ACH580 Parameter Groups

Parameter Group Changes

Color = Combined Groups

Note: Parameters are listed in numerical order with first priority given to the ACH550 menu structure, and second priority given to the ACH580 menu structure.

ACH550		ACH580
• 01	Operating Data	01
• 03	Status Words	06
• 04	Fault History	04
• N/A	Diagnostics	05
• 10	Start/Stop Direction	**20**
• N/A	DI5 DI/FI Configuration	11
• 11	Reference Select	**22 (Speeds), 28 (Frequencies)**
• 12	Constant Speeds	**22 (Speeds), 28 (Frequencies)**
• 13	Analog Inputs	12
• 14	Relay Outputs	10
• 15	Analog Outputs	13
• 16	System Controls	**20**
• 17	Fire Override	70
• 20	Limits	30
• 21	Start/Stop Mode	21
• 22	Accel/Decel	23 (Speeds), **28 (Frequencies)**
• 23	Speed Control	25
• 25	Critical Speeds	**22 (Speeds), 28 (Frequencies)**
• 26	Motor Control	97 (Flux Optimization is in 45.11)
• 30	Fault Functions	**31**
• 31	Auto Reset	**31**
• 32	Supervision	32
• 33	Information	07
• 34	Panel Display	Edit panel display via the “Options” menu accessed from the home view

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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 *parameter* that is the result of a measurement or calculation by the drive, or contains status information. Most actual signals are read-only, but some (especially counter-type actual signals) can be reset.
Def	(In the following table, shown on the same row as the parameter name) The default value of a *parameter* when used in the Factory macro. For information on other macro-specific parameter values, see chapter *Default configuration*.
FbEq16	(In the following table, shown on the same row as the parameter range, or for each selection) 16-bit fieldbus equivalent: The scaling between the value shown on the 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.	*336*
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 AI	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).	*405*
24 Speed reference conditioning	Speed error calculation; speed error window control configuration; speed error step.	*407*
25 Speed control	Speed controller settings.	*408*
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 1…6.	*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	Settings for the energy saving calculators as well as peak and energy loggers.	*496*
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.	*521*
71 External PID1	Configuration of external PID.	*526*
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.	*534*
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; anti-cogging (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 Actual values		Basic signals for monitoring the drive. All parameters in this group are read-only unless otherwise noted. **Note:** Values of these actual signals are filtered with the filter time defined in group *46 Monitoring/scaling settings*. The selection lists for parameters in other groups mean the raw value of the actual signal instead. For example, if a selection is "Output frequency" it does not point to the value of parameter *01.06 Output frequency* but to the raw value.	
01.01	*Motor speed used*	Estimated motor speed. A filter time constant for this signal can be defined by parameter *46.11 Filter time motor speed*.	-
	-30000.00… 30000.00 rpm	Estimated motor speed.	See par. *46.01*
01.02	*Motor speed estimated*	Estimated motor speed in rpm. A filter time constant for this signal can be defined by parameter *46.11 Filter time motor speed*.	-
	-30000.00… 30000.00 rpm	Estimated motor speed.	See par. *46.01*
01.03	*Motor speed %*	Motor speed in percent of the synchronous motor speed.	-
	-1000.00… 1000.00%	Motor speed.	10 = 1%
01.06	*Output frequency*	Estimated drive output frequency in Hz. A filter time constant for this signal can be defined by parameter *46.12 Filter time output frequency*.	-
	-500.00…500.00 Hz	Estimated output frequency.	See par. *46.02*
01.07	*Motor current*	Measured (absolute) motor current in A.	-
	0.00…30000.00 A	Motor current.	See par. *46.05*
01.08	*Motor current % of motor nom*	Motor current (drive output current) in percent of the nominal motor current.	-
	0.0…1000.0%	Motor current.	1 = 1%
01.09	*Motor current % of drive nom*	Motor current (drive output current) in percent of the nominal drive current.	-
	0.0…1000.0%	Motor current.	1 = 1%
01.10	*Motor torque*	Motor torque in percent of the nominal motor torque. See also parameter *01.30 Nominal torque scale*. A filter time constant for this signal can be defined by parameter *46.13 Filter time motor torque*.	-
	-1600.0…1600.0%	Motor torque.	See par. *46.03*
01.11	*DC voltage*	Measured DC link voltage.	-
	0.00…2000.00 V	DC link voltage.	10 = 1 V
01.13	*Output voltage*	Calculated motor voltage in V AC.	-
	0…2000 V	Motor voltage.	1 = 1 V

No.	Name/Value	Description	Def/FbEq16
01.14	*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.	-
	0…65535 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.	-
	0…1000 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.	-
	0…1000 kWh	Energy in kWh.	10 = 1 kWh
01.24	*Flux actual %*	Used flux reference in percent of nominal flux of motor.	-
	0…200%	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.	-
	0.000…4000000 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.	-
	40.0…120.0 °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	Description	Def/FbEq16
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 01.55…01.58 resets all of them.	-
	0…65535 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 01.55…01.58 resets all of them.	-
	0…1000 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 01.55…01.58 resets all of them.	-
	0…1000 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 *01.55*…*01.58* resets all of them.	-
	-200000000.0… 200000000.0 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*.	-
	0.00…500.00 Hz	Estimated output frequency.	See par. *46.02*
01.64	*Abs motor torque*	Absolute value of parameter *01.10 Motor torque*.	-
	0.0…1600.0%	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.	-
	0…30000 kW	Nominal power.	1 = 1 kW

03 Input references		Values of references received from various sources. All parameters in this group are read-only unless otherwise noted.	
03.01	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 *Fieldbus control through a fieldbus adapter*	-
	-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 Warnings and faults		Information on warnings and faults that occurred last. For explanations of individual warning and fault codes, see chapter Fault tracing. All parameters in this group are read-only unless otherwise noted. Fault and event logs can be cleared with parameter 96.51 Clear fault and event logger.	
04.01	Tripping fault	Code of the 1st active fault (the fault that caused the current trip).	-
	0000h…FFFFh	1st active fault.	1 = 1
04.02	Active fault 2	Code of the 2nd active fault.	-
	0000h…FFFFh	2nd active fault.	1 = 1
04.03	Active fault 3	Code of the 3rd active fault.	-
	0000h…FFFFh	3rd active fault.	1 = 1
04.06	Active warning 1	Code of the 1st active warning.	-
	0000h…FFFFh	1st active warning.	1 = 1
04.07	Active warning 2	Code of the 2nd active warning.	-
	0000h…FFFFh	2nd active warning.	1 = 1
04.08	Active warning 3	Code of the 3rd active warning.	-
	0000h…FFFFh	3rd active warning.	1 = 1
04.11	Latest fault	Code of the 1st stored (non-active) fault.	-
	0000h…FFFFh	1st stored fault.	1 = 1
04.12	2nd latest fault	Code of the 2nd stored (non-active) fault.	-
	0000h…FFFFh	2nd stored fault.	1 = 1
04.13	3rd latest fault	Code of the 3rd stored (non-active) fault.	-
	0000h…FFFFh	3rd stored fault.	1 = 1
04.16	Latest warning	Code of the 1st stored (non-active) warning.	-
	0000h…FFFFh	1st stored warning.	1 = 1
04.17	2nd latest warning	Code of the 2nd stored (non-active) warning.	-
	0000h…FFFFh	2nd stored warning.	1 = 1
04.18	3rd latest warning	Code of the 3rd stored (non-active) warning.	-
	0000h…FFFFh	3rd stored warning.	1 = 1

No.	Name/Value	Description	Def/FbEq16
04.40	*Event word 1*	User-defined event word. This word collects the status of the events (warnings, faults or pure events) selected by parameters *04.41*…*04.71*. This parameter is read-only.	-

Bit	Name	Description
0	User bit 0	1 = Event selected by parameter *04.41* is active
1	User bit 1	1 = Event selected by parameter *04.43* is active
…	…	…
15	User bit 15	1 = Event selected by parameter *04.71* is active

	0000h…FFFFh	User-defined event word.	1 = 1
04.41	*Event word 1 bit 0 code*	Selects the hexadecimal code of an event (warning, fault or pure event) whose status is shown as bit 0 of *04.40 Event word 1*. The event codes are listed in chapter *Fault tracing* (page *183*).	0000h
	0000h…FFFFh	Code of event.	1 = 1
04.43	*Event word 1 bit 1 code*	Selects the hexadecimal code of an event (warning, fault or pure event) whose status is shown as bit 1 of *04.40 Event word 1*. The event codes are listed in chapter *Fault tracing* (page *183*).	0000h
	0000h…FFFFh	Code of event.	1 = 1
04.45, 04.47, 04.49, …	…	…	…
04.71	*Event word 1 bit 15 code*	Selects the hexadecimal code of an event (warning, fault or pure event) whose status is shown as bit 15 of *04.40 Event word 1*. The event codes are listed in chapter *Fault tracing* (page *183*).	0000h
	0000h…FFFFh	Code of event.	1 = 1

05 Diagnostics		Various run-time-type counters and measurements related to drive maintenance. All parameters in this group are read-only unless otherwise noted.	
05.01	*On-time counter*	On-time counter. The counter runs when the drive is powered.	-
	0…65535 d	On-time counter.	1 = 1 d
05.02	*Run-time counter*	Motor run-time counter in full days. The counter runs when the inverter modulates.	-
	0…65535 d	Motor run-time counter.	1 = 1 d
05.03	*Hours run*	Corresponding parameter to *05.02 Run-time counter* in hours, that is, 24 * *05.02* value + fractional part of a day.	-
	0.0… 429496729.5 h	Hours.	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.	-
	0…65535 d	Cooling fan run-time counter.	1 = 1 d

No.	Name/Value	Description	Def/FbEq16
05.08	*Cabinet temperature*	Temperature inside the cabinet. Activated by bit 6 of parameter *95.21 HW options word 2*. Only for ACH580-07 cabinet drives.	-
	-40… 120 °C or °F	Temperature inside the cabinet in degrees Celsius or Fahrenheit.	1 = unit
05.10	*Control board temperature*	Measured temperature of the control board	-
	-100… 300 °C or °F	Control board temperature in degrees Celsius or Fahrenheit.	1 = unit
05.11	*Inverter temperature*	Estimated drive temperature in percent of fault limit. The fault limit varies according to the type of the drive. 0.0% = 0 °C (32 °F) 100.0% = Fault limit	-
	-40.0…160.0%	Drive temperature in percent.	1 = 1%
05.20	*Diagnostic word 1*	Diagnostic word 1. For possible causes and remedies, see chapter *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 warning	1 = Yes = Drive has generated a warning. 0 = None active = No warning active.
2	Any fault	1 = Yes = Drive has tripped on a fault. 0 = None active = No fault active.
3	Reserved	
4	Overcurrent flt	Yes = Drive has tripped on fault *2310 Overcurrent*
5	Reserved	
6	DC overvoltage	Yes = Drive has tripped on fault *3210 DC link overvoltage*.
7	DC undervoltage	Yes = Drive has tripped on fault *3220 DC link undervoltage*.
8	Reserved	
9	Device overtemp flt	Yes = Drive has tripped on fault *4310 Excess temperature*.
10…15	Reserved	

	0000h…FFFFh	Diagnostic word 1.	1 = 1
05.21	*Diagnostic word 2*	Diagnostic word 2. For possible causes and remedies, see chapter *Fault tracing*.	-

Bit	Name	Value
0…9	Reserved	
10	Motor overtemp flt	Yes = Drive has tripped on fault *4981 External temperature 1* or *4982 External temperature 2*.
11…15	Reserved	

	0000h…FFFFh	Diagnostic word 2.	1 = 1

No.	Name/Value	Description	Def/FbEq16
05.22	*Diagnostic word 3*	Diagnostic word 3.	-

Bit	Name	Value
0…8	Reserved	
9	kWh pulse	Yes = kWh pulse is active.
10	Reserved	
11	Fan command	On = Drive fan is rotating above idle speed.
12…15	Reserved	

	0000h…FFFFh	Diagnostic word 3.	1 = 1
05.80	*Motor speed at fault*	Copy of parameter *01.01 Motor speed used* at the occurrence of the latest fault. Parameters *05.80*…*05.89* are shown for each fault in the fault log.	-
	-30000.00… 30000.00 rpm	Estimated motor speed.	
05.81	*Output frequency at fault*	Copy of parameter *01.06 Output frequency* at the occurrence of the latest fault.	-
	-500.00…500.00 Hz	Estimated output frequency.	
05.82	*DC voltage at fault*	Copy of parameter *01.11 DC voltage* at the occurrence of the latest fault.	-
	0.00…2000.00 V	DC link voltage.	10 = 1 V
05.83	*Motor current at fault*	Copy of parameter *01.07 Motor current* at the occurrence of the latest fault.	-
	0.00…30000.00 A	Motor current.	10 = 1 V
05.84	*Motor torque at fault*	Copy of parameter *01.10 Motor torque* at the occurrence of the latest fault.	-
	-1600.0…1600.0%	Motor torque.	
05.85	*Main status word at fault*	Copy of parameter *06.11 Main status word* at the occurrence of the latest fault.	-
	0000h…FFFFh	Main status word.	1 = 1
05.86	*DI delayed status at fault*	Copy of parameter *10.02 DI delayed status* at the occurrence of the latest fault.	-
	0000h…FFFFh	Delayed status for digital inputs.	1 = 1
05.87	*Inverter temperature at fault*	Copy of parameter *05.11 Inverter temperature* at the occurrence of the latest fault.	-
		Drive temperature in °C.	1 = 1
05.88	*Reference used at fault*	Copy of parameter *28.01 Frequency ref ramp input* (in scalar control mode) or *23.01 Speed ref ramp input* (in speed control mode) at the occurrence of the latest fault.	-
	-500.00…500.00 Hz or -30000.00…30000.00 rpm	Frequency or speed reference	1 = 1
05.89	*HVAC status word at fault*	Copy of parameter *06.22 HVAC status word* at the occurrence of the latest fault.	-
	0000h…FFFFh		1 = 1

No.	Name/Value	Description	Def/FbEq16
05.111	Line converter temperature	*(Only visible for ACH580-31).* Estimated supply unit temperature in percent of fault limit. 0.0% = 0 °C (32 °F) 94% approx. = Warning limit 100.0% = Fault limit	-
	-40.0 … 160.0%	Supply unit temperature in percent.	1 = 1%
05.121	MCB closing counter	*(Only visible for ACH580-31).* Counts the closures of the main circuit breaker of the supply unit.	-
	0…4294967295	Count of closures of main circuit breaker.	1 = 1

06 Control and status words		Drive control and status words.	
06.01	Main control word	The main control word of the drive. This parameter shows the control signals as received from the selected sources (such as digital inputs, the fieldbus interfaces and the application program). For the control word bit descriptions see page 295. The related status word and state diagram are presented on pages 296 and 297 respectively. This parameter is read-only. **Note:** When using fieldbus control, this parameter value is not the same as the Control word value that the drive receives from the PLC. For the exact value, see 50.12 FBA A debug mode.	-
	0000h…FFFFh	Main control word.	1 = 1

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

No.	Name/Value	Description	Def/FbEq16
06.11	*Main status word*	Main status word of the drive. For the status word bit descriptions see page *296*. The related control word and state diagram are presented on pages *295* and *297* respectively. This parameter is read-only. **Note:** When using fieldbus control, this parameter value is not the same as the Status word value that the drive sends to the PLC. For the exact value, see *50.12 FBA A debug mode*.	-
	0000h…FFFFh	Main status word.	1 = 1

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*

No.	Name/Value	Description	Def/FbEq16
06.16	Drive status word 1	Drive status word 1. This parameter is read-only.	-

Bit	Name	Description
0	Enabled	1 = If Run permissive (par. 20.40) and start interlock signals (par. 20.41…20.44) signals are all present. **Note:** This bit is not affected by the presence of a fault.
1	Inhibited	1 = Start inhibited. To start the drive, the inhibiting signal (see par. 06.18) must be removed and the start signal cycled.
2	DC charged	1 = DC circuit has been charged
3	Ready to start	1 = Drive is ready to receive a start command
4	Following reference	1 = Drive is ready to follow given reference
5	Started	1 = Drive has been started
6	Modulating	1 = Drive is modulating (output stage is being controlled)
7	Limiting	1 = Any operating limit (speed, torque, etc.) is active
8	Local control	1 = Drive is in local control
9	Network control	1 = Drive is in *network control* (see page 21).
10	Ext1 active	1 = Control location EXT1 active
11	Ext2 active	1 = Control location EXT2 active
12	Reserved	
13	Start request	1 = If Start requested. 0 = When Run permissive signal (see par. 20.40) is 0.
14…15	Reserved	

	0000h…FFFFh	Drive status word 1.	1 = 1
06.17	Drive status word 2	Drive status word 2. This parameter is read-only.	-

Bit	Name	Description
0	Identification run done	1 = Motor identification (ID) run has been performed
1	Magnetized	1 = The motor has been magnetized
2	Reserved	
3	Speed control	1 = Speed control mode active
4	Reserved	
5	Safe reference active	1 = A “safe” reference is applied by functions such as parameters 49.05 and 50.02
6	Last speed active	1 = A “last speed” reference is applied by functions such as parameters 49.05 and 50.02
7	Loss of reference	1 = Reference signal lost
8	Emergency stop failed	1 = Emergency stop failed (see parameters 31.32 and 31.33)
9…12	Reserved	
13	Start delay active	1 = Start delay (par. 21.22) active.
14…15	Reserved	

	0000h…FFFFh	Drive status word 2.	1 = 1

No.	Name/Value	Description	Def/FbEq16
06.18	*Start inhibit status word*	Start inhibit status word. This word specifies the source of the inhibiting signal that is preventing the drive from starting. The conditions marked with an asterisk (*) only require that the start command is cycled. In all other instances, the inhibiting condition must be removed first. See also parameter *06.16 Drive status word 1*, bit 1. This parameter is read-only.	-

Bit	Name	Description
0	Not ready run	1 = DC voltage is missing or drive has not been parametrized correctly. Check the parameters in groups 95 and 99.
1	Ctrl location changed	* 1 = Control location has changed
2	SSW inhibit	1 = Control program is keeping itself in inhibited state
3	Fault reset	* 1 = A fault has been reset
4	Start interlocked	1 = Start interlocked
5	Run permissive	1 = Run permissive signal missing
6	Reserved	
7	STO	1 = Safe torque off function active
8	Current calibration ended	* 1 = Current calibration routine has finished
9	ID run ended	* 1 = Motor identification run has finished
10	Reserved	
11	Em Off1	1 = Emergency stop signal (mode off1)
12	Em Off2	1 = Emergency stop signal (mode off2)
13	Em Off3	1 = Emergency stop signal (mode off3)
14	Auto reset inhibit	1 = The autoreset function is inhibiting operation
15		

	0000h…FFFFh	Start inhibit status word.	1 = 1
06.19	*Speed control status word*	Speed control status word. This parameter is read-only.	-

Bit	Name	Description
0	Zero speed	1 = Drive has been running below zero speed limit (par. *21.06*) for a time defined by parameter *21.07 Zero speed delay*
1	Forward	1 = Drive is running in forward direction above zero speed limit (par. *21.06*)
2	Reverse	1 = Drive is running in reverse direction above zero speed limit (par. *21.06*)
3…6	Reserved	
7	Any constant speed request	1 = A constant speed or frequency has been selected; see par. *06.20*.
8…15	Reserved	

	0000h…FFFFh	Speed control status word.	1 = 1

No.	Name/Value	Description	Def/FbEq16
06.20	*Constant speed status word*	Constant speed/frequency status word. Indicates which constant speed or frequency is active (if any). See also parameter *06.19 Speed control status word*, bit 7, and section *Constant speeds/frequencies* (page *177*). This parameter is read-only.	-

Bit	Name	Description
0	Constant speed 1	1 = Constant speed or frequency 1 selected
1	Constant speed 2	1 = Constant speed or frequency 2 selected
2	Constant speed 3	1 = Constant speed or frequency 3 selected
3	Constant speed 4	1 = Constant speed or frequency 4 selected
4	Constant speed 5	1 = Constant speed or frequency 5 selected
5	Constant speed 6	1 = Constant speed or frequency 6 selected
6	Constant speed 7	1 = Constant speed or frequency 7 selected
7…15	Reserved	

	0000h…FFFFh	Constant speed/frequency status word.	1 = 1
06.21	*Drive status word 3*	Drive status word 3. This parameter is read-only.	-

Bit	Name	Description
0	DC hold active	1 = DC hold is active
1	Post-magnetizing active	1 = Post-magnetizing is active
2	Motor pre-heating active	1 = Motor pre-heating is active
3	PM smooth start active	1 = PM smooth start active
4…15	Reserved	

	0000h…FFFFh	Drive status word 1.	1 = 1

No.	Name/Value	Description	Def/FbEq16
06.22	*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.
13…15	Reserved	

	0000h…FFFFh		1 = 1
06.30	*MSW bit 11 selection*	Selects a binary source whose status is transmitted as bit 11 (User bit 0) of *06.11 Main status word*.	*Ext ctrl loc*
	False	0.	0
	True	1.	1
	Ext ctrl loc	Bit 11 of *06.01 Main control word* (see page *337*).	2
	Other [bit]	Source selection (see *Terms and abbreviations* 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 *Terms and abbreviations* 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 *Terms and abbreviations* 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 *Terms and abbreviations* 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
4…6	Reserved	
7	Warning	1 = A warning is active
8	Modulating	1 = The supply unit is modulating
9	Remote	1 = Remote control (EXT1 or EXT2) 0 = Local control
10	Net ok	1 = Supply network voltage OK
11…12	Reserved	
13	Charging or ready run	1 = Bit 1 or bit 14 active
14	Charging	1 = Charging circuit is active 0 = Charging circuit is not active
15	Reserved	

	0000h…FFFFh	Supply unit status word.	1 = 1

No.	Name/Value	Description	Def/FbEq16
06.39	*Internal state machine LSU CW*	*(Only visible for 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
4…6	Reserved	
7	RESET	0 -> 1 = Reset an active fault. A fresh start command is required after reset.
8…15	Reserved	

	0000h…FFFFh	Supply unit control word.	1 = 1
06.116	*LSU drive status word 1*	*(Only visible for 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
14…15	Reserved	

	0000h…FFFFh	Drive status word 1.	1 = 1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>06.118</td><td>LSU start inhibit status word</td><td>(Only visible for ACH580-31).
This word specifies the source of the inhibiting condition that is preventing the supply unit from starting.
See also section Control of a supply unit (LSU) (page 98), and parameter group 60 DDCS communication.
This parameter is read-only.

<table><tr><th>Bit</th><th>Name</th></tr><tr><td>0</td><td>Not ready run</td></tr><tr><td>1</td><td>Ctrl location changed</td></tr><tr><td>2</td><td>SSW inhibit</td></tr><tr><td>3</td><td>Fault reset</td></tr><tr><td>4</td><td>Lost start enable</td></tr><tr><td>5</td><td>Lost run enable</td></tr><tr><td>6…8</td><td>Reserved</td></tr><tr><td>9</td><td>Charging overload</td></tr><tr><td>10…11</td><td>Reserved</td></tr><tr><td>12</td><td>Em Off2</td></tr><tr><td>13</td><td>Em Off3</td></tr><tr><td>14</td><td>Auto reset inhibit</td></tr><tr><td>15</td><td>Reserved</td></tr></table></td><td>-</td></tr>
<tr><td></td><td>0000h…FFFFh</td><td>Start inhibit status word of supply unit.</td><td>1 = 1</td></tr>
<tr><td colspan="2">07 System info</td><td>Drive hardware and firmware information.
All parameters in this group are read-only.</td><td></td></tr>
<tr><td>07.03</td><td>Drive rating id</td><td>Type of the drive. (Rating ID in brackets.)</td><td>-</td></tr>
<tr><td>07.04</td><td>Firmware name</td><td>Firmware identification.</td><td>-</td></tr>
<tr><td>07.05</td><td>Firmware version</td><td>Version number of the firmware.</td><td>-</td></tr>
<tr><td>07.06</td><td>Loading package name</td><td>Name of the firmware loading package.</td><td>-</td></tr>
<tr><td>07.07</td><td>Loading package version</td><td>Version number of the firmware loading package.</td><td>-</td></tr>
<tr><td>07.11</td><td>Cpu usage</td><td>Microprocessor load in percent.</td><td>-</td></tr>
<tr><td></td><td>0…100%</td><td>Microprocessor load.</td><td>1 = 1%</td></tr>
<tr><td>07.25</td><td>Customization package name</td><td>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.</td><td>-</td></tr>
<tr><td>07.26</td><td>Customization package version</td><td>Customization package version number. Also visible under System info on the control panel or the Drive composer PC tool.</td><td>-</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
07.30	*Adaptive program status*	Shows the status of the adaptive program. See section *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
4…13	Reserved	
14	State changing	1 = State change in progress in adaptive programming engine
15	Faulted	1 = Error in adaptive program

	0000h…FFFFh	Adaptive program status.	1 = 1
07.31	*AP sequence state*	Shows the number of the active state of the sequence program part of the adaptive program (AP). If adaptive programming is not running, or it does not contain a sequence program, the parameter is zero.	
	0…20		1 = 1
07.106	*LSU loading package name*	*(Only visible for ACH580-31).* Name of the loading package of the supply unit firmware.	-
07.107	*LSU loading package version*	*(Only visible for ACH580-31).* Version number of the loading package of the supply unit firmware.	-
10 Standard DI, RO		Configuration of digital inputs and relay outputs.	
10.01	*DI status*	Displays the electrical status of digital inputs DI6…DI1. The activation/deactivation delays of the inputs (if any are specified) are ignored. Bits 0…5 reflect the status of DI1…DI6. **Example:** 0000000000010011b = DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off. This parameter is read-only.	-
	0000h…FFFFh	Status of digital inputs.	1 = 1

No.	Name/Value	Description	Def/FbEq16
10.02	*DI delayed status*	Displays the status of digital inputs DI1…DI6. Bits 0…5 reflect the delayed status of DI1…DI6. **Example:** 0000000000010011b = DI5, DI2 and DI1 are on, DI3, DI4 and DI6 are off. This word is updated only after a 2 ms activation/deactivation delay. When the value of a digital input changes, it must remain the same in two consecutive samples, that is for 2 ms, for the new value to be accepted. This parameter 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.
6…15	Reserved	

	0000h…FFFFh	Delayed status for digital inputs.	1 = 1
10.03	*DI force selection*	The electrical statuses of the digital inputs can be overridden, for example, testing purposes. A bit in parameter *10.04 DI forced data* is provided for each digital input, and its value is applied whenever the corresponding bit in this parameter is 1. **Note:** Boot and power cycle reset the force selections (parameters *10.03* and *10.04*).	0000h

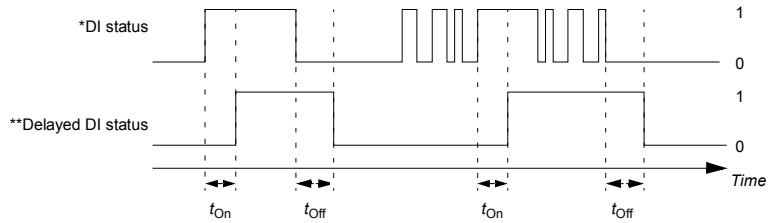
Bit	Name	Value
0	DI1	1 = Force DI1 to value of bit 0 of parameter *10.04 DI forced data*. (0 = Normal mode)
1	DI2	1 = Force DI2 to value of bit 1 of parameter *10.04 DI forced data*. (0 = Normal mode)
2	DI3	1 = Force DI3 to value of bit 2 of parameter *10.04 DI forced data*. (0 = Normal mode)
3	DI4	1 = Force DI4 to value of bit 3 of parameter *10.04 DI forced data*. (0 = Normal mode)
4	DI5	1 = Force DI5 to value of bit 4 of parameter *10.04 DI forced data*. (0 = Normal mode)
5	DI6	1 = Force DI6 to value of bit 5 of parameter *10.04 DI forced data*. (0 = Normal mode)
6…15	Reserved	

	0000h…FFFFh	Override selection for digital inputs.	1 = 1

No.	Name/Value	Description	Def/FbEq16
10.04	*DI forced data*	Allows the data value of a forced digital input to be changed from 0 to 1. It is only possible to force an input that has been selected in parameter *10.03 DI force selection*. Bit 0 is the forced value for DI1; bit 5 is the forced value for the DI6.	0000h

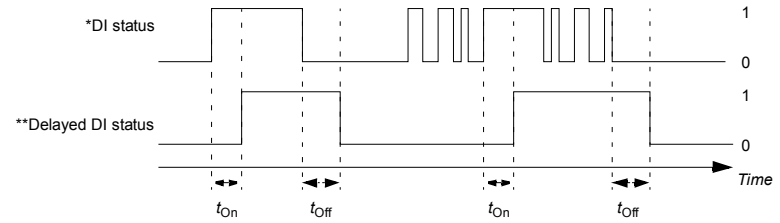
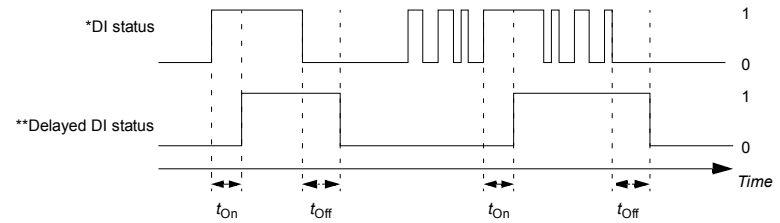
Bit	Name	Value
0	DI1	1 = Force the value of this bit to D1, if so defined in parameter *10.03 DI force selection*.
1	DI2	1 = Force the value of this bit to D3, if so defined in parameter *10.03 DI force selection*.
2	DI3	1 = Force the value of this bit to D3, if so defined in parameter *10.03 DI force selection*.
3	DI4	1 = Force the value of this bit to D4, if so defined in parameter *10.03 DI force selection*.
4	DI5	1 = Force the value of this bit to D5, if so defined in parameter *10.03 DI force selection*.
5	DI6	1 = Force the value of this bit to D6, if so defined in parameter *10.03 DI force selection*.
6…15	Reserved	

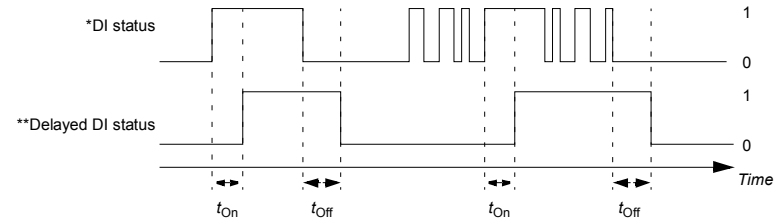
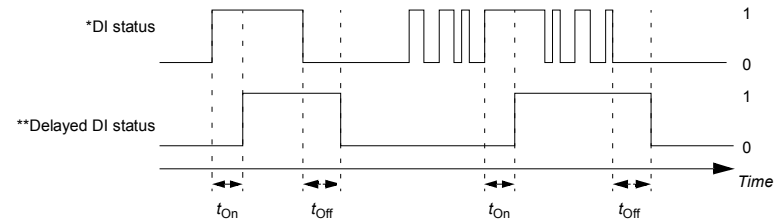
	0000h…FFFFh	Forced values of digital inputs.	1 = 1
10.05	*DI1 ON delay*	Defines the activation delay for digital input DI1.	0.0 s



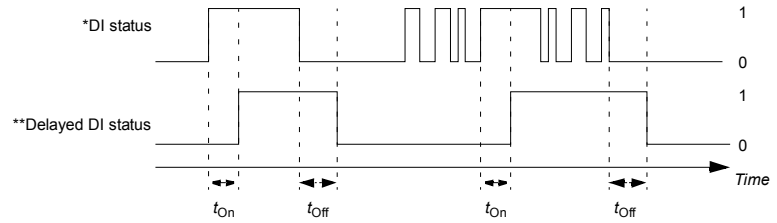
t_{On} = *10.05 DI1 ON delay*
t_{Off} = *10.06 DI1 OFF delay*
*Electrical status of digital input. Indicated by *10.01 DI status*.
**Indicated by *10.02 DI delayed status*.

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

No.	Name/Value	Description	Def/FbEq16
10.07	*DI2 ON delay*	Defines the activation delay for digital input DI2.	0.0 s
		 t_{On} = *10.07 DI2 ON delay* t_{Off} = *10.08 DI2 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	Activation delay for DI2.	10 = 1 s
10.08	*DI2 OFF delay*	Defines the deactivation delay for digital input DI2. See parameter *10.07 DI2 ON delay*.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DI2.	10 = 1 s
10.09	*DI3 ON delay*	Defines the activation delay for digital input DI3.	0.0 s
		 t_{On} = *10.09 DI3 ON delay* t_{Off} = *10.10 DI3 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	Activation delay for DI3.	10 = 1 s
10.10	*DI3 OFF delay*	Defines the deactivation delay for digital input DI3. See parameter *10.09 DI3 ON delay*.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DI3.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
10.11	*DI4 ON delay*	Defines the activation delay for digital input DI4.	0.0 s
		 t_{On} = *10.11 DI4 ON delay* t_{Off} = *10.12 DI4 OFF delay* *Electrical status of digital input. Indicated by *10.01 DI status*. **Indicated by *10.02 DI delayed status*.	
	0.0 … 3000.0 s	Activation delay for DI4.	10 = 1 s
10.12	*DI4 OFF delay*	Defines the deactivation delay for digital input DI4. See parameter *10.11 DI4 ON delay*.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DI4.	10 = 1 s
10.13	*DI5 ON delay*	Defines the activation delay for digital input DI5.	0.0 s
		 t_{On} = *10.13 DI5 ON delay* t_{Off} = *10.14 DI5 OFF delay* *Electrical status of digital input. Indicated by *10.01 DI status*. **Indicated by *10.02 DI delayed status*.	
	0.0 … 3000.0 s	Activation delay for DI5.	10 = 1 s
10.14	*DI5 OFF delay*	Defines the deactivation delay for digital input DI5. See parameter *10.13 DI5 ON delay*.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DI5.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
10.15	*DI6 ON delay*	Defines the activation delay for digital input DI6.	0.0 s



t_{On} = *10.15 DI6 ON delay*
t_{Off} = *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	Activation delay for DI6.	10 = 1 s
10.16	*DI6 OFF delay*	Defines the deactivation delay for digital input DI6. See parameter *10.15 DI6 ON delay*.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for DI6.	10 = 1 s
10.21	*RO status*	Status of relay outputs RO3…RO1.	-

Bit	Value
0	1 = RO1 is energized.
1	1 = RO2 is energized.
2	1 = RO3 is energized.
3…15	Reserved

	0000h…FFFFh	Status of relay outputs.	1 = 1
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*).	0000h

Bit	Value
0	1 = Force RO1 to value of bit 0 of parameter *10.23 RO forced data*. (0 = Normal mode)
1	1 = Force RO2 to value of bit 1 of parameter *10.23 RO forced data*. (0 = Normal mode)
2	1 = Force RO3 to value of bit 2 of parameter *10.23 RO forced data*. (0 = Normal mode)
3…15	Reserved

	0000h…FFFFh	Override selection for relay outputs.	1 = 1

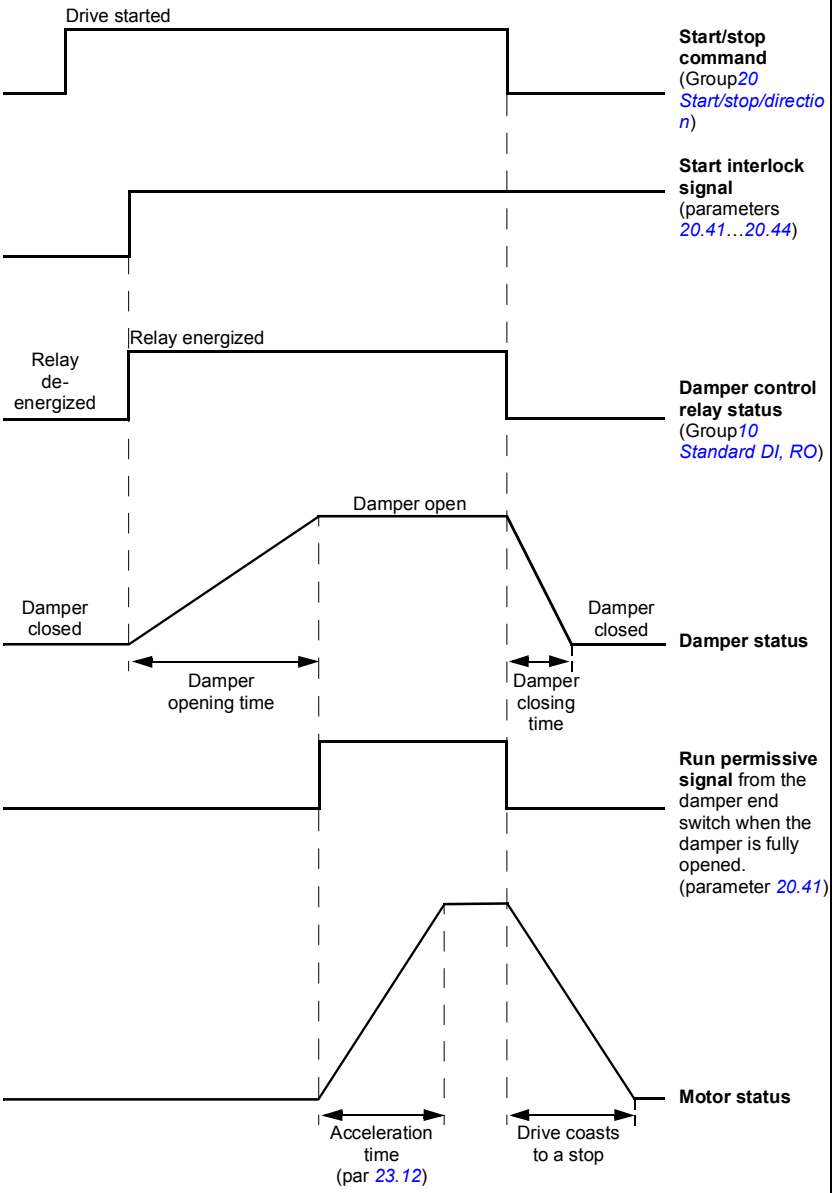
No.	Name/Value	Description	Def/FbEq16
10.23	*RO forced data*	Contains the values of relay outputs that are used instead of the connected signals if selected in parameter *10.22 RO force selection*. Bit 0 is the forced value for RO1.	

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*.
3…15	Reserved

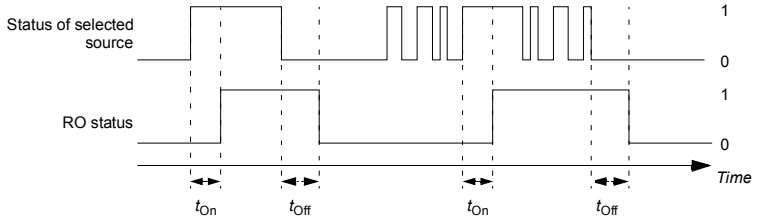
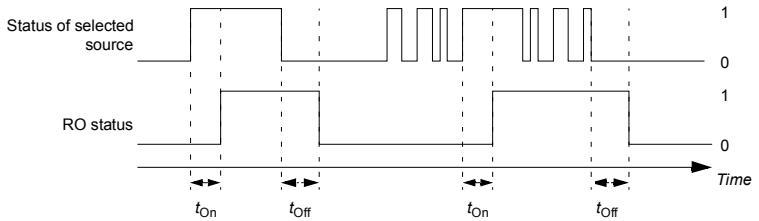
	0000h…FFFFh	Forced RO values.	1 = 1
10.24	*RO1 source*	Selects a drive signal to be connected to relay output RO1.	*Damper control*
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready run	Bit 1 of *06.11 Main status word* (see page *337*).	2
	Enabled	Bit 0 of *06.16 Drive 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		25…26
	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		30…32
	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		36…38
	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		43…44
	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		49…52
	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 *04.41*…*04.71* is on.	53

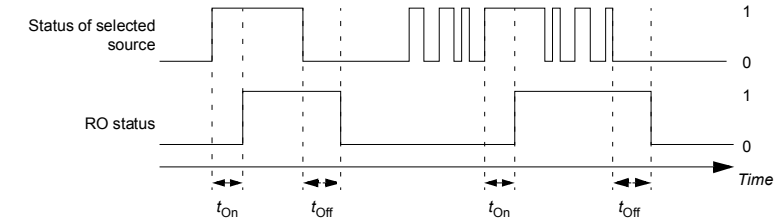
No.	Name/Value	Description	Def/FbEq16
	Damper control	See the figure below.	54



	Run permissive	Bit 7 of *06.22 HVAC status word*.	55
	Start interlock 1	Bit 8 of *06.22 HVAC status word*.	56

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 *Terms and abbreviations* on page *324*).	-
10.25	*RO1 ON delay*	Defines the activation delay for relay output RO1.	0.0 s
		 t_{On} = *10.25 RO1 ON delay* t_{Off} = *10.26 RO1 OFF delay*	
	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
		 t_{On} = *10.28 RO2 ON delay* t_{Off} = *10.29 RO2 OFF delay*	
	0.0 … 3000.0 s	Activation delay for RO2.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
10.29	RO2 OFF delay	Defines the deactivation delay for relay output RO2. See parameter 10.28 RO2 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for RO2.	10 = 1 s
10.30	RO3 source	Selects a drive signal to be connected to relay output RO3. For the available selections, see parameter 10.24 RO1 source.	Fault (-1)
10.31	RO3 ON delay	Defines the activation delay for relay output RO3.	0.0 s



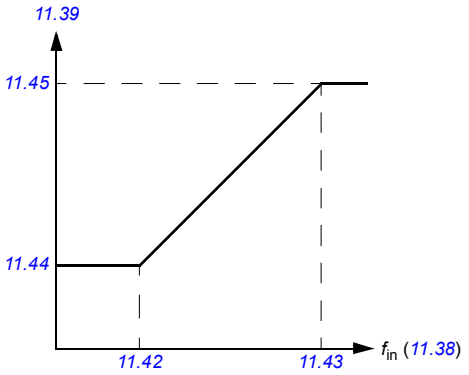
t_{On} = 10.31 RO3 ON delay
t_{Off} = 10.32 RO3 OFF delay

	0.0 … 3000.0 s	Activation delay for RO3.	10 = 1 s
10.32	RO3 OFF delay	Defines the deactivation delay for relay output RO3. See parameter 10.31 RO3 ON delay.	0.0 s
	0.0 … 3000.0 s	Deactivation delay for RO3.	10 = 1 s
10.99	RO/DIO control word	Storage parameter for controlling the relay outputs, for example, through the embedded fieldbus interface. To control the relay outputs (RO) of the drive, send a control word with the bit assignments shown below as Modbus I/O data. Set the target selection parameter of that particular data (58.101…58.114) to RO/DIO control word. In the source selection parameter of the desired output, select the appropriate bit of this word.	0000h

Bit	Name	Description
0	RO1	Source bits for relay outputs RO1…RO3. See parameters 10.24, 10.27 and 10.30.
1	RO2	
2	RO3	
3	RO4	Source bits for relay outputs RO4…RO5 with a CHDI-01 or CMOD-01 extension module. See parameters 15.07 and.15.10.
4	RO5	
5…7	Reserved	
8	DIO1	Source bit for digital output DO1 with a CMOD-01 extension module. See parameter 15.23.
9…15	Reserved	

	0000h…FFFFh	RO/DIO control word.	1 = 1
10.101	RO1 toggle counter	Displays the number of times relay output RO1 has changed states. Can be reset from the control panel by pressing the Reset softkey for 3 seconds.	-
	0…4294967000	State change count.	1 = 1

No.	Name/Value	Description	Def/FbEq16
10.102	RO2 toggle counter	Displays the number of times relay output RO2 has changed states. Can be reset from the control panel by pressing the Reset softkey for 3 seconds.	-
	0…4294967000	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.	-
	0…4294967000	State change count.	1 = 1

11 Standard DIO, FI, FO		Configuration of the frequency input.	
11.21	DI5 configuration	Selects how digital input 5 is used.	Digital input
	Digital input	DI5 is used as a digital input.	0
	Frequency input	DI5 is used as a frequency input.	1
11.38	Freq in 1 actual value	Displays the value of frequency input 1 (via DI5 when it is used as a frequency input) before scaling. See parameter 11.42 Freq in 1 min. This parameter is read-only.	-
	0 … 16000 Hz	Unscaled value of frequency input 1.	1 = 1 Hz
11.39	Freq in 1 scaled value	Displays the value of frequency input 1 (via DI5 when it is used as a frequency input) after scaling. See parameter 11.42 Freq in 1 min. This parameter is read-only.	-
	-32768.000… 32767.000	Scaled value of frequency input 1 (DI5).	1 = 1
11.42	Freq in 1 min	Defines the minimum for the frequency actually arriving at frequency input 1 (DI5 when it is used as a frequency input). The incoming frequency signal (11.38 Freq in 1 actual value) is scaled into an internal signal (11.39 Freq in 1 scaled value) by parameters 11.42…11.45 as follows:  	0 Hz
	0 … 16000 Hz	Minimum frequency of frequency input 1 (DI5).	1 = 1 Hz

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 at scaled min*	Defines the value that is required to correspond internally to the minimum input frequency defined by parameter *11.42 Freq in 1 min*. See diagram at parameter *11.42 Freq in 1 min*.	0.000
	-32768.000… 32767.000	Value corresponding to minimum of frequency input 1.	1 = 1
11.45	*Freq in 1 at scaled max*	Defines the value that is required to correspond internally to the maximum input frequency defined by parameter *11.43 Freq in 1 max*. See diagram at parameter *11.42 Freq in 1 min*.	1500.000; 1800.000 (*95.20* b0)
	-32768.000… 32767.000	Value corresponding to maximum of frequency input 1.	1 = 1

12 Standard AI		Configuration of standard analog inputs.	
12.02	*AI force selection*	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:** • AI filter times (parameters *12.16 AI1 filter time* and *12.26 AI2 filter time*) have no effect on forced AI values (parameters *12.13 AI1 forced value* and *12.23 AI2 forced value*). • Boot and power cycle reset the force selections (parameters *12.02* and *12.03*).	0000h

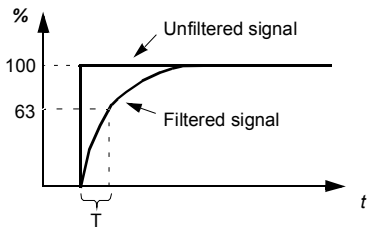
Bit	Name	Value
0	AI1	1 = Force AI1 to value of parameter *12.13 AI1 forced value*.
1	AI2	1 = Force AI2 to value of parameter *12.23 AI2 forced value*.
2…15	Reserved	

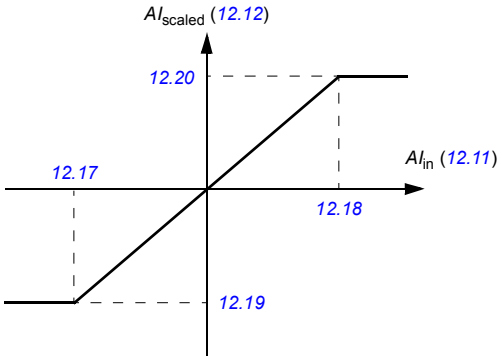
	0000h…FFFFh	Forced values selector for analog inputs AI1 and AI2.	1 = 1
12.03	*AI supervision function*	Selects how the drive reacts when an analog input signal moves out of the minimum and/or maximum limits specified for the input. The supervision applies a margin of 0.5 V or 1.0 mA to the limits. For 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 AI supervision selection*.	*No action*
	No action	No action taken.	0
	Fault	Drive trips on fault *80A0 AI supervision*.	1
	Warning	Drive generates warning *A8A0 AI supervision*.	2
	Last speed	Drive generates warning *A8A0 AI supervision* and freezes the speed (or frequency) to the level the drive was operating at. The speed/frequency is determined on the basis of actual speed using 850 ms low-pass filtering. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	3

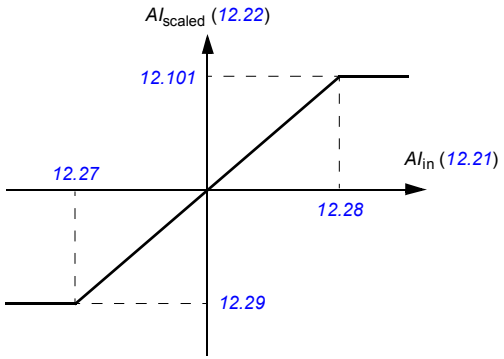
No.	Name/Value	Description	Def/FbEq16
	Speed ref safe	Drive generates warning *A8A0 AI supervision* and sets the speed to the speed defined by parameter *22.41 Speed ref safe* (or *28.41 Frequency ref safe* when frequency reference is being used). **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	4
12.04	*AI supervision selection*	Specifies the analog input limits to be supervised. See parameter *12.03 AI supervision function*.	0000h

Bit	Name	Description
0	AI1 < MIN	1 = Minimum limit supervision of AI1 active.
1	AI1 > MAX	1 = Maximum limit supervision of AI1 active.
2	AI2 < MIN	1 = Minimum limit supervision of AI2 active.
3	AI2 > MAX	1 = Maximum limit supervision of AI2 active.
4…15	Reserved	

	0000h…FFFFh	Activation of analog input supervision.	1 = 1
12.11	*AI1 actual value*	Displays the value of analog input AI1 in mA or V (depending on whether the input is set to current or voltage by a hardware setting). This parameter is read-only.	-
	0.000…22.000 mA or 0.000…11.000 V	Value of analog input AI1.	1000 = 1 unit
12.12	*AI1 scaled value*	Displays the value of analog input AI1 after scaling. See parameters *12.19 AI1 scaled at AI1 min* and *12.20 AI1 scaled at AI1 max*. This parameter is read-only.	-
	-32768.000… 32767.000	Scaled value of analog input AI1.	1 = 1
12.13	*AI1 forced value*	Forced value that can be used instead of the true reading of the input. See parameter *12.02 AI force selection*.	-
	0.000…20.000 mA or 0.000…10.000 V	Forced value of analog input AI1.	1000 = 1 unit
12.15	*AI1 unit selection*	Selects the unit for readings and settings related to analog input AI1.	*V*
	V	Volts.	2
	mA	Milliamperes.	10

No.	Name/Value	Description	Def/FbEq16
12.16	*AI1 filter time*	Defines the filter time constant for analog input AI1.  $O = I \times (1 - e^{-t/T})$ 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
	0.000…30.000 s	Filter time constant.	1000 = 1 s
12.17	*AI1 min*	Defines the minimum site value for analog input AI1. 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 AI1 scaled at AI1 min*.	4.000 mA or 0.000 V
	0.000…20.000 mA or 0.000…10.000 V	Minimum value of AI1.	1000 = 1 unit
12.18	*AI1 max*	Defines the maximum site value for analog input AI1. 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 AI1 scaled at AI1 min*.	20.000 mA or 10.000 V
	0.000…22.000 mA or 0.000…11.000 V	Maximum value of AI1.	1000 = 1 unit

No.	Name/Value	Description	Def/FbEq16
12.19	AI1 scaled at AI1 min	Defines the real internal value that corresponds to the minimum analog input AI1 value defined by parameter 12.17 AI1 min. (Changing the polarity settings of 12.19 and 12.20 can effectively invert the analog input.)  	0.000
	-32768.000… 32767.000	Real value corresponding to minimum AI1 value.	1 = 1
12.20	AI1 scaled at AI1 max	Defines the real internal value that corresponds to the maximum analog input AI1 value defined by parameter 12.18 AI1 max. See the drawing at parameter 12.19 AI1 scaled at AI1 min.	50.000; 60.000 (95.20 b0)
	-32768.000… 32767.000	Real value corresponding to maximum AI1 value.	1 = 1
12.21	AI2 actual value	Displays the value of analog input AI2 in mA or V (depending on whether the input is set to current or voltage by a hardware setting). This parameter is read-only.	-
	0.000…22.000 mA or 0.000…11.000 V	Value of analog input AI2.	1000 = 1 unit
12.22	AI2 scaled value	Displays the value of analog input AI2 after scaling. See parameters 12.29 AI2 scaled at AI2 min and 12.101 AI1 percent value. This parameter is read-only.	-
	-32768.000… 32767.000	Scaled value of analog input AI2.	1 = 1
12.23	AI2 forced value	Forced value that can be used instead of the true reading of the input. See parameter 12.02 AI force selection.	-
	0.000…20.000 mA or 0.000…10.000 V	Forced value of analog input AI2.	1000 = 1 unit
12.25	AI2 unit selection	Selects the unit for readings and settings related to analog input AI2.	mA
	V	Volts.	2
	mA	Milliamperes.	10
12.26	AI2 filter time	Defines the filter time constant for analog input AI2. See parameter 12.16 AI1 filter time.	0.100 s
	0.000…30.000 s	Filter time constant.	1000 = 1 s

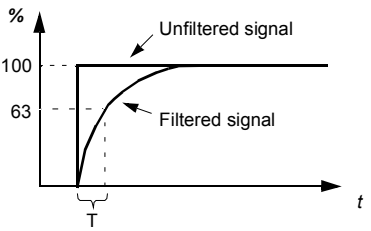
No.	Name/Value	Description	Def/FbEq16
12.27	AI2 min	Defines the minimum site value for analog input AI2. Set the value actually sent to the drive when the analog signal from plant is wound to its minimum setting.	0.000 mA
	0.000…20.000 mA or 0.000…10.000 V	Minimum value of AI2.	1000 = 1 unit
12.28	AI2 max	Defines the maximum site value for analog input AI2. Set the value actually sent to the drive when the analog signal from plant is wound to its maximum setting.	10.000 mA
	0.000…22.000 mA or 0.000…11.000 V	Maximum value of AI2.	1000 = 1 unit
12.29	AI2 scaled at AI2 min	Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter 12.27 AI2 min. (Changing the polarity settings of 12.29 and 12.101 can effectively invert the analog input.) 	0.000
	-32768.000… 32767.000	Real value corresponding to minimum AI2 value.	1 = 1
12.30	AI2 scaled at AI2 max	Defines the real value that corresponds to the minimum analog input AI2 value defined by parameter 12.28 AI2 max. See the drawing at parameter of 12.29 AI2 scaled at AI2 min.	50.000
	-32768.000… 32767.000	Real value corresponding to maximum AI2 value.	1 = 1
12.101	AI1 percent value	Value of analog input AI1 in percent of AI1 scaling (12.18 AI1 max - 12.17 AI1 min).	-
	0.00…100.00%	AI1 value	100 = 1%
12.102	AI2 percent value	Value of analog input AI2 in percent of AI2 scaling (12.28 AI2 max - 12.27 AI2 min).	-
	0.00…100.00%	AI2 value	100 = 1%

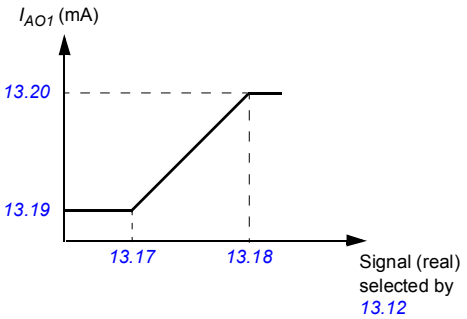
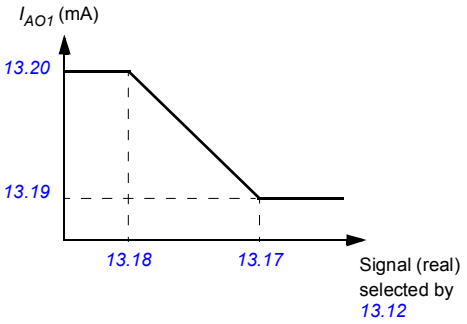
No.	Name/Value	Description	Def/FbEq16
13 Standard AO		Configuration of standard analog outputs.	
13.02	AO force selection	The source signals of the analog outputs can be overridden, for example, for testing purposes. A forced value parameter is provided for each analog output, and its value is applied whenever the corresponding bit in this parameter is 1. **Note:** Boot and power cycle reset the force selections (parameters 13.02 and 13.11).	0000h

Bit	Name	Value
0	AO1	1 = Force AO1 to value of parameter 13.13 AO1 forced value. (0 = Normal mode)
1	AO2	1 = Force AO2 to value of parameter 13.23 AO2 forced value. (0 = Normal mode)
2…15	Reserved	

	0000h…FFFFh	Forced values selector for analog outputs AO1 and AO2.	1 = 1
13.11	AO1 actual value	Displays the value of AO1 in mA or V. This parameter is read-only.	-
	0.000…22.000 mA / 0.000…11.000 V	Value of AO1.	1 = 1 mA
13.12	AO1 source	Selects a signal to be connected to analog output AO1.	Output frequency
	Zero	None.	0
	Motor speed used	01.01 Motor speed used (page 327).	1
	Reserved		2
	Output frequency	01.06 Output frequency (page 327).	3
	Motor current	01.07 Motor current (page 327).	4
	Motor current % of motor nominal	01.08 Motor current % of motor nom (page 327).	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
	Reserved		17…19
	Temp sensor 1 excitation	The output is used to feed an excitation current to the temperature sensor 1, see parameter 35.11 Temperature 1 source. See also section Programmable protection functions (page 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		21…25
	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 *Terms and abbreviations* 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
	0.000…22.000 mA / 0.000…11.000 V	Forced value for AO1.	1 = 1 unit
13.15	*AO1 unit selection*	Selects the unit for readings and settings related to analog input AO1.	*V*
	V	Volts.	2
	mA	Milliamperes.	10

No.	Name/Value	Description	Def/FbEq16
13.16	*AO1 filter time*	Defines the filtering time constant for analog output AO1.  $O = I \times (1 - e^{-t/T})$ 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

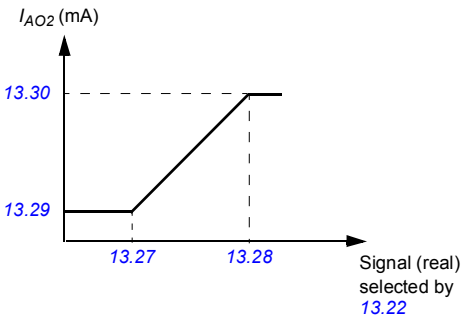
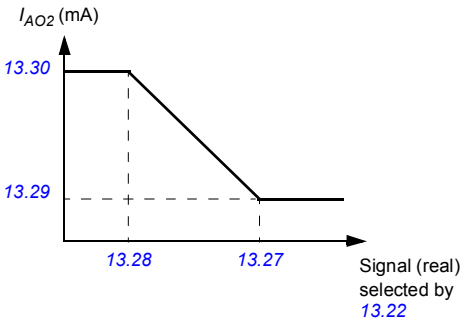
No.	Name/Value	Description	Def/FbEq16
13.17	*AO1 source min*	Defines the real minimum value of the signal (selected by parameter *13.12 AO1 source*) that corresponds to the minimum required AO1 output value (defined by parameter *13.19 AO1 out at AO1 src min*).  Programming *13.17* as the maximum value and *13.18* as the minimum value inverts the output.  	0.0

No.	Name/Value	Description	Def/FbEq16

AO has automatic scaling. Every time the source for the AO is changed, the scaling range is changed accordingly. User given minimum and maximum values override the automatic values.

	13.12 AO1 source, *13.22 AO2 source*	*13.17 AO1 source min*, *13.27 AO2 source min*	*13.18 AO1 source max*, *13.28 AO2 source max*
0	*Zero*	N/A (Output is constant zero.)	
1	*Motor speed used*	0	*46.01 Speed scaling*
3	*Output frequency*	0	*46.02 Frequency scaling*
4	*Motor current*	0	*30.17 Maximum current*
5	*Motor current % of motor nominal*	0%	100%
6	*Motor torque*	0	*46.03 Torque scaling*
7	*DC voltage*	Min. value of *01.11 DC voltage*	Max. value of *01.11 DC voltage*
8	*Output power*	0	*46.04 Power scaling*
10	*Speed ref ramp in*	0	*46.01 Speed scaling*
11	*Speed ref ramp out*	0	*46.01 Speed scaling*
12	*Speed ref used*	0	*46.01 Speed scaling*
14	*Freq ref used*	0	*46.02 Frequency scaling*
16	*Process PID out*	Min. value of *40.01 Process PID output actual*	Max. value of *40.01 Process PID output actual*
20	*Temp sensor 1 excitation*	N/A (Analog output is not scaled; it is determined by the sensor's triggering voltage.)	
21	*Temp sensor 2 excitation*		
26	*Abs motor speed used*	0	*46.01 Speed scaling*
27	*Abs motor speed %*	0	*46.01 Speed scaling*
28	*Abs output frequency*	0	*46.02 Frequency scaling*
30	*Abs motor torque*	0	*46.03 Torque scaling*
31	*Abs output power*	0	*46.04 Power scaling*
32	*Abs motor shaft power*	0	*46.04 Power scaling*
33	*External PID1 out*	Min. value of *71.01 External PID act value*	Max. value of *71.01 External PID act value*
	Other	Min. value of the selected parameter	Max. value of the selected parameter

	-32768.0…32767.0	Real signal value corresponding to minimum AO1 output value.	1 = 1
13.18	*AO1 source max*	Defines the real maximum value of the signal (selected by parameter *13.12 AO1 source*) that corresponds to the maximum required AO1 output value (defined by parameter *13.20 AO1 out at AO1 src max*). See parameter *13.17 AO1 source min*.	50.0; 60.0 (*95.20* b0)
	-32768.0…32767.0	Real signal value corresponding to maximum AO1 output value.	1 = 1
13.19	*AO1 out at AO1 src min*	Defines the minimum output value for analog output AO1. See also drawing at parameter *13.17 AO1 source min*.	0.000 V
	0.000…22.000 mA / 0.000…11.000 V	Minimum AO1 output value.	1000 = 1 unit
13.20	*AO1 out at AO1 src max*	Defines the maximum output value for analog output AO1. See also drawing at parameter *13.17 AO1 source min*.	10.000 V
	0.000…22.000 mA / 0.000…11.000 V	Maximum AO1 output value.	1000 = 1 unit

No.	Name/Value	Description	Def/FbEq16
13.21	*AO2 actual value*	Displays the value of AO2 in mA. This parameter is read-only.	-
	0.000 … 22.000 mA	Value of AO2.	1000 = 1 mA
13.22	*AO2 source*	Selects a signal to be connected to analog output AO2. Alternatively, sets the output to excitation mode to feed a constant current to a temperature sensor. For the selections, see parameter *13.12 AO1 source*.	*Motor current*
13.23	*AO2 forced value*	Forced value that can be used instead of the selected output signal. See parameter *13.02 AO force selection*.	0.000 mA
	0.000 … 22.000 mA	Forced value for AO2.	1000 = 1 mA
13.26	*AO2 filter time*	Defines the filtering time constant for analog output AO2. See parameter *13.16 AO1 filter time*.	0.100 s
	0.000 … 30.000 s	Filter time constant.	1000 = 1 s
13.27	*AO2 source min*	Defines the real minimum value of the signal (selected by parameter *13.22 AO2 source*) that corresponds to the minimum required AO2 output value (defined by parameter *13.29 AO2 out at AO2 src min*). See parameter *13.17 AO1 source min* about the AO automatic scaling.  Programming *13.27* as the maximum value and *13.28* as the minimum value inverts the output. 	0.0
	-32768.0…32767.0	Real signal value corresponding to minimum AO2 output value.	1 = 1

No.	Name/Value	Description	Def/FbEq16
13.28	AO2 source max	Defines the real maximum value of the signal (selected by parameter 13.22 AO2 source) that corresponds to the maximum required AO2 output value (defined by parameter 13.30 AO2 out at AO2 src max). See parameter 13.27 AO2 source min. See parameter 13.17 AO1 source min about the AO automatic scaling.	
	-32768.0…32767.0	Real signal value corresponding to maximum AO2 output value.	1 = 1
13.29	AO2 out at AO2 src min	Defines the minimum output value for analog output AO2. See also drawing at parameter 13.27 AO2 source min.	0.000 mA
	0.000 … 22.000 mA	Minimum AO2 output value.	1000 = 1 mA
13.30	AO2 out at AO2 src max	Defines the maximum output value for analog output AO2. See also drawing at parameter 13.27 AO2 source min.	20.000 mA
	0.000 … 22.000 mA	Maximum AO2 output value.	1000 = 1 mA
13.91	AO1 data storage	Storage parameter for controlling analog output AO1, for example, through the embedded fieldbus interface. In parameter 13.12 AO1 source, select AO1 data storage. Then set this parameter as the target of the incoming value data. With the embedded fieldbus interface, simply set the target selection parameter of that particular data (58.101…58.114) to AO1 data storage.	0.00
	-327.68…327.67	Storage parameter for AO1.	100 = 1
13.92	AO2 data storage	Storage parameter for controlling analog output AO2, for example, through the embedded fieldbus interface. In parameter 13.22 AO2 source, select AO2 data storage. Then set this parameter as the target of the incoming value data. With the embedded fieldbus interface, simply set the target selection parameter of that particular data (58.101…58.114) to AO2 data storage.	0.00
	-327.68…327.67	Storage parameter for AO2.	100 = 1

15 I/O extension module		Configuration of the I/O extension module installed in slot 2. See also section Programmable I/O extensions (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 None, 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/Value	Description	Def/FbEq16
15.02	*Detected extension module*	I/O extension module detected on the drive.	*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
15.03	*DI status*	Displays the status of the digital inputs DI7…DI12 on the extension module Bit 0 indicates the status of DI7. **Example:** 001001b = DI7 and DI10 are on, remainder are off. This parameter is read-only.	-

Bit	Name	Description
0	DI7	1 = Digital input 7 is ON.
1	DI8	1 = Digital input 8 is ON.
2	DI9	1 = Digital input 9 is ON.
3	DI10	1 = Digital input 10 is ON.
4	DI11	1 = Digital input 11 is ON.
5	DI12	1 = Digital input 12 is ON.
6…15	Reserved	

	0000h…FFFFh	Status of digital input/outputs.	1 = 1
15.04	*RO/DO status*	Displays the status of the relay outputs RO4 and RO5 and digital output DO1 on the extension module. Bits 0…1 indicates the status of RO4…RO5; bit 5 indicates the status of DO1. **Example:** 100101b = RO4 is on, RO5 is off. and DO1 is on. This parameter is read-only.	-

Bit	Name	Description
0	RO4	1 = Relay output 4 is ON.
1	RO5	1 = Relay output 5 is ON
2…4	Reserved	
5	DO1	1 = Digital output 1 is ON.
6…15	Reserved	

	0000h…FFFFh	Status of relay/digital outputs.	1 = 1

No.	Name/Value	Description	Def/FbEq16
15.05	RO/DO force selection	The electrical statuses of the relay/digital outputs can be overridden, for example, for testing purposes. A bit in parameter 15.06 RO/DO forced data is provided for each relay or digital output, and its value is applied whenever the corresponding bit in this parameter is 1. **Note:** Boot and power cycle reset the force selections (parameters 15.05 and 15.06).	0000h

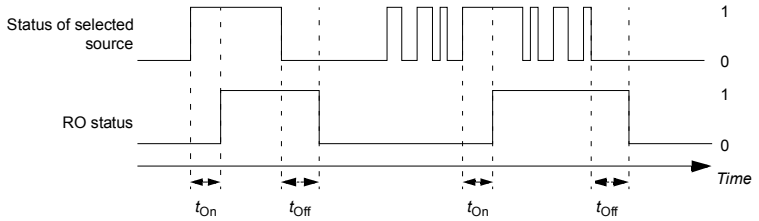
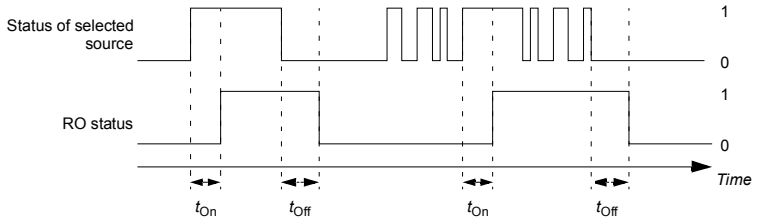
Bit	Name	Value
0	RO4	1 = Force RO4 to value of bit 0 of parameter 15.06 RO/DO forced data. (0 = Normal mode)
1	RO5	1 = Force RO5 to value of bit 1 of parameter 15.06 RO/DO forced data. (0 = Normal mode)
2…4	Reserved	
5	DO1	1 = Force DO1 to value of bit 5 of parameter 15.06 RO/DO forced data. (0 = Normal mode)
6…15	Reserved	

	0000h…FFFFh	Override selection for relay/digital outputs.	1 = 1
15.06	RO/DO forced data	Allows the data value of a forced relay or digital output to be changed from 0 to 1. It is only possible to force an output that has been selected in parameter 15.05 RO/DO force selection. Bits 0…1 are the forced values for RO4…RO5; bit 5 is the forced value for DO1.	0000h

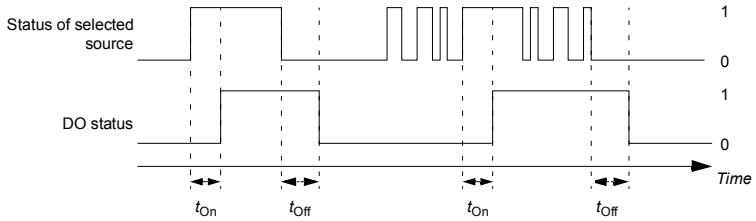
Bit	Name	Description
0	RO4	1 = Force the value of this bit to RO4, if so defined in parameter 15.05 RO/DO force selection.
1	RO5	1 = Force the value of this bit to RO5, if so defined in parameter 15.05 RO/DO force selection.
2…4	Reserved	
5	DO1	1 = Force the value of this bit to DO1 if so defined in parameter 15.05 RO/DO force selection.
6…15	Reserved	

	0000h…FFFFh	Forced values of relay/digital outputs.	1 = 1
15.07	RO4 source	Selects a drive signal to be connected to relay output RO4.	Not energized
	Not energized	Output is not energized.	0
	Energized	Output is energized.	1
	Ready run	Bit 1 of 06.11 Main status word (see page 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

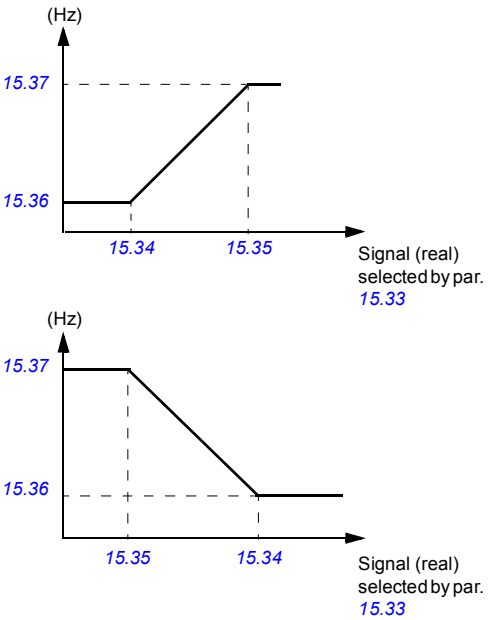
No.	Name/Value	Description	Def/FbEq16
	Reverse	Bit 2 of *06.19 Speed control status word* (see page *339*).	10
	Zero speed	Bit 0 of *06.19 Speed control status word* (see page *339*).	11
	Above limit	Bit 10 of *06.17 Drive status word 2* (see page *338*).	12
	Warning	Bit 7 of *06.11 Main status word* (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		25…26
	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		30…32
	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		36…38
	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		43…44
	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 *04.41*…*04.71* 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 *Terms and abbreviations* on page *324*).	-
15.08	*RO4 ON delay*	Defines the activation delay for relay output RO4.	0.0 s
		 t_{On} = *15.08 RO4 ON delay* t_{Off} = *15.09 RO4 OFF delay*	
	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
		 t_{On} = *15.11 RO5 ON delay* t_{Off} = *15.12 RO5 OFF delay*	
	0.0 … 3000.0 s	Activation delay for RO5.	10 = 1 s

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		25…26
	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		30…32

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		36…38
	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 *04.41*…*04.71* 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 *Terms and abbreviations* 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
		 t_{On} = *15.24 DO1 ON delay* t_{Off} = *15.25 DO1 OFF delay*	
	0.0 … 3000.0 s	Activation delay for DO1.	10 = 1 s

No.	Name/Value	Description	Def/FbEq16
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 Terms and abbreviations 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. 	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	Def/FbEq16
19 Operation mode		Selection of local and external control location sources and operating modes. See also section *Operating modes of the drive* (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		3…9
	Scalar (Hz)	Frequency control in scalar motor control mode (in scalar motor control mode).	10
	Forced magn.	Motor is in magnetizing mode.	20
19.11	*Ext1/Ext2 selection*	Selects the source for external control location EXT1/EXT2 selection. 0 = EXT1 1 = EXT2	*EXT1*
	EXT1	EXT1 (permanently selected).	0
	EXT2	EXT2 (permanently selected).	1
	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		9…18
	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		22…24
	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		28…31
	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 *Terms and abbreviations* 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 Terms and abbreviations 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 Start/stop/direction		Start/stop/direction and run/start enable signal source selection; positive/negative reference enable signal source selection. For information on control locations, see section Local control vs. external control (page 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 20.02…20.05.	In1 Start
	Not selected	No start or stop command sources selected.	0
	In1 Start	The source of the start and stop commands is selected by parameter 20.03 Ext1 in1 source. The state transitions of the source bits are interpreted as follows: **State of source 1 (20.03)** / **Command** 0 -> 1 (20.02 = Edge) 1 (20.02 = Level) / Start 0 / Stop	1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>In1 Start; In2 Dir</td><td>The source selected by 20.03 Ext1 in1 source is the start signal; the source selected by 20.04 Ext1 in2 source determines the direction. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.03)</th><th>State of source 2 (20.04)</th><th>Command</th></tr><tr><td>0</td><td>Any</td><td>Stop</td></tr><tr><td>0 -> 1 (20.02 = Edge)
1 (20.02 = Level)</td><td>0</td><td>Start forward</td></tr><tr><td></td><td>1</td><td>Start reverse</td></tr></table></td><td>2</td></tr>
<tr><td></td><td>In1 Start fwd; In2 Start rev</td><td>The source selected by 20.03 Ext1 in1 source is the forward start signal; the source selected by 20.04 Ext1 in2 source is the reverse start signal. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.03)</th><th>State of source 2 (20.04)</th><th>Command</th></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>0 -> 1 (20.02 = Edge)
1 (20.02 = Level)</td><td>0</td><td>Start forward</td></tr><tr><td>0</td><td>0 -> 1 (20.02 = Edge)
1 (20.02 = Level)</td><td>Start reverse</td></tr><tr><td>1</td><td>1</td><td>Stop</td></tr></table></td><td>3</td></tr>
<tr><td></td><td>In1P Start; In2 Stop</td><td>The sources of the start and stop commands are selected by parameters 20.03 Ext1 in1 source and 20.04 Ext1 in2 source. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.03)</th><th>State of source 2 (20.04)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>Start</td></tr><tr><td>Any</td><td>0</td><td>Stop</td></tr></table>Notes:
• 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 Level (1).
• When source 2 is 0, the Start and Stop keys on the control panel are disabled.</td><td>4</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>In1P Start; In2 Stop; In3 Dir</td><td>The sources of the start and stop commands are selected by parameters 20.03 Ext1 in1 source and 20.04 Ext1 in2 source. The source selected by 20.05 Ext1 in3 source determines the direction. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.03)</th><th>State of source 2 (20.04)</th><th>State of source 3 (20.05)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>0</td><td>Start forward</td></tr><tr><td>0 -> 1</td><td>1</td><td>1</td><td>Start reverse</td></tr><tr><td>Any</td><td>0</td><td>Any</td><td>Stop</td></tr></table>Notes:
• 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 Level (1).
• When source 2 is 0, the Start and Stop keys on the control panel are disabled.</td><td>5</td></tr>
<tr><td></td><td>In1P Start fwd; In2P Start rev; In3 Stop</td><td>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:
<table><tr><th>State of source 1 (20.03)</th><th>State of source 2 (20.04)</th><th>State of source 3 (20.05)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>Any</td><td>1</td><td>Start forward</td></tr><tr><td>Any</td><td>0 -> 1</td><td>1</td><td>Start reverse</td></tr><tr><td>Any</td><td>Any</td><td>0</td><td>Stop</td></tr></table>Note: Parameter 20.02 Ext1 start trigger type has no effect with this setting.</td><td>6</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>7…10</td></tr>
<tr><td></td><td>Control panel</td><td>The start and stop commands are taken from the control panel (or PC connected to the panel connector).</td><td>11</td></tr>
<tr><td></td><td>Fieldbus A</td><td>The start and stop commands are taken from fieldbus adapter A.
Note: Set also 20.02 Ext1 start trigger type to Level.</td><td>12</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>13</td></tr>
<tr><td></td><td>Embedded fieldbus</td><td>The start and stop commands are taken from the embedded fieldbus interface.
Note: Set also 20.02 Ext1 start trigger type to Level.</td><td>14</td></tr>
<tr><td>20.02</td><td>Ext1 start trigger type</td><td>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.</td><td>Level</td></tr>
<tr><td></td><td>Edge</td><td>The start signal is edge-triggered.</td><td>0</td></tr>
<tr><td></td><td>Level</td><td>The start signal is level-triggered.</td><td>1</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>20.03</td><td>Ext1 in1 source</td><td>Selects source 1 for parameter 20.01 Ext1 commands.</td><td>DI1</td></tr>
<tr><td></td><td>Always off</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>Always on</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>DI1</td><td>Digital input DI1 (10.02 DI delayed status, bit 0).</td><td>2</td></tr>
<tr><td></td><td>DI2</td><td>Digital input DI2 (10.02 DI delayed status, bit 1).</td><td>3</td></tr>
<tr><td></td><td>DI3</td><td>Digital input DI3 (10.02 DI delayed status, bit 2).</td><td>4</td></tr>
<tr><td></td><td>DI4</td><td>Digital input DI4 (10.02 DI delayed status, bit 3).</td><td>5</td></tr>
<tr><td></td><td>DI5</td><td>Digital input DI5 (10.02 DI delayed status, bit 4).</td><td>6</td></tr>
<tr><td></td><td>DI6</td><td>Digital input DI6 (10.02 DI delayed status, bit 5).</td><td>7</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>8…17</td></tr>
<tr><td></td><td>Timed function 1</td><td>Bit 0 of 34.01 Timed functions status (see page 451).</td><td>18</td></tr>
<tr><td></td><td>Timed function 2</td><td>Bit 1 of 34.01 Timed functions status (see page 451).</td><td>19</td></tr>
<tr><td></td><td>Timed function 3</td><td>Bit 2 of 34.01 Timed functions status (see page 451).</td><td>20</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>21…23</td></tr>
<tr><td></td><td>Supervision 1</td><td>Bit 0 of 32.01 Supervision status (see page 444).</td><td>24</td></tr>
<tr><td></td><td>Supervision 2</td><td>Bit 1 of 32.01 Supervision status (see page 444).</td><td>25</td></tr>
<tr><td></td><td>Supervision 3</td><td>Bit 2 of 32.01 Supervision status (see page 444).</td><td>26</td></tr>
<tr><td></td><td>Other [bit]</td><td>Source selection (see Terms and abbreviations on page 324).</td><td>-</td></tr>
<tr><td>20.04</td><td>Ext1 in2 source</td><td>Selects source 2 for parameter 20.01 Ext1 commands.
For the available selections, see parameter 20.03 Ext1 in1 source.</td><td>Always off</td></tr>
<tr><td>20.05</td><td>Ext1 in3 source</td><td>Selects source 3 for parameter 20.01 Ext1 commands.
For the available selections, see parameter 20.03 Ext1 in1 source.</td><td>Always off</td></tr>
<tr><td>20.06</td><td>Ext2 commands</td><td>Selects the source of start, stop and direction commands for external control location 2 (EXT2).
See parameter 20.21 for the determination of the actual direction. See also parameters 20.07…20.10.</td><td>Not selected</td></tr>
<tr><td></td><td>Not selected</td><td>No start or stop command sources selected.</td><td>0</td></tr>
<tr><td></td><td>In1 Start</td><td>The source of the start and stop commands is selected by parameter 20.08 Ext2 in1 source. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.08)</th><th>Command</th></tr><tr><td>0 -> 1 (20.07 = Edge)
1 (20.07 = Level)</td><td>Start</td></tr><tr><td>0</td><td>Stop</td></tr></table></td><td>1</td></tr>
<tr><td></td><td>In1 Start; In2 Dir</td><td>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:
<table><tr><th>State of source 1 (20.08)</th><th>State of source 2 (20.09)</th><th>Command</th></tr><tr><td>0</td><td>Any</td><td>Stop</td></tr><tr><td rowspan="2">0 -> 1 (20.07 = Edge)
1 (20.07 = Level)</td><td>0</td><td>Start forward</td></tr><tr><td>1</td><td>Start reverse</td></tr></table></td><td>2</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>In1 Start fwd; In2 Start rev</td><td>The source selected by 20.08 Ext2 in1 source is the forward start signal; the source selected by 20.09 Ext2 in2 source is the reverse start signal. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.08)</th><th>State of source 2 (20.09)</th><th>Command</th></tr><tr><td>0</td><td>0</td><td>Stop</td></tr><tr><td>0 -> 1 (20.07 = Edge)
1 (20.07 = Level)</td><td>0</td><td>Start forward</td></tr><tr><td>0</td><td>0 -> 1 (20.07 = Edge)
1 (20.07 = Level)</td><td>Start reverse</td></tr><tr><td>1</td><td>1</td><td>Stop</td></tr></table></td><td>3</td></tr>
<tr><td></td><td>In1P Start; In2 Stop</td><td>The sources of the start and stop commands are selected by parameters 20.08 Ext2 in1 source and 20.09 Ext2 in2 source. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.08)</th><th>State of source 2 (20.09)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>Start</td></tr><tr><td>Any</td><td>0</td><td>Stop</td></tr></table>Notes:
• Parameter 20.07 Ext2 start trigger type has no effect with this setting.
• When source 2 is 0, the Start and Stop keys on the control panel are disabled.</td><td>4</td></tr>
<tr><td></td><td>In1P Start; In2 Stop; In3 Dir</td><td>The sources of the start and stop commands are selected by parameters 20.08 Ext2 in1 source and 20.09 Ext2 in2 source. The source selected by 20.10 Ext2 in3 source determines the direction. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.08)</th><th>State of source 2 (20.09)</th><th>State of source 3 (20.10)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>1</td><td>0</td><td>Start forward</td></tr><tr><td>0 -> 1</td><td>1</td><td>1</td><td>Start reverse</td></tr><tr><td>Any</td><td>0</td><td>Any</td><td>Stop</td></tr></table>Notes:
• Parameter 20.07 Ext2 start trigger type has no effect with this setting.
• When source 2 is 0, the Start and Stop keys on the control panel are disabled.</td><td>5</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>In1P Start fwd; In2P Start rev; In3 Stop</td><td>The sources of the start and stop commands are selected by parameters 20.08 Ext2 in1 source, 20.09 Ext2 in2 source and 20.10 Ext2 in3 source. The source selected by 20.10 Ext2 in3 source determines the direction. The state transitions of the source bits are interpreted as follows:
<table><tr><th>State of source 1 (20.08)</th><th>State of source 2 (20.09)</th><th>State of source 3 (20.10)</th><th>Command</th></tr><tr><td>0 -> 1</td><td>Any</td><td>1</td><td>Start forward</td></tr><tr><td>Any</td><td>0 -> 1</td><td>1</td><td>Start reverse</td></tr><tr><td>Any</td><td>Any</td><td>0</td><td>Stop</td></tr></table>Note: Parameter 20.07 Ext2 start trigger type has no effect with this setting.</td><td>6</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>7…10</td></tr>
<tr><td></td><td>Control panel</td><td>The start and stop commands are taken from the control panel (or PC connected to the panel connector).</td><td>11</td></tr>
<tr><td></td><td>Fieldbus A</td><td>The start and stop commands are taken from fieldbus adapter A.
Note: Set also 20.07 Ext2 start trigger type to Level.</td><td>12</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>13</td></tr>
<tr><td></td><td>Embedded fieldbus</td><td>The start and stop commands are taken from the embedded fieldbus interface.
Note: Set also 20.07 Ext2 start trigger type to Level.</td><td>14</td></tr>
<tr><td>20.07</td><td>Ext2 start trigger type</td><td>Defines whether the start signal for external control location EXT2 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 20.06 Ext2 commands.</td><td>Level</td></tr>
<tr><td></td><td>Edge</td><td>The start signal is edge-triggered.</td><td>0</td></tr>
<tr><td></td><td>Level</td><td>The start signal is level-triggered.</td><td>1</td></tr>
<tr><td>20.08</td><td>Ext2 in1 source</td><td>Selects source 1 for parameter 20.06 Ext2 commands.
For the available selections, see parameter 20.03 Ext1 in1 source.</td><td>Always off</td></tr>
<tr><td>20.09</td><td>Ext2 in2 source</td><td>Selects source 2 for parameter 20.06 Ext2 commands.
For the available selections, see parameter 20.03 Ext1 in1 source.</td><td>Always off</td></tr>
<tr><td>20.10</td><td>Ext2 in3 source</td><td>Selects source 3 for parameter 20.06 Ext2 commands.
For the available selections, see parameter 20.03 Ext1 in1 source.</td><td>Always off</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>20.21</td><td>Direction</td><td>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).

<table><tr><td></td><td>Direction command = Forward</td><td>Direction command = Reverse</td><td>Direction command not defined</td></tr><tr><td>Par. 20.21 Direction = Forward</td><td>Forward</td><td>Forward</td><td>Forward</td></tr><tr><td>Par. 20.21 Direction = Reverse</td><td>Reverse</td><td>Reverse</td><td>Reverse</td></tr><tr><td>Par. 20.21 Direction = Request</td><td>Forward, but
• If reference from Constant, Floating point control (Motor potentiometer), PID, Safe speed, Last or Panel reference, reference used as is.
• If reference from the network, reference used as is.</td><td>Reverse, but
• If reference from Constant or PID, reference used as is.
• If reference from the network, Panel, Analog input, Floating point control (Motor potentiometer), Safe speed or Last reference, reference multiplied by -1.</td><td>Forward</td></tr></table></td><td>Forward</td></tr>
<tr><td></td><td>Request</td><td>In external control the direction is selected by a direction command (parameter 20.01 Ext1 commands or 20.06 Ext2 commands).
If the reference comes from Constant (constant speeds/frequencies), Floating point control (Motor potentiometer), PID, Speed ref safe, Last speed reference or Panel reference, the reference is used as is.
If the reference comes from a fieldbus:
• if the direction command is forward, the reference is used as is
• if the direction command is reverse, the reference is multiplied by -1.</td><td>0</td></tr>
<tr><td></td><td>Forward</td><td>Motor rotates forward regardless of the sign of the external reference. (Negative reference values are replaced by zero. Positive reference values are used as is.)</td><td>1</td></tr>
<tr><td></td><td>Reverse</td><td>Motor rotates reverse regardless of the sign of the external reference. (Negative reference values are replaced by zero. Positive reference values are multiplied by -1.)</td><td>2</td></tr>
<tr><td>20.40</td><td>Run permissive</td><td>Selects the source of the Run permissive signal.
Value 0 of the source deactivates the Run permissive and prevents running.
Value 1 of the source activates the Run permissive and permits running.</td><td>Not used</td></tr>
<tr><td></td><td>Not used</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>Not used</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>DI1</td><td>Digital input DI1 (10.02 DI delayed status, bit 0).</td><td>2</td></tr>
<tr><td></td><td>DI2</td><td>Digital input DI2 (10.02 DI delayed status, bit 1).</td><td>3</td></tr>
</table>

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 *Terms and abbreviations* 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 *Other [bit]* 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 *Terms and abbreviations* on page *324*).	-

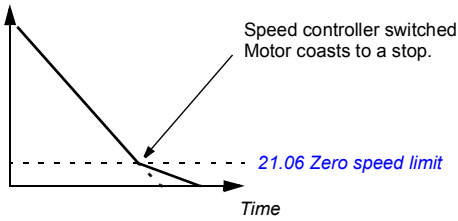
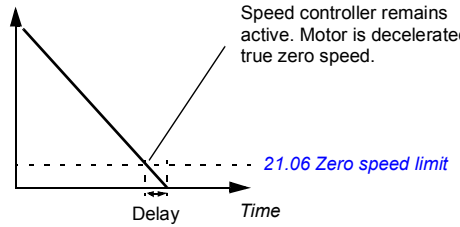
No.	Name/Value	Description	Def/FbEq16
20.42	*Start interlock 2*	Selects the source of the Start interlock 2 signal. For the selections, see parameter *20.41 Start interlock 1*.	*Not used*
20.43	*Start interlock 3*	Selects the source of the Start interlock 3 signal. Start interlock 3 is not supported 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 Start/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. ⚠ **WARNING!** The drive will start after the set magnetizing time has passed even if motor magnetization is not completed. In applications where a full break-away torque is essential, ensure that the constant magnetizing time is long enough to allow generation of full magnetization and torque.	1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>Automatic</td><td>Automatic start guarantees optimal motor start in most cases. It includes the flying start function (starting into a rotating motor) and the automatic restart function. The drive motor control program identifies the flux as well as the mechanical state of the motor and starts the motor instantly under all conditions.
Note: If parameter 99.04 Motor control mode is set to Scalar, no flying start or automatic restart is possible unless parameter 21.19 Scalar start mode is set to Automatic.</td><td>2</td></tr>
<tr><td>21.02</td><td>Magnetization time</td><td>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:
<table><tr><th>Motor rated power</th><th>Constant magnetizing time</th></tr><tr><td>< 1 kW</td><td>≥ 50 to 100 ms</td></tr><tr><td>1 to 10 kW</td><td>≥ 100 to 200 ms</td></tr><tr><td>10 to 200 kW</td><td>≥ 200 to 1000 ms</td></tr><tr><td>200 to 1000 kW</td><td>≥ 1000 to 2000 ms</td></tr></table>Note: This parameter cannot be changed while the drive is running.</td><td>500 ms</td></tr>
<tr><td></td><td>0…10000 ms</td><td>Constant DC magnetizing time.</td><td>1 = 1 ms</td></tr>
<tr><td>21.03</td><td>Stop mode</td><td>Selects the way the motor is stopped when a stop command is received.
Additional braking is possible by selecting flux braking (see parameter 97.05 Flux braking).</td><td>Coast</td></tr>
<tr><td></td><td>Coast</td><td>Stop by switching off the output semiconductors of the drive. The motor coasts to a stop.
WARNING! If a mechanical brake is used, ensure it is safe to stop the drive by coasting.</td><td>0</td></tr>
<tr><td></td><td>Ramp</td><td>Stop along the active deceleration ramp. See parameter group 23 Speed reference ramp on page 405 or 28 Frequency reference chain on page 413.</td><td>1</td></tr>
<tr><td></td><td>Torque limit</td><td>Stop according to torque limits (parameters 30.19 and 30.20). This mode is only possible in vector motor control mode.</td><td>2</td></tr>
</table>

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 Terms and abbreviations 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
	0.00…30000.00 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*  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*  	0 ms
	0…30000 ms	Zero speed delay.	1 = 1 ms

No.	Name/Value	Description	Def/FbEq16
21.08	DC current control	Activates/deactivates the DC hold and post-magnetization functions. See section 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.	0000b

Bit	Name	Value
0	DC hold	1 = Enable DC hold. See section DC hold (page 130). **Note:** The DC hold function has no effect if the start signal is switched off.
1	Post magnetization	1 = Enable post-magnetization. See section Settings (page 131). **Note:** Post-magnetization is only available when ramping is the selected stop mode (see parameter 21.03 Stop mode).
2…15	Reserved	

	0000b…0011b	DC magnetization selection.	1 = 1
21.09	DC hold speed	Defines the DC hold speed in speed control mode. See parameter 21.08 DC current control, and section DC hold (page 130).	5.00 rpm
	0.00…1000.00 rpm	DC hold speed.	See par. 46.01
21.10	DC current reference	Defines the DC hold current in percent of the motor nominal current. See parameter 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%
	0.0…100.0%	DC hold current.	1 = 1%
21.11	Post magnetization time	Defines the length of time for which post-magnetization is active after stopping the motor. The magnetization current is defined by parameter 21.10 DC current reference. See parameter 21.08 DC current control.	0 s
	0…3000 s	Post-magnetization time.	1 = 1 s
21.14	Pre-heating input source	Selects the source for controlling pre-heating for the motor. The status of the pre-heating is shown as bit 2 of 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	0. 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

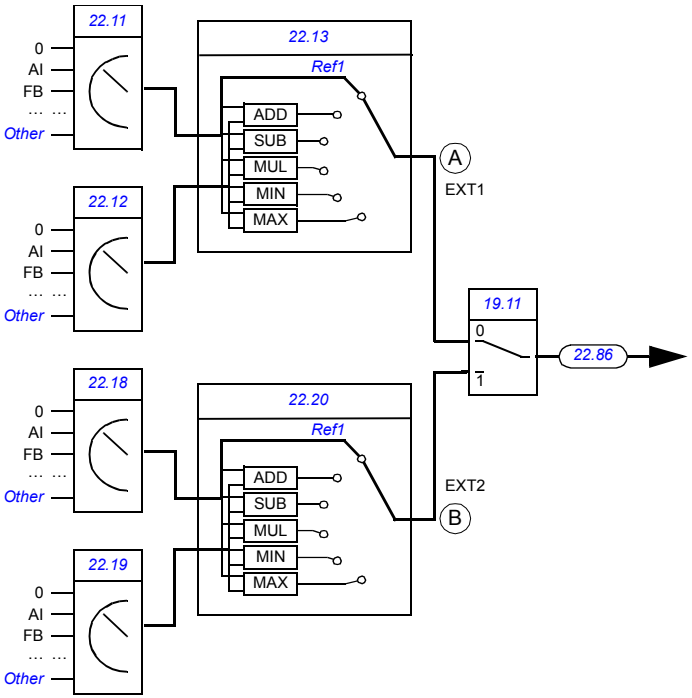
No.	Name/Value	Description	Def/FbEq16
	Supervision 1	Bit 0 of *32.01 Supervision status* (see page *444*).	8
	Supervision 2	Bit 1 of *32.01 Supervision status* (see page *444*).	9
	Supervision 3	Bit 2 of *32.01 Supervision status* (see page *444*).	10
	Timed function 1	Bit 0 of *34.01 Timed functions 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 *Terms and abbreviations* on page *324*).	-
21.15	*Pre-heating time delay*	Time delay before pre-heating starts after the drive is stopped.	60 s
	10…3000 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%
	0.0…30.0%	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
	0.1…10.0 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. **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.	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

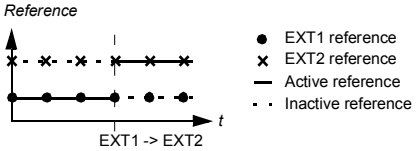
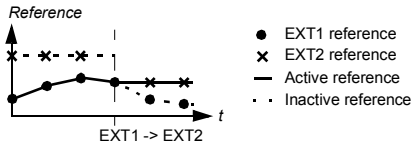
No.	Name/Value	Description	Def/FbEq16
21.21	DC hold frequency	Defines the DC hold frequency, which is used instead of parameter 21.09 DC hold speed when the motor is in scalar frequency mode. See parameter 21.08 DC current control, and section DC hold (page 130).	5.00 Hz
	0.00…1000.00 Hz	DC hold frequency.	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 AFE9 Start delay is shown. Start delay can be used with all start modes.	0.00 s
	0.00…60.00 s	Start delay	1 = 1 s
21.23	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%
	10.0…100.0%	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%
	2.0…100.0%	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%
	15.0…300.0%	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

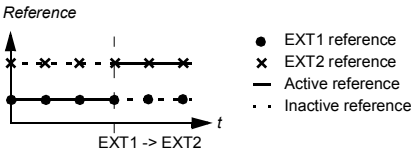
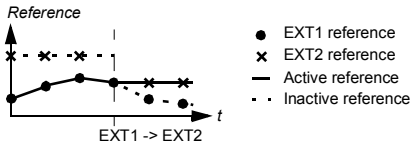
No.	Name/Value	Description	Def/FbEq16
	Speed comp FWD	If the direction of rotation is forward, speed compensation is used for constant distance braking. Speed difference (between used speed and maximum speed) is compensated by running the drive with current speed before the motor is stopped along a ramp. 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
	0.00…1000.00 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%
	0…100%	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 *21.18 Auto restart time* 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 Speed reference selection		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 *Speed reference source selection II* 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).	*AI1 scaled*



	Zero	None.	0
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
	AI2 scaled	*12.22 AI2 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		6…7
	EFB ref1	*03.09 EFB reference 1* (see page *332*).	8
	EFB ref2	*03.10 EFB reference 2* (see page *332*).	9
	Reserved		10…14

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. 	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. 	19
	Other	Source selection (see *Terms and abbreviations* 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
	AI1 scaled	12.12 AI1 scaled value (see page 358).	1
	AI2 scaled	12.22 AI2 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		6…7
	EFB ref1	03.09 EFB reference 1 (see page 332).	8
	EFB ref2	03.10 EFB reference 2 (see page 332).	9
	Reserved		10…14
	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. 	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. 	19
	Other	Source selection (see Terms and abbreviations 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

No.	Name/Value	Description	Def/FbEq16
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 (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
22.21	*Constant speed function*	Determines how constant speeds are selected, and whether the rotation direction signal is considered or not when applying a constant speed.	0000b

Bit	Name	Information
0	Constant speed mode	1 = Packed: 7 constant speeds are selectable using the three sources defined by parameters *22.22*, *22.23* and *22.24*.
		0 = Separate: Constant speeds 1, 2 and 3 are separately activated by the sources defined by parameters *22.22*, *22.23* and *22.24* respectively. In case of conflict, the constant speed with the smaller number takes priority.
1	Direction enable	1 = Start dir: To determine running direction for a constant speed, the sign of the constant speed setting (parameters *22.26*…*22.32*) is multiplied by the direction signal (forward: +1, reverse: -1). This effectively allows the drive to have 14 (7 forward, 7 reverse) constant speeds if all values in *22.26*…*22.32* are positive. ⚠ **WARNING:** If the direction signal is reverse and the active constant speed is negative, the drive will run in the forward direction.
		0 = According to Par: The running direction for the constant speed is determined by the sign of the constant speed setting (parameters *22.26*…*22.32*).
2…15	Reserved	

	0000h…FFFFh	Constant speed configuration word.	1 = 1

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>22.22</td><td>Constant speed sel1</td><td>When bit 0 of parameter 22.21 Constant speed function is 0 (Separate), selects a source that activates constant speed 1.
When bit 0 of parameter 22.21 Constant speed function is 1 (Packed), this parameter and parameters 22.23 Constant speed sel2 and 22.24 Constant speed sel3 select three sources whose states activate constant speeds as follows:
<table><tr><th>Source defined by par. 22.22</th><th>Source defined by par. 22.23</th><th>Source defined by par. 22.24</th><th>Constant speed active</th></tr><tr><td>0</td><td>0</td><td>0</td><td>None</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Constant speed 1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Constant speed 2</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Constant speed 3</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Constant speed 4</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Constant speed 5</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Constant speed 6</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Constant speed 7</td></tr></table></td><td>DI3</td></tr>
<tr><td></td><td>Always off</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>Always on</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>DI1</td><td>Digital input DI1 (10.02 DI delayed status, bit 0).</td><td>2</td></tr>
<tr><td></td><td>DI2</td><td>Digital input DI2 (10.02 DI delayed status, bit 1).</td><td>3</td></tr>
<tr><td></td><td>DI3</td><td>Digital input DI3 (10.02 DI delayed status, bit 2).</td><td>4</td></tr>
<tr><td></td><td>DI4</td><td>Digital input DI4 (10.02 DI delayed status, bit 3).</td><td>5</td></tr>
<tr><td></td><td>DI5</td><td>Digital input DI5 (10.02 DI delayed status, bit 4).</td><td>6</td></tr>
<tr><td></td><td>DI6</td><td>Digital input DI6 (10.02 DI delayed status, bit 5).</td><td>7</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>8…17</td></tr>
<tr><td></td><td>Timed function 1</td><td>Bit 0 of 34.01 Timed functions status (see page 451).</td><td>18</td></tr>
<tr><td></td><td>Timed function 2</td><td>Bit 1 of 34.01 Timed functions status (see page 451).</td><td>19</td></tr>
<tr><td></td><td>Timed function 3</td><td>Bit 2 of 34.01 Timed functions status (see page 451).</td><td>20</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>21…23</td></tr>
<tr><td></td><td>Supervision 1</td><td>Bit 0 of 32.01 Supervision status (see page 444).</td><td>24</td></tr>
<tr><td></td><td>Supervision 2</td><td>Bit 1 of 32.01 Supervision status (see page 444).</td><td>25</td></tr>
<tr><td></td><td>Supervision 3</td><td>Bit 2 of 32.01 Supervision status (see page 444).</td><td>26</td></tr>
<tr><td></td><td>Other [bit]</td><td>Source selection (see Terms and abbreviations on page 324).</td><td>-</td></tr>
<tr><td>22.23</td><td>Constant speed sel2</td><td>When bit 0 of parameter 22.21 Constant speed function is 0 (Separate), selects a source that activates constant speed 2.
When bit 0 of parameter 22.21 Constant speed function is 1 (Packed), this parameter and parameters 22.22 Constant speed sel1 and 22.24 Constant speed sel3 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.</td><td>Always off</td></tr>
</table>

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 AI 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/Value	Description	Def/FbEq16
22.51	*Critical speed function*	Enables/disables the critical speeds function. Also determines whether the specified ranges are effective in both rotating directions or not. See also section *Critical speeds/frequencies* (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 22.52…22.57 are taken into account.
		0 = Absolute: Parameters 22.52…22.57 are handled as absolute values. Each range is effective in both directions of rotation.
2…15	Reserved	

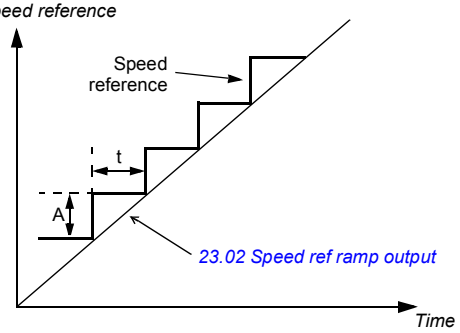
	0000b…0011b	Critical speeds configuration word.	1 = 1
22.52	*Critical speed 1 low*	Defines the low limit for critical speed range 1. **Note:** This value must be less than or equal to the value of *22.53 Critical speed 1 high*.	0.00 rpm
	-30000.00… 30000.00 rpm	Low limit for critical speed 1.	See par. *46.01*
22.53	*Critical speed 1 high*	Defines the high limit for critical speed range 1. **Note:** This value must be greater than or equal to the value of *22.52 Critical speed 1 low*.	0.00 rpm
	-30000.00… 30000.00 rpm	High limit for critical speed 1.	See par. *46.01*
22.54	*Critical speed 2 low*	Defines the low limit for critical speed range 2. **Note:** This value must be less than or equal to the value of *22.55 Critical speed 2 high*.	0.00 rpm
	-30000.00… 30000.00 rpm	Low limit for critical speed 2.	See par. *46.01*
22.55	*Critical speed 2 high*	Defines the high limit for critical speed range 2. **Note:** This value must be greater than or equal to the value of *22.54 Critical speed 2 low*.	0.00 rpm
	-30000.00… 30000.00 rpm	High limit for critical speed 2.	See par. *46.01*
22.56	*Critical speed 3 low*	Defines the low limit for critical speed range 3. **Note:** This value must be less than or equal to the value of *22.57 Critical speed 3 high*.	0.00 rpm
	-30000.00… 30000.00 rpm	Low limit for critical speed 3.	See par. *46.01*
22.57	*Critical speed 3 high*	Defines the high limit for critical speed range 3. **Note:** This value must be greater than or equal to the value of *22.56 Critical speed 3 low*.	0.00 rpm
	-30000.00… 30000.00 rpm	High 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		8…17
	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		21…23
	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 *Terms and abbreviations* 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
	0.0…3600.0 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 *22.71*…*22.74*.) 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 Speed reference ramp		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 Speed reference ramping and shaping 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 23.12…23.15. 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		8…17
	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 Terms and abbreviations on page 324).	-

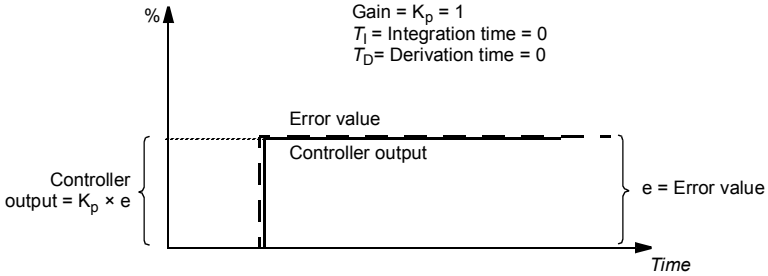
No.	Name/Value	Description	Def/FbEq16
23.12	Acceleration time 1	Defines acceleration time 1 as the time required for the speed to change from zero to the speed defined by parameter 46.01 Speed scaling (**not** to parameter 30.12 Maximum speed). If the speed reference increases faster than the set acceleration 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
	0.000…1800.000 s	Acceleration time 1.	10 = 1 s
23.13	Deceleration time 1	Defines deceleration time 1 as the time required for the speed to change from the speed defined by parameter 46.01 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
	0.000…1800.000 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
	0.000…1800.000 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
	0.000…1800.000 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 23.11…23.15. • The same parameter value is also used in frequency control mode (ramp parameters 28.71…28.75).	3.000 s
	0.000…1800.000 s	Emergency stop Off3 deceleration time.	10 = 1 s

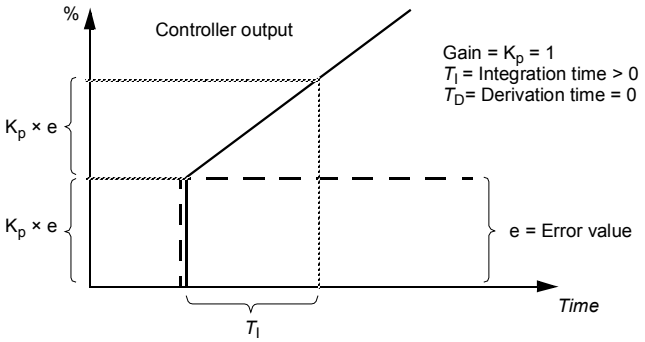
No.	Name/Value	Description	Def/FbEq16
23.28	Variable slope enable	Activates the variable slope function, which controls the slope of the speed ramp during a speed reference change. This allows for a constantly variable ramp rate to be generated, instead of just the standard two ramps normally available. 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. *Speed reference*  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
	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
	2…30000 ms	Variable slope rate.	1 = 1 ms

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 Speed error calculation 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 Speed error calculation on page 309. This parameter is read-only.	-
	-30000.00… 30000.00 rpm	Speed feedback used for speed error calculation.	See par. 46.01

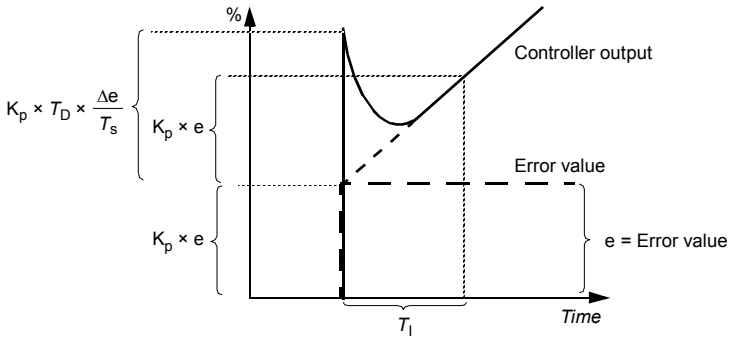
No.	Name/Value	Description	Def/FbEq16
24.03	*Speed error filtered*	Displays the filtered speed error. See control chain diagram *Speed error calculation* on page 309. This parameter is read-only.	-
	-30000.0…30000.0 rpm	Filtered speed error.	See par. 46.01
24.04	*Speed error inverted*	Displays the inverted (unfiltered) speed error. See control chain diagram *Speed error calculation* on page 309. 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
	0…10000 ms	Speed error filtering time constant. 0 = filtering disabled.	1 = 1 ms

25 Speed 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 *Speed error calculation* on page 309. This parameter is read-only.	-
	-1600.0…1600.0%	Limited speed controller output torque.	See par. 46.03

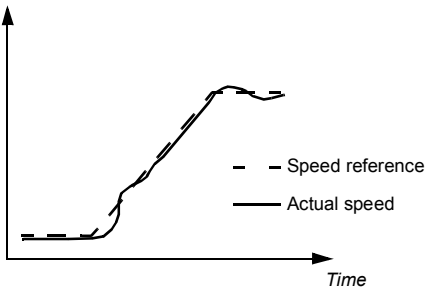
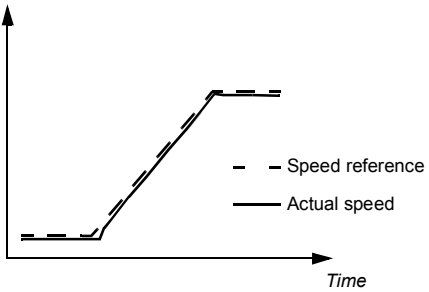
No.	Name/Value	Description	Def/FbEq16
25.02	*Speed proportional gain*	Defines the proportional gain (K_p) of the speed controller. Too high a gain may cause speed oscillation. The figure below shows the speed controller output after an error step when the error remains constant.	10.00
			
		If gain is 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.	
	0.00…250.00	Proportional gain for speed controller.	100 = 1

No.	Name/Value	Description	Def/FbEq16
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
	0.00…1000.00 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
	0.000…10.000 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
	0…10000 ms	Derivation filter time constant.	1 = 1 ms



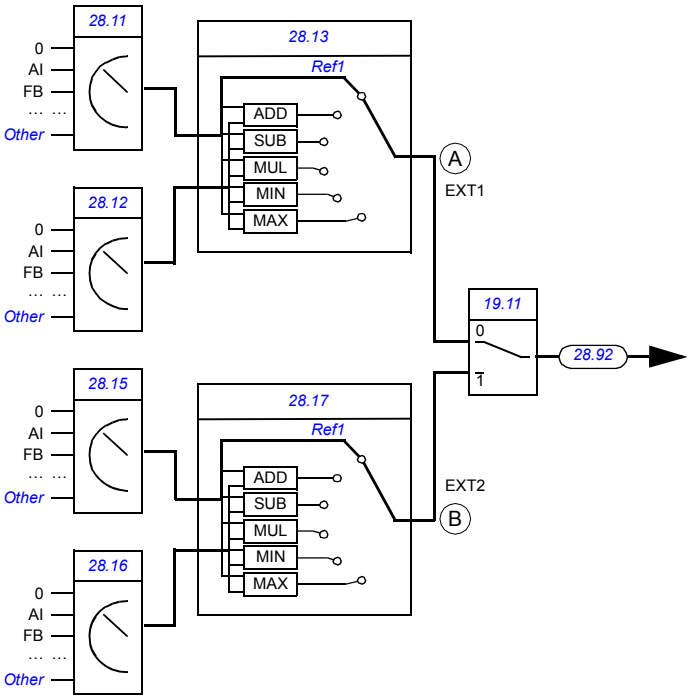
Gain = K_p = 1
T_I = Integration time > 0
T_D= Derivation time > 0
T_s= Sample time period = 250 µs
Δe = Error value change between two samples

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:**  **Acceleration compensation:** 	0.00 s
	0.00…1000.00 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
	0.0…1000.0 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
	1.00…250.00	Proportional gain upon an emergency stop.	100 = 1

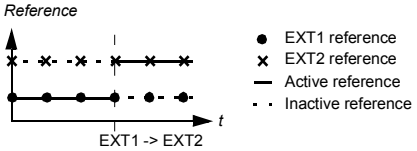
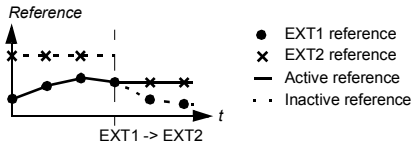
No.	Name/Value	Description	Def/FbEq16
25.53	*Torque prop reference*	Displays the output of the proportional (P) part of the speed controller. See control chain diagram *Speed error calculation* on page 309. This parameter is read-only.	-
	-30000.0… 30000.0%	P-part output of speed controller.	See par. 46.03
25.54	*Torque integral reference*	Displays the output of the integral (I) part of the speed controller. See control chain diagram *Speed error calculation* 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 *Speed error calculation* 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 *Speed error calculation* on page 309. This parameter is read-only.	-
	-30000.0… 30000.0%	Output of acceleration compensation function.	See par. 46.03

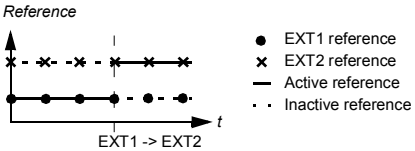
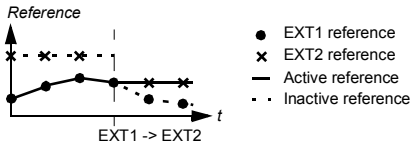
28 Frequency reference chain		Settings for the frequency reference chain. See the control chain diagrams on pages 304 and 305.	
28.01	*Frequency ref ramp input*	Displays the used frequency reference before ramping. See the control chain diagrams *Frequency reference selection* on page 304 and *Frequency reference modification* on page 305. This parameter is read-only.	-
	-500.00…500.00 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.	-
	-500.00…500.00 Hz	Final frequency reference.	See par. 46.02

No.	Name/Value	Description	Def/FbEq16
28.11	*Ext1 frequency ref1*	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).	*AI1 scaled*



Zero	None.	0
AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
AI2 scaled	*12.22 AI2 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		6…7
EFB ref1	*03.09 EFB reference 1* (see page *332*).	8
EFB ref2	*03.10 EFB reference 2* (see page *332*).	9
Reserved		10…14

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. 	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. 	19
	Other	Source selection (see *Terms and abbreviations* 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
	AI1 scaled	12.12 AI1 scaled value (see page 358).	1
	AI2 scaled	12.22 AI2 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		6…7
	EFB ref1	03.09 EFB reference 1 (see page 332).	8
	EFB ref2	03.10 EFB reference 2 (see page 332).	9
	Reserved		10…14
	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. 	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. 	19
	Other	Source selection (see Terms and abbreviations 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

No.	Name/Value	Description	Def/FbEq16
28.17	*Ext2 frequency 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 (ref1 + ref2)	The sum of the reference sources is used as frequency reference 1.	1
	Sub (ref1 - 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 (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
28.21	*Constant frequency function*	Determines how constant frequencies are selected, and whether the rotation direction signal is considered or not when applying a constant frequency.	0000b

Bit	Name	Information
0	Const freq mode	1 = Packed: 7 constant frequencies are selectable using the three sources defined by parameters *28.22*, *28.23* and *28.24*.
		0 = Separate: Constant frequencies 1, 2 and 3 are separately activated by the sources defined by parameters *28.22*, *28.23* and *28.24* respectively. In case of conflict, the constant frequency with the smaller number takes priority.
1	Direction enable	1 = Start dir: To determine running direction for a constant speed, the sign of the constant speed setting (parameters *22.26*…*22.32*) is multiplied by the direction signal (forward: +1, reverse: -1). This effectively allows the drive to have 14 (7 forward, 7 reverse) constant speeds if all values in *22.26*…*22.32* are positive. ⚠ **WARNING:** If the direction signal is reverse and the active constant speed is negative, the drive will run in the forward direction.
		0 = According to Par: The running direction for the constant speed is determined by the sign of the constant speed setting (parameters *22.26*…*22.32*).
2…15	Reserved	

	0000b…0011b	Constant frequency configuration word.	1 = 1

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		8…17
	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		21…23
	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 Terms and abbreviations 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)
	-500.00…500.00 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)
	-500.00…500.00 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)
	-500.00…500.00 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)
	-500.00…500.00 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)
	-500.00…500.00 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)
	-500.00…500.00 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)
	-500.00…500.00 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
	-500.00…500.00 Hz	Safe frequency reference.	See par. 46.02

No.	Name/Value	Description	Def/FbEq16
28.51	*Critical frequency function*	Enables/disables the critical frequencies function. Also determines whether the specified ranges are effective in both rotating directions or not. See also section *Critical speeds/frequencies* (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 28.52…28.57 are taken into account.
		0 = Absolute: Parameters 28.52…28.57 are handled as absolute values. Each range is effective in both directions of rotation.

	0000b…0011b	Critical frequencies configuration word.	1 = 1
28.52	*Critical frequency 1 low*	Defines the low limit for critical frequency 1. **Note:** This value must be less than or equal to the value of *28.53 Critical frequency 1 high*.	0.00 Hz
	-500.00…500.00 Hz	Low limit for critical frequency 1.	See par. 46.02
28.53	*Critical frequency 1 high*	Defines the high limit for critical frequency 1. **Note:** This value must be greater than or equal to the value of *28.52 Critical frequency 1 low*.	0.00 Hz
	-500.00…500.00 Hz	High limit for critical frequency 1.	See par. 46.02
28.54	*Critical frequency 2 low*	Defines the low limit for critical frequency 2. **Note:** This value must be less than or equal to the value of *28.55 Critical frequency 2 high*.	0.00 Hz
	-500.00…500.00 Hz	Low limit for critical frequency 2.	See par. 46.02
28.55	*Critical frequency 2 high*	Defines the high limit for critical frequency 2. **Note:** This value must be greater than or equal to the value of *28.54 Critical frequency 2 low*.	0.00 Hz
	-500.00…500.00 Hz	High limit for critical frequency 2.	See par. 46.02
28.56	*Critical frequency 3 low*	Defines the low limit for critical frequency 3. **Note:** This value must be less than or equal to the value of *28.57 Critical frequency 3 high*.	0.00 Hz
	-500.00…500.00 Hz	Low limit for critical frequency 3.	See par. 46.02
28.57	*Critical frequency 3 high*	Defines the high limit for critical frequency 3. **Note:** This value must be greater than or equal to the value of *28.56 Critical frequency 3 low*.	0.00 Hz
	-500.00…500.00 Hz	High limit for critical frequency 3.	See par. 46.02
28.71	*Freq ramp set selection*	Selects a source that switches between the two sets of acceleration/deceleration times defined by parameters 28.72…28.75. 0 = Acceleration time 1 and deceleration time 1 are in force 1 = Acceleration time 2 and deceleration time 2 are in force	*Acc/Dec time 1*
	Acc/Dec 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		8…17
	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 *Terms and abbreviations* 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
	0.000…1800.000 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
	0.000…1800.000 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
	0.000…1800.000 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
	0.000…1800.000 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

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 *Terms and abbreviations* 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*on page *304*. This parameter is read-only.	-
	-500.00…500.00 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 *Frequency reference selection*on page *304*. This parameter is read-only.	-
	-500.00…500.00 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 *Frequency reference modification* on page *305*. This parameter is read-only.	-
	-500.00…500.00 Hz	Frequency reference before ramping and limiting.	See par. *46.02*

No.	Name/Value	Description	Def/FbEq16
30 Limits		Drive operation limits.	
30.01	*Limit word 1*	Displays limit word 1. This parameter is read-only.	-

Bit	Name	Description
0	Torq lim	1 = Drive torque is being limited by the motor control (undervoltage control, current control, load angle control or pull-out control), or by the torque limits defined by parameters.
1…2	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*.
4	Torq ref min	1 = Torque reference is being limited by *30.19 Minimum torque 1*, *30.26 Power motoring limit* or *30.27 Power generating limit*.
5	Tlim max speed	1 = Torque reference is being limited by the rush control because of maximum speed limit (*30.12 Maximum speed*)
6	Tlim min speed	1 = Torque reference is being limited by the rush control because of minimum speed limit (*30.11 Minimum speed*)
7	Max speed ref lim	1 = Speed reference is being limited by *30.12 Maximum speed*
8	Min speed ref lim	1 = Speed reference is being limited by *30.11 Minimum speed*
9	Max freq ref lim	1 = Frequency reference is being limited by *30.14 Maximum frequency*
10	Min freq ref lim	1 = Frequency reference is being limited by *30.13 Minimum frequency*
11…15	Reserved	

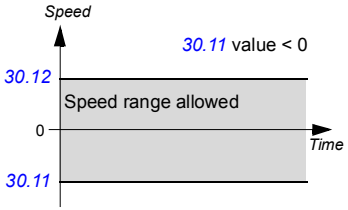
	0000h…FFFFh	Limit word 1.	1 = 1

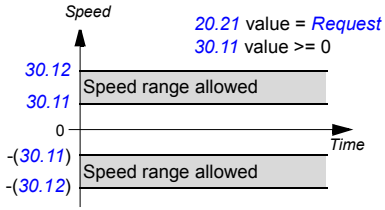
No.	Name/Value	Description	Def/FbEq16
30.02	*Torque limit status*	Displays the torque controller limitation status word. This parameter is read-only.	-

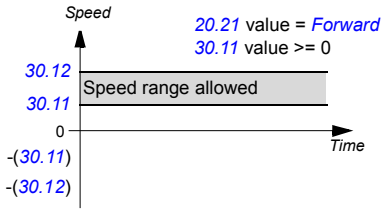
Bit	Name	Description
0	Undervoltage	*1 = Intermediate DC circuit undervoltage
1	Overvoltage	*1 = Intermediate DC circuit overvoltage
2	Minimum torque	*1 = Torque is being limited by *30.19 Minimum torque 1*, *30.26 Power motoring limit* or *30.27 Power generating limit*
3	Maximum torque	*1 = Torque is being limited by *30.20 Maximum torque 1*, *30.26 Power motoring limit* or *30.27 Power generating limit*
4	Internal current	1 = An inverter current limit (identified by bits 8…11) is active
5	Load angle	(With permanent magnet motors and reluctance motors only) 1 = Load angle limit is active, ie. the motor cannot produce any more torque
6	Motor pullout	(With asynchronous motors only) Motor pull-out limit is active, ie. the motor cannot produce any more torque
7	Reserved	
8	Thermal	1 = Input current is being limited by the main circuit thermal limit
9	Max current	*1 = Maximum output current (I_{MAX}) is being limited
10	User current	*1 = Output current is being limited by *30.17 Maximum current*
11	Thermal IGBT	*1 = Output current is being limited by a calculated thermal current value
12…15	Reserved	
*Only one out of bits 0…3, and one out of bits 9…11 can be on simultaneously. The bit typically indicates the limit that is exceeded first.		

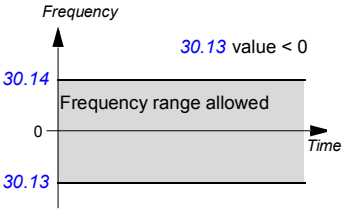
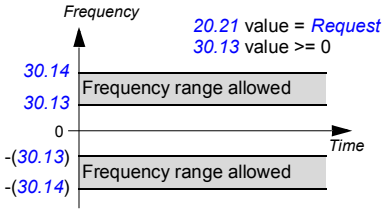
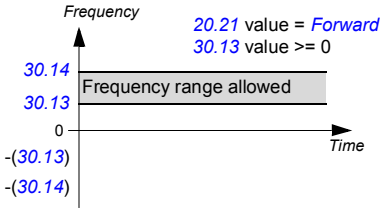
	0000h…FFFFh	Torque limitation status word.	1 = 1

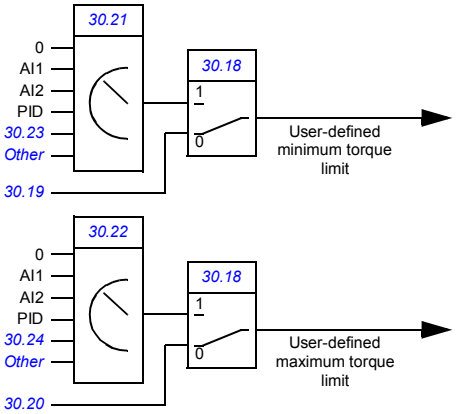
No.	Name/Value	Description	Def/FbEq16
30.11	*Minimum speed*	Defines together with *30.12 Maximum speed* the allowed speed range. See the figure below. A positive or zero minimum speed value defines two ranges, one positive and one negative. A negative minimum speed value defines one range. **WARNING!** The absolute value of *30.11 Minimum speed* must not be higher than the absolute value of *30.12 Maximum speed*. **WARNING!** In speed control mode only. In frequency control mode, use frequency limits (*30.13* and *30.14*).	0.00 rpm
	-30000.00… 30000.00 rpm	Minimum allowed speed.	See par. *46.01*
30.12	*Maximum speed*	Defines together with *30.11 Minimum speed* the allowed speed range. See parameter *30.11 Minimum speed*. **Note:** This parameter does not affect the speed acceleration and deceleration ramp times. See parameter *46.01 Speed scaling*.	1500.00 rpm; 1800.00 rpm (*95.20* b0)
	-30000.00… 30000.00 rpm	Maximum speed.	See par. *46.01*





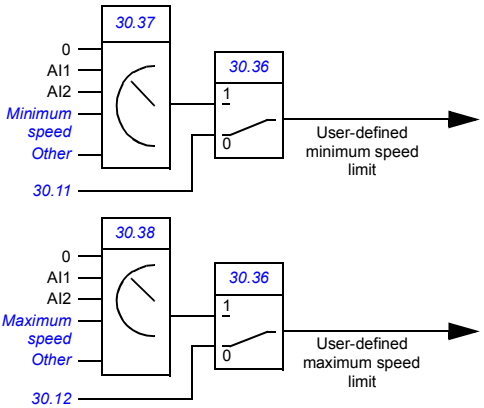


No.	Name/Value	Description	Def/FbEq16
30.13	*Minimum frequency*	Defines together with *30.14 Maximum frequency* the allowed frequency range. See the figure. A positive or zero minimum frequency value defines two ranges, one positive and one negative. **WARNING!** The absolute value of *30.13 Minimum frequency* must not be higher than the absolute value of *30.14 Maximum frequency*. **WARNING!** in frequency control mode only.   	0.00 Hz
	-500.00…500.00 Hz	Minimum frequency.	See par. *46.02*
30.14	*Maximum frequency*	Defines together with *30.13 Minimum frequency* the allowed frequency range. See parameter *30.13 Minimum frequency*. **Note:** This parameter does not affect the frequency acceleration and deceleration ramp times. See parameter *46.02 Frequency scaling*.	50.00 Hz; 60.00 Hz (*95.20* b0)
	-500.00…500.00 Hz	Maximum frequency.	See par. *46.02*
30.17	*Maximum current*	Defines the maximum allowed motor current. This depends on the drive type; it is automatically determined on the basis of the rating. The system sets the default value to 90% of the rated current so you can increase the parameter value by 10% if needed (not valid for ACH580-01-12A7-4 drive type).	0.00 A
	0.00…30000.00 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).  **Note:** In addition to the user-defined limits, torque may be limited for other reasons (such as power limitation). See block diagram *Torque limitation* on page 312.	Torque limit set 1
	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		8…10
	EFB	Only for the DCU profile. DCU control word bit 15 received through the embedded fieldbus interface.	11
	Other [bit]	Source selection (see Terms and abbreviations 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%
	-1600.0…0.0%	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%
	0.0…1600.0%	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
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
	AI2 scaled	*12.22 AI2 scaled value* (see page *360*).	2
	Reserved		3…14
	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 *Terms and abbreviations* 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
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
	AI2 scaled	*12.22 AI2 scaled value* (see page *360*).	2
	Reserved		3…14

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 *Terms and abbreviations* 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%
	-1600.0…0.0%	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%
	0.0…1600.0%	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%
	0.00…600.00%	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%
	-600.00…0.00%	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). 	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 *Terms and abbreviations* 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
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
	AI2 scaled	*12.22 AI2 scaled value* (see page *360*).	2
	Reserved		3…10
	Minimum speed	*30.11 Minimum speed*.	11
	Other	Source selection (see *Terms and abbreviations* 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
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
	AI2 scaled	*12.22 AI2 scaled value* (see page *360*).	2
	Reserved		3…11
	Maximum speed	*30.12 Maximum speed*.	12
	Other	Source selection (see *Terms and abbreviations* on page *324*).	-

No.	Name/Value	Description	Def/FbEq16
30.101	LSU limit word 1	*(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 max	1 = Power reference is being limited by supply control program parameters
1	P user ref min	
2	P user max	1 = Power is being limited by parameter 30.149
3	Reserved	
4	P cooling overtemp	1 = Power reference is being limited because of coolant overtemperature
5	P power unit overtemp	1 = Power reference is being limited because of supply unit overtemperature
6…15	Reserved	

	0000h…FFFFh	Supply unit limit word 1.	1 = 1
30.102	LSU limit word 2	*(Only visible for ACH580-31)* Displays limit word 2 of the supply unit. This parameter is read-only.	-

Bit	Name	Description
0	Q user ref max	1 = Reactive power reference is being limited
1	Q user ref min	
2	Q cooling overtemp	1 = Reactive power reference is being limited because of coolant overtemperature
3	Reserved	
4	AC overvoltage	1 = AC overvoltage protection
5…6	Reserved	
7	AC diff max	1 = (When AC voltage-type reactive power reference is being used) Input of AC control is being limited
8	AC diff min	
9…15	Reserved	

	0000h…FFFFh	Supply unit limit word 2.	1 = 1

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 6…9 and 14…15.
5	Reactive current limit	1 = Reactive current is being limited. For details, see bits 12…13.
6	Thermal limit	1 = Active current is being limited by internal main circuit thermal limit
7	SOA limit	1 = Active current is being limited by internal safe operation area limit
8	User current limit	1 = Active current is being limited by current limit set by supply control program parameters
9	Thermal IGBT	1 = Active current is being limited based on internal maximum thermal IGBT stress limit
10…11	Reserved	
12	Q act neg	1 = Negative reactive current is being limited by maximum total current
13	Q act pos	1 = Positive reactive current is being limited by maximum total current
14	P act neg	1 = Negative active current is being limited by maximum total current
15	P act pos	1 = Positive reactive current is being limited by maximum total current

	0000h…FFFFh	Supply unit limit word 3.	1 = 1
30.104	*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	Udc ref max	1 = DC reference is being limited by supply control program parameters
1	Udc ref min	
2	User I max	1 = Current is being limited by supply control program parameters
3	Temp I max	1 = Current is being limited based on temperature
4…15	Reserved	

	0000h…FFFFh	Supply unit limit word 4.	1 = 1
30.149	*LSU maximum power limit*	*(Only visible for 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 Fault functions		Configuration of external events; selection of behavior of the drive upon fault situations.	
31.01	External event 1 source	Defines the source of external event 1. See also parameter 31.02 External event 1 type. 0 = Trigger event 1 = Normal operation	Inactive (true)
	Active (false)	0.	0
	Inactive (true)	1.	1
	Reserved		2
	DI1	Digital input DI1 (10.02 DI delayed status, bit 0).	3
	DI2	Digital input DI2 (10.02 DI delayed status, bit 1).	4
	DI3	Digital input DI3 (10.02 DI delayed status, bit 2).	5
	DI4	Digital input DI4 (10.02 DI delayed status, bit 3).	6
	DI5	Digital input DI5 (10.02 DI delayed status, bit 4).	7
	DI6	Digital input DI6 (10.02 DI delayed status, bit 5).	8
	Other [bit]	Source selection (see Terms and abbreviations on page 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		8…17
	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		21…23
	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 *Terms and abbreviations* on page *324*).	-

No.	Name/Value	Description	Def/FbEq16
31.12	*Autoreset 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 (00…1100b)

Bit	Fault
0	Overcurrent
1	Overvoltage
2	Undervoltage
3	AI supervision fault
4…9	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	External fault 5 (from source selected by parameter *31.09 External event 5 source*)

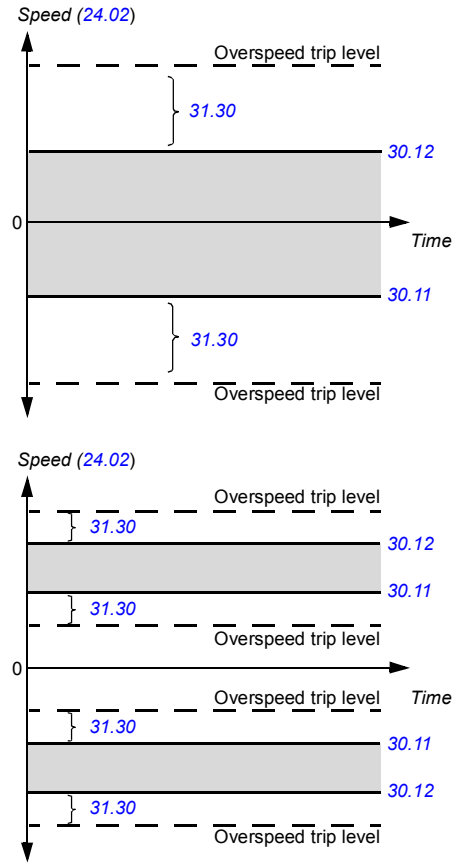
	0000h…FFFFh	Automatic reset configuration word.	1 = 1
31.13	*Selectable fault*	Defines the fault that can be automatically reset using parameter *31.12 Autoreset selection*, bit 10. Faults are listed in chapter *Fault tracing* (page *197*).	0000h
	0000h…FFFFh	Fault code.	10 = 1
31.14	*Number of trials*	Defines the number of automatic fault resets the drive performs within the time defined by parameter *31.15 Total trials time*.	5
	0…5	Number of automatic resets.	10 = 1
31.15	*Total trials 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*.	30.0 s
	1.0…600.0 s	Time for automatic resets.	10 = 1 s
31.16	*Delay time*	Defines the time that the drive will wait after a fault before attempting an automatic reset. See parameter *31.12 Autoreset selection*.	5.0 s
	0.0…120.0 s	Autoreset delay.	10 = 1 s

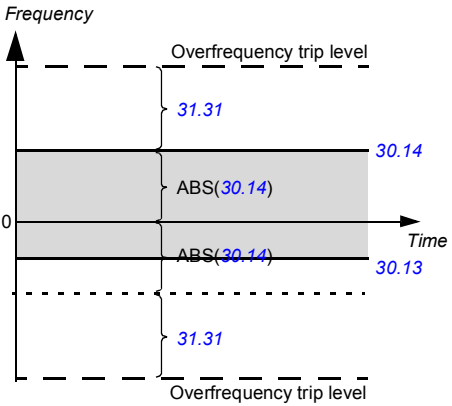
No.	Name/Value	Description	Def/FbEq16
31.19	Motor phase loss	Selects how the drive reacts when a motor phase loss is detected. In scalar motor control mode: • The supervision activates above 10% of the motor nominal frequency. If any of the phase currents stays very small for a certain time limit, the 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

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>31.22</td><td>STO indication run/stop</td><td>Selects which indications are given when one or both Safe torque off (STO) signals are switched off or lost. The indications also depend on whether the drive is running or stopped when this occurs.
The tables at each selection below show the indications generated with that particular setting.
Notes:
• This parameter does not affect the operation of the STO function itself. The STO function will operate regardless of the setting of this parameter: a running drive will stop upon removal of one or both STO signals, and will not start until both STO signals are restored and all faults reset.
• The loss of only one STO signal always generates a fault as it is interpreted as a malfunction.
• With the CPTC-02 ATEX-certified thermistor protection module, follow the instructions given in the CPTC-02 ATEX-certified thermistor protection module, Ex II (2) GD (+L537+Q971) user's manual (3AXD50000030058 [English]).
For more information on the STO, see chapter The Safe torque off function in the Hardware manual of the drive.</td><td>Fault/Fault</td></tr>
<tr><td></td><td>Fault/Fault</td><td><table>
<tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr>
<tr><th>IN1</th><th>IN2</th></tr>
<tr><td>0</td><td>0</td><td>Fault 5091 Safe torque off</td></tr>
<tr><td>0</td><td>1</td><td>Faults 5091 Safe torque off
and
FA81 Safe torque off 1</td></tr>
<tr><td>1</td><td>0</td><td>Faults 5091 Safe torque off
and
FA82 Safe torque off 2</td></tr>
<tr><td>1</td><td>1</td><td>(Normal operation)</td></tr>
</table></td><td>0</td></tr>
<tr><td></td><td>Fault/Warning</td><td><table>
<tr><th colspan="2">Inputs</th><th colspan="2">Indication</th></tr>
<tr><th>IN1</th><th>IN2</th><th>Running</th><th>Stopped</th></tr>
<tr><td>0</td><td>0</td><td>Fault 5091 Safe torque off</td><td>Warning A5A0 Safe torque off</td></tr>
<tr><td>0</td><td>1</td><td>Faults 5091 Safe torque off
and FA81 Safe torque off 1</td><td>Warning A5A0 Safe torque off and fault FA81 Safe torque off 1</td></tr>
<tr><td>1</td><td>0</td><td>Faults 5091 Safe torque off
and FA82 Safe torque off 2</td><td>Warning A5A0 Safe torque off and fault FA82 Safe torque off 2</td></tr>
<tr><td>1</td><td>1</td><td colspan="2">(Normal operation)</td></tr>
</table></td><td>1</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>Fault/Event</td><td>
<table>
<tr><th colspan="2">Inputs</th><th colspan="2">Indication</th></tr>
<tr><th>IN1</th><th>IN2</th><th>Running</th><th>Stopped</th></tr>
<tr><td>0</td><td>0</td><td>Fault 5091 Safe torque off</td><td>Event B5A0 STO event</td></tr>
<tr><td>0</td><td>1</td><td>Faults 5091 Safe torque off and FA81 Safe torque off 1</td><td>Event B5A0 STO event and fault FA81 Safe torque off 1</td></tr>
<tr><td>1</td><td>0</td><td>Faults 5091 Safe torque off and FA82 Safe torque off 2</td><td>Event B5A0 STO event and fault FA82 Safe torque off 2</td></tr>
<tr><td>1</td><td>1</td><td colspan="2">(Normal operation)</td></tr>
</table>
</td><td>2</td></tr>
<tr><td></td><td>Warning/Warning</td><td>
<table>
<tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr>
<tr><th>IN1</th><th>IN2</th></tr>
<tr><td>0</td><td>0</td><td>Warning A5A0 Safe torque off</td></tr>
<tr><td>0</td><td>1</td><td>Warning A5A0 Safe torque off and fault FA81 Safe torque off 1</td></tr>
<tr><td>1</td><td>0</td><td>Warning A5A0 Safe torque off and fault FA82 Safe torque off 2</td></tr>
<tr><td>1</td><td>1</td><td>(Normal operation)</td></tr>
</table>
</td><td>3</td></tr>
<tr><td></td><td>Event/Event</td><td>
<table>
<tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr>
<tr><th>IN1</th><th>IN2</th></tr>
<tr><td>0</td><td>0</td><td>Event B5A0 STO event</td></tr>
<tr><td>0</td><td>1</td><td>Event B5A0 STO event and fault FA81 Safe torque off 1</td></tr>
<tr><td>1</td><td>0</td><td>Event B5A0 STO event and fault FA82 Safe torque off 2</td></tr>
<tr><td>1</td><td>1</td><td>(Normal operation)</td></tr>
</table>
</td><td>4</td></tr>
<tr><td></td><td>No indication/No indication</td><td>
<table>
<tr><th colspan="2">Inputs</th><th rowspan="2">Indication (running or stopped)</th></tr>
<tr><th>IN1</th><th>IN2</th></tr>
<tr><td>0</td><td>0</td><td>None</td></tr>
<tr><td>0</td><td>1</td><td>Fault FA81 Safe torque off 1</td></tr>
<tr><td>1</td><td>0</td><td>Fault FA82 Safe torque off 2</td></tr>
<tr><td>1</td><td>1</td><td>(Normal operation)</td></tr>
</table>
</td><td>5</td></tr>
<tr><td>31.23</td><td>Wiring or earth fault</td><td>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.</td><td>Fault</td></tr>
<tr><td></td><td>No action</td><td>No action taken.</td><td>0</td></tr>
</table>

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%
	0.0…1600.0%	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)
	0.00…10000.00 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)
	0.00…1000.00 Hz	Stall frequency limit.	See par. *46.02*
31.28	*Stall time*	Stall time. See parameter *31.24 Stall function*.	20 s
	0…3600 s	Stall time.	-

No.	Name/Value	Description	Def/FbEq16
31.30	Overspeed trip margin	Defines, together with 31.11 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 31.11 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.  	500.00 rpm; 500.00 rpm (95.20 b0)
	0.00…10000.00 rpm	Overspeed trip margin.	See par. 46.01

No.	Name/Value	Description	Def/FbEq16
31.31	*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. 	15.00 Hz
	0.00…10000.00 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 *23.11*…*23.15* (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%
	0…300%	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 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 a value other than 0%, this parameter defines a delay between the receipt of the emergency stop command and the activation of the supervision. It is recommended to specify a short delay to allow the speed change rate to stabilize.	0 s
	0…100 s	Maximum ramp-down time, or supervision activation delay.	1 = 1 s
31.36	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/Value	Description	Def/FbEq16
32 Supervision		Configuration of signal supervision functions 1…6. Six values can be chosen to be monitored; a warning or fault is generated whenever predefined limits are exceeded. See also section *Diagnostics menu* (page *177*).	
32.01	*Supervision status*	Signal supervision status word. Indicates whether the values monitored by the signal supervision functions are within or outside their respective limits. **Note:** This word is independent of the drive actions defined by parameters *32.06*, *32.16*, *32.26*, *32.36*, *32.46* and *32.56*.	0000b

Bit	Name	Description
0	Supervision 1 active	1 = Signal selected by *32.07* is outside its limits.
1	Supervision 2 active	1 = Signal selected by *32.17* is outside its limits.
2	Supervision 3 active	1 = Signal selected by *32.27* is outside its limits.
3	Supervision 4 active	1 = Signal selected by *32.37* is outside its limits.
4	Supervision 5 active	1 = Signal selected by *32.47* is outside its limits.
5	Supervision 6 active	1 = Signal selected by *32.27* is outside its limits.
6…15	Reserved	

	0000h…FFFFh	Signal supervision status word.	1 = 1
32.05	*Supervision 1 function*	Selects the mode of signal supervision function 1. Determines how the monitored signal (see parameter *32.07*) is compared to its lower and upper limits (*32.09* and *32.10* respectively). The action to be taken when the condition is fulfilled is selected by *32.06*.	*Disabled*
	Disabled	Signal supervision 1 not in use.	0
	Low	Action is taken whenever the signal falls below its lower limit.	1
	High	Action is taken whenever the signal rises above its upper limit.	2
	Abs low	Action is taken whenever the absolute value of the signal falls below its (absolute) lower limit.	3
	Abs high	Action is taken whenever the absolute value of the signal rises above its (absolute) upper limit.	4
	Both	Action is taken whenever the signal falls below its low limit or rises above its high limit.	5
	Abs both	Action is taken whenever the absolute value of the signal falls below its (absolute) low limit or rises above its (absolute) high limit.	6
	Hysteresis	See parameter *32.11 Supervision 1 hysteresis*.	7
32.06	*Supervision 1 action*	Selects whether the drive generates a fault, warning or neither when the value monitored by signal supervision 1 exceeds its limits. **Note:** This parameter does not affect the status indicated by *32.01 Supervision status*.	*No action*
	No action	No warning or fault generated.	0
	Warning	Drive generates warning *A8B0 ABB Signal supervision 1*.	1
	Fault	Drive trips on fault *80B0 Signal supervision 1*.	2
	Fault if running	If running, the drive trips on fault *80B0 Signal supervision 1*.	3

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
	AI1	12.11 AI1 actual value (page 358).	9
	AI2	12.21 AI2 actual value (page 360).	10
	Reserved		11…17
	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 Terms and abbreviations 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
	0.00…100000.00	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
	0.00…100000.00	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
	0.00…100000.00	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
	0.00…100000.00	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
	0.00…100000.00	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
	0.00…100000.00	Hysteresis.	-

No.	Name/Value	Description	Def/FbEq16
34 Timed functions		Configuration of the timed functions. See section *Timed functions* on page *124*.	
34.01	*Timed functions status*	Status of the combined timers. The status of a combined timer is the logical OR of all timers connected to it. This parameter is read-only.	-

Bit	Name	Description
0	Timed function 1	1 = Active.
1	Timed function 2	1 = Active.
2	Timed function 3	1 = Active.
3…15	Reserved	

	0000h…0FFFFh	Status of combined timers 1…3.	1 = 1
34.02	*Timer status*	Status of timers 1…12. This parameter is read-only.	-

Bit	Name	Description
0	Timer 1	1 = Active.
1	Timer 2	1 = Active.
2	Timer 3	1 = Active.
3	Timer 4	1 = Active.
4	Timer 5	1 = Active.
5	Timer 6	1 = Active.
6	Timer 7	1 = Active.
7	Timer 8	1 = Active.
8	Timer 9	1 = Active.
9	Timer 10	1 = Active.
10	Timer 11	1 = Active.
11	Timer 12	1 = Active.
12…15	Reserved	

	0000h…FFFFh	Timer status.	1 = 1

No.	Name/Value	Description	Def/FbEq16
34.04	*Season/exception day status*	Status of seasons 1…4, exception weekday and exception holiday. Only one season can be active at a time. A day can be a workday and a holiday at the same time. This parameter is read-only.	-

Bit	Name	Description
0	Season 1	1 = Active.
1	Season 2	1 = Active.
2	Season 3	1 = Active.
3	Season 4	1 = Active.
4…9	Reserved	
10	Exception workday	1 = Active.
11	Exception holiday	1 = Active.
12…15	Reserved	

	0000h…FFFFh	Status of the seasons and exception weekday and holiday.	1 = 1
34.10	*Timed functions enable*	Selects the source for the timed functions enable signal. 0 = Disabled. 1 = Enabled.	*Disabled*
	Disabled	0.	0
	Enabled	1.	1
	DI1	Digital input DI1 (*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 *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 0…10 in the timer configuration) and the start time and duration of the timer (see *34.12* and *34.13*). Exception day settings, parameters *34.70*…*34.90*, 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 0…10 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 *34.70*…*34.90*. 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 0…10 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 *34.70*…*34.90* and the current time matches with the time range defined by *34.12* and *34.13*. During Exception days, weekday and season bits are ignored.
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 0…10 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 *34.70*…*34.90* and the current time matches with the time range defined by *34.12* and *34.13*. During Exception days, weekday and season bits are ignored.
14…15	Reserved	

No.	Name/Value	Description	Def/FbEq16

Examples of how the timer configuration defines when the Timer is active are shown below.

Bits of parameter *34.11 Timer 1 configuration*														
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Season1	Season2	Season3	Season4	Exceptions	Holidays	Workdays	
1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	0	0	0	**Example 1:** Timer is active during the times of the day defined by other parameters every Weekday and every Season. Exception day settings (*34.70*…*34.90*) do not have any effect on the Timer.
1	**1**	**1**	**1**	**1**	0	0	1	1	1	1	0	0	0	**Example 2:** Timer is active during the times of the day defined by other parameters from Mon to Fri, every Season. Exception day settings (*34.70*…*34.90*) do not have any effect on the Timer.
1	1	1	1	1	0	0	0	0	**1**	0	0	0	0	**Example 3:** Timer is active during the times of the day defined by other parameters from Mon to Fri, only during Season 3 (can be configured as, eg, summer). Exception day settings (*34.70*…*34.90*) do not have any effect on the Timer.
1	1	1	1	1	0	0	1	1	1	1	**1**	**1**	0	**Example 4:** Timer is active during the times of the day defined by other parameters from Mon to Fri, every Season. In addition, the Timer is active every Exception day Holidays, regardless what is the day or season.
1	0	1	0	1	0	1	1	1	0	0	**1**	0	**1**	**Example 5:** Timer is active during the times of the day defined by other parameters on Mon, Wed, Fri and Sun, during Season1 and Season 2. In addition, the Timer is active every Exception day Workdays, regardless what is the day or season.
1	1	1	1	1	1	1	1	1	1	1	**1**	**0**	**0**	**Example 6:** Timer is active during the times of the day defined by other parameters every Weekday and every Season. The Timer is inactive during all Exception days.

	0000h…FFFFh	Configuration of timer 1.	1 = 1
34.12	*Timer 1 start time*	Defines the daily start time of timer 1. The time can be changed in second steps. The timer can be started at an other time than the start time. For example, if the timer's duration is more than one day and the active session starts during the time, the timer is started at 00:00 and stopped when there is no duration left.	00:00:00
	00:00:00…23:59:59	Daily start time of the timer.	1 = 1

No.	Name/Value	Description	Def/FbEq16
34.13	*Timer 1 duration*	Defines the duration of timer 1. The duration can be changed in minute steps. The duration can extend over the change of the day but if an exception day becomes active, the period is interrupted at midnight. In the same way the period started on an exception day stays active only until the end of the day, even if the duration is longer. The timer will continue after a break if there is duration left.	00 00:00
	00 00:00…07 00:00	Timer duration.	1 = 1
34.14	*Timer 2 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.15	*Timer 2 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.16	*Timer 2 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.17	*Timer 3 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.18	*Timer 3 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.19	*Timer 3 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.20	*Timer 4 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.21	*Timer 4 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.22	*Timer 4 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.23	*Timer 5 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.24	*Timer 5 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.25	*Timer 5 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.26	*Timer 6 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.27	*Timer 6 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.28	*Timer 6 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.29	*Timer 7 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.30	*Timer 7 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.31	*Timer 7 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.32	*Timer 8 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.33	*Timer 8 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.34	*Timer 8 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.35	*Timer 9 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.36	*Timer 9 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.37	*Timer 9 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.38	*Timer 10 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b
34.39	*Timer 10 start time*	See *34.12 Timer 1 start time*.	00:00:00
34.40	*Timer 10 duration*	See *34.13 Timer 1 duration*.	00 00:00
34.41	*Timer 11 configuration*	See *34.11 Timer 1 configuration*.	0000 0111 1000 0000b

No.	Name/Value	Description	Def/FbEq16
34.42	*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 (1…4) must be given in increasing order to use all seasons. The default value is interpreted that the season is not configured. If the season start dates are not in increasing order and the value is something else than the default value, a season configuration warning is given.	01.01.
	01.01…31.12	Season start date.	
34.61	*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 1…3 are periods (duration can be defined) and exceptions 4…16 are days (duration is always 24 hours). **Example:** If the value is 4, exceptions 1…4 are active, and exceptions 5…16 are not active.	3
	0…16	Number of active exception periods or days.	-

No.	Name/Value	Description	Def/FbEq16
34.71	*Exception types*	Defines the types of exceptions 1…16 as workday or holiday. Exceptions 1…3 are periods (duration can be defined) and exceptions 4…16 are days (duration is always 24 hours).	0000 0000 0000 0000b

Bit	Name	Description
0	Exception 1	0 = Workday. 1 = Holiday
1	Exception 2	0 = Workday. 1 = Holiday
2	Exception 3	0 = Workday. 1 = Holiday
3	Exception 4	0 = Workday. 1 = Holiday
4	Exception 5	0 = Workday. 1 = Holiday
5	Exception 6	0 = Workday. 1 = Holiday
6	Exception 7	0 = Workday. 1 = Holiday
7	Exception 8	0 = Workday. 1 = Holiday
8	Exception 9	0 = Workday. 1 = Holiday
9	Exception 10	0 = Workday. 1 = Holiday
10	Exception 11	0 = Workday. 1 = Holiday
11	Exception 12	0 = Workday. 1 = Holiday
12	Exception 13	0 = Workday. 1 = Holiday
13	Exception 14	0 = Workday. 1 = Holiday
14	Exception 15	0 = Workday. 1 = Holiday
15	Exception 16	0 = Workday. 1 = Holiday

	0000h…FFFFh	Types of exception period or days.	1 = 1
34.72	*Exception 1 start*	Defines the start date of the exception period in format dd.mm, where dd is the number of the day and mm is the number of the month. The timer started on an exception day is always stopped at 23:59:59 even if it has duration left. The same date can be configured to be holiday and workday. The date is active if any of exception days are active.	01.01.
	01.01.…31.12.	Start date of exception period 1.	
34.73	*Exception 1 length*	Defines the length of the exception period in days. Exception period is handled the same as a number of consecutive exception days.	0 d
	0…60 d	Length of exception period 1.	1 = 1
34.74	*Exception 2 start*	See *34.72 Exception 1 start*.	01.01.
34.75	*Exception 2 length*	See *34.73 Exception 1 length*.	0 d
34.76	*Exception 3 start*	See *34.72 Exception 1 start*.	01.01.
34.77	*Exception 3 length*	See *34.73 Exception 1 length*.	0 d
34.78	*Exception day 4*	Defines the date of exception day 4.	01.01.
	01.01.…31.12.	Start date of exception day 4. The timer started on an exception day is always stopped at 23:59:59 even if it has duration left.	
34.79	*Exception day 5*	See *34.79 Exception day 4*.	01.01
34.80	*Exception day 6*	See *34.79 Exception day 4*.	01.01
34.81	*Exception day 7*	See *34.79 Exception day 4*	01.01
34.82	*Exception day 8*	See *34.79 Exception day 4*.	01.01

No.	Name/Value	Description	Def/FbEq16
34.83	*Exception day 9*	See *34.79 Exception day 4*.	01.01
34.84	*Exception day 10*	See *34.79 Exception day 4*.	01.01
34.85	*Exception day 11*	See *34.79 Exception day 4*.	01.01
34.86	*Exception day 12*	See *34.79 Exception day 4*.	01.01
34.87	*Exception day 13*	See *34.79 Exception day 4*.	01.01
34.88	*Exception day 14*	See *34.79 Exception day 4*.	01.01
34.89	*Exception day 15*	See *34.79 Exception day 4*.	01.01
34.90	*Exception day 16*	See *34.79 Exception day 4*.	01.01
34.100	*Timed function 1*	Defines which timers are connected to combined timer 1. 0 = Not connected. 1 = Connected. See *34.01 Timed functions status*.	0000 0000 0000 0000b

Bit	Name	Description
0	Timer 1	0 = Inactive. 1 = Active.
1	Timer 2	0 = Inactive. 1 = Active.
2	Timer 3	0 = Inactive. 1 = Active.
3	Timer 4	0 = Inactive. 1 = Active.
4	Timer 5	0 = Inactive. 1 = Active.
5	Timer 6	0 = Inactive. 1 = Active.
6	Timer 7	0 = Inactive. 1 = Active.
7	Timer 8	0 = Inactive. 1 = Active.
8	Timer 9	0 = Inactive. 1 = Active.
9	Timer 10	0 = Inactive. 1 = Active.
10	Timer 11	0 = Inactive. 1 = Active.
11	Timer 12	0 = Inactive. 1 = Active.
12…15	Reserved	

	0000h…FFFFh	Timers connected to combined timer 1.	1 = 1
34.101	*Timed function 2*	Defines which timers are connected to combined timer 2. See *34.01 Timed functions status*.	0000 0000 0000 0000b
34.102	*Timed function 3*	Defines which timers are connected to combined timer 3. See *34.01 Timed functions status*.	0000 0000 0000 0000b
34.110	*Boost time function*	Defines which combined timers (that is, timers that are connected to the combined timers) are activated with the extra time function.	0000 0000 0000 0000b

Bit	Name	Description
0	Timed function 1	0 = Inactive. 1 = Active.
1	Timed function 2	0 = Inactive. 1 = Active.
2	Timed function 3	0 = Inactive. 1 = Active.
3…15	Reserved	

	0000h…FFFFh	Combined timers including the extra timer.	1 = 1

No.	Name/Value	Description	Def/FbEq16
34.111	Boost time activation source	Selects the source of extra time activation signal. 0 = Disabled. 1 = Enabled.	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 Terms and abbreviations 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 00:00…07 00:00	Extra time duration.	1 = 1

35 Motor thermal protection		Motor thermal protection settings such as temperature measurement configuration, load curve definition and motor fan control configuration. See also section Programmable protection functions (page 174).	
35.01	Motor estimated temperature	Displays the motor temperature as estimated by the internal motor thermal protection model (see parameters 35.50…35.55). The unit is selected by parameter 96.16 Unit selection. This parameter is read-only.	-
	-60…1000 °C or -76…1832 °F	Estimated motor temperature.	1 = 1°
35.02	Measured temperature 1	Displays the temperature received through the source defined by parameter 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.	-
	-60…5000 °C or -76…9032 °F, 0 ohm or [35.12] ohm	Measured temperature 1.	1 = 1 unit

No.	Name/Value	Description	Def/FbEq16
35.03	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.	-
	-60…5000 °C or -76…9032 °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		3…4

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		9…10
	Direct temperature	The temperature is taken from the source selected by parameter *35.14 Temperature 1 AI source*. The value of the source is assumed to be degrees Celsius.	11
	KTY83 analog I/O	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		17…18
	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

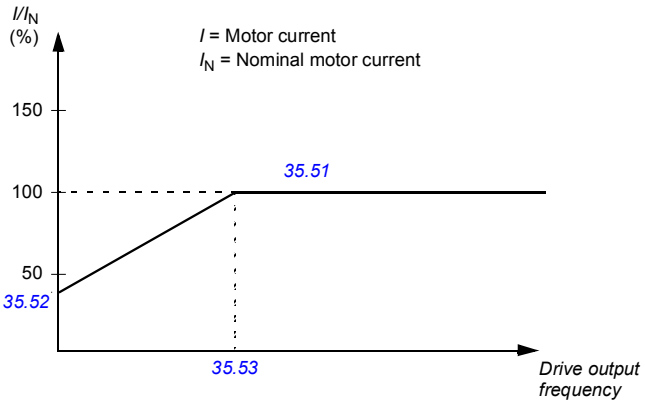
No.	Name/Value	Description	Def/FbEq16
35.12	Temperature 1 fault limit	Defines the fault limit for temperature supervision function 1. When measured temperature 1 exceeds the limit, the drive trips on fault 4981 External temperature 1. The unit is selected by parameter 96.16 Unit selection. **Note:** 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
	-60…5000 °C or -76…9032 °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
	-60…5000 °C or -76…9032 °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
	AI1 actual value	Analog input AI1 on the control unit.	1
	AI2 actual value	Analog input AI2 on the control unit.	2
	Other	Source selection (see Terms and abbreviations 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 sensor. As the resistance of the sensor increases along with its temperature, the voltage over the sensor increases. The voltage is read by the analog input and converted into degrees.	2
	Reserved		3…4
	1 × Pt100 analog I/O	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		19…10
	Direct temperature	The temperature is taken from the source selected by parameter *35.24 Temperature 2 AI source*. The value of the source is assumed to be degrees Celsius.	11

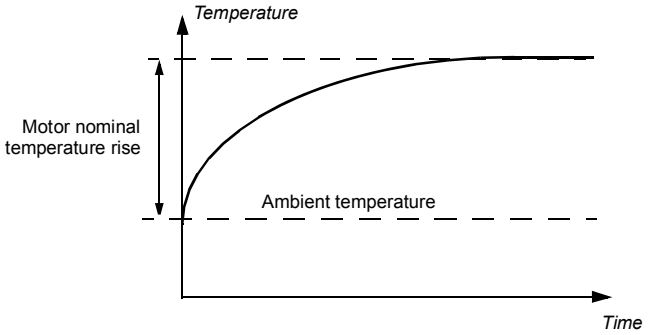
No.	Name/Value	Description	Def/FbEq16
	KTY83 analog I/O	KTY83 sensor connected to the analog input selected by parameter *35.14 Temperature 1 AI source* and an analog output. The following settings are required: • Set the hardware jumper or switch related to the analog input to ***U*** (voltage). Any 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 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.	12
	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 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.	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 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.	16

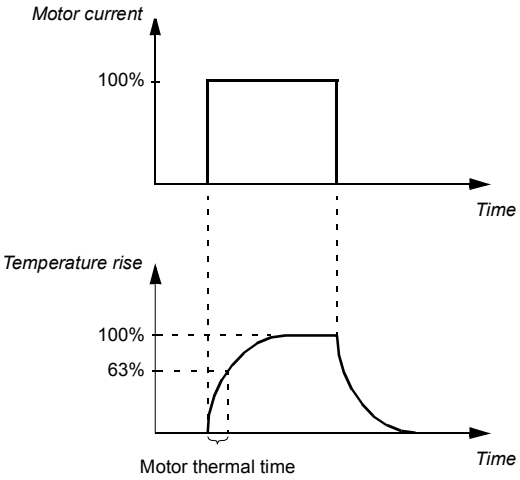
No.	Name/Value	Description	Def/FbEq16
	Reserved		17…18
	PTC extension module	PTC is connected to the CMOD-02 multifunction extension module, which is installed in drive slot 2. See chapter *Optional I/O extension modules, section CMOD-02 multifunction extension module (external 24 V AC/DC and isolated 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
	-60…5000 °C or -76…9032 °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
	-60…5000 °C or -76…9032 °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
	AI1 actual value	Analog input AI1 on the control unit.	1
	AI2 actual value	Analog input AI2 on the control unit.	2
	Other	Source selection (see *Terms and abbreviations* 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 35.50…35.55. The motor temperature increases if it operates in the region above the load curve, and decreases if it operates in the region below the load curve. **WARNING!** The model cannot protect the motor if the motor does not cool properly because of dust, dirt, etc.	20 °C or 68 °F
	-60…100 °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.	110%
	50…150%	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%
	25…150%	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
	1.00…500.00 Hz	Break point for the motor load curve.	See par. *46.02*
35.54	*Motor nominal temperature rise*	Defines the temperature rise of the motor above ambient when the motor is loaded with nominal current. See the motor manufacturer's recommendations. The unit is selected by parameter *96.16 Unit selection*.	80 °C or 176 °F
	0…300 °C or 32…572 °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
	100…10000 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
	Class 40	Motor overload class 40.	4

No.	Name/Value	Description	Def/FbEq16
36 Load analyzer		Peak value and amplitude logger settings. See also section *Load analyzer* (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 *36.10*…*36.15*. The peak value logger can be reset using parameter *36.09 Reset loggers*. The logger is also reset whenever the signal source is changed. The date and time of the last reset are stored into parameters *36.16* and *36.17* respectively.	*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 *Terms and abbreviations* on page *324*).	-
36.02	*PVL filter time*	Peak value logger filtering time. See parameter *36.01 PVL signal source*.	2.00 s
	0.00…120.00 s	Peak value logger filtering time.	100 = 1 s
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 *36.40*…*36.49*. Each parameter represents an amplitude range, and shows what portion of the samples fall within that range. The signal value corresponding to 100% is defined by parameter *36.07 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
	0.00…32767.00	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
	0.00…2000.00 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 I_{max} value given in the ratings table in chapter Technical data in the *Hardware manual* of the drive.	0.00%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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%
	0.00…100.00%	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 User load curve		Settings for user load curve. See also section *User load curve* (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.
4…15	Reserved	

	0000h…FFFFh	Status of the monitored signal.	1 = 1
37.02	*ULC supervision signal*	Selects the signal to be monitored. The function compares the absolute value of the signal against the load curve.	*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 *Terms and abbreviations* 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
	-30000.0…30000.0 rpm	Speed.	1 = 1 rpm
37.12	*ULC speed table point 2*	Defines the second speed point. See parameter *37.11 ULC speed table point 1*.	750.0 rpm
	-30000.0…30000.0 rpm	Speed.	1 = 1 rpm
37.13	*ULC speed table point 3*	Defines the third speed point. See parameter *37.11 ULC speed table point 1*.	1290.0 rpm
	-30000.0…30000.0 rpm	Speed.	1 = 1 rpm
37.14	*ULC speed table point 4*	Defines the fourth speed point. See parameter *37.11 ULC speed table point 1*.	1500.0 rpm
	-30000.0…30000.0 rpm	Speed.	1 = 1 rpm
37.15	*ULC speed table point 5*	Defines the fifth speed point. See parameter *37.11 ULC speed table point 1*.	1800.0 rpm
	-30000.0…30000.0 rpm	Speed.	1 = 1 rpm
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
	-500.0…500.0 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
	-500.0…500.0 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
	-500.0…500.0 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
	-500.0…500.0 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
	-500.0…500.0 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 1…37.15 ULC speed table point 5 or 37.15 ULC speed table point 5…37.20 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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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 1…37.15 ULC speed table point 5 or 37.15 ULC speed table point 5…37.20 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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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%
	-1600.0…1600.0%	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
	0.0…10000.0 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
	0.0…10000.0 s	Underload timer	1 = 1 s

40 Process PID set 1		Parameter values for process PID control. The drive output can be controlled by the process PID. When the process PID control is enabled, the drive controls the process feedback to the reference value. Two different parameter sets can be defined for the process PID. One parameter set is in use at a time. The first set is made up of parameters 40.07…40.50, 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 Process PID controller on page 316. 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.	-
	-200000…200000 PID unit 1	Setpoint for process PID controller.	1 = 1 PID unit 1

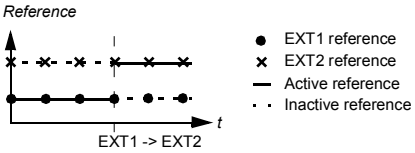
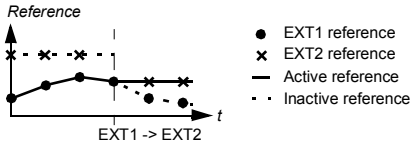
No.	Name/Value	Description	Def/FbEq16
40.04	Process PID deviation actual	Displays the process PID deviation. By default, this value equals setpoint - feedback, but deviation can be inverted by parameter 40.31 Set 1 deviation inversion. See control chain diagram Process PID controller on page 316. This 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. 40.16…40.23)
13…15	Reserved	

	0000h…FFFFh	Process PID control status word.	1 = 1
40.07	Process PID operation mode	Activates/deactivates process PID control. **Note:** Process PID control is only available in external control; see section Local control vs. external control (page 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 PID setpoint compensation on page 314.	AI2 percent
	Not selected	None.	0
	AI1 scaled	12.12 AI1 scaled value (see page 358).	1
	AI2 scaled	12.22 AI2 scaled value (see page 360).	2
	Freq in scaled	11.39 Freq in 1 scaled value (see page 356).	3
	Reserved		4…7
	AI1 percent	12.101 AI1 percent value (see page 361).	8
	AI2 percent	12.102 AI2 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 *Terms and abbreviations* 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*
	In1	Source 1.	0
	In1+In2	Sum of sources 1 and 2.	1
	In1-In2	Source 2 subtracted from source 1.	2
	In1*In2	Source 1 multiplied by source 2.	3
	In1/In2	Source 1 divided by source 2.	4
	MIN(In1,In2)	Smaller of the two sources.	5
	MAX(In1,In2)	Greater of the two sources.	6
	AVE(In1,In2)	Average of the two sources.	7
	sqrt(In1)	Square root of source 1.	8
	sqrt(In1-In2)	Square root of (source 1 - source 2).	9
	sqrt(In1+In2)	Square root of (source 1 + source 2).	10
	sqrt(In1)+sqrt(In2)	Square root of source 1 + square root of source 2.	11
	k*sqrt(In1)	Square root of source 1. (k = 1)	12
	k*sqrt(In1-In2)	Square root of (source 1 - source 2). (k = 1)	13
40.11	*Set 1 feedback filter time*	Defines the filter time constant for process feedback.	0.000 s
	0.000…30.000 s	Feedback filter time.	1 = 1 s

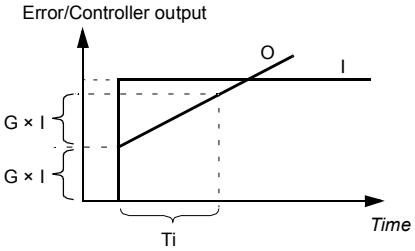
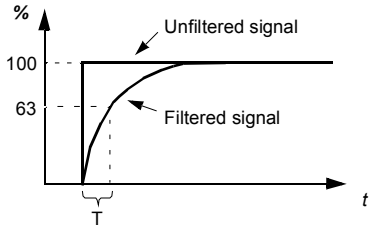
<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>40.14</td><td>Set 1 setpoint scaling</td><td>Defines, together with parameter 40.15 Set 1 output scaling, a general scaling factor for the process PID control chain.
If the parameter is set to zero, automatic 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.</td><td>0.00</td></tr>
<tr><td></td><td>-200000.00… 200000.00</td><td>Scaling.</td><td>1 = 1</td></tr>
<tr><td>40.15</td><td>Set 1 output scaling</td><td>See parameter 40.14 Set 1 setpoint scaling.
If the parameter is set to zero, scaling is automatic:
<table><tr><th>Operation mode (see par. 19.01)</th><th>Scaling</th></tr><tr><td>Speed control</td><td>46.01 Speed scaling</td></tr><tr><td>Frequency control</td><td>46.02 Frequency scaling</td></tr></table></td><td>0.00</td></tr>
<tr><td></td><td>-200000.00… 200000.00</td><td>Process PID controller output base.</td><td>1 = 1</td></tr>
<tr><td>40.16</td><td>Set 1 setpoint 1 source</td><td>Selects the primary source of process PID setpoint. See the control chain diagram on page 314.</td><td>AI1 percent</td></tr>
<tr><td></td><td>Not selected</td><td>None.</td><td>0</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>1</td></tr>
<tr><td></td><td>Internal setpoint</td><td>Internal setpoint. See parameter 40.19 Set 1 internal setpoint sel1.</td><td>2</td></tr>
<tr><td></td><td>AI1 scaled</td><td>12.12 AI1 scaled value (see page 358).</td><td>3</td></tr>
<tr><td></td><td>AI2 scaled</td><td>12.22 AI2 scaled value (see page 360).</td><td>4</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>5…7</td></tr>
<tr><td></td><td>Motor potentiometer</td><td>22.80 Motor potentiometer ref act (output of the Floating point control (Motor potentiometer)).</td><td>8</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>9</td></tr>
<tr><td></td><td>Freq in scaled</td><td>11.39 Freq in 1 scaled value (see page 356).</td><td>10</td></tr>
<tr><td></td><td>AI1 percent</td><td>12.101 AI1 percent value (see page 361)</td><td>11</td></tr>
<tr><td></td><td>AI2 percent</td><td>12.102 AI2 percent value (see page 361)</td><td>12</td></tr>
</table>

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*.) 	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. 	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		17…18
	EFB ref1	*03.09 EFB reference 1* (see page *332*).	19
	EFB ref2	*03.10 EFB reference 2* (see page *332*).	20
	Reserved		21…23
	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 *Terms and abbreviations* 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*
	In1	Source 1.	0
	In1+In2	Sum of sources 1 and 2.	1
	In1-In2	Source 2 subtracted from source 1.	2

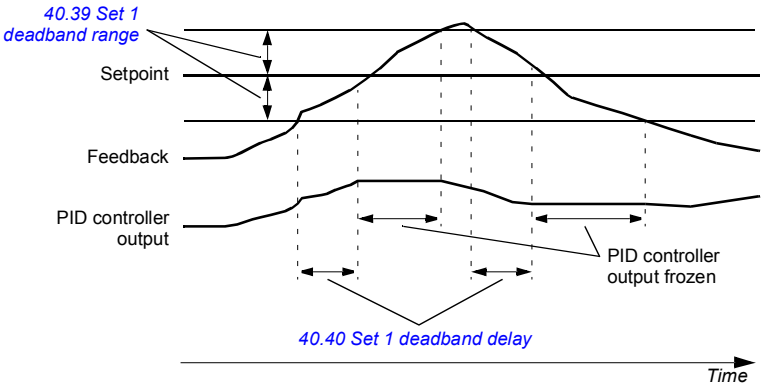
<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>In1*In2</td><td>Source 1 multiplied by source 2.</td><td>3</td></tr>
<tr><td></td><td>In1/In2</td><td>Source 1 divided by source 2.</td><td>4</td></tr>
<tr><td></td><td>MIN(In1,In2)</td><td>Smaller of the two sources.</td><td>5</td></tr>
<tr><td></td><td>MAX(In1,In2)</td><td>Greater of the two sources.</td><td>6</td></tr>
<tr><td></td><td>AVE(In1,In2)</td><td>Average of the two sources.</td><td>7</td></tr>
<tr><td></td><td>sqrt(In1)</td><td>Square root of source 1.</td><td>8</td></tr>
<tr><td></td><td>sqrt(In1-In2)</td><td>Square root of (source 1 - source 2).</td><td>9</td></tr>
<tr><td></td><td>sqrt(In1+In2)</td><td>Square root of (source 1 + source 2).</td><td>10</td></tr>
<tr><td></td><td>sqrt(In1)+sqrt(In2)</td><td>Square root of source 1 + square root of source 2.</td><td>11</td></tr>
<tr><td></td><td>k*sqrt(In1)</td><td>Square root of source 1. (k = 1)</td><td>12</td></tr>
<tr><td></td><td>k*sqrt(In1-In2)</td><td>Square root of (source 1 - source 2). (k = 1)</td><td>13</td></tr>
<tr><td>40.19</td><td>Set 1 internal setpoint sel1</td><td>Selects together with 40.20 Set 1 internal setpoint sel2 the internal setpoint out of the presets defined by parameters 40.21…40.24.
Note: Parameters 40.16 Set 1 setpoint 1 source and 40.17 Set 1 setpoint 2 source must be set to Internal setpoint.<table><tr><th>Source defined by par. 40.19</th><th>Source defined by par. 40.20</th><th>Setpoint preset active</th></tr><tr><td>0</td><td>0</td><td>0 (par. 40.24)</td></tr><tr><td>1</td><td>0</td><td>1 (par. 40.21)</td></tr><tr><td>0</td><td>1</td><td>2 (par. 40.22)</td></tr><tr><td>1</td><td>1</td><td>3 (par. 40.23)</td></tr></table></td><td>Not selected</td></tr>
<tr><td></td><td>Not selected</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>Selected</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>DI1</td><td>Digital input DI1 (10.02 DI delayed status, bit 0).</td><td>2</td></tr>
<tr><td></td><td>DI2</td><td>Digital input DI2 (10.02 DI delayed status, bit 1).</td><td>3</td></tr>
<tr><td></td><td>DI3</td><td>Digital input DI3 (10.02 DI delayed status, bit 2).</td><td>4</td></tr>
<tr><td></td><td>DI4</td><td>Digital input DI4 (10.02 DI delayed status, bit 3).</td><td>5</td></tr>
<tr><td></td><td>DI5</td><td>Digital input DI5 (10.02 DI delayed status, bit 4).</td><td>6</td></tr>
<tr><td></td><td>DI6</td><td>Digital input DI6 (10.02 DI delayed status, bit 5).</td><td>7</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>8…17</td></tr>
<tr><td></td><td>Timed function 1</td><td>Bit 0 of 34.01 Timed functions status (see page 451).</td><td>18</td></tr>
<tr><td></td><td>Timed function 2</td><td>Bit 1 of 34.01 Timed functions status (see page 451).</td><td>19</td></tr>
<tr><td></td><td>Timed function 3</td><td>Bit 2 of 34.01 Timed functions status (see page 451).</td><td>20</td></tr>
<tr><td></td><td>Supervision 1</td><td>Bit 0 of 32.01 Supervision status (see page 444).</td><td>21</td></tr>
<tr><td></td><td>Supervision 2</td><td>Bit 1 of 32.01 Supervision status (see page 444).</td><td>22</td></tr>
<tr><td></td><td>Supervision 3</td><td>Bit 2 of 32.01 Supervision status (see page 444).</td><td>23</td></tr>
<tr><td></td><td>Other [bit]</td><td>Source selection (see Terms and abbreviations on page 324).</td><td>-</td></tr>
<tr><td>40.20</td><td>Set 1 internal setpoint sel2</td><td>Selects together with 40.19 Set 1 internal setpoint sel1 the internal setpoint used out of the three internal setpoints defined by parameters 40.21…40.23. See table at 40.19 Set 1 internal setpoint sel1.</td><td>Not selected</td></tr>
<tr><td></td><td>Not selected</td><td>0.</td><td>0</td></tr>
</table>

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		8…17
	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 *Terms and abbreviations* 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
	0.0…1800.0 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
	0.0…1800.0 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		8…17
	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 Terms and abbreviations 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 Terms and abbreviations 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
	0.01…100.00	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.  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.	3.0 s
	0.0…9999.0 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
	0.000…10.000 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.  $O = I \times (1 - e^{-t/T})$ I = filter input (step) O = filter output *t* = time T = filter time constant	0.0 s
	0.0…10.0 s	Filter time constant.	10 = 1 s

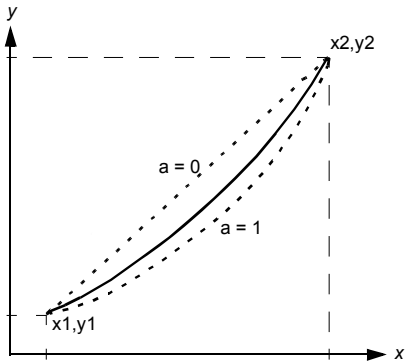
No.	Name/Value	Description	Def/FbEq16
40.36	*Set 1 output min*	Defines the minimum limit for the process PID controller output. Using the minimum and maximum limits, it is possible to restrict the operation range.	0.00
	-200000.00… 200000.00	Minimum limit for process PID controller output.	1 = 1
40.37	*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		8…17
	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 *Terms and abbreviations* 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
			
	0.0……200000.0	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
	0.0…200000.0	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
	0.0…3600.0 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
	0.0…3600.0 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
	0.0…200000.0 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
	0.00…60.00 s	Wake-up delay.	1 = 1 s
40.49	Set 1 tracking mode	Activates (or selects a source that activates) tracking mode. In tracking mode, the value selected by parameter 40.50 Set 1 tracking ref selection is substituted for the PID controller output. See also section Tracking (page 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		8…17
	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 Terms and abbreviations 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
	AI1 scaled	12.12 AI1 scaled value (see page 358).	1
	AI2 scaled	12.22 AI2 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 Terms and abbreviations 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 *40.07*…*40.50*) or set 2 (group *41 Process PID set 2*) is used.	*PID set 1*
	PID set 1	0. Process PID parameter set 1 in use.	0
	PID set 2	1. Process PID parameter set 2 in use.	1
	DI1	Digital input DI1 (*10.02 DI delayed status*, bit 0).	2
	DI2	Digital input DI2 (*10.02 DI delayed status*, bit 1).	3
	DI3	Digital input DI3 (*10.02 DI delayed status*, bit 2).	4
	DI4	Digital input DI4 (*10.02 DI delayed status*, bit 3).	5
	DI5	Digital input DI5 (*10.02 DI delayed status*, bit 4).	6
	DI6	Digital input DI6 (*10.02 DI delayed status*, bit 5).	7
	Reserved		8…17
	Timed function 1	Bit 0 of *34.01 Timed functions status* (see page *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 *Terms and abbreviations* 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 *Terms and abbreviations* 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 *Terms and abbreviations* 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 *Terms and abbreviations* 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 *PID 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 *40.71*…*40.76*. The compensated setpoint curve will be a mixture of a straight line between the points and a squared line between the points:  *x* = value from *40.71 Set 1 compensation input source* *y* = *40.70 Compensated setpoint* *a* = *40.76 Set 1 compensation non-linearity* Compensated setpoint curve = a ∗ squared function + (1 - a) ∗ linear function	
	-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.	*AI1 percent*
	Not selected	None.	0
	Reserved		1
	Internal setpoint	Internal setpoint. See parameter *40.19 Set 1 internal setpoint sel1*.	2
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	3
	AI2 scaled	*12.22 AI2 scaled value* (see page *360*).	4
	Reserved		5…7
	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
	AI1 percent	*12.101 AI1 percent value* (see page *361*)	11
	AI2 percent	*12.102 AI2 percent value* (see page *361*)	12
	Reserved		13…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

No.	Name/Value	Description	Def/FbEq16
	Reserved		17…18
	EFB ref1	*03.09 EFB reference 1* (see page *332*).	19
	EFB ref2	*03.10 EFB reference 2* (see page *332*).	20
	Reserved		21…23
	Setpoint data storage	*40.92 Setpoint data storage* (see page *492*)	24
	Other	Source selection (see *Terms and abbreviations* 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*.	
	0…100%	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 (*58.101*…*58.114*) to *Feedback data storage*. In *40.08 Set 1 feedback 1 source* (or *40.09 Set 1 feedback 2 source*), select *Feedback data storage*.	-
	-327.68…327.67	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 (*58.101*…*58.114*)) to *Setpoint data storage*. In *40.16 Set 1 setpoint 1 source* (or *40.17 Set 1 setpoint 2 source*), select *Setpoint data storage*.	-
	-327.68…327.67	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%
	-100.00…100.00%	Percentage.	100 = 1%
40.97	*Process PID feedback %*	Percentage scaled signal of parameter *40.02 Process PID feedback actual*.	0.00%
	-100.00…100.00%	Percentage.	100 = 1%
40.98	*Process PID setpoint %*	Percentage scaled signal of parameter *40.03 Process PID setpoint actual*.	0.00%
	-100.00…100.00%	Percentage.	100 = 1%
40.99	*Process PID deviation %*	Percentage scaled signal of parameter *40.04 Process PID deviation actual*.	0.00%
	-100.00…100.00%	.Percentage.	100 = 1%

41 Process PID set 2		A second set of parameter values for process PID control. The selection between this set and first set (parameter group *40 Process PID set 1*) is made by parameter *40.57 PID set1/set2 selection*. See also parameters *40.01*…*40.06*, and control chain 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*.	*AI2 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*.	*AI1 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*.	*AI1 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 Brake 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.	-
	0.0…120.0%	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 *Resistor braking* in the *Hardware manual* 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 Terms and abbreviations on page 324).	-
43.08	Brake resistor thermal tc	Defines§ the thermal time constant for the brake resistor thermal model.	0 s
	0…10000 s	Brake resistor thermal time constant, ie the rated time to achieve 63% temperature.	1 = 1 s

No.	Name/Value	Description	Def/FbEq16
43.09	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
	0.0…1000.0 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%
	0…150%	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%
	0…150%	Brake resistor temperature warning limit.	1 = 1%

45 Energy efficiency		Settings for the energy saving calculators as well as peak and energy loggers. See also section Diagnostics menu (page 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).	-
	0…65535 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).	-
	0…999 MWh	Energy savings in MWh.	1 = 1 MWh

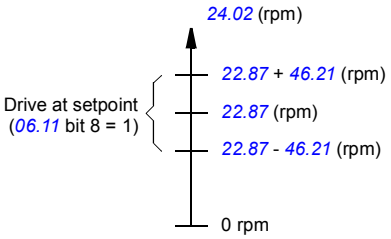
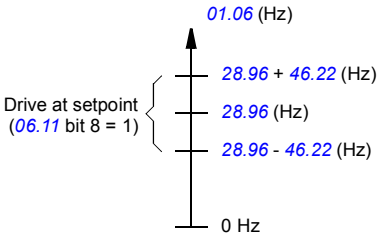
No.	Name/Value	Description	Def/FbEq16
45.03	Saved kW hours	Energy saved in kWh compared to direct-on-line motor connection. If the internal brake chopper of the drive is enabled, all energy fed by the motor to the drive is assumed to be converted into heat, but the calculation still records savings made 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).	-
	0.0…999.9 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).	-
	0.0…214748364.0 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).	-
	0…4294967295 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).	-
	0.00…999.99 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*).	-
	0…65535 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*).	-
	0.0…999.9 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*).	-
	0.0…214748300.8 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 1…20% depending on load torque and speed. **Note:** With a permanent magnet motor and a synchronous reluctance motor, energy optimization is always enabled regardless of this parameter.	*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 1 = 45.13 Energy tariff 2	Energy tariff 1
	Energy tariff 1	0.	0
	Energy tariff 2	1.	1
	DI1	Digital input DI1 (10.02 DI delayed status, bit 0).	2
	DI2	Digital input DI2 (10.02 DI delayed status, bit 1).	3
	DI3	Digital input DI3 (10.02 DI delayed status, bit 2).	4
	DI4	Digital input DI4 (10.02 DI delayed status, bit 3).	5
	DI5	Digital input DI5 (10.02 DI delayed status, bit 4).	6
	DI6	Digital input DI6 (10.02 DI delayed status, bit 5).	7
	Other [bit]	Source selection (see Terms and abbreviations 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)
	0.000…65.535 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
	0.00…10000000.00 kW	Motor power.	1 = 1 kW
45.21	Energy calculations reset	Resets the savings counter parameters 45.01…45.10.	Done
	Done	Reset not requested (normal operation), or reset complete.	0
	Reset	Reset the savings counter parameters. The value reverts automatically to Done.	1
45.24	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)
	0.10…30000.00 rpm	Acceleration/deceleration terminal/initial speed.	1 = 1 rpm
46.02	*Frequency scaling*	Defines the maximum frequency value used to define the acceleration ramp rate and the initial frequency value used to define deceleration ramp rate (see parameter group *28 Frequency reference chain*). The frequency acceleration and deceleration ramp times are therefore related to this value (**not** to parameter *30.14 Maximum frequency*). Also defines the 16-bit scaling of frequency-related parameters. The value of this parameter corresponds to 20000, for example, in fieldbus communication.	50.00 Hz; 60.00 Hz (*95.20* b0)
	0.10…1000.00 Hz	Acceleration/deceleration terminal/initial frequency.	10 = 1 Hz
46.03	*Torque scaling*	Defines the 16-bit scaling of torque parameters. The value of this parameter (in percent of nominal motor torque) corresponds to 10000, for example, in fieldbus communication.	100.0%
	0.1…1000.0%	Torque corresponding to 10000 on fieldbus.	10 = 1%
46.04	*Power scaling*	Defines the output power value that corresponds to 10000, for example, in fieldbus communication.	1000.00
	0.10 …30000.00	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
	0…30000 A		
46.06	*Speed ref zero scaling*	Defines a speed corresponding to a zero reference received from fieldbus (either the embedded fieldbus interface, or interface FBA A). For example, with a setting of 500, the fieldbus reference range of 0…20000 would correspond to a speed of 500…[*46.01*] rpm. **Note:** This parameter is effective only with the ABB Drives communication profile.	0.00 rpm
	0.00 … 30000.00 rpm	Speed corresponding to minimum fieldbus reference.	1 = 1 rpm
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 0…20000 would correspond to a speed of 30…[*46.02*] Hz. **Note:** This parameter is effective only with the ABB Drives communication profile.	0.00 Hz
	0.00 … 1000.00 Hz	Frequency corresponding to minimum fieldbus reference.	10 = 1 Hz

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
	2…20000 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
	2…20000 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
	2…20000 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
	2…20000 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*. 	50.00 rpm
	0.00…30000.00 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*. 	2.00 Hz
	0.00…1000.00 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)
	0.00…30000.00 rpm	“Above limit” indication trigger level for speed control.	See par. 46.01
46.32	Above frequency limit	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)
	0.00…1000.00 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 Data storage		Data storage parameters that can be written to and read from using other parameters’ source and target settings. Note that there are different storage parameters for different data types. See also section Data storage parameters (page 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
	-32768…32767	16-bit data.	1 = 1
47.22	*Data storage 2 int16*	Data storage parameter 18.	0
	-32768…32767	16-bit data.	1 = 1
47.23	*Data storage 3 int16*	Data storage parameter 19.	0
	-32768…32767	16-bit data.	1 = 1
47.24	*Data storage 4 int16*	Data storage parameter 20.	0
	-32768…32767	16-bit data.	1 = 1

49 Panel port communication		Communication settings for the control panel port on the drive.	
49.01	*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
	1…32	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
	0.3…3000.0 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 *49.01*…*49.05*. **Note:** Refreshing may cause a communication break, so reconnecting the drive may be required.	*Done*
	Done	Refresh done or not requested.	0
	Configure	Refresh parameters *49.01*…*49.05*. The value reverts automatically to *Done*.	1

50 Fieldbus adapter (FBA)		Fieldbus communication configuration. See also chapter *Fieldbus control through a fieldbus adapter* (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 *FBA A communication*. 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 *FBA A communication*. This occurs even though no control is expected from the fieldbus.	4
	Warning	Drive generates warning *A7C1 FBA A communication*. This only occurs if control is expected from the fieldbus. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	5

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>50.03</td><td>FBA A comm loss t out</td><td>Defines the time delay before the action defined by parameter 50.02 FBA A comm loss func is taken. Time count starts when the communication link fails to update the message.
Note: There is a 60-second boot-up delay immediately after power-up. During the delay, the communication break monitoring is disabled (but communication itself can be active).</td><td>0.3 s</td></tr>
<tr><td></td><td>0.3…6553.5 s</td><td>Time delay.</td><td>1 = 1 s</td></tr>
<tr><td>50.04</td><td>FBA A ref1 type</td><td>Selects the type and scaling of reference 1 received from fieldbus adapter A. The scaling of the reference is defined by parameters 46.01…46.04, depending on which reference type is selected by this parameter.</td><td>Speed or frequency</td></tr>
<tr><td></td><td>Speed or frequency</td><td>Type and scaling is chosen automatically according to the currently active operation mode as follows:
<table><tr><th>Operation mode (see par. 19.01)</th><th>Reference 1 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table></td><td>0</td></tr>
<tr><td></td><td>Transparent</td><td>No scaling is applied (the 16-bit scaling is 1 = 1 unit).</td><td>1</td></tr>
<tr><td></td><td>General</td><td>Generic reference with a 16-bit scaling of 100 = 1 (ie. integer and two decimals).</td><td>2</td></tr>
<tr><td></td><td>Torque</td><td>The scaling is defined by parameter 46.03 Torque scaling.</td><td>3</td></tr>
<tr><td></td><td>Speed</td><td>The scaling is defined by parameter 46.01 Speed scaling.</td><td>4</td></tr>
<tr><td></td><td>Frequency</td><td>The scaling is defined by parameter 46.02 Frequency scaling.</td><td>5</td></tr>
<tr><td>50.05</td><td>FBA A ref2 type</td><td>Selects the type and scaling of reference 2 received from fieldbus adapter A. The scaling of the reference is defined by parameters 46.01…46.04, depending on which reference type is selected by this parameter.</td><td>Speed or frequency</td></tr>
<tr><td></td><td>Speed or frequency</td><td>Type and scaling is chosen automatically according to the currently active operation mode as follows:
<table><tr><th>Operation mode (see par. 19.01)</th><th>Reference 2 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table>Please select Speed (selection 4) or Frequency (selection 5) manually.</td><td>0</td></tr>
<tr><td></td><td>Transparent</td><td>No scaling is applied (the 16-bit scaling is 1 = 1 unit).</td><td>1</td></tr>
<tr><td></td><td>General</td><td>Generic reference with a 16-bit scaling of 100 = 1 (ie. integer and two decimals).</td><td>2</td></tr>
<tr><td></td><td>Torque</td><td>The scaling is defined by parameter 46.03 Torque scaling.</td><td>3</td></tr>
<tr><td></td><td>Speed</td><td>The scaling is defined by parameter 46.01 Speed scaling.</td><td>4</td></tr>
<tr><td></td><td>Frequency</td><td>The scaling is defined by parameter 46.02 Frequency scaling.</td><td>5</td></tr>
<tr><td>50.06</td><td>FBA A SW sel</td><td>Selects the source of the Status word to be sent to the fieldbus network through fieldbus adapter A.</td><td>Auto</td></tr>
<tr><td></td><td>Auto</td><td>Source of the Status word is chosen automatically.</td><td>0</td></tr>
</table>

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td></td><td>Transparent mode</td><td>The source selected by parameter 50.09 FBA A SW transparent source is transmitted as the Status word to the fieldbus network through fieldbus adapter A.</td><td>1</td></tr>
<tr><td>50.07</td><td>FBA A actual 1 type</td><td>Selects the type and scaling of actual value 1 transmitted to the fieldbus network through fieldbus adapter A. The scaling of the value is defined by parameters 46.01…46.04, depending on which actual value type is selected by this parameter.</td><td>Speed or frequency</td></tr>
<tr><td></td><td>Speed or frequency</td><td>Type and scaling is chosen automatically according to the currently active operation mode as follows:<table><tr><th>Operation mode (see par. 19.01)</th><th>Actual value 1 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table></td><td>0</td></tr>
<tr><td></td><td>Transparent</td><td>The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1. No scaling is applied (the 16-bit scaling is 1 = 1 unit).</td><td>1</td></tr>
<tr><td></td><td>General</td><td>The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (ie. integer and two decimals).</td><td>2</td></tr>
<tr><td></td><td>Torque</td><td>The scaling is defined by parameter 46.03 Torque scaling.</td><td>3</td></tr>
<tr><td></td><td>Speed</td><td>01.01 Motor speed used is sent as actual value 1. The scaling is defined by parameter 46.01 Speed scaling.</td><td>4</td></tr>
<tr><td></td><td>Frequency</td><td>01.06 Output frequency is sent as actual value 1. The scaling is defined by parameter 46.02 Frequency scaling.</td><td>5</td></tr>
<tr><td>50.08</td><td>FBA A actual 2 type</td><td>Selects the type and scaling of actual value 2 transmitted to the fieldbus network through fieldbus adapter A. The scaling of the value is defined by parameters 46.01…46.04, depending on which actual value type is selected by this parameter.</td><td>Speed or frequency</td></tr>
<tr><td></td><td>Speed or frequency</td><td>Type and scaling is chosen automatically according to the currently active operation mode as follows:<table><tr><th>Operation mode (see par. 19.01)</th><th>Actual value 2 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table>Select Speed (selection 4) or Frequency (selection 5) manually.</td><td>0</td></tr>
<tr><td></td><td>Transparent</td><td>The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1. No scaling is applied (the 16-bit scaling is 1 = 1 unit).</td><td>1</td></tr>
<tr><td></td><td>General</td><td>The value selected by parameter 50.10 FBA A act1 transparent source is sent as actual value 1 with a 16-bit scaling of 100 = 1 unit (ie. integer and two decimals).</td><td>2</td></tr>
<tr><td></td><td>Torque</td><td>01.10 Motor torque is sent as actual value 1. The scaling is defined by parameter 46.03 Torque scaling.</td><td>3</td></tr>
<tr><td></td><td>Speed</td><td>01.01 Motor speed used is sent as actual value 1. The scaling is defined by parameter 46.01 Speed scaling.</td><td>4</td></tr>
</table>

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 *Terms and abbreviations* 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 *Terms and abbreviations* 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 *Terms and abbreviations* 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 *50.13*…*50.18*.	*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… FFFFFFFFh	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… FFFFFFFFh	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 FBA A settings		Fieldbus adapter A configuration.	
51.01	FBA A type	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.	-
51.02	FBA A Par2	Parameters 51.02…51.26 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.	-
	0…65535	Fieldbus adapter configuration parameter.	1 = 1
…	…	…	…
51.26	FBA A Par26	See parameter 51.02 FBA A Par2.	-
	0…65535	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 Done. **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.	-
	0…65535	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.	-
	0…65535	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 FBA A data in		Selection of data to be transferred from drive to fieldbus controller through fieldbus adapter A. **Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
52.01	*FBA A data in1*	Parameters *52.01*…*52.12* 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

No.	Name/Value	Description	Def/FbEq16
	Reserved		7…10
	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		17…23
	SW2 16bit	Status Word 2 (16 bits)	24
	Other	Source selection (see *Terms and abbreviations* on page *324*).	-
…	…	…	…
52.12	*FBA A data in12*	See parameter *52.01 FBA A data in1*.	*None*

53 FBA A data out		Selection of data to be transferred from fieldbus controller to drive through fieldbus adapter A. **Note:** 32-bit values require two consecutive parameters. Whenever a 32-bit value is selected in a data parameter, the next parameter is automatically reserved.	
53.01	*FBA A data out1*	Parameters *53.01*…*53.12* select data to be transferred from the fieldbus controller to the drive through fieldbus adapter A.	*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		7…10
	CW 32bit	Control Word (32 bits)	11
	Ref1 32bit	Reference REF1 (32 bits)	12
	Ref2 32bit	Reference REF2 (32 bits)	13
	Reserved		14…20
	CW2 16bit	Control Word 2 (16 bits)	21
	Other	Source selection (see *Terms and abbreviations* on page *324*).	-
…	…	…	…
53.12	*FBA A data out12*	See parameter *53.01 FBA A data out1*.	*None*

58 Embedded fieldbus		Configuration of the embedded fieldbus (EFB) interface. See also chapter *Modbus RTU control through the embedded fieldbus interface (EFB)* (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
	BACnet MSTP	Embedded fieldbus interface is enabled and uses the BACnet MS/TP protocol.	2
	Reserved		3…4

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 1…247 are allowable. Also called Station ID, MAC Address or Device Address. Two devices with the same address are not allowed on-line. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter *58.06 Communication control* (*Refresh settings*).	1
	0…255	Node address (values 1…247 are allowed).	1 = 1
58.04	*Baud rate*	Selects the transfer rate of the fieldbus link. When using selection *Autodetect*, 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 Communication control* (*Refresh settings*).	Modbus RTU: *19.2 kbps* BACnet MS/TP: *Autodetect* N2: *9.6 kbps*
	Autodetect	Baud rate detected automatically.	0
	4.8 kbps	4.8 kbit/s.	1
	9.6 kbps	9.6 kbit/s.	2
	19.2 kbps	19.2 kbit/s.	3
	38.4 kbps	38.4 kbit/s.	4
	57.6 kbps	57.6 kbit/s.	5
	76.8 kbps	76.8 kbit/s.	6
	115.2 kbps	115.2 kbit/s.	7
58.05	*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 *58.01*…*58.05*, *58.14*…*58.17*, *58.25*, *58.28*…*58.34*) and takes changed EFB configuration settings in use. Reverts automatically to *Enabled*.	1

No.	Name/Value	Description	Def/FbEq16
	Silent mode	Activates silent mode (no messages are transmitted). Silent mode can be terminated by activating the *Refresh settings* 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.

	0000h…FFFFh	EFB communication status.	1 = 1
58.08	*Received packets*	Displays a count of valid packets addressed to the drive. During normal operation, this number increases constantly. Can be reset from the control panel by pressing the Reset softkey for 3 seconds.	-
	0…4294967295	Number of received packets addressed to the drive.	1 = 1
58.09	*Transmitted packets*	Displays a count of valid packets transmitted by the drive. During normal operation, this number increases constantly. Can be reset from the control panel by pressing the Reset softkey for 3 seconds.	-
	0…4294967295	Number of transmitted packets.	1 = 1
58.10	*All packets*	Displays a count of valid packets addressed to any device on the bus. During normal operation, this number increases constantly. Can be reset from the control panel by pressing the Reset softkey for 3 seconds.	-
	0…4294967295	Number of all received packets.	1 = 1

No.	Name/Value	Description	Def/FbEq16
58.11	*UART errors*	Displays a count of character errors received by the drive. An increasing count indicates a configuration problem on the bus. Can be reset from the control panel by pressing the Reset softkey for 3 seconds.	-
	0…4294967295	Number of UART errors.	1 = 1
58.12	*CRC errors*	Displays a count of packets with a CRC error received by the drive. An increasing count indicates interference on the bus. Can be reset from the control panel by pressing the Reset softkey for 3 seconds.	-
	0…4294967295	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
	0…4294967295	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 *A7CE EFB comm loss* and freezes the speed to the level the drive was operating at. The speed is determined on the basis of actual speed using 850 ms low-pass filtering. This occurs if control or reference is expected from the EFB. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	2
	Speed ref safe	Drive generates warning *A7CE EFB comm loss* and sets the speed to the speed defined by parameter *22.41 Speed ref safe* (or *28.41 Frequency ref safe* when frequency reference is being used). This occurs if control or reference is expected from the EFB. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	3
	Fault always	Drive continuously monitors for communication loss. Drive trips on fault *6681 EFB comm loss*. This happens even though the drive is in a control location where the EFB start/stop or reference is not used.	4
	Warning	Drive generates warning *A7CE EFB comm loss*. This occurs even though no control is expected from the EFB. **WARNING!** Make sure that it is safe to continue operation in case of a communication break.	5

No.	Name/Value	Description	Def/FbEq16
58.15	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
	0.0…6000.0 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
	0…65535 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… FFFFFFFFh	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… FFFFFFFFh	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

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>58.26</td><td>EFB ref1 type</td><td>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.</td><td>Speed or frequency</td></tr>
<tr><td></td><td>Speed or frequency</td><td>Type and scaling is chosen automatically according to the currently active operation mode as follows.
<table><tr><th>Operation mode (see par. 19.01)</th><th>Reference 1 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table></td><td>0</td></tr>
<tr><td></td><td>Transparent</td><td>No scaling is applied.</td><td>1</td></tr>
<tr><td></td><td>General</td><td>Generic reference without a specific unit. Scaling: 1 = 100.</td><td>2</td></tr>
<tr><td></td><td>Torque</td><td>Torque reference. The scaling is defined by parameter 46.03 Torque scaling.</td><td>3</td></tr>
<tr><td></td><td>Speed</td><td>Speed reference. The scaling is defined by parameter 46.01 Speed scaling.</td><td>4</td></tr>
<tr><td></td><td>Frequency</td><td>Frequency reference. The scaling is defined by parameter 46.02 Frequency scaling.</td><td>5</td></tr>
<tr><td>58.27</td><td>EFB ref2 type</td><td>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.</td><td>Speed or frequency</td></tr>
<tr><td>58.28</td><td>EFB act1 type</td><td>Modbus RTU only: Selects the type of actual value 1.</td><td>Speed or frequency</td></tr>
<tr><td></td><td>Speed or frequency</td><td>Type and scaling is chosen automatically according to the currently active operation mode as follows.
<table><tr><th>Operation mode (see par. 19.01)</th><th>Actual 1 type</th></tr><tr><td>Speed control</td><td>Speed</td></tr><tr><td>Frequency control</td><td>Frequency</td></tr></table></td><td>0</td></tr>
<tr><td></td><td>Transparent</td><td>No scaling is applied.</td><td>1</td></tr>
<tr><td></td><td>General</td><td>Generic reference without a specific unit. Scaling: 1 = 100.</td><td>2</td></tr>
<tr><td></td><td>Torque</td><td>Scaling is defined by parameter 46.03 Torque scaling.</td><td>3</td></tr>
<tr><td></td><td>Speed</td><td>Scaling is defined by parameter 46.01 Speed scaling.</td><td>4</td></tr>
<tr><td></td><td>Frequency</td><td>Scaling is defined by parameter 46.02 Frequency scaling.</td><td>5</td></tr>
<tr><td>58.29</td><td>EFB act2 type</td><td>Modbus RTU only: Selects the type of actual value 2.
For the selections, see parameter 58.28 EFB act1 type.</td><td>Transparent</td></tr>
<tr><td>58.30</td><td>EFB status word transparent source</td><td>N2 only: Selects the source of actual value 1 when parameter 58.28 EFB act1 type is set to Transparent.</td><td>Not selected</td></tr>
<tr><td></td><td>Not selected</td><td>None.</td><td>0</td></tr>
<tr><td></td><td>Other</td><td>Source selection (see Terms and abbreviations on page 324).</td><td>-</td></tr>
<tr><td>58.31</td><td>EFB act1 transparent source</td><td>Modbus RTU, N2 only: Selects the source of actual value 1 when parameter 58.28 EFB act1 type is set to Transparent.</td><td>Not selected</td></tr>
<tr><td></td><td>Not selected</td><td>None.</td><td>0</td></tr>
<tr><td></td><td>Other</td><td>Source selection (see Terms and abbreviations on page 324).</td><td>-</td></tr>
</table>

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 Terms and abbreviations on page 324).	-
58.33	Addressing mode	Modbus RTU only: Defines the mapping between parameters and holding registers in the 400101…465535 Modbus register range. Changes to this parameter take effect after the control unit is rebooted or the new settings validated by parameter 58.06 Communication control (Refresh settings).	Mode 0
	Mode 0	16-bit values (groups 1…99, indexes 1…99): 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 1…99, indexes 1…99): 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 1…255, indexes 1…255): 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 1…127, indexes 1…255): 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 0…4194303 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
	0…4194303	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
	0…127	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
	0…10	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
	0…10	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
	0…60 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 *None*.	*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		7…10
	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		17…20
	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		25…30
	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		34…39
	Feedback data storage	Parameter *40.91 Feedback data storage*.	40
	Setpoint data storage	Parameter *40.92 Setpoint data storage*.	41
	Other	Source selection (see *Terms and abbreviations* 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 DDCS communication		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 *Control of a supply unit (LSU)* (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 *Control of a supply unit (LSU)* (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
	0…65535 ms	Timeout for communication between converters.	
60.79	INU-LSU comm loss function	Selects how the inverter unit reacts to a communication break between the inverter unit and the other converter (typically the supply unit). ⚠ **WARNING!** With settings other than *Fault*, the inverter unit will continue operating based on the status information that was last received from the other converter. Make sure this does not cause danger.	*Fault*
	No action	No action taken.	0
	Warning	Drive generates warning *AF80 INU-LSU comm loss*.	1
	Fault	Drive trips on fault *7580 INU-LSU comm loss*.	2
61 D2D and DDCS transmit data		Defines the data sent to the DDCS link. 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
	0…65535	Data to be sent as word 1 of data set 10.	
61.202	INU-LSU data set 10 data 2 value	Displays (in integer format) the data to be sent to the other converter as word 2 of data set 10.	0
	0…65535	Data to be sent as word 2 of data set 10.	
61.203	INU-LSU data set 10 data 3 value	Displays (in integer format) the data to be sent to the other converter as word 3 of data set 10.	0
	0…65535	Data to be sent as word 3 of data set 10.	

No.	Name/Value	Description	Def/FbEq16
62 D2D and DDCS receive data		Defines the data sent to the DDCS link. 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
	0…65535	Data to be sent as word 1 of data set 10.	

70 Override		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.
5…6	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.
12…15	Reserved	

70.02	*Override*	Enables the override function. For override with ACH580-31, see section *LSU Override* 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 *Terms and abbreviations* 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
	AI1	*12.12 AI1 scaled value* (page *358*).	1
	AI2	*12.22 AI2 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 *Terms and abbreviations* 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
	-500.0…500.0 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 *20.40 Run permissive* is 0.
1	Start interlock 1	1 = The override is not allowed to start the motor or the motor will be stopped, if the source defined by parameter *20.41 Start interlock 1* is 0.
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.
5…15	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 1…5 defines a specific number of automatic reset trials.	5
	0…5	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
	5.0…120.0 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	Description	Def/FbEq16
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 warning 1	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/Value	Description	Def/FbEq16
71 External PID1		Configuration of external PID. See control chain diagrams *External PID setpoint and feedback source selection*, and *External PID controller* on pages *317* and *318*, respectively.	
71.01	*External PID act value*	See parameter *40.01 Process PID output actual*.	-
71.02	*Feedback act value*	See parameter *40.02 Process PID feedback actual*.	-
71.03	*Setpoint act value*	See parameter *40.03 Process PID setpoint actual*.	-
71.04	*Deviation act value*	See parameter *40.04 Process PID deviation actual*.	-
71.06	*PID status word*	Displays status information on process external PID control. This parameter is read-only.	-

Bit	Name	Value
0	PID active	1 = Process PID control active.
1	Reserved	
2	Output frozen	1 = Process PID controller output frozen. Bit is set if parameter *71.38 Output freeze enable* is TRUE, or the deadband function is active (bit 9 is set).
3…6	Reserved	
7	Output limit high	1 = PID output is being limited by par. *71.37*.
8	Output limit low	1 = PID output is being limited by par. *71.36*.
9	Deadband active	1 = Deadband is active.
10…11	Reserved	
12	Internal setpoint active	1 = Internal setpoint active (see par. *71.16*…*71.23*)
13…15	Reserved	

	0000h…FFFFh	Process PID control status word.	1 = 1
71.07	*PID operation mode*	See parameter *40.07 Process PID operation mode*.	*Off*
71.08	*Feedback 1 source*	See parameter *40.08 Set 1 feedback 1 source*.	*AI2 percent*
71.11	*Feedback filter time*	See parameter *40.11 Set 1 feedback filter time*.	0.000 s
71.14	*Setpoint scaling*	Defines, together with parameter *71.15 Output scaling*, a general scaling factor for the external PID control chain. The scaling can be utilized when, for example, the process setpoint is input in Hz, and the output of the PID controller is used as an rpm value in speed control. In this case, this parameter might be set to 50, and parameter *71.15* to the nominal motor speed at 50 Hz. In effect, the output of the PID controller [*71.15*] when deviation (setpoint - feedback) = [*71.14*] and [*71.32*] = 1. **Note:** The scaling is based on the ratio between *71.14* and *71.15*. For example, the values 50 and 1500 would produce the same scaling as 1 and 3.	100.00
	-200000.00… 200000.0	Process setpoint base.	1 = 1
71.15	*Output scaling*	See parameter *71.14 Setpoint scaling*.	100.00
	-200000.00… 200000.0	Process PID controller output base.	1 = 1
71.16	*Setpoint 1 source*	See parameter *40.16 Set 1 setpoint 1 source*.	*AI1 percent*

No.	Name/Value	Description	Def/FbEq16
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
	0.0…200000.0	Range	1 = 1
71.40	Deadband delay	Defines the deadband delay for the deadband function. See parameter 71.39 Deadband range.	0.0 s
	0.0…3600.0 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 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	Def/FbEq16
72.06	PID status word	Displays status information on process external PID control. This parameter 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 parameter 72.38 Output freeze enable is TRUE, or the deadband function is active (bit 9 is set).
3…6	Reserved	
7	Output limit high	1 = PID output is being limited by par. 72.37.
8	Output limit low	1 = PID output is being limited by par. 72.36.
9	Deadband active	1 = Deadband is active.
10…11	Reserved	
12	Internal setpoint active	1 = Internal setpoint active (see par. 72.16…72.23)
13…15	Reserved	

	0000h…FFFFh	Process PID control status word.	1 = 1
72.07	PID operation mode	See parameter 40.07 Process PID operation mode.	Off
72.08	Feedback 1 source	See parameter 40.08 Set 1 feedback 1 source.	AI1 scaled
72.11	Feedback filter time	See parameter 40.11 Set 1 feedback filter time.	0.000 s
72.14	Setpoint scaling	Defines, together with parameter 72.15 Output scaling, a general scaling factor for the external PID control chain. The scaling can be utilized when, for example, the process setpoint is input in Hz, and the output of the PID controller is used as an rpm value in speed control. In this case, this parameter might be set to 50, and parameter 72.15 to the nominal motor speed at 50 Hz. In effect, the output of the PID controller [72.15] when deviation (setpoint - feedback) = [72.14] and [72.32] = 1. **Note:** The scaling is based on the ratio between 72.14 and 72.15. For example, the values 50 and 1500 would produce the same scaling as 1 and 3.	100.00
	-200000.00… 200000.00	Process setpoint base.	1 = 1
72.15	Output scaling	See parameter 72.14 Setpoint scaling.	100.00
	-200000.00… 200000.00	Process PID controller output base.	1 = 1
72.16	Setpoint 1 source	See parameter 40.16 Set 1 setpoint 1 source.	AI2 scaled
72.19	Internal setpoint sel1	See parameter 40.19 Set 1 internal setpoint sel1.	Not selected
72.20	Internal setpoint sel2	See parameter 40.20 Set 1 internal setpoint sel2.	Not selected
72.21	Internal setpoint 1	See parameter 40.21 Set 1 internal setpoint 1.	0.00 PID Ext2 customer unit
72.22	Internal setpoint 2	See parameter 40.22 Set 1 internal setpoint 2.	0.00 PID Ext2 customer unit

No.	Name/Value	Description	Def/FbEq16
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
	0.0…200000.0	Range	1 = 1
72.40	Deadband delay	Defines the deadband delay for the deadband function. See parameter 72.39 Deadband range.	0.0 s
	0.0…3600.0 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/Value	Description	Def/FbEq16
73.06	PID status word	Displays status information on process external PID control. This parameter 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 parameter 73.38 Output freeze enable is TRUE, or the deadband function is active (bit 9 is set).
3…6	Reserved	
7	Output limit high	1 = PID output is being limited by par. 73.37.
8	Output limit low	1 = PID output is being limited by par. 73.36.
9	Deadband active	1 = Deadband is active.
10…11	Reserved	
12	Internal setpoint active	1 = Internal setpoint active (see par. 73.16…73.21)
13…15	Reserved	

	0000h…FFFFh	Process PID control status word.	1 = 1
73.07	PID operation mode	See parameter 40.07 Process PID operation mode.	Off
73.08	Feedback 1 source	See parameter 40.08 Set 1 feedback 1 source.	AI1 scaled
73.11	Feedback filter time	See parameter 40.11 Set 1 feedback filter time.	0.000 s
73.14	Setpoint scaling	Defines, together with parameter 73.15 Output scaling, a general scaling factor for the external PID control chain. The scaling can be utilized when, for example, the process setpoint is input in Hz, and the output of the PID controller is used as an rpm value in speed control. In this case, this parameter might be set to 50, and parameter 73.15 to the nominal motor speed at 50 Hz. In effect, the output of the PID controller [73.15] when deviation (setpoint - feedback) = [73.14] and [73.32] = 1. **Note:** The scaling is based on the ratio between 73.14 and 73.15. For example, the values 50 and 1500 would produce the same scaling as 1 and 3.	100.00
	-200000.00… 200000.00	Process setpoint base.	1 = 1
73.15	Output scaling	See parameter 73.14 Setpoint scaling.	100.00
	-200000.00… 200000.00	Process PID controller output base.	1 = 1
73.16	Setpoint 1 source	See parameter 40.16 Set 1 setpoint 1 source.	AI2 scaled
73.19	Internal setpoint sel1	See parameter 40.19 Set 1 internal setpoint sel1.	Not selected
73.20	Internal setpoint sel2	See parameter 40.20 Set 1 internal setpoint sel2.	Not selected
73.21	Internal setpoint 1	See parameter 40.21 Set 1 internal setpoint 1.	0.00 PID Ext3 customer unit
73.22	Internal setpoint 2	See parameter 40.22 Set 1 internal setpoint 2.	0.00 PID Ext3 customer unit

No.	Name/Value	Description	Def/FbEq16
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
	0.0…200000.0	Range	1 = 1
73.40	Deadband delay	Defines the deadband delay for the deadband function. See parameter 73.39 Deadband range.	0.0 s
	0.0…3600.0 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	Description	Def/FbEq16
74.06	PID status word	Displays status information on process external PID control. This parameter 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 parameter 74.38 Output freeze enable is TRUE, or the deadband function is active (bit 9 is set).
3…6	Reserved	
7	Output limit high	1 = PID output is being limited by par. 74.37.
8	Output limit low	1 = PID output is being limited by par. 74.36.
9	Deadband active	1 = Deadband is active.
10…11	Reserved	
12	Internal setpoint active	1 = Internal setpoint active (see par. 74.16…74.23)
13…15	Reserved	

	0000h…FFFFh	Process PID control status word.	1 = 1
74.07	PID operation mode	See parameter 40.07 Process PID operation mode.	Off
74.08	Feedback 1 source	See parameter 40.08 Set 1 feedback 1 source.	AI1 scaled
74.11	Feedback filter time	See parameter 40.11 Set 1 feedback filter time.	0.000 s
74.14	Setpoint scaling	Defines, together with parameter 74.15 Output scaling, a general scaling factor for the external PID control chain. The scaling can be utilized when, for example, the process setpoint is input in Hz, and the output of the PID controller is used as an rpm value in speed control. In this case, this parameter might be set to 50, and parameter 74.15 to the nominal motor speed at 50 Hz. In effect, the output of the PID controller [74.15] when deviation (setpoint - feedback) = [74.14] and [74.32] = 1. **Note:** The scaling is based on the ratio between 74.14 and 74.15. For example, the values 50 and 1500 would produce the same scaling as 1 and 3.	100.00
	-200000.00… 200000.00	Process setpoint base.	1 = 1
74.15	Output scaling	See parameter 74.14 Setpoint scaling.	100.00
	-200000.00… 200000.00	Process PID controller output base.	1 = 1
74.16	Setpoint 1 source	See parameter 40.16 Set 1 setpoint 1 source.	AI2 scaled
74.19	Internal setpoint sel1	See parameter 40.19 Set 1 internal setpoint sel1.	Not selected
74.20	Internal setpoint sel2	See parameter 40.20 Set 1 internal setpoint sel2.	Not selected
74.21	Internal setpoint 1	See parameter 40.21 Set 1 internal setpoint 1.	0.00 PID Ext4 customer unit
74.22	Internal setpoint 2	See parameter 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
	0.0…200000.0	Range	1 = 1
74.40	*Deadband delay*	Defines the deadband delay for the deadband function. See parameter *74.39 Deadband range*.	0.0 s
	0.0…3600.0 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/Value	Description	Def/FbEq16
76 PFC configuration		PFC (Pump and fan control) and Autochange configuration parameters. See also section *Single pump and fan control (PFC)* on page *150*.	
76.01	*PFC status*	Displays the running/stopped status of the PFC motors. PFC1, PFC2, PFC3 and PFC4 always correspond to the 1st…4th motor of the PFC system. If *76.74 Autochange auxiliary PFC* auxiliary PFC is set to *Aux motors only*, PFC1 represents the motor connected to the drive and PFC2 the first auxiliary motor (the 2nd motor of the system). If *76.74* is set to *All motors*, PFC1 is the first motor, PFC2 the 2nd. The drive can be connected to any of these motors depending on the Autochange functionality.	-

Bit	Name	Value
0	PFC 1 running	0 = Stop, 1 = Start
1	PFC 2 running	0 = Stop, 1 = Start
2	PFC 3 running	0 = Stop, 1 = Start
3	PFC 4 running	0 = Stop, 1 = Start
4…15	Reserved	

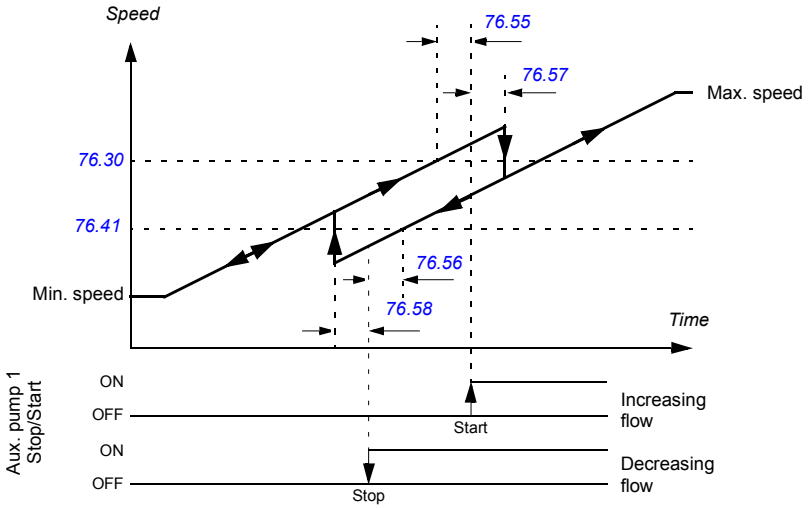
	0000h…FFFFh	Status of the PFC relay outputs.	1 = 1
76.02	*PFC system status*	Displays the status of the PFC system in text format. Provides a quick PFC system overview, for example, if the parameter is added to the Home view on the control panel.	-
	PFC disabled	PFC (Pump and fan control) is enabled.	0
	PFC enabled (not started)	PFC is enabled but not started.	1
	SPFC enabled (not started)	SPFC (Soft pump and fan control) is enabled but not started.	2
	MPFC enabled	Reserved.	3
	Running with VSD	The drive is controlling one pump/fan motor, no auxiliary motors are used.	100
	Running with VSD + 1 Aux	One auxiliary motor has been taken in use.	101
	Running with VSD + 2 Aux	Two auxiliary motor have been taken in use.	102
	Running with VSD + 3 Aux	Three auxiliary motor have been taken in use.	103
	Starting Aux1	Auxiliary motor 1 is being started.	200
	Starting Aux2	Auxiliary motor 2 is being started.	201
	Starting Aux2	Auxiliary motor 3 is being started.	202
	Stopping Aux1	Auxiliary motor 1 is being stopped.	300
	Stopping Aux2	Auxiliary motor 2 is being stopped.	301
	Stopping Aux2	Auxiliary motor 3 is being stopped.	302
	Autochange active	Autochange, that is, automatic rotation of the start order is active.	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
3…4	Reserved	
5	In PFC control	0 = False, 1 = True
6…10	Reserved	
11	Interlocked	0 = False, 1 = True
12…15	Reserved	

	0000h…FFFFh	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

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 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.	2
	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
	1…4	Number of motors.	1 = 1
76.26	*Min number of motors allowed*	Minimum number of motors running simultaneously.	1
	0…4	Minimum number of motors.	1 = 1
76.27	*Max number of motors allowed*	Maximum number of motors running simultaneously.	1
	1…4	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 is not aborted if the speed of the first auxiliary motor decreases	Vector: 1300 rpm; Scalar 48 Hz; 58 Hz (95.20 b0)
			
	0…32767 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)
	0…32767 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
	0.00…12600.00 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
	0.00…12600.00 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
	0.00…1000.00 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
	0.00…1000.00 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
	0.20…600.00 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
	0.00…1800.00 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 to the new reference).	1.00 s
	0.00…1800.00 s	Time.	1 = 1 s
76.70	Autochange	Defines the way the autochange is triggered. In all cases except *Even wear*, the start order is moved one step forward each time the autochange occurs. If the start order initially is 1-2-3-4, after the first autochange the order will be 2-3-4-1, etc. For *Even wear*, the start order will be determined so that the running times of all motors remain within the defined limit. **Note:** Autochange only occurs when the speed of the drive is below the speed defined by parameter *76.73 Autochange level*. See also section *Autochange* on page *150*.	*Not selected*
	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 *Terms and abbreviations* on page *324*).	-
76.71	*Autochange interval*	Specifies the interval that is used in setting *Fixed interval* of parameter *76.70 Autochange*.	1.00 h
	0.00…42949672.95 h	Time.	1 = 1 h
76.72	*Maximum wear imbalance*	Specifies the maximum wear imbalance, or difference in running times between any motor, used by the *Even wear* setting of parameter *76.70 Autochange*.	10.00 h
	0.00…1000000.00 h	Time.	1 = 1 h
76.73	*Autochange level*	Upper speed limit for the Autochange to occur. The Autochange occurs when: • 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%
	0.0…300.0%	Speed/frequency in percentage of the nominal speed or frequency of the drive motor.	1 = 1%
76.74	*Autochange auxiliary PFC*	Selects whether only auxiliary motors or all motors are included in the Autochange function.	*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 *Terms and abbreviations* 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 *Terms and abbreviations* on page *324*).	-

77 PFC maintenance and monitoring		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 Flow 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
	-100.00…100.00%	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
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
	AI2 scaled	*12.22 AI2 scaled value* (see page *360*).	2
	Freq in scaled	*11.39 Freq in 1 scaled value* (see page *356*).	3
	AI1 percent	*12.101 AI1 percent value* (see page *361*).	8
	AI2 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 *Terms and abbreviations* 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
	AI1 scaled	*12.12 AI1 scaled value* (see page *358*).	1
	AI2 scaled	*12.22 AI2 scaled value* (see page *360*).	2
	Freq in scaled	*11.39 Freq in 1 scaled value* (see page *356*).	3
	AI1 percent	*12.101 AI1 percent value* (see page *361*).	8
	AI2 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 *Terms and abbreviations* 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*
	In1	Use *80.11 Flow feedback 1 source* directly as the flow value.	0
	In2	Use *80.12 Flow feedback 2 source* directly as the flow value.	1
	Reserved		2…7

No.	Name/Value	Description	Def/FbEq16
	sqrt(In1)	Flow is calculated as a square root of a differential pressure measurement: $k\sqrt{\Delta P}$ The differential pressure value is selected with *80.11 Flow feedback 1 source*.	8
	sqrt(In1-In2)	Flow is calculated as a square root of two measured absolute pressure measurements: $k\sqrt{(P_1 - P_2)}$ The pressure measurement sources are selected with *80.11 Flow feedback 1 source* and *80.12 Flow feedback 2 source*.	9
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 LSU 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
	0…65535 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
	380…415 V	380…415 V	2
	440…480 V	440…480 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.	-
	0…65535 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].	00000000h

Bit	Name	Information
0	EX motor	1 = The driven motor is an Ex motor provided by ABB for potentially 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.
2…15	Reserved	

	00000000h… FFFFFFFFh	Hardware options configuration word.	1 = 1

No.	Name/Value	Description	Def/FbEq16
95.20	HW options word 1	Specifies hardware-related options that require differentiated parameter defaults. This parameter is not affected by a parameter restore.	-

Bit	Name	Value
0	Supply frequency 60 Hz	See section *Differences in the default values between 50 Hz and 60 Hz supply frequency settings* on page 568. 0 = 50 Hz. 1 = 60 Hz.
1…12	Reserved	
13	du/dt filter activation	When active, an external du/dt filter is connected to the drive/inverter output. The setting will limit the output switching frequency, and force the fan of the drive/inverter module to full speed. 0 = du/dt filter inactive. 1 = du/dt filter active.
14	Reserved	
15	INU-ISU communication	*1 = IGBT supply unit control by inverter unit active. Makes several parameters visible in groups 01, 05, 06, 07, 30, 31, 60, 61, 62, 94 and 96

*See section *Control of a supply unit (LSU)* (page 98).

	0000h…FFFFh	Hardware options configuration word.	1 = 1
95.21	HW options word 2	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
0…4	Reserved	
5	Bypass present	1 = Bypass is used.
6	Cabinet drive	0 = Inactive, 1 = Active.
7	Cabinet fan	0 = Inactive, 1 = Active.
6…15	Reserved	

	0000b…0101b	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**.)	Not selected
	Not selected	None.	0
	English	English.	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 *96.100…96.102*, 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 *96.100…96.102*. 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*).	
	0…99999999	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
3…9	Reserved
10	Override parameter lock
11	OEM access level 1
12	OEM access level 2
13	OEM access level 3
14	Parameter lock
15	Reserved

	00000000h… FFFFFFFFh	Active access levels.	-
96.04	*Macro select*	Selects the control macro. See chapter *Default configuration* (page *81*) for more information. After a selection is made, the parameter reverts automatically to *Done*.	*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	*Parameter restore*	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 • I/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 *96.100*…*96.102*.	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 *96.100*…*96.102*. • 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 *Data storage parameters* (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		8…19
	User1 backup	User set 1 has been saved or loaded.	20
	User2 backup	User set 2 has been saved or loaded.	21
	User3 backup	User set 3 has been saved or loaded.	22
	User4 backup	User set 4 has been saved or loaded.	23
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 14…16, 47, 50…58 and 92…93) 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		6…17
	Save to set 1	Save user parameter set 1.	18
	Save to set 2	Save user parameter set 2.	19
	Save to set 3	Save user parameter set 3.	20
	Save to set 4	Save user parameter set 4.	21

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>96.12</td><td>User set I/O mode in1</td><td>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:<table><tr><th>Status of source defined by par. 96.12</th><th>Status of source defined by par. 96.13</th><th>User parameter set selected</th></tr><tr><td>0</td><td>0</td><td>Set 1</td></tr><tr><td>1</td><td>0</td><td>Set 2</td></tr><tr><td>0</td><td>1</td><td>Set 3</td></tr><tr><td>1</td><td>1</td><td>Set 4</td></tr></table></td><td>Not selected</td></tr>
<tr><td></td><td>Not selected</td><td>0.</td><td>0</td></tr>
<tr><td></td><td>Selected</td><td>1.</td><td>1</td></tr>
<tr><td></td><td>DI1</td><td>Digital input DI1 (10.02 DI delayed status, bit 0).</td><td>2</td></tr>
<tr><td></td><td>DI2</td><td>Digital input DI2 (10.02 DI delayed status, bit 1).</td><td>3</td></tr>
<tr><td></td><td>DI3</td><td>Digital input DI3 (10.02 DI delayed status, bit 2).</td><td>4</td></tr>
<tr><td></td><td>DI4</td><td>Digital input DI4 (10.02 DI delayed status, bit 3).</td><td>5</td></tr>
<tr><td></td><td>DI5</td><td>Digital input DI5 (10.02 DI delayed status, bit 4).</td><td>6</td></tr>
<tr><td></td><td>DI6</td><td>Digital input DI6 (10.02 DI delayed status, bit 5).</td><td>7</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>8…17</td></tr>
<tr><td></td><td>Timed function 1</td><td>Bit 0 of 34.01 Timed functions status (see page 451).</td><td>18</td></tr>
<tr><td></td><td>Timed function 2</td><td>Bit 1 of 34.01 Timed functions status (see page 451).</td><td>19</td></tr>
<tr><td></td><td>Timed function 3</td><td>Bit 2 of 34.01 Timed functions status (see page 451).</td><td>20</td></tr>
<tr><td></td><td>Reserved</td><td></td><td>21…23</td></tr>
<tr><td></td><td>Supervision 1</td><td>Bit 0 of 32.01 Supervision status (see page 444).</td><td>24</td></tr>
<tr><td></td><td>Supervision 2</td><td>Bit 1 of 32.01 Supervision status (see page 444).</td><td>25</td></tr>
<tr><td></td><td>Supervision 3</td><td>Bit 2 of 32.01 Supervision status (see page 444).</td><td>26</td></tr>
<tr><td></td><td>Other [bit]</td><td>Source selection (see Terms and abbreviations on page 324).</td><td>-</td></tr>
<tr><td>96.13</td><td>User set I/O mode in2</td><td>See parameter 96.12 User set I/O mode in1.</td><td>Not selected</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
96.16	Unit selection	Selects the unit of parameters indicating power, temperature and torque.	0000b

Bit	Name	Information
0	Power unit	0 = kW
		1 = hp
1	Reserved	
2	Temperature unit	0 = °C
		1 = °F
3	Reserved	
4	Torque unit	0 = Nm (N·m)
		1 = lbft (lb·ft)
5…15	Reserved	

	00000000h… FFFFFFFFh	Unit selection word.	1 = 1
96.20	Time sync primary source	Defines the 1st priority external source for synchronization of the drive's time and date.	Panel link
	Internal	No external source selected.	0
	Reserved		1…2
	Fieldbus A	Fieldbus interface A.	3
	Reserved		4…5
	Embedded FB	Embedded fieldbus interface.	6
	Reserved		7
	Panel link	Control panel, or Drive composer PC tool connected to the control panel.	8
	Ethernet tool link	Drive composer PC tool through an FENA module.	9
96.51	Clear fault and event logger	Clears all events from the drive's fault and event logs. See section Warning/fault history on page 184.	Done
	Done	0 = No action	0
	Clear	1 = Clear the loggers.	1
96.54	Checksum action	Selects 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 action	No action taken. (The checksum feature is not in use.)	0
	Pure event	Drive generates an event log entry B686 Checksum mismatch.	1
	Warning	Drive generates warning A686 Checksum mismatch.	2
	Warning and prevent start	Drive generates warning A686 Checksum mismatch. Starting the drive is prevented.	3
	Fault	Drive trips on fault 6200 Checksum mismatch.	4

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>96.55</td><td>Checksum control word</td><td>Bits 8…9 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 12…13 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.

<table><tr><th>Bit</th><th>Name</th><th>Description</th></tr><tr><td>0…7</td><td>Reserved</td><td></td></tr><tr><td>8</td><td>Approved checksum A</td><td>1 = Enabled: Checksum A (96.71) is observed. 0 = Disabled.</td></tr><tr><td>9</td><td>Approved checksum B</td><td>1 = Enabled: Checksum B (96.72) is observed. 0 = Disabled.</td></tr><tr><td>10…11</td><td>Reserved</td><td></td></tr><tr><td>12</td><td>Set approved checksum A</td><td>1 = Set: Copy value of 96.68 into 96.71. 0 = Done (copy has been made).</td></tr><tr><td>13</td><td>Set approved checksum B</td><td>1 = Set: Copy value of 96.69 into 96.72. 0 = Done (copy has been made).</td></tr><tr><td>14…15</td><td>Reserved</td><td></td></tr></table></td><td>00000000h</td></tr>
<tr><td></td><td>00000000… FFFFFFFFh</td><td>Checksum control word.</td><td>1 = 1</td></tr>
<tr><td>96.68</td><td>Actual checksum A</td><td>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 10…13, 15, 19…25, 28, 30…32, 34…37, 40…41, 43, 45…46, 70…74, 76, 80, 94…99.
See also section Parameter checksum calculation (page 179).</td><td>0h</td></tr>
<tr><td></td><td>00000000h… FFFFFFFFh</td><td>Actual checksum.</td><td>-</td></tr>
<tr><td>96.69</td><td>Actual checksum B</td><td>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 10…13, 15, 19…25, 28, 30…32, 34, 35…37, 40…41, 43, 46, 70…74, 76, 80, 94…97.
See also section Parameter checksum calculation (page 179).</td><td>0h</td></tr>
<tr><td></td><td>00000000h… FFFFFFFFh</td><td>Actual checksum.</td><td>-</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
96.70	Disable adaptive program	Enables/disables the adaptive program (if present). See also section Adaptive programming (page 93).	Yes
	No	Adaptive program enabled.	0
	Yes	Adaptive program disabled.	1
96.71	Approved checksum A	Approved (reference) checksum A.	0h
	00000000h… FFFFFFFFh	Approved checksum A.	-
96.72	Approved checksum B	Approved (reference) checksum B.	0h
	00000000h… FFFFFFFFh	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).	10000000
	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

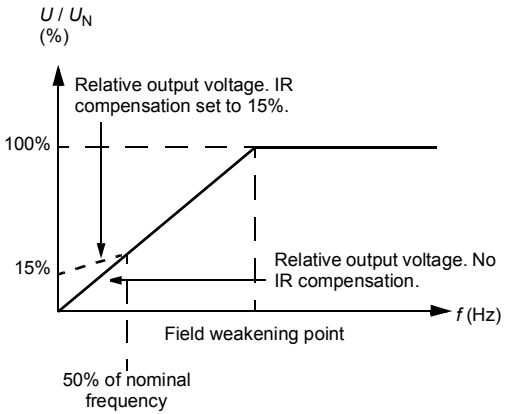
Bit	Name	Information
0	Disable ABB access levels	1 = ABB access levels (service, advanced programmer, etc.; see *96.03*) disabled
1	Freeze parameter lock state	1 = Changing the parameter lock state prevented, ie. pass code 358 has no effect
2	Disable file download	1 = Loading of files to drive prevented. 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.
3…4	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.
8…10	Reserved	
11	Disable OEM access level 1	1 = OEM access level 1 disabled
12	Disable OEM access level 2	1 = OEM access level 2 disabled
13	Disable OEM access level 3	1 = OEM access level 3 disabled
14…15	Reserved	

	0000h…FFFFh	Selection of actions to be prevented by user lock.	-
96.108	*LSU control board 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
	0…1	1 = Reboot the supply control unit.	1 = 1

No.	Name/Value	Description	Def/FbEq16
97 Motor control		Switching frequency; slip gain; voltage reserve; flux braking; anti-cogging (signal injection); IR compensation.	
97.01	*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%
	0…200%	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_{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%
	-4…50%	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. ⚠ **WARNING!** Using full flux braking heats up the motor especially in cyclic operation. Make sure that the motor can withstand this if you have a cyclic application.	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%
	0.0 … 1600.0%	Optimizer torque limit.	10 = 1%

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%
	25…400%	Rotor time constant tuning.	1 = 1%

<table>
<tr><th>No.</th><th>Name/Value</th><th>Description</th><th>Def/FbEq16</th></tr>
<tr><td>97.13</td><td>IR compensation</td><td>Defines the relative output voltage boost at zero speed (IR compensation). The function is useful in applications with a high break-away torque where vector control cannot be applied.
 

Typical IR compensation values are shown below.
<table>
<tr><th colspan="6">3-phase U_N = 400 V (380…415 V) drives</th></tr>
<tr><td>P_N (kW)</td><td>3</td><td>7.5</td><td>15</td><td>37</td><td>132</td></tr>
<tr><td>IR compensation (%)</td><td>2.3</td><td>1.7</td><td>1.3</td><td>1.1</td><td>0.6</td></tr>
</table>
See also section IR compensation for scalar motor control on page 127).</td><td>Type specific (%)</td></tr>
<tr><td></td><td>0.00…50.00%</td><td>Voltage boost at zero speed in percent of nominal motor voltage.</td><td>1 = 1%</td></tr>
<tr><td>97.15</td><td>Motor model temperature adaptation</td><td>Enables the motor model temperature adaptation. Estimated motor temperature can be used to adapt temperature dependent parameters (for example, resistances) of motor model.</td><td>Disabled</td></tr>
<tr><td></td><td>Disabled</td><td>Temperature adaptation disabled.</td><td>0</td></tr>
<tr><td></td><td>Estimated temperature</td><td>Temperature adaptation with motor temperature estimate (parameter 35.01 Motor estimated temperature).</td><td>1</td></tr>
<tr><td>97.16</td><td>Stator temperature factor</td><td>Tunes the motor temperature dependence of stator parameters (stator resistance).</td><td>50%</td></tr>
<tr><td></td><td>0…200%</td><td>Tuning factor.</td><td>1 = 1%</td></tr>
<tr><td>97.17</td><td>Rotor temperature factor</td><td>Tunes the motor temperature dependence of rotor parameters (eg. rotor resistance).</td><td>100%</td></tr>
<tr><td></td><td>0…200%</td><td>Tuning factor.</td><td>1 = 1%</td></tr>
</table>

No.	Name/Value	Description	Def/FbEq16
97.20	U/F ratio	Selects the form for the U/f (voltage to frequency) ratio below field weakening point. For scalar control only. **Notes:** • The U/f function cannot be used with energy optimization; if 45.11 Energy optimizer is set to Enable, parameter 97.20 U/F ratio is ignored. • 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].	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 User motor parameters		Motor values supplied by the user that are used in the motor model. These parameters are useful for non-standard motors, or to just get more accurate motor control of the motor on site. A better motor model always improves the shaft performance.	
98.01	User motor model mode	Activates the motor model parameters 98.02…98.12 and 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 98.02…98.12 are then updated according to the motor characteristics identified during the ID run. • Measurements made directly from the motor terminals during the ID run are likely to produce slightly different values than those on a data sheet from a motor manufacturer. • This parameter cannot be changed while the drive is running.	Not selected
	Not selected	Parameters 98.02…98.12 inactive.	0
	Motor parameters	The values of parameters 98.02… 98.12 are used as the motor model.	1

No.	Name/Value	Description	Def/FbEq16
98.02	*Rs user*	Defines the stator resistance R_S of the motor model. With a star-connected motor, R_S is the resistance of one winding. With a delta-connected motor, R_S is one-third of the resistance of one winding.	0.00000 p.u.
	0.00000…0.50000 p.u.	Stator resistance in per unit.	-
98.03	*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.
	0.00000…0.50000 p.u.	Rotor resistance in per unit.	-
98.04	*Lm user*	Defines the main inductance L_M of the motor model. **Note:** This parameter is valid only for asynchronous motors.	0.00000 p.u.
	0.00000…10.00000 p.u.	Main inductance in per unit.	-
98.05	*SigmaL user*	Defines the leakage inductance σL_S. **Note:** This parameter is valid only for asynchronous motors.	0.00000 p.u.
	0.00000…1.00000 p.u.	Leakage inductance in per unit.	-
98.06	*Ld user*	Defines the direct axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	0.00000 p.u.
	0.00000…10.00000 p.u	Direct axis inductance in per unit.	-
98.07	*Lq user*	Defines the quadrature axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	0.00000 p.u.
	0.00000…10.00000 p.u	Quadrature axis inductance in per unit.	-
98.08	*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
	0.00000…100.00000 ohm	Stator resistance.	-
98.10	*Rr user SI*	Defines the rotor resistance R_R of the motor model. **Note:** This parameter is valid only for asynchronous motors.	0.00000 ohm
	0.00000…100.00000 ohm	Rotor resistance.	-
98.11	*Lm user SI*	Defines the main inductance L_M of the motor model. **Note:** This parameter is valid only for asynchronous motors.	0.00 mH
	0.00…100000.00 mH	Main inductance.	1 = 10000 mH
98.12	*SigmaL user SI*	Defines the leakage inductance σL_S. **Note:** This parameter is valid only for asynchronous motors.	0.00 mH
	0.00…100000.00 mH	Leakage inductance.	1 = 10000 mH

No.	Name/Value	Description	Def/FbEq16
98.13	*Ld user SI*	Defines the direct axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	0.00 mH
	0.00…100000.00 mH	Direct axis inductance.	1 = 10000 mH
98.14	*Lq user SI*	Defines the quadrature axis (synchronous) inductance. **Note:** This parameter is valid only for permanent magnet motors.	0.00 mH
	0.00…100000.00 mH	Quadrature axis inductance.	1 = 10000 mH

99 Motor data		Motor configuration settings.	
99.03	*Motor type*	Selects the motor type. **Note:** This parameter cannot be changed while the drive is running.	*Asynchronous 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 *Scalar* 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 *Operating modes of the drive* (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
	0.0…6400.0 A	Nominal current of the motor. The allowable range is 1/6…2 × I_N of the drive (0…2 × 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
	0.0…960.0 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.	50.00 Hz
	0.00…500.00 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.	0 rpm
	0…30000 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
	0.00…1.00	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
	0.000…4000000.000 N·m or 0.000…2950248.597 lb·ft	Nominal motor torque.	1 = 100 unit

No.	Name/Value	Description	Def/FbEq16
99.13	*ID run requested*	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 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*, *99.06*…*99.12*) have been changed. • Ensure that the Safe Torque Off and emergency stop circuits (if any) are closed during the ID run. • Mechanical brake (if present) is not opened by the logic for the ID run. • This parameter cannot be changed while the drive is running.	*None*
	None	No motor ID run is requested. This mode can be selected only if the ID run (*Normal* / *Reduced* / *Standstill* / *Advanced*) has already been performed once.	0
	Normal	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. • 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 50…100% of the nominal speed during the ID run. ENSURE THAT IT IS SAFE TO RUN THE MOTOR BEFORE PERFORMING THE ID RUN!	1

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 50…100% 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		4…5
	Advanced	Advanced ID run. Only for frames R6…R11 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		4…5
	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
	0…1000	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.	*U V W*
	U V W	Normal.	0
	U W V	Reversed rotation direction.	1

Differences in the default values between 50 Hz and 60 Hz supply frequency settings

Parameter *95.20 HW options word 1* bit 0 *Supply frequency 60 Hz* changes the drive parameter default values according to the supply frequency, 50 Hz or 60 Hz. The bit is set according to the market before the drive is delivered.

If you need to change from 50 Hz to 60 Hz, or vice versa, change the value of the bit and then do a complete reset to the drive. After that you have to reselect the macro to be used.

The table below shows the parameters whose default values depend on the supply frequency setting. The supply frequency setting, with the type designation of the drive, also affects Group *99 Motor data* parameter values though these parameters are not listed in the table.

No	**Name**	*95.20 HW options word 1* bit *Supply frequency 60 Hz* = **50 Hz**	*95.20 HW options word 1* bit *Supply frequency 60 Hz* = **60 Hz**
11.45	*Freq in 1 at scaled max*	1500.000	1800.000
15.35	*Freq out 1 src max*	1500.000	1800.000
12.20	*AI1 scaled at AI1 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

14

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 pre-selected settings.
Binary src	Binary source: the value of the parameter can be taken from a specific bit in another parameter value (“Other”). Sometimes the value can be fixed to 0 (false) or 1 (true). In addition, the parameter may offer other pre-selected settings.
Data	Data parameter
FbEq32	32-bit fieldbus equivalent: The scaling between the value shown on the panel and the integer used in communication when a 32-bit value is selected for transmission to an external system. The corresponding 16-bit scalings are listed in chapter *Parameters* (page *323*).
List	Selection list.

Term	Definition
No.	Parameter number.
PB	Packed Boolean (bit list).
Real	Real number.
Type	Parameter type. See *Analog src*, *Binary src*, *List*, *PB*, *Real*.

Fieldbus addresses

Refer to the *User's manual* of the fieldbus adapter.

Parameter groups 1…9

No.	Name	Type	Range	Unit	FbEq32
01 Actual values					
01.01	Motor speed used	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
01.02	Motor speed estimated	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
01.03	Motor speed %	*Real*	-1000.00…1000.00	%	100 = 1%
01.06	Output frequency	*Real*	-500.00…500.00	Hz	100 = 1 Hz
01.07	Motor current	*Real*	0.00…30000.00	A	100 = 1 A
01.08	Motor current % of motor nom	*Real*	0.0…1000.0	%	10 = 1%
01.09	Motor current % of drive nom	*Real*	0.0…1000.0	%	10 = 1%
01.10	Motor torque	*Real*	-1600.0…1600.0	%	10 = 1%
01.11	DC voltage	*Real*	0.00…2000.00	V	100 = 1 V
01.13	Output voltage	*Real*	0…2000	V	1 = 1 V
01.14	Output power	*Real*	-32768.00…32767.00	kW or hp	100 = 1 unit
01.15	Output power % of motor nom	*Real*	-300.00…300.00	%	100 = 1%
01.16	Output power % of drive nom	*Real*	-300.00…300.00	%	100 = 1%
01.17	Motor shaft power	*Real*	-32768.00…32767.00	kW or hp	100 = 1 unit
01.18	Inverter GWh counter	*Real*	0…65535	GWh	1 = 1 GWh
01.19	Inverter MWh counter	*Real*	0…1000	MWh	1 = 1 MWh
01.20	Inverter kWh counter	*Real*	0…1000	kWh	1 = 1 kWh
01.24	Flux actual %	*Real*	0…200	%	1 = 1%
01.30	Nominal torque scale	*Real*	0.000…4000000	N·m or lb·ft	1000 = 1 unit
01.31	Ambient temperature	*Real*	-40.0…120.0	°C or °F	10 = 1 °
01.50	Current hour kWh	*Real*	0.00…1000000.00	kWh	100 = 1 kWh
01.51	Previous hour kWh	*Real*	0.00…1000000.00	kWh	100 = 1 kWh
01.52	Current day kWh	*Real*	0.00…1000000.00	kWh	100 = 1 kWh
01.53	Previous day kWh	*Real*	0.00…1000000.00	kWh	100 = 1 kWh
01.54	Cumulative inverter energy	*Real*	-200000000.0… 200000000.0	kWh	1 = 1 kWh
01.55	Inverter GWh counter (resettable)	*Real*	0…65535	GWh	1 = 1 GWh
01.56	Inverter MWh counter (resettable)	*Real*	0…1000	MWh	1 = 1 MWh
01.57	Inverter kWh counter (resettable)	*Real*	0…1000	kWh	1 = 1 kWh
01.58	Cumulative inverter energy (resettable)	*Real*	-200000000.0… 200000000.0	kWh	1 = 1 kWh
01.61	Abs motor speed used		0.00…30000.00	rpm	100 = 1 rpm
01.62	Abs motor speed %		0.00…1000.00%	%	100 = 1%
01.63	Abs output frequency		0.00…500.00 Hz	Hz	100 = 1 Hz
01.64	Abs motor torque		0.0…1600.0	%	10 = 1%
01.65	Abs output power		0.00…32767.00	kW	100 = 1 kW
01.66	Abs output power % motor nom		0.00…300.00	%	100 = 1%

No.	Name	Type	Range	Unit	FbEq32
01.67	Abs output power % drive nom		0.00…300.00	%	100 = 1%
01.68	Abs motor shaft power		0.00…32767.00	kW	100 = 1 kW
(Parameters 01.102…01.164 only visible for ACH580-31)					
01.102	Line current	*Real*	0.00 … 30000.00	A	100 = 1 A
01.104	Active current	*Real*	0.00 … 30000.00	A	100 = 1 A
01.106	Reactive current	*Real*	0.00 … 30000.00	A	100 = 1 A
01.108	Grid frequency	*Real*	0.00 … 100.00	Hz	100 = 1 Hz
01.109	Grid voltage	*Real*	0.00 … 2000.00	V	100 = 1 V
01.110	Grid apparent power	*Real*	-30000.00 … 30000.00	kVA	100 = 1 kVA
01.112	Grid power	*Real*	-30000.00 … 30000.00	kW	100 = 1 kW
01.114	Grid reactive power	*Real*	-30000.00 … 30000.00	kvar	100 = 1 kvar
01.116	LSU cos Phi	*Real*	-1.00 … 1.00	-	100 = 1
01.164	LSU nominal power	*Real*	0…30000	kW	1 = 1 kW
03 Input references					
03.01	Panel reference	*Real*	-100000.00…100000.00	-	100 = 1
03.02	Panel reference remote	*Real*	-100000.00…100000.00	-	100 = 1
03.05	FB A reference 1	*Real*	-100000.00…100000.00	-	100 = 1
03.06	FB A reference 2	*Real*	-100000.00…100000.00	-	100 = 1
03.09	EFB reference 1	*Real*	-30000.00…30000.00	-	100 = 1
03.10	EFB reference 2	*Real*	-30000.00…30000.00	-	100 = 1
04 Warnings and faults					
04.01	Tripping fault	*Data*	0000h…FFFFh	-	1 = 1
04.02	Active fault 2	*Data*	0000h…FFFFh	-	1 = 1
04.03	Active fault 3	*Data*	0000h…FFFFh	-	1 = 1
04.06	Active warning 1	*Data*	0000h…FFFFh	-	1 = 1
04.07	Active warning 2	*Data*	0000h…FFFFh	-	1 = 1
04.08	Active warning 3	*Data*	0000h…FFFFh	-	1 = 1
04.11	Latest fault	*Data*	0000h…FFFFh	-	1 = 1
04.12	2nd latest fault	*Data*	0000h…FFFFh	-	1 = 1
04.13	3rd latest fault	*Data*	0000h…FFFFh	-	1 = 1
04.16	Latest warning	*Data*	0000h…FFFFh	-	1 = 1
04.17	2nd latest warning	*Data*	0000h…FFFFh	-	1 = 1
04.18	3rd latest warning	*Data*	0000h…FFFFh	-	1 = 1
04.40	Event word 1	*PB*	0000h…FFFFh	-	1 = 1
04.41	Event word 1 bit 0 code	*Data*	0000h…FFFFh	-	1 = 1
04.43	Event word 1 bit 1 code	*Data*	0000h…FFFFh	-	1 = 1
04.45, 04,47, 04,49, …	…	…	…	…	
04.71	Event word 1 bit 15 code	*Data*	0000h…FFFFh	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
05 Diagnostics					
05.01	On-time counter	*Real*	0…65535	d	1 = 1 d
05.02	Run-time counter	*Real*	0…65535	d	1 = 1 d
05.03	Hours run	*Real*	0.0…429496729.5	h	10 = 1 h
05.04	Fan on-time counter	*Real*	0…65535	d	1 = 1 d
05.08	Cabinet temperature	*Real*	-40…120	°C or °F	10 = 1 °
05.10	Control board temperature	*Real*	-100…300	°C or °F	10 = 1 °
05.11	Inverter temperature	*Real*	-40.0…160.0	%	10 = 1%
05.20	Diagnostic word 1	*PB*	0000h…FFFFh	-	
05.21	Diagnostic word 2	*PB*	0000h…FFFFh	-	
05.22	Diagnostic word 3	*PB*	0000h…FFFFh	-	
05.80	Motor speed at fault	*Real*	-30000…30000.00	rpm	100 = 1 rpm
05.81	Output frequency at fault	*Real*	-500.00…500.00	Hz	100 = 1 Hz
05.82	DC voltage at fault	*Real*	0.00…2000.00	V	100 = 1 V
05.83	Motor current at fault	*Real*	0.00…30000.00	A	100 = 1 A
05.84	Motor torque at fault	*Real*	-1600.0…1600.0	%	10 = 1%
05.85	Main status word at fault	*PB*	0000h…FFFFh	-	1 = 1
05.86	DI delayed status at fault	*PB*	0000h…FFFFh	-	1 = 1
05.87	Inverter temperature at fault	*Real*	-40.0…160.0	%	10 = 1%
05.88	Reference used at fault	*Real*	-500.00…500.00 or -30000.00…30000.00	Hz or rpm	100 = 1 unit
05.89	HVAC status word at fault	*PB*	0000h…FFFFh	-	1 = 1
(Parameters 05.111…05.121 only visible for ACH580-31)					
05.111	Line converter temperature	*Real*	-40.0 … 160.0	%	10 = 1%
05.121	MCB closing counter	*Real*	0…4294967295	%	1 = 1
06 Control and status words					
06.01	Main control word	*PB*	0000h…FFFFh	-	1 = 1
06.11	Main status word	*PB*	0000h…FFFFh	-	1 = 1
06.16	Drive status word 1	*PB*	0000h…FFFFh	-	1 = 1
06.17	Drive status word 2	*PB*	0000h…FFFFh	-	1 = 1
06.18	Start inhibit status word	*PB*	0000h…FFFFh	-	1 = 1
06.19	Speed control status word	*PB*	0000h…FFFFh	-	1 = 1
06.20	Constant speed status word	*PB*	0000h…FFFFh	-	1 = 1
06.21	Drive status word 3	*PB*	0000h…FFFFh	-	1 = 1
06.22	HVAC status word	*PB*	0000h…FFFFh	-	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 06.36…06.118 only visible for ACH580-31)					
06.36	LSU Status word	*PB*	0000h…FFFFh	-	1 = 1
06.39	Internal state machine LSU CW	*PB*	0000h…FFFFh	-	1 = 1
06.116	LSU drive status word 1	*PB*	0000h…FFFFh	-	1 = 1
06.118	LSU start inhibit status word	*PB*	0000h…FFFFh	-	1 = 1
07 System info					
07.03	Drive rating id	*List*	0…999	-	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*	0…100	%	1 = 1%
07.25	Customization package name	*Data*	-	-	1 = 1
07.26	Customization package version	*Data*	-	-	1 = 1
07.30	Adaptive program status	*PB*	0000h…FFFFh	-	1 = 1
07.31	AP sequence state	*Data*	0…20	-	1 = 1
(Parameters 07.106…07.107 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 Standard DI, RO					
10.01	DI status	*PB*	0000h…FFFFh	-	1 = 1
10.02	DI delayed status	*PB*	0000h…FFFFh	-	1 = 1
10.03	DI force selection	*PB*	0000h…FFFFh	-	1 = 1
10.04	DI forced data	*PB*	0000h…FFFFh	-	1 = 1
10.05	DI1 ON delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.06	DI1 OFF delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.07	DI2 ON delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.08	DI2 OFF delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.09	DI3 ON delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.10	DI3 OFF delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.11	DI4 ON delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.12	DI4 OFF delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.13	DI5 ON delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.14	DI5 OFF delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.15	DI6 ON delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.16	DI6 OFF delay	*Real*	0.0 … 3000.0	s	10 = 1 s
10.21	RO status	*PB*	0000h…FFFFh	-	1 = 1
10.22	RO force selection	*PB*	0000h…FFFFh	-	1 = 1
10.23	RO forced data	*PB*	0000h…FFFFh	-	1 = 1
10.24	RO1 source	*Binary src*	-	-	1 = 1
10.25	RO1 ON delay	*Real*	0.0…3000.0	s	10 = 1 s
10.26	RO1 OFF delay	*Real*	0.0…3000.0	s	10 = 1 s
10.27	RO2 source	*Binary src*	-	-	1 = 1
10.28	RO2 ON delay	*Real*	0.0…3000.0	s	10 = 1 s
10.29	RO2 OFF delay	*Real*	0.0…3000.0	s	10 = 1 s
10.30	RO3 source	*Binary src*	-	-	1 = 1
10.31	RO3 ON delay	*Real*	0.0…3000.0	s	10 = 1 s
10.32	RO3 OFF delay	*Real*	0.0…3000.0	s	10 = 1 s
10.99	RO/DIO control word	*PB*	0000h…FFFFh	-	1 = 1
10.101	RO1 toggle counter	*Real*	0…4294967000	-	1 = 1
10.102	RO2 toggle counter	*Real*	0…4294967000	-	1 = 1
10.103	RO3 toggle counter	*Real*	0…4294967000	-	1 = 1
11 Standard DIO, FI, FO					
11.21	DI5 configuration	*List*	0…1	-	1 = 1
11.38	Freq in 1 actual value	*Real*	0…16000	Hz	1 = 1 Hz
11.39	Freq in 1 scaled value	*Real*	-32768.000…32767.000	-	1000 = 1

No.	Name	Type	Range	Unit	FbEq32
11.42	Freq in 1 min	*Real*	0…16000	Hz	1 = 1 Hz
11.43	Freq in 1 max	*Real*	0…16000	Hz	1 = 1 Hz
11.44	Freq in 1 at scaled min	*Real*	-32768.000…32767.000	-	1000 = 1
11.45	Freq in 1 at scaled max	*Real*	-32768.000…32767.000	-	1000 = 1
12 Standard AI					
12.02	AI force selection	*PB*	0000h…FFFFh	-	1 = 1
12.03	AI supervision function	*List*	0…4	-	1 = 1
12.04	AI supervision selection	*PB*	0000h…FFFFh	-	1 = 1
12.11	AI1 actual value	*Real*	0.000…22.000 mA or 0.000…11.000 V	mA or V	1000 = 1 unit
12.12	AI1 scaled value	*Real*	-32768.000…32767.000	-	1000 = 1
12.13	AI1 forced value	*Real*	0.000…20.000 mA or 0.000…10.000 V	mA or V	1000 = 1 unit
12.15	AI1 unit selection	*List*	2, 10	-	1 = 1
12.16	AI1 filter time	*Real*	0.000…30.000	s	1000 = 1 s
12.17	AI1 min	*Real*	0.000…20.000 mA or 0.000…10.000 V	mA or V	1000 = 1 unit
12.18	AI1 max	*Real*	0.000…22.000 mA or 0.000…11.000 V	mA or V	1000 = 1 unit
12.19	AI1 scaled at AI1 min	*Real*	-32768.000…32767.000	-	1000 = 1
12.20	AI1 scaled at AI1 max	*Real*	-32768.000…32767.000	-	1000 = 1
12.21	AI2 actual value	*Real*	0.000…22.000 mA or 0.000…11.000 V	mA or V	1000 = 1 unit
12.22	AI2 scaled value	*Real*	-32768.000…32767.000	-	1000 = 1
12.23	AI2 forced value	*Real*	0.000…20.000 mA or 0.000…10.000 V	mA or V	1000 = 1 unit
12.25	AI2 unit selection	*List*	2, 10	-	1 = 1
12.26	AI2 filter time	*Real*	0.000…30.000	s	1000 = 1 s
12.27	AI2 min	*Real*	0.000…20.000 mA or 0.000…10.000 V	mA or V	1000 = 1 unit
12.28	AI2 max	*Real*	0.000…22.000 mA or 0.000…11.000 V	mA or V	1000 = 1 unit
12.29	AI2 scaled at AI2 min	*Real*	-32768.000…32767.000	-	1000 = 1
12.30	AI2 scaled at AI2 max	*Real*	-32768.000…32767.000	-	1000 = 1
12.101	AI1 percent value	*Real*	0.00…100.00	%	100 = 1%
12.102	AI2 percent value	*Real*	0.00…100.00	%	100 = 1%
13 Standard AO					
13.02	AO force selection	*PB*	0000h…FFFFh	-	1 = 1
13.11	AO1 actual value	*Real*	0.000…22.000 or 0.000…11000 V	mA	1000 = 1 mA
13.12	AO1 source	*Analog src*	-	-	1 = 1
13.13	AO1 forced value	*Real*	0.000…22.000 or 0.000…11000 V	mA	1000 = 1 mA
13.15	AO1 unit selection	*List*	2, 10	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
13.16	AO1 filter time	*Real*	0.000…30.000	s	1000 = 1 s
13.17	AO1 source min	*Real*	-32768.0…32767.0	-	10 = 1
13.18	AO1 source max	*Real*	-32768.0…32767.0	-	10 = 1
13.19	AO1 out at AO1 src min	*Real*	0.000…22.000 or 0.000…11000 V	mA	1000 = 1 mA
13.20	AO1 out at AO1 src max	*Real*	0.000…22.000 or 0.000…11000 V	mA	1000 = 1 mA
13.21	AO2 actual value	*Real*	0.000…22.000	mA	1000 = 1 mA
13.22	AO2 source	*Analog src*	-	-	1 = 1
13.23	AO2 forced value	*Real*	0.000…22.000	mA	1000 = 1 mA
13.26	AO2 filter time	*Real*	0.000…30.000	s	1000 = 1 s
13.27	AO2 source min	*Real*	-32768.0…32767.0	-	10 = 1
13.28	AO2 source max	*Real*	-32768.0…32767.0	-	10 = 1
13.29	AO2 out at AO2 src min	*Real*	0.000…22.000	mA	1000 = 1 mA
13.30	AO2 out at AO2 src max	*Real*	0.000…22.000	mA	1000 = 1 mA
13.91	AO1 data storage	*Real*	-327.68…327.67	-	100 = 1
13.92	AO2 data storage	*Real*	-327.68…327.67	-	100 = 1
15 I/O extension module					
15.01	Extension module type	*List*	0…4	-	1 = 1
15.02	Detected extension module	*List*	0…4	-	1 = 1
15.03	DI status	*PB*	0000h…FFFFh	-	1 = 1
15.04	RO/DO status	*PB*	0000h…FFFFh	-	1 = 1
15.05	RO/DO force selection	*PB*	0000h…FFFFh	-	1 = 1
15.06	RO/DO forced data	*PB*	0000h…FFFFh	-	1 = 1
15.07	RO4 source	*Binary src*	-	-	1 = 1
15.08	RO4 ON delay	*Real*	0.0…3000.0	s	10 = 1 s
15.09	RO4 OFF delay	*Real*	0.0…3000.0	s	10 = 1 s
15.10	RO5 source	*Binary src*	-	-	1 = 1
15.11	RO5 ON delay	*Real*	0.0…3000.0	s	10 = 1 s
15.12	RO5 OFF delay	*Real*	0.0…3000.0	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*	0.0…3000.0	s	10 = 1 s
15.25	DO1 OFF delay	*Real*	0.0…3000.0	s	10 = 1 s
15.32	Freq out 1 actual value	*Real*	0…16000	Hz	1 = 1 Hz
15.33	Freq out 1 source	*Analog src*	-	-	1 = 1
15.34	Freq out 1 src min	*Real*	-32768.0…32767.0	-	1000 = 1
15.35	Freq out 1 src max	*Real*	-32768.0…32767.0	-	1000 = 1

No.	Name	Type	Range	Unit	FbEq32
15.36	Freq out 1 at src min	*Real*	0…16000	Hz	1 = 1 Hz
15.37	Freq out 1 at src max	*Real*	0…16000	Hz	1 = 1 Hz
19 Operation mode					
19.01	Actual operation mode	*List*	1…6, 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*	0…2	-	1 = 1
20 Start/stop/direction					
20.01	Ext1 commands	*List*	0…6, 11…12, 14	-	1 = 1
20.02	Ext1 start trigger type	*List*	0…1	-	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*	0…6, 11…12, 14	-	1 = 1
20.07	Ext2 start trigger type	*List*	0…1	-	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*	0…2	-	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	Type	Range	Unit	FbEq32
20.50	Start interlock 4 text	*Binary src*	-	-	1 = 1
20.51	Start interlock condition	*Binary src*	-	-	1 = 1
21 Start/stop mode					
21.01	Start mode	*List*	0…2	-	1 = 1
21.02	Magnetization time	*Real*	0…10000	ms	1 = 1 ms
21.03	Stop mode	*List*	0…2	-	1 = 1
21.04	Emergency stop mode	*List*	0…2	-	1 = 1
21.05	Emergency stop source	*Binary src*	-	-	1 = 1
21.06	Zero speed limit	*Real*	0.00…30000.00	rpm	100 = 1 rpm
21.07	Zero speed delay	*Real*	0…30000	ms	1 = 1 ms
21.08	DC current control	*PB*	0000b…0011b	-	1 = 1
21.09	DC hold speed	*Real*	0.00…1000.00	rpm	100 = 1 rpm
21.10	DC current reference	*Real*	0.0…100.0	%	10 = 1%
21.11	Post magnetization time	*Real*	0…3000	s	1 = 1 s
21.14	Pre-heating input source	*Binary src*	-	-	1 = 1
21.15	Pre-heating time delay	*Real*	0…3000	s	1 = 1 s
21.16	Pre-heating current	*Real*	0.0…30.0	%	10 = 1%
21.18	Auto restart time	*Real*	0.0, 0.1…10.0	s	10 = 1 s
21.19	Scalar start mode	*List*	0…6	-	1 = 1
21.21	DC hold frequency	*Real*	0.00…1000.00	Hz	100 = 1 Hz
21.22	Start delay	*Real*	0.00…60.00	s	100 = 1 s
21.23	Smooth start	*Real*	0…2	-	1 = 1
21.24	Smooth start current	*Real*	10.0…100.0	%	100 = 1%
21.25	Smooth start speed	*Real*	2.0…100.0	%	100 = 1%
21.26	Torque boost current	*Real*	15.0…300.0	%	100 = 1%
21.30	Speed compensated stop mode	*Real*	0…3	-	1 = 1
21.31	Speed comp stop delay	*Real*	0.00…1000.00	s	100 = 1 s
21.32	Speed comp stop threshold	*Real*	0…100	%	1 = 1%
21.34	Force auto restart	*List*	0…1	-	1 = 1
22 Speed reference selection					
22.01	Speed ref unlimited	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.11	Ext1 speed ref1	*Analog src*	-	-	1 = 1
22.12	Ext1 speed ref2	*Analog src*	-	-	1 = 1
22.13	Ext1 speed function	*List*	0…5	-	1 = 1
22.18	Ext2 speed ref1	*Analog src*	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
22.19	Ext2 speed ref2	*Analog src*	-	-	1 = 1
22.20	Ext2 speed function	*List*	0…5	-	1 = 1
22.21	Constant speed function	*PB*	0000h…FFFFh	-	1 = 1
22.22	Constant speed sel1	*Binary src*	-	-	1 = 1
22.23	Constant speed sel2	*Binary src*	-	-	1 = 1
22.24	Constant speed sel3	*Binary src*	-	-	1 = 1
22.26	Constant speed 1	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.27	Constant speed 2	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.28	Constant speed 3	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.29	Constant speed 4	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.30	Constant speed 5	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.31	Constant speed 6	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.32	Constant speed 7	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.41	Speed ref safe	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.51	Critical speed function	*PB*	00b…11b	-	1 = 1
22.52	Critical speed 1 low	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.53	Critical speed 1 high	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.54	Critical speed 2 low	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.55	Critical speed 2 high	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.56	Critical speed 3 low	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.57	Critical speed 3 high	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.71	Motor potentiometer function	*List*	0…3	-	1 = 1
22.72	Motor potentiometer initial value	*Real*	-32768.00…32767.00	-	100 = 1
22.73	Motor potentiometer up source	*Binary src*	-	-	1 = 1
22.74	Motor potentiometer down source	*Binary src*	-	-	1 = 1
22.75	Motor potentiometer ramp time	*Real*	0.0…3600.0	s	10 = 1 s
22.76	Motor potentiometer min value	*Real*	-32768.00…32767.00	-	100 = 1
22.77	Motor potentiometer max value	*Real*	-32768.00…32767.00	-	100 = 1
22.80	Motor potentiometer ref act	*Real*	-32768.00…32767.00	-	100 = 1
22.86	Speed reference act 6	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
22.87	Speed reference act 7	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
23 Speed reference ramp					
23.01	Speed ref ramp input	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
23.02	Speed ref ramp output	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
23.11	Ramp set selection	*Binary src*	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
23.12	Acceleration time 1	*Real*	0.000…1800.000	s	1000 = 1 s
23.13	Deceleration time 1	*Real*	0.000…1800.000	s	1000 = 1 s
23.14	Acceleration time 2	*Real*	0.000…1800.000	s	1000 = 1 s
23.15	Deceleration time 2	*Real*	0.000…1800.000	s	1000 = 1 s
23.23	Emergency stop time	*Real*	0.000…1800.000	s	1000 = 1 s
23.28	Variable slope enable	*List*	0…1	-	1 = 1
23.29	Variable slope rate	*Real*	2…30000	ms	1 = 1 ms
24 Speed reference conditioning					
24.01	Used speed reference	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
24.02	Used speed feedback	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
24.03	Speed error filtered	*Real*	-30000.0…30000.0	rpm	100 = 1 rpm
24.04	Speed error inverted	*Real*	-30000.0…30000.0	rpm	100 = 1 rpm
24.11	Speed correction	*Real*	-10000.00…10000.00	rpm	100 = 1 rpm
24.12	Speed error filter time	*Real*	0…10000	ms	1 = 1 ms
25 Speed control					
25.01	Torque reference speed control	*Real*	-1600.0…1600.0	%	10 = 1%
25.02	Speed proportional gain	*Real*	0.00…250.00	-	100 = 1
25.03	Speed integration time	*Real*	0.00…1000.00	s	100 = 1 s
25.04	Speed derivation time	*Real*	0.000…10.000	s	1000 = 1 s
25.05	Derivation filter time	*Real*	0…10000	ms	1 = 1 ms
25.06	Acc comp derivation time	*Real*	0.00…1000.00	s	100 = 1 s
25.07	Acc comp filter time	*Real*	0.0…1000.0	ms	10 = 1 ms
25.15	Proportional gain em stop	*Real*	1.00…250.00	-	100 = 1
25.53	Torque prop reference	*Real*	-30000.0…30000.0	%	10 = 1%
25.54	Torque integral reference	*Real*	-30000.0…30000.0	%	10 = 1%
25.55	Torque deriv reference	*Real*	-30000.0…30000.0	%	10 = 1%
25.56	Torque acc compensation	*Real*	-30000.0…30000.0	%	10 = 1%
28 Frequency reference chain					
28.01	Frequency ref ramp input	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.02	Frequency ref ramp output	*Real*	-500.00…500.00	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*	0…5	-	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*	0…5	-	1 = 1
28.21	Constant frequency function	*PB*	00b…11b	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
28.22	Constant frequency sel1	*Binary src*	-	-	1 = 1
28.23	Constant frequency sel2	*Binary src*	-	-	1 = 1
28.24	Constant frequency sel3	*Binary src*	-	-	1 = 1
28.26	Constant frequency 1	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.27	Constant frequency 2	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.28	Constant frequency 3	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.29	Constant frequency 4	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.30	Constant frequency 5	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.31	Constant frequency 6	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.32	Constant frequency 7	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.41	Frequency ref safe	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.51	Critical frequency function	*PB*	00b…11b	-	1 = 1
28.52	Critical frequency 1 low	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.53	Critical frequency 1 high	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.54	Critical frequency 2 low	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.55	Critical frequency 2 high	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.56	Critical frequency 3 low	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.57	Critical frequency 3 high	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.71	Freq ramp set selection	*Binary src*	-	-	1 = 1
28.72	Freq acceleration time 1	*Real*	0.000…1800.000	s	1000 = 1 s
28.73	Freq deceleration time 1	*Real*	0.000…1800.000	s	1000 = 1 s
28.74	Freq acceleration time 2	*Real*	0.000…1800.000	s	1000 = 1 s
28.75	Freq deceleration time 2	*Real*	0.000…1800.000	s	1000 = 1 s
28.76	Freq ramp in zero source	*Binary src*	-	-	1 = 1
28.92	Frequency ref act 3	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.96	Frequency ref act 7	*Real*	-500.00…500.00	Hz	100 = 1 Hz
28.97	Frequency ref unlimited	*Real*	-500.00…500.00	Hz	100 = 1 Hz
30 Limits					
30.01	Limit word 1	*PB*	0000h…FFFFh	-	1 = 1
30.02	Torque limit status	*PB*	0000h…FFFFh	-	1 = 1
30.11	Minimum speed	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
30.12	Maximum speed	*Real*	-30000.00…30000.00	rpm	100 = 1 rpm
30.13	Minimum frequency	*Real*	-500.00…500.00	Hz	100 = 1 Hz
30.14	Maximum frequency	*Real*	-500.00…500.00	Hz	100 = 1 Hz
30.17	Maximum current	*Real*	0.00…30000.00	A	100 = 1 A
30.18	Torq lim sel	*Binary src*	-	-	1 = 1
30.19	Minimum torque 1	*Real*	-1600.0…0.0	%	10 = 1%

No.	Name	Type	Range	Unit	FbEq32
30.20	Maximum torque 1	*Real*	0.0…1600.0	%	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*	-1600.0…0.0	%	10 = 1%
30.24	Maximum torque 2	*Real*	0.0…1600.0	%	10 = 1%
30.26	Power motoring limit	*Real*	0.00…600.00	%	100 = 1%
30.27	Power generating limit	*Real*	-600.00…0.00	%	100 = 1%
30.30	Overvoltage control	*List*	0…1	-	1 = 1
30.31	Undervoltage control	*List*	0…1	-	1 = 1
30.35	Thermal current limitation	*List*	0…1	-	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
(Parameters 30.101…30.149 only visible for ACH580-31)					
30.101	LSU limit word 1	*PB*	0000h…FFFFh	-	1 = 1
30.102	LSU limit word 2	*PB*	0000h…FFFFh	-	1 = 1
30.103	LSU limit word 3	*PB*	0000h…FFFFh	-	1 = 1
30.104	LSU limit word 4	*PB*	0000h…FFFFh	-	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*	0…1	-	1 = 1
31.03	External event 2 source	*Binary src*	-	-	1 = 1
31.04	External event 2 type	*List*	0…1	-	1 = 1
31.05	External event 3 source	*Binary src*	-	-	1 = 1
31.06	External event 3 type	*List*	0…1	-	1 = 1
31.07	External event 4 source	*Binary src*	-	-	1 = 1
31.08	External event 4 type	*List*	0…1	-	1 = 1
31.09	External event 5 source	*Binary src*	-	-	1 = 1
31.10	External event 5 type	*List*	0…1	-	1 = 1
31.11	Fault reset selection	*Binary src*	-	-	1 = 1
31.12	Autoreset selection	*PB*	0000h…FFFFh	-	1 = 1
31.13	Selectable fault	*Real*	0000h…FFFFh	-	1 = 1
31.14	Number of trials	*Real*	0…5	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
31.15	Total trials time	*Real*	1.0…600.0	s	10 = 1 s
31.16	Delay time	*Real*	0.0…120.0	s	10 = 1 s
31.19	Motor phase loss	*List*	0…1	-	1 = 1
31.20	Earth fault	*List*	0…2	-	1 = 1
31.21	Supply phase loss	*List*	0…1	-	1 = 1
31.22	STO indication run/stop	*List*	0…5	-	1 = 1
31.23	Wiring or earth fault	*List*	0…1	-	1 = 1
31.24	Stall function	*List*	0…2	-	1 = 1
31.25	Stall current limit	*Real*	0.0…1600.0	%	10 = 1%
31.26	Stall speed limit	*Real*	0.00…10000.00	rpm	100 = 1 rpm
31.27	Stall frequency limit	*Real*	0.00…1000.00	Hz	100 = 1 Hz
31.28	Stall time	*Real*	0…3600	s	1 = 1 s
31.30	Overspeed trip margin	*Real*	0.00…10000.00	rpm	100 = 1 rpm
31.31	Frequency trip margin	*Real*	0.00…10000.00	Hz	100 = 1 Hz
31.32	Emergency ramp supervision	*Real*	0…300	%	1 = 1%
31.33	Emergency ramp supervision delay	*Real*	0…100	s	1 = 1 s
31.36	Aux fan fault bybass	*List*	0…1	-	1 = 1
(Parameters 31.120…31.121 only visible for ACH580-31)					
31.120	LSU earth fault	*List*	0…1	-	1 = 1
31.121	LSU supply phase loss	*List*	0…1	-	1 = 1
32 Supervision					
32.01	Supervision status	*PB*	0000h…FFFFh	-	1 = 1
32.05	Supervision 1 function	*List*	0…6	-	1 = 1
32.06	Supervision 1 action	*List*	0…3	-	1 = 1
32.07	Supervision 1 signal	*Analog src*	-	-	1 = 1
32.08	Supervision 1 filter time	*Real*	0.000…30.000	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*	0.00…100000.00	-	100 = 1
32.15	Supervision 2 function	*List*	0…6	-	1 = 1
32.16	Supervision 2 action	*List*	0…3	-	1 = 1
32.17	Supervision 2 signal	*Analog src*	-	-	1 = 1
32.18	Supervision 2 filter time	*Real*	0.000…30.000	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*	0.00…100000.00	-	100 = 1

No.	Name	Type	Range	Unit	FbEq32
32.25	Supervision 3 function	*List*	0…6	-	1 = 1
32.26	Supervision 3 action	*List*	0…3	-	1 = 1
32.27	Supervision 3 signal	*Analog src*	-	-	1 = 1
32.28	Supervision 3 filter time	*Real*	0.000…30.000	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*	0.00…100000.00	-	100 = 1
32.35	Supervision 4 function	*List*	0…6	-	1 = 1
32.36	Supervision 4 action	*List*	0…3	-	1 = 1
32.37	Supervision 4 signal	*Analog src*	-	-	1 = 1
32.38	Supervision 4 filter time	*Real*	0.000…30.000	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*	0.00…100000.00	-	100 = 1
32.45	Supervision 5 function	*List*	0…6	-	1 = 1
32.46	Supervision 5 action	*List*	0…3	-	1 = 1
32.47	Supervision 5 signal	*Analog src*	-	-	1 = 1
32.48	Supervision 5 filter time	*Real*	0.000…30.000	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*	0.00…100000.00	-	100 = 1
32.55	Supervision 6 function	*List*	0…6	-	1 = 1
32.56	Supervision 6 action	*List*	0…3	-	1 = 1
32.57	Supervision 6 signal	*Analog src*	-	-	1 = 1
32.58	Supervision 6 filter time	*Real*	0.000…30.000	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*	0.00…100000.00	-	100 = 1
34 Timed functions					
34.01	Timed functions status	*PB*	0000h…FFFFh	-	1 = 1
34.02	Timer status	*PB*	0000h…FFFFh	-	1 = 1
34.04	Season/exception day status	*PB*	0000h…FFFFh	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
34.10	Timed functions enable	*Binary src*	-	-	1 = 1
34.11	Timer 1 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.12	Timer 1 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.13	Timer 1 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.14	Timer 2 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.15	Timer 2 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.16	Timer 2 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.17	Timer 3 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.18	Timer 3 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.19	Timer 3 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.20	Timer 4 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.21	Timer 4 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.22	Timer 4 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.23	Timer 5 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.24	Timer 5 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.25	Timer 5 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.26	Timer 6 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.27	Timer 6 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.28	Timer 6 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.29	Timer 7 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.30	Timer 7 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.31	Timer 7 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.32	Timer 8 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.33	Timer 8 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.34	Timer 8 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.35	Timer 9 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.36	Timer 9 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.37	Timer 9 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.38	Timer 10 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.39	Timer 10 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.40	Timer 10 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.41	Timer 11 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.42	Timer 11 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.43	Timer 11 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.44	Timer 12 configuration	*PB*	0000h…FFFFh	-	1 = 1
34.45	Timer 12 start time	Time	00:00:00…23:59:59	s	1 = 1 s
34.46	Timer 12 duration	Duration	00 00:00…07 00:00	min	1 = 1 min
34.60	Season 1 start date	Date	01.01…31.12	d	1 = 1 d
34.61	Season 2 start date	Date	01.01…31.12	d	1 = 1 d
34.62	Season 3 start date	Date	01.01…31.12	d	1 = 1 d

No.	Name	Type	Range	Unit	FbEq32
34.63	Season 4 start date	Date	01.01…31.12	d	1 = 1 d
34.70	Number of active exceptions	*Real*	0…16	-	1 = 1
34.71	Exception types	*PB*	0000h…FFFFh	-	1 = 1
34.72	Exception 1 start	Date	01.01…31.12	d	1 = 1 d
34.73	Exception 1 length	*Real*	0…60	d	1 = 1 d
34.74	Exception 2 start	Date	01.01…31.12	d	1 = 1 d
34.75	Exception 2 length	*Real*	0…60	d	1 = 1 d
34.76	Exception 3 start	Date	01.01…31.12	d	1 = 1 d
34.77	Exception 3 length	*Real*	0…60	d	1 = 1 d
34.78	Exception day 4	Date	01.01…31.12	d	1 = 1 d
34.79	Exception day 5	Date	01.01…31.12	d	1 = 1 d
34.80	Exception day 6	Date	01.01…31.12	d	1 = 1 d
34.81	Exception day 7	Date	01.01…31.12	d	1 = 1 d
34.82	Exception day 8	Date	01.01…31.12	d	1 = 1 d
34.83	Exception day 9	Date	01.01…31.12	d	1 = 1 d
34.84	Exception day 10	Date	01.01…31.12	d	1 = 1 d
34.85	Exception day 11	Date	01.01…31.12	d	1 = 1 d
34.86	Exception day 12	Date	01.01…31.12	d	1 = 1 d
34.87	Exception day 13	Date	01.01…31.12	d	1 = 1 d
34.88	Exception day 14	Date	01.01…31.12	d	1 = 1 d
34.89	Exception day 15	Date	01.01…31.12	d	1 = 1 d
34.90	Exception day 16	Date	01.01…31.12	d	1 = 1 d
34.100	Timed function 1	*PB*	0000h…FFFFh	-	1 = 1
34.101	Timed function 2	*PB*	0000h…FFFFh	-	1 = 1
34.102	Timed function 3	*PB*	0000h…FFFFh	-	1 = 1
34.110	Boost time function	*PB*	0000h…FFFFh	-	1 = 1
34.111	Boost time activation source	*Binary src*	-	-	1 = 1
34.112	Boost time duration	Duration	00 00:00…07 00:00	min	1 = 1 min
35 Motor thermal protection					
35.01	Motor estimated temperature	*Real*	-60…1000 °C or -76…1832 °F	°C or °F	1 = 1 °
35.02	Measured temperature 1	*Real*	-60…5000 °C or -76…9032 °F, 0 ohm or [*35.12*] ohm	°C, °F or ohm	1 = 1 unit
35.03	Measured temperature 2	*Real*	-60…5000 °C or -76…9032 °F, 0 ohm or [*35.12*] ohm	°C, °F or ohm	1 = 1 unit
35.11	Temperature 1 source	*List*	0…2, 5…8, 11…16, 19, 21, 22	-	1 = 1
35.12	Temperature 1 fault limit	*Real*	-60…5000 °C or -76…9032 °F	°C, °F or ohm	1 = 1 unit

No.	Name	Type	Range	Unit	FbEq32
35.13	Temperature 1 warning limit	*Real*	-60…5000 °C or -76…9032 °F	°C, °F or ohm	1 = 1 unit
35.14	Temperature 1 AI source	*Analog src*	-	-	1 = 1
35.21	Temperature 2 source	*List*	0…2, 5…8, 11…16, 19	-	1 = 1
35.22	Temperature 2 fault limit	*Real*	-60…5000 °C or -76…9032 °F	°C, °F or ohm	1 = 1 unit
35.23	Temperature 2 warning limit	*Real*	-60…5000 °C or -76…9032 °F	°C, °F or ohm	1 = 1 unit
35.24	Temperature 2 AI source	*Analog src*	-	-	1 = 1
35.31	Safe motor temperature enable	*List*	0…1	-	1 = 1
35.50	Motor ambient temperature	*Real*	-60…100 °C or -76 … 212 °F	°C	1 = 1 °
35.51	Motor load curve	*Real*	50…150	%	1 = 1%
35.52	Zero speed load	*Real*	25…150	%	1 = 1%
35.53	Break point	*Real*	1.00 … 500.00	Hz	100 = 1 Hz
35.54	Motor nominal temperature rise	*Real*	0…300 °C or 32…572 °F	°C or °F	1 = 1 °
35.55	Motor thermal time constant	*Real*	100…10000	s	1 = 1 s
35.57	Motor overload class	*List*	0…5	-	1 = 1
36 Load analyzer					
36.01	PVL signal source	*Analog src*	-	-	1 = 1
36.02	PVL filter time	*Real*	0.00…120.00	s	100 = 1 s
36.06	AL2 signal source	*Analog src*	-	-	1 = 1
36.07	AL2 signal scaling	*Real*	0.00…32767.00	-	100 = 1
36.09	Reset loggers	*List*	0…3	-	1 = 1
36.10	PVL peak value	*Real*	-32768.00…32767.00	-	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*	-32768.00…32767.00	A	100 = 1 A
36.14	PVL DC voltage at peak	*Real*	0.00…2000.00	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*	0.00…100.00	%	100 = 1%
36.21	AL1 10 to 20%	*Real*	0.00…100.00	%	100 = 1%
36.22	AL1 20 to 30%	*Real*	0.00…100.00	%	100 = 1%
36.23	AL1 30 to 40%	*Real*	0.00…100.00	%	100 = 1%
36.24	AL1 40 to 50%	*Real*	0.00…100.00	%	100 = 1%
36.25	AL1 50 to 60%	*Real*	0.00…100.00	%	100 = 1%

No.	Name	Type	Range	Unit	FbEq32
36.26	AL1 60 to 70%	*Real*	0.00…100.00	%	100 = 1%
36.27	AL1 70 to 80%	*Real*	0.00…100.00	%	100 = 1%
36.28	AL1 80 to 90%	*Real*	0.00…100.00	%	100 = 1%
36.29	AL1 over 90%	*Real*	0.00…100.00	%	100 = 1%
36.40	AL2 0 to 10%	*Real*	0.00…100.00	%	100 = 1%
36.41	AL2 10 to 20%	*Real*	0.00…100.00	%	100 = 1%
36.42	AL2 20 to 30%	*Real*	0.00…100.00	%	100 = 1%
36.43	AL2 30 to 40%	*Real*	0.00…100.00	%	100 = 1%
36.44	AL2 40 to 50%	*Real*	0.00…100.00	%	100 = 1%
36.45	AL2 50 to 60%	*Real*	0.00…100.00	%	100 = 1%
36.46	AL2 60 to 70%	*Real*	0.00…100.00	%	100 = 1%
36.47	AL2 70 to 80%	*Real*	0.00…100.00	%	100 = 1%
36.48	AL2 80 to 90%	*Real*	0.00…100.00	%	100 = 1%
36.49	AL2 over 90%	*Real*	0.00…100.00	%	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*	0000h…FFFFh	-	1 = 1
37.02	ULC supervision signal	*Analog src*	-	-	1 = 1
37.03	ULC overload actions	*List*	0…3	-	1 = 1
37.04	ULC underload actions	*List*	0…3	-	1 = 1
37.11	ULC speed table point 1	*Real*	-30000.0…30000.0	rpm	10 = 1 rpm
37.12	ULC speed table point 2	*Real*	-30000.0…30000.0	rpm	10 = 1 rpm
37.13	ULC speed table point 3	*Real*	-30000.0…30000.0	rpm	10 = 1 rpm
37.14	ULC speed table point 4	*Real*	-30000.0…30000.0	rpm	10 = 1 rpm
37.15	ULC speed table point 5	*Real*	-30000.0…30000.0	rpm	10 = 1 rpm
37.16	ULC frequency table point 1	*Real*	-500.0…500.0	Hz	10 = 1 Hz
37.17	ULC frequency table point 2	*Real*	-500.0…500.0	Hz	10 = 1 Hz
37.18	ULC frequency table point 3	*Real*	-500.0…500.0	Hz	10 = 1 Hz
37.19	ULC frequency table point 4	*Real*	-500.0…500.0	Hz	10 = 1 Hz
37.20	ULC frequency table point 5	*Real*	-500.0…500.0	Hz	10 = 1 Hz
37.21	ULC underload point 1	*Real*	-1600.0…1600.0	%	10 = 1%
37.22	ULC underload point 2	*Real*	-1600.0…1600.0	%	10 = 1%
37.23	ULC underload point 3	*Real*	-1600.0…1600.0	%	10 = 1%
37.24	ULC underload point 4	*Real*	-1600.0…1600.0	%	10 = 1%
37.25	ULC underload point 5	*Real*	-1600.0…1600.0	%	10 = 1%
37.31	ULC overload point 1	*Real*	-1600.0…1600.0	%	10 = 1%
37.32	ULC overload point 2	*Real*	-1600.0…1600.0	%	10 = 1%
37.33	ULC overload point 3	*Real*	-1600.0…1600.0	%	10 = 1%
37.34	ULC overload point 4	*Real*	-1600.0…1600.0	%	10 = 1%

No.	Name	Type	Range	Unit	FbEq32
37.35	ULC overload point 5	*Real*	-1600.0…1600.0	%	10 = 1%
37.41	ULC overload timer	*Real*	0.0…10000.0	s	10 = 1 s
37.42	ULC underload timer	*Real*	0.0…10000.0	s	10 = 1 s
40 Process PID set 1					
40.01	Process PID output actual	*Real*	-200000.00…200000.00	%	100 = 1 %
40.02	Process PID feedback actual	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.03	Process PID setpoint actual	*Real*	-200000…200000	PID unit 1	100 = 1 PID unit 1
40.04	Process PID deviation actual	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.06	Process PID status word	*PB*	0000h…FFFFh	-	1 = 1
40.07	Process PID operation mode	*List*	0…2	-	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*	0…13	-	1 = 1
40.11	Set 1 feedback filter time	*Real*	0.000…30.000	s	1000 = 1 s
40.14	Set 1 setpoint scaling	*Real*	-200000.00…200000.00	-	100 = 1
40.15	Set 1 output scaling	*Real*	-200000.00…200000.00	-	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*	0…13	-	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*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.22	Set 1 internal setpoint 2	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.23	Set 1 internal setpoint 3	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.24	Set 1 internal setpoint 0	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.26	Set 1 setpoint min	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.27	Set 1 setpoint max	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.28	Set 1 setpoint increase time	*Real*	0.0…1800.0	s	10 = 1 s
40.29	Set 1 setpoint decrease time	*Real*	0.0…1800.0	s	10 = 1 s
40.30	Set 1 setpoint freeze enable	*Binary src*	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
40.31	Set 1 deviation inversion	*Binary src*	-	-	1 = 1
40.32	Set 1 gain	*Real*	0.10…100.00	-	100 = 1
40.33	Set 1 integration time	*Real*	0.0…9999.0	s	10 = 1 s
40.34	Set 1 derivation time	*Real*	0.000…10.000	s	1000 = 1 s
40.35	Set 1 derivation filter time	*Real*	0.0…10.0	s	10 = 1 s
40.36	Set 1 output min	*Real*	-200000.00…200000.00	-	100 = 1
40.37	Set 1 output max	*Real*	-200000.00…200000.00	-	100 = 1
40.38	Set 1 output freeze enable	*Binary src*	-	-	1 = 1
40.39	Set 1 deadband range	*Real*	0……200000.0	-	10 = 1
40.40	Set 1 deadband delay	*Real*	0.0 … 3600.0	s	10 = 1 s
40.43	Set 1 sleep level	*Real*	0.0…200000.0	-	10 = 1
40.44	Set 1 sleep delay	*Real*	0.0…3600.0	s	10 = 1 s
40.45	Set 1 sleep boost time	*Real*	0.0…3600.0	s	10 = 1 s
40.46	Set 1 sleep boost step	*Real*	0.0…200000.0	PID unit 1	10 = 1 PID unit 1
40.47	Set 1 wake-up deviation	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.48	Set 1 wake-up delay	*Real*	0.00…60.00	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*	-	-	1 = 1
40.58	Set 1 increase prevention	*Binary src*	-	-	1 = 1
40.59	Set 1 decrease prevention	*Binary src*	-	-	1 = 1
40.60	Set 1 PID activation source	*Binary src*	-	-	1 = 1
40.61	Setpoint actual scaling	*Real*	-200000.00…200000.00	-	100 = 1
40.62	PID internal setpoint actual	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.70	Compensated setpoint	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
40.71	Set 1 compensation input source	*List*	0, 2…4, 8, 10…12, 15…16, 19…20, 24	-	1 = 1
40.72	Set 1 compensation input 1	*Real*	-200000.00…200000.00	-	100 = 1
40.73	Set 1 compensated output 1	*Real*	-200000.00…200000.00	-	100 = 1
40.74	Set 1 compensation input 2	*Real*	-200000.00…200000.00	-	100 = 1
40.75	Set 1 compensated output 2	*Real*	-200000.00…200000.00	-	100 = 1
40.76	Set 1 compensation non-linearity	*Real*	0…100	%	1= 1%
40.80	Set 1 PID output min source	*List*	0…1	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
40.81	Set 1 PID output max source	*List*	0…1	-	1 = 1
40.89	Set 1 setpoint multiplier	*Real*	-200000.00…200000.00	-	100 = 1
40.90	Set 1 feedback multiplier	*Real*	--200000.00…200000.00	-	100 = 1
40.91	Feedback data storage	*Real*	-327.68…327.67	-	100 = 1
40.92	Setpoint data storage	*Real*	-327.68…327.67	-	100 = 1
40.96	Process PID output %	*Real*	-100.00…100.00	%	100 = 1%
40.97	Process PID feedback %	*Real*	-100.00…100.00	%	100 = 1%
40.98	Process PID setpoint %	*Real*	-100.00…100.00	%	100 = 1%
40.99	Process PID deviation %	*Real*	-100.00…100.00	%	100 = 1%
41 Process 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*	0…13	-	1 = 1
41.11	Set 2 feedback filter time	*Real*	0.000…30.000	s	1000 = 1 s
41.14	Set 2 setpoint scaling	*Real*	-200000.00…200000.00	-	100 = 1
41.15	Set 2 output scaling	*Real*	-200000.00…200000.00	-	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*	0…13	-	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*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
41.22	Set 2 internal setpoint 2	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
41.23	Set 2 internal setpoint 3	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
41.24	Set 2 internal setpoint 0	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
41.26	Set 2 setpoint min	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
41.27	Set 2 setpoint max	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
41.28	Set 2 setpoint increase time	*Real*	0.0…1800.0	s	10 = 1 s
41.29	Set 2 setpoint decrease time	*Real*	0.0…1800.0	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*	0.10…100.00	-	100 = 1
41.33	Set 2 integration time	*Real*	0.0…9999.0	s	10 = 1 s
41.34	Set 2 derivation time	*Real*	0.000…10.000	s	1000 = 1 s
41.35	Set 2 derivation filter time	*Real*	0.0…10.0	s	10 = 1 s
41.36	Set 2 output min	*Real*	-200000.00…200000.00	-	100 = 1
41.37	Set 2 output max	*Real*	-200000.00…200000.00	-	100 = 1
41.38	Set 2 output freeze enable	*Binary src*	-	-	1 = 1
41.39	Set 2 deadband range	*Real*	0……200000.0	-	10 = 1
41.40	Set 2 deadband delay	*Real*	0.0 … 3600.0	s	10 = 1 s
41.43	Set 2 sleep level	*Real*	0.0…200000.0	-	10 = 1
41.44	Set 2 sleep delay	*Real*	0.0…3600.0	s	10 = 1 s
41.45	Set 2 sleep boost time	*Real*	0.0…3600.0	s	10 = 1 s
41.46	Set 2 sleep boost step	*Real*	0.0…200000.0	PID unit 1	10 = 1 PID unit 1
41.47	Set 2 wake-up deviation	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
41.48	Set 2 wake-up delay	*Real*	0.00…60.00	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, 2…4, 8, 10…12, 15…16, 19…20, 24	-	1 = 1
41.72	Set 2 compensation input 1	*Real*	-200000.00…200000.00	-	100 = 1
41.73	Set 2 compensated output 1	*Real*	-200000.00…200000.00	-	100 = 1
41.74	Set 2 compensation input 2	*Real*	-200000.00…200000.00	-	100 = 1
41.75	Set 2 compensated output 2	*Real*	-200000.00…200000.00	-	100 = 1
41.76	Set 2 compensation non-linearity	*Real*	0…100	%	1= 1%
41.80	Set 2 PID output min source	*List*	0…1	-	1 = 1
41.81	Set 2 PID output max source	*List*	0…1	-	1 = 1
41.89	Set 2 setpoint multiplier	*Real*	-200000.00…200000.00	-	100 = 1
41.90	Set 2 feedback multiplier	*Real*	-200000.00…200000.00	-	100 = 1
43 Brake chopper					
43.01	Braking resistor temperature	*Real*	0.0…120.0	%	10 = 1%
43.06	Brake chopper function	*List*	0…3	-	1 = 1
43.07	Brake chopper run enable	*Binary src*	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
43.08	Brake resistor thermal tc	*Real*	0…10000	s	1 = 1 s
43.09	Brake resistor Pmax cont	*Real*	0.00…10000.00	kW	100 = 1 kW
43.10	Brake resistance	*Real*	0.0…1000.0	ohm	10 = 1 ohm
43.11	Brake resistor fault limit	*Real*	0…150	%	1 = 1%
43.12	Brake resistor warning limit	*Real*	0…150	%	1 = 1%
45 Energy efficiency					
45.01	Saved GW hours	*Real*	0…65535	GWh	1 = 1 GWh
45.02	Saved MW hours	*Real*	0…999	MWh	1 = 1 MWh
45.03	Saved kW hours	*Real*	0.0…999.9	kWh	10 = 1 kWh
45.04	Saved energy	*Real*	0.0…214748364.0	kWh	10 = 1 kWh
45.05	Saved money x1000	*Real*	0…4294967295 thousands	(defina-ble)	1 = 1 currency unit
45.06	Saved money	*Real*	0.00…999.99	(defina-ble)	100 = 1 currency unit
45.07	Saved amount	*Real*	0.00…21474830.08	(defina-ble)	100 = 1 currency unit
45.08	CO2 reduction in kilotons	*Real*	0…65535	metric kiloton	1 = 1 metric kiloton
45.09	CO2 reduction in tons	*Real*	0.0…999.9	metric ton	10 = 1 metric ton
45.10	Total saved CO2	*Real*	0.0…214748300.8	metric ton	10 = 1 metric ton
45.11	Energy optimizer	*List*	0…1	-	1 = 1
45.12	Energy tariff 1	*Real*	0.000…4294966.296	(defina-ble)	1000 = 1 currency unit
45.13	Energy tariff 2	*Real*	0.000…4294966.296	(defina-ble)	1000 = 1 currency unit
45.14	Tariff selection	*Binary src*	-	-	1 = 1
45.18	CO2 conversion factor	*Real*	0.000…65.535	tn/ MWh	1000 = 1 tn/MWh
45.19	Comparison power	*Real*	0.00…10000000.00	kW	10 = 1 kW
45.21	Energy calculations reset	*List*	0…1	-	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 Monitoring/scaling settings					
46.01	Speed scaling	*Real*	0.00…30000.00	rpm	100 = 1 rpm
46.02	Frequency scaling	*Real*	0.10…1000.00	Hz	100 = 1 Hz
46.03	Torque scaling	*Real*	0.1…1000.0	%	10 = 1%
46.04	Power scaling	*Real*	0.10…30000.00	-	10 = 1
46.05	Current scaling	*Real*	0…30000	A	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*	0.00…1000.00	Hz	100 = 1 Hz
46.11	Filter time motor speed	*Real*	2…20000	ms	1 = 1 ms
46.12	Filter time output frequency	*Real*	2…20000	ms	1 = 1 ms
46.13	Filter time motor torque	*Real*	2…20000	ms	1 = 1 ms
46.14	Filter time power	*Real*	2…20000	ms	1 = 1 ms
46.21	At speed hysteresis	*Real*	0.00…30000.00	rpm	100 = 1 rpm
46.22	At frequency hysteresis	*Real*	0.00…1000.00	Hz	100 = 1 Hz
46.31	Above speed limit	*Real*	0.00…30000.00	rpm	100 = 1 rpm
46.32	Above frequency limit	*Real*	0.00…1000.00	Hz	100 = 1 Hz
46.41	kWh pulse scaling	*Real*	0.001…1000.000	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*	-32768…32767	-	1 = 1
47.22	Data storage 2 int16	*Real*	-32768…32767	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
47.23	Data storage 3 int16	*Real*	-32768…32767	-	1 = 1
47.24	Data storage 4 int16	*Real*	-32768…32767	-	1 = 1
49 Panel port communication					
49.01	Node ID number	*Real*	1…32	-	1 = 1
49.03	Baud rate	*List*	1…5	-	1 = 1
49.04	Communication loss time	*Real*	0.3…3000.0	s	10 = 1 s
49.05	Communication loss action	*List*	0…3	-	1 = 1
49.06	Refresh settings	*List*	0…1	-	1 = 1
50 Fieldbus adapter (FBA)					
50.01	FBA A enable	*List*	0…1	-	1 = 1
50.02	FBA A comm loss func	*List*	0…5	-	1 = 1
50.03	FBA A comm loss t out	*Real*	0.3…6553.5	s	10 = 1 s
50.04	FBA A ref1 type	*List*	0…5	-	1 = 1
50.05	FBA A ref2 type	*List*	0…5	-	1 = 1
50.06	FBA A SW sel	*List*	0…1	-	1 = 1
50.07	FBA A actual 1 type	*List*	0…5	-	1 = 1
50.08	FBA A actual 2 type	*List*	0…5	-	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*	0…1	-	1 = 1
50.13	FBA A control word	*Data*	00000000h…FFFFFFFFh	-	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*	00000000h…FFFFFFFFh	-	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*	0…65535	-	1 = 1
…	…	…	…	…	
51.26	FBA A Par26	*Real*	0…65535	-	1 = 1
51.27	FBA A par refresh	*List*	0…1	-	1 = 1
51.28	FBA A par table ver	*Data*	-	-	1 = 1
51.29	FBA A drive type code	*Real*	0…65535	-	1 = 1
51.30	FBA A mapping file ver	*Real*	0…65535	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
51.31	D2FBA A comm status	*List*	0…6	-	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
53 FBA A data out					
53.01	FBA A data out1	*List*	-	-	1 = 1
…	…	…	…	…	
53.12	FBA A data out12	*List*	-	-	1 = 1
58 Embedded fieldbus					
58.01	Protocol enable	*List*	0…2, 5	-	1 = 1
58.02	Protocol ID	*Real*	0000h…FFFFh	-	1 = 1
58.03	Node address	*Real*	0…255	-	1 = 1
58.04	Baud rate	*List*	0…7	-	1 = 1
58.05	Parity	*List*	0…3	-	1 = 1
58.06	Communication control	*List*	0…2	-	1 = 1
58.07	Communication diagnostics	*PB*	0000h…FFFFh	-	1 = 1
58.08	Received packets	*Real*	0…4294967295	-	1 = 1
58.09	Transmitted packets	*Real*	0…4294967295	-	1 = 1
58.10	All packets	*Real*	0…4294967295	-	1 = 1
58.11	UART errors	*Real*	0…4294967295	-	1 = 1
58.12	CRC errors	*Real*	0…4294967295	-	1 = 1
58.13	Token counter	*Real*	0…4294967295	-	1 = 1
58.14	Communication loss action	*List*	0…5	-	1 = 1
58.15	Communication loss mode	*List*	1…2	-	1 = 1
58.16	Communication loss time	*Real*	0.0…6000.0	s	10 = 1 s
58.17	Transmit delay	*Real*	0…65535	ms	1 = 1 ms
58.18	EFB control word	*PB*	00000000h…FFFFFFFFh	-	1 = 1
58.19	EFB status word	*PB*	00000000h…FFFFFFFFh	-	1 = 1
58.25	Control profile	*List*	0, 5	-	1 = 1
58.26	EFB ref1 type	*List*	0…5	-	1 = 1
58.27	EFB ref2 type	*List*	0…5	-	1 = 1
58.28	EFB act1 type	*List*	0…5	-	1 = 1
58.29	EFB act2 type	*List*	0…5	-	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*	0…2	-	1 = 1
58.34	Word order	*List*	0…1	-	1 = 1
58.40	Device object ID	*Real*	0…4194303	-	1 = 1
58.41	Max master	*Real*	0…127	-	1 = 1
58.42	Max info frames	*Real*	0…10	-	1 = 1
58.43	Max APDU retries	*Real*	0…10	-	1 = 1
58.44	APDU timeout	*Real*	0…60	s	1 = 1
58.101	Data I/O 1	*Analog src*	-	-	1 = 1
58.102	Data I/O 2	*Analog src*	-	-	1 = 1
58.103	Data I/O 3	*Analog src*	-	-	1 = 1
58.104	Data I/O 4	*Analog src*	-	-	1 = 1
58.105	Data I/O 5	*Analog src*	-	-	1 = 1
58.106	Data I/O 6	*Analog src*	-	-	1 = 1
58.107	Data I/O 7	*Analog src*	-	-	1 = 1
…	…	…	…	…	
58.114	Data I/O 14	*Analog src*	-	-	1 = 1
60 DDCS communication					
(Parameters 60.71…60.79 only visible for ACH580-31)					
60.71	INU-LSU communication port	*List*	-	-	1 = 1
60.78	INU-LSU comm loss timeout	*Real*	0…65535	ms	-
60.79	INU-LSU comm loss function	*Binary src*	-	-	1 = 1
61 D2D and DDCS transmit data					
(Parameters 61.201…61.203 only visible for ACH580-31)					
61.201	INU-LSU data set 10 data 1 value	*Real*	0…65535	-	-
61.202	INU-LSU data set 10 data 2 value	*Real*	0…65535	-	-
61.203	INU-LSU data set 10 data 3 value	*Real*	0…65535	-	-
62 D2D and DDCS receive data					
(Parameter 62.201 only visible for ACH580-31)					
62.201	INU-LSU data set 11 data 1 value	*Real*	0…65535	-	-
70 Override					
70.01	Override status	*PB*	0000h…FFFFh	-	1 = 1
70.02	Override	*List*	0…1	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
70.03	Override activation source	*Binary src*	-	-	1 = 1
70.04	Override reference source	*List*	0…6	-	1 = 1
70.05	Override direction	*Binary src*	-	-	1 = 1
70.06	Override frequency	*Real*	-500.0…500.0	Hz	100 = 1 Hz
70.07	Override speed	*Real*	-30000.0…30000.0	rpm	100 = 1 rpm
70.10	Override enables selection	*PB*	0000h…FFFFh	-	1 = 1
70.20	Override fault handling	*List*	0…1	-	1 = 1
70.21	Override auto reset trials	*Real*	0…5	-	1 = 1
70.22	Override auto reset time	*Real*	5.0…120.0	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	Type	Range	Unit	FbEq32
71 External PID1					
71.01	External PID act value	*Real*	-200000.00…200000.00	%	100 = 1%
71.02	Feedback act value	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
71.03	Setpoint act value	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
71.04	Deviation act value	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
71.06	PID status word	*PB*	0000h…FFFFh	-	1 = 1
71.07	PID operation mode	*List*	0…2	-	1 = 1
71.08	Feedback 1 source	*Analog src*	-	-	1 = 1
71.11	Feedback filter time	*Real*	0.000…30.000	s	1000 = 1 s
71.14	Setpoint scaling	*Real*	-200000.00…200000.00	-	100 = 1
71.15	Output scaling	*Real*	-200000.00…200000.00	-	100 = 1
71.16	Setpoint 1 source	*Analog src*	-	-	1 = 1
71.19	Internal setpoint sel1	*Binary src*	-	-	1 = 1
71.20	Internal setpoint sel2	*Binary src*	-	-	1 = 1
71.21	Internal setpoint 1	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
71.22	Internal setpoint 2	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
71.23	Internal setpoint 3	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
71.26	Setpoint min	*Real*	-200000.00…200000.00	-	100 = 1
71.27	Setpoint max	*Real*	-200000.00…200000.00	-	100 = 1
71.31	Deviation inversion	*Binary src*	-	-	1 = 1
71.32	Gain	*Real*	0.10…100.00	-	100 = 1
71.33	Integration time	*Real*	0.0…9999.0	s	10 = 1 s
71.34	Derivation time	*Real*	0.000…10.000	s	1000 = 1 s
71.35	Derivation filter time	*Real*	0.0…10.0	s	10 = 1 s
71.36	Output min	*Real*	-200000.00…200000.00	-	10 = 1
71.37	Output max	*Real*	-200000.00…200000.00	-	10 = 1
71.38	Output freeze enable	*Binary src*	-	-	1 = 1
71.39	Deadband range	*Real*	0.0…200000.0	-	10 = 1
71.40	Deadband delay	*Real*	0.0…3600.0	s	10 = 1 s
71.58	Increase prevention	*Binary src*	-	-	1 = 1
71.59	Decrease prevention	*Binary src*	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
71.62	Internal setpoint actual	*Real*	-200000.00…200000.00	PID unit 1	100 = 1 PID unit 1
72 External PID2					
72.01	External PID act value	*Real*	-200000.00…200000.00	%	100 = 1%
72.02	Feedback act value	*Real*	-200000.00…200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
72.03	Setpoint act value	*Real*	-200000.00…200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
72.04	Deviation act value	*Real*	-200000.00…200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
72.06	PID status word	*PB*	0000h…FFFFh	-	1 = 1
72.07	PID operation mode	*List*	0…2	-	1 = 1
72.08	Feedback 1 source	*Analog src*	-	-	1 = 1
72.11	Feedback filter time	*Real*	0.000…30.000	s	1000 = 1 s
72.14	Setpoint scaling	*Real*	-200000.00…200000.00	-	100 = 1
72.15	Output scaling	*Real*	-200000.00…200000.00	-	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*	-200000.00…200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
72.22	Internal setpoint 2	*Real*	-200000.00…200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
72.23	Internal setpoint 3	*Real*	-200000.00…200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
72.26	Setpoint min	*Real*	-200000.00…200000.00	-	100 = 1
72.27	Setpoint max	*Real*	-200000.00…200000.00	-	100 = 1
72.31	Deviation inversion	*Binary src*	-	-	1 = 1
72.32	Gain	*Real*	0.10…100.00	-	100 = 1
72.33	Integration time	*Real*	0.0…9999.0	s	10 = 1 s
72.34	Derivation time	*Real*	0.000…10.000	s	1000 = 1 s
72.35	Derivation filter time	*Real*	0.0…10.0	s	10 = 1 s
72.36	Output min	*Real*	-200000.00…200000.00	-	10 = 1
72.37	Output max	*Real*	-200000.00…200000.00	-	10 = 1
72.38	Output freeze enable	*Binary src*	-	-	1 = 1

No.	Name	Type	Range	Unit	FbEq32
72.39	Deadband range	*Real*	0.0…200000.0	-	10 = 1
72.40	Deadband delay	*Real*	0.0…3600.0	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*	-200000.00…200000.00	PID Ext2 customer unit	100 = 1 PID Ext2 customer unit
73 External PID3					
73.01	External PID act value	*Real*	-200000.00…200000.00	%	100 = 1%
73.02	Feedback act value	*Real*	-200000.00…200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.03	Setpoint act value	*Real*	-200000.00…200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.04	Deviation act value	*Real*	-200000.00…200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.06	PID status word	*PB*	0000h…FFFFh	-	1 = 1
73.07	PID operation mode	*List*	0…2	-	1 = 1
73.08	Feedback 1 source	*Analog src*	-	-	1 = 1
73.11	Feedback filter time	*Real*	0.000…30.000	s	1000 = 1 s
73.14	Setpoint scaling	*Real*	-200000.00…200000.00	-	100 = 1
73.15	Output scaling	*Real*	-200000.00…200000.00	-	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*	-200000.00…200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.22	Internal setpoint 2	*Real*	-200000.00…200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.23	Internal setpoint 3	*Real*	-200000.00…200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
73.26	Setpoint min	*Real*	-200000.00…200000.00	-	100 = 1
73.27	Setpoint max	*Real*	-200000.00…200000.00	-	100 = 1
73.31	Deviation inversion	*Binary src*	-	-	1 = 1
73.32	Gain	*Real*	0.10…100.00	-	100 = 1
73.33	Integration time	*Real*	0.0…9999.0	s	10 = 1 s

No.	Name	Type	Range	Unit	FbEq32
73.34	Derivation time	*Real*	0.000…10.000	s	1000 = 1 s
73.35	Derivation filter time	*Real*	0.0…10.0	s	10 = 1 s
73.36	Output min	*Real*	-200000.00…200000.00	-	10 = 1
73.37	Output max	*Real*	-200000.00…200000.00	-	10 = 1
73.38	Output freeze enable	*Binary src*	-	-	1 = 1
73.39	Deadband range	*Real*	0.0…200000.0	-	10 = 1
73.40	Deadband delay	*Real*	0.0…3600.0	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*	-200000.00…200000.00	PID Ext3 customer unit	100 = 1 PID Ext3 customer unit
74 External PID4					
74.01	External PID act value	*Real*	-200000.00…200000.00	%	100 = 1%
74.02	Feedback act value	*Real*	-200000.00…200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.03	Setpoint act value	*Real*	-200000.00…200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.04	Deviation act value	*Real*	-200000.00…200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.06	PID status word	*PB*	0000h…FFFFh	-	1 = 1
74.07	PID operation mode	*List*	0…2	-	1 = 1
74.08	Feedback 1 source	*Analog src*	-	-	1 = 1
74.11	Feedback filter time	*Real*	0.000…30.000	s	1000 = 1 s
74.14	Setpoint scaling	*Real*	-200000.00…200000.00	-	100 = 1
74.15	Output scaling	*Real*	-200000.00…200000.00	-	100 = 1
74.16	Setpoint 1 source	*Analog src*	-	-	1 = 1
74.19	Internal setpoint sel1	*Binary src*	-	-	1 = 1
74.20	Internal setpoint sel2	*Binary src*	-	-	1 = 1
74.21	Internal setpoint 1	*Real*	-200000.00…200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.22	Internal setpoint 2	*Real*	-200000.00…200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
74.23	Internal setpoint 3	*Real*	-200000.00…200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit

No.	Name	Type	Range	Unit	FbEq32
74.26	Setpoint min	*Real*	-200000.00…200000.00	-	100 = 1
74.27	Setpoint max	*Real*	-200000.00…200000.00	-	100 = 1
74.31	Deviation inversion	*Binary src*	-	-	1 = 1
74.32	Gain	*Real*	0.10…100.00	-	100 = 1
74.33	Integration time	*Real*	0.0…9999.0	s	10 = 1 s
74.34	Derivation time	*Real*	0.000…10.000	s	1000 = 1 s
74.35	Derivation filter time	*Real*	0.0…10.0	s	10 = 1 s
74.36	Output min	*Real*	-200000.00…200000.00	-	10 = 1
74.37	Output max	*Real*	-200000.00…200000.00	-	10 = 1
74.38	Output freeze enable	*Binary src*	-	-	1 = 1
74.39	Deadband range	*Real*	0.0…200000.0	-	10 = 1
74.40	Deadband delay	*Real*	0.0…3600.0	s	10 = 1 s
74.58	Increase prevention	*Binary src*	-	-	1 = 1
74.59	Decrease prevention	*Binary src*	-	-	1 = 1
74.62	Internal setpoint actual	*Real*	-200000.00…200000.00	PID Ext4 customer unit	100 = 1 PID Ext4 customer unit
76 PFC configuration					
76.01	PFC status	*PB*	0000h…FFFFh	-	1 = 1
76.02	PFC system status	*List*	0…3, 100…103, 200…202, 300…302, 400, 500, 600, 700, 800…801, 4…9	-	1 = 1
76.11	Pump/fan status 1	*PB*	0000h…FFFFh	-	1 = 1
76.12	Pump/fan status 2	*PB*	0000h…FFFFh	-	1 = 1
76.13	Pump/fan status 3	*PB*	0000h…FFFFh	-	1 = 1
76.14	Pump/fan status 4	*PB*	0000h…FFFFh	-	1 = 1
76.21	PFC configuration	*List*	0, 2…3	-	1 = 1
76.25	Number of motors	*Real*	1…4	-	1 = 1
76.26	Min number of motors allowed	*Real*	0…4	-	1 = 1
76.27	Max number of motors allowed	*Real*	1…4	-	1 = 1
76.30	Start point 1	*Real*	0…32767	rpm/Hz	1 = 1 unit
76.31	Start point 2	*Real*	0…32767	rpm/Hz	1 = 1 unit
76.32	Start point 3	*Real*	0…32767	rpm/Hz	1 = 1 unit
76.41	Stop point 1	*Real*	0…32767	rpm/Hz	1 = 1 unit
76.42	Stop point 2	*Real*	0…32767	rpm/Hz	1 = 1 unit
76.43	Stop point 3	*Real*	0…32767	rpm/Hz	1 = 1 unit
76.55	Start delay	*Real*	0.00…12600.00	s	100 = 1 s
76.56	Stop delay	*Real*	0.00…12600.00	s	100 = 1 s
76.57	Speed hold on	*Real*	0.00…1000.00	s	100 = 1 s
		Real	0.00…1000.00	s	100 = 1 s

No.	Name	Type	Range	Unit	FbEq32
76.58	Speed hold off	*Real*	0.00…1000.00	s	100 = 1 s
		Real	0.00…1000.00	s	100 = 1 s
76.59	PFC contactor delay	*Real*	0.20…600.00	s	100 = 1 s
76.60	PFC ramp acceleration time	*Real*	0.00…1800.00	s	100 = 1 s
76.61	PFC ramp deceleration time	*Real*	0.00…1800.00	s	100 = 1 s
76.70	Autochange	*List*	0…13	-	1 = 1
76.71	Autochange interval	*Real*	0.00…42949672.95	h	100 = 1 h
76.72	Maximum wear imbalance	*Real*	0.00…1000000.00	h	100 = 1 h
76.73	Autochange level	*Real*	0.0…300.0	%	10 = 1%
76.74	Autochange auxiliary PFC	*List*	0…1	-	1 = 1
76.81	PFC 1 interlock	*List*	0…10	-	1 = 1
76.82	PFC 2 interlock	*List*	0…10	-	1 = 1
76.83	PFC 3 interlock	*List*	0…10	-	1 = 1
76.84	PFC 4 interlock	*List*	0…10	-	1 = 1
76.95	Regulator bypass control	*Binary src*	-	-	-
77 PFC maintenance and monitoring					
77.10	PFC runtime change	*List*	0…5	-	1 = 1
77.11	Pump/fan 1 running time	*Real*	0.00…42949672.95	h	100 = 1 h
77.12	Pump/fan 2 running time	*Real*	0.00…42949672.95	h	100 = 1 h
77.13	Pump/fan 3 running time	*Real*	0.00…42949672.95	h	100 = 1 h
77.14	Pump/fan 4 running time	*Real*	0.00…42949672.95	h	100 = 1 h
80 Flow calculation					
80.01	Actual flow	*Real*	-10000.00…10000.00	-	100 = 1
80.02	Actual flow percentage	*Real*	-100.00…100.00	%	100 = 1
80.11	Flow feedback 1 source	*List*	0…3, 8…10,	-	1 = 1
80.12	Flow feedback 2 source	*List*	0…3, 8…10,	-	1 = 1
80.13	Flow feedback function	*List*	0…1, 8…9,	-	1 = 1
80.14	Flow feedback multiplier	*Real*	-200000.00…200000.00	-	100 = 1
80.15	Maximum flow	*Real*	-200000.00…200000.00	-	100 = 1
94 LSU control					
(Parameters 94.01…94.41 only visible for ACH580-31)					
94.01	LSU control	*List*	0…1	-	1 = 1
94.02	LSU panel communication	*List*	0…1	-	1 = 1
94.10	LSU max charging time	*Real*	0…65535	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, 2…3	-	1 = 1
95.02	Adaptive voltage limits	*List*	0…1	-	1 = 1
95.03	Estimated AC supply voltage	*Real*	0…65535	V	1 = 1 V
95.04	Control board supply	*List*	0…1	-	1 = 1
95.15	Special HW settings	*PB*	00000000h…FFFFFFFFh	-	1 = 1
95.20	HW options word 1	*PB*	0000h…FFFFh	-	1 = 1
95.21	HW options word 2	*PB*	0000h…FFFFh	-	1 = 1
96 System					
96.01	Language	*List*	-	-	1 = 1
96.02	Pass code	*Data*	0…99999999	-	1 = 1
96.03	Access level status	*PB*	00000000h…FFFFFFFFh	-	1 = 1
96.04	Macro select	*List*	0…1	-	1 = 1
96.05	Macro active	*List*	1	-	1 = 1
96.06	Parameter restore	*List*	0, 2, 8, 32, 62, 512, 1024, 34560	-	1 = 1
96.07	Parameter save manually	*List*	0…1	-	1 = 1
96.08	Control board boot	*List*	0…1	-	1 = 1
96.10	User set status	*List*	0…7, 20…23	-	1 = 1
96.11	User set save/load	*List*	0…5, 18…21	-	1 = 1
96.12	User set I/O mode in1	*Binary src*	-	-	-
96.13	User set I/O mode in2	*Binary src*	-	-	-
96.16	Unit selection	*PB*	0000h…FFFFh		1 = 1
96.20	Time sync primary source	*List*	0, 2, 6, 8, 9	-	1 = 1
96.51	Clear fault and event logger	*Real*	0…1	-	1 = 1
96.54	Checksum action	*List*	0…4	-	1 = 1
96.55	Checksum control word	*PB*	0000h…FFFFh	-	1 = 1
96.68	Actual checksum A	*PB*	00000000h…FFFFFFFFh	-	1 = 1
96.69	Actual checksum B	*PB*	00000000h…FFFFFFFFh	-	1 = 1
96.70	Disable adaptive program	*List*	0…1	-	1 = 1
96.71	Approved checksum A	*PB*	00000000h…FFFFFFFFh	-	1 = 1
96.72	Approved checksum B	*PB*	00000000h…FFFFFFFFh	-	1 = 1
96.78	550 Compatibility mode	*List*	0…1	-	1 = 1
96.100	Change user pass code	*Data*	10000000…99999999	-	1 = 1
96.101	Confirm user pass code	*Data*	10000000…99999999	-	1 = 1
96.102	User lock functionality	*PB*	0000h…FFFFh	-	1 = 1
(Parameter 96.108 only visible only visible for ACH580-31)					
96.108	LSU control board boot	*Real*	0…1	-	1 = 1
97 Motor control					
97.01	Switching frequency reference	*List*	2, 4, 8, 12	kHz	1 = 1 kHz

No.	Name	Type	Range	Unit	FbEq32
97.02	Minimum switching frequency	*List*	1.5, 2, 4, 8, 12	kHz	1 = 1 kHz
97.03	Slip gain	*Real*	0…200	%	1 = 1%
97.04	Voltage reserve	*Real*	-4…50	%	1 = 1%
97.05	Flux braking	*List*	0…2	-	1 = 1
97.08	Optimizer minimum torque	*Real*	0.0 … 1600.0	%	10 = 1%
97.10	Signal injection	*List*	0…4	-	1 = 1
97.11	TR tuning	*Real*	25…400	%	1 = 1%
97.13	IR compensation	*Real*	0.00…50.00	%	100 = 1%
97.15	Motor model temperature adaptation	*List*	0…1	-	1 = 1
97.16	Stator temperature factor	*Real*	0…200	%	1 = 1%
97.17	Rotor temperature factor	*Real*	0…200	%	1 = 1%
97.20	U/F ratio	*List*	0…1	-	1 = 1
97.49	Slip gain for scalar	*Real*	0 …200	%	1 = 1%
97.94	IR comp max frequency	*Real*	1.0 …1000.0	%	1 = 1%
98 User motor parameters					
98.01	User motor model mode	*List*	0…1	-	1 = 1
98.02	Rs user	*Real*	0.0000…0.50000	p.u.	100000 = 1 p.u.
98.03	Rr user	*Real*	0.0000…0.50000	p.u.	100000 = 1 p.u.
98.04	Lm user	*Real*	0.00000…10.00000	p.u.	100000 = 1 p.u.
98.05	SigmaL user	*Real*	0.00000…1.00000	p.u.	100000 = 1 p.u.
98.06	Ld user	*Real*	0.00000…10.00000	p.u.	100000 = 1 p.u.
98.07	Lq user	*Real*	0.00000…10.00000	p.u.	100000 = 1 p.u.
98.08	PM flux user	*Real*	0.00000…2.00000	p.u.	100000 = 1 p.u.
98.09	Rs user SI	*Real*	0.00000…100.00000	ohm	100000 = 1 p.u.
98.10	Rr user SI	*Real*	0.00000…100.00000	ohm	100000 = 1 p.u.
98.11	Lm user SI	*Real*	0.00…100000.00	mH	100 = 1 mH
98.12	SigmaL user SI	*Real*	0.00…100000.00	mH	100 = 1 mH
98.13	Ld user SI	*Real*	0.00…100000.00	mH	100 = 1 mH
98.14	Lq user SI	*Real*	0.00…100000.00	mH	100 = 1 mH
99 Motor data					
99.03	Motor type	*List*	0…2	-	1 = 1
99.04	Motor control mode	*List*	0…1	-	1 = 1
99.06	Motor nominal current	*Real*	0.0…6400.0	A	10 = 1 A
99.07	Motor nominal voltage	*Real*	0.0…960.0	V	10 = 1 V

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*	0.00…10000.00 kW or 0.00 … 13404.83 hp	kW or hp	100 = 1 unit
99.11	Motor nominal cos Φ	*Real*	0.00 … 1.00	-	100 = 1
99.12	Motor nominal torque	*Real*	0.000…4000000.000 N·m or 0.000…2950248.597 lb·ft	N·m or lb·ft	1000 = 1 unit
99.13	ID run requested	*List*	0…3, 6	-	1 = 1
99.14	Last ID run performed	*List*	0…3, 6	-	1 = 1
99.15	Motor polepairs calculated	*Real*	0…1000	-	1 = 1
99.16	Motor phase order	*List*	0…1	-	1 = 1