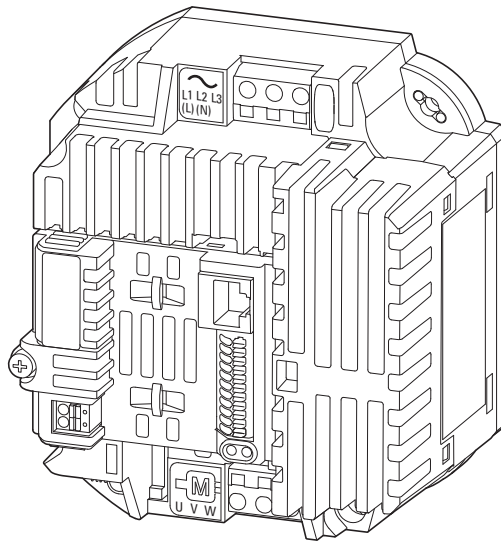


PowerXL™

DB1

Variable Frequency Drives

Parameter Manual



Powering Business Worldwide

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Original operating manual

The German-language edition of this document is the original operating manual.

Translation of the original operating manual

All editions of this document other than those in German language are translations of the original operating manual.

1. Edition 2017, publication date 09/17

© 2017 by Eaton Industries GmbH, 53105 Bonn, Germany

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Subject to alteration.



Danger! **Dangerous electrical voltage!**

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices cannot be accidentally retriggered.
- Verify isolation from the supply.
- Ground and short-circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions (IL) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalizing. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O connection so that a cable or wire breakage on the signal side does not result in undefined states in the automation device.
- Ensure a reliable electrical isolation of the low voltage for the 24 V supply. Only use power supply units complying with IEC 60364-4-41 or HD 384.4.41 S2 (VDE 0100 part 410).
- Deviations of the mains voltage from the nominal value must not exceed the tolerance limits given in the technical data, otherwise this may cause malfunction and dangerous operation.
- Emergency-Stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency switching off devices must not cause restart.
- Built-in devices for enclosures or cabinets must only be run and operated in an installed state, desk-top devices or portable devices only when the housing is closed.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency switching off devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks, etc.).
- During operation, and depending on their degree of protection, variable frequency drives may have live, uninsulated, moving, and/or rotating parts, as well as hot surfaces.
- The impermissible removal of the required cover, improper installation or incorrect operation of the motor or variable frequency drive can cause the failure of the device and serious injury and/or material damage.
- Comply with all applicable national accident prevention regulations (e.g. BGV A3) when working with energized variable frequency drives.
- The electrical installation must be carried out in accordance with the relevant regulations (e.g. with regard to cable cross sections, fuses, PE).
- All transport, installation, commissioning and maintenance work must only be carried out by trained personnel (observe IEC 60364, HD 384 or DIN VDE 0100 and national accident prevention regulations).
- If applicable, systems in which variable frequency drives are installed must be equipped with additional monitoring and protective devices in accordance with the applicable safety regulations, e.g., the German Equipment and Product Safety Act, accident prevention regulations, etc. Making changes to the variable frequency drives by using the operating software is allowed.
- Keep all covers and doors closed during operation.
- When designing the machine, the user must incorporate mechanisms and measures that limit the consequences of a drive controller malfunction or failure (an increase in motor speed or the motor's sudden stop) so as to prevent hazards to people and property, e.g.:
 - Additional stand-alone devices for monitoring parameters that are relevant to safety (speed, travel, end positions, etc.)
 - Electrical and non-electrical safety devices (interlocks or mechanical locks) for mechanisms that protect the entire system
 - Due to the possibility of there being capacitors that are still holding a charge, do not touch live device parts or terminals immediately after disconnecting the variable frequency drives from the supply voltage. Heed the corresponding labels on the variable frequency drives

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0 About This Manual

This manual provides special information that is intended to enable you to configure the parameters for a DB1 variable frequency drive according to your needs.

The details apply to the indicated hardware and software versions.



For a general description (installation, technical data, etc.) of DB1 variable frequency drives, please refer to manual MN040031EN ("Installation Manual").

0.1 Target group

This MN040034EN manual is intended for engineers and electricians. Electrical engineering and physics-related knowledge and skills will be required in order to be able to commission the corresponding devices.

We assume that you have a good knowledge of engineering fundamentals and that you are familiar with handling electrical systems and machines, as well as with reading technical drawings.

0.2 List of revisions

The following significant amendments have been introduced since previous issues:

Publication date	Page	Keyword	new	modified	deleted
09/17		First edition	–	–	–

0.3 Writing conventions

Symbols with the following meaning are used in this manual:

- ▶ Indicates instructions to be followed.

0.3.1 Hazard warnings of material damages

ATTENTION

Warns about the possibility of material damage.

0.3.2 Hazard warnings of personal injury



WARNING

Warns of the possibility of hazardous situations that may possibly cause slight injury.



WARNING

Warns of the possibility of hazardous situations that could result in serious injury or even death.



DANGER

Warns of hazardous situations that result in serious injury or death.

0.3.3 Helpful hints



Indicates useful tips.



All the specifications in this manual refer to the hardware and software versions documented in it.



More information on the devices described here can be found on the Internet under:

www.eaton.eu/powerxl

as well as:

www.eaton.eu/documentation

1 General

1.1 Parameter Groups

The functions of variable frequency drive DB1 are configured using parameters that are divided into five groups (P00-01 to P00-30, P00-31 to P00-50, P-01 to P-14, P-15 to P-59, and P-60 to P-68):

Table 1: Parameter Groups

Parameter group	Topic
P00-01 – P00-30	Monitor
P00-31 – P00-50	Monitor Advanced
P-01 – P-14	Basic
P-15 – P-59	Extended
P-60 – P-68	Advanced



The following page (“Menu structure”) features a diagram showing how to switch between parameter groups.

Default settings

By default (= unit as supplied), only parameter group 1 (“Basic”) will be accessible.

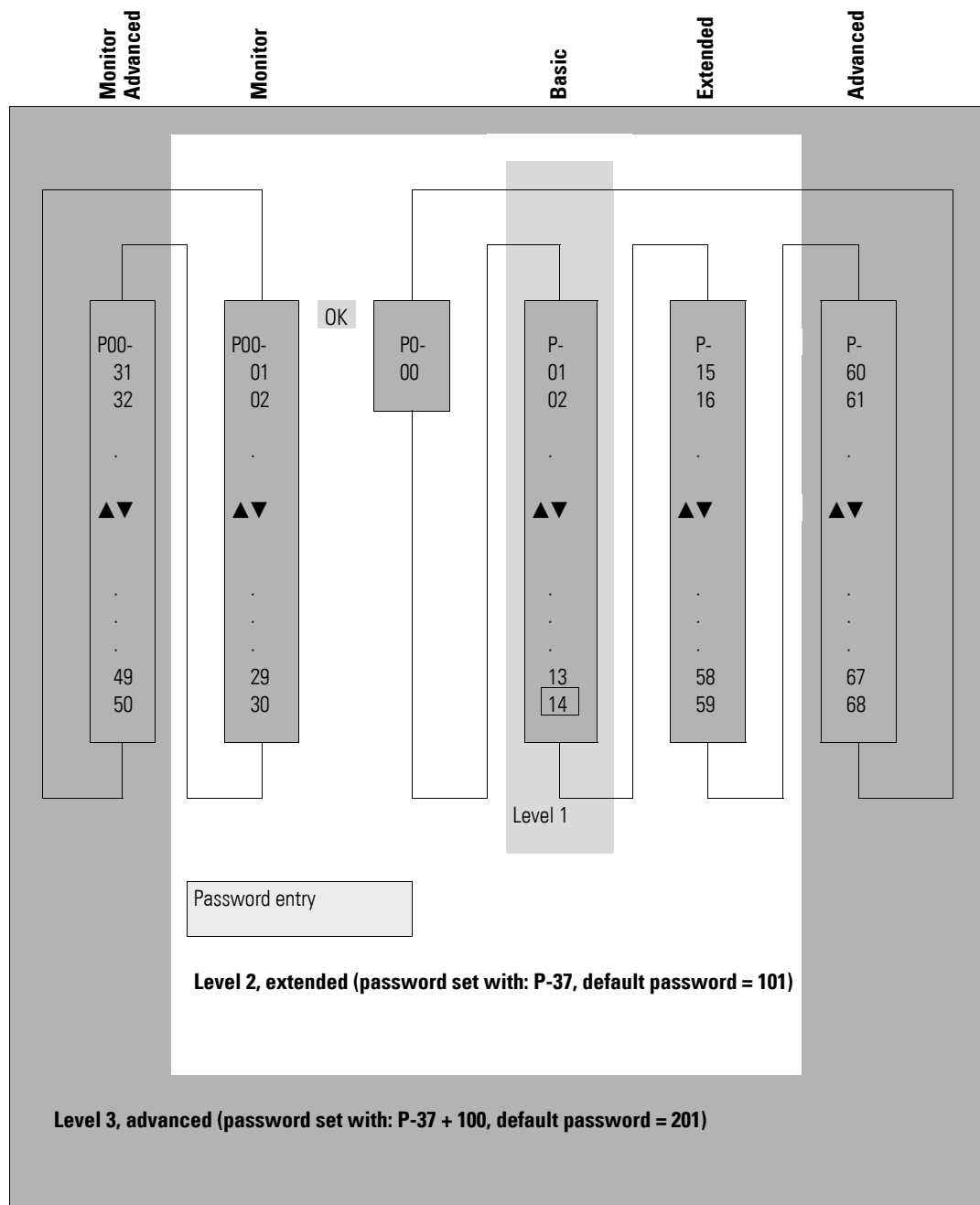
Extended parameter set

By entering a password in parameter P-14, Level 2 (“Extended”) can be accessed.

The default password is:

- Access to level 2: 101
Users can change this password as required:
- Password for level 2 with: P-37
- Advanced parameter set:
Can be accessed by entering the password for level 2 (P-37 + 100)

1.2 Menu structure



2 Keypad

The devices of the DB1 range can be configured using the optional keypads DX-KEY-LED2 and DX-KEY -OLED. They are connected to the device using an RJ45 patch cable.

2.1 Operating unit elements

The following diagram shows the elements of the external keypad DX-KEY-LED2.

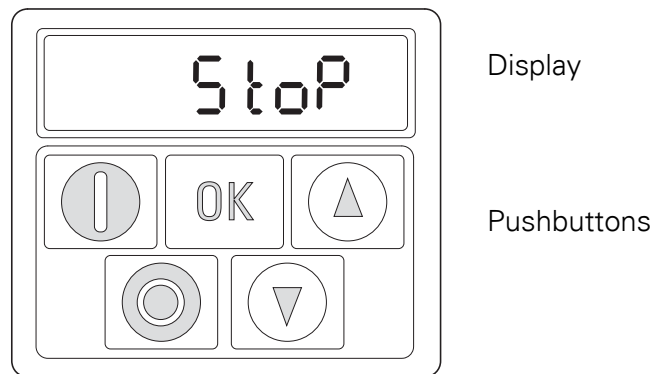







Figure 1: Operating unit view

Table 2: Keypad elements – Buttons

Button	Command	Explanation
	OK	<ul style="list-style-type: none"> Opens and closes the parameter interface Saves parameter values
	START	<ul style="list-style-type: none"> Starting the variable frequency drive¹⁾ Changing the operating direction²⁾
	STOP	<ul style="list-style-type: none"> Stopping the variable frequency drive¹⁾ Reset – Resetting after an error message
	UP	<ul style="list-style-type: none"> Accelerating¹⁾ Increases the parameter value
	DOWN	<ul style="list-style-type: none"> Decelerating¹⁾ Decreases the parameter value

Note:


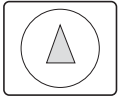
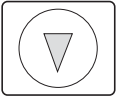

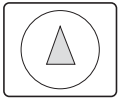
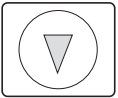


- 1) Only if P-12 = 1 (one operating direction) or = 2 (two operating directions)
- 2) Only if P-12 = 2

2 Keypad

2.2 Adjust parameters



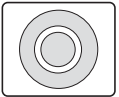
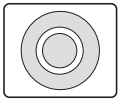
2.2 Adjust parameters

Table 3: Navigating within the keypad

Commands	Description
	Press the OK button and hold it down for two seconds in order to access the parameter interface → The display will show the parameter that was last used.
 	Use the ▲ and ▼ buttons to select a parameter
	Press the OK button.
 	Use the ▲ and ▼ buttons to change the parameter's value
	Press the OK button to confirm the parameter value change.
	Press the OK button and hold it down for two seconds in order to exit the parameter interface
Navigating between parameter groups	
	The parameters are in sequential order. This means that moving forward from the last parameter in a parameter group will take you to the first parameter in the next parameter group and the other way around.


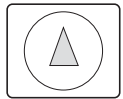
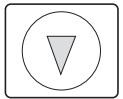

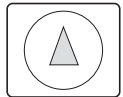
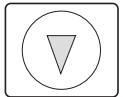

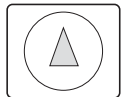
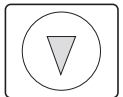

2.3 Resetting Parameters (RESET)

Table 4: Resetting parameters (RESET)

Commands	Description
Reset to default settings	
  	Press the ▲ and ▼ and STOP buttons and hold them down for two seconds → All parameters will be reset to their factory settings. The keypad displays <i>P - DEF</i> .
Resetting after a fault	
	Press the STOP button to reset the unit after a fault

2.4 Extended parameter set

Table 5: Enabling and disabling access to the extended parameter set





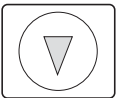


Commands	Description
Enabling access to the extended parameter set	
	Press the OK button and hold it down for two seconds in order to access the parameter interface → The display will show the parameter that was last used.
 	Use the ▲ and ▼ buttons to select parameter P-14
	Press the OK button.
 	Use the ▲ and ▼ buttons to enter the password set with P-37 (default setting: 101)
	Press the OK button to confirm → The extended parameter set (Parameter > P-14 and display value P00-...) is now available.
Disabling access to the extended parameter set	
 	Use the ▲ and ▼ buttons to set a value for P-14 that does not match the password (P-37).
	Press the OK button to confirm → Only the "basic parameters," i.e., parameters P-01 to P-14, will be available now.



The extended parameter set (default setting P-37 = 101) includes all parameters, from P-01 to P-59. Additional parameters (up to P-68) can be configured for specific applications. The password that needs to be entered in P-14 is equal to the value yielded by P-37 + 100.




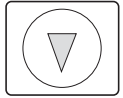
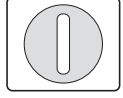

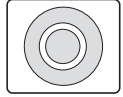
2.5 "Monitor" submenu

Table 6: "Monitor" submenu

Commands	Description
Accessing the "Monitor" submenu	
 	Parameter Level 2 must be approved with P-14. Use the ▲ and ▼ buttons to select parameter P-00.
	Press the OK button. → The submenu with P00-01 to P00-30 is now accessible. Note: The parameter range from P00-01 to P00-50 is available in the menu for advanced users (level 3).
Navigating within the "Monitor" submenu	
 	Use the ▲ and ▼ buttons to select parameter P00-01 to P00-30 (or to P00-50 at Level 3).
	Press the OK button to confirm.
Exiting the "Monitor" submenu	
	Press the OK button (several times if necessary). → Only parameter P-00 is available now.

2.6 Control via keypad

Table 7: Control via keypad

Button	Command	Explanation
	OK	P-12 = 1 or = 2 <ul style="list-style-type: none"> • P-12 = 1: one operating direction (FWD) • P-12 = 2: two operating directions (FWD/REV)
	START	Starts the variable frequency drive
 		▲ Accelerate ▼ Decrease speed
	START	Changes the operating direction if the motor is running Note: P-12 = 2 only
	OK	Changes the value being displayed: A, rpm, etc.
	STOP	Stops the variable frequency drive

Note:


In this mode, a high-level signal must be applied at terminal 2 (DI1) as an enable signal for the DB1 variable frequency drive.

3 Control signal terminals

3.1 Correspondence between inputs/outputs and terminals

3 Control signal terminals

3.1 Correspondence between inputs/outputs and terminals

Input/Output	Terminals
Inputs	
DI1	Terminal 2
DI2	Terminal 3
DI3/AI2	Terminal 4
DI4/AI1	Terminal 6
Outputs	
AO1/DO1	Terminal 8
RO1 (relay, N/O)	

Parameter P-15 can be used to select the configuration for the control signal terminals. More specifically, you can select predefined terminal configurations by setting P-15 to a value between 0 and 8.

The setting (digital/analog) for terminals 4 and 6 will be configured automatically based on the value set for P-15.

3.1 Correspondence between inputs/outputs and terminals

The following abbreviations are used throughout this document:

Table 8: Abbreviations

Abbreviation	Meaning
AI1 REF	Analog input AI1 (terminal 6) Used as a speed setpoint input <ul style="list-style-type: none"> • P-16: Configuration (voltage input, current input, etc.) • P-35: Scaling • P-39: Offset
AI2 REF	Analog input AI2 (terminal 4) Used as a speed setpoint input. <ul style="list-style-type: none"> • P-47: Configuration (voltage input, current input, etc.)
DIR	Used to select an operating direction Used together with the START command. <ul style="list-style-type: none"> • Low = Forward (FWD) • High = Reverse (REV) <p>Note: If there is a wire breakage and the REV operating direction is selected, this will cause the drive to reverse! Alternative: Use configuration with FWD/REV.</p>
DOWN	Used to reduce the speed if a digital setpoint value is selected (P-12 = 1 or = 2). Used together with the UP command.
ENA	Variable frequency drive enable signal A start signal (START, FWD, REV) is additionally required for starting. If ENA is removed, the drive will coast.
EXTFLT	External fault This enables an external signal to be incorporated into the variable frequency drive error messages. A high-level signal must be present on the terminal during operation. A low-level signal causes the drive to switch off with an $E - E r , P$ error message.
FWD	Used to start the drive in the forward direction (FWD = Forward) If a high-level signal is applied at the corresponding terminal, the drive will accelerate with the selected ramp. Removing the signal will cause the drive to stop. In this case, the specific way in which it stops will depend on the value set for P1-05 (stop mode). Once the variable frequency drive stops, it will be locked. In applications with two operating directions, the reverse direction can be selected with REV. FWD and REV are XOR'd. If both signals are applied simultaneously, the drive will ramp down to zero with the quick stop ramp (P-24).
INV	Used to reverse the operating direction The operating direction will be reversed as per the configured ramps: Low = do not reverse, High = reverse
Pulse FWD (NO) Pulse REV (NO) Pulse STOP (NC)	Pulse control Used to control the drive like a latching reversing contactor circuit. The Pulse STOP signal must always be present when operating the drive. If the signal is not present, it will not be possible to start the drive / the drive will ramp down to zero. To start, all that is required is a pulse via the FWD (forward) or REV (reverse) signal. The FWD and REV signals do not need to be continuously applied during operation.
REV	Used to start the drive in the reverse direction (REV = Reverse) If a high-level signal is applied at the corresponding terminal, the drive will accelerate with the selected ramp. Removing the signal will cause the drive to stop. In this case, the specific way in which it stops will depend on the value set for P-05 (stop mode). Once the variable frequency drive stops, it will be locked. In applications with two operating directions, the forward direction is selected with FWD. FWD and REV are XOR'd. If both signals are applied simultaneously, the drive will ramp down to zero with the quick stop ramp (P-24).
Select AI1 REF/AI2 REF	Used to select between the analog setpoint values on AI1 (terminal 6) and AI2 (terminal 4) <ul style="list-style-type: none"> • AI1 = Low • AI2 = High
Select AI1 REF/f-Fix	Used to select between the analog speed setpoint value at analog input 1 (AI1 = terminal 6) and a fixed frequency. The fixed frequency itself can be selected with the Select f-Fix Bit0, Select f-Fix Bit1, Select f-Fix Bit2 commands. <ul style="list-style-type: none"> • Low = Analog setpoint value • High = fixed frequency

3 Control signal terminals

3.1 Correspondence between inputs/outputs and terminals

Abbreviation	Meaning															
Select AI1 REF/f-Fix1	Used to select between the analog speed setpoint value at analog input 1 (AI1 = terminal 6) and fixed frequency 1 (f-Fix1), which is set with P-20. <ul style="list-style-type: none"> Low = Analog setpoint value High = f-Fix1 															
Select AI1 REF/f-Fix2	Used to select between the analog speed setpoint value at analog input 1 (AI1 = terminal 6) and the fixed frequency (f-Fix2) set with P-21. <ul style="list-style-type: none"> Low = Analog setpoint value High = f-Fix2 															
Select BUS REF/AI1 REF	Used to select between setpoint values <ul style="list-style-type: none"> Low = Setpoint value from bus High = AI1 															
Select BUS REF/DIG REF	Used to select between setpoint values <ul style="list-style-type: none"> Low = Setpoint value from bus High = Digital setpoint value 															
Select BUS REF/f-Fix	Used to select between setpoint values <ul style="list-style-type: none"> Low = Setpoint value from bus High = fixed frequency The fixed frequency itself is selected with the Select f-Fix Bit0, Select f-Fix Bit1 commands.															
Select BUS REF/f-Fix1	Used to select between the setpoint value from the bus and fixed frequency 1 (f-Fix1), which is set with P-20 <ul style="list-style-type: none"> Low = Setpoint value from bus High = f-Fix1 															
Select BUS REF/f-Fix4	Used to select between the setpoint value from the bus and fixed frequency 4 (f-Fix4), which is set with P-23 <ul style="list-style-type: none"> Low = Setpoint value from bus High = f-Fix4 															
Select DIG REF/AI1 REF	Used to select between the digital speed setpoint value, set with the keypad or with the UP and DOWN commands, and analog setpoint value AI1 REF (terminal 6). <ul style="list-style-type: none"> Low = Digital setpoint value High = AI1 															
Select DIG REF/f-Fix1	Used to select between the digital speed setpoint value, set with the keypad or with the UP and DOWN commands, and fixed frequency 1 (f-Fix1) set with P-20. <ul style="list-style-type: none"> Low = Digital setpoint value High = f-Fix1 															
Select DIG REF/f-Fix4	Used to select between the digital speed setpoint value (set with the keypad or with the UP and DOWN commands) and fixed frequency 4 (f-Fix4), which is set with P-23. <ul style="list-style-type: none"> Low = Digital setpoint value High = f-Fix4 															
Select f-Fix Bit0/f-Fix Bit1	Used to select a fixed frequency with digital commands Fixed frequencies f-Fix1 to f-Fix4 are defined with parameters P-20 up to P-23. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Fixed frequency</th> <th>Bit 1</th> <th>Bit 0</th> </tr> </thead> <tbody> <tr> <td>f-Fix1 (P-20)</td> <td>0</td> <td>0</td> </tr> <tr> <td>f-Fix2 (P-21)</td> <td>0</td> <td>1</td> </tr> <tr> <td>f-Fix3 (P-22)</td> <td>1</td> <td>0</td> </tr> <tr> <td>f-Fix4 (P-23)</td> <td>1</td> <td>1</td> </tr> </tbody> </table> <p>0 = Low 1 = High</p>	Fixed frequency	Bit 1	Bit 0	f-Fix1 (P-20)	0	0	f-Fix2 (P-21)	0	1	f-Fix3 (P-22)	1	0	f-Fix4 (P-23)	1	1
Fixed frequency	Bit 1	Bit 0														
f-Fix1 (P-20)	0	0														
f-Fix2 (P-21)	0	1														
f-Fix3 (P-22)	1	0														
f-Fix4 (P-23)	1	1														
Select f-Fix/BUS REF	Used to select between a fixed frequency and the setpoint value from the bus. <ul style="list-style-type: none"> Low = Fixed frequency High = Setpoint value from bus 															
Select f-Fix/DIG REF	Used to select between a fixed frequency and the digital setpoint value, which is set with the keypad or with the UP and DOWN commands. <ul style="list-style-type: none"> Low = Fixed frequency High = Digital setpoint value 															

3.1 Correspondence between inputs/outputs and terminals

Abbreviation	Meaning
Select f-Fix/f-max	Used to select between a fixed frequency and the maximum speed set with P-01. <ul style="list-style-type: none"> • Low = Fixed frequency • High = maximum speed <p>The fixed frequency itself is selected with the Select f-Fix Bit0 or Select f-Fix Bit1 commands.</p>
Select f-Fix2/f-Fix4	Used to select between f-Fix2 and f-Fix4 <ul style="list-style-type: none"> • Low = f-Fix2 • High = f-Fix4
Select f-Fix4/AI1 REF	Used to select between f-Fix4 and the analog setpoint value (terminal 6) <ul style="list-style-type: none"> • Low = f-Fix4 • High = Analog setpoint value
Select f-Fix4/BUS REF	Used to select between fixed frequency f-Fix4 (P-23) and the setpoint value from the bus <ul style="list-style-type: none"> • Low = f-Fix4 • High = Setpoint value from bus
Select f-Fix4/DIG REF	Used to select between fixed frequency f-Fix4 (P-23) and the digital setpoint value, which is set with the keypad or with the UP and DOWN commands. <ul style="list-style-type: none"> • Low = f-Fix4 • High = Digital setpoint value
Select f-Fix4/f-Fix2	Used to select between f-Fix4 and f-Fix2 <ul style="list-style-type: none"> • Low = f-Fix4 • High = f-Fix2
Select f-Fix4/PI REF	Used to select between fixed frequency 4 (f-Fix4) and the setpoint value from the PI controller's output <ul style="list-style-type: none"> • Low = f-Fix4 • High = Setpoint value from PI controller output
Select Fire Mode/Normal OP	The fire mode function allows the variable frequency drive to keep running in emergency situations until it is no longer able to work. When this mode is selected, drive fault signals will be ignored. <ul style="list-style-type: none"> • Low = Fire mode • High = Normal mode
Select PI REF/AI1 REF	Used to select between setpoint values <ul style="list-style-type: none"> • Low = setpoint from the PI controller's output • High = AI1
Select PI REF/f-Fix1	Used to select between setpoint values <ul style="list-style-type: none"> • Low = setpoint from the PI controller's output • High = f-Fix1, set with P-20.
Select t-dec/t-Quick-dec	This command must be present (there must be a high-level signal at the corresponding terminal) in order to be able to run the variable frequency drive. If the signal is removed (low level), the unit will immediately do a quick stop with the ramp defined in P-24.
START	Used to start/stop the drive If a high-level signal is applied at the corresponding terminal, the drive will accelerate with the selected ramp. Removing the signal will cause the drive to stop. In this case, the specific way in which it stops will depend on the value set for P-05 (stop mode). Once the variable frequency drive stops, it will be locked. In applications with two operating directions, the directions are selected using the DIR and INV commands.
START INV	In applications in which the keypad is used to set a setpoint value: When the START command is issued, the drive will start running in the operating direction that was last selected. If START INV is used to start the drive, the drive will run in the opposite direction.
UP	Used to increase the speed if a digital setpoint is selected (P-12 = 1 or = 2). Used together with the DOWN command.

3 Control signal terminals

3.2 Configuration of the control signal terminals

3.2 Configuration of the control signal terminals

3.2.1 P-12 = 0: Terminal mode

Table 9: P-12 = 0: Terminal mode

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	DIR	Select AI1 REF/f-Fix1	AI1 REF
1	FWD	Select AI1 REF/f-Fix	Select f-Fix Bit0	AI1 REF
2	FWD	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix/f-max
3	FWD	Select AI1 REF/f-Fix1	EXTFLT	AI1 REF
4	FWD	Select AI1 REF/AI2 REF	AI2 REF	AI1 REF
5	FWD	REV	Select AI1 REF/f-Fix1	AI1 REF
6	START	DIR	EXTFLT	AI1 REF
7	FWD	REV	EXTFLT	AI1 REF
8	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1
9	FWD	REV	Select f-Fix Bit0	Select f-Fix Bit1
10	Pulse FWD (NO)	Pulse STOP (NC)	Select AI1 REF/f-Fix1	AI1 REF
11	Pulse FWD (NO)	Pulse STOP (NC)	Pulse REV (NO)	AI1 REF
12	FWD	Select t-dec/t-QuickDec	Select AI1 REF/f-Fix1	AI1 REF
13	FWD	Select f-Fix Bit0	EXTFLT	Select f-Fix Bit1
14	Pulse FWD (NO)	Pulse STOP (NC)	Pulse REV (NO)	Select DIG REF/f-Fix1
15	FWD	Select f-Fix4/AI1 REF	Select Fire Mode/Normal OP	AI1 REF
16	FWD	Select f-Fix4/f-Fix2	Select Fire Mode/Normal OP	DIR
17	FWD	Select f-Fix Bit0	Select Fire Mode/Normal OP	Select f-Fix Bit1

The setpoint and the control commands are set/assigned via terminals.

3.2.2 P-12 = 1 Digital setpoint, 1 operating direction

Table 10: P-12 = 1: Digital setpoint, 1 operating direction

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	UP	DOWN	DIR
1	Not permissible			
2	FWD	UP	DOWN	Select DIG REF/f-Fix1
3	FWD	UP	EXTFLT	DOWN
4	START	UP	Select DIG REF/AI1 REF	AI1 REF
5	Not permissible			
6	START	DIR	EXTFLT	Select DIG REF/f-Fix1
7	FWD	REV	EXTFLT	Select DIG REF/f-Fix1
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	FWD	No function	EXTFLT	No function
14	Not permissible			
15	FWD	Select f-Fix/DIG REF	Select Fire Mode/Normal OP	Select f-Fix4/f-Fix2
16	FWD	Select f-Fix4/DIG REF	Select Fire Mode/Normal OP	DIR
17	FWD	Select DIG REF/f-Fix4	Select Fire Mode/Normal OP	DIR

The setpoint value is set using the keypad = digital setpoint value.
The arrow buttons are used to adjust the setpoint value.

3 Control signal terminals

3.2 Configuration of the control signal terminals

3.2.3 P-12 = 2: Digital setpoint, two operating directions

Table 11: P-12 = 2: Digital setpoint, 2 operating directions

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	UP	DOWN	DIR
1	Not permissible			
2	FWD	UP	DOWN	Select DIG REF/f-Fix1
3	FWD	UP	EXTFLT	DOWN
4	START	UP	Select DIG REF/AI1 REF	AI1 REF
5	Not permissible			
6	START	DIR	EXTFLT	Select DIG REF/f-Fix1
7	FWD	REV	EXTFLT	Select DIG REF/f-Fix1
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	FWD	No function	EXTFLT	No function
14	Not permissible			
15	FWD	Select f-Fix/DIG REF	Select Fire Mode/Normal OP	Select f-Fix4/f-Fix2
16	FWD	Select f-Fix4/DIG REF	Select Fire Mode/Normal OP	DIR
17	FWD	Select DIG REF/f-Fix4	Select Fire Mode/Normal OP	DIR

The setpoint value is set using the keypad = digital setpoint value.
The arrow buttons are used to adjust the setpoint value.

P-12 = 2: If the motor is running, pressing the green button again will reverse the operating direction. The last operating direction will be stored when the unit is switched off.

3 Control signal terminals
3.2 Configuration of the control signal terminals

3.2.4 P-12 = 3: Control via Modbus with internal acceleration and deceleration ramps

Table 12: P-12 = 3: Control via Modbus with internal acceleration and deceleration ramps

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	START	Select BUS REF/f-Fix	Select f-Fix Bit0	No function
6	START	Select BUS REF/AI1 REF	EXTFLT	AI1 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function
14	Not permissible			
15	FWD	Select f-Fix/BUS REF	Select Fire Mode/Normal OP	Select f-Fix4/f-Fix2
16	FWD	Select f-Fix4/BUS REF	Select Fire Mode/Normal OP	No function
17	FWD	Select BUS REF/f-Fix4	Select Fire Mode/Normal OP	No function

3 Control signal terminals

3.2 Configuration of the control signal terminals

3.2.5 P-12 = 4: Control via Modbus, ramps via Modbus

Table 13: P-12 = 4: Control via Modbus, ramps via Modbus

P-15	D11 (terminal 2)	D12 (terminal 3)	D13/A12 (terminal 4)	D14/A11 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	START	Select BUS REF/f-Fix	Select f-Fix Bit0	No function
6	START	Select BUS REF/A11 REF	EXTFLT	A11 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function
14	Not permissible			
15	FWD	Select f-Fix/BUS REF	Select Fire Mode/Normal OP	Select f-Fix4/f-Fix2
16	FWD	Select f-Fix4/BUS REF	Select Fire Mode/Normal OP	No function
17	FWD	Select BUS REF/f-Fix4	Select Fire Mode/Normal OP	No function

3.2.6 P-12 = 5: PI controller

Table 14: P-12 = 5: PI controller

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	FWD	Select PI REF/f-Fix1	PI feedback	No function
1	FWD	Select PI REF/AI1 REF	PI feedback	AI1 REF
2	Not permissible			
3	FWD	Select PI REF/f-Fix1	EXTFLT	PI feedback
4	Not permissible			
5	Not permissible			
6	Not permissible			
7	Not permissible			
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	Not permissible			
14	Not permissible			
15	FWD	Select f-Fix4/PI REF	Select Fire Mode/Normal OP	No function
16 ¹⁾	FWD	Select f-Fix4/f-Fix2	Select Fire Mode/Normal OP	No function
17 ¹⁾	FWD	Select f-Fix2/f-Fix4	Select Fire Mode/Normal OP	No function

1) If P-15 = 16 or 17, the fixed frequencies will only be enabled in fire mode.

3 Control signal terminals

3.2 Configuration of the control signal terminals

3.2.7 P-12 = 6: PI controller with summation of AI1

Table 15: P-12 = 6: PI controller with summation of AI1

P-15	D11 (terminal 2)	D12 (terminal 3)	D13/AI2 (terminal 4)	D14/AI1 (terminal 6)
0	FWD	Select PI REF/f-Fix1	PI feedback	No function
1	FWD	Select PI REF/AI1 REF	PI feedback	AI1 REF
2	Not permissible			
3	FWD	Select PI REF/f-Fix1	EXTFLT	PI feedback
4	Not permissible			
5	Not permissible			
6	Not permissible			
7	Not permissible			
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	Not permissible			
14	Not permissible			
15	FWD	Select f-Fix4/PI REF	Select Fire Mode/Normal OP	No function
16 ¹⁾	FWD	Select f-Fix4/f-Fix2	Select Fire Mode/Normal OP	No function
17 ¹⁾	FWD	Select f-Fix2/f-Fix4	Select Fire Mode/Normal OP	No function

1) If P-15 = 16 or 17, the fixed frequencies will only be enabled in fire mode.

3.2.8 P-12 = 7: Control via CAN with internal acceleration and deceleration ramps

Table 16: P-12 = 7: Control via CAN with internal acceleration and deceleration ramps

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	START	Select BUS REF/f-Fix	Select f-Fix Bit0	No function
6	START	Select BUS REF/AI1 REF	EXTFLT	AI1 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function
14	Not permissible			
15	FWD	Select f-Fix/BUS REF	Select Fire Mode/Normal OP	Select f-Fix4/f-Fix2
16	FWD	Select f-Fix4/BUS REF	Select Fire Mode/Normal OP	No function
17	FWD	Select BUS REF/f-Fix4	Select Fire Mode/Normal OP	No function

3 Control signal terminals

3.2 Configuration of the control signal terminals

3.2.9 P-12 = 8: Control via CAN, ramps via Modbus

Table 17: P-12 = 8: Control via CAN, ramps via Modbus

P-15	D11 (terminal 2)	D12 (terminal 3)	D13/A12 (terminal 4)	D14/A11 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	START	Select BUS REF/f-Fix	Select f-Fix Bit0	No function
6	START	Select BUS REF/A11 REF	EXTFLT	A11 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function
14	Not permissible			
15	FWD	Select f-Fix/BUS REF	Select Fire Mode/Normal OP	Select f-Fix4/f-Fix2
16	FWD	Select f-Fix4/BUS REF	Select Fire Mode/Normal OP	No function
17	FWD	Select BUS REF/f-Fix4	Select Fire Mode/Normal OP	No function

4 Messages

The messages are displayed on the connected (optional) keypad.

4.1 List of messages

Table 18: Messages

Status signal	Possible cause and remedy
<i>StoP</i>	Ready to start. There is no drive enable signal present. There are no error messages present.
<i>P-dEF</i>	The parameters' default settings have been loaded.
<i>O-I</i>	<p>Overcurrent at variable frequency drive output</p> <p>Occurs right after switching on the unit:</p> <ul style="list-style-type: none"> • Check the cable connection between the variable frequency drive and the motor • Check the motor for shorted windings and ground faults <p>Occurs when starting the motor:</p> <ul style="list-style-type: none"> • Check whether the motor can rotate freely and make sure that it is not being blocked mechanically. • Motor with mechanical brake: Check whether this has been triggered. • Check the connection configuration (star/delta) • Check to make sure that the correct rated motor current has been entered in P-08 • Increase the acceleration ramp time (t-acc, P-03) if necessary. • Reduce the voltage boost with P-11. <p>Occurs during operation at a constant speed:</p> <ul style="list-style-type: none"> • Check whether the motor is overloaded. <p>Occurs during acceleration/deceleration:</p> <ul style="list-style-type: none"> • The ramp times are too short and require too much power. <p>If P-03 or P-04 cannot be increased, a larger device may be required.</p>
<i>I.L-t rP</i>	<p>Motor overload. The thermal protection mechanism has tripped as a result of the device being run above the rated motor current set with P-08 longer than a specific time.</p> <ul style="list-style-type: none"> • Check to make sure that the rated motor current has been entered in P-08. • Check the motor's connection configuration (e.g., star/delta). • If the decimal points on the display flash during operation, this means that the unit is being run in its overload range (> P-08). In this case, use P-03 to make the acceleration ramp longer or reduce the load. • Check whether the motor is being blocked mechanically or whether there are any additional loads.
<i>PS-t rP</i>	<p>Overcurrent (Hardware)</p> <ul style="list-style-type: none"> • Check the wiring to the motor and the motor itself for short-circuits and ground faults. • Disconnect the motor cable from the variable frequency drive and switch the variable frequency drive back on. • If the fault message still appears, the device needs to be replaced. Before commissioning the new device, check the system for short-circuits or ground faults that could have caused the device to fail.
<i>OUoL t</i>	<p>Overvoltage in DC link</p> <ul style="list-style-type: none"> • Check to make sure that the supply voltage falls within the range for which the variable frequency drive is sized. <p>If the error occurs during deceleration or stopping:</p> <ul style="list-style-type: none"> • Extend the deceleration ramp (P-04/P-24).

4 Messages

4.1 List of messages

Status signal	Possible cause and remedy
<i>UUOLt</i>	<p>Undervoltage in DC link</p> <p>Note: Generally, this message will appear when the supply voltage is switched off on the device and the DC link voltage dies away. In this case, there is no fault.</p> <p>If the message appears during operation:</p> <ul style="list-style-type: none"> • Check whether the power supply voltage is too low. • Check all components/devices in the variable frequency drive's feeder circuit (circuit-breaker, contactor, choke, etc.) to make sure they are connected properly and have an adequate contact resistance.
<i>O-t</i>	<p>Overtemperature at heat sink. The drive is too hot.</p> <ul style="list-style-type: none"> • Check whether the variable frequency drive is being operated at the ambient temperature specified for it. (max. 60 °C – depending on cooling). • Make sure that cooling air can circulate freely (clearances to neighboring devices above and below the variable frequency drive). • Improve the ventilation in the control cabinet if necessary. The ventilation vent on the device must not be blocked, e.g., by dirt or due to devices being installed too closely together.
<i>U-t</i>	<p>Under-temperature.</p> <p>The message will appear if the ambient temperature falls below -10 °C. In order to be able to start the drive, the temperature must be higher than this.</p>
<i>th-FLt</i>	<p>Malfunctioning heat sink thermistor.</p> <ul style="list-style-type: none"> • Please contact your nearest Eaton sales branch.
<i>E-ErrP</i>	<p>External fault (at digital input 3, terminal 4). There must be a high-level signal at this input in order to be able to run the variable frequency drive. If a thermistor is connected to terminal 4:</p> <ul style="list-style-type: none"> • Check whether the motor is too hot.
<i>SC-ErrP</i>	<p>Serial communication lost</p> <ul style="list-style-type: none"> • Check whether the connection to other variable frequency drives and external devices is in order: Each device on the bus must have a unique address. Two devices cannot have the same address.
<i>P-L055</i>	<p>Incoming power phase failure (only for devices with a three-phase power supply)</p>
<i>SPI n-F</i>	<p>Speed detection before switching (on the running motor) unsuccessful.</p>
<i>dRAM-F</i>	<p>Error in internal memory. The parameters have not been saved and the default settings have been loaded. Change the parameter values (again) and save them once more. If the message appears again, please contact your nearest Eaton sales branch.</p>
<i>4-20 F</i>	<p>The analog input's input current does not fall within the specified range.</p> <ul style="list-style-type: none"> • Check the setting in P-16 for AI1 and P-47 for AI2 <p>In the case of 4-20mA:</p> <ul style="list-style-type: none"> • Check the setpoint connection for wire breakage.
<i>SC-FLt</i>	<p>Internal error</p> <ul style="list-style-type: none"> • Please contact your nearest Eaton sales branch.
<i>FAULT4</i>	<p>Internal error</p> <ul style="list-style-type: none"> • Please contact your nearest Eaton sales branch.

4.2 Operating status indicators

The DB1 variable frequency drive status is displayed by two LEDs (A1 and A2).

LED	Behavior	Meaning
A1	See Table 19 below.	Device status display
A2	Flashing	Communication via RJ45 is active
	Off	Communication via RJ45 is inactive

Table 19: Device status display

Status of variable frequency drive DB1	LED A1			Meaning
	Green	Red	Yellow	
Stop/Inhibit	Slowly flashing	Off	<ul style="list-style-type: none"> Off On when Fire mode is active 	<ul style="list-style-type: none"> Device is being supplied with power. No START signal is present. <p>Note: START includes FWD and REV in this case.</p>
Operation	to	Off	<ul style="list-style-type: none"> Off On when Fire mode is active Slowly flashing in the event of overload (current > P-08) 	<ul style="list-style-type: none"> Device is being supplied with power. There are no error messages present. A START signal is present or the drive is decelerating after the START signal has been removed. <p>Note: START includes FWD and REV in this case.</p>
Standby	to	Off	Flashing every 3 seconds	The drive goes into standby mode after it has been operated for the time defined using P-48 with a minimum frequency of f-min (P-02).
Failed to read line	Off	to	<ul style="list-style-type: none"> Off On when Fire mode is active 	<ul style="list-style-type: none"> The device has switched off due to an error. The device will automatically attempt to restart if it is in Fire mode.
Incorrect configuration	Off	Flashing every 3 seconds	Off	I/O module and power unit are incompatible.
Communication error	Off	Intermittent red and yellow flashing		Communication error. The communication parameters are set using P-36.
Device fault	Off	Slowly flashing	Off	Internal device fault. The device must be replaced.
External 24 V supply	Simultaneous green and yellow flashing	Off	Simultaneous green and yellow flashing	–
Data transfer with DX-COM-STICK2 was successful	Rapid flashing for 2 seconds	Off	Off	The parameter transfer from DX-COM-STICK2 to device DB1 has completed successfully.
Error in data transfer with DX-COM-STICK2	Off	Rapid flashing for 2 seconds	Off	Error in parameter transfer of DX-COM-STICK2 to device DB1 due to parameter set error or an interruption during transfer.

4 Messages

4.2 Operating status indicators

Status of variable frequency drive DB1	LED A1			Meaning
	Green	Red	Yellow	
Data error in DX-COM-STICK2	Off	Off	Rapid flashing for 2 seconds	Error during parameter transfer from DX-COM-STICK2 to device DB1, because the parameter set is incompatible with the device (different performance class or different firmware version).
Upgrading software power unit	All colors flash intermittently in the following sequence: green, yellow, red, yellow.			A software upgrade is being performed for the power unit.
Upgrading I/O-module software	All colors are faintly illuminated.			A software upgrade is being performed for the I/O module.

5 Parameters

The following tables use a number of acronyms. These acronyms are defined below:

Abbreviation	Meaning
min. value	Minimum value
max. value	Maximum value
DS	Default setting (the parameter's value when using the device's factory settings)



None of the parameters in parameter group 0 can be modified by the user, i.e., they are read-only parameters.

5.1 "Monitor" parameter group

Table 20: "Monitor" parameter group

Parameter	Name	min. value	max. value	Description
P00-01	AI1	0	100%	Analog input 1 Level of the signal applied to analog input 1 after scaling and offsets have been applied.
P00-02	Analog input 2	0	100%	Analog input 2 Level of the signal applied to analog input 2 after scaling and offsets have been applied.
P00-03	Frequency setpoint	-P-01	P-01	Frequency Reference in Hz. Will be calculated into rpm when motor data are available. Value of the drive internal digital reference.
P00-04	DI1 Status	0	1	Digital input status Status of the digital inputs starting on the left hand side with digital input 1 etc.
	DI2 Status	0	1	
	DI3 Status	0	1	
	DI4 Status	0	1	
	DI5 Status	0	1	
P00-05	PID1 Output	0	100%	PI(D) controller 1 Output
P00-06	DC-Link Voltage Ripple	0	1000V	DC-Link Voltage Ripple
P00-07	Motor voltage	0V	600VAC	Instantaneous output voltage
P00-08	DC link voltage	0V	1000VDC	Instantaneous DC Link Voltage
P00-09	Actual Switching Frequency	-20°C	100°C	Instantaneous Heatsink Temperature
P00-10	t-Run	0 h	99999 h	Total operating time of the drive since the date of manufacture
P00-11	t-Run since Trip	0 h	65000 h	Total operating time of the drive since the last trip occurred

5 Parameters

5.1 "Monitor" parameter group

Parameter	Name	min. value	max. value	Description
P00-12	t-Run since Trip	0h	65000 h	Total operating time of the drive since the last trip occurred Displayed in hours, minutes and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds"
P00-13	Last Fault1 PDP	–	–	Displays the last four faults.
P00-14	t-HoursRun Enable	0	65000 h	Total operating time of the drive since the last drive ENABLE signal was applied. Displayed in hours, minutes and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds"
P00-15	DC-Link0 Log	0 V	1000 V DC	DC link voltage log Recording of the most recent 8 samples of the DC bus voltage prior to a drive trip condition occurring. The sample interval is 256 ms. The sample interval is 256 ms.
P00-16	Heatsink0 Log	-20°C	120°C	Heatsink temperature log Shows the last eight heat sink temperature values before the device was switched off due to a fault. The sample interval is 500 ms.
P00-17	MotorCurrent0 Log	0 A	2 · I _e	Motor current log Shows the last eight motor current values before the device was switched off due to a fault. The sample interval is 256 ms.
P00-18	DC-Link V-Ripple0 Log	0 V	1000 V	DC bus Voltage Ripple Log
P00-19	AmbientTemp0 Log	-20°C	120°C	Internal Ambient Temperature Log
P00-20	T-Controlboard	-80°C	120°C	Internal ambient temperature of the device, measured on the control board
P00-21	FB Process Data In 1			Input Data 1, Value
	Input Data 2 Value			Input Data 2, Value
	Input Data 3 Value			Input Data 3, Value
	Input Data 4 Value			Input Data 4, Value
P00-22	Output data 1 value			Output Data 1, Value
	Output data 2 value			Output Data 2, Value
	Output data 3 value			Output Data 3, Value
	Output data 4 value			Output Data 4, Value
P00-23	t-Run IGBT in OT	0 h	65000 h	Time elapsed, in which the drive has operated with a high heatsink temperature
P00-24	t-Run PCB in OT	0 h	65000 h	Time elapsed, in which the drive has operated with a high temperature at the PCBs (ambient temperature)
P00-25	Motor speed	-P-01	P-01	Motorspeed (calculated or measured)
P00-26	MWh Meter	–	–	Energy Consumption MWh Meter (not resettable)
P00-27	Fan Runtime	0 h	65000 h	Run time of the integrated fan (not resettable)
P00-28	System Version			System version

5 Parameters

5.1 “Monitor” parameter group

Parameter	Name	min. value	max. value	Description
P00-29	NoOfInputPhases			Number of input phases
	FrameSize			Construction size
	kW/HP			motor power
	Power@Ue			Device Power at Device Voltage Rating
	Device Voltage			Rated voltage
	DeviceType			Type of device
P00-30	Serial Number			Serial Number of the device
P00-31	Magnetizing current I_d	0 A	100.0 A	Calculated Magnetizing Current
P00-31	Torque current I_q	0 A	100.0 A	Calculated Torque producing Current
P00-32	Switching frequency	4 kHz	32 kHz	Power stage switching frequency. Higher frequency reduces the audible 'ringing' noise from the motor, and improves the output current waveform, Disadvantage: Higher loss in the device.
P00-33	FaultCounter Overcurrent	0	65535	Indicates how often “Overcurrent” occurred
P00-34	FaultCounter DC-Overvoltage	0	65535	Indicates how often “DC Overvoltage” occurred
P00-35	FaultCounter DC Undervoltage	0	65535	Indicates how often “DC Undervoltage” occurred
P00-36	FaultCounter Overtemperature Heatsink	0	65535	Indicates how often “Overtemperature Heatsink” occurred
P00-37	FaultCounter Overcurrent Brake Chopper	0	65535	Indicates how often “Overcurrent Brake Chopper” occurred
P00-38	FaultCounter Overtemperature Ambient	0	65535	Indicates how often “Overtemperature Ambient” occurred
P00-39	FaultCounter Communication Loss	0	65535	Indicates how often “Communication Loss” occurred
P00-40	FaultCounter CANopen COM Loss	0	65535	Indicates how often “CANopen COM Loss” occurred
P00-41	FaultCounter Internal Fault (IO)	0	65535	Indicates how often “Internal Fault (IO)” occurred
P00-42	FaultCounter Internal Fault (DSP)	0	65535	Indicates how often “Internal Fault (DSP)” occurred
P00-43	t-PowerOn			Total time for which the drive was powered up since the day of manufacture.
P00-44	n/a			
P00-45	n/a			
P00-46	n/a			
P00-47	t-FireMode Active			Run time in Fire Mode
P00-47	FaultCounter Fire detected			Indicates how often “Fire detected” occurred
P00-48	ScopeChannel1			
P00-48	ScopeChannel2			
P00-49	ScopeChannel3			
P00-49	ScopeChannel4			
P00-50	System Software Version			System Software Version
P00-50	Application software version			I/O Controller / Application SW Version

5 Parameters

5.2 "Basic" parameter group

5.2 "Basic" parameter group

Table 21: "Basic" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-01	f-max	0.0 Hz	5 x P-09	Determines the maximum output frequency. This can be set to any value between "f-min" (P-02) and 5x the "Motor Nom Frequency", set with P-09. When "Motor Nom Frequency" (P-09) is changed, P-01 is set to the value of P-09. "Motor Nom Speed" (P-10) = 0, Displays max. Output frequency in Hz "Motor Nom Speed" (P-10) > 0, Displays max. speed as rpm.	50.0 Hz
P-02	f-min	0.0 Hz	P-01	Determines the min. output frequency. This can be set to any value between 0 and "f-max" (P-01). When "Motor Nom Frequency" (P-09) is changed, P-01 is set to zero. "Motor Nom Speed" (P-10) = 0, Displays min. Output frequency in Hz "Motor Nom Speed" (P-10) > 0, Displays min. speed as rpm.	0.0 Hz
P-03	t-acc	0.0 s	600 s	Sets the acceleration ramp time in seconds. The time interval set in "t-acc" represents the time taken to accelerate from zero to "Motor Nom Frequency" (P-09).	5.0 s
P-04	t-dec	0.0 s	600 s	Sets the deceleration ramp time in seconds. The time interval set in "t-dec" represents the time taken to decelerate from "Motor Nom Frequency" (P-09) to zero.	5.0 s
P-05	Stop mode	0	3	Determines the action taken by the drive in the event of the drive enable signal being removed. 0: Ramp. When the enable signal is removed, the drive will ramp to stop, with the rate controlled by "t-dec" (P-04). 1: Coasting. When the enable signal is removed, the drive output is immediately disabled, and the motor will coast (freewheel) to stop. 2 : Ramp. When the enable signal is removed, the drive will ramp to stop, with the rate controlled by "t-dec" (P-04). If the mains supply is lost, the drive will ramp to stop using the deceleration ramp set by P-24. Condition: P-24 is set to a time that is shorter than the one for discharging the DC link. Otherwise the drive will trip due to "under voltage". 3: AC flux braking. When stopping the drive, AC flux braking is used to reduce the stopping time.	1
P-06	EnergyOptimizer	0	1	When energy optimization is activated, the motor voltage is dynamically varied, dependent on load. This results in reduced voltage being applied to the motor on light load, significantly reduce energy consumption. This mode of operation is less suitable for dynamic applications where the load conditions can suddenly increase significantly.	0

5 Parameters

5.2 "Basic" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-07	Motor Nom Voltage	0 / 20V	U_e	Defines the Motor rated voltage. When the output frequency is greater than the "Motor Nom Frequency" (P-09), the output voltage is controlled at the level set with "Motor Nom Voltage" (P-07).	U_e
P-08	Motor Nom Current	$0.25 I_e - I_e$	I_e	Rated motor current By setting the "Motor Nom Current" in the drive, the motor overload protection is configured to match the motor rating. When the measured motor current exceeds "Motor Nom Current", the decimal points on the drive display will flash to indicate an overload condition. If this condition persists, the drive will eventually trip due to overload. Display: <i>I.E - E r P</i>	I_e
P-09	Motor Nom Frequency	25 hz	500 hz	The rated frequency of the motor. This is the frequency at which "Motor Nom Voltage" is applied to the motor. Below this frequency, the applied motor voltage will be reduced. Note: If the value for P-09 is changed, the following parameters will be reset to their default settings: P-01 f-max P-02 f-min P-10 Motor Nom Speed P-20 f-Fix1 P-21 f-Fix2 P-22 f-Fix3 P-23 f-Fix4	50 hz
P-10	Motor Nom Speed	0 / 200 rpm	30000 rpm	Motor rated speed. P-10 = 0: Indication of the output frequency in Hz P-10 > 0: the speed related parameters (P-01, P-02, etc.) will be displayed in rpm. The slip compensation is also activated, where the shaft speed of the motor is maintained under varying load conditions by compensating for the load-dependent slip of the motor. If the value entered for P-10 corresponds to a synchronous speed (e.g., 3000 rpm for a 2-pole motor at 50 Hz), the speed will be shown in rpm, but the slip compensation function will not be activated.	0 rpm
P-11	V-Boost	$0.0\% U_e$	f (FS) FS1: $25\% U_e$ FS2: $20\% U_e$ FS3: $15\% U_e$ FS4: $10\% U_e$	Voltage is used to increase the applied motor voltage at low output frequency, in order to improve low speed and starting torque. If the value is too high, this can result in an excessive motor current, resulting in overheating. Increased motor cooling may be required.	f (FS) FS1: $3\% U_e$ FS2: $2.5\% U_e$ FS3: $2\% U_e$ FS4: $1.5\% U_e$

5 Parameters

5.2 "Basic" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-12	Local ProcessData Source	0	8	<p>Local Configuration of Command and Reference Sources</p> <p>0: Terminal mode. The drive responds directly to signals applied to the control terminals. 1: The drive can be controlled in the forward direction only using an internal/external keypad. 2 : The drive can be controlled in the forward and reverse directions using an internal/external keypad. 2: Bi-directional Keypad Control. The drive can be controlled in the forward and reverse directions using an internal/external or remote Keypad. Pressing the keypad START button toggles between forward and reverse. 3: Control via Modbus RTU communication 4: Control via Modbus. Ramp times via Modbus 5: PI controller with external actual value 6: PI controller with external actual value and totalized value of AI1 7: CANopen (internal ramp times) 8: CANopen (CANopen ramp times)</p>	0
P-13	Application Mode Macro	0	2	<p>Influences multiple parameter values inside the drive and combines them to an application specific configuration.</p> <p>0: Industrial mode (constant torque, no spin start) 1: Pump mode (variable torque for induction motors, no spin start) 2 : Fan mode (variable torque for induction motors, spin start)</p>	
P-14	Password	0	65535	<p>Entry of the password to get access to the extended parameter set.</p> <p>The value to be put in is determined by P-37 (default: 101). Access to Level 2 (extended → P-01 to P-59 and P00-01 to P00-30): P-37 Access to Level 3 (advanced → P-01 to P-68 and P00-01 to P00-50): P-37 + 100</p>	0

5.3 "Extended" parameter group

Table 22: "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-15	DI Config Select	0	17	<p>Configuration of digital inputs with a fix set of combinations</p> <p>The setting of P-15 determines the input configuration depending on P-12. The setting of P-15 determines the input configuration depending on P-12.</p> <p>Possible configurations → Section 3.2 "Configuration of the control signal terminals", page 16</p>	5
P-16	AI1 signal range	0	7	<p>Configures the Analog input 1 for the selected signal source type.</p> <p>0: 0 - 10V 1: bipolar 0 - 10V 2: 0 - 20 mA 3: t 4 - 20 mA (Trips in case of wire break) 4: r 4 - 20 mA (Ramps to f-fix1 (P-20) in case of wire break) 5: t 20 - 4 mA (Trips in case of wire break) 6: r 20 - 4 mA (Ramps to f-fix1 (P-20) in case of wire break) 7: 10 - 0V</p>	0
P-17	Switching frequency	0	f (I _e)	<p>Power stage switching frequency. Higher frequency reduces the audible 'ringing' noise from the motor, and improves the output current waveform, Disadvantage: Higher loss in the device.</p> <p>0: 4 kHz 1: 8 kHz 2: 12 kHz 3: 16 kHz 4: 24 kHz 5: 32 kHz</p>	f (I _e)
P-18	RO1 Function	0	11	<p>Selection of the function of output relay RO1</p> <p>0: RUN, approved (FWD/REV) 1: READY, DB1 ready for operation. The relay contact is closed when a voltage is applied to the device and there is no error message. 2: Speed = speed setpoint value 3: Error message (DB1 is not ready for operation) 4: Speed ≥ RO1 Upper Limit (P-19) 5: Motor current ≥ RO1 Upper Limit (P-19) 6: Speed < RO1 Upper Limit (P-19) 7: Motor current < RO1 Upper Limit (P-19) 8: Drive not enabled 9: Speed not at setpoint value 10: Analog input AI2 > RO1 Upper Limit (P-19) 11: DB1 ready for operation. The relay contact is closed when a voltage is applied to the device and there is no error message. The hardware enable signal on the terminal (ENA) must also be present.</p>	0

5 Parameters

5.3 "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-19	RO1 upper Limit	0.00%	200.00%	Switching ON threshold of relay RO1 with P-18 = 4...7, 10	100.00%
P-20	Preset Speed 1	f-min	f-max	Preset Fixed Frequency 1 Value can be adjusted between f-min and f-max. Selection via a digital control signal. If P-09 is changed, the value is reset to default.	15.0 Hz
P-21	Preset Speed 2	f-min	f-max	Preset Fixed Frequency 2 Value can be adjusted between f-min and f-max. Selection via a digital control signal. If P-09 is changed, the value is reset to default.	0.0 Hz
P-22	Preset Speed 3	f-min	f-max	Preset Fixed Frequency 3 Value can be adjusted between f-min and f-max. Selection via a digital control signal. If P-09 is changed, the value is reset to default.	0.0 Hz
P-23	Preset Speed 4	f-min	f-max	Preset Fixed Frequency 4 Value can be adjusted between f-min and f-max. Selection via a digital control signal. If P-09 is changed, the value is reset to default.	0.0 Hz
P-24	t-QuickDec	0.00 s	600.0 s	Quick Stop Ramp In default the second deceleration ramp is activated by applying voltage to DI1 and DI2 (terminals 2 and 3) at the same time.	0.00 s
P-25	AO1 Function	0	12	Select Signal to show on the analog output P-25 = 0, ...,7, 10, 11 = digital output 0: RUN, approval (FWD/REV) 1: READY, DB1 ready for operation 2: Speed = speed setpoint value 3: Error message (DB1 is not ready for operation) 4: Speed \geq RO1 Upper Limit (P-19) 5: Motor current \geq RO1 Upper Limit (P-19) 6: Speed < RO1 Upper Limit (P-19) 7: Motor current < RO1 Upper Limit (P-19) 10: Drive not enabled 11: Speed not at setpoint value P-25 = 8,9,12 = analog output 8: Speed (0 to 100 % f-max (P-01)) 9: Motor current (0 to 200 % Motor Nom Current (P-08)) 12: motor power	8
P-26	f-SkipBand1	0.0 Hz	f-max	Skip frequency band width Defines the frequency range around f-Skip1 in which the drive doesn't work in steady-state to avoid mechanical resonances in the application. During acceleration and deceleration this range is passed through by using the ramps set with P-03 and P-04.	0.0 Hz

5 Parameters

5.3 "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-27	f-Skip1	0.0 Hz	f-max	Centre point of the frequency band defined by f-Skip-Band1 in which the drive doesn't work in steady-state.	0.0 Hz
P-28	V/Hz Mid Voltage	0V	P-07	Voltage to shape V/f curve Defines the adjustment voltage at the frequency set in P-29.	0V
P-29	f-MidV/f	0 hz	P-09	Frequency to shape V/f curve Sets the frequency at which the adjustment voltage defined with P-28 is applied to the motor.	0 hz
P-30	Start mode	0	6	Defines the behavior of the drive relating to the enable digital input and also configures the automatic restart function. Edge-r: Following power on or a RESET, the drive will not start if the enable signal is still present. To start DB1 a rising edge is necessary. Auto-0: Following a power on or a RESET, the drive will automatically start if the enable signal is still present. Auto-1 to 5: Following a trip due to a fault, the drive will automatically make up to five attempts to restart at 25 second intervals. The drive must be powered down to reset the counter. The number of restart attempts are counted, and if the drive fails to start on the final attempt, the drive will trip, after which a manual RESET will be required. Caution: An automatic restart is only possible if the control commands are given via terminals (P-12 = 0 and P-12 = 11 if, after a communication loss, the control is automatically toggled to the terminals).	0
P-31	Digital Reference Reset Mode	0	7	Defines the behavior of the drive on START when used in Keypad control or when controlled with UP/DOWN commands via terminals. 0: Start with min. Speed 1: Start with latest speed before switching off (= Default) 2 : Start with min. speed (Auto-r) 3: Start with latest speed before switching off (Auto-r) 4: Start with current running speed 5: Start with f-Fix4 6: Start with current running speed (Auto-r) 7: Start with f-Fix4 (Auto-r) Auto-r: START and STOP button on the keypad are disabled. DC1 starts with a START command at the terminals.	1

5 Parameters

5.3 "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-32	t-DCBrake@Stop	0.0 s	25.0 s	Duration of DC braking at Stop and before Start. Setting "0" disables DC braking. The braking level is set using P-68.	0.0 s
	DCBrake	0	2	Sets the instances when DC braking is enabled. 0: DC braking on Stop 1: DC braking before Start 2 : DC braking before Start and on Stop	0
P-33	Spin Start Enable	0	2	Spin Start Enable Enables spin start, where the drive starts from the detected motor speed. A short start delay is possible if the rotor is stationary. Recommended for applications where the motor spins when applying the FWD/REV signal to the drive (high inertia loads, fans ...) 0: Spin start disabled 1: Spin start enabled 2 : Spin start enabled in the event of a fault, network outage, or coast to stop (P-05 = 1) Note: The settings for P-33 will be adjusted if parameter P-13 is changed. (P-33 = 0 if P-13 = 0 or 1, P-33 = 2 if P-13 = 2)	0
P-34	Brake Chopper	0	4	Enable Brake Chopper Enables the brake chopper for size FS2. Software protection can be selected for brake resistors with a 200 W nominal power rating. 0: Brake chopper not enabled 1: Brake chopper enabled with software protection 2 : Brake chopper enabled without software protection 3: Brake chopper enabled during speed setpoint change only (with software protection) 4: Brake chopper enabled during speed setpoint change only (without software protection) Note: This parameter can only be set to a value > 0 on devices of size FS2. Devices with frame size FS1 do not feature an internal braking chopper	0
P-35	All Gain	0.00%	2000.00%	Scaling of the Analog Input 1 Output value = Input value * Scaling. Example: P-16 = 0 - 10 V, P-35 = 200 %: at 5 V the motor would run at max. speed (P-01) (5 V x 200 % = 10 V) In slave mode (P-12 = 14) the slave speed is scaled with P-35.	100.00%

5 Parameters

5.3 "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-36	RS485-0 Address	1	63		1
	RS485-0 Baudrate	0	6	Baud Rate 2: 9.6 kbit/s 3: 19.2 kbit/s 4: 38.4 kbit/s 5: 57.6 kbit/s 6: 115.2 kbit/s	6
	Comm Timeout Modbus RTU	0	8	Comm Timeout Modbus RTU Time between a communication loss and the resulting action. Setting "0" disables the action after communications trip. t: Indicates that the drive will trip if time is exceeded r: Indicates that the drive will ramp to stop if time is exceeded 0: no action 1: t 30 ms 2: t 100 ms 3: t 1000 ms 4: t 3000 ms 5: r 30 ms 6: r 100 ms 7: r 1000 ms 8: r 3000 ms	4
P-37	Password Level2	0	9999	Defines the password which is used to get access to extended parameter set (Level 2). In addition, it also defines the password needed to get access to the advanced parameter set (P-37 + 100). Access via P-14.	101
P-38	Parameter lock	0	1	Determines whether to lock the parameters 0: OFF. All parameters can be changed. 1: ON. Parameter values can be displayed, but cannot be changed. If a remote keypad is connected, parameters cannot be accessed by the remote keypad if they are locked.	0
P-39	AI1 Offset	-500.00%	500.00%	Offset Analog Input 1 Resolution 0.1 %	0.00%

5 Parameters

5.3 "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-40	Display Scale	0.000	16000 %	Scale factor display Customer specific scaling factor. With P-40 > 0 a "c" appears on the left hand side of the display. With P-10 = 0 the scaling factor is applied to the frequency, with P-10 > 0, to the speed. The value is displayed in real-time on the drives display.	0.000
	Display Scale Source	0	3	Source to Scale factor display Source of the displayed value 0: Motor speed 1: Motor current 2: Analog input AI2 3: PI controller, actual value	0
P-41	PID1 Kp	0.1	30	PI(D) controller proportional gain Higher values will result in a larger change at the frequency inverter output frequency as a response to small changes in the feedback. Too high value can cause instability	1
P-42	PID1 Control I Time	0.0 s	30.0 s	PI(D) controller integral time constant Higher values will result in a more damped response. Used in systems in which the overall process responds slowly.	1.0 s
P-43	PID1 Mode	0	1	PI(D) controller 1 mode 0: direct mode. This setting is used when an increase of the feedback signal should lead to a decrease of the motor speed. 1: inverse mode. If an increasing feedback signal should increase the speed of the motor, use inverse mode.	0
P-44	PID1 setpoint 1 source	0	1	Defines the set point source 1 of controller 1 0: digital set point signal, set with P-45 1: Analog input 1	0
P-45	PID1 Set Point Digital	0.00%	100.00%	Digital set point controller 1 Digital set point of the PI controller in case P44 = 0	0.00%
P-46	PID1 Feedback 1 Source	0	5	Defines the feedback source 1 of controller 1 0: Analog input 2 (AI2) 1: Analog input 1 (AI1) 2: Motor current 3: DC link voltage 4: Difference AI1 - AI2 5: max. value of AI1 and AI2	0

5 Parameters

5.3 "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-47	AI2 signal range	0	6	Configures the Analog input 2 for the selected signal source type. 0: 0 - 10V 1: 0 - 20 mA 2: t 4 - 20 mA (Trips in case of wire breakage) 3: r 4 - 20 mA (Ramps to f-fix1 (P-20) in case of wire break) 4: t 20 - 4 mA (Trips in case of wire break) 5: r 20 - 4 mA (Ramps to f-fix1 (P-20) in case of wire break) 6: Ptc-th (connection of a thermistor for motor protection)	0
P-48	t-Standby	0.0 s	25.0 s	Time after which the drive changes to standby mode (inverter output disabled) when the motor is running at min. speed (f-min). 0: Standby Mode disabled not equal to zero: The device will switch to standby mode after the time specified here. Operation automatically resumes as soon as the speed set point increases above P-02.	0.0 s
P-49	PID1 WakeUpLevel	0.00%	100.00%	Wake-up level controller 1 Sets an error level (difference between the PID reference and feedback values) above which the PID controller will wake from Standby mode. Sets an error level (difference between PI set point and feedback values) above which the PI controller will wake from standby mode.	0.00%
P-50	CAN0 Baudrate	0	3	CANopen Baudrate Sets the Baudrate in case CANopen is used 0: 125 kbit/s 1: 250 kbit/s 2: 500 kbit/s 3: 1MBit/s 4: 50 kbit/s 5: 20 kbit/s	2
P-51	T-Memory Enable	0	1	If this function is enabled, the computed thermal model for the motor will be automatically saved when the supply voltage is switched off. The stored values will then be used when it is switched back on. If this function is disabled, the motor thermal history is reset to zero on every power up. 0: Thermal memory disabled 1: Thermal memory enabled	0

5 Parameters

5.3 "Extended" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-54	RO1 Hysteresis	0.00 %	100.00 %	Hysteresis for relay output 1 This parameter defines a lower switching threshold if P-18 is set to 4, 5, 6, or 7. Switching threshold = operating point (P-19) - hysteresis (P-54) P-18 = 4 or 5: Output will be logic 1 if value \geq switching point, output will be logic 0 if value < switching threshold P-18 = 6 or 7: Output will be logic 0 if value \geq switching point, output will be logic 1 if value < switching threshold	0.00%
P-55	RO1 switch-on delay	0.0 s	250.0 s	Delay time before the Relay switches from logic 0 to logic 1.	0.0 s
P-56	Reserved Parameter			Reserved Parameter	
P-57	Reserved Parameter			Reserved Parameter	
P-58	Reserved Parameter			Reserved Parameter	
P-59	Reserved Parameter			Reserved Parameter	

5.4 "Advanced" parameter group

Table 23: "Advanced" parameter group

Parameter	Name	min. value	max. value	Description	DS
P-60	Motor Control Mode	0	4	Motor Control Mode An autotune must be performed if setting 2 up to 4 is used. It is recommended with setting 0 0: Speed control with torque limit (vector) 1: Speed control (V/f) 2: PM motor speed control 3: Brushless DC motor speed control 4: SyncRel motor speed control	1
P-61	Motor Identification	0	1	Motor Identification If P-61 is set to 1, auto-tuning will start automatically when the motor is stopped in order to determine the motor parameters for optimum control and efficiency. Following completion of the autotune, the parameter automatically returns to 0.	0
P-62	MSC Gain	0.00 %	200.00 %	Speed controller Gain for Kp and Ti as combined value	50.00 %
P-63	I-CurrentLimit	0.10 %	175 %	Current limit in amperes x 10, one decimal place	150 %
P-64	Motor Stator Resistance R1	0.00 Ohm	655.35 Ohm	Stator resistance of the motor For induction and PM motors: Resistance value phase / phase [Rs] in Ohms. This value is determined during the motor identification run.	f(I _e)
P-65	Motor stator inductance d-axis	0.0 mH	6553.5 mH	Stator inductance of the motor, magnetizing For induction motors Inductance phase / phase in henry units [H] For PM motors: d-axis inductance phase [Lsd] in henry units [H]	f(I _e)
P-66	Motor stator inductance q-axis	0.0 mH	6553.5 mH	Stator inductance of the motor, torque producing For PM motors: q-axis inductance phase [Lsq] in henry units [H]	f(I _e)
P-67	f-DCBrake@Stop	0.0 Hz	P-01	Output frequency in Hz at which DC braking starts during the deceleration phase. If "Stop Mode" is set to coasting, DC braking starts at stop command immediately.	0.0 Hz
P-68	DC-Brake Current	0.0%	100.0%	Amount of DC current as a percentage of the "Motor Nom Current" that is injected into the motor during DC braking.	20.0 %