

ABB DRIVES FOR HVAC

ACH580 HVAC control program

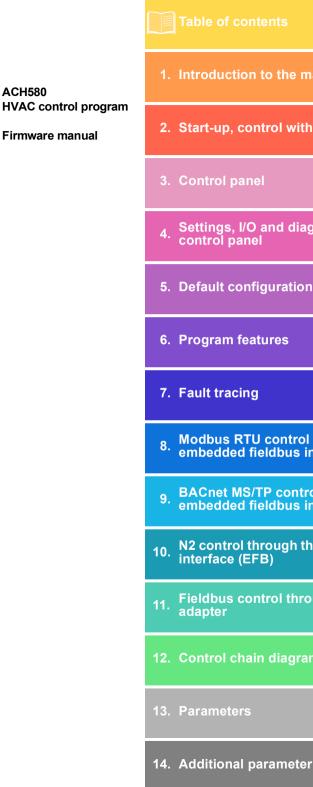
Firmware manual



Related documents are listed on page 17.



ACH580-01 manuals



ACH580

Firmware manual

1. Introduction to the manual

- 2. Start-up, control with I/O and ID run
- 3. Control panel
- Settings, I/O and diagnostics on the control panel
- 7. Fault tracing

 - Modbus RTU control through the embedded fieldbus interface (EFB)
- N2 control through the embedded fieldbus 10. interface (EFB)

BACnet MS/TP control through the embedded fieldbus interface (EFB)

- Fieldbus control through a fieldbus

adapter

- 12. Control chain diagrams
- 14. Additional parameter data

Part 1

1.1	Introd	luction	to the	manual

Contents of this chapter Applicability Safety instructions Target audience Purpose of the manual Contents of this manual Related documents Categorization by frame (size) Cybersecurity disclaimer	15 16 16 16 17 19
2. Start-up, control with I/O and ID run	
Contents of this chapter	24 el
How to perform the ID run ID run procedure	34
3. Control panel	
Contents of this chapter Removing and reinstalling the control panel Layout of the default control panel Layout of the control panel display Home view displays Keys Key shortcuts	43 44 45 47 49
4. Settings, I/O and diagnostics on the control panel	
Contents of this chapter Primary settings menu HVAC quick setup Start, stop, reference Motor Ramps Limits Communication PID control Override	52 53 54 56 58 59 60 65

Fault functions Security	
Advanced functions	
Clock, region, display	
Reset to defaults	
I/O menu	
Diagnostics menu	
System info menu	
Energy efficiency menu	
Backups menu	
5. Default configuration	
Contents of this chapter	Ω1
HVAC default	
Default control connections for the HVAC default	
PID control, single motor	
Default Control Confidentials for the Fib Control, single motor	 . 00
6. Program features	
What this chapter contains	 . 87
Local control vs. external control	 . 87
Local control	 . 88
External control	 . 89
Operating modes of the drive	 . 91
Drive configuration and programming	 . 92
Configuring via default configurations	 . 92
Configuring via menus	 . 92
Configuring via parameters	 92
Adaptive programming	 . 93
Control interfaces	 . 96
Programmable analog inputs	 . 96
Programmable analog outputs	
Programmable digital inputs and outputs	
Programmable frequency input and output	 96
Programmable relay outputs	
Programmable I/O extensions	
Fieldbus control	
Control of a supply unit (LSU)	
Override	100
Overview	100
Activating the Override mode	100
Reference for override speed/frequency	101
Override mode features	101
Application example 1: Override for single override frequency control	104
Application example 2: Override for PID control	108
Interlocks	111
Overview	111
Application examples of interlocks	112
Run permissives	115

Overview	
Configuration	115
Wiring connections	
Functionality	116
Application example 1: Damper end switch	117
Application example 2: Valve opening	117
Ramps	118
Overview	
Application examples	
Limits	
Limits overview	
Application examples	
Application control	
Automatic fault resets	
External events	
Constant speeds/frequencies	
· · · · · · · · · · · · · · · · · · ·	
Critical speeds/frequencies	
Timed functions	
Motor control	
Speed control mode	
Frequency control mode	
Motor types	
Motor identification	
Scalar motor control	126
U/f ratio	127
Flux braking	128
Start methods – DC magnetization	129
Switching frequency	131
Motor thermal protection	
Vector control	137
Speed control performance figures	
Floating point control (Motor potentiometer)	
DC voltage control	
Overvoltage control	140
Undervoltage control (power loss ride-through)	140
Voltage control and trip limits	
Brake chopper	
Supervisory	
Signal supervision	
Application example 1: Dirty filter	144
Application example 2: High current	
User load curve	
Process PID control	
Multipump control	
Single pump and fan control (PFC)	
Application example 1: Supply fan, Basic speed follower	152
Application example 2: Supply fan, basic speed follower with interlock and sta	
Application example 3: Supply fan, speed follower complete integration	
Application example 4: Supply fan, PID control	
Application example 5: Cooling tower fan, speed follower	160
Application example 6: Cooling tower, PID	

Application example 7: Chilled water pump	166
Application example 8: Condenser water pump	168
Energy efficiency	170
Energy optimization	170
Energy saving calculators	170
Load analyzer	171
Managing settings	173
User parameter sets	173
Safety and protections	174
Fixed/Standard protections	174
Programmable protection functions	174
Emergency stop	175
Diagnostics	177
Diagnostics menu	177
Miscellaneous	178
Backup and restore	178
Data storage parameters	179
Parameter checksum calculation	179
User lock	180
Sine filter support	181
7. Fault tracing	
What this chapter contains	183
Safety	183
Indications	183
Warnings and faults	183
Pure events	184
Editable messages	184
Warning/fault history	184
Event log	184
Viewing warning/fault information	185
QR code generation for mobile service application	185
Warning messages	186
Fault messages	197
Warnings and faults from the LSU supply unit	209
Warnings	209
Faults	
8. Modbus RTU control through the embedded fieldbus interface (El	FB)
What this chapter contains	213
System overview	
Connecting the drive to the fieldbus	
Setting up the embedded fieldbus interface	216
Setting the drive control parameters	
Basics of the embedded fieldbus interface	219
Control word and Status word	220
References	220
Actual values	
Data input/outputs	
Data inputouputo	

Register addressing	220
About the control profiles	
Control Word	
Control Word for the ABB Drives profile	
Control Word for the DCU Profile	224
Status Word	227
Status Word for the ABB Drives profile	227
Status Word for the DCU Profile	228
State transition diagrams	
State transition diagram for the ABB Drives profile	230
References	233
References for the ABB Drives profile and DCU Profile	233
Actual values	
Actual values for the ABB Drives profile and DCU Profile	
Modbus holding register addresses	
Modbus holding register addresses for the ABB Drives profile and DCU Profile	
Modbus function codes	
Exception codes	
Coils (0xxxx reference set)	
Discrete inputs (1xxxx reference set)	
Error code registers (holding registers 400090400100)	242
9. BACnet MS/TP control through the embedded fieldbus interface (EFB)	
Contents of this chapter	243
BACnet overview	243
Hardware installation	244
Connecting devices to a BACnet MS/TP EIA-485 network	244
Connecting the drive to the building automation controller	
Starting up BACnet communication through the Primary settings menu	
Starting up fieldbus communication with parameters	
Activating drive control functions	250
Drive control	
Miscellaneous drive control	
Communication fault	252
	252 254
Drive feedback	252 254 254
Drive feedback	252 254 254 257
Drive feedback Parameter setting example Frequency control	252 254 254 257 257
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement	252 254 254 257 257 258
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description:	252 254 254 257 257 258 258
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L):	252 254 254 257 257 258 258 258
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L): List all BACnet interoperability building blocks supported (Annex K):	252 254 257 257 258 258 258 258
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L): List all BACnet interoperability building blocks supported (Annex K): Segmentation capability:	252 254 257 257 258 258 258 258 258
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L): List all BACnet interoperability building blocks supported (Annex K): Segmentation capability: Standard object types supported:	252 254 257 257 258 258 258 258 258 259
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L): List all BACnet interoperability building blocks supported (Annex K): Segmentation capability: Standard object types supported: Data link layer options:	252 254 257 257 258 258 258 258 258 259 259
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L): List all BACnet interoperability building blocks supported (Annex K): Segmentation capability: Standard object types supported: Data link layer options: Device address binding:	252 254 257 257 258 258 258 258 259 259 259
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L): List all BACnet interoperability building blocks supported (Annex K): Segmentation capability: Standard object types supported: Data link layer options: Device address binding: Networking options:	252 254 257 257 258 258 258 258 259 259 259 259 259
Drive feedback Parameter setting example Frequency control BACnet protocol implementation conformance statement Product description: BACnet standardized device profile (Annex L): List all BACnet interoperability building blocks supported (Annex K): Segmentation capability: Standard object types supported: Data link layer options: Device address binding:	252 254 257 257 258 258 258 258 259 259 259 259 260

Binary input object instance summary Binary output object instance summary Binary value object instance summary Analog input object instance summary Analog output object instance summary Analog value object instance summary Multistate value object instance summary Loop object instance summary Mailbox function	263 265 265 265 270 272
10. N2 control through the embedded fieldbus interface (EFB)	
Contents of this chapter N2 overview Supported features Metasys integration Drive device type Hardware installation Connecting devices to a N2 EIA-485 network Connecting the drive to the building automation controller N2 analog input objects N2 binary input objects N2 analog output objects N2 binary output objects DDL file for NCU	275 276 277 278 279 279 279 279 281 282 283
11. Fieldbus control through a fieldbus adapter	
11. Fieldbus control through a fieldbus adapter What this chapter contains System overview Basics of the fieldbus control interface Control word and Status word References Actual values Contents of the fieldbus Control word (ABB Drives profile) Contents of the fieldbus Status word (ABB Drives profile) The state diagram	289 291 292 293 294 295 296
What this chapter contains System overview Basics of the fieldbus control interface Control word and Status word References Actual values Contents of the fieldbus Control word (ABB Drives profile) Contents of the fieldbus Status word (ABB Drives profile)	289 291 292 293 294 295 296 297 298
What this chapter contains System overview Basics of the fieldbus control interface Control word and Status word References Actual values Contents of the fieldbus Control word (ABB Drives profile) Contents of the fieldbus Status word (ABB Drives profile) The state diagram Setting up the drive for fieldbus control Parameter setting example: FPBA (PROFIBUS DP) with ABB Drives profile	289 291 292 293 294 295 296 297 298

Speed feedback 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 Direction lock Override	311 312 313 314 315 316 317 318
Part 2 Parameters	
13. Parameters	
What this chapter contains	323
Terms and abbreviations	
Summary of parameter groups	
Parameter listing	
01 Actual values	
03 Input references	
04 Warnings and faults	
05 Diagnostics	
06 Control and status words	
07 System info	
10 Standard DI, RO	
11 Standard DIO, FI, FO	
12 Standard Al	
13 Standard AO	
15 I/O extension module	
19 Operation mode	
20 Start/stop/direction	
21 Start/stop mode	
22 Speed reference selection	
23 Speed reference ramp	
24 Speed reference conditioning	
25 Speed control	407
28 Frequency reference chain	
30 Limits	
31 Fault functions	
32 Supervision	
34 Timed functions	
35 Motor thermal protection	
36 Load analyzer	
37 User load curve	
41 Process PID set 2	
43 Brake chopper	
45 Energy efficiency	
46 Monitoring/scaling settings	50°

47 Data storage 49 Panel port communication 50 Fieldbus adapter (FBA)	504
51 FBA A settings 52 FBA A data in	509 510
53 FBA A data out 58 Embedded fieldbus 60 DDCS communication	511
61 D2D and DDCS transmit data	521
71 External PID1 72 External PID2	526 527
73 External PID3 74 External PID4 76 PFC configuration	531 534
77 PFC maintenance and monitoring	542
95 HW configuration	544 546
97 Motor control 98 User motor parameters 99 Motor data	560 562
Differences in the default values between 50 Hz and 60 Hz supply frequency settings 14. Additional parameter data	568
What this chapter contains Terms and abbreviations Fieldbus addresses Parameter groups 19 Parameter groups 1099	571 572 573
Further information	
Product and service inquiries Product training Providing feedback on ABB Drives manuals Document library on the Internet	611 611
bootinent ilbrary on the internet	011

ACH580 HVAC control program

Firmware manual Part 1

- 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 configuration
- 6. Program features
- 7. Fault tracing
- 8. Modbus RTU control through the embedded fieldbus interface (EFB)
- 9. BACnet MS/TP control through the embedded fieldbus interface (EFB)
- 10. N2 control through the embedded fieldbus interface (EFB)
- 11. Fieldbus control through a fieldbus adapter
- 12. Control chain diagrams



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 ACH580 HVAC control program (version 2.06).

Note: For ACH580 standard control program, there are different firmwares, depending on the control unit construction and frame size: For frame sizes R0...R5, firmware AHVK2 is used, and for frames sizes R6...R11, firmware AHVK4 is used.

Note: For ACH580-31 frame size R3. AHVK4 is used on the INU side. For frame sizes R3 and R6, AISK8 is used on the ISU side.

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 ACH580-31, to check the ISU firmware version in use, select **Menu > Exit >** 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 183.

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 23) 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 43) 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 51) describes the simplified settings and diagnostic functions provided on the assistant control panel.
- Settings, I/O and diagnostics on the control panel (page 51)Default configuration (page 81) contains the connection diagram of the HVAC default configuration together with a connection diagram. The predefined default configuration will save the user time when configuring the drive.
- Program features (page 87) describes program features with lists of related user settings, actual signals, and fault and warning messages.
- Modbus RTU control through the embedded fieldbus interface (EFB) (page 213) describes the communication to and from a fieldbus network using the drive embedded fieldbus interface with the Modbus RTU protocol.

- BACnet MS/TP control through the embedded fieldbus interface (EFB) (page 243) describes the communication to and from a fieldbus network using the drive embedded fieldbus interface with the BACnet MS/TP protocol.
- N2 control through the embedded fieldbus interface (EFB) (page 275) describes the communication to and from a fieldbus network using the drive embedded fieldbus interface with the BACnet MS/TP protocol.
- Fieldbus control through a fieldbus adapter (page 289) describes the communication to and from a fieldbus network using an optional fieldbus adapter module.
- Fault tracing (page 183) lists the warning and fault messages with possible causes and remedies.
- Control chain diagrams (page 303) describes the parameter structure within the drive.
- Parameters (page 183) describes the parameters used to program the drive.
- Additional parameter data (page 571) contains further information on the parameters.
- Further information (inside of the back cover, page 611) 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)
ACH580 HVAC control program firmware manual	3AXD50000027537
ACH580 HVAC control program firmware manual, Part 1	3AXD50000209811
ACH580 HVAC control program firmware manual, Part 2 Parameters	3AXD50000209828
Adaptive programming application guide	3AXD50000028574
ACH580-01 (0.75 to 250 kW, 1 to 350 hp) hardware manual	3AXD50000044839
ACH580-31 hardware manual	3AXD50000037066
ACH580-01 quick installation and start-up guide for frames R1 to R5	3AXD50000044861
ACH580-01 quick installation and start-up guide for frames R6 to R9	3AXD50000036602
ACH580 Installation, Operation, and Maintenance Manual (I, O & M) (US only)	3AXD50000049127
Quick start-up guide for ACH580 HVAC control program	3AXD50000047658
ACH580-31 quick installation guide	3AXD50000048001
ACX-AP-x assistant control panels user's manual	3AUA0000085685

Option manuals and guides

Option manuals and guides		
BACnet Protocol Implementation Conformance Statement (PICS)	3AXD10000387059	
CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual	3AXD50000030058	
CDPI-01 communication adapter module user's manual	3AXD50000009929)
DPMP-01 mounting platform for control panels	3AUA0000100140	
DPMP-02/03 mounting platform for control panels	3AUA0000136205	
FBIP-21 BACnet/IP adapter module user's manual	3AXD50000028468	1
FCAN-01 CANopen adapter module user's manual	3AFE68615500	
FCNA-01 ControlNet adapter module user's manual	3AUA0000141650	
FDNA-01 DeviceNet™ adapter module user's manual	3AFE68573360	
FEIP-21 Ethernet/IP adapter module user's manual	3AXD50000158621	
FECA-01 EtherCAT adapter module user's manual	3AUA0000068940	
FENA-01/-11/-21 Ethernet adapter module user's manual	3AUA0000093568	
FEPL-02 Ethernet POWERLINK adapter module user's manual	3AUA0000123527	
FMBT-21 Modbus/TCP adapter module user's manual	3AXD50000158607	•
FPBA-01 PROFIBUS DP adapter module user's manual	3AFE68573271	
FPNO-21 PROFINET adapter module user's manual	3AXD50000158614	!
FSCA-01 RS-485 adapter module user's manual	3AUA0000109533	
Flange mounting kit installation supplement	3AXD50000019100	1
Flange mounting kit quick installation guide for ACX580-01 frames R0 to R5	3AXD50000036610	For type codes ACX580-01-02A6-4, ACX580-01-03A3-4, etc.
Flange mounting kit quick installation guide for ACX580-01 frames R1 to R5	3AXD50000119172	For type codes ACX580-01-02A7-4, ACX580-01-03A4-4, etc.
Flange mounting kit quick installation guide for ACS880-01 and ACX580-01 frames R6 to R9	3AXD50000019099	
Flange mounting kit quick installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31 frame R3	3AXD50000181506	•
Flange mounting kit quick installation guide for ACS880-11, ACS880-31, ACH580-31 and ACQ580-31 frames R6 and R8	3AXD50000133611	
ACS580, ACH580 and ACQ580 drive module frames R3, R5 to R9 for cabinet installation (options +P940 and +P944 supplement	3AXD50000210305	i
Main switch and EMC C1 filter options (+F278, +F316, +E223) installation supplement for ACS580-01, ACH580-01 and ACH580-01 frames R1 to R5	3AXD50000155132	
Common mode filter kit for frames R7 and R8 (option +E208) installation guide	3XD50000015179	
UK gland plate (+H358) installation guide for ACS880- 11, ACS880-31, ACH580-31and ACQ580-31	3AXD50000110711	
UL Type 12 hood quick installation guide for ACS580-01, ACH580-01 and ACQ580-01 frames R1 to R9	3AXD50000196067	•

Tool and maintenance manuals and guides

Drive composer PC tool user's manual 3A	NUA0000094606
Converter module capacitor reforming instructions 3E	BFE64059629
NETA-21 remote monitoring tool user's manual 3A	AUA0000096939
NETA-21 remote monitoring tool installation and start-up 3A	AUA0000096881

Categorization by frame (size)

The ACH580 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 ACH580 supports the Hand-Off-Auto panels ACH-AP-H and ACH-AP-W (with a Bluetooth interface).		
Al	Analog input; interface for analog input signals		
AO	Analog output; interface for analog output signals		
BACnet™	BACnet™ is a registered trademark of American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).		
BAS	Building automation system		
BMS	Building management system		
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.		
CDPI-01	Communication adapter module		
CCA-01	Configuration adapter		
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)		
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 ACH580-31 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		
FBIP-21	Optional BACnet/IP adapter module		

Term/abbreviation	Explanation
FCAN-01	Optional CANopen adapter module
FCNA-01	ControlNet adapter module
FDNA-01	Optional DeviceNet adapter module
FECA-01	Optional EtherCAT adapter module
FEIP-21	Optional Ethernet/IP adapter module
FENA-01/-11/-21	Optional Ethernet adapter module for EtherNet/IP, Modbus TCP and PROFINET IO protocols
FEPL-02	Optional Ethernet POWERLINK 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, R0 and R1. The type designation label attached to the drive shows the frame of the drive, see chapter Operation principle and hardware description, section Type designation label in the Hardware manual of the drive.
FSCA-01	Optional RSA-485 adapter module
FW Part 1	ACH580 standard control program firmware manual, Part 1 (3AXD50000209811 [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	ACH580 standard control program firmware manual, Part 2 Parameters (3AXD50000209828 [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
LSW	Least significant word
NETA-21	Remote monitoring tool
Network control	With fieldbus protocols based on the Common Industrial Protocol (CIP TM), 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: • FDNA-01 DeviceNet adapter module user's manual (3AFE68573360 [English]), and • FENA-01/-11/-21 Ethernet adapter module user's manual (3AUA0000093568 [English]).

Term/abbreviation	Explanation
Parameter	User-adjustable operation instruction to the drive, or signal measured or calculated by the drive
PFC	Single pump control
PID controller	Proportional-integral-derivative 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,
R0, R1,	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
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.

See also section *Parameter checksum calculation* on page 179.

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 ACH580-31. 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.				
<u></u>	Δ Read and obey the instructions in chapter Safety instructions at the beginning of the				
	rdware manual of the drive. Ignoring the instructions can cause physical injury or death, or				
dar	mage to the equipment				
	Check the installation. See chapter <i>Installation checklist</i> in the <i>Hardware manual</i> of the drive.				
	Make sure there is no active start on (DI1 in factory settings, that is, HVAC default). 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				
	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				
	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. Use keys , , , and to move the cursor and/or change values depending on the active view. Key shows a context-sensitive help page. For more information, see ACX-AP-x assistant control panels user's manual (3AUA0000085685 [English]).				
	1 – First start assistant guided settings:				
	Language, motor nominal values, and date and time				
	Have the motor name plate data at hand.				
	Power up the drive.				

The First start assistant guides you through the first start-up. 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). Note: After you have selected the language, it takes a few minutes to download the language file to the control panel.	English Deutsch Suomi Français Italiano Nederlands Svenska OK ►
ACH580-31 drive: Select the supply voltage with parameter 95.01 Supply voltage: 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 380415 V or 440480 V 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 ACH580.	
Select Commission the drive and press (Next).	Off

Select the localization you want to use and press (Next).	Off �	(~ ACH580	0.0 Hz
(Next).	Localiza		
	Unit defa		
	Internati	dard (Imperial)	
	OO Stain	aara (iiriperiai)	
	Back	15:16	Next
Change the units shown on the panel if needed.	Off�	(~ ACH580	0.0 Hz
Go to the edit view of a selected row by	Units		
pressing •.	Change t	he display units if r	
 Scroll the view with	Power:		kW►
(Next).	Tempera	ature:	°C► Nm►
	Torque: Currenct	er.	INI™ ►
	Back	15·17	Next
To select a value in an edit view:		10.11	
 Use ♠ and ♥ to select the value. 	Off ◊	(~ ACH580	0.0 Hz
Press (Save) to accept the new setting, or	Power:		
press (Cancel) to go back to the previous	kW		
view without making changes.	hp		
	Cancel	15:17	Save
Set the date and time as well as date and time display formats.	Off�	(~ ACH580	0.0 Hz
Go to the edit view of a selected row by	Date & t		
pressing .		ter the current dat	
 Scroll the view with ▲ and ▼. 	Date Time		4.02.2017 ► 15:17:50 ►
Go to the next view by pressing (Next).	Show da	ate as dav.m	nonth.year ►
	Show tir	,	24-hour ►
	Back	15:17	Next

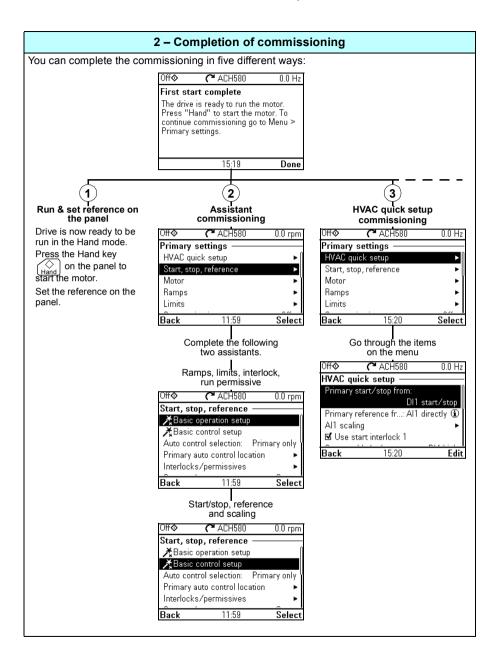
Refer to the motor nameplate for the following nominal value settings of the motor. Enter the values exactly as shown on the motor nameplate. Example of a nameplate of an induction (asynchronous) motor: CE O ⊕-ABB Motors M2AA 200 MLA 4 3 ~ motor IEC 200 M/L 55 No Ins cl IP 55 cos φ IA/IN tE/s kW r/min Α Hъ 690 Y 30 1475 32.5 0.83 50 400 D 50 30 1475 56 0.83 660 Y 50 1470 34 0.83 30 0.83 380 D 1470 59 50 30 415 D 50 30 1475 54 0.83 440 D 60 35 1770 59 0.83 3GAA 202 001 - ADA Cat. no 6210/C3 6312/C3 180 kg ⊕ IEC 34-1 Check that the motor data is correct. Values are Off C⁴ ACH580 0.0 Hz predefined on the basis of the drive size but you Motor nominal values should verify that they correspond to the motor. Find the values on the motor's Start with the motor type. nameplate, and enter them here: · Go to the edit view of a selected row by Current: 1.2 A ► pressing (). Speed: 1360 rpm ▶ Voltage: 230.0 V ▶ Motor nominal cos Φ and nominal torque are 15:18 Back Next optional. Press (Next) to continue. To change a value in an edit view: $Off \phi$ C ACH580 $\Pi\Pi$ H_{Z} Current: riaht. Press (Save) to accept the new setting, or press (Cancel) to go back to the previous view without making changes. 0.0 4.8 Cancel 15:18 Save This step is optional, and requires rotating the Off 💠 **~** ACH580 0.0 Hz motor. Do not do this if it could cause any risk, or if Direction test? the mechanical set-up does not allow it. Spin the motor to check direction? To do the direction test, select **Spin the motor** Spin the motor and press (Next). Not now

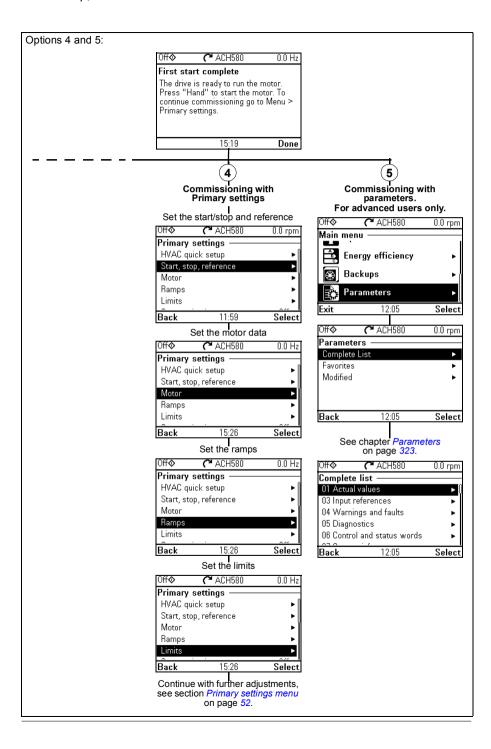
Back

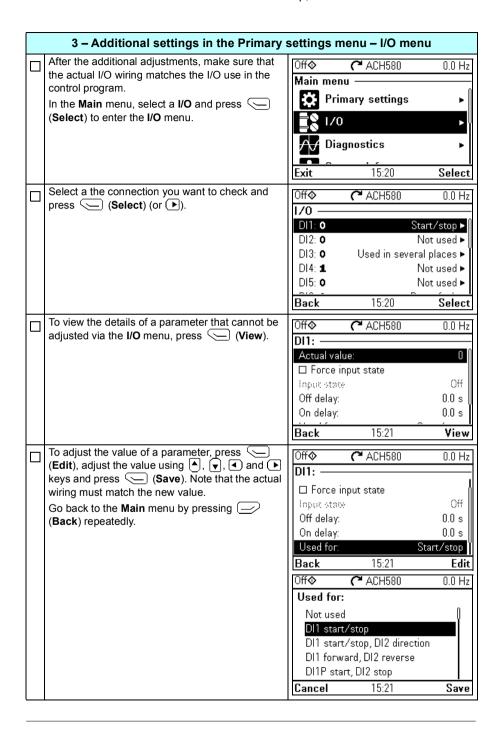
15:19

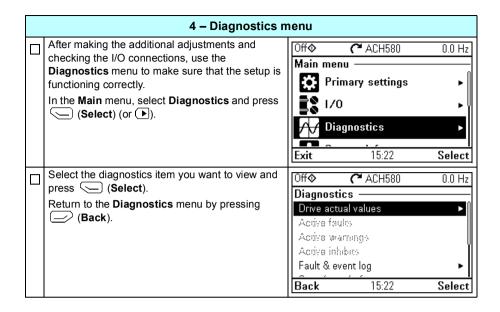
Next

_	D th I	T		
	Press the Hand key 🖒 on the panel to start the drive	Off ♦ (~ ACH580 5.0 Hz		
	drive.	Press Hand		
		Warning: Until set-up is done, safeties		
		are not active and motor speed is 5		
		Hz.		
		Press Hand now to spin the motor,		
		then check the direction of rotation.		
		Back 15:19		
		Bdck 10.10		
	Check the direction of the motor.	Hand ♦ ಎ ACH580 \$ 5.0 Hz		
	If it is forward, select Yes, motor is spinning	Is this forward?		
	forward and press (Next) to continue.	Selecting "No, fix direction" tells the		
	If the direction is not forward, select No, fix	drive to change direction, and labels		
	direction and press (Next) to continue.	the new direction "forward".		
		Yes, motor is spinning forward		
		No, fix direction		
		15:19 Next		
	The first start is new complete and the drive is			
	The first start is now complete and the drive is ready for use.	Off♦ C ACH580 0.0 Hz		
	ress (Done) to enter the Home view.	First start complete		
	(Done) to enter the Home view.	The drive is ready to run the motor.		
		Press "Hand" to start the motor. To continue commissioning go to Menu >		
		Primary settings.		
		15:19 Done		
	The Home view 1 monitoring the values of the			
	The Home view 1 monitoring the values of the selected signals is shown on the panel.	Off		
	5	Off ACH580 0.0 Hz Output frequency		
	selected signals is shown on the panel.	Off ACH580 0.0 Hz Output frequency Hz		
	selected signals is shown on the panel. There are eight different Home view displays. Home view 1 is the default Home view. You can browse them with keys and so section	Off ACH580 0.0 Hz Output frequency		
	selected signals is shown on the panel. There are eight different Home view displays. Home view 1 is the default Home view. You can	Off ACH580 0.0 Hz Output frequency Hz		









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:

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

Preliminary settings

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.

Note: Default settings only allow forward direction.

Make sure that the control connections are wired according to the connection diagram given for the HVAC default.

Make sure that the drive is in external control. To switch to external control, press key Auto

See section HVAC default on page 83.

In external control, the panel display shows text Auto at the top left.

Starting and controlling the speed of the motor

Start by switching digital input DI1 on.

The arrow starts rotating. It is dotted until the setpoint

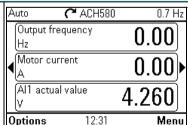
Regulate the drive output frequency (motor speed) by adjusting voltage of analog input AI.

Note: If the drive will not start, check that the start interlock 1 (parameter 20.41) is active (1). For the HVAC default, the start interlock 1 is connected to DI4 by default.

Auto 🚡 AC	H580 0.7 Hz
Output frequency Hz	0.00
Motor current A	0.47
Al1 actual value V	4.260
Options 12	2:30 Menu

Stopping the motor

Switch digital input DI1 off. The arrow stops rotating.



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 35) or with parameter 99.13 ID run requested (see page 39).

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

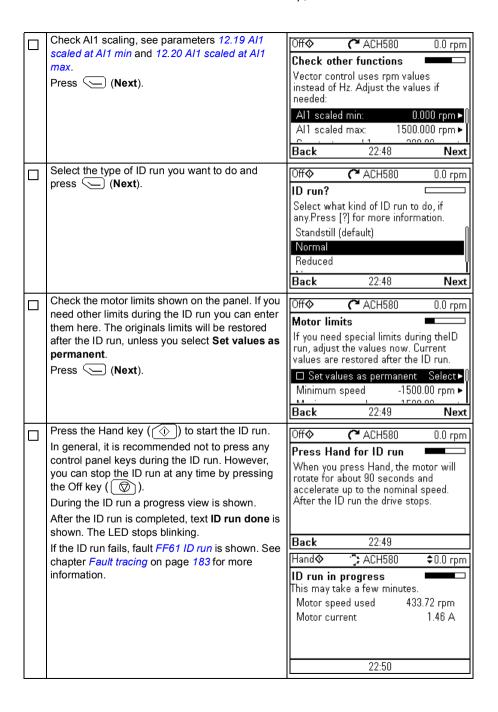
- set parameter 99.04 Motor control mode to Vector, and
 - for I/O controlled drive, check parameters in groups 22 Speed reference selection, 23 Speed reference ramp, 12 Standard AI, 30 Limits and 46 Monitoring/scaling settings.

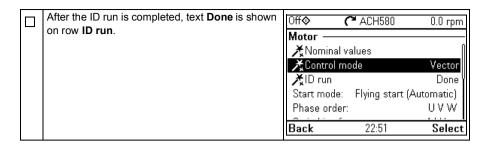
ID run procedure

With the ID run assistant

Pre-check					
1	WARNING! The motor will run at up to approximately 5080% 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 driven equipment				
	Check that the values of the motor data paramete nameplate.	ers are equivalent to those on the motor			
	Check that the STO circuit is closed.				
	The assistant will ask if you want to use temporar following conditions:	y motor limits. They must meet the			
	$Minimum speed \leq 0 rpm$				
	Maximum speed = motor rated speed (Normal ID run procedure needs the motor to be run at 100% speed.)				
	Maximum current > I _{HD}				
	Maximum torque > 50%				
	Make sure that the 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.	Off♦ (* ACH580 0.0 Hz			
	Select Primary settings and press	Main menu —			
	(Select) (or •).	Primary settings			
		■2 1/0			
		Diagnostics			
		Exit 22:47 Select			
	Select Motor and press (Select) (or).	Auto 🌈 ACH580 0.0 Hz			
		Primary settings			
		HVAC quick setup ▶ Start, stop, reference ▶			
		Motor -			
		Ramps ▶			
		Limits			
		Back 22:47 Select			

	If the control modes is scalar, select Control	Auto	C ACH580	0.0 Hz
	mode and press (Select) (or) and	Motor -	₹ A011000	0.0 112
	continue to the next step.		ſ	
		₹Control mode Sc		
		Start m	ode: Flying start (.	Automatic)
		Phase o		UVW
		Switchi	ng frequency	4 kHz ►
		Back	22:48	Select
	Select Vector control and press (Select)	Off�	(~ ACH580	0.0 Hz
	(or ▶).	Control	mode	
			ettings depend on th	
			you change the mo will help you to adju	
		Scalar		st tilese.
		Vector		
		D	22.40	C L .
		Back	22:48	Select
	Warning message Identification run is shown. Press (Hide) to continue.	Off�	~ ACH580	0.0 rpm
	(11120) to continue.		Warning AFF6	
		11	Aux code: 0000 0001	_
			ication run Ientification run abo	22:48:10
		perform		iul to be
		Hide	22:48	How to fix
	Check the motor speed limits. The following must	Auto	(~ ACH580	0.0 rpm
	be true:	Check r	notor limits	
	 Minimum speed ≤ 0 rpm Maximum speed = motor rated speed. 	These motor limits apply to vector control. Adjust the values if needed:		
			•	
			m speed Im speed 150	4 mg7 00.00 •4 mg7 00.00
			ını speeu 150 ım current	2.92 A ►
		Back	22:49	Next
		васк	22:49	
	Check the motor current as well as torque limits. The following must be true:	Auto	(~ ACH580	0.0 rpm
	Maximum current > I _{HD}		motor limits	
	• Maximum torque > 50%.	These motor limits apply to vector control. Adjust the values if needed:		
	Press (Next).		1.	00.00 rpm ► (
		11	m current	2.92 A ▶
		Minimu	m torque 1	-300.0 % ▶
		Back	22:49	Next
		1		4





With parameter 99.13 ID run requested

	Pre-check				
<u> </u>	WARNING! The motor will run at up to a speed during the ID run. The motor will run sure that it is safe to run the motor be	otate in	the forward direction.		
	De-couple the motor from the driven equipment				
	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, R before the ID run, check that the new settings me	•	•	changed	
	30.11 Minimum speed ≤ 0 rpm				
	30.12 Maximum speed = motor rated speed (Norm be run at 100% speed.)	nal ID ru	in procedure needs the	e motor to	
	30.17 Maximum current > I _{HD}				
	30.20 Maximum torque 1 > 50% or 30.24 Maximum torque limit set is in use according to parameter 3			on which	
	Check that signals				
	run permissive (parameter 20.40 Run permissive)	is activ	/e		
	Make sure that the 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.	Off ◊	(~ ACH580	0.0 rpm	
	Press A.	Main	menu —		
		<u>□</u>	Primary settings	•	
		30	1/0	• Y	
		\mathcal{M}	Diagnostics	•	
		Exit	22:51	Select	
	Select Parameters and press (Select) (or	Off ◊	(~ ACH580	0.0 rpm	
	().	Main	menu ————		
		A B C	Energy efficiency	•	
		₩)	Backups	▶	
			Parameters	•	
		Exit	22:51	Select	

	Select Complete list and press (Select)	Off ⊘	A CLUEGO	0.0
	(or ▶).	∪π φ Parame	~ ACH580	0.0 rpm
			eters ———— ete List	
		Favorit		-
		Modifie		
		Back	22:51	Select
_	Scroll the page with [▲] and [▼], and select			
	parameter group 99 Motor data and press	Off�	← ACH580	0.0 rpm
	(Select) (or ▶).	II -	ete list ———	ı
			configuration	▶
		96 Syst	tem or control	*
			or control r motor parameters	
			or data	
		Back	22:52	Select
-	Open II the arrange with (A) and (C) and a deat			Delect
	Scroll the page with (A) and (V), and select parameter 99.13 ID run requested and press	Off 	(~ ACH580	0.0 rpm
	(Select) (or).	99 Mot	or data ——	
			otor nominal speed	1430 rpm
			otor nominal power	0.75 kW
			otor nominal cos φ	0.00
			otor nominal torque) run requested	0.000 Nm (None
		Back	22:52	Edit
				Calt
	Select the ID run type and press (Save) (or).	Off �	(~ ACH580	0.0 rpm
	(2).	99.13 I	D run requested	
		[0] N	lone	
			lormal	
			educed	
			tandstill	
		<u> </u>	dvanced	
		Cancel	22:52	Save

Panel LED starts blinking green to indicate an active warning (AFF6).

The AFF6 warning view is shown when no key has been pressed for one minute. Pressing \(\subseteq \) (How to fix) shows text informing that the ID run will be done at the next start. You can hide the warning view by pressing (Hide).

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 ().

During the ID run the arrow is rotating at the top. After the ID run is completed, text ID run done is shown. The LED stops blinking.

If the ID run fails, fault FF61 ID run is shown. See chapter Fault tracing on page 183 for more information.

Off 	(~ ACH580	0.0 rpm		
Warning AFF6 Aux code: 0000 0000 Identification run 22:52: Motor identification run about to be performed				
Hide	22:52	How to fix		
Hand♦	🏠 ACH580	\$0.0 rpm		
99 Motor	data —			
99.09 Moto	or nominal speed	1430 rpm		
99.10 Moto	r nominal power	0.75 kW		
99.11 Moto	or nominal cos φ	0.00		
99.12 Moto	or nominal torque	0.000 Nm		
99.13 ID ru	ın requested	Normal		
Back	22:52	Edit		



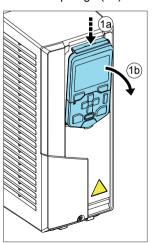
Control panel

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

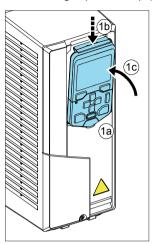
To remove the control panel, press the retaining clip at the top (1a) and pull it forward from the top edge (1b).



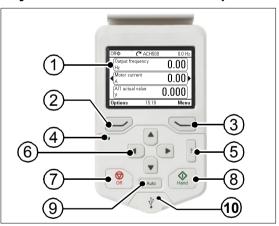




To reinstall the control panel, put the bottom of the container in position (1a), press the retaining clip at the top (1b) and push the control panel in at the top edge (1c).



Layout of the default control panel

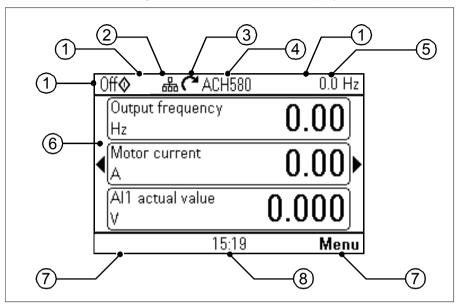


1	Layout of the control panel display
2	Left softkey
3	Right softkey
4	Status LED, see chapter <i>Maintenance</i> and hardware diagnostics, section <i>LEDs</i> in the <i>Hardware manual of the</i> drive.
5	Help

	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:



- 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		Giving reference from this 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 panel indicate which actions are allowed:

Text/Ic	ons		Starting from this control panel	•	Giving reference from this 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 panel
Auto			Not allowed	Not allowed	Not allowed
Auto	\lambda		Allowed	Allowed	Not allowed
Auto		‡	Not allowed	Allowed	Allowed
Auto		‡	Allowed	Allowed	Allowed

- 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.

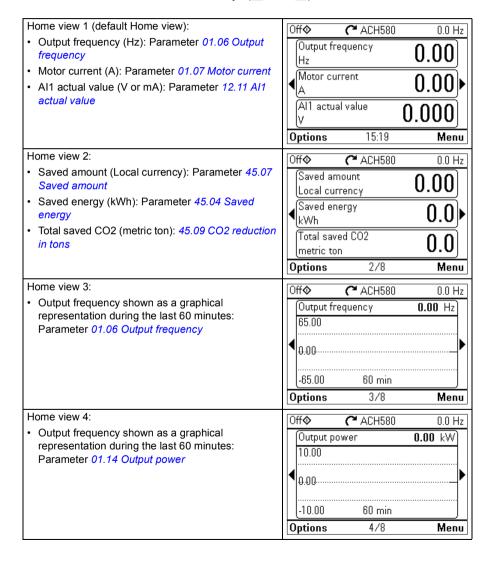
Status icon	Animation	Drive status
ر	-	Stopped
K	-	Stopped, start inhibited
₹ С	Blinking	Stopped, start command given but start inhibited. See Menu > Diagnostics on the control panel
% +⊗	Blinking	Faulted
C +	Blinking	Running, at reference, but the reference value is 0
(2+k)	Rotating	Running, not at reference
G → J	Rotating	Running, at reference
∭	-	Pre-heating (motor heating) active
$\mathbf{Z}_{\!$	-	PID sleep mode active

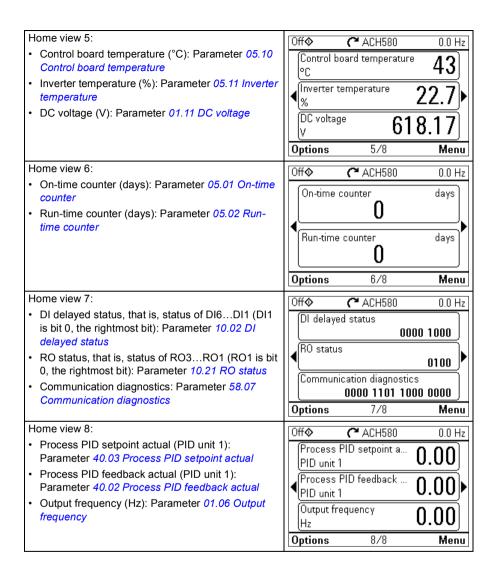
- Drive name: If a name has been given, it is displayed in the top pane. By default, it is "ACH580". You can change the name on the control panel by selecting Menu > Primary settings > Clock, region, display (see page 72).
- 5. **Reference value**: Speed, frequency, etc. is shown with its unit. For information on changing the reference value in the **Primary settings** menu (see page *58*).
- 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 45 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.
- 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 72).

You can adjust the display contrast and back light functionality on the control panel by selecting Menu > Primary settings > Clock, region, display (see page 72).

Home view displays

There are eight different Home view displays. Home view 1 is the default Home view. You can browse them with the arrow keys (◀) and ♠).





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 own 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 kevs

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 ACH580 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 87.

Hand key ((\(\bar{\psi} \)):

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

Off key ((((a)):

• Stops the drive and switches to the Off mode.

Auto key (Auto):

• 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 (+).

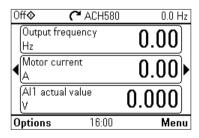
Shortcut	Available in	Effect
+ 4	any view	Save a screenshot. Up to fifteen images may be stored in the control panel memory. To transfer images to PC, connect the assistant control panel to PC with a USB cable and the panel will mount itself as an MTP (media transfer protocol) device. Pictures are stored in the screen shots folder. For more instructions, see ACX-AP-x assistant control panels user's manual (3AUA0000085685 [English]).
	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.
4 + •	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.

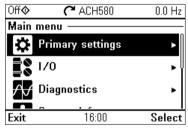
Settings, I/O and diagnostics on the control panel

Contents of this chapter

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

To get to the Primary settings, I/O, Diagnostic, System info, Energy efficiency or Backups menu from the Home view, first select Menu to go the Main menu, and in the Main menu, select the menu you want.





Primary settings menu



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

After making the guided settings using the first start assistant, you may want to select another default configuration by selecting Start, stop, reference > Basic control set-up > How do you want to control? and then selecting a default configuration.

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

We recommend that you make at least these additional settings:

- Set Start, stop, reference values
- Ramps
- Limits

With the **Primary settings** menu, you can also adjust settings related to the motor, fieldbus communication, PID, override, fault functions, advanced functions and clock, region and display. In addition, you can reset the fault and event logs, 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.

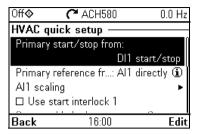
Note that the **Primary settings** menu only enables you to modify some of the settings: more advanced configuration is done via the parameters: Select Menu > Parameters. For more information on the different parameters, see chapter Parameters on page 323.

In the **Setting** menu, the **\(\Lambda \)** symbol indicates multiple connected signals/parameters. The 💏 symbol indicates that the setting provides an assistant when modifying the parameters.

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.

HVAC quick setup

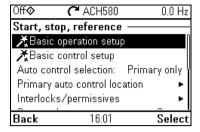


Use the HVAC quick setup submenu to go through the most important settings (basic setup and basic operation) at start-up if you do not want to do it with the assistants.

The table below provides detailed information about the available setting items in the HVAC quick setup menu.

Menu item	Description	Corresponding parameter
Primary start/stop from:	Set where the start and stop comes in the Auto mode.	
Primary reference from:	Set where the reference comes in the Auto mode.	
Al scaling		
Use start interlock 1	Selected/Unselected	
Start enabled when:	Start enabled when: DIx high	20.41 Start interlock 1
Use run permissive	Selected/Unselected	
Run enabled when:	Run enabled when: Dlx high	20.40 Run permissive
Minimum speed: Minimum frequency:		30.13 Minimum speed 30.11 Minimum frequency
Acceleration time:		23.12 Acceleration time 1 28.72 Freq acceleration time 1
Deceleration time:		23.13 Deceleration time 1 28.73 Freq deceleration time 1
Stop mode:		21.03 Stop mode
★Motor nominal values	Enter the motor's nominal values from the motor's nameplate.	99.03 Motor type 99.12 Motor nominal torque
Date & time	Set the time and date, and their formats.	

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.

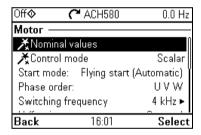
The table below provides detailed information about the available setting items in the Start, stop, reference menu.

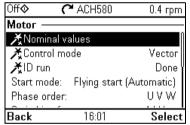
Menu item	Description	Corresponding parameter
X Basic operation	Ramps	
setup	Limits	
	Start interlock signal	
	Run permissive signal	
	Naming the drive	
XBasic control setup	Direct control via I/O (HVAC default configuration)	
	Reference (AI1) scaling	
	Direct control via I/O	
	Reference (Al1) scaling	
	PID control, single motor	
	Feedback (Al2) scaling	
	Setpoint source	
	Constant setpoint	
Auto control selection:	Where the drive gets the signal to switch to between control locations (Ext1 and Ext2).	19.11 Ext1/Ext2 selection
Primary auto control location	Settings for the primary remote control location, Ext1.	
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 Al1 min 12.18 Al1 max 12.27 Al2 min 12.28 Al2 max 20.06 Ext2 commands 20.08 Ext2 in1 source 20.09 Ext2 in3 source 20.10 Ext2 in3 source

Menu item	Description	Corresponding parameter
Interlock/permissives	starting when a specific digital input is low.	20.40 Run permissive20.41 Start interlock 1
	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".	20.42 Start interlock 2 20.43 Start interlock 3 20.44 Start interlock 4
	See section <i>Interlocks</i> on page 111.	20.45 Start interlock stop mode
Stop mode:	Sets how the drive stops the motor.	21.03 Stop mode
Pump and fan control	Selects PFC or SPFC control.	76.21 PFC configuration
	Configures the PFC/SPFC I/O.	76.25 Number of motors
	Configures PFC/SPFC control.	76.27 Max number of motors allowed
	Configures Autochange.	76.59 PFC contactor
	1	delay
	See section Single pump and fan control (PFC) on page 150.	10.24 RO1 source 10.27 RO2 source 10.30 RO3 source
		76.81 PFC 1 interlock
		76.82 PFC 2 interlock 76.83 PFC 3 interlock
		76.84 PFC 4 interlock
		76.30 Start point 1
		76.31 Start point 2
		76.32 Start point 3
		76.41 Stop point 1
		76.42 Stop point 2
		76.43 Stop point 3
		76.55 Start delay 76.56 Stop delay
		76.70 Autochange
		76.71 Autochange
		interval
		76.72 Maximum wear imbalance
		76.73 Autochange level
Constant speeds /	These settings are for using a constant value as	28.21 Constant
'	the reference. By default, this is set to On	frequency function or
'	See section Constant speeds/frequencies on page	22.21 Constant speed
	122.	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.	21.01 Start mode
		21.02 Magnetization
Ot and all all and	Onto be see the adding about the seed of	time
Start delay:	Sets how the drive starts the motor.	21.22 Start delay

Menu item	Description	Corresponding parameter
Critical speeds/frequencies	Prevents running in critical ranges (speeds or frequencies). See section Critical speeds/frequencies on page 123.	Vector control: 22.51 Critical speed function 22.52 Critical speed 1 low 22.53 Critical speed 1 high 22.54 Critical speed 2 low 22.55 Critical speed 2 high 22.56 Critical speed 3 low 22.57 Critical speed 3 high Scalar control: 28.51 Critical frequency function 28.57 Critical frequency 3 high

Motor





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 menu.

Menu item		Corresponding parameter
	nameplate.	99.03 Motor type 99.12 Motor nominal torque

Menu item	Description	Corresponding parameter
XControl mode	Selects whether to use scalar or vector control mode.	99.04 Motor control mode
	For information on scalar control mode, see section Scalar motor control on page 126.	
	For information on vector control mode, see section <i>Vector control</i> on page 137.	
Start mode:	Sets how the drive starts the motor (for example, pre-magnetize or not). For more information, see section <i>Start methods – DC magnetization</i> on page 129.	21 Start/stop mode
Phase order:	If the motor turns in the wrong direction, 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 highest and the lowest allowed switching frequencies. For more information, see section <i>Switching frequency</i> on page <i>131</i> .	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 <i>U/f ratio</i> on page <i>127</i> .	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 <i>IR compensation for scalar motor control</i> on page 127.	97.13 IR compensation
Pre-heating	Turns pre-heating on or off. 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 <i>Start methods – DC magnetization</i> on page 129.	21.14 Pre-heating input source 21.16 Pre-heating current
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.	35 Motor thermal protection
	By default, motor thermal estimate protection is on. We recommend checking the values for the protection to function properly.	
	For more information, see section <i>Motor thermal protection</i> on page 132.	
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.	35 Motor thermal protection
	For more information, see section <i>Motor thermal protection</i> on page <i>132</i> .	

Menu item	Description	Corresponding parameter
Flux braking:	Sets how much current to use for braking, ie. how the motor is magnetized before starting. For more information, see section <i>Flux braking</i> on page 128.	97.05 Flux braking
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 <i>Stall protection (parameters 31.2431.28)</i> on page 175.	31.24 Stall function 31.25 Stall current limit 31.26 Stall speed limit 31.27 Stall frequency limit 31.28 Stall time

Ramps

Off ◊	~ ACH580	0.0 Hz
Ramps —		
Acceleration	on time:	30.000 s
Deceleration	on time:	30.000 s
Stop mode	:	Coast
Ramp time	target freque	endy: 50.00 Hz 🏻
☐ Use two	ramp sets	
Back	16:01	Edit

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

See also section Ramps on page 118.

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 menu.

Menu item	Description	Corresponding parameter
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

Menu item	Description	Corresponding parameter
Use two ramp sets	Sets the use of a second acceleration/deceleration ramp set. If unselected, only one ramp set is used. Note that if this selection is not enabled, the selections below are not available.	
Activate ramp set 2	To switch ramp sets, you can either: use a digital input (low = set 1; high = set 2), or automatically switch to set 2 above a certain frequency/speed.	23.11 Ramp set selection 28.71 Freq ramp set selection
Acceleration time 2	Sets the time between standstill and "scaling speed" when using ramp set 2.	23.14 Acceleration time 2 28.74 Freq acceleration time 2
Deceleration time 2	Sets the time between standstill and "scaling speed" when using ramp set 2.	23.15 Deceleration time 2 28.75 Freq deceleration time 2

Limits

Off� (ACH580	0.0 Hz
Limits ——		
Minimum fre	quency:	0.00 Hz
Maximum fro	equency:	50.00 Hz
Maximum cu	ırrent:	3.06 A
Back	16:01	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 121.

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 Ramps menu, see page 58; these limit parameters have no effect on ramps.

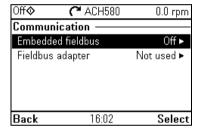
The table below provides detailed information about the available setting items in the I imits menu

Menu item		Corresponding parameter
	poto the minimum operating hoqueries. The oto	30.13 Minimum frequency
' '	poto tire maximum operating modulency i i module	30.14 Maximum frequency

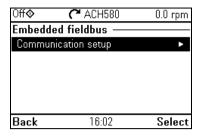
Menu item	Description	Corresponding parameter
Minimum speed:	Sets the minimum operating speed. Affects vector control only.	30.11 Minimum speed
Maximum speed:	Sets the maximum operating speed. Affects vector control only.	30.12 Maximum speed
Minimum torque:	Sets the minimum operating torque. Affects 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

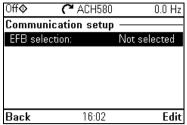
Communication

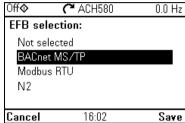
Use the Communications menu to set up and view communication through embedded fieldbus or fieldbus adapter.



Embedded fieldbus







Use the settings in the Embedded fieldbus submenu to use the drive with the following protocols:

- Modbus RTU
- **BACnet MS/TP**
- N2

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 menu is to make the protocol configurations easier.

See also chapters

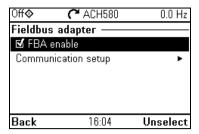
- Modbus RTU control through the embedded fieldbus interface (EFB) on page 213
- BACnet MS/TP control through the embedded fieldbus interface (EFB) on page 243
- N2 control through the embedded fieldbus interface (EFB) on page 275.

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

Menu item	•	Corresponding parameter
EFB selection	Select the protocol you want to use.	58.01 Protocol enable

Menu item	Description	Corresponding parameter
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 58.40 Device object ID 58.41 Max master 58.42 Max info frames 58.43 Max APDU retries 58.14 Communication loss action 58.15 Communication loss mode 58.16 Communication loss time 58.06 Communication control
Pass through I/O -> Drive control setup	After applying the settings, press Back twice to see Pass through I/O on the Communication menu. Select it to go to the Drive control setup menu. For relay output control, select Relay outputs and set the source of appropriate relays to EFB. For analog output control, select Analog outputs configure the appropriate analog outputs.	
Diagnostics	 Actual status: Status value: EFB data from client View what the drive EFB receives from the fieldbus master (PLC) / BACnet client (eg BMS). EFB data to client View what the drive EFB sends to the fieldbus master (PLC) / BACnet client (eg BMS). 	58.07 Communication diagnostics 58.08 Received packets 58.11 UART errors 58.12 CRC errors 58.13 Token counter 58.18 EFB control word 03.09 EFB reference 1 58.09 Transmitted packets 58.19 EFB status word

Fieldbus adapter



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:

 BACnet/IP: FBIP-21 adapter CANopen: FCAN-01 adapter ControlNet: FCNA-01 adapter DeviceNet: FDNA-01 adapter

EtherCAT: FECA-01 adapter

Ethernet/IP: FEIP-21. FENA-11/-21 adapter

ETH Pwrlink: FEPL-02 adapter

ModbusTCP: FMBT-21 adapter. FENA-11/-21 adapter

PROFIBUS-DB: FBPA-01 adapter

PROFINET IO: FPNO-21, FENA-11/-21 adapter

Ethernet/IP: FENA-11/-21 adapter

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 menu is to make the protocol configurations easier.

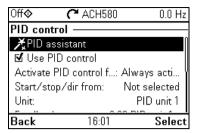
See also chapter Fieldbus control through a fieldbus adapter on page 289.

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

Menu item		Corresponding parameter
Fieldbus adapter	FBA enable: Select this if you want to use the drive	50.01 FBA A enable
	with a fieldbus adapter.	

Menu item	Description	Corresponding parameter
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
Drive control setup	Sets how a fieldbus master can control this drive, and how the drive reacts if the fieldbus communication fails.	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 28.72 Freq acceleration time 1 28.73 Freq deceleration time 1 51.27 FBA A par refresh
Received data from master	Sets what the drive's fieldbus module expects to receive from the fieldbus master (PLC). After changing these settings, select Apply settings to fieldbus module .	50.13 FBA A control word 53 FBA A data out 51.27 FBA A par refresh
Send data to master	Sets what the drive's fieldbus module sends to the fieldbus master (PLC). After changing these settings, select Apply settings to fieldbus module .	50.16 FBA A status word 52 FBA A data in 51.27 FBA A par refresh
Apply settings to fieldbus module	Applies modified settings to the fieldbus module.	51.27 FBA A par refresh

PID control



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

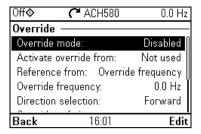
See also section Process PID control on page 147.

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

Menu item	Description	Corresponding parameter
ĂPID assistant	Configures secondary control location to use PID control.	
	<u>Feedback:</u> Al2. Adjust the scaling of Al2 signal for feedback, if required.	
	<u>Setpoint:</u> Select a constant value, control panel or Al1. If you selected Al2, adjust the scaling of Al1 signal for setpoint.	
	Start/stop: 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
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 20.05 Ext1 in3 source 20.06 Ext2 commands 20.07 Ext2 start trigger type 20.08 Ext2 in1 source 20.09 Ext2 in2 source 20.10 Ext2 in3 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

Menu item	Description	Corresponding parameter
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. 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": • 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.	40.04 Process PID deviation actual 40.31 Set 1 deviation inversion
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 147.	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

Override

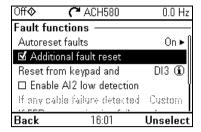


The **Override** submenu contains settings the override function

See also section Override on page 100.

Menu item	Description	Corresponding parameter
	Override mode: Activate override from: Reference from: Override frequency: Direction selection: Override safeties:	70.02 Override 70.03 Override activation source 70.04 Override reference source 70.06 Override frequency 70.05 Override direction 70.10 Override enables selection
	Use autoreset for critical faults Wait between reset attempts: Max attempts:	70.20 Override fault handling 70.22 Override auto reset time 70.21 Override auto reset trials

Fault functions



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

Menu item	Description	Corresponding parameter
Autoreset faults	Reset faults automatically. For more information, see section <i>Sleep and boost functions for process PID control</i> on page 147.	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.	31.11 Fault reset selection
	A fault can be reset from the fieldbus even if Reset faults manually is unselected.	
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
Enable AI2 low detection	Enable Al2 minimum limit supervision Al2 < MIN.	12.04 Al supervision selection, bit 2
If any cable failure detected	Define action to be taken when Al2 low detection is enabled and Al2 is less than the minimum limit (Al2 < MIN).	12.03 AI supervision function
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 <i>If EFB communication fails:</i> is taken.	58.16 Communication loss time

Security

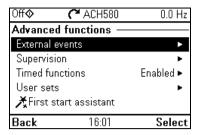


The **Security** submenu is a protected menu that you can open with the user pass code. The menu lets you prevent actions and functionalities with the user lock. You can also change the user lock pass code.

See also section *User lock* on page 180.

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 <i>A6B0 User lock is open</i> is active. After making your changes in the menu, select row	96.02 Pass code
	Lock this menu and press Select .	
Lock all parameters Lock override settings 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. Store the code in a safe place – the protection cannot be disabled even by ABB if the code is lost. 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



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 menu.

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

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 <i>External events</i> on page 122.	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	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 444. For more information, see section Signal supervision on page 144.	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 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	Enables using the drive with timed functions. For complete settings, see group 34 Timed functions on page 451. For more information, see section Timed functions on page 124.	34.100 Timed function 1 34.101 Timed function 2 34.102 Timed function 3 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 34.111 Boost time activation source 34.112 Boost time duration
User sets	This submenu enables you to save four sets of settings for easy switching. For more information about user sets, see section Data storage parameters on page 179.	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
⊁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 menu.

Menu item	Description	Corresponding parameter
Select 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.	96.01 Language
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 status bar at the top of the 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 panel screen (in addition to the fault-specific information).	
Edit texts	Edit drive name, currency unit, PID unit, Start interlocks 14, Run permissive, Signal supervisions 13, External faults 13, Contact info.	
Display settings	Adjust the brightness, contrast and display power save delay of the panel screen or to invert white and black.	

Menu item	Description	Corresponding parameter
Show in lists	Show or hide the numeric IDs of:	
	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

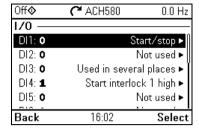


The **Reset to defaults** submenu enables you to reset parameters and other settings.

	Corresponding parameter	
	96.51 Clear fault and	
logs.	event logger	
Restores the home view layout back to show the	96.06 Parameter	
values of the default parameters defined by the	restore, selection Reset home view	
	Clears all events from the drive's fault and event logs. Restores the home view layout back to show the values of the default parameters defined by the	

Menu item	Description	Corresponding parameter
Reset non-HW parameters	Restores all editable parameter values to default values, except motor data and ID run results l/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 parameter 95.01 Supply voltage differentiated defaults implemented by parameters 95.20 HW options word 1 and 95.21 HW options word 2 user lock configuration parameters 96.10096.102.	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
Reset all parameters	Restores all editable parameter values to default values, except • 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 • user lock configuration parameters 96.10096.102 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.	96.06 Parameter restore, selection Reset end user texts
Reset first start assistant	Resets first start assistant to the initial state.	
Reset all to factory defaults	Restores all drive parameters and settings back to initial factory values, except differentiated defaults implemented by parameters 95.20 HW options word 1 and 95.21 HW options word 2.	96.06 Parameter restore, selection All to factory defaults

I/O menu



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 also 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.

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.	
Al1	This submenu lists the functions that use Al1 as input.	
Al2	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		
RO4	This submenu lists what information goes into relay output 4.	

Menu item	Description
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.

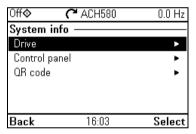
To clear the fault and event logger, select Menu > Primary settings > Reset to defaults > Reset fault and event logs, or set parameter 96.51 Clear fault and event logger to value Clear.

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, 06.22 HVAC 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 feedback 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.	

Menu item	Description	
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 05.8005.89.	
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.	
Communication	This view provides status information and sent and received data from	
status	fieldbus for troubleshooting.	
Motor summary	This view provides motor information: nominal values, control mode and whether ID run has been completed.	

System info menu



To go the I/O 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:	
	Product id:	
	Product type:	
	FW version:	07.05 Firmware version
	LP version:	07.07 Loading package version
	Backup version:	vorsion

Menu item	Description	Corresponding parameter
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 service application, which then sends the QR code to ABB for analysis.	

Energy efficiency menu

Off \diamond	4 ACH580	0.0 Hz
Energy efficie	ency —	
Total energy s	aved	0.0 kWh ►
Used, last hou	г	0.00 kWh ▶
Used, last day		0.00 kWh ▶
Used, last mor	nth	0.00 kWh ▶
Used, total		0.0 kWh ►
		0.00.1111
Back	16:03	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 170 and *Load analyzer* on page 171.

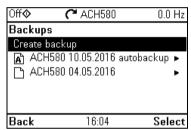
The table below provides detailed information about the available setting items in the Energy efficiency menu.

Menu item	Description	Corresponding parameter
Total energy saved	Energy saved in kWh compared to direct-on-line motor connection. Corresponding money saved.	45.04 Saved energy 45.07 Saved amount 45.10 Total saved CO2
Used, last hour	Corresponding CO ₂ saved. Energy used during the last hour (the last 60 minutes).	45.26 Hourly total energy (resettable)
	Average power during the last hour (value of 45.26 divided by one hour).	

Menu item	Description	Corresponding parameter
Used, last day	Energy used during the previous day (between midnight of the previous day and midnight of the present day).	45.30 Last day total energy
	Average power during the last day (value of 45.30 divided by 24 hours).	
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).	45.35 Last month total energy
	Average power during the last month (value of 45.30 divided by 732 hours).	
Used, total	All-time total used energy	01.54 Cumulative
	Resettable total used energy	inverter energy 01.58 Inverter kWh counter (resettable)
Peak power	Hourly peak power (during the last 60 minutes) Time of the hourly peak time	45.24 Hourly peak power value
	Daily peak power (during the previous day)	45.25 Hourly peak power time
	Time of the daily peak time	45.27 Daily peak power
	Monthly peak power (during the previous month) Time of the monthly peak time	value (resettable) 45.28 Daily peak power
	Date of the monthly peak time	time 45.31 Monthly peak
	All-time peak power	power value (resettable)
	Time of all time peak power	45.33 Monthly peak power time
	Date of all time peak power	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)	
	Load profile configuration	36.06 AL2 signal source
		36.07 AL2 signal scaling 36.09 Reset loggers
	Peak value logger	36.01 PVL signal source
	T Car value logger	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

Menu item	Description	Corresponding parameter
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





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

For backups and restores, see section Backup and restore on 178 page.



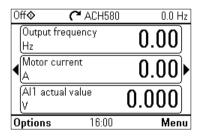
Default configuration

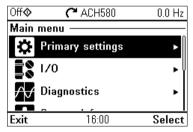
Contents of this chapter

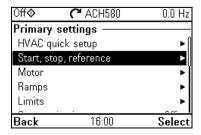
This chapter describes the intended use, operation and default control connections of the application.

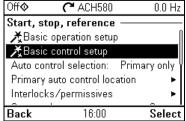
You select default configurations in the Primary settings menu.

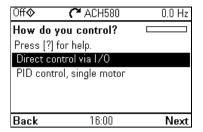
To get to the **Primary settings** menu from the Home view, first select **Menu** to go the Main menu, and then select Primary settings. Select Start, stop, reference, and How do you control? then shows the default configurations (Direct control via I/O means the HVAC default configuration.)











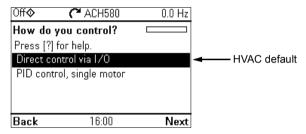
HVAC default

This is the default configuration for HVAC (factory default). The HVAC default direct I/O control is used, for example, for typical I/O controlled BMS applications.

This configuration uses a direct speed reference in the Auto mode, with speed reference connected to analog input 1 (Al1). The start command is given with digital input 1 (DI1).

In the Hand/Off mode, the speed reference and start command are given through the control panel (operator keypad).

Note: You select default configurations in the Primary settings menu, not with parameter 96.04 Macro select. This parameter is only used for Drive customizer support.



Input signals

- Analog frequency/speed reference (Al1)
- Start/stop selection (DI1)
- Constant speed/frequency selection (DI3)
- Start interlock 1 (DI4)

Output signals

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

Terminal sizes:

```
R0...R5: 0.2...2.5 mm<sup>2</sup> (24...14 AWG): Terminals +24V, DGND, DCOM, B+, A-, DGND,
          0.14...1.5 mm<sup>2</sup> (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)

1

Default control connections for the HVAC default

		X1	Reference volt	tage and analog inputs and outputs				
_		1	SCR	Signal cable shield (screen)				
110 kohm ▼		2	Al1	Output frequency/speed reference: 010 V				
		3	AGND	Analog input circuit common				
		4	+10V	Reference voltage 10 V DC				
	1 1	5	AI2	Actual feedback: 020 mA				
O 6.		6	AGND					
max.		7	AO1 Output frequency: 010 V					
500 ohm		8	AO2	Motor current: 020 mA				
	7.	9	AGND					
	1)	X2 & X3	Aux. voltage or	utput and programmable digital inputs				
		10	+24V	Aux. voltage output +24 V DC, max. 250 mA				
		11	DGND	Aux. voltage output common				
	2)	12	DCOM					
		13	DI1	Stop (0) / Start (1)				
		14	DI2	Not configured				
		15	DI3	Constant frequency/speed selection				
		16	DI4	Start interlock 1 (1 = allow start)				
		17	DI5	Not configured				
		18	DI6	Not configured				
		X6, X7, X8	Relay outputs					
	•	19	RO1C	Damper control Energize damper				
Damper actuator		20	RO1A	250 V AC / 30 V DC 19 connected to 21				
	•	21	RO1B	├				
	-	22	RO2C	Running Running				
Run status		23	RO2A	250 V AC / 30 V DC 22 connected to 24				
	-	24	RO2B	<u></u>				
F. 10.1.1	-	25	RO3C	Fault (-1) Fault condition				
Fault status	•	26	RO3A	250 V AC / 30 V DC 25 connected to 26				
		27	RO3B	<u> </u>				
		X5	Embedded fiel	dbus				
		29	B+					
		30	A-	Embedded fieldbus, EFB (EIA-485)				
		31	DGND	1 ' ' '				
		S4	TERM	Termination switch				
		S5	BIAS	Bias resistors switch				
		X4	Safe torque off					
	_	34	OUT1					
		35	OUT2	Safe torque off. Factory connection. Both circuits				
	2)	36	SGND	must be closed for the drive to start. See chapter				
	2)	37	IN1	The Safe torque off function in the Hardware				
		38	IN2	manual of the drive				
		X10	24 V AC/DC	<u> </u>				
		40	24 V AC/DC+ in	R6R11 only: Ext. 24V AC/DC input to power up the				
	3)	41	24 V AC/DC- in					

Notes:

¹⁾ Ground the outer shield of the cable 360 degrees under the grounding clamp on the grounding shelf for the control cables.

²⁾ Connected with jumpers at the factory.

³⁾ Only frames R6...R11 have terminals 40 and 41 for external 24 V AC/DC input.

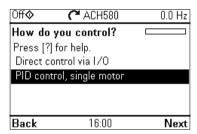
PID control, single motor

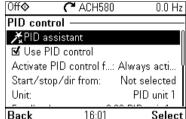
This configuration offers quick setup of PID control for keeping flow or pressure constant. It requires a measurement feedback from the process, and the feedback signal must be connected to the analog input 2 (Al2). You can specify the setpoint to come from analog input 1 (Al1) or from the control panel (operator keypad) in the Auto mode, or you can set a constant setpoint.

In the Hand/Off mode, the speed reference and start command are given through the control panel. In the Hand mode the speed reference is the direct speed reference and a PID setpoint value

After you have commissioned the drive to use the PID control operation, single motor, you can adjust Process PI(D) in the PID control submenu of the Primary settings menu (see page 65).

Note: You select default configurations in the Primary settings menu, not with parameter 96.04 *Macro select.* This parameter is only used for Drive customizer support.





Input signals

- Setpoint selected from: control panel setpoint/ constant setpoint / analog input (AI1)
- PID feedback (Al2)
- Start/stop selection (DI1)
- Constant speed/frequency selection (DI3)
- Start interlock 1 (DI4)

Output signals

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

Terminal sizes:

R0...R5: 0.2...2.5 mm² (24...14 AWG): Terminals +24V, DGND, DCOM, B+, A-, DGND, 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)

Default control connections for the PID control, single motor

	X1	Reference volt	tage and analog inputs and outputs				
-	1	SCR	Signal cable shield (screen)				
110 kohm 🔻	2	Al1	Panel setpoint ref/ Constant setpoint: 010 V				
1 10 KOIIII 🗸	3	AGND	Analog input circuit common				
<u> </u>	4	+10V	Reference voltage 10 V DC				
1 !	5	Al2	PID feedback: 020 mA				
	6	AGND	Analog input circuit common				
max.	7	AO1	Output frequency: 010 V				
500 ohm	8	AO2	Motor current: 020 mA				
	9	AGND	Analog output circuit common				
1)	X2 & X3	Aux. voltage o	Aux. voltage output and programmable digital inputs				
	10	+24V	Aux. voltage output +24 V DC, max. 250 mA				
0.5	11	DGND	Aux. voltage output common				
2)	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	Start interlock 1 (1 = allow start)				
	17	DI5	Not configured				
	18	DI6	Not configured				
	X6, X7, X8	Relay outputs	-				
◄—	19	RO1C	Damper control Energize damper				
Damper actuator	20	RO1A	250 V AC / 30 V DC 19 connected to 21				
◄	21	RO1B	├				
◄	22	RO2C	Running Running				
Run status	23	RO2A	250 V AC / 30 V DC 22 connected to 24				
◄	24	RO2B	→ 2 A				
Fault status	25	RO3C	Fault (-1) Fault condition				
1 auit status	26	RO3A	250 V AC / 30 V DC 25 connected to 26				
	27	RO3B	⊢				
	X5	Embedded fiel	dbus				
	29	B+					
	30	A-	Embedded fieldbus, EFB (EIA-485)				
	31	DGND					
	S4	TERM	Termination switch				
	S5	BIAS	Bias resistors switch				
	X4	Safe torque of	f				
Г	34	OUT1	Safe torque off. Factory connection. Both circuits				
0)	35	OUT2	must be closed for the drive to start. See chapter				
2) 2)	36	SGND	The Safe torque off function in the Hardware				
ή -	37	IN1	manual of the drive				
	38	IN2					
	X10	24 V AC/DC	,				
3	40	24 V AC/DC+ in					
3	41	24 V AC/DC- in	control unit when the main supply is disconnected.				

Notes:

¹⁾ Ground the outer shield of the cable 360 degrees under the grounding clamp on the grounding shelf for the control cables.

²⁾ Connected with jumpers at the factory.

³⁾ Only frames R6...R11 have terminals 40 and 41 for external 24 V AC/DC input.



Program features

What this chapter contains

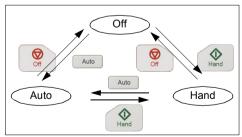
This chapter describes some of the more important functions within the control program, how to use them and how to program them to operate. It also explains the control locations and operating modes.

Local control vs. external control

The ACH580 has two main control locations; external and local. In local control there are additionally three different modes: Off, Hand and Auto modes.

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.

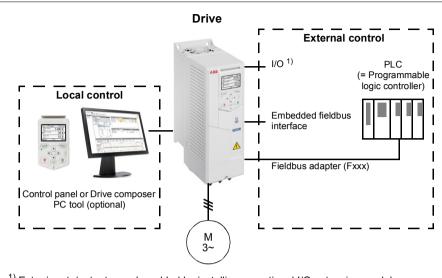
The following diagram shows the state transitions when you press the Hand, Off or Auto button:



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.

Note: Override function overrides the actual running mode.



¹⁾ Extra inputs/outputs can be added by installing an optional I/O extension module (CMOD-01, CMOD-02, CHDI-01 or CPTC-02) in drive slot.

Local control

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

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

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 break. (The parameter has no effect in external control.)

External control

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

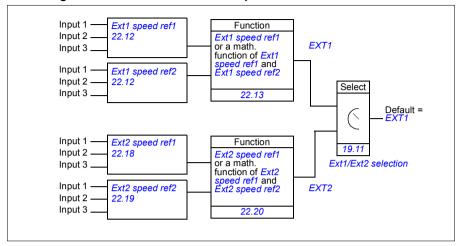
- the I/O terminals (digital and analog inputs), or optional I/O extension modules
- · the fieldbus interface (via the embedded fieldbus interface or an optional fieldbus adapter module).

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...20.10 Ext2 in3 source. The operating mode can be selected separately for each location, which enables guick 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.

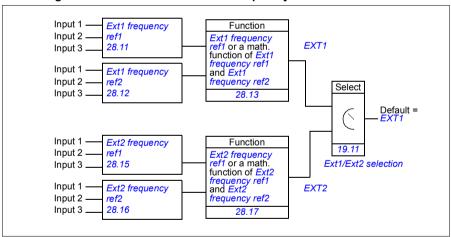
Communication fail functionality

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).

Block diagram: EXT1/EXT2 selection for speed control



Block diagram: EXT1/EXT2 selection for frequency control

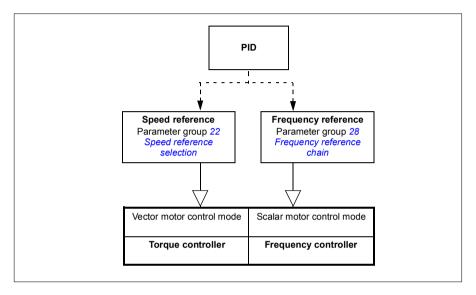


Settings

- Parameters 19.11 Ext1/Ext2 selection (page 377); 20.01 Ext1 commands...20.10 Ext2 in3 source (page 378)
- Parameters 22.11 Ext1 speed ref1...22.20 Ext2 speed function (page 396)
- Parameters 28.11 Ext1 frequency ref1...28.17 Ext2 frequency function (page 414).

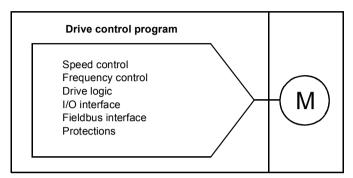
Operating modes of the drive

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 configuration (page 81).

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 51).

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 51)
- the Drive composer PC tool, as described in Drive composer user's manual (3AUA0000094606 [English]), or
- the fieldbus interface, as described in chapters Modbus RTU control through the embedded fieldbus interface (EFB) (see page 213) and Fieldbus control through a fieldbus adapter (see page 297).

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 pro PC tool (version 1.10 or later, 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			
Al1	12.11 Al1 actual value			
Al2	12.21 Al2 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			

94 Program features

Inputs available to the adaptive program			
Input	Source		
Status			
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		
Data storage			
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		
1/0	•		
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		
Start control			
Ext1/Ext2 selection	19.11 Ext1/Ext2 selection		
Ext1 in1 cmd	20.03 Ext1 in1 source		
Ext1 in2 cmd	20.04 Ext2 in2 source		
Ext1 in3 cmd	20.05 Ext1 in3 source		
Ext2 in1 cmd	20.08 Ext2 in1 source		
Ext2 in2 cmd	20.09 Ext2 in2 source		
Ext2 in3 cmd	20.10 Ext2 in3 source		
Fault reset	31.11 Fault reset selection		
Speed control	•		
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		
Frequency control	•		
Ext1 frequency reference	28.11 Ext1 frequency ref1		
Limit function			
Minimum torque 2	30.21 Min torque 2 source		
Maximum torque 2	30.22 Max torque 2 source		
Events	•		
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		

Outputs available to the adaptive program			
Output	Target		
External event 5	31.09 External event 5 source		
Data Storage			
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		
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 201.

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 357).

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.

Settinas

Parameter group 13 Standard AO (page 362).

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 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 345) and 11 Standard DIO, FI, FO (page 356).

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 345) and 11 Standard DIO, FI, FO (page 356).

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 345).

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.

Location	Digital inputs (DI)	Digital outputs (DO)	Digital I/Os (DIO)	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 368).

Fieldbus control

The drive can be connected to several different automation systems through its fieldbus interfaces. See chapters Modbus RTU control through the embedded fieldbus interface (EFB) (page 213) and Fieldbus control through a fieldbus adapter (page 289).

Settings

Parameter groups 50 Fieldbus adapter (FBA) (page 505), 51 FBA A settings (page 509), 52 FBA A data in (page 510), and 53 FBA A data out (page 511) and 58 Embedded fieldbus (page 511).

Control of a supply unit (LSU)

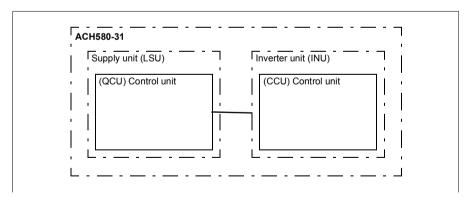
Overview

This feature is only supported for ACH580-31 drives.

An ACH580-31 drive consists of one 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 channel.



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 sets 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.

LSU Override

When override is activated in the inverter, it is also activated in the supply unit and stays active until it is deactivated.

When a fault occurs in the supply unit, it tries to reset it automatically. If the fault cannot be reset within a 30 s delay, the supply unit reboots and continues operation if the fault is not active. If there is a permanent fault, that is, a fault that cannot be reset, occurs in the supply unit, it reboots immediately. If the fault still persists, the supply unit keeps repooting every 30 seconds until the fault disappears.

Faults occurred in the supply unit during override are stored in the override fault logs (see parameter group 70 Override).

If override is active in the supply unit when the communication between the inverter and the supply units is disconnected, the supply unit reboots and continues operation, if possible, until it gets a deactivate command from the inverter.

Settings

- Parameters 01.102...01.164 (page 330), 05.111...05.121 (page 336), 06.36...06.39 (page 342), 06.116...06.118 (page 343), 07.106...07.107 (page 345), 30.101...30.149 (page 432), 31.120...31.121 (page 443) and 96.108 LSU control board boot (page 555).
- Parameter groups 60 DDCS communication (page 520), 61 D2D and DDCS transmit data (page 520), 62 D2D and DDCS receive data (page 521) and LSU control board boot (page 543).
- Parameter group 70 Override (page 521).

Override

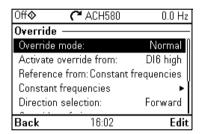
Overview

The override mode, a flexible way to configure a critical response, is typically used in fan applications that require a special operating mode to assist with fire and smoke control. The override mode can also be used in a variety of different applications besides life safety control.

Note: The following section details the operation of override for a stand-alone drive in scalar mode. See section *Scalar motor control* (page 126).

Activating the Override mode

When override is activated, the drive follows the programmed functionality defined in the parameter group 70 Override, using the settings defined in the Menu > Primary settings > Override menu. The override mode is activated through an assigned digital input in the drive, which you select in the Primary settings > Override > Activate override from: menu. The digital input also acts as the start command for the drive in override mode.



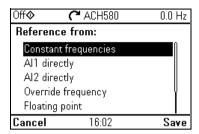
Select Normal or Critical override mode in **Menu > Primary settings > Override > Override mode**:

To lock the override settings, select **Menu > Primary settings > Security**. Unlock the **Security** menu by entering the user pass code. Then select **Lock override settings**. Lock the menu at the end.

When override is deactivated, the drive returns to the original programmed mode of operation. Note that if the drive was in the Hand mode before override was selected, the drive returns to the Off mode after override is deactivated.

Reference for override speed/frequency

You can configure the drive to run in seven different override mode types by selecting the reference for override speed/frequency in the **Reference from:** menu.



- Constant frequencies allows you to select multiple, constant frequencies based on multiple digital inputs.
- Al1 directly or Al2 directly is the speed reference in the override mode.
- Override frequency commands the drive frequency to a single preprogrammed value.
- Floating point uses two defined digital inputs to increase or decrease the drive frequency. Initial values can be configured, as well as, minimum and maximum values and ramp times.
- Force stop stops the drive following the defined stop mode.
- PID, set1 controls the drive frequency using the output value of the process PID controller for PID parameter set 1.

Override mode features

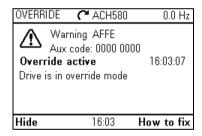
When placed into the override mode, the drive shows the following features and behavior.

- Once in override, the drive ignores all fieldbus communication commands for start/stop and speed reference.
- In the override mode the drive ignores all commands from the control panel: for example, Hand/Off/Auto requests and any parameters changes that would affect override are ignored. If a DriveWare tool is connected via the USB port, it will be ianored.
- · Activating the override mode also initiates a start command. There is no need for a secondary start command while in the override mode.

 The run permissive signal and the signal source for the start interlock(s) that will be followed during the override mode can be set up from the Primary settings > Override > Override safeties menu.



- When override is enabled, the drive ignores all inputs with the exception of the
 override activation/deactivation input, the digital inputs selecting the constant
 frequency or frequencies and the safeties selected to be effective in the override
 mode. Selecting which ones remain active is done in the Override safeties menu
 and they can be the run permissive signal and/or up to four start interlock(s).
- When the override mode is active, the drive displays warning message Override
 active.



 The monitoring of parameters by fieldbus communication is still available during the override mode. Pass through I/O points (analog outputs, relays outputs and digital inputs that are controlled through a fieldbus) will operate normally and pass data through the drive. Faults are grouped into high priority faults and low priority faults. High priority faults are displayed and they will stop the drive. See parameter group 70 Override (page 521) for fault handling. The following is a list of the high priority faults:

2310 Overcurrent	4982 External temperature 2
2330 Earth leakage	5090 STO hardware failure
2340 Short circuit	5091 Safe torque off
3210 DC link overvoltage	FA81 Safe torque off 1
4981 External temperature 1	FA82 Safe torque off 2

- Unless listed above, all other faults are low priority faults. Active low priority faults are reset when the drive enters the override mode. Low priority faults are ignored when the drive is in the override mode.
- You can select whether or not to use autoreset for critical faults (Use autoreset for critical faults) or require a manual reset from the control panel or designated digital input.
- The number of high priority fault reset attempts is affected by the override mode. You can select: Disabled. Normal. or Critical. Disabled indicates that override is not being used. Normal follows the programmed number of fault resets. Critical allows for an infinite number of fault resets.
- · The override configuration is able to be locked through the drive's access level security. See parameter group 96 System (page 546) for pass code and access level settings.
- · The AI supervision function still operates for any override modes that utilize an analog input. Thus if an analog input signal is lost, the drive will operate based on parameter group 12 Standard AI (page 357) configuration.
- If Safe Torque Off (STO) is triggered while the drive is in the override mode, the drive exits override and follows the programming for STO alarm and fault configuration. A fault code is displayed to let the operator know the drive is in an STO condition. When STO is disabled, the drive does not go back into override operation.

Settings

- Menu > Primary settings > Override
- Parameter group 70 Override (page 521)
- Parameter group 12 Standard AI (page 357)
- Parameter group 96 System (page 546).

Application example 1: Override for single override frequency control

The air handler unit (AHU) that normally provides conditioned air to the occupied zone may be switched into a smoke control mode by the fire alarm system. The AHU dampers are typically configured to full outside air and exhaust air paths, in smoke control mode. The supply fan and the return/exhaust fan are controlled to predetermined speeds to provide the specified air flow and space pressurization. This example consists of:

- A start/stop command from the building automation system (BAS) for Normal mode operation
- A 0...10 V DC analog speed command signal from the BAS for Normal mode operation
- A Freezestat safety configured as a low priority safety interlock that will be ignored in the override mode
- A duct high static pressure safety (Overpressure) configured as a high priority safety interlock that will operate in normal and override modes
- A supply air smoke detector/alarm safety configured as a high priority safety interlock that will operate in normal and override modes
- In the override mode, the drive will operate at a single, predefined override frequency (air balance preset of 48 Hz)
- In the override mode the high priority safeties will be reset as many times as required to ensure the system stays in operation
- Override mode is enabled by relay output from the fire alarm system to the drive
- · A run/stop status feedback from the drive to the BAS
- A fault/not-faulted status feedback from the drive to the BAS.

Wiring diagram

010 V DC speed reference signal - 1 SCR Signal cable shield (screen) 2 Al1 Output frequency/speed reference signal - 3 AGND Analog input circuit common + 10V Reference voltage 10 V DC 5 Al2 Actual feedback: 020 mA 6 AGND Analog input circuit common - AO1 Output frequency: 010 V 8 AO2 Motor current: 020 mA	co: 0 10 V		
reference signal 3	co: 0 10 V		
4 +10V Reference voltage 10 V DC 5 Al2 Actual feedback: 020 mA 6 AGND Analog input circuit common 7 AO1 Output frequency: 010 V	CC. U 10 V		
5 Al2 Actual feedback: 020 mA 6 AGND Analog input circuit common 7 AO1 Output frequency: 010 V			
6 AGND Analog input circuit common 7 AO1 Output frequency: 010 V			
7 AO1 Output frequency: 010 V			
	Analog input circuit common		
Motor current: 0 20 m/	Output frequency: 010 V		
8 AO2 Motor current: 020 mA	Motor current: 020 mA		
9 AGND Analog output circuit common			
X2 & X3 Aux. voltage output and programmable digital input	uts		
10 +24V Aux. voltage output +24 V DC, max	x. 250 mA		
Start/stop signal 11 DGND Aux. voltage output common			
DCOM Digital input common for all			
Freezestat safety 13 DI1 Stop (0) / Start (1)			
14 DI2 Not configured	Ŭ		
High static safety 15 DI3 Start interlock 3 (1 = allow start)			
(Overpressure) DI4 Start Interiock 1 (1 - allow start)			
DIS Start interlock 2 (1 = allow start)			
Supply air smoke 18 DI6 Override detector safety 75 YZ V8 Polay outputs			
AG, AT, AG Relay outputs			
	rgize damper		
1.0 1.1	onnected to 21		
21 RO1B - 2A			
Running Runr	9		
1.0-2.	onnected to 24		
24 RO2B 2 A			
Fault Status	t condition		
	onnected to 26		
27 RO3B 2 A			

Quick steps - Programming summary

Unless otherwise noted, the settings listed below are changed relative to the drive's factory defaults to meet the application requirements. The settings identified below are specific to the configuration of override mode and configuration of the Interlock text, and do not review the complete normal mode configuration.

Menu > Primary settings > Override

Edit Override mode: Critical

Edit Activate override from: DI6 high
 Edit Reference from: Override frequency

Edit Override frequency: 48.0 Hz

Edit Direction selection: Forward (default)

Select Override safeties

✓ Use start interlock 1

✓ Use start interlock 2

Edit Wait between reset attempts: 5.0 s (default)

• Edit Max attempts: 5 (default)

Menu > Primary settings > Start, stop, reference > Interlocks/permissives

✓ Use start interlock 1

· Edit Description text: Overpressure

Select Use start interlock 2

Edit Start enabled when: DI5 high
Edit Description text: Smoke alarm

Select Use start interlock 3

Edit Start enabled when: DI3 high
Edit Description text: Freezestat

Application example 2: Override for PID control

In the application example 1, the drive ran at a predetermined fixed frequency. In this example, the drive will use its internal PID loop to control based on a fixed pressure. A common application of the control scheme used in application example 2 is for the control of a dedicated stairwell pressurization fan in multi-story buildings during a fire or smoke event. The drive controls the stairwell pressurization fan speed to maintain a specific level of positive pressure in the stairwell. The positive pressure relative to the occupied space helps reduce the amount of smoke that enters the stairwell. This example consists of:

- The drive/fan only operates during a fire or smoke event
- An analog differential pressure sensor measuring the pressure differential between the stairwell and the occupied space
- An override input (Run) from the fire alarm system to start the drive and place it in the override mode
- · A dedicated "shutdown" command from the fire alarm system
- An isolation damper end-switch contact closure, wired from the damper to the drive, to indicate the damper open/close status. (The isolation damper has to be proven open for the fan to operate.)
- A High pressure static safety (Overpressure)
- Resetting of high priority faults is Normal with two resets. (This is not "run to destruction".)
- A run/stop status feedback from the drive to the building automation system (BAS)
- · A fault/not-faulted status feedback from the drive to the BAS.

Wiring diagram

	X1	Reference voltage and analog inputs and outputs						
	1	SCR	Signal cable shield (screen)					
	2	Al1	Output frequency/speed reference: 010 V					
	3	AGND	Analog input circuit common					
	4	+10V	Reference voltage 10 V DC					
420 mA pressure → +	5	Al2	Actual feedback: 420 mA					
feedback signal	6	AGND	Analog input circuit common					
	7	AO1	Output frequency: 010 V					
	8	AO2	Motor current: 020 mA					
	9	AGND	Analog output circuit common					
	X2 & X3	Aux. voltage output and programmable digital inputs						
Damper end switch	10	+24V	Aux. voltage output +24 V DC, max. 250 mA					
	11	DGND	Aux. voltage output common					
	12	DCOM	Digital input common for all					
High static safety (Overpressure)	13	DI1	Stop (0) / Start (1)					
	14	DI2	Run permissive (1 = allow start)					
Fire alarm	15	DI3	Not configured					
"shutdown")	16	DI4	Start interlock 1 (1 = allow start)					
´ \	17	DI5	Start interlock 2 (1 = allow start)					
Fire alarm override/run	18	DI6	Override					
overnde/run		Relay outputs						
Damper actuator	19	RO1C	Damper control Energize damper					
	20	RO1A	250 V AC / 30 V DC 19 connected to 21					
	21	RO1B	□ □ 2A					
Run status Fault status	22	RO2C	Running Running					
	23	RO2A	250 V AC / 30 V DC 22 connected to 24					
	24	RO2B	2 A					
	25	RO3C	Fault (-1) Fault condition					
	26	RO3A	250 V AC / 30 V DC 25 connected to 26					
	27	RO3B	<u></u>					

Quick steps - Programming summary

Unless otherwise noted, the settings listed below are changed relative to the drive's factory defaults to meet the application requirements. The settings identified below are specific to configuration of the Override mode and configuration of the Interlock text, and do not review the complete setup of the PID configuration.

Primary settings > Override

- · Edit Override mode: Normal
- Edit Activate override from: DI6 high
- Edit Reference from: PID, set 1
- Edit Direction selection: Forward (default)
- Select Override safeties
 - Select Run permissive signal
 - Select Start interlock 1
 - Select Start interlock 2
- Select **Use autoreset for critical faults**
 - Edit Wait between reset attempts: 5.0 s (default)
 - Edit Max attempts: 2

Primary settings > Start, stop, reference > Interlocks/permissives

- Select ☑ Run permissive signal
 - Edit Description text: Damper end switch
- Select Use start interlock 1
 - · Edit Description text: Overpressure
- Select Use start interlock 2
 - · Edit Start enabled when: DI5 high
 - Edit Description text: Smoke alarm

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.

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 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).

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 building automation system (BAS) controller.

Failure to wire the interlock(s) directly to the drive can:

- Inadvertently allow Hand mode operation, when an interlock is not satisfied.
- Prevent operation in the Hand mode. For example, one or more interlocks are
 wired to a separate BAS controller that then provides a single interlock to the
 drive. If the BAS controller has failed, the drive will not be receiving the interlock
 status from BAS controller, thus not allowing it to run in the Hand mode.

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

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

Settings

- Menu > Primary settings > Start, stop, reference > Interlocks/Permissives
- Parameter 20.41 Start interlock 1 (page 385).

Application examples of interlocks

The following are application examples of interlocks that can be connected to the drive. The drive has predefined text available for all of these examples.

- Overpressure. This interlock is typically used with air handlers for air duct protection. This interlock stops operation when the measured pressure exceeds a threshold, to prevent damage to ductwork. For integration examples, see Application example 2: Supply fan, basic speed follower with interlock and status (page 154) and Application example 3: Supply fan, speed follower complete integration (page 156).
- 2. Motor disconnect open. This interlock is used in a variety of applications that have a disconnect switch between the drive and motor, to indicate the disconnect switch has been opened. This interlock prevents the drive from attempting to operate a motor while the disconnect switch is open. Note that without this interlock wired to the drive, under certain operating conditions, the motor will attempt to draw a high amount of inrush current once the disconnect switch is closed. This high amount of current may cause the drive to fault to protect itself.
- 3. **Vibration trip.** This interlock is typically used with cooling towers for vibration protection. This interlock stops operation when the measured vibration exceeds a threshold, to prevent damage to the tower.
 - A vibration switch that is connected to the drive digital input setup as an interlock should be a latching style vibration switch. A latching style vibration switch requires manual reset to allow the drive to run the motor again. If the vibration switch is an auto reset style, the drive digital input should be setup as an external

event to fault the drive. This can be done in Menu > Primary Settings > Advanced functions > External events

For integration examples, see Application example 5: Cooling tower fan, speed follower (page 160) and Application example 6: Cooling tower, PID (page 162).

- 4. **Smoke alarm.** This interlock is typically used with air handlers to stop the propagation of smoke through air ducts. This interlock stops operation when the measured smoke exceeds a threshold, to limit the amount of smoke spread through the system. For an integration example, see Application example 3: Supply fan, speed follower complete integration (page 156).
- 5. **Freezestat.** This interlock is typically used with air handlers for coil protection. This interlock stops operation when the measured temperature is below a threshold, to prevent freezing and subsequent coil damage. For an integration example, see Application example 4: Supply fan, PID control (page 158).
- 6. Firestat. This interlock is typically used with air handlers. This interlock stops operation when the measured temperature is above a threshold, possibly indicating a fire in the building.
- 7. Low suction or Low pressure. This interlock is typically used with pumps for pump protection. This interlock stops operation when the measured pressure on the suction side of the pump is below a threshold, to prevent pump damage from having it run dry.
- 8. Access door. This interlock is used in a variety of applications that have an access door. This interlock stops operation when the access door is opened. Note that an interlock is not an acceptable alternative to following proper safety procedures.
- 9. Auxiliary open. This interlock text is a generic term used in a variety of applications that have auxiliary contacts that need to stop drive operation. This interlock stops operation when the auxiliary has been opened.
- 10. Pressure relief. This interlock is used in applications that have a pressure relief method, such as a pressure relief valve, that also has an interlock tied to this relief method. This interlock stops operation when pressure exceeds a threshold and pressure is being mechanically relieved.
- 11. Start interlock 1, Start interlock 2, Start interlock 3, and Start interlock 4. This interlock text is a generic term used in a variety of applications that have interlocks. This interlock stops operation when the interlock has been opened or closed depending on the setup. ABB recommends using the predefined Descriptive text and/or custom Label text whenever possible, as this will simplify any future interlock troubleshooting needs.
- 12. Label text. Provides up to 35 characters of free/custom text describing the interlock. This text will appear on the drive control panel when the interlock is no longer satisfied. This text can be used to better describe the interlock itself or its physical location. This text can also be used to enter a phone number for the local

114 Program features

support of that equipment. Note that the Label text option is separate from the predefined text, thus the two can be used in conjunction with each other. For example, the predefined text can be selected for Overpressure, while the Label text may state "Reset switch located in control panel."

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. This end-switch could be part of a damper or valve control scheme. 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 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.

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 building automation system (BAS) controller.

Failure to wire the permissive directly to the drive can:

- Inadvertently allow Hand mode operation when a permissive is not satisfied.
- Prevent operation in the Hand mode. For example, a permissive is wired to a separate BAS controller that then reproduces a permissive to the drive. If the BAS controller were to fail, the drive will not be receiving the permissive status from the BAS controller, thus not allowing it to run in the Hand mode.

Functionality

The drive allows predefined Descriptive text, and Label text (free text), to be associated with the Run permissive. The 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 is configured 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 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, Running, and Damper control. Relay settings that are affected by run permissive include: Warning and Fault/Warning.

Settings

- Menu > Primary settings > Start, stop, reference > Interlocks/permissives
- Parameter 20.40 Run permissive (page 384).

Application example 1: Damper end switch

The run permissive function is used in damper control to monitor the damper status through the damper end switch. Sequence of operation:

- 1. Drive receives start command, either via Hand or Auto source.
- 2. Drive verifies safeties are satisfied and end switch has not yet been satisfied.
- 3. Drive activates a relay output that was programmed to Damper control. This relav allows power to the actuator.
- 4. Once the damper end switch closes, run permissive is satisfied and the drive outputs to the motor.

See the figure on page 353 and Application example 3: Supply fan, speed follower complete integration (page 156).

Application example 2: Valve opening

The Run permissive function is used in valve control to prevent the pump from running until the valve is opened. The sequence for valve opening is similar to the previous damper example, although the relay output in step 3 could also be programmed for Started or Running.

Ramps

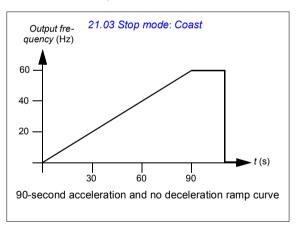
Overview

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.

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**.

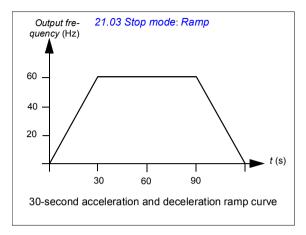
The deceleration ramp is the amount of time required for the drive to ramp down from the ramp time target frequency to 0 Hz. The most typical settings of ramp time target frequency are 50 Hz outside of North America and 60 Hz for North America. Note that the ramps function is always active during operation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

In fan applications, the stop mode is typically set to coast, which causes 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. 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 guickly, 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 HVAC pumps and fans, 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.

The drive also supports the ability to have two ramp sets. This feature is most commonly used in situations where a fast acceleration time is needed to a certain speed, and then a slower acceleration time is needed above that speed. This feature is configured with Menu > Primary settings > Ramps > Use two ramp sets.

Settings

- Menu > Primary settings > Ramps
- Speed reference ramping: Parameters 23.11...23.15 and 46.01 (pages 405 and 501)
- Frequency reference ramping: Parameters 28.71...28.75 and 46.02 (pages 420 and 501)
- Floating point control (Motor potentiometer): Parameter 22.75 (page 404)
- Emergency stop ("Off3" mode): Parameter 23,23 Emergency stop time (page 406).

Application examples

Referring to Application example 7: Chilled water pump (page 166) and Application example 8: Condenser water pump (page 168), the drive is programmed to have the drive ramp the motor to a stop to prevent water hammer. All of the fan application examples are set up to coast to stop.

In the case of the fan application examples, it is not necessary to control the fan while stopping because the resistive forces are not great enough to cause damage to any part in the system. The fan will slowly come to a stop due to the air resistance and friction in the system. If a drive receives a new run command while the fan is still slowing, the drive can catch the spinning motor and ramp the fan to the reference speed.

In the pump application examples, the fluid in the pipes can create enough force on the pump to cause the pump to come to a stop very quickly after the drive stops controlling the motor. This sudden stop will cause a pressure surge in the pipes, often known as water hammer. Water hammer problems include noise and vibration, but can also cause major problems like pipe collapse. By using the drive to control the slowdown of the pump over a longer period of time, the pressure change is not sudden and the water hammer issue is eliminated.

Limits

Limits overview

The drive has multiple limits that can be set to prevent the drive from causing damage to the motor or the mechanical 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. Also, certain gearbox style cooling towers require a minimum speed setting to provide proper lubrication of the gearbox. 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.

Application examples

Referring to Application example 5: Cooling tower fan. speed follower (page 160) and Application example 6: Cooling tower, PID (page 162), the minimum frequency is set based on limitations on the lubrication requirements of the fan's gearbox. In this case, the limit was is based on information provided by the equipment manufacturer.

While the other examples on pages 152...168 do not use limitations, there may be a benefit. For example, in the pumping application examples, a pump manufacturer may recommend a minimum flow of 25%. Flow is linearly related to motor speed. In this example, assuming a 60 Hz pump system, the drive's minimum frequency would be set to 15 Hz.

Application control

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 436).

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**.

Settings

- Menu > Primary settings > Advanced functions > External events
- Parameters 31.01...31.10 (page 434).

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 395) and 28 Frequency reference chain (page 413).

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.

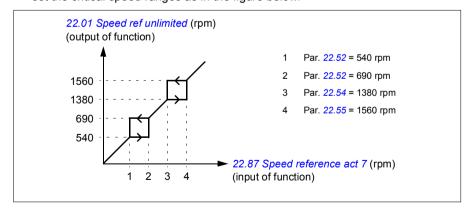
When the drive is limiting the allowed output speeds/frequencies, it limits to the absolutely lowest critical speed (critical speed low or critical frequency low) when accelerating from standstill, unless the speed reference is over the upper critical speed/ frequency limit.

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

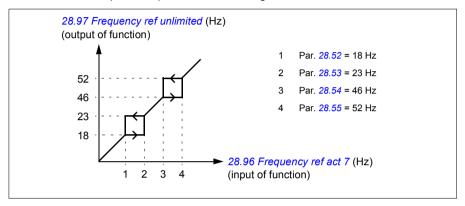
- enable the critical speeds function by turning on bit 0 of parameter 22.51 Critical speed function, and
- set the critical speed ranges as in the figure below.



Example for critical frequencies:

A fan 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 speed frequencies as in the figure below.



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 402)
- Critical frequencies: parameters 28.51...28.57 (page 420).

Timed functions

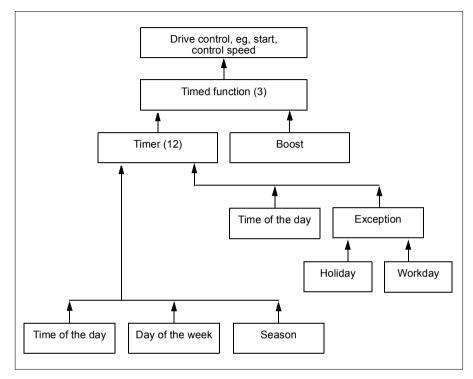
The base entity of the timed functions is called a timer. A timer can be active based on time of the day, day of the week and season of the year. In addition to these time related parameters, the timer activation can be influenced by so called exceptional days (configurable as holiday or workday). For 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 exceptional days.

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 fan or pump 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 451).

Motor control

Speed control mode

The motor follows a speed reference given to the drive. This mode can be used either 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 395.

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 413.

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 565)

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:

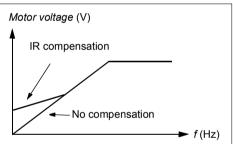
- If the exact nominal motor values are not available or the drive needs to run different motor after the commissioning phase
- If a short commissioning time is needed or no ID run is wanted
- In multimotor systems: 1) if the load is not equally shared between the motors. 2) if the motors are of different 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 runs a medium-voltage motor through a step-up transformer
- 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 91).

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 559), 97.94 IR comp max frequency (page 560) and 99.04 Motor control mode (page 562)
- Parameter group 28 Frequency reference chain (page 413).

U/f ratio

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 or fan 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.

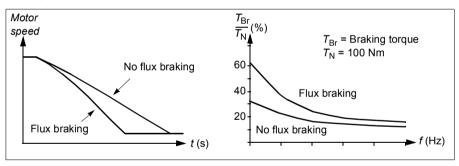
The *U*/f function cannot be used with energy optimization; if parameter 45.11 Energy optimizer is set to Enable, parameter 97.20 *U*/F ratio is ignored.

Settings

- Menu > Primary settings > Motor > U/f ratio
- Parameter 97.20 U/F ratio (page 560).

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 557).

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 postmagnetization.

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.

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 391).

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.

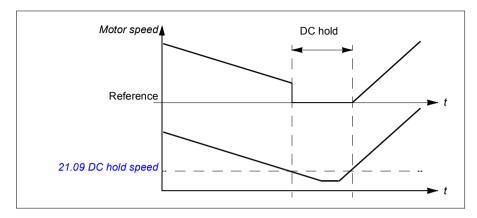
Settings

 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.

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. Postmagnetization 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).

Settinas

 Parameters 21.03 Stop mode (page 388), 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 8 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
- Parameter 97.01 Switching frequency reference and 97.02 Minimum switching frequency (page 544).

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:

- 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.
- 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.

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

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.

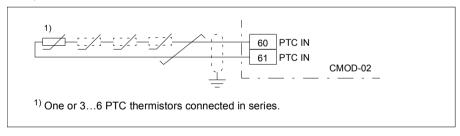
To fulfil this requirement, connect a thermistor to the drive's control terminals using any of these alternatives:

- 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.

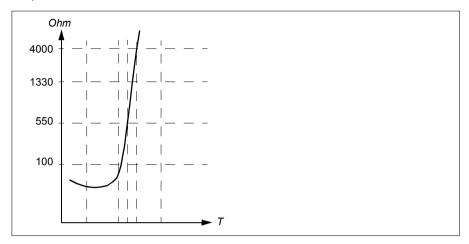
Temperature monitoring using PTC sensors

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).



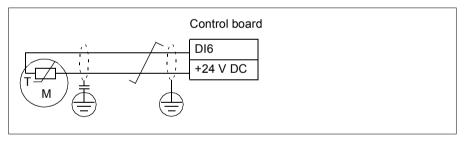
The resistance of the PTC sensor increases when its temperature rises. The increasing resistance of the sensor decreases the voltage at the input, and eventually its state switches from 1 to 0, indicating overtemperature.

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 133.



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 133.

For the wiring of the sensor, see chapter Electrical installation, section Al1 and Al2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs (X1) in the Hardware manual of the drive

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 133.

For the wiring of the sensor, see chapter Electrical installation, Al1 and Al2 as Pt100. Pt1000, Ni1000, KTY83 and KTY84 sensor inputs (X1) in the Hardware manual of the rive.

Temperature monitoring using Ni1000 sensors

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. The temperature measurement function reads the voltage through the analog input and converts it into degrees Celsius.

See section *Insulation* on page 133.

For the wiring of the sensor, see chapter Electrical installation, Al1 and Al2 as Pt100, Pt1000, Ni1000, KTY83 and KTY84 sensor inputs (X1) in the Hardware manual of the drive.

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 136 show typical KTY84 sensor resistance values as a function of the motor operating temperature.

See section *Insulation* on page 133.

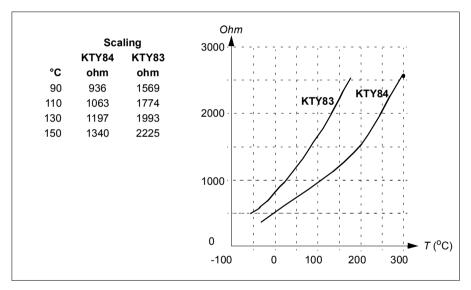
For the wiring of the sensor, see chapter *Electrical installation*, *Al1 and Al2 as Pt100*, *Pt1000*, *Ni1000*, *KTY83 and KTY84 sensor inputs* (X1) in the *Hardware manual* of the drive

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.

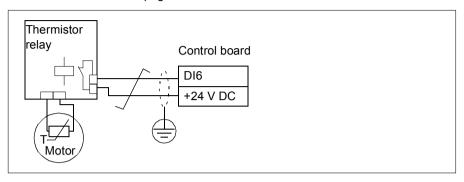
See section *Insulation* on page 133.

For the wiring of the sensor, see chapter *Electrical installation*, *Al1 and Al2 as Pt100*, *Pt1000*, *Ni1000*, *KTY83 and KTY84 sensor inputs* (*X1*) in the *Hardware manual* of the drive.

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 133.



Settings

Parameter group 35 Motor thermal protection (page 459).

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.

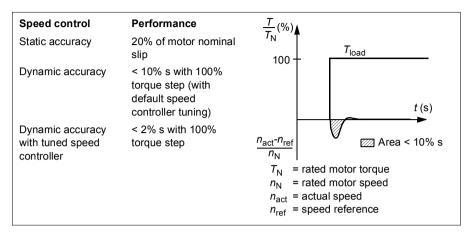
Stator flux is calculated by integrating the motor voltage in vector space. Rotor flux can be calculated from stator flux and the motor model. Motor torque is produced by controlling current 90 degrees from the rotor flux. By utilizing the identified motor model, the rotor flux estimate is improved. 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 562) and 99.13 ID run requested (page 565).

Speed control performance figures

The table below shows typical performance figures for speed control.



Floating point control (Motor potentiometer)

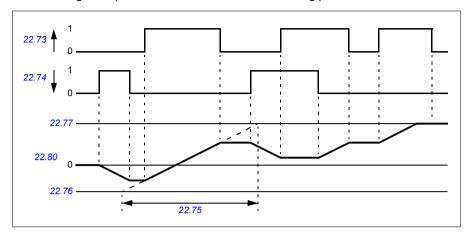
The Floating point control (parameters are named Motor potentiometer, however) is, in effect, a counter whose value can be adjusted up and down using two digital signals selected by parameters 22.73 Motor potentiometer up source and 22.74 Motor potentiometer down source.

When the Floating point control 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.

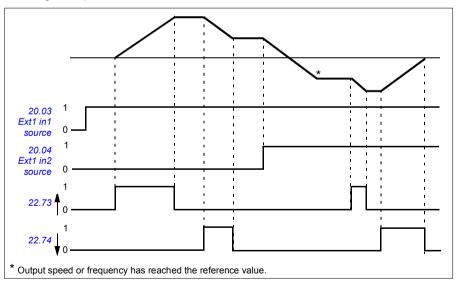
The change rate is defined in 22.75 Motor potentiometer ramp time as the time it would take for the value to change from the minimum (22.76 Motor potentiometer min value) to the maximum (22.77 Motor potentiometer max value) or vice versa. If the up and down signals are simultaneously on, the counter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

The output of the Floating point control counter 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.





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 403).

DC voltage control

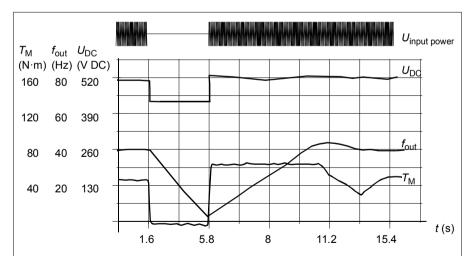
Overvoltage control

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.



 $U_{\rm DC}$ = Intermediate circuit voltage of the drive, $f_{\rm out}$ = Output frequency of the drive, $T_{\rm M}$ = Motor torque

Loss of supply voltage at nominal load (f_{out} = 40 Hz). The intermediate circuit DC voltage drops to the minimum limit. The controller keeps the voltage steady as long as the input power is switched off. The drive runs the motor in generator mode. The motor speed falls but the drive is operational as long as the motor has enough kinetic energy.

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]				
See 95.01 Supply voltage.	AC supply voltage range [V] 380415	AC supply voltage range [V] 440480			
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	0.85×1.41×par 95.03 value 1)	0.85×1.41×par 95.03 value 1)			
	0.85×1.41×380 = 455 ²⁾	0.85×1.41×440 = 527 ²⁾			
Undervoltage control limit	0.75×1.41×par 95.03 value 1)	0.75×1.41×par 95.03 value 1)			
	0.75×1.41×380 = 402 ²⁾	0.75×1.41×440 = 465 ²⁾			
Charging relay closing limit	0.75×1.41×par 95.03 value 1)	0.75×1.41×par 95.03 value 1)			
	0.75×1.41×380 = 402 ²⁾	0.75×1.41×440 = 465 ²⁾			
Charging relay opening limit	0.65×1.41×par 95.03 value 1)	0.65×1.41 ×par 95.03 value 1)			
	0.65×1.41×380 = 348 ²⁾	0.65×1.41×440 = 403 ²⁾			
DC voltage at upper bound of supply voltage range $(U_{\rm DCmax})$	560	648			
DC voltage at lower bound of supply voltage range ($U_{\rm DCmin}$)	513	594			
Charging activation/standby limit 3)	0.65×1.41×par 95.03 value 1)	0.65×1.41×par 95.03 value 1)			
	0.65×1.41×380 = 348 ²⁾	0.65×1.41×440 = 403 ²⁾			
Undervoltage fault limit	0.45×1.41×par 95.03 value 1)	0.45×1.41×par 95.03 value 1)			
	0.45×1.41×380 = 241 ²⁾	0.45×1.41×440 = 279 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 ACH580-31.

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).

ACH580-31	Supply voltage range [V AC] (see 95.01 Supply voltage)							
Level [V DC (% of UDCmax)]	208240	380415	440480	500	525600	660690		
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.

Settinas

 Parameters 01.11 DC voltage (page 327), 30.30 Overvoltage control (page 429), 30.31 Undervoltage control (page 430), 95.01 Supply voltage (page 544) and 95.02 Adaptive voltage limits (page 545).

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 $U_{\rm DCmax}$. 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 327); parameter group 43 Brake chopper (page 494).

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 444).

Application example 1: Dirty filter

The supervisory function can be used to indicate a dirty filter. Since pressure drop across the air filter increases as the filter becomes dirty, a transducer can be installed that measures the differential pressure across the filter. The transducer output signal is an analog value that is fed back to an analog input on the drive. The supervisory function in the drive is configured to monitor the analog value.

For example, the user wants to be notified when an air handler filter needs to be replaced. Starting with a published value for the drop across a clean filter, a value is established that corresponds to a dirty filter scenario. The drive is then configured to monitor the transducer's analog output signal. This includes a supervision level to indicate when a threshold for a dirty filter has been exceeded. To use this status, a drive relay output can be used instead of a separate relay to indicate the filter status. This information may also be monitored over fieldbus communications, such as BACnet.

The benefit of using the drive to accomplish this function is to eliminate the need for one analog (transducer) input on the controller, thereby resulting in reduced cost of the building automation controller for the air handler.

Application example 2: High current

The supervisory function can be used to monitor motor current for increasing or excessive loading. This increase in loading may be due to mechanical failure/wear. A single "high current" threshold may be used with the supervisory function. Alternately, parameter group 37 *User load curve* (page 473) can be used to detect this scenario throughout the entire speed range, as shown under *User load curve* (page 145).

For example, a fan bearing is beginning to fail due to lack of lubrication. The bearing surfaces are beginning to bind, causing the motor current draw to exceed its normal

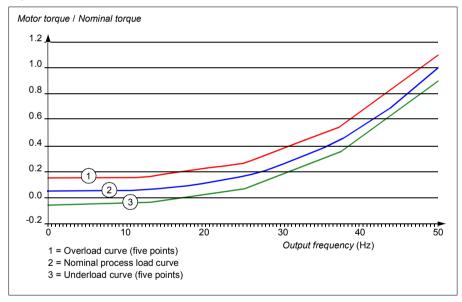
level. The supervisory function indicates the load is drawing higher current than normal. As a result, service personnel can investigate the problem. The goal is to find the problem before a catastrophic failure occurs.

User load curve

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 fan load profiles becoming too high.

Underload can be, for example, used to monitor for load dropping and breaking of conveyer belts or fan belts.

Settings

Parameter group 37 User load curve (page 473).

Application example: Proof of flow

The user load curve function can be used to indicate proof of flow. Proof of flow is most commonly used for indicating a broken belt on a belt-driven fan. This drive function eliminates the need and cost for an external current-sensing relay and is more reliable. External current-sensing relays depend on the difference in motor current draw between a full-speed, no-load condition (broken belt) and a slow speed with load. This difference is minimal since the motor's magnetizing current makes up the vast majority of the motor's current consumption, which is unrelated to load. The drive's user load curve is adjustable and ideal for variable speed, variable torque, proof-of-flow applications.

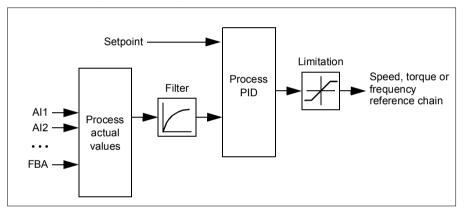
For example, during commissioning of the fan, the motor torque is recorded with the belt installed and the fan operating at 50% speed. The drive panel is capable of displaying the motor torque. See parameter *01.10 Motor torque* (page *327*) Using this value as a reference point, a low torque threshold is determined to indicate a broken belt indication. This technique verifies that not only the drive is running the motor, but that the motor is also loaded by the application. A time delay value is available and configurable to allow for system variables. A relay output can be configured for the user load curve (proof of flow) status.

Process PID control

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 314 and 316.



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 87).

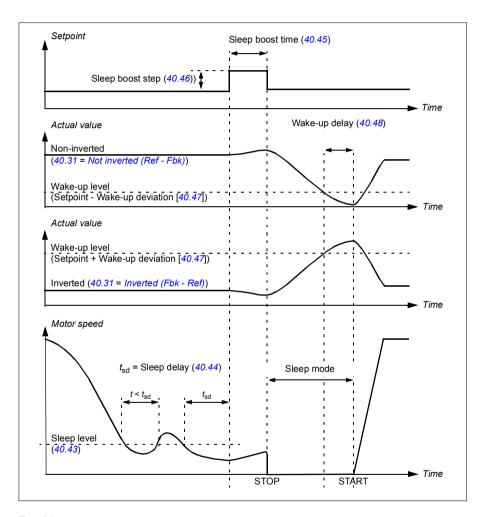
Sleep and boost functions for process PID control

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 wakeup 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 476) and 41 Process PID set 2
	(page 492).

Multipump control

Single pump and fan control (PFC)

The Single pump and fan control (PFC) is used in pump or fan systems consisting of one drive and multiple pumps or fans. The drive controls the speed of one of the pumps/fans and in addition connects (and disconnects) the other pumps/fans 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 and fan control (PFC) is supported in external control location EXT2 only.

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/fans equal over time to even their wear. The other is to prevent any pump/fan 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 124).

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).

Soft pump and fan control (SPFC)

The Soft pump and fan control (SPFC) logic is a variant of the PFC logic for pump and fan 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/fan unit to be started and starts controlling the speed of that one, while the previously controlled unit now is 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.

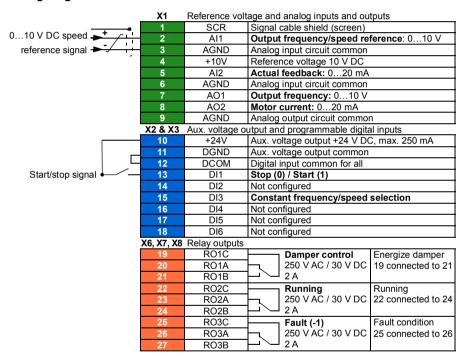
Settings

- Parameter group 10 Standard DI, RO (page 345)
- Parameter group 40 Process PID set 1 (page 476)
- Parameter groups 76 PFC configuration (page 534) and 77 PFC maintenance and monitoring (page 541).

Application example 1: Supply fan, Basic speed follower

There are a variety of different inputs and control schemes that may be applied to a drive being used on a supply fan. The example below consists of one of the more basic configurations. The following pages will build upon this example and provide more advanced examples. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- A 0...10 V DC analog speed command signal from the BAS
- No safeties to the drive and no status feedback to the BAS.



Quick steps – Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

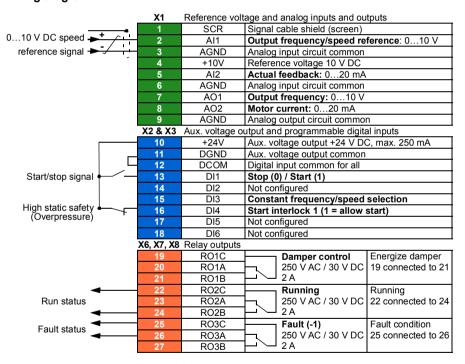
Menu > Primary settings	Start, stop, reference	ce > Interlocks/permissives
-------------------------	--	-----------------------------

Unselect □ Use start interlock 1

Application example 2: Supply fan, basic speed follower with interlock and status

There are a variety of different inputs and control schemes that may be applied to a drive being used as the controller for a supply fan. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- A 0...10 V DC analog speed command signal from the BAS
- A duct high static pressure safety (Overpressure) contact wired to the drive
- A run/stop status feedback from the drive to the BAS
- A fault/not-faulted status feedback from the drive to the BAS.



Quick steps – Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

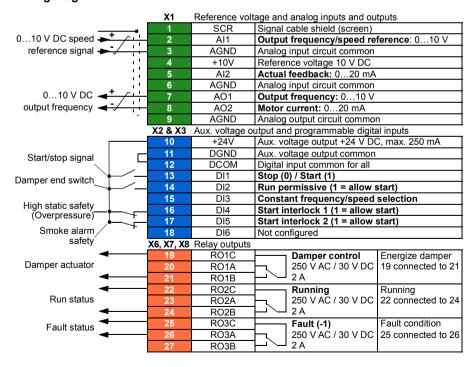
Menu > Primary settings > Start, stop, reference > Interlocks/permissives

- ✓ Use start interlock 1
 - Edit **Description text**: Overpressure

Application example 3: Supply fan, speed follower complete integration

There are a variety of different inputs and control schemes that may be applied to a drive being used as the controller for a supply fan. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- A 0...10 V DC analog speed command signal from the BAS
- A damper end-switch contact closure to the drive, to indicate the damper open/closed status
- · A duct high static pressure safety (Overpressure) contact wired to the drive
- A supply air Smoke alarm safety contact wired to the drive
- A run/stop status feedback from the drive to the BAS
- A fault/not-faulted status feedback from the drive to the BAS
- · A relay output to the external, actuator control circuit to open an isolation damper
- A 0...10 V DC analog output signal from the drive, to indicate drive output frequency, to the BAS.



Quick steps – Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

Primary settings > Start, stop, reference > Interlocks/permissives

• Select **☑** Use run permissive signal

• Edit Run enabled when: DI2 high

• Edit **Description text**: Damper end switch

✓ Use start interlock 1

• Edit **Description text**: Overpressure

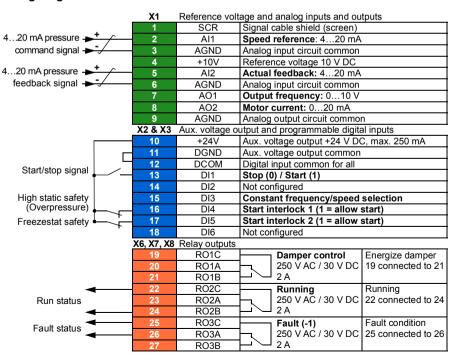
Select ✓ Use start interlock 2.

• Edit Start enabled when: DI5 high • Edit **Description text**: Smoke alarm

Application example 4: Supply fan, PID control

The drive can be used with a supply fan to maintain static air duct pressure. The drive must speed up when the pressure is too low, and slow down when the pressure is too high. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- A 4...20 mA setpoint command signal from the BAS
 - 4 mA = 0.0 kPa (or 0.0 inWC)
 - 20 mA = 0.5 kPa (or 2.0 inWC)
- A 4...20 mA analog pressure transducer feedback signal wired to the drive with a pressure range of 0...1.25 kPa (0...5 inWC)
 - 4 mA = 0.0 kPa (0.0 inWC)
 - 20 mA = 1.25 kPa (5.0 inWC)
- A duct high static pressure safety (Overpressure) contact wired to the drive
- A Freezestat safety contact wired to the drive
- A run/stop status feedback from the drive to the BAS
- · A fault/not-faulted status feedback from the drive to the BAS.



Quick steps - Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

Menu > Primary settings > Start, stop, reference > Interlocks/permissives

✓ Use start interlock 1

Edit Description text: Overpressure

Select

 Use start interlock 2

Edit Description text: Freezestat

Menu > Primary settings > PID control

Select Use PID control

Edit Start/stop/dir from: DI1 start/stop

Edit **Unit**: *kPa* (or *inWC*)

Menu > Primary settings > PID control > Feedback

Edit Source: Al2 Scaled

Menu > Primary settings > PID control > Feedback > Al2 Scaling

Edit Range: 4...20 mA

• Edit **Scaled min**: 0 kPa (or 0 inWC)

• Edit Scaled max: 1.25 kPa (or 5.0 inWC)

Menu > Primary settings > PID control > Setpoint

Edit Source: Al1 scaled

Menu > Primary settings > PID control > Setpoint > Al1 Scaling

Edit Range: 4...20 mA

• Edit Scaled min: 0.0 kPa (or 0.0 inWC) Edit Scaled max: 0.5 kPa (or 2.0 inWC)

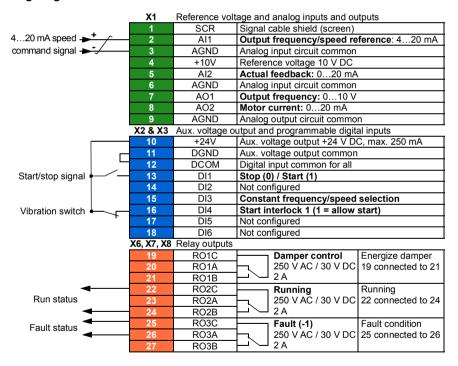
Menu > Primary settings > PID control

Tuning (adjust the gain and integration time of the PID, as needed for the application)

Application example 5: Cooling tower fan, speed follower

There are a variety of different inputs and control schemes that may be applied to a drive being used as the controller for a cooling tower. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- A 4...20 mA analog speed command signal from the BAS
- · A vibration safety switch contact wired to the drive
- A run/stop status feedback from the drive to the BAS
- A fault/not-faulted status feedback from the drive to the BAS
- Minimum frequency programmed to 30 Hz due to lubrication needs of this particular fan's right angle gear box.



Quick steps - Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

Menu > Primary settings > Start, stop, reference > Primary auto control location > Al1 scaling

• Edit Range: 4...20 mA

Primary settings > Start, stop, reference > Interlocks/permissives

✓ Use start interlock 1

Edit Description text: Vibration switch

Primary setting > Limits

• Edit Minimum frequency: 30.00 Hz

Application example 6: Cooling tower, PID

There are a variety of different inputs and control schemes that may be applied to a drive being used as the controller for a Cooling tower. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- Water temperature setpoint fixed at 24 °C (75 °F). The drive speeds up the fan when the temperature is too warm, and slows it down when the temperature is too cool
- A 4...20 mA analog water temperature transducer feedback signal wired directly to the drive with a temperature range of -30...50 °C (-22...122 °F)
 - 4 mA = -30 °C (-22 °F)
 - 20 mA = 50 °C (122 °F)
- · A vibration safety switch contact wired to the drive
- A run/stop status feedback from the drive to the BAS
- A fault/not-faulted status feedback from the drive to the BAS
- Minimum frequency programmed to 20 Hz due to lubrication needs of this particular fan's right angle gear box
- The drive stops the fan and enters sleep mode when the motor speed drops below 25 Hz for more than 30 seconds
- The drive wakes up from sleep mode when the water temperature increases above 26 °C (79 °F), which is also a deviation of 2 °C (4 °F) above the setpoint of 24 °C (75 °F)

	X1	Reference volt	tage and analog inputs and outputs	
	1	SCR	Signal cable shield (screen)	
	2	Al1	Output frequency/speed reference: 010 V	
	3	AGND	Analog input circuit common	
	4	+10V	Reference voltage 10 V DC	
420 mA temp. → +	5	Al2	Al2 Actual feedback: 420 mA	
feedback signal +	6	AGND	AGND Analog input circuit common	
	7	AO1	O1 Output frequency: 010 V	
	8	AO2	AO2 Motor current: 020 mA	
	9	AGND	Analog output circuit common	
	X2 & X3	Aux. voltage o	utput 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	
Start/stop signal ————	13	DI1	11 Stop (0) / Start (1)	
	14	DI2	Not configured	
	15	DI3	Constant frequency/speed selection	
Vibration switch -	16	DI4	Start interlock 1 (1 = allow start)	
F	17	DI5	Not configured	
	18	DI6	Not configured	
	X6, X7, X8	Relay outputs		
	19	RO1C	Damper control Energize damper	
	20	RO1A	250 V AC / 30 V DC 19 connected to 21	
	21	RO1B	⊢	
◄	22	RO2C	Running Running	
Run status	23	RO2A	250 V AC / 30 V DC 22 connected to 24	
◀——	24	RO2B	→ 2 A	
Fault status	25	RO3C	Fault (-1) Fault condition	
- duit status	26	RO3A	250 V AC / 30 V DC 25 connected to 26	
	27	RO3B	— → 2A	

Quick steps - Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

Menu > Primary settings > Start, stop, reference > Interlocks/permissives

✓ Use Start interlock 1

· Edit Description text: Vibration switch

Menu > Primary settings > Limits

• Edit Minimum frequency: 20 Hz

Menu > Primary settings > PID control

Select Use PID control

Edit Start/stop/dir from: DI1 start/stop

• Edit **Unit**: °C (or °F)

Menu > Primary Settings > PID control > Feedback

Edit Source: Al2 Scaled

Menu > Primary Settings > PID control > Feedback > Al2 Scaling

• Edit Range: 4...20 mA

Edit Scaled min: -30.0°C (or -22°F)
 Edit Scaled max: 50.0°C (or 122°F)

Menu > Primary Settings > PID control > Setpoint

· Edit Source: Constant setpoint

Edit Constant setpoint 1: 24.0°C (or 75.0°F)

Menu > Primary Settings > PID control >

 Tuning (adjust the gain and integration time of the PID, as needed for the application)

Edit Increase output: Feedback > setpoint

Menu > Primary Settings > PID control > Sleep function

Select Use sleep function

• Edit Activation level: 25 Hz

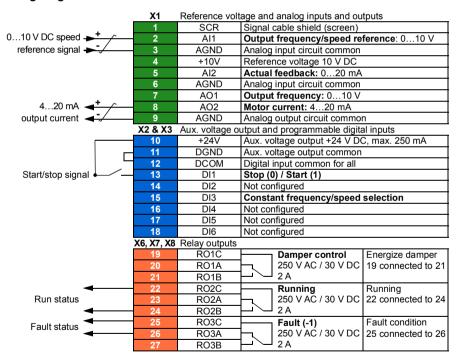
• Edit **Delay:** 30.0 s

Edit Wake-up deviation: 2 °C (or 4 °F)

Application example 7: Chilled water pump

There are a variety of different inputs and control schemes that may be applied to the drive being used on a chilled water pump. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- A 0...10 V DC analog speed command signal from the BAS
- · A run/stop status feedback from the drive to the BAS
- A fault/not-faulted status feedback from the drive to the BAS
- A 4...20 mA analog output signal from the drive, to indicate drive output current, to the BAS
- When a stop command is received, the drive shall ramp the motor to a stop to prevent water hammer.



Quick steps – Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

Menu > I/O > AO2

• Edit Range: 4...20 mA

Menu > Primary settings > Ramps

• Edit Stop mode: Ramp

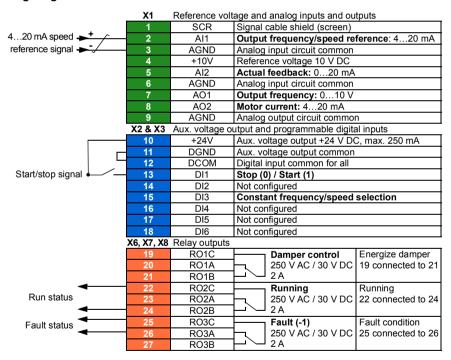
Menu > Primary settings > Start, stop, reference > Interlocks/permissives

Unselect □ Use start interlock 1

Application example 8: Condenser water pump

There are a variety of different inputs and control schemes that may be applied to a drive being used on a condenser water pump. The example below consists of:

- Start/stop contact closure from the building automation system (BAS)
- A 4...20 mA analog speed command signal from the BAS
- · A run/stop status feedback from the drive to the BAS
- A fault/not-faulted status feedback from the drive to the BAS
- When a stop command is received, the drive ramps the motor to a stop to prevent water hammer
- Minimum frequency set to 20 Hz.



Quick steps – Programming summary

Settings listed below are changed relative to the drive's factory defaults to meet the application requirements:

Menu > Primary settings > Start, stop, reference > Primary auto control location Al1 scaling

• Edit Range: 4...20 mA

Menu > Primary settings > Start, stop, reference > Interlocks/permissives

Unselect □ Use start interlock 1

Menu > Primary settings > Ramps

• Edit Stop mode: Ramp

Menu > Primary setting > Limits

• Edit Minimum frequency: 20 Hz

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 498).

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 171).

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 496)
- Parameters 01.50 Current hour kWh, 01.51 Previous hour kWh, 01.52 Current day kWh and 01.53 Previous day kWh on page 328
- 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

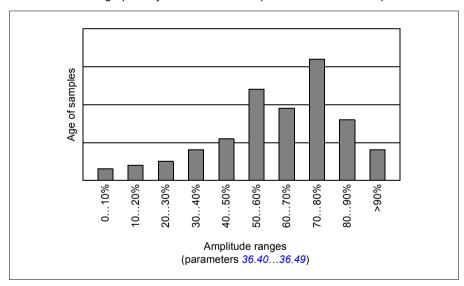
The user can select a signal to be monitored by a peak value logger. The logger records the peak value of the signal along with the time the peak occurred, as well as motor current. DC voltage and motor speed at the time of the peak. The peak value is sampled at 2 ms intervals.

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 panel or the Drive composer PC tool.



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 470).

Managing settings

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 also possible to use digital inputs to switch between user parameter sets. To change a user parameter set, the drive has to be stopped.

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 settings (groups 50...53 and 58)
- parameter 95.01 Supply voltage.

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.

Settings

- Menu > Primary settings > Advanced functions > User sets
- Parameters 96.10...96.13 (page 549).

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 140.

DC undervoltage

See section Undervoltage control (power loss ride-through) on page 140.

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.

Earth (Ground) fault detection (parameter 31.20)

Note that

- an earth fault in the supply cable does not activate the protection
- in a grounded supply, the protection activates within 2 milliseconds
- in an ungrounded supply, the supply capacitance must be 1 microfarad or more
- the capacitive currents caused by shielded motor cables up to 300 meters will not activate the protection
- the protection is deactivated when the drive is stopped.

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.

Al 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.

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 389), 21.05 Emergency stop source (page 389), 23.23 Emergency stop time (page 406), 31.32 Emergency ramp supervision (page 442) and 31.33 Emergency ramp supervision delay (page 443).

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 panel. The assistant 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 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 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 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.

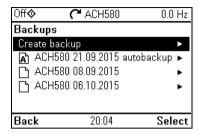
Parameter changes from fieldbus interfaces are ignored unless you have forced parameter saving with parameter *96.07 Parameter save manually*.

Restore

The backups are shown on the 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 panel firmware is restored to a drive with a new firmware from October 2014 or later





Settinas

- Menu > Backups
- Parameter 96.07 Parameter save manually (page 548).

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 503).

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.

Settinas

Parameters 96.54...96.69, 96.71...96.72 (page 552).

User lock

For better 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 22).

- 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, finish with Enter.
- Confirm the new pass code in 96.100 Change user pass code.



WARNING! Store the pass code in a safe place – the user lock cannot be opened even by ABB 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.

Settinas

Parameters 96.02 (page 547) and 96.100...96.102 (page 554).

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 95.01 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.

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

Settings

Parameter 95.01 Special HW settings (page 544).

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 panel or from a selectable source (parameter 31.11 Fault reset selection) such as the digital inputs of the drive. Reseting 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 186.

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

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 185.

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 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 332).

For previously occurred faults and warnings, see

- Menu > Diagnostics > Fault & event log
- parameters in group 04 Warnings and faults (page 332).

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 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 Electrical installation, section Checking the insulation of the assembly in the Hardware manual 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 Electrical installation, section Checking the insulation of the assembly in the Hardware manual 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 Electrical installation, section Checking the insulation of the assembly in the Hardware manual 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
A3A2	DC link undervoltage	Intermediate circuit DC voltage too low (when the drive is stopped).	may cause the motor to rush uncontrollably, or may overload the brake chopper or resistor. Check the supply voltage.
АЗАА	DC not charged	The voltage of the intermediate DC circuit has not yet risen to operating level.	If the problem persists, contact your local ABB representative.
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 R4R9) or if it exceeds 50 °C /122 °F (IP21 frames R0R9), 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, this warning will be generated even if the corresponding fault is defeated. See fault 5081 Auxiliary fan broken (page 200).
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 438). 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 XYYY 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 (96.7196.72) 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.	Check the auxiliary code. See actions for each code below.
		The drive is not dimensioned correctly.	

Code (hex)	Warning / Aux. code	Cause	What to do
	0001	Slip frequency is too small.	Check the settings of the motor
	0002	Synchronous and nominal speeds differ too much.	configuration parameters in groups 98 and 99. Check that the drive is sized correctly for
	0003	Nominal speed is higher than synchronous speed with 1 pole pair.	the motor.
	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 panel to the drive to synchronize the clock. If basic 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 96.10096.102 are visible.	Close the user lock by entering an invalid pass code in parameter 96.02 Pass code. See section Parameter checksum calculation (page 179).
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 179).
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	Al 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 37.1137.15) has a higher value than the previous point.
	0001	Frequency points inconsistent.	Check that each frequency point (37.2037.16) has a higher value than the previous point.
	0002	Underload point above overload point.	Check that each overload point (37.3137.35) has a higher value than
	0003	Overload point below underload point.	the corresponding underload point (37.2137.25).
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.
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.
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 43.0843.10) is incorrect. The parameter is specified by the auxiliary code.
	0000 0001	Resistance value too low.	Check value of 43.10.
	0000 0002	Thermal time constant not given.	Check value of 43.08.
	0000 0003	Maximum continuous power not given.	Check value of 43.09.

Code (hex)	Warning / Aux. code	Cause	What to do
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 43.0643.10). 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.
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	Al supervision Programmable warning: 12.03 Al 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 Al.
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.

Code (hex)	Warning / Aux. code	Cause	What to do
	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).
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).

Code (hex)	Warning / Aux. code	Cause	What to do
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.
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.	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.	The auxiliary code specifies the original warning code in the supply unit control program. See chapter Fault tracing in ACS880 IGBT supply control program firmware manual (3AUA0000131562 [English]).

Code (hex)	Warning / Aux. code	Cause	What to do
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 date34.63 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 147), and parameters 40.4340.48.
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
AFE2	Emergency stop (off1 or off3)	Drive has received an emergency stop (mode selection off1 or off3) command.	drive. 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.
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.
AFF5	Override new start required	The Safe torque off function was active and has been reset while in Override.	A new start signal is required to start the drive again.
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.
AFFE	Override active	Drive is in override mode.	Informative warning.
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 438).
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 189).

196 Fault tracing

Code (hex)	Warning / Aux. code	Cause	What to do
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: 76.8176.84. 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 76.8176.84.
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 76.8176.84.

Fault messages

Code (hex)	Fault / Aux. code	Cause	What to do
1080	Backup/Restore timeout	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 be repeat this. If the fault persists, contact your local ABB representative.
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 Electrical installation, section Checking the insulation of the assembly in the Hardware manual of the drive.
2330	Earth leakage Programmable fault: 31.20 Earth fault	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. Try running the motor in scalar control mode if allowed. (See parameter 99.04 Motor control mode.) If no earth fault can be detected, contact your local ABB representative.
2340	Short circuit	Short-circuit in motor cable(s) or motor	Check motor and motor cable for cabling errors. Check there are no power factor correction capacitors or surge absorbers in motor cable. Cycle the power to the drive.

Code (hex)	Fault / Aux. code	Cause	What to do
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.	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.
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.	Check input power line fuses. Check for loose power cable connections. Check for input power supply imbalance.
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.	Check that overvoltage control is on (parameter 30.30 Overvoltage control). Check that the supply voltage matches the nominal input voltage of the drive. Check the supply line for static or transient overvoltage. Check brake chopper and resistor (if present). Check deceleration time. Use coast-to-stop function (if applicable). Retrofit drive with brake chopper and brake resistor. Check that the brake resistor is dimensioned properly and the resistance is between acceptable range for the drive.
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.

Code (hex)	Fault / Aux. code	Cause	What to do
4290	Cooling	Drive module temperature is excessive.	Check ambient temperature. If it exceeds 40 °C/104 °F (IP21 frames R4R9) or if it exceeds 50 °C /122 °F (IP21 frames R0R9), ensure that load current does not exceed derated load capacity of drive. For all P55 frames, check the derating temperatures. See chapter Technical data, section Derating in the Hardware manual 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 (Editable message text)	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 (Editable message text)	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).
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 CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual (3AXD50000030058 [English].
4991	Safe motor temperature	The CPTC-02 module indicates overtemperature: • 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 <i>A581 Fan</i> (page <i>188</i>).

Code (hex)	Fault / Aux. code	Cause	What to do
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 th the cover is off, activate parameter 31.36 Aux fan fault bybass within 2 min from control unit reboot to temporarily suppress the fault. 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 438). 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 be 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.
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.

Code (hex)	Fault / Aux. code	Cause	What to do
5696	PU state feedback	State feedback from output phases does not match control signals.	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 189).
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.
	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.

Code (hex)	Fault / Aux. code	Cause	What to do
	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	Adapt the program to current block
	0024	current firmware version.	library and firmware version.
	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 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 panel or PC-tool has failed to communicate with the drive as part this operation.	Check 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.
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.

Code (hex)	Fault / Aux. code	Cause	What to do
6684	EFB load fault	Embedded fieldbus (EFB) protocol firmware could not be loaded.	Contact your local ABB representative.
		Version mismatch between EFB protocol firmware and drive firmware.	
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.
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.
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 Resistor braking in the Hardware manual of the drive. Replace brake chopper (if replaceable).

Code (hex)	Fault / Aux. code	Cause	What to do
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 (23.1123.15 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
	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 settings52 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 Fault tracing in ACS880 IGBT supply control program firmware manual (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	Al supervision Programmable fault: 12.03 Al 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	Al1LessMIN	
	0002	Al1GreaterMAX	
	0003	Al2LessMIN.	
	0004	Al2GreaterMAX	
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.
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 438). Check the value of parameter 95.04 Control board supply.
FA82	Safe torque off 2	Safe torque off function is active, ie. STO circuit 2 is broken.	

Code (hex)	Fault / Aux. code	Cause	What to do
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 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 30.12 > (0.55 × 99.09) > (0.50 × synchronous speed) 30.11 ≤ 0, and supply voltage ≥ (0.66 × 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.
	00050008	Internal error.	Contact your local ABB representative.
	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.

Code (hex)	Fault / Aux. code	Cause	What to do
	000D	(Permanent magnet motors only) Second acceleration did not finish within reasonable time.	Contact your local ABB representative.
	000E0010	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 ACH580-31 only.

Warnings

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.

Faults

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.

Modbus RTU control through the embedded fieldbus interface (EFB)

What this chapter contains

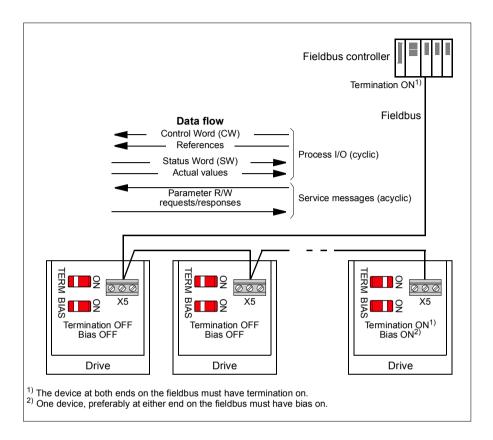
The chapter describes how the drive can be controlled by external devices over a communication network (fieldbus) using the embedded fieldbus interface.

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.

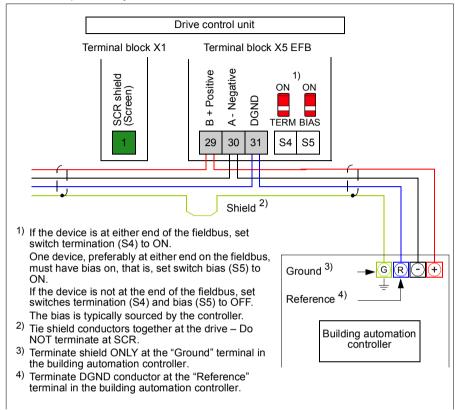


Connecting the drive to the fieldbus

Connect terminal block X5 on the control unit of the drive to the fieldbus. The connection diagram is shown below.

See also chapter BACnet MS/TP control through the embedded fieldbus interface (EFB), section Hardware installation (page 244).

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	Protocol enable	Modbus RTU	Initializes embedded fieldbus communication.		
EMBED	EMBEDDED MODBUS CONFIGURATION				
58.03	Node address	1 (default)	Node address. There must be no two nodes with the same node address online.		
58.04	Baud rate	19.2 kbps (default)	Defines the communication speed of the link. Use the same setting as in the master station.		
58.05	Parity	8 EVEN 1 (default)	Selects the parity and stop bit setting. Use the same setting as in the master station.		
58.14	Communication loss action	No (default)	Defines the action taken when a communication loss is detected.		
58.15	Communication loss mode	Cw / Ref1 / Ref2 (default)	Enables/disables communication loss monitoring and defines the means for resetting the counter of the communication loss delay.		
58.16	Communication loss time	30.0 s (default)	Defines the timeout limit for the communication monitoring.		
58.17	Transmit delay	0 ms (default)	Defines a response delay for the drive.		
58.25	Control profile	ABB Drives (default)	Selects the control profile used by the drive. See section <i>Basics of the embedded fieldbus interface</i> (page 219).		
58.26	EFB ref1 type	Speed or	Defines the types of fieldbus references 1 and		
58.27	EFB ref2 type	frequency (default for 58.26), Transparent, General, Speed, Frequency	2. The scaling for each reference type is defined by parameters 46.0146.03. With the Speed or frequency setting, the type is selected automatically according to the currently active drive control mode.		
58.28 58.29	EFB act1 type EFB act2 type	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 46.0146.03. With the Speed or frequency setting, the type is selected automatically according to the currently active drive control mode.		

Parame	eter	Setting for fieldbus control	Function/Information		
58.31 58.32	EFB act1 transparent source EFB act2 transparent source	Not selected	Defines the source of actual values 1 and 2 when the 58.26 EFB ref1 type (58.27 EFB ref2 type) is set to Transparent.		
58.33	Addressing mode	Mode 0 (default)	Defines the mapping between parameters and holding registers in the 400001465536 (10065535) Modbus register range.		
58.34	Word order	LO-HI (default)	Defines the order of the data words in the Modbus message frame.		
	Data I/O 1 Data I/O 14	For example, the default settings (I/Os 16 contain the control word, the status word, two references and two actual values)	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.		
		RO/DIO control word, AO1 data storage, AO2 data storage, Feedback data storage, Setpoint data storage	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	Refresh settings	Validates the settings of the configuration parameters.		

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	Embedded fieldbus	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 REFER	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

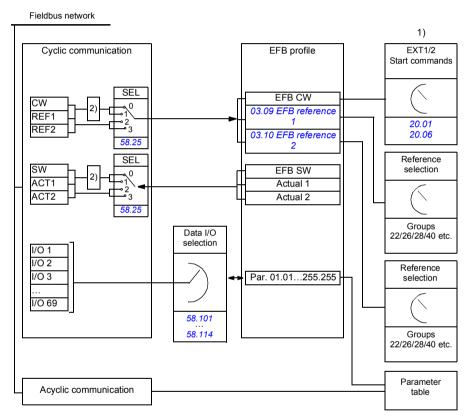
EFB references can be selected as the source at virtually any signal selector parameter by selecting *Other*, then either 03.09 EFB reference 1 or 03.10 EFB reference 2.

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 222).

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 1/2, 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 222).

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 222).

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, torque 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 222).

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 222).

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

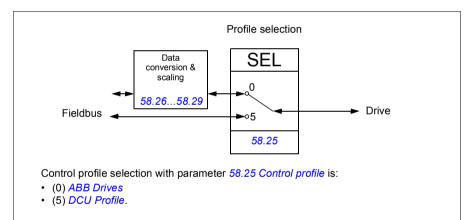
A control profile defines the rules for data transfer between the drive and the fieldbus master, for example:

- · 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 230.

Bit	Name	Value	STATE/Description
0	OFF1_	1	Proceed to READY TO OPERATE.
	CONTROL		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_	1	Continue operation (OFF2 inactive).
	CONTROL	0	Emergency OFF, coast to stop. Proceed to OFF2 ACTIVE, proceed to SWITCH-ON INHIBITED.
2	OFF3_	1	Continue operation (OFF3 inactive).
	CONTROL	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_	1	Proceed to OPERATION ENABLED.
	OPERATION		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	ramp function. Proceed to RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED.
		0	Halt ramping (Ramp Function Generator output held).
6	RAMP_IN_	1	Normal operation. Proceed to OPERATING .
	ZERO		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_	1	Fieldbus control d.	
	CMD	0	Control Word <> 0 or Reference <> 0: Retain last Control Word and Reference.	
			Control Word = 0 and Reference = 0: Fieldbus control d. Reference and deceleration/acceleration ramp are locked.	
11	LOC cont field 0 Sele cont		Select External Control Location EXT2. Effective if the control location is parameterized to be selected from the fieldbus.	
			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	
13	USER_1		for application-specific functionality.	
14	USER_2			
15	USER_3		7	

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	0 STOP		Stop according to the Stop Mode parameter or the stop mode request bits (bits 79).
		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	4 RESET		Fault reset if an active fault exists.
		0	(no op)
5	5 EXT2		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_RA	1	Normal ramp stop mode
	MP	0	(no op) Default to parameter stop mode if bits 79 are all 0.
8	STOPMODE_EM	1	Emergency ramp stop mode.
	ERGENCY_RAM P	0	(no op) Default to parameter stop mode if bits 79 are all 0.
9	STOPMODE_CO	1	Coast stop mode.
	AST	0	(no op) Default to parameter stop mode if bits 79 are all 0.
10	RAMP_PAIR _2	1	Select ramp set 2 (Acceleration time 2 / Deceleration time 2) when parameter 23.11 Ramp set selection is set to EFB DCU CW bit 10.
		0	Select ramp set 1 (Acceleration time 1 / Deceleration time 1) when parameter 23.11 Ramp set selection is set to EFB DCU CW bit 10.
11	RAMP_OUT_ZER O	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_LO CK	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.
15	TORQ_LIM_PAIR _2	1	Select torque limit set 2 (Minimum torque 2 / Maximum torque 2) when parameter 30.18 Torq lim sel is set to EFB.
		0	Select torque limit set 1 (Minimum torque 1 / Maximum torque 1) when parameter 30.18 Torq lim sel is set to EFB.
16	16 FB_LOCAL_CTL		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.

Bit	Name	Value	State/Description
19	Reserved		
20	Reserved		
21	Reserved		
22	USER_0		Writable control bits that can be combined with drive logic
23	USER_1		for application-specific functionality.
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 230.

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_	1	SWITCH-ON INHIBITED.
	INHIB	0	-
7	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
12	USER_1		application-specific functionality.
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.

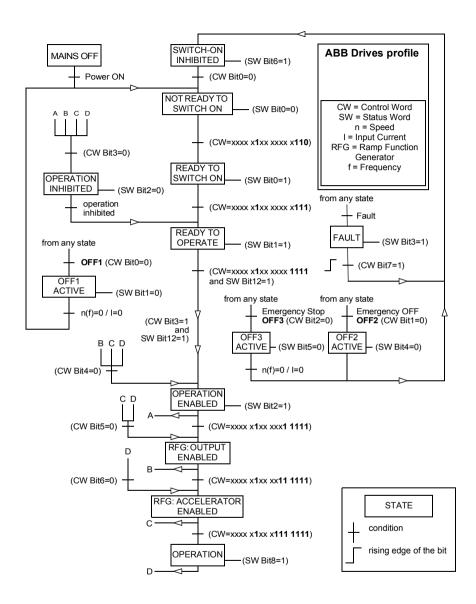
Bit	Name	Value	State/Description	
0	READY	1	Drive is ready to receive the start command.	
		0	Drive is not ready.	
1	ENABLED	1	Run permissive and all start interlocks are active.	
		0	Run permissive and all start interlocks are not active.	
2	STARTED	1	Drive has received start command.	
		0	Drive has 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 46.3146.	
		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	
12	PANEL_LOCAL	1	Panel/keypad (or PC tool) is in local control mode.	
		0	Panel/keypad (or PC tool) is not in local control mode.	

Bit	Name	Value	State/Description
13			Fieldbus is in local control mode.
	AL	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
23	USER_1		application-specific functionality.
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 223 and Status Word for the ABB Drives profile on page 227.



The start and stop sequences are given below.

Control word:

Start:

- 476h -> NOT READY TO SWITCH ON
- If MSW bit 0 = 1 then
 - 477h -> READY TO SWITCH ON (Stopped)
 - 47Fh -> OPERATION (Running)

Stop:

- 477h = Stop according to 21.03 Stop mode
- 47Eh = OFF1 ramp stop (Note: uninterruptable ramp stop)

Fault reset:

Rising edge of MCW bit 7

Start after STO:

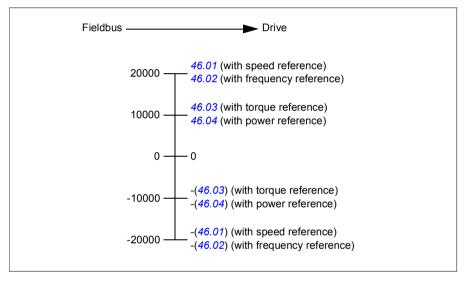
 If 31.22 STO indication run/stop is not Fault/ Fault, check that 06.18 Start inhibit status word, bit 7 STO = 0 before giving a start command.

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 (see page 516).



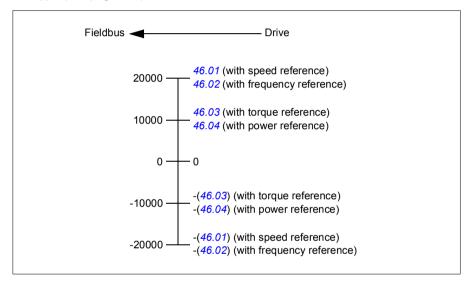
The scaled references are shown by parameters 03.09 EFB reference 1 and 03.10 EFB reference 2.

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 (see page 516).



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 (CW 16bit). See sections Control Word for the ABB Drives profile (page 223) and Control Word for the DCU Profile (page 224).			
	The selection can be changed using parameter 58.101 Data I/O 1.			
400002	Default: Reference 1 (Ref1 16bit).			
	The selection can be changed using parameter 58.102 Data I/O 2.			
400003	Default: Reference 2 (Ref2 16bit).			
	The selection can be changed using parameter 58.102 Data I/O 2.			
400004	Default: Status Word (SW 16bit). See sections Status Word for the ABB Drives profile (page 227) and Status Word for the DCU Profile (page 228).			
	The selection can be changed using parameter 58.102 Data I/O 2.			
400005	Default: Actual value 1 (Act1 16bit).			
	The selection can be changed using parameter 58.105 Data I/O 5.			
400006	Actual value 2 (Act2 16bit).			
	The selection can be changed using parameter 58.106 Data I/O 6.			
400007400014	Data in/out 714.			
	Selected by parameters 58.107 Data I/O 758.114 Data I/O 14.			
400015400089	Unused			
400090400100	Error code access. See section <i>Error code registers (holding registers 400090400100)</i> (page 242).			
400101465536	Parameter read/write. Parameters are mapped to register addresses according to parameter 58.33 Addressing mode.			

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	Provides a series of tests for checking the communication, or for checking various internal error conditions. Supported subcodes:
		O0h Return Query Data: Echo/loopback test.
		01h Restart Comm Option: Restarts and initializes the EFB, clears communications event counters. 04h Force Listen Only Mode
		OAh Clear Counters and Diagnostic Register OBh Return Bus Message Count
		OCh Return Bus Comm. Error Count
		ODh Return Bus Exception Error Count
		OEh Return Slave Message Count
		OFh 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.
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.

Code	Function name	Description
2Bh / 0Eh	Encapsulated Interface	Supported subcodes:
	Transport	OEh Read Device Identification: Allows reading the identification and other information.
		Supported ID codes (access type):
		00h: Request to get the basic device identification (stream access)
		04h: Request to get one specific identification object (individual access)
		Supported Object IDs:
		00h: Vendor Name ("ABB")
		01h: Product Code (for example, "AHVKx")
		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: ("ACH580").

Exception codes

The table below shows the Modbus exception codes supported by the embedded fieldbus interface.

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 <i>Error code registers (holding registers 400090400100)</i> on page 242.

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
800000	RESET	STOPMODE_RAMP
000009	Not for ACH580/ACQ580	STOPMODE_EMERGENCY_RAMP
000010	Not for ACH580/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 10.99 RO/DIO control word, bit 0)	Control for relay output RO1 (parameter 10.99 RO/DIO control word, bit 0)
000034	Control for relay output RO2 (parameter 10.99 RO/DIO control word, bit 1)	Control for relay output RO2 (parameter 10.99 RO/DIO control word, bit 1)
000035	Control for relay output RO3 (parameter 10.99 RO/DIO control word, bit 2)	Control for relay output RO3 (parameter 10.99 RO/DIO control word, bit 2)
000036	Control for relay output RO4 (parameter 10.99 RO/DIO control word, bit 3)	Control for relay output RO4 (parameter 10.99 RO/DIO control word, bit 3)
000037	Control for relay output RO5 (parameter 10.99 RO/DIO control word, bit 4)	Control for relay output RO5 (parameter 10.99 RO/DIO control word, 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 (9195). 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). • 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.

BACnet MS/TP control through the embedded fieldbus interface (EFB)

Contents of this chapter

The chapter describes BACnet MS/TP control through the embedded fieldbus interface (EFB): supported functionality, services and objects as well as how to configure the BACnet through the **Primary settings** menu and with parameters.

BACnet overview

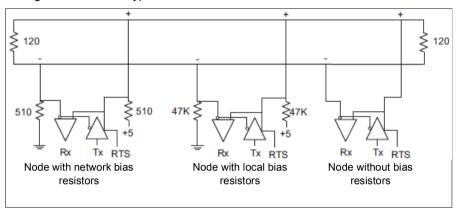
BACnet is an open standard for data communication that enables interoperability between different building systems (eg fire, security, lighting, HVAC, elevator, etc.) and devices in building automation and control applications. It enables data sharing among different types of devices from a broad set of suppliers.

You will find BACnet Protocol Implementation Conformance Statement (PICS) (3AXD10000387059 [English]) for the ACH580 in the ABB Document library on the Internet.

Hardware installation

Connecting devices to a BACnet MS/TP EIA-485 network

The figure shows three types of nodes connected on the EIA-485 network.

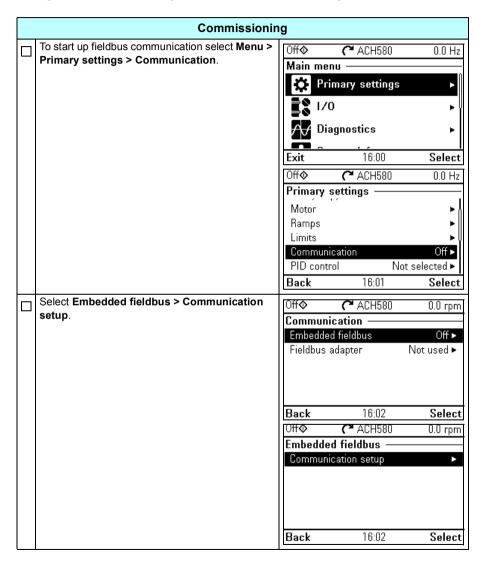


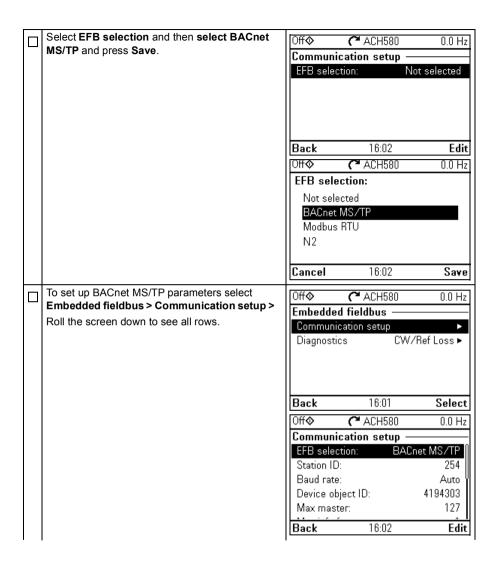
Connecting the drive to the building automation controller

For connecting the EFB terminal block X5 of the drive to the building automation controller via the EIA-485 network, see section *Connecting the drive to the fieldbus* on page *214*.

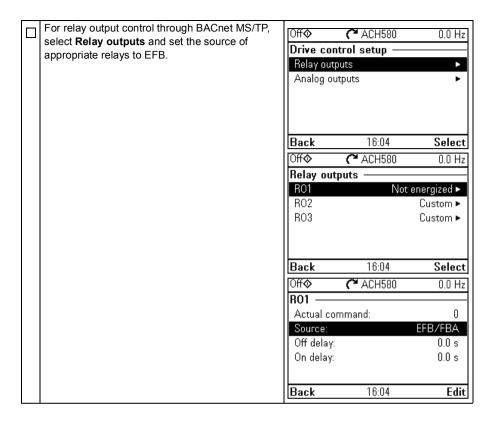
Starting up BACnet communication through the Primary settings menu

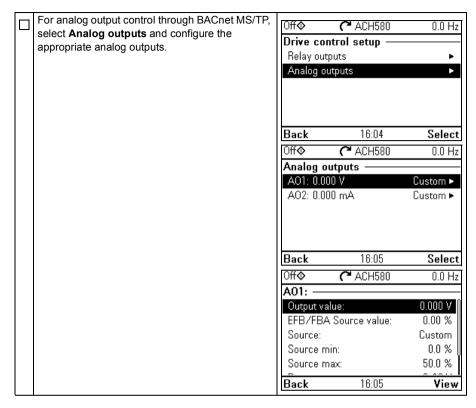
The **Primary settings** menu enables easy programming of the most common settings for the drive including BACnet communication settings.





validate your settings.	Communi Ignore fai		
	Max APD If commu Communi Ignore fai	16:03 ACH580 cation setup - U retries: nication fails: cation unde: C' lures shorter tha	Edit 0.0 Hz 3 Fault W / Ref1 n: 30.0 s
After validating the settings, press Back twice until you see Pass through I/O on the Communication menu. Select Pass through I/O and then Drive control setup.	Embedder Fieldbus a Pass thro	d fieldbus BACr adapter ugh I/O	0.0 Hz let MS/TP ► Not used ► Select
ս C	ntil you see Pass through I/O on the communication menu. select Pass through I/O and then Drive control	Communi Max APD If communi Communi Ignore fai Apply: Back Sommunication menu. Select Pass through I/O and then Drive control etup	Communication setup — Max APDU retries: If communication fails: Communication unde: If commu





Starting up fieldbus communication with parameters

Follow these steps to setup fieldbus communication with parameters in the Parameters menu. For example of appropriate values, see section Activating drive control functions on page 250.

- 1. Power up the drive.
- 2. Enable BACnet communication by setting parameter 58.01 Protocol enable to BACnet MSTP.
- 3. Configure network settings with parameters 58.03 Node address and 58.04 Baud
- 4. Define the device object instance value with parameter 58.40 Device object ID.

Note: The object instance value should be unique and in the range 1...4194303.

- 5. Define communication loss function to detect communication loss between EFB and the drive:
 - Set the communication loss mode and communication loss time with parameters 58.15 Communication loss mode and 58.16 Communication loss time.
 - Select how the drive reacts to an EFB communication break with parameter 58.14 Communication loss action.
- 6. Save the valid parameter values to permanent memory by setting parameter 96.07 Parameter save manually to Save.
- 7. Validate the settings made in parameter group 58 Embedded fieldbus by setting parameter 58.06 Communication control to Refresh settings.
- 8. You can use parameters 58.07...58.13 for diagnostics. You can reset counters 58.08...58.12 by setting the parameter value to 0.
- Set the relevant drive control parameters to control the drive according to the application.

Note: You find all embedded fieldbus parameters in group *58 Embedded fieldbus* on page *511*.

Activating drive control functions

Drive control

To enable fieldbus control of various drive functions through BACnet MS/TP, do the following:

- Configure the drive to accept embedded fieldbus communication by enabling BACnet communication and defining the node address and device id for the drive.
- Select the individual control functions to use the embedded fieldbus as a source. This makes the input source come from the corresponding BACnet object.

Note: Change those parameter of the functions that you want to control through BACnet MS/TP. All other parameters can remain as factory default values.

Start/stop direction control

For Start/stop direction control through fieldbus, configure the following drive parameters and set the fieldbus controller supplied command(s) in the appropriate location:

Drive parameter	Value	Description	BACnet object
20.01 Ext1 commands	Embedded fieldbus	Start/stop by fieldbus with Ext1 selected	BV10
20.07 Ext2 commands	Embedded fieldbus	Start/stop by fieldbus with Ext2 selected	BV10

Drive parameter	Value	Description	BACnet object
20.21 Direction	Request	Direction by fieldbus, if required	BV11

Input reference select

The tables below show how to use the BACnet embedded fieldbus to select the drive input references for frequency and speed control modes

- For frequency control, set parameter 99.04 Motor control mode = Scalar (default value for ACH580). See section *Frequency reference* on page 251 and parameter group 28 Frequency reference chain on page 413.
- For speed control, set parameter 99.04 Motor control mode = Vector. See section. Speed reference on page 251 and parameter group 22 Speed reference selection on page 395.

Vector control has better accuracy than scalar control, but vector control cannot be used in all situations. See parameter 99.04 Motor control mode.

Frequency reference

For using the BACnet embedded fieldbus to provide input frequency references to the drive, configure the following drive parameters and set the fieldbus controller supplied reference word(s) in the appropriate location:

Drive parameter	Value	Description	BACnet object
19.11 Ext1/Ext2 selection	32 = EFB MCW bit 11	Reference set selection by fieldbus	BV13
28.11 Ext1 frequency ref1	8 = <i>EFB</i> ref1 1)	Frequency reference source 1	AV16 Input Reference1
28.15 Ext2 frequency ref1	9 = <i>EFB</i> ref2 ¹⁾	Frequency reference source 2	AV17 Input Reference 2
46.02 Frequency scaling	50.00 Hz ¹⁾	16-bit scaling of frequency-related parameters	No direct BACnet object

¹⁾ As an example

Speed reference

For using the BACnet embedded fieldbus to provide input speed references to the drive, configure the following drive parameters and set the fieldbus controller supplied reference word(s) in the appropriate location:

Drive parameter	Value	Description	BACnet object
19.11 Ext1/Ext2 selection	32 =EFB MCW bit 11	Reference set selection by fieldbus	BV13
22.11 Ext1 speed ref1	8 = <i>EFB</i> ref1 ¹⁾	Speed reference source 1	AV16 Input Reference1
22.18 Ext2 speed ref1	9 = <i>EFB</i> ref2 1)	Speed reference source 2	AV17 Input Reference 2
46.01 Speed scaling	1500 rpm ¹⁾	16-bit scaling of speed-related parameters	No direct BACnet object

¹⁾ As an example

Miscellaneous drive control

To use the BACnet embedded fieldbus for different drive control functions, configure the following drive parameters and set the fieldbus controller supplied command(s) in the appropriate location:

Drive parameter	Value	Description	BACnet object
20.40 Run permissive	15 = Embedded fieldbus	Run permission by fieldbus	BV12
No direct drive parameter. Via BACnet object the fault reset always goes through.	-	Fault reset via fieldbus	BV14
20.41 Start interlock 1	15 = Embedded fieldbus	Source for start interlock 1 is fieldbus	BV20
20.42 Start interlock 2	15 = Embedded fieldbus	Source for start interlock 2 is fieldbus	BV21

Relay output control

For relay output control through BACnet embedded fieldbus,

- set the following drive parameters to select the source for the ROs
- program the drive for control through BACnet.

Drive parameter	Value	Description	BACnet object
10.24 RO1 source	40 = RO/DIO control word bit0	Relay output 1 controlled by fieldbus	BO0
10.27 RO2 source	41 = RO/DIO control word bit1	Relay output 2 controlled by fieldbus	BO1
10.30 RO3 source	42 = RO/DIO control word bit2	Relay output 3 controlled by fieldbus	BO2
15.07 RO4 source	Other (10.99 RO/DIO control word, bit 3)	Relay output 4 controlled by fieldbus	BO3
15.10 RO5 source	Other (10.99 RO/DIO control word, bit 4)	Relay output 5 controlled by fieldbus	BO4
15.23 DO1 source	Other (10.99 RO/DIO control word, bit 8)	Digital output 1 controlled by fieldbus	BO5

Data point connections

The BACnet objects control parameter 10.99 RO/DIO control word bit values. These bits need to be connected to the corresponding RO and DO sources as above.

BACnet object	Drive parameter	Description
BO0BO5	10.99 RO/DIO control word	Storage parameter for relay outputs and digital output

Analog output control

For analog output control through BACnet embedded fieldbus, configure the following drive parameters and set the fieldbus controller supplied analog value(s) in the appropriate location:

Drive parameter	Value	Description	BACnet object
13.12 AO1 source	37 = AO1 data storage	Analog output 1 controlled by fieldbus	AO0
13.22 AO2 source	38 = AO2 data storage	Analog output 2 controlled by fieldbus	AO1
13.17 AO1 source min	0.0 1)	Minimum value of signal selected by parameter 13.12 AO1 source	No direct BACnet object
13.18 AO1 source max	100.0 ¹⁾	Maximum value of signal selected by parameter 13.12 AO1 source	No direct BACnet object
13.27 AO2 source min	0.0 1)	Minimum value of signal selected by parameter 13.22 AO2 source	No direct BACnet object
13.28 AO2 source max	100.0 ¹⁾	Maximum value of signal selected by parameter 13.22 AO2 source	No direct BACnet object

¹⁾ As an example

Data point connections

The BACnet objects control parameters 13.91 AO1 data storage and 13.92 AO2 data storage values. These values need to be connected to the corresponding AO sources as above.

BACnet object	Drive parameter	Description
AO0	13.91 AO1 data storage	Storage parameter for AO1
AO1	13.92 AO2 data storage	Storage parameter for AO2

PID control

For PID control through BACnet embedded fieldbus, configure the following drive parameters and set the fieldbus controller supplied PID value(s) in the appropriate location:

Drive parameter	Value	Description	BACnet object
40.08 Set 1 feedback 1 source	10 = Feedback data storage	Feedback 1 source data storage	AV43
40.09 Set 1 feedback 2 source	10 = Feedback data storage	Feedback 2 source data storage	AV43
40.16 Set 1 setpoint 1 source	24 = Setpoint data storage	Setpoint 1 source data storage	AV42
40.17 Set 1 setpoint 2 source	24 = Setpoint data storage	Setpoint 2 source data storage	AV42

Data point connections

The BACnet objects control parameters 40.91 Feedback data storage and 40.92 Setpoint data storage. These values need to be connected to the corresponding PID setpoint and feedback values as above.

BACnet object	Drive parameter	Description
AV43	40.91 Feedback data storage	Storage parameter for process feedback value
AV42	40.92 Setpoint data storage	Storage parameter for process setpoint value

Communication fault

BACnet has no built-in feature to detect communication timeout, because it is not a synchronous protocol. If communication timeouts are needed, you can use the following parameters to detect timeouts based on different packets and specifying the drive action.

Drive parameter	Value	Description
58.15 Communication loss mode	1 = Any message 2 = Cw / Ref1 / Ref2	Defines which message types reset the timeout counter for detecting an EFB communication loss.
58.14 Communication loss action	0 = No 1 = Fault 2 = Last speed 3 = Speed ref safe 4 = Fault always 5 = Warning	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 are validated by parameter 58.06 Communication control (1 = Refresh settings).
58.16 Communication loss time	0.06000.0 s	Sets a timeout for EFB communication. If a communication break lasts longer than the timeout, the action specified by parameter 58.16 Communication loss time is taken.

Drive feedback

The inputs to the BMS controller (drive output signals) have pre-defined content. These drive feedback signals do not require any additional drive configuration. The following table lists a subset of the supported feedback data. For a complete listing, see the Protocol Implementation Conformance Statement (PICS) (3AXD10000387059 [English]), which you can find in the ABB Document library on the Internet.

Drive parameter	Description	BACnet object
01.01 Motor speed used	Estimated motor speed (rpm)	AV0
01.06 Output frequency	Estimated drive output frequency (Hz)	AV1
01.11 DC voltage	DC link voltage (V)	AV2
01.13 Output voltage	Calculated motor voltage (V AC)	AV3
01.07 Motor current	Measured (absolute) motor current (A)	AV4
01.10 Motor torque	Motor torque in percent of the nominal motor torque (%)	AV5

Drive parameter	Description	BACnet object
01.14 Output power	Drive output power (kW)	AV6
05.11 Inverter temperature	Estimated drive temperature in percent of fault limit (%)	AV7
01.20 Inverter kWh counter	Amount of energy that has passed through the drive (in either direction) in full kilowatthours. Whenever the counter rolls over, 01.19 Inverter MWh counter is incremented. The minimum value is zero.	AV9
35.01 Motor estimated temperature	Displays the motor temperature (°C or °F) as estimated by the internal motor thermal protection model. The unit is selected by parameter 96.16 Unit selection.	AV15
01.03 Motor speed %	Motor speed in percent of the synchronous motor speed.	AV31
40.01 Process PID output actual	PID controller output	AV44
40.04 Process PID deviation actual	PID deviation	AV49
01.50 Current hour kWh	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.	AV130
01.51 Previous hour kWh	Previous hour energy consumption. The value 01.50 Current hour kWh 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.	AV131
01.52 Current day kWh	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.	AV132
01.53 Previous day kWh	Previous day energy consumption. The value 01.52 Current day kWh 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.	AV133
04.01 Tripping fault	Fault that caused the current trip (active fault)	AV18
04.11 Latest fault	Previous fault (non-active)	AV19
04.12 2nd latest fault	Fault before the previous fault (non-active)	AV20

The actual output values of the drive can be read from AV0...AV6, AV31 and AV32:

Object ID	Default object name	Description	Min/max present value	Unit	Present value access type
AV0	Output-RPM	Motor speed	0, nominal speed	rpm	R
AV1	Output-Freq	Output frequency	-500, 500	Hz	R

Object ID	Default object name	Description	Min/max present value	Unit	Present value access type
AV2	DC-Voltage	DC link voltage	0, 2000	V	R
AV3	Output-Voltage	AC output voltage	0, 2000	V	R
AV4	Output-Current	Output current of drive	0, nominal current	Α	R
AV5	Output-Torque	Output torque of motor as a percentage of nominal torque	-1600, 1600	%	R
AV6	Output-Power	Output power in kW	nominal power (+/-)	kW	R
AV31	Output-Speed	Actual motor speed	-200, 200	%	R
AV32	Output-Current- Range	Actual motor current	0, 200	%	R

Parameter setting example

Frequency control

The table below shows an example of how to configure a basic frequency control application. The rest of parameters can be left as default values.

Drive parameter	Settings	Description
58.06 Communication control	0 = Enabled	Normal operation
58.03 Node address	181 ¹⁾	Defines the node address of the drive on the fieldbus link.
58.40 Device object ID	51 ¹⁾	Configures device object ID.
58.16 Communication loss time	30 ¹⁾	Sets the communication timeout as 30 seconds.
58.15 Communication loss mode	1 = Any message 1)	The timeout feature monitors any directed message received from the drive.
58.06 Communication control	0 = Refresh settings	Refreshes settings and takes changed EFB configuration settings in use.
20.01 Ext1 commands		Selects the embedded fieldbus interface as the source of start and stop commands for external control location 1.
28.11 Ext1 frequency ref1		Selects embedded fieldbus reference 1 as the source for frequency reference 1.

¹⁾ Example

BACnet protocol implementation conformance statement

Document: 3AXD10000387059. Rev 10

Date: May 18, 2018

Vendor name: ABB. Vendor ID 127

Product name: HVAC Drive Product model number: ACH580

Applications software version: Drive FW: 2.x.x.x BACnet Appl: 2025

Firmware revision: 14.01 BACnet protocol revision: 14

Product description:

De DD D

The ACH580 is a high-performance variable speed drive (VSD) designed for HVAC and refrigeration applications. Product supports native BACnet, connecting directly to the MS/TP LAN. MS/TP baud rates are supported up to 115.2 kbps, as well as master and slave mode functionalities. Over BACnet, the drive can be fully controlled and monitored as a standard variable speed drive. In addition, the drive's standard I/O is available over BACnet to the user application.

BACnet standardized device profile (Annex L):

	BACnet Operator Workstation (B-OWS)
	BACnet Advanced Operator Workstation (B-AWS)
	BACnet Operator Display (B-OD)
	BACnet Building Controller (B-BC)
	BACnet Advanced Application Controller (B-AAC)
√	BACnet Application specific Controller (B-ASC)
	BACnet Smart Sensor (B-SS)
	BACnet Smart Actuator (B-SA)

List all BACnet interoperability building blocks supported (Annex **K**):

D3-KF-D	Data Shanny-Neaur Toperty
DS-RPM-B	Data Sharing-ReadProperty Multiple
DS-WP-B	Data Sharing-WriteProperty
DS-WPM-B	Data Sharing-WriteProperty Multiple
DS-COV-B	Data Sharing-Change of Value
DM-DDB-B	Device Management-DynamicDeviceBinding
DM-DOB-B	Device Management-DynamicObjectBinding
DM-DCC-B	Device Management-DeviceCommunicationControl
DM-RD-B	Device Management-ReinitializeDevice
DM-TS-B	Device Management-Time Synchronization

Data Sharing-ReadProperty

S	egmentation capability:	
	Able to transmit segmented messages Able to receive segmented messages	Window size: - Window size: -
S	tandard object types supported:	
	t instantiation is static, i.e. objects cannot be cre ocument for object details.	ated or deleted. Refer to tables at end of
D	ata link layer options:	
	BACnet IP, (Annex J) BACnet IP, (Annex J), foreign device ISO 8802-3, Ethernet (Clause 7) ATA 878.1, 2.5 Mb. ARCNET (Clause 8) ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s) MS/TP master (Clause 9), baud rate(s): 9.6k, 19.2k, 38 MS/TP slave (Clause 9), baud rate(s): 9.6k, 19.2k, 38 Point-to-point, EIA 232 (Clause 10), baud rate(s): Point-to-point, modem, (Clause 10), baud rate(s): LonTalk, (Clause 11), medium: BACnet/ZigBee (ANNEX O) Other:	8.4k, 76.8k, 115.2k .4k, 76.8k, 115.2k
D	evice address binding:	
	ic device binding supported? (This is currently nor slaves and certain other devices.)☐ Yes ☑ I	
N	etworking options:	
	Router, Clause 6 BACnet/IP to MS/TP BACnet/ ISO 8802-3, Ethernet to MS/TP BACnet/ IP to BACnet/ ISO 8802-3, Ethernet BACnet/IP to BACnet/ ISO 8802-3, Ethernet to	o MS/TP
	Annex H, BACnet tunneling router over IP BACnet/IP broadcast management device (BBMD) Does the BBMD support registrations by foreig Max BDT (Broadcast distribution table Does the BBMD support network address trans	e)-entries:

■ Ne	etwork security opti	ons:			
	Secure device - is capable of Multiple applicatio Supports encrypti Key server (NS-K	using In-specton (NSS)	S-ED BIBB) B)		•
Cł	naracter sets suppo	rted	:		
	ing support for multiple cha	aracte	er sets does not imply that t	hey c	an all be supported
☑	ISO 10646 (UTF-8) ISO 10646 (UCS-2)		IBM /Microsoft DBCS ISO 10646 (UCS-4)		ISO 8859-1 JIS X 0208
If this	product is a communica	ation	gateway, describe the ty	/pes	of non-BACnet

If this product is a communication gateway, describe the types of non-BACnet equipment/network(s) that the gateway supports:

Object/Property support matrix

The following table summarizes the object types/properties supported and default values:

				Object ty	pe			
Property	Binary input	Binary output	Binary value	Analog input	Analog output	Analog value	Multistate value	Loop
Object identifier	R	R	R	R	R	R	R	R
Object name	W, P	W, P	R	W, P	W, P	R ⁽¹⁾	R	W,P
Object type	R	R	R	R	R	R	R	R
Present value	R	С	С	R	С	С	R	R
Status flags	R	R	R	R	R	R	R	R
Event state	R	R	R	R	R	R	R	R
Out-of-service	W	W	W	W	W	W	W	W
Polarity	W, P	W, P						
Active text	R	R	R					
Inactive text	R	R	R					
Units				R	R	R		
Min present value				R	R	R		
Max present value				R	R	R		
Priority array		R	R		R	R		
Relinquish default		W, P	W,P		W, P	W, P		
COV increment				W,P	W,P	W,P		
Number of states							R	
State text							R	
Property list	R	R	R	R	R	R	R	R
	R = Read only, W = Writable, C = Commandable, P = Persist AV16, AV17, AV21, AV22, AV40-AV44, AV55, AV56, AV59, AV120- 129 have W, P Max length of writable object names is 25 characters							

Device object instance summary

The following table summarizes the device object supported:

Device object						
Property	Flag	Туре	Default value			
Object identifier	W, P	OID	4194303			
Object name	W, P	CharString, max length 25	AC Drive 4194303			
Object type	R	Enum	DEV (8)			
System status	R	Enum				
Vendor name	R	CharString	ABB			
Vendor identifier	R	Unsigned	127			
Model name	R	CharString	ACH580			

Firmware revision	R	CharString	14.01
Application software revision	R	CharString	
Description	W, P	CharString, max length 100	"ACH580 is a high-performance variable speed drive designed for HVAC and refrigeration applications."
Location	W, P	CharString, max length 50	"(not set)"
Protocol version	R	Unsigned	1
Protocol revision	R	Unsigned	14
Protocol services supported	R	BitString	
Protocol object types supported	R	BitString	
Object list	R	Array of OID	
Max APDU length accepted	R	Unsigned	480
Segmentation supported	R	Enum	No segmentation (3)
Local time	R	BACnetTime	
Local date	R	BACnetDate	
APDU timeout	W, P	Unsigned	10000 ms
Number of APDU retries	W, P	Unsigned	3
Max master	W, P	Unsigned	127
Max info frames	W, P	Unsigned	1
Device address binding	R	List of Struct	
Database revision	R, P	Unsigned	
Active COV subscriptions	R	Array of BACnetCOVSubscription	
Serial number	R	CharString	
Property list	R	Array of Unsigned	
Flags: R = Read only, W = Writable, C = Commandable, P = Pers			

Binary input object instance summary

The following table summarizes the binary input objects supported:

Object ID	Object name	Description	Active/Inactive text	Present value access type
BI0	RO1-Monitor	Status of relay output 1	On / Off	R
BI1	RO2-Monitor	Status of relay output 2	On / Off	R
BI2	RO3-Monitor	Status of relay output 3	On / Off	R
BI3	RO4-Monitor	Status of relay output 4	On / Off	R
BI4	RO5-Monitor	Status of relay output 5	On / Off	R
BI5	DO1-Monitor	Status of digital output 1	On / Off	R
BI6	DI1-Monitor	Status of digital input 1	On / Off	R
BI7	DI2-Monitor	Status of digital input 2	On / Off	R
BI8	DI3-Monitor	Status of digital input 3	On / Off	R

Object ID	Object name	Description	Active/Inactive text	Present value access type
BI9	DI4-Monitor	Status of digital input 4	On / Off	R
BI10	DI5-Monitor	Status of digital input 5	On / Off	R
BI11	DI6-Monitor	Status of digital input 6	On / Off	R

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Binary output object instance summary

The following table summarizes the binary output objects supported:

Object ID	Object name	Description	Active/Inactive text	Present value access type
BO0	RO1-Command	Output state of relay 1	On / Off	С
BO1	RO2-Command	Output state of relay 2	On / Off	С
BO2	RO3-Command	Output state of relay 3	On / Off	С
BO3	RO4-Command	Output state of relay 4	On / Off	С
BO4	RO5-Command	Output state of relay 5	On / Off	С
BO5	DO1-Command	Output state of digital output 1	On / Off	С

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Binary value object instance summary

The following table summarizes the binary value objects supported:

Object ID	Object name	Description	Active/Inactive text	Present value access type
BV0	RUN-STOP- Monitor	Drive's run status	Run / Stop	R
BV1	Direction- Monitor	Rotational direction of the motor	Reverse / Forward	R
BV2	OK-FAULT- Monitor	Actual fault status of drive	Fault / OK	R
BV3	EXT1-EXT2- Monitor	Actual control source	Ext2 / Ext1	R
BV4	HAND-AUTO- Monitor	Actual operating mode.	Hand / Auto	R
BV5	Warning- Monitor	Actual warning status	Warning / OK	R
BV7	Ready-Monitor	Actual ready status	Ready / Not-Ready	R
BV8	At-Setpoint- Monitor	Actual at setpoint status	Yes / No	R
BV9	Enabled- Monitor	Actual run enabled status	Enable / Disable	R

Object ID	Object name	Description	Active/Inactive text	Present value access type
BV10	RUN-STOP- Command	Command to start drive	Run / Stop	С
BV11	Direction- Command	Command to rotational direction	Reverse / Forward	С
BV12	Run- Permissive- Command	Command to run permissive command	Enable / Disable	С
BV13	EXT1-EXT2- Command	Commanded to external 1 or external 2 selection	Ext2 / Ext1	С
BV14	Fault-Reset- Command	Commanded to fault reset	Reset / No	W
BV15-BV16	<reserved></reserved>			
BV17	Lock- Parameters	Actual status of parameter lock.	Lock / Unlock	R
BV18	Control- Override- Command	Command the drive into BACnet control override. In this mode, BACnet acquires drive control from its normal source. Note that HAND mode of the panel has priority over BACnet Control Override.	On / Off	С
BV19	Control- Override- Monitor	Indicates if drive has been placed in BACnet control override by commanding BV18. In this mode, BACnet acquires drive control from its normal source. Note that HAND mode of the panel has priority over BACnet control override.	On / Off	R
BV20	Start-Interlock- 1-Command	Command to start enable 1	Enable / Disable	С
BV21	Start-Interlock- 2-Command	Command to start enable 2	Enable / Disable	С
BV24	Started-Monitor	Actual start status	Started / Not- Started	R
BV25	Safe-Torque- Off-Monitor	Actual status of Safe Torque Off	Active / OK	R
BV26	Underload- Monitor	Indicates if ULC signal is lower than the Underload curve	Underload / OK	R
BV27	Overload- Monitor	Indicates if ULC signal is higher than the overload curve	Overload / OK	R
BV28	Motor-Heating- Command	Command to motor heating mode	On / Off	W
BV29	Motor-Heating- Monitor	Actual status of motor heating mode	On / Off	R
BV30	User0-Monitor	Actual status of "User bit0" in drive status word	On / Off	R
BV31	User1-Monitor	Actual status of "User bit1" in drive status word	On / Off	R
BV32	User2-Monitor	Actual status of "User bit2" in drive status word	On / Off	R

Object ID	Object name	Description	Active/Inactive text	Present value access type
BV33	User3-Monitor	Actual status of "User bit3" in drive status word	On / Off	R
BV34	User0- Command	Commands "User bit0" in drive status word	On / Off	С
BV35	User1- Command	Commands "User bit1" in drive status word	On / Off	С
BV36	User2- Command	Commands "User bit2" in drive status word	On / Off	С
BV37	User3- Command	Commands "User bit3" in drive status word	On / Off	С
BV38	<reserved></reserved>			
BV39	Parameter- Save-Command	Command to save drive parameters and BACnet property data (properties marked as 'P=Persist')	Save / No	W
BV40	PID-Set-Select	Command to Process PID set1 or Process PID set2 selection	Set1 / Set2	W

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Analog input object instance summary

The following table summarizes the analog input objects supported:

Object ID	Default object name	Description	Min / Max present value	Units	Present value access type
Al0	Al1-Monitor	Indicates the input level of analog input 1.	0100	Percent (%)	R
Al1	Al2-Monitor	Indicates the input level of analog input 2.	0100	Percent (%)	R

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Analog output object instance summary

The following table summarizes the analog output objects supported:

Object ID	Default object name	Description	Min / Max present value	Units	Present value access type
AO0	AO1-Command	Controls analog output 1 (drive must be configured for BACnet control).	0100	Percent	С
AO1	AO2-Command	Controls analog output 2 (drive must be configured for BACnet control).	0100	Percent	С

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Analog value object instance summary

The following table summarizes the analog value objects supported:

Object ID	Default object name	Description	Min / Max present value	Units	Present value access type
AV0	Output-RPM	Motor speed	0, nominal speed	rpm	R
AV1	Output-Freq	Output frequency	-500, 500	Hz	R
AV2	DC-Voltage	DC bus voltage	0, 2000	V	R
AV3	Output-Voltage	AC output voltage	0, 2000	V	R
AV4	Output-Current	Output current of drive	0, nominal current	А	R
AV5	Output-Torque	Output torque of motor as a percentage of nominal torque	-1600, 1600	%	R
AV6	Output-Power	Output power in kW	nominal power (+/-)	kW	R
AV7	Operating- Temp-Range	Heatsink temperature	-40, 160	%	R
AV8	Kilowatt-Hour- Meter-R	Drive's cumulative energy usage. This value is resettable.	0,65535	kWh	W
AV9	Kilowatt-Hour- Meter-NR	Drive's cumulative energy usage. This value is not resettable.	0, 6553599999	kWh	R
AV10	Process-PID- Feedback	This object is the process PID feedback signal.	0, 100	%	R
AV11	Process-PID- Deviation	This object is the process PID output signal's deviation from its setpoint.	0, 100	%	R
AV12	External-PID- Feedback	This object is the external PID feedback signal.	0, 100	%	R
AV13	External-PID- Deviation	This object is the external PID output signal's deviation from its setpoint.	0, 100	%	R
AV14	Running-Hours	Drive's resettable run time (reset by writing 0).	0, 3.40282347e38	hours	R
AV15	Motor-Temp- Degrees-C	Motor temperature	-10, 200	°C	R
AV16	Input- Reference-1	Speed setpoint 1	-150, 150	%	С

Object ID	Default object name	Description	Min / Max present value	Units	Present value access type	
AV17	Input- Reference-2	Speed setpoint 2.	-150, 150	%	С	
AV18	Active-Fault	Displays most recent fault currently active.			R	
AV19	Previous-Fault- 1	Displays most recent stored (non-active) fault			R	
AV20	Previous-Fault- 2	Displays the second most recent stored (non-active) fault			R	
AV21	AO1-Monitor	Output level of analog output 1	0, 100	%	R	
AV22	AO2-Monitor	Output level of analog output 2	0, 100	%	R	
AV23	Accel-1- Seconds	Ramp1 acceleration time	0, 1800	S	W	
AV24	Decel-1- Seconds	Ramp 1 deceleration time	0, 1800	S	W	
AV25	Mbox-Param	Parameter number to be used by mailbox function.		No Units	W	
AV26	Mbox-Data	Set (W) or indicate (R) of the data value of mailbox function		No Units	W	
AV27	External-PID- Setpoint	This object sets the external PID controller setpoint	0,100	%	С	
AV27-AV28	<reserved></reserved>					
AV29	Min-Speed	Defines the allowed minimum output frequency	-500, 500	Hz	W	
AV30	Max-Speed	Defines the allowed maximum output frequency	-500, 500	Hz	W	
AV31	Output-Speed	Actual motor speed	-200, 200	%	R	
AV32	Output-Current- Range	Actual motor current	0, 200	%	R	
AV33	Max-Current	Max motor current	0, nominal current	А	W	
AV34-AV39	<reserved></reserved>					
AV40	V40 LOOP- Feedback- Monitor Monitor Loop controller feedback value after source selection, mathematical function and filtering (read-only)		0, 100	%	R	
AV41 LOOP-Setpoint- Monitor Loop controller setpoint value after source selection, mathematical function limitation and ramping (read-only)		0,100	%	R		

Object ID	Object ID Default object D name		Min / Max present value	Units	Present value access type
AV120	Data-IO-1	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.101		No Units	W
AV121	Data-IO-2	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.102		No Units	W
AV122	Data-IO-3	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.103		No Units	W
AV123	Data-IO-4	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.104		No Units	W
AV124	Data-IO-5	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.105 (Read-only)		No Units	R
AV125	Data-IO-6	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.106 (Read-only)		No Units	R
AV126	Data-IO-7	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.107 (Read-only)		No Units	R
AV127	Data-IO-8	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.108 (Read-only)		No Units	R
AV128	Data-IO-9	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.109 (Read-only)		No Units	R
AV129	Data-IO-10	Holds the value of drive parameter, which is mapped using Data I/O parameter 58.110 (Read-only)		No Units	R
AV130	Kilowatt-Hour- This-Hour	Current hour energy consumption	0, 3.40282347e38	kWh	R
AV131	Kilowatt-Hour- Last-Hour	Last hour energy consumption	0, 3.40282347e38	kWh	R
AV132	Kilowatt-Hour- This-Day	Current day energy consumption	0, 3.40282347e38	kWh	R

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Object ID	Default object name	Description	Min / Max present value	Units	Present value access type
AV133	Kilowatt-Hour- Last-Day	Last day energy consumption	0, 3.40282347e38	kWh	R

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Multistate value object instance summary

The following table summarizes the multistate value objects supported:

Object ID	Object name	Description	State text	Present value access type
MSV0	HAND-AUTO- Reference	Indicates whether the drive is under Hand or Auto control, or if override mode is active.	Off, Hand, Auto, Override	R
MSV1	Active-Fault-1	Enumerated type of the most recent fault currently active	None, Comm-Error, Overcurrent, Overtemperature, Overspeed, Overvoltage, Undervoltage, Short-Circuit, Ground-Fault, Motor-Overload, Inverter-Overload, Motor-Underload, External-Fault, Operator-Interface-Error, Config-Error, Feedback-Failure, Output-Phase-Loss Motor-Stall, Power-Unit-Error, Input-Phase-Fault, Internal-Failure, STO-Active, Other	R

Object ID	ject ID Object name Description State text		State text	Present value access type
MSV2	Active-Fault-2	Enumerated type of the 2nd most recent fault currently active	None, Comm-Error, Overcurrent, Overtemperature, Overspeed, Overyoltage, Undervoltage, Short-Circuit, Ground-Fault, Motor-Overload, Inverter-Overload, External-Fault, Operator-Interface-Error, Config-Error, Feedback-Failure, Output-Phase-Loss Motor-Unit-Error, Input-Phase-Fault, Internal-Failure, STO-Active, Other	R
MSV3	Active-Fault-3 Enumerated type of the 3rd most recent fault currently active		None, Comm-Error, Overcurrent, Overtemperature, Overspeed, Overyoltage, Undervoltage, Short-Circuit, Ground-Fault, Motor-Overload, Inverter-Overload, Motor-Underload, External-Fault, Operator-Interface-Error, Config-Error, Feedback-Failure, Output-Phase-Loss Motor-Stall, Power-Unit-Error, Input-Phase-Fault, Internal-Failure, STO-Active, Other	R

Object ID	Object name	Description	State text	Present value access type
MSV4	Active-Warning- 1	Enumerated type of the most recent warning currently active	None, Comm-Error, Current-Limit, Overtemperature, Start-Interlock-1, Start-Interlock-2, Start-Interlock-3, Start-Interlock-4, Run-Permissive, Internal-Warning, Start-Delay, Other	R
MSV5	Active-Warning- 2	Enumerated type of the 2nd most recent warning currently active	None, Comm-Error, Current-Limit, Overtemperature, Start-Interlock-1, Start-Interlock-2, Start-Interlock-3, Start-Interlock-4, Run-Permissive, Internal-Warning, Start-Delay, Other	R
MSV6	Active-Warning-	Enumerated type of the 3rd most recent warning currently active	None, Comm-Error, Current-Limit, Overtemperature, Start-Interlock-1, Start-Interlock-2, Start-Interlock-3, Start-Interlock-4, Run-Permissive, Internal-Warning, Start-Delay, Other	R

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Loop object instance summary

The following table summarizes the loop objects supported:

Object ID	Object name	Description	Manipulated variable reference	Controlled variable reference	Setpoint reference	Present value access type
LOOP0	LOOP-Set1	Loop object for process PID set 1	AV44 Present Value	AV43 Present Value	AV42 Present Value	R

Object ID	Object name	Description	Manipulated variable reference	Controlled variable reference	Setpoint reference	Present value access type
LOOP1	LOOP-Set2	Loop object for process PID set 2	AV44 Present Value	AV43 Present Value	AV42 Present Value	R

Note: For present value access types, R = Read-only, W = Writeable, C = Commandable. Commandable values support priority arrays & relinquish defaults.

Mailbox function

The drive provides a Mailbox function to access parameters that have not been predefined by the protocol. Using mailbox, any drive parameter can be identified and read. Mailbox can also be used to adjust parameter settings by writing a value to any parameter identified. The following table shows the mailbox objects.

Object ID	Default object name	Description	Min/max present value	Unit	Present value access type
AV25	Mbox-Param	Parameter number to be used by mailbox function.		No units	W
AV26	Mbox-Data	Set (W) or indicate (R) of the data value of mailbox function			W

To use the Mailbox function, write the parameter address to the Mbox-Param object as a floating point value. The three lowest digits in the integer part are used for the parameter index within the parameter group.

Example: For parameter 47.01, write the address as 47001.00 to the Mbox-Param object. For parameter 47.999, write the address as 47999.00 to the Mbox-Param object.

Read or write the value to the Mbox-Data object as a floating point value. If the parameter is a decimal type parameter it's value is shown as a decimal number. The value of an integer type parameter is shown as an integer number.

Example: If parameter 47.01 has value 12.554 it is shown just as it is. If parameter 47.21 has value 125, it is shown just like that, without a decimal part.

274	BACnet MS/TP control through the embedded fieldbus interface (EFB)					

N2 control through the embedded fieldbus interface (EFB)

Contents of this chapter

The chapter describes N2 control through the embedded fieldbus interface (EFB): supported functionality, services and objects as well as how to configure the N2 with parameters.

N2 overview

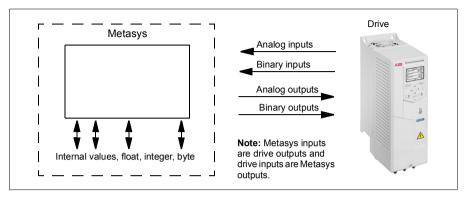
The N2 fieldbus connection to the ACH580 drives is based on an industry standard RS-485 physical interface. The N2 fieldbus protocol is a master-slave type, serial communication protocol, used by the Johnson Controls Metasys® system. In the Metasys architecture the N2 fieldbus connects object interfaces and remote controllers to network control units (NCUs).

The N2 fieldbus can also be used to connect ACH580 drives to the Metasys Companion product line.

This section describes the use of the N2 fieldbus with the ACH580 drive's connection and does not describe the protocol in detail.

Supported features

In the N2 fieldbus protocol the ACH580 drive appears as a "virtual object".



A virtual object is made up of:

- · analog inputs
- binary inputs
- · analog outputs
- · binary outputs
- internal values for floating point, integer, and byte values.

The ACH580 drive does not support N2 fieldbus communication "internal values".

All of the analog and binary I/O objects are listed below, starting with N2 analog input objects.

Analog input - the analog input objects support the following features:

- · analog input actual value in engineering units
- · low alarm limit
- low warning limit
- · high warning limit
- · high alarm limit
- differential value for the hysteresis of the alarms and warnings
- · change of state (COS) enabled
- alarm enabled
- warning enabled
- override value is received, but there is no action taken.

Binary input - the binary input objects support the following features:

- binary input actual value
- normal / alarm state specification
- alarm enabled
- change of state (COS) enabled
- override value is received, but there is no action taken.

Analog output - the analog output objects support the following features:

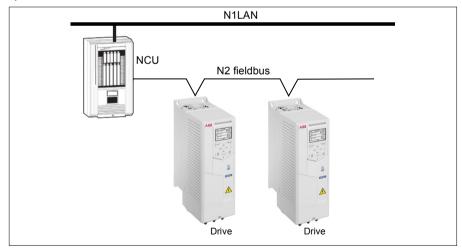
- analog output value in engineering units
- override value is used to change the analog output value. It is not possible to return to the previous value by removing the override. The override feature is used only to change the value.

Binary output - the binary output objects support the following features:

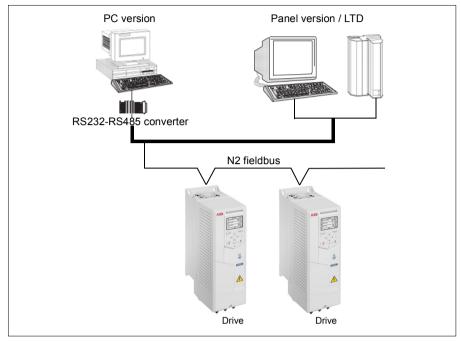
- binary output value
- override value is used to change the binary output value. It is not possible to return to the previous value by removing the override. The override feature is used only to change the value.

Metasys integration

The following diagram shows the drives' integration to the Johnson Controls Metasys system.



The following diagram shows the drive's integration to the Johnson Controls Metasys Companion system.



On the N2 fieldbus each ACH580 drive can be accessed by the full complement of Metasys FMS features, including change-of-state (COS) monitoring, alarm notification, scheduling, trend, and totalization.

On one N2 fieldbus segment there can be up to 32 nodes while integrating ACH580 drives with Johnson Controls Metasys.

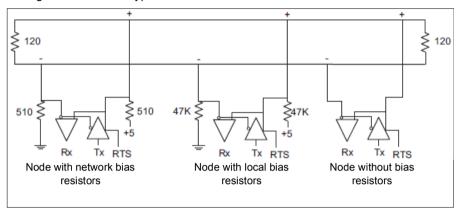
Drive device type

For the Metasys and Metasys Companion products, the device type for the ACH580 drive is VND.

Hardware installation

Connecting devices to a N2 EIA-485 network

The figure shows three types of nodes connected on the EIA-485 network.



Connecting the drive to the building automation controller

For connecting the EFB terminal block X5 of the drive to the building automation controller via the EIA-485 network, see section Connecting the drive to the fieldbus on page 214.

N2 analog input objects

The following table lists the N2 analog input objects defined for the ACH580 drive.

	N2 analog inputs							
No	Object	Drive parameter	Scale factor	Units	Range	Notes		
Al1	OUTPUT FREQUENCY	01.06 Output frequency	100	Hz	0250			
Al2	RATED SPEED	01.62 Abs motor speed %	100	%	0100			
Al3	SPEED	01.01 Motor speed used	100	rpm	09999			
Al4	CURRENT	01.07 Motor current	100	Α	09999			
AI5	TORQUE	01.10 Motor torque	100	%	-200 200			
Al6	POWER	01.17 Motor shaft power	10	kW	09999			
AI7	DRIVE TEMPERATURE	05.11 Inverter temperature	10	%	-40160			

	N2 analog inputs						
No	Object	Drive parameter	Scale factor	Units	Range	Notes	
Al8	KILOWATT HOURS	01.58 Cumulative inverter energy (resettable)	10	kW	065535		
AI9	MEGAWATT HOURS	Derived value	10000	MWh	065535	Parameter 01.54 Cumulative inverter energy / 1000	
AI10	RUN TIME	05.03 Hours run	10	h	065535		
A11	DC BUS VOLTAGE	01.11 DC voltage	100	٧	0999		
Al12	OUTPUT VOLTAGE	01.13 Output voltage	1	V	0999		
AI13	PRC PID FEEDBACK	40.97 Process PID feedback %	100	%	0100		
Al14	PRC PID DEVIATION	40.99 Process PID deviation %	100	%	0100		
AI15	EXT PID FEEDBACK	Derived value	10	%	0100	= 71.02 Feedback act value * 1000 / 71.14 Setpoint scaling	
AI16	EXT PID DEVIATION	Derived value	10	%	0100	= 71.04 Deviation act value * 1000 / 71.14 Setpoint scaling	
AI17	LAST FAULT	Derived value	1		fault code	Most recent fault	
AI18	PREV FAULT	Derived value	1		fault code	Second most recent fault	
Al19	OLDEST FAULT	Derived value	1		fault code	Third most recent fault	
AI20	AI 1 ACTUAL	12.101 AI1 percent value	100	%	0100		
Al21	AI 2 ACTUAL	12.102 AI2 percent value	100	%	0100		
Al22	AO 1 ACTUAL	13.11 AO1 actual value	1000	mA	020		
Al23	AO 2 ACTUAL	13.21 AO2 actual value	1000	mA	020		
AI24	MOTOR TEMP	Derived value	1	°C	0200	Value is derived from 35.01, 35.02 and 35.03: If 35.11 and 35.21 are both non-zero, the temperature is the maximum value of 35.02 and 35.03. If only 35.11 is non-zero, the temperature is value of 35.02. If only 35.21 is non-zero, the temperature is value of 35.03. If both 35.11 and 35.21 are zero, the value is as 35.01.	

N2 binary input objects

The following table lists the N2 binary input objects defined for the ACH580 drive.

	N2 binary inputs						
No	Object	Drive parameter	Range				
BI1	STOP/RUN	Status Word, bit 2	0 = Drive received start command 1 = Drive has not received start command				
BI2	FORWARD/REVERSE	Status Word, bit 11	0 = Forward, 1 = Reverse				
BI3	FAULT STATUS	Status Word, bit 15	0 = OK, 1 = Drive fault				
BI4	RELAY 1 STATUS	10.21 RO status, bit 0	0 = Off, 1 = On				
BI5	RELAY 2 STATUS	10.21 RO status, bit 1	0 = Off, 1 = On				
BI6	RELAY 3 STATUS	10.21 RO status, bit 2	0 = Off, 1 = On				
BI7	RELAY 4 STATUS	15.04 RO/DO status, bit 0	0 = Off, 1 = On				
BI8	RELAY 5 STATUS	15.04 RO/DO status, bit 1	0 = Off, 1 = On				
BI9	DIGITAL OUTPUT1 STATUS	15.04 RO/DO status, bit 2	0 = Off, 1 = On				
BI10	INPUT 1 STATUS	10.02 DI delayed status, bit 0	0 = Off, 1 = On				
BI11	INPUT 2 STATUS	10.02 DI delayed status, bit 1	0 = Off, 1 = On				
BI12	INPUT 3 STATUS	10.02 DI delayed status, bit 2	0 = Off, 1 = On				
BI13	INPUT 4 STATUS	10.02 DI delayed status, bit 3	0 = Off, 1 = On				
BI14	INPUT 5 STATUS	10.02 DI delayed status, bit 4	0 = Off, 1 = On				
BI15	INPUT 6 STATUS	10.02 DI delayed status, bit 5	0 = Off, 1 = On				
BI16	EXTERNAL 2 SELECT	DCU Status Word, bit 14	0 = EXT1 active, 1 = EXT2 active				
BI17	HAND/AUTO	DCU Status Word, bit 12	0 = AUTO, 1 = HAND				
BI18	ALARM	DCU Status Word, bit 16	0 = OK, 1 = Warning/alarm				
BI20	DRIVE READY	DCU Status Word, bit 0	0 = Not ready, 1 = Ready				
BI21	AT SETPOINT	DCU Status Word, bit	0 = No, 1 = At setpoint				
BI22	RUN ENABLED	DCU Status Word, bit	0 = Not enabled, 1 = Enabled				
BI23	N2 LOCAL MODE	DCU Status Word, bit 13	0 = Auto, 1 = N2 local				
BI24	N2 CONTROL SRC	DCU Status Word, bit 26	0 = No, 1 = Yes				
BI25	N2 REF1 SRC	DCU Status Word, bit 27	0 = No, 1 = Yes				

	N2 binary inputs						
No	No Object Drive parameter Range						
BI26	N2 REF2 SRC	DCU Status Word, bit 28	0 = No, 1 = Yes				

N2 analog output objects

The following table lists the N2 analog output objects defined for the ACH580 drive.

	N2 analog outputs							
No	Object	Drive parameter	Scale factor	Units	Range	Notes		
AO1	REFERENCE 1	Reference 1	10	%	0100			
AO2	REFERENCE 2	Reference 2	10	%	0100			
AO3	ACCEL TIME 1	No direct mapping	1000	S	0.11800	If parameter 99.04 Motor control mode is set to vector mode (99.04 = 0), map to 23.12 Acceleration time 1. to scalar mode (99.04 = 1), map to 28.72 Freq acceleration time 1.		
AO4	DECEL TIME 1	No direct mapping	1000	S	0.11800	If parameter 99.04 Motor control mode is set to vector mode (99.04 = 0), map to 23.13 Deceleration time 1 to scalar mode (99.04 = 1), map to 28.73 Freq deceleration time 1.		
AO5	CURRENT LIMIT	30.17 Maximum current	100	Α	01.3*I _{2N}			
AO6	PID1-CONT GAIN	40.32 Set 1 gain	100	%	0.1100			
AO7	PID1-CONT I-TIME	40.33 Set 1 integration time	10	s	0.1600			
AO8	PID1-CONT D-TIME	40.34 Set 1 derivation time	10	s	010			
AO9	PID1-CONT D FILTER	40.35 Set 1 derivation filter time	10	s	010			
AO10	PID2-CONT GAIN	41.32 Set 2 gain	100	%	0.1100			
AO11	PID2-CONT I-TIME	41.33 Set 2 integration time	10	s	0.1600			
AO12	PID2-CONT D-TIME	41.34 Set 2 derivation time	1000	s	010			
AO13	PID2-CONT D FILTER	41.35 Set 2 derivation filter time	10	s	010			
AO14	COMMAND AO 1	13.91 AO1 data storage	10	%	0100			
AO15	COMMAND AO 2	13.92 AO2 data storage	10	%	0100			

	N2 analog outputs							
No	Object	Drive parameter	Scale factor	Units	Range	Notes		
AO16	EXT PID SETPOINT	71.21 Internal setpoint 1	100	%	0100			
AO17	SPD OUT MIN	Derived value	10	%	0200	Writing: • scalar mode: 30.13 Minimum frequency = AO17 * 99.08 Motor nominal frequency • vector mode: 30.11 Minimum speed = AO17 * 99.09 Motor nominal speed. Reading: • scalar mode: 99.08 Motor nominal frequency / 30.13 Minimum frequency • vector mode: 99.09 Motor nominal speed / 30.11 Minimum speed.		
AO18	SPD OUT MAX	Derived value	10	%	0200	Writing: • scalar mode: 30.14 Maximum frequency =AO17 * 99.08 Motor nominal frequency • vector mode: 30.12 Maximum speed = AO17 * 99.09 Motor nominal speed. Reading: • scalar mode: 99.08 Motor nominal frequency / 30.13 Minimum frequency • vector mode: 99.09 Motor nominal speed/30.11 Minimum speed.		
AO19	MAILBOX PARAMETER		1		065535	Mailbox feature is not supported		
AO20	MAILBOX DATA		1		065535	Mailbox feature is not supported		

N2 binary output objects

The following table lists the N2 binary output objects defined for the ACH580 drive.

	N2 binary outputs							
No	Object	Drive parameter	Range	Notes				
BO1	STOP/START	DCU Control Word, bit 0 and bit 1	0 = Stop, 1 = Start to Speed	Stop: set bit 0, clear bit 1 Start: set bit 1, clear bit 0				

	N2 binary outputs							
No	Object	Drive parameter	Range	Notes				
BO2	FORWARD/REVERSE	DCU Control Word, bit 12	0 = Forward, 1 = Reverse					
ВО3	PANEL LOCK	Derived	0 = Open, 1 = Locked	Derived from 96.03 Access level status, bit 14 parameter lock				
BO4	RUN ENABLE	Derived value	0 = Enable, 1 = Disable	Invert DCU control word bit 6, RUN_DISABLE				
BO5	REF1/REF2 SELECT	DCU Control Word, bit 5, EXT	0 = Ref1, 1 = Ref2					
BO6	FAULT RESET	DCU Control Word, bit 4, RESET	Change 0 -> 1 Resets					
BO7	COMMAND RO 1	10.99 RO/DIO control word, bit 0	0 = Off, 1 = On					
BO8	COMMAND RO 2	10.99 RO/DIO control word, bit 1	0 = Off, 1 = On					
ВО9	COMMAND RO 3	10.99 RO/DIO control word, bit 2	0 = Off, 1 = On					
BO10	COMMAND RO 4	10.99 RO/DIO control word, bit 3	0 = Off, 1 = On					
BO11	COMMAND RO 5	10.99 RO/DIO control word, bit 4	0 = Off, 1 = On					
BO12	COMMAND RO 6	10.99 RO/DIO control word, bit 5	0 = Off, 1 = On					
BO13	RESET RUN TIME	Indirectly mapping	0 = N/A, 1 = On (Reset run rime, 05.03 Hours run)					
BO14	RESET KWH COUNT	Indirectly mapping	0 = N/A, 1 = On (Reset kWh count 01.58 Cumulative inverter energy (resettable))					
BO15	PRC PID SELECT	40.57 PID set1/set2 selection (indirectly)	0 = SET1, 1 = SET2	If BO15 = 0, 40.57 PID set1/set2 selection is set to PID Set1 (1). If BO15 = 1, 40.57 PID set1/set2 selection is set to PID Set2 (2).				
BO16	N2 LOCAL CTL 1)	DCU Control Word, bit 16	0 = Auto, 1 = N2					
BO17	N2 LOCAL REF 1)	DCU Control Word, bit 17	0 = Auto, 1 = N2					
BO18	SAVE PARAMETERS	96.07 Parameter save manually (indirectly)	0 = N/A, 1 = On (Save Parameters)					
BO19	READ MAILBOX		0 = No, 1 = Yes	Mailbox feature is not supported				
BO20	WRITE MAILBOX		0 = No, 1 = Yes	Mailbox feature is not supported				

	N2 binary outputs						
No	Object	Drive parameter	Range	Notes			

¹⁾ N2 LOCAL CTL and N2 LOCAL REF have priority over drive input terminals. Use these binary outputs for temporary N2 control of the drive when COMM is not the selected control source Need to be verified.

DDI file for NCU

The listing below is the data definition language (DDL) file for ACH580 drives used with the network control units (NCU). It is useful when defining drive I/O objects to the network controller units. Below is the ACH580.DDL file listing.

ABB Drives, ACH 580 Variable Frequency Drive

CSMODEL "ACH 580"."VND"

AITITLE "Analog Inputs"

BITITLE "Binary Inputs"

AOTITLE "Analog Outputs"

BOTITLE "Binary Outputs"

CSAI "AI1",N,N,"FREQ ACT","Hz"

CSAI "AI2",N,N,"PCT ACT","%"

CSAI "AI3",N,N,"SPEED","RPM"

CSAI "AI4".N.N."CURRENT"."A"

CSAI "AI5",N,N,"TORQUE","%"

CSAI "AI6",N,N,"POWER","kW"

CSAI "AI7",N,N,"DRV TEMP PCT","%"

CSAI "AI8", N, N, "ENERGY k", "kWh"

CSAI "AI9",N,N,"ENERGY M","MWh"

CSAI "AI10",N,N,"RUN_TIME","H"

CSAI "AI11",N,N,"DC VOLT","V"

CSAI "AI12",N,N,"VOLT ACT","V"

CSAI "AI13", N, N, "PID1 ACT", "%"

CSAI "AI14",N,N,"PID2_DEV","%"

CSAI "AI15",N,N,"PID2 ACT","%"

CSAI "AI16", N, N, "PID2 DEV", "%"

```
CSAI "AI17", N, N, "LAST FLT", "Code"
```

CSAI "AI18", N, N, "PREV FLT". "Code"

CSAI "AI19",N,N,"1ST FLT","Code"

CSAI "AI20", N, N, "AI 1 ACT", "%"

CSAI "AI21", N, N, "AI 2 ACT", "%"

CSAI "AI22", N, N, "AO 1 ACT", "mA"

CSAI "AI23", N, N, "AO_2 ACT", "mA"

CSAI "AI24",N,N,"MTR TEMP","°C"

CSBI "BI1", N, N, "STOP/RUN", "STOP", "RUN"

CSBI "BI2", N, N, "FWD/REV", "FWD", "REV"

CSBI "BI3".N.N."FAULT"."OK"."FLT"

CSBI "BI4",N,N,"RELAY 1","OFF","ON"

CSBI "BI5", N, N, "RELAY 2", "OFF", "ON"

CSBI "BI6",N,N,"RELAY_3","OFF","ON"

CSBI "BI7", N, N, "RELAY 4", "OFF", "ON"

CSBI "BI8", N, N, "RELAY 5", "OFF", "ON"

CSBI "BI9", N, N, "DO 1", "OFF", "ON"

CSBI "BI10".N.N."INPUT 1"."OFF"."ON"

CSBI "BI11", N, N, "INPUT 2", "OFF", "ON"

CSBI "BI12",N,N,"INPUT 3","OFF","ON"

CSBI "BI13",N,N,"INPUT 4","OFF","ON"

CSBI "BI14",N,N,"INPUT 5","OFF","ON"

CSBI "BI15", N, N, "INPUT 6", "OFF", "ON"

CSBI "BI16",N,N,"EXT1/2","EXT1","EXT2"

CSBI "BI17",N,N,"HND/AUTO","AUTO","HAND"

CSBI "BI18", N, N, "ALARM", "OFF", "ON"

CSBI "BI20",N,N,"DRV REDY","NO","YES"

CSBI "BI21",N,N,"AT_SETPT","NO","YES"

CSBI "BI22", N, N, "RUN_ENAB", "NO", "YES"

CSBI "BI23",N,N,"N2_LOC_M","AUTO","N2_L"

CSBI "BI24",N,N,"N2_CTRL","NO","YES"

CSBI "BI25",N,N,"N2 R1SRC","NO","YES"

CSBI "BI26",N,N,"N2_R2SRC","NO","YES"

CSAO "AO1",Y,Y,"REF_1","%"

```
CSAO "AO2", Y, Y, "REF 2", "%"
```

CSAO "AO3".Y.Y."ACCEL 1"."s"

CSAO "AO4", Y, Y, "DECEL 1", "s"

CSAO "AO5".Y.Y."CURR LIM"."A"

CSAO "AO6", Y, Y, "PID1 GN", "%"

CSAO "AO7", Y, Y, "PID1 I", "s"

CSAO "AO8", Y, Y, "PID1 D", "s"

CSAO "AO9", Y, Y, "PID1 FLT", "s"

CSAO "AO10", Y, Y, PID2 GN", "%"

CSAO "AO11", Y, Y, "PID2 I", "s"

CSAO "AO12", Y, Y, "PID2 D", "s"

CSAO "AO13", Y, Y, "PID2 FLT", "s"

CSAO "AO14".Y.Y."CMD AO 1"."%"

CSAO "AO15", Y, Y, "CMD AO 2", "%"

CSAO "AO16", Y, Y, "PI2 STPT", "%"

CSAO "AO17", Y, Y, "MIN SPD", "%"

CSAO "AO18".Y.Y."MAX SPD"."%"

CSAO "AO19", Y, Y, "MB PARAM", ""

CSAO "AO20", Y, Y, "MB DATA", ""

CSBO "BO1", Y, Y, "START", "STOP", "START"

CSBO "BO2", Y, Y, "REVERSE", "FWD", "REV"

CSBO "BO3", Y, Y, "PAN LOCK", "OPEN", "LOCKED"

CSBO "BO4", Y, Y, "RUN ENAB", "ENABLE", "DISABLE"

CSBO "BO5", Y, Y, "R1/2 SEL", "EXT 1", "EXT 2"

CSBO "BO6", Y, Y, "FLT RSET", "-", "RESET"

CSBO "BO7", Y, Y, "CMD RO 1", "OFF", "ON"

CSBO "BO8", Y, Y, "CMD_RO_2", "OFF", "ON"

CSBO "BO9", Y, Y, "CMD RO 3", "OFF", "ON"

CSBO "BO10", Y, Y, "CMD RO 4", "OFF", "ON"

CSBO "BO11", Y, Y, "CMD RO 5", "OFF", "ON"

CSBO "BO12", Y, Y, "CMD_RO_6", "OFF", "ON"

CSBO "BO13", Y, Y, "RST_RTIM", "OFF", "RESET"

CSBO "BO14", Y, Y, "RST KWH", "OFF", "RESET"

CSBO "BO15", Y, Y, "PID SEL", "SET1", "SET2"

CSBO "BO16",Y,Y,"N2_LOC_C","AUTO","N2"
CSBO "BO17",Y,Y,"N2_LOC_R","AUTO","N2"
CSBO "BO18",Y,Y,"SAV_PRMS","OFF","SAVE"
CSBO "BO19",Y,Y,"READ_MB","NO","READ"
CSBO "BO20",Y,Y,"WRITE_MB","NO","WRITE"



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.

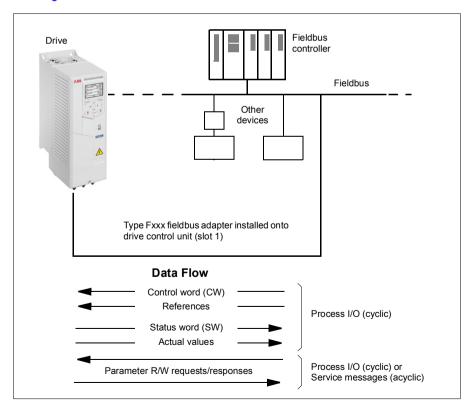
System overview

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

- BACnet/IP (FBIP-21 adapter)
- CANopen (FCAN-01 adapter)
- ControlNet (FCNA-01 adapter)
- DeviceNetTM (FDNA-01 adapter)
- Ethernet POWERLINK (FEPL-02 adapter)
- EtherCAT (FECA-01 adapter)
- EtherNet/IPTM (FENA-11/-21 adapter)
- Modbus/RTU (FSCA-01 adapter)
- ModbusTCP (FBMT-21 adapter, FENA-11/-21 adapter)
- PROFINET IO (FENA-11/-21 adapter)
- PROFIBUS DP (FPBA-01 adapter)

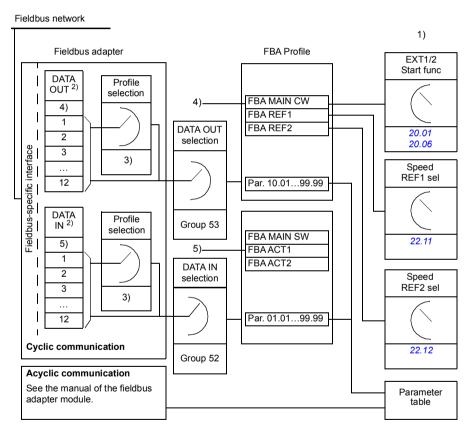
Note: The text and examples in this chapter describe the configuration of one fieldbus adapter (FBAA) by parameters 50.01 ...50.18 and parameter groups 51 FBA A settings...53 FBA A data out.



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.



- 1) See also other parameters which can be controlled from fieldbus.
- 2) The maximum number of data words used is protocol-dependent.
- 3) Profile/instance selection parameters. Fieldbus module specific parameters. For more information, see the *User's manual* of the appropriate fieldbus adapter module.
- 4) With DeviceNet, the control part is transmitted directly.
- 5) With DeviceNet, the actual value part is transmitted directly.

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 295 and 296, respectively. The drive states are presented in the state diagram (page 297). 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.

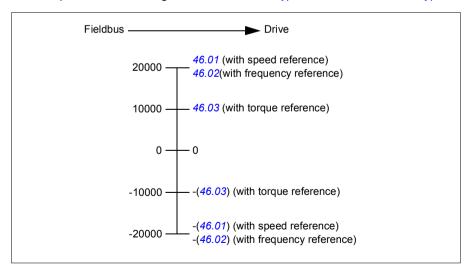
Debugging the network words

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.

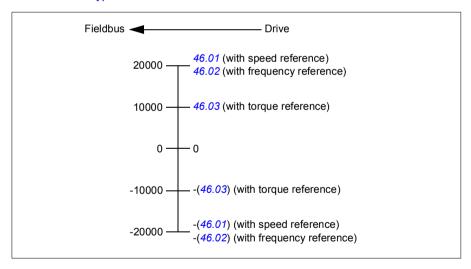
Actual values are 16-bit words containing information on the operation of the drive. The types of the monitored signals are selected by parameters 50.07 FBA A actual 1 type and 50.08 FBA A actual 2 type.

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 **297**).

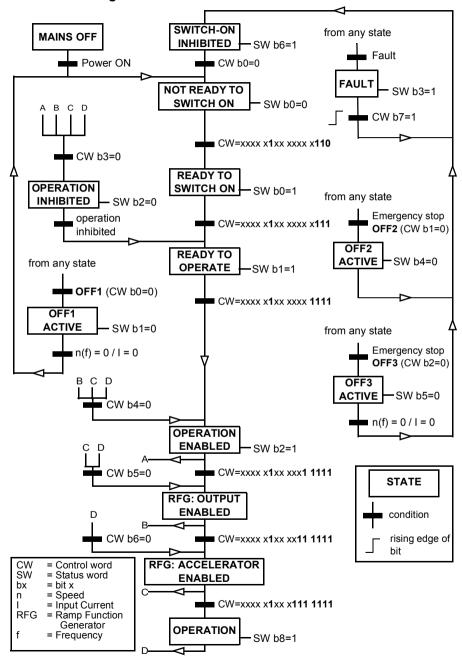
Bit	Name	Value	STATE/Description		
0	Off1 control	1	Proceed to READY TO OPERATE.		
		0	Stop along currently active deceleration ramp. Proceed to OFF1 ACTIVE ; proceed to READY TO SWITCH ON unless other interlocks (OFF2, OFF3) are active.		
1	Off2 control	1	Continue operation (OFF2 inactive).		
		0	Emergency 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 <i>06.18 Start inhibit status word</i> .		
		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	ramp function. Proceed to RAMP FUNCTION GENERATOR: ACCELERATOR ENABLED.		
		0	Halt ramping (Ramp Function Generator output held).		
6	6 Ramp in zero		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.		
89	Reserved	•			
10	Remote cmd	1	Fieldbus control enabled.		
		0	Control word and reference not getting through to the drive, except for bits 02.		
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		
13	User bit 1	1	1		
		0			
14	User bit 2	1	1		
		0	1		
15	User bit 3	1	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 **297**).

Bit	Name	Value	STATE/Description	
0	Ready to switch	1	READY TO SWITCH ON.	
	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 46.2146.22).	
		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			

The state diagram



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	e 1
In	Status word	Speed actual value	e Motor current DC volta		ge	

The table below gives the recommended drive parameter settings.

Drive parameter	Setting for ACX580 drives	Description	
50.01 FBA A enable	1 = [slot number]	s communication between the drive and the fieldbus adapter module.	
50.04 FBA A ref1 type	4 = Speed	Selects the fieldbus A reference 1 type and scaling.	
50.07 FBA A actual 1 type	0 = Speed or frequency	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	
53.02 FBA data out2	2 = Ref1 16bit	Reference 1 (speed)	

Drive parameter	Setting for ACX580 drives	Description
53.03 FBA data out3	23.12 ²⁾	Acceleration time 1
53.05 FBA data out5	23.13 ²⁾	Deceleration time 1
51.27 FBA A par refresh	1 = Configure	Validates the configuration parameter settings.
20.01 Ext1 commands	12 = Fieldbus A	Selects fieldbus adapter A as the source of the start and stop commands for external control location EXT1.
20.02 Ext1 start trigger type	1 = Level	Selects a level-triggered start signal for external control location EXT1.
22.11 Ext1 speed ref1	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	e 1
In	Status word	Speed actual value	Motor cu	rrent	DC volta	ge

The table below gives the recommended drive parameter settings.

Drive parameter	Setting for ACX580 drives	Description		
50.01 FBA A enable	1 = [slot number]	s communication between the drive and the fieldbus adapter module.		
50.04 FBA A ref1 type	4 = Speed	Selects the fieldbus A reference 1 type and scaling.		
50.07 FBA A actual 1 type	0 = Speed or frequency	Selects the actual value type and scalin 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		
53.02 FBA data out2	2 = Ref1 16bit	Reference 1 (speed)		

Drive parameter	Setting for ACX580 drives	Description
53.03 FBA data out3	23.12 ²⁾	Acceleration time 1
53.05 FBA data out5	23.13 ²⁾	Deceleration time 1
51.27 FBA A par refresh	1 = Configure	Validates the configuration parameter settings.
20.01 Ext1 commands	12 = Fieldbus A	Selects fieldbus adapter A as the source of the start and stop commands for external control location EXT1.
20.02 Ext1 start trigger type	1 = Level	Selects a level-triggered start signal for external control location EXT1.
22.11 Ext1 speed ref1	4 = FB A ref1	Selects fieldbus A reference 1 as the source for speed reference 1.

¹⁾ Read-only or automatically detected/set

The start and stop sequences for the parameter examples above are given below.

Control word:

Start:

- 476h -> NOT READY TO SWITCH ON
- If MSW bit 0 = 1 then
 - 477h -> READY TO SWITCH ON (Stopped)
 - 47Fh -> OPERATION (Running)

Stop:

- 477h = Stop according to 21.03 Stop mode
- 47Eh = OFF1 ramp stop (Note: uninterruptable ramp 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.

²⁾ Example

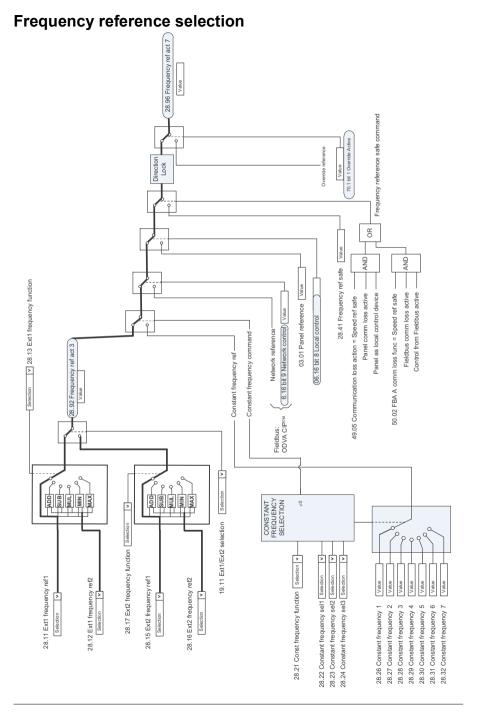
Control chain diagrams

Contents of this chapter

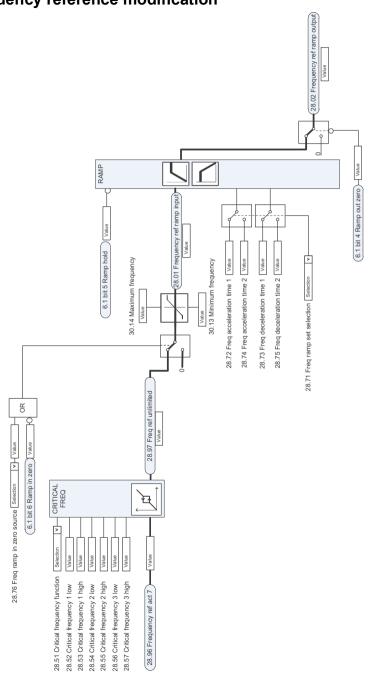
The chapter presents the reference chains of the drive. The control chain diagrams can be used to trace how parameters interact and where parameters have an effect within the drive parameter system.

For a more general diagram, see section Operating modes of the drive (page 91).

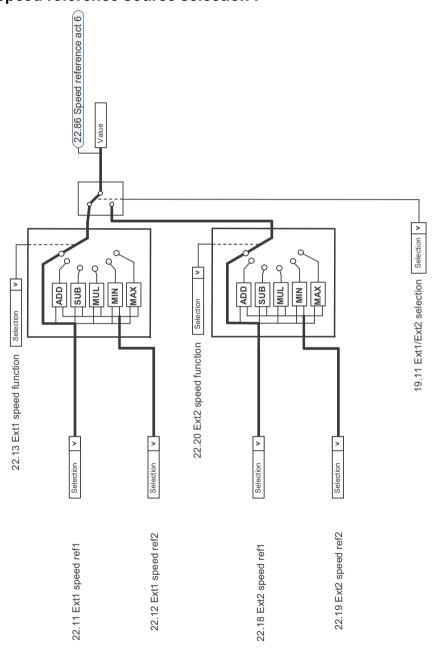
304



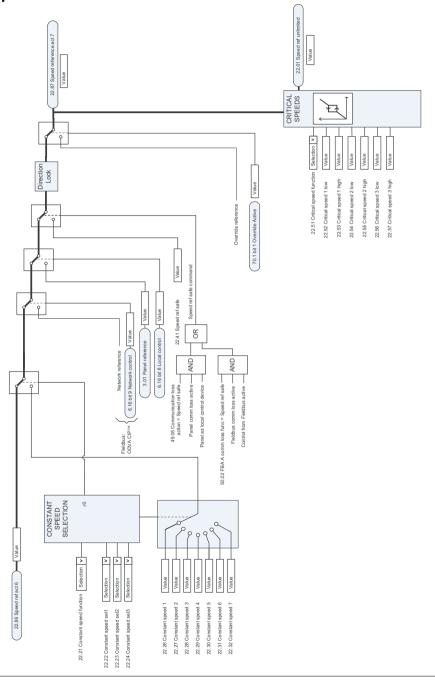
Frequency reference modification

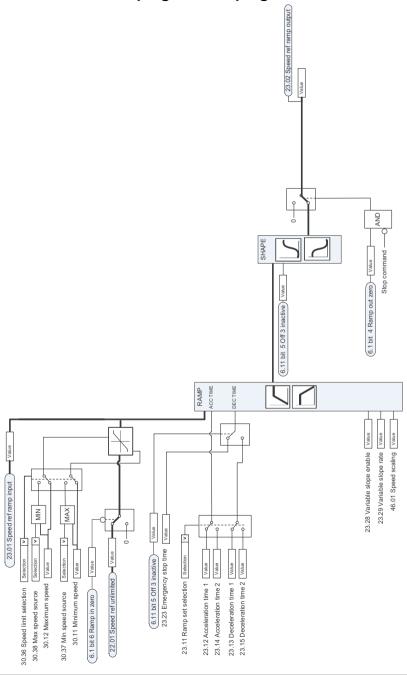


Speed reference source selection I

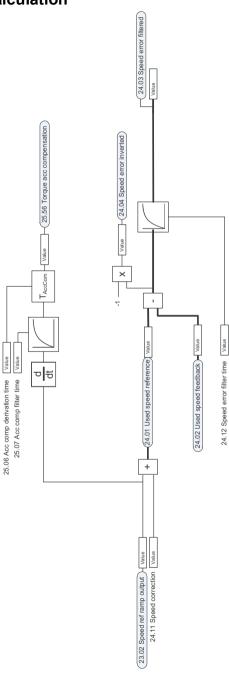


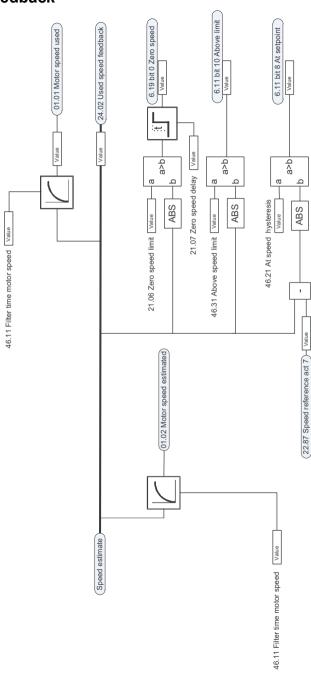
Speed reference source selection II



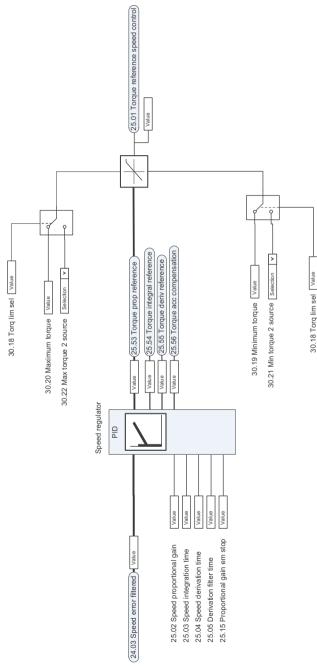


Speed error calculation

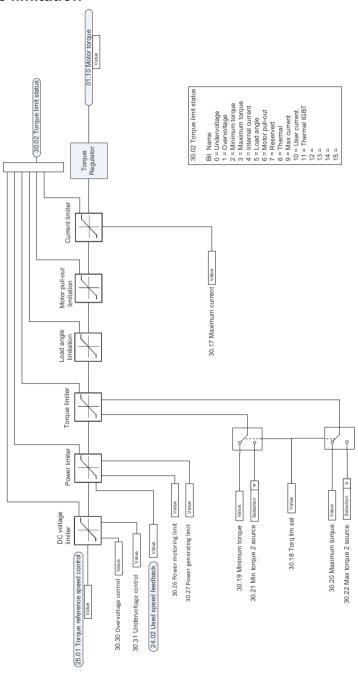




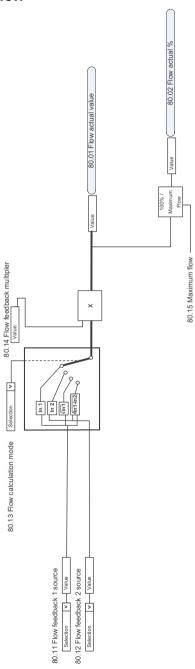
Speed controller



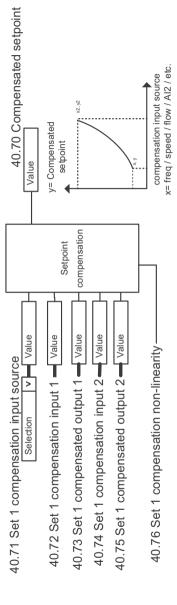
Torque limitation



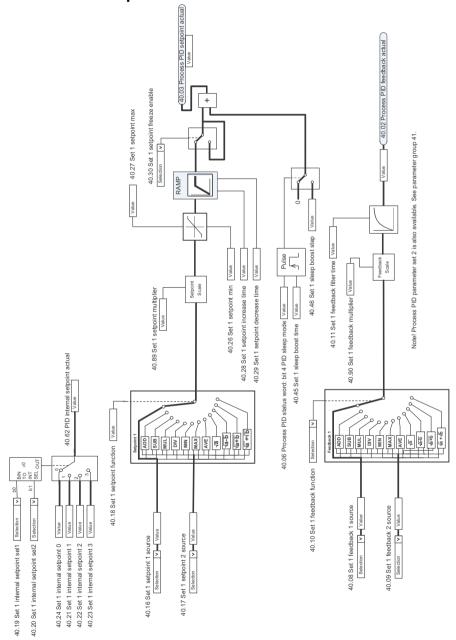
PID flow calculation



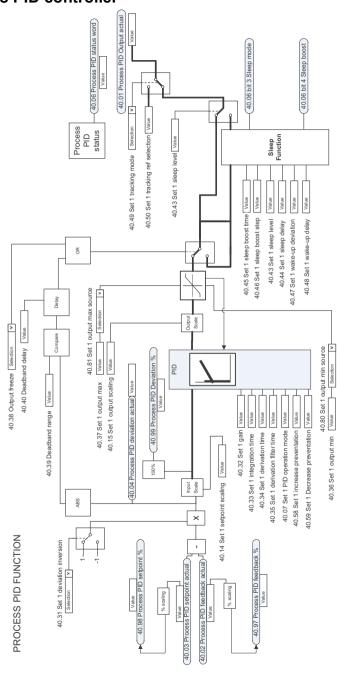
PID setpoint compensation



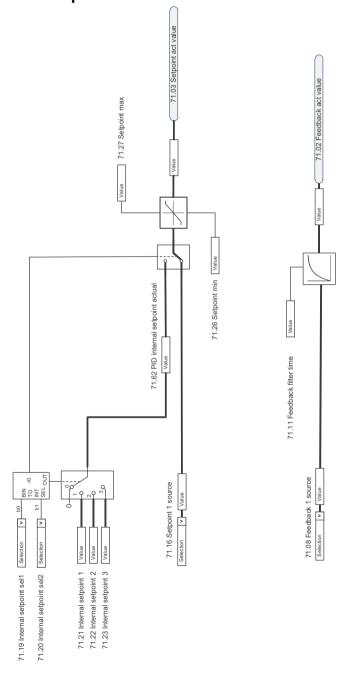
Process PID setpoint and feedback source selection



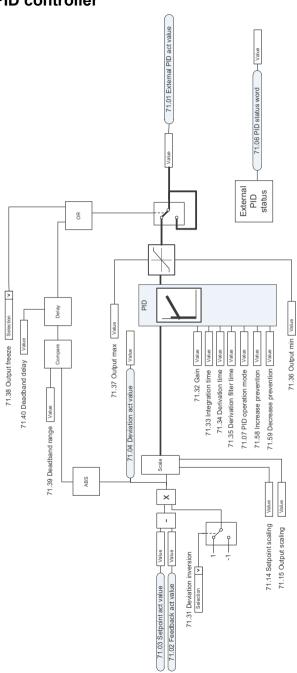
Process PID controller



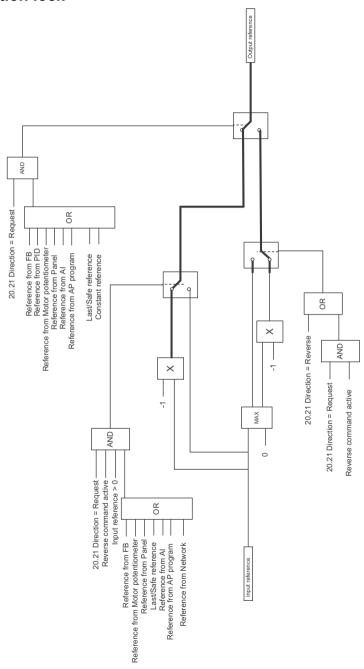
External PID setpoint and feedback source selection



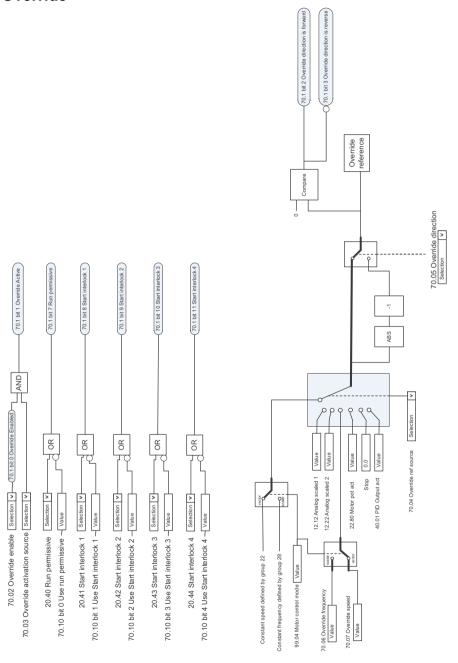
External PID controller



Direction lock



Override



ACH580 HVAC control program

Firmware manual Part 2 Parameters

13. Parameters

14. Additional parameter data

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 568, 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 <i>parameter</i> 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 <i>parameter</i> when used in the Factory macro. For information on other macro-specific parameter values, see chapter <i>Default configuration</i> .
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 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 571).
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.	327	
03 Input references	Values of references received from various sources.	331	
04 Warnings and faults	Information on warnings and faults that occurred last.	332	
05 Diagnostics	Various run-time-type counters and measurements related to drive maintenance.	333	
06 Control and status words	Drive control and status words.		
07 System info	Drive hardware and firmware information.	344	
10 Standard DI, RO	Configuration of digital inputs and relay outputs.	345	
11 Standard DIO, FI, FO	Configuration of the frequency input.	356	
12 Standard Al	Configuration of standard analog inputs.	357	
13 Standard AO	Configuration of standard analog outputs.	362	
15 I/O extension module	Configuration of the I/O extension module installed in slot 2.	368	
19 Operation mode	Selection of local and external control location sources and operating modes.	377	
20 Start/stop/direction	Start/stop/direction and run/start enable signal source selection; positive/negative reference enable signal source selection.	378	
21 Start/stop mode	Start and stop modes; emergency stop mode and signal source selection; DC magnetization settings.	387	
22 Speed reference selection Speed reference selection; Floating point control (Motor potentiometer) settings.		395	
23 Speed reference ramp	Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive).		
24 Speed reference conditioning	Speed error calculation; speed error window control configuration; speed error step.		
25 Speed control	Speed controller settings.		
28 Frequency reference chain	Settings for the frequency reference chain.	413	
30 Limits	Drive operation limits.	423	
31 Fault functions	Configuration of external events; selection of behavior of the drive upon fault situations.	434	
32 Supervision	Configuration of signal supervision functions 16.	444	
34 Timed functions	Configuration of the timed functions.	451	
35 Motor thermal protection	Motor thermal protection settings such as temperature measurement configuration, load curve definition and motor fan control configuration.	459	
36 Load analyzer	Peak value and amplitude logger settings.	470	
37 User load curve	Settings for user load curve.	473	
40 Process PID set 1	Parameter values for process PID control.	476	
41 Process PID set 2	A second set of parameter values for process PID control.	492	
43 Brake chopper	Settings for the internal brake chopper.	494	
45 Energy efficiency			
46 Monitoring/scaling settings	Speed supervision settings; actual signal filtering; general scaling settings.	501	

Group	Contents	Page
47 Data storage	Data storage parameters that can be written to and read from using other parameters' source and target settings.	503
49 Panel port communication	Communication settings for the control panel port on the drive.	504
50 Fieldbus adapter (FBA)	Fieldbus communication configuration.	505
51 FBA A settings	Fieldbus adapter A configuration.	509
52 FBA A data in	Selection of data to be transferred from drive to fieldbus controller through fieldbus adapter A.	510
53 FBA A data out	Selection of data to be transferred from fieldbus controller to drive through fieldbus adapter A.	511
58 Embedded fieldbus	Configuration of the embedded fieldbus (EFB) interface.	511
60 DDCS communication	DCS communication configuration.	520
61 D2D and DDCS transmit data	Defines the data sent to the DDCS link.	520
62 D2D and DDCS receive data	Defines the data sent to the DDCS link.	521
70 Override	Enabling/disabling of override function, override activation signal and override speed/frequency.	
71 External PID1	Configuration of external PID.	
72 External PID2	Configuration of external PID2.	527
73 External PID3	Configuration of external PID3.	529
74 External PID4	Configuration of external PID4.	531
76 PFC configuration	PFC (Pump and fan control) and Autochange configuration parameters.	
77 PFC maintenance and monitoring	PFC (Pump and fan control) maintenance and monitoring parameters.	541
80 Flow calculation	Actual flow calculation.	542
94 LSU control	Control of the supply unit of the drive, such as DC voltage and reactive power reference.	543
95 HW configuration	Various hardware-related settings.	544
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.		546
97 Motor control	Switching frequency; slip gain; voltage reserve; flux braking; anticogging (signal injection); IR compensation.	556
98 User motor parameters	Motor values supplied by the user that are used in the motor model.	560
99 Motor data	Motor configuration settings.	562

Parameter listing

No.	Name/Value	Description	Def/FbEq16
01 Act	tual 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.	-
	-500.00500.00 Hz	Estimated output frequency.	See par. 46.02
01.07	Motor current	Measured (absolute) motor current in A.	-
	0.0030000.00 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.	-
	0.01000.0%	Motor current.	1 = 1%
01.09	Motor current % of drive nom	Motor current (drive output current) in percent of the nominal drive current.	-
	0.01000.0%	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.	-
	-1600.01600.0%	Motor torque.	See par. 46.03
01.11	DC voltage	Measured DC link voltage.	-
	0.002000.00 V	DC link voltage.	10 = 1 V
01.13	Output voltage	Calculated motor voltage in V AC.	-
	02000 V	Motor voltage.	1 = 1 V

No. Name/Value		Description	Def/FbEq16
01.14	Output power	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 or hp	Output power.	See par. 46.04
01.15	Output power % of motor nom	Output power in percent of the nominal motor power.	-
	-300.00 300.00%	Output power.	1 = 1%
01.16	Output power % of drive nom	Output power in percent of the nominal drive power.	-
	-300.00 300.00%	Output power.	1 = 1%
01.17	Motor shaft power	Estimated mechanical power at motor shaft.	-
	-32768.00 32767.00 kW or hp	Motor shaft power.	1 = 1 unit
01.18	Inverter GWh counter	Amount of energy that has passed through the drive (in either direction) in full gigawatt-hours. The minimum value is zero.	-
	065535 GWh	Energy in GWh.	1 = 1 GWh
01.19	Inverter MWh counter	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.	-
	01000 MWh	Energy in MWh.	1 = 1 MWh
01.20	Inverter kWh counter	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.	-
	01000 kWh	Energy in kWh.	10 = 1 kWh
01.24	Flux actual %	Used flux reference in percent of nominal flux of motor.	-
	0200%	Flux reference.	1 = 1%
01.30	Nominal torque scale	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.	-
	0.0004000000 N·m or lb·ft	Nominal torque.	1 = 100 unit
01.31	Ambient temperature	Ambient temperature of the drive. Only for drive frames R6 or larger.	-
	40.0120.0 °C or °F	Temperature.	1 = 1 °
01.50	Current hour kWh	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		111 (11)		
01.51	Previous hour kWh	Previous hour energy consumption. The value 01.50 Current hour kWh 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	Current day kWh	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	Previous day kWh	Previous day energy consumption. The value 01.52 Current day kWh 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	Cumulative inverter energy	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	Inverter GWh counter (resettable)	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 01.5501.58 resets all of them.		
	065535 GWh	Energy in GWh.	1 = 1 GWh	
01.56	Inverter MWh counter (resettable)	Amount of energy that has passed through the drive (in either direction) in full megawatt-hours. Whenever the counter rolls over, 01.55 Inverter GWh counter (resettable) 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 01.5501.58 resets all of them.		
	01000 MWh	Energy in MWh.	1 = 1 MWh	
01.57	Inverter kWh counter (resettable)	Amount of energy that has passed through the drive (in either direction) in full kilowatt-hours. Whenever the counter rolls over, 01.56 Inverter MWh counter (resettable) 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 01.5501.58 resets all of them.		
	01000 kWh	Energy in kWh.	10 = 1 kWh	

No. Name/Value		Description	Def/FbEq16
01.58	Cumulative inverter energy (resettable)	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 01.5501.58 resets all of them.	-
	-200000000.0 2000000000.0 kWh	Energy in kWh.	10 = 1 kWh
01.61	Abs motor speed used	Absolute value of parameter 01.01 Motor speed used.	-
	0.00 30000.00 rpm	Estimated motor speed.	See par. 46.01
01.62	Abs motor speed %	Absolute value of parameter 01.03 Motor speed %.	-
	0.00 1000.00%	Estimated motor speed.	10 = 1%
01.63	Abs output frequency	Absolute value of parameter 01.06 Output frequency.	-
	0.00500.00 Hz	Estimated output frequency.	See par. 46.02
01.64	Abs motor torque	Absolute value of parameter 01.10 Motor torque.	-
	0.01600.0%	Motor torque.	See par. 46.03
01.65	Abs output power	Absolute value of parameter 01.14 Output power.	-
	0.00 32767.00 kW or hp	Output power.	1 = 1 kW
01.66	Abs output power % motor nom	Absolute value of parameter 01.15 Output power % of motor nom.	-
	0.00 300.00%	Output power.	1 = 1%
01.67	Abs output power % drive nom	Absolute value of parameter 01.16 Output power % of drive nom.	-
	0.00 300.00%	Output power.	1 = 1%
01.68	Abs motor shaft power	Absolute value of parameter 01.17 Motor shaft power.	-
	0.00 32767.00 kW or hp	Motor shaft power.	1 = 1 kW
01.102	Line current	(Only visible for ACH580-31). Estimated line current flowing through the supply unit.	-
	0.00 30000.00 A	Estimated line current.	See par. 46.05
01.104	Active current	(Only visible for ACH580-31). Estimated active current flowing through the supply unit.	-
	0.00 30000.00 A	Estimated active current.	See par. 46.05
01.106	Reactive current	(Only visible for ACH580-31). 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	Grid frequency	(Only visible for ACH580-31). Estimated frequency of the power supply network.	-
	0.00 100.00 Hz	Estimated supply frequency.	See par. 46.02
01.109	Grid voltage	(Only visible for ACH580-31). Estimated voltage of the power supply network.	-
	0.00 2000.00 V	Estimated supply voltage.	10 = 1 V
01.110	Grid apparent power	(Only visible for ACH580-31). Estimated apparent power being transferred through the supply unit.	-
	-30000.00 30000.00 kVA	Estimated apparent power.	See par. 46.04
01.112	Grid power	(Only visible for ACH580-31). Estimated power being transferred through the supply unit.	-
	-30000.00 30000.00 kW	Estimated supply power.	See par. 46.04
01.114	Grid reactive power	(Only visible for ACH580-31). Estimated reactive power being transferred through the supply unit.	-
	-30000.00 30000.00 kvar	Estimated reactive power.	10 = 1 kvar
01.116	LSU cos Phi	(Only visible for ACH580-31). Power factor of the supply unit.	-
	-1.00 1.00	Power factor.	100 = 1
01.164	LSU nominal power	(Only visible for ACH580-31). Nominal power of the supply unit.	-
	030000 kW	Nominal power.	1 = 1 kW

03 Inp	Values of references received from various sources. All parameters in this group are read-only unless otherwise noted.		
03.01	Panel reference	Reference 1 given from the control panel or PC tool.	-
	-100000.00 100000.00	Control panel or PC tool reference.	1 = 10
03.02	Panel reference remote	Reference 2 given from the control panel or PC tool.	-
	-100000.00 100000.00	Control panel or PC tool reference.	1 = 10
03.05	FB A reference 1	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	FB A reference 2	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 Wal	rnings 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).	-
	0000hFFFFh	1st active fault.	1 = 1
04.02	Active fault 2	Code of the 2nd active fault.	-
	0000hFFFFh	2nd active fault.	1 = 1
04.03	Active fault 3	Code of the 3rd active fault.	-
	0000hFFFFh	3rd active fault.	1 = 1
04.06	Active warning 1	Code of the 1st active warning.	-
	0000hFFFFh	1st active warning.	1 = 1
04.07	Active warning 2	Code of the 2nd active warning.	-
	0000hFFFFh	2nd active warning.	1 = 1
04.08	Active warning 3	Code of the 3rd active warning.	-
	0000hFFFFh	3rd active warning.	1 = 1
04.11	Latest fault	Code of the 1st stored (non-active) fault.	-
	0000hFFFFh	1st stored fault.	1 = 1
04.12	2nd latest fault	Code of the 2nd stored (non-active) fault.	-
	0000hFFFFh	2nd stored fault.	1 = 1
04.13	3rd latest fault	Code of the 3rd stored (non-active) fault.	-
	0000hFFFFh	3rd stored fault.	1 = 1
04.16	Latest warning	Code of the 1st stored (non-active) warning.	-
	0000hFFFFh	1st stored warning.	1 = 1
04.17	2nd latest warning	Code of the 2nd stored (non-active) warning.	-
	0000hFFFFh	2nd stored warning.	1 = 1
04.18	3rd latest warning	Code of the 3rd stored (non-active) warning.	-
	0000hFFFFh	3rd stored warning.	1 = 1

No.	Name	/Value	Description	Def/FbEq16
04.40	e		User-defined event word. This word collects the status of events (warnings, faults or pure events) selected by parameters 04.4104.71. This parameter is read-only.	the -
	Bit	Name	Description	
	0	User bit 0	1 = Event selected by parameter 04.41 is activ	е
	1	User bit 1	1 = Event selected by parameter 04.43 is activ	е
	15	User bit 15	1 = Event selected by parameter 04.71 is activ	е
		•	·	
	0000h	FFFFh	User-defined event word.	1 = 1
04.41	41 Event word 1 bit 0 code		Selects the hexadecimal code of an event (warning, fault 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 183).	
	0000h	FFFFh	Code of event.	1 = 1
04.43	code pur		Selects the hexadecimal code of an event (warning, fault 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 183).	
	0000h	0000hFFFFh Code of event.	1 = 1	
04.45, 04.47, 04.49,				
04.71	Event code	word 1 bit 15	Selects the hexadecimal code of an event (warning, fault pure event) whose status is shown as bit 15 of 04.40 Even word 1. The event codes are listed in chapter Fault tracing (page 183).	nt
	0000h	FFFFh	Code of event.	1 = 1

05 Dia	agnostics	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.	-
	065535 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.	-
	065535 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.	10 = 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.	-
	065535 d	Cooling fan run-time counter.	1 = 1 d

No.	Name/	ne/Value Desc		ption	Def/FbEq16	
05.08	Cabine temper	mperature parame		rature inside the cabinet. Activated by bit 6 of eter 95.21 HW options word 2. or ACH580-07 cabinet drives.	-	
	-40 1	20 °C or °F	Tempe Fahren	rature inside the cabinet in degrees Celsius or heit.	1 = unit	
05.10	Control temper		Measu	red temperature of the control board	-	
	-100	300 °C or °F	Contro	I board temperature in degrees Celsius or Fahrenheit.	1 = unit	
05.11	Inverter temper		limit va 0.0% =	ted drive temperature in percent of fault limit. The fault ries according to the type of the drive. o °C (32 °F) 6 = Fault limit	-	
	-40.0	160.0%	Drive to	emperature in percent.	1 = 1%	
05.20	Diagnostic word 1			stic word 1. For possible causes and remedies, see r Fault tracing.	-	
	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 warnin	g	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	Overcurren	t flt	Yes = Drive has tripped on fault 2310 Overcurrent		
	5	Reserved				
	6	DC overvol	tage	Yes = Drive has tripped on fault 3210 DC link overvoltage.		
	7	DC underve	oltage	Yes = Drive has tripped on fault 3220 DC link undervoltage.		
	8	Reserved				
	9	Device ove	rtemp flt	Yes = Drive has tripped on fault 4310 Excess temperate	ture.	
	1015	Reserved				
	0000h.	FFFFh	Diagno	estic word 1.	1 = 1	
05.21	Diagno	stic word 2		stic word 2. For possible causes and remedies, see refault tracing.	-	
	Bit	Name		Value		
	09	Reserved		<u> </u>		
	10	Motor over	emp flt	Yes = Drive has tripped on fault 4981 External temperature 1 or 4982 External temperature 2.		
	1115 Reserved					

Diagnostic word 2.

0000h...FFFFh

1 = 1

No.	Name/V	alue	Descri	ption	Def/FbEq16			
05.22	Diagnos	tic word 3	Diagno	ostic word 3.	-			
	Bit	Name		Value				
	08	Reserved						
	9 kWh pulse			Yes = kWh pulse is active.				
	10	Reserved		(Fares to mental				
	11	Fan comma	and	On = Drive fan is rotating above idle speed.				
	1215	Reserved		211 - Brive fair to foldering above falle speed.				
		1						
	0000h	.FFFFh	Diagno	ostic word 3.	1 = 1			
05.80	Motor sp	peed at fault	of the I	of parameter 01.01 Motor speed used at the occurrence atest fault. Parameters 05.8005.89 are shown for ault in the fault log.	-			
	-30000.0 30000.0		Estima	ted motor speed.				
05.81	Output fi fault	requency at		of parameter 01.06 Output frequency at the occurrence atest fault.	-			
	-500.00. Hz	500.00	Estima	Estimated output frequency.				
05.82	DC volta	age at fault	Copy of parameter 01.11 DC voltage at the occurrence of the latest fault.		-			
	0.002000.00 V		DC link	DC link voltage.				
05.83	Motor current at fault			of parameter 01.07 Motor current at the occurrence of est fault.	-			
	0.003	0000.00 A	Motor	Motor current.				
05.84	Motor to	rque at fault		of parameter 01.10 Motor torque at the occurrence of est fault.	-			
	-1600.0.	1600.0%	Motor t	torque.				
05.85	Main sta fault	atus word at		of parameter 06.11 Main status word at the occurrence atest fault.	-			
	0000h	.FFFFh	Main s	tatus word.	1 = 1			
05.86	DI delay fault	ed status at		of parameter 10.02 DI delayed status at the occurrence atest fault.	-			
	0000h	.FFFFh	Delaye	ed status for digital inputs.	1 = 1			
05.87	Inverter tempera	ture at fault	Copy o	of parameter 05.11 Inverter temperature at the ence of the latest fault.	-			
			Drive to	emperature in °C.	1 = 1			
05.88	Referen fault	ce used at	control	of parameter 28.01 Frequency ref ramp input (in scalar mode) or 23.01 Speed ref ramp input (in speed control at the occurrence of the latest fault.	-			
	-30000.0	500.00 Hz or 030000.00 rpm	Freque	ency or speed reference	1 = 1			
05.89	HVAC st	tatus word		of parameter 06.22 HVAC status word at the ence of the latest fault.	-			
	0000h	.FFFFh			1 = 1			

No.	Name/Value	Desci	ription	Def/FbEq16
05.111	Line converter temperature	Estim 0.0% 94% a	visible for ACH580-31). ated supply unit temperature in percent of fault limit. = 0 °C (32 °F) approx. = Warning limit % = Fault limit	-
	-40.0 160.0%	Suppl	y unit temperature in percent.	1 = 1%
05.121	MCB closing counter	, ,	visible for ACH580-31). s the closures of the main circuit breaker of the supply	-
	04294967295	Count	of closures of main circuit breaker.	1 = 1
06 Cor words	ntrol and status	Drive	control and status words.	
		as dig progra For th relate pages This p Note: not th receiv	of signals as received from the selected sources (such ital inputs, the fieldbus interfaces and the application am). e control word bit descriptions see page 295. The d status word and state diagram are presented on 296 and 297 respectively. earameter is read-only. When using fieldbus control, this parameter value is e same as the Control word value that the drive es from the PLC. For the exact value, see 50.12 FBA A mode.	
		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	
	0000hFFFFh	Mair	positral word	1 = 1
	0000IIFFFF[]	iviaili	control word.	

No.	Name/Value	Descrip	ption	Def/FbEq16
06.11	Main status word	For the related pages 2 This pa Note: V	atus word of the drive. status word bit descriptions see page 296. The control word and state diagram are presented on 295 and 297 respectively. rameter is read-only. When using fieldbus control, this parameter value is same as the Status word value that the drive sends to C. For the exact value, see 50.12 FBA A debug mode.	-
		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	
	0000hFFFFh	Main sta	atus word.	1 = 1

0000h...FFFFh

Drive status word 2.

1 = 1

٠.	Name/Value		Descrip	tion	Def/FbEq16	
.16	Drive st	atus word 1		atus word 1. ameter is read-only.	-	
	Bit	Name	lD	escription		
	0	Enabled	1 2	= If Run permissive (par. 20.40) and start interlock sig 0.4120.44) signals are all present. lote: This bit is not affected by the presence of a fault.		
	1	Inhibited	1	= Start inhibited. To start the drive, the inhibiting signa 6.18) must be removed and the start signal cycled.		
	2	DC charge	d 1	= DC circuit has been charged		
	3	Ready to st	tart 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	d)	
	7	Limiting	1	= Any operating limit (speed, torque, etc.) is active	rque, etc.) is active	
	8	Local contr	ol 1	= Drive is in local control		
	9	Network co	ntrol 1	= Drive is in <i>network control</i> (see page 21).		
	10	Ext1 active	1	1 = Control location EXT1 active		
	11	Ext2 active	1	= Control location EXT2 active		
	12	Reserved	<u> </u>			
	13	Start reque		= If Start requested. 0 = When Run permissive signal 0.40) is 0.	= If Start requested. 0 = When Run permissive signal (see par. 0.40) is 0.	
	1415	Reserved	•			
	0000h	.FFFFh	Drive sta	atus word 1.	1 = 1	
.17	Drive st	atus word 2		atus word 2. ameter is read-only.	-	
	Bit	Name		Description		
	0	Identification	n run don	e 1 = Motor identification (ID) run has been performe	d	
	1	Magnetized	d	1 = The motor has been magnetized		
	2	Reserved				
	3	Speed conf	trol	1 = Speed control mode active		
	4	Reserved		'		
	5	Safe refere	nce 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 parameters 49.05 and 50.02	such as	
	7	Loss of refe	erence	1 = Reference signal lost		
				<u> </u>		
	8	Emergency stop failed		a Emergency step rames (see parameters smell		
	8 912	Reserved	stop lalle	a Emergency ctep tanea (eee parameters chief		
	-	,		1 = Start delay (par. 21.22) active.		

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		

	0000hFFFFh	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)		
36	Reserved			
7	Any constant speed request	1 = A constant speed or frequency has been selected; see par. 06.20.		
815	Reserved			

0000hFFFFh	Speed control status word.	1 = 1
	-p	

	Name	Name/Value Descript		ption		Def/FbEq16
06.20	Consta status	ant speed word	constar parame Consta	nt spe eter <i>0</i> 0 ent spe	eed/frequency status word. Indicates which led or frequency is active (if any). See also 6.19 Speed control status word, bit 7, and section leds/frequencies (page 177). ter is read-only.	-
	Bit	Name			Description	
	0	Constant s	peed 1		1 = Constant speed or frequency 1 selected	
	1	Constant s	peed 2		1 = Constant speed or frequency 2 selected	
	2	Constant s	peed 3		1 = Constant speed or frequency 3 selected	
	3	Constant s	peed 4		1 = Constant speed or frequency 4 selected	
	4	Constant s	peed 5		1 = Constant speed or frequency 5 selected	
	5	Constant s	peed 6		1 = Constant speed or frequency 6 selected	
	6	Constant speed 7			1 = Constant speed or frequency 7 selected	
	715	Reserved				
	0000h	FFFFh	Consta	nt spe	eed/frequency status word.	1 = 1
26.21	Drive status word 3 Drive		Drive s	tatus	word 3.	-
			This pa	ırame	ter is read-only.	
	Bit	Name			ription	
	0			1 = D	C hold is active	
		DC hold ac			*	
	1	Post-magnactive			ost-magnetizing is active	
	1	Post-magn	etizing	1 = P	*	
		Post-magnactive Motor pre-h	etizing	1 = Po	ost-magnetizing is active	
	2	Post-magniactive Motor pre-hactive PM smooth	etizing	1 = Po	ost-magnetizing is active	
	2	Post-magnactive Motor pre-hactive PM smoothactive	etizing	1 = Po	ost-magnetizing is active	

No.	Name/Value	Description	Def/FbEq16
06.22	HVAC status word	HVAC specific status word.	-
		This parameter is read-only.	

Bit	Name	Description
0	Hand mode	0 = Drive is not operated from the panel in the Hand mode; 1 = Drive is operated from the 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	Override	0 = Drive is not in the override mode; 1 = Drive is in the override mode.
4	Pre-heating	0 = Motor pre-heating is not active; 1 = Motor pre-heating is active.
5	Damper control	0 = Damper control is not active; 1 = Damper control is active.
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.
1315	Reserved	

	0000hFFFFh		1 = 1
06.30	MSW bit 11 selection	Selects a binary source whose status is transmitted as bit 11 (User bit 0) of <i>06.11 Main status word</i> .	Ext ctrl loc
	False	0.	0
	True	1.	1
	Ext ctrl loc	Bit 11 of 06.01 Main control word (see page 337).	2
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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.	Run permissive
	False	0.	0
	True	1.	1
	Run permissive	Status of the external run permissive signal (see parameter 20.40 Run permissive).	3
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
06.32	MSW bit 13 selection	Selects a binary source whose status is transmitted as bit 13 (User bit 2) of 06.11 Main status word.	False
	False	0.	0
	True	1.	1

No.	Name/Value Description		Def/FbEq16	
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-	
06.33	MSW bit 14 selection	Selects a binary source whose status is transmitted as bit 14 (User bit 3) of 06.11 Main status word.	False	
	False	0.	0	
	True	1.	1	
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-	
06.36	LSU Status word	(Only visible for ACH580-31). Shows the status of the supply unit. See also section Control of a supply unit (LSU) (page 98), and parameter group 60 DDCS communication. 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
46	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
1112	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	•

1 = 1

Supply unit status word.

0000h...FFFFh

No.	Name/Value	Description	Def/FbEq16
06.39	Internal state machine LSU CW	(Only visible for ACH580-31). 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
46	Reserved	
7	RESET	0 -> 1 = Reset an active fault. A fresh start command is required after reset.
815	Reserved	•

	0000hFFFFh	Supply unit control word.	1 = 1
06.116	LSU drive status word 1	(Only visible for ACH580-31). Drive status word 1 received from the supply unit. See also section Control of a supply unit (LSU) (page 98), 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
1415	Reserved	

0000hFFFFh	Drive status word 1.	1 = 1

No.	Name/Value	Descrip	tion	Def/FbEq16
06.118	LSU start inhibit	(Only vis	sible for ACH580-31).	-
	status word		d specifies the source of the inhibiting condition that	
			nting the supply unit from starting.	
			section Control of a supply unit (LSU) (page 98),	
			ameter group 60 DDCS communication. ameter is read-only.	
		Tills par	ameter is read-only.	l
		Bit	Name	
		0	Not ready run	
		1	Ctrl location changed	
		2	SSW inhibit	
		3	Fault reset	
		4	Lost start enable	
		5	Lost run enable	
		68	Reserved	
		9	Charging overload	
		1011	Reserved	
		12	Em Off2	
		13	Em Off3	
		14	Auto reset inhibit	
		15	Reserved	
	0000hFFFFh	Start inh	ibit status word of supply unit.	1 = 1
07 514	etom info	Drivo ha	rdware and firmware information	

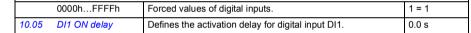
07 Sys	stem info	Drive hardware and firmware information. All parameters in this group are read-only.	
07.03	Drive rating id	Type of the drive. (Rating ID in brackets.)	-
07.04	Firmware name	Firmware identification.	-
07.05	Firmware version	Version number of the firmware.	-
07.06	Loading package name	Name of the firmware loading package.	-
07.07	Loading package version	Version number of the firmware loading package.	-
07.11	Cpu usage	Microprocessor load in percent.	-
	0100%	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.	-
07.26	Customization package version	Customization package version number. Also visible under System info on the control panel or the Drive composer PC tool.	-

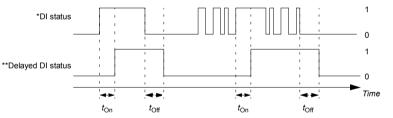
No.	Name/\	/alue	Description	on	Def/FbEq16
07.30	Adaptive program status		Shows the	status of the adaptive program.	-
			See section	n Adaptive programming (page 93).	
	Bit	Name		Description	
	0	Initialized		1 = Adaptive program initialized	
	1	Editing		1 = Adaptive program is being edited	
	2	Edit done		1 = Editing of adaptive program finished	
	3	Running		1 = Adaptive program running	
	413	Reserved			
	14	State chang	ging	1 = State change in progress in adaptive program	ming engine
	15	Faulted		1 = Error in adaptive program	
	0000h	FFFFh	Adaptive p	orogram status.	1 = 1
07.31	AP sequence state		program p programm	number of the active state of the sequence art of the adaptive program (AP). If adaptive ing is not running, or it does not contain a program, the parameter is zero.	
	020				1 = 1
07.106	LSU loa packag		, ,	le for ACH580-31). ne loading package of the supply unit firmware.	-
07.107	LSU loa packag	ading e version	, ,	le for ACH580-31). Imber of the loading package of the supply unit	-
10 Sta	ndard E	OI, RO	Configurat	ion of digital inputs and relay outputs.	
10.01	DI statu	IS	activation/ specified) Bits 05 r	ne electrical status of digital inputs DI6DI1. The deactivation delays of the inputs (if any are are ignored. reflect the status of DI1DI6.	-
			DI3, DI4 a	0000000000010011b = DI5, DI2 and DI1 are on, and DI6 are off.	
	00001		· ·	neter is read-only.	1
	0000h	FFFFh	Status of o	ligital inputs.	1 = 1

	Name/	Name/Value		Description				
10.02	DI dela	yed statu	Example DI3, DI4 This won delay. W remain the	the status of digital inputs DI1DI6. Bits 05 reflect yed status of DI1DI6. e: 0000000000010011b = DI5, DI2 and DI1 are on, and DI6 are off. d is updated only after a 2 ms activation/deactivation/hen the value of a digital input changes, it must he same in two consecutive samples, that is for 2 ms, ew value to be accepted. ameter is read-only.	-			
	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.				
	615	Reserv	/ed					
	0000hFFFFh			status for digital inputs. strical statuses of the digital inputs can be overridden,	1 = 1			
			for exam forced da applied v Note: Bo	aple, testing purposes. A bit in parameter 10.04 DI ata is provided for each digital input, and its value is whenever the corresponding bit in this parameter is 1. bot and power cycle reset the force selections ters 10.03 and 10.04).				
	Bit	Name	Value					
	0	DI1	1 = Force DI1 mode)	= Force DI1 to value of bit 0 of parameter 10.04 DI forced data. (node)				
	1	DI2	1 = Force DI2 mode)	2 to value of bit 1 of parameter 10.04 DI forced data. (
		_	_					
	2	DI3	mode)	3 to value of bit 2 of parameter 10.04 DI forced data. (
	3	DI3	mode) 1 = Force DI4 mode)	4 to value of bit 3 of parameter 10.04 DI forced data. () = Normal			
			mode) 1 = Force DI4 mode) 1 = Force DI5 mode)	4 to value of bit 3 of parameter 10.04 DI forced data. (to value of bit 4 of parameter 10.04 DI forced data. (to value of bit 4 of parameter 10.04 DI forced data.)) = Normal) = Normal			
	3 4 5	DI4 DI5 DI6	mode) 1 = Force DI4 mode) 1 = Force DI5 mode) 1 = Force DI6 mode)	4 to value of bit 3 of parameter 10.04 DI forced data. () = Normal) = Normal			
	3	DI4	mode) 1 = Force DI4 mode) 1 = Force DI5 mode) 1 = Force DI6 mode)	4 to value of bit 3 of parameter 10.04 DI forced data. (to value of bit 4 of parameter 10.04 DI forced data. (to value of bit 4 of parameter 10.04 DI forced data.)) = Normal) = Normal			
	3 4 5	DI4 DI5 DI6	mode) 1 = Force DI4 mode) 1 = Force DI5 mode) 1 = Force DI6 mode)	4 to value of bit 3 of parameter 10.04 DI forced data. (to value of bit 4 of parameter 10.04 DI forced data. (to value of bit 4 of parameter 10.04 DI forced data.)) = Normal) = Normal			

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

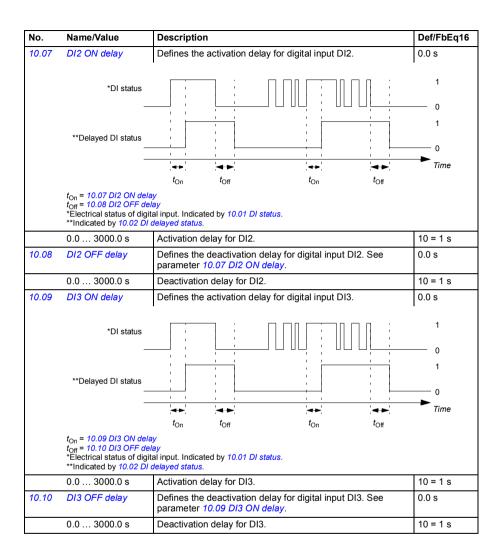
Bit	Name	Value		
0	DI1	1 = Force the value of this bit to D1, if so defined in parameter 10.03 DI force selection.		
1	DI2	1 = Force the value of this bit to D3, if so defined in parameter 10.03 DI force selection.		
2	DI3	1 = Force the value of this bit to D3, if so defined in parameter 10.03 DI force 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.		
615	Reserved			

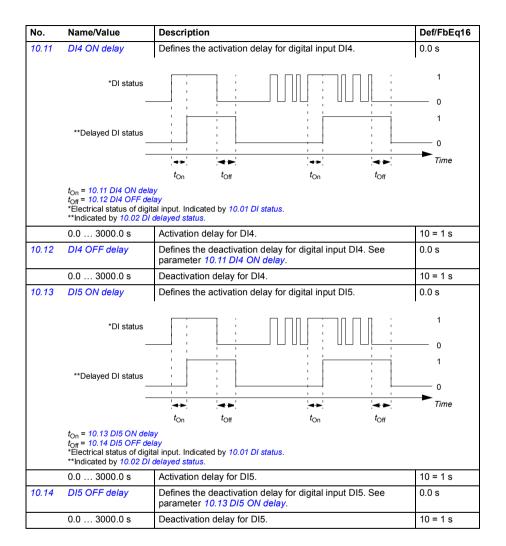




$$\begin{split} t_{\rm On} &= 10.05 \, {\rm DI1 \,\, ON \,\, delay} \\ t_{\rm Off} &= 10.06 \, {\rm DI1 \,\, OFF \,\, delay} \\ \text{*Electrical status of digital input. Indicated by 10.01 \, DI \,\, status.} \\ \text{**Indicated by } 10.02 \, {\rm DI \,\, delayed \,\, status.} \end{split}$$

	0.0 3000.0 s	Activation delay for DI1.	10 = 1 s
10.06		Defines the deactivation delay for digital input DI1. See parameter 10.05 DI1 ON delay.	0.0 s
	0.0 3000.0 s	Deactivation delay for DI1.	10 = 1 s





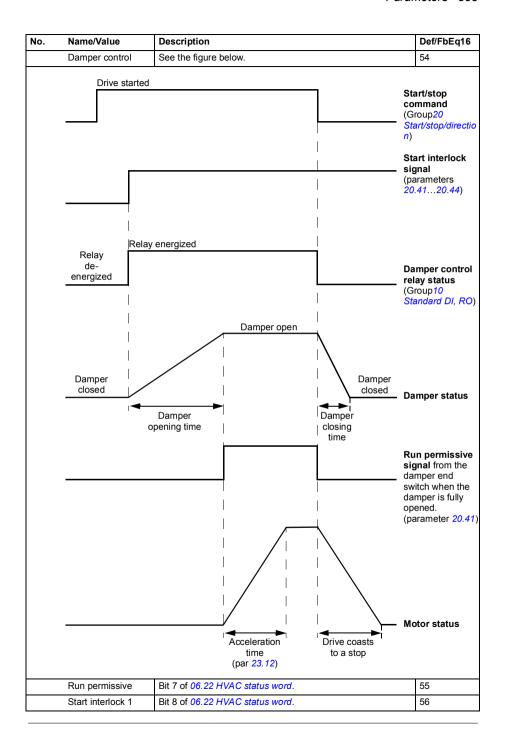
**Delayed DI status **Delayed DI status **Delayed DI status **Incomparison to the status of the s	ef/FbEq16		Description	ne/Value	No. Nam		
**Delayed DI status **Delayed DI status **Delayed DI status **Delayed DI status **Indicated by 10.02 DI delayed status. **Indicated by 10.02 DI delayed sta	.0 s	tion delay for digital input DI6.	Defines the act	ON delay	10.15 DI6		
Delayed DI status **Delayed DI status **Indicated by 10.02 Di delayed status. **Indicated by 10.02 Di de	1 - 0			*DI status			
ton = 10.15 DI6 ON delay ton = 10.16 DI6 OFF delay *Electrical status of digital input. Indicated by 10.01 DI status. **Indicated by 10.02 DI delayed status. 0.0 3000.0 s	1 0			elayed DI status —	**De		
ton = 10.15 Di6 ON delay ton = 10.16 Di6 OFF delay "Electrical status of digital input. Indicated by 10.01 DI status. "Indicated by 10.02 DI delayed status. 0.0 3000.0 s	Time	-{	←>				
Defines the deactivation delay for digital input DI6. See parameter 10.15 DI6 ON delay. 0.0 3000.0 s Deactivation delay for DI6. 10.21 RO status Status of relay outputs RO3RO1. Bit Value			y ay al input. Indicated b	10.16 DI6 OFF dea trical status of digit	t _{Off} = *Elec		
parameter 10.15 DI6 ON delay. 0.0 3000.0 s Deactivation delay for DI6. 10.21 RO status Status of relay outputs RO3RO1. Bit Value	0 = 1 s	r DI6.	Activation delay	3000.0 s	0.0 .		
Status of relay outputs RO3RO1. Status of	.0 s			OFF delay	10.16 DI6		
Bit Value 0	0 = 1 s	for DI6.	Deactivation de	3000.0 s	0.0 .		
0 1 = RO1 is energized. 1 1 = RO2 is energized. 2 1 = RO3 is energized. 315 Reserved 1 = RO force selection The signals connected to the relay outputs can be overridden for, for example, testing purposes. A bit in parameter 10.23 RO forced data is applied whenever the corresponding bit in this parameter is 1. Note: Boot and power cycle reset the force selections (parameters 10.22 and 10.23). Bit Value 0 1 = Force RO1 to value of bit 0 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data.		puts RO3RO1.	Status of relay	status	10.21 RO s		
1				Value	Bit		
2			energized.	1 = RO1 is	0		
315 Reserved 0000hFFFh Status of relay outputs. 1 = 00000 The signals connected to the relay outputs can be overridden for, for example, testing purposes. A bit in parameter 10.23 RO forced data is provided for each relay 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 10.22 and 10.23). Bit Value 1 = Force RO1 to value of bit 0 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data.			energized.	1 = RO2 is	1		
0000hFFFh Status of relay outputs. 10.22 RO force selection The signals connected to the relay outputs can be overridden for, for example, testing purposes. A bit in parameter 10.23 RO forced data is provided for each relay 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 10.22 and 10.23). Bit Value 1 = Force RO1 to value of bit 0 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data.			1 = RO3 is	2			
The signals connected to the relay outputs can be overridden for, for example, testing purposes. A bit in parameter 10.23 RO forced data is provided for each relay 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 10.22 and 10.23). Bit Value 1 = Force RO1 to value of bit 0 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data.	Reserved						
for, for example, testing purposes. A bit in parameter 10.23 RO forced data is provided for each relay 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 10.22 and 10.23). Bit Value 1 = Force RO1 to value of bit 0 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data.	= 1	puts.	Status of relay	DhFFFFh	0000		
1 = Force RO1 to value of bit 0 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data.	000h	esting purposes. A bit in parameter 10.23 provided for each relay output, and its value er the corresponding bit in this parameter is ower cycle reset the force selections	for, for example RO forced data is applied when 1. Note: Boot and	force selection	10.22 RO f		
1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal			Bit Value				
1 = Force RO2 to value of bit 1 of parameter 10.23 RO forced data. (0 = Normal 1 = Force RO3 to value of bit 2 of parameter 10.23 RO forced data. (0 = Normal	nal mode)						
·	,	· · · · · · · · · · · · · · · · · · ·					
315 Reserved	nal mode)	of parameter 10.23 RO forced data. (0 = No	O3 to value of b	1 = Force F	2		
				15 Reserved	31		
0000hFFFFh Override selection for relay outputs.	_ 4	for a law automia	O	Db	2022		

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.	

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.
315	Reserved

	0000hFFFFh	Forced RO values.	1 = 1
10.24	RO1 source	Selects a drive signal to be connected to relay output RO1.	Damper control
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready run	Bit 1 of 06.11 Main status word (see page 337).	2
	Enabled	Bit 0 of 06.16 Drive status word 1 (see page 338).	4
	Started	Bit 5 of 06.16 Drive status word 1 (see page 338).	5
	Magnetized	Bit 1 of 06.17 Drive status word 2 (see page 338).	6
	Running	Bit 6 of 06.16 Drive status word 1 (see page 338).	7
	Ready ref	Bit 2 of 06.11 Main status word (see page 337).	8
	At setpoint	Bit 8 of 06.11 Main status word (see page 337).	9
	Reverse	Bit 2 of 06.19 Speed control status word (see page 339).	10
	Zero speed	Bit 0 of 06.19 Speed control status word (see page 339).	11
	Above limit	Bit 10 of 06.17 Drive status word 2 (see page 338).	12
	Warning	Bit 7 of 06.11 Main status word (see page 337).	13
	Fault	Bit 3 of 06.11 Main status word (see page 337).	14
	Fault (-1)	Inverted bit 3 of 06.11 Main status word (see page 337).	15
	Fault/Warning	Bit 3 of 06.11 Main status word OR bit 7 of 06.11 Main status word (see page 337).	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 338).	23
	Remote control	Bit 9 of 06.11 Main status word (see page 337).	24

No.	Name/Value	Description	Def/FbEq16
	Reserved		2526
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	27
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	28
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	29
	Reserved		3032
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	33
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	34
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	35
	Reserved		3638
	Start delay	Bit 13 of 06.17 Drive status word 2 (see page 338).	39
	RO/DIO control word bit0	Bit 0 of 10.99 RO/DIO control word (see page 355).	40
	RO/DIO control word bit1	Bit 1 of 10.99 RO/DIO control word (see page 355).	41
	RO/DIO control word bit2	Bit 2 of 10.99 RO/DIO control word (see page 355).	42
	Reserved		4344
	PFC1	Bit 0 of 76.01 PFC status (see page 534).	45
	PFC2	Bit 1 of 76.01 PFC status (see page 534).	46
	PFC3	Bit 2 of 76.01 PFC status (see page 534).	47
	PFC4	Bit 3 of 76.01 PFC status (see page 534).	48
	Reserved		4952
	Event word 1	Event word 1 = 1 if any bit of 04.40 Event word 1 (see page 333) is 1, that is, if any warning, fault or pure event that has been defined with parameters 04.4104.71 is on.	53



No.	Name/Value	Description	Def/FbEq16
	Start interlock 2	Bit 9 of 06.22 HVAC status word.	57
	Start interlock 3	Bit 10 of 06.22 HVAC status word.	58
	Start interlock 4	Bit 11 of 06.22 HVAC status word.	59
	All start interlocks	Bit 12 of 06.22 HVAC status word.	60
	User load curve	Bit 3 (Outside load limit) of 37.01 ULC output status word (see page 473).	61
	RO/DIO control word	For 10.24 RO1 source: Bit 0 (RO1) of 10.99 RO/DIO control word (see page 355). For 10.27 RO2 source: Bit 1 (RO2) of 10.99 RO/DIO control word (see page 355). For 10.30 RO3 source: Bit 2 (RO3) of 10.99 RO/DIO control word (see page 355).	62
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
10.25	RO1 ON delay	Defines the activation delay for relay output RO1.	0.0 s
	Status of selected source		1 0 1
	RO status —		0
	t _{On} = 10.25 RO1 ON de t _{Off} = 10.26 RO1 OFF de	ton toff ton toff lay elay	
	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
	Status of selected source		1 0 1
		ton toff ton toff	0 → Time
	$t_{\text{On}} = 10.28 \text{ RO2 ON de.}$ $t_{\text{Off}} = 10.29 \text{ RO2 OFF de.}$	elay	Terr
	0.0 3000.0 s	Activation delay for RO2.	10 = 1 s

No.	Name/V	alue	Description	Def/FbEq16
10.29	RO2 OF	F delay	Defines the deactivation delay for relay output RO2. See parameter 10.28 RO2 ON delay.	0.0 s
	0.0 3	000.0 s	Deactivation delay for RO2.	10 = 1 s
10.30	RO3 so	urce	Selects a drive signal to be connected to relay output RO3. For the available selections, see parameter 10.24 RO1 source.	Fault (-1)
10.31	RO3 OI	l delay	Defines the activation delay for relay output RO3.	0.0 s
	Status	s of selected source	4-1 4-1 4-1	1 0 1
			t_{On} t_{Off} t_{On} t_{Off}	
		31 RO3 ON dei 32 RO3 OFF de		
	0.0 3	000.0 s	Activation delay for RO3.	10 = 1 s
10.32			Defines the deactivation delay for relay output RO3. See parameter 10.31 RO3 ON delay.	0.0 s
	0.0 3	000.0 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 (58.10158.114) 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	1
	0	RO1	Source bits for relay outputs RO1RO3. See paramete	rs 10.24,
	1	RO2	10.27 and 10.30.	,
	2	RO3		
	3	RO4	Source bits for relay outputs RO4RO5 with a CHDI-01	or CMOD-01
	4	RO5	extension module. See parameters 15.07 and 15.10.	
	57	Reserved		
	8	DIO1	Source bit for digital output DO1 with a CMOD-01 exten See parameter 15.23.	sion module.
	915	Reserved		
	0000hFFFFh		RO/DIO control word.	1 = 1
10.101	stat Car		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.	-
04294967000		1967000	State change count.	1 = 1

No.	Name/Value	Description	Def/FbEq16
10.102	 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. 		-
	04294967000	State change count.	1 = 1
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.	-
	04294967000	State change count.	1 = 1

Digital input DI5 is used as a digital input. Frequency input DI5 is used as a frequency input. DI5 is used as a frequency input. 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. Displays the value of frequency input 1. 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. Scaled value of frequency input 1 (DI5). 32768.000 Scaled value of frequency input 1 (DI5).				
Digital input Frequency input Dis is used as a digital input. Frequency input Dis is used as a frequency input. 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. Displays the value of frequency input 1. Inspect of frequency input 1. 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. Scaled value of frequency input 1 (DI5). 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 11.4211.45 as follows: 11.39 11.45 11.44 11.45 11.45 11.45 11.45 11.45 11.43 In (11.38)	11 Sta	ndard DIO, FI, FO	Configuration of the frequency input.	
Frequency input 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. Displays the value of frequency input 1. 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. Scaled value of frequency input 1 (DI5). 1 = 1 Defines the minimum for the frequency actually arriving at frequency input 1 (DI5 when it is used as a freque	11.21	DI5 configuration	Selects how digital input 5 is used.	Digital input
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. 11.39 Freq in 1 scaled value Displays the value of frequency input 1. 1 = 1 Hz 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. Scaled value of frequency input 1 (DI5). 1 = 1 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 11.4211.45 as follows: 11.39 11.44 11.45 In (11.38)		Digital input	DI5 is used as a digital input.	0
used as a frequency input) before scaling. See parameter 11.42 Freq in 1 min. This parameter is read-only. 11.39 Freq in 1 scaled value of frequency input 1. 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. Scaled value of frequency input 1 (DI5). 32767.000 Scaled value of frequency input 1 (DI5). 1 = 1 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 11.4211.45 as follows: 11.39 11.44 11.45 In (11.38)		Frequency input	DI5 is used as a frequency input.	1
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. Scaled value of frequency input 1 (DI5). 1 = 1 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 11.4211.45 as follows: 11.39 11.44 11.44 11.45 11.45 11.45 11.46 11.47 11.48	11.38		used as a frequency input) before scaling. See parameter 11.42 Freq in 1 min.	-
used as a frequency input) after scaling. See parameter 11.42 Freq in 1 min. This parameter is read-only. Scaled value of frequency input 1 (DI5). 1 = 1 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 11.4211.45 as follows: 11.39 11.44 11.45 11.45 11.46 11.47 11.48 In (11.38)		0 16000 Hz	Unscaled value of frequency input 1.	1 = 1 Hz
32767.000 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 11.4211.45 as follows: 11.39 11.45 — — — — — — — — — — — — — — — — — — —	11.39		used as a frequency input) after scaling. See parameter 11.42 Freq in 1 min.	-
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 11.4211.45 as follows: 11.45 11.45 11.45 11.45 11.46 11.47 11.48			Scaled value of frequency input 1 (DI5).	1 = 1
0 16000 Hz Minimum frequency of frequency input 1 (DI5). 1 = 1 Hz	11.42	Freq in 1 min	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 11.4211.45 as follows: 11.39 11.45	0 Hz
		0 16000 Hz	Minimum frequency of frequency input 1 (DI5).	1 = 1 Hz

No.	Name/Value		Description	Def/FbEq16
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.v	16000 Hz
	0 16000 Hz		Maximum frequency for frequency input 1 (DI5).	1 = 1 Hz
11.44	Freq in 1 min	1 at scale	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
	-32768.0 32767.0		Value corresponding to minimum of frequency input 1.	1 = 1
11.45	Freq in 1 max	1 at scale	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)
	-32768.0 32767.0		Value corresponding to maximum of frequency input 1.	1 = 1
12 Sta	ndard A	I	Configuration of standard analog inputs.	
12.02 Al force selection		selection	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. Notes: Al filter times (parameters 12.16 Al1 filter time and 12.26 Al2 filter time) have no effect on forced Al values (parameters 12.13 Al1 forced value and 12.23 Al2 forced value). Boot and power cycle reset the force selections (parameters 12.02 and 12.03).	0000h
	Bit	Name	Value	
	0	Al1	1 = Force Al1 to value of parameter 12.13 Al1 forced value.	
	1	Al2	1 = Force Al2 to value of parameter 12.23 Al2 forced value.	
	215 Reserved		d	
	0000h	FFFFh	Forced values selector for analog inputs Al1 and Al2.	1 = 1
12.03	Al super function		Selects how the drive reacts when an analog input signal moves out of the minimum and/or maximum limits specified for the input. 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 Al supervision selection.	No action
	No actio	n	No action taken.	0
	Fault		Drive trips on fault 80A0 AI supervision.	1
	Warning		Drive generates warning A8A0 AI supervision.	2
	Last speed		Drive generates warning A8A0 Al 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	3

No.	Name/Value		Description		Def/FbEq16	
	Speed ref safe		spee safe	generates warning A8A0 AI supervision and sets the d to the speed defined by parameter 22.41 Speed ref (or 28.41 Frequency ref safe when frequency reference ng used). WARNING! Make sure that it is safe to continue operation in case of a communication break.	4	
12.04	AI supervision selection			ifies the analog input limits to be supervised. See meter 12.03 Al supervision function.	0000h	
	Bit Name			Description		
	0	AI1 < MIN		1 = Minimum limit supervision of Al1 active.		
	1	AI1 > MAX		1 = Maximum limit supervision of AI1 active.		
	2	AI2 < MIN		1 = Minimum limit supervision of Al2 active.		
	3	Al2 > MAX		1 = Maximum limit supervision of Al2 active.		
	415	Reserved				
	0000hFFFFh		Activ	ation of analog input supervision.	1 = 1	
12.11	Al1 actual value		on wh	ays the value of analog input AI1 in mA or V (depending nether the input is set to current or voltage by a hardware ig). parameter is read-only.	-	
	0.00022.000 mA or 0.00011.000 V		Value	e of analog input Al1.	1000 = 1 unit	
12.12	Al1 scaled value		parar at Al	ays the value of analog input Al1 after scaling. See meters 12.19 Al1 scaled at Al1 min and 12.20 Al1 scaled 1 max. parameter is read-only.	-	
	-32768.000 32767.000		Scale	ed value of analog input Al1.	1 = 1	
12.13 Al1 force				ed value that can be used instead of the true reading of uput. See parameter 12.02 Al force selection.	-	
	0.00020.000 mA or 0.00010.000 V		Force	ed value of analog input Al1.	1000 = 1 unit	
12.15	Al1 unit selection		Selectin selection in put	cts the unit for readings and settings related to analog AI1.	V	
	V		Volts		2	
	mA		Millia	mperes.	10	

No.	Name/Value	Description	Def/FbEq16
12.16	Al1 filter time	Defines the filter time constant for analog input Al1. "Unfiltered signal 100 63 Filtered signal O = I × (1 - e ^{-t/T}) I = filter input (step) O = filter output t = time T = filter time constant 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.	0.100 s
	0.00030.000 s	Filter time constant.	1000 = 1 s
12.17	Al1 min	Defines the minimum site value for analog input Al1. Set the value actually sent to the drive when the analog signal from plant is wound to its minimum setting. See also parameter 12.19 Al1 scaled at Al1 min.	4.000 mA or 0.000 V
	0.00020.000 mA or 0.00010.000 V	Minimum value of Al1.	1000 = 1 unit
12.18	Al1 max	Defines the maximum site value for analog input Al1. Set the value actually sent to the drive when the analog signal from plant is wound to its maximum setting. See also parameter 12.19 Al1 scaled at Al1 min.	20.000 mA or 10.000 V
	0.00022.000 mA or 0.00011.000 V	Maximum value of Al1.	1000 = 1 unit

No.	Name/Value	Description	Def/FbEq16
12.19	Al1 scaled at Al1 min	Defines the real internal value that corresponds to the minimum analog input Al1 value defined by parameter 12.17 Al1 min. (Changing the polarity settings of 12.19 and 12.20 can effectively invert the analog input.) Al _{scaled} (12.12) 12.20 12.18	0.000
	-32768.000 32767.000	Real value corresponding to minimum Al1 value.	1 = 1
12.20	Al1 scaled at Al1 max	Defines the real internal value that corresponds to the maximum analog input Al1 value defined by parameter 12.18 Al1 max. See the drawing at parameter 12.19 Al1 scaled at Al1 min.	50.000; 60.000 (95.20 b0)
	-32768.000 32767.000	Real value corresponding to maximum Al1 value.	1 = 1
12.21	Al2 actual value	Displays the value of analog input Al2 in mA or V (depending on whether the input is set to current or voltage by a hardware setting). This parameter is read-only.	-
	0.00022.000 mA or 0.00011.000 V	Value of analog input Al2.	1000 = 1 unit
12.22	Al2 scaled value	Displays the value of analog input Al2 after scaling. See parameters 12.29 Al2 scaled at Al2 min and 12.101 Al1 percent value. This parameter is read-only.	-
	-32768.000 32767.000	Scaled value of analog input AI2.	1 = 1
12.23	Al2 forced value	Forced value that can be used instead of the true reading of the input. See parameter 12.02 AI force selection.	-
	0.00020.000 mA or 0.00010.000 V	Forced value of analog input AI2.	1000 = 1 unit
12.25	Al2 unit selection	Selects the unit for readings and settings related to analog input Al2.	mA
	V	Volts.	2
	mA	Milliamperes.	10
12.26	Al2 filter time	Defines the filter time constant for analog input Al2. See parameter 12.16 Al1 filter time.	0.100 s
	0.00030.000 s	Filter time constant.	1000 = 1 s

No.	Name/Value	Description	Def/FbEq16
12.27	Al2 min	Defines the minimum site value for analog input Al2. Set the value actually sent to the drive when the analog signal from plant is wound to its minimum setting.	0.000 mA
	0.00020.000 mA or 0.00010.000 V	Minimum value of AI2.	1000 = 1 unit
12.28	Al2 max	Defines the maximum site value for analog input Al2. Set the value actually sent to the drive when the analog signal from plant is wound to its maximum setting.	10.000 mA
	0.00022.000 mA or 0.00011.000 V	Maximum value of AI2.	1000 = 1 unit
12.29	Al2 scaled at Al2 min	Defines the real value that corresponds to the minimum analog input Al2 value defined by parameter 12.27 Al2 min. (Changing the polarity settings of 12.29 and 12.101 can effectively invert the analog input.) Al _{scaled} (12.22) 12.101	0.000
	-32768.000 32767.000	Real value corresponding to minimum Al2 value.	1 = 1
12.30	Al2 scaled at Al2 max	Defines the real value that corresponds to the minimum analog input Al2 value defined by parameter 12.28 Al2 max. See the drawing at parameter of 12.29 Al2 scaled at Al2 min.	50.000
	-32768.000 32767.000	Real value corresponding to maximum Al2 value.	1 = 1
12.101	Al1 percent value	Value of analog input Al1 in percent of Al1 scaling (12.18 Al1 max - 12.17 Al1 min).	-
	0.00100.00%	Al1 value	100 = 1%
12.102	Al2 percent value	Value of analog input Al2 in percent of Al2 scaling (12.28 Al2 max - 12.27 Al2 min).	-
	0.00100.00%	Al2 value	100 = 1%

No.	Name/Value		Description	Def/FbEq16
13 Sta	13 Standard AO		Configuration of standard analog outputs.	
13.02 AO force selection		e selectior	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
	Bit	Name	Value	
	0	AO1	1 = Force AO1 to value of parameter 13.13 AO1 forced value. (0 mode)	= Normal
	1	AO2	1 = Force AO2 to value of parameter 13.23 AO2 forced value. (0 mode)	= Normal
	215	Reserve	/	
	L	_1		
	0000h	.FFFFh	Forced values selector for analog outputs AO1 and AO2.	1 = 1
13.11	AO1 ac	tual value	Displays the value of AO1 in mA or V. This parameter is read-only.	-
		22.000 m/ 11.000 V	A / 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 s	peed used	01.01 Motor speed used (page 327).	1
	Reserve	ed		2
	Output t	frequency	01.06 Output frequency (page 327).	3
	Motor c	urrent	01.07 Motor current (page 327).	4
	Motor co	urrent % o ominal	f 01.08 Motor current % of motor nom (page 327).	5
	Motor to	orque	01.10 Motor torque (page 327).	6
	DC volta	age	01.11 DC voltage (page 327).	7
	Output	power	01.14 Output power (page 328).	8
	Reserve	ed		9
	Speed r	ef ramp in	23.01 Speed ref ramp input (page 405).	10
	Speed r	ef ramp ou	ut 23.02 Speed ref ramp output (page 405).	11
	Speed r	ef used	24.01 Used speed reference (page 407).	12
	Reserve	ed		13
	Freq ref	fused	28.02 Frequency ref ramp output (page 413).	14
	Reserve	ed		15
	Process	s PID out	40.01 Process PID output actual (page 476).	16
	Reserve	ed		1719
	Temp se 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 174).	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 174).	21
	Reserved		2125
	Abs motor speed used	01.61 Abs motor speed used (page 330).	26
	Abs motor speed %	01.62 Abs motor speed % (page 330).	27
	Abs output frequency	01.63 Abs output frequency (page 330).	28
	Reserved		29
	Abs motor torque	01.64 Abs motor torque (page 330).	30
	Abs output power	01.65 Abs output power (page 330).	31
	Abs motor shaft power	01.68 Abs motor shaft power (page 330).	32
	External PID1 out	71.01 External PID act value (page 526).	33
	External PID2 out	72.01 External PID act value (page 527).	34
	External PID3 out	73.01 External PID act value (page 529).	35
	External PID4 out	74.01 External PID act value (page 531).	36
	AO1 data storage	13.91 AO1 data storage (page 368).	37
	AO2 data storage	13.92 AO2 data storage (page 368).	38
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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
	0.00022.000 mA / 0.00011.000 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

No.	Name/Value	Description	Def/FbEq16
13.16	AO1 filter time	Defines the filtering time constant for analog output AO1. Unfiltered signal T O = I × (1 - e ^{-t/T}) I = filter input (step) O = filter output t = time T = filter time constant	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	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). IAO1 (mA) 13.19 13.17 13.18 Signal (real) selected by 13.12 Programming 13.17 as the maximum value and 13.18 as the minimum value inverts the output.	0.0
		13.18 13.17 Signal (real) selected by 13.12	

No.	Nam	e/Value	Description			Def/FbEq16	
			1	me the source for the AO is cha	nged, the scaling		
				User given minimum and maximum values override the automatic values.			
		13.12 AO1 so		13.17 AO1 source min,	13.18 AO1 source		
	•	13.22 AO2 so	urce	13.27 AO2 source min	13.28 AO2 source	ce max	
	0	Zero Motor speed used		N/A (Output is constant zero.)		ti	
	1	Motor speed used		0	46.01 Speed sca		
	3	Output freque	ncy	0	46.02 Frequency		
	<i>4</i> <i>5</i>	Motor current Motor current	0/ of motor	0%	30.17 Maximum 100%	current	
	5	nominal	% OI IIIOLOI	0%	100%		
	6	Motor torque		0	46.03 Torque sca	aling	
	7	DC voltage		Min. value of 01.11 DC voltage	Max. value of 01 voltage	.11 DC	
	8	Output power		0	46.04 Power sca	aling	
	10	Speed ref ram	ıp in	0	46.01 Speed sca	aling	
	11	Speed ref ram	p out	0	46.01 Speed sca	aling	
	12	Speed ref use	d	0	46.01 Speed sca	aling	
	14	Freq ref used		0	46.02 Frequency	/ scaling	
	16	Process PID o	out	Min. value of 40.01 Process PID output actual	Max. value of 40 PID output actual		
	20	Temp sensor	1 excitation	N/A (Analog output is not scal	ed; it is determine	d by the	
	21	Temp sensor 2 excitation		sensor's triggering voltage.)			
	26	Abs motor spe		0	46.01 Speed sca	scaling ncy scaling	
	27	Abs motor spe	eed %	0	46.01 Speed sca		
	28	Abs output fre	quency	0	46.02 Frequency		
	30	Abs motor tore	que	0	46.03 Torque sca	aling	
	31	Abs output po	wer	0	46.04 Power sca	aling	
	32	Abs motor sha		0	46.04 Power sca		
	33	External PID1	out	Min. value of 71.01 External PID act value	Max. value of 71 PID act value	.01 External	
		Other		Min. value of the selected parameter	Max. value of the parameter	e selected	
	-327	68.032767.0	Real signal v value.	alue corresponding to minimum	AO1 output	1 = 1	
13.18	A01	source max	parameter 13 maximum red	nes the real maximum value of the signal (selected by meter 13.12 AO1 source) that corresponds to the imum required AO1 output value (defined by parameter 0 AO1 out at AO1 src max). See parameter 13.17 AO1 ce min.		50.0; 60.0 (95.20 b0)	
	-327	68.032767.0	Real signal value corresponding to maximum AO1 output value.		n AO1 output	1 = 1	
13.19	AO1 min	out at AO1 src		ne minimum output value for analog output AO1. drawing at parameter <i>13.17 AO1 source min</i> .		0.000 V	
		022.000 mA / 011.000 V	Minimum AO	AO1 output value.		1000 = 1 unit	
13.20	AO1 max	out at AO1 src		naximum output value for analowing at parameter 13.17 AO1 s	• .	10.000 V	
		022.000 mA / 011.000 V	Maximum AC	01 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. I _{AO2} (mA) 13.29 Programming 13.27 as the maximum value and 13.28 as the minimum value inverts the output. I _{AO2} (mA) 13.30 13.29 Signal (real) selected by 13.22 Signal (real) selected by 13.29	0.0
	-32768.032767.0	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.	
	-32768.032767.0	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 (58.10158.114) to AO1 data storage.	0.00
	-327.68327.67	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 (58.10158.114) to AO2 data storage.	0.00
	-327.68327.67	Storage parameter for AO2.	100 = 1
15 I/O modul	extension le	Configuration of the I/O extension module installed in slot 2. See also section <i>Programmable I/O extensions</i> (page 97). 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 dive is powered, the drive automatically sets the value to the type it has detected (= value of parameter 15.02 Detected extension module); otherwise warning A7AB Extension I/O configuration failure is generated and you have to set the value of this parameter manually.	None
	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-01115/230 V digital input extension module.	3
	CPTC-02	CPTC-02 extension module (external 24 V and ATEX certified PTC interface).	4

No.	Name/	/alue	Description		Def/FbEq16
15.02	Detecte module	ed extension	I/O extension mo	dule detected on the drive.	None
	None		Inactive.		0
	CMOD-	-01	CMOD-01 multifu 24 V AC/DC and	inction extension module (external digital I/O).	1
	CMOD-	-02		inction extension module (external isolated PTC interface).	2
	CHDI-0	1	CHDI-01115/230	V digital input extension module.	3
	CPTC-	02	CPTC-02 extensi certified PTC inte	ion module (external 24 V and ATEX erface).	4
15.03	DI status		extension module Bit 0 indicates the	e status of DI7. 1b = DI7 and DI10 are on, remainder are off.	-
	Bit	Name	Des	cription	
	0	DI7		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 10 is ON.	
	5	DI12		1 = Digital input 12 is ON.	
			1 - Digital input 12 is Oiv.		
	615 Reserved				
	0000hFFFFh		Status of digital in	nput/outputs.	1 = 1
15.04	RO/DO status		digital output DO Bits 01 indicate the status of DO1	1b = RO4 is on, RO5 is off. and DO1 is on.	-
	Bit	Name	Des	cription	
	0	RO4		Relay output 4 is ON.	
	1	RO5		Relay output 5 is ON	
	24	Reserved	I "	- '	
	5	DO1	11 =	1 = Digital output 1 is ON.	
	615	Reserved	I*	<u> </u>	
	20	1.000.700			

			The state of	D. ((E) E. 40	
No. 15.05	Name/\ RO/DO		Description The electrical statuses of the relay/digital outputs can be	Def/FbEq16	
70.00	selection		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. Note: Boot and power cycle reset the force selections (parameters 15.05 and 15.06).		
	Bit	Name	Value		
	0	RO4	1 = Force RO4 to value of bit 0 of parameter 15.06 RO/DO force Normal mode)	d data. (0 =	
	1	RO5	1 = Force RO5 to value of bit 1 of parameter 15.06 RO/DO force Normal mode)	d data. (0 =	
	24	Reserved			
	5	DO1	1 = Force DO1 to value of bit 5 of parameter <i>15.06 RO/DO force</i> Normal mode)	d data. (0 =	
	615	Reserved	[
	0.0001	FFFF:	Overside calculation for relativity (1911)	14 - 4	
	0000h		Override selection for relay/digital outputs.	1 = 1	
15.06	RO/DO forced data		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 01 are the forced values for RO4RO5; bit 5 is the forced value for DO1.	0000h	
	Bit	Name	Description		
	0	RO4	1 = Force the value of this bit to RO4, if so defined in parame RO/DO force selection.	eter 15.05	
	1 RO5		1 = Force the value of this bit to RO5, if so defined in parameter 15.05 RO/DO force selection.		
	24	Reserved			
	5	DO1	1 = Force the value of this bit to DO1 if so defined in parameter 15.05 RO/DO force selection.		
	615 Reserved				
	00001	FFFF!	Terror of the Open Control	14 4	
	0000h		Forced values of relay/digital outputs.	1 = 1	
15.07	RO4 so	urce	Selects a drive signal to be connected to relay output RO4.	Not energized	
	Not ene	rgized	Output is not energized.	0	
	Energiz		Output is energized.	1	
	Ready r		Bit 1 of 06.11 Main status word (see page 337).	2	
	Reserve			3	
	Enabled	i .	Bit 0 of 06.16 Drive status word 1 (see page 338).	4	
	Started		Bit 5 of 06.16 Drive status word 1 (see page 338).	5	
	Magnet		Bit 1 of 06.17 Drive status word 2 (see page 338).	6	
	Running		Bit 6 of 06.16 Drive status word 1 (see page 338).	7	
	Ready r		Bit 2 of 06.11 Main status word (see page 337).	8	
ı	At setpoint		Bit 8 of 06.11 Main status word (see page 337).	9	

No.	Name/Value	Description	Def/FbEq16
	Reverse	Bit 2 of 06.19 Speed control status word (see page 339).	10
	Zero speed	Bit 0 of 06.19 Speed control status word (see page 339).	11
	Above limit	Bit 10 of 06.17 Drive status word 2 (see page 338).	12
	Warning	Bit 7 of 06.11 Main status word (see page 337).	13
	Fault	Bit 3 of 06.11 Main status word (see page 337).	14
	Fault (-1)	Inverted bit 3 of 06.11 Main status word (see page 337).	15
	Fault/Warning	Bit 3 of 06.11 Main status word OR bit 7 of 06.11 Main status word (see page 337).	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 338).	23
	Remote control	Bit 9 of 06.11 Main status word (see page 337).	24
	Reserved		2526
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	27
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	28
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	29
	Reserved		3032
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	33
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	34
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	35
	Reserved		3638
	Start delay	Bit 13 of 06.17 Drive status word 2 (see page 338).	39
	RO/DIO control word bit0	Bit 0 of 10.99 RO/DIO control word (see page 355).	40
	RO/DIO control word bit1	Bit 1 of 10.99 RO/DIO control word (see page 355).	41
	RO/DIO control word bit2	Bit 2 of 10.99 RO/DIO control word (see page 355).	42
	Reserved		4344
	PFC1	Bit 0 of 76.01 PFC status (see page 534).	45
	PFC2	Bit 1 of 76.01 PFC status (see page 534).	46
	PFC3	Bit 2 of 76.01 PFC status (see page 534).	47
	PFC4	Bit 3 of 76.01 PFC status (see page 534).	48
	Event word 1	Event word 1 = 1 if any bit of 04.40 Event word 1 (see page 333) is 1, that is, if any warning, fault or pure event that has been defined with parameters 04.4104.71 is on.	53

No.	Name/Value	Description	Def/FbEq16
	Damper control	See the diagram on page 353.	54
	Run permissive	Bit 7 of 06.22 HVAC status word.	55
	Start interlock 1	Bit 8 of 06.22 HVAC status word.	56
	Start interlock 2	Bit 9 of 06.22 HVAC status word.	57
	Start interlock 3	Bit 10 of 06.22 HVAC status word.	58
	Start interlock 4	Bit 11 of 06.22 HVAC status word.	59
	All start interlocks	Bit 12 of 06.22 HVAC status word.	60
	User load curve	Bit 3 (Outside load limit) of 37.01 ULC output status word (see page 473).	61
	RO/DIO control word	For 15.07 RO4 source: Bit 3 (RO4) of 10.99 RO/DIO control word (see page 355). For 15.10 RO5 source: Bit 4 (RO5) of 10.99 RO/DIO control word (see page 355).	62
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
15.08	RO4 ON delay	Defines the activation delay for relay output RO4.	0.0 s
	Status of selected source	ton toff ton toff	1 0 1 Time
	$t_{\text{On}} = 15.08 \text{RO4 ON del} t_{\text{Off}} = 15.09 \text{RO4 OFF del}$		
	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.	Not energized
15.11	RO5 ON delay	Defines the activation delay for relay output RO5.	0.0 s
	Status of selected source RO status ton = 15.11 RO5 ON del		1 0 1 Time
	t _{Off} = 15.12 RO5 OFF de	Activation delay for RO5.	10 = 1 s
		ı	l

No.	Name/Value	Description	Def/FbEq16
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 337).	2
	Reserved		3
	Enabled	Bit 0 of 06.16 Drive status word 1 (see page 338).	4
	Started	Bit 5 of 06.16 Drive status word 1 (see page 338).	5
	Magnetized	Bit 1 of 06.17 Drive status word 2 (see page 338).	6
	Running	Bit 6 of 06.16 Drive status word 1 (see page 338).	7
	Ready ref	Bit 2 of 06.11 Main status word (see page 337).	8
	At setpoint	Bit 8 of 06.11 Main status word (see page 337).	9
	Reverse	Bit 2 of 06.19 Speed control status word (see page 339).	10
	Zero speed	Bit 0 of 06.19 Speed control status word (see page 339).	11
	Above limit	Bit 10 of 06.17 Drive status word 2 (see page 338).	12
	Warning	Bit 7 of 06.11 Main status word (see page 337).	13
	Fault	Bit 3 of 06.11 Main status word (see page 337).	14
	Fault (-1)	Inverted bit 3 of 06.11 Main status word (see page 337).	15
	Fault/Warning	Bit 3 of 06.11 Main status word OR bit 7 of 06.11 Main status word (see page 337).	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 338).	23
	Remote control	Bit 9 of 06.11 Main status word (see page 337).	24
	Reserved		2526
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	27
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	28
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	29
	Reserved		3032

No.	Name/Value	Description	Def/FbEq16
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	33
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	34
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	35
	Reserved		3638
	Start delay	Bit 13 of 06.17 Drive status word 2 (see page 338).	39
	RO/DIO control word bit0	Bit 0 of 10.99 RO/DIO control word (see page 355).	40
	RO/DIO control word bit1	Bit 1 of 10.99 RO/DIO control word (see page 355).	41
	RO/DIO control word bit2	Bit 2 of 10.99 RO/DIO control word (see page 355).	42
	PFC1	Bit 0 of 76.01 PFC status (see page 534).	45
	PFC2	Bit 1 of 76.01 PFC status (see page 534).	46
	PFC3	Bit 2 of 76.01 PFC status (see page 534).	47
	PFC4	Bit 3 of 76.01 PFC status (see page 534).	48
	Event word 1	Event word 1 = 1 if any bit of 04.40 Event word 1 (see page 333) is 1, that is, if any warning, fault or pure event that has been defined with parameters 04.4104.71 is on.	53
	Damper control	See the diagram on page 353.	54
	Run permissive	Bit 7 of 06.22 HVAC status word.	55
	Start interlock 1	Bit 8 of 06.22 HVAC status word.	56
	Start interlock 2	Bit 9 of 06.22 HVAC status word.	57
	Start interlock 3	Bit 10 of 06.22 HVAC status word.	58
	Start interlock 4	Bit 11 of 06.22 HVAC status word.	59
	All start interlocks	Bit 12 of 06.22 HVAC status word.	60
	User load curve	Bit 3 (Outside load limit) of 37.01 ULC output status word (see page 473).	61
	RO/DIO control word	For 15.23 DO1 source: Bit 8 (DIO1) of 10.99 RO/DIO control word (see page 355).	62
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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
	Status of selected source		1
	DO status		0 1 0 1
		ton toff ton toff	iiiic
	t_{On} = 15.24 DO1 ON dec t_{Off} = 15.25 DO1 OFF dec	ay elay	
	0.0 3000.0 s	Activation delay for DO1.	10 = 1 s

No.	Name/Value	Name/Value Description			
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 327).	1		
	Output frequency	01.06 Output frequency (page 327).	3		
	Motor current	01.07 Motor current (page 327).	4		
	Motor torque	01.10 Motor torque (page 327).	6		
	DC voltage	01.11 DC voltage (page 327).	7		
	Output power	01.14 Output power (page 328).	8		
	Speed ref ramp in	23.01 Speed ref ramp input (page 405).	10		
	Speed ref ramp out	23.02 Speed ref ramp output (page 405).	11		
	Speed ref used	24.01 Used speed reference (page 407).	12		
	Reserved		13		
	Freq ref used	28.02 Frequency ref ramp output (page 413).	14		
	Reserved		15		
	Process PID out	40.01 Process PID output actual (page 476).	16		
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-		

No.	Name/Value	Description	Def/FbEq16
15.34	Freq out 1 src min	Defines the real value of the signal (selected by parameter 15.33 Freq out 1 source) that corresponds to the minimum value of frequency output 1 (defined by parameter 15.36 Freq out 1 at src min). This applies when 15.22 DO1 configuration is set to Frequency output. (Hz) 15.37 15.36 Signal (real) selected by par. 15.33 Signal (real) selected by par. 15.33	0.000
	-32768.000 32767.000	Real signal value corresponding to minimum value of frequency output 1.	1 = 1
15.35	Freq out 1 src max	Defines the real value of the signal (selected by parameter 15.33 Freq out 1 source) that corresponds to the maximum value of frequency output 1 (defined by parameter 15.37 Freq out 1 at src max). This applies when 15.22 DO1 configuration is set to Frequency output. See parameter 15.34 Freq out 1 src min.	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	Freq out 1 at src min	Defines the minimum output value of frequency output 1 when 15.22 DO1 configuration is set to Frequency output. See also drawing at parameter 15.34 Freq out 1 src min.	0 Hz
	0 16000 Hz	Minimum frequency output 1 value.	1 = 1 Hz
15.37	Freq out 1 at src max	Defines the maximum value of frequency output 1 when 15.22 DO1 configuration is set to Frequency output. See also drawing at parameter 15.34 Freq out 1 src min.	16000 Hz
	0 16000 Hz	Maximum value of frequency output 1.	1 = 1 Hz

No.	Name/Value	Description	
19 Op	eration mode	Selection of local and external control location sources and operating modes. See also section <i>Operating modes of the drive</i> (page 91).	
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		39
	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
	FBA A MCW bit 11	Control word bit 11 received through fieldbus interface A.	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
	Reserved		918
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	19
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	20
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	21
	Reserved		2224
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	25
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	26
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	27
	Reserved		2831
	EFB MCW bit 11	Control word bit 11 received through the embedded fieldbus interface.	32
	FBA A 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
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-

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 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 active
	Not active	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 <i>Terms and abbreviations</i> on page 324).	-
19.19	HAND/OFF disable action	Selects which buttons are disabled on the 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 Sta	rt/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 <i>Local control vs. external control</i> (page 87).	
20.01	Ext1 commands	Selects the source of start, stop and direction commands for external control location 1 (EXT1). See parameter 20.21 for the determination of the actual direction. See also parameters 20.0220.05.	In1 Start
	Not selected No start or stop command sources selected.		
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:			1
		State of source 1 (20.03) Command	

No.	Name/Value	Description			Def/FbEq16
	In1 Start; In2 Dir	The source selected by signal; the source selected determines the direction bits are interpreted as for	2		
		State of source 1 (20.03)	State of source 2 (20.04)	Command	
		0	Any	Stop	
		0 -> 1 (20.02 = Edge)	0	Start forward	
		1 (20.02 = Level)	1	Start reverse	
	In1 Start fwd; In2 Start rev	The source selected by start signal; the source the reverse start signal. bits are interpreted as for	selected by 20.04 Ext1. The state transitions of	in2 source is	3
		State of source 1 (20.03)	State of source 2 (20.04)	Command	
		0	0	Stop	
		0 -> 1 (20.02 = Edge) 1 (20.02 = Level)	0	Start forward	
		0	0 -> 1 (20.02 = Edge) 1 (20.02 = Level)	Start reverse	
		1	1	Stop	
	In1P Start; In2 Stop	The sources of the start parameters 20.03 Ext1. The state transitions of follows:	in1 source and 20.04 Ex	t1 in2 source.	4
		State of source 1 (20.03)	State of source 2 (20.04)	Command	
		0 -> 1	1	Start	
		Any	0	Stop	
		this setting except if that the motor was ru start if parameter 20. Level (1).	11 start trigger type has a 111P is on at power up unning at power-down), 02 Ext1 start trigger typ the Start and Stop keys	(this implies the motor will e is set to	

No.	Name/Value	Description				Def/FbEq16
	In1P Start; In2 Stop; In3 Dir	parameters 20.	03 Ext1 in1 sou ected by 20.05 b tate transitions	rce and 20.04 E Ext1 in3 source	are selected by Ext1 in2 source. determines the its are	5
		State of source 1 (20.03)	State of source 2 (20.04)	State of source 3 (20.05)	Command	
		0 -> 1	1	0	Start forward	
		0 -> 1	1	1	Start reverse	
		Any	0	Any	Stop	
		this setting e that the moto start if param Level (1). • When source	 Parameter 20.02 Ext1 start trigger type has no effect with this setting except if 1n1P is on at power up (this implies that the motor was running at power-down), the motor will start if parameter 20.02 Ext1 start trigger type is set to 			
	In1P Start fwd; In2P Start rev; In3 Stop	The sources of the start and stop commands are selected by parameters 20.03 Ext1 in1 source, 20.04 Ext1 in2 source and 20.05 Ext1 in3 source. The source selected by 20.05 Ext1 in3 source determines the stop. The state transitions of the source bits are interpreted as follows:				6
		State of source 1 (20.03)	State of source 2 (20.04)	State of source 3 (20.05)	Command	
		0 -> 1	Any	1	Start forward	
		Any	0 -> 1	1	Start reverse	
		Note: Paramete with this setting		0 tart trigger type	Stop has no effect	
	Reserved					710
	Control panel	The start and si				11
	Fieldbus A	The start and st A. Note: Set also			ieldbus adapter	12
	Reserved					13
	Embedded fieldbus	The start and si fieldbus interfact Note: Set also	14			
20.02	Ext1 start trigger type	Note: This para signal is selected	Defines whether the start signal for external control location EXT1 is edge-triggered or level-triggered. Note: This parameter is not effective if a pulse-type start signal is selected. See the descriptions of the selections of parameter 20.01 Ext1 commands.			
	Edge	The start signal	is edge-trigger	red.		0
	Level	The start signal	is level-trigger	ed.		1

No.	Name/Value	Description	Description				
20.03	Ext1 in1 source	Selects source 1 for par	rameter 20.01 Ext1 con	mmands.	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	2).	4		
	DI4	Digital input DI4 (10.02	DI delayed status, bit 3	3).	5		
	DI5	Digital input DI5 (10.02	DI delayed status, bit 4	1).	6		
	DI6	Digital input DI6 (10.02	DI delayed status, bit s	5).	7		
	Reserved						
	Timed function 1	Bit 0 of 34.01 Timed fun	Bit 0 of 34.01 Timed functions status (see page 451).				
	Timed function 2	Bit 1 of 34.01 Timed fun	Bit 1 of 34.01 Timed functions status (see page 451).				
	Timed function 3	Bit 2 of 34.01 Timed fun	ections status (see pag	e 451).	20		
	Reserved				2123		
	Supervision 1	Bit 0 of 32.01 Supervision	on status (see page 44	14).	24		
	Supervision 2	Bit 1 of 32.01 Supervision	on status (see page 44	14).	25		
	Supervision 3	Bit 2 of 32.01 Supervision	on status (see page 44	14).	26		
	Other [bit]	Source selection (see 7	erms and abbreviation	s on page 324).	-		
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.				
20.05	Ext1 in3 source		Selects source 3 for parameter 20.01 Ext1 commands. For the available selections, see parameter 20.03 Ext1 in1 source.				
20.06	Ext2 commands	Selects the source of st external control location See parameter 20.21 fo direction. See also para	2 (EXT2). r the determination of		Not selected		
	Not selected	No start or stop comma	nd sources selected.		0		
	In1 Start	The source of the start a parameter 20.08 Ext2 ir source bits are interpret	and stop commands is 1 source. The state traced as follows:		1		
	State of source 1 (20.08) Command 0 -> 1 (20.07 = Edge) Start 1 (20.07 = Level) Stop						
In1 Start; In2 Dir The source selected by 20.08 Ext2 in1 source is the start signal; the source selected by 20.09 Ext2 in2 source determines the direction. The state transitions of the source bits are interpreted as follows:					2		
		State of source 1 (20.08)	State of source 2 (20.09)	Command			
		0	Any	Stop			
		0 -> 1 (20.07 = Edge) 1 (20.07 = Level)	0	Start forward Start reverse			
		, , , , , ,	· · · · · · · · · · · · · · · · · · ·	1			

No.	Name/Value	Description				Def/FbEq16
	In1 Start fwd; In2 Start rev	The source selecte start signal; the souther reverse start sibits are interpreted	urce selecte gnal. The st	d by 20.09 Ext2	in2 source is	3
		State of source 1 State of source 2 Command		Command		
		0		0	Stop	
		0 -> 1 (20.07 = Ed 1 (20.07 = Leve	• /	0	Start forward	
		0		l (20.07 = Edge ₎ 20.07 = Level)	Start reverse	
		1		1	Stop	
	In1P Start; In2 Stop	The sources of the parameters 20.08 in The state transition follows:	Ext2 in1 sou	rce and 20.09 E	xt2 in2 source.	4
		State of source (20.08)	1 State	of source 2 (20.09)	Command	
		0 -> 1		1	Start	
		Any		0	Stop	
		Notes: • Parameter 20.0 this setting. • When source 2 panel are disable.				
	In1P Start; In2 Stop; In3 Dir	The sources of the parameters 20.08 in The source selected direction. The state interpreted as follows:	Ext2 in1 sou ed by 20.10 i e transitions	rce and 20.09 E Ext2 in3 source	ext2 in2 source. determines the	5
			State of source 2 (20.09)	State of source 3 (20.10)	Command	
		0 -> 1	1	0	Start forward	
		0 -> 1	1	1	Start reverse	
		Any	0	Any	Stop	
		Notes: • Parameter 20.0 this setting. • When source 2 panel are disable.				

No.	Name/Value	Description	- 	- 	·	Def/FbEq16
	In1P Start fwd; In2P Start rev; In3 Stop	parameters 20.	08 Ext2 in1 sou source. The sounces the direction	urce, 20.09 Ext2 urce selected by n. The state tra	are selected by in2 source and y 20.10 Ext2 in3 nsitions of the	6
		State of source 1 (20.08)	State of source 2 (20.09)	State of source 3 (20.10)	Command	
		0 -> 1	Any	1	Start forward	
		Any	0 -> 1	1	Start reverse	
		Any	Any	0	Stop	
		Note: Paramete with this setting		tart trigger type	has no effect	
	Reserved					710
	Control panel	ontrol panel The start and stop commands are taken from the control panel (or PC connected to the panel connector).				
	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 si fieldbus interfact Note: Set also	ce.			14
20.07	Ext2 start trigger type	Defines whethe EXT2 is edge-to Note: This para signal is selecte parameter 20.0	riggered or leve ameter is not effed. See the des	el-triggered. fective if a pulse scriptions of the	e-type start	Level
	Edge	The start signal	is edge-trigger	ed.		0
	Level	The start signal	is level-trigger	ed.		1
20.08	Ext2 in1 source	Selects source For the availabl source.				Always off
20.09	Ext2 in2 source	Selects source For the availabl source.				Always off
20.10	Ext2 in3 source	Selects source For the availabl source.				Always off

No.	Name/Value	Description			Def/FbEq16	
20.21	Direction	Reference direction lock. Defines the direction of the drive rather than the sign of the reference, except in some cases. In the table the actual drive rotation is shown as a function of parameter 20.21 Direction and Direction command (from parameter 20.01 Ext1 commands or 20.06 Ext2 commands).			Forward	
	Direction	n command =	Direction command = Reverse	Direction comi	mand not	
	Par. 20.21 Direction = Forward		Forward	Forward		
	Par. 20.21 Direction = Reverse Reverse		Reverse	Reverse		
	Cons contri poter Safe Pane refere	n, but erence from tant, Floating point ol (Motor titometer), PID, speed, Last or I reference, ence used as is. erence from the ork, reference used	If reference from the network, Panel, Analog input, Floating point control (Motor potentiometer), Safe speed or Last reference.			
	command (parame commands). If the reference co speeds/frequencie potentiometer), PI Panel reference, till the reference co if the direction cas is if the direction cas is froward Motor rotates forw reference. (Negati		the direction is selected by a eter 20.01 Ext1 commands or mes from Constant (constant s), Floating point control (McD, Speed ref safe, Last speed reference is used as is. mes from a fieldbus: command is forward, the referencement of the reference command is reverse, the reference is used as is.	totor d reference or	0	
			ward regardless of the sign of the external tive reference values are replaced by zero. e values are used as is.)		1	
	Reverse Motor rotates reverse regardless of the sign of the reference. (Negative reference values are replaced Positive reference values are multiplied by -1.)				2	
20.40	Run permissive	Value 0 of the sour prevents running.	of the Run permissive signarce deactivates the Run permiserce activates the Run permiser.	nissive and	Not used	
	Not used	0.			0	
	Not used	1.			1	
	DI1	Digital input DI1 (1	0.02 DI delayed status, bit 0).	2	
	DI2	Digital input DI2 (1	0.02 DI delayed status, bit 1).	3	

No.	Name/Value	Description	Def/FbEq16
	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
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
20.41	Start interlock 1	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.	DI4
	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	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 20.41 Start interlock 1 and 20.42 Start interlock 2.	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 20.41 Start interlock 1 and 20.42 Start interlock 2.	15
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-

No.	Name/Value	Description	Def/FbEq16
20.42	Start interlock 2	Selects the source of the Start interlock 2 signal. For the selections, see parameter 20.41 Start interlock 1.	Not used
20.43	Start interlock 3	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 20.41 Start interlock 1.	Not used
20.44	Start interlock 4	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 20.41 Start interlock 1.	Not used
20.45	Start interlock stop mode	Follows motor stop mode selection, see parameter 21.03 Stop mode.	Not used
	Not used	Not in use.	0
	Coast	The motor coasts to a stop.	1
	Ramp	Stop along the active deceleration ramp.	2
20.46	Run permissive text	Alternative alarm texts for the run permissive. There is also label text (free text) for the run permissive. The 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.	Run permissive
	Run permissive		0
	Damper end switch		1
	Valve opening		2
	Pre-lube cycle		3
20.47	Start interlock 1 text	Alternative alarm texts for the start interlock 1. There is also label text (free text) for each start interlock. The 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.	Start interlock 1
	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

No.	Name/Value	Description	Def/FbEq16
20.48	Start interlock 2 text	Alternative alarm texts for the start interlock 2. See parameter 20.47 Start interlock 1 text.	Start interlock 2
	Start interlock 2	For other selections, see parameter 20.47 Start interlock 1 text.	0
20.49	Start interlock 3 text	Alternative alarm texts for the start interlock 3. See parameter 20.47 Start interlock 1 text.	Start interlock 3
	Start interlock 3	For other selections, see parameter 20.47 Start interlock 1 text.	0
20.50	Start interlock 4 text	Alternative alarm texts for the start interlock 4. See parameter 20.47 Start interlock 1 text.	Start interlock 4
	Start interlock 4	For other selections, see parameter 20.47 Start interlock 1 text.	0
20.50	Start interlock condition	Selects the condition for start interlock function. This parameter determines if the start command is needed before start interlock warnings are displayed.	Start command ignored
	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
21 Sta	art/stop mode	Start and stop modes; emergency stop mode and signal source selection; DC magnetization settings.	
21.01	Start mode	Selects the motor start function for the vector motor control mode, ie. when 99.04 Motor control mode is set to Vector. Notes: The start function for the scalar motor control mode is selected by parameter 21.19 Scalar start mode. Starting into a rotating motor is not possible when DC magnetizing is selected (Fast or Const time). With permanent magnet motors, Automatic start mode must be used. This parameter cannot be changed while the drive is running. See also section Start methods – DC magnetization (page 129).	Automatic
	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	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. MARNING! 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.	1

No.	Name/Value	Description		Def/FbEq16
	Automatic	Automatic start guarantees opt It includes the flying start funct motor) and the automatic resta control program identifies the f state of the motor and starts th conditions. Note: If parameter 99.04 Moto no flying start or automatic resparameter 21.19 Scalar start n	2	
21.02	Defines the pre-magnetization time when • parameter 21.01 Start mode is set to Const time (in vector motor control mode), or • parameter 21.19 Scalar start mode is set to Const time (in scalar motor control mode). 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:		e is set to Const time (in vector of the mode is set to Const time (in rive automatically lee set time. To ensure full of to the same value as, or stant. If not known, use the	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	
		Note: This parameter cannot brunning.	e changed while the drive is	
	010000 ms	Constant DC magnetizing time	l.	1 = 1 ms
21.03	Stop mode	Selects the way the motor is st is received. Additional braking is possible to parameter 97.05 Flux braking)	by selecting flux braking (see	Coast
	Coast	Stop by switching off the output The motor coasts to a stop. WARNING! If a mechal safe to stop the drive by	nical brake is used, ensure it is	0
	Ramp	Stop along the active decelera group 23 Speed reference ram Frequency reference chain on	<i>p</i> on page <i>405</i> or <i>28</i>	1
	Torque limit	Stop according to torque limits (This mode is only possible in v		2

No.	Name/Value	Description	Def/FbEq16
21.04	Emergency stop mode	Selects the way the motor is stopped when an emergency stop command is received. The source of the emergency stop signal is selected by parameter 21.05 Emergency stop source.	Ramp stop (Off1)
	Ramp stop (Off1)	With the drive running: 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. With the drive stopped: 1 = Starting allowed. 0 = Starting not allowed.	0
	Coast stop (Off2)	With the drive running: • 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. With the drive stopped: • 1 = Starting allowed. • 0 = Starting not allowed.	1
	Eme ramp stop (Off3)	With the drive running: 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. With the drive stopped: 1 = Starting allowed 0 = Starting not allowed	2
21.05	Emergency stop source	Selects the source of the emergency stop signal. The stop mode is selected by parameter 21.04 Emergency stop mode. 0 = Emergency stop active 1 = Normal operation Note: This parameter cannot be changed while the drive is running.	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 <i>Terms and abbreviations</i> on page 324).	-

No.	Name/Value	Description	Def/FbEq16
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
	0.0030000.00 rpm	Zero speed limit.	See par. 46.01
21.07	Zero speed delay	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. Without zero speed delay: The drive receives a stop command and decelerates along a ramp. When actual motor speed falls below the value of parameter 21.06 Zero speed limit, inverter modulation is stopped and the motor coasts to a standstill. Speed Speed controller switched off: Motor coasts to a stop. With zero speed delay: The drive receives a stop command and decelerates along a ramp. When actual motor speed falls below the value of parameter 21.06 Zero speed limit, 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. Speed Speed controller remains active. Motor is decelerated to true zero speed. **Time** Speed Speed controller remains active. Motor is decelerated to true zero speed. **Time** **Time	0 ms
	030000 ms	Zero speed delay.	1 = 1 ms

No.	Name/V	alue/	Description	Def/FbEq16
21.08	DC curr	ent contro	Activates/deactivates the DC hold and post-magnetization functions. See section Start methods – DC magnetization (page 129). 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.	0000Ь
	Bit	Name	Value	
	0	DC hold	1 = Enable DC hold. See section <i>DC hold</i> (page 130).	
	1	Post	Note: The DC hold function has no effect if the start signal is swit 1 = Enable post-magnetization. See section <i>Settings</i> (page 131).	ched off.
		magneti zation		elected stop
	215	Reserve		
				'
	0000b	.0011b	DC magnetization selection.	1 = 1
21.09	DC hold		Defines the DC hold speed in speed control mode. See parameter 21.08 DC current control, and section DC hold (page 130).	5.00 rpm
	0.001	000.00 rpr	m DC hold speed.	See par. 46.01
21.10	DC curr reference		Defines the DC hold current in percent of the motor nominal current. See parameter 21.08 DC current control, and section Start methods – DC magnetization (page 129). After 100 s post-magnetization time, the maximum magnetization current is limited to the magnetization current corresponding to the actual flux reference.	30.0%
	0.010	0.0%	DC hold current.	1 = 1%
21.11	Post ma time	agnetizatio	n Defines the length of time for which post-magnetization is active after stopping the motor. The magnetization current is defined by parameter 21.10 DC current reference. See parameter 21.08 DC current control.	0 s
	03000) s	Post-magnetization time.	1 = 1 s
21.14	Pre-hea source	ting input	Selects the source for controlling pre-heating for the motor. The status of the pre-heating is shown as bit 2 of 06.21 Drive status word 3. Notes: The heating function requires that STO is not triggered. The heating function requires that the drive is not faulted.	Off
	Off		Pre-heating is always deactivated.	0
	On		1. Pre-heating is always activated when the drive is stopped.	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

No.	Name/Value	Description	Def/FbEq16
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	8
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	9
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	10
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	11
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	12
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	13
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
21.15	Pre-heating time delay	Time delay before pre-heating starts after the drive is stopped.	60 s
	103000 s	Pre-heating time delay.	1 = 1 s
21.16	Pre-heating current	Defines the DC current used to heat the motor. The value is in percent of the nominal motor current.	0.0%
	0.030.0%	Pre-heating current.	1 = 1%
21.18	Auto restart time	The motor can be automatically started after a short supply power failure using the automatic restart function. See section Automatic restart (page 141). 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 21.34 Force auto restart. This parameter has effect only if parameter 95.04 Control board supply is set to External 24V. 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.	10.0 s
	0.0 s	Automatic restarting disabled.	0
	0.110.0 s	Maximum power failure duration.	1 = 1 s
21.19	Scalar start mode	Selects the motor start function for the scalar motor control mode, ie. when 99.04 Motor control mode is set to Scalar. Notes: 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. See also section Start methods – DC magnetization (page 129).	Automatic
	Normal	Immediate start from zero speed.	0

No.	Name/Value	Description	Def/FbEq16
	Const time	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. Note: This mode cannot be used to start into a rotating motor. 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.	1
	Automatic	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. Note: Cannot be used in multimotor systems.	2
	Torque boost	The drive pre-magnetizes the motor before the start. The pre- magnetizing time is defined by parameter 21.02 Magnetization time. 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. This mode should selected if a high break-away torque is required. Note: This mode cannot be used to start into a rotating motor. MARNING! 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.	3
	Automatic+boost	Automatic start with torque boost. Automatic start is performed first and the motor is magnetized. If the speed is found to be zero, torque boost is applied.	4
	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

No.	Name/Value	Description	Def/FbEq16
21.21	DC hold frequency	Defines the DC hold frequency, which is used instead of parameter 21.09 DC hold speed when the motor is in scalar frequency mode. See parameter 21.08 DC current control, and section DC hold (page 130).	5.00 Hz
	0.001000.00 Hz	DC hold frequency.	1 = 1 Hz
21.22	Start delay	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
	0.0060.00 s	Start delay	1 = 1 s
21.23	Smooth start	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.	Disabled
	Disabled	Disabled.	0
	Enabled always	Enabled always.	1
	Start only	Enabled when starting the motor.	2
21.24	Smooth start current	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%
	10.0100.0%	Value in percent of the nominal motor current.	1 = 1%
21.25	Smooth start speed	Output frequency up to which the current vector rotation is used. See parameter 21.19 Scalar start mode. Can be used for permanent magnet synchronous motors only.	10.0%
	2.0100.0%	Value as a percentage of the nominal motor frequency.	1 = 1%
21.26	Torque boost current	Defines the maximum supplied current to motor when (21.19 Scalar start mode is set to Torque boost (see page 393). 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%
	15.0300.0%	Value in percent of the nominal motor current.	1 = 1%
21.30	Speed compensated stop mode	Selects the method used to stop the drive. Speed compensated stop is active only if the operation mode is not torque, and parameter 21.03 Stop mode is Ramp.	Off
	Off	Stop according parameter 21.03 Stop mode, no speed compensated stop.	0

No.	Name/Value	Description	Def/FbEq16
	Speed comp FWD	If the direction of rotation is forward, speed compensation is used for constant distance braking. Speed difference (between used speed and maximum speed) is compensated by running the drive with current speed before the motor is stopped along a ramp. If the direction of rotation is reverse, the drive is stopped along a ramp.	1
	Speed comp REV	If the direction of rotation is reverse, speed compensation is used for constant distance braking. Speed difference (between used speed and maximum speed) is compensated by running the drive with current speed before the motor is stopped along a ramp. If the direction of rotation is forward, the drive is stopped along a ramp.	2
	Speed comp bipolar	Regardless of the direction of rotation, speed compensation is used for constant distance braking. Speed difference (between used speed and maximum speed) is compensated by running the drive with current speed before the motor is stopped along a ramp.	3
21.31	Speed comp stop delay	This delay adds distance to the total distance traveled during a stop from maximum speed. It is used to adjust the distance to match requirements so that the distance traveled is not solely determined by the deceleration rate.	0.00 s
	0.001000.00 s	Speed delay.	1 = 1 s
21.32	Speed comp stop threshold	This parameter sets a speed threshold below which the Speed compensated stop feature is disabled. In this speed region, the speed compensated stop is not attempted and the drive stops as it would, using the ramp option.	10%
	0100%	Speed threshold as a percent of the motor nominal speed.	1 = 1%
21.34	Force auto restart	Forces automatic restart. The parameter is applicable only if parameter 95.04 Control board supply is set to External 24V.	Enable
	Disable	Force auto restart disabled. Parameter <i>21.18 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 Auto restart time is ignored. The drive never trips on the undervoltage fault and the start signal is on forever. When he DC voltage is restored, the normal operation continues.	1
22 Spe selecti	eed reference ion	Speed reference selection; Floating point control (Motor potentiometer) settings. See control chain diagrams Speed reference source selection I (page 306)Speed controller (page 311).	
22.01	Speed ref unlimited	Displays the output of the speed reference selection block. See control chain diagram <i>Speed reference source selection II</i> on page 307. This parameter is read-only.	-
	-30000.00 30000.00 rpm	Value of the selected speed reference.	See par. 46.01

No.	Name/Value	Description	Def/FbEq16
22.11	Ext1 speed ref1	Selects EXT1 speed reference source 1. Two signal sources can be defined by this parameter and 22.12 Ext1 speed ref2. A mathematical function (22.13 Ext1 speed function) applied to the two signals creates an EXT1 reference (A in the figure below). A digital source selected by 19.11 Ext1/Ext2 selection can be used to switch between EXT1 reference and the corresponding EXT2 reference defined by parameters 22.18 Ext2 speed ref1, 22.19 Ext2 speed ref2 and 22.20 Ext2 speed function (B in the figure below).	Al1 scaled
	0 Al FB Other Other Other Other Other Other Other Other Other	22.18 22.20 Ref1 SUB MUL MIN MIN MIN ADD EXT2 B	2.86
	0 — AI — FB — Other —	T MAX — °	
	Zero	None.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	Reserved		3
	FB A ref1	03.05 FB A reference 1 (see page 331).	4
	FB A ref2	03.06 FB A reference 2 (see page 331).	5
	Reserved		67
	EFB ref1	03.09 EFB reference 1 (see page 332).	8
	EFB ref2	03.10 EFB reference 2 (see page 332).	9
	Reserved		1014

No.	Name/Value	Description	Def/FbEq16
	Motor potentiometer	22.80 Motor potentiometer ref act (output of the Floating point control (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
	Control panel (ref saved)	Panel reference (03.01 Panel reference, see page 331) saved by the control system for the location where the control returns is used as the reference. Reference EXT1 reference EXT2 reference Active reference Inactive reference	18
	Control panel (ref copied)	Panel reference (03.01 Panel reference, see page 331) 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. Reference EXT1 reference EXT2 reference Active reference Inactive reference	19
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
22.12	Ext1 speed ref2	Selects EXT1 speed reference source 2. For the selections, and a diagram of reference source selection, see parameter 22.11 Ext1 speed ref1.	Zero
22.13	Ext1 speed function	Selects a mathematical function between the reference sources selected by parameters 22.11 Ext1 speed ref1 and 22.12 Ext1 speed ref2. See diagram at 22.11 Ext1 speed ref1.	Ref1
	Ref1	Signal selected by 22.11 Ext1 speed ref1 is used as speed reference 1 as such (no function applied).	0
	Add (ref1 + ref2)	The sum of the reference sources is used as speed reference 1.	1
	Sub (ref1 - ref2)	The subtraction ([22.11 Ext1 speed ref1] - [22.12 Ext1 speed ref2]) of the reference sources is used as speed reference 1.	2
	Mul (ref1 × ref2)	The multiplication of the reference sources is used as speed reference 1.	3
	Min (ref1, ref2)	The smaller of the reference sources is used as speed reference 1.	4
	Max (ref1, ref2)	The greater of the reference sources is used as speed reference 1.	5

No.	Name/Value	Description	Def/FbEq16
22.18	Ext2 speed ref1	Selects EXT2 speed reference source 1. Two signal sources can be defined by this parameter and 22.19 Ext2 speed ref2. A mathematical function (22.20 Ext2 speed function) applied to the two signals creates an EXT2 reference. See diagram at 28.11 Ext1 frequency ref1.	Zero
	Zero	None.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	Reserved		3
	FB A ref1	03.05 FB A reference 1 (see page 331).	4
	FB A ref2	03.06 FB A reference 2 (see page 331).	5
	Reserved		67
	EFB ref1	03.09 EFB reference 1 (see page 332).	8
	EFB ref2	03.10 EFB reference 2 (see page 332).	9
	Reserved		1014
	Motor potentiometer	22.80 Motor potentiometer ref act (output of the Floating point control (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
	Control panel (ref saved)	Panel reference (03.01 Panel reference, see page 331) saved by the control system for the location where the control returns is used as the reference. Reference EXT1 reference EXT2 reference Active reference Inactive reference	18
	Control panel (ref copied)	Panel reference (03.01 Panel reference, see page 331) 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. Reference EXT1 reference EXT2 reference Active reference Inactive reference	19
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
22.19	Ext2 speed ref2	Selects EXT2 speed reference source 2. For the selections, and a diagram of reference source selection, see parameter 22.18 Ext2 speed ref1.	Zero

1 = 1

lo.	Name/	Value	Description	Def/FbEq1
22.20	Ext2 speed function		Selects a mathematical function between the reference sources selected by parameters 22.18 Ext2 speed ref1 and 22.19 Ext2 speed ref2. See diagram at 22.18 Ext2 speed ref1.	Ref1
	Ref1		Signal selected by Ext2 speed ref1 is used as speed reference 1 as such (no function applied).	0
	Add (re	ef1 + ref2)	The sum of the reference sources is used as speed reference 1.	1
	Sub (re	ef1 - ref2)	The subtraction ([22.11 Ext1 speed ref1] - [22.12 Ext1 speed ref2]) of the reference sources is used as speed reference 1.	2
	Mul (re	f1 × ref2)	The multiplication of the reference sources is used as speed reference 1. $ \\$	3
	Min (re	f1, ref2)	The smaller of the reference sources is used as speed reference 1.	4
	Max (re	ef1, ref2)	The greater of the reference sources is used as speed reference 1.	5
2.21	Consta function	nt speed n	Determines how constant speeds are selected, and whether the rotation direction signal is considered or not when applying a constant speed.	0000b
	Bit	1	l	
		Name	Information	
	0		linformation eed 1 = Packed: 7 constant speeds are selectable using the the defined by parameters 22.22, 22.23 and 22.24. 0 = Separate: Constant speeds 1, 2 and 3 are separately the sources defined by parameters 22.22, 22.23 and 22.24. In case of conflict, the constant speed with the smaller nu priority.	activated by 4 respectively
		Constant sp	eed 1 = Packed: 7 constant speeds are selectable using the the defined by parameters 22.22, 22.23 and 22.24. 0 = Separate: Constant speeds 1, 2 and 3 are separately the sources defined by parameters 22.22, 22.23 and 22.24. In case of conflict, the constant speed with the smaller nu priority. 1 = Start dir: To determine running direction for a constant sign of the constant speed setting (parameters 22.2622 multiplied by the direction signal (forward: +1, reverse: -1) effectively allows the drive to have 14 (7 forward, 7 revers speeds if all values in 22.2622.32 are positive. WARNING: If the direction signal is reverse and the constant speed is negative, the drive will run in the direction. 0 = According to Par: The running direction for the constant determined by the sign of the constant speed setting (parameters).	activated by 4 respectively mber takes t speed, the 2.32 is). This se) constant the active e forward
	0	Constant sp mode	eed 1 = Packed: 7 constant speeds are selectable using the the defined by parameters 22.22, 22.23 and 22.24. 0 = Separate: Constant speeds 1, 2 and 3 are separately the sources defined by parameters 22.22, 22.23 and 22.2 In case of conflict, the constant speed with the smaller nu priority. 1 = Start dir: To determine running direction for a constant sign of the constant speed setting (parameters 22.2622 multiplied by the direction signal (forward: +1, reverse: -1) effectively allows the drive to have 14 (7 forward, 7 revers speeds if all values in 22.2622.32 are positive. WARNING: If the direction signal is reverse and the constant speed is negative, the drive will run in the direction. 0 = According to Par: The running direction for the constant	activated by 4 respectively mber takes t speed, the 2.32 is). This se) constant the active e forward

Constant speed configuration word.

0000h...FFFFh

No.	Name/\	Value	Description			Def/FbEq16
22.22	Consta sel1	,	When bit 0 of parame (Separate), selects a When bit 0 of parame (Packed), this param speed sel2 and 22.2- sources whose state:	source that activate eter 22.21 Constant eter and parameter 4 Constant speed so	es constant speed 1. s speed function is 1 s 22.23 Constant e/3 select three	DI3
		Source define by par. 22.2		Source defined by par. 22.24	Constant speed ac	ctive
		0	0	0	None	
		1	0	0	Constant speed	
		0	1	0	Constant speed	
		1 0	1 0	0	Constant speed Constant speed	
		1	0	1	Constant speed	
		0	1	1	Constant speed	
		1	1	1	Constant speed	
	Always	off	0.			0
	Always		1.			1
	DI1		Digital input DI1 (<i>10.</i> 0	02 DI dolovod statu	o hit O\	2
	DI2		<u> </u>	<u> </u>	<u> </u>	3
			Digital input DI2 (10.0	<u> </u>	<u> </u>	
	DI3		Digital input DI3 (10.0	<u> </u>	<u> </u>	4
	DI4		Digital input DI4 (10.0		· · ·	5
	DI5		Digital input DI5 (10.0	<u> </u>	<u> </u>	6
	DI6 Dig		Digital input DI6 (10.02 DI delayed status, bit 5).		7	
	Reserv	ed				817
	Timed f	unction 1	Bit 0 of 34.01 Timed functions status (see page 451).		18	
	Timed f	unction 2	Bit 1 of 34.01 Timed	functions status (se	e page 451).	19
	Timed f	function 3	Bit 2 of 34.01 Timed	functions status (se	e page 451).	20
	Reserv	ed				2123
	Superv	ision 1	Bit 0 of 32.01 Superv	rision status (see pa	ige 444).	24
	Superv	ision 2	Bit 1 of 32.01 Superv	rision status (see pa	ige 444).	25
	Superv	ision 3	Bit 2 of 32.01 Superv	rision status (see pa	ige 444).	26
	Other [l	bit]	Source selection (see	e Terms and abbrev	riations on page 324).	-
22.23	Consta sel2		When bit 0 of parame (Packed), this param speed sel1 and 22.24 sources that are used at parameter 22.22 of	source that activate eter 22.21 Constant eter and parameter 4 Constant speed so d to activate constant speed self	es constant speed 2. speed function is 1 s 22.22 Constant e/3 select three nt speeds. See table	Always off

No.	Name/Value	Description	Def/FbEq16
22.24	Constant speed sel3	When bit 0 of parameter 22.21 Constant speed function is 0 (Separate), selects a source that activates constant speed 3. When bit 0 of parameter 22.21 Constant speed function is 1 (Packed), this parameter and parameters 22.22 Constant speed sel1 and 22.23 Constant speed sel2 select three sources that are used to activate constant speeds. See table at parameter 22.22 Constant speed sel1. For the selections, see parameter 22.22 Constant speed sel1.	Always off
22.26	Constant speed 1	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. 46.01
22.27	Constant speed 2	Defines constant speed 2.	600.00 rpm; 720.00 rpm (95.20 b0)
	-30000.00 30000.00 rpm	Constant speed 2.	See par. 46.01
22.28	Constant speed 3	Defines constant speed 3.	900.00 rpm; 1080.00 rpm (95.20 b0)
	-30000.00 30000.00 rpm	Constant speed 3.	See par. 46.01
22.29	Constant speed 4	Defines constant speed 4.	1200.00 rpm; 1440.00 rpm (95.20 b0)
	-30000.00 30000.00 rpm	Constant speed 4.	See par. 46.01
22.30	Constant speed 5	Defines constant speed 5.	1500.00 rpm; 1800.00 rpm (95.20 b0)
	-30000.00 30000.00 rpm	Constant speed 5.	See par. 46.01
22.31	Constant speed 6	Defines constant speed 6.	2400.00 rpm; 2880.00 rpm (95.20 b0)
	-30000.00 30000.00 rpm	Constant speed 6.	See par. 46.01
22.32	Constant speed 7	Defines constant speed 7.	3000.00 rpm; 3600.00 rpm (95.20 b0)
	-30000.00 30000.00 rpm	Constant speed 7.	See par. 46.01
22.41	Speed ref safe	Defines a safe speed reference value that is used with supervision functions such as 12.03 Al supervision function 49.05 Communication loss action 50.02 FBA A comm loss func.	0.00 rpm
	-30000.00 30000.00 rpm	Safe speed reference.	See par. 46.01

No.	Name/V	alue	Des	scription	Def/FbEq16
22.51	Critical speed function		dete rota	ables/disables the critical speeds function. Also ermines whether the specified ranges are effective in both ating directions or not. e also section <i>Critical speeds/frequencies</i> (page 123).	0000b
	Bit	Name		Information	
	0	Enable		1 = Enable: Critical speeds enabled.	
				0 = Disable: Critical speeds disabled.	
	1	Sign mode		1 = Signed: The signs of parameters 22.5222.57 are tak account.	
				0 = Absolute: Parameters 22.5222.57 are handled as abs Each range is effective in both directions of rotation.	solute values.
	215	Reserved			
		•			•
	0000b	.0011b	Crit	ical speeds configuration word.	1 = 1
22.52	Critical s	speed 1 low	Not	rines the low limit for critical speed range 1. te: This value must be less than or equal to the value of 53 Critical speed 1 high.	0.00 rpm
	-30000.0 30000.0		Lov	v limit for critical speed 1.	See par. 46.01
22.53	Critical s high	speed 1	Not	ines the high limit for critical speed range 1. te: This value must be greater than or equal to the value of 52 Critical speed 1 low.	0.00 rpm
	-30000.0 30000.0		Hig	h limit for critical speed 1.	See par. 46.01
22.54	Critical speed 2 low		Not	fines the low limit for critical speed range 2. te: This value must be less than or equal to the value of 55 Critical speed 2 high.	0.00 rpm
	-30000.0 30000.0		Lov	v limit for critical speed 2.	See par. 46.01
22.55	Critical s high	speed 2	Not	ines the high limit for critical speed range 2. te: This value must be greater than or equal to the value of 54 Critical speed 2 low.	0.00 rpm
	-30000.0 30000.0		Hig	h limit for critical speed 2.	See par. 46.01
22.56	Critical s	speed 3 low	Not	ines the low limit for critical speed range 3. te: This value must be less than or equal to the value of 57 Critical speed 3 high.	0.00 rpm
	-30000.0 30000.0		Lov	v limit for critical speed 3.	See par. 46.01
22.57	Critical s high	speed 3	Not	ines the high limit for critical speed range 3. te: This value must be greater than or equal to the value of 56 Critical speed 3 low.	0.00 rpm
_	-30000.0 30000.0		Hig	h limit for critical speed 3.	See par. 46.01

No.	Name/Value	Description	Def/FbEq16
22.71	Motor potentiometer function	Activates and selects the mode of the Floating point control (Motor potentiometer).	Disabled
	Disabled	Floating point control (Motor potentiometer) is disabled and the Floating point control (Motor potentiometer) counter value set to 0.	0
	Enabled (init at stop /power-up)	When enabled, the Floating point control (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 Floating point control (Motor potentiometer) counter is retained over a power cycle.	2
	Enabled (init to actual)	Whenever another reference source is selected, the value of the Floating point control (Motor potentiometer) counter follows that reference. After the source of reference returns to the Floating point control (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 Floating point control (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 Floating point control (Motor potentiometer) counter up signal. 0 = No change 1 = Increase Floating point control (Motor potentiometer) counter value. (If both the up and down sources are on, the potentiometer value will not change.) Note: Floating point control (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 Floating point control (Motor potentiometer) on page 138.	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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19

No.	Name/Value	Description	Def/FbEq16
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Reserved		2123
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	24
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	25
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	26
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
22.74	Motor potentiometer down source	Selects the source of Floating point control (Motor potentiometer) counter down signal. 0 = No change 1 = Decrease Floating point control (Motor potentiometer) counter value. (If both the up and down sources are on, the counter value will not change.) Note: Floating point control (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 Floating point control (Motor potentiometer) on page 138. For the selections, see parameter 22.73 Motor potentiometer up source.	Not used
22.75	Motor potentiometer ramp time	Defines the change rate of the Floating point control (Motor potentiometer) counter. This parameter specifies the time required for the Floating point control (Motor potentiometer) to change from minimum (22.76) to maximum (22.77). The same change rate applies in both directions.	40.0 s
	0.03600.0 s	Counter change time.	10 = 1 s
22.76	Motor potentiometer min value	Defines the minimum value of the Floating point control (Motor potentiometer) counter. Note: If vector control mode is used, value of this parameter must be changed.	-50.00
	-32768.00 32767.00	Counter minimum.	1 = 1
22.77	Motor potentiometer max value	Defines the maximum value of the Floating point control (Motor potentiometer) counter. Note: If vector control mode is used, value of this parameter must be changed.	50.00
	-32768.00 32767.00	Counter maximum.	1 = 1
22.80	Motor potentiometer ref act	The output of the Floating point control (Motor potentiometer) function. (The meter is configured using parameters 22.7122.74.) This parameter is read-only.	-
	-32768.00 32767.00	Value of the Floating point control (Motor potentiometer) counter.	1 = 1
22.86	Speed reference act 6	Displays the value of the speed reference (EXT1 or EXT2) that has been selected by 19.11 Ext1/Ext2 selection. See diagram at 22.11 Ext1 speed ref1 or control chain diagram Speed reference source selection I on page 306. This parameter is read-only.	-
	-30000.00 30000.00 rpm	Speed reference after additive 2.	See par. 46.01

No.	Name/Value	Description	Def/FbEq16
22.87	Speed reference act 7	Displays the value of speed reference before application of critical speeds. See the control chain diagram on page 307. The value is received from 22.86 Speed reference act 6 unless overridden by • any constant speed • network control reference (see page 21) • control panel reference • safe speed reference. This parameter is read-only.	-
	-30000.00 30000.00 rpm	Speed reference before application of critical speeds.	See par. 46.01

23 Spo ramp	eed reference	Speed reference ramp settings (programming of the acceleration and deceleration rates for the drive). See control chain diagram Speed reference ramping and shaping on page 308.	
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 ramping and shaping</i> on page 308. 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 Speed reference ramping and shaping on page 308. This parameter is read-only.	-
	-30000.00 30000.00 rpm	Speed reference after ramping and shaping.	See par. 46.01
23.11	Ramp set selection	Selects the source that switches between the two sets of acceleration/deceleration ramp times defined by parameters 23.1223.15. 0 = Acceleration time 1 and deceleration time 1 are active 1 = Acceleration time 2 and deceleration time 2 are active	Acc/Dec time 1
	Acc/Dec time 1	0.	0
	Acc/Dec time 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
	Reserved		817
	FBA A	For Transparent16 and Transparent32 profiles only. DCU control word bit 10 received through the fieldbus adapter.	18
	Reserved		19
	EFB DCU CW bit 10	Only for the DCU profile. DCU control word bit 10 received through the embedded fieldbus interface.	20
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-

No.	Name/Value	Description	Def/FbEq16
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 Speed scaling (not to parameter 30.12 Maximum speed). 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.	20.000 s
	0.0001800.000 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 Speed scaling (not from parameter 30.12 Maximum speed) 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 Overvoltage control). 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.	20.000 s
	0.0001800.000 s	Deceleration time 1.	10 = 1 s
23.14	Acceleration time 2	Defines acceleration time 2. See parameter 23.12 Acceleration time 1.	60.000 s
	0.0001800.000 s	Acceleration time 2.	10 = 1 s
23.15	Deceleration time 2	Defines deceleration time 2. See parameter 23.13 Deceleration time 1.	60.000 s
	0.0001800.000 s	Deceleration time 2.	10 = 1 s
23.23	Emergency stop time	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: - Emergency stop Off1 uses the standard deceleration ramp as defined by parameters 23.1123.15. - The same parameter value is also used in frequency control mode (ramp parameters 28.7128.75).	3.000 s
	0.0001800.000 s	Emergency stop Off3 deceleration time.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
23.28	Variable slope enable	Activates the variable slope function, which controls the slope of the speed ramp during a speed reference change. This allows for a constantly variable ramp rate to be generated, instead of just the standard two ramps normally available. If the update interval of the signal from an external control system and the variable slope rate (23.29 Variable slope rate) are equal, speed reference (23.02 Speed ref ramp output) is a straight line.	Off
		Speed reference Speed reference 23.02 Speed ref ramp output Time t = update interval of signal from an external control system A = speed reference change during t This function is only active in external control.	
	Off	Variable slope disabled.	0
	On	Variable slope enabled (not available in local control).	1
23.29	Variable slope rate	Defines the rate of the speed reference change when variable slope is enabled by parameter 23.28 Variable slope enable. For the best result, enter the reference update interval into this parameter.	50 ms
	230000 ms	Variable slope rate.	1 = 1 ms
	eed reference ioning	Speed error calculation; speed error window control configuration; speed error step. See control chain diagram Speed error calculation on page 309.	
24.01	Used speed reference	Displays the ramped and corrected speed reference (before speed error calculation). See control chain diagram Speed error calculation on page 309.	-

24 Speed reference conditioning		Speed error calculation; speed error window control configuration; speed error step. See control chain diagram Speed error calculation on page 309.	
24.01	Used speed reference	Displays the ramped and corrected speed reference (before speed error calculation). See control chain diagram <i>Speed error calculation</i> on page 309. This parameter is read-only.	-
	-30000.00 30000.00 rpm	Speed reference used for speed error calculation.	See par. 46.01
24.02	Used speed feedback	Displays the speed feedback used for speed error calculation. See control chain diagram <i>Speed error calculation</i> on page 309. This parameter is read-only.	-
	-30000.00 30000.00 rpm	Speed feedback used for speed error calculation.	See par. 46.01

No.	Name/Value	Description	Def/FbEq16
24.03	Speed error filtered	Displays the filtered speed error. See control chain diagram Speed error calculation on page 309. This parameter is read-only.	-
	-30000.0 30000.0 rpm	Filtered speed error.	See par. 46.01
24.04	Speed error inverted	Displays the inverted (unfiltered) speed error. See control chain diagram <i>Speed error calculation</i> on page <i>309</i> . This parameter is read-only.	-
	-30000.0 30000.0 rpm	Inverted speed error.	See par. 46.01
24.11	Speed correction	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 309.	0.00 rpm
	-10000.00 10000.00 rpm	Speed reference correction.	See par. 46.01
24.12	Speed error filter time	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
	010000 ms	Speed error filtering time constant. 0 = filtering disabled.	1 = 1 ms
25 Sp	eed control	Speed controller settings. See control chain diagram Speed error calculation on page 309.	
25.01	Torque reference speed control	Displays the speed controller output that is transferred to the torque controller. See control chain diagram <i>Speed error calculation</i> on page 309.	-

This parameter is read-only.

-1600.0...1600.0%

Limited speed controller output torque.

See par. 46.03

No.	Name/Value	Description	Def/FbEq16
25.02	Speed proportional gain	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.	10.00
	Ċ	Gain = $K_p = 1$ $T_l = Integration time = 0$ $T_D = Derivation time = 0$ Error value	
	Controller output = K _p × e	Controller output e = Tin	Error value ne
		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 × gain.	
	0.00250.00	Proportional gain for speed controller.	100 = 1

No.	Name/Value	Description	Def/FbEq16
No. 25.03	Speed integration time	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. 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. Anti-windup (the integrator just integrates up to 100%) stops the integrator if the controller output is limited. The figure below shows the speed controller output after an error step when the error remains constant.	2.50 s
	% ▲ K _p × e	Controller output Gain = $K_p = 1$ $T_1 = Integration time > T_D = Derivation time = 0$	
	К _р × е }	e = Error value)
		Time Time	
	0.001000.00 s	Integration time for speed controller.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
25.04	Speed derivation time	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. The speed error derivative must be filtered with a low pass filter to eliminate disturbances. The figure below shows the speed controller output after an error step when the error remains constant.	0.000 s
	(%	
		Controller output	
	$K_p \times T_D \times \frac{\Delta e}{T_s} \left\{ K_p \right.$	× e Error value	
	κ_{p}	e = Error v	ralue
		T _I Time	
	Τ ₁ : Τ _D Τ _s :	ain = K _p = 1 = Integration time > 0 = Derivation time > 0 = Sample time period = 250 μs = Error value change between two samples	
	0.00010.000 s	Derivation time for speed controller.	1000 = 1 s
25.05	Derivation filter time	Defines the derivation filter time constant. See parameter 25.04 Speed derivation time.	8 ms
	010000 ms	Derivation filter time constant.	1 = 1 ms

No.	Name/Value	Description	Def/FbEq16
25.06	Acc comp derivation time	Defines the derivation time for acceleration(/deceleration) compensation. In order to compensate for a high inertia load during acceleration, a derivative of the reference is added to the output of the speed controller. The principle of a derivative action is described under parameter 25.04 Speed derivation time. Note: As a general rule, set this parameter to the value between 50 and 100% of the sum of the mechanical time constants of the motor and the driven machine. The figure below shows the speed responses when a high inertia load is accelerated along a ramp. No acceleration compensation: - Speed reference Actual speed - Speed reference Actual speed	0.00 s
		/	
		Time	
	0.001000.00 s	Acceleration compensation derivation time.	10 = 1 s
25.07	Acc comp filter time	Defines the acceleration (or deceleration) compensation filter time constant. See parameters 25.04 Speed derivation time and 25.06 Acc comp derivation time.	8.0 ms
	0.01000.0 ms	Acceleration/deceleration compensation filter time.	1 = 1 ms
25.15	Proportional gain em stop	Defines the proportional gain for the speed controller when an emergency stop is active. See parameter 25.02 Speed proportional gain.	10.00
	1.00250.00	Proportional gain upon an emergency stop.	100 = 1

See par. 46.02

No.	Name/Value	Description	Def/FbEq16
25.53	Torque prop reference	Displays the output of the proportional (P) part of the speed controller. See control chain diagram <i>Speed error calculation</i> on page 309. This parameter is read-only.	-
	-30000.0 30000.0%	P-part output of speed controller.	See par. 46.03
25.54	Torque integral reference	Displays the output of the integral (I) part of the speed controller. See control chain diagram <i>Speed error calculation</i> on page 309. This parameter is read-only.	-
	-30000.0 30000.0%	I-part output of speed controller.	See par. 46.03
25.55	Torque deriv reference	Displays the output of the derivative (D) part of the speed controller. See control chain diagram <i>Speed error calculation</i> on page 309. This parameter is read-only.	-
	-30000.0 30000.0%	D-part output of speed controller.	See par. 46.03
25.56	Torque acc compensation	Displays the output of the acceleration compensation function. See control chain diagram <i>Speed error calculation</i> on page 309. This parameter is read-only.	-
	-30000.0 30000.0%	Output of acceleration compensation function.	See par. 46.03
28 Fre	quency reference	Settings for the frequency reference chain. See the control chain diagrams on pages 304 and 305.	
28.01	Frequency ref ramp input	Displays the used frequency reference before ramping. See the control chain diagrams <i>Frequency reference selection</i> on page 304 and <i>Frequency reference modification</i> on page 305. This parameter is read-only.	-
	-500.00500.00 Hz	Frequency reference before ramping.	See par. 46.02
28.02	Frequency ref ramp output	Displays the final frequency reference (after selection, limitation and ramping). See control chain diagram on page 304.	-

This parameter is read-only.

Final frequency reference.

-500.00...500.00

Hz

No. Name/Value	Description	Def/FbEq16
28.11 Ext1 frequency re	Selects EXT1 frequency reference source 1. Two signal sources can be defined by this parameter and 28.12 Ext1 frequency ref2. A mathematical function (28.13 Ext1 frequency function) applied to the two signals creates an EXT1 reference (A in the figure below). A digital source selected by 19.11 Ext1/Ext2 selection can be used to switch between EXT1 reference and the corresponding EXT2 reference defined by parameters 28.15 Ext2 frequency ref1, 28.16 Ext2 frequency ref2 and 28.17 Ext2 frequency function (B in the figure below).	Al1 scaled
A FE Other	ADD SUB MUL MIN O EXT1 19.11 O T SUB MMAX ADD O EXT2 B EXT2 B MUL MAX ADD O EXT2 B EXT2	3.92
Zero	None.	0
Al1 scaled	12.12 Al1 scaled value (see page 358).	1
Al2 scaled	12.22 Al2 scaled value (see page 360).	2
Reserved		3
FB A ref1	03.05 FB A reference 1 (see page 331).	4
FB A ref2	03.06 FB A reference 2 (see page 331).	5
Reserved		67
EFB ref1	03.09 EFB reference 1 (see page 332).	8
EFB ref2	03.10 EFB reference 2 (see page 332).	9
Reserved		1014

No.	Name/Value	Description	Def/FbEq16
	Motor potentiometer	22.80 Motor potentiometer ref act (output of the Floating point control (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
	Control panel (ref saved)	Panel reference (03.01 Panel reference, see page 331) saved by the control system for the location where the control returns is used as the reference. Reference * X - X - X - X - X - X - X - X - X - X	18
	Control panel (ref copied)	Panel reference (03.01 Panel reference, see page 331) 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. Reference **EXT1 reference** **EXT1 reference** **EXT2 reference** **Active reference** Inactive reference** Inactive reference**	19
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
28.12	Ext1 frequency ref2	Selects EXT1 frequency reference source 2. For the selections, and a diagram of reference source selection, see parameter 28.11 Ext1 frequency ref1.	Zero
28.13	Ext1 frequency function	Selects a mathematical function between the reference sources selected by parameters 28.11 Ext1 frequency ref1 and 28.12 Ext1 frequency ref2. See diagram at 28.11 Ext1 frequency ref1.	Ref1
	Ref1	Signal selected by 28.11 Ext1 frequency ref1 is used as frequency reference 1 as such (no function applied).	0
	Add (ref1 + ref2)	The sum of the reference sources is used as frequency reference 1.	1
	Sub (ref1 - ref2)	The subtraction ([28.11 Ext1 frequency ref1] - [28.12 Ext1 frequency ref2]) of the reference sources is used as frequency reference 1.	2
	Mul (ref1 × ref2)	The multiplication of the reference sources is used as frequency reference 1.	3
	Min (ref1, ref2)	The smaller of the reference sources is used as frequency reference 1.	4
	Max (ref1, ref2)	The greater of the reference sources is used as frequency reference 1.	5

No.	Name/Value	Description	Def/FbEq16
28.15	Ext2 frequency ref1	Selects EXT2 frequency reference source 1. Two signal sources can be defined by this parameter and 28.16 Ext2 frequency ref2. A mathematical function (28.17 Ext2 frequency function) applied to the two signals creates an EXT2 reference. See diagram at 28.11 Ext1 frequency ref1.	Zero
	Zero	None.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	Reserved		3
	FB A ref1	03.05 FB A reference 1 (see page 331).	4
	FB A ref2	03.06 FB A reference 2 (see page 331).	5
	Reserved		67
	EFB ref1	03.09 EFB reference 1 (see page 332).	8
	EFB ref2	03.10 EFB reference 2 (see page 332).	9
	Reserved		1014
	Motor potentiometer	22.80 Motor potentiometer ref act (output of the Floating point control (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
	Control panel (ref saved)	Panel reference (03.01 Panel reference, see page 331) saved by the control system for the location where the control returns is used as the reference. Reference	18
		EXT1 reference X EXT2 reference Active reference I EXT1 -> EXT2	
	Control panel (ref copied)	Panel reference (03.01 Panel reference, see page 331) 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.	19
		Reference EXT1 reference EXT2 reference Active reference Inactive reference	
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
28.16	Ext2 frequency ref2	Selects EXT2 frequency reference source 2. For the selections, and a diagram of reference source selection, see parameter 28.15 Ext2 frequency ref1.	Zero

1 = 1

No.	Name/V	'alue	Description	Def/FbEq16
28.17	Ext2 free function		Selects a mathematical function between the reference sources selected by parameters 28.15 Ext2 frequency ref1 and 28.16 Ext2 frequency ref2. See diagram at 28.15 Ext2 frequency ref1.	Ref1
	Ref1		Signal selected by 28.15 Ext2 frequency ref1 is used as frequency reference 1 as such (no function applied).	0
	Add (ref	f1 + ref2)	The sum of the reference sources is used as frequency reference 1.	1
	Sub (ref	f1 - ref2)	The subtraction ([28.15 Ext2 frequency ref1] - [28.16 Ext2 frequency ref2]) of the reference sources is used as frequency reference 1.	2
	Mul (ref	1 × ref2)	The multiplication of the reference sources is used as frequency reference 1.	3
	Min (ref	1, ref2)	The smaller of the reference sources is used as frequency reference 1.	4
	Max (re	f1, ref2)	The greater of the reference sources is used as frequency reference 1.	5
28.21	Constar function	nt frequency	Determines how constant frequencies are selected, and whether the rotation direction signal is considered or not when applying a constant frequency.	0000b
28.21			whether the rotation direction signal is considered or not	0000b
28.21	function		whether the rotation direction signal is considered or not when applying a constant frequency. Information 1 = Packed: 7 constant frequencies are selectable using sources defined by parameters 28.22, 28.23 and 28.24.	the three
28.21	function	Name Const freq	whether the rotation direction signal is considered or not when applying a constant frequency. Information 1 = Packed: 7 constant frequencies are selectable using	the three ately activated 28.24
28.21	function	Name Const freq	whether the rotation direction signal is considered or not when applying a constant frequency. Information 1 = Packed: 7 constant frequencies are selectable using sources defined by parameters 28.22, 28.23 and 28.24. 0 = Separate: Constant frequencies 1, 2 and 3 are separate; by the sources defined by parameters 28.22, 28.23 and 2 respectively. In case of conflict, the constant frequency we have the constant frequency where the constant frequency we have the	the three ately activated 28.24 iith the smaller at speed, the 2.32) is b. This se) constant the active
28.21	Bit 0	Name Const freq mode	whether the rotation direction signal is considered or not when applying a constant frequency. Information 1 = Packed: 7 constant frequencies are selectable using sources defined by parameters 28.22, 28.23 and 28.24. 0 = Separate: Constant frequencies 1, 2 and 3 are separ. by the sources defined by parameters 28.22, 28.23 and 2 respectively. In case of conflict, the constant frequency wnumber takes priority. 1 = Start dir: To determine running direction for a constant sign of the constant speed setting (parameters 22.262 multiplied by the direction signal (forward: +1, reverse: -1 effectively allows the drive to have 14 (7 forward, 7 revenspeeds if all values in 22.2622.32 are positive. WARNING: If the direction signal is reverse and the constant speed is negative, the drive will run in the	the three ately activated 28.24 with the smaller at speed, the 2.32) is). This se) constant the active e forward ant speed is

Constant frequency configuration word.

0000b...0011b

No.	Name/Value	Description	Def/FbEq16
28.22	Constant frequency sel1	When bit 0 of parameter 28.21 Constant frequency function is 0 (Separate), selects a source that activates constant frequency 1. When bit 0 of parameter 28.21 Constant frequency function is 1 (Packed), this parameter and parameters 28.23 Constant frequency sel2 and 28.24 Constant frequency sel3 select three sources whose states activate constant frequencies as follows:	DI3

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 (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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Reserved		2123
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	24
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	25
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	26
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
28.23	Constant frequency sel2	When bit 0 of parameter 28.21 Constant frequency function is 0 (Separate), selects a source that activates constant frequency 2. When bit 0 of parameter 28.21 Constant frequency function is 1 (Packed), this parameter and parameters 28.22 Constant frequency sel1 and 28.24 Constant frequency sel3 select three sources that are used to activate constant frequencies. See table at parameter 28.22 Constant frequency sel1. For the selections, see parameter 28.22 Constant frequency sel1.	Always off

No.	Name/Value	Description	Def/FbEq16
28.24	Constant frequency sel3	When bit 0 of parameter 28.21 Constant frequency function is 0 (Separate), selects a source that activates constant frequency 3. When bit 0 of parameter 28.21 Constant frequency function is 1 (Packed), this parameter and parameters 28.22 Constant frequency sel1 and 28.23 Constant frequency sel2 select three sources that are used to activate constant frequencies. See table at parameter 28.22 Constant frequency sel1. For the selections, see parameter 28.22 Constant frequency sel1.	Always off
28.26	Constant frequency 1	Defines constant frequency 1 (the frequency the motor will turn when constant frequency 1 is selected).	5.00 Hz; 6.00 Hz (95.20 b0)
	-500.00500.00 Hz	Constant frequency 1.	See par. 46.02
28.27	Constant frequency 2	Defines constant frequency 2.	10.00 Hz; 12.00 Hz (95.20 b0)
	-500.00500.00 Hz	Constant frequency 2.	See par. 46.02
28.28	Constant frequency 3	Defines constant frequency 3.	15.00 Hz; 18.00 Hz (95.20 b0)
	-500.00500.00 Hz	Constant frequency 3.	See par. 46.02
28.29	Constant frequency 4	Defines constant frequency 4.	20.00 Hz; 24.00 Hz (95.20 b0)
	-500.00500.00 Hz	Constant frequency 4.	See par. 46.02
28.30	Constant frequency 5	Defines constant frequency 5.	25.00 Hz; 30.00 Hz (95.20 b0)
	-500.00500.00 Hz	Constant frequency 5.	See par. 46.02
28.31	Constant frequency 6	Defines constant frequency 6.	40.00 Hz; 48.00 Hz (95.20 b0)
	-500.00500.00 Hz	Constant frequency 6.	See par. 46.02
28.32	Constant frequency 7	Defines constant frequency 7.	50.00 Hz; 60.00 Hz (95.20 b0)
	-500.00500.00 Hz	Constant frequency 7.	See par. 46.02
28.41	Frequency ref safe	Defines a safe frequency reference value that is used with supervision functions such as 12.03 AI supervision function 49.05 Communication loss action 50.02 FBA A comm loss func.	0.00 Hz
	-500.00500.00 Hz	Safe frequency reference.	See par. 46.02

No.	Name/Value		Des	scription	Def/FbEq16
28.51	Critica functio	l frequency n	dete rota	ables/disables the critical frequencies function. Also ermines whether the specified ranges are effective in both ating directions or not. e also section <i>Critical speeds/frequencies</i> (page 123).	0000b
	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 28.5228.8 into account.	
				0 = Absolute: Parameters 28.5228.57 are handled as abs Each range is effective in both directions of rotation.	solute values.
	00006	0011b	Crit	tical fraguescies configuration word	1 = 1
00.50				tical frequencies configuration word.	
28.52	low	I frequency 1	Not	te: This value must be less than or equal to the value of 53 Critical frequency 1 high.	0.00 Hz
	-500.0 Hz	0500.00	Lov	v limit for critical frequency 1.	See par. 46.02
28.53	Critical frequency 1 high		Not	fines the high limit for critical frequency 1. te: This value must be greater than or equal to the value of 52 Critical frequency 1 low.	0.00 Hz
	-500.0 Hz	0500.00	Hig	h limit for critical frequency 1.	See par. 46.02
28.54	Critica low	I frequency 2	Not	fines the low limit for critical frequency 2. te: This value must be less than or equal to the value of 55 Critical frequency 2 high.	0.00 Hz
	-500.0 Hz	0500.00	Lov	v limit for critical frequency 2.	See par. 46.02
28.55	55 Critical frequency 2 high		Not	fines the high limit for critical frequency 2. te: This value must be greater than or equal to the value of 54 Critical frequency 2 low.	0.00 Hz
	-500.0 Hz	0500.00	Hig	h limit for critical frequency 2.	See par. 46.02
28.56	Critica low	I frequency 3	Not	fines the low limit for critical frequency 3. te: This value must be less than or equal to the value of 57 Critical frequency 3 high.	0.00 Hz
	-500.0 Hz	0500.00	Lov	v limit for critical frequency 3.	See par. 46.02
28.57	Critica high	I frequency 3	Not	fines the high limit for critical frequency 3. te: This value must be greater than or equal to the value of 56 Critical frequency 3 low.	0.00 Hz
	-500.0 Hz	0500.00	Hig	h limit for critical frequency 3.	See par. 46.02
28.71	Freq ra selecti	amp set on	28.	ects a source that switches between the two sets of seleration/deceleration times defined by parameters 7228.75.	Acc/Dec time 1
			-	Acceleration time 1 and deceleration time 1 are in force Acceleration time 2 and deceleration time 2 are in force	
	Acc/De	ec time 1	0.		0

No.	Name/Value	Description	Def/FbEq16
	Acc/Dec time 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
	Reserved		817
	FBA A	For Transparent16 and Transparent32 profiles only. DCU control word bit 10 received through the fieldbus adapter.	18
	Reserved		19
	EFB DCU CW bit 0	Only for the DCU profile. DCU control word bit 10 received through the embedded fieldbus interface.	20
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
28.72	Freq acceleration time 1	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.	30.000 s
	0.0001800.000 s	Acceleration time 1.	10 = 1 s
28.73	Freq deceleration time 1	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.	30.000 s
	0.0001800.000 s	Deceleration time 1.	10 = 1 s
28.74	Freq acceleration time 2	Defines acceleration time 2. See parameter 28.72 Freq acceleration time 1.	60.000 s
	0.0001800.000 s	Acceleration time 2.	10 = 1 s
28.75	Freq deceleration time 2	Defines deceleration time 2. See parameter 28.73 Freq deceleration time 1.	60.000 s
	0.0001800.000 s	Deceleration time 2.	10 = 1 s
28.76	Freq ramp in zero source	Selects a source that forces the frequency reference to zero. 0 = Force frequency reference to zero 1 = Normal operation	Inactive
	Active	0.	0
-	Inactive	1.	1

422 Parameters

No.	Name/Value	Description	Def/FbEq16
	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
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
28.92	Frequency ref act 3	Displays the frequency reference after the function applied by parameter 28.13 Ext1 frequency function (if any), and after selection (19.11 Ext1/Ext2 selection). See control chain diagram Frequency reference selection page 304. This parameter is read-only.	-
	-500.00500.00 Hz	Frequency reference after selection.	See par. 46.02
28.96	Frequency ref act 7	Displays the frequency reference after application of constant frequencies, control panel reference, etc. See control chain diagram <i>Frequency reference selection</i> on page 304. This parameter is read-only.	-
	-500.00500.00 Hz	Frequency reference 7.	See par. 46.02
28.97	Frequency ref unlimited	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 305. This parameter is read-only.	-
	-500.00500.00 Hz	Frequency reference before ramping and limiting.	See par. 46.02

s imit war		Neive energian limits		
imit wor		Prive operation limits.		
		Displays limit word 1. his parameter is read-only.	-	
Bit	Name	Description		
)	Torq lim	T = Drive torque is being limited by the motor control (undervo control, current control, load angle control or pull-out control), of torque limits defined by parameters.		
12	Reserved			
3	Torq ref max	1 = Torque reference is being limited by 30.20 Maximum torque 1, 30.26 Power motoring limit or 30.27 Power generating limit. 1 = Torque reference is being limited by 30.19 Minimum torque 1, 30.26 Power motoring limit or 30.27 Power generating limit. 1 = Torque reference is being limited by the rush control because of maximum speed limit (30.12 Maximum speed) 1 = Torque reference is being limited by the rush control because of minimum speed limit (30.11 Minimum speed)		
ļ	Torq ref min			
5	Tlim max spe			
3	Tlim min spee			
7	Max speed re	f lim 1 = Speed reference is being limited by 30.12 Maximun	speed	
3	Min speed ref	lim 1 = Speed reference is being limited by 30.11 Minimum	speed	
)	Max freq ref li	m 1 = Frequency reference is being limited by 30.14 Maxir	num frequency	
10	Min freq ref li	1 = Frequency reference is being limited by 30.13 Minimum frequency		
1115	Reserved			
	2	Torq lim Reserved Torq ref max Torq ref min Tlim max spec Tlim min spec Max speed ref Min speed ref Max freq ref li Min freq ref lir	Torq lim 1 = Drive torque is being limited by the motor control (un control, current control, load angle control or pull-out control decided by parameters. 1 = Torque reference is being limited by 30.20 Maximum 30.26 Power motoring limit or 30.27 Power generating limit or 30.27 Power generating limit or 30.26 Power motoring limit or 30.27 Power generating limit or 30.26 Power motoring limited by 30.19 Minimum 30.26 Power motoring limit of 30.27 Power generating limit in a speed limit (30.12 Maximum speed) 1 = Torque reference is being limited by the rush control minimum speed limit (30.11 Minimum speed) 1 = Torque reference is being limited by 30.12 Maximum speed limit (30.11 Minimum speed) 2 Max speed ref lim 1 = Speed reference is being limited by 30.11 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Minimum 1 = Frequency reference is being limited by 30.13 Mi	

0000h...FFFFh

	Name	/Value	Desc	ription	Def/FbEq1
?	Torque	e limit status	-		
			This	parameter is read-only.	
	Bit	Name		Description	
	0	Undervolta	ge	*1 = Intermediate DC circuit undervoltage	
	1	Overvoltage	Э	*1 = Intermediate DC circuit overvoltage	
	2	Minimum to	rque	*1 = Torque is being limited by 30.19 Minimum torqu motoring limit or 30.27 Power generating limit	e 1, 30.26 Power
	3	Maximum to	orque	*1 = Torque is being limited by 30.20 Maximum torque motoring limit or 30.27 Power generating limit	ie 1, 30.26 Powe
	4	Internal cur	rent	1 = An inverter current limit (identified by bits 811) is active	
	5	Load angle		(With permanent magnet motors and reluctance mol 1 = Load angle limit is active, ie. the motor cannot pr torque	• ,
	6	Motor pullo	ut	(With asynchronous motors only) Motor pull-out limit is active, ie. the motor cannot pro torque	duce any more
	7	Reserved			
	8	Thermal		1 = Input current is being limited by the main circuit t	hermal limit
	9	Max curren	t	*1 = Maximum output current (I _{MAX}) is being limited	
	10	User currer	nt	*1 = Output current is being limited by 30.17 Maximu	ım current
	11	Thermal IG	ВТ	*1 = Output current is being limited by a calculated the value	nermal current
	121	5 Reserved			
		**Only one out of bits 03, and one out of bits 911 can be on simultaneously. The bit typically indicates the limit that is exceeded first.			

Torque limitation status word.

1 = 1

No.	Name/Value	Description	Def/FbEq16
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. MARNING! 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
	30.14 Frequency rai		
	30.13	Time -(30.13) -(30.14) Frequency range allowed	Time
		30.14 30.13 Frequency 20.21 value 30.13 value Frequency range allowed	
		-(30.13) -(30.14)	Time
	-500.00500.00 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)
	-500.00500.00 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 ACH580-01-12A7-4 drive type).	0.00 A
	0.0030000.00 A	Maximum motor current.	1 = 1 A

No.	Name/Value	Description	Def/FbEq16
30.18	Torq lim sel	Selects a source that switches between two different predefined minimum torque limit sets. 0 = minimum torque limit defined by 30.19 and maximum torque limit defined by 30.20 are active 1 = minimum torque limit selected by 30.21 and maximum torque limit defined by 30.22 are active The user can define two sets of torque limits, and switch between the sets using a binary source such as a digital input. The first set of limits is defined by parameters 30.19 and 30.20. The second set has selector parameters for both the minimum (30.21) and maximum (30.22) limits that allows the use of a selectable analog source (such as an analog input).	Torque limit set 1
		30.21 Al1 Al2 PID 30.23 Other 30.19 User-defined minimum torque limit	
		30.22 Al1 Al2 PID 30.24 Other 30.20 User-defined maximum torque limit	
		Note: In addition to the user-defined limits, torque may be limited for other reasons (such as power limitation). See block diagram <i>Torque limitation</i> on page <i>312</i> .	
	Torque limit set 1	0 (minimum torque limit defined by 30.19 and maximum torque limit defined by 30.20 are active).	0
	Torque limit set 2	1 (minimum torque limit selected by 30.21 and maximum torque limit defined by 30.22 are active).	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		810
	EFB	Only for the DCU profile. DCU control word bit 15 received through the embedded fieldbus interface.	11
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-

No.	Name/Value	Description	Def/FbEq16
30.19	Minimum torque 1	Defines a minimum torque limit for the drive (in percent of nominal motor torque). See diagram at parameter 30.18 Torq lim sel. The limit is effective when • the source selected by 30.18 Torq lim sel is 0, or • 30.18 is set to Torque limit set 1. 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), or direction limit (20.21 Direction) 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%
	-1600.00.0%	Minimum torque limit 1.	See par. 46.03
30.20	Maximum torque 1	Defines a maximum torque limit for the drive (in percent of nominal motor torque). See diagram at parameter 30.18 Torq lim sel. The limit is effective when the source selected by 30.18 Torq lim sel is 0, or 30.18 is set to Torque limit set 1.	300.0%
	0.01600.0%	Maximum torque 1.	See par. 46.03
30.21	Min torque 2 source	Defines the source of the minimum torque limit for the drive (in percent of nominal motor torque) when • the source selected by parameter 30.18 Torq lim sel is 1, or • 30.18 is set to Torque limit set 2. See diagram at 30.18 Torq lim sel. Note: Any positive values received from the selected source are inverted.	Minimum torque 2
	Zero	None.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	Reserved		314
	PID	40.01 Process PID output actual (output of the process PID controller).	15
	Minimum torque 2	30.23 Minimum torque 2.	16
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
30.22	Max torque 2 source	Defines the source of the maximum torque limit for the drive (in percent of nominal motor torque) when • the source selected by parameter 30.18 Torq lim sel is 1, or • 30.18 is set to Torque limit set 2. See diagram at 30.18 Torq lim sel. Note: Any negative values received from the selected source are inverted.	Maximum torque 2
	Zero	None.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2

No.	Name/Value	Description	Def/FbEq16
	PID	40.01 Process PID output actual (output of the process PID controller).	15
	Maximum torque 2	30.24 Maximum torque 2.	16
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
30.23	Minimum torque 2	Defines the minimum torque limit for the drive (in percent of nominal motor torque) when • the source selected by 30.18 Torq lim sel is 1, or • 30.18 is set to Torque limit set 2 and • 30.21 Min torque 2 source is set to Minimum torque 2. See diagram at 30.18 Torq lim sel.	-300.0%
	-1600.00.0%	Minimum torque limit 2.	See par. 46.03
30.24	Maximum torque 2	Defines the maximum torque limit for the drive (in percent of nominal motor torque) when The limit is effective when the source selected by 30.18 Torq lim sel is 1, or 30.18 is set to Torque limit set 2 and 30.22 Max torque 2 source is set to Maximum torque 2. See diagram at 30.18 Torq lim sel.	300.0%
	0.01600.0%	Maximum torque limit 2.	See par. 46.03
30.26	Power motoring limit	Defines the maximum allowed power fed by the inverter to the motor in percent of nominal motor power.	300.00%
	0.00600.00%	Maximum motoring power.	1 = 1%
30.27	Power generating limit	Defines the maximum allowed power fed by the motor to the inverter in percent of nominal motor power. 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), or direction limit (20.21 Direction) 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.	-300.00%
	-600.000.00%	Maximum generating power.	1 = 1%
30.30	Overvoltage control	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. Note: If the drive is equipped with a brake chopper and resistor, or a regenerative supply unit, the controller must be disabled.	Enable
	Disable	Overvoltage control disabled.	0
	Enable	Overvoltage control enabled.	1

No.	Name/Value	Description	Def/FbEq16
30.31	Undervoltage control	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.	Enable
	Disable	Undervoltage control disabled.	0
	Enable	Undervoltage control enabled.	1
30.35	Thermal current limitation	Enables/disables temperature-based output current limitation. The limitation should only be disabled if required by the application.	Enable
	Disable	Thermal current limitation disabled.	0
	Enable	Thermal current limitation enabled.	1
30.36	Speed limit selection	Selects a source that switches between two different predefined adjustable speed limit sets. 0 = minimum speed limit defined by 30.11 and maximum speed limit defined by 30.12 are active 1 = minimum speed limit selected by 30.37 and maximum speed limit defined by 30.38 are active. The user can define two sets of speed limits, and switch between the sets using a binary source such as a digital input. The first set of limits is defined by parameters 30.11 Minimum speed and 30.12 Maximum speed. 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). 30.37 Al1 Al2 Maximum speed Other 30.38 User-defined minimum speed limit limit User-defined maximum speed limit speed limit limit	Not selected
	Not selected	Adjustable speed limits are disabled. (Minimum speed limit defined by 30.11 Minimum speed and maximum speed limit defined by 30.12 Maximum speed are active).	0

No.	Name/Value	Description	Def/FbEq16	
	Selected	Adjustable speed limits are enabled. (Minimum speed limit defined by 30.37 Minimum speed source and maximum speed limit defined by 30.38 Maximum speed source 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 DI delayed status, bit 0).	5	
	DI2	Digital input DI2 (10.02 DI delayed status, bit 1).	6	
	DI3	Digital input DI3 (10.02 DI delayed status, bit 2).	7	
	DI4	Digital input DI4 (10.02 DI delayed status, bit 3).	8	
	DI5	Digital input DI5 (10.02 DI delayed status, bit 4).	9	
	DI6	Digital input DI6 (10.02 DI delayed status, bit 5).	10	
	Reserved		11	
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-	
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	
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1	
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2	
	Reserved		310	
	Minimum speed	30.11 Minimum speed.	11	
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-	
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	
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1	
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2	
	Reserved		311	
	Maximum speed	30.12 Maximum speed.	12	
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-	

ο.	Name/	Value	Des	cription	Def/FbEq16	
).101			Disp	(Only visible for ACH580-31) Displays limit word 1 of the supply unit. This parameter is read-only.		
	Bit	Name		Description		
	0	P user ref r	nax	1 = Power reference is being limited by supply control p	rogram	
	1	P user ref r	nin	parameters		
	2	P user max		1 = Power is being limited by parameter 30.149		
	3	Reserved		<u> </u>		
	4	P cooling overtemp		1 = Power reference is being limited because of coolant overtemperature		
	5	P power un overtemp	it	1 = Power reference is being limited because of supply overtemperature	unit	
	615	Reserved		'		
80.102	LSU limit word 2		(Onl	pply unit limit word 1.		
			This	parameter is read-only.		
	Bit	Name		Description		
	Bit 0	Name Q user ref r	nax	Description 1 = Reactive power reference is being limited		
				•		
	0	Q user ref		•	of coolant	
	0	Q user ref r Q user ref r Q cooling		1 = Reactive power reference is being limited 1 = Reactive power reference is being limited because of	of coolant	
	0 1 2	Q user ref r Q user ref r Q cooling overtemp	min	1 = Reactive power reference is being limited 1 = Reactive power reference is being limited because of	of coolant	
	0 1 2 3	Q user ref r Q user ref r Q cooling overtemp Reserved	min	1 = Reactive power reference is being limited 1 = Reactive power reference is being limited because overtemperature	of coolant	
	0 1 2 3 4	Q user ref r Q user ref r Q cooling overtemp Reserved AC overvol	nin	1 = Reactive power reference is being limited 1 = Reactive power reference is being limited because overtemperature 1 = AC overvoltage protection 1 = (When AC voltage-type reactive power reference is		
	0 1 2 3 4	Q user ref r Q user ref r Q cooling overtemp Reserved AC overvol Reserved	nin	1 = Reactive power reference is being limited 1 = Reactive power reference is being limited because overtemperature 1 = AC overvoltage protection		

Supply unit limit word 2.

1 = 1

0000h...FFFFh

No.	Name/Value	Description	Def/FbEq16
30.103	LSU limit word 3	(Only visible for ACH580-31)	-
		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 69 and 1415.		
5	Reactive current limit	1 = Reactive current is being limited. For details, see bits 1213.		
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	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		
1011	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		

	0000hFFFFh Supply unit limit word 3.			
3	0.104 LSU limit word 4	(Only visible for ACH580-31) Displays limit word 4 of the supply unit. This parameter is read-only.	-	

Bit	Name	Description
0		1 = DC reference is being limited by supply control program
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
415	Reserved	

	0000hFFFFh Supply unit limit word 4.					
30.149	LSU maximum power limit	(Only visible for ACH580-31) Defines a maximum power limit for the supply unit.	130.0%			
	0.0 200.0%	Maximum power limit for supply unit.	1 = 1%			

No.	Name/Value	Description	Def/FbEq16	
31 Fat	ult 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 <i>Terms and abbreviations</i> on page 324).	-	
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	
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.	Inactive (true)	
31.06	External event 3 type	Selects the type of external event 3.	Fault	
	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.	Inactive (true)	
31.08	External event 4 type	Selects the type of external event 4.	Fault	
	Fault	The external event generates a fault.	0	
	Warning	The external event generates a warning.	1	

No.	Name/Value	Description	Def/FbEq16
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.	Inactive (true)
31.10	External event 5 type	Selects the type of external event 5.	Fault
	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.	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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Reserved		2123
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	24
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	25
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	26
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-

No.	Name/\	/alue	Description	Def/FbEq16				
31.12	Autores	set selection	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. 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. The bits of this binary number correspond to the following faults:	000Ch (001100b)				
	Bit Fault							
	0	Overcurren	t					
	1	Overvoltage	е					
	2	Undervolta	ge					
	3	3 Al supervision fault						
	49 Reserved							
	10	Selectable fault (see parameter 31.13 Selectable fault)						
	11	External fault 1 (from source selected by parameter 31.01 External event 1 source)						
	12	External fault 2 (from source selected by parameter 31.03 External event 2 source)						
	13	External fault 3 (from source selected by parameter 31.05 External event 3 source)						
	14	External fault 4 (from source selected by parameter 31.07 External event 4 source)						
	15	15 External fault 5 (from source selected by parameter 31.09 External event 5 source)						
	0000h.	FFFFh	Automatic reset configuration word.	1 = 1				
31.13	Selecta	ble fault	Defines the fault that can be automatically reset using parameter 31.12 Autoreset selection, bit 10. Faults are listed in chapter Fault tracing (page 197).	0000h				
	0000h.	FFFFh	Fault code.	10 = 1				
31.14	Numbe	r of trials	Defines the number of automatic fault resets the drive performs within the time defined by parameter 31.15 Total trials time.	5				
	05		Number of automatic resets.	10 = 1				
31.15	Total tri	als time	Defines the time the automatic reset function will attempt to reset the drive. During this time, it will perform the number of automatic resets defined by 31.14 Number of trials.					
	1.060	0.0 s	Time for automatic resets.	10 = 1 s				
31.16	Delay to	ime	Defines the time that the drive will wait after a fault before attempting an automatic reset. See parameter 31.12 Autoreset selection.	5.0 s				
		20.0 s	Autoreset delay.	10 = 1 s				

No.	Name/Value	Description	Def/FbEq16
31.19	Motor phase loss	Selects how the drive reacts when a motor phase loss is detected. In scalar motor control mode: 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
31.20	Earth fault	Selects how the drive reacts when an earth (ground) fault or current unbalance is detected in the motor or the motor cable.	Fault
	No action	No action taken.	0
	Warning	Drive generates warning A2B3 Earth leakage.	1
	Fault	Drive trips on fault 2330 Earth leakage.	2
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

No.	Name/Value	Descri	ption			Def/FbEq16
31.22	STO indication run/stop	torque indicati stoppe	off (ST ons al d whe	n indications are given w TO) signals are switched so depend on whether the n this occurs.	off or lost. The ne drive is running or	Fault/Fault
		genera	ted wi	each selection below shath that particular setting.		
		func the s rem both • The as it • With mod <i>ATE</i> (+L£ [Eng	parantion its setting oval of STO loss o is intended the Colule, for STO setting states of the Colule, for STO setting states of the Columbia setting setting states of the Columbia setti	neter does not affect the self. The STO function w of this parameter: a runifone or both STO signal signals are restored and fonly one STO signal all arpreted as a malfunctior PTC-02 ATEX-certified to llow the instructions give ified thermistor protection on the STO, section in the Hardware medit in the self-self-self-self-self-self-self-self-	ill operate regardless of ning drive will stop upon s, and will not start until all faults reset. ways generates a fault h. thermistor protection en in the CPTC-02 n module, Ex II (2) GD (D50000030058 e chapter The Safe	
	Fault/Fault	10.900			u.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0
		Inp IN1	uts IN2	Indication (runi	ning or stopped)	
		0	0	Fault 5091 S	afe torque off	
		0	1	a	Safe torque off nd torque off 1	
		1	0	а	Safe torque off nd torque off 2	
		1	1	(Normal (operation)	
	Fault/Warning	+				1
	r adio vvairiing	Inp	uts	Indic	ation	'
		IN1	IN2	Running	Stopped	
		0	0	Fault 5091 Safe torque off	Warning A5A0 Safe torque off	
		0	1	Faults 5091 Safe torque off and FA81 Safe torque off 1	Warning A5A0 Safe torque off and fault FA81 Safe torque off 1	
		1	0	Faults 5091 Safe torque off and FA82 Safe torque off 2	Warning A5A0 Safe torque off and fault FA82 Safe torque off 2	
		1	1	(Normal	operation)	

No.	Name/Value	Descri	ption			Def/FbEq16			
	Fault/Event					2			
		Inp	uts	Indic	ation				
		IN1	IN2	Running	Stopped				
		0	0	Fault 5091 Safe torque off	Event B5A0 STO event				
		0	1	Faults 5091 Safe torque off and FA81 Safe torque off 1	Event B5A0 STO event and fault FA81 Safe torque off 1				
		1	0	Faults 5091 Safe torque off and FA82 Safe torque off 2	Event B5A0 STO event and fault FA82 Safe torque off 2				
		1	1	(Normal o	operation)				
	Warning/Warning					3			
		Inp	uts	Indication (sing or stop=sd\				
		IN1	IN2	- indication (runr	ning or stopped)				
		0	0		Safe torque off				
		0	1	Safe tor	rque off and fault FA81 que off 1				
		1	0	Safe tor	rque off and fault FA82 que off 2				
		1	1	(Normal o	operation)				
	Event/Event					4			
		Inp IN1	uts IN2	Indication (runr	ning or stopped)				
		0	0	Event B5A0	STO event				
		0	1		nt and fault FA81 Safe e off 1				
		1	0		nt and fault FA82 Safe e off 2				
		1	1	(Normal o	operation)				
	No indication/No					5			
	indication	Inp	uts						
		IN1	IN2	indication (runr	ning or stopped)				
		0	0	No	one				
		0	1	Fault FA81 Sa	afe torque off 1				
		1	0	Fault FA82 Sa	afe torque off 2				
		1	1	(Normal o	operation)				
31.23	Wiring or earth fault	motor of drive n	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 ACH580-31 this parameter is write protected and its value is No action.						
	No action	No action taken.							

440 Parameters

No.	Name/Value	Description	Def/FbEq16
	Fault	Drive trips on fault 3181 Wiring or earth fault.	1
31.24	Stall function	Selects how the drive reacts to a motor stall condition. A stall condition is defined as follows: The drive exceeds the stall current limit (31.25 Stall current limit), and the output frequency is below the level set by parameter 31.27 Stall frequency limit or the motor speed is below the level set by parameter 31.26 Stall speed limit, and the conditions above have been true longer than the time set by parameter 31.28 Stall time.	No action
	No action	None (stall supervision disabled).	0
	Warning	Drive generates warning A780 Motor stall.	1
	Fault	Drive trips on fault 7121 Motor stall.	2
31.25	Stall current limit	Stall current limit in percent of the nominal current of the motor. See parameter 31.24 Stall function.	200.0%
	0.01600.0%	Stall current limit.	-
31.26	Stall speed limit	Stall speed limit in rpm. See parameter 31.24 Stall function.	150.00 rpm; 180.00 rpm (95.20 b0)
	0.0010000.00 rpm	Stall speed limit.	See par. 46.01
31.27	Stall frequency limit	Stall frequency limit. See parameter 31.24 Stall function. Note: Setting the limit below 10 Hz is not recommended.	15.00 Hz; 18.00 Hz (95.20 b0)
	0.001000.00 Hz	Stall frequency limit.	See par. 46.02
31.28	Stall time	Stall time. See parameter 31.24 Stall function.	20 s
	03600 s	Stall time.	-

No.	Name/Value	Description	Def/FbEq16
31.30	Overspeed trip margin	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. WARNING! This function only supervises the speed in vector motor control mode. The function is not effective in scalar motor control mode. Example: If the maximum speed is 1420 rpm and speed trip margin is 300 rpm, the drive trips at 1720 rpm. Speed (24.02) Overspeed trip level 31.30 Overspeed trip level 31.30 Overspeed trip level Overspeed trip level Time 30.11 31.30 Overspeed trip level Overspeed trip level	500.00 rpm; 500.00 rpm (95.20 b0)
	0.0010000.00 rpm	Overspeed trip margin.	See par. 46.01

No.	Name/Value	Description	Def/FbEq16
31.31	Frequency trip margin	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. 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. WARNING! This function only supervises the frequency in scalar motor control mode. Frequency Overfrequency trip level 31.31 ABS(30.14) Overfrequency trip level	15.00 Hz
	0.0010000.00 Hz	Overfrequency trip margin.	1 = 1 Hz
31.32	Emergency ramp supervision	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. The supervision is based on either • observing the time within which the motor stops, or • comparing the actual and expected deceleration rates. 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 23.1123.15 (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. If 31.32 is set to 0% and 31.33 is set to 0 s, the emergency stop ramp supervision is disabled. See also parameter 21.04 Emergency stop mode.	0%
	0300%	Maximum deviation from expected deceleration rate.	1 = 1%

No.	Name/Value	Description	Def/FbEq16
31.33	Emergency ramp supervision delay	If parameter 31.32 Emergency ramp supervision 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 7380 Emergency ramp failed, sets bit 8 of 06.17 Drive status word 2, and coasts to a stop. If 31.32 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
	0100 s	Maximum ramp-down time, or supervision activation delay.	1 = 1 s
31.36	Aux fan fault bybass	Temporarily suppresses auxiliary fan faults. Certain drive types (especially those protected to IP55) have an auxiliary fan built into the front cover as standard. If the fan is stuck or disconnected, the control program generates fault 5081 Auxiliary fan broken. If it is necessary to operate the drive without the front cover (for example, during commissioning), this parameter can be activated to temporarily generate warning A582 Auxiliary fan missing instead of the fault. Notes: The parameter must be activated within 2 minutes of drive reboot (either by cycling the power or by parameter 96.08). The parameter will be in effect until the auxiliary fan is reconnected and detected, or until the next control unit reboot.	Off
	Off	Normal operation, Aux fan supervision generates a fault.	0
	Temporarily bypassed	The auxiliary fan fault is temporarily replaced by a warning indication. The setting will revert automatically to Off.	1
31.120	LSU earth fault	(Only visible for ACH580-31) Selects how the supply unit reacts when an earth fault or current unbalance is detected.	Fault
	No action	No action taken.	0
	Warning	The supply unit generates warning AE02 Earth leakage.	1
	Fault	The supply unit trips on fault 2E01 Earth leakage.	2
31.121	LSU supply phase loss	(Only visible for ACH580-31) Selects how the supply unit reacts when a supply phase loss is detected.	Fault
	No action	No action taken.	0
	Fault	The supply unit trips on fault 3E00 Input phase loss.	1

No.	Name/V	/alue	Description		Def/FbEq16
32 Suj	pervisio	n	Six values can is generated w	of signal supervision functions 16. be chosen to be monitored; a warning or fault thenever predefined limits are exceeded. on Diagnostics menu (page 177).	
32.01	Supervi	sion status	Indicates whet supervision ful limits. Note: This wo	sion status word. ther the values monitored by the signal notions are within or outside their respective rd is independent of the drive actions defined 32.06, 32.16, 32.26, 32.36, 32.46 and 32.56.	0000Ь
	Bit	Name		Description	
	0	Supervision	1 active	1 = Signal selected by 32.07 is outside its limits	š.
	1	Supervision		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.
	3	Supervision	1 4 active	1 = Signal selected by 32.37 is outside its limits	S.
	4	Supervision		1 = Signal selected by 32.47 is outside its limits	S.
	5	Supervision	n 6 active	1 = Signal selected by 32.27 is outside its limits	S.
	615	Reserved			
					·
	0000h	.FFFFh	Signal supervi	sion status word.	1 = 1
32.05	Supervi 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 Abs low Abs high		Action is taken limit.	whenever the signal rises above its upper	2
				whenever the absolute value of the signal falls blute) lower limit.	3
				whenever the absolute value of the signal (absolute) upper limit.	4
	Both		Action is taken	whenever the signal falls below its low limit or high limit.	5
	Abs bot	h		whenever the absolute value of the signal falls blute) low limit or rises above its (absolute) high	6
	Hystere	sis	See paramete	r 32.11 Supervision 1 hysteresis.	7
32.06	Supervi action		Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 1 exceeds its limits.		No action
			Note: This par 32.01 Supervis	rameter does not affect the status indicated by sion status.	
	No actio	on	No warning or	fault generated.	0
	Warning]	Drive generate	es warning A8B0 ABB Signal supervision 1.	1
	Fault		Drive trips on t	fault 80B0 Signal supervision 1.	2
	Fault if r	unning	If running, the	drive trips on fault 80B0 Signal supervision 1.	3

No.	Name/Value	Description	Def/FbEq16
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 327).	1
	Reserved		2
	Frequency	01.06 Output frequency (page 327).	3
	Current	01.07 Motor current (page 327).	4
	Reserved		5
	Torque	01.10 Motor torque (page 327).	6
	DC voltage	01.11 DC voltage (page 327).	7
	Output power	01.14 Output power (page 328).	8
	Al1	12.11 Al1 actual value (page 358).	9
	Al2	12.21 Al2 actual value (page 360).	10
	Reserved		1117
	Speed ref ramp in	23.01 Speed ref ramp input (page 405).	18
	Speed ref ramp out	23.02 Speed ref ramp output (page 405).	19
	Speed ref used	24.01 Used speed reference (page 407).	20
	Reserved		21
	Freq ref used	28.02 Frequency ref ramp output (page 413).	22
	Inverter temperature	05.11 Inverter temperature (page 334).	23
	Process PID output	40.01 Process PID output actual (page 476).	24
	Process PID feedback	40.02 Process PID feedback actual (page 476).	25
	Process PID setpoint	40.03 Process PID setpoint actual (page 476).	26
	Process PID deviation	40.04 Process PID deviation actual (page 477).	27
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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.	-
32.11	Supervision 1 hysteresis	Defines the hysteresis for the signal monitored by signal supervision 1. 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
	0.00100000.00	Hysteresis.	-

No.	Name/Value	Description	Def/FbEq16
32.15	Supervision 2 function	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.	Disabled
	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	See parameter 32.21 Supervision 2 hysteresis.	7
32.16	Supervision 2 action	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.	No action
	No action	No warning or fault generated.	0
	Warning	Drive generates warning A8B1 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	Supervision 2 signal	Selects the signal to be monitored by signal supervision function 2. For the available selections, see parameter 32.07 Supervision 1 signal.	Current
32.18	Supervision 2 filter time	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	Supervision 2 low	Defines the lower limit for signal supervision 2.	0.00
	-21474836.00 21474836.00	Low limit.	-
32.20	Supervision 2 high	Defines the upper limit for signal supervision 2.	0.00
	-21474836.00 21474836.00	Upper limit.	-
32.21	Supervision 2 hysteresis	Defines the hysteresis for the signal monitored by signal supervision 2. 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
	0.00100000.00	Hysteresis.	-

No.	Name/Value	Description	Def/FbEq16
32.25	Supervision 3 function	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.	Disabled
	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	See parameter 32.31 Supervision 3 hysteresis.	7
32.26	Supervision 3 action	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.	No action
	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	Supervision 3 signal	Selects the signal to be monitored by signal supervision function 3. For the available selections, see parameter 32.07 Supervision 1 signal.	Torque
32.28	Supervision 3 filter time	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
32.29	Supervision 3 low	Defines the lower limit for signal supervision 3.	0.00
	-21474836.00 21474836.00	Low limit.	-
32.30	Supervision 3 high	Defines the upper limit for signal supervision 3.	0.00
	-21474836.00 21474836.00	Upper limit.	-
32.31	Supervision 3 hysteresis	Defines the hysteresis for the signal monitored by signal supervision 3. 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
	0.00100000.00	Hysteresis.	-

No.	Name/Value	Description	Def/FbEq16
32.35	Supervision 4 function	Selects the mode of signal supervision function 4. Determines how the monitored signal (see parameter 32.37) is compared to its lower and upper limits (32.39 and 32.30 respectively). The action to be taken when the condition is fulfilled is selected by 32.36.	Disabled
	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	See parameter 32.41 Supervision 4 hysteresis.	7
32.36	Supervision 4 action	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 32.01 Supervision status.	No action
	No action	No warning or fault generated.	0
	Warning	Drive generates warning A8B3 ABB Signal supervision 4.	1
	Fault	Drive trips on fault 80B3 Signal supervision 4.	2
	Fault if running	Drive trips on fault 80B3 Signal supervision 4 if the motor is running.	3
32.37	Supervision 4 signal	Selects the signal to be monitored by signal supervision function 4. For the available selections, see parameter 32.07 Supervision 1 signal.	Zero
32.38	Supervision 4 filter time	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	Supervision 4 low	Defines the lower limit for signal supervision 4.	0.00
	-21474836.00 21474836.00	Low limit.	-
32.40	Supervision 4 high	Defines the upper limit for signal supervision 4.	0.00
	-21474836.00 21474836.00	Upper limit.	-
32.41	Supervision 4 hysteresis	Defines the hysteresis for the signal monitored by signal supervision 4. 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
	0.00100000.00	Hysteresis.	-

No.	Name/Value	Description	Def/FbEq16
32.45 Supervision 5 function		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.	Disabled
	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	See parameter 32.51 Supervision 5 hysteresis.	7
32.46	Supervision 5 action	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.	No action
	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	Drive trips on fault 80B4 Signal supervision 5 if the motor is running.	3
32.47	Supervision 5 signal	Selects the signal to be monitored by signal supervision function 5. For the available selections, see parameter 32.07 Supervision 1 signal.	Zero
32.48	Supervision 5 filter time	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	Supervision 5 low	Defines the lower limit for signal supervision 5.	0.00
	-21474836.00 21474836.00	Low limit.	-
32.50	Supervision 5 high	Defines the upper limit for signal supervision 5.	0.00
	-21474836.00 21474836.00	Upper limit.	-
32.51	Supervision 5 hysteresis	Defines the hysteresis for the signal monitored by signal supervision 5. 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
	0.00100000.00	Hysteresis.	-

No.	Name/Value	Description	Def/FbEq16
32.55	Supervision 6 function	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.	Disabled
	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	See parameter 32.61 Supervision 6 hysteresis.	7
32.56	Supervision 6 action	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.	No action
	No action	No warning or fault generated.	0
	Warning	Drive generates warning A8B5 ABB Signal supervision 6.	1
	Fault	Drive trips on fault 80B5 Signal supervision 6 is generated.	2
	Fault if running	Drive trips on fault 80B5 Signal supervision 6 is generated if the motor is running.	3
32.57	Supervision 6 signal	Selects the signal to be monitored by signal supervision function 6. For the available selections, see parameter 32.07 Supervision 1 signal.	Zero
32.58	Supervision 6 filter time	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	Supervision 6 low	Defines the lower limit for signal supervision 6.	0.00
	-21474836.00 21474836.00	Low limit.	-
32.60	Supervision 6 high	Defines the upper limit for signal supervision 6.	0.00
	-21474836.00 21474836.00	Upper limit.	-
32.61	Supervision 6 hysteresis	Defines the hysteresis for the signal monitored by signal supervision 6. 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
	0.00100000.00	Hysteresis.	-

No.	Name/Value Descr		Description		Def/FbEq16
34 Tin	34 Timed functions			of the timed functions. Timed functions on page 124.	
34.01	Timed fu status	unctions	timer is the lo	combined timers. The status of a combined gical OR of all timers connected to it. er is read-only.	-
	Bit	Name		Description	
	0	Timed fund	tion 1	1 = Active.	
	1	Timed fund	tion 2	1 = Active.	
	2	Timed fund	tion 3	1 = Active.	
	315	Reserved			
		-1			
	0000h	.0FFFFh	Status of com	bined timers 13.	1 = 1
34.02	Timer st			ers 112. er 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.	
	1215	Reserved			
		•			
	0000h	FFFFh	Timer status.		1 = 1

No.	Name/\	/alue	Description		Def/FbEq16
34.04	Season/exception day status		holiday. Only o	ons 14, exception weekday and exception one season can be active at a time. A day can and a holiday at the same time.	-
	Bit	Name		Description	
	0	Season 1		1 = Active.	
	1	Season 2		1 = Active.	
	2	Season 3		1 = Active.	
	3	Season 4		1 = Active.	
	49	Reserved			
	10	Exception v	,	1 = Active.	
	11	Exception I Reserved	noliday	1 = Active.	
	1215				T
	0000h	.FFFFh	Status of the s	easons and exception weekday and holiday.	1 = 1
34.10	Timed functions enable		Selects the so 0 = Disabled. 1 = Enabled.	urce for the timed functions enable signal.	Disabled
	Disabled		0.		0
	Enabled	d	1.	1.	1
	DI1		Digital input DI	I1 (10.02 DI delayed status, bit 0).	2
	DI2		Digital input DI	I2 (10.02 DI delayed status, bit 1).	3
	DI3		Digital input DI	Digital input DI3 (10.02 DI delayed status, bit 2).	4
	DI4		Digital input DI	Digital input DI4 (10.02 DI delayed status, bit 3).	5
	DI5		Digital input DI	l5 (10.02 DI delayed status, bit 4).	6
	DI6		Digital input DI	l6 (10.02 DI delayed status, bit 5).	7
	Other [b	oit]	Source selection	on (see Terms and abbreviations on page 324).	-

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	0 = Exceptions days are disabled. The timer follows only weekday and season settings (bits 010 in the timer configuration) and the start time and duration of the timer (see 34.12 and 34.13).
		Exception day settings, parameters 34.7034.90, do not have any effect on this timer.
		1 = Exception days are enabled. The timer is active during the weekdays and seasons defined with bits 010 and the times defined by 34.12 and 34.13.
		In addition, the timer is active during the exception days defined with bit 12, bit 13 and parameters 34.7034.90. If bit 12 and bit 13 are both zero, the timer is inactive during the exception days.
12	Holidays	This bit has no effect unless bit 11 = 1 (Exceptions days are enabled). When bits 11 and 12 are both 1, the timer is active during the weekdays and seasons defined with bits 010 and times defined by parameters 34.12 and 34.13. In addition, the timer is active when the ongoing day is defined as Exception day Holiday by parameters 34.7034.90 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.
13	Workdays	This bit has no effect unless bit 11 = 1 (Exceptions enabled). When bits 11 and 13 are both 1, the Timer is active during the weekdays and seasons defined with bits 010 and the times defined by parameters 34.12 and 34.13. In addition, the timer is active when the ongoing day is defined as Exception day Workday by parameters 34.7034.90 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.
141	5 Reserved	-

No.	Name/Value				De	esc	Description					Def/FbEq16				
	Ex	am	ple	s o	f ho	wc	the	tim	ner	CO	nfig	ura	atio	n d	efines when the Timer is active are shown	below.
		Bits of parameter 34.11 Timer 1 configuration														
	34	. //		riei		Г	Ť									
	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		Example 1: Timer is active during the tim defined by other parameters <u>every Weekd Season</u> . Exception day settings (34.7034.90) do effect on the Timer.	ay and every
	1	1	1	1	1	0	0	1	1	1	1	0	0		Example 2: Timer is active during the tim defined by other parameters from Mon to Season. Exception day settings (34.7034.90) do effect on the Timer.	Fri, every
	1	1	1	1	1	0	0	0	0	1	0	0	0	0	Example 3: Timer is active during the tim defined by other parameters from Mon to during Season 3 (can be configured as, e Exception day settings (34.7034.90) do effect on the Timer.	Fri, <u>only</u> g, summer).
	1	1	1	1	1	0	0	1	1	1	1	1	1	0	Example 4: Timer is active during the tim defined by other parameters from Mon to Season. In addition, the Timer is active every Excelled Holidays, regardless what is the day or see	Fri, every
	1	0	1	0	1	0	1	1	1	0	0	1	0	1	Example 5: Timer is active during the tim defined by other parameters on Mon, Weson, during Season1 and Season 2. In addition, the Timer is active every Exce Workdays, regardless what is the day or season 1.	d, Fri and
	1	1	1	1	1	1	1	1	1	1	1	1	0	0	Example 6: Timer is active during the tim defined by other parameters every Weekd Season. The Timer is <u>inactive during all Exception</u>	ay and every
	00	00h	۱	FFI	FFŀ	1		Co	onfi	gu	rati	on	of t	ime	er 1.	1 = 1
34.12	changed in second s The timer can be sta For example, if the tir the active session sta						geo ime xai ctiv) ai	d in er c mpl re s nd s	se an e, i ess stop	be if th sior	nd s sta ie ti n st ed v	arted at an other time than the start time. imer's duration is more than one day and arts during the time, the timer is started at when there is no duration left.	00:00:00			
	00	:00	:00	2	23:5	59:	59	Da	aily	sta	art t	ime	e of	f th	e 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 00:0007 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
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	Timer 11 start time	See 34.12 Timer 1 start time.	00:00:00
34.43	Timer 11 duration	See 34.13 Timer 1 duration.	00 00:00
34.44	Timer 12 configuration	See 34.11 Timer 1 configuration.	0000 0111 1000 0000b
34.45	Timer 12 start time	See 34.12 Timer 1 start time.	00:00:00
34.46	Timer 12 duration	See 34.13 Timer 1 duration.	00 00:00
34.60	Season 1 start date	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 (14) 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.
	01.0131.12	Season start date.	
34.61	Season 2 start date	Defines the start date of season 2. See 34.60 Season 1 start date.	01.01.
34.62	Season 3 start date	Defines the start date of season 3. See 34.60 Season 1 start date.	01.01.
34.63	Season 4 start date	Defines the start date of season 4. See 34.60 Season 1 start date.	01.01.
34.70	Number of active exceptions	Defines how many of the exceptions are active by specifying the last active one. All preceding exceptions are active. Exceptions 13 are periods (duration can be defined) and exceptions 416 are days (duration is always 24 hours). Example: If the value is 4, exceptions 14 are active, and exceptions 516 are not active.	3
	016	Number of active exception periods or days.	-

01.01

No.	Name	/Value	Description		Def/FbEq16	
34.71	Exception types		Exceptions 1.	pes of exceptions 116 as workday or holiday3 are periods (duration can be defined) and .16 are days (duration is always 24 hours).	0000 0000 0000 0000b	
	Bit	Name		Description		
	0	Exception	1	0 = Workday. 1 = Holiday		
	1	Exception 2	2	0 = Workday. 1 = Holiday		
	2	Exception 3	3	0 = Workday. 1 = Holiday		
	3	Exception 4	4	0 = Workday. 1 = Holiday		
	4	Exception 9	5	0 = Workday. 1 = Holiday		
	5	Exception 6		0 = Workday. 1 = Holiday		
	6	Exception		0 = Workday. 1 = Holiday		
	7	Exception 8		0 = Workday. 1 = Holiday		
	8	Exception		0 = Workday. 1 = Holiday		
	9	Exception		0 = Workday. 1 = Holiday		
	10	Exception		0 = Workday. 1 = Holiday		
	11	Exception		0 = Workday. 1 = Holiday		
	12 13	Exception		0 = Workday. 1 = Holiday		
	14	Exception 5				
	15	Exception				
	10	LXCCPtion	10	0 - Workday. 1 - Holiday		
	0000h	FFFFh	Typog of oyoo	ption period or days.	1 = 1	
34.72			- ''	01.01.		
34.72	Ехсер	tion 1 start	Defines the standard mm, where number of the The timer star 23:59:59 even The same date The date is ac	01.01.		
	01.01.	31.12.	Start date of e			
34.73		tion 1 length	Defines the let Exception per consecutive et	0 d		
	060	d	Length of exce	eption period 1.	1 = 1	
34.74	Ехсер	tion 2 start	See 34.72 Exc	ception 1 start.	01.01.	
34.75	Ехсер	tion 2 length	See 34.73 Exc	ception 1 length.	0 d	
34.76	Exception 3 start		See 34.72 Exc	ception 1 start.	01.01.	
34.77	Ехсер	tion 3 length	See 34.73 Exc	ception 1 length.	0 d	
34.78	Ехсер	tion day 4	Defines the da	ate of exception day 4.	01.01.	
	01.01.	31.12.	Start date of e The timer star 23:59:59 even			
34.79	Ехсер	tion day 5	See 34.79 Exc	ception day 4.	01.01	
34.80	Ехсер	tion day 6	See 34.79 Exc	ception day 4.	01.01	
34.81	Ехсер	tion day 7	See 34.79 Exc	ception day 4	01.01	
	<u> </u>					

See 34.79 Exception day 4.

34.82

Exception day 8

No.	Name/Valu	ie	Description		Def/FbEq16	
34.83	Exception of	day 9	See 34.79 Exception da	ay 4.	01.01	
34.84	Exception of	day 10	See 34.79 Exception da	ay 4.	01.01	
34.85	Exception of	day 11	See 34.79 Exception da	ay 4.	01.01	
34.86	Exception of	day 12	See 34.79 Exception da	ay 4.	01.01	
34.87	Exception of	day 13	See 34.79 Exception da	ay 4.	01.01	
34.88	Exception of	day 14	See 34.79 Exception da	ay 4.	01.01	
34.89	Exception of	day 15	See 34.79 Exception da	ay 4.	01.01	
34.90	Exception of	day 16	See 34.79 Exception da	ay 4.	01.01	
34.100	Timed func	ction 1	Defines which timers at 0 = Not connected. 1 = Connected. See 34.01 Timed functions	re connected to combined timer 1.	0000 0000 0000 0000b	
	Bit N	ame	Descrip	tion	•	
	Λ Ti	imor 1	0 = lnac	0 = Inactive 1 = Active		

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.
1215	Reserved	

	0000hFFFFh	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.
315	Reserved	

0000hFFFFh	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.	Off
	Off	0.	0
	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
Other [bit]		Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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 DI1 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 DI is deactivated.	00 00:00
	00 00:0007 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. See also section <i>Programmable protection functions</i> (page 174).	
35.01	Motor estimated temperature	Displays the motor temperature as estimated by the internal motor thermal protection model (see parameters 35.5035.55). The unit is selected by parameter 96.16 Unit selection. This parameter is read-only.	-
	-601000 °C or -761832 °F	Estimated motor temperature.	1 = 1°
35.02	Measured temperature 1	Displays the temperature received through the source defined by parameter 35.11 Temperature 1 source. The unit is selected by parameter 96.16 Unit selection. 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. This parameter is read-only.	-
	-605000 °C or -769032 °F, 0 ohm or [35.12] ohm	Measured temperature 1.	1 = 1 unit

No.	Name/Value	Description	Def/FbEq16
35.03	Measured temperature 2	Displays the temperature received through the source defined by parameter 35.21 Temperature 2 source. The unit is selected by parameter 96.16 Unit selection. 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. This parameter is read-only.	-
	-605000 °C or -769032 °F, 0 ohm or [35.22] ohm	Measured temperature 2.	1 = 1 unit
35.11	Temperature 1 source	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.	Estimated temperature
	Disabled	None. Temperature monitoring function 1 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
	KTY84 analog I/O	KTY84 sensor connected to the analog input selected by parameter 35.14 Temperature 1 AI source and an analog output. The following settings are required: 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. 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		34

No.	Name/Value	Description	Def/FbEq16
	1 × Pt100 analog I/O	Pt100 sensor connected to a standard analog input selected by parameter 35.14 Temperature 1 AI source and an analog output. The following settings are required: 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. 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.	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	PTC sensor is connected to DI6. 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.	8
	Reserved		910
	Direct temperature	The temperature is taken from the source selected by parameter 35.14 Temperature 1 Al source. The value of the source is assumed to be degrees Celsius.	11
	KTY83 analog I/O	KTY83 sensor connected to the analog input selected by parameter 35.14 Temperature 1 AI source and an analog output. The following settings are required: 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. 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.	12

No.	Name/Value	Description	Def/FbEq16
	1 × Pt1000 analog I/O	Pt1000 sensor connected to a standard analog input selected by parameter 35.14 Temperature 1 AI source and an analog output. The following settings are required: 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. 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.	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	Ni1000 sensor connected to the analog input selected by parameter 35.14 Temperature 1 AI source and an analog output. The following settings are required: • 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. 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.	16
	Reserved		1718
	PTC extension module	PTC is connected to the CMOD-02 multifunction extension module, which is installed in drive slot 2. 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).	19
	Reserved		20
	Therm(0)	PTC sensor or a normally closed thermistor connected relay 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	Temperature 1 fault limit	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 Hardware manual), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the Hardware manual), the fault is reset.	130 °C or 266 °F
	-605000 °C or -769032 °F	Fault limit for temperature monitoring function 1.	1 = 1 °
35.13	Temperature 1 warning limit	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 Hardware manual), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the Hardware manual), the fault is reset.	110 °C or 230 °F
	-605000 °C or -769032 °F	Warning limit for temperature monitoring function 1.	1 = 1 °
35.14	Temperature 1 AI source	Specifies the analog input when the setting of 35.11 Temperature 1 source requires measurement through an analog input.	Not selected
	Not selected	None.	0
	Al1 actual value	Analog input Al1 on the control unit.	1
	Al2 actual value	Analog input Al2 on the control unit.	2
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
35.21	Temperature 2 source	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.	Disabled
	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	 KTY84 sensor connected to the analog input selected by parameter 35.24 Temperature 2 AI source and an analog output. The following settings are required: 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. The analog output feeds a constant current through the 	2
		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.	
	Reserved		34
	1 × Pt100 analog	Pt100 sensor connected to a standard analog input selected by parameter 35.24 Temperature 2 AI source and an analog output. The following settings are required: • 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. 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.	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	PTC sensor is connected to DI6. 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.	8
	Reserved		1910
	Direct temperature	The temperature is taken from the source selected by parameter 35.24 Temperature 2 Al source. The value of the source is assumed to be degrees Celsius.	11

dearees.

No.	Name/Value	Description	Def/FbEq16
	Reserved		1718
	PTC extension module	PTC is connected to the CMOD-02 multifunction extension module, which is installed in drive slot 2. 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).	19
	Reserved		20
	Therm(0)	PTC sensor or a normally closed thermistor connected relay 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	Temperature 2 fault limit	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 Hardware manual), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the Hardware manual), the fault is reset.	130 °C or 266 °F
	-605000 °C or -769032 °F	Fault limit for temperature monitoring function 2.	1 = 1 °
35.23	Temperature 2 warning limit	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 Hardware manual), the drive trips on the fault and when PTC has decreased below recovery threshold of the CMOD-02 (see the Hardware manual), the fault is reset.	110 °C or 230 °F
	-605000 °C or -769032 °F	Warning limit for temperature monitoring function 2.	1 = 1 °
35.24	Temperature 2 AI source	Specifies the analog input when the setting of 35.11 Temperature 1 source requires measurement through an analog input.	Not selected
	Not selected	None.	0
	Al1 actual value	Analog input Al1 on the control unit.	1
	Al2 actual value	Analog input Al2 on the control unit.	2
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
35.31	Safe motor temperature enable	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.	Off
	Off	Activated.	0
	On	Deactivated.	1

No.	Name/Value	Description	Def/FbEq16
35.50	Motor ambient temperature	Defines the ambient temperature of the motor for the motor thermal protection model. The unit is selected by parameter 96.16 Unit selection. The motor thermal protection model estimates the motor temperature on the basis of parameters 35.5035.55. 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. WARNING! The model cannot protect the motor if the motor does not cool properly because of dust, dirt, etc.	20 °C or 68 °F
	-60100 °C or -76 212 °F	Ambient temperature.	1 = 1°
35.51	Motor load curve	Defines the motor load curve together with parameters 35.52 Zero speed load and 35.53 Break point. The load curve is used by the motor thermal protection model to estimate the motor temperature. 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. I = Motor current I _N = Nominal motor current	110%
	50 35.52	35.53 Drive outp	ut
		frequency	
	50150%	Maximum load for the motor load curve.	1 = 1%
35.52	Zero speed load	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. See parameter 35.51 Motor load curve.	70%
	25150%	Zero speed load for the motor load curve.	1 = 1%

No.	Name/Value	Description	Def/FbEq16
35.53	Break point	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
	1.00500.00 Hz	Break point for the motor load curve.	See par. 46.02
35.54	35.54 Motor nominal Defines the temperature rise of the motor above ambient		80 °C or 176 °F
	0300 °C or 32572 °F	Temperature rise.	1 = 1°

No.	Name/Value	Description	Def/FbEq16
35.55	Motor thermal time constant	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. 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 time its rated current. 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.	256 s
		Motor current	
		Time	
		Temperature rise	
		Motor thermal time Time	
	10010000 s	Motor thermal time constant.	1 = 1 s
35.57	Motor overload class	Defines the motor overload class. This parameter allows the drive to replace a motor overload relay.	Class 20
	Class 5	Motor overload class 5.	0
	Class 10	Motor overload class 10.	1
	Class 20	Motor overload class 20.	2
	Class 30	Motor overload class 30.	3
		Motor overload class 40.	4

No.	Name/Value	Description	Def/FbEq16
36 Loa	d analyzer	Peak value and amplitude logger settings. See also section <i>Load analyzer</i> (page 171).	
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 36.1036.15. 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.	Output power
	Not selected	None (peak value logger disabled).	0
	Motor speed used	01.01 Motor speed used (page 327).	1
	Reserved		2
	Output frequency	01.06 Output frequency (page 327).	3
	Motor current	01.07 Motor current (page 327).	4
	Reserved		5
	Motor torque	01.10 Motor torque (page 327).	6
	DC voltage	01.11 DC voltage (page 327).	7
	Output power	01.14 Output power (page 328).	8
	Reserved		9
	Speed ref ramp in	23.01 Speed ref ramp input (page 405).	10
	Speed ref ramp out	23.02 Speed ref ramp output (page 405).	11
	Speed ref used	24.01 Used speed reference (page 407).	12
	Reserved		13
	Freq ref used	28.02 Frequency ref ramp output (page 413).	14
	Reserved		15
	Process PID out	40.01 Process PID output actual (page 476).	16
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
36.02	PVL filter time	Peak value logger filtering time. See parameter 36.01 PVL signal source.	2.00 s
	0.00120.00 s	Peak value logger filtering time.	100 = 1 s
36.06	AL2 signal source	Selects the signal to be monitored by amplitude logger 2. The signal is sampled at 200 ms intervals. The results are displayed by parameters 36.4036.49. 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 AL2 signal scaling. Amplitude logger 2 can be reset using parameter 36.09 Reset loggers. 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 PVL signal source.	Motor torque
36.07	AL2 signal scaling	Defines the signal value that corresponds to 100% amplitude.	100.00
	0.0032767.00	Signal value corresponding to 100%.	1 = 1

No.	Name/Value	Description	Def/FbEq16
36.09	Reset loggers	Resets the peak value logger and/or amplitude logger 2. (Amplitude logger 1 cannot be reset.)	Done
	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	PVL peak value	Peak value recorded by the peak value logger.	0.00
	-32768.00 32767.00	Peak value.	1 = 1
36.11	PVL peak date	The date on which the peak value was recorded.	01.01.1980
	-	Peak occurrence date.	-
36.12	PVL peak time	The time at which the peak value was recorded.	00:00:00
	-	Peak occurrence time.	-
36.13	PVL current at peak	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	PVL DC voltage at peak	Voltage in the intermediate DC circuit of the drive at the moment the peak value was recorded.	0.00 V
	0.002000.00 V	DC voltage at peak.	10 = 1 V
36.15	PVL speed at peak	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	PVL reset date	The date on which the peak value logger was last reset.	01.01.1980
	-	Last reset date of the peak value logger.	-
36.17	PVL reset time	The time at which the peak value logger was last reset.	00:00:00
	-	Last reset time of the peak value logger.	-
36.20	AL1 0 to 10%	Percentage of samples recorded by amplitude logger 1 that fall between 0 and 10%. 100% corresponds to the $l_{\rm max}$ value given in the ratings table in chapter Technical data in the Hardware manual of the drive.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 0 and 10%.	1 = 1%
36.21	AL1 10 to 20%	Percentage of samples recorded by amplitude logger 1 that fall between 10 and 20%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 10 and 20%.	1 = 1%
36.22	AL1 20 to 30%	Percentage of samples recorded by amplitude logger 1 that fall between 20 and 30%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 20 and 30%.	1 = 1%
36.23	AL1 30 to 40%	Percentage of samples recorded by amplitude logger 1 that fall between 30 and 40%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 30 and 40%.	1 = 1%
36.24	AL1 40 to 50%	Percentage of samples recorded by amplitude logger 1 that fall between 40 and 50%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 40 and 50%.	1 = 1%

No.	Name/Value	Description	Def/FbEq16
36.25	AL1 50 to 60%	Percentage of samples recorded by amplitude logger 1 that fall between 50 and 60%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 50 and 60%.	1 = 1%
36.26	AL1 60 to 70%	Percentage of samples recorded by amplitude logger 1 that fall between 60 and 70%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 60 and 70%.	1 = 1%
36.27	AL1 70 to 80%	Percentage of samples recorded by amplitude logger 1 that fall between 70 and 80%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 70 and 80%.	1 = 1%
36.28	AL1 80 to 90%	Percentage of samples recorded by amplitude logger 1 that fall between 80 and 90%.	0.00%
	0.00100.00%	Amplitude logger 1 samples between 80 and 90%.	1 = 1%
36.29	AL1 over 90%	Percentage of samples recorded by amplitude logger 1 that exceed 90%.	0.00%
	0.00100.00%	Amplitude logger 1 samples over 90%.	1 = 1%
36.40	AL2 0 to 10%	Percentage of samples recorded by amplitude logger 2 that fall between 0 and 10%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 0 and 10%.	1 = 1%
36.41	AL2 10 to 20%	Percentage of samples recorded by amplitude logger 2 that fall between 10 and 20%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 10 and 20%.	1 = 1%
36.42	AL2 20 to 30%	Percentage of samples recorded by amplitude logger 2 that fall between 20 and 30%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 20 and 30%.	1 = 1%
36.43	AL2 30 to 40%	Percentage of samples recorded by amplitude logger 2 that fall between 30 and 40%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 30 and 40%.	1 = 1%
36.44	AL2 40 to 50%	Percentage of samples recorded by amplitude logger 2 that fall between 40 and 50%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 40 and 50%.	1 = 1%
36.45	AL2 50 to 60%	Percentage of samples recorded by amplitude logger 2 that fall between 50 and 60%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 50 and 60%.	1 = 1%
36.46	AL2 60 to 70%	Percentage of samples recorded by amplitude logger 2 that fall between 60 and 70%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 60 and 70%.	1 = 1%
36.47	AL2 70 to 80%	Percentage of samples recorded by amplitude logger 2 that fall between 70 and 80%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 70 and 80%.	1 = 1%
36.48	AL2 80 to 90%	Percentage of samples recorded by amplitude logger 2 that fall between 80 and 90%.	0.00%
	0.00100.00%	Amplitude logger 2 samples between 80 and 90%.	1 = 1%
36.49	AL2 over 90%	Percentage of samples recorded by amplitude logger 2 that exceed 90%.	0.00%
	0.00100.00%	Amplitude logger 2 samples over 90%.	1 = 1%

No.	Name/Value	Description	Def/FbEq16
36.50	AL2 reset date	The date on which amplitude logger 2 was last reset.	01.01.1980
	-	Last reset date of amplitude logger 2.	-
36.51	AL2 reset time	The time at which amplitude logger 2 was last reset.	00:00:01
	-	Last reset time of amplitude logger 2.	-
37 Us	er load curve	Settings for user load curve.	

37 User load curve		Settings for user load curve. See also section <i>User load curve</i> (page 177).	
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.
415	Reserved	

	0000hFFFFh	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.	Motor torque %
	Not selected	No signal selected (monitoring disabled).	0
	Motor speed %	01.03 Motor speed % (page 327).	1
	Motor current %	01.08 Motor current % of motor nom (page 327).	2
	Motor torque %	01.10 Motor torque (page 327).	3
	Output power % of motor nominal	01.15 Output power % of motor nom (page 328).	4
	Output power % of drive nominal	01.16 Output power % of drive nom (page 328).	5
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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.	Disabled
	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. The 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

No.	Name/Value	Description	Def/FbEq16
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.	Disabled
	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. The 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 Vector or if 99.04 Motor control mode is set to Scalar 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
	-30000.030000.0 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
	-30000.030000.0 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
	-30000.030000.0 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
	-30000.030000.0 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
	-30000.030000.0 rpm	Speed.	1 = 1 rpm
37.16	ULC frequency table point 1	Defines the first of the five frequency points on the X-axis of the user load curve. Frequency points are used if parameter 99.04 Motor control mode is set to Scalar 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
	-500.0500.0 Hz	Frequency.	1 = 1 Hz
37.17	ULC frequency table point 2	Defines the second frequency point. See parameter 37.16 ULC frequency table point 1.	25.0 Hz
	-500.0500.0 Hz	Frequency.	1 = 1 Hz

No.	Name/Value	Description	Def/FbEq16
37.18	ULC frequency table point 3	Defines the third frequency point. See parameter 37.16 ULC frequency table point 1.	43.0 Hz
	-500.0500.0 Hz	Frequency.	1 = 1 Hz
37.19	ULC frequency table point 4	Defines the fourth frequency point. See parameter 37.16 ULC frequency table point 1.	50.0 Hz
	-500.0500.0 Hz	Frequency.	1 = 1 Hz
37.20	ULC frequency table point 5	Defines the fifth frequency point. See parameter 37.16 ULC frequency table point 1.	60.0 Hz
	-500.0500.0 Hz	Frequency.	1 = 1 Hz
37.21	ULC underload point 1	Defines the first of the five points on the Y-axis that together with the corresponding point on the X-axis (37.11 ULC speed table point 137.15 ULC speed table point 5 or 37.15 ULC speed table point 537.20 ULC frequency table point 5) define the underload (lower) curve. Each point of the underload curve must have a lower value than the corresponding overload point.	10.0%
	-1600.01600.0%	Underload point.	1 = 1%
37.22	ULC underload point 2	Defines the second underload point. See parameter 37.21 ULC underload point 1.	15.0%
	-1600.01600.0%	Underload point.	1 = 1%
37.23	ULC underload point 3	Defines the third underload point. See parameter 37.21 ULC underload point 1	25.0%
	-1600.01600.0%	Underload point.	1 = 1%
37.24	ULC underload point 4	Defines the fourth underload point. See parameter 37.21 ULC underload point 1	30.0%
	-1600.01600.0%	Underload point.	1 = 1%
37.25	ULC underload point 5	Defines the fifth underload point. See parameter 37.21 ULC underload point 1	30.0%
	-1600.01600.0%	Underload point.	1 = 1%
37.31	ULC overload point 1	Defines the first of the five points on the Y-axis that together with the corresponding point on the X-axis (37.11 ULC speed table point 137.15 ULC speed table point 5 or 37.15 ULC speed table point 537.20 ULC frequency table point 5) define the overload (higher) curve. Each point of the overload curve must have a higher value than the corresponding underload point.	300.0%
	-1600.01600.0%	Overload point.	1 = 1%
37.32	ULC overload point 2	Defines the second overload point. See parameter 37.31 ULC overload point 1.	300.0%
	-1600.01600.0%	Overload point.	1 = 1%
37.33	ULC overload point 3	Defines the third overload point. See parameter 37.31 ULC overload point 1.	300.0%
	-1600.01600.0%	Overload point.	1 = 1%
37.34	ULC overload point 4	Defines the fourth overload point. See parameter 37.31 ULC overload point 1.	300.0%
	-1600.01600.0%	Overload point.	1 = 1%

No.	Name/Value	Description	Def/FbEq16
37.35	ULC overload point 5	Defines the fifth overload point. See parameter 37.31 ULC overload point 1.	300.0%
	-1600.01600.0%	Overload point.	1 = 1%
37.41	ULC overload timer	Defines the time for which the monitored signal must continuously stay above the overload curve before the drive takes the action selected by 37.03 ULC overload actions.	20.0 s
	0.010000.0 s	Overload timer.	1 = 1 s
37.42	ULC underload timer	Defines the time for which the monitored signal must continuously stay below the underload curve before the drive takes the action selected by 37.04 ULC underload actions.	20.0 s
	0.010000.0 s	Underload timer	1 = 1 s
40 Pro	cess 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 40.0740.50, the second set is defined by the parameters in group 41 Process PID set 2. The binary source that defines which set is used is selected by parameter 40.57 PID set1/set2 selection. See also control chain diagrams PID setpoint compensation on page 314 and Process PID controller on page 316. To set the PID customer unit, select Menu > Primary settings > PID > Unit on the panel.	
40.01	Process PID output actual	Displays the output of the process PID controller. See control chain diagram <i>Process PID controller</i> on page <i>316</i> . This parameter is read-only.	-
	-200000.00 200000.00	Process PID controller output.	1 = 1
40.02	Process PID feedback actual	Displays the value of process feedback after source selection, mathematical function (parameter 40.10 Set 1 feedback function), and filtering. See control chain diagram PID setpoint compensation on page 314. This parameter is read-only.	-
	-200000.00 200000.00 PID unit 1	Process feedback.	1 = 1 PID unit 1
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 314. This parameter is read-only.	-
	-200000200000 PID unit 1	Setpoint for process PID controller.	1 = 1 PID unit 1

No.	Name/Value	Description	Def/FbEq16
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 316. This parameter is read-only.	-
	-200000.00 200000.00 PID unit 1	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. 40.1640.23)
1315	Reserved	

	0000hFFFFh	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 87).	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 <i>PID</i> setpoint compensation on page 314.	Al2 percent
	Not selected	None.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	Freq in scaled	11.39 Freq in 1 scaled value (see page 356).	3
	Reserved		47
	Al1 percent	12.101 Al1 percent value (see page 361).	8
	Al2 percent	12.102 Al2 percent value (see page 361).	9

No.	Name/Value	Description	Def/FbEq16
	Feedback data storage	40.91 Feedback data storage (see page 492). (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
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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.	Not selected
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.)	In1
	ln1	Source 1.	0
	ln1+ln2	Sum of sources 1 and 2.	1
	ln1-ln2	Source 2 subtracted from source 1.	2
	ln1*ln2	Source 1 multiplied by source 2.	3
	ln1/ln2	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(ln1)+sqrt(ln2)	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
	0.00030.000 s	Feedback filter time.	1 = 1 s

No.	Name/Value	Description	Def/FbEq16
40.14	Set 1 setpoint scaling	Defines, together with parameter 40.15 Set 1 output scaling, a general scaling factor for the process PID control chain. 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 actual scaling. 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. In effect, the output of the PID controller = [40.15] when deviation (setpoint - feedback) = [40.14] and [40.32] = 1. 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.	0.00
	-200000.00 200000.00	Scaling.	1 = 1
40.15	Set 1 output scaling	See parameter 40.14 Set 1 setpoint scaling. If the parameter is set to zero, scaling is automatic: Operation mode (see par. 19.01) Speed control 46.01 Speed scaling Frequency control 46.02 Frequency scaling	0.00
	-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 314.	Al1 percent
	Not selected	None.	0
	Reserved		1
	Internal setpoint	Internal setpoint. See parameter 40.19 Set 1 internal setpoint sel1.	2
	Al1 scaled	12.12 Al1 scaled value (see page 358).	3
	Al2 scaled	12.22 Al2 scaled value (see page 360).	4
	Reserved		57
	Motor potentiometer	22.80 Motor potentiometer ref act (output of the Floating point control (Motor potentiometer)).	8
	Reserved		9
	Freq in scaled	11.39 Freq in 1 scaled value (see page 356).	10
	Al1 percent	12.101 Al1 percent value (see page 361)	11
	Al2 percent	12.102 Al2 percent value (see page 361)	12

No.	Name/Value	Description	Def/FbEq16
	Control panel (ref saved)	Panel reference (03.01 Panel reference, see page 331) 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.) Reference EXT1 reference EXT2 reference Active reference Inactive reference	13
	Control panel (ref copied)	Panel reference (03.01 Panel reference, see page 331) 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. Reference **EXT1 reference** **EXT2 reference** - Active reference* Inactive reference* Inactive reference* **Inactive reference** **Inactive reference**	14
	FB A ref1	03.05 FB A reference 1 (see page 331).	15
	FB A ref2	03.06 FB A reference 2 (see page 331).	16
	Reserved		1718
	EFB ref1	03.09 EFB reference 1 (see page 332).	19
	EFB ref2	03.10 EFB reference 2 (see page 332).	20
	Reserved		2123
	Setpoint data storage	40.92 Setpoint data storage (see page 492). (Selection not available for parameter 71.16 Setpoint 1 source.)	24
	Compensated setpoint	40.70 Compensated setpoint (see page 490).	25
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.17	Set 1 setpoint 2 source	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.	Not selected
40.18	Set 1 setpoint function	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.)	In1
	ln1	Source 1.	0
	ln1+ln2	Sum of sources 1 and 2.	1
	In1-In2	Source 2 subtracted from source 1.	2

No.	Name/Value	Description			Def/FbEq16
	ln1*ln2	Source 1 multiplie	d by source 2.		3
	ln1/ln2	Source 1 divided b	y 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 sou	irce 1.		8
	sqrt(In1-In2)	Square root of (so	urce 1 - source 2).		9
	sqrt(ln1+ln2)	Square root of (so	urce 1 + source 2)	•	10
	sqrt(ln1)+sqrt(ln2)	Square root of sou	irce 1 + square roo	ot of source 2.	11
	k*sqrt(In1)	Square root of sou	irce 1. (k = 1)		12
	k*sqrt(In1-In2)	Square root of (so	urce 1 - source 2).	(k = 1)	13
40.19	Set 1 internal setpoint sel1	internal setpoint or 40.2140.24. Note: Parameters	ut of the presets de	ernal setpoint sel2 the efined by parameters int 1 source and 40.17 to Internal setpoint.	Not 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 (1	10.02 DI delaved si	tatus hit (1)	2
	DI2	Digital input DI2 (1			3
	DI3	Digital input DI3 (1			4
	DI4	Digital input DI4 (1			5
	DI5	Digital input DI5 (1			6
	DI6	Digital input DI6 (1			7
	Reserved	gp a.v (, /-	817
	Timed function 1	Bit 0 of 34.01 Time	ed functions status	(see page 451).	18
	Timed function 2	Bit 1 of 34.01 Time			19
	Timed function 3	Bit 2 of 34.01 Time			20
	Supervision 1	Bit 0 of 32.01 Sup			21
	Supervision 2	Bit 1 of 32.01 Sup	<u> </u>	<u> </u>	22
	Supervision 3	Bit 2 of 32.01 Sup	<u> </u>	<u> </u>	23
	Other [bit]	·	<u> </u>	breviations on page 324).	-
40.20	Set 1 internal setpoint sel2	Selects together winternal setpoint us	rith 40.19 Set 1 into sed out of the three eters 40.2140.23	ernal setpoint sel1 the e internal setpoints. See table at 40.19 Set	Not selected
	Not selected	0.			0

No.	Name/Value	Description	Def/FbEq16
	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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	21
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	22
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	23
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.21	Set 1 internal setpoint 1	Internal process setpoint 1. See parameter 40.19 Set 1 internal setpoint sel1.	0.00 PID unit 1
	-200000.00 200000.00 PID unit 1	Internal process setpoint 1.	1 = 1 PID unit 1
40.22	Set 1 internal setpoint 2	Internal process setpoint 2. See parameter 40.19 Set 1 internal setpoint sel1.	0.00 PID unit 1
	-200000.00 200000.00 PID unit 1	Internal process setpoint 2.	1 = 1 PID unit 1
40.23	Set 1 internal setpoint 3	Internal process setpoint 3. See parameter 40.19 Set 1 internal setpoint sel1.	0.00 PID unit 1
	-200000.00 200000.00 PID unit 1	Internal process setpoint 3.	1 = 1 PID unit 1
40.24	Set 1 internal setpoint 0	Internal process setpoint 0. See parameter 40.19 Set 1 internal setpoint sel1.	0.00 PID unit 1
	-200000.00 200000.00 PID unit 1	Internal process setpoint 0.	1 = 1 PID unit 1
40.26	Set 1 setpoint min	Defines a minimum limit for the process PID controller setpoint.	0.00 PID unit 1
	-200000.00 200000.00 PID unit 1	Minimum limit for process PID controller setpoint.	1 = 1 PID unit 1
40.27	Set 1 setpoint max	Defines a maximum limit for the process PID controller setpoint.	200000.00 PID unit 1
	-200000.00 200000.00 PID unit 1	Maximum limit for process PID controller setpoint.	1 = 1 PID unit 1

No.	Name/Value	Description	Def/FbEq16
40.28	Set 1 setpoint increase time	Defines the minimum time it takes for the setpoint to increase from 0% to 100%.	0.0 s
	0.01800.0 s	Setpoint increase time.	1 = 1
40.29	Set 1 setpoint decrease time	Defines the minimum time it takes for the setpoint to decrease from 100% to 0%.	0.0 s
	0.01800.0 s	Setpoint decrease time.	1 = 1
40.30	Set 1 setpoint freeze enable	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.	Not selected
	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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	21
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	22
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	23
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.31	Set 1 deviation inversion	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 147).	Not inverted (Ref - Fbk)
	Not inverted (Ref - Fbk)	0.	0
	Inverted (Fbk - Ref)	1.	1
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.32	Set 1 gain	Defines the gain for the process PID controller. See parameter 40.33 Set 1 integration time.	2.50
	0.01100.00	Gain for PID controller.	100 = 1

No.	Name/Value	Description	Def/FbEq16
40.33	Set 1 integration time	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. Error/Controller output	3.0 s
		G × I G × I Ti Time I = controller input (error) O = controller output G = gain Ti = integration time	
		Note: Setting this value to 0 disables the "I" part, turning the PID controller into a PD controller.	
	0.09999.0 s	Integration time.	1 = 1 s
40.34	Set 1 derivation time	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 × ($E_K - E_{K-1}$)/ T_S , in which $T_S = 2$ ms sample time $E = Error = Process reference - process feedback.$	0.000 s
	0.00010.000 s	Derivation time.	1000 = 1 s
40.35	Set 1 derivation filter time	Defines the time constant of the 1-pole filter used to smooth the derivative component of the process PID controller. "Unfiltered signal 100 63 Filtered signal O = I × (1 - e ^{-t/T}) I = filter input (step) O = filter output t = time T = filter time constant	0.0 s
	0.010.0 s	Filter time constant.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
40.36	Set 1 output min	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	Set 1 output max	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	Set 1 output freeze enable	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.	Not selected
	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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	21
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	22
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	23
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-

No.	Name/Value	Description	Def/FbEq16
40.39	Set 1 deadband range	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 Set 1 deadband delay), the PID controller output is frozen. Normal operation resumes after the feedback value leaves the deadband.	0.0
	40.39 Set 1		
	deadband range		
	Setpo	pint	
	Feedba	ack	
	DID		
	PID contro out	put' \	
		PID co output	ntroller frozen
		output .	
		40.40 Set 1 deadband delay	
		·	Time
	0.0200000.0	Deadband range.	1 = 1
40.40	Set 1 deadband delay	Delay for the deadband. See parameter 40.39 Set 1 deadband range.	0.0 s
	0.0 3600.0 s	Delay for deadband area.	1 = 1 s
40.43	Set 1 sleep level	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 Process PID output actual) to the value of this parameter. If PID output remains below this value longer than the sleep delay defined by 40.44 Set 1 sleep delay, the drive enters the sleep mode and stops the motor.	0.0
	0.0200000.0	Sleep start level.	1 = 1
40.44	Set 1 sleep delay	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 Set 1 sleep level, and resets when the sleep mode is disabled.	60.0 s
	0.03600.0 s	Sleep start delay.	1 = 1 s
40.45	Set 1 sleep boost time	Defines a boost time for the sleep boost step. See parameter 40.46 Set 1 sleep boost step.	0.0 s
	0.03600.0 s	Sleep boost time.	1 = 1 s
40.46	Set 1 sleep boost step	When the drive is entering sleep mode, the process setpoint is increased by this value for the time defined by parameter 40.45 Set 1 sleep boost time. If active, sleep boost is aborted when the drive wakes up.	0.0 PID unit 1
	0.0200000.0 PID unit 1	Sleep boost step.	1 = 1 PID unit 1

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 PID unit 1
	-200000.00 200000.00 PID unit 1	Wake-up level (as deviation between process setpoint and feedback).	1 = 1 PID unit 1
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
	0.0060.00 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 148). 1 = Tracking mode enabled	Not selected
	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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	21
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	22
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	23
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.50	Set 1 tracking ref selection	Selects the value source for tracking mode. See parameter 40.49 Set 1 tracking mode.	Not selected
	Not selected	None.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	FB A ref1	03.05 FB A reference 1 (see page 331).	3
	FB A ref2	03.06 FB A reference 2 (see page 331).	4
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-

No.	Name/Value	Description	Def/FbEq16
40.57	PID set1/set2 selection	Selects the source that determines whether process PID parameter set 1 (parameters 40.0740.50) 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		817
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	18
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	20
	Supervision 1	Bit 0 of 32.01 Supervision status (see page 444).	21
	Supervision 2	Bit 1 of 32.01 Supervision status (see page 444).	22
	Supervision 3	Bit 2 of 32.01 Supervision status (see page 444).	23
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
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 <i>Terms and abbreviations</i> on page 324).	-
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
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.60	Set 1 PID activation source	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.	On
	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
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.61	Setpoint actual scaling	Actual setpoint scaling. See parameter 40.14 Set 1 setpoint scaling.	100.00
	-200000.00 200000.00	Scaling.	1 = 1
40.62	PID internal setpoint actual	Displays the value of the internal setpoint. See control chain diagram <i>PID</i> setpoint compensation on page 314. This parameter is read-only.	-
	-200000.00 200000.00 PID unit 1	Process PID internal setpoint.	1 = 1 PID unit 1

No.	Name/Value	Description	Def/FbEq16
40.70	Compensated setpoint	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 40.7140.76. The compensated setpoint curve will be a mixture of a straight line between the points and a squared line between the points: x2,y2 x2,y2 x2,y2 x2 = 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	
	-200000.00 200000.00 PID unit 1	Compensated setpoint value.	1 = 1 PID unit 1
40.71	Set 1 compensation input source	Selects the source for set 1 compensation input.	Al1 percent
	Not selected	None.	0
	Reserved		1
	Internal setpoint	Internal setpoint. See parameter 40.19 Set 1 internal setpoint sel1.	2
	Al1 scaled	12.12 Al1 scaled value (see page 358).	3
	Al2 scaled	12.22 Al2 scaled value (see page 360).	4
	Reserved		57
	Motor potentiometer	22.80 Motor potentiometer ref act (output of the Floating point control (Motor potentiometer)).	8
	Reserved		9
	Freq in scaled	11.39 Freq in 1 scaled value (see page 356).	10
	Al1 percent	12.101 Al1 percent value (see page 361)	11
	Al2 percent	12.102 Al2 percent value (see page 361)	12
	Reserved		1314
	FB A ref1	03.05 FB A reference 1 (see page 331).	15
	FB A ref2	03.06 FB A reference 2 (see page 331).	16

No.	Name/Value	Description	Def/FbEq16
	Reserved		1718
	EFB ref1	03.09 EFB reference 1 (see page 332).	19
	EFB ref2	03.10 EFB reference 2 (see page 332).	20
	Reserved		2123
	Setpoint data storage	40.92 Setpoint data storage (see page 492)	24
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
40.72	Set 1 compensation input 1	Point x1 on the setpoint compensation curve, see parameter 40.71 Compensated setpoint.	
	-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.	
	-200000.00 200000.00 PID unit 1	Compensated setpoint value.	1 = 1 PID unit 1
40.74	Set 1 compensation input 2	Point x2 on the setpoint compensation curve, see parameter 40.71 Compensated setpoint.	
	-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.	
	-200000.00 200000.00 PID unit 1	Compensated setpoint value.	1 = 1 PID unit 1
40.76	Set 1 compensation non-linearity	Describes the non-linearity of the setpoint compensation curve, see parameter 40.70 Compensated setpoint.	
	0100%	Percentage.	1 = 1
40.80	Set 1 PID output min source	Selects the source for set 1 PID output minimum.	Set1 output min
	None	Not selected.	0
	Set1 output min	40.36 Set 1 output min.	1
40.81	Set 1 PID output max source	Selects the source for set 1 PID output minimum.	Set1 output max
	None	Not selected.	0
	Set1 output max	40.37 Set 1 output max	1
40.89	Set 1 setpoint multiplier	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	Set 1 feedback multiplier	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

No.	Name/Value	Description	Def/FbEq16
40.91	Feedback data storage	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 (58.10158.114) to Feedback data storage. In 40.08 Set 1 feedback 1 source (or 40.09 Set 1 feedback 2 source), select Feedback data storage.	-
	-327.68327.67	Storage parameter for process feedback.	100 = 1
40.92	Setpoint data storage	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 (58.10158.114)) to Setpoint data storage. In 40.16 Set 1 setpoint 1 source (or 40.17 Set 1 setpoint 2 source), select Setpoint data storage.	-
	-327.68327.67	Storage parameter for process setpoint.	100 = 1
40.96	Process PID output %	Percentage scaled signal of parameter 40.01 Process PID feedback actual.	0.00%
	-100.00100.00%	Percentage.	100 = 1%
40.97	Process PID feedback %	Percentage scaled signal of parameter 40.02 Process PID feedback actual.	0.00%
	-100.00100.00%	Percentage.	100 = 1%
40.98	Process PID setpoint %	Percentage scaled signal of parameter 40.03 Process PID setpoint actual.	0.00%
	-100.00100.00%	Percentage.	100 = 1%
40.99	Process PID deviation %	Percentage scaled signal of parameter 40.04 Process PID deviation actual.	0.00%
	-100.00100.00%	.Percentage.	100 = 1%
41 Pro	ocess 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 40.0140.06, and control chain diagrams PID setpoint compensation and Process PID controller on pages 314 and 316, respectively.	
41.08	Set 2 feedback 1 source	See parameter 40.08 Set 1 feedback 1 source.	Al2 percent
41.09	Set 2 feedback 2 source	See parameter 40.09 Set 1 feedback 2 source.	Not selected
41.10	Set 2 feedback function	See parameter 40.10 Set 1 feedback function.	In1
41.11	Set 2 feedback filter time	See parameter 40.11 Set 1 feedback filter time.	0.000 s
41.14	Set 2 setpoint scaling	See parameter 40.14 Set 1 setpoint scaling.	0.00
41.15	Set 2 output scaling	See parameter 40.15 Set 1 output scaling.	0.00
41.16	Set 2 setpoint 1 source	See parameter 40.16 Set 1 setpoint 1 source.	Al1 percent
41.17	Set 2 setpoint 2 source	See parameter 40.17 Set 1 setpoint 2 source.	Not selected

No.	Name/Value	Description	Def/FbEq16
41.18	Set 2 setpoint function	See parameter 40.18 Set 1 setpoint function.	In1
41.19	Set 2 internal setpoint sel1	See parameter 40.19 Set 1 internal setpoint sel1.	Not selected
41.20	Set 2 internal setpoint sel2	See parameter 40.20 Set 1 internal setpoint sel2.	Not selected
41.21	Set 2 internal setpoint 1	See parameter 40.21 Set 1 internal setpoint 1.	0.00 PID unit 1
41.22	Set 2 internal setpoint 2	See parameter 40.22 Set 1 internal setpoint 2.	0.00 PID unit 1
41.23	Set 2 internal setpoint 3	See parameter 40.23 Set 1 internal setpoint 3.	0.00 PID unit 1
41.24	Set 2 internal setpoint 0	See parameter 40.24 Set 1 internal setpoint 0.	0.00 PID unit 1
41.26	Set 2 setpoint min	See parameter 40.26 Set 1 setpoint min.	0.00 PID unit 1
41.27	Set 2 setpoint max	See parameter 40.27 Set 1 setpoint max.	200000.00 PID unit 1
41.28	Set 2 setpoint increase time	See parameter 40.28 Set 1 setpoint increase time.	0.0 s
41.29	Set 2 setpoint decrease time	See parameter 40.29 Set 1 setpoint decrease time.	0.0 s
41.30	Set 2 setpoint freeze enable	See parameter 40.30 Set 1 setpoint freeze enable.	Not selected
41.31	Set 2 deviation inversion	See parameter 40.31 Set 1 deviation inversion.	Not inverted (Ref - Fbk)
41.32	Set 2 gain	See parameter 40.32 Set 1 gain.	2.50
41.33	Set 2 integration time	See parameter 40.33 Set 1 integration time.	3.0 s
41.34	Set 2 derivation time	See parameter 40.34 Set 1 derivation time.	0.000 s
41.35	Set 2 derivation filter time	See parameter 40.35 Set 1 derivation filter time.	0.0 s
41.36	Set 2 output min	See parameter 40.36 Set 1 output min.	0.00
41.37	Set 2 output max	See parameter 40.37 Set 1 output max.	100.00
41.38	Set 2 output freeze enable	See parameter 40.38 Set 1 output freeze enable.	Not selected
41.39	Set 2 deadband range	See parameter 40.39 Set 1 deadband range.	0.0
41.40	Set 2 deadband delay	See parameter 40.40 Set 1 deadband delay.	0.0 s
41.43	Set 2 sleep level	See parameter 40.43 Set 1 sleep level.	0.0
41.44	Set 2 sleep delay	See parameter 40.44 Set 1 sleep delay.	60.0 s
41.45	Set 2 sleep boost time	See parameter 40.45 Set 1 sleep boost time.	0.0 s
41.46	Set 2 sleep boost step	See parameter 40.46 Set 1 sleep boost step.	0.0 PID unit 1

No.	Name/Value	Description	Def/FbEq16
41.47	Set 2 wake-up deviation	See parameter 40.47 Set 1 wake-up deviation.	0.00 PID unit 1
41.48	Set 2 wake-up delay	See parameter 40.48 Set 1 wake-up delay.	0.50 s
41.49	Set 2 tracking mode	See parameter 40.49 Set 1 tracking mode.	Not selected
41.50	Set 2 tracking ref selection	See parameter 40.50 Set 1 tracking ref selection.	Not selected
41.58	Set 2 increase prevention	See parameter 40.58 Set 1 increase prevention.	No
41.59	Set 2 decrease prevention	See parameter 40.59 Set 1 decrease prevention.	No
41.60	Set 2 PID activation source	See parameter 40.60 Set 1 PID activation source.	On
41.71	Set 2 compensation input source	See parameter 40.71 Set 1 compensation input source.	Al1 percent
41.72	Set 2 compensation input 1	See parameter 40.72 Set 1 compensation input 1.	
41.73	Set 2 compensated output 1	See parameter 40.73 Set 1 compensated output 1.	
41.74	Set 2 compensation input 2	See parameter 40.74 Set 1 compensation input 2.	
41.75	Set 2 compensated output 2	See parameter 40.75 Set 1 compensated output 2.	
41.76	Set 2 compensation non-linearity	See parameter 40.76 Set 1 compensation non-linearity.	
41.80	Set 2 PID output min source	See parameter 40.80 Set 1 PID output min source.	Set1 output min
41.81	Set 2 PID output max source	See parameter 40.81 Set 1 PID output max source.	Set1 output max
41.89	Set 2 setpoint multiplier	See parameter 40.89 Set 1 setpoint multiplier.	1.00
41.90	Set 2 feedback multiplier	Defines the multiplier k used in formulas of parameter 41.10 Set 2 feedback function. See parameter 40.90 Set 1 feedback multiplier.	1.00
43 Bra	ke chopper	Settings for the internal brake chopper.	
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.	-
	0.0120.0%	Estimated brake resistor temperature.	1 = 1%

No.	Name/Value	Description	Def/FbEq16
43.06	Brake chopper function	Enables brake chopper control and selects the brake resistor overload protection method (calculation or measurement). Note: Before enabling brake chopper control, ensure that 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.	Disabled
	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 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	Brake chopper run enable	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.	On
	Off	0.	0
	On	1.	1
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
43.08	Brake resistor thermal tc	Defines§ the thermal time constant for the brake resistor thermal model.	0 s
	010000 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	Brake resistor Pmax cont	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	Brake resistance	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
	0.01000.0 ohm	Brake resistor resistance value.	1 = 1 ohm
43.11	Brake resistor fault limit	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%
	0150%	Brake resistor temperature fault limit.	1 = 1%
43.12	Brake resistor warning limit	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%
	0150%	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 <i>Diagnostics menu</i> (page 177).	
45.01	Saved GW hours	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).	-
	065535 GWh	Energy savings in GWh.	1 = 1 GWh
45.02	Saved MW hours	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).	-
	0999 MWh	Energy savings in MWh.	1 = 1 MWh

No.	Name/Value	Description	Def/FbEq16
45.03	Saved kW hours	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 45.02 Saved MW hours is incremented. This parameter is read-only (see parameter 45.21 Energy calculations reset).	-
	0.0999.9 kWh	Energy savings in kWh.	10 = 1 kWh
45.04	Saved energy	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 45.21 Energy calculations reset).	-
	0.0214748364.0 kWh	Energy savings in kWh.	1 = 1 kWh
45.05	Saved money x1000	Monetary savings in thousands compared to direct-on-line motor connection. This parameter is incremented when 45.06 Saved money 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 45.21 Energy calculations reset).	-
	04294967295 thousands (unit x 1000)	Monetary savings in thousands of units.	1 = 1 unit
45.06	Saved money	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 (45.14 Tariff selection). When this parameter rolls over, parameter 45.05 Saved money x1000 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 45.21 Energy calculations reset).	-
	0.00999.99 units	Monetary savings.	1 = 1 unit
45.07	Saved amount	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 (45.14 Tariff selection). 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 45.21 Energy calculations reset).	-
	0.00 21474830.08 units	Monetary savings.	1 = 1 unit

No.	Name/Value	Description	Def/FbEq16
45.08	CO2 reduction in kilotons	Reduction in CO ₂ emissions in metric kilotons compared to direct-on-line motor connection. This value is incremented when parameter 45.09 CO2 reduction in tons rolls over.	-
		This parameter is read-only (see parameter 45.21 Energy calculations reset).	
	065535 metric kilotons	Reduction in CO ₂ emissions in metric kilotons.	1 = 1 metric kiloton
45.09	CO2 reduction in tons	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 45.18 CO2 conversion factor (by default, 0.5 metric tons/MWh). When this parameter rolls over, parameter 45.08 CO2 reduction in kilotons is incremented. This parameter is read-only (see parameter 45.21 Energy calculations reset).	-
	0.0999.9 metric tons	Reduction in CO ₂ emissions in metric tons.	1 = 1 metric ton
45.10	Total saved CO2	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 45.18 CO2 conversion factor (by default, 0.5 metric tons/MWh). This parameter is read-only (see parameter 45.21 Energy calculations reset).	-
	0.0214748300.8 metric tons	Reduction in CO ₂ emissions in metric tons.	1 = 1 metric ton
45.11	Energy optimizer	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 120% 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.	Enable
	Disable	Energy optimization disabled.	0
	Enable	Energy optimization enabled.	1
45.12	Energy tariff 1	Defines energy tariff 1 (price of energy per kWh). Depending on the setting of parameter 45.14 Tariff selection, either this value or 45.13 Energy tariff 2 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	Energy tariff 2	Defines energy tariff 2 (price of energy per kWh). See parameter 45.12 Energy tariff 1.	0.200 units
	0.000 4294966.296 units	Energy tariff 2.	-

No.	Name/Value	Description	Def/FbEq16
45.14	Tariff selection	Selects (or defines a source that selects) which pre-defined energy tariff is used. 0 = 45.12 Energy tariff 1	Energy tariff 1
		1 = 45.13 Energy tariff 2	
	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
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
45.18	CO2 conversion factor	Defines a factor for conversion of saved energy into CO ₂ emissions (kg/kWh or tn/MWh).	0.500 tn/MWh (metric ton)
	0.00065.535 tn/MWh	Factor for conversion of saved energy into CO ₂ emissions.	1 = 1 tn/MWh
45.19	Comparison power	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.	0.00 kW
	0.0010000000.00 kW	Motor power.	1 = 1 kW
45.21	Energy calculations reset	Resets the savings counter parameters 45.0145.10.	Done
	Done	Reset not requested (normal operation), or reset complete.	0
	Reset	Reset the savings counter parameters. The value reverts automatically to <i>Done</i> .	1
45.24	Hourly peak power value	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	Hourly peak power time	Time of the peak power value during the last hour.	00:00:00
		Time.	N/A
45.26	Hourly total energy (resettable)	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	Daily peak power value (resettable)	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	Daily peak power time	Time of the peak power since midnight of the present day.	00:00:00
		Time.	N/A
45.29	Daily total energy (resettable)	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	Last day total energy	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	Monthly peak power value (resettable)	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	Monthly peak power date	Date of the peak power during the present month.	1.1.1980
		Date.	N/A
45.33	Monthly peak power time	Time of the peak power during the present month.	00:00:00
		Time.	N/A
45.34	Monthly total energy (resettable)	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	Last month total energy	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	Lifetime peak power value	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	Lifetime peak power date	Date of the peak power over the drive lifetime.	1.1.1980
		Date.	N/A
45.38	Lifetime peak power time	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)
	0.1030000.00 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)
	0.101000.00 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%
	0.11000.0%	Torque corresponding to 10000 on fieldbus.	10 = 1%
46.04	Power scaling	Defines the output power value that corresponds to 10000, for example, in fieldbus communication.	1000.00
	0.1030000.00	Power corresponding to 10000 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 in fieldbus communication.	10000 A
	030000 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 020000 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
46.07	Frequency ref zero scaling	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 020000 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

No.	Name/Value	Description	Def/FbEq16
46.11	Filter time motor speed	Defines a filter time for signals 01.01 Motor speed used and 01.02 Motor speed estimated.	500 ms
	220000 ms	Motor speed signal filter time.	1 = 1 ms
46.12	Filter time output frequency	Defines a filter time for signal 01.06 Output frequency.	500 ms
	220000 ms	Output frequency signal filter time.	1 = 1 ms
46.13	Filter time motor torque	Defines a filter time for signal 01.10 Motor torque.	100 ms
	220000 ms	Motor torque signal filter time.	1 = 1 ms
46.14	Filter time power	Defines a filter time for signal 01.14 Output power.	100 ms
	220000 ms	Output power signal filter time.	1 = 1 ms
46.21	At speed hysteresis	Defines the "at setpoint" limits for speed control of the drive. When the difference between reference (22.87 Speed reference act 7) and the speed (24.02 Used speed feedback) is smaller than 46.21 At speed hysteresis, the drive is considered to be "at setpoint". This is indicated by bit 8 of 06.11 Main status word. 24.02 (rpm) Drive at setpoint (06.11 bit 8 = 1) Drive at setpoint (22.87 + 46.21 (rpm) 22.87 - 46.21 (rpm)	50.00 rpm
	0.0030000.00 rpm	Limit for "at setpoint" indication in speed control.	See par. 46.01
46.22	At frequency hysteresis	Defines the "at setpoint" limits for frequency control of the drive. When the absolute difference between reference (28.96 Frequency ref ramp input) and actual frequency (01.06 Output frequency) is smaller than 46.22 At frequency hysteresis, the drive is considered to be "at setpoint". This is indicated by bit 8 of 06.11 Main status word. 01.06 (Hz) Drive at setpoint (06.11 bit 8 = 1) Drive at setpoint (28.96 + 46.22 (Hz) 28.96 - 46.22 (Hz) 0 Hz	2.00 Hz
	0.001000.00 Hz	Limit for "at setpoint" indication in frequency control.	See par. 46.02

No.	Name/Value	Description	Def/FbEq16
46.31	Above speed limit	Defines the trigger level for "above limit" indication in speed control. When actual speed exceeds the limit, bit 10 of 06.17 Drive status word 2 is set. This is indicated by bit 10 in 06.11 Main status word.	1500.00 rpm; 1800.00 rpm (95.20 b0)
	0.0030000.00 rpm	"Above limit" indication trigger level for speed control.	See par. 46.01
limit frequency of bit 10 of 06.		Defines the trigger level for "above limit" indication in frequency control. When actual frequency exceeds the limit, bit 10 of 06.17 Drive status word 2 is set. This is indicated by bit 10 in 06.11 Main status word.	50.00 Hz; 60.00 Hz (95.20 b0)
	0.001000.00 Hz	"Above limit" indication trigger level for frequency control.	See par. 46.02
46.41	kWh pulse scaling	Defines the trigger level for the "kWh pulse" on for 50 ms. The output of the pulse is bit 9 of 05.22 Diagnostic word 3.	1.000 kWh
	0.001 1000.000 kWh	"kWh pulse" on trigger level.	1 = 1 kWh
47 Da	ta 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 <i>Data storage parameters</i> (page 179).	
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.	-
			•

No.	Name/Value	Description	Def/FbEq16
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
	-3276832767	16-bit data.	1 = 1
47.22	Data storage 2 int16	Data storage parameter 18.	0
	-3276832767	16-bit data.	1 = 1
47.23	Data storage 3 int16	Data storage parameter 19.	0
	-3276832767	16-bit data.	1 = 1
47.24	Data storage 4 int16	Data storage parameter 20.	0
	-3276832767	16-bit data.	1 = 1

49 Panel port communication		Communication settings for the control panel port on the drive.	
49.01	Node ID number	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
	132	Node ID.	1 = 1
49.03	Baud rate	Defines the transfer rate of the link.	230.4 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	Communication loss time	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 Communication loss action is taken.	10.0 s
	0.33000.0 s	Panel/PC tool communication timeout.	10 = 1 s
49.05	Communication loss action	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 Control panel loss.	1
	Last speed	Drive generates warning A7EE Panel 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. WARNING! Make sure that it is safe to continue operation in case of a communication break.	2

No.	Name/Value	Description	Def/FbEq16
	Speed ref safe	Drive generates warning A7EE Panel 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). WARNING! Make sure that it is safe to continue operation in case of a communication break.	3
49.06	Refresh settings	Applies the settings of parameters 49.0149.05. 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 49.0149.05. The value reverts automatically to <i>Done</i> .	1
50 Fie (FBA)	ldbus adapter	Fieldbus communication configuration. See also chapter <i>Fieldbus control through a fieldbus adapter</i> (page 289).	
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 <i>FBA A communication</i> . This only occurs if control is expected from the fieldbus (FBA A 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 FBAA 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

No.	Name/Value	Description		Def/FbEq16
50.03	FBA A comm loss t out		oot-up delay immediately after e communication break	0.3 s
	0.36553.5 s	Time delay.		1 = 1 s
50.04	FBA A ref1 type	Selects the type and scaling of fieldbus adapter A. The scaling parameters 46.0146.04, dep type is selected by this parameters	of the reference is defined by sending on which reference	Speed or frequency
	Speed or frequency	Type and scaling is chosen aut currently active operation mode		0
		Operation mode (see par. 19.01)	Reference 1 type	
		Speed control	Speed	
		Frequency control	Frequency	
	Transparent	No scaling is applied (the 16-b	it scaling is 1 = 1 unit).	1
	General	Generic reference with a 16-bit and two decimals).	t scaling of 100 = 1 (ie. integer	2
	Torque	The scaling is defined by parar	meter 46.03 Torque scaling.	3
	Speed	The scaling is defined by parar	meter 46.01 Speed scaling.	4
	Frequency	The scaling is defined by parar	meter 46.02 Frequency scaling.	5
50.05	FBA A ref2 type	Selects the type and scaling of fieldbus adapter A. The scaling parameters 46.0146.04, dep type is selected by this parameters	of the reference is defined by ending on which reference	Speed or frequency
	Speed or frequency	Type and scaling is chosen aut currently active operation mode		0
		Operation mode (see par. 19.01)	Reference 2 type	
		Speed control	Speed	
		Please select Speed (selection manually.	Frequency 1 4) or Frequency (selection 5)	
	Transparent	No scaling is applied (the 16-b	it scaling is 1 = 1 unit).	1
	General	Generic reference with a 16-bit and two decimals).	t scaling of 100 = 1 (ie. integer	2
	Torque	The scaling is defined by parar	meter 46.03 Torque scaling.	3
	Speed	The scaling is defined by parar	meter 46.01 Speed scaling.	4
	Frequency	The scaling is defined by parar	meter 46.02 Frequency scaling.	5
50.06	FBA A SW sel	Selects the source of the Statu fieldbus network through fieldb		Auto
	Auto	Source of the Status word is ch	nosen automatically.	0

No.	Name/Value	Description		Def/FbEq16
	Transparent mode	The source selected by param transparent source is transmitt fieldbus network through fieldb	ed as the Status word to the	1
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 46.0146.04, depending on which actual value type is selected by this parameter.		Speed or frequency
	Speed or frequency	Type and scaling is chosen aut currently active operation mode		0
		Operation mode (see par. 19.01)	Actual value 1 type	
		Speed control	Speed	
		Frequency control	Frequency	
	Transparent	The value selected by paramet transparent source is sent as a applied (the 16-bit scaling is 1	actual value 1. No scaling is	1
	General	The value selected by parameter transparent source is sent as a scaling of 100 = 1 unit (ie. integrated)	actual value 1 with a 16-bit	2
	Torque	The scaling is defined by parar	meter 46.03 Torque scaling.	3
	Speed	01.01 Motor speed used is sen is defined by parameter 46.01		4
	Frequency	01.06 Output frequency is sent is defined by parameter 46.02		5
50.08	FBA A actual 2 type			Speed or frequency
	Speed or frequency	Type and scaling is chosen autourrently active operation mode		0
		Operation mode (see par. 19.01)	Actual value 2 type	
		Speed control	Speed	
		Frequency control	Frequency	
		Select Speed (selection 4) or F manually.	Frequency (selection 5)	
	Transparent	The value selected by parameter transparent source is sent as a applied (the 16-bit scaling is 1	ectual value 1. No scaling is	1
	General	The value selected by parameter transparent source is sent as a scaling of 100 = 1 unit (ie. integral)	ctual value 1 with a 16-bit	2
	Torque	01.10 Motor torque is sent as a defined by parameter 46.03 To		3
	Speed	01.01 Motor speed used is sen is defined by parameter 46.01		4

No.	Name/Value	Description	Def/FbEq16
	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 <i>Terms and abbreviations</i> on page 324).	-
50.10	FBA A act1 transparent source	When parameter 50.07 FBA A actual 1 type is set to Transparent, this parameter selects the source of actual value 1 transmitted to the fieldbus network through fieldbus adapter A.	Not selected
	Not selected	No source selected.	-
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
50.11	FBA A act2 transparent source	When parameter 50.08 FBA A actual 2 type is set to Transparent, this parameter selects the source of actual value 2 transmitted to the fieldbus network through fieldbus adapter A.	Not selected
	Not selected	No source selected.	-
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
50.12	FBA A debug mode	This parameter enables debug mode. Displays raw (unmodified) data received from and sent to fieldbus adapter A in parameters 50.1350.18.	Disable
	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	FBA A control word	Displays the raw (unmodified) control word sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 50.12 FBA A debug mode. This parameter is read-only.	-
	00000000h FFFFFFFh	Control word sent by master to fieldbus adapter A.	-
50.14	FBA A reference 1	Displays raw (unmodified) reference REF1 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 50.12 FBA A debug mode. This parameter is read-only.	-
	-2147483648 2147483647	Raw REF1 sent by master to fieldbus adapter A.	-
50.15	FBA A reference 2	Displays raw (unmodified) reference REF2 sent by the master (PLC) to fieldbus adapter A if debugging is enabled by parameter 50.12 FBA A debug mode. This parameter is read-only.	-
	-2147483648 2147483647	Raw REF2 sent by master to fieldbus adapter A.	-
50.16	FBA A status word	Displays the raw (unmodified) status word sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter 50.12 FBA A debug mode. This parameter is read-only.	-
	00000000h FFFFFFFh	Status word sent by fieldbus adapter A to master.	-

No.	Name/Value	Description	Def/FbEq16
50.17	FBA A actual value 1	Displays raw (unmodified) actual value ACT1 sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter 50.12 FBA A debug mode. This parameter is read-only.	-
	-2147483648 2147483647	Raw ACT1 sent by fieldbus adapter A to master.	-
50.18	FBA A actual value 2	Displays raw (unmodified) actual value ACT2 sent by fieldbus adapter A to the master (PLC) if debugging is enabled by parameter 50.12 FBA A debug mode. This parameter is read-only.	-
	-2147483648 2147483647	Raw ACT2 sent by fieldbus adapter A to master.	-
51 FR	A A settings	Fieldbus adapter A configuration.	
51.02	FBA A Par2	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 50.01 FBA A enable 1 = PROFIBUS-DP 32 = CANopen 37 = DeviceNet 128 = Ethernet 132 = PROFInet IO 135 = EtherCAT 136 = ETH Pwrlink 485 = RS-485 comm 101 = ControlNet 47808 = BACnet/IP 2222 = Ethernet/IP 502 = Modbus/TCP This parameter is read-only. Parameters 51.0251.26 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.	
	065535	Fieldbus adapter configuration parameter.	1 = 1
51.26	FBA A Par26	See parameter 51.02 FBA A Par2.	-
	065535	Fieldbus adapter configuration parameter.	1 = 1
51.27	FBA A par refresh	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.	Done
	Done	Refreshing done.	0
	Configure	Refreshing.	1
51.28	FBA A par table ver	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.	-

No.	Name/Value	Description	Def/FbEq16
51.29	FBA A drive type code	Displays the drive type code in the fieldbus adapter module mapping file (stored in the memory of the drive). This parameter is read-only.	-
	065535	Drive type code stored in the mapping file.	1 = 1
51.30	FBA A mapping file ver	Displays the fieldbus adapter module mapping file revision stored in the memory of the drive in decimal format. This parameter is read-only.	-
	065535	Mapping file revision.	1 = 1
51.31	D2FBA A comm status	Displays the status of the fieldbus adapter module communication.	Not configured
	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	FBA A comm SW ver	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	FBA A appl SW ver	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 FB/	A 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	FBA A data in1	Parameters 52.0152.12 select data to be transferred from the drive to the fieldbus controller through fieldbus adapter A.	None
	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

2

3...4

No.	Name/Value	Description	Def/FbEq16
	Reserved		710
	CW 32bit	Control Word (32 bits)	11
	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		1723
	SW2 16bit	Status Word 2 (16 bits)	24
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
52.12	FBA A data in12	See parameter 52.01 FBA A data in1.	None
53 FBA	A 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 53.0153.12 select data to be transferred from the fieldbus controller to the drive through fieldbus adapter A.	None
	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		710
	CW 32bit	Control Word (32 bits)	11
	Ref1 32bit	Reference REF1 (32 bits)	12
	Ref2 32bit	Reference REF2 (32 bits)	13
	Reserved		1420
	CW2 16bit	Control Word 2 (16 bits)	21
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
	•••		
53.12	FBA A data out12	See parameter 53.01 FBA A data out1.	None
58 Em	bedded fieldbus	Configuration of the embedded fieldbus (EFB) interface. See also chapter <i>Modbus RTU control through the embedded fieldbus interface (EFB)</i> (page 213).	
58.01	Protocol enable	Enables/disables the embedded fieldbus interface and selects the protocol to use.	None
	None	None (communication disabled).	0
	Modbus RTU	Embedded fieldbus interface is enabled and uses the Modbus RTU protocol.	1

Embedded fieldbus interface is enabled and uses the BACnet MS/TP protocol.

BACnet MSTP

Reserved

No.	Name/Value	Description	Def/FbEq16
	N2	Embedded fieldbus interface is enabled and uses the N2 protocol.	5
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
58.03	Node address	Defines the node address of the drive on the fieldbus link. Values 1247 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
	0255	Node address (values 1247 are allowed).	1 = 1
58.04	Baud rate	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 Autodetect, 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	Modbus RTU: 19.2 kbps BACnet MS/TP: Autodetect N2: 9.6 kbps
		Communication control (Refresh settings).	
	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	Parity	Modbus RTU, N2 only: 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	Communication control	Takes changed EFB settings in use, or activates silent mode.	Enabled
	Enabled	Normal operation.	0
	Refresh settings	Refreshes settings (parameters 58.0158.05, 58.1458.17, 58.25, 58.2858.34) and takes changed EFB configuration settings in use. Reverts automatically to <i>Enabled</i> .	1

No.	Name/Value	Description	Def/FbEq16
	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
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).	-

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 BACnet.
14	Reserved	
15	Internal error	1 = Internal error occurred. Contact your local ABB representative.

	0000hFFFFh	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.	-
	04294967295	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.	-
	04294967295	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.	-
	04294967295	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.	
	04294967295	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.	-
	04294967295	Number of CRC errors.	1 = 1
58.13	Token counter	BACnet MS/TP only: Contains a count of the number of times this device has received the token. Used for diagnostic purposes.	0
	04294967295	Counter	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
	No	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 ATCE 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 ATCE 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	Communication loss mode	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.	Cw / Ref1 / Ref2
	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	Communication loss time	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.	30.0 s
	0.06000.0 s	EFB communication timeout.	1 = 1
58.17	Transmit delay	Modbus RTU, N2 only: 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
	065535 ms	Minimum response delay.	1 = 1
58.18	EFB control word	Modbus RTU, BACnet MS/TP only: Displays the raw (unmodified) control word sent by the Modbus controller to the drive. For debugging purposes. This parameter is read-only.	-
	00000000h FFFFFFFh	Control word sent by Modbus controller to the drive.	1 = 1
58.19	EFB status word	Modbus RTU, BACnet MS/TP only: Displays the raw (unmodified) status word for debugging purposes. This parameter is read-only.	-
	00000000h FFFFFFFh	Status word sent by the drive to the Modbus controller.	1 = 1
58.25	Control profile	Modbus RTU only: 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 222.	ABB Drives
	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	EFB ref1 type	Modbus RTU only: Selects the type and scaling of reference 1 received through the embedded fieldbus interface. The scaled reference is displayed by 03.09 EFB reference 1.	Speed or frequency	
	Speed or frequency	Type and scaling is chosen automatically according to the currently active operation mode as follows.	0	
		Operation mode (see par. 19.01) Reference 1 type		
		Speed control Speed		
		Frequency control Frequency		
	Transparent	No scaling is applied.	1	
	General	Generic reference without a specific unit. Scaling: 1 = 100.	2	
	Torque	Torque reference. The scaling is defined by parameter 46.03 Torque scaling.	3	
	Speed	Speed reference. The scaling is defined by parameter 46.01 Speed scaling.	4	
	Frequency	Frequency reference. The scaling is defined by parameter 46.02 Frequency scaling.	5	
58.27	EFB ref2 type	Modbus RTU only: Selects the type and scaling of reference 2 received through the embedded fieldbus interface. The scaled reference is displayed by 03.10 EFB reference 2.	Speed or frequency	
58.28	EFB act1 type	Modbus RTU only: Selects the type of actual value 1.	Speed or frequency	
	Speed or frequency	Type and scaling is chosen automatically according to the currently active operation mode as follows.	0	
		Operation mode (see par. 19.01) Actual 1 type		
		Speed control Speed		
		Frequency control Frequency		
	Transparent	No scaling is applied.	1	
	General	Generic reference without a specific unit. Scaling: 1 = 100.	2	
	Torque	Scaling is defined by parameter 46.03 Torque scaling.	3	
	Speed	Scaling is defined by parameter 46.01 Speed scaling.	4	
	Frequency	Scaling is defined by parameter 46.02 Frequency scaling.	5	
58.29	EFB act2 type	Modbus RTU only: Selects the type of actual value 2. For the selections, see parameter 58.28 EFB act1 type.	Transparent	
58.30	EFB status word transparent source	N2 only: Selects the source of actual value 1 when parameter 58.28 EFB act1 type is set to Transparent.	Not selected	
	Not selected	None.	0	
	Other	Source selection (see Terms and abbreviations on page 324).	-	
58.31	EFB act1 transparent source	Modbus RTU, N2 only: Selects the source of actual value 1 when parameter 58.28 EFB act1 type is set to Transparent.	Not selected	
	Not selected	None.	0	
	Other	Source selection (see Terms and abbreviations on page 324).	-	

No.	Name/Value	Description	Def/FbEq16
58.32	EFB act2 transparent source	Modbus RTU, N2 only: Selects the source of actual value 2 when parameter 58.29 EFB act2 type is set to Transparent.	Not selected
	Not selected	None.	0
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
58.33	Addressing mode	Modbus RTU only: Defines the mapping between parameters and holding registers in the 400101465535 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	16-bit values (groups 199, indexes 199): Register address = 400000 + 100 × parameter group + parameter index. For example, parameter 22.80 would be mapped to register 400000 + 2200 + 80 = 402280. 32-bit values (groups 199, indexes 199): 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	16-bit values (groups 1255, indexes 1255): 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	32-bit values (groups 1127, indexes 1255): 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	Modbus RTU only: 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
58.40	Device object ID	BACnet MS/TP only: The Device object ID must be unique across all BACnet devices in the building network. Valid values are in range 04194303 The default Device object ID (4194303) is invalid per the BACnet specification. 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).	4194303
	04194303	ID.	
58.41	Max master	BACnet MS/TP only: The highest master address for devices on the BACnet MS/TP bus. 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).	127
	0127	Address.	1 = 1

No.	Name/Value	Description	Def/FbEq16
58.42	Max info frames	BACnet MS/TP only: The maximum number of information frames the device may transmit before it must pass the token. 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
	010	Maximum number information frames.	1 = 1
58.43	Max APDU retries	BACnet MS/TP only: Number of retries to send when no response is seen to confirmed requests. 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).	3
	010	Number of retries.	1 = 1
58.44	APDU timeout	BACnet MS/TP only: The amount of time in seconds between retransmissions when an expected acknowledgement has not been received. 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).	10 s
	060 s	Timeout.	1 = 1
58.101	Data I/O 1	Modbus RTU, BACnet MS/TP only: 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 aha(16 bits)	6
	Reserved		710
	CW 32bit	Control Word (32 bits)	11
	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		1720
	CW2 16bit	ABB Drives profile: not used; DCU Profile: upper 16 bits of the DCU control word	21
	SW2 16bit	ABB Drives profile: not used / always zero; DCU Profile: upper 16 bits of the DCU status word	24

No.	Name/Value	Description	Def/FbEq16
	Reserved		2530
	RO/DIO control word	Parameter 10.99 RO/DIO control word.	31
	AO1 data storage	Parameter 13.91 AO1 data storage.	32
	AO2 data storage	Parameter 13.92 AO2 data storage.	33
	Reserved		3439
	Feedback data storage	Parameter 40.91 Feedback data storage.	40
	Setpoint data storage	Parameter 40.92 Setpoint data storage.	41
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
58.102	Data I/O 2	Modbus RTU. BACnet MS/TP only: 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 58.101 Data I/O 1.	Ref1 16bit
58.103	Data I/O 3	Modbus RTU. BACnet MS/TP only: 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 58.101 Data I/O 1.	Ref2 16bit
58.104	Data I/O 4	Modbus RTU, BACnet MS/TP only: 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 58.101 Data I/O 1.	SW 16bit
58.105	Data I/O 5	Modbus RTU. BACnet MS/TP only: 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 58.101 Data I/O 1.	Act1 16bit
58.106	Data I/O 6	Modbus RTU. BACnet MS/TP only: 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 58.101 Data I/O 1.	Act2 16bit
58.107	Data I/O 7	Modbus RTU, BACnet MS/TP only: Parameter selector for Modbus register address 400007. For the selections, see parameter 58.101 Data I/O 1.	None
	•••		
58.114	Data I/O 14	Modbus RTU. BACnet MS/TP only: Parameter selector for Modbus register address 400014. For the selections, see parameter 58.101 Data I/O 1.	None

No.	Name/Value	Description	Def/FbEq16
60 DDG comm	CS unication	DCS communication configuration. 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 <i>Control of a supply unit (LSU)</i> (page 98). The communication utilizes the internal communication channel between the inverter unit (INU) and the supply unit (LSU). This parameter group is only visible for ACH580-31 drives.	
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 <i>Control of a supply unit (LSU)</i> (page 98).	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
	065535 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
	and DDCS nit data	Defines the data sent to the DDCS link. See also parameter group 60 DDCS communication. This parameter group is only visible for ACH580-31 drives.	
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
	065535	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
	065535	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
	065535	Data to be sent as word 3 of data set 10.	

No.	Name/Value	Description	Def/FbEq16
62 D2L receive	o and DDCS e data	Defines the data sent to the DDCS link. See also parameter group 60 DDCS communication. This parameter group is only visible for ACH580-31 drives.	
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
	065535	Data to be sent as word 1 of data set 10.	

70 Ov	erride	Enabling/disabling of override function, override activation signal and override speed/frequency. See control chain diagram Override on page 320	
70.01	Override status	Shows the override status. This parameter is read-only.	-

Bit	Name	Description
0	Override enabled	0 = Override is disabled; 1 = Override is enabled.
1	Override active	0 = Override is inactive; 1 = Drive is active.
2	Override direction is forward	0 = Override direction is not forward; 1 = Override direction is forward.
3	Override direction is reverse	0 = Override direction is not reverse; 1 = Override direction is reverse.
4	Override stop mode is active	0 = Override stop mode is not active; 1 = Override stop mode is active.
56	Reserved	
7	Run permissive	0 = Prevents running; 1 = Permits running.
8	Start interlock 1	0 = Prevents starting; 1 = Permits starting.
9	Start interlock 2	0 = Prevents starting; 1 = Permits starting.
10	Start interlock 3	0 = Prevents starting; 1 = Permits starting.
11	Start interlock 4	0 = Prevents starting; 1 = Permits starting.
1215	Reserved	

70.02	Override	Enables the override function. For override with ACH580-31, see section <i>LSU Override</i> on page 99.	Off
	Off	Override disabled.	0
	On	Override enabled.	1
	Critical	Allows for an infinite number of fault resets.	2
70.03	Override activation source	Selects the source of the override activation. Value 0 of the source deactivates the override. Value 1 of the source activates the override.	Not used
	Not used	0.	0
	DI1	Digital input DI1 (10.02 DI delayed status, bit 0).	1
	DI2	Digital input DI2 (10.02 DI delayed status, bit 1).	2
	DI3	Digital input DI3 (10.02 DI delayed status, bit 2).	3
	DI4	Digital input DI4 (10.02 DI delayed status, bit 3).	4
	DI5	Digital input DI5 (10.02 DI delayed status, bit 4).	5
	DI6	Digital input DI6 (10.02 DI delayed status, bit 5).	6
	-DI1	Digital input DI1 (10.02 DI delayed status, bit 0).	7
	-DI2	Digital input DI2 (10.02 DI delayed status, bit 1).	8

No.	Name/Value	Description	Def/FbEq16
	-DI3	Digital input DI3 (10.02 DI delayed status, bit 2).	9
	-DI4	Digital input DI4 (10.02 DI delayed status, bit 3).	10
	-DI5	Digital input DI5 (10.02 DI delayed status, bit 4).	11
	-DI6	Digital input DI6 (10.02 DI delayed status, bit 5).	12
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
70.04	Override reference source	Selects the source for the speed used in the override mode.	Override speed/freq
	Constant speed	Constant speed used as the reference.	0
	Al1	12.12 Al1 scaled value (page 358).	1
	Al2	12.22 Al2 scaled value (page 360).	2
	Override speed/freq	Parameter 70.06 Override frequency or 70.07 Override speed is used as the reference.	3
	Motor potentiometer	22.80 Motor potentiometer ref act (output of the Floating point control (Motor potentiometer)).	4
	Stop	The output of the drive is shut off and the motor no longer runs. Override is displayed on the panel but the motor does not run. Drive follows the specified stop type.	5
	Process PID set 1	40.01 Process PID output actual (page 476).	6
70.05	Override direction	Selects the source of the motor direction used in the override mode.	Forward
	Forward	Direction is forward.	0
	Reverse	Direction is reverse.	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
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
70.06	Override frequency	Defines the frequency used as reference in the override mode if 70.04 Override reference source is set to Override speed/freq and the drive is in frequency mode.	0.0 Hz
	-500.0500.0 Hz	Override frequency.	1 = 1 Hz
70.07	Override speed	Defines the speed used in as reference the override mode if 70.04 Override reference source is set to Override speed/freq and the drive is in speed mode.	0.0 Hz
	30000.0 30000.0 rpm	Override speed.	1 = rpm

No.	Name/Value	Description	Def/FbEq16
70.10	Override enables selection	Selects which start interlock and run permissive input signals configured in the drive parameters will not allow the override function to run the motor or will stop running the motor. The drive remains in override mode nevertheless.	00000b

Bit	Name	Description			
0	Run permissive	1 = The override is not allowed to run the motor or the motor will be stopped, if the source defined by parameter <i>20.40 Run permissive</i> is 0.			
1	Start interlock 1				
2	Start interlock 2	1 = The override is not allowed to start the motor or the motor will be stopped, if the source defined by parameter 20.42 Start interlock 2 is 0.			
3	Start interlock 3	1 = The override is not allowed to start the motor or the motor will be stopped, if the source defined by parameter 20.43 Start interlock 3 is 0.			
4	Start interlock 4	1 = The override is not allowed to start the motor or the motor will be stopped, if the source defined by parameter 20.44 Start interlock 4 is 0.			
515	Reserved				

70.20	Override fault handling	Faults are grouped into high priority faults and low priority faults. The following faults are high priority, and they are displayed and they will stop the drive: 2310 Overcurrent, 2330 Earth leakage, 2340 Short circuit, 3210 DC link overvoltage, 4981 External temperature 1, 4982 External temperature 2, 5090 STO hardware failure, 5091 Safe torque off, FA81 Safe torque off 1, FA82 Safe torque off 2. Other faults are low priority faults. Active low priority faults are reset when the drive enters override mode. Low priority faults are ignored when the drive is in override mode.	Fault on high priority
	Fault on high priority	Fault on high priority faults. The fault must be reset from the control panel or from a digital input.	0
	Autoreset	Fault on high priority faults (except STO related faults) with automatic fault reset and run. See the list of high priority faults above. See parameter 70.21 Override auto reset trials.	1
70.21	Override auto reset trials	Defines the number of automatic fault resets the drive performs during override operation. When the parameter is set to 0, reset trials are made continuously during the override operation. A value of 15 defines a specific number of automatic reset trials.	5
	05	Number of automatic reset trials.	1 = 1
70.22	Override auto reset time	Defines the time the drive will wait after a fault before attempting an automatic fault reset.	5.0 s
	5.0120.0 s	Auto reset delay time.	10 = 1 s
70.40	Override log 1 start date	Displays the start date of the last Override activation.	01.01.1980
		Start date.	

No.	Name/Value	Description	Def/FbEq16
70.41	Override log 1 start time	Displays the start time of the last Override activation.	00:00:00
		Start time.	
70.42	Override log 1 end date	Displays the end date of the last Override situation. If the drive is in Override mode, the parameter shows the current date.	01.01.1980
		End date.	
70.43	Override log 1 end time	Displays the end time of the last Override situation. If the drive is in Override mode, the parameter shows the current time.	00:00:00
		End time.	
70.44	Override log 1 fault 1	Displays the last fault, if any, that occurred during the last operation of override.	0
		Fault description.	
70.45	Override log 1 fault 2	Displays the second last fault, if any, that occurred during the last operation of override.	0
		Fault description.	
70.46	Override log 1 fault 3	Displays the third last fault, if any, that occurred during the last operation of override.	0
		Fault description.	
70.47	Override log 1 warning 1	Displays the last warning, if any, that occurred during the last operation of override.	0
		Warning description.	
70.48	Override log 1 warning 2	Displays the second last warning, if any, that occurred during the last operation of override.	0
		Warning description.	
70.49	Override log 1 warning 3	Displays the third last warning, if any, that occurred during the last operation of override.	0
		Warning description.	
70.50	Override log 2 start date	Displays the start date of the second last Override activation.	01.01.1980
		Start date.	
70.51	Override log 2 start time	Displays the start time of the second last Override activation.	00:00:00
		Start time.	
70.52	Override log 2 end date	Displays the end date of the second last Override situation.	01.01.1980
		End date.	
70.53	Override log 2 end time	Displays the end time of the second last Override situation.	00:00:00
		End time.	
70.54	Override log 2 fault 1	Displays the last fault, if any, that occurred during the second last operation of override.	0
		Fault description.	
70.55	Override log 2 fault 2	Displays the second last fault, if any, that occurred during the second last operation of override.	0
		Fault description.	

No.	Name/Value				
70.56	Override log 2 fault 3	Displays the third last fault, if any, that occurred during the second last operation of override.	0		
		Fault description.			
70.57	Override log 2 Displays the last warning, if any, that occurred during the second last operation of override.		0		
		Warning description.			
70.58	Override log 2 warning 2	Displays the second last warning, if any, that occurred during second the last operation of override.	0		
		Warning description.			
70.59	Override log 2 warning 3	Displays the third last warning, if any, that occurred during the second last operation of override.	0		
		Warning description.			
70.60	Override log 3 start date	Displays the start date of the third last Override activation.	01.01.1980		
		Start date.			
70.61	Override log 3 end date	Displays the start time of the third last Override activation.	00:00:00		
		Start time.			
70.62	Override log 3 start time	Displays the end date of the third last Override situation.	01.01.1980		
		End date.			
70.63	Override log 3 end time	Displays the end time of the third last Override situation.	00:00:00		
		End time.			
70.64	Override log 3 fault 1	Displays the last fault, if any, that occurred during the third last operation of override.	0		
		Fault description.			
70.65	Override log 3 fault 2	Displays the second last fault, if any, that occurred during the third last operation of override.	0		
		Fault description.			
70.66	Override log 3 fault 3	Displays the third last fault, if any, that occurred during the third last operation of override.	0		
		Fault description.			
70.67	Override log 3 warning 1	Displays the last warning, if any, that occurred during the third last operation of override.	0		
		Warning description.			
70.68	Override log 3 warning 2	Displays the second last warning, if any, that occurred during third the last operation of override.	0		
		Warning description.			
70.69	Override log 3 warning 3	Displays the third last warning, if any, that occurred during the third last operation of override.	0		
		Warning description.			

No.	Name/\	/alue	Descri	ption	Def/FbEq16	
71 Ex	ternal Pi	ID1	See confeedbar pages	uration of external PID. ntrol chain diagrams External PID setpoint and ck source selection, and External PID controller on 317 and 318, respectively.		
71.01	value	II PID act	See pa	nameter 40.01 Process PID output actual.	-	
71.02		ck act value		rameter 40.02 Process PID feedback actual.	-	
71.03		t act value		rameter 40.03 Process PID setpoint actual.	-	
71.04		on act value		rameter 40.04 Process PID deviation actual.	-	
71.06	PID sta	tus word		s status information on process external PID control. arameter is read-only.	-	
	Bit	Name		Value		
	0	PID active		1 = Process PID control active.		
	1	Reserved				
	2	Output froz	en	1 = Process PID controller output frozen. Bit is set if parameter 71.38 Output freeze enable is TRUE, or the deadband function active (bit 9 is set).		
	36	Reserved				
	7	Output limit		1 = PID output is being limited by par. 71.37.		
	8	Output limit		1 = PID output is being limited by par. 71.36.		
	9	Deadband	active	1 = Deadband is active.		
	1011	Reserved Internal set active	point	oint 1 = Internal setpoint active (see par. 71.1671.23)		
	1315					
			•		_	
	0000h			s PID control status word.	1 = 1	
71.07		eration mode		rameter 40.07 Process PID operation mode.	Off	
71.08		ck 1 source		rameter 40.08 Set 1 feedback 1 source.	Al2 percent 0.000 s	
71.11	Feedba	ck filter time	See pa	ee parameter 40.11 Set 1 feedback filter time.		
71.14	Setpoint scaling		general scaling setpoir used a parame nomina In effect deviation Note: 71.15.	s, together with parameter 71.15 Output scaling, a I scaling factor for the external PID control chain. The can be utilized when, for example, the process it is input in Hz, and the output of the PID controller is an rpm value in speed control. In this case, this eter might be set to 50, and parameter 71.15 to the all motor speed at 50 Hz. St, the output of the PID controller [71.15] when con (setpoint - feedback) = [71.14] and [71.32] = 1. The scaling is based on the ratio between 71.14 and For example, the values 50 and 1500 would produce the scaling as 1 and 3.	100.00	
	-200000 200000		Proces	s setpoint base.	1 = 1	
71.15	Output	scaling	See pa	rameter 71.14 Setpoint scaling.	100.00	
	-200000 200000		Proces	s PID controller output base.	1 = 1	
71.16	Setpoin	t 1 source	See pa	rameter 40.16 Set 1 setpoint 1 source.	Al1 percent	

No.	o. Name/Value Description			
71.19	Internal setpoint sel1	See parameter 40.19 Set 1 internal setpoint sel1.	Not selected	
71.20	Internal setpoint sel2	See parameter 40.20 Set 1 internal setpoint sel2.	Not selected	
71.21	Internal setpoint 1	See parameter 40.21 Set 1 internal setpoint 1.	0.00 PID unit 1	
71.22	Internal setpoint 2	See parameter 40.22 Set 1 internal setpoint 2.	0.00 PID unit 1	
71.23	Internal setpoint 3	See parameter 40.23 Set 1 internal setpoint 3.	0.00 PID unit 1	
71.26	Setpoint min	See parameter 40.26 Set 1 setpoint min.	0.00	
71.27	Setpoint max	See parameter 40.27 Set 1 setpoint max.	200000.00	
71.31	Deviation inversion	See parameter 40.31 Set 1 deviation inversion.	Not inverted (Ref - Fbk)	
71.32	Gain	See parameter 40.32 Set 1 gain.	1.00	
71.33	Integration time	See parameter 40.33 Set 1 integration time.	60.0 s	
71.34	Derivation time	See parameter 40.34 Set 1 derivation time.	0.000 s	
71.35	Derivation filter time	See parameter 40.35 Set 1 derivation filter time.	0.0 s	
71.36	Output min	See parameter 40.36 Set 1 output min.	-200000.00	
71.37	Output max	See parameter 40.37 Set 1 output max.	200000.00	
71.38	Output freeze enable	See parameter 40.38 Set 1 output freeze enable.	Not selected	
71.39	Deadband range	The control program compares the absolute value of parameter 71.04 Deviation act value to the deadband range defined by this parameter. If the absolute value is within the deadband range for the time period defined by parameter 71.40 Deadband delay, PID's deadband mode is activated and 71.06 PID status word bit 9 Deadband active is set. Then PID's output is frozen and 71.06 PID status word bit 2 Output frozen is set. If the absolute value is equal or greater than the deadband range, PID's deadband mode is deactivated.	0.0	
	0.0200000.0	Range	1 = 1	
71.40	Deadband delay	Defines the deadband delay for the deadband function. See parameter 71.39 Deadband range.	0.0 s	
	0.03600.0 s	Delay	1 = 1 s	
71.58	Increase prevention	See parameter 40.58 Set 1 increase prevention.	No	
71.59	Decrease prevention	See parameter 40.59 Set 1 decrease prevention.	No	
71.62	Internal setpoint actual	See parameter 40.62 PID internal setpoint actual.	0.00 PID unit 1	
72 Ex	ternal PID2	Configuration of external PID2.		
72.01	External PID act	See parameter 40.01 Process PID output actual		

72 External PID2		Configuration of external PID2.	
72.01	External PID act value	See parameter 40.01 Process PID output actual.	-
72.02	Feedback act value	See parameter 40.02 Process PID feedback actual.	-
72.03	Setpoint act value	See parameter 40.03 Process PID setpoint actual.	-
72.04	Deviation act value	See parameter 40.04 Process PID deviation actual.	-

No.	Name/Value Description		Descr	iption	Def/FbEq16
72.06	PID sta	tus word		ys status information on process external PID control. arameter is read-only.	-
	Bit	Name		Value	
	0 PID active			1 = Process PID control active.	
	1	Reserved			
	2	Output froz	en	1 = Process PID controller output frozen. Bit is set if particles output freeze enable is TRUE, or the deadband active (bit 9 is set).	
	36	Reserved			
	7	Output limit	high	1 = PID output is being limited by par. 72.37.	
	8	Output limit	low	1 = PID output is being limited by par. 72.36.	
	9	Deadband	active	1 = Deadband is active.	
	1011	Reserved			
	12	Internal set active	point	1 = Internal setpoint active (see par. 72.1672.23)	
	1315	Reserved			
	0000h.	FFFFh	Proces	ss PID control status word.	1 = 1
72.07	PID ope	eration mode	See pa	arameter 40.07 Process PID operation mode.	Off
72.08		ack 1 source	See parameter 40.08 Set 1 feedback 1 source.		Al1 scaled
72.11	Feedba	ack filter time	See pa	arameter 40.11 Set 1 feedback filter time.	0.000 s
72.14	Setpoint scaling		genera scaling setpoil used a param nomina In effect deviati Note: 72.15.	s, together with parameter 72.15 Output scaling, a all scaling factor for the external PID control chain. The g can be utilized when, for example, the process it is input in Hz, and the output of the PID controller is an rpm value in speed control. In this case, this eter might be set to 50, and parameter 72.15 to the all motor speed at 50 Hz. ct, the output of the PID controller [72.15] when on (setpoint - feedback) = [72.14] and [72.32] = 1. The scaling is based on the ratio between 72.14 and For example, the values 50 and 1500 would produce me scaling as 1 and 3.	100.00
	-20000 200000		Proces	ss setpoint base.	1 = 1
72.15	Output	scaling	See pa	arameter 72.14 Setpoint scaling.	100.00
	-20000 200000		Proces	ss PID controller output base.	1 = 1
72.16	Setpoir	nt 1 source	See pa	arameter 40.16 Set 1 setpoint 1 source.	Al2 scaled
72.19	Interna sel1	l setpoint	See pa	arameter 40.19 Set 1 internal setpoint sel1.	Not selected
72.20	Interna sel2	l setpoint	See pa	arameter 40.20 Set 1 internal setpoint sel2.	Not selected
72.21	Interna	l setpoint 1	See pa	arameter 40.21 Set 1 internal setpoint 1.	0.00 PID Ext2 customer un
72.22	Interna	l setpoint 2	See pa	arameter 40.22 Set 1 internal setpoint 2.	0.00 PID Ext2

customer unit

No.	Io. Name/Value Description			
72.23	Internal setpoint 3	See parameter 40.23 Set 1 internal setpoint 3.	0.00 PID Ext2 customer unit	
72.26	Setpoint min	See parameter 40.26 Set 1 setpoint min.	0.00	
72.27	Setpoint max	See parameter 40.27 Set 1 setpoint max.	200000.00	
72.31	Deviation inversion	See parameter 40.31 Set 1 deviation inversion.	Not inverted (Ref - Fbk)	
72.32	Gain	See parameter 40.32 Set 1 gain.	1.00	
72.33	Integration time	See parameter 40.33 Set 1 integration time.	60.0 s	
72.34	Derivation time	See parameter 40.34 Set 1 derivation time.	0.000 s	
72.35	Derivation filter time	See parameter 40.35 Set 1 derivation filter time.	0.0 s	
72.36	Output min	See parameter 40.36 Set 1 output min.	-200000.00	
72.37	Output max	See parameter 40.37 Set 1 output max.	200000.00	
72.38	Output freeze enable	See parameter 40.38 Set 1 output freeze enable.	Not selected	
72.39	Deadband range	The control program compares the absolute value of parameter 72.04 Deviation act value to the deadband range defined by this parameter. If the absolute value is within the deadband range for the time period defined by parameter 72.40 Deadband delay, PID's deadband mode is activated and 72.06 PID status word bit 9 Deadband active is set. Then PID's output is frozen and 72.06 PID status word bit 2 Output frozen is set. If the absolute value is equal or greater than the deadband range, PID's deadband mode is deactivated.	0.0	
	0.0200000.0	Range	1 = 1	
72.40	Deadband delay	Defines the deadband delay for the deadband function. See parameter 72.39 Deadband range.	0.0 s	
	0.03600.0 s	Delay	1 = 1 s	
72.58	Increase prevention	See parameter 40.58 Set 1 increase prevention.	No	
72.59	Decrease prevention	See parameter 40.59 Set 1 decrease prevention.	No	
72.62	Internal setpoint actual	See parameter 40.62 PID internal setpoint actual.	0.00 PID Ext2 customer unit	

73 External PID3		Configuration of external PID3.	
73.01	External PID act value	See parameter 40.01 Process PID output actual.	-
73.02	Feedback act value	See parameter 40.02 Process PID feedback actual.	-
73.03	Setpoint act value	See parameter 40.03 Process PID setpoint actual.	-
73.04	Deviation act value	See parameter 40.04 Process PID deviation actual.	-

No.	Name/V	alue	Descri	ption	Def/FbEq16
73.06	PID stat	us word		ys status information on process external PID control. arameter is read-only.	-
	Bit	Name		Value	
	0	PID active		1 = Process PID control active.	
	1	Reserved			
	2	Output froz	en	1 = Process PID controller output frozen. Bit is set if para 73.38 Output freeze enable is TRUE, or the deadband active (bit 9 is set).	
	36	Reserved			
	7	Output limit	high	1 = PID output is being limited by par. 73.37.	
	8	Output limit	low	1 = PID output is being limited by par. 73.36.	
	9	Deadband	active	1 = Deadband is active.	
	1011	Reserved			
	12	Internal set active	point	1 = Internal setpoint active (see par. 73.1673.21)	
	1315	Reserved			
	0000h			ss PID control status word.	1 = 1
73.07				arameter 40.07 Process PID operation mode.	Off
73.08		ck 1 source	· ·	arameter 40.08 Set 1 feedback 1 source.	Al1 scaled
73.11		ck filter time		arameter 40.11 Set 1 feedback filter time.	0.000 s
73.14	Setpoint scaling		general scaling setpoir used a parame nominal In effective deviation Note: 73.15. the sar	s, together with parameter 73.15 Output scaling, a ll scaling factor for the external PID control chain. The just can be utilized when, for example, the process it is input in Hz, and the output of the PID controller is an rpm value in speed control. In this case, this eter might be set to 50, and parameter 73.15 to the all motor speed at 50 Hz. Let, the output of the PID controller [73.15] when on (setpoint - feedback) = [73.14] and [73.32] = 1. The scaling is based on the ratio between 73.14 and For example, the values 50 and 1500 would produce the scaling as 1 and 3.	100.00
	-200000 200000.		Proces	s setpoint base.	1 = 1
73.15	Output s	scaling	See pa	arameter 73.14 Setpoint scaling.	100.00
	-200000 200000.		Process PID controller output base.		1 = 1
73.16	Setpoint	t 1 source	See pa	arameter 40.16 Set 1 setpoint 1 source.	Al2 scaled
73.19	Internal sel1	setpoint	See pa	arameter 40.19 Set 1 internal setpoint sel1.	Not selected
73.20	Internal sel2	setpoint	See pa	arameter 40.20 Set 1 internal setpoint sel2.	Not selected
73.21	Internal	setpoint 1	See pa	arameter 40.21 Set 1 internal setpoint 1.	0.00 PID Ext3 customer unit
73.22	Internal	setpoint 2	See pa	arameter 40.22 Set 1 internal setpoint 2.	0.00 PID

Ext3 customer unit

No.	lo. Name/Value Description				
73.23	Internal setpoint 3	See parameter 40.23 Set 1 internal setpoint 3.	0.00 PID Ext3 customer unit		
73.26	Setpoint min	See parameter 40.26 Set 1 setpoint min.	0.00		
73.27	Setpoint max	See parameter 40.27 Set 1 setpoint max.	200000.00		
73.31	Deviation inversion	See parameter 40.31 Set 1 deviation inversion.	Not inverted (Ref - Fbk)		
73.32	Gain	See parameter 40.32 Set 1 gain.	1.00		
73.33	Integration time	See parameter 40.33 Set 1 integration time.	60.0 s		
73.34	Derivation time	See parameter 40.34 Set 1 derivation time.	0.000 s		
73.35	Derivation filter time	See parameter 40.35 Set 1 derivation filter time.	0.0 s		
73.36	Output min	See parameter 40.36 Set 1 output min.	-200000.00		
73.37	Output max	See parameter 40.37 Set 1 output max.	200000.00		
73.38	Output freeze enable	See parameter 40.38 Set 1 output freeze enable.	Not selected		
73.39	Deadband range	The control program compares the absolute value of parameter 73.04 Deviation act value to the deadband range defined by this parameter. If the absolute value is within the deadband range for the time period defined by parameter 73.40 Deadband delay, PID's deadband mode is activated and 73.06 PID status word bit 9 Deadband active is set. Then PID's output is frozen and 73.06 PID status word bit 2 Output frozen is set. If the absolute value is equal or greater than the deadband range, PID's deadband mode is deactivated.	0.0		
	0.0200000.0	Range	1 = 1		
73.40	Deadband delay	Defines the deadband delay for the deadband function. See parameter 73.39 Deadband range.	0.0 s		
	0.03600.0 s	Delay	1 = 1 s		
73.58	Increase prevention	See parameter 40.58 Set 1 increase prevention.	No		
73.59	Decrease prevention	See parameter 40.59 Set 1 decrease prevention.	No		
73.62	Internal setpoint actual	See parameter 40.62 PID internal setpoint actual.	0.00 PID Ext3 customer unit		

74 External PID4		Configuration of external PID4.	
74.01	External PID act value	See parameter 40.01 Process PID output actual.	-
74.02	Feedback act value	See parameter 40.02 Process PID feedback actual.	-
74.03	Setpoint act value	See parameter 40.03 Process PID setpoint actual.	-
74.04	Deviation act value	See parameter 40.04 Process PID deviation actual.	-

No.	Name/Value		Descri	ption	Def/FbEq16	
74.06	PID sta	tus word		ys status information on process external PID control. arameter is read-only.	-	
	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 particles output freeze enable is TRUE, or the deadband active (bit 9 is set).		
	36	Reserved				
	7	Output limit		1 = PID output is being limited by par. 74.37.		
	8	Output limit		1 = PID output is being limited by par. 74.36.		
	9	Deadband	active	1 = Deadband is active.		
	1011	Reserved				
	12	Internal set active	point	1 = Internal setpoint active (see par. 74.1674.23)		
	1315	Reserved				
	0000h.	FFFFh	Proces	ss PID control status word.	1 = 1	
74.07	PID op	eration mode	See pa	arameter 40.07 Process PID operation mode.	Off	
74.08	Feedback 1 source Se		See pa	arameter 40.08 Set 1 feedback 1 source.	Al1 scaled	
74.11	Feedba	ack filter time	ne See parameter 40.11 Set 1 feedback filter time.		0.000 s	
74.14	Setpoint scaling		genera scaling setpoir used a parame nomina In effect deviation Note: 74.15.	s, together with parameter 74.15 Output scaling, a all scaling factor for the external PID control chain. The plant can be utilized when, for example, the process it is input in Hz, and the output of the PID controller is an rpm value in speed control. In this case, this eter might be set to 50, and parameter 74.15 to the all motor speed at 50 Hz. but the output of the PID controller [74.15] when con (setpoint - feedback) = [74.14] and [74.32] = 1. The scaling is based on the ratio between 74.14 and For example, the values 50 and 1500 would produce me scaling as 1 and 3.	100.00	
	-20000 200000		Proces	s setpoint base.	1 = 1	
74.15	Output	scaling	See pa	arameter 74.14 Setpoint scaling.	100.00	
	-20000 200000		Proces	s PID controller output base.	1 = 1	
74.16	Setpoir	nt 1 source	See pa	arameter 40.16 Set 1 setpoint 1 source.	Al2 scaled	
74.19	Interna sel1	l setpoint	See pa	arameter 40.19 Set 1 internal setpoint sel1.	Not selected	
74.20	Interna sel2	l setpoint	See pa	arameter 40.20 Set 1 internal setpoint sel2.	Not selected	
74.21	Interna	l setpoint 1	See pa	arameter 40.21 Set 1 internal setpoint 1.	0.00 PID Ext4 customer ur	
74.22	Interna	setpoint 2	See pa	arameter 40.22 Set 1 internal setpoint 2.	0.00 PID	

Ext4 customer unit

No.	Name/Value	Description	Def/FbEq16
74.23	Internal setpoint 3	See parameter 40.23 Set 1 internal setpoint 3.	0.00 PID Ext4 customer unit
74.26	Setpoint min	See parameter 40.26 Set 1 setpoint min.	0.00
74.27	Setpoint max	See parameter 40.27 Set 1 setpoint max.	200000.00
74.31	Deviation inversion	See parameter 40.31 Set 1 deviation inversion.	Not inverted (Ref - Fbk)
74.32	Gain	See parameter 40.32 Set 1 gain.	1.00
74.33	Integration time	See parameter 40.33 Set 1 integration time.	60.0 s
74.34	Derivation time	See parameter 40.34 Set 1 derivation time.	0.000 s
74.35	Derivation filter time	See parameter 40.35 Set 1 derivation filter time.	0.0 s
74.36	Output min	See parameter 40.36 Set 1 output min.	-200000.00
74.37	Output max	See parameter 40.37 Set 1 output max.	200000.00
74.38	Output freeze enable	See parameter 40.38 Set 1 output freeze enable.	Not selected
74.39	Deadband range	The control program compares the absolute value of parameter 74.04 Deviation act value to the deadband range defined by this parameter. If the absolute value is within the deadband range for the time period defined by parameter 74.40 Deadband delay, PID's deadband mode is activated and 74.06 PID status word bit 9 Deadband active is set. Then PID's output is frozen and 74.06 PID status word bit 2 Output frozen is set. If the absolute value is equal or greater than the deadband range, PID's deadband mode is deactivated.	0.0
	0.0200000.0	Range	1 = 1
74.40	Deadband delay	Defines the deadband delay for the deadband function. See parameter 74.39 Deadband range.	0.0 s
	0.03600.0 s	Delay	1 = 1 s
74.58	Increase prevention	See parameter 40.58 Set 1 increase prevention.	No
74.59	Decrease prevention	See parameter 40.59 Set 1 decrease prevention.	No
74.62	Internal setpoint actual	See parameter 40.62 PID internal setpoint actual.	0.00 Ext4 customer unit

No.	Name/V	alue alue	Description		Def/FbEq16
76 PF(Config	uration	parameters.	fan control) and Autochange configuration Single pump and fan control (PFC) on page	
76.01	PFC status		PFC1, PFC2, PF 1st4th motor of auxiliary PFC aux represents the m first auxiliary mot set to All motors,	ning/stopped status of the PFC motors. C3 and PFC4 always correspond to the f the PFC system. If 76.74 Autochange xiliary PFC is set to Aux motors only, PFC1 otor connected to the drive and PFC2 the ror (the 2nd motor of the system). If 76.74 is PFC1 is the first motor, PFC2 the 2nd. The nected to any of these motors depending on functionality.	-
	Bit	Name		Value	
	0	PFC 1 runn	ing	0 = Stop, 1 = Start	
	1	PFC 2 runn	ing	0 = Stop, 1 = Start	
	2	PFC 3 runn	ing	0 = Stop, 1 = Start	
	3	PFC 4 runn	ing	0 = Stop, 1 = Start	
	415	Reserved			
	0000h	FFFFh	Status of the PF0	C relay outputs	1 = 1
76.02	PFC system status		Displays the status of the PFC system in text format. Provides a quick PFC system overview, for example, if the parameter is		-
			added to the Hon	ne view on the control panel.	
	PFC disabled		PFC (Pump and	fan control) is enabled.	0
	PFC ena started)	abled (not	PFC is enabled b	out not started.	1
	SPFC e started)	nabled (not	SPFC (Soft pump	p and fan control) is enabled but not started.	2
	MPFC enabled		Reserved.		3
	Running with VSD		The drive is contr motors are used.	rolling one pump/fan motor, no auxiliary	100
	Running + 1 Aux	with VSD	One auxiliary mo	tor has been taken in use.	101
	Running + 2 Aux	with VSD	Two auxiliary mo	tor have been taken in use.	102
	Running + 3 Aux	with VSD	Three auxiliary m	notor 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	g Aux1	Auxiliary motor 1	is being stopped.	300
	Stopping	g Aux2	Auxiliary motor 2	is being stopped.	301
	Stopping	g Aux2	Auxiliary motor 3	is being stopped.	302
	Autocha	nge active	Autochange, that active.	t is, automatic rotation of the start order is	400

No.	Name/Value	Description	Def/FbEq16
	No auxiliary motors available to be started	No auxiliary motors are available to be started, for example, all are already running, or a motor in 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 D503 VSD controlled PFC motor interlocked (page 196) is generated.	7
	All motors interlocked	All motors are interlocked (not available). Warning D502 All motors interlocked (page 196) 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
76.11	Pump/fan status 1	Shows the status of pump or fan 1.	-

Bit	Name	Value
0	Ready	0 = False, 1 = True
1	Reserved	
2	Running	0 = False, 1 = True
34	Reserved	
5	In PFC control	0 = False, 1 = True
610	Reserved	
11	Interlocked	0 = False, 1 = True
1215	Reserved	

	0000hFFFFh	Status of pump or fan 1.	1 = 1
76.12	Pump/fan status 2	See parameter 76.11 Pump/fan status 1.	-
76.13	Pump/fan status 3	See parameter 76.11 Pump/fan status 1.	-
76.14	Pump/fan status 4	See parameter 76.11 Pump/fan status 1.	-
76.21	PFC configuration	Selects the multi-pump/fan control (PFC) mode.	Off
	Off	PFC disabled.	0
	Reserved		1

536 Parameters

No.	Name/Value	Description	Def/FbEq16
	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	2
		The frequency (group 28 Frequency reference chain) / speed (group 22 Speed reference selection) reference must be defined as PID for the PFC functionality to work properly.	
	SPFC	SPFC enabled. See section Soft pump and fan control (SPFC) on page.151	3
76.25	Number of motors	Total number of motors used in the application, including the motor connected directly to the drive.	1
	14	Number of motors.	1 = 1
76.26	Min number of motors allowed	Minimum number of motors running simultaneously.	1
	04	Minimum number of motors.	1 = 1
76.27	Max number of motors allowed	Maximum number of motors running simultaneously.	1
	14	Maximum number of motors.	1 = 1

No.	Name/Value	Description	Def/FbEq16
76.30	Start point 1	Defines the start speed (Hz/rpm) for the first auxiliary motor. As the motor speed or frequency exceeds the limit defined by this parameter, a new auxiliary motor is started. 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. 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 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 decreases	Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0)
	Speed	76.55	1
	76.30 76.41	76.57	Max. speed
	Wiiii. Speed	76.58 Tim	е
	Aux. pump 1 Stop/Start ON ON OFF OFF OFF OFF OFF OFF OFF OFF O	Start Increasing flow Decreasing flow	
	032767 rpm/Hz	Speed/frequency.	1 = 1 unit
76.31	Start point 2	Defines the start speed (Hz/rpm) for the second auxiliary motor. See parameter 76.31 Start point 1.	Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0)
76.32	Start point 3	Defines the start speed (Hz/rpm) for the third auxiliary motor. See parameter 76.31 Start point 1.	Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0)

No.	Name/Value	Description	Def/FbEq16
76.41	Stop point 1	Defines the stop speed (Hz/rpm) 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 76.56 Stop delay 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 [Start point 1-Stop point 1] after the auxiliary motor stops.	Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0)
	032767 rpm/Hz	Speed/frequency	1 = 1 unit
76.42	Stop point 2	Defines the stop speed (Hz/rpm) for the second auxiliary motor. See parameter 76.41 Stop point 1.	Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0)
76.43	Stop point 3	Defines the stop speed (Hz/rpm) for the third auxiliary motor. See parameter 76.41 Stop point 1.	Vector: 800 rpm; Scalar 25 Hz; 30 Hz (95.20 b0)
76.55	Start delay	Defines a start delay for auxiliary motors. See parameter 76.31 Start point 1.	10.00 s
	0.0012600.00 s	Time delay.	1 = 1 s
76.56	Stop delay	Defines a stop delay for auxiliary motors. See parameter 76.31 Stop point 1.	10.00 s
	0.0012600.00 s	Time delay.	1 = 1 s
76.57	Speed hold on	Hold time for auxiliary motor switch-on. See parameter 76.31 Start point 1.	0.00 s
	0.001000.00 s	Time.	1 = 1 s
76.58	Speed hold off	Hold time for auxiliary motor switch-off. See parameter 76.31 Stop point 1.	0.00 s
	0.001000.00 s	Time.	1 = 1 s
76.59	PFC contactor delay	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
	0.20600.00 s	Time delay.	1 = 1 s
76.60	PFC ramp acceleration time	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
	0.001800.00 s	Time.	1 = 1 s

No.	Name/Value	Description	Def/FbEq16
76.61	PFC ramp deceleration time	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	1.00 s
		to the new reference).	
	0.001800.00 s	Time.	1 = 1 s
76.70	Autochange	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.	Not selected
		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.	
	Matadadad	See also section <i>Autochange</i> on page <i>150</i> .	0
	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
	Timed function 1	Autochange triggered by timed function 1 (bit 0 of 34.01 Timed functions status (see page 451)).	8
	Timed function 2	Autochange triggered by timed function 2 (bit 1 of 34.01 Timed functions status (see page 451)).	9
	Timed function 3	Autochange triggered by timed function 3 (bit 2 of 34.01 Timed functions status (see page 451)).	10
	Fixed interval	Autochange is done when the interval determined in the parameter 76.71 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

No.	Name/Value	Description	Def/FbEq16
	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 PFC maintenance and monitoring	13
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
76.71	Autochange interval	Specifies the interval that is used in setting <i>Fixed interval</i> of parameter <i>76.70 Autochange</i> .	1.00 h
	0.0042949672.95 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 <i>Even wear</i> setting of parameter <i>76.70 Autochange</i> .	10.00 h
	0.001000000.00 h	Time.	1 = 1 h
76.73	Autochange level	Upper speed limit for the Autochange to occur. The Autochange occurs when: • the condition defined in 76.70 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%
	0.0300.0%	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.	Aux motors only
	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 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
	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
76.81	PFC 1 interlock	Defines if the PFC motor 1 can be started. An interlocked PFC motor cannot be started. 0 = Interlocked (not available) 1 = Available.	Available. PFC motor is available
	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 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

No.	Name/Value	Description	Def/FbEq16
	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
	Timed function 1	Bit 0 of 34.01 Timed functions status (see page 451).	8
	Timed function 2	Bit 1 of 34.01 Timed functions status (see page 451).	9
	Timed function 3	Bit 2 of 34.01 Timed functions status (see page 451).	10
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
76.82	PFC 2 interlock	See parameter 76.81 PFC 1 interlock.	Available. PFC motor is available
76.83	PFC 3 interlock	See parameter 76.81 PFC 1 interlock.	Available. PFC motor is available
76.84	PFC 4 interlock	See parameter 76.81 PFC 1 interlock.	Available. PFC motor is available
76.95	Regulator bypass control	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.	Disable
	Disable	Automatic starting and stopping is disabled.	0
	Enable	Automatic starting and stopping is enabled.	1
	Other [bit]	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
	C maintenance onitoring	PFC (Pump and fan control) maintenance and monitoring parameters.	
77.10	PFC runtime change	Enables the reset, or arbitrary setting, of 77.11 Pump/fan 1 running time 77.14 Pump/fan 4 running time.	Done
	Done	The parameter automatically reverts back to this value.	0
	Set any PFC run time	Enables the setting of 77.11 Pump/fan 1 running time 77.14 Pump/fan 4 running time to an arbitrary value.	1
	Reset PFC1 run time	Resets parameter 77.11 Pump/fan 1 running time.	2
	Reset PFC2 run time	Resets parameter 77.12 Pump/fan 2 running time.	3
	Reset PFC3 run time	Resets parameter 77.13 Pump/fan 3 running time.	4
	Reset PFC4 run time	Resets parameter 77.14 Pump/fan 4 running time.	4
77.11	Pump/fan 1 running time	Running time counter of pump/fan 1. Can be set or reset by parameter 77.10 Pump/fan 1 running time.	0.00 h
	0.00 42949672.95 h	Time	1 = 1 h
77.12	Pump/fan 2 running time	See parameter 77.11 Pump/fan 1 running time.	0.00 h
77.13	Pump/fan 3 running time	See parameter 77.11 Pump/fan 1 running time.	0.00 h

No.	Name/Value	Description	Def/FbEq16
77.14	Pump/fan 4 running time	See parameter 77.11 Pump/fan 1 running time.	0.00 h
80 Flo	w calculation	Actual flow calculation.	
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 313.	-
	-200000.00 200000.00	Calculated flow.	1 = 1
80.02	Actual flow	Shows the percentage of parameter 80.01 Actual flow from 80.15 Maximum flow.	0.00
	-100.00100.00%	Flow percentage.	100 = 1%
80.11	Flow feedback 1 source	Selects the source for the flow feedback 1.	Not selected
	Not selected	Feedback not used.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	Freq in scaled	11.39 Freq in 1 scaled value (see page 356).	3
	Al1 percent	12.101 Al1 percent value (see page 361).	8
	Al2 percent	12.102 AI2 percent value (see page 361).	9
	Feedback data storage	40.91 Feedback data storage (see page 492).	10
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
80.12	Flow feedback 2 source	Selects the source for the flow feedback 2.	Not selected
	Not selected	Feedback not used.	0
	Al1 scaled	12.12 Al1 scaled value (see page 358).	1
	Al2 scaled	12.22 Al2 scaled value (see page 360).	2
	Freq in scaled	11.39 Freq in 1 scaled value (see page 356).	3
	Al1 percent	12.101 Al1 percent value (see page 361).	8
	Al2 percent	12.102 AI2 percent value (see page 361).	9
	Feedback data storage	40.91 Feedback data storage (see page 492).	10
	Other	Source selection (see <i>Terms and abbreviations</i> on page 324).	-
80.13	Flow feedback function	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.	In1
	ln1	Use 80.11 Flow feedback 1 source directly as the flow value.	0
	ln2	Use 80.12 Flow feedback 2 source directly as the flow value.	1
	Reserved		27

No.	Name/Value	Description	Def/FbEq16
	sqrt(In1)	Flow is calculated as a square root of a differential pressure measurement:	8
		$k\sqrt{\Delta P}$	
		The differential pressure value is selected with 80.11 Flow feedback 1 source.	
	sqrt(In1-In2)	Flow is calculated as a square root of two measured absolute pressure measurements:	9
		$k\sqrt{(P_1-P_2)}$	
		The pressure measurement sources are selected with 80.11 Flow feedback 1 source and 80.12 Flow feedback 2 source.	
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
	-200000.00 200000.00	Flow.	1 = 1
94 LS	U control	Control of the supply unit of the drive, such as DC voltage and reactive power reference. Note that the references defined here must also be selected as the reference source in the supply control program to be effective. This group is only visible for ACH580-31. See also section Control of a supply unit (LSU) (page 98).	
94.01	LSU control	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.	On
	Off	INU-LSU state machine disabled.	0
	On	INU-LSU state machine enabled.	1
94.02	LSU panel communication	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 ACH580-31	Disable
	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
94.10	LSU max charging time	Defines the maximum time the supply unit (LSU) is allowed for charging before fault 7584 LSU charge failed is generated.	15 s
	065535 s	Maximum charging time.	1 = 1 s

No.	Name/Value	Description	Def/FbEq16
94.11	LSU stop delay	Defines a stop delay for the supply unit. This parameter can be used to delay the opening of the main breaker/contactor when a restart is expected.	600.0 s
	0.0 3600.0 s	Supply unit stop delay.	10 = 1 s
94.22	User DC voltage reference	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	User reactive power reference	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	Power mot limit on net loss	Defines the maximum shaft power for motoring mode upon a supply network failure when IGBT supply unit control is active (bit 15 of 95.20 HW options word 1 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	Power gen limit on net loss	Defines the maximum shaft power for generating upon a supply network failure when supply unit control is active (bit 15 of 95.20 HW options word 1 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%
95 HW	/ configuration	Various hardware-related settings.	
95.01	Supply voltage	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. WARNING! An incorrect setting may cause the motor to rush uncontrollably, or the brake chopper or resistor to overload. 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. Note: In ACH580-31, you have to select the supply voltage manually as the automatic selection is not supported.	Automatic / not selected
	Automatic / not selected	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 Enable, in which case the drive estimates the supply voltage itself. Note: Not supported for ACH580-31.	0
	380415 V	380415 V	2
	440480 V	440480 V	3

No.	Name/Value	Description	Def/FbEq16
95.02	Adaptive voltage limits	Enables adaptive voltage limits. 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. This function is also useful if the AC supply voltage to the drive is high, as the warning levels are raised accordingly.	Enable
	Disable	Adaptive voltage limits disabled.	0
	Enable	Adaptive voltage limits enabled.	1
95.03	Estimated AC supply voltage	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. Note: This parameter is not used for ACH580-31. The supply voltage is shown by parameter 01.109 Grid voltage.	-
	065535 V	Voltage.	10 = 1 V
95.04	Control board supply	Specifies how the control board of the drive is powered.	Internal 24V
	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
95.15	Special HW settings	Contains hardware-related settings that can be enabled and disabled by toggling the specific bits. Notes: • The installation of the hardware specified by this parameter may require derating of drive output, or impose other limitations. Refer to the hardware manual of the drive. • 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].	0000000h

Bit	Name	Information	
0		1 = The driven motor is an Ex motor provided by ABB for potentiall explosive atmospheres. This sets the required minimum switching frequency for ABB Ex motors.	
		Notes:	
		 For non-ABB Ex 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.	
215	Reserved		

0000000h FFFFFFFh	Hardware options configuration word.	1 = 1

Specifies hardware-related options that require differentiated parameter defaults. This parameter defaults. This parameter is not affected by a parameter restore.	NI.	Name O	fal	D	test	D-4/Eh E 4.0	
Supply frequency 60 Hz				Specifi	les hardware-related options that require differentiated eter defaults.	Def/FbEq16	
G0 Hz G0 H		Bit	Name		Value		
112 Reserved 13 du/dt filter activation		0	Supply frequency 60 Hz		See section Differences in the default values between 50 Hz and 60 Hz supply frequency settings on page 568. 0 = 50 Hz.		
13 du/dt filter activation When active, an external du/dt filter is connected to the drive/inverte output. The setting will limit the output switching frequency, and force the fan of the drive/inverter module to full speed. 0 = du/dt filter inactive. 1 = du/dt filter inactive. 1 = du/dt filter active. 1 = du/dt filter inactive. 1		112					
15					output. The setting will limit the output switching frequer force the fan of the drive/inverter module to full speed. 0 = du/dt filter inactive.		
See section Control of a supply unit (LSU) (page 98). *See section configuration word. *See parameter set supply unit (LSU) (page 98). *See section configuration word. *See parameter set supply unit (LSU) (page 98).		14	Reserved				
Document Document		15		ition	parameters visible in groups 01, 05, 06, 07, 30, 31, 60,		
Specifies more hardware-related options that require differentiated parameter defaults. See parameter 95.20 HW options word 1. WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information Information word, recheck the values of the affected parameters. Active Parameter switching and bits in the parameter interface and other displayed information when viewed on the control panel. Notes: Not all languages listed below are necessarily supported.		*See se	ection Control	l of a su _l	pply unit (LSU) (page 98).		
differentiated parameter defaults. See parameter 95.20 HW options word 1. WARNING! After switching any bits in this word, recheck the values of the affected parameters. Bit Name Information 04 Reserved 5 Bypass present 1 = Bypass is used. 6 Cabinet drive 0 = Inactive, 1 = Active. 7 Cabinet fan 0 = Inactive, 1 = Active. 615 Reserved 0000b0101b Hardware options configuration word 2. 1 = 1 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 Selects the language of the parameter interface and other displayed information when viewed on the control panel. Notes: 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.)		0000h	.FFFFh	Hardwa	are options configuration word.	1 = 1	
04 Reserved 5 Bypass present 1 = Bypass is used. 6 Cabinet drive 0 = Inactive, 1 = Active. 7 Cabinet fan 0 = Inactive, 1 = Active. 615 Reserved Unough0101b Hardware options configuration word 2. 1 = 1 Selects the language selection; access levels; macro selection; parameter save and restore; control unit reboot; user parameter sets; unit selection; parameter checksum calculation; user lock. Selects the language of the parameter interface and other displayed information when viewed on the control panel. Notes: 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.)					s word 1. WARNING! After switching any bits in this word,		
5 Bypass present 1 = Bypass is used. 6 Cabinet drive 0 = Inactive, 1 = Active. 7 Cabinet fan 0 = Inactive, 1 = Active. 615 Reserved 0000b0101b Hardware options configuration word 2. 1 = 1 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 Selects the language of the parameter interface and other displayed information when viewed on the control panel. Notes: 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.)		Bit	Name		Information		
6 Cabinet drive 0 = Inactive, 1 = Active. 7 Cabinet fan 0 = Inactive, 1 = Active. 615 Reserved 0000b0101b Hardware options configuration word 2. 1 = 1 1 =		04	Reserved				
7 Cabinet fan 0 = Inactive, 1 = Active. 615 Reserved 0000b0101b Hardware options configuration word 2. 1 = 1 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 Selects the language of the parameter interface and other displayed information when viewed on the control panel. Notes: 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.)		5	Bypass pre	sent			
615 Reserved O000b0101b Hardware options configuration word 2. 1 = 1		6			0 = Inactive, 1 = Active.		
Document Document		7		0 = Inactive, 1 = Active.			
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 Selects the language of the parameter interface and other displayed information when viewed on the control panel. Notes: 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		615	Reserved				
parameter save and restore; control unit reboot; user parameter sets; unit selection; parameter checksum calculation; user lock. 96.01 Language Selects the language of the parameter interface and other displayed information when viewed on the control panel. Notes: 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		0000b	.0101b	Hardwa	are options configuration word 2.	1 = 1	
displayed information when viewed on the control panel. Notes: 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	96 Sys	6 System		parame	eter save and restore; control unit reboot; user eter sets; unit selection; parameter checksum		
13.00.00.00.00	96.01	96.01 Language		display Notes: Not This Driv	red information when viewed on the control panel. all languages listed below are necessarily supported. parameter does not affect the languages visible in the composer PC tool. (Those are specified under View	Not selected	
English English. 1033		Not sele	ected	None.		0	
		English		English	٦.	1033	

No.	Name/Value	Description	Def/FbEq16
	Deutsch	German.	1031
	Italiano	Italian.	1040
	Español	Spanish.	3082
	Portugues	Portuguese.	2070
	Nederlands	Dutch.	1043
	Français	French.	1036
	Dansk	Danish.	1030
	Suomi	Finnish.	1035
	Svenska	Swedish.	1053
	Russki	Russian.	1049
	Polski	Polish.	1045
	Türkçe	Turkish.	1055
	Chinese (Simplified, PRC)	Simplified Chinese.	2052
96.02	Pass code	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. Entering "358" toggles the parameter lock, which prevents the changing of all other parameters through the control panel or the Drive composer PC tool. Entering the user pass code (by default, "10000000") enables parameters 96.10096.102, which can be used to define a new user pass code and to select the actions that are to be prevented. Entering an invalid pass code will close the user lock if open, ie. hide parameters 96.10096.102. After entering the code, check that the parameters are in fact hidden. If they are not, enter another (random) pass code. Note: You must change the default user pass code to maintain a high level of cybersecurity. Store the code in a safe place — the protection cannot be disabled even by ABB if the code is lost. See also section Parameter checksum calculation (page 179).	
	099999999	Pass code.	-

No.	Name/Value		Description	Def/FbEq16
96.03	Access level status		Shows which access levels have been activated by pass codes entered into parameter 96.02 Pass code.	0001b
	Bit	Name		
	0	End user		
	1	Service		
	2	Advanced	programmer	
	39	Reserved		
	10	Override pa	arameter lock	
	11	OEM acces	ss level 1	
	12	OEM acces	ss level 2	
	13	OEM acces	ss level 3	
	14	Parameter	lock	
	15	Reserved		
	000000 FFFFF		Active access levels.	-
96.04	Macro	select	Selects the control macro. See chapter <i>Default configuration</i> (page <i>81</i>) for more information. After a selection is made, the parameter reverts automatically to <i>Done</i> .	Done
	Done		Macro selection complete; normal operation.	0
	HVAC (default	Factory default (page 83). For scalar motor control. You cannot select HVAC default with this parameter but only in the Primary settings menu, see page 81.	1
96.05	Macro	active	Shows which control macro is currently selected. See chapter Default configuration (page 81) for more information. To change the macro, use parameter 96.04 Macro select.	HVAC default
	HVAC (default	Factory default (page 83). For scalar motor control.	1
96.06			Restores the original settings of the control program, ie. parameter default values. Note: This parameter cannot be changed while the drive is running.	Done
	Done		Restoring is completed.	0
	Restore defaults		Restores all editable parameter values to default values, except motor data and ID run results l/O extension module settings end user texts, such as customized warnings and faults control panel/PC communication settings fieldbus adapter settings control macro selection and the parameter defaults implemented by it parameter 95.01 Supply voltage differentiated defaults implemented by parameters 95.20 HW options word 1 and 95.21 HW options word 2 user lock configuration parameters 96.10096.102.	8

No.	Name/Value	Description	Def/FbEq16
	Clear all	Restores all editable parameter values to default values, except • end user texts, such as customized warnings and faults • 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 • user lock configuration parameters 96.10096.102. • group 49 Panel port communication 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 contact info, customized fault and warning texts, PID unit and currency unit.	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 • differentiated defaults implemented by parameters 95.20 HW options word 1 and 95.21 HW options word 2.	34560
96.07	Parameter save manually	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 • 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.	Done
	Done	Save completed.	0
	Save	Save in progress.	1
96.08	Control board boot	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.	No action
	No action	1 = No action.	0
	Reboot	1 = Reboot the control unit.	1
96.10	User set status	Shows the status of the user parameter sets. This parameter is read-only. See also section <i>Data storage parameters</i> (page 179).	-
	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

No.	Name/Value	Description	Def/FbEq16
	User1 IO active	User set 1 has been selected by parameters 96.12 User set I/O mode in1 and 96.13 User set I/O mode in2.	4
	User2 IO active	User set 2 has been selected by parameters 96.12 User set I/O mode in1 and 96.13 User set I/O mode in2.	5
	User3 IO active	User set 3 has been selected by parameters 96.12 User set I/O mode in1 and 96.13 User set I/O mode in2.	6
	User4 IO active	User set 4 has been selected by parameters 96.12 User set I/O mode in1 and 96.13 User set I/O mode in2.	7
	Reserved		819
	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
96.11	User set save/load	Enables the saving and restoring of up to four custom sets of parameter settings. The set that was in use before powering down the drive is in use after the next power-up. Notes: Some hardware configuration settings, such as I/O extension module and fieldbus configuration parameters (groups 1416, 47, 5058 and 9293) 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. This parameter cannot be changed while the drive is running	No action
	No action	Load or save operation complete; normal operation.	0
	User set I/O mode	Load user parameter set using parameters 96.12 User set I/O mode in1 and 96.13 User set I/O mode in2.	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		617
	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

No.	Name/Value	Description			Def/FbEq16
96.12	User set I/O mode in1	When parameter 96.11 User set save/load is set to User set I/O mode, selects the user parameter set together with parameter 96.13 User set I/O mode in2 as follows:			Not selected
		Status of source defined by par. 96.12	Status of source defined by par. 96.13	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 (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				817
	Timed function 1	Bit 0 of 34.01 Timed	Bit 0 of 34.01 Timed functions status (see page 451).		
	Timed function 2	Bit 1 of 34.01 Timed	functions status (see	e page 451).	19
	Timed function 3	Bit 2 of 34.01 Timed	functions status (see	e page 451).	20
	Reserved				2123
	Supervision 1	Bit 0 of 32.01 Super	vision status (see pag	ge 444).	24
	Supervision 2	Bit 1 of 32.01 Super	vision status (see pag	ge 444).	25
	Supervision 3	Bit 2 of 32.01 Super	vision status (see pag	ge 444).	26
	Other [bit]	Source selection (se	e Terms and abbrevi	ations on page 324).	-
96.13	User set I/O mode in2	See parameter 96.12	2 User set I/O mode	in1.	Not selected

No.	Name/Value		Des	scription	Def/FbEq16	
96.16	Unit sele	ection		Selects the unit of parameters indicating power, temperature and torque.		
	Bit	Name		Information		
	0	Power unit		0 = kW		
				1 = hp		
	1	Reserved		lo - °0		
	2	Temperature unit		0 = °C 1 = °F		
	3			-		
	4	Torque unit		0 = Nm (N·m)		
				1 = lbft (lb·ft)		
	515	Reserved				
	0000000 FFFFF		Uni	t selection word.	1 = 1	
96.20	Time syr source	nc primary		fines the 1st priority external source for synchronization of drive's time and date.	Panel link	
	Internal		No	external source selected.	0	
	Reserve	d			12	
	Fieldbus A		Fiel	ldbus interface A.	3	
	Reserved				45	
	Embedded FB		Em	bedded fieldbus interface.	6	
	Reserved				7	
	Panel link			ntrol panel, or Drive composer PC tool connected to the ttrol panel.	8	
	Ethernet	tool link	Driv	ve composer PC tool through an FENA module.	9	
96.51	Clear fau			ars all events from the drive's fault and event logs. See tion Warning/fault history on page 184.	Done	
	Done		0 =	No action	0	
	Clear		1 =	Clear the loggers.	1	
96.54	Checksu	ım action	• <u>v</u>	ects how the drive reacts when 96.55 Checksum control word, bit 8 = 1 (Approved checksum A): if the parameter checksum 96.68 Actual checksum A does not match 96.71 Approved checksum A, and/or when 96.55 Checksum control word, bit 9 = 1 (Approved checksum B): if the parameter checksum 96.69 Actual checksum B does not match 96.72 Approved checksum B.	No action	
	No actio	n	No	action taken. (The checksum feature is not in use.)	0	
	Pure eve	ent		ve generates an event log entry B686 Checksum smatch.	1	
	Warning		Driv	ve generates warning A686 Checksum mismatch.	2	
	Warning prevent			ve generates warning A686 Checksum mismatch. Starting drive is prevented.	3	
	Fault		Driv	ve trips on fault 6200 Checksum mismatch.	4	

No.	Name/Value	Description	Def/FbEq16
96.55	Checksum control word	Bits 89 select which comparison(s) are made: • Bit 8 = 1 (Approved checksum A): 96.68 Actual checksum A is compared to 96.71 Approved checksum A, and/or • Bit 9 = 1 (Approved checksum A): if 96.69 Actual checksum B is compared to 96.72 Approved checksum B. Bits 1213 select approved (reference) checksum parameter(s) into which the actual checksum(s) from parameter(s) are copied: • Bit 12 = 1 (Set approved checksum A): Value of 96.68 Actual checksum A is copied into 96.71 Approved checksum A, and/or • Bit 13 = 1 (Set approved checksum B): Value of 96.69 Actual checksum B copied into 96.72 Approved checksum B.	0000000h

Bit	Name	Description
07	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.
1011	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).
1415	Reserved	

	0000000	Charlesum central word	1 = 1
	00000000 FFFFFFFh	Checksum control word.	1=1
96.68	Actual checksum A	Displays the actual parameter configuration checksum. Checksum A calculation does not include • fieldbus settings. The parameters included in the calculation are user editable parameters in parameter groups 1013, 15, 1925, 28, 3032, 3437, 4041, 43, 4546, 7074, 76, 80, 9499. See also section Parameter checksum calculation (page 179).	0h
	00000000h FFFFFFFh	Actual checksum.	-
96.69	Actual checksum B	Displays the actual parameter configuration checksum B. Checksum B calculation does not include • fieldbus settings • motor data settings • energy data settings. The parameters included in the calculation are user editable parameters in parameter groups 1013, 15, 1925, 28, 3032, 34, 3537, 4041, 43, 46, 7074, 76, 80, 9497. See also section Parameter checksum calculation (page 179).	Oh
	00000000h FFFFFFFh	Actual checksum.	-

No.	Name/Value	Description	Def/FbEq16
96.70	Disable adaptive program	Enables/disables the adaptive program (if present). See also section <i>Adaptive programming</i> (page 93).	Yes
	No	Adaptive program enabled.	0
	Yes	Adaptive program disabled.	1
96.71	Approved checksum A	Approved (reference) checksum A.	0h
	00000000h FFFFFFFh	Approved checksum A.	-
96.72	Approved checksum B	Approved (reference) checksum B.	0h
	00000000h FFFFFFFh	Approved checksum B.	-
96.78	550 Compatibility mode	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	Change user pass code	(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 179).	1000000
	10000000 99999999	New user pass code.	-
96.101	Confirm user pass code	(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.	-

No.	Name/Value	Description	Def/FbEq16
96.102	User lock functionality	(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 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.
34	Reserved	
5	Override lock	1 = Override locked. Group 70 Override parameters and reference or control chain parameters that have been selected to be used for override are write protected.
6	Reserved	
7	Disable panel Bluetooth	1 = Bluetooth disabled on ACS-AP-W control panel. If the drive is part of a panel bus, Bluetooth is disabled on all panels.
810	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
1415	Reserved	

0000hFFFFh	Selection of actions to be prevented by user lock.	-
96.108 LSU control bo boot	(Only visible for ACH580-31). 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
01	1 = Reboot the supply control unit.	1 = 1

No.	Name/Value	Description	Def/FbEq16
97 Mo	tor control	Switching frequency; slip gain; voltage reserve; flux braking; anti-cogging (signal injection); IR compensation.	
97.01	Switching frequency reference	Defines the switching frequency of the drive that is used as long as the drive stays below the thermal limit. Higher switching frequency results in lower acoustic motor noise. Lower switching frequency generates less switching losses and reduce EMC emissions. Notes: 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 CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual (3AXD50000030058 [English]. With an ABB EX motor, follow the instructions given in the ABB EX motor documentation.	2 kHz
	2 kHz	2 kHz.	2
	4 kHz	4 kHz.	4
	8 kHz	8 kHz.	8
	12 kHz	12 kHz.	12
97.02	Minimum switching frequency	Lowest switching frequency value that is allowed. Depends on the frame size. 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. Inverter temperature is shown by parameter 05.11 Inverter temperature. Notes: 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]. 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	Slip gain	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. 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%).	100%
	0200%	Slip gain.	1 = 1%
97.04	Voltage reserve	Defines the minimum allowed voltage reserve. When the voltage reserve has decreased to the set value, the drive enters the field weakening area. Note: This is an expert level parameter and should not be adjusted without appropriate skill. If the intermediate circuit DC voltage $U_{\rm dc}$ = 550 V and the voltage reserve is 5%, the RMS value of the maximum output voltage in steady-state operation is 0.95 × 550 V / sqrt(2) = 369 V 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.	-2%
	-450%	Voltage reserve.	1 = 1%
97.05	Flux braking	Defines the level of flux braking power. (Other stopping and braking modes can be configured in parameter group 21 Start/stop mode). Note: This is an expert level parameter and should not be adjusted without appropriate skill.	Disabled
	Disabled	Flux braking is disabled.	0
	Moderate	Flux level is limited during the braking. Deceleration time is longer compared to full braking.	1
	Full	Maximum braking power. Almost all available current is used to convert the mechanical braking energy to thermal energy in the motor. **Marning!* 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.	2
97.08	Optimizer minimum torque	This parameter can be used to improve the control dynamics of a synchronous reluctance motor or a salient permanent magnet synchronous motor. 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.	0.0%
		current and improve the torque response at low speeds.	

No.	Name/Value	Description	Def/FbEq16
97.10	Signal injection	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. Notes: 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.	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	Rotor time constant tuning. 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. Note: This is an expert level parameter and should not be adjusted without appropriate skill.	100%
	25400%	Rotor time constant tuning.	1 = 1%

No.	Name/Value	Description					Def/FbEq16
97.13	IR compensation	Defines the relative output voltage compensation). The function is us high break-away torque where verapplied. U / U _N (%) Relative output voltage. If compensation set to 15% 100% Field weakening frequency Typical IR compensation values a 3-phase U _N = 400 V (380415 V P _N (kW)	R R 6. Relative R communication of the communicatio	e outpute of the state of the s	ut voltagion.	ge. No - f (Hz)	Type specific (%)
	0.0050.00%	Voltage boost at zero speed in percent of nominal motor voltage.					1 = 1%
97.15	Motor model temperature adaptation	Enables the motor model tempera motor temperature can be used to dependent parameters (for examp model.	adap	t tempe	erature		Disabled
	Disabled	Temperature adaptation disabled.					0
	Estimated temperature	Temperature adaptation with moto (parameter 35.01 Motor estimated				ate	1
97.16	Stator temperature factor	Tunes the motor temperature depresentation parameters (stator resistance).	enden	ce of s	tator		50%
	0200%	Tuning factor.				1 = 1%	
97.17	Rotor temperature factor	Tunes the motor temperature dep parameters (eg. rotor resistance).		ce of r	otor		100%
	0200%	Tuning factor.					1 = 1%

No.	Name/Value	Description	Def/FbEq16
97.20	U/F ratio	Selects the form for the <i>Ulf</i> (voltage to frequency) ratio below field weakening point. For scalar control only. Notes: • The <i>Ulf</i> function cannot be used with energy optimization; if 45.11 Energy optimizer is set to Enable, parameter 97.20 <i>U/F ratio</i> 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].	Squared
	Linear	Linear ratio for constant torque applications.	0
	Squared	Squared ratio for centrifugal pump and fan applications. With squared U/f ratio the noise level is lower for most operating frequencies. Not recommended for permanent magnet motors.	1
97.49	Slip gain for scalar	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 Scalar).	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	IR comp max frequency	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 1000.0%	Frequency.	1 = 1%
98 Use param 98.01	er motor leters User motor model	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. Activates the motor model parameters 98.0298.12 and	Not selected
	mode	98.14. Notes: Parameter value is automatically set to zero when ID run is selected by parameter 99.13 ID run requested. The values of parameters 98.0298.12 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.	
	Not selected	Parameters 98.0298.12 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	Rs user	Defines the stator resistance $R_{\rm S}$ of the motor model. With a star-connected motor, $R_{\rm S}$ is the resistance of one winding. With a delta-connected motor, $R_{\rm S}$ is one-third of the resistance of one winding.	0.00000 p.u.
	0.000000.50000 p.u.	Stator resistance in per unit.	-
98.03	Rr user Defines the rotor resistance R_R of the motor model. Note: This parameter is valid only for asynchronous motors.		0.00000 p.u.
	0.000000.50000 p.u.	Rotor resistance in per unit.	-
98.04	Lm user	Defines the main inductance $L_{\rm M}$ of the motor model. Note: This parameter is valid only for asynchronous motors.	0.00000 p.u.
	0.0000010.00000 p.u.	Main inductance in per unit.	-
98.05	SigmaL user	Ser Defines the leakage inductance σL_S . Note: This parameter is valid only for asynchronous motors.	
	0.000001.00000 p.u.	Leakage inductance in per unit.	-
98.06	Ld user	Defines the direct axis (synchronous) inductance. Note: This parameter is valid only for permanent magnet motors.	0.00000 p.u.
	0.0000010.00000 p.u	Direct axis inductance in per unit.	-
98.07	Lq user	Defines the quadrature axis (synchronous) inductance. Note: This parameter is valid only for permanent magnet motors.	0.00000 p.u.
	0.0000010.00000 p.u	Quadrature axis inductance in per unit.	-
98.08	PM flux user	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	Rs user SI	Defines the stator resistance R_S of the motor model.	0.00000 ohm
	0.00000100.0000 0 ohm	Stator resistance.	-
98.10	Rr user SI	Defines the rotor resistance $R_{\rm R}$ of the motor model. Note : This parameter is valid only for asynchronous motors.	0.00000 ohm
	0.00000100.0000 0 ohm	Rotor resistance.	-
98.11	Lm user SI	Defines the main inductance $L_{\rm M}$ of the motor model. Note: This parameter is valid only for asynchronous motors.	0.00 mH
	0.00100000.00 mH	Main inductance.	1 = 10000 mH
98.12	SigmaL user SI	Defines the leakage inductance $\sigma L_{\rm S}$. Note: This parameter is valid only for asynchronous motors.	0.00 mH
	0.00100000.00 mH	Leakage inductance.	1 = 10000 mH

No.	Name/Value	Description	Def/FbEq16
98.13 Ld user SI Defines the direct axis (synchronous) inductance. Note: This parameter is valid only for permanent m motors.		Note: This parameter is valid only for permanent magnet	0.00 mH
	0.00100000.00 mH	Direct axis inductance.	1 = 10000 mH
98.14	Lq user SI	Defines the quadrature axis (synchronous) inductance. Note: This parameter is valid only for permanent magnet motors.	0.00 mH
	0.00100000.00 mH	Quadrature axis inductance.	1 = 10000 mH

99 Mo	tor data	Motor configuration settings.	
99.03	Motor type	Selects the motor type. Note: This parameter cannot be changed while the drive is running.	Asynchro- nous motor
	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	Motor control mode	Selects the motor control mode.	Scalar
	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 91)).	0

No.	Name/Value	Description	Def/FbEq16
	Scalar	Scalar control. Suitable for most applications, if top performance is not required. Motor identification run is not required. Note: Scalar control must be used in the following situations: • 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). Note: Correct motor operation requires that the magnetizing current of the motor does not exceed 90% of the nominal current of the inverter. See also section Operating modes of the drive (page 91).	1
99.06	Motor nominal current	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. Notes: 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.	0.0 A
	0.06400.0 A	Nominal current of the motor. The allowable range is $1/62 \times I_N$ of the drive $(02 \times I_N)$ with scalar control mode).	1 = 1 A
99.07	Motor nominal voltage	Defines the nominal motor voltage supplied to the motor. This setting must match the value on the rating plate of the motor. Notes: • 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 × 60 V = 180 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
	0.0960.0 V	Nominal voltage of the motor.	10 = 1 V
99.08	Motor nominal frequency	Defines the nominal motor frequency. This setting must match the value on the rating plate of the motor. Note: This parameter cannot be changed while the drive is running.	
	0.00500.00 Hz	Nominal frequency of the motor.	10 = 1 Hz
99.09	Motor nominal speed	Defines the nominal motor speed. The setting must match the value on the rating plate of the motor. Note: This parameter cannot be changed while the drive is running.	
	030000 rpm	Nominal speed of the motor.	1 = 1 rpm

No.	Name/Value	Description	Def/FbEq16
99.10	Motor nominal power	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.	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	Motor nominal cos Φ	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: 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
	0.001.00	Cosphi of the motor.	100 = 1
99.12	Motor nominal torque	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
	0.0004000000.000 N·m or 0.0002950248.597 lb·ft	Nominal motor torque.	1 = 100 unit

No.	Name/Value	Description	Def/FbEq16
99.13	ID run requested	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. 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. After the ID run, the drive stops and this parameter is automatically set to None. Notes: • To ensure that the ID run can work properly, the drive limits	None
		in group 30 (maximum speed and minimum speed, and maximum torque and minimum torque) must to 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, 99.0699.12) 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	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	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. Notes: 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.	1
		Check the direction of rotation of the motor before starting the ID run. During the run, the motor will rotate in the forward direction. WARNING! The motor will run at up to approximately 50100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR.	
		ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!	

No.	Name/Value	Description	Def/FbEq16
	Reduced	Reduced ID run. This mode should be selected instead of the Normal or Advanced ID Run if • 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). 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). 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. WARNING! The motor will run at up to approximately 50100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!	2
	Standstill	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. Note: This mode should be selected only if the Normal, Reduced or Advanced ID run is not possible due to the restrictions caused by the connected mechanics (for example, with lift or crane applications).	3
	Reserved		45
	Advanced	Advanced ID run. Only for frames R6R11 and ACH580-31. 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. Note: The driven machinery must be de-coupled from the motor because of high torque and speed transients that are applied. 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!	6
99.14	Last ID run performed	Shows the type of ID run that was performed last. For more information about the different modes, see the selections of parameter 99.13 ID run requested.	None
	None	No ID run has been performed.	0
	Normal	Normal ID run.	1
	Reduced	Reduced ID run.	2
	Standstill	Standstill ID run.	3
	Reserved		45
	Advanced	Advanced ID run.	6

No.	Name/Value	Description	Def/FbEq16
99.15	Motor polepairs calculated	Calculated number of pole pairs in the motor.	0
	01000	Number of pole pairs.	1 = 1
99.16	Motor phase order	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: 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.	UVW
	UVW	Normal.	0
	UWV	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	Freq in 1 at scaled max	1500.000	1800.000
15.35	Freq out 1 src max	1500.000	1800.000
12.20	Al1 scaled at Al1 max	50.000	60.000
13.18	AO1 source max	50.0	60.0
22.26	Constant speed 1	300.00 rpm	360.00 rpm
22.27	Constant speed 2	600.00 rpm	720.00 rpm
22.28	Constant speed 3	900 .00 rpm	1080.00 rpm
22.29	Constant speed 4	1200.00 rpm	1440.00 rpm
22.30	Constant speed 5	1500.00 rpm	1800.00 rpm
22.30	Constant speed 6	2400.00 rpm	2880.00 rpm
22.31	Constant speed 7	3000.00 rpm	3600.00 rpm
28.26	Constant frequency 1	5.00 Hz	6.00 Hz
28.27	Constant frequency 2	10.00 Hz	12.00 Hz
28.28	Constant frequency 3	15.00 Hz	18.00 Hz
28.29	Constant frequency 4	20.00 Hz	24.00 Hz
28.30	Constant frequency 5	25.00 Hz	30.00 Hz
28.31	Constant frequency 6	40.00 Hz	48.00 Hz
28.32	Constant frequency 7	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

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 323).

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 preselected 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 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 <i>Parameters</i> (page 323).
List	Selection list.

Term	Definition
No.	Parameter number.
РВ	Packed Boolean (bit list).
Real	Real number.
Туре	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	Туре	Range	Unit	FbEq32	
01 Actual values						
01.01	Motor speed used	Real	-30000.0030000.00	rpm	100 = 1 rpm	
01.02	Motor speed estimated	Real	-30000.0030000.00	rpm	100 = 1 rpm	
01.03	Motor speed %	Real	-1000.001000.00	%	100 = 1%	
01.06	Output frequency	Real	-500.00500.00	Hz	100 = 1 Hz	
01.07	Motor current	Real	0.0030000.00	Α	100 = 1 A	
01.08	Motor current % of motor nom	Real	0.01000.0	%	10 = 1%	
01.09	Motor current % of drive nom	Real	0.01000.0	%	10 = 1%	
01.10	Motor torque	Real	-1600.01600.0	%	10 = 1%	
01.11	DC voltage	Real	0.002000.00	V	100 = 1 V	
01.13	Output voltage	Real	02000	V	1 = 1 V	
01.14	Output power	Real	-32768.0032767.00	kW or hp	100 = 1 unit	
01.15	Output power % of motor nom	Real	-300.00300.00	%	100 = 1%	
01.16	Output power % of drive nom	Real	-300.00300.00	%	100 = 1%	
01.17	Motor shaft power	Real	-32768.0032767.00	kW or hp	100 = 1 unit	
01.18	Inverter GWh counter	Real	065535	GWh	1 = 1 GWh	
01.19	Inverter MWh counter	Real	01000	MWh	1 = 1 MWh	
01.20	Inverter kWh counter	Real	01000	kWh	1 = 1 kWh	
01.24	Flux actual %	Real	0200	%	1 = 1%	
01.30	Nominal torque scale	Real	0.0004000000	N·m or lb·ft	1000 = 1 unit	
01.31	Ambient temperature	Real	-40.0120.0	°C or °F	10 = 1 °	
01.50	Current hour kWh	Real	0.001000000.00	kWh	100 = 1 kWh	
01.51	Previous hour kWh	Real	0.001000000.00	kWh	100 = 1 kWh	
01.52	Current day kWh	Real	0.001000000.00	kWh	100 = 1 kWh	
01.53	Previous day kWh	Real	0.001000000.00	kWh	100 = 1 kWh	
01.54	Cumulative inverter energy	Real	-200000000.0 2000000000.0	kWh	1 = 1 kWh	
01.55	Inverter GWh counter (resettable)	Real	065535	GWh	1 = 1 GWh	
01.56	Inverter MWh counter (resettable)	Real	01000	MWh	1 = 1 MWh	
01.57	Inverter kWh counter (resettable)	Real	01000	kWh	1 = 1 kWh	
01.58	Cumulative inverter energy (resettable)	Real	-20000000.0 200000000.0	kWh	1 = 1 kWh	
01.61	Abs motor speed used		0.0030000.00	rpm	100 = 1 rpm	
01.62	Abs motor speed %		0.001000.00%	%	100 = 1%	
01.63	Abs output frequency		0.00500.00 Hz	Hz	100 = 1 Hz	
01.64	Abs motor torque		0.01600.0	%	10 = 1%	
01.65	Abs output power		0.0032767.00	kW	100 = 1 kW	
01.66	Abs output power % motor nom		0.00300.00	%	100 = 1%	

No.	Name	Type	Range	Unit	FbEq32		
01.67	Abs output power % drive nom		0.00300.00	%	100 = 1%		
01.68	Abs motor shaft power		0.0032767.00	kW	100 = 1 kW		
	(Parameters 01.10201.164 only visible for ACH580-31)						
01.102	Line current	Real	0.00 30000.00	Α	100 = 1 A		
01.104	Active current	Real	0.00 30000.00	Α	100 = 1 A		
01.106	Reactive current	Real	0.00 30000.00	Α	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	030000	kW	1 = 1 kW		
03 Input	references						
03.01	Panel reference	Real	-100000.00100000.00	-	100 = 1		
03.02	Panel reference remote	Real	-100000.00100000.00	-	100 = 1		
03.05	FB A reference 1	Real	-100000.00100000.00	-	100 = 1		
03.06	FB A reference 2	Real	-100000.00100000.00	-	100 = 1		
03.09	EFB reference 1	Real	-30000.0030000.00	-	100 = 1		
03.10	EFB reference 2	Real	-30000.0030000.00	-	100 = 1		
04 Warn	ings and faults						
04.01	Tripping fault	Data	0000hFFFFh	-	1 = 1		
04.02	Active fault 2	Data	0000hFFFFh	-	1 = 1		
04.03	Active fault 3	Data	0000hFFFFh	-	1 = 1		
04.06	Active warning 1	Data	0000hFFFFh	-	1 = 1		
04.07	Active warning 2	Data	0000hFFFFh	-	1 = 1		
04.08	Active warning 3	Data	0000hFFFFh	-	1 = 1		
04.11	Latest fault	Data	0000hFFFFh	-	1 = 1		
04.12	2nd latest fault	Data	0000hFFFFh	ı	1 = 1		
04.13	3rd latest fault	Data	0000hFFFFh	1	1 = 1		
04.16	Latest warning	Data	0000hFFFFh	1	1 = 1		
04.17	2nd latest warning	Data	0000hFFFFh	1	1 = 1		
04.18	3rd latest warning	Data	0000hFFFFh	1	1 = 1		
04.40	Event word 1	PB	0000hFFFFh	-	1 = 1		
04.41	Event word 1 bit 0 code	Data	0000hFFFFh	-	1 = 1		
04.43	Event word 1 bit 1 code	Data	0000hFFFFh	-	1 = 1		
04.45, 04,47, 04,49, 		•••					
04.71	Event word 1 bit 15 code	Data	0000hFFFFh	-	1 = 1		

No.	Name	Туре	Range	Unit	FbEq32	
05 Diagnostics						
05.01	On-time counter	Real	065535	d	1 = 1 d	
05.02	Run-time counter	Real	065535	d	1 = 1 d	
05.03	Hours run	Real	0.0429496729.5	h	10 = 1 h	
05.04	Fan on-time counter	Real	065535	d	1 = 1 d	
05.08	Cabinet temperature	Real	-40120	°C or °F	10 = 1 °	
05.10	Control board temperature	Real	-100300	°C or °F	10 = 1 °	
05.11	Inverter temperature	Real	-40.0160.0	%	10 = 1%	
05.20	Diagnostic word 1	PB	0000hFFFFh	-		
05.21	Diagnostic word 2	PB	0000hFFFFh	-		
05.22	Diagnostic word 3	PB	0000hFFFFh	-		
05.80	Motor speed at fault	Real	-3000030000.00	rpm	100 = 1 rpm	
05.81	Output frequency at fault	Real	-500.00500.00	Hz	100 = 1 Hz	
05.82	DC voltage at fault	Real	0.002000.00	V	100 = 1 V	
05.83	Motor current at fault	Real	0.0030000.00	Α	100 = 1 A	
05.84	Motor torque at fault	Real	-1600.01600.0	%	10 = 1%	
05.85	Main status word at fault	PB	0000hFFFFh	-	1 = 1	
05.86	DI delayed status at fault	PB	0000hFFFFh	-	1 = 1	
05.87	Inverter temperature at fault	Real	-40.0160.0	%	10 = 1%	
05.88	Reference used at fault	Real	-500.00500.00 or -30000.0030000.00	Hz or rpm	100 = 1 unit	
05.89	HVAC status word at fault	PB	0000hFFFFh	-	1 = 1	
	(Parameters 0	5.11105.1	21 only visible for ACH580-3	1)		
05.111	Line converter temperature	Real	-40.0 160.0	%	10 = 1%	
05.121	MCB closing counter	Real	04294967295	%	1 = 1	
06 Cont	rol and status words					
06.01	Main control word	PB	0000hFFFFh	-	1 = 1	
06.11	Main status word	PB	0000hFFFFh	-	1 = 1	
06.16	Drive status word 1	PB	0000hFFFFh	-	1 = 1	
06.17	Drive status word 2	PB	0000hFFFFh	-	1 = 1	
06.18	Start inhibit status word	PB	0000hFFFFh	-	1 = 1	
06.19	Speed control status word	PB	0000hFFFFh	-	1 = 1	
06.20	Constant speed status word	PB	0000hFFFFh	-	1 = 1	
06.21	Drive status word 3	PB	0000hFFFFh	-	1 = 1	
06.22	HVAC status word	PB	0000hFFFFh	-	1 = 1	
06.30	MSW bit 11 selection	Binary src	-	-	1 = 1	
06.31	MSW bit 12 selection	Binary src	-	-	1 = 1	
06.32	MSW bit 13 selection	Binary src	-	-	1 = 1	
06.33	MSW bit 14 selection	Binary src	-	-	1 = 1	

No.	Name	Type	Range	Unit	FbEq32		
	(Parameters 06.3606.118 only visible for ACH580-31)						
06.36	LSU Status word	PB	0000hFFFFh	-	1 = 1		
06.39	Internal state machine LSU CW	PB	0000hFFFFh	-	1 = 1		
06.116	LSU drive status word 1	PB	0000hFFFFh	-	1 = 1		
06.118	LSU start inhibit status word	PB	0000hFFFFh	-	1 = 1		
07 Syste	em info						
07.03	Drive rating id	List	0999	-	1 = 1		
07.04	Firmware name	List	-	-	1 = 1		
07.05	Firmware version	Data	-	-	1 = 1		
07.06	Loading package name	List	-	-	1 = 1		
07.07	Loading package version	Data	-	-	1 = 1		
07.11	Cpu usage	Real	0100	%	1 = 1%		
07.25	Customization package name	Data	-	-	1 = 1		
07.26	Customization package version	Data	-	-	1 = 1		
07.30	Adaptive program status	PB	0000hFFFFh	-	1 = 1		
07.31	AP sequence state	Data	020	-	1 = 1		
(Parameters 07.10607.107 only visible for ACH580-31)							
07.106	LSU loading package name	List	-	-	1 = 1		
07.107	LSU loading package version	Data	-	-	1 = 1		

Parameter groups 10...99

No.	Name	Type	Range	Unit	FbEq32
10 Stan	dard DI, RO				
10.01	DI status	PB	0000hFFFFh	-	1 = 1
10.02	DI delayed status	PB	0000hFFFFh	-	1 = 1
10.03	DI force selection	PB	0000hFFFFh	-	1 = 1
10.04	DI forced data	PB	0000hFFFFh	-	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	0000hFFFFh	-	1 = 1
10.22	RO force selection	PB	0000hFFFFh	-	1 = 1
10.23	RO forced data	PB	0000hFFFFh	-	1 = 1
10.24	RO1 source	Binary src	-	-	1 = 1
10.25	RO1 ON delay	Real	0.03000.0	s	10 = 1 s
10.26	RO1 OFF delay	Real	0.03000.0	S	10 = 1 s
10.27	RO2 source	Binary src	-	-	1 = 1
10.28	RO2 ON delay	Real	0.03000.0	s	10 = 1 s
10.29	RO2 OFF delay	Real	0.03000.0	s	10 = 1 s
10.30	RO3 source	Binary src	-	-	1 = 1
10.31	RO3 ON delay	Real	0.03000.0	S	10 = 1 s
10.32	RO3 OFF delay	Real	0.03000.0	S	10 = 1 s
10.99	RO/DIO control word	PB	0000hFFFFh	-	1 = 1
10.101	RO1 toggle counter	Real	04294967000	-	1 = 1
10.102	RO2 toggle counter	Real	04294967000	-	1 = 1
10.103	RO3 toggle counter	Real	04294967000	-	1 = 1
11 Stan	dard DIO, FI, FO				
11.21	DI5 configuration	List	01	-	1 = 1
11.38	Freq in 1 actual value	Real	016000	Hz	1 = 1 Hz
11.39	Freq in 1 scaled value	Real	-32768.00032767.000	-	1000 = 1

No.	Name	Туре	Range	Unit	FbEq32
11.42	Freq in 1 min	Real	016000	Hz	1 = 1 Hz
11.43	Freq in 1 max	Real	016000	Hz	1 = 1 Hz
11.44	Freq in 1 at scaled min	Real	-32768.00032767.000	-	1000 = 1
11.45	Freq in 1 at scaled max	Real	-32768.00032767.000	-	1000 = 1
12 Stan	dard Al			•	
12.02	Al force selection	PB	0000hFFFFh	-	1 = 1
12.03	Al supervision function	List	04	-	1 = 1
12.04	Al supervision selection	PB	0000hFFFFh	-	1 = 1
12.11	Al1 actual value	Real	0.00022.000 mA or 0.00011.000 V	mA or V	1000 = 1 unit
12.12	Al1 scaled value	Real	-32768.00032767.000	-	1000 = 1
12.13	Al1 forced value	Real	0.00020.000 mA or 0.00010.000 V	mA or V	1000 = 1 unit
12.15	Al1 unit selection	List	2, 10	-	1 = 1
12.16	AI1 filter time	Real	0.00030.000	s	1000 = 1 s
12.17	Al1 min	Real	0.00020.000 mA or 0.00010.000 V	mA or V	1000 = 1 unit
12.18	Al1 max	Real	0.00022.000 mA or 0.00011.000 V	mA or V	1000 = 1 unit
12.19	Al1 scaled at Al1 min	Real	-32768.00032767.000	-	1000 = 1
12.20	Al1 scaled at Al1 max	Real	-32768.00032767.000	-	1000 = 1
12.21	Al2 actual value	Real	0.00022.000 mA or 0.00011.000 V	mA or V	1000 = 1 unit
12.22	Al2 scaled value	Real	-32768.00032767.000	-	1000 = 1
12.23	Al2 forced value	Real	0.00020.000 mA or 0.00010.000 V	mA or V	1000 = 1 unit
12.25	Al2 unit selection	List	2, 10	-	1 = 1
12.26	AI2 filter time	Real	0.00030.000	s	1000 = 1 s
12.27	AI2 min	Real	0.00020.000 mA or 0.00010.000 V	mA or V	1000 = 1 unit
12.28	AI2 max	Real	0.00022.000 mA or 0.00011.000 V	mA or V	1000 = 1 unit
12.29	Al2 scaled at Al2 min	Real	-32768.00032767.000	-	1000 = 1
12.30	Al2 scaled at Al2 max	Real	-32768.00032767.000	-	1000 = 1
12.101	Al1 percent value	Real	0.00100.00	%	100 = 1%
12.102	Al2 percent value	Real	0.00100.00	%	100 = 1%
13 Stan	dard AO				
13.02	AO force selection	PB	0000hFFFFh	-	1 = 1
13.11	AO1 actual value	Real	0.00022.000 or 0.00011000 V	mA	1000 = 1 mA
13.12	AO1 source	Analog src	-	-	1 = 1
13.13	AO1 forced value	Real	0.00022.000 or 0.00011000 V	mA	1000 = 1 mA
13.15	AO1 unit selection	List	2, 10	-	1 = 1

No.	Name	Туре	Range	Unit	FbEq32
13.16	AO1 filter time	Real	0.00030.000	s	1000 = 1 s
13.17	AO1 source min	Real	-32768.032767.0	-	10 = 1
13.18	AO1 source max	Real	-32768.032767.0	-	10 = 1
13.19	AO1 out at AO1 src min	Real	0.00022.000 or 0.00011000 V	mA	1000 = 1 mA
13.20	AO1 out at AO1 src max	Real	0.00022.000 or 0.00011000 V	mA	1000 = 1 mA
13.21	AO2 actual value	Real	0.00022.000	mA	1000 = 1 mA
13.22	AO2 source	Analog src	-	-	1 = 1
13.23	AO2 forced value	Real	0.00022.000	mA	1000 = 1 mA
13.26	AO2 filter time	Real	0.00030.000	s	1000 = 1 s
13.27	AO2 source min	Real	-32768.032767.0	-	10 = 1
13.28	AO2 source max	Real	-32768.032767.0	-	10 = 1
13.29	AO2 out at AO2 src min	Real	0.00022.000	mA	1000 = 1 mA
13.30	AO2 out at AO2 src max	Real	0.00022.000	mA	1000 = 1 mA
13.91	AO1 data storage	Real	-327.68327.67	-	100 = 1
13.92	AO2 data storage	Real	-327.68327.67	-	100 = 1
15 I/O e	xtension module				
15.01	Extension module type	List	04	-	1 = 1
15.02	Detected extension module	List	04	-	1 = 1
15.03	DI status	PB	0000hFFFFh	-	1 = 1
15.04	RO/DO status	PB	0000hFFFFh	-	1 = 1
15.05	RO/DO force selection	PB	0000hFFFFh	-	1 = 1
15.06	RO/DO forced data	PB	0000hFFFFh	-	1 = 1
15.07	RO4 source	Binary src	-	-	1 = 1
15.08	RO4 ON delay	Real	0.03000.0	s	10 = 1 s
15.09	RO4 OFF delay	Real	0.03000.0	S	10 = 1 s
15.10	RO5 source	Binary src	-	-	1 = 1
15.11	RO5 ON delay	Real	0.03000.0	s	10 = 1 s
15.12	RO5 OFF delay	Real	0.03000.0	s	10 = 1 s
15.22	DO1 configuration	List	0, 2	-	1 = 1
15.23	DO1 source	Binary src	-	-	1 = 1
15.24	DO1 ON delay	Real	0.03000.0	s	10 = 1 s
15.25	DO1 OFF delay	Real	0.03000.0	S	10 = 1 s
15.32	Freq out 1 actual value	Real	016000	Hz	1 = 1 Hz
15.33	Freq out 1 source	Analog src	-	-	1 = 1
15.34	Freq out 1 src min	Real	-32768.032767.0	-	1000 = 1
15.35	Freq out 1 src max	Real	-32768.032767.0	-	1000 = 1

No.	Name	Туре	Range	Unit	FbEq32					
15.36	Freq out 1 at src min	Real	016000	Hz	1 = 1 Hz					
15.37	Freq out 1 at src max	Real	016000	Hz	1 = 1 Hz					
19 Oper	19 Operation mode									
19.01	Actual operation mode	List	16, 10, 20	-	1 = 1					
19.11	Ext1/Ext2 selection	Binary src	-	-	1 = 1					
19.18	HAND/OFF disable source	Binary src	-	-	1 = 1					
19.19	HAND/OFF disable action	List	02	-	1 = 1					
20 Start	/stop/direction									
20.01	Ext1 commands	List	06, 1112, 14	-	1 = 1					
20.02	Ext1 start trigger type	List	01	-	1 = 1					
20.03	Ext1 in1 source	Binary src	-	-	1 = 1					
20.04	Ext1 in2 source	Binary src	-	-	1 = 1					
20.05	Ext1 in3 source	Binary src	-	-	1 = 1					
20.06	Ext2 commands	List	06, 1112, 14	-	1 = 1					
20.07	Ext2 start trigger type	List	01	-	1 = 1					
20.08	Ext2 in1 source	Binary src	-	-	1 = 1					
20.09	Ext2 in2 source	Binary src	-	-	1 = 1					
20.10	Ext2 in3 source	Binary src	-	-	1 = 1					
20.21	Direction	List	02	-	1 = 1					
20.40	Run permissive	Binary src	-	-	1 = 1					
20.41	Start interlock 1	Binary src	-	-	1 = 1					
20.42	Start interlock 2	Binary src	-	-	1 = 1					
20.43	Start interlock 3	Binary src	-	-	1 = 1					
20.44	Start interlock 4	Binary src	-	-	1 = 1					
20.45	Start interlock stop mode	Binary src	-	-	1 = 1					
20.46	Run permissive text	Binary src	-	-	1 = 1					
20.47	Start interlock 1 text	Binary src	-	-	1 = 1					
20.48	Start interlock 2 text	Binary src	-	-	1 = 1					
20.49	Start interlock 3 text	Binary src	-	-	1 = 1					

No.	Name	Туре	Range	Unit	FbEq32
20.50	Start interlock 4 text	Binary	-	-	1 = 1
00.54	Otant interded to a sandition	src		_	1 = 1
20.51	Start interlock condition	Binary src	-	-	1 = 1
21 Start	/stop mode	1			1
21.01	Start mode	List	02	-	1 = 1
21.02	Magnetization time	Real	010000	ms	1 = 1 ms
21.03	Stop mode	List	02	-	1 = 1
21.04	Emergency stop mode	List	02	-	1 = 1
21.05	Emergency stop source	Binary src	-	-	1 = 1
21.06	Zero speed limit	Real	0.0030000.00	rpm	100 = 1 rpm
21.07	Zero speed delay	Real	030000	ms	1 = 1 ms
21.08	DC current control	PB	0000b0011b	-	1 = 1
21.09	DC hold speed	Real	0.001000.00	rpm	100 = 1 rpm
21.10	DC current reference	Real	0.0100.0	%	10 = 1%
21.11	Post magnetization time	Real	03000	S	1 = 1 s
21.14	Pre-heating input source	Binary src	-	-	1 = 1
21.15	Pre-heating time delay	Real	03000	s	1 = 1 s
21.16	Pre-heating current	Real	0.030.0	%	10 = 1%
21.18	Auto restart time	Real	0.0, 0.110.0	s	10 = 1 s
21.19	Scalar start mode	List	06	-	1 = 1
21.21	DC hold frequency	Real	0.001000.00	Hz	100 = 1 Hz
21.22	Start delay	Real	0.0060.00	S	100 = 1 s
21.23	Smooth start	Real	02	-	1 = 1
21.24	Smooth start current	Real	10.0100.0	%	100 = 1%
21.25	Smooth start speed	Real	2.0100.0	%	100 = 1%
21.26	Torque boost current	Real	15.0300.0	%	100 = 1%
21.30	Speed compensated stop mode	Real	03	-	1 = 1
21.31	Speed comp stop delay	Real	0.001000.00	s	100 = 1 s
21.32	Speed comp stop threshold	Real	0100	%	1 = 1%
21.34	Force auto restart	List	01	-	1 = 1
22 Spee	d reference selection				
22.01	Speed ref unlimited	Real	-30000.0030000.00	rpm	100 = 1 rpm
22.11	Ext1 speed ref1	Analog src	-	-	1 = 1
22.12	Ext1 speed ref2	Analog src	-	-	1 = 1
22.13	Ext1 speed function	List	05	-	1 = 1
22.18	Ext2 speed ref1	Analog src	-	-	1 = 1

No.	Name	Туре	Range	Unit	FbEq32
23.12	Acceleration time 1	Real	0.0001800.000	s	1000 = 1 s
23.13	Deceleration time 1	Real	0.0001800.000	s	1000 = 1 s
23.14	Acceleration time 2	Real	0.0001800.000	s	1000 = 1 s
23.15	Deceleration time 2	Real	0.0001800.000	s	1000 = 1 s
23.23	Emergency stop time	Real	0.0001800.000	s	1000 = 1 s
23.28	Variable slope enable	List	01	-	1 = 1
23.29	Variable slope rate	Real	230000	ms	1 = 1 ms
24 Spee	d reference conditioning				
24.01	Used speed reference	Real	-30000.0030000.00	rpm	100 = 1 rpm
24.02	Used speed feedback	Real	-30000.0030000.00	rpm	100 = 1 rpm
24.03	Speed error filtered	Real	-30000.030000.0	rpm	100 = 1 rpm
24.04	Speed error inverted	Real	-30000.030000.0	rpm	100 = 1 rpm
24.11	Speed correction	Real	-10000.0010000.00	rpm	100 = 1 rpm
24.12	Speed error filter time	Real	010000	ms	1 = 1 ms
25 Spee	d control				
25.01	Torque reference speed control	Real	-1600.01600.0	%	10 = 1%
25.02	Speed proportional gain	Real	0.00250.00	-	100 = 1
25.03	Speed integration time	Real	0.001000.00	s	100 = 1 s
25.04	Speed derivation time	Real	0.00010.000	s	1000 = 1 s
25.05	Derivation filter time	Real	010000	ms	1 = 1 ms
25.06	Acc comp derivation time	Real	0.001000.00	S	100 = 1 s
25.07	Acc comp filter time	Real	0.01000.0	ms	10 = 1 ms
25.15	Proportional gain em stop	Real	1.00250.00	-	100 = 1
25.53	Torque prop reference	Real	-30000.030000.0	%	10 = 1%
25.54	Torque integral reference	Real	-30000.030000.0	%	10 = 1%
25.55	Torque deriv reference	Real	-30000.030000.0	%	10 = 1%
25.56	Torque acc compensation	Real	-30000.030000.0	%	10 = 1%
28 Freq	uency reference chain				
28.01	Frequency ref ramp input	Real	-500.00500.00	Hz	100 = 1 Hz
28.02	Frequency ref ramp output	Real	-500.00500.00	Hz	100 = 1 Hz
28.11	Ext1 frequency ref1	Analog src	-	=	1 = 1
28.12	Ext1 frequency ref2	Analog src	-	-	1 = 1
28.13	Ext1 frequency function	List	05	-	1 = 1
28.15	Ext2 frequency ref1	Analog src	-	-	1 = 1
28.16	Ext2 frequency ref2	Analog src	-	-	1 = 1
28.17	Ext2 frequency function	List	05	-	1 = 1
28.21	Constant frequency function	PB	00b11b	-	1 = 1

28.22 Constant frequency sel1 Binary src - 1 = 1	No.	Name	Type	Range	Unit	FbEq32
28.23 Constant frequency sel2 Binary src	28.22	Constant frequency sel1		-	-	1 = 1
28.24 Constant frequency sel3 Binary src		0 / //				
28.26 Constant frequency 1 Real -500.00500.00 Hz 100 = 1 Hz	28.23	Constant frequency sei2		-	-	1 = 1
28.26 Constant frequency 1 Real -500.00500.00 Hz 100 = 1 Hz	28.24	Constant frequency sel3	Binary	=	-	1 = 1
28.27 Constant frequency 2 Real -500.00500.00 Hz 100 = 1 Hz			src			
28.28 Constant frequency 3 Real -500.00500.00 Hz 100 = 1 Hz	28.26	Constant frequency 1	Real	-500.00500.00	Hz	
28.29 Constant frequency 4 Real -500.00500.00 Hz 100 = 1 Hz	28.27	Constant frequency 2	Real	-500.00500.00	Hz	100 = 1 Hz
28.30 Constant frequency 5 Real -500.00500.00 Hz 100 = 1 Hz	28.28	Constant frequency 3	Real	-500.00500.00	Hz	100 = 1 Hz
28.31 Constant frequency 6 Real -500.00500.00 Hz 100 = 1 Hz	28.29	Constant frequency 4	Real	-500.00500.00	Hz	100 = 1 Hz
28.32 Constant frequency 7 Real -500.00500.00 Hz 100 = 1 Hz 28.41 Frequency ref safe Real -500.00500.00 Hz 100 = 1 Hz 28.51 Critical frequency function PB 00b11b - 1 = 1 28.52 Critical frequency 1 low Real -500.00500.00 Hz 100 = 1 Hz 28.53 Critical frequency 2 low Real -500.00500.00 Hz 100 = 1 Hz 28.54 Critical frequency 2 high Real -500.00500.00 Hz 100 = 1 Hz 28.55 Critical frequency 3 low Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq ramp set selection Binary - - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s <	28.30	Constant frequency 5	Real	-500.00500.00	Hz	100 = 1 Hz
28.41 Frequency ref safe Real -500.00500.00 Hz 100 = 1 Hz 28.51 Critical frequency function PB 00b11b - 1 = 1 28.52 Critical frequency 1 low Real -500.00500.00 Hz 100 = 1 Hz 28.53 Critical frequency 2 low Real -500.00500.00 Hz 100 = 1 Hz 28.54 Critical frequency 2 high Real -500.00500.00 Hz 100 = 1 Hz 28.55 Critical frequency 3 low Real -500.00500.00 Hz 100 = 1 Hz 28.56 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq amp set selection Binary src - - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s <t< td=""><td>28.31</td><td>Constant frequency 6</td><td>Real</td><td>-500.00500.00</td><td>Hz</td><td>100 = 1 Hz</td></t<>	28.31	Constant frequency 6	Real	-500.00500.00	Hz	100 = 1 Hz
28.51 Critical frequency function PB 00b11b - 1 = 1 28.52 Critical frequency 1 low Real -500.00500.00 Hz 100 = 1 Hz 28.53 Critical frequency 2 low Real -500.00500.00 Hz 100 = 1 Hz 28.54 Critical frequency 2 low Real -500.00500.00 Hz 100 = 1 Hz 28.55 Critical frequency 3 low Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 ligh Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 ligh Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 ligh Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 ligh Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq amp set selection Binary src - 1 = 1 1 100 = 1 Hz 28.72 Freq deceleration time 1 Real 0.0001800.000 s	28.32	Constant frequency 7	Real	-500.00500.00	Hz	100 = 1 Hz
28.52 Critical frequency 1 low Real -500.00500.00 Hz 100 = 1 Hz	28.41	Frequency ref safe	Real	-500.00500.00	Hz	100 = 1 Hz
28.53 Critical frequency 1 high Real -500.00500.00 Hz 100 = 1 Hz 28.54 Critical frequency 2 low Real -500.00500.00 Hz 100 = 1 Hz 28.55 Critical frequency 2 high Real -500.00500.00 Hz 100 = 1 Hz 28.56 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq ramp set selection Binary src - - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq armp in zero source Binary src - - 1 = 1 <tr< td=""><td>28.51</td><td>Critical frequency function</td><td>PB</td><td>00b11b</td><td>-</td><td>1 = 1</td></tr<>	28.51	Critical frequency function	PB	00b11b	-	1 = 1
28.54 Critical frequency 2 low Real -500.00500.00 Hz 100 = 1 Hz 28.55 Critical frequency 2 high Real -500.00500.00 Hz 100 = 1 Hz 28.56 Critical frequency 3 low Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq ramp set selection Binary src - - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30.01 Limi	28.52	Critical frequency 1 low	Real	-500.00500.00	Hz	100 = 1 Hz
28.55 Critical frequency 2 high Real -500.00500.00 Hz 100 = 1 Hz 28.56 Critical frequency 3 low Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq ramp set selection Binary src - - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz	28.53	Critical frequency 1 high	Real	-500.00500.00	Hz	100 = 1 Hz
28.56 Critical frequency 3 low Real -500.00500.00 Hz 100 = 1 Hz 28.57 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq ramp set selection Binary src - - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.02 <td< td=""><td>28.54</td><td>Critical frequency 2 low</td><td>Real</td><td>-500.00500.00</td><td>Hz</td><td>100 = 1 Hz</td></td<>	28.54	Critical frequency 2 low	Real	-500.00500.00	Hz	100 = 1 Hz
28.57 Critical frequency 3 high Real -500.00500.00 Hz 100 = 1 Hz 28.71 Freq ramp set selection Binary src - - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 30.01 Limits PB 0000hFFFFh - 1 = 1 30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.12 Maximum speed	28.55	Critical frequency 2 high	Real	-500.00500.00	Hz	100 = 1 Hz
28.71 Freq ramp set selection Binary src - 1 = 1 28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq amp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30.1 Limit word 1 PB 0000hFFFFh - 1 = 1 30.12 Maximum speed Real -30000.0030000.00 rpm 100 = 1 rpm 30.13 Minimum frequency	28.56	Critical frequency 3 low	Real	-500.00500.00	Hz	100 = 1 Hz
28.72 Freq acceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.73 Freq deceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.12 Maximum speed Real -30000.0030000.00 rpm 100 = 1 rpm 30.12 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 <	28.57	Critical frequency 3 high	Real	-500.00500.00	Hz	100 = 1 Hz
28.73 Freq deceleration time 1 Real 0.0001800.000 s 1000 = 1 s 28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Max	28.71	Freq ramp set selection		-	-	1 = 1
28.74 Freq acceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -500.00500.00 Hz 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current	28.72	Freq acceleration time 1	Real	0.0001800.000	s	1000 = 1 s
28.75 Freq deceleration time 2 Real 0.0001800.000 s 1000 = 1 s 28.76 Freq ramp in zero source Binary src - - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real -500.003000.00 A 100 = 1 A 30.18 Torq lim sel <	28.73	Freq deceleration time 1	Real	0.0001800.000	s	1000 = 1 s
28.76 Freq ramp in zero source Binary src - 1 = 1 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30 Limits 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -3000.003000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real -500.003000.00 A 100 = 1 A 30.18 Torq lim sel Binary src - - - 1 = 1	28.74	Freq acceleration time 2	Real	0.0001800.000	s	1000 = 1 s
src src 28.92 Frequency ref act 3 Real -500.00500.00 Hz 100 = 1 Hz 28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30 Limits 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Maximum frequency Real -500.00500.00 A 100 = 1 Hz 30.18 Torq lim sel Binary src - - - - - - - - - - - -	28.75	Freq deceleration time 2	Real	0.0001800.000	s	1000 = 1 s
28.96 Frequency ref act 7 Real -500.00500.00 Hz 100 = 1 Hz 28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30 Limits 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real 0.0030000.00 A 100 = 1 A 30.18 Torq lim sel Binary src - - 1 = 1	28.76	Freq ramp in zero source		-	-	1 = 1
28.97 Frequency ref unlimited Real -500.00500.00 Hz 100 = 1 Hz 30 Limits 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1 30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -30000.003000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real 0.0030000.00 A 100 = 1 A 30.18 Torq lim sel Binary src - - 1 = 1	28.92	Frequency ref act 3	Real	-500.00500.00	Hz	100 = 1 Hz
30 Limits 30.01 Limit word 1 PB 0000hFFFFh - 1 = 1	28.96	Frequency ref act 7	Real	-500.00500.00	Hz	100 = 1 Hz
30.01 Limit word 1 PB 0000hFFFFh - 1 = 1	28.97	Frequency ref unlimited	Real	-500.00500.00	Hz	100 = 1 Hz
30.02 Torque limit status PB 0000hFFFFh - 1 = 1 30.11 Minimum speed Real -30000.0030000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -30000.0030000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real 0.0030000.00 A 100 = 1 A 30.18 Torq lim sel Binary src - - 1 = 1	30 Limit	s				
30.11 Minimum speed Real -30000.0030000.00 rpm 100 = 1 rpm 30.12 Maximum speed Real -30000.0030000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real 0.0030000.00 A 100 = 1 A 30.18 Torq lim sel Binary src - - 1 = 1	30.01	Limit word 1	PB	0000hFFFFh	-	1 = 1
30.12 Maximum speed Real -30000.0030000.00 rpm 100 = 1 rpm 30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real 0.0030000.00 A 100 = 1 A 30.18 Torq lim sel Binary src - - 1 = 1	30.02	Torque limit status	PB	0000hFFFFh	-	1 = 1
30.13 Minimum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.14 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz 30.17 Maximum current Real 0.0030000.00 A 100 = 1 A 30.18 Torq lim sel Binary src - 1 = 1	30.11	Minimum speed	Real	-30000.0030000.00	rpm	100 = 1 rpm
30.14 Maximum frequency Real -500.00500.00 Hz 100 = 1 Hz	30.12	Maximum speed	Real	-30000.0030000.00	rpm	100 = 1 rpm
30.17 Maximum current	30.13	Minimum frequency	Real	-500.00500.00	Hz	100 = 1 Hz
30.18 Torq lim sel	30.14	Maximum frequency	Real	-500.00500.00	Hz	100 = 1 Hz
src	30.17	Maximum current	Real	0.0030000.00	Α	100 = 1 A
	30.18	Torq lim sel	•	-	-	1 = 1
	30.19	Minimum torque 1	Real	-1600.00.0	%	10 = 1%

No.	Name	Type	Range	Unit	FbEq32
30.20	Maximum torque 1	Real	0.01600.0	%	10 = 1%
30.21	Min torque 2 source	Analog src	-	-	1 = 1
30.22	Max torque 2 source	Analog src	-	-	1 = 1
30.23	Minimum torque 2	Real	-1600.00.0	%	10 = 1%
30.24	Maximum torque 2	Real	0.01600.0	%	10 = 1%
30.26	Power motoring limit	Real	0.00600.00	%	100 = 1%
30.27	Power generating limit	Real	-600.000.00	%	100 = 1%
30.30	Overvoltage control	List	01	-	1 = 1
30.31	Undervoltage control	List	01	-	1 = 1
30.35	Thermal current limitation	List	01	-	1 = 1
30.36	Speed limit selection	Binary src	-	-	1 = 1
30.37	Minimum speed source	Analog src	-	-	1 = 1
30.38	Maximum speed source	Analog src	-	-	1 = 1
	,		49 only visible for ACH580-	31)	
	LSU limit word 1	PB	0000hFFFFh	-	1 = 1
30.102	LSU limit word 2	PB	0000hFFFFh	-	1 = 1
	LSU limit word 3	PB	0000hFFFFh	-	1 = 1
30.104	LSU limit word 4	PB	0000hFFFFh	-	1 = 1
30.149	LSU maximum power limit	Real	0.0 200.0	%	10 = 1%
31 Fault	functions				
31.01	External event 1 source	Binary src	-	-	1 = 1
31.02	External event 1 type	List	01	-	1 = 1
31.03	External event 2 source	Binary src	-	-	1 = 1
31.04	External event 2 type	List	01	-	1 = 1
31.05	External event 3 source	Binary src	-	-	1 = 1
31.06	External event 3 type	List	01	-	1 = 1
31.07	External event 4 source	Binary src	-	-	1 = 1
31.08	External event 4 type	List	01	-	1 = 1
31.09	External event 5 source	Binary src	-	-	1 = 1
31.10	External event 5 type	List	01	-	1 = 1
31.11	Fault reset selection	Binary src	-	-	1 = 1
31.12	Autoreset selection	PB	0000hFFFFh	-	1 = 1
31.13	Selectable fault	Real	0000hFFFFh	-	1 = 1
31.14	Number of trials	Real	05	-	1 = 1

No.	Name	Туре	Range	Unit	FbEq32				
31.15	Total trials time	Real	1.0600.0	S	10 = 1 s				
31.16	Delay time	Real	0.0120.0	S	10 = 1 s				
31.19	Motor phase loss	List	01	-	1 = 1				
31.20	Earth fault	List	02	-	1 = 1				
31.21	Supply phase loss	List	01	-	1 = 1				
31.22	STO indication run/stop	List	05	-	1 = 1				
31.23	Wiring or earth fault	List	01	-	1 = 1				
31.24	Stall function	List	02	-	1 = 1				
31.25	Stall current limit	Real	0.01600.0	%	10 = 1%				
31.26	Stall speed limit	Real	0.0010000.00	rpm	100 = 1 rpm				
31.27	Stall frequency limit	Real	0.001000.00	Hz	100 = 1 Hz				
31.28	Stall time	Real	03600	S	1 = 1 s				
31.30	Overspeed trip margin	Real	0.0010000.00	rpm	100 = 1 rpm				
31.31	Frequency trip margin	Real	0.0010000.00	Hz	100 = 1 Hz				
31.32	Emergency ramp supervision	Real	0300	%	1 = 1%				
31.33	Emergency ramp supervision delay	Real	0100	S	1 = 1 s				
31.36	Aux fan fault bybass	List	01	-	1 = 1				
	(Parameters 31.12031.121 only visible for ACH580-31)								
31.120	LSU earth fault	List	01	-	1 = 1				
31.121	LSU supply phase loss	List	01	-	1 = 1				
32 Supe	rvision								
32.01	Supervision status	PB	0000hFFFFh	-	1 = 1				
32.05	Supervision 1 function	List	06	-	1 = 1				
32.06	Supervision 1 action	List	03	-	1 = 1				
32.07	Supervision 1 signal	Analog src	-	-	1 = 1				
32.08	Supervision 1 filter time	Real	0.00030.000	s	1000 = 1 s				
32.09	Supervision 1 low	Real	-21474836.00 21474836.00	-	100 = 1				
32.10	Supervision 1 high	Real	-21474836.00 21474836.00	-	100 = 1				
32.11	Supervision 1 hysteresis	Real	0.00100000.00	-	100 = 1				
32.15	Supervision 2 function	List	06	-	1 = 1				
32.16	Supervision 2 action	List	03	-	1 = 1				
32.17	Supervision 2 signal	Analog src	-	-	1 = 1				
32.18	Supervision 2 filter time	Real	0.00030.000	S	1000 = 1 s				
32.19	Supervision 2 low	Real	-21474836.00 21474836.00	-	100 = 1				
32.20	Supervision 2 high	Real	-21474836.00 21474836.00	-	100 = 1				
32.21	Supervision 2 hysteresis	Real	0.00100000.00	-	100 = 1				

No.	Name	Туре	Range	Unit	FbEq32
32.25	Supervision 3 function	List	06	-	1 = 1
32.26	Supervision 3 action	List	03	-	1 = 1
32.27	Supervision 3 signal	Analog src	-	-	1 = 1
32.28	Supervision 3 filter time	Real	0.00030.000	S	1000 = 1 s
32.29	Supervision 3 low	Real	-21474836.00 21474836.00	-	100 = 1
32.30	Supervision 3 high	Real	-21474836.00 21474836.00	-	100 = 1
32.31	Supervision 3 hysteresis	Real	0.00100000.00	-	100 = 1
32.35	Supervision 4 function	List	06	-	1 = 1
32.36	Supervision 4 action	List	03	-	1 = 1
32.37	Supervision 4 signal	Analog src	-	-	1 = 1
32.38	Supervision 4 filter time	Real	0.00030.000	s	1000 = 1 s
32.39	Supervision 4 low	Real	-21474836.00 21474836.00	-	100 = 1
32.40	Supervision 4 high	Real	-21474836.00 21474836.00	-	100 = 1
32.41	Supervision 4 hysteresis	Real	0.00100000.00	-	100 = 1
32.45	Supervision 5 function	List	06	-	1 = 1
32.46	Supervision 5 action	List	03	-	1 = 1
32.47	Supervision 5 signal	Analog src	-	-	1 = 1
32.48	Supervision 5 filter time	Real	0.00030.000	S	1000 = 1 s
32.49	Supervision 5 low	Real	-21474836.00 21474836.00	-	100 = 1
32.50	Supervision 5 high	Real	-21474836.00 21474836.00	-	100 = 1
32.51	Supervision 5 hysteresis	Real	0.00100000.00	-	100 = 1
32.55	Supervision 6 function	List	06	-	1 = 1
32.56	Supervision 6 action	List	03	-	1 = 1
32.57	Supervision 6 signal	Analog src	-	-	1 = 1
32.58	Supervision 6 filter time	Real	0.00030.000	s	1000 = 1 s
32.59	Supervision 6 low	Real	-21474836.00 21474836.00	-	100 = 1
32.60	Supervision 6 high	Real	-21474836.00 21474836.00	-	100 = 1
32.61	Supervision 6 hysteresis	Real	0.00100000.00	-	100 = 1
34 Time	d functions				
34.01	Timed functions status	PB	0000hFFFFh	-	1 = 1
34.02	Timer status	PB	0000hFFFFh	-	1 = 1
34.04	Season/exception day status	PB	0000hFFFFh	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
34.10	Timed functions enable	Binary	-	-	1 = 1
		src			
	Timer 1 configuration	PB	0000hFFFFh	-	1 = 1
	Timer 1 start time	Time	00:00:0023:59:59	S	1 = 1 s
	Timer 1 duration	Duration	00 00:0007 00:00	min	1 = 1 min
	Timer 2 configuration	PB	0000hFFFFh	-	1 = 1
34.15	Timer 2 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.16	Timer 2 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.17	Timer 3 configuration	PB	0000hFFFFh	-	1 = 1
34.18	Timer 3 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.19	Timer 3 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.20	Timer 4 configuration	PB	0000hFFFFh	-	1 = 1
34.21	Timer 4 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.22	Timer 4 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.23	Timer 5 configuration	PB	0000hFFFFh	-	1 = 1
34.24	Timer 5 start time	Time	00:00:0023:59:59	s	1 = 1 s
34.25	Timer 5 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.26	Timer 6 configuration	PB	0000hFFFFh	-	1 = 1
34.27	Timer 6 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.28	Timer 6 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.29	Timer 7 configuration	PB	0000hFFFFh	-	1 = 1
34.30	Timer 7 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.31	Timer 7 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.32	Timer 8 configuration	PB	0000hFFFFh	-	1 = 1
34.33	Timer 8 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.34	Timer 8 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.35	Timer 9 configuration	PB	0000hFFFFh	-	1 = 1
34.36	Timer 9 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.37	Timer 9 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.38	Timer 10 configuration	PB	0000hFFFFh	-	1 = 1
34.39	Timer 10 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.40	Timer 10 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.41	Timer 11 configuration	PB	0000hFFFFh	-	1 = 1
34.42	Timer 11 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.43	Timer 11 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.44	Timer 12 configuration	PB	0000hFFFFh	-	1 = 1
34.45	Timer 12 start time	Time	00:00:0023:59:59	S	1 = 1 s
34.46	Timer 12 duration	Duration	00 00:0007 00:00	min	1 = 1 min
34.60	Season 1 start date	Date	01.0131.12	d	1 = 1 d
34.61	Season 2 start date	Date	01.0131.12	d	1 = 1 d
34.62	Season 3 start date	Date	01.0131.12	d	1 = 1 d

No.	Name	Туре	Range	Unit	FbEq32
34.63	Season 4 start date	Date	01.0131.12	d	1 = 1 d
34.70	Number of active exceptions	Real	016	-	1 = 1
34.71	Exception types	PB	0000hFFFFh	-	1 = 1
34.72	Exception 1 start	Date	01.0131.12	d	1 = 1 d
34.73	Exception 1 length	Real	060	d	1 = 1 d
34.74	Exception 2 start	Date	01.0131.12	d	1 = 1 d
34.75	Exception 2 length	Real	060	d	1 = 1 d
34.76	Exception 3 start	Date	01.0131.12	d	1 = 1 d
34.77	Exception 3 length	Real	060	d	1 = 1 d
34.78	Exception day 4	Date	01.0131.12	d	1 = 1 d
34.79	Exception day 5	Date	01.0131.12	d	1 = 1 d
34.80	Exception day 6	Date	01.0131.12	d	1 = 1 d
34.81	Exception day 7	Date	01.0131.12	d	1 = 1 d
34.82	Exception day 8	Date	01.0131.12	d	1 = 1 d
34.83	Exception day 9	Date	01.0131.12	d	1 = 1 d
34.84	Exception day 10	Date	01.0131.12	d	1 = 1 d
34.85	Exception day 11	Date	01.0131.12	d	1 = 1 d
34.86	Exception day 12	Date	01.0131.12	d	1 = 1 d
34.87	Exception day 13	Date	01.0131.12	d	1 = 1 d
34.88	Exception day 14	Date	01.0131.12	d	1 = 1 d
34.89	Exception day 15	Date	01.0131.12	d	1 = 1 d
34.90	Exception day 16	Date	01.0131.12	d	1 = 1 d
34.100	Timed function 1	PB	0000hFFFFh	i	1 = 1
34.101	Timed function 2	PB	0000hFFFFh	i	1 = 1
34.102	Timed function 3	PB	0000hFFFFh	ı	1 = 1
34.110	Boost time function	PB	0000hFFFFh	-	1 = 1
34.111	Boost time activation source	Binary src	-	-	1 = 1
34.112	Boost time duration	Duration	00 00:0007 00:00	min	1 = 1 min
35 Moto	r thermal protection				
35.01	Motor estimated temperature	Real	-601000 °C or -761832 °F	°C or °F	1 = 1 °
35.02	Measured temperature 1	Real	-605000 °C or -769032 °F, 0 ohm or [<i>35.12</i>] ohm	°C, °F or ohm	1 = 1 unit
35.03	Measured temperature 2	Real	-605000 °C or -769032 °F, 0 ohm or [35.12] ohm	°C, °F or ohm	1 = 1 unit
35.11	Temperature 1 source	List	02, 58, 1116, 19, 21, 22	-	1 = 1
35.12	Temperature 1 fault limit	Real	-605000 °C or -769032 °F	°C, °F or ohm	1 = 1 unit

No.	Name	Туре	Range	Unit	FbEq32
35.13	Temperature 1 warning limit	Real	-605000 °C or -769032 °F	°C, °F or ohm	1 = 1 unit
35.14	Temperature 1 Al source	Analog src	-	-	1 = 1
35.21	Temperature 2 source	List	02, 58, 1116, 19	-	1 = 1
35.22	Temperature 2 fault limit	Real	-605000 °C or -769032 °F	°C, °F or ohm	1 = 1 unit
35.23	Temperature 2 warning limit	Real	-605000 °C or -769032 °F	°C, °F or ohm	1 = 1 unit
35.24	Temperature 2 Al source	Analog src	-	-	1 = 1
35.31	Safe motor temperature enable	List	01	-	1 = 1
35.50	Motor ambient temperature	Real	-60100 °C or -76 212 °F	°C	1 = 1 °
35.51	Motor load curve	Real	50150	%	1 = 1%
35.52	Zero speed load	Real	25150	%	1 = 1%
35.53	Break point	Real	1.00 500.00	Hz	100 = 1 Hz
35.54	Motor nominal temperature rise	Real	0300 °C or 32572 °F	°C or °F	1 = 1 °
35.55	Motor thermal time constant	Real	10010000	s	1 = 1 s
35.57	Motor overload class	List	05	-	1 = 1
36 Load	analyzer				
36.01	PVL signal source	Analog src	-	-	1 = 1
36.02	PVL filter time	Real	0.00120.00	s	100 = 1 s
36.06	AL2 signal source	Analog src	-	-	1 = 1
36.07	AL2 signal scaling	Real	0.0032767.00	-	100 = 1
36.09	Reset loggers	List	03	-	1 = 1
36.10	PVL peak value	Real	-32768.0032767.00	-	100 = 1
36.11	PVL peak date	Data	-	-	1 = 1
36.12	PVL peak time	Data	=	-	1 = 1
36.13	PVL current at peak	Real	-32768.0032767.00	Α	100 = 1 A
36.14	PVL DC voltage at peak	Real	0.002000.00	V	100 = 1 V
36.15	PVL speed at peak	Real	-30000.00 30000.00	rpm	100 = 1 rpm
36.16	PVL reset date	Data	=	-	1 = 1
36.17	PVL reset time	Data	=	-	1 = 1
36.20	AL1 0 to 10%	Real	0.00100.00	%	100 = 1%
36.21	AL1 10 to 20%	Real	0.00100.00	%	100 = 1%
36.22	AL1 20 to 30%	Real	0.00100.00	%	100 = 1%
36.23	AL1 30 to 40%	Real	0.00100.00	%	100 = 1%
36.24	AL1 40 to 50%	Real	0.00100.00	%	100 = 1%
36.25	AL1 50 to 60%	Real	0.00100.00	%	100 = 1%

No.	Name	Type	Range	Unit	FbEq32
36.26	AL1 60 to 70%	Real	0.00100.00	%	100 = 1%
36.27	AL1 70 to 80%	Real	0.00100.00	%	100 = 1%
36.28	AL1 80 to 90%	Real	0.00100.00	%	100 = 1%
36.29	AL1 over 90%	Real	0.00100.00	%	100 = 1%
36.40	AL2 0 to 10%	Real	0.00100.00	%	100 = 1%
36.41	AL2 10 to 20%	Real	0.00100.00	%	100 = 1%
36.42	AL2 20 to 30%	Real	0.00100.00	%	100 = 1%
36.43	AL2 30 to 40%	Real	0.00100.00	%	100 = 1%
36.44	AL2 40 to 50%	Real	0.00100.00	%	100 = 1%
36.45	AL2 50 to 60%	Real	0.00100.00	%	100 = 1%
36.46	AL2 60 to 70%	Real	0.00100.00	%	100 = 1%
36.47	AL2 70 to 80%	Real	0.00100.00	%	100 = 1%
36.48	AL2 80 to 90%	Real	0.00100.00	%	100 = 1%
36.49	AL2 over 90%	Real	0.00100.00	%	100 = 1%
36.50	AL2 reset date	Data	-	-	1 = 1
36.51	AL2 reset time	Data	-	-	1 = 1
37 User	load curve				
37.01	ULC output status word	PB	0000hFFFFh	-	1 = 1
37.02	ULC supervision signal	Analog src	-	-	1 = 1
37.03	ULC overload actions	List	03	-	1 = 1
37.04	ULC underload actions	List	03	-	1 = 1
37.11	ULC speed table point 1	Real	-30000.030000.0	rpm	10 = 1 rpm
37.12	ULC speed table point 2	Real	-30000.030000.0	rpm	10 = 1 rpm
37.13	ULC speed table point 3	Real	-30000.030000.0	rpm	10 = 1 rpm
37.14	ULC speed table point 4	Real	-30000.030000.0	rpm	10 = 1 rpm
37.15	ULC speed table point 5	Real	-30000.030000.0	rpm	10 = 1 rpm
37.16	ULC frequency table point 1	Real	-500.0500.0	Hz	10 = 1 Hz
37.17	ULC frequency table point 2	Real	-500.0500.0	Hz	10 = 1 Hz
37.18	ULC frequency table point 3	Real	-500.0500.0	Hz	10 = 1 Hz
37.19	ULC frequency table point 4	Real	-500.0500.0	Hz	10 = 1 Hz
37.20	ULC frequency table point 5	Real	-500.0500.0	Hz	10 = 1 Hz
37.21	ULC underload point 1	Real	-1600.01600.0	%	10 = 1%
37.22	ULC underload point 2	Real	-1600.01600.0	%	10 = 1%
37.23	ULC underload point 3	Real	-1600.01600.0	%	10 = 1%
37.24	ULC underload point 4	Real	-1600.01600.0	%	10 = 1%
37.25	ULC underload point 5	Real	-1600.01600.0	%	10 = 1%
37.31	ULC overload point 1	Real	-1600.01600.0	%	10 = 1%
37.32	ULC overload point 2	Real	-1600.01600.0	%	10 = 1%
37.33	ULC overload point 3	Real	-1600.01600.0	%	10 = 1%
37.34	ULC overload point 4	Real	-1600.01600.0	%	10 = 1%

No.	Name	Type	Range	Unit	FbEq32			
37.35	ULC overload point 5	Real	-1600.01600.0	%	10 = 1%			
37.41	ULC overload timer	Real	0.010000.0	s	10 = 1 s			
37.42	ULC underload timer	Real	0.010000.0	s	10 = 1 s			
40 Proc	40 Process PID set 1							
40.01	Process PID output actual	Real	-200000.00200000.00	%	100 = 1 %			
40.02	Process PID feedback actual	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.03	Process PID setpoint actual	Real	-200000200000	PID unit 1	100 = 1 PID unit 1			
40.04	Process PID deviation actual	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.06	Process PID status word	PB	0000hFFFFh	-	1 = 1			
40.07	Process PID operation mode	List	02	-	1 = 1			
40.08	Set 1 feedback 1 source	Analog src	-	-	1 = 1			
40.09	Set 1 feedback 2 source	Analog src	-	-	1 = 1			
40.10	Set 1 feedback function	List	013	-	1 = 1			
40.11	Set 1 feedback filter time	Real	0.00030.000	S	1000 = 1 s			
40.14	Set 1 setpoint scaling	Real	-200000.00200000.00	-	100 = 1			
40.15	Set 1 output scaling	Real	-200000.00200000.00	-	100 = 1			
40.16	Set 1 setpoint 1 source	Analog src	-	-	1 = 1			
40.17	Set 1 setpoint 2 source	Analog src	-	-	1 = 1			
40.18	Set 1 setpoint function	List	013	-	1 = 1			
40.19	Set 1 internal setpoint sel1	Binary src	-	-	1 = 1			
40.20	Set 1 internal setpoint sel2	Binary src	-	-	1 = 1			
40.21	Set 1 internal setpoint 1	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.22	Set 1 internal setpoint 2	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.23	Set 1 internal setpoint 3	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.24	Set 1 internal setpoint 0	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.26	Set 1 setpoint min	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.27	Set 1 setpoint max	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
40.28	Set 1 setpoint increase time	Real	0.01800.0	s	10 = 1 s			
40.29	Set 1 setpoint decrease time	Real	0.01800.0	s	10 = 1 s			
40.30	Set 1 setpoint freeze enable	Binary src	-	-	1 = 1			

No.	Name	Туре	Range	Unit	FbEq32
40.31	Set 1 deviation inversion	Binary src	-	-	1 = 1
40.32	Set 1 gain	Real	0.10100.00	-	100 = 1
40.33	Set 1 integration time	Real	0.09999.0	S	10 = 1 s
40.34	Set 1 derivation time	Real	0.00010.000	S	1000 = 1 s
40.35	Set 1 derivation filter time	Real	0.010.0	S	10 = 1 s
40.36	Set 1 output min	Real	-200000.00200000.00	-	100 = 1
40.37	Set 1 output max	Real	-200000.00200000.00	-	100 = 1
40.38	Set 1 output freeze enable	Binary src	-	-	1 = 1
40.39	Set 1 deadband range	Real	0200000.0	-	10 = 1
40.40	Set 1 deadband delay	Real	0.0 3600.0	S	10 = 1 s
40.43	Set 1 sleep level	Real	0.0200000.0	-	10 = 1
40.44	Set 1 sleep delay	Real	0.03600.0	S	10 = 1 s
40.45	Set 1 sleep boost time	Real	0.03600.0	S	10 = 1 s
40.46	Set 1 sleep boost step	Real	0.0200000.0	PID unit 1	10 = 1 PID unit 1
40.47	Set 1 wake-up deviation	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
40.48	Set 1 wake-up delay	Real	0.0060.00	S	100 = 1 s
40.49	Set 1 tracking mode	Binary src	-	-	1 = 1
40.50	Set 1 tracking ref selection	Analog src	-	-	1 = 1
40.57	PID set1/set2 selection	Binary src	-	ı	1 = 1
40.58	Set 1 increase prevention	Binary src	-	ı	1 = 1
40.59	Set 1 decrease prevention	Binary src	-	ı	1 = 1
40.60	Set 1 PID activation source	Binary src	-	ı	1 = 1
40.61	Setpoint actual scaling	Real	-200000.00200000.00	-	100 = 1
40.62	PID internal setpoint actual	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
40.70	Compensated setpoint	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
40.71	Set 1 compensation input source	List	0, 24, 8, 1012, 1516, 1920, 24	ı	1 = 1
40.72	Set 1 compensation input 1	Real	-200000.00200000.00	-	100 = 1
40.73	Set 1 compensated output 1	Real	-200000.00200000.00	-	100 = 1
40.74	Set 1 compensation input 2	Real	-200000.00200000.00	-	100 = 1
40.75	Set 1 compensated output 2	Real	-200000.00200000.00	-	100 = 1
40.76	Set 1 compensation non- linearity	Real	0100	%	1= 1%
40.80	Set 1 PID output min source	List	01	-	1 = 1

No.	Name	Туре	Range	Unit	FbEq32
40.81	Set 1 PID output max source	List	01	-	1 = 1
40.89	Set 1 setpoint multiplier	Real	-200000.00200000.00	-	100 = 1
40.90	Set 1 feedback multiplier	Real	200000.00200000.00	-	100 = 1
40.91	Feedback data storage	Real	-327.68327.67	-	100 = 1
40.92	Setpoint data storage	Real	-327.68327.67	-	100 = 1
40.96	Process PID output %	Real	-100.00100.00	%	100 = 1%
40.97	Process PID feedback %	Real	-100.00100.00	%	100 = 1%
40.98	Process PID setpoint %	Real	-100.00100.00	%	100 = 1%
40.99	Process PID deviation %	Real	-100.00100.00	%	100 = 1%
41 Proc	ess PID set 2				
41.08	Set 2 feedback 1 source	Analog src	-	-	1 = 1
41.09	Set 2 feedback 2 source	Analog src	-	-	1 = 1
41.10	Set 2 feedback function	List	013	-	1 = 1
41.11	Set 2 feedback filter time	Real	0.00030.000	s	1000 = 1 s
41.14	Set 2 setpoint scaling	Real	-200000.00200000.00	-	100 = 1
41.15	Set 2 output scaling	Real	-200000.00200000.00	-	100 = 1
41.16	Set 2 setpoint 1 source	Analog src	-	-	1 = 1
41.17	Set 2 setpoint 2 source	Analog src	-	-	1 = 1
41.18	Set 2 setpoint function	List	013	-	1 = 1
41.19	Set 2 internal setpoint sel1	Binary src	-	-	1 = 1
41.20	Set 2 internal setpoint sel2	Binary src	-	-	1 = 1
41.21	Set 2 internal setpoint 1	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
41.22	Set 2 internal setpoint 2	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
41.23	Set 2 internal setpoint 3	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
41.24	Set 2 internal setpoint 0	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
41.26	Set 2 setpoint min	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
41.27	Set 2 setpoint max	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
41.28	Set 2 setpoint increase time	Real	0.01800.0	S	10 = 1 s
41.29	Set 2 setpoint decrease time	Real	0.01800.0	S	10 = 1 s
41.30	Set 2 setpoint freeze enable	Binary src	-	-	1 = 1
41.31	Set 2 deviation inversion	Binary src	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
41.32	Set 2 gain	Real	0.10100.00	-	100 = 1
41.33	Set 2 integration time	Real	0.09999.0	s	10 = 1 s
41.34	Set 2 derivation time	Real	0.00010.000	s	1000 = 1 s
41.35	Set 2 derivation filter time	Real	0.010.0	s	10 = 1 s
41.36	Set 2 output min	Real	-200000.00200000.00	-	100 = 1
41.37	Set 2 output max	Real	-200000.00200000.00	-	100 = 1
41.38	Set 2 output freeze enable	Binary src	-	-	1 = 1
41.39	Set 2 deadband range	Real	0200000.0	-	10 = 1
41.40	Set 2 deadband delay	Real	0.0 3600.0	S	10 = 1 s
41.43	Set 2 sleep level	Real	0.0200000.0	-	10 = 1
41.44	Set 2 sleep delay	Real	0.03600.0	S	10 = 1 s
41.45	Set 2 sleep boost time	Real	0.03600.0	S	10 = 1 s
41.46	Set 2 sleep boost step	Real	0.0200000.0	PID unit 1	10 = 1 PID unit 1
41.47	Set 2 wake-up deviation	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1
41.48	Set 2 wake-up delay	Real	0.0060.00	S	100 = 1 s
41.49	Set 2 tracking mode	Binary src	-	-	1 = 1
41.50	Set 2 tracking ref selection	Analog src	-	-	1 = 1
41.58	Set 2 increase prevention	Binary src	-	-	1 = 1
41.59	Set 2 decrease prevention	Binary src	-	-	1 = 1
41.60	Set 2 PID activation source	Binary src	-	-	1 = 1
41.71	Set 2 compensation input source	List	0, 24, 8, 1012, 1516, 1920, 24	-	1 = 1
41.72	Set 2 compensation input 1	Real	-200000.00200000.00	-	100 = 1
41.73	Set 2 compensated output 1	Real	-200000.00200000.00	-	100 = 1
41.74	Set 2 compensation input 2	Real	-200000.00200000.00	-	100 = 1
41.75	Set 2 compensated output 2	Real	-200000.00200000.00	-	100 = 1
41.76	Set 2 compensation non- linearity	Real	0100	%	1= 1%
41.80	Set 2 PID output min source	List	01	-	1 = 1
41.81	Set 2 PID output max source	List	01	-	1 = 1
41.89	Set 2 setpoint multiplier	Real	-200000.00200000.00	-	100 = 1
41.90	Set 2 feedback multiplier	Real	-200000.00200000.00	-	100 = 1
43 Brak	e chopper				
43.01	Braking resistor temperature	Real	0.0120.0	%	10 = 1%
43.06	Brake chopper function	List	03	-	1 = 1
43.07	Brake chopper run enable	Binary src	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
43.08	Brake resistor thermal to	Real	010000	s	1 = 1 s
43.09	Brake resistor Pmax cont	Real	0.0010000.00	kW	100 = 1 kW
43.10	Brake resistance	Real	0.01000.0	ohm	10 = 1 ohm
43.11	Brake resistor fault limit	Real	0150	%	1 = 1%
43.12	Brake resistor warning limit	Real	0150	%	1 = 1%
45 Ener	gy efficiency		<u> </u>		
45.01	Saved GW hours	Real	065535	GWh	1 = 1 GWh
45.02	Saved MW hours	Real	0999	MWh	1 = 1 MWh
45.03	Saved kW hours	Real	0.0999.9	kWh	10 = 1 kWh
45.04	Saved energy	Real	0.0214748364.0	kWh	10 = 1 kWh
45.05	Saved money x1000	Real	04294967295 thousands	(defina- ble)	1 = 1 currency unit
45.06	Saved money	Real	0.00999.99	(defina- ble)	100 = 1 currency unit
45.07	Saved amount	Real	0.0021474830.08	(defina- ble)	100 = 1 currency unit
45.08	CO2 reduction in kilotons	Real	065535	metric kiloton	1 = 1 metric kiloton
45.09	CO2 reduction in tons	Real	0.0999.9	metric ton	10 = 1 metric ton
45.10	Total saved CO2	Real	0.0214748300.8	metric ton	10 = 1 metric ton
45.11	Energy optimizer	List	01	-	1 = 1
45.12	Energy tariff 1	Real	0.0004294966.296	(defina- ble)	1000 = 1 currency unit
45.13	Energy tariff 2	Real	0.0004294966.296	(defina- ble)	1000 = 1 currency unit
45.14	Tariff selection	Binary src	-	-	1 = 1
45.18	CO2 conversion factor	Real	0.00065.535	tn/ MWh	1000 = 1 tn/MWh
45.19	Comparison power	Real	0.0010000000.00	kW	10 = 1 kW
45.21	Energy calculations reset	List	01	-	1 = 1
45.24	Hourly peak power value	Real	-3000.00 3000.00	kW	1 = 1 kW
45.25	Hourly peak power time	Real			N/A
45.26	Hourly total energy (resettable)	Real	-3000.00 3000.00	kWh	1 = 1 kWh
45.27	Daily peak power value (resettable)	Real	-3000.00 3000.00	kW	1 = 1 kW
45.28	Daily peak power time	Real			N/A
45.29	Daily total energy (resettable)	Real	-30000.00 30000.00	kWh	1 = 1 kWh
45.30	Last day total energy	Real	-30000.00 30000.00	kWh	1 = 1 kWh
45.31	Monthly peak power value (resettable)	Real	-3000.00 3000.00	kW	1 = 1 kW

No.	Name	Type	Range	Unit	FbEq32
45.32	Monthly peak power date	Real			N/A
45.33	Monthly peak power time	Real			N/A
45.34	Monthly total energy (resettable)	Real	-1000000.00 1000000.00	kWh	1 = 1 kWh
45.35	Last month total energy	Real	-1000000.00 1000000.00	kWh	1 = 1 kWh
45.36	Lifetime peak power value	Real	-3000.00 3000.00	kW	1 = 1 kW
45.37	Lifetime peak power date	Real			N/A
45.38	Lifetime peak power time	Real			N/A
46 Moni	itoring/scaling settings				
46.01	Speed scaling	Real	0.0030000.00	rpm	100 = 1 rpm
46.02	Frequency scaling	Real	0.101000.00	Hz	100 = 1 Hz
46.03	Torque scaling	Real	0.11000.0	%	10 = 1%
46.04	Power scaling	Real	0.1030000.00	-	10 = 1
46.05	Current scaling	Real	030000	Α	1 = 1 A
46.06	Speed ref zero scaling	Real	0.00 30000.00	rpm	100 = 1 rpm
46.07	Frequency ref zero scaling	Real	0.001000.00	Hz	100 = 1 Hz
46.11	Filter time motor speed	Real	220000	ms	1 = 1 ms
46.12	Filter time output frequency	Real	220000	ms	1 = 1 ms
46.13	Filter time motor torque	Real	220000	ms	1 = 1 ms
46.14	Filter time power	Real	220000	ms	1 = 1 ms
46.21	At speed hysteresis	Real	0.0030000.00	rpm	100 = 1 rpm
46.22	At frequency hysteresis	Real	0.001000.00	Hz	100 = 1 Hz
46.31	Above speed limit	Real	0.0030000.00	rpm	100 = 1 rpm
46.32	Above frequency limit	Real	0.001000.00	Hz	100 = 1 Hz
46.41	kWh pulse scaling	Real	0.0011000.000	kWh	1000 = 1 kWh
47 Data	storage				
47.01	Data storage 1 real32	Real	-2147483.000 2147483.000	=	1000 = 1
47.02	Data storage 2 real32	Real	-2147483.000 2147483.000	-	1000 = 1
47.03	Data storage 3 real32	Real	-2147483.000 2147483.000	-	1000 = 1
47.04	Data storage 4 real32	Real	-2147483.000 2147483.000	-	1000 = 1
47.11	Data storage 1 int32	Real	-2147483648 2147483647	-	1 = 1
47.12	Data storage 2 int32	Real	-2147483648 2147483647	-	1 = 1
47.13	Data storage 3 int32	Real	-2147483648 2147483647	=	1 = 1
47.14	Data storage 4 int32	Real	-2147483648 2147483647	-	1 = 1
47.21	Data storage 1 int16	Real	-3276832767	-	1 = 1
47.22	Data storage 2 int16	Real	-3276832767	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32				
47.23	Data storage 3 int16	Real	-3276832767	-	1 = 1				
47.24	Data storage 4 int16	Real	-3276832767	-	1 = 1				
49 Pane	49 Panel port communication								
49.01	Node ID number	Real	132	-	1 = 1				
49.03	Baud rate	List	15	-	1 = 1				
49.04	Communication loss time	Real	0.33000.0	S	10 = 1 s				
49.05	Communication loss action	List	03	-	1 = 1				
49.06	Refresh settings	List	01	-	1 = 1				
50 Field	bus adapter (FBA)								
50.01	FBA A enable	List	01	-	1 = 1				
50.02	FBA A comm loss func	List	05	-	1 = 1				
50.03	FBA A comm loss t out	Real	0.36553.5	s	10 = 1 s				
50.04	FBA A ref1 type	List	05	-	1 = 1				
50.05	FBA A ref2 type	List	05	-	1 = 1				
50.06	FBA A SW sel	List	01	-	1 = 1				
50.07	FBA A actual 1 type	List	05	-	1 = 1				
50.08	FBA A actual 2 type	List	05	-	1 = 1				
50.09	FBA A SW transparent source	Analog src	-	-	1 = 1				
50.10	FBA A act1 transparent source	Analog src	-	-	1 = 1				
50.11	FBA A act2 transparent source	Analog src	-	-	1 = 1				
50.12	FBA A debug mode	List	01	-	1 = 1				
50.13	FBA A control word	Data	00000000hFFFFFFFh	-	1 = 1				
50.14	FBA A reference 1	Real	-2147483648 2147483647	-	1 = 1				
50.15	FBA A reference 2	Real	-2147483648 2147483647	-	1 = 1				
50.16	FBA A status word	Data	00000000hFFFFFFFh	-	1 = 1				
50.17	FBA A actual value 1	Real	-2147483648 2147483647	-	1 = 1				
50.18	FBA A actual value 2	Real	-2147483648 2147483647	-	1 = 1				
51 FBA	A settings								
51.01	FBA A type	List	-	-	1 = 1				
51.02	FBA A Par2	Real	065535	-	1 = 1				
51.26	FBA A Par26	Real	065535	-	1 = 1				
51.27	FBA A par refresh	List	01	-	1 = 1				
51.28	FBA A par table ver	Data	-	-	1 = 1				
51.29	FBA A drive type code	Real	065535	-	1 = 1				
51.30	FBA A mapping file ver	Real	065535	-	1 = 1				

No.	Name	Туре	Range	Unit	FbEq32			
51.31	D2FBA A comm status	List	06	-	1 = 1			
51.32	FBA A comm SW ver	Data	-	-	1 = 1			
51.33	FBA A appl SW ver	Data	-	-	1 = 1			
52 FBA A data in								
52.01	FBA A data in1	List	-	-	1 = 1			

52.12	FBA A data in12	List	-	1	1 = 1			
53 FBA	A data out							
53.01	FBA A data out1	List	-	-	1 = 1			
53.12	FBA A data out12	List	=	-	1 = 1			
58 Emb	edded fieldbus							
58.01	Protocol enable	List	02, 5	-	1 = 1			
58.02	Protocol ID	Real	0000hFFFFh	-	1 = 1			
58.03	Node address	Real	0255	-	1 = 1			
58.04	Baud rate	List	07	-	1 = 1			
58.05	Parity	List	03	-	1 = 1			
58.06	Communication control	List	02	-	1 = 1			
58.07	Communication diagnostics	PB	0000hFFFFh	-	1 = 1			
58.08	Received packets	Real	04294967295	-	1 = 1			
58.09	Transmitted packets	Real	04294967295	-	1 = 1			
58.10	All packets	Real	04294967295	-	1 = 1			
58.11	UART errors	Real	04294967295	-	1 = 1			
58.12	CRC errors	Real	04294967295	-	1 = 1			
58.13	Token counter	Real	04294967295	-	1 = 1			
58.14	Communication loss action	List	05	-	1 = 1			
58.15	Communication loss mode	List	12	-	1 = 1			
58.16	Communication loss time	Real	0.06000.0	s	10 = 1 s			
58.17	Transmit delay	Real	065535	ms	1 = 1 ms			
58.18	EFB control word	PB	00000000hFFFFFFFh	-	1 = 1			
58.19	EFB status word	PB	00000000hFFFFFFFh	-	1 = 1			
58.25	Control profile	List	0, 5	-	1 = 1			
58.26	EFB ref1 type	List	05	-	1 = 1			
58.27	EFB ref2 type	List	05	ı	1 = 1			
58.28	EFB act1 type	List	05	ı	1 = 1			
58.29	EFB act2 type	List	05	-	1 = 1			
58.30	EFB status word transparent source	List	0	-	1 = 1			
58.31	EFB act1 transparent source	Analog src	-	-	1 = 1			
58.32	EFB act2 transparent source	Analog src	-	-	1 = 1			

No.	Name	Type	Range	Unit	FbEq32
58.33	Addressing mode	List	02	-	1 = 1
58.34	Word order	List	01	-	1 = 1
58.40	Device object ID	Real	04194303	-	1 = 1
58.41	Max master	Real	0127	-	1 = 1
58.42	Max info frames	Real	010	-	1 = 1
58.43	Max APDU retries	Real	010	-	1 = 1
58.44	APDU timeout	Real	060	s	1 = 1
58.101	Data I/O 1	Analog src	-	-	1 = 1
58.102	Data I/O 2	Analog src	-	i	1 = 1
58.103	Data I/O 3	Analog src	-	ı	1 = 1
58.104	Data I/O 4	Analog src	-	i	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 DDC	S communication				
	(Parameters 6	<u> </u>	9 only visible for ACH580-31)		
60.71	INU-LSU communication port	List	-	-	1 = 1
60.78	INU-LSU comm loss timeout	Real	065535	ms	-
60.79	INU-LSU comm loss function	Binary src	-	-	1 = 1
61 D2D	and DDCS transmit data				
	(Parameters 61	.20161.2	203 only visible for ACH580-3	1)	
61.201	INU-LSU data set 10 data 1 value	Real	065535	-	-
61.202	INU-LSU data set 10 data 2 value	Real	065535	-	-
61.203	INU-LSU data set 10 data 3 value	Real	065535	=	-
62 D2D	and DDCS receive data				
	(Paramete	er <mark>62.201</mark> oi	nly visible for ACH580-31)		
62.201	INU-LSU data set 11 data 1 value	Real	065535	-	-
70 Over	ride				
70.01	Override status	PB	0000hFFFFh	-	1 = 1
70.02	Override	List	01	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
70.03	Override activation source	Binary	-	-	1 = 1
		src			
70.04	Override reference source	List	06	-	1 = 1
70.05	Override direction	Binary src	-	-	1 = 1
70.06	Override frequency	Real	-500.0500.0	Hz	100 = 1 Hz
70.07	Override speed	Real	-30000.030000.0	rpm	100 = 1 rpm
70.10	Override enables selection	PB	0000hFFFFh	-	1 = 1
70.20	Override fault handling	List	01	-	1 = 1
70.21	Override auto reset trials	Real	05	-	1 = 1
70.22	Override auto reset time	Real	5.0120.0	s	10 = 1
70.40	Override log 1 start date	Real		-	
70.41	Override log 1 start time	Real		-	
70.42	Override log 1 end date	Real		-	
70.43	Override log 1 end time	Real		-	
70.44	Override log 1 fault 1	Real		-	
70.45	Override log 1 fault 2	Real		-	
70.46	Override log 1 fault 3	Real		-	
70.47	Override log 1 warning 1	Real		-	
70.48	Override log 1 warning 2	Real		-	
70.49	Override log 1 warning 3	Real		-	
70.50	Override log 2 start date	Real		-	
70.51	Override log 2 start time	Real		-	
70.52	Override log 2 end date	Real		-	
70.53	Override log 2 end time	Real		-	
70.54	Override log 2 fault 1	Real		-	
70.55	Override log 2 fault 2	Real		-	
70.56	Override log 2 fault 3	Real		-	
70.57	Override log 2 warning 1	Real		-	
70.58	Override log 2 warning 2	Real		-	
70.59	Override log 2 warning 3	Real		-	
70.60	Override log 3 start date	Real		-	
70.61	Override log 3 start time	Real		-	
70.62	Override log 3 end date	Real		-	
70.63	Override log 3 end time	Real		-	
70.64	Override log 3 fault 1	Real		-	
70.65	Override log 3 fault 2	Real		-	
70.66	Override log 3 fault 3	Real		-	
70.67	Override log 3 warning 1	Real		-	
70.68	Override log 3 warning 2	Real		-	
70.69	Override log 3 warning 3	Real		-	

No.	Name	Туре	Range	Unit	FbEq32			
71.62	Internal setpoint actual	Real	-200000.00200000.00	PID unit 1	100 = 1 PID unit 1			
72 Exte	72 External PID2							
72.01	External PID act value	Real	-200000.00200000.00	%	100 = 1%			
72.02	Feedback act value	Real	-200000.00200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit			
72.03	Setpoint act value	Real	-200000.00200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit			
72.04	Deviation act value	Real	-200000.00200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit			
72.06	PID status word	PB	0000hFFFFh	-	1 = 1			
72.07	PID operation mode	List	02	-	1 = 1			
72.08	Feedback 1 source	Analog src	-	-	1 = 1			
72.11	Feedback filter time	Real	0.00030.000	s	1000 = 1 s			
72.14	Setpoint scaling	Real	-200000.00200000.00	-	100 = 1			
72.15	Output scaling	Real	-200000.00200000.00	-	100 = 1			
72.16	Setpoint 1 source	Analog src	-	-	1 = 1			
72.19	Internal setpoint sel1	Binary src	-	-	1 = 1			
72.20	Internal setpoint sel2	Binary src	-	-	1 = 1			
72.21	Internal setpoint 1	Real	-200000.00200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit			
72.22	Internal setpoint 2	Real	-200000.00200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit			
72.23	Internal setpoint 3	Real	-200000.00200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit			
72.26	Setpoint min	Real	-200000.00200000.00	-	100 = 1			
72.27	Setpoint max	Real	-200000.00200000.00	-	100 = 1			
72.31	Deviation inversion	Binary src	-	-	1 = 1			
72.32	Gain	Real	0.10100.00	-	100 = 1			
72.33	Integration time	Real	0.09999.0	s	10 = 1 s			
72.34	Derivation time	Real	0.00010.000	s	1000 = 1 s			
72.35	Derivation filter time	Real	0.010.0	s	10 = 1 s			
72.36	Output min	Real	-200000.00200000.00	-	10 = 1			
72.37	Output max	Real	-200000.00200000.00	-	10 = 1			
72.38	Output freeze enable	Binary src	-	-	1 = 1			

No.	Name	Type	Range	Unit	FbEq32
72.39	Deadband range	Real	0.0200000.0	-	10 = 1
72.40	Deadband delay	Real	0.03600.0	s	10 = 1 s
72.58	Increase prevention	Binary src	-	-	1 = 1
72.59	Decrease prevention	Binary src	-	-	1 = 1
72.62	Internal setpoint actual	Real	-200000.00200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
73 Exte	rnal PID3				
73.01	External PID act value	Real	-200000.00200000.00	%	100 = 1%
73.02	Feedback act value	Real	-200000.00200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.03	Setpoint act value	Real	-200000.00200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.04	Deviation act value	Real	-200000.00200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.06	PID status word	PB	0000hFFFFh	-	1 = 1
73.07	PID operation mode	List	02	-	1 = 1
73.08	Feedback 1 source	Analog src	-	-	1 = 1
73.11	Feedback filter time	Real	0.00030.000	s	1000 = 1 s
73.14	Setpoint scaling	Real	-200000.00200000.00	-	100 = 1
73.15	Output scaling	Real	-200000.00200000.00	-	100 = 1
73.16	Setpoint 1 source	Analog src	-	-	1 = 1
73.19	Internal setpoint sel1	Binary src	-	-	1 = 1
73.20	Internal setpoint sel2	Binary src	-	-	1 = 1
73.21	Internal setpoint 1	Real	-200000.00200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.22	Internal setpoint 2	Real	-200000.00200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.23	Internal setpoint 3	Real	-200000.00200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.26	Setpoint min	Real	-200000.00200000.00	-	100 = 1
73.27	Setpoint max	Real	-200000.00200000.00	-	100 = 1
73.31	Deviation inversion	Binary src	-	-	1 = 1
73.32	Gain	Real	0.10100.00	-	100 = 1
73.33	Integration time	Real	0.09999.0	S	10 = 1 s

No.	Name	Type	Range	Unit	FbEq32
73.34	Derivation time	Real	0.00010.000	s	1000 = 1 s
73.35	Derivation filter time	Real	0.010.0	s	10 = 1 s
73.36	Output min	Real	-200000.00200000.00	-	10 = 1
73.37	Output max	Real	-200000.00200000.00	-	10 = 1
73.38	Output freeze enable	Binary src	-	-	1 = 1
73.39	Deadband range	Real	0.0200000.0	-	10 = 1
73.40	Deadband delay	Real	0.03600.0	s	10 = 1 s
73.58	Increase prevention	Binary src	-	-	1 = 1
73.59	Decrease prevention	Binary src	-	-	1 = 1
73.62	Internal setpoint actual	Real	-200000.00200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
74 Exte	rnal PID4				
74.01	External PID act value	Real	-200000.00200000.00	%	100 = 1%
74.02	Feedback act value	Real	-200000.00200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.03	Setpoint act value	Real	-200000.00200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.04	Deviation act value	Real	-200000.00200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.06	PID status word	PB	0000hFFFFh	-	1 = 1
74.07	PID operation mode	List	02	-	1 = 1
74.08	Feedback 1 source	Analog src	-	-	1 = 1
74.11	Feedback filter time	Real	0.00030.000	s	1000 = 1 s
74.14	Setpoint scaling	Real	-200000.00200000.00	-	100 = 1
74.15	Output scaling	Real	-200000.00200000.00	-	100 = 1
74.16	Setpoint 1 source	Analog src	-	-	1 = 1
74.19	Internal setpoint sel1	Binary src	1	-	1 = 1
74.20	Internal setpoint sel2	Binary src	1	-	1 = 1
74.21	Internal setpoint 1	Real	-200000.00200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.22	Internal setpoint 2	Real	-200000.00200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.23	Internal setpoint 3	Real	-200000.00200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit

No.	Name	Type	Range	Unit	FbEq32
74.26	Setpoint min	Real	-200000.00200000.00	-	100 = 1
74.27	Setpoint max	Real	-200000.00200000.00	-	100 = 1
74.31	Deviation inversion	Binary src	-	-	1 = 1
74.32	Gain	Real	0.10100.00	-	100 = 1
74.33	Integration time	Real	0.09999.0	s	10 = 1 s
74.34	Derivation time	Real	0.00010.000	s	1000 = 1 s
74.35	Derivation filter time	Real	0.010.0	s	10 = 1 s
74.36	Output min	Real	-200000.00200000.00	-	10 = 1
74.37	Output max	Real	-200000.00200000.00	-	10 = 1
74.38	Output freeze enable	Binary src	-	-	1 = 1
74.39	Deadband range	Real	0.0200000.0	-	10 = 1
74.40	Deadband delay	Real	0.03600.0	S	10 = 1 s
74.58	Increase prevention	Binary src	-	-	1 = 1
74.59	Decrease prevention	Binary src	-	1	1 = 1
74.62	Internal setpoint actual	Real	-200000.00200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
76 PFC	configuration				
76.01	PFC status	PB	0000hFFFFh	-	1 = 1
76.02	PFC system status	List	03, 100103, 200202, 300302, 400, 500, 600, 700, 800801, 49	-	1 = 1
76.11	Pump/fan status 1	PB	0000hFFFFh	-	1 = 1
76.12	Pump/fan status 2	PB	0000hFFFFh	-	1 = 1
76.13	Pump/fan status 3	PB	0000hFFFFh	-	1 = 1
76.14	Pump/fan status 4	PB	0000hFFFFh	-	1 = 1
76.21	PFC configuration	List	0, 23	-	1 = 1
76.25	Number of motors	Real	14	-	1 = 1
76.26	Min number of motors allowed	Real	04	-	1 = 1
76.27	Max number of motors allowed	Real	14	-	1 = 1
76.30	Start point 1	Real	032767	rpm/Hz	1 = 1 unit
76.31	Start point 2	Real	032767	rpm/Hz	1 = 1 unit
76.32	Start point 3	Real	032767	rpm/Hz	1 = 1 unit
76.41	Stop point 1	Real	032767	rpm/Hz	1 = 1 unit
76.42	Stop point 2	Real	032767	rpm/Hz	1 = 1 unit
76.43	Stop point 3	Real	032767	rpm/Hz	1 = 1 unit
76.55	Start delay	Real	0.0012600.00	S	100 = 1 s
76.56	Stop delay	Real	0.0012600.00	S	100 = 1 s
76.57	Speed hold on	Real	0.001000.00	S	100 = 1 s
		Real	0.001000.00	S	100 = 1 s

No.	Name	Туре	Range	Unit	FbEq32
76.58	Speed hold off	Real	0.001000.00	S	100 = 1 s
		Real	0.001000.00	s	100 = 1 s
76.59	PFC contactor delay	Real	0.20600.00	s	100 = 1 s
76.60	PFC ramp acceleration time	Real	0.001800.00	s	100 = 1 s
76.61	PFC ramp deceleration time	Real	0.001800.00	s	100 = 1 s
76.70	Autochange	List	013	-	1 = 1
76.71	Autochange interval	Real	0.0042949672.95	h	100 = 1 h
76.72	Maximum wear imbalance	Real	0.001000000.00	h	100 = 1 h
76.73	Autochange level	Real	0.0300.0	%	10 = 1%
76.74	Autochange auxiliary PFC	List	01	-	1 = 1
76.81	PFC 1 interlock	List	010	-	1 = 1
76.82	PFC 2 interlock	List	010	-	1 = 1
76.83	PFC 3 interlock	List	010	-	1 = 1
76.84	PFC 4 interlock	List	010	-	1 = 1
76.95	Regulator bypass control	Binary src	-	-	-
77 PFC	maintenance and monitoring				
77.10	PFC runtime change	List	05	-	1 = 1
77.11	Pump/fan 1 running time	Real	0.0042949672.95	h	100 = 1 h
77.12	Pump/fan 2 running time	Real	0.0042949672.95	h	100 = 1 h
77.13	Pump/fan 3 running time	Real	0.0042949672.95	h	100 = 1 h
77.14	Pump/fan 4 running time	Real	0.0042949672.95	h	100 = 1 h
80 Flow	calculation				
80.01	Actual flow	Real	-10000.0010000.00	-	100 = 1
80.02	Actual flow percentage	Real	-100.00100.00	%	100 = 1
80.11	Flow feedback 1 source	List	03, 810,	-	1 = 1
80.12	Flow feedback 2 source	List	03, 810,	-	1 = 1
80.13	Flow feedback function	List	01, 89,	-	1 = 1
80.14	Flow feedback multiplier	Real	-200000.00200000.00	-	100 = 1
80.15	Maximum flow	Real	-200000.00200000.00	-	100 = 1
94 LSU	control				
	(Parameters 9	4.0194.4	41 only visible for ACH580-31,)	
94.01	LSU control	List	01	-	1 = 1
94.02	LSU panel communication	List	01	-	1 = 1
94.10	LSU max charging time	Real	065535	s	1 = 1 s
94.11	LSU stop delay	Real	0.0 3600.0	S	10 = 1 s
94.22	User DC voltage reference	Real	0.0 2000.0	V	10 = 1 V
94.32	User reactive power reference	Real	-3276.8 3276.7	kvar	10 = 1 kvar
94.40	Power mot limit on net loss	Real	0.00 600.00	%	100 = 1%
94.41	Power gen limit on net loss	Real	-600.00 0.00	%	100 = 1%

No.	Name	Type	Range	Unit	FbEq32	
95 HW configuration						
95.01	Supply voltage	List	0, 23	-	1 = 1	
95.02	Adaptive voltage limits	List	01	-	1 = 1	
95.03	Estimated AC supply voltage	Real	065535	V	1 = 1 V	
95.04	Control board supply	List	01	-	1 = 1	
95.15	Special HW settings	PB	00000000hFFFFFFFh	-	1 = 1	
95.20	HW options word 1	PB	0000hFFFFh	-	1 = 1	
95.21	HW options word 2	PB	0000hFFFFh	-	1 = 1	
96 Syste	em					
96.01	Language	List	-	-	1 = 1	
96.02	Pass code	Data	099999999	-	1 = 1	
96.03	Access level status	PB	00000000hFFFFFFFh	-	1 = 1	
96.04	Macro select	List	01	-	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	01	-	1 = 1	
96.08	Control board boot	List	01	-	1 = 1	
96.10	User set status	List	07, 2023	-	1 = 1	
96.11	User set save/load	List	05, 1821	-	1 = 1	
96.12	User set I/O mode in1	Binary src	-	-	-	
96.13	User set I/O mode in2	Binary src	-	i	-	
96.16	Unit selection	PB	0000hFFFFh		1 = 1	
96.20	Time sync primary source	List	0, 2, 6, 8, 9	ı	1 = 1	
96.51	Clear fault and event logger	Real	01	ı	1 = 1	
96.54	Checksum action	List	04	ı	1 = 1	
96.55	Checksum control word	PB	0000hFFFFh	ı	1 = 1	
96.68	Actual checksum A	PB	00000000hFFFFFFFh	i	1 = 1	
96.69	Actual checksum B	PB	00000000hFFFFFFFh	ı	1 = 1	
96.70	Disable adaptive program	List	01	ı	1 = 1	
96.71	Approved checksum A	PB	00000000hFFFFFFFh	-	1 = 1	
96.72	Approved checksum B	PB	00000000hFFFFFFFh	-	1 = 1	
96.78	550 Compatibility mode	List	01	ı	1 = 1	
96.100	Change user pass code	Data	1000000099999999	-	1 = 1	
96.101	Confirm user pass code	Data	1000000099999999		1 = 1	
96.102	User lock functionality	PB	0000hFFFFh		1 = 1	
	(Parameter 96.1	108 only vis	sible only visible for ACH580-3	11)		
96.108	LSU control board boot	Real	01	-	1 = 1	
97 Moto	r control					
97.01	Switching frequency reference	List	2, 4, 8, 12	kHz	1 = 1 kHz	

No.	Name	Туре	Range	Unit	FbEq32
97.02	Minimum switching frequency	List	1.5, 2, 4, 8, 12	kHz	1 = 1 kHz
97.03	Slip gain	Real	0200	%	1 = 1%
97.04	Voltage reserve	Real	-450	%	1 = 1%
97.05	Flux braking	List	02	-	1 = 1
97.08	Optimizer minimum torque	Real	0.0 1600.0	%	10 = 1%
97.10	Signal injection	List	04	-	1 = 1
97.11	TR tuning	Real	25400	%	1 = 1%
97.13	IR compensation	Real	0.0050.00	%	100 = 1%
97.15	Motor model temperature adaptation	List	01	-	1 = 1
97.16	Stator temperature factor	Real	0200	%	1 = 1%
97.17	Rotor temperature factor	Real	0200	%	1 = 1%
97.20	U/F ratio	List	01	-	1 = 1
97.49	Slip gain for scalar	Real	0200	%	1 = 1%
97.94	IR comp max frequency	Real	1.01000.0	%	1 = 1%
98 User	motor parameters				
98.01	User motor model mode	List	01	-	1 = 1
98.02	Rs user	Real	0.00000.50000	p.u.	100000 = 1 p.u.
98.03	Rr user	Real	0.00000.50000	p.u.	100000 = 1 p.u.
98.04	Lm user	Real	0.0000010.00000	p.u.	100000 = 1 p.u.
98.05	SigmaL user	Real	0.000001.00000	p.u.	100000 = 1 p.u.
98.06	Ld user	Real	0.0000010.00000	p.u.	100000 = 1 p.u.
98.07	Lq user	Real	0.0000010.00000	p.u.	100000 = 1 p.u.
98.08	PM flux user	Real	0.000002.00000	p.u.	100000 = 1 p.u.
98.09	Rs user SI	Real	0.00000100.00000	ohm	100000 = 1 p.u.
98.10	Rr user SI	Real	0.00000100.00000	ohm	100000 = 1 p.u.
98.11	Lm user SI	Real	0.00100000.00	mH	100 = 1 mH
98.12	SigmaL user SI	Real	0.00100000.00	mH	100 = 1 mH
98.13	Ld user SI	Real	0.00100000.00	mH	100 = 1 mH
98.14	Lq user SI	Real	0.00100000.00	mH	100 = 1 mH
99 Moto	or data				
99.03	Motor type	List	02	-	1 = 1
99.04	Motor control mode	List	01	-	1 = 1
99.06	Motor nominal current	Real	0.06400.0	Α	10 = 1 A
99.07	Motor nominal voltage	Real	0.0960.0	V	10 = 1 V

610 Additional parameter data

No.	Name	Type	Range	Unit	FbEq32
99.08	Motor nominal frequency	Real	0.00 500.00	Hz	100 = 1 Hz
99.09	Motor nominal speed	Real	0 30000	rpm	1 = 1 rpm
99.10	Motor nominal power	Real	0.0010000.00 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	0.0004000000.000 N·m or 0.0002950248.597 lb·ft	N·m or lb·ft	1000 = 1 unit
99.13	ID run requested	List	03, 6	-	1 = 1
99.14	Last ID run performed	List	03, 6	-	1 = 1
99.15	Motor polepairs calculated	Real	01000	-	1 = 1
99.16	Motor phase order	List	01	-	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.

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