

# PowerXL™

## DC1 Variable Frequency Drives

### Parameter Manual

Parameter	Designation	Value	Description	DS
P00-01	Analog Input1	0 - 1000	Analog input 1 Level of the signal applied to analog input 1 after scaling and offsets have been applied.	0
P00-02	Analog Input 2	0 - 1000	Analog input 2 Level of the signal applied to analog input 2 after scaling and offsets have been applied.	0
P00-03	Frequency Reference	-P-01 - +P-01	Frequency Reference in Hz. Will be calculated into rpm when motor data are available. Value of the drive internal digital reference	0

...



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### **Original operating manual**

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

### **Translation of the original operating manual**

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

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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.



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## 0 About this manual

This manual provides special information that is intended to enable you to configure the parameters for a DC1 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 DC1 variable frequency drives, please refer to manual MN04020003Z ("Installation Manual").

### 0.1 Target group

The content of MN04020004Z-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	Modified	Deleted
11/16		P-12 = 12: SWD control + setpoint value, auto			✓
01/16	–	Initial issue			
This manual (MN04020004Z – "Parameter Configuration Manual") was part of manual MN04020003Z up to version 12/2013.					

### 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](http://www.eaton.eu/powerxl)

as well as:

[www.eaton.eu/documentation](http://www.eaton.eu/documentation)



# 1 General

## 1.1 Parameter Groups

The DC1 variable frequency drive's functions are configured with the use of parameters. These parameters are subdivided into three groups (P0-00, P-01 to P-14, and P15 to P-55):

Table 1: Parameter Groups

Parameter group	Theme
P0-00	Monitor
P-01 – P-14	Basic
P-15 – P-55	Extended



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 (“Extended“) can be accessed by using parameter P-14 to enter the correct password.

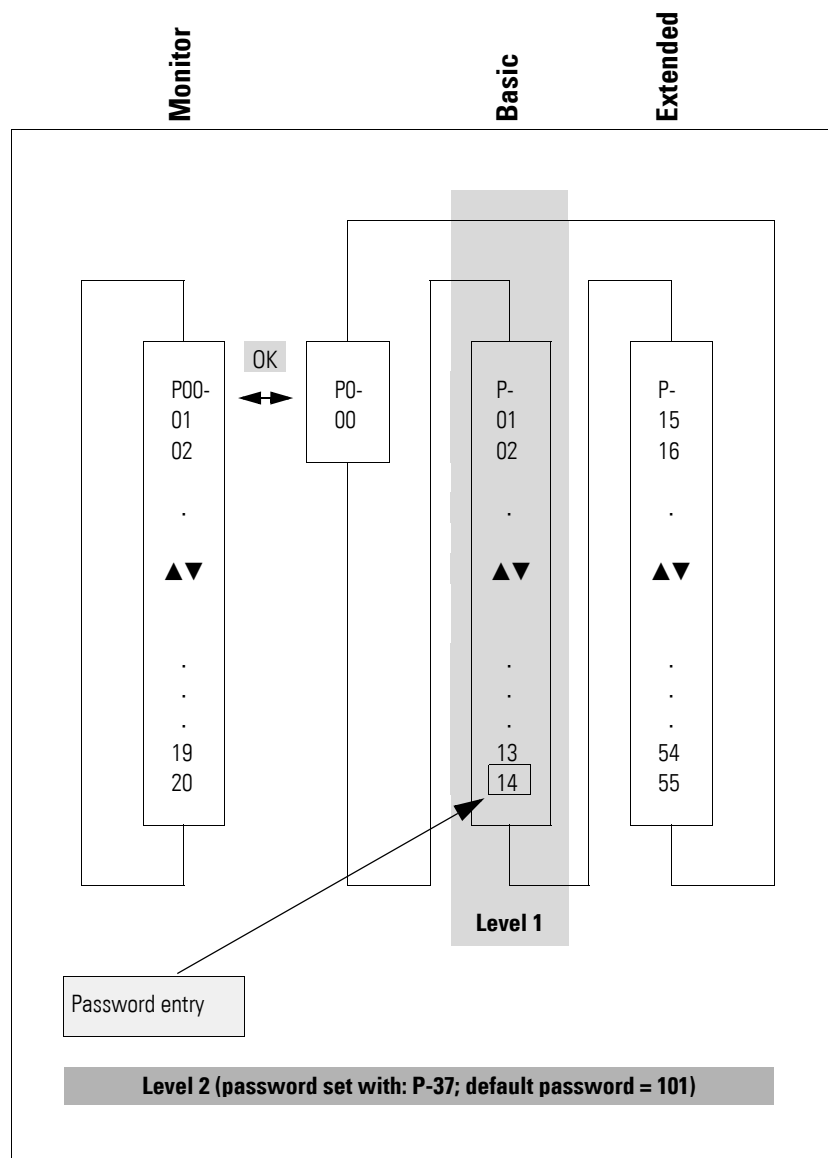
The default password is:

- Access to level 2: 101

Users can change this password as required:

- Password for Level 2 with: P-37

## 1.2 Menu structure



## 2 Control unit



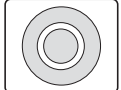


### 2.1 Control unit elements

The following figure shows the elements of the DC1 variable frequency drive integrated operating unit.



Figure 1: Operating unit view

Table 2: Keypad elements – Buttons


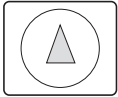
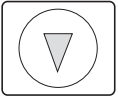

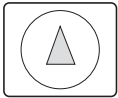
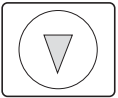


Button	Attribute ID	Explanation
	<b>OK</b>	<ul style="list-style-type: none"> <li>• Opens and closes the parameter interface</li> <li>• Saves parameter values</li> </ul>
	<b>START</b>	<ul style="list-style-type: none"> <li>• Starts the variable frequency drive<sup>1)</sup></li> <li>• Changes the operating direction<sup>2)</sup></li> </ul>
	<b>STOP</b>	<ul style="list-style-type: none"> <li>• Stops the variable frequency drive<sup>1)</sup></li> <li>• Reset – Resetting after an error message</li> </ul>
	<b>UP</b>	<ul style="list-style-type: none"> <li>• Increases the speed<sup>1)</sup></li> <li>• Increases the parameter value</li> </ul>
	<b>DOWN</b>	<ul style="list-style-type: none"> <li>• Decreases the speed<sup>1)</sup></li> <li>• Decreases the parameter value</li> </ul>

**Note:**

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

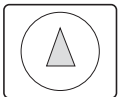
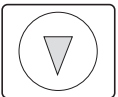
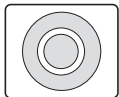
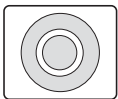
## 2.2 Setting parameters

Table 3: Navigating within the keypad

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


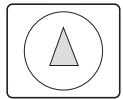
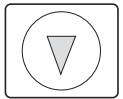

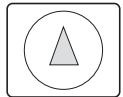
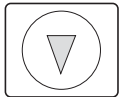

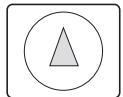
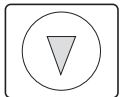

## 2.3 Resetting Parameters (RESET)

Table 4: Resetting parameters (RESET)

Commands	Description
<b>Restoring default settings</b>	
  	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 <i>P - dEF</i> .
<b>Resetting after a fault</b>	
	Press the <b>STOP</b> button to reset the unit after a fault





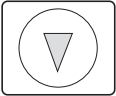


## 2.4 Extended parameter set

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

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




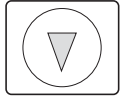


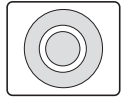
## 2.5 "Monitor" submenu

Table 6: "Monitor" submenu

Commands	Description
<b>Accessing the "Monitor" submenu</b>	
 	<p>Access to parameter level 2 must have already been enabled with P-14.</p> <p>Use the ▲ and ▼ buttons to select parameter P-00.</p>
	<p>Press the <b>OK</b> button.        → The submenu with P00-01 to P00-20 will now be accessible.</p>
<b>Navigating within the "Monitor" submenu</b>	
 	<p>Use the ▲ and ▼ buttons to select parameters P00-01 to P00-20.</p>
	<p>Press the <b>OK</b> button to confirm.</p>
<b>Exiting the "Monitor" submenu</b>	
	<p>Press the <b>OK</b> button (several times if necessary).        → Only parameter P-00 will be available now.</p>

## 2.6 Control via keypad

Table 7: Control via keypad

Button	Attribute ID	Explanation
	<b>OK</b>	P-12 = 1 or = 2 <ul style="list-style-type: none"> <li>• P-12 = 1: one operating direction (FWD)</li> <li>• P-12 = 2: two operating directions (FWD/REV)</li> </ul>
	<b>START</b>	Starts the variable frequency drive
 		▲ Increase speed ▼ Decrease speed
	<b>START</b>	Changes the operating direction if the motor is running  <b>Note:</b> Only if P-12 = 2
	<b>OK</b>	Changes the value being displayed: A, rpm, etc.
	<b>STOP</b>	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 DC1 variable frequency drive.

## 3 Control signal terminals

### 3.1 Correspondence between inputs/outputs and terminals

## 3 Control signal terminals

### 3.1 Correspondence between inputs/outputs and terminals

Input/Output	Clips
<b>Entries</b>	
DigIN: 1	Terminal 2
DI2	Terminal 3
DI3/AI2	Terminal 4
DI4/AI1	Terminal 6
<b>Outputs</b>	
A01/D01	Terminal 8
R01 (relay, N/O)	Terminals 10/11

Parameter P-15 can be used to select the configuration for the control signal terminals. More specifically, you can select predefined terminal configurations by setting P-15 to a value between 0 and 13.

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



## 3 Control signal terminals

### 3.1 Correspondence between inputs/outputs and terminals

The following abbreviations are used throughout this document:

Table 8: Abbreviations

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

### 3 Control signal terminals

#### 3.1 Correspondence between inputs/outputs and terminals

Abbreviation	Significance															
Select AI1 REF/AI2 REF	Used to select between the analog setpoint values on AI1 (terminal 6) and AI2 (terminal 4) <ul style="list-style-type: none"> <li>AI1 = Low</li> <li>AI2 = High</li> </ul>															
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. <ul style="list-style-type: none"> <li>Low = analog setpoint value</li> <li>High = fixed frequency</li> </ul>															
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 P-20. <ul style="list-style-type: none"> <li>Low = analog setpoint value</li> <li>High = Preset Speed 1</li> </ul>															
Select BUS REF/AI1 REF	Used to select between setpoint values <ul style="list-style-type: none"> <li>Low = Speed reference value from bus</li> <li>High = AI2</li> </ul>															
Select BUS REF/DIG REF	Used to select between setpoint values <ul style="list-style-type: none"> <li>Low = Speed reference value from bus</li> <li>High = fixed frequency</li> </ul> The fixed frequency itself is selected with the Select f-Fix Bit0, Select f-Fix Bit1 commands.															
Select BUS REF/f-Fix1	Used to select between setpoint values – set with P-20 <ul style="list-style-type: none"> <li>Low = Speed reference value from bus</li> <li>High = Preset Speed 1</li> </ul>															
Select DIG REF/AI1 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 AI1 REF (terminal 6) <ul style="list-style-type: none"> <li>Low = digital setpoint value</li> <li>High = AI1</li> </ul>															
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 P-20. <ul style="list-style-type: none"> <li>Low = digital setpoint value</li> <li>High = Preset Speed 1</li> </ul>															
Select f-Fix Bit0/f-Fix Bit1	Used to select a fixed frequency with digital commands Fixed frequencies f-Fix1, ..., f-Fix8 are defined with parameters P-20 up to P-23. <table border="1"> <thead> <tr> <th>Fixed</th> <th>Bit 1</th> <th>Bit 0</th> </tr> </thead> <tbody> <tr> <td>f-Fix1 (P-20)</td> <td>0</td> <td>0</td> </tr> <tr> <td>f-Fix2 (P-21)</td> <td>0</td> <td>1</td> </tr> <tr> <td>f-Fix3 (P-22)</td> <td>1</td> <td>0</td> </tr> <tr> <td>f-Fix4 (P-23)</td> <td>1</td> <td>1</td> </tr> </tbody> </table> <p>0 = Low 1 = High</p>	Fixed	Bit 1	Bit 0	f-Fix1 (P-20)	0	0	f-Fix2 (P-21)	0	1	f-Fix3 (P-22)	1	0	f-Fix4 (P-23)	1	1
Fixed	Bit 1	Bit 0														
f-Fix1 (P-20)	0	0														
f-Fix2 (P-21)	0	1														
f-Fix3 (P-22)	1	0														
f-Fix4 (P-23)	1	1														
Select f-Fix/f-max	Used to select between a fixed frequency and the maximum speed set with P-01. <ul style="list-style-type: none"> <li>Low = fixed frequency</li> <li>High = maximum speed</li> </ul> The fixed frequency itself is selected with the Select f-Fix Bit0 or Select f-Fix Bit1 commands.															
Select PI REF/AI1 REF	Used to select between setpoint values <ul style="list-style-type: none"> <li>Low = setpoint from the PI controller's output</li> <li>High = AI1</li> </ul>															

## 3.1 Correspondence between inputs/outputs and terminals

Abbreviation	Significance
Select PI REF/f-Fix1	Used to select between setpoint values <ul style="list-style-type: none"> <li>• Low = setpoint from the PI controller's output</li> <li>• High = f-Fix1, set with P-20</li> </ul>
Select t-dec/t-Quick-dec	This command must be present (there must be a high-level signal at the corresponding terminal) in order to be able to run the variable frequency drive. If the signal is removed (low level), the unit will immediately do a quick stop with the ramp defined in P-24.
START	Used to start/stop the drive If a high-level signal is applied at the corresponding terminal, the drive will accelerate with the selected ramp. Removing the signal will cause the drive to stop. In this case, the specific way in which it stops will depend on the value set for P-05 (stop mode). Once the variable frequency drive stops, it will be locked. In applications with two operating directions, the directions are selected using the DIR and INV commands.
START INV	In applications in which the keypad is used to set a setpoint value: When the START command is issued, the drive will start running in the operating direction that was last selected. If START INV is used to start the drive, the drive will run in the opposite direction.
UP	Used to increase the speed if a digital setpoint is selected (P-12 = 1 or = 2). Used together with the DOWN command.

### 3 Control signal terminals

#### 3.2 Configuration of the control signal terminals

### 3.2 Configuration of the control signal terminals

#### 3.2.1 P-12 = 0: Terminal-based operation

Table 9: P-12 = 0: Terminal-based operation

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

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

### 3.2.2 P-12 = 1: digital setpoint value, 1 operating direction

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

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

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

### 3 Control signal terminals

#### 3.2 Configuration of the control signal terminals

#### 3.2.3 P-12 = 2: digital setpoint value, 2 operating directions

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

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

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

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

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

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

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	Not permissible			
6	START	Select BUS REF/AI1 REF	EXTFLT	AI1 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function

### 3 Control signal terminals

#### 3.2 Configuration of the control signal terminals

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

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

P-15	D11 (terminal 2)	D12 (terminal 3)	D13/A12 (terminal 4)	D14/A11 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	Not permissible			
6	START	Select BUS REF/A11 REF	EXTFLT	A11 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function



## 3.2.6 P-12 = 5: PI controller

Table 14: P-12 = 5: PI controller

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

### 3 Control signal terminals

#### 3.2 Configuration of the control signal terminals

#### 3.2.7 P-12 = 6: PI controller with AI1 totaling

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

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

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

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

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	Not permissible			
6	START	Select BUS REF/AI1 REF	EXTFLT	AI1 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function

### 3 Control signal terminals

#### 3.2 Configuration of the control signal terminals

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

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

P-15	D11 (terminal 2)	D12 (terminal 3)	D13/A12 (terminal 4)	D14/A11 (terminal 6)
0	START	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	START	Select BUS REF/f-Fix1	EXTFLT	No function
4	Not permissible			
5	Not permissible			
6	START	Select BUS REF/A11 REF	EXTFLT	A11 REF
7	START	Select BUS REF/DIG REF	EXTFLT	No function
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function

**3.2.10 P-12 = 9: SWD control + setpoint value**

Table 18: P-12 = 9: SWD control + setpoint value

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	ENA	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	Not permissible			
4	Not permissible			
5	Not permissible			
6	Not permissible			
7	Not permissible			
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	ENA	No function	EXTFLT	No function

### 3 Control signal terminals

#### 3.2 Configuration of the control signal terminals

##### 3.2.11 P-12 = 10: SWD control

Table 19: P-12 = 10: SWD control

P-15	D11 (terminal 2)	D12 (terminal 3)	D13/AI2 (terminal 4)	D14/AI1 (terminal 6)
0	FWD	No function	Select AI1 REF/f-Fix1	AI1 REF
1	FWD	Select AI1 REF/f-Fix	Select f-Fix Bit0	AI1 REF
2	FWD	Select f-Fix Bit0	Select f-Fix Bit1	Select f-Fix/f-max
3	FWD	Select AI1 REF/f-Fix1	EXTFLT	AI1 REF
4	FWD	Select AI2 REF/AI1 REF	AI2 REF	AI1 REF
5	Not permissible			
6	FWD	No function	EXTFLT	AI1 REF
7	Not permissible			
8	START	DIR	Select f-Fix Bit0	Select f-Fix Bit1
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	START	No function	EXTFLT	No function

### 3.2.12 P-12 = 11: SWD setpoint value

Table 20: P-12 = 11: SWD setpoint value

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	ENA	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	Not permissible			
4	Not permissible			
5	Not permissible			
6	Not permissible			
7	Not permissible			
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	ENA	No function	EXTFLT	No function

### 3 Control signal terminals

#### 3.2 Configuration of the control signal terminals

##### 3.2.13 P-12 = 13: SWD control + setpoint value, DI ENA

Table 21: P-12 = 13: SWD control + setpoint value, DI ENA

P-15	DI1 (terminal 2)	DI2 (terminal 3)	DI3/AI2 (terminal 4)	DI4/AI1 (terminal 6)
0	ENA	No function	No function	No function
1	Not permissible			
2	Not permissible			
3	Not permissible			
4	Not permissible			
5	Not permissible			
6	Not permissible			
7	Not permissible			
8	Not permissible			
9	Not permissible			
10	Not permissible			
11	Not permissible			
12	Not permissible			
13	ENA	No function	EXTFLT	No function



## 4 Messages

### 4.1 List of messages

Table 22: Messages

Message	Possible causes and fixes
<i>S TDP</i>	Ready to start. There is no drive enable signal present. There are no fault messages present.
<i>P-dEF</i>	The parameters' default settings have been loaded.
<i>O-I</i>	<p>Overcurrent at variable frequency drive output</p> <p>Occurs right after switching on the unit:</p> <ul style="list-style-type: none"> <li>• Check the cable connection between the variable frequency drive and the motor</li> <li>• Check the motor for shorted turns and ground faults</li> </ul> <p>Occurs when starting the motor:</p> <ul style="list-style-type: none"> <li>• Check whether the motor can rotate freely and make sure that it is not being blocked mechanically.</li> <li>• Motor with mechanical brake: Check whether the brake is being applied.</li> <li>• Check the connection configuration (star/delta)</li> <li>• Check to make sure that the correct rated motor current has been entered in P-08</li> <li>• Increase the acceleration ramp time (t-acc, P-03) if necessary.</li> <li>• Reduce the voltage boost with P-11.</li> </ul> <p>Occurs during operation at a constant speed:</p> <ul style="list-style-type: none"> <li>• Check whether the motor is overloaded.</li> </ul> <p>Occurs during acceleration/deceleration:</p> <ul style="list-style-type: none"> <li>• The ramp times are too short and require too much power.</li> </ul> <p>If P-03 / P-04 cannot be increased, a larger device may be required.</p>
<i>I.L-ErrP</i>	<p>Motor overload. The thermal protection mechanism has tripped as a result of the device being run above the rated motor current set with P-08 longer than a specific time.</p> <ul style="list-style-type: none"> <li>• Check to make sure that the rated motor current has been entered in P-08.</li> <li>• Check the motor's connection configuration (e.g., star/delta)</li> <li>• If the decimal points on the display flash during operation, this means that the unit is being run in its overload range (&gt; P-08). In this case, use P-03 to make the acceleration ramp longer or reduce the load.</li> <li>• Check whether the motor is being blocked mechanically or whether there are any additional loads.</li> </ul>
<i>OI-b</i>	<p>Excessively high braking current</p> <ul style="list-style-type: none"> <li>• Check the brake resistor and its wiring for short-circuits and ground faults.</li> <li>• Make sure that the braking resistance value is not lower than the minimum permissible braking resistance.</li> </ul>
<i>OL-br</i>	<p>Thermal overload on brake resistor. The drive has been switched off in order to prevent the brake resistor from being thermally destroyed. This message will only be output if P-34 = 1 ("braking chopper")</p> <ul style="list-style-type: none"> <li>• Make the P-04 and P-24 ramp times longer in order to have less frequent braking.</li> <li>• Reduce the load's inertia (if possible).</li> </ul> <p>If the protection achieved with P-34 = 1 is not adequate for the brake resistor being used:</p> <ul style="list-style-type: none"> <li>• Provide external protection for the brake resistor and set P-34 to a value of 2.</li> </ul>
<i>PS-ErrP</i>	<p>Overcurrent (Hardware)</p> <ul style="list-style-type: none"> <li>• Check the wiring to the motor and the motor itself for short-circuits and ground faults.</li> <li>• Disconnect the motor cable from the variable frequency drive and switch the variable frequency drive back on.</li> <li>• 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.</li> </ul>
<i>OUal E</i>	<p>Overvoltage in DC link</p> <ul style="list-style-type: none"> <li>• Check to make sure that the supply voltage falls within the range for which the variable frequency drive is sized.</li> </ul> <p>If the error occurs during deceleration or stopping:</p> <ul style="list-style-type: none"> <li>• Make the deceleration ramp (P-04/P-24) longer or use the brake resistor and activate the braking chopper with P-34 (only on devices with frame size FS2, FS3, or FS4).</li> </ul>

## 4 Messages

### 4.1 List of messages

Message	Possible causes and fixes
<i>UUOLt</i>	<p>Undervoltage in DC link</p> <p><b>Note:</b> Generally, this message will appear when the supply voltage is switched off on the device and the DC link voltage dies away. In this case, there is no fault.</p> <p>If the message appears during operation:</p> <ul style="list-style-type: none"> <li>• Check whether the power supply voltage is too low.</li> <li>• 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.</li> </ul>
<i>O-t</i>	<p>Overtemperature at heat sink. The drive is too hot.</p> <ul style="list-style-type: none"> <li>• 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).</li> <li>• Make sure that cooling air can circulate freely (clearances to neighboring devices above and below the variable frequency drive).</li> <li>• Improve the ventilation in the control cabinet 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.</li> </ul>
<i>U-t</i>	<p>Under-temperature.</p> <p>The message will appear if the ambient temperature falls below -10 °C. In order to be able to start the drive, the temperature must be higher than this.</p>
<i>th-FLt</i>	<p>Malfunctioning heat sink thermistor.</p> <ul style="list-style-type: none"> <li>• Please contact your nearest Eaton sales branch.</li> </ul>
<i>E-ErrP</i>	<p>External fault (at digital input 3, terminal 4). There must be a high-level signal at this input in order to be able to run the variable frequency drive. If a thermistor is connected to terminal 4:</p> <ul style="list-style-type: none"> <li>• Check whether the motor is too hot.</li> </ul>
<i>SC-ErrP</i>	<p>Serial communication lost</p> <ul style="list-style-type: none"> <li>• Check to make sure that the connection to other variable frequency drives and external modules is set up and working correctly: every module on the bus must have its own address. There must not be two or more modules with the exact same address!</li> </ul>
<i>P-LOSS</i>	<p>Incoming power phase failure (only for devices with a three-phase power supply)</p>
<i>SPI n-F</i>	<p>Speed detection before switching (on the running motor) unsuccessful.</p>
<i>dRAM-F</i>	<p>Error in internal memory. The parameters have not been saved and the default settings have been loaded. Change the parameter values (again) and save them once more. If the message appears again, please contact your nearest Eaton sales branch.</p>
<i>4-20 F</i>	<p>The analog input's input current does not fall within the specified range.</p> <ul style="list-style-type: none"> <li>• Check the setting in P-16 for AI1 and P-47 for AI2</li> </ul> <p>In the case of 4-20mA:</p> <ul style="list-style-type: none"> <li>• Check the setpoint connection for wire breakage</li> </ul>
<i>SC-FLt</i>	<p>Internal error</p> <ul style="list-style-type: none"> <li>• Please contact your nearest Eaton sales branch</li> </ul>
<i>FAULTY</i>	<p>Internal error</p> <ul style="list-style-type: none"> <li>• Please contact your nearest Eaton sales branch</li> </ul>

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

Table 23: Possible messages after a data transfer

<b>View</b>	<b>Description</b>
<i>PR55-r</i>	Parameter transfer to DX-COM-STICK interface card was successful
<i>DS-Loc</i>	DX-COM-STICK is interlocked. In order to transfer data, check the switch position on the side.
<i>FRIL-r</i>	Error while attempting to read the parameters from the variable frequency drive.
<i>PR55-t</i>	Parameter transfer to variable frequency drive successful.
<i>FRIL-P</i>	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.
<i>FRIL-t</i>	Error when attempting to copy parameter set to variable frequency drive
<i>no-dRt</i>	No data found in DX-COM-STICK.
<i>dr-Loc</i>	Parameter set in variable frequency drive locked. Unlock variable frequency drive first.
<i>dr-rUn</i>	The variable frequency drive has an enable signal and cannot take new parameters. Stop the variable frequency drive.
<i>tYPE-E</i>	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.
<i>tYPE-F</i>	The DX-COM-STICK is not compatible with the variable frequency drive.

## 5 Parameter

### 5.1 "Monitor" parameter group

## 5 Parameter

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

Abbreviation	Significance
<b>ID</b>	Unique identification code
<b>RUN</b>	The parameter can be accessed during operation ("Run" signal)
<b>DS</b>	Default setting (the parameter's value when using the device's factory settings)



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

### 5.1 "Monitor" parameter group

Table 24: "Monitor" parameter group

Parameter	Designation	Value	Description	DS
P00-01	Analog Input1	0 - 1000	Analog input 1 Level of the signal applied to analog input 1 after scaling and offsets have been applied.	0
P00-02	Analog Input 2	0 - 1000	Analog input 2 Level of the signal applied to analog input 2 after scaling and offsets have been applied.	0
P00-03	Frequency Reference	-P-01 - +P-01	Frequency Reference in Hz. Will be calculated into rpm when motor data are available. Value of the drive internal digital reference	0
P00-04	DI1 Status	0, 1	Status of the digital inputs starting on the left hand side with digital input 1 etc.	0
P00-05	Device Temperature	–	Unit Temperature	0
P00-06	DC-link Voltage Ripple	–	DC-Link Voltage Ripple	0
P00-07	Motor Voltage	0 - 500	Instantaneous output voltage	0
P00-08	DC-Link Voltage	0 - 1000	Instantaneous DC Link Voltage	0
P00-09	Heatsink Temperature	-20 - +100 °C	Instantaneous Heatsink Temperature	0
P00-10	t-Run	0h0m0s - 65535h59m59s	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".	0
P00-11	t-Run since Restart	0h0m0s - 65535h59m59s	Run time since power on or last Reset Total operating time of the drive since the last trip occurred or the last power OFF in hours, minutes and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds".	0

## 5 Parameter

### 5.1 "Monitor" parameter group

Parameter	Designation	Value	Description	DS
P00-12	t-Run since Trip	0h0m0s - 65535h59m59s	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".	0
P00-13	t-HoursRun Enable	0h0m0s - 65535h59m59s	Total operating time of the drive since the last drive ENABLE signal was applied. Displayed in hours, minutes and seconds. Pressing the UP key on the drive keypad will change the display from "hours" to "minutes and seconds"	0
P00-14	Actual Switching Frequency	0 - 5	Actual switching frequency	0
P00-15	DC-Link0 Log	0 - 1200	DC link voltage log Recording of the most recent 8 samples of the DC bus voltage prior to a drive trip condition occurring. Scan time: 256 ms	0
P00-16	Heatsink0 Log	-249	Heatsink temperature log Recording of the most recent 8 samples of the heatsink temperature prior to a drive trip condition occurring. Scan time: 500 ms	0
P00-17	MotorCurrent0 Log	0 - N/A	Motor current log Recording of the most recent 8 samples of the Motor current prior to a drive trip condition occurring. Scan time: 256 ms	0
P00-18	Application version	–	Application Version	0
	System Version	–	System version	
P00-19	Serial Number	–	Serial Number of the device	0
P00-20	FrameSize	1 - ...	Framesize	0
	NoOfInputPhases		Number of input phases	0
	kW/HP		Instance Motor Power	0
	Power@Ue	370 - 15000	Device Power at Device Voltage Rating	0
	Device voltage	230 - 460	Rated voltage	0
	DeviceType	–	Device Type	0

## 5 Parameter

### 5.2 "Basic" parameter group

#### 5.2 "Basic" parameter group

Table 25: "Basic" parameter group

Parameter	Designation	Value	Description	DS
P-01	f-max	0.0 Hz - 5 x P-09	Sets the upper limit for the speed of the motor. This can be set to any value between "f-min" and 5x the "motor nom frequency". <ul style="list-style-type: none"> <li>"Motor Nom Speed" (P-10) = 0, the maximum speed limit will be displayed in Hz.</li> <li>"Motor Nom Speed" (P-10) &gt; 0, the maximum speed limit will be displayed in rpm.</li> </ul>	50.0 hz
P-02	f-min	0.0 Hz - P-01	Sets the lower limit for the speed of the motor. This can be set to any value between 0 and "f-max" (P-01) <ul style="list-style-type: none"> <li>"Motor Nom Speed" (P-10) = 0, the minimum speed limit will be displayed in Hz.</li> <li>"Motor Nom Speed" (P-10) &gt; 0, the minimum speed limit will be displayed in rpm.</li> </ul>	0.0 hz
P-03	t-acc	0.00 - 600 s	Acceleration ramp time in seconds. The time interval represents the time taken to accelerate from zero to "Motor Nom Frequency" (P-09).	5.0 s
P-04	t-dec	0.00 - 600 s	Deceleration ramp time in seconds. The time interval represents the time taken to decelerate from "Motor Nom Frequency" (P-09) to zero.	5.0 s
P-05	Stop Mode	0, 1, 2	Determines the action taken by the drive in the event of the drive enable signal being removed. <ul style="list-style-type: none"> <li><b>0:</b> Ramp down to stop. When the enable signal is removed, the drive will ramp to stop, with the rate controlled by "t-dec" (P-04).</li> <li><b>1.:</b> Coast to stop. When the enable signal is removed, the drive output is immediately disabled, and the motor will coast (freewheel) to stop.</li> <li><b>2.</b> Ramp down to stop. When the enable signal is removed, the drive will ramp to stop, with the rate controlled by "t-dec" (P-04). If the mains supply is lost the drive will ramp to stop using the deceleration ramp set by P-24. Condition: P-24 is set to a time which is shorter than the one for discharging the DC link. Otherwise the drive will trip due to "under voltage".</li> </ul>	1
P-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.  0: OFF 1: ON  <b>Hint:</b> This mode of operation is less suitable for dynamic applications where the load conditions can suddenly increase significantly.	0

## 5 Parameter

### 5.2 "Basic" parameter group

Parameter	Designation	Value	Description	DS
P-07	Motor Nom Voltage	0 20 V - $U_e$	Defined motor rated voltage. When the output frequency is greater than the "Motor Nom Frequency" (P-09), the output voltage is controlled at the level set with "Motor Nom Voltage" (P-07).	$U_e$
P-08	Motor Nom Current	0.25 $I_e$ - $I_e$	Motor rated current. By setting the "Motor Nom Current" in the drive, the motor overload protection is configured to match the motor rating. When the measured motor current exceeds "Motor Nom Current", the decimal points on the drive display will flash to indicate an overload condition. If this condition persists, the drive will eventually trip, displaying I.t-trP, preventing thermal overload of the motor.	$I_e$
P-09	Motor Nom Frequency	25 - 500 Hz	The rated frequency of the motor. This is the frequency at which "Motor Nom Voltage" is applied to the motor. Below this frequency, the applied motor voltage will be reduced.	50 Hz
P-10	Motor Nom Speed	0 200 - 30000 rpm	Motor Nom Speed <ul style="list-style-type: none"> <li>• (P-10) = 0, the maximum speed limit will be displayed in Hz.</li> <li>• P-10 &gt; 0: the speed related parameters (f-max, f-min etc.) will be displayed in rpm.</li> </ul> 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.	0 rpm
P-11	V-Boost	0.0 % $U_e$ - f (FS)  FS1: 20 % $U_e$ FS2: 15 % $U_e$ FS3: 10 % $U_e$	Voltage is used to increase the applied motor voltage at low output frequency, in order to improve low speed and starting torque. Excessive voltage boost levels may result in increased motor current and temperature, and forced ventilation may be required.	f (FS)

## 5 Parameter

### 5.2 "Basic" parameter group

Parameter	Designation	Value	Description	DS
P-12	Local ProcessData Source	0 - 11, 13	<p>Local Configuration of Command and Reference Sources</p> <p>Possible values:</p> <ul style="list-style-type: none"> <li>• 0: Terminal Control. The drive responds directly to signals applied to the control terminals.</li> <li>• 1: Uni-directional Keypad Control. The drive can be controlled in the forward direction only using an internal/external or remote Keypad</li> <li>• 2: Bi-directional Keypad Control. The drive can be controlled in the forward and reverse directions using an internal/external or remote Keypad. Pressing the keypad START button toggles between forward and reverse.</li> <li>• 3: Modbus Control. Control via Modbus RTU communication.</li> <li>• 4: Modbus Control. Ramp times via Modbus</li> <li>• 5: PI controller with external actual value</li> <li>• 6: PI controller with external actual value and totalized value of AI1</li> <li>• 7: CANOpen (internal ramp times)</li> <li>• 8: CANOpen (CANOpen ramp times)</li> <li>• 9: SmartWire Device Control and speed ref.</li> <li>• 10: SmartWire Device Control and terminal speed ref.</li> <li>• 11: Terminal Control and SmartWire Device speed ref.</li> <li>• 12: not permissible</li> <li>• 13: SmartWire Device Control and speed ref. Digital input sets enable</li> </ul>	0
P-13	Last fault	–	last fault	0
P-14	Password	0 - 9999	<p>Entry of the password to get access to the extended parameter set.</p> <p>The value to be put in is determined by P-37 (default: 101). Extended parameters are accessible.</p>	0



## 5.3 "Extended" parameter group

Table 26: "Extended" parameter group

Parameter	Designation	Value	Description	DS
P-15	DI Config Select	0 - 13	<p>Configuration of digital inputs with a fix set of combinations</p> <p>The setting of P-15 determines the input configuration depending on P-12.</p> <p>Configuration in terminal mode (P-12 = 0):</p> <ul style="list-style-type: none"> <li>• 0: [START] [DIR] [Select REF / f-fix1] [AI1 REF]</li> <li>• 1: [FWD] [Select REF / f-fix] [Select f-fix Bit 0] [AI1 REF]</li> <li>• 2: [FWD] [Select f-fix Bit 0] [Select f-fix Bit 1] [Select f-fix / max Speed (P-01)]</li> <li>• 3: [FWD] [Select REF / f-fix1] [EXTFLT] [AI1 REF]</li> <li>• 4: [FWD] [Select AI1 REF / AI2 REF] [AI2 REF] [AI1 REF]</li> <li>• 5: [FWD] [REV] [Select REF / f-fix1] [AI1 REF]</li> <li>• 6: [START] [DIR] [EXTFLT] [AI1 REF]</li> <li>• 7: [FWD] [REV] [EXTFLT] [AI1 REF]</li> <li>• 8: [START] [DIR] [Select f-fix Bit 0] [Select f-fix Bit 1]</li> <li>• 9: [FWD] [REV] [Select f-fix Bit 0] [Select f-fix Bit 1]</li> <li>• 10: [Pulse FWD (NO)] [Pulse STOP (NC)] [Select REF / f-fix1] [AI1 REF]</li> <li>• 11: [Pulse FWD (NO)] [Pulse STOP (NC)] [Pulse REV (NO)] [AI1 REF]</li> <li>• 12: [FWD] [Select t-dec1 / t-QuickDec] [Select REF / f-fix1] [AI1 REF]</li> <li>• 13: [FWD] [Select f-fix Bit 0] [EXTFLT] [Select f-fix Bit 1]</li> </ul>	5
P-16	AI1 Signal Range	0 - 6	<p>Configures the Analog input 1 for the selected signal source type.</p> <p>Possible values:</p> <ul style="list-style-type: none"> <li>• 0: 0 - 10 V</li> <li>• 1: bipolar 0 - 10 V</li> <li>• 2: 0 - 20 mA</li> <li>• 3: t 4 - 20 mA (Trips in case of wire break)</li> <li>• 4: r 4 - 20 mA (Ramps to f-fix1 (P-20) in case of wire break)</li> <li>• 5: t 20 - 4 mA (Trips in case of wire break)</li> <li>• 6: r 20 - 4 mA (Ramps to f-fix1 (P-20) in case of wire break)</li> </ul>	0
P-17	Switching Frequency	0 - f (Ie)	<p>Power stage switching frequency.</p> <p>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.</p> <ul style="list-style-type: none"> <li>• 0: 4 kHz</li> <li>• 1: 8 kHz</li> <li>• 2: 12 kHz</li> <li>• 3: 16 kHz</li> <li>• 4: 24 kHz</li> <li>• 5: 32 kHz</li> </ul>	f (Ie)

## 5 Parameter

### 5.3 "Extended" parameter group

Parameter	Designation	Value	Description	DS
P-18	RO1 Function	0 - 9	Selection of the function of output relay RO1  Possible values: <ul style="list-style-type: none"> <li>• 0: RUN, enable (FWD/REV)</li> <li>• 1: READY, DC1 ready for operation</li> <li>• 2: Speed = frequency reference value</li> <li>• 3: Fault (DC1 not ready)</li> <li>• 4: Speed <math>\geq</math> RO1 Upper Limit (P-19)</li> <li>• 5: Motor current <math>\geq</math> RO1 Upper Limit (P-19)</li> <li>• 6: Speed &lt; RO1 Upper Limit (P-19)</li> <li>• 7: Motor current &lt; RO1 Upper Limit (P-19)</li> <li>• 8: Drive not enabled</li> <li>• 9: Speed not matching speed reference value</li> </ul>	0
P-19	RO1 upper limit	0 - 2	Switching ON threshold of relay RO1 with P-18 = 4, ..., 7	1
P-20	f-Fix1	f-min - f-max	Preset Fixed Frequency 1 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	15.0 hz
P-21	f-Fix2	f-min - f-max	Preset Fixed Frequency 2 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	0.0 hz
P-22	f-Fix3	f-min - f-max	Preset Fixed Frequency 3 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	0.0 hz
P-23	f-Fix4	f-min - f-max	Preset Fixed Frequency 4 Value can be adjusted between f-min and f-max. Selection via a digital control signal.	0.0 hz
P-24	t-QuickDec	0.00 - 25 s	Quick Stop Ramp In default the second deceleration ramp is activated by applying voltage to DI1 and DI2 (terminals 2 and 3) at the same time	0.00 s
P-25	AO1 Function	0 - 9	Select Signal to show on the analog output  Possible values: P-25 = 0, ..., 7 = digital output <ul style="list-style-type: none"> <li>• 0: RUN, enable (FWD/REV)</li> <li>• 1: READY, DC1 ready for operation</li> <li>• 2: Speed = frequency reference value</li> <li>• 3: Fault (DC1 not ready)</li> <li>• 4: Speed <math>\geq</math> RO1 Upper Limit (P-19)</li> <li>• 5: Motor current <math>\geq</math> RO1 Upper Limit (P-19)</li> <li>• 6: Speed &lt; RO1 Upper Limit (P-19)</li> <li>• 7: Motor current &lt; RO1 Upper Limit (P-19)</li> </ul> P-25 = 8, 9 = analog output <ul style="list-style-type: none"> <li>• 8: Output Frequency (0 - 100 % f-max (P-01))</li> <li>• 9: Motor current (0 - 200 % Motor Nom Current (P-08))</li> </ul>	8
P-26	f-SkipBand1	0.0 Hz - f-max	Skip frequency band width Defines the frequency range around f-Skip1 in which the drive doesn't work in steady-state to avoid mechanical resonances in the application. During acceleration and deceleration this range is passed through by using the ramps set with P-03 and P-04.	0.0 hz

## 5 Parameter

### 5.3 "Extended" parameter group

Parameter	Designation	Value	Description	DS
P-27	f-Skip1	0.0 Hz - f-max	Centre point of the frequency band defined by f-Skip-Band1 in which the drive doesn't work in steady-state.	0.0 hz
P-28	V-MidV/f	0 V - P-07	Voltage to shape V/f curve Defines the adjustment voltage at the frequency set in P-29.	0 V
P-29	f-MidV/f	0 Hz - P-09	Frequency to shape V/f curve Sets the frequency at which the adjustment voltage defined with P-28 is applied to the motor.	0 hz
P-30	Start Mode	0 - 6	<p>Defines the behaviour of the drive relating to the enable digital input and also configures the automatic restart function.</p> <p>Possible values:</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Auto-0 : Following a power on or reset, the drive will automatically start if digital input 1 is closed.</li> <li>• Auto-1 to 5: Following a trip, the drive will make up to 5 attempts to restart at 25 second intervals. The drive must be powered down to reset the counter. The number of restart attempts are counted, and if the drive fails to start on the final attempt, the drive will trip, and will require the user to manually reset the fault.</li> </ul> <p><b>Attention:</b> An automatic restart is only possible when the control commands are given via terminals (P-12 = 0, P-12 = 11 when, after a communication loss, the control is toggled to the terminals).</p>	0
P-31	Digital Reference Reset Mode	0 - 3	<p>Defines the behavior of the drive on START when used in Keypad control or when controlled with UP/DOWN commands via terminals.</p> <p>Possible values:</p> <ul style="list-style-type: none"> <li>• 0: Start at min speed</li> <li>• 1: Start with latest speed before switching off</li> <li>• 2: Start at min speed (Auto-r)</li> <li>• 3: Start with latest speed before switching off (Auto-r)</li> <li>• Auto r: START and STOP button on the keypad are disabled. DC1 starts with a START command at the terminals.</li> </ul>	1

## 5 Parameter

### 5.3 "Extended" parameter group

Parameter	Designation	Value	Description	DS
P-32	t-DCBrake@Stop	0.0 s - 25.0 s	Duration of DC braking at Stop Determines how long DC injection current is supplied to the motor. The DC braking is activated by setting P-32 > 0. DC braking is applied when the output frequency has ramped to zero (P-05 = 0 or 2). P-11 V-Boost is used to set the braking level. With P-05 = 1 (coast to stop) DC braking is not applied.	0.0 s
	f-Boost	0 - 120 Hz	Frequency used to start a single phase motor. The setting 0 disables the boost function. The duration is determined by P-33.  <b>Hint:</b> This parameter exists only in devices DC1-S (single phase motors) instead of t-DCBrake@Stop.	0
P-33	Spin Start Enable	0, 1	Spin Start Enable Frame size 1: Starts DC injection braking on FWD/REV. Duration and braking level are set by P-32 and P11 respectively. Frame sizes 2 and 3: Enables spin start, where the drive starts from the detected motor speed. A short start delay is possible if the rotor is stationary. Recommended for applications where the motor spins when applying the FWD/REV signal to the drive (high inertia loads, fans ...)	0
	t-Boost	0.0 - 150.0 s	Time, in which the motor is supplied with the frequency defined in P-32. The voltage increases linearly from P-11 to P-07. The setting 0 disables the boost function.  <b>Hint:</b> This parameter exists only in devices DC1-S... (single phase motors) instead of "Spin Start Enable".	0
P-34	Brake Chopper	0, 1, 2	Enable Brake Chopper Enables Brake Chopper on sizes FS2 and FS3. Software protection can be selected for brake resistors with a 200 W rating. <ul style="list-style-type: none"> <li>0: Disabled</li> <li>1: Enabled with software protection</li> <li>2: Enables without software protection. This parameter can only be set to a value &gt; 0 on drives sizes FS2 and FS3. Size FS1 does not have a brake chopper inside the drive.</li> </ul>	0
P-35	All Gain	0 - 5	Scaling of the Analog Input 1 Output value = Input value x Scaling Example: P-16 = 0 - 10 V, P-35 = 200 %: at 5 V the motor turns with max speed (P-01) (5 V x 200 % = 10 V)	1

5 Parameter  
5.3 "Extended" parameter group

Parameter	Designation	Value	Description	DS
P-36	RS485-0 Address	1 - 63	Unique drive address in a communication network.	1
	RS485-0 Baudrate	0 - 6	RS485 Baudrate <ul style="list-style-type: none"> <li>• 2: 9.6 kbit/s</li> <li>• 3: 19.2 kbit/s</li> <li>• 4: 38.4 kbit/s</li> <li>• 5: 57.6 kbit/s</li> <li>• 6: 115.2 kbit/s</li> </ul>	6
	Modbus RTU0 COM Timeout	0 - 8	Modbus RTU0 COM Timeout Time between a communication loss and the resulting action. Setting 0 disables the action after communications trip. t: indicates the drive will trip if time exceeded. r: indicates the drive will ramp to stop if time exceeded.  Possible values: <ul style="list-style-type: none"> <li>• 0: no action</li> <li>• 1: t 30 ms</li> <li>• 2: t 100 ms</li> <li>• 3: t 1000 ms</li> <li>• 4: t 3000 ms</li> <li>• 5: r 30 ms</li> <li>• 6: r 100 ms</li> <li>• 7: r 1000 ms</li> <li>• 8: r 3000 ms</li> </ul>	4
P-37	Password Level2	0 - 9999	Defines the password which is used to get access to extended parameter set (Level 2). Access via P-14.	101
P-38	Parameter Lock	0 - 1	Determines whether to lock the parameters  Possible values: <ul style="list-style-type: none"> <li>• 0: OFF. All parameters can be accessed and changed</li> <li>• 1: ON. Determines whether to lock the parameters. If a remote keypad is connected, parameters cannot be accessed by the remote keypad if they are locked.</li> </ul>	0
P-39	AI1 Offset	-10	Offset of Analog Input 1 Resolution: 0.1 %	0
P-40	Display Scale	0.000 - 6.000	Scale factor display Customer specific scaling factor. With P-40 > 0 a "c" appears on the left hand side of the display. With P10 = 0 the scaling factor is applied to the frequency, with P10 > 0, to the speed. The value is displayed in real-time on the drives display.	0.000
P-41	PID1 Kp	0.1 - 30	PI(D) controller proportional gain Higher values will result in a larger change at the frequency inverter output frequency as a response to small changes in the feedback.	0
P-42	PID1 Ti	0.0 - 30.0 s	PI(D) controller integral time constant Higher values will result in a more damped response. Used in systems in which the overall process responds slowly.	1.0 s

## 5 Parameter

### 5.3 "Extended" parameter group

Parameter	Designation	Value	Description	DS
P-43	PID1 Mode	0, 1	PI(D) controller 1 mode  Possible values: <ul style="list-style-type: none"> <li>0: direct mode. This setting is used when an increase of the feedback signal should lead to a decrease of the motor speed.</li> <li>1: inverse mode. If an increasing feedback signal should increase the speed of the motor, use inverse mode.</li> </ul>	0
P-44	PID1 Set Point 1 Source	0, 1	Defines the set point source 1 of controller 1  Possible values: <ul style="list-style-type: none"> <li>0: digital set point signal, set with P-45</li> <li>1: analog input 1</li> </ul>	0
P-45	PID1 Set Point Digital	0, 1	Digital set point controller 1 Digital set point of the PI controller in case P44 = 0	0
P-46	PID1 Feedback 1 Source	0 - 5	Defines the feedback source 1 of controller 1  Possible values: <ul style="list-style-type: none"> <li>0: Analog-Eingang 2 (AI2)</li> <li>1: Analog Input 1 (AI1)</li> <li>2: motor current</li> <li>3: DC-link voltage</li> <li>4: difference AI1 - AI2</li> <li>5: max value of AI1 and AI2</li> </ul>	0
P-47	AI2 Signal Range	0 - 5	Configures the Analog input 2 for the selected signal source type.  Possible values: <ul style="list-style-type: none"> <li>0: 0 - 10 V</li> <li>1: 0 - 20 mA</li> <li>2: t 4 - 20 mA (Trips in case of wire break)</li> <li>3: r 4 - 20 mA (Ramps to f-fix1 (P-20) in case of wire break)</li> <li>4: t 20 - 4 mA (Trips in case of wire break)</li> <li>5: r 20 - 4 mA (Ramps to f-fix1 (P-20) in case of wire break)</li> </ul>	0
P-48	t-Standby	0.0 - 25.0 s	Time after which the drive changes to stand by mode (inverter output disabled) when running at min speed (f-min)  0: Standby mode disabled non-zero: enter standby mode after the time specified in this parameter. Operation automatically resumes as soon as the speed set point increases above P-02.	0.0 s
P-49	PID1 WakeUpLevel	0, 1	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.	0
P-50	CAN0 Baudrate	0 - 3	CANopen Baudrate  Possible values: <ul style="list-style-type: none"> <li>0: 125 kbit/s</li> <li>1: 250 kBit/s</li> <li>2: 500 kbit/s</li> <li>3: 1000 kbit/s</li> </ul>	2

## 5 Parameter 5.3 "Extended" parameter group

Parameter	Designation	Value	Description	DS
P-51	T-Memory Enable	0, 1	<p>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.</p> <p>Possible values:</p> <ul style="list-style-type: none"> <li>• 0: Thermal memory disabled</li> <li>• 1: Thermal memory enabled</li> </ul>	0
P-52	ParameterAccess	0, 1	<p>Parameter Access</p> <p>Possible values:</p> <ul style="list-style-type: none"> <li>• 0: All parameters can be changed by any source.</li> <li>• 1: All parameters locked; can only be changed by the SmartWire DT Device.</li> </ul>	0
P-53	Action@Communication Loss	0 - 4	<p>Drive reaction after SWD master communication loss. Master communication loss delay time is set by "Modbus RTU0 COM Timeout" (P-36).</p> <p>Possible values:</p> <ul style="list-style-type: none"> <li>• 0: No reaction, continue work</li> <li>• 1: Set warning, continue work</li> <li>• 2: stop (if ramp enabled)</li> <li>• 3: quick stop</li> <li>• 4: coast stop</li> </ul>	0
P-54	R01 Hysteresis	0, 1	<p>Hysteresis for relay output 1</p> <p>This parameter defines a lower reaction threshold level in case P-18 is set to 4, ..., 7.  Threshold level = limit (P-19) - hysteresis (P-54)  P-18 = 4 or 5: output will be logic 1 if the value <math>\geq</math> limit, output will be logic 0 if value &lt; level  P-18 = 6 or 7: output will be logic 0 if the value <math>\geq</math> limit, output will be logic 1 if value &lt; level</p>	0
P-55	R01 Switch-On Delay	0.0 - 250.0 s	<p>Delay time before the Relay switches from logic 0 to logic 1.</p>	0.0 s