PowerXL™

DA1
Variable Frequency Drives

Parameter Manual

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Original Operating Instructions
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 German manual.

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Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.

- Ensure that devices cannot be accidentally restarted.

- Verify isolation from the supply.

- Earth and short circuit the device.

- Cover or enclose any adjacent live components.

- Follow the engineering instructions (AWA/IL) for 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, PES) must be connected to the protective earth (PE) or the potential equalisation. The system installer is responsible for implementing this connection.

- Connecting cables and signal lines should be installed so that inductive or capacitive interference does 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 interface so that an open circuit on the signal side does not result in undefined states in the automation devices.

- Ensure a reliable electrical isolation of the extra-low voltage of the 24 V supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD384.4.41 S2.

- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, 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-stop devices must not cause a restart.

- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed and with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.

- 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-stop devices should be implemented.

- Wherever faults in the automation system may cause injury or material damage, 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.).

- Depending on their degree of protection, frequency inverters may contain live bright metal parts, moving or rotating components or hot surfaces during and immediately after operation.

- Removal of the required covers, improper installation or incorrect operation of motor or frequency inverter may cause the failure of the device and may lead to serious injury or damage.

- The applicable national accident prevention and safety regulations apply to all work carried on live frequency inverters.

- The electrical installation must be carried out in accordance with the relevant regulations (e. g. with regard to cable cross sections, fuses, PE).

- Transport, installation, commissioning and maintenance work must be carried out only by qualified personnel (IEC 60364, HD 384 and national occupational safety regulations).

- Installations containing frequency inverters must be provided with additional monitoring and protective devices in accordance with the applicable safety regulations. Modifications to the frequency inverters using the operating software are permitted.

- All covers and doors must be kept closed during operation.

- To reduce the hazards for people or equipment, the user must include in the machine design measures that restrict the consequences of a malfunction or failure of the drive (increased motor speed or sudden standstill of motor). These measures include:

  – Other independent devices for monitoring safety-related variables (speed, travel, end positions etc.).

  – Electrical or non-electrical system-wide measures (electrical or mechanical interlocks).

  – Never touch live parts or cable connections of the frequency inverter after it has been disconnected from the power supply. Due to the charge in the capacitors, these parts may still be live after disconnection. Fit appropriate warning signs.

Table of contents

0 About this manual

This manual provides special information that is intended to enable you to configure the parameters for a DA1 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 DA1 variable frequency drives, please refer to manual MN04020005Z ("Installation Manual").

0.1 Target group

The content of MN04020006Z-EN manual is written 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

Publication date	Page	Keyword	New	Modifi cation	Deleted
11/16		P1-12 = 12: SWD control + setpoint value, auto			✓
01/16	–	Initial issue			
		This manual (MN04020006Z – "Parameter Configuration Manual") was part of manual MN04020005Z up to version 10/2012.			

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

> *NOTICE*
> Warns about the possibility of material damage.

0.3.2 Hazard warnings of personal injury

> ⚠ **CAUTION**
> 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 Tips

→   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 DA1 variable frequency drive's functions are configured with the use of parameters. These parameters are subdivided into ten groups (P0-…, …, P9-…):

Table 1:   Parameter Groups

Parameter group	Theme
P0	Monitor
P1	Basic
P2	Functions
P3	PID
P4	Modbus
P5	Bus
P6	Extended
P7	motor
P8	Ramps
P9	control assembly

➜ 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

Level 2 (menu P0 to menu P5) and level 3 (menu P0 to menu P9) can be accessed by using parameter P-14 to enter the correct password.

The default passwords are:

• Access to level 2: 101
• Access to level 3: 201

Users can change this password as required:

• Password for Level 2 with: P2-40
• Password for Level 3 with: P6-30

1.2 Menu structure

Control assembly

| P9- | 01 | 02 | . | ▶ ◀ | . . . | 40 | 41 |

P0-01

Ramps

| P8- | 01 | 02 | . | ▶ ◀ | . . . | 12 | 13 |

OK + ▲ or ▶

Motor

| P7- | 01 | 02 | . | ▶ ◀ | . . . | 16 | 17 |

Extended

| P6- | 01 | 02 | . | ▶ ◀ | . . . | 29 | 30 |

Bus

| P5- | 01 | 02 | . | ▶ ◀ | . . . | 15 | 16 |

Mode

| P4- | 01 | 02 | . | ▶ ◀ | . . . | 11 | 12 |

PID

| P3- | 01 | 02 | . | ▶ ◀ | . . . | 13 | 18 |

Functions

| P2- | 01 | 02 | . | ▶ ◀ | . . . | 39 | 40 |

Basic

| P1- | 01 | 02 | . | ▶ ◀ | . . . | 13 | 14 |

Level 1

Monitor

| P0- | 01 | 02 | . | ▶ ◀ | . . . | 79 | 80 |

P5-01 / P9-01

Password entry

Level 2 (password set with: P2-40; default password = 101)

Level 3 (password set with: P6-30, default password = 201)
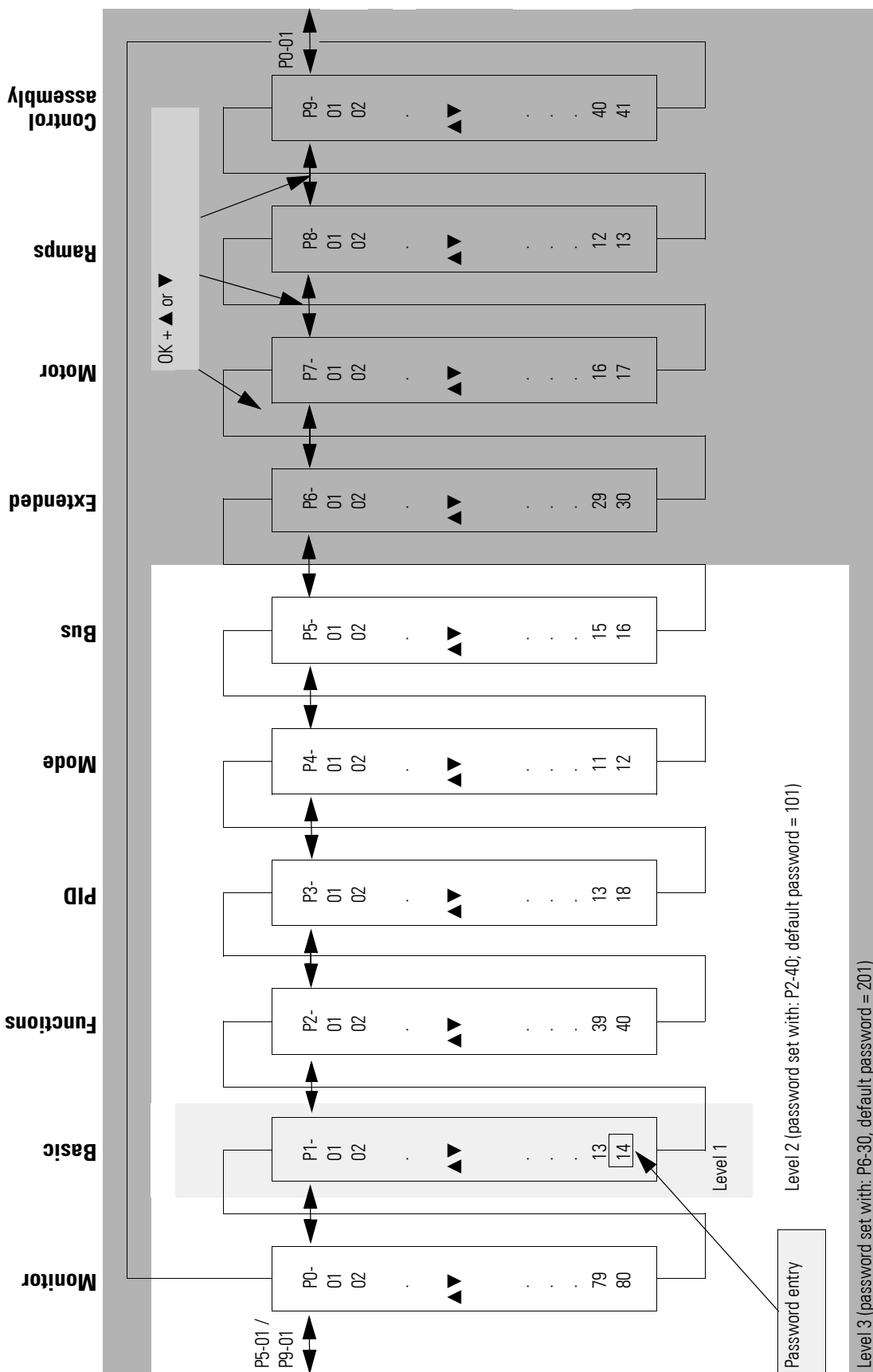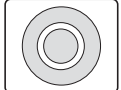
2 Operating unit

2.1 Control unit elements

The following figure shows the elements of the DA1 variable frequency drive integrated operating unit.

View

Push buttons

Figure 1: Operating unit view

Table 2: Keypad elements – Buttons

Button	Attribute ID	Explanation
OK	OK	• Opens and closes the parameter interface • Saves parameter values • Changes the value being displayed: A, rpm, etc.
	START	• Starts the variable frequency drive[1] • Changes the operating direction[2] if the motor is running
	STOP	• Stops the variable frequency drive[1] • Reset – Resetting after an error message
	UP	• Increases the speed[1] • Increment numeric value or parameter number
	DOWN	• Decreases the speed[1] • Decrement numeric value or parameter number
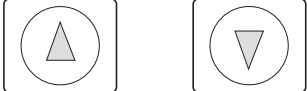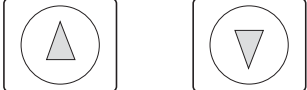
Note:
1) P1-12 = 1 only (one operating direction) or = 2 (two operating directions)
2) P1-12 = 2 only
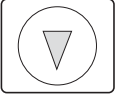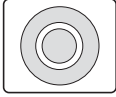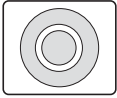
2.2 Setting parameters

Table 3:   Navigating within the keypad

Commands	Description
OK	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
OK	Press the **OK** button.
▲ ▼	Use the ▲ and ▼ buttons to change the parameter's value
OK	Press the **OK** button to confirm the parameter value change.
OK	Press the **OK** button and hold it down for two seconds in order to exit the parameter interface
	Switching between two parameter groups The parameters are in sequential order. In other words: 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. Press the ▲ and **STOP** buttons to jump to the first parameter in the next parameter group
▲ ◉	Press the ▼ and **STOP** buttons to jump to the first parameter in the previous parameter group
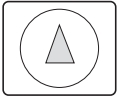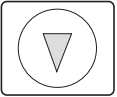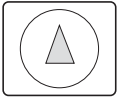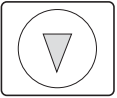
2.3 Resetting Parameters (RESET)

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 restored to their default settings. The keypad will display $P\text{-}dEF$.
Resetting after a fault	
	Press the **STOP** button to reset the unit after a fault
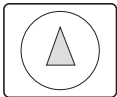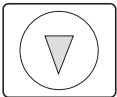
2.4 Extended parameter set

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 P1-14.
	Press the **OK** button.
	Use the ▲ and ▼ buttons to enter the password set with P2-40 (level 2; default: 101) or P6-30 (level 3; default: 201)
	Press the **OK** button to confirm → The extended parameter set will now be available.
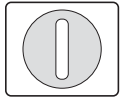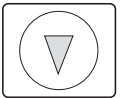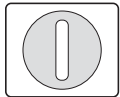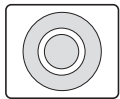
Commands	Description
Disabling access to the extended parameter set	
	Use the ▲ and ▼ buttons to set a value for P1-14 that does not match the password (P2-40 or P6-30).
	Press the **OK** button to confirm → Only the "basic parameters," i.e., the parameters in the first parameter group (P1-01 to P1-14), will be accessible now.

2.5 Control via keypad

Table 6:   Control via keypad

Button	Attribute ID	Explanation
	OK	P1-12 = 1 or = 2 • P1-12 = 1: one operating direction (FWD) • P1-12 = 2: two operating directions (FWD/REV)
	START	Starts the variable frequency drive
		▲ Increase speed ▼ Decrease speed
	START	Changes the operating direction if the motor is running **Note:** P1-12 = 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 DA1 variable frequency drive.

3 Control signal terminals

3.1 Correspondence between inputs/outputs and terminals

Input/Output	Clips
Entries	
DI1	Terminal 2
DI2	Terminal 3
DI3	Terminal 4
DI4/AI1	Terminal 6
DI5/AI2	Terminal 10
DigIN: 6	Terminal 1 on DXA-EXT-3DI1RO
DigIN: 7	Terminal 2 on DXA-EXT-3DI1RO
DigIN: 8	Terminal 3 on DXA-EXT-3DI1RO
Safety Torque Off	Terminals 12 / 13
Outputs	
AO1/DO1	Terminal 8
AO2/DO2	Terminal 11
RO1 (relays, changeover contacts)	Terminals 14/15/16
RO2 (relay, N/O)	Terminals 17/18
RO3 (relay, N/O)	Terminals 5/6 on DXA-EXT-3DI1RO or Terminals 1/2 on DXA-EXT-3RO
RO4 (relay, N/O)	Terminals 3/4 on DXA-EXT-3RO
RO5 (relay, N/O)	Terminals 5/6 on DXA-EXT-3RO

Parameter P1-13 can be used to select the configuration for the control signal terminals. More specifically, you can select predefined terminal configurations by setting P1-13 to a value between 1 and 21. The setting (digital/analog) for terminals 6 and 10 will be configured automatically based on the value set for parameter P1-13. In addition to this, you have the option of configuring the terminals freely. To do this, set P1-13 to 0. You can then use menu 9 to configure the terminals according to your needs.

The following control signal terminal configuration tables use the abbreviations and acronyms listed below:

3 Control signal terminals

3.1 Correspondence between inputs/outputs and terminals

Table 7: Abbreviations and acronyms for control signal terminal configurations

Abbreviation	Significance
AI1 REF	Analog input AI1 (terminal 6) Used as a speed setpoint input. • P2-30: configuration (voltage input/current input …) • P2-31: scaling • P2-32: offset
AI2 REF	Analog input AI2 (terminal 10) Used as a speed setpoint input. • P2-33: configuration (voltage input/current input …) • P2-34: scaling • P2-35: offset
AI2 Torque REF	Analog input AI2 (terminal 10) Used as a torque setpoint input. • P2-33: configuration (voltage input/current input …) • P2-34: scaling • P2-35: offset
DIR	Used to select an operating direction Used together with the START command. • Low = clockwise rotating field (FWD) • High = anticlockwise rotating field (REV) **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.
DOWN	Used to reduce the speed if a digital setpoint value is selected (P1-12 = 1 or = 2). Used together with the UP command.
ENA	Variable frequency drive enable signal (ENA = Enable) A start signal (START, FWD, REV) is additionally required for starting. If ENA is removed, the drive will coast.
EXTFLT	Ext Fault/Warning Can be used to integrate an external signal into the variable frequency drive's fault messages. During operation, there must be a high-level signal at the terminal. If the unit detects a low-level signal instead, the drive will be switched off and display $E\text{-}tr\ _iP$ as a fault message.
FWD	Starts the drive with a clockwise rotating field (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 counterclockwise rotating field is linked to 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 (P2-25).
INV	Change of rotation (INV = Inverse) The operating direction will be reversed as per the configured ramps. • High = invert • Low = Do not 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 (clockwise rotating field) or REV (anticlockwise rotating field) signal. The FWD and REV signals do not need to be continuously applied during operation. In order to be able to use this function, P9-05 must be set to 1.

Abbreviation	Significance
REV	Starts the drive with a counterclockwise rotating field (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 P1-05 (stop mode). Once the variable frequency drive stops, it will be locked. In applications with two operating directions, the clockwise rotating field 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 (P2-25).
Select Quick-Dec	Quick Stop If both inputs have a high level at the same time, the drive will do a quick stop with the ramp configured with P2-25.
Select AI1 REF/AI2 REF	Used to select between the analog setpoint values on AI1 (terminal 6) and AI2 (terminal 10) • AI1 = Low • AI2 = High
Select AI1 REF/f-Fix	Used to select between the analog speed reference 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. • Low = analog setpoint value • High = fixed frequency
Select AI1 REF/f-Fix1	Used to select between the analog speed reference value at analog input 1 (AI1 = terminal 6) and fixed frequency 1 (f-Fix1), which is set with P2-01. • Low = analog setpoint value • High = Preset Speed 1
Select BUS REF/AI2 REF	Used to select between setpoint values • Low = Setpoint from bus or from a master drive (if P1-12 = 5) • High = AI2

Select BUS REF/f-Fix	Used to select between setpoint values
	• Low = Setpoint from bus or from a master drive (if P1-12 = 5)
	• High = fixed frequency.
	   The fixed frequency itself is selected with the
	   Select f-Fix Bit0, Select f-Fix Bit1, Select f-Fix Bit2 commands.

Select BUS REF/f-Fix1	Used to select between setpoint values • Low = Setpoint from bus or from a master drive (if P1-12 = 5) • High = f-Fix1 (set with P2-01)
Select DIG REF/AI2 REF	Used to select between the digital speed reference value (set with the keypad or with the UP and DOWN commands) and analog setpoint value AI2 REF (terminal 10) • Low = digital setpoint value • High = AI2
Select DIG REF/f-Fix	Used to select between the digital speed reference value (set with the keypad or with the UP and DOWN commands) and a fixed frequency The fixed frequency itself is selected with the Select f-Fix Bit0, Select f-Fix Bit1, Select f-Fix Bit2 commands. • Low = analog setpoint value • High = fixed frequency
Select DIG REF/f-Fix1	Used to select between the digital speed reference value (set with the keypad or with the UP and DOWN commands) and fixed frequency 1 (f-Fix1) set with P2-01 • Low = digital setpoint value • High = Preset Speed 1

3 Control signal terminals

3.1 Correspondence between inputs/outputs and terminals

Abbreviation	Significance
Select f-Fix Bit0 Select f-Fix Bit1 Select f-Fix Bit2	Used to select a fixed frequency with digital commands Fixed frequencies f-Fix1, …, f-Fix8 are defined with parameters P2-01, …, P2-08. _(table below)_ 0 = Low; 1 = High
Select PID REF/AI2 REF	Used to select between setpoint values • Low = Setpoint from the PID controller's output • High = AI2

Select PID REF/f-Fix	Used to select between setpoint values
	• Low = Setpoint from the PID controller's output
	• High = Fixed frequency
	  The fixed frequency itself is selected with the
	  Select f-Fix Bit0, Select f-Fix Bit1, Select f-Fix Bit2 commands.

Select PID REF/f-Fix1	Used to select between setpoint values • Low = Setpoint from the PID controller's output • High = f-Fix1 (set with P2-01)
Select Quick-dec	Used to activate a quick stop with the ramp set with P2-25 In order to activate the quick stop, there must be a high signal at both terminals
Select t-dec/t-dec2	Used to select between deceleration ramp 1 t-dec set with P1-04 and deceleration ramp 2 t-dec2 (P8-11) • Low = Deceleration ramp 1 • High = Deceleration ramp 2
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 P1-05 (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.
UP	Used to increase the speed if a digital setpoint is selected (P1-12 = 1 or 2) Used together with the DOWN command.

Fixed frequency	Bit2	Bit1	Bit0
f-Fix1 (P2-01)	0	0	0
f-Fix2 (P2-02)	0	0	1
f-Fix3 (P2-03)	0	1	0
f-Fix4 (P2-04)	0	1	1
f-Fix5 (P2-05)	1	0	0
f-Fix6 (P2-06)	1	0	1
f-Fix7 (P2-07)	1	1	0
f-Fix8 (P2-08)	1	1	1

3.2 Configuration of the control signal terminals

3.2.1 P1-12 = 0: Terminal-based operation (= default setting)

Table 8: P1-12 = 0: Terminal-based operation (= default setting)

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	START	DIR	Select AI1 REF/f-Fix	AI1 REF	Select f-Fix Bit0
2	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
3	START	DIR	Select AI1 REF/f-Fix1	AI1 REF	AI2 Torque REF
4	START	DIR	Select AI1 REF/f-Fix1	AI1 REF	Select t-dec/t-dec2
5	START	DIR	Select AI1 REF/AI2 REF	AI1 REF	AI2 REF
6	START	DIR	Select AI1 REF/f-Fix1	AI1 REF	EXTFLT
7	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
8	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
9	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	Select AI1 REF/f-Fix
10	START	DIR	UP	DOWN	Select DIG REF/f-Fix1
11	FWD	REV	Select AI1 REF/f-Fix	AI1 REF	Select f-Fix Bit0
12	FWD	REV	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
13	FWD	REV	Select AI1 REF/f-Fix1	AI1 REF	AI2 Torque REF
14	FWD	REV	Select AI1 REF/f-Fix1	AI1 REF	Select t-dec/t-dec2
15	FWD	REV	Select AI1 REF/AI2 REF	AI1 REF	AI2 REF
16	FWD	REV	Select AI1 REF/f-Fix1	AI1 REF	EXTFLT
17	FWD	REV	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
18	FWD	REV	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
19	FWD	REV	Select f-Fix Bit0	Select f-Fix Bit1	Select AI1 REF/f-Fix
20	FWD	REV	UP	DOWN	Select REF/f-Fix1
21	Pulse FWD (NO)	Pulse STOP (NC)	Pulse REV (NO)	AI1 REF	Select AI1 REF/f-Fix1

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

P1-12 =11: default settings

- AI1 REF, 0 - 10 V analog setpoint at control signal terminal 6 (= 0 - f_{max})
- f-Fix Bit0, fixed frequency 1 = 5 Hz (f-Fix1, P2-01) and
  fixed frequency 2 = 10 Hz (f-Fix2, P2-02)

3.2.2 P1-12 = 1: Digital setpoint value, 1 operating direction

Table 9: P1-12 = 1: Digital setpoint value, 1 operating direction

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	START	DIR	Select DIG REF/f-Fix	No function	Select f-Fix Bit0
2	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
3	START	DIR	Select DIG REF/f-Fix1	No function	No function
4	START	DIR	Select DIG REF/f-Fix1	No function	Select t-dec/t-dec2
5	START	DIR	Select DIG REF/AI2 REF	No function	AI2 REF
6	START	DIR	Select DIG REF/f-Fix1	No function	EXTFLT
7	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
8	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
9	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1	Select DIG REF/f-Fix
10	START	DIR	UP	DOWN	Select DIG REF/f-Fix1
11	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix	No function	Select f-Fix Bit0
12	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
13	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix1	No function	No function
14	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix1	No function	Select t-dec/t-dec2
15	Select Quick-dec	Select Quick-dec	Select DIG REF/AI2 REF	No function	AI2 REF
16	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix1	No function	EXTFLT
17	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
18	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
19	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select DIG REF/f-Fix
20	Select Quick-dec	Select Quick-dec	UP	DOWN	Select DIG REF/f-Fix1
21	Not permissible				

The setpoint value is set using the keypad = digital setpoint value.

The arrow keys are used to adjust the setpoint value.

- If P1-13 = 1,…,10:
  DI2 can be used to select the operating direction.

- P1-13 = 10 or P1-13 = 20:
  DI3 and DI4 can also be used to adjust the setpoint. In this case, they will work simultaneously with the arrow keys on the keypad.

3.2.3 P1-12 = 2: Digital setpoint value, 2 operating directions

Table 10: P1-12 = 2: digital setpoint value, 2 operating directions

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	START	INV	Select DIG REF/f-Fix	No function	Select f-Fix Bit0
2	START	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
3	START	INV	Select DIG REF/f-Fix1	No function	No function
4	START	INV	Select DIG REF/f-Fix1	No function	Select t-dec/t-dec2
5	START	INV	Select DIG REF/AI2 REF	No function	AI2 REF
6	START	INV	Select DIG REF/f-Fix1	No function	EXTFLT
7	START	INV	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
8	START	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
9	START	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select DIG REF/f-Fix
10	START	INV	UP	DOWN	Select DIG REF/f-Fix1
11	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix	No function	Select f-Fix Bit0
12	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
13	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix1	No function	No function
14	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix1	No function	Select t-dec/t-dec2
15	Select Quick-dec	Select Quick-dec	Select DIG REF/AI2 REF	No function	AI2 REF
16	Select Quick-dec	Select Quick-dec	Select DIG REF/f-Fix1	No function	EXTFLT
17	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
18	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
19	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select DIG REF/f-Fix
20	Select Quick-dec	Select Quick-dec	UP	DOWN	Select DIG REF/f-Fix1
21	Not permissible				

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

- P1-13 = 1,…,10:
  If P1-13 = 1,…,10, a signal at DI2 will cause the operating direction set with the keypad to be reversed.
- P1-13 = 10 or P1-13 = 20:
  DI3 and DI4 can also be used to adjust the setpoint. In this case, they will work at the same time as the arrow keys on the keypad.

3.2.4 P1-12 = 3: PID controller

Table 11: P1-12 = 3: PID controller

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	Not permissible				
2	Not permissible				
3	START	DIR	Select PID REF/f-Fix1	Defined with P3-05/P3-10	Defined with P3-05/P3-10
4	Not permissible				
5	START	DIR	Select PID REF/AI2 REF	PID actual value (P3-10 = 1)	AI2 REF
6	START	DIR	Select PID REF/f-Fix1	PID actual value (P3-10 = 1)	EXTFLT
7	Not permissible				
8	Not permissible				
9	Not permissible				
10	Not permissible				
11	Not permissible				
12	Not permissible				
13	FWD	REV	Select PID REF/f-Fix1	Defined with P3-05/P3-10	Defined with P3-05/P3-10
14	Not permissible				
15	FWD	REV	Select PID REF/AI2 REF	PID actual value (P3-10 = 1)	AI2 REF
16	FWD	REV	Select PID REF/f-Fix1	PID actual value (P3-10 = 1)	EXTFLT
17	Not permissible				
18	Not permissible				
19	Not permissible				
20	Not permissible				
21	Not permissible				

3.2.5 P1-12 = 4: Control via field bus

Table 12: P1-12 = 4: Control via field bus

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	START	INV	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
2	Not permissible				
3	Not permissible				
4	START	INV	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
5	START	INV	Select BUS REF/AI2 REF	No function	AI2 REF
6	START	INV	Select BUS REF/f-Fix1	No function	EXTFLT
7	Not permissible				
8	Not permissible				
9	START	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
10	START	INV	No function	No function	Select BUS REF/f-Fix1
11	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
12	Not permissible				
13	Not permissible				
14	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
15	Select Quick-dec	Select Quick-dec	Select BUS REF/AI2 REF	No function	AI2 REF
16	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	EXTFLT
17	Not permissible				
18	Not permissible				
19	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
20	Select Quick-dec	Select Quick-dec	No function	No function	Select BUS REF/f-Fix1
21	Not permissible				

- P1-13 = 1, …,10:
  An enable signal is required at DI1 in order to run the drive. The drive is started through the bus.
- P1-13 = 11, …, 20:
  The enable signal for the drive is issued exclusively through the bus. Simultaneously applying a signal at DI1 and DI2 will result in a quick stop.

3.2.6 P1-12 = 5: Slave mode

Table 13: P1-12 = 5: Slave mode

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	START	INV	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
2	Not permissible				
3	Not permissible				
4	START	INV	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
5	START	INV	Select BUS REF/AI2 REF	No function	AI2 REF
6	START	INV	Select BUS REF/f-Fix1	No function	EXTFLT
7	Not permissible				
8	Not permissible				
9	START	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
10	START	INV	No function	No function	Select BUS REF/f-Fix1
11	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
12	Not permissible				
13	Not permissible				
14	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
15	Select Quick-dec	Select Quick-dec	Select BUS REF/AI2 REF	No function	AI2 REF
16	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	EXTFLT
17	Not permissible				
18	Not permissible				
19	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
20	Select Quick-dec	Select Quick-dec	No function	No function	Select BUS REF/f-Fix1
21	Not permissible				

In order to be able to run the slave, an enable signal for the master is always required as well – even if the setpoint does not come from the master!

3.2.7 P1-12 = 6: Control via CANopen

Table 14: P1-12 = 6: Control via CANopen

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	ENA	INV	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
2	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
3	ENA	INV	Select BUS REF/f-Fix1	No function	AI2 Torque REF
4	ENA	INV	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
5	ENA	INV	Select BUS REF/AI2 REF	No function	AI2 REF
6	ENA	INV	Select BUS REF/f-Fix1	No function	EXTFLT
7	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
8	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
9	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
10	ENA	INV	No function	No function	Select BUS REF/f-Fix1
11	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix	No function	Select f-Fix Bit0
12	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
13	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	AI2 Torque REF
14	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	Select t-dec/t-dec2
15	Select Quick-dec	Select Quick-dec	Select BUS REF/AI2 REF	No function	AI2 REF
16	Select Quick-dec	Select Quick-dec	Select BUS REF/f-Fix1	No function	EXTFLT
17	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
18	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
19	Select Quick-dec	Select Quick-dec	Select f-Fix Bit0	Select f-Fix Bit1	Select BUS REF/f-Fix
20	Select Quick-dec	Select Quick-dec	No function	No function	Select BUS REF/f-Fix1
21	Not permissible				

- P1-13 = 1, …, 10:
  An enable signal is required at DI1 in order to run the drive. The drive is started through the bus.
- P1-13 = 11, …, 20:
  The enable signal for the drive is issued exclusively through the bus. Simultaneously applying a signal at DI1 and DI2 will result in a quick stop.

3.2.8 P1-12 = 9: SWD control + setpoint value

Table 15: P1-12 = 9: SWD control + setpoint value

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	ENA	No function	No function	No function	No function
2	ENA	No function	No function	No function	No function
3	ENA	No function	No function	No function	No function
4	ENA	No function	No function	No function	No function
5	ENA	No function	No function	No function	No function
6	ENA	No function	No function	No function	No function
7	ENA	No function	No function	No function	No function
8	ENA	No function	No function	No function	No function
9	ENA	No function	No function	No function	No function
10	ENA	No function	No function	No function	No function
11	ENA	No function	No function	No function	No function
12	ENA	No function	No function	No function	No function
13	ENA	No function	No function	No function	No function
14	ENA	No function	No function	No function	No function
15	ENA	No function	No function	No function	No function
16	ENA	No function	No function	No function	No function
17	ENA	No function	No function	No function	No function
18	ENA	No function	No function	No function	No function
19	ENA	No function	No function	No function	No function
20	ENA	No function	No function	No function	No function
21	Not permissible				

3.2.9 P1-12 = 10: SWD control

Table 16: P1-12 = 10: SWD control

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	ENA	INV	Select AI1 REF/f-Fix	AI1 REF	Select f-Fix Bit0
2	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
3	ENA	INV	Select AI1 REF/f-Fix1	AI1 REF	AI2 Torque REF
4	ENA	INV	Select AI1 REF/f-Fix1	AI1 REF	Select t-dec/t-dec2
5	ENA	INV	Select AI1 REF/AI2 REF	AI1 REF	AI2 REF
6	ENA	INV	Select AI1 REF/f-Fix1	AI1 REF	EXTFLT
7	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
8	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
9	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select REF/f-Fix
10	ENA	INV	UP	DOWN	Select DIG REF/f-Fix1
11	ENA	INV	Select AI1 REF/f-Fix	AI1 REF	Select f-Fix Bit0
12	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix Bit2
13	ENA	INV	Select AI1 REF/f-Fix1	AI1 REF	AI2 Torque REF
14	ENA	INV	Select AI1 REF/f-Fix1	AI1 REF	Select t-dec/t-dec2
15	ENA	INV	Select AI1 REF/AI2	AI1 REF	AI2 REF
16	ENA	INV	Select AI1 REF/f-Fix1	AI1 REF	EXTFLT
17	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	EXTFLT
18	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select t-dec/t-dec2
19	ENA	INV	Select f-Fix Bit0	Select f-Fix Bit1	Select REF/f-Fix
20	ENA	INV	UP	DOWN	Select DIG REF/f-Fix1
21	Not permissible				

3.2.10 P1-12 = 11: SWD setpoint value

Table 17: P1-12 = 11: SWD setpoint value

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	ENA	No function	No function	No function	No function
2	ENA	No function	No function	No function	No function
3	ENA	No function	No function	No function	No function
4	ENA	No function	No function	No function	No function
5	ENA	No function	No function	No function	No function
6	ENA	No function	No function	No function	No function
7	ENA	No function	No function	No function	No function
8	ENA	No function	No function	No function	No function
9	ENA	No function	No function	No function	No function
10	ENA	No function	No function	No function	No function
11	ENA	No function	No function	No function	No function
12	ENA	No function	No function	No function	No function
13	ENA	No function	No function	No function	No function
14	ENA	No function	No function	No function	No function
15	ENA	No function	No function	No function	No function
16	ENA	No function	No function	No function	No function
17	ENA	No function	No function	No function	No function
18	ENA	No function	No function	No function	No function
19	ENA	No function	No function	No function	No function
20	ENA	No function	No function	No function	No function
21	Not permissible				

3.2.11 P1-12 = 13: SmartWire-DT control + setpoint, start via bus and terminal

Table 18: P1-12 = 13: SmartWire-DT control + setpoint, start via bus and terminal

P1-13	DI1 (terminal 2)	DI2 (terminal 3)	DI3 (terminal 4)	DI4/AI1 (terminal 6)	DI5/AI2 (terminal 10)
0	user-definable	user-definable	user-definable	user-definable	user-definable
1	ENA	START	No function	No function	No function
2	ENA	START	No function	No function	No function
3	ENA	START	No function	No function	No function
4	ENA	START	No function	No function	No function
5	ENA	START	No function	No function	No function
6	ENA	START	No function	No function	No function
7	ENA	START	No function	No function	No function
8	ENA	START	No function	No function	No function
9	ENA	START	No function	No function	No function
10	ENA	START	No function	No function	No function
11	ENA	START	No function	No function	No function
12	ENA	START	No function	No function	No function
13	ENA	START	No function	No function	No function
14	ENA	START	No function	No function	No function
15	ENA	START	No function	No function	No function
16	ENA	START	No function	No function	No function
17	ENA	START	No function	No function	No function
18	ENA	START	No function	No function	No function
19	ENA	START	No function	No function	No function
20	ENA	START	No function	No function	No function
21	Not permissible				

An enable signal is required at DI1 in order to run the drive.
The start signal is issued both through the bus and DI2 (AND'ed).

4 Messages

4.1 List of messages

The following messages can occur:

Table 19: List of messages

Message	No.	Possible causes and fixes
5 7OP	–	Ready to start. There is no drive enable signal present. There are no fault messages present.
no-FLt	00	Shown for P0-13 if there are no messages in the error register.
OI-b	01	Excessively high braking current • Check the brake resistor and its wiring for short-circuits and ground faults. • Make sure that the braking resistance value is not lower than the minimum permissible braking resistance.
OL-br	02	Thermal overload on brake resistor The drive has been switched off in order to prevent the brake resistor from being thermally destroyed. • Make the P1-04 and P2-25 ramp times longer in order to have less frequent braking. • Reduce the load's inertia, if possible.
O-I	03	Overcurrent at variable frequency drive output Occurs right after switching on the unit: • Check the cable connection between the variable frequency drive and the motor • Check the motor for shorted turns and ground faults Occurs when starting the motor: • Check whether the motor can rotate freely and make sure that it is not being blocked mechanically. • Motor with mechanical brake: Check whether the brake is being applied. • Check the connection configuration (star/delta). • Check to make sure that the motor data was entered correctly in P1-07, P1-08, and P1-09. • In vector control mode (P4-01 = 0 or 1): Check to make sure that the cos φ (P4-05) value was entered correctly and that a motor identification run was performed correctly. • Increase the acceleration ramp time (t-acc, P1-03) if necessary. • In speed control mode (P4-01 = 2): Reduce the voltage boost with P1-11. Occurs during operation at a constant speed: • Check whether the motor is overloaded. Occurs during acceleration/deceleration: • The ramp times are too short and require too much power. If P-03 / P-04 cannot be increased, a larger device may be required.
I.t-trP	04	Motor overload. The thermal protection mechanism has tripped as a result of the device being run above the rated motor current set with P1-08 longer than a specific time. • Check to make sure that the motor data was entered correctly in P1-07, P1-08, and P1-09. • In vector control mode (P4-01 = 0 or 1): Check to make sure that the cos φ (P4-05) value was entered correctly and that a motor identification run was performed correctly. • Check the motor's connection configuration (e.g., start/delta) • If the decimal points on the display flash during operation, this means that the unit is being run in its overload range (> P1-08). In this case, use P1-03 to make the acceleration ramp longer or reduce the load. • Make sure that the motor is not being mechanically blocked and that there are no additional loads on the motor.

Message	No.	Possible causes and fixes
PS-trP	05	Overcurrent (Hardware) • 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.
O.Uolt	06	Overvoltage in DC link The DC link voltage value can be viewed using parameter P0-20. P0-36 contains a fault register with the last values before the unit was switched off (scan time: 256 ms). • Check to make sure that the supply voltage falls within the range for which the variable frequency drive is sized. • If the fault occurs during deceleration or stopping: Make the deceleration ramp (P1-04/P2-25) longer or use the brake resistor. • In vector control mode (P4-01 = 0 or = 1): Reduce the speed controller's gain (P4-03). • If using the PID controller: Reduce P3-11 (PID1 fault ramp) to ensure that the ramps are active.
U.Uolt	07	Undervoltage in DC link. **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. If the message appears during operation: • 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.
O-t	08	Overtemperature at heat sink. The drive is too hot. The heat sink temperature can be viewed by using P0-21. P0-38 contains a fault register with the last values before the unit was switched off (scan time: 30 s). • Check to make sure that the variable frequency drive is being operated within the ambient temperature range specified for it (IP20 devices: max. 50 °C; IP66 devices: max. 40 °C). • Check to make sure that the device fan is running. • Make sure that cooling air can circulate freely (clearances to neighboring devices above and below the variable frequency drive). • Improve the control cabinet's ventilation if necessary: The device's vents must not be obstructed, e.g., by dirt or as a result of devices being installed too close to each other. • Reduce the carrier frequency with P2-24. • Reduce the load if possible.
U-t	09	Under-temperature 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-dEF	10	The parameters' default settings have been loaded. • Press the STOP button: You will be able to reconfigure the drive after doing so.
E-triP	11	External fault (at digital input 5, terminal 10, if P1-13 = 6/7/16/17). 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 10, check whether the motor is too hot.

4 Messages

4.1 List of messages

Message	No.	Possible causes and fixes
SC-Ob5	12	Communication error with an external operating unit or with a PC. • Check connections.
FLt-dc	13	Excessively high DC link voltage ripple The DC link voltage ripple can be viewed using P0-16. P0-37 contains a fault register with the last values before the unit was switched off (scan time: 20 ms). • Check to make sure that all the mains supply phases are present and that their voltage balance falls within the permissible tolerance range (3 %). • Reduce the load if possible. • If the fault persists, please contact your nearest Eaton sales branch.
P-LOSS	14	Incoming power phase failure (only for devices with a three-phase power supply)
h O-1	15	Overcurrent at output • See fault No. 03.
th-FLt	16	Malfunctioning heat sink thermistor. • Please contact your nearest Eaton sales branch.
dAtA-F	17	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.
4-20 F	18	The analog input's input current does not fall within the specified range. • Check the setting in P2-30 for AI1 (terminal 6) and P2-33 for AI2 (terminal 10). • In the case of 4-20 mA: Check the setpoint connection for wire breakage.
dAtA-E	19	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.
U-dEF	20	The customer's settings for the parameters have been imported. • Press the STOP button.
F-Ptc	21	Motor PTC thermistor overtemperature
FAn-F	22	The device's internal fan is experiencing a fault In the case of frame size FS8: Wrong device fan operating direction Check the supply voltage phase sequence (L1–L2–L3).
O-hEAt	23	The measured ambient temperature exceeds the specified value. • Check the device's internal fan. • Make sure that the required clearance around the device is being maintained and that cooling air can flow through the vents on the device unimpeded. • Reduce the carrier frequency with P2-24. • If possible: Reduce the load.
O-torq	24	Maximum permissible torque exceeded. • If possible: Reduce the load or increase acceleration time t-acc.
U-torq	25	Only active if brake control is enabled in hoisting gear mode (P2-18 = 8). The torque produced before the hoisting gear's mechanical brake is enabled falls below the set threshold.
OUt-F	26	Device output fault • Please contact your nearest Eaton sales branch.
Sto-F	29	Internal STO circuit fault • Please contact your nearest Eaton sales branch.

Message	No.	Possible causes and fixes
Enc-01	30	No communication between the encoder module and the variable frequency drive. • Check to make sure that the module is correctly plugged in and secured.
Enc-02 SP-Err	31	The calculated motor speed is different from the measured motor speed. • Check the encoder connection, including the corresponding shielding. • Increase the value of P6-07 if necessary.
Enc-03	32	The motor speed and the PPR value entered in P6-06 do not match. The PPR value in P6-06 must be at least 60. • Check the speed entered in P1-10.
Enc-04	33	Channel A fault: Usually a bad connection. • Check wiring.
Enc-05	34	Channel B fault Usually a bad connection. • Check wiring.
Enc-06	35	Error on channels A and B Usually a bad connection. • Check wiring.
AtF-01	40	Motor identification failed: The measured stator resistance varies between the phases. • Make sure that the motor is connected properly and working correctly. • Check the motor windings to make sure they have the same resistance values.
AtF-02	41	Motor identification failed: The measured stator resistance is too large. • Make sure that the motor is connected properly and working correctly. • Check to make sure that the device's rated output matches the motor's rated output. The difference should not exceed one full output class.
AtF-03	42	Motor identification failed: The measured motor inductance is too low. • Make sure that the motor is connected properly and working correctly.
AtF-04	43	Motor identification failed: The measured motor inductance is too high. • Make sure that the motor is connected properly and working correctly. • Check to make sure that the device's rated output matches the motor's rated output. The difference should not exceed one full output class.
AtF-05	44	Motor identification failed: The measured motor parameters do not match. • Make sure that the motor is connected properly and working correctly. • Check to make sure that the device's rated output matches the motor's rated output. The difference should not exceed one full output class.
OUt-Ph	49	A phase in the motor cable is not connected or has a discontinuity.
Sc-F01	50	No valid Modbus frame was received within the time specified in P5-06. • Check to make sure that the network master is working correctly. • Check connecting cables. • Increase the value of P5-06 to an acceptable value.
Sc-F02	51	No valid CANopen frame was received within the time specified in P5-06. • Check to make sure that the network master is working correctly. • Check connecting cables. • Increase the value of P5-06 to an acceptable value.
Sc-F03	52	Communication between the device and the plugged-in optional field bus module has dropped out. • Check to make sure that the module is installed properly.

4 Messages

4.1 List of messages

Message	No.	Possible causes and fixes
5c-F04	53	Communication between the device and the plugged-in I/O expansion has dropped out. • Check to make sure that the module is installed properly.
OF-01	60	No internal connection to an optional card
OF-02	61	Optional module in undefined operating state
PLC-01	70	Non-supported function block from function block editor
PLC-02	71	Program from function block editor is too big
PLC-03	72	Division by zero
PLC-04	73	Lower limit is higher than upper limit
PLC-05	74	Overflow table Function block editor

4.2 Messages after a data transfer with a DX-COM-STICK

Table 20: Possible messages after a data transfer

View	Description
PASS-r	Parameter transfer to DX-COM-STICK interface card was successful
DS-Loc	DX-COM-STICK is interlocked. In order to transfer data, check the switch position on the side.
FAiL-r	Error while attempting to read the parameters from the variable frequency drive.
PASS-t	Parameter transfer to variable frequency drive successful.
FAiL-P	The parameter set stored in the DX-COM-STICK is for a different output variable (different motor current, motor output, etc.) than that of the connected variable frequency drive.
FAil-t	Error when attempting to copy parameter set to variable frequency drive
no-dAt	No data found in DX-COM-STICK.
dr-Loc	Parameter set in variable frequency drive locked. Unlock variable frequency drive first.
dr-rUn	The variable frequency drive has an enable signal and cannot take new parameters. Stop the variable frequency drive.
tYPE-E	The parameter set stored in the DX-COM-STICK does not match the variable frequency drive. Only transfers from the variable frequency drive to the DX-COM-STICK are possible.
tYPE-F	The DX-COM-STICK is not compatible with the variable frequency drive.

5 Parameter

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

Abbreviation	Significance
RUN	The parameter can be accessed during operation ("Run" signal)
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 0

Table 21: "Monitor" parameter group 0

Para-meter	Designation	Description
P0-01	Analog Input1	Analog Input 1 Level of the signal applied to analog input 1 (terminal 6) after scaling and offsets have been applied. Display 1000 ≙ 100 %.
P0-02	Analog Input2	Analog input 2 Level of the signal applied to analog input 2 (terminal 10) after scaling and offsets have been applied. Display 1000 ≙ 100 %
P0-03	DI1 Status	Status of the Digital Inputs Status of the digital inputs, including the ones on option boards, starting on the left hand side with digital input 1, …, 8. Display: • 0 = Low • 1 = High
P0-04	f-PreRamp	Speed reference in front of the ramp
P0-05	Torque Reference	Torque Reference Display: 1000 ≙ 100%
P0-06	MotorPot Reference	Digital reference value, e.g. coming from the keypad
P0-07	f-Ref Interface0	Speed reference received via fieldbus interface
P0-08	PID1 Set Point	Reference PID Controller 1 Display 4096 ≙ 100 %
P0-09	PID1 Feedback 1	Feedback value PID Controller 1 Display 4096 ≙ 100 %
P0-10	PID1 Output	PI(D) controller 1 Output Display 4096 ≙ 100 %
P0-11	Motor Voltage	Instantaneous output voltage
P0-12	Motor Torque	Motor Torque Display 1000 ≙ 100 %
P0-13	Fault Log	Display of the 4 latest faults

Para-meter	Designation	Description
P0-14	Magnetizing current I_q	Calculated Magnetizing Current (I_q), providing an autotune has successfully been completed.
P0-15	Torque current I_d	Calculated Torque producing Current (I_d), providing an autotune has successfully been completed.
P0-16	DC-Link Voltage Ripple	DC-Link Voltage Ripple
P0-17	Motor Stator Resistance Meas	Measured Motor Stator Resistance (R_S), providing an autotune has successfully been completed.
P0-18	Motor Stator Inductance Meas	Measured Motor Stator Inductance (L_S), providing an autotune has successfully been completed.
P0-19	Motor Rotor Resistance Meas	Measured Motor Rotor Resistance (R_r), providing an autotune has successfully been completed.
P0-20	DC-Link Voltage	Instantaneous DC Link Voltage Display 600 ≙ 600 V
P0-21	Heatsink Temperature	Instantaneous Heatsink Temperature Display 40 ≙ 40 °C
P0-22	TimeToNextService	Time remaining to next service The service interval is set with P6-24.
P0-23	t-Run IGBT in OT	Time elapsed, in which the drive has operated with a high heatsink temperature Displays the time in hours and minutes above 85 °C. The value is used for various internal protective functions.
P0-24	t-Run PCB in OT	Time elapsed, in which the drive has operated with a high temperature at the PCBs (ambient temperature) Displays the time in hours and minutes above 80 °C. The value is used for various internal protective functions.
P0-25	Motor Speed	Motorspeed (calculated or measured) In vector mode this parameter displays the calculated motor speed if no encoder is present. In case of an encoder feedback the measured speed is displayed.
P0-26	kWh Meter	Energy Consumption kWh Meter (resettable) Displays the energy consumption in kWh. When the value reaches 1000, it is reset back to 0 and the number of MWh in P0-27 is increased by 1. This parameter contains 2 values. The first value visible can be reset by the user with P6-23 = 1. The second value cannot be reset and shows together with P0-27 the energy consumption since the day of manufacture.
P0-27	MWh Meter	Energy Consumption MWh Meter Shows the power consumed in MWh. This parameter contains two values: The first value shown when the parameter is accessed is the value that the user can reset with P6-23 = 1. The second value cannot be reset and, together with P0-26, shows the total energy consumption since the device's date of manufacture.
P0-28	Application Version	Application Version • Level 1: Application version + Check sum • Level 2: System version + Check sum

5 Parameter

5.1 "Monitor" parameter group 0

Para-meter	Designation	Description
P0-29	"Device Information"	Shows specific device information. The first piece of information can be accessed by pressing the **OK** button. To view other information, press the ▲ and ▼ arrow keys.
	FrameSize	Frame Size
	NoOfInputPhases	Number of input phases
	kW/HP	Motor Power
	Power@Ue	Device Power at Device Voltage Rating
	Device Voltage	Device Voltage Rating
	DeviceType	Device Type
P0-30	Serial Number	Serial Number of the device
P0-31	t-Run	Total operating time of the drive since the date of manufacture Displayed in hours, minutes and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds".
P0-32	t-Run since Restart	Total operating time of the drive since the last trip occured or power down in hours, minutes and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds".
P0-33	t-Run since Trip	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".
P0-34	t-HoursRun Enable	The drive's operating time since the most recent enable signal, in hours, minutes, and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds".
P0-35	Fan Runtime	Run time of the integrated fan (resettable by the user) Displayed in hours. Value 1 is the time since last reset with P6-22. Pressing the UP key on the keypad will change the display to "Fan runtime since the date of manufacture" ("F" is displayed at the beginning of the line).
P0-36	DC-Link0 Log	DC link voltage log Displays the most recent 8 samples of the DC bus voltage prior to a drive trip condition occurring. The sample interval is 256 ms.
P0-37	DC-Link V-Ripple0 Log	DC link voltage ripple history Shows the last eight DC link voltage ripple values before the device was switched off due to a fault. Scan time: 20 ms
P0-38	Heatsink0 Log	Heatsink temperature log Displays the most recent 8 samples of the heat sink temperature prior to a drive trip condition occurring. The sample interval is 30 s.
P0-39	AmbientTemp0 Log	Internal Ambient Temperature Log Displays the most recent 8 samples of the internal ambient temperature prior to a drive trip condition occurring. The sample interval is 30 s.
P0-40	MotorCurrent0 Log	Motor current log Displays the most recent 8 samples of the Motor current prior to a drive trip condition occurring. The sample interval is 256 ms.

Para-meter	Designation	Description
P0-41	FaultCounter Overcurrent	Counts, how often "Overcurrent" occured
P0-42	Fault-Counter DC-Overvoltage	Counts, how often "DC-Overvoltage" occured
P0-43	Fault-Counter DC-Undervoltage	Counts, how often "DC-Undervoltage" occured
P0-44	FaultCounter Overtemperature Heatsink	Number of times the device has been switched off due to heatsink overtemperature since the date of manufacture
P0-45	FaultCounter Overcurrent Brake Chopper	Number of times the device has been switched off due to the brake chopper since the date of manufacture
P0-46	FaultCounter Overtemperature Ambient	Number of times the device has been switched off due to overtemperature (internal ambient temperature) since the date of manufacture
P0-47	FaultCounter Internal Fault (IO)	Number of communication errors between the power section and control section detected by the I/O processor since the last time the unit was switched on
P0-48	FaultCounter Internal Fault (DSP)	Number of communication errors between the power section and control section detected by the power section processor since the last time the unit was switched on
P0-49	FaultCounter Communication Loss	Number of Modbus communication errors detected by the I/O processor since the last time the unit was switched on
P0-50	FaultCounter CANopen COM Loss	Number of CANopen communication errors detected by the I/O processor since the last time the unit was switched on
P0-51	Input Data1 Value	Input Data 1, Value Process Input Data (PDI, received from the fieldbus). There are 4 entries for this parameter (PDI1 … PDI4). By default it shows the CANopen exchanged data. In case a fieldbus module is present inside the drive and P1-12 is set to 4, the fieldbus data are displayed.
P0-52	Ouput Data1 Value	Output Data 1, value Process Output Data (PDO, received from the fieldbus). There are 4 entries for this parameter (PDO1 … PDO4). By default it shows the CANopen exchanged data. In case a fieldbus module is present inside the drive and P1-12 is set to 4, the fieldbus data are displayed.
P0-53	–	Phase U, current ofset and reference (value for diagnosis in case of problems)
P0-54	–	Phase V, current ofset and reference (value for diagnosis in case of problems)
P0-55	–	Reserved Parameter
P0-56	Brake Chopper t-On	1st line: max. On Time of the Brake Chopper 2nd line: Duty Cycle
P0-57	Stator voltage	U_d and U_q of the stator voltage. 1st value = U_d ("d" at the beginning of the line) Pressing the UP key on the drive keypad the display will change to U_q ("q" at the beginning of the line).
P0-58	Encoder Speed	Encoder Feedback Speed (If Encoder is present) Displayed in Hz or rpm
P0-59	f-RefOfFreq-Ref	Speed reference received by a frequency signal
P0-60	n-Slip	Motor Slip Speed Calculated. Displayed in Hz or rpm
P0-61	Relay hysteresis	Switching hysteresis of the Output Relays RO1 and RO2 in Hz resp. rpm. Display value = P6-04 x P1-01 **Remark:** Only in cases where P2-11 and/or P2-13 are set to 2 or 3.

5 Parameter

5.1 "Monitor" parameter group 0

Para-meter	Designation	Description
P0-62	DroopFeedback	Difference in speed of two motors to achieve an equal load sharing. Displayed in Hz or rpm. → P6-09
P0-63	f-PostRamp	Speed reference after the ramp
P0-64	Actual Switching Frequency	Actual switching frequency. The value may be less than the one set with P2-24. → P6-02
P0-65	t-PowerOn	Total time for which the drive was powered up since the day of manufacture. Displayed in hours, minutes and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds"
P0-66	UserProgramID	ID of a program generated by the Function Block Editor. This ID can be set by the user when developing the program.
P0-67	M-Ref Interface	Torque reference received via fieldbus interface
P0-68	t-accNetwork	Ramp time received via fieldbus interface. **Remark:** This value is only active with P5-07 = 1
P0-69	FaultCounter Option COM Loss	Number of communication errors in an optional module since the last time the unit was switched on
P0-70	OptionID0	Identification Code of an option installed
P0-71	OptionSignature	Fieldbus Module Identifier (Option)
P0-72	T-Controlboard	Internal device ambient temperature
P0-73	24h timer	Content of an internal 24 h timer in minutes. The timer starts to count when power is applied to the drive, and allows simple time based functions to be programmed with the function block editor.
P0-74	L1 Input Voltage	Input voltage L1
P0-75	L2 Input Voltage	Input voltage L2
P0-76	L3 Input Voltage	Input voltage L3
P0-77	Encoder Puls counter	Encoder Feedback Value The two values (High Word and Low Word) contain the 32 Bit value of the Encoder Input
P0-78	–	Test Parameter
P0-79	Application Software Version	I/O Controller / Application SW Version Pressing the UP key on the drive keypad will change the display to System Software
P0-79	System Software Version	System Software Version
P0-80	Value@Pointer	Pointer on an internal parameter Displays the value selected with P6-28.

5.2 Parameter group 1 ("Basic")

Table 22: Parameter group 1 ("Basic")

Para-meter	RUN	Designation	Value	Description	DS
P1-01	✓	f-max	500 Hz max.	Maximum output frequency This can be set to any value between "f-min" and 5x the "motor nom frequency". • "Motor Nom Speed" (P1-10) = 0, the maximum speed limit will be displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, the maximum speed limit will be displayed in rpm.	50.0 Hz
P1-02	✓	f-min		Minimum output frequency This can be set to any value between 0 and "f-max" (P1-01) • "Motor Nom Speed" (P1-10) = 0, the minimum speed limit will be displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, the minimum speed limit will be displayed in rpm.	0.0 Hz
P1-03	✓	t-acc	0.0 - 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" (P1-09).	5.0 s
P1-04	✓	t-dec	0.0 - 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" (P1-09) to zero.	5.0 s
P1-05	✓	Stop Mode	0, …, 4	Determines the action taken by the drive in the event of the drive enable signal being removed. This parameter is also used to disable (P1-05 = 0 or 1) or enable (P1-05 = 2 or 3) a brake chopper. Possible values: • **0**: Ramp to stop. When the enable signal is removed, the drive will ramp to stop, with the rate controlled by "t-dec" (P1-04). A brake chopper (where fitted) is always disabled. • **1**: Coasting. When the enable signal is removed, the drive output is immediately disabled, and the motor will coast (freewheel) to stop. If the load can continue to rotate due to inertia and may possibly be re-enabled whilst the motor is still rotating, the Spin Start Function shall be enabled with P2-26. A brake chopper (where fitted) is always disabled, even during normal operation. • **2**: Ramping. When the enable signal is removed, the drive will ramp to stop, with the rate controlled by "t-dec" (P1-04). In this mode the brake chopper (where fitted) is always enabled. • **3**: Coasting. When the enable signal is removed, the drive output is immediately disabled, and the motor will coast (freewheel) to stop. If the load can continue to rotate due to inertia and may possibly be re-enabled whilst the motor is still rotating, the Spin Start Function shall be enabled with P2-26. In this mode the brake chopper (where fitted) is enabled during normal operation, but not after removing the enable signal. • **4**: AC flux braking. When stopping the drive, AC flux braking is used to reduce the stopping time. In this mode the brake chopper is disabled, even during normal operation.	1

Para-meter	RUN	Designation	Value	Description	DS
P1-06	✓	EnergyOptimizer	0, 1	EnergyOptimizer 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. Available settings: • **0**: OFF • **1**: ON **Remark:** This mode of operation is less suitable for dynamic applications where the load conditions can suddenly increase significantly.	0
P1-07	–	Motor Nom Voltage		Defines the Motor rated voltage. If P1-07 = 0 the DC bus voltage compensation is disabled (in V/f mode only) and the output voltage will be equal to the incoming supply voltage when operating at "Motor Nom Frequency" (P1-09).	U_e
P1-08	–	Motor Nom Current		Motor rated current. By setting the "Motor Nom Current" in the drive, the motor overload protection is configured to match the motor rating. If the motor current exceeds the value set with P1-08, the flashing decimal points on the display will indicate that there is an overload. If this situation persists for a prolonged period of time, the device may switch off due to overloading. Display: $I.t - t \cdot P$	I_e
P1-09	–	Motor Nom Frequency		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. Above this frequency the voltage remains limited to "Motor Nom Voltage"	50 Hz
P1-10	✓	Motor Nom Speed		Motor rated speed • P1-10 = 0: the speed of the motor will be displayed in Hz. • P1-10 > 0: the speed related parameters (f-max, f-min 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 "Motor Nom Speed" = motor synchronous speed (e.g. 3000rpm for a 2-pole 50Hz motor), the speed can be displayed in rpm without activating the slip compensation. **Remark:** When the drive is operated with the optional Encoder Feedback Interface, this parameter must be set to the correct nameplate rpm of the connected motor.	0 rpm
P1-11	–	V-Boost		Voltage is used to increase the applied motor voltage at low output frequency, in order to improve low speed and starting torque. Excessive voltage boost levels may result in increased motor current and temperature, and forced ventilation may be required. An automatic setting (Auto) is also possible, whereby the drive will automatically adjust this parameter based on the motor parameters measured during an Autotune. **Remark:** This parameter will only be enabled when using speed control (expanded V/Hz, P4-01 = 2).	2.5 % of P1-07

Para-meter	RUN	Designation	Value	Description	DS
P1-12	–	Local ProcessData Source	0, …, 6, 9, 10, 11, 13

7, 8: reserved | Local Configuration of Command and Reference Sources

Possible values:
• **0**: Terminal Control. The drive responds directly to signals applied to the control terminals.
• **1**: Uni-directional digital reference. The drive can be controlled in the forward direction only using a digital reference (via internal or remote Keypad or terminals)
• **2**: Bi-directional digital reference. The drive can be controlled in the forward and reverse directions using a digital reference (via internal or remote Keypad or terminals). Pressing the keypad START button toggles between forward and reverse.
• **3**: PID controller. The output frequency will be controlled by the internal PID controller
• **4**: Fieldbus Control. Control via Modbus RTU if no fieldbus option is present, otherwise control from the fieldbus option module
• **5**: Slave Mode. The Variable Frequency Drive acts as a slave to a connected drive operating in Master Mode.
• **6**: CANopen Control. Control via the CANopen bus connected to the RJ45 serial interface connector.
• **7**: Reserved
• **8**: Reserved
• **9**: SmartWire Device Control and speed ref.
• **10**: SmartWire Device Control and terminal speed ref.
• **11**: Terminal Control and SmartWire Device speed ref.
• **12**: not permissible
• **13**: SmartWire Device Control and speed ref. Digital input sets enable. | 0 |

Para-meter	RUN	Designation	Value	Description	DS
P1-13	–	DI Config Select	0, 1, …, 21	Configuration of digital inputs with a fix set of combinations The setting of P1-13 determines the input configuration depending on P1-12. Configuration in terminal mode (P01-12 = 0): • **0**: User defined • **1**: [START] [DIR] [Select REF / f-Fix] [AI1 REF] [Select f-Fix Bit0] • **2**: [START] [DIR] [Select f-Fix Bit0] [Select f-Fix Bit1] [Select f-Fix Bit2] • **3**: [START] [DIR] [Select REF / f-Fix1] [AI1 REF] [AI2 Torque REF] • **4**: [START] [DIR] [Select REF / f-Fix1] [AI1 REF] [Select t-dec1 / t-Quick-Dec] • **5**: [START] [DIR] [Select REF / AI2] [AI1 REF] [AI2 REF] • **6**: [START] [DIR] [Select REF / f-Fix1] [AI1 REF] [EXTFLT] • **7**: [START] [DIR] [Select f-Fix Bit0] [Select f-Fix Bit1] [EXTFLT] • **8**: [START] [DIR] [Select f-Fix Bit0] [Select f-Fix Bit1] [Select t-dec1 / t-Quick-Dec] • **9**: [START] [DIR] [Select f-Fix Bit0] [Select f-Fix Bit1] [Select REF / f-Fix] • **10**: [START] [DIR] [UP] [DOWN] [Select REF / f-Fix1] • **11**: [FWD] [REV] [Select REF / f-Fix] [AI1 REF] [Select f-Fix Bit0] • **12**: [FWD] [REV] [Select f-Fix Bit0] [Select f-Fix Bit1] [Select f-Fix Bit2] • **13**: [FWD] [REV] [Select REF / f-Fix1] [AI1 REF] [AI2 Torque REF] • **14**: [FWD] [REV] [Select REF / f-Fix1] [AI1 REF] [Select t-dec1 / t-Quick-Dec] • **15**: [FWD] [REV] [Select REF / AI2] [AI1 REF] [AI2 REF] • **16**: [FWD] [REV] [Select REF / f-Fix1] [AI1 REF] [EXTFLT] • **17**: [FWD] [REV] [Select f-Fix Bit0] [Select f-Fix Bit1] [EXTFLT] • **18**: [FWD] [REV] [Select f-Fix Bit0] [Select f-Fix Bit1] [Select t-dec1 / t-Quick-Dec] • **19**: [FWD] [REV] [Select f-Fix Bit0] [Select f-Fix Bit1] [Select REF / f-Fix] • **20**: [FWD] [REV] [UP] [DOWN] [Select REF / f-Fix1] • **21**: [Pulse FWD (NO)] [Pulse STOP (NC)] [Pulse REV (NO)] [AI1 REF] [Select REF / f-Fix1] Select REF = reference defined by P9-10, …, P9-17 and selected by P9-18 … P9-20. Default: analog reference at AI1	11
P1-14		Password		Entry of the password to get access to the extended parameter set. The value to be put in is determined by the level to be accessed. • Level 2 (Access to parameter groups 0 to 5): P1-14 = P2-40 (Default: 101) • Level 3 (Access to parameter groups 0 to 9): P1-14 = P6-30 (Default: 201)	Level 2: 101 Level 3: 201

5.3 Parameter group 2 ("Functions")

Table 23: Parameter group 2 ("Functions")

Para-meter	RUN	Designation	Value	Description	DS
P2-01	✓	f-Fix1	–	Preset Fixed Frequency 1 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	5.0 Hz
P2-02	✓	f-Fix2	–	Preset Fixed Frequency 2 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	10.0 Hz
P2-03	✓	f-Fix3	–	Preset Fixed Frequency 3 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	25.0 Hz
P2-04	✓	f-Fix4	–	Preset Fixed Frequency 4 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	50.0 Hz
P2-05	✓	f-Fix5	–	Preset Fixed Frequency 5 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	0.0 Hz
P2-06	✓	f-Fix6	–	Preset Fixed Frequency 6 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	0.0 Hz
P2-07	✓	f-Fix7	–	Preset Fixed Frequency 7 Value can be adjusted between f-min and f-max. Selection via a digital control signal. When Hoist mode is active (P2-18 = 8), this parameter defines the frequency or speed which will be used to generate a holding torque prior to releasing the mechanical brake. If P1-10 > 0 the value is entered and displayed in rpm. This parameter must be set > 0 when using hoist mode and the value should be high enough to ensure the connected motor can develop sufficient torque to hold the maximum load capacity.	0.0 Hz
P2-08	✓	f-Fix8	–	Preset Fixed Frequency 8 Value can be adjusted between f-min and f-max. Selection via a digital control signal. When hoist mode is active (P2-18 = 8) this parameter defines the frequency or speed at which the drive will signal the motor brake to close when stopping. If P1-10 > 0 the value is entered and displayed in rpm. This parameter must be set > 0 when using hoist mode and the value should be high enough to ensure the connected motor can develop sufficient torque to hold the maximum load capacity.	0.0 Hz
P2-09	✓	f-Skip1	–	Centre point of the frequency band defined by f-Skip-Band1 in which the drive doesn't work in steady-state.	0.0 Hz
P2-10	✓	f-SkipBand1	–	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. • Lower limit: = P2-09 - P2-10/2 • Upper limit = P2-09 + P2-10/2 The definition applies for both senses of rotation.	0.0 Hz

Para-meter	RUN	Designation	Value	Description	DS
P2-11	✓	ADO1 Function & Mode	0, 1, …, 11	Selection of kind (analog or digital) and function of ADO1 / AO1 Possible values: P2-11 = 0, …, 7: digital output • **0**: RUN, enable (FWD/REV) • **1**: READY, DA1 ready for operation • **2**: Speed: speed reference value • **3**: Speed > Speed Zero • **4**: Speed; ON: ≧ P2-16 / OFF: < P2-17 • **5**: Motor current; ON: ≧ P2-16 / OFF: < P2-17 • **6**: Motor torque; ON: ≧ P2-16 / OFF: < P2-17 • **7**: Analog input AI2; ON: ≧ P2-16 / OFF: < P2-17 P2-11 = 8, …,11: Analog output • **8**: Output frequency (0 - 100 % f-max (P1-01)) • **9**: Motor current (0 - 200 % Motor rated current (P1-08)) • **10**: Motor torque (0 - 200 % Motor rated torque) • **11**: Motor power (0 - 200 % Motor rated power)	8
P2-12	✓	AO1 SignalFormat	0, 1, …, 5	Selection of the signal format at Analog Output 1 (AO1) Possible values: • **0**: 0 - 10 V • **1**: 10 - 0 V • **2**: 0 - 20 mA • **3**: 20 - mA • **4**: 4 - 20 mA • **5**: 20 - 4 mA	0
P2-13	✓	ADO2 Function & Mode	0, 1, …, 11	Selection of kind (analog or digital) and function of ADO2 / AO2 Possible values: P2-13 = 0, …, 7: digital output • **0**: RUN, enable (FWD/REV) • **1**: READY, DA1 ready for operation • **2**: Speed: speed reference value • **3**: Speed > Speed Zero • **4**: Speed; ON: ≧ P2-19 / OFF: < P2-20 • **5**: Motor current; ON: ≧ P2-19 / OFF: < P2-20 • **6**: Motor torque; ON: ≧ P2-19 / OFF: < P2-20 • **7**: Analog input AI2; ON: > P2-19 / OFF: < P2-20 P2-13 = 8, …,11: Analog output • **8**: Output frequency (0 - 100 % f-max (P1-01)) • **9**: Motor current (0 - 200 % Motor rated current (P1-08)) • **10**: Motor torque (0 - 200 % Motor rated torque) • **11**: Motor power (0 - 200 % Motor rated power)	9
P2-14	✓	AO2 SignalFormat	0, 1, …, 5	Selection of the signal format at Analog Output 2 (AO2) Possible values: • **0**: 0 - 10 V • **1**: 10 - 0 V • **2**: 0 - 20 mA • **3**: 20 - 0 mA • **4**: 4 - 20 mA • **5**: 20 - 4 mA	0

Para-meter	RUN	Designation	Value	Description	DS
P2-15	✓	RO1 Function	0, 1, …, 7, 10, 11, 13	Selection of the function of output relay RO1 Possible values: • **0**: RUN, enable (FWD/REV) • **1**: READY, DA1 ready for operation • **2**: Speed = speed reference value • **3**: Speed > Speed Zero • **4**: Speed; ON: ≧ P2-16 / OFF: < P2-17 • **5**: Motor current; ON: ≧ P2-16 / OFF: < P2-17 • **6**: Motor torque; ON: ≧ P2-16 / OFF: < P2-17 • **7**: Analog input AI2; ON: > P2-16 / OFF: < P2-17 • **8**: Reserved • **9**: Reserved • **9**: Reserved • **10**: Maintenance due. The Service Interval Time (P6-24) has elapsed. • **11**: Drive ready. The drive is: not in inhibit mode (STO), not in mains loss condition and not in trip condition. The mains AC power is present and the hardware enable is applied. • **12**: Reserved • **13**: STO (Safe Torque OFF) Status	1
P2-16	✓	RO1 upper Limit		Switching ON threshold of relay RO1 ⟶ P2-11 and P2-15	100.0 %
P2-17	✓	RO1 lower Limit		Switching OFF threshold of relay RO1 ⟶ P2-11 and P2-16	0.0 %
P2-18	✓	RO2 Function	0, 1, …, 7, 10, 11, 13	Selection of the function of output relay RO2 Possible values: • **0**: RUN, enable (FWD/REV) • **1**: READY, DA1 ready for operation • **2**: Speed = speed reference value • **3**: Speed > Speed Zero • **4**: Speed; ON: ≧ P2-19 / OFF: < P2-20 • **5**: Motor current; ON: ≧ P2-19 / OFF: < P2-20 • **6**: Motor torque; ON: ≧ P2-19 / OFF: < P2-20 • **7**: Analog input AI2; ON: ≧ P2-19 / OFF: < P2-20 • **8**: Hoist brake control. (Enables the operating mode for hoists). ON: output frequency ≧ P2-07 with START (FWD/REV) command present. OFF: output frequency ≦ P2-08 with no START (FWD/REV) command active. • **9**: Reserved • **9**: Reserved • **10**: Maintenance due. The Service Interval Time (P6-24) has elapsed. • **11**: Drive ready. The drive is: not in inhibit mode (STO), not in mains loss condition and not in trip condition. The mains AC power is present and the hardware enable is applied. • **12**: Reserved • **13**: STO (Safe Torque OFF) Status	0
P2-19	✓	RO2 upper Limit		Switching ON threshold of relay RO2 ⟶ P2-13 and P2-18	100.0 %
P2-20	✓	RO2 lower Limit		Switching OFF threshold of relay RO2 ⟶ P2-13 and P2-18	0.0 %

Para-meter	RUN	Designation	Value	Description	DS
P2-21	✓	Display Scale		Scale factor display Determines the factor for scaling the display. • When set to 0.000 the scaling is disabled. • The variable selected in P2-22 is scaled by the factor set in P2-21	0.000
P2-22	✓	Display Source	0, 1, 2, 3	Display Source Selects the variable to be displayed and scaled by P2-21 Possible values: • **0**: Motor Speed • **1**: Motor current • **2**: Analog input 2 (AI2) • **3**: P0-80 with one fixed decimal place (signed)	0
P2-23	✓	t-n=0 Wait		ZeroSpeedHoldTime Determines the time for which the drive output is held at zero speed when stopping, before the drive output is disabled.	0.2 s
P2-24	✓	Switching Frequency	0, 1, …, 5	Power stage switching frequency. Higher frequency reduces the audible ringing noise from the motor, and improves the output current waveform, at the expense of increased heat losses within the drive. Possible values: • **0**: 4 kHz • **1**: 8 kHz • **2**: 12 kHz • **3**: 16 kHz • **4**: 24 kHz • **5**: 32 kHz **Attention:** In case a sine wave filter is used, the switching frequency has to be in the range which is permissible for the filter. In this case P2-24 has to be set to twice the switching frequency mentioned on the filter. **Example:** Sine wave filter for 4 kHz → Setting of P2-24: 8 kHz!	3
P2-25	✓	t-QuickDec		Quick Stop Ramp The ramp is activated: • If DI1 and DI2 (terminals 2 and 3) are activated simultaneously and P1-13 = 11, …, 20 • If the mains voltage drops out and P2-38 = 2. If P2-25 = 0.0, the drive will coast without a ramp.	0.00 s

Para-meter	RUN	Designation	Value	Description	DS
P2-26	✓	Spin Start Enable	0, 1, 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 ...), especially with P1-05 = 1 or 3 (coast to stop) Possible values: • **0**: Spin start OFF • **1**: Spin Start ON • **2**: Spin Start ON on coast (P1-05 = 1 or 3), mains loss or trip due to a fault, but not before start in general. This provides a faster starting in cases where it is known that the motor is at standstill prior to enable, but spin start will still activate if the previous motor stop condition was an uncontrolled stop.	0
P2-27	✓	Standby Mode		Standby Mode Possible values: • **0**: Standby Mode disabled • **> 0**: The drive will enter Standby Mode (Output disabled), if the minumum frequency (P1-02) is maintained for the time specified in this parameter. Operation automatically resumes as soon as the reference increases above P1-02.	0.0 s
P2-28	–	Slave SpeedScalingControl	0, 1, …, 3	SlaveSpeedScalingControl Enabled in slave mode only (P1-12 = 5). The digital setpoint value can be multiplied by a preset factor and/or adjusted with an analog value. Possible values: • **0**: No scaling or offset is applied • **1**: Speed = Digital reference x P2-29 • **2**: Speed = (Digital reference x P2-29) + Reference at Analog Input 1 (AI1, Terminal 6) • **3**: Speed = (Digital reference x P2-29) x Reference at Analog Input 1 (AI1, Terminal 6)	0
P2-29	✓	Slave SpeedScalingFactor	-500.0 - +500 %	SlaveSpeedScalingFactor Setting of the Scaling Factor (see P2-28)	100.0 %
P2-30	–	AI1 Signal Range	0, 1, …, 7	Configures the Analog input 1 for the selected signal source type. Possible values: • **0**: 0 - 10 V • **1**: 10 - 0 V • **2**: bipolar 0 - 10 V • **3**: 0 - 20 mA • **4**: t 4 - 20 mA (Trips in case of wire break) • **5**: r 4 - 20 mA (Ramps to f-fix8 (P2-08) in case of wire break) • **6**: t 20 - 4 mA (Trips in case of wire break) • **7**: r 20 - 4 mA (Ramps to f-fix8 (P2-08) in case of wire break)	0
P2-31	✓	AI1 Gain	0.0 - 2000.0 %	Scaling of the Analog Input 1 Output value = Input value x Scaling. The scaling is also applied to an Offset, set with P2-32 **Example:** P2-30 = 0…10 V, P2-31 = 200 %: at 5 V the motor turns with max speed (P1-01) (5 V x 200 % = 10 V)	100.0 %

Para-meter	RUN	Designation	Value	Description	DS
P2-32	✓	AI1 Offset	-500.0 - +500 %	Offset Analog Input 1 Sets an offset as a percentage of the full scale range of the Analog Input 1 (AI1), which is subtracted from the signal at AI1. Positive values of P2-32 lead to a decrease, negative ones to an increase.	0.0 %
P2-33	✓	AI2 Signal Range	0, 1, …, 7	Configures the Analog input 2 for the selected signal source type. Possible values: • **0**: 0 - 10 V • **1**: 10 - 0 V • **2**: Ptc-th (Thermistor connecvtion) • **3**: 0 - 20 mA • **4**: t 4 - 20 mA (Trips in case of wire break) • **5**: r 4 - 20 mA (Ramps to f-fix8 (P2-08) in case of wire break) • **6**: t 20 - 4 mA (Trips in case of wire break) • **7**: r 20 - 4 mA (Ramps to f-fix8 (P2-08) in case of wire break)	0
P2-34	✓	AI2 Gain	0.0 - 2000.0 %	Scaling of the Analog Input 2 Output value = Input value x Scaling. The scaling is also applied to an Offset, set with P2-35 **Example:** P2-33 = 0 - 10 V, P-2-34 = 200 %: at 5 V the motor turns with max speed (P1-01) (5 V x 200 % = 10 V)	100.0 %
P2-35	✓	AI2 Offset		Offset Analog Input 2 Sets an offset as a percentage of the full scale range of the Analog Input 2 (AI2), which is subtracted from the signal at AI2. Positive values of P2-35 lead to a decrease, negative ones to an increase.	100.0 %
P2-36	✓	Start Mode	0, 1, …, 6	Defines the behavior of the drive relating to the enable digital input and also configures the automatic restart function. Possible values: • **0**: Edge-r : Following power on or reset, the drive will not start if a start signal (FWD/REV) is still present. To start DC1 a rising edge is necessary. • **1**: Auto-0 : Following a power on or reset, the drive will automatically start if digital input 1 is closed. • **2 … 6**: Auto-1 to 5 : Following a trip, the drive will make up to 5 attempts to restart at intervals set in P6-03. 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, and will require the user to manually reset the fault. **Attention:** An automatic restart is only possible when the control commands are given via terminals (P1-12 = 0, P1-12 = 11when, after a communication loss, the control is toggled to the terminals).	0

Para-meter	RUN	Designation	Value	Description	DS
P2-37	✓	Digital Reference Reset Mode	0, 1, …, 7	Defines the behavior of the drive on START when used in Keypad control or when controlled with UP/DOWN commands via terminals. This parameter is only active when P1-12: 1 or 2 (digital reference) Possible values: P2-37 = 0, …, 3 → Control via keypad • **0**: Start at min speed • **1**: Start with latest speed set with keypad • **2**: Start with latest speed before switching off (typically used when multiple sources for the reference are available e.g. Manual / Automatic or Local / Remote …) • **3**: Start with f-fix 8 (P2-08) P2-37 = 4, …, 7 → Control via terminals (P1-13: 10 or 20) The START and STOP buttons on the keypad will be disabled. • **4**: Start at min speed • **5**: Start with latest speed set via terminals • **6**: Start with latest speed before switching off (typically used when multiple sources for the reference are available e.g. Manual / Automatic or Local / Remote …) • **7**: Start with f-fix 8 (P2-08)	1
P2-38	✓	Action@MainsLoss	0, 1, 2, 3	MainsLossStopControl Determines the behavior of an enabled drive at mains loss. Possible values: • **0**: Mains loss ride through. The drive will attempt to continue operating by recovering energy from the load, provided that the mains loss period is short enough and that enough energy can be recovered. The Enable signal must be present for thge whole period of mains loss, otherwise the drive stops with the ramp set in P2-25) • **1**: Coast to stop The drive will immediately disable the output and the motor coasts to stop. When using this setting with high inertia loads, the Spin Start function (P2-26) may need to be enabled to have a quick restart • **2**: Quick Stop (P2-25) The drive stops with the ramp set in P2-25. • **3**: Mains loss disabled This setting has to be used when the drive is powered through DC bus link directly. No supply through the input terminals.	0
P2-39	✓	Parameter Lock	0, 1	Determines whether to lock the parameters Possible values: • **0**: OFF. All parameters can be accessed and 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
P2-40	✓	Password Level2		Defines the password which is used to get access to extended parameter set (Level 2). Access via P1-14.	101

5.4 Parameter group 3 ("PID")

Table 24: Parameter group 3 ("PID")

Para meter	RUN	Designation	Value	Description	DS
P3-01	✓	PID1		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	1.0
P3-02	✓	PID1 Ti		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
P3-03	✓	PID1 Kd		PID controller differential time constant	0.00 s
P3-04	✓	PID1 Mode	0, 1	PI(D) controller 1 mode Possible values: • **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
P3-05	✓	PID1 Set Point 1 Source	0, 1, 2	Defines the set point source 1 of controller 1 Possible values: • **0**: digital set point signal, set with P3-06 • **1**: analog input 1 • **2**: analog input 2	0
P3-06	✓	PID1 Set Point Digital		Digital set point controller 1 Digital set point of the PID controller in case P3-05 = 0	0.0 %
P3-07	✓	PID1 Out upper limit		PID1-OutLimHigh max. output value of the PI(D) controller	100.0 %
P3-08	✓	PID1 Out lower limit		PID1-OutLimLow min. output value of the PI(D) controller	0.0 %
P3-09	✓	PID1 Output LimitSelect	0, 1, 2, 3	Source selection for the output limitation Possible values: • **0**: The output range of the PID controller is limited by P3-07 and P3-08 • **1**: Upper limit = value at analog input 1; lower limit = P3-08 • **2**: Upper limit = P3-07; lower limit = value at analog input 1 • **3**: The output value from the PID controller is added to the speed reference applied to analog input 1	0
P3-10	✓	PID1 Feedback 1 Source	0, 1	Defines the feedback source 1 of controller 1 Possible values: • **0**: analog input 2 (AI2) • **1**: analog input 1 (AI1)	0

Para meter	RUN	Designation	Value	Description	DS
P3-11	✓	PID1 Error Ramp		PI(D)1 Error Ramp Defines a threshold PID error level, whereby if the difference between the setpoint and the feedback values is less than the set threshold, the internal ramp times of the drive are disabled. Where a greater PID error exists, the ramp times are enabled to limit the rate of change of motor speed on large PID errors, and react quickly on small errors. This parameter is intended to allow the user to disable the drive internal ramps where a fast reaction of PID control is required, however by only disabling the ramps when a small PID error exists, the risk of possible over current or over voltage trips being generated are reduced. Setting to 0.0 means that the drives ramps are always enabled.	0.0 %
P3-12	✓	PID1 feedback 1 DispScale		PID1 FeedBack Display scaling factor Applies a scaling factor to the displayed PID feedback, allowing the user to display the actual signal level from a transducer, e.g. 0…15 bar etc.	0.000
P3-13	✓	PID1 WakeUpLevel		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.	5.0 %
P3-14	–	Reserved Parameter		Reserved Parameter	0
P3-15	–	Reserved Parameter		Reserved Parameter	0
P3-16	–	Reserved Parameter		Reserved Parameter	0
P3-17	–	Reserved Parameter		Reserved Parameter	0
P3-18	✓	PID1 ResetControl	0, 1	This parameter is used to control the reset behavior of the PID loop. Possible values: • **0**: PID loop will run continuously as long as P gain (P3-01) ist not zero • **1**: PID loop will only run when the drive is enabled. If the drive is not running, the PID output will be reset to zero (including the integral result)	0

5.5 Parameter group 4 ("Mode")

Table 25: Parameter group 4 ("Mode")

Para-meter	RUN	Designation	Value	Description	DS
P4-01	–	Motor Control Mode	0, 1, …, 6	Motor Control Mode An autotune must be performed if setting 0 / 1 / 3 / 4 is used Possible values: • **0**: Speed Control with Torque Limit (vector) • **1**: Torque Control with Speed Limit (vector) • **2**: Speed Control (enhanced V/f) • **3**: PM Motor Speed Control • **4**: PM Motor Torque Control • **5**: Brushless DC Motor Speed Control • **6**: SyncRel Motor Speed Control	2
P4-02	–	Motor Identification	0, 1	Motor Identification When set to 1, the drive immediately carries out a non-rotating autotune to measure the motor parameters for optimum control and efficiency. Following completion of the autotune, the parameter automatically returns to 0. Possible values: • **0**: OFF • **1**: ON **Remark:** This function cannot be activated by using the DrivesConnect software When operating with Vector Control (P4-01 = 0 or 1) this parameter must be set to the motor nameplate power factor before performing auto tune.	0
P4-03	✓	MSC Kp		Proportional gain K_p at Motor Speed Control (P4-01 = 0, 3, 5, 6)	50.0 %
P4-04	✓	MSC Ti	0 - 2000 s	Integral time T_i at Motor speed Control (P4-01 = 0, 3, 5, 6)	0.050 s
P4-05	✓	Motor PF		Power factor cos phi of the motor When operating with Vector Control (P4-01 = 0 or 1) this parameter must be set to the motor nameplate power factor.	f (I_e)
P4-06	✓	M-Ref Source	0, 1, …, 5	Source for the torque reference P4-01 = 0: This parameter defines the source for the max. torque limit. P4-01 = 1: This parameter defines the source for the torque reference Possible values: • **0**: Fixed value. The torque reference / limit is set in P4-07 • **1**: Analog Input 1 (Terminal 6) controls the torque from 0 to P4-07 • **2**: Analog Input 2 (Terminal 10) controls the torque from 0 to P4-07 • **3**: Fieldbus. The torque reference is set via fieldbus, limited by P4-07. • **4**: Master / Slave. The torque reference from the master is used as torque limit for the Slave • **5**: PID Controller. The PID controller is used to control the torque from 0 to P4-07	0
P4-07	✓	M-Max Motoring		M-Max Motoring When working in Vector mode (P4-01 = 0 or 1) this parameter defines the max. torque limit or reference used by the drive in conjunction with P4-06.	150 %

Para-meter	RUN	Designation	Value	Description	DS
P4-08	✓	M-Min Motoring		M-Min Motoring When working in Vector mode (P4-01 = 0 or 1) this parameter defines a min. torque limit. When the drive is enabled, it will always attempt to maintain this torque on the motor. **Caution:** this can lead to situations where the setpoint frequency is exceeded!	0 %
P4-09	✓	M-Max Generative		M-Max Generative When working in Vector mode (P4-01 = 0 or 1) this parameter defines the max. torque limit during regeneration.	100 %
P4-10	–	f-MidV/f		Frequency to shape V/f curve When operating in V/f mode (P4-01 = 2) this parameter is used in conjunction with P4-11 and sets a frequency point at which the voltage set in P4-11 is applied to the motor. **Attention:** Care must be taken to avoid overheating and damaging the motor when using this function!	0.0 %
P4-11	✓	V-MidV/f		Voltage to shape V/f curve Used in conjunction with P4-10.	0.0 %
P4-12	✓	T-Memory Enable	0, 1	When enabled, the motor thermal memory retention function will save the calculated motor thermal history on drive power down, using this saved value as the starting value on next power up. If this function is disabled, the motor thermal history is reset to zero on every power up. Possible values: • **0**: Thermal memory OFF • **1**: Thermal memory ON	0
P4-13		Change Phasesequence Motor	0, 1	Changes the sequence of the output phases. This prevents, that two phases of the motor cable have to be changed in case the motor runs in the wrong direction. • 0 = U, V, W (cw) • 1 = U, W, V (ccw) **Remark:** This parameter has to be set to "0" when using encoder feedback.	0

5.6 Parameter group 5 ("Bus")

Table 26: Parameter group 5 ("Bus")

Para-meter	RUN	Designation	Value	Description	DS
P5-01	✓	PDP address		The drive's unique address on a communication network	1
P5-02	✓	CAN0 Baudrate	0, 1, 2, 3	CANopen Baudrate Possible values: • **0**: 125 kBit/s • **1**: 250 kBit/s • **2**: 500 kBit/s • **3**: 1000 kBit/s	2
P5-03	✓	RS485-0 Baudrate	0, 1, …, 4	RS485 Baudrate Possible values: • **0**: 9.6 kBit/s • **1**: 19.2 kBit/s • **2**: 38.4 kBit/s • **3**: 57.6 kBit/s • **4**: 115.2 kBit/s	4
P5-04	✓	RS485-0 ParityType	0, 1, 2, 3	RS485 0 Parity Type Possible values: • **0**: No parity, 1 stop bit (N-1) • **1**: No parity, 2 stop bits (N-2) • **2**: Odd parity, 1 stop bit (0-1) • **3**: Even parity, 1 stop bit (E-1)	0
P5-05	✓	Modbus RTU0 COM Timeout		Timeout With an active communication link, if a valid telegram is not received by the drive within the period set with this parameter, the drive will react as set in P5-06.	1.0 s
P5-06	✓	Action@Modbus RTU Fault	0, 1, 2, 3	Modbus communication loss error Possible values: • **0**: Switch off • **1**: Ramps down to a full stop and is switched off. • **2**: Ramps down to a full stop; no fault message. • **3**: Ramps to fixed frequency 8 (P2-08).	0
P5-07	✓	FieldbusRampControl	0, 1	Fieldbus Ramp Control Possible values: • **0**: OFF. Ramps are controlled from internal drives parameters • **1**: ON. Ramps are controlled by the fieldbus.	0

Para-meter	RUN	Designation	Value	Description	DS
P5-08	✓	NETSendPZD4	0, 1, …, 7	Configuration of the 4th process data word PDO-4 from the drive to the network master during cyclic communication. Possible values: • **0**: Torque as percentage value with one decimal place, e.g. 123 = 12.3 % • **1**: Output power in kW with 2 decimal places, e.g. 400 = 4.00 kW • **2**: Status of the digital inputs (DI). Bit 0 = Status DI1, Bit 1 = Status DI2 …) • **3**: Signal level at Analog Input 2 (AI2). 0 - 1000 = 0 - 100.0 % • **4**: Heatsink temperature. 0 - 100 = 0 - 100 °C • **5**: User register 1. Configuration with Function Block Editor • **6**: User register 2. Configuration with Function Block Editor • **7**: P0-80 value (Selection via P6-28)	0
P5-09	–	Reserved Parameter		Reserved Parameter	–
P5-10	–	Reserved Parameter		Reserved Parameter	–
P5-11	–	Reserved Parameter		Reserved Parameter	–
P5-12	✓	NETSendPZD3	0, 1, …, 7	Configuration of the 3rd process data word PDO-3 from the drive to the network master during cyclic communication. Possible values: • **0**: Motor current in A with one decimal place, e.g. 100 = 10.0 A • **1**: Output power in kW with 2 decimal places, e.g. 400 = 4.00 kW • **2**: Status of the digital inputs (DI). Bit 0 = Status DI1, Bit 1 = Status DI2 … • **3**: Signal level at Analog Input 2 (AI2). 0 - 1000 = 0 - 100.0 % • **4**: Heatsink temperature. 0 - 100 = 0 - 100 °C • **5**: User register 1. Configuration with Function Block Editor • **6**: User register 2. Configuration with Function Block Editor • **7**: P0-80 value (Selection via P6-28)	0
P5-13	✓	NETReceivePZD4	0, 1	Configuration of the 4th process data word PDI-4 from the network master to the drive during cyclic communication. Possible values: • **0**: User defined ramp times with 2 decimal places • **1**: User register 4. Configuration with Function Block Editor or via Parameters in group 9.	0
P5-14	✓	NETReceivePZD3	0, 1, 2	Configuration of the 3rd process data word PDI-3 from the network master to the drive during cyclic communication. Possible values: • **0**: Torque Reference/Limit. -5000 - + 5000 = -500.0 % - + 500.0 % • **1**: User defined PID reference. 0 - 1000 = 0 % - 100.0 % • **2**: User register 3. Configuration with Function Block Editor or via Parameters in group 9.	0

Para-meter	RUN	Designation	Value	Description	DS
P5-15	✓	ParameterAccess	0, 1	Parameter access Possible values: • **0**: All parameters can be changed from any source. • **1**: All parameters are locked and can only be changed via SmartWire-DT.	0
P5-16	✓	Action@Communication Loss		Number of Modbus communication errors detected by the I/O processor since the last time the unit was switched on Possible values: • **0**: No response • **1**: Output warning; drive continues to run • **2**: Stop if ramp active • **3**: Run-down • **4**: Switch off	0
P5-17		Modbus RTU0 Response Delay	0, …, 16	Delays the response to Modbus devices, which are not fully compliant with the modbus specification and require a longer delay time between telegrams The setting corresponds to the time, which is necessary to transmit 0 - 16 Bytes. The exact delay time depends on the baudrate.	0

5.7 Parameter group 6 ("extended")

Table 27: Parameter group 6 ("extended")

Para-meter	RUN	Designation	Value	Description	DS
P6-01	–	FirmwareUpgrade Enable	0, 1, 2, 3	Firmware Upgrade Enable Possible values: • **0**: no upgrade possible • **1**: upgrade control part and power part • **2**: upgrade control part only • **3**: upgrade power part only **Remark:** This function cannot be activated by using the DrivesConnect software	0
P6-02	✓	Auto Thermal Management	0, 1, …, 5	AutoThermalManagement In case of too high temperature at the heatsink, the drive reduces the switching frequency set with P2-24 to reduce the likelihood of an overtemperature trip. P6-02 determines the lower limit of the reduction. Possible values: • **0**: 4 kHz • **1**: 8 kHz • **2**: 12 kHz • **3**: 16 kHz • **4**: 24 kHz • **5**: 32 kHz **Attention:** In cases where a sine wave filter is used in the drive's output circuit, the switching frequency has to be kept constant to avoid resonances. In this cases P2-24 and P6-02 have to be set to the same value.	0
P6-03	✓	Auto Reset Delay		AutoResetDelay Determines the time which will elapse between consecutive drive reset attempts when Auto Reset is enabled in P2-36.	20 s
P6-04	✓	RO1 n-Hysteresis		Speed dependant hysteresis for Relay Outputs This parameter is used in conjunction with P2-11 (AO1 Function) and P2-13 (AO2 Function), when they are set to 2 (Speed = Speed Reference Value) or 3 (Speed > Speed Zero). P6-04 defines a tolerance band to avoid "chatter" of the relay. If the speed is inside the defined band, the relay signals "Speed = Speed Reference Value" resp. "Speed > Speed Zero". The tolerance band is given in % of P1-09. **Example:** P2-13 = 3, P1-09 = 50 Hz, P6-04 = 5 % → the relay contact closes above 2.5 Hz.	0.3 %

Para-meter	RUN	Designation	Value	Description	DS
P6-05	–	Encoder Feedback Enable	0, 1	EncoderFeedbackEnable Enables the operation with encoder feedback. For correct operation, ensure that the encoder is properly fitted to the motor and its wiring is connected to the encoder feedback module in accordance with the manual. **Attention:** Before enabling this parameter, ensure that the sense of rotation is correct by using parameter P0-58 while running in V/f mode (P4-01=2). The sign in P0-58 should match that of the speed reference. (+ = cw (FWD); - = ccw (REV)). Possible values: • **0**: Encoder feedback disabled • **1**: Encoder feedback enabled	0
P6-06	–	Encoder PPR		EncoderPPR Number of pulses per revolution of the encoder. This value has to be set correctly to guarantee a proper operation of the drive when the encoder feedback module is enabled (P6-05 = 1). Improper setting of this parameter could cause the loss of control of the drive and / or a trip. If set to zero, encoder feedback will be disabled.	0
P6-07	✓	Speed Error Limit		SpeedErrorTripLevel This parameter specifies the max. permissible error between the encoder feedback and the speed, calculated by the internal motor control algorithms.If the speed error exceeds the limit the drive will trip. When set to zero, this protection is disabled.	5.0 %
P6-08	✓	Freq RefMax		Frequency at an input terminal of the drive which, in case the speed reference is given as a frequency signal, corresponds to the max. output frequency (f-max). The frequency input signal is connected to Terminal 4 (DI3) and must be in the range between 5 kHz and 20 kHz. When set to 0 this function is disabled.	0 kHz
P6-09	✓	DroopMax		max. Speed Droop Value This parameter is used to share the load between motors equally. The speed reference is changed depending on the load. • P6-09 = 0: Function disabled • P6-09 > 0 defines a slip speed droop at rated torque as a percentage of "MotorNomFrequency" (P1-09). The reference for the motor speed will be reduced, depending on the load. Droop speed at rated load = P6-09 x P1-09 Amount of the speed reduction = (P6-09 x P1-09) x actual torque / rated torque Speed = speed reference - speed droop	0.0 %
P6-10	✓	PLC Operation Enable	0, 1	Enables the use of function blocks, which are created with the function block editor. Possible values: • **0**: Function blocks disabled • **1**: Function blocks enabled	0
P6-11	✓	t-f-Fix before Start		Defines a time after Enable for which the drive is operated with a fixed frequency. Fixed frequency specified with f-Fix7 (P2-07). This function can be used on pumps, to provide a reverse spin on start, to clear potential blockages. • **Enable** - ramp to fFix7 - time set with P6-11 elapses - ramp to the set speed • **0**: Function disabled	0 s

Para-meter	RUN	Designation	Value	Description	DS
P6-12	✓	t-f-Fix after Stop		Defines a time after removing the Enable signal for which the drive is operated with a fixed frequency Fixed frequency specified with f-Fix8 (P2-08). This function can be used on underground pumps, to provide an unwind of the drives shaft on stopping. • **Remove Enable** - ramp to fFix8 - time set with P6-12 elapses - ramp to stop. • **0**: Function disabled	0 s
P6-13	✓	Brake Release Delay		Determines the time before the mechanical brake is released. When hoist mode is active (P2-18 = 8) the control of the mechanical brake will be delayed by the time set here, to enable the motor to develop torque (adjustable with fFix7 (P2-07)).	0.2 s
P6-14	✓	Brake Apply Delay		Determines the time between the signal to close the brake and disabling of the drive. When hoist mode is active (P2-18 = 8) the drive will run with the speed set in fFix8 (P2-08) for the time set here before it is disabled. The time has to be chosen in a way that it is not below the brake response time (specified by the brake manufacturer). The min. time is 0.1 s.	0.3 s
P6-15	✓	Brake M-Level Release		Required motor torque level at which the mechanical brake may be released. Determines the torque in % of the rated motor torque, which has to be present, before the mechanical brake may be released. It is used to ensure, that the motor is connected and produces sufficient torque to prevent the load dropping on release of the mechanical brake. This function is not active in V/f mode (P4-01 = 2)	8.0 %
P6-16	✓	Brake M-Level Timeout		Time, in which the motor torque, necessary for a release of a mechanical brake, has to be built up. Is this torque, set with P6-15, not built up within this time, the drive trips.	5.0 s
P6-17	✓	Max Torque Timeout		Max. time, for which the motor is allowed to operate with max. torque, before the drive trips. The torque limitation is set with P4-07 (motor) resp. P4-09 (generator). This parameter is only active in Vector Mode (P4-01 = 0 or 1).	5.0 s
P6-18	–	DCBrakeCurrent	Auto 0 - 30 %	Amount of DC current as a percentage of the "Motor Nom Current" that is injected into the motor during DC braking. DC braking is only possible in V/f Control Mode (P4-01 = 2). The Stop Mode has to be set to "Ramp to stop" (P1-05 = 2). During DC brake the ramp, set with P2-25, is effective. The duration of a DC braking is determined by the ramp set with P2-25 and the "Zero Speed Hold Time" set with P2-23. A DC braking will always be performed when the Quick Stop Ramp is activated (see P2-25). With P6-18 = Auto the brake current is set automatically, based on stator resistance and magnetizing current. Stator resistance and magnetizing current are set to typical values by default, but can also be evaluated by performing an Auto Tune (P4-02), when necessary.	0 %
P6-19	✓	Brake Resistor		Resistance of the brake resistor in Ohms This value, together with P6-20, is used for the thermal protection of the brake resistor.	Depends on the model

5.7 Parameter group 6 ("extended")

Para-meter	RUN	Designation	Value	Description	DS
P6-20	✓	P-Brake Resistor		Power of the brake resistor in kW Resolution: 0.1 kW. This value, together with P6-19, is used for the thermal protection of the brake resistor.	Depends on the model
P6-21	✓	Brake Chopper ED Heat-Up		Brake Chopper Duty Cycle At very low temperatures (< -10 °C) the drive doesn't work and indicates "Under temperature" (Fault code 09 "U-t"). On devices of the frame sizes FS2, FS3 and FS4 (optional) brake resistors mounted to the heatsink can be used to warm up the device. Parameter P6-21 determines the duty cycle. **Attention:** It is important to provide thermal protection of the brake resistor to avoid overload.	2.0 %
P6-22	✓	Reset Fan RunTime	0, 1	Resets the internal fan run-time counter, indicated by P0-35, back to 0. Possible values: • **0**: no Reset • **1**: Reset: Reset of P6-22 to 0 is done automatically.	0
P6-23	✓	Reset kWh Meter	0, 1	Resets the energy counter Resets the internal energy counter, indicated by P0-26 (kWh) and P0-27 (MWh), back to 0. Possible values: • **0**: no Reset • **1**: Reset: Reset of P6-23 to 0 is done automatically.	0
P6-24	✓	Service Interval Time		Service Interval Time Defines the number of operating hours, after which the service indicator is shown on the display. With P6-25 = 1 the counter is set to the value defined here. The remaining time until the next service is indicated with P0-22.	0
P6-25	✓	Reset ServiceIndicator		Reset Service Indicator With P6-25 = 1 the counter for the remaining hours until the next service is set to the value defined in P6-24. Reset of P6-25 to 0 is done automatically.	0
P6-26	✓	AO1 Scale		Scaling of the Analog Output 1 Defines a scaling factor in % for the signal at Analog Output 1.	100.0 %
P6-27	✓	AO1 Offset		Offset Analog Output 1 Defines an offset in % of 10 V for the signal at Analog Output 1. • **Positive** value of P6-27: Voltage at Analog Output 1 is reduced • **Negative** value of P6-27: Voltage at Analog Output 1 is increased	0.0 %

Para-meter	RUN	Designation	Value	Description	DS
P6-28	✓	PointerToParameter		Pointer to an internal variable P6-28 defines the internal variable (or the parameter), whose value is displayed with P0-80. In addition the value can be transferred to a fieldbus master vir Process Data Word 3 (PZD3, to be set with P5-12) or 4 (PZD4, to be set with P5-08). P6-28 is monstly used in conjunction with the Function Block Editor.	0
P6-29	–	Save Parameters	0, 1, 2	Save parameters as default Pressing the UP, DOWN, and STOP buttons on the keypad at the same time will load a predefined parameter set onto the device. Normally, this parameter set will contain the device's factory settings. However, P6-29 can be used to change this parameter set. Possible values: • **0**: deactivated • **1**: The current parameter values will be stored as the default settings, and pressing the UP, DOWN, and STOP buttons on the keypad will load these values. • **2**: The custom parameter set stored with P6-29 will be reset back to factory settings. P6-29 will be reset to 0 automatically.	0
P6-30	✓	Password Level3		Defines the password which is used to get access to extended parameter set (Level 3). Access via P-14	201

5.8 Parameter group 7 ("Motor")

Table 28: Parameter group 7 ("Motor")

Para meter	RUN	Designation	Value	Description	DS
P7-01	✓	Motor Stator Resistance R1		Stator resistance of the motor For induction and PM motors: phase to phase resistance value $[R_s]$ in Ohms	f (I_e)
P7-02	✓	Motor Rotor Resistance R2		Rotor resistance of the motor For induction motors: phase to phase resistance value $[R_r]$ in Ohms	f (I_e)
P7-03	✓	Motor Stator Inductance d-Axis		Stator inductance of the motor, torque producing • For induction motors: Phase to phase inductance value in Henry [H] • For PM-Motors: phase d-axis inductance value $[L_{sd}]$ in Henry [H]	f (I_e)
P7-04	✓	Magnetizing Current @M=0		Magnetizing current For induction motors: Magnetizing current / no load current $[I_d$ rms] Before Auto-Tune this value is approximated to 30 - 40 % of the motor rated current (P1-08), assuming a motor power factor (cos phi) of 0.8. It is automatically calculated on the basis of P1-08 respectively as a result of an Auto-tune.	f (I_e)
P7-05	✓	Leak Inductance Rel		Relative Leakage Inductance of the motor Specified as a percentage [Sigma] of the stator inductance.	0.100
P7-06	✓	Motor Stator Inductance q-Axis		Stator inductance of the motor, magnetizing For PM-Motors: phase q-axis inductance value $[L_{sd}]$ in Henry [H]	f (I_e)
P7-07	✓	EnhancedGeneratorControl	0, 1	EnhancedGeneratorControl Adaptation of the motor model in vector mode and with PM motors to achieve a better performance of the drive when regenerating. Possible values: • **0**: disable • **1**: enable	0
P7-08	✓	ParameterAdaptation	0, 1	ParameterAdaptation Possible values: • **0**: The motor parameters are identified once during auto tune and remain unchanged afterwards. • **1**: The motor parameters are identified during auto tune. These values are used at start. During operation the drive estimates the actual values automatically and uses them. **Background:** Changes e.g. of the resistance because of temperature changes. This parameter is only used in Vector Mode (P4-01 = 0 / 1 / 3 / 4)	0
P7-09	✓	Overvoltage Currentlimit		Current limitation to prevent over voltage trips This parameter is only active at Speed Control with Torque Limit (P4-01 = 0) and becomes effective in case the DC link voltage exceeds a threshold. This value, set internally, is just below the one for a trip because of over voltage. P7-08 limits the torque producing current at the output, to prevent energy feedback which may lead to an over voltage trip. A small value of P7-09 limits the torque of the motor, when the DC link voltage exceeds the threshoild. A high value can lead to current distortions and to a rough behavior of the motor.	5.0 %

Para meter	RUN	Designation	Value	Description	DS
P7-10	✓	LoadInertiaFactor		Ratio of the inertia of a complete system to the one of a motor only (J_{tot} / J_{mot}) The default value (10) can mostly be kept. It is used as feed forward, to provide the optimal torque during the acceleration phase. By using the exact value, a better reaction and dynamics of the complete system will be achieved. If the ratio of the inertias is not known, the factory setting should not be changed.	10
P7-11	✓	PWM lower Limit		Minimum pulse width of the output voltage This parameter is used in applications with long motor cables. Increasing the value reduces the risk of an over current trip but it also reduces the value of the max. possible output voltage at a given input voltage.	150
P7-12	✓	t-Excitation-V/f		Magnetizing period in V/f and PM Mode • **Induction motors** (P4-01 = 2): This parameter defines a delay time for the control of the magnetizing current after a Start signal for the drive in V/f mode. Too low values can cause an over current trip, if the acceleration ramp is very short. • **PM-motors** (P4-01 = 3 / 4): This value is used to align the rotor flux on enable.	f (I_e)
P7-13	✓	MSC Kd		Differential gain for the speed controller Used in Vector mode. Specified in %.	0.0 %
P7-14	✓	Torque Boost		Torque Boost at low speeds Set in % of the motor rated current (P1-08). At lower speeds a current is injected into the motor, to achieve an effective operation. Parameter P7-15 determines, up to which speed P7-14 is effective. Setting of P7-14: • Run the motor at the lowest speed, which is required by the application • Increase value of P7-14, until the reuired torque is present as well as a smooth opreation of the motor. **Note:** This function is not active with Speed Control (V/f, P4-01 = 2).	0.0 %
P7-15	✓	f-Torque Boost Limit		Torque Boost Range Determines the frequency in % of P1-09, up to which the torque boost, set with P7-14, is active. Above this frequency the torque boost is not active.	0.0 %
P7-16	✓	PM-MotorSignalIn	0, 1, 2, 3	Selection of the signal to identify the rotor position at PM motors Possible values: • **0**: disabled (= factory settings) • **1**: Identification during magnetizing period • **2**: Identification during low speed operation • **3**: Identification during magnetizing period and low speed operation	0
P7-17	✓	PM-MotorSignalInLevel		Selection of voltage and duration of the signal to identify the rotor position at PM motors If this value is set too low, the rotor's position may not be detected, in which case excessively high values may result in the device being switched off due to overcurrent.	10

5.9 Parameter group 8 ("Ramp")

Table 29: Parameter group 8 ("Ramp")

Para meter	RUN	Designation	Value	Description	DS
P8-01	✓	t-acc2		Sets the acceleration ramp time 2 in seconds. The time interval set in "t-acc2" represents the time taken to accelerate from zero to "Motor Nom Frequency" (P1-09).	FS2, FS3: 5.0 s FS4, …: 10.0 s
P8-02	✓	n-accMulti1		Frequency / speed, at which the acceleration ramp changes from t-acc1 to t-acc2. This can be set to any value between 0 and "f-max" (P1-01) • "Motor Nom Speed" (P1-10) = 0, displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, displayed in rpm. • Frequency / Speed > P8-06 = t-acc4 • Frequency / Speed > P8-04 AND < P8-06 = t-acc3 • Frequency / Speed > P8-02 AND < P8-04 AND < P8-06 = t-acc2 • Frequency / Speed < P8-02 AND < P8-04 AND < P8-06 = t-acc1" **Remark:** The AND condition must be interpreted as a "logical AND operator," i.e., all conditions linked with AND must be met simultaneously.	0.0 Hz
P8-03	✓	t-acc3		Sets the acceleration ramp time 3 in seconds. The time interval set in "t-acc3" represents the time taken to accelerate from zero to "Motor Nom Frequency" (P1-09).	FS2, FS3: 5.0 s FS4, …: 10.0 s
P8-04	✓	n-accMulti2		Frequency / speed, at which the acceleration ramp changes from t-acc2 to t-acc3. This can be set to any value between 0 and "f-max" (P1-01) • "Motor Nom Speed" (P1-10) = 0, displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, displayed in rpm. Description of the functionality see ➞ P8-02	0.0 Hz
P8-05	✓	t-acc4		Sets the acceleration ramp time 4 in seconds. The time interval set in "t-acc4" represents the time taken to accelerate from zero to "Motor Nom Frequency" (P1-09).	FS2, FS3: 5.0 s FS4, …: 10.0 s
P8-06	✓	n-accMulti3		Frequency / speed, at which the acceleration ramp changes from t-acc3 to t-acc4. This can be set to any value between 0 and "f-max" (P1-01) • "Motor Nom Speed" (P1-10) = 0, displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, displayed in rpm. Description of the functionality see ➞ P8-02	0.0 Hz
P8-07	✓	t-dec4		Sets the deceleration ramp time 4 in seconds. The time interval set in "t-dec4" represents the time taken to decelerate from "Motor Nom Frequency" (P1-09) to zero.	FS2, FS3: 5.0 s FS4, …: 10.0 s

Para meter	RUN	Designation	Value	Description	DS
P8-08	✓	n-decMulti3		Frequency / speed, at which the deceleration ramp changes from t-dec4 to t-dec3. This can be set to any value between 0 and "f-max" (P1-01) • "Motor Nom Speed" (P1-10) = 0, displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, displayed in rpm. • Frequency / Speed > P8-08 = t-dec4 • Frequency / Speed > P8-10 AND < P8-08 = t-dec3 • Frequency / Speed > P8-12 AND < P8-10 AND < P8-08 = t-dec2 • Frequency / Speed < P8-12 AND < P8-10 AND < P8-08 = t-dec1 **Remark:** The AND condition must be interpreted as a "logical AND operator," i.e., all conditions linked with AND must be met simultaneously.	0.0 Hz
P8-09	✓	t-dec3		Sets the deceleration ramp time 3 in seconds. The time interval set in "t-dec3" represents the time taken to decelerate from "Motor Nom Frequency" (P1-09) to zero.	FS2, FS3: 5.0 s FS4, …: 10.0 s
P8-10	✓	n-decMulti2		Frequency / speed, at which the deceleration ramp changes from t-dec3 to t-dec2. This can be set to any value between 0 and "f-max" (P1-01) • "Motor Nom Speed" (P1-10) = 0, displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, displayed in rpm. Description of the functionality see ➜ P8-02	0.0 Hz
P8-11	✓	t-dec2		Sets the deceleration ramp time 2 in seconds. The time interval set in "t-dec2" represents the time taken to decelerate from "Motor Nom Frequency" (P1-09) to zero.	FS2, FS3: 5.0 s FS4, …: 10.0 s
P8-12	✓	n-decMulti1		Frequency / speed, at which the deceleration ramp changes from t-dec2 to t-dec1. This can be set to any value between 0 and "f-max" (P1-01) • "Motor Nom Speed" (P1-10) = 0, displayed in Hz. • "Motor Nom Speed" (P1-10) > 0, displayed in rpm. Description of the functionality see ➜ P8-08	0.0 Hz
P8-13	✓	Ramp Mode	0, 1	Source for ramp selection • **0**: Acceleration and Deceleration ramps 1 (t-acc1 (P1-03) und t-dec1 (P1-04)) are used. With a corresponding configuration in parameter group 9 a selection of individual ramps with P9: 24, …, 27 is possible. • **1**: Acceleration and deceleration are carried out with the ramps set in P8-01 … P8-12.	0
P8-14	–	Reserved Parameter		Reserved Parameter	–
P8-15	–	Reserved Parameter		Reserved Parameter	–

5.10 Parameter group 9 ("Control")

Table 30: Parameter group 9 ("Control")

Para meter	RUN	Designation	Value	Description	DS
P9-01	–	Enable Operation Source	0, 1, …, 8	Source for Enable Signal This signal is usually assigned to Digital Input 1. It is e.g. used in applications, where the START signal comes via fieldbus or from a function block. This signal (logic = 1) is necessary to operate the drive. At removal (logic = 0) the drive stops with the ramp selected by P9-26 / P9-27. Possible sources: • **0**: STO (Terminals 12 / 13) • **1**: Digital Input 1 (DI1 = Terminal 2) • **2**: Digital Input 2 (DI2 = Terminal 3) • **3**: Digital Input 3 (DI3 = Terminal 4) • **4**: Digital Input 4 (DI4 = Terminal 6) • **5**: Digital Input 5 (DI5 = Terminal 10) • **6**: Digital Input 6 (DI6 = Terminal 1 on DXA-EXT-3DI1RO) • **7**: Digital Input 7 (DI7 = Terminal 2 on DXA-EXT-3DI1RO) • **8**: Digital Input 8 (DI8 = Terminal 3 on DXA-EXT-3DI1RO) **Remark:** To use the parameters in group 9 (P9-...), P1-13 has to be "0" (user defined)	0

Para meter	RUN	Designation	Value	Description	DS
P9-02	–	QuickStop Source	0, 1, …, 25	Source for Quick Stop This signal (logic = 1) is necessary to operate the drive. At removal (logic = 0) the drive stops with the ramp selected by P2-25). Possible sources: • **0**: OFF / Function not activated • **1**: Digital Input 1 (DI1 = Terminal 2) • **2**: Digital Input 2 (DI2 = Terminal 3) • **3**: Digital Input 3 (DI3 = Terminal 4) • **4**: Digital Input 4 (DI4 = Terminal 6) • **5**: Digital Input 5 (DI5 = Terminal 10) • **6**: Digital input 6 (DI6 = terminal 1 on DXA-EXT-3DI1RO) • **7**: Digital input 7 (DI7 = terminal 2 on DXA-EXT-3DI1RO) • **8**: Digital input 8 (DI8 = terminal 3 on DXA-EXT-3DI1RO) • **9**: Analog Output 1 (AO1 = Terminal 8) • **10**: Analog Output 2 (AO2 = Terminal 11) • **11**: Digital Output 1 (RO1 = Terminal 14 / 15 / 16) • **12**: Digital Output 2 (RO2 = Terminal 17 / 18) • **13**: Digital Output 3 (DO3 = Terminal 5 / 6 on DXA-EXT-3DI1RO resp. Terminal 1 / 2 on DXA-EXT-3RO) • **14**: Digital Output 4 (DO4 = Terminal 3 / 4 on DXA-EXT-3RO) • **15**: Digital Output 5 (DO5 = Terminal 5 / 6 on DXA-EXT-3RO) • **16**: ON / Function activated • **17**: User register 1 • **18**: User register 2 • **19**: User register 3 • **20**: User register 4 • **21**: User register 5 • **22**: User register 6 • **23**: User register 7 • **24**: User register 8 • **25**: User register 9 **Remark:** To use the parameters in group 9 (P9-...), P1-13 has to be "0" (user defined)	0
P9-03	–	FWD Source		Source for the FWD command This signal (logic = 1) is necessary to operate the drive in the forward direction of rotation. At removal (logic = 0) the drive stops with the ramp selected by P9-26 / P9-27. When FWD and REV command are applied simultaneously, the drive executes a Quick Stop. Possible sources: ➜ P9-02 The source, selected here, can also be configured for a control with a latch signal. Description ➜ P9-05	1

Parameter	RUN	Designation	Value	Description	DS
P9-04	–	REV Source		Source for the REV command This signal (logic = 1) is necessary to operate the drive in the reverse direction of rotation. At removal (logic = 0) the drive stops with the ramp selected by P9-26 / P9-27. When FWD and REV command are applied simultaneously, the drive executes a Quick Stop. Possible sources: → P9-02 The source, selected here, can also be configured for a control with a latch signal. Description → P9-05	2
P9-05	–	Signal Format	0, 1	Enables Latch function for FWD / REV inputs • **0**: OFF. The commands for forward (FWD) and reverse (REV) have to be applied constantly. • **1**: Latch control ON. The drive can be started, stopped and reversed by means of pulses. Function: • P9-01 (Enable): This signal has to be applied constantly during run. Removing the signal for a short time leads to a stop of the drive. For a restart a signal at the source, defined with P9-03 or P9-04, is necessary. • P9-03 (FWD): Start of the drive (direction: forward) via a pulse at the source defined here. To stop the removing of the enable signal is necessary. • P9-04 (REV): Start of the drive (direction: reverse) via a pulse at the source defined here. To stop the removing of the enable signal is necessary. • When FWD and REV commands are present simultaneously the drive will stop.	0
P9-06	–	Force REV Source		Source for "Force reverse operation" This signal (logic = 1) forces the drive to run in the reverse direction. It is irrelevant, if the FWD or the REV command is applied. Without this signal (logic = 0) the sense of rotation is determined by FWD and REV commands. Possible sources: → P9-02	0
P9-07	–	FaultReset Source		Source for Fault RESET A rising edge of this signal (from logic = 0 to 1) resets existing fault messages. Possible sources: → P9-02	1
P9-08	–	External Fault1 Source		Source for the "External Fault" signal • Logic 0 = external fault • Logic 1 = no external fault Possible sources: → P9-02	0
P9-09	–	LocalRemote @Startup		Source for "Local / Remote" selection This parameter is only effective with P1-12 > 0. It enables the changeover between the command channel defined by P1-12 and the sources selected with P9-01, …, P9-07. • Logic 0 = Command channel according P1-12 • Logic 1 = The drive is controlled by the sources defined with P9-01, …, P9-07. Possible sources: → P9-02	16

Para meter	RUN	Designation	Value	Description	DS
P9-10	–	SpeedSource1	0, 1, …, 16	Source for "Speed Reference 1" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: • **0**: Analog input 1 as speed reference • **1**: Analog input 2 as speed reference • **2**: Preset fixed frequency (selected with P9-21, …, P9-23) • **3**: Digital reference (keypad) • **4**: PID controller output • **5**: Master speed • **6**: Speed reference via fieldbus • **7**: Reference from function block • **8**: Frequency reference (see P6-08) • **9**: Preset fixed frequency f-fix1 (P2-01) • **10**: Preset fixed frequency f-fix2 (P2-02) • **11**: Preset fixed frequency f-fix3 (P2-03) • **12**: Preset fixed frequency f-fix4 (P2-04) • **13**: Preset fixed frequency f-fix5 (P2-05) • **14**: Preset fixed frequency f-fix6 (P2-06) • **15**: Preset fixed frequency f-fix7 (P2-07) • **16**: Preset fixed frequency f-fix8 (P2-08) **Remark:** To use the parameters in group 9 (P9-…), P1-13 has to be 0 (user defined)	0
P9-11	–	SpeedSource2	0, 1, …, 16	Source for "Speed Reference 2" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: ⟶ P9-10	2
P9-12	–	SpeedSource3	0, 1, …, 16	Source for "Speed Reference 3" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: ⟶ P9-10	0
P9-13	–	SpeedSource4	0, 1, …, 16	Source for "Speed Reference 4" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: ⟶ P9-10	0
P9-14	–	SpeedSource5	0, 1, …, 16	Source for "Speed Reference 5" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: ⟶ P9-10	0

Para meter	RUN	Designation	Value	Description	DS
P9-15	–	SpeedSource6	0, 1, …, 16	Source for "Speed Reference 6" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: → P9-10	0
P9-16	–	SpeedSource7	0, 1, …, 16	Source for "Speed Reference 7" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: → P9-10	0
P9-17	–	SpeedSource8	0, 1, …, 16	Source for "Speed Reference 8" It is possible to define up to 8 sources for the speed reference, and to select them during operation using P9-18, …, P9-20. When changing the speed reference source, the operation is effective immediately. A stop and restart is not required. Possible sources: → P9-10	0
P9-18	–	Speed Select B0	0, 1, …, 25	Speed Reference Select Bit 0 Parameters P9-18 … P9-20 determine the selection of the actual speed reference value, defined by P9-10, …, P9-17. Selection: <table><tr><th>Speed Reference</th><th>P9-18</th><th>P9-19</th><th>P9-20</th></tr><tr><td>Speed reference value 1 (P9-10)</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Speed reference value 2 (P9-11)</td><td>1</td><td>0</td><td>0</td></tr><tr><td>Speed reference value 3 (P9-12)</td><td>0</td><td>1</td><td>0</td></tr><tr><td>Speed reference value 4 (P9-13)</td><td>1</td><td>1</td><td>0</td></tr><tr><td>Speed reference value 5 (P9-14)</td><td>0</td><td>0</td><td>1</td></tr><tr><td>Speed reference value 6 (P9-15)</td><td>1</td><td>0</td><td>1</td></tr><tr><td>Speed reference value 7 (P9-16)</td><td>0</td><td>1</td><td>1</td></tr><tr><td>Speed reference value 8 (P9-17)</td><td>1</td><td>1</td><td>1</td></tr></table> Possible sources: → P9-02	3
P9-19	–	Speed Select B1	0, 1, …, 25	Speed Reference Select Bit 1 Parameters P9-18, …, P9-20 determine the selection of the actual speed reference value, defined by P9-10, …, P9-17. Selection → P9-18 Possible sources: → P9-02	0

Para meter	RUN	Designation	Value	Description	DS
P9-20	–	Speed Select B2	0, 1, …, 25	Speed Reference Select Bit 2 Parameters P9-18, …, P9-20 determine the selection of the actual speed reference value, defined by P9-10, …, P9-17. Selection ➞ P9-18 Possible sources: ➞ P9-02	0
P9-21	–	f-Fix Select B0	0, 1, …, 25	Preset Fixed Frequency Select Bit 0 Parameters P9-21, …, P9-23 determine the selection of the preset fixed frequencies defined by P2-01, …, P2-08. Selection: <table><tr><th>Preset Speed</th><th>P9-21</th><th>P9-22</th><th>P9-23</th></tr><tr><td>f-Fix1 (P2-01)</td><td>0</td><td>0</td><td>0</td></tr><tr><td>f-Fix2 (P2-02)</td><td>1</td><td>0</td><td>0</td></tr><tr><td>f-Fix3 (P2-03)</td><td>0</td><td>1</td><td>0</td></tr><tr><td>f-Fix4 (P2-04)</td><td>1</td><td>1</td><td>0</td></tr><tr><td>f-Fix5 (P2-05)</td><td>0</td><td>0</td><td>1</td></tr><tr><td>f-Fix6 (P2-06)</td><td>1</td><td>0</td><td>1</td></tr><tr><td>f-Fix7 (P2-07)</td><td>0</td><td>1</td><td>1</td></tr><tr><td>f-Fix8 (P2-08)</td><td>1</td><td>1</td><td>1</td></tr></table> Possible sources: ➞ P9-02	5
P9-22	–	f-Fix Select B1	0, 1, …, 25	Preset Fixed Frequency Select Bit 1 Parameters P9-21, …, P9-23 determine the selection of the preset fixed frequencies defined by P2-01, …, P2-08. Selection ➞ P9-21 Possible sources: ➞ P9-02	0
P9-23	–	f-Fix Select B2	0, 1, …, 25	Preset Fixed Frequency Select Bit 2 Parameters P9-21, …, P9-23 determine the selection of the preset fixed frequencies defined by P2-01, …, P2-08. Selection ➞ P9-21 Possible sources: ➞ P9-02	0

Para meter	RUN	Designation	Value	Description	DS
P9-24	–	t-acc Select B0	0, 1, …, 25	Acceleration Ramp Select Bit 0 With parameters P9-24 and P9-25 alternative acceleration ramp times can be selected. Condition is, that P8-13 is set to 0, because otherwise the selection of the ramps is done automatically depending on the speed. Selection: | Acceleration time	P9-24	P9-25
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t-acc (P1-03)	0	0
t-acc2 (P8-01)	1	0
t-acc3 (P8-02)	0	1
t-acc4 (P8-03)	1	1	 Possible sources: ➞ P9-02	0
P9-25	–	t-acc Select B1	0, 1, …, 25	Acceleration Ramp Select Bit 1 With parameters P9-24 and P9-25 alternative acceleration ramp times can be selected. Condition is, that P8-13 is set to 0, because otherwise the selection of the ramps is done automatically depending on the speed. Selection ➞ P9-24 Possible sources: ➞ P9-02	0
P9-26	–	t-dec Select B0	0, 1, …, 25	Deceleration Ramp Select Bit 0 With parameters P9-26 and P9-27 alternative deceleration ramp times can be selected. Condition is, that P8-13 is set to 0, because otherwise the selection of the ramps is done automatically depending on the speed. Selection: | Deceleration time	P9-26	P9-27
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t-dec (P1-04)	0	0
t-dec2 (P8-11)	1	0
t-dec3 (P8-09)	0	1
t-dec4 (P8-07)	1	1	 Possible sources: ➞ P9-02	0
P9-27	–	t-dec Select B1	0, 1, …, 25	Deceleration Ramp Select Bit 1 With parameters P9-26 and P9-27 alternative deceleration ramp times can be selected. Condition is, that P8-13 is set to 0, because otherwise the selection of the ramps is done automatically depending on the speed. Selection ➞ P9-26 Possible sources: ➞ P9-02	0

Para meter	RUN	Designation	Value	Description	DS
P9-28	–	digRef UP Source	0, 1, …, 25	Source for "Increase Digital Reference" Defines the souce of a signal for the increasement of the digital reference (Motorpot) • Logic 0 = no increasement of the digital reference • Logic 1 = The digital reference will be increased. Acceleration according t-acc (P1-03) Possible sources: ⟶ P9-02	0
P9-29	–	digRef DOWN Source	0, 1, …, 25	Source for "Decrease Digital Reference" Defines the souce of a signal for an decreasement of the digital reference (Motorpot) • Logic 0 = no decreasement of the digital reference • Logic 1 = The digital reference will be decreased. Deceleration according t-dec (P1-04) Possible sources: ⟶ P9-02	0
P9-30	–	EnableDirFWD Source		Enable Direction FWD Defines a source for a signal to enable the "forward" (FWD) sense of rotation. • Logic 0 = An operation in forward direction is not possible. If the motor already turns in forward direction when the signal changes from logic 1 to 0, it ramps to stand still by using the quick stop ramp (P2-25) • Logic 1 = An operation in forward direction is possible. Possible sources: ⟶ P9-02	0
P9-31	–	EnableDirREV Source		Enable Direction REV Defines a source for a signal to enable the "reverse" (REV) sense of rotation. • Logic 0 = An operation in reverse direction is not possible. If the motor already turns in reverse direction when the signal changes from logic 1 to 0, it ramps to stand still by using the quick stop ramp (P2-25). • Logic 1 = An operation in reverse direction is possible. Possible sources: ⟶ P9-02	0
P9-32	–	Reserved Parameter		Reserved Parameter	0
P9-33	–	ADO1 Function & Mode Extension	0, 1, 2	Selection of additional functions for ADO1 • **0**: Function of the Analog Output 1 is determined by P2-11 • **1**: User defined digital output (0 V / 24 V) from function block • **2**: User defined analog output from function block	0
P9-34	–	ADO2 Function & Mode Extension	0, 1, 2	Selection of additional functions for ADO2 • **0**: Function of the Analog Output 2 is determined by P2-13 • **1**: User defined digital output (0 V / 24 V) from function block • **2**: User defined analog output from function block	0
P9-35	–	RO1 Function Extension	0, 1	Selection of additional functions for RO1 • **0**: Function of Relay Output 1 is determined by P2-15 • **1**: User defined output from function block	0
P9-36	–	RO2 Function Extension	0, 1	Selection of additional functions for RO2 • **0**: Function of Relay Output 2 is determined by P2-18 • **1**: User defined output from function block	0
P9-37	–	Display Scale Source	0, 1	Source to Scale factor display • **0**: The source of the scaling factor is determined by P2-21. • **1**: User defined source from function block	0

5 Parameter

5.10 Parameter group 9 ("Control")

Parameter	RUN	Designation	Value	Description	DS
P9-38	–	PID1 Set Point1 Source Ext	0, 1	Selection of additional sources for PID1 reference • **0**: The source of the reference is determined by P3-05. • **1**: User defined source from function block	0
P9-39	–	PID1 Feedback1 Source Ext	0, 1	Selection of additional sources for PID1 feedback • **0**: The source of the feedback is determined by P3-10. • **1**: User defined source from function block	0
P9-40	–	M-Ref Source Extension	0, 1	Extended Selection values for Source of torque reference • **0**: The source of the reference is determined by P4-06. • **1**: User defined source from function block	0

P9-41	–	RO5 Function Extension	0, 1	Selection of additional functions for RO5
				The relays are located on option boards.
				• **0**: Factory settings active
				  (Relay 3: Drive healthy (DXA-EXT-3RO + DXA-EXT-3DI1RO)
				  Relay 4: Drive tripped (DXA-EXT-3RO)
				  Relay 5: Drive running (DXA-EXT-3RO))
				• **1**: User defined output from function block
					0