
ABB DRIVES FOR WATER

ACQ580 pump control program

Firmware manual



Related documents are listed on page [15](#).

**ACQ580
pump control program**

Firmware manual



Table of contents

1. Introduction to the manual

2. Start-up, control with I/O and ID run

3. Control panel

4. Settings, I/O and diagnostics on the control panel

5. Default I/O configuration

6. Program features

7. Fault tracing

8. Fieldbus control through the embedded fieldbus interface (EFB)

9. Fieldbus control through a fieldbus adapter

10. Control chain diagrams

11. Parameters

12. Additional parameter data



Table of contents

1. Introduction to the manual

| | |
|--------------------------------|----|
| Contents of this chapter | 13 |
| Applicability | 13 |
| Safety instructions | 13 |
| Target audience | 14 |
| Purpose of the manual | 14 |
| Contents of this manual | 14 |
| Related documents | 15 |
| Categorization by frame (size) | 16 |
| Cybersecurity disclaimer | 19 |

2. Start-up, control with I/O and ID run

| | |
|--|----|
| Contents of this chapter | 21 |
| How to start up the drive | 22 |
| How to start up the drive using the First start assistant on the Hand-Off-Auto control panel | 22 |
| How to control the drive through the I/O interface | 28 |
| How to perform the ID run | 29 |
| ID run procedure with the ID Run assistant | 30 |

3. Control panel

| | |
|--|----|
| Contents of this chapter | 35 |
| Removing and reinstalling the control panel | 35 |
| Layout of the standard Hand-Off-Auto panel control panel | 36 |
| Layout of the control panel display | 37 |
| Home view displays | 40 |
| IPC and Level control additional Home view displays | 41 |
| Keys | 42 |
| Key shortcuts | 43 |

4. Settings, I/O and diagnostics on the control panel

| | |
|--------------------------|----|
| Contents of this chapter | 45 |
| Primary settings | 46 |
| Start, stop, reference | 47 |
| Motor | 49 |
| Pump features | 51 |
| PID control | 53 |
| Multipump control | 55 |
| Ramps | 58 |
| Limits | 59 |
| Fieldbus | 60 |
| Fault functions | 64 |



6 Table of contents

| | |
|------------------------|----|
| Security | 65 |
| Advanced functions | 66 |
| Clock, region, display | 68 |
| Reset to defaults | 70 |
| I/O menu | 71 |
| Diagnostics menu | 72 |
| System info menu | 74 |
| Energy efficiency menu | 75 |
| Backups menu | 77 |

5. Default I/O configuration

| | |
|--------------------------|----|
| Contents of this chapter | 79 |
| Water default | 80 |

6. Program features

| | |
|---|-----|
| What this chapter contains | 83 |
| Local control vs. external control | 83 |
| Local control | 84 |
| External control | 85 |
| Operating modes of the drive | 86 |
| Drive configuration and programming | 87 |
| Configuring via default configurations | 87 |
| Configuring via menus | 87 |
| Configuring via parameters | 87 |
| Adaptive programming | 88 |
| Control interfaces | 91 |
| Programmable analog inputs | 91 |
| Programmable analog outputs | 91 |
| Programmable digital inputs and outputs | 91 |
| Programmable frequency input and output | 91 |
| Programmable relay outputs | 92 |
| Programmable I/O extensions | 92 |
| Fieldbus control | 93 |
| Control of a line supply unit (LSU) | 93 |
| Pump control features | 95 |
| Intelligent pump control (IPC) | 95 |
| Application example: IPC system with three drives and three pumps | 100 |
| Single pump control (PFC/SPFC) | 106 |
| Level control | 113 |
| Soft pipe fill | 115 |
| Sensorless flow calculation | 115 |
| Pump cleaning | 118 |
| Dry pump protection | 121 |
| Pump inlet and outlet protection | 121 |
| Ramps – Quick ramps | 122 |
| Automatic fault resets | 123 |
| External events | 124 |
| Constant speeds/frequencies | 124 |
| Critical speeds/frequencies | 124 |



| | |
|--|-----|
| Timed functions | 126 |
| Ramps | 128 |
| Overview | 128 |
| Functionality | 128 |
| Process PID control (PID/Loop controller) | 130 |
| Limits | 133 |
| Limits overview | 133 |
| Interlocks | 134 |
| Overview | 134 |
| Configuration | 134 |
| Wiring connections | 135 |
| Functionality | 135 |
| Run permissives | 136 |
| Overview | 136 |
| Configuration | 136 |
| Wiring connections | 136 |
| Functionality | 137 |
| Application example 1: Valve opening | 137 |
| Motor control | 138 |
| Frequency control mode | 138 |
| Scalar motor control | 138 |
| Speed control mode | 139 |
| Vector control | 139 |
| Motor types | 139 |
| Motor identification | 140 |
| U/f ratio | 140 |
| Flux braking | 141 |
| Start methods – DC magnetization | 142 |
| Switching frequency | 144 |
| Motor thermal protection | 145 |
| Motor overload protection | 151 |
| Speed control performance figures | 153 |
| Torque control performance figures | 153 |
| Motor potentiometer | 154 |
| DC voltage control | 155 |
| Overvoltage control | 155 |
| Undervoltage control (power loss ride-through) | 155 |
| Voltage control and trip limits | 157 |
| Brake chopper | 159 |
| Supervisory | 161 |
| Signal supervision | 161 |
| User load curve (Condition monitoring) | 161 |
| Energy efficiency | 163 |
| Energy optimization | 163 |
| Energy saving calculators | 163 |
| Load analyzer | 164 |
| User parameter sets | 166 |
| System safety and protections | 167 |
| Fixed/Standard protections | 167 |
| Programmable protection functions | 167 |
| Emergency stop | 168 |



| | |
|--------------------------------------|-----|
| Diagnostics | 170 |
| Diagnostics menu | 170 |
| Miscellaneous | 171 |
| Backup and restore | 171 |
| Data storage parameters | 172 |
| Parameter checksum calculation | 172 |
| User lock | 174 |
| Sine filter support | 174 |

7. Fault tracing

| | |
|---|-----|
| What this chapter contains | 177 |
| Safety | 177 |
| Indications | 177 |
| Warnings and faults | 177 |
| Pure events | 178 |
| Editable messages | 178 |
| Warning/fault history | 178 |
| Event log | 178 |
| Viewing warning/fault information | 179 |
| QR code generation for mobile service application | 179 |
| Warning messages | 180 |
| Fault messages | 192 |
| Warnings and faults from the LSU supply unit | 205 |
| Warning messages | 205 |
| Fault messages | 206 |

8. Fieldbus control through the embedded fieldbus interface (EFB)

| | |
|---|-----|
| What this chapter contains | 209 |
| System overview | 209 |
| Connecting the drive to the fieldbus | 209 |
| Setting up the embedded fieldbus interface | 211 |
| Setting the drive control parameters | 212 |
| Basics of the embedded fieldbus interface | 214 |
| Control word and Status word | 215 |
| References | 215 |
| Actual values | 215 |
| Data input/outputs | 215 |
| Register addressing | 215 |
| About the control profiles | 217 |
| Control Word | 218 |
| Control Word for the ABB Drives profile | 218 |
| Control Word for the DCU Profile | 219 |
| Status Word | 222 |
| Status Word for the ABB Drives profile | 222 |
| Status Word for the DCU Profile | 223 |
| State transition diagrams | 225 |
| State transition diagram for the ABB Drives profile | 225 |
| References | 228 |
| References for the ABB Drives profile and DCU Profile | 228 |



| | |
|--|-----|
| Actual values | 229 |
| Actual values for the ABB Drives profile and DCU Profile | 229 |
| Modbus holding register addresses | 230 |
| Modbus holding register addresses for the ABB Drives profile and DCU Profile | 230 |
| Modbus function codes | 231 |
| Exception codes | 232 |
| Coils (0xxxx reference set) | 233 |
| Discrete inputs (1xxxx reference set) | 235 |
| Error code registers (holding registers 400090...400100) | 237 |

9. Fieldbus control through a fieldbus adapter

| | |
|---|-----|
| What this chapter contains | 239 |
| System overview | 239 |
| Basics of the fieldbus control interface | 241 |
| Control word and Status word | 242 |
| References | 243 |
| Actual values | 244 |
| Contents of the fieldbus Control word (ABB Drives profile) | 245 |
| Contents of the fieldbus Status word (ABB Drives profile) | 246 |
| The state diagram | 247 |
| Setting up the drive for fieldbus control | 248 |
| Parameter setting example: FPBA (PROFIBUS DP) with ABB Drives profile | 249 |
| Parameter setting example: FPBA (PROFIBUS DP) with PROFIdrive profile | 251 |
| Automatic drive configuration for fieldbus control | 253 |

10. Control chain diagrams

| | |
|---|-----|
| Contents of this chapter | 255 |
| Frequency reference selection | 256 |
| Frequency reference modification | 257 |
| Speed reference source selection II | 258 |
| Speed reference ramping and shaping | 259 |
| Speed error calculation | 260 |
| Speed feedback | 261 |
| Speed controller | 262 |
| Torque limitation | 263 |
| PID flow calculation | 264 |
| PID setpoint compensation | 265 |
| Process PID setpoint and feedback source selection | 266 |
| Process PID controller | 267 |
| External PID setpoint and feedback source selection | 268 |
| External PID controller | 269 |
| | 270 |

11. Parameters

| | |
|-----------------------------|-----|
| What this chapter contains | 271 |
| Terms and abbreviations | 272 |
| Summary of parameter groups | 273 |
| Parameter listing | 275 |



| | |
|---|-----|
| 01 Actual values | 275 |
| 03 Input references | 279 |
| 04 Warnings and faults | 280 |
| 05 Diagnostics | 282 |
| 06 Control and status words | 285 |
| 07 System info | 294 |
| 10 Standard DI, RO | 296 |
| 11 Standard DIO, FI, FO | 306 |
| 12 Standard AI | 307 |
| 13 Standard AO | 312 |
| 15 I/O extension module | 317 |
| 19 Operation mode | 326 |
| 20 Start/stop/direction | 327 |
| 21 Start/stop mode | 333 |
| 22 Speed reference selection | 341 |
| 23 Speed reference ramp | 349 |
| 24 Speed reference conditioning | 350 |
| 25 Speed control | 351 |
| 28 Frequency reference chain | 354 |
| 30 Limits | 361 |
| 31 Fault functions | 368 |
| 32 Supervision | 377 |
| 34 Timed functions | 384 |
| 35 Motor thermal protection | 392 |
| 36 Load analyzer | 403 |
| 37 User load curve | 406 |
| 40 Process PID set 1 | 409 |
| 41 Process PID set 2 | 426 |
| 43 Brake chopper | 428 |
| 45 Energy efficiency | 430 |
| 46 Monitoring/scaling settings | 435 |
| 47 Data storage | 438 |
| 49 Panel port communication | 439 |
| 50 Fieldbus adapter (FBA) | 440 |
| 51 FBA A settings | 444 |
| 52 FBA A data in | 445 |
| 53 FBA A data out | 446 |
| 58 Embedded fieldbus | 446 |
| 60 DDCS communication | 454 |
| 61 D2D and DDCS transmit data | 454 |
| 62 D2D and DDCS receive data | 455 |
| 71 External PID1 | 455 |
| 76 Multipump configuration | 457 |
| 77 Multipump maintenance and monitoring | 469 |
| 80 Flow calculation and protection | 471 |
| 81 Sensor settings | 475 |
| 82 Pump protections | 477 |
| 83 Pump cleaning | 480 |
| 94 LSU control | 482 |
| 95 HW configuration | 484 |
| 96 System | 487 |



| | |
|---|-----|
| 97 Motor control | 497 |
| 98 User motor parameters | 501 |
| 99 Motor data | 503 |
| Differences in the default values between 50 Hz and 60 Hz supply frequency settings | 509 |

12. Additional parameter data

| | |
|----------------------------------|-----|
| What this chapter contains | 511 |
| Terms and abbreviations | 511 |
| Fieldbus addresses | 512 |
| Parameter groups 1...9 | 513 |
| Parameter groups 10...99 | 517 |

Further information

| | |
|--|-----|
| Product and service inquiries | 549 |
| Product training | 549 |
| Providing feedback on ABB Drives manuals | 549 |
| Document library on the Internet | 549 |



1

Introduction to the manual

Contents of this chapter

The chapter describes applicability, target audience and purpose of this manual. It also describes the contents of this manual and refers to a list of related manuals for more information.

Applicability

The manual applies to the ACQ580 pump control program (version 2.09 and later).

To check the firmware version of the control program in use, see system information (select **Menu > System info > Drive**) or parameter [07.05 Firmware version](#) on the control panel.

For ACQ580-31 and ACQ580-34, to check the LSU firmware version in use, select **Menu > Options > Select drive > QCON-21** and then select **Menu > System info > Drive**, or see parameters [07.106 LSU loading package name](#) and [07.107 LSU loading package version](#) on the control panel.

Safety instructions

Follow all safety instructions.

- Read the **complete safety instructions** in the *Hardware manual* of the drive before you install, commission, or use the drive.
 - Read the **firmware function-specific warnings and notes** before changing parameter values. These warnings and notes are included in the parameter descriptions presented in chapter [Parameters](#) on page [177](#).
-

Target audience

The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

The manual is written for readers worldwide. Both SI and imperial units are shown. Special US instructions for installations in the United States are given.

Purpose of the manual

This manual provides information needed for designing, commissioning, or operating the drive system.

Contents of this manual

The manual consists of the following chapters:

- [Introduction to the manual](#) (this chapter) describes applicability, target audience, purpose and contents of this manual. At the end, it lists terms and abbreviations.
 - [Start-up, control with I/O and ID run](#) (page 21) describes how to start up the drive as well as how to start, change the direction of the motor rotation and adjust the motor speed through the I/O interface.
 - [Control panel](#) (page 35) contains instructions for removing and reinstalling the assistant control panel and briefly describes its display, keys and key shortcuts.
 - [Settings, I/O and diagnostics on the control panel](#) (page 45) describes the simplified settings and diagnostic functions provided on the assistant control panel.
 - [Default I/O configuration](#) (page 79) contains the connection diagram of the Water default configuration together with a connection diagram. The predefined default configuration will save the user time when configuring the drive.
 - [Program features](#) (page 83) describes program features with lists of related user settings, actual signals, and fault and warning messages.
 - [Fieldbus control through the embedded fieldbus interface \(EFB\)](#) (page 209) describes the communication to and from a fieldbus network using the drive embedded fieldbus interface with the Modbus RTU protocol.
 - [Fieldbus control through a fieldbus adapter](#) (page 239) describes the communication to and from a fieldbus network using an optional fieldbus adapter module.
 - [Fault tracing](#) (page 177) lists the warning and fault messages with possible causes and remedies.
 - [Control chain diagrams](#) (page 255) describes the parameter structure within the drive.
 - [Parameters](#) (page 177) describes the parameters used to program the drive.
 - [Additional parameter data](#) (page 511) contains further information on the parameters.
-

- [Further information](#) (inside of the back cover, page 549) describes how to make product and service inquiries, get information on product training, provide feedback on ABB Drives manuals and find documents on the Internet.

Related documents

You can find manuals and other product documents in PDF format on the Internet. See section [Document library on the Internet](#) on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative

| Drive manuals and guides | Code (English) |
|--|---------------------------------|
| <i>ACQ580 pump control program firmware manual</i> | 3AXD50000035867 |
| <i>ACQ580-01 (0.75 to 250 kW, 1.0 to 350 hp) hardware manual</i> | 3AXD50000044862 |
| <i>ACQ580-31 hardware manual</i> | 3AXD50000045935 |
| <i>ACQ580-34 hardware manual</i> | 3AXD50000420025 |
| <i>ACQ580-01 quick installation and start-up guide for frames R1 to R5</i> | 3AXD50000044864 |
| <i>ACQ580-01 quick installation and start-up guide for frames R6 to R9</i> | 3AXD50000037301 |
| <i>ACQ580-01 US quick installation and start-up guide</i> | 3AXD50000049128 |
| <i>Quick start-up guide for ACQ580 pump control program</i> | 3AXD50000048773 |
| <i>ACQ580-31 quick installation guide</i> | 3AXD50000049859 |
| <i>ACQ580-34 quick installation guide</i> | 3AXD50000424634 |
| <i>Adaptive programming application guide</i> | 3AXD50000028574 |
| <i>ACx-AP-x assistant control panels user's manual</i> | 3AUA0000085685 |
| Option manuals and guides | |
| <i>CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual</i> | 3AXD50000030058 |
| <i>CDPI-01 communication adapter module user's manual</i> | 3AXD50000009929 |
| <i>FCAN-01 CANopen adapter module user's manual</i> | 3AFE68615500 |
| <i>FDNA-01 DeviceNet™ adapter module user's manual</i> | 3AFE68573360 |
| <i>FEIP-21 Ethernet/IP adapter module user's manual</i> | 3AXD50000158621 |
| <i>FENA-01/-11/-21 Ethernet adapter module user's manual</i> | 3AUA00000093568 |
| <i>FMBT-21 Modbus/TCP adapter module user's manual</i> | 3AXD50000158607 |
| <i>FPBA-01 PROFIBUS DP adapter module user's manual</i> | 3AFE68573271 |
| <i>FPNO-21 PROFINET adapter module user's manual</i> | 3AXD50000158614 |
| <i>FSCA-01 RS-485 adapter module user's manual</i> | 3AUA0000109533 |
| <i>Flange mounting kit installation supplement</i> | 3AXD50000019100 |
| <i>Flange mounting kit quick installation guide for ACX580-01 frames R1 to R3</i> | 3AXD50000119172 |
| <i>Flange mounting kit quick installation guide for ACS580-01, ACH580-01 and ACQ580-01 frames R4 to R5</i> | 3AXD50000287093 |

| | |
|--|----------------------------------|
| <i>Flange mounting kit quick installation guide for ACS880-01 and ACX580-01 frames R6 to R9</i> | 3AXD50000019099 |
| <i>Flange mounting kit quick installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31 frame R3</i> | 3AXD500000181506 |
| <i>Flange mounting kit quick installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31 frames R6 and R8</i> | 3AXD500000133611 |
| <i>ACS580, ACH580 and ACQ580 drive module frames R3, R5 to R9 for cabinet installation (options +P940 and +P944 supplement</i> | 3AXD500000210305 |
| <i>Main switch and EMC C1 filter options (+F278, +F316, +E223) installation supplement for ACS580-01, ACH580-01 and ACQ580-01 IP55 frames R1 to R5</i> | 3AXD500000155132 |
| <i>Common mode filter kit for frames R7 and R8 (option +E208) installation guide</i> | 3XD50000015179 |
| <i>UK gland plate (+H358) installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31</i> | 3AXD500000110711 |
| <i>UL Type 12 hood quick installation guide for ACS580-01, ACH580-01 and ACQ580-01 frames R1 to R9</i> | 3AXD500000196067 |

Tool and maintenance manuals and guides

| | |
|---|---------------------------------|
| <i>Drive composer PC tool user's manual</i> | 3AUA00000094606 |
| <i>Converter module capacitor reforming instructions</i> | 3BFE64059629 |
| <i>NETA-21 remote monitoring tool user's manual</i> | 3AUA00000096939 |
| <i>NETA-21 remote monitoring tool installation and start-up guide</i> | 3AUA00000096881 |



[ACQ580-01 manuals](#)

Categorization by frame (size)

The ACQ580 is manufactured in several frames (frame sizes), which are denoted as RN, where N is an integer. Some information which only concern certain frames are marked with the symbol of the frame (RN).

The frame is marked on the type designation label attached to the drive, see chapter *Operation principle and hardware description*, section *Type designation label* in the *Hardware manual* of the drive.

Terms and abbreviations

| Term/abbreviation | Explanation |
|--------------------|---|
| ACx-AP-x | Assistant control panel, advanced operator keypad for communication with the drive. The default assistant control panel for the ACQ580 is ACH-AP-H (Hand-Off-Auto control panel). |
| AI | Analog input; interface for analog input signals |
| AO | Analog output; interface for analog output signals |
| Brake chopper | Conducts the surplus energy from the intermediate circuit of the drive to the brake resistor when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor. |
| Brake resistor | Dissipates the drive surplus braking energy conducted by the brake chopper to heat. Essential part of the brake circuit. See chapter <i>Brake chopper</i> in the <i>Hardware manual</i> of the drive. |
| Control board | Circuit board in which the control program runs. |
| CCA-01 | Cold configuration adapter |
| CDPI-01 | Communication adapter module |
| CHDI-01 | Optional 115/230 V digital input extension module |
| CMOD-01 | Optional multifunction extension module (external 24 V AC/DC and digital I/O extension) |
| CMOD-02 | Optional multifunction extension module (external 24 V AC/DC and isolated PTC interface) |
| CPTC-02 | Optional multifunction extension module (external 24 V and ATEX certified PTC interface) |
| CRC | Cyclic redundancy check. The IPC checks the parameter group validity in terms of CRC. |
| DC link | DC circuit between rectifier and inverter |
| DC link capacitors | Energy storage which stabilizes the intermediate circuit DC voltage |
| DDCS | Distributed drives communication system; a protocol used in communication between ABB drive equipment, used for ACQ580-31 and ACQ580-34 drives. |
| DI | Digital input; interface for digital input signals |
| DO | Digital output; interface for digital output signals |
| DPMP-01 | Mounting platform for ACx-AP control panel (flange mounting) |
| DPMP-02/03 | Mounting platform for ACx-AP control panel (surface mounting) |
| Drive | Frequency converter for controlling AC motors |
| EFB | Embedded fieldbus |
| FBA | Fieldbus adapter |
| FCAN-01 | Optional CANopen adapter module |
| FDNA-01 | Optional DeviceNet adapter module |
| FEIP-21 | Optional Ethernet/IP adapter module |

| Term/abbreviation | Explanation |
|----------------------|--|
| FENA-21 | Optional Ethernet adapter module for EtherNet/IP, Modbus TCP and PROFINET IO protocols |
| FMBA-01 | Optional Modbus RTU adapter module |
| FMBT-21 | Optional Modbus/TCP adapter module |
| FPBA-01 | Optional PROFIBUS DP adapter module |
| FPNO-21 | Optional PROFINET adapter module |
| Frame (size) | Refers to drive physical size, for example, R1 and R2. The type designation label attached to the drive shows the frame of the drive, see chapter <i>Operation principle and hardware description</i> , section <i>Type designation label</i> in the <i>Hardware manual</i> of the drive. |
| FSCA-01 | Optional RSA-485 adapter module |
| FW Part 1 | ACQ580 pump control program firmware manual, Part 1 (3AXD50000266449 [English]). This printed manual includes all chapters except Parameters and Additional parameter data. The abbreviation is used in FW Part 2 to refer to items in FW Part 1. |
| FW Part 2 | ACQ580 pump control program firmware manual, Part 2 Parameters (3AXD50000266463 [English]). This printed manual includes chapters Parameters and Additional parameter data. The abbreviation is used in FW Part 1 to refer to items in FW Part 2. |
| ID run | Motor identification run. During the identification run, the drive will identify the characteristics of the motor for optimum motor control. |
| IGBT | Insulated gate bipolar transistor |
| Intermediate circuit | See DC link . |
| Inverter | Converts direct current and voltage to alternating current and voltage. |
| I/O | Input/Output |
| IPC | Intelligent pump control |
| LSW | Least significant word |
| NETA-21 | Remote monitoring tool |
| Network control | With fieldbus protocols based on the Common Industrial Protocol (CIP™), such as DeviceNet and Ethernet/IP, denotes the control of the drive using the Net Ctrl and Net Ref objects of the ODVA AC/DC Drive Profile. For more information, see www.odva.org , and the following manuals: <ul style="list-style-type: none"> • <i>FDNA-01 DeviceNet adapter module user's manual</i> (3AFE68573360 [English]), and • <i>FENA-01/-11/-21 Ethernet adapter module user's manual</i> (3AUA0000093568 [English]) • <i>FEIP-21 Ethernet/IP adapter module user's manual</i> (3AXD50000158621 [English]). |
| Parameter | User-adjustable operation instruction to the drive, or signal measured or calculated by the drive |
| PFC | Single pump control. One drive controls multiple pumps with motors. |

| Term/abbreviation | Explanation |
|--|---|
| PID/Loop controller | Proportional–integral–derivative controller, also known as closed loop controller. Drive speed control is based on PID algorithm. |
| PLC | Programmable logic controller |
| PROFIBUS, PROFIBUS DP, PROFINET IO | Registered trademarks of PI - PROFIBUS & PROFINET International |
| PTC | Positive temperature coefficient, thermistor whose resistance is dependent on temperature. |
| R1, R2 ... R11 | Frame (size) |
| RO | Relay output; interface for a digital output signal. Implemented with a relay. |
| Rectifier | Converts alternating current and voltage to direct current and voltage. |
| SPFC | Soft pump control. One drive controls multiple pumps with motors. |
| STO | Safe torque off. See chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive. |

Cybersecurity disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

2

2

Start-up, control with I/O and ID run

Contents of this chapter










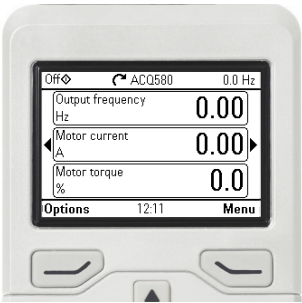
The chapter describes how to:












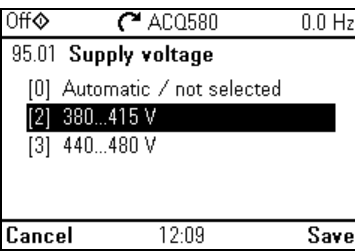


- perform the start-up
- start, stop, change the direction of the motor rotation and adjust the speed of the motor through the I/O interface
- perform an Identification run (ID run) for the drive.





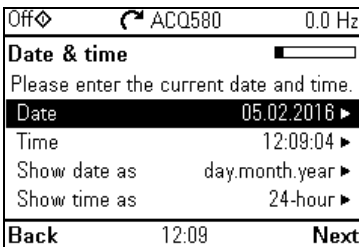






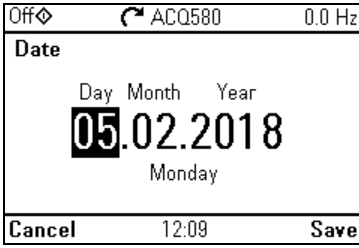




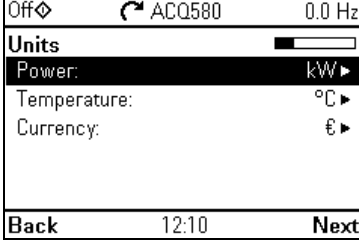


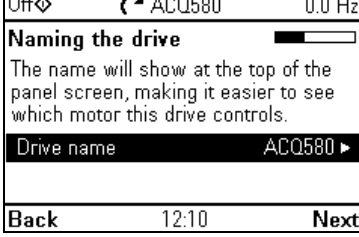
How to start up the drive

Note: Automatic selection of supply voltage is not supported in ACQ580-31 and ACQ580-34. You must select the supply voltage manually using parameter [95.01 Supply voltage](#). Follow the instructions below.

How to start up the drive using the First start assistant on the Hand-Off-Auto control panel

| Safety | |
|---|--|
|  Do not start-up the drive unless you are a qualified electrician. Read and obey the instructions in chapter <i>Safety instructions</i> at the beginning of the <i>Hardware manual</i> of the drive. Ignoring the instructions can cause physical injury or death, or damage to the equipment | |
| <input type="checkbox"/> | Check the installation. See chapter <i>Installation checklist</i> in the <i>Hardware manual</i> of the drive. |
| <input type="checkbox"/> |  Make sure there is no active start on (DI1 in factory settings, that is, Water default configuration). The drive will start up automatically at power-up if the external run command is on and the drive is in the external control mode. Check that the starting of the motor does not cause any danger. De-couple the driven machine if <ul style="list-style-type: none">• there is a risk of damage in case of an incorrect direction of rotation, or• a Normal ID run is required during the drive start-up, when the load torque is higher than 20% or the machinery is not able to withstand the nominal torque transient during the ID run. |
| Hints on using the assistant control panel | |
| <p>The two commands at the bottom of the display (Options and Menu in the figure on the right), show the functions of the two softkeys  and  located below the display. The commands assigned to the softkeys vary depending on the context.</p> <p>Use keys , ,  and  to move the cursor and/or change values depending on the active view.</p> <p>Key  shows a context-sensitive help page.</p> <p>For more information, see <i>ACx-AP-x assistant control panels user's manual</i> (3AUA0000085685 [English]).</p> |  |
| 1 – First start assistant guided settings: Language, date and time, and motor nominal values | |
| <input type="checkbox"/> | Have the motor or pump name plate data at hand. Power up the drive. |

| | | |
|--------------------------|--|--|
| <input type="checkbox"/> | <p>The First start assistant guides you through the first start-up.</p> <p>The assistant begins automatically. Wait until the control panel enters the view shown on the right. Select the language you want to use by highlighting it (if not already highlighted) and pressing  (OK).</p> |  <p>English Deutsch Suomi Français Italiano Svenska Español</p> <p>OK ►</p> |
| <input type="checkbox"/> | <p>ACQ580-31 and ACQ580-34 drives: Select the supply voltage with parameter 95.01 Supply voltage:</p> <ul style="list-style-type: none"> In the First start assistant menu, select Exit and press  (Next). In the Home view, press  (Menu) to enter the Main menu. In the Main menu, go to Parameters > Complete list > 95 HW configuration by selecting the correct row and pressing  (Select) repeatedly. Select parameter 95.01 Supply voltage and press  (Edit). Select supply voltage 380...415 or 440...480 using keys  and . Press  (Save). Go back to the Main menu by pressing  (Back) repeatedly. In the Main menu, select First start assistant and press  (Select) to enter the First start assistant menu. Continue with the following steps for commissioning the ACQ580. |  <p>Off ◊ ACQ580 0.0 Hz</p> <p>95.01 Supply voltage</p> <p>[0] Automatic / not selected [2] 380...415 V [3] 440...480 V</p> <p>Cancel 12:09 Save</p> |
| <input type="checkbox"/> | <p>Select Start set-up and press  (Next).</p> |  <p>Off ◊ ACQ580 0.0 Hz</p> <p>First start assistant</p> <p>Set up drive now?</p> <p>Start set-up Exit & don't show at power-up Not now</p> <p>12:09 Next</p> |

| | | |
|--------------------------|---|--|
| <input type="checkbox"/> | <p>Set the date and time as well as date and time display formats.</p> <ul style="list-style-type: none"> Go to the edit view of a selected row by pressing . Scroll the view with  and . <p>Go to the next view by pressing  (Next).</p> |  |
| <input type="checkbox"/> | <p>To change a value in an edit view:</p> <ul style="list-style-type: none"> Use  and  to move the cursor left and right. Use  and  to change the value. Press  (Save) to accept the new setting, or press  (Cancel) to go back to the previous view without making changes. |  |
| <input type="checkbox"/> | <p>Change the units shown on the control panel if needed.</p> <ul style="list-style-type: none"> Go to the edit view of a selected row by pressing . Scroll the view with  and . <p>Go to the next view by pressing  (Next).</p> |  |
| <input type="checkbox"/> | <p>To give the drive a name that will be shown at the top, press .</p> <p>If you do not want to change the default name (ACQ580), continue by pressing  (Next).</p> <p>Hint: Name the drive, for example, Pump 1.</p> |  |

Refer to the motor or pump nameplate for the following nominal value settings of the motor. Enter the values exactly as shown on the motor or pump nameplate.

Example of a nameplate of an induction (asynchronous) motor:

| ABB Motors CE | | | | | | | | | |
|----------------------------|----|----|-------|------|------------|-------|------|--|--|
| 3 ~ motor M2AA 200 MLA 4 | | | | | | | | | |
| IEC 200 M/L 55 | | | | | | | | | |
| No | | | | | | | | | |
| Ins.cl. F IP 55 | | | | | | | | | |
| V | Hz | kW | r/min | A | cos ϕ | IA/IN | tE/s | | |
| 690 Y | 50 | 30 | 1475 | 32.5 | 0.83 | | | | |
| 400 D | 50 | 30 | 1475 | 56 | 0.83 | | | | |
| 660 Y | 50 | 30 | 1470 | 34 | 0.83 | | | | |
| 380 D | 50 | 30 | 1470 | 59 | 0.83 | | | | |
| 415 D | 50 | 30 | 1475 | 54 | 0.83 | | | | |
| 440 D | 60 | 35 | 1770 | 59 | 0.83 | | | | |
| Cat. no 3GAA 202 001 - ADA | | | | | | | | | |
| 6312/C3 6210/C3 180 kg | | | | | | | | | |
| IEC 34-1 | | | | | | | | | |

- ☐ Check that the motor data is correct. Values are predefined on the basis of the drive size but you should verify that they correspond to the motor. Start with the motor type. Go to the edit view of a selected row by pressing .
- Scroll the view with and .
- Motor nominal cos ϕ and nominal torque are optional.
- Press (**Next**) to continue.

Off ACQ580 0.0 Hz

Motor nominal values

Find the values on the motor's nameplate, and enter them here:

Type: Asynchronous motor

Current: 1.8 A

Voltage: 400.0 V

Back 12:10 Next

- ☐ Adjust the limits according to your needs.
- Go to the edit view of a selected row by pressing .
 - Scroll the view with and .
- Go to the next view by pressing (**Next**).

Off ACQ580 0.0 Hz

Limits

Check the allowed operation range:

Minimum frequency 0.00 Hz

Maximum frequency 50.00 Hz

Back 12:10 Next

- ☐ If you want to make a backup of the settings made so far, select **Backup** and press (**Next**). If you do not want to make a backup, select **Not now** and press (**Next**).

Off ACQ580 0.0 Hz


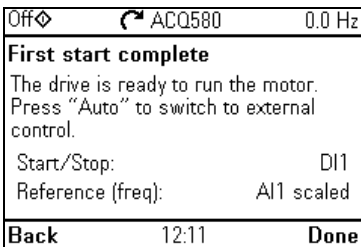


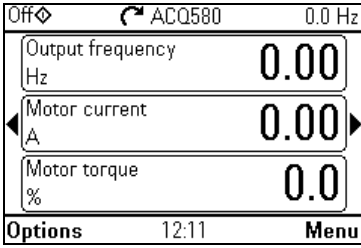






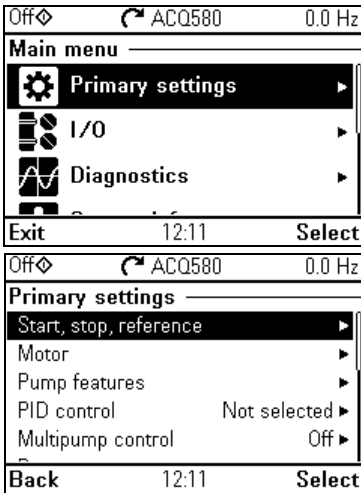
Make backup?

Copies all settings into a backup file stored in the control panel. To restore a backup, go to Menu > Backups.

Backup

Not now

Back 12:10 Next

| | | |
|---|---|--|
| <input type="checkbox"/> | <p>The first start is now complete and the drive is ready for use.</p> <p>Press  (Done) to enter the Home view.</p> |  |
| <input type="checkbox"/> | <p>The Home view 1 monitoring the values of the selected signals is shown on the control panel.</p> <p>There are four preconfigured Home view displays. Home view 1 is the default Home view. You can browse them with keys  and . See section Home view displays on page 40.</p> |  |
| <h2>2 – Additional settings in the Primary settings menu</h2> | | |
| <input type="checkbox"/> | <p>Make any additional adjustments, for example, pump protections, starting from the Main menu – press  (Menu) to enter the Main menu.</p> <p>Select Primary settings and press  (Select) (or ).</p> <p>In the Primary settings menu, select Pump features and press  (Select) (or ).</p> <p>To get more information on the Primary settings menu items, press  to open the help page.</p> |  |

3 – Hand/Off/Auto operation

- The drive can be in remote control or local control, and in local control there are additionally two different modes.

Remote control: Drive is controlled from the I/O or the fieldbus.

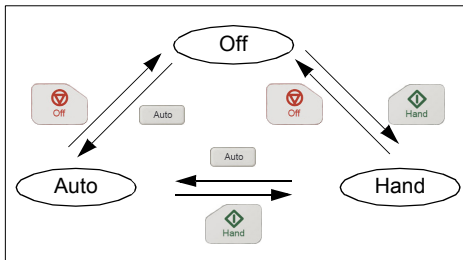
- Top row of the view shows Auto.

Local control: Drive is controlled from the control panel.

- Top row of the view shows Off, that is, the drive is in the Off mode. Drive is stopped.
- Top row of the view shows Hand, that is, the drive is in the Hand mode. Drive is running. The initial reference in the Hand mode is copied from the drive reference.

Symbol \blacktriangleleft on the top row indicates that you can change the reference with \blacktriangleup and \blacktriangledown .

The following diagram shows the state transitions when you press the Hand, Off or Auto button:



Note: When you restart the drive while fault 7081 Control panel loss is active, the mode changes from Hand or Off to Auto.

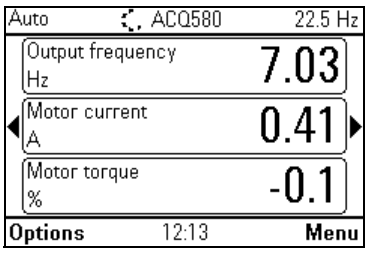
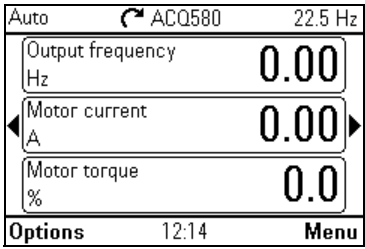
| | | |
|---|--------|---------|
| Auto | ACQ580 | 30.0 Hz |
| Output frequency | Hz | 30.00 |
| Motor current | A | 0.46 |
| Motor torque | % | 8.9 |
| Options | 12:30 | Menu |
| Off | ACQ580 | 0.0 Hz |
| Output frequency | Hz | 0.00 |
| Motor current | A | 0.00 |
| Motor torque | % | 0.0 |
| Options | 12:37 | Menu |
| Hand | ACQ580 | 30.0 Hz |
| Output frequency | Hz | 30.00 |
| Motor current | A | 0.46 |
| Motor torque | % | 8.8 |
| Reference | 12:38 | Menu |
| Off | ACQ580 | 0.0 Hz |
| <div> Fault 7081 Aux code: 0000 0000 Control panel loss 12:41:43 Control panel loss fault </div> | | |
| Hide | 12:42 | Reset |

How to control the drive through the I/O interface

The table below describes how to operate the drive through the digital and analog inputs when:

2

- the motor start-up is performed, and
- the default parameter settings of the Water default configurations are in use.

| Preliminary settings | |
|--|--|
| <p>If you need to change the direction of rotation, check that limits allow reverse direction: Check parameter group 30 Limits and make sure that the minimum limit has a negative value and the maximum limit has a positive value.</p> <p>Default settings only allow forward direction.</p> <p>Note: Efficient pump cleaning can require reverse speed.</p> <p>Make sure that the control connections are wired according to the connection diagram given for the Water default.</p> <p>Make sure that the drive is in external control. To switch to external control, press key Auto.</p> | <p>See section Water default on page 80.</p> <p>In external control, the control panel display shows text Auto at the top left.</p> |
| Starting and controlling the speed of the motor | |
| <p>Start by switching digital input DI1 on.</p> <p>The arrow starts rotating. It is dotted until the setpoint is reached.</p> <p>Regulate the drive output frequency (motor speed) by adjusting voltage of analog input AI1.</p> <p>Note: If the drive will not start, check that the start interlock 1 (parameter 20.41) is active (1). For the Water default, the start interlock 1 is connected to DI4 by default.</p> |  |
| Stopping the motor | |
| <p>Switch digital input DI1 off. The arrow stops rotating.</p> |  |

How to perform the ID run

The drive automatically estimates motor characteristics using *Standstill* ID run when the drive is started for the first time in vector control and after any motor parameter (group *99 Motor data*) is changed. This is valid when

- parameter *99.13 ID run requested* selection is *Standstill* and
- parameter *99.04 Motor control mode* selection is *Vector*.

In most applications there is no need to perform a separate ID run. The ID run should be selected manually if:

- vector control mode is used (parameter *99.04 Motor control mode* is set to *Vector*), and
- permanent magnet motor (PM) is used (parameter *99.03 Motor type* is set to *Permanent magnet motor*), or
- synchronous reluctance motor (SynRM) is used (parameter *99.03 Motor type* is set to *SynRM*), or
- drive operates near zero speed references, or
- operation at torque range above the motor nominal torque, over a wide speed range is needed.

Do the ID run with the ID run assistant by selecting **Menu > Primary settings > Motor > ID run** (see page 30).

Note: If motor parameters (*99 Motor data*) are changed after the ID run, it must be repeated.

Note: If you have already parameterized your application using the scalar motor control mode (*99.04 Motor control mode* is set to *Scalar*) and you need to change motor control mode to *Vector*,

- change the control mode to vector with the **Control mode** assistant (go to **Menu > Primary settings > Motor > Control mode**) and follow the instructions. The ID run assistant then guides you through the ID run.

or

- set parameter *99.04 Motor control mode* to *Vector*, and
 - for I/O controlled drive, check parameters in groups *22 Speed reference selection*, *23 Speed reference ramp*, *12 Standard AI*, *30 Limits* and *46 Monitoring/scaling settings*.

ID run procedure with the ID Run assistant

2

Pre-check

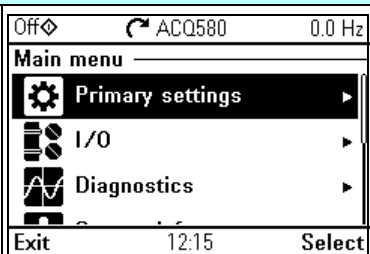


WARNING! The motor will run at up to approximately 50...80% of the nominal speed during the ID run. The motor will rotate in the forward direction. **Make sure that it is safe to run the motor before performing the ID run!**

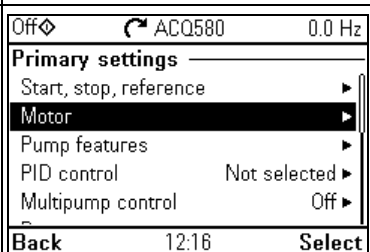
- ☐ De-couple the motor from the pump.
 - ☐ Check that the values of the motor data parameters are equivalent to those on the motor nameplate.
 - ☐ Check that the STO circuit is closed.
- If parameter values (from group **10 Standard DI, RO** to group **99 Motor data**) are changed before the ID run, check that the new settings meet the following conditions:
- ☐ **30.11 Minimum speed** ≤ 0 rpm
 - ☐ **30.12 Maximum speed** = motor rated speed (Normal ID run procedure needs the motor to be run at 100% speed.)
 - ☐ **30.17 Maximum current** $> I_{HD}$
 - ☐ **30.20 Maximum torque 1** $> 50\%$.
- Check that the run permissive signal (parameter **20.40 Run permissive**) is active
- ☐ Make sure that the control panel is in the Off mode control (text Off shown at the top left). Press the Off key to switch to the Off mode.



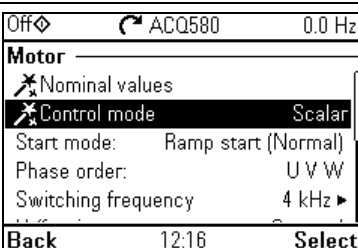





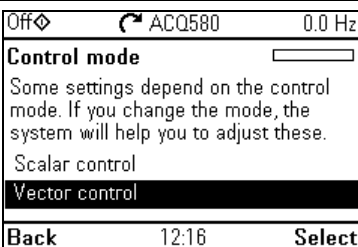

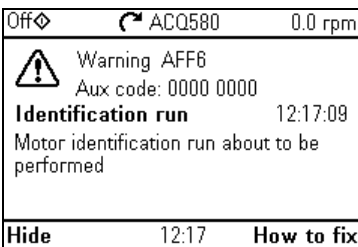


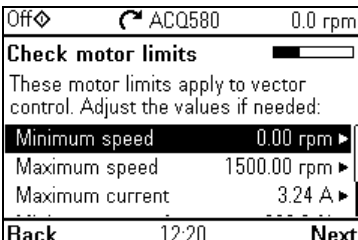

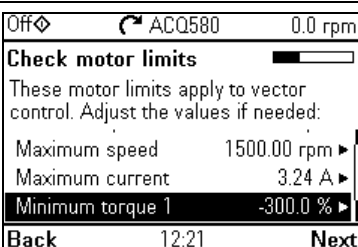

ID run

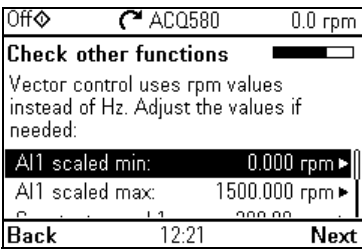


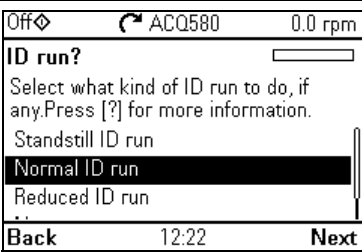
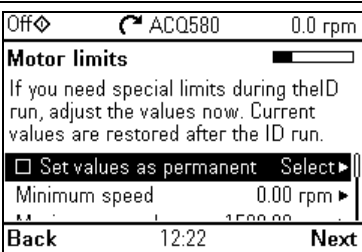


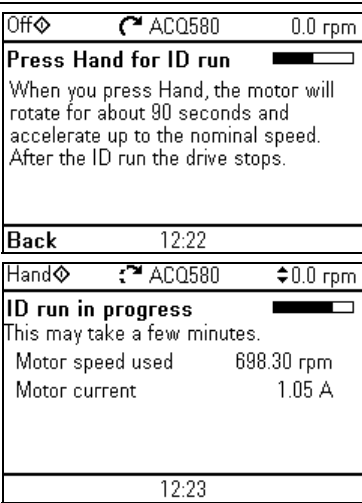
- ☐ Go to the **Main** menu by pressing (**Menu**) in the Home view.
Select **Primary settings** and press (**Select**) (or).

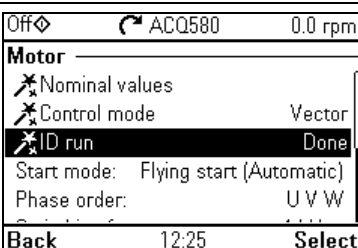


- ☐ Select **Motor** and press (**Select**) (or).



| | | |
|--------------------------|---|--|
| <input type="checkbox"/> | <p>If the control modes is scalar, select Control mode and press  (Select) (or ) and continue to the next step.</p> |  <p>Off  ACQ580 0.0 Hz</p> <p>Motor</p> <p> Nominal values</p> <p> Control mode Scalar</p> <p>Start mode: Ramp start (Normal)</p> <p>Phase order: U V W</p> <p>Switching frequency 4 kHz ▶</p> <p>Back 12:16 Select</p> |
| <input type="checkbox"/> | <p>Select Vector control and press  (Select) (or )</p> |  <p>Off  ACQ580 0.0 Hz</p> <p>Control mode</p> <p>Some settings depend on the control mode. If you change the mode, the system will help you to adjust these.</p> <p>Scalar control</p> <p>Vector control</p> <p>Back 12:16 Select</p> |
| <input type="checkbox"/> | <p>Warning message Identification run is shown for a moment.</p> |  <p>Off  ACQ580 0.0 rpm</p> <p> Warning AFF6 Aux code: 0000 0000</p> <p>Identification run 12:17:09</p> <p>Motor identification run about to be performed</p> <p>Hide 12:17 How to fix</p> |
| <input type="checkbox"/> | <p>Check the motor speed limits. The following must be true:</p> <ul style="list-style-type: none"> • Minimum speed ≤ 0 rpm • Maximum speed = motor rated speed. |  <p>Off  ACQ580 0.0 rpm</p> <p>Check motor limits</p> <p>These motor limits apply to vector control. Adjust the values if needed:</p> <p>Minimum speed 0.00 rpm ▶</p> <p>Maximum speed 1500.00 rpm ▶</p> <p>Maximum current 3.24 A ▶</p> <p>Back 12:20 Next</p> |
| <input type="checkbox"/> | <p>Check the motor current as well as torque limits. The following must be true:</p> <ul style="list-style-type: none"> • Maximum current $> I_{HD}$ • Maximum torque $> 50\%$. |  <p>Off  ACQ580 0.0 rpm</p> <p>Check motor limits</p> <p>These motor limits apply to vector control. Adjust the values if needed:</p> <p>Maximum speed 1500.00 rpm ▶</p> <p>Maximum current 3.24 A ▶</p> <p>Minimum torque 1 -300.0 % ▶</p> <p>Back 12:21 Next</p> |

| | | |
|--------------------------|--|--|
| <input type="checkbox"/> | <p>Check that AI is scaled correctly for the control mode in use. In speed control mode, check that AI1 scaled max = 1500 or 1800 rpm. In scalar control mode, check AI1 scaled max = 50 or 60 Hz.</p> |  |
| <input type="checkbox"/> | <p>Select the type of ID run (see parameter 99.13 ID run requested) to be performed and press  (Select) (or ).</p> |  |
| <input type="checkbox"/> | <p>Check the motor limits shown on the control panel. If you need other limits during the ID run you can enter them here. The originals limits will be restored after the ID run, unless you select Set values as permanent.</p> |  |
| <input type="checkbox"/> | <p>Press the Hand key () to start the ID run. In general, it is recommended not to press any control panel keys during the ID run. However, you can stop the ID run at any time by pressing the Off key ().</p> <p>During the ID run a progress view is shown.</p> <p>After the ID run is completed, text ID run done is shown. The LED stops blinking.</p> <p>If the ID run fails, fault FF61 ID run is shown. See chapter Fault tracing on page 177 for more information.</p> |  |

| | | |
|--------------------------|---|---|
| <input type="checkbox"/> | <p>After the ID run is completed, text Done is shown on row ID run.</p> |  <p>The screenshot shows a motor control interface. At the top, it displays 'Off' with a diamond icon, 'ACQ580', and '0.0 rpm'. Below this is a 'Motor' section with a list of items: 'Nominal values', 'Control mode' (set to 'Vector'), 'ID run' (set to 'Done'), 'Start mode: Flying start (Automatic)', and 'Phase order: U V W'. At the bottom, there are 'Back' and 'Select' buttons, with a timestamp '12:25' in the center.</p> |
|--------------------------|---|---|

3

3

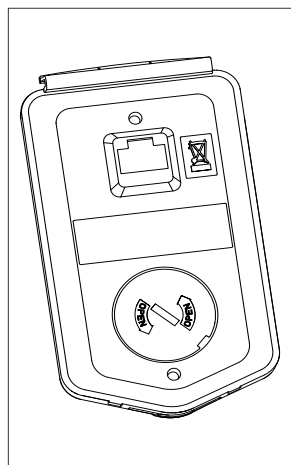
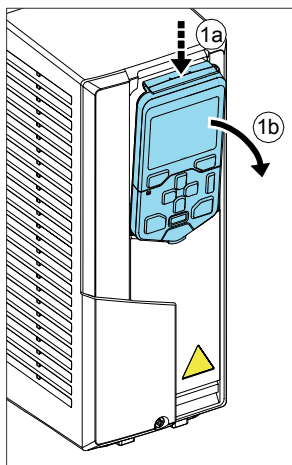
Control panel

Contents of this chapter

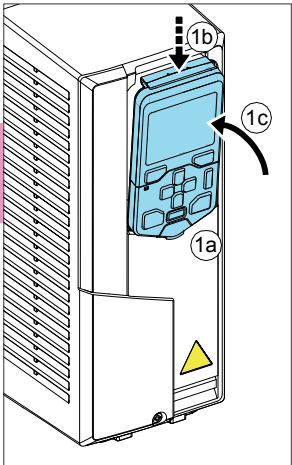
This chapter contains instructions for removing and reinstalling the assistant control panel and briefly describes its display, keys and key shortcuts. For more information, see *ACx-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).

Removing and reinstalling the control panel

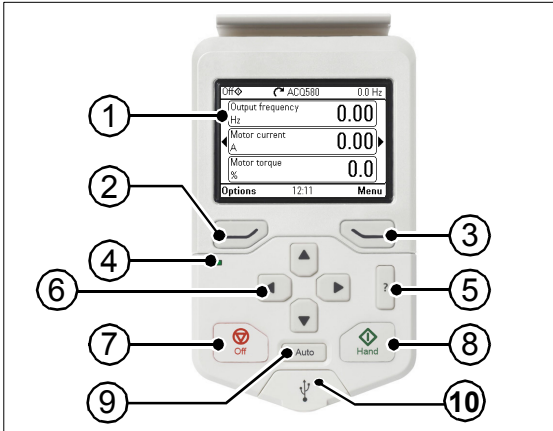
To remove the control panel, press the retaining clip at the top (1a) and pull it forward from the top edge (1b).



To reinstall the control panel, put the bottom of the container in position (1a), press the retaining clip at the top (1b) and push the control panel in at the top edge (1c).



Layout of the standard Hand-Off-Auto panel control panel

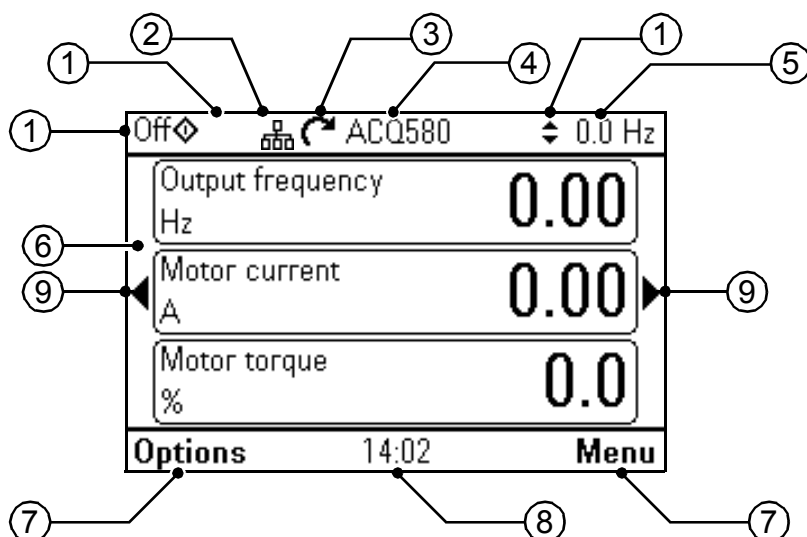


| | |
|---|---|
| 1 | Layout of the control panel display |
| 2 | Left softkey |
| 3 | Right softkey |
| 4 | Status LED, see chapter Maintenance and hardware diagnostics, section LEDs in the Hardware manual of the drive. |
| 5 | Help |

| | |
|----|-------------------------------|
| 6 | The arrow keys |
| 7 | Off (see Hand, Off and Auto) |
| 8 | Hand (see Hand, Off and Auto) |
| 9 | Auto (see Hand, Off and Auto) |
| 10 | USB connector |

Layout of the control panel display

In most views, the following elements are shown on the display:





1. Control location and related icons: Indicates how the drive is controlled:





- **No text:** The drive is in local control, but controlled from another device. The icons in the top pane indicate which actions are allowed:

| Text/Icons | Starting from this control panel | Stopping from this control panel | Giving reference from this control panel |
|------------|----------------------------------|----------------------------------|--|
| | Not allowed | Not allowed | Not allowed |










- **Local:** The drive is in local control, and controlled from this control panel. The icons in the top pane indicate which actions are allowed:



| Text/Icons | Starting from this control panel | Stopping from this control panel | Giving reference from this control panel |
|--|----------------------------------|----------------------------------|--|
| Off  | Allowed | Drive is stopped | Not allowed |
| Hand  | Allowed | Allowed | Allowed |

- **External:** The drive is in external control, ie, controlled through I/O or fieldbus. The icons in the top pane indicate which actions are allowed with the control panel:

| Text/Icons | Starting from this control panel | Stopping from this control panel | Giving reference from this control panel |
|--|----------------------------------|----------------------------------|--|
| Auto | Not allowed | Not allowed | Not allowed |
| Auto  | Allowed | Allowed | Not allowed |
| Auto  | Not allowed | Allowed | Allowed |
| Auto   | Allowed | Allowed | Allowed |

2. **Panel bus:** Indicates that there are more than one drive connected to this panel. To switch to another drive, go to **Options > Select drive**.
3. **Status icon:** Indicates the status of the drive and the motor. The direction of the arrow indicates forward (clockwise) or reverse (counter-clockwise) rotation.

| Status icon | Animation | Drive status |
|--|-----------|---|
|  | - | Stopped |
|  | - | Stopped, start inhibited |
|  | Blinking | Stopped, start command given but start inhibited. See Menu > Diagnostics on the control panel |
|  | Blinking | Faulted |
|  | Blinking | Running, at reference, but the reference value is 0 |
|  | Rotating | Running, not at reference |
|  | Rotating | Running, at reference |
|  | - | Pre-heating (motor heating) active |
|  | - | PID sleep mode active |

4. **Drive name:** If a name has been given, it is displayed in the top pane. By default, it is "ACQ580". You can change the name on the control panel by selecting **Menu > Primary settings > Clock, region, display** (see page 68).
5. **Reference value:** Speed, frequency, etc. is shown with its unit. For information on changing the reference value in the **Primary settings** menu (see page 51).
6. **Content area:** The actual content of the view is displayed in this area. The content varies from view to view. The example view on page 37 is the main view of the control panel which is called the Home view.
7. **Softkey selections:** Displays the functions of the softkeys ( and ) in a given context.

8. **Clock:** The clock displays the current time. You can change the time and time format on the control panel by selecting **Menu > Primary settings > Clock, region, display** (see page 68).
9. **Side arrows:** When side arrows are visible, you can browse other Home views with the arrow keys (◀) and (▶).

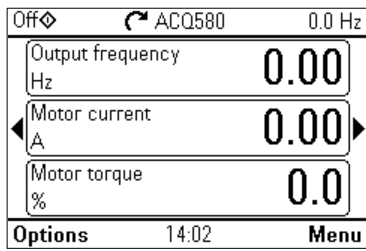
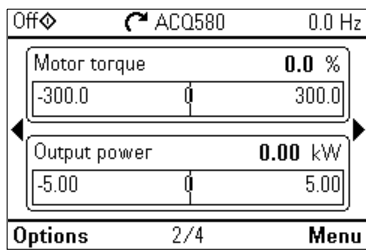
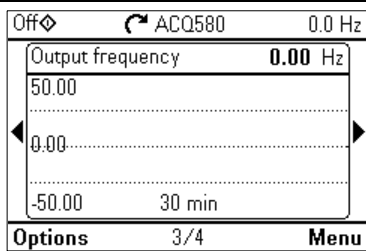
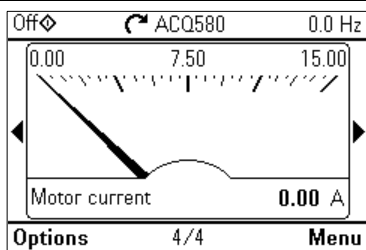
You can adjust the display contrast and back light functionality on the control panel by selecting **Menu > Primary settings > Clock, region, display** (see page 68).

Home view displays

There are four different preconfigured basic Home view displays. In addition, there are six preconfigured IPC Home views and seven preconfigured Level control Home views (see section [IPC and Level control additional Home view displays](#) page 41).

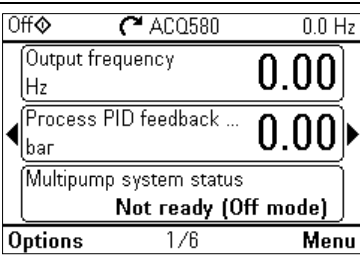
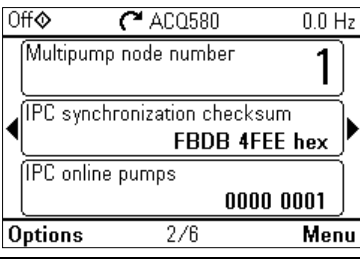
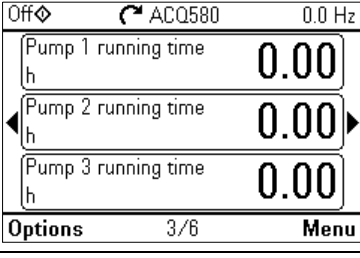
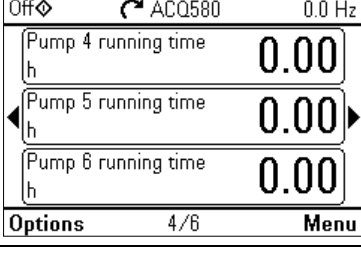
Home view 1 is the default Home view. You can browse them with the arrow keys (◀) and (▶).

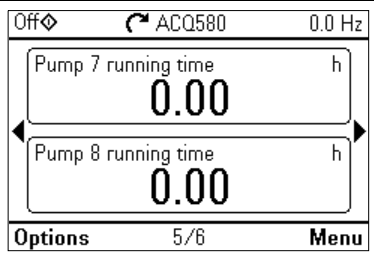
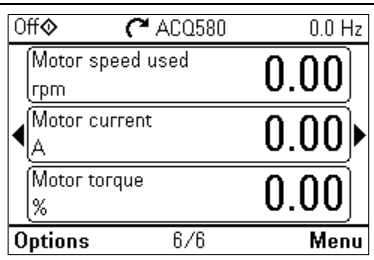
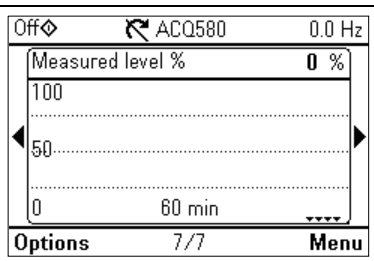
3

| | |
|---|---|
| <p>Home view 1 (default Home view):</p> <ul style="list-style-type: none"> Output frequency (Hz): Parameter 01.06 Output frequency Motor current (A): Parameter 01.07 Motor current Motor torque (%): Parameter 01.10 Motor torque |  |
| <p>Home view 2:</p> <ul style="list-style-type: none"> Motor torque (%): Parameter 01.10 Motor torque Parameter 01.14 Output power |  |
| <p>Home view 3:</p> <ul style="list-style-type: none"> Output frequency shown as a graphical representation during the last 30 minutes: Parameter 01.06 Output frequency |  |
| <p>Home view 4:</p> <ul style="list-style-type: none"> Motor current shown as a dial gauge: Parameter 01.07 Motor current |  |

■ IPC and Level control additional Home view displays

There are six preconfigured IPC Home views and seven preconfigured Level control Home views, of which the first six are the same as IPC home views.

| | |
|--|--|
| <p>IPC / Level control Home view 1 (default IPC / level control home view):</p> <ul style="list-style-type: none"> Output frequency (Hz): Parameter 01.06 Output frequency Process feedback (bar): Parameter 40.02 Process PID feedback actual Multipump system status: Parameter 76.02 Multipump system status |  |
| <p>IIPC / level control Home view 2:</p> <ul style="list-style-type: none"> Multipump node number: Parameter 76.22 Multipump node number IPC synchronization checksum: Parameter 76.105 IPC synchronization checksum IPC online pumps: Parameter 76.01 PFC status |  |
| <p>IPC / level control Home view 3:</p> <ul style="list-style-type: none"> Pump 1 running time: Parameter 77.11 Pump 1 running time Pump 2 running time: Parameter 77.12 Pump 2 running time Pump 3 running time: Parameter 77.13 Pump 3 running time |  |
| <p>IPC / level control Home view 4:</p> <ul style="list-style-type: none"> Pump 4 running time: Parameter 77.14 Pump 4 running time Pump 5 running time: Parameter 77.15 Pump 5 running time Pump 6 running time: Parameter 77.16 Pump 6 running time |  |


| | |
|---|---|
| <p>IPC / level control Home view 5:</p> <ul style="list-style-type: none"> Pump 7 running time: Parameter 77.17 Pump 7 running time Pump 8 running time: Parameter 77.18 Pump 8 running time |  |
| <p>IPC / level control Home view 6:</p> <ul style="list-style-type: none"> Output frequency (Hz): Parameter 01.06 Output frequency Motor current (A): Parameter 01.07 Motor current Motor torque (%): Parameter 01.10 Motor torque |  |
| <p>Level control Home view 7:</p> <ul style="list-style-type: none"> Measured level (%) shown as a graphical representation during the last 60 minute: Parameter 76.06 Measured level % |  |


Keys

The keys of the control panel are described below.




Left softkey



The left softkey () is usually used for exiting and canceling. Its function in a given situation is shown by the softkey selection in the bottom left corner of the display.







Holding  down exits each view in turn until you are back in the Home view. This function does not work in special screens.

Right softkey


The right softkey () is usually used for selecting, accepting and confirming. The function of the right softkey in a given situation is shown by the softkey selection in the bottom right corner of the display.

The arrow keys

The up and down arrow keys ( and ) are used to highlight selections in menus and selection lists, to scroll up and down on text pages, and to adjust values when, for example, setting the time, entering a passcode or changing a parameter value.

The left and right arrow keys ( and ) are used to move the cursor left and right in parameter editing and to move forward and backward in assistants. In menus,  and  function the same way as  and , respectively.

Help


The help key () opens a help page. The help page is context-sensitive, in other words, the content of the page is relevant to the menu or view in question.

Hand, Off and Auto


The ACQ580 can be in local or external control. The local control has two modes: Hand and Off. See also the diagram in section [Local control vs. external control](#) on page 83.

Hand key ():

- In local control / Off mode: Starts the drive. The drive will switch to the Hand mode.
- In external control: Switches the drive to local control / Hand mode, keeping it running.

Off key ():




- Stops the drive and switches to the Off mode.
















Auto key ():

- In local control: The drive will switch to external control.

Key shortcuts

The table below lists key shortcuts and combinations. Simultaneous key presses are indicated by the plus sign (+).

| Shortcut | Available in | Effect |
|--|--------------|---|
|  +  +  | any view | Save a screenshot. Up to fifteen images may be stored in the control panel memory. To transfer images to PC, connect the assistant control panel to PC with a USB cable and the panel will mount itself as an MTP (media transfer protocol) device. Pictures are stored in the screen shots folder. For more instructions, see <i>ACX-AP-x assistant control panels user's manual</i> (3AUA0000085685 [English]). |

| Shortcut | Available in | Effect |
|--|---|--|
|  +  ,  +  | any view | Adjust backlight brightness. |
|  +  ,  +  | any view | Adjust display contrast. |
|  or  | Home view | Adjust reference. |
|  +  | parameter edit views | Revert an editable parameter to its default value. |
|  +  | view showing a list of selections for a parameter | Show/hide selection index numbers. |
|  (keep down) | any view | Return to the Home view by pressing down the key until the Home view is shown. |

4

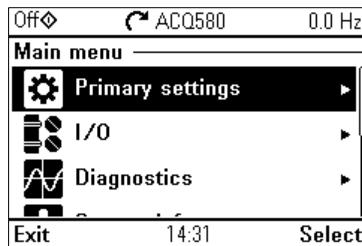
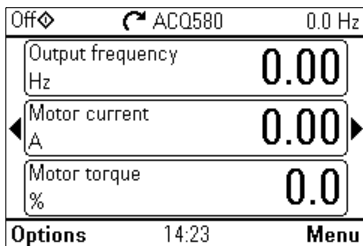
Settings, I/O and diagnostics on the control panel

4

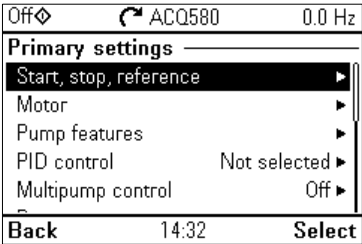
Contents of this chapter

This chapter provides detailed information about the **Primary settings**, **I/O**, **Diagnostics**, **System info**, **Energy efficiency** and **Backups** menus using the control panel.

To get to these menus from the Home view, first select **Menu** to go the **Main** menu, and in the **Main** menu, select the menu you want



Primary settings



4


To go the **Primary settings** menu from the Home view, select **Menu > Primary settings**.


After using the guided settings with the first start assistant, you may want to select another default configuration by selecting **Start, stop, reference > Basic operations set-up** and **Start, stop, reference > Basic control set-up** and following the set-up assistants to configure process and control settings.

The **Primary settings** menu enables you to adjust and define additional settings used in the drive.

With the **Primary settings** menu, you can also adjust settings related to the motor pump functionalities, fieldbus communication, PID, fault functions, advanced functions and clock, region and display. In addition, you can reset the fault and event logs, control panel Home view, parameters not related to hardware, fieldbus settings, motor data and ID run results, all parameters, end user texts as well as reset everything to factory defaults.

Note that the **Primary settings** menu enables you to program the majority of the drive functionality or features: more advanced configuration is done via the parameters: Select **Menu > Parameters**. For more information on the different parameters, see chapter [Parameters](#) on page 271.

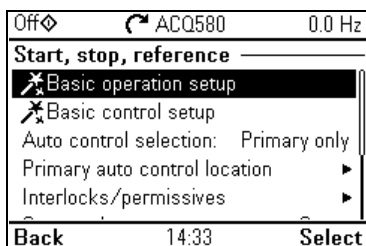
In the **Setting** menu, the  symbol indicates multiple connected signals/parameters.

The  symbol indicates that the setting provides an assistant when modifying the parameters. When using an assistant make sure that all the set values are saved by completing the assistant.

To get more information on **Primary settings** menu items, press the  key to open the help page.

The sections below provide detailed information about the contents of the different submenus available in the **Primary settings** menu.

Start, stop, reference



Use the **Start, stop, reference** submenu to set up start/stop commands, reference, and related features, such as constant speeds or run permissions.

The table below provides detailed information about the available setting items in the **Start, stop, reference** submenu.

| Menu item | Description | Corresponding parameter |
|------------------------|---|-------------------------|
| *Basic operation setup | <u>Equipment type?</u> Blower <ul style="list-style-type: none"> • Ramps • Control setup Pump <ul style="list-style-type: none"> • Submersible/turbine • Quick ramp stage 1 • Quick ramp stage 2 • Normal ramp stage 3 • Control setup Other <ul style="list-style-type: none"> • Ramps • Control setup | |

| Menu item | Description | Corresponding parameter |
|---------------------------------|--|---|
| Basic control setup | <p><u>How do you control?</u></p> <p><u>SCADA</u></p> <ul style="list-style-type: none"> Reference (AI1) scaling Relay outputs "Start interlock signal" "Run permissive signal" <p><u>Direct control via I/O (Water default configuration)</u></p> <ul style="list-style-type: none"> Reference (AI1) scaling Relay outputs "Start interlock signal" "Run permissive signal" <p><u>Direct control via fieldbus comm.</u></p> <ul style="list-style-type: none"> Communication settings <p><u>PID control, single motor</u></p> <ul style="list-style-type: none"> Feedback (AI2) scaling Setpoint source Constant setpoint <p><u>Hand mode</u></p> | |
| Auto control selection: | Where the drive gets the signal to switch between control locations (Ext1 and Ext2). | 19.11 Ext1/Ext2 selection |
| Primary auto control location | Settings for the primary remote control location, Ext1. Enabling Ext1 gives a second set of start/stop/reference sources for remote control. | 12.17 AI1 min 12.18 AI1 max |
| Secondary auto control location | Settings for the secondary remote control location, Ext2. These settings include reference source, start, stop, direction and command sources for Ext2. By default, Ext2 is set to Off . | 19.11 Ext1/Ext2 selection 28.15 Ext2 frequency ref1 or 22.18 Ext2 speed ref1 12.17 AI1 min 12.18 AI1 max 12.27 AI2 min 12.28 AI2 max 20.06 Ext2 commands 20.08 Ext2 in1 source 20.09 Ext2 in2 source |
| Interlocks/permissives | Settings to prevent the drive from running or starting when a specific digital input is low. You can enter a custom text to use instead of "Run permissive", "Start interlock 1", "Start interlock 2", "Start interlock 3" and "Start interlock 4". See section Interlocks on page 134 . | 20.40 Run permissive 20.41 Start interlock 1 20.42 Start interlock 2 20.43 Start interlock 3 20.44 Start interlock 4 20.45 Start interlock stop mode |
| Stop mode: | Sets how the drive stops the motor: with ramp or coast stop. | 21.03 Stop mode |

| Menu item | Description | Corresponding parameter |
|---|---|---|
| Constant speeds / Constant frequencies | These settings are for using a constant value as the reference. By default, constant freq/speed 1 is activated by DI3 . See section Constant speeds/frequencies on page 124. | 28.21 Constant frequency function or 22.21 Constant speed function 28.26 Constant frequency 1 28.27 Constant frequency 2 28.28 Constant frequency 3 22.26 Constant speed 1 22.27 Constant speed 2 22.28 Constant speed 3 |
| Start mode: | Sets how the drive starts the motor. <ul style="list-style-type: none"> • Automatic • Ramp start (normal) • Ramp start with torque boost • Automatic + boost • Constant time pre-magnetization • Flying start • Flying start + torque boost | 21.01 Start mode 21.02 Magnetization time |
| Start delay: | Sets how the drive starts the motor. | 21.22 Start delay |

Motor

| | | |
|---------------------------------|--------|--------|
| Off | ACQ580 | 0.0 Hz |
| Motor | | |
| Nominal values | | |
| Control mode | | |
| Start mode: Ramp start (Normal) | | |
| Phase order: U V W | | |
| Switching frequency 4 kHz | | |
| Back | 14:33 | Select |



| | | |
|--------------------------------------|--------|----------|
| Auto | ACQ580 | 35.5 rpm |
| Motor | | |
| Nominal values | | |
| Control mode | | |
| ID run | | |
| Start mode: Flying start (Automatic) | | |
| Phase order: U V W | | |
| Back | 13:12 | Select |

Use the **Motor** submenu to adjust motor-related settings, such as nominal values, control mode or thermal protection.

Note that settings that are visible depend on other selections, for example, vector or scalar control mode, used motor type or selected start mode.

Three assistants are available: Control mode, Nominal value and ID run (for vector control mode only).

The table below provides detailed information about the available setting items in the **Motor** submenu.

| Menu item | Description | Corresponding parameter |
|---|---|--|
|  Nominal values | Enter the motor's nominal values from the motor's nameplate. | 99.03 Motor type ... 99.12 Motor nominal torque |
|  Control mode | Selects whether to use scalar or vector control mode. For information on scalar control mode, see section Scalar motor control on page 138. For information on vector control mode, see section Vector control on page 139. | 99.04 Motor control mode |
| Start mode: | Sets how the drive starts the motor (for example, pre-magnetize or not). <ul style="list-style-type: none"> • Automatic • Ramp start (normal) • Ramp start with torque boost • Automatic + boost • Constant time pre-magnetization • Flying start • Flying start + torque boost | 21 Start/stop mode 21.02 Magnetization time |
| Phase order: | If the forward direction of the motor is wrong, change this setting to fix the direction instead of changing the phase order on the motor cable. | 99.16 Motor phase order |
| Switching frequency | Sets the target and lowest allowed switching frequencies. For more information, see section Switching frequency on page 144. | 97.01 Switching frequency reference 97.02 Minimum switching frequency |
| U/f ratio: | The form of voltage to frequency ratio below field weakening point. For more information, see section U/f ratio on page 140. | 97.20 U/F ratio |
| IR compensation: | Sets how much to boost voltage at zero speed. Increase this for higher break-away torque. For more information, see section IR compensation for scalar motor control on page 138. | 97.13 IR compensation |
| Pre-heating | Settings for motor preheating. The drive can prevent condensation in a stopped motor by feeding it a fixed current (% of motor nominal current). Use in humid or cold conditions to prevent condensation. For more information, see section Start methods – DC magnetization on page 142. | 21.14 Pre-heating input source 21.16 Pre-heating current |

| Menu item | Description | Corresponding parameter |
|------------------------------|---|---|
| Thermal protection estimated | The settings in this submenu are meant to protect the motor from overheating by automatically triggering a fault or warning above a certain temperature. By default, motor thermal estimate protection is on. We recommend checking the values for the protection to function properly. For more information, see section Motor thermal protection on page 145. | 35 Motor thermal protection |
| Thermal protection measured | The settings in this submenu are meant to protect the motor with a thermal measurement from overheating by automatically triggering a fault or warning above a certain temperature. For more information, see section Motor thermal protection on page 145. | 35 Motor thermal protection |
| Stall protection | The settings in this submenu are meant to protect the motor in a stall situation. You can adjust the supervision limits (current, frequency and time) and choose how the drive reacts to a motor stall condition. For more information, see section Stall protection (parameters 31.24...31.28) on page 168. | 31.24 Stall function 31.25 Stall current limit 31.26 Stall speed limit 31.27 Stall frequency limit 31.28 Stall time |

4

Pump features

| | | |
|----------------------|------------------------|--------|
| Off | ACQ580 | 0.0 Hz |
| Pump features | | |
| Flow protection | | |
| Pressure protection | | |
| Dry pump protection | | |
| Critical frequencies | Off | |
| Flow calculation | 0.00 m ³ /h | |
| Back | 14:29 | Select |

Use the **Pump features** submenu to adjust pump-related settings, such as pump protection functionalities, soft pipe fill or pump cleaning configurations.

The table below provides detailed information about the available setting items in the **Pump features** submenu.

| Menu item | Description | Corresponding parameter |
|-----------------|---|--|
| Flow protection | Configures the maximum and minimum values for the flow and flow protection. | 80.15 Maximum flow 80.16 Minimum flow 80.17 Maximum flow protection 80.18 Minimum flow protection 80.19 Flow check delay |

| Menu item | Description | Corresponding parameter |
|-----------------------------|---|--|
| Pressure protection | Configures settings for protection of the pump from too high or low pressure. | 81.10 Inlet pressure source 81.11 Outlet pressure source 82.30 Outlet minimum pressure protection 82.31 Outlet minimum pressure warning level 82.35 Outlet maximum pressure protection 82.37 Outlet maximum pressure warning level 82.40 Inlet minimum pressure protection 82.41 Inlet minimum pressure warning level 82.45 Pressure check delay |
| Dry pump protection | Configures settings for dry pump protection. Dry pump protection function ensures that the water pump is not running without water and protects the pump from damaging. | 82.20 Dry run protection 82.21 Dry run source |
| Critical speeds/frequencies | <p>Enables or disables the critical frequencies function.</p> <p>Determines whether the specified ranges are effective in both rotating directions or not.</p> <p>See also section Critical speeds/frequencies on page 124.</p> | 28.51 Critical frequency function 28.52 Critical frequency 1 low 28.53 Critical frequency 1 high 28.54 Critical frequency 2 low 28.55 Critical frequency 2 high 28.56 Critical frequency 3 low 28.57 Critical frequency 3 high |
| Flow calculation | Configures the settings for sensor based or sensorless flow calculation functionality. Flow calculation measures the amount of water flowing based on the sensor feedback or without sensor based on the pump curve data. | 80.12 Flow feedback 2 source 80.13 Flow feedback function 80.14 Flow feedback multiplier |
| Soft pipe fill | Configures settings for filling the pipeline with a gentle approach. This helps to avoid sudden pressure peaks and reduces the risk of water hammer which can cause damage to the water pipes. | 40.14 Set 1 setpoint scaling 40.28 Set 1 setpoint increase time 40.29 Set 1 setpoint decrease time 82.25 Soft pipe fill supervision |

| Menu item | Description | Corresponding parameter |
|---------------|---|--|
| Pump cleaning | Configures the adjustments for pump cleaning functionality. Pump cleaning makes it possible to clean the pumps automatically when needed. This function reduces downtime and lowers manual cleaning costs. It also lowers pump's total running costs due to higher pump average operating efficiency. | 83.11 Pump cleaning triggers 83.16 Cycles in cleaning program 83.20 Cleaning speed step 83.25 Time to cleaning speed 83.26 Time to zero-speed 83.27 Cleaning on time 83.28 Cleaning off time |

PID control

The **PID** submenu contains settings and actual values for the process PID controller. PID is only used in remote control.

See also section [Process PID control \(PID/Loop controller\)](#) on page 130.

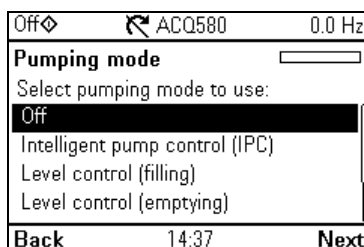
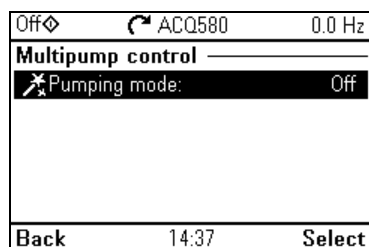
The table below provides detailed information about the available setting items in the **PID** submenu.

| Menu item | Description | Corresponding parameter |
|---------------------------|---|--|
| PID assistant | Configures secondary control location to use PID control. <u>Feedback</u> : AI2. Adjust the scaling of AI2 signal for feedback, if required. <u>Setpoint</u> : Select a constant value, control panel or AI1. If you selected AI2, adjust the scaling of AI1 signal for setpoint. <u>Start/stop</u> : DI | |
| Use PID control: | Select if PID control is used or not. | 40.07 Process PID operation mode |
| Activate PID control from | Sets where the drive gets the signal to switch between control locations (Ext1 and Ext2) | 19.11 Ext1/Ext2 selection |

| Menu item | Description | Corresponding parameter |
|----------------------|---|--|
| Start/stop/dir from: | Selects the source for start, stop and direction. | 20.01 Ext1 commands 20.02 Ext1 start trigger type 20.03 Ext1 in1 source 20.04 Ext1 in2 source 20.06 Ext2 commands 20.07 Ext2 start trigger type 20.08 Ext2 in1 source 20.09 Ext2 in2 source |
| Unit: | PID unit 1 (PID customer unit). Sets the text shown as the unit for setpoint, feedback and deviation. | |
| PID status: | View process PID status. | 40.06 Process PID status word |
| Feedback: | View or configure process PID feedback, ie, the measured value. | 40.02 Process PID feedback actual 40.08 Set 1 feedback 1 source 40.11 Set 1 feedback filter time |
| Setpoint: | View or configure the process PID setpoint, ie, the target process value. You can also use a constant setpoint value instead of (or in addition to) an external setpoint source. When a constant setpoint is active, it overrides the normal setpoint. | 40.03 Process PID setpoint actual 40.16 Set 1 setpoint 1 source 40.26 Set 1 setpoint min 40.27 Set 1 setpoint max |
| Tuning | The Tuning submenu contains settings for gain, integration time and derivation time. <ol style="list-style-type: none"> 1. Make sure it is safe to start the motor and run the actual process. 2. Start the motor in remote control. 3. Change setpoint by a small amount. 4. Watch how feedback reacts. 5. Adjust gain/integration/derivation. 6. Repeat steps 3-5 until feedback reacts as desired. | 40.04 Process PID deviation actual 40.32 Set 1 gain 40.33 Set 1 integration time 40.34 Set 1 derivation time 40.35 Set 1 derivation filter time |
| Increase output: | Select whether deviation means “feedback minus setpoint” or “setpoint minus feedback”: <ul style="list-style-type: none"> • Feedback < Setpoint: Drive increases motor speed when feedback signal is below setpoint. Examples: Supply fan or pump. • Feedback > Setpoint: Drive increases motor speed when feedback signal is greater than setpoint. Example: Cooling tower. | 40.31 Set 1 deviation inversion |

| Menu item | Description | Corresponding parameter |
|----------------|---|--|
| Output | View the process PID output or set its range. | 40.01 Process PID output actual 40.36 Set 1 output min 40.37 Set 1 output max |
| Sleep function | The sleep function can be used to save energy by stopping the motor during low demand. By default, sleep function is disabled. If enabled, the motor automatically stops when demand is low, and starts again when deviation grows too large. This saves energy when rotating the motor at low speeds would be useless. See section Sleep and boost functions for process PID control on page 130. | 40.43 Set 1 sleep level 40.44 Set 1 sleep delay 40.45 Set 1 sleep boost time 40.46 Set 1 sleep boost step 40.47 Set 1 wake-up deviation 40.48 Set 1 wake-up delay |

■ Multipump control





Multipump (IPC, intelligent pump control) systems allows up to 8 drives to be connected to each other. This menu contains programming assistants for load sharing, balancing the run time between the pumps and keeping each pump running optimally.

If the active pumps cannot meet the demand, the system automatically starts or stops pumps one by one. Pump order can be set by the efficiency class of each pump (e.g. pumps with high efficiency are primarily used) or in order to balance the runtime (pumps which run the least, start first). This saves energy and extends the pump life time.

See also section [Pump control features](#) on page 95.

The table below provides detailed information about the available setting items in the **Multipump control** submenu.

| Menu item | Description | Corresponding parameter |
|---|--|--|
|  Pumping mode | Selects the pumping mode. <ul style="list-style-type: none">• Off• Intelligent pump control (IPC)• Level control (filling) (LC)• Level control (emptying) (LC)• Single pump control (PC)• Soft pump control (SPC) | 76.21 Multipump configuration |
| 4 <i>For intelligent pump control (IPC) and level control (LC):</i> Pump node number | Node number: | |
| <i>For intelligent pump control (IPC) and level control (LC):</i> I2I configuration / Multipump comms (I2I) link | Selects if EFB or FBMA-01 via FBA is used for communication. | 76.24 IPC communication port |
| <i>For intelligent pump control (IPC) and level control (LC):</i> Settings for this pump | Drive name Node number Can be master Prefer this pump | 76.22 Multipump node number 76.23 Master enable 76.77 Pump priority |
| <i>For intelligent pump control (IPC) and level control (LC):</i> Shared settings |  Synchronization settings Total number of pumps Efficient speed Always run at least: 1 pumps (<i>for IPC</i>) Never run more than: 8 pumps (<i>for IPC</i>) Start/stop from: (<i>for level control</i>) Level feedback (<i>for level control</i>) <ul style="list-style-type: none">Measured levelMeasured level %Level sourceAI1 scalingAI2 scalingLevel unit | 76.25 Number of motors 76.53 LC efficient speed 76.26 Min number of motors allowed 76.27 Max number of motors allowed 76.05 Measured level 76.06 Measured level % 76.51 LC level source 76.52 LC level unit |

| Menu item | Description | Corresponding parameter |
|---|---|--|
| For intelligent pump control (IPC) and level control (LC): Shared settings | Start/stop speeds (for IPC) / Start/stop levels (for level control) Start 2nd pump at: ... Start xth pump at: (as an example x = 4 = Total number of pumps) Stop xth pump at: ... Stop 1st pump at: Run full speed at: (for level control) Maximum time between levels: (for level control) Transition smoothing (for IPC) Ignore demand spikes under Ignore demand dips under Autochange Maximum wear imbalance: 10.00 h Maximum stationary time: 0.0 h Autochange only below: 45 Hz (for IPC) PID control (for IPC) See PID control submenu on page 53. | 76.30 Start point 1 ... 76.33 Start point 4 76.44 Stop point 4 ... 76.41 Stop point 1 ... 76.55 Start delay 76.56 Stop delay ... 76.72 Maximum wear imbalance 76.76 Max stationary time 76.73 Autochange level |
| For single pump control (PC): Configure pump control I/O | Number of motors: Include drive motor Contactor delay Configure RO:s PC2 is controlled by: ... PC6 is controlled by: Configure interlocks PC1 is interlocked by: ... PC6 is interlocked by Check I/O configuration See I/O menu on page 71. | 76.25 Number of motors 76.59 PFC contactor delay 10.24 RO1 source 10.27 RO2 source 10.30 RO3 source 15.07 RO4 source 15.10 RO5 source ... 76.81 PFC 1 interlock 76.82 PFC 2 interlock 76.83 PFC 3 interlock 76.84 PFC 4 interlock 76.85 PFC 5 interlock 76.86 PFC 6 interlock |

| Menu item | Description | Corresponding parameter |
|---|---|---|
| For soft pump control (SPC): Configure pump control | PC Start, stop, reference Secondary auto control location Start/stop from: Reference from: Configure Process PID: See PID control submenu on page 53. Aux motors started at: Aux motors stopped at: Start delay: Stop delay: | 76.55 Start delay 76.56 Stop delay |
| For single pump control (PC) and for soft pump control (SPC): Configure Autochange | Autochange triggered by: Fixed interval: (for fixed interval) Maximum wear imbalance: (for even wear) Autochange allowed below: | 76.70 PFC Autochange 76.71 PFC Autochange interval 76.72 Maximum wear imbalance 76.73 Autochange level |

Ramps

| | | |
|-----------------------------|----------|--------|
| Off | ACQ580 | 0.0 Hz |
| Ramps | | |
| Quick ramps | | |
| Acceleration time: | 5.000 s | |
| Deceleration time: | 5.000 s | |
| Stop mode: | Coast | |
| Ramp time target frequency: | 50.00 Hz | |
| Back | 14:37 | Select |

Use the **Ramps** submenu to set up acceleration and deceleration settings.



See also section [Ramps](#) on page 128.

Note: To set ramps, you also have to specify parameter [46.01 Speed scaling](#) (in speed control mode) or [46.02 Frequency scaling](#) (in frequency control mode).

The table below provides detailed information about the available setting items in the **Ramps** submenu.

| Menu item | Description | Corresponding parameter |
|-----------------------------|---|---|
| Quick ramps | The quick ramp function allows you to use two additional ramp sets to accelerate or decelerate the pump. See also section Ramps – Quick ramps on page 122. | 82.01 Quick ramp mode 82.05 Quick ramp 1 accel. time 82.06 Quick ramp 1 decel. time 82.07 Quick ramp 1 upper limit 82.10 Quick ramp 2 accel. time 82.11 Quick ramp 2 decel. time 82.12 Quick ramp 2 upper limit |
| Acceleration time: | This is the time between standstill and “scaling speed” when using the default ramps (set 1). | 23.12 Acceleration time 1 28.72 Freq acceleration time 1 |
| Deceleration time: | This is the time between standstill and “scaling speed” when using the default ramps (set 1). | 23.13 Deceleration time 1 28.73 Freq deceleration time 1 |
| Stop mode: | Sets how the drive stops the motor. | 21.03 Stop mode |
| Ramp time target frequency: | Sets the maximum frequency for acceleration = the initial frequency for deceleration. For scalar control mode. | 46.02 Frequency scaling |
| Ramp time target speed: | Sets the maximum speed for acceleration = the initial speed for deceleration. For vector control mode | 46.01 Speed scaling |

Limits

| | | |
|---|--|-------------|
| Off  |  ACQ580 | 0.0 Hz |
| Limits | | |
| Minimum frequency: | | 0.00 Hz |
| Maximum frequency: | | 50.00 Hz |
| Maximum current: | | 2.92 A |
| Back | 14:37 | Edit |

Use the **Limits** submenu to set the allowed operating range. This function is intended to protect the motor, connected hardware and mechanics. The drive stays within these limits, no matter what reference value it gets.

See also section [Limits](#) on page 133.

Note: To set ramps, you also have to specify parameter [46.01 Speed scaling](#) (in speed control mode) or [46.02 Frequency scaling](#) (in frequency control mode) in the [Pump features](#) menu, see page 51; these limit parameters have no effect on ramps.

The table below provides detailed information about the available setting items in the **Limits** submenu.

| Menu item | Description | Corresponding parameter |
|--------------------|--|---|
| Minimum frequency: | Sets the minimum operating frequency. Affects scalar control only. | 30.13 Minimum frequency |
| Maximum frequency: | Sets the maximum operating frequency. Affects scalar control only. | 30.14 Maximum frequency |
| Minimum speed: | Sets the minimum operating speed. Affects vector control only. | 30.11 Minimum speed |
| Maximum speed: | Sets the maximum operating speed. Affects vector control only. | 30.12 Maximum speed |
| Minimum torque: | Sets the minimum operating torque. Affects vector control only. | 30.19 Minimum torque 1 |
| Maximum torque: | Sets the maximum operating torque. Affects vector control only. | 30.20 Maximum torque 1 |
| Maximum current: | Sets the maximum output current. | 30.17 Maximum current |

Fieldbus

Off ACQ580 0.0 Hz

Fieldbus

Embedded fieldbus None / IPC co... ▶

Fieldbus adapter Not used ▶

Back 14:38 Select

Use the **Fieldbus** menu to set up and view communication through embedded fieldbus or fieldbus adapter.

Embedded fieldbus

Off ACQ580 0.0 Hz

Embedded fieldbus

Communication setup ▶

Diagnostics Comm Loss ▶

Back 15:10 Select

Off ACQ580 0.0 Hz

Communication setup

EFB selection: Not selected

Back 15:11 Edit

Off ACQ580 0.0 Hz

EFB selection:

Not selected

Modbus RTU

None / IPC communication

Cancel 15:12 Save

4

Use the settings in the **Embedded fieldbus** submenu to use the drive with the Modbus RTU protocol.

You can also configure all the embedded fieldbus related settings via the parameters (parameter group [58 Embedded fieldbus](#)), but the purpose of the **Embedded fieldbus** submenu is to make the protocol configurations easier.

See also chapter [Fieldbus control through a fieldbus adapter](#) on page 209.

The table below provides detailed information about the available setting items in the **Embedded fieldbus** submenu. Note that some of the items only become active once you have enabled embedded fieldbus.

| Menu item | Description | Corresponding parameter |
|---------------------|--|--|
| EFB selection | Select the protocol you want to use. | 58.01 Protocol enable |
| Communication setup | To set up communication between the drive and the fieldbus master, define these settings and then select Apply settings to embedded fieldbus module . | 58 Embedded fieldbus 58.03 Node address (Station ID) 58.04 Baud rate Modbus RTU: 58.05 Parity Modbus RTU: 58.25 Control profile 58.15 Communication loss mode 58.16 Communication loss time 58.06 Communication control |

| Menu item | Description | Corresponding parameter |
|-------------|--|--|
| Diagnostics | <p>Diagnose embedded fieldbus communication, such as status, load of communication and message counters.</p> <ul style="list-style-type: none"> Actual status: Status value: EFB data from client <p>View what the drive EFB receives from the fieldbus master (PLC/SCADA).</p> <ul style="list-style-type: none"> EFB data to client <p>View what the drive EFB sends to the fieldbus master (PLC/SCADA).</p> | <p>58.07 Communication diagnostics</p> <p>58.08 Received packets</p> <p>58.11 UART errors</p> <p>58.12 CRC errors</p> <p>58.18 EFB control word</p> <p>03.09 EFB reference 1</p> <p>58.09 Transmitted packets</p> <p>58.19 EFB status word</p> |

4

Fieldbus adapter

| | | |
|--|--------|-----------------|
| Off | ACQ580 | 0.0 Hz |
| Fieldbus adapter | | |
| <input checked="" type="checkbox"/> FBA enable | | |
| Communication setup | | ► |
| Diagnostics | | Off-line ► |
| Drive control setup | | ► |
| Back | 15:13 | Unselect |

Use the settings in the **Fieldbus adapter** submenu to use the drive with the following fieldbus protocols, shown with the optional fieldbus adapter module required:

- CANopen: FCAN-01 adapter
- DeviceNet: FDNA-01 adapter
- Ethernet/IP: FEIP-21 adapter, FENA-21 adapter
- ModbusTCP: FMBT-21 adapter, FENA-21 adapter
- PROFIBUS-DB: FBPA-01 adapter
- PROFINET IO: FPNO-21 adapter, FENA-21 adapter
- Ethernet/IP: FENA-21 adapter

Check the supported fieldbus modules with your ABB representative.

You can also configure all the fieldbus related settings via the parameters (parameter groups [50 Fieldbus adapter \(FBA\)](#), [51 FBA A settings](#), [52 FBA A data in](#), [53 FBA A data out](#), [58 Embedded fieldbus](#), but the purpose of the **Fieldbus adapter** submenu is to make the protocol configurations easier.

See also chapter [Fieldbus control through a fieldbus adapter](#) on page 239.

The table below provides detailed information about the available setting items in the **Fieldbus adapter** submenu. Note that some of the items only became active once you have enabled fieldbus.

| Menu item | Description | Corresponding parameter |
|---------------------|--|--|
| Fieldbus adapter | FBA enable: Select this if you want to use the drive with a fieldbus adapter. | 50.01 FBA A enable |
| Communication setup | Select the module (protocol). To set up communication between the drive and the fieldbus master, define these settings and then select Apply settings to fieldbus module . | 51.01 FBA A type 58.01 Protocol enable 51 FBA A settings 51.01 FBA A type 51.02 FBA A Par2 51.27 FBA A par refresh 51.31 D2FBA A comm status 50.13 FBA A control word 50.16 FBA A status word 51.27 FBA A par refresh |
| Diagnostics | Diagnose fieldbus communication, such as status, load of communication and message counters. Information on FBA A data from master and to master. | |
| Drive control setup | Sets how a fieldbus master can control this drive, and how the drive reacts if the fieldbus communication fails. Define these settings and then select Apply settings to fieldbus module . | 20.01 Ext1 commands 19.11 Ext1/Ext2 selection 22.11 Ext1 speed ref1 28.11 Ext1 frequency ref1 22.41 Speed ref safe 28.41 Frequency ref safe 50.03 FBA A comm loss t out 46.01 Speed scaling 46.02 Frequency scaling 23.12 Acceleration time 1 23.13 Deceleration time 1 28.72 Freq acceleration time 1 28.73 Freq deceleration time 1 51.27 FBA A par refresh |

Fault functions

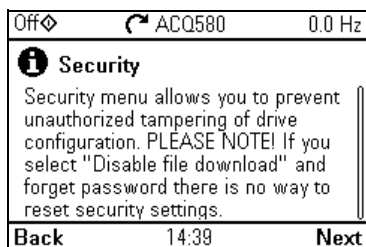
| | | |
|--|--------|--------|
| Off | ACQ580 | 0.0 Hz |
| Fault functions | | |
| Autoreset faults | | On ▶ |
| <input checked="" type="checkbox"/> Additional fault reset | | |
| Reset from keypad and | | DI3 ⓘ |
| Back | 20:31 | Select |

4

The **Fault functions** submenu contains settings for resetting faults automatically or manually.

| Menu item | Description | Corresponding parameter |
|--|--|--|
| Autoreset faults | Reset faults automatically. For more information, see section Sleep and boost functions for process PID control on page 130. | 31.12 Autoreset selection 31.14 Number of trials 31.15 Total trials time 31.16 Delay time |
| Additional fault reset | You can reset an active fault via I/O: a rising pulse in the selected input means reset. A fault can be reset from the fieldbus even if Reset faults manually is unselected. | 31.11 Fault reset selection |
| Reset from keypad and... | Define from where you want to reset faults manually. Note that this submenu is active only if you have selected to reset faults manually. | 31.11 Fault reset selection |
| If EFB communication fails: | Define action to be taken if EFB communication fails. | 58.14 Communication loss action |
| If EFB communication under monitoring: | Define which message types reset the timeout counter for detecting an EFB communication loss. | 58.15 Communication loss mode |
| Ignore EFB failures shorter than: | Define a timeout for EFB communication. If a communication break lasts longer than the timeout, the action specified in If EFB communication fails: is taken. | 58.16 Communication loss time |

Security



The **Security** submenu is a protected menu that you can open with the user pass code. The menu lets you prevent actions and functionalities with the user lock. You can also change the user lock pass code.

See also section [User lock](#) on page 174.

| Menu item | Description | Corresponding parameter |
|--|--|--|
| Unlock this menu / Lock this menu | You have to enter the user passcode to unlock the menu. The default passcode is "10000000". While you have the user lock open, warning A6B0 User lock is open is active. After making your changes in the menu, select row Lock this menu and press Select . | 96.02 Pass code |
| Lock all parameters Disable backup and restore Disable OEM access level Disable ABB access level Disable file download | | 96.102 User lock functionality |
| Change security passcode | Note: You must change the default user pass code to maintain a high level of cybersecurity. <u>Store the code in a safe place – ABB CANNOT UNLOCK THE DRIVE ONCE YOU CHANGE THE PASS CODE.</u> Enter first the new passcode and then re-enter the new passcode to confirm it. | 96.02 Pass code 96.100 Change user pass code 96.101 Confirm user pass code |

Advanced functions

| | | |
|----------------------------|--------|---------------|
| Off | ACQ580 | 0.0 Hz |
| Advanced functions | | |
| External events ▶ | | |
| Supervision ▶ | | |
| Timed functions Disabled ▶ | | |
| User sets ▶ | | |
| ✱ First start assistant | | |
| Back | 14:39 | Select |

4

The **Advanced functions** submenu contains settings for advanced functions, such as triggering or resetting custom faults via I/O, signal supervision, using the drive with timed functions, or switching between several entire sets of settings. In addition you can run the First start assistant from this submenu.

The table below provides detailed information about the available setting items in the **Advanced functions** submenu.

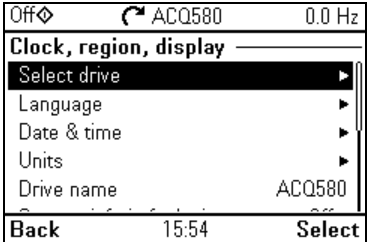
| Menu item | Description | Corresponding parameter |
|-----------------|---|--|
| External events | Enables you to define custom faults or warnings you can trigger via digital input. The texts of these messages are customizable. For more information, see section External events on page 124 . | 31.01 External event 1 source 31.02 External event 1 type 31.03 External event 2 source 31.04 External event 2 type 31.05 External event 3 source 31.06 External event 3 type |

| Menu item | Description | Corresponding parameter |
|-----------------|---|---|
| Supervision | <p>You can select three signals to be supervised. If a signal is outside predefined limits a fault or warning is generated. For complete settings, see group 32 Supervision on page 377.</p> <p>For more information, see section Signal supervision on page 161.</p> | 32.01 Supervision status 32.05 Supervision 1 function 32.06 Supervision 1 action 32.07 Supervision 1 signal 32.09 Supervision 1 low 32.10 Supervision 1 high 32.11 Supervision 1 hysteresis... 32.25 Supervision 3 function 32.26 Supervision 3 action 32.27 Supervision 3 signal 32.29 Supervision 3 low 32.30 Supervision 3 high 32.31 Supervision 3 hysteresis |
| Timed functions | <p>Enables using the drive with timed functions. For complete settings, see group 34 Timed functions on page 384.</p> <p>For more information, see section Timed functions on page 126.</p> | 34.100 Timed function 1 34.101 Timed function 2 34.102 Timed function 3 34.111 Boost time activation source 34.112 Boost time duration 34.11 Timed functions enable 34.11 Timer 1 configuration 34.12 Timer 1 start time 34.13 Timer 1 duration ... 34.44 Timer 12 configuration 34.45 Timer 12 start time 34.46 Timer 12 duration |
| User sets | <p>This submenu enables you to save four sets of settings for easy switching.</p> <p>For more information about user sets, see section Data storage parameters on page 172.</p> | 96.11 User set save/load 96.10 User set status 96.12 User set I/O mode in1 96.13 User set I/O mode in2 |

4

| Menu item | Description | Corresponding parameter |
|---------------------------|--|-------------------------|
| Confirmation for HAND/OFF | Selects if you want to add confirmation for Hand and Off buttons so that they need to be pressed twice within five seconds to operate. The control panel shows a message about pressing twice after the first press. This selection can be used to prevent accidental Hand and Off button presses. If Hand and/or Off buttons are disabled with parameters 19.18 HAND/OFF disable source and 19.19 HAND/OFF disable action , this setting has no effect. | |
| First start assistant | Runs the same First start assistant that is used to commission the drive. | |

■ Clock, region, display



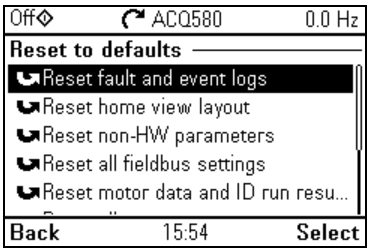
The **Clock, region, display** submenu contains settings for language, date and time, display (such as brightness) and settings for changing how information is displayed on screen.

The table below provides detailed information about the available setting items in the **Clock, region, display** submenu.

| Menu item | Description | Corresponding parameter |
|--------------|---|--------------------------------|
| Select drive | If more than one drive is connected to this control panel, select the drive to be controlled here. To see the other drives, set <i>Panel bus</i> to <i>On</i> and enable networking in the parameters of each drive. | |
| Language | Change the language used on the control panel screen. Note that the language is loaded from the drive so this takes some time. Available languages vary depending on the drive firmware language package installed: Standard language package, European language package or Asian language package. Parameter 07.10 Language file set shows the language package in use. | 96.01 Language |

| Menu item | Description | Corresponding parameter |
|----------------------------|---|-------------------------|
| Date & time | Set the time and date, and their formats. | |
| Units | Select the units used for power, temperature, torque and currency. | 96.16 Unit selection |
| Drive name | The drive name defined in this setting is shown in the PC tool and at the status bar at the top of the control panel screen while using the drive. If more than one drives are connected to the control panel, the drive names make it easy to identify each drive. It also identifies any backups you create for this drive. | |
| Contact info in fault view | Define a fixed text that is shown during any fault (for example, who to contact in case of a fault). If a fault occurs, this information appears on the control panel screen (in addition to the fault-specific information). | |
| Edit texts | Set the drive name, adjust currency unit and PID unit, and edit Start interlocks 1...4, Run permissive, Signal supervisions 1...3, External faults 1...3, Contact info. | |
| Display settings | Adjust the brightness, contrast and display power save delay of the control panel screen or to invert white and black. | |
| Show in lists | Show or hide the numeric IDs of: <ul style="list-style-type: none"> parameters and groups option list items bits devices in Options > Select drive | |
| Edit Home view | Select the parameters displayed in the Home view, with display style, decimals, name, unit, minimum and maximum. | |
| Show inhibit pop-up | Enables or disables pop-up views showing information on inhibits, for example, when you try to start the drive but it is prevented. | |

Reset to defaults



4

The **Reset to defaults** submenu enables you to reset parameters and other settings.

| Menu item | Description | Corresponding parameter |
|-------------------------------------|---|---|
| Reset fault and event logs | Clears all events from the drive's fault and event logs. | 96.51 Clear fault and event logger |
| Reset home view layout | Restores the home view layout back to show the values of the default parameters defined by the selected control macro. | 96.06 Parameter restore , selection Reset home view |
| Reset non-HW parameters | Restores all editable parameter values to default values, except <ul style="list-style-type: none">motor data and ID run resultsI/O extension module settingsend user texts, such as customized warnings and faults, and the drive namecontrol panel/PC communication settingsfieldbus adapter settingsparameter 95.01 Supply voltageparameters 95.20 HW options word 1 and 95.21 HW options word 2user lock configuration parameters 96.100...96.102. | 96.06 Parameter restore , selection Restore defaults |
| Reset all fieldbus settings | Restores all fieldbus and communication related settings to default values. Note: Fieldbus, control panel and PC tool communication are interrupted during the restore. | 96.06 Parameter restore , selection Reset all fieldbus settings |
| Reset motor data and ID run results | Restores all motor nominal values and motor ID run results to default values. | 96.06 Parameter restore , selection Reset motor data |

| Menu item | Description | Corresponding parameter |
|-------------------------------|--|---|
| Reset all parameters | Restores all editable parameter values to default values, except <ul style="list-style-type: none"> • end user texts, such as customized warnings and faults, and the drive name • control panel/PC communication settings • parameter 95.01 Supply voltage • differentiated defaults implemented by parameters 95.20 HW options word 1 and 95.21 HW options word 2 and the differentiated defaults implemented by them • user lock configuration parameters 96.100...96.102 • group 49 Panel port communication parameters. | 96.06 Parameter restore , selection Clear all |
| Reset end user texts | Restores all end user texts to default values, including the drive name, contact info, customized fault and warning texts, PID unit and currency unit. Note: PID unit is reset only if it is user editable text, that is, parameter 40.79 Set 1 units is set to User text. | 96.06 Parameter restore , selection Reset end user texts |
| Reset first start assistant | Resets the first start assistant so that at the next time drive is powered on the first start assistant is shown. | |
| Reset all to factory defaults | Restores all drive parameters and settings back to initial factory values, except <ul style="list-style-type: none"> • parameters 95.20 HW options word 1 and 95.21 HW options word 2 and the differentiated defaults implemented by them. | 96.06 Parameter restore , selection All to factory defaults |

I/O menu

| | | |
|--------|------------------------|--------|
| Off | ACQ580 | 0.0 Hz |
| I/O | | |
| DI1: 1 | Start/stop | ▶ |
| DI2: 0 | Not used | ▶ |
| DI3: 0 | Used in several places | ▶ |
| DI4: 0 | Not used | ▶ |
| DI5: 1 | Not used | ▶ |
| Back | 15:54 | Select |

To go the I/O menu from the Home view, select **Menu > I/O**.

Use the I/O menu to make sure that the actual I/O wiring matches the I/O use in the control program. It answers the questions:

- What is each input being used for?
- What is the meaning of each output?

You can configure and add and remove use of inputs and outputs.

In the **I/O** menu, each row provides the following information:

- Terminal name and number
- Electrical status
- Logical meaning of the drive

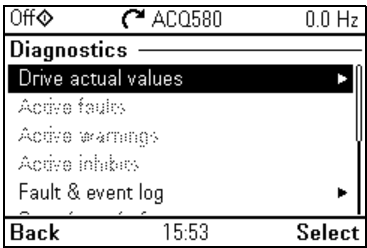
Each row also provides a submenu that provides further information on the menu item and lets you make changes to the I/O connections.

The table below provides detailed information about the contents of the different submenus available in the **I/O** menu.

4

| Menu item | Description |
|----------------------|---|
| DI1 | This submenu lists the functions that use DI1 as input. |
| DI2 | This submenu lists the functions that use DI2 as input. |
| DI3 | This submenu lists the functions that use DI3 as input. |
| DI4 | This submenu lists the functions that use DI4 as input. |
| DI5 | This submenu lists the functions that use DI5 as input. |
| DI6 | This submenu lists the functions that use DI6 or FI as input. The connector can be used as either digital input or frequency input. |
| AI1 | This submenu lists the functions that use AI1 as input. |
| AI2 | This submenu lists the functions that use AI2 as input. |
| RO1 | This submenu lists what information goes into relay output 1. |
| RO2 | This submenu lists what information goes into relay output 2. |
| RO3 | This submenu lists what information goes into relay output 3. |
| AO1 | This submenu lists what information goes into AO1. |
| AO2 | This submenu lists what information goes into AO2. |
| I/O extension | This submenu has the following submenus: |
| RO4 | This submenu lists what information goes into relay output 4. |
| RO5 | This submenu lists what information goes into relay output 5. |
| DO1 | This submenu lists what information goes into digital output 1. |

Diagnostics menu



To go the **Diagnostics** menu from the Home view, select **Menu > Diagnostics**.

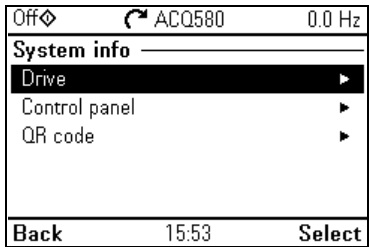
The **Diagnostics** menu provides you with diagnostic information, such as faults and warnings, and helps you to resolve potential problems. Use the menu to make sure that the drive setup is functioning correctly.

To clear the fault and event logger, select **Menu > Primary settings > Reset to defaults > Reset fault and event logs**, or set parameter [96.51 Clear fault and event logger](#) to value [Reset](#).

The table below provides detailed information about the contents of the different views available in the **Diagnostics** menu.

| Menu item | Description |
|--------------------------------|---|
| Drive actual values | Shows actual values: 01.01 Motor speed used , 01.06 Output frequency , 01.07 Motor current , 01.10 Motor torque , 01.11 DC voltage , 01.13 Output voltage , 01.14 Output power , 06.01 Main control word , 06.11 Main status word , 19.01 Actual operation mode , 05.01 On-time counter , 05.02 Run-time counter , 05.04 Fan on-time counter , 05.10 Control board temperature , 05.11 Inverter temperature , 35.01 Motor estimated temperature , 35.02 Measured temperature 1 , 35.03 Measured temperature 2 , 40.01 Process PID output actual , 40.02 Process PID feedback actual , 40.03 Process PID setpoint actual , 40.04 Process PID deviation actual , 40.07 Process PID operation mode . |
| Active faults | This view shows the currently active faults and provides instructions on how to fix and reset them. |
| Active warnings | This view shows the currently active warnings and provides instructions on how to fix them. |
| Active inhibits | This view shows up to five simultaneous active start inhibits and how to fix them. |
| Fault & event log | This view lists the faults, warnings and other events that have occurred in the drive. Press Details to see, for each stored fault, the fault code, time and values of nine parameters (actual signals and status words) stored at the time of the fault. The values of the parameters for the latest fault are in parameters 05.80...05.89 . |
| Start, stop, reference summary | This view shows where the drive is currently taking its start and stop commands and reference. The view is updated in real time. If the drive is not starting or stopping as expected, or runs at an undesired speed, use this view to find out where the control comes from. |
| Limit status | This view describes any limits currently affecting operation. If the drive is running at undesired speed, use this view to find out if any limitations are active. |
| Load profile | This view shows results of the load analyzer. Amplitude loggers show load distribution diagrams: how much of the drive's running time was spent at each load level. The peak value logger lists maximum momentary load levels. |
| Communication status | This view provides status information and sent and received data from fieldbus for troubleshooting. |
| Motor summary | This view provides motor information: nominal values, control mode and whether ID run has been completed. |

System info menu



4

To go the **System info** menu from the Home view, select **Menu > System info**.

The **System info** menu shows information of the drive and the control panel. In problem situations you can also request the drive to generate a QR code for ABB service, so they can better assist you.

The table below provides detailed information about the available setting items in the **System info** menu.

| Menu item | Description | Corresponding parameter |
|---------------|---|---|
| Drive | Panel bus id: Serial number Product name: Product type: LP version: Backup version: FW version | 07.07 Loading package version 07.05 Firmware version |
| Control panel | Product type: HW version: FW version: Serial number: Manufacturing date: | |
| QR code | The drive generates a QR code (or a series of QR codes), which contains drive identification data, information on the latest events, and values of status and counter parameters. You can read the QR code with a mobile device containing the ABB application, which then sends the QR code to ABB for analysis. | |

Energy efficiency menu

| | | |
|--------------------------|------------|--------|
| Off | ACQ580 | 0.0 Hz |
| Energy efficiency | | |
| Total energy saved | 0.0 kWh ▶ | |
| Used, last hour | 0.00 kWh ▶ | |
| Used, last day | 0.00 kWh ▶ | |
| Used, last month | 0.00 kWh ▶ | |
| Used, total | 0.0 kWh ▶ | |
| Back | 15:53 | Select |

To go the **Energy efficiency** menu from the Home view, select **Menu > Energy efficiency**.

Use the **Energy efficiency** menu to view energy and power values, view and change settings of the load analyzer (= amplitude and peak value loggers), for example, view graphical representation of the two amplitude loggers, as well as and change energy calculation settings.





See also sections [Energy efficiency](#) on page 163 and [Load analyzer](#) on page 164.




The table below provides detailed information about the available setting items in the **Energy efficiency** menu.

| Menu item | Description | Corresponding parameter |
|--------------------|---|---|
| Total energy saved | Energy saved in kWh compared to direct-on-line motor connection. Corresponding money saved. Corresponding CO ₂ saved. | 45.04 Saved energy 45.07 Saved amount 45.10 Total saved CO ₂ |
| Used, last hour | Energy used during the last hour (the last 60 minutes). Average power during the last hour (value of 45.26 divided by one hour). | 45.26 Hourly total energy (resettable) |
| Used, last day | Energy used during the previous day (between midnight of the previous day and midnight of the present day). Average power during the last day (value of 45.30 divided by 24 hours). | 45.30 Last day total energy |
| Used, last month | Energy used during the previous month (between midnight of the first day or the previous month and midnight of the first day of the present month). Average power during the last month (value of 45.30 divided by 732 hours). | 45.35 Last month total energy |
| Used, total | All-time total used energy Resettable total used energy | 01.54 Cumulative inverter energy 01.58 Cumulative inverter energy (resettable) |

| Menu item | Description | Corresponding parameter |
|----------------------|--|--|
| Peak power | Hourly peak power (during the last 60 minutes) Time of the hourly peak power Daily peak power (during the previous day) Time of the daily peak power Monthly peak power (during the previous month) Time of the monthly peak power Date of the monthly peak power All-time peak power Time of all time peak power Date of all time peak power | 45.24 Hourly peak power value 45.25 Hourly peak power time 45.27 Daily peak power value (resettable) 45.28 Daily peak power time 45.31 Monthly peak power value (resettable) 45.33 Monthly peak power time 45.32 Monthly peak power date 45.36 Lifetime peak power value 45.38 Lifetime peak power time 45.37 Lifetime peak power time |
| Load profile | Amplitude logger 1 (graphical representation) Amplitude logger 2 (graphical representation) Amplitude loggers show load distribution diagrams: how much of the drive's running time was spent at each load level. Load profile configuration Peak value logger The peak value logger lists maximum momentary load levels. | 36.06 AL2 signal source 36.07 AL2 signal scaling 36.09 Reset loggers 36.01 PVL signal source 36.02 PVL filter time 36.10 PVL peak value 36.11 PVL peak date 36.12 PVL peak time 36.13 PVL current at peak 36.14 PVL DC voltage at peak 36.15 PVL speed at peak 36.16 PVL reset date 36.17 PVL reset time |
| Calculation settings | Energy optimizer Energy tariff 1 Energy tariff 2 Tariff selection CO ₂ conversion Comparison power Reset saved energy counters Reset total used counter | 45.11 Energy optimizer (Disable or Enable) 45.12 Energy tariff 1 45.13 Energy tariff 2 45.14 Tariff selection 45.18 CO₂ conversion factor 45.19 Comparison power 45.21 Energy calculations reset Enter 0 to 01.58 Inverter kWh counter (resettable) |

Backups menu

| | | | |
|---|---|---------------|---------|
| Auto |  | ACQ580 | 5.0 bar |
| Backups | | | |
| Create backup ▶ | | | |
|  | ACQ580 04.04.2019 autobackup ▶ | | |
|  | ACQ580 05.09.2018 ▶ | | |
|  | ACQ580 12.09.2016 ▶ | | |
| Back | 13:29 | Select | |

| | | | |
|---|---|---------------|---------|
| Auto |  | ACQ580 | 5.0 bar |
| ACQ580 05.09.2018 | | | |
|  | View backup contents ▶ | | |
|  | Restore all parameters | | |
| | Select par restore group ▶ | | |
| | Select user sets ▶ | | |
| | Select prod. data items ▶ | | |
| Back | 13:29 | Select | |

To go to the **Backups** menu from the Home view, select **Backups**.

For backups and restores, see section [Backup and restore](#) on [171](#) page.

5

Default I/O configuration

5

Contents of this chapter

This chapter describes the intended use, operation and default control connections of the application.

Water default

This is the default configuration of control connections for water and waste water applications.

Default control connections for the Water default

| | | | |
|--|----|--|---|
| | | X1 Reference voltage and analog inputs and outputs | |
| | 1 | SCR | Signal cable shield (screen) |
| | 2 | AI1 | Output frequency/speed reference: 0...10 V |
| | 3 | AGND | Analog input circuit common |
| | 4 | +10V | Reference voltage 10 V DC |
| | 5 | AI2 | Actual feedback: 0...10 V |
| | 6 | AGND | Analog input circuit common |
| | 7 | AO1 | Output frequency: 0...10 V |
| | 8 | AO2 | Motor current: 0...20 mA |
| | 9 | AGND | Analog output circuit common |
| | | X2 & X3 Aux. voltage output and programmable digital inputs | |
| | 10 | +24V | Aux. voltage output +24 V DC, max. 250 mA |
| | 11 | DGND | Aux. voltage output common |
| | 12 | DCOM | Digital input common for all |
| | 13 | DI1 | Stop (0) / Start (1) |
| | 14 | DI2 | Not configured |
| | 15 | DI3 | Constant frequency/speed selection |
| | 16 | DI4 | Not configured |
| | 17 | DI5 | Not configured |
| | 18 | DI6 | Not configured |
| | | X6, X7, X8 Relay outputs | |
| | 19 | RO1C | Ready run 250 V AC / 30 V DC 2 A |
| | 20 | RO1A | |
| | 21 | RO1B | |
| | 22 | RO2C | Running 250 V AC / 30 V DC 2 A |
| | 23 | RO2A | |
| | 24 | RO2B | |
| | 25 | RO3C | Fault (-1) 250 V AC / 30 V DC 2 A |
| | 26 | RO3A | |
| | 27 | RO3B | |
| | | X5 Embedded fieldbus | |
| | 29 | B+ | Embedded fieldbus, EFB (EIA-485) |
| | 30 | A- | |
| | 31 | DGND | |
| | S4 | TERM | Termination switch |
| | S5 | BIAS | Bias resistors switch |
| | | X4 Safe torque off | |
| | 34 | OUT1 | Safe torque off. Factory connection. Both circuits must be closed for the drive to start. See chapter <i>The Safe torque off function in the Hardware manual</i> of the drive |
| | 35 | OUT2 | |
| | 36 | SGND | |
| | 37 | IN1 | |
| | 38 | IN2 | |
| | | X10 24 V AC/DC | |
| | 40 | 24 V AC/DC+ in | R6...R11 only: Ext. 24V AC/DC input to power up the control unit when the main supply is disconnected. |
| | 41 | 24 V AC/DC- in | |

See the notes on the next page.

See the notes on the next page.

Terminal sizes:

R1...R5: 0.2...2.5 mm² (24...14 AWG): Terminals +24V, DGND, DCOM, B+, A-, DGND, Ext. 24V

0.14...1.5 mm² (26...16 AWG): Terminals DI, AI, AO, AGND, RO, STO

R6...R9: 0.14...2.5 mm² (all terminals)

Tightening torques: 0.5...0.6 N·m (0.4 lbf·ft)

Notes:

- 3) Ground the outer shield of the cable 360 degrees under the grounding clamp on the grounding shelf for the control cables.
- 4) Connected with jumpers at the factory.
- 5) Only frames R6...R11 have terminals 40 and 41 for external 24 V AC/DC input.

Input signals

- Analog frequency reference (AI1)
- Start/stop selection (DI1)
- Constant speed/frequency selection (DI3)

Output signals

- Analog output AO1: Output frequency
- Analog output AO2: Motor current
- Relay output 1: Ready run
- Relay output 2: Running
- Relay output 3: Fault (-1)

6

Program features

What this chapter contains

This chapter describes some of the more important functions within the control program, how to use them and how to program them to operate. It also explains the control locations and operating modes.

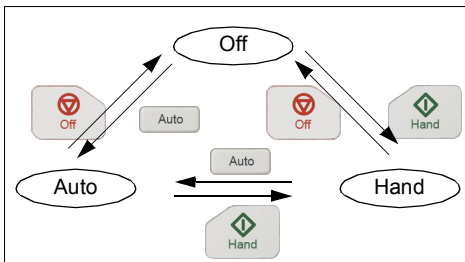
6

Local control vs. external control

The ACQ580 has two main control locations: external and local. In local control there are two different modes: Off and Hand.

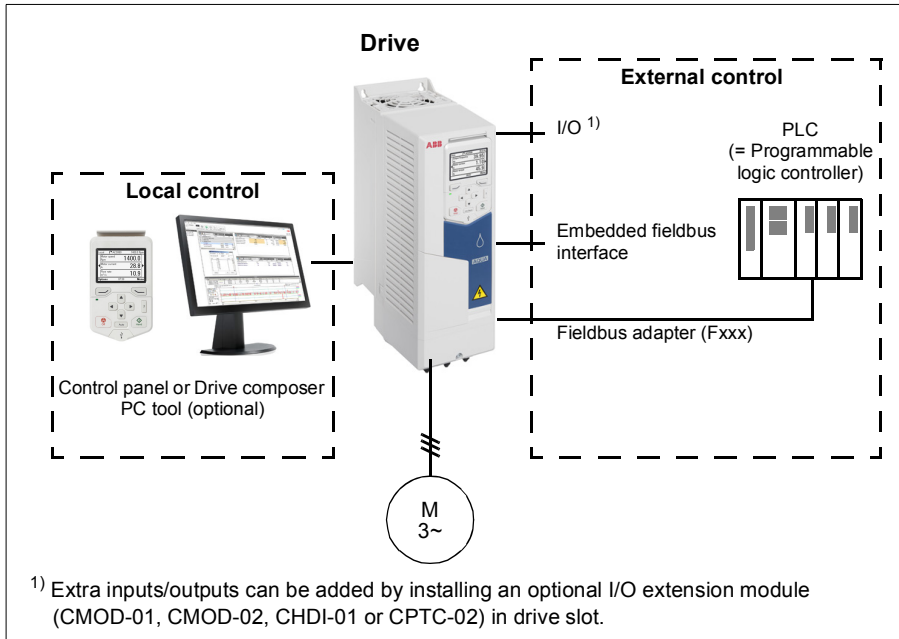
In the Off mode, the drive is stopped. In the Hand mode, the drive is running. The initial reference in the Hand mode is copied from the drive reference.

The following diagram shows the state transitions when you press the Hand, Off or Auto button:



The control location can also be selected in the PC tool.

Note: When you restart the drive while fault *7081 Control panel loss* is active, the mode changes from Hand or Off to Auto.



Local control

When the drive is in local control, control commands are given through

- the control panel keypad
- a PC equipped with Drive composer PC tool.

Speed control mode is available in vector motor control mode; frequency mode is available when scalar motor control mode is used.

Local control is mainly used during commissioning and maintenance. The control panel always overrides the external control signal sources when used in local control. Changing the control location to local can be prevented by parameter [19.18 HAND/OFF disable source](#).

The user can select with parameter [49.05 Communication loss action](#) how the drive reacts to a control panel or PC tool communication loss. (The parameter has no effect in external control.)

■ External control

When the drive is in external control, control commands are given through

- the I/O terminals (digital and analog inputs), or optional I/O extension modules
- the fieldbus interface (via the embedded fieldbus interface or an optional fieldbus adapter module).

Two external control locations, EXT1 and EXT2, are available. The user can select the sources of the start and stop commands separately for each location by setting parameters [20.01 Ext1 commands...](#)[20.09 Ext2 in2 source](#). The operating mode can be selected separately for each location, which enables quick switching between different operating modes, for example, speed and process PID control. Selection between EXT1 and EXT2 is done via any binary source such as a digital input or fieldbus control word (parameter [19.11 Ext1/Ext2 selection](#)). The source of reference is selectable for each operating mode separately.

Communication fail functionality

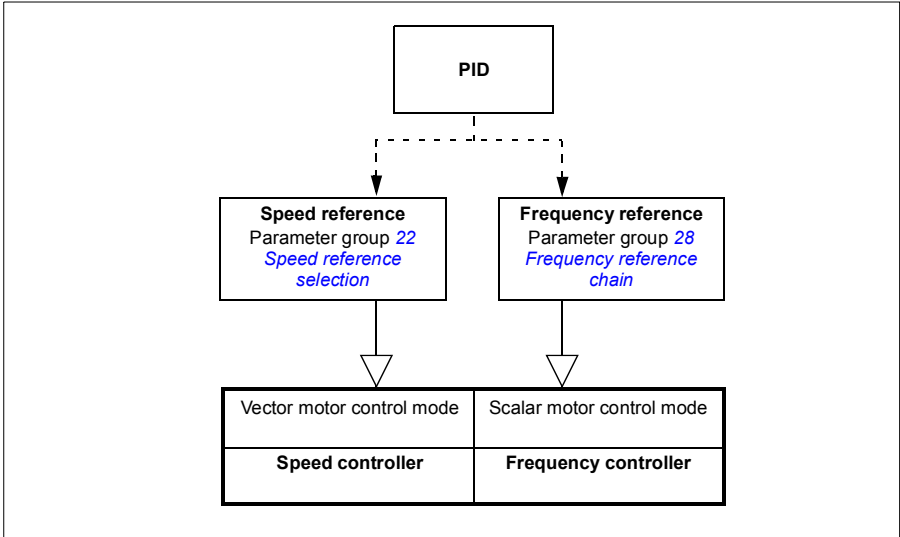
The communication fail functionality ensures continuous process without interruptions. If there is a communication loss, the drive automatically changes the control location from EXT1 to EXT2. This enables process to be controlled, for example, with the drive PID controller. When the original control location recovers, the drive automatically switches control back to the communication network (EXT1).

Settings

- Parameters [19.11 Ext1/Ext2 selection](#) (page 326); [20.01 Ext1 commands...](#)[20.09 Ext2 in2 source](#) (page 327).

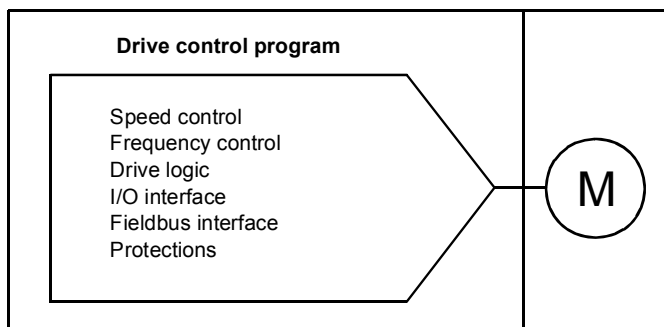
Operating modes of the drive

The drive can operate in several operating modes with different types of reference. The mode is selectable for each control location (Local, EXT1 and EXT2) in parameter group [19 Operation mode](#). An overview of the different reference types and control chains is shown below.



Drive configuration and programming

The drive control program performs the main control functions, including speed and frequency control, drive logic (start/stop), I/O, feedback, communication and protection functions. Control program functions are configured and programmed with parameters.



■ Configuring via default configurations

Default configurations are predefined I/O configurations. See chapter [Default I/O configuration](#) (page 79).

■ Configuring via menus

The drive can be configured using the **Primary settings** and other menus on the control panel. They effectively change parameters but they guide you with assistants, and you do not have to know the parameter names and numbers. See chapter [Settings, I/O and diagnostics on the control panel](#) (page 45).

■ Configuring via parameters

Parameters configure all of the standard drive operations and can be set via

- the control panel, as described in chapter [Control panel](#) (see page 35)
- the Drive composer PC tool, as described in *Drive composer user's manual* (3AUA0000094606 [English]), or
- the fieldbus interface, as described in chapters [Fieldbus control through the embedded fieldbus interface \(EFB\)](#) (see page 209) and [Fieldbus control through a fieldbus adapter](#) (see page 239).

All parameter settings are stored automatically to the permanent memory of the drive. However, if an external +24 V DC power supply is used for the drive control unit, it is highly recommended to force a save by using parameter [96.07 Parameter save manually](#) before powering down the control unit after any parameter changes have been made.

If necessary, the default parameter values can be restored by parameter [96.06 Parameter restore](#).

Adaptive programming

Conventionally, the user can control the operation of the drive by parameters. However, the standard parameters have a fixed set of choices or a setting range. To further customize the operation of the drive, an adaptive program can be constructed out of a set of function blocks.

The Drive composer PC tools (available separately) has an Adaptive programming feature with a graphical user interface for building the custom program. The function blocks include the usual arithmetic and logical functions, as well as, for example, selection, comparison and timer blocks.

The physical inputs, drive status information, actual values, constants and parameters can be used as the input for the program. The output of the program can be used, for example, as a start signal, external event or reference, or connected to the drive outputs. See the table below for a listing of the available inputs and outputs.

If you connect the output of the adaptive program to a selection parameter that is a pointer parameter, the selection parameter will be write-protected.

Example:

If parameter [31.01 External event 1 source](#) is connected to an adaptive programming block output, the parameter value is shown as Adaptive program on a control panel or PC tool. The parameter is write-protected (= the selection cannot be changed).

The status of the adaptive program is shown by parameter [07.30 Adaptive program status](#). The adaptive program can be disabled by [96.70 Disable adaptive program](#).

For more information, see the *Adaptive programming application guide* (3AXD50000028574 [English]).

| Inputs available to the adaptive program | |
|--|---|
| Input | Source |
| I/O | |
| DI1 | 10.02 DI delayed status , bit 0 |
| DI2 | 10.02 DI delayed status , bit 1 |
| DI3 | 10.02 DI delayed status , bit 2 |
| DI4 | 10.02 DI delayed status , bit 3 |
| DI5 | 10.02 DI delayed status , bit 4 |
| DI6 | 10.02 DI delayed status , bit 5 |
| AI1 | 12.11 AI1 actual value |
| AI2 | 12.21 AI2 actual value |
| Actual signals | |
| Motor speed | 01.01 Motor speed used |
| Output frequency | 01.06 Output frequency |
| Motor current | 01.07 Motor current |
| Motor torque | 01.10 Motor torque |
| Motor shaft power | 01.17 Motor shaft power |

| Inputs available to the adaptive program | |
|--|--|
| Input | Source |
| <i>Status</i> | |
| Enabled | 06.16 Drive status word 1 , bit 0 |
| Inhibited | 06.16 Drive status word 1 , bit 1 |
| Ready to start | 06.16 Drive status word 1 , bit 3 |
| Tripped | 06.11 Main status word , bit 3 |
| At setpoint | 06.11 Main status word , bit 8 |
| Limiting | 06.16 Drive status word 1 , bit 7 |
| Ext1 active | 06.16 Drive status word 1 , bit 10 |
| Ext2 active | 06.16 Drive status word 1 , bit 11 |
| <i>Data storage</i> | |
| Data storage 1 real32 | 47.01 Data storage 1 real32 |
| Data storage 2 real32 | 47.02 Data storage 2 real32 |
| Data storage 3 real32 | 47.03 Data storage 3 real32 |
| Data storage 4 real32 | 47.04 Data storage 4 real32 |

| Outputs available to the adaptive program | |
|---|---|
| Output | Target |
| <i>I/O</i> | |
| RO1 | 10.24 RO1 source |
| RO2 | 10.27 RO2 source |
| RO3 | 10.30 RO3 source |
| AO1 | 13.12 AO1 source |
| AO2 | 13.22 AO2 source |
| <i>Start control</i> | |
| Ext1/Ext2 selection | 19.11 Ext1/Ext2 selection |
| Ext1 in1 cmd | 20.03 Ext1 in1 source |
| Ext1 in2 cmd | 20.04 Ext1 in2 source |
| Ext2 in1 cmd | 20.08 Ext2 in1 source |
| Ext2 in2 cmd | 20.09 Ext2 in2 source |
| Fault reset | 31.11 Fault reset selection |
| <i>Speed control</i> | |
| Ext1 speed reference | 22.11 Ext1 speed ref1 |
| Speed proportional gain | 25.02 Speed proportional gain |
| Speed integration time | 25.03 Speed integration time |
| Acceleration time 1 | 23.12 Acceleration time 1 |
| Deceleration time 1 | 23.13 Deceleration time 1 |
| <i>Frequency control</i> | |
| Ext1 frequency reference | 28.11 Ext1 frequency ref1 |
| <i>Events</i> | |
| External event 1 | 31.01 External event 1 source |
| External event 2 | 31.03 External event 2 source |
| External event 3 | 31.05 External event 3 source |
| External event 4 | 31.07 External event 4 source |
| External event 5 | 31.09 External event 5 source |
| <i>Data Storage</i> | |
| Data storage 1 real32 | 47.01 Data storage 1 real32 |
| Data storage 2 real32 | 47.02 Data storage 2 real32 |
| Data storage 3 real32 | 47.03 Data storage 3 real32 |

| Outputs available to the adaptive program | |
|---|--|
| Output | Target |
| Data storage 4 real32 | 47.04 Data storage 4 real32 |
| Process PID | |
| Set 1 setpoint 1 | 40.16 Set 1 setpoint 1 source |
| Set 1 setpoint 2 | 40.17 Set 1 setpoint 2 source |
| Set 1 feedback 1 | 40.08 Set 1 feedback 1 source |
| Set 1 feedback 2 | 40.09 Set 1 feedback 2 source |
| Set 1 gain | 40.32 Set 1 gain |
| Set 1 integration time | 40.33 Set 1 integration time |
| Set 1 tracking mode | 40.49 Set 1 tracking mode |
| Set 1 track reference | 40.50 Set 1 tracking ref selection |

Adaptive program fault and aux code formats

The format of the aux code:

| | | |
|--------------------------|--------------------------|-----------------------|
| Bits 24-31: State number | Bits 16-23: block number | Bits 0-15: error code |
|--------------------------|--------------------------|-----------------------|

If the state number is zero but the block number has a value, the fault is related to a function block in the base program. If both state number and block number are zero, the fault is a generic fault that is not related to a specific block.

See fault [64A6 Adaptive program](#) on page [196](#).

Sequence program

An adaptive program can contain base program and sequence program parts. Base program is run continuously when adaptive program is in running mode. The functionality of the base program is programmed using function blocks and system inputs and outputs.

Sequence program is a state machine. This means that only one state of the sequence program is run at a time. You can create a sequence program by adding states and programming the state programs using the same program elements as in the base program. You can program state transitions by adding state transition outputs to the state programs. The state transition rules are programmed using function blocks.

The number of the active state of the sequence program is shown by parameter [07.31 AP sequence state](#).

Control interfaces

■ Programmable analog inputs

The control unit has two programmable analog inputs. Each of the inputs can be independently set as a voltage (0/2...10 V) or current (0/4...20 mA) input with parameters. Each input can be filtered, inverted and scaled.

Settings

- Parameter group [12 Standard AI](#) (page [307](#)).

■ Programmable analog outputs

The control unit has two current (0...20 mA) analog outputs. Analog output 1 can be set as a voltage (0/2...10 V) or current (0/4...20 mA) output with a parameter. Analog output 2 always uses current. Each output can be filtered, inverted and scaled.

Settings

- Parameter group [13 Standard AO](#) (page [312](#)).

■ Programmable digital inputs and outputs

The control unit has six digital inputs.

Digital input DI5 can be used as a frequency input.

Digital input DI6 can be used as a thermistor input.

Six digital inputs can be added by using a CHDI-01 115/230 V digital input extension module and one digital output by using a CMOD-01 multifunction extension module.

Settings

- Parameter groups [10 Standard DI, RO](#) (page [296](#)) and [11 Standard DIO, FI, FO](#) (page [306](#)).

■ Programmable frequency input and output

Digital input DI5 can be configured as a frequency input.

A frequency output can be implemented with a CMOD-01 multifunction extension module.

Settings

- Parameter groups [10 Standard DI, RO](#) (page [296](#)) and [11 Standard DIO, FI, FO](#) (page [306](#)).

■ **Programmable relay outputs**

The control unit has three relay outputs. The signal to be indicated by the outputs can be selected by parameters.

Two relay outputs can be added by using a CMOD-01 multifunction extension module or a CHDI-01 115/230 V digital input extension module.

Settings

- Parameter group [10 Standard DI, RO](#) (page [296](#)).

■ **Programmable I/O extensions**

Inputs and outputs can be added by using a CMOD-01 or CMOD-02 multifunction extension module or a CHDI-01 115/230 V digital input extension module. The module is mounted on option slot 2 of the control unit.

The table below shows the number of I/O on the control unit as well as optional CMOD-01, CMOD-02 and a CHDI-01 modules.

6

| Location | Digital inputs (DI) | Digital outputs (DO) | Analog inputs (AI) | Analog outputs (AO) | Relay outputs (RO) |
|--------------|---------------------|----------------------|--------------------|---------------------|----------------------|
| Control unit | 6 | - | 2 | 2 | 3 |
| CMOD-01 | - | 1 | - | - | 2 |
| CMOD-02 | - | - | - | - | 1 (non-configurable) |
| CHDI-01 | 6 (115/230 V) | - | - | - | 2 |

The I/O extension module can be activated and configured using parameter group 15.

The CMOD-02 offers, in addition to the relay output (non-configurable), a +24VDC/AC input and a thermistor input.

Note: The configuration parameter group contains parameters that display the values of the inputs on the extension module. These parameters are the only way of utilizing the inputs on an I/O extension module as signal sources. To connect to an input, choose the setting *Other* in the source selector parameter, then specify the appropriate value parameter (and bit, for digital signals) in group 15.

Note: With the CHDI, you can use up to six additional digital inputs. The CHDI does in no way affect the fixed digital inputs on the control board.

Settings

- Parameter group [15 I/O extension module](#) (page [317](#)).

Fieldbus control

The drive can be connected to several different automation systems through its fieldbus interfaces. See chapters *Fieldbus control through the embedded fieldbus interface (EFB)* (page 209) and *Fieldbus control through a fieldbus adapter* (page 239).

Settings

- Parameter groups *50 Fieldbus adapter (FBA)* (page 440), *51 FBA A settings* (page 444), *52 FBA A data in* (page 445), and *53 FBA A data out* (page 446) and *58 Embedded fieldbus* (page 446).

Control of a line supply unit (LSU)

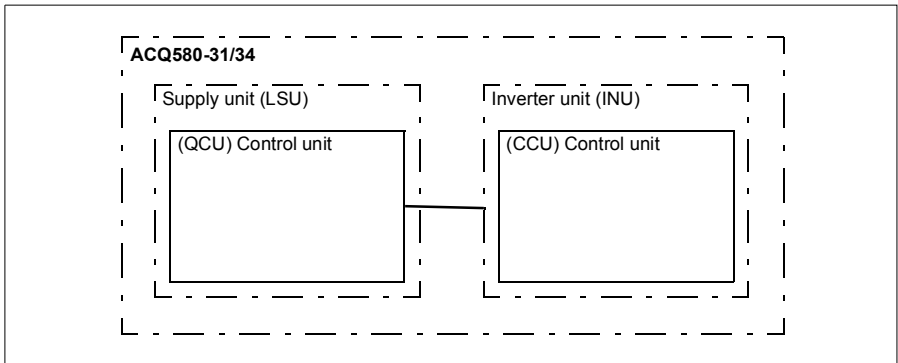
Overview

This feature is only supported for ACQ580-31 and ACQ580-34 drives.

ACQ580-31 and ACQ580-34 drives consist of one line supply unit (LSU) and one inverter unit (INU). The supply unit can be controlled through the inverter unit. For example, the inverter unit can send a control word and references to the supply unit, enabling the control of both units from the interfaces of one control program.

Topology

The control units of the supply unit and the inverter unit are connected by an internal communication bus.



Communication

The communication between the units consists of data sets of three 16-bit words each. The inverter unit sends a data set to the supply unit, which returns the next data set to the inverter unit.

The communication uses data sets 10 and 11, updated at 2 ms intervals. Data set 10 is sent by the inverter unit to the supply unit, while data set 11 is sent by the supply

unit to the inverter unit. The contents of the data sets are freely configurable, but data set 10 typically contains the control word, while data set 11 returns the status word.

If the supply unit supports it, is possible to send a DC voltage and/or reactive power reference to it from the inverter parameter group [94 LSU control](#). A supply unit will also send actual signals to the inverter unit which are visible in parameter group [01 Actual values](#).

Settings

- Parameters in groups:
 - [01 Actual values](#) (page [275](#)): [01.102...01.164](#)
 - [05 Diagnostics](#) (page [282](#)): [05.111...05.121](#)
 - [06 Control and status words](#) (page [285](#)): [06.36...06.39](#), [06.116...06.118](#)
 - [07 System info](#) (page [294](#)): [07.106...07.107](#)
 - [30 Limits](#) (page [361](#)): [30.101...30.149](#)
 - [31 Fault functions](#) (page [368](#)): [31.120...31.121](#)
 - [96 System](#) (page [487](#)): [96.108 LSU control board boot](#)
- Parameter groups [60 DDCS communication](#) (page [454](#)), [61 D2D and DDCS transmit data](#) (page [454](#)), [62 D2D and DDCS receive data](#) (page [455](#)) and [LSU control board boot](#) (page [482](#)).

Pump control features

Note: ABB recommends reading the pump manufacturer's instructions for optimal performance.

■ Intelligent pump control (IPC)

Multipump systems consist of several pumps, each connected to a separate drive. This arrangement enables a high flexibility in load sharing, balancing the run time between the pumps and keeping each pump running optimally. If the active pumps cannot meet the demand, the system automatically starts or stops pumps one by one.

The order of the pumps used can be defined to balance the run time better (pumps that have run the least, start first) or can be set by the efficiency class of each pump (for example, pumps with high efficiency are primarily used).

Multipump systems achieve high-level redundancy, if one pump fails or requires maintenance, other pumps can take over the operation. Efficiency, continuous operation and easy maintenance are reasons why multipump systems can be found in a variety of different applications in the water and waste water industry.

In the IPC system one drive at a time acts as an master and you can use up to seven follower drives. The master drive controls the whole multi-pump-system and has the following tasks:

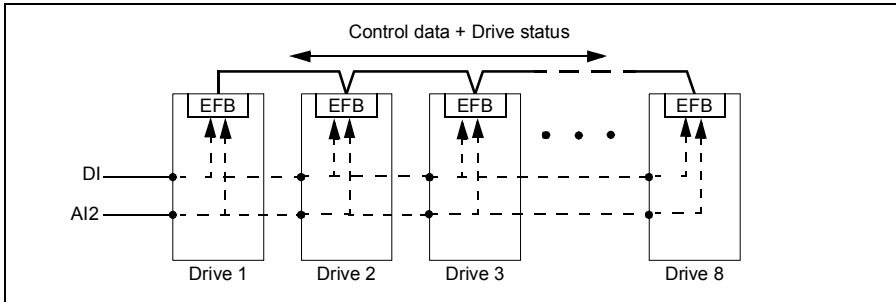
- activating and deactivating the follower drives
- regulating the systems speed with its internal PID loop control according an internal set-point
- processing the I/O signals (set-point and feedback signals)

The IPC system supports redundancy, so that in case of a pump failure or a drive is disconnected for maintenance, the system still continues the operation with the remaining drives. The IPC system can be enabled using primary settings or parameter [76.21 Multipump configuration](#).

The IPC system at first increases the pump speed and if this speed is not sufficient, the system will start a new pump based on process demand. While starting a new pump, the speed of the already running pumps is reduced to allow smooth flow of liquid.

In an IPC system, the drives communicates through inverter-to-inverter link on embedded fieldbus. Each drive receives a start command through digital input DI and a process value through analog input AI2. Settings for setpoint and actual value are

not copied through the inverter-to-inverter link. Actual value needs separate input for all the drives to ensure redundant system.



Starting the IPC system

The IPC system starts operation when the drive receives a start command from external control location EXT2 (parameter [20.08 Ext2 in1 source](#)). The start command indicates that the pump is available to the IPC system. However, the system sends the actual start command to the follower drives based on the required output of the system.

6

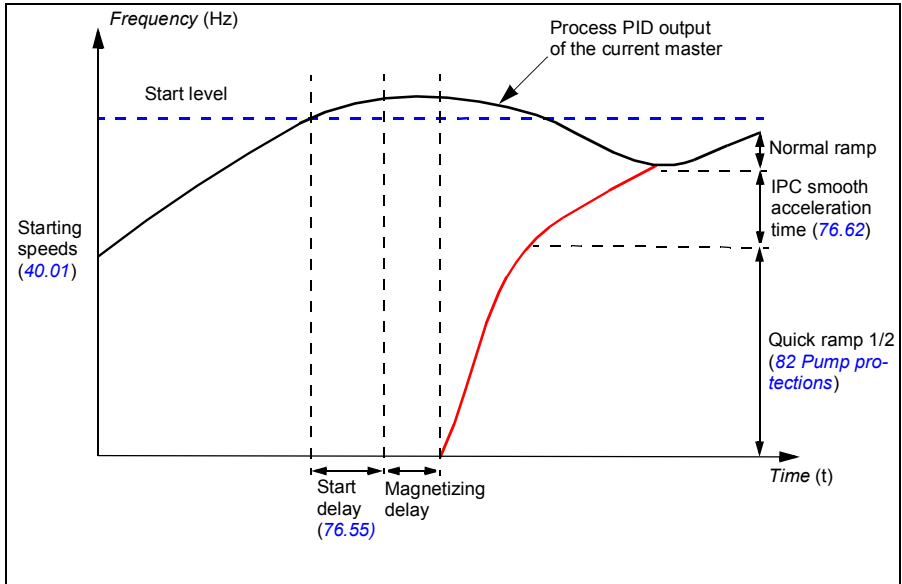
If all drives in the system receive a start command simultaneously, then the drive with the lowest node number will start as the master drive. See parameter [76.22 Multipump node number](#) (page [460](#)).

For optimal energy operation, you can combine the PID sleep function with IPC system. For information on PID sleep function, see [Sleep and boost functions for process PID control](#) (page [130](#)).

Note: The IPC system is not active on external control location EXT1.

Smooth pump transitions

The figure below shows the smooth pump transitions with different ramp times.



The timing diagram of Smooth pump transitions shows the pump starting steps. In this case, the process PID output of the current master has exceeded the start level (76.30...76.36).

1. The IPC system starts a new pump after the start delay time (76.55 Start delay) is elapsed.
2. After the motor is magnetized and starts rotating, the new pump accelerates using quick ramp 1 and 2 to obtain productive zone. After quick ramps (see section [Ramps – Quick ramps](#) on page 122), the IPC smooth acceleration time is used to accelerate the pump to master speed.

Note: This operation is effective only when quick ramp mode is enabled with parameter 82.01 Quick ramp mode (page 477).

3. The new pump then accelerates along IPC smooth ramp time defined with parameter 76.62 IPC smooth acceleration time.
4. When a new pump is accelerating, the other pumps decelerate to maintain the stable output of the system, shown as Normal ramp in the diagram.
5. After the new pump reaches the speed of the current master pump, the new pump becomes the new master.
6. The new master and all the remaining pumps will start to follow the master drive speed defined by the process PID of the master drive.

Pump priorities

The pumps are prioritized based on energy efficiency and process demand.

- **High** – more energy efficient pumps
- **Normal** – less energy efficient pumps
- **Low** – pumps which do not run unless process demands

You can select the pump priority with parameter [76.77 Pump priority](#). The IPC system prefers high priority pumps over normal and low priority pumps. You can limit the time with parameter [76.76 Max stationary time](#), so that even the low priority pumps are often run to keep them in operational condition.

Master- follower change principle

1. The master controls the process until the follower has reached the setpoint. There is no master follower change if the setpoint is not achieved.

This allows for example the pump cleaning function for the follower pump at start-up without confusing the system.

6

2. Max stationary time is followed (if that is set).

This has high priority because it makes sure the pump is kept in good condition and it just does not stay inoperative.

3. After checking the max stationary time, the pump priorities are followed.

This makes sure the pumps with high priority are operated the most often.

4. If none of the above conditions are set, the system tries to balance the operation time between all the pumps.

Automatic parameter synchronization

Automatic parameter synchronization feature reduces the number of configuration steps in the IPC system.

The synchronized parameter groups are selected with parameter [76.102 IPC synchronization settings](#). In addition, there are some drive dependent parameters that are not synchronized, like [76.22 Multipump node number](#). To enable synchronization of a parameter group between two or more drives, the group synchronization must be enabled in all the drives.

The synchronization process uses two mechanisms to make sure that the parameter groups are synchronized. When a parameter value is changed in a drive, it broadcasts the changed parameter value to inverter-to-inverter (I2I) link. From the inverter-to-inverter (I2I) link, all the drives that have the synchronization enabled, reads the value and set their own parameter value.

In addition, the drive periodically broadcast the group [CRC](#) (cyclic redundancy check) to the inverter-to-inverter (I2I) link along with the time stamp of the last edit time of the group. From this information, the drives can conclude if the group is synchronized

and which drive has the latest parameter values. If there is a [CRC](#) mismatch, the drives request the parameter values from the parameter group and from the drive with the latest values.

You can monitor changes in the drive configuration with Parameter checksum calculation, see section [Parameter checksum calculation](#) on page [172](#).

■ Application example: IPC system with three drives and three pumps

In this example three drives with three pumps are connected to work in cooperation. The example simulates how the pressure sensor controls the system. The external pressure sensor needs to be connected to the system and it will send the information to the drive, which controls the operation of the pump as well as the follower drives.

The drive can be used in Hand mode (local control) which gives ability to set the speed from the control panel. Drive can be started and stopped with Hand and Off buttons on the control panel.

The drive can be as well used in Auto mode (remote control), in this example remote control is executed with PID. PID uses external sensor to set reference speed for the pumps, signal comes to analog EXT2 (AI2 = Analog Input 2).

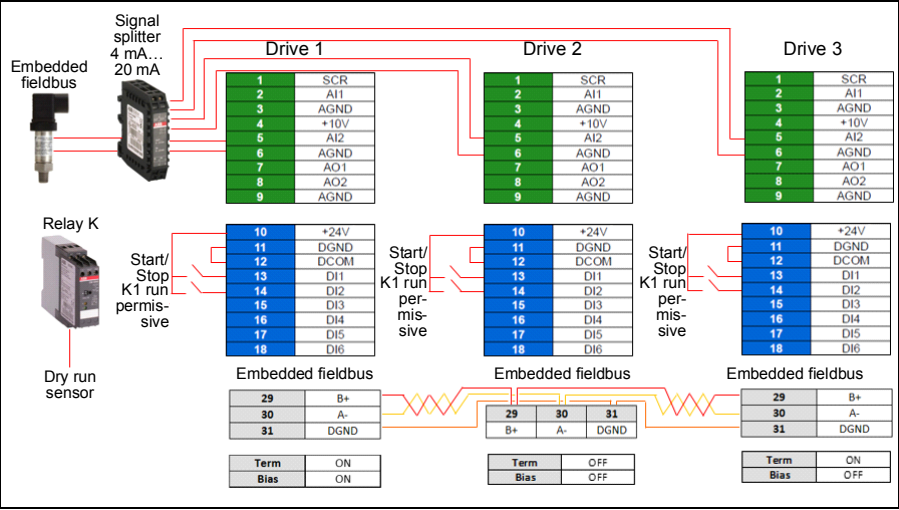
To start the system, the following digital inputs are used as run permissive signals: DI1 Enable start of the system (Start / Stop) and DI2 Run Permission (dry pump sensor connection).

Notes:

- IPC system requires that all the drives are programmed with same firmware version. Different firmware version generates an IPC version error fault because internal checksum will have mismatch.
- When the start signal is given simultaneously to all the drives in the system, it will start all the pumps for a short time to define master and followers and then continue operation with only the required amount of pumps.

For the general connection diagram, see page 96.

Wiring diagram



Note: If a current signal is used, use a signal splitter to connect the sensor signal to all drives that may take on the master role.

Voltage signal can also be used for sensor feedback. This allows chaining the sensor signal.

Quick steps – Programming summary

Start up all three drives normally (see section [How to start up the drive](#) on page 22).

Configure IPC in the first drive

The drive offers a synchronization feature which automatically ensures that all the AI and PID settings are equal. Most of the IPC settings are also synchronized between drives. This helps to avoid mistakes and speeds up the commissioning process.

Menu > Primary settings

- Select **Multipump control**
- Select and edit **Pumping mode: *Intelligent pump control (IPC)***
- Press **Next**
 - Edit **Node number**: (This number must be unique for each drive in the IPC system. In this example, we are using 1 for the first drive, 2 for the second drive and 3 for the third drive.)
 - Press **Next**
- Select **Settings for this pump**
 - Edit **Drive name**: (Keep the default name or give a unique name.)
 - Edit **Node number**: (Enter Node number if not already given above.)
 - Select ☒ **Can be master**. (In this example all three drives can act as a master. Redundant operation requires moving master. If this is not selected, the drive can only operate as a follower.)
 - Edit **Prefer this pump: *Medium***. (The pumps can be prioritized based on energy efficiency and process demand: High - more energy efficient pumps, Medium - less energy efficient pumps, Low - pumps which do not run unless process demands. Similar pumps are recommended to be used in booster applications.)
 - Press **Back**
- Select **Shared settings**
 - Select **Synchronization settings**
 - Edit **Do you want to allow synchronization of settings with other drives?: Yes**. (Synchronization will save significant amount of time for the total system configuration. It also ensures that values within selected parameter groups are equal and copied according to last changed parameter.
 - Press **Next**
 - Edit **Select settings to copy between all drives:**
 - Select ☒ **AI settings**
 - Select ☒ **PID settings**
 - Select ☒ **IPC shared settings**

- Press **Next**
- Edit **Total number of pumps:** 3
- Edit **Always run at least:** 1 pump
- Edit **Never more than:** 3 pumps (These three pieces of information are synchronized over the inverter-to-inverter link between all drives.)
- Select **Start/stop speeds** (Define when a pump should be started or stopped by the system in order to meet the demand, keeping the target pressure.
Example values:

- Edit **Start 2nd pump at:** 48 Hz
- Edit **Start 3rd pump at:** 48 Hz
- Edit **Stop 3rd pump at:** 25 Hz
- Edit **Stop 2nd pump at:** 25 Hz

If the first pump cannot keep the pressure and exceeds 48 Hz, the second pump will be activated. If the demand is still rising and both pumps exceed 48 Hz the third pump will be activated.

If the demand declines and the three activated pumps fall under 25 Hz, the third pump will be deactivated. If the demand is still too low and the remaining two pumps fall below 25 Hz, the second pump will be deactivated.

These values **must** be defined according to the system. In many applications the start and stop speeds fall in narrow range, for example, 40...45 Hz.

- Press **Back**
- Select **Transition smoothing**
 - Edit **Ignore demand spikes under:** 2.00 s (The spike time describes how long the output frequency needs to be over, in this case, 48 Hz until the IPC starts the next drive.)
 - Edit **Ignore demand dips under:** 3.00 s (The dip time describes how long the frequency needs to stay below 25 Hz until the IPC stops one drive. This smooths the IPC behavior and avoids unnecessary starts and stops of the drives.)
 - Press **Back**
- Select **Autochange**. This function ensures, that the run time of all drives in the system is balanced.
 - Edit **Maximum wear imbalance:** 12 h. (This specifies the maximum difference in the running time between the drives in an IPC system.)
 - Edit **Maximum stationary time:** 0.0 h. (This makes sure the pump get exercised frequently. This protects especially low prioritized pump from pump blockages. Value 0.0 h disables the parameter.)

- Edit **Autochange only below**: 100%. (This specifies the maximum speed when pump change is allowed. Value 100% allows a pump change action whenever it is needed.)
- Press **Back**
- Select **PID control (Secondary reference, EXT2)**
- Select ☒ **Use PID control**
- Edit **Activate PID control from**: *Always active*
- Edit **Start/stop/dir from**: *DI Start/stop*
- Edit **Unit**: bar
- Edit **PID status**: *0 hex*
- Select **Feedback**
 - Edit **Actual value**: *0.0 bar*
 - Edit **Source**: *AI2 scaled*
 - Select **AI2 scaling**
 - Edit **Range**: *4...20 mA*
 - Edit **Scaled min**: *0.000 bar*
 - Edit **Scaled max**: *6.000 bar*
 - Press **Back**
 - Edit **filter time**: *0.000 s*
 - Press **Back**
- Select **Setpoint**
 - Edit **Actual value**: *0.0 bar*
 - Edit **Source**: *Constant setpoint*
 - Edit **Constant setpoint 1**: *4.00 bar*
 - Edit **Constant setpoint 2**: *0.00 bar*
 - Edit **Minimum**: *0.00 bar*
 - Edit **Maximum**: *6.00 bar*
 - Press **Back**
- Select **Tuning**
 - Edit **Deviation actual value**: *0.00 bar*
 - Edit **Gain**: *1.00*
 - Edit **Integration time**: *0.000 s*
 - Edit **Derivation time**: *0.000 s*
 - Edit **Derivation filter time**: *0.0 s*
 - Press **Back**
- Edit **Increase output**: *Feedback < Setpoint* (Used when filling booster pump or tank. "Feedback > Setpoint" is used, for example, when emptying a tank.)

- Select **Output**:
 - Edit **Actual value**: 0.00
 - Edit **Minimum**: 0.00
 - Edit **Maximum**: 50.00 (Hz) or 100.0 (%)
 - Press **Back**
- Select and edit **Sleep function**: Off
- Press **Back** repeatedly to get to **Primary settings**.

Configure the rest of the drives

After starting up and configuring IPC of the first drive in the system, you can then start-up the rest of the drives (see section [How to start up the drive](#) on page 22).

Then configure each of these drive as follows.

Menu > Primary settings

- Select **Multipump control**
- Edit **Pumping mode**: *Intelligent pump control (IPC)*
- Press **Next**
 - Edit **Node number**: (The rest of the drives, in this example 2...3.)
 - Press **Next**
- Select **Settings for this pump**
 - Edit **Drive name**: (Give a unique name.)
 - Edit **Node number**: (Enter Node number if not already given above.)
 - Select ☒ **Can be master**
 - Edit **Prefer this pump**: *Medium*
 - Press **Back**
- Select **Shared settings**
 - Select **Synchronization settings**
 - Edit **Do you want to allow synchronization of settings with other drives?**: Yes.
 - Press **Next**
 - Edit **Select settings to copy between all drives**:
 - Select ☒ **AI settings**
 - Select ☒ **PID settings**
 - Select ☒ **IPC shared settings**
 - Press **Back** repeatedly to get to **Primary settings**.

Now all the above parameter settings are copied to this drive and the system is ready to run.

Settings

- **Menu > Primary settings > Multipump Control (IPC)**
- Parameter group [01 Actual values](#) (page 275)
- Parameter group [40 Process PID set 1](#) (page 409)
- Parameter groups [76 Multipump configuration](#) (page 457), [77 Multipump maintenance and monitoring](#) (page 469) and [82 Pump protections](#) (page 477).

Single pump control (PFC/SPFC)

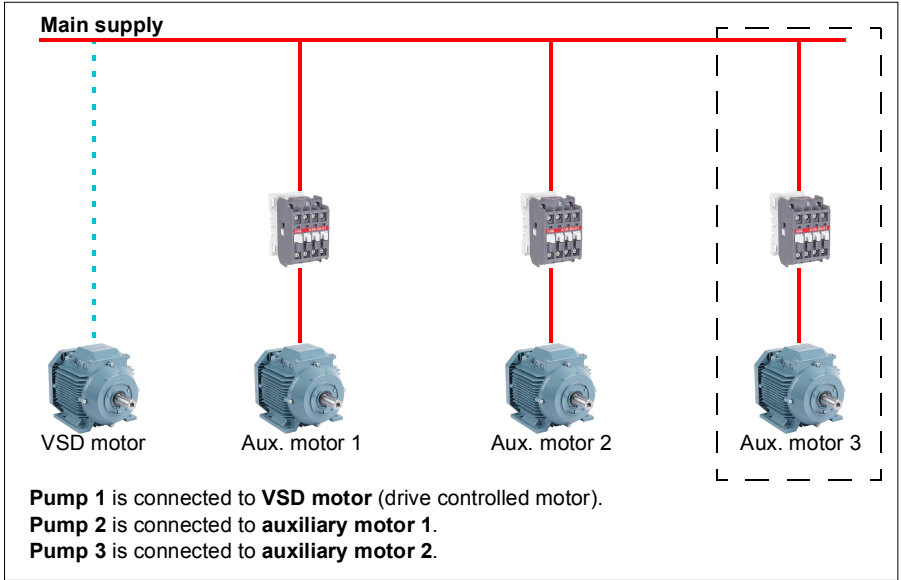
The Single pump control (PFC) is used in pump systems consisting of one drive and multiple pumps. The drive controls the speed of one of the pumps and in addition connects (and disconnects) the other pumps directly to the supply network through contactors.

The PFC control logic switches auxiliary motors on and off as required by the capacity changes of the process. In a pump application, for example, the drive controls the motor of the first pump, varying the motor speed to control the output of the pump. This pump is the speed regulated pump. When the demand (represented by the process PID reference) exceeds the capacity of the first pump (a user defined speed/frequency limit), the PFC logic automatically starts an auxiliary pump. The logic also reduces the speed of the first pump, controlled by the drive, to account for the addition to the total system output by the auxiliary pump. Then, as before, the PID controller adjusts the speed/frequency of the first pump in such a way that the system output meets the process needs. If the demand continues to increase, the PFC logic adds further auxiliary pumps, in a similar manner as just described.

As the demand drops, making the speed of the first pump fall below a minimum limit (user defined as a speed/frequency limit), the PFC logic automatically stops an auxiliary pump. The PFC logic also increases the speed of the drive controlled pump to account for the missing output of the stopped auxiliary pump.

The Single pump control (PFC) is supported in external control location EXT2 only.

Example: Three-pump constant pressure water supply application



| Flow consumption vs. pump status | | | |
|----------------------------------|--------|--------|--------|
| Consumption | Pump 1 | Pump 2 | Pump 2 |
| Low | VSD | Off | Off |
| ↓ | VSD | DOL | Off |
| High | VSD | DOL | DOL |
| ↓ | VSD | DOL | Off |
| Low | VSD | Off | Off |

VSD = Controlled by drive, tuning the output speed according to PID control.

DOL = Direct On Line. Pump is running at fixed motor nominal speed.

Off = Off-line. Pump stops.

Soft pump control (SPFC)

The Soft pump control (SPFC) logic is a variant of the PFC logic for pump and alternation applications where lower pressure peaks are desirable when a new auxiliary motor is to be started. The SPFC logic is an easy way to implement soft starting of direct on line (auxiliary) motors.

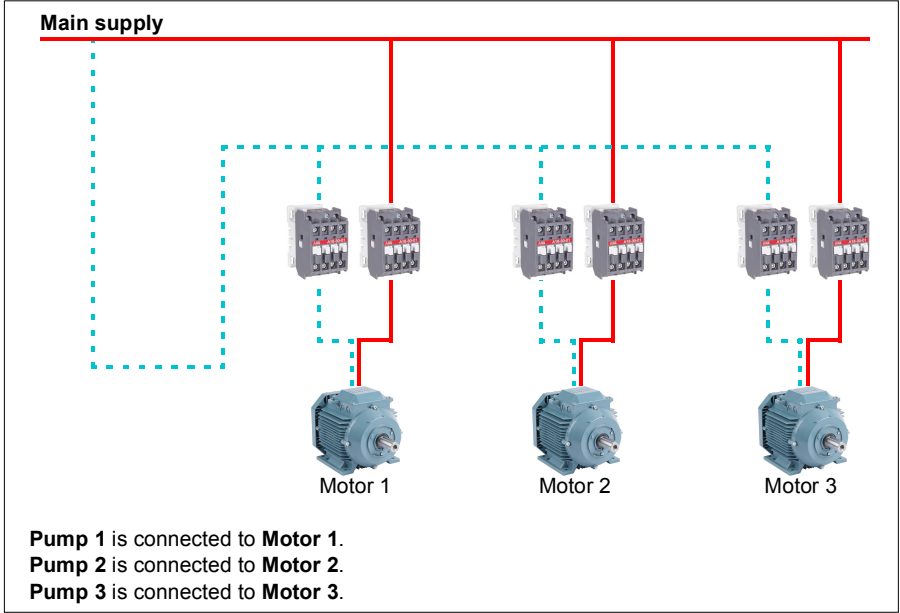
The main difference between traditional PFC and SPFC logic is how the SPFC logic connects auxiliary motors on-line. When the criteria for starting a new motor is fulfilled (see above) the SPFC logic connects the drive controlled motor to the supply network in a flying start, that is, while the motor is still coasting. The drive then connects to the


next pump unit to be started and starts controlling the speed of that one, while the previously controlled unit is now connected directly on line through a contactor.

Further (auxiliary) motors are started in a similar manner. The motor stopping routine is the same as for the normal PFC routine.

In some cases SPFC makes it possible to soften the start-up current while connecting auxiliary motors on-line. Lower pressure peaks on the pipelines and pumps may be achieved as a result.

Example: Three-pump constant pressure water supply application





| Flow consumption and pump status | | | |
|----------------------------------|--------|--------|--------|
| Consumption | Pump 1 | Pump 2 | Pump 2 |
| Low | VSD | Off | Off |
| ↓ | DOL | VSD | Off |
| High | DOL | DOL | VSD |
| ↓ | DOL | Off | VSD |
| Low | Off | Off | VSD |
| ↓ | VSD | Off | DOL |
| High | DOL | VSD | DOL |
| ↓ | DOL | VSD | Off |
| Low | Off | VSD | Off |
| ↓ | VSD | DOL | Off |
| High | DOL | DOL | VSD |

VSD = Controlled by drive, tuning the output speed according to PID control.

DOL = Direct On Line. Pump is running at fixed motor nominal speed.

Off = Off-line. Pump stops.

Autochange

Automatic rotation of the start order, or Autochange functionality, serves two main purposes in many PFC type setups. One is to keep the run times of the pumps equal over time to even their wear. The other is to prevent any pump from standing still for too long, which would clog up the unit. In some cases it is desirable to rotate the start order only when all units are stopped, for example, to minimize the impact on the process.

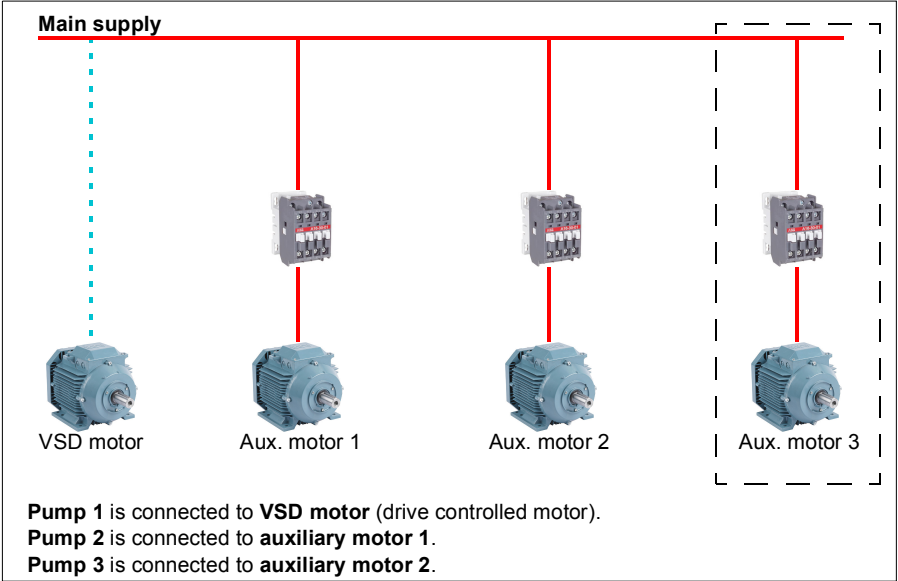
The Autochange can also be triggered by the Timed function (see page 126).

There are three modes of autochange according to what kind of PFC and SPFC together with auxiliary circuit are implemented.

1. Autochange PFC with auxiliary motors only

Example: Three-pump constant pressure water supply application.

Two pumps fulfill the flow consumption for long term running, and the third pump is reserved for shifting. In this mode, only two auxiliary motors, pump 2 and pump 3, shift working.



| Flow consumption and pump status | | | |
|----------------------------------|--------|--------|--------|
| Consumption | Pump 1 | Pump 2 | Pump 2 |
| Low | VSD | Off | Off |
| Normal | VSD | DOL | Off |
| ↓ | VSD | Off | DOL |
| ↓ | VSD | DOL | Off |
| Normal | VSD | Off | DOL |

VSD = Controlled by drive, tuning the output speed according to PID control.

DOL = Direct On Line. Pump is running at fixed motor nominal speed.

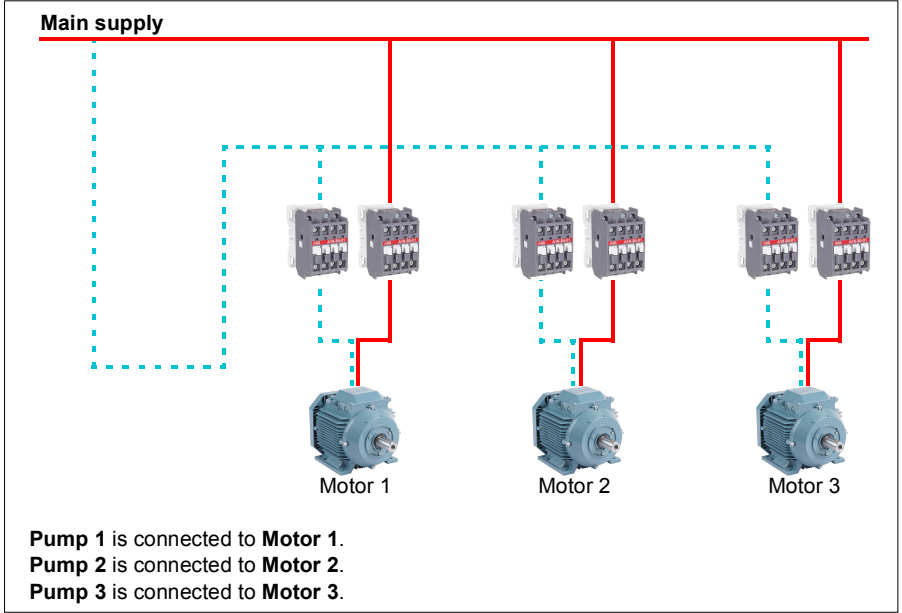
Off = Off-line. Pump stops.

2. Autochange PFC with all motors

Example: Three-pump constant pressure water supply application

Two pumps fulfill the flow consumption for long term running, and the third pump is reserved for shifting. Because all motors will be shifted for autochange routine, special auxiliary circuit is needed, which is the same as for the SPFC system.

In this mode, the VSD motor will move to the next pump one by one, but the auxiliary motor will always be put on-line in DOL mode. However, three pumps are shifted overall.



| Flow consumption and pump status | | | |
|----------------------------------|--------|--------|--------|
| Consumption | Pump 1 | Pump 2 | Pump 2 |
| Low | VSD | Off | Off |
| Normal | VSD | DOL | Off |
| ↓ | Off | VSD | DOL |
| ↓ | DOL | Off | VSD |
| Normal | VSD | DOL | Off |

VSD = Controlled by drive, tuning the output speed according to PID control.
DOL = Direct On Line. Pump is running at fixed motor nominal speed.
Off = Off-line. Pump stops.

3. Autochange with SPFC

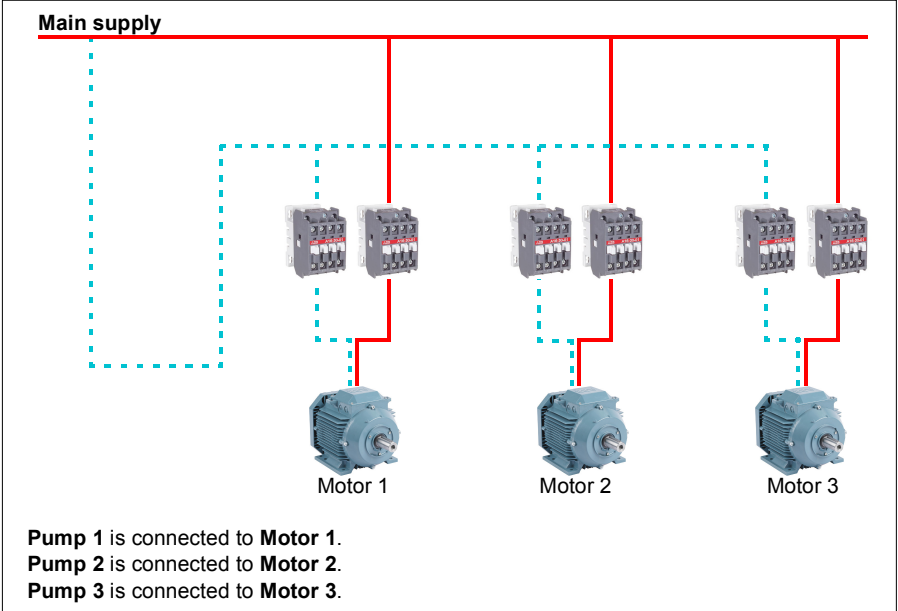
Auxiliary motor is meaningless in SPFC. So it does not matter if you select All motors or Aux motor only.

Example: Three-pump constant pressure water supply application

Two pumps fulfills the flow consumption for long term running, and the third pump is reserved for shifting.

SPFC system supports autochange naturally. No extra component is needed as long as SPFC is already working there. In this mode, all the pumps are always started by the drive as they are in SPFC normal operation.

6



| Flow consumption and pump status | | | |
|----------------------------------|--------|--------|--------|
| Consumption | Pump 1 | Pump 2 | Pump 2 |
| Low | VSD | Off | Off |
| Normal | DOL | VSD | Off |
| ↓ | Off | DOL | VSD |
| ↓ | VSD | Off | DOL |
| Normal | DOL | VSD | Off |

VSD = Controlled by drive, tuning the output speed according to PID control.

DOL = Direct On Line. Pump is running at fixed motor nominal speed.

Off = Off-line. Pump stops.

Interlock

There is an option to define interlock signals for each motor in the PFC system. When the interlock signal of a motor is Available, the motor participates in the PFC starting sequence. If the signal is Interlocked, the motor is excluded. This feature can be used for informing the PFC logic that a motor is not available (for example, due to maintenance or manual direct-on-line starting).

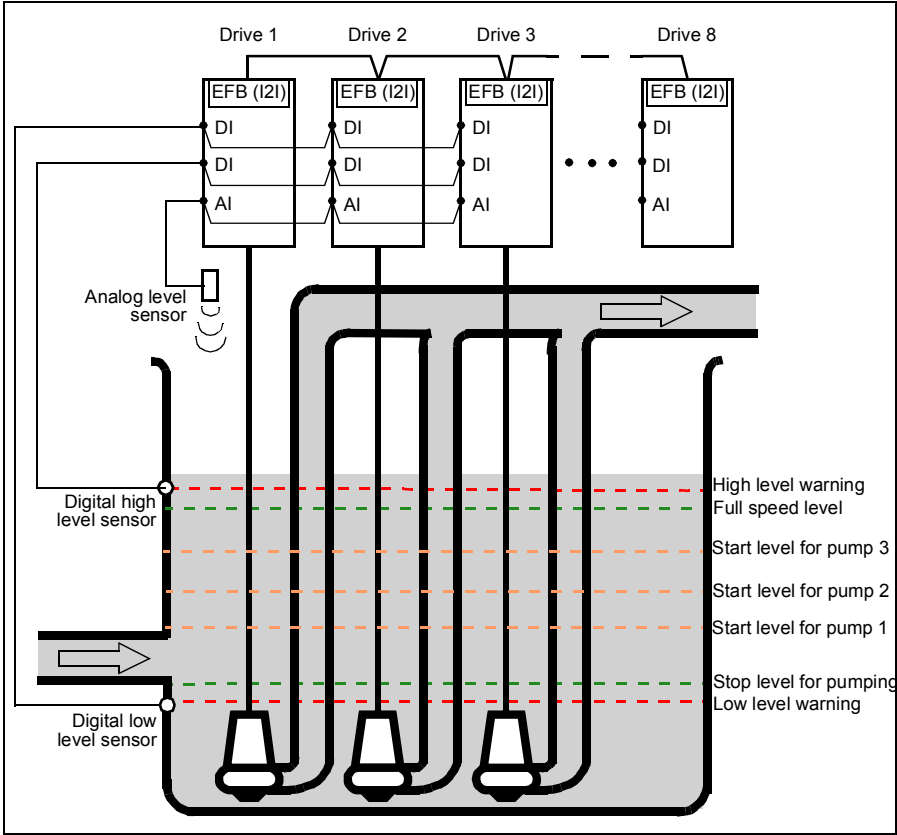
Settings

- Parameter group [10 Standard DI, RO](#) (page [296](#))
- Parameter group [40 Process PID set 1](#) (page [409](#))
- Parameter groups [76 Multipump configuration](#) (page [457](#)) and [77 Multipump maintenance and monitoring](#) (page [469](#)).
-

Level control

The Level control function can be used to control the water level in tank filling or emptying application. The function supports up to eight pumps. The function can be enabled by setting parameter [76.21 Multipump configuration](#) to [Level control - Emptying](#) or [Level control - Filling](#).

The figure below represents a waste water pumping system in emptying mode. The system has varying water level and the pumps will start and stop based on measured level.



The first pump (master) will start when the actual level is above the start point 1. More pumps will start and stop based on the rising (emptying) or falling (filling) water levels of individual pumps. In case of a pump failure or if drive is disconnected for maintenance, the system still continues operation with the remaining pumps and drives.

The digital high level and low level sensors can be used to generate a warning or fault when the water level in the container raises or falls to the abnormal operation area. The analog level sensor connected to an analog input measures the water level.

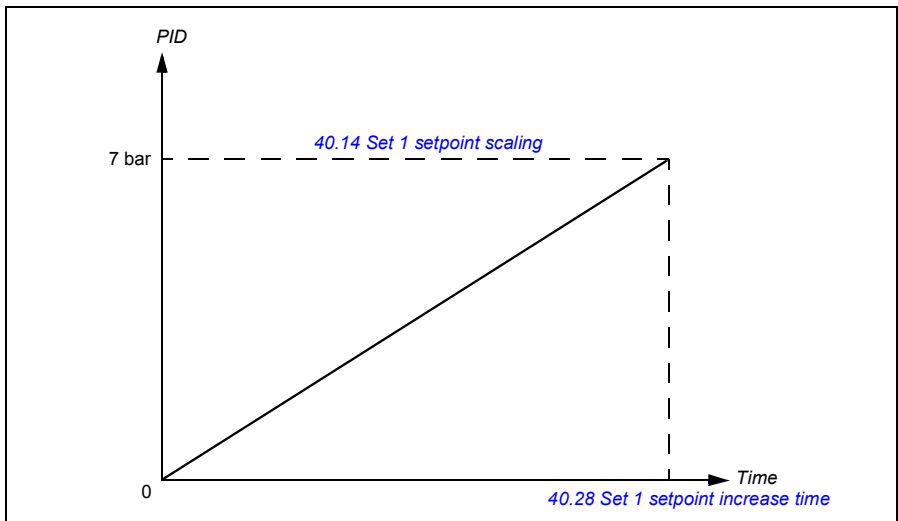
Settings

Parameter group [76 Multipump configuration](#) (page 457).

Soft pipe fill

The Soft pipe fill function can be used to fill an empty pipe softly. The function can avoid sudden charge of water and rise in pressure in a closed valve or a nozzle at the end of the pump system.

The figure below illustrates the operation of the Soft pipe fill function.



If the pumping system is leaking or is damaged then the setpoint will not reach in time. To detect such a condition, you can enable soft pipe fill supervision to generate a warning or a fault. The time is calculated with the last reference change in parameter [40.03 Process PID setpoint actual](#).

Settings

- **Menu - Primary settings - Pump features - Soft pipe fill**
- Parameter groups [40 Process PID set 1](#) (page 409) and [82 Pump protections](#) (page 477).

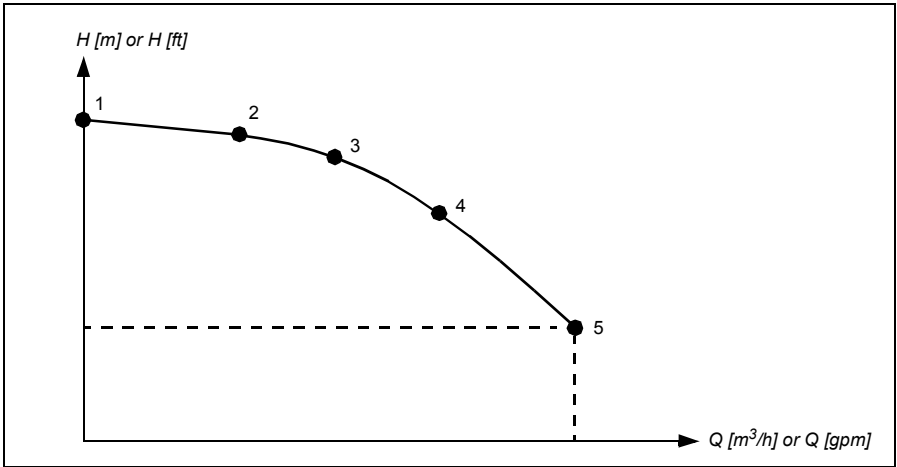
Sensorless flow calculation

The flow calculation function provides a reasonably accurate (typically $\pm 3\ldots 6\%$) calculation of the flow without the installation of a separate flow meter. The flow is calculated on the basis of parameter data such as pump inlet and outlet diameters,

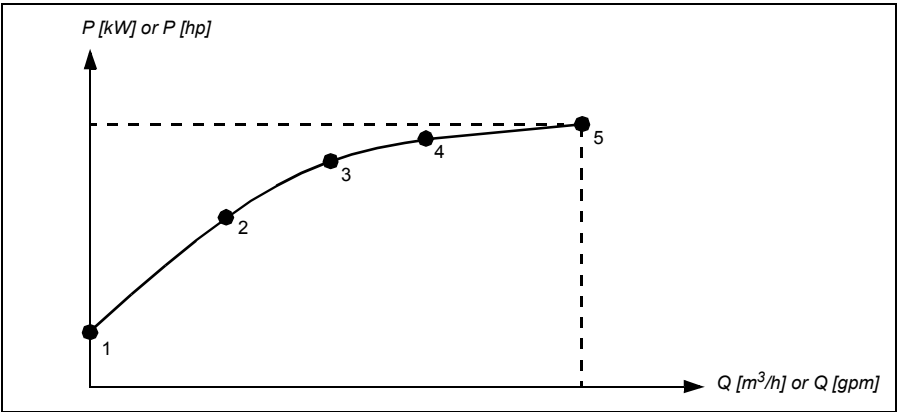
pressure at pump inlet and outlet, height difference of pressure sensors, and pump characteristics.

The user can either define a PQ (power/flow) or HQ (head/flow) performance curve that is used as the basis for the calculation. It is also possible to use differential pressure based flow feedback.

The figure below shows the HQ performance curve of the pump for the flow calculation function.



The figure below shows the PQ performance curve of the pump for the flow calculation function.



Notes:

- The flow calculation function cannot be used for invoicing purposes.
- The flow calculation function cannot be used outside the normal operating range of the pump.
- Head points in HQ curve are expected to be in descending order ($H1 > H2 > H3 > H4 > H5$).
- Power points in PQ curve are expected to be in ascending order ($P1 < P2 < P3 < P4 < P5$).

Parameter group [80 Flow calculation and protection](#) (page 471) defines the HQ/PQ or differential pressure based flow feedback and [81 Sensor settings](#) (page 475) defines pump inlet and outlet selection for HQ calculation

Settings

- Parameter group [80 Flow calculation and protection](#) (page 471) and [81 Sensor settings](#) (page 475).

Pump cleaning

The pump cleaning function is mainly used in wastewater applications to prevent solid particles from being stuck on the pump impellers or in the piping. This function consists of a programmable sequence of forward and reverse rotations of the pump to shake off and remove any residue or rags on the impeller or piping.

The Pump cleaning function prevents:

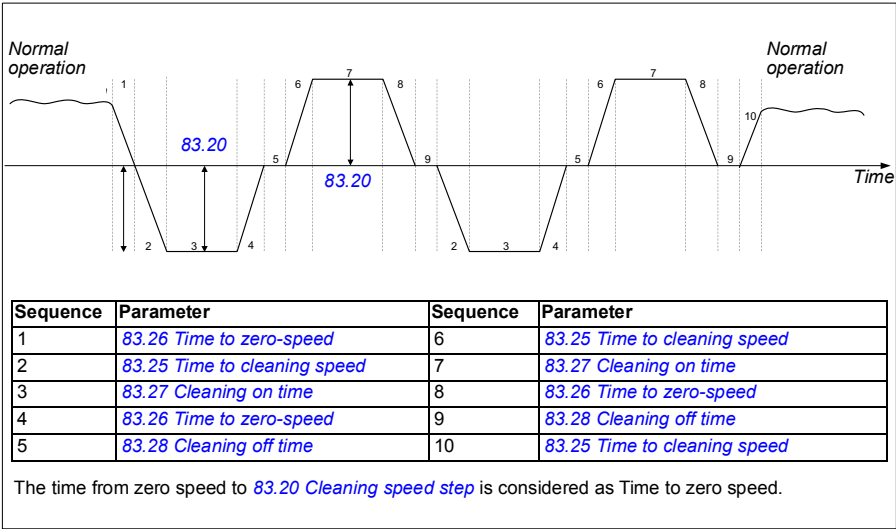
- blockages and decreases the need of manual cleaning
- increases the lifetime of the pump, pipes and impellers, and
- improves energy efficiency of the system.

Pump cleaning sequence

The drive starts cleaning with a pulse in the opposite direction of the running direction. The speed step size is same for both positive and negative directions.

The pump cleaning sequence can have several positive and negative direction speed steps in one cleaning sequence.

6



When the negative speed is not allowed, the drive ignores phases 1...4.

Note: Cleaning in a negative direction requires negative minimum speed/frequency in parameter 30.11 Minimum speed / 30.13 Minimum frequency.

1. The pump system meets the triggering conditions defined by parameter [83.10 Pump cleaning action](#). At these conditions, normal operation stops and the drive uses the target time defined in parameter [83.26 Time to zero-speed](#) to reach zero speed.
2. Acceleration for cleaning is defined by parameter [83.25 Time to cleaning speed](#).
3. The pump runs at cleaning speed for the time defined by parameter [83.27 Cleaning on time](#).
4. The pump decelerates to zero-speed. Target time is defined by parameter [83.26 Time to zero-speed](#).
5. The pump is stopped until parameter [83.28 Cleaning off time](#) is elapsed.
6. The pump accelerates the pump speed to positive direction. See parameter [83.25 Time to cleaning speed](#).
7. The pump runs at the positive cleaning speed. See parameter [83.27 Cleaning on time](#).
8. The pump decreases the pump speed back to zero defined by parameter [83.26 Time to zero-speed](#).
9. The drive waits until the parameter [83.28 Cleaning off time](#) is elapsed. A new cleaning sequence starts or normal operation starts.
10. The pump starts following speed/frequency reference of the active control location. During acceleration to speed/frequency, the drive follows pump cleaning acceleration time [83.25 Time to cleaning speed](#).

The drive automatically determines the fastest ramp during the pump cleaning and used to protect the pump. It is possible that the quick ramps (see section [Ramps – Quick ramps](#) on page [122](#)) are faster than the pump cleaning ramps.

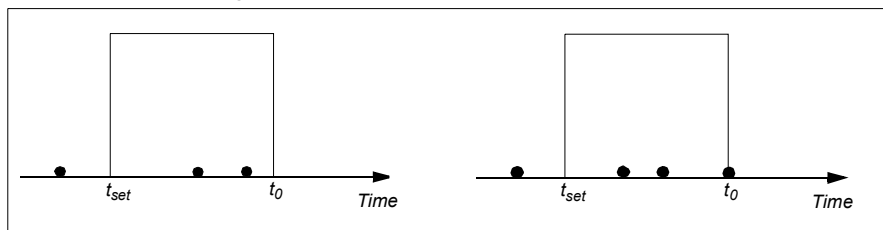
The cleaning sequence starts based on the selected triggering conditions. The cleaning sequence follows the diagram on page [118](#). You can start the sequence in these conditions:

- on every start and stop
- based on the monitoring pump condition (for example, supervision 1...3; underload and overload curve, see group [37 User load curve](#) on page [406](#))
- based on time interval (for example, at every 10 hours)
- manually (for example, DI4 to DI6, defined by parameter [83.12 Manually force cleaning](#))
- through fieldbus, using parameter [83.12 Manually force cleaning](#). Set the parameter to a value of 1 (a 2 s pulse) from the fieldbus to start a cleaning cycle from an overriding controller.

Cleaning count monitoring

The cleaning count monitoring function calculates the number of cleaning cycles inside a user-defined monitoring window. Too frequent cleaning attempts may indicate a pump problem (such as blockage) that the pump cleaning function cannot solve alone but it requires manual inspection and cleaning. The following figures describes the operation of cleaning count monitoring.

For example, set the cleaning count time to one hour. The pump cleaning function trips on a fault if it detects too frequent cleaning cycles. The drive completes three pump cleaning cycles. The drive continuous its operation as long as the time interval between three cleanings are over the user defined value (one hour).



6

The third pump cleaning cycle starts within the preset count time (one hour) and the pump cleaning function trips on a fault and the pump is stopped without performing the third cleaning cycle. After resetting fault, the drive starts with the third pump cleaning cycle.

If the parameter [83.35 Cleaning count fault](#) is set to *No action*, supervision is not executed. If you change the parameter [83.35 Cleaning count fault](#) to *Warning* or *Fault*, the pump cleaning count starts from zero.

When the pump cleaning function is active and maximum number of cycles per time unit is reached, the drive displays a warning which appears in the event log.

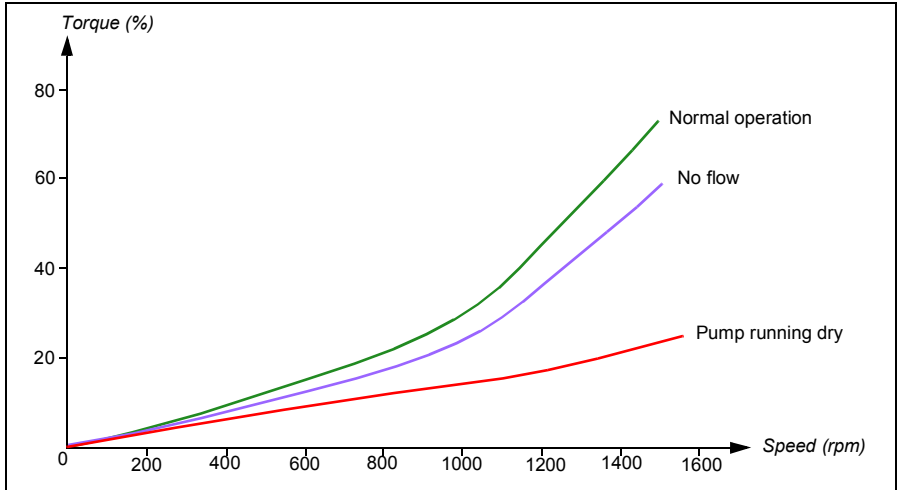
Settings

- **Menu - Primary settings - Pump cleaning**
- Parameter group [83 Pump cleaning](#) (page [480](#)).

■ Dry pump protection

The Dry pump protection function can be used to protect the pump from getting dry.

The figure below illustrates the operation of dry pump protection function.



6

The dry pump can be detected using the underload curve, low level mechanical switch and pressure sensor.

- **Underload curve** - Detects the pump from getting dry and generates a warning or fault.
- **Low/high level mechanical switch** - Indicates the water level in the pump system through a digital input and generates a warning or fault.
- **Pressure sensor** - Connected to Supervision 1...3 through an analog input. The output of supervision indicates the pump inlet getting dry and generates a warning or fault.

Settings

- **Menu** -> **Primary settings** -> **Pump features** -> **Dry pump protection**
- Parameter group [82 Pump protections](#) (page 477).

■ Pump inlet and outlet protection

The Pump inlet and outlet protection function monitors pump inlet and outlet pressure and takes the user defined actions in case the pressure is outside the normal range.

The inlet and outlet minimum pressure protection function can first generate a warning when the pump pressure is below minimum pressure warning level for pressure check delay time. If the pressure continues to fall below the minimum pressure fault level, a fault is generated.

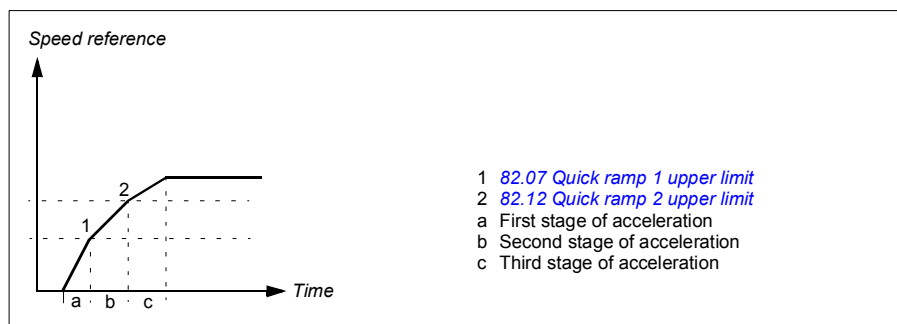
The outlet maximum pressure protection function can first generate a warning when the pump outlet pressure is above maximum pressure warning level for pressure check delay time. If the pressure continues to rise above the maximum pressure fault level, a fault is generated.

Settings

- **Menu -> Primary settings -> Pump features -> Pressure protection**
- Parameter group [81 Sensor settings](#) (page 475) and [82 Pump protections](#) (page 477).

Ramps – Quick ramps

The quick ramp function allows use of two additional ramp sets to accelerate or decelerate the pump. The following figure illustrates the acceleration in a quick ramp mode when both additional ramp sets are used.



In submersible (a.k.a borehole) pumps, the mechanical wearing of bearings can be reduced by ramping the pump quickly to a certain speed.

For ramps in general, see section [Ramps](#) on page 128.

Note: ABB recommends reading the pump manufacturer's instructions for safe operation and optimal performance.

The following examples describes the first, second and third stage of acceleration in quick ramp mode.

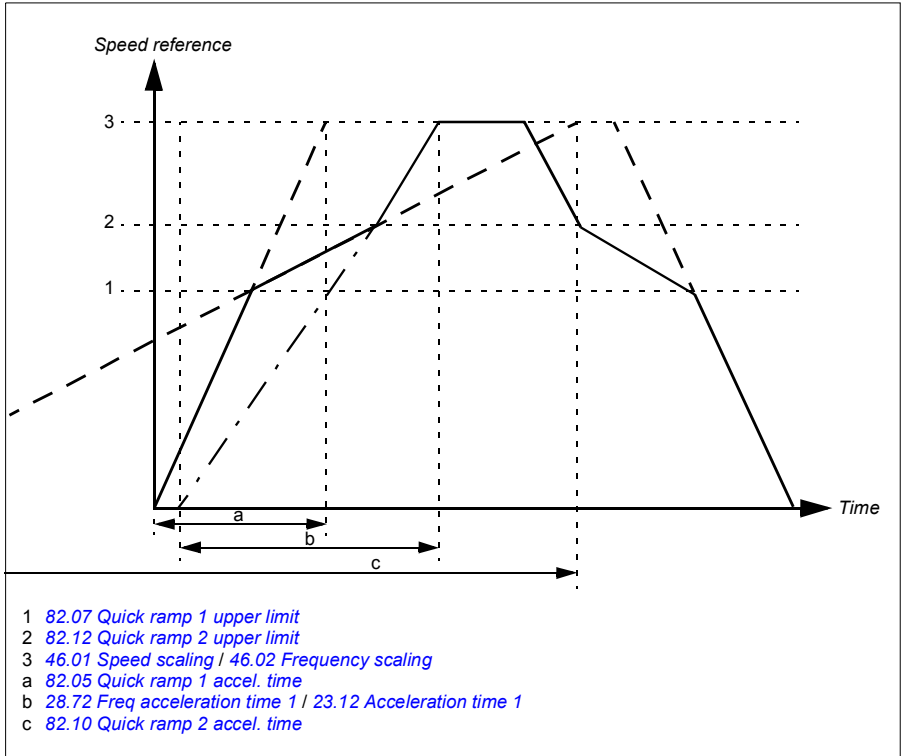
- First stage of acceleration (a) is to lift the impeller so that the fluid protects the bearings and sealings. Otherwise, the pump can get damaged. For example, 0 Hz to 25/30 Hz with ramp time of 1 second.
- Second stage of acceleration (b) is optional. The pump produces a valid flow in this region, so the reasonable acceleration rate is requested to overcome the static head and limit the turbidity. The effective inside region is 25/30 to 43/45 Hz and the ramp times typically are between 10 to 45 seconds.

Note: Acceleration time is proportional to full speed range. This means that if quick ramp 2 is configured from 20 Hz to 40 Hz, set time is 30 sec and the full

speed is 60 Hz, the actual acceleration time from 20 Hz to 40 Hz is 10 sec. Full speed value is defined by parameter [46.01 Speed scaling](#) or [46.02 Frequency scaling](#).

- Third stage of acceleration (c) is a normal ramp. The pump provides a reasonable flow rate. The drive uses normal ramp times, for example, 60 seconds.

Another example:



Settings

- **Menu > Primary settings > Ramps > Quick ramps**
- Pump protections - Quick ramps: Parameter group [82 Pump protections](#) (page [477](#)).

Automatic fault resets

The drive can automatically reset itself after overcurrent, overvoltage, undervoltage and external faults. The user can also specify a fault that is automatically reset.

By default, automatic resets are off and must be specifically activated by the user.



WARNING! Before you activate the function, make sure that no dangerous situations can occur. The function resets the drive automatically and continues operation after a fault.

Settings

- **Menu > Primary settings > Advanced functions > Autoreset faults**
- Parameters [31.12...31.16](#) (page [370](#)).

External events

Five different event signals from the process can be connected to selectable inputs to generate trips and warnings for the driven equipment. When the signal is lost, an external event (fault, warning, or a mere log entry) is generated. The contents of the messages can be edited on the control panel by selecting **Menu > Primary settings > Advanced functions > External events**.

6

Settings

- **Menu > Primary settings > Advanced functions > External events**
- Parameters [31.01...31.10](#) (page [368](#)).

Constant speeds/frequencies

Constant speeds and frequencies are predefined references that can be quickly activated, for example, through digital inputs. It is possible to define up to 7 speeds for speed control and 7 constant frequencies for frequency control.



WARNING: Speeds and frequencies override the normal reference irrespective of where the reference is coming from.

Settings

- **Menu > Primary settings > Start, stop, reference > Constant speeds**
- **Menu > Primary settings > Start, stop, reference > Constant frequencies**
- Parameter groups [22 Speed reference selection](#) (page [341](#)) and [28 Frequency reference chain](#) (page [354](#)).

Critical speeds/frequencies

Critical speeds (sometimes called “skip speeds”) can be predefined for applications where it is necessary to avoid certain motor speeds or speed ranges because of, for example, mechanical resonance problems.

The critical speeds function prevents the reference from dwelling within a critical band for extended times. When a changing reference ([22.87 Speed reference act 7](#)) enters

a critical range, the output of the function ([22.01 Speed ref unlimited](#)) freezes until the reference exits the range. Any instant change in the output is smoothed out by the ramping function further in the reference chain.

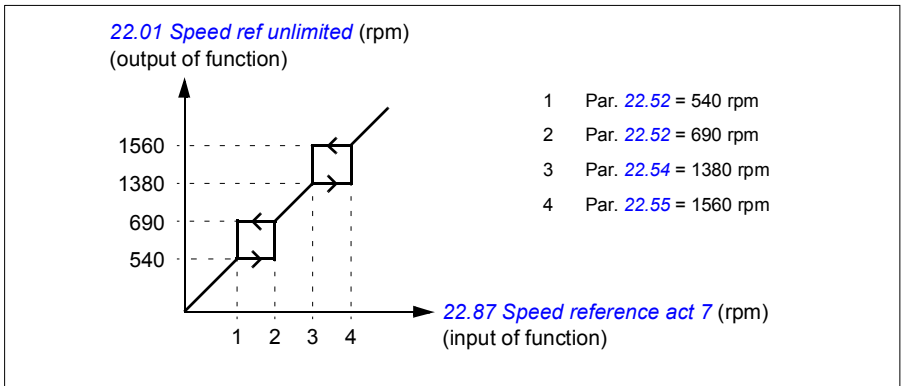
When the drive is limiting the allowed output speeds/frequencies, it limits to the absolutely lowest critical speed (critical speed low or critical frequency low) when accelerating from standstill, unless the speed reference is over the upper critical speed/ frequency limit.

The function is also available for scalar motor control with a frequency reference. The input of the function is shown by [28.96 Frequency ref act 7](#), the output by [28.97 Frequency ref unlimited](#).

Example for critical speeds:

A pump has vibrations in the range of 540...690 rpm and 1380...1560 rpm. To make the drive avoid these speed ranges,

- enable the critical speeds function by turning on bit 0 of parameter [22.51 Critical speed function](#), and
- set the critical speed ranges as in the figure below.

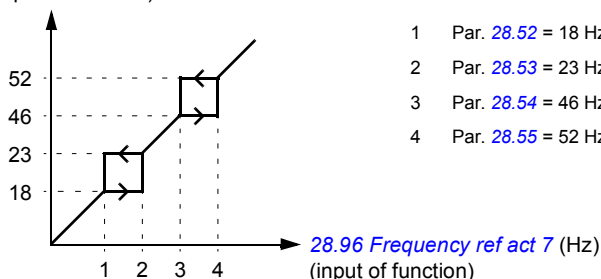


Example for critical frequencies:

A pump has vibrations in the range of 18...23 Hz and 46...52 Hz. To make the drive avoid these frequency ranges,

- enable the critical frequencies function by turning on bit 0 of parameter [28.51 Critical frequency function](#), and
- set the critical frequency ranges as in the figure below.

[28.97 Frequency ref unlimited](#) (Hz)
(output of function)

**Settings**

- **Menu > Primary settings > Start, stop, reference > Constant speeds**
- **Menu > Primary settings > Start, stop, reference > Constant frequencies**
- Critical speeds: parameters [22.51](#)...[22.57](#) (page [346](#))
- Critical frequencies: parameters [28.51](#)...[28.57](#) (page [359](#)).

Timed functions

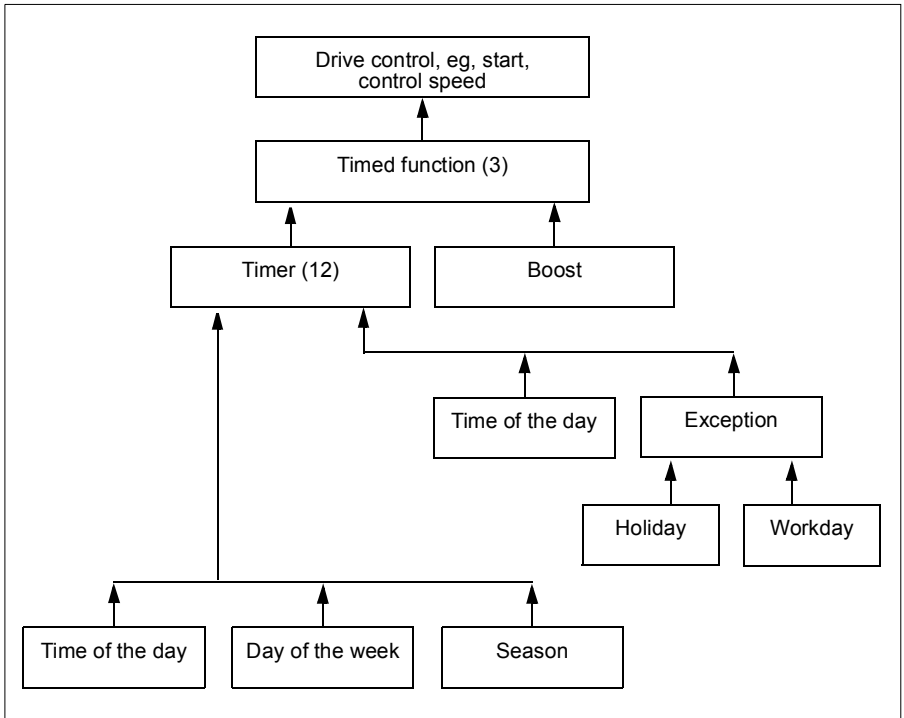
The base entity of the timed functions is called a timer. A timer can be active based on time of the day, day of the week and season of the year. In addition to these time related parameters, the timer activation can be influenced by so called days of exception (configurable as holiday or workday). For example, 25.12. (Dec 25th) can be defined as holiday in many countries. A timer can be set to be active or inactive during the days of exception.

Several timers can be connected to a timed function with the OR function. Thus if any of the timers connected to a timed function is active, the timed function is also active. The timed function is then in turn controlling normal drive functions like starting the drive, choosing the right speed or right setpoint for the PID loop controller.

In many cases where a pump or other equipment is controlled with a timed function, it is often required that there is a possibility to override the time program for a short while. The overriding functionality is called boost. The boost is directly affecting selected timed function(s) and switches it (them) on for a predefined time. The boost

mode is typically activated through a digital input and its operation time is set in parameters.

A diagram illustrating the relations of the timed functions entities is shown below.



Settings

- **Menu > Primary settings > Advanced functions > Timed functions**
- Parameter group [34 Timed functions](#) (page [384](#)).

Ramps

Overview

Ramps refer to acceleration and deceleration times. The ramps function adjusts the rate of how fast or slow a drive changes the motor speed with respect to the commanded speed. Ramps should be configured based on the specific application requirements.

Additional quick ramps are provided for starting submersible pumps. See section [Ramps – Quick ramps](#) on page 122.

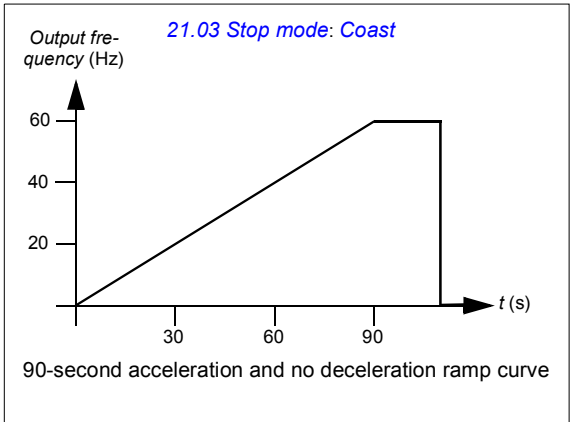
Functionality

Acceleration ramps are recommended for all applications. The acceleration ramp is the amount of time required for the drive to ramp up the motor from 0 Hz to the ramp time target frequency setting. The Ramp time target frequency setting is located under **Menu > Primary Settings > Ramps**.

6

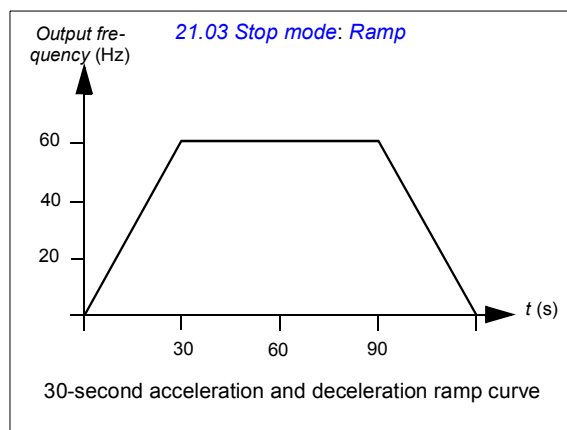
The deceleration ramp is the amount of time required for the drive to ramp down from the ramp time target frequency to 0 Hz. The most typical settings of ramp time target frequency are 50 Hz outside of North America and 60 Hz for North America. Note that the ramps function is always active during operation and not just used for starting and stopping modes.

If the stop mode is set to coast, it will cause the drive to ignore the deceleration ramp while stopping. In this scenario, the drive will no longer be controlling the speed of the motor once the run command is removed. The figure below shows a ramp curve for 90-second acceleration and no deceleration.



In pump applications, the stop mode is typically set to ramp and the deceleration ramp is used while stopping. Ramping a pump motor to a stop helps prevent issues

such as water hammer and assist in closing the check valve. The figure below shows a ramp curve for 30-second acceleration and deceleration.



If the acceleration time is too short, the drive may trip out on overcurrent. If the deceleration ramp is set to stop too quickly, the drive may trip out on overvoltage. These scenarios are unlikely in most applications due to the internal current and voltage limiting features built into the drive.

Each application and motor is unique. As a general guideline for pumps, ramp times are often set between 30 and 90 seconds. Typically a larger drive/motor has a longer ramp time. However, certain applications or pump types require a much faster or slower ramp time.

Settings

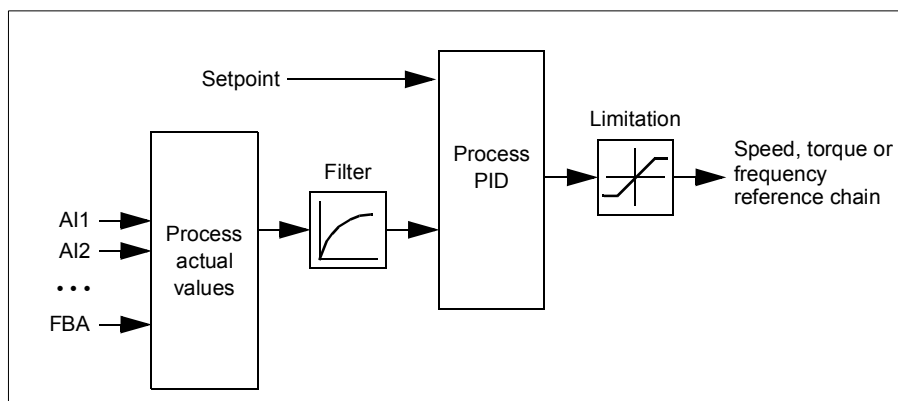
- **Menu > Primary settings > Ramps**
- Speed reference ramping: Parameters [23.12](#)...[23.13](#) and [46.01](#) (pages [349](#) and [435](#))
- Frequency reference ramping: Parameters [28.72](#)...[28.73](#) and [46.02](#) (pages [360](#) and [435](#))
- Motor potentiometer: Parameter [22.75](#) (page [348](#))
- Emergency stop ("Off3" mode): Parameter [23.23 Emergency stop time](#) (page [350](#)).

Process PID control (PID/Loop controller)

There are two built-in process PID controllers (PID set 1 and PID set 2) in the drive. The controller can be used to control process variables such as pressure or flow in the pipe or fluid level in the container.

In process PID control, a process reference (setpoint) is connected to the drive instead of a speed reference. An actual value (process feedback) is also brought back to the drive. The process PID control adjusts the drive speed in order to keep the measured process quantity (actual value) at the desired level (setpoint). This means that user does not need to set a frequency/speed/torque reference to the drive but the drive adjust its operation according to the process PID.

The simplified block diagram below illustrates the process PID control. For more detailed block diagrams, see pages 265 and 267.



The drive contains two complete sets of process PID controller settings that can be alternated whenever necessary; see parameter [40.57 PID set1/set2 selection](#).

Note: Process PID control is only available in external control location EXT2; see section [Local control vs. external control](#) (page 83).

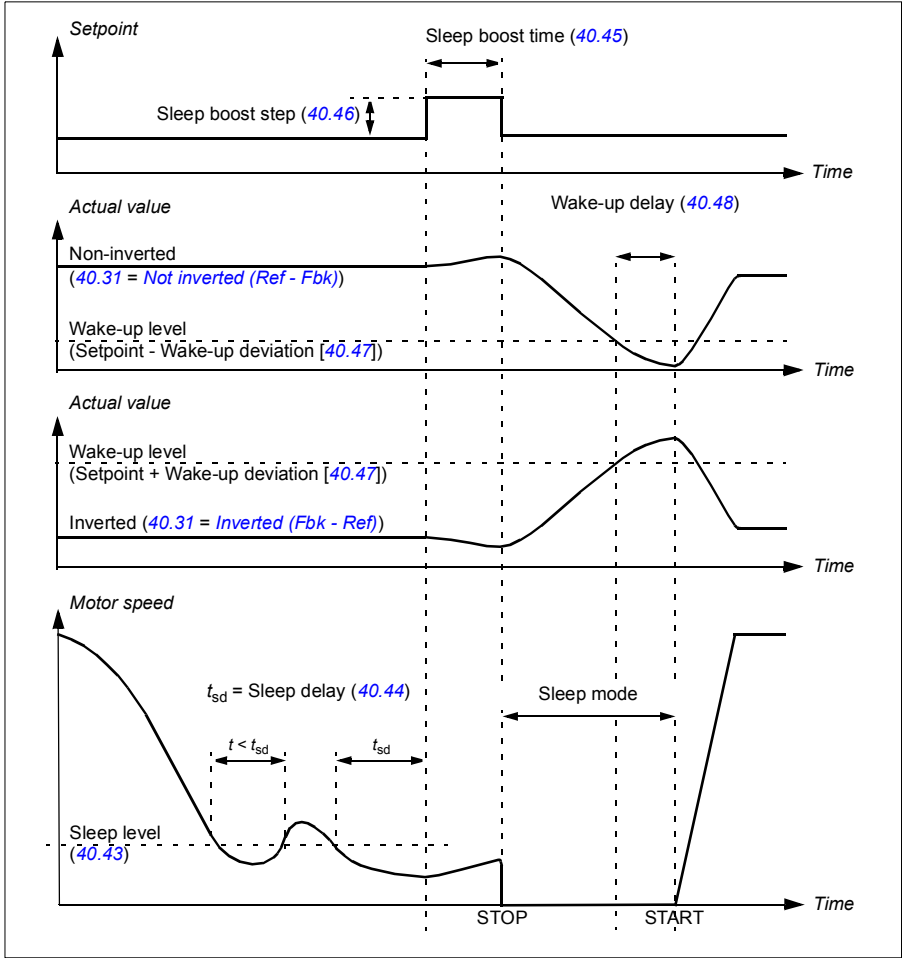
Sleep and boost functions for process PID control

The sleep function is suitable for PID control applications where the consumption varies, such as clean water pumping systems. When used, it stops the pump completely during low demand, instead of running the pump slowly below its efficient operating range. The following example visualizes the operation of the function.

Example: The drive controls a pressure boost pump. The water consumption falls at night. As a consequence, the process PID controller decreases the motor speed. However, due to natural losses in the pipes and the low efficiency of the centrifugal pump at low speeds, the motor would never stop rotating. The sleep function detects the slow rotation and stops the unnecessary pumping after the sleep delay has passed. The drive shifts into sleep mode, still monitoring the pressure. The pumping

resumes when the pressure falls under the predefined minimum level and the wake-up delay has passed.

The user can extend the PID sleep time by the boost functionality. The boost functionality increases the process setpoint for a predetermined time before the drive enters the sleep mode.



Tracking

In tracking mode, the PID block output is set directly to the value of parameter [40.50](#) (or [41.50](#)) [Set 1 tracking ref selection](#). The internal I term of the PID controller is set so that no transient is allowed to pass on to the output, so when the tracking mode is left, normal process control operation can be resumed without a significant bump.

Settings

- Parameter groups [40 Process PID set 1](#) (page [409](#)) and [41 Process PID set 2](#) (page [426](#)).

Limits

■ Limits overview

The drive has multiple limits that can be set to prevent the drive from causing damage to the motor or the pump system. Limits can be applied to the minimum and maximum frequency, speed, or torque and the maximum current. Frequency limits are used in scalar motor control mode, while speed limits are used in vector motor control mode.

Setting a minimum speed/frequency may be used to prevent a pump or motor from overheating. Running a certain pump or motor type at too slow a speed will decrease its ability to cool itself. Equipment that runs warmer, or lacks proper lubrication, will likely have a shorter lifespan. Consult the equipment manufacturer for minimum speed/frequency settings.

Setting a maximum speed/frequency may be used to prevent excessive mechanical stress. Mechanical stress at levels above the equipment's design will likely shorten the lifespan of the equipment. Consult the equipment manufacturer to determine the maximum safe speed/frequency.

The maximum current setting will prevent steady-state operation above a specific current operation. Note that this setting is unrelated to the motor overload protection, which is configured based on actual motor current information entered into the drive.

Settings

- **Menu > Primary Settings > Limits**
- Parameter group [30 Limits](#).

Interlocks

■ Overview

Interlocks provide a way to prevent the drive from running when an input is not satisfied. The interlock feature of the drive is often used to wire safeties back to the drive. ABB does not recommend wiring interlocks in series with each other, unless there are more than four interlocks. Wiring interlocks separately allows for faster system troubleshooting, as the drive provides quick identification on which individual interlock is no longer satisfied. Monitoring the status of each interlock is available over fieldbus communications.

Interlocks typically are wired to the drive's digital inputs (DI), DI1 through DI6. Certain fieldbus communications can also be used to control interlocks, although typically not recommended for most applications.

■ Configuration

6

You can configure interlocks either in the **Primary settings** menu, or via parameter group [20 Start/stop/direction](#) in the **Parameters** menu. ABB recommends configuration via the **Primary settings** menu (**Menu > Primary settings > Start, stop, reference > Interlocks/permissives**).

Interlocks are configurable for normally open or normally closed functionality.

- For example, in the **Primary settings**, selecting an interlock for DI4 high indicates that digital input 4 must be closed, or logic 1, to allow the drive to run. A setting of DI4 low indicates the digital input must be open, or logic 0, to allow the drive to run. If the interlock is not in a logic state that will allow the drive to run, the interlock is unsatisfied. If the interlock is in a logic state that will allow the drive to run, the interlock is satisfied.

An unsatisfied interlock is indicated on the drive control panel display via a flashing green LED light, and a flashing warning on the display. You can set up the drive to indicate an unsatisfied interlock in one of two methods (**Menu > Primary settings > Start, stop, reference > Interlocks/permissives > Interlock warning condition**). This setting applies to all the interlocks.

- Indicate a warning, whenever an interlock is unsatisfied, regardless of a run command.
- Indicate a warning, whenever an interlock is unsatisfied and a run command is present.

You can configure the drive for either coast or ramp to a stop, when the interlock changes to an unsatisfied state (**Menu > Primary settings > Start, stop, reference > Interlocks/permissives > Interlock stop mode**).

■ Wiring connections

Interlocks function in both Auto and Hand control modes. ABB recommends that the system interlocks are wired directly to the drive, and not to an external PLC/SCADA.

Failure to wire the interlock(s) directly to the drive can inadvertently allow Hand mode operation, when an interlock is not satisfied.

■ Functionality

The drive allows predefined descriptive text and label text (free text) to be independently associated with each of the four different interlocks. The control panel display will display that specific text when the interlock becomes unsatisfied.

You configure (select) the predefined descriptive text in **Menu > Primary settings > Start, stop, reference > Interlocks/Permissives > Descriptive text**.

You configure (edit) the label text in **Menu > Primary settings > Start, stop, reference > Interlocks/Permissives > Label text**.

Settings and diagnostics

- **Menu > Primary settings > Start, stop, reference > Interlocks/Permissives**
- Parameter [20.41 Start interlock 1](#) (page [330](#))
- Warnings [AFEE Start interlock 1](#), [AFEF Start interlock 2](#), [AFF0 Start interlock 3](#) and [AFF1 Start interlock 4](#).

Run permissives

Overview

The run permissive function provides a way to prevent the drive from outputting to a motor when an input is not satisfied. This function is used to support applications that require the drive to first trigger an external event before the drive starts to ramp the motor. Run permissive is often used in conjunction with an end-switch wired back to the drive. Monitoring the status of the run permissive is available over fieldbus communications.

Run permissive is different from start interlock:

- A run permissive makes the drive enter a run state but does not provide an output to the motor.
- An unsatisfied run permissive input will only indicate a warning on the control panel display if a start command is also provided. No warning will be provided if the start command is not present. Start interlock is configurable to acknowledge, or ignore, the start command status when determining if a warning must be indicated.

6

The run permissive is typically wired to one of the drive's digital inputs (DI), DI1 through DI6. DI2 is most commonly used. Certain fieldbus communications can also be used to control run permissive, although typically not recommended for most applications.

Configuration

You can configure run permissive either in the **Primary settings** menu, or via parameter group [20 Start/stop/direction](#) in the **Parameters** menu. ABB recommends configuration via the **Primary settings** menu (**Menu > Primary settings > Start, stop, reference > Interlocks/permissives**). Run permissive is configurable for normally open or normally closed functionality.

Wiring connections

The run permissive functions in both Auto and Hand control modes. ABB recommends that any system permissive is wired directly to the drive and not to an external PLC/SCADA.

Failure to wire the permissive directly to the drive can inadvertently allow Hand mode operation when a permissive is not satisfied.

■ Functionality

The drive allows predefined Descriptive text, and Label text (free text), to be associated with the Run permissive. The control panel will display that specific text when the permissive becomes unsatisfied.

- You configure (select) the predefined descriptive text in **Menu > Primary settings > Start, stop, reference > Interlocks/Permissives > Descriptive text.**
- You configure (edit) the label text in **Menu > Primary settings > Start, stop, reference > Interlocks/Permissives > Label text.**

Run permissive features include the following:

- With no run command issued and run permissive not satisfied, no warning is displayed.
- With a start command issued and run permissive not satisfied, the drive displays a warning that the run permissive is missing, the status LED will flash green, and the control panel's direction arrow is dashed and rotating. The drive remains in running mode, but does not output to the motor until run permissive is satisfied.
- During normal operation of the motor, if run permissive changes state, the drive will coast to stop and display a warning that run permissive is keeping the drive from outputting to the motor.
- Relay settings that are not affected by run permissive input not being satisfied include: Ready run, Enabled, Started and Running. Relay settings that are affected by run permissive include: Warning and Fault/Warning.

Settings and diagnostics

- **Menu > Primary settings > Start, stop, reference > Interlocks/permissives**
- Parameter [20.40 Run permissive](#) (page [330](#))
- Warning [AFED Run permissive](#).

■ Application example 1: Valve opening

The Run permissive function is used in valve control to prevent the pump from running until the valve is opened. Sequence of operation:

1. Drive receives start command, either via Hand or Auto source.
2. Drive verifies safeties are satisfied and valve position has not yet been satisfied.
3. Drive activates a relay output that was programmed to Valve opening (could have also been programmed to Started or Running). This relay allows power to the actuator.
4. Once the valve is opened, run permissive is satisfied and the drive outputs to the motor.

Motor control

Frequency control mode

The motor follows a frequency reference given to the drive. Frequency control is available in both local and external control. It is supported in scalar motor control only.

Frequency control uses frequency reference chain. Select frequency reference with parameters in group [28 Frequency reference chain](#) on page [354](#).

Scalar motor control

Scalar motor control is the default motor control method. In scalar control mode, the drive is controlled with a frequency reference. However, the excellent performance of vector control is not achieved in scalar control.

It is recommended to activate scalar motor control mode in the following situations:

- If the exact nominal motor values are not available or the drive needs to run different motor after the commissioning phase
- If a short commissioning time is needed or no ID run is wanted
- In multimotor systems: 1) if the load is not equally shared between the motors, 2) if the motors are of different sizes, or 3) if the motors are going to be changed after motor identification (ID run)
- If the nominal current of the motor is less than 1/6 of the nominal output current of the drive
- If the drive is used without a motor connected (for example, for test purposes)
- If the drive is equipped with a sine filter.

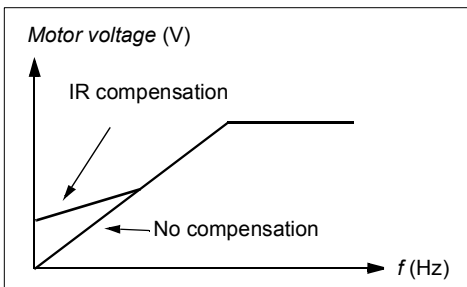
In scalar control, some standard features are not available.

See also section [Operating modes of the drive](#) (page [86](#)).

IR compensation for scalar motor control

IR compensation (also known as voltage boost) is available only when the motor control mode is scalar. When IR compensation is activated, the drive gives an extra voltage boost to the motor at low speeds. IR compensation is useful in applications, such as positive displacement pumps, that require a high break-away torque.

In vector control, no IR compensation is possible or needed as it is applied automatically.



Settings

- **Menu > Primary settings > Motor > IR compensation**
- Parameters [97.13 IR compensation](#) (page 500), [97.94 IR comp max frequency](#) (page 501) and [99.04 Motor control mode](#) (page 503)
- Parameter group [28 Frequency reference chain](#) (page 354).

Speed control mode

The motor follows a speed reference given to the drive. This mode can be used with estimated speed used as feedback.

Speed control mode is available in both local and external control. It is supported in vector motor control only.

Speed control uses speed reference chain. Select speed reference with parameters in group [22 Speed reference selection](#) on page 341.

Vector control

Vector control is the motor control mode that is intended for applications where high control accuracy is needed. It offers better control over whole speed range, in particular in applications where slow speed with high torque is needed. It requires an identification run at startup. Vector control cannot be used in all applications, for example, when sine filters are being used or there are multiple motors connected to single drive.

The switching of the output semiconductors is controlled to achieve the required stator flux and motor torque. The reference value for the torque controller comes from the speed controller.

Stator flux is calculated by integrating the motor voltage in vector space. Rotor flux can be calculated from stator flux and the motor model. Motor torque is produced by controlling current 90 degrees from the rotor flux. By utilizing the identified motor model, the rotor flux estimate is improved. Actual motor shaft speed is not needed for the motor control.

Settings

- **Menu > Primary settings > Motor > Control mode**
- Parameters [99.04 Motor control mode](#) (page 503) and [99.13 ID run requested](#) (page 506).

Motor types

The drive supports asynchronous AC induction, permanent magnet (PM) and synchronous reluctance motors (SynRM).

■ Motor identification

The performance of vector control is based on an accurate motor model determined during the motor start-up.

A motor identification magnetization is automatically performed the first time the start command is given. During this first start-up, the motor is magnetized at zero speed for several seconds and the motor and motor cable resistance are measured to allow the motor model to be created. This identification method is suitable for most applications.

In demanding applications a separate Identification run (ID run) can be performed.

Settings

- **Menu > Primary settings > Motor > Control mode > Vector control**
- Parameter [99.13 ID run requested](#) (page [506](#)).

■ U/f ratio

6

The U/f function is only available in scalar motor control mode, which uses frequency control.

The function has two modes: linear and squared.

In linear mode, the ratio of voltage to frequency is constant below the field weakening point. This is used in constant torque applications where it may be necessary to produce torque at or near the rated torque of the motor throughout the frequency range

In squared mode (default), the ratio of the voltage to frequency increases as the square of the frequency below the field weakening point. This is typically used in centrifugal pump applications. For these applications, the torque required follows the square relationship with frequency. Therefore, if the voltage is varied using the square relationship, the motor operates at improved efficiency and lower noise levels in these applications. Thus using squared mode saves energy.

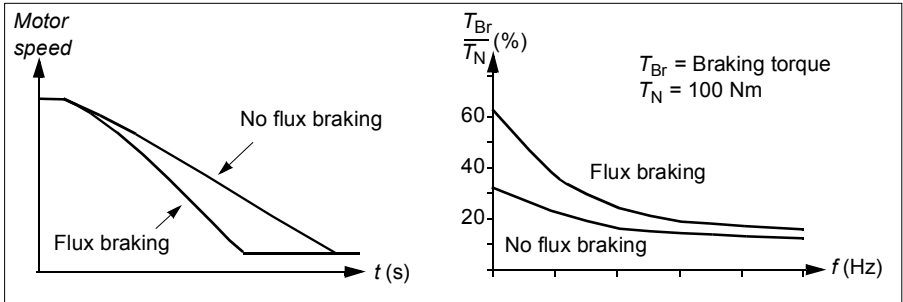
The U/f function cannot be used with energy optimization; if parameter [45.11 Energy optimizer](#) is set to [Enable](#), parameter [97.20 U/F ratio](#) is ignored.

Settings

- **Menu > Primary settings > Motor > U/f ratio**
- Parameter [97.20 U/F ratio](#) (page [501](#)).

Flux braking

The drive can provide greater deceleration by raising the level of magnetization in the motor. By increasing the motor flux, the energy generated by the motor during braking can be converted to motor thermal energy.



The drive monitors the motor status continuously, also during flux braking. Therefore, flux braking can be used both for stopping the motor and for changing the speed. The other benefits of flux braking are:

- The braking starts immediately after a stop command is given. The function does not need to wait for the flux reduction before it can start the braking.
- The cooling of the induction motor is efficient. The stator current of the motor increases during flux braking, not the rotor current. The stator cools much more efficiently than the rotor.
- Flux braking can be used with induction motors and permanent magnet synchronous motors.

Two braking power levels are available:

- Moderate braking provides faster deceleration compared to a situation where flux braking is disabled. The flux level of the motor is limited to prevent excessive heating of the motor.
- Full braking exploits almost all available current to convert the mechanical braking energy to motor thermal energy. Braking time is shorter compared to moderate braking. In cyclic use, motor heating may be significant.



WARNING: The motor needs to be rated to absorb the thermal energy generated by flux braking.

Settings

- **Menu > Primary settings > Motor > Flux braking**
- Parameter [97.05 Flux braking](#) (page [498](#)).

■ Start methods – DC magnetization

The drive has different magnetization functions for different phases of motor start/rotation/stop: pre-heating (motor heating), pre-magnetization, DC hold and post-magnetization.

Pre-heating (Motor heating)

The pre-heating function keeps the motor warm and prevents condensation inside the motor by feeding it with DC current when the drive has been stopped. The heating can only be on when the drive is in the stopped state, and starting the drive stops the heating.

When pre-heating is activated and the stop command is given, pre-heating starts immediately if the drive is running below the zero speed limit (see bit 0 in parameter [06.19 Speed control status word](#)). If the drive is running above the zero speed limit, pre-heating is delayed by the time defined by parameter [21.15 Pre-heating time delay](#) to prevent excessive current.

6

The function can be defined to be always active when the drive is stopped or it can be activated by a digital input, fieldbus, timed function or supervision function. For example, with the help of signal supervision function, the heating can be activated by a thermal measurement signal from the motor.

The pre-heating current fed to the motor can be defined as 0...30% of the nominal motor current.

Notes:

- In applications where the motor keeps rotating for a long time after the modulation is stopped, it is recommended to use ramp stop with pre-heating to prevent a sudden pull at the rotor when the pre-heating is activated.
- The heating function requires that the STO circuit is closed or not triggered open.
- The heating function requires that the drive is not faulted.
- The heating function is allowed even if Run permissive signal is missing.
- The heating function is allowed even if one or more Start interlock signals are missing.
- Pre-heating uses DC hold to produce current.

Settings

- **Menu > Primary settings > Motor > Pre-heating**
- Parameters [21.14 Pre-heating input source](#), [21.15 Pre-heating time delay](#) and [21.16 Pre-heating current](#) (page 337).

Pre-magnetization

Pre-magnetization refers to DC magnetization of the motor before start. Depending on the selected start mode ([21.01 Start mode](#) or [21.19 Scalar start mode](#)), pre-

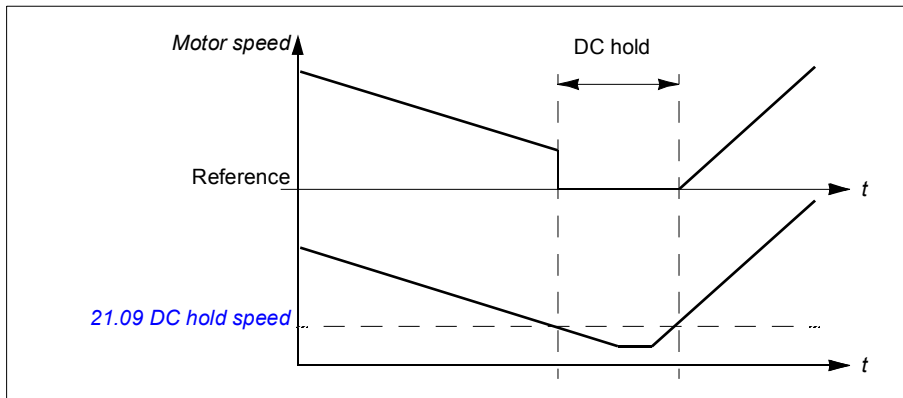
magnetization can be applied to guarantee the highest possible breakaway torque, up to 200% of the nominal torque of the motor. By adjusting the pre-magnetization time ([21.02 Magnetization time](#)), it is possible to synchronize the motor start and, for example, the release of a mechanical brake.

Settings

- Parameters [21.01 Start mode](#), [21.19 Scalar start mode](#), [21.02 Magnetization time](#).

DC hold

The function makes it possible to lock the rotor at (near) zero speed in the middle of normal operation. DC hold is activated by parameter [21.08 DC current control](#). When both the reference and motor speed drop below a certain level (parameter [21.09 DC hold speed](#)), the drive will stop generating sinusoidal current and start to inject DC into the motor. The current is set by parameter [21.10 DC current reference](#). When the reference exceeds parameter [21.09 DC hold speed](#), normal drive operation continues.



Settings

- Parameters [21.08 DC current control](#) and [21.09 DC hold speed](#).

DC brake

This function enables DC injection braking after modulation has stopped for a certain period ([21.11 Post magnetization time](#)). DC injection braking can be used to quickly stop the motor without using a mechanical brake. DC brake is activated by parameter [21.08 DC current control](#). The DC braking current is set by parameter [21.10 DC current reference](#).

Post-magnetization.

The function keeps the motor magnetized for a certain period (parameter [21.11 Post magnetization time](#)) after stopping. This is to prevent the machinery from moving under load, for example, before a mechanical brake can be applied. Post-magnetization is activated by parameter [21.08 DC current control](#). The magnetization current is set by parameter [21.10 DC current reference](#).

Note: Post-magnetization is only available when ramp stop is selected (see parameter [21.03 Stop mode](#)).

Settings

- Parameters [21.03 Stop mode](#) (page 334), [21.08 DC current control](#) and [21.11 Post magnetization time](#).

Switching frequency

The drive has two switching frequencies: reference switching frequency and minimum switching frequency. The drive tries to keep the highest allowed switching frequency (= reference switching frequency) if thermally possible, and then adjusts dynamically between the reference and minimum switching frequencies depending on the drive temperature. When the drive reaches the minimum switching frequency (= lowest allowed switching frequency), it starts to limit output current as the heating up continues.

For derating, see chapter *Technical data*, section *Switching frequency derating* in the *Hardware manual* of the drive.

Example 1: If you need to fix the switching frequency to a certain value as with some external filters, for example, with EMC C1 filters (see the *Hardware manual* of the drive), set both the reference and the minimum switching frequency to this value and the drive will retain this switching frequency.

Example 2: If the reference switching frequency is set to 12 kHz and the minimum switching frequency is set to the smallest available value, the drive maintains the highest possible switching frequency to reduce motor noise and only when the drive heats it will decrease the switching frequency. This is useful, for example, in applications where low noise is necessary but higher noise can be tolerated when the full output current is needed.

Settings

- Menu > Primary settings > Motor > Switching frequency**
- Parameters [97.01 Switching frequency reference](#) and [97.02 Minimum switching frequency](#) (page 484).

■ Motor thermal protection

The control program features two separate motor temperature monitoring functions. The temperature data sources and warning/trip limits can be set up independently for each function.

The motor temperature can be monitored using

- the motor thermal protection model (estimated temperature derived internally inside the drive), or
- sensors installed in the windings. This will result in a more accurate motor model.

Motor thermal protection model

The drive calculates the temperature of the motor on the basis of the following assumptions:

1. When power is applied to the drive for the first time, the motor is assumed to be at ambient temperature (defined by parameter [35.50 Motor ambient temperature](#)). After this, when power is applied to the drive, the motor is assumed to be at the estimated temperature.
2. Motor temperature is calculated using the user-adjustable motor thermal time and motor load curve. The load curve should be adjusted in case the ambient temperature exceeds 30 °C.

The motor thermal protection model fulfills standard IEC/EN 61800-5-1 ed. 2.1 requirements for thermal memory retention and speed sensitivity. The estimated temperature is retained over power down. Speed dependency is set by parameters [35.51 Motor load curve](#), [35.52 Zero speed load](#) and [35.53 Break point](#).

Note: The motor thermal model can be used when only one motor is connected to the drive.

Insulation



WARNING! IEC 60664 requires double or reinforced insulation between live parts and the surface of accessible parts of electrical equipment which are either non-conductive or conductive but not connected to the protective earth.

To fulfil this requirement, connect a thermistor to the drive's control terminals using any of these alternatives:

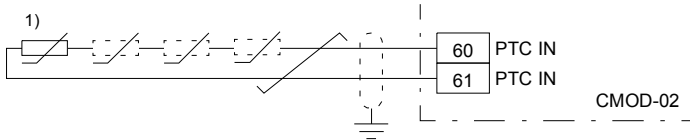
- Separate the thermistor from live parts of the motor with double reinforced insulation.
- Protect all circuits connected to the drive's digital and analog inputs. Protect against contact, and insulate from other low voltage circuits with basic insulation (rated for the same voltage level as the drive's main circuit).
- Use an external thermistor relay. The relay insulation must be rated for the same voltage level as the drive's main circuit.

When CMOD-02 multifunction module is used, it provides sufficient insulation.

6

Temperature monitoring using PTC sensors

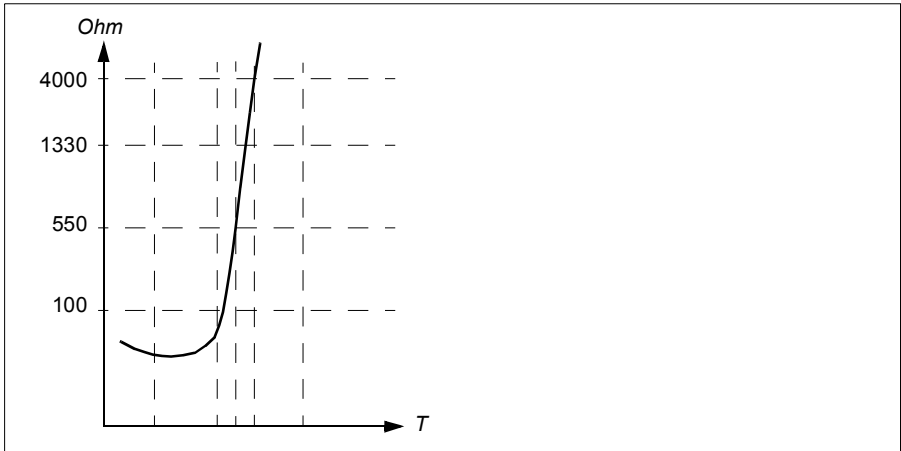
PTC sensors are connected through a CMOD-02 multifunction module (see chapter *Optional I/O extension modules*, section *CMOD-02 multifunction extension module (external 24 V AC/DC and isolated PTC interface)* in the *Hardware manual* of the drive).



¹⁾ One or 3...6 PTC thermistors connected in series.

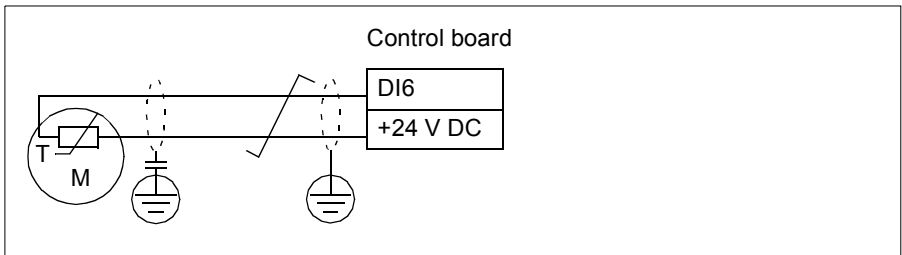
The resistance of the PTC sensor increases when its temperature rises. The increasing resistance of the sensor decreases the voltage at the input, and eventually its state switches from 1 to 0, indicating overtemperature.

The figure below shows typical PTC sensor resistance values as a function of temperature.



One isolated PTC sensor can also be connected directly to digital input DI6. At the motor end, the cable shield should be earthed through a capacitor. If this is not possible, leave the shield unconnected.

See section [Insulation](#) on page 146.



Temperature monitoring using Pt100 sensors

1...3 Pt100 sensors can be connected in series to an analog input and an analog output.

The analog output feeds a constant excitation current of 9.1 mA through the sensor. The sensor resistance increases as the motor temperature rises, as does the voltage over the sensor. The temperature measurement function reads the voltage through the analog input and converts it into degrees Celsius.

It is possible to adjust the motor temperature supervision limits and select how the drive reacts when overtemperature is detected.

See section [Insulation](#) on page 146.

For the wiring of the sensor, see [AI1 and AI2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs \(X1\)](#) on page 150.

Temperature monitoring using Pt1000 sensors

1...3 Pt1000 sensors can be connected in series to an analog input and an analog output.

The analog output feeds a constant excitation current of 0.1 mA through the sensor. The sensor resistance increases as the motor temperature rises, as does the voltage over the sensor. The temperature measurement function reads the voltage through the analog input and converts it into degrees Celsius.

See section [Insulation](#) on page 146.

For the wiring of the sensor, see [AI1 and AI2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs \(X1\)](#) on page 150.

Temperature monitoring using Ni1000 sensors

6

One Ni1000 sensor can be connected to an analog input and an analog output on the control unit.

The analog output feeds a constant excitation current of 9.1 mA through the sensor. The sensor resistance increases as the motor temperature rises, as does the voltage over the sensor. Resistance at 100 degrees Celsius is 1618 ohm, and the rate of change is 6180 ppm / degrees Celsius. The temperature measurement function reads the voltage through the analog input and converts it into degrees Celsius.

See section [Insulation](#) on page 146.

For the wiring of the sensor, see section [AI1 and AI2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs \(X1\)](#) on page 150.

Temperature monitoring using KTY84 sensors

One KTY84 sensor can be connected to an analog input and an analog output on the control unit.

The analog output feeds a constant excitation current of 2.0 mA through the sensor. The sensor resistance increases as the motor temperature rises, as does the voltage over the sensor. The temperature measurement function reads the voltage through the analog input and converts it into degrees Celsius.

The figure and table on page 149 show typical KTY84 sensor resistance values as a function of the motor operating temperature.

See section [Insulation](#) on page 146.

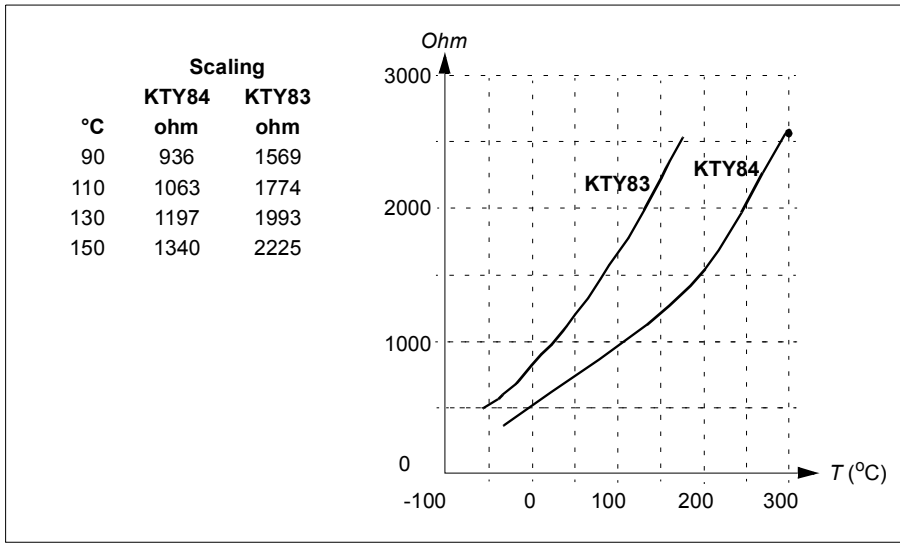
For the wiring of the sensor, see section [AI1 and AI2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs \(X1\)](#) on page 150.

Temperature monitoring using KTY83 sensors

One KTY83 sensor can be connected to an analog input and an analog output on the control unit.

The analog output feeds a constant excitation current of 1.0 mA through the sensor. The sensor resistance increases as the motor temperature rises, as does the voltage over the sensor. The temperature measurement function reads the voltage through the analog input and converts it into degrees Celsius.

The figure and table below show typical KTY83 sensor resistance values as a function of the motor operating temperature.



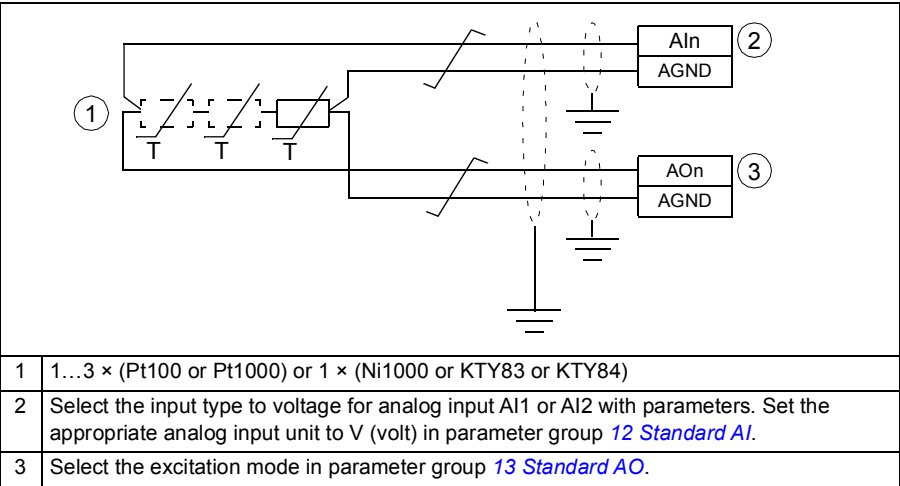
It is possible to adjust the motor temperature supervision limits and select how the drive reacts when overtemperature is detected.

See section [Insulation](#) on page 146.

For the wiring of the sensor, see section [AI1 and AI2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs \(X1\)](#) on page 150.

AI1 and AI2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs (X1)

One, two or three Pt100 sensors; one, two or three Pt1000 sensors; or one Ni1000, KTY83 or KTY84 sensor for motor temperature measurement can be connected between an analog input and output as shown below. Do not connect both ends of the cable shields directly to ground. If a capacitor cannot be used at one end, leave that end of the shield unconnected.

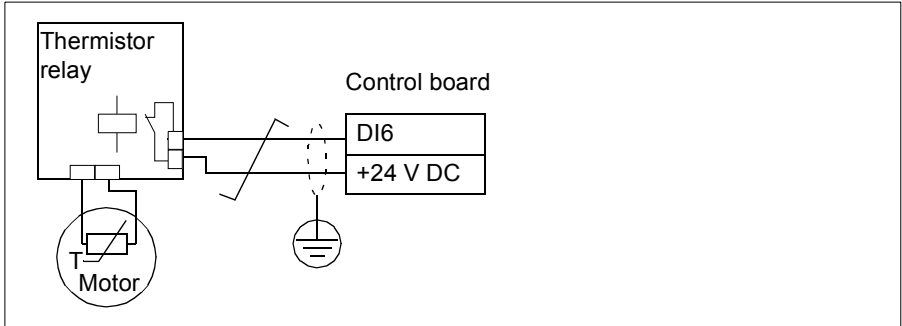


WARNING! As the inputs pictured above are not insulated according to IEC 60664, the connection of the motor temperature sensor requires double or reinforced insulation between motor live parts and the sensor. If the assembly does not fulfill the requirement, the I/O board terminals must be protected against contact and must not be connected to other equipment or the temperature sensor must be isolated from the I/O terminals.

Temperature monitoring using thermistor relays

A normally closed or a normally open thermistor relay can be connected to digital input DI6.

See section [Insulation](#) on page 146.



Settings

- **Menu > Primary settings > Motor > Thermal protection estimated**
- **Menu > Primary settings > Motor > Thermal protection measured**
- Parameter group [35 Motor thermal protection](#) (page 392).

Motor overload protection

This section describes motor overload protection without using motor thermal protection model, either with estimated or measured temperature. For protection with the motor thermal protection model, see section [Motor thermal protection](#) on page 145.

Motor overload protection is required and specified by multiple standards including the US National Electric Code (NEC), UL 508C and the common UL/IEC 61800-5-1 standard in conjunction with IEC 60947-4-1. The standards allow for motor overload protection without external temperature sensors.

The protection feature allows the user to specify the class of operation in the same manner as the overload relays are specified in standards IEC 60947-4-1 and NEMA ICS 2.

Motor overload protection requires that you specify a motor current tripping level. This is defined by a curve using parameters [35.51 Motor load curve](#), [35.52 Zero speed load](#) and [35.53 Break point](#). The tripping level is the motor current at which the overload protection will ultimately trip if the motor current remains at this level continuously.

The motor overload class (class of operation), parameter [35.57 Motor overload class](#), is given as the time required for the overload relay to trip when operating at 7.2 times

the tripping level in the case of IEC 60947-4-1 and 6 times the tripping level in the case of NEMA ICS 2. The standards also specify the time to trip for current levels between the tripping level and the 6 times tripping level. The drive satisfies the IEC standard and NEMA standard trip times.

Using class 20 satisfies the UL 508C requirements.

The motor overload algorithm monitors the squared ratio (motor current / tripping level)² and accumulates this over time. This is sometimes referred to as I^2t protection. The accumulated value is shown with parameter [35.05 Motor overload level](#).

You can define with parameter [35.56 Motor overload action](#) that when [35.05 Motor overload level](#) reaches 88%, a motor overload warning will be generated, and when it reaches 100%, the drive will trip on the motor overload fault. The rate at which this internal value is increased depends on the actual current, tripping level current and overload class selected.

Parameters [35.51 Motor load curve](#), [35.52 Zero speed load](#) and [35.53 Break point](#) serve a dual purpose. They determine the load curve for temperature estimate when using motor thermal protection model as well as specify the overload tripping level.

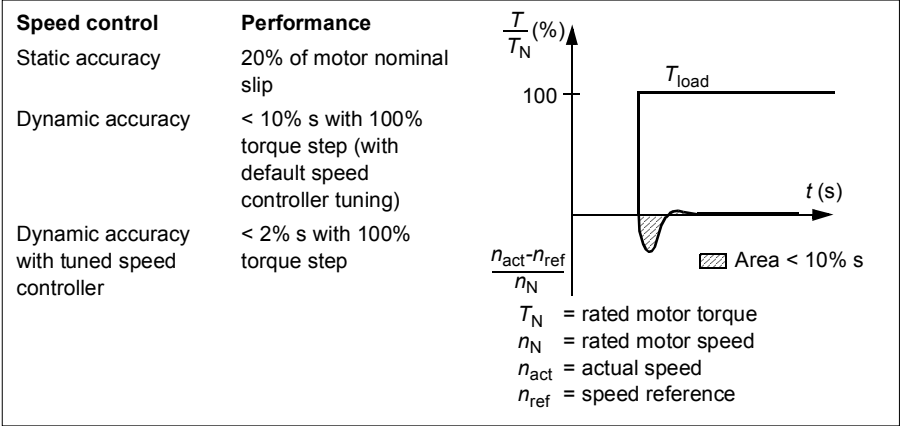
Motor overload protection fulfills standard IEC/EN 61800-5-1 ed. 2.1 requirements for thermal memory retention and speed sensitivity. The motor overload state is retained over power down. Speed dependency is set by parameters [35.51 Motor load curve](#), [35.52 Zero speed load](#) and [35.53 Break point](#).

Settings

- Parameters common to motor thermal protection and motor overload protection: [35.51 Motor load curve](#) (page 400), [35.52 Zero speed load](#) (page 400) and [35.53 Break point](#) (page 401).
- Parameters specific to motor overload protection: [35.05 Motor overload level](#) (page 393), [35.56 Motor overload action](#) (page 402) and [35.57 Motor overload class](#) (page 402).

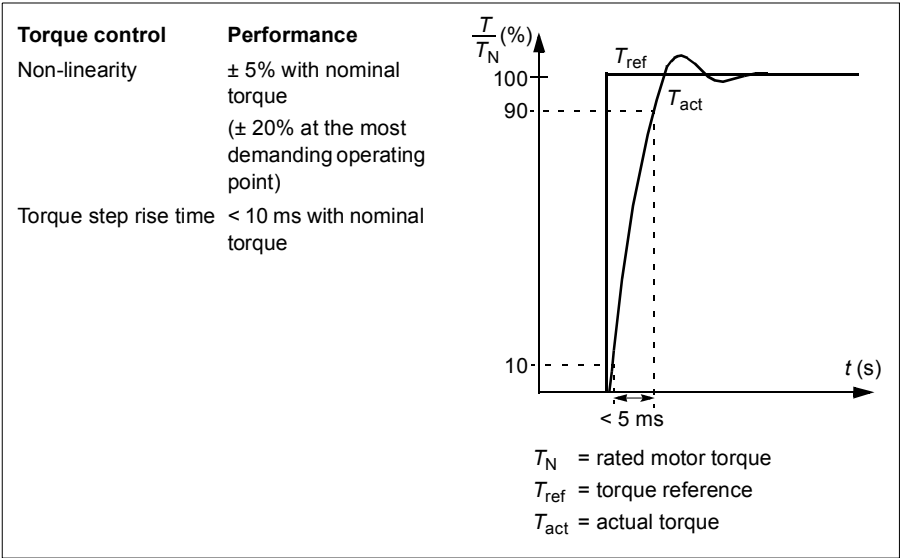
Speed control performance figures

The table below shows typical performance figures for speed control.



Torque control performance figures

The drive can perform precise torque control in vector control mode without any speed feedback from the motor shaft. The table below shows typical performance figures for vector control.



■ Motor potentiometer

The Motor potentiometer is, in effect, a counter whose value can be adjusted up and down using two digital signals selected by parameters [22.73 Motor potentiometer up source](#) and [22.74 Motor potentiometer down source](#).

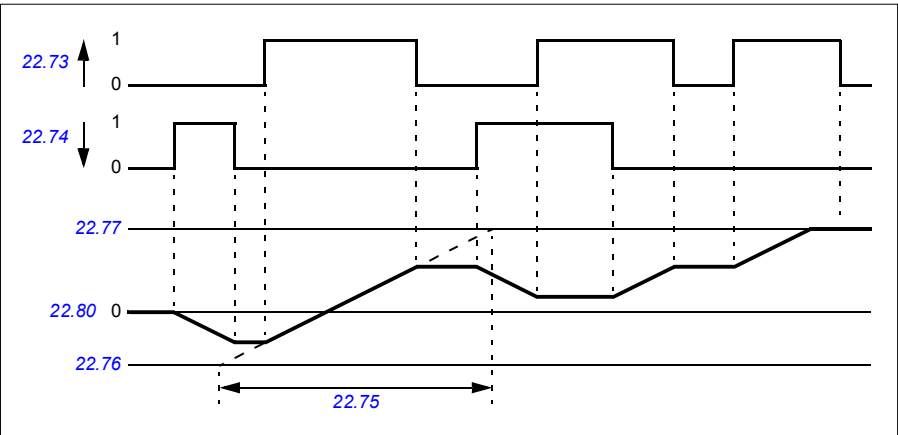
When the Motor potentiometer is enabled by [22.71 Motor potentiometer function](#), the counter assumes the value set by [22.72 Motor potentiometer initial value](#). Depending on the mode selected in [22.71](#), the counter value is either retained or reset over a power cycle.

The change rate is defined in [22.75 Motor potentiometer ramp time](#) as the time it would take for the value to change from the minimum ([22.76 Motor potentiometer min value](#)) to the maximum ([22.77 Motor potentiometer max value](#)) or vice versa. If the up and down signals are simultaneously on, the counter value does not change.

The output of the Motor potentiometer is shown by [22.80 Motor potentiometer ref act](#), which can directly be set as the reference source in the main selector parameters, or used as an input by other source selector parameters, both in scalar and vector control.

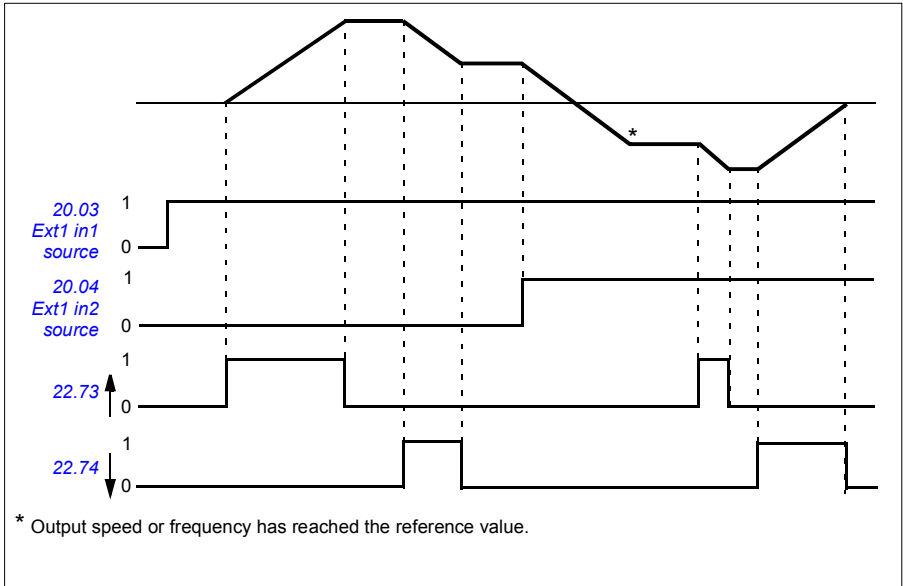
6

The following example shows the behavior of the Motor potentiometer counter value.



Parameters [22.73 Motor potentiometer up source](#) and [22.74 Motor potentiometer down source](#) control speed or frequency from zero to maximum speed or frequency.

The running direction can be changed with parameter [20.04 Ext1 in2 source](#). See the following example.



Settings

- Parameters [22.71...22.80](#) (page [346](#)).

DC voltage control

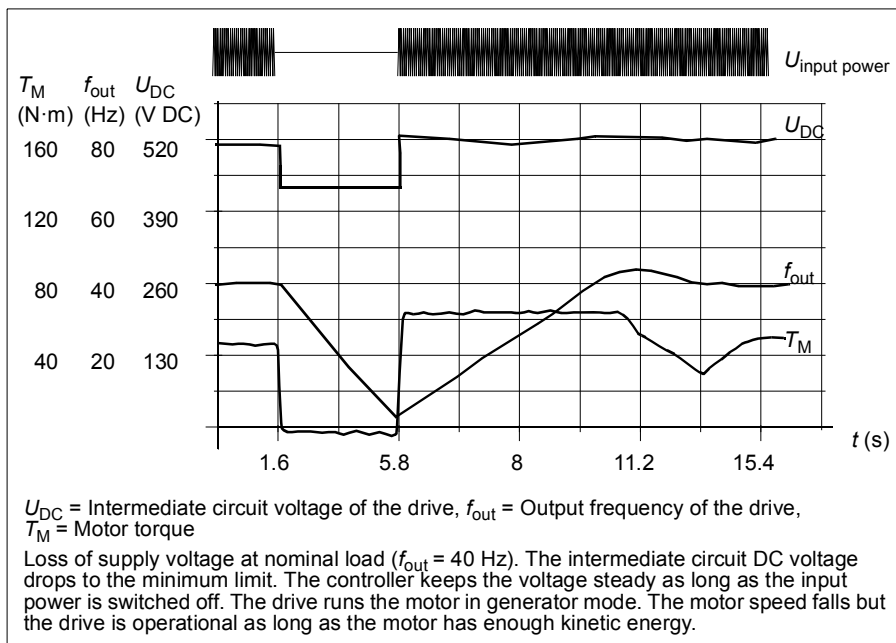
Overvoltage control

Overvoltage control of the intermediate DC link is typically needed when the motor is in generating mode. The motor can generate when it decelerates or when the load overhauls the motor shaft, causing the shaft to turn faster than the applied speed or frequency. To prevent the DC voltage from exceeding the overvoltage control limit, the overvoltage controller automatically decreases the generating torque when the limit is reached. The overvoltage controller also increases any programmed deceleration times if the limit is reached; to achieve shorter deceleration times, a brake chopper and resistor may be required.

Undervoltage control (power loss ride-through)

If the incoming supply voltage is cut off, the drive will continue to operate by utilizing the kinetic energy of the rotating motor. The drive will be fully operational as long as the motor rotates and generates energy to the drive. The drive can continue operation after the break if the main contactor (if present) remained closed.

Note: Units equipped with a main contactor must be equipped with a hold circuit (for example, UPS) to keep the contactor control circuit closed during a short supply break.



Implementing the undervoltage control (power loss ride-through)

Implement the undervoltage control function as follows:

- Check that the undervoltage control function of the drive is enabled with parameter [30.31 Undervoltage control](#).
- Parameter [21.01 Start mode](#) must be set to *Automatic* (in vector mode) or parameter [21.19 Scalar start mode](#) to *Automatic* (in scalar mode) to make flying start (starting into a rotating motor) possible.

If the installation is equipped with a main contactor, prevent its tripping at the input power break. For example, use a time delay relay (hold) in the contactor control circuit.



WARNING! Make sure that the flying restart of the motor will not cause any danger. If you are in doubt, do not implement the undervoltage control function.

Automatic restart

It is possible to restart the drive automatically after a short (max. 10 seconds) power supply failure by using the Automatic restart function, provided that the drive is allowed to run for 10 seconds without the cooling fans operating.

When enabled, the function takes the following actions upon a supply failure to a successful restart:

- The undervoltage fault is suppressed (but a warning is generated).
- Modulation and cooling is stopped to conserve any remaining energy.
- DC circuit pre-charging is enabled.

If the DC voltage is restored before the expiration of the period defined by parameter [21.18 Auto restart time](#) and the start signal is still on, normal operation will continue. However, if the DC voltage remains too low at that point, the drive trips on a fault, [3220 DC link undervoltage](#).

If parameter [21.34 Force auto restart](#) is set to [Enable](#), the drive never trips on the undervoltage fault and the start signal is on forever. When the DC voltage is restored, the normal operation continues.



WARNING! Before you activate the function, make sure that no dangerous situations can occur. The function restarts the drive automatically and continues operation after a supply break.

Voltage control and trip limits

The control and trip limits of the intermediate DC voltage regulator are relative to the supply voltage as well as drive/inverter type. The DC voltage (U_{DC}) is approximately 1.35 times the line-to-line supply voltage, and is displayed by parameter [01.11 DC voltage](#).

The following table shows the values of selected DC voltage levels. Note that the absolute voltages vary according to the drive/inverter type and AC supply voltage range.

| | DC voltage level [V] | |
|--|---|---|
| | AC supply voltage range [V] 380...415 | AC supply voltage range [V] 440...480 |
| See 95.01 Supply voltage . | | |
| Overvoltage fault limit | 840 | 840 |
| Overvoltage control limit | 780 | 780 |
| Internal brake chopper start limit | 780 | 780 |
| Internal brake chopper stop limit | 760 | 760 |
| Overvoltage warning limit | 745 | 745 |
| Undervoltage warning limit | $0.85 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.85 \times 1.41 \times 380 = 455 ^{2)}$ | $0.85 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.85 \times 1.41 \times 440 = 527 ^{2)}$ |

| | DC voltage level [V] | |
|---|--|--|
| | AC supply voltage range [V] 380...415 | AC supply voltage range [V] 440...480 |
| See 95.01 Supply voltage. | | |
| Undervoltage control limit | $0.75 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.75 \times 1.41 \times 380 = 402 \text{ } ^{2)}$ | $0.75 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.75 \times 1.41 \times 440 = 465 \text{ } ^{2)}$ |
| Charging relay closing limit | $0.78 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.75 \times 1.41 \times 380 = 402 \text{ } ^{2)}$ | $0.78 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.75 \times 1.41 \times 440 = 465 \text{ } ^{2)}$ |
| Charging relay opening limit | $0.73 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.65 \times 1.41 \times 380 = 348 \text{ } ^{2)}$ | $0.73 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.65 \times 1.41 \times 440 = 403 \text{ } ^{2)}$ |
| DC voltage at upper bound of supply voltage range (U_{DCmax}) | 560 | 648 |
| DC voltage at lower bound of supply voltage range (U_{DCmin}) | 513 | 594 |
| Charging activation/standby limit ³⁾ | $0.73 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.65 \times 1.41 \times 380 = 348 \text{ } ^{2)}$ | $0.73 \times 1.41 \times \text{par } 95.03 \text{ value } ^{1)}$ $0.65 \times 1.41 \times 440 = 403 \text{ } ^{2)}$ |
| ¹⁾ 95.01 Supply voltage is set to Automatic / not selected and 95.02 Adaptive voltage limits is set to Enable, the value of parameter 95.03 Estimated AC supply voltage is used, ²⁾ otherwise the lower limit of the range selected with parameter 95.01 Supply voltage is used. ³⁾ When standby is activated, drive modulation is stopped, the fan is stopped and the pre-charge circuit is activated. If the voltage exceeds this level again, the drive has to complete charging before it will automatically continue operation. | | |

The following table shows the values of selected DC voltage levels for ACQ580-31/34.

All levels are relative to the supply voltage range selected in parameter [95.01 Supply voltage](#). The following table shows the values of selected DC voltage levels in volts and in percent of U_{DCmax} (the DC voltage at the upper bound of the supply voltage range).

| ACQ580-31/34 | | Supply voltage range [V AC] (see 95.01 Supply voltage) | | | | |
|---|-----------|---|-----------|-----------|------------|------------|
| Level [V DC (% of U_{DCmax})] | 208...240 | 380...415 | 440...480 | 500 | 525...600 | 660...690 |
| Overvoltage fault limit | 489/440* | 800 | 878 | 880 | 1113 | 1218 |
| Overvoltage control limit | 405 (125) | 700 (125) | 810 (125) | 810 (120) | 1013 (125) | 1167 (125) |
| Internal brake chopper at 100% pulse width | 403 (124) | 697 (124) | 806 (124) | 806 (119) | 1008 (124) | 1159 (124) |
| Internal brake chopper at 0% pulse width | 375 (116) | 648 (116) | 749 (116) | 780 (116) | 936 (116) | 1077 (116) |
| Overvoltage warning limit | 373 (115) | 644 (115) | 745 (115) | 776 (115) | 932 (115) | 1071 (115) |
| U_{DCmax} = DC voltage at upper bound of supply voltage range | 324 (100) | 560 (100) | 648 (100) | 675 (100) | 810 (100) | 932 (100) |
| DC voltage at lower bound of supply voltage range | 281 | 513 | 594 | 675 | 709 | 891 |
| Undervoltage control and warning limit | 239 (85) | 436 (85) | 505 (85) | 574 (85) | 602 (85) | 757 (85) |
| Charging activation/standby limit | 225 (80) | 410 (80) | 475 (80) | 540 (80) | 567 (80) | 713 (80) |
| Undervoltage fault limit | 168 (60) | 308 (60) | 356 (60) | 405 (60) | 425 (60) | 535 (60) |

*489 V with frames R1...R3, 440 V with frames R4...R8.

Settings

- Parameters [01.11 DC voltage](#) (page 275), [30.30 Overvoltage control](#) (page 364), [30.31 Undervoltage control](#) (page 364), [95.01 Supply voltage](#) (page 484) and [95.02 Adaptive voltage limits](#) (page 484).

Brake chopper

A brake chopper can be used to handle the energy generated by a decelerating motor. When the DC voltage rises high enough, the chopper connects the DC circuit to an external brake resistor. The chopper operates on the pulse width modulation principle.

The internal brake choppers in the drive (in frames R0...R3) start conducting when the DC link voltage reaches approximately $1.15 \times U_{DCmax}$. 100% maximum pulse width is reached at approximately $1.2 \times U_{DCmax}$. (U_{DCmax} is the DC voltage corresponding to the maximum of the AC supply voltage range.) For information on external brake choppers, refer to their documentation.

Note: Overvoltage control needs to be disabled for the chopper to operate.

Settings

- Parameter [01.11 DC voltage](#) (page [275](#)); parameter group [43 Brake chopper](#) (page [428](#)).

Supervisory

Signal supervision

Six signals can be selected to be supervised by this function. Whenever a supervised signal exceeds or falls below predefined limits, a bit in [32.01 Supervision status](#) is activated, and a warning or fault generated.

The supervised signal is low-pass filtered.

Settings

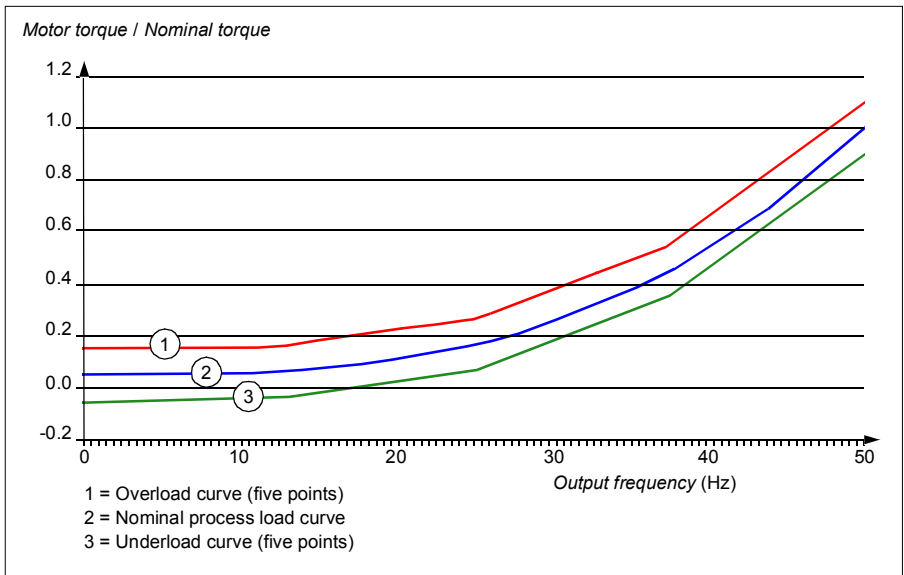
- Parameter group [32 Supervision](#) (page [377](#)).

User load curve (Condition monitoring)

The User load curve provides a supervisory function that monitors an input signal as a function of frequency or speed, and load. It shows the status of the monitored signal and can give a warning or fault based on the violation of a user defined profile.

The user load curve consists of an overload and an underload curve, or just one of them. Each curve is formed by five points that represent the monitored signal as a function of frequency or speed.

In the example below, the user load curve is constructed from the motor nominal torque to which a 10% margin is added and subtracted. The margin curves define a working envelope for the motor so that excursions outside the envelope can be supervised, timed and detected.



An overload warning and/or fault can be set to occur if the monitored signal stays continuously over the overload curve for a defined time. An underload warning and/or fault can be set to occur if the monitored signal stays continuously under the underload for a defined time.

Overload can be, for example, used to monitor for a stuck pump or dirty impeller.

Underload can be, for example, used to monitor for load dropping and for a blockage in pump inlet (suction side).

The load curve can be used as a trigger for the pump cleaning function. (Underload = blocked inlet on the pump, Overload = blockage in the pump impeller or output of the pump).

The user load curve can also, over a longer time period, be used to demonstrate when the efficiency of a pump system may be dropping so it can be used along with a maintenance trigger.

Settings

- Parameter group [37 User load curve](#) (page [406](#)).

Energy efficiency

Energy optimization

The function optimizes the motor flux so that total energy consumption and motor noise level are reduced when the drive operates below the nominal load. The total efficiency (motor and drive) can be improved by 1...20% depending on load torque and speed. Energy optimization is enabled by default.

Note: With permanent magnet and synchronous reluctance motors, energy optimization is always enabled.

Settings

- **Menu > Energy efficiency**
- Parameter [45.11 Energy optimizer](#) (page [432](#)).

Energy saving calculators

This feature consists of the following functionalities:

- An energy optimizer that adjusts the motor flux in such a way that the total system efficiency is maximized
- A counter that monitors used and saved energy by the motor and displays them in kWh, currency or volume of CO₂ emissions, and
- A load analyzer showing the load profile of the drive (see separate section on page [164](#)).

In addition, there are counters that show energy consumption in kWh of the current and previous hour as well as the current and previous day.

The amount of energy that has passed through the drive (in either direction) is counted and shown as full GWh, MWh and kWh. The cumulative energy is also shown as full kWh. All these counters are resettable.

Note: The accuracy of the energy savings calculation is directly dependent on the accuracy of the reference motor power given in parameter [45.19 Comparison power](#).

Settings

- **Menu > Energy efficiency**
- Parameter group [45 Energy efficiency](#) (page [430](#))
- Parameters [01.50 Current hour kWh](#), [01.51 Previous hour kWh](#), [01.52 Current day kWh](#) and [01.53 Previous day kWh](#) on page [276](#).
- Parameters [01.55 Inverter GWh counter \(resettable\)](#), [01.56 Inverter MWh counter \(resettable\)](#), [01.57 Inverter kWh counter \(resettable\)](#) and [01.58 Cumulative inverter energy \(resettable\)](#).

■ Load analyzer

Peak value logger

The user can select a signal to be monitored by a peak value logger. The logger records the peak value of the signal along with the time the peak occurred, as well as motor current, DC voltage and motor speed at the time of the peak. The peak value is sampled at 2 ms intervals.

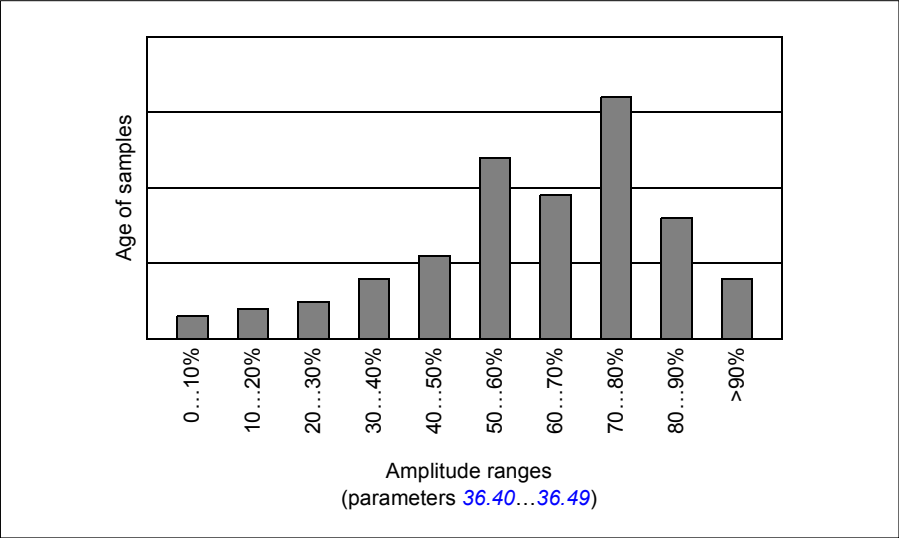
Amplitude loggers

The control program has two amplitude loggers.

For amplitude logger 2, the user can select a signal to be sampled at 200 ms intervals, and specify a value that corresponds to 100%. The collected samples are sorted into 10 read-only parameters according to their amplitude. Each parameter represents an amplitude range 10 age points wide, and displays the age of the collected samples that have fallen within that range.

You can view this graphically with the assistant control panel or the Drive composer PC tool.

6



Amplitude logger 1 is fixed to monitor motor current, and cannot be reset. With amplitude logger 1, 100% corresponds to the maximum output current of the drive (I_{max}), which is listed in the *Hardware manual* of the drive. The measured current is logged continuously. The distribution of samples is shown by parameters [36.20...36.29](#).

Settings

- **Menu > Diagnostics > Load profile**
- Parameter group [36 Load analyzer](#) (page [403](#)).

User parameter sets

The drive supports four user parameter sets that can be saved to the permanent memory and recalled using drive parameters. It is possible to use digital inputs to switch between user parameter sets.

A user parameter set contains all editable values in parameter groups 10...99 except

- forced I/O values such as parameters [10.03 DI force selection](#) and [10.04 DI forced data](#)
- I/O extension module settings (group 15)
- data storage parameters (group 47)
- fieldbus communication enable parameter ([50.01 FBA A enable](#))
- other fieldbus communication settings (groups 51...53 and 58)
- some hardware settings in group [95 HW configuration](#) (for example parameter [95.01 Supply voltage](#),
- user set selection parameters [96.11](#)...[96.13](#).

6

As the motor settings are included in the user parameter sets, make sure the settings correspond to the motor used in the application before recalling a user set. In an application where different motors are used with the drive, the motor ID run needs to be performed with each motor and the results saved to different user sets. The appropriate set can then be recalled when the motor is switched.

If no parameter sets have been saved, attempting to load a set will create all sets from the currently active parameter settings.

Switching between sets is only possible with the drive stopped.

Settings

- **Menu > Primary settings > Advanced functions > User sets**
- Parameters [96.10](#)...[96.13](#) (page [491](#)).

System safety and protections

■ Fixed/Standard protections

Overcurrent

If the output current exceeds the internal overcurrent limit, the IGBTs are shut down immediately to protect the drive.

DC overvoltage

See section [Overvoltage control](#) on page 155.

DC undervoltage

See section [Undervoltage control \(power loss ride-through\)](#) on page 155.

Drive temperature

If the temperature rises high enough, the drive first starts to limit the switching frequency and then the current to protect itself. If it is still keeps heating up, for example, because of a fan failure, an overtemperature fault is generated.

Short circuit

In case of a short circuit, the IGBTs are shut down immediately to protect the drive.

■ Programmable protection functions

Motor phase loss detection (parameter 31.19)

The parameter selects how the drive reacts whenever a motor phase loss is detected.

Supply phase loss detection (parameter 31.21)

The parameter selects how the drive reacts whenever a supply phase loss is detected.

Safe torque off detection (parameter 31.22)

The drive monitors the status of the Safe torque off input, and this parameter selects which indications are given when the signals are lost. (The parameter does not affect the operation of the Safe torque off function itself.) For more information on the Safe torque off function, see chapter *Planning the electrical installation*, section *Implementing the Safe torque off function* in the *Hardware manual* of the drive.

Swapped supply and motor cabling (parameter 31.23)

The drive can detect if the supply and motor cables have accidentally been swapped (for example, if the supply is connected to the motor connection of the drive). The parameter selects if a fault is generated or not.

Stall protection (parameters 31.24...31.28)

The drive protects the motor in a stall situation. It is possible to adjust the supervision limits (current, frequency and time) and choose how the drive reacts to a motor stall condition.

Overspeed protection (parameter 31.30...31.31)

The user can set overspeed and overfrequency limits by specifying a margin that is added to the currently-used maximum and minimum speed or frequency limits.

Local control loss detection (parameter 49.05)

The parameter selects how the drive reacts to a control panel or PC tool communication break.

AI supervision (parameters 12.03...12.04)

The parameters select how the drive reacts when an analog input signal moves out of the minimum and/or maximum limits specified for the input. This can be due to broken I/O wiring or sensor.

6

Emergency stop

The emergency stop signal is connected to the input selected by parameter 21.05 *Emergency stop source*. An emergency stop can also be generated through fieldbus (parameter 06.01 *Main control word*, bits 0...2).

The mode of the emergency stop is selected by parameter 21.04 *Emergency stop mode*. The following modes are available:

- Off1: Stop along the standard deceleration ramp defined for the particular reference type in use
- Off2: Stop by coasting
- Off3: Stop by the emergency stop ramp defined by parameter 23.23 *Emergency stop time*.
- Stop torque.

With Off1 or Off3 emergency stop modes, the ramp-down of the motor speed can be supervised by parameters 31.32 *Emergency ramp supervision* and 31.33 *Emergency ramp supervision delay*.

Notes:

- The installer of the equipment is responsible for installing the emergency stop devices and all additional devices needed for the emergency stop function to fulfill

the required emergency stop categories. For more information, contact your local ABB representative.

- After an emergency stop signal is detected, the emergency stop function cannot be canceled even though the signal is canceled.
- If the minimum (or maximum) torque limit is set to 0%, the emergency stop function may not be able to stop the drive.

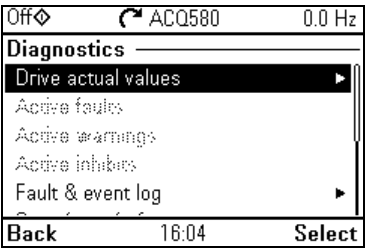
Settings

- Parameters [21.04 Emergency stop mode](#) (page 334), [21.05 Emergency stop source](#) (page 334), [23.23 Emergency stop time](#) (page 350), [31.32 Emergency ramp supervision](#) (page 375) and [31.33 Emergency ramp supervision delay](#) (page 376).

Diagnostics

Diagnostics menu

The **Diagnostics** menu provides quick information about active faults, warnings and inhibits in the drive and how to fix and reset them. It also helps you to find out why the drive is not starting, stopping or running at the desired speed.



- **Drive actual values**
- **Active faults:** Use this view to see currently active faults and how to fix and reset them.
- **Active warnings:** Use this view to see currently active warnings and how to fix them.
- **Active inhibits:** Use this view to see the active inhibits and how to fix them. In addition, in the **Clock, region, display** menu you can disable (enabled by default) pop-up views showing information on inhibits when you try to start the drive but it is prevented.
- **Fault and event log:** Shows lists faults and other events.
- **Start/stop/reference summary:** Use this view to find out where the control comes from if the drive is not starting or stopping as expected, or runs at an undesired speed.
- **Limit status:** Use this view to find out whether any limitations are active if the drive is running at undesired speed.
- **Communication status:** Use this view to find out status information and sent and received data from fieldbus.
- **Motor summary:** Use this view to find out motor nominal values, control mode and whether ID run has been completed.

Settings

- **Menu > Diagnostics**
- **Menu > Primary settings > Clock, region, display > Show inhibit pop-up.**

Miscellaneous

Backup and restore

You can make backups of the settings manually to the assistant control panel. The assistant control panel also keeps one automatic backup. You can restore a backup to another drive, or a new drive replacing a faulty one. You can make backups and restore on the control panel or with the Drive composer PC tool.

Backup

Manual backup

Make a backup when necessary, for example, after you have started up the drive or when you want to copy the settings to another drive.

Parameter changes from fieldbus interfaces are ignored unless you have forced parameter saving with parameter [96.07 Parameter save manually](#).




Automatic backup

The assistant control panel has a dedicated space for one automatic backup. An automatic backup is created two hours after the last parameter change. After completing the backup, the control panel waits for 24 hours before checking if there are additional parameter changes. If there are, it creates a new backup overwriting the previous one when two hours have passed after the latest change.

You cannot adjust the delay time or disable the automatic backup function.

Parameter changes from fieldbus interfaces are ignored unless you have forced parameter saving with parameter [96.07 Parameter save manually](#).

Restore

The backups are shown on the control panel. Automatic backups are marked with icon  and manual backups with . To restore a backup, select it and press . In the following display you can view backup contents and restore all parameters or select a subset to be restored.

Note: To restore a backup, the drive has to be in Local control.

Note: There is a risk of removing the **QR code** menu entry permanently if a backup from a drive with an old firmware or old control panel firmware is restored to a drive with a new firmware from October 2014 or later.

| | | |
|--------------------------------|--------|--------|
| Off | ACQ580 | 0.0 Hz |
| Backups | | |
| Create backup ▶ | | |
| ACQ580 06.06.2016 autobackup ▶ | | |
| ACQ580 01.06.2016 ▶ | | |
| ACQ580 17.06.2016 ▶ | | |
| Back | 20:04 | Select |

| | | |
|----------------------------|--------|--------|
| Off | ACQ580 | 0.0 Hz |
| ACQ580 17.06.2016 | | |
| View backup contents ▶ | | |
| Restore all parameters | | |
| Select par restore group ▶ | | |
| Select user sets ▶ | | |
| Select prod. data items ▶ | | |
| Back | 20:05 | Select |

Settings

- **Menu > Backups**
- Parameter [96.07 Parameter save manually](#) (page 490).

6

Data storage parameters

Twelve (eight 32-bit, four 16-bit) parameters are reserved for data storage. These parameters are unconnected by default and can be used for linking, testing and commissioning purposes. They can be written to and read from using other parameters' source or target selections.

Settings

- Parameter group [47 Data storage](#) (page 438).

Parameter checksum calculation

Two parameter checksums, A and B, can be calculated from a set of parameters to monitor changes in the drive configuration. The sets are different for checksums A and B. Each of these checksum is compared to the corresponding reference checksum; in case of a mismatch, an event (a pure event, warning or fault) is generated. The calculated checksum can be set as the new reference checksum.

The set of parameters for checksum A does not include fieldbus settings.

The parameters included in the checksum A calculation are user editable parameters in parameter groups 10...13, 15, 19...25, 28, 30...32, 34...37, 40...41, 43, 45...46, 70...74, 76, 80, 94...99.

The set of parameters for checksum B does not include

- fieldbus settings
- motor data settings
- energy data settings.

The parameters included in the checksum B calculation are user editable parameters in parameter groups 10...13, 15, 19...25, 28, 30...32, 34, 35...37, 40...41, 43, 46, 70...74, 76, 80, 94...97.

Settings

- Parameters [96.54...96.69](#), [96.71...96.72](#) (page [494](#)).

■ User lock

For improved cybersecurity, it is highly recommended that you set a master pass code to prevent, for example, the changing of parameter values and/or the loading of firmware and other files.



WARNING! ABB will not be liable for damages or losses caused by the failure to activate the user lock using a new pass code. See [Cybersecurity disclaimer](#) (page 19).

- To activate the user lock for the first time:
- Enter the default pass code, 10000000, into [96.02 Pass code](#). This will make parameters [96.100...96.102](#) visible.
- Enter a new pass code into [96.100 Change user pass code](#). Always use eight digits; if using Drive composer PC tool, finish with Enter.
- Confirm the new pass code in [96.100 Change user pass code](#).

6



WARNING! Store the pass code in a safe place – even ABB cannot open the user lock if the pass code is lost.

- In [96.102 User lock functionality](#), define the actions that you want to prevent (we recommend you select all the actions unless otherwise required by the application).
- Enter an invalid pass code into [96.02 Pass code](#).
- Activate [96.08 Control board boot](#), or cycle the power to the drive.
- Check that parameters [96.100...96.102](#) are hidden. If they are not, enter another random pass code into [96.02](#).

To reopen the lock, enter your pass code into [96.02 Pass code](#). This will again make parameters [96.100...96.102](#) visible.

Settings

- Parameters [96.02](#) (page 489) and [96.100...96.102](#) (page 495).

■ Sine filter support

The control program has a setting that enables the use of ABB sine filters (available separately). With a sine filter connected to the output of the drive, bit 1 of [95.15 Special HW settings](#) must be switched on. The setting forces the drive to use the scalar motor control mode, and limits the switching and output frequencies to

- prevent the drive from operating at filter resonance frequencies, and
- protect the filter from overheating.

With a sine filter connected to the output of the drive, the drive must use scalar motor control mode, and limit the switching and output frequencies to

- prevent the drive from operating at filter resonance frequencies, and
- protect the filter from overheating.

When using ABB sine filters (available separately), this is done automatically when you switch bit 1 of [95.15 Special HW settings](#) on.

Contact your local ABB representative before connecting a sine filter from another manufacturer.

Settings

- Parameter [95.15 Special HW settings](#) (page [484](#)).

7

Fault tracing

What this chapter contains

The chapter lists the warning and fault messages including possible causes and corrective actions. The causes of most warnings and faults can be identified and corrected using the information in this chapter. If not, contact an ABB service representative. If you have a possibility to use the Drive composer PC tool, send the Support package created by the Drive composer to the ABB service representative.

Warnings and faults are listed below in separate tables. Each table is sorted by warning/fault code.

Safety



WARNING! Only qualified electricians are allowed to service the drive. Read the instructions in chapter *Safety instructions* at the beginning of the *Hardware manual* of the drive before working on the drive.

Indications

■ Warnings and faults

Warnings and faults indicate an abnormal drive status. The codes and names of active warnings and faults are displayed on the control panel of the drive as well as in the Drive composer PC tool. Only the codes of warnings and faults are available over fieldbus.

Warnings do not need to be reset; they stop showing when the cause of the warning ceases. Warnings do not trip the drive and it will continue to operate the motor.

Faults latch inside the drive and cause the drive to trip, and the motor stops. After the cause of a fault has been removed, the fault can be reset from the control panel or from a selectable source (parameter [31.11 Fault reset selection](#)) such as the digital inputs of the drive. Resetting the fault creates an event [64FF Fault reset](#). After the reset, the drive can be restarted.

Note that some faults require a reboot of the control unit either by switching the power off and on, or using parameter [96.08 Control board boot](#) – this is mentioned in the fault listing wherever appropriate.

■ Pure events

In addition to warnings and faults, there are pure events that are only recorded in the event log of the drive. The codes of these events are included in the [Warning messages](#) table on page [180](#).

■ Editable messages

For external events, the action (fault or warning), name and the message text can be edited. To specify external events, select **Menu > Primary settings > Advanced functions > External events**.

Contact information can also be included and the text edited. To specify contact information, select **Menu > Primary settings > Clock, region, display > Contact info view**.

7

Warning/fault history

■ Event log

All indications are stored in the event log with a time stamp and other information. The event log stores information on

- the last 8 fault recordings, that is, faults that tripped the drive or fault resets
- the last 10 warnings or pure events that occurred.

See section [Viewing warning/fault information](#) on page [179](#).

To clear the fault and event logger, select **Menu > Primary settings > Reset to defaults > Reset fault and event logs**, or set parameter [96.51 Clear fault and event logger](#) to value Clear.

Auxiliary codes

Some events generate an auxiliary code that often helps in pinpointing the problem. On the control panel, the auxiliary code is stored as part of the details of the event; in the Drive composer PC tool, the auxiliary code is shown in the event listing.

■ Viewing warning/fault information

The drive is able to store a list of the active faults actually causing the drive to trip at the present time. The drive also stores a list of faults and warnings that have previously occurred.

For each stored fault, the control panel shows the fault code, time and values of nine parameters (actual signals and status words) stored at the time of the fault. The values of the parameters for the latest fault are in parameters [05.80...05.89](#).

For active faults and warnings, see

- **Menu > Diagnostics > Active faults**
- **Menu > Diagnostics > Active warnings**
- parameters in group [04 Warnings and faults](#) (page [280](#)).

For previously occurred faults and warnings, see

- **Menu > Diagnostics > Fault & event log**
- parameters in group [04 Warnings and faults](#) (page [280](#)).

The event log can also be accessed (and reset) using the Drive composer PC tool. See *Drive composer PC tool user's manual* (3AUA0000094606 [English]).

QR code generation for mobile service application

A QR code (or a series of QR codes) can be generated by the drive for display on the control panel. The QR code contains drive identification data, information on the latest events, and values of status and counter parameters. The code can be read with a mobile device containing the ABB service application, which then sends the data to ABB for analysis. For more information on the application, contact your local ABB service representative.

To generate the QR code, select **Menu > System info > QR code**.

Note: If a control panel which does not support QR code generation (version older than v.6.4x) is used, the **QR code** menu entry will disappear totally and will not be available any longer either with control panels supporting the QR code generation.

Note: There is a risk of removing the **QR code** menu permanently if a backup from a drive with an old firmware or old panel firmware is restored to a drive with a new firmware from October 2014 or later.

Warning messages

Note: The list also contains events that only appear in the Event log.

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|---------------------|--|---|
| 64FF | Fault reset | A fault has been reset from the control panel, Drive composer PC tool, fieldbus or I/O. | Event. Informative only. |
| A2B1 | Overcurrent | Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this warning may also be caused by an earth fault or supply phase loss. | Check motor load. Check acceleration times in parameter group 23 Speed reference ramp (speed control) or 28 Frequency reference chain (frequency control). Also check parameters 46.01 Speed scaling , 46.02 Frequency scaling and 46.03 Torque scaling . Check motor and motor cable (including phasing and delta/star connection). Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter <i>Electrical installation</i> , section <i>Checking the insulation of the assembly</i> in the <i>Hardware manual</i> of the drive. Check there are no contactors opening and closing in motor cable. Check that the start-up data in parameter group 99 Motor data corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in motor cable. |
| A2B3 | Earth leakage | Drive has detected load unbalance typically due to earth fault in motor or motor cable. | Check there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter <i>Electrical installation</i> , section <i>Checking the insulation of the assembly</i> in the <i>Hardware manual</i> of the drive. If an earth fault is found, fix or change the motor cable and/or motor. If no earth fault can be detected, contact your local ABB representative. |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|---|--|---|
| A2B4 | Short circuit | Short-circuit in motor cable(s) or motor. | Check motor and motor cable for cabling errors. Check motor and motor cable (including phasing and delta/star connection). Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter <i>Electrical installation</i> , section <i>Checking the insulation of the assembly</i> in the <i>Hardware manual</i> of the drive. Check there are no power factor correction capacitors or surge absorbers in motor cable. |
| A2BA | IGBT overload | Excessive IGBT junction to case temperature. This warning protects the IGBT(s) and can be activated by a short circuit in the motor cable. | Check motor cable. Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power. |
| A3A1 | DC link overvoltage | Intermediate circuit DC voltage too high (when the drive is stopped). | Check the supply voltage setting (parameter 95.01 Supply voltage). Note that the wrong setting of the parameter may cause the motor to rush uncontrollably, or may overload the brake chopper or resistor. Check the supply voltage. If the problem persists, contact your local ABB representative. |
| A3A2 | DC link undervoltage | Intermediate circuit DC voltage too low (when the drive is stopped). | |
| A3AA | DC not charged | The voltage of the intermediate DC circuit has not yet risen to operating level. | |
| A490 | Incorrect temperature sensor setup | Temperature cannot be supervised due to incorrect adapter setup. | Check the settings of temperature source parameters 35.11 and 35.21 . |
| A491 | External temperature 1 (Editable message text) | Measured temperature 1 has exceeded warning limit. | Check the value of parameter 35.02 Measured temperature 1 . Check the cooling of the motor (or other equipment whose temperature is being measured). Check the value of 35.13 Temperature 1 warning limit . |
| A492 | External temperature 2 (Editable message text) | Measured temperature 2 has exceeded warning limit. | Check the value of parameter 35.03 Measured temperature 2 . Check the cooling of the motor (or other equipment whose temperature is being measured). Check the value of 35.23 Temperature 2 warning limit . |
| A4A0 | Control board temperature | Control board temperature is too high. | Check the auxiliary code. See actions for each code below. |
| | (none) | Temperature above warning limit | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. |
| | 1 | Thermistor broken | Contact an ABB service representative for control board replacement. |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|---|--|---|
| A4A1 | IGBT overtemperature | Estimated drive IGBT temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power. |
| A4A9 | Cooling | Drive module temperature is excessive. | Check ambient temperature. If it exceeds 40 °C/104 °F (IP21 frames R4...R9) or if it exceeds 50 °C /122 °F (IP21 frames R0...R9), ensure that load current does not exceed derated load capacity of drive. For all P55 frames, check the derating temperatures. See chapter <i>Technical data</i> , section <i>Derating</i> in the <i>Hardware manual</i> of the drive. Check drive module cooling air flow and fan operation. Check inside of cabinet and heatsink of drive module for dust pick-up. Clean whenever necessary. |
| A4B0 | Excess temperature | Power unit module temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power. |
| A4B1 | Excess temperature difference | High temperature difference between the IGBTs of different phases. | Check the motor cabling. Check cooling of drive module(s). |
| A4F6 | IGBT temperature | Drive IGBT temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power. |
| A581 | Fan | Cooling fan feedback missing. | Check the auxiliary code to identify the fan. Code 0 denotes main fan 1. Other codes (format XYZ): "X" specifies state code (1 : ID run, 2 : normal). "Y" = 0, "Z" specifies the index of the fan (1 : Main fan 1, 2 : Main fan 2, 3 : Main fan 3). Check fan operation and connection. Replace fan if faulty. |
| A582 | Auxiliary fan missing | An auxiliary cooling fan (IP55 internal fan) is stuck or disconnected. | Check the auxiliary code. Check the auxiliary fan and connection. Replace faulty fan. Make sure the front cover of the drive is in place and tightened. If the commissioning of the drive requires that the cover is off, set parameter 31.22 STO indication run/stop temporarily to value No action within two minutes from power-up. |
| A5A0 | Safe torque off Programmable warning: 31.22 STO indication run/stop | Safe torque off function is active, ie, safety circuit signal(s) connected to connector STO is lost. | Check safety circuit connections. For more information, chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and description of parameter 31.22 STO indication run/stop (page 371). Check the value of parameter 95.04 Control board supply . |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|---|--|---|
| A5EA | Measurement circuit temperature | Problem with internal temperature measurement of the drive. | Contact your local ABB representative. |
| A5EB | PU board powerfail | Power unit power supply failure. | Contact your local ABB representative. |
| A5ED | Measurement circuit ADC | Measurement circuit fault. | Contact your local ABB representative. |
| A5EE | Measurement circuit DFF | Measurement circuit fault. | Contact your local ABB representative. |
| A5EF | PU state feedback | State feedback from output phases does not match control signals. | Contact your local ABB representative. |
| A5F0 | Charging feedback | Charging feedback signal missing. | Check the feedback signal coming from the charging system. |
| A682 | Flash erase speed exceeded | The flash memory (in the memory unit) has been erased too frequently, compromising the lifetime of the memory. | Avoid forcing unnecessary parameter saves by parameter 96.07 or cyclic parameter writes (such as user logger triggering through parameters). Check the auxiliary code (format YYYY YZZZ). "X" specifies the source of warning (1: generic flash erase supervision). "ZZZ" specifies the flash subsector number that generated the warning. |
| A686 | Checksum mismatch Programmable warning: 96.54 Checksum action | The calculated parameter checksum does not match any enabled reference checksum. | Check that all necessary approved (reference) checksums (96.71...96.72) are enabled in 96.55 Checksum control word . Check the parameter configuration. Using 96.55 Checksum control word , enable a checksum parameter and copy the actual checksum into that parameter. |
| A687 | Checksum configuration | An action has been defined for a parameter checksum mismatch but the feature has not been configured. | Contact your local ABB representative for configuring the feature, or disable the feature in 96.54 Checksum action . |
| A6A4 | Motor nominal value | The motor parameters are set incorrectly. The drive is not dimensioned correctly. | Check the auxiliary code. See actions for each code below. |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|------------------------------|---|--|
| | 0001 | Slip frequency is too small. | Check the settings of the motor configuration parameters in groups 98 and 99. Check that the drive is sized correctly for the motor. |
| | 0002 | Synchronous and nominal speeds differ too much. | |
| | 0003 | Nominal speed is higher than synchronous speed with 1 pole pair. | |
| | 0004 | Nominal current is outside limits | |
| | 0005 | Nominal voltage is outside limits. | |
| | 0006 | Nominal power is higher than apparent power. | |
| | 0007 | Nominal power not consistent with nominal speed and torque. | |
| A6A5 | No motor data | Parameters in group 99 have not been set. | Check that all the required parameters in group 99 have been set. Note: It is normal for this warning to appear during the start-up and continue until the motor data is entered. |
| A6A6 | Voltage category unselected | The voltage category has not been defined. | Set voltage category in parameter 95.01 Supply voltage . |
| A6A7 | System time not set | System time is not set. Timed functions cannot be used and fault log dates are not correct. | Set the system time manually or connect the control panel to the drive to synchronize the clock. If basic control panel is used, synchronize the clock through the EFB or a fieldbus module. Set parameter 34.10 Timed functions enable to Disabled to disable the timed functions if they are not used. |
| A6B0 | User lock is open | The user lock is open, ie, user lock configuration parameters 96.100...96.102 are visible. | Close the user lock by entering an invalid pass code in parameter 96.02 Pass code . See section Parameter checksum calculation (page 172). |
| A6B1 | User pass code not confirmed | A new user pass code has been entered in parameter 96.100 but not confirmed in 96.101 . | Confirm the new pass code by entering the same code in 96.101 . To cancel, close the user lock without confirming the new code. See section Parameter checksum calculation (page 172). |
| A6D1 | FBA A parameter conflict | The drive does not have a functionality requested by a PLC, or requested functionality has not been activated. | Check PLC programming. Check settings of parameter groups 50 Fieldbus adapter (FBA) . |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|--|---|--|
| A6E5 | AI parametrization | The current/voltage hardware setting of an analog input does not correspond to parameter settings. | Check the event log for an auxiliary code. The code identifies the analog input whose settings are in conflict. Adjust either the hardware setting (on the drive control unit) or parameter 12.15/12.25 . Note: Control board reboot (either by cycling the power or through parameter 96.08 Control board boot) is required to validate any changes in the hardware settings. |
| A6E6 | ULC configuration | User load curve configuration error. | Check the auxiliary code (format XXXX ZZZZ). "ZZZZ" indicates the problem (see actions for each code below). |
| | 0000 | Speed points inconsistent. | Check that each speed point (parameters 37.11...37.15) has a higher value than the previous point. |
| | 0001 | Frequency points inconsistent. | Check that each frequency point (37.20...37.16) has a higher value than the previous point. |
| | 0002 | Underload point above overload point. | Check that each overload point (37.31...37.35) has a higher value than the corresponding underload point (37.21...37.25). |
| | 0003 | Overload point below underload point. | |
| A6E7 | IPC configuration warning | IPC configuration error. | Check the auxiliary code (format XXXX ZZZZ). "ZZZZ" indicates the problem (see actions for each code below). |
| | 0001 | IPC incorrectly configured for EFB. | Check that if parameter 76.21 Multipump configuration is set to <i>IPC, Level control - Emptying</i> or <i>Level control - Filling</i> , parameter 58.01 Protocol enable is set to <i>None / IPC communication</i> . Check that if 58.01 Protocol enable is set to <i>None / IPC communication</i> , 76.21 Multipump configuration is set to <i>IPC, Level control - Emptying</i> or <i>Level control - Filling</i> , and 76.24 IPC communication port is set to <i>EFB</i> . |
| | 0002 | IPC incorrectly configured for FBA. | Check that if parameter 76.21 Multipump configuration is set to none of <i>IPC, Level control - Emptying</i> or <i>Level control - Filling</i> , parameter 50.01 FBA A enable is set to <i>Disable</i> . |
| A780 | Motor stall Programmable warning: 31.24 Stall function | Motor is operating in stall region because of, for example, excessive load or insufficient motor power. | Check motor load and drive ratings. Check fault function parameters. |
| A783 | Motor overload | Motor current is too high. | Check for overloaded motor. Adjust the parameters used for the motor overload function (35.51...35.53) and 35.55...35.56 . |
| A792 | Brake resistor wiring | Brake resistor short circuit or brake chopper control fault. For drive frames R6 or larger. | Check brake chopper and brake resistor connection. Ensure brake resistor is not damaged. |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|--|---|--|
| A793 | BR excess temperature | Brake resistor temperature has exceeded warning limit defined by parameter 43.12 Brake resistor warning limit . | Stop drive. Let resistor cool down. Check resistor overload protection function settings (parameter group 43 Brake chopper . Check warning limit setting, parameter 43.12 Brake resistor warning limit . Check that the resistor has been dimensioned correctly. Check that braking cycle meets allowed limits. |
| A794 | BR data | Brake resistor data has not been given. | One or more of the resistor data settings (parameters 43.08...43.10) is incorrect. The parameter is specified by the auxiliary code. |
| | 0000 0001 | Resistance value too low. | Check value of 43.10 Brake resistance . |
| | 0000 0002 | Thermal time constant not given. | Check value of 43.08 Brake resistor thermal tc . |
| | 0000 0003 | Maximum continuous power not given. | Check value of 43.09 Brake resistor Pmax cont . |
| A79C | BC IGBT excess temperature | Brake chopper IGBT temperature has exceeded internal warning limit. | Let chopper cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check the dimensioning and cooling of the cabinet. Check resistor overload protection function settings (parameters 43.06...43.10). Check minimum allowed resistor value for the chopper being used. Check that braking cycle meets allowed limits. Check that drive supply AC voltage is not excessive. |
| A7AB | Extension I/O configuration failure | Installed CMOD module is not the same as configured. | Check that the installed module (shown by parameter 15.02 Detected extension module) is the same as selected by parameter 15.01 Extension module type . |
| A7C1 | FBA A communication Programmable warning: 50.02 FBA A comm loss func | Cyclical communication between drive and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost. | Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 50 Fieldbus adapter (FBA) , 51 FBA A settings , 52 FBA A data in and 53 FBA A data out . Check cable connections. Check if communication master is able to communicate. |
| A7CE | EFB comm loss Programmable warning: 58.14 Communication loss action | Communication break in embedded fieldbus (EFB) communication. | Check the status of the fieldbus master (online/offline/error etc.). Check cable connections to the EIA-485/X5 terminals 29, 30 and 31 on the control unit. |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|--|--|--|
| A7EE | Panel loss Programmable warning: 49.05 Communication loss action | Control panel or PC tool selected as active control location for drive has ceased communicating. | Check PC tool or control panel connection. Check control panel connector. Check mounting platform if being used. Disconnect and reconnect the control panel. |
| A88F | Cooling fan | Maintenance timer limit exceeded. | Consider changing the cooling fan. Parameter 05.04 Fan on-time counter shows the running time of the cooling fan. |
| A8A0 | AI supervision Programmable warning: 12.03 AI supervision function | An analog signal is outside the limits specified for the analog input. | Check signal level at the analog input. Check the wiring connected to the input. Check the minimum and maximum limits of the input in parameter group 12 Standard AI . |
| A8A1 | RO life warning | The relay has changed states more than the recommended number of times. | Change the control board or stop using the relay output. |
| | 0001 | Relay output 1 | Change the control board or stop using relay output 1. |
| | 0002 | Relay output 2 | Change the control board or stop using relay output 2. |
| | 0003 | Relay output 3 | Change the control board or stop using relay output 3. |
| A8A2 | RO toggle warning | The relay output is changing states faster than recommended, for example, if a fast changing frequency signal is connected to it. The relay lifetime will be exceeded shortly. | Replace the signal connected to the relay output source with a less frequently changing signal. |
| | 0001 | Relay output 1 | Select a different signal with parameter 10.24 RO1 source . |
| | 0002 | Relay output 2 | Select a different signal with parameter 10.27 RO2 source . |
| | 0003 | Relay output 3 | Select a different signal with parameter 10.30 RO3 source . |
| A8B0 | ABB Signal supervision 1 (Editable message text) Programmable warning: 32.06 Supervision 1 action | Warning generated by the signal supervision function 1. | Check the source of the warning (parameter 32.07 Supervision 1 signal). |
| A8B1 | ABB Signal supervision 2 (Editable message text) Programmable warning: 32.16 Supervision 2 action | Warning generated by the signal supervision function 2. | Check the source of the warning (parameter 32.17 Supervision 2 signal). |
| A8B2 | ABB Signal supervision 3 (Editable message text) Programmable warning: 32.26 Supervision 3 action | Warning generated by the signal supervision function 3. | Check the source of the warning (parameter 32.27 Supervision 3 signal). |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|--|--|--|
| A8B3 | ABB Signal supervision 4 (Editable message text) Programmable warning: 32.36 Supervision 4 action | Warning generated by the signal supervision function 4. | Check the source of the warning (parameter 32.37 Supervision 4 signal). |
| A8B4 | ABB Signal supervision 5 (Editable message text) Programmable warning: 32.46 Supervision 5 action | Warning generated by the signal supervision function 5. | Check the source of the warning (parameter 32.47 Supervision 5 signal). |
| A8B5 | ABB Signal supervision 6 (Editable message text) Programmable warning: 32.56 Supervision 6 action | Warning generated by the signal supervision function 6. | Check the source of the warning (parameter 32.57 Supervision 6 signal). |
| A8BE | ULC overload warning Programmable fault: 37.03 ULC overload actions | Selected signal has exceeded the user overload curve. | Check for any operating conditions increasing the monitored signal (for example, the loading of the motor if the torque or current is being monitored). Check the definition of the load curve (parameter group 37 User load curve). |
| A8BF | ULC underload warning Programmable fault: 37.04 ULC underload actions | Selected signal has fallen below the user underload curve. | Check for any operating conditions decreasing the monitored signal (for example, loss of load if the torque or current is being monitored). Check the definition of the load curve (parameter group 37 User load curve). |
| A981 | External warning 1 (Editable message text) Programmable warning: 31.01 External event 1 source 31.02 External event 1 type | Fault in external device 1. | Check the external device. Check setting of parameter 31.01 External event 1 source . |
| A982 | External warning 2 (Editable message text) Programmable warning: 31.03 External event 2 source 31.04 External event 2 type | Fault in external device 2. | Check the external device. Check setting of parameter 31.03 External event 2 source . |
| A983 | External warning 3 (Editable message text) Programmable warning: 31.05 External event 3 source 31.06 External event 3 type | Fault in external device 3. | Check the external device. Check setting of parameter 31.05 External event 3 source . |
| A984 | External warning 4 (Editable message text) Programmable warning: 31.07 External event 4 source 31.08 External event 4 type | Fault in external device 4. | Check the external device. Check setting of parameter 31.07 External event 4 source . |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|--|---|---|
| A985 | External warning 5 (Editable message text) Programmable warning: 31.09 External event 5 source 31.10 External event 5 type | Fault in external device 5. | Check the external device. Check setting of parameter 31.09 External event 5 source . |
| AF80 | INU-LSU comm loss Programmable warning: 60.79 INU-LSU comm loss function | DDCS (fiber optic) communication between converters (for example, the inverter unit and the supply unit) is lost. Note that the inverter unit will continue operating based on the status information that was last received from the other converter. | Only for ACQ580-31 and ACQ580-34. Check status of other converter (parameters 06.36 and 06.39). Check settings of parameter group 60 DDCS communication . Check the corresponding settings in the control program of the other converter. Check cable connections. If necessary, replace cables. |
| AF85 | Line side unit warning | The supply unit (or other converter) has generated a warning. | Only for ACQ580-31 and ACQ580-34. The auxiliary code specifies the original warning code in the supply unit control program. See chapter <i>Fault tracing in ACS880 IGBT supply control program firmware manual</i> (3AUA0000131562 [English]). |
| AF88 | Season configuration warning | You have configured a season which starts before the previous season. | Configure the seasons with increasing start dates, see parameters 34.60 Season 1 start date... 34.63 Season 4 start date . |
| AF8C | Process PID sleep mode | The drive is entering sleep mode. | Informative warning. See section Sleep and boost functions for process PID control (page 130), and parameters 40.43...40.48 . |
| AFAA | Autoreset | A fault is about to be autoreset. | Informative warning. See the settings in parameter group 31 Fault functions . |
| AFE1 | Emergency stop (off2) | Drive has received an emergency stop (mode selection off2) command. | Check that it is safe to continue operation. Then return emergency stop push button to normal position. Restart drive. |
| AFE2 | Emergency stop (off1 or off3) | Drive has received an emergency stop (mode selection off1 or off3) command. | If the emergency stop was unintentional, check the source selected by parameter 21.05 Emergency stop source . |
| AFE9 | Start delay | The start delay is active and the drive will start the motor after a predefined delay. | Informative warning. See parameter 21.22 Start delay . |
| AFED | Run permissive | Run permissive is keeping the drive from running the motor. | Check the setting of (and source selected by) parameter 20.40 Run permissive . |
| AFEE | Start interlock 1 | Start interlock 1 is keeping the drive from starting. | Check the signal source selected for parameter 20.41 Start interlock 1 . |
| AFEF | Start interlock 2 | Start interlock 2 is keeping the drive from starting. | Check the signal source selected for parameter 20.42 Start interlock 2 . |
| AFF0 | Start interlock 3 | Start interlock 3 is keeping the drive from starting. | Check the signal source selected for parameter 20.43 Start interlock 3 . |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|--|--|--|
| AFF1 | Start interlock 4 | Start interlock 4 is keeping the drive from starting. | Check the signal source selected for parameter 20.44 Start interlock 4 . |
| AFF6 | Identification run | Motor ID run will occur at next start. | Informative warning. |
| AFF8 | Motor heating active | Pre-heating is being performed | Informative warning. Motor pre-heating is active. Current specified by parameter 21.16 Pre-heating current is being passed through the motor. |
| B5A0 | STO event Programmable event: 31.22 STO indication run/stop | Safe torque off function is active, ie, safety circuit signal(s) connected to connector STO is lost. | Informative warning. Check safety circuit connections. For more information, see chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and description of parameter 31.22 STO indication run/stop (page 371). |
| B686 | Checksum mismatch Programmable event: 96.54 Checksum action | The calculated parameter checksum does not match any enabled reference checksum. | See A686 Checksum mismatch (page 183). |
| D405 | Pipe fill-timeout Programmable warning: 82.25 Soft pipe fill supervision | Soft pipe fill is reached the timeout limit. The PID output is not reached the setpoint after reference ramping is ended and timeout limit is elapsed. | Check the pipe for possible leakage. See parameter 82.25 Soft pipe fill supervision and 82.26 Time-out limit . |
| D501 | No more available PFC motors | No more PFC motors can be started because they can be interlocked or in the Hand mode. | Check that there are no interlocked PFC motors, see parameters: 76.81...76.84 . If all motors are in use, the PFC system is not adequately dimensioned to handle the demand. |
| D502 | All motors interlocked | All the motors in the PFC system are interlocked. | Check that there are no interlocked PFC motors, see parameters 76.81...76.84 . |
| D503 | VSD controlled PFC motor interlocked | The motor connected to the drive is interlocked (unavailable). | Motor connected to the drive is interlocked and thus cannot be started. Remove the corresponding interlock to start the drive controlled PFC motor. See parameters 76.81...76.84 . |
| D505 | Max cleaning warning Programmable warning: 83.35 Cleaning count fault | Maximum number of cleanings are reached in defined time. The Pump cleaning is unable to clean the pump and hence, manual cleaning is required. | Check the pump for blockages. Clean the pump manually if needed. Check parameters 83.35 Cleaning count fault to 83.37 Maximum cleaning count . |
| D506 | Pump cleaning not possible | Pump cleaning cannot be started. The drive needs to be in remote control and start signal is activated. | Change control location to Auto. |
| D507 | Pump cleaning needed | Dirt detection indicates that the pump needs cleaning but automatic pump cleaning is not allowed. | Perform pump cleaning manually. Start pump cleaning by changing parameter 83.12 Manually force cleaning to Start cleaning now . |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|--|--|---|
| D508 | High level Programmable warning: 76.93 LC high level action | Water level is reached the high level limit. Level control is unable to control the level for the following reasons: <ul style="list-style-type: none"> • running out of pumping capacity. • analog feedback sensor failure. | Check analog level sensor. Check that all the pumps are operating normally. Check parameters 76.91 LC high level switch and 76.93 LC high level action . |
| D509 | Low level Programmable warning: 76.92 LC low level action | Water level is reached the low level limit. Level control is unable to control the level for the following reasons: <ul style="list-style-type: none"> • running out of pumping capacity. • analog feedback sensor failure. | Check analog level sensor. Check that all the pumps are operating normally. Check parameters 76.90 LC low level switch and 76.92 LC low level action . |
| D50A | Running dry Programmable warning: 82.20 Dry run protection | Dry run protection is activated. | Check the pump inlet for sufficient water level. Check dry run protection settings in parameters 82.20 Dry run protection and 82.21 Dry run source . |
| D50C | Maximum flow protection Programmable warning: 80.17 Maximum flow protection | Actual flow is exceeded the defined warning level. | Check the system for leakages. Check flow protection settings in parameters 80.15 Maximum flow , 80.17 Maximum flow protection and 80.19 Flow check delay . |
| D50D | Minimum flow protection Programmable warning: 80.18 Minimum flow protection | Actual flow is below the defined warning level. | Check that the inlet and outlet valves are open. Check flow protection settings in parameters 80.16 Minimum flow , 80.18 Minimum flow protection and 80.19 Flow check delay . |
| D50E | Outlet minimum pressure Programmable warning: 82.30 Outlet minimum pressure protection | Measured outlet pressure is below the defined warning limit. | Check the pump outlet for leakages. Check the configuration of outlet pressure protection. See parameters 82.30 Outlet minimum pressure protection and 82.31 Outlet minimum pressure warning level . |
| D50F | Outlet maximum pressure Programmable warning: 82.35 Outlet maximum pressure protection | Measured outlet pressure is above the defined warning limit. | Check the pump outlet for blockages or closed valve. Check the configuration of outlet pressure protection. See parameters 82.35 Outlet maximum pressure protection and 82.37 Outlet maximum pressure warning level . |
| D510 | Inlet minimum pressure Programmable warning: Inlet minimum pressure protection | Measured inlet pressure is below the defined warning level. | Check the pump inlet for blockages or closed valve. Check the configuration of inlet pressure protection. See parameters 82.40 Inlet minimum pressure protection and 82.41 Inlet minimum pressure warning level . |

Fault messages

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|------------------------|--|--|
| 1080 | Backup/Restore timeout | Control panel or PC tool has failed to communicate with the drive when backup was being made or restored. | Request backup or restore again. |
| 1081 | Rating ID fault | Drive software has not been able to read the rating ID of the drive. | Reset the fault to make the drive try to reread the rating ID. If the fault reappears, cycle the power to the drive. You may have to repeat this. If the fault persists, contact your local ABB representative. |
| 2281 | Calibration | Measured offset of output phase current measurement or difference between output phase U2 and W2 current measurement is too great (the values are updated during current calibration). | Try performing the current calibration again (select Current measurement calibration at parameter 99.13 ID run requested). If the fault persists, contact your local ABB representative. Auxiliary codes are shown below. |
| | 0001 | Too high offset error in U-phase current. | |
| | 0002 | Too high offset error in V-phase current. | |
| | 0003 | Too high offset error in W-phase current. | |
| | 0004 | Too high gain difference detected between phase current measurements. | |
| 2310 | Overcurrent | Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this fault may also be caused by an earth fault or supply phase loss. | Check motor load. Check acceleration times in parameter group 23 Speed reference ramp (speed control) or 28 Frequency reference chain (frequency control). Also check parameters 46.01 Speed scaling , 46.02 Frequency scaling and 46.03 Torque scaling . Check motor and motor cable (including phasing and delta/star connection). Check there are no contactors opening and closing in motor cable. Check that the start-up data in parameter group 99 corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter <i>Electrical installation</i> , section <i>Checking the insulation of the assembly</i> in the <i>Hardware manual</i> of the drive. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|--|--|--|
| 2330 | Earth leakage | Drive has detected load unbalance typically due to earth fault in motor or motor cable. | <p>Check there are no power factor correction capacitors or surge absorbers in motor cable.</p> <p>Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable.</p> <p>Try running the motor in scalar control mode if allowed. (See parameter 99.04 Motor control mode.)</p> <p>If no earth fault can be detected, contact your local ABB representative.</p> |
| 2340 | Short circuit | Short-circuit in motor cable(s) or motor. | <p>Check motor and motor cable for cabling errors.</p> <p>Check there are no power factor correction capacitors or surge absorbers in motor cable.</p> <p>Cycle the power to the drive.</p> |
| | 0080 | State feedback from output phases does not match control signals. For frames R6 and R7. | |
| 2381 | IGBT overload | Excessive IGBT junction to case temperature. This fault protects the IGBT(s) and can be activated by a short circuit in the motor cable. | <p>Check motor cable.</p> <p>Check ambient conditions.</p> <p>Check air flow and fan operation.</p> <p>Check heatsink fins for dust pick-up.</p> <p>Check motor power against drive power.</p> |
| 3130 | Input phase loss Programmable fault: 31.21 Supply phase loss | Intermediate circuit DC voltage is oscillating due to missing input power line phase or blown fuse. | <p>Check input power line fuses.</p> <p>Check for loose power cable connections.</p> <p>Check for input power supply imbalance.</p> |
| 3181 | Wiring or earth fault Programmable fault: 31.23 Wiring or earth fault | Incorrect input power and motor cable connection (ie. input power cable is connected to drive motor connection). | Check input power connections. |
| 3210 | DC link overvoltage | Excessive intermediate circuit DC voltage. | <p>Check that overvoltage control is on (parameter 30.30 Overvoltage control).</p> <p>Check that the supply voltage matches the nominal input voltage of the drive.</p> <p>Check the supply line for static or transient overvoltage.</p> <p>Check brake chopper and resistor (if present).</p> <p>Check deceleration time.</p> <p>Use coast-to-stop function (if applicable).</p> <p>Retrofit drive with brake chopper and brake resistor.</p> <p>Check that the brake resistor is dimensioned properly and the resistance is between acceptable range for the drive.</p> |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|---|---|--|
| 3220 | DC link undervoltage | Intermediate circuit DC voltage is not sufficient because of a missing supply phase, blown fuse or fault in the rectifier bridge. | Check supply cabling, fuses and switchgear. |
| 3381 | Output phase loss Programmable fault: 31.19 Motor phase loss | Motor circuit fault due to missing motor connection (all three phases are not connected). | Connect motor cable. |
| 4110 | Control board temperature | Control board temperature is too high. | Check proper cooling of the drive. Check the auxiliary cooling fan. |
| 4210 | IGBT overtemperature | Estimated drive IGBT temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power. |
| 4290 | Cooling | Drive module temperature is excessive. | Check ambient temperature. If it exceeds 40 °C / 104 °F (IP21 frames R4...R9) or if it exceeds 50 °C / 122 °F (IP21 frames R0...R9), ensure that load current does not exceed derated load capacity of drive. For all P55 frames, check the derating temperatures. See chapter <i>Technical data</i> , section <i>Derating</i> in the <i>Hardware manual</i> of the drive. Check drive module cooling air flow and fan operation. Check inside of cabinet and heatsink of drive module for dust pick-up. Clean whenever necessary. |
| 42F1 | IGBT temperature | Drive IGBT temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power. |
| 4310 | Excess temperature | Power unit module temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against drive power. |
| 4380 | Excess temperature difference | High temperature difference between the IGBTs of different phases. | Check the motor cabling. Check cooling of drive module(s). |
| 4981 | External temperature 1 | Measured temperature 1 has exceeded fault limit. | Check the value of parameter 35.02 Measured temperature 1 . Check the cooling of the motor (or other equipment whose temperature is being measured). |
| 4982 | External temperature 2 | Measured temperature 2 has exceeded fault limit. | Check the value of parameter 35.03 Measured temperature 2 . Check the cooling of the motor (or other equipment whose temperature is being measured). |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|--|---|--|
| 4990 | CPTC-02 not found | CPTC-02 extension module is not detected in option slot 2. | Power down the drive and check that the module is properly inserted in option slot 2. See also <i>CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual</i> (3AXD50000030058 [English]). |
| 4991 | Safe motor temperature | The CPTC-02 module indicates overtemperature: <ul style="list-style-type: none"> motor temperature is too high, or the thermistor is in short-circuit or disconnected | Check the cooling of the motor. Check the motor load and drive ratings. Check the wiring of the temperature sensor. Repair wiring if faulty. Measure the resistance of the sensor. Replace the sensor if faulty. |
| 5080 | Fan | Cooling fan feedback missing. | See A581 Fan (page 182). |
| 5081 | Auxiliary fan broken | An auxiliary cooling fan (connected to the fan connectors on the control unit) is stuck or disconnected. | Check the auxiliary code. Check auxiliary fan(s) and connection(s). Replace fan if faulty. Make sure the front cover of the drive is in place and tightened. If the commissioning of the drive requires that the cover is off, set parameter 31.36 Aux fan fault function temporarily to value <i>No action</i> within two minutes from power-up. Reboot the control unit (using parameter 96.08 Control board boot or by cycling power. |
| | 0001 | Auxiliary fan 1 broken. | |
| | 0002 | Auxiliary fan 2 broken. | |
| 5090 | STO hardware failure | STO hardware diagnostics has detected hardware failure. | Contact your local ABB representative for hardware replacement. |
| 5091 | Safe torque off Programmable fault: 31.22 STO indication run/stop | Safe torque off function is active, ie, safety circuit signal(s) connected to connector STO is broken during start or run. | Check safety circuit connections. For more information, see chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and description of parameter 31.22 STO indication run/stop (page 371). Check the value of parameter 95.04 Control board supply . |
| 5092 | PU logic error | Power unit memory has cleared. | Contact your local ABB representative. |
| 5093 | Rating ID mismatch | The hardware of the drive does not match the information stored in the memory. This may occur, for example, after a firmware update. | Cycle the power to the drive. You may have to repeat this. |
| 5094 | Measurement circuit temperature | Problem with internal temperature measurement of the drive. | Contact your local ABB representative. |
| 5098 | I/O communication loss | Internal standard I/O communication failure. | Try resetting the fault or reboot the drive. |
| 50A0 | Fan | Cooling fan stuck or disconnected. | Check fan operation and connection. Replace fan if faulty. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|--|--|---|
| 5681 | PU communication | Communication errors detected between the drive control unit and the power unit. | Check the connection between the drive control unit and the power unit. Check the value of parameter 95.04 Control board supply . |
| 5682 | Power unit lost | Connection between the drive control unit and the power unit is lost. | Check the connection between the control unit and the power unit. |
| 5691 | Measurement circuit ADC | Measurement circuit fault. | Contact your local ABB representative. |
| 5692 | PU board powerfail | Power unit power supply failure. | Contact your local ABB representative. |
| 5693 | Measurement circuit DFF | Measurement circuit fault. | Contact your local ABB representative. |
| 5697 | Charging feedback | Charging feedback signal missing. | Check the feedback signal coming from the charging system |
| 5698 | Unknown PU fault | The power unit logic has generated a fault which is not known by the software. | Check the logic and software compatibility. |
| 6181 | FPGA version incompatible | Firmware and FPGA versions are incompatible. | Reboot the control unit (using parameter 96.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative |
| 6200 | Checksum mismatch Programmable fault: 96.54 Checksum action | The calculated parameter checksum does not match any enabled reference checksum. | See A686 Checksum mismatch (page 183). |
| 6306 | FBA A mapping file | Fieldbus adapter A mapping file read error. | Contact your local ABB representative. |
| 6481 | Task overload | Internal fault. | Reboot the control unit (using parameter 96.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative |
| 6487 | Stack overflow | Internal fault. | Reboot the control unit (using parameter 96.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative |
| 64A1 | Internal file load | File read error. | Reboot the control unit (using parameter 96.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative |
| 64A4 | Rating ID fault | Rating ID load error. | Contact your local ABB representative. |
| 64A6 | Adaptive program | Error running the adaptive program. | Check the auxiliary code (format XXYY ZZZZ). "XX" specifies the number of the state (00=base program) and "YY" specifies the number of the function block (0000=generic error). "ZZZZ" indicates the problem. |
| | 000A | Program corrupted or block non-existent | Restore the template program or download the program to the drive. |
| | 000C | Required block input missing | Check the inputs of the block. |
| | 000E | Program corrupted or block non-existent | Restore the template program or download the program to the drive. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|--|---|--|
| | 0011 | Program too large. | Remove blocks until the error stops. |
| | 0012 | Program is empty. | Correct the program and download it to the drive. |
| | 001C | A non-existing parameter or block is used in the program. | Edit the program to correct the parameter reference, or to use an existing block. |
| | 001D | Parameter type invalid for selected pin. | Edit the program to correct the parameter reference. |
| | 001E | Output to parameter failed because the parameter was write-protected. | Check the parameter reference in the program. Check for other sources affecting the target parameter. |
| | 0023 | Program file incompatible with current firmware version. | Adapt the program to current block library and firmware version. |
| | 0024 | | |
| | Other | – | Contact your local ABB representative, quoting the auxiliary code. |
| 64B1 | Internal SSW fault | Internal fault. | Reboot the control unit (using parameter 96.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative. |
| 64B2 | User set fault | Loading of user parameter set failed because <ul style="list-style-type: none"> • requested set does not exist • set is not compatible with control program • drive was switched off during loading. | Ensure that a valid user parameter set exists. Reload if uncertain. |
| 64E1 | Kernel overload | Operating system error. | Reboot the control unit (using parameter 96.08 Control board boot) or by cycling power. If the problem persists, contact your local ABB representative. |
| 64B1 | Fault reset | A fault has been reset. The cause of the fault no longer exists and the fault reset has been requested and completed. | Informative fault. |
| 6581 | Parameter system | Parameter load or save failed. | Try forcing a save using parameter 96.07 Parameter save manually . Retry. |
| 6591 | Backup/Restore timeout | During backup creating or restoring operation a control panel or PC tool has failed to communicate with the drive as part this operation. | Check control panel or PC tool communication and if it is still in backup or restore state. |
| 65A1 | FBA A parameter conflict | The drive does not have a functionality requested by PLC, or requested functionality has not been activated. | Check PLC programming. Check settings of parameter groups 50 Fieldbus adapter (FBA) and 51 FBA A settings . |
| 6681 | EFB comm loss Programmable fault: 58.14 Communication loss action | Communication break in embedded fieldbus (EFB) communication. | Check the status of the fieldbus master (online/offline/error etc.). Check cable connections to the EIA-485/X5 terminals 29, 30 and 31 on the control unit. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|---|--|---|
| 6682 | EFB config file | Embedded fieldbus (EFB) configuration file could not be read. | Contact your local ABB representative. |
| 6683 | EFB invalid parameterization | Embedded fieldbus (EFB) parameter settings inconsistent or not compatible with selected protocol. | Check the settings in parameter group 58 Embedded fieldbus . |
| 6684 | EFB load fault | Embedded fieldbus (EFB) protocol firmware could not be loaded. Version mismatch between EFB protocol firmware and drive firmware. | Contact your local ABB representative. |
| 6685 | EFB fault 2 | Fault reserved for the EFB protocol application. | Check the documentation of the protocol. |
| 6686 | EFB fault 3 | Fault reserved for the EFB protocol application. | Check the documentation of the protocol. |
| 6882 | Text 32-bit table overflow | Internal fault. | Reset the fault. Contact your local ABB representative if the fault persists. |
| 6885 | Text file overflow | Internal fault. | Reset the fault. Contact your local ABB representative if the fault persists. |
| 7081 | Control panel loss Programmable fault: 49.05 Communication loss action | Control panel or PC tool selected as active control location for drive has ceased communicating. | Check PC tool or control panel connection. Check control panel connector. Disconnect and reconnect the control panel. |
| 7085 | Incompatible option module | Fieldbus option module not supported. | Replace the module with a supported type. |
| 7100 | Excitation current | Excitation current feedback low or missing | |
| 7121 | Motor stall Programmable fault: 31.24 Stall function | Motor is operating in stall region because of, for example, excessive load or insufficient motor power. | Check motor load and drive ratings. Check fault function parameters. |
| 7122 | Motor overload | Motor current is too high. | Check for overloaded motor. Adjust the parameters used for the motor overload function (35.51...35.53) and 35.55...35.56 . |
| 7181 | Brake resistor | Brake resistor broken or not connected. | Check that a brake resistor has been connected. Check the condition of the brake resistor. Check the dimensioning of the brake resistor. |
| 7183 | BR excess temperature | Brake resistor temperature has exceeded fault limit defined by parameter 43.11 Brake resistor fault limit . | Stop drive. Let resistor cool down. Check resistor overload protection function settings (parameter group 43 Brake chopper). Check fault limit setting, parameter 43.11 Brake resistor fault limit . Check that braking cycle meets allowed limits. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|----------------------------|--|--|
| 7184 | Brake resistor wiring | Brake resistor short circuit or brake chopper control fault. | Check brake chopper and brake resistor connection. Ensure brake resistor is not damaged. |
| 7191 | BC short circuit | Short circuit in brake chopper IGBT. | Ensure brake resistor is connected and not damaged. Check the electrical specifications of the brake resistor against chapter <i>Resistor braking</i> in the <i>Hardware manual</i> of the drive. Replace brake chopper (if replaceable). |
| 7192 | BC IGBT excess temperature | Brake chopper IGBT temperature has exceeded internal fault limit. | Let chopper cool down. Check for excessive ambient temperature. Check for cooling fan failure. Check for obstructions in the air flow. Check resistor overload protection function settings (parameter group 43 Brake chopper). Check that braking cycle meets allowed limits. Check that drive supply AC voltage is not excessive. |
| 7310 | Overspeed | Motor is turning faster than highest allowed speed due to incorrectly set minimum/maximum speed, insufficient braking torque or changes in load when using torque reference. | Check minimum/maximum speed settings, parameters 30.11 Minimum speed and 30.12 Maximum speed . Check adequacy of motor braking torque. Check applicability of torque control. Check need for brake chopper and resistor(s). |
| 73B0 | Emergency ramp failed | Emergency stop did not finish within expected time. | Check the settings of parameters 31.32 Emergency ramp supervision and 31.33 Emergency ramp supervision delay . Check the predefined ramp times (23.12...23.13 for mode Off1, 23.23 for mode Off3). |
| 73F0 | Overfrequency | Maximum allowed output frequency exceeded. | Check the auxiliary code. |
| | 00FA | Motor is turning faster than the highest allowed frequency due to incorrectly set minimum/maximum frequency or the motor rushes because of too high supply voltage or incorrect supply voltage selection in parameter 95.01 Supply voltage . | Check minimum/maximum frequency settings, parameters 31.13 Minimum frequency and 31.14 Maximum frequency . Check used supply voltage and voltage selection parameter 95.01 Supply voltage . |
| | Other | – | Contact your local ABB representative, quoting the auxiliary code. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|---|--|---|
| 7510 | FBA A communication Programmable fault: 50.02 FBA A comm loss func | Cyclical communication between drive and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost. | Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups 50 Fieldbus adapter (FBA) , 51 FBA A settings , 52 FBA A data in and 53 FBA A data out . Check cable connections. Check if communication master is able to communicate. |
| 7580 | INU-LSU comm loss Programmable fault: 60.79 INU-LSU comm loss function | DDCS communication between the inverter unit and the supply unit is lost. | Check status of the supply unit (parameter group 06 Control and status words). Check settings of parameter group 60 DDCS communication . Check the corresponding settings in the control program of the supply unit. Check cable connections. If necessary, replace cables. |
| 7583 | Line side unit faulted | The supply unit connected to the inverter unit has generated a fault. | The auxiliary code specifies the original fault code in the supply unit control program. See chapter <i>Fault tracing</i> in <i>ACS880 IGBT supply control program firmware manual</i> (3AUA0000131562 [English]). |
| 7584 | LSU charge failed | The supply unit was not ready (ie. the main contactor/breaker could not be closed) within expected time. | Check settings of parameter 94.10 LSU max charging time . Check that parameter 60.71 INU-LSU communication port is set to DDCS via BC . Check that the supply unit is enabled, allowed to start, and can be controlled by the inverter unit (eg. not in local control mode). |
| 8001 | ULC underload fault | User load curve: Signal has been too long under the underload curve. | See parameter 37.04 ULC underload actions . |
| 8002 | ULC overload fault | User load curve: Signal has been too long over the overload curve. | See parameter 37.03 ULC overload actions . |
| 80A0 | AI supervision Programmable fault: 12.03 AI supervision function | An analog signal is outside the limits specified for the analog input. | Check signal level at the analog input. Check the auxiliary code. Check the wiring connected to the input. Check the minimum and maximum limits of the input in parameter group 12 Standard AI . |
| | 0001 | AI1LessMIN | |
| | 0002 | AI1GreaterMAX | |
| | 0003 | AI2LessMIN. | |
| | 0004 | AI2GreaterMAX | |
| 80B0 | Signal supervision 1 (Editable message text) Programmable fault: 32.06 Supervision 1 action | Fault generated by the signal supervision function 1. | Check the source of the fault (parameter 32.07 Supervision 1 signal). |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|--|--|--|
| 80B1 | Signal supervision 2 (Editable message text) Programmable fault: 32.16 Supervision 2 action | Fault generated by the signal supervision function 2. | Check the source of the fault (parameter 32.17 Supervision 2 signal). |
| 80B2 | Signal supervision 3 (Editable message text) Programmable fault: 32.26 Supervision 3 action | Fault generated by the signal supervision function 3. | Check the source of the fault (parameter 32.27 Supervision 3 signal). |
| 80B3 | Signal supervision 4 (Editable message text) Programmable fault: 32.36 Supervision 4 action | Fault generated by the signal supervision function 4. | Check the source of the fault (parameter 32.37 Supervision 4 signal). |
| 80B4 | Signal supervision 5 (Editable message text) Programmable fault: 32.46 Supervision 5 action | Fault generated by the signal supervision function 5. | Check the source of the fault (parameter 32.47 Supervision 5 signal). |
| 80B5 | Signal supervision 6 (Editable message text) Programmable fault: 32.56 Supervision 6 action | Fault generated by the signal supervision function 6. | Check the source of the fault (parameter 32.57 Supervision 6 signal). |
| 9081 | External fault 1 (Editable message text) Programmable fault: 31.01 External event 1 source , 31.02 External event 1 type | Fault in external device 1. | Check the external device. Check setting of parameter 31.01 External event 1 source . |
| 9082 | External fault 2 (Editable message text) Programmable fault: 31.03 External event 2 source , 31.04 External event 2 type | Fault in external device 2. | Check the external device. Check setting of parameter 31.03 External event 2 source . |
| 9083 | External fault 3 (Editable message text) Programmable fault: 31.05 External event 3 source , 31.06 External event 3 type | Fault in external device 3. | Check the external device. Check setting of parameter 31.05 External event 3 source . |
| 9084 | External fault 4 (Editable message text) Programmable fault: 31.07 External event 4 source , 31.08 External event 4 type | Fault in external device 4. | Check the external device. Check setting of parameter 31.07 External event 4 source . |
| 9085 | External fault 5 (Editable message text) Programmable fault: 31.09 External event 5 source , 31.10 External event 5 type | Fault in external device 5. | Check the external device. Check setting of parameter 31.09 External event 5 source . |
| D401 | Max cleaning fault Programmable fault: 83.35 Cleaning count fault | The maximum number of cleanings are reached in the defined time. The pump cleaning is unable to clean the pump and hence, manual cleaning is required. | Check the pump for blockages. Clean the pump manually if needed. Check parameters 83.35 Cleaning count fault to 83.37 Maximum cleaning count . |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|---|--|---|
| D402 | High level Programmable fault: 76.93 LC high level action | Water level is reached the high level limit. Level control is unable to control the level for the following reasons: <ul style="list-style-type: none"> • running out of pumping capacity or • analog feedback sensor failure. | Check the analog level sensor. Check that all pumps are operating normally. Check parameters 76.91 LC high level switch and 76.93 LC high level action . |
| D403 | Low level Programmable fault: 76.92 LC low level action | Water level is reached the low level limit. Level control is unable to control the level for the following reasons: <ul style="list-style-type: none"> • running out of pumping capacity or • analog feedback sensor failure. | Check the analog level sensor. Check that all pumps are operating normally. Check parameters 76.90 LC low level switch and 76.92 LC low level action . |
| D404 | Running dry Programmable fault: 82.20 Dry run protection | Dry run protection is activated. | Check the pump inlet for sufficient water level. Check dry run protection settings in parameters 82.20 Dry run protection and 82.21 Dry run source . |
| D406 | Maximum flow protection Programmable fault: 80.17 Maximum flow protection | Actual flow is exceeded the defined fault level. | Check the system for leakages. Check flow protection settings in parameters 80.15 Maximum flow , 80.17 Maximum flow protection and 80.19 Flow check delay . |
| D407 | Minimum flow protection Programmable fault: 80.18 Minimum flow protection | Actual flow is below the defined fault level. | Check that the inlet and outlet valves are open. Check flow protection settings in parameters 80.16 Minimum flow , 80.18 Minimum flow protection and 80.19 Flow check delay . |
| D408 | Outlet minimum pressure Programmable fault: 82.30 Outlet minimum pressure protection | The measured outlet pressure is below the defined fault limit. | Check the pump outlet for leakages. Check the configuration of outlet pressure protection. See parameter 82.30 Outlet minimum pressure protection and 82.32 Outlet minimum pressure fault level . |
| D409 | Outlet maximum pressure Programmable fault: 82.35 Outlet maximum pressure protection | The measured outlet pressure is above the defined fault limit. | Check the pump outlet for blockages or closed valve. Check the configuration of outlet pressure protection. See parameters 82.35 Outlet maximum pressure protection and 82.38 Outlet maximum pressure fault level . |
| D40A | Inlet minimum pressure Programmable fault: Inlet minimum pressure protection | The measured inlet pressure is below the defined fault level. | Check the pump inlet for blockages or closed valve. Check the configuration of inlet pressure protection. See parameters 82.40 Inlet minimum pressure protection and 82.41 Inlet minimum pressure warning level . |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|---|---|---|
| D50B | Pipe fill-timeout Programmable fault: 82.25 Soft pipe fill supervision | Soft pipe fill has reached timeout limit. The PID output is not reached the setpoint after reference ramping is ended and the timeout limit is elapsed. | Check the pipe for possible leakage. See parameter 82.25 Soft pipe fill supervision and 82.26 Time-out limit . |
| FA81 | Safe torque off 1 | Safe torque off function is active, ie, STO circuit 1 is broken. | Check safety circuit connections. For more information, see chapter <i>The Safe torque off function</i> in the <i>Hardware manual</i> of the drive and description of parameter 31.22 STO indication run/stop (page 371). |
| FA82 | Safe torque off 2 | Safe torque off function is active, ie, STO circuit 2 is broken. | Check the value of parameter 95.04 Control board supply . |
| FF61 | ID run | Motor ID run was not completed successfully. | Check the nominal motor values in parameter group 99 Motor data . Check that no external control system is connected to the drive. Cycle the power to the drive (and its control unit, if powered separately). Check that no operation limits prevent the completion of the ID run. Restore parameters to default settings and try again. Check that the motor shaft is not locked. Check the auxiliary code. The second number of the code indicates the problem (see actions for each code below). |
| | 0001 | Maximum current limit too low. | Check settings of parameters 99.06 Motor nominal current and 30.17 Maximum current . Make sure that $30.17 > 99.06$. Check that the drive is dimensioned correctly according to the motor. |
| | 0002 | Maximum speed limit or calculated field weakening point too low. | Check settings of parameters <ul style="list-style-type: none"> 30.11 Minimum speed 30.12 Maximum speed 99.07 Motor nominal voltage 99.08 Motor nominal frequency 99.09 Motor nominal speed. Make sure that <ul style="list-style-type: none"> $30.12 > (0.55 \times 99.09) > (0.50 \times \text{synchronous speed})$ $30.11 \leq 0$, and supply voltage $\geq (0.66 \times 99.07)$. |
| | 0003 | Maximum torque limit too low. | Check settings of parameter 99.12 Motor nominal torque , and the torque limits in group 30 Limits . Make sure that the maximum torque limit in force is greater than 100%. |
| | 0004 | Current measurement calibration did not finish within reasonable time | Contact your local ABB representative. |
| | 0005...0008 | Internal error. | Contact your local ABB representative. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|--------------------------|--|--|
| | 0009 | (Asynchronous motors only) Acceleration did not finish within reasonable time. | Contact your local ABB representative. |
| | 000A | (Asynchronous motors only) Deceleration did not finish within reasonable time. | Contact your local ABB representative. |
| | 000B | (Asynchronous motors only) Speed dropped to zero during ID run. | Contact your local ABB representative. |
| | 000C | (Permanent magnet motors only) First acceleration did not finish within reasonable time. | Contact your local ABB representative. |
| | 000D | (Permanent magnet motors only) Second acceleration did not finish within reasonable time. | Contact your local ABB representative. |
| | 000E...0010 | Internal error. | Contact your local ABB representative. |
| | 0011 | (Synchronous reluctance motors only) Pulse test error. | Contact your local ABB representative. |
| | 0012 | Motor too large for advanced standstill ID run. | Check that the motor and drive sizes are compatible. Contact your local ABB representative. |
| | 0013 | (Asynchronous motors only) Motor data error. | Check that the motor nominal value settings in the drive are the same as in the motor nameplate. Contact your local ABB representative. |
| FF63 | STO diagnostics failure. | SW internal malfunction. | Reboot the control unit (using parameter 96.08 Control board boot) or by cycling power. |
| FF81 | FB A force trip | A fault trip command has been received through fieldbus adapter A. | Check the fault information provided by the PLC. |
| FF8E | EFB force trip | A fault trip command has been received through the embedded fieldbus interface. | Check the fault information provided by the PLC. |

Warnings and faults from the LSU supply unit

For ACQ580-31 and ACQ580-34 only.

For the parameters, see FW Part 2

Warning messages

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|----------------------|--|--|
| AE01 | Overcurrent | Output current has exceeded internal fault limit. | Check supply voltage. Check that there are no power factor correction capacitors or surge absorbers in supply cable. Check motor load and acceleration times. Check power semiconductors (IGBTs) and current transducers. |
| AE02 | Earth leakage | IGBT supply has detected load unbalance. | Check AC fuses. Check for earth leakages. Check supply cabling. Check power modules. Check there are no power factor correction capacitors or surge absorbers in supply cable. |
| AE03 | Short circuit | IGBT supply has detected short circuit. | Check supply cable. Check there are no power factor correction capacitors or surge absorbers in supply cable. |
| AE04 | IGBT overload | Excessive IGBT junction to case temperature. | Check supply cable. |
| AE09 | DC link overvoltage | Excessive intermediate circuit DC voltage. Note: This warning can be shown only when the IGBT supply unit is not modulating. | Check that parameter 95.01 Supply voltage is set according to the supply voltage in use. |
| AE0A | DC link undervoltage | Intermediate circuit DC voltage is not sufficient due to missing phase in supply voltage, blown fuse or rectifier bridge internal fault. Note: This warning can be shown only when the IGBT supply unit is not modulating. | Check supply and fuses. |
| AE0B | DC not charged | The voltage of the intermediate DC circuit has not yet risen to operating level. | Check the input voltage setting in parameter 95.01 Supply voltage . Check the input voltage. If the problem persists, contact your local ABB representative. |
| AE14 | Excess temperature | High temperature difference between the IGBTs of different phases. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. Check motor power against IGBT supply unit power. |

| Code (hex) | Warning / Aux. code | Cause | What to do |
|------------|-----------------------------|---|---|
| AE24 | Voltage category unselected | The supply voltage range has not been defined. | Define the supply voltage range (parameter 95.01 Supply voltage). |
| AE3E | Panel loss | Control panel or PC tool selected as active control location has ceased communicating. | Check PC tool or control panel connection. Check control panel connector. Replace control panel in mounting platform. |
| AE78 | Net lost | Net lost is detected. | Resynchronize the IGBT supply unit to the grid after net lost. |
| AE79 | Power fail saving | Power fail saving is requested too frequently. Due to the limited saving interval some of the requests do not trigger the saving and power fail data may be lost. This may be caused by DC voltage oscillation. | Check the supply voltage. |

Fault messages

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|----------------------|--|---|
| 2E00 | Overcurrent | Output current has exceeded internal fault limit. | Check supply voltage. Check that there are no power factor correction capacitors or surge absorbers in supply cable. Check motor load and acceleration times. Check power semiconductors (IGBTs) and current transducers. |
| 2E01 | Earth leakage | IGBT supply unit has detected an earth fault. | Check AC fuses. Check for earth leakages. Check supply cabling. Check power modules. Check there are no power factor correction capacitors or surge absorbers in supply cable. If no earth fault can be detected, contact your local ABB representative. |
| 2E02 | Short circuit | IGBT supply unit has detected short circuit. | Check supply cable. Check there are no power factor correction capacitors or surge absorbers in supply cable |
| 2E04 | IGBT overload | Excessive IGBT junction to case temperature. | Check the load. |
| 3E00 | Input phase loss | Input phase loss detected by the IGBT bridge. | Check the AC fuses. Check for input power supply imbalance. |
| 3E04 | DC link overvoltage | Excessive intermediate circuit DC voltage. | Check that parameter 95.01 Supply voltage is set according to the supply voltage in use. |
| 3E05 | DC link undervoltage | Intermediate circuit DC voltage is not sufficient because of a missing supply phase or blown fuse. | Check supply cabling, fuses and switchgear. |

| Code (hex) | Fault / Aux. code | Cause | What to do |
|------------|--------------------|--|---|
| 3E08 | LSU charging | DC link voltage is not high enough after charging. | Check mains supply and fuses. Check the event log for an auxiliary code. The auxiliary code identifies the event (see below). |
| | 2 | DC voltage level is not acceptable. | Check supply connection. |
| 4E01 | Cooling | Power module temperature is excessive. | Check ambient temperature. If it exceeds 40 °C (104 °F), ensure that load current does not exceed derated load capacity. See appropriate hardware manual. Check power module cooling air flow and fan operation. Check inside of cabinet and heatsink of power module for dust pick-up. Clean whenever necessary. |
| 4E02 | IGBT temperature | IGBT temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. |
| 4E03 | Excess temperature | Power unit module temperature is excessive. | Check ambient conditions. Check air flow and fan operation. Check heatsink fins for dust pick-up. |
| 5E05 | Rating ID mismatch | The hardware of the supply unit does not match the information stored in the memory unit. This may occur eg, after a firmware update or memory unit replacement. | Cycle the power to the supply unit. If the problem persists, contact your local ABB representative. |
| 7E01 | Panel loss | Control panel or PC tool selected as active control location has ceased communicating. | Check PC tool or control panel connection. Check control panel connector. Replace control panel in mounting platform. |
| 8E07 | Net lost | Net lost is detected. Duration of net lost is too long. | Resynchronize the IGBT supply unit to the grid after net lost. |

8

Fieldbus control through the embedded fieldbus interface (EFB)

What this chapter contains

The chapter describes how the drive can be controlled by external devices over a communication network (fieldbus) using the embedded fieldbus interface.

System overview

The drive can be connected to an external control system through a communication link using either a fieldbus adapter or the embedded fieldbus interface.

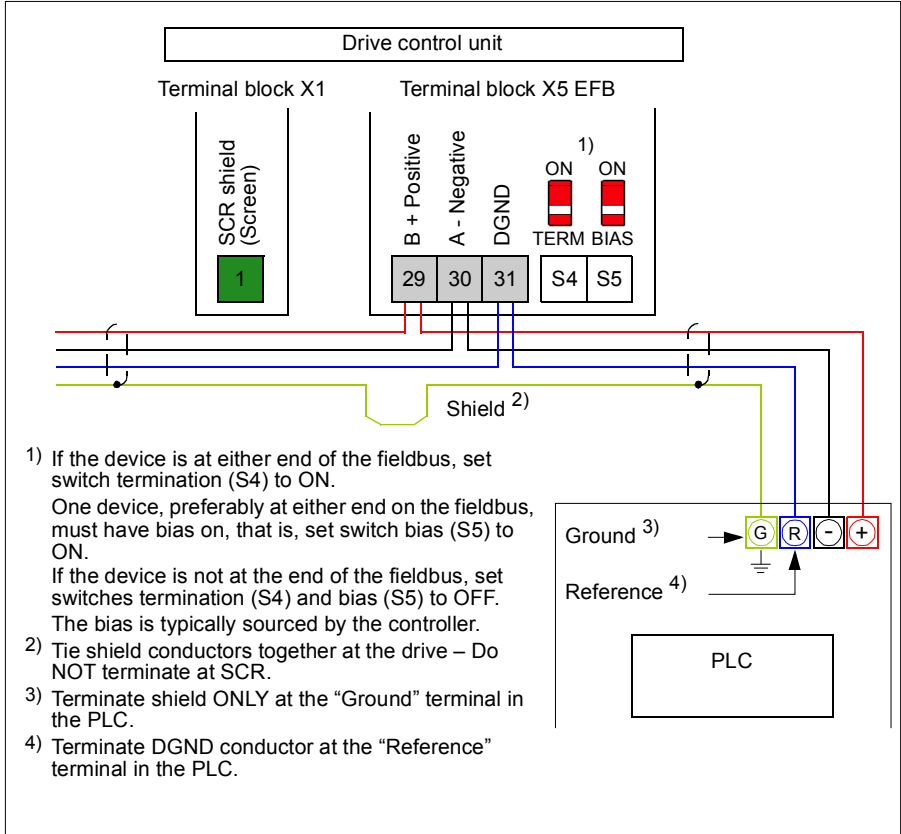
The embedded fieldbus interface supports the Modbus RTU protocol. The drive control program can handle 10 Modbus registers in a 10-millisecond time level. For example, if the drive receives a request to read 20 registers, it will start its response within 22 ms of receiving the request – 20 ms for processing the request and 2 ms overhead for handling the bus. The actual response time depends on other factors as well, such as the baud rate (a parameter setting in the drive).

The drive can be set to receive all of its control information through the fieldbus interface, or the control can be distributed between the embedded fieldbus interface and other available sources, for example, digital and analog inputs.

Connecting the drive to the fieldbus

Connect terminal block X5 with B+, A- and DGND terminals on the control unit of the drive to the fieldbus. The connection diagram is shown below.

Use preferably three conductors and a shield for the connection.



Setting up the embedded fieldbus interface

Set the drive up for the embedded fieldbus communication with the parameters shown in the table below. The **Setting for fieldbus control** column gives either the value to use or the default value. The **Function/Information** column gives a description of the parameter.

| Parameter | Setting for fieldbus control | Function/Information |
|--|---|--|
| COMMUNICATION INITIALIZATION | | |
| 58.01 <i>Protocol enable</i> | <i>Modbus RTU</i> | Initializes embedded fieldbus communication. |
| EMBEDDED MODBUS CONFIGURATION | | |
| 58.03 <i>Node address</i> | 1 (default) | Node address. There must be no two nodes with the same node address online. |
| 58.04 <i>Baud rate</i> | 19.2 kbps (default) | Defines the communication speed of the link. Use the same setting as in the master station. |
| 58.05 <i>Parity</i> | 8 EVEN 1 (default) | Selects the parity and stop bit setting. Use the same setting as in the master station. |
| 58.14 <i>Communication loss action</i> | No action (default) | Defines the action taken when a communication loss is detected. |
| 58.15 <i>Communication loss mode</i> | Cw / Ref1 / Ref2 (default) | Enables/disables communication loss monitoring and defines the means for resetting the counter of the communication loss delay. |
| 58.16 <i>Communication loss time</i> | 30.0 s (default) | Defines the timeout limit for the communication monitoring. |
| 58.17 <i>Transmit delay</i> | 0 ms (default) | Defines a response delay for the drive. |
| 58.25 <i>Control profile</i> | ABB Drives (default) | Selects the control profile used by the drive. See section <i>Basics of the embedded fieldbus interface</i> (page 214). |
| 58.26 <i>EFB ref1 type</i> 58.27 <i>EFB ref2 type</i> | Speed or frequency (default for 58.26), Transparent, General, Transparent for 58.27) Speed, Frequency | Defines the types of fieldbus references 1 and 2. The scaling for each reference type is defined by parameters 46.01...46.03. With the <i>Speed or frequency</i> setting, the type is selected automatically according to the currently active drive control mode. |
| 58.28 <i>EFB act1 type</i> 58.29 <i>EFB act2 type</i> | Speed or frequency (default for 58.28), Transparent (default for 58.29), General, Speed, Frequency | Defines the types of actual values 1 and 2. The scaling for each actual value type is defined by parameters 46.01...46.03. With the <i>Speed or frequency</i> setting, the type is selected automatically according to the currently active drive control mode. |

| Parameter | Setting for fieldbus control | Function/Information |
|---|---|---|
| 58.31 EFB act1 58.32 transparent source EFB act2 transparent source | <i>Not selected</i> | Defines the source of actual values 1 and 2 when the 58.26 EFB ref1 type (58.27 EFB ref2 type) is set to <i>Transparent</i> . |
| 58.33 Addressing mode | <i>Mode 0</i> (default) | Defines the mapping between parameters and holding registers in the 400001...465536 (100...65535) Modbus register range. |
| 58.34 Word order | <i>LO-HI</i> (default) | Defines the order of the data words in the Modbus message frame. |
| 58.101 Data I/O 1 ... 58.114 Data I/O 14 | For example, the default settings (I/Os 1...6 contain the control word, the status word, two references and two actual values) RO/DIO control word , AO1 data storage , AO2 data storage , Feedback data storage , Setpoint data storage | Defines the address of the drive parameter which the Modbus master accesses when it reads from or writes to the register address corresponding to Modbus In/Out parameters. Select the parameters that you want to read or write through the Modbus I/O words. These settings write the incoming data into storage parameters 10.99 RO/DIO control word , 13.91 AO1 data storage , 13.92 AO2 data storage , 40.91 Feedback data storage or 40.92 Setpoint data storage . |
| 58.06 Communication control | <i>Refresh settings</i> | Validates the settings of the configuration parameters. |

8

The new settings will take effect when the drive is powered up the next time, or when they are validated by parameter [58.06 Communication control](#) (*Refresh settings*).

Setting the drive control parameters

After the embedded fieldbus interface has been set up, check and adjust the drive control parameters listed in the table below. The **Setting for fieldbus control** column gives the value or values to use when the embedded fieldbus signal is the desired source or destination for that particular drive control signal. The **Function/Information** column gives a description of the parameter.

| Parameter | Setting for fieldbus control | Function/Information |
|-------------------------------------|------------------------------|--|
| CONTROL COMMAND SOURCE SELECTION | | |
| 20.01 Ext1 commands | <i>Embedded fieldbus</i> | Selects fieldbus as the source for the start and stop commands when EXT1 is selected as the active control location. |

| Parameter | Setting for fieldbus control | Function/Information |
|-------------------------------------|-----------------------------------|--|
| 20.06 Ext2 commands | Embedded fieldbus | Selects fieldbus as the source for the start and stop commands when EXT2 is selected as the active control location. |

SPEED REFERENCE SELECTION

| | | |
|---------------------------------------|--------------------------|--|
| 22.11 Ext1 speed ref1 | EFB ref1 | Selects a reference received through the embedded fieldbus interface as speed reference 1. |
| 22.18 Ext2 speed ref1 | EFB ref1 | Selects a reference received through the embedded fieldbus interface as speed reference 2. |

FREQUENCY REFERENCE SELECTION

| | | |
|---|--------------------------|--|
| 28.11 Ext1 frequency ref1 | EFB ref1 | Selects a reference received through the embedded fieldbus interface as frequency reference 1. |
| 28.15 Ext2 frequency ref1 | EFB ref1 | Selects a reference received through the embedded fieldbus interface as frequency reference 2. |

OTHER SELECTIONS

EFB references can be selected as the source at virtually any signal selector parameter by selecting [Other](#), then either [03.09 EFB reference 1](#) or [03.10 EFB reference 2](#).

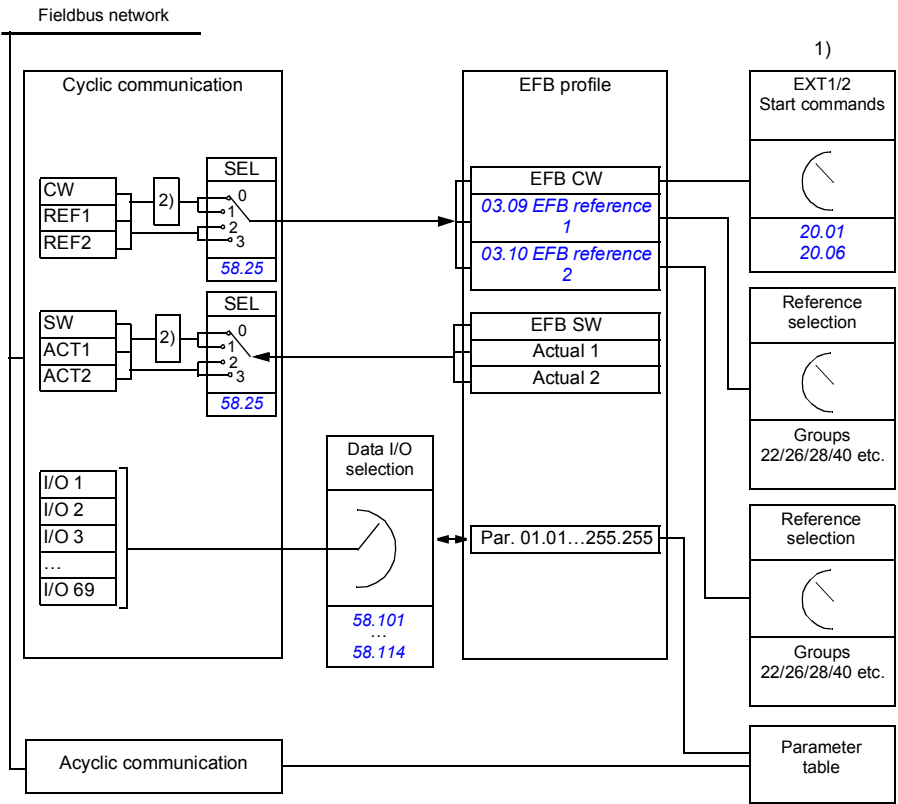
SYSTEM CONTROL INPUTS

| | | |
|---|---|--|
| 96.07 Parameter save manually | Save (reverts to Done) | Saves parameter value changes (including those made through fieldbus control) to permanent memory. |
|---|---|--|

Basics of the embedded fieldbus interface

The cyclic communication between a fieldbus system and the drive consists of 16-bit data words or 32-bit data words (with a transparent control profile).

The diagram below illustrates the operation of the embedded fieldbus interface. The signals transferred in the cyclic communication are explained further below the diagram.



1. See also other parameters which can be controlled through fieldbus.
2. Data conversion if parameter **58.25 Control profile** is set to **ABB Drives**. See section **About the control profiles** (page 217).

■ Control word and Status word

The Control Word (CW) is a 16-bit or 32-bit packed boolean word. It is the principal means of controlling the drive from a fieldbus system. The CW is sent by the fieldbus controller to the drive. With drive parameters, the user selects the EFB CW as the source of drive control commands (such as start/stop, emergency stop, selection between external control locations EXT1 and EXT2, or fault reset). The drive switches between its states according to the bit-coded instructions of the CW.

The fieldbus CW is either written to the drive as it is or the data is converted. See section [About the control profiles](#) (page 217).

The fieldbus Status Word (SW) is a 16-bit or 32-bit packed boolean word. It contains status information from the drive to the fieldbus controller. The drive SW is either written to the fieldbus SW as it is or the data is converted. See section [About the control profiles](#) (page 217).

■ References

EFB references 1 and 2 are 16-bit or 32-bit signed integers. The contents of each reference word can be used as the source of virtually any signal, such as the speed, frequency or process reference. In embedded fieldbus communication, references 1 and 2 are displayed by [03.09 EFB reference 1](#) and [03.10 EFB reference 2](#) respectively. Whether the references are scaled or not depends on the settings of [58.26 EFB ref1 type](#) and [58.27 EFB ref2 type](#). See section [About the control profiles](#) (page 217).

■ Actual values

Fieldbus actual signals (ACT1 and ACT2) are 16-bit or 32-bit signed integers. They convey selected drive parameter values from the drive to the master. Whether the actual values are scaled or not depends on the settings of [58.28 EFB act1 type](#) and [58.29 EFB act2 type](#). See section [About the control profiles](#) (page 217).

■ Data input/outputs

Data input/outputs are 16-bit or 32-bit words containing selected drive parameter values. Parameters [58.101 Data I/O 1](#) ... [58.114 Data I/O 14](#) define the addresses from which the master either reads data (input) or to which it writes data (output).

■ Register addressing

The address field of Modbus requests for accessing holding registers is 16 bits. This allows the Modbus protocol to support addressing of 65536 holding registers.

Historically, Modbus master devices used 5-digit decimal addresses from 40001 to 49999 to represent holding register addresses. The 5-digit decimal addressing limited to 9999 the number of holding registers that could be addressed.

Modern Modbus master devices typically provide a means to access the full range of 65536 Modbus holding registers. One of these methods is to use 6-digit decimal addresses from 400001 to 465536. This manual uses 6-digit decimal addressing to represent Modbus holding register addresses.

Modbus master devices that are limited to the 5-digit decimal addressing may still access registers 400001 to 409999 by using 5-digit decimal addresses 40001 to 49999. Registers 410000-465536 are inaccessible to these masters.

See parameter [58.33 Addressing mode](#).

Note: Register addresses of 32-bit parameters cannot be accessed by using 5-digit register numbers.

About the control profiles

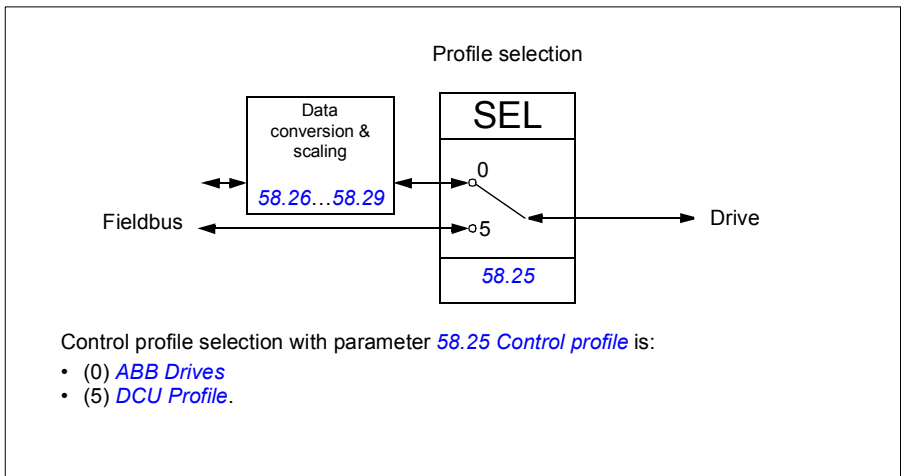
A control profile defines the rules for data transfer between the drive and the fieldbus master, for example:

- if packed boolean words are converted and how
- if signal values are scaled and how
- how drive register addresses are mapped for the fieldbus master.

You can configure the drive to receive and send messages according to one of the two profiles:

- [ABB Drives](#)
- [DCU Profile](#).

For the ABB Drives profile, the embedded fieldbus interface of the drive converts the fieldbus data to and from the native data used in the drive. The DCU Profile involves no data conversion or scaling. The figure below illustrates the effect of the profile selection.



Control Word

■ Control Word for the ABB Drives profile

The table below shows the contents of the fieldbus Control Word for the ABB Drives control profile. The embedded fieldbus interface converts this word to the form in which it is used in the drive. The upper case boldface text refers to the states shown in *State transition diagram for the ABB Drives profile* on page 225.

| Bit | Name | Value | STATE/Description |
|-----|-----------------------|-------|---|
| 0 | OFF1_ CONTROL | 1 | Proceed to READY TO OPERATE. |
| | | 0 | Stop along currently active deceleration ramp. Proceed to OFF1 ACTIVE ; proceed to READY TO SWITCH ON unless other interlocks (OFF2, OFF3) are active. |
| 1 | OFF2_ CONTROL | 1 | Continue operation (OFF2 inactive). |
| | | 0 | Emergency OFF, coast to stop. Proceed to OFF2 ACTIVE , proceed to SWITCH-ON INHIBITED . |
| 2 | OFF3_ CONTROL | 1 | Continue operation (OFF3 inactive). |
| | | 0 | Emergency stop, stop within time defined by drive parameter. Proceed to OFF3 ACTIVE ; proceed to SWITCH-ON INHIBITED . Warning: Ensure that the motor and driven machine can be stopped using this stop mode. |
| 3 | INHIBIT_ OPERATION | 1 | Proceed to OPERATION ENABLED . Note: Run permissive signal must be active; see the drive documentation. If the drive is set to receive the Run permissive signal from the fieldbus, this bit activates the signal. |
| | | 0 | Inhibit operation. Proceed to OPERATION INHIBITED . |
| 4 | RAMP_OUT_ ZERO | 1 | Normal operation. Proceed to RAMP FUNCTION GENERATOR: OUTPUT ENABLED . |
| | | 0 | Force Ramp Function Generator output to zero. Drive ramps to stop (current and DC voltage limits in force). |
| 5 | RAMP_HOLD | 1 | Enable ramp function. Proceed to RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED . |
| | | 0 | Halt ramping (Ramp Function Generator output held). |
| 6 | RAMP_IN_ ZERO | 1 | Normal operation. Proceed to OPERATING . Note: This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters. |
| | | 0 | Force Ramp Function Generator input to zero. |
| 7 | RESET | 0=>1 | Fault reset if an active fault exists. Proceed to SWITCH-ON INHIBITED . Note: This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters. |
| | | 0 | Continue normal operation. |

| Bit | Name | Value | STATE/Description |
|-----|--------------|-------|--|
| 8 | Reserved | | |
| 9 | Reserved | | |
| 10 | REMOTE_CMD | 1 | Fieldbus control d. |
| | | 0 | Control Word \leftrightarrow 0 or Reference \leftrightarrow 0: Retain last Control Word and Reference. Control Word = 0 and Reference = 0: Fieldbus control d. Reference and deceleration/acceleration ramp are locked. |
| 11 | EXT_CTRL_LOC | 1 | Select External Control Location EXT2. Effective if the control location is parameterized to be selected from the fieldbus. |
| | | 0 | Select External Control Location EXT1. Effective if the control location is parameterized to be selected from the fieldbus. |
| 12 | USER_0 | | Writable control bits that can be combined with drive logic for application-specific functionality. |
| 13 | USER_1 | | |
| 14 | USER_2 | | |
| 15 | USER_3 | | |

■ Control Word for the DCU Profile

The embedded fieldbus interface writes the fieldbus Control Word as is to the drive Control Word bits 0 to 15. Bits 16 to 32 of the drive Control Word are not in use.

| Bit | Name | Value | State/Description |
|-----|----------|-------|--|
| 0 | STOP | 1 | Stop according to the Stop Mode parameter or the stop mode request bits (bits 7...9). |
| | | 0 | (no op) |
| 1 | START | 1 | Start the drive. |
| | | 0 | (no op) |
| 2 | REVERSE | 1 | Reverse direction of motor rotation. |
| | | 0 | Direction of motor rotation depends on the sign of reference: Positive reference: Forward Negative reference: Reverse. |
| 3 | Reserved | | |
| 4 | RESET | 0=>1 | Fault reset if an active fault exists. |
| | | 0 | (no op) |
| 5 | EXT2 | 1 | Select External control location EXT2. Effective if the control location is parameterized to be selected from the fieldbus. |
| | | 0 | Select External control location EXT1. Effective if the control location is parameterized to be selected from the fieldbus. |

| Bit | Name | Value | State/Description |
|-----|----------------------------|-------|---|
| 6 | RUN_DISABLE | 1 | Run disable. If the drive is set to receive the run enable signal from the fieldbus, this bit deactivates the signal. |
| | | 0 | Run enable. If the drive is set to receive the run enable signal from the fieldbus, this bit activates the signal. |
| 7 | STOPMODE_RAMP | 1 | Normal ramp stop mode |
| | | 0 | (no op) Default to parameter stop mode if bits 7...9 are all 0. |
| 8 | STOPMODE_EMERGENCY_RAMP | 1 | Emergency ramp stop mode. |
| | | 0 | (no op) Default to parameter stop mode if bits 7...9 are all 0. |
| 9 | STOPMODE_COAST | 1 | Coast stop mode. |
| | | 0 | (no op) Default to parameter stop mode if bits 7...9 are all 0. |
| 10 | RAMP_PAIR_2 | 1 | (no op) |
| | | 0 | Select ramp set 1 (Acceleration time 1 / Deceleration time 1). |
| 11 | RAMP_OUT_ZERO | 1 | Force Ramp Function Generator output to zero. Drive ramps to stop (current and DC voltage limits in force). |
| | | 0 | Normal operation. |
| 12 | RAMP_HOLD | 1 | Halt ramping (Ramp Function Generator output held). |
| | | 0 | Normal operation. |
| 13 | RAMP_IN_ZERO | 1 | Force Ramp Function Generator input to zero. |
| | | 0 | Normal operation. |
| 14 | REQ_LOCAL_LOCK | 1 | Drive does not switch to local control mode (see parameter 19.18 HAND/OFF disable source). |
| | | 0 | Drive can switch between local and external control modes. |
| 16 | FB_LOCAL_CTL | 1 | Local mode for control from the fieldbus is requested. Steal control from the active source. |
| | | 0 | (no op) |
| 17 | FB_LOCAL_REF | 1 | Local mode for reference from the fieldbus is requested. Steal reference from the active source. |
| | | 0 | (no op) |
| 18 | Reserved for RUN_DISABLE_1 | | Not yet implemented. |
| 19 | Reserved | | |
| 20 | Reserved | | |
| 21 | Reserved | | |

| Bit | Name | Value | State/Description |
|-------------|----------|-------|---|
| 22 | USER_0 | | Writable control bits that can be combined with drive logic for application-specific functionality. |
| 23 | USER_1 | | |
| 24 | USER_2 | | |
| 25 | USER_3 | | |
| 26... 31 | Reserved | | |

Status Word

■ Status Word for the ABB Drives profile

The table below shows the fieldbus Status Word for the ABB Drives control profile. The embedded fieldbus interface converts the drive Status Word into this form for the fieldbus. The upper case boldface text refers to the states shown in [State transition diagram for the ABB Drives profile](#) on page 225.

| Bit | Name | Value | STATE/Description |
|-----|--------------|-------|--|
| 0 | RDY_ON | 1 | READY TO SWITCH ON. |
| | | 0 | NOT READY TO SWITCH ON. |
| 1 | RDY_RUN | 1 | READY TO OPERATE. |
| | | 0 | OFF1 ACTIVE. |
| 2 | RDY_REF | 1 | OPERATION ENABLED. |
| | | 0 | OPERATION INHIBITED. |
| 3 | TRIPPED | 1 | FAULT. |
| | | 0 | No fault. |
| 4 | OFF_2_STATUS | 1 | OFF2 inactive. |
| | | 0 | OFF2 ACTIVE. |
| 5 | OFF_3_STATUS | 1 | OFF3 inactive. |
| | | 0 | OFF3 ACTIVE. |
| 6 | SWC_ON_INHIB | 1 | SWITCH-ON INHIBITED. |
| | | 0 | — |
| 7 | ALARM | 1 | Warning/Alarm. |
| | | 0 | No warning/alarm. |
| 8 | AT_SETPOINT | 1 | OPERATING. Actual value equals Reference (is within tolerance limits, for example, in speed control, speed error is 10% max. of nominal motor speed). |
| | | 0 | Actual value differs from Reference (is outside tolerance limits). |
| 9 | REMOTE | 1 | Drive control location: REMOTE (EXT1 or EXT2). |
| | | 0 | Drive control location: LOCAL. |
| 10 | ABOVE_LIMIT | 1 | Actual frequency or speed equals or exceeds supervision limit (set by drive parameter). Valid in both directions of rotation. Set by drive parameters: 46.31 Above speed limit and 46.32 Above frequency limit . These parameters are indicated by bit 10 of 06.11 Main status word . |
| | | 0 | Actual frequency or speed within supervision limit. |

| Bit | Name | Value | STATE/Description |
|-----|----------|-------|---|
| 11 | USER_0 | | Status bits that can be combined with drive logic for application-specific functionality. |
| 12 | USER_1 | | |
| 13 | USER_2 | | |
| 14 | USER_3 | | |
| 15 | Reserved | | |

■ Status Word for the DCU Profile

The embedded fieldbus interface writes the drive Status Word bits 0 to 15 to the fieldbus Status Word as is. Bits 16 to 32 of the drive Status Word are not in use.

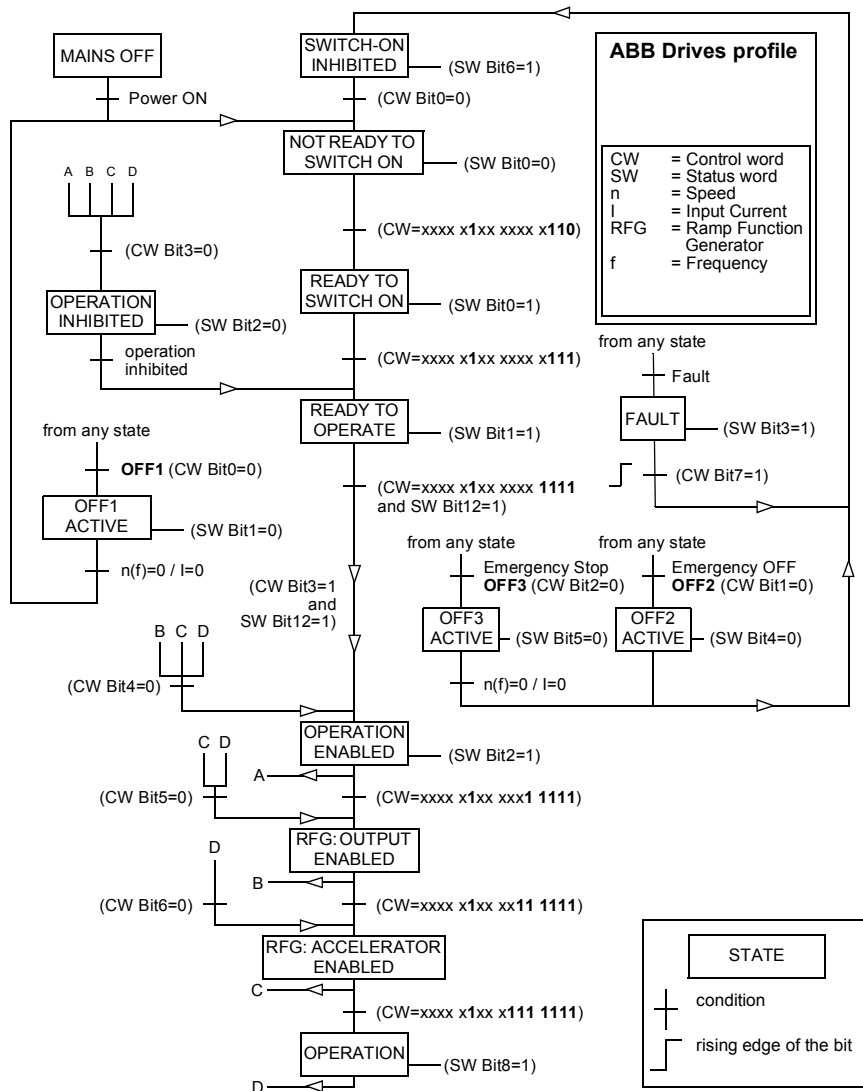
| Bit | Name | Value | State/Description |
|-----|--------------|-------|--|
| 0 | READY | 1 | Drive is ready to receive the start command. |
| | | 0 | Drive is not ready. |
| 1 | ENABLED | 1 | Run permissive and all start interlocks are active. |
| | | 0 | Run permissive and all start interlocks are not active. |
| 2 | STARTED | 1 | Drive has received start command. |
| | | 0 | Drive has not received start command. |
| 3 | RUNNING | 1 | Drive is modulating. |
| | | 0 | Drive is not modulating. |
| 4 | ZERO_SPEED | 1 | Drive is at zero speed. |
| | | 0 | Drive is not at zero speed. |
| 5 | ACCELERATING | 1 | Drive speed is increasing. |
| | | 0 | Drive speed is not increasing. |
| 6 | DECELERATING | 1 | Drive speed is decreasing. |
| | | 0 | Drive speed is not decreasing. |
| 7 | AT_SETPOINT | 1 | Drive is at setpoint. |
| | | 0 | Drive is not at setpoint. |
| 8 | LIMIT | 1 | Drive operation is limited. |
| | | 0 | Drive operation is not limited. |
| 9 | SUPERVISION | 1 | Actual value (speed, frequency or torque) is above a limit. Limit is set with parameters 46.31...46. |
| | | 0 | Actual value (speed, frequency or torque) is within limits. |
| 10 | REVERSE_REF | 1 | Drive reference is in the reverse direction. |
| | | 0 | Drive reference is in the forward direction |
| 11 | REVERSE_ACT | 1 | Drive is running in the reverse direction |
| | | 0 | Drive is running in the forward direction |

| Bit | Name | Value | State/Description |
|-------------|----------------|-------|---|
| 12 | PANEL_LOCAL | 1 | Control panel/keypad (or PC tool) is in local control mode. |
| | | 0 | Control panel/keypad (or PC tool) is not in local control mode. |
| 13 | FIELDBUS_LOCAL | 1 | Fieldbus is in local control mode. |
| | | 0 | Fieldbus is not in local control mode. |
| 14 | EXT2_ACT | 1 | External control location EXT2 is active. |
| | | 0 | External control location EXT1 is active. |
| 15 | FAULT | 1 | Drive is faulted. |
| | | 0 | Drive is not faulted. |
| 16 | ALARM | 1 | Warning/Alarm is active. |
| | | 0 | No warning/alarm. |
| 17 | Reserved | | |
| 18 | DIRLOCK | 1 | Direction lock is ON. (Direction change is locked out.) |
| | | 0 | Direction lock is OFF. |
| 19 | LOCALLOCK | 1 | Local mode lock is ON. (Local mode is locked out.) |
| | | 0 | Local mode lock is OFF. |
| 20 | Reserved | | |
| 21 | Reserved | | |
| 22 | USER_0 | | Status bits that can be combined with drive logic for application-specific functionality. |
| 23 | USER_1 | | |
| 24 | USER_2 | | |
| 25 | USER_3 | | |
| 26 | REQ_CTL | 1 | Control has been granted to this channel. |
| | | 0 | Control has not been granted to this channel. |
| 27 | REQ_REF1 | 1 | Reference 1 has been requested in this channel. |
| | | 0 | Reference 1 has not been requested in this channel. |
| 28 | REQ_REF2 | 1 | Reference 2 has been requested in this channel. |
| | | 0 | Reference 2 has not been requested in this channel. |
| 29... 31 | Reserved | | |

State transition diagrams

■ State transition diagram for the ABB Drives profile

The diagram below shows the state transitions in the drive when the drive is using the ABB Drives profile and the drive is configured to follow the commands of the control word from the embedded fieldbus interface. The upper case texts refer to the states which are used in the tables representing the fieldbus Control and Status words. See sections [Control Word for the ABB Drives profile](#) on page 218 and [Status Word for the ABB Drives profile](#) on page 222.



The start and stop sequences are given below.

Control word:

Start:

- 1150 (476h) → NOT READY TO SWITCH ON
- If MSW bit 0 = 1 then
 - 1150 (47Eh) → READY TO SWITCH ON (Stopped)
 - 1151 (47Fh) → OPERATION (Running)

Stop:

- 1150 (47Eh) = OFF1 ramp stop (Note: uninterruptable ramp stop)
- 1149 (47Dh) = coast to stop
- 1147 (47Bh) = emergency stop

Fault reset:

- Rising edge of MCW bit 7

Start after STO:

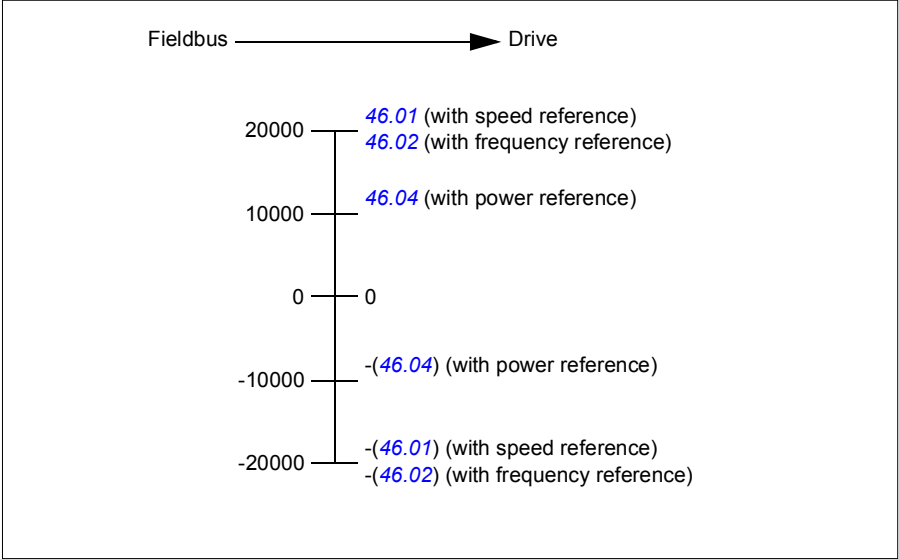
- If [31.22 STO indication run/stop](#) is not Fault/ Fault, check that [06.18 Start inhibit status word](#), bit 7 STO = 0 before giving a start command.

References

■ References for the ABB Drives profile and DCU Profile

The ABB Drives profile supports the use of two references, EFB reference 1 and EFB reference 2. The references are 16-bit words each containing a sign bit and a 15-bit integer. A negative reference is formed by calculating the two's complement from the corresponding positive reference.

The references are scaled as defined by parameters [46.01...46.04](#); which scaling is in use depends on the setting of [58.26 EFB ref1 type](#) and [58.27 EFB ref2 type](#).



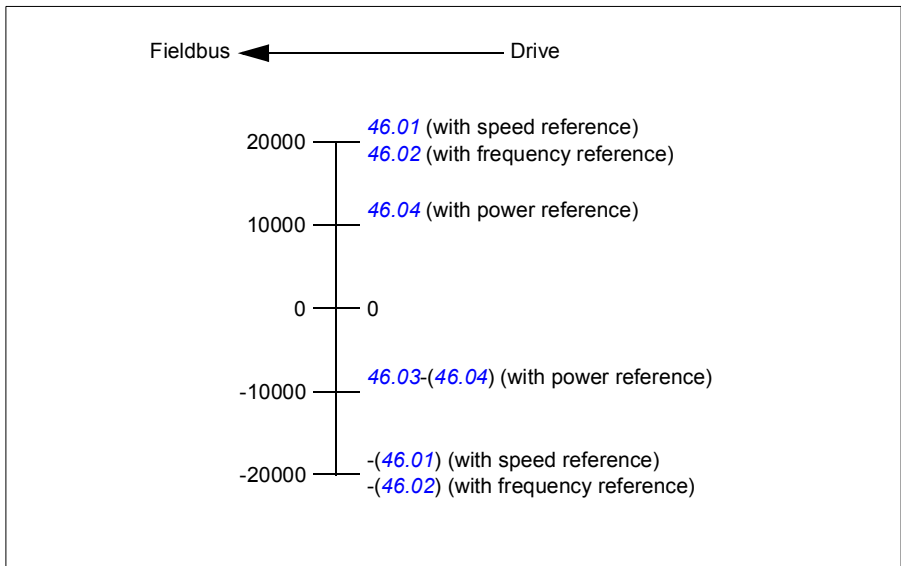
The scaled references are shown by parameters [03.09 EFB reference 1](#) and [03.10 EFB reference 2](#).

Actual values

Actual values for the ABB Drives profile and DCU Profile

The ABB Drives profile supports the use of two fieldbus actual values, ACT1 and ACT2. The actual values are 16-bit words each containing a sign bit and a 15-bit integer. A negative value is formed by calculating the two's complement from the corresponding positive value.

The actual values are scaled as defined by parameters [46.01...46.04](#); which scaling is in use depends on the setting of parameters [58.28 EFB act1 type](#) and [58.29 EFB act2 type](#).



Modbus holding register addresses

■ Modbus holding register addresses for the ABB Drives profile and DCU Profile

The table below shows the default Modbus holding register addresses for the drive data with the ABB Drives profile. This profile provides a converted 16-bit access to the drive data.

Note: Only the 16 least significant bits of the drive's 32-bit Control and Status Words can be accessed.

Note: Bits 16 through 32 of the DCU Control/Status word are not in use if 16-bit control/status word is used with the DCU Profile.

| Register address | Register data (16-bit words) |
|------------------|--|
| 400001 | Default: Control word (<i>CW 16bit</i>). See sections <i>Control Word for the ABB Drives profile</i> (page 218) and <i>Control Word for the DCU Profile</i> (page 219). The selection can be changed using parameter <i>58.101 Data I/O 1</i> . |
| 400002 | Default: Reference 1 (<i>Ref1 16bit</i>). The selection can be changed using parameter <i>58.102 Data I/O 2</i> . |
| 400003 | Default: Reference 2 (<i>Ref2 16bit</i>). The selection can be changed using parameter <i>58.103 Data I/O 3</i> . |
| 400004 | Default: Status Word (<i>SW 16bit</i>). See sections <i>Status Word for the ABB Drives profile</i> (page 222) and <i>Status Word for the DCU Profile</i> (page 223). The selection can be changed using parameter <i>58.104 Data I/O 4</i> . |
| 400005 | Default: Actual value 1 (<i>Act1 16bit</i>). The selection can be changed using parameter <i>58.105 Data I/O 5</i> . |
| 400006 | Actual value 2 (<i>Act2 16bit</i>). The selection can be changed using parameter <i>58.106 Data I/O 6</i> . |
| 400007...400014 | Data in/out 7...14. Selected by parameters <i>58.107 Data I/O 7</i> ... <i>58.114 Data I/O 14</i> . |
| 400015...400089 | Unused |
| 400090...400100 | Error code access. See section <i>Error code registers (holding registers 400090...400100)</i> (page 237). |
| 400101...465536 | Parameter read/write. Parameters are mapped to register addresses according to parameter <i>58.33 Addressing mode</i> . |

Modbus function codes

The table below shows the Modbus function codes supported by the embedded fieldbus interface.

| Code | Function name | Description |
|------|--------------------------|--|
| 01h | Read Coils | Reads the 0/1 status of coils (0X references). |
| 02h | Read Discrete Inputs | Reads the 0/1 status of discrete inputs (1X references). |
| 03h | Read Holding Registers | Reads the binary contents of holding registers (4X references). |
| 05h | Write Single Coil | Forces a single coil (0X reference) to 0 or 1. |
| 06h | Write Single Register | Writes a single holding register (4X reference). |
| 08h | Diagnostics | <p>Provides a series of tests for checking the communication, or for checking various internal error conditions.</p> <p>Supported subcodes:</p> <ul style="list-style-type: none"> • 00h Return Query Data: Echo/loopback test. • 01h Restart Comm Option: Restarts and initializes the EFB, clears communications event counters. • 04h Force Listen Only Mode • 0Ah Clear Counters and Diagnostic Register • 0Bh Return Bus Message Count • 0Ch Return Bus Comm. Error Count • 0Dh Return Bus Exception Error Count • 0Eh Return Slave Message Count • 0Fh Return Slave No Response Count • 10h Return Slave NAK (negative acknowledge) Count • 11h Return Slave Busy Count • 12h Return Bus Character Overrun Count • 14h Clear Overrun Counter and Flag |
| 0Bh | Get Comm Event Counter | Returns a status word and an event count. |
| 0Fh | Write Multiple Coils | Forces a sequence of coils (0X references) to 0 or 1. |
| 10h | Write Multiple Registers | Writes the contents of a contiguous block of holding registers (4X references). |
| 16h | Mask Write Register | Modifies the contents of a 4X register using a combination of an AND mask, an OR mask, and the register's current contents. |

| Code | Function name | Description |
|-----------|----------------------------------|--|
| 17h | Read/Write Multiple Registers | Writes the contents of a contiguous block of 4X registers, then reads the contents of another group of registers (the same or different than those written) in a server device. |
| 2Bh / 0Eh | Encapsulated Interface Transport | Supported subcodes: <ul style="list-style-type: none">• 0Eh Read Device Identification: Allows reading the identification and other information. Supported ID codes (access type): <ul style="list-style-type: none">• 00h: Request to get the basic device identification (stream access)• 04h: Request to get one specific identification object (individual access) Supported Object IDs: <ul style="list-style-type: none">• 00h: Vendor Name ("ABB")• 01h: Product Code (for example, "AQAKx")• 02h: Major Minor Revision (combination of contents of parameters 07.05 Firmware version and 58.02 Protocol ID).• 03h: Vendor URL ("www.abb.com")• 04h: Product name: ("ACQ580"). |

Exception codes

The table below shows the Modbus exception codes supported by the embedded fieldbus interface.

8

| Code | Name | Description |
|------|------------------|---|
| 01h | ILLEGAL FUNCTION | The function code received in the query is not an allowable action for the server. |
| 02h | ILLEGAL ADDRESS | The data address received in the query is not an allowable address for the server. |
| 03h | ILLEGAL VALUE | The requested quantity of registers is larger than the device can handle. This error does not mean that a value written to the device is outside of the valid range. |
| 04h | DEVICE FAILURE | An unrecoverable error occurred while the server was attempting to perform the requested action. See section Error code registers (holding registers 400090...400100) on page 237 . |

Coils (0xxxx reference set)

Coils are 1-bit read/write values. Control Word bits are exposed with this data type. The table below summarizes the Modbus coils (0xxxx reference set). Note that the references are 1-based index which match the address transmitted on the wire.

| Reference | ABB Drives profile | DCU Profile |
|-----------|--------------------|-------------------------|
| 000001 | OFF1_CONTROL | STOP |
| 000002 | OFF2_CONTROL | START |
| 000003 | OFF3_CONTROL | Reserved |
| 000004 | INHIBIT_OPERATION | Reserved |
| 000005 | RAMP_OUT_ZERO | RESET |
| 000006 | RAMP_HOLD | EXT2 |
| 000007 | RAMP_IN_ZERO | RUN_DISABLE |
| 000008 | RESET | STOPMODE_RAMP |
| 000009 | Not for ACQ580 | STOPMODE_EMERGENCY_RAMP |
| 000010 | Not for ACQ580 | STOPMODE_COAST |
| 000011 | REMOTE_CMD | Reserved |
| 000012 | EXT_CTRL_LOC | RAMP_OUT_ZERO |
| 000013 | USER_0 | RAMP_HOLD |
| 000014 | USER_1 | RAMP_IN_ZERO |
| 000015 | USER_2 | Reserved |
| 000016 | USER_3 | Reserved |
| 000017 | Reserved | FB_LOCAL_CTL |
| 000018 | Reserved | FB_LOCAL_REF |
| 000019 | Reserved | Reserved |
| 000020 | Reserved | Reserved |
| 000021 | Reserved | Reserved |
| 000022 | Reserved | Reserved |
| 000023 | Reserved | USER_0 |
| 000024 | Reserved | USER_1 |
| 000025 | Reserved | USER_2 |
| 000026 | Reserved | USER_3 |
| 000027 | Reserved | Reserved |
| 000028 | Reserved | Reserved |
| 000029 | Reserved | Reserved |
| 000030 | Reserved | Reserved |
| 000031 | Reserved | Reserved |
| 000032 | Reserved | Reserved |

| Reference | ABB Drives profile | DCU Profile |
|-----------|--|--|
| 000033 | Control for relay output RO1 (parameter <i>10.99 RO/DIO control word</i> , bit 0) | Control for relay output RO1 (parameter <i>10.99 RO/DIO control word</i> , bit 0) |
| 000034 | Control for relay output RO2 (parameter <i>10.99 RO/DIO control word</i> , bit 1) | Control for relay output RO2 (parameter <i>10.99 RO/DIO control word</i> , bit 1) |
| 000035 | Control for relay output RO3 (parameter <i>10.99 RO/DIO control word</i> , bit 2) | Control for relay output RO3 (parameter <i>10.99 RO/DIO control word</i> , bit 2) |
| 000036 | Control for relay output RO4 (parameter <i>10.99 RO/DIO control word</i> , bit 3) | Control for relay output RO4 (parameter <i>10.99 RO/DIO control word</i> , bit 3) |
| 000037 | Control for relay output RO5 (parameter <i>10.99 RO/DIO control word</i> , bit 4) | Control for relay output RO5 (parameter <i>10.99 RO/DIO control word</i> , bit 4) |

Discrete inputs (1xxxx reference set)

Discrete inputs are 1-bit read-only values. Status Word bits are exposed with this data type. The table below summarizes the Modbus discrete inputs (1xxxx reference set). Note that the references are 1-based index which match the address transmitted on the wire.

| Reference | ABB Drives profile | DCU Profile |
|-----------|--------------------|----------------|
| 100001 | RDY_ON | READY |
| 100002 | RDY_RUN | D |
| 100003 | RDY_REF | Reserved |
| 100004 | TRIPPED | RUNNING |
| 100005 | OFF_2_STATUS | ZERO_SPEED |
| 100006 | OFF_3_STATUS | Reserved |
| 100007 | SWC_ON_INHIB | Reserved |
| 100008 | ALARM | AT_SETPOINT |
| 100009 | AT_SETPOINT | LIMIT |
| 100010 | REMOTE | SUPERVISION |
| 100011 | ABOVE_LIMIT | Reserved |
| 100012 | USER_0 | Reserved |
| 100013 | USER_1 | PANEL_LOCAL |
| 100014 | USER_2 | FIELDBUS_LOCAL |
| 100015 | USER_3 | EXT2_ACT |
| 100016 | Reserved | FAULT |
| 100017 | Reserved | ALARM |
| 100018 | Reserved | Reserved |
| 100019 | Reserved | Reserved |
| 100020 | Reserved | Reserved |
| 100021 | Reserved | Reserved |
| 100022 | Reserved | Reserved |
| 100023 | Reserved | USER_0 |
| 100024 | Reserved | USER_1 |
| 100025 | Reserved | USER_2 |
| 100026 | Reserved | USER_3 |
| 100027 | Reserved | REQ_CTL |
| 100028 | Reserved | Reserved |
| 100029 | Reserved | Reserved |
| 100030 | Reserved | Reserved |
| 100031 | Reserved | Reserved |
| 100032 | Reserved | Reserved |

| Reference | ABB Drives profile | DCU Profile |
|-----------|---|---|
| 100033 | Delayed status of digital input DI1 (parameter 10.02 DI delayed status , bit 0) | Delayed status of digital input DI1 (parameter 10.02 DI delayed status , bit 0) |
| 100034 | Delayed status of digital input DI2 (parameter 10.02 DI delayed status , bit 1) | Delayed status of digital input DI2 (parameter 10.02 DI delayed status , bit 1) |
| 100035 | Delayed status of digital input DI3 (parameter 10.02 DI delayed status , bit 2) | Delayed status of digital input DI3 (parameter 10.02 DI delayed status , bit 2) |
| 100036 | Delayed status of digital input DI4 (parameter 10.02 DI delayed status , bit 3) | Delayed status of digital input DI4 (parameter 10.02 DI delayed status , bit 3) |
| 100037 | Delayed status of digital input DI5 (parameter 10.02 DI delayed status , bit 4) | Delayed status of digital input DI5 (parameter 10.02 DI delayed status , bit 4) |
| 100038 | Delayed status of digital input DI6 (parameter 10.02 DI delayed status , bit 5) | Delayed status of digital input DI6 (parameter 10.02 DI delayed status , bit 5) |

Error code registers (holding registers 400090...400100)

These registers contain information about the last query. The error register is cleared when a query has finished successfully.

| Reference | Name | Description |
|-----------|------------------------------------|--|
| 400090 | Reset Error Registers | 1 = Reset internal error registers (91...95). 0 = Do nothing. |
| 400091 | Error Function Code | Function code of the failed query. |
| 400092 | Error Code | Set when exception code 04h is generated (see table above). <ul style="list-style-type: none"> • 00h No error • 02h Low/High limit exceeded • 03h Faulty Index: Unavailable index of an array parameter • 05h Incorrect Data Type: Value does not match the data type of the parameter • 65h General Error: Undefined error when handling query |
| 400093 | Failed Register | The last register (discrete input, coil, input register or holding register) that failed to be read or written. |
| 400094 | Last Register Written Successfully | The last register (discrete input, coil, input register or holding register) that was written successfully. |
| 400095 | Last Register Read Successfully | The last register (discrete input, coil, input register or holding register) that was read successfully. |

9

Fieldbus control through a fieldbus adapter

What this chapter contains

This chapter describes how the drive can be controlled by external devices over a communication network (fieldbus) through an optional fieldbus adapter module.

The fieldbus control interface of the drive is described first, followed by a configuration example.

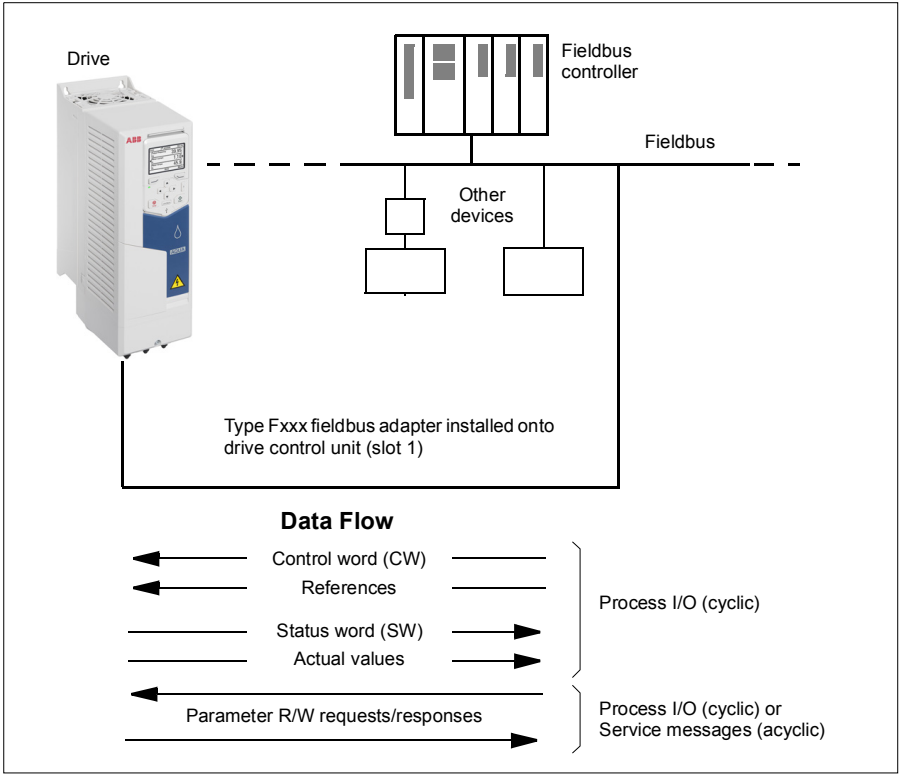
System overview

The drive can be connected to an external control system through an optional fieldbus adapter ("fieldbus adapter A" = FBA A) mounted onto the control unit of the drive. The drive can be configured to receive all of its control information through the fieldbus interface, or the control can be distributed between the fieldbus interface and other available sources such as digital and analog inputs, depending on how control locations EXT1 and EXT2 are configured.

Fieldbus adapters are available for various communication systems and protocols, for example

- CANopen (FCAN-01 adapter)
 - DeviceNet™ (FDNA-01 adapter)
 - EtherNet/IP™ (FEIP-21 adapter, FENA-21 adapter)
 - Modbus/RTU (FSCA-01 adapter)
 - ModbusTCP (FBMT-21 adapter, FENA-21 adapter)
 - PROFINET IO (FPNO-21 adapter, FENA-21 adapter)
 - PROFIBUS DP (FPBA-01 adapter)
-

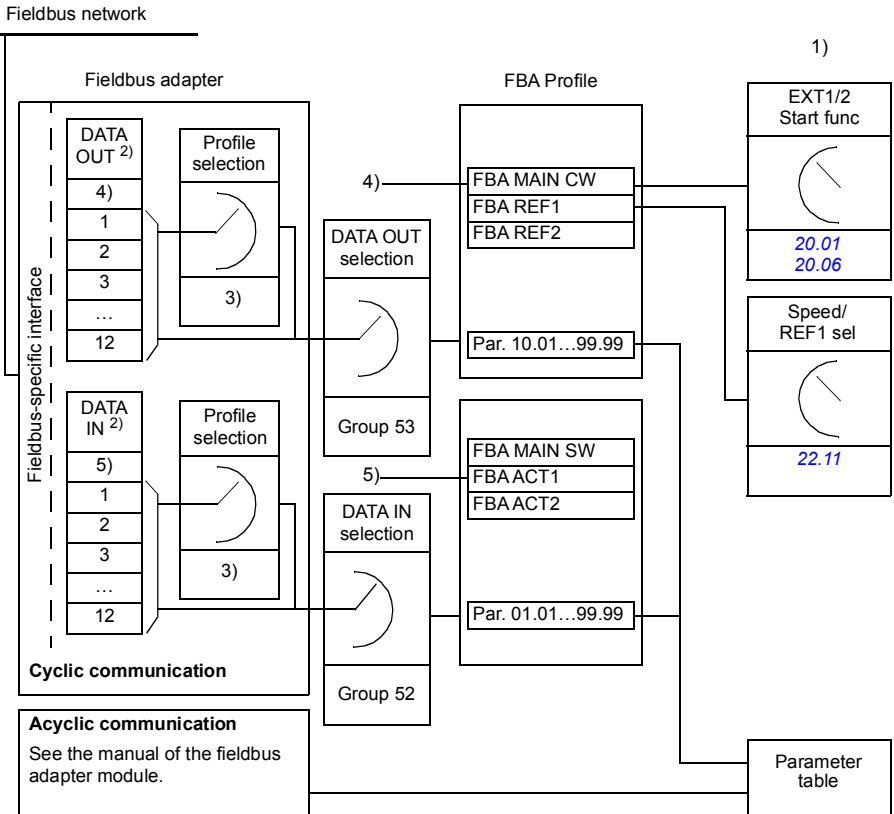
Note: The text and examples in this chapter describe the configuration of one fieldbus adapter (FBAA) by parameters [50.01](#) ... [50.18](#) and parameter groups [51 FBA A settings](#)...[53 FBA A data out](#).



Basics of the fieldbus control interface

The cyclic communication between a fieldbus system and the drive consists of 16- or 32-bit input and output data words. The drive is able to support a maximum of 12 data words (16 bits) in each direction.

Data transmitted from the drive to the fieldbus controller is defined by parameters [52.01 FBA A data in1](#) ... [52.12 FBA A data in12](#). The data transmitted from the fieldbus controller to the drive is defined by parameters [53.01 FBA A data out1](#) ... [53.12 FBA A data out12](#).



■ Control word and Status word

The Control word is the principal means for controlling the drive from a fieldbus system. It is sent by the fieldbus master station to the drive through the adapter module. The drive switches between its states according to the bit-coded instructions in the Control word, and returns status information to the master in the Status word.

For the ABB Drives communication profile, the contents of the Control word and the Status word are detailed on pages [245](#) and [246](#), respectively. The drive states are presented in the state diagram (page [247](#)). For other fieldbus-specific communication profiles, see the *User's manual* of the fieldbus adapter.

Debugging the network words

If parameter [50.12 FBA A debug mode](#) is set to *Fast*, the Control word received from the fieldbus is shown by parameter [50.13 FBA A control word](#), and the Status word transmitted to the fieldbus network by [50.16 FBA A status word](#). This “raw” data is very useful to determine if the fieldbus master is transmitting the correct data before handing control to the fieldbus network.

References

References are 16-bit words containing a sign bit and a 15-bit integer. A negative reference (indicating reversed direction of rotation) is formed by calculating the two's complement from the corresponding positive reference.

ABB drives can receive control information from multiple sources including analog and digital inputs, the drive control panel and a fieldbus adapter module. In order to have the drive controlled through the fieldbus, the module must be defined as the source for control information such as reference. This is done using the source selection parameters in groups [22 Speed reference selection](#) and [28 Frequency reference chain](#).

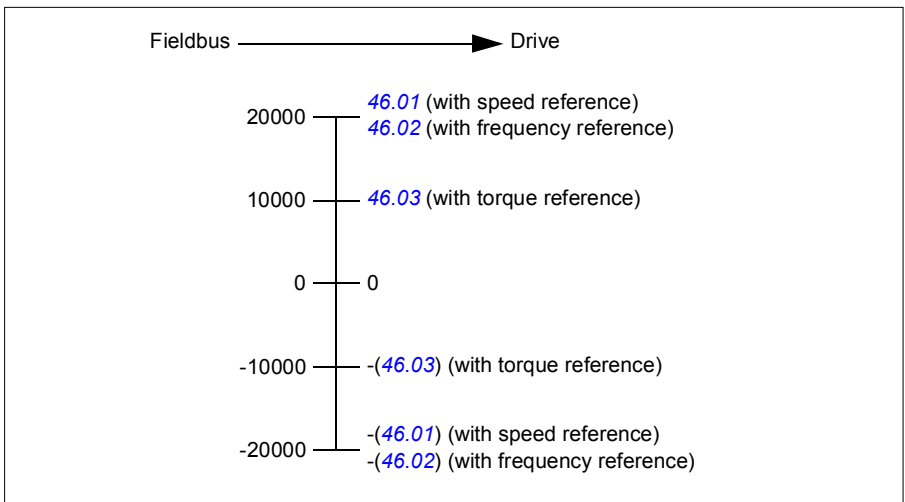
Debugging the network words

If parameter [50.12 FBA A debug mode](#) is set to *Fast*, the references received from the fieldbus are displayed by [50.14 FBA A reference 1](#) and [50.15 FBA A reference 2](#).

Scaling of references

Note: The scalings described below are for the ABB Drives communication profile. Fieldbus-specific communication profiles may use different scalings. For more information, see the *User's manual* of the fieldbus adapter.

The references are scaled as defined by parameters [46.01...46.04](#); which scaling is in use depends on the setting of [50.04 FBA A ref1 type](#) and [50.05 FBA A ref2 type](#).



The scaled references are shown by parameters [03.05 FB A reference 1](#) and [03.06 FB A reference 2](#).

■ **Actual values**

Note: The scalings described below are for the ABB Drives communication profile. Fieldbus-specific communication profiles may use different scalings. For more information, see the *User’s manual* of the fieldbus adapter.

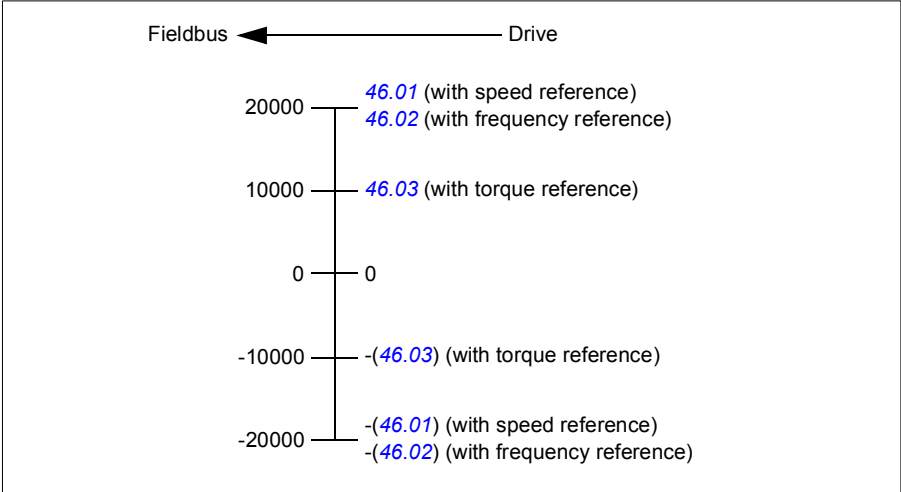
Actual values are 16-bit words containing information on the operation of the drive. The types of the monitored signals are selected by parameters *50.07 FBA A actual 1 type* and *50.08 FBA A actual 2 type*.

Debugging the network words

If parameter *50.12 FBA A debug mode* is set to *Fast*, the actual values sent to the fieldbus are displayed by *50.17 FBA A actual value 1* and *50.18 FBA A actual value 2*.


Scaling of actual values

The actual values are scaled as defined by parameters *46.01...46.04*; which scaling is in use depends on the setting of parameters *50.07 FBA A actual 1 type* and *50.08 FBA A actual 2 type*.



■ Contents of the fieldbus Control word (ABB Drives profile)

The upper case boldface text refers to the states shown in the state diagram (page 247).

| Bit | Name | Value | STATE/Description |
|-------|---------------|-------|--|
| 0 | Off1 control | 1 | Proceed to READY TO OPERATE . |
| | | 0 | Stop along currently active deceleration ramp. Proceed to OFF1 ACTIVE ; proceed to READY TO SWITCH ON unless other interlocks (OFF2, OFF3) are active. |
| 1 | Off2 control | 1 | Continue operation (OFF2 inactive). |
| | | 0 | Emergency OFF, coast to a stop. Proceed to OFF2 ACTIVE , proceed to SWITCH-ON INHIBITED . |
| 2 | Off3 control | 1 | Continue operation (OFF3 inactive). |
| | | 0 | Emergency stop, stop within time defined by drive parameter. Proceed to OFF3 ACTIVE ; proceed to SWITCH-ON INHIBITED .  WARNING: Ensure motor and driven machine can be stopped using this stop mode. |
| 3 | Run | 1 | Proceed to OPERATION ENABLED . Note: Run permissive signal must be active; see the drive documentation. If the drive is set to receive the Run permissive signal from the fieldbus, this bit activates the signal. See also parameter 06.18 Start inhibit status word . |
| | | 0 | Inhibit operation. Proceed to OPERATION INHIBITED . |
| 4 | Ramp out zero | 1 | Normal operation. Proceed to RAMP FUNCTION GENERATOR: OUTPUT ENABLED . |
| | | 0 | Force Ramp function generator output to zero. The drive will immediately decelerate to zero speed (observing the torque limits). |
| 5 | Ramp hold | 1 | Enable ramp function. Proceed to RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED . |
| | | 0 | Halt ramping (Ramp Function Generator output held). |
| 6 | Ramp in zero | 1 | Normal operation. Proceed to OPERATING . Note: This bit is effective only if the fieldbus interface is set as the source for this signal by drive parameters. |
| | | 0 | Force Ramp function generator input to zero. |
| 7 | Reset | 0=>1 | Fault reset if an active fault exists. Proceed to SWITCH-ON INHIBITED . Note: This bit is effective only if the fieldbus interface is set as the source of the reset signal by drive parameters. |
| | | 0 | Continue normal operation. |
| 8...9 | Reserved | | |
| 10 | Remote cmd | 1 | Fieldbus control enabled. |
| | | 0 | Control word and reference not getting through to the drive, except for bits 0...2. |
| 11 | Ext ctrl loc | 1 | Select External Control Location EXT2. Effective if control location is parameterized to be selected from fieldbus. |
| | | 0 | Select External Control Location EXT1. Effective if control location is parameterized to be selected from fieldbus. |
| 12 | User bit 0 | 1 | User configurable |
| | | 0 | |
| 13 | User bit 1 | 1 | |
| | | 0 | |
| 14 | User bit 2 | 1 | |
| | | 0 | |
| 15 | User bit 3 | 1 | |
| | | 0 | |

■ **Contents of the fieldbus Status word (ABB Drives profile)**

The upper case boldface text refers to the states shown in the state diagram (page 247).

| Bit | Name | Value | STATE/Description |
|-----|---------------------|-------|---|
| 0 | Ready to switch ON | 1 | READY TO SWITCH ON. |
| | | 0 | NOT READY TO SWITCH ON. |
| 1 | Ready run | 1 | READY TO OPERATE. |
| | | 0 | OFF1 ACTIVE. |
| 2 | Ready ref | 1 | OPERATION ENABLED. |
| | | 0 | OPERATION INHIBITED. See also parameter 06.18 Start inhibit status word . |
| 3 | Tripped | 1 | FAULT. |
| | | 0 | No fault. |
| 4 | Off 2 inactive | 1 | OFF2 inactive. |
| | | 0 | OFF2 ACTIVE. |
| 5 | Off 3 inactive | 1 | OFF3 inactive. |
| | | 0 | OFF3 ACTIVE. |
| 6 | Switch-on inhibited | 1 | SWITCH-ON INHIBITED. |
| | | 0 | — |
| 7 | Warning | 1 | Warning active. |
| | | 0 | No warning active. |
| 8 | At setpoint | 1 | OPERATING. Actual value equals reference = is within tolerance limits (see parameters 46.21...46.22). |
| | | 0 | Actual value differs from reference = is outside tolerance limits. |
| 9 | Remote | 1 | Drive control location: REMOTE (EXT1 or EXT2). |
| | | 0 | Drive control location: LOCAL. |
| 10 | Above limit | - | See bit 10 of 06.17 Drive status word 2 . |
| 11 | User bit 0 | - | See parameter 06.30 MSW bit 11 selection . |
| 12 | User bit 1 | - | See parameter 06.31 MSW bit 12 selection . |
| 13 | User bit 2 | - | See parameter 06.32 MSW bit 13 selection . |
| 14 | User bit 3 | - | See parameter 06.33 MSW bit 14 selection . |
| 15 | Reserved | | |

Setting up the drive for fieldbus control

1. Install the fieldbus adapter module mechanically and electrically according to the instructions given in the *User's manual* of the module.
2. Power up the drive.
3. Enable the communication between the drive and the fieldbus adapter module with parameter [50.01 FBA A enable](#).
4. With [50.02 FBA A comm loss func](#), select how the drive should react to a fieldbus communication break.
Note: This function monitors both the communication between the fieldbus master and the adapter module and the communication between the adapter module and the drive.
5. With [50.03 FBA A comm loss t out](#), define the time between communication break detection and the selected action.
6. Select application-specific values for the rest of the parameters in group [50 Fieldbus adapter \(FBA\)](#), starting from [50.04](#). Examples of appropriate values are shown in the tables below.
7. Set the fieldbus adapter module configuration parameters in group [51 FBA A settings](#). As a minimum, set the required node address and the communication profile.
8. Define the process data transferred to and from the drive in parameter groups [52 FBA A data in](#) and [53 FBA A data out](#).
Note: Depending on the communication protocol and profile being used, the Control word and Status word may already be configured to be sent/received by the communication system.
9. Save the valid parameter values to permanent memory by setting parameter [96.07 Parameter save manually](#) to [Save](#).
10. Validate the settings made in parameter groups 51, 52 and 53 by setting parameter [51.27 FBA A par refresh](#) to [Configure](#).
11. Configure control locations EXT1 and EXT2 to allow control and reference signals to come from the fieldbus. Examples of appropriate values are shown in the tables below.

■ Parameter setting example: FPBA (PROFIBUS DP) with ABB Drives profile

This example shows how to configure a basic speed control application that uses the ABB Drives communication profile with PPO Type 2. The start/stop commands and reference are according to the ABB Drives profile, speed control mode.

The reference values sent over the fieldbus have to be scaled within the drive so they have the desired effect. The reference value ± 20000 corresponds to the range of speed set in parameter [46.01 Speed scaling](#) (both forward and reverse directions). For example, if [46.01](#) is set to 480 rpm, then 20000 sent over fieldbus will request 480 rpm.

| Direction | PZD1 | PZD2 | PZD3 | PZD4 | PZD5 | PZD6 |
|-----------|--------------|--------------------|---------------|------|------------|------|
| Out | Control word | Speed reference | Acc time 1 | | Dec time 1 | |
| In | Status word | Speed actual value | Motor current | | DC voltage | |

The table below gives the recommended drive parameter settings.

| Drive parameter | Setting for ACQ580 drives | Description |
|---|-------------------------------|--|
| 50.01 FBA A enable | 1 = [slot number] | Enables/disables communication between the drive and the fieldbus adapter module. |
| 50.04 FBA A ref1 type | 4 = <i>Speed</i> | Selects the fieldbus A reference 1 type and scaling. |
| 50.07 FBA A actual 1 type | 0 = <i>Speed or frequency</i> | Selects the actual value type and scaling according to the currently active Ref1 mode defined in parameter 50.04 . |
| 51.01 FBA A type | 1 = FPBA ¹⁾ | Displays the type of the fieldbus adapter module. |
| 51.02 Node address | 3 ²⁾ | Defines the PROFIBUS node address of the fieldbus adapter module. |
| 51.03 Baud rate | 12000 ¹⁾ | Displays the current baud rate on the PROFIBUS network in kbit/s. |
| 51.04 MSG type | 1 = PPO2 ¹⁾ | Displays the telegram type selected by the PLC configuration tool. |
| 51.05 Profile | 1 = ABB Drives | Selects the Control word according to the ABB Drives profile (speed control mode). |
| 51.07 RPBA mode | 0 = Disabled | Disables the RPBA emulation mode. |
| 52.01 FBA A data in1 | 4 = SW 16bit ¹⁾ | Status word |
| 52.02 FBA data in2 | 5 = Act1 16bit | Actual value 1 |
| 52.03 FBA data in3 | 01.07 ²⁾ | Motor current |
| 52.05 FBA data in5 | 01.11 ²⁾ | DC voltage |
| 53.01 FBA data out1 | 1 = CW 16bit ¹⁾ | Control word |

| Drive parameter | Setting for ACQ580 drives | Description |
|--------------------------------------|---------------------------|---|
| 53.02 FBA data out2 | 2 = Ref1 16bit | Reference 1 (speed) |
| 53.03 FBA data out3 | 23.12 ²⁾ | Acceleration time 1 |
| 53.05 FBA data out5 | 23.13 ²⁾ | Deceleration time 1 |
| <i>51.27 FBA A par refresh</i> | 1 = Configure | Validates the configuration parameter settings. |
| <i>20.01 Ext1 commands</i> | 12 = Fieldbus A | Selects fieldbus adapter A as the source of the start and stop commands for external control location EXT1. |
| <i>20.02 Ext1 start trigger type</i> | 1 = Level | Selects a level-triggered start signal for external control location EXT1. |
| <i>22.11 Ext1 speed ref1</i> | 4 = FB A ref1 | Selects fieldbus A reference 1 as the source for speed reference 1. |

1) Read-only or automatically detected/set

2) Example

■ Parameter setting example: FPBA (PROFIBUS DP) with PROFIdrive profile

This example shows how to configure a basic speed control application that uses the PROFIdrive communication profile with PPO Type 2. The start/stop commands and reference are according to the PROFIdrive profile, speed control mode.

The reference values sent over the fieldbus have to be scaled within the drive so they have the desired effect. The reference value ± 16384 (4000h) corresponds to the range of speed set in parameter [46.01 Speed scaling](#) (both forward and reverse directions). For example, if [46.01](#) is set to 480 rpm, then 4000h sent over fieldbus will request 480 rpm.

| Direction | PZD1 | PZD2 | PZD3 | PZD4 | PZD5 | PZD6 |
|-----------|--------------|--------------------|---------------|------|------------|------|
| Out | Control word | Speed reference | Acc time 1 | | Dec time 1 | |
| In | Status word | Speed actual value | Motor current | | DC voltage | |

The table below gives the recommended drive parameter settings.

| Drive parameter | Setting for ACQ580 drives | Description |
|---|--------------------------------------|--|
| 50.01 FBA A enable | 1 = [slot number] | Enables/disables communication between the drive and the fieldbus adapter module. |
| 50.04 FBA A ref1 type | 4 = <i>Speed</i> | Selects the fieldbus A reference 1 type and scaling. |
| 50.07 FBA A actual 1 type | 0 = <i>Speed or frequency</i> | Selects the actual value type and scaling according to the currently active Ref1 mode defined in parameter 50.04 . |
| 51.01 FBA A type | 1 = FPBA ¹⁾ | Displays the type of the fieldbus adapter module. |
| 51.02 Node address | 3 ²⁾ | Defines the PROFIBUS node address of the fieldbus adapter module. |
| 51.03 Baud rate | 12000 ¹⁾ | Displays the current baud rate on the PROFIBUS network in kbit/s. |
| 51.04 MSG type | 1 = PPO2 ¹⁾ | Displays the telegram type selected by the PLC configuration tool. |
| 51.05 Profile | 0 = PROFIdrive | Selects the Control word according to the PROFIdrive profile (speed control mode). |
| 51.07 RPBA mode | 0 = Disabled | Disables the RPBA emulation mode. |
| 52.01 FBA A data in1 | 4 = SW 16bit ¹⁾ | Status word |
| 52.02 FBA data in2 | 5 = Act1 16bit | Actual value 1 |
| 52.03 FBA data in3 | 01.07 ²⁾ | Motor current |
| 52.05 FBA data in5 | 01.11 ²⁾ | DC voltage |
| 53.01 FBA data out1 | 1 = CW 16bit ¹⁾ | Control word |

| Drive parameter | Setting for ACQ580 drives | Description |
|--------------------------------------|-------------------------------|---|
| 53.02 FBA data out2 | 2 = Ref1 16bit | Reference 1 (speed) |
| 53.03 FBA data out3 | 23.12 ²⁾ | Acceleration time 1 |
| 53.05 FBA data out5 | 23.13 ²⁾ | Deceleration time 1 |
| <i>51.27 FBA A par refresh</i> | 1 = <i>Configure</i> | Validates the configuration parameter settings. |
| <i>20.01 Ext1 commands</i> | 12 = <i>Fieldbus A</i> | Selects fieldbus adapter A as the source of the start and stop commands for external control location EXT1. |
| <i>20.02 Ext1 start trigger type</i> | 1 = <i>Level</i> | Selects a level-triggered start signal for external control location EXT1. |
| <i>22.11 Ext1 speed ref1</i> | 4 = <i>FB A ref1</i> | Selects fieldbus A reference 1 as the source for speed reference 1. |

¹⁾ Read-only or automatically detected/set

²⁾ Example

The start and stop sequences for the parameter examples above are given below.

Control word:

Start:

- 1150 (476h) → NOT READY TO SWITCH ON
- If MSW bit 0 = 1 then
 - 1150 (47Eh) → READY TO SWITCH ON (Stopped)
 - 1151 (47Fh) → OPERATION (Running)

Stop:

- 1150 (47Eh) = OFF1 ramp stop (Note: uninterruptable ramp stop)
- 1149 (47Dh) = coast to stop
- 1147 (47Bh) = emergency stop

Fault reset:

- Rising edge of MCW bit 7

Start after STO:

- If *31.22 STO indication run/stop* is not Fault/ Fault, check that *06.18 Start inhibit status word*, bit 7 STO = 0 before giving a start command.

Automatic drive configuration for fieldbus control

The parameters set on module detection are shown in the table below. See also parameters [07.35 Drive configuration](#) and [07.36 Drive configuration 2](#)

| Option | 50.01 FBA A enable | 50.02 FBA A comm loss func | 51.02 FBA A Par2 | 51.04 FBA A Par4 | 51.05 FBA A Par5 | 51.06 FBA A Par6 |
|---------|--------------------|----------------------------|------------------|------------------|------------------|------------------|
| FENA-21 | 1 (Enable) | 0 (No action) | 11 | 0 | - | - |
| FPBA-01 | 1 (Enable) | 0 (No action) | - | - | 1 | - |
| FCAN-01 | 1 (Enable) | 0 (No action) | - | - | 0 | - |
| FSCA-01 | 1 (Enable) | 0 (No action) | - | - | - | 10 |
| FEIP-21 | 1 (Enable) | 0 (No action) | 100 | 0 | - | - |
| FMBT-21 | 1 (Enable) | 0 (No action) | 0 | 0 | - | - |
| FPNO-21 | 1 (Enable) | 0 (No action) | 11 | 0 | - | - |
| FDNA-01 | 1 (Enable) | 0 (No action) | - | - | - | - |

| Option | 51.07 FBA A Par7 | 51.21 FBA A Par21 | 51.23 FBA A Par23 | 51.24 FBA A Par24 | 52.01 FBA data in1 | 52.02 FBA data in2 |
|---------|------------------|-------------------|-------------------|-------------------|--------------------|--------------------|
| FENA-21 | - | - | - | - | 4 | 5 |
| FPBA-01 | - | - | - | - | 4 | 5 |
| FCAN-01 | - | - | - | - | - | - |
| FSCA-01 | 1 | - | - | - | - | - |
| FEIP-21 | - | - | 128 | 128 | - | - |
| FMBT-21 | - | 1 | - | - | - | - |
| FPNO-21 | - | - | - | - | 4 | 5 |
| FDNA-01 | - | - | - | - | - | - |

| Option | 53.01 FBA data out1 | 53.02 FBA data out2 |
|---------|---------------------|---------------------|
| FENA-21 | 1 | 2 |
| FPBA-01 | 1 | 2 |
| FCAN-01 | - | - |
| FSCA-01 | | |
| FEIP-21 | - | - |
| FMBT-21 | - | - |
| FPNO-21 | 1 | 2 |
| FDNA-01 | - | - |

10

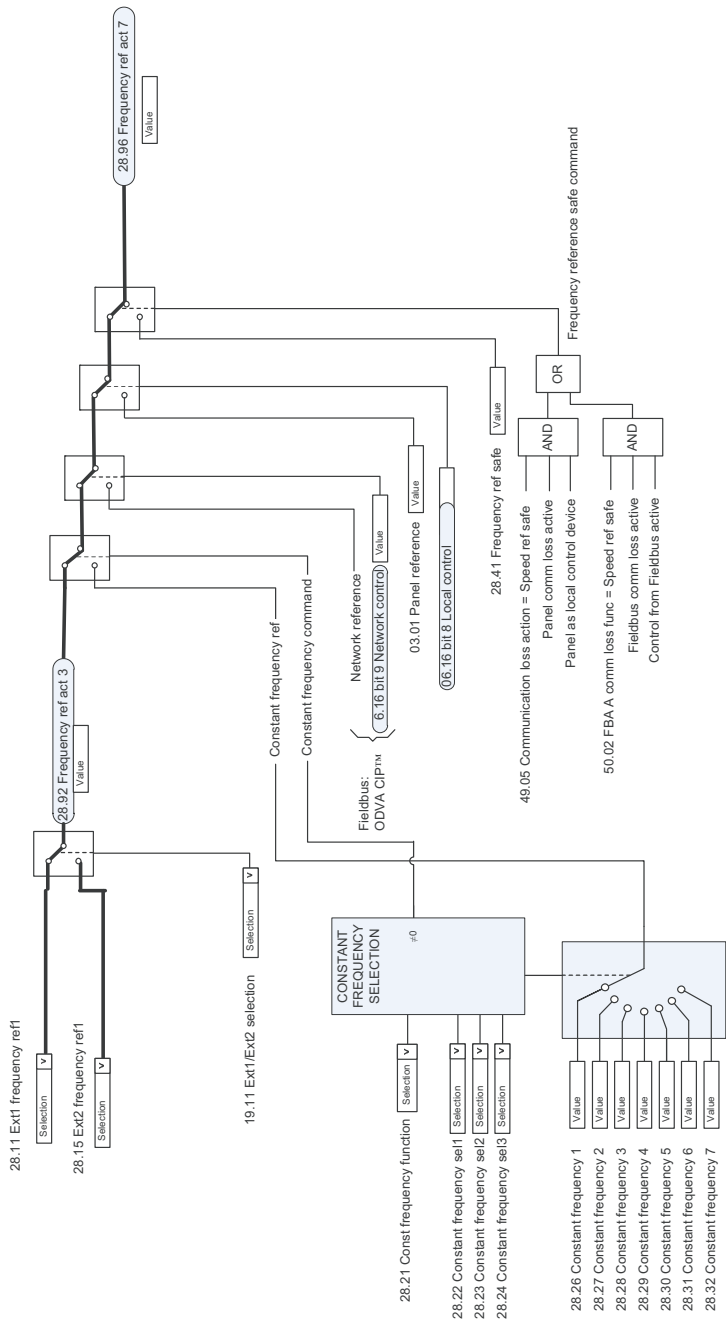
Control chain diagrams

Contents of this chapter

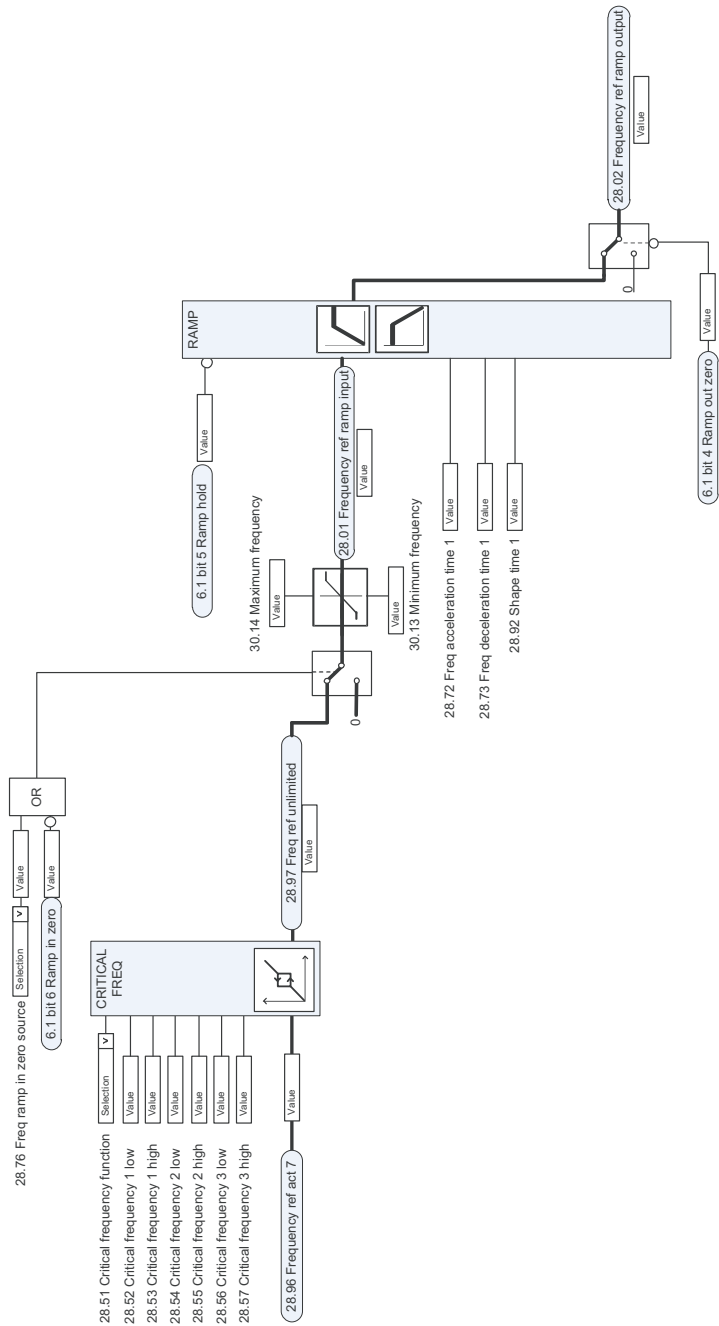
The chapter presents the reference chains of the drive. The control chain diagrams can be used to trace how parameters interact and where parameters have an effect within the drive parameter system.

For a more general diagram, see section [Operating modes of the drive](#) (page 86).

Frequency reference selection

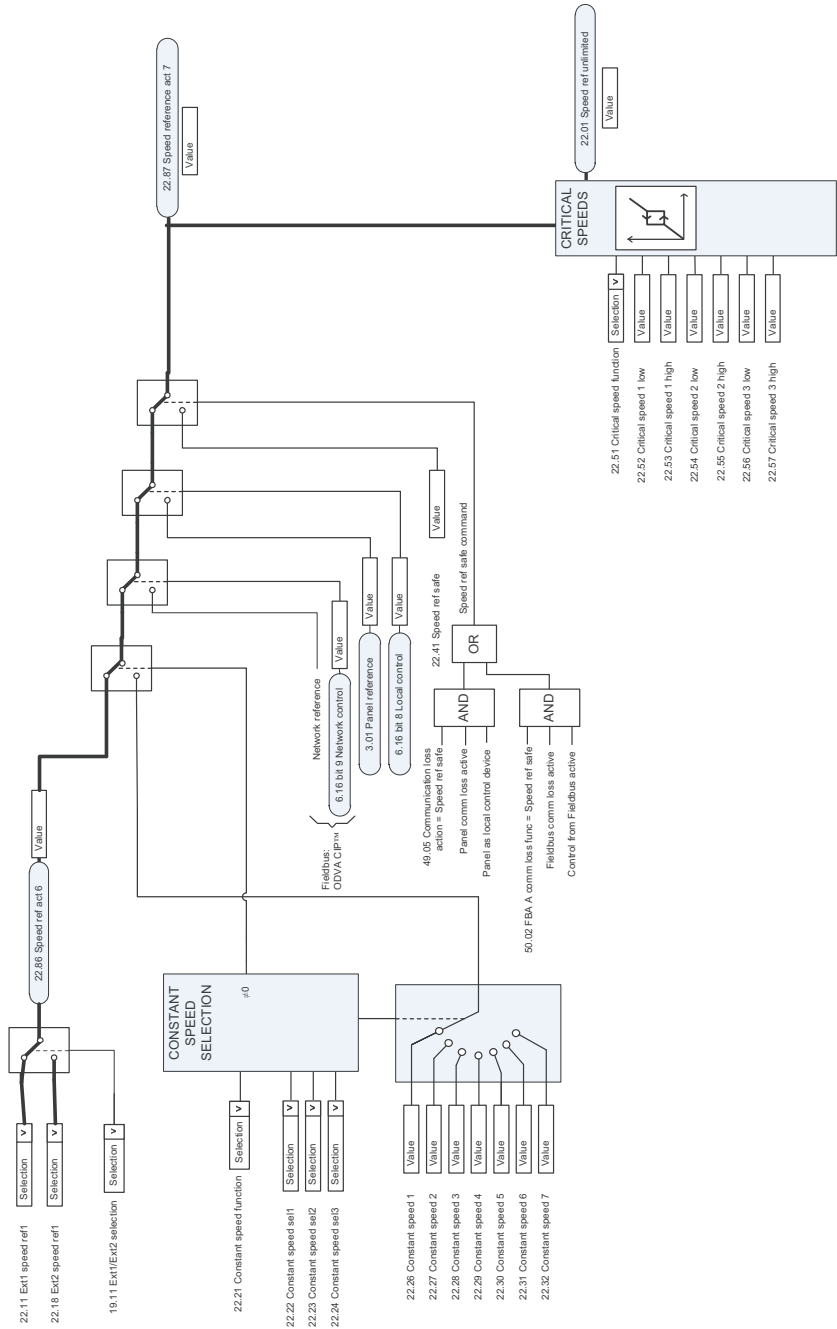


Frequency reference modification

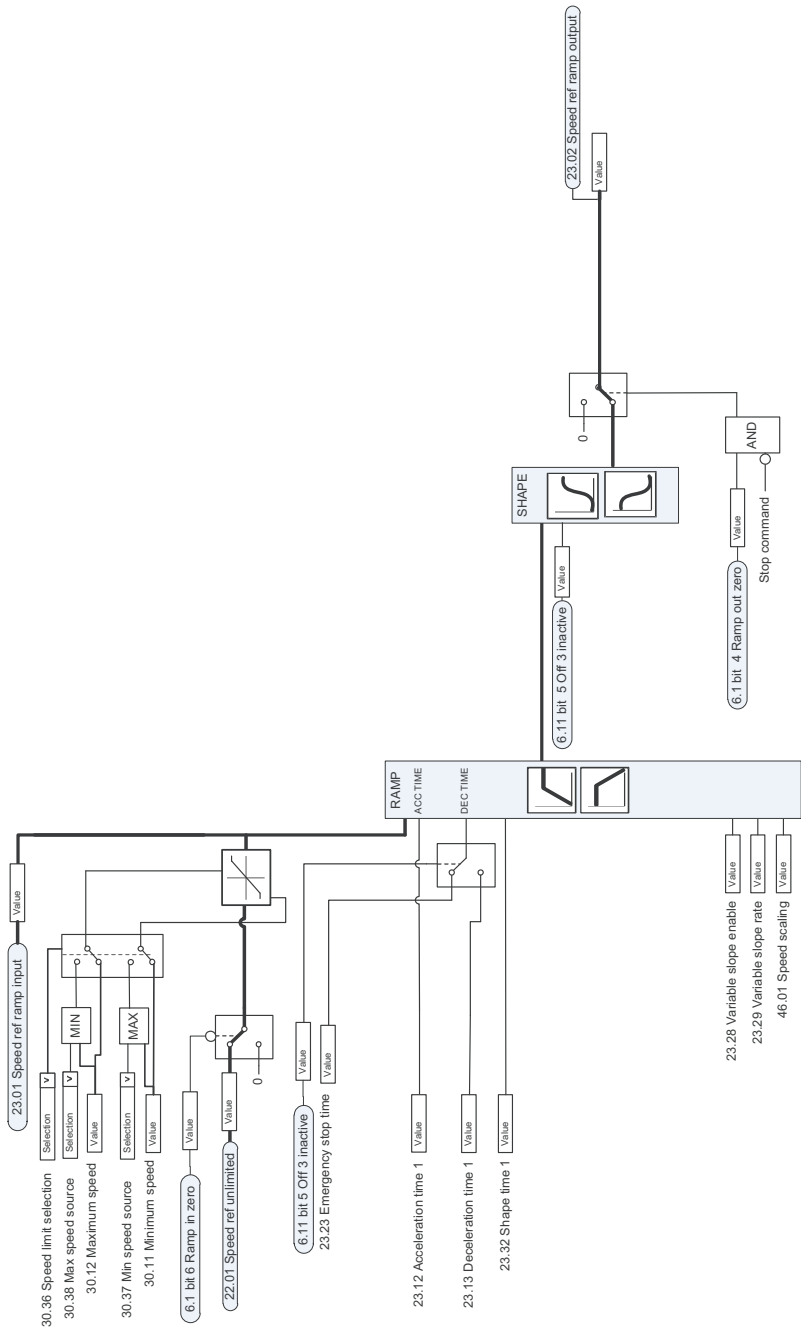


Speed reference source selection II

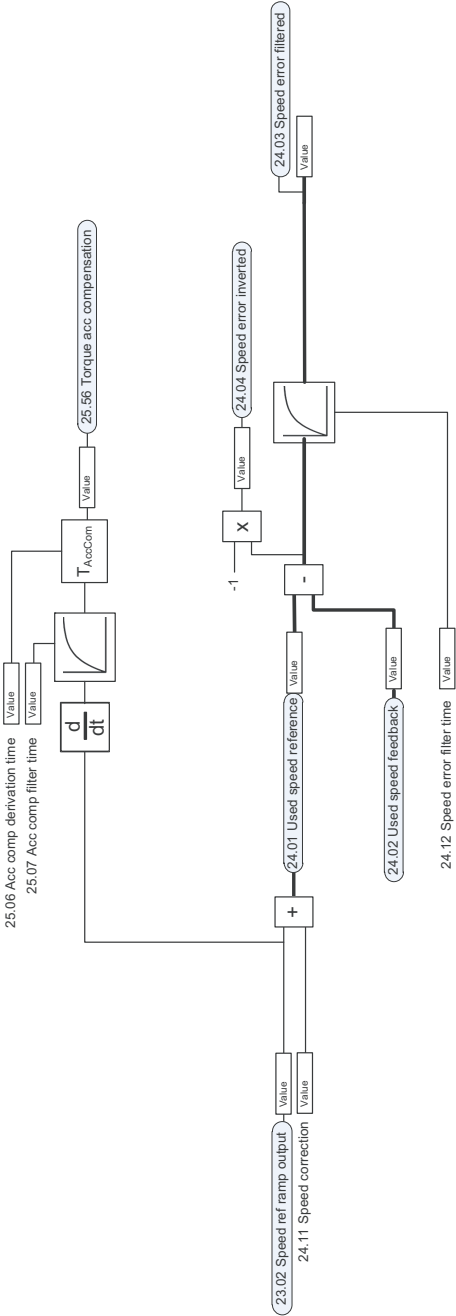
10



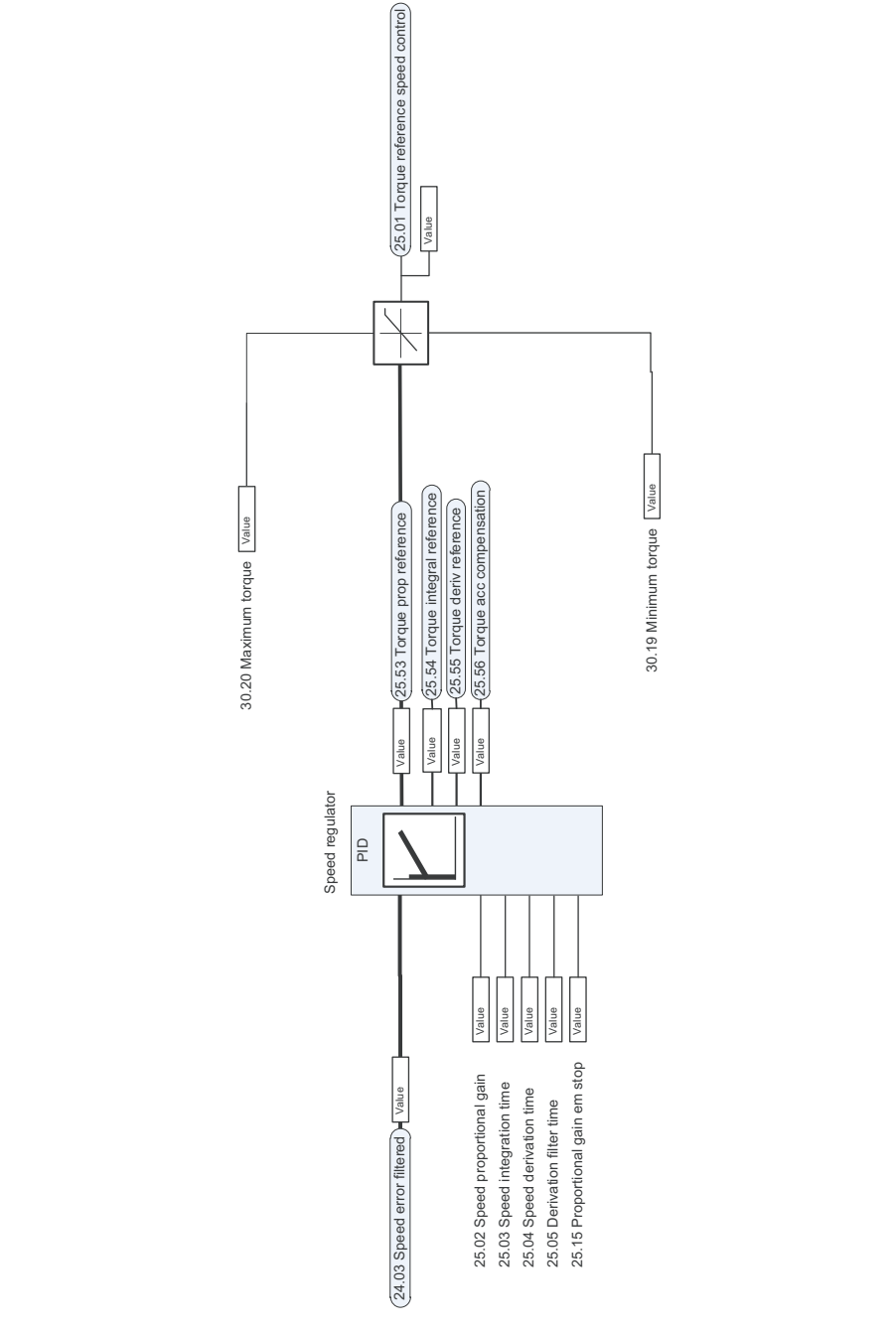
Speed reference ramping and shaping



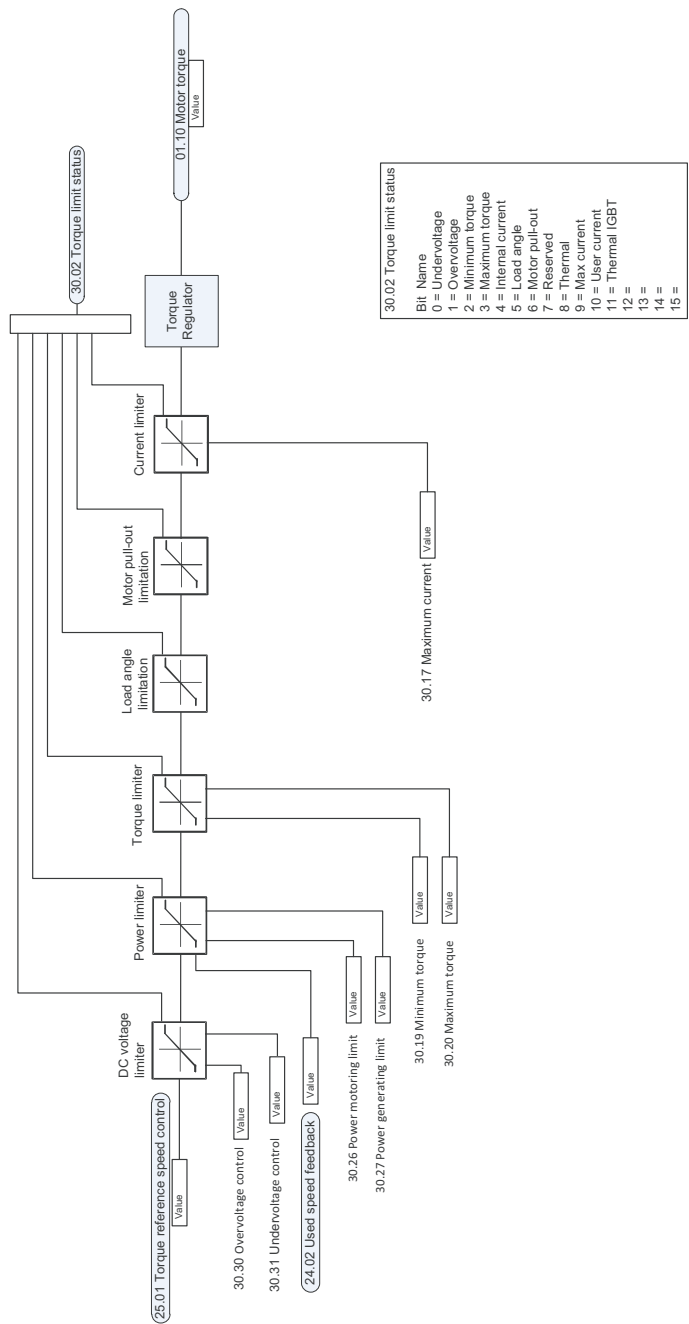
Speed error calculation



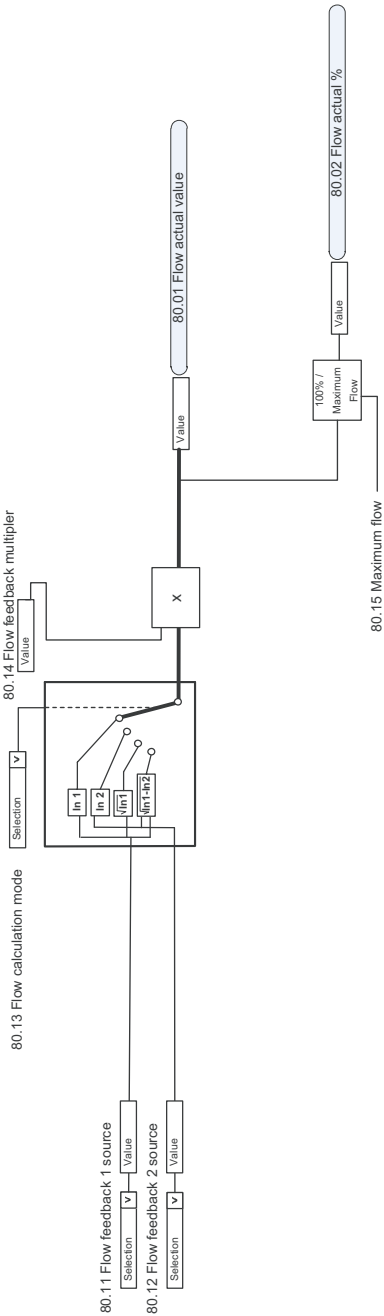
Speed controller



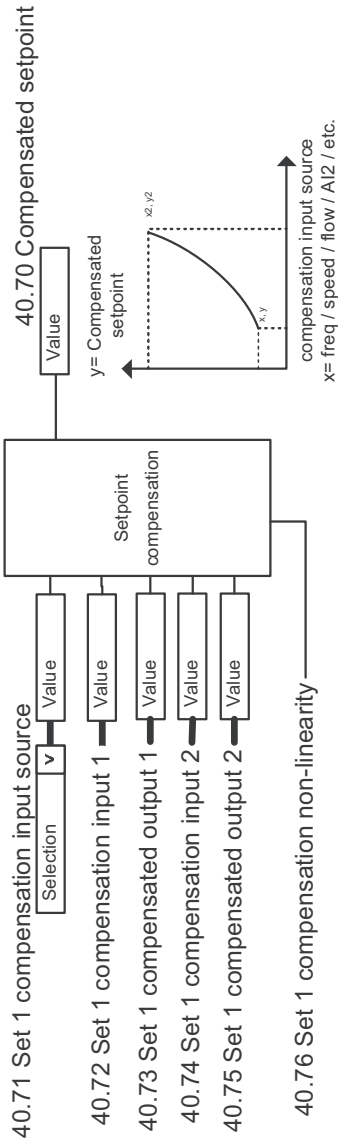
Torque limitation



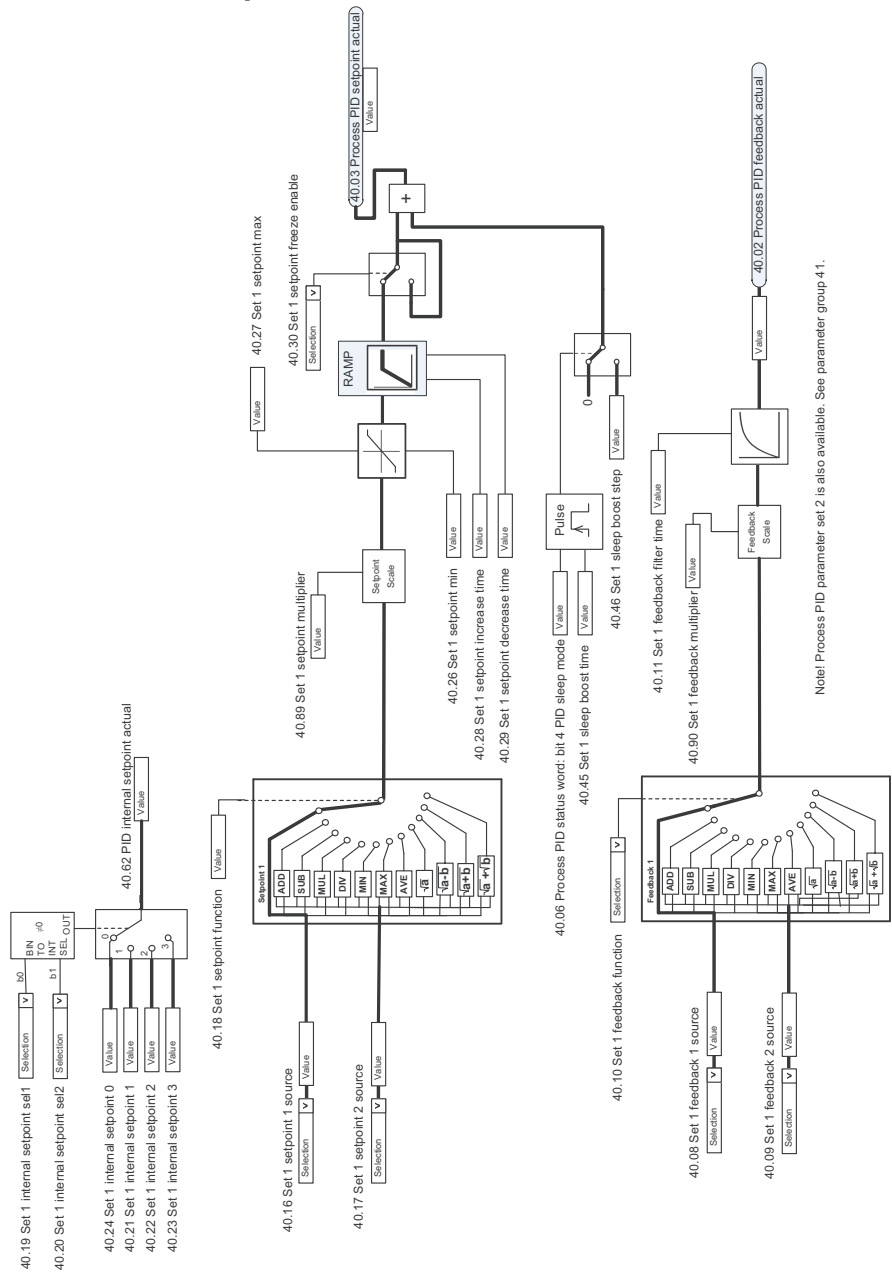
PID flow calculation



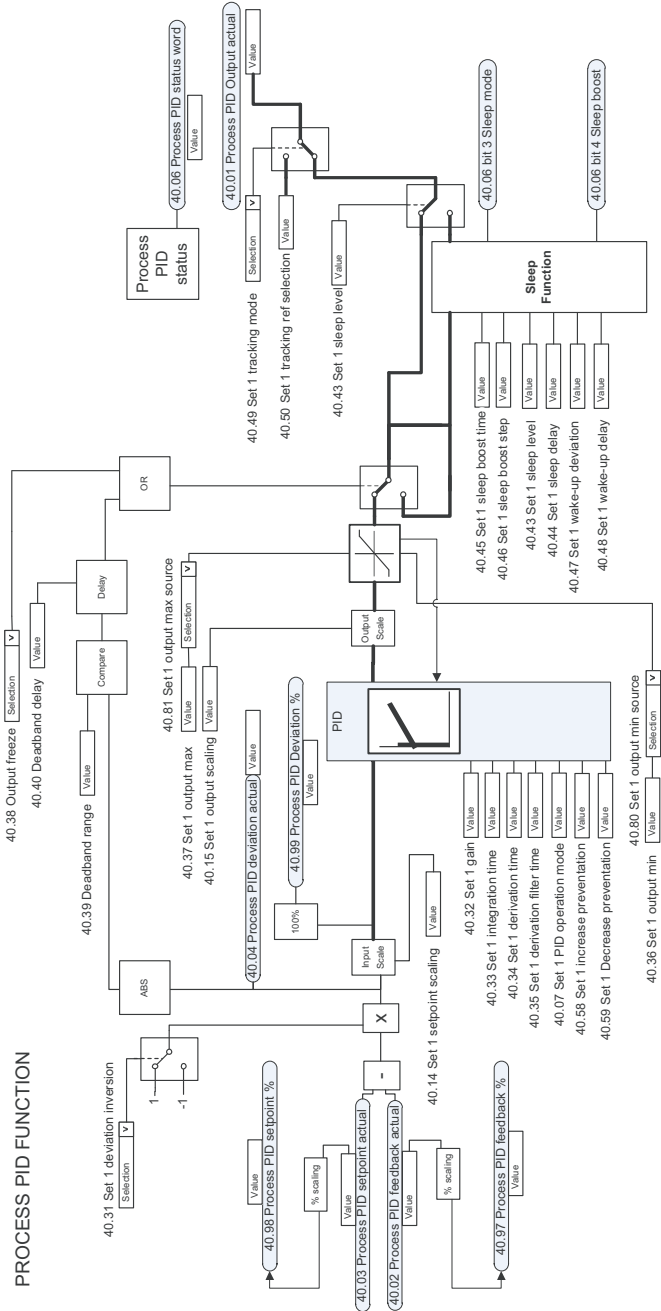
PID setpoint compensation



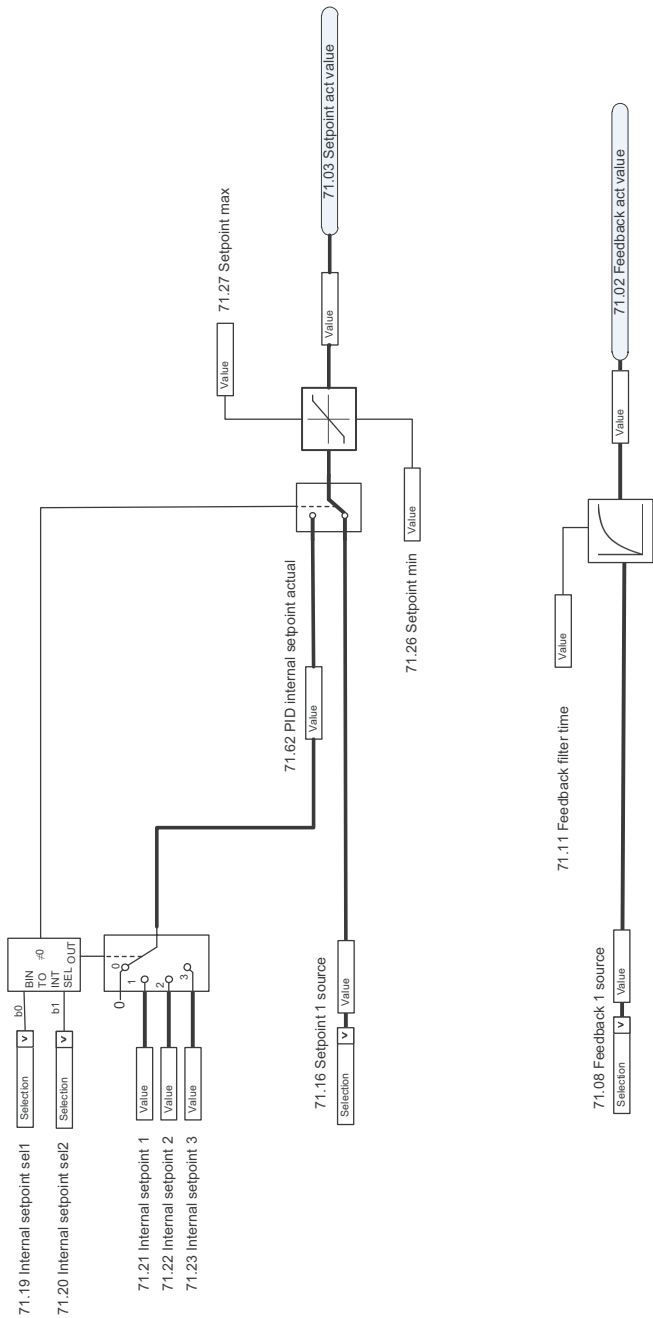
Process PID setpoint and feedback source selection



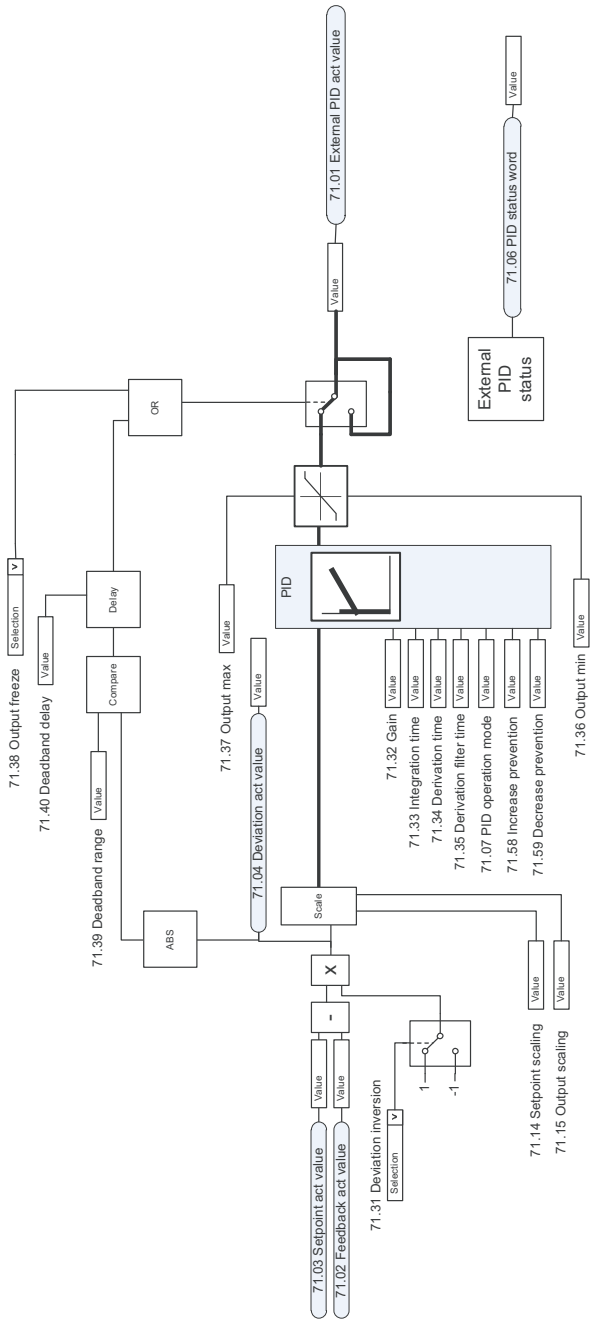
Process PID controller



External PID setpoint and feedback source selection



External PID controller



11

Parameters

What this chapter contains

The chapter describes the parameters, including actual signals, of the control program. At the end of the chapter, on page [509](#), there is a separate list of the parameters whose default values are different between 50 Hz and 60 Hz supply frequency settings.

Terms and abbreviations

| Term | Definition |
|--------------------|--|
| Actual signal | Type of parameter that is the result of a measurement or calculation by the drive, or contains status information. Most actual signals are read-only, but some (especially counter-type actual signals) can be reset. |
| Def | (In the following table, shown on the same row as the parameter name) The default value of a parameter when used in the default configuration. For information on other macro-specific parameter values, see chapter Default I/O configuration . |
| FbEq16 | (In the following table, shown on the same row as the parameter range, or for each selection) 16-bit fieldbus equivalent: The scaling between the value shown on the control panel and the integer used in communication when a 16-bit value is selected for transmission to an external system. A dash (-) indicates that the parameter is not accessible in 16-bit format. The corresponding 32-bit scalings are listed in chapter Additional parameter data (page 511). |
| Other | The value is taken from another parameter. Choosing "Other" displays a parameter list in which the user can specify the source parameter. |
| Other [bit] | The value is taken from a specific bit in another parameter. Choosing "Other" displays a parameter list in which the user can specify the source parameter and bit. |
| Parameter | Either a user-adjustable operating instruction for the drive, or an actual signal . |
| p.u. | Per unit |
| [parameter number] | Value of the parameter |

Summary of parameter groups

| Group | Contents | Page |
|---|--|---------------------|
| 01 Actual values | Basic signals for monitoring the drive. | 275 |
| 03 Input references | Values of references received from various sources. | 279 |
| 04 Warnings and faults | Information on warnings and faults that occurred last. | 280 |
| 05 Diagnostics | Various run-time-type counters and measurements related to drive maintenance. | 282 |
| 06 Control and status words | Drive control and status words. | 285 |
| 07 System info | Drive hardware and firmware information. | 294 |
| 10 Standard DI, RO | Configuration of digital inputs and relay outputs. | 296 |
| 11 Standard DIO, FI, FO | Configuration of the frequency input. | 306 |
| 12 Standard AI | Configuration of standard analog inputs. | 307 |
| 13 Standard AO | Configuration of standard analog outputs. | 312 |
| 15 I/O extension module | Configuration of the I/O extension module installed in slot 2. | 317 |
| 19 Operation mode | Selection of local and external control location sources and operating modes. | 326 |
| 20 Start/stop/direction | Start/stop/direction and run/start enable signal source selection; positive/negative reference enable signal source selection. | 327 |
| 21 Start/stop mode | Start and stop modes; emergency stop mode and signal source selection; DC magnetization settings. | 333 |
| 22 Speed reference selection | Speed reference selection; Motor potentiometer settings. | 341 |
| 23 Speed reference ramp | Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive). | 349 |
| 24 Speed reference conditioning | Speed error calculation; speed error window control configuration; speed error step. | 350 |
| 25 Speed control | Speed controller settings. | 351 |
| 28 Frequency reference chain | Settings for the frequency reference chain. | 354 |
| 30 Limits | Drive operation limits. | 361 |
| 31 Fault functions | Configuration of external events; selection of behavior of the drive upon fault situations. | 368 |
| 32 Supervision | Configuration of signal supervision functions 1...6. | 377 |
| 34 Timed functions | Configuration of the timed functions. | 384 |
| 35 Motor thermal protection | Motor thermal protection settings such as temperature measurement configuration, load curve definition and motor fan control configuration; motor overload protection. | 392 |
| 36 Load analyzer | Peak value and amplitude logger settings. | 403 |
| 37 User load curve | Settings for user load curve. | 406 |
| 40 Process PID set 1 | Parameter values for process PID control. | 409 |
| 41 Process PID set 2 | A second set of parameter values for process PID control. | 426 |
| 43 Brake chopper | Settings for the internal brake chopper. | 428 |
| 45 Energy efficiency | Settings for the energy saving calculators as well as peak and energy loggers. | 430 |
| 46 Monitoring/scaling settings | Speed supervision settings; actual signal filtering; general scaling settings. | 435 |
| 47 Data storage | Data storage parameters that can be written to and read from using other parameters' source and target settings. | 438 |

| Group | Contents | Page |
|--|--|---------------------|
| <i>49 Panel port communication</i> | Communication settings for the control panel port on the drive. | 439 |
| <i>50 Fieldbus adapter (FBA)</i> | Fieldbus communication configuration. | 440 |
| <i>51 FBA A settings</i> | Fieldbus adapter A configuration. | 444 |
| <i>52 FBA A data in</i> | Selection of data to be transferred from drive to fieldbus controller through fieldbus adapter A. | 445 |
| <i>53 FBA A data out</i> | Selection of data to be transferred from fieldbus controller to drive through fieldbus adapter A. | 446 |
| <i>58 Embedded fieldbus</i> | Configuration of the embedded fieldbus (EFB) interface. | 446 |
| <i>60 DDCS communication</i> | DCS communication configuration. | 454 |
| <i>61 D2D and DDCS transmit data</i> | Defines the data sent to the DDCS link. | 454 |
| <i>62 D2D and DDCS receive data</i> | Defines the data sent to the DDCS link. | 455 |
| <i>71 External PID1</i> | Configuration of external PID. | 455 |
| <i>76 Multipump configuration</i> | Multipump configuration parameters. | 457 |
| <i>77 Multipump maintenance and monitoring</i> | Multipump maintenance and monitoring parameters. | 469 |
| <i>80 Flow calculation and protection</i> | Actual flow calculation. | 471 |
| <i>81 Sensor settings</i> | Sensor settings for inlet and outlet pressure protection function. | 475 |
| <i>82 Pump protections</i> | Settings for quick ramp functions. | 477 |
| <i>83 Pump cleaning</i> | Settings for the pump cleaning sequence. | 480 |
| <i>94 LSU control</i> | Control of the supply unit of the drive, such as DC voltage and reactive power reference. | 482 |
| <i>95 HW configuration</i> | Various hardware-related settings. | 484 |
| <i>96 System</i> | Language selection; access levels; macro selection; parameter save and restore; control unit reboot; user parameter sets; unit selection; parameter checksum calculation; user lock. | 487 |
| <i>97 Motor control</i> | Switching frequency; slip gain; voltage reserve; flux braking; anti-cogging (signal injection); IR compensation. | 497 |
| <i>98 User motor parameters</i> | Motor values supplied by the user that are used in the motor model. | 501 |
| <i>99 Motor data</i> | Motor configuration settings. | 503 |

Parameter listing

| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------|--|---|--------------------------------|
| 01 Actual values | | Basic signals for monitoring the drive. All parameters in this group are read-only unless otherwise noted. Note: Values of these actual signals are filtered with the filter time defined in group 46 Monitoring/scaling settings . The selection lists for parameters in other groups mean the raw value of the actual signal instead. For example, if a selection is "Output frequency" it does not point to the value of parameter 01.06 Output frequency but to the raw value. | |
| 01.01 | Motor speed used | Estimated motor speed. A filter time constant for this signal can be defined by parameter 46.11 Filter time motor speed . | - |
| | -30000.00... 30000.00 rpm | Estimated motor speed. | See par. 46.01 |
| 01.02 | Motor speed estimated | Estimated motor speed in rpm. A filter time constant for this signal can be defined by parameter 46.11 Filter time motor speed . | - |
| | -30000.00... 30000.00 rpm | Estimated motor speed. | See par. 46.01 |
| 01.03 | Motor speed % | Motor speed in percent of the synchronous motor speed. | - |
| | -1000.00... 1000.00% | Motor speed. | 10 = 1% |
| 01.06 | Output frequency | Estimated drive output frequency in Hz. A filter time constant for this signal can be defined by parameter 46.12 Filter time output frequency . | - |
| | -500.00...500.00 Hz | Estimated output frequency. | See par. 46.02 |
| 01.07 | Motor current | Measured (absolute) motor current in A. | - |
| | 0.00...30000.00 A | Motor current. | See par. 46.05 |
| 01.08 | Motor current % of motor nom | Motor current (drive output current) in percent of the nominal motor current. | - |
| | 0.0...1000.0% | Motor current. | 1 = 1% |
| 01.09 | Motor current % of drive nom | Motor current (drive output current) in percent of the nominal drive current. | - |
| | 0.0...1000.0% | Motor current. | 1 = 1% |
| 01.10 | Motor torque | Motor torque in percent of the nominal motor torque. See also parameter 01.30 Nominal torque scale . A filter time constant for this signal can be defined by parameter 46.13 Filter time motor torque . | - |
| | -1600.0...1600.0% | Motor torque. | See par. 46.03 |
| 01.11 | DC voltage | Measured DC link voltage. | - |
| | 0.00...2000.00 V | DC link voltage. | 10 = 1 V |
| 01.13 | Output voltage | Calculated motor voltage in V AC. | - |
| | 0...2000 V | Motor voltage. | 1 = 1 V |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------------|---|--------------------------------|
| 01.14 | <i>Output power</i> | Drive output power. The unit is selected by parameter 96.16 Unit selection . A filter time constant for this signal can be defined by parameter 46.14 Filter time power . | - |
| | -32768.00... 32767.00 kW | Output power. | See par. 46.04 |
| 01.15 | <i>Output power % of motor nom</i> | Output power in percent of the nominal motor power. | - |
| | -300.00... 300.00% | Output power. | 1 = 1% |
| 01.16 | <i>Output power % of drive nom</i> | Output power in percent of the nominal drive power. | - |
| | -300.00... 300.00% | Output power. | 1 = 1% |
| 01.17 | <i>Motor shaft power</i> | Estimated mechanical power at motor shaft. | - |
| | -32768.00... 32767.00 kW or hp | Motor shaft power. | 1 = 1 unit |
| 01.18 | <i>Inverter GWh counter</i> | Amount of energy that has passed through the drive (in either direction) in full gigawatt-hours. The minimum value is zero. | - |
| | 0...65535 GWh | Energy in GWh. | 1 = 1 GWh |
| 01.19 | <i>Inverter MWh counter</i> | Amount of energy that has passed through the drive (in either direction) in full megawatt-hours. Whenever the counter rolls over, 01.18 Inverter GWh counter is incremented. The minimum value is zero. | - |
| | 0...1000 MWh | Energy in MWh. | 1 = 1 MWh |
| 01.20 | <i>Inverter kWh counter</i> | Amount of energy that has passed through the drive (in either direction) in full kilowatt-hours. Whenever the counter rolls over, 01.19 Inverter MWh counter is incremented. The minimum value is zero. | - |
| | 0...1000 kWh | Energy in kWh. | 10 = 1 kWh |
| 01.24 | <i>Flux actual %</i> | Used flux reference in percent of nominal flux of motor. | - |
| | 0...200% | Flux reference. | 1 = 1% |
| 01.30 | <i>Nominal torque scale</i> | Torque that corresponds to 100% of nominal motor torque. The unit is selected by parameter 96.16 Unit selection . Note: This value is copied from parameter 99.12 Motor nominal torque if entered. Otherwise the value is calculated from other motor data. | - |
| | 0.000...4000000 N·m or lb·ft | Nominal torque. | 1 = 100 unit |
| 01.31 | <i>Ambient temperature</i> | Ambient temperature of the drive. Only for drive frames R6 or larger. | - |
| | 40.0...120.0 °C or °F | Temperature. | 1 = 1 ° |
| 01.50 | <i>Current hour kWh</i> | Current hour energy consumption. This is the energy of the last 60 minutes (not necessarily continuous) the drive has been running, not the energy of a calendar hour. If the power is cycled, after the drive is again up and running, the parameter value is set to the value it had before the power cycle. | - |
| | 0.00 ... 1000000.00 kWh | Energy. | 1 = 1 kWh |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|---|------------|
| 01.51 | <i>Previous hour kWh</i> | Previous hour energy consumption. The value <i>01.50 Current hour kWh</i> is stored here when its values has been cumulated for 60 minutes. If the power is cycled, after the drive is again up and running, the parameter value is set to the value it had before the power cycle. | - |
| | 0.00... 1000000.00 kWh | Energy. | 1 = 1 kWh |
| 01.52 | <i>Current day kWh</i> | Current day energy consumption. This is the energy of the last 24 hours (not necessarily continuous) the drive has been running, not the energy of a calendar day. If the power is cycled, after the drive is again up and running, the parameter value is set to the value it had before the power cycle. | - |
| | 0.00... 1000000.00 kWh | Energy. | 1 = 1 kWh |
| 01.53 | <i>Previous day kWh</i> | Previous day energy consumption. The value <i>01.52 Current day kWh</i> is stored here when its value has been cumulated for 24 hours. If the power is cycled, after the drive is again up and running, the parameter value is set to the value it had before the power cycle. | - |
| | 0.00... 1000000.00 kWh | Energy. | 1 = 1 kWh |
| 01.54 | <i>Cumulative inverter energy</i> | Amount of energy that has passed through the drive (in either direction) in full kilowatt-hours. The minimum value is zero. | - |
| | -200000000.0... 200000000.0 kWh | Energy in kWh. | 10 = 1 kWh |
| 01.55 | <i>Inverter GWh counter (resettable)</i> | Amount of energy that has passed through the drive (in either direction) in full gigawatt-hours. The minimum value is zero. You can reset the value by setting it to zero or by pressing the Reset softkey for 3 seconds. Resetting any of parameters <i>01.55...01.58</i> resets all of them. | - |
| | 0...65535 GWh | Energy in GWh. | 1 = 1 GWh |
| 01.56 | <i>Inverter MWh counter (resettable)</i> | Amount of energy that has passed through the drive (in either direction) in full megawatt-hours. Whenever the counter rolls over, <i>01.55 Inverter GWh counter (resettable)</i> is incremented. The minimum value is zero. You can reset the value by setting it to zero or by pressing the Reset softkey for 3 seconds. Resetting any of parameters <i>01.55...01.58</i> resets all of them. | - |
| | 0...1000 MWh | Energy in MWh. | 1 = 1 MWh |
| 01.57 | <i>Inverter kWh counter (resettable)</i> | Amount of energy that has passed through the drive (in either direction) in full kilowatt-hours. Whenever the counter rolls over, <i>01.56 Inverter MWh counter (resettable)</i> is incremented. The minimum value is zero. You can reset the value by setting it to zero or by pressing the Reset softkey for 3 seconds. Resetting any of parameters <i>01.55...01.58</i> resets all of them. | - |
| | 0...1000 kWh | Energy in kWh. | 10 = 1 kWh |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|--|---|-------------------|
| 01.58 | <i>Cumulative inverter energy (resettable)</i> | Amount of energy that has passed through the drive (in either direction) in full kilowatt-hours. The minimum value is zero. You can reset the value by setting it to zero or by pressing the Reset softkey for 3 seconds. Resetting any of parameters 01.55...01.58 resets all of them. | - |
| | -200000000.0... 200000000.0 kWh | Energy in kWh. | 10 = 1 kWh |
| 01.61 | <i>Abs motor speed used</i> | Absolute value of parameter 01.01 Motor speed used. | - |
| | 0.00... 30000.00 rpm | Estimated motor speed. | See par. 46.01 |
| 01.62 | <i>Abs motor speed %</i> | Absolute value of parameter 01.03 Motor speed %. | - |
| | 0.00... 1000.00% | Estimated motor speed. | 10 = 1% |
| 01.63 | <i>Abs output frequency</i> | Absolute value of parameter 01.06 Output frequency. | - |
| | 0.00...500.00 Hz | Estimated output frequency. | See par. 46.02 |
| 01.64 | <i>Abs motor torque</i> | Absolute value of parameter 01.10 Motor torque. | - |
| | 0.0...1600.0% | Motor torque. | See par. 46.03 |
| 01.65 | <i>Abs output power</i> | Absolute value of parameter 01.14 Output power. | - |
| | 0.00... 32767.00 kW | Output power. | 1 = 1 kW |
| 01.66 | <i>Abs output power % motor nom</i> | Absolute value of parameter 01.15 Output power % of motor nom. | - |
| | 0.00... 300.00% | Output power. | 1 = 1% |
| 01.67 | <i>Abs output power % drive nom</i> | Absolute value of parameter 01.16 Output power % of drive nom. | - |
| | 0.00... 300.00% | Output power. | 1 = 1% |
| 01.68 | <i>Abs motor shaft power</i> | Absolute value of parameter 01.17 Motor shaft power. | - |
| | 0.00... 32767.00 kW or hp | Motor shaft power. | 1 = 1 unit |
| 01.102 | <i>Line current</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated line current flowing through the supply unit. | - |
| | 0.00 ... 30000.00 A | Estimated line current. | See par. 46.05 |
| 01.104 | <i>Active current</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated active current flowing through the supply unit. | - |
| | 0.00 ... 30000.00 A | Estimated active current. | See par. 46.05 |
| 01.106 | <i>Reactive current</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated reactive current flowing through the supply unit. | - |
| | 0.00 ... 30000.00 A | Estimated reactive current. | See par. 46.05 |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|--------------------------------|--|-------------------|
| 01.108 | <i>Grid frequency</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated frequency of the power supply network. | - |
| | 0.00 ... 100.00 Hz | Estimated supply frequency. | See par. 46.02 |
| 01.109 | <i>Grid voltage</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated voltage of the power supply network. | - |
| | 0.00 ... 2000.00 V | Estimated supply voltage. | 10 = 1 V |
| 01.110 | <i>Grid apparent power</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated apparent power being transferred through the supply unit. | - |
| | -30000.00 ... 30000.00 kVA | Estimated apparent power. | See par. 46.04 |
| 01.112 | <i>Grid power</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated power being transferred through the supply unit. | - |
| | -30000.00 ... 30000.00 kW | Estimated supply power. | See par. 46.04 |
| 01.114 | <i>Grid reactive power</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated reactive power being transferred through the supply unit. | - |
| | -30000.00 ... 30000.00 kvar | Estimated reactive power. | 10 = 1 kvar |
| 01.116 | <i>LSU cos Phi</i> | (Only visible for ACQ580-31 and ACQ580-34). Power factor of the supply unit. | - |
| | -1.00 ... 1.00 | Power factor. | 100 = 1 |
| 01.164 | <i>LSU nominal power</i> | (Only visible for ACQ580-31 and ACQ580-34). Nominal power of the supply unit. | - |
| | 0...30000 kW | Nominal power. | 1 = 1 kW |

| | | | |
|----------------------------|-------------------------------|---|--------|
| 03 Input references | | Values of references received from various sources. All parameters in this group are read-only unless otherwise noted. | |
| 03.01 | <i>Panel reference</i> | Reference 1 given from the control panel or PC tool. | - |
| | -100000.00... 100000.00 | Control panel or PC tool reference. | 1 = 10 |
| 03.02 | <i>Panel reference remote</i> | Reference 2 given from the control panel or PC tool. | - |
| | -100000.00... 100000.00 | Control panel or PC tool reference. | 1 = 10 |
| 03.05 | <i>FB A reference 1</i> | Reference 1 received through fieldbus adapter A. See also chapter <i>Fieldbus control through a fieldbus adapter</i> | - |
| | -100000.00... 100000.00 | Reference 1 from fieldbus adapter A. | 1 = 10 |
| 03.06 | <i>FB A reference 2</i> | Reference 2 received through fieldbus adapter A. | - |
| | -100000.00... 100000.00 | Reference 2 from fieldbus adapter A. | 1 = 10 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------------|------------------------------------|--|------------|
| 03.09 | EFB reference 1 | Scaled reference 1 received through the embedded fieldbus interface. | 1 = 10 |
| | -30000.00... 30000.00 | Scaled reference 1 received through the embedded fieldbus interface. | 1 = 10 |
| 03.10 | EFB reference 2 | Scaled reference 2 received through the embedded fieldbus interface. | 1 = 10 |
| | -30000.00... 30000.00 | Scaled reference 2 received through the embedded fieldbus interface. | 1 = 10 |
| 04 Warnings and faults | | Information on warnings and faults that occurred last. For explanations of individual warning and fault codes, see chapter Fault tracing . All parameters in this group are read-only unless otherwise noted. Fault and event logs can be cleared with parameter 96.51 Clear fault and event logger . | |
| 04.01 | Tripping fault | Code of the 1st active fault (the fault that caused the current trip). | - |
| | 0000h...FFFFh | 1st active fault. | 1 = 1 |
| 04.02 | Active fault 2 | Code of the 2nd active fault. | - |
| | 0000h...FFFFh | 2nd active fault. | 1 = 1 |
| 04.03 | Active fault 3 | Code of the 3rd active fault. | - |
| | 0000h...FFFFh | 3rd active fault. | 1 = 1 |
| 04.06 | Active warning 1 | Code of the 1st active warning. | - |
| | 0000h...FFFFh | 1st active warning. | 1 = 1 |
| 04.07 | Active warning 2 | Code of the 2nd active warning. | - |
| | 0000h...FFFFh | 2nd active warning. | 1 = 1 |
| 04.08 | Active warning 3 | Code of the 3rd active warning. | - |
| | 0000h...FFFFh | 3rd active warning. | 1 = 1 |
| 04.11 | Latest fault | Code of the 1st stored (non-active) fault. | - |
| | 0000h...FFFFh | 1st stored fault. | 1 = 1 |
| 04.12 | 2nd latest fault | Code of the 2nd stored (non-active) fault. | - |
| | 0000h...FFFFh | 2nd stored fault. | 1 = 1 |
| 04.13 | 3rd latest fault | Code of the 3rd stored (non-active) fault. | - |
| | 0000h...FFFFh | 3rd stored fault. | 1 = 1 |
| 04.16 | Latest warning | Code of the 1st stored (non-active) warning. | - |
| | 0000h...FFFFh | 1st stored warning. | 1 = 1 |
| 04.17 | 2nd latest warning | Code of the 2nd stored (non-active) warning. | - |
| | 0000h...FFFFh | 2nd stored warning. | 1 = 1 |
| 04.18 | 3rd latest warning | Code of the 3rd stored (non-active) warning. | - |
| | 0000h...FFFFh | 3rd stored warning. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | |
|--|--------------------------|---|------------|-----|------|-------------|---|------------|---|---|------------|---|-----|-----|-----|----|-------------|---|
| 04.40 | Event word 1 | User-defined event word. This word collects the status of the events (warnings, faults or pure events) selected by parameters 04.41...04.71. This parameter is read-only. | - | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>User bit 0</td><td>1 = Event selected by parameter 04.41 is active</td></tr><tr><td>1</td><td>User bit 1</td><td>1 = Event selected by parameter 04.43 is active</td></tr><tr><td>...</td><td>...</td><td>...</td></tr><tr><td>15</td><td>User bit 15</td><td>1 = Event selected by parameter 04.71 is active</td></tr></table> | | | | Bit | Name | Description | 0 | User bit 0 | 1 = Event selected by parameter 04.41 is active | 1 | User bit 1 | 1 = Event selected by parameter 04.43 is active | ... | ... | ... | 15 | User bit 15 | 1 = Event selected by parameter 04.71 is active |
| Bit | Name | Description | | | | | | | | | | | | | | | | |
| 0 | User bit 0 | 1 = Event selected by parameter 04.41 is active | | | | | | | | | | | | | | | | |
| 1 | User bit 1 | 1 = Event selected by parameter 04.43 is active | | | | | | | | | | | | | | | | |
| ... | ... | ... | | | | | | | | | | | | | | | | |
| 15 | User bit 15 | 1 = Event selected by parameter 04.71 is active | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | User-defined event word. | 1 = 1 | | | | | | | | | | | | | | | |
| 04.41 | Event word 1 bit 0 code | Selects the hexadecimal code of an event (warning, fault or pure event) whose status is shown as bit 0 of 04.40 Event word 1. The event codes are listed in chapter Fault tracing (page 177). | 2310h | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Code of event. | 1 = 1 | | | | | | | | | | | | | | | |
| 04.43 | Event word 1 bit 1 code | Selects the hexadecimal code of an event (warning, fault or pure event) whose status is shown as bit 1 of 04.40 Event word 1. The event codes are listed in chapter Fault tracing (page 177). | 3210h | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Code of event. | 1 = 1 | | | | | | | | | | | | | | | |
| 04.45 | Event word 1 bit 2 code | ... | 4310h | | | | | | | | | | | | | | | |
| 04.47 | Event word 1 bit 3 code | ... | 2340h | | | | | | | | | | | | | | | |
| 04.49 | Event word 1 bit 4 code | ... | 0000h | | | | | | | | | | | | | | | |
| 04.51 | Event word 1 bit 5 code | ... | 3220h | | | | | | | | | | | | | | | |
| 04.53 | Event word 1 bit 6 code | ... | 80A0h | | | | | | | | | | | | | | | |
| 04.55 | Event word 1 bit 7 code | ... | 0000h | | | | | | | | | | | | | | | |
| 04.57 | Event word 1 bit 8 code | ... | 7122h | | | | | | | | | | | | | | | |
| 04.59 | Event word 1 bit 9 code | ... | 7081h | | | | | | | | | | | | | | | |
| 04.61 | Event word 1 bit 10 code | ... | FF61h | | | | | | | | | | | | | | | |
| 04.63 | Event word 1 bit 11 code | ... | 7121h | | | | | | | | | | | | | | | |
| 04.65 | Event word 1 bit 12 code | ... | 4110h | | | | | | | | | | | | | | | |
| 04.67 | Event word 1 bit 13 code | ... | 9081h | | | | | | | | | | | | | | | |
| 04.69 | Event word 1 bit 14 code | ... | 9082h | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|----------------------------------|---|------------|
| 04.71 | Event word 1 bit 15 code | Selects the hexadecimal code of an event (warning, fault or pure event) whose status is shown as bit 15 of 04.40 Event word 1 . The event codes are listed in chapter Fault tracing (page 177). | 2330h |
| | 0000h...FFFFh | Code of event. | 1 = 1 |
| 05 Diagnostics | | | |
| | | Various run-time-type counters and measurements related to drive maintenance. All parameters in this group are read-only unless otherwise noted. | |
| 05.01 | On-time counter | On-time counter. The counter runs when the drive is powered. | - |
| | 0...65535 d | On-time counter. | 1 = 1 d |
| 05.02 | Run-time counter | Motor run-time counter in full days. The counter runs when the inverter modulates. | - |
| | 0...65535 d | Motor run-time counter. | 1 = 1 d |
| 05.03 | Hours run | Corresponding parameter to 05.02 Run-time counter in hours, that is, 24 * 05.02 value + fractional part of a day. | - |
| | 0.0... 429496729.5 h | Hours. | 1 = 1 h |
| 05.04 | Fan on-time counter | Running time of the drive cooling fan. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | - |
| | 0...65535 d | Cooling fan run-time counter. | 1 = 1 d |
| 05.08 | Cabinet temperature | (Only visible for ACQ580-07 cabinet drives). Temperature inside the cabinet. Activated by bit 6 of parameter 95.21 HW options word 2 . | - |
| | -40... 120 °C or °F | Temperature inside the cabinet in degrees Celsius or Fahrenheit. | 1 = 1 unit |
| 05.10 | Control board temperature | Measured temperature of the control board | - |
| | -100... 300 °C or °F | Control board temperature in degrees Celsius or Fahrenheit. | 1 = 1 unit |
| 05.11 | Inverter temperature | Estimated drive temperature in percent of fault limit. The fault limit varies according to the type of the drive. 0.0% = 0 °C (32 °F) 100.0% = Fault limit | - |
| | -40.0...160.0% | Drive temperature in percent. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------|---|------------|
| 05.20 | Diagnostic word 1 | Diagnostic word 1. For possible causes and remedies, see chapter <i>Fault tracing</i> . | - |

| Bit | Name | Value |
|---------|----------------------|---|
| 0 | Any warning or fault | 1 = Yes = Drive has generated a warning or tripped on a fault. 0 = None active = No warning or fault active. |
| 1 | Any warning | 1 = Yes = Drive has generated a warning. 0 = None active = No warning active. |
| 2 | Any fault | 1 = Yes = Drive has tripped on a fault. 0 = None active = No fault active. |
| 3 | Reserved | |
| 4 | Overcurrent fit | Yes = Drive has tripped on fault <i>2310 Overcurrent</i> |
| 5 | Reserved | |
| 6 | DC overvoltage | Yes = Drive has tripped on fault <i>3210 DC link overvoltage</i> . |
| 7 | DC undervoltage | Yes = Drive has tripped on fault <i>3220 DC link undervoltage</i> . |
| 8 | Reserved | |
| 9 | Device overtemp fit | Yes = Drive has tripped on fault <i>4310 Excess temperature</i> . |
| 10...15 | Reserved | |

| | | | |
|---------------|--|--------------------|-------|
| 0000h...FFFFh | | Diagnostic word 1. | 1 = 1 |
|---------------|--|--------------------|-------|

| | | | |
|-------|-------------------|---|---|
| 05.21 | Diagnostic word 2 | Diagnostic word 2. For possible causes and remedies, see chapter <i>Fault tracing</i> . | - |
|-------|-------------------|---|---|

| Bit | Name | Value |
|---------|--------------------|---|
| 0...9 | Reserved | |
| 10 | Motor overtemp fit | Yes = Drive has tripped on fault <i>4981 External temperature 1</i> or <i>4982 External temperature 2</i> . |
| 11...15 | Reserved | |

| | | | |
|---------------|--|--------------------|-------|
| 0000h...FFFFh | | Diagnostic word 2. | 1 = 1 |
|---------------|--|--------------------|-------|

| | | | |
|-------|-------------------|--------------------|---|
| 05.22 | Diagnostic word 3 | Diagnostic word 3. | - |
|-------|-------------------|--------------------|---|

| Bit | Name | Value |
|---------|-------------|--|
| 0...8 | Reserved | |
| 9 | kWh pulse | Yes = kWh pulse is active. |
| 10 | Reserved | |
| 11 | Fan command | On = Drive fan is rotating above idle speed. |
| 12...15 | Reserved | |

| | | | |
|---------------|--|--------------------|-------|
| 0000h...FFFFh | | Diagnostic word 3. | 1 = 1 |
|---------------|--|--------------------|-------|

| | | | |
|-------|----------------------|---|---|
| 05.80 | Motor speed at fault | Copy of parameter <i>01.01 Motor speed used</i> at the occurrence of the latest fault. Parameters <i>05.80...05.89</i> are shown for each fault in the fault log. | - |
|-------|----------------------|---|---|

| | | |
|------------------------------|------------------------|--|
| -30000.00... 30000.00 rpm | Estimated motor speed. | |
|------------------------------|------------------------|--|

| No. | Name/Value | Description | Def/FbEq16 |
|--------|---|---|------------|
| 05.81 | <i>Output frequency at fault</i> | Copy of parameter <i>01.06 Output frequency</i> at the occurrence of the latest fault. | - |
| | -500.00...500.00 Hz | Estimated output frequency. | |
| 05.82 | <i>DC voltage at fault</i> | Copy of parameter <i>01.11 DC voltage</i> at the occurrence of the latest fault. | - |
| | 0.00...2000.00 V | DC link voltage. | 10 = 1 V |
| 05.83 | <i>Motor current at fault</i> | Copy of parameter <i>01.07 Motor current</i> at the occurrence of the latest fault. | - |
| | 0.00...30000.00 A | Motor current. | 10 = 1 V |
| 05.84 | <i>Motor torque at fault</i> | Copy of parameter <i>01.10 Motor torque</i> at the occurrence of the latest fault. | - |
| | -1600.0...1600.0% | Motor torque. | |
| 05.85 | <i>Main status word at fault</i> | Copy of parameter <i>06.11 Main status word</i> at the occurrence of the latest fault. | - |
| | 0000h...FFFFh | Main status word. | 1 = 1 |
| 05.86 | <i>DI delayed status at fault</i> | Copy of parameter <i>10.02 DI delayed status</i> at the occurrence of the latest fault. | - |
| | 0000h...FFFFh | Delayed status for digital inputs. | 1 = 1 |
| 05.87 | <i>Inverter temperature at fault</i> | Copy of parameter <i>05.11 Inverter temperature</i> at the occurrence of the latest fault. | - |
| | -40...160 °C | Drive temperature in °C. | 1 = 1 |
| 05.88 | <i>Reference used at fault</i> | Copy of parameter <i>28.01 Frequency ref ramp input</i> (in scalar control mode) or <i>23.01 Speed ref ramp input</i> (in speed control mode) at the occurrence of the latest fault. | - |
| | -500.00...500.00 Hz or -30000.00...30000.00 rpm | Frequency or speed reference | 1 = 1 |
| 05.89 | <i>Hand-off-auto status word at fault</i> | Copy of parameter <i>06.22 Hand-off-auto status word</i> at the occurrence of the latest fault. | - |
| | 0000h...FFFFh | | 1 = 1 |
| 05.111 | <i>Line converter temperature</i> | (Only visible for ACQ580-31 and ACQ580-34). Estimated supply unit temperature in percent of fault limit. 0.0% = 0 °C (32 °F) 94% approx. = Warning limit 100.0% = Fault limit | - |
| | -40.0 ... 160.0% | Supply unit temperature in percent. | 1 = 1% |
| 05.121 | <i>MCB closing counter</i> | (Only visible for ACQ580-31 and ACQ580-34). Counts the closures of the main circuit breaker of the supply unit. | - |
| | 0...4294967295 | Count of closures of main circuit breaker. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|-------------------|---|------------|------|---|--------------|---|--------------|---|--------------|---|-----|---|---------------|---|-----------|---|--------------|---|-------|---|----------|---|----------|----|------------|----|--------------|----|------------|----|------------|----|------------|----|------------|---|
| 06 Control and status words | | Drive control and status words. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 06.01 | Main control word | <p>The main control word of the drive. This parameter shows the control signals as received from the selected sources (such as digital inputs, the fieldbus interfaces and the application program).</p> <p>For the control word bit descriptions see page 245. The related status word and state diagram are presented on pages 246 and 247 respectively.</p> <p>This parameter is read-only.</p> <p>Note: When using fieldbus control, this parameter value is not the same as the Control word value that the drive receives from the PLC. For the exact value, see 50.12 FBA A debug mode.</p> <table><tr><th>Bit</th><th>Name</th></tr><tr><td>0</td><td>Off1 control</td></tr><tr><td>1</td><td>Off2 control</td></tr><tr><td>2</td><td>Off3 control</td></tr><tr><td>3</td><td>Run</td></tr><tr><td>4</td><td>Ramp out zero</td></tr><tr><td>5</td><td>Ramp hold</td></tr><tr><td>6</td><td>Ramp in zero</td></tr><tr><td>7</td><td>Reset</td></tr><tr><td>8</td><td>Reserved</td></tr><tr><td>9</td><td>Reserved</td></tr><tr><td>10</td><td>Remote cmd</td></tr><tr><td>11</td><td>Ext ctrl loc</td></tr><tr><td>12</td><td>User bit 0</td></tr><tr><td>13</td><td>User bit 1</td></tr><tr><td>14</td><td>User bit 2</td></tr><tr><td>15</td><td>User bit 3</td></tr></table> | Bit | Name | 0 | Off1 control | 1 | Off2 control | 2 | Off3 control | 3 | Run | 4 | Ramp out zero | 5 | Ramp hold | 6 | Ramp in zero | 7 | Reset | 8 | Reserved | 9 | Reserved | 10 | Remote cmd | 11 | Ext ctrl loc | 12 | User bit 0 | 13 | User bit 1 | 14 | User bit 2 | 15 | User bit 3 | - |
| Bit | Name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Off1 control | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Off2 control | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Off3 control | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Ramp out zero | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Ramp hold | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Ramp in zero | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Remote cmd | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Ext ctrl loc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | User bit 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | User bit 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | User bit 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | User bit 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Main control word. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|---------------------|---|------------|------|---|--------------------|---|-----------|---|-----------|---|---------|---|----------------|---|----------------|---|---------------------|---|---------|---|-------------|---|--------|----|-------------|----|------------|----|------------|----|------------|----|------------|----|----------|---|
| 06.11 | Main status word | <p>Main status word of the drive.</p> <p>For the status word bit descriptions see page 246. The related control word and state diagram are presented on pages 245 and 247 respectively.</p> <p>This parameter is read-only.</p> <p>Note: When using fieldbus control, this parameter value is not the same as the Status word value that the drive sends to the PLC. For the exact value, see 50.12 FBA A debug mode.</p> <table><tr><th>Bit</th><th>Name</th></tr><tr><td>0</td><td>Ready to switch ON</td></tr><tr><td>1</td><td>Ready run</td></tr><tr><td>2</td><td>Ready ref</td></tr><tr><td>3</td><td>Tripped</td></tr><tr><td>4</td><td>Off 2 inactive</td></tr><tr><td>5</td><td>Off 3 inactive</td></tr><tr><td>6</td><td>Switch-on inhibited</td></tr><tr><td>7</td><td>Warning</td></tr><tr><td>8</td><td>At setpoint</td></tr><tr><td>9</td><td>Remote</td></tr><tr><td>10</td><td>Above limit</td></tr><tr><td>11</td><td>User bit 0</td></tr><tr><td>12</td><td>User bit 1</td></tr><tr><td>13</td><td>User bit 2</td></tr><tr><td>14</td><td>User bit 3</td></tr><tr><td>15</td><td>Reserved</td></tr></table> | Bit | Name | 0 | Ready to switch ON | 1 | Ready run | 2 | Ready ref | 3 | Tripped | 4 | Off 2 inactive | 5 | Off 3 inactive | 6 | Switch-on inhibited | 7 | Warning | 8 | At setpoint | 9 | Remote | 10 | Above limit | 11 | User bit 0 | 12 | User bit 1 | 13 | User bit 2 | 14 | User bit 3 | 15 | Reserved | - |
| Bit | Name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Ready to switch ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Ready run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Ready ref | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Tripped | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Off 2 inactive | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Off 3 inactive | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Switch-on inhibited | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Warning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | At setpoint | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Remote | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Above limit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | User bit 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | User bit 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | User bit 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | User bit 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Main status word. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------|--|------------|
| 06.16 | Drive status word 1 | Drive status word 1. This parameter is read-only. | - |

| Bit | Name | Description |
|-----|---------------------|---|
| 0 | Enabled | 1 = If start interlock signals (par. 20.41...20.44) are all present. Note: This bit is not affected by the presence of a fault. |
| 1 | Inhibited | 1 = Start inhibited. To start the drive, the inhibiting signal (see par. 06.18) must be removed and the start signal cycled. |
| 2 | DC charged | 1 = DC circuit has been charged |
| 3 | Ready to start | 1 = Drive is ready to receive a start command |
| 4 | Following reference | 1 = Drive is ready to follow given reference |
| 5 | Started | 1 = Drive has been started |
| 6 | Modulating | 1 = Drive is modulating (output stage is being controlled) |
| 7 | Limiting | 1 = Any operating limit (speed, torque, etc.) is active |
| 8 | Local control | 1 = Drive is in local control |
| 9 | Network control | 1 = Drive is in network control (see page 18). |
| 10 | Ext1 active | 1 = Control location EXT1 active |
| 11 | Ext2 active | 1 = Control location EXT2 active |
| 12 | Reserved | |
| 13 | Start request | 1 = If Start requested. 0 = When Run permissive signal (see par. 20.40) is 0. |
| 14 | Running | 1 = Drive is controlling speed or frequency, in PID sleep or pre-magnetization. |
| 15 | Reserved | |

| | | |
|---------------|----------------------|-------|
| 0000h...FFFFh | Drive status word 1. | 1 = 1 |
|---------------|----------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------|--|------------|
| 06.17 | Drive status word 2 | Drive status word 2. This parameter is read-only. | - |

| Bit | Name | Description |
|---------|-------------------------|---|
| 0 | Identification run done | 1 = Motor identification (ID) run has been performed |
| 1 | Magnetized | 1 = The motor has been magnetized |
| 2 | Reserved | |
| 3 | Speed control | 1 = Speed control mode active |
| 4 | Reserved | |
| 5 | Safe reference active | 1 = A "safe" reference is applied by functions such as parameters 49.05 and 50.02 |
| 6 | Last speed active | 1 = A "last speed" reference is applied by functions such as parameters 49.05 and 50.02 |
| 7 | Reserved | |
| 8 | Emergency stop failed | 1 = Emergency stop failed (see parameters 31.32 and 31.33) |
| 9 | Reserved | |
| 10 | Above limit | 1 = Actual speed or frequency equals or exceeds limit (defined by parameters 46.31 ... 46.32). Valid in both directions of rotation. |
| 11...12 | Reserved | |
| 13 | Start delay active | 1 = Start delay (par. 21.22) active. |
| 14...15 | Reserved | |

| | | |
|---------------|----------------------|-------|
| 0000h...FFFFh | Drive status word 2. | 1 = 1 |
|---------------|----------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------|--|------------|
| 06.18 | Start inhibit status word | Start inhibit status word. This word specifies the source of the inhibiting signal that is preventing the drive from starting. The conditions marked with an asterisk (*) only require that the start command is cycled. In all other instances, the inhibiting condition must be removed first. See also parameter 06.16 Drive status word 1, bit 1. This parameter is read-only. | - |

| Bit | Name | Description |
|-----|---------------------------|---|
| 0 | Not ready run | 1 = DC voltage is missing or drive has not been parametrized correctly. Check the parameters in groups 95 and 99. |
| 1 | Ctrl location changed | * 1 = Control location has changed |
| 2 | SSW inhibit | 1 = Control program is keeping itself in inhibited state |
| 3 | Fault reset | * 1 = A fault has been reset |
| 4 | Start interlocked | 1 = Start interlocked |
| 5 | Run permissive | 1 = Run permissive signal missing |
| 6 | Reserved | |
| 7 | STO | 1 = Safe torque off function active |
| 8 | Current calibration ended | * 1 = Current calibration routine has finished |
| 9 | ID run ended | * 1 = Motor identification run has finished |
| 10 | Reserved | |
| 11 | Em Off1 | 1 = Emergency stop signal (mode off1) |
| 12 | Em Off2 | 1 = Emergency stop signal (mode off2) |
| 13 | Em Off3 | 1 = Emergency stop signal (mode off3) |
| 14 | Auto reset inhibit | 1 = The autoreset function is inhibiting operation |
| 15 | Reserved | |

| | | |
|---------------|----------------------------|-------|
| 0000h...FFFFh | Start inhibit status word. | 1 = 1 |
|---------------|----------------------------|-------|

| | | | |
|-------|---------------------------|---|---|
| 06.19 | Speed control status word | Speed control status word. This parameter is read-only. | - |
|-------|---------------------------|---|---|

| Bit | Name | Description |
|--------|----------------------------|---|
| 0 | Zero speed | 1 = Drive has been running below zero speed limit (par. 21.06) for a time defined by parameter 21.07 Zero speed delay |
| 1 | Forward | 1 = Drive is running in forward direction above zero speed limit (par. 21.06) |
| 2 | Reverse | 1 = Drive is running in reverse direction above zero speed limit (par. 21.06) |
| 3...6 | Reserved | |
| 7 | Any constant speed request | 1 = A constant speed or frequency has been selected; see par. 06.20. |
| 8...15 | Reserved | |

| | | |
|---------------|----------------------------|-------|
| 0000h...FFFFh | Speed control status word. | 1 = 1 |
|---------------|----------------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------|--|------------|
| 06.20 | Constant speed status word | Constant speed/frequency status word. Indicates which constant speed or frequency is active (if any). See also parameter 06.19 Speed control status word, bit 7, and section Constant speeds/frequencies (page 170). This parameter is read-only. | - |

| Bit | Name | Description |
|--------|------------------|--|
| 0 | Constant speed 1 | 1 = Constant speed or frequency 1 selected |
| 1 | Constant speed 2 | 1 = Constant speed or frequency 2 selected |
| 2 | Constant speed 3 | 1 = Constant speed or frequency 3 selected |
| 3 | Constant speed 4 | 1 = Constant speed or frequency 4 selected |
| 4 | Constant speed 5 | 1 = Constant speed or frequency 5 selected |
| 5 | Constant speed 6 | 1 = Constant speed or frequency 6 selected |
| 6 | Constant speed 7 | 1 = Constant speed or frequency 7 selected |
| 7...15 | Reserved | |

| | | | |
|---------------|---------------------------------------|--|---|
| 0000h...FFFFh | Constant speed/frequency status word. | 1 = 1 | |
| 06.21 | Drive status word 3 | Drive status word 3. This parameter is read-only. | - |

| Bit | Name | Description |
|--------|--------------------------|---------------------------------|
| 0 | DC hold active | 1 = DC hold is active |
| 1 | Post-magnetizing active | 1 = Post-magnetizing is active |
| 2 | Motor pre-heating active | 1 = Motor pre-heating is active |
| 3 | PM smooth start active | 1 = PM smooth start active |
| 4...15 | Reserved | |

| | | |
|---------------|----------------------|-------|
| 0000h...FFFFh | Drive status word 1. | 1 = 1 |
|---------------|----------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---------------------------|---|----------------|-----|------|-------------|---|-----------|--|---|----------|---|---|-----------|---|---|----------|--|---|-------------|---|-------|----------|--|---|----------------|---|---|-------------------|---|---|-------------------|---|----|-------------------|---|----|-------------------|---|----|----------------------|---|---------|----------|--|
| 06.22 | Hand-off-auto status word | ACQ580 specific status word. This parameter is read-only. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>Hand mode</td><td>0 = Drive is not operated from the control panel in the Hand mode; 1 = Drive is operated from the control panel in the Hand mode</td></tr><tr><td>1</td><td>Off mode</td><td>0 = Drive is not in the Off mode; 1 = Drive is in the Off mode.</td></tr><tr><td>2</td><td>Auto mode</td><td>0 = Drive is not in the Auto mode; 1 = Drive is in the Auto mode.</td></tr><tr><td>3</td><td>Reserved</td><td></td></tr><tr><td>4</td><td>Pre-heating</td><td>0 = Motor pre-heating is not active; 1 = Motor pre-heating is active.</td></tr><tr><td>5...6</td><td>Reserved</td><td></td></tr><tr><td>7</td><td>Run permissive</td><td>0 = Run permissive is not present, drive is not allowed to run; 1 = Run permissive is present, drive is allowed to run.</td></tr><tr><td>8</td><td>Start interlock 1</td><td>0 = Start interlock 1 is not present, drive is not allowed to start; 1 = Start interlock 1 is present, drive is allowed to start.</td></tr><tr><td>9</td><td>Start interlock 2</td><td>0 = Start interlock 2 is not present, drive is not allowed to start; 1 = Start interlock 2 is present, drive is allowed to start.</td></tr><tr><td>10</td><td>Start interlock 3</td><td>0 = Start interlock 3 is not present, drive is not allowed to start; 1 = Start interlock 3 is present, drive is allowed to start.</td></tr><tr><td>11</td><td>Start interlock 4</td><td>0 = Start interlock 4 is not present, drive is not allowed to start; 1 = Start interlock 4 is present, drive is allowed to start.</td></tr><tr><td>12</td><td>All start interlocks</td><td>0 = One or more of Start interlock 1, Start interlock 2, Start interlock 3 or Start interlock 4 is not present, drive is not allowed to start; 1 = Start interlock 1 and Start interlock 2 and Start interlock 3 and Start interlock 4 are all present, drive is allowed to start.</td></tr><tr><td>13...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Description | 0 | Hand mode | 0 = Drive is not operated from the control panel in the Hand mode; 1 = Drive is operated from the control panel in the Hand mode | 1 | Off mode | 0 = Drive is not in the Off mode; 1 = Drive is in the Off mode. | 2 | Auto mode | 0 = Drive is not in the Auto mode; 1 = Drive is in the Auto mode. | 3 | Reserved | | 4 | Pre-heating | 0 = Motor pre-heating is not active; 1 = Motor pre-heating is active. | 5...6 | Reserved | | 7 | Run permissive | 0 = Run permissive is not present, drive is not allowed to run; 1 = Run permissive is present, drive is allowed to run. | 8 | Start interlock 1 | 0 = Start interlock 1 is not present, drive is not allowed to start; 1 = Start interlock 1 is present, drive is allowed to start. | 9 | Start interlock 2 | 0 = Start interlock 2 is not present, drive is not allowed to start; 1 = Start interlock 2 is present, drive is allowed to start. | 10 | Start interlock 3 | 0 = Start interlock 3 is not present, drive is not allowed to start; 1 = Start interlock 3 is present, drive is allowed to start. | 11 | Start interlock 4 | 0 = Start interlock 4 is not present, drive is not allowed to start; 1 = Start interlock 4 is present, drive is allowed to start. | 12 | All start interlocks | 0 = One or more of Start interlock 1, Start interlock 2, Start interlock 3 or Start interlock 4 is not present, drive is not allowed to start; 1 = Start interlock 1 and Start interlock 2 and Start interlock 3 and Start interlock 4 are all present, drive is allowed to start. | 13...15 | Reserved | |
| Bit | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Hand mode | 0 = Drive is not operated from the control panel in the Hand mode; 1 = Drive is operated from the control panel in the Hand mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Off mode | 0 = Drive is not in the Off mode; 1 = Drive is in the Off mode. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Auto mode | 0 = Drive is not in the Auto mode; 1 = Drive is in the Auto mode. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Pre-heating | 0 = Motor pre-heating is not active; 1 = Motor pre-heating is active. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5...6 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Run permissive | 0 = Run permissive is not present, drive is not allowed to run; 1 = Run permissive is present, drive is allowed to run. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Start interlock 1 | 0 = Start interlock 1 is not present, drive is not allowed to start; 1 = Start interlock 1 is present, drive is allowed to start. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Start interlock 2 | 0 = Start interlock 2 is not present, drive is not allowed to start; 1 = Start interlock 2 is present, drive is allowed to start. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Start interlock 3 | 0 = Start interlock 3 is not present, drive is not allowed to start; 1 = Start interlock 3 is present, drive is allowed to start. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Start interlock 4 | 0 = Start interlock 4 is not present, drive is not allowed to start; 1 = Start interlock 4 is present, drive is allowed to start. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | All start interlocks | 0 = One or more of Start interlock 1, Start interlock 2, Start interlock 3 or Start interlock 4 is not present, drive is not allowed to start; 1 = Start interlock 1 and Start interlock 2 and Start interlock 3 and Start interlock 4 are all present, drive is allowed to start. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13...15 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 06.29 | MSW bit 10 selection | Selects a binary source whose status is transmitted as bit 10 (User bit 0) of 06.11 Main status word. | Above limit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | False | 0. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | True | 1. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Above limit | Bit 10 of 06.17 Drive status word 2 (see page 288). | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 06.30 | MSW bit 11 selection | Selects a binary source whose status is transmitted as bit 11 (User bit 0) of 06.11 Main status word. | Ext ctrl loc | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | False | 0. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | True | 1. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ext ctrl loc | Bit 11 of 06.01 Main control word (see page 286). | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 06.31 | MSW bit 12 selection | Selects a binary source whose status is transmitted as bit 12 (User bit 1) of 06.11 Main status word. | Ext run enable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | False | 0. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | True | 1. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------|---|--------------|
| | Ext run enable | Inverted bit 5 of <i>06.18 Start inhibit status word</i> status word (see page 289). | 2 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 06.32 | <i>MSW bit 13 selection</i> | Selects a binary source whose status is transmitted as bit 13 (User bit 2) of <i>06.11 Main status word</i> . | <i>False</i> |
| | False | 0. | 0 |
| | True | 1. | 1 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 06.33 | <i>MSW bit 14 selection</i> | Selects a binary source whose status is transmitted as bit 14 (User bit 3) of <i>06.11 Main status word</i> . | <i>False</i> |
| | False | 0. | 0 |
| | True | 1. | 1 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 06.36 | <i>LSU Status word</i> | <i>(Only visible for ACQ580-31 and ACQ580-34).</i> Shows the status of the supply unit. See also section <i>Control of a line supply unit (LSU)</i> (page 93), and parameter group <i>60 DDCS communication</i> . This parameter is read-only. | - |

| Bit | Name | Description |
|---------|-----------------------|--|
| 0 | Ready on | 1 = Ready to switch on |
| 1 | Ready run | 1 = Ready to operate, DC link charged |
| 2 | Ready ref | 1 = Operation enabled |
| 3 | Tripped | 1 = A fault is active |
| 4...6 | Reserved | |
| 7 | Warning | 1 = A warning is active |
| 8 | Modulating | 1 = The supply unit is modulating |
| 9 | Remote | 1 = Remote control (EXT1 or EXT2) 0 = Local control |
| 10 | Net ok | 1 = Supply network voltage OK |
| 11...12 | Reserved | |
| 13 | Charging or ready run | 1 = Bit 1 or bit 14 active |
| 14 | Charging | 1 = Charging circuit is active 0 = Charging circuit is not active |
| 15 | Reserved | |

| | | |
|---------------|--------------------------|-------|
| 0000h...FFFFh | Supply unit status word. | 1 = 1 |
|---------------|--------------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------|---|------------|
| 06.39 | Internal state machine LSU CW | (Only visible for ACQ580-31 and ACQ580-34). Shows the control word sent to the supply unit from the INU-LSU (inverter unit/supply unit) state machine. This parameter is read-only. | - |

| Bit | Name | Description |
|--------|----------|--|
| 0 | ON/OFF | 1 = Start charging 0 = Open main contactor (switch power off) |
| 1 | OFF 2 | 0 = Emergency stop (Off2) |
| 2 | OFF 3 | 0 = Emergency stop (Off3) |
| 3 | START | 1 = Start modulating 0 = Stop modulating |
| 4...6 | Reserved | |
| 7 | RESET | 0 -> 1 = Reset an active fault. A fresh start command is required after reset. |
| 8...15 | Reserved | |

| | | |
|---------------|---------------------------|-------|
| 0000h...FFFFh | Supply unit control word. | 1 = 1 |
|---------------|---------------------------|-------|

| | | | |
|--------|-------------------------|--|---|
| 06.116 | LSU drive status word 1 | (Only visible for ACQ580-31 and ACQ580-34). Drive status word 1 received from the supply unit. See also section Control of a line supply unit (LSU) (page 93), and parameter group 60 DDCS communication . This parameter is read-only. | - |
|--------|-------------------------|--|---|

| Bit | Name | Description |
|---------|-------------------|---|
| 0 | Enabled | 1 = Run enable and start enable signals are present |
| 1 | Inhibited | 1 = Start inhibited (see bit 1 of parameter 06.16 Drive status word 1) |
| 2 | Operation allowed | 1 = Drive is ready to operate |
| 3 | Ready to start | 1 = Drive is ready to receive a start command |
| 4 | Running | 1 = Drive is ready to follow given reference |
| 5 | Started | 1 = Drive has been started |
| 6 | Modulating | 1 = Drive is modulating (output stage is being controlled) |
| 7 | Limiting | 1 = Any operating limit is active |
| 8 | Local control | 1 = Drive is in local control |
| 9 | Network control | 1 = Drive is in network control |
| 10 | Ext1 active | 1 = Control location EXT1 active |
| 11 | Ext2 active | 1 = Control location EXT2 active |
| 12 | Charging active | 1 = Charging circuit is active 0 = Charging circuit is not active |
| 13 | MCB relay | 1 = MCB relay is closed |
| 14...15 | Reserved | |

| | | |
|---------------|----------------------|-------|
| 0000h...FFFFh | Drive status word 1. | 1 = 1 |
|---------------|----------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|-------------------------------|--|------------|------|---|---------------|---|-----------------------|---|-------------|---|-------------|---|-------------------|---|-----------------|-------|----------|---|-------------------|---------|----------|----|---------|----|---------|----|--------------------|----|----------|--|
| 06.118 | LSU start inhibit status word | (Only visible for ACQ580-31 and ACQ580-34). This word specifies the source of the inhibiting condition that is preventing the supply unit from starting. See also section <i>Control of a line supply unit (LSU)</i> (page 93), and parameter group <i>60 DDCS communication</i> . This parameter is read-only. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table><tr><th>Bit</th><th>Name</th></tr><tr><td>0</td><td>Not ready run</td></tr><tr><td>1</td><td>Ctrl location changed</td></tr><tr><td>2</td><td>SSW inhibit</td></tr><tr><td>3</td><td>Fault reset</td></tr><tr><td>4</td><td>Lost start enable</td></tr><tr><td>5</td><td>Lost run enable</td></tr><tr><td>6...8</td><td>Reserved</td></tr><tr><td>9</td><td>Charging overload</td></tr><tr><td>10...11</td><td>Reserved</td></tr><tr><td>12</td><td>Em Off2</td></tr><tr><td>13</td><td>Em Off3</td></tr><tr><td>14</td><td>Auto reset inhibit</td></tr><tr><td>15</td><td>Reserved</td></tr></table> | Bit | Name | 0 | Not ready run | 1 | Ctrl location changed | 2 | SSW inhibit | 3 | Fault reset | 4 | Lost start enable | 5 | Lost run enable | 6...8 | Reserved | 9 | Charging overload | 10...11 | Reserved | 12 | Em Off2 | 13 | Em Off3 | 14 | Auto reset inhibit | 15 | Reserved | |
| Bit | Name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Not ready run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Ctrl location changed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | SSW inhibit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Fault reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Lost start enable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Lost run enable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6...8 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Charging overload | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10...11 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Em Off2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Em Off3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Auto reset inhibit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Start inhibit status word of supply unit. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07 System info | | Drive hardware and firmware information. All parameters in this group are read-only. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.03 | Drive rating id | Type of the drive. (Rating ID in brackets.) | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.04 | Firmware name | Firmware identification. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.05 | Firmware version | Version number of the firmware. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.06 | Loading package name | Name of the firmware loading package. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.07 | Loading package version | Version number of the firmware loading package. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.10 | Language file set | The language file set (language package) in use, see parameter <i>96.01 Language</i> . The language file set value is written to this parameter after the first start-up, and it is available in this parameter through power-ups. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Not known | No language file set in use. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Global | Global language file set in use. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | European | European language file set in use. | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Asian | Asian language file set in use. | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.11 | Cpu usage | Microprocessor load in percent. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0...100% | Microprocessor load. | 1 = 1% | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 07.25 | Customization package name | First five ASCII letters of the name given to the customization package. The full name is visible under System info on the control panel or the Drive composer PC tool. _N/A_ = None. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------|--|------------|
| 07.26 | Customization package version | Customization package version number. Also visible under System info on the control panel or the Drive composer PC tool. | - |
| 07.30 | Adaptive program status | Shows the status of the adaptive program. See section Adaptive programming (page 88). | - |

| Bit | Name | Description |
|--------|----------------|---|
| 0 | Initialized | 1 = Adaptive program initialized |
| 1 | Editing | 1 = Adaptive program is being edited |
| 2 | Edit done | 1 = Editing of adaptive program finished |
| 3 | Running | 1 = Adaptive program running |
| 4...13 | Reserved | |
| 14 | State changing | 1 = State change in progress in adaptive programming engine |
| 15 | Faulted | 1 = Error in adaptive program |

| | | | |
|---------------|--------------------------|---|-------|
| 0000h...FFFFh | Adaptive program status. | 1 = 1 | |
| 07.31 | AP sequence state | Shows the number of the active state of the sequence program part of the adaptive program (AP). If adaptive programming is not running, or it does not contain a sequence program, the parameter is zero. | |
| 0...20 | | | 1 = 1 |
| 07.35 | Drive configuration | Plug 'n' play configuration. Performs HW initialization, and shows the detected module configuration of the drive. During the HW initialization, if the drive is not able to detect any module, the value is set to 1, Base unit. For information on automatic setting of parameters after detecting a module, see section Automatic drive configuration for fieldbus control on page 253. | 0000h |

| Bit | Name | Description |
|-------|-----------------|--|
| 0 | Not initialized | 1 = Drive configuration has not been initialized |
| 1 | Base unit | 1 = Drive has not detected any modules. |
| 2 | Reserved | |
| 3 | FENA-21 | 1 = FENA-21 Two-port Ethernet adapter module included |
| 4 | Reserved | |
| 5 | FPBA-01 | 1 = FPBA-01 PROFIBUS DP adapter module included |
| 6 | FCAN-01 | 1 = FCAN-01 CANopen adapter module included |
| 7...9 | Reserved | |
| 10 | FSCA-01 | 1 = FSCA-01 Modbus/RTU adapter module included |
| 11 | FEIP-21 | 1 = FEIP-21 Two-port EtherNet/IP adapter module included |
| 12 | FMBT-21 | 1 = FMBT-21 Two-port Modbus/TCP adapter module included |
| 13 | Reserved | |
| 14 | FBNO-21 | 1 = FPNO-21 Two-port PROFINET IO adapter module included |

| | | |
|---------------|----------------------|-------|
| 0000h...FFFFh | Drive configuration. | 1 = 1 |
|---------------|----------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------|---|------------|
| 07.36 | Drive configuration 2 | Shows the detected module configuration. See parameter 07.35 Drive configuration. | |

| Bit | Name | Description |
|--------|----------|--|
| 0 | Reserved | |
| 1 | FDNA-01 | 1 = FDNA-01 DeviceNet™ adapter module include |
| 2 | Reserved | |
| 3 | CMOD-01 | 1 = CMOD-01 External 24 V AC/DC and digital I/O extension module included |
| 4 | CMOD-02 | 1 = CMOD-02 External 24 V AC/DC and isolated PTC interface extension module included |
| 5 | CPTC-02 | 1 = CPTC-02 ATEX certified PTC interface and external 24 V extension module included |
| 6 | CHDI-01 | 1 = CHDI-01 115/230 V digital input extension module included |
| 7...15 | Reserved | |

| | | |
|------------------------------------|---|-------|
| 0000h...FFFFh | Drive configuration. | 1 = 1 |
| 07.106 LSU loading package name | (Only visible for ACQ580-31 and ACQ580-34). Name of the loading package of the supply unit firmware. | - |
| 07.107 LSU loading package version | (Only visible for ACQ580-31 and ACQ580-34). Version number of the loading package of the supply unit firmware. | - |

| | | |
|--------------------|---|-------|
| 10 Standard DI, RO | Configuration of digital inputs and relay outputs. | |
| 10.01 DI status | Displays the electrical status of digital inputs DI1...DI6. The activation/deactivation delays of the inputs (if any are specified) are ignored. Bits 0...5 reflect the delayed status of DI1...DI6. Example: 0000000000010011b = DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off. This parameter is read-only. | - |
| 0000h...FFFFh | Status of digital inputs. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------|--|------------|-----|------|-------------|---|-----|--|---|-----|--|---|-----|--|---|-----|--|---|-----|--|---|-----|--|--------|----------|--|
| 10.02 | DI delayed status | <p>Displays the status of digital inputs DI1...DI6. Bits 0...5 reflect the delayed status of DI1...DI6.</p> <p>Example: 000000000010011b = DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off.</p> <p>This word is updated only after a 2 ms activation/deactivation delay. When the value of a digital input changes, it must remain the same in two consecutive samples, that is for 2 ms, for the new value to be accepted.</p> <p>This parameter is read-only.</p> | - | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>DI1</td><td>1 = Digital input 1 is ON.</td></tr><tr><td>1</td><td>DI2</td><td>1 = Digital input 2 is ON.</td></tr><tr><td>2</td><td>DI3</td><td>1 = Digital input 3 is ON.</td></tr><tr><td>3</td><td>DI4</td><td>1 = Digital input 4 is ON.</td></tr><tr><td>4</td><td>DI5</td><td>1 = Digital input 5 is ON.</td></tr><tr><td>5</td><td>DI6</td><td>1 = Digital input 6 is ON.</td></tr><tr><td>6...15</td><td colspan="2">Reserved</td></tr></table> | | | | Bit | Name | Description | 0 | DI1 | 1 = Digital input 1 is ON. | 1 | DI2 | 1 = Digital input 2 is ON. | 2 | DI3 | 1 = Digital input 3 is ON. | 3 | DI4 | 1 = Digital input 4 is ON. | 4 | DI5 | 1 = Digital input 5 is ON. | 5 | DI6 | 1 = Digital input 6 is ON. | 6...15 | Reserved | |
| Bit | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | DI1 | 1 = Digital input 1 is ON. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | DI2 | 1 = Digital input 2 is ON. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | DI3 | 1 = Digital input 3 is ON. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | DI4 | 1 = Digital input 4 is ON. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | DI5 | 1 = Digital input 5 is ON. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | DI6 | 1 = Digital input 6 is ON. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6...15 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Delayed status for digital inputs. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.03 | DI force selection | <p>The electrical statuses of the digital inputs can be overridden, for example, testing purposes. A bit in parameter 10.04 DI forced data is provided for each digital input, and its value is applied whenever the corresponding bit in this parameter is 1.</p> <p>Note: Boot and power cycle reset the force selections (parameters 10.03 and 10.04).</p> | 0000h | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>DI1</td><td>1 = Force DI1 to value of bit 0 of parameter 10.04 DI forced data. (0 = Normal mode)</td></tr><tr><td>1</td><td>DI2</td><td>1 = Force DI2 to value of bit 1 of parameter 10.04 DI forced data. (0 = Normal mode)</td></tr><tr><td>2</td><td>DI3</td><td>1 = Force DI3 to value of bit 2 of parameter 10.04 DI forced data. (0 = Normal mode)</td></tr><tr><td>3</td><td>DI4</td><td>1 = Force DI4 to value of bit 3 of parameter 10.04 DI forced data. (0 = Normal mode)</td></tr><tr><td>4</td><td>DI5</td><td>1 = Force DI5 to value of bit 4 of parameter 10.04 DI forced data. (0 = Normal mode)</td></tr><tr><td>5</td><td>DI6</td><td>1 = Force DI6 to value of bit 5 of parameter 10.04 DI forced data. (0 = Normal mode)</td></tr><tr><td>6...15</td><td colspan="2">Reserved</td></tr></table> | | | | Bit | Name | Value | 0 | DI1 | 1 = Force DI1 to value of bit 0 of parameter 10.04 DI forced data . (0 = Normal mode) | 1 | DI2 | 1 = Force DI2 to value of bit 1 of parameter 10.04 DI forced data . (0 = Normal mode) | 2 | DI3 | 1 = Force DI3 to value of bit 2 of parameter 10.04 DI forced data . (0 = Normal mode) | 3 | DI4 | 1 = Force DI4 to value of bit 3 of parameter 10.04 DI forced data . (0 = Normal mode) | 4 | DI5 | 1 = Force DI5 to value of bit 4 of parameter 10.04 DI forced data . (0 = Normal mode) | 5 | DI6 | 1 = Force DI6 to value of bit 5 of parameter 10.04 DI forced data . (0 = Normal mode) | 6...15 | Reserved | |
| Bit | Name | Value | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | DI1 | 1 = Force DI1 to value of bit 0 of parameter 10.04 DI forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | DI2 | 1 = Force DI2 to value of bit 1 of parameter 10.04 DI forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | DI3 | 1 = Force DI3 to value of bit 2 of parameter 10.04 DI forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | DI4 | 1 = Force DI4 to value of bit 3 of parameter 10.04 DI forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | DI5 | 1 = Force DI5 to value of bit 4 of parameter 10.04 DI forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | DI6 | 1 = Force DI6 to value of bit 5 of parameter 10.04 DI forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6...15 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Override selection for digital inputs. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------|---|------------|
| 10.04 | DI forced data | Allows the data value of a forced digital input to be changed from 0 to 1. It is only possible to force an input that has been selected in parameter 10.03 DI force selection. Bit 0 is the forced value for DI1; bit 5 is the forced value for the DI6. | 0000h |

| Bit | Name | Value |
|--------|----------|---|
| 0 | DI1 | 1 = Force the value of this bit to D1, if so defined in parameter 10.03 DI force selection. |
| 1 | DI2 | 1 = Force the value of this bit to D3, if so defined in parameter 10.03 DI force selection. |
| 2 | DI3 | 1 = Force the value of this bit to D3, if so defined in parameter 10.03 DI force selection. |
| 3 | DI4 | 1 = Force the value of this bit to D4, if so defined in parameter 10.03 DI force selection. |
| 4 | DI5 | 1 = Force the value of this bit to D5, if so defined in parameter 10.03 DI force selection. |
| 5 | DI6 | 1 = Force the value of this bit to D6, if so defined in parameter 10.03 DI force selection. |
| 6...15 | Reserved | |

| | | |
|---------------|----------------------------------|-------|
| 0000h...FFFFh | Forced values of digital inputs. | 1 = 1 |
|---------------|----------------------------------|-------|

| | | | |
|-------|--------------|---|--------|
| 10.05 | DI1 ON delay | Defines the activation delay for digital input DI1. | 0.00 s |
|-------|--------------|---|--------|

*DI status

**Delayed DI status

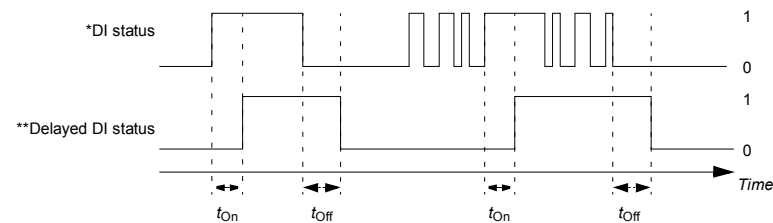
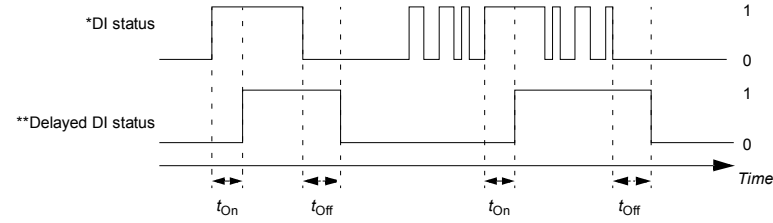
t_{On} t_{Off} t_{On} t_{Off} Time

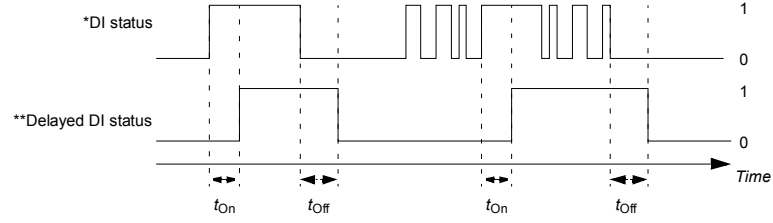
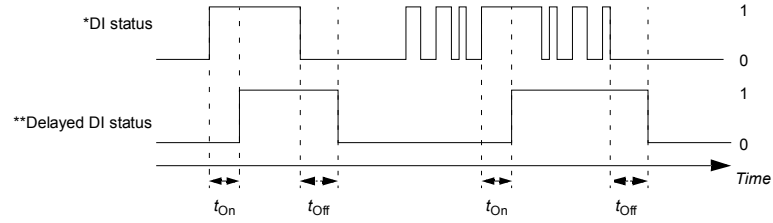
t_{On} = 10.05 DI1 ON delay
 t_{Off} = 10.06 DI1 OFF delay
*Electrical status of digital input. Indicated by 10.01 DI status.
**Indicated by 10.02 DI delayed status.

| | | |
|--------------------|---------------------------|----------|
| 0.00 ... 3000.00 s | Activation delay for DI1. | 10 = 1 s |
|--------------------|---------------------------|----------|

| | | | |
|-------|---------------|---|--------|
| 10.06 | DI1 OFF delay | Defines the deactivation delay for digital input DI1. See parameter 10.05 DI1 ON delay. | 0.00 s |
|-------|---------------|---|--------|

| | | |
|--------------------|-----------------------------|----------|
| 0.00 ... 3000.00 s | Deactivation delay for DI1. | 10 = 1 s |
|--------------------|-----------------------------|----------|

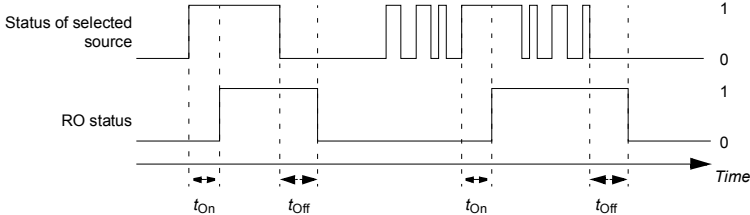
| No. | Name/Value | Description | Def/FbEq16 |
|--|----------------------|---|------------|
| 10.07 | <i>DI2 ON delay</i> | Defines the activation delay for digital input DI2. | 0.00 s |
|  <p> $t_{On} = 10.07 \text{ DI2 ON delay}$ $t_{Off} = 10.08 \text{ DI2 OFF delay}$ *Electrical status of digital input. Indicated by 10.01 DI status. **Indicated by 10.02 DI delayed status. </p> | | | |
| | 0.00 ... 3000.00 s | Activation delay for DI2. | 10 = 1 s |
| 10.08 | <i>DI2 OFF delay</i> | Defines the deactivation delay for digital input DI2. See parameter 10.07 DI2 ON delay. | 0.00 s |
| | 0.00 ... 3000.00 s | Deactivation delay for DI2. | 10 = 1 s |
| 10.09 | <i>DI3 ON delay</i> | Defines the activation delay for digital input DI3. | 0.00 s |
|  <p> $t_{On} = 10.09 \text{ DI3 ON delay}$ $t_{Off} = 10.10 \text{ DI3 OFF delay}$ *Electrical status of digital input. Indicated by 10.01 DI status. **Indicated by 10.02 DI delayed status. </p> | | | |
| | 0.00 ... 3000.00 s | Activation delay for DI3. | 10 = 1 s |
| 10.10 | <i>DI3 OFF delay</i> | Defines the deactivation delay for digital input DI3. See parameter 10.09 DI3 ON delay. | 0.00 s |
| | 0.00 ... 3000.00 s | Deactivation delay for DI3. | 10 = 1 s |

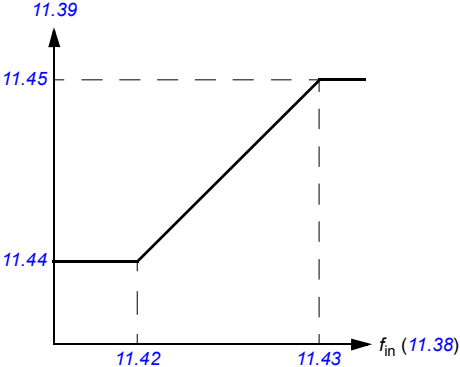
| No. | Name/Value | Description | Def/FbEq16 |
|---|--------------------|---|------------|
| 10.11 | DI4 ON delay | Defines the activation delay for digital input DI4. | 0.00 s |
| <div><p>$t_{On} = 10.11$ DI4 ON delay $t_{Off} = 10.12$ DI4 OFF delay *Electrical status of digital input. Indicated by 10.01 DI status. **Indicated by 10.02 DI delayed status.</p></div> | | | |
| | 0.00 ... 3000.00 s | Activation delay for DI4. | 10 = 1 s |
| 10.12 | DI4 OFF delay | Defines the deactivation delay for digital input DI4. See parameter 10.11 DI4 ON delay. | 0.00 s |
| | 0.00 ... 3000.00 s | Deactivation delay for DI4. | 10 = 1 s |
| 10.13 | DI5 ON delay | Defines the activation delay for digital input DI5. | 0.00 s |
| <div><p>$t_{On} = 10.13$ DI5 ON delay $t_{Off} = 10.14$ DI5 OFF delay *Electrical status of digital input. Indicated by 10.01 DI status. **Indicated by 10.02 DI delayed status.</p></div> | | | |
| | 0.00 ... 3000.00 s | Activation delay for DI5. | 10 = 1 s |
| 10.14 | DI5 OFF delay | Defines the deactivation delay for digital input DI5. See parameter 10.13 DI5 ON delay. | 0.00 s |
| | 0.00 ... 3000.00 s | Deactivation delay for DI5. | 10 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | |
|---|--|---|------------|-----|-------|---|--|---|--|---|--|--------|----------|
| 10.23 | RO forced data | Contains the values of relay outputs that are used instead of the connected signals if selected in parameter 10.22 RO force selection. Bit 0 is the forced value for RO1. | 0000h | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Value</th></tr><tr><td>0</td><td>1 = Force the value of this bit to RO1, if so defined in parameter 10.22 RO force selection.</td></tr><tr><td>1</td><td>1 = Force the value of this bit to RO2, if so defined in parameter 10.22 RO force selection.</td></tr><tr><td>2</td><td>1 = Force the value of this bit to RO3, if so defined in parameter 10.22 RO force selection.</td></tr><tr><td>3...15</td><td>Reserved</td></tr></table> | | | | Bit | Value | 0 | 1 = Force the value of this bit to RO1, if so defined in parameter 10.22 RO force selection. | 1 | 1 = Force the value of this bit to RO2, if so defined in parameter 10.22 RO force selection. | 2 | 1 = Force the value of this bit to RO3, if so defined in parameter 10.22 RO force selection. | 3...15 | Reserved |
| Bit | Value | | | | | | | | | | | | |
| 0 | 1 = Force the value of this bit to RO1, if so defined in parameter 10.22 RO force selection. | | | | | | | | | | | | |
| 1 | 1 = Force the value of this bit to RO2, if so defined in parameter 10.22 RO force selection. | | | | | | | | | | | | |
| 2 | 1 = Force the value of this bit to RO3, if so defined in parameter 10.22 RO force selection. | | | | | | | | | | | | |
| 3...15 | Reserved | | | | | | | | | | | | |
| | 0000h...FFFFh | Forced RO values. | 1 = 1 | | | | | | | | | | |
| 10.24 | RO1 source | Selects a drive signal to be connected to relay output RO1. | Ready run | | | | | | | | | | |
| | Not energized | Output is not energized. | 0 | | | | | | | | | | |
| | Energized | Output is energized. | 1 | | | | | | | | | | |
| | Ready run | Bit 1 of 06.11 Main status word (see page 286). | 2 | | | | | | | | | | |
| | Enabled | Bit 0 of 06.16 Drive status word 1 (see page 287). | 4 | | | | | | | | | | |
| | Started | Bit 5 of 06.16 Drive status word 1 (see page 287). | 5 | | | | | | | | | | |
| | Magnetized | Bit 1 of 06.17 Drive status word 2 (see page 288). | 6 | | | | | | | | | | |
| | Running | Bit 6 of 06.16 Drive status word 1 (see page 287). | 7 | | | | | | | | | | |
| | Ready ref | Bit 2 of 06.11 Main status word (see page 286). | 8 | | | | | | | | | | |
| | At setpoint | Bit 8 of 06.11 Main status word (see page 286). | 9 | | | | | | | | | | |
| | Reverse | Bit 2 of 06.19 Speed control status word (see page 289). | 10 | | | | | | | | | | |
| | Zero speed | Bit 0 of 06.19 Speed control status word (see page 289). | 11 | | | | | | | | | | |
| | Above limit | Bit 10 of 06.17 Drive status word 2 (see page 288). | 12 | | | | | | | | | | |
| | Warning | Bit 7 of 06.11 Main status word (see page 286). | 13 | | | | | | | | | | |
| | Fault | Bit 3 of 06.11 Main status word (see page 286). | 14 | | | | | | | | | | |
| | Fault (-1) | Inverted bit 3 of 06.11 Main status word (see page 286). | 15 | | | | | | | | | | |
| | Fault/Warning | Bit 3 of 06.11 Main status word OR bit 7 of 06.11 Main status word (see page 286). | 16 | | | | | | | | | | |
| | Overcurrent | Fault 2310 Overcurrent has occurred. | 17 | | | | | | | | | | |
| | Overvoltage | Fault 3210 DC link overvoltage has occurred. | 18 | | | | | | | | | | |
| | Drive temp | Fault 2381 IGBT overload, 4110 Control board temperature, 4210 IGBT overtemperature, 4290 Cooling, 42F1 IGBT temperature, 4310 Excess temperature or 4380 Excess temperature difference has occurred. | 19 | | | | | | | | | | |
| | Undervoltage | Fault 3220 DC link undervoltage has occurred. | 20 | | | | | | | | | | |
| | Motor temp | Fault 4981 External temperature 1 or 4982 External temperature 2 has occurred. | 21 | | | | | | | | | | |
| | Reserved | | 22 | | | | | | | | | | |
| | Ext2 active | Bit 11 of 06.16 Drive status word 1 (see page 287). | 23 | | | | | | | | | | |
| | Remote control | Bit 9 of 06.11 Main status word (see page 286). | 24 | | | | | | | | | | |
| | Reserved | | 25...26 | | | | | | | | | | |


| No. | Name/Value | Description | Def/FbEq16 |
|-----|-----------------------------|--|------------|
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 27 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 28 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 29 |
| | Reserved | | 30...32 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 33 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 34 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 35 |
| | Reserved | | 36...38 |
| | Start delay | Bit 13 of 06.17 Drive status word 2 (see page 288). | 39 |
| | RO/DIO control word bit0 | Bit 0 of 10.99 RO/DIO control word (see page 305). | 40 |
| | RO/DIO control word bit1 | Bit 1 of 10.99 RO/DIO control word (see page 305). | 41 |
| | RO/DIO control word bit2 | Bit 2 of 10.99 RO/DIO control word (see page 305). | 42 |
| | Reserved | | 43...44 |
| | PFC1 | Bit 0 of 76.01 PFC status (see page 457). | 45 |
| | PFC2 | Bit 1 of 76.01 PFC status (see page 457). | 46 |
| | PFC3 | Bit 2 of 76.01 PFC status (see page 457). | 47 |
| | PFC4 | Bit 3 of 76.01 PFC status (see page 457). | 48 |
| | PFC5 | Bit 4 of 76.01 PFC status (see page 457). | 49 |
| | PFC6 | Bit 5 of 76.01 PFC status (see page 457). | 50 |
| | Reserved | | 51...52 |
| | Event word 1 | Event word 1 = 1 if any bit of 04.40 Event word 1 (see page 281) is 1, that is, if any warning, fault or pure event that has been defined with parameters 04.41...04.71 is on. | 53 |
| | Reserved | | 54 |
| | Run permissive | Bit 7 of 06.22 Hand-off-auto status word . | 55 |
| | Start interlock 1 | Bit 8 of 06.22 Hand-off-auto status word . | 56 |
| | Start interlock 2 | Bit 9 of 06.22 Hand-off-auto status word . | 57 |
| | Start interlock 3 | Bit 10 of 06.22 Hand-off-auto status word . | 58 |
| | Start interlock 4 | Bit 11 of 06.22 Hand-off-auto status word . | 59 |
| | All start interlocks | Bit 12 of 06.22 Hand-off-auto status word . | 60 |
| | User load curve | Bit 3 (Outside load limit) of 37.01 ULC output status word (see page 406). | 61 |
| | RO/DIO control word | For 10.24 RO1 source : Bit 0 (RO1) of 10.99 RO/DIO control word (see page 305). For 10.27 RO2 source : Bit 1 (RO2) of 10.99 RO/DIO control word (see page 305). For 10.30 RO3 source : Bit 2 (RO3) of 10.99 RO/DIO control word (see page 305). | 62 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |


| No. | Name/Value | Description | Def/FbEq16 |
|---|------------------|---|------------|
| 10.25 | RO1 ON delay | Defines the activation delay for relay output RO1. | 0.0 s |
| <div><p>$t_{On} = 10.25 \text{ RO1 ON delay}$ $t_{Off} = 10.26 \text{ RO1 OFF delay}$</p></div> | | | |
| | 0.0 ... 3000.0 s | Activation delay for RO1. | 10 = 1 s |
| 10.26 | RO1 OFF delay | Defines the deactivation delay for relay output RO1. See parameter 10.25 RO1 ON delay. | 0.0 s |
| | 0.0 ... 3000.0 s | Deactivation delay for RO1. | 10 = 1 s |
| 10.27 | RO2 source | Selects a drive signal to be connected to relay output RO2. For the available selections, see parameter 10.24 RO1 source. | Running |
| 10.28 | RO2 ON delay | Defines the activation delay for relay output RO2. | 0.0 s |
| <div><p>$t_{On} = 10.28 \text{ RO2 ON delay}$ $t_{Off} = 10.29 \text{ RO2 OFF delay}$</p></div> | | | |
| | 0.0 ... 3000.0 s | Activation delay for RO2. | 10 = 1 s |
| 10.29 | RO2 OFF delay | Defines the deactivation delay for relay output RO2. See parameter 10.28 RO2 ON delay. | 0.0 s |
| | 0.0 ... 3000.0 s | Deactivation delay for RO2. | 10 = 1 s |
| 10.30 | RO3 source | Selects a drive signal to be connected to relay output RO3. For the available selections, see parameter 10.24 RO1 source. | Fault (-1) |

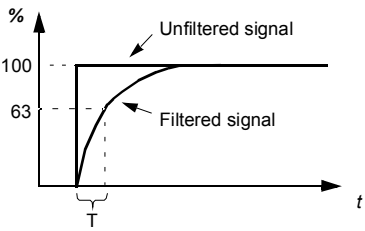
| No. | Name/Value | Description | Def/FbEq16 |
|---|---------------------|--|------------|
| 10.31 | RO3 ON delay | Defines the activation delay for relay output RO3. | 0.0 s |
|  <p> t_{On} = 10.31 RO3 ON delay t_{Off} = 10.32 RO3 OFF delay </p> | | | |
| | 0.0 ... 3000.0 s | Activation delay for RO3. | 10 = 1 s |
| 10.32 | RO3 OFF delay | Defines the deactivation delay for relay output RO3. See parameter 10.31 RO3 ON delay. | 0.0 s |
| | 0.0 ... 3000.0 s | Deactivation delay for RO3. | 10 = 1 s |
| 10.99 | RO/DIO control word | Storage parameter for controlling the relay outputs, for example, through the embedded fieldbus interface. To control the relay outputs (RO) of the drive, send a control word with the bit assignments shown below as Modbus I/O data. Set the target selection parameter of that particular data (58.101...58.114) to RO/DIO control word. In the source selection parameter of the desired output, select the appropriate bit of this word. | 0000h |
| Bit | Name | Description | |
| 0 | RO1 | Source bits for relay outputs RO1...RO3. See parameters 10.24, 10.27 and 10.30. | |
| 1 | RO2 | | |
| 2 | RO3 | | |
| 3 | RO4 | Source bits for relay outputs RO4...RO5 with a CHDI-01 or CMOD-01 extension module. See parameters 15.07 and 15.10. | |
| 4 | RO5 | | |
| 5...7 | Reserved | | |
| 8 | DIO1 | Source bit for digital output DO1 with a CMOD-01 extension module. See parameter 15.23. | |
| 9...15 | Reserved | | |
| | 0000h...FFFFh | RO/DIO control word. | 1 = 1 |
| 10.101 | RO1 toggle counter | Displays the number of times relay output RO1 has changed states. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 5 |
| | 0...4294967000 | State change count. | 1 = 1 |
| 10.102 | RO2 toggle counter | Displays the number of times relay output RO2 has changed states. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 0 |
| | 0...4294967000 | State change count. | 1 = 1 |

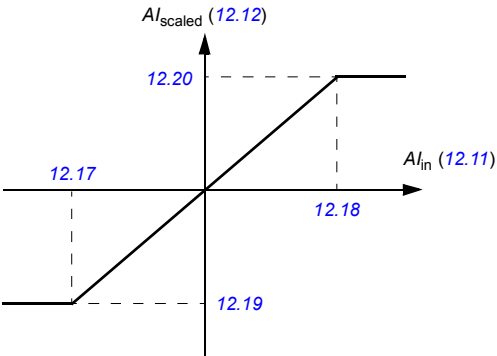
| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------|----------------------------|---|---------------|
| 10.103 | RO3 toggle counter | Displays the number of times relay output RO3 has changed states. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 5 |
| | 0...4294967000 | State change count. | 1 = 1 |
| 11 Standard DIO, FI, FO | | | |
| 11.21 | DI5 configuration | Selects how digital input 5 is used. | Digital input |
| | Digital input | DI5 is used as a digital input. | 0 |
| | Frequency input | DI5 is used as a frequency input. | 1 |
| 11.38 | Freq in 1 actual value | Displays the value of frequency input 1 (via DI5 when it is used as a frequency input) before scaling. See parameter 11.42 Freq in 1 min. This parameter is read-only. | - |
| | 0 ... 16000 Hz | Unscaled value of frequency input 1 (DI5). | 1 = 1 Hz |
| 11.39 | Freq in 1 scaled value | Displays the value of frequency input 1 (via DI5 when it is used as a frequency input) after scaling. See parameter 11.42 Freq in 1 min. This parameter is read-only. | - |
| | -32768.000... 32767.000 | Scaled value of frequency input 1 (DI5). | 1 = 1 |
| 11.42 | Freq in 1 min | Defines the minimum for the frequency actually arriving at frequency input 1 (DI5) when it is used as a frequency input). The incoming frequency signal (11.38 Freq in 1 actual value) is scaled into an internal signal (11.39 Freq in 1 scaled value) by parameters 11.42...11.45 as follows:  | 0 Hz |
| | 0 ... 16000 Hz | Minimum frequency of frequency input 1 (DI5). | 1 = 1 Hz |
| 11.43 | Freq in 1 max | Defines the maximum for the frequency actually arriving at frequency input 1 (DI5) when it is used as a frequency input). See parameter 11.42 Freq in 1 min. | 16000 Hz |
| | 0 ... 16000 Hz | Maximum frequency for frequency input 1 (DI5). | 1 = 1 Hz |

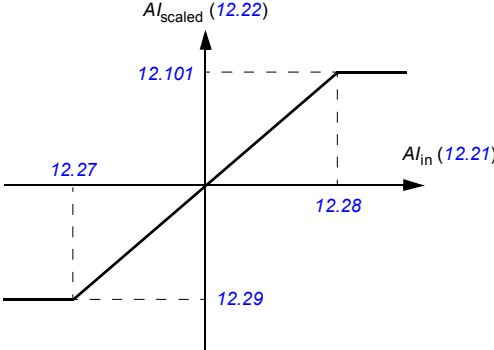
| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|--|---|
| 11.44 | <i>Freq in 1 at scaled min</i> | Defines the value that is required to correspond internally to the minimum input frequency defined by parameter 11.42 Freq in 1 min . See diagram at parameter 11.42 Freq in 1 min . | 0.000 |
| | -32768.000... 32767.000 | Value corresponding to minimum of frequency input 1. | 1 = 1 |
| 11.45 | <i>Freq in 1 at scaled max</i> | Defines the value that is required to correspond internally to the maximum input frequency defined by parameter 11.43 Freq in 1 max . See diagram at parameter 11.42 Freq in 1 min . | 1500.000; 1800.000 (95.20 b0) |
| | -32768.000... 32767.000 | Value corresponding to maximum of frequency input 1. | 1 = 1 |

| 12 Standard AI | | Configuration of standard analog inputs. | | | | | | | | | | | | | |
|--|-------------------------|--|-----------|-----|------|-------|---|-----|--|---|-----|--|--------|----------|--|
| 12.02 | AI force selection | <p>The true readings of the analog inputs can be overridden, for example, for testing purposes. A forced value parameter is provided for each analog input, and its value is applied whenever the corresponding bit in this parameter is 1.</p> <p>Notes:</p> <ul style="list-style-type: none">AI filter times (parameters 12.16 AI1 filter time and 12.26 AI2 filter time) have no effect on forced AI values (parameters 12.13 AI1 forced value and 12.23 AI2 forced value).Boot and power cycle reset the force selections (parameters 12.02 and 12.03). | 0000h | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>AI1</td><td>1 = Force AI1 to value of parameter 12.13 AI1 forced value.</td></tr><tr><td>1</td><td>AI2</td><td>1 = Force AI2 to value of parameter 12.23 AI2 forced value.</td></tr><tr><td>2...15</td><td colspan="2">Reserved</td></tr></table> | | | | Bit | Name | Value | 0 | AI1 | 1 = Force AI1 to value of parameter 12.13 AI1 forced value . | 1 | AI2 | 1 = Force AI2 to value of parameter 12.23 AI2 forced value . | 2...15 | Reserved | |
| Bit | Name | Value | | | | | | | | | | | | | |
| 0 | AI1 | 1 = Force AI1 to value of parameter 12.13 AI1 forced value . | | | | | | | | | | | | | |
| 1 | AI2 | 1 = Force AI2 to value of parameter 12.23 AI2 forced value . | | | | | | | | | | | | | |
| 2...15 | Reserved | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Forced values selector for analog inputs AI1 and AI2. | 1 = 1 | | | | | | | | | | | | |
| 12.03 | AI supervision function | <p>Selects how the drive reacts when an analog input signal moves out of the minimum and/or maximum limits specified for the input.</p> <p>The supervision applies a margin of 0.5 V or 1.0 mA to the limits. For example, if the maximum limit for the input is 7.000 V, the maximum limit supervision activates at 7.500 V. The inputs and the limits to be observed are selected by parameter 12.04 AI supervision selection.</p> | No action | | | | | | | | | | | | |
| No action | | No action taken. | 0 | | | | | | | | | | | | |
| Fault | | Drive trips on fault 80A0 AI supervision . | 1 | | | | | | | | | | | | |
| Warning | | Drive generates warning A8A0 AI supervision . | 2 | | | | | | | | | | | | |
| Last speed | | <p>Drive generates warning A8A0 AI supervision and freezes the speed (or frequency) to the level the drive was operating at. The speed/frequency is determined on the basis of actual speed using 850 ms low-pass filtering.</p> <p> WARNING! Make sure that it is safe to continue operation in case of a communication break.</p> | 3 | | | | | | | | | | | | |

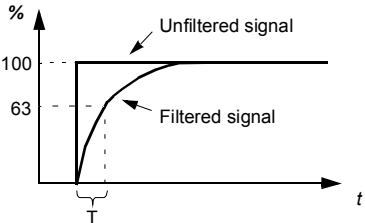
| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | |
|---|--|--|---------------|-----|------|-------------|---|-----------|--|---|-----------|--|---|-----------|--|---|-----------|--|--------|----------|--|
| | Speed ref safe | Drive generates warning A8A0 AI supervision and sets the speed to the speed defined by parameter 22.41 Speed ref safe (or 28.41 Frequency ref safe when frequency reference is being used).  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 4 | | | | | | | | | | | | | | | | | | |
| 12.04 | AI supervision selection | Specifies the analog input limits to be supervised. See parameter 12.03 AI supervision function . | 0000h | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>AI1 < MIN</td><td>1 = Minimum limit supervision of AI1 active.</td></tr><tr><td>1</td><td>AI1 > MAX</td><td>1 = Maximum limit supervision of AI1 active.</td></tr><tr><td>2</td><td>AI2 < MIN</td><td>1 = Minimum limit supervision of AI2 active.</td></tr><tr><td>3</td><td>AI2 > MAX</td><td>1 = Maximum limit supervision of AI2 active.</td></tr><tr><td>4...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Description | 0 | AI1 < MIN | 1 = Minimum limit supervision of AI1 active. | 1 | AI1 > MAX | 1 = Maximum limit supervision of AI1 active. | 2 | AI2 < MIN | 1 = Minimum limit supervision of AI2 active. | 3 | AI2 > MAX | 1 = Maximum limit supervision of AI2 active. | 4...15 | Reserved | |
| Bit | Name | Description | | | | | | | | | | | | | | | | | | | |
| 0 | AI1 < MIN | 1 = Minimum limit supervision of AI1 active. | | | | | | | | | | | | | | | | | | | |
| 1 | AI1 > MAX | 1 = Maximum limit supervision of AI1 active. | | | | | | | | | | | | | | | | | | | |
| 2 | AI2 < MIN | 1 = Minimum limit supervision of AI2 active. | | | | | | | | | | | | | | | | | | | |
| 3 | AI2 > MAX | 1 = Maximum limit supervision of AI2 active. | | | | | | | | | | | | | | | | | | | |
| 4...15 | Reserved | | | | | | | | | | | | | | | | | | | | |
| | 0000h...FFFFh | Activation of analog input supervision. | 1 = 1 | | | | | | | | | | | | | | | | | | |
| 12.11 | AI1 actual value | Displays the value of analog input AI1 in mA or V (depending on whether the input is set to current or voltage by a hardware setting). This parameter is read-only. | - | | | | | | | | | | | | | | | | | | |
| | 0.000...22.000 mA or 0.000...11.000 V | Value of analog input AI1. | 1000 = 1 unit | | | | | | | | | | | | | | | | | | |
| 12.12 | AI1 scaled value | Displays the value of analog input AI1 after scaling. See parameters 12.19 AI1 scaled at AI1 min and 12.20 AI1 scaled at AI1 max . This parameter is read-only. | - | | | | | | | | | | | | | | | | | | |
| | -32768.000... 32767.000 | Scaled value of analog input AI1. | 1 = 1 | | | | | | | | | | | | | | | | | | |
| 12.13 | AI1 forced value | Forced value that can be used instead of the true reading of the input. See parameter 12.02 AI force selection . | - | | | | | | | | | | | | | | | | | | |
| | 0.000...22.000 mA or 0.000...11.000 V | Forced value of analog input AI1. | 1000 = 1 unit | | | | | | | | | | | | | | | | | | |
| 12.15 | AI1 unit selection | Selects the unit for readings and settings related to analog input AI1. | V | | | | | | | | | | | | | | | | | | |
| | V | Volts. | 2 | | | | | | | | | | | | | | | | | | |
| | mA | Milliamperes. | 10 | | | | | | | | | | | | | | | | | | |

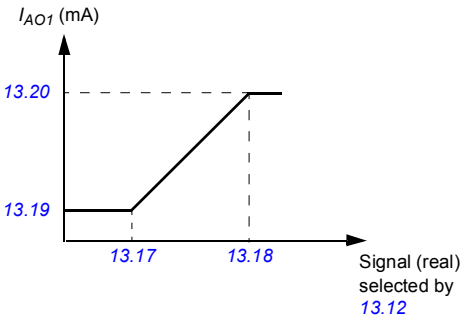
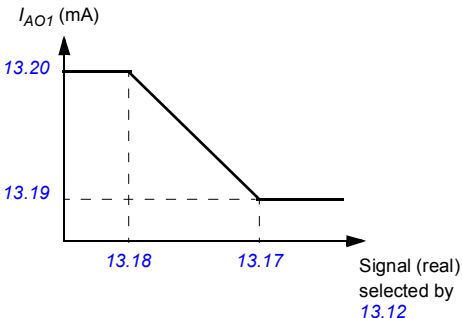
| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|-----------------------|
| 12.16 | <i>AI1 filter time</i> | <p>Defines the filter time constant for analog input AI1.</p>  $O = I \times (1 - e^{-t/T})$ <p> I = filter input (step) O = filter output t = time T = filter time constant </p> <p>Note: The signal is also filtered due to the signal interface hardware (approximately 0.25 ms time constant). This cannot be changed by any parameter.</p> | 0.100 s |
| | 0.000...30.000 s | Filter time constant. | 1000 = 1 s |
| 12.17 | <i>AI1 min</i> | <p>Defines the minimum site value for analog input AI1.</p> <p>Set the value actually sent to the drive when the analog signal from plant is wound to its minimum setting.</p> <p>See also parameter 12.19 AI1 scaled at AI1 min.</p> | 4.000 mA or 0.000 V |
| | 0.000...22.000 mA or 0.000...11.000 V | Minimum value of AI1. | 1000 = 1 unit |
| 12.18 | <i>AI1 max</i> | <p>Defines the maximum site value for analog input AI1.</p> <p>Set the value actually sent to the drive when the analog signal from plant is wound to its maximum setting.</p> <p>See also parameter 12.19 AI1 scaled at AI1 min.</p> | 20.000 mA or 10.000 V |
| | 0.000...22.000 mA or 0.000...11.000 V | Maximum value of AI1. | 1000 = 1 unit |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|--|
| 12.19 | <i>AI1 scaled at AI1 min</i> | <p>Defines the real internal value that corresponds to the minimum analog input AI1 value defined by parameter 12.17 AI1 min. (Changing the polarity settings of 12.19 and 12.20 can effectively invert the analog input.)</p>  | 0.000 |
| | -32768.000... 32767.000 | Real value corresponding to minimum AI1 value. | 1 = 1 |
| 12.20 | <i>AI1 scaled at AI1 max</i> | <p>Defines the real internal value that corresponds to the maximum analog input AI1 value defined by parameter 12.18 AI1 max. See the drawing at parameter 12.19 AI1 scaled at AI1 min.</p> | 50.000; 60.000 (95.20 b0) |
| | -32768.000... 32767.000 | Real value corresponding to maximum AI1 value. | 1 = 1 |
| 12.21 | <i>AI2 actual value</i> | <p>Displays the value of analog input AI2 in mA or V (depending on whether the input is set to current or voltage by a hardware setting). This parameter is read-only.</p> | - |
| | 0.000...22.000 mA or 0.000...11.000 V | Value of analog input AI2. | 1000 = 1 unit |
| 12.22 | <i>AI2 scaled value</i> | <p>Displays the value of analog input AI2 after scaling. See parameters 12.29 AI2 scaled at AI2 min and 12.101 AI1 percent value. This parameter is read-only.</p> | - |
| | -32768.000... 32767.000 | Scaled value of analog input AI2. | 1 = 1 |
| 12.23 | <i>AI2 forced value</i> | <p>Forced value that can be used instead of the true reading of the input. See parameter 12.02 AI force selection.</p> | - |
| | 0.000...22.000 mA or 0.000...11.000 V | Forced value of analog input AI2. | 1000 = 1 unit |
| 12.25 | <i>AI2 unit selection</i> | <p>Selects the unit for readings and settings related to analog input AI2.</p> | V |
| | V | Volts. | 2 |
| | mA | Milliamperes. | 10 |
| 12.26 | <i>AI2 filter time</i> | <p>Defines the filter time constant for analog input AI2. See parameter 12.16 AI1 filter time.</p> | 0.100 s |
| | 0.000...30.000 s | Filter time constant. | 1000 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|--|---|---------------|
| 12.27 | <i>AI2 min</i> | Defines the minimum site value for analog input AI2. Set the value actually sent to the drive when the analog signal from plant is wound to its minimum setting. | 0.000 V |
| | 0.000...22.000 mA or 0.000...11.000 V | Minimum value of AI2. | 1000 = 1 unit |
| 12.28 | <i>AI2 max</i> | Defines the maximum site value for analog input AI2. Set the value actually sent to the drive when the analog signal from plant is wound to its maximum setting. | 10.000 V |
| | 0.000...22.000 mA or 0.000...11.000 V | Maximum value of AI2. | 1000 = 1 unit |
| 12.29 | <i>AI2 scaled at AI2 min</i> | Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter <i>12.27 AI2 min</i> . (Changing the polarity settings of <i>12.29</i> and <i>12.101</i> can effectively invert the analog input.)  | 0.000 |
| | -32768.000... 32767.000 | Real value corresponding to minimum AI2 value. | 1 = 1 |
| 12.30 | <i>AI2 scaled at AI2 max</i> | Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter <i>12.28 AI2 max</i> . See the drawing at parameter of <i>12.29 AI2 scaled at AI2 min</i> . | 50.000 |
| | -32768.000... 32767.000 | Real value corresponding to maximum AI2 value. | 1 = 1 |
| 12.101 | <i>AI1 percent value</i> | Value of analog input AI1 in percent of AI1 scaling (<i>12.18 AI1 max</i> - <i>12.17 AI1 min</i>). | - |
| | 0.00...100.00% | AI1 value | 100 = 1% |
| 12.102 | <i>AI2 percent value</i> | Value of analog input AI2 in percent of AI2 scaling (<i>12.28 AI2 max</i> - <i>12.27 AI2 min</i>). | - |
| | 0.00...100.00% | AI2 value | 100 = 1% |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | |
|---|----------------------------------|---|------------------|-----|------|-------|---|-----|---|---|-----|---|--------|----------|--|
| 13 Standard AO | | Configuration of standard analog outputs. | | | | | | | | | | | | | |
| 13.02 | AO force selection | The source signals of the analog outputs can be overridden, for example, for testing purposes. A forced value parameter is provided for each analog output, and its value is applied whenever the corresponding bit in this parameter is 1. Note: Boot and power cycle reset the force selections (parameters 13.02 and 13.11). | 0000h | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>AO1</td><td>1 = Force AO1 to value of parameter 13.13 AO1 forced value. (0 = Normal mode)</td></tr><tr><td>1</td><td>AO2</td><td>1 = Force AO2 to value of parameter 13.23 AO2 forced value. (0 = Normal mode)</td></tr><tr><td>2...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Value | 0 | AO1 | 1 = Force AO1 to value of parameter 13.13 AO1 forced value. (0 = Normal mode) | 1 | AO2 | 1 = Force AO2 to value of parameter 13.23 AO2 forced value. (0 = Normal mode) | 2...15 | Reserved | |
| Bit | Name | Value | | | | | | | | | | | | | |
| 0 | AO1 | 1 = Force AO1 to value of parameter 13.13 AO1 forced value. (0 = Normal mode) | | | | | | | | | | | | | |
| 1 | AO2 | 1 = Force AO2 to value of parameter 13.23 AO2 forced value. (0 = Normal mode) | | | | | | | | | | | | | |
| 2...15 | Reserved | | | | | | | | | | | | | | |
| | 0000h...FFFFh | Forced values selector for analog outputs AO1 and AO2. | 1 = 1 | | | | | | | | | | | | |
| 13.11 | AO1 actual value | Displays the value of AO1 in mA or V. This parameter is read-only. | - | | | | | | | | | | | | |
| | 0.000...11.000 V | Value of AO1. | 1 = 1 mA | | | | | | | | | | | | |
| 13.12 | AO1 source | Selects a signal to be connected to analog output AO1. | Output frequency | | | | | | | | | | | | |
| | Zero | None. | 0 | | | | | | | | | | | | |
| | Motor speed used | 01.01 Motor speed used (page 275). | 1 | | | | | | | | | | | | |
| | Reserved | | 2 | | | | | | | | | | | | |
| | Output frequency | 01.06 Output frequency (page 275). | 3 | | | | | | | | | | | | |
| | Motor current | 01.07 Motor current (page 275). | 4 | | | | | | | | | | | | |
| | Motor current % of motor nominal | 01.08 Motor current % of motor nom (page 275). | 5 | | | | | | | | | | | | |
| | Motor torque | 01.10 Motor torque (page 275). | 6 | | | | | | | | | | | | |
| | DC voltage | 01.11 DC voltage (page 275). | 7 | | | | | | | | | | | | |
| | Output power | 01.14 Output power (page 276). | 8 | | | | | | | | | | | | |
| | Reserved | | 9 | | | | | | | | | | | | |
| | Speed ref ramp in | 23.01 Speed ref ramp input (page 349). | 10 | | | | | | | | | | | | |
| | Speed ref ramp out | 23.02 Speed ref ramp output (page 349). | 11 | | | | | | | | | | | | |
| | Speed ref used | 24.01 Used speed reference (page 350). | 12 | | | | | | | | | | | | |
| | Reserved | | 13 | | | | | | | | | | | | |
| | Freq ref used | 28.02 Frequency ref ramp output (page 354). | 14 | | | | | | | | | | | | |
| | Reserved | | 15 | | | | | | | | | | | | |
| | Process PID out | 40.01 Process PID output actual (page 409). | 16 | | | | | | | | | | | | |
| | Reserved | | 17...19 | | | | | | | | | | | | |
| | Temp sensor 1 excitation | The output is used to feed an excitation current to the temperature sensor 1, see parameter 35.11 Temperature 1 source. See also section Programmable protection functions (page 167). | 20 | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|--------------------------------------|---|------------|
| | Temp sensor 2 excitation | The output is used to feed an excitation current to the temperature sensor 2, see parameter 35.21 Temperature 2 source . See also section Programmable protection functions (page 167). | 21 |
| | Reserved | | 21...25 |
| | Abs motor speed used | 01.61 Abs motor speed used (page 278). | 26 |
| | Abs motor speed % | 01.62 Abs motor speed % (page 278). | 27 |
| | Abs output frequency | 01.63 Abs output frequency (page 278). | 28 |
| | Reserved | | 29 |
| | Abs motor torque | 01.64 Abs motor torque (page 278). | 30 |
| | Abs output power | 01.65 Abs output power (page 278). | 31 |
| | Abs motor shaft power | 01.68 Abs motor shaft power (page 278). | 32 |
| | External PID1 out | 71.01 External PID act value (page 455). | 33 |
| | Reserved | | 34...36 |
| | AO1 data storage | 13.91 AO1 data storage (page 317). | 37 |
| | AO2 data storage | 13.92 AO2 data storage (page 317). | 38 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 13.13 | AO1 forced value | Forced value that can be used instead of the selected output signal. See parameter 13.02 AO force selection . | 0.000 V |
| | 0.000...22.000 mA / 0.000...11.000 V | Forced value for AO1. | 1 = 1 unit |
| 13.15 | AO1 unit selection | Selects the unit for readings and settings related to analog input AO1. | V |
| | V | Volts. | 2 |
| | mA | Milliamperes. | 10 |
| 13.16 | AO1 filter time | <p>Defines the filtering time constant for analog output AO1.</p>  $O = I \times (1 - e^{-t/T})$ <p> I = filter input (step) O = filter output t = time T = filter time constant </p> | 0.100 s |
| | 0.000 ... 30.000 s | Filter time constant. | 1000 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------|---|------------|
| 13.17 | AO1 source min | <p>Defines the real minimum value of the signal (selected by parameter 13.12 AO1 source) that corresponds to the minimum required AO1 output value (defined by parameter 13.19 AO1 out at AO1 src min).</p>  <p>Programming 13.17 as the maximum value and 13.18 as the minimum value inverts the output.</p>  | 0.0 |

| No. | Name/Value | Description | Def/FbEq16 |
|---|--|---|--|
| AO has automatic scaling. Every time the source for the AO is changed, the scaling range is changed accordingly. User given minimum and maximum values override the automatic values. | | | |
| | 13.12 AO1 source , 13.22 AO2 source | 13.17 AO1 source min , 13.27 AO2 source min | 13.18 AO1 source max , 13.28 AO2 source max |
| 0 | Zero | N/A (Output is constant zero.) | |
| 1 | Motor speed used | 0 | 46.01 Speed scaling |
| 3 | Output frequency | 0 | 46.02 Frequency scaling |
| 4 | Motor current | 0 | Max. value of 30.17 Maximum current |
| 5 | Motor current % of motor nominal | 0% | 100% |
| 6 | Motor torque | 0 | 46.03 Torque scaling |
| 7 | DC voltage | Min. value of 01.11 DC voltage | Max. value of 01.11 DC voltage |
| 8 | Output power | 0 | 46.04 Power scaling |
| 10 | Speed ref ramp in | 0 | 46.01 Speed scaling |
| 11 | Speed ref ramp out | 0 | 46.01 Speed scaling |
| 12 | Speed ref used | 0 | 46.01 Speed scaling |
| 14 | Freq ref used | 0 | 46.02 Frequency scaling |
| 16 | Process PID out | Min. value of 40.01 Process PID output actual | Max. value of 40.01 Process PID output actual |
| 20 | Temp sensor 1 excitation | N/A (Analog output is not scaled; it is determined by the sensor's triggering voltage.) | |
| 21 | Temp sensor 2 excitation | | |
| 26 | Abs motor speed used | 0 | 46.01 Speed scaling |
| 27 | Abs motor speed % | 0 | 46.01 Speed scaling |
| 28 | Abs output frequency | 0 | 46.02 Frequency scaling |
| 30 | Abs motor torque | 0 | 46.03 Torque scaling |
| 31 | Abs output power | 0 | 46.04 Power scaling |
| 32 | Abs motor shaft power | 0 | 46.04 Power scaling |
| 33 | External PID1 out | Min. value of 71.01 External PID act value | Max. value of 71.01 External PID act value |
| | Other | Min. value of the selected parameter | Max. value of the selected parameter |
| | | | |
| -32768.0...32767.0 | | Real signal value corresponding to minimum AO1 output value. | 1 = 1 |
| 13.18 | AO1 source max | Defines the real maximum value of the signal (selected by parameter 13.12 AO1 source) that corresponds to the maximum required AO1 output value (defined by parameter 13.20 AO1 out at AO1 src max). See parameter 13.17 AO1 source min . | 50.0; 60.0 (95.20 b0) |
| -32768.0...32767.0 | | Real signal value corresponding to maximum AO1 output value. | 1 = 1 |
| 13.19 | AO1 out at AO1 src min | Defines the minimum output value for analog output AO1. See also drawing at parameter 13.17 AO1 source min . | 0.000 V |
| 0.000...22.000 mA / 0.000...11.000 V | | Minimum AO1 output value. | 1000 = 1 unit |
| 13.20 | AO1 out at AO1 src max | Defines the maximum output value for analog output AO1. See also drawing at parameter 13.17 AO1 source min . | 10.000 V |
| 0.000...22.000 mA / 0.000...11.000 V | | Maximum AO1 output value. | 1000 = 1 unit |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------|--|---------------|
| 13.21 | AO2 actual value | Displays the value of AO2 in mA. This parameter is read-only. | - |
| | 0.000 ... 22.000 mA | Value of AO2. | 1000 = 1 mA |
| 13.22 | AO2 source | Selects a signal to be connected to analog output AO2. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. For the selections, see parameter 13.12 AO1 source. | Motor current |
| 13.23 | AO2 forced value | Forced value that can be used instead of the selected output signal. See parameter 13.02 AO force selection. | 0.000 mA |
| | 0.000 ... 22.000 mA | Forced value for AO2. | 1000 = 1 mA |
| 13.26 | AO2 filter time | Defines the filtering time constant for analog output AO2. See parameter 13.16 AO1 filter time. | 0.100 s |
| | 0.000 ... 30.000 s | Filter time constant. | 1000 = 1 s |
| 13.27 | AO2 source min | Defines the real minimum value of the signal (selected by parameter 13.22 AO2 source) that corresponds to the minimum required AO2 output value (defined by parameter 13.29 AO2 out at AO2 src min). See parameter 13.17 AO1 source min about the AO automatic scaling. <div> </div> Programming 13.27 as the maximum value and 13.28 as the minimum value inverts the output. <div> </div> | 0.0 |
| | -32768.0...32767.0 | Real signal value corresponding to minimum AO2 output value. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------|------------------------|---|-------------|
| 13.28 | AO2 source max | Defines the real maximum value of the signal (selected by parameter 13.22 AO2 source) that corresponds to the maximum required AO2 output value (defined by parameter 13.30 AO2 out at AO2 src max). See parameter 13.27 AO2 source min. See parameter 13.17 AO1 source min about the AO automatic scaling. | 30000.0 |
| | -32768.0...32767.0 | Real signal value corresponding to maximum AO2 output value. | 1 = 1 |
| 13.29 | AO2 out at AO2 src min | Defines the minimum output value for analog output AO2. See also drawing at parameter 13.27 AO2 source min. | 0.000 mA |
| | 0.000 ... 22.000 mA | Minimum AO2 output value. | 1000 = 1 mA |
| 13.30 | AO2 out at AO2 src max | Defines the maximum output value for analog output AO2. See also drawing at parameter 13.27 AO2 source min. | 20.000 mA |
| | 0.000 ... 22.000 mA | Maximum AO2 output value. | 1000 = 1 mA |
| 13.91 | AO1 data storage | Storage parameter for controlling analog output AO1, for example, through the embedded fieldbus interface. In parameter 13.12 AO1 source, select AO1 data storage. Then set this parameter as the target of the incoming value data. With the embedded fieldbus interface, simply set the target selection parameter of that particular data (58.101...58.114) to AO1 data storage. | 0.00 |
| | -327.68...327.67 | Storage parameter for AO1. | 100 = 1 |
| 13.92 | AO2 data storage | Storage parameter for controlling analog output AO2, for example, through the embedded fieldbus interface. In parameter 13.22 AO2 source, select AO2 data storage. Then set this parameter as the target of the incoming value data. With the embedded fieldbus interface, simply set the target selection parameter of that particular data (58.101...58.114) to AO2 data storage. | 0.00 |
| | -327.68...327.67 | Storage parameter for AO2. | 100 = 1 |
| 15 I/O extension module | | Configuration of the I/O extension module installed in slot 2. See also section <i>Programmable I/O extensions</i> (page 92). Note: The contents of the parameter group vary according to the selected I/O extension module type. | |
| 15.01 | Extension module type | Activates (and specifies the type of) I/O extension module. If the value is <i>None</i> , when an extension module has been installed and the drive is powered, the drive automatically sets the value to the type it has detected (= value of parameter 15.02 Detected extension module); otherwise warning <i>A7AB Extension I/O configuration failure</i> is generated and you have to set the value of this parameter manually. | CMOD-01 |
| | None | Inactive. | 0 |
| | CMOD-01 | CMOD-01 multifunction extension module (external 24 V AC/DC and digital I/O). | 1 |
| | CMOD-02 | CMOD-02 multifunction extension module (external 24 V AC/DC and isolated PTC interface). | 2 |
| | CHDI-01 | CHDI-01 115/230 V digital input extension module. | 3 |
| | CPTC-02 | CPTC-02 extension module (external 24 V and ATEX certified PTC interface). | 4 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------|---|------------|
| 15.02 | Detected extension module | I/O extension module detected on the drive. | CMOD-01 |
| | None | Inactive. | 0 |
| | CMOD-01 | CMOD-01 multifunction extension module (external 24 V AC/DC and digital I/O). | 1 |
| | CMOD-02 | CMOD-02 multifunction extension module (external 24 V AC/DC and isolated PTC interface). | 2 |
| | CHDI-01 | CHDI-01 115/230 V digital input extension module. | 3 |
| | CPTC-02 | CPTC-02 extension module (external 24 V and ATEX certified PTC interface). | 4 |
| 15.03 | DI status | Displays the status of the digital inputs DI7...DI12 on the extension module Bit 0 indicates the status of DI7. Example: 001001b = DI7 and DI10 are on, remainder are off. This parameter is read-only. | - |

| Bit | Name | Description |
|--------|----------|-----------------------------|
| 0 | DI7 | 1 = Digital input 7 is ON. |
| 1 | DI8 | 1 = Digital input 8 is ON. |
| 2 | DI9 | 1 = Digital input 9 is ON. |
| 3 | DI10 | 1 = Digital input 10 is ON. |
| 4 | DI11 | 1 = Digital input 11 is ON. |
| 5 | DI12 | 1 = Digital input 12 is ON. |
| 6...15 | Reserved | |

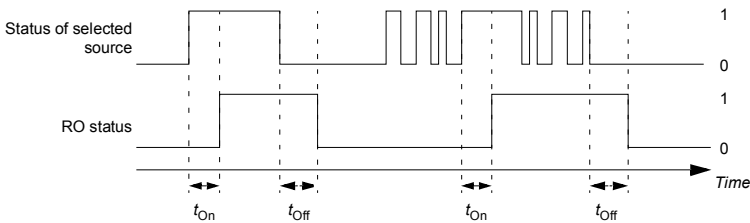
| | | | |
|-------|---------------|---|-------|
| | 0000h...FFFFh | Status of digital input/outputs. | 1 = 1 |
| 15.04 | RO/DO status | Displays the status of the relay outputs RO4 and RO5 and digital output DO1 on the extension module. Bits 0...1 indicates the status of RO4...RO5; bit 5 indicates the status of DO1. Example: 100101b = RO4 is on, RO5 is off. and DO1 is on. This parameter is read-only. | - |

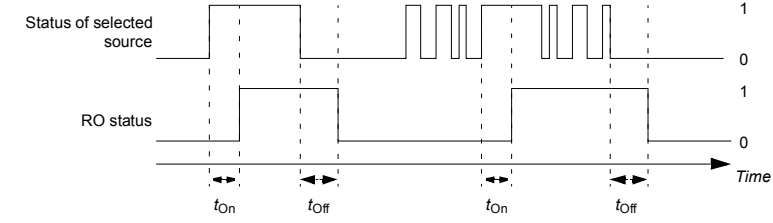
| Bit | Name | Description |
|--------|----------|-----------------------------|
| 0 | RO4 | 1 = Relay output 4 is ON. |
| 1 | RO5 | 1 = Relay output 5 is ON |
| 2...4 | Reserved | |
| 5 | DO1 | 1 = Digital output 1 is ON. |
| 6...15 | Reserved | |

| | | | |
|--|---------------|----------------------------------|-------|
| | 0000h...FFFFh | Status of relay/digital outputs. | 1 = 1 |
|--|---------------|----------------------------------|-------|

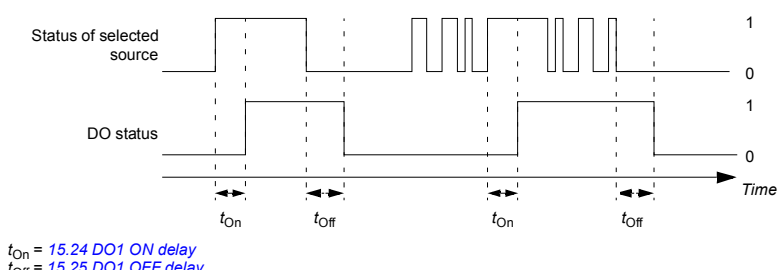
| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | |
|--|-----------------------|--|---------------|-----|------|-------------|---|-----|--|---|-----|--|-------|----------|--|---|-----|---|--------|----------|--|
| 15.05 | RO/DO force selection | <p>The electrical statuses of the relay/digital outputs can be overridden, for example, for testing purposes. A bit in parameter 15.06 RO/DO forced data is provided for each relay or digital output, and its value is applied whenever the corresponding bit in this parameter is 1.</p> <p>Note: Boot and power cycle reset the force selections (parameters 15.05 and 15.06).</p> | 0000h | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>RO4</td><td>1 = Force RO4 to value of bit 0 of parameter 15.06 RO/DO forced data. (0 = Normal mode)</td></tr><tr><td>1</td><td>RO5</td><td>1 = Force RO5 to value of bit 1 of parameter 15.06 RO/DO forced data. (0 = Normal mode)</td></tr><tr><td>2...4</td><td>Reserved</td><td></td></tr><tr><td>5</td><td>DO1</td><td>1 = Force DO1 to value of bit 5 of parameter 15.06 RO/DO forced data. (0 = Normal mode)</td></tr><tr><td>6...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Value | 0 | RO4 | 1 = Force RO4 to value of bit 0 of parameter 15.06 RO/DO forced data . (0 = Normal mode) | 1 | RO5 | 1 = Force RO5 to value of bit 1 of parameter 15.06 RO/DO forced data . (0 = Normal mode) | 2...4 | Reserved | | 5 | DO1 | 1 = Force DO1 to value of bit 5 of parameter 15.06 RO/DO forced data . (0 = Normal mode) | 6...15 | Reserved | |
| Bit | Name | Value | | | | | | | | | | | | | | | | | | | |
| 0 | RO4 | 1 = Force RO4 to value of bit 0 of parameter 15.06 RO/DO forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | |
| 1 | RO5 | 1 = Force RO5 to value of bit 1 of parameter 15.06 RO/DO forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | |
| 2...4 | Reserved | | | | | | | | | | | | | | | | | | | | |
| 5 | DO1 | 1 = Force DO1 to value of bit 5 of parameter 15.06 RO/DO forced data . (0 = Normal mode) | | | | | | | | | | | | | | | | | | | |
| 6...15 | Reserved | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Override selection for relay/digital outputs. | 1 = 1 | | | | | | | | | | | | | | | | | | |
| 15.06 | RO/DO forced data | <p>Allows the data value of a forced relay or digital output to be changed from 0 to 1. It is only possible to force an output that has been selected in parameter 15.05 RO/DO force selection. Bits 0...1 are the forced values for RO4...RO5; bit 5 is the forced value for DO1.</p> | 0000h | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>RO4</td><td>1 = Force the value of this bit to RO4, if so defined in parameter 15.05 RO/DO force selection.</td></tr><tr><td>1</td><td>RO5</td><td>1 = Force the value of this bit to RO5, if so defined in parameter 15.05 RO/DO force selection.</td></tr><tr><td>2...4</td><td>Reserved</td><td></td></tr><tr><td>5</td><td>DO1</td><td>1 = Force the value of this bit to DO1 if so defined in parameter 15.05 RO/DO force selection.</td></tr><tr><td>6...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Description | 0 | RO4 | 1 = Force the value of this bit to RO4, if so defined in parameter 15.05 RO/DO force selection . | 1 | RO5 | 1 = Force the value of this bit to RO5, if so defined in parameter 15.05 RO/DO force selection . | 2...4 | Reserved | | 5 | DO1 | 1 = Force the value of this bit to DO1 if so defined in parameter 15.05 RO/DO force selection . | 6...15 | Reserved | |
| Bit | Name | Description | | | | | | | | | | | | | | | | | | | |
| 0 | RO4 | 1 = Force the value of this bit to RO4, if so defined in parameter 15.05 RO/DO force selection . | | | | | | | | | | | | | | | | | | | |
| 1 | RO5 | 1 = Force the value of this bit to RO5, if so defined in parameter 15.05 RO/DO force selection . | | | | | | | | | | | | | | | | | | | |
| 2...4 | Reserved | | | | | | | | | | | | | | | | | | | | |
| 5 | DO1 | 1 = Force the value of this bit to DO1 if so defined in parameter 15.05 RO/DO force selection . | | | | | | | | | | | | | | | | | | | |
| 6...15 | Reserved | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Forced values of relay/digital outputs. | 1 = 1 | | | | | | | | | | | | | | | | | | |
| 15.07 | RO4 source | Selects a drive signal to be connected to relay output RO4. | Not energized | | | | | | | | | | | | | | | | | | |
| Not energized | | Output is not energized. | 0 | | | | | | | | | | | | | | | | | | |
| Energized | | Output is energized. | 1 | | | | | | | | | | | | | | | | | | |
| Ready run | | Bit 1 of 06.11 Main status word (see page 286). | 2 | | | | | | | | | | | | | | | | | | |
| Reserved | | | 3 | | | | | | | | | | | | | | | | | | |
| Enabled | | Bit 0 of 06.16 Drive status word 1 (see page 287). | 4 | | | | | | | | | | | | | | | | | | |
| Started | | Bit 5 of 06.16 Drive status word 1 (see page 287). | 5 | | | | | | | | | | | | | | | | | | |
| Magnetized | | Bit 1 of 06.17 Drive status word 2 (see page 288). | 6 | | | | | | | | | | | | | | | | | | |
| Running | | Bit 6 of 06.16 Drive status word 1 (see page 287). | 7 | | | | | | | | | | | | | | | | | | |
| Ready ref | | Bit 2 of 06.11 Main status word (see page 286). | 8 | | | | | | | | | | | | | | | | | | |
| At setpoint | | Bit 8 of 06.11 Main status word (see page 286). | 9 | | | | | | | | | | | | | | | | | | |

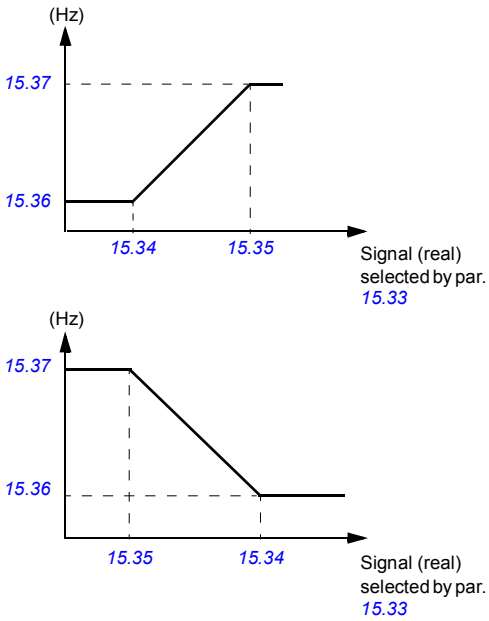
| No. | Name/Value | Description | Def/FbEq16 |
|-----|--------------------------|--|------------|
| | Reverse | Bit 2 of 06.19 Speed control status word (see page 289). | 10 |
| | Zero speed | Bit 0 of 06.19 Speed control status word (see page 289). | 11 |
| | Above limit | Bit 10 of 06.17 Drive status word 2 (see page 288). | 12 |
| | Warning | Bit 7 of 06.11 Main status word (see page 286). | 13 |
| | Fault | Bit 3 of 06.11 Main status word (see page 286). | 14 |
| | Fault (-1) | Inverted bit 3 of 06.11 Main status word (see page 286). | 15 |
| | Fault/Warning | Bit 3 of 06.11 Main status word OR bit 7 of 06.11 Main status word (see page 286). | 16 |
| | Overcurrent | Fault 2310 Overcurrent has occurred. | 17 |
| | Overvoltage | Fault 3210 DC link overvoltage has occurred. | 18 |
| | Drive temp | Fault 2381 IGBT overload , 4110 Control board temperature , 4210 IGBT overtemperature , 4290 Cooling , 42F1 IGBT temperature , 4310 Excess temperature or 4380 Excess temperature difference has occurred. | 19 |
| | Undervoltage | Fault 3220 DC link undervoltage has occurred. | 20 |
| | Motor temp | Fault 4981 External temperature 1 or 4982 External temperature 2 has occurred. | 21 |
| | Reserved | | 22 |
| | Ext2 active | Bit 11 of 06.16 Drive status word 1 (see page 287). | 23 |
| | Remote control | Bit 9 of 06.11 Main status word (see page 286). | 24 |
| | Reserved | | 25...26 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 27 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 28 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 29 |
| | Reserved | | 30...32 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 33 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 34 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 35 |
| | Reserved | | 36...38 |
| | Start delay | Bit 13 of 06.17 Drive status word 2 (see page 288). | 39 |
| | RO/DIO control word bit0 | Bit 0 of 10.99 RO/DIO control word (see page 305). | 40 |
| | RO/DIO control word bit1 | Bit 1 of 10.99 RO/DIO control word (see page 305). | 41 |
| | RO/DIO control word bit2 | Bit 2 of 10.99 RO/DIO control word (see page 305). | 42 |
| | Reserved | | 43...44 |
| | PFC1 | Bit 0 of 76.01 PFC status (see page 457). | 45 |
| | PFC2 | Bit 1 of 76.01 PFC status (see page 457). | 46 |
| | PFC3 | Bit 2 of 76.01 PFC status (see page 457). | 47 |
| | PFC4 | Bit 3 of 76.01 PFC status (see page 457). | 48 |
| | PFC5 | Bit 4 of 76.01 PFC status (see page 457). | 49 |
| | PFC6 | Bit 5 of 76.01 PFC status (see page 457). | 50 |
| | Reserved | | 51...52 |

| No. | Name/Value | Description | Def/FbEq16 |
|---|----------------------|--|------------------------------|
| | Event word 1 | Event word 1 = 1 if any bit of 04.40 Event word 1 (see page 281) is 1, that is, if any warning, fault or pure event that has been defined with parameters 04.41...04.71 is on. | 53 |
| | Reserved | | 54 |
| | Run permissive | Bit 7 of 06.22 Hand-off-auto status word . | 55 |
| | Start interlock 1 | Bit 8 of 06.22 Hand-off-auto status word . | 56 |
| | Start interlock 2 | Bit 9 of 06.22 Hand-off-auto status word . | 57 |
| | Start interlock 3 | Bit 10 of 06.22 Hand-off-auto status word . | 58 |
| | Start interlock 4 | Bit 11 of 06.22 Hand-off-auto status word . | 59 |
| | All start interlocks | Bit 12 of 06.22 Hand-off-auto status word . | 60 |
| | User load curve | Bit 3 (Outside load limit) of 37.01 ULC output status word (see page 406). | 61 |
| | RO/DIO control word | For 15.07 RO4 source : Bit 3 (RO4) of 10.99 RO/DIO control word (see page 305). For 15.10 RO5 source : Bit 4 (RO5) of 10.99 RO/DIO control word (see page 305). | 62 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 15.08 | RO4 ON delay | Defines the activation delay for relay output RO4. | 0.0 s |
|  <p> $t_{On} = 15.08 \text{ RO4 ON delay}$ $t_{Off} = 15.09 \text{ RO4 OFF delay}$ </p> | | | |
| | 0.0 ... 3000.0 s | Activation delay for RO4. | 10 = 1 s |
| 15.09 | RO4 OFF delay | Defines the deactivation delay for relay output RO4. See parameter 15.08 RO4 ON delay . | 0.0 s |
| | 0.0 ... 3000.0 s | Deactivation delay for RO4. | 10 = 1 s |
| 15.10 | RO5 source | Selects a drive signal to be connected to relay output RO5. For the available selections, see parameter 15.07 RO4 source . | <i>Not energized source.</i> |

| No. | Name/Value | Description | Def/FbEq16 |
|---|-------------------|---|----------------|
| 15.11 | RO5 ON delay | Defines the activation delay for relay output RO5. | 0.0 s |
|  <p> $t_{On} = 15.11 \text{ RO5 ON delay}$ $t_{Off} = 15.12 \text{ RO5 OFF delay}$ </p> | | | |
| | 0.0 ... 3000.0 s | Activation delay for RO5. | 10 = 1 s |
| 15.12 | RO5 OFF delay | Defines the deactivation delay for relay output RO5. See parameter 15.11 RO5 ON delay. | 0.0 s |
| | 0.0 ... 3000.0 s | Deactivation delay for RO5. | 10 = 1 s |
| 15.22 | DO1 configuration | Selects how DO1 is used. | Digital output |
| | Digital output | DO1 is used as a digital output. | 0 |
| | Frequency output | DO1 is used as a frequency output. | 2 |
| 15.23 | DO1 source | Selects a drive signal to be connected to digital output DO1 when 15.22 DO1 configuration is set to Digital output. | Not energized |
| | Not energized | Output is not energized. | 0 |
| | Energized | Output is energized. | 1 |
| | Ready run | Bit 1 of 06.11 Main status word (see page 286). | 2 |
| | Reserved | | 3 |
| | Enabled | Bit 0 of 06.16 Drive status word 1 (see page 287). | 4 |
| | Started | Bit 5 of 06.16 Drive status word 1 (see page 287). | 5 |
| | Magnetized | Bit 1 of 06.17 Drive status word 2 (see page 288). | 6 |
| | Running | Bit 6 of 06.16 Drive status word 1 (see page 287). | 7 |
| | Ready ref | Bit 2 of 06.11 Main status word (see page 286). | 8 |
| | At setpoint | Bit 8 of 06.11 Main status word (see page 286). | 9 |
| | Reverse | Bit 2 of 06.19 Speed control status word (see page 289). | 10 |
| | Zero speed | Bit 0 of 06.19 Speed control status word (see page 289). | 11 |
| | Above limit | Bit 10 of 06.17 Drive status word 2 (see page 288). | 12 |
| | Warning | Bit 7 of 06.11 Main status word (see page 286). | 13 |
| | Fault | Bit 3 of 06.11 Main status word (see page 286). | 14 |
| | Fault (-1) | Inverted bit 3 of 06.11 Main status word (see page 286). | 15 |
| | Fault/Warning | Bit 3 of 06.11 Main status word OR bit 7 of 06.11 Main status word (see page 286). | 16 |
| | Overcurrent | Fault 2310 Overcurrent has occurred. | 17 |
| | Overvoltage | Fault 3210 DC link overvoltage has occurred. | 18 |
| | Drive temp | Fault 2381 IGBT overload, 4110 Control board temperature, 4210 IGBT overtemperature, 4290 Cooling, 42F1 IGBT temperature, 4310 Excess temperature or 4380 Excess temperature difference has occurred. | 19 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----|-----------------------------|---|------------|
| | Undervoltage | Fault 3220 DC link undervoltage has occurred. | 20 |
| | Motor temp | Fault 4981 External temperature 1 or 4982 External temperature 2 has occurred. | 21 |
| | Reserved | | 22 |
| | Ext2 active | Bit 11 of 06.16 Drive status word 1 (see page 287). | 23 |
| | Remote control | Bit 9 of 06.11 Main status word (see page 286). | 24 |
| | Reserved | | 25...26 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 27 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 28 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 29 |
| | Reserved | | 30...32 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 33 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 34 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 35 |
| | Reserved | | 36...38 |
| | Start delay | Bit 13 of 06.17 Drive status word 2 (see page 288). | 39 |
| | RO/DIO control word bit0 | Bit 0 of 10.99 RO/DIO control word (see page 305). | 40 |
| | RO/DIO control word bit1 | Bit 1 of 10.99 RO/DIO control word (see page 305). | 41 |
| | RO/DIO control word bit2 | Bit 2 of 10.99 RO/DIO control word (see page 305). | 42 |
| | PFC1 | Bit 0 of 76.01 PFC status (see page 457). | 45 |
| | PFC2 | Bit 1 of 76.01 PFC status (see page 457). | 46 |
| | PFC3 | Bit 2 of 76.01 PFC status (see page 457). | 47 |
| | PFC4 | Bit 3 of 76.01 PFC status (see page 457). | 48 |
| | PFC5 | Bit 4 of 76.01 PFC status (see page 457). | 49 |
| | PFC6 | Bit 5 of 76.01 PFC status (see page 457). | 50 |
| | Reserved | | 51...52 |
| | Event word 1 | Event word 1 = 1 if any bit of 04.40 Event word 1 (see page 281) is 1, that is, if any warning, fault or pure event that has been defined with parameters 04.41...04.71 is on. | 53 |
| | Reserved | | 54 |
| | Run permissive | Bit 7 of 06.22 Hand-off-auto status word . | 55 |
| | Start interlock 1 | Bit 8 of 06.22 Hand-off-auto status word . | 56 |
| | Start interlock 2 | Bit 9 of 06.22 Hand-off-auto status word . | 57 |
| | Start interlock 3 | Bit 10 of 06.22 Hand-off-auto status word . | 58 |
| | Start interlock 4 | Bit 11 of 06.22 Hand-off-auto status word . | 59 |
| | All start interlocks | Bit 12 of 06.22 Hand-off-auto status word . | 60 |
| | User load curve | Bit 3 (Outside load limit) of 37.01 ULC output status word (see page 406). | 61 |
| | RO/DIO control word | For 15.23 DO1 source ; Bit 8 (DIO1) of 10.99 RO/DIO control word (see page 305). | 62 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 |
|--|-------------------------|--|----------------------------------|
| 15.24 | DO1 ON delay | Defines the activation delay for digital output DO1 when 15.22 DO1 configuration is set to Digital output . | 0.0 s |
|  <p>t_{On} = 15.24 DO1 ON delay t_{Off} = 15.25 DO1 OFF delay</p> | | | |
| | 0.0 ... 3000.0 s | Activation delay for DO1. | 10 = 1 s |
| 15.25 | DO1 OFF delay | Defines the deactivation delay for relay output DO1 when 15.22 DO1 configuration is set to Digital output . See parameter 15.24 DO1 ON delay . | 0.0 s |
| | 0.0 ... 3000.0 s | Deactivation delay for DO1. | 10 = 1 s |
| 15.32 | Freq out 1 actual value | Displays the value of frequency output 1 at digital output DO1 when 15.22 DO1 configuration is set to Frequency output . This parameter is read-only. | - |
| | 0 ... 16000 Hz | Value of frequency output 1. | 1 = 1 Hz |
| 15.33 | Freq out 1 source | Selects a signal to be connected to digital output DO1 when 15.22 DO1 configuration is set to Frequency output . Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. | Motor speed used |
| | Not selected | None. | 0 |
| | Motor speed used | 01.01 Motor speed used (page 275). | 1 |
| | Output frequency | 01.06 Output frequency (page 275). | 3 |
| | Motor current | 01.07 Motor current (page 275). | 4 |
| | Motor torque | 01.10 Motor torque (page 275). | 6 |
| | DC voltage | 01.11 DC voltage (page 275). | 7 |
| | Output power | 01.14 Output power (page 276). | 8 |
| | Speed ref ramp in | 23.01 Speed ref ramp input (page 349). | 10 |
| | Speed ref ramp out | 23.02 Speed ref ramp output (page 349). | 11 |
| | Speed ref used | 24.01 Used speed reference (page 350). | 12 |
| | Reserved | | 13 |
| | Freq ref used | 28.02 Frequency ref ramp output (page 354). | 14 |
| | Reserved | | 15 |
| | Process PID out | 40.01 Process PID output actual (page 409). | 16 |
| | Other | Source selection (see Terms and abbreviations on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------|---|-------------------------------------|
| 15.34 | <i>Freq out 1 src min</i> | <p>Defines the real value of the signal (selected by parameter 15.33 <i>Freq out 1 source</i>) that corresponds to the minimum value of frequency output 1 (defined by parameter 15.36 <i>Freq out 1 at src min</i>). This applies when 15.22 <i>DO1 configuration</i> is set to <i>Frequency output</i>.</p>  <p>Signal (real) selected by par. 15.33</p> <p>Signal (real) selected by par. 15.33</p> | 0.000 |
| | -32768.000... 32767.000 | Real signal value corresponding to minimum value of frequency output 1. | 1 = 1 |
| 15.35 | <i>Freq out 1 src max</i> | <p>Defines the real value of the signal (selected by parameter 15.33 <i>Freq out 1 source</i>) that corresponds to the maximum value of frequency output 1 (defined by parameter 15.37 <i>Freq out 1 at src max</i>). This applies when 15.22 <i>DO1 configuration</i> is set to <i>Frequency output</i>. See parameter 15.34 <i>Freq out 1 src min</i>.</p> | 1500.000; 1800.000 (95.20 b0) |
| | -32768.000... 32767.000 | Real signal value corresponding to maximum value of frequency output 1. | 1 = 1 |
| 15.36 | <i>Freq out 1 at src min</i> | <p>Defines the minimum output value of frequency output 1 when 15.22 <i>DO1 configuration</i> is set to <i>Frequency output</i>. See also drawing at parameter 15.34 <i>Freq out 1 src min</i>.</p> | 0 Hz |
| | 0 ... 16000 Hz | Minimum frequency output 1 value. | 1 = 1 Hz |
| 15.37 | <i>Freq out 1 at src max</i> | <p>Defines the maximum value of frequency output 1 when 15.22 <i>DO1 configuration</i> is set to <i>Frequency output</i>. See also drawing at parameter 15.34 <i>Freq out 1 src min</i>.</p> | 16000 Hz |
| | 0 ... 16000 Hz | Maximum value of frequency output 1. | 1 = 1 Hz |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------------------|------------------------------|--|-------------|
| 19 Operation mode | | Selection of local and external control location sources and operating modes. See also section <i>Operating modes of the drive</i> (page 86). | |
| 19.01 | Actual operation mode | Displays the operating mode currently used. See parameter 19.11. This parameter is read-only. | - |
| | Zero | None. | 1 |
| | Speed | Speed control (in vector motor control mode). | 2 |
| | Reserved | | 3...9 |
| | Scalar (Hz) | Frequency control in scalar motor control mode (in scalar motor control mode). | 10 |
| | Forced magn. | Motor is in magnetizing mode. | 20 |
| 19.11 | Ext1/Ext2 selection | Selects the source for external control location EXT1/EXT2 selection. 0 = EXT1 1 = EXT2 | EXT1 |
| | EXT1 | EXT1 (permanently selected). | 0 |
| | EXT2 | EXT2 (permanently selected). | 1 |
| | FBAA MCW bit 11 | Control word bit 11 received through fieldbus interface A. | 2 |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 3 |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 4 |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 5 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 6 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 7 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 8 |
| | Reserved | | 9...18 |
| | Timed function 1 | Bit 0 of <i>34.01 Timed functions status</i> (see page 384). | 19 |
| | Timed function 2 | Bit 1 of <i>34.01 Timed functions status</i> (see page 384). | 20 |
| | Timed function 3 | Bit 2 of <i>34.01 Timed functions status</i> (see page 384). | 21 |
| | Reserved | | 22...24 |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 25 |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 26 |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 27 |
| | Reserved | | 28...31 |
| | EFB MCW bit 11 | Control word bit 11 received through the embedded fieldbus interface. | 32 |
| | FBAA connection loss | Detected communication loss of fieldbus interface A changes control mode to EXT2. | 33 |
| | EFB connection loss | Detected communication loss of embedded fieldbus interface changes control mode to EXT2. | 34 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | |
|---------------------------|-------------------------|---|---------------------------|---------|-----------------------|-------|-------------------|------|---|------|---|
| 19.18 | HAND/OFF disable source | Selects the source for Hand/Off disable. 1 = Hand and/or Off buttons are disabled on the control panel and in Drive composer PC tool. Parameter 19.19 HAND/OFF disable action specifies which buttons are disabled or enabled. If the HAND/OFF disable is activated while the drive is in the Hand mode, the mode will be automatically switched to Off and the motor stops, and the user must start the motor again. | Not used | | | | | | | | |
| | Not used | 0 = Hand and/or Off buttons are enabled and operational. | 0 | | | | | | | | |
| | Active | 1 = Hand and/or Off buttons are disabled and not operational. | 1 | | | | | | | | |
| | DI1 | Digital input DI1 (10.02 DI delayed status, bit 0). | 2 | | | | | | | | |
| | DI2 | Digital input DI2 (10.02 DI delayed status, bit 1). | 3 | | | | | | | | |
| | DI3 | Digital input DI3 (10.02 DI delayed status, bit 2). | 4 | | | | | | | | |
| | DI4 | Digital input DI4 (10.02 DI delayed status, bit 3). | 5 | | | | | | | | |
| | DI5 | Digital input DI5 (10.02 DI delayed status, bit 4). | 6 | | | | | | | | |
| | DI6 | Digital input DI6 (10.02 DI delayed status, bit 5). | 7 | | | | | | | | |
| | Comms | DCU profile control word bit 14 received through the embedded fieldbus interface. If a fieldbus adapter that supports transparent mode profiles is used, DCU control word bit 14 through the transparent mode profile is used. | 8 | | | | | | | | |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - | | | | | | | | |
| 19.19 | HAND/OFF disable action | Selects which buttons are disabled on the control panel and in the Drive composer PC tool when parameter 19.18 HAND/OFF disable source is disabled. | HAND | | | | | | | | |
| | HAND | Hand button disabled. | 0 | | | | | | | | |
| | OFF and HAND | Both Off and Hand buttons disabled. | 1 | | | | | | | | |
| | OFF when Auto | Off button is disabled when the drive is in the Auto mode. Off button is again enabled after the Hand button has been pressed. | 2 | | | | | | | | |
| | | | | | | | | | | | |
| 20 Start/stop/direction | | Start/stop/direction and run/start enable signal source selection; positive/negative reference enable signal source selection. For information on control locations, see section Local control vs. external control (page 83). | | | | | | | | | |
| 20.01 | Ext1 commands | Selects the source of start, stop and direction commands for external control location 1 (EXT1). See also parameters 20.02...20.04. | In1 Start | | | | | | | | |
| | Not selected | No start or stop command sources selected. | 0 | | | | | | | | |
| | In1 Start | The source of the start and stop commands is selected by parameter 20.03 Ext1 in1 source. The state transitions of the source bits are interpreted as follows: <table><tr><th>State of source 1 (20.03)</th><th>Command</th></tr><tr><td>0 -> 1 (20.02 = Edge)</td><td>Start</td></tr><tr><td>1 (20.02 = Level)</td><td>Stop</td></tr><tr><td>0</td><td>Stop</td></tr></table> | State of source 1 (20.03) | Command | 0 -> 1 (20.02 = Edge) | Start | 1 (20.02 = Level) | Stop | 0 | Stop | 1 |
| State of source 1 (20.03) | Command | | | | | | | | | | |
| 0 -> 1 (20.02 = Edge) | Start | | | | | | | | | | |
| 1 (20.02 = Level) | Stop | | | | | | | | | | |
| 0 | Stop | | | | | | | | | | |
| | Reserved | | 2...3 | | | | | | | | |


| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | |
|--|--|--|--|--|---------|--------|---|-------|-----|---|------|---|
| | In1P Start; In2 Stop | <p>The sources of the start and stop commands are selected by parameters 20.03 Ext1 in1 source and 20.04 Ext1 in2 source. The state transitions of the source bits are interpreted as follows:</p> <table><tr><th>State of source 1 (20.03)</th><th>State of source 2 (20.04)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>Start</td></tr><tr><td>Any</td><td>0</td><td>Stop</td></tr></table> <p>Notes:</p> <ul style="list-style-type: none">Parameter 20.02 Ext1 start trigger type only has an effect at startup of the drive with this setting. If the start input is ON and 20.02 = Level (1) when the drive starts up, the motor will restart. Parameter 20.02 has no effect at any other time.When source 2 is 0, the Start and Stop keys on the control panel are disabled. | State of source 1 (20.03) | State of source 2 (20.04) | Command | 0 -> 1 | 1 | Start | Any | 0 | Stop | 4 |
| State of source 1 (20.03) | State of source 2 (20.04) | Command | | | | | | | | | | |
| 0 -> 1 | 1 | Start | | | | | | | | | | |
| Any | 0 | Stop | | | | | | | | | | |
| | Reserved | | 5...10 | | | | | | | | | |
| | Control panel | <p>The start and stop commands are taken from the control panel (or PC connected to the control panel connector).</p> <p>Note: This selection requires ACS-AP-I control panel that uses Start/Stop/Loc/Rem logic.</p> | 11 | | | | | | | | | |
| | Fieldbus A | <p>The start and stop commands are taken from fieldbus adapter A.</p> <p>Note: Set also 20.02 Ext1 start trigger type to Level.</p> | 12 | | | | | | | | | |
| | Reserved | | 13 | | | | | | | | | |
| | Embedded fieldbus | <p>The start and stop commands are taken from the embedded fieldbus interface.</p> <p>Note: Set also 20.02 Ext1 start trigger type to Level.</p> | 14 | | | | | | | | | |
| 20.02 | Ext1 start trigger type | <p>Defines whether the start signal for external control location EXT1 is edge-triggered or level-triggered.</p> <p>Note: If a pulse type start signal is selected, this parameter is only effective at drive startup. See the descriptions of the selections of parameter 20.01 Ext1 commands.</p> | Level | | | | | | | | | |
| | Edge | The start signal is edge-triggered. | 0 | | | | | | | | | |
| | Level | The start signal is level-triggered. | 1 | | | | | | | | | |
| 20.03 | Ext1 in1 source | Selects source 1 for parameter 20.01 Ext1 commands . | DI1 | | | | | | | | | |
| | Always off | 0. | 0 | | | | | | | | | |
| | Always on | 1. | 1 | | | | | | | | | |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 | | | | | | | | | |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 | | | | | | | | | |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 | | | | | | | | | |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 | | | | | | | | | |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 | | | | | | | | | |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 | | | | | | | | | |
| | Reserved | | 8...17 | | | | | | | | | |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 | | | | | | | | | |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 | | | | | | | | | |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 | | | | | | | | | |


| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | |
|---|---|---|---|---|---|--------|---|-------|-----|------|------|---|
| | Reserved | | 21...23 | | | | | | | | | |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 24 | | | | | | | | | |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 25 | | | | | | | | | |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 26 | | | | | | | | | |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - | | | | | | | | | |
| 20.04 | Ext1 in2 source | Selects source 2 for parameter 20.01 Ext1 commands . For the available selections, see parameter 20.03 Ext1 in1 source . | Always off | | | | | | | | | |
| 20.06 | Ext2 commands | Selects the source of start, stop and direction commands for external control location 2 (EXT2). See also parameters 20.07...20.09 . | Not selected | | | | | | | | | |
| | Not selected | No start or stop command sources selected. | 0 | | | | | | | | | |
| | In1 Start | The source of the start and stop commands is selected by parameter 20.08 Ext2 in1 source . The state transitions of the source bits are interpreted as follows: <table border="1"><thead><tr><th>State of source 1 (20.08)</th><th>Command</th></tr></thead><tbody><tr><td>0 -> 1 (20.07 = Edge)</td><td>Start</td></tr><tr><td>1 (20.07 = Level)</td><td></td></tr><tr><td>0</td><td>Stop</td></tr></tbody></table> | State of source 1 (20.08) | Command | 0 -> 1 (20.07 = Edge) | Start | 1 (20.07 = Level) | | 0 | Stop | 1 | |
| State of source 1 (20.08) | Command | | | | | | | | | | | |
| 0 -> 1 (20.07 = Edge) | Start | | | | | | | | | | | |
| 1 (20.07 = Level) | | | | | | | | | | | | |
| 0 | Stop | | | | | | | | | | | |
| | In1P Start; In2 Stop | The sources of the start and stop commands are selected by parameters 20.08 Ext2 in1 source and 20.09 Ext2 in2 source . The state transitions of the source bits are interpreted as follows: <table border="1"><thead><tr><th>State of source 1 (20.08)</th><th>State of source 2 (20.09)</th><th>Command</th></tr></thead><tbody><tr><td>0 -> 1</td><td>1</td><td>Start</td></tr><tr><td>Any</td><td>0</td><td>Stop</td></tr></tbody></table> Notes: <ul style="list-style-type: none">Parameter 20.07 Ext2 start trigger type only has an effect at startup of the drive with this setting. If the start input is ON and 20.02 = Level (1) when the drive starts up, the motor will restart. Parameter 20.07 has no effect at any other time.When source 2 is 0, the Start and Stop keys on the control panel are disabled. | State of source 1 (20.08) | State of source 2 (20.09) | Command | 0 -> 1 | 1 | Start | Any | 0 | Stop | 4 |
| State of source 1 (20.08) | State of source 2 (20.09) | Command | | | | | | | | | | |
| 0 -> 1 | 1 | Start | | | | | | | | | | |
| Any | 0 | Stop | | | | | | | | | | |
| | Reserved | | 7...10 | | | | | | | | | |
| | Control panel | The start and stop commands are taken from the control panel (or PC connected to the control panel connector). Note: This selection requires ACS-AP-I control panel that uses Start/Stop/Loc/Rem logic. | 11 | | | | | | | | | |
| | Fieldbus A | The start and stop commands are taken from fieldbus adapter A. Note: Set also 20.07 Ext2 start trigger type to Level . | 12 | | | | | | | | | |
| | Reserved | | 13 | | | | | | | | | |
| | Embedded fieldbus | The start and stop commands are taken from the embedded fieldbus interface. Note: Set also 20.07 Ext2 start trigger type to Level . | 14 | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|---|-------------------|
| 20.07 | <i>Ext2 start trigger type</i> | Defines whether the start signal for external control location EXT2 is edge-triggered or level-triggered. Note: If a pulse type start signal is selected, this parameter is only effective at drive startup. See the descriptions of the selections of parameter 20.06 Ext2 commands . | <i>Level</i> |
| | Edge | The start signal is edge-triggered. | 0 |
| | Level | The start signal is level-triggered. | 1 |
| 20.08 | <i>Ext2 in1 source</i> | Selects source 1 for parameter 20.06 Ext2 commands . For the available selections, see parameter 20.03 Ext1 in1 source . | <i>Always off</i> |
| 20.09 | <i>Ext2 in2 source</i> | Selects source 2 for parameter 20.06 Ext2 commands . For the available selections, see parameter 20.03 Ext1 in1 source . | <i>Always off</i> |
| 20.40 | <i>Run permissive</i> | Selects the source of the Run permissive signal. Value 0 of the source deactivates the Run permissive and prevents running. Value 1 of the source activates the Run permissive and permits running. | <i>Not used</i> |
| | Not used | 0. | 0 |
| | Not used | 1. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | -DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 8 |
| | -DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 9 |
| | -DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 10 |
| | -DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 11 |
| | -DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 12 |
| | -DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 13 |
| | Fieldbus adapter | Control word bit 3 received through the fieldbus interface. | 14 |
| | Embedded fieldbus | ABB Drives profile: Control word bit 3 received through the embedded fieldbus interface DCU profile: Inverse of control word bit 6 received through the embedded fieldbus interface. | 15 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 20.41 | <i>Start interlock 1</i> | Selects the source of the Start interlock 1 signal. Value 0 of the source deactivates the Start interlock 1 signal and inhibits starting. Value 1 of the source activates the Start interlock 1 signal and allows starting. | <i>Not used</i> |
| | Not used | 0. | 0 |
| | Not used | 1. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |

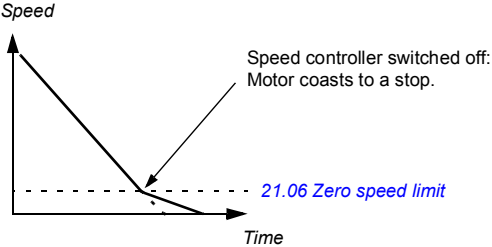
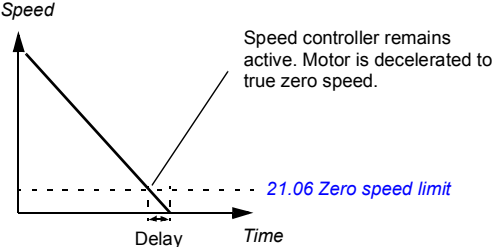
| No. | Name/Value | Description | Def/FbEq16 |
|--------------|----------------------------------|---|-----------------------|
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | -DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 8 |
| | -DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 9 |
| | -DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 10 |
| | -DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 11 |
| | -DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 12 |
| | -DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 13 |
| | Fieldbus adapter | This selection cannot be used to control Start interlock with ABB drives profile from the fieldbus adapter. Use <i>Other [bit]</i> and map to control word user bits. This selection is only available for <i>20.41 Start interlock 1</i> and <i>20.42 Start interlock 2</i> . | 14 |
| | Embedded fieldbus | Start interlock 1: DCU profile: Inverse of control word bit 18 received through the embedded fieldbus interface. Start interlock 2: Inverse of bit 19. This selection is only available for <i>20.41 Start interlock 1</i> and <i>20.42 Start interlock 2</i> . | 15 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| <i>20.42</i> | <i>Start interlock 2</i> | Selects the source of the Start interlock 2 signal. For the selections, see parameter <i>20.41 Start interlock 1</i> . | <i>Not used</i> |
| <i>20.43</i> | <i>Start interlock 3</i> | Selects the source of the Start interlock 3 signal. Start interlock 3 is not supported over the Fieldbus adapter or Embedded fieldbus. For the other selections than 14 and 15, see parameter <i>20.41 Start interlock 1</i> . | <i>Not used</i> |
| <i>20.44</i> | <i>Start interlock 4</i> | Selects the source of the Start interlock 4 signal. Start interlock 4 is not supported over the Fieldbus adapter or Embedded fieldbus. For the other selections than 14 and 15, see parameter <i>20.41 Start interlock 1</i> . | <i>Not used</i> |
| <i>20.45</i> | <i>Start interlock stop mode</i> | Follows motor stop mode selection, see parameter <i>21.03 Stop mode</i> . | <i>Not used</i> |
| | Not used | Not in use. | 0 |
| | Coast | The motor coasts to a stop. | 1 |
| | Ramp | Stop along the active deceleration ramp. | 2 |
| <i>20.46</i> | <i>Run permissive text</i> | Alternative alarm texts for the run permissive. There is also label text (free text) for the run permissive. The control panel display will display the text when the run permissive becomes unsatisfied. You edit the label text in Menu > Primary settings > Start, stop, reference > Interlocks/Permissives > Label text . | <i>Run permissive</i> |
| | Run permissive | | 0 |
| | Reserved | | 1 |
| | Valve opening | | 2 |
| | Pre-lube cycle | | 3 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|------------------------------|
| | Interlock open | | 5 |
| 20.47 | <i>Start interlock 1 text</i> | Alternative alarm texts for the start interlock 1. There is also label text (free text) for each start interlock. The control panel display will display that specific text when the interlock becomes unsatisfied. You edit the label text in Menu > Primary settings > Start, stop, reference > Interlocks/Permissives > Label text. | <i>Start interlock 1</i> |
| | Start interlock 1 | | 0 |
| | Vibration switch | | 1 |
| | Firestat | | 2 |
| | Freezestat | | 3 |
| | Overpressure | | 4 |
| | Vibration trip | | 5 |
| | Smoke alarm | | 6 |
| | Auxiliary open | | 7 |
| | Low suction | | 8 |
| | Low pressure | | 9 |
| | Access door | | 10 |
| | Pressure relief | | 11 |
| | Motor disconnect open | | 12 |
| | Safety option | | 14 |
| | Interlock open | | 15 |
| 20.48 | <i>Start interlock 2 text</i> | Alternative alarm texts for the start interlock 2. See parameter <i>20.47 Start interlock 1 text.</i> | <i>Start interlock 2</i> |
| | Start interlock 2 | For other selections, see parameter <i>20.47 Start interlock 1 text.</i> | 0 |
| 20.49 | <i>Start interlock 3 text</i> | Alternative alarm texts for the start interlock 3. See parameter <i>20.47 Start interlock 1 text.</i> | <i>Start interlock 3</i> |
| | Start interlock 3 | For other selections, see parameter <i>20.47 Start interlock 1 text.</i> | 0 |
| 20.50 | <i>Start interlock 4 text</i> | Alternative alarm texts for the start interlock 4. See parameter <i>20.47 Start interlock 1 text.</i> | <i>Start interlock 4</i> |
| | Start interlock 4 | For other selections, see parameter <i>20.47 Start interlock 1 text.</i> | 0 |
| 20.51 | <i>Start interlock condition</i> | Selects the condition for start interlock function. This parameter determines if the start command is needed before start interlock warnings are displayed. | <i>Start command ignored</i> |
| | Start command ignored | Start interlock warnings are displayed if the interlocks are missing. | 0 |
| | Start command required | Start command must be present before the start interlock warnings are displayed if the interlocks are missing. | 1 |


| No. | Name/Value | Description | Def/FbEq16 |
|---------------------------|-------------------|--|------------------|
| 21 Start/stop mode | | Start and stop modes; emergency stop mode and signal source selection; DC magnetization settings. | |
| 21.01 | <i>Start mode</i> | <p>Selects the motor start function for the vector motor control mode, ie, when <i>99.04 Motor control mode</i> is set to <i>Vector</i>.</p> <p>Notes:</p> <ul style="list-style-type: none"> The start function for the scalar motor control mode is selected by parameter <i>21.19 Scalar start mode</i>. Starting into a rotating motor is not possible when DC magnetizing is selected (<i>Fast</i> or <i>Const time</i>). With permanent magnet motors, <i>Automatic</i> start mode must be used. This parameter cannot be changed while the drive is running. <p>See also section <i>Start methods – DC magnetization</i> (page 142).</p> | <i>Automatic</i> |
| | Fast | The drive pre-magnetizes the motor before start. The pre-magnetizing time is determined automatically, being typically 200 ms to 2 s depending on motor size. This mode should be selected if a high break-away torque is required. | 0 |
| | Const time | <p>The drive pre-magnetizes the motor before start. The pre-magnetizing time is defined by parameter <i>21.02 Magnetization time</i>. This mode should be selected if constant pre-magnetizing time is required (for example, if the motor start must be synchronized with the release of a mechanical brake). This setting also guarantees the highest possible break-away torque when the pre-magnetizing time is set long enough.</p> <p> WARNING! The drive will start after the set magnetizing time has passed even if motor magnetization is not completed. In applications where a full break-away torque is essential, ensure that the constant magnetizing time is long enough to allow generation of full magnetization and torque.</p> | 1 |
| | Automatic | <p>Automatic start guarantees optimal motor start in most cases. It includes the flying start function (starting into a rotating motor) and the automatic restart function. The drive motor control program identifies the flux as well as the mechanical state of the motor and starts the motor instantly under all conditions.</p> <p>Note: If parameter <i>99.04 Motor control mode</i> is set to <i>Scalar</i>, no flying start or automatic restart is possible unless parameter <i>21.19 Scalar start mode</i> is set to <i>Automatic</i>.</p> | 2 |



| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | |
|-------------------|---------------------------|---|-------------------|---------------------------|--------|----------------|------------|-----------------|--------------|------------------|----------------|-------------------|--------|
| 21.02 | Magnetization time | <p>Defines the pre-magnetization time when</p> <ul style="list-style-type: none">parameter 21.01 Start mode is set to Const time (in vector motor control mode), orparameter 21.19 Scalar start mode is set to Const time (in scalar motor control mode). <p>After the start command, the drive automatically premagnetizes the motor for the set time. To ensure full magnetizing, set this parameter to the same value as, or higher than, the rotor time constant. If not known, use the rule-of-thumb value given in the table below:</p> <table><tr><th>Motor rated power</th><th>Constant magnetizing time</th></tr><tr><td>< 1 kW</td><td>≥ 50 to 100 ms</td></tr><tr><td>1 to 10 kW</td><td>≥ 100 to 200 ms</td></tr><tr><td>10 to 200 kW</td><td>≥ 200 to 1000 ms</td></tr><tr><td>200 to 1000 kW</td><td>≥ 1000 to 2000 ms</td></tr></table> <p>Note: This parameter cannot be changed while the drive is running.</p> | Motor rated power | Constant magnetizing time | < 1 kW | ≥ 50 to 100 ms | 1 to 10 kW | ≥ 100 to 200 ms | 10 to 200 kW | ≥ 200 to 1000 ms | 200 to 1000 kW | ≥ 1000 to 2000 ms | 500 ms |
| Motor rated power | Constant magnetizing time | | | | | | | | | | | | |
| < 1 kW | ≥ 50 to 100 ms | | | | | | | | | | | | |
| 1 to 10 kW | ≥ 100 to 200 ms | | | | | | | | | | | | |
| 10 to 200 kW | ≥ 200 to 1000 ms | | | | | | | | | | | | |
| 200 to 1000 kW | ≥ 1000 to 2000 ms | | | | | | | | | | | | |
| | 0...10000 ms | Constant DC magnetizing time. | 1 = 1 ms | | | | | | | | | | |
| 21.03 | Stop mode | <p>Selects the way the motor is stopped when a stop command is received.</p> <p>Additional braking is possible by selecting flux braking (see parameter 97.05 Flux braking).</p> | Ramp | | | | | | | | | | |
| | Coast | <p>Stop by switching off the output semiconductors of the drive. The motor coasts to a stop.</p> <p> WARNING! If a mechanical brake is used, ensure it is safe to stop the drive by coasting.</p> | 0 | | | | | | | | | | |
| | Ramp | <p>Stop along the active deceleration ramp. See parameter group 23 Speed reference ramp on page 349 or 28 Frequency reference chain on page 354.</p> | 1 | | | | | | | | | | |
| | Torque limit | <p>Stop according to torque limits (parameters 30.19 and 30.20). This mode is only possible in vector motor control mode.</p> | 2 | | | | | | | | | | |
| 21.04 | Emergency stop mode | <p>Selects the way the motor is stopped when an emergency stop command is received.</p> <p>The source of the emergency stop signal is selected by parameter 21.05 Emergency stop source.</p> | Ramp stop (Off1) | | | | | | | | | | |
| | Ramp stop (Off1) | <p>With the drive running:</p> <ul style="list-style-type: none">1 = Normal operation.0 = Normal stop along the standard deceleration ramp defined for the particular reference type. After the drive has stopped, it can be restarted by removing the emergency stop signal and switching the start signal from 0 to 1. <p>With the drive stopped:</p> <ul style="list-style-type: none">1 = Starting allowed.0 = Starting not allowed. | 0 | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|---------------------------------------|---|---------------------------------|
| | Coast stop (Off2) | <p>With the drive running:</p> <ul style="list-style-type: none"> • 1 = Normal operation. • 0 = Stop by coasting. The drive can be restarted by restoring the start interlock signal and switching the start signal from 0 to 1. <p>With the drive stopped:</p> <ul style="list-style-type: none"> • 1 = Starting allowed. • 0 = Starting not allowed. | 1 |
| | Eme ramp stop (Off3) | <p>With the drive running:</p> <ul style="list-style-type: none"> • 1 = Normal operation • 0 = Stop by ramping along emergency stop ramp defined by parameter 23.23 Emergency stop time. After the drive has stopped, it can be restarted by removing the emergency stop signal and switching the start signal from 0 to 1. <p>With the drive stopped:</p> <ul style="list-style-type: none"> • 1 = Starting allowed • 0 = Starting not allowed | 2 |
| 21.05 | Emergency stop source | <p>Selects the source of the emergency stop signal. The stop mode is selected by parameter 21.04 Emergency stop mode.</p> <p>0 = Emergency stop active 1 = Normal operation</p> <p>Note: This parameter cannot be changed while the drive is running.</p> | Inactive (true) |
| | Active (false) | 0. | 0 |
| | Inactive (true) | 1. | 1 |
| | Reserved | | 2 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 3 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 4 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 5 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 6 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 7 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 8 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |
| 21.06 | Zero speed limit | Defines the zero speed limit. The motor is stopped along a speed ramp (when ramped stop is selected or emergency stop time is used) until the defined zero speed limit is reached. After the zero speed delay, the motor coasts to a stop. | 30.00 rpm |
| | 0.00...30000.00 rpm | Zero speed limit. | See par. 46.01 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------|--|------------|
| 21.07 | Zero speed delay | <p>Defines the delay for the zero speed delay function. The function is useful in applications where a smooth and quick restarting is essential. During the delay, the drive knows the rotor position accurately.</p> <p><u>Without zero speed delay:</u></p> <p>The drive receives a stop command and decelerates along a ramp. When actual motor speed falls below the value of parameter <i>21.06 Zero speed limit</i>, inverter modulation is stopped and the motor coasts to a standstill.</p>  <p><u>With zero speed delay:</u></p> <p>The drive receives a stop command and decelerates along a ramp. When actual motor speed falls below the value of parameter <i>21.06 Zero speed limit</i>, the zero speed delay function activates. During the delay the function keeps the speed controller live: the inverter modulates, motor is magnetized and the drive is ready for a quick restart.</p>  <p>Speed</p> <p>Time</p> <p>Speed controller switched off: Motor coasts to a stop.</p> <p><i>21.06 Zero speed limit</i></p> <p>Speed</p> <p>Time</p> <p>Speed controller remains active. Motor is decelerated to true zero speed.</p> <p><i>21.06 Zero speed limit</i></p> <p>Delay</p> | 0 ms |
| | 0...30000 ms | Zero speed delay. | 1 = 1 ms |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | |
|--|--------------------------|--|----------------|-----|------|-------|---|---------|--|---|--------------------|---|---|----------|---|--------|----------|--|
| 21.08 | DC current control | Activates/deactivates the DC hold and post-magnetization functions. See section <i>Start methods – DC magnetization</i> (page 142). Note: DC magnetization causes the motor to heat up. In applications where long DC magnetization times are required, externally ventilated motors should be used. If the DC magnetization period is long, DC magnetization cannot prevent the motor shaft from rotating if a constant load is applied to the motor. | 0000b | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>DC hold</td><td>1 = Enable DC hold. See section <i>DC hold</i> (page 143). Note: The DC hold function has no effect if the start signal is switched off.</td></tr><tr><td>1</td><td>Post magnetization</td><td>1 = Enable post-magnetization. See section <i>Settings</i> (page 143). Note: Post-magnetization is only available when ramping is the selected stop mode (see parameter <i>21.03 Stop mode</i>).</td></tr><tr><td>2</td><td>DC brake</td><td>1 = Enables DC injection braking after modulation has stopped. Notes:<ul style="list-style-type: none">To enable DC brake, parameter <i>21.03 Stop mode</i> has to be set to <i>Coast</i>.DC braking current can be set with parameter <i>21.10 DC current reference</i>.DC braking time can be set with parameter <i>21.11 Post magnetization time</i>.</td></tr><tr><td>3...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Value | 0 | DC hold | 1 = Enable DC hold. See section <i>DC hold</i> (page 143). Note: The DC hold function has no effect if the start signal is switched off. | 1 | Post magnetization | 1 = Enable post-magnetization. See section <i>Settings</i> (page 143). Note: Post-magnetization is only available when ramping is the selected stop mode (see parameter <i>21.03 Stop mode</i>). | 2 | DC brake | 1 = Enables DC injection braking after modulation has stopped. Notes: <ul style="list-style-type: none">To enable DC brake, parameter <i>21.03 Stop mode</i> has to be set to <i>Coast</i>.DC braking current can be set with parameter <i>21.10 DC current reference</i>.DC braking time can be set with parameter <i>21.11 Post magnetization time</i>. | 3...15 | Reserved | |
| Bit | Name | Value | | | | | | | | | | | | | | | | |
| 0 | DC hold | 1 = Enable DC hold. See section <i>DC hold</i> (page 143). Note: The DC hold function has no effect if the start signal is switched off. | | | | | | | | | | | | | | | | |
| 1 | Post magnetization | 1 = Enable post-magnetization. See section <i>Settings</i> (page 143). Note: Post-magnetization is only available when ramping is the selected stop mode (see parameter <i>21.03 Stop mode</i>). | | | | | | | | | | | | | | | | |
| 2 | DC brake | 1 = Enables DC injection braking after modulation has stopped. Notes: <ul style="list-style-type: none">To enable DC brake, parameter <i>21.03 Stop mode</i> has to be set to <i>Coast</i>.DC braking current can be set with parameter <i>21.10 DC current reference</i>.DC braking time can be set with parameter <i>21.11 Post magnetization time</i>. | | | | | | | | | | | | | | | | |
| 3...15 | Reserved | | | | | | | | | | | | | | | | | |
| 0000b...0011b | | DC magnetization selection. | 1 = 1 | | | | | | | | | | | | | | | |
| 21.09 | DC hold speed | Defines the DC hold speed in speed control mode. See parameter <i>21.08 DC current control</i> , and section <i>DC hold</i> (page 143). | 5.00 rpm | | | | | | | | | | | | | | | |
| 0.00...1000.00 rpm | | DC hold speed. | See par. 46.01 | | | | | | | | | | | | | | | |
| 21.10 | DC current reference | Defines the DC hold current in percent of the motor nominal current. See parameter <i>21.08 DC current control</i> , and section <i>Start methods – DC magnetization</i> (page 142). After 100 s post-magnetization time, the maximum magnetization current is limited to the magnetization current corresponding to the actual flux reference. | 30.0% | | | | | | | | | | | | | | | |
| 0.0...100.0% | | DC hold current. | 1 = 1% | | | | | | | | | | | | | | | |
| 21.11 | Post magnetization time | Defines the length of time for which post-magnetization is active after stopping the motor. The magnetization current is defined by parameter <i>21.10 DC current reference</i> . See parameter <i>21.08 DC current control</i> . | 0 s | | | | | | | | | | | | | | | |
| 0...3000 s | | Post-magnetization time. | 1 = 1 s | | | | | | | | | | | | | | | |
| 21.14 | Pre-heating input source | Selects the source for controlling pre-heating for the motor. The status of the pre-heating is shown as bit 2 of <i>06.21 Drive status word 3</i> . Notes: <ul style="list-style-type: none">The heating function requires that STO is not triggered.The heating function requires that the drive is not faulted. | Off | | | | | | | | | | | | | | | |
| Off | | 0. Pre-heating is always deactivated. | 0 | | | | | | | | | | | | | | | |
| On | | 1. Pre-heating is always activated when the drive is stopped. | 1 | | | | | | | | | | | | | | | |
| DI1 | | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 | | | | | | | | | | | | | | | |
| DI2 | | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------|-------------------------------|--|------------|
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 8 |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 9 |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 10 |
| | Timed function 1 | Bit 0 of <i>34.01 Timed functions status</i> (see page 384). | 11 |
| | Timed function 2 | Bit 1 of <i>34.01 Timed functions status</i> (see page 384). | 12 |
| | Timed function 3 | Bit 2 of <i>34.01 Timed functions status</i> (see page 384). | 13 |
| | MCW user bit 0 | Bit 12 of <i>06.01 Main control word</i> (see page 285). | 16 |
| | MCW user bit 1 | Bit 13 of <i>06.01 Main control word</i> (see page 285). | 17 |
| | MCW user bit 2 | Bit 14 of <i>06.01 Main control word</i> (see page 285). | 18 |
| | MCW user bit 3 | Bit 15 of <i>06.01 Main control word</i> (see page 285). | 19 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| <i>21.15</i> | <i>Pre-heating time delay</i> | Time delay before pre-heating starts after the drive is stopped. | 60 s |
| | 10...3000 s | Pre-heating time delay. | 1 = 1 s |
| <i>21.16</i> | <i>Pre-heating current</i> | Defines the DC current used to heat the motor. The value is in percent of the nominal motor current. | 0.0% |
| | 0.0...30.0% | Pre-heating current. | 1 = 1% |
| <i>21.18</i> | <i>Auto restart time</i> | <p>The motor can be automatically started after a short supply power failure using the automatic restart function. See section <i>Automatic restart</i> (page 157).</p> <p>When this parameter is set to 0.0 seconds, automatic restarting is disabled. Otherwise, the parameter defines the maximum duration of the power failure after which restarting is attempted. Note that this time also includes the DC precharging delay. See also parameter <i>21.34 Force auto restart</i>.</p> <p>This parameter has effect only if parameter <i>95.04 Control board supply</i> is set to <i>External 24V</i>.</p> <p> WARNING! Before you activate the function, make sure that no dangerous situations can occur. The function restarts the drive automatically and continues operation after a supply break.</p> | 10.0 s |
| | 0.0 s | Automatic restarting disabled. | 0 |
| | 0.1...10.0 s | Maximum power failure duration. | 1 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------|--|------------|
| 21.19 | Scalar start mode | <p>Selects the motor start function for the scalar motor control mode, ie, when 99.04 Motor control mode is set to Scalar.</p> <p>Notes:</p> <ul style="list-style-type: none"> The start function for the vector motor control mode is selected by parameter 21.01 Start mode. With permanent magnet motors, Automatic start mode must be used. This parameter cannot be changed while the drive is running. <p>See also section Start methods – DC magnetization (page 142).</p> | Normal |
| | Normal | Immediate start from zero speed. | 0 |
| | Const time | <p>The drive pre-magnetizes the motor before start. The pre-magnetizing time is defined by parameter 21.02 Magnetization time. This mode should be selected if constant pre-magnetizing time is required (for example, if the motor start must be synchronized with the release of a mechanical brake). This setting also guarantees the highest possible break-away torque when the pre-magnetizing time is set long enough.</p> <p>Note: This mode cannot be used to start into a rotating motor.</p> <p> WARNING! The drive will start after the set pre-magnetizing time has passed even if motor magnetization is not completed. In applications where a full break-away torque is essential, ensure that the constant magnetizing time is long enough to allow generation of full magnetization and torque.</p> | 1 |
| | Automatic | <p>The drive automatically selects the correct output frequency to start a rotating motor. This is useful for flying starts: if the motor is already rotating, the drive will start smoothly at the current frequency.</p> <p>Note: Cannot be used in multimotor systems.</p> | 2 |
| | Torque boost | <p>The drive pre-magnetizes the motor before the start. The pre-magnetizing time is defined by parameter 21.02 Magnetization time.</p> <p>Torque boost is applied at start. Torque boost is stopped when output frequency exceeds 40% of nominal frequency or when it is equal to the reference value. See parameter 21.26 Torque boost current.</p> <p>This mode should be selected if a high break-away torque is required.</p> <p>Note: This mode cannot be used to start into a rotating motor.</p> <p> WARNING! The drive will start after the set pre-magnetizing time has passed even if motor magnetization is not completed. In applications where a full break-away torque is essential, ensure that the constant magnetizing time is long enough to allow generation of full magnetization and torque.</p> | 3 |
| | Automatic+boost | <p>Automatic start with torque boost.</p> <p>Automatic start is performed first and the motor is magnetized. If the speed is found to be zero, torque boost is applied.</p> | 4 |


| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------|--|-----------------|
| | Flying start | The drive automatically selects the correct output frequency to start a rotating motor. If the motor is already rotating, drive will start smoothly at the current frequency. – The mode will start the motor with vector control and switch to scalar control on the fly when the motor speed has been found. Compared to the Automatic start mode, Flying start detects the motor speed faster. Flying start requires more accurate information about motor model. Therefore standstill ID run is done automatically when the drive is started for the first time after selecting Flying start. Motor plate values should be accurate. Wrong plate values may decrease the starting performance | 5 |
| | Flying start+boost | Flying start with torque boost. Flying start is performed first and the motor is magnetized. If the speed is found to be zero, torque boost is applied. | 6 |
| 21.21 | <i>DC hold frequency</i> | Defines the DC hold frequency, which is used instead of parameter <i>21.09 DC hold speed</i> when the motor is in scalar frequency mode. See parameter <i>21.08 DC current control</i> , and section <i>DC hold</i> (page 143). | 5.00 Hz |
| | 0.00...1000.00 Hz | DC hold frequency. | 1 = 1 Hz |
| 21.22 | <i>Start delay</i> | Defines the start delay. After the conditions for start have been fulfilled, the drive waits until the delay has elapsed and then starts the motor. During the delay, warning <i>AFE9 Start delay</i> is shown. Start delay can be used with all start modes. | 0.00 s |
| | 0.00...60.00 s | Start delay | 1 = 1 s |
| 21.23 | <i>Smooth start</i> | Selects the forced current vector rotation mode at low speeds. When the smooth start mode is selected, the rate of acceleration is limited by the acceleration and deceleration ramp times. If the process driven by the permanent magnet synchronous motor has high inertia, slow ramp times are recommended. Can be used for permanent magnet synchronous motors only. | <i>Disabled</i> |
| | Disabled | Disabled. | 0 |
| | Enabled always | Enabled always. | 1 |
| | Start only | Enabled when starting the motor. | 2 |
| 21.24 | <i>Smooth start current</i> | Current used in the current vector rotation at low speeds. Increase the smooth start current if the application requires motor shaft swinging needs to be minimized. Note that accurate torque control is not possible in the current vector rotation mode. Can be used for permanent magnet synchronous motors only. | 50.0% |
| | 10.0...100.0% | Value in percent of the nominal motor current. | 1 = 1% |
| 21.25 | <i>Smooth start speed</i> | Output frequency up to which the current vector rotation is used. See parameter <i>21.19 Scalar start mode</i> . Can be used for permanent magnet synchronous motors only. | 10.0% |
| | 2.0...100.0% | Value as a percentage of the nominal motor frequency. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------|--|----------------|
| 21.26 | <i>Torque boost current</i> | Defines the maximum supplied current to motor when (21.19 <i>Scalar start mode</i> is set to <i>Torque boost</i> (see page 339). Parameter value is in percent of the motor nominal current. Nominal value of the parameter is 100.0%. Torque boost is only applied at start, ending when output frequency exceeds 40% of nominal frequency or when output frequency is equal to reference. Can be used in scalar mode only. | 100.0% |
| | 15.0...300.0% | Value in percent of the nominal motor current. | 1 = 1% |
| 21.34 | <i>Force auto restart</i> | Forces automatic restart. The parameter is applicable only if parameter 95.04 <i>Control board supply</i> is set to <i>External 24V</i> . | <i>Enable</i> |
| | Disable | Force auto restart disabled. Parameter 21.18 <i>Auto restart time</i> is in effect if its value is more than 0.0 s. | 0 |
| | Enable | Force auto restart enabled. Parameter 21.18 <i>Auto restart time</i> is ignored. The drive never trips on the undervoltage fault and the start signal is on forever. When the DC voltage is restored, the normal operation continues. | 1 |
| 21.35 | <i>Preheating power</i> | Defines the power used to heat the motor. | 0.00 kW |
| | 0.00 ... 10.00 kW | Preheating power. | 100 = 1 |
| 21.36 | <i>Preheating unit</i> | Defines if preheating is specified as current or power. | <i>Current</i> |
| | Current | | 0 |
| | Power | | 1 |

| | | | |
|-------------------------------------|----------------------------|--|-------------------|
| 22 Speed reference selection | | Speed reference selection; Motor potentiometer settings. See control chain diagrams <i>Speed reference source selection II</i> (page 258)... <i>Speed controller</i> (page 262). | |
| 22.01 | <i>Speed ref unlimited</i> | Displays the output of the speed reference selection block. See control chain diagram <i>Speed reference source selection II</i> on page 258. This parameter is read-only. | - |
| | -30000.00... 30000.00 rpm | Value of the selected speed reference. | See par. 46.01 |
| 22.11 | <i>Ext1 speed ref1</i> | Selects EXT1 speed reference source 1. A digital source selected by 19.11 <i>Ext1/Ext2 selection</i> can be used to switch between EXT1 reference and the corresponding EXT2 reference defined by parameter 22.18 <i>Ext2 speed ref1</i> . | <i>AI1 scaled</i> |
| | Zero | None. | 0 |
| | AI1 scaled | 12.12 <i>AI1 scaled value</i> (see page 308). | 1 |
| | AI2 scaled | 12.22 <i>AI2 scaled value</i> (see page 310). | 2 |
| | Reserved | | 3 |
| | FB A ref1 | 03.05 <i>FB A reference 1</i> (see page 279). | 4 |
| | FB A ref2 | 03.06 <i>FB A reference 2</i> (see page 279). | 5 |
| | Reserved | | 6...7 |
| | EFB ref1 | 03.09 <i>EFB reference 1</i> (see page 280). | 8 |
| | EFB ref2 | 03.10 <i>EFB reference 2</i> (see page 280). | 9 |
| | Reserved | | 10...14 |
| | Motor potentiometer | 22.80 <i>Motor potentiometer ref act</i> (output of the Motor potentiometer). | 15 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------|---|------------|
| | PID | 40.01 Process PID output actual (output of the process PID controller). | 16 |
| | Frequency input | 11.38 Freq in 1 actual value (when DI5 is used as a frequency input). | 17 |
| | Control panel (ref saved) | <p>Control panel reference (03.01 Panel reference, see page 279) saved by the control system for the location where the control returns is used as the reference.</p> <p>Reference</p> <p>● EXT1 reference x EXT2 reference — Active reference . . Inactive reference</p> | 18 |
| | Control panel (ref copied) | <p>Control panel reference (03.01 Panel reference, see page 279) for the previous control location is used as the reference when the control location changes if the references for the two locations are of the same type (eg frequency/speed/torque/PID); otherwise, the actual signal is used as the new reference.</p> <p>Reference</p> <p>● EXT1 reference x EXT2 reference — Active reference . . Inactive reference</p> | 19 |
| | Level control | Parameter 76.07 LC speed ref (output of the Level control function). | 30 |
| | Other | Source selection (see Terms and abbreviations on page 272). | - |
| 22.18 | Ext2 speed ref1 | Selects EXT2 speed reference source 1. | Zero |
| | Zero | None. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | Reserved | | 3 |
| | FB A ref1 | 03.05 FB A reference 1 (see page 279). | 4 |
| | FB A ref2 | 03.06 FB A reference 2 (see page 279). | 5 |
| | Reserved | | 6...7 |
| | EFB ref1 | 03.09 EFB reference 1 (see page 280). | 8 |
| | EFB ref2 | 03.10 EFB reference 2 (see page 280). | 9 |
| | Reserved | | 10...14 |
| | Motor potentiometer | 22.80 Motor potentiometer ref act (output of the Motor potentiometer). | 15 |
| | PID | 40.01 Process PID output actual (output of the process PID controller). | 16 |
| | Frequency input | 11.38 Freq in 1 actual value (when DI5 is used as a frequency input). | 17 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|---|------------|
| | Control panel (ref saved) | <p>Control panel reference (03.01 Panel reference, see page 279) saved by the control system for the location where the control returns is used as the reference.</p> <p>Reference</p> <p>● EXT1 reference x EXT2 reference — Active reference · Inactive reference</p> <p>EXT1 -> EXT2</p> | 18 |
| | Control panel (ref copied) | <p>Control panel reference (03.01 Panel reference, see page 279) for the previous control location is used as the reference when the control location changes if the references for the two locations are of the same type (eg frequency/speed/torque/PID); otherwise, the actual signal is used as the new reference.</p> <p>Reference</p> <p>● EXT1 reference x EXT2 reference — Active reference · Inactive reference</p> <p>EXT1 -> EXT2</p> | 19 |
| | Level control | Parameter 76.07 LC speed ref (output of the Level control function). | 30 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 22.21 | <i>Constant speed function</i> | Determines how constant speeds are selected, and whether the rotation direction signal is considered or not when applying a constant speed. | 0001b |

| Bit | Name | Information |
|--------|---------------------|---|
| 0 | Constant speed mode | <p>1 = Packed: 7 constant speeds are selectable using the three sources defined by parameters 22.22, 22.23 and 22.24.</p> <p>0 = Separate: Constant speeds 1, 2 and 3 are separately activated by the sources defined by parameters 22.22, 22.23 and 22.24 respectively. In case of conflict, the constant speed with the smaller number takes priority.</p> |
| 1 | Direction enable | <p>1 = Start dir: To determine running direction for a constant speed, the sign of the constant speed setting (parameters 22.26...22.32) is multiplied by the direction signal (forward: +1, reverse: -1). This effectively allows the drive to have 14 (7 forward, 7 reverse) constant speeds if all values in 22.26...22.32 are positive.</p> <p> WARNING: If the direction signal is reverse and the active constant speed is negative, the drive will run in the forward direction.</p> <p>0 = According to Par: The running direction for the constant speed is determined by the sign of the constant speed setting (parameters 22.26...22.32).</p> |
| 2...15 | Reserved | |

| | | |
|---------------|------------------------------------|-------|
| 0000h...FFFFh | Constant speed configuration word. | 1 = 1 |
|---------------|------------------------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------------------------|---|-----------------------|------------------------------|------------------------------|------------------------------|-----------------------|---|---|---|------|---|---|---|------------------|---|---|---|------------------|---|---|---|------------------|---|---|---|------------------|---|---|---|------------------|---|---|---|------------------|---|---|---|------------------|
| 22.22 | <i>Constant speed sel1</i> | When bit 0 of parameter <i>22.21 Constant speed function</i> is 0 (Separate), selects a source that activates constant speed 1. When bit 0 of parameter <i>22.21 Constant speed function</i> is 1 (Packed), this parameter and parameters <i>22.23 Constant speed sel2</i> and <i>22.24 Constant speed sel3</i> select three sources whose states activate constant speeds as follows: | <i>DI3</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Source defined by par. 22.22</th><th>Source defined by par. 22.23</th><th>Source defined by par. 22.24</th><th>Constant speed active</th></tr> </thead> <tbody> <tr><td>0</td><td>0</td><td>0</td><td>None</td></tr> <tr><td>1</td><td>0</td><td>0</td><td>Constant speed 1</td></tr> <tr><td>0</td><td>1</td><td>0</td><td>Constant speed 2</td></tr> <tr><td>1</td><td>1</td><td>0</td><td>Constant speed 3</td></tr> <tr><td>0</td><td>0</td><td>1</td><td>Constant speed 4</td></tr> <tr><td>1</td><td>0</td><td>1</td><td>Constant speed 5</td></tr> <tr><td>0</td><td>1</td><td>1</td><td>Constant speed 6</td></tr> <tr><td>1</td><td>1</td><td>1</td><td>Constant speed 7</td></tr> </tbody> </table> | | | | Source defined by par. 22.22 | Source defined by par. 22.23 | Source defined by par. 22.24 | Constant speed active | 0 | 0 | 0 | None | 1 | 0 | 0 | Constant speed 1 | 0 | 1 | 0 | Constant speed 2 | 1 | 1 | 0 | Constant speed 3 | 0 | 0 | 1 | Constant speed 4 | 1 | 0 | 1 | Constant speed 5 | 0 | 1 | 1 | Constant speed 6 | 1 | 1 | 1 | Constant speed 7 |
| Source defined by par. 22.22 | Source defined by par. 22.23 | Source defined by par. 22.24 | Constant speed active | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | Constant speed 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | Constant speed 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | Constant speed 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | Constant speed 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | Constant speed 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | Constant speed 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | Constant speed 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Always off | 0. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Always on | 1. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Reserved | | 8...17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Timed function 1 | Bit 0 of <i>34.01 Timed functions status</i> (see page 384). | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Timed function 2 | Bit 1 of <i>34.01 Timed functions status</i> (see page 384). | 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Timed function 3 | Bit 2 of <i>34.01 Timed functions status</i> (see page 384). | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Reserved | | 21...23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22.23 | <i>Constant speed sel2</i> | When bit 0 of parameter <i>22.21 Constant speed function</i> is 0 (Separate), selects a source that activates constant speed 2. When bit 0 of parameter <i>22.21 Constant speed function</i> is 1 (Packed), this parameter and parameters <i>22.22 Constant speed sel1</i> and <i>22.24 Constant speed sel3</i> select three sources that are used to activate constant speeds. See table at parameter <i>22.22 Constant speed sel1</i> . For the selections, see parameter <i>22.22 Constant speed sel1</i> . | <i>Always off</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------|---|---|
| 22.24 | <i>Constant speed sel3</i> | When bit 0 of parameter <i>22.21 Constant speed function</i> is 0 (Separate), selects a source that activates constant speed 3. When bit 0 of parameter <i>22.21 Constant speed function</i> is 1 (Packed), this parameter and parameters <i>22.22 Constant speed sel1</i> and <i>22.23 Constant speed sel2</i> select three sources that are used to activate constant speeds. See table at parameter <i>22.22 Constant speed sel1</i> . For the selections, see parameter <i>22.22 Constant speed sel1</i> . | <i>Always off</i> |
| 22.26 | <i>Constant speed 1</i> | Defines constant speed 1 (the speed the motor will turn when constant speed 1 is selected). | 300.00 rpm; 360.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Constant speed 1. | See par. <i>46.01</i> |
| 22.27 | <i>Constant speed 2</i> | Defines constant speed 2. | 600.00 rpm; 720.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Constant speed 2. | See par. <i>46.01</i> |
| 22.28 | <i>Constant speed 3</i> | Defines constant speed 3. | 900.00 rpm; 1080.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Constant speed 3. | See par. <i>46.01</i> |
| 22.29 | <i>Constant speed 4</i> | Defines constant speed 4. | 1200.00 rpm; 1440.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Constant speed 4. | See par. <i>46.01</i> |
| 22.30 | <i>Constant speed 5</i> | Defines constant speed 5. | 1500.00 rpm; 1800.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Constant speed 5. | See par. <i>46.01</i> |
| 22.31 | <i>Constant speed 6</i> | Defines constant speed 6. | 2400.00 rpm; 2880.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Constant speed 6. | See par. <i>46.01</i> |
| 22.32 | <i>Constant speed 7</i> | Defines constant speed 7. | 3000.00 rpm; 3600.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Constant speed 7. | See par. <i>46.01</i> |
| 22.41 | <i>Speed ref safe</i> | Defines a safe speed reference value that is used with supervision functions such as <ul style="list-style-type: none"> <i>12.03 AI supervision function</i> <i>49.05 Communication loss action</i> <i>50.02 FBA A comm loss func.</i> | 0.00 rpm |
| | -30000.00... 30000.00 rpm | Safe speed reference. | See par. <i>46.01</i> |

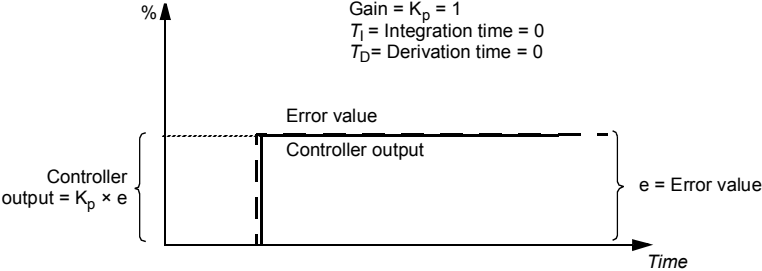
| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | |
|---|-------------------------------------|--|-----------------|-----|------|-------------|---|--------|--------------------------------------|--|---|-----------|---|--|--------|----------|--|
| 22.51 | <i>Critical speed function</i> | Enables/disables the critical speeds function. Also determines whether the specified ranges are effective in both rotating directions or not. See also section <i>Critical speeds/frequencies</i> (page 124). | 0000b | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Information</th></tr><tr><td rowspan="2">0</td><td rowspan="2">Enable</td><td>1 = Enable: Critical speeds enabled.</td></tr><tr><td>0 = Disable: Critical speeds disabled.</td></tr><tr><td rowspan="2">1</td><td rowspan="2">Sign mode</td><td>1 = Signed: The signs of parameters 22.52...22.57 are taken into account.</td></tr><tr><td>0 = Absolute: Parameters 22.52...22.57 are handled as absolute values. Each range is effective in both directions of rotation.</td></tr><tr><td>2...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Information | 0 | Enable | 1 = Enable: Critical speeds enabled. | 0 = Disable: Critical speeds disabled. | 1 | Sign mode | 1 = Signed: The signs of parameters 22.52...22.57 are taken into account. | 0 = Absolute: Parameters 22.52...22.57 are handled as absolute values. Each range is effective in both directions of rotation. | 2...15 | Reserved | |
| Bit | Name | Information | | | | | | | | | | | | | | | |
| 0 | Enable | 1 = Enable: Critical speeds enabled. | | | | | | | | | | | | | | | |
| | | 0 = Disable: Critical speeds disabled. | | | | | | | | | | | | | | | |
| 1 | Sign mode | 1 = Signed: The signs of parameters 22.52...22.57 are taken into account. | | | | | | | | | | | | | | | |
| | | 0 = Absolute: Parameters 22.52...22.57 are handled as absolute values. Each range is effective in both directions of rotation. | | | | | | | | | | | | | | | |
| 2...15 | Reserved | | | | | | | | | | | | | | | | |
| | 0000b...0011b | Critical speeds configuration word. | 1 = 1 | | | | | | | | | | | | | | |
| 22.52 | <i>Critical speed 1 low</i> | Defines the low limit for critical speed range 1. Note: This value must be less than or equal to the value of 22.53 <i>Critical speed 1 high</i> . | 0.00 rpm | | | | | | | | | | | | | | |
| | -30000.00... 30000.00 rpm | Low limit for critical speed 1. | See par. 46.01 | | | | | | | | | | | | | | |
| 22.53 | <i>Critical speed 1 high</i> | Defines the high limit for critical speed range 1. Note: This value must be greater than or equal to the value of 22.52 <i>Critical speed 1 low</i> . | 0.00 rpm | | | | | | | | | | | | | | |
| | -30000.00... 30000.00 rpm | High limit for critical speed 1. | See par. 46.01 | | | | | | | | | | | | | | |
| 22.54 | <i>Critical speed 2 low</i> | Defines the low limit for critical speed range 2. Note: This value must be less than or equal to the value of 22.55 <i>Critical speed 2 high</i> . | 0.00 rpm | | | | | | | | | | | | | | |
| | -30000.00... 30000.00 rpm | Low limit for critical speed 2. | See par. 46.01 | | | | | | | | | | | | | | |
| 22.55 | <i>Critical speed 2 high</i> | Defines the high limit for critical speed range 2. Note: This value must be greater than or equal to the value of 22.54 <i>Critical speed 2 low</i> . | 0.00 rpm | | | | | | | | | | | | | | |
| | -30000.00... 30000.00 rpm | High limit for critical speed 2. | See par. 46.01 | | | | | | | | | | | | | | |
| 22.56 | <i>Critical speed 3 low</i> | Defines the low limit for critical speed range 3. Note: This value must be less than or equal to the value of 22.57 <i>Critical speed 3 high</i> . | 0.00 rpm | | | | | | | | | | | | | | |
| | -30000.00... 30000.00 rpm | Low limit for critical speed 3. | See par. 46.01 | | | | | | | | | | | | | | |
| 22.57 | <i>Critical speed 3 high</i> | Defines the high limit for critical speed range 3. Note: This value must be greater than or equal to the value of 22.56 <i>Critical speed 3 low</i> . | 0.00 rpm | | | | | | | | | | | | | | |
| | -30000.00... 30000.00 rpm | High limit for critical speed 3. | See par. 46.01 | | | | | | | | | | | | | | |
| 22.71 | <i>Motor potentiometer function</i> | Activates and selects the mode of the Motor potentiometer. | <i>Disabled</i> | | | | | | | | | | | | | | |
| | Disabled | Motor potentiometer is disabled and the Motor potentiometer counter value set to 0. | 0 | | | | | | | | | | | | | | |

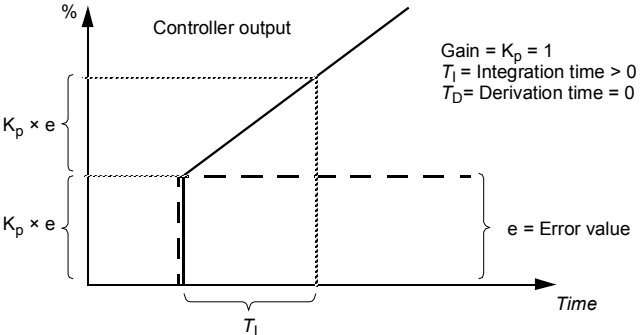
| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|---|--|--------------------------|
| | Enabled (init at stop /power-up) | When enabled, the Motor potentiometer counter first adopts the value defined by parameter 22.72 Motor potentiometer initial value . The value can then be adjusted from the up and down sources defined by parameters 22.73 Motor potentiometer up source and 22.74 Motor potentiometer down source . A stop or a power cycle will reset the counter to the initial value (22.72). | 1 |
| | Enabled (resume always) | As Enabled (init at stop /power-up) , but the Motor potentiometer counter is retained over a power cycle. | 2 |
| | Enabled (init to actual) | Whenever another reference source is selected, the value of the Motor potentiometer counter follows that reference. After the source of reference returns to the Motor potentiometer counter, its value can again be changed by the up and down sources (defined by 22.73 and 22.74). | 3 |
| 22.72 | Motor potentiometer initial value | Defines an initial value (starting point) for the Motor potentiometer counter. See the selections of parameter 22.71 Motor potentiometer function . | 0.00 |
| | -32768.00... 32767.00 | Initial value for the counter. | 1 = 1 |
| 22.73 | Motor potentiometer up source | Selects the source of Motor potentiometer counter up signal. 0 = No change 1 = Increase Motor potentiometer counter value. (If both the up and down sources are on, the potentiometer value will not change.) Note: Motor potentiometer function up/down source control speed or frequency from zero to maximum speed or frequency. The running direction can be changed with parameter 20.04 Ext1 in2 source . See the figure in section Motor potentiometer on page 154. | Not used |
| | Not used | 0. | 0 |
| | Not used | 1. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 |
| | Reserved | | 21...23 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 24 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 25 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 26 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |

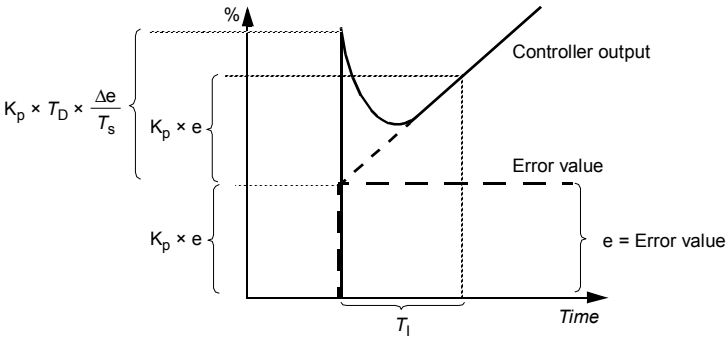
| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|-----------------------|
| 22.74 | <i>Motor potentiometer down source</i> | <p>Selects the source of Motor potentiometer counter down signal.</p> <p>0 = No change 1 = Decrease Motor potentiometer counter value. (If both the up and down sources are on, the counter value will not change.)</p> <p>Note: Motor potentiometer function up/down source control speed or frequency from zero to maximum speed or frequency. The running direction can be changed with parameter <i>20.04 Ext1 in2 source</i>. See the figure in section <i>Motor potentiometer</i> on page 154.</p> <p>For the selections, see parameter <i>22.73 Motor potentiometer up source</i>.</p> | <i>Not used</i> |
| 22.75 | <i>Motor potentiometer ramp time</i> | <p>Defines the change rate of the Motor potentiometer counter. This parameter specifies the time required for the Motor potentiometer to change from minimum (<i>22.76</i>) to maximum (<i>22.77</i>). The same change rate applies in both directions.</p> | 40.0 s |
| | 0.0...3600.0 s | Counter change time. | 10 = 1 s |
| 22.76 | <i>Motor potentiometer min value</i> | <p>Defines the minimum value of the Motor potentiometer counter.</p> <p>Note: If vector control mode is used, value of this parameter must be changed.</p> | -50.00 |
| | -32768.00... 32767.00 | Counter minimum. | 1 = 1 |
| 22.77 | <i>Motor potentiometer max value</i> | <p>Defines the maximum value of the Motor potentiometer counter.</p> <p>Note: If vector control mode is used, value of this parameter must be changed.</p> | 50.00 |
| | -32768.00... 32767.00 | Counter maximum. | 1 = 1 |
| 22.80 | <i>Motor potentiometer ref act</i> | <p>The output of the Motor potentiometer function. (The meter is configured using parameters <i>22.71...22.74</i>.)</p> <p>This parameter is read-only.</p> | - |
| | -32768.00... 32767.00 | Value of the Motor potentiometer counter. | 1 = 1 |
| 22.86 | <i>Speed reference act 6</i> | <p>Displays the value of the speed reference (EXT1 or EXT2) that has been selected by <i>19.11 Ext1/Ext2 selection</i>. See diagram at <i>22.11 Ext1 speed ref1</i> or control chain diagram <i>Speed reference source selection II</i> on page 258.</p> <p>This parameter is read-only.</p> | - |
| | -30000.00... 30000.00 rpm | Speed reference after additive 2. | See par. <i>46.01</i> |
| 22.87 | <i>Speed reference act 7</i> | <p>Displays the value of speed reference before application of critical speeds. See the control chain diagram on page 258.</p> <p>The value is received from <i>22.86 Speed reference act 6</i> unless overridden by</p> <ul style="list-style-type: none"> any constant speed <i>network control</i> reference (see page 18) control panel reference safe speed reference. <p>This parameter is read-only.</p> | - |
| | -30000.00... 30000.00 rpm | Speed reference before application of critical speeds. | See par. <i>46.01</i> |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------|------------------------------|--|----------------|
| 23 | Speed reference ramp | Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive). See control chain diagram <i>Speed reference source selection II</i> on page 258. | |
| 23.01 | Speed ref ramp input | Displays the used speed reference (in rpm) before it enters the ramping and shaping functions. See control chain diagram <i>Speed reference source selection II</i> on page 258. This parameter is read-only. | - |
| | -30000.00... 30000.00 rpm | Speed reference before ramping and shaping. | See par. 46.01 |
| 23.02 | Speed ref ramp output | Displays the ramped and shaped speed reference in rpm. See control chain diagram <i>Speed reference source selection II</i> on page 258. This parameter is read-only. | - |
| | -30000.00... 30000.00 rpm | Speed reference after ramping and shaping. | See par. 46.01 |
| 23.12 | Acceleration time 1 | Defines acceleration time 1 as the time required for the speed to change from zero to the speed defined by parameter 46.01 <i>Speed scaling</i> (not to parameter 30.12 <i>Maximum speed</i>). If the speed reference increases faster than the set acceleration rate, the motor speed will follow the acceleration rate. If the speed reference increases slower than the set acceleration rate, the motor speed will follow the reference. If the acceleration time is set too short, the drive will automatically prolong the acceleration in order not to exceed the drive torque limits. | 5.000 s |
| | 0.000...1800.000 s | Acceleration time 1. | 10 = 1 s |
| 23.13 | Deceleration time 1 | Defines deceleration time 1 as the time required for the speed to change from the speed defined by parameter 46.01 <i>Speed scaling</i> (not from parameter 30.12 <i>Maximum speed</i>) to zero. If the speed reference decreases slower than the set deceleration rate, the motor speed will follow the reference. If the reference changes faster than the set deceleration rate, the motor speed will follow the deceleration rate. If the deceleration rate is set too short, the drive will automatically prolong the deceleration in order not to exceed drive torque limits (or not to exceed a safe DC link voltage). If there is any doubt about the deceleration time being too short, ensure that DC overvoltage control is on (parameter 30.30 <i>Overvoltage control</i>). Note: If a short deceleration time is needed for a high inertia application, the drive should be equipped with braking equipment such as a brake chopper and brake resistor. | 5.000 s |
| | 0.000...1800.000 s | Deceleration time 1. | 10 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|--|------------------------------|--|--------------------------------|
| 23.23 | <i>Emergency stop time</i> | Defines the time inside which the drive is stopped if an emergency stop Off3 is activated (ie. the time required for the speed to change from the speed value defined by parameter 46.01 Speed scaling or 46.02 Frequency scaling to zero). Emergency stop mode and activation source are selected by parameters 21.04 Emergency stop mode and 21.05 Emergency stop source respectively. Emergency stop can also be activated through fieldbus. Notes: <ul style="list-style-type: none"> Emergency stop Off1 uses the standard deceleration ramp as defined by parameters 23.12...23.13. The same parameter value is also used in frequency control mode (ramp parameters 28.72...28.73). | 3.000 s |
| | 0.000...1800.000 s | Emergency stop Off3 deceleration time. | 10 = 1 s |
| 23.32 | <i>Shape time 1</i> | Defines the shape of acceleration ramp at the beginning of acceleration. | 0.000 s |
| | 0.000...1800.000 s | Shape time 1. | |
| 24 Speed reference conditioning | | Speed error calculation; speed error window control configuration; speed error step. See control chain diagram Speed error calculation on page 260 . | |
| 24.01 | <i>Used speed reference</i> | Displays the ramped and corrected speed reference (before speed error calculation). See control chain diagram Speed error calculation on page 260 . This parameter is read-only. | - |
| | -30000.00... 30000.00 rpm | Speed reference used for speed error calculation. | See par. 46.01 |
| 24.02 | <i>Used speed feedback</i> | Displays the speed feedback used for speed error calculation. See control chain diagram Speed error calculation on page 260 . This parameter is read-only. | - |
| | -30000.00... 30000.00 rpm | Speed feedback used for speed error calculation. | See par. 46.01 |
| 24.03 | <i>Speed error filtered</i> | Displays the filtered speed error. See control chain diagram Speed error calculation on page 260 . This parameter is read-only. | - |
| | -30000.00... 30000.00 rpm | Filtered speed error. | See par. 46.01 |
| 24.04 | <i>Speed error inverted</i> | Displays the inverted (unfiltered) speed error. See control chain diagram Speed error calculation on page 260 . This parameter is read-only. | - |
| | -30000.0... 30000.0 rpm | Inverted speed error. | See par. 46.01 |
| 24.11 | <i>Speed correction</i> | Defines a speed reference correction, ie, a value added to the existing reference between ramping and limitation. This is useful to trim the speed if necessary, for example, to adjust draw between sections of a paper machine. See control chain diagram Speed error calculation on page 260 . | 0.00 rpm |
| | -10000.00... 10000.00 rpm | Speed reference correction. | See par. 46.01 |

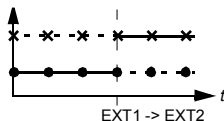
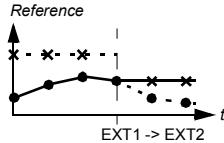
| No. | Name/Value | Description | Def/FbEq16 |
|---|---------------------------------------|--|----------------|
| 24.12 | <i>Speed error filter time</i> | Defines the time constant of the speed error low-pass filter. If the used speed reference changes rapidly, the possible interferences in the speed measurement can be filtered with the speed error filter. Reducing the ripple with this filter may cause speed controller tuning problems. A long filter time constant and fast acceleration time contradict one another. A very long filter time results in unstable control. | 0 ms |
| | 0...10000 ms | Speed error filtering time constant. 0 = filtering disabled. | 1 = 1 ms |
| 25 Speed control | | Speed controller settings. See control chain diagram <i>Speed error calculation</i> on page 260. | |
| 25.01 | <i>Torque reference speed control</i> | Displays the speed controller output that is transferred to the torque controller. See control chain diagram <i>Speed error calculation</i> on page 260. This parameter is read-only. | - |
| | -1600.0...1600.0% | Limited speed controller output torque. | See par. 46.03 |
| 25.02 | <i>Speed proportional gain</i> | Defines the proportional gain (K_p) of the speed controller. Too high a gain may cause speed oscillation. The figure below shows the speed controller output after an error step when the error remains constant. | 5.00 |
|  <p>Gain = $K_p = 1$ T_I = Integration time = 0 T_D = Derivation time = 0</p> <p>Controller output = $K_p \times e$</p> <p>e = Error value</p> <p>If gain is set to 1, a 10% change in error value (reference - actual value) causes the speed controller output to change by 10%, ie, the output value is input \times gain.</p> | | | |
| | 0.00...250.00 | Proportional gain for speed controller. | 100 = 1 |


| No. | Name/Value | Description | Def/FbEq16 |
|------------------|------------------------|---|------------|
| 25.03 | Speed integration time | <p>Defines the integration time of the speed controller. The integration time defines the rate at which the controller output changes when the error value is constant and the proportional gain of the speed controller is 1. The shorter the integration time, the faster the continuous error value is corrected. This time constant must be set to the same order of magnitude as the time constant (time to respond) of the actual mechanical system being controlled, otherwise instability will result.</p> <p>Setting the integration time to zero disables the I-part of the controller. This is useful to do when tuning the proportional gain; adjust the proportional gain first, then return the integration time.</p> <p>Anti-windup (the integrator just integrates up to 100%) stops the integrator if the controller output is limited.</p> <p>The figure below shows the speed controller output after an error step when the error remains constant.</p>  | 2.50 s |
| 0.00...1000.00 s | | Integration time for speed controller. | 10 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|--------------------------------|
| 25.04 | <i>Speed derivation time</i> | <p>Defines the derivation time of the speed controller. Derivative action boosts the controller output if the error value changes. The longer the derivation time, the more the speed controller output is boosted during the change. If the derivation time is set to zero, the controller works as a PI controller, otherwise as a PID controller. The derivation makes the control more responsive for disturbances. For simple applications, derivative time is not normally required and should be left at zero.</p> <p>The speed error derivative must be filtered with a low pass filter to eliminate disturbances.</p> <p>The figure below shows the speed controller output after an error step when the error remains constant.</p>  <p>Gain = $K_p = 1$ T_I = Integration time > 0 T_D = Derivation time > 0 T_s = Sample time period = 250 μs Δe = Error value change between two samples</p> | 0.000 s |
| | 0.000...10.000 s | Derivation time for speed controller. | 1000 = 1 s |
| 25.05 | <i>Derivation filter time</i> | Defines the derivation filter time constant. See parameter 25.04 Speed derivation time . | 8 ms |
| | 0...10000 ms | Derivation filter time constant. | 1 = 1 ms |
| 25.15 | <i>Proportional gain em stop</i> | Defines the proportional gain for the speed controller when an emergency stop is active. See parameter 25.02 Speed proportional gain . | 10.00 |
| | 1.00...250.00 | Proportional gain upon an emergency stop. | 100 = 1 |
| 25.53 | <i>Torque prop reference</i> | Displays the output of the proportional (P) part of the speed controller. See control chain diagram Speed error calculation on page 260. This parameter is read-only. | - |
| | -30000.0... 30000.0% | P-part output of speed controller. | See par. 46.03 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------------------|---|--|--------------------------|
| 25.54 | <i>Torque integral reference</i> | Displays the output of the integral (I) part of the speed controller. See control chain diagram <i>Speed error calculation</i> on page 260. This parameter is read-only. | - |
| | -30000.0... 30000.0% | I-part output of speed controller. | See par. 46.03 |
| 25.55 | <i>Torque deriv reference</i> | Displays the output of the derivative (D) part of the speed controller. See control chain diagram <i>Speed error calculation</i> on page 260. This parameter is read-only. | - |
| | -30000.0... 30000.0% | D-part output of speed controller. | See par. 46.03 |
| 28 Frequency reference chain | | Settings for the frequency reference chain. See the control chain diagrams on pages 256 and 257. | |
| 28.01 | <i>Frequency ref ramp input</i> | Displays the used frequency reference before ramping. See the control chain diagrams <i>Frequency reference selection</i> on page 256 and <i>Frequency reference modification</i> on page 257. This parameter is read-only. | - |
| | -500.00...500.00 Hz | Frequency reference before ramping. | See par. 46.02 |
| 28.02 | <i>Frequency ref ramp output</i> | Displays the final frequency reference (after selection, limitation and ramping). See control chain diagram on page 256. This parameter is read-only. | - |
| | -500.00...500.00 Hz | Final frequency reference. | See par. 46.02 |
| 28.11 | <i>Ext1 frequency ref1</i> | Selects EXT1 frequency reference source 1. | A11 scaled |
| | Zero | None. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | Reserved | | 3 |
| | FB A ref1 | 03.05 FB A reference 1 (see page 279). | 4 |
| | FB A ref2 | 03.06 FB A reference 2 (see page 279). | 5 |
| | Reserved | | 6...7 |
| | EFB ref1 | 03.09 EFB reference 1 (see page 280). | 8 |
| | EFB ref2 | 03.10 EFB reference 2 (see page 280). | 9 |
| | Reserved | | 10...14 |
| | Motor potentiometer | 22.80 Motor potentiometer ref act (output of the Motor potentiometer). | 15 |
| | PID | 40.01 Process PID output actual (output of the process PID controller). | 16 |
| | Frequency input | 11.38 Freq in 1 actual value (when DI5 is used as a frequency input). | 17 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|-------------------------------------|---|----------------------|
| | Control panel (ref saved) | <p>Control panel reference (03.01 Panel reference, see page 279) saved by the control system for the location where the control returns is used as the reference.</p> <p>Reference</p> <p>● EXT1 reference x EXT2 reference — Active reference - - Inactive reference</p> <p>EXT1 -> EXT2</p> | 18 |
| | Control panel (ref copied) | <p>Control panel reference (03.01 Panel reference, see page 279) for the previous control location is used as the reference when the control location changes if the references for the two locations are of the same type (eg frequency/speed/torque/PID); otherwise, the actual signal is used as the new reference.</p> <p>Reference</p> <p>● EXT1 reference x EXT2 reference — Active reference - - Inactive reference</p> <p>EXT1 -> EXT2</p> | 19 |
| | Level control | Parameter 76.07 LC speed ref (output of the Level control function). | 30 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 28.15 | Ext2 frequency ref1 | Selects EXT2 frequency reference source 1. | Zero |
| | Zero | None. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | Reserved | | 3 |
| | FB A ref1 | 03.05 FB A reference 1 (see page 279). | 4 |
| | FB A ref2 | 03.06 FB A reference 2 (see page 279). | 5 |
| | Reserved | | 6...7 |
| | EFB ref1 | 03.09 EFB reference 1 (see page 280). | 8 |
| | EFB ref2 | 03.10 EFB reference 2 (see page 280). | 9 |
| | Reserved | | 10...14 |
| | Motor potentiometer | 22.80 Motor potentiometer ref act (output of the Motor potentiometer). | 15 |
| | PID | 40.01 Process PID output actual (output of the process PID controller). | 16 |
| | Frequency input | 11.38 Freq in 1 actual value (when DI5 is used as a frequency input). | 17 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|---|--|------------|
| | Control panel (ref saved) | <p>Control panel reference (03.01 Panel reference, see page 279) saved by the control system for the location where the control returns is used as the reference.</p> <p><i>Reference</i></p>  <p>● EXT1 reference x EXT2 reference — Active reference - - Inactive reference</p> <p>EXT1 -> EXT2</p> | 18 |
| | Control panel (ref copied) | <p>Control panel reference (03.01 Panel reference, see page 279) for the previous control location is used as the reference when the control location changes if the references for the two locations are of the same type (eg frequency/speed/torque/PID); otherwise, the actual signal is used as the new reference.</p> <p><i>Reference</i></p>  <p>● EXT1 reference x EXT2 reference — Active reference - - Inactive reference</p> <p>EXT1 -> EXT2</p> | 19 |
| | Level control | Parameter 76.07 LC speed ref (output of the Level control function). | 30 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 28.21 | Constant frequency function | Determines how constant frequencies are selected, and whether the rotation direction signal is considered or not when applying a constant frequency. | 0001b |

| Bit | Name | Information |
|--------|------------------|---|
| 0 | Const freq mode | <p>1 = Packed: 7 constant frequencies are selectable using the three sources defined by parameters 28.22, 28.23 and 28.24.</p> <p>0 = Separate: Constant frequencies 1, 2 and 3 are separately activated by the sources defined by parameters 28.22, 28.23 and 28.24 respectively. In case of conflict, the constant frequency with the smaller number takes priority.</p> |
| 1 | Direction enable | <p>1 = Start dir: To determine running direction for a constant speed, the sign of the constant speed setting (parameters 22.26...22.32) is multiplied by the direction signal (forward: +1, reverse: -1). This effectively allows the drive to have 14 (7 forward, 7 reverse) constant speeds if all values in 22.26...22.32 are positive.</p> <p> WARNING: If the direction signal is reverse and the active constant speed is negative, the drive will run in the forward direction.</p> <p>0 = According to Par: The running direction for the constant speed is determined by the sign of the constant speed setting (parameters 22.26...22.32).</p> |
| 2...15 | Reserved | |

| | | |
|---------------|--|-------|
| 0000b...0011b | Constant frequency configuration word. | 1 = 1 |
|---------------|--|-------|

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------------------|--|---------------------------|------------------------------|------------------------------|------------------------------|---------------------------|---|---|---|------|---|---|---|----------------------|---|---|---|----------------------|---|---|---|----------------------|---|---|---|----------------------|---|---|---|----------------------|---|---|---|----------------------|---|---|---|----------------------|
| 28.22 | <i>Constant frequency sel1</i> | <p>When bit 0 of parameter <i>28.21 Constant frequency function</i> is 0 (Separate), selects a source that activates constant frequency 1.</p> <p>When bit 0 of parameter <i>28.21 Constant frequency function</i> is 1 (Packed), this parameter and parameters <i>28.23 Constant frequency sel2</i> and <i>28.24 Constant frequency sel3</i> select three sources whose states activate constant frequencies as follows:</p> | <i>DI3</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table> <tr> <th>Source defined by par. 28.22</th><th>Source defined by par. 28.23</th><th>Source defined by par. 28.24</th><th>Constant frequency active</th></tr> <tr> <td>0</td><td>0</td><td>0</td><td>None</td></tr> <tr> <td>1</td><td>0</td><td>0</td><td>Constant frequency 1</td></tr> <tr> <td>0</td><td>1</td><td>0</td><td>Constant frequency 2</td></tr> <tr> <td>1</td><td>1</td><td>0</td><td>Constant frequency 3</td></tr> <tr> <td>0</td><td>0</td><td>1</td><td>Constant frequency 4</td></tr> <tr> <td>1</td><td>0</td><td>1</td><td>Constant frequency 5</td></tr> <tr> <td>0</td><td>1</td><td>1</td><td>Constant frequency 6</td></tr> <tr> <td>1</td><td>1</td><td>1</td><td>Constant frequency 7</td></tr> </table> | | | | Source defined by par. 28.22 | Source defined by par. 28.23 | Source defined by par. 28.24 | Constant frequency active | 0 | 0 | 0 | None | 1 | 0 | 0 | Constant frequency 1 | 0 | 1 | 0 | Constant frequency 2 | 1 | 1 | 0 | Constant frequency 3 | 0 | 0 | 1 | Constant frequency 4 | 1 | 0 | 1 | Constant frequency 5 | 0 | 1 | 1 | Constant frequency 6 | 1 | 1 | 1 | Constant frequency 7 |
| Source defined by par. 28.22 | Source defined by par. 28.23 | Source defined by par. 28.24 | Constant frequency active | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | Constant frequency 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | Constant frequency 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | Constant frequency 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | Constant frequency 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | Constant frequency 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | Constant frequency 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | Constant frequency 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Always off | 0. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Always on | 1. | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Reserved | | 8...17 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Timed function 1 | Bit 0 of <i>34.01 Timed functions status</i> (see page 384). | 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Timed function 2 | Bit 1 of <i>34.01 Timed functions status</i> (see page 384). | 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Timed function 3 | Bit 2 of <i>34.01 Timed functions status</i> (see page 384). | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Reserved | | 21...23 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 24 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 26 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28.23 | <i>Constant frequency sel2</i> | <p>When bit 0 of parameter <i>28.21 Constant frequency function</i> is 0 (Separate), selects a source that activates constant frequency 2.</p> <p>When bit 0 of parameter <i>28.21 Constant frequency function</i> is 1 (Packed), this parameter and parameters <i>28.22 Constant frequency sel1</i> and <i>28.24 Constant frequency sel3</i> select three sources that are used to activate constant frequencies. See table at parameter <i>28.22 Constant frequency sel1</i>.</p> <p>For the selections, see parameter <i>28.22 Constant frequency sel1</i>.</p> | <i>Always off</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|---|---|
| 28.24 | <i>Constant frequency sel3</i> | When bit 0 of parameter <i>28.21 Constant frequency function</i> is 0 (Separate), selects a source that activates constant frequency 3. When bit 0 of parameter <i>28.21 Constant frequency function</i> is 1 (Packed), this parameter and parameters <i>28.22 Constant frequency sel1</i> and <i>28.23 Constant frequency sel2</i> select three sources that are used to activate constant frequencies. See table at parameter <i>28.22 Constant frequency sel1</i> . For the selections, see parameter <i>28.22 Constant frequency sel1</i> . | <i>Always off</i> |
| 28.26 | <i>Constant frequency 1</i> | Defines constant frequency 1 (the frequency the motor will turn when constant frequency 1 is selected). | 5.00 Hz; 6.00 Hz (<i>95.20</i> b0) |
| | -500.00...500.00 Hz | Constant frequency 1. | See par. <i>46.02</i> |
| 28.27 | <i>Constant frequency 2</i> | Defines constant frequency 2. | 10.00 Hz; 12.00 Hz (<i>95.20</i> b0) |
| | -500.00...500.00 Hz | Constant frequency 2. | See par. <i>46.02</i> |
| 28.28 | <i>Constant frequency 3</i> | Defines constant frequency 3. | 15.00 Hz; 18.00 Hz (<i>95.20</i> b0) |
| | -500.00...500.00 Hz | Constant frequency 3. | See par. <i>46.02</i> |
| 28.29 | <i>Constant frequency 4</i> | Defines constant frequency 4. | 20.00 Hz; 24.00 Hz (<i>95.20</i> b0) |
| | -500.00...500.00 Hz | Constant frequency 4. | See par. <i>46.02</i> |
| 28.30 | <i>Constant frequency 5</i> | Defines constant frequency 5. | 25.00 Hz; 30.00 Hz (<i>95.20</i> b0) |
| | -500.00...500.00 Hz | Constant frequency 5. | See par. <i>46.02</i> |
| 28.31 | <i>Constant frequency 6</i> | Defines constant frequency 6. | 40.00 Hz; 48.00 Hz (<i>95.20</i> b0) |
| | -500.00...500.00 Hz | Constant frequency 6. | See par. <i>46.02</i> |
| 28.32 | <i>Constant frequency 7</i> | Defines constant frequency 7. | 50.00 Hz; 60.00 Hz (<i>95.20</i> b0) |
| | -500.00...500.00 Hz | Constant frequency 7. | See par. <i>46.02</i> |
| 28.41 | <i>Frequency ref safe</i> | Defines a safe frequency reference value that is used with supervision functions such as <ul style="list-style-type: none"> <i>12.03 AI supervision function</i> <i>49.05 Communication loss action</i> <i>50.02 FBA A comm loss func.</i> | 0.00 Hz |
| | -500.00...500.00 Hz | Safe frequency reference. | See par. <i>46.02</i> |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | |
|--|------------------------------------|---|----------------|-----|------|-------------|---|-----------|--|---|-----------|---|
| 28.51 | <i>Critical frequency function</i> | Enables/disables the critical frequencies function. Also determines whether the specified ranges are effective in both rotating directions or not. See also section <i>Critical speeds/frequencies</i> (page 124). | 0000b | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Information</th></tr><tr><td>0</td><td>Crit freq</td><td>1 = Enable: Critical frequencies enabled. 0 = Disable: Critical frequencies disabled.</td></tr><tr><td>1</td><td>Sign mode</td><td>1 = According to par: The signs of parameters 28.52...28.57 are taken into account. 0 = Absolute: Parameters 28.52...28.57 are handled as absolute values. Each range is effective in both directions of rotation.</td></tr></table> | | | | Bit | Name | Information | 0 | Crit freq | 1 = Enable: Critical frequencies enabled. 0 = Disable: Critical frequencies disabled. | 1 | Sign mode | 1 = According to par: The signs of parameters 28.52...28.57 are taken into account. 0 = Absolute: Parameters 28.52...28.57 are handled as absolute values. Each range is effective in both directions of rotation. |
| Bit | Name | Information | | | | | | | | | | |
| 0 | Crit freq | 1 = Enable: Critical frequencies enabled. 0 = Disable: Critical frequencies disabled. | | | | | | | | | | |
| 1 | Sign mode | 1 = According to par: The signs of parameters 28.52...28.57 are taken into account. 0 = Absolute: Parameters 28.52...28.57 are handled as absolute values. Each range is effective in both directions of rotation. | | | | | | | | | | |
| | 0000b...0011b | Critical frequencies configuration word. | 1 = 1 | | | | | | | | | |
| 28.52 | <i>Critical frequency 1 low</i> | Defines the low limit for critical frequency 1. Note: This value must be less than or equal to the value of 28.53 <i>Critical frequency 1 high</i> . | 0.00 Hz | | | | | | | | | |
| | -500.00...500.00 Hz | Low limit for critical frequency 1. | See par. 46.02 | | | | | | | | | |
| 28.53 | <i>Critical frequency 1 high</i> | Defines the high limit for critical frequency 1. Note: This value must be greater than or equal to the value of 28.52 <i>Critical frequency 1 low</i> . | 0.00 Hz | | | | | | | | | |
| | -500.00...500.00 Hz | High limit for critical frequency 1. | See par. 46.02 | | | | | | | | | |
| 28.54 | <i>Critical frequency 2 low</i> | Defines the low limit for critical frequency 2. Note: This value must be less than or equal to the value of 28.55 <i>Critical frequency 2 high</i> . | 0.00 Hz | | | | | | | | | |
| | -500.00...500.00 Hz | Low limit for critical frequency 2. | See par. 46.02 | | | | | | | | | |
| 28.55 | <i>Critical frequency 2 high</i> | Defines the high limit for critical frequency 2. Note: This value must be greater than or equal to the value of 28.54 <i>Critical frequency 2 low</i> . | 0.00 Hz | | | | | | | | | |
| | -500.00...500.00 Hz | High limit for critical frequency 2. | See par. 46.02 | | | | | | | | | |
| 28.56 | <i>Critical frequency 3 low</i> | Defines the low limit for critical frequency 3. Note: This value must be less than or equal to the value of 28.57 <i>Critical frequency 3 high</i> . | 0.00 Hz | | | | | | | | | |
| | -500.00...500.00 Hz | Low limit for critical frequency 3. | See par. 46.02 | | | | | | | | | |
| 28.57 | <i>Critical frequency 3 high</i> | Defines the high limit for critical frequency 3. Note: This value must be greater than or equal to the value of 28.56 <i>Critical frequency 3 low</i> . | 0.00 Hz | | | | | | | | | |
| | -500.00...500.00 Hz | High limit for critical frequency 3. | See par. 46.02 | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------------|---|--------------------------------|
| 28.72 | <i>Freq acceleration time 1</i> | Defines acceleration time 1 as the time required for the frequency to change from zero to the frequency defined by parameter 46.02 Frequency scaling . After this frequency has been reached, the acceleration continues with the same rate to the value defined by parameter 30.14 Maximum frequency . If the reference increases faster than the set acceleration rate, the motor will follow the acceleration rate. If the reference increases slower than the set acceleration rate, the motor frequency will follow the reference. If the acceleration time is set too short, the drive will automatically prolong the acceleration in order not to exceed the drive torque limits. | 5.000 s |
| | 0.000...1800.000 s | Acceleration time 1. | 10 = 1 s |
| 28.73 | <i>Freq deceleration time 1</i> | Defines deceleration time 1 as the time required for the frequency to change from the frequency defined by parameter 46.02 Frequency scaling (not from parameter 30.14 Maximum frequency) to zero. If there is any doubt about the deceleration time being too short, ensure that DC overvoltage control (30.30 Overvoltage control) is on. Note: If a short deceleration time is needed for a high inertia application, the drive should be equipped with braking equipment such as a brake chopper and brake resistor. | 5.000 s |
| | 0.000...1800.000 s | Deceleration time 1. | 10 = 1 s |
| 28.76 | <i>Freq ramp in zero source</i> | Selects a source that forces the frequency reference to zero. 0 = Force frequency reference to zero 1 = Normal operation | <i>Inactive</i> |
| | Active | 0. | 0 |
| | Inactive | 1. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 28.82 | <i>Shape time 1</i> | Defines the shape of acceleration ramp at the beginning of acceleration. | 0.000 s |
| | 0.000...1800.000 s | Shape time 1. | 10 = 1 s |
| 28.92 | <i>Frequency ref act 3</i> | Displays the frequency reference after selection (19.11 Ext1/Ext2 selection). See control chain diagram Frequency reference selection on page 256. This parameter is read-only. | - |
| | -500.00...500.00 Hz | Frequency reference after selection. | See par. 46.02 |
| 28.96 | <i>Frequency ref act 7</i> | Displays the frequency reference after application of constant frequencies, control panel reference, etc. See control chain diagram Frequency reference selection on page 256. This parameter is read-only. | - |
| | -500.00...500.00 Hz | Frequency reference 7. | See par. 46.02 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|---|----------------|
| 28.97 | <i>Frequency ref unlimited</i> | Displays the frequency reference after application of critical frequencies, but before ramping and limiting. See control chain diagram <i>Frequency reference modification</i> on page 257. This parameter is read-only. | - |
| | -500.00...500.00 Hz | Frequency reference before ramping and limiting. | See par. 46.02 |

| 30 Limits | | Drive operation limits. | |
|-----------|--------------|--|---|
| 30.01 | Limit word 1 | Displays limit word 1. This parameter is read-only. | - |

| Bit | Name | Description |
|---------|-------------------|--|
| 0 | Torq lim | 1 = Drive torque is being limited by the motor control (undervoltage control, current control, load angle control or pull-out control), or by the torque limits defined by parameters. |
| 1...4 | Reserved | |
| 5 | Tlim max speed | 1 = Torque reference is being limited by the rush control because of maximum speed limit (30.12 Maximum speed) |
| 6 | Tlim min speed | 1 = Torque reference is being limited by the rush control because of minimum speed limit (30.11 Minimum speed) |
| 7 | Max speed ref lim | 1 = Speed reference is being limited by 30.12 Maximum speed |
| 8 | Min speed ref lim | 1 = Speed reference is being limited by 30.11 Minimum speed |
| 9 | Max freq ref lim | 1 = Frequency reference is being limited by 30.14 Maximum frequency |
| 10 | Min freq ref lim | 1 = Frequency reference is being limited by 30.13 Minimum frequency |
| 11...15 | Reserved | |



| | | |
|---------------|---------------|-------|
| 0000h...FFFFh | Limit word 1. | 1 = 1 |
|---------------|---------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------|--|------------|
| 30.02 | Torque limit status | Displays the torque controller limitation status word. This parameter is read-only. | - |

| Bit | Name | Description |
|---------|------------------|---|
| 0 | Undervoltage | *1 = Intermediate DC circuit undervoltage |
| 1 | Overvoltage | *1 = Intermediate DC circuit overvoltage |
| 2 | Minimum torque | *1 = Torque is being limited by 30.19 Minimum torque 1, 30.26 Power motoring limit or 30.27 Power generating limit |
| 3 | Maximum torque | *1 = Torque is being limited by 30.20 Maximum torque 1, 30.26 Power motoring limit or 30.27 Power generating limit |
| 4 | Internal current | 1 = An inverter current limit (identified by bits 8...11) is active |
| 5 | Load angle | (With permanent magnet motors and reluctance motors only) 1 = Load angle limit is active, ie, the motor cannot produce any more torque |
| 6 | Motor pullout | (With asynchronous motors only) Motor pull-out limit is active, ie, the motor cannot produce any more torque |
| 7 | Reserved | |
| 8 | Thermal | 1 = Input current is being limited by the main circuit thermal limit |
| 9 | Max current | *1 = Maximum output current (I _{MAX}) is being limited |
| 10 | User current | *1 = Output current is being limited by 30.17 Maximum current |
| 11 | Thermal IGBT | *1 = Output current is being limited by a calculated thermal current value |
| 12...15 | Reserved | |

*Only one out of bits 0...3, and one out of bits 9...11 can be on simultaneously. The bit typically indicates the limit that is exceeded first.

| | | |
|---------------|--------------------------------|-------|
| 0000h...FFFFh | Torque limitation status word. | 1 = 1 |
|---------------|--------------------------------|-------|

| | | | |
|-------|---------------|--|----------|
| 30.11 | Minimum speed | Defines together with 30.12 Maximum speed the allowed speed range. See the figure below. A positive or zero minimum speed value defines two ranges, one positive and one negative. A negative minimum speed value defines one range.  WARNING! The absolute value of 30.11 Minimum speed must not be higher than the absolute value of 30.12 Maximum speed.  WARNING! In speed control mode only. In frequency control mode, use frequency limits (30.13 and 30.14). | 0.00 rpm |
|-------|---------------|--|----------|

Speed

30.12

0



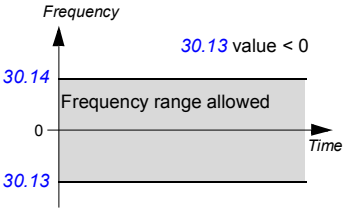
30.11

30.11 value < 0

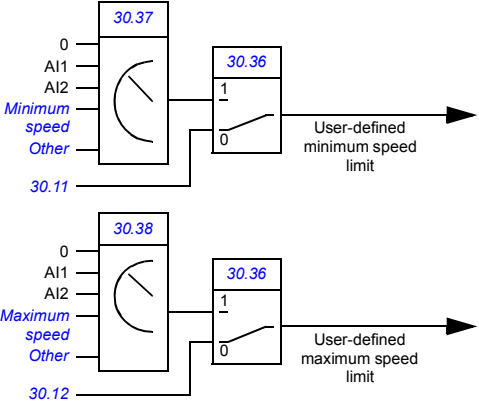
Speed range allowed

Time

| | | |
|------------------------------|------------------------|----------------|
| -30000.00... 30000.00 rpm | Minimum allowed speed. | See par. 46.01 |
|------------------------------|------------------------|----------------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------|--|---|
| 30.12 | Maximum speed | Defines together with 30.11 Minimum speed the allowed speed range. See parameter 30.11 Minimum speed. Note: This parameter does not affect the speed acceleration and deceleration ramp times. See parameter 46.01 Speed scaling. | 1500.00 rpm; 1800.00 rpm (95.20 b0) |
| | -30000.00... 30000.00 rpm | Maximum speed. | See par. 46.01 |
| 30.13 | Minimum frequency | Defines together with 30.14 Maximum frequency the allowed frequency range. See the figure. A positive or zero minimum frequency value defines two ranges, one positive and one negative.  WARNING! The absolute value of 30.13 Minimum frequency must not be higher than the absolute value of 30.14 Maximum frequency.  WARNING! in frequency control mode only. | 0.00 Hz |
| | |  | |
| | -500.00...500.00 Hz | Minimum frequency. | See par. 46.02 |
| 30.14 | Maximum frequency | Defines together with 30.13 Minimum frequency the allowed frequency range. See parameter 30.13 Minimum frequency. Note: This parameter does not affect the frequency acceleration and deceleration ramp times. See parameter 46.02 Frequency scaling. | 50.00 Hz; 60.00 Hz (95.20 b0) |
| | -500.00...500.00 Hz | Maximum frequency. | See par. 46.02 |
| 30.17 | Maximum current | Defines the maximum allowed motor current. This depends on the drive type; it is automatically determined on the basis of the rating. The system sets the default value to 90% of the rated current so you can increase the parameter value by 10% if needed (not valid for ACQ580-01-12A7-4 drive type). | 0.00 A |
| | 0.00...30000.00 A | Maximum motor current. | 1 = 1 A |
| 30.19 | Minimum torque 1 | Defines a minimum torque limit for the drive (in percent of nominal motor torque). Note: If your application, like a pump or a fan, requires that the motor must rotate in one direction only, use speed/ frequency limit (30.11 Minimum speed/30.13 Minimum frequency) to achieve this. Do not set parameter 30.19 Minimum torque 1 or 30.27 Power generating limit to 0%, as the drive is then not able to stop correctly. | -300.0% |
| | -1600.0...0.0% | Minimum torque limit 1. | See par. 46.03 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------------|--|--------------------------------|
| 30.20 | <i>Maximum torque 1</i> | <ul style="list-style-type: none"> Defines a maximum torque limit for the drive (in percent of nominal motor torque). | 300.0% |
| | 0.0...1600.0% | Maximum torque 1. | See par. 46.03 |
| 30.26 | <i>Power motoring limit</i> | Defines the maximum allowed power fed by the inverter to the motor in percent of nominal motor power. | 300.00% |
| | 0.00...600.00% | Maximum motoring power. | 1 = 1% |
| 30.27 | <i>Power generating limit</i> | <p>Defines the maximum allowed power fed by the motor to the inverter in percent of nominal motor power.</p> <p>Note: If your application, like a pump or a fan, requires that the motor must rotate in one direction only, use speed/frequency limit (30.11 Minimum speed/30.13 Minimum frequency) to achieve this. Do not set parameter 30.19 Minimum torque 1 or 30.27 Power generating limit to 0%, as the drive is then not able to stop correctly.</p> | -300.00% |
| | -600.00...0.00% | Maximum generating power. | 1 = 1% |
| 30.30 | <i>Overvoltage control</i> | <p>Enables the overvoltage control of the intermediate DC link. Fast braking of a high inertia load causes the voltage to rise to the overvoltage control limit. To prevent the DC voltage from exceeding the limit, the overvoltage controller automatically decreases the braking torque.</p> <p>Note: If the drive is equipped with a brake chopper and resistor, or a regenerative supply unit, the controller must be disabled.</p> | <i>Enable</i> |
| | Disable | Overvoltage control disabled. | 0 |
| | Enable | Overvoltage control enabled. | 1 |
| 30.31 | <i>Undervoltage control</i> | <p>Enables the undervoltage control of the intermediate DC link. If the DC voltage drops due to input power cut off, the undervoltage controller will automatically decrease the motor torque in order to keep the voltage above the lower limit. By decreasing the motor torque, the inertia of the load will cause regeneration back to the drive, keeping the DC link charged and preventing an undervoltage trip until the motor coasts to a stop. This will act as a power-loss ride-through functionality in systems with high inertia, such as a centrifuge or a fan.</p> | <i>Enable</i> |
| | Disable | Undervoltage control disabled. | 0 |
| | Enable | Undervoltage control enabled. | 1 |
| 30.35 | <i>Thermal current limitation</i> | Enables/disables temperature-based output current limitation. The limitation should only be disabled if required by the application. | <i>Enable</i> |
| | Disable | Thermal current limitation disabled. | 0 |
| | Enable | Thermal current limitation enabled. | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------|--|---------------------|
| 30.36 | <i>Speed limit selection</i> | <p>Selects a source that switches between two different predefined adjustable speed limit sets.</p> <p>0 = minimum speed limit defined by 30.11 and maximum speed limit defined by 30.12 are active</p> <p>1 = minimum speed limit selected by 30.37 and maximum speed limit defined by 30.38 are active.</p> <p>The user can define two sets of speed limits, and switch between the sets using a binary source such as a digital input.</p> <p>The first set of limits is defined by parameters 30.11 <i>Minimum speed</i> and 30.12 <i>Maximum speed</i>. The second set has selector parameters for both the minimum (30.37) and maximum (30.38) limits that allows the use of a selectable analog source (such as an analog input).</p>  | <i>Not selected</i> |
| | Not selected | Adjustable speed limits are disabled. (Minimum speed limit defined by 30.11 <i>Minimum speed</i> and maximum speed limit defined by 30.12 <i>Maximum speed</i> are active). | 0 |
| | Selected | Adjustable speed limits are enabled. (Minimum speed limit defined by 30.37 <i>Minimum speed source</i> and maximum speed limit defined by 30.38 <i>Maximum speed source</i> are active). | 1 |
| | Ext1 active | Adjustable speed limits are enabled if EXT1 is active. | 2 |
| | Ext2 active | Adjustable speed limits are enabled if EXT2 is active. | 3 |
| | Reserved | | 4 |
| | DI1 | Digital input DI1 (10.02 <i>DI delayed status</i> , bit 0). | 5 |
| | DI2 | Digital input DI2 (10.02 <i>DI delayed status</i> , bit 1). | 6 |
| | DI3 | Digital input DI3 (10.02 <i>DI delayed status</i> , bit 2). | 7 |
| | DI4 | Digital input DI4 (10.02 <i>DI delayed status</i> , bit 3). | 8 |
| | DI5 | Digital input DI5 (10.02 <i>DI delayed status</i> , bit 4). | 9 |
| | DI6 | Digital input DI6 (10.02 <i>DI delayed status</i> , bit 5). | 10 |
| | Reserved | | 11 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|----------------------|--|---------------|
| 30.37 | Minimum speed source | Defines the source of a minimum speed limit for the drive when the source is selected by 30.36 Speed limit selection. Note: In vector motor control mode only. In scalar motor control mode, use frequency limits 30.13 and 30.14. | Minimum speed |
| | Zero | None. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | Reserved | | 3...10 |
| | Minimum speed | 30.11 Minimum speed. | 11 |
| | Other | Source selection (see Terms and abbreviations on page 272). | - |
| 30.38 | Maximum speed source | Defines the source of a maximum speed limit for the drive when the source is selected by 30.36 Speed limit selection. Note: In vector motor control mode only. In scalar motor control mode, use frequency limits 30.13 and 30.14. | Maximum speed |
| | Zero | None. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | Reserved | | 3...11 |
| | Maximum speed | 30.12 Maximum speed. | 12 |
| | Other | Source selection (see Terms and abbreviations on page 272). | - |
| 30.101 | LSU limit word 1 | (Only visible for ACQ580-31 and ACQ580-34). Displays limit word 1 of the supply unit. This parameter is read-only. | - |

| Bit | Name | Description |
|--------|-----------------------|---|
| 0 | P user ref max | 1 = Power reference is being limited by supply control program |
| 1 | P user ref min | parameters |
| 2 | P user max | 1 = Power is being limited by parameter 30.149 |
| 3 | Reserved | |
| 4 | P cooling overtemp | 1 = Power reference is being limited because of coolant overtemperature |
| 5 | P power unit overtemp | 1 = Power reference is being limited because of supply unit overtemperature |
| 6...15 | Reserved | |

| | | |
|---------------|---------------------------|-------|
| 0000h...FFFFh | Supply unit limit word 1. | 1 = 1 |
|---------------|---------------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|--------|------------------|--|------------|
| 30.102 | LSU limit word 2 | (Only visible for ACQ580-31 and ACQ580-34). Displays limit word 2 of the supply unit. This parameter is read-only. | - |

| Bit | Name | Description |
|--------|--------------------|---|
| 0 | Q user ref max | 1 = Reactive power reference is being limited |
| 1 | Q user ref min | |
| 2 | Q cooling overtemp | 1 = Reactive power reference is being limited because of coolant overtemperature |
| 3 | Reserved | |
| 4 | AC overvoltage | 1 = AC overvoltage protection |
| 5...6 | Reserved | |
| 7 | AC diff max | 1 = (When AC voltage-type reactive power reference is being used) Input of AC control is being limited |
| 8 | AC diff min | |
| 9...15 | Reserved | |

| | | |
|---------------|---------------------------|-------|
| 0000h...FFFFh | Supply unit limit word 2. | 1 = 1 |
|---------------|---------------------------|-------|

| | | | |
|--------|------------------|--|---|
| 30.103 | LSU limit word 3 | (Only visible for ACQ580-31 and ACQ580-34). Displays limit word 3 of the supply unit. This parameter is read-only. | - |
|--------|------------------|--|---|

| Bit | Name | Description |
|---------|------------------------|---|
| 0 | Undervoltage limit | 1 = Power is being limited by the undervoltage controller |
| 1 | Overvoltage limit | 1 = Power is being limited by the overvoltage controller |
| 2 | Motoring power | 1 = Power is being limited by temperature or user power limits (see parameter 30.149) |
| 3 | Reserved | |
| 4 | Active current limit | 1 = Active current is being limited. For details, see bits 6...9 and 14...15. |
| 5 | Reactive current limit | 1 = Reactive current is being limited. For details, see bits 12...13. |
| 6 | Thermal limit | 1 = Active current is being limited by internal main circuit thermal limit |
| 7 | SOA limit | 1 = Active current is being limited by internal safe operation area limit |
| 8 | User current limit | 1 = Active current is being limited by current limit set by supply control program parameters |
| 9 | Thermal IGBT | 1 = Active current is being limited based on internal maximum thermal IGBT stress limit |
| 10...11 | Reserved | |
| 12 | Q act neg | 1 = Negative reactive current is being limited by maximum total current |
| 13 | Q act pos | 1 = Positive reactive current is being limited by maximum total current |
| 14 | P act neg | 1 = Negative active current is being limited by maximum total current |
| 15 | P act pos | 1 = Positive reactive current is being limited by maximum total current |

| | | |
|---------------|---------------------------|-------|
| 0000h...FFFFh | Supply unit limit word 3. | 1 = 1 |
|---------------|---------------------------|-------|


| No. | Name/Value | Description | Def/FbEq16 |
|--------|------------------|--|------------|
| 30.104 | LSU limit word 4 | (Only visible for ACQ580-31 and ACQ580-34). Displays limit word 4 of the supply unit. This parameter is read-only. | - |

| Bit | Name | Description |
|--------|-------------|--|
| 0 | Udc ref max | 1 = DC reference is being limited by supply control program parameters |
| 1 | Udc ref min | parameters |
| 2 | User I max | 1 = Current is being limited by supply control program parameters |
| 3 | Temp I max | 1 = Current is being limited based on temperature |
| 4...15 | Reserved | |

| | | | |
|----------------|--------------------------------------|---|--------|
| 0000h...FFFFh | Supply unit limit word 4. | 1 = 1 | |
| 30.149 | LSU maximum power limit | (Only visible for ACQ580-31 and ACQ580-34). Defines a maximum power limit for the supply unit. | 130.0% |
| 0.0 ... 200.0% | Maximum power limit for supply unit. | 1 = 1% | |

| | | | |
|--------------------|-------------------------|---|-----------------|
| 31 Fault functions | | Configuration of external events; selection of behavior of the drive upon fault situations. | |
| 31.01 | External event 1 source | Defines the source of external event 1. See also parameter 31.02 External event 1 type. 0 = Trigger event 1 = Normal operation | Inactive (true) |
| | Active (false) | 0. | 0 |
| | Inactive (true) | 1. | 1 |
| | Reserved | | 2 |
| | DI1 | Digital input DI1 (10.02 DI delayed status, bit 0). | 3 |
| | DI2 | Digital input DI2 (10.02 DI delayed status, bit 1). | 4 |
| | DI3 | Digital input DI3 (10.02 DI delayed status, bit 2). | 5 |
| | DI4 | Digital input DI4 (10.02 DI delayed status, bit 3). | 6 |
| | DI5 | Digital input DI5 (10.02 DI delayed status, bit 4). | 7 |
| | DI6 | Digital input DI6 (10.02 DI delayed status, bit 5). | 8 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |
| 31.02 | External event 1 type | Selects the type of external event 1. | Fault |
| | Fault | The external event generates a fault. | 0 |
| | Warning | The external event generates a warning. | 1 |
| 31.03 | External event 2 source | Defines the source of external event 2. See also parameter 31.04 External event 2 type. For the selections, see parameter 31.01 External event 1 source. | Inactive (true) |
| 31.04 | External event 2 type | Selects the type of external event 2. | Fault |
| | Fault | The external event generates a fault. | 0 |
| | Warning | The external event generates a warning. | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---|---|------------------------|
| 31.05 | External event 3 source | Defines the source of external event 3. See also parameter 31.06 External event 3 type . For the selections, see parameter 31.01 External event 1 source . | <i>Inactive (true)</i> |
| 31.06 | External event 3 type | Selects the type of external event 3. | <i>Fault</i> |
| | Fault | The external event generates a fault. | 0 |
| | Warning | The external event generates a warning. | 1 |
| 31.07 | External event 4 source | Defines the source of external event 4. See also parameter 31.08 External event 4 type . For the selections, see parameter 31.01 External event 1 source . | <i>Inactive (true)</i> |
| 31.08 | External event 4 type | Selects the type of external event 4. | <i>Fault</i> |
| | Fault | The external event generates a fault. | 0 |
| | Warning | The external event generates a warning. | 1 |
| 31.09 | External event 5 source | Defines the source of external event 5. See also parameter 31.10 External event 5 type . For the selections, see parameter 31.01 External event 1 source . | <i>Inactive (true)</i> |
| 31.10 | External event 5 type | Selects the type of external event 5. | <i>Fault</i> |
| | Fault | The external event generates a fault. | 0 |
| | Warning | The external event generates a warning. | 1 |
| 31.11 | Fault reset selection | Selects the source of an external fault reset signal. The signal resets the drive after a fault trip if the cause of the fault no longer exists. 0 -> 1 = Reset Note: A fault reset from the fieldbus interface is always observed regardless of this parameter. | <i>Not used</i> |
| | Not used | 0. | 0 |
| | Not used | 1. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 |
| | Reserved | | 21...23 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 24 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 25 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 26 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------|---|-----------------------|
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 31.12 | <i>Autoreset selection</i> | <p>Selects faults that are automatically reset. The parameter is a 16-bit word with each bit corresponding to a fault type. Whenever a bit is set to 1, the corresponding fault is automatically reset.</p> <p> WARNING! Before you activate the function, make sure that no dangerous situations can occur. The function restarts the drive automatically and continues operation after a fault.</p> <p>The bits of this binary number correspond to the following faults:</p> | 0000h (00...1100b) |


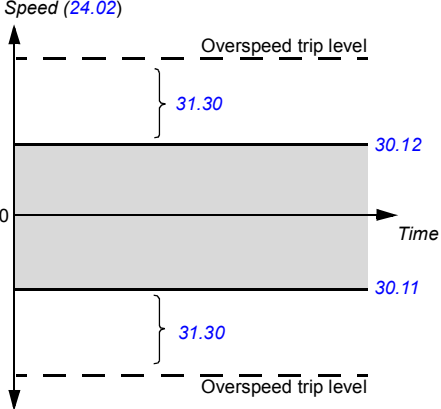
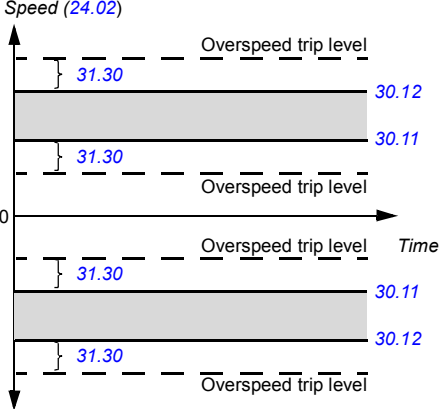
| Bit | Fault |
|-------|--|
| 0 | Overcurrent |
| 1 | Overvoltage |
| 2 | Undervoltage |
| 3 | AI supervision fault |
| 4...9 | Reserved |
| 10 | Selectable fault (see parameter 31.13 <i>Selectable fault</i>) |
| 11 | External fault 1 (from source selected by parameter 31.01 <i>External event 1 source</i>) |
| 12 | External fault 2 (from source selected by parameter 31.03 <i>External event 2 source</i>) |
| 13 | External fault 3 (from source selected by parameter 31.05 <i>External event 3 source</i>) |
| 14 | External fault 4 (from source selected by parameter 31.07 <i>External event 4 source</i>) |
| 15 | External fault 5 (from source selected by parameter 31.09 <i>External event 5 source</i>) |


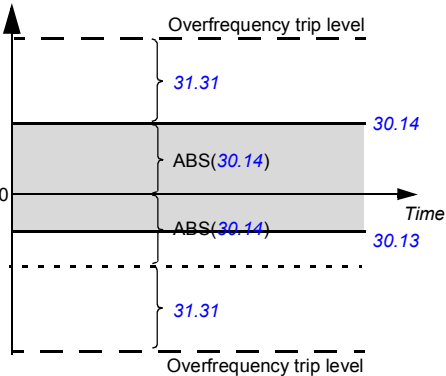
| | | |
|--------------------------------|--|----------|
| 0000h...FFFFh | Automatic reset configuration word. | 1 = 1 |
| 31.13 <i>Selectable fault</i> | Defines the fault that can be automatically reset using parameter 31.12 <i>Autoreset selection</i> , bit 10. Faults are listed in chapter <i>Fault tracing</i> (page 192). | 0000h |
| 0000h...FFFFh | Fault code. | 10 = 1 |
| 31.14 <i>Number of trials</i> | <p>Defines the maximum number of automatic resets that the drive is allowed to attempt within the time specified by 31.15 <i>Total trials time</i>.</p> <p>If the fault persists, subsequent reset attempts will be made at intervals defined by 31.16 <i>Delay time</i>.</p> <p>The faults to be automatically reset are defined by 31.12 <i>Autoreset selection</i>.</p> | 0 |
| 0...5 | Number of automatic resets. | 10 = 1 |
| 31.15 <i>Total trials time</i> | <p>Defines a time window for automatic fault resets. The maximum number of attempts made during any period of this length is defined by 31.14 <i>Number of trials</i>.</p> <p>Note: If the fault condition remains and cannot be reset, each reset attempt will generate an event and start a new time window. In practice, if the specified number of resets (31.14) at specified intervals (31.16) take longer than the value of 31.15, the drive will continue to attempt resetting the fault until the cause is eventually removed.</p> | 30.0 s |
| 1.0...600.0 s | Time for automatic resets. | 10 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | |
|--------|-------------------------|---|-------------|--|---------------------------------|-----|-----|---|---|----------------------------|---|---|--|---|---|--|---|---|--------------------|---|
| 31.16 | Delay time | Defines the time that the drive will wait after a fault before attempting an automatic reset. See parameter 31.12 Autoreset selection. | 0.0 s | | | | | | | | | | | | | | | | | |
| | 0.0...120.0 s | Autoreset delay. | 10 = 1 s | | | | | | | | | | | | | | | | | |
| 31.19 | Motor phase loss | Selects how the drive reacts when a motor phase loss is detected. In scalar motor control mode: <ul style="list-style-type: none">The supervision activates above 10% of the motor nominal frequency. If any of the phase currents stays very small for a certain time limit, the output phase loss fault is given.If the motor nominal current is below 1/6 of the drive nominal current or there is no motor connected, ABB recommends to disable the motor output phase loss function. | Fault | | | | | | | | | | | | | | | | | |
| | No action | No action taken. | 0 | | | | | | | | | | | | | | | | | |
| | Fault | Drive trips on fault 3381 Output phase loss. | 1 | | | | | | | | | | | | | | | | | |
| 31.21 | Supply phase loss | Selects how the drive reacts when a supply phase loss is detected. | Fault | | | | | | | | | | | | | | | | | |
| | No action | No action taken. | 0 | | | | | | | | | | | | | | | | | |
| | Fault | Drive trips on fault 3130 Input phase loss. | 1 | | | | | | | | | | | | | | | | | |
| 31.22 | STO indication run/stop | Selects which indications are given when one or both Safe torque off (STO) signals are switched off or lost. The indications also depend on whether the drive is running or stopped when this occurs. The tables at each selection below show the indications generated with that particular setting. Notes: <ul style="list-style-type: none">This parameter does not affect the operation of the STO function itself. The STO function will operate regardless of the setting of this parameter: a running drive will stop upon removal of one or both STO signals, and will not start until both STO signals are restored and all faults reset.The loss of only one STO signal always generates a fault as it is interpreted as a malfunction.With the CPTC-02 ATEX-certified thermistor protection module, follow the instructions given in the CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual (3AXD50000030058 [English]). For more information on the STO, see chapter The Safe torque off function in the Hardware manual of the drive. | Fault/Fault | | | | | | | | | | | | | | | | | |
| | Fault/Fault | <table><tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr><tr><th>IN1</th><th>IN2</th></tr><tr><td>0</td><td>0</td><td>Fault 5091 Safe torque off</td></tr><tr><td>0</td><td>1</td><td>Faults 5091 Safe torque off and FA81 Safe torque off 1</td></tr><tr><td>1</td><td>0</td><td>Faults 5091 Safe torque off and FA82 Safe torque off 2</td></tr><tr><td>1</td><td>1</td><td>(Normal operation)</td></tr></table> | Inputs | | Indication (running or stopped) | IN1 | IN2 | 0 | 0 | Fault 5091 Safe torque off | 0 | 1 | Faults 5091 Safe torque off and FA81 Safe torque off 1 | 1 | 0 | Faults 5091 Safe torque off and FA82 Safe torque off 2 | 1 | 1 | (Normal operation) | 0 |
| Inputs | | Indication (running or stopped) | | | | | | | | | | | | | | | | | | |
| IN1 | IN2 | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | Fault 5091 Safe torque off | | | | | | | | | | | | | | | | | | |
| 0 | 1 | Faults 5091 Safe torque off and FA81 Safe torque off 1 | | | | | | | | | | | | | | | | | | |
| 1 | 0 | Faults 5091 Safe torque off and FA82 Safe torque off 2 | | | | | | | | | | | | | | | | | | |
| 1 | 1 | (Normal operation) | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----------------|--|------------|---|---|-----|-----|-----|---------|-------------------------------------|---|---|---|-------------------------------------|---|---|--|---|--------------------|---|--|---|---|---|--------------------|--|---|
| | Fault/Warning | <table><tr><th colspan="2">Inputs</th><th colspan="2">Indication</th></tr><tr><th>IN1</th><th>IN2</th><th>Running</th><th>Stopped</th></tr><tr><td>0</td><td>0</td><td>Fault <i>5091 Safe torque off</i></td><td>Warning <i>A5A0 Safe torque off</i></td></tr><tr><td>0</td><td>1</td><td>Faults <i>5091 Safe torque off</i> and <i>FA81 Safe torque off 1</i></td><td>Warning <i>A5A0 Safe torque off</i> and fault <i>FA81 Safe torque off 1</i></td></tr><tr><td>1</td><td>0</td><td>Faults <i>5091 Safe torque off</i> and <i>FA82 Safe torque off 2</i></td><td>Warning <i>A5A0 Safe torque off</i> and fault <i>FA82 Safe torque off 2</i></td></tr><tr><td>1</td><td>1</td><td colspan="2">(Normal operation)</td></tr></table> | Inputs | | Indication | | IN1 | IN2 | Running | Stopped | 0 | 0 | Fault <i>5091 Safe torque off</i> | Warning <i>A5A0 Safe torque off</i> | 0 | 1 | Faults <i>5091 Safe torque off</i> and <i>FA81 Safe torque off 1</i> | Warning <i>A5A0 Safe torque off</i> and fault <i>FA81 Safe torque off 1</i> | 1 | 0 | Faults <i>5091 Safe torque off</i> and <i>FA82 Safe torque off 2</i> | Warning <i>A5A0 Safe torque off</i> and fault <i>FA82 Safe torque off 2</i> | 1 | 1 | (Normal operation) | | 1 |
| | | Inputs | | Indication | | | | | | | | | | | | | | | | | | | | | | | |
| | | IN1 | IN2 | Running | Stopped | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 0 | Fault <i>5091 Safe torque off</i> | Warning <i>A5A0 Safe torque off</i> | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 1 | Faults <i>5091 Safe torque off</i> and <i>FA81 Safe torque off 1</i> | Warning <i>A5A0 Safe torque off</i> and fault <i>FA81 Safe torque off 1</i> | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 0 | Faults <i>5091 Safe torque off</i> and <i>FA82 Safe torque off 2</i> | Warning <i>A5A0 Safe torque off</i> and fault <i>FA82 Safe torque off 2</i> | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | (Normal operation) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Fault/Event | <table><tr><th colspan="2">Inputs</th><th colspan="2">Indication</th></tr><tr><th>IN1</th><th>IN2</th><th>Running</th><th>Stopped</th></tr><tr><td>0</td><td>0</td><td>Fault <i>5091 Safe torque off</i></td><td>Event <i>B5A0 STO event</i></td></tr><tr><td>0</td><td>1</td><td>Faults <i>5091 Safe torque off</i> and <i>FA81 Safe torque off 1</i></td><td>Event <i>B5A0 STO event</i> and fault <i>FA81 Safe torque off 1</i></td></tr><tr><td>1</td><td>0</td><td>Faults <i>5091 Safe torque off</i> and <i>FA82 Safe torque off 2</i></td><td>Event <i>B5A0 STO event</i> and fault <i>FA82 Safe torque off 2</i></td></tr><tr><td>1</td><td>1</td><td colspan="2">(Normal operation)</td></tr></table> | Inputs | | Indication | | IN1 | IN2 | Running | Stopped | 0 | 0 | Fault <i>5091 Safe torque off</i> | Event <i>B5A0 STO event</i> | 0 | 1 | Faults <i>5091 Safe torque off</i> and <i>FA81 Safe torque off 1</i> | Event <i>B5A0 STO event</i> and fault <i>FA81 Safe torque off 1</i> | 1 | 0 | Faults <i>5091 Safe torque off</i> and <i>FA82 Safe torque off 2</i> | Event <i>B5A0 STO event</i> and fault <i>FA82 Safe torque off 2</i> | 1 | 1 | (Normal operation) | | 2 |
| | | Inputs | | Indication | | | | | | | | | | | | | | | | | | | | | | | |
| | | IN1 | IN2 | Running | Stopped | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 0 | Fault <i>5091 Safe torque off</i> | Event <i>B5A0 STO event</i> | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 1 | Faults <i>5091 Safe torque off</i> and <i>FA81 Safe torque off 1</i> | Event <i>B5A0 STO event</i> and fault <i>FA81 Safe torque off 1</i> | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 0 | Faults <i>5091 Safe torque off</i> and <i>FA82 Safe torque off 2</i> | Event <i>B5A0 STO event</i> and fault <i>FA82 Safe torque off 2</i> | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | (Normal operation) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Warning/Warning | <table><tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr><tr><th>IN1</th><th>IN2</th></tr><tr><td>0</td><td>0</td><td>Warning <i>A5A0 Safe torque off</i></td></tr><tr><td>0</td><td>1</td><td>Warning <i>A5A0 Safe torque off</i> and fault <i>FA81 Safe torque off 1</i></td></tr><tr><td>1</td><td>0</td><td>Warning <i>A5A0 Safe torque off</i> and fault <i>FA82 Safe torque off 2</i></td></tr><tr><td>1</td><td>1</td><td>(Normal operation)</td></tr></table> | Inputs | | Indication (running or stopped) | IN1 | IN2 | 0 | 0 | Warning <i>A5A0 Safe torque off</i> | 0 | 1 | Warning <i>A5A0 Safe torque off</i> and fault <i>FA81 Safe torque off 1</i> | 1 | 0 | Warning <i>A5A0 Safe torque off</i> and fault <i>FA82 Safe torque off 2</i> | 1 | 1 | (Normal operation) | 3 | | | | | | | |
| | | Inputs | | Indication (running or stopped) | | | | | | | | | | | | | | | | | | | | | | | |
| | | IN1 | IN2 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 0 | Warning <i>A5A0 Safe torque off</i> | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 1 | Warning <i>A5A0 Safe torque off</i> and fault <i>FA81 Safe torque off 1</i> | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 0 | Warning <i>A5A0 Safe torque off</i> and fault <i>FA82 Safe torque off 2</i> | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | (Normal operation) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Event/Event | <table><tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr><tr><th>IN1</th><th>IN2</th></tr><tr><td>0</td><td>0</td><td>Event <i>B5A0 STO event</i></td></tr><tr><td>0</td><td>1</td><td>Event <i>B5A0 STO event</i> and fault <i>FA81 Safe torque off 1</i></td></tr><tr><td>1</td><td>0</td><td>Event <i>B5A0 STO event</i> and fault <i>FA82 Safe torque off 2</i></td></tr><tr><td>1</td><td>1</td><td>(Normal operation)</td></tr></table> | Inputs | | Indication (running or stopped) | IN1 | IN2 | 0 | 0 | Event <i>B5A0 STO event</i> | 0 | 1 | Event <i>B5A0 STO event</i> and fault <i>FA81 Safe torque off 1</i> | 1 | 0 | Event <i>B5A0 STO event</i> and fault <i>FA82 Safe torque off 2</i> | 1 | 1 | (Normal operation) | 4 | | | | | | | |
| | | Inputs | | Indication (running or stopped) | | | | | | | | | | | | | | | | | | | | | | | |
| | | IN1 | IN2 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 0 | Event <i>B5A0 STO event</i> | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | 1 | Event <i>B5A0 STO event</i> and fault <i>FA81 Safe torque off 1</i> | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 0 | Event <i>B5A0 STO event</i> and fault <i>FA82 Safe torque off 2</i> | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | (Normal operation) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | |
|--------|------------------------------|---|---|--|---------------------------------|-----|-----|---|---|------|---|---|-------------------------------------|---|---|-------------------------------------|---|---|--------------------|---|
| | No indication/No indication | <table><tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr><tr><th>IN1</th><th>IN2</th></tr><tr><td>0</td><td>0</td><td>None</td></tr><tr><td>0</td><td>1</td><td>Fault <i>FA81 Safe torque off 1</i></td></tr><tr><td>1</td><td>0</td><td>Fault <i>FA82 Safe torque off 2</i></td></tr><tr><td>1</td><td>1</td><td>(Normal operation)</td></tr></table> | Inputs | | Indication (running or stopped) | IN1 | IN2 | 0 | 0 | None | 0 | 1 | Fault <i>FA81 Safe torque off 1</i> | 1 | 0 | Fault <i>FA82 Safe torque off 2</i> | 1 | 1 | (Normal operation) | 5 |
| Inputs | | Indication (running or stopped) | | | | | | | | | | | | | | | | | | |
| IN1 | IN2 | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | None | | | | | | | | | | | | | | | | | | |
| 0 | 1 | Fault <i>FA81 Safe torque off 1</i> | | | | | | | | | | | | | | | | | | |
| 1 | 0 | Fault <i>FA82 Safe torque off 2</i> | | | | | | | | | | | | | | | | | | |
| 1 | 1 | (Normal operation) | | | | | | | | | | | | | | | | | | |
| 31.23 | <i>Wiring or earth fault</i> | Selects how the drive reacts to incorrect input power and motor cable connection (ie. input power cable is connected to drive motor connection). Note: For ACQ580-31 and ACQ580-34 this parameter is write protected and its value is <i>No action</i> . | <i>Fault</i> | | | | | | | | | | | | | | | | | |
| | No action | No action taken. | 0 | | | | | | | | | | | | | | | | | |
| | Fault | Drive trips on fault <i>3181 Wiring or earth fault</i> . | 1 | | | | | | | | | | | | | | | | | |
| 31.24 | <i>Stall function</i> | Selects how the drive reacts to a motor stall condition. A stall condition is defined as follows: <ul style="list-style-type: none">• The drive exceeds the stall current limit (<i>31.25 Stall current limit</i>), and• the output frequency is below the level set by parameter <i>31.27 Stall frequency limit</i> or the motor speed is below the level set by parameter <i>31.26 Stall speed limit</i>, and• the conditions above have been true longer than the time set by parameter <i>31.28 Stall time</i>. | <i>No action</i> | | | | | | | | | | | | | | | | | |
| | No action | None (stall supervision disabled). | 0 | | | | | | | | | | | | | | | | | |
| | Warning | Drive generates warning <i>A780 Motor stall</i> . | 1 | | | | | | | | | | | | | | | | | |
| | Fault | Drive trips on fault <i>7121 Motor stall</i> . | 2 | | | | | | | | | | | | | | | | | |
| 31.25 | <i>Stall current limit</i> | Stall current limit in percent of the nominal current of the motor. See parameter <i>31.24 Stall function</i> . | 200.0% | | | | | | | | | | | | | | | | | |
| | 0.0...1600.0% | Stall current limit. | 10 = 1% | | | | | | | | | | | | | | | | | |
| 31.26 | <i>Stall speed limit</i> | Stall speed limit in rpm. See parameter <i>31.24 Stall function</i> . | 150.00 rpm; 180.00 rpm (<i>95.20</i> b0) | | | | | | | | | | | | | | | | | |
| | 0.00...10000.00 rpm | Stall speed limit. | See par. <i>46.01</i> | | | | | | | | | | | | | | | | | |
| 31.27 | <i>Stall frequency limit</i> | Stall frequency limit. See parameter <i>31.24 Stall function</i> . Note: Setting the limit below 10 Hz is not recommended. | 15.00 Hz; 18.00 Hz (<i>95.20</i> b0) | | | | | | | | | | | | | | | | | |
| | 0.00...1000.00 Hz | Stall frequency limit. | See par. <i>46.02</i> | | | | | | | | | | | | | | | | | |
| 31.28 | <i>Stall time</i> | Stall time. See parameter <i>31.24 Stall function</i> . | 20 s | | | | | | | | | | | | | | | | | |
| | 0...3600 s | Stall time. | 1 = 1 s | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------|--|---|
| 31.30 | Overspeed trip margin | <p>Defines, together with 30.11 Minimum speed and 30.12 Maximum speed, the maximum allowed speed of the motor (overspeed protection). If the speed (24.02 Used speed feedback) exceeds the speed limit defined by parameter 30.11 or 30.12 by more than the value of this parameter, the drive trips on the 7310 Overspeed fault.</p> <p> WARNING! This function only supervises the speed in vector motor control mode. The function is not effective in scalar motor control mode.</p> <p>Example: If the maximum speed is 1420 rpm and speed trip margin is 300 rpm, the drive trips at 1720 rpm.</p> <p>Speed (24.02)</p>  <p>Speed (24.02)</p>  | 500.00 rpm; 500.00 rpm (95.20 b0) |
| | 0.00...10000.00 rpm | Overspeed trip margin. | See par. 46.01 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------------|---|------------|
| 31.31 | <i>Frequency trip margin</i> | <p>Defines, together with 30.13 Minimum frequency and 30.14 Maximum frequency, the maximum allowed frequency of the motor (overfrequency protection). The absolute value of this overfrequency trip level is calculated by adding the value of this parameter to the higher of the absolute values of 30.13 Minimum frequency and 30.14 Maximum frequency.</p> <p>If the output frequency (01.06 Output frequency) exceeds the overfrequency trip level (ie. the absolute value of the output frequency exceeds the absolute value of the overfrequency trip level), the drive trips on fault 73F0 Overfrequency.</p> <p>WARNING! This function only supervises the frequency in scalar motor control mode.</p> <p> Frequency</p>  <p>The graph illustrates the frequency supervision logic. The vertical axis represents Frequency, and the horizontal axis represents Time. A horizontal dashed line at the top indicates the 'Overfrequency trip level'. A shaded gray rectangular region represents the allowed frequency range, bounded by 'ABS(30.14)' on the bottom and '30.14' on the top. The parameter '31.31' is indicated as the margin between the trip level and the top of the shaded region, and also between the bottom of the shaded region and a lower dashed line. The parameter '30.13' is indicated as the minimum frequency below the shaded region.</p> | 15.00 Hz |
| | 0.00...10000.00 Hz | Overfrequency trip margin. | 1 = 1 Hz |
| 31.32 | <i>Emergency ramp supervision</i> | <p>Parameters 31.32 Emergency ramp supervision and 31.33 Emergency ramp supervision delay, together with the derivative of 24.02 Used speed feedback, provide a supervision function for emergency stop modes Off1 and Off3.</p> <p>The supervision is based on either</p> <ul style="list-style-type: none"> observing the time within which the motor stops, or comparing the actual and expected deceleration rates. <p>If this parameter is set to 0%, the maximum stop time is directly set in parameter 31.33. Otherwise, 31.32 defines the maximum allowed deviation from the expected deceleration rate, which is calculated from parameters 23.12...23.13 (Off1) or 23.23 Emergency stop time (Off3). If the actual deceleration rate (24.02) deviates too much from the expected rate, the drive trips on fault 73B0 Emergency ramp failed, sets bit 8 of 06.17 Drive status word 2, and coasts to a stop.</p> <p>If 31.32 is set to 0% and 31.33 is set to 0 s, the emergency stop ramp supervision is disabled.</p> <p>See also parameter 21.04 Emergency stop mode.</p> | 0% |
| | 0...300% | Maximum deviation from expected deceleration rate. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|---|---|--------------|
| 31.33 | <i>Emergency ramp supervision delay</i> | If parameter <i>31.32 Emergency ramp supervision</i> is set to 0%, this parameter defines the maximum time an emergency stop (mode Off1 or Off3) is allowed to take. If the motor has not stopped when the time elapses, the drive trips on fault <i>73B0 Emergency ramp failed</i> , sets bit 8 of <i>06.17 Drive status word 2</i> , and coasts to a stop. If <i>31.32</i> is set to a value other than 0%, this parameter defines a delay between the receipt of the emergency stop command and the activation of the supervision. It is recommended to specify a short delay to allow the speed change rate to stabilize. | 0 s |
| | 0...100 s | Maximum ramp-down time, or supervision activation delay. | 1 = 1 s |
| 31.35 | <i>Main fan fault function</i> | Selects how the drive reacts when a main cooling fan speed problem is detected. For frame sizes R6 or larger only. An event is triggered according to the value of this parameter (fault, warning or no action) <ul style="list-style-type: none"> if the rotation speed signal from the fan is lower than the measured fan maximum speed (determined during the fan ID run) if the measured fan maximum speed is lower than the predefined minimum value. | <i>Fault</i> |
| | Fault | Drive trips on fault <i>5080 Fan</i> | 0 |
| | Warning | Drive generates warning <i>A581 Fan</i> . | 1 |
| | No action | No action taken. | 2 |
| 31.36 | <i>Aux fan fault function</i> | Selects how the drive reacts when an auxiliary fan problem is detected. Certain drive types (especially those protected to IP55) have an auxiliary fan built into the front cover as standard. If it is necessary to operate the drive without the front cover (for example, during commissioning), you can set the parameter to value <i>No action</i> within two minutes from power-up to temporarily suppress the fault or warning. Return the value to <i>Fault</i> or <i>Warning</i> afterwards. On frame sizes R1...R5, the auxiliary fan is attached to connector X10 and on frame sizes R6 and larger to connector X16. | <i>Fault</i> |
| | Fault | The drive trips on fault <i>5081 Auxiliary fan broken</i> . The fault is suppressed for two minutes after power-up. | 0 |
| | Warning | The drive generates warning <i>A582 Auxiliary fan missing</i> . The warning is suppressed for two minutes after power-up. | 1 |
| | No action | No action taken. | 2 |
| 31.120 | <i>LSU earth fault</i> | (Only visible for ACQ580-31 and ACQ580-34). Selects how the supply unit reacts when an earth fault or current unbalance is detected. | <i>Fault</i> |
| | No action | No action taken. | 0 |
| | Warning | The supply unit generates warning <i>AE02 Earth leakage</i> . | 1 |
| | Fault | The supply unit trips on fault <i>2E01 Earth leakage</i> . | 2 |
| 31.121 | <i>LSU supply phase loss</i> | (Only visible for ACQ580-31 and ACQ580-34). Selects how the supply unit reacts when a supply phase loss is detected. | <i>Fault</i> |
| | No action | No action taken. | 0 |
| | Fault | The supply unit trips on fault <i>3E00 Input phase loss</i> . | 1 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------------------|---|------------|-----|------|-------------|---|----------------------|---|---|----------------------|---|---|----------------------|---|---|----------------------|---|---|----------------------|---|---|----------------------|---|--------|----------|--|
| 32 Supervision | | Configuration of signal supervision functions 1...6. Six values can be chosen to be monitored; a warning or fault is generated whenever predefined limits are exceeded. See also section <i>Diagnostics menu</i> (page 170). | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32.01 | Supervision status | Signal supervision status word. Indicates whether the values monitored by the signal supervision functions are within or outside their respective limits. Note: This word is independent of the drive actions defined by parameters 32.06, 32.16, 32.26, 32.36, 32.46 and 32.56. | 0000b | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>Supervision 1 active</td><td>1 = Signal selected by 32.07 is outside its limits.</td></tr><tr><td>1</td><td>Supervision 2 active</td><td>1 = Signal selected by 32.17 is outside its limits.</td></tr><tr><td>2</td><td>Supervision 3 active</td><td>1 = Signal selected by 32.27 is outside its limits.</td></tr><tr><td>3</td><td>Supervision 4 active</td><td>1 = Signal selected by 32.37 is outside its limits.</td></tr><tr><td>4</td><td>Supervision 5 active</td><td>1 = Signal selected by 32.47 is outside its limits.</td></tr><tr><td>5</td><td>Supervision 6 active</td><td>1 = Signal selected by 32.27 is outside its limits.</td></tr><tr><td>6...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Description | 0 | Supervision 1 active | 1 = Signal selected by 32.07 is outside its limits. | 1 | Supervision 2 active | 1 = Signal selected by 32.17 is outside its limits. | 2 | Supervision 3 active | 1 = Signal selected by 32.27 is outside its limits. | 3 | Supervision 4 active | 1 = Signal selected by 32.37 is outside its limits. | 4 | Supervision 5 active | 1 = Signal selected by 32.47 is outside its limits. | 5 | Supervision 6 active | 1 = Signal selected by 32.27 is outside its limits. | 6...15 | Reserved | |
| Bit | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Supervision 1 active | 1 = Signal selected by 32.07 is outside its limits. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Supervision 2 active | 1 = Signal selected by 32.17 is outside its limits. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Supervision 3 active | 1 = Signal selected by 32.27 is outside its limits. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Supervision 4 active | 1 = Signal selected by 32.37 is outside its limits. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Supervision 5 active | 1 = Signal selected by 32.47 is outside its limits. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Supervision 6 active | 1 = Signal selected by 32.27 is outside its limits. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6...15 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Signal supervision status word. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 32.05 | Supervision 1 function | Selects the mode of signal supervision function 1. Determines how the monitored signal (see parameter 32.07) is compared to its lower and upper limits (32.09 and 32.10 respectively). The action to be taken when the condition is fulfilled is selected by 32.06. | Disabled | | | | | | | | | | | | | | | | | | | | | | | | |
| Disabled | | Signal supervision 1 not in use. | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| Low | | Action is taken whenever the signal falls below its lower limit. | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| High | | Action is taken whenever the signal rises above its upper limit. | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| Abs low | | Action is taken whenever the absolute value of the signal falls below its (absolute) lower limit. | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Abs high | | Action is taken whenever the absolute value of the signal rises above its (absolute) upper limit. | 4 | | | | | | | | | | | | | | | | | | | | | | | | |
| Both | | Action is taken whenever the signal falls below its low limit or rises above its high limit. | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Abs both | | Action is taken whenever the absolute value of the signal falls below its (absolute) low limit or rises above its (absolute) high limit. | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| Hysteresis | | Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 7 | | | | | | | | | | | | | | | | | | | | | | | | |
| 32.06 | Supervision 1 action | Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 1 exceeds its limits. Note: This parameter does not affect the status indicated by 32.01 Supervision status. | No action | | | | | | | | | | | | | | | | | | | | | | | | |
| No action | | No warning or fault generated. | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| Warning | | Drive generates warning A8B0 ABB Signal supervision 1. | 1 | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------|---|--|---------------------------|
| | Fault | Drive trips on fault 80B0 Signal supervision 1 . | 2 |
| | Fault if running | If running, the drive trips on fault 80B0 Signal supervision 1 . | 3 |
| 32.07 | Supervision 1 signal | Selects the signal to be monitored by signal supervision function 1. | Frequency |
| | Zero | None. | 0 |
| | Speed | 01.01 Motor speed used (page 275). | 1 |
| | Reserved | | 2 |
| | Frequency | 01.06 Output frequency (page 275). | 3 |
| | Current | 01.07 Motor current (page 275). | 4 |
| | Reserved | | 5 |
| | Torque | 01.10 Motor torque (page 275). | 6 |
| | DC voltage | 01.11 DC voltage (page 275). | 7 |
| | Output power | 01.14 Output power (page 276). | 8 |
| | AI1 | 12.11 AI1 actual value (page 308). | 9 |
| | AI2 | 12.21 AI2 actual value (page 310). | 10 |
| | Reserved | | 11...17 |
| | Speed ref ramp in | 23.01 Speed ref ramp input (page 349). | 18 |
| | Speed ref ramp out | 23.02 Speed ref ramp output (page 349). | 19 |
| | Speed ref used | 24.01 Used speed reference (page 350). | 20 |
| | Reserved | | 21 |
| | Freq ref used | 28.02 Frequency ref ramp output (page 354). | 22 |
| | Inverter temperature | 05.11 Inverter temperature (page 282). | 23 |
| | Process PID output | 40.01 Process PID output actual (page 409). | 24 |
| | Process PID feedback | 40.02 Process PID feedback actual (page 409). | 25 |
| | Process PID setpoint | 40.03 Process PID setpoint actual (page 410). | 26 |
| | Process PID deviation | 40.04 Process PID deviation actual (page 410). | 27 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 32.08 | Supervision 1 filter time | Defines a filter time constant for the signal monitored by signal supervision 1. | 0.000 s |
| | 0.000 ... 30.000 s | Signal filter time. | 1000 = 1 s |
| 32.09 | Supervision 1 low | Defines the lower limit for signal supervision 1. | 0.00 |
| | -21474836.00... 21474836.00 | Low limit. | - |
| 32.10 | Supervision 1 high | Defines the upper limit for signal supervision 1. | 0.00 |
| | -21474836.00... 21474836.00 | Upper limit. | - |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|------------------|
| 32.11 | <i>Supervision 1 hysteresis</i> | Defines the hysteresis for the signal monitored by signal supervision 1. This parameter applies to all selections for parameter 32.05 Supervision 1 function , not just Hysteresis (7). Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 0.00 |
| | 0.00...100000.00 | Hysteresis. | - |
| 32.15 | <i>Supervision 2 function</i> | Selects the mode of signal supervision function 2. Determines how the monitored signal (see parameter 32.17) is compared to its lower and upper limits (32.19 and 32.20 respectively). The action to be taken when the condition is fulfilled is selected by 32.16 . | <i>Disabled</i> |
| | Disabled | Signal supervision 2 not in use. | 0 |
| | Low | Action is taken whenever the signal falls below its lower limit. | 1 |
| | High | Action is taken whenever the signal rises above its upper limit. | 2 |
| | Abs low | Action is taken whenever the absolute value of the signal falls below its (absolute) lower limit. | 3 |
| | Abs high | Action is taken whenever the absolute value of the signal rises above its (absolute) upper limit. | 4 |
| | Both | Action is taken whenever the signal falls below its low limit or rises above its high limit. | 5 |
| | Abs both | Action is taken whenever the absolute value of the signal falls below its (absolute) low limit or rises above its (absolute) high limit. | 6 |
| | Hysteresis | Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 7 |
| 32.16 | <i>Supervision 2 action</i> | Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 2 exceeds its limits. Note: This parameter does not affect the status indicated by 32.01 Supervision status . | <i>No action</i> |
| | No action | No warning or fault generated. | 0 |
| | Warning | Drive generates warning 80B1 ABB Signal supervision 2 . | 1 |
| | Fault | Drive trips on fault 80B1 Signal supervision 2 . | 2 |
| | Fault if running | If running, the drive trips on fault 80B1 Signal supervision 2 . | 3 |
| 32.17 | <i>Supervision 2 signal</i> | Selects the signal to be monitored by signal supervision function 2. For the available selections, see parameter 32.07 Supervision 1 signal . | <i>Current</i> |
| 32.18 | <i>Supervision 2 filter time</i> | Defines a filter time constant for the signal monitored by signal supervision 2. | 0.000 s |
| | 0.000 ... 30.000 s | Signal filter time. | 1000 = 1 s |
| 32.19 | <i>Supervision 2 low</i> | Defines the lower limit for signal supervision 2. | 0.00 |
| | -21474836.00... 21474836.00 | Low limit. | - |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|------------------|
| 32.20 | <i>Supervision 2 high</i> | Defines the upper limit for signal supervision 2. | 0.00 |
| | -21474836.00... 21474836.00 | Upper limit. | - |
| 32.21 | <i>Supervision 2 hysteresis</i> | Defines the hysteresis for the signal monitored by signal supervision 2. This parameter applies to all selections for parameter 32.15 Supervision 2 function , not just Hysteresis (7). Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 0.00 |
| | 0.00...100000.00 | Hysteresis. | - |
| 32.25 | <i>Supervision 3 function</i> | Selects the mode of signal supervision function 3. Determines how the monitored signal (see parameter 32.27) is compared to its lower and upper limits (32.29 and 32.30 respectively). The action to be taken when the condition is fulfilled is selected by 32.26 . | <i>Disabled</i> |
| | Disabled | Signal supervision 3 not in use. | 0 |
| | Low | Action is taken whenever the signal falls below its lower limit. | 1 |
| | High | Action is taken whenever the signal rises above its upper limit. | 2 |
| | Abs low | Action is taken whenever the absolute value of the signal falls below its (absolute) lower limit. | 3 |
| | Abs high | Action is taken whenever the absolute value of the signal rises above its (absolute) upper limit. | 4 |
| | Both | Action is taken whenever the signal falls below its low limit or rises above its high limit. | 5 |
| | Abs both | Action is taken whenever the absolute value of the signal falls below its (absolute) low limit or rises above its (absolute) high limit. | 6 |
| | Hysteresis | Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 7 |
| 32.26 | <i>Supervision 3 action</i> | Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 3 exceeds its limits. Note: This parameter does not affect the status indicated by 32.01 Supervision status . | <i>No action</i> |
| | No action | No warning or fault generated. | 0 |
| | Warning | Drive generates warning A8B2 ABB Signal supervision 3 . | 1 |
| | Fault | Drive trips on fault 80B2 Signal supervision 3 . | 2 |
| | Fault if running | If running, the drive trips on fault 80B2 Signal supervision 3 . | 3 |
| 32.27 | <i>Supervision 3 signal</i> | Selects the signal to be monitored by signal supervision function 3. For the available selections, see parameter 32.07 Supervision 1 signal . | <i>Torque</i> |
| 32.28 | <i>Supervision 3 filter time</i> | Defines a filter time constant for the signal monitored by signal supervision 3. | 0.000 s |
| | 0.000 ... 30.000 s | Signal filter time. | 1000 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------------|---|------------------|
| 32.29 | <i>Supervision 3 low</i> | Defines the lower limit for signal supervision 3. | 0.00 |
| | -21474836.00... 21474836.00 | Low limit. | - |
| 32.30 | <i>Supervision 3 high</i> | Defines the upper limit for signal supervision 3. | 0.00 |
| | -21474836.00... 21474836.00 | Upper limit. | - |
| 32.31 | <i>Supervision 3 hysteresis</i> | Defines the hysteresis for the signal monitored by signal supervision 3. This parameter applies to all selections for parameter <i>32.25 Supervision 3 function</i> , not just Hysteresis (7). Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 0.00 |
| | 0.00...100000.00 | Hysteresis. | - |
| 32.35 | <i>Supervision 4 function</i> | Selects the mode of signal supervision function 4. Determines how the monitored signal (see parameter <i>32.37</i>) is compared to its lower and upper limits (<i>32.39</i> and <i>32.30</i> respectively). The action to be taken when the condition is fulfilled is selected by <i>32.36</i> . | <i>Disabled</i> |
| | Disabled | Signal supervision 4 not in use. | 0 |
| | Low | Action is taken whenever the signal falls below its lower limit. | 1 |
| | High | Action is taken whenever the signal rises above its upper limit. | 2 |
| | Abs low | Action is taken whenever the absolute value of the signal falls below its (absolute) lower limit. | 3 |
| | Abs high | Action is taken whenever the absolute value of the signal rises above its (absolute) upper limit. | 4 |
| | Both | Action is taken whenever the signal falls below its low limit or rises above its high limit. | 5 |
| | Abs both | Action is taken whenever the absolute value of the signal falls below its (absolute) low limit or rises above its (absolute) high limit. | 6 |
| | Hysteresis | Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 7 |
| 32.36 | <i>Supervision 4 action</i> | Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 4 exceeds its limits. Note: This parameter does not affect the status indicated by <i>32.01 Supervision status</i> . | <i>No action</i> |
| | No action | No warning or fault generated. | 0 |
| | Warning | Drive generates warning <i>A8B3 ABB Signal supervision 4</i> . | 1 |
| | Fault | Drive trips on fault <i>80B3 Signal supervision 4</i> . | 2 |
| | Fault if running | If running, the drive trips on fault <i>80B3 Signal supervision 4</i> . | 3 |
| 32.37 | <i>Supervision 4 signal</i> | Selects the signal to be monitored by signal supervision function 4. For the available selections, see parameter <i>32.07 Supervision 1 signal</i> . | <i>Zero</i> |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|------------------|
| 32.38 | <i>Supervision 4 filter time</i> | Defines a filter time constant for the signal monitored by signal supervision 4. | 0.000 s |
| | 0.000 ... 30.000 s | Signal filter time. | 1000 = 1 s |
| 32.39 | <i>Supervision 4 low</i> | Defines the lower limit for signal supervision 4. | 0.00 |
| | -21474836.00... 21474836.00 | Low limit. | - |
| 32.40 | <i>Supervision 4 high</i> | Defines the upper limit for signal supervision 4. | 0.00 |
| | -21474836.00... 21474836.00 | Upper limit. | - |
| 32.41 | <i>Supervision 4 hysteresis</i> | Defines the hysteresis for the signal monitored by signal supervision 4. This parameter applies to all selections for parameter 32.35 Supervision 4 function , not just Hysteresis (7). Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 0.00 |
| | 0.00...100000.00 | Hysteresis. | - |
| 32.45 | <i>Supervision 5 function</i> | Selects the mode of signal supervision function 5. Determines how the monitored signal (see parameter 32.47) is compared to its lower and upper limits (32.49 and 32.40 respectively). The action to be taken when the condition is fulfilled is selected by 32.46 . | <i>Disabled</i> |
| | Disabled | Signal supervision 5 not in use. | 0 |
| | Low | Action is taken whenever the signal falls below its lower limit. | 1 |
| | High | Action is taken whenever the signal rises above its upper limit. | 2 |
| | Abs low | Action is taken whenever the absolute value of the signal falls below its (absolute) lower limit. | 3 |
| | Abs high | Action is taken whenever the absolute value of the signal rises above its (absolute) upper limit. | 4 |
| | Both | Action is taken whenever the signal falls below its low limit or rises above its high limit. | 5 |
| | Abs both | Action is taken whenever the absolute value of the signal falls below its (absolute) low limit or rises above its (absolute) high limit. | 6 |
| | Hysteresis | Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 7 |
| 32.46 | <i>Supervision 5 action</i> | Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 5 exceeds its limits. Note: This parameter does not affect the status indicated by 32.01 Supervision status . | <i>No action</i> |
| | No action | No warning or fault generated. | 0 |
| | Warning | Drive generates warning A8B4 ABB Signal supervision 5 . | 1 |
| | Fault | Drive trips on fault 80B4 Signal supervision 5 . | 2 |
| | Fault if running | If running, the drive trips on fault 80B4 Signal supervision 5 . | 3 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|------------------|
| 32.47 | <i>Supervision 5 signal</i> | Selects the signal to be monitored by signal supervision function 5. For the available selections, see parameter 32.07 Supervision 1 signal . | <i>Zero</i> |
| 32.48 | <i>Supervision 5 filter time</i> | Defines a filter time constant for the signal monitored by signal supervision 5. | 0.000 s |
| | 0.000 ... 30.000 s | Signal filter time. | 1000 = 1 s |
| 32.49 | <i>Supervision 5 low</i> | Defines the lower limit for signal supervision 5. | 0.00 |
| | -21474836.00... 21474836.00 | Low limit. | - |
| 32.50 | <i>Supervision 5 high</i> | Defines the upper limit for signal supervision 5. | 0.00 |
| | -21474836.00... 21474836.00 | Upper limit. | - |
| 32.51 | <i>Supervision 5 hysteresis</i> | Defines the hysteresis for the signal monitored by signal supervision 5. This parameter applies to all selections for parameter 32.45 Supervision 5 function , not just Hysteresis (7). Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 0.00 |
| | 0.00...100000.00 | Hysteresis. | - |
| 32.55 | <i>Supervision 6 function</i> | Selects the mode of signal supervision function 6. Determines how the monitored signal (see parameter 32.57) is compared to its lower and upper limits (32.59 and 32.50 respectively). The action to be taken when the condition is fulfilled is selected by 32.56 . | <i>Disabled</i> |
| | Disabled | Signal supervision 6 not in use. | 0 |
| | Low | Action is taken whenever the signal falls below its lower limit. | 1 |
| | High | Action is taken whenever the signal rises above its upper limit. | 2 |
| | Abs low | Action is taken whenever the absolute value of the signal falls below its (absolute) lower limit. | 3 |
| | Abs high | Action is taken whenever the absolute value of the signal rises above its (absolute) upper limit. | 4 |
| | Both | Action is taken whenever the signal falls below its low limit or rises above its high limit. | 5 |
| | Abs both | Action is taken whenever the absolute value of the signal falls below its (absolute) low limit or rises above its (absolute) high limit. | 6 |
| | Hysteresis | Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. | 7 |
| 32.56 | <i>Supervision 6 action</i> | Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 6 exceeds its limits. Note: This parameter does not affect the status indicated by 32.01 Supervision status . | <i>No action</i> |
| | No action | No warning or fault generated. | 0 |
| | Warning | Drive generates warning A8B5 ABB Signal supervision 6 . | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|-------------|
| | Fault | Drive trips on fault <i>80B5 Signal supervision 6</i> is generated. | 2 |
| | Fault if running | If running, the drive trips on fault <i>80B5 Signal supervision 6</i> | 3 |
| 32.57 | <i>Supervision 6 signal</i> | Selects the signal to be monitored by signal supervision function 6. For the available selections, see parameter <i>32.07 Supervision 1 signal</i> . | <i>Zero</i> |
| 32.58 | <i>Supervision 6 filter time</i> | Defines a filter time constant for the signal monitored by signal supervision 6. | 0.000 s |
| | 0.000 ... 30.000 s | Signal filter time. | 1000 = 1 s |
| 32.59 | <i>Supervision 6 low</i> | Defines the lower limit for signal supervision 6. | 0.00 |
| | -21474836.00... 21474836.00 | Low limit. | - |
| 32.60 | <i>Supervision 6 high</i> | Defines the upper limit for signal supervision 6. | 0.00 |
| | -21474836.00... 21474836.00 | Upper limit. | - |
| 32.61 | <i>Supervision 6 hysteresis</i> | Defines the hysteresis for the signal monitored by signal supervision 6. This parameter applies to all selections for parameter <i>32.55 Supervision 6 function</i> , not just Hysteresis (7). Action is taken whenever the signal rises above the value defined by the upper limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the lower limit - 0.5 · hysteresis. Action is taken whenever the signal rises above the value defined by the limit + 0.5 · hysteresis. The action is deactivated when the signal falls below the value defined by the limit - 0.5 · hysteresis. | 0.00 |
| | 0.00...100000.00 | Hysteresis. | - |

| | | |
|---------------------------|--|--|
| 34 Timed functions | Configuration of the timed functions. See section <i>Timed functions</i> on page 126. | |
|---------------------------|--|--|

| | | | |
|-------|-------------------------------|--|---|
| 34.01 | <i>Timed functions status</i> | Status of the combined timers. The status of a combined timer is the logical OR of all timers connected to it. This parameter is read-only. | - |
|-------|-------------------------------|--|---|

| Bit | Name | Description |
|--------|------------------|-------------|
| 0 | Timed function 1 | 1 = Active. |
| 1 | Timed function 2 | 1 = Active. |
| 2 | Timed function 3 | 1 = Active. |
| 3...15 | Reserved | |

| | | |
|----------------|----------------------------------|-------|
| 0000h...0FFFFh | Status of combined timers 1...3. | 1 = 1 |
|----------------|----------------------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------|--|------------|
| 34.02 | Timer status | Status of timers 1...12. This parameter is read-only. | - |

| Bit | Name | Description |
|---------|----------|-------------|
| 0 | Timer 1 | 1 = Active. |
| 1 | Timer 2 | 1 = Active. |
| 2 | Timer 3 | 1 = Active. |
| 3 | Timer 4 | 1 = Active. |
| 4 | Timer 5 | 1 = Active. |
| 5 | Timer 6 | 1 = Active. |
| 6 | Timer 7 | 1 = Active. |
| 7 | Timer 8 | 1 = Active. |
| 8 | Timer 9 | 1 = Active. |
| 9 | Timer 10 | 1 = Active. |
| 10 | Timer 11 | 1 = Active. |
| 11 | Timer 12 | 1 = Active. |
| 12...15 | Reserved | |

| | | |
|---------------|---------------|-------|
| 0000h...FFFFh | Timer status. | 1 = 1 |
|---------------|---------------|-------|

| | | | |
|-------|-----------------------------|---|---|
| 34.04 | Season/exception day status | Status of seasons 1...4, exception weekday and exception holiday. Only one season can be active at a time. A day can be a workday and a holiday at the same time. This parameter is read-only. | - |
|-------|-----------------------------|---|---|

| Bit | Name | Description |
|---------|-------------------|-------------|
| 0 | Season 1 | 1 = Active. |
| 1 | Season 2 | 1 = Active. |
| 2 | Season 3 | 1 = Active. |
| 3 | Season 4 | 1 = Active. |
| 4...9 | Reserved | |
| 10 | Exception workday | 1 = Active. |
| 11 | Exception holiday | 1 = Active. |
| 12...15 | Reserved | |

| | | |
|---------------|--|-------|
| 0000h...FFFFh | Status of the seasons and exception weekday and holiday. | 1 = 1 |
|---------------|--|-------|

| | | | |
|-------|------------------------|--|----------|
| 34.10 | Timed functions enable | Selects the source for the timed functions enable signal. 0 = Disabled. 1 = Enabled. | Disabled |
| | Disabled | 0. | 0 |
| | Enabled | 1. | 1 |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | Other [bit] | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------|---------------------------------|-------------------------|
| 34.11 | Timer 1 configuration | Defines when timer 1 is active. | 0000 0111 1000 0000b |

| Bit | Name | Description |
|---------|------------|--|
| 0 | Monday | 1 = Monday is an active start day. |
| 1 | Tuesday | 1 = Tuesday is an active start day. |
| 2 | Wednesday | 1 = Wednesday is an active start day. |
| 3 | Thursday | 1 = Thursday is an active start day. |
| 4 | Friday | 1 = Friday is an active start day. |
| 5 | Saturday | 1 = Saturday is an active start day. |
| 6 | Sunday | 1 = Sunday is an active start day. |
| 7 | Season 1 | 1 = Timer is active in season 1. |
| 8 | Season 2 | 1 = Timer is active in season 2. |
| 9 | Season 3 | 1 = Timer is active in season 3. |
| 10 | Season 4 | 1 = Timer is active in season 4. |
| 11 | Exceptions | <p>0 = Exceptions days are disabled. The timer follows only weekday and season settings (bits 0...10 in the timer configuration) and the start time and duration of the timer (see 34.12 and 34.13).</p> <p>Exception day settings, parameters 34.70...34.90, do not have any effect on this timer.</p> <p>1 = Exception days are enabled. The timer is active during the weekdays and seasons defined with bits 0...10 and the times defined by 34.12 and 34.13.</p> <p>In addition, the timer is active during the exception days defined with bit 12, bit 13 and parameters 34.70...34.90. If bit 12 and bit 13 are both zero, the timer is inactive during the exception days.</p> |
| 12 | Holidays | <p>This bit has no effect unless bit 11 = 1 (Exceptions days are enabled).</p> <p>When bits 11 and 12 are both 1, the timer is active during the weekdays and seasons defined with bits 0...10 and times defined by parameters 34.12 and 34.13.</p> <p>In addition, the timer is active when the ongoing day is defined as Exception day Holiday by parameters 34.70...34.90 and the current time matches with the time range defined by 34.12 and 34.13. During Exception days, weekday and season bits are ignored.</p> |
| 13 | Workdays | <p>This bit has no effect unless bit 11 = 1 (Exceptions enabled).</p> <p>When bits 11 and 13 are both 1, the Timer is active during the weekdays and seasons defined with bits 0...10 and the times defined by parameters 34.12 and 34.13.</p> <p>In addition, the timer is active when the ongoing day is defined as Exception day Workday by parameters 34.70...34.90 and the current time matches with the time range defined by 34.12 and 34.13. During Exception days, weekday and season bits are ignored.</p> |
| 14...15 | Reserved | |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | |
|---|------------|-------------|------------|--------|----------|--------|---------|---------|---------|---------|------------|----------|----------|--|----------|
| Examples of how the timer configuration defines when the Timer is active are shown below. | | | | | | | | | | | | | | | |
| Bits of parameter 34.11 Timer 1 configuration | | | | | | | | | | | | | | | |
| Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Season1 | Season2 | Season3 | Season4 | Exceptions | Holidays | Workdays | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Example 1: Timer is active during the times of the day defined by other parameters <u>every Weekday</u> and <u>every Season</u> . Exception day settings (34.70...34.90) do not have any effect on the Timer. | |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Example 2: Timer is active during the times of the day defined by other parameters from <u>Mon to Fri</u> , every Season. Exception day settings (34.70...34.90) do not have any effect on the Timer. | |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | Example 3: Timer is active during the times of the day defined by other parameters from Mon to Fri, <u>only during Season 3</u> (can be configured as, eg, summer). Exception day settings (34.70...34.90) do not have any effect on the Timer. | |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | Example 4: Timer is active during the times of the day defined by other parameters from Mon to Fri, every Season. In addition, the Timer is active <u>every Exception day</u> , <u>Holidays</u> , <u>regardless what is the day or season</u> . | |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | Example 5: Timer is active during the times of the day defined by other parameters on Mon, Wed, Fri and Sun, during Season1 and Season 2. In addition, the Timer is active every <u>Exception day</u> , <u>Workdays</u> , <u>regardless what is the day or season</u> . | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | Example 6: Timer is active during the times of the day defined by other parameters every Weekday and every Season. The Timer is <u>inactive during all Exception days</u> . | |
| 0000h...FFFFh | | | | | | | | | | | | | | Configuration of timer 1. | 1 = 1 |
| 34.12 Timer 1 start time | | | | | | | | | | | | | | Defines the daily start time of timer 1. The time can be changed in second steps. The timer can be started at an other time than the start time. For example, if the timer's duration is more than one day and the active session starts during the time, the timer is started at 00:00 and stopped when there is no duration left. | 00:00:00 |
| 00:00:00...23:59:59 | | | | | | | | | | | | | | Daily start time of the timer. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|-------------------------|
| 34.13 | Timer 1 duration | Defines the duration of timer 1. The duration can be changed in minute steps. The duration can extend over the change of the day but if an exception day becomes active, the period is interrupted at midnight. In the same way the period started on an exception day stays active only until the end of the day, even if the duration is longer. The timer will continue after a break if there is duration left. | 00 00:00 |
| | 00 00:00...07 00:00 | Timer duration. | 1 = 1 |
| 34.14 | Timer 2 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.15 | Timer 2 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.16 | Timer 2 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.17 | Timer 3 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.18 | Timer 3 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.19 | Timer 3 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.20 | Timer 4 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.21 | Timer 4 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.22 | Timer 4 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.23 | Timer 5 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.24 | Timer 5 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.25 | Timer 5 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.26 | Timer 6 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.27 | Timer 6 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.28 | Timer 6 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.29 | Timer 7 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.30 | Timer 7 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.31 | Timer 7 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.32 | Timer 8 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.33 | Timer 8 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.34 | Timer 8 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.35 | Timer 9 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.36 | Timer 9 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.37 | Timer 9 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.38 | Timer 10 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.39 | Timer 10 start time | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.40 | Timer 10 duration | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.41 | Timer 11 configuration | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------------|---|-------------------------|
| 34.42 | <i>Timer 11 start time</i> | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.43 | <i>Timer 11 duration</i> | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.44 | <i>Timer 12 configuration</i> | See 34.11 Timer 1 configuration . | 0000 0111 1000 0000b |
| 34.45 | <i>Timer 12 start time</i> | See 34.12 Timer 1 start time . | 00:00:00 |
| 34.46 | <i>Timer 12 duration</i> | See 34.13 Timer 1 duration . | 00 00:00 |
| 34.60 | <i>Season 1 start date</i> | Defines the start date of season 1 in format dd.mm, where dd is the number of the day and mm is the number of the month. The season changes at midnight. One season can be active at a time. Timers are started on exception days even if they are not inside the active season. The season start dates (1...4) must be given in increasing order to use all seasons. The default value is interpreted that the season is not configured. If the season start dates are not in increasing order and the value is something else than the default value, a season configuration warning is given. | 01.01. |
| | 01.01...31.12 | Season start date. | |
| 34.61 | <i>Season 2 start date</i> | Defines the start date of season 2. See 34.60 Season 1 start date . | 01.01. |
| 34.62 | <i>Season 3 start date</i> | Defines the start date of season 3. See 34.60 Season 1 start date . | 01.01. |
| 34.63 | <i>Season 4 start date</i> | Defines the start date of season 4. See 34.60 Season 1 start date . | 01.01. |
| 34.70 | <i>Number of active exceptions</i> | Defines how many of the exceptions are active by specifying the last active one. All preceding exceptions are active. Exceptions 1...3 are periods (duration can be defined) and exceptions 4...16 are days (duration is always 24 hours). Example: If the value is 4, exceptions 1...4 are active, and exceptions 5...16 are not active. | 3 |
| | 0...16 | Number of active exception periods or days. | - |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------|--|-------------------------|-----|------|-------------|---|-------------|--------------------------|---|-------------|--------------------------|---|-------------|--------------------------|---|-------------|--------------------------|---|-------------|--------------------------|---|-------------|--------------------------|---|-------------|--------------------------|---|-------------|--------------------------|---|-------------|--------------------------|---|--------------|--------------------------|----|--------------|--------------------------|----|--------------|--------------------------|----|--------------|--------------------------|----|--------------|--------------------------|----|--------------|--------------------------|----|--------------|--------------------------|
| 34.71 | Exception types | Defines the types of exceptions 1...16 as workday or holiday. Exceptions 1...3 are periods (duration can be defined) and exceptions 4...16 are days (duration is always 24 hours). | 0000 0000 0000 0000b | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>Exception 1</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>1</td><td>Exception 2</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>2</td><td>Exception 3</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>3</td><td>Exception 4</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>4</td><td>Exception 5</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>5</td><td>Exception 6</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>6</td><td>Exception 7</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>7</td><td>Exception 8</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>8</td><td>Exception 9</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>9</td><td>Exception 10</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>10</td><td>Exception 11</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>11</td><td>Exception 12</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>12</td><td>Exception 13</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>13</td><td>Exception 14</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>14</td><td>Exception 15</td><td>0 = Workday. 1 = Holiday</td></tr><tr><td>15</td><td>Exception 16</td><td>0 = Workday. 1 = Holiday</td></tr></table> | | | | Bit | Name | Description | 0 | Exception 1 | 0 = Workday. 1 = Holiday | 1 | Exception 2 | 0 = Workday. 1 = Holiday | 2 | Exception 3 | 0 = Workday. 1 = Holiday | 3 | Exception 4 | 0 = Workday. 1 = Holiday | 4 | Exception 5 | 0 = Workday. 1 = Holiday | 5 | Exception 6 | 0 = Workday. 1 = Holiday | 6 | Exception 7 | 0 = Workday. 1 = Holiday | 7 | Exception 8 | 0 = Workday. 1 = Holiday | 8 | Exception 9 | 0 = Workday. 1 = Holiday | 9 | Exception 10 | 0 = Workday. 1 = Holiday | 10 | Exception 11 | 0 = Workday. 1 = Holiday | 11 | Exception 12 | 0 = Workday. 1 = Holiday | 12 | Exception 13 | 0 = Workday. 1 = Holiday | 13 | Exception 14 | 0 = Workday. 1 = Holiday | 14 | Exception 15 | 0 = Workday. 1 = Holiday | 15 | Exception 16 | 0 = Workday. 1 = Holiday |
| Bit | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Exception 1 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Exception 2 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Exception 3 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Exception 4 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Exception 5 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Exception 6 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Exception 7 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Exception 8 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Exception 9 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Exception 10 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Exception 11 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Exception 12 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Exception 13 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Exception 14 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Exception 15 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | Exception 16 | 0 = Workday. 1 = Holiday | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Types of exception period or days. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.72 | Exception 1 start | Defines the start date of the exception period in format dd.mm, where dd is the number of the day and mm is the number of the month. The timer started on an exception day is always stopped at 23:59:59 even if it has duration left. The same date can be configured to be holiday and workday. The date is active if any of exception days are active. | 01.01. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01.01....31.12. | | Start date of exception period 1. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.73 | Exception 1 length | Defines the length of the exception period in days. Exception period is handled the same as a number of consecutive exception days. | 0 d | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0...60 d | | Length of exception period 1. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.74 | Exception 2 start | See 34.72 Exception 1 start. | 01.01. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.75 | Exception 2 length | See 34.73 Exception 1 length. | 0 d | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.76 | Exception 3 start | See 34.72 Exception 1 start. | 01.01. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.77 | Exception 3 length | See 34.73 Exception 1 length. | 0 d | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.78 | Exception day 4 | Defines the date of exception day 4. | 01.01. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 01.01....31.12. | | Start date of exception day 4. The timer started on an exception day is always stopped at 23:59:59 even if it has duration left. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.79 | Exception day 5 | See 34.79 Exception day 4. | 01.01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.80 | Exception day 6 | See 34.79 Exception day 4. | 01.01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.81 | Exception day 7 | See 34.79 Exception day 4 | 01.01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34.82 | Exception day 8 | See 34.79 Exception day 4. | 01.01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|------------------|--|-------------------------|
| 34.83 | Exception day 9 | See 34.79 Exception day 4. | 01.01 |
| 34.84 | Exception day 10 | See 34.79 Exception day 4. | 01.01 |
| 34.85 | Exception day 11 | See 34.79 Exception day 4. | 01.01 |
| 34.86 | Exception day 12 | See 34.79 Exception day 4. | 01.01 |
| 34.87 | Exception day 13 | See 34.79 Exception day 4. | 01.01 |
| 34.88 | Exception day 14 | See 34.79 Exception day 4. | 01.01 |
| 34.89 | Exception day 15 | See 34.79 Exception day 4. | 01.01 |
| 34.90 | Exception day 16 | See 34.79 Exception day 4. | 01.01 |
| 34.100 | Timed function 1 | Defines which timers are connected to combined timer 1. 0 = Not connected. 1 = Connected. See 34.01 Timed functions status. | 0000 0000 0000 0000b |

| Bit | Name | Description |
|---------|----------|---------------------------|
| 0 | Timer 1 | 0 = Inactive. 1 = Active. |
| 1 | Timer 2 | 0 = Inactive. 1 = Active. |
| 2 | Timer 3 | 0 = Inactive. 1 = Active. |
| 3 | Timer 4 | 0 = Inactive. 1 = Active. |
| 4 | Timer 5 | 0 = Inactive. 1 = Active. |
| 5 | Timer 6 | 0 = Inactive. 1 = Active. |
| 6 | Timer 7 | 0 = Inactive. 1 = Active. |
| 7 | Timer 8 | 0 = Inactive. 1 = Active. |
| 8 | Timer 9 | 0 = Inactive. 1 = Active. |
| 9 | Timer 10 | 0 = Inactive. 1 = Active. |
| 10 | Timer 11 | 0 = Inactive. 1 = Active. |
| 11 | Timer 12 | 0 = Inactive. 1 = Active. |
| 12...15 | Reserved | |

| | | | |
|---------------|---------------------------------------|---|-------------------------|
| 0000h...FFFFh | Timers connected to combined timer 1. | 1 = 1 | |
| 34.101 | Timed function 2 | Defines which timers are connected to combined timer 2. See 34.01 Timed functions status. | 0000 0000 0000 0000b |
| 34.102 | Timed function 3 | Defines which timers are connected to combined timer 3. See 34.01 Timed functions status. | 0000 0000 0000 0000b |
| 34.110 | Boost time function | Defines which combined timers (that is, timers that are connected to the combined timers) are activated with the extra time function. | 0000 0000 0000 0000b |

| Bit | Name | Description |
|--------|------------------|---------------------------|
| 0 | Timed function 1 | 0 = Inactive. 1 = Active. |
| 1 | Timed function 2 | 0 = Inactive. 1 = Active. |
| 2 | Timed function 3 | 0 = Inactive. 1 = Active. |
| 3...15 | Reserved | |

| | | |
|---------------|--|-------|
| 0000h...FFFFh | Combined timers including the extra timer. | 1 = 1 |
|---------------|--|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|------------------------------------|---|---|------------|
| 34.111 | Boost time activation source | Selects the source of extra time activation signal. 0 = Disabled. 1 = Enabled. | <i>Off</i> |
| | Off | 0. | 0 |
| | On | 1. | 1 |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 34.112 | Boost time duration | Defines the time inside which the extra time is deactivated after extra time activation signal is switched off. Example: If parameter 34.111 Boost time activation source is set to <i>DI1</i> and 34.112 Boost time duration is set to 00 01:30, the extra time is active for 1 hour and 30 minutes after digital input DI1 is deactivated. | 00 00:00 |
| | 00 00:00...07 00:00 | Extra time duration. | 1 = 1 |
| 35 Motor thermal protection | | Motor thermal protection settings such as temperature measurement configuration, load curve definition and motor fan control configuration; motor overload protection. See also section <i>Programmable protection functions</i> (page 167). | |
| 35.01 | Motor estimated temperature | Displays the motor temperature as estimated by the internal motor thermal protection model (see parameters <i>35.50...35.55</i>). The unit is selected by parameter <i>96.16 Unit selection</i> . This parameter is read-only. | - |
| | -60...1000 °C or -76...1832 °F | Estimated motor temperature. | 1 = 1° |
| 35.02 | Measured temperature 1 | Displays the temperature received through the source defined by parameter <i>35.11 Temperature 1 source</i> . The unit is selected by parameter <i>96.16 Unit selection</i> . Note: With a PTC sensor, the value shown is not a valid measurement. Either 0 ohm (normal temperature) or the value of parameter <i>35.22 Temperature 2 fault limit</i> (excessive temperature) is shown. This parameter is read-only. | - |
| | -60...5000 °C or -76...9032 °F, 0 ohm or [35.12] ohm | Measured temperature 1. | 1 = 1 unit |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---|--|------------------------------|
| 35.03 | <i>Measured temperature 2</i> | Displays the temperature received through the source defined by parameter <i>35.21 Temperature 2 source</i> . The unit is selected by parameter <i>96.16 Unit selection</i> . Note: With a PTC sensor, the value shown is not a valid measurement. Either 0 ohm (normal temperature) or the value of parameter <i>35.22 Temperature 2 fault limit</i> (excessive temperature) is shown. This parameter is read-only. | - |
| | -60...5000 °C or -76...9032 °F, 0 ohm or [35.22] ohm | Measured temperature 2. | 1 = 1 unit |
| 35.05 | <i>Motor overload level</i> | Motor overload level as a percent of the motor overload fault limit. See section <i>Motor overload protection</i> (page 151). This parameter is read-only. | 0.0% |
| | 0.0...100.0% | Motor overload level. 0.0% No motor overloading 88.0% Motor overloaded to warning level 100.0% Motor overloaded to fault level. | 10 = 1% |
| 35.11 | <i>Temperature 1 source</i> | Selects the source from which measured temperature 1 is read. Usually this source is from a sensor connected to the motor controlled by the drive, but it could be used to measure and monitor a temperature from other parts of the process as long as a suitable sensor is used as per the selection list. | <i>Estimated temperature</i> |
| | Disabled | None. Temperature monitoring function 1 is disabled. | 0 |
| | Estimated temperature | Estimated motor temperature (see parameter <i>35.01 Motor estimated temperature</i>). The temperature is estimated from an internal drive calculation. It is important to set up the ambient temperature of the motor in <i>35.50 Motor ambient temperature</i> . | 1 |
| | KTY84 analog I/O | KTY84 sensor connected to the analog input selected by parameter <i>35.14 Temperature 1 AI source</i> and an analog output. The following settings are required: <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group <i>12 Standard AI</i> to V (volt). In parameter group <i>13 Standard AO</i>, set the source selection parameter of the analog output to <i>Temp sensor 1 excitation</i>. The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees. | 2 |
| | Reserved | | 3...4 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----|----------------------|---|------------|
| | 1 × Pt100 analog I/O | <p>Pt100 sensor connected to a standard analog input selected by parameter 35.14 Temperature 1 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 1 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 5 |
| | 2 × Pt100 analog I/O | As selection 1 × Pt100 analog I/O , but with two sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 6 |
| | 3 × Pt100 analog I/O | As selection 1 × Pt100 analog I/O , but with three sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 7 |
| | PTC DI6 | <p>PTC sensor is connected to DI6.</p> <p>Note: With a PTC sensor, the value shown is not a valid measurement. Either 0 ohm (normal temperature) or the value of parameter 35.22 Temperature 2 fault limit (excessive temperature) is shown.</p> | 8 |
| | Reserved | | 9...10 |
| | Direct temperature | The temperature is taken from the source selected by parameter 35.14 Temperature 1 AI source . The value of the source is assumed to be degrees Celsius. | 11 |
| | KTY83 analog I/O | <p>KTY83 sensor connected to the analog input selected by parameter 35.14 Temperature 1 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 1 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 12 |


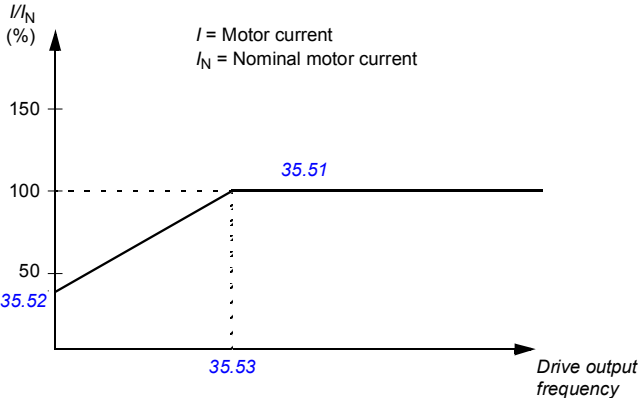
| No. | Name/Value | Description | Def/FbEq16 |
|-----|-----------------------|--|------------|
| | 1 × Pt1000 analog I/O | <p>Pt1000 sensor connected to a standard analog input selected by parameter 35.14 Temperature 1 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 1 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 13 |
| | 2 × Pt1000 analog I/O | As selection 1 × Pt1000 analog I/O , but with two sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 14 |
| | 3 × Pt1000 analog I/O | As selection 1 × Pt1000 analog I/O , but with three sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 15 |
| | Ni1000 | <p>Ni1000 sensor connected to the analog input selected by parameter 35.14 Temperature 1 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 1 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 16 |
| | Reserved | | 17...18 |
| | PTC extension module | PTC is connected to the CMOD-02 multifunction extension module, which is installed in drive slot 2. See chapter <i>Optional I/O extension modules, section CMOD-02 multifunction extension module (external 24 V AC/DC and isolated PTC interface)</i> in the <i>Hardware manual</i> of the drive). | 19 |
| | Reserved | | 20 |
| | Therm(0) | PTC sensor or a normally closed thermistor relay connected to digital input DI6. The motor is overheated when the digital input is 0. | 21 |
| | Therm(1) | Normally open thermistor relay connected to digital input DI6. The motor is overheated when the digital input is 1. | 22 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------------|---|---------------------|
| 35.12 | <i>Temperature 1 fault limit</i> | Defines the fault limit for temperature supervision function 1. When measured temperature 1 exceeds the limit, the drive trips on fault 4981 External temperature 1 . The unit is selected by parameter 96.16 Unit selection . Note: With a PTC sensor, changing the value of this parameter has no effect on fault generation. When PTC is over the triggering threshold of the CMOD-02 (see the <i>Hardware manual</i>), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the <i>Hardware manual</i>), the fault is reset. | 130 °C or 266 °F |
| | -60...5000 °C or -76...9032 °F | Fault limit for temperature monitoring function 1. | 1 = 1 ° |
| 35.13 | <i>Temperature 1 warning limit</i> | Defines the warning limit for temperature supervision function 1. When measured temperature 1 exceeds the limit, warning A491 External temperature 1 is generated. The unit is selected by parameter 96.16 Unit selection . Note: With a PTC sensor, changing the value of this parameter has no effect on warning generation. When PTC is over the triggering threshold of the CMOD-02 (see the <i>Hardware manual</i>), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the <i>Hardware manual</i>), the fault is reset. | 110 °C or 230 °F |
| | -60...5000 °C or -76...9032 °F | Warning limit for temperature monitoring function 1. | 1 = 1 ° |
| 35.14 | <i>Temperature 1 AI source</i> | Specifies the analog input when the setting of 35.11 Temperature 1 source requires measurement through an analog input. Note: If parameter 35.11 Temperature 1 source is set to <i>Direct temperature</i> , use selection <i>Other</i> here, and point to 12.12 AI1 scaled value . | <i>Not selected</i> |
| | Not selected | None. | 0 |
| | AI1 actual value | Analog input AI1 on the control unit. | 1 |
| | AI2 actual value | Analog input AI2 on the control unit. | 2 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 35.21 | <i>Temperature 2 source</i> | Selects the source from which measured temperature 2 is read. Usually this source is from a sensor connected to the motor controlled by the drive, but it could be used to measure and monitor a temperature from other parts of the process as long as a suitable sensor is used as per the selection list. | <i>Disabled</i> |
| | Disabled | None. Temperature monitoring function 2 is disabled. | 0 |
| | Estimated temperature | Estimated motor temperature (see parameter 35.01 Motor estimated temperature). The temperature is estimated from an internal drive calculation. It is important to set up the ambient temperature of the motor in 35.50 Motor ambient temperature . | 1 |

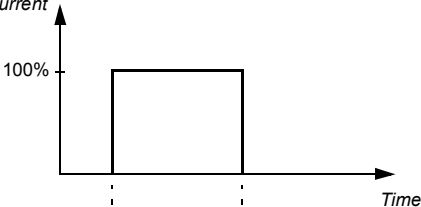
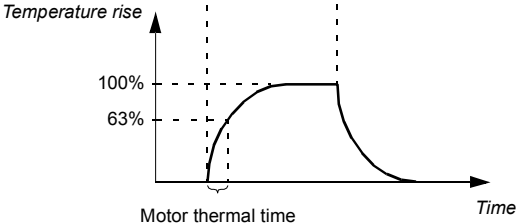
| No. | Name/Value | Description | Def/FbEq16 |
|-----|----------------------|---|------------|
| | KTY84 analog I/O | <p>KTY84 sensor connected to the analog input selected by parameter 35.24 Temperature 2 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 2 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 2 |
| | Reserved | | 3...4 |
| | 1 × Pt100 analog I/O | <p>Pt100 sensor connected to a standard analog input selected by parameter 35.24 Temperature 2 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 2 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 5 |
| | 2 × Pt100 analog I/O | As selection 1 × Pt100 analog I/O , but with two sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 6 |
| | 3 × Pt100 analog I/O | As selection 1 × Pt100 analog I/O , but with three sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 7 |
| | PTC DI6 | <p>PTC sensor is connected to DI6.</p> <p>Note: With a PTC sensor, the value shown is not a valid measurement. Either 0 ohm (normal temperature) or the value of parameter 35.22 Temperature 2 fault limit (excessive temperature) is shown.</p> | 8 |
| | Reserved | | 9...10 |
| | Direct temperature | The temperature is taken from the source selected by parameter 35.24 Temperature 2 AI source . The value of the source is assumed to be degrees Celsius. | 11 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----|-----------------------|--|------------|
| | KTY83 analog I/O | <p>KTY83 sensor connected to the analog input selected by parameter 35.14 Temperature 1 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 2 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 12 |
| | 1 × Pt1000 analog I/O | <p>Pt1000 sensor connected to a standard analog input selected by parameter 35.14 Temperature 1 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 2 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 13 |
| | 2 × Pt1000 analog I/O | As selection 1 × Pt1000 analog I/O , but with two sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 14 |
| | 3 × Pt1000 analog I/O | As selection 1 × Pt1000 analog I/O , but with three sensors connected in series. Using multiple sensors improves measurement accuracy significantly. | 15 |
| | Ni1000 | <p>Ni1000 sensor connected to the analog input selected by parameter 35.14 Temperature 1 AI source and an analog output.</p> <p>The following settings are required:</p> <ul style="list-style-type: none"> Set the hardware jumper or switch related to the analog input to U (voltage). Any change must be validated by a control unit reboot. Set the appropriate analog input unit selection parameter in group 12 Standard AI to V (volt). In parameter group 13 Standard AO, set the source selection parameter of the analog output to Temp sensor 2 excitation. <p>The analog output feeds a constant current through the sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.</p> | 16 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------------|---|---------------------|
| | Reserved | | 17...18 |
| | PTC extension module | PTC is connected to the CMOD-02 multifunction extension module, which is installed in drive slot 2. See chapter <i>Optional I/O extension modules, section CMOD-02 multifunction extension module (external 24 V AC/DC and isolated PTC interface)</i> in the <i>Hardware manual</i> of the drive). | 19 |
| | Reserved | | 20 |
| | Therm(0) | PTC sensor or a normally closed thermistor relay connected to digital input DI6. The motor is overheated when the digital input is 0. | 21 |
| | Therm(1) | Normally open thermistor relay connected to digital input DI6. The motor is overheated when the digital input is 1. | 22 |
| 35.22 | <i>Temperature 2 fault limit</i> | Defines the fault limit for temperature supervision function 2. When measured temperature 1 exceeds the limit, the drive trips on fault 4982 External temperature 2 . The unit is selected by parameter 96.16 Unit selection . Note: With a PTC sensor, changing the value of this parameter has no effect on fault generation. When PTC is over the triggering threshold of the CMOD-02 (see the <i>Hardware manual</i>), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the <i>Hardware manual</i>), the fault is reset. | 130 °C or 266 °F |
| | -60...5000 °C or -76...9032 °F | Fault limit for temperature monitoring function 2. | 1 = 1 ° |
| 35.23 | <i>Temperature 2 warning limit</i> | Defines the warning limit for temperature supervision function 2. When measured temperature 1 exceeds the limit, warning A492 External temperature 2 is generated. The unit is selected by parameter 96.16 Unit selection . Note: With a PTC sensor, changing the value of this parameter has no effect on warning generation. When PTC is over the triggering threshold of the CMOD-02 (see the <i>Hardware manual</i>), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the <i>Hardware manual</i>), the fault is reset. | 110 °C or 230 °F |
| | -60...5000 °C or -76...9032 °F | Warning limit for temperature monitoring function 2. | 1 = 1 ° |
| 35.24 | <i>Temperature 2 AI source</i> | Specifies the analog input when the setting of 35.11 Temperature 1 source requires measurement through an analog input. | <i>Not selected</i> |
| | Not selected | None. | 0 |
| | AI1 actual value | Analog input AI1 on the control unit. | 1 |
| | AI2 actual value | Analog input AI2 on the control unit. | 2 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 35.31 | <i>Safe motor temperature enable</i> | Activates or deactivates the Safe motor temperature (SMT) fault indication 4991 Safe motor temperature . Automatically activated when the CPTC-02 ATEX-certified thermistor protection module is connected to the drive. | <i>Off</i> |
| | Off | Activated. | 0 |
| | On | Deactivated. | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|---|-----------------------------------|---|----------------|
| 35.50 | Motor ambient temperature | <p>Defines the ambient temperature of the motor for the motor thermal protection model. The unit is selected by parameter 96.16 Unit selection.</p> <p>The motor thermal protection model estimates the motor temperature on the basis of parameters 35.50...35.55. The motor temperature increases if it operates in the region above the load curve, and decreases if it operates in the region below the load curve.</p> <p> WARNING! The model cannot protect the motor if the motor does not cool properly because of dust, dirt, etc.</p> | 20 °C or 68 °F |
| | -60...100 °C or -76 ... 212 °F | Ambient temperature. | 1 = 1° |
| 35.51 | Motor load curve | <p>Defines the motor load curve together with parameters 35.52 Zero speed load and 35.53 Break point.</p> <p>The load curve is used by the motor thermal protection model to estimate the motor temperature and by the overload protection to specify the overload tripping level.</p> <p>When the parameter is set to 100%, the maximum load is taken as the value of parameter 99.06 Motor nominal current (higher loads heat up the motor). The load curve level should be adjusted if the ambient temperature differs from the nominal value set in 35.50 Motor ambient temperature.</p> | 110% |
| <div>  </div> | | | |
| | 50...150% | Maximum load for the motor load curve. | 1 = 1% |
| 35.52 | Zero speed load | <p>Defines the motor load curve together with parameters 35.51 Motor load curve and 35.53 Break point. Defines the maximum motor load at zero speed of the load curve. A higher value can be used if the motor has an external motor fan to boost the cooling. See the motor manufacturer's recommendations.</p> <p>See parameter 35.51 Motor load curve.</p> | 70% |
| | 25...150% | Zero speed load for the motor load curve. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|--|---------------------------------------|--|--------------------------------|
| 35.53 | <i>Break point</i> | Defines the motor load curve together with parameters 35.51 Motor load curve and 35.52 Zero speed load . Defines the break point frequency of the load curve, ie, the point at which the motor load curve begins to decrease from the value of parameter 35.51 Motor load curve towards the value of parameter 35.52 Zero speed load . See parameter 35.51 Motor load curve . | 45.00 Hz |
| | 1.00...500.00 Hz | Break point for the motor load curve. | See par. 46.02 |
| 35.54 | <i>Motor nominal temperature rise</i> | Defines the temperature rise of the motor above ambient when the motor is loaded with nominal current. See the motor manufacturer's recommendations. The unit is selected by parameter 96.16 Unit selection . | 80 °C or 176 °F |
| <p>The graph illustrates the temperature rise of a motor over time. The vertical axis is labeled 'Temperature' and the horizontal axis is labeled 'Time'. A horizontal dashed line represents the 'Ambient temperature'. A solid curve starts from the ambient temperature and rises, leveling off at a higher temperature. A vertical double-headed arrow between the ambient temperature line and the steady-state level of the curve is labeled 'Motor nominal temperature rise'.</p> | | | |
| | 0...300 °C or 32...572 °F | Temperature rise. | 1 = 1° |

| No. | Name/Value | Description | Def/FbEq16 |
|--|-----------------------------|---|-------------------|
| 35.55 | Motor thermal time constant | <p>Defines the thermal time constant for use with the motor thermal protection model, defined as the time to reach 63% of the nominal motor temperature. See the motor manufacturer's recommendations.</p> <p>For thermal protection according to UL requirements for NEMA class motors, use the rule of thumb: Motor thermal time equals 35 times t6, where t6 (in seconds) is specified by the motor manufacturer as the time that the motor can safely operate at six times its rated current.</p> <p>The thermal time for Class 10 trip curve is 350 s, for Class 20 trip curve 700 s and for Class 30 trip curve 1050 s.</p> | 256 s |
| <div><div>Motor current</div><div></div><div>Time</div></div> <div><div>Temperature rise</div><div></div><div>Time</div></div> | | | |
| | 100...10000 s | Motor thermal time constant. | 1 = 1 s |
| 35.56 | Motor overload action | Selects the action taken when motor overload is detected. See section Motor overload protection (page 151). | Warning and fault |
| | No action | No action taken. | 0 |
| | Warning only | Drive generates warning A783 Motor overload when the motor is overloaded to the warning level, that is, parameter 35.05 Motor overload level reaches value 88.0%. | 1 |
| | Warning and fault | Drive generates warning A783 Motor overload when the motor is overloaded to the warning level, that is, parameter 35.05 Motor overload level reaches value 88.0%. Drive trips on fault 7122 Motor overload when the motor is overloaded to the fault level, that is, parameter 35.05 Motor overload level reaches value 100.0%. | 2 |
| 35.57 | Motor overload class | Defines the motor overload class to be used. The class of protection is specified by the user as the time for tripping at 7.2 times (IEC 60947-4-1) or 6 times (NEMA ICS) the tripping level current. See section Motor overload protection (page 151). | Class 20 |
| | Class 5 | Motor overload class 5. | 0 |
| | Class 10 | Motor overload class 10. | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------|--------------------------|--|----------------------|
| | Class 20 | Motor overload class 20. | 2 |
| | Class 30 | Motor overload class 30. | 3 |
| | Class 40 | Motor overload class 40. | 4 |
| 36 Load analyzer | | Peak value and amplitude logger settings. See also section Load analyzer (page 164). | |
| 36.01 | PVL signal source | Selects the signal to be monitored by the peak value logger. The signal is filtered using the filtering time specified by parameter 36.02 PVL filter time . The peak value is stored, along with other pre-selected signals at the time, into parameters 36.10...36.15 . The peak value logger can be reset using parameter 36.09 Reset loggers . The logger is also reset whenever the signal source is changed. The date and time of the last reset are stored into parameters 36.16 and 36.17 respectively. | Motor current |
| | Not selected | None (peak value logger disabled). | 0 |
| | Motor speed used | 01.01 Motor speed used (page 275). | 1 |
| | Reserved | | 2 |
| | Output frequency | 01.06 Output frequency (page 275). | 3 |
| | Motor current | 01.07 Motor current (page 275). | 4 |
| | Reserved | | 5 |
| | Motor torque | 01.10 Motor torque (page 275). | 6 |
| | DC voltage | 01.11 DC voltage (page 275). | 7 |
| | Output power | 01.14 Output power (page 276). | 8 |
| | Reserved | | 9 |
| | Speed ref ramp in | 23.01 Speed ref ramp input (page 349). | 10 |
| | Speed ref ramp out | 23.02 Speed ref ramp output (page 349). | 11 |
| | Speed ref used | 24.01 Used speed reference (page 350). | 12 |
| | Reserved | | 13 |
| | Freq ref used | 28.02 Frequency ref ramp output (page 354). | 14 |
| | Reserved | | 15 |
| | Process PID out | 40.01 Process PID output actual (page 409). | 16 |
| | Other | Source selection (see Terms and abbreviations on page 272). | - |
| 36.02 | PVL filter time | Peak value logger filtering time. See parameter 36.01 PVL signal source . | 2.00 s |
| | 0.00...120.00 s | Peak value logger filtering time. | 100 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------|--|---------------------|
| 36.06 | <i>AL2 signal source</i> | Selects the signal to be monitored by amplitude logger 2. The signal is sampled at 200 ms intervals. The results are displayed by parameters 36.40...36.49. Each parameter represents an amplitude range, and shows what portion of the samples fall within that range. The signal value corresponding to 100% is defined by parameter 36.07 <i>AL2 signal scaling</i> . Amplitude logger 2 can be reset using parameter 36.09 <i>Reset loggers</i> . The logger is also reset whenever the signal source or scaling is changed. The date and time of the last reset are stored into parameters 36.50 and 36.51 respectively. For the selections, see parameter 36.01 <i>PVL signal source</i> . | <i>Output power</i> |
| 36.07 | <i>AL2 signal scaling</i> | Defines the signal value that corresponds to 100% amplitude. | 100.00 |
| | 0.00...32767.00 | Signal value corresponding to 100%. | 1 = 1 |
| 36.09 | <i>Reset loggers</i> | Resets the peak value logger and/or amplitude logger 2. (Amplitude logger 1 cannot be reset.) | <i>Done</i> |
| | Done | Reset completed or not requested (normal operation). | 0 |
| | All | Reset both the peak value logger and amplitude logger 2. | 1 |
| | PVL | Reset the peak value logger. | 2 |
| | AL2 | Reset amplitude logger 2. | 3 |
| 36.10 | <i>PVL peak value</i> | Peak value recorded by the peak value logger. | 0.00 |
| | -32768.00... 32767.00 | Peak value. | 1 = 1 |
| 36.11 | <i>PVL peak date</i> | The date on which the peak value was recorded. | 01.01.1980 |
| | - | Peak occurrence date. | - |
| 36.12 | <i>PVL peak time</i> | The time at which the peak value was recorded. | 00:00:05 |
| | - | Peak occurrence time. | - |
| 36.13 | <i>PVL current at peak</i> | Motor current at the moment the peak value was recorded. | 0.00 A |
| | -32768.00... 32767.00 A | Motor current at peak. | 1 = 1 A |
| 36.14 | <i>PVL DC voltage at peak</i> | Voltage in the intermediate DC circuit of the drive at the moment the peak value was recorded. | 0.00 V |
| | 0.00...2000.00 V | DC voltage at peak. | 10 = 1 V |
| 36.15 | <i>PVL speed at peak</i> | Motor speed at the moment the peak value was recorded. | 0.00 rpm |
| | -30000.00... 30000.00 rpm | Motor speed at peak. | See par. 46.01 |
| 36.16 | <i>PVL reset date</i> | The date on which the peak value logger was last reset. | 01.01.1980 |
| | - | Last reset date of the peak value logger. | - |
| 36.17 | <i>PVL reset time</i> | The time at which the peak value logger was last reset. | 00:00:05 |
| | - | Last reset time of the peak value logger. | - |
| 36.20 | <i>AL1 0 to 10%</i> | Percentage of samples recorded by amplitude logger 1 that fall between 0 and 10%. 100% corresponds to the I_{\max} value given in the ratings table in chapter Technical data in the <i>Hardware manual</i> of the drive. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 0 and 10%. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------|--|------------|
| 36.21 | AL 1 10 to 20% | Percentage of samples recorded by amplitude logger 1 that fall between 10 and 20%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 10 and 20%. | 1 = 1% |
| 36.22 | AL 1 20 to 30% | Percentage of samples recorded by amplitude logger 1 that fall between 20 and 30%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 20 and 30%. | 1 = 1% |
| 36.23 | AL 1 30 to 40% | Percentage of samples recorded by amplitude logger 1 that fall between 30 and 40%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 30 and 40%. | 1 = 1% |
| 36.24 | AL 1 40 to 50% | Percentage of samples recorded by amplitude logger 1 that fall between 40 and 50%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 40 and 50%. | 1 = 1% |
| 36.25 | AL 1 50 to 60% | Percentage of samples recorded by amplitude logger 1 that fall between 50 and 60%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 50 and 60%. | 1 = 1% |
| 36.26 | AL 1 60 to 70% | Percentage of samples recorded by amplitude logger 1 that fall between 60 and 70%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 60 and 70%. | 1 = 1% |
| 36.27 | AL 1 70 to 80% | Percentage of samples recorded by amplitude logger 1 that fall between 70 and 80%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 70 and 80%. | 1 = 1% |
| 36.28 | AL 1 80 to 90% | Percentage of samples recorded by amplitude logger 1 that fall between 80 and 90%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples between 80 and 90%. | 1 = 1% |
| 36.29 | AL 1 over 90% | Percentage of samples recorded by amplitude logger 1 that exceed 90%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 1 samples over 90%. | 1 = 1% |
| 36.40 | AL 2 0 to 10% | Percentage of samples recorded by amplitude logger 2 that fall between 0 and 10%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 0 and 10%. | 1 = 1% |
| 36.41 | AL 2 10 to 20% | Percentage of samples recorded by amplitude logger 2 that fall between 10 and 20%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 10 and 20%. | 1 = 1% |
| 36.42 | AL 2 20 to 30% | Percentage of samples recorded by amplitude logger 2 that fall between 20 and 30%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 20 and 30%. | 1 = 1% |
| 36.43 | AL 2 30 to 40% | Percentage of samples recorded by amplitude logger 2 that fall between 30 and 40%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 30 and 40%. | 1 = 1% |
| 36.44 | AL 2 40 to 50% | Percentage of samples recorded by amplitude logger 2 that fall between 40 and 50%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 40 and 50%. | 1 = 1% |
| 36.45 | AL 2 50 to 60% | Percentage of samples recorded by amplitude logger 2 that fall between 50 and 60%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 50 and 60%. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------|--|------------|
| 36.46 | <i>AL2 60 to 70%</i> | Percentage of samples recorded by amplitude logger 2 that fall between 60 and 70%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 60 and 70%. | 1 = 1% |
| 36.47 | <i>AL2 70 to 80%</i> | Percentage of samples recorded by amplitude logger 2 that fall between 70 and 80%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 70 and 80%. | 1 = 1% |
| 36.48 | <i>AL2 80 to 90%</i> | Percentage of samples recorded by amplitude logger 2 that fall between 80 and 90%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples between 80 and 90%. | 1 = 1% |
| 36.49 | <i>AL2 over 90%</i> | Percentage of samples recorded by amplitude logger 2 that exceed 90%. | 0.00% |
| | 0.00...100.00% | Amplitude logger 2 samples over 90%. | 1 = 1% |
| 36.50 | <i>AL2 reset date</i> | The date on which amplitude logger 2 was last reset. | 01.01.1980 |
| | - | Last reset date of amplitude logger 2. | - |
| 36.51 | <i>AL2 reset time</i> | The time at which amplitude logger 2 was last reset. | 00:00:05 |
| | - | Last reset time of amplitude logger 2. | - |

| | | | |
|---------------------------|-------------------------------|--|-------|
| 37 User load curve | | Settings for user load curve. See also section <i>User load curve (Condition monitoring)</i> (page 170). | |
| 37.01 | ULC output status word | Displays the status of the monitored signal. The status is shown only while the drive is running. (The status word is independent of the actions and delays selected by parameters 37.03, 37.04, 37.41 and 37.42.) This parameter is read-only. | 0000h |

| Bit | Name | Description |
|--------|--------------------|--|
| 0 | Under load limit | 1 = Signal lower than the underload curve. |
| 1 | Within load range | 1 = Signal between the underload and overload curve. |
| 2 | Overload limit | 1 = Signal higher than the overload curve. |
| 3 | Outside load limit | 1 = Signal lower than the underload curve or higher than the overload curve. |
| 4...15 | Reserved | |

| | | | |
|---------------------------------|-------------------------------|--|-----------------------|
| 0000h...FFFFh | | Status of the monitored signal. | 1 = 1 |
| 37.02 | ULC supervision signal | Selects the signal to be monitored. The function compares the absolute value of the signal against the load curve. | <i>Motor torque %</i> |
| Not selected | | No signal selected (monitoring disabled). | 0 |
| Motor speed % | | <i>01.03 Motor speed %</i> (page 275). | 1 |
| Motor current % | | <i>01.08 Motor current % of motor nom</i> (page 275). | 2 |
| Motor torque % | | <i>01.10 Motor torque</i> (page 275). | 3 |
| Output power % of motor nominal | | <i>01.15 Output power % of motor nom</i> (page 276). | 4 |
| Output power % of drive nominal | | <i>01.16 Output power % of drive nom</i> (page 276). | 5 |
| <i>Other</i> | | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------|--------------------------------|---|-----------------|
| 37.03 | ULC overload actions | Selects how the drive reacts if the absolute value of the monitored signal stays continuously above the overload curve for longer than the value of 37.41 ULC overload timer . | <i>Disabled</i> |
| | Disabled | No action taken. | 0 |
| | Warning | Drive generates warning A8BE ULC overload warning . | 1 |
| | Fault | Drive trips on fault 8002 ULC overload fault . | 2 |
| | Warning/Fault | Drive generates warning A8BE ULC overload warning if the signal stays continuously above the overload curve for half of the time defined by parameter 37.41 ULC overload timer . Drive trips on fault 8002 ULC overload fault if the signal stays continuously above the overload curve for a time defined by parameter 37.41 ULC overload timer . | 3 |
| 37.04 | ULC underload actions | Selects how the drive reacts if the absolute value of the monitored signal stays continuously above the overload curve for longer than the value of 37.42 ULC underload timer . | <i>Disabled</i> |
| | Disabled | No action taken. | 0 |
| | Warning | Drive generates warning A8BF ULC underload warning . | 1 |
| | Fault | Drive trips on fault 8001 ULC underload fault . | 2 |
| | Warning/Fault | Drive generates warning A8BF ULC underload warning if the signal stays continuously below the underload curve for half of the time defined by parameter 37.41 ULC overload timer . Drive trips on fault 8001 ULC underload fault if the signal stays continuously above the underload curve for a time defined by parameter 37.42 ULC underload timer . | 3 |
| 37.11 | ULC speed table point 1 | Defines the first of the five speed points on the X-axis of the user load curve. Speed points are used if parameter 99.04 Motor control mode is set to <i>Vector</i> or if 99.04 Motor control mode is set to <i>Scalar</i> and the reference unit is rpm. The five points must be in order from lowest to highest. The points are defined as positive values, but the range is symmetrically effective also in the negative direction. The monitoring is not active outside these two areas. | 150.0 rpm |
| | -30000.0...30000.0 rpm | Speed. | 1 = 1 rpm |
| 37.12 | ULC speed table point 2 | Defines the second speed point. See parameter 37.11 ULC speed table point 1 . | 750.0 rpm |
| | -30000.0...30000.0 rpm | Speed. | 1 = 1 rpm |
| 37.13 | ULC speed table point 3 | Defines the third speed point. See parameter 37.11 ULC speed table point 1 . | 1290.0 rpm |
| | -30000.0...30000.0 rpm | Speed. | 1 = 1 rpm |
| 37.14 | ULC speed table point 4 | Defines the fourth speed point. See parameter 37.11 ULC speed table point 1 . | 1500.0 rpm |
| | -30000.0...30000.0 rpm | Speed. | 1 = 1 rpm |
| 37.15 | ULC speed table point 5 | Defines the fifth speed point. See parameter 37.11 ULC speed table point 1 . | 1800.0 rpm |
| | -30000.0...30000.0 rpm | Speed. | 1 = 1 rpm |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------------|--|------------|
| 37.16 | <i>ULC frequency table point 1</i> | Defines the first of the five frequency points on the X-axis of the user load curve. Frequency points are used if parameter <i>99.04 Motor control mode</i> is set to <i>Scalar</i> and the reference unit is Hz. The five points must be in order from lowest to highest. The points are defined as positive values, but the range is symmetrically effective also in the negative direction. The monitoring is not active outside these two areas. | 5.0 Hz |
| | -500.0...500.0 Hz | Frequency. | 1 = 1 Hz |
| 37.17 | <i>ULC frequency table point 2</i> | Defines the second frequency point. See parameter <i>37.16 ULC frequency table point 1</i> . | 25.0 Hz |
| | -500.0...500.0 Hz | Frequency. | 1 = 1 Hz |
| 37.18 | <i>ULC frequency table point 3</i> | Defines the third frequency point. See parameter <i>37.16 ULC frequency table point 1</i> . | 43.0 Hz |
| | -500.0...500.0 Hz | Frequency. | 1 = 1 Hz |
| 37.19 | <i>ULC frequency table point 4</i> | Defines the fourth frequency point. See parameter <i>37.16 ULC frequency table point 1</i> . | 50.0 Hz |
| | -500.0...500.0 Hz | Frequency. | 1 = 1 Hz |
| 37.20 | <i>ULC frequency table point 5</i> | Defines the fifth frequency point. See parameter <i>37.16 ULC frequency table point 1</i> . | 60.0 Hz |
| | -500.0...500.0 Hz | Frequency. | 1 = 1 Hz |
| 37.21 | <i>ULC underload point 1</i> | Defines the first of the five points on the Y-axis that together with the corresponding point on the X-axis (<i>37.11 ULC speed table point 1...37.15 ULC speed table point 5</i> or <i>37.15 ULC speed table point 5...37.20 ULC frequency table point 5</i>) define the underload (lower) curve. Each point of the underload curve must have a lower value than the corresponding overload point. | 10.0% |
| | -1600.0...1600.0% | Underload point. | 1 = 1% |
| 37.22 | <i>ULC underload point 2</i> | Defines the second underload point. See parameter <i>37.21 ULC underload point 1</i> . | 15.0% |
| | -1600.0...1600.0% | Underload point. | 1 = 1% |
| 37.23 | <i>ULC underload point 3</i> | Defines the third underload point. See parameter <i>37.21 ULC underload point 1</i> | 25.0% |
| | -1600.0...1600.0% | Underload point. | 1 = 1% |
| 37.24 | <i>ULC underload point 4</i> | Defines the fourth underload point. See parameter <i>37.21 ULC underload point 1</i> | 30.0% |
| | -1600.0...1600.0% | Underload point. | 1 = 1% |
| 37.25 | <i>ULC underload point 5</i> | Defines the fifth underload point. See parameter <i>37.21 ULC underload point 1</i> | 30.0% |
| | -1600.0...1600.0% | Underload point. | 1 = 1% |
| 37.31 | <i>ULC overload point 1</i> | Defines the first of the five points on the Y-axis that together with the corresponding point on the X-axis (<i>37.11 ULC speed table point 1...37.15 ULC speed table point 5</i> or <i>37.15 ULC speed table point 5...37.20 ULC frequency table point 5</i>) define the overload (higher) curve. Each point of the overload curve must have a higher value than the corresponding underload point. | 300.0% |
| | -1600.0...1600.0% | Overload point. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------------|------------------------------------|--|------------|
| 37.32 | <i>ULC overload point 2</i> | Defines the second overload point. See parameter <i>37.31 ULC overload point 1</i> . | 300.0% |
| | -1600.0...1600.0% | Overload point. | 1 = 1% |
| 37.33 | <i>ULC overload point 3</i> | Defines the third overload point. See parameter <i>37.31 ULC overload point 1</i> . | 300.0% |
| | -1600.0...1600.0% | Overload point. | 1 = 1% |
| 37.34 | <i>ULC overload point 4</i> | Defines the fourth overload point. See parameter <i>37.31 ULC overload point 1</i> . | 300.0% |
| | -1600.0...1600.0% | Overload point. | 1 = 1% |
| 37.35 | <i>ULC overload point 5</i> | Defines the fifth overload point. See parameter <i>37.31 ULC overload point 1</i> . | 300.0% |
| | -1600.0...1600.0% | Overload point. | 1 = 1% |
| 37.41 | <i>ULC overload timer</i> | Defines the time for which the monitored signal must continuously stay above the overload curve before the drive takes the action selected by <i>37.03 ULC overload actions</i> . | 20.0 s |
| | 0.0...10000.0 s | Overload timer. | 1 = 1 s |
| 37.42 | <i>ULC underload timer</i> | Defines the time for which the monitored signal must continuously stay below the underload curve before the drive takes the action selected by <i>37.04 ULC underload actions</i> . | 20.0 s |
| | 0.0...10000.0 s | Underload timer | 1 = 1 s |
| 40 Process PID set 1 | | | |
| | | Parameter values for process PID control. The drive output can be controlled by the process PID. When the process PID control is enabled, the drive controls the process feedback to the reference value. Two different parameter sets can be defined for the process PID. One parameter set is in use at a time. The first set is made up of parameters <i>40.07...40.50</i> , the second set is defined by the parameters in group <i>41 Process PID set 2</i> . The binary source that defines which set is used is selected by parameter <i>40.57 PID set1/set2 selection</i> . See also control chain diagram <i>PID setpoint compensation</i> on page 265. To set the PID customer unit, select Menu > Primary settings > PID > Unit on the control panel. | |
| 40.01 | <i>Process PID output actual</i> | Displays the output of the process PID controller. See control chain diagram <i>Process PID controller</i> on page 267. This parameter is read-only. | - |
| | -200000.00... 200000.00 | Process PID controller output. | 1 = 1 |
| 40.02 | <i>Process PID feedback actual</i> | Displays the value of process feedback after source selection, mathematical function (parameter <i>40.10 Set 1 feedback function</i>), and filtering. See control chain diagram <i>PID setpoint compensation</i> on page 265. This parameter is read-only. | - |
| | -200000.00... 200000.00 bar | Process feedback. | 1 = 1 bar |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------|--|---------------------|
| 40.03 | Process PID setpoint actual | Displays the value of process PID setpoint after source selection, mathematical function (40.18 Set 1 setpoint function), limitation and ramping. See control chain diagram PID setpoint compensation on page 265. This parameter is read-only. | - |
| | -200000...200000 bar | Setpoint for process PID controller. | 1 = 1 bar |
| 40.04 | Process PID deviation actual | Displays the process PID deviation. By default, this value equals setpoint - feedback, but deviation can be inverted by parameter 40.31 Set 1 deviation inversion. See control chain diagram Process PID controller on page 267. This parameter is read-only. | - |
| | -200000.00...200000.00 bar | PID deviation. | 1 = 1 PID unit 1 |
| 40.06 | Process PID status word | Displays status information on process PID control. This parameter is read-only. | - |

| Bit | Name | Value |
|---------|--------------------------|---|
| 0 | PID active | 1 = Process PID control active. |
| 1 | Setpoint frozen | 1 = Process PID setpoint frozen. |
| 2 | Output frozen | 1 = Process PID controller output frozen. |
| 3 | PID sleep mode | 1 = Sleep mode active. |
| 4 | Sleep boost | 1 = Sleep boost active. |
| 5 | Reserved | |
| 6 | Tracking mode | 1 = Tracking function active. |
| 7 | Output limit high | 1 = PID output is being limited by par. 40.37. |
| 8 | Output limit low | 1 = PID output is being limited by par. 40.36. |
| 9 | Deadband active | 1 = Feedback value is in the deadband range (40.39). |
| 10 | PID set | 0 = Parameter set 1 in use. 1 = Parameter set 2 in use. |
| 11 | Reserved | |
| 12 | Internal setpoint active | 1 = Internal setpoint active (see par. 40.16...40.23) |
| 13...15 | Reserved | |

| | | | |
|-------|----------------------------|---|------------|
| | 0000h...FFFFh | Process PID control status word. | 1 = 1 |
| 40.07 | Process PID operation mode | Activates/deactivates process PID control. Note: Process PID control is only available in external control; see section Local control vs. external control (page 83). | Off |
| | Off | Process PID control inactive. | 0 |
| | On | Process PID control active. | 1 |
| | On when drive running | Process PID control is active when the drive is running. | 2 |
| 40.08 | Set 1 feedback 1 source | Selects the primary source of process feedback. See control chain diagram PID setpoint compensation on page 265. | AI2 scaled |
| | Not selected | None. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | Freq in scaled | 11.39 Freq in 1 scaled value (see page 306). | 3 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|--|---|---------------------|
| | Reserved | | 4...7 |
| | AI1 percent | 12.101 AI1 percent value (see page 311). | 8 |
| | AI2 percent | 12.102 AI2 percent value (see page 311). | 9 |
| | Feedback data storage | 40.91 Feedback data storage (see page 425). (Selection not available for parameter 71.08 Feedback 1 source .) | 10 |
| | Actual flow | Parameter 80.01 Actual flow . | 11 |
| | Actual flow % | Parameter 80.02 Actual flow . | 12 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.09 | Set 1 feedback 2 source | Selects the second source of process feedback. The second source is used only if the setpoint function requires two inputs. For the selections, see parameter 40.08 Set 1 feedback 1 source . | <i>Not selected</i> |
| 40.10 | Set 1 feedback function | Defines how process feedback is calculated from the two feedback sources selected by parameters 40.08 Set 1 feedback 1 source and 40.09 Set 1 feedback 2 source . The result of the function (for any selection) is multiplied by parameter 40.90 Set 1 feedback multiplier . (That is why in selections 12 and 13, the multiplier k is constant 1.) | <i>In1</i> |
| | In1 | Source 1. | 0 |
| | In1+In2 | Sum of sources 1 and 2. | 1 |
| | In1-In2 | Source 2 subtracted from source 1. | 2 |
| | In1*In2 | Source 1 multiplied by source 2. | 3 |
| | In1/In2 | Source 1 divided by source 2. | 4 |
| | MIN(In1,In2) | Smaller of the two sources. | 5 |
| | MAX(In1,In2) | Greater of the two sources. | 6 |
| | AVE(In1,In2) | Average of the two sources. | 7 |
| | sqrt(In1) | Square root of source 1. | 8 |
| | sqrt(In1-In2) | Square root of (source 1 - source 2). | 9 |
| | sqrt(In1+In2) | Square root of (source 1 + source 2). | 10 |
| | sqrt(In1)+sqrt(In2) | Square root of source 1 + square root of source 2. | 11 |
| | k*sqrt(In1) | Square root of source 1. (k = 1) | 12 |
| | k*sqrt(In1-In2) | Square root of (source 1 - source 2). (k = 1) | 13 |
| 40.11 | Set 1 feedback filter time | Defines the filter time constant for process feedback. | 0.000 s |
| | 0.000...30.000 s | Feedback filter time. | 1 = 1 s |

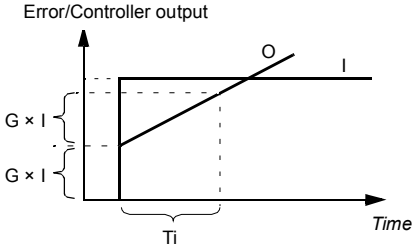
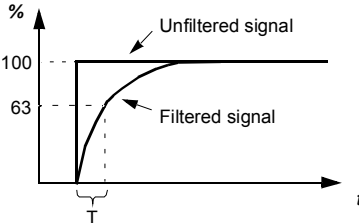
| No. | Name/Value | Description | Def/FbEq16 | | | | | | |
|------------------------------------|----------------------------|--|------------------------------------|---------|---------------|---------------------|-------------------|-------------------------|------|
| 40.14 | Set 1 setpoint scaling | <p>Defines, together with parameter 40.15 Set 1 output scaling, a general scaling factor for the process PID control chain.</p> <p>If the parameter is set to zero, automatic setpoint scaling is activated, where suitable setpoint scale is calculated according to selected setpoint source. Actual setpoint scale is shown in parameter 40.61 Setpoint scaling actual.</p> <p>The scaling can be utilized when, for example, the process setpoint is input in Hz, and the output of the PID controller is used as an rpm value in speed control. In this case, this parameter might be set to 50, and parameter 40.15 to the nominal motor speed at 50 Hz.</p> <p>In effect, the output of the PID controller = [40.15] when deviation (setpoint - feedback) = [40.14] and [40.32] = 1.</p> <p>Note: The scaling is based on the ratio between 40.14 and 40.15. For example, the values 50 and 1500 would produce the same scaling as 1 and 30.</p> | 0.00 | | | | | | |
| | -200000.00... 200000.00 | Process setpoint base. | 1 = 1 | | | | | | |
| 40.15 | Set 1 output scaling | <p>See parameter 40.14 Set 1 setpoint scaling.</p> <p>If the parameter is set to zero, scaling is automatic:</p> <table><tr><th>Operation mode (see par. 19.01)</th><th>Scaling</th></tr><tr><td>Speed control</td><td>46.01 Speed scaling</td></tr><tr><td>Frequency control</td><td>46.02 Frequency scaling</td></tr></table> | Operation mode (see par. 19.01) | Scaling | Speed control | 46.01 Speed scaling | Frequency control | 46.02 Frequency scaling | 0.00 |
| Operation mode (see par. 19.01) | Scaling | | | | | | | | |
| Speed control | 46.01 Speed scaling | | | | | | | | |
| Frequency control | 46.02 Frequency scaling | | | | | | | | |
| | -200000.00... 200000.00 | Process PID controller output base. | 1 = 1 | | | | | | |
| 40.16 | Set 1 setpoint 1 source | Selects the primary source of process PID setpoint. See the control chain diagram on page 265. | Internal setpoint | | | | | | |
| | Not selected | None. | 0 | | | | | | |
| | Reserved | | 1 | | | | | | |
| | Internal setpoint | Internal setpoint. See parameter 40.19 Set 1 internal setpoint sel1. | 2 | | | | | | |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 3 | | | | | | |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 4 | | | | | | |
| | Reserved | | 5...7 | | | | | | |
| | Motor potentiometer | 22.80 Motor potentiometer ref act (output of the Motor potentiometer). | 8 | | | | | | |
| | Reserved | | 9 | | | | | | |
| | Freq in scaled | 11.39 Freq in 1 scaled value (see page 306). | 10 | | | | | | |
| | AI1 percent | 12.101 AI1 percent value (see page 311) | 11 | | | | | | |
| | AI2 percent | 12.102 AI2 percent value (see page 311) | 12 | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------|--|--------------|
| | Control panel (ref saved) | <p>Control panel reference (03.01 Panel reference, see page 279) saved by the control system for the location where the control returns is used as the reference. (Selection not available for parameter 71.16 Setpoint 1 source.)</p> | 13 |
| | Control panel (ref copied) | <p>Control panel reference (03.01 Panel reference, see page 279) for the previous control location is used as the reference when the control location changes if the references for the two locations are of the same type (eg frequency/speed/torque/PID); otherwise, the actual signal is used as the new reference.</p> | 14 |
| | FB A ref1 | 03.05 FB A reference 1 (see page 279). | 15 |
| | FB A ref2 | 03.06 FB A reference 2 (see page 279). | 16 |
| | Reserved | | 17...18 |
| | EFB ref1 | 03.09 EFB reference 1 (see page 280). | 19 |
| | EFB ref2 | 03.10 EFB reference 2 (see page 280). | 20 |
| | Reserved | | 21...23 |
| | Setpoint data storage | 40.92 Setpoint data storage (see page 425). (Selection not available for parameter 71.16 Setpoint 1 source .) | 24 |
| | Compensated setpoint | 40.70 Compensated setpoint (see page 423). | 25 |
| | Other | Source selection (see Terms and abbreviations on page 272). | - |
| 40.17 | Set 1 setpoint 2 source | <p>Selects the second source of process setpoint. The second source is used only if the setpoint function requires two inputs. For the selections, see parameter 40.16 Set 1 setpoint 1 source.</p> | Not selected |
| 40.18 | Set 1 setpoint function | <p>Selects a function between the setpoint sources selected by parameters 40.16 Set 1 setpoint 1 source and 40.17 Set 1 setpoint 2 source. The result of the function (for any selection) is multiplied by parameter 40.89 Set 1 setpoint multiplier. (That is why in selections 12 and 13, the multiplier k is constant 1.)</p> | In1 |
| | In1 | Source 1. | 0 |
| | In1+In2 | Sum of sources 1 and 2. | 1 |
| | In1-In2 | Source 2 subtracted from source 1. | 2 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | |
|------------------------------|------------------------------|---|------------------------------|------------------------------|------------------------|---|---|----------------|---|---|----------------|---|---|----------------|---|---|----------------|----------|
| | In1*In2 | Source 1 multiplied by source 2. | 3 | | | | | | | | | | | | | | | |
| | In1/In2 | Source 1 divided by source 2. | 4 | | | | | | | | | | | | | | | |
| | MIN(In1,In2) | Smaller of the two sources. | 5 | | | | | | | | | | | | | | | |
| | MAX(In1,In2) | Greater of the two sources. | 6 | | | | | | | | | | | | | | | |
| | AVE(In1,In2) | Average of the two sources. | 7 | | | | | | | | | | | | | | | |
| | sqrt(In1) | Square root of source 1. | 8 | | | | | | | | | | | | | | | |
| | sqrt(In1-In2) | Square root of (source 1 - source 2). | 9 | | | | | | | | | | | | | | | |
| | sqrt(In1+In2) | Square root of (source 1 + source 2). | 10 | | | | | | | | | | | | | | | |
| | sqrt(In1)+sqrt(In2) | Square root of source 1 + square root of source 2. | 11 | | | | | | | | | | | | | | | |
| | k*sqrt(In1) | Square root of source 1. (k = 1) | 12 | | | | | | | | | | | | | | | |
| | k*sqrt(In1-In2) | Square root of (source 1 - source 2). (k = 1) | 13 | | | | | | | | | | | | | | | |
| 40.19 | Set 1 internal setpoint sel1 | <div>Selects together with 40.20 Set 1 internal setpoint sel2 the internal setpoint out of the presets defined by parameters 40.21...40.24.</div> <div>Note: Parameters 40.16 Set 1 setpoint 1 source and 40.17 Set 1 setpoint 2 source must be set to Internal setpoint.</div> <table><tr><th>Source defined by par. 40.19</th><th>Source defined by par. 40.20</th><th>Setpoint preset active</th></tr><tr><td>0</td><td>0</td><td>0 (par. 40.24)</td></tr><tr><td>1</td><td>0</td><td>1 (par. 40.21)</td></tr><tr><td>0</td><td>1</td><td>2 (par. 40.22)</td></tr><tr><td>1</td><td>1</td><td>3 (par. 40.23)</td></tr></table> | Source defined by par. 40.19 | Source defined by par. 40.20 | Setpoint preset active | 0 | 0 | 0 (par. 40.24) | 1 | 0 | 1 (par. 40.21) | 0 | 1 | 2 (par. 40.22) | 1 | 1 | 3 (par. 40.23) | Selected |
| Source defined by par. 40.19 | Source defined by par. 40.20 | Setpoint preset active | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 (par. 40.24) | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 (par. 40.21) | | | | | | | | | | | | | | | | |
| 0 | 1 | 2 (par. 40.22) | | | | | | | | | | | | | | | | |
| 1 | 1 | 3 (par. 40.23) | | | | | | | | | | | | | | | | |
| | Not selected | 0. | 0 | | | | | | | | | | | | | | | |
| | Selected | 1. | 1 | | | | | | | | | | | | | | | |
| | DI1 | Digital input DI1 (10.02 DI delayed status, bit 0). | 2 | | | | | | | | | | | | | | | |
| | DI2 | Digital input DI2 (10.02 DI delayed status, bit 1). | 3 | | | | | | | | | | | | | | | |
| | DI3 | Digital input DI3 (10.02 DI delayed status, bit 2). | 4 | | | | | | | | | | | | | | | |
| | DI4 | Digital input DI4 (10.02 DI delayed status, bit 3). | 5 | | | | | | | | | | | | | | | |
| | DI5 | Digital input DI5 (10.02 DI delayed status, bit 4). | 6 | | | | | | | | | | | | | | | |
| | DI6 | Digital input DI6 (10.02 DI delayed status, bit 5). | 7 | | | | | | | | | | | | | | | |
| | Reserved | | 8...17 | | | | | | | | | | | | | | | |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 | | | | | | | | | | | | | | | |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 | | | | | | | | | | | | | | | |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 | | | | | | | | | | | | | | | |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 21 | | | | | | | | | | | | | | | |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 22 | | | | | | | | | | | | | | | |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 23 | | | | | | | | | | | | | | | |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - | | | | | | | | | | | | | | | |
| 40.20 | Set 1 internal setpoint sel2 | Selects together with 40.19 Set 1 internal setpoint sel1 the internal setpoint used out of the three internal setpoints defined by parameters 40.21...40.23. See table at 40.19 Set 1 internal setpoint sel1. | Not selected | | | | | | | | | | | | | | | |
| | Not selected | 0. | 0 | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|--|------------|
| | Selected | 1. | 1 |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of <i>34.01 Timed functions status</i> (see page 384). | 18 |
| | Timed function 2 | Bit 1 of <i>34.01 Timed functions status</i> (see page 384). | 19 |
| | Timed function 3 | Bit 2 of <i>34.01 Timed functions status</i> (see page 384). | 20 |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 21 |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 22 |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 23 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 40.21 | <i>Set 1 internal setpoint 1</i> | Internal process setpoint 1. See parameter <i>40.19 Set 1 internal setpoint sel1</i> . | 0.00 bar |
| | -200000.00... 200000.00 bar | Internal process setpoint 1. | 1 = 1 bar |
| 40.22 | <i>Set 1 internal setpoint 2</i> | Internal process setpoint 2. See parameter <i>40.19 Set 1 internal setpoint sel1</i> . | 0.00 bar |
| | -200000.00... 200000.00 bar | Internal process setpoint 2. | 1 = 1 bar |
| 40.23 | <i>Set 1 internal setpoint 3</i> | Internal process setpoint 3. See parameter <i>40.19 Set 1 internal setpoint sel1</i> . | 0.00 bar |
| | -200000.00... 200000.00 bar | Internal process setpoint 3. | 1 = 1 bar |
| 40.24 | <i>Set 1 internal setpoint 0</i> | Internal process setpoint 0. See parameter <i>40.19 Set 1 internal setpoint sel1</i> . | 0.00 bar |
| | -200000.00... 200000.00 bar | Internal process setpoint 0. | 1 = 1 bar |
| 40.26 | <i>Set 1 setpoint min</i> | Defines a minimum limit for the process PID controller setpoint. | 0.00 bar |
| | -200000.00... 200000.00 bar | Minimum limit for process PID controller setpoint. | 1 = 1 bar |
| 40.27 | <i>Set 1 setpoint max</i> | Defines a maximum limit for the process PID controller setpoint. | 5.00 bar |
| | -200000.00... 200000.00 bar | Maximum limit for process PID controller setpoint. | 1 = 1 bar |
| 40.28 | <i>Set 1 setpoint increase time</i> | Defines the minimum time it takes for the setpoint to increase from 0% to 100%. | 0.0 s |
| | 0.0...32767.0 s | Setpoint increase time. | 1 = 1 |
| 40.29 | <i>Set 1 setpoint decrease time</i> | Defines the minimum time it takes for the setpoint to decrease from 100% to 0%. | 0.0 s |
| | 0.0...32767.0 s | Setpoint decrease time. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|--|---------------------------------|
| 40.30 | <i>Set 1 setpoint freeze enable</i> | Freezes, or defines a source that can be used to freeze, the setpoint of the process PID controller. This feature is useful when the reference is based on a process feedback connected to an analog input, and the sensor must be serviced without stopping the process. 1 = Process PID controller setpoint frozen See also parameter 40.38 Set 1 output freeze enable . | <i>Not selected</i> |
| | Not selected | Process PID controller setpoint not frozen. | 0 |
| | Selected | Process PID controller setpoint frozen. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 21 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 22 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 23 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.31 | <i>Set 1 deviation inversion</i> | Inverts the input of the process PID controller. 0 = Deviation not inverted (Deviation = Setpoint - Feedback) 1 = Deviation inverted (Deviation = Feedback - Setpoint) See also section Sleep and boost functions for process PID control (page 130). | <i>Not inverted (Ref - Fbk)</i> |
| | Not inverted (Ref - Fbk) | 0. | 0 |
| | Inverted (Fbk - Ref) | 1. | 1 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.32 | <i>Set 1 gain</i> | Defines the gain for the process PID controller. See parameter 40.33 Set 1 integration time . | 1.00 |
| | 0.01...100.00 | Gain for PID controller. | 100 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|--|------------|
| 40.33 | <i>Set 1 integration time</i> | <p>Defines the integration time for the process PID controller. This time needs to be set to the same order of magnitude as the reaction time of the process being controlled, otherwise instability will result.</p>  <p>I = controller input (error) O = controller output G = gain T_i = integration time</p> <p>Note: Setting this value to 0 disables the "I" part, turning the PID controller into a PD controller.</p> | 10.0 s |
| | 0.0...9999.0 s | Integration time. | 1 = 1 s |
| 40.34 | <i>Set 1 derivation time</i> | <p>Defines the derivation time of the process PID controller. The derivative component at the controller output is calculated on basis of two consecutive error values (E_{K-1} and E_K) according to the following formula: $PID\ DERIV\ TIME \times (E_K - E_{K-1}) / T_S$, in which $T_S = 2\ ms$ sample time E = Error = Process reference - process feedback.</p> | 0.000 s |
| | 0.000...10.000 s | Derivation time. | 1000 = 1 s |
| 40.35 | <i>Set 1 derivation filter time</i> | <p>Defines the time constant of the 1-pole filter used to smooth the derivative component of the process PID controller.</p>  <p>$O = I \times (1 - e^{-t/T})$</p> <p>$I$ = filter input (step) O = filter output t = time T = filter time constant</p> | 0.0 s |
| | 0.0...10.0 s | Filter time constant. | 10 = 1 s |

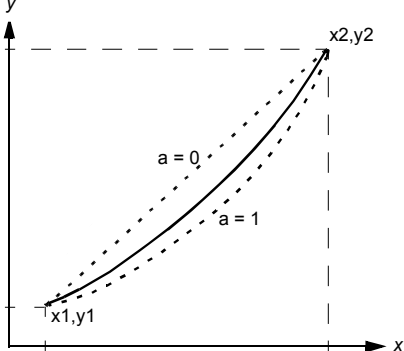
| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------------|---|---------------------|
| 40.36 | <i>Set 1 output min</i> | Defines the minimum limit for the process PID controller output. Using the minimum and maximum limits, it is possible to restrict the operation range. | 0.00 |
| | -200000.00... 200000.00 | Minimum limit for process PID controller output. | 1 = 1 |
| 40.37 | <i>Set 1 output max</i> | Defines the maximum limit for the process PID controller output. See parameter 40.36 Set 1 output min . | 100.00 |
| | -200000.00... 200000.00 | Maximum limit for process PID controller output. | 1 = 1 |
| 40.38 | <i>Set 1 output freeze enable</i> | Freezes (or defines a source that can be used to freeze) the output of the process PID controller, keeping the output at the value it was before freeze was enabled. This feature can be used when, for example, a sensor providing process feedback must to be serviced without stopping the process. 1 = Process PID controller output frozen See also parameter 40.30 Set 1 setpoint freeze enable . | <i>Not selected</i> |
| | Not selected | Process PID controller output not frozen. | 0 |
| | Selected | Process PID controller output frozen. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 21 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 22 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 23 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------|--|------------|
| 40.39 | <i>Set 1 deadband range</i> | Defines a deadband around the setpoint. Whenever process feedback enters the deadband, a delay timer starts. If the feedback remains within the deadband longer than the delay (40.40 <i>Set 1 deadband delay</i>), the PID controller output is frozen. Normal operation resumes after the feedback value leaves the deadband. | 0.0 bar |
| | | | |
| | 0.0.....200000.0 | Deadband range. | 1 = 1 |
| 40.40 | <i>Set 1 deadband delay</i> | Delay for the deadband. See parameter 40.39 <i>Set 1 deadband range</i> . | 0.0 s |
| | 0.0 ... 3600.0 s | Delay for deadband area. | 1 = 1 s |
| 40.43 | <i>Set 1 sleep level</i> | Defines the start limit for the sleep function. If the value is 0.0, set 1 sleep mode is disabled. The sleep function compares PID output (parameter 40.01 <i>Process PID output actual</i>) to the value of this parameter. If PID output remains below this value longer than the sleep delay defined by 40.44 <i>Set 1 sleep delay</i> , the drive enters the sleep mode and stops the motor. | 0.0 |
| | 0.0...200000.0 | Sleep start level. | 1 = 1 |
| 40.44 | <i>Set 1 sleep delay</i> | Defines a delay before the sleep function actually becomes enabled, to prevent nuisance sleeping. The delay timer starts when the sleep mode is enabled by parameter 40.43 <i>Set 1 sleep level</i> , and resets when the sleep mode is disabled. | 60.0 s |
| | 0.0...3600.0 s | Sleep start delay. | 1 = 1 s |
| 40.45 | <i>Set 1 sleep boost time</i> | Defines a boost time for the sleep boost step. See parameter 40.46 <i>Set 1 sleep boost step</i> . | 0.0 s |
| | 0.0...3600.0 s | Sleep boost time. | 1 = 1 s |
| 40.46 | <i>Set 1 sleep boost step</i> | When the drive is entering sleep mode, the process setpoint is increased by this value for the time defined by parameter 40.45 <i>Set 1 sleep boost time</i> . If active, sleep boost is aborted when the drive wakes up. | 0.0 bar |
| | 0.0...200000.0 bar | Sleep boost step. | 1 = 1 bar |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|---|---------------------|
| 40.47 | Set 1 wake-up deviation | Defines the wake-up level as deviation between process setpoint and feedback. When the deviation exceeds the value of this parameter, and remains there for the duration of the wake-up delay (40.48 Set 1 wake-up delay), the drive wakes up. See also parameter 40.31 Set 1 deviation inversion . | 0.00 bar |
| | -200000.00... 200000.00 bar | Wake-up level (as deviation between process setpoint and feedback). | 1 = 1 bar |
| 40.48 | Set 1 wake-up delay | Defines a wake-up delay for the sleep function to prevent nuisance wake-ups. See parameter 40.47 Set 1 wake-up deviation . The delay timer starts when the deviation exceeds the wake-up level (40.47 Set 1 wake-up deviation), and resets if the deviation falls below the wake-up level. | 0.50 s |
| | 0.00...60.00 s | Wake-up delay. | 1 = 1 s |
| 40.49 | Set 1 tracking mode | Activates (or selects a source that activates) tracking mode. In tracking mode, the value selected by parameter 40.50 Set 1 tracking ref selection is substituted for the PID controller output. See also section Tracking (page 132). 1 = Tracking mode enabled | <i>Not selected</i> |
| | Not selected | 0. | 0 |
| | Selected | 1. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 21 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 22 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 23 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.50 | Set 1 tracking ref selection | Selects the value source for tracking mode. See parameter 40.49 Set 1 tracking mode . | <i>Not selected</i> |
| | Not selected | None. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | FB A ref1 | 03.05 FB A reference 1 (see page 279). | 3 |
| | FB A ref2 | 03.06 FB A reference 2 (see page 279). | 4 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---|--|---------------------------|
| 40.57 | PID set1/set2 selection | Selects the source that determines whether process PID parameter set 1 (parameters 40.07...40.50) or set 2 (group 41 Process PID set 2) is used. | PID set 1 |
| | PID set 1 | 0. Process PID parameter set 1 in use. | 0 |
| | PID set 2 | 1. Process PID parameter set 2 in use. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of 34.01 Timed functions status (see page 384). | 18 |
| | Timed function 2 | Bit 1 of 34.01 Timed functions status (see page 384). | 19 |
| | Timed function 3 | Bit 2 of 34.01 Timed functions status (see page 384). | 20 |
| | Supervision 1 | Bit 0 of 32.01 Supervision status (see page 377). | 21 |
| | Supervision 2 | Bit 1 of 32.01 Supervision status (see page 377). | 22 |
| | Supervision 3 | Bit 2 of 32.01 Supervision status (see page 377). | 23 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |
| 40.58 | Set 1 increase prevention | Prevention of PID integration term increase for PID set 1. | No |
| | No | Increase prevention not in use. | 0 |
| | Limiting | The PID integration term is not increased if the maximum value for the PID output is reached. This parameter is valid for the PID set 1. | 1 |
| | Ext PID min lim | The process PID integration term is not increased when the output of the external PID has reached its minimum limit. In this setup, the external PID is used as a source for the process PID. This parameter is valid for the PID set 1. | 2 |
| | Ext PID max lim | The process PID integration term is not increased when the output of the external PID has reached its maximum limit. In this setup, the external PID is used as a source for the process PID. This parameter is valid for the PID set 1. | 3 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |
| 40.59 | Set 1 decrease prevention | Prevention of PID integration term decrease for PID set 1. | No |
| | No | Decrease prevention not in use. | 0 |
| | Limiting | The PID integration term is not decreased if the minimum value for the PID output is reached. This parameter is valid for the PID set 1. | 1 |
| | Ext PID min lim | The process PID integration term is not decreased when the output of the external PID has reached its minimum limit. In this setup, the external PID is used as a source for the process PID. This parameter is valid for the PID set 1. | 2 |
| | Ext PID max lim | The process PID integration term is not decreased when the output of the external PID has reached its maximum limit. In this setup, the external PID is used as a source for the process PID. This parameter is valid for the PID set 1. | 3 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|--|------------|
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.60 | <i>Set 1 PID activation source</i> | Selects a source that enables/disables process PID control. See also parameter 40.07 Process PID operation mode . 0 = Process PID control disabled. 1 = Process PID control enabled. | <i>On</i> |
| | Off | 0. | 0 |
| | On | 1. | 1 |
| | Follow Ext1/Ext2 selection | Process PID control is disabled when external control location EXT1 is active, and enabled when external control location EXT2 is active. See also parameter 19.11 Ext1/Ext2 selection . | 2 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 3 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 4 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 5 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 6 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 7 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 8 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.61 | <i>Setpoint scaling actual</i> | Actual setpoint scaling. See parameter 40.14 Set 1 setpoint scaling . | 50.00 |
| | -200000.00... 200000.00 | Scaling. | 1 = 1 |
| 40.62 | <i>PID internal setpoint actual</i> | Displays the value of the internal setpoint. See control chain diagram PID setpoint compensation on page 265. This parameter is read-only. | - |
| | -200000.00... 200000.00 bar | Process PID internal setpoint. | 1 = 1 bar |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|--------------------|
| 40.70 | <i>Compensated setpoint</i> | <p>Compensated setpoint determined for the input specified by parameter 40.71 Set 1 compensation input source. The determination of the compensated setpoint is based on the curve specified by points (x1, y1), (x2, y2) and the non-linearity of the curve specified with parameters 40.71...40.76. The compensated setpoint curve will be a mixture of a straight line between the points and a squared line between the points:</p>  <p>x = value from 40.71 Set 1 compensation input source y = 40.70 Compensated setpoint a = 40.76 Set 1 compensation non-linearity Compensated setpoint curve = a * squared function + (1 - a) * linear function</p> | - |
| | -21474836.48... 21474835.20 bar | Compensated setpoint value. | 1 = 1 bar |
| 40.71 | <i>Set 1 compensation input source</i> | Selects the source for set 1 compensation input. | <i>AI1 percent</i> |
| | Not selected | None. | 0 |
| | Reserved | | 1 |
| | Internal setpoint | Internal setpoint. See parameter 40.19 Set 1 internal setpoint sel1 . | 2 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 3 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 4 |
| | Reserved | | 5...7 |
| | Motor potentiometer | 22.80 Motor potentiometer ref act (output of the Motor potentiometer). | 8 |
| | Reserved | | 9 |
| | Freq in scaled | 11.39 Freq in 1 scaled value (see page 306). | 10 |
| | AI1 percent | 12.101 AI1 percent value (see page 311) | 11 |
| | AI2 percent | 12.102 AI2 percent value (see page 311) | 12 |
| | Reserved | | 13...14 |
| | FB A ref1 | 03.05 FB A reference 1 (see page 279). | 15 |
| | FB A ref2 | 03.06 FB A reference 2 (see page 279). | 16 |
| | Reserved | | 17...18 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|--|---|---------------------|
| | EFB ref1 | 03.09 EFB reference 1 (see page 280). | 19 |
| | EFB ref2 | 03.10 EFB reference 2 (see page 280). | 20 |
| | Reserved | | 21...23 |
| | Setpoint data storage | 40.92 Setpoint data storage (see page 425) | 24 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.72 | Set 1 compensation input 1 | Point x1 on the setpoint compensation curve, see parameter 40.71 Compensated setpoint . | 0.00 |
| | -200000.00... 200000.00 | Setpoint value. | 1 = 1 |
| 40.73 | Set 1 compensated output 1 | Point y1 (= the compensated output of parameter 40.72 Set 1 compensation input 1) on the setpoint compensation curve, see parameter 40.70 Compensated setpoint . | 0.00 bar |
| | -200000.00... 200000.00 bar | Compensated setpoint value. | 1 = 1 bar |
| 40.74 | Set 1 compensation input 2 | Point x2 on the setpoint compensation curve, see parameter 40.71 Compensated setpoint . | 0.00 |
| | -200000.00... 200000.00 | Setpoint value. | 1 = 1 |
| 40.75 | Set 1 compensated output 2 | Point y2 (= the compensated output of parameter 40.74 Set 1 compensation input 2) on the setpoint compensation curve, see parameter 40.70 Compensated setpoint . | 0.00 bar |
| | -200000.00... 200000.00 bar | Compensated setpoint value. | 1 = 1 bar |
| 40.76 | Set 1 compensation non-linearity | Describes the non-linearity of the setpoint compensation curve, see parameter 40.70 Compensated setpoint . | 0% |
| | 0...100% | Percentage. | 1 = 1 |
| 40.79 | Set 1 units | Unit used for PID set 1. | bar |
| | User text | User editable text. | 0 |
| | % | | 4 |
| | bar | | 74 |
| | kPa | | 75 |
| | Pa | | 77 |
| | psi | | 76 |
| | CFM | | 26 |
| | inH ₂ O | | 58 |
| | °C | | 150 |
| | °F | | 151 |
| | mbar | | 44 |
| | m ³ /h | | 78 |
| | dm ³ /h | | 21 |
| | l/s | | 79 |
| | l/min | | 37 |
| | l/h | | 38 |
| | m ³ /s | | 88 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------------|---|------------------------|
| | m ³ /min | | 40 |
| | km ³ /h | | 131 |
| | gal/s | | 47 |
| | ft ³ /s | | 50 |
| | ft ³ /min | | 51 |
| | ft ³ /h | | 52 |
| | ppm | | 34 |
| | inHg | | 29 |
| | kCFM | | 126 |
| | inWC | | 65 |
| | gpm | | 80 |
| | gal/min | | 48 |
| | in wg | | 59 |
| | MPa | | 94 |
| | ftWC | | 125 |
| 40.80 | <i>Set 1 PID output min source</i> | Selects the source for set 1 PID output minimum. | <i>Set1 output min</i> |
| | None | Not selected. | 0 |
| | Set1 output min | 40.36 Set 1 output min. | 1 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.81 | <i>Set 1 PID output max source</i> | Selects the source for set 1 PID output maximum. | <i>Set1 output max</i> |
| | None | Not selected. | 0 |
| | Set1 output max | 40.37 Set 1 output max | 1 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 40.89 | <i>Set 1 setpoint multiplier</i> | Defines the multiplier with which the result of the function specified by parameter 40.18 Set 1 setpoint function is multiplied. | 1.00 |
| | -200000.00... 200000.00 | Multiplier. | 1 = 1 |
| 40.90 | <i>Set 1 feedback multiplier</i> | Defines the multiplier with which the result of the function specified by parameter 40.10 Set 1 feedback function is multiplied. | 1.00 |
| | -200000.00... 200000.00 | Multiplier. | 1 = 1 |
| 40.91 | <i>Feedback data storage</i> | Storage parameter for receiving a process feedback value, for example, through the embedded fieldbus interface. The value can be sent to the drive as Modbus I/O data. Set the target selection parameter of that particular data (58.101...58.114) to <i>Feedback data storage</i> . In 40.08 Set 1 feedback 1 source (or 40.09 Set 1 feedback 2 source), select <i>Feedback data storage</i> . | 0.00 |
| | -327.68...327.67 | Storage parameter for process feedback. | 100 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|--|------------|
| 40.92 | <i>Setpoint data storage</i> | Storage parameter for receiving a process setpoint value, for example, through the embedded fieldbus interface. The value can be sent to the drive as Modbus I/O data. Set the target selection parameter of that particular data (58.101...58.114) to <i>Setpoint data storage</i> . In 40.16 Set 1 setpoint 1 source (or 40.17 Set 1 setpoint 2 source), select <i>Setpoint data storage</i> . | 0.00 |
| | -327.68...327.67 | Storage parameter for process setpoint. | 100 = 1 |
| 40.96 | <i>Process PID output %</i> | Percentage scaled signal of parameter 40.01 Process PID feedback actual. | 0.00% |
| | -100.00...100.00% | Percentage. | 100 = 1% |
| 40.97 | <i>Process PID feedback %</i> | Percentage scaled signal of parameter 40.02 Process PID feedback actual. | 0.00% |
| | -100.00...100.00% | Percentage. | 100 = 1% |
| 40.98 | <i>Process PID setpoint %</i> | Percentage scaled signal of parameter 40.03 Process PID setpoint actual. | 0.00% |
| | -100.00...100.00% | Percentage. | 100 = 1% |
| 40.99 | <i>Process PID deviation %</i> | Percentage scaled signal of parameter 40.04 Process PID deviation actual. | 0.00% |
| | -100.00...100.00% | Percentage. | 100 = 1% |

| | | | |
|-----------------------------|-------------------------------------|--|---------------------|
| 41 Process PID set 2 | | A second set of parameter values for process PID control. The selection between this set and first set (parameter group 40 Process PID set 1) is made by parameter 40.57 PID set1/set2 selection. See also parameters 40.01...40.06, and control chain diagram <i>PID setpoint compensation</i> on page 265. | |
| 41.08 | <i>Set 2 feedback 1 source</i> | See parameter 40.08 Set 1 feedback 1 source. | <i>AI2 percent</i> |
| 41.09 | <i>Set 2 feedback 2 source</i> | See parameter 40.09 Set 1 feedback 2 source. | <i>Not selected</i> |
| 41.10 | <i>Set 2 feedback function</i> | See parameter 40.10 Set 1 feedback function. | <i>In1</i> |
| 41.11 | <i>Set 2 feedback filter time</i> | See parameter 40.11 Set 1 feedback filter time. | 0.000 s |
| 41.14 | <i>Set 2 setpoint scaling</i> | See parameter 40.14 Set 1 setpoint scaling. | 0.00 |
| 41.15 | <i>Set 2 output scaling</i> | See parameter 40.15 Set 1 output scaling. | 0.00 |
| 41.16 | <i>Set 2 setpoint 1 source</i> | See parameter 40.16 Set 1 setpoint 1 source. | <i>AI1 percent</i> |
| 41.17 | <i>Set 2 setpoint 2 source</i> | See parameter 40.17 Set 1 setpoint 2 source. | <i>Not selected</i> |
| 41.18 | <i>Set 2 setpoint function</i> | See parameter 40.18 Set 1 setpoint function. | <i>In1</i> |
| 41.19 | <i>Set 2 internal setpoint sel1</i> | See parameter 40.19 Set 1 internal setpoint sel1. | <i>Not selected</i> |
| 41.20 | <i>Set 2 internal setpoint sel2</i> | See parameter 40.20 Set 1 internal setpoint sel2. | <i>Not selected</i> |
| 41.21 | <i>Set 2 internal setpoint 1</i> | See parameter 40.21 Set 1 internal setpoint 1. | 0.00 bar |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|--|---------------------------------|
| 41.22 | <i>Set 2 internal setpoint 2</i> | See parameter <i>40.22 Set 1 internal setpoint 2.</i> | 0.00 bar |
| 41.23 | <i>Set 2 internal setpoint 3</i> | See parameter <i>40.23 Set 1 internal setpoint 3.</i> | 0.00 bar |
| 41.24 | <i>Set 2 internal setpoint 0</i> | See parameter <i>40.24 Set 1 internal setpoint 0.</i> | 0.00 bar |
| 41.26 | <i>Set 2 setpoint min</i> | See parameter <i>40.26 Set 1 setpoint min.</i> | 0.00 bar |
| 41.27 | <i>Set 2 setpoint max</i> | See parameter <i>40.27 Set 1 setpoint max.</i> | 200000.00 bar |
| 41.28 | <i>Set 2 setpoint increase time</i> | See parameter <i>40.28 Set 1 setpoint increase time.</i> | 0.0 s |
| 41.29 | <i>Set 2 setpoint decrease time</i> | See parameter <i>40.29 Set 1 setpoint decrease time.</i> | 0.0 s |
| 41.30 | <i>Set 2 setpoint freeze enable</i> | See parameter <i>40.30 Set 1 setpoint freeze enable.</i> | <i>Not selected</i> |
| 41.31 | <i>Set 2 deviation inversion</i> | See parameter <i>40.31 Set 1 deviation inversion.</i> | <i>Not inverted (Ref - Fbk)</i> |
| 41.32 | <i>Set 2 gain</i> | See parameter <i>40.32 Set 1 gain.</i> | 1.00 |
| 41.33 | <i>Set 2 integration time</i> | See parameter <i>40.33 Set 1 integration time.</i> | 60.0 s |
| 41.34 | <i>Set 2 derivation time</i> | See parameter <i>40.34 Set 1 derivation time.</i> | 0.000 s |
| 41.35 | <i>Set 2 derivation filter time</i> | See parameter <i>40.35 Set 1 derivation filter time.</i> | 0.0 s |
| 41.36 | <i>Set 2 output min</i> | See parameter <i>40.36 Set 1 output min.</i> | 0.00 |
| 41.37 | <i>Set 2 output max</i> | See parameter <i>40.37 Set 1 output max.</i> | 100.00 |
| 41.38 | <i>Set 2 output freeze enable</i> | See parameter <i>40.38 Set 1 output freeze enable.</i> | <i>Not selected</i> |
| 41.39 | <i>Set 2 deadband range</i> | See parameter <i>40.39 Set 1 deadband range.</i> | 0.0 bar |
| 41.40 | <i>Set 2 deadband delay</i> | See parameter <i>40.40 Set 1 deadband delay.</i> | 0.0 s |
| 41.43 | <i>Set 2 sleep level</i> | See parameter <i>40.43 Set 1 sleep level.</i> | 0.0 |
| 41.44 | <i>Set 2 sleep delay</i> | See parameter <i>40.44 Set 1 sleep delay.</i> | 60.0 s |
| 41.45 | <i>Set 2 sleep boost time</i> | See parameter <i>40.45 Set 1 sleep boost time.</i> | 0.0 s |
| 41.46 | <i>Set 2 sleep boost step</i> | See parameter <i>40.46 Set 1 sleep boost step.</i> | 0.0 bar |
| 41.47 | <i>Set 2 wake-up deviation</i> | See parameter <i>40.47 Set 1 wake-up deviation.</i> | 0.00 bar |
| 41.48 | <i>Set 2 wake-up delay</i> | See parameter <i>40.48 Set 1 wake-up delay.</i> | 0.50 s |
| 41.49 | <i>Set 2 tracking mode</i> | See parameter <i>40.49 Set 1 tracking mode.</i> | <i>Not selected</i> |
| 41.50 | <i>Set 2 tracking ref selection</i> | See parameter <i>40.50 Set 1 tracking ref selection.</i> | <i>Not selected</i> |
| 41.58 | <i>Set 2 increase prevention</i> | See parameter <i>40.58 Set 1 increase prevention.</i> | <i>No</i> |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---|--|------------------------|
| 41.59 | <i>Set 2 decrease prevention</i> | See parameter <i>40.59 Set 1 decrease prevention</i> . | No |
| 41.60 | <i>Set 2 PID activation source</i> | See parameter <i>40.60 Set 1 PID activation source</i> . | On |
| 41.71 | <i>Set 2 compensation input source</i> | See parameter <i>40.71 Set 1 compensation input source</i> . | AI1 percent |
| 41.72 | <i>Set 2 compensation input 1</i> | See parameter <i>40.72 Set 1 compensation input 1</i> . | 0.00 |
| 41.73 | <i>Set 2 compensated output 1</i> | See parameter <i>40.73 Set 1 compensated output 1</i> . | 0.00 bar |
| 41.74 | <i>Set 2 compensation input 2</i> | See parameter <i>40.74 Set 1 compensation input 2</i> . | 0.00 |
| 41.75 | <i>Set 2 compensated output 2</i> | See parameter <i>40.75 Set 1 compensated output 2</i> . | 0.00 bar |
| 41.76 | <i>Set 2 compensation non-linearity</i> | See parameter <i>40.76 Set 1 compensation non-linearity</i> . | 0% |
| 41.79 | <i>Set 2 units</i> | See parameter <i>40.79 Set 1 units</i> . | bar |
| 41.80 | <i>Set 2 PID output min source</i> | Selects the source for set 2 PID output minimum. | <i>Set2 output min</i> |
| | None | None. | 0 |
| | Set2 output min | <i>41.36 Set 2 output min</i> | 1 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 41.81 | <i>Set 2 PID output max source</i> | Selects the source for set 2 PID output maximum. | <i>Set2 output max</i> |
| | None | None. | 0 |
| | Set2 output max | <i>41.37 Set 2 output max</i> | 1 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 41.89 | <i>Set 2 setpoint multiplier</i> | See parameter <i>40.89 Set 1 setpoint multiplier</i> . | 1.00 |
| 41.90 | <i>Set 2 feedback multiplier</i> | Defines the multiplier k used in formulas of parameter <i>41.10 Set 2 feedback function</i> . See parameter <i>40.90 Set 1 feedback multiplier</i> . | 1.00 |

43 Brake chopper

Settings for the internal brake chopper.

Note: These parameters apply to internal brake chopper only. When using external brake, you must disable brake chopper function by setting parameter *43.06 Brake chopper function* to value *Disabled*.

43.01 Braking resistor temperature

Displays the estimated temperature of the brake resistor, or how close the brake resistor is to being too hot. The value is given in percent where 100% is the eventual temperature the resistor would reach when loaded long enough with its rated maximum load capacity (*43.09 Brake resistor Pmax cont*). The temperature calculation is based on the values of parameters *43.08*, *43.09* and *43.10*, and on the assumption that the resistor is installed as instructed by the manufacturer (ie it cools down as expected). This parameter is read-only.

0.0...120.0%

Estimated brake resistor temperature.

1 = 1%

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|-----------------|
| 43.06 | <i>Brake chopper function</i> | Enables brake chopper control and selects the brake resistor overload protection method (calculation or measurement). Note: Before enabling brake chopper control, ensure that <ul style="list-style-type: none"> a brake resistor is connected overvoltage control is switched off (parameter 30.30 Overvoltage control) the supply voltage range (parameter 95.01 Supply voltage) has been selected correctly. Note: When using external brake chopper, set this parameter to value <i>Disabled</i> . | <i>Disabled</i> |
| | Disabled | Brake chopper control disabled. | 0 |
| | Enabled with thermal model | Brake chopper control enabled with brake resistor protection based on the thermal model. If you select this, you must also specify the values needed by the model, ie, parameters 43.08... 43.12 . See the resistor data sheet. | 1 |
| | Enabled without thermal model | Brake chopper control enabled without resistor overload protection based on the thermal model. This setting can be used, for example, if the resistor is equipped with a thermal switch that is wired to open the main contactor of the drive if the resistor overheats. For more information, see chapter <i>Resistor braking</i> in the <i>Hardware manual</i> of the drive. | 2 |
| | Overvoltage peak protection | Brake chopper control enabled in an overvoltage condition. This setting is intended for situations where <ul style="list-style-type: none"> the braking chopper is not needed for runtime operation, ie, to dissipate the inertial energy of the motor, the motor is able to store a considerable amount magnetic energy in its windings, and the motor might, deliberately or inadvertently, be stopped by coasting. In such a situation, the motor would potentially discharge enough magnetic energy towards the drive to cause damage. To protect the drive, the brake chopper can be used with a small resistor dimensioned merely to handle the magnetic energy (not the inertial energy) of the motor. With this setting, the brake chopper is activated only whenever the DC voltage exceeds the overvoltage limit. During normal use, the brake chopper is not operating. | 3 |
| 43.07 | <i>Brake chopper run enable</i> | Selects the source for quick brake chopper on/off control. 0 = Brake chopper IGBT pulses are cut off 1 = Normal brake chopper IGBT modulation allowed. | <i>On</i> |
| | Off | 0. | 0 |
| | On | 1. | 1 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 43.08 | <i>Brake resistor thermal tc</i> | Defines§ the thermal time constant for the brake resistor thermal model. | 0 s |
| | 0...10000 s | Brake resistor thermal time constant, ie, the rated time to achieve 63% temperature. | 1 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------------|---|---|------------|
| 43.09 | <i>Brake resistor Pmax cont</i> | Defines the maximum continuous load of the brake resistor that will eventually raise the resistor temperature to the maximum allowed value (= continuous heat dissipation capacity of the resistor in kW) but not above it. The value is used in the resistor overload protection based on the thermal model. See parameter 43.06 Brake chopper function and the data sheet of the brake resistor used. | 0.00 kW |
| | 0.00... 10000.00 kW | Maximum continuous load of the brake resistor. | 1 = 1 kW |
| 43.10 | <i>Brake resistance</i> | Defines the resistance value of the brake resistor. The value is used for the brake resistor protection based on the thermal model. See parameter 43.06 Brake chopper function . | 0.0 ohm |
| | 0.0...1000.0 ohm | Brake resistor resistance value. | 1 = 1 ohm |
| 43.11 | <i>Brake resistor fault limit</i> | Selects the fault limit for the brake resistor protection based on the thermal model. See parameter 43.06 Brake chopper function . When the limit is exceeded, the drive trips on fault 7183 BR excess temperature . The value is given in percent of the temperature the resistor reaches when loaded with the power defined by parameter 43.09 Brake resistor Pmax cont . | 105% |
| | 0...150% | Brake resistor temperature fault limit. | 1 = 1% |
| 43.12 | <i>Brake resistor warning limit</i> | Selects the warning limit for the brake resistor protection based on the thermal model. See parameter 43.06 Brake chopper function . When the limit is exceeded, the drive generates warning A793 BR excess temperature . The value is given in percent of the temperature the resistor reaches when loaded with the power defined by parameter 43.09 Brake resistor Pmax cont . | 95% |
| | 0...150% | Brake resistor temperature warning limit. | 1 = 1% |
| 45 Energy efficiency | | Settings for the energy saving calculators as well as peak and energy loggers. See also section Diagnostics menu (page 170). | |
| 45.01 | <i>Saved GW hours</i> | Energy saved in GWh compared to direct-on-line motor connection. This parameter is incremented when 45.02 Saved MW hours rolls over. This parameter is read-only (see parameter 45.21 Energy calculations reset). | - |
| | 0...65535 GWh | Energy savings in GWh. | 1 = 1 GWh |
| 45.02 | <i>Saved MW hours</i> | Energy saved in MWh compared to direct-on-line motor connection. This parameter is incremented when 45.03 Saved kW hours rolls over. When this parameter rolls over, parameter 45.01 Saved GW hours is incremented. This parameter is read-only (see parameter 45.21 Energy calculations reset). | - |
| | 0...999 MWh | Energy savings in MWh. | 1 = 1 MWh |

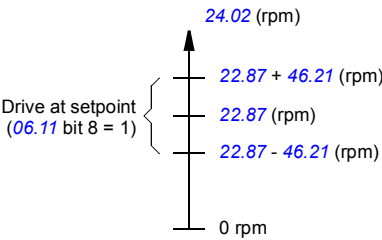
| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|------------|
| 45.03 | <i>Saved kW hours</i> | Energy saved in kWh compared to direct-on-line motor connection. If the internal brake chopper of the drive is enabled, all energy fed by the motor to the drive is assumed to be converted into heat, but the calculation still records savings made by controlling the speed. If the chopper is disabled, then regenerated energy from the motor is also recorded here. When this parameter rolls over, parameter <i>45.02 Saved MW hours</i> is incremented. This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0.0...999.9 kWh | Energy savings in kWh. | 10 = 1 kWh |
| 45.04 | <i>Saved energy</i> | Energy saved in kWh compared to direct-on-line motor connection. If the internal brake chopper of the drive is enabled, all energy fed by the motor to the drive is assumed to be converted into heat. This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0.0...214748352.0 kWh | Energy savings in kWh. | 1 = 1 kWh |
| 45.05 | <i>Saved money x1000</i> | Monetary savings in thousands compared to direct-on-line motor connection. This parameter is incremented when <i>45.06 Saved money</i> rolls over. If you have not set the currency during the first start-up, you can specify it in Main menu > Primary settings > Clock, region display > Units > Currency . This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0...4294967295 thousands (unit x 1000) | Monetary savings in thousands of units. | 1 = 1 unit |
| 45.06 | <i>Saved money</i> | Monetary savings compared to direct-on-line motor connection. This value is a calculated by multiplying the saved energy in kWh by the currently active energy tariff (<i>45.14 Tariff selection</i>). When this parameter rolls over, parameter <i>45.05 Saved money x1000</i> is incremented. If you have not set the currency during the first start-up, you can specify it in Main menu > Primary settings > Clock, region display > Units > Currency . This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0.00...999.99 units | Monetary savings. | 1 = 1 unit |
| 45.07 | <i>Saved amount</i> | Monetary savings compared to direct-on-line motor connection. This value is a calculated by multiplying the saved energy in kWh by the currently active energy tariff (<i>45.14 Tariff selection</i>). If you have not set the currency during the first start-up, you can specify it in Main menu > Primary settings > Clock, region display > Units > Currency . This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0.00...21474830.08 units | Monetary savings. | 1 = 1 unit |

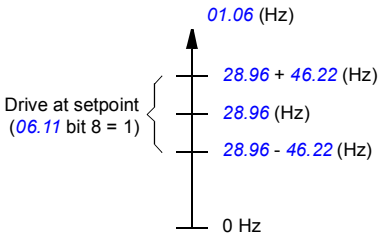
| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------------|--|----------------------|
| 45.08 | <i>CO2 reduction in kilotons</i> | Reduction in CO ₂ emissions in metric kilotons compared to direct-on-line motor connection. This value is incremented when parameter <i>45.09 CO2 reduction in tons</i> rolls over. This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0...65535 metric kilotons | Reduction in CO ₂ emissions in metric kilotons. | 1 = 1 metric kiloton |
| 45.09 | <i>CO2 reduction in tons</i> | Reduction in CO ₂ emissions in metric tons compared to direct-on-line motor connection. This value is calculated by multiplying the saved energy in MWh by the value of parameter <i>45.18 CO2 conversion factor</i> (by default, 0.5 metric tons/MWh). When this parameter rolls over, parameter <i>45.08 CO2 reduction in kilotons</i> is incremented. This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0.0...999.9 metric tons | Reduction in CO ₂ emissions in metric tons. | 1 = 1 metric ton |
| 45.10 | <i>Total saved CO2</i> | Reduction in CO ₂ emissions in metric tons compared to direct-on-line motor connection. This value is calculated by multiplying the saved energy in MWh by the value of parameter <i>45.18 CO2 conversion factor</i> (by default, 0.5 metric tons/MWh). This parameter is read-only (see parameter <i>45.21 Energy calculations reset</i>). | - |
| | 0.0...214748300.8 metric tons | Reduction in CO ₂ emissions in metric tons. | 1 = 1 metric ton |
| 45.11 | <i>Energy optimizer</i> | Enables/disables the energy optimization function. The function optimizes the motor flux so that total energy consumption and motor noise level are reduced when the drive operates below the nominal load. The total efficiency (motor and drive) can be improved by 1...20% depending on load torque and speed. Note: With a permanent magnet motor and a synchronous reluctance motor, energy optimization is always enabled regardless of this parameter. | <i>Disable</i> |
| | Disable | Energy optimization disabled. | 0 |
| | Enable | Energy optimization enabled. | 1 |
| 45.12 | <i>Energy tariff 1</i> | Defines energy tariff 1 (price of energy per kWh). Depending on the setting of parameter <i>45.14 Tariff selection</i> , either this value or <i>45.13 Energy tariff 2</i> is used for reference when monetary savings are calculated. If you have not set the currency during the first start-up, you can specify it in Main menu > Primary settings > Clock, region display > Units > Currency . Note: Tariffs are read only at the instant of selection, and are not applied retroactively. | 0.100 units |
| | 0.000... 4294966.296 units | Energy tariff 1. | - |
| 45.13 | <i>Energy tariff 2</i> | Defines energy tariff 2 (price of energy per kWh). See parameter <i>45.12 Energy tariff 1</i> . | 0.200 units |
| | 0.000... 4294966.296 units | Energy tariff 2. | - |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---|--|---------------------------------|
| 45.14 | <i>Tariff selection</i> | Selects (or defines a source that selects) which pre-defined energy tariff is used. 0 = 45.12 Energy tariff 1 1 = 45.13 Energy tariff 2 | Energy tariff 1 |
| | Energy tariff 1 | 0. | 0 |
| | Energy tariff 2 | 1. | 1 |
| | DI1 | Digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 DI delayed status , bit 5). | 7 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 45.18 | <i>CO₂ conversion factor</i> | Defines a factor for conversion of saved energy into CO ₂ emissions (kg/kWh or tn/MWh). | 0.500 tn/MWh (metric ton) |
| | 0.000...65.535 tn/MWh | Factor for conversion of saved energy into CO ₂ emissions. | 1 = 1 tn/MWh |
| 45.19 | <i>Comparison power</i> | Actual power that the motor absorbs when connected direct-on-line and operating the application. The value is used for reference when energy savings are calculated. Note: The accuracy of the energy savings calculation is directly dependent on the accuracy of this value. If nothing is entered here, then the nominal motor power is used by the calculation, but that may inflate the energy savings reported as many motors do not absorb nameplate power. | 0.75 kW |
| | 0.00...10000000.00 kW | Motor power. | 1 = 1 kW |
| 45.21 | <i>Energy calculations reset</i> | Resets the savings counter parameters 45.01...45.10 . | Done |
| | Done | Reset not requested (normal operation), or reset complete. | 0 |
| | Reset | Reset the savings counter parameters. The value reverts automatically to Done . | 1 |
| 45.24 | <i>Hourly peak power value</i> | Value of the peak power during the last hour, that is, the most recent 60 minutes after the drive has been powered up. The parameter is updated once every 10 minutes unless the hourly peak is found in the most recent 10 minutes. In that case, the values is shown immediately. | 0.00 kW |
| | -3000.00 ... 3000.00 kW | Peak power value. | 10 = 1 kW |
| 45.25 | <i>Hourly peak power time</i> | Time of the peak power value during the last hour. | 00:00:00 |
| | | Time. | N/A |
| 45.26 | <i>Hourly total energy (resettable)</i> | Total energy consumption during the last hour, that is, the most recent 60 minutes. You can reset the value by setting it to zero. | 0.00 kWh |
| | -3000.00 ... 3000.00 kWh | Total energy. | 10 = 1 kWh |



| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|--------------|
| 45.27 | <i>Daily peak power value (resettable)</i> | Value of the peak power since midnight of the present day. You can reset the value by setting it to zero. | 0.00 kW |
| | -3000.00 ... 3000.00 kW | Peak power value. | 10 = 1 kW |
| 45.28 | <i>Daily peak power time</i> | Time of the peak power since midnight of the present day. | 00:00:00 |
| | | Time. | N/A |
| 45.29 | <i>Daily total energy (resettable)</i> | Total energy consumption since midnight of the present day. You can reset the value by setting it to zero. | 0.00 kWh |
| | -30000.00 ... 30000.00 kWh | Total energy. | 1 = 1 kWh |
| 45.30 | <i>Last day total energy</i> | Total energy consumption during the previous day, that is, between midnight of the previous day and midnight of the present day | 0.00 kWh |
| | -30000.00 ... 30000.00 kWh | Total energy. | 1 = 1 kWh |
| 45.31 | <i>Monthly peak power value (resettable)</i> | Value of the peak power during the present month, that is, since midnight of the first day of the present month. You can reset the value by setting it to zero. | 0.00 kW |
| | -3000.00 ... 3000.00 kW | Peak power value. | 10 = 1 kW |
| 45.32 | <i>Monthly peak power date</i> | Date of the peak power during the present month. | 1.1.1980 |
| | | Date. | N/A |
| 45.33 | <i>Monthly peak power time</i> | Time of the peak power during the present month. | 00:00:00 |
| | | Time. | N/A |
| 45.34 | <i>Monthly total energy (resettable)</i> | Total energy consumption from the beginning of the present month. You can reset the value by setting it to zero. | 0.00 kWh |
| | -1000000.00 ... 1000000.00 kWh | Total energy. | 0.01 = 1 kWh |
| 45.35 | <i>Last month total energy</i> | Total energy consumption during the previous month, that is, between midnight of the first day or the previous month and midnight of the first day of the present month. | 0.00 kWh |
| | -1000000.00 ... 1000000.00 kWh | | 0.01 = 1 kWh |
| 45.36 | <i>Lifetime peak power value</i> | Value of the peak power over the drive lifetime. | 0.00 kW |
| | -3000.00 ... 3000.00 kW | Peak power value. | 10 = 1 kW |
| 45.37 | <i>Lifetime peak power date</i> | Date of the peak power over the drive lifetime. | 1.1.1980 |
| | | Date. | N/A |
| 45.38 | <i>Lifetime peak power time</i> | Time of the peak power over the drive lifetime. | 00:00:00 |
| | | Time. | N/A |




| No. | Name/Value | Description | Def/FbEq16 |
|---------------------------------------|---|---|---|
| 46 Monitoring/scaling settings | | Speed supervision settings; actual signal filtering; general scaling settings. | |
| 46.01 | Speed scaling | Defines the maximum speed value used to define the acceleration ramp rate and the initial speed value used to define the deceleration ramp rate (see parameter group 23 Speed reference ramp). The speed acceleration and deceleration ramp times are therefore related to this value (not to parameter 30.12 Maximum speed). Also defines the 16-bit scaling of speed-related parameters. The value of this parameter corresponds to 20000, for example, in fieldbus communication. | 1500.00 rpm; 1800.00 rpm (95.20 b0) |
| | 0.10...30000.00 rpm | Acceleration/deceleration terminal/initial speed. | 1 = 1 rpm |
| 46.02 | Frequency scaling | Defines the maximum frequency value used to define the acceleration ramp rate and the initial frequency value used to define deceleration ramp rate (see parameter group 28 Frequency reference chain). The frequency acceleration and deceleration ramp times are therefore related to this value (not to parameter 30.14 Maximum frequency). Also defines the 16-bit scaling of frequency-related parameters. The value of this parameter corresponds to 20000, for example, in fieldbus communication. | 50.00 Hz; 60.00 Hz (95.20 b0) |
| | 0.10...1000.00 Hz | Acceleration/deceleration terminal/initial frequency. | 10 = 1 Hz |
| 46.03 | Torque scaling | Defines the 16-bit scaling of torque parameters. The value of this parameter (in percent of nominal motor torque) corresponds to 10000, for example, in fieldbus communication. | 100.0% |
| | 0.1...1000.0% | Torque corresponding to 10000 on fieldbus. | 10 = 1% |
| 46.04 | Power scaling | Defines the 16-bit scaling of power parameters. The value of this parameter corresponds to 10000, for example, in fieldbus communication. The unit is selected by parameter 96.16 Unit selection . For 32-bit scaling see parameter 46.43 Power decimals . | 1000.00 kW or hp |
| | 0.10 ... 30000.00 kW or 0.10 ... 40214.48 hp | Power corresponding to 1000 on fieldbus. | 1 = 1 unit |
| 46.05 | Current scaling | Defines the 16-bit scaling of current parameters. The value of this parameter corresponds to 10000, for example, in fieldbus communication. For 32-bit scaling see parameter 46.44 Current decimals . | 10000 A |
| | 0...30000 A | | 1 = 1 A |
| 46.06 | Speed ref zero scaling | Defines a speed corresponding to a zero reference received from fieldbus (either the embedded fieldbus interface, or interface FBA A). For example, with a setting of 500, the fieldbus reference range of 0...20000 would correspond to a speed of 500... [46.01] rpm. Note: This parameter is effective only with the ABB Drives communication profile. | 0.00 rpm |
| | 0.00 ... 30000.00 rpm | Speed corresponding to minimum fieldbus reference. | 1 = 1 rpm |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|--|-----------------------|
| 46.07 | <i>Frequency ref zero scaling</i> | Defines a frequency corresponding to a zero reference received from fieldbus (either the embedded fieldbus interface, or interface FBA). For example, with a setting of 30, the fieldbus reference range of 0...20000 would correspond to a speed of 30...[46.02] Hz. Note: This parameter is effective only with the ABB Drives communication profile. | 0.00 Hz |
| | 0.00 ... 1000.00 Hz | Frequency corresponding to minimum fieldbus reference. | 10 = 1 Hz |
| 46.11 | <i>Filter time motor speed</i> | Defines a filter time for signals <i>01.01 Motor speed used</i> and <i>01.02 Motor speed estimated</i> . | 500 ms |
| | 2...20000 ms | Motor speed signal filter time. | 1 = 1 ms |
| 46.12 | <i>Filter time output frequency</i> | Defines a filter time for signal <i>01.06 Output frequency</i> . | 500 ms |
| | 2...20000 ms | Output frequency signal filter time. | 1 = 1 ms |
| 46.13 | <i>Filter time motor torque</i> | Defines a filter time for signal <i>01.10 Motor torque</i> . | 100 ms |
| | 2...20000 ms | Motor torque signal filter time. | 1 = 1 ms |
| 46.14 | <i>Filter time power</i> | Defines a filter time for signal <i>01.14 Output power</i> . | 100 ms |
| | 2...20000 ms | Output power signal filter time. | 1 = 1 ms |
| 46.21 | <i>At speed hysteresis</i> | Defines the “at setpoint” limits for speed control of the drive. When the difference between reference (<i>22.87 Speed reference act 7</i>) and the speed (<i>24.02 Used speed feedback</i>) is smaller than <i>46.21 At speed hysteresis</i> , the drive is considered to be “at setpoint”. This is indicated by bit 8 of <i>06.11 Main status word</i> .  | 50.00 rpm |
| | 0.00...30000.00 rpm | Limit for “at setpoint” indication in speed control. | See par. <i>46.01</i> |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|---|---|
| 46.22 | <i>At frequency hysteresis</i> | <p>Defines the “at setpoint” limits for frequency control of the drive. When the absolute difference between reference (28.96 <i>Frequency ref ramp input</i>) and actual frequency (01.06 <i>Output frequency</i>) is smaller than 46.22 <i>At frequency hysteresis</i>, the drive is considered to be “at setpoint”. This is indicated by bit 8 of 06.11 <i>Main status word</i>.</p>  | 2.00 Hz |
| | 0.00...1000.00 Hz | Limit for “at setpoint” indication in frequency control. | See par. 46.02 |
| 46.31 | <i>Above speed limit</i> | <p>Defines the trigger level for “above limit” indication in speed control. When actual speed exceeds the limit, bit 10 of 06.17 <i>Drive status word 2</i> is set.</p> <p>This is also indicated by bit 10 in 06.11 <i>Main status word</i>.</p> | 1500.00 rpm; 1800.00 rpm (95.20 b0) |
| | 0.00...30000.00 rpm | “Above limit” indication trigger level for speed control. | See par. 46.01 |
| 46.32 | <i>Above frequency limit</i> | <p>Defines the trigger level for “above limit” indication in frequency control. When actual frequency exceeds the limit, bit 10 of 06.17 <i>Drive status word 2</i> is set.</p> <p>This is also indicated by bit 10 in 06.11 <i>Main status word</i>.</p> | 50.00 Hz; 60.00 Hz (95.20 b0) |
| | 0.00...1000.00 Hz | “Above limit” indication trigger level for frequency control. | See par. 46.02 |
| 46.41 | <i>kWh pulse scaling</i> | Defines the trigger level for the “kWh pulse” on for 50 ms. The output of the pulse is bit 9 of 05.22 <i>Diagnostic word 3</i> . | 1.000 kWh |
| | 0.001... 1000.000 kWh | “kWh pulse” on trigger level. | 1 = 1 kWh |
| 46.43 | <i>Power decimals</i> | <p>Defines the number of decimals shown for parameter 99.10 <i>Motor nominal power</i> on the control panel and Drive composer PC tool. It also defines 32-bit scaling of power parameters.</p> <p>The value of this parameter corresponds to the number of decimals assumed in the 32-bit integer fieldbus communication.</p> <p>For 16-bit scaling, see parameter 46.04 <i>Power scaling</i>.</p> | 2 |
| | 0...3 | Number of decimals. | 1 = 1 |
| 46.44 | <i>Current decimals</i> | <p>Defines the number of decimals shown for parameter 99.06 <i>Motor nominal current</i> on the control panel and Drive composer PC tool. It also defines 32-bit scaling of current parameters.</p> <p>The value of this parameter corresponds to the number of decimals assumed in the 32-bit integer fieldbus communication.</p> <p>For 16-bit scaling, see parameter 46.05 <i>Current scaling</i>.</p> | 1 |
| | 0...3 | Number of decimals. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|------------------------|---------------------------------------|--|------------|
| 47 Data storage | | Data storage parameters that can be written to and read from using other parameters' source and target settings. Note that there are different storage parameters for different data types. See also section Data storage parameters (page 172). | |
| 47.01 | Data storage 1 real32 | Data storage parameter 1. | 0.000 |
| | -2147483.000... 2147483.000 | 32-bit data. | - |
| 47.02 | Data storage 2 real32 | Data storage parameter 2. | 0.000 |
| | -2147483.000... 2147483.000 | 32-bit data. | - |
| 47.03 | Data storage 3 real32 | Data storage parameter 3. | 0.000 |
| | -2147483.000... 2147483.000 | 32-bit data. | - |
| 47.04 | Data storage 4 real32 | Data storage parameter 4. | 0.000 |
| | -2147483.000... 2147483.000 | 32-bit data. | - |
| 47.11 | Data storage 1 int32 | Data storage parameter 9. | 0 |
| | -2147483648... 2147483647 | 32-bit data. | - |
| 47.12 | Data storage 2 int32 | Data storage parameter 10. | 0 |
| | -2147483648... 2147483647 | 32-bit data. | - |
| 47.13 | Data storage 3 int32 | Data storage parameter 11. | 0 |
| | -2147483648... 2147483647 | 32-bit data. | - |
| 47.14 | Data storage 4 int32 | Data storage parameter 12. | 0 |
| | -2147483648... 2147483647 | 32-bit data. | - |
| 47.21 | Data storage 1 int16 | Data storage parameter 17. | 0 |
| | -32768...32767 | 16-bit data. | 1 = 1 |
| 47.22 | Data storage 2 int16 | Data storage parameter 18. | 0 |
| | -32768...32767 | 16-bit data. | 1 = 1 |
| 47.23 | Data storage 3 int16 | Data storage parameter 19. | 0 |
| | -32768...32767 | 16-bit data. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|------------------------------------|----------------------------------|---|------------|
| 47.24 | <i>Data storage 4 int16</i> | Data storage parameter 20. | 0 |
| | -32768...32767 | 16-bit data. | 1 = 1 |
| 49 Panel port communication | | Communication settings for the control panel port on the drive. | |
| 49.01 | <i>Node ID number</i> | Defines the node ID of the drive. All devices connected to the network must have a unique node ID. Note: For networked drives, it is advisable to reserve ID 1 for spare/replacement drives. | 1 |
| | 1...32 | Node ID. | 1 = 1 |
| 49.03 | <i>Baud rate</i> | Defines the transfer rate of the link. | 115.2 kbps |
| | 38.4 kbps | 38.4 kbit/s. | 1 |
| | 57.6 kbps | 57.6 kbit/s. | 2 |
| | 86.4 kbps | 86.4 kbit/s. | 3 |
| | 115.2 kbps | 115.2 kbit/s. | 4 |
| | 230.4 kbps | 230.4 kbit/s. | 5 |
| 49.04 | <i>Communication loss time</i> | Sets a timeout for control panel (or PC tool) communication. If a communication break lasts longer than the timeout, the action specified by parameter 49.05 <i>Communication loss action</i> is taken. | 10.0 s |
| | 0.3...3000.0 s | Control panel/PC tool communication timeout. | 10 = 1 s |
| 49.05 | <i>Communication loss action</i> | Selects how the drive reacts to a control panel (or PC tool) communication break. | Fault |
| | No action | No action taken. | 0 |
| | Fault | Drive trips on fault 7081 <i>Control panel loss</i> . | 1 |
| | Last speed | Drive generates warning <i>A7EE Panel loss</i> and freezes the speed to the level the drive was operating at. The speed is determined on the basis of actual speed using 850 ms low-pass filtering.  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 2 |
| | Speed ref safe | Drive generates warning <i>A7EE Panel loss</i> and sets the speed to the speed defined by parameter 22.41 <i>Speed ref safe</i> (or 28.41 <i>Frequency ref safe</i> when frequency reference is being used).  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 3 |
| 49.06 | <i>Refresh settings</i> | Applies the settings of parameters 49.01...49.05. Note: Refreshing may cause a communication break, so reconnecting the drive may be required. | Done |
| | Done | Refresh done or not requested. | 0 |
| | Configure | Refresh parameters 49.01...49.05. The value reverts automatically to <i>Done</i> . | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------|-------------------------------|---|------------|
| 50 | Fieldbus adapter (FBA) | Fieldbus communication configuration. See also chapter <i>Fieldbus control through a fieldbus adapter</i> (page 239). | |
| 50.01 | FBA A enable | Enables/disables communication between the drive and fieldbus adapter A, and specifies the slot the adapter is installed into. | Disable |
| | Disable | Communication between drive and fieldbus adapter A disabled. | 0 |
| | Enable | Communication between drive and fieldbus adapter A enabled. The adapter is in slot 1. | 1 |
| 50.02 | FBA A comm loss func | Selects how the drive reacts upon a fieldbus communication break. The time delay is defined by parameter 50.03 FBA A comm loss t out. | No action |
| | No action | No action taken. | 0 |
| | Fault | Drive trips on fault 7510 FBA A communication. This only occurs if control is expected from the fieldbus (FBAA selected as source of start/stop/reference in the currently active control location). | 1 |
| | Last speed | Drive generates warning A7C1 FBA A communication and freezes the speed to the level the drive was operating at. This only occurs if control is expected from the fieldbus. The speed is determined on the basis of actual speed using 850 ms low-pass filtering.  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 2 |
| | Speed ref safe | Drive generates warning A7C1 FBA A communication and sets the speed to the value defined by parameter 22.41 Speed ref safe (when speed reference is being used) or 28.41 Frequency ref safe (when frequency reference is being used). This only occurs if control is expected from the fieldbus.  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 3 |
| | Fault always | Drive trips on fault 7510 FBA A communication. This occurs even though no control is expected from the fieldbus. | 4 |
| | Warning | Drive generates warning A7C1 FBA A communication. This only occurs if control is expected from the fieldbus.  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 5 |
| 50.03 | FBA A comm loss t out | Defines the time delay before the action defined by parameter 50.02 FBA A comm loss func is taken. Time count starts when the communication link fails to update the message. Note: There is a 60-second boot-up delay immediately after power-up. During the delay, the communication break monitoring is disabled (but communication itself can be active). | 0.3 s |
| | 0.3...6553.5 s | Time delay. | 1 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | |
|------------------------------------|--------------------|---|------------------------------------|------------------|---------------|-------|-------------------|-----------|---|
| 50.04 | FBA A ref1 type | Selects the type and scaling of reference 1 received from fieldbus adapter A. The scaling of the reference is defined by parameters 46.01...46.04, depending on which reference type is selected by this parameter. | Speed or frequency | | | | | | |
| | Speed or frequency | Type and scaling is chosen automatically according to the currently active operation mode as follows: <table><tr><th>Operation mode (see par. 19.01)</th><th>Reference 1 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table> | Operation mode (see par. 19.01) | Reference 1 type | Speed control | Speed | Frequency control | Frequency | 0 |
| Operation mode (see par. 19.01) | Reference 1 type | | | | | | | | |
| Speed control | Speed | | | | | | | | |
| Frequency control | Frequency | | | | | | | | |
| | Transparent | No scaling is applied (the 16-bit scaling is 1 = 1 unit). | 1 | | | | | | |
| | General | Generic reference with a 16-bit scaling of 100 = 1 (ie. integer and two decimals). | 2 | | | | | | |
| | Speed | The scaling is defined by parameter 46.01 Speed scaling. | 4 | | | | | | |
| | Frequency | The scaling is defined by parameter 46.02 Frequency scaling. | 5 | | | | | | |
| 50.05 | FBA A ref2 type | Selects the type and scaling of reference 2 received from fieldbus adapter A. The scaling of the reference is defined by parameters 46.01...46.04, depending on which reference type is selected by this parameter. | Speed or frequency | | | | | | |
| | Speed or frequency | Type and scaling is chosen automatically according to the currently active operation mode as follows: <table><tr><th>Operation mode (see par. 19.01)</th><th>Reference 2 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table> Select Speed (selection 4) or Frequency (selection 5) manually. | Operation mode (see par. 19.01) | Reference 2 type | Speed control | Speed | Frequency control | Frequency | 0 |
| Operation mode (see par. 19.01) | Reference 2 type | | | | | | | | |
| Speed control | Speed | | | | | | | | |
| Frequency control | Frequency | | | | | | | | |
| | Transparent | No scaling is applied (the 16-bit scaling is 1 = 1 unit). | 1 | | | | | | |
| | General | Generic reference with a 16-bit scaling of 100 = 1 (ie. integer and two decimals). | 2 | | | | | | |
| | Speed | The scaling is defined by parameter 46.01 Speed scaling. | 4 | | | | | | |
| | Frequency | The scaling is defined by parameter 46.02 Frequency scaling. | 5 | | | | | | |
| 50.06 | FBA A SW sel | Selects the source of the Status word to be sent to the fieldbus network through fieldbus adapter A. | Auto | | | | | | |
| | Auto | Source of the Status word is chosen automatically. | 0 | | | | | | |
| | Transparent mode | The source selected by parameter 50.09 FBA A SW transparent source is transmitted as the Status word to the fieldbus network through fieldbus adapter A. | 1 | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | |
|------------------------------------|-----------------------------|---|------------------------------------|---------------------|---------------|-------|-------------------|-----------|---|
| 50.07 | FBA A actual 1 type | Selects the type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter A. The scaling of the value is defined by parameters 46.01...46.04, depending on which actual value type is selected by this parameter. | Speed or frequency | | | | | | |
| | Speed or frequency | Type and scaling is chosen automatically according to the currently active operation mode as follows: <table><tr><th>Operation mode (see par. 19.01)</th><th>Actual value 1 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table> | Operation mode (see par. 19.01) | Actual value 1 type | Speed control | Speed | Frequency control | Frequency | 0 |
| Operation mode (see par. 19.01) | Actual value 1 type | | | | | | | | |
| Speed control | Speed | | | | | | | | |
| Frequency control | Frequency | | | | | | | | |
| | Transparent | The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1. No scaling is applied (the 16-bit scaling is 1 = 1 unit). | 1 | | | | | | |
| | General | The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (ie. integer and two decimals). | 2 | | | | | | |
| | Speed | 01.01 Motor speed used is sent as actual value 1. The scaling is defined by parameter 46.01 Speed scaling. | 4 | | | | | | |
| | Frequency | 01.06 Output frequency is sent as actual value 1. The scaling is defined by parameter 46.02 Frequency scaling. | 5 | | | | | | |
| 50.08 | FBA A actual 2 type | Selects the type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter A. The scaling of the value is defined by parameters 46.01...46.04, depending on which actual value type is selected by this parameter. | Speed or frequency | | | | | | |
| | Speed or frequency | Type and scaling is chosen automatically according to the currently active operation mode as follows: <table><tr><th>Operation mode (see par. 19.01)</th><th>Actual value 2 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table> Select Speed (selection 4) or Frequency (selection 5) manually. | Operation mode (see par. 19.01) | Actual value 2 type | Speed control | Speed | Frequency control | Frequency | 0 |
| Operation mode (see par. 19.01) | Actual value 2 type | | | | | | | | |
| Speed control | Speed | | | | | | | | |
| Frequency control | Frequency | | | | | | | | |
| | Transparent | The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1. No scaling is applied (the 16-bit scaling is 1 = 1 unit). | 1 | | | | | | |
| | General | The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (ie. integer and two decimals). | 2 | | | | | | |
| | Speed | 01.01 Motor speed used is sent as actual value 1. The scaling is defined by parameter 46.01 Speed scaling. | 4 | | | | | | |
| | Frequency | 01.06 Output frequency is sent as actual value 1. The scaling is defined by parameter 46.02 Frequency scaling. | 5 | | | | | | |
| 50.09 | FBA A SW transparent source | Selects the source of the fieldbus status word when parameter 50.06 FBA A SW sel is set to Transparent mode. | Not selected | | | | | | |
| | Not selected | No source selected. | - | | | | | | |
| | Other | Source selection (see Terms and abbreviations on page 272). | - | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------------|--|---------------------|
| 50.10 | <i>FBA A act1 transparent source</i> | When parameter <i>50.07 FBA A actual 1 type</i> is set to <i>Transparent</i> , this parameter selects the source of actual value 1 transmitted to the fieldbus network through fieldbus adapter A. | <i>Not selected</i> |
| | Not selected | No source selected. | - |
| | <i>Other</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 50.11 | <i>FBA A act2 transparent source</i> | When parameter <i>50.08 FBA A actual 2 type</i> is set to <i>Transparent</i> , this parameter selects the source of actual value 2 transmitted to the fieldbus network through fieldbus adapter A. | <i>Not selected</i> |
| | Not selected | No source selected. | - |
| | <i>Other</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 50.12 | <i>FBA A debug mode</i> | This parameter enables debug mode. Displays raw (unmodified) data received from and sent to fieldbus adapter A in parameters <i>50.13...50.18</i> . | <i>Disable</i> |
| | Disable | Debug mode disabled. | 0 |
| | Fast | Debug mode enabled. Cyclical data update is as fast as possible which increases CPU load on the drive. | 1 |
| 50.13 | <i>FBA A control word</i> | Displays the raw (unmodified) control word sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter <i>50.12 FBA A debug mode</i> . This parameter is read-only. | - |
| | 0000000h... FFFFFFFh | Control word sent by master to fieldbus adapter A. | - |
| 50.14 | <i>FBA A reference 1</i> | Displays raw (unmodified) reference REF1 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter <i>50.12 FBA A debug mode</i> . This parameter is read-only. | - |
| | -2147483648... 2147483647 | Raw REF1 sent by master to fieldbus adapter A. | - |
| 50.15 | <i>FBA A reference 2</i> | Displays raw (unmodified) reference REF2 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter <i>50.12 FBA A debug mode</i> . This parameter is read-only. | - |
| | -2147483648... 2147483647 | Raw REF2 sent by master to fieldbus adapter A. | - |
| 50.16 | <i>FBA A status word</i> | Displays the raw (unmodified) status word sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter <i>50.12 FBA A debug mode</i> . This parameter is read-only. | - |
| | 0000000h... FFFFFFFh | Status word sent by fieldbus adapter A to master. | - |
| 50.17 | <i>FBA A actual value 1</i> | Displays raw (unmodified) actual value ACT1 sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter <i>50.12 FBA A debug mode</i> . This parameter is read-only. | - |
| | -2147483648... 2147483647 | Raw ACT1 sent by fieldbus adapter A to master. | - |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------------------|------------------------------|--|-------------|
| 50.18 | <i>FBA A actual value 2</i> | Displays raw (unmodified) actual value ACT2 sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter <i>50.12 FBA A debug mode</i> . This parameter is read-only. | - |
| | -2147483648... 2147483647 | Raw ACT2 sent by fieldbus adapter A to master. | - |
| 51 FBA A settings | | Fieldbus adapter A configuration. | |
| 51.01 | <i>FBA A type</i> | Displays the type of the connected fieldbus adapter module. 0 = None. Module is not found or is not properly connected, or is disabled by parameter <i>50.01 FBA A enable</i> . 1 = PROFIBUS-DP 32 = CANopen 37 = DeviceNet 128 = Ethernet 132 = PROFINet IO 135 = EtherCAT 136 = ETH Pwlink (Ethernet Powerlink) 485 = RS-485 comm 101 = ControlNet 2222 = Ethernet/IP 502 = Modbus/TCP This parameter is read-only. | - |
| 51.02 | <i>FBA A Par2</i> | Parameters <i>51.02...51.26</i> are adapter module-specific. For more information, see the documentation of the fieldbus adapter module. Note that not all of these parameters are necessarily in use. | 0 |
| | 0...65535 | Fieldbus adapter configuration parameter. | 1 = 1 |
| | ... | ... | ... |
| 51.26 | <i>FBA A Par26</i> | See parameter <i>51.02 FBA A Par2</i> . | - |
| | 0...65535 | Fieldbus adapter configuration parameter. | 1 = 1 |
| 51.27 | <i>FBA A par refresh</i> | Validates any changed fieldbus adapter module configuration settings. After refreshing, the value reverts automatically to <i>Done</i> . Note: This parameter cannot be changed while the drive is running. | <i>Done</i> |
| | Done | Refreshing done. | 0 |
| | Configure | Refreshing. | 1 |
| 51.28 | <i>FBA A par table ver</i> | Displays the parameter table revision of the fieldbus adapter module mapping file (stored in the memory of the drive). In format axyz, where ax = major table revision number; yz = minor table revision number. This parameter is read-only. | - |
| | | Parameter table revision of adapter module. | - |
| 51.29 | <i>FBA A drive type code</i> | Displays the drive type code in the fieldbus adapter module mapping file (stored in the memory of the drive). This parameter is read-only. | - |
| | 0...65535 | Drive type code stored in the mapping file. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------|---|-----------------------|
| 51.30 | <i>FBA A mapping file ver</i> | Displays the fieldbus adapter module mapping file revision stored in the memory of the drive in decimal format. This parameter is read-only. | - |
| | 0...65535 | Mapping file revision. | 1 = 1 |
| 51.31 | <i>D2FBA A comm status</i> | Displays the status of the fieldbus adapter module communication | <i>Not configured</i> |
| | Not configured | Adapter is not configured. | 0 |
| | Initializing | Adapter is initializing. | 1 |
| | Time out | A timeout has occurred in the communication between the adapter and the drive. | 2 |
| | Configuration error | Adapter configuration error: mapping file not found in the file system of the drive, or mapping file upload has failed more than three times. | 3 |
| | Off-line | Fieldbus communication is off-line. | 4 |
| | On-line | Fieldbus communication is on-line, or fieldbus adapter has been configured not to detect a communication break. For more information, see the documentation of the fieldbus adapter. | 5 |
| | Reset | Adapter is performing a hardware reset. | 6 |
| 51.32 | <i>FBA A comm SW ver</i> | Displays the common program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number or letter. Example: 190A = revision 1.90A. | |
| | | Common program revision of adapter module. | - |
| 51.33 | <i>FBA A appl SW ver</i> | Displays the application program revision of the adapter module in format axyz, where a = major revision number, xy = minor revision number, z = correction number or letter. Example: 190A = revision 1.90A. | |
| | | Application program version of adapter module. | - |

| | | | |
|-------------------------|------------------------|--|-------------|
| 52 FBA A data in | | Selection of data to be transferred from drive to fieldbus controller through fieldbus adapter A. Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved. | |
| 52.01 | <i>FBA A data in 1</i> | Parameters 52.01...52.12 select data to be transferred from the drive to the fieldbus controller through fieldbus adapter A. | <i>None</i> |
| | None | None. | 0 |
| | CW 16bit | Control Word (16 bits) | 1 |
| | Ref1 16bit | Reference REF1 (16 bits) | 2 |
| | Ref2 16bit | Reference REF2 (16 bits) | 3 |
| | SW 16bit | Status Word (16 bits) | 4 |
| | Act1 16bit | Actual value ACT1 (16 bits) | 5 |
| | Act2 16bit | Actual value ACT2 (16 bits) | 6 |
| | Reserved | | 7...10 |
| | CW 32bit | Control Word (32 bits) | 11 |
| | Ref1 32bit | Reference REF1 (32 bits) | 12 |
| | Ref2 32bit | Reference REF2 (32 bits) | 13 |




| No. | Name/Value | Description | Def/FbEq16 |
|--------------|------------------------|---|-------------|
| | SW 32bit | Status Word (32 bits) | 14 |
| | Act1 32bit | Actual value ACT1 (32 bits) | 15 |
| | Act2 32bit | Actual value ACT2 (32 bits) | 16 |
| | Reserved | | 17...23 |
| | SW2 16bit | Status Word 2 (16 bits) | 24 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| ... | ... | ... | ... |
| 52.12 | FBA A data in12 | See parameter 52.01 FBA A data in1 . | <i>None</i> |

| | | | |
|--------------------------|--|--|-------------|
| 53 FBA A data out | Selection of data to be transferred from fieldbus controller to drive through fieldbus adapter A. Note: 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved. | | |
| 53.01 | FBA A data out1 | Parameters 53.01 ... 53.12 select data to be transferred from the fieldbus controller to the drive through fieldbus adapter A. | <i>None</i> |
| | None | None. | 0 |
| | CW 16bit | Control Word (16 bits) | 1 |
| | Ref1 16bit | Reference REF1 (16 bits) | 2 |
| | Ref2 16bit | Reference REF2 (16 bits) | 3 |
| | Reserved | | 7...10 |
| | CW 32bit | Control Word (32 bits) | 11 |
| | Ref1 32bit | Reference REF1 (32 bits) | 12 |
| | Ref2 32bit | Reference REF2 (32 bits) | 13 |
| | Reserved | | 14...20 |
| | CW2 16bit | Control Word 2 (16 bits) | 21 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| ... | ... | ... | ... |
| 53.12 | FBA A data out12 | See parameter 53.01 FBA A data out1 . | <i>None</i> |

| | | | |
|-----------------------------|---|---|-------------|
| 58 Embedded fieldbus | Configuration of the embedded fieldbus (EFB) interface. See also chapter Fieldbus control through the embedded fieldbus interface (EFB) (page 209). | | |
| 58.01 | Protocol enable | Enables/disables the embedded fieldbus interface and selects the protocol to use. | <i>None</i> |
| | None | None (communication disabled). | 0 |
| | Modbus RTU | Embedded fieldbus interface is enabled and uses the Modbus RTU protocol. | 1 |
| | Reserved | | 2...3 |
| | None / IPC communication | Embedded fieldbus interface is enabled and is used for IPC communication. | 4 |
| 58.02 | Protocol ID | Displays the protocol ID and revision. First 4 bits specify the protocol ID and last 12 bits specify the revision. This parameter is read-only. | - |
| | | Protocol ID and revision. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------|---|---------------------------------------|
| 58.03 | <i>Node address</i> | Defines the node address of the drive on the fieldbus link. Values 1...247 are allowable. Also called Station ID, MAC Address or Device Address. Two devices with the same address are not allowed on-line. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . | 1 |
| | 0...255 | Node address (values 1...247 are allowed). | 1 = 1 |
| 58.04 | <i>Baud rate</i> | Selects the transfer rate of the fieldbus link. When using selection <i>Autodetect</i> , the parity setting of the bus must be known and configured in parameter 58.05 Parity . When parameter 58.04 Baud rate is set to <i>Autodetect</i> , the EFB settings must be refreshed with parameter 58.06 . The bus is monitored for a period of time and the detected baud rate is set as the value of this parameter. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . | Modbus RTU: 19.2 kbps |
| | Autodetect | Baud rate detected automatically. | 0 |
| | 4.8 kbps | 4.8 kbit/s. | 1 |
| | 9.6 kbps | 9.6 kbit/s. | 2 |
| | 19.2 kbps | 19.2 kbit/s. | 3 |
| | 38.4 kbps | 38.4 kbit/s. | 4 |
| | 57.6 kbps | 57.6 kbit/s. | 5 |
| | 76.8 kbps | 76.8 kbit/s. | 6 |
| | 115.2 kbps | 115.2 kbit/s. | 7 |
| 58.05 | <i>Parity</i> | <u>Modbus RTU only:</u> Selects the type of parity bit and number of stop bits. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . | 8 EVEN 1 |
| | 8 NONE 1 | Eight data bits, no parity bit, one stop bit. | 0 |
| | 8 NONE 2 | Eight data bits, no parity bit, two stop bits. | 1 |
| | 8 EVEN 1 | Eight data bits, even parity bit, one stop bit. | 2 |
| | 8 ODD 1 | Eight data bits, odd parity bit, one stop bit. | 3 |
| 58.06 | <i>Communication control</i> | Takes changed EFB settings in use, or activates silent mode. | <i>Enabled</i> |
| | Enabled | Normal operation. | 0 |
| | Refresh settings | Refreshes settings (parameters 58.01...58.05 , 58.14...58.17 , 58.25 , 58.28...58.34) and takes changed EFB configuration settings in use. Reverts automatically to <i>Enabled</i> . | 1 |
| | Silent mode | Activates silent mode (no messages are transmitted). Silent mode can be terminated by activating the <i>Refresh settings</i> selection of this parameter. | 2 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---------------------------|--|------------|-----|------|-------------|---|-------------|-------------------------------|---|-----------------|--|---|-------------|--|---|-------------|--|---|--------------|--|---|--------------|--|---|-----------------|--|---|-----------------|--|---|------------|--|---|---------------------------|---|----|-----------|--|----|-------------|---|----|----------|--|----|------------|---|----|----------|--|----|----------------|---|
| 58.07 | Communication diagnostics | Displays the status of the EFB communication. This parameter is read-only. Note that the name is only visible when the error is present (bit value is 1). | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0</td><td>Init failed</td><td>1 = EFB initialization failed</td></tr><tr><td>1</td><td>Addr config err</td><td>1 = Node address not allowed by protocol</td></tr><tr><td>2</td><td>Silent mode</td><td>1 = Drive not allowed to transmit 0 = Drive allowed to transmit</td></tr><tr><td>3</td><td>Autobauding</td><td>1 = Automatic detection of baud rate is in use (see parameter 58.04)</td></tr><tr><td>4</td><td>Wiring error</td><td>1 = Errors detected (A/B wires possibly swapped)</td></tr><tr><td>5</td><td>Parity error</td><td>1 = Error detected: check parameters 58.04 and 58.05</td></tr><tr><td>6</td><td>Baud rate error</td><td>1 = Error detected: check parameters 58.05 and 58.04</td></tr><tr><td>7</td><td>No bus activity</td><td>1 = 0 bytes received during last 5 seconds</td></tr><tr><td>8</td><td>No packets</td><td>1 = 0 packets (addressed to any device) detected during last 5 seconds</td></tr><tr><td>9</td><td>Noise or addressing error</td><td>1 = Errors detected (interference, or another device with the same address on line)</td></tr><tr><td>10</td><td>Comm loss</td><td>1 = 0 packets addressed to the drive received within timeout (58.16)</td></tr><tr><td>11</td><td>CW/Ref loss</td><td>1 = No control word or references received within timeout (58.16)</td></tr><tr><td>12</td><td>Reserved</td><td></td></tr><tr><td>13</td><td>Protocol 1</td><td>1 = Duplicate ID detected on the network. Used for IPC.</td></tr><tr><td>14</td><td>Reserved</td><td></td></tr><tr><td>15</td><td>Internal error</td><td>1 = Internal error occurred. Contact your local ABB representative.</td></tr></table> | | | | Bit | Name | Description | 0 | Init failed | 1 = EFB initialization failed | 1 | Addr config err | 1 = Node address not allowed by protocol | 2 | Silent mode | 1 = Drive not allowed to transmit 0 = Drive allowed to transmit | 3 | Autobauding | 1 = Automatic detection of baud rate is in use (see parameter 58.04) | 4 | Wiring error | 1 = Errors detected (A/B wires possibly swapped) | 5 | Parity error | 1 = Error detected: check parameters 58.04 and 58.05 | 6 | Baud rate error | 1 = Error detected: check parameters 58.05 and 58.04 | 7 | No bus activity | 1 = 0 bytes received during last 5 seconds | 8 | No packets | 1 = 0 packets (addressed to any device) detected during last 5 seconds | 9 | Noise or addressing error | 1 = Errors detected (interference, or another device with the same address on line) | 10 | Comm loss | 1 = 0 packets addressed to the drive received within timeout (58.16) | 11 | CW/Ref loss | 1 = No control word or references received within timeout (58.16) | 12 | Reserved | | 13 | Protocol 1 | 1 = Duplicate ID detected on the network. Used for IPC. | 14 | Reserved | | 15 | Internal error | 1 = Internal error occurred. Contact your local ABB representative. |
| Bit | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Init failed | 1 = EFB initialization failed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Addr config err | 1 = Node address not allowed by protocol | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Silent mode | 1 = Drive not allowed to transmit 0 = Drive allowed to transmit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Autobauding | 1 = Automatic detection of baud rate is in use (see parameter 58.04) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Wiring error | 1 = Errors detected (A/B wires possibly swapped) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Parity error | 1 = Error detected: check parameters 58.04 and 58.05 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Baud rate error | 1 = Error detected: check parameters 58.05 and 58.04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | No bus activity | 1 = 0 bytes received during last 5 seconds | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | No packets | 1 = 0 packets (addressed to any device) detected during last 5 seconds | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Noise or addressing error | 1 = Errors detected (interference, or another device with the same address on line) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Comm loss | 1 = 0 packets addressed to the drive received within timeout (58.16) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | CW/Ref loss | 1 = No control word or references received within timeout (58.16) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Protocol 1 | 1 = Duplicate ID detected on the network. Used for IPC. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | Internal error | 1 = Internal error occurred. Contact your local ABB representative. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | EFB communication status. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 58.08 | Received packets | Displays a count of valid packets addressed to the drive. During normal operation, this number increases constantly. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0...4294967295 | | Number of received packets addressed to the drive. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 58.09 | Transmitted packets | Displays a count of valid packets transmitted by the drive. During normal operation, this number increases constantly. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0...4294967295 | | Number of transmitted packets. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 58.10 | All packets | Displays a count of valid packets addressed to any device on the bus. During normal operation, this number increases constantly. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0...4294967295 | | Number of all received packets. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |


| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------|--|------------|
| 58.11 | UART errors | Displays a count of character errors received by the drive. An increasing count indicates a configuration problem on the bus. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 0 |
| | 0...4294967295 | Number of UART errors. | 1 = 1 |
| 58.12 | CRC errors | Displays a count of packets with a CRC error received by the drive. An increasing count indicates interference on the bus. Can be reset from the control panel by pressing the Reset softkey for 3 seconds. | 0 |
| | 0...4294967295 | Number of CRC errors. | 1 = 1 |
| 58.14 | Communication loss action | Selects how the drive reacts to an EFB communication break. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings). See also parameters 58.15 Communication loss mode and 58.16 Communication loss time. | No action |
| | No action | No action taken (monitoring disabled). | 0 |
| | Fault | Drive monitors communication loss when start/stop is expected from the EFB on the currently active control location. The drive trips on fault 6681 EFB comm loss if control in the currently active control location is expected from the EFB or reference is coming from the EFB, and the communication is lost. | 1 |
| | Last speed | Drive generates warning A7CE EFB comm loss and freezes the speed to the level the drive was operating at. The speed is determined on the basis of actual speed using 850 ms low-pass filtering. This occurs if control or reference is expected from the EFB.  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 2 |
| | Speed ref safe | Drive generates warning A7CE EFB comm loss and sets the speed to the speed defined by parameter 22.41 Speed ref safe (or 28.41 Frequency ref safe when frequency reference is being used). This occurs if control or reference is expected from the EFB.  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 3 |
| | Fault always | Drive continuously monitors for communication loss. Drive trips on fault 6681 EFB comm loss. This happens even though the drive is in a control location where the EFB start/stop or reference is not used. | 4 |
| | Warning | Drive generates warning A7CE EFB comm loss. This occurs even though no control is expected from the EFB.  WARNING! Make sure that it is safe to continue operation in case of a communication break. | 5 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|--|-------------------------|
| 58.15 | <i>Communication loss mode</i> | Defines which message types reset the timeout counter for detecting an EFB communication loss. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . See also parameters 58.14 Communication loss action and 58.16 Communication loss time . | <i>Cw / Ref1 / Ref2</i> |
| | Any message | Any message addressed to the drive resets the timeout. | 1 |
| | Cw / Ref1 / Ref2 | A write of the control word or a reference resets the timeout. | 2 |
| 58.16 | <i>Communication loss time</i> | Sets a timeout for EFB communication. If a communication break lasts longer than the timeout, the action specified by parameter 58.14 Communication loss action is taken. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . See also parameter 58.15 Communication loss mode . Note: There is a 30-second boot-up delay immediately after power-up. | 10.0 s |
| | 0.0...6000.0 s | EFB communication timeout. | 1 = 1 |
| 58.17 | <i>Transmit delay</i> | <u>Modbus RTU only:</u> Defines a minimum response delay in addition to any fixed delay imposed by the protocol. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . | 0 ms |
| | 0...65535 ms | Minimum response delay. | 1 = 1 |
| 58.18 | <i>EFB control word</i> | <u>Modbus RTU only:</u> Displays the raw (unmodified) control word sent by the Modbus controller to the drive. For debugging purposes. This parameter is read-only. | - |
| | 00000000h... FFFFFFFFh | Control word sent by Modbus controller to the drive. | 1 = 1 |
| 58.19 | <i>EFB status word</i> | <u>Modbus RTU only:</u> Displays the raw (unmodified) status word for debugging purposes. This parameter is read-only. | - |
| | 00000000h... FFFFFFFFh | Status word sent by the drive to the Modbus controller. | 1 = 1 |
| 58.25 | <i>Control profile</i> | <u>Modbus RTU only:</u> Defines the communication profile used by the Modbus protocol. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . See section About the control profiles on page 217. | <i>ABB Drives</i> |
| | ABB Drives | ABB Drives control profile (with a 16-bit control word) | 0 |
| | DCU Profile | DCU control profile (with a 16 or 32-bit control word) | 5 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | |
|--|------------------------------------|--|--|------------------|---------------|--------------|-------------------|------------------|---|
| 58.26 | <i>EFB ref1 type</i> | <u>Modbus RTU only</u> : Selects the type and scaling of reference 1 received through the embedded fieldbus interface. The scaled reference is displayed by <i>03.09 EFB reference 1</i> . | <i>Speed or frequency</i> | | | | | | |
| | Speed or frequency | Type and scaling is chosen automatically according to the currently active operation mode as follows. <table><tr><th>Operation mode (see par. <i>19.01</i>)</th><th>Reference 1 type</th></tr><tr><td>Speed control</td><td><i>Speed</i></td></tr><tr><td>Frequency control</td><td><i>Frequency</i></td></tr></table> | Operation mode (see par. <i>19.01</i>) | Reference 1 type | Speed control | <i>Speed</i> | Frequency control | <i>Frequency</i> | 0 |
| Operation mode (see par. <i>19.01</i>) | Reference 1 type | | | | | | | | |
| Speed control | <i>Speed</i> | | | | | | | | |
| Frequency control | <i>Frequency</i> | | | | | | | | |
| | Transparent | No scaling is applied. | 1 | | | | | | |
| | General | Generic reference without a specific unit. Scaling: 1 = 100. | 2 | | | | | | |
| | Speed | Speed reference. The scaling is defined by parameter <i>46.01 Speed scaling</i> . | 4 | | | | | | |
| | Frequency | Frequency reference. The scaling is defined by parameter <i>46.02 Frequency scaling</i> . | 5 | | | | | | |
| 58.27 | <i>EFB ref2 type</i> | <u>Modbus RTU only</u> : Selects the type and scaling of reference 2 received through the embedded fieldbus interface. The scaled reference is displayed by <i>03.10 EFB reference 2</i> . | <i>Speed or frequency</i> | | | | | | |
| 58.28 | <i>EFB act1 type</i> | <u>Modbus RTU only</u> : Selects the type of actual value 1. | <i>Speed or frequency</i> | | | | | | |
| | Speed or frequency | Type and scaling is chosen automatically according to the currently active operation mode as follows. <table><tr><th>Operation mode (see par. <i>19.01</i>)</th><th>Actual 1 type</th></tr><tr><td>Speed control</td><td><i>Speed</i></td></tr><tr><td>Frequency control</td><td><i>Frequency</i></td></tr></table> | Operation mode (see par. <i>19.01</i>) | Actual 1 type | Speed control | <i>Speed</i> | Frequency control | <i>Frequency</i> | 0 |
| Operation mode (see par. <i>19.01</i>) | Actual 1 type | | | | | | | | |
| Speed control | <i>Speed</i> | | | | | | | | |
| Frequency control | <i>Frequency</i> | | | | | | | | |
| | Transparent | No scaling is applied. | 1 | | | | | | |
| | General | Generic reference without a specific unit. Scaling: 1 = 100. | 2 | | | | | | |
| | Speed | Scaling is defined by parameter <i>46.01 Speed scaling</i> . | 4 | | | | | | |
| | Frequency | Scaling is defined by parameter <i>46.02 Frequency scaling</i> . | 5 | | | | | | |
| 58.29 | <i>EFB act2 type</i> | <u>Modbus RTU only</u> : Selects the type of actual value 2. For the selections, see parameter <i>58.28 EFB act1 type</i> . | <i>Transparent</i> | | | | | | |
| 58.31 | <i>EFB act1 transparent source</i> | <u>Modbus RTU only</u> : Selects the source of actual value 1 when parameter <i>58.28 EFB act1 type</i> is set to <i>Transparent</i> . | <i>Not selected</i> | | | | | | |
| | Not selected | None. | 0 | | | | | | |
| | <i>Other</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - | | | | | | |
| 58.32 | <i>EFB act2 transparent source</i> | <u>Modbus RTU</u> : Selects the source of actual value 2 when parameter <i>58.29 EFB act2 type</i> is set to <i>Transparent</i> . | <i>Not selected</i> | | | | | | |
| | Not selected | None. | 0 | | | | | | |
| | <i>Other</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|-----------------|--|------------|
| 58.33 | Addressing mode | <u>Modbus RTU only</u> : Defines the mapping between parameters and holding registers in the 400101...465535 Modbus register range. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . | Mode 0 |
| | Mode 0 | <u>16-bit values (groups 1...99, indexes 1...99)</u> : Register address = 400000 + 100 × parameter group + parameter index. For example, parameter 22.80 would be mapped to register 400000 + 2200 + 80 = 402280. <u>32-bit values (groups 1...99, indexes 1...99)</u> : Register address = 420000 + 200 × parameter group + 2 × parameter index. For example, parameter 22.80 would be mapped to register 420000 + 4400 + 160 = 424560. | 0 |
| | Mode 1 | <u>16-bit values (groups 1...255, indexes 1...255)</u> : Register address = 400000 + 256 × parameter group + parameter index. For example, parameter 22.80 would be mapped to register 400000 + 5632 + 80 = 405712. | 1 |
| | Mode 2 | <u>32-bit values (groups 1...127, indexes 1...255)</u> : Register address = 400000 + 512 × parameter group + 2 × parameter index. For example, parameter 22.80 would be mapped to register 400000 + 11264 + 160 = 411424. | 2 |
| 58.34 | Word order | <u>Modbus RTU only</u> : Selects in which order 16-bit registers of 32-bit parameters are transferred. For each register, the first byte contains the high order byte and the second byte contains the low order byte. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings) . | LO-HI |
| | HI-LO | The first register contains the high order word, the second contains the low order word. | 0 |
| | LO-HI | The first register contains the low order word, the second contains the high order word. | 1 |
| 58.101 | Data I/O 1 | <u>Modbus RTU only</u> : Defines the address in the drive which the Modbus master accesses when it reads from or writes to the register address corresponding to Modbus register 1 (400001). The master defines the type of the data (input or output). The value is transmitted in a Modbus frame consisting of two 16-bit words. If the value is 16-bit, it is transmitted in the LSW (least significant word). If the value is 32-bit, the subsequent parameter is also reserved for it and must be set to <i>None</i> . | CW 16bit |
| | None | No mapping, register is always zero. | 0 |
| | CW 16bit | ABB Drives profile: 16-bit ABB drives control word; DCU Profile : lower 16 bits of the DCU control word | 1 |
| | Ref1 16bit | Reference REF1 (16 bits) | 2 |
| | Ref2 16bit | Reference REF2 (16 bits) | 3 |
| | SW 16bit | ABB Drives profile: 16-bit ABB drives status word; DCU Profile : lower 16 bits of the DCU status word | 4 |
| | Act1 16bit | Actual value ACT1 (16 bits) | 5 |
| | Act2 16bit | Actual value ACT2 aka(16 bits) | 6 |
| | Reserved | | 7...10 |
| | CW 32bit | Control Word (32 bits) | 11 |

| No. | Name/Value | Description | Def/FbEq16 |
|---------------|-----------------------|---|-------------------|
| | Ref1 32bit | Reference REF1 (32 bits) | 12 |
| | Ref2 32bit | Reference REF2 (32 bits) | 13 |
| | SW 32bit | Status Word (32 bits) | 14 |
| | Act1 32bit | Actual value ACT1 (32 bits) | 15 |
| | Act2 32bit | Actual value ACT2 (32 bits) | 16 |
| | Reserved | | 17...20 |
| | CW2 16bit | <i>ABB Drives</i> profile: not used; <i>DCU Profile</i> : upper 16 bits of the DCU control word | 21 |
| | SW2 16bit | <i>ABB Drives</i> profile: not used / always zero; <i>DCU Profile</i> : upper 16 bits of the DCU status word | 24 |
| | Reserved | | 25...30 |
| | RO/DIO control word | Parameter <i>10.99 RO/DIO control word</i> . | 31 |
| | AO1 data storage | Parameter <i>13.91 AO1 data storage</i> . | 32 |
| | AO2 data storage | Parameter <i>13.92 AO2 data storage</i> . | 33 |
| | Reserved | | 34...39 |
| | Feedback data storage | Parameter <i>40.91 Feedback data storage</i> . | 40 |
| | Setpoint data storage | Parameter <i>40.92 Setpoint data storage</i> . | 41 |
| | <i>Other</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| <i>58.102</i> | <i>Data I/O 2</i> | <u>Modbus RTU only</u> : Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 400002. For the selections, see parameter <i>58.101 Data I/O 1</i> . | <i>Ref1 16bit</i> |
| <i>58.103</i> | <i>Data I/O 3</i> | <u>Modbus RTU only</u> : Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 400003. For the selections, see parameter <i>58.101 Data I/O 1</i> . | <i>Ref2 16bit</i> |
| <i>58.104</i> | <i>Data I/O 4</i> | <u>Modbus RTU only</u> : Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 400004. For the selections, see parameter <i>58.101 Data I/O 1</i> . | <i>SW 16bit</i> |
| <i>58.105</i> | <i>Data I/O 5</i> | <u>Modbus RTU only</u> : Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 400005. For the selections, see parameter <i>58.101 Data I/O 1</i> . | <i>Act1 16bit</i> |
| <i>58.106</i> | <i>Data I/O 6</i> | <u>Modbus RTU only</u> : Defines the address in the drive which the Modbus master accesses when it reads from or writes to register address 400006. For the selections, see parameter <i>58.101 Data I/O 1</i> . | <i>Act2 16bit</i> |
| <i>58.107</i> | <i>Data I/O 7</i> | <u>Modbus RTU only</u> : Parameter selector for Modbus register address 400007. For the selections, see parameter <i>58.101 Data I/O 1</i> . | <i>None</i> |
| ... | ... | ... | ... |
| <i>58.114</i> | <i>Data I/O 14</i> | <u>Modbus RTU only</u> : Parameter selector for Modbus register address 400014. For the selections, see parameter <i>58.101 Data I/O 1</i> . | <i>None</i> |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------------------------------|--|---|-----------------------|
| 60 DDCS communication | | DCS communication configuration. (Only visible for ACQ580-31 and ACQ580-34). The DDCS protocol is used in the communication between the drive (or more precisely, an inverter unit) and the supply unit of the drive system. See section Control of a line supply unit (LSU) (page 93). The communication utilizes the internal communication channel between the inverter unit (INU) and the supply unit (LSU). | |
| 60.71 | INU-LSU communication port | Selects the DDCS channel used for connecting to another converter (such as a supply unit). The selections available, as well as the default, depend on drive hardware. See also section Control of a line supply unit (LSU) (page 93). | see text |
| | Not in use | None (communication disabled). | 0 |
| | DDCS via BC | Connector X201. | 15 |
| 60.78 | INU-LSU comm loss timeout | Sets a timeout for communication with another converter (such as the supply unit). If a communication break lasts longer than the timeout, the action specified by parameter 60.79 INU-LSU comm loss function is taken. | 100 ms |
| | 0...65535 ms | Timeout for communication between converters. | |
| 60.79 | INU-LSU comm loss function | Selects how the inverter unit reacts to a communication break between the inverter unit and the other converter (typically the supply unit).  WARNING! With settings other than Fault , the inverter unit will continue operating based on the status information that was last received from the other converter. Make sure this does not cause danger. | Fault |
| | No action | No action taken. | 0 |
| | Warning | Drive generates warning AF80 INU-LSU comm loss . | 1 |
| | Fault | Drive trips on fault 7580 INU-LSU comm loss . | 2 |
| 61 D2D and DDCS transmit data | | Defines the data sent to the DDCS link. (Only visible for ACQ580-31 and ACQ580-34). See also parameter group 60 DDCS communication . | |
| 61.201 | INU-LSU data set 10 data 1 value | Displays (in integer format) the data to be sent to the other converter as word 1 of data set 10. | 0 |
| | 0...65535 | Data to be sent as word 1 of data set 10. | |
| 61.202 | INU-LSU data set 10 data 2 value | Displays (in integer format) the data to be sent to the other converter as word 2 of data set 10. | 0 |
| | 0...65535 | Data to be sent as word 2 of data set 10. | |
| 61.203 | INU-LSU data set 10 data 3 value | Displays (in integer format) the data to be sent to the other converter as word 3 of data set 10. | 0 |
| | 0...65535 | Data to be sent as word 3 of data set 10. | |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|-------------|-----|------|-------|---|------------|---------------------------------|---|----------|--|---|---------------|--|-------|----------|--|---|-------------------|---|---|------------------|---|---|-----------------|-------------------------|---------|----------|--|----|--------------------------|--|---------|----------|--|
| 62 D2D and DDCS receive data | | Defines the data sent to the DDCS link. (Only visible for ACQ580-31 and ACQ580-34). See also parameter group 60 DDCS communication . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 62.201 | INU-LSU data set 11 data 1 value | Displays (in integer format) the data to be sent to the other converter as word 1 of data set 10. | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0...65535 | Data to be sent as word 1 of data set 10. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71 External PID1 | | Configuration of external PID. See control chain diagrams External PID setpoint and feedback source selection , and External PID controller on pages 268 and 269 , respectively. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.01 | External PID act value | See parameter 40.01 Process PID output actual . | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.02 | Feedback act value | See parameter 40.02 Process PID feedback actual . | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.03 | Setpoint act value | See parameter 40.03 Process PID setpoint actual . | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.04 | Deviation act value | See parameter 40.04 Process PID deviation actual . | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.06 | PID status word | Displays status information on process external PID control. This parameter is read-only. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>PID active</td><td>1 = Process PID control active.</td></tr><tr><td>1</td><td>Reserved</td><td></td></tr><tr><td>2</td><td>Output frozen</td><td>1 = Process PID controller output frozen. Bit is set if parameter 71.38 Output freeze enable is TRUE, or the deadband function is active (bit 9 is set).</td></tr><tr><td>3...6</td><td>Reserved</td><td></td></tr><tr><td>7</td><td>Output limit high</td><td>1 = PID output is being limited by par. 71.37.</td></tr><tr><td>8</td><td>Output limit low</td><td>1 = PID output is being limited by par. 71.36.</td></tr><tr><td>9</td><td>Deadband active</td><td>1 = Deadband is active.</td></tr><tr><td>10...11</td><td>Reserved</td><td></td></tr><tr><td>12</td><td>Internal setpoint active</td><td>1 = Internal setpoint active (see par. 71.16...71.23)</td></tr><tr><td>13...15</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Value | 0 | PID active | 1 = Process PID control active. | 1 | Reserved | | 2 | Output frozen | 1 = Process PID controller output frozen. Bit is set if parameter 71.38 Output freeze enable is TRUE, or the deadband function is active (bit 9 is set). | 3...6 | Reserved | | 7 | Output limit high | 1 = PID output is being limited by par. 71.37 . | 8 | Output limit low | 1 = PID output is being limited by par. 71.36 . | 9 | Deadband active | 1 = Deadband is active. | 10...11 | Reserved | | 12 | Internal setpoint active | 1 = Internal setpoint active (see par. 71.16...71.23) | 13...15 | Reserved | |
| Bit | Name | Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | PID active | 1 = Process PID control active. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Output frozen | 1 = Process PID controller output frozen. Bit is set if parameter 71.38 Output freeze enable is TRUE, or the deadband function is active (bit 9 is set). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3...6 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Output limit high | 1 = PID output is being limited by par. 71.37 . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Output limit low | 1 = PID output is being limited by par. 71.36 . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Deadband active | 1 = Deadband is active. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10...11 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Internal setpoint active | 1 = Internal setpoint active (see par. 71.16...71.23) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13...15 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0000h...FFFFh | Process PID control status word. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.07 | PID operation mode | See parameter 40.07 Process PID operation mode . | Off | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.08 | Feedback 1 source | See parameter 40.08 Set 1 feedback 1 source . | A/2 percent | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.11 | Feedback filter time | See parameter 40.11 Set 1 feedback filter time . | 0.000 s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71.14 | Setpoint scaling | Defines, together with parameter 71.15 Output scaling , a general scaling factor for the external PID control chain. The scaling can be utilized when, for example, the process setpoint is input in Hz, and the output of the PID controller is used as an rpm value in speed control. In this case, this parameter might be set to 50, and parameter 71.15 to the nominal motor speed at 50 Hz. In effect, the output of the PID controller [71.15] when deviation (setpoint - feedback) = [71.14] and [71.32] = 1. Note: The scaling is based on the ratio between 71.14 and 71.15 . For example, the values 50 and 1500 would produce the same scaling as 1 and 3. | 1500.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------------|---|---------------------------------|
| | -200000.00... 200000.0 | Process setpoint base. | 1 = 1 |
| 71.15 | <i>Output scaling</i> | See parameter <i>71.14 Setpoint scaling</i> . | 1500.00 |
| | -200000.00... 200000.0 | Process PID controller output base. | 1 = 1 |
| 71.16 | <i>Setpoint 1 source</i> | See parameter <i>40.16 Set 1 setpoint 1 source</i> . | <i>Al1 percent</i> |
| 71.19 | <i>Internal setpoint sel1</i> | See parameter <i>40.19 Set 1 internal setpoint sel1</i> . | <i>Not selected</i> |
| 71.20 | <i>Internal setpoint sel2</i> | See parameter <i>40.20 Set 1 internal setpoint sel2</i> . | <i>Not selected</i> |
| 71.21 | <i>Internal setpoint 1</i> | See parameter <i>40.21 Set 1 internal setpoint 1</i> . | 0.00% |
| 71.22 | <i>Internal setpoint 2</i> | See parameter <i>40.22 Set 1 internal setpoint 2</i> . | 0.00% |
| 71.23 | <i>Internal setpoint 3</i> | See parameter <i>40.23 Set 1 internal setpoint 3</i> . | 0.00% |
| 71.26 | <i>Setpoint min</i> | See parameter <i>40.26 Set 1 setpoint min</i> . | 0.00% |
| 71.27 | <i>Setpoint max</i> | See parameter <i>40.27 Set 1 setpoint max</i> . | 200000.00% |
| 71.31 | <i>Deviation inversion</i> | See parameter <i>40.31 Set 1 deviation inversion</i> . | <i>Not inverted (Ref - Fbk)</i> |
| 71.32 | <i>Gain</i> | See parameter <i>40.32 Set 1 gain</i> . | 1.00 |
| 71.33 | <i>Integration time</i> | See parameter <i>40.33 Set 1 integration time</i> . | 60.0 s |
| 71.34 | <i>Derivation time</i> | See parameter <i>40.34 Set 1 derivation time</i> . | 0.000 s |
| 71.35 | <i>Derivation filter time</i> | See parameter <i>40.35 Set 1 derivation filter time</i> . | 0.0 s |
| 71.36 | <i>Output min</i> | See parameter <i>40.36 Set 1 output min</i> . | -200000.00% |
| 71.37 | <i>Output max</i> | See parameter <i>40.37 Set 1 output max</i> . | 200000.00% |
| 71.38 | <i>Output freeze enable</i> | See parameter <i>40.38 Set 1 output freeze enable</i> . | <i>Not selected</i> |
| 71.39 | <i>Deadband range</i> | The control program compares the absolute value of parameter <i>71.04 Deviation act value</i> to the deadband range defined by this parameter. If the absolute value is within the deadband range for the time period defined by parameter <i>71.40 Deadband delay</i> , PID's deadband mode is activated and <i>71.06 PID status word</i> bit 9 <i>Deadband active</i> is set. Then PID's output is frozen and <i>71.06 PID status word</i> bit 2 <i>Output frozen</i> is set. If the absolute value is equal or greater than the deadband range, PID's deadband mode is deactivated. | 0.0% |
| | 0.0...200000.0 | Range | 1 = 1 |
| 71.40 | <i>Deadband delay</i> | Defines the deadband delay for the deadband function. See parameter <i>71.39 Deadband range</i> . | 0.0 s |
| | 0.0...3600.0 s | Delay | 1 = 1 s |
| 71.58 | <i>Increase prevention</i> | See parameter <i>40.58 Set 1 increase prevention</i> . | <i>No</i> |
| 71.59 | <i>Decrease prevention</i> | See parameter <i>40.59 Set 1 decrease prevention</i> . | <i>No</i> |
| 71.62 | <i>Internal setpoint actual</i> | See parameter <i>40.62 PID internal setpoint actual</i> . | 0.00% |
| 71.79 | <i>External PID units</i> | Unit used for external PID. | % |
| | | See parameter <i>40.79 Set 1 units</i> . | |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------------------|--|--------------|-----|------|-------|---|---------------|---------------------|---|---------------|---------------------|---|---------------|---------------------|---|---------------|---------------------|---|---------------|---------------------|---|---------------|---------------------|--------|----------|--|
| 76 Multipump configuration | | Multipump configuration parameters. See sections Energy efficiency on page 163, Energy efficiency on page 163 and on page 113. Notes: <ul style="list-style-type: none">Parameters are dynamically hidden based on selection of pumping mode (76.21 Multipump configuration) and number of motors (76.25 Number of motors).Multipump is supported only with option +N845 and software version 2.01.100.12. | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76.01 | PFC status | Displays the running/stopped status of the PFC motors. PFC1, PFC2, PFC3, PFC4, PFC5 and PFC6 always correspond to the 1st...46th motor of the PFC system. If 76.74 Autochange auxiliary PFC auxiliary PFC is set to Aux motors only , PFC1 represents the motor connected to the drive and PFC2 the first auxiliary motor (the 2nd motor of the system). If 76.74 is set to All motors , PFC1 is the first motor, PFC2 the 2nd. The drive can be connected to any of these motors depending on the Autochange functionality. | - | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>PFC 1 running</td><td>0 = Stop, 1 = Start</td></tr><tr><td>1</td><td>PFC 2 running</td><td>0 = Stop, 1 = Start</td></tr><tr><td>2</td><td>PFC 3 running</td><td>0 = Stop, 1 = Start</td></tr><tr><td>3</td><td>PFC 4 running</td><td>0 = Stop, 1 = Start</td></tr><tr><td>4</td><td>PFC 5 running</td><td>0 = Stop, 1 = Start</td></tr><tr><td>5</td><td>PFC 6 running</td><td>0 = Stop, 1 = Start</td></tr><tr><td>6...45</td><td>Reserved</td><td></td></tr></table> | | | | Bit | Name | Value | 0 | PFC 1 running | 0 = Stop, 1 = Start | 1 | PFC 2 running | 0 = Stop, 1 = Start | 2 | PFC 3 running | 0 = Stop, 1 = Start | 3 | PFC 4 running | 0 = Stop, 1 = Start | 4 | PFC 5 running | 0 = Stop, 1 = Start | 5 | PFC 6 running | 0 = Stop, 1 = Start | 6...45 | Reserved | |
| Bit | Name | Value | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | PFC 1 running | 0 = Stop, 1 = Start | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | PFC 2 running | 0 = Stop, 1 = Start | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | PFC 3 running | 0 = Stop, 1 = Start | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | PFC 4 running | 0 = Stop, 1 = Start | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | PFC 5 running | 0 = Stop, 1 = Start | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | PFC 6 running | 0 = Stop, 1 = Start | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6...45 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0000h...FFFFh | | Status of the PFC relay outputs. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 76.02 | Multipump system status | Displays the status of the multipump system in text format. Provides a quick PFC system overview, for example, if the parameter is added to the Home view on the control panel. | PFC disabled | | | | | | | | | | | | | | | | | | | | | | | | |
| PFC disabled | | PFC (Pump control) is disabled. | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| PFC enabled (not started) | | PFC is enabled but not started. | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| SPFC enabled (not started) | | SPFC (Soft pump control) is enabled but not started. | 2 | | | | | | | | | | | | | | | | | | | | | | | | |
| MPFC enabled | | Reserved. | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Running with VSD | | The drive is controlling one pump motor, no auxiliary motors are used. | 100 | | | | | | | | | | | | | | | | | | | | | | | | |
| Running with VSD + 1 Aux | | One auxiliary motor has been taken in use. | 101 | | | | | | | | | | | | | | | | | | | | | | | | |
| Running with VSD + 2 Aux | | Two auxiliary motor have been taken in use. | 102 | | | | | | | | | | | | | | | | | | | | | | | | |
| Running with VSD + 3 Aux | | Three auxiliary motor have been taken in use. | 103 | | | | | | | | | | | | | | | | | | | | | | | | |
| Starting Aux1 | | Auxiliary motor 1 is being started. | 200 | | | | | | | | | | | | | | | | | | | | | | | | |
| Starting Aux2 | | Auxiliary motor 2 is being started. | 201 | | | | | | | | | | | | | | | | | | | | | | | | |
| Starting Aux2 | | Auxiliary motor 3 is being started. | 202 | | | | | | | | | | | | | | | | | | | | | | | | |
| Stopping Aux1 | | Auxiliary motor 1 is being stopped. | 300 | | | | | | | | | | | | | | | | | | | | | | | | |
| Stopping Aux2 | | Auxiliary motor 2 is being stopped. | 301 | | | | | | | | | | | | | | | | | | | | | | | | |
| Stopping Aux2 | | Auxiliary motor 3 is being stopped. | 302 | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-----|---|--|------------|
| | Autochange active | Autochange, that is, automatic rotation of the start order is active. | 400 |
| | No auxiliary motors available to be started | No auxiliary motors are available to be started, for example, all are already running, or a motor is not available due to maintenance. | 500 |
| | Regulator bypass active | Direct-on-line pumps are automatically started and stopped. | 600 |
| | MPFC connection ok | Reserved. | 700 |
| | PID sleep | PID sleep is in use, and the pump can be stopped in during low demand. | 800 |
| | PID sleep boost | PID sleep with extended sleep time is in use, and the pump can be stopped in during low demand. | 801 |
| | Invalid configuration | PFC configuration is invalid. | 4 |
| | PFC inactive (local control) | PFC is inactive because the drive is in local control. | 5 |
| | PFC inactive (invalid operation mode) | PFC is inactive because of an invalid operation mode. | 6 |
| | Drive motor interlocked | The motor connected to the drive is interlocked (not available). Warning <i>D503 VSD controlled PFC motor interlocked</i> (page 190) is generated. | 7 |
| | All motors interlocked | All motors are interlocked (not available). Warning <i>D502 All motors interlocked</i> (page 190) is generated. | 8 |
| | PFC inactive (ext1 active) | PFC is inactive because external control location EXT1 is in use. PFC is supported in EXT2 only. | 9 |
| | Interlocked | Pump is interlocked. | 701 |
| | Not ready | IPC is not ready. | 702 |
| | Standby | Drive is in standby mode. | 703 |
| | Master | Drive is master, running. | 704 |
| | Master (limited) | Drive is master, one or more pumps are offline or inhibited. | 705 |
| | Follower | Drive is follower. | 706 |
| | Follower (limited) | Drive is follower, one or more pumps are offline or inhibited. | 707 |
| | Follower (starting) | Drive is follower, starting. | 708 |
| | Master (stop delay) | Drive is master, waiting until stop delay time has passed. | 709 |
| | Master (start delay) | Drive is master, waiting until start delay time has passed. | 710 |
| | Master (wait start ack) | Waiting for master pump. | 711 |
| | Master (starting follower) | Drive is master, follower is starting. | 712 |
| | Master (wait switch ack) | Waiting for master pump. | 713 |
| | Master (stopping follower) | Drive is master, follower is stopping. | 714 |
| | Master (offline) | Drive is master, offline. | 715 |
| | Not ready (node error) | Duplicate node(s) with same ID detected. | 716 |


| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---------------------------------|--|------------|-----|------|-------|---|-------|---------------------|---|--------------|---------------------|---|---------|---------------------|-------|----------|--|---|----------------|---------------------|---|----------------|---------------------|---|---------------|---------------------|---|---------------|---------------------|--------|----------|--|----|-------------|---------------------|
| | Follower (stopping) | Pump is a follower and stopping | 717 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Not ready (Off mode) | Drive is in Off mode. | 718 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Not ready (Hand mode) | Drive is in Hand mode. | 719 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Not ready (Hand mode (EXT1)) | EXT1 selected as external control source. | 720 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Standby (offline) | Drive is in standby mode, no remote pumps are connected | 721 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Master (autochange) | Drive is master, master is changing. | 722 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Master (PID sleep) | Drive is master, PID is sleeping. | 723 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | IPC version error | FW versions are not compatible between drives. | 724 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Synchronizing settings | Synchronizing settings. | 725 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Master (sleep) | Level control, No pumps are running, pump is the next master. | 726 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Not ready | No nodes defined. | 727 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Master (decaking) | Drive is master, decaking. | 728 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Not ready (pumping mode) | Node settings mismatch. | 729 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Not ready (level conflict) | Conflict in pump start or stop levels. | 730 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76.05 | Measured level | Displays the measured level. This parameter is active when parameter 76.21 Multipump configuration is set to Level control - Emptying or Level control - Filling. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.00...32767.00 m | Measured level in meters. | 1 = 1 m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76.06 | Measured level % | Displays the measured level as a percentage of level control operation area. The signal is scaled to stop level 1 and full speed level. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0...100% | Measured level in %. | 1 = 1 % | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76.07 | LC speed ref | Displays the level control speed reference. | 1 = 1 Hz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | -2147483648... 2147483520 Hz | Level control speed reference. | 1 = 1 Hz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76.11 | Pump status 1 | Shows the status of pump. | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th><th>Value</th></tr><tr><td>0</td><td>Ready</td><td>0 = False, 1 = True</td></tr><tr><td>1</td><td>CRC mismatch</td><td>0 = False, 1 = True</td></tr><tr><td>2</td><td>Running</td><td>0 = False, 1 = True</td></tr><tr><td>3...4</td><td>Reserved</td><td></td></tr><tr><td>5</td><td>In PFC control</td><td>0 = False, 1 = True</td></tr><tr><td>6</td><td>In IPC control</td><td>0 = False, 1 = True</td></tr><tr><td>7</td><td>Master enable</td><td>0 = False, 1 = True</td></tr><tr><td>8</td><td>Active master</td><td>0 = False, 1 = True</td></tr><tr><td>9...10</td><td>Reserved</td><td></td></tr><tr><td>11</td><td>Interlocked</td><td>0 = False, 1 = True</td></tr></table> | | | | Bit | Name | Value | 0 | Ready | 0 = False, 1 = True | 1 | CRC mismatch | 0 = False, 1 = True | 2 | Running | 0 = False, 1 = True | 3...4 | Reserved | | 5 | In PFC control | 0 = False, 1 = True | 6 | In IPC control | 0 = False, 1 = True | 7 | Master enable | 0 = False, 1 = True | 8 | Active master | 0 = False, 1 = True | 9...10 | Reserved | | 11 | Interlocked | 0 = False, 1 = True |
| Bit | Name | Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Ready | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | CRC mismatch | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Running | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3...4 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | In PFC control | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | In IPC control | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Master enable | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Active master | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9...10 | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Interlocked | 0 = False, 1 = True | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0000h...FFFFh | Status of pump 1. | 1 = 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|---|-----------------|
| 76.12 | <i>Pump status 2</i> | See parameter <i>76.11 Pump status 1</i> | - |
| 76.13 | <i>Pump status 3</i> | See parameter <i>76.11 Pump status 1</i> | - |
| 76.14 | <i>Pump status 4</i> | See parameter <i>76.11 Pump status 1</i> | - |
| 76.15 | <i>Pump status 5</i> | See parameter <i>76.11 Pump status 1</i> . | - |
| 76.16 | <i>Pump status 6</i> | See parameter <i>76.11 Pump status 1</i> . | - |
| 76.17 | <i>Pump status 7</i> | See parameter <i>76.11 Pump status 1</i> . | - |
| 76.18 | <i>Pump status 8</i> | See parameter <i>76.11 Pump status 1</i> . | - |
| 76.21 | <i>Multipump configuration</i> | Selects the multipump mode. | <i>Off</i> |
| | Off | PFC disabled. | 0 |
| | IPC | IPC enabled. See <i>Intelligent pump control (IPC)</i> on page 95. | 1 |
| | PFC | PFC enabled. One pump at a time is controlled by the drive. The remaining pumps are direct-on-line pumps that are started and stopped by the drive logic. The frequency (group <i>28 Frequency reference chain</i>) / speed (group <i>22 Speed reference selection</i>) reference must be defined as PID for the PFC functionality to work properly. See <i>Single pump control (PFC/SPFC)</i> on page 106. | 2 |
| | SPFC | SPFC enabled. See section <i>Soft pump control (SPFC)</i> on page 107. | 3 |
| | Level control - Emptying | Level control - Emptying is enabled. See section <i>Level control</i> on page 113. | 4 |
| | Level control - Filling | Level control - Filling is enabled. See section <i>Level control</i> on page 113. | 5 |
| 76.22 | <i>Multipump node number</i> | Node number of the drive on inverter-to-inverter link. Note: <ul style="list-style-type: none">Each drive on the link has a unique node number.If the drive is not given a priority class, the node number is also used in determining the starting order of the pumps. | 1 |
| | 1...8 | IPC node number. | |
| 76.23 | <i>Master enable</i> | Selects if this pump operate as a master drive of the IPC system. The master drive must have sensor connection in order to control the process. | <i>Selected</i> |
| | Not selected | The drive can only be a follower on a inverter-to-inverter link. | 0 |
| | Selected | The drive can be a master on a inverter-to-inverter link. | 1 |
| 76.24 | <i>IPC communication port</i> | Multipump feature can be used over embedded fieldbus interface, or fieldbus adapter interface with FMBA-01 adapter. Using FMBA-01 adapter allows embedded fieldbus to be used for other purposes. If parameters have been incorrectly defined, the drive generates warning <i>A6E7 IPC configuration warning</i> . | <i>EFB</i> |
| | EFB | Embedded fieldbus interface is used for IPC communication. Set parameter <i>76.21 Multipump configuration</i> to value <i>IPC</i> , <i>Level control - Emptying</i> or <i>Level control - Filling</i> and parameter <i>58.01 Protocol enable</i> to value <i>None / IPC communication</i> . | 0 |
| | FBA | Fieldbus adapter interface with FBMA-01 adapter is used for IPC communication. Connect FBMA-01 adapter to slot 1. Set parameter <i>50.01 FBA A enable</i> to value <i>Disable</i> . | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|--|-------------------------------------|--|---|
| 76.25 | <i>Number of motors</i> | Total number of motors used in the application, including the motor connected directly to the drive. | 1 |
| | 1...8 | Number of motors. | 1 = 1 |
| 76.26 | <i>Min number of motors allowed</i> | Minimum number of motors running simultaneously. | 1 |
| | 0...8 | Minimum number of motors. | 1 = 1 |
| 76.27 | <i>Max number of motors allowed</i> | Maximum number of motors running simultaneously. | 1 |
| | 1...8 | Maximum number of motors. | 1 = 1 |
| 76.30 | <i>Start point 1</i> | <p>Defines the start speed (Hz/rpm/m) for the first auxiliary motor. As the motor speed or frequency exceeds the limit defined by this parameter, a new auxiliary motor is started.</p> <p>To avoid nuisance starts of the second auxiliary motor, the speed of the variable speed motor should be higher than the start speed for the duration defined by parameter 76.55 Start delay. If the speed decreases below the start speed, the auxiliary motor is not started.</p> <p>To maintain the process conditions during the start of the second auxiliary motor, a speed hold on time can be defined with parameter 76.57 PFC speed hold on. Certain pump types do not produce significant flow with low frequencies. The speed hold on time can be used to compensate the time needed to accelerate the second auxiliary motor to a speed where it produces flow. The start of the second auxiliary motor is not aborted if the speed of the first auxiliary motor decreases</p> | Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0) Level control: 20.00 m |
| <p>The graph shows Speed on the Y-axis and Time on the X-axis. A solid line represents the speed profile, starting at 'Min. speed' and rising to 'Max. speed'. A dashed line at level 76.30 indicates the start speed. A horizontal dashed line at level 76.41 is labeled 'Min. speed'. Vertical dashed lines mark time intervals: 76.55 (Start delay), 76.56 (Speed hold on time), 76.57 (PFC speed hold on), and 76.58 (Stop). Below the graph, a timeline for 'Aux. pump 1' shows states: ON, Stop, Start, ON, Stop. Arrows indicate 'Increasing flow' and 'Decreasing flow' periods.</p> | | | |
| | 0.00...32767.00 rpm/Hz/m | Speed/frequency/level | 1 = 1 unit |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------|--|---|
| 76.31 | <i>Start point 2</i> | Defines the start point (Hz/rpm/m) for the second auxiliary motor. See parameter <i>76.31 Start point 1</i> . | Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0) Level control: 25.00 m |
| 76.32 | <i>Start point 3</i> | Defines the start point (Hz/rpm/m) for the third auxiliary motor. See parameter <i>76.31 Start point 1</i> . | Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0) Level control: 30.00 m |
| 76.33 | <i>Start point 4</i> | Defines the start point (Hz/rpm/m) for the fourth follower pump/auxiliary motor. See parameter <i>76.30 Start point 1</i> . | Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0) Level control: 32.50 m |
| 76.34 | <i>Start point 5</i> | Defines the start point (Hz/rpm/m) for the fifth follower pump/auxiliary motor. See parameter <i>76.30 Start point 1</i> . | Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0) Level control: 35.00 m |
| 76.35 | <i>Start point 6</i> | Defines the start point (Hz/rpm/m) for the sixth follower pump/auxiliary motor. See parameter <i>76.30 Start point 1</i> . | Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0) Level control: 37.50 m |
| 76.36 | <i>Start point 7</i> | Defines the start point (Hz/rpm/m) for the seventh follower pump/auxiliary motor. See parameter <i>76.30 Start point 1</i> . | Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0) Level control: 40.00 m |
| 76.37 | <i>Start point 8</i> | Defines the start point for the eighth follower pump/auxiliary motor. See parameter <i>76.30 Start point 1</i> . Note: This parameter is active only in the Level control only. | Level control: 42.50 m |
| 76.41 | <i>Stop point 1</i> | Defines the stop point (Hz/rpm/m) for the first auxiliary motor. When the speed of the motor connected directly to the drive falls below this value and one auxiliary motor is running, the stop delay defined by parameter <i>76.56 Stop delay</i> is started. If the speed is still at the same level or lower when the stop delay elapses, the first auxiliary motor stops. The running speed of the drive is increased by [<i>Start point 1 - Stop point 1</i>] after the auxiliary motor stops. | Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0) Level control: 15.00 m |
| | 0.00...32767.00 rpm/Hz/m | Speed/frequency/level | 1 = 1 unit |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|---|---|
| 76.42 | Stop point 2 | Defines the stop point (Hz/rpm/m) for the second auxiliary motor. See parameter 76.41 Stop point 1 . | Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0) Level control: 15.00 m |
| 76.43 | Stop point 3 | Defines the stop point (Hz/rpm/m) for the third auxiliary motor. See parameter 76.41 Stop point 1 . | Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0) Level control: 15.00 m |
| 76.44 | Stop point 4 | Defines the stop point (Hz/rpm/m) for the fourth follower pump/auxiliary motor. See parameter 76.41 Stop point 1 . | Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0) Level control: 15.00 m |
| 76.45 | Stop point 5 | Defines the stop point (Hz/rpm/m) for the fifth follower pump/auxiliary motor. See parameter 76.41 Stop point 1 . | Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0) Level control: 15.00 m |
| 76.46 | Stop point 6 | Defines the stop point (Hz/rpm/m) for the sixth follower pump/auxiliary motor. See parameter 76.41 Stop point 1 . | Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0) Level control: 15.00 m |
| 76.47 | Stop point 7 | Defines the stop point (Hz/rpm/m) for the seventh follower pump/auxiliary motor. See parameter 76.41 Stop point 1 . | Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0) Level control: 15.00 m |
| 76.48 | Stop point 8 | Defines the stop point for the eighth follower pump/auxiliary motor. See parameter 76.41 Stop point 1 . Note: This parameter is active in Level control only. | Level control: 15.00 m |
| 76.50 | LC full speed point | Defines the level at which all the pumps will run at maximum speed/frequency defined with parameter 30.12 Maximum speed or 30.14 Maximum frequency . | Level control: 45.00 m |
| | 0.00...32767.00 m | Level control full speed level. | 1 = 1 m |
| 76.51 | LC level source | Defines the source for level measurement. | AI2 scaled |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | AI1 percent | 12.101 AI1 percent value (see page 311). | 8 |
| | AI2 percent | 12.102 AI2 percent value (see page 311). | 9 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------------|---|--------------------------------------|
| 76.52 | <i>LC level unit</i> | Defines the unit for level control measurement (parameter <i>76.05 Measured level</i>). | <i>meters</i> |
| | percent | Level control is measured in percent. | 4 |
| | feet | Level control is measured in feet. | 27 |
| | centimeters | Level control is measured in centimeter. | 69 |
| | meters | Level control is measured in meter. | 72 |
| | inches | Level control is measured in inch. | 73 |
| 76.53 | <i>LC efficient speed</i> | Defines the most economical speed for pumping. The level control follows this speed as long as the speed is below the level defined with parameter <i>76.50 LC full speed point</i> . | Vector: 1300 rpm Scalar: 44 Hz |
| | -2147483648... 2147483520 unit | Efficient speed for pumping. | 1 = 1 unit |
| 76.54 | <i>LC max time at level</i> | Defines the maximum time that the tank level can be between two start levels before forcing already running pumps to full speed. With constant inflow, the new starting pump will change the level to avoid caking. | 1.0 h |
| | 0.0...1800.0 h | Level control maximum time in hours. | 1 = 1 |
| 76.55 | <i>Start delay</i> | Defines the delay time for starting the auxiliary motors. See parameter <i>76.31 Start point 1</i> . | 10.00 s |
| | 0.00...12600.00 s | Time delay. | 1 = 1 s |
| 76.56 | <i>Stop delay</i> | Defines the delay time for starting the auxiliary motors. See parameter <i>76.31 Stop point 1</i> . | 10.00 s |
| | 0.00...12600.00 s | Time delay. | 1 = 1 s |
| 76.57 | <i>PFC speed hold on</i> | Hold time for auxiliary motor switch-on. See parameter <i>76.31 Start point 1</i> . | 0.00 s |
| | 0.00...1000.00 s | Time. | 1 = 1 s |
| 76.58 | <i>PFC speed hold off</i> | Hold time for auxiliary motor switch-off. See parameter <i>76.31 Stop point 1</i> . | 0.00 s |
| | 0.00...1000.00 s | Time. | 1 = 1 s |
| 76.59 | <i>PFC contactor delay</i> | Start delay for the motor that is directly controlled by the drive. This does not affect the starting of the auxiliary motors.  WARNING! There must always be a delay set if the motors are equipped with star-delta starters. The delay must be set longer than the time setting of the starter. After the motor is switched on by the relay output of the drive, there must be enough time for the star-delta starter to first switch to star and then back to delta before the motor is connected to the drive. | 0.50 s |
| | 0.20...600.00 s | Time delay. | 1 = 1 s |
| 76.60 | <i>PFC ramp acceleration time</i> | Defines the acceleration time for the drive motor speed compensation, when an auxiliary motor is stopped. This ramp time is also used for the drive motor to accelerate after an autochange has occurred. The parameter sets the ramp-up time as seconds from zero to maximum frequency (not from the previous reference to the new reference). | 1.00 s |
| | 0.00...1800.00 s | Time. | 1 = 1 s |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------------|--|---------------------|
| 76.61 | <i>PFC ramp deceleration time</i> | Defines the deceleration time for the drive motor speed compensation, when an auxiliary motor is started. This ramp time is also used for the drive motor to decelerate after an autochange has occurred. The parameter sets the ramp-up time as seconds from maximum to zero frequency (not from the previous reference to the new reference). | 1.00 s |
| | 0.00...1800.00 s | Time. | 1 = 1 s |
| 76.62 | <i>IPC smooth acceleration time</i> | Defines the ramp time of a new starting pump. A pump that is started by current master follows the speed until all the pumps rotate at the same speed and master role is changed. The smooth acceleration time must be longer than the time defined with parameter 40.33 Set 1 integration time . Note: Quick ramp overrides the smooth ramp. See parameter group 82 Pump protections on page 477 . | 20.00 |
| | 3.00...1800.00 s | IPC smooth acceleration time in seconds. | 1 = 1 s |
| 76.63 | <i>IPC smooth deceleration time</i> | Defines the ramp time that is used to stop the pump. A pump that is stopped by current master follows the speed until it is stopped completely. The smooth deceleration time must be longer than the time defined with parameter 40.33 Set 1 integration time . Note: Quick ramps overrides the smooth ramp. See parameter group 82 Pump protections on page 477 . | 20.00 |
| | 3.00...1800.00 s | IPC smooth deceleration time in seconds. | 1 = 1 s |
| 76.70 | <i>PFC Autochange</i> | Defines the way the autochange is triggered. In all cases except <i>Even wear</i> , the start order is moved one step forward each time the autochange occurs. If the start order initially is 1-2-3-4, after the first autochange the order will be 2-3-4-1, etc. For <i>Even wear</i> , the start order will be determined so that the running times of all motors remain within the defined limit. Note: Autochange only occurs when the speed of the drive is below the speed defined by parameter 76.73 Autochange level . See also section Autochange on page 109 . Note: This parameter is applicable for PFC/SPFC only. | <i>Not selected</i> |
| | Not selected | Autochange disabled. | 0 |
| | Selected | Rising edge starts the autochange if autochange conditions are met. | 1 |
| | DI1 | Autochange triggered by the rising edge of digital input DI1 (10.02 DI delayed status , bit 0). | 2 |
| | DI2 | Autochange triggered by the rising edge of digital input DI2 (10.02 DI delayed status , bit 1). | 3 |
| | DI3 | Autochange triggered by the rising edge of digital input DI3 (10.02 DI delayed status , bit 2). | 4 |
| | DI4 | Autochange triggered by the rising edge of digital input DI4 (10.02 DI delayed status , bit 3). | 5 |
| | DI5 | Autochange triggered by the rising edge of digital input DI5 (10.02 DI delayed status , bit 4). | 6 |
| | DI6 | Autochange triggered by the rising edge of digital input DI6 (10.02 DI delayed status , bit 5). | 7 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|--|---|------------------------|
| | Timed function 1 | Autochange triggered by timed function 1 (bit 0 of 34.01 Timed functions status (see page 384)). | 8 |
| | Timed function 2 | Autochange triggered by timed function 2 (bit 1 of 34.01 Timed functions status (see page 384)). | 9 |
| | Timed function 3 | Autochange triggered by timed function 3 (bit 2 of 34.01 Timed functions status (see page 384)). | 10 |
| | Fixed interval | Autochange is done when the interval determined in the parameter 76.71 PFC Autochange interval has elapsed. | 11 |
| | All stop | Autochange is done when all the motors are stopped. The PID sleep feature (parameters 40.43 Set 1 sleep level ... 40.48 Set 1 wake-up delay) must be used for the drive to stop when the process demand is low. | 12 |
| | Even wear | The running time of the motors are balanced by the drive. When the difference in running time between the motors with the least and most running hours exceeds the time defined by parameter 76.72 Maximum wear imbalance , the autochange occurs. The running hours of the motors can be found in group 77 Multipump maintenance and monitoring . | 13 |
| | <i>Other [bit]</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 76.71 | PFC Autochange interval | Specifies the interval that is used in setting Fixed interval of parameter 76.70 PFC Autochange . | 1.00 h |
| | 0.00...42949672.95 h | Time. | 1 = 1 h |
| 76.72 | Maximum wear imbalance | Specifies the maximum wear imbalance, or difference in running times between any motor, used by the Even wear setting of parameter 76.70 PFC Autochange . | 10.00 h |
| | 0.00...1000000.00 h | Time. | 1 = 1 h |
| 76.73 | Autochange level | Upper speed limit for the Autochange to occur. The Autochange occurs when: <ul style="list-style-type: none"> the condition defined in 76.70 PFC Autochange is fulfilled and, the speed of the drive motor 01.03 Motor speed % is below the speed limit defined in this parameter. Note: When the value is selected as 0%, this speed limit check is disabled. | 100.0% |
| | 0.0...300.0% | Speed/frequency in percentage of the nominal speed or frequency of the drive motor. | 1 = 1% |
| 76.74 | Autochange auxiliary PFC | Selects whether only auxiliary motors or all motors are included in the Autochange function. | <i>Aux motors only</i> |
| | All motors | All motors, including the one connected to the drive participates in the autochange. The Autochange logic will connect the drive to each of the motors according to setting of parameter 76.70 PFC Autochange . Note: The first motor (PFC1) also requires the appropriate hardware contactor connections and PFC1 must be defined in one of the relay output source parameters. | 0 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------------|---|--|
| | Aux motors only | Only auxiliary (direct-on-line) motors are affected by the autochange function. Note: PFC1 refers to the motor that is fixed to the drive and must not be selected in any of the relay output source parameters. Only the starting order of the auxiliary motors will be rotated. | 1 |
| 76.76 | <i>Max stationary time</i> | Defines the maximum time that a low priority pump can be stationary. The IPC system uses pump priorities to start/stop the pumps. This parameter sets the upper limit for stationary time so that the pump blockage can be avoided. | 0.0 h |
| | 0.0...214748352.0 h | Maximum stationary time in hours. | 1 = 1 h |
| 76.77 | <i>Pump priority</i> | Selects the priority of the pump in an IPC system. Note: Parameter 76.76 <i>Max stationary time</i> defines the maximum time that a low priority pump can be stationary. | <i>Normal</i> |
| | High | High priority pump. The IPC system prefers high priority pump. | 1 |
| | Normal | Normal priority pump. | 3 |
| | Low | Low priority pump. The low priority pump runs as little as possible. It is started only when the demand requires full pumping capacity. | 5 |
| 76.81 | <i>PFC 1 interlock</i> | Defines if the PFC motor 1 can be started. An interlocked PFC motor cannot be started. 0 = Interlocked (not available) 1 = Available. | <i>Available. PFC motor is available</i> |
| | Interlocked. PFC motor is not in use | PFC motor is interlocked and not available. | 0 |
| | Available. PFC motor is available | PFC motor is available. | 1 |
| | DI1 | Digital input DI1 (10.02 <i>DI delayed status</i> , bit 0). | 2 |
| | DI2 | Digital input DI2 (10.02 <i>DI delayed status</i> , bit 1). | 3 |
| | DI3 | Digital input DI3 (10.02 <i>DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (10.02 <i>DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (10.02 <i>DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (10.02 <i>DI delayed status</i> , bit 5). | 7 |
| | Timed function 1 | Bit 0 of 34.01 <i>Timed functions status</i> (see page 384). | 8 |
| | Timed function 2 | Bit 1 of 34.01 <i>Timed functions status</i> (see page 384). | 9 |
| | Timed function 3 | Bit 2 of 34.01 <i>Timed functions status</i> (see page 384). | 10 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 76.82 | <i>PFC 2 interlock</i> | See parameter 76.81 <i>PFC 1 interlock</i> . | <i>Available. PFC motor is available</i> |
| 76.83 | <i>PFC 3 interlock</i> | See parameter 76.81 <i>PFC 1 interlock</i> . | <i>Available. PFC motor is available</i> |
| 76.84 | <i>PFC 4 interlock</i> | See parameter 76.81 <i>PFC 1 interlock</i> . | <i>Available. PFC motor is available</i> |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------|--|--|
| 76.85 | <i>PFC 5 interlock</i> | See parameter <i>76.81 PFC 1 interlock</i> . | <i>Available. PFC motor is available</i> |
| 76.86 | <i>PFC 6 interlock</i> | See parameter <i>76.81 PFC 1 interlock</i> . | <i>Available. PFC motor is available</i> |
| 76.90 | <i>LC low level switch</i> | Selects the source for digital low level switch. | <i>Selected</i> |
| | Not selected | Low level switch is inactive. | 0 |
| | Selected | Low level switch is active. | 1 |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 8 |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 9 |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 10 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 76.91 | <i>LC high level switch</i> | Selects the source for digital high level switch. | <i>Selected</i> |
| | Not selected | High level switch is inactive. | 0 |
| | Selected | High level switch is active. | 1 |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 |
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 8 |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 9 |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 10 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 76.92 | <i>LC low level action</i> | Selects the action for drive to indicate when digital low level switch is activated. See parameter <i>76.90 LC low level switch</i> (page 468). | <i>Warning</i> |
| | No action | Low level switch is disabled and does not generate any event. | 0 |
| | Warning | Low level switch generates warning <i>D509 Low level</i> . | 1 |
| | Fault | Low level switch trips on fault <i>D403 Low level</i> . | 2 |
| 76.93 | <i>LC high level action</i> | Selects the action for drive to indicate when digital high level switch is activated. See parameter <i>76.91 LC high level switch</i> (page 468). | <i>Warning</i> |
| | No action | High level switch is disabled and does not generate any event. | 0 |
| | Warning | High level switch generates warning <i>D508 High level</i> . | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|--------------------------------------|---|----------------|
| | Fault | High level switch trips on fault <i>D402 High level</i> . | 2 |
| 76.95 | <i>Regulator bypass control</i> | Defines if direct-on-line pumps are automatically started and stopped. This setting can be used in applications with a low number of sensors and low accuracy requirements. | <i>Disable</i> |
| | Disable | Automatic starting and stopping is disabled. | 0 |
| | Enable | Automatic starting and stopping is enabled. | 1 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 76.101 | <i>IPC parameter synchronization</i> | Defines parameter synchronization in IPC system. | <i>Enable</i> |
| | Disable | Parameter synchronization is disabled. | 1 |
| | Enable | Parameter synchronization is enabled. | 2 |
| 76.102 | <i>IPC synchronization settings</i> | Selects the settings that are synchronized between drives in inverter-to-inverter communication bus. The process PID and IPC parameters are synchronized. Note: This parameter does not synchronize AI parameters. | 0b0110 |

| Bit | Name | Value |
|--------|------------------------------|--|
| 0 | AI parameters | Parameter group <i>12 Standard AI</i> . |
| 1 | Process PID set 1 parameters | Parameter group <i>40 Process PID set 1</i> . Parameters <i>19.11 Ext1/Ext2 selection</i> , <i>20.06 Ext2 commands</i> , <i>20.08 Ext2 in1 source</i> , <i>22.18 Ext2 speed ref1</i> and <i>28.15 Ext2 frequency ref1</i> . |
| 2 | IPC parameters | Parameter group <i>76 Multipump configuration</i> and <i>77 Multipump maintenance and monitoring</i> . |
| 3...15 | Reserved | |

| | | |
|--------|-------------------------------------|--|
| 76.105 | <i>IPC synchronization checksum</i> | Displays the calculated parameter checksum (CRC) of the parameter groups selected with parameter <i>76.102 IPC synchronization settings</i> . If the value of this parameter is same on all the drives, then the configuration is also synchronized correctly. |
|--------|-------------------------------------|--|

| | | | |
|--|--|-------------|--|
| 77 Multipump maintenance and monitoring | Multipump maintenance and monitoring parameters. | | |
| 77.10 <i>PFC runtime change</i> | Enables the reset, or arbitrary setting, of <i>77.11 Pump 1 running time ... 77.18 Pump 8 running time</i> . | <i>Done</i> | |
| Done | The parameter automatically reverts back to this value. | 0 | |
| Set any PFC run time | Enables the setting of <i>77.11 Pump 1 running time ... 77.18 Pump 8 running time</i> to an arbitrary value. | 1 | |
| Reset PFC1 run time | Resets parameter <i>77.11 Pump 1 running time</i> . | 2 | |
| Reset PFC2 run time | Resets parameter <i>77.12 Pump 2 running time</i> . | 3 | |
| Reset PFC3 run time | Resets parameter <i>77.13 Pump 3 running time</i> . | 4 | |
| Reset PFC4 run time | Resets parameter <i>77.14 Pump 4 running time</i> . | 4 | |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|-------------------------------------|--|------------|
| | Reset PFC5 run time | Resets parameter 77.15 Pump 5 running time . | 6 |
| | Reset PFC6 run time | Resets parameter 77.16 Pump 6 running time . | 7 |
| | Reset PFC7 run time | Resets parameter 77.17 Pump 7 running time . | 8 |
| | Reset PFC8 run time | Resets parameter 77.18 Pump 8 running time . | 9 |
| 77.11 | Pump 1 running time | Running time counter of pump 1. Can be set or reset by parameter 77.10 PFC runtime change . | 0.00 h |
| | 0.00... 42949672.95 h | Time | 1 = 1 h |
| 77.12 | Pump 2 running time | See parameter 77.11 Pump 1 running time . | 0.00 h |
| 77.13 | Pump 3 running time | See parameter 77.11 Pump 1 running time . | 0.00 h |
| 77.14 | Pump 4 running time | See parameter 77.11 Pump 1 running time . | 0.00 h |
| 77.15 | Pump 5 running time | See parameter 77.11 Pump 1 running time . | 0.00 h |
| 77.16 | Pump 6 running time | See parameter 77.11 Pump 1 running time . | 0.00 h |
| 77.17 | Pump 7 running time | See parameter 77.11 Pump 1 running time . | 0.00 h |
| 77.18 | Pump 8 running time | See parameter 77.11 Pump 1 running time . | 0.00 h |
| 77.20 | IPC online pumps | Displays the pumps which can establish connection through inverter-to-inverter communication. For example, in a three pump system, drive 1 and drive 2 can see each other but drive 3 cannot see other drives. Drive 1 = 0011b, Drive 2 = 0011b, Drive 3 = 0100b | |

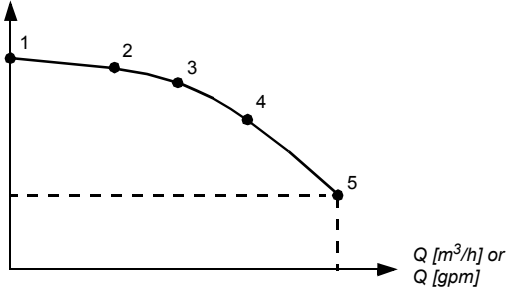
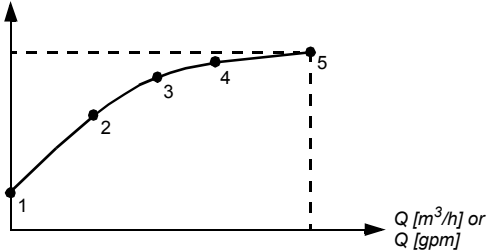
| Bit | Name | Descriptions |
|--------|----------|-------------------|
| 0 | Node 1 | Pump 1 is online. |
| 1 | Node 2 | Pump 2 is online. |
| 2 | Node 3 | Pump 3 is online. |
| 3 | Node 4 | Pump 4 is online. |
| 4 | Node 5 | Pump 5 is online. |
| 5 | Node 6 | Pump 6 is online. |
| 6 | Node 7 | Pump 7 is online. |
| 7 | Node 8 | Pump 8 is online. |
| 8...15 | Reserved | |

| | | | |
|-----------------------|--------------------------------------|---|--|
| 77.21 | IPC comm loss status | Displays the drives communication loss status. You can override default communication loss actions by setting start interlock or constant speed based on the bit values. Note: Bits will reset to zero when communication is restored. | |
|-----------------------|--------------------------------------|---|--|

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | |
|--------|--|---|------------|-----|------|--------------|---|-----------------------------|---|---|---|---|---|-------------------------------------|---|---|--------------------------------------|---|--------|----------|--|
| | | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th>Bit</th><th>Name</th><th>Descriptions</th></tr><tr><td>0</td><td>Running master in comm loss</td><td>The running master drive has lost the connection to other drives. By default, this drive continues as a running master.</td></tr><tr><td>1</td><td>Running follower (master enable) in comm loss</td><td>The running follower drive which is set as master enabled drive has lost the connection to other drives. By default, this drive will be a master (offline).</td></tr><tr><td>2</td><td>Standby master enabled in comm loss</td><td>The master enabled drive which is in standby mode has lost the connection to other drives. By default, this drive remains in standby mode if already running drives can maintain the process.</td></tr><tr><td>3</td><td>Standby master disabled in comm loss</td><td>The master disabled drive which is in standby mode has lost the connection to other drives. By default, this drive remains in standby mode.</td></tr><tr><td>4...15</td><td colspan="2">Reserved</td></tr></table> | | | Bit | Name | Descriptions | 0 | Running master in comm loss | The running master drive has lost the connection to other drives. By default, this drive continues as a running master. | 1 | Running follower (master enable) in comm loss | The running follower drive which is set as master enabled drive has lost the connection to other drives. By default, this drive will be a master (offline). | 2 | Standby master enabled in comm loss | The master enabled drive which is in standby mode has lost the connection to other drives. By default, this drive remains in standby mode if already running drives can maintain the process. | 3 | Standby master disabled in comm loss | The master disabled drive which is in standby mode has lost the connection to other drives. By default, this drive remains in standby mode. | 4...15 | Reserved | |
| Bit | Name | Descriptions | | | | | | | | | | | | | | | | | | | |
| 0 | Running master in comm loss | The running master drive has lost the connection to other drives. By default, this drive continues as a running master. | | | | | | | | | | | | | | | | | | | |
| 1 | Running follower (master enable) in comm loss | The running follower drive which is set as master enabled drive has lost the connection to other drives. By default, this drive will be a master (offline). | | | | | | | | | | | | | | | | | | | |
| 2 | Standby master enabled in comm loss | The master enabled drive which is in standby mode has lost the connection to other drives. By default, this drive remains in standby mode if already running drives can maintain the process. | | | | | | | | | | | | | | | | | | | |
| 3 | Standby master disabled in comm loss | The master disabled drive which is in standby mode has lost the connection to other drives. By default, this drive remains in standby mode. | | | | | | | | | | | | | | | | | | | |
| 4...15 | Reserved | | | | | | | | | | | | | | | | | | | | |

| | | |
|--|--|------------------------------|
| 80 Flow calculation and protection | Actual flow calculation. Note: Parameters are dynamically hidden based on selection of flow calculation mode. Parameters are visible according to the selection of parameter 80.13 Flow feedback function . | |
| 80.01 Actual flow | Actual system flow that is either calculated from the pressure difference, measured directly or estimated from the pump curves. The calculation method is selected with parameter 80.13 Flow feedback function . See control chain diagram PID flow calculation on page 264. | - |
| -200000.00... 200000.00 m ³ /h | Calculated flow. | 1 = 1 m ³ /h |
| 80.02 Actual flow | Shows the percentage of parameter 80.01 Actual flow from 80.15 Maximum flow . | 0.00 |
| -100.00...100.00% | Flow percentage. | 100 = 1% |
| 80.03 Total flow | Shows cumulative calculated flow. | 0.00 |
| 0.00... 21474836.00 m ³ | Total calculated flow. | 1 = 1 m ³ |
| 80.04 Specific energy | Shows the ratio of pump flow rate and power input. | 0.00 |
| 0.00... 32767.95 m ³ /kWh | Specific energy of the pump. | 1 = 1 m ³ /kWh |
| 80.05 Estimated pump head | Shows the estimated head produced by the pump. | 0.00 m |
| 0.00...32767.00 m | Estimated pump head. | 1 = 1 m |
| 80.11 Flow feedback 1 source | Selects the source for the flow feedback 1. | Not selected |
| Not selected | Feedback not used. | 0 |
| AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| Freq in scaled | 11.39 Freq in 1 scaled value (see page 306). | 3 |
| AI1 percent | 12.101 AI1 percent value (see page 311). | 8 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------|---|---------------------|
| | AI2 percent | 12.102 AI2 percent value (see page 311). | 9 |
| | Feedback data storage | 40.91 Feedback data storage (see page 425). | 10 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 80.12 | <i>Flow feedback 2 source</i> | Selects the source for the flow feedback 2. | <i>Not selected</i> |
| | Not selected | Feedback not used. | 0 |
| | AI1 scaled | 12.12 AI1 scaled value (see page 308). | 1 |
| | AI2 scaled | 12.22 AI2 scaled value (see page 310). | 2 |
| | Freq in scaled | 11.39 Freq in 1 scaled value (see page 306). | 3 |
| | AI1 percent | 12.101 AI1 percent value (see page 311). | 8 |
| | AI2 percent | 12.102 AI2 percent value (see page 311). | 9 |
| | Feedback data storage | 40.91 Feedback data storage (see page 425). | 10 |
| | <i>Other</i> | Source selection (see Terms and abbreviations on page 272). | - |
| 80.13 | <i>Flow feedback function</i> | Selects a function between the flow feedback sources selected by parameters 80.11 Flow feedback 1 source and 80.12 Flow feedback 2 source . The result of the function (for any selection) is multiplied by parameter 80.14 Flow feedback multiplier . | <i>In1</i> |
| | In1 | Use 80.11 Flow feedback 1 source directly as the flow value. | 0 |
| | In2 | Use 80.12 Flow feedback 2 source directly as the flow value. | 1 |
| | Reserved | | 2...7 |
| | sqrt(In1) | Flow is calculated as a square root of a differential pressure measurement: $k\sqrt{\Delta P}$ The differential pressure value is selected with 80.11 Flow feedback 1 source . | 8 |
| | sqrt(In1-In2) | Flow is calculated as a square root of two measured absolute pressure measurements: $k\sqrt{(P_1 - P_2)}$ The pressure measurement sources are selected with 80.11 Flow feedback 1 source and 80.12 Flow feedback 2 source . | 9 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|--|---|---------------------------|
| | HQ curve | <p>The HQ curve is used for flow calculation.</p> <p>You can configure pressure sensor settings with parameter group 81 Sensor settings.</p> <p>The figure below shows the HQ performance curve of the pump for the flow calculation function.</p> <p>$H [m]$ or $H [ft]$</p>  <p>$Q [m^3/h]$ or $Q [gpm]$</p> | 100 |
| | PQ curve | <p>The PQ curve is used for flow calculation.</p> <p>You can configure pressure sensor settings with parameter group 81 Sensor settings.</p> <p>The figure below shows the PQ performance curve of the pump for the flow calculation function.</p> <p>$P [kW]$ or $P [hp]$</p>  <p>$Q [m^3/h]$ or $Q [gpm]$</p> | 101 |
| 80.14 | Flow feedback multiplier | Defines the multiplier (k) used with the flow calculation. The output value of 80.13 Flow feedback function is multiplied by this value. | 1.00 |
| | -200000.00... 200000.00 | Multiplier. | 1 = 1 |
| 80.15 | Maximum flow | Defines the nominal maximum flow of the system. This value is used to calculate the actual flow percentage value so that the value 100% for 80.02 corresponds to the value of this parameter. | 1000.00 m ³ /h |
| | -200000.00... 200000.00 m ³ /h | Limit for maximum flow protection. | 1 = 1 m ³ /h |
| 80.16 | Minimum flow | Defines the nominal minimum flow of the system. | 1.00 |
| | -200000.00... 200000.00 m ³ /h | Limit for minimum flow protection. | 1 = 1 m ³ /h |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------------------|---|---------------------------|
| 80.17 | <i>Maximum flow protection</i> | Selects the action for maximum flow protection function. | <i>No action</i> |
| | No action | Maximum flow protection is disabled. | 0 |
| | Warning | Drive generates warning <i>D50C Maximum flow protection</i> | 1 |
| | Fault | Drive trips on fault <i>D406 Maximum flow protection</i> . | 2 |
| | Speed ref safe | Speed reference safe is activated. | 3 |
| 80.18 | <i>Minimum flow protection</i> | Selects the action for minimum flow protection function. | <i>No action</i> |
| | No action | Minimum flow protection is disabled. | 0 |
| | Warning | Drive generates warning <i>D50D Minimum flow protection</i> . | 1 |
| | Fault | Drive trips on fault <i>D407 Minimum flow protection</i> . | 2 |
| | Speed ref safe | Speed reference safe is activated. | 3 |
| 80.19 | <i>Flow check delay</i> | Defines the time after motor start when the flow protection is active. | 5.00 s |
| | 0.00...3600.00 s | Flow check delay. | 1 = 1 s |
| 80.22 | <i>Pump inlet diameter</i> | Defines the pump inlet pipe diameter. | 0.100 m |
| | 0.010... 32767.000 m | Pump inlet pipe diameter. | 1 = 1 m |
| 80.23 | <i>Pump outlet diameter</i> | Defines the pump outlet pipe diameter. | 0.100 m |
| | 0.010... 32767.000 m | Pump outlet pipe diameter. | 1 = 1 m |
| 80.26 | <i>Calculation minimum speed</i> | Defines the speed limit below which flow is not calculated. | 5.00 m |
| | 0.00...32767.00 m | Minimum speed limit for flow calculation. | 1 = 1 m |
| 80.28 | <i>Density</i> | Defines the density of the fluid to be pumped for the flow calculation function. | 1000.00 kg/m ³ |
| | 0.00... 32767.00 kg/m ³ | Fluid density. | 1 = 1 kg/m ³ |
| 80.29 | <i>Total flow reset</i> | Resets the signal <i>80.02 Total flow</i> . | <i>Not selected</i> |
| | Not selected | Total flow reset is not selected. | 0 |
| | Reset | Resets cumulative flow counter. Note: The value reverts automatically to <i>Not selected</i> after the flow is reset. | 1 |
| 80.40 | <i>HQ curve H1</i> | Defines the head at point 1 of the HQ performance curve. See section <i>Pump inlet and outlet protection</i> (page 121). | 0.00 m |
| | 0.00...32767.00 m | Head at point 1 of the HQ curve. | 1 = 1 m |
| 80.41 | <i>HQ curve H2</i> | Defines the head at point 2 of the HQ performance curve. See parameter <i>80.40 HQ curve H1</i> (page 474). | 0.00 m |
| 80.42 | <i>HQ curve H3</i> | Defines the head at point 3 of the HQ performance curve. See parameter <i>80.40 HQ curve H1</i> (page 474). | 0.00 m |
| 80.43 | <i>HQ curve H4</i> | Defines the head at point 4 of the HQ performance curve. See parameter <i>80.40 HQ curve H1</i> (page 474). | 0.00 m |
| 80.44 | <i>HQ curve H5</i> | Defines the head at point 5 of the HQ performance curve. See parameter <i>80.40 HQ curve H1</i> (page 474). | 0.00 m |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--|--|-------------------------|
| 80.50 | <i>PQ curve P1</i> | Defines the power input of pump at point 1 on the PQ performance curve. See section <i>Pump inlet and outlet protection</i> (page 121). | 0.00 kW |
| | 0.00...32767.00 kW | Power input of pump at point 1. | 1 = 1 kW |
| 80.51 | <i>PQ curve P2</i> | Defines the power input of pump at point 2 on the PQ performance curve. See parameter <i>80.50 PQ curve P1</i> (page 475). | 0.00 |
| 80.52 | <i>PQ curve P3</i> | Defines the power input of pump at point 3 on the PQ performance curve. See parameter <i>80.50 PQ curve P1</i> (page 475). | 0.00 |
| 80.53 | <i>PQ curve P4</i> | Defines the power input of pump at point 4 on the PQ performance curve. See parameter <i>80.50 PQ curve P1</i> (page 475). | 0.00 |
| 80.54 | <i>PQ curve P5</i> | Defines the power input of pump at point 5 on the PQ performance curve. See parameter <i>80.50 PQ curve P1</i> (page 475). | 0.00 |
| 80.60 | <i>Q value Q1</i> | Defines the flow rate at point 1 on the PQ performance curve. See section <i>Pump inlet and outlet protection</i> (page 121). | 0.00 m ³ /h |
| | 0.00... 200000.00 m ³ /h | Flow rate at point 1 of the PQ curve. | 1 = 1 m ³ /h |
| 80.61 | <i>Q value Q2</i> | Defines the flow rate at point 2 on the PQ performance curve. See parameter <i>80.60 Q value Q1</i> (page 475). | 0.00 m ³ /h |
| 80.62 | <i>Q value Q3</i> | Defines the flow rate at point 3 on the PQ performance curve. See parameter <i>80.60 Q value Q1</i> (page 475). | 0.00 m ³ /h |
| 80.63 | <i>Q value Q4</i> | Defines the flow rate at point 4 on the PQ performance curve. See parameter <i>80.60 Q value Q1</i> (page 475). | 0.00 m ³ /h |
| 80.64 | <i>Q value Q5</i> | Defines the flow rate at point 5 on the PQ performance curve. See parameter <i>80.60 Q value Q1</i> (page 475). | 0.00 m ³ /h |

| | | | |
|---------------------------|-------------------------------|--|-------------------|
| 81 Sensor settings | | Sensor settings for inlet and outlet pressure protection function. | |
| 81.01 | <i>Actual inlet pressure</i> | Shows the actual inlet pressure. Note: By default the parameter unit will be bar. However, the unit can be changed according to the parameter <i>81.20 Pressure unit</i> . | 0.00 |
| | 0.00...32767.00 bar | Actual inlet pressure. | 1 = 1 bar |
| 81.02 | <i>Actual outlet pressure</i> | Shows the actual outlet pressure. | 0.00 |
| | 0.00...32767.00 bar | Actual outlet pressure. | 1 = 1 bar |
| 81.10 | <i>Inlet pressure source</i> | Selects the primary source used for pump inlet pressure measurement. | <i>AI1 scaled</i> |
| | Not selected | None | 0 |
| | AI1 scaled | Parameter <i>12.12 AI1 scaled value</i> . | 1 |
| | AI2 scaled | Parameter <i>12.22 AI2 scaled value</i> . | 2 |
| | Freq in scaled | Parameter <i>11.39 Freq in 1 scaled value</i> . | 3 |
| | AI1 percent | Parameter <i>12.101 AI1 percent value</i> . | 8 |
| | AI2 percent | Parameter <i>12.102 AI2 percent value</i> . | 9 |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------|--|---|----------------------------|
| | Feedback data storage | Parameter 40.91 Feedback data storage . | 10 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |
| 81.11 | Outlet pressure source | Selects the primary source used for pump outlet pressure measurement. | AI2 scaled |
| | Not selected | None | 0 |
| | AI1 scaled | Parameter 12.12 AI1 scaled value . | 1 |
| | AI2 scaled | Parameter 12.22 AI2 scaled value . | 2 |
| | Freq in scaled | Parameter 11.39 Freq in 1 scaled value . | 3 |
| | AI1 percent | Parameter 12.101 AI1 percent value . | 8 |
| | AI2 percent | Parameter 12.102 AI2 percent value . | 9 |
| | Feedback data storage | Parameter 40.91 Feedback data storage . | 10 |
| | Other [bit] | Source selection (see Terms and abbreviations on page 272). | - |
| 81.12 | Sensors height difference | Defines the height difference between inlet and outlet pressure sensors for flow calculation. | 0.00 |
| | 0.00...32767.00 m | Sensors height difference. | 1 = 1 m |
| 81.20 | Pressure unit | Selects the unit of pressure. | bar |
| | bar | Pressure | 0 |
| | kPa | Kilo pascal | 1 |
| | psi | Pound per square inch | 2 |
| | Pa | Pascal | 3 |
| 81.21 | Flow unit | Selects the unit of flow. The selection affects total flow and specific energy units. | m3/h |
| | m ³ /h | Cubic meter per hour. | 0 |
| | l/s | Liters per second. | 1 |
| | gpm | US gallon per minute. | 2 |
| 81.22 | Length unit | Selects the unit of estimated head points, sensors height difference and pump inlet/outlet diameters. | meters |
| | centimeters | Length unit in centimeter. | 69 |
| | meters | Length unit in meter. | 72 |
| | Inches | Length unit in inch. | 73 |
| | feet | Length unit in feet. | 27 |
| 81.23 | Density unit | Selects the unit of density. | kg/m3 |
| | kg/m ³ | Kilograms per cubic meter. | 0 |
| | kg/l | Kilograms per liter. | 1 |
| | lb/gal | Pounds per US gallon. | 2 |

| No. | Name/Value | Description | Def/FbEq16 |
|----------------------------|---------------------------------|---|-----------------|
| 82 Pump protections | | Settings for quick ramp functions. See section Settings (page 129). | |
| 82.01 | Quick ramp mode | Enables quick ramp mode with quick ramp set 1 or with both quick ramp set 1 and quick ramp set 2. Quick ramp set 1 consists of 82.05 Quick ramp 1 accel. time and 82.06 Quick ramp 1 decel. time . Quick ramp set 2 consists of 82.10 Quick ramp 2 accel. time and 82.11 Quick ramp 2 decel. time . | <i>Disabled</i> |
| | Disabled | Quick ramp mode is disabled. | 0 |
| | Use 1 quick ramp | Quick ramp set 1 is used. | 1 |
| | Use 2 quick ramps | Both quick ramp set 1 and set 2 are used. | 2 |
| 82.05 | Quick ramp 1 accel. time | Defines the quick ramp set 1 acceleration rate. The acceleration rate is defined as the time to accelerate from zero speed to the speed value defined by parameter 46.01 Speed scaling or 46.02 Frequency scaling . This acceleration rate is effective from zero to speed/frequency defined by parameter 82.07 Quick ramp 1 upper limit . | 1.00 |
| | 0.10...5.00 s | Time. | 100 = 1s |
| 82.06 | Quick ramp 1 decel. time | Defines the quick ramp set 1 deceleration rate. The deceleration rate is defined as the time to decelerate from the speed value defined by parameters 46.01 Speed scaling or 46.02 Frequency scaling to zero speed. This deceleration rate is effective from speed/frequency defined by parameter 82.07 Quick ramp 1 upper limit to zero. | |
| | 0.10...5.00 s | Time. | 100 = 1s |
| 82.07 | Quick ramp 1 upper limit | Defines the maximum speed/frequency for quick ramp 1. Above this speed/frequency, the drive uses either quick ramp 2 and normal ramp time or only normal ramp time depending on parameter 82.01 Quick ramp mode . | 30 |
| | 15...100 Hz | Frequency/Speed limit. | 1 = 1Hz |
| 82.10 | Quick ramp 2 accel. time | Defines the quick ramp set 2 acceleration rate. The acceleration rate is defined as the time to accelerate from zero speed to the speed value defined by parameter 46.01 Speed scaling or 46.02 Frequency scaling . This acceleration rate is effective in speed/frequency range defined by parameters 82.07 Quick ramp 1 upper limit and 82.12 Quick ramp 2 upper limit . | 10.00 |
| | 0.10...1800.00 s | Time. | 100 = 1s |
| 82.11 | Quick ramp 2 decel. time | Defines the quick ramp set 2 deceleration rate. The deceleration rate is defined as the time to decelerate from the speed value defined by parameters 46.01 Speed scaling or 46.02 Frequency scaling to zero speed. This deceleration rate is in speed/frequency range defined by parameters 82.07 Quick ramp 1 upper limit and 82.12 Quick ramp 2 upper limit . | 10.00 |
| | 0.10...1800.00 s | Time. | 100 = 1s |
| 82.12 | Quick ramp 2 upper limit | Defines the maximum speed/frequency for the quick ramp 2. Above this speed/frequency, the drive either uses quick ramp 2 or normal ramp time depending on selection in parameter 82.01 Quick ramp mode . | 45 |
| | 15...100 Hz | Frequency/Speed limit. | 1 = 1Hz |

| No. | Name/Value | Description | Def/FbEq16 |
|--------------|--|---|-------------------------|
| 82.20 | <i>Dry run protection</i> | Selects dry run protection mode. | <i>No action</i> |
| | No action | Dry run protection is disabled. | 0 |
| | Warning | Dry run protection generates warning <i>D50A Running dry</i> . | 1 |
| | Fault | Dry run protection generates fault <i>D404 Running dry</i> . | 2 |
| | Fault if running | Dry run protection generates a fault if the source signal is high when running. | 3 |
| 82.21 | <i>Dry run source</i> | Selects the source for dry run protection. | <i>Under load curve</i> |
| | Under load curve | Activates dry run protection (parameter <i>37.01 ULC output status word</i> , bit 0). See section <i>Diagnostics</i> (page 170). | 0 |
| | DI1 | Digital input DI1. | 1 |
| | DI2 | Digital input DI2. | 2 |
| | DI3 | Digital input DI3. | 3 |
| | DI4 | Digital input DI4. | 4 |
| | DI5 | Digital input DI5. | 5 |
| | DI6 | Digital input DI6. | 6 |
| | Supervision 1 | Activates dry run protection. | 7 |
| | Supervision 2 | Activates dry run protection. | 8 |
| | Supervision 3 | Activates dry run protection. | 9 |
| 82.25 | <i>Soft pipe fill supervision</i> | Selects the drive action in case the system does not reach the setpoint in time defined with parameter <i>82.26 Time-out limit</i> . The time is calculated with the last reference change in parameter <i>40.03 Process PID setpoint actual</i> . | <i>No action</i> |
| | No action | Soft pipe fill time-out is disabled. | 0 |
| | Warning | Soft pipe fill supervision function generates warning <i>D405 Pipe fill-timeout</i> . | 1 |
| | Fault | Soft pipe fill supervision function generates fault <i>D50B Pipe fill-timeout</i> . | 2 |
| 82.26 | <i>Time-out limit</i> | Defines the delay time at which setpoint must be reached after last change in PID reference ramp output. | 60.0 |
| | 0.0...1800.0 s | Time-out limit in seconds. | 1 = 1 s |
| 82.30 | <i>Outlet minimum pressure protection</i> | Enables outlet minimum pressure protection function. | <i>Disabled</i> |
| | Disabled | Outlet minimum pressure protection function is disabled. | 0 |
| | Warning | Outlet minimum pressure protection function generates warning <i>D50E Outlet minimum pressure</i> when the outlet minimum pressure is below the level defined with parameter <i>82.31 Outlet minimum pressure warning level</i> for a time set in <i>82.45 Pressure check delay</i> . | 1 |
| | Fault | Outlet minimum pressure protection function generates fault <i>D408 Outlet minimum pressure</i> when the outlet minimum pressure is below the level defined with parameter <i>82.32 Outlet minimum pressure fault level</i> for a time set in parameter <i>82.45 Pressure check delay</i> . | 2 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|---|--|--------------------------|
| | Warning/Fault | Outlet minimum pressure protection function first generates a warning when the pressure is below the level defined with parameter 82.31 Outlet minimum pressure warning level for a time set in parameter 82.45 Pressure check delay . If the pressure continues to fall below the level defined with parameter 82.32 Outlet minimum pressure fault level , outlet minimum pressure fault is generated. | 3 |
| 82.31 | Outlet minimum pressure warning level | Defines the level at which drive should generate the outlet minimum pressure warning. | 0.00 |
| | 0.00...32767.00 bar | Outlet minimum pressure warning level. | 1 = 1 bar |
| 82.32 | Outlet minimum pressure fault level | Defines the level at which drive should generate the outlet minimum pressure fault. | 0.00 |
| | 0.00...32767.00 bar | Outlet minimum pressure fault level. | 1 = 1 bar |
| 82.35 | Outlet maximum pressure protection | Enables outlet maximum pressure protection function. | Disabled |
| | Disabled | Outlet maximum pressure protection is disabled. | 0 |
| | Warning | Outlet maximum pressure protection function generates warning D50F Outlet maximum pressure when the pressure is above the level defined with parameter 82.37 Outlet maximum pressure warning level for a time set in parameter 82.45 Pressure check delay . | 1 |
| | Fault | Outlet maximum pressure protection function generates fault D409 Outlet maximum pressure when the pressure is above the level defined with parameter 82.38 Outlet maximum pressure fault level for a time set in parameter 82.45 Pressure check delay . | 2 |
| | Warning/Fault | Outlet maximum pressure protection function first generates a warning when the pressure is above the level defined with parameter 82.37 Outlet maximum pressure warning level for a time set in parameter 82.45 Pressure check delay . If the pressure raises above the level defined with parameter 82.38 Outlet maximum pressure fault level , outlet maximum pressure fault is generated. | 3 |
| 82.37 | Outlet maximum pressure warning level | Defines the level at which drive should generate the outlet maximum pressure warning. | 0.00 |
| | 0.00...32767.00 bar | Outlet maximum pressure warning level. | 1 = 1 bar |
| 82.38 | Outlet maximum pressure fault level | Defines the level at which drive should generate the outlet maximum pressure fault. | 0.00 |
| | 0.00...32767.00 bar | Outlet maximum pressure fault level. | 1 = 1 bar |
| 82.40 | Inlet minimum pressure protection | Enables inlet minimum pressure protection function. | Disabled |
| | Disabled | Inlet minimum pressure protection is disabled. | 0 |
| | Warning | Inlet minimum pressure protection function generates warning D510 Inlet minimum pressure when the pressure is below the level defined with parameter 82.41 Inlet minimum pressure warning level for a time set in 82.45 Pressure check delay . | 1 |
| | Fault | Inlet minimum pressure protection function generates fault D40A Inlet minimum pressure when the pressure is below the level defined with parameter 82.42 Inlet minimum pressure fault level for a time set in 82.45 Pressure check delay . | 2 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------|--|---|-----------------|
| | Warning/Fault | Inlet minimum pressure protection function first generates a warning when the pressure is below the level defined with parameter 82.41 Inlet minimum pressure warning level for a time set in 82.45 Pressure check delay . If the pressure continues to fall below the level defined with parameter 82.42 Inlet minimum pressure fault level , a fault is generated. | 3 |
| 82.41 | Inlet minimum pressure warning level | Defines the level at which drive should generate the inlet minimum pressure warning. | 0.00 |
| | 0.00...32767.00 bar | Inlet minimum pressure warning level. | 1 = 1 bar |
| 82.42 | Inlet minimum pressure fault level | Defines the level at which drive should generate the inlet minimum pressure fault. | 0.00 |
| | 0.00...32767.00 bar | Inlet minimum pressure fault level. | 1 = 1 bar |
| 82.45 | Pressure check delay | Defines the delay time at which the pressure supervisions are inactive. You can adjust check delay for a system in which the pressure does not increase immediately after starting the motor. | 3.00 |
| | 0.00...3600.00 s | Pressure check delay time. | 1 = 1 s |
| 83 Pump cleaning | | Settings for the pump cleaning sequence. See section Pump cleaning (page 118). | |
| 83.01 | Pump cleaning status | Displays the status of pump cleaning. | <i>Disabled</i> |
| | Disabled | Cleaning sequence is disabled. | 0 |
| | Pump clean | Cleaning sequence is active. | 1 |
| | No triggers configured | Triggers are not configured. | 2 |
| | Waiting for triggering | Waiting for triggering signal. | 3 |
| | Triggered | Cleaning sequence is triggered by parameter 83.11 specifies warning generation only. | 4 |
| 83.02 | Pump cleaning progress | Displays the pump cleaning progress. | 0 |
| | 0...100% | Percentage | 10 = 1% |
| 83.03 | Total cleaning count | Displays the total cleaning count. | 0 |
| | 0...4294967295 | Total cleaning count. | - |
| 83.10 | Pump cleaning action | Enables the pump cleaning action. | <i>Cleaning</i> |
| | Off | Pump cleaning is disabled. | 0 |
| | Cleaning | Pump cleaning is started based on triggers. | 1 |
| | Warning only | Generates warning message based on triggers. | 2 |


| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------------------|--|------------|
| 83.11 | <i>Pump cleaning triggers</i> | Enables/disables the pump cleaning sequence for the drive, and defines the triggering conditions. Note: If DI1 remains On after cleaning is finished, no cleaning sequence is started. The drive starts cleaning on next start, if the trigger signal is On when motor is started. | 0b0000 |

| Bit | Name | Description |
|-------|---------------------|--|
| 0 | Reserved | |
| 1 | Every start | Cleaning starts at every start. |
| 2 | Every stop | Cleaning starts at every stop. |
| 3 | Reserved | |
| 4 | Overload detection | Cleaning sequence starts when overload situation is detected. To set up the overload curve, see parameters in group <i>37 User load curve</i> . |
| 5 | Underload detection | Cleaning sequence starts when underload situation is detected. To set up the overload curve, see parameters in group <i>37 User load curve</i> . |
| 6 | Fixed time interval | Time interval defined by parameter <i>83.15 Fixed time interval</i> . |
| 7 | Combined timer1 | Combined timer 1 of timed functions starts cleaning. |
| 8...9 | Reserved | |
| 10 | Supervision 1 | Cleaning sequence starts when Supervision 1 is high. |
| 11 | Supervision 2 | Cleaning sequence starts when Supervision 2 is high. |
| 12 | Supervision 3 | Cleaning sequence starts when Supervision 3 is high. |
| 13 | DI4 | Cleaning sequence starts when DI4 is high. |
| 14 | DI5 | Cleaning sequence starts when DI5 is high. |
| 15 | DI6 | Cleaning sequence starts when DI6 is high. |

| | | | |
|-------|-----------------------------------|---|-------------------|
| 83.12 | <i>Manually force cleaning</i> | Starts pump cleaning. | <i>Not active</i> |
| | Not active | Pump cleaning is not active. | 0 |
| | Start cleaning now | Starts pump cleaning immediately. | 1 |
| | DI4 | Starts pump cleaning when DI4 goes high. | 2 |
| | DI5 | Starts pump cleaning when DI5 goes high. | 3 |
| | DI4 | Starts pump cleaning when DI6 goes high. | 4 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 83.15 | <i>Fixed time interval</i> | Defines the constant time interval between cleaning cycles. This parameter is used only when cleaning is triggered by time interval. | 02 00:00 |
| | 00 00:00...45 23:59 | Time interval in format h min:s). | 1 = 1 |
| 83.16 | <i>Cycles in cleaning program</i> | Defines the number of cycles performed in cleaning program. For example, 1 cycle = 1 forward + 1 reverse step. | 3 |
| | 1...65535 | Value range. | |
| 83.20 | <i>Cleaning speed step</i> | Defines the speed/frequency step size in pump cleaning. Cleaning speed step is same for positive and negative directions. Note: If you have disabled the negative rotation direction by speed limits, the pump cleaning does not operate in the negative direction. | 80 |
| | 0...100% | Percentage of the cleaning speed/frequency value. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|-----------------------|-------------------------------|--|------------------|
| 83.25 | <i>Time to cleaning speed</i> | Defines the time required for the drive to reach cleaning speed set by parameter <i>83.20 Cleaning speed step</i> . | 3.000 |
| | 0.000...60.000 s | Time. | 1 = 1s |
| 83.26 | <i>Time to zero-speed</i> | Defines the time required for the drive to reach zero speed from the cleaning speed set by parameter <i>83.20 Cleaning speed step</i> . | 3.000 |
| | 0.000...60.000 s | Time | 1 = 1s |
| 83.27 | <i>Cleaning on time</i> | Defines the cleaning On time when the drive is running at cleaning speed set by parameter <i>83.20 Cleaning speed step</i> . | 10.000 |
| | 0.000...1000.000 s | Time. | 1 = 1s |
| 83.28 | <i>Cleaning off time</i> | Defines the cleaning Off time when the drive stays at zero speed between positive and negative pulses and after one cleaning cycle before starting a new cleaning cycle. | 5.000 |
| | 0.000...1000.000 s | Time. | 1 = 1s |
| 83.35 | <i>Cleaning count fault</i> | Activates the cleaning count monitoring, and selects the action it takes if it detects too many cleaning starts within the time defined by parameter <i>83.36 Cleaning count time</i> . See section <i>Cleaning count monitoring</i> (page 120). | <i>No action</i> |
| | No action | No action. | 0 |
| | Warning | Warning. | 1 |
| | Fault | Fault. | 2 |
| 83.36 | <i>Cleaning count time</i> | Defines the time for cleaning count monitoring. See section <i>Cleaning count monitoring</i> (page 120). | 00 01:00 |
| | 00 00:00...45:12:15 | Time. | 1 = 1 |
| 83.37 | <i>Maximum cleaning count</i> | Defines the maximum cleaning counts allowed. See section <i>Cleaning count monitoring</i> (page 120). | 5 |
| | 0...30 | Maximum cleaning counts. | 1 = 1 |
| 94 LSU control | | Control of the supply unit of the drive, such as DC voltage and reactive power reference. (Only visible for ACQ580-31 and ACQ580-34). Note that the references defined here must also be selected as the reference source in the supply control program to be effective. See also section <i>Control of a line supply unit (LSU)</i> (page 93). | |
| 94.01 | <i>LSU control</i> | Enables/disables the internal INU-LSU state machine. When the state machine is enabled, the inverter unit (INU) controls the supply unit (LSU) and prevents the inverter unit from starting until the supply unit is ready. When the state machine is disabled, the status of the supply unit (LSU) is ignored by the inverter unit. | <i>On</i> |
| | Off | INU-LSU state machine disabled. | 0 |
| | On | INU-LSU state machine enabled. | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------------|--|--------------------------------------|
| 94.02 | <i>LSU panel communication</i> | Enables/disables control panel and PC tool access to the supply unit (line-side converter) via the inverter unit (motor-side converter). Note: This feature is only supported by ACQ580-31 and ACQ580-34. | <i>Disable</i> |
| | Disable | Direct control panel and PC tool access to supply unit control board via inverter unit is disabled. Drive acts as single inverter on the panel bus. | 0 |
| | Enable | Direct control panel and PC tool access to supply unit control board via inverter unit is enabled. Drive unit shows as two separate units (inverter and supply unit) on the panel bus. | 1 |
| 94.04 | <i>INU-LSU status word profile</i> | Defines INU-LSU status word profile. Note: This feature is only supported by ACQ580-31. | <i>ABB single drives standard SW</i> |
| | ABB single drives standard SW | Drive indicates Ready run state in <i>06.11 Main status word</i> bit 1 when DC link is charged. This way the drive behaves in a similar way than -01 type drives. | 0 |
| | Backwards compatible SW | Drive indicates Ready run state in <i>06.11 Main status word</i> bit 1 after the main contactor is closed and LSU is running. | 1 |
| 94.10 | <i>LSU max charging time</i> | Defines the maximum time the supply unit (LSU) is allowed for charging before fault <i>7584 LSU charge failed</i> is generated. | 15 s |
| | 0...65535 s | Maximum charging time. | 1 = 1 s |
| 94.11 | <i>LSU stop delay</i> | Defines a stop delay for the supply unit. This parameter can be used to delay the opening of the main breaker/contactors when a restart is expected. | 600.0 s |
| | 0.0 ... 3600.0 s | Supply unit stop delay. | 10 = 1 s |
| 94.22 | <i>User DC voltage reference</i> | Defines the DC voltage reference for the supply unit. | 0.0 V |
| | 0.0 ... 2000.0 V | User DC reference. | 10 = 1 V |
| 94.32 | <i>User reactive power reference</i> | Defines the reactive power reference for the supply unit. | 0.0 kvar |
| | -3276.8 ... 3276.7 kvar | User reactive power reference. | 10 = 1 kvar |
| 94.40 | <i>Power mot limit on net loss</i> | Defines the maximum shaft power for motoring mode upon a supply network failure when IGBT supply unit control is active (bit 15 of <i>95.20 HW options word 1</i> is on). The value is given in percent of nominal motor power. | 600.00% |
| | 0.00 ... 600.00% | Maximum shaft power for motoring mode upon a supply network failure. | 1 = 1% |
| 94.41 | <i>Power gen limit on net loss</i> | Defines the maximum shaft power for generating upon a supply network failure when supply unit control is active (bit 15 of <i>95.20 HW options word 1</i> is on). The value is given in percent of nominal motor power. | -600.00% |
| | -600.00 ... 0.00% | Maximum shaft power for generating mode upon a supply network failure. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|----------------------------|------------------------------------|--|---------------------------------|
| 95 HW configuration | | Various hardware-related settings. | |
| 95.01 | <i>Supply voltage</i> | <p>Selects the supply voltage range. This parameter is used by the drive to determine the nominal voltage of the supply network. The parameter also affects the current ratings and the DC voltage control functions (trip and brake chopper activation limits) of the drive.</p> <p> WARNING! An incorrect setting may cause the motor to rush uncontrollably, or the brake chopper or resistor to overload.</p> <p>Note: The selections shown depend on the hardware of the drive. If only one voltage range is valid for the drive in question, it is selected by default.</p> <p>Note: In ACQ580-31 and ACQ580-34, you have to select the supply voltage manually as the automatic selection is not supported.</p> | <i>Automatic / not selected</i> |
| | Automatic / not selected | <p>No voltage range selected. The drive will not start modulating before a range is selected, unless parameter 95.02 Adaptive voltage limits is set to <i>Enable</i>, in which case the drive estimates the supply voltage itself.</p> <p>Note: Not supported for ACQ580-31 and ACQ580-34.</p> | 0 |
| | 208...240 V | 208...240 V | 1 |
| | 380...415 V | 380...415 V | 2 |
| | 440...480 V | 440...480 V | 3 |
| | 575...600 V | 575...600 V | 5 |
| 95.02 | <i>Adaptive voltage limits</i> | <p>Enables adaptive voltage limits.</p> <p>Adaptive voltage limits can be used if, for example, an IGBT supply unit is used to raise the DC voltage level. If the communication between the inverter and IGBT supply unit is active, the voltage limits are related to the DC voltage reference from the IGBT supply unit. Otherwise the limits are calculated based on the measured DC voltage at the end of the pre-charging sequence.</p> <p>This function is also useful if the AC supply voltage to the drive is high, as the warning levels are raised accordingly.</p> | <i>Enable</i> |
| | Disable | Adaptive voltage limits disabled. | 0 |
| | Enable | Adaptive voltage limits enabled. | 1 |
| 95.03 | <i>Estimated AC supply voltage</i> | <p>AC supply voltage estimated by calculation. Estimation is done every time the drive is powered up and is based on the rise speed of voltage level of the DC bus while the drive charges the DC bus.</p> <p>Note: This parameter is not used for ACQ580-31 and ACQ580-34. The supply voltage is shown by parameter 01.109 Grid voltage.</p> | - |
| | 0...65535 V | Voltage. | 10 = 1 V |
| 95.04 | <i>Control board supply</i> | Specifies how the control board of the drive is powered. | <i>Internal 24V</i> |
| | Internal 24V | The drive control board is powered from the drive power unit it is connected to. | 0 |
| | External 24V | The drive control board is powered from an external power supply. | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|----------------------------|---|------------|
| 95.15 | <i>Special HW settings</i> | <p>Contains hardware-related settings that can be enabled and disabled by toggling the specific bits.</p> <p>Notes:</p> <ul style="list-style-type: none"> The installation of the hardware specified by this parameter may require derating of drive output, or impose other limitations. Refer to (ATEX) the hardware manual of the drive. With the CPTC-02 ATEX-certified thermistor protection module, follow the instructions given in the <i>CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual</i> (3AXD50000030058 [English]). | 00000000h |


| Bit | Name | Information |
|--------|-----------------|---|
| 0 | EX motor | <p>1 = The driven motor is an Ex (ATEX) motor provided by ABB for potentially explosive atmospheres. This sets the required minimum switching frequency for ABB Ex (ATEX) motors.</p> <p>Notes:</p> <ul style="list-style-type: none"> For non-ABB Ex (ATEX) motors, use parameters 97.01 and 97.02 to define the correct minimum switching frequency. If you have a multimotor system, contact your local ABB representative. |
| 1 | ABB Sine filter | 1 = An ABB sine filter is connected to the output of the drive. |
| 2...15 | Reserved | |

| | | |
|---------------------------|--|-------|
| 00000000h... FFFFFFFFh | Hardware options configuration word. | 1 = 1 |
| 95.20 HW options word 1 | Specifies hardware-related options that require differentiated parameter defaults. This parameter is not affected by a parameter restore. | - |

| Bit | Name | Value |
|--------|-------------------------|--|
| 0 | Supply frequency 60 Hz | <p>See section <i>Differences in the default values between 50 Hz and 60 Hz supply frequency settings</i> on page 509.</p> <p>0 = 50 Hz. 1 = 60 Hz.</p> |
| 1...12 | Reserved | |
| 13 | du/dt filter activation | <p>When active, an external du/dt filter is connected to the drive/inverter output. The setting will limit the output switching frequency, and force the fan of the drive/inverter module to full speed.</p> <p>0 = du/dt filter inactive. 1 = du/dt filter active.</p> |
| 14 | Reserved | |
| 15 | INU-ISU communication | *1 = IGBT supply unit control by inverter unit active. Makes several parameters visible in groups 01 , 05 , 06 , 07 , 30 , 31 , 60 , 61 , 62 , 94 and 96 . |

*See section *Control of a line supply unit (LSU)* (page 93).

| | | |
|---------------|--------------------------------------|-------|
| 0000h...FFFFh | Hardware options configuration word. | 1 = 1 |
|---------------|--------------------------------------|-------|

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-------------------|--|------------|
| 95.21 | HW options word 2 | <div>Specifies more hardware-related options that require differentiated parameter defaults. See parameter 95.20 HW options word 1.</div> <div> WARNING! After switching any bits in this word, recheck the values of the affected parameters.</div> | - |

| Bit | Name | Information |
|--------|---------------|---|
| 0...5 | Reserved | |
| 6 | Cabinet drive | 0 = Inactive, 1 = Active. Only for drive frames R6 or larger. |
| 7 | Cabinet fan | 0 = Inactive, 1 = Active. Only for drive frames R6 or larger. |
| 8...15 | Reserved | |

| | | | |
|---------------|------------------|---|-------|
| 0000b...0101b | | Hardware options configuration word 2. | 1 = 1 |
| 95.200 | Cooling fan mode | Cooling fan operation mode. | Auto |
| Auto | | Fan runs normally: Fan on/off, fan speed reference can autochange according to the drive state. | 0 |
| Always on | | Fan always runs at 100% speed reference. | 1 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------|---|------------|----------------|----------|-------|---------|----------|----------|----------|--------|----------|----------|----------|---------|----------|----------|----------|------------|----------|----------|----------|--------|----------|----------|----------|----------------------|----------|--|----------|---------|----------|--|--|---------|----------|--|--|--------|----------|--|--|---------|----------|--|--|---------|----------|--|--|-------|--|----------|--|--------|--|----------|--|---------|--|----------|--|-------|--|----------|--|------------------|--|----------|--|--------------------|--|----------|--|--------|--|--------------|--|--------|--|--|----------|----------|--|--|----------|------|--|--|----------|----------------|
| 96 System | | Language selection; access levels; macro selection; parameter save and restore; control unit reboot; user parameter sets; unit selection; parameter checksum calculation; user lock. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 96.01 | Language | <p>Selects the language of the parameter interface and other displayed information when viewed on the control panel.</p> <p>Drive supports multiple languages. The languages are divided in three firmware packages: Global, European and Asian.</p> <p>The default package is Global package that supports languages marked with X and G. European delta supports languages marked with X and E. Asian delta supports languages marked with X and A.</p> <table border="1"> <thead> <tr> <th>Language</th><th>Global package</th><th>European</th><th>Asian</th></tr> </thead> <tbody> <tr><td>English</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>German</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>Spanish</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>Portuguese</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>French</td><td>X</td><td>X</td><td>X</td></tr> <tr><td>Chinese (Simplified)</td><td>X</td><td></td><td>X</td></tr> <tr><td>Italian</td><td>G</td><td></td><td></td></tr> <tr><td>Finnish</td><td>G</td><td></td><td></td></tr> <tr><td>Polish</td><td>G</td><td></td><td></td></tr> <tr><td>Russian</td><td>G</td><td></td><td></td></tr> <tr><td>Turkish</td><td>G</td><td></td><td></td></tr> <tr><td>Dutch</td><td></td><td>E</td><td></td></tr> <tr><td>Danish</td><td></td><td>E</td><td></td></tr> <tr><td>Swedish</td><td></td><td>E</td><td></td></tr> <tr><td>Czech</td><td></td><td>E</td><td></td></tr> <tr><td>Greek (Ellinika)</td><td></td><td>E</td><td></td></tr> <tr><td>Hungarian (Magyar)</td><td></td><td>E</td><td></td></tr> <tr><td>Hebrew</td><td></td><td>(E)</td><td></td></tr> <tr><td>Korean</td><td></td><td></td><td>A</td></tr> <tr><td>Japanese</td><td></td><td></td><td>A</td></tr> <tr><td>Thai</td><td></td><td></td><td>A</td></tr> </tbody> </table> <p> X = Common language, available in all packages G = Available in Global package only E = Available in European package only (E) = Will be available later A = Available in Asian package only </p> | Language | Global package | European | Asian | English | X | X | X | German | X | X | X | Spanish | X | X | X | Portuguese | X | X | X | French | X | X | X | Chinese (Simplified) | X | | X | Italian | G | | | Finnish | G | | | Polish | G | | | Russian | G | | | Turkish | G | | | Dutch | | E | | Danish | | E | | Swedish | | E | | Czech | | E | | Greek (Ellinika) | | E | | Hungarian (Magyar) | | E | | Hebrew | | (E) | | Korean | | | A | Japanese | | | A | Thai | | | A | English |
| Language | Global package | European | Asian | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| English | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| German | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Spanish | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Portuguese | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| French | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chinese (Simplified) | X | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Italian | G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Finnish | G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Polish | G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Russian | G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Turkish | G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dutch | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Danish | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Swedish | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Czech | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Greek (Ellinika) | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hungarian (Magyar) | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hebrew | | (E) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Korean | | | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Japanese | | | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thai | | | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-----|---------------------------|---|------------|
| | | <p>The drives include the language package corresponding to the order's geographical location. No plus code or other actions are needed.</p> <p>Examples:</p> <ul style="list-style-type: none"> • If the order is placed in Sweden, the drives will be delivered with the Global package (default package). • If the order is placed in Poland, the drives will be updated with European package before the delivery. • If the order is placed in Japan, the drives will be updated with Asian package before the delivery. <p>All the language package variants are available from your local drives support.</p> <p>Notes:</p> <ul style="list-style-type: none"> • Not all languages listed below are necessarily supported. • This parameter does not affect the languages visible in the Drive composer PC tool. (Those are specified under View > Settings > Drive default language.) | |
| | Not selected | None. | 0 |
| | English | English. Included in all packages. | 1033 |
| | Deutsch | German. Included in all packages. | 1031 |
| | Italiano | Italian. Included in Global package. | 1040 |
| | Español | Spanish. Included in all packages. | 3082 |
| | Portugues | Portuguese. Included in all packages. | 2070 |
| | Nederlands | Dutch. Included in European package. | 1043 |
| | Français | French. Included in all packages. | 1036 |
| | Dansk | Danish. Included in European package. | 1030 |
| | Suomi | Finnish. Included in Global package. | 1035 |
| | Svenska | Swedish. Included in European package. | 1053 |
| | Russki | Russian. Included in Global package. | 1049 |
| | Türkçe | Turkish. Included in Global package. | 1055 |
| | Chinese (Simplified, PRC) | Simplified Chinese. Included in Global and Asian packages. | 2052 |
| | ?eský | Czech. Included in European package. | 1029 |
| | Greek | Greek. Included in European package. | 1032 |
| | Magyar | Hungarian. Included in European package. | 1038 |
| | Korean | Korean. Included in Asian package. | 1042 |
| | Japanese | Japanese. Included in Asian package. | 1041 |
| | Thai | Thai. Included in Asian package. | 1054 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | | | |
|---|-----------------------|---|---------------|-----|------|---|----------|---|---------|---|---------------------|--------|----------|----|--------------------|----|--------------------|----|--------------------|----|----------------|----|----------|
| 96.02 | Pass code | <p>Pass codes can be entered into this parameter to activate further access levels (see parameter 96.03 Access level status) or to configure the user lock.</p> <p>Entering "358" toggles the parameter lock, which prevents the changing of all other parameters through the control panel or the Drive composer PC tool.</p> <p>Entering the user pass code (by default, "10000000") enables parameters 96.100...96.102, which can be used to define a new user pass code and to select the actions that are to be prevented.</p> <p>Entering an invalid pass code will close the user lock if open, ie, hide parameters 96.100...96.102. After entering the code, check that the parameters are in fact hidden. If they are not, enter another (random) pass code.</p> <p>Note: You must change the default user pass code to maintain a high level of cybersecurity. <u>Store the code in a safe place – ABB CANNOT UNLOCK THE DRIVE ONCE YOU CHANGE THE PASS CODE.</u></p> <p>See also section Parameter checksum calculation (page 172).</p> | | | | | | | | | | | | | | | | | | | | | |
| | 0...99999999 | Pass code. | - | | | | | | | | | | | | | | | | | | | | |
| 96.03 | Access level status | Shows which access levels have been activated by pass codes entered into parameter 96.02 Pass code . | 0001b | | | | | | | | | | | | | | | | | | | | |
| <table><tr><th>Bit</th><th>Name</th></tr><tr><td>0</td><td>End user</td></tr><tr><td>1</td><td>Service</td></tr><tr><td>2</td><td>Advanced programmer</td></tr><tr><td>3...10</td><td>Reserved</td></tr><tr><td>11</td><td>OEM access level 1</td></tr><tr><td>12</td><td>OEM access level 2</td></tr><tr><td>13</td><td>OEM access level 3</td></tr><tr><td>14</td><td>Parameter lock</td></tr><tr><td>15</td><td>Reserved</td></tr></table> | | | | Bit | Name | 0 | End user | 1 | Service | 2 | Advanced programmer | 3...10 | Reserved | 11 | OEM access level 1 | 12 | OEM access level 2 | 13 | OEM access level 3 | 14 | Parameter lock | 15 | Reserved |
| Bit | Name | | | | | | | | | | | | | | | | | | | | | | |
| 0 | End user | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Service | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Advanced programmer | | | | | | | | | | | | | | | | | | | | | | |
| 3...10 | Reserved | | | | | | | | | | | | | | | | | | | | | | |
| 11 | OEM access level 1 | | | | | | | | | | | | | | | | | | | | | | |
| 12 | OEM access level 2 | | | | | | | | | | | | | | | | | | | | | | |
| 13 | OEM access level 3 | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Parameter lock | | | | | | | | | | | | | | | | | | | | | | |
| 15 | Reserved | | | | | | | | | | | | | | | | | | | | | | |
| | 00000000h...FFFFFFFFh | Active access levels. | - | | | | | | | | | | | | | | | | | | | | |
| 96.04 | Macro select | Selects the control macro. See chapter Default I/O configuration (page 79) for more information. After a selection is made, the parameter reverts automatically to Done . | Done | | | | | | | | | | | | | | | | | | | | |
| | Done | Macro selection complete; normal operation. | 0 | | | | | | | | | | | | | | | | | | | | |
| | Water default | Factory default (page 80). For scalar motor control. | 1 | | | | | | | | | | | | | | | | | | | | |
| 96.05 | Macro active | Shows which control macro is currently selected. See chapter Default I/O configuration (page 79) for more information. To change the macro, use parameter 96.04 Macro select . | Water default | | | | | | | | | | | | | | | | | | | | |
| | Water default | Factory default (page 80). For scalar motor control. | 1 | | | | | | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------|---|-------------|
| 96.06 | <i>Parameter restore</i> | Restores the original settings of the control program, ie, parameter default values. Note: This parameter cannot be changed while the drive is running. | <i>Done</i> |
| | Done | Restoring is completed. | 0 |
| | Restore defaults | Restores all editable parameter values to default values, except <ul style="list-style-type: none"> • motor data and ID run results • I/O extension module settings • end user texts, such as customized warnings and faults, and the drive name • control panel/PC communication settings • fieldbus adapter settings • control macro selection and the parameter defaults implemented by it • <i>parameter 95.01 Supply voltage</i> • differentiated defaults implemented by parameters <i>95.20 HW options word 1</i> and <i>95.21 HW options word 2</i> • user lock configuration parameters <i>96.100...96.102</i>. | 8 |
| | Clear all | Restores all editable parameter values to default values, except <ul style="list-style-type: none"> • end user texts, such as customized warnings and faults, and the drive name • control panel/PC communication settings • <i>parameter 95.01 Supply voltage</i> • differentiated defaults implemented by parameters <i>95.20 HW options word 1</i> and <i>95.21 HW options word 2</i> • user lock configuration parameters <i>96.100...96.102</i>. • group <i>49 Panel port communication</i> parameters. | 62 |
| | Reset all fieldbus settings | Restores all fieldbus and communication related settings to default values. Note: Fieldbus, control panel and PC tool communication are interrupted during the restore. | 32 |
| | Reset home view | Restores the home view layout back to show the values of the default parameters defined by the control macro in use | 512 |
| | Reset end user texts | Restores all end user texts to default values, including the drive name, contact info, customized fault and warning texts, PID unit and currency unit. Note: PID unit is reset only if it is user editable text, that is, parameter <i>40.79 Set 1 units</i> is set to User text. | 1024 |
| | Reset motor data | Restores all motor nominal values and motor ID run results to default values. | 2 |
| | All to factory defaults | Restores all drive parameters and settings back to initial factory values, except <ul style="list-style-type: none"> • differentiated defaults implemented by parameters <i>95.20 HW options word 1</i> and <i>95.21 HW options word 2</i>. | 34560 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------------|--|------------------|
| 96.07 | <i>Parameter save manually</i> | Saves the valid parameter values to the permanent memory on the drive control unit to ensure that operation can continue after cycling the power. Save the parameters with this parameter <ul style="list-style-type: none"> to store values sent from the fieldbus when using external +24 V DC power supply to the control unit: to save parameter changes before you power down the control unit. The supply has a very short hold-up time when powered off. Note: A new parameter value is saved automatically when changed from the PC tool or control panel but not when altered through a fieldbus adapter connection. | <i>Done</i> |
| | Done | Save completed. | 0 |
| | Save | Save in progress. | 1 |
| 96.08 | <i>Control board boot</i> | Changing the value of this parameter to 1 reboots the control unit (without requiring a power off/on cycle of the complete drive module). The value reverts to 0 automatically. | <i>No action</i> |
| | No action | 1 = No action. | 0 |
| | Reboot | 1 = Reboot the control unit. | 1 |
| 96.10 | <i>User set status</i> | Shows the status of the user parameter sets. This parameter is read-only. See also section <i>Data storage parameters</i> (page 172). | - |
| | n/a | No user parameter sets have been saved. | 0 |
| | Loading | A user set is being loaded. | 1 |
| | Saving | A user set is being saved. | 2 |
| | Faulted | Invalid or empty parameter set. | 3 |
| | User1 IO active | User set 1 has been selected by parameters <i>96.12 User set I/O mode in1</i> and <i>96.13 User set I/O mode in2</i> . | 4 |
| | User2 IO active | User set 2 has been selected by parameters <i>96.12 User set I/O mode in1</i> and <i>96.13 User set I/O mode in2</i> . | 5 |
| | User3 IO active | User set 3 has been selected by parameters <i>96.12 User set I/O mode in1</i> and <i>96.13 User set I/O mode in2</i> . | 6 |
| | User4 IO active | User set 4 has been selected by parameters <i>96.12 User set I/O mode in1</i> and <i>96.13 User set I/O mode in2</i> . | 7 |
| | Reserved | | 8...19 |
| | User1 backup | User set 1 has been saved or loaded. | 20 |
| | User2 backup | User set 2 has been saved or loaded. | 21 |
| | User3 backup | User set 3 has been saved or loaded. | 22 |
| | User4 backup | User set 4 has been saved or loaded. | 23 |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | |
|---|---|--|---|---|-----------------------------|---|---|-------|---|---|-------|---|---|-------|---|---|-------|--------------|
| 96.11 | User set save/load | <p>Enables the saving and restoring of up to four custom sets of parameter settings. See section <i>User parameter sets</i> (page 166).</p> <p>The set that was in use before powering down the drive is in use after the next power-up.</p> <p>Notes:</p> <ul style="list-style-type: none">• Hardware configuration settings, such as I/O extension module and fieldbus configuration parameters (groups 14...16, 47, 51...58 and 92...93, and parameter <i>50.01 FBA A enable</i>), and forced input/output values (such as <i>10.03 DI force selection</i> and <i>10.04 DI forced data</i>) are not included in user parameter sets.• Parameter changes made after loading a set are not automatically stored – they must be saved using this parameter.• If no sets have been saved, attempting to load a set will create all sets from the currently active parameter settings.• Switching between sets is only possible with the drive stopped. | No action | | | | | | | | | | | | | | | |
| | No action | Load or save operation complete; normal operation. | 0 | | | | | | | | | | | | | | | |
| | User set I/O mode | Load user parameter set using parameters <i>96.12 User set I/O mode in1</i> and <i>96.13 User set I/O mode in2</i> . | 1 | | | | | | | | | | | | | | | |
| | Load set 1 | Load user parameter set 1. | 2 | | | | | | | | | | | | | | | |
| | Load set 2 | Load user parameter set 2. | 3 | | | | | | | | | | | | | | | |
| | Load set 3 | Load user parameter set 3. | 4 | | | | | | | | | | | | | | | |
| | Load set 4 | Load user parameter set 4. | 5 | | | | | | | | | | | | | | | |
| | Reserved | | 6...17 | | | | | | | | | | | | | | | |
| | Save to set 1 | Save user parameter set 1. | 18 | | | | | | | | | | | | | | | |
| | Save to set 2 | Save user parameter set 2. | 19 | | | | | | | | | | | | | | | |
| | Save to set 3 | Save user parameter set 3. | 20 | | | | | | | | | | | | | | | |
| | Save to set 4 | Save user parameter set 4. | 21 | | | | | | | | | | | | | | | |
| 96.12 | User set I/O mode in1 | <p>When parameter <i>96.11 User set save/load</i> is set to <i>User set I/O mode</i>, selects the user parameter set together with parameter <i>96.13 User set I/O mode in2</i> as follows:</p> <table><tr><th>Status of source defined by par. <i>96.12</i></th><th>Status of source defined by par. <i>96.13</i></th><th>User parameter set selected</th></tr><tr><td>0</td><td>0</td><td>Set 1</td></tr><tr><td>1</td><td>0</td><td>Set 2</td></tr><tr><td>0</td><td>1</td><td>Set 3</td></tr><tr><td>1</td><td>1</td><td>Set 4</td></tr></table> | Status of source defined by par. <i>96.12</i> | Status of source defined by par. <i>96.13</i> | User parameter set selected | 0 | 0 | Set 1 | 1 | 0 | Set 2 | 0 | 1 | Set 3 | 1 | 1 | Set 4 | Not selected |
| Status of source defined by par. <i>96.12</i> | Status of source defined by par. <i>96.13</i> | User parameter set selected | | | | | | | | | | | | | | | | |
| 0 | 0 | Set 1 | | | | | | | | | | | | | | | | |
| 1 | 0 | Set 2 | | | | | | | | | | | | | | | | |
| 0 | 1 | Set 3 | | | | | | | | | | | | | | | | |
| 1 | 1 | Set 4 | | | | | | | | | | | | | | | | |
| | Not selected | 0. | 0 | | | | | | | | | | | | | | | |
| | Selected | 1. | 1 | | | | | | | | | | | | | | | |
| | DI1 | Digital input DI1 (<i>10.02 DI delayed status</i> , bit 0). | 2 | | | | | | | | | | | | | | | |
| | DI2 | Digital input DI2 (<i>10.02 DI delayed status</i> , bit 1). | 3 | | | | | | | | | | | | | | | |
| | DI3 | Digital input DI3 (<i>10.02 DI delayed status</i> , bit 2). | 4 | | | | | | | | | | | | | | | |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------------------|--|---------------------|
| | DI4 | Digital input DI4 (<i>10.02 DI delayed status</i> , bit 3). | 5 |
| | DI5 | Digital input DI5 (<i>10.02 DI delayed status</i> , bit 4). | 6 |
| | DI6 | Digital input DI6 (<i>10.02 DI delayed status</i> , bit 5). | 7 |
| | Reserved | | 8...17 |
| | Timed function 1 | Bit 0 of <i>34.01 Timed functions status</i> (see page 384). | 18 |
| | Timed function 2 | Bit 1 of <i>34.01 Timed functions status</i> (see page 384). | 19 |
| | Timed function 3 | Bit 2 of <i>34.01 Timed functions status</i> (see page 384). | 20 |
| | Reserved | | 21...23 |
| | Supervision 1 | Bit 0 of <i>32.01 Supervision status</i> (see page 377). | 24 |
| | Supervision 2 | Bit 1 of <i>32.01 Supervision status</i> (see page 377). | 25 |
| | Supervision 3 | Bit 2 of <i>32.01 Supervision status</i> (see page 377). | 26 |
| | <i>Other [bit]</i> | Source selection (see <i>Terms and abbreviations</i> on page 272). | - |
| 96.13 | <i>User set I/O mode in2</i> | See parameter 96.12 <i>User set I/O mode in1</i> . | <i>Not selected</i> |
| 96.16 | <i>Unit selection</i> | Selects the unit of parameters indicating power, temperature and torque. | 0000b |

| Bit | Name | Information |
|--------|------------------|----------------------------------|
| 0 | Power unit | 0 = kW 1 = hp |
| 1 | Reserved | |
| 2 | Temperature unit | 0 = °C 1 = °F |
| 3 | Reserved | |
| 4 | Torque unit | 0 = Nm (N·m) 1 = lbft (lb·ft) |
| 5...15 | Reserved | |

| | | |
|--------------------------|-------------------------------------|--|
| 00000000h... FFFFFFFh | Unit selection word. | 1 = 1 |
| 96.20 | <i>Time sync primary source</i> | Defines the 1st priority external source for synchronization of the drive's time and date. <i>Panel link</i> |
| | Internal | No external source selected. 0 |
| | Reserved | 1...2 |
| | Fieldbus A | Fieldbus interface A. 3 |
| | Reserved | 4...5 |
| | Embedded FB | Embedded fieldbus interface. 6 |
| | Reserved | 7 |
| | Panel link | Control panel, or Drive composer PC tool connected to the control panel. 8 |
| | Ethernet tool link | Drive composer PC tool through an FENA module. 9 |
| 96.51 | <i>Clear fault and event logger</i> | Clears all events from the drive's fault and event logs. See section <i>Warning/fault history</i> on page 178. <i>Done</i> |
| | Done | 0 = No action 0 |
| | Reset | 1 = Clear the loggers. 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------|--|------------|
| 96.54 | Checksum action | Selects how the drive reacts <ul style="list-style-type: none">• <u>when 96.55 Checksum control word, bit 8 = 1 (Approved checksum A)</u>: if the parameter checksum 96.68 Actual checksum A does not match 96.71 Approved checksum A, and/or• <u>when 96.55 Checksum control word, bit 9 = 1 (Approved checksum B)</u>: if the parameter checksum 96.69 Actual checksum B does not match 96.72 Approved checksum B. | No action |
| | No action | No action taken. (The checksum feature is not in use.) | 0 |
| | Pure event | Drive generates an event log entry B686 Checksum mismatch. | 1 |
| | Warning | Drive generates warning A686 Checksum mismatch. | 2 |
| | Warning and prevent start | Drive generates warning A686 Checksum mismatch. Starting the drive is prevented. | 3 |
| | Fault | Drive trips on fault 6200 Checksum mismatch. | 4 |
| 96.55 | Checksum control word | Bits 8...9 select which comparison(s) are made: <ul style="list-style-type: none">• <u>Bit 8 = 1 (Approved checksum A)</u>: 96.68 Actual checksum A is compared to 96.71 Approved checksum A, and/or• <u>Bit 9 = 1 (Approved checksum A)</u>: if 96.69 Actual checksum B is compared to 96.72 Approved checksum B. Bits 12...13 select approved (reference) checksum parameter(s) into which the actual checksum(s) from parameter(s) are copied: <ul style="list-style-type: none">• <u>Bit 12 = 1 (Set approved checksum A)</u>: Value of 96.68 Actual checksum A is copied into 96.71 Approved checksum A, and/or• <u>Bit 13 = 1 (Set approved checksum B)</u>: Value of 96.69 Actual checksum B copied into 96.72 Approved checksum B. | 00000000h |

| Bit | Name | Description |
|---------|-------------------------|---|
| 0...7 | Reserved | |
| 8 | Approved checksum A | 1 = Enabled: Checksum A (96.71) is observed. 0 = Disabled. |
| 9 | Approved checksum B | 1 = Enabled: Checksum B (96.72) is observed. 0 = Disabled. |
| 10...11 | Reserved | |
| 12 | Set approved checksum A | 1 = Set: Copy value of 96.68 into 96.71. 0 = Done (copy has been made). |
| 13 | Set approved checksum B | 1 = Set: Copy value of 96.69 into 96.72. 0 = Done (copy has been made). |
| 14...15 | Reserved | |

| | | |
|--------------------------|------------------------|-------|
| 00000000... FFFFFFFFh | Checksum control word. | 1 = 1 |
|--------------------------|------------------------|-------|


| No. | Name/Value | Description | Def/FbEq16 |
|--------|---------------------------------|--|------------|
| 96.68 | <i>Actual checksum A</i> | Displays the actual parameter configuration checksum. Checksum A calculation does not include <ul style="list-style-type: none"> • fieldbus settings. The parameters included in the calculation are user editable parameters in parameter groups 10...13, 15, 19...25, 28, 30...32, 34...37, 40...41, 43, 45...46, 70...74, 76, 80, 94...99. See also section Parameter checksum calculation (page 172). | 0h |
| | 00000000h... FFFFFFFFh | Actual checksum. | - |
| 96.69 | <i>Actual checksum B</i> | Displays the actual parameter configuration checksum B. Checksum B calculation does not include <ul style="list-style-type: none"> • fieldbus settings • motor data settings • energy data settings. The parameters included in the calculation are user editable parameters in parameter groups 10...13, 15, 19...25, 28, 30...32, 34, 35...37, 40...41, 43, 46, 70...74, 76, 80, 94...97. See also section Parameter checksum calculation (page 172). | 0h |
| | 00000000h... FFFFFFFFh | Actual checksum. | - |
| 96.70 | <i>Disable adaptive program</i> | Enables/disables the adaptive program (if present). See also section Adaptive programming (page 88). | Yes |
| | No | Adaptive program enabled. | 0 |
| | Yes | Adaptive program disabled. | 1 |
| 96.71 | <i>Approved checksum A</i> | Approved (reference) checksum A. | 0h |
| | 00000000h... FFFFFFFFh | Approved checksum A. | - |
| 96.72 | <i>Approved checksum B</i> | Approved (reference) checksum B. | 0h |
| | 00000000h... FFFFFFFFh | Approved checksum B. | - |
| 96.78 | <i>550 Compatibility mode</i> | Enables/disables a Modbus user to access a select set of parameters using 550 register numbering. | Disable |
| | Disable | 1 = Using 550 register numbering disabled. | 0 |
| | Enable | 0 = Using 550 register numbering enabled. | 1 |
| 96.100 | <i>Change user pass code</i> | (Visible when user lock is open) To change the current user pass code, enter a new code into this parameter as well as 96.101 Confirm user pass code . A warning will be active until the new pass code is confirmed. To cancel changing the pass code, close the user lock without confirming. To close the lock, enter an invalid pass code in parameter 96.02 Pass code , activate parameter 96.08 Control board boot , or cycle the power. See also section Parameter checksum calculation (page 172). | 10000000 |
| | 10000000... 99999999 | New user pass code. | - |

| No. | Name/Value | Description | Def/FbEq16 |
|--------|--------------------------------|--|------------|
| 96.101 | <i>Confirm user pass code</i> | (Visible when user lock is open) Confirms the new user pass code entered in 96.100 Change user pass code . | |
| | 10000000... 99999999 | Confirmation of new user pass code. | - |
| 96.102 | <i>User lock functionality</i> | (Visible when user lock is open) Selects the actions or functionalities to be prevented by the user lock. Note that the changes made take effect only when the user lock is closed. See parameter 96.02 Pass code . Note: We recommend you select all the actions and functionalities unless otherwise required by the application. | 0000h |

| Bit | Name | Information |
|---------|-----------------------------|--|
| 0 | Disable ABB access levels | 1 = ABB access levels (service, advanced programmer, etc.; see 96.03) disabled |
| 1 | Freeze parameter lock state | 1 = Changing the parameter lock state prevented, ie, pass code 358 has no effect |
| 2 | Disable file download | 1 = Loading of files to drive prevented. This applies to <ul style="list-style-type: none"> firmware upgrades parameter restore loading an adaptive program changing home view of control panel editing drive texts editing the favorite parameters list on control panel configuration settings made through control panel such as time/date formats and enabling/disabling clock display. |
| 3 | Reserved | |
| 4 | Disable backups | 0 = Backups are enabled. 1 = Backups are disabled. |
| 7 | Disable panel Bluetooth | 1 = Bluetooth disabled on ACH-AP-W control panel. If the drive is part of a panel bus, Bluetooth is disabled on all control panels. |
| 8...10 | Reserved | |
| 11 | Disable OEM access level 1 | 1 = OEM access level 1 disabled |
| 12 | Disable OEM access level 2 | 1 = OEM access level 2 disabled |
| 13 | Disable OEM access level 3 | 1 = OEM access level 3 disabled |
| 14...15 | Reserved | |

| | | | |
|--------|-------------------------------|---|-------|
| | 0000h...FFFFh | Selection of actions to be prevented by user lock. | - |
| 96.108 | <i>LSU control board boot</i> | (Only visible for ACQ580-31 and ACQ580-34). Changing the value of this parameter to 1 reboots the supply control unit (without requiring a power off/on cycle of the drive system). The value reverts to 0 automatically. | 0 |
| | 0...1 | 1 = Reboot the supply control unit. | 1 = 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------------------------|--------------------------------------|---|------------|
| 97 Motor control | | Switching frequency; slip gain; voltage reserve; flux braking; anti-cogging (signal injection); IR compensation. | |
| 97.01 | <i>Switching frequency reference</i> | <p>Defines the switching frequency of the drive that is used as long as the drive stays below the thermal limit.</p> <p>Higher switching frequency results in lower acoustic motor noise. Lower switching frequency generates less switching losses and reduce EMC emissions.</p> <p>Notes:</p> <ul style="list-style-type: none"> • If you have a multimotor system, contact your local ABB representative. • With the CPTC-02 ATEX-certified thermistor protection module, follow the instructions given in the <i>CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual</i> (3AXD50000030058 [English]). • With an ABB EX motor, follow the instructions given in the ABB EX motor documentation. | 4 kHz |
| | 2 kHz | 2 kHz. | 2 |
| | 4 kHz | 4 kHz. | 4 |
| | 8 kHz | 8 kHz. | 8 |
| | 12 kHz | 12 kHz. | 12 |
| 97.02 | <i>Minimum switching frequency</i> | <p>Lowest switching frequency value that is allowed. Depends on the frame size.</p> <p>When drive is reaching the thermal limit, it will automatically start to reduce the switching frequency until the minimum allowed value is reached. Once the minimum has been reached, the drive will automatically start limiting the output current to keep the temperature below the thermal limit.</p> <p>Inverter temperature is shown by parameter <i>05.11 Inverter temperature</i>.</p> <p>Notes:</p> <ul style="list-style-type: none"> • With the CPTC-02 ATEX-certified thermistor protection module, follow the instructions given in the <i>CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual</i> (3AXD50000030058 [English]). • With an ABB EX motor, follow the instructions given in the ABB EX motor documentation. | 2 kHz |
| | 1.5 kHz | 1.5 kHz. Not for all frame sizes. | 1 |
| | 2 kHz | 2 kHz. | 2 |
| | 4 kHz | 4 kHz. | 4 |
| | 8 kHz | 8 kHz. | 8 |
| | 12 kHz | 12 kHz. | 12 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---------------------------------|---|-----------------|
| 97.03 | <i>Slip gain</i> | <p>Defines the slip gain which is used to improve the estimated motor slip. 100% means full slip gain; 0% means no slip gain. The default value is 100%. Other values can be used if a static speed error is detected despite having the setting at full slip gain.</p> <p>Example (with nominal load and nominal slip of 40 rpm): A 1000 rpm constant speed reference is given to the drive. Despite having full slip gain (= 100%), a manual tachometer measurement from the motor axis gives a speed value of 998 rpm. The static speed error is 1000 rpm - 998 rpm = 2 rpm. To compensate the error, the slip gain should be increased to 105% (2 rpm / 40 rpm = 5%).</p> | 100% |
| | 0...200% | Slip gain. | 1 = 1% |
| 97.04 | <i>Voltage reserve</i> | <p>Defines the minimum allowed voltage reserve. When the voltage reserve has decreased to the set value, the drive enters the field weakening area.</p> <p>Note: This is an expert level parameter and should not be adjusted without appropriate skill.</p> <p>If the intermediate circuit DC voltage $U_{dc} = 550$ V and the voltage reserve is 5%, the RMS value of the maximum output voltage in steady-state operation is $0.95 \times 550 \text{ V} / \sqrt{2} = 369 \text{ V}$</p> <p>The dynamic performance of the motor control in the field weakening area can be improved by increasing the voltage reserve value, but the drive enters the field weakening area earlier.</p> | -2% |
| | -4...50% | Voltage reserve. | 1 = 1% |
| 97.05 | <i>Flux braking</i> | <p>Defines the level of flux braking power. (Other stopping and braking modes can be configured in parameter group 21 Start/stop mode).</p> <p>Note: This is an expert level parameter and should not be adjusted without appropriate skill.</p> | <i>Disabled</i> |
| | Disabled | Flux braking is disabled. | 0 |
| | Moderate | Flux level is limited during the braking. Deceleration time is longer compared to full braking. | 1 |
| | Full | <p>Maximum braking power. Almost all available current is used to convert the mechanical braking energy to thermal energy in the motor.</p> <p> WARNING! Using full flux braking heats up the motor especially in cyclic operation. Make sure that the motor can withstand this if you have a cyclic application.</p> | 2 |
| 97.08 | <i>Optimizer minimum torque</i> | <p>This parameter can be used to improve the control dynamics of a synchronous reluctance motor or a salient permanent magnet synchronous motor.</p> <p>As a rule of thumb, define a level to which the output torque must rise with minimum delay. This will increase the motor current and improve the torque response at low speeds.</p> | 0.0% |
| | 0.0 ... 1600.0% | Optimizer torque limit. | 10 = 1% |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------|--|------------|
| 97.10 | Signal injection | <p>Enables the anti-cogging function: a high-frequency alternating signal is injected to the motor in the low speed region to improve the stability of torque control. This removes the "cogging" that can sometimes be seen as the rotor passes the motor magnetic poles. Anti-cogging can be enabled with different amplitude levels.</p> <p>Notes:</p> <ul style="list-style-type: none"> • This is an expert level parameter and should not be adjusted without appropriate skill. • Use as low a level as possible that gives satisfactory performance. • Signal injection cannot be applied to asynchronous motors. • For ACQ580-01 frames R6...R9 as well as ACQ580-31 and ACQ580-34 drives. | Disabled |
| | Disabled | Anti-cogging disabled. | 0 |
| | Enabled (5%) | Anti-cogging enabled with amplitude level of 5%. | 1 |
| | Enabled (10%) | Anti-cogging enabled with amplitude level of 10%. | 2 |
| | Enabled (15%) | Anti-cogging enabled with amplitude level of 15%. | 3 |
| | Enabled (20%) | Anti-cogging enabled with amplitude level of 20%. | 4 |
| 97.11 | TR tuning | <p>Rotor time constant tuning.</p> <p>This parameter can be used to improve torque accuracy in closed-loop control of an induction motor. Normally, the motor identification run provides sufficient torque accuracy, but manual fine-tuning can be applied in exceptionally demanding applications to achieve optimal performance.</p> <p>Note: This is an expert level parameter and should not be adjusted without appropriate skill.</p> | 100% |
| | 25...400% | Rotor time constant tuning. | 1 = 1% |

| No. | Name/Value | Description | Def/FbEq16 | | | | | | | | | | | | | | | | | | |
|---|------------------------------------|---|---|-----|-----|--|--|--|------------|---|-----|----|----|-----|---------------------|-----|-----|-----|-----|-----|-------------------|
| 97.13 | IR compensation | <p>Defines the relative output voltage boost at zero speed (IR compensation). The function is useful in applications with a high break-away torque where vector control cannot be applied.</p> <div><p>U / U_N (%)</p><p>100%</p><p>15%</p><p>Relative output voltage. IR compensation set to 15%.</p><p>Relative output voltage. No IR compensation.</p><p>Field weakening point</p><p>50% of nominal frequency</p><p>f (Hz)</p><p>Typical IR compensation values are shown below.</p><table><tr><th colspan="6">3-phase $U_N = 400\text{ V}$ (380...415 V) drives</th></tr><tr><td>P_N (kW)</td><td>3</td><td>7.5</td><td>15</td><td>37</td><td>132</td></tr><tr><td>IR compensation (%)</td><td>2.3</td><td>1.7</td><td>1.3</td><td>1.1</td><td>0.6</td></tr></table><p>See also section <i>IR compensation for scalar motor control</i> on page 138).</p></div> | 3-phase $U_N = 400\text{ V}$ (380...415 V) drives | | | | | | P_N (kW) | 3 | 7.5 | 15 | 37 | 132 | IR compensation (%) | 2.3 | 1.7 | 1.3 | 1.1 | 0.6 | Type specific (%) |
| 3-phase $U_N = 400\text{ V}$ (380...415 V) drives | | | | | | | | | | | | | | | | | | | | | |
| P_N (kW) | 3 | 7.5 | 15 | 37 | 132 | | | | | | | | | | | | | | | | |
| IR compensation (%) | 2.3 | 1.7 | 1.3 | 1.1 | 0.6 | | | | | | | | | | | | | | | | |
| | 0.00...50.00% | Voltage boost at zero speed in percent of nominal motor voltage. | 1 = 1% | | | | | | | | | | | | | | | | | | |
| 97.15 | Motor model temperature adaptation | Enables the motor model temperature adaptation. Estimated motor temperature can be used to adapt temperature dependent parameters (for example, resistances) of motor model. | Disabled | | | | | | | | | | | | | | | | | | |
| | Disabled | Temperature adaptation disabled. | 0 | | | | | | | | | | | | | | | | | | |
| | Estimated temperature | Temperature adaptation with motor temperature estimate (parameter 35.01 <i>Motor estimated temperature</i>). | 1 | | | | | | | | | | | | | | | | | | |
| 97.16 | Stator temperature factor | Tunes the motor temperature dependence of stator parameters (stator resistance). | 50% | | | | | | | | | | | | | | | | | | |
| | 0...200% | Tuning factor. | 1 = 1% | | | | | | | | | | | | | | | | | | |
| 97.17 | Rotor temperature factor | Tunes the motor temperature dependence of rotor parameters (eg. rotor resistance). | 100% | | | | | | | | | | | | | | | | | | |
| | 0...200% | Tuning factor. | 1 = 1% | | | | | | | | | | | | | | | | | | |


| No. | Name/Value | Description | Def/FbEq16 |
|---------------------------------|------------------------------|---|---------------------|
| 97.20 | <i>U/F ratio</i> | Selects the form for the <i>U/f</i> (voltage to frequency) ratio below field weakening point. For scalar control only. Notes: <ul style="list-style-type: none"> The <i>U/f</i> function cannot be used with energy optimization; if 45.11 Energy optimizer is set to <i>Enable</i>, parameter 97.20 U/F ratio is ignored. With the CPTC-02 ATEX-certified thermistor protection module, follow the instructions given in the <i>CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual</i> (3AXD50000030058 [English]). | <i>Squared</i> |
| | Linear | Linear ratio for constant torque applications. | 0 |
| | Squared | Squared ratio for centrifugal pump and fan applications. With squared <i>U/f</i> ratio the noise level is lower for most operating frequencies. Not recommended for permanent magnet motors. | 1 |
| 97.49 | <i>Slip gain for scalar</i> | Sets gain for slip compensation in percent when the drive is operating in scalar control mode. A squirrel-cage motor slips under load. Increasing the frequency as the motor torque increases compensates for the slip. Note: This parameter is only effective in scalar motor control mode (parameter 99.04 Motor control mode is set to <i>Scalar</i>). | 0% |
| | 0 ... 200% | 0% = No slip compensation. 0 ... 200% = Increasing slip compensation. 100% means full slip compensation according to parameter 99.08 Motor nominal frequency and 99.09 Motor nominal speed . | 1 = 1% |
| 97.94 | <i>IR comp max frequency</i> | Sets the frequency at which IR compensation set by parameter 97.13 IR compensation reaches 0 V. Unit is percent of the motor nominal frequency. | 50.0% |
| | 1.0 ... 200.0% | Frequency. | 1 = 1% |
| 98 User motor parameters | | Motor values supplied by the user that are used in the motor model. These parameters are useful for non-standard motors, or to just get more accurate motor control of the motor on site. A better motor model always improves the shaft performance. | |
| 98.01 | <i>User motor model mode</i> | Activates the motor model parameters 98.02...98.12 and 98.14 . Notes: <ul style="list-style-type: none"> Parameter value is automatically set to zero when ID run is selected by parameter 99.13 ID run requested. The values of parameters 98.02...98.12 are then updated according to the motor characteristics identified during the ID run. Measurements made directly from the motor terminals during the ID run are likely to produce slightly different values than those on a data sheet from a motor manufacturer. This parameter cannot be changed while the drive is running. | <i>Not selected</i> |
| | Not selected | Parameters 98.02...98.12 inactive. | 0 |
| | Motor parameters | The values of parameters 98.02... 98.12 are used as the motor model. | 1 |



| No. | Name/Value | Description | Def/FbEq16 |
|-------|--------------------------|--|--------------|
| 98.02 | <i>Rs user</i> | Defines the stator resistance R_S of the motor model. With a star-connected motor, R_S is the resistance of one winding. With a delta-connected motor, R_S is one-third of the resistance of one winding. | 0.00000 p.u. |
| | 0.00000...0.50000 p.u. | Stator resistance in per unit. | - |
| 98.03 | <i>Rr user</i> | Defines the rotor resistance R_R of the motor model. Note: This parameter is valid only for asynchronous motors. | 0.00000 p.u. |
| | 0.00000...0.50000 p.u. | Rotor resistance in per unit. | - |
| 98.04 | <i>Lm user</i> | Defines the main inductance L_M of the motor model. Note: This parameter is valid only for asynchronous motors. | 0.00000 p.u. |
| | 0.00000...10.00000 p.u. | Main inductance in per unit. | - |
| 98.05 | <i>SigmaL user</i> | Defines the leakage inductance σL_S . Note: This parameter is valid only for asynchronous motors. | 0.00000 p.u. |
| | 0.00000...1.00000 p.u. | Leakage inductance in per unit. | - |
| 98.06 | <i>Ld user</i> | Defines the direct axis (synchronous) inductance. Note: This parameter is valid only for permanent magnet motors. | 0.00000 p.u. |
| | 0.00000...10.00000 p.u. | Direct axis inductance in per unit. | - |
| 98.07 | <i>Lq user</i> | Defines the quadrature axis (synchronous) inductance. Note: This parameter is valid only for permanent magnet motors. | 0.00000 p.u. |
| | 0.00000...10.00000 p.u. | Quadrature axis inductance in per unit. | - |
| 98.08 | <i>PM flux user</i> | Defines the permanent magnet flux. Note: This parameter is valid only for permanent magnet motors. | 0.00000 p.u. |
| | 0.00000...2.00000 p.u. | Permanent magnet flux in per unit. | - |
| 98.09 | <i>Rs user SI</i> | Defines the stator resistance R_S of the motor model. | 0.00000 ohm |
| | 0.00000...100.0000 0 ohm | Stator resistance. | - |
| 98.10 | <i>Rr user SI</i> | Defines the rotor resistance R_R of the motor model. Note: This parameter is valid only for asynchronous motors. | 0.00000 ohm |
| | 0.00000...100.0000 0 ohm | Rotor resistance. | - |
| 98.11 | <i>Lm user SI</i> | Defines the main inductance L_M of the motor model. Note: This parameter is valid only for asynchronous motors. | 0.00 mH |
| | 0.00...100000.00 mH | Main inductance. | 1 = 10000 mH |
| 98.12 | <i>SigmaL user SI</i> | Defines the leakage inductance σL_S . Note: This parameter is valid only for asynchronous motors. | 0.00 mH |
| | 0.00...100000.00 mH | Leakage inductance. | 1 = 10000 mH |

| No. | Name/Value | Description | Def/FbEq16 |
|----------------------|---------------------------|---|---------------------------|
| 98.13 | <i>Ld user SI</i> | Defines the direct axis (synchronous) inductance. Note: This parameter is valid only for permanent magnet motors. | 0.00 mH |
| | 0.00...100000.00 mH | Direct axis inductance. | 1 = 10000 mH |
| 98.14 | <i>Lq user SI</i> | Defines the quadrature axis (synchronous) inductance. Note: This parameter is valid only for permanent magnet motors. | 0.00 mH |
| | 0.00...100000.00 mH | Quadrature axis inductance. | 1 = 10000 mH |
| 99 Motor data | | Motor configuration settings. | |
| 99.03 | <i>Motor type</i> | Selects the motor type. Note: This parameter cannot be changed while the drive is running. | <i>Asynchronous motor</i> |
| | Asynchronous motor | Standard squirrel cage AC induction motor (asynchronous induction motor). | 0 |
| | Permanent magnet motor | Permanent magnet motor. Three-phase AC synchronous motor with permanent magnet rotor and sinusoidal BackEMF voltage. Note: With permanent magnet motors special attention must be paid on setting the motor nominal values correctly in parameter group 99 Motor data . You must use vector control. If the nominal BackEMF voltage of the motor is not available, a full ID run should be performed for improving performance. | 1 |
| | SynRM | Synchronous reluctance motor. Three-phase AC synchronous motor with salient pole rotor without permanent magnets. With synchronous reluctance motors you must use vector control. | 2 |
| 99.04 | <i>Motor control mode</i> | Selects the motor control mode. | <i>Scalar</i> |
| | Vector | Vector control. Vector control has better accuracy than scalar control but cannot be used in all situations (see selection <i>Scalar</i> below). Requires motor identification run (ID run). See parameter 99.13 ID run requested . Note: In vector control the drive performs a standstill ID run at the first start if ID run has not been previously performed. A new start command is required after standstill ID run. Note: To achieve a better motor control performance, you can perform a normal ID run without load. See also section <i>Operating modes of the drive</i> (page 86). | 0 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---|--|------------|
| | Scalar | <p>Scalar control. Suitable for most applications, if top performance is not required.</p> <p>Motor identification run is not required.</p> <p>Note: Scalar control must be used in the following situations:</p> <ul style="list-style-type: none"> • with multimotor systems 1) if the load is not equally shared between the motors, 2) if the motors are of different sizes, or 3) if the motors are going to be changed after the motor identification (ID run) • if the nominal current of the motor is less than 1/6 of the nominal output current of the drive • if the drive is used with no motor connected (for example, for test purposes). <p>Note: Correct motor operation requires that the magnetizing current of the motor does not exceed 90% of the nominal current of the inverter.</p> <p>See also section Operating modes of the drive (page 86).</p> | 1 |
| 99.06 | Motor nominal current | <p>Defines the nominal motor current. Must be equal to the value on the motor rating plate. If multiple motors are connected to the drive, enter the total current of the motors.</p> <p>Notes:</p> <ul style="list-style-type: none"> • Correct motor operation requires that the magnetizing current of the motor does not exceed 90% of the nominal current of the drive. • This parameter cannot be changed while the drive is running. <p>For 16-bit scaling, see parameter 46.05 Current scaling.</p> | 0.0 A |
| | 0.0...6400.0 A | Nominal current of the motor. The allowable range is $1/6 \dots 2 \times I_N$ of the drive ($0 \dots 2 \times I_N$ with scalar control mode). | 1 = 1 A |
| 99.07 | Motor nominal voltage | <p>Defines the nominal motor voltage supplied to the motor. This setting must match the value on the rating plate of the motor.</p> <p>Notes:</p> <ul style="list-style-type: none"> • With permanent magnet motors, the nominal voltage is the BackEMF voltage at nominal speed of the motor. If the voltage is given as voltage per rpm, for example, 60 V per 1000 rpm, the voltage for a nominal speed of 3000 rpm is $3 \times 60 \text{ V} = 180 \text{ V}$. • The stress on the motor insulation is always dependent on the drive supply voltage. This also applies to the case where the motor voltage rating is lower than that of the drive and the supply. • This parameter cannot be changed while the drive is running. | 0.0 V |
| | 0.0...960.0 V | Nominal voltage of the motor. | 10 = 1 V |
| 99.08 | Motor nominal frequency | <p>Defines the nominal motor frequency. This setting must match the value on the rating plate of the motor.</p> <p>Note: This parameter cannot be changed while the drive is running.</p> | 50.00 Hz |
| | 0.00...500.00 Hz | Nominal frequency of the motor. | 10 = 1 Hz |
| 99.09 | Motor nominal speed | <p>Defines the nominal motor speed. The setting must match the value on the rating plate of the motor.</p> <p>Note: This parameter cannot be changed while the drive is running.</p> | 0 rpm |
| | 0...30000 rpm | Nominal speed of the motor. | 1 = 1 rpm |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|---|---|--------------------|
| 99.10 | <i>Motor nominal power</i> | Defines the nominal motor power. The setting must match the value on the rating plate of the motor. If multiple motors are connected to the drive, enter the total power of the motors. The unit is selected by parameter 96.16 Unit selection . Note: This parameter cannot be changed while the drive is running. For 16-bit scaling, see parameter 46.04 Power scaling . | 0.00 kW or hp |
| | 0.00... 10000.00 kW or 0.00... 13404.83 hp | Nominal power of the motor. | 1 = 1 unit |
| 99.11 | <i>Motor nominal cos ?</i> | Defines the cosphi of the motor for a more accurate motor model. The value is not obligatory, but is useful with an asynchronous motor, especially when performing a standstill identification run. With a permanent magnet or synchronous reluctance motor, this value is not needed. Notes: <ul style="list-style-type: none"> Do not enter an estimated value. If you do not know the exact value, leave the parameter at zero. This parameter cannot be changed while the drive is running. | 0.00 |
| | 0.00...1.00 | Cosphi of the motor. | 100 = 1 |
| 99.12 | <i>Motor nominal torque</i> | Defines the nominal motor shaft torque for a more accurate motor model. Not obligatory. The unit is selected by parameter 96.16 Unit selection . Note: This parameter cannot be changed while the drive is running. | 0.000 N·m or lb·ft |
| | 0.000...4000000.000 N·m or 0.000...2950248.597 lb·ft | Nominal motor torque. | 1 = 100 unit |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|------------------|--|----------------------|
| 99.13 | ID run requested | <p>Selects the type of the motor identification routine (ID run) performed at the next start of the drive. During the ID run, the drive will identify the characteristics of the motor for optimum motor control.</p> <p>If no ID run has been performed yet (or if default parameter values have been restored using parameter 96.06 Parameter restore), this parameter is automatically set to Standstill, signifying that an ID run must be performed.</p> <p>After the ID run, the drive stops and this parameter is automatically set to None.</p> <p>Notes:</p> <ul style="list-style-type: none"> To ensure that the ID run can work properly, the drive limits in group 30 (maximum speed and minimum speed, and maximum torque and minimum torque) must be large enough (the range specified by the limits must be wide enough. If, for example, speed limits are less than the motor nominal speed, the ID run cannot be completed). For the Advanced ID run, the machinery must always be de-coupled from the motor. With a permanent magnet or synchronous reluctance motor, a Normal, Reduced or Standstill ID run requires that the motor shaft is NOT locked and the load torque is less than 10%. With scalar control mode (99.04 Motor control mode = Scalar), the ID run is not requested automatically. However, an ID run can be performed for more accurate torque estimation. Once the ID run is activated, it can be canceled by stopping the drive. The ID run must be performed every time any of the motor parameters (99.04, 99.06...99.12) have been changed. Ensure that the Safe Torque Off and emergency stop circuits (if any) are closed during the ID run. Mechanical brake (if present) is not opened by the logic for the ID run. This parameter cannot be changed while the drive is running. | None |
| | None | No motor ID run is requested. This mode can be selected only if the ID run (Normal / Reduced / Standstill / Advanced) has already been performed once. | 0 |
| | Normal | <p>Normal ID run. Guarantees good control accuracy for all cases. The ID run takes about 90 seconds. This mode should be selected whenever it is possible.</p> <p>Notes:</p> <ul style="list-style-type: none"> If the load torque will be higher than 20% of motor nominal torque, or if the machinery is not able to withstand the nominal torque transient during the ID run, then the driven machinery must be de-coupled from the motor during a Normal ID run. Check the direction of rotation of the motor before starting the ID run. During the run, the motor will rotate in the forward direction. <p> WARNING! The motor will run at up to approximately 50...100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!</p> | 1 |

| No. | Name/Value | Description | Def/FbEq16 |
|-----|---------------------------------|---|------------|
| | Reduced | <p>Reduced ID run. This mode should be selected instead of the <i>Normal</i> or <i>Advanced</i> ID run if</p> <ul style="list-style-type: none"> mechanical losses are higher than 20% (ie. the motor cannot be de-coupled from the driven equipment), or if flux reduction is not allowed while the motor is running (ie. in case of a motor with an integrated brake supplied from the motor terminals). <p>With this ID run mode, the resultant motor control in the field weakening area or at high torques is not necessarily as accurate as motor control following a Normal ID run. Reduced ID run is completed faster than the Normal ID run (< 90 seconds).</p> <p>Note: Check the direction of rotation of the motor before starting the ID run. During the run, the motor will rotate in the forward direction.</p> <p> WARNING! The motor will run at up to approximately 50...100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!</p> | 2 |
| | Standstill | <p>Standstill ID run. The motor is injected with DC current. With an AC induction (asynchronous) motor, the motor shaft is not rotated. With a permanent magnet motor, the shaft can rotate up to half a revolution.</p> <p>Note: This mode should be selected only if the <i>Normal</i>, <i>Reduced</i> or <i>Advanced</i> ID run is not possible due to the restrictions caused by the connected mechanics (for example, with lift or crane applications).</p> | 3 |
| | Reserved | | 4 |
| | Current measurement calibration | Current offset and gain measurement calibration is set to calibrate the control loops. The calibration will be performed at the next start. Only for frames R6...R11. | 5 |
| | Advanced | <p>Advanced ID run. Only for frames R6...R9 and ACQ580-31 drives.</p> <p>Guarantees the best possible control accuracy. The ID run takes a very long time to complete. This mode should be selected when top performance is needed across the whole operating area.</p> <p>Note: The driven machinery must be de-coupled from the motor because of high torque and speed transients that are applied.</p> <p> WARNING! The motor may run at up to the maximum (positive) and minimum (negative) allowed speed during the ID run. Several accelerations and decelerations are done. The maximum torque, current and speed allowed by the limit parameters may be utilized. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!</p> | 6 |
| | Reserved | | 7 |
| | Adaptive | <p>Adaptive ID run. Improves the motor model accuracy during normal operation of the drive.</p> <p>The drive performs a Standstill ID run first. Motor parameters are then updated with better accuracy during an adaptation sequence when following user's driving profile. When the adaptation is complete, parameters <i>99.14 Last ID run performed</i> changes from Standstill to Adaptive. Motor parameters are updated automatically and the user is not required to update any other parameter.e:.</p> | 8 |

| No. | Name/Value | Description | Def/FbEq16 |
|-------|-----------------------------------|--|--------------|
| 99.14 | <i>Last ID run performed</i> | Shows the type of ID run that was performed last. For more information about the different modes, see the selections of parameter 99.13 <i>ID run requested</i> . | <i>None</i> |
| | None | No ID run has been performed. | 0 |
| | Normal | <i>Normal</i> ID run. | 1 |
| | Reduced | <i>Reduced</i> ID run. | 2 |
| | Standstill | <i>Standstill</i> ID run. | 3 |
| | Reserved | | 4...5 |
| | Advanced | <i>Advanced</i> ID run. | 6 |
| | Reserved | | 7 |
| | Adaptive | <i>Adaptive</i> ID run | 8 |
| 99.15 | <i>Motor polepairs calculated</i> | Calculated number of pole pairs in the motor. | 0 |
| | 0...1000 | Number of pole pairs. | 1 = 1 |
| 99.16 | <i>Motor phase order</i> | Switches the rotation direction of motor. This parameter can be used if the motor turns in the wrong direction (for example, because of the wrong phase order in the motor cable), and correcting the cabling is considered impractical. Note: <ul style="list-style-type: none"> Changing this parameter does not affect speed reference polarities, so positive speed reference will rotate the motor forward. The phase order selection just ensures that "forward" is in fact the correct direction. | <i>U V W</i> |
| | U V W | Normal. | 0 |
| | U W V | Reversed rotation direction. | 1 |

Differences in the default values between 50 Hz and 60 Hz supply frequency settings

Parameter *95.20 HW options word 1* bit 0 *Supply frequency 60 Hz* changes the drive parameter default values according to the supply frequency, 50 Hz or 60 Hz. The bit is set according to the market before the drive is delivered.

If you need to change from 50 Hz to 60 Hz, or vice versa, change the value of the bit and then do a complete reset to the drive. After that you have to reselect the macro to be used.

The table below shows the parameters whose default values depend on the supply frequency setting. The supply frequency setting, with the type designation of the drive, also affects Group *99 Motor data* parameter values though these parameters are not listed in the table.

| No. | Name | 95.20 HW options word 1 bit Supply frequency 60 Hz = 50 Hz | 95.20 HW options word 1 bit Supply frequency 60 Hz = 60 Hz |
|-------|--------------------------------|--|--|
| 11.45 | <i>Freq in 1 at scaled max</i> | 1500.000 | 1800.000 |
| 15.35 | <i>Freq out 1 src max</i> | 1500.000 | 1800.000 |
| 12.20 | <i>AI1 scaled at AI1 max</i> | 50.000 | 60.000 |
| 13.18 | <i>AO1 source max</i> | 50.0 | 60.0 |
| 22.26 | <i>Constant speed 1</i> | 300.00 rpm | 360.00 rpm |
| 22.27 | <i>Constant speed 2</i> | 600.00 rpm | 720.00 rpm |
| 22.28 | <i>Constant speed 3</i> | 900.00 rpm | 1080.00 rpm |
| 22.29 | <i>Constant speed 4</i> | 1200.00 rpm | 1440.00 rpm |
| 22.30 | <i>Constant speed 5</i> | 1500.00 rpm | 1800.00 rpm |
| 22.31 | <i>Constant speed 6</i> | 2400.00 rpm | 2880.00 rpm |
| 22.32 | <i>Constant speed 7</i> | 3000.00 rpm | 3600.00 rpm |
| 28.26 | <i>Constant frequency 1</i> | 5.00 Hz | 6.00 Hz |
| 28.27 | <i>Constant frequency 2</i> | 10.00 Hz | 12.00 Hz |
| 28.28 | <i>Constant frequency 3</i> | 15.00 Hz | 18.00 Hz |
| 28.29 | <i>Constant frequency 4</i> | 20.00 Hz | 24.00 Hz |
| 28.30 | <i>Constant frequency 5</i> | 25.00 Hz | 30.00 Hz |
| 28.31 | <i>Constant frequency 6</i> | 40.00 Hz | 48.00 Hz |
| 28.32 | <i>Constant frequency 7</i> | 50.00 Hz | 60.00 Hz |

| No. | Name | 95.20 HW options word 1 bit Supply frequency 60 Hz = 50 Hz | 95.20 HW options word 1 bit Supply frequency 60 Hz = 60 Hz |
|-------|-----------------------|--|--|
| 30.12 | Maximum speed | 1500.00 rpm | 1800.00 rpm |
| 30.14 | Maximum frequency | 50.00 Hz | 60.00 Hz |
| 31.26 | Stall speed limit | 150.00 rpm | 180.00 rpm |
| 31.27 | Stall frequency limit | 15.00 Hz | 18.00 Hz |
| 31.30 | Overspeed trip margin | 500.00 rpm | 500.00 rpm |
| 46.01 | Speed scaling | 1500.00 rpm | 1800.00 rpm |
| 46.02 | Frequency scaling | 50.00 Hz | 60.00 Hz |
| 46.31 | Above speed limit | 1500.00 rpm | 1800.00 rpm |
| 46.32 | Above frequency limit | 50.00 Hz | 60.00 Hz |

12

Additional parameter data

What this chapter contains

This chapter lists the parameters with some additional data such as their ranges and 32-bit fieldbus scaling. For parameter descriptions, see chapter [Parameters](#) (page 271).

Terms and abbreviations

| Term | Definition |
|---------------|--|
| Actual signal | Signal measured or calculated by the drive. Usually can only be monitored but not adjusted; some counter-type signals can however be reset. |
| Analog src | Analog source: the parameter can be set to the value of another parameter by choosing “Other”, and selecting the source parameter from a list. In addition to the “Other” selection, the parameter may offer other pre-selected settings. |
| Binary src | Binary source: the value of the parameter can be taken from a specific bit in another parameter value (“Other”). Sometimes the value can be fixed to 0 (false) or 1 (true). In addition, the parameter may offer other pre-selected settings. |
| Data | Data parameter |
| FbEq32 | 32-bit fieldbus equivalent: The scaling between the value shown on the control panel and the integer used in communication when a 32-bit value is selected for transmission to an external system. The corresponding 16-bit scalings are listed in chapter Parameters (page 271). |
| List | Selection list. |

| Term | Definition |
|------|--|
| No. | Parameter number. |
| PB | Packed Boolean (bit list). |
| Real | Real number. |
| Type | Parameter type. See Analog src , Binary src , List , PB , Real . |

Fieldbus addresses

Refer to the *User’s manual* of the fieldbus adapter.

Parameter groups 1...9

| No. | Name | Type | Range | Unit | FbEq32 |
|-------------------------|---|------|--------------------------------|--------------|---------------|
| 01 Actual values | | | | | |
| 01.01 | Motor speed used | Real | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 01.02 | Motor speed estimated | Real | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 01.03 | Motor speed % | Real | -1000.00...1000.00 | % | 100 = 1% |
| 01.06 | Output frequency | Real | -500.00...500.00 | Hz | 100 = 1 Hz |
| 01.07 | Motor current | Real | 0.00...30000.00 | A | 100 = 1 A |
| 01.08 | Motor current % of motor nom | Real | 0.0...1000.0 | % | 10 = 1% |
| 01.09 | Motor current % of drive nom | Real | 0.0...1000.0 | % | 10 = 1% |
| 01.10 | Motor torque | Real | -1600.0...1600.0 | % | 10 = 1% |
| 01.11 | DC voltage | Real | 0.00...2000.00 | V | 100 = 1 V |
| 01.13 | Output voltage | Real | 0...2000 | V | 1 = 1 V |
| 01.14 | Output power | Real | -32768.00...32767.00 | kW | 100 = kW |
| 01.15 | Output power % of motor nom | Real | -300.00...300.00 | % | 100 = 1% |
| 01.16 | Output power % of drive nom | Real | -300.00...300.00 | % | 100 = 1% |
| 01.17 | Motor shaft power | Real | -32768.00...32767.00 | kW or hp | 100 = 1 unit |
| 01.18 | Inverter GWh counter | Real | 0...65535 | GWh | 1 = 1 GWh |
| 01.19 | Inverter MWh counter | Real | 0...1000 | MWh | 1 = 1 MWh |
| 01.20 | Inverter kWh counter | Real | 0...1000 | kWh | 1 = 1 kWh |
| 01.24 | Flux actual % | Real | 0...200 | % | 1 = 1% |
| 01.30 | Nominal torque scale | Real | 0.000...4000000 | N·m or lb·ft | 1000 = 1 unit |
| 01.31 | Ambient temperature | Real | -40.0...120.0 | °C or °F | 10 = 1 ° |
| 01.50 | Current hour kWh | Real | 0.00...1000000.00 | kWh | 100 = 1 kWh |
| 01.51 | Previous hour kWh | Real | 0.00...1000000.00 | kWh | 100 = 1 kWh |
| 01.52 | Current day kWh | Real | 0.00...1000000.00 | kWh | 100 = 1 kWh |
| 01.53 | Previous day kWh | Real | 0.00...1000000.00 | kWh | 100 = 1 kWh |
| 01.54 | Cumulative inverter energy | Real | -200000000.0... 200000000.0 | kWh | 1 = 1 kWh |
| 01.55 | Inverter GWh counter (resettable) | Real | 0...65535 | GWh | 1 = 1 GWh |
| 01.56 | Inverter MWh counter (resettable) | Real | 0...1000 | MWh | 1 = 1 MWh |
| 01.57 | Inverter kWh counter (resettable) | Real | 0...1000 | kWh | 1 = 1 kWh |
| 01.58 | Cumulative inverter energy (resettable) | Real | -200000000.0... 200000000.0 | kWh | 1 = 1 kWh |
| 01.61 | Abs motor speed used | | 0.00...30000.00 | rpm | 100 = 1 rpm |
| 01.62 | Abs motor speed % | | 0.00...1000.00% | % | 100 = 1% |
| 01.63 | Abs output frequency | | 0.00...500.00 Hz | Hz | 100 = 1 Hz |
| 01.64 | Abs motor torque | | 0.0...1600.0 | % | 10 = 1% |
| 01.65 | Abs output power | | 0.00...32767.00 | kW | 100 = 1 kW |
| 01.66 | Abs output power % motor nom | | 0.00...300.00 | % | 100 = 1% |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|------------------------------|------|------------------------|----------|--------------|
| 01.67 | Abs output power % drive nom | | 0.00...300.00 | % | 100 = 1% |
| 01.68 | Abs motor shaft power | | 0.00...32767.00 | kW or hp | 100 = 1 unit |
| (Parameters 01.102...01.164 only visible for ACQ580-31 and ACQ580-34). | | | | | |
| 01.102 | Line current | Real | 0.00 ... 30000.00 | A | 100 = 1 A |
| 01.104 | Active current | Real | 0.00 ... 30000.00 | A | 100 = 1 A |
| 01.106 | Reactive current | Real | 0.00 ... 30000.00 | A | 100 = 1 A |
| 01.108 | Grid frequency | Real | 0.00 ... 100.00 | Hz | 100 = 1 Hz |
| 01.109 | Grid voltage | Real | 0.00 ... 2000.00 | V | 100 = 1 V |
| 01.110 | Grid apparent power | Real | -30000.00 ... 30000.00 | kVA | 100 = 1 kVA |
| 01.112 | Grid power | Real | -30000.00 ... 30000.00 | kW | 100 = 1 kW |
| 01.114 | Grid reactive power | Real | -30000.00 ... 30000.00 | kvar | 100 = 1 kvar |
| 01.116 | LSU cos Phi | Real | -1.00 ... 1.00 | - | 100 = 1 |
| 01.164 | LSU nominal power | Real | 0...30000 | kW | 1 = 1 kW |
| 03 Input references | | | | | |
| 03.01 | Panel reference | Real | -100000.00...100000.00 | - | 100 = 1 |
| 03.02 | Panel reference remote | Real | -100000.00...100000.00 | - | 100 = 1 |
| 03.05 | FB A reference 1 | Real | -100000.00...100000.00 | - | 100 = 1 |
| 03.06 | FB A reference 2 | Real | -100000.00...100000.00 | - | 100 = 1 |
| 03.09 | EFB reference 1 | Real | -30000.00...30000.00 | - | 100 = 1 |
| 03.10 | EFB reference 2 | Real | -30000.00...30000.00 | - | 100 = 1 |
| 04 Warnings and faults | | | | | |
| 04.01 | Tripping fault | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.02 | Active fault 2 | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.03 | Active fault 3 | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.06 | Active warning 1 | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.07 | Active warning 2 | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.08 | Active warning 3 | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.11 | Latest fault | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.12 | 2nd latest fault | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.13 | 3rd latest fault | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.16 | Latest warning | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.17 | 2nd latest warning | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.18 | 3rd latest warning | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.40 | Event word 1 | PB | 0000h...FFFFh | - | 1 = 1 |
| 04.41 | Event word 1 bit 0 code | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.43 | Event word 1 bit 1 code | Data | 0000h...FFFFh | - | 1 = 1 |
| 04.45, 04.47, 04.49, ... | ... | ... | ... | ... | |
| 04.71 | Event word 1 bit 15 code | Data | 0000h...FFFFh | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|------------------------------------|-----------------------|---|--------------|--------------|
| 05 Diagnostics | | | | | |
| 05.01 | On-time counter | <i>Real</i> | 0...65535 | d | 1 = 1 d |
| 05.02 | Run-time counter | <i>Real</i> | 0...65535 | d | 1 = 1 d |
| 05.03 | Hours run | <i>Real</i> | 0.0...429496729.5 | h | 10 = 1 h |
| 05.04 | Fan on-time counter | <i>Real</i> | 0...65535 | d | 1 = 1 d |
| 05.08 | Cabinet temperature | <i>Real</i> | -40...120 | °C or °F | 10 = 1 ° |
| 05.10 | Control board temperature | <i>Real</i> | -100...300 | °C or °F | 10 = 1 ° |
| 05.11 | Inverter temperature | <i>Real</i> | -40.0...160.0 | % | 10 = 1% |
| 05.20 | Diagnostic word 1 | <i>PB</i> | 0000h...FFFFh | - | |
| 05.21 | Diagnostic word 2 | <i>PB</i> | 0000h...FFFFh | - | |
| 05.22 | Diagnostic word 3 | <i>PB</i> | 0000h...FFFFh | - | |
| 05.80 | Motor speed at fault | <i>Real</i> | -30000...30000.00 | rpm | 100 = 1 rpm |
| 05.81 | Output frequency at fault | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 05.82 | DC voltage at fault | <i>Real</i> | 0.00...2000.00 | V | 100 = 1 V |
| 05.83 | Motor current at fault | <i>Real</i> | 0.00...30000.00 | A | 100 = 1 A |
| 05.84 | Motor torque at fault | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 05.85 | Main status word at fault | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 05.86 | DI delayed status at fault | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 05.87 | Inverter temperature at fault | <i>Real</i> | -40.0...160.0 | % | 10 = 1% |
| 05.88 | Reference used at fault | <i>Real</i> | -500.00...500.00 or -30000.00...30000.00 | Hz or rpm | 100 = 1 unit |
| 05.89 | Hand-off-auto status word at fault | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| <i>(Parameters 05.111...05.121 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 05.111 | Line converter temperature | <i>Real</i> | -40.0 ... 160.0 | % | 10 = 1% |
| 05.121 | MCB closing counter | <i>Real</i> | 0...4294967295 | % | 1 = 1 |
| 06 Control and status words | | | | | |
| 06.01 | Main control word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.11 | Main status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.16 | Drive status word 1 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.17 | Drive status word 2 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.18 | Start inhibit status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.19 | Speed control status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.20 | Constant speed status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.21 | Drive status word 3 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.22 | Hand-off-auto status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.29 | MSW bit 10 selection | <i>Binary src</i> | - | - | 1 = 1 |
| 06.30 | MSW bit 11 selection | <i>Binary src</i> | - | - | 1 = 1 |
| 06.31 | MSW bit 12 selection | <i>Binary src</i> | - | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|-------------------------------|-------------------|---------------|------|--------|
| 06.32 | MSW bit 13 selection | <i>Binary src</i> | - | - | 1 = 1 |
| 06.33 | MSW bit 14 selection | <i>Binary src</i> | - | - | 1 = 1 |
| <i>(Parameters 06.36...06.118 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 06.36 | LSU Status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.39 | Internal state machine LSU CW | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.116 | LSU drive status word 1 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 06.118 | LSU start inhibit status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 07 System info | | | | | |
| 07.03 | Drive rating id | <i>List</i> | 0...999 | - | 1 = 1 |
| 07.04 | Firmware name | <i>List</i> | - | - | 1 = 1 |
| 07.05 | Firmware version | <i>Data</i> | - | - | 1 = 1 |
| 07.06 | Loading package name | <i>List</i> | - | - | 1 = 1 |
| 07.07 | Loading package version | <i>Data</i> | - | - | 1 = 1 |
| 07.10 | Language file set | <i>List</i> | - | - | 1 = 1 |
| 07.11 | Cpu usage | <i>Real</i> | 0...100 | % | 1 = 1% |
| 07.25 | Customization package name | <i>Data</i> | - | - | 1 = 1 |
| 07.26 | Customization package version | <i>Data</i> | - | - | 1 = 1 |
| 07.30 | Adaptive program status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 07.31 | AP sequence state | <i>Data</i> | 0...20 | - | 1 = 1 |
| 07.35 | Drive configuration | | 0000h...FFFFh | | |
| 07.36 | Drive configuration 2 | | 0000h...FFFFh | | |
| <i>(Parameters 07.106...07.107 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 07.106 | LSU loading package name | <i>List</i> | - | - | 1 = 1 |
| 07.107 | LSU loading package version | <i>Data</i> | - | - | 1 = 1 |

Parameter groups 10...99

| No. | Name | Type | Range | Unit | FbEq32 |
|--------------------------------|------------------------|------------|------------------------|------|----------|
| 10 Standard DI, RO | | | | | |
| 10.01 | DI status | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.02 | DI delayed status | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.03 | DI force selection | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.04 | DI forced data | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.05 | DI1 ON delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.06 | DI1 OFF delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.07 | DI2 ON delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.08 | DI2 OFF delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.09 | DI3 ON delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.10 | DI3 OFF delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.11 | DI4 ON delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.12 | DI4 OFF delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.13 | DI5 ON delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.14 | DI5 OFF delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.15 | DI6 ON delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.16 | DI6 OFF delay | Real | 0.0 ... 3000.0 | s | 10 = 1 s |
| 10.21 | RO status | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.22 | RO force selection | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.23 | RO forced data | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.24 | RO1 source | Binary src | - | - | 1 = 1 |
| 10.25 | RO1 ON delay | Real | 0.0...3000.0 | s | 10 = 1 s |
| 10.26 | RO1 OFF delay | Real | 0.0...3000.0 | s | 10 = 1 s |
| 10.27 | RO2 source | Binary src | - | - | 1 = 1 |
| 10.28 | RO2 ON delay | Real | 0.0...3000.0 | s | 10 = 1 s |
| 10.29 | RO2 OFF delay | Real | 0.0...3000.0 | s | 10 = 1 s |
| 10.30 | RO3 source | Binary src | - | - | 1 = 1 |
| 10.31 | RO3 ON delay | Real | 0.0...3000.0 | s | 10 = 1 s |
| 10.32 | RO3 OFF delay | Real | 0.0...3000.0 | s | 10 = 1 s |
| 10.99 | RO/DIO control word | PB | 0000h...FFFFh | - | 1 = 1 |
| 10.101 | RO1 toggle counter | Real | 0...4294967000 | - | 1 = 1 |
| 10.102 | RO2 toggle counter | Real | 0...4294967000 | - | 1 = 1 |
| 10.103 | RO3 toggle counter | Real | 0...4294967000 | - | 1 = 1 |
| 11 Standard DIO, FI, FO | | | | | |
| 11.21 | DI5 configuration | List | 0...1 | - | 1 = 1 |
| 11.38 | Freq in 1 actual value | Real | 0...16000 | Hz | 1 = 1 Hz |
| 11.39 | Freq in 1 scaled value | Real | -32768.000...32767.000 | - | 1000 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-----------------------|--------------------------|-----------------------|--|---------|---------------|
| 11.42 | Freq in 1 min | <i>Real</i> | 0...16000 | Hz | 1 = 1 Hz |
| 11.43 | Freq in 1 max | <i>Real</i> | 0...16000 | Hz | 1 = 1 Hz |
| 11.44 | Freq in 1 at scaled min | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 11.45 | Freq in 1 at scaled max | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 12 Standard AI | | | | | |
| 12.02 | AI force selection | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 12.03 | AI supervision function | <i>List</i> | 0...4 | - | 1 = 1 |
| 12.04 | AI supervision selection | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 12.11 | AI1 actual value | <i>Real</i> | 0.000...22.000 mA or 0.000...11.000 V | mA or V | 1000 = 1 unit |
| 12.12 | AI1 scaled value | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 12.13 | AI1 forced value | <i>Real</i> | 0.000...20.000 mA or 0.000...10.000 V | mA or V | 1000 = 1 unit |
| 12.15 | AI1 unit selection | <i>List</i> | 2, 10 | - | 1 = 1 |
| 12.16 | AI1 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 12.17 | AI1 min | <i>Real</i> | 0.000...20.000 mA or 0.000...10.000 V | mA or V | 1000 = 1 unit |
| 12.18 | AI1 max | <i>Real</i> | 0.000...22.000 mA or 0.000...11.000 V | mA or V | 1000 = 1 unit |
| 12.19 | AI1 scaled at AI1 min | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 12.20 | AI1 scaled at AI1 max | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 12.21 | AI2 actual value | <i>Real</i> | 0.000...22.000 mA or 0.000...11.000 V | mA or V | 1000 = 1 unit |
| 12.22 | AI2 scaled value | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 12.23 | AI2 forced value | <i>Real</i> | 0.000...20.000 mA or 0.000...10.000 V | mA or V | 1000 = 1 unit |
| 12.25 | AI2 unit selection | <i>List</i> | 2, 10 | - | 1 = 1 |
| 12.26 | AI2 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 12.27 | AI2 min | <i>Real</i> | 0.000...20.000 mA or 0.000...10.000 V | mA or V | 1000 = 1 unit |
| 12.28 | AI2 max | <i>Real</i> | 0.000...22.000 mA or 0.000...11.000 V | mA or V | 1000 = 1 unit |
| 12.29 | AI2 scaled at AI2 min | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 12.30 | AI2 scaled at AI2 max | <i>Real</i> | -32768.000...32767.000 | - | 1000 = 1 |
| 12.101 | AI1 percent value | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 12.102 | AI2 percent value | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 13 Standard AO | | | | | |
| 13.02 | AO force selection | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 13.11 | AO1 actual value | <i>Real</i> | 0.000...22.000 mA or 0.000...11000 V | mA or V | 1000 = 1 unit |
| 13.12 | AO1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 13.13 | AO1 forced value | <i>Real</i> | 0.000...22.000 mA or 0.000...11000 V | mA or V | 1000 = 1 unit |
| 13.15 | AO1 unit selection | <i>List</i> | 2, 10 | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|--------------------------------|---------------------------|-----------------------|---|---------|---------------|
| 13.16 | AO1 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 13.17 | AO1 source min | <i>Real</i> | -32768.0...32767.0 | - | 10 = 1 |
| 13.18 | AO1 source max | <i>Real</i> | -32768.0...32767.0 | - | 10 = 1 |
| 13.19 | AO1 out at AO1 src min | <i>Real</i> | 0.000...22.000 mA or 0.000...11000 V | mA or V | 1000 = 1 unit |
| 13.20 | AO1 out at AO1 src max | <i>Real</i> | 0.000...22.000 mA or 0.000...11000 V | mA or V | 1000 = 1 unit |
| 13.21 | AO2 actual value | <i>Real</i> | 0.000...22.000 | mA | 1000 = 1 mA |
| 13.22 | AO2 source | <i>Analog src</i> | - | - | 1 = 1 |
| 13.23 | AO2 forced value | <i>Real</i> | 0.000...22.000 | mA | 1000 = 1 mA |
| 13.26 | AO2 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 13.27 | AO2 source min | <i>Real</i> | -32768.0...32767.0 | - | 10 = 1 |
| 13.28 | AO2 source max | <i>Real</i> | -32768.0...32767.0 | - | 10 = 1 |
| 13.29 | AO2 out at AO2 src min | <i>Real</i> | 0.000...22.000 | mA | 1000 = 1 mA |
| 13.30 | AO2 out at AO2 src max | <i>Real</i> | 0.000...22.000 | mA | 1000 = 1 mA |
| 13.91 | AO1 data storage | <i>Real</i> | -327.68...327.67 | - | 100 = 1 |
| 13.92 | AO2 data storage | <i>Real</i> | -327.68...327.67 | - | 100 = 1 |
| 15 I/O extension module | | | | | |
| 15.01 | Extension module type | <i>List</i> | 0...4 | - | 1 = 1 |
| 15.02 | Detected extension module | <i>List</i> | 0...4 | - | 1 = 1 |
| 15.03 | DI status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 15.04 | RO/DO status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 15.05 | RO/DO force selection | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 15.06 | RO/DO forced data | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 15.07 | RO4 source | <i>Binary src</i> | - | - | 1 = 1 |
| 15.08 | RO4 ON delay | <i>Real</i> | 0.0...3000.0 | s | 10 = 1 s |
| 15.09 | RO4 OFF delay | <i>Real</i> | 0.0...3000.0 | s | 10 = 1 s |
| 15.10 | RO5 source | <i>Binary src</i> | - | - | 1 = 1 |
| 15.11 | RO5 ON delay | <i>Real</i> | 0.0...3000.0 | s | 10 = 1 s |
| 15.12 | RO5 OFF delay | <i>Real</i> | 0.0...3000.0 | s | 10 = 1 s |
| 15.22 | DO1 configuration | <i>List</i> | 0, 2 | - | 1 = 1 |
| 15.23 | DO1 source | <i>Binary src</i> | - | - | 1 = 1 |
| 15.24 | DO1 ON delay | <i>Real</i> | 0.0...3000.0 | s | 10 = 1 s |
| 15.25 | DO1 OFF delay | <i>Real</i> | 0.0...3000.0 | s | 10 = 1 s |
| 15.32 | Freq out 1 actual value | <i>Real</i> | 0...16000 | Hz | 1 = 1 Hz |
| 15.33 | Freq out 1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 15.34 | Freq out 1 src min | <i>Real</i> | -32768.0...32767.0 | - | 1000 = 1 |
| 15.35 | Freq out 1 src max | <i>Real</i> | -32768.0...32767.0 | - | 1000 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|--------------------------------|---------------------------|-------------------|-----------------------|------|----------|
| 15.36 | Freq out 1 at src min | <i>Real</i> | 0...16000 | Hz | 1 = 1 Hz |
| 15.37 | Freq out 1 at src max | <i>Real</i> | 0...16000 | Hz | 1 = 1 Hz |
| 19 Operation mode | | | | | |
| 19.01 | Actual operation mode | <i>List</i> | 1...2, 10, 20 | - | 1 = 1 |
| 19.11 | Ext1/Ext2 selection | <i>Binary src</i> | - | - | 1 = 1 |
| 19.18 | HAND/OFF disable source | <i>Binary src</i> | - | - | 1 = 1 |
| 19.19 | HAND/OFF disable action | <i>List</i> | 0...2 | - | 1 = 1 |
| 20 Start/stop/direction | | | | | |
| 20.01 | Ext1 commands | <i>List</i> | 0...1, 4, 11...12, 14 | - | 1 = 1 |
| 20.02 | Ext1 start trigger type | <i>List</i> | 0...1 | - | 1 = 1 |
| 20.03 | Ext1 in1 source | <i>Binary src</i> | - | - | 1 = 1 |
| 20.04 | Ext1 in2 source | <i>Binary src</i> | - | - | 1 = 1 |
| 20.06 | Ext2 commands | <i>List</i> | 0...6, 11...12, 14 | - | 1 = 1 |
| 20.07 | Ext2 start trigger type | <i>List</i> | 0...1 | - | 1 = 1 |
| 20.08 | Ext2 in1 source | <i>Binary src</i> | - | - | 1 = 1 |
| 20.09 | Ext2 in2 source | <i>Binary src</i> | - | - | 1 = 1 |
| 20.40 | Run permissive | <i>Binary src</i> | - | - | 1 = 1 |
| 20.41 | Start interlock 1 | <i>Binary src</i> | - | - | 1 = 1 |
| 20.42 | Start interlock 2 | <i>Binary src</i> | - | - | 1 = 1 |
| 20.43 | Start interlock 3 | <i>Binary src</i> | - | - | 1 = 1 |
| 20.44 | Start interlock 4 | <i>Binary src</i> | - | - | 1 = 1 |
| 20.45 | Start interlock stop mode | <i>Binary src</i> | - | - | 1 = 1 |
| 20.46 | Run permissive text | <i>Binary src</i> | - | - | 1 = 1 |
| 20.47 | Start interlock 1 text | <i>Binary src</i> | - | - | 1 = 1 |
| 20.48 | Start interlock 2 text | <i>Binary src</i> | - | - | 1 = 1 |
| 20.49 | Start interlock 3 text | <i>Binary src</i> | - | - | 1 = 1 |
| 20.50 | Start interlock 4 text | <i>Binary src</i> | - | - | 1 = 1 |
| 20.51 | Start interlock condition | <i>Binary src</i> | - | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------------------------------------|--------------------------|------------|----------------------|------|-------------|
| 21 Start/stop mode | | | | | |
| 21.01 | Start mode | List | 0...2 | - | 1 = 1 |
| 21.02 | Magnetization time | Real | 0...10000 | ms | 1 = 1 ms |
| 21.03 | Stop mode | List | 0...2 | - | 1 = 1 |
| 21.04 | Emergency stop mode | List | 0...2 | - | 1 = 1 |
| 21.05 | Emergency stop source | Binary src | - | - | 1 = 1 |
| 21.06 | Zero speed limit | Real | 0.00...30000.00 | rpm | 100 = 1 rpm |
| 21.07 | Zero speed delay | Real | 0...30000 | ms | 1 = 1 ms |
| 21.08 | DC current control | PB | 0000b...0011b | - | 1 = 1 |
| 21.09 | DC hold speed | Real | 0.00...1000.00 | rpm | 100 = 1 rpm |
| 21.10 | DC current reference | Real | 0.0...100.0 | % | 10 = 1% |
| 21.11 | Post magnetization time | Real | 0...3000 | s | 1 = 1 s |
| 21.14 | Pre-heating input source | Binary src | - | - | 1 = 1 |
| 21.15 | Pre-heating time delay | Real | 0...3000 | s | 1 = 1 s |
| 21.16 | Pre-heating current | Real | 0.0...30.0 | % | 10 = 1% |
| 21.18 | Auto restart time | Real | 0.0, 0.1...10.0 | s | 10 = 1 s |
| 21.19 | Scalar start mode | List | 0...6 | - | 1 = 1 |
| 21.21 | DC hold frequency | Real | 0.00...1000.00 | Hz | 100 = 1 Hz |
| 21.22 | Start delay | Real | 0.00...60.00 | s | 100 = 1 s |
| 21.23 | Smooth start | Real | 0...2 | - | 1 = 1 |
| 21.24 | Smooth start current | Real | 10.0...100.0 | % | 100 = 1% |
| 21.25 | Smooth start speed | Real | 2.0...100.0 | % | 100 = 1% |
| 21.26 | Torque boost current | Real | 15.0...300.0 | % | 100 = 1% |
| 21.34 | Force auto restart | List | 0...1 | - | 1 = 1 |
| 21.35 | Preheating power | Real | 0.00 ... 10.00 | kW | 100 = 1 |
| 21.36 | Preheating unit | List | 0...1 | - | 1 = 1 |
| 22 Speed reference selection | | | | | |
| 22.01 | Speed ref unlimited | Real | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.11 | Ext1 speed ref1 | Analog src | - | - | 1 = 1 |
| 22.18 | Ext2 speed ref1 | Analog src | - | - | 1 = 1 |
| 22.21 | Constant speed function | PB | 0000h...FFFFh | - | 1 = 1 |
| 22.22 | Constant speed sel1 | Binary src | - | - | 1 = 1 |
| 22.23 | Constant speed sel2 | Binary src | - | - | 1 = 1 |
| 22.24 | Constant speed sel3 | Binary src | - | - | 1 = 1 |
| 22.26 | Constant speed 1 | Real | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.27 | Constant speed 2 | Real | -30000.00...30000.00 | rpm | 100 = 1 rpm |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|-----------------------------------|-------------------|----------------------|------|-------------|
| 22.28 | Constant speed 3 | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.29 | Constant speed 4 | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.30 | Constant speed 5 | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.31 | Constant speed 6 | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.32 | Constant speed 7 | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.41 | Speed ref safe | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.51 | Critical speed function | <i>PB</i> | 00b...11b | - | 1 = 1 |
| 22.52 | Critical speed 1 low | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.53 | Critical speed 1 high | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.54 | Critical speed 2 low | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.55 | Critical speed 2 high | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.56 | Critical speed 3 low | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.57 | Critical speed 3 high | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.71 | Motor potentiometer function | <i>List</i> | 0...3 | - | 1 = 1 |
| 22.72 | Motor potentiometer initial value | <i>Real</i> | -32768.00...32767.00 | - | 100 = 1 |
| 22.73 | Motor potentiometer up source | <i>Binary src</i> | - | - | 1 = 1 |
| 22.74 | Motor potentiometer down source | <i>Binary src</i> | - | - | 1 = 1 |
| 22.75 | Motor potentiometer ramp time | <i>Real</i> | 0.0...3600.0 | s | 10 = 1 s |
| 22.76 | Motor potentiometer min value | <i>Real</i> | -32768.00...32767.00 | - | 100 = 1 |
| 22.77 | Motor potentiometer max value | <i>Real</i> | -32768.00...32767.00 | - | 100 = 1 |
| 22.80 | Motor potentiometer ref act | <i>Real</i> | -32768.00...32767.00 | - | 100 = 1 |
| 22.86 | Speed reference act 6 | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 22.87 | Speed reference act 7 | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 23 Speed reference ramp | | | | | |
| 23.01 | Speed ref ramp input | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 23.02 | Speed ref ramp output | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 23.12 | Acceleration time 1 | <i>Real</i> | 0.000...1800.000 | s | 1000 = 1 s |
| 23.13 | Deceleration time 1 | <i>Real</i> | 0.000...1800.000 | s | 1000 = 1 s |
| 23.23 | Emergency stop time | <i>Real</i> | 0.000...1800.000 | s | 1000 = 1 s |
| 23.32 | Shape time 1 | <i>Real</i> | 0.000...1800.000 | s | 1000 = 1 s |
| 24 Speed reference conditioning | | | | | |
| 24.01 | Used speed reference | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 24.02 | Used speed feedback | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 24.03 | Speed error filtered | <i>Real</i> | -30000.0...30000.0 | rpm | 100 = 1 rpm |
| 24.04 | Speed error inverted | <i>Real</i> | -30000.0...30000.0 | rpm | 100 = 1 rpm |
| 24.11 | Speed correction | <i>Real</i> | -10000.00...10000.00 | rpm | 100 = 1 rpm |
| 24.12 | Speed error filter time | <i>Real</i> | 0...10000 | ms | 1 = 1 ms |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------------------------------------|--------------------------------|-------------------|--------------------|------|------------|
| 25 Speed control | | | | | |
| 25.01 | Torque reference speed control | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 25.02 | Speed proportional gain | <i>Real</i> | 0.00...250.00 | - | 100 = 1 |
| 25.03 | Speed integration time | <i>Real</i> | 0.00...1000.00 | s | 100 = 1 s |
| 25.04 | Speed derivation time | <i>Real</i> | 0.000...10.000 | s | 1000 = 1 s |
| 25.05 | Derivation filter time | <i>Real</i> | 0...10000 | ms | 1 = 1 ms |
| 25.15 | Proportional gain em stop | <i>Real</i> | 1.00...250.00 | - | 100 = 1 |
| 25.53 | Torque prop reference | <i>Real</i> | -30000.0...30000.0 | % | 10 = 1% |
| 25.54 | Torque integral reference | <i>Real</i> | -30000.0...30000.0 | % | 10 = 1% |
| 25.55 | Torque deriv reference | <i>Real</i> | -30000.0...30000.0 | % | 10 = 1% |
| 28 Frequency reference chain | | | | | |
| 28.01 | Frequency ref ramp input | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.02 | Frequency ref ramp output | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.11 | Ext1 frequency ref1 | <i>Analog src</i> | - | - | 1 = 1 |
| 28.15 | Ext2 frequency ref1 | <i>Analog src</i> | - | - | 1 = 1 |
| 28.21 | Constant frequency function | <i>PB</i> | 00b...11b | - | 1 = 1 |
| 28.22 | Constant frequency sel1 | <i>Binary src</i> | - | - | 1 = 1 |
| 28.23 | Constant frequency sel2 | <i>Binary src</i> | - | - | 1 = 1 |
| 28.24 | Constant frequency sel3 | <i>Binary src</i> | - | - | 1 = 1 |
| 28.26 | Constant frequency 1 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.27 | Constant frequency 2 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.28 | Constant frequency 3 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.29 | Constant frequency 4 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.30 | Constant frequency 5 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.31 | Constant frequency 6 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.32 | Constant frequency 7 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.41 | Frequency ref safe | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.51 | Critical frequency function | <i>PB</i> | 00b...11b | - | 1 = 1 |
| 28.52 | Critical frequency 1 low | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.53 | Critical frequency 1 high | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.54 | Critical frequency 2 low | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.55 | Critical frequency 2 high | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.56 | Critical frequency 3 low | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.57 | Critical frequency 3 high | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.72 | Freq acceleration time 1 | <i>Real</i> | 0.000...1800.000 | s | 1000 = 1 s |
| 28.73 | Freq deceleration time 1 | <i>Real</i> | 0.000...1800.000 | s | 1000 = 1 s |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|----------------------------|-------------------|----------------------|------|-------------|
| 28.76 | Freq ramp in zero source | <i>Binary src</i> | - | - | 1 = 1 |
| 28.82 | Shape time 1 | <i>Real</i> | 0.000...1800.000 | s | 1000 = 1 s |
| 28.92 | Frequency ref act 3 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.96 | Frequency ref act 7 | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 28.97 | Frequency ref unlimited | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 30 Limits | | | | | |
| 30.01 | Limit word 1 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 30.02 | Torque limit status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 30.11 | Minimum speed | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 30.12 | Maximum speed | <i>Real</i> | -30000.00...30000.00 | rpm | 100 = 1 rpm |
| 30.13 | Minimum frequency | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 30.14 | Maximum frequency | <i>Real</i> | -500.00...500.00 | Hz | 100 = 1 Hz |
| 30.17 | Maximum current | <i>Real</i> | 0.00...30000.00 | A | 100 = 1 A |
| 30.19 | Minimum torque 1 | <i>Real</i> | -1600.0...0.0 | % | 10 = 1% |
| 30.20 | Maximum torque 1 | <i>Real</i> | 0.0...1600.0 | % | 10 = 1% |
| 30.26 | Power motoring limit | <i>Real</i> | 0.00...600.00 | % | 100 = 1% |
| 30.27 | Power generating limit | <i>Real</i> | -600.00...0.00 | % | 100 = 1% |
| 30.30 | Overvoltage control | <i>List</i> | 0...1 | - | 1 = 1 |
| 30.31 | Undervoltage control | <i>List</i> | 0...1 | - | 1 = 1 |
| 30.35 | Thermal current limitation | <i>List</i> | 0...1 | - | 1 = 1 |
| 30.36 | Speed limit selection | <i>Binary src</i> | - | - | 1 = 1 |
| 30.37 | Minimum speed source | <i>Analog src</i> | - | - | 1 = 1 |
| 30.38 | Maximum speed source | <i>Analog src</i> | - | - | 1 = 1 |
| <i>(Parameters 30.101...30.149 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 30.101 | LSU limit word 1 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 30.102 | LSU limit word 2 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 30.103 | LSU limit word 3 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 30.104 | LSU limit word 4 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 30.149 | LSU maximum power limit | <i>Real</i> | 0.0 ... 200.0 | % | 10 = 1% |
| 31 Fault functions | | | | | |
| 31.01 | External event 1 source | <i>Binary src</i> | - | - | 1 = 1 |
| 31.02 | External event 1 type | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.03 | External event 2 source | <i>Binary src</i> | - | - | 1 = 1 |
| 31.04 | External event 2 type | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.05 | External event 3 source | <i>Binary src</i> | - | - | 1 = 1 |
| 31.06 | External event 3 type | <i>List</i> | 0...1 | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|----------------------------------|-------------------|--------------------------------|------|-------------|
| 31.07 | External event 4 source | <i>Binary src</i> | - | - | 1 = 1 |
| 31.08 | External event 4 type | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.09 | External event 5 source | <i>Binary src</i> | - | - | 1 = 1 |
| 31.10 | External event 5 type | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.11 | Fault reset selection | <i>Binary src</i> | - | - | 1 = 1 |
| 31.12 | Autoreset selection | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 31.13 | Selectable fault | <i>Real</i> | 0000h...FFFFh | - | 1 = 1 |
| 31.14 | Number of trials | <i>Real</i> | 0...5 | - | 1 = 1 |
| 31.15 | Total trials time | <i>Real</i> | 1.0...600.0 | s | 10 = 1 s |
| 31.16 | Delay time | <i>Real</i> | 0.0...120.0 | s | 10 = 1 s |
| 31.19 | Motor phase loss | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.21 | Supply phase loss | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.22 | STO indication run/stop | <i>List</i> | 0...5 | - | 1 = 1 |
| 31.23 | Wiring or earth fault | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.24 | Stall function | <i>List</i> | 0...2 | - | 1 = 1 |
| 31.25 | Stall current limit | <i>Real</i> | 0.0...1600.0 | % | 10 = 1% |
| 31.26 | Stall speed limit | <i>Real</i> | 0.00...10000.00 | rpm | 100 = 1 rpm |
| 31.27 | Stall frequency limit | <i>Real</i> | 0.00...1000.00 | Hz | 100 = 1 Hz |
| 31.28 | Stall time | <i>Real</i> | 0...3600 | s | 1 = 1 s |
| 31.30 | Overspeed trip margin | <i>Real</i> | 0.00...10000.00 | rpm | 100 = 1 rpm |
| 31.31 | Frequency trip margin | <i>Real</i> | 0.00...10000.00 | Hz | 100 = 1 Hz |
| 31.32 | Emergency ramp supervision | <i>Real</i> | 0...300 | % | 1 = 1% |
| 31.33 | Emergency ramp supervision delay | <i>Real</i> | 0...100 | s | 1 = 1 s |
| 31.35 | Main fan fault function | <i>List</i> | 0...2 | - | 1 = 1 |
| 31.36 | Aux fan fault function | <i>List</i> | 0...1 | - | 1 = 1 |
| <i>(Parameters 31.120...31.121 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 31.120 | LSU earth fault | <i>List</i> | 0...1 | - | 1 = 1 |
| 31.121 | LSU supply phase loss | <i>List</i> | 0...1 | - | 1 = 1 |
| 32 Supervision | | | | | |
| 32.01 | Supervision status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 32.05 | Supervision 1 function | <i>List</i> | 0...7 | - | 1 = 1 |
| 32.06 | Supervision 1 action | <i>List</i> | 0...3 | - | 1 = 1 |
| 32.07 | Supervision 1 signal | <i>Analog src</i> | - | - | 1 = 1 |
| 32.08 | Supervision 1 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 32.09 | Supervision 1 low | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.10 | Supervision 1 high | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------|---------------------------|-------------------|--------------------------------|------|------------|
| 32.11 | Supervision 1 hysteresis | <i>Real</i> | 0.00...100000.00 | - | 100 = 1 |
| 32.15 | Supervision 2 function | <i>List</i> | 0...7 | - | 1 = 1 |
| 32.16 | Supervision 2 action | <i>List</i> | 0...3 | - | 1 = 1 |
| 32.17 | Supervision 2 signal | <i>Analog src</i> | - | - | 1 = 1 |
| 32.18 | Supervision 2 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 32.19 | Supervision 2 low | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.20 | Supervision 2 high | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.21 | Supervision 2 hysteresis | <i>Real</i> | 0.00...100000.00 | - | 100 = 1 |
| 32.25 | Supervision 3 function | <i>List</i> | 0...7 | - | 1 = 1 |
| 32.26 | Supervision 3 action | <i>List</i> | 0...3 | - | 1 = 17 |
| 32.27 | Supervision 3 signal | <i>Analog src</i> | - | - | 1 = 1 |
| 32.28 | Supervision 3 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 32.29 | Supervision 3 low | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.30 | Supervision 3 high | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.31 | Supervision 3 hysteresis | <i>Real</i> | 0.00...100000.00 | - | 100 = 1 |
| 32.35 | Supervision 4 function | <i>List</i> | 0...7 | - | 1 = 1 |
| 32.36 | Supervision 4 action | <i>List</i> | 0...3 | - | 1 = 1 |
| 32.37 | Supervision 4 signal | <i>Analog src</i> | - | - | 1 = 1 |
| 32.38 | Supervision 4 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 32.39 | Supervision 4 low | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.40 | Supervision 4 high | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.41 | Supervision 4 hysteresis | <i>Real</i> | 0.00...100000.00 | - | 100 = 1 |
| 32.45 | Supervision 5 function | <i>List</i> | 0...7 | - | 1 = 1 |
| 32.46 | Supervision 5 action | <i>List</i> | 0...3 | - | 1 = 1 |
| 32.47 | Supervision 5 signal | <i>Analog src</i> | - | - | 1 = 1 |
| 32.48 | Supervision 5 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 32.49 | Supervision 5 low | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.50 | Supervision 5 high | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.51 | Supervision 5 hysteresis | <i>Real</i> | 0.00...100000.00 | - | 100 = 1 |
| 32.55 | Supervision 6 function | <i>List</i> | 0...7 | - | 1 = 1 |
| 32.56 | Supervision 6 action | <i>List</i> | 0...3 | - | 1 = 1 |
| 32.57 | Supervision 6 signal | <i>Analog src</i> | - | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|---------------------------|-----------------------------|-------------------|--------------------------------|------|------------|
| 32.58 | Supervision 6 filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 32.59 | Supervision 6 low | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.60 | Supervision 6 high | <i>Real</i> | -21474836.00... 21474836.00 | - | 100 = 1 |
| 32.61 | Supervision 6 hysteresis | <i>Real</i> | 0.00...100000.00 | - | 100 = 1 |
| 34 Timed functions | | | | | |
| 34.01 | Timed functions status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.02 | Timer status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.04 | Season/exception day status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.10 | Timed functions enable | <i>Binary src</i> | - | - | 1 = 1 |
| 34.11 | Timer 1 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.12 | Timer 1 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.13 | Timer 1 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.14 | Timer 2 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.15 | Timer 2 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.16 | Timer 2 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.17 | Timer 3 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.18 | Timer 3 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.19 | Timer 3 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.20 | Timer 4 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.21 | Timer 4 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.22 | Timer 4 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.23 | Timer 5 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.24 | Timer 5 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.25 | Timer 5 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.26 | Timer 6 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.27 | Timer 6 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.28 | Timer 6 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.29 | Timer 7 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.30 | Timer 7 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.31 | Timer 7 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.32 | Timer 8 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.33 | Timer 8 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.34 | Timer 8 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.35 | Timer 9 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.36 | Timer 9 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.37 | Timer 9 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.38 | Timer 10 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.39 | Timer 10 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.40 | Timer 10 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |

| No. | Name | Type | Range | Unit | FbEq32 |
|------------------------------------|------------------------------|-------------------|-----------------------------------|----------|-----------|
| 34.41 | Timer 11 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.42 | Timer 11 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.43 | Timer 11 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.44 | Timer 12 configuration | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.45 | Timer 12 start time | Time | 00:00:00...23:59:59 | s | 1 = 1 s |
| 34.46 | Timer 12 duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 34.60 | Season 1 start date | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.61 | Season 2 start date | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.62 | Season 3 start date | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.63 | Season 4 start date | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.70 | Number of active exceptions | <i>Real</i> | 0...16 | - | 1 = 1 |
| 34.71 | Exception types | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.72 | Exception 1 start | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.73 | Exception 1 length | <i>Real</i> | 0...60 | d | 1 = 1 d |
| 34.74 | Exception 2 start | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.75 | Exception 2 length | <i>Real</i> | 0...60 | d | 1 = 1 d |
| 34.76 | Exception 3 start | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.77 | Exception 3 length | <i>Real</i> | 0...60 | d | 1 = 1 d |
| 34.78 | Exception day 4 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.79 | Exception day 5 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.80 | Exception day 6 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.81 | Exception day 7 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.82 | Exception day 8 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.83 | Exception day 9 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.84 | Exception day 10 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.85 | Exception day 11 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.86 | Exception day 12 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.87 | Exception day 13 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.88 | Exception day 14 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.89 | Exception day 15 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.90 | Exception day 16 | Date | 01.01...31.12 | d | 1 = 1 d |
| 34.100 | Timed function 1 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.101 | Timed function 2 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.102 | Timed function 3 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.110 | Boost time function | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 34.111 | Boost time activation source | <i>Binary src</i> | - | - | 1 = 1 |
| 34.112 | Boost time duration | Duration | 00 00:00...07 00:00 | min | 1 = 1 min |
| 35 Motor thermal protection | | | | | |
| 35.01 | Motor estimated temperature | <i>Real</i> | -60...1000 °C or -76...1832 °F | °C or °F | 1 = 1 ° |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------------------------|-----------------------------------|-----------------------|---|------------------|------------|
| 35.02 | Measured temperature 1 | <i>Real</i> | -60...5000 °C or -76...9032 °F, 0 ohm or [35.12] ohm | °C, °F or ohm | 1 = 1 unit |
| 35.03 | Measured temperature 2 | <i>Real</i> | -60...5000 °C or -76...9032 °F, 0 ohm or [35.12] ohm | °C, °F or ohm | 1 = 1 unit |
| 35.05 | Motor overload level | <i>Real</i> | 0.0...100.0% | % | 100 = 1% |
| 35.11 | Temperature 1 source | <i>List</i> | 0...2, 5...8, 11...16, 18, 21, 22 | - | 1 = 1 |
| 35.12 | Temperature 1 fault limit | <i>Real</i> | -60...5000 °C or -76...9032 °F | °C, °F or ohm | 1 = 1 unit |
| 35.13 | Temperature 1 warning limit | <i>Real</i> | -60...5000 °C or -76...9032 °F | °C, °F or ohm | 1 = 1 unit |
| 35.14 | Temperature 1 AI source | <i>Analog src</i> | - | - | 1 = 1 |
| 35.21 | Temperature 2 source | <i>List</i> | 0...2, 5...8, 11...16, 18 | - | 1 = 1 |
| 35.22 | Temperature 2 fault limit | <i>Real</i> | -60...5000 °C or -76...9032 °F | °C, °F or ohm | 1 = 1 unit |
| 35.23 | Temperature 2 warning limit | <i>Real</i> | -60...5000 °C or -76...9032 °F | °C, °F or ohm | 1 = 1 unit |
| 35.24 | Temperature 2 AI source | <i>Analog src</i> | - | - | 1 = 1 |
| 35.31 | Safe motor temperature enable | <i>List</i> | 0...1 | - | 1 = 1 |
| 35.50 | Motor ambient temperature | <i>Real</i> | -60...100 °C or -76 ... 212 °F | °C | 1 = 1 ° |
| 35.51 | Motor load curve | <i>Real</i> | 50...150 | % | 1 = 1% |
| 35.52 | Zero speed load | <i>Real</i> | 25...150 | % | 1 = 1% |
| 35.53 | Break point | <i>Real</i> | 1.00 ... 500.00 | Hz | 100 = 1 Hz |
| 35.54 | Motor nominal temperature rise | <i>Real</i> | 0...300 °C or 32...572 °F | °C or °F | 1 = 1 ° |
| 35.55 | Motor thermal time constant | <i>Real</i> | 100...10000 | s | 1 = 1 s |
| 35.56 | Motor overload action | <i>List</i> | 0...2 | - | 1 = 1 |
| 35.57 | Motor overload class | <i>List</i> | 0...5 | - | 1 = 1 |
| 36 Load analyzer | | | | | |
| 36.01 | PVL signal source | <i>Analog src</i> | - | - | 1 = 1 |
| 36.02 | PVL filter time | <i>Real</i> | 0.00...120.00 | s | 100 = 1 s |
| 36.06 | AL2 signal source | <i>Analog src</i> | - | - | 1 = 1 |
| 36.07 | AL2 signal scaling | <i>Real</i> | 0.00...32767.00 | - | 100 = 1 |
| 36.09 | Reset loggers | <i>List</i> | 0...3 | - | 1 = 1 |
| 36.10 | PVL peak value | <i>Real</i> | -32768.00...32767.00 | - | 100 = 1 |
| 36.11 | PVL peak date | <i>Data</i> | - | - | 1 = 1 |
| 36.12 | PVL peak time | <i>Data</i> | - | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|---------------------------|-----------------------------|-------------------|-----------------------|------|-------------|
| 36.13 | PVL current at peak | <i>Real</i> | -32768.00...32767.00 | A | 100 = 1 A |
| 36.14 | PVL DC voltage at peak | <i>Real</i> | 0.00...2000.00 | V | 100 = 1 V |
| 36.15 | PVL speed at peak | <i>Real</i> | -30000.00... 30000.00 | rpm | 100 = 1 rpm |
| 36.16 | PVL reset date | <i>Data</i> | - | - | 1 = 1 |
| 36.17 | PVL reset time | <i>Data</i> | - | - | 1 = 1 |
| 36.20 | AL1 0 to 10% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.21 | AL1 10 to 20% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.22 | AL1 20 to 30% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.23 | AL1 30 to 40% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.24 | AL1 40 to 50% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.25 | AL1 50 to 60% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.26 | AL1 60 to 70% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.27 | AL1 70 to 80% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.28 | AL1 80 to 90% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.29 | AL1 over 90% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.40 | AL2 0 to 10% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.41 | AL2 10 to 20% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.42 | AL2 20 to 30% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.43 | AL2 30 to 40% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.44 | AL2 40 to 50% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.45 | AL2 50 to 60% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.46 | AL2 60 to 70% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.47 | AL2 70 to 80% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.48 | AL2 80 to 90% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.49 | AL2 over 90% | <i>Real</i> | 0.00...100.00 | % | 100 = 1% |
| 36.50 | AL2 reset date | <i>Data</i> | - | - | 1 = 1 |
| 36.51 | AL2 reset time | <i>Data</i> | - | - | 1 = 1 |
| 37 User load curve | | | | | |
| 37.01 | ULC output status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 37.02 | ULC supervision signal | <i>Analog src</i> | - | - | 1 = 1 |
| 37.03 | ULC overload actions | <i>List</i> | 0...3 | - | 1 = 1 |
| 37.04 | ULC underload actions | <i>List</i> | 0...3 | - | 1 = 1 |
| 37.11 | ULC speed table point 1 | <i>Real</i> | -30000.0...30000.0 | rpm | 10 = 1 rpm |
| 37.12 | ULC speed table point 2 | <i>Real</i> | -30000.0...30000.0 | rpm | 10 = 1 rpm |
| 37.13 | ULC speed table point 3 | <i>Real</i> | -30000.0...30000.0 | rpm | 10 = 1 rpm |
| 37.14 | ULC speed table point 4 | <i>Real</i> | -30000.0...30000.0 | rpm | 10 = 1 rpm |
| 37.15 | ULC speed table point 5 | <i>Real</i> | -30000.0...30000.0 | rpm | 10 = 1 rpm |
| 37.16 | ULC frequency table point 1 | <i>Real</i> | -500.0...500.0 | Hz | 10 = 1 Hz |
| 37.17 | ULC frequency table point 2 | <i>Real</i> | -500.0...500.0 | Hz | 10 = 1 Hz |
| 37.18 | ULC frequency table point 3 | <i>Real</i> | -500.0...500.0 | Hz | 10 = 1 Hz |

| No. | Name | Type | Range | Unit | FbEq32 |
|-----------------------------|------------------------------|-------------------|------------------------|------------|--------------------|
| 37.19 | ULC frequency table point 4 | <i>Real</i> | -500.0...500.0 | Hz | 10 = 1 Hz |
| 37.20 | ULC frequency table point 5 | <i>Real</i> | -500.0...500.0 | Hz | 10 = 1 Hz |
| 37.21 | ULC underload point 1 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.22 | ULC underload point 2 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.23 | ULC underload point 3 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.24 | ULC underload point 4 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.25 | ULC underload point 5 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.31 | ULC overload point 1 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.32 | ULC overload point 2 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.33 | ULC overload point 3 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.34 | ULC overload point 4 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.35 | ULC overload point 5 | <i>Real</i> | -1600.0...1600.0 | % | 10 = 1% |
| 37.41 | ULC overload timer | <i>Real</i> | 0.0...10000.0 | s | 10 = 1 s |
| 37.42 | ULC underload timer | <i>Real</i> | 0.0...10000.0 | s | 10 = 1 s |
| 40 Process PID set 1 | | | | | |
| 40.01 | Process PID output actual | <i>Real</i> | -200000.00...200000.00 | % | 100 = 1 % |
| 40.02 | Process PID feedback actual | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.03 | Process PID setpoint actual | <i>Real</i> | -200000...200000 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.04 | Process PID deviation actual | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.06 | Process PID status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 40.07 | Process PID operation mode | <i>List</i> | 0...2 | - | 1 = 1 |
| 40.08 | Set 1 feedback 1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 40.09 | Set 1 feedback 2 source | <i>Analog src</i> | - | - | 1 = 1 |
| 40.10 | Set 1 feedback function | <i>List</i> | 0...13 | - | 1 = 1 |
| 40.11 | Set 1 feedback filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 40.14 | Set 1 setpoint scaling | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.15 | Set 1 output scaling | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.16 | Set 1 setpoint 1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 40.17 | Set 1 setpoint 2 source | <i>Analog src</i> | - | - | 1 = 1 |
| 40.18 | Set 1 setpoint function | <i>List</i> | 0...13 | - | 1 = 1 |
| 40.19 | Set 1 internal setpoint sel1 | <i>Binary src</i> | - | - | 1 = 1 |
| 40.20 | Set 1 internal setpoint sel2 | <i>Binary src</i> | - | - | 1 = 1 |
| 40.21 | Set 1 internal setpoint 1 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.22 | Set 1 internal setpoint 2 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------|------------------------------|-------------------|------------------------|------------|--------------------|
| 40.23 | Set 1 internal setpoint 3 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.24 | Set 1 internal setpoint 0 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.26 | Set 1 setpoint min | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.27 | Set 1 setpoint max | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.28 | Set 1 setpoint increase time | <i>Real</i> | 0.0...1800.0 | s | 10 = 1 s |
| 40.29 | Set 1 setpoint decrease time | <i>Real</i> | 0.0...1800.0 | s | 10 = 1 s |
| 40.30 | Set 1 setpoint freeze enable | <i>Binary src</i> | - | - | 1 = 1 |
| 40.31 | Set 1 deviation inversion | <i>Binary src</i> | - | - | 1 = 1 |
| 40.32 | Set 1 gain | <i>Real</i> | 0.10...100.00 | - | 100 = 1 |
| 40.33 | Set 1 integration time | <i>Real</i> | 0.0...9999.0 | s | 10 = 1 s |
| 40.34 | Set 1 derivation time | <i>Real</i> | 0.000...10.000 | s | 1000 = 1 s |
| 40.35 | Set 1 derivation filter time | <i>Real</i> | 0.0...10.0 | s | 10 = 1 s |
| 40.36 | Set 1 output min | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.37 | Set 1 output max | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.38 | Set 1 output freeze enable | <i>Binary src</i> | - | - | 1 = 1 |
| 40.39 | Set 1 deadband range | <i>Real</i> | 0.....200000.0 | - | 10 = 1 |
| 40.40 | Set 1 deadband delay | <i>Real</i> | 0.0 ... 3600.0 | s | 10 = 1 s |
| 40.43 | Set 1 sleep level | <i>Real</i> | 0.0...200000.0 | - | 10 = 1 |
| 40.44 | Set 1 sleep delay | <i>Real</i> | 0.0...3600.0 | s | 10 = 1 s |
| 40.45 | Set 1 sleep boost time | <i>Real</i> | 0.0...3600.0 | s | 10 = 1 s |
| 40.46 | Set 1 sleep boost step | <i>Real</i> | 0.0...200000.0 | PID unit 1 | 10 = 1 PID unit 1 |
| 40.47 | Set 1 wake-up deviation | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.48 | Set 1 wake-up delay | <i>Real</i> | 0.00...60.00 | s | 100 = 1 s |
| 40.49 | Set 1 tracking mode | <i>Binary src</i> | - | - | 1 = 1 |
| 40.50 | Set 1 tracking ref selection | <i>Analog src</i> | - | - | 1 = 1 |
| 40.57 | PID set1/set2 selection | <i>Binary src</i> | - | - | 1 = 1 |
| 40.58 | Set 1 increase prevention | <i>Binary src</i> | - | - | 1 = 1 |
| 40.59 | Set 1 decrease prevention | <i>Binary src</i> | - | - | 1 = 1 |
| 40.60 | Set 1 PID activation source | <i>Binary src</i> | - | - | 1 = 1 |
| 40.61 | Setpoint scaling actual | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-----------------------------|----------------------------------|-------------------|--|------------|--------------------|
| 40.62 | PID internal setpoint actual | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.70 | Compensated setpoint | <i>Real</i> | -21474836.48... 21474835.20 | PID unit 1 | 100 = 1 PID unit 1 |
| 40.71 | Set 1 compensation input source | <i>List</i> | 0, 2...4, 8, 10...12, 15...16, 19...20, 24 | - | 1 = 1 |
| 40.72 | Set 1 compensation input 1 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.73 | Set 1 compensated output 1 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.74 | Set 1 compensation input 2 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.75 | Set 1 compensated output 2 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.76 | Set 1 compensation non-linearity | <i>Real</i> | 0...100 | % | 1= 1% |
| 40.79 | Set 1 units | <i>List</i> | | - | 1 = 1 |
| 40.80 | Set 1 PID output min source | <i>List</i> | 0...1 | - | 1 = 1 |
| 40.81 | Set 1 PID output max source | <i>List</i> | 0...1 | - | 1 = 1 |
| 40.89 | Set 1 setpoint multiplier | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.90 | Set 1 feedback multiplier | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 40.91 | Feedback data storage | <i>Real</i> | -327.68...327.67 | - | 100 = 1 |
| 40.92 | Setpoint data storage | <i>Real</i> | -327.68...327.67 | - | 100 = 1 |
| 40.96 | Process PID output % | <i>Real</i> | -100.00...100.00 | % | 100 = 1% |
| 40.97 | Process PID feedback % | <i>Real</i> | -100.00...100.00 | % | 100 = 1% |
| 40.98 | Process PID setpoint % | <i>Real</i> | -100.00...100.00 | % | 100 = 1% |
| 40.99 | Process PID deviation % | <i>Real</i> | -100.00...100.00 | % | 100 = 1% |
| 41 Process PID set 2 | | | | | |
| 41.08 | Set 2 feedback 1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 41.09 | Set 2 feedback 2 source | <i>Analog src</i> | - | - | 1 = 1 |
| 41.10 | Set 2 feedback function | <i>List</i> | 0...13 | - | 1 = 1 |
| 41.11 | Set 2 feedback filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 41.14 | Set 2 setpoint scaling | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.15 | Set 2 output scaling | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.16 | Set 2 setpoint 1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 41.17 | Set 2 setpoint 2 source | <i>Analog src</i> | - | - | 1 = 1 |
| 41.18 | Set 2 setpoint function | <i>List</i> | 0...13 | - | 1 = 1 |
| 41.19 | Set 2 internal setpoint sel1 | <i>Binary src</i> | - | - | 1 = 1 |
| 41.20 | Set 2 internal setpoint sel2 | <i>Binary src</i> | - | - | 1 = 1 |
| 41.21 | Set 2 internal setpoint 1 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 41.22 | Set 2 internal setpoint 2 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------|---------------------------------|-------------------|--|------------|--------------------|
| 41.23 | Set 2 internal setpoint 3 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 41.24 | Set 2 internal setpoint 0 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 41.26 | Set 2 setpoint min | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 41.27 | Set 2 setpoint max | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 41.28 | Set 2 setpoint increase time | <i>Real</i> | 0.0...1800.0 | s | 10 = 1 s |
| 41.29 | Set 2 setpoint decrease time | <i>Real</i> | 0.0...1800.0 | s | 10 = 1 s |
| 41.30 | Set 2 setpoint freeze enable | <i>Binary src</i> | - | - | 1 = 1 |
| 41.31 | Set 2 deviation inversion | <i>Binary src</i> | - | - | 1 = 1 |
| 41.32 | Set 2 gain | <i>Real</i> | 0.10...100.00 | - | 100 = 1 |
| 41.33 | Set 2 integration time | <i>Real</i> | 0.0...9999.0 | s | 10 = 1 s |
| 41.34 | Set 2 derivation time | <i>Real</i> | 0.000...10.000 | s | 1000 = 1 s |
| 41.35 | Set 2 derivation filter time | <i>Real</i> | 0.0...10.0 | s | 10 = 1 s |
| 41.36 | Set 2 output min | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.37 | Set 2 output max | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.38 | Set 2 output freeze enable | <i>Binary src</i> | - | - | 1 = 1 |
| 41.39 | Set 2 deadband range | <i>Real</i> | 0.....200000.0 | - | 10 = 1 |
| 41.40 | Set 2 deadband delay | <i>Real</i> | 0.0 ... 3600.0 | s | 10 = 1 s |
| 41.43 | Set 2 sleep level | <i>Real</i> | 0.0...200000.0 | - | 10 = 1 |
| 41.44 | Set 2 sleep delay | <i>Real</i> | 0.0...3600.0 | s | 10 = 1 s |
| 41.45 | Set 2 sleep boost time | <i>Real</i> | 0.0...3600.0 | s | 10 = 1 s |
| 41.46 | Set 2 sleep boost step | <i>Real</i> | 0.0...200000.0 | PID unit 1 | 10 = 1 PID unit 1 |
| 41.47 | Set 2 wake-up deviation | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 41.48 | Set 2 wake-up delay | <i>Real</i> | 0.00...60.00 | s | 100 = 1 s |
| 41.49 | Set 2 tracking mode | <i>Binary src</i> | - | - | 1 = 1 |
| 41.50 | Set 2 tracking ref selection | <i>Analog src</i> | - | - | 1 = 1 |
| 41.58 | Set 2 increase prevention | <i>Binary src</i> | - | - | 1 = 1 |
| 41.59 | Set 2 decrease prevention | <i>Binary src</i> | - | - | 1 = 1 |
| 41.60 | Set 2 PID activation source | <i>Binary src</i> | - | - | 1 = 1 |
| 41.71 | Set 2 compensation input source | <i>List</i> | 0, 2...4, 8, 10...12, 15...16, 19...20, 24 | - | 1 = 1 |
| 41.72 | Set 2 compensation input 1 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.73 | Set 2 compensated output 1 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-----------------------------|----------------------------------|-------------------|--------------------------|----------------|------------------------|
| 41.74 | Set 2 compensation input 2 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.75 | Set 2 compensated output 2 | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.76 | Set 2 compensation non-linearity | <i>Real</i> | 0...100 | % | 1 = 1% |
| 41.79 | Set 2 units | <i>List</i> | | - | 1 = 1 |
| 41.80 | Set 2 PID output min source | <i>List</i> | 0...1 | - | 1 = 1 |
| 41.81 | Set 2 PID output max source | <i>List</i> | 0...1 | - | 1 = 1 |
| 41.89 | Set 2 setpoint multiplier | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 41.90 | Set 2 feedback multiplier | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 43 Brake chopper | | | | | |
| 43.01 | Braking resistor temperature | <i>Real</i> | 0.0...120.0 | % | 10 = 1% |
| 43.06 | Brake chopper function | <i>List</i> | 0...3 | - | 1 = 1 |
| 43.07 | Brake chopper run enable | <i>Binary src</i> | - | - | 1 = 1 |
| 43.08 | Brake resistor thermal tc | <i>Real</i> | 0...10000 | s | 1 = 1 s |
| 43.09 | Brake resistor Pmax cont | <i>Real</i> | 0.00...10000.00 | kW | 100 = 1 kW |
| 43.10 | Brake resistance | <i>Real</i> | 0.0...1000.0 | ohm | 10 = 1 ohm |
| 43.11 | Brake resistor fault limit | <i>Real</i> | 0...150 | % | 1 = 1% |
| 43.12 | Brake resistor warning limit | <i>Real</i> | 0...150 | % | 1 = 1% |
| 45 Energy efficiency | | | | | |
| 45.01 | Saved GW hours | <i>Real</i> | 0...65535 | GWh | 1 = 1 GWh |
| 45.02 | Saved MW hours | <i>Real</i> | 0...999 | MWh | 1 = 1 MWh |
| 45.03 | Saved kW hours | <i>Real</i> | 0.0...999.9 | kWh | 10 = 1 kWh |
| 45.04 | Saved energy | <i>Real</i> | 0.0...214748364.0 | kWh | 10 = 1 kWh |
| 45.05 | Saved money x1000 | <i>Real</i> | 0...4294967295 thousands | (definable) | 1 = 1 currency unit |
| 45.06 | Saved money | <i>Real</i> | 0.00...999.99 | (definable) | 100 = 1 currency unit |
| 45.07 | Saved amount | <i>Real</i> | 0.00...21474830.08 | (definable) | 100 = 1 currency unit |
| 45.08 | CO2 reduction in kilotons | <i>Real</i> | 0...65535 | metric kiloton | 1 = 1 metric kiloton |
| 45.09 | CO2 reduction in tons | <i>Real</i> | 0.0...999.9 | metric ton | 10 = 1 metric ton |
| 45.10 | Total saved CO2 | <i>Real</i> | 0.0...214748300.8 | metric ton | 10 = 1 metric ton |
| 45.11 | Energy optimizer | <i>List</i> | 0...1 | - | 1 = 1 |
| 45.12 | Energy tariff 1 | <i>Real</i> | 0.000...4294966.296 | (definable) | 1000 = 1 currency unit |
| 45.13 | Energy tariff 2 | <i>Real</i> | 0.000...4294966.296 | (definable) | 1000 = 1 currency unit |
| 45.14 | Tariff selection | <i>Binary src</i> | - | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|---------------------------------------|---------------------------------------|-------------|----------------------------|----------|-----------------|
| 45.18 | CO2 conversion factor | <i>Real</i> | 0.000...65.535 | tn/ MWh | 1000 = 1 tn/MWh |
| 45.19 | Comparison power | <i>Real</i> | 0.00...10000000.00 | kW | 10 = 1 kW |
| 45.21 | Energy calculations reset | <i>List</i> | 0...1 | - | 1 = 1 |
| 45.24 | Hourly peak power value | <i>Real</i> | -3000.00 ... 3000.00 | kW | 1 = 1 kW |
| 45.25 | Hourly peak power time | <i>Real</i> | | | N/A |
| 45.26 | Hourly total energy (resettable) | <i>Real</i> | -3000.00 ... 3000.00 | kWh | 1 = 1 kWh |
| 45.27 | Daily peak power value (resettable) | <i>Real</i> | -3000.00 ... 3000.00 | kW | 1 = 1 kW |
| 45.28 | Daily peak power time | <i>Real</i> | | | N/A |
| 45.29 | Daily total energy (resettable) | <i>Real</i> | -30000.00 ... 30000.00 | kWh | 1 = 1 kWh |
| 45.30 | Last day total energy | <i>Real</i> | -30000.00 ... 30000.00 | kWh | 1 = 1 kWh |
| 45.31 | Monthly peak power value (resettable) | <i>Real</i> | -3000.00 ... 3000.00 | kW | 1 = 1 kW |
| 45.32 | Monthly peak power date | <i>Real</i> | | | N/A |
| 45.33 | Monthly peak power time | <i>Real</i> | | | N/A |
| 45.34 | Monthly total energy (resettable) | <i>Real</i> | -1000000.00 ... 1000000.00 | kWh | 1 = 1 kWh |
| 45.35 | Last month total energy | <i>Real</i> | -1000000.00 ... 1000000.00 | kWh | 1 = 1 kWh |
| 45.36 | Lifetime peak power value | <i>Real</i> | -3000.00 ... 3000.00 | kW | 1 = 1 kW |
| 45.37 | Lifetime peak power date | <i>Real</i> | | | N/A |
| 45.38 | Lifetime peak power time | <i>Real</i> | | | N/A |
| 46 Monitoring/scaling settings | | | | | |
| 46.01 | Speed scaling | <i>Real</i> | 0.00...30000.00 | rpm | 100 = 1 rpm |
| 46.02 | Frequency scaling | <i>Real</i> | 0.10...1000.00 | Hz | 100 = 1 Hz |
| 46.03 | Torque scaling | <i>Real</i> | 0.1...1000.0 | % | 10 = 1% |
| 46.04 | Power scaling | <i>Real</i> | 0.10...30000.00 kW or hp | kW or hp | 10 = 1 unit |
| 46.05 | Current scaling | <i>Real</i> | 0...30000 | A | 1 = 1 A |
| 46.06 | Speed ref zero scaling | <i>Real</i> | 0.00 ... 30000.00 | rpm | 100 = 1 rpm |
| 46.07 | Frequency ref zero scaling | <i>Real</i> | 0.00...1000.00 | Hz | 100 = 1 Hz |
| 46.11 | Filter time motor speed | <i>Real</i> | 2...20000 | ms | 1 = 1 ms |
| 46.12 | Filter time output frequency | <i>Real</i> | 2...20000 | ms | 1 = 1 ms |
| 46.13 | Filter time motor torque | <i>Real</i> | 2...20000 | ms | 1 = 1 ms |
| 46.14 | Filter time power | <i>Real</i> | 2...20000 | ms | 1 = 1 ms |
| 46.21 | At speed hysteresis | <i>Real</i> | 0.00...30000.00 | rpm | 100 = 1 rpm |
| 46.22 | At frequency hysteresis | <i>Real</i> | 0.00...1000.00 | Hz | 100 = 1 Hz |
| 46.31 | Above speed limit | <i>Real</i> | 0.00...30000.00 | rpm | 100 = 1 rpm |
| 46.32 | Above frequency limit | <i>Real</i> | 0.00...1000.00 | Hz | 100 = 1 Hz |
| 46.41 | kWh pulse scaling | <i>Real</i> | 0.001...1000.000 | kWh | 1000 = 1 kWh |
| 46.43 | Power decimals | <i>Real</i> | 0...3 | - | 1 = 1 |
| 46.44 | Current decimals | <i>Real</i> | 0...3 | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|------------------------------------|-------------------------------|-------------------|--------------------------------|------|----------|
| 47 Data storage | | | | | |
| 47.01 | Data storage 1 real32 | <i>Real</i> | -2147483.000... 2147483.000 | - | 1000 = 1 |
| 47.02 | Data storage 2 real32 | <i>Real</i> | -2147483.000... 2147483.000 | - | 1000 = 1 |
| 47.03 | Data storage 3 real32 | <i>Real</i> | -2147483.000... 2147483.000 | - | 1000 = 1 |
| 47.04 | Data storage 4 real32 | <i>Real</i> | -2147483.000... 2147483.000 | - | 1000 = 1 |
| 47.11 | Data storage 1 int32 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 47.12 | Data storage 2 int32 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 47.13 | Data storage 3 int32 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 47.14 | Data storage 4 int32 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 47.21 | Data storage 1 int16 | <i>Real</i> | -32768...32767 | - | 1 = 1 |
| 47.22 | Data storage 2 int16 | <i>Real</i> | -32768...32767 | - | 1 = 1 |
| 47.23 | Data storage 3 int16 | <i>Real</i> | -32768...32767 | - | 1 = 1 |
| 47.24 | Data storage 4 int16 | <i>Real</i> | -32768...32767 | - | 1 = 1 |
| 49 Panel port communication | | | | | |
| 49.01 | Node ID number | <i>Real</i> | 1...32 | - | 1 = 1 |
| 49.03 | Baud rate | <i>List</i> | 1...5 | - | 1 = 1 |
| 49.04 | Communication loss time | <i>Real</i> | 0.3...3000.0 | s | 10 = 1 s |
| 49.05 | Communication loss action | <i>List</i> | 0...3 | - | 1 = 1 |
| 49.06 | Refresh settings | <i>List</i> | 0...1 | - | 1 = 1 |
| 50 Fieldbus adapter (FBA) | | | | | |
| 50.01 | FBA A enable | <i>List</i> | 0...1 | - | 1 = 1 |
| 50.02 | FBA A comm loss func | <i>List</i> | 0...5 | - | 1 = 1 |
| 50.03 | FBA A comm loss t out | <i>Real</i> | 0.3...6553.5 | s | 10 = 1 s |
| 50.04 | FBA A ref1 type | <i>List</i> | 0...5 | - | 1 = 1 |
| 50.05 | FBA A ref2 type | <i>List</i> | 0...5 | - | 1 = 1 |
| 50.06 | FBA A SW sel | <i>List</i> | 0...1 | - | 1 = 1 |
| 50.07 | FBA A actual 1 type | <i>List</i> | 0...5 | - | 1 = 1 |
| 50.08 | FBA A actual 2 type | <i>List</i> | 0...5 | - | 1 = 1 |
| 50.09 | FBA A SW transparent source | <i>Analog src</i> | - | - | 1 = 1 |
| 50.10 | FBA A act1 transparent source | <i>Analog src</i> | - | - | 1 = 1 |
| 50.11 | FBA A act2 transparent source | <i>Analog src</i> | - | - | 1 = 1 |
| 50.12 | FBA A debug mode | <i>List</i> | 0...1 | - | 1 = 1 |
| 50.13 | FBA A control word | <i>Data</i> | 00000000h...FFFFFFFFh | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-----------------------------|---------------------------|-------------|------------------------------|------|--------|
| 50.14 | FBA A reference 1 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 50.15 | FBA A reference 2 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 50.16 | FBA A status word | <i>Data</i> | 00000000h...FFFFFFFh | - | 1 = 1 |
| 50.17 | FBA A actual value 1 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 50.18 | FBA A actual value 2 | <i>Real</i> | -2147483648... 2147483647 | - | 1 = 1 |
| 51 FBA A settings | | | | | |
| 51.01 | FBA A type | <i>List</i> | - | - | 1 = 1 |
| 51.02 | FBA A Par2 | <i>Real</i> | 0...65535 | - | 1 = 1 |
| ... | ... | ... | ... | ... | |
| 51.26 | FBA A Par26 | <i>Real</i> | 0...65535 | - | 1 = 1 |
| 51.27 | FBA A par refresh | <i>List</i> | 0...1 | - | 1 = 1 |
| 51.28 | FBA A par table ver | <i>Data</i> | - | - | 1 = 1 |
| 51.29 | FBA A drive type code | <i>Real</i> | 0...65535 | - | 1 = 1 |
| 51.30 | FBA A mapping file ver | <i>Real</i> | 0...65535 | - | 1 = 1 |
| 51.31 | D2FBA A comm status | <i>List</i> | 0...6 | - | 1 = 1 |
| 51.32 | FBA A comm SW ver | <i>Data</i> | - | - | 1 = 1 |
| 51.33 | FBA A appl SW ver | <i>Data</i> | - | - | 1 = 1 |
| 52 FBA A data in | | | | | |
| 52.01 | FBA A data in1 | <i>List</i> | - | - | 1 = 1 |
| ... | ... | ... | ... | ... | |
| 52.12 | FBA A data in12 | <i>List</i> | - | - | 1 = 1 |
| 53 FBA A data out | | | | | |
| 53.01 | FBA A data out1 | <i>List</i> | - | - | 1 = 1 |
| ... | ... | ... | ... | ... | |
| 53.12 | FBA A data out12 | <i>List</i> | - | - | 1 = 1 |
| 58 Embedded fieldbus | | | | | |
| 58.01 | Protocol enable | <i>List</i> | 0...1,4 | - | 1 = 1 |
| 58.02 | Protocol ID | <i>Real</i> | 0000h...FFFFh | - | 1 = 1 |
| 58.03 | Node address | <i>Real</i> | 0...255 | - | 1 = 1 |
| 58.04 | Baud rate | <i>List</i> | 0...7 | - | 1 = 1 |
| 58.05 | Parity | <i>List</i> | 0...3 | - | 1 = 1 |
| 58.06 | Communication control | <i>List</i> | 0...2 | - | 1 = 1 |
| 58.07 | Communication diagnostics | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 58.08 | Received packets | <i>Real</i> | 0...4294967295 | - | 1 = 1 |
| 58.09 | Transmitted packets | <i>Real</i> | 0...4294967295 | - | 1 = 1 |
| 58.10 | All packets | <i>Real</i> | 0...4294967295 | - | 1 = 1 |
| 58.11 | UART errors | <i>Real</i> | 0...4294967295 | - | 1 = 1 |
| 58.12 | CRC errors | <i>Real</i> | 0...4294967295 | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|----------------------------------|------------|-----------------------|------|----------|
| 58.14 | Communication loss action | List | 0...5 | - | 1 = 1 |
| 58.15 | Communication loss mode | List | 1...2 | - | 1 = 1 |
| 58.16 | Communication loss time | Real | 0.0...6000.0 | s | 10 = 1 s |
| 58.17 | Transmit delay | Real | 0...65535 | ms | 1 = 1 ms |
| 58.18 | EFB control word | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 58.19 | EFB status word | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 58.25 | Control profile | List | 0, 5 | - | 1 = 1 |
| 58.26 | EFB ref1 type | List | 0...2, 4...5 | - | 1 = 1 |
| 58.27 | EFB ref2 type | List | 0...2, 4...5 | - | 1 = 1 |
| 58.28 | EFB act1 type | List | 0...2, 4...5 | - | 1 = 1 |
| 58.29 | EFB act2 type | List | 0...2, 4...5 | - | 1 = 1 |
| 58.31 | EFB act1 transparent source | Analog src | - | - | 1 = 1 |
| 58.32 | EFB act2 transparent source | Analog src | - | - | 1 = 1 |
| 58.33 | Addressing mode | List | 0...2 | - | 1 = 1 |
| 58.34 | Word order | List | 0...1 | - | 1 = 1 |
| 58.101 | Data I/O 1 | Analog src | - | - | 1 = 1 |
| 58.102 | Data I/O 2 | Analog src | - | - | 1 = 1 |
| 58.103 | Data I/O 3 | Analog src | - | - | 1 = 1 |
| 58.104 | Data I/O 4 | Analog src | - | - | 1 = 1 |
| 58.105 | Data I/O 5 | Analog src | - | - | 1 = 1 |
| 58.106 | Data I/O 6 | Analog src | - | - | 1 = 1 |
| 58.107 | Data I/O 7 | Analog src | - | - | 1 = 1 |
| ... | ... | ... | ... | ... | ... |
| 58.114 | Data I/O 14 | Analog src | - | - | 1 = 1 |
| 60 DDCS communication | | | | | |
| <i>(Parameters 60.71...60.79 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 60.71 | INU-LSU communication port | List | - | - | 1 = 1 |
| 60.78 | INU-LSU comm loss timeout | Real | 0...65535 | ms | - |
| 60.79 | INU-LSU comm loss function | Binary src | - | - | 1 = 1 |
| 61 D2D and DDCS transmit data | | | | | |
| <i>(Parameters 61.201...61.203 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 61.201 | INU-LSU data set 10 data 1 value | Real | 0...65535 | - | - |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|----------------------------------|-------------------|------------------------|------------|--------------------|
| 61.202 | INU-LSU data set 10 data 2 value | <i>Real</i> | 0...65535 | - | - |
| 61.203 | INU-LSU data set 10 data 3 value | <i>Real</i> | 0...65535 | - | - |
| 62 D2D and DDCS receive data | | | | | |
| <i>(Parameter 62.201 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 62.201 | INU-LSU data set 11 data 1 value | <i>Real</i> | 0...65535 | - | - |
| 71 External PID1 | | | | | |
| 71.01 | External PID act value | <i>Real</i> | -200000.00...200000.00 | % | 100 = 1% |
| 71.02 | Feedback act value | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 71.03 | Setpoint act value | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 71.04 | Deviation act value | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 71.06 | PID status word | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 71.07 | PID operation mode | <i>List</i> | 0...2 | - | 1 = 1 |
| 71.08 | Feedback 1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 71.11 | Feedback filter time | <i>Real</i> | 0.000...30.000 | s | 1000 = 1 s |
| 71.14 | Setpoint scaling | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 71.15 | Output scaling | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 71.16 | Setpoint 1 source | <i>Analog src</i> | - | - | 1 = 1 |
| 71.19 | Internal setpoint sel1 | <i>Binary src</i> | - | - | 1 = 1 |
| 71.20 | Internal setpoint sel2 | <i>Binary src</i> | - | - | 1 = 1 |
| 71.21 | Internal setpoint 1 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 71.22 | Internal setpoint 2 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 71.23 | Internal setpoint 3 | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 71.26 | Setpoint min | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 71.27 | Setpoint max | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 71.31 | Deviation inversion | <i>Binary src</i> | - | - | 1 = 1 |
| 71.32 | Gain | <i>Real</i> | 0.10...100.00 | - | 100 = 1 |
| 71.33 | Integration time | <i>Real</i> | 0.0...9999.0 | s | 10 = 1 s |
| 71.34 | Derivation time | <i>Real</i> | 0.000...10.000 | s | 1000 = 1 s |
| 71.35 | Derivation filter time | <i>Real</i> | 0.0...10.0 | s | 10 = 1 s |
| 71.36 | Output min | <i>Real</i> | -200000.00...200000.00 | - | 10 = 1 |
| 71.37 | Output max | <i>Real</i> | -200000.00...200000.00 | - | 10 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|-----------------------------------|------------------------------|-------------------|--|------------|--------------------|
| 71.38 | Output freeze enable | <i>Binary src</i> | - | - | 1 = 1 |
| 71.39 | Deadband range | <i>Real</i> | 0.0...200000.0 | - | 10 = 1 |
| 71.40 | Deadband delay | <i>Real</i> | 0.0...3600.0 | s | 10 = 1 s |
| 71.58 | Increase prevention | <i>Binary src</i> | - | - | 1 = 1 |
| 71.59 | Decrease prevention | <i>Binary src</i> | - | - | 1 = 1 |
| 71.62 | Internal setpoint actual | <i>Real</i> | -200000.00...200000.00 | PID unit 1 | 100 = 1 PID unit 1 |
| 71.79 | External PID units | <i>List</i> | | - | 1 = 1 |
| 76 Multipump configuration | | | | | |
| 76.01 | PFC status | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.02 | Multipump system status | <i>List</i> | 0...3, 100...103, 200...202, 300...302, 400, 500, 600, 700, 800...801, 4...9 | - | 1 = 1 |
| 76.05 | Measured level | <i>Real</i> | 0.00...32767.00 | m | 10 = 1 |
| 76.06 | Measured level % | <i>Real</i> | 0...100 | % | 1 = 1 |
| 76.07 | LC speed ref | <i>Real</i> | -2147483648...2147483520 | Hz | 1 = Hz |
| 76.11 | Pump status 1 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.12 | Pump status 2 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.13 | Pump status 3 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.14 | Pump status 4 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.15 | Pump status 5 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.16 | Pump status 6 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.17 | Pump status 7 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.18 | Pump status 8 | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.21 | Multipump configuration | <i>List</i> | 0, 1...5 | - | 1 = 1 |
| 76.22 | Multipump node number | <i>Real</i> | 1...8 | - | 1 = 1 |
| 76.23 | Master enable | <i>List</i> | 0...1 | - | 1 = 1 |
| 76.24 | IPC communication port | <i>List</i> | 0...1 | - | 1 = 1 |
| 76.25 | Number of motors | <i>Real</i> | 1...8 | - | 1 = 1 |
| 76.26 | Min number of motors allowed | <i>Real</i> | 0...8 | - | 1 = 1 |
| 76.27 | Max number of motors allowed | <i>Real</i> | 1...8 | - | 1 = 1 |
| 76.30 | Start point 1 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.31 | Start point 2 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.32 | Start point 3 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.33 | Start point 4 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.34 | Start point 5 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.35 | Start point 6 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.36 | Start point 7 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.37 | Start point 8 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.41 | Stop point 1 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------|------------------------------|-----------------------|------------------------------------|----------|------------|
| 76.42 | Stop point 2 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.43 | Stop point 3 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.44 | Stop point 4 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.45 | Stop point 5 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.46 | Stop point 6 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.47 | Stop point 7 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.48 | Stop point 8 | <i>Real</i> | 0.00...32767.00 | rpm/Hz/m | 1 = 1 unit |
| 76.50 | LC full speed point | <i>Real</i> | 0.00...32767.00 | m | 1 = 1 m |
| 76.51 | LC level source | <i>List</i> | - | - | 1 = 1 |
| 76.52 | LC level unit | <i>List</i> | - | - | 1 = 1 |
| 76.53 | LC efficient speed | <i>Real</i> | -2147483648... 2147482147483520 | rpm/Hz | 1 = 1 unit |
| 76.54 | LC max time at level | <i>Real</i> | 0.0...1800.0 | h | 100 = 1 h |
| 76.55 | Start delay | <i>Real</i> | 0.00...12600.00 | s | 100 = 1 s |
| 76.56 | Stop delay | <i>Real</i> | 0.00...12600.00 | s | 100 = 1 s |
| 76.57 | PFC speed hold on | <i>Real</i> | 0.00...1000.00 | s | 100 = 1 s |
| 76.58 | PFC speed hold off | <i>Real</i> | 0.00...1000.00 | s | 100 = 1 s |
| 76.59 | PFC contactor delay | <i>Real</i> | 0.20...600.00 | s | 100 = 1 s |
| 76.60 | PFC ramp acceleration time | <i>Real</i> | 0.00...1800.00 | s | 100 = 1 s |
| 76.61 | PFC ramp deceleration time | <i>Real</i> | 0.00...1800.00 | s | 100 = 1 s |
| 76.62 | IPC smooth acceleration time | <i>Real</i> | 3.00...1800.00 | s | 100 = 1 s |
| 76.63 | IPC smooth deceleration time | <i>Real</i> | 3.00...1800.00 | s | 100 = 1 s |
| 76.70 | PFC Autochange | <i>List</i> | - | - | 1 = 1 |
| 76.71 | PFC Autochange interval | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 76.72 | Maximum wear imbalance | <i>Real</i> | 0.00...1000000.00 | h | 100 = 1 h |
| 76.73 | Autochange level | <i>Real</i> | 0.0...300.0 | % | 10 = 1% |
| 76.74 | Autochange auxiliary PFC | <i>List</i> | - | - | - |
| 76.76 | Max stationary time | <i>Real</i> | 0.0...214748368.0 | h | 10 = 1 h |
| 76.77 | Pump priority | <i>Binary src</i> | - | - | - |
| 76.81 | PFC 1 interlock | <i>List</i> | - | - | 1 = 1 |
| 76.82 | PFC 2 interlock | <i>List</i> | - | - | 1 = 1 |
| 76.83 | PFC 3 interlock | <i>List</i> | - | - | 1 = 1 |
| 76.84 | PFC 4 interlock | <i>List</i> | - | - | 1 = 1 |
| 76.85 | PFC 5 interlock | <i>List</i> | - | - | 1 = 1 |
| 76.86 | PFC 6 interlock | <i>List</i> | - | - | 1 = 1 |
| 76.90 | LC low level switch | <i>List</i> | - | - | 1 = 1 |
| 76.91 | LC high level switch | <i>List</i> | - | - | 1 = 1 |
| 76.92 | LC low level action | <i>List</i> | - | - | 1 = 1 |
| 76.93 | LC high level action | <i>List</i> | - | - | 1 = 1 |
| 76.95 | Regulator bypass control | <i>Binary src</i> | - | - | - |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|-------------------------------|-------------------|------------------------------------|---------------------|-----------|
| 76.101 | IPC parameter synchronization | <i>Binary src</i> | - | - | - |
| 76.102 | IPC synchronization settings | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 76.105 | IPC synchronization checksum | <i>PB</i> | - | - | 1 = 1 |
| 77 Multipump maintenance and monitoring | | | | | |
| 77.10 | PFC runtime change | <i>List</i> | - | - | 1 = 1 |
| 77.11 | Pump 1 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.12 | Pump 2 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.13 | Pump 3 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.14 | Pump 4 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.15 | Pump 5 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.16 | Pump 6 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.17 | Pump 7 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.18 | Pump 8 running time | <i>Real</i> | 0.00...42949672.95 | h | 100 = 1 h |
| 77.20 | IPC online pumps | <i>PB</i> | 0b0000...0b1111 1111 1111 1111 | - | - |
| 77.21 | IPC comm loss status | <i>PB</i> | 0b0000... 0b1111 1111 1111 1111 | - | - |
| 80 Flow calculation and protection | | | | | |
| 80.01 | Actual flow | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 80.02 | Actual flow percentage | <i>Real</i> | -100.00...100.00 | % | 100 = 1 |
| 80.03 | Total flow | <i>Real</i> | 0.00...21474836.00 | m ³ | 100 = 1 |
| 80.04 | Specific energy | <i>Real</i> | 0.00...32767.95 | m ³ /kWh | 100 = 1 |
| 80.05 | Estimated pump head | <i>Real</i> | 0.00...32767.00 | m | 100 = 1 |
| 80.11 | Flow feedback 1 source | <i>List</i> | 0...3, 8...10, | - | 1 = 1 |
| 80.12 | Flow feedback 2 source | <i>List</i> | 0...3, 8...10, | - | 1 = 1 |
| 80.13 | Flow feedback function | <i>List</i> | 0...1, 8...9, | - | 1 = 1 |
| 80.14 | Flow feedback multiplier | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 80.15 | Maximum flow | <i>Real</i> | -200000.00...200000.00 | - | 100 = 1 |
| 80.16 | Minimum flow | <i>Real</i> | -200000.00...200000.00 | m ³ /h | 100 = 1 |
| 80.17 | Maximum flow protection | <i>List</i> | - | - | 1 = 1 |
| 80.18 | Minimum flow protection | <i>List</i> | - | - | 1 = 1 |
| 80.19 | Flow check delay | <i>Real</i> | 0.00...3600.00 | s | 100 = 1 |
| 80.22 | Pump inlet diameter | <i>Real</i> | 0.010...32767.000 | m | 1000 = 1 |
| 80.23 | Pump outlet diameter | <i>Real</i> | 0.010...32767.000 | m | 1000 = 1 |
| 80.26 | Calculation minimum speed | <i>Real</i> | 0.00...32767.00 | Hz | 100 = 1 |
| 80.28 | Density | <i>Real</i> | 0.00...32767.00 | kg/m ³ | |
| 80.29 | Total flow reset | <i>Real</i> | - | - | 1 = 1 |
| 80.40 | HQ curve H1 | <i>Real</i> | 0.00...32767.00 | m | 100 = 1 |
| 80.41 | HQ curve H2 | <i>Real</i> | 0.00...32767.00 | m | 100 = 1 |
| 80.42 | HQ curve H3 | <i>Real</i> | 0.00...32767.00 | m | 100 = 1 |
| 80.43 | HQ curve H4 | <i>Real</i> | 0.00...32767.00 | m | 100 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|----------------------------|---------------------------------------|-------------|------------------|-------------------|---------|
| 80.44 | HQ curve H5 | <i>Real</i> | 0.00...32767.00 | m | 100 = 1 |
| 80.50 | PQ curve P1 | <i>Real</i> | 0.00...32767.00 | kW | 100 = 1 |
| 80.51 | PQ curve P2 | <i>Real</i> | 0.00...32767.00 | kW | 100 = 1 |
| 80.52 | PQ curve P3 | <i>Real</i> | 0.00...32767.00 | kW | 100 = 1 |
| 80.53 | PQ curve P4 | <i>Real</i> | 0.00...32767.00 | kW | 100 = 1 |
| 80.54 | PQ curve P5 | <i>Real</i> | 0.00...32767.00 | kW | 100 = 1 |
| 80.60 | Q value Q1 | <i>Real</i> | 0.00...200000.00 | m ³ /h | 100 = 1 |
| 80.61 | Q value Q2 | <i>Real</i> | 0.00...200000.00 | m ³ /h | 100 = 1 |
| 80.62 | Q value Q3 | <i>Real</i> | 0.00...200000.00 | m ³ /h | 100 = 1 |
| 80.63 | Q value Q4 | <i>Real</i> | 0.00...200000.00 | m ³ /h | 100 = 1 |
| 80.64 | Q value Q5 | <i>Real</i> | 0.00...200000.00 | m ³ /h | 100 = 1 |
| 81 Sensor settings | | | | | |
| 81.01 | Actual inlet pressure | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |
| 81.02 | Actual outlet pressure | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |
| 81.10 | Inlet pressure source | <i>List</i> | - | - | 1 = 1 |
| 81.11 | Outlet pressure source | <i>List</i> | - | - | 1 = 1 |
| 81.12 | Sensors height difference | <i>Real</i> | 0.00...32767.00 | m | 100 = 1 |
| 81.20 | Pressure unit | <i>List</i> | - | - | 1 = 1 |
| 81.21 | Flow unit | <i>List</i> | - | - | 1 = 1 |
| 81.22 | Length unit | <i>List</i> | - | - | 1 = 1 |
| 81.23 | Density unit | <i>List</i> | - | - | 1 = 1 |
| 82 Pump protections | | | | | |
| 82.01 | Quick ramp mode | <i>List</i> | 0...2 | - | 1 = 1 |
| 82.05 | Quick ramp 1 accel. time | <i>Real</i> | 0.10...5.00 | s | 1 = 1 |
| 82.06 | Quick ramp 1 decel. time | <i>Real</i> | 0.10...5.00 | s | 1 = 1 |
| 82.07 | Quick ramp 1 upper limit | <i>Real</i> | 15...100 | Hz | 1 = 1 |
| 82.10 | Quick ramp 2 accel. time | <i>Real</i> | 0.10...20.00 | s | 1 = 1 |
| 82.11 | Quick ramp 2 decel. time | <i>Real</i> | 0.10...20.00 | s | 1 = 1 |
| 82.12 | Quick ramp 2 upper limit | <i>Real</i> | 15...100 | Hz | 1 = 1 |
| 82.20 | Dry run protection | <i>List</i> | - | - | 1 = 1 |
| 82.21 | Dry run source | <i>List</i> | - | - | 1 = 1 |
| 82.25 | Soft pipe fill supervision | <i>List</i> | - | - | 1 = 1 |
| 82.26 | Time-out limit | <i>Real</i> | 0.0...1800.0 | s | 10 = 1 |
| 82.30 | Outlet minimum pressure protection | <i>List</i> | - | - | 1 = 1 |
| 82.31 | Outlet minimum pressure warning level | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |
| 82.32 | Outlet minimum pressure fault level | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |
| 82.35 | Outlet maximum pressure protection | <i>List</i> | - | - | 1 = 1 |
| 82.37 | Outlet maximum pressure warning level | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|--|--------------------------------------|-------------------|---------------------|------|-------------|
| 82.38 | Outlet maximum pressure fault level | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |
| 82.40 | Inlet minimum pressure protection | <i>List</i> | - | - | 1 = 1 |
| 82.41 | Inlet minimum pressure warning level | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |
| 82.42 | Inlet minimum pressure fault level | <i>Real</i> | 0.00...32767.00 | bar | 100 = 1 |
| 82.45 | Pressure check delay | <i>Real</i> | 0.00...3600.00 | s | 100 = 1 |
| 83 Pump cleaning | | | | | |
| 83.01 | Pump cleaning status | <i>Binary src</i> | - | - | - |
| 83.02 | Pump cleaning progress | <i>Real</i> | 0.0...100.0 | % | 1 = 1 |
| 83.03 | Total cleaning count | <i>Real</i> | 0...1000000 | - | 1 = 1 |
| 83.10 | Pump cleaning action | <i>Binary src</i> | - | - | - |
| 83.11 | Pump cleaning triggers | <i>PB</i> | 0000h...FFFFh | - | 1 = 1 |
| 83.12 | Manually force cleaning | <i>Binary src</i> | - | - | - |
| 83.15 | Fixed time interval | Time | 00:00:00...45:12:15 | s | 1 = 1 |
| 83.16 | Cycles in cleaning program | <i>Real</i> | 1...65535 | - | 1 = 1 |
| 83.20 | Cleaning speed step | <i>Real</i> | 0...100 | % | 1 = 1 |
| 83.25 | Time to cleaning speed | <i>Real</i> | 0.000...60.000 | s | 1 = 1 |
| 83.26 | Time to zero-speed | <i>Real</i> | 0.000...60.000 | s | 1 = 1 |
| 83.27 | Cleaning on time | <i>Real</i> | 0.000...1000.000 | s | 1 = 1 |
| 83.28 | Cleaning off time | <i>Real</i> | 0.000...1000.000 | s | 1 = 1 |
| 83.35 | Cleaning count fault | <i>Binary src</i> | - | - | 1 = 1 |
| 83.36 | Cleaning count time | Time | 00:00:00...45:23:59 | s | 1 = 1 |
| 83.37 | Maximum cleaning count | <i>Real</i> | 0...30 | - | 1 = 1 |
| 94 LSU control | | | | | |
| <i>(Parameters 94.01...94.41 only visible for ACQ580-31 and ACQ580-34)</i> | | | | | |
| 94.01 | LSU control | <i>List</i> | 0...1 | - | 1 = 1 |
| 94.02 | LSU panel communication | <i>List</i> | 0...1 | - | 1 = 1 |
| 94.04 | INU-LSU status word profile | <i>List</i> | 0...1 | - | 1 = 1 |
| 94.10 | LSU max charging time | <i>Real</i> | 0...65535 | s | 1 = 1 s |
| 94.11 | LSU stop delay | <i>Real</i> | 0.0 ... 3600.0 | s | 10 = 1 s |
| 94.22 | User DC voltage reference | <i>Real</i> | 0.0 ... 2000.0 | V | 10 = 1 V |
| 94.32 | User reactive power reference | <i>Real</i> | -3276.8 ... 3276.7 | kvar | 10 = 1 kvar |
| 94.40 | Power mot limit on net loss | <i>Real</i> | 0.00 ... 600.00 | % | 100 = 1 % |
| 94.41 | Power gen limit on net loss | <i>Real</i> | -600.00 ... 0.00 | % | 100 = 1 % |
| 95 HW configuration | | | | | |
| 95.01 | Supply voltage | <i>List</i> | 0, 2, 3, 5 | - | 1 = 1 |

| No. | Name | Type | Range | Unit | FbEq32 |
|---|-------------------------------|------------|-----------------------------------|------|-----------|
| 95.02 | Adaptive voltage limits | List | 0...1 | - | 1 = 1 |
| 95.03 | Estimated AC supply voltage | Real | 0...65535 | V | 1 = 1 V |
| 95.04 | Control board supply | List | 0...1 | - | 1 = 1 |
| 95.15 | Special HW settings | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 95.20 | HW options word 1 | PB | 0000h...FFFFh | - | 1 = 1 |
| 95.21 | HW options word 2 | PB | 0000h...FFFFh | - | 1 = 1 |
| 95.200 | Cooling fan mode | List | 0...1 | - | 1 = 1 |
| 96 System | | | | | |
| 96.01 | Language | List | - | - | 1 = 1 |
| 96.02 | Pass code | Data | 0...99999999 | - | 1 = 1 |
| 96.03 | Access level status | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 96.04 | Macro select | List | 0...1 | - | 1 = 1 |
| 96.05 | Macro active | List | 1 | - | 1 = 1 |
| 96.06 | Parameter restore | List | 0, 2, 8, 32, 62, 512, 1024, 34560 | - | 1 = 1 |
| 96.07 | Parameter save manually | List | 0...1 | - | 1 = 1 |
| 96.08 | Control board boot | List | 0...1 | - | 1 = 1 |
| 96.10 | User set status | List | 0...7, 20...23 | - | 1 = 1 |
| 96.11 | User set save/load | List | 0...5, 18...21 | - | 1 = 1 |
| 96.12 | User set I/O mode in1 | Binary src | - | - | - |
| 96.13 | User set I/O mode in2 | Binary src | - | - | - |
| 96.16 | Unit selection | PB | 0000h...FFFFh | - | 1 = 1 |
| 96.20 | Time sync primary source | List | 0, 3, 6, 8, 9 | - | 1 = 1 |
| 96.51 | Clear fault and event logger | Real | 0...1 | - | 1 = 1 |
| 96.54 | Checksum action | List | 0...4 | - | 1 = 1 |
| 96.55 | Checksum control word | PB | 0000h...FFFFh | - | 1 = 1 |
| 96.68 | Actual checksum A | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 96.69 | Actual checksum B | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 96.70 | Disable adaptive program | List | 0...1 | - | 1 = 1 |
| 96.71 | Approved checksum A | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 96.72 | Approved checksum B | PB | 00000000h...FFFFFFFFh | - | 1 = 1 |
| 96.78 | 550 Compatibility mode | List | 0...1 | - | 1 = 1 |
| 96.100 | Change user pass code | Data | 10000000...99999999 | - | 1 = 1 |
| 96.101 | Confirm user pass code | Data | 10000000...99999999 | - | 1 = 1 |
| 96.102 | User lock functionality | PB | 0000h...FFFFh | - | 1 = 1 |
| (Parameter 96.108 only visible for ACQ580-31 and ACQ580-34) | | | | | |
| 96.108 | LSU control board boot | Real | 0...1 | - | 1 = 1 |
| 97 Motor control | | | | | |
| 97.01 | Switching frequency reference | List | 2, 4, 8, 12 | kHz | 1 = 1 kHz |
| 97.02 | Minimum switching frequency | List | 1.5, 2, 4, 8, 12 | kHz | 1 = 1 kHz |

| No. | Name | Type | Range | Unit | FbEq32 |
|---------------------------------|------------------------------------|-------------|---------------------|------|-----------------|
| 97.03 | Slip gain | <i>Real</i> | 0...200 | % | 1 = 1% |
| 97.04 | Voltage reserve | <i>Real</i> | -4...50 | % | 1 = 1% |
| 97.05 | Flux braking | <i>List</i> | 0...2 | - | 1 = 1 |
| 97.08 | Optimizer minimum torque | <i>Real</i> | 0.0 ... 1600.0 | % | 10 = 1% |
| 97.10 | Signal injection | <i>List</i> | 0...4 | - | 1 = 1 |
| 97.11 | TR tuning | <i>Real</i> | 25...400 | % | 1 = 1% |
| 97.13 | IR compensation | <i>Real</i> | 0.00...50.00 | % | 100 = 1% |
| 97.15 | Motor model temperature adaptation | <i>List</i> | 0...1 | - | 1 = 1 |
| 97.16 | Stator temperature factor | <i>Real</i> | 0...200 | % | 1 = 1% |
| 97.17 | Rotor temperature factor | <i>Real</i> | 0...200 | % | 1 = 1% |
| 97.20 | U/F ratio | <i>List</i> | 0...1 | - | 1 = 1 |
| 97.49 | Slip gain for scalar | <i>Real</i> | 0 ... 200 | % | 1 = 1% |
| 97.94 | IR comp max frequency | <i>Real</i> | 1.0 ... 200.0 | % | 1 = 1% |
| 98 User motor parameters | | | | | |
| 98.01 | User motor model mode | <i>List</i> | 0...1 | - | 1 = 1 |
| 98.02 | Rs user | <i>Real</i> | 0.0000...0.50000 | p.u. | 100000 = 1 p.u. |
| 98.03 | Rr user | <i>Real</i> | 0.0000...0.50000 | p.u. | 100000 = 1 p.u. |
| 98.04 | Lm user | <i>Real</i> | 0.00000...10.00000 | p.u. | 100000 = 1 p.u. |
| 98.05 | SigmaL user | <i>Real</i> | 0.00000...1.00000 | p.u. | 100000 = 1 p.u. |
| 98.06 | Ld user | <i>Real</i> | 0.00000...10.00000 | p.u. | 100000 = 1 p.u. |
| 98.07 | Lq user | <i>Real</i> | 0.00000...10.00000 | p.u. | 100000 = 1 p.u. |
| 98.08 | PM flux user | <i>Real</i> | 0.00000...2.00000 | p.u. | 100000 = 1 p.u. |
| 98.09 | Rs user SI | <i>Real</i> | 0.00000...100.00000 | ohm | 100000 = 1 p.u. |
| 98.10 | Rr user SI | <i>Real</i> | 0.00000...100.00000 | ohm | 100000 = 1 p.u. |
| 98.11 | Lm user SI | <i>Real</i> | 0.00...100000.00 | mH | 100 = 1 mH |
| 98.12 | SigmaL user SI | <i>Real</i> | 0.00...100000.00 | mH | 100 = 1 mH |
| 98.13 | Ld user SI | <i>Real</i> | 0.00...100000.00 | mH | 100 = 1 mH |
| 98.14 | Lq user SI | <i>Real</i> | 0.00...100000.00 | mH | 100 = 1 mH |
| 99 Motor data | | | | | |
| 99.03 | Motor type | <i>List</i> | 0...2 | - | 1 = 1 |
| 99.04 | Motor control mode | <i>List</i> | 0...1 | - | 1 = 1 |
| 99.06 | Motor nominal current | <i>Real</i> | 0.0...6400.0 | A | 10 = 1 A |
| 99.07 | Motor nominal voltage | <i>Real</i> | 0.0...960.0 | V | 10 = 1 V |
| 99.08 | Motor nominal frequency | <i>Real</i> | 0.00 ... 500.00 | Hz | 100 = 1 Hz |

| No. | Name | Type | Range | Unit | FbEq32 |
|-------|----------------------------|------|---|-----------------|---------------|
| 99.09 | Motor nominal speed | Real | 0 ... 30000 | rpm | 1 = 1 rpm |
| 99.10 | Motor nominal power | Real | 0.00...10000.00 kW or 0.00 ... 13404.83 hp | kW or hp | 100 = 1 unit |
| 99.11 | Motor nominal cos Φ | Real | 0.00 ... 1.00 | - | 100 = 1 |
| 99.12 | Motor nominal torque | Real | 0.000...4000000.000 N·m or 0.000...2950248.597 lb·ft | N·m or lb·ft | 1000 = 1 unit |
| 99.13 | ID run requested | List | 0...3, 6, 8 | - | 1 = 1 |
| 99.14 | Last ID run performed | List | 0...3, 6, 8 | - | 1 = 1 |
| 99.15 | Motor polepairs calculated | Real | 0...1000 | - | 1 = 1 |
| 99.16 | Motor phase order | List | 0...1 | - | 1 = 1 |

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

Product training

For information on ABB product training, navigate to new.abb.com/service/training.

Providing feedback on ABB Drives manuals

Your comments on our manuals are welcome. Navigate to new.abb.com/drives/manuals-feedback-form.

Document library on the Internet

You can find manuals and other product documents in PDF format on the Internet at www.abb.com/drives/documents.



abb.com/drives



3AXD50000035867D