

Drive for decentralised
control systems

FlexiMova[®] mm

Programming Manual



Proprietary notice

Programming manual **FlexiMova® mm - Rev.05**

Original operating instructions.

All rights reserved. It is strictly prohibited to reproduce, edit and/or disclose the contents of this document to third parties without the written approval of the Manufacturer.

Technical specifications are subject to change without notice.

© REEL S.r.l. a Socio Unico (A KSB Company), Ponte di Nanto, 16.09.2019

1 INTRODUCTION	3
1.1 Purpose of the Manual.....	3
1.2 Software version	3
1.3 Additional documents.....	3
2 OPERATING MODES	4
2.1 Manual.....	4
2.2 Automatic.....	4
2.2.1 Speed/torque control	4
2.2.2 Position control.....	6
3 DESCRIPTION OF THE PARAMETERS	8
Section 1: Operating data.....	8
Section 1-1: Login.....	8
Section 1-2: Supervision.....	8
Section 1-3: Commands	19
Section 1-4: Date and time	19
Section 2: Alarm log.....	20
Section 3: Main menu	21
Section 3-1: General settings.....	21
Section 3-3: Inverter	29
Section 3-4: Inputs and outputs	42
Section 3-5: References	57
Section 3-6: Process PID.....	67
Section 3-7: Positioning controller.....	81
Section 3-8: Fieldbus.....	95
Section 3-9: Safety functions	95
Section 3-10: Electric gearbox.....	96
Section 4: Information.....	99
Section 4-1: Inverter.....	99
Section 4-2: LCP	100
Section 4.3: Fieldbus.....	100

4 LCP INTERFACE.....	103
4.1 Graphic display.....	104
4.2 Manual operation via LCP.....	106
4.3 Menu buttons	107
4.3.1 Menu: Operating data.....	107
4.3.2 Menu: Alarm log.....	107
4.3.3 Main menu	109
4.3.4 Information menu	110
4.4 Service Interface and LED Coding.....	110
5 TROUBLESHOOTING	111
5.1 Alarms.....	111
5.2 Warning	113

1 Introduction

1.1 Purpose of the Manual

This manual contains: information required for the configuration and programming of the **FlexiMova® mm**, examples of how it functions and troubleshooting information.

The target audience of this manual is qualified people who are familiar with the operation of a frequency converter and the typical automation that it enables.

1.2 Software version

The parameters and functions described in this manual refer to the **FlexiMova® mm** updated to the version:

V 1.3.6

The firmware version is stated in parameter 4-1-2.

1.3 Additional documents

In this manual you will find references made to the following additional documents. They include:

- **FlexiMova® mm – Design and Installation Manual**
This manual contains all the information you need to install the product and for the correct sizing of the components.
- **FlexiMova® mm – Modbus Fieldbus Manual**
This manual contains all the information you need to install, program and use the optional Modbus RTU RS485 communication protocol.
- **FlexiMova® mm – Profibus Fieldbus Manual**
This manual contains all the information you need to install, program and use the optional Profibus DP communication protocol.
- **FlexiMova® mm – Profinet Fieldbus Manual**
This manual contains all the information you need to install, program and use the optional ProfiNet communication protocol.



INFORMATION

Updated documents are available in the download section of the Manufacturer's website <https://www.reel.it>

2 Operating modes

2.1 Manual

In the manual operating mode the product is speed/torque controlled at the setpoint in parameter 1-3-2/1-3-3.

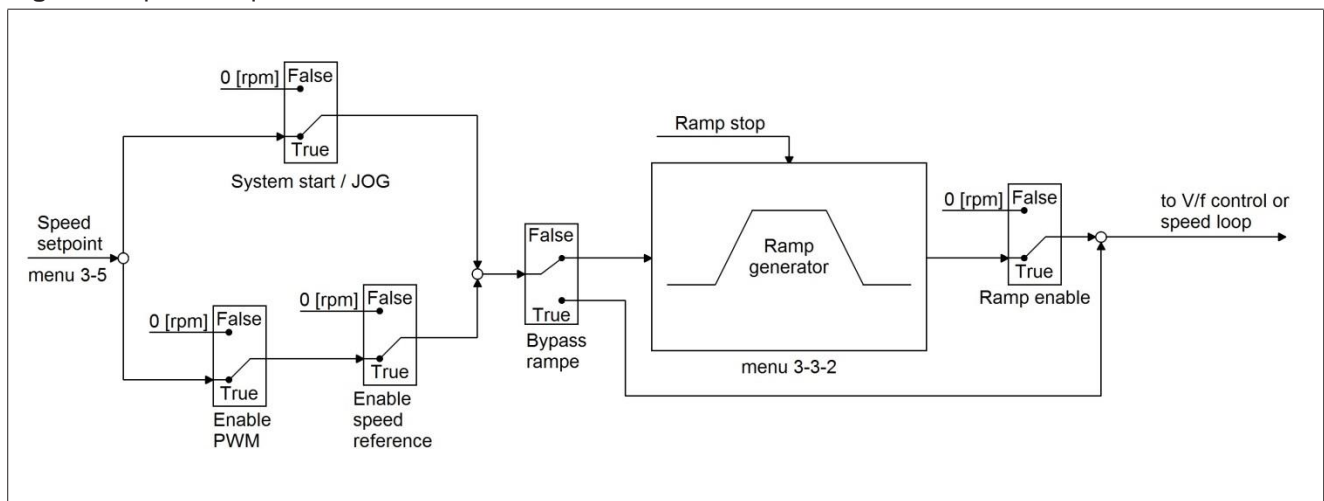
Switching from “Manual” to “Off” stops the motor as defined in parameter 3-1-3. In this mode the IO functions, the reference management and the process PID controller are ignored.

2.2 Automatic

2.2.1 Speed/torque control

In the automatic operating mode the motor speed/torque control is managed through the IO interface, the fieldbus or the process PID controller.

Figure 1: Speed/torque control



Various methods are provided for enabling motor rotation:

- **“Start system”**: enabling of the PWM modulation and the speed reference are automatic. With start system active the PWM and the reference are enabled, when it is disabled the reference is zeroed and when the ramp output speed is zero, the PWM is also disabled. The speed reference is given by the priorities set in menus 3-5 **“JOG”**:
- **“JOG”**: it functions like “Start system” but the speed reference is the one set in menus 3-5-10.
- **“Enable PWM” – “Enable speed ref.”**: enabling of the PWM modulation and the speed reference is managed independently through the dedicated controls.

The two enabling methods are exclusive. The enabling method is decided by selecting the desired digital functions in menus 3-4-2-1 “Digital input Functions”.



INFORMATION

If digital input functions that are compatible with both modes are selected then the “System start” function becomes irrelevant.

Enable PWM: enables (True) or disables (False) the modulation on the motor. In this enable method with only this input active the motor remains stopped in torque mode. If this input is disabled while the motor is rotating the motor will be disabled and will coast to a stop.

It will not be possible to re-enable the modulation for the period of time specified in Par. 3-3-11-5 "Lock time".

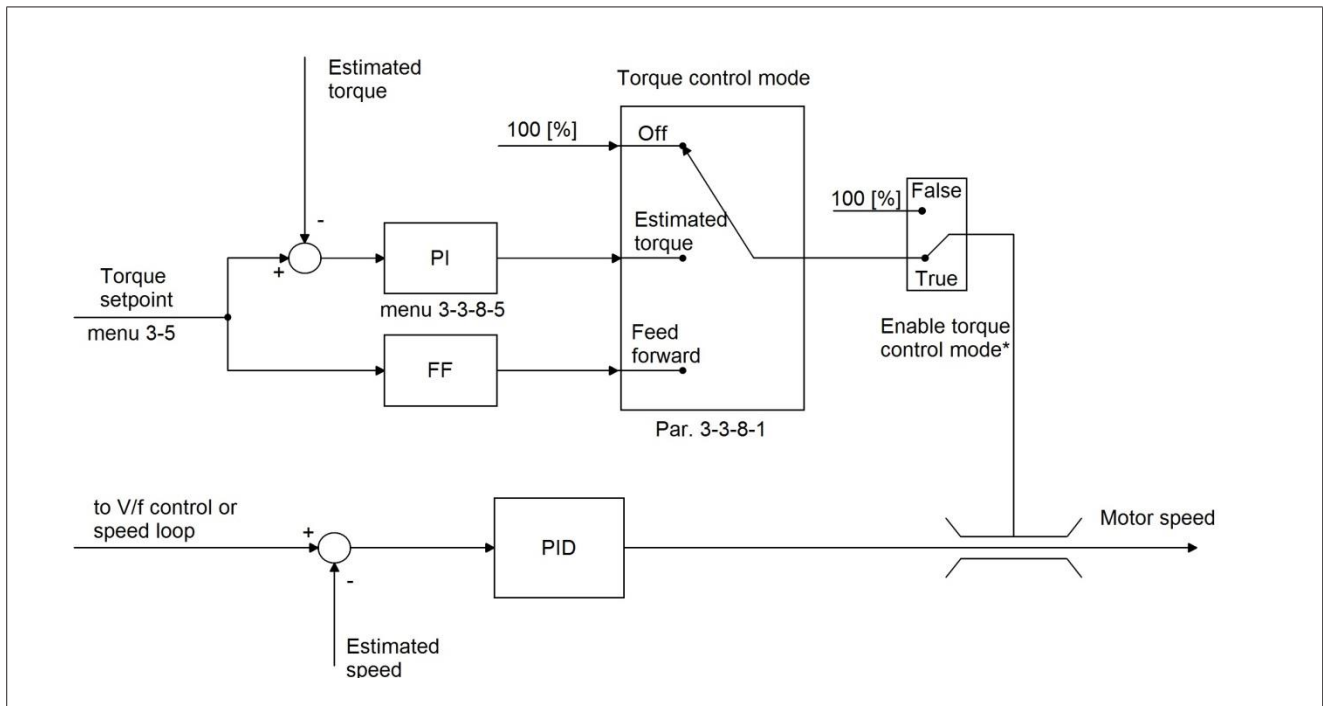
Enable speed reference: enables (True) or disables (False) the speed reference. If this input is disabled while the motor is rotating the motor stops with the deceleration ramp set in menu 3-3-2.

The torque control can be enabled through par. 3-3-8-1.

Two operating modes are implemented: "feed forward" and "est. torque" that executes a feedback action with the PI controller (constants settable in section 3-3-8-5). The torque control can be enabled/disabled through the digital input with the "Speed/torque" function that can be set in the parameters in section 3-4-2-1. In the torque control the secondary reference (par. 3-5-5) is used as the actual motor speed limit.

The figure below shows the enabling and operating diagram of the torque control.

Figure 2: Enabling and operating diagram of the torque control

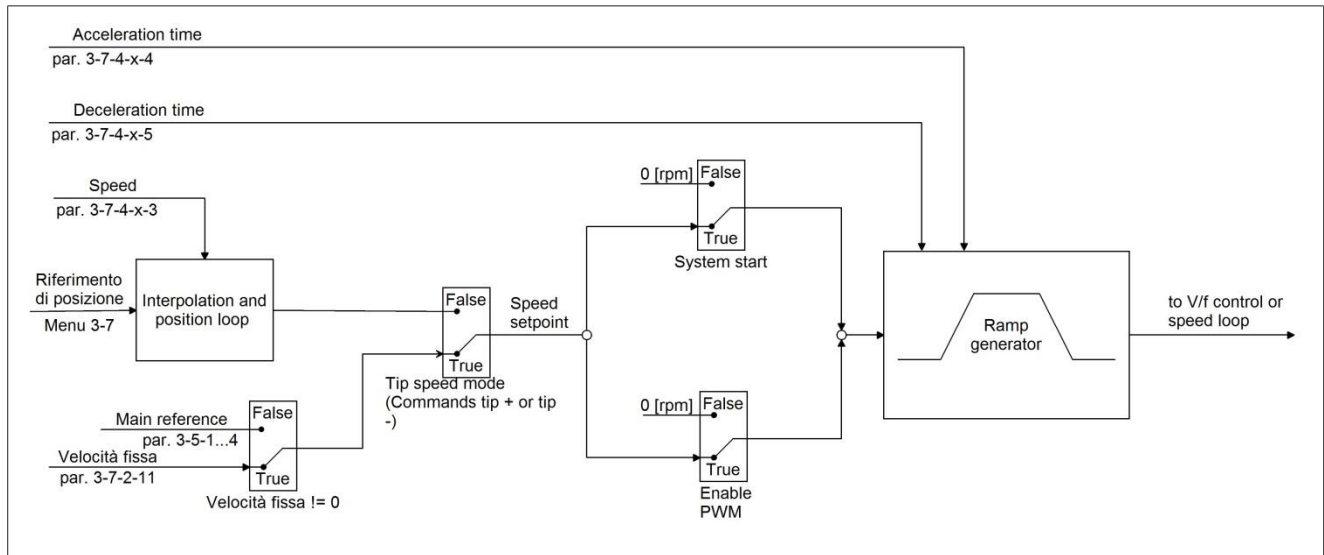


2.2.2 Position control

2.2.2.1 Positioning control

The positioning mode can be enabled in parameter 3-7-1 “Positioning mode” with a setting other than “Off”. In the automatic operating mode the motor position control is managed through the IO or Fieldbus interface.

Figure 3: Positioning control



Various methods are provided for enabling motor rotation:

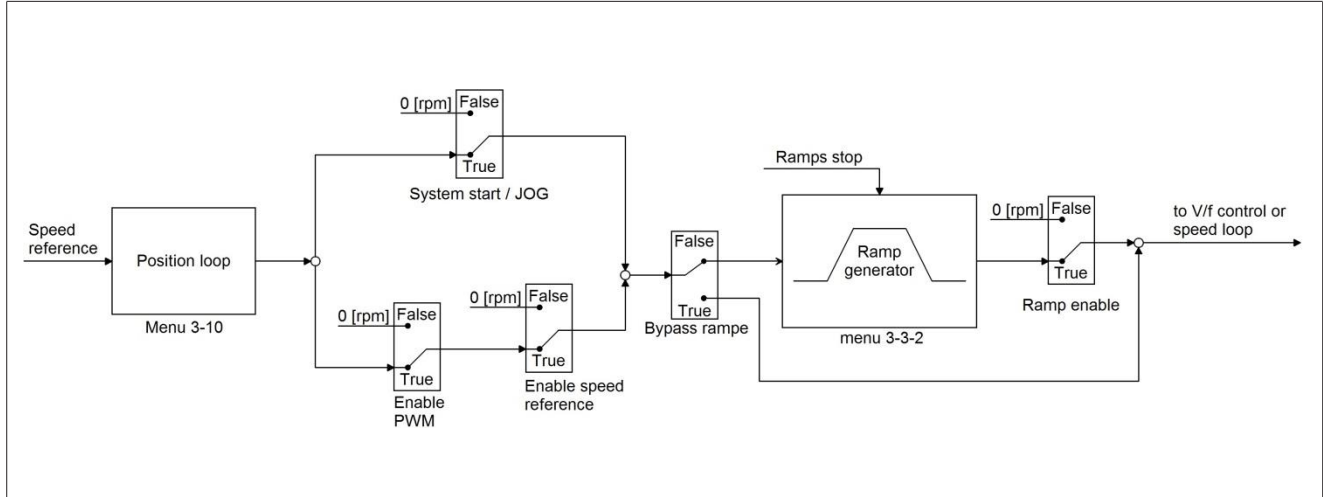
- **Start system:** In position control mode the “Start system” command includes the PWM enable command and the “Start”, “Step” or “Halt” command depending on the status of the positioner.
- Positive front:
 - Enable PWM + Start if the positioner is not performing any positioning sequence.
 - Enable PWM + Step if the positioner is performing a sequence and is stopped with a halt command.
- Negative front:
 - Disable PWM + Halt. The drive deactivates the modulation once the ramp to stop is completed.
- **Enable PWM:** enables (True) or disables (False) the modulation on the motor. In this enable method with only this input active the motor remains stopped in torque mode. If this input is disabled while the motor is rotating the motor will be disabled and will coast to a stop. It will not be possible to re-enable the modulation for the period of time specified in Par. 3-3-11-5 “Lock time”.

2.2.2.2 Electric gearbox

The electric shaft mode can be enabled in parameter 3-10-1 “Electric gearbox” with a setting other than “Off”.

In the automatic operating mode the motor position control is managed through the IO or Fieldbus interface.

Figure 4: Position control (electric gearbox)



Various methods are provided for enabling motor rotation:

- **“Start system”**: enabling of the PWM modulation and the speed reference are automatic. With start system active the PWM and the reference are enabled, when it is disabled the reference is zeroed and when the ramp output speed is zero, the PWM is also disabled.
- The speed reference is given by the priorities set in menus 3-5 **“JOG”**: it functions like “Start system” but the speed reference is the one set in menus 3-5-10.
- **“Enable PWM”** - **“Enable speed reference”**: enabling of the PWM modulation and the speed reference is managed independently through the dedicated controls.

The two enabling methods are exclusive. The enabling method is decided by selecting the desired digital functions in menus 3-4-2-1 “Digital input functions”.



INFORMATION

If digital input functions that are compatible with both modes are selected then the “Start system” function becomes irrelevant.

Enable PWM: enables (True) or disables (False) the modulation on the motor. In this enable method with only this input active the motor remains stopped in torque mode. If this input is disabled while the motor is rotating the motor will be disabled and will coast to a stop. It will not be possible to re-enable the modulation for the period of time specified in Par. 3-3-11-5 “Lock time”.

Enable speed reference: enables (True) or disables (False) the speed reference. If this input is disabled while the motor is rotating the motor stops with the deceleration ramp set in menu 3-3-2.

3 Description of the parameters

Section 1: Operating data

Section 1-1: Login

Parameter	Description	Setting
1-1-1 User login	Login function with password input.	Default: /
		Min.: 0000
		Max.: 9999
1-1-2 Logout	Logout function.	Default: /
		Min.: 0000
		Max.: 9999
1-1-3 Customer password [c]	Password for Customer level login.	Default: 0000
		Min.: 0000
		Max.: 9999

Section 1-2: Supervision

The parameters contained in this section are read-only.

Section 1-2-1: Motor and frequency converter

Parameter	Description	Setting
1-2-1-1 Motor frequency	Motor rotation frequency. If the motor rotates counterclockwise (CCW) the frequency will be displayed with a negative sign.	Default: 0.00 [Hz]
		Min.: -500.00 [Hz]
		Max.: 500.00 [Hz]
1-2-1-2 Motor speed	Motor rotation speed. If the motor rotates counterclockwise (CCW) the speed will be displayed with a negative sign.	Default: 0 [rpm]
		Min.: -30000 [rpm]
		Max.: 30000 [rpm]
1-2-1-3 Motor current	Pass-through current on the motor.	Default: 0.00 [A]
		Min.: 0.00 [A]
		Max.: 250.00 [A]
1-2-1-4 Motor voltage	Voltage (V) applied to the motor. Read-only parameter.	Default: 0.00 [V]
		Min.: 0.00 [V]
		Max.: 999.00 [V]

Parameter	Description	Setting
1-2-1-5 Motor input power	Electrical power input to the motor. Read-only parameter.	Default: 0.000 [kW]
		Min.: 0.000 [kW]
		Max.: 110.000 [kW]
1-2-1-6 Motor output power	Mechanical power developed by the motor. Read-only parameter.	Default: 0.000 [kW]
		Min.: 0.000 [kW]
		Max.: 110.000 [kW]
1-2-1-7 Motor torque	Estimated motor shaft torque. Read-only parameter.	Default: 0 [Nm]
		Min.: 0 [Nm]
		Max.: 9999 [Nm]
1-2-1-8 Motor CosPhi	Motor power factor (cosΦ). Read-only parameter.	Default: 0.000
		Min.: 0.0000
		Max.: 1.000
1-2-1-9 Motor PTC	Resistance of the PTC temperature sensor installed on the motor. Read-only parameter.	Default: 0 [Ohm]
		Min.: 0 [Ohm]
		Max.: 10000 [Ohm]
1-2-1-10 DC-Link voltage	DC-Link bus voltage. Read-only parameter.	Default: 0.00 [V]
		Min.: 0.00 [V]
		Max.: 1000.00 [V]
1-2-1-11 Power temperature	Temperature of the IGBT module on the power board. Read-only parameter.	Default: 0.0 [°C]
		Min.: -200.0 [°C]
		Max.: 350.0 [°C]
1-2-1-12 Board temperature	Control board temperature. Read-only parameter.	Default: 0.0 [°C]
		Min.: -200.0 [°C]
		Max.: 350.0 [°C]

Parameter	Description	Setting
1-2-1-13 Inverter efficiency	Estimated efficiency of the inverter. Read-only parameter.	Default: 0.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
1-2-1-14 Inverter I2T	Percentage of the I2T counter.	Default: 0.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
1-2-1-15 Drive operating hours	Indicates how long the inverter has been operating. Expressed in hours. Read-only parameter.	Default: 0.0 [h]
		Min.: 0.0 [h]
		Max.: 4.2949673E9 [h]
1-2-1-16 Motor operating hours	Amount of motor running time.	Default: 0.0 [h]
		Min.: 0.0 [h]
		Max.: 4.2949673E9 [h]
1-2-1-17 Drive status	Drive operating status: Bit0: Line present (1= true, 0= false). Bit1: PWM (1= enabled, 0= disabled). Bit2: Speed reference (1= enabled, 0= disabled). Bit3: Torque control (1= enabled, 0= disabled). Bit4: Motor rotation direction (1= CCW, 0= CW). Bit5: Motor running (1= true, 0= false). Bit6: Setpoint reached (1= true, 0= false). Bit7: Alarm status (1= true, 0= false). Bit8: Warning status (1= true, 0= false). Bit9: AMA procedure in progress (1= true, 0= false). Bit10: Locked (1= true, 0= false). Bit11: Process PID controller enabled (1= true, 0= false). Bit12: Positioning controller enabled(1= true, 0= false). Bit13: Electric shaft enabled (1= true, 0= false). Bit14: Not used. Bit15: Fieldbus control active	Default: 0x0
		Min.: 0x0
		Max.: 0xFFFF

Section 1-2-2: Positioning controller

Menu visible with “positioning controller” macro enabled. See section 3-7.

Parameter	Description	Setting
1-2-2-1 Actual pos. setpoint	Profile position setpoint in progress. The value is expressed in the digital units (*) configured by the user in par. 3-7-2-3.	Default: 0 [*]
		Min.: -65000000 [*]
		Max.: 65000000 [*]
1-2-2-2 Actual position	Actual position. The value is expressed in the digital units ([*]) configured by the user in par. 3-7-2-3.	Default: 0 [*]
		Min.: -65000000 [*]
		Max.: 65000000 [*]
1-2-2-3 Positioning status	Operating status of the positioning controller: Bit0: Line present Bit1: PWM active Bit2: Profile in progress Bit3: Profile halted Bit4: Direction (0= CW, 1= CCW) Bit5: Motor rotating Bit6: Setpoint reached Bit7: Alarm status Bit8: Warning status Bit9: AMA procedure in progress Bit10: Locked Bit11: Homing procedure active Bit12: Homing procedure completed Bit13: Fixed speed mode active Bit14: Not used. Bit15: Fieldbus control active	Default: 0x0
		Min.: 0x0
		Max.: 0xFFFF
1-2-2-4 Current profile	Indicates the profile in progress. 0 indicates no profile in progress.	Default: 0
		Min.: 0
		Max.: 8
1-2-2-5 Selected profile	Indicates the profile selected via the digital inputs or via parameter 3-7-2-12. The profile indicated here will be loaded into “Current profile ” following a “Start” command. 0 indicates no profile in progress.	Default: 0
		Min.: 0
		Max.: 8

Section 1-2-3: Inputs/Outputs

Parameter	Description	Setting
1-2-3-1 Digital inputs	Status of the digital inputs (DIN) (0= Inactive, 1= Active). Bit0: Digital input 1 (terminal C2 on the control board). Bit1: Digital input 2 (terminal C3 on the control board). Bit2: Digital input 3 (terminal C4 on the control board). Bit3: Digital input 4 (terminal C5 on the control board). Bit4: diagnostic channel STO digital input (terminal C6 on the control board). Bit5: Safety Hardware Channel STO digital input (terminal C10 on the control board). Bit6: input DIN6 (terminal F4 on RX-I/O-A board and terminal F1 on FX-I/O-B and FX-I/O-C boards). Bit7: input DIN7 (terminal F5 on FX-I/O-A board and terminal F2 on FX-I/O-B and FX-I/O-C boards). Bit8: input DIN8 (terminal F6 on FX-I/O-A board and terminal F3 on FX-I/O-B and FX-I/O-C boards).	Default: 0b
		Min.: 0b
		Max.: 11111111b
1-2-3-2 Digital outputs	Status of the digital outputs (Relay) (0= Inactive, 1= Active). Bit0: relay output 1 (terminals A3 (NO) and A4 (NC) on the control board). Bit1: relay output 2 (terminals A8 (NO) and A9 (NC) on the control board). Bit2: relay output 3 (terminals E1 (NO) and E2 (NC) on FX-I/O-A board and terminals D8 (NO) and D9 (NC) on FX-I/O-C boards). Bit3: relay output 4 (terminal D2 (NO) on FX-I/O-A board and terminal D6 (NO) on FX-I/O-C board). Bit4: relay output 5 (terminal D3 (NO) on FX-I/O-A board and terminal D5 (NO) on FX-I/O-C board). Bit5: relay output 6 (terminal D4 (NO) on FX-I/O-A board and terminal D4 (NO) on FX-I/O-C board). Bit6: relay output 7 (terminal D5 (NO) on FX-I/O-A board and terminal D3 (NO) on FX-I/O-C board). Bit7: relay output 8 (terminal D6 (NO) on FX-I/O-A board and terminal D2 (NO) on FX-I/O-C board). Bit8: digital output 1 (terminal E4 on RX-I/O-A board). Bit9: digital output 2 (terminal E5 on FX-I/O-A board).	Default: 0b
		Min.: 0b
		Max.: 11111111b
1-2-3-3 Analog input 1	Value of analog input 1. Unit of measurement and range depend on par. 3-4-1-1.	Default: 0.0 [V]
		Min.: -10.0 [V] -20.0 [mA]
		Max.: 10.0 [V] 20.0 [mA]
1-2-3-4 Analog input 2	Value of analog input 2. Unit of measurement and range depend on par. 3-4-1-4.	Default: 0.0 [V]
		Min.: -10.0 [V] -20.0 [mA]
		Max.: 10.0 [V] 20.0 [mA]

Parameter	Description	Setting
1-2-3-5 Analog input 3	Value of analog input 3. Unit of measurement and range depend on par. 3-4-1-7. Parameter visible with "FX-I/O-A" expander board connected.	Default: 0.0 [V]
		Min.: -10.0 [V] -20.0 [mA]
		Max.: 10.0 [V] 20.0 [mA]
1-2-3-6 Analog output 1	Value of analog output 1. Unit of measurement and range depend on par. 3-4-4-5.	Default: 0.0 [V]
		Min.: 0.0 [V] 0.0 [mA] 0.0 [kHz]
		Max.: 10.0 [V] 20.0 [mA] 100.0 [kHz]
1-2-3-7 Analog output 2	Value of analog output 1. Unit of measurement and range depend on par. 3-4-4-12. Parameter visible with "FX-I/O-A" expander board connected.	Default: 0.0 [V]
		Min.: 0.0 [V] 0.0 [mA] 0.0 [kHz]
		Max.: 10.0 [V] 20.0 [mA] 100.0 [kHz]
1-2-3-8 Frequency Input	Value of Frequency Input This parameter is visible when digital input "DIN1 Function" is set as "Frequency Input".	Default: 0.0 [kHz]
		Min.: 0.0 [kHz]
		Max.: 100.0 [kHz]

Section 1-2-4: Process PID

Menu visible with process PID active. See section 3-6.

Parameter	Description	Setting
1-2-4-1 Process PID Setpoint	Setpoint of the process PID. Unit of measurement and range depend on par. 3-6-2, 3-6-8 and 3-6-9.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200.0 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
1-2-4-2 Process PID Feedback	Process PID feedback, with scaling according to par. 3-6-13. Unit of measurement and range depend on par. 3-6-2, 3-6-11 and 3-6-12.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200.0 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]

Section 1-2-4-3: Multi Drive

Menu visible with Multi-Drive function active and on drives with “Master” and “Slave1” addresses. See section 3-6-21.

Parameter	Description	Setting	
1-2-4-3-1 Number of connected slaves	Number of “Slave” drives that the “Master” has found on scanning the Multi-Drive communication.	Default: 0	
		Min.: 0	
		Max.: 5	
1-2-4-3-2 Number of running drives	Number of drives with running motor.	Default: 0	
		Min.: 0	
		Max.: 6	
1-2-4-3-3 Controlled drive address	Address of the currently controlled drive.		Default: Master
	Function	Description	
	Master	Master drive in Multi-Drive communication.	
	Slave 1 (secondary master)	Slave drive in Multi-Drive communication. If the master drive fails, the drive with the Slave 1 address becomes the master in the Multi-Drive communication enabling the unit to continue working. Redundancy of the cabling (if used) and the parameters between the “Master” drive and the “Slave1” drive is advisable.	Min.: /
	Slave 2-5	Slave drive in Multi-Drive communication.	Max.: /

Section 1-2-5: Fieldbus

Menu visible with fieldbus module connected.

Section 1-2-5-1: Profibus module

Menu visible with Profibus module connected.

Parameter	Description	Setting	
1-2-5-1-1 Transmission speed	Transmission speed of the Profibus module.	Default: /	
		Min.: /	
		Max.: /	
1-2-5-1-2 Module info	Advanced information on the CPU.	Default: /	
		Min.: /	
		Max.: /	
1-2-5-1-3 ASIC communication state	CPU communication log.	Default: /	
		Min.: /	
		Max.: /	
1-2-5-1-4 ASIC communication error	CPU error log.	Default: /	
		Min.: /	
		Max.: /	
1-2-5-1-5 Module type	Type of module set by the master.		Default: Not configured
	Function	Description	Min.: /
	Not assigned	No modules configured.	
	PROFIdrive standard telegram 1,7 and 9	Telegram according to PROFIdrive standard. For further information consult the specific manual for the module.	
Free telegram 1-5	Free telegram configurable by the user. For further information consult the specific manual for the module.	Max.: /	

Section 1-2-5-2: Profinet module

Menu visible with Profinet module connected.

Parameter	Description	Setting
1-2-5-2-1 IP address	Module's Ethernet network IP address.	Default: /
		Min.: /
		Max.: /
1-2-5-2-2 Subnet mask	Module's subnet mask in the Ethernet network.	Default: /
		Min.: /
		Max.: /
1-2-5-2-3 Gateway	Module gateway to the Ethernet network.	Default: /
		Min.: /
		Max.: /
1-2-5-2-4 Profinet device name	Name of the module in the Ethernet network.	Default: /
		Min.: /
		Max.: /
1-2-5-2-5 Module info	Advanced information on the CPU.	Default: /
		Min.: /
		Max.: /
1-2-5-2-6 ASIC communication state	CPU communication log.	Default: /
		Min.: /
		Max.: /
1-2-5-2-7 ASIC communication error	CPU error log.	Default: /
		Min.: /
		Max.: /

Parameter	Description	Setting	
1-2-5-2-8 Module type	Type of module set by the master.	Default: Not configured	
	Function	Description	
	Not assigned	No modules configured.	Min.: /
	PROFIdrive standard telegram 1,7 and 9	Telegram according to PROFIdrive standard. For further information consult the specific manual for the module.	Max.: /
	Free telegram 1-5	Free telegram configurable by the user. For further information consult the specific manual for the module.	

Section 1-2-6: Safety function

Menu visible with safety function enabled. See section 3-9.

Parameter	Description	Setting
1-2-6 Timeout STO check	Indicates the hours remaining until the drive stops to request a control of the STO chain integrated in the converter. This value only appears if the periodic control of the STO inputs is enabled. The counter is reset at each STO request.	Default: 8760 [h]
		Min.: 0 [h]
		Max.: 1200000 [h]

Section 1-2-7: Electric gearbox

Menu visible with electric gearbox function enabled. See section 3-10.

Parameter	Description	Setting
1-2-7-1 Gearbox position setpoint	Position setpoint.	Default: 0 [deg]
		Min.: 0 [deg]
		Max.: 360 [deg]
1-2-7-2 Gearbox actual position	Current position.	Default: 0 [deg]
		Min.: 0 [deg]
		Max.: 360 [deg]

Section 1-3: Commands

Parameter	Description	Setting								
1-3-1 Drive mode	Selection of the operating modes for the converter.	Default: Off								
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>The converter does not command any speed/torque reference to the motor.</td> </tr> <tr> <td>Man</td> <td>The converter commands the speed/torque set in parameters 1-3-2 and 1-3-3 to the motor. In this mode the motor starts as soon as any speed reference other than zero is set.</td> </tr> <tr> <td>Auto</td> <td>The converter can operate in a closed loop (process PID) or in an open loop depending on the parameters set in section 3 -Settings. In this mode the motor does not start if rotation is not enabled through the appropriately set digital inputs.</td> </tr> </tbody> </table>	Function	Description	Off	The converter does not command any speed/torque reference to the motor.	Man	The converter commands the speed/torque set in parameters 1-3-2 and 1-3-3 to the motor. In this mode the motor starts as soon as any speed reference other than zero is set.	Auto	The converter can operate in a closed loop (process PID) or in an open loop depending on the parameters set in section 3 -Settings. In this mode the motor does not start if rotation is not enabled through the appropriately set digital inputs.	Min.: /
	Function	Description								
	Off	The converter does not command any speed/torque reference to the motor.								
Man	The converter commands the speed/torque set in parameters 1-3-2 and 1-3-3 to the motor. In this mode the motor starts as soon as any speed reference other than zero is set.									
Auto	The converter can operate in a closed loop (process PID) or in an open loop depending on the parameters set in section 3 -Settings. In this mode the motor does not start if rotation is not enabled through the appropriately set digital inputs.									
<p>You can change the mode from the LCP module with the “Off”, “Man” or “Auto” buttons.</p> <p>In case the parameter 3-1-11 is on, the drive mode is visible only after the login.</p>	Max.: /									
1-3-2 Manual speed reference	Setting of the speed reference. Unit of measurement depends on par. 3-1-1.	Default: 0 [Hz] Min.: Par. 3-2-3-3 Max.: Par. 3-2-3-4								
1-3-3 Manual torque reference	Setting of the torque reference [Nm]. Parameter visible in the “Vector” or “SRM” control, with torque control enabled.	Default: 0.00 [Nm] Min.: 0.00 [Nm] Max.: Par. 3-2-3-5								

Section 1-4: Date and time

Parameter	Description	Setting
1-4-1 System time	System time display.	Default: 00:00 Min.: / Max.: /
1-4-2 System date	System date display.	Default: 01.01.1980 Min.: / Max.: /

Section 2: Alarm log

Parameter	Description	Setting																
2-1 Active alerts	Function for displaying the active alarms on the converter. Parameter only visible on the LPC module. To display the active alarms on SW PC use the "Active alerts" page.	Default: /																
		Min.: /																
		Max.: /																
2-2 Alerts history	Function for displaying the alarm history. Parameter only visible on the LPC module. To display the active alarms on SW PC use the "Alerts history" page.	Default: /																
		Min.: /																
		Max.: /																
2-4 Reset alert type [c]	Setting of the alerts reset mode:	Default: Manual																
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Manual</td> <td>The alarms must be reset manually by pressing the "OK" button on the LCP or through the relevant procedure using the SW PC.</td> </tr> <tr> <td>Inf. reset @ 5 min</td> <td>The converter automatically resets the alarm an infinite number of times after a period of 5 min.</td> </tr> <tr> <td>Inf. reset @ 15 min</td> <td>The converter automatically resets the alarm an infinite number of times after a period of 15 min.</td> </tr> <tr> <td>1 s 10 s 30 s</td> <td>The converter makes 3 attempts to reset with increasing times (1= 1 s; 2= 10 s; 3= 30 s). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.</td> </tr> <tr> <td>10 s 60 s 5 min</td> <td>The converter makes 3 attempts to reset with increasing times (1= 10 s; 2= 60 s; 3= 5 min). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.</td> </tr> <tr> <td>10 s 60 s Inf. reset @ 5 min</td> <td>The converter makes 3 attempts to reset with increasing times (1= 10 s; 2= 60 s; inf= 5 min). Once the available number of attempts have been used up the Drive automatically resets the alarm an infinite number of times after a period of 15 min.</td> </tr> <tr> <td>10 s 60 s 5 min 1 h</td> <td>The converter makes 4 attempts to reset with increasing times (1= 10 s; 2= 60 s; 3= 5 min; 4= 1 h). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.</td> </tr> </tbody> </table>	Function	Description	Manual	The alarms must be reset manually by pressing the "OK" button on the LCP or through the relevant procedure using the SW PC.	Inf. reset @ 5 min	The converter automatically resets the alarm an infinite number of times after a period of 5 min.	Inf. reset @ 15 min	The converter automatically resets the alarm an infinite number of times after a period of 15 min.	1 s 10 s 30 s	The converter makes 3 attempts to reset with increasing times (1= 1 s; 2= 10 s; 3= 30 s). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.	10 s 60 s 5 min	The converter makes 3 attempts to reset with increasing times (1= 10 s; 2= 60 s; 3= 5 min). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.	10 s 60 s Inf. reset @ 5 min	The converter makes 3 attempts to reset with increasing times (1= 10 s; 2= 60 s; inf= 5 min). Once the available number of attempts have been used up the Drive automatically resets the alarm an infinite number of times after a period of 15 min.	10 s 60 s 5 min 1 h	The converter makes 4 attempts to reset with increasing times (1= 10 s; 2= 60 s; 3= 5 min; 4= 1 h). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.	Min.: /
	Function	Description																
	Manual	The alarms must be reset manually by pressing the "OK" button on the LCP or through the relevant procedure using the SW PC.																
	Inf. reset @ 5 min	The converter automatically resets the alarm an infinite number of times after a period of 5 min.																
	Inf. reset @ 15 min	The converter automatically resets the alarm an infinite number of times after a period of 15 min.																
	1 s 10 s 30 s	The converter makes 3 attempts to reset with increasing times (1= 1 s; 2= 10 s; 3= 30 s). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.																
	10 s 60 s 5 min	The converter makes 3 attempts to reset with increasing times (1= 10 s; 2= 60 s; 3= 5 min). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.																
	10 s 60 s Inf. reset @ 5 min	The converter makes 3 attempts to reset with increasing times (1= 10 s; 2= 60 s; inf= 5 min). Once the available number of attempts have been used up the Drive automatically resets the alarm an infinite number of times after a period of 15 min.																
	10 s 60 s 5 min 1 h	The converter makes 4 attempts to reset with increasing times (1= 10 s; 2= 60 s; 3= 5 min; 4= 1 h). Once the available number of attempts have been used up the alarm will have to be set manually. The attempts decrease after 30 s of operation without alarms.																
	Max.: /																	
The timer for the alarm reset starts once the cause for the alarm has been eliminated, to prevent the converter from re-enabling due to the cause that is still pending.																		

Section 3: Main menu

Section 3-1: General settings

Parameter	Description	Setting
3-1-1 Unit of measurement selection	Selection of the unit of measurement with which the rotation speed of the motor shaft will be expressed.	Default: [Hz]
		Min.: /
		Max.: /
3-1-2 LCP module language	Selection of the language for the LCP module (Italian, English).	Default: Italiano
		Min.: /
		Max.: /
3-1-3 LCP "Off" button function	Selection of the "OFF" button function of the LCP module:	
	Function	Description
	Ramp to stop	When the "Off" button is depressed the drive will stop the motor with a deceleration ramp set in menu 3-2-2.
	Coast to stop	When the "Off" button is depressed the drive will stop the modulation, allowing the motor to coast to a stop.
3-1-4 LCP backlight mode	Selection of the backlight mode for the LCP:	
	Function	Description
	Always on	The backlight is always on.
	Always off	The backlight is always off.
	Timeout	The backlight goes out after a period of inactivity set in par. 3.1.5.
3-1-5 Backlight timeout	The amount of time the LCP module backlight stays on. Parameter visible with par. 3-1-4 set on "Timeout".	Default: 15.0 [sec]
		Min.: 0.0 [sec]
		Max.: 300.0 [sec]
3-1-6 LCP contrast setting	Contrast setting of the LCP module.	Default: 45.0 [%]
		Min.: 25.0 [%]
		Max.: 65.0 [%]

Parameter	Description		Setting
3-1-7 Stop mode "System start"	Stop mode selection due to command "Stop mode" disabling from digital input.		Default: /
	Function	Description	Min.: /
	Ramp stop	Once the "System start" input is disabled, the drive will stop the motor with a deceleration ramp set in menu 3-2-2.	Max.: /
Coast stop	Once the "System start" input is disabled, the drive will stop the modulation, leaving the motor free.		

Section 3-1-8: Parameter sets

Parameter	Description	Setting
3-1-8-1 Load settings 1 [c]	Function for load settings 1.	Default: /
		Min.: /
		Max.: /
3-1-8-2 Load settings 2 [c]	Function for loading settings 2.	Default: /
		Min.: /
		Max.: /
3-1-8-3 Save settings 1 [c]	Function for saving the current settings as settings 1. If a setting 1 had already previously been saved, it will be overwritten.	Default: /
		Min.: /
		Max.: /
3-1-8-4 Save settings 2 [c]	Function for saving the current settings as settings 2. If a setting 2 had already previously been saved, it will be overwritten.	Default: /
		Min.: /
		Max.: /
3-1-8-5 Load factory settings [c]	Function for loading the factory default setting.	Default: /
		Min.: /
		Max.: /
3-1-8-8 Load settings from LCP [c]	Function for loading the settings saved in LCP module.	Default: /
		Min.: /
		Max.: /
3-1-8-9 Load settings in LCP [c]	Function for saving the actual settings in LCP module.	Default: /
		Min.: /
		Max.: /

Section 3-1-9: Date and time

Parameter	Description	Setting																																						
3-1-9-1 Set date	Function for changing the system date (dd.mm.yyyy).	Default: /																																						
		Min.: /																																						
		Max.: /																																						
3-1-9-2 Set time	Function for changing the system time.	Default: /																																						
		Min.: /																																						
		Max.: /																																						
3-1-10 Measurement view [c]	<p>In this section (visible only from HMI) it is possible to select the values displayed in the main screen. It is possible to visualize up to 8 values among the following.</p> <table border="1"> <thead> <tr> <th>Function</th> <th>Parameter Ref.</th> </tr> </thead> <tbody> <tr><td>Motor frequency</td><td>1-2-1-1</td></tr> <tr><td>Motor speed</td><td>1-2-1-2</td></tr> <tr><td>Motor current</td><td>1-2-1-3</td></tr> <tr><td>Motor tension</td><td>1-2-1-4</td></tr> <tr><td>Motor input power</td><td>1-2-1-5</td></tr> <tr><td>Motor output power</td><td>1-2-1-6</td></tr> <tr><td>Motor torque</td><td>1-2-1-7</td></tr> <tr><td>Motor PTC</td><td>1-2-1-9</td></tr> <tr><td>DC-Link voltage</td><td>1-2-1-10</td></tr> <tr><td>Inverter efficiency</td><td>1-2-1-13</td></tr> <tr><td>Actual pos. setpoint</td><td>1-2-2-1</td></tr> <tr><td>Actual position</td><td>1-2-2-2</td></tr> <tr><td>Current profile</td><td>1-2-2-4</td></tr> <tr><td>Analog input 1</td><td>1-2-3-3</td></tr> <tr><td>Analog input 2</td><td>1-2-3-4</td></tr> <tr><td>Analog input 3</td><td>1-2-3-5</td></tr> <tr><td>Process PID setpoint</td><td>1-2-4-1</td></tr> <tr><td>Process PID feedback</td><td>1-2-4-2</td></tr> </tbody> </table> <p>To change a visualization, press "OK" from HMI on the visualization and select the desired value from the list above. To remove a visualization select the empty item [---].</p>	Function	Parameter Ref.	Motor frequency	1-2-1-1	Motor speed	1-2-1-2	Motor current	1-2-1-3	Motor tension	1-2-1-4	Motor input power	1-2-1-5	Motor output power	1-2-1-6	Motor torque	1-2-1-7	Motor PTC	1-2-1-9	DC-Link voltage	1-2-1-10	Inverter efficiency	1-2-1-13	Actual pos. setpoint	1-2-2-1	Actual position	1-2-2-2	Current profile	1-2-2-4	Analog input 1	1-2-3-3	Analog input 2	1-2-3-4	Analog input 3	1-2-3-5	Process PID setpoint	1-2-4-1	Process PID feedback	1-2-4-2	Default: /
		Function	Parameter Ref.																																					
		Motor frequency	1-2-1-1																																					
		Motor speed	1-2-1-2																																					
		Motor current	1-2-1-3																																					
		Motor tension	1-2-1-4																																					
		Motor input power	1-2-1-5																																					
		Motor output power	1-2-1-6																																					
		Motor torque	1-2-1-7																																					
		Motor PTC	1-2-1-9																																					
		DC-Link voltage	1-2-1-10																																					
		Inverter efficiency	1-2-1-13																																					
		Actual pos. setpoint	1-2-2-1																																					
		Actual position	1-2-2-2																																					
		Current profile	1-2-2-4																																					
		Analog input 1	1-2-3-3																																					
		Analog input 2	1-2-3-4																																					
		Analog input 3	1-2-3-5																																					
		Process PID setpoint	1-2-4-1																																					
		Process PID feedback	1-2-4-2																																					
Min.: /																																								
Max.: /																																								
3-1-11 Operating mode requires Login [c]	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>It is possible to change the operating mode in any condition.</td> </tr> <tr> <td>ON</td> <td>The operating mode is adjustable only if the Login has been executed.</td> </tr> </tbody> </table>	Function	Description	OFF	It is possible to change the operating mode in any condition.	ON	The operating mode is adjustable only if the Login has been executed.	Default: OFF																																
		Function	Description																																					
		OFF	It is possible to change the operating mode in any condition.																																					
ON	The operating mode is adjustable only if the Login has been executed.																																							
Min.: /																																								
Max.: /																																								

Section 3-2.: Motor

Section 3-2-1: Motor data

Parameter	Description	Setting
3-2-1-1 Motor type [c]	Selection of the motor type: Asynchronous [V/F] Asynchronous [Vector] Synchronous reluctance[SRM]	Default: [V/F]
		Min.: /
		Max.: /
3-2-1-2 Synchronous Reluctance selected motor [c]	Function for displaying the selected REEL SuPremE® motor type. Read-only parameter and only visible in the controller.	Default: /
		Min.: /
		Max.: /
3-2-1-3 Nominal motor power [c]	Nominal power of the motor.	Default: /
		Min.: 0.000 [kW]
		Max.: 110.000 [kW]
3-2-1-4 Nominal motor voltage [c]	Nominal voltage of the motor.	Default: 400.00 [V]
		Min.: 0.00 [V]
		Max.: 1000.00 [V]
3-2-1-5 Nominal motor frequency [c]	Nominal frequency of the motor.	Default: 50.0 [Hz]
		Min.: 0.0 [Hz]
		Max.: 500.0 [Hz]
3-2-1-6 Nominal motor current [c]	Nominal current of the motor.	Default: 0.01 [A]
		Min.: 0.00 [A]
		Max.: 2 * Par. 4-1-6
3-2-1-7 Nominal motor speed [c]	Nominal speed of the motor.	Default: 1500 [rpm]
		Min.: 0 [rpm]
		Max.: 30000 [rpm]
3-2-1-8 Nominal cosPhi value [c]	Setting of the motor's nominal power factor (cosΦ).	Default: 0.85
		Min.: 0.00
		Max.: 1.00

Parameter	Description	Setting								
<p>3-2-1-9 Start AMA</p> <p>[c]</p>	<p>Function for automatic calibration of the motor's advanced parameters. The function can be activated with "Vector" or "SRM" control, with the motor at a standstill and with "Auto On" selected. Three different modes are implemented:</p> <table border="1" data-bbox="371 383 1249 658"> <thead> <tr> <th data-bbox="371 383 580 421">Function</th> <th data-bbox="580 383 1249 421">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="371 421 580 521">AMA advanced - rotating</td> <td data-bbox="580 421 1249 521">The advanced motor data are calculated through measurement during which the motor rotates at approx. 10 % of the rated speed.</td> </tr> <tr> <td data-bbox="371 521 580 591">AMA standard - not rotating</td> <td data-bbox="580 521 1249 591">The advanced motor data are calculated through measurement during which the motor is at a standstill.</td> </tr> <tr> <td data-bbox="371 591 580 658">AMA offline</td> <td data-bbox="580 591 1249 658">The advanced motor data required for the setting of the vector are calculated based on the rated motor</td> </tr> </tbody> </table> <p>Before starting the automatic motor adaptation procedure make sure that the data on the motor nameplate have been programmed correctly. If performing the standard automatic motor adaptation procedure as with the advanced one using long connecting cables measurement errors may occur in identifying the advanced motor data. This could cause non-optimal operation of the motor or even failure to operate. In these cases it is always advisable to use the offline automatic motor adaptation.</p> <p>It can take several minutes to perform the standard AMA and particularly the advanced AMA depending on the construction size of the motor.</p> <p>If it is not possible to calculate the advanced motor data with AMA or if any other alarm trips during the procedure, an A10 "AMA Error" alarm is generated. In this case the advanced motor data are not memorised and the AMA must be restarted.</p> <p>Only the "Offline" mode is currently available with the "SRM" control.</p> <p>If the advanced data for the REEL SuPremE[®] motor cannot be calculated the alarm "A16 Lack of adequate motor data" is generated. Check the data on the motor nameplate of the REEL SuPremE[®] motor.</p>	Function	Description	AMA advanced - rotating	The advanced motor data are calculated through measurement during which the motor rotates at approx. 10 % of the rated speed.	AMA standard - not rotating	The advanced motor data are calculated through measurement during which the motor is at a standstill.	AMA offline	The advanced motor data required for the setting of the vector are calculated based on the rated motor	<p>Default: /</p> <hr/> <p>Min.: /</p> <hr/> <p>Max.: /</p>
Function	Description									
AMA advanced - rotating	The advanced motor data are calculated through measurement during which the motor rotates at approx. 10 % of the rated speed.									
AMA standard - not rotating	The advanced motor data are calculated through measurement during which the motor is at a standstill.									
AMA offline	The advanced motor data required for the setting of the vector are calculated based on the rated motor									

Section 3-2-2: Thermal protection

Parameter	Description	Setting
3-2-2-1 PTC protection [c]	Enabling of PTC alarm management.	
	Function	Description
	Off	PTC protection disabled.
	On	When the threshold set in par. 3-2-2-2 is exceeded the drive stops and signals A6 "PTC motor protection".
		Default: On
		Min.: /
		Max.: /
3-2-2-2 PTC threshold value [c]	Threshold value in [Ohm] for triggering the PTC alarm (A6) and PTC warning (W4). The PTC alarm must be enabled through parameter 3-2-2-1. Parameter visible with PTC protection active (Par. 3-2-2-1 = On).	
		Default: 1330 [Ohm]
		Min.: 0 [Ohm]
		Max.: 7500 [Ohm]
3-2-2-3 Motor I2T protection [c]	Selection of the I2T alarm trigger mode.	
	Function	Description
	Alarm	The drive stops and signals "A5" when the I2T counter reaches 90%. The duration of the count can be set in parameter 3-2-2-4.
	Speed reduction	The drive reduces the speed when the I2T count reaches 90%. The duration of the count can be set in parameter 3-2-2-4. If the motor speed drops below the threshold set in parameter 3-2-2-5 or the counter reaches 100% the drive stops and signals "A5".
		Default: /
		Min.: /
		Max.: /
3-2-2-4 I2T timing [c]	I2T count time [sec]. Once this time has elapsed it is possible to have I2T alarm trip or to reduce the speed in accordance with the setting in parameter 3-2-2-3.	
		Default: 60.0 [sec]
		Min.: 0.0 [sec]
		Max.: 60.0 [sec]
3-2-2-5 I2T stop speed [c]	Setting of the speed threshold below which the drive stops and signals alarm "A5". The motor speed must last for at least 1 [s] below this threshold, before signalling the alarm. Parameter only visible if parameter 3-2-2-3 is set at "Speed reduction".	
		Default: 0.0 [Hz]
		Min.: Par. 3-2-3-3
		Max.: Par. 3-2-3-4
3-2-2-6 I2T Threshold [c]	Setting of threshold (percentage of nominal motor current) used for starting I2T counting. If increased it allows to delay the counting for I2T in order to consider the tolerances on nominal motor data.	
		Default: 100.0 [%]
		Min.: 50.0 [%]
		Max.: 125.0 [%]

Section 3-2-3: Motor limitations

Parameter	Description	Setting
3-2-3-1 Allowed motor direction rotation [c]	Setting the permitted direction of motor rotation. If the parameter is set at "Both" a positive speed reference will cause the motor to rotate clockwise (CW), whereas a negative reference will cause it to rotate counterclockwise (CCW). This parameter has no effect if the positioner is enabled (par. 3-7-1 "Positioning modes" other than "Off").	Default: CW
		Min.: /
		Max.: /
3-2-3-2 Maximum motor current [c]	Parameter for setting the maximum motor current.	Default: 0.01 [A]
		Min.: 0.01 [A]
		Max.: Par. 4-1-5
3-2-3-3 Minimum motor speed [c]	Setting the minimum motor speed. The unit of measurement depends on the setting in par. 3-1-1: [Hz] or [rpm].	Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: Par. 3-2-3-4
3-2-3-4 Maximum motor speed [c]	Setting the maximum motor speed. The unit of measurement depends on the setting in par. 3-1-1: [Hz] or [rpm].	Default: 50.0 [Hz]
		Min.: Par. 3-2-3-3
		Max.: 500.0 [Hz] 30000 [rpm]
3-2-3-5 Maximum motor torque [c]	Displays the maximum motor torque. Parameter visible in SRM" or "Vector" control. Read-only parameter calculated internally by the manufacturer based on the other motor parameters.	Default: 0.00 [Nm]
		Min.: 0.00 [Nm]
		Max.: 500.00 [Nm]
3-2-3-6 Min. Speed indication [msr] [c]	Setting of the threshold for indication of "Motor Running". The unit of measurement depends on the setting in par. 3-1-1: [Hz] or [rpm].	Default: 0.2 [Hz]
		Min.: 0.0 [Hz]
		Max.: Par. 3-2-3-4

Section 3-3: Inverter

Section 3-3-1: PWM

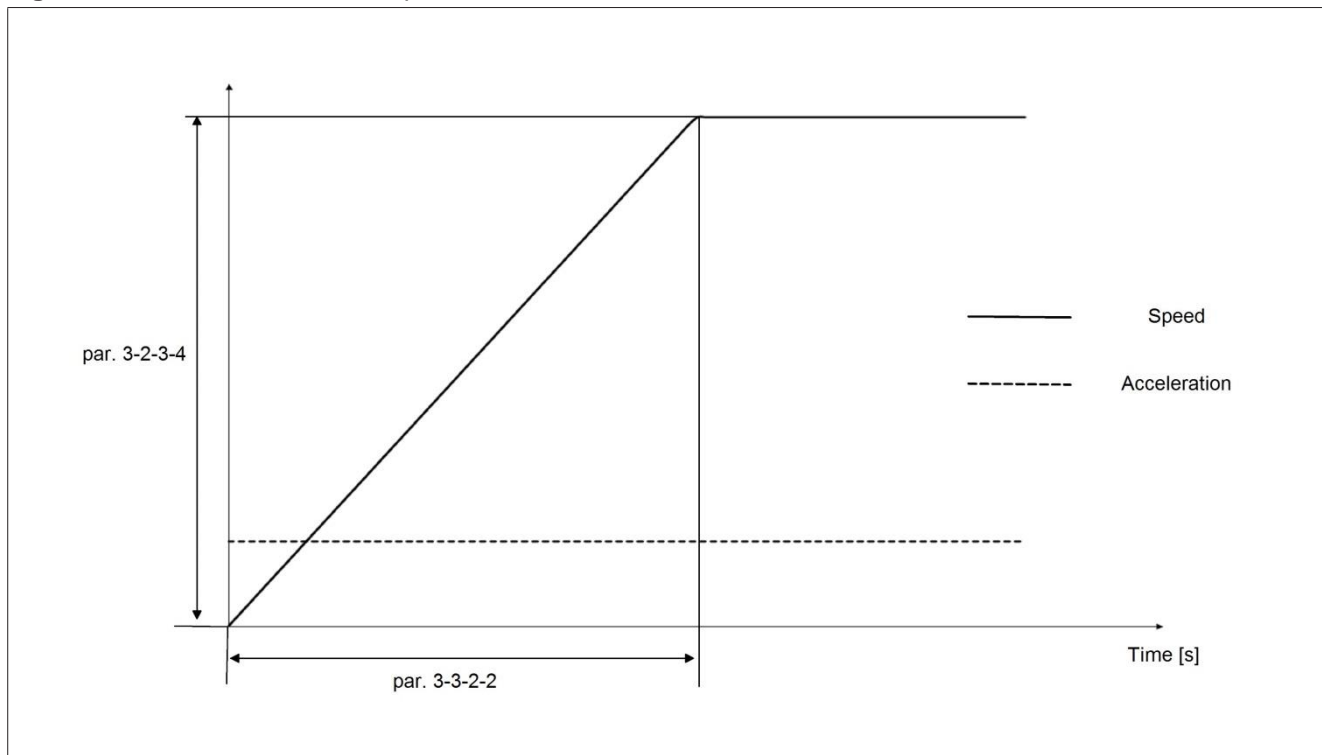
Parameter	Description	Setting
3-3-1-1 Switching frequency [c]	Setting of the drive's switching frequency [kHz]. It is not possible to set a switching frequency less than [kHz] for the "SRM" control.	Default: 4
		Min.: 2
		Max.: 8
3-3-1-2 Random mode [c]	Enabling of the "random PWM" function. This function is used to reduce the acoustic noise emitted by the motor. Parameter not visible in [SRM] control.	Default: Off
		Min.: /
		Max.: /

Section 3-3-2: Ramps

Motor acceleration and deceleration are controlled through the parameters 3-3-2-2 "Acceleration time" and 3-3-2-3 "Deceleration time" set in [sec] and with reference to parameter 3-2-3-3 "Maximum motor speed". A secondary ramp is also available (parameters 3-3-2-4 and 3-3-2-5) that can be activated through the "Change ramp" function from digital input or by setting a value to which to change the ramp in parameter 3-3-2-10 "Change ramp value".

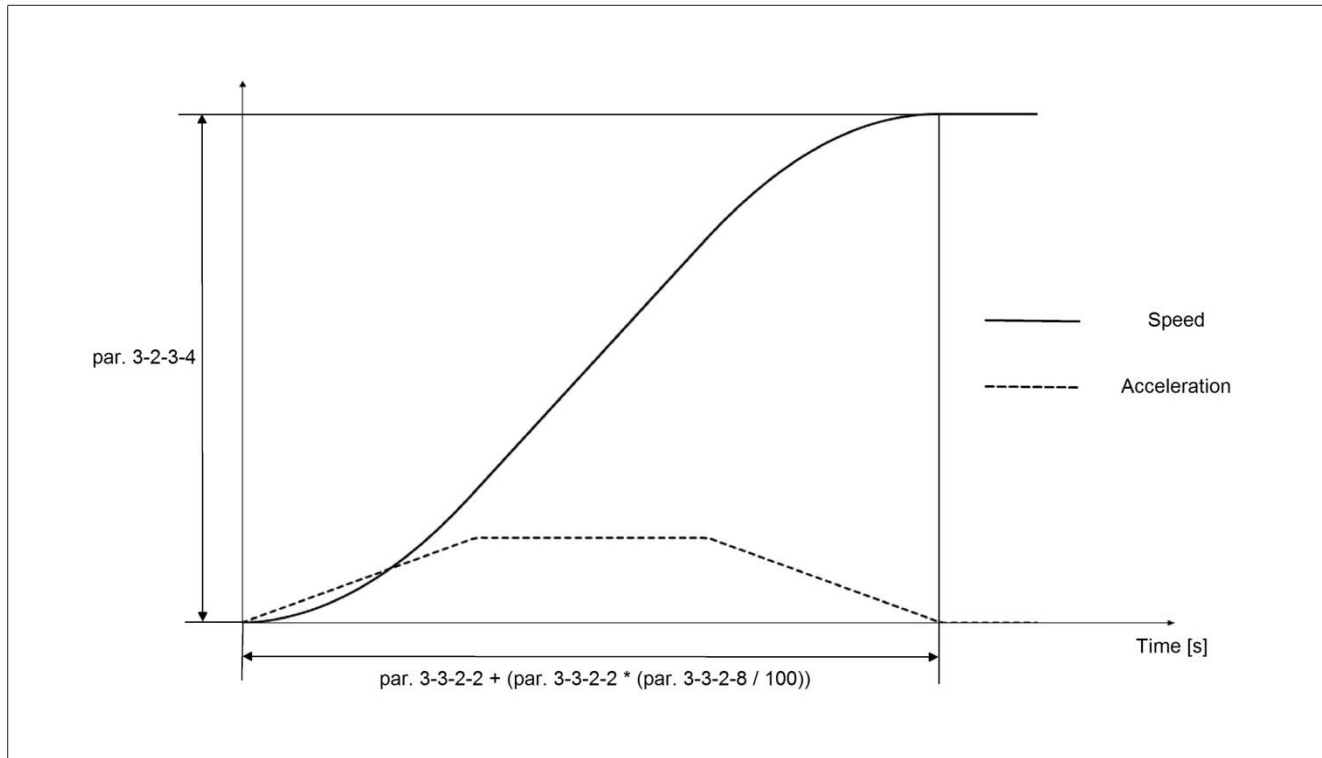
The JOG modes operate with a dedicated acceleration and deceleration ramp. Select linear acceleration ramp or S acceleration ramp via parameter 3-3-2-1 "Ramp type".

Figure 5: Linear acceleration ramp



With the S acceleration ramp you must also set parameters 3-3-2-8 “S ramp acceleration percentage” and 3-3-2-9 “S ramp deceleration percentage” expressed as a percentage with respect to the acceleration and deceleration time (parameters 3-3-2-2/3-3-2-3 or 3-3-2-4/3-3-2-5). This is how the acceleration profile is defined.

Figure 6: S acceleration ramp



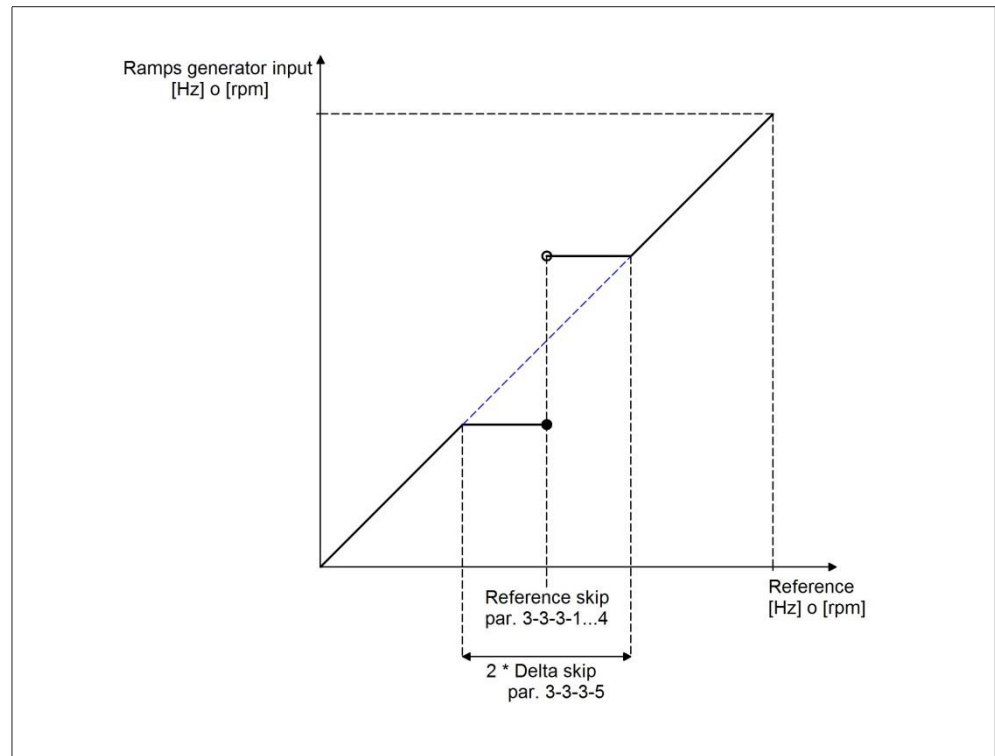
Parameter	Description	Setting						
3-3-2-1 Ramp type [c]	Setting the type of ramp:	Default: Linear						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Linear</td> <td>The drive will accelerate following a linear profile with uniform acceleration.</td> </tr> <tr> <td>S ramp</td> <td>The drive will accelerate following an S profile with trapezoidal acceleration.</td> </tr> </tbody> </table>	Function	Description	Linear	The drive will accelerate following a linear profile with uniform acceleration.	S ramp	The drive will accelerate following an S profile with trapezoidal acceleration.	Min.: /
	Function	Description						
Linear	The drive will accelerate following a linear profile with uniform acceleration.							
S ramp	The drive will accelerate following an S profile with trapezoidal acceleration.							
		Max.: /						
3-3-2-2 Acceleration time [c]	Acceleration ramp time. The motor will employ the time expressed in this parameter to go from stop to the maximum speed expressed in par. 3-2-3-4 “Maximum motor speed”.	Default: 3.0 [sec]						
		Min.: 0.0 [sec]						
		Max.: 600.0 [sec]						
3-3-2-3 Deceleration time [c]	Deceleration ramp time. The motor will employ the time expressed in this parameter to go from the maximum speed expressed in par. 3-2-3-4 “Maximum motor speed” to stop.	Default: 3.0 [sec]						
		Min.: 0.0 [sec]						
		Max.: 600.0 [sec]						
3-3-2-4 Secondary acceleration time [c]	Secondary acceleration ramp time, activated through the “Change ramp” function from digital input or par. 3-3-2-10. The motor will employ the time expressed in this parameter to go from stop to the maximum speed expressed in par. 3-2-3-3 “Maximum motor speed”.	Default: 3.0 [sec]						
		Min.: 0.0 [sec]						
		Max.: 600.0 [sec]						

Parameter	Description	Setting
3-3-2-5 Secondary deceleration time [c]	Secondary deceleration ramp time, activated through the “Change ramp” function from digital input or par. 3-3-2-10. The motor will employ the time expressed in this parameter to go from the maximum speed expressed in par. 3-2-3-3 “Maximum motor speed” to zero.	Default: 3.0 [sec]
		Min.: 0.0 [sec]
		Max.: 600.0 [sec]
3-3-2-6 JOG ramp time [c]	Acceleration ramp time for JOG. The motor will employ the time expressed in this parameter to go from stop to the maximum speed expressed in par. 3-2-3-4 “Maximum motor speed” when the JOG reference is activated.	Default: 3.0 [sec]
		Min.: 0.0 [sec]
		Max.: 600.0 [sec]
3-3-2-7 Quick stop deceleration time [c]	Quick deceleration ramp time. The motor will employ the time expressed in this parameter to go from the maximum speed expressed in par. 3-2-3-3 “Maximum motor speed” to zero when the quick stop function is activated. Quick stop can be selected via the function from digital input or the fieldbus.	Default: 3.0 [sec]
		Min.: 0.0 [sec]
		Max.: 600.0 [sec]
3-3-2-8 S ramp acceleration time [c]	Setting of the S ramp acceleration time. Expressed as a percentage of the acceleration ramp in use. Parameter visible with “S ramp” set in par. 3-3-2-1.	Default: 50.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-2-9 S ramp deceleration time [c]	Setting of the S ramp deceleration time. Expressed as a percentage of the acceleration ramp in use. Parameter visible with “S ramp” set in par. 3-3-2-1.	Default: 50.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-2-10 Switch ramp value [c]	Setting of the speed to which the drive switches automatically from the primary to the secondary ramp and vice versa. The unit of measurement depends on the setting of parameter 3-1-1: [Hz] or [rpm]. If the value is set at 0.0, the function is deactivated.	Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: Par. 3-2-3-4

Section 3-3-3: Skip reference

Through this function it is possible to select up to 4 speed intervals defined in Par. 3-3-3-1 to par 3-3-3-4 and 3-3-3-5 "Delta skip" in which the drive will never command the motor except for transitory periods defined by the acceleration and deceleration ramps.

Figure 7: Skip reference



Parameter	Description	Setting
3-3-3-1 Reference skip 1 [c]	Speed 1 at which the drive will never command the motor. The unit of measurement depends on the setting in parameter 3-1-1: [Hz] or [rpm].	Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: Par. 3-2-3-4
3-3-3-2 Reference skip 2 [c]	Speed 2 at which the drive will never command the motor. The unit of measurement depends on the setting in parameter 3-1-2: [Hz] or [rpm].	Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: Par. 3-2-3-4
3-3-3-3 Reference skip 3 [c]	Speed 3 at which the drive will never command the motor. The unit of measurement depends on the setting in parameter 3-1-2: [Hz] or [rpm].	Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: Par. 3-2-3-4

Parameter	Description	Setting
3-3-3-4 Reference skip 4 [c]	Speed 4 at which the drive will never command the motor. The unit of measurement depends on the setting in parameter 3-1-2: [Hz] or [rpm].	Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: Par. 3-2-3-4
3-3-3-5 Delta skip [c]	Around the set speeds at which the drive will never command the motor. The unit of measurement depends on the setting in parameter 3-1-2: [Hz] or [rpm].	Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: 10.0 [Hz] 600 [rpm]

Section 3-3-4: V/f control for asynchronous motors

Menu visible in "V/f" control.

Parameter	Description	Setting
3-3-4-1 V/f Boost V0 [c]	Characteristic V/f setup. Voltage value applied to the motor at 0[Hz], serves to apply a voltage boost to compensate for the motor RI. Expressed as a [%] of par. 3-2-1-4.	Default: 2.0 [%]
		Min.: 0.0 [%]
		Max.: 15.0 [%]
3-3-4-2 V/f V1 [c]	Characteristic V/f setup. Voltage applied to the motor at frequency F1. Expressed as a [%] of par. 3-2-1-4.	Default: 20.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-4-3 V/f F1 [c]	Characteristic V/f setup. Reference frequency for the elaboration of a "broken line" that alters the linear V/F ratio. Expressed as a [%] of par. 3-2-3-4.	Default: 20.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-4-4 V/f V2 [c]	Characteristic V/f setup. Voltage applied to the motor at frequency F2. Expressed as a [%] of par. 3-2-1-4.	Default: 40.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-4-5 V/f F2 [c]	Characteristic V/f setup. Reference frequency for the elaboration of a "broken line" that alters the linear V/F ratio. Expressed as a [%] of par. 3-2-3-4.	Default: 40.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]

Parameter	Description	Setting
3-3-4-6 V/f V3 [c]	Characteristic V/f setup. Voltage applied to the motor at frequency F3. Expressed as a [%] of par. 3-2-1-4.	Default: 80.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-4-7 V/f F3 [c]	Characteristic V/f setup. Reference frequency for the elaboration of a “broken line” that alters the linear V/F ratio. Expressed as a [%] of par. 3-2-3-4.	Default: 80.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-4-8 V/f V4 [c]	Characteristic V/f setup. Voltage applied to the motor at frequency F3. Expressed as a [%] of par. 3-2-1-4.	Default: 100.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]
3-3-4-9 V/f F4 [c]	Characteristic V/f setup. Reference frequency for the elaboration of a “broken line” that alters the linear V/F ratio. Expressed as a [%] of par. 3-2-3-4.	Default: 100.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]

Section 3-3-5: Vector control for asynchronous motors

Menu visible in “Vector” control.

Parameter	Description	Setting
3-3-5-1 Rs [s]	Stator phase resistance.	Default: 0.0000 [Ohm]
		Min.: 0.0000 [Ohm]
		Max.: 32.0000 [Ohm]
3-3-5-2 Ls [s]	Stator phase inductance.	Default: 0.0 [mH]
		Min.: 0.0 [mH]
		Max.: 6553.5 [mH]
3-3-5-3 Tr [s]	Rotor time constant.	Default: 0.0 [msec]
		Min.: 0.0 [msec]
		Max.: 6553.5 [msec]
3-3-5-4 Km [s]	Magnetic coupling coefficient between stator and rotor.	Default: 0.0000
		Min.: 0.0000
		Max.: 1.0000

Section 3-3-6: Vector control for synchronous motors

Future implementation.

Section 3-3-7: Vector control for synchronous reluctance motors

Section visible in “SRM” control.

Parameter	Description	Setting
3-3-7-1 Rs [s]	Stator phase resistance.	Default: 0.0000 [Ohm]
		Min.: 0.0000 [Ohm]
		Max.: 32.0000 [Ohm]
3-3-7-2 Ldset [s]	Flux-Set nominal value.	Default: 0.0
		Min.: 0.0
		Max.: 25000.0
3-3-7-3 Injection [s]	Amplitude of the injected signal used by the SRM control for detecting the speed at low speed.	Default: 0.0
		Min.: 0.0
		Max.: 1000.0
3-3-7-4 KLS [s]	Gain of slow speed models of SRM motors in slow speed operating modes.	Default: 0.0
		Min.: 0.0
		Max.: 5000.0
3-3-7-5 KHS [s]	Gain of high speed models of SRM motors in slow speed operating modes.	Default: 0.0
		Min.: 0.0
		Max.: 5000.0
3-3-7-6 KHH [s]	Gain of high speed models of SRM motors in high speed operating modes.	Default: 0.0
		Min.: 0.0
		Max.: 5000.0
3-3-7-7 KpTrack [s]	Settings of the Sensorless tracking PI controller. These parameters, together with KLS - KHS - KHH detect the motor electric angle used for the orientation of the sensorless control.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0
3-3-7-8 KiTrack [s]	Settings of the Sensorless tracking PI controller. These parameters, together with KLS - KHS - KHH detect the motor electric angle used for the orientation of the sensorless control.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0

Parameter	Description	Setting
3-3-7-9 Noise reduction [c]	Enabling of the reduction of the overmodulation signal based on the load demand on the motor. This results in reduced noise of the system at low speed.	Default: Off
		Min.: /
		Max.: /
3-3-7-10 MaxKT enable [c]	Enables the motor efficiency control to reduce consumption.	Default: Off
		Min.: /
		Max.: /
3-3-7-11 MaxKT angle [s]	MaxKT angle for SRM efficiency function.	Default: 0.0 [deg]
		Min.: 45.0 [deg]
		Max.: 90.0 [deg]
3-3-7-12 MaxKT percentage [c]	Defines the minimum magnetization percentage that the energy saving function can regulate. The smaller the value, the greater the regulation and consequently the greater the energy saving. Values that are too low have a negative effect on the stability of the system.	Default: 70.0 [%]
		Min.: 50.0 [%]
		Max.: 95.0 [%]

Section 3-3-8: Motor control settings

Parameter	Description	Setting
3-3-8-1 Torque control mode [c]	Selection of torque control mode:	Default: Off
	Function	Description
	Off	Torque control disabled.
	Feed forward	This function controls a percentage of the current that creates open loop torque.
	Estimated torque	This function controls the torque delivered through the PI. The feedback comes from the estimated torque of the control.
	Parameter visible in [SRM] or [Vector] control.	Min.: /
3-3-8-2 Field weakening proportional gain [s]	Proportional gain constant of the PI controller to optimise the field weakening performance or performance in the presence of a weak mains voltage.	Max.: /
		Default: 10.0
		Min.: 0.0
		Max.: 9999.0

Parameter	Description	Setting
3-3-8-3 Field weakening integral gain [s]	Integral gain constant of the PI controller to optimise the field weakening performance or performance in the presence of a weak mains voltage.	Default: 1.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-4 Speed compensation [s]	Asynchronous motor slip compensation. Parameter visible in [V/F] or [Vector] control and can only be modified if par. 3-1-1 is set on "rpm". Parameter sets automatically when par. 3-1-1 is modified (rpm: Hz = 0.0%; Hz: rpm = 100.0%).	Default: 100.0 [%]
		Min.: 0.0 [%]
		Max.: 300.0 [%]

Section 3-3-8-5: motor control PID

This menu contains the parameters for regulating the PID controllers that control the motors.

Parameter	Description	Setting
3-3-8-5-1 Kpl [c]	Proportional K current feedback loop.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-5-2 Kil [c]	Integral K current feedback loop.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-5-3 Kpflx [c]	Proportional K flux feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-5-4 Kiflx [c]	Integral K flux feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-5-5 Kpw [c]	Proportional K speed feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0

Parameter	Description	Setting
3-3-8-5-6 Kiw [c]	Integral K speed feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-5-7 Kdw [c]	Derivative K speed feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 0.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-5-8 Tdw [c]	Filtering time of the derivative action on the speed feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 0.1 [sec]
		Min.: 0.0 [sec]
		Max.: 30.0 [sec]
3-3-8-5-9 KpT [c]	Proportional K torque feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 100.0
		Min.: 0.0
		Max.: 9999.0
3-3-8-5-10 KiT [c]	Integral K torque feedback loop. Parameter visible in [SRM] or [Vector] control.	Default: 10.0
		Min.: 0.0
		Max.: 9999.0

Section 3-3-9: Feedback

Future implementation

Section 3-3-10: Motor flying start

The “motor flying start” function enables the inverter to control a motor whose shaft is rotating due to external causes. The function synchronises the output frequency of the inverter at the motor’s rotating speed, without transmitting significant torque to the motor shaft.

At each startup the inverter performs the “motor flying start” sequence by injecting the current defined in parameter “3-3-10-3” for the amount of time indicated in parameter “3-3-10-2”. This search stage where the motor rotation speed is recognized is followed by a synchronization stage where the motor is piloted without producing torque. The total time necessary to start the motor could therefore be greater than the time indicated in the parameter “Flying start time”. The “flying start” function for asynchronous motors is only capable of detecting the rotation if the real speed is in the same direction as the setpoint speed. This does not apply to “REEL SuPremE®” motors. For a good recognition of rotation for an asynchronous motor a time of 2-4 s is required with an injected current of 25%-40%.

REEL SuPremE® motors can achieve good results even with shorter times and lower currents.

Higher time values obviously correspond to greater precision but this affects the motor startup time. An increase in the injected current also has a positive effect on the precision but it produces braking torque that could cause overvoltage in the inverter and consequently trigger the relevant alarm.

Parameter	Description	Setting		
3-3-10-1 Flying start enable [c]	Enabling of the motor flying start function.			
	Function	Description		
	Off	Function disabled.		
	On	Function enabled.		
		Default: Off Min.: / Max.: /		
3-3-10-2 Time for flying start [c]	Time in which the inverter performs the motor rotation speed search cycle.			
				Default: 3.0 [sec]
				Min.: 0.0 [sec]
		Max.: 20.0 [sec]		
3-3-10-3 Current for flying start [c]	Defines the current injected into the motor for the recognition of the rotating speed. Parameter expressed as a [%] of par 3-2-1-6 "Motor rated current".			
				Default: 20.0 [%]
				Min.: 10.0 [%]
		Max.: 45.0 [%]		

Section 3-3-11: Advanced settings

Parameter	Description	Setting																																																																																																
3-3-11-1 Drive size [c]	Displays the Drive size <table border="1"> <thead> <tr> <th>Drive size</th> <th>Power [kW]</th> <th>Inom [A]</th> <th>Imax [A]</th> </tr> </thead> <tbody> <tr> <td colspan="4">Size A</td> </tr> <tr> <td>1.0</td> <td>0.37</td> <td>1.3</td> <td>2.0</td> </tr> <tr> <td>2.0</td> <td>0.55</td> <td>1.8</td> <td>2.7</td> </tr> <tr> <td>3.0</td> <td>0.75</td> <td>2.5</td> <td>3.8</td> </tr> <tr> <td>4.0</td> <td>1.1</td> <td>3.5</td> <td>5.3</td> </tr> <tr> <td>5.0</td> <td>1.5</td> <td>4.9</td> <td>7.4</td> </tr> <tr> <td colspan="4">Size B</td> </tr> <tr> <td>6.0</td> <td>2.2</td> <td>6.0</td> <td>9.0</td> </tr> <tr> <td>7.0</td> <td>3.0</td> <td>8.0</td> <td>12.0</td> </tr> <tr> <td>8.0</td> <td>4.0</td> <td>10.0</td> <td>15.0</td> </tr> <tr> <td colspan="4">Size C</td> </tr> <tr> <td>9.0</td> <td>5.5</td> <td>14.0</td> <td>21.0</td> </tr> <tr> <td>10.0</td> <td>7.5</td> <td>18.0</td> <td>27.0</td> </tr> <tr> <td>11.0</td> <td>11.0</td> <td>26.0</td> <td>39.0</td> </tr> <tr> <td colspan="4">Size D</td> </tr> <tr> <td>12.0</td> <td>15.0</td> <td>34.5</td> <td>51.8</td> </tr> <tr> <td>13.0</td> <td>18.5</td> <td>44.0</td> <td>66.0</td> </tr> <tr> <td>14.0</td> <td>22.0</td> <td>51.0</td> <td>76.5</td> </tr> <tr> <td>15.0</td> <td>30.0</td> <td>68.0</td> <td>102.0</td> </tr> <tr> <td colspan="4">Size E</td> </tr> <tr> <td>16.0</td> <td>37.0</td> <td>84.0</td> <td>126.0</td> </tr> <tr> <td>17.0</td> <td>45.0</td> <td>101.0</td> <td>151.5</td> </tr> <tr> <td>18.0</td> <td>55.0</td> <td>120.0</td> <td>180.0</td> </tr> </tbody> </table> Read-only parameter.	Drive size	Power [kW]	Inom [A]	Imax [A]	Size A				1.0	0.37	1.3	2.0	2.0	0.55	1.8	2.7	3.0	0.75	2.5	3.8	4.0	1.1	3.5	5.3	5.0	1.5	4.9	7.4	Size B				6.0	2.2	6.0	9.0	7.0	3.0	8.0	12.0	8.0	4.0	10.0	15.0	Size C				9.0	5.5	14.0	21.0	10.0	7.5	18.0	27.0	11.0	11.0	26.0	39.0	Size D				12.0	15.0	34.5	51.8	13.0	18.5	44.0	66.0	14.0	22.0	51.0	76.5	15.0	30.0	68.0	102.0	Size E				16.0	37.0	84.0	126.0	17.0	45.0	101.0	151.5	18.0	55.0	120.0	180.0	Default: / Min.: / Max.: /
Drive size	Power [kW]	Inom [A]	Imax [A]																																																																																															
Size A																																																																																																		
1.0	0.37	1.3	2.0																																																																																															
2.0	0.55	1.8	2.7																																																																																															
3.0	0.75	2.5	3.8																																																																																															
4.0	1.1	3.5	5.3																																																																																															
5.0	1.5	4.9	7.4																																																																																															
Size B																																																																																																		
6.0	2.2	6.0	9.0																																																																																															
7.0	3.0	8.0	12.0																																																																																															
8.0	4.0	10.0	15.0																																																																																															
Size C																																																																																																		
9.0	5.5	14.0	21.0																																																																																															
10.0	7.5	18.0	27.0																																																																																															
11.0	11.0	26.0	39.0																																																																																															
Size D																																																																																																		
12.0	15.0	34.5	51.8																																																																																															
13.0	18.5	44.0	66.0																																																																																															
14.0	22.0	51.0	76.5																																																																																															
15.0	30.0	68.0	102.0																																																																																															
Size E																																																																																																		
16.0	37.0	84.0	126.0																																																																																															
17.0	45.0	101.0	151.5																																																																																															
18.0	55.0	120.0	180.0																																																																																															
3-3-11-2 Drive size power [c]	Display of the power size. Read-only parameter.	Default: / Min.: 0.370 [kW] Max.: 55.000 [kW]																																																																																																
3-3-11-3 DC-Link offset [c]	Calibration offset for reading of DC-Link bus. Read-only parameter.	Default: 0 [V] Min.: -100 [V] Max.: 100 [V]																																																																																																
3-3-11-4 Brake resistor time [c]	Brake resistor activation time [msec] in time frame of 10 [sec]. If set at 0 [msec], control of the brake resistor is disabled. If set at 10000 [msec] the result is continuous use of braking and alarm A11 will never be triggered. To select the braking resistor according to your requirements see the installation and design manual. Parameter 3-3-11-9 must be selected in "Braking chopper" for the proper operation.	Default: 0 [msec] Min.: 0 [msec] Max.: 10000 [msec]																																																																																																

Parameter	Description	Setting						
3-3-11-5 Lock time [c]	Lock time for the motor after an alarm or disabling of the PWM with the motor rotating. If the “motor flying start” function is not enabled this parameter prevents the motor from enabling while it is potentially rotating. The actual waiting time is calculated linearly as the ratio between the nominal speed to which the parameter refers and the speed at which the motor was rotating.	Default: 0.0 [sec]						
		Min.: 0.0 [sec]						
		Max.: 600.0 [sec]						
3-3-11-6 Dead-time compensation [s]	Enabling of the IGBT dead times.	Default: Off						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Function disabled.</td> </tr> <tr> <td>On</td> <td>Compensates for the distortion caused by the dead times of the IGBT.</td> </tr> </tbody> </table>	Function	Description	Off	Function disabled.	On	Compensates for the distortion caused by the dead times of the IGBT.	Min.: /
	Function	Description						
	Off	Function disabled.						
On	Compensates for the distortion caused by the dead times of the IGBT.							
In [V/F] control it can have a big effect for a stable operation without load. In [Vector] or [SRM] it can affect the control performance and efficiency.	Max.: /							
3-3-11-7 Efficient modulation [s]	Enable command for the “Efficient Modulation” function. This reduces inverter losses at the expense of increased motor noise due to the greater output current ripple.	Default: Off						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Function disabled.</td> </tr> <tr> <td>On</td> <td>Function enabled.</td> </tr> </tbody> </table>	Function	Description	Off	Function disabled.	On	Function enabled.	Min.: /
	Function	Description						
	Off	Function disabled.						
On	Function enabled.							
	Max.: /							
3-3-11-9 Brake-control mode [c]	Selects how to handle the motor in case of brake request.	Default: Braking torque limitation						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Braking torque limitation</td> <td>If the motor is braking and the DC-bus voltage exceed the Warning, the inverter sets zero braking torque in order to bring the voltage inside allowed limits.</td> </tr> <tr> <td>Braking chopper</td> <td>If the motor is braking and the DC-bus voltage exceed the Warning, the brake resistor is enabled in order to bring the voltage inside allowed limits. Parameter 3-3-11-4 must be set to a proper value.</td> </tr> </tbody> </table>	Function	Description	Braking torque limitation	If the motor is braking and the DC-bus voltage exceed the Warning, the inverter sets zero braking torque in order to bring the voltage inside allowed limits.	Braking chopper	If the motor is braking and the DC-bus voltage exceed the Warning, the brake resistor is enabled in order to bring the voltage inside allowed limits. Parameter 3-3-11-4 must be set to a proper value.	Min.: /
	Function	Description						
	Braking torque limitation	If the motor is braking and the DC-bus voltage exceed the Warning, the inverter sets zero braking torque in order to bring the voltage inside allowed limits.						
Braking chopper	If the motor is braking and the DC-bus voltage exceed the Warning, the brake resistor is enabled in order to bring the voltage inside allowed limits. Parameter 3-3-11-4 must be set to a proper value.							
	Max.: /							
3-3-11-10 Filter on estimated speed [c]	Filtering on estimated speed. Increasing this cut-off value will return a faster speed response but with higher estimation noise.	Default: 10.0 [Hz]						
		Min.: 1.0 [Hz]						
		Max.: 100.0 [Hz]						

Parameter	Description	Setting				
3-3-11-11 Filter on estimated torque [c]	Filtering on estimated torque. Increasing this cut-off value will return a faster torque response but with higher estimation noise.	Default: 10.0 [Hz]				
		Min.: 1.0 [Hz]				
		Max.: 100.0 [Hz]				
3-3-11-12 Clockwise rotation [c]	Selection of the Clockwise rotation. Setting this parameter allows to easily invert the rotation direction instead of changing the cabling of motor phases.	Default: Standard				
		Min.: /				
		Max.: /				
		<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Standard</td> <td>If the motor is cabled respecting the sequence U-V-W, the rotation direction will be clockwise CW.</td> </tr> <tr> <td>Inverse</td> <td>If the motor is cabled respecting the sequence U-V-W, the rotation direction will be counter-clockwise CCW.</td> </tr> </tbody> </table>	Function	Description	Standard	If the motor is cabled respecting the sequence U-V-W, the rotation direction will be clockwise CW.
Function	Description					
Standard	If the motor is cabled respecting the sequence U-V-W, the rotation direction will be clockwise CW.					
Inverse	If the motor is cabled respecting the sequence U-V-W, the rotation direction will be counter-clockwise CCW.					

Section 3-4: Inputs and outputs

Section 3-4-1: Analog inputs

Parameter	Description	Setting										
3-4-1-1 AN1 type [c]	Type of analog input1.	Default: 0 ÷ 20 mA										
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-10 V</td> <td>0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].</td> </tr> <tr> <td>4-20 mA</td> <td>4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%]</td> </tr> <tr> <td>0-20 mA</td> <td>0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].</td> </tr> <tr> <td>-10 ÷ +10 V -</td> <td>-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].</td> </tr> </tbody> </table>	Function	Description	0-10 V	0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].	4-20 mA	4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%]	0-20 mA	0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].	-10 ÷ +10 V -	-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].	Min.: /
	Function	Description										
	0-10 V	0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].										
	4-20 mA	4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%]										
0-20 mA	0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].											
-10 ÷ +10 V -	-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].											
		Max.: /										
3-4-1-2 AN1 offset [s]	Calibration offset of analog signal 1.	Default: 0.0 [mA]										
		Min.: -24.0 [mA] 12.00 [V]										
		Max.: 24.0 [mA] -12.00 [V]										

Parameter	Description	Setting											
3-4-1-3 AN1 gain [s]	Calibration gain of analog signal 1. Calibration of the gain must be carried out at 90% of the full scale after having calibrated the corresponding offset.	Default: 1.0000											
		Min.: 0.5000											
		Max.: 2.0000											
3-4-1-4 AN2 type [c]	Type of analog input 2.	Default: 0-20mA											
		Min.: /											
		Max.: /											
		<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-10 V</td> <td>0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].</td> </tr> <tr> <td>4-20 mA</td> <td>4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%] Below 4 [mA] alarm A14 "Broken signal cable" is generated.</td> </tr> <tr> <td>0-20 mA</td> <td>0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].</td> </tr> <tr> <td>-10 ÷ +10 V -</td> <td>-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].</td> </tr> </tbody> </table>		Function	Description	0-10 V	0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].	4-20 mA	4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%] Below 4 [mA] alarm A14 "Broken signal cable" is generated.	0-20 mA	0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].	-10 ÷ +10 V -	-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].
		Function	Description										
0-10 V	0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].												
4-20 mA	4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%] Below 4 [mA] alarm A14 "Broken signal cable" is generated.												
0-20 mA	0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].												
-10 ÷ +10 V -	-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].												
Max.: /													
Default: 0.0 [mA]													
Min.: -24.0 [mA] 12.00 [V]													
Max.: 24.0 [mA] -12.00 [V]													
3-4-1-5 AN2 offset [s]	Calibration offset of analog signal 2. Calibration of the offset must be carried out at 90% of the full scale with the corresponding unity gain. The unit of measurement displayed depends on the setting in parameter 3-4-1-4: [V] or [mA].	Default: 0.0 [mA]											
		Min.: -24.0 [mA] 12.00 [V]											
		Max.: 24.0 [mA] -12.00 [V]											
3-4-1-6 AN2 gain [s]	Calibration gain of analog signal 2. Calibration of the gain must be carried out at 90% of the full scale after having calibrated the corresponding offset.	Default: 1.0000											
		Min.: 0.5000											
		Max.: 2.0000											
3-4-1-7 AN3 type [c]	Type of analog input 3.	Default: 0-20 mA											
		Min.: /											
		Max.: /											
		<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-10 V</td> <td>0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].</td> </tr> <tr> <td>4-20 mA</td> <td>4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%] Below 4 [mA] alarm A14 "Broken signal cable" is generated.</td> </tr> <tr> <td>0-20 mA</td> <td>0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].</td> </tr> <tr> <td>-10 ÷ +10 V -</td> <td>-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].</td> </tr> </tbody> </table>		Function	Description	0-10 V	0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].	4-20 mA	4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%] Below 4 [mA] alarm A14 "Broken signal cable" is generated.	0-20 mA	0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].	-10 ÷ +10 V -	-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].
		Function	Description										
0-10 V	0.00 [V] = 0 [%]; 10.00 [V] = 100 [%].												
4-20 mA	4.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%] Below 4 [mA] alarm A14 "Broken signal cable" is generated.												
0-20 mA	0.0 [mA] = 0 [%]; 20.0 [mA] = 100 [%].												
-10 ÷ +10 V -	-10.00 [V] = 0 [%]; 10.00 [V] = 100 [%].												
Max.: /													
Default: 0.0 [mA]													
Min.: -24.0 [mA] 12.00 [V]													
Max.: 24.0 [mA] -12.00 [V]													
3-4-1-8 AN3 offset [s]	Calibration offset of analog signal 3. Calibration of the offset must be carried out at 10% of the full scale with the corresponding unity gain. The unit of measurement displayed depends on the setting in parameter 3-4-1-7: [V] or [mA]. Parameter visible with IO "FX-I/O-A" expander board connected.	Default: 0.0 [mA]											
		Min.: -24.0 [mA] 12.00 [V]											
		Max.: 24.0 [mA] -12.00 [V]											

Parameter	Description	Setting
3-4-1-9 AN3 gain [s]	Calibration gain of analog signal 3. Calibration of the gain must be carried out at 90% of the full scale after having calibrated the corresponding offset. Parameter visible with IO "FX-I/O-A" expander board connected.	Default: 1.0000
		Min.: 0.5000
		Max.: 2.0000
3-4-1-10 Maximum speed reference value [c]	Value of the speed reference value corresponding to 100% of the analog value. The unit of measurement depends on the setting in parameter 3-1-1: [Hz] or [rpm].	Default: 50.0 [Hz]
		Min.: Par. 3-4-1-10
		Max.: Par. 3-2-3-4
3-4-1-11 Minimum speed reference value [c]	Value of the speed reference value corresponding to 0% of the analog value. The unit of measurement depends on the setting in parameter 3-1-2: [Hz] or [rpm].	Default: 0.0 [Hz]
		Min.: 3-2-3-3
		Max.: Par. 3-4-1-9
3-4-1-12 Maximum torque reference value [c]	Setting of the torque reference value corresponding to 100% of the analog value [Nm]. Parameter visible in [SRM] or [Vector] control.	Default: 0.00 [Nm]
		Min.: Par. 3-4-1-13
		Max.: Par. 3-2-3-5
3-4-1-13 Minimum torque reference value [c]	Setting of the torque reference value corresponding to 0% of the analog value [Nm]. Parameter visible in [SRM] or [Vector] control.	Default: 0.00 [Nm]
		Min.: 0.00 [Nm]
		Max.: Par. 3-4-1-12

Section 3-4-2: Digital inputs
Section 3-4-2-1: Digital input functions

Parameter	Description	Setting	
3-4-2-1-1 DIN1 Function [c]	Defines the function of digital input 1:	Default: Start system	
	Function	Description	
	Disabled	Varying the digital input in any way has no effect.	
	Start system	Commands the motor to start (input active) or stop (input inactive) via the ramps.	
	Change rotation direction	Reverses the rotation direction of the motor with input active. This selection is possible only with rotation direction set as "Both" (parameter 3-2-3-1)	
	Digital pot. +	With input active the digital potentiometer increments its value by one step expressed in par. 3-5-12-1 after a time expressed in parameter 3-5-12-2.	Min.: /
	Digital pot. -	With input active the digital potentiometer decreases its value by one step expressed in par. 3-5-12-1 after a time expressed in parameter 3-5-12-2.	
	Jog 1	With input active the motor commands the speed set in parameter 3-5-10-1. If the motor is stopped it also commands the startup.	
	Jog 2	With input active the motor commands the speed set in parameter 3-5-10-12. If the motor is stopped it also commands the startup.	
	Jog 3	With input active the motor commands the speed set in parameter 3-5-10-3. If the motor is stopped it also commands the startup.	
	MultiReference Bit0	Bit 0 selector for MultiReference. (see menu 3-5-11).	Max.: /
	MultiReference Bit1	Bit 1 selector for MultiReference. (see menu 3-5-11).	
	MultiReference Bit2	Bit 2 selector for MultiReference. (see menu 3-5-11).	
	Speed/torque	Speed/torque control selector.	
	Reset alarms	Resets any active alarms with input active.	
	Bypass ramps	Disables the acceleration and deceleration ramps with input active.	
	External alert	If active it stops the motor and triggers alarm A7 "External alert". It can be used to signal a system fault that requires stopping the inverter.	
Frequency input	If active, the drive can receive the speed reference through the frequency input. Settable only on DIN1. Input range: 0-100 [kHz], 24 V.		
to be continued...			

Parameter	Description		Setting
	Function	Description	
	Sel AN output Bit0	Bit 0 selector of the analog output function (see menu 3-4-4).	
	Sel AN output Bit1	Bit 1 selector of the analog output function (see menu 3-4-4).	
	Enable PWM	If set, it enables the PWM modulation. If "PWM On" or "EN1 On" are selected they must be set separately.	
	Enable speed ref.	If active, it enables the speed reference. If "PWM On" or "EN1 On" are selected they must be set separately.	
	Enable PID	If active, it enables the process PID controller.	
	Change ramp	Primary ramp (input inactive) or secondary (input active) selector.	
	Enable ramps	If selected, it commands the enabling of the ramps. If the DIN has been reset the speed reference is 0 [rpm].	
	Freeze ramp	If selected, with input active it freezes the speed reference.	
	Posi Start	If Positioning controller is active, it will execute the selected profile	
	Posi Step	If Positioning controller is active, it will resume the profile previously stopped with an HALT command. It allows to move to the next profile in case that the Position Setpoint is reached and the Start mode is set as "Step command".	
	Posi Next	If Positioning controller is active, it will stop the profile in execution and load the next profile without wait for the setpoint to be reached. The Start mode of the profile must be set as "Next command".	
	Posi Halt	If Positioning controller is active, it will stop the profile in execution and stop the motor with the ramp selected in the profile.	
	Posi Tip+	If Positioning controller is active, it will move the motor in the positive direction with a fixed speed set in parameter 3-7-2-11.	
	Posi Tip-	If Positioning controller is active, it will move the motor in the negative direction with a fixed speed set in parameter 3-7-2-11.	
	Posi Step/Halt	It implements in a unique command, the commands "Posi Step" with level high and "Posi Halt" with level low.	
	Posi start homing	It starts the sequence for setting the initial position (Homing)	
	Posi teach in	On the positive edge, the actual position is saved in the actual profile as position setpoint.	
	to be continued...		

Parameter	Description		Setting
	Function	Description	
	Posi limit switch+	Used for connecting a limit switch for the maximum position	
	Posi limit switch-	Used for connecting a limit switch for the minimum position	
	Posi home switch	Used for connecting the sensor that gives the initial position (Homing)	
	Posi continuous ref- switch	Used for connecting the sensor that provides the continuous reference during the positioning. See 3-7-3-10 "Continuous Referencing"	
	Profile selection Bit0	Bit0 for selection of active positioning profile	
	Profile selection Bit1	Bit1 for selection of active positioning profile	
	Profile selection Bit2	Bit2 for selection of active positioning profile	
	Gearbox JOG+	With "Electric Gearbox" active, allows the correction of actual position with positive direction with the quantity set in parameter 3-10-2-7.	
	Gearbox JOG-	With "Electric Gearbox" active, allows the correction of actual position with negative direction with the quantity set in parameter 3-10-2-7.	
	PID Multireference Bit0	Bit 0 selector of the MultiReference relating to process PID (see menu 3-6-7).	
	PID Multireference Bit1	Bit 1 selector of the MultiReference relating to process PID (see menu 3-6-7).	
	PID Multireference Bit2	Bit 2 selector of the MultiReference relating to process PID (see menu 3-6-7).	
	System Start CW	Commands the motor to start (input active) or stop (input inactive) via the ramps and force the rotation direction CW. This input is visible only if parameter 3-2-3-1 is set as "Both".	
	System Start CCW	Commands the motor to start (input active) or stop (input inactive) via the ramps and force the rotation direction CCW. This input is visible only if parameter 3-2-3-1 is set as "Both".	
	User settings selection	It loads the parameter set previously saved as "Parameter Set 1" in case of input low or "Parameter Set 2" with input high.	

Parameter	Description	Setting
3-4-2-1-2 DIN2 Function [c]	Defines the function of digital input 2. See function 3-4-2-1-1.	Default: Reset
		Min.: /
		Max.: /
3-4-2-1-3 DIN3 Function [c]	Defines the function of digital input 3. See function 3-4-2-1-1.	Default: Disabled
		Min.: /
		Max.: /
3-4-2-1-4 DIN4 Function [c]	Defines the function of digital input 4. See function 3-4-2-1-1.	Default: Disabled
		Min.: /
		Max.: /
3-4-2-1-5 DIN-STO Function [c]	Input used for the STO. Read only parameter.	Default: STO Diagnostics
		Min.: /
		Max.: /
3-4-2-1-6 HW-STO Function [c]	Input used for the STO. Read only parameter.	Default: Safety
		Min.: /
		Max.: /
3-4-2-1-7 DIN6 Function [c]	Defines the function of digital input 6. See function 3-4-2-1-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-B" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-2-1-8 DIN7 Function [c]	Defines the function of digital input 7. See function 3-4-2-1-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-B" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-2-1-9 DIN8 Function [c]	Defines the function of digital input 8. See function 3-4-2-1-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-B" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /

Section 3-4-2-2: Polarity of digital inputs

Parameter	Description	Setting
3-4-2-2-1 DIN1 polarity [c]	Defines the polarity of digital input 1:	Default: Positive
	Function	Description
	Positive	24 V input to activate the associated function.
	Negative	0 V input to activate the associated function.
		Min.: / Max.: /
3-4-2-2-2 DIN2 polarity [c]	Defines the polarity of digital input 2:	Default: Positive
	Function	Description
	Positive	24 V input to activate the associated function.
	Negative	0 V input to activate the associated function.
		Min.: / Max.: /
3-4-2-2-3 DIN3 polarity [c]	Defines the polarity of digital input 3:	Default: Positive
	Function	Description
	Positive	24 V input to activate the associated function.
	Negative	0 V input to activate the associated function.
		Min.: / Max.: /
3-4-2-2-4 DIN4 polarity [c]	Defines the polarity of digital input 4:	Default: Positive
	Function	Description
	Positive	24 V input to activate the associated function.
	Negative	0 V input to activate the associated function.
		Min.: / Max.: /
3-4-2-2-5 DIN6 polarity [c]	Defines the polarity of digital input 6:	Default: Positive
	Function	Description
	Positive	24 V input to activate the associated function.
	Negative	0 V input to activate the associated function.
		Min.: / Max.: /
3-4-2-2-6 DIN7 polarity [c]	Defines the polarity of digital input 7:	Default: Positive
	Function	Description
	Positive	24 V input to activate the associated function.
	Negative	0 V input to activate the associated function.
		Min.: / Max.: /
3-4-2-2-7 DIN8 polarity [c]	Defines the polarity of digital input 8:	Default: Positive
	Function	Description
	Positive	24 V input to activate the associated function.
	Negative	0 V input to activate the associated function.
		Min.: / Max.: /

Section 3-4-3: Digital and relay outputs

Parameter	Description	Setting																												
3-4-3-1 Relay function [c]	Defines the function of the relay output 1: <table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Disabled</td> <td>Output disabled.</td> </tr> <tr> <td>Rotating</td> <td>Output active while motor is rotating. Input active with frequency greater than 0.5 [Hz].</td> </tr> <tr> <td>Mechanical brake</td> <td>Output is active when the mechanical brake actuates. It must be selected for the "Mechanical Brake" function to be enabled." (see menu 3-4-5).</td> </tr> <tr> <td>Speed set reached</td> <td>Output active when the motor reaches the setpoint speed.</td> </tr> <tr> <td>Direction</td> <td>Output active when the motor rotates clockwise (CW) and inactive when it rotates counter clockwise (CCW).</td> </tr> <tr> <td>Alarm</td> <td>Output active if the drive is in alarm state.</td> </tr> <tr> <td>Warning</td> <td>Output active if the drive is in warning state.</td> </tr> <tr> <td>Drive thermal warning</td> <td>Output active if the drive is in overheated state.</td> </tr> <tr> <td>Motor thermal warning</td> <td>Output active if the drive is in motor 12T count state.</td> </tr> <tr> <td>Drive Ok</td> <td>Output active if the drive is not in alarm or warning state.</td> </tr> <tr> <td>STO</td> <td>Output active if the drive is in STO state.</td> </tr> <tr> <td>Position setpoint reached</td> <td>Output active when the motor reaches the setpoint position, in positioning mode.</td> </tr> <tr> <td>Multi-Drive cascade control</td> <td>The output is controlled by the Multi-Drive function (see menu 3-6-21).</td> </tr> </tbody> </table>	Function	Description	Disabled	Output disabled.	Rotating	Output active while motor is rotating. Input active with frequency greater than 0.5 [Hz].	Mechanical brake	Output is active when the mechanical brake actuates. It must be selected for the "Mechanical Brake" function to be enabled." (see menu 3-4-5).	Speed set reached	Output active when the motor reaches the setpoint speed.	Direction	Output active when the motor rotates clockwise (CW) and inactive when it rotates counter clockwise (CCW).	Alarm	Output active if the drive is in alarm state.	Warning	Output active if the drive is in warning state.	Drive thermal warning	Output active if the drive is in overheated state.	Motor thermal warning	Output active if the drive is in motor 12T count state.	Drive Ok	Output active if the drive is not in alarm or warning state.	STO	Output active if the drive is in STO state.	Position setpoint reached	Output active when the motor reaches the setpoint position, in positioning mode.	Multi-Drive cascade control	The output is controlled by the Multi-Drive function (see menu 3-6-21).	Default: Drive OK Min.: / Max.: /
	Function	Description																												
	Disabled	Output disabled.																												
	Rotating	Output active while motor is rotating. Input active with frequency greater than 0.5 [Hz].																												
	Mechanical brake	Output is active when the mechanical brake actuates. It must be selected for the "Mechanical Brake" function to be enabled." (see menu 3-4-5).																												
	Speed set reached	Output active when the motor reaches the setpoint speed.																												
	Direction	Output active when the motor rotates clockwise (CW) and inactive when it rotates counter clockwise (CCW).																												
	Alarm	Output active if the drive is in alarm state.																												
	Warning	Output active if the drive is in warning state.																												
	Drive thermal warning	Output active if the drive is in overheated state.																												
	Motor thermal warning	Output active if the drive is in motor 12T count state.																												
	Drive Ok	Output active if the drive is not in alarm or warning state.																												
	STO	Output active if the drive is in STO state.																												
	Position setpoint reached	Output active when the motor reaches the setpoint position, in positioning mode.																												
Multi-Drive cascade control	The output is controlled by the Multi-Drive function (see menu 3-6-21).																													
3-4-3-2 Relay 2 function [c]	Defines the function of relay output 2. See function 3-4-3-1.	Default: Rotating																												
		Min.: /																												
		Max.: /																												
3-4-3-3 Relay 3 function [c]	Defines the function of relay output 3. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabled																												
		Min.: /																												
		Max.: /																												

Parameter	Description	Setting
3-4-3-4 Relay 4 function [c]	Defines the function of relay output 4. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-3-5 Relay 5 function [c]	Defines the function of relay output 5. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-3-6 Relay 6 function [c]	Defines the function of relay output 6. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-3-7 Relay 7 function [c]	Defines the function of relay output 7. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-3-8 Relay 8 function [c]	Defines the function of relay output 8. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-3-9 Switch on delay [c]	Setting of the delay time for activation of the relay [sec].	Default: 0.5
		Min.: 0.0 [sec]
		Max.: 10.0 [sec]
3-4-3-10 Switch off delay [c]	Setting of the delay time for deactivation of the relay [sec].	Default: 0.5
		Min.: 0.0 [sec]
		Max.: 10.0 [sec]

Parameter	Description	Setting
3-4-3-11 Digital output 1 function [c]	Defines the function of digital output 1. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabled
		Min.: /
		Max.: /
3-4-3-12 Digital output 2 function [c]	Defines the function of digital output 2. See function 3-4-3-1. Parameter visible with IO "FX-I/O-A" or "FX-I/O-C" expander board connected.	Default: Disabilitata
		Min.: /
		Max.: /

Section 3-4-4: Analog outputs

The analog outputs enable the monitoring of the Inverter.

Four different process values can be assigned to the analog output.

The choice of the value to assign is made with two digital inputs.

For this purpose, program the digital inputs function on "Sel AN output Bit0" or "Sel AN output Bit01".

Active Selection	Sel AN output Bit1	Sel AN output Bit0
Analog Output function 1	0	0
Analog Output function 2	0	1
Analog Output function 3	1	0
Analog Output function 4	1	1

If no inputs are selected then the function expressed in par. 3-4-4-1 "Function 1 analog output 1" is assigned to the analog output.

The type of analog output 1 selected in par. 3-4-4-5 must be in line with the type of output hardware selection made through the DIP-Switches present on the board next to the signal terminal block.

0-20 mA / 4-20 mA (Default)
DIP1 OFF – DIP2 OFF

0-10 V
DIP1 OFF – DIP2 ON

0-100 kHz
DIP1 ON – DIP2 OFF

Parameter	Description	Setting	
3-4-4-1 Analog output 1 function 1 [c]	Defines function 1 of analog output 1.	Default: Speed	
	Function	Description	
	Disabled	Output disabled	
	Speed	The output value will be proportional to the speed at which the motor is running (if par. 3-2-3-1 = "Both": Min. = par. 3-2-3-4; Max. = par. 3-2-3-4; If par. 3-2-3-1 = "CW" or "CCW": Min. = par. 3-2-3-3; Max. = par. 3-2-3-4).	Min.: /
	Current	The output value will be proportional to the pass-through current on the motor (Min. = 0 A; Max. = par. 3-2-3-2).	
	DC-Link voltage	The output value will be proportional to the DC-Link voltage (Min. = 0 V; Max. = 1000 V).	Max.: /
	Estimated torque	The output value will be proportional to the estimated torque of the motor shaft (Min. = 0 Nm; Max. = par. 3-2-3-5).	
	Mechanical power	The output value will be proportional to the mechanical power of the motor shaft (Min. = 0 kW; Max. = par. 3-2-1-3 + 50%).	
	PID Setpoint	The output value will be proportional to the active process PID Setpoint (Min. = 3-6-12; Max. = par. 3-6-11).	
	PID Feedback	The output value will be proportional to the process PID Setpoint (Min. = 3-6-12; Max. = par. 3-6-11).	
	Analog Input 1	The output value will be proportional to the analog input 1. The output range depends on the selection (0-10V, +-10V)	
	Analog Input 2	The output value will be proportional to the analog input 2. The output range depends on the selection (0-10V, +-10V)	
	Analog Input 3	The output value will be proportional to the analog input 3. The output range depends on the selection (0-10V, +-10V)	
	Speed Setpoint	The output value will be proportional to the Speed setpoint (if par. 3-2-3-1 = "Both": Min = - par. 3-2-3-1 = "CW" or "CCW": Min. = par. 3-2-3-3; Max. = par. 3-2-3-4).	
	Torque Setpoint	The output value is proportional to the torque setpoint when this mode is active (Min. = 0 Nm; Max. = par. 3-2-3-5).	
	Actual pos. setpoint	The output value is proportional to the actual position setpoint when the positioning function is active. (Min. = par. 3-7-2-7; Max. = par. 3-7-2-6).	
	Actual position	The output value is proportional to the actual position when the positioning function is active. (Min. = par. 3-7-2-7; Max. = par. 3-7-2-6).	
+10V / 20mA	The output value is the max available value (+10V or 20mA)		

Parameter	Description	Setting										
3-4-4-2 Analog output 1 function 2 [c]	Defines function 2 of analog output 1. See function 3-4-4-1.	Default: Current										
		Min.: /										
		Max.: /										
3-4-4-3 Analog output 1 function 3 [c]	Defines function 3 of analog output 1. See function 3-4-4-1.	Default: Mechanical power										
		Min.: /										
		Max.: /										
3-4-4-4 Analog output 1 function 4 [c]	Defines function 4 of analog output 1. See function 3-4-4-1.	Default: Estimated torque										
		Min.: /										
		Max.: /										
3-4-4-5 Analog output 1 type [c]	Defines the type of analog output 1. The configuration of this parameter must be in line with the type of output hardware selection made through the DIP-Switches present on the board next to the signal terminal block.											
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-10 V</td> <td>0 [%] = 0 [V]; 100 [%] = 10 [V] DIP1 OFF – DIP2 ON.</td> </tr> <tr> <td>4-20 mA</td> <td>0 [%] = 4 [mA]; 100 [%] = 20 [mA] DIP1 OFF – DIP2 OFF.</td> </tr> <tr> <td>0-20 mA</td> <td>0 [%] = 0 [mA]; 100 [%] = 20 [mA] DIP1 OFF – DIP2 OFF.</td> </tr> <tr> <td>0-100 kHz</td> <td>0 [%] = 0 [kHz]; 100 [%] = 100 [kHz] DIP1 ON – DIP2 OFF.</td> </tr> </tbody> </table>		Function	Description	0-10 V	0 [%] = 0 [V]; 100 [%] = 10 [V] DIP1 OFF – DIP2 ON.	4-20 mA	0 [%] = 4 [mA]; 100 [%] = 20 [mA] DIP1 OFF – DIP2 OFF.	0-20 mA	0 [%] = 0 [mA]; 100 [%] = 20 [mA] DIP1 OFF – DIP2 OFF.	0-100 kHz	0 [%] = 0 [kHz]; 100 [%] = 100 [kHz] DIP1 ON – DIP2 OFF.
	Function	Description										
	0-10 V	0 [%] = 0 [V]; 100 [%] = 10 [V] DIP1 OFF – DIP2 ON.										
	4-20 mA	0 [%] = 4 [mA]; 100 [%] = 20 [mA] DIP1 OFF – DIP2 OFF.										
	0-20 mA	0 [%] = 0 [mA]; 100 [%] = 20 [mA] DIP1 OFF – DIP2 OFF.										
0-100 kHz	0 [%] = 0 [kHz]; 100 [%] = 100 [kHz] DIP1 ON – DIP2 OFF.											
Default: 0-20 mA												
Min.: /												
Max.: /												

Parameter	Description	Setting								
3-4-4-8 Analog output 2 function 1 [c]	Defines function 1 of analog output 2. See function 3-4-4-1. Parameter visible with IO "FX-I/O-A" expander board connected.	Default: Speed								
		Min.: /								
		Max.: /								
3-4-4-9 Analog output 2 function 2 [c]	Defines function 2 of analog output 2. See function 3-4-4-1. Parameter visible with IO "FX-I/O-A" expander board connected.	Default: Current								
		Min.: /								
		Max.: /								
3-4-4-10 Analog output 2 function 3 [c]	Defines function 3 of analog output 2. See function 3-4-4-1. Parameter visible with IO "FX-I/O-A" expander board connected.	Default: Mechanical power								
		Min.: /								
		Max.: /								
3-4-4-11 Analog output 2 function 4 [c]	Defines function 4 of analog output 2. See function 3-4-4-1. Parameter visible with IO "FX-I/O-A" expander board connected.	Default: Estimated torque								
		Min.: /								
		Max.: /								
3-4-4-12 Analog output 2 type [c]	Defines the type of analog output 2.									
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0-10 V</td> <td>0 [%] = 0 [V] ; 100 [%] = 10 [V].</td> </tr> <tr> <td>0-20 mA</td> <td>0 [%] = 0 [mA] ; 100 [%] = 20 [mA].</td> </tr> <tr> <td>4-20 mA</td> <td>0 [%] = 4 [mA] ; 100 [%] = 20 [mA].</td> </tr> </tbody> </table>		Function	Description	0-10 V	0 [%] = 0 [V] ; 100 [%] = 10 [V].	0-20 mA	0 [%] = 0 [mA] ; 100 [%] = 20 [mA].	4-20 mA	0 [%] = 4 [mA] ; 100 [%] = 20 [mA].
	Function	Description								
	0-10 V	0 [%] = 0 [V] ; 100 [%] = 10 [V].								
	0-20 mA	0 [%] = 0 [mA] ; 100 [%] = 20 [mA].								
4-20 mA	0 [%] = 4 [mA] ; 100 [%] = 20 [mA].									
Parameter visible with IO "FX-I/O-A" expander board connected.										
Default: 0-20 mA										
Min.: /										
Max.: /										

Section 3-4-5: Mechanical brake

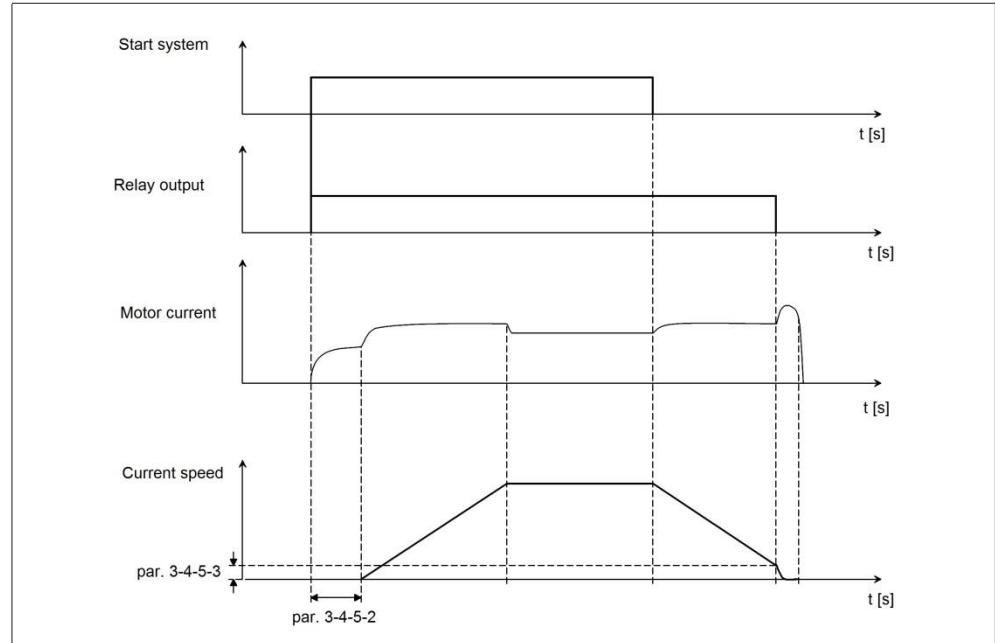
Parameters for controlling the engage/disengage commands for the motor's built-in static brake (if installed).

It is enabled via parameter 3-4-5-1.

Operating logic:

Engage sequence: at each enabling (run), the drive commands the brake to engage immediately, but enables the speed control with a delay equal to the time set in parameter 3-4-5-2 "Mechanical brake engage time". This parameter must be set with a slightly longer time than the brake's mechanical engage time.

Disengage sequence: at each disabling of the drive, the motor is slowed down to zero rotations. Once the speed set in parameter 3-4-5-3 "Brake activation speed" is reached, the brake is commanded to disengage and the drive disables immediately. The "Static brake" function is not applicable in applications that require the motor to support the load upon disengaging the mechanical brake.

Figure 8: Mechanical brake


Parameter	Description	Setting						
3-4-5-1 Mechanical brake application [c]	Selection of the type of mechanical brake.	Default: Off						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Functions disabled</td> </tr> <tr> <td>Static brake</td> <td>Type of brake to use for application where the brake is not required to support the load when disengaged.</td> </tr> </tbody> </table>	Function	Description	Off	Functions disabled	Static brake	Type of brake to use for application where the brake is not required to support the load when disengaged.	Min.: /
	Function	Description						
Off	Functions disabled							
Static brake	Type of brake to use for application where the brake is not required to support the load when disengaged.							
		Max.: /						
3-4-5-2 Open time mechanical brake [c]	Setting of the mechanical brake engage time.	Default: 1.0 [sec] Min.: 0.0 [sec] Max.: 30.0 [sec]						
3-4-5-3 Activate brake speed [c]	Setting of the activation speed for the mechanical brake. The unit of measurement depends on the setting in parameter 3-1-1: [Hz] or [rpm].	Default: 0.0 [Hz] Min.: 0.0 [Hz] 0.0 [rpm] Max.: par. 3-2-3-4						

Section 3-5: References

Figure 9: Diagram of the method for calculating the speed reference

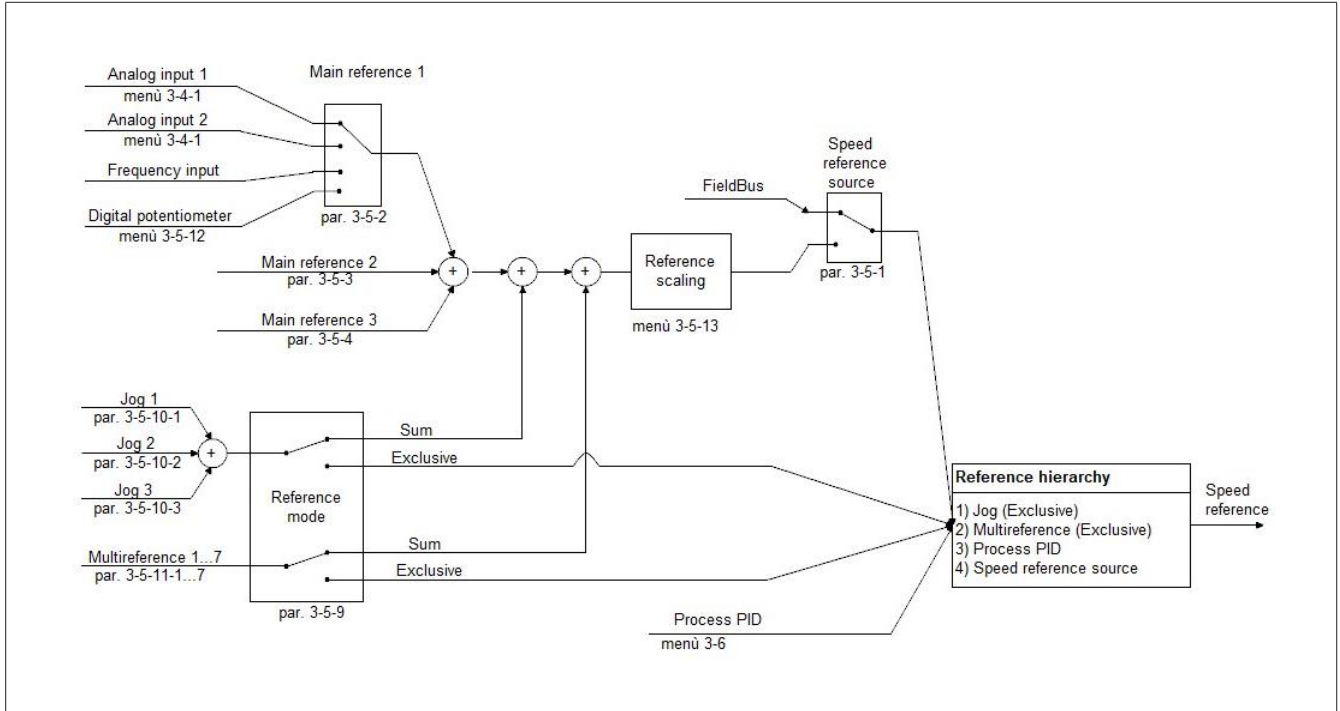
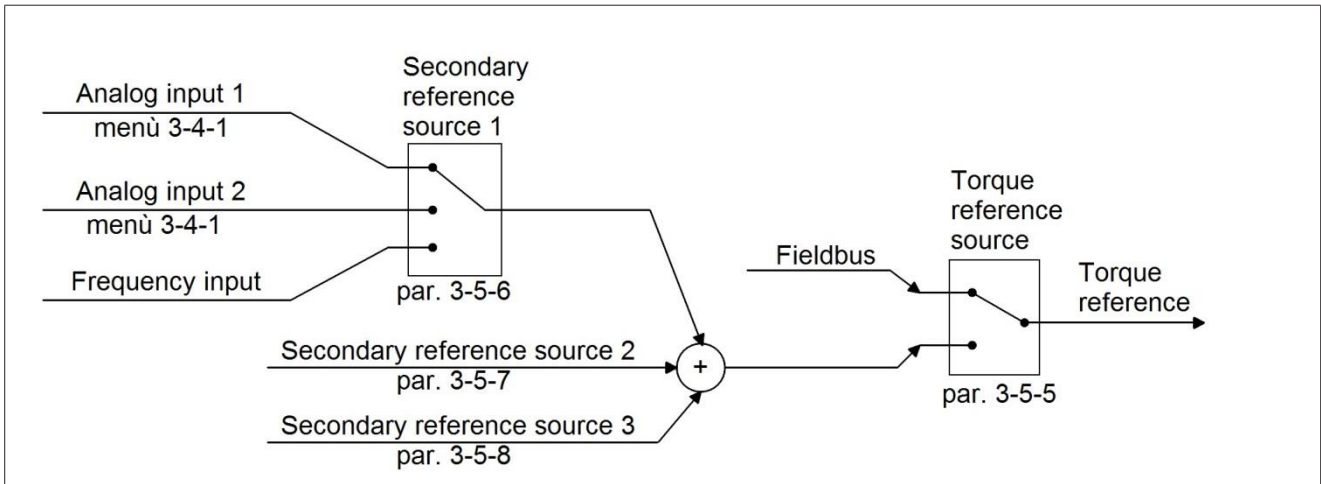


Figure 10: Diagram of the method for calculating the torque reference



The diagrams above show the possible sources of the speed and torque references in "AUTO" operating mode.

Parameter	Description	Setting														
3-5-1 Speed reference source [c]	Selection of the source for the speed reference:	Default: Primary reference														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Primary reference</td> <td>The setpoint is calculated by adding the setpoints of parameters 3-5-2, 3-5-3, 3-5-4 and the MultiReference and JOG setpoints. If the reference combination mode (parameter 3-5-9) is set on "Exclusive", the JOG and Multistep references impose their setpoint on the reference.</td> </tr> <tr> <td>Fieldbus</td> <td>The setpoint is received from fieldbus communication.</td> </tr> </tbody> </table>	Function	Description	Primary reference	The setpoint is calculated by adding the setpoints of parameters 3-5-2, 3-5-3, 3-5-4 and the MultiReference and JOG setpoints. If the reference combination mode (parameter 3-5-9) is set on "Exclusive", the JOG and Multistep references impose their setpoint on the reference.	Fieldbus	The setpoint is received from fieldbus communication.	Min.: / Max.: /								
	Function	Description														
Primary reference	The setpoint is calculated by adding the setpoints of parameters 3-5-2, 3-5-3, 3-5-4 and the MultiReference and JOG setpoints. If the reference combination mode (parameter 3-5-9) is set on "Exclusive", the JOG and Multistep references impose their setpoint on the reference.															
Fieldbus	The setpoint is received from fieldbus communication.															
3-5-2 Main reference 1 [c]	Selection of the first source for the primary reference. It is added to the sources selected in par. 3-5-3 and par.3-5-4.	Default: Analog input +1														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>No function</td> <td>Does not contribute to the calculation of the setpoint.</td> </tr> <tr> <td>Analog input 1</td> <td>Contributes with a value proportional to the percentage calculated from analog 1. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% e 10 V = 100%).</td> </tr> <tr> <td>Analog input 2</td> <td>Contributes with a value proportional to the percentage calculated from analog 2. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% e 10 V = 100%).</td> </tr> <tr> <td>Analog input 3</td> <td>Contributes with a value proportional to the percentage calculated from analog 3. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% e 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.</td> </tr> <tr> <td>Frequency input</td> <td>Contributes with a value that is proportional to the frequency input.</td> </tr> <tr> <td>Digital potentiometer</td> <td>Contributes with a value that is calculated by the "Digital potentiometer" function (par. 3-5-11-1 to 3-5-11-3).</td> </tr> </tbody> </table>	Function	Description	No function	Does not contribute to the calculation of the setpoint.	Analog input 1	Contributes with a value proportional to the percentage calculated from analog 1. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% e 10 V = 100%).	Analog input 2	Contributes with a value proportional to the percentage calculated from analog 2. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% e 10 V = 100%).	Analog input 3	Contributes with a value proportional to the percentage calculated from analog 3. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% e 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.	Frequency input	Contributes with a value that is proportional to the frequency input.	Digital potentiometer	Contributes with a value that is calculated by the "Digital potentiometer" function (par. 3-5-11-1 to 3-5-11-3).	Min.: / Max.: /
	Function	Description														
	No function	Does not contribute to the calculation of the setpoint.														
	Analog input 1	Contributes with a value proportional to the percentage calculated from analog 1. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% e 10 V = 100%).														
	Analog input 2	Contributes with a value proportional to the percentage calculated from analog 2. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% e 10 V = 100%).														
	Analog input 3	Contributes with a value proportional to the percentage calculated from analog 3. (Min. = 0% = par. 3-2-3-3; Max. = 100% = par. 3-2-3-4). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% e 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.														
Frequency input	Contributes with a value that is proportional to the frequency input.															
Digital potentiometer	Contributes with a value that is calculated by the "Digital potentiometer" function (par. 3-5-11-1 to 3-5-11-3).															
3-5-3 Main reference 2 [c]	Selection of the second source for the primary reference. It is added to the sources selected in par. 3-5-2 and par. 3-5-4. See function par. 3-5-2.	Default: No function														
		Min.: /														
		Max.: /														

Parameter	Description	Setting													
3-5-4 Main reference 3 [c]	Selection of the third source for the primary reference. It is added to the sources selected in par. 3-5-2 and par.3-5-3. See function par. 3-5-2.	Default: No function													
		Min.: / Max.: /													
3-5-5 Torque reference source [c]	Selects the source for the torque reference:														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Secondary reference</td> <td>Setpoint viene is calculated by adding the parameters 3-5-6, 3-5-7, 3-5-8 setpoints.</td> </tr> <tr> <td>FieldBus</td> <td>The setpoint is received by Field Bus communication.</td> </tr> </tbody> </table>	Function	Description	Secondary reference	Setpoint viene is calculated by adding the parameters 3-5-6, 3-5-7, 3-5-8 setpoints.	FieldBus	The setpoint is received by Field Bus communication.	Default: Secondary reference							
	Function	Description													
Secondary reference	Setpoint viene is calculated by adding the parameters 3-5-6, 3-5-7, 3-5-8 setpoints.														
FieldBus	The setpoint is received by Field Bus communication.														
Min.: / Max.: /															
3-5-6 Secondary reference 1 [c]	First source for the secondary reference. It is added to the sources selected in par. 3-5-7 and 3-5-8.														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>No function</td> <td>Does not contribute to the calculation of the setpoint.</td> </tr> <tr> <td>Analog input 1</td> <td>Contributes with a value proportional to the percentage calculated from analog 1. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).</td> </tr> <tr> <td>Analog input 2</td> <td>Contributes with a value proportional to the percentage calculated from analog 2. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).</td> </tr> <tr> <td>Analog input 3</td> <td>Contributes with a value proportional to the percentage calculated from analog 3. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.</td> </tr> <tr> <td>Frequency input</td> <td>Contributes with a value that is proportional to the frequency input.</td> </tr> </tbody> </table>		Function	Description	No function	Does not contribute to the calculation of the setpoint.	Analog input 1	Contributes with a value proportional to the percentage calculated from analog 1. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).	Analog input 2	Contributes with a value proportional to the percentage calculated from analog 2. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).	Analog input 3	Contributes with a value proportional to the percentage calculated from analog 3. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.	Frequency input	Contributes with a value that is proportional to the frequency input.	Default: No function
	Function	Description													
	No function	Does not contribute to the calculation of the setpoint.													
	Analog input 1	Contributes with a value proportional to the percentage calculated from analog 1. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).													
	Analog input 2	Contributes with a value proportional to the percentage calculated from analog 2. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).													
Analog input 3	Contributes with a value proportional to the percentage calculated from analog 3. (Min. = 0% = par. 3-2-3-12; Max. = 100% = par. 3-2-3-13). The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.														
Frequency input	Contributes with a value that is proportional to the frequency input.														
Min.: /	Max.: /														
3-5-7 Secondary Reference 2 [c]	Second source for the secondary reference. It is added to the sources selected in par. 3-5-6 and par.3-5-8. See function par. 3-5-6.														
	Default: No function														
	Min.: / Max.: /														

Parameter	Description	Setting						
3-5-8 Secondary reference 3 [c]	Third source for the secondary reference. It is added to the sources selected in par. 3-5-7 and par.3-5-8. See function par. 3-5-6.	Default: No function						
		Min.: /						
		Max.: /						
3-5-9 Reference mode [c]	Parameter for setting the reference combination mode:							
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Sum</td> <td>The “Primary reference”, “JOG” and “Multistep” references are added together.</td> </tr> <tr> <td>Exclusive</td> <td>The speed reference is calculated according to the following hierarchy: - JOG - Multireference - Primary reference</td> </tr> </tbody> </table>		Function	Description	Sum	The “Primary reference”, “JOG” and “Multistep” references are added together.	Exclusive	The speed reference is calculated according to the following hierarchy: - JOG - Multireference - Primary reference
	Function	Description						
	Sum	The “Primary reference”, “JOG” and “Multistep” references are added together.						
Exclusive	The speed reference is calculated according to the following hierarchy: - JOG - Multireference - Primary reference							
Default: Exclusive								
Min.: /								
		Max.: /						

Section 3-5-10: JOG

If both the JOG and Multireference functions are set then the JOG function prevails over the Multireferences.

If several JOGs are activated they will be added together.

Parameter	Description	Setting
3-5-10-1 JOG 1 [c]	Fixed speed 1 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it configure a digital input Din as Jog1.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4
3-5-10-2 JOG 2 [c]	Fixed speed 2 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-2). To enable it configure a digital input Din as Jog2.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4
3-5-10-3 JOG 3 [c]	Fixed speed 3 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-2). To enable it configure a digital input Din as Jog3.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4

Section 3-5-11: MultiReference

To select the various Multireferences configure 3 digital inputs respectively as “MultiReference Bit0”, “MultiReference Bit1” and “MultiReference Bit2”. The selection is made according to the table below:

Active selection	Multireference Bit2	Multireference Bit1	Multireference Bit0
Null	0	0	0
MultiReference 1	0	0	1
MultiReference 2	0	1	0
MultiReference 3	0	1	1
MultiReference 4	1	0	0
MultiReference 5	1	0	1
MultiReference 6	1	1	0
MultiReference 7	1	1	1

If both the JOG and MultiReference functions are set via the relevant parameters such as “Exclusive” then the JOG function prevails over the MultiReferences.

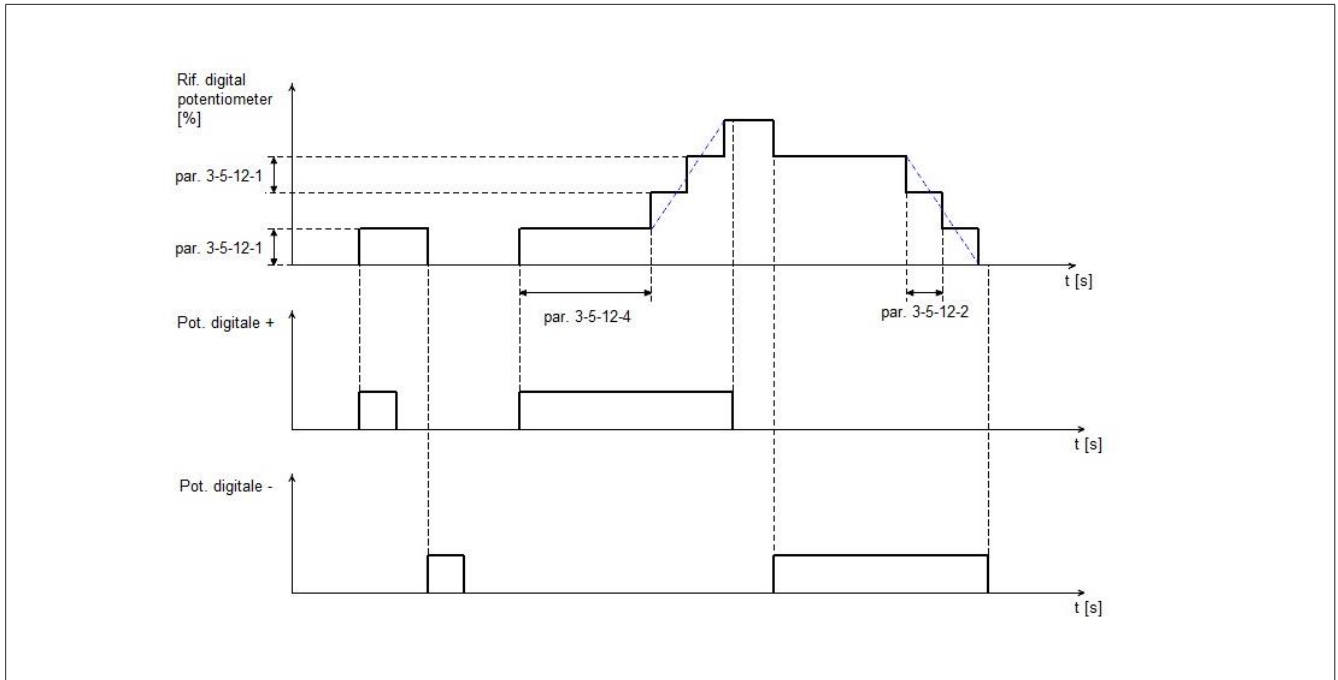
Parameter	Description	Setting
3-5-11-1 MultiReference 1 [c]	Digital reference 1 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it, configure “MultiReference Bit0/1/2” on 3 Din inputs.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4
3-5-11-2 MultiReference 2 [c]	Digital reference 2 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it, configure “MultiReference Bit0/1/2” on 3 Din inputs.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4
3-5-11-3 MultiReference 3 [c]	Digital reference 3 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it, configure “MultiReference Bit0/1/2” on 3 Din inputs.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4
3-5-11-4 MultiReference 4 [c]	Digital reference 4 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it, configure “MultiReference Bit0/1/2” on 3 Din inputs.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4
3-5-11-5 MultiReference 5 [c]	Digital reference 5 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it, configure “MultiReference Bit0/1/2” on 3 Din inputs.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4

Parameter	Description	Setting
3-5-11-6 MultiReference 6 [c]	Digital reference 6 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it, configure "MultiReference Bit0/1/2" on 3 Din inputs.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4
3-5-11-7 MultiReference 7 [c]	Digital reference 7 expressed in [Hz] or [rpm] (according to the setting in par. 3-1-1). To enable it, configure "MultiReference Bit0/1/2" on 3 Din inputs.	Default: 0.0 [Hz]
		Min.: par. 3-2-3-4
		Max.: par. 3-2-3-4

Section 3-5-12: Digital potentiometer

To use the “Digital potentiometer” function it is necessary to set two digital inputs in the “Digital pot. +” and “Digital pot. -” functions and set a source of the primary reference (par. 3-4-5-2 to 3-4-5-4) as “Digital potentiometer”. The operation is explained in the figure below:

Figure 11: Digital potentiometer



Parameter	Description	Setting						
3-5-12-1 Step [c]	Instantaneous increment or decrement percentage of the reference upon activation of the “Digital pot.+” or “Digital pot.-” inputs. If the input is maintained active for a minimum of 3 [sec], the reference increments with the percentage given by the ratio between parameters 3-5-12-1 and 3-5-12-2.	Default: 0.1 [%]						
		Min.: 0.1 [%]						
		Max.: 100.0 [%]						
3-5-12-2 Time to step [c]	If the increment/decrement of the digital potentiometer is maintained active for a minimum of 3 [sec], this parameter defines the time interval with which the reference will be incremented/decremented by the percentage set in 3-5-12-1.	Default: 0.1 [sec]						
		Min.: 0.1 [sec]						
		Max.: 120.0 [sec]						
3-5-12-3 Save reference at shutdown [c]	Enables the resetting of the “Digital potentiometer” when the drive is energised.							
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>When switched on the reference of the “Digital potentiometer” will equal 0 [%].</td> </tr> <tr> <td>On</td> <td>When switched on the reference of the “Digital potentiometer” will equal the value of the reference before it was switched off.</td> </tr> </tbody> </table>		Function	Description	Off	When switched on the reference of the “Digital potentiometer” will equal 0 [%].	On	When switched on the reference of the “Digital potentiometer” will equal the value of the reference before it was switched off.
	Function	Description						
	Off	When switched on the reference of the “Digital potentiometer” will equal 0 [%].						
On	When switched on the reference of the “Digital potentiometer” will equal the value of the reference before it was switched off.							
		Default: Off						
		Min.: /						
		Max.: /						

Parameter	Description	Setting						
3-5-12-4 Delay before ramp-setpoint [c]	It defines the time that input "Digital Pot. +" or "Digital Pot. -" must be kept pressed before the reference start its variation with the defined ramp.	Default: 3.0 [s]						
		Min.: 0.0 [s]						
		Max.: 10.0 [s]						
3-5-12-5 Working range [c]	It defines the working range for this function <table border="1" data-bbox="403 454 1224 719"> <thead> <tr> <th>Funzione</th> <th>Descrizione</th> </tr> </thead> <tbody> <tr> <td>Bidirectional</td> <td>The reference is modified between the min. and the max. speed limit.</td> </tr> <tr> <td>Unidirectional</td> <td>The reference is modified between the max. speed limit and zero.</td> </tr> </tbody> </table>	Funzione	Descrizione	Bidirectional	The reference is modified between the min. and the max. speed limit.	Unidirectional	The reference is modified between the max. speed limit and zero.	Default: Bidirectional
	Funzione	Descrizione						
	Bidirectional	The reference is modified between the min. and the max. speed limit.						
	Unidirectional	The reference is modified between the max. speed limit and zero.						
		Min.: /						
		Max.: /						
	This parameter is visible only if parameter 3-2-3-1 "Allowed motor direction" is set to "Both".							

Section 3-5-13: Reference scaling

Function that enables the configuration of an analog input as speed reference gain.

Scaling factor = % source par. 3-5-13-2.

Multiply : Scaling factor > 50.0%

$$\text{Gain} = 1 + (\text{Reference scaling gain} - 1) \times \frac{\text{Scaling factor} - 50.0}{50.0}$$

Divide: Scaling factor ≤ 50.0%

$$\text{Gain} = \frac{1}{1 + (\text{Reference scaling gain} - 1) \times \frac{(50.0 - \text{Scaling factor})}{50.0}}$$

Real speed = speed reference x gain

EXAMPLE:

▪Multiply
 speed reference = 750 rpm
 3-5-13-2 = Analog input 2
 3-5-13-3 = 2.0
 Analog input 2 = 6 V = 60%

$$\text{Gain} = 1 + (2.0 - 1) \times \frac{(60.0 - 50.0)}{50.0} = 1.2$$

Real speed = 750 [rpm] x 1.2 = 900 [rpm]

▪Divide
 speed reference = 750 rpm
 3-5-13-2 = Analog input 2
 3-5-13-3 = 2.0
 Analog input 2 = 4 V = 40%

$$\text{Gain} = \frac{1}{1 + (2.0 - 1) \times \frac{(50.0 - 40.0)}{50.0}} = 0.83$$

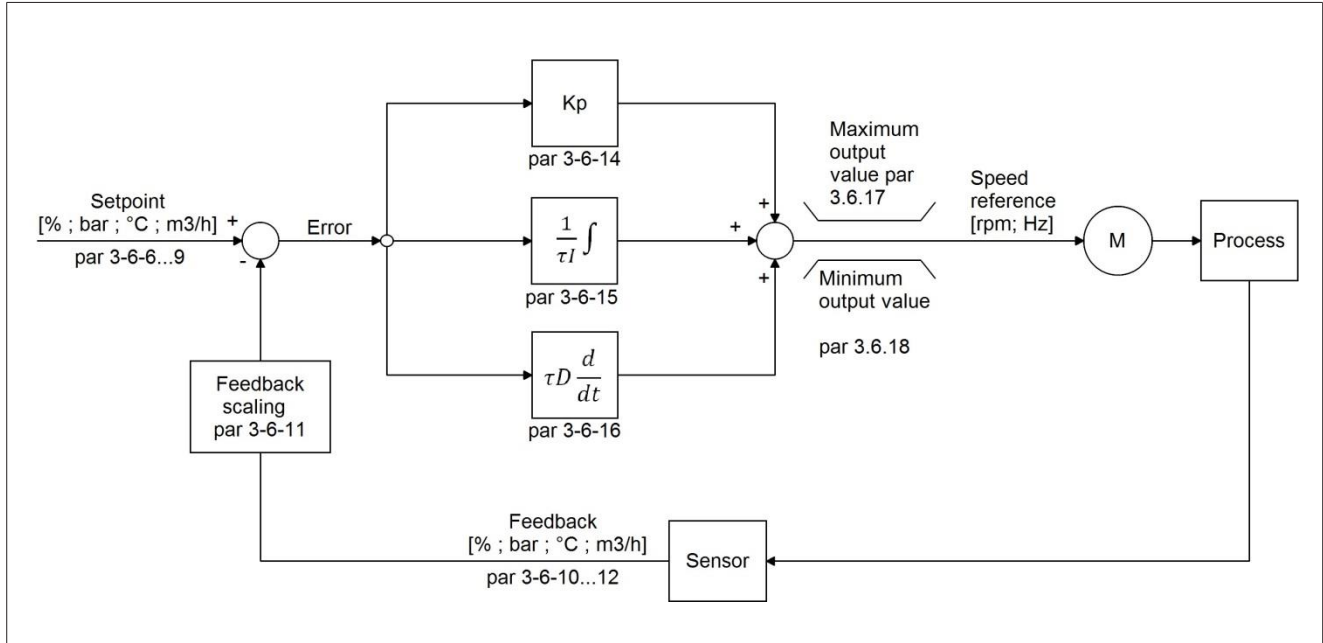
Real speed = 750 [rpm] x 0.83 = 622.5 [rpm]

Parameter	Description	Setting												
3-5-13-1 Reference scaling enable [c]	Enabling of the “Speed reference scaling” function.	Default: Off												
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>“Speed reference scaling” function disabled.</td> </tr> <tr> <td>On</td> <td>“Speed reference scaling” function enabled.</td> </tr> </tbody> </table>	Function	Description	Off	“Speed reference scaling” function disabled.	On	“Speed reference scaling” function enabled.	Min.: /						
	Function	Description												
Off	“Speed reference scaling” function disabled.													
On	“Speed reference scaling” function enabled.													
		Max.: /												
3-5-13-2 Scaling percentage source [c]	Selection of the source of the scaling percentage.	Default: No function												
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>No function</td> <td>No source selected.</td> </tr> <tr> <td>Analog input 1</td> <td>Contributes with a value proportional to the percentage calculated from analog 1. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).</td> </tr> <tr> <td>Analog input 2</td> <td>Contributes with a value proportional to the percentage calculated from analog 2. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).</td> </tr> <tr> <td>Analog input 3</td> <td>Contributes with a value proportional to the percentage calculated from analog 3. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO “FX-I/O-A” expander board connected.</td> </tr> <tr> <td>Frequency input</td> <td>Contributes with a value that is proportional to the frequency input (Min = 0 [kHz] = 0 [%], Max. = 100 [kHz] = 100%).</td> </tr> </tbody> </table>	Function	Description	No function	No source selected.	Analog input 1	Contributes with a value proportional to the percentage calculated from analog 1. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).	Analog input 2	Contributes with a value proportional to the percentage calculated from analog 2. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).	Analog input 3	Contributes with a value proportional to the percentage calculated from analog 3. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO “FX-I/O-A” expander board connected.	Frequency input	Contributes with a value that is proportional to the frequency input (Min = 0 [kHz] = 0 [%], Max. = 100 [kHz] = 100%).	Min.: /
	Function	Description												
	No function	No source selected.												
	Analog input 1	Contributes with a value proportional to the percentage calculated from analog 1. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).												
Analog input 2	Contributes with a value proportional to the percentage calculated from analog 2. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).													
Analog input 3	Contributes with a value proportional to the percentage calculated from analog 3. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO “FX-I/O-A” expander board connected.													
Frequency input	Contributes with a value that is proportional to the frequency input (Min = 0 [kHz] = 0 [%], Max. = 100 [kHz] = 100%).													
		Max.: /												
3-5-13-3 Reference scaling gain [c]	Setting of the full scale for the scaling.	Default: 2.00												
		Min.: 2.00												
		Max.: 20.00												

Section 3-6: Process PID

The drive has a built-in process PID that maintains the desired value by adjusting the output frequency of the drive when the load in the actuator varies.

Figure 12: Process PID



Parameter	Description	Setting
3-6-1 Process PID mode [c]	PID controller process mode:	
	Function	Description
	Off	PID controller disabled
	Positive correction	PID controller with positive input error (setpoint – feedback), increases speed.
	Negative correction	PID controller with positive input error (setpoint - feedback), reduces speed.
3-6-2 PID param unit [c]	Setting of the unit of measurement for the setpoint and feedback of the process PID controller.	
	Function	Description
	Pressure	Units of measurement available: - bar [%] - pounds per square inch [Psi] - kilo Pascal [kPa]
	Flow	Units of measurement available: - cubic metres per hour [m ³ /h] - litres per minute [l/min] - gallons per minute [gal/min]
	Temperature	Units of measurement available: - degrees Celsius [°C] - farad [F] - degrees Kelvin [K]

Parameter	Description	Setting														
3-6-3 Unit [c]	Setting of the physical quantity for the pressure:	Default: bar														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Bar</td> <td>bar</td> </tr> <tr> <td>Psi</td> <td>pounds per square inch</td> </tr> <tr> <td>kPa</td> <td>kilo Pascal</td> </tr> </tbody> </table>	Function	Description	Bar	bar	Psi	pounds per square inch	kPa	kilo Pascal	Min.: /						
	Function	Description														
	Bar	bar														
	Psi	pounds per square inch														
kPa	kilo Pascal															
	Parameter visible if par 3-6-2 is set on "Pressure".	Max.: /														
3-6-4 Flow unit [c]	Setting of the physical quantity for the flow rate:	Default: m ³ /h														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>m³/h</td> <td>cubic metres per hour</td> </tr> <tr> <td>l/min</td> <td>litres per minute</td> </tr> <tr> <td>gal/min</td> <td>gallons per minute</td> </tr> </tbody> </table>	Function	Description	m ³ /h	cubic metres per hour	l/min	litres per minute	gal/min	gallons per minute	Min.: /						
	Function	Description														
	m ³ /h	cubic metres per hour														
	l/min	litres per minute														
gal/min	gallons per minute															
	Parameter visible if par 3-6-2 is set on "Flow".	Max.: /														
3-6-5 Temperature unit [c]	Setting of the physical quantity for the temperature:	Default: °C														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>°C</td> <td>Celsius</td> </tr> <tr> <td>F</td> <td>Farad</td> </tr> <tr> <td>K</td> <td>Kelvin</td> </tr> </tbody> </table>	Function	Description	°C	Celsius	F	Farad	K	Kelvin	Min.: /						
	Function	Description														
	°C	Celsius														
	F	Farad														
K	Kelvin															
	Parameter visible if par 3-6-2 is set on "Temperature".	Max.: /														
3-6-6 PID setpoint source [c]	Select the source for the reference of the process PID:	Default: Manual														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Manual</td> <td>The setpoint is entered manually in parameter 3-6-7.</td> </tr> <tr> <td>Analog input 1</td> <td>The setpoint is acquired as a [%] of the value of analog input 1. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).</td> </tr> <tr> <td>Analog input 2</td> <td>The setpoint is acquired as a [%] of the value of analog input 2. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).</td> </tr> <tr> <td>Analog input 3</td> <td>The setpoint is acquired as a [%] of the value of analog input 3. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.</td> </tr> <tr> <td>Frequency input</td> <td>The setpoint is acquired from the frequency input.</td> </tr> <tr> <td>Remote</td> <td>The setpoint is acquired from fieldbus communication.</td> </tr> </tbody> </table>	Function	Description	Manual	The setpoint is entered manually in parameter 3-6-7.	Analog input 1	The setpoint is acquired as a [%] of the value of analog input 1. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).	Analog input 2	The setpoint is acquired as a [%] of the value of analog input 2. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).	Analog input 3	The setpoint is acquired as a [%] of the value of analog input 3. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.	Frequency input	The setpoint is acquired from the frequency input.	Remote	The setpoint is acquired from fieldbus communication.	Min.: /
	Function	Description														
	Manual	The setpoint is entered manually in parameter 3-6-7.														
	Analog input 1	The setpoint is acquired as a [%] of the value of analog input 1. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).														
	Analog input 2	The setpoint is acquired as a [%] of the value of analog input 2. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%).														
	Analog input 3	The setpoint is acquired as a [%] of the value of analog input 3. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-4 = 0-10 V, 0 V = 0% and 10 V = 100%). Parameter visible with IO "FX-I/O-A" expander board connected.														
	Frequency input	The setpoint is acquired from the frequency input.														
Remote	The setpoint is acquired from fieldbus communication.															
		Max.: /														

Section 3-6-7: Manual setpoint

In this section are contained the parameters to set the setpoint used in “Manual” mode of the process PID. It is possible to select the desired setpoint via digital inputs configured with the “PID Multireference Bit0/1/2” function. With digital input disabled or not configured the PID will work with the parameter 3-6-7-1 “Manual setpoint 1”; with at least an active output the process PID setpoint will be selected as in the table below.

To select the various Multireference, setup 3 digital inputs respectively as “MultiReference Bit0”, “MultiReference Bit1” e “MultiReference Bit2”. The selection occurs as in the table below:

Active selection	PID Multireference Bit2	PID Multireference Bit1	PID Multireference Bit0
Manual setpoint 1	0	0	0
Manual setpoint 2	0	0	1
Manual setpoint 3	0	1	0
Manual setpoint 4	0	1	1
Manual setpoint 5	1	0	0
Manual setpoint 6	1	0	1
Manual setpoint 7	1	1	0
Manual setpoint 8	1	1	1

Parameter	Description	Setting
3-6-7-1 Manual setpoint 1 [c]	Manual setting of the process PID setpoint 1. Parameter visible if par. 3-6-6 is set to “Manual”. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%] Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C] Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
3-6-7-2 Manual setpoint 2 [c]	Manual setting of the process PID setpoint 2. Parameter visible if par. 3-6-6 is set to “Manual”. To enable it setup “PID MultiReference Bit0/1/2” on the Din inputs. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%] Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C] Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]

Parameter	Description	Setting
3-6-7-3 Manual setpoint 3 [c]	Manual setting of the process PID setpoint 3. Parameter visible if par. 3-6-6 is set to "Manual". To enable it setup "PID MultiReference Bit0/1/2" on the Din inputs. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
3-6-7-4 Manual setpoint 4 [c]	Manual setting of the process PID setpoint 4. Parameter visible if par. 3-6-6 is set to "Manual". To enable it setup "PID MultiReference Bit0/1/2" on the Din inputs. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
3-6-7-5 Manual setpoint 5 [c]	Manual setting of the process PID setpoint 5. Parameter visible if par. 3-6-6 is set to "Manual". To enable it setup "PID MultiReference Bit0/1/2" on the Din inputs. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
3-6-7-6 Manual setpoint 6 [c]	Manual setting of the process PID setpoint 6. Parameter visible if par. 3-6-6 is set to "Manual". To enable it setup "PID MultiReference Bit0/1/2" on the Din inputs. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]

Parameter	Description	Setting
3-6-7-7 Manual setpoint 7 [c]	Manual setting of the process PID setpoint 7. Parameter visible if par. 3-6-6 is set to "Manual". To enable it setup "PID MultiReference Bit0/1/2" on the Din inputs. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
3-6-7-8 Manual setpoint 8 [c]	Manual setting of the process PID setpoint 8. Parameter visible if par. 3-6-6 is set to "Manual". To enable it setup "PID MultiReference Bit0/1/2" on the Din inputs. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
3-6-8 Maximum setpoint value [c]	Parameter for setting the maximum value of the analog setpoint. Parameter visible if par. 3-6-6 is set at any setting but "Manual". The unit of measurement depends on par. 3-6-2.	Default: 100.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]
3-6-9 Minimum setpoint value [c]	Parameter for setting the minimum value of the analog setpoint. Parameter visible if par. 3-6-6 is set at any setting but "Manual". The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]

Parameter	Description	Setting	
3-6-10 PID feedback source [c]	Select the source for the PID feedback:	Default: Analog input 2	
	Function	Description	
	Analog input 1	The setpoint is acquired as a [%] of the value of analog input 1. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).	Min.: /
	Analog input 2	The setpoint is acquired as a [%] of the value of analog input 2. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).	Max.: /
	Analog input 3	The setpoint is acquired as a [%] of the value of analog input 3. The percentage is calculated based on the type of analog used (e.i. par. 3-4-1-1 = 0-10 V, 0 V = 0% and 10 V = 100%).	
Frequency input	The setpoint is acquired from the frequency input.		
3-6-11 Maximum feedback value [c]	Parameter for setting the maximum value for the analog feedback. The unit of measurement depends on par. 3-6-2.	Default: 100.0 [%]	
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]	
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]	
3-6-12 Minimum feedback value [c]	Parameter for setting the minimum value for the analog feedback. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]	
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]	
		Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]	
3-6-13 PID feedback scaling [c]	Process feedback scaling factor. Examples: <ul style="list-style-type: none"> ▪ K Feedback = 1 “unit weight ”: the feedback corresponds to the setpoint. ▪ K Feedback = 0.5 “weight 0.5”: 100% feedback feeds back 50% of the setpoint. ▪ K Feedback = 5 “weight 5”: 20% feedback feeds back 100% of the setpoint. 	Default: 1.0	
		Min.: 0.0	
		Max.: 9999.0	

Parameter	Description	Setting
3-6-14 Proportional gain [c]	Proportional constant used by the process PID controller. The greater this value, the more reactive the controller. Values that are too high can, however, lead to oscillations in the system.	Default: 1.0
		Min.: 0.0
		Max.: 9999.0
3-6-15 Integral time [c]	Time constant, in seconds, associated to the PID's integral action. The integral action eliminates steady state error. The smaller this value the more reactive the controller. Values that are too low can lead to overshoot or oscillations in the system. If set at 0 the integral action is disabled.	Default: 1.0 [s]
		Min.: 0.0 [s]
		Max.: 9999.0 [s]
3-6-16 Derivative time [c]	Time constant, in seconds, associated to the PID's derivative action. It applies a correction proportional to the instantaneous error change. The smaller this value, the greater the correction. Values that are too low can amplify the noise on the transducer and affect system stability. If set at 0 the derivative action is disabled.	Default: 1.0 [s]
		Min.: 0.0 [s]
		Max.: 9999.0 [s]

Section 3-6-17: Maximum output value

In this section it is possible to set the process PID's maximum output value. This value will be set in parameter 3-6-17-2 in the case that the parameter 3-6-17-1 is set to "Manual", while it will be calculate in the same way of speed reference (refer to section 3-5 fig.9) if the parameter 3-6-17-1 is set to "Speed reference"

Parameter	Description	Setting						
3-6-17-1 Maximum output reference source [c]	Parameter for the setting of the output reference maximum value source.	Default: Manual						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Manual</td> <td>The maximum output reference value will be set in parameter 3-6-17-2</td> </tr> <tr> <td>Speed reference</td> <td>The maximum output reference value will be calculate in the same way of speed reference (refer to section 3-5 fig.9)</td> </tr> </tbody> </table>	Function	Description	Manual	The maximum output reference value will be set in parameter 3-6-17-2	Speed reference	The maximum output reference value will be calculate in the same way of speed reference (refer to section 3-5 fig.9)	Min.: /
	Function	Description						
Manual	The maximum output reference value will be set in parameter 3-6-17-2							
Speed reference	The maximum output reference value will be calculate in the same way of speed reference (refer to section 3-5 fig.9)							
		Max.: /						
3-6-17-2 Maximum output reference value [c]	Parameter for setting the maximum value of the output reference. The unit of measurement depends on par. 3-1-1.	Default: 50.0 [Hz]						
		Min.: Par. 3-6-18						
		Max.: Par. 3-2-3-4						

Section 3-6-18: Minimum output value

In this section it is possible to set the process PID's minimum output value. This value will be constant in the event that only the parameter 3-6-18-1 is set, while it will be variable in the event that also the parameter 3-6-18-2 is set to a value higher than "Minimum value 1". In this case the minimum value will be calculated according to the process PID setpoint following the formula below:

$$\text{Min. output value} = \text{Min. value 1} + \text{Actual Setpoint} * \frac{\text{Min. value 2} - \text{Min. value 1}}{\text{Max. Feedback value} - \text{Min Feedback value}}$$

Parameter	Description	Setting
3-6-18-1 Minimum value 1 [c]	Parameter for the setting of the output reference minimum value. The unit of measurement depends on par. 3-1-1.	Default: 0.0 [Hz]
		Min.: Par. 3-2-3-3
		Max.: Par. 3-6-17
3-6-18-2 Minimum value 2 [c]	Parameter for the setting of the output reference minimum value. The unit of measurement depends on par. 3-1-1.	Default: 0.0 [Hz]
		Min.: Par. 3-2-3-3
		Max.: Par. 3-6-17

Section 3-6-19: PID congruence control

This function disables the drive if the feedback of the process PID can't reach the expected setpoint.
Used to highlight any system faults.

Parameter	Description	Setting
3-6-19-1 Congruence Time [c]	Time for PID congruence detection [sec]. If after this time the feedback of the process PID has not reached the value set in parameter 3-6-19-2 and/or the error between Setpoint and Feedback is higher than the value set in parameter 3-6-19-3, the inverter trips alarm A21 "Process PID Congruence". If set at 0 the "PID congruence control" is disabled.	Default: 60 [sec]
		Min.: 0 [sec]
		Max.: 300 [sec]
3-6-19-2 PID minimum feedback value [c]	Minimum value that Feedback of the Process PID must reach during operation. If it is not reached within the time set in 3-6-19-1 the inverter stops with alarm A21. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: par. 3-6-11
3-6-19-3 Delta Feedback threshold [c]	Maximum allowed error value between Setpoint and Feedback of the Process PID during operation. If the error is higher than value set in this parameter for the time set in 3-6-19-1 the inverter stops with alarm A21. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.: par. 3-6-11

Section 3-6-20: Standby

This function disables the drive if the process PID controls a frequency that is lower than the output value set in par. 3-6-20-3 for a time set in par. 3-6-20-1. The drive disables and displays the warning W14 “Process PID standby”.

The inverter is enabled again when the feedback value drops below the setpoint by a percentage set in par. 3-6-20-2.

Parameter	Description	Setting
3-6-20-1 Standby time [c]	Standby function activation time [sec]. If after this time the PID is working at the minimum set frequency, the inverter signals warning W14 “Standby” and resets the speed reference. If set at 0 the function is disabled.	Default: 10 [sec]
		Min.: 0 [sec]
		Max.: 300 [sec]
3-6-20-2 Standby hysteresis [c]	Hysteresis value to exit the standby state. When the difference between the setpoint and the feedback exceeds the value indicated in this parameter, the drive resumes normal operation. The unit of measurement depends on par. 3-6-2.	Default: 0.0 [%]
		Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]
		Max.:
		par. 3-6-11

Section 3-6-20-3: Stand-by speed

In this section it is possible to set the frequency value from whence the stand-by condition intervention's count starts. With the only parameter 3-6-20-3-1 set, that frequency value results fixed, while it will be variable according to the process PID setpoint, when 3-6-20-3-2 is set to a value superior than “Stand-by speed 2”, following the formula below:

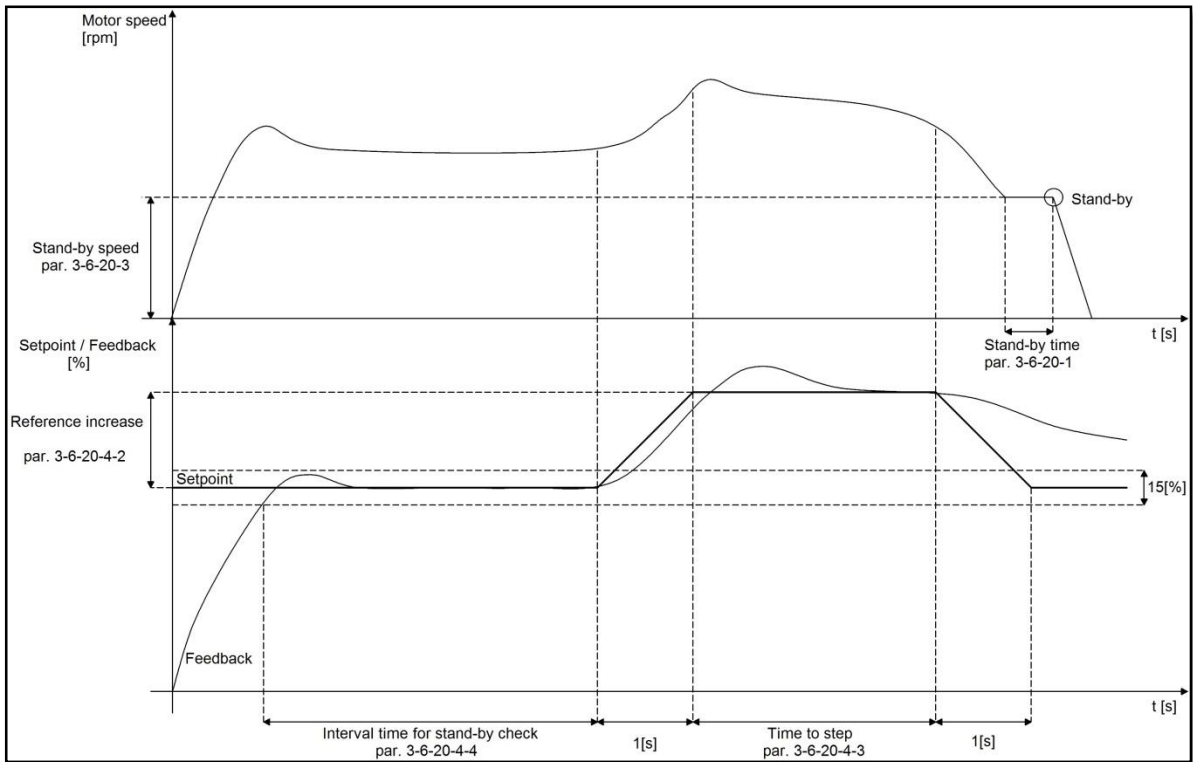
$$\text{Standby speed} = \text{Standby speed 1} + \text{Actual setpoint} * \frac{\text{Standby speed 2} - \text{Standby speed 1}}{\text{Maximum feedback value} - \text{Minimum feedback value}}$$

In the event that both values are null, the frequency value will be the minimum active output value.

Parameter	Description	Setting
3-6-20-3-1 Velocità di stand-by 1 [c]	Parametro per l'impostazione della velocità 1 alla quale inizia il conteggio del “tempo di stand-by”. L'unità di misura dipende dal par. 3-1-1.	Default: 0.0 [Hz]
		Min.: Par. 3-6-18
		Max.: Par. 3-6-17
3-6-20-3-2 Velocità di stand-by 2 [c]	Parametro per l'impostazione della velocità 2 alla quale inizia il conteggio del “tempo di stand-by”. L'unità di misura dipende dal par. 3-1-1.	Default: 0.0 [Hz]
		Min.: Par. 3-6-18
		Max.: Par. 3-6-17

Section 3-6-20-4: Advanced Stand-by

The advanced Stand-by function allows the correct Stand-by condition recognition even in those conditions where the process PID is not able to discern the need to stop the inverter. Those conditions may occur when an output frequency variation doesn't correspond anymore to the feedback value variation we want to adjust.



Specifically, if the feedback actual value remains around the 15[%] of the setpoint for the time expressed in par. 3-6-20-4-4 "Interval time for Stand-by check", the drive will increase the setpoint of the value set in par. 3-6-20-4-2 "Delta reference" for the time expressed in par. 3-6-20-4-6 "Time for delta reference".

If at the end of the procedure the Stand-by conditions will occur the drive will be stopped, otherwise the procedure will be repeated after a time expressed in par. 3-6-20-4-4 "Interval time for Stand-by check".

Parameter	Description	Setting
3-6-20-4-1 Advanced Stand-by enabling [c]	Advanced Stand-by function enabling.	Default: Off
	Function	Description
	Off	Function disabled.
	On	The inverter makes a periodic variation of the working point, in order to discern the Stand-by condition.
		Min.: / Max.: /

Parameter	Description	Setting
-----------	-------------	---------

<p>3-6-20-4-2 Delta reference</p> <p>[c]</p>	<p>Parameter for the setting of the actual setpoint's periodic increase width.</p> <p>The unit of measurement depends on par. 3-6-2.</p>	<p>Default: 0.75 %</p> <p>Min.: 0.0 [%] -1.0 [bar] 0.0 [m³/h] -200 [°C]</p> <p>Max.: 10.0 [%] 99.9 [bar] 999.9 [m³/h] 35.0 [°C]</p>
<p>3-6-20-4-3 Time for delta reference</p> <p>[c]</p>	<p>Parameter for the setting of the time when the process PID applies the setpoint increase.</p>	<p>Default: 3.0s</p> <p>Min.: 1.0s</p> <p>Max.: 30.0s</p>
<p>3-6-20-4-4 Interval time for stand-by check</p> <p>[c]</p>	<p>Parameter for the setting of the time interval when the process PID will make the stand-by advanced control by applying the delta reference.</p>	<p>Default: 30.0s</p> <p>Min.: 10.0s</p> <p>Max.: 600.0s</p>

Section 3-6-21: Multi-drive

The Multi-Drive function enables control of several motors with a single “Master”. The switch to the next drive control in the system, if present, occurs if the drive modulation is already operating at the maximum value set in par. 3-6-17 and the error between process feedback and setpoint is above the threshold set in par. 3-6-21-5 for a time set in par. 3-6-21-6.

The waiting time is ignored if, once the maximum speed is reached, the error between setpoint and feedback is greater than parameter 3-6-21-7.

The switch back to the preceding drive control in the system, if present, occurs in a similar way when the drive modulation is operating at the minimum value set in par. 3-6-17 for a time defined in par. 3-6-21-8.

If the standby function is active on the drive at minimum speed, the drive will be stopped and the warning will be displayed.

Two operating modes are available:
“Master Control” and “Cascade Control”.

▪ Master Control

The “Master Control” operating mode involves the use of 2 or more FlexiMova drives, with a maximum of 6 drives in all, connected to each other through serial transmission.

The drives must be connected to each other via the RS485 ports located on the “FX-I/O-B” or “FX-I/O-C” expander boards that are configured for the “Multi-Drive” function (Dip switch “485SELECT” set at “ON”).

The drive hierarchy is defined in par. 3-6-21-2 (Master, Slave 1...5). The signals for the remote controls (setpoint source, feedback source and digital inputs) must be connected to the drive configured as “Master”.

Two types of redundancy are implemented:

- In the event of a “Master” drive fault, the drive configured as “Slave1 (secondary Master)” takes control of the system. Therefore the remote control signals and the main process PID parameters (setpoint/feedback source or constant and manual setpoints) should also be connected to this drive. If the “Master” drive resumes correct operation, after a re-synchronization procedure, it will take control of the system.
- The process PID feedback can be installed on any of the drives. In the event of a feedback fault connected to the “Master” drive, the reading is done by any operational sensor of the unit.

In this mode it is also possible to activate the “drive alternation” function to ensure uniform wear and tear of the system (Par. 3-6-21-4).

▪ Cascade Control

The “Cascade Control” mode involves the use of one FlexiMova drive and 1 or 2 fixed speed drives, connected to the dedicated terminals of the relay outputs on the multi-drive expander board.

In the “Cascade Control” mode it is necessary to set the number of relay-controlled motors for in-line start at Par. 3-6-21-3.

To activate this function the fixed speed motors must firstly be connected through the relays present on the “FX-I/O-C” expander board. Once the connection has been made set the number of “Slave” drives present in the system in parameter 3-6-21-3 for in-line start.

Parameter	Description	Setting														
3-6-21-1 Multi-drive mode [c]	Operating mode.	Default: Off														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Multi-Drive function disabled.</td> </tr> <tr> <td>Master control</td> <td>This mode involves the use of 2 or more FlexiMova drives, with a maximum of 6 drives in all, connected to each other through serial communication.</td> </tr> <tr> <td>Cascade control</td> <td>This mode involves the use of one FlexiMova drive and 1 or 2 fixed speed drives, connected to the dedicated terminals of the relay outputs on the multi-drive expander board.</td> </tr> </tbody> </table>	Function	Description	Off	Multi-Drive function disabled.	Master control	This mode involves the use of 2 or more FlexiMova drives, with a maximum of 6 drives in all, connected to each other through serial communication.	Cascade control	This mode involves the use of one FlexiMova drive and 1 or 2 fixed speed drives, connected to the dedicated terminals of the relay outputs on the multi-drive expander board.	Min.: / Max.: /						
	Function	Description														
	Off	Multi-Drive function disabled.														
Master control	This mode involves the use of 2 or more FlexiMova drives, with a maximum of 6 drives in all, connected to each other through serial communication.															
Cascade control	This mode involves the use of one FlexiMova drive and 1 or 2 fixed speed drives, connected to the dedicated terminals of the relay outputs on the multi-drive expander board.															
3-6-21-2 Drive address [c]	Drive address in the multi-drive communication in “Master Control” mode.	Default: Slave 1 (secondary master)														
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Master</td> <td>Master drive in the Multi-Drive communication.</td> </tr> <tr> <td>Slave 1 (secondary master)</td> <td>Slave drive in the Multi-Drive communication. If the event of a fault, the drive with the Slave 1 address becomes the master in the Multi-Drive communication to enable the unit to continue working. Redundancy of the cabling (if used) and the parameters between the “Master” drive and the “Slave1” drive is advisable.</td> </tr> <tr> <td>Slave 2</td> <td>Slave drive in the Multi-Drive communication.</td> </tr> <tr> <td>Slave 3</td> <td>Slave drive in the Multi-Drive communication.</td> </tr> <tr> <td>Slave 4</td> <td>Slave drive in the Multi-Drive communication.</td> </tr> <tr> <td>Slave 5</td> <td>Slave drive in the Multi-Drive communication.</td> </tr> </tbody> </table>	Function	Description	Master	Master drive in the Multi-Drive communication.	Slave 1 (secondary master)	Slave drive in the Multi-Drive communication. If the event of a fault, the drive with the Slave 1 address becomes the master in the Multi-Drive communication to enable the unit to continue working. Redundancy of the cabling (if used) and the parameters between the “Master” drive and the “Slave1” drive is advisable.	Slave 2	Slave drive in the Multi-Drive communication.	Slave 3	Slave drive in the Multi-Drive communication.	Slave 4	Slave drive in the Multi-Drive communication.	Slave 5	Slave drive in the Multi-Drive communication.	Min.: / Max.: /
	Function	Description														
	Master	Master drive in the Multi-Drive communication.														
	Slave 1 (secondary master)	Slave drive in the Multi-Drive communication. If the event of a fault, the drive with the Slave 1 address becomes the master in the Multi-Drive communication to enable the unit to continue working. Redundancy of the cabling (if used) and the parameters between the “Master” drive and the “Slave1” drive is advisable.														
	Slave 2	Slave drive in the Multi-Drive communication.														
	Slave 3	Slave drive in the Multi-Drive communication.														
	Slave 4	Slave drive in the Multi-Drive communication.														
Slave 5	Slave drive in the Multi-Drive communication.															
3-6-21-3 Number of connected slaves [c]	Number of drives connected in “Cascade Control” mode.	Default: 1														
		Min.: 1														
		Max.: 2														

Parameter	Description	Setting				
3-6-21-4 Enable drive alternation [c]	Parameter for enabling/disabling the alternation function in “Master Control” mode. This function consists in operating the drives in ascending order according to the number of hours that the motor works, enabling the drives to work the same amount of time, thereby increasing the life of the unit.	Default: 1				
		Min.: /				
		Max.: /				
		<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Function disabled. On request the drives that make up the unit will start according to the order of their addresses (Master, Slave1, Slave2...).</td> </tr> <tr> <td>On</td> <td>Function enabled.</td> </tr> </tbody> </table>	Function	Description	Off	Function disabled. On request the drives that make up the unit will start according to the order of their addresses (Master, Slave1, Slave2...).
Function	Description					
Off	Function disabled. On request the drives that make up the unit will start according to the order of their addresses (Master, Slave1, Slave2...).					
On	Function enabled.					
3-6-21-5 Error threshold for next start [c]	Error threshold (calculated as: setpoint - feedback) beyond which the count begins to start the next drive. The unit of measurement depends on par. 3-6-2.	Default: 1.0 [%]				
Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]						
Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]						
3-6-21-6 Delay before start [c]		Delay for the start of the next drive.	Default: 3.0 [sec]			
Min.: 0.0 [sec]						
Max.: 600 [sec]						
3-6-21-7 Error threshold for immediate start [c]	Error threshold (calculated as: setpoint - feedback) beyond which the next drive starts without delays. The unit of measurement depends on par. 3-6-2.	Default: 5.0 [%]				
Min.: 0.0 [%] -1.0 [bar] 0.0 [m ³ /h] -200 [°C]						
Max.: 100.0 [%] 999.9 [bar] 9999.9 [m ³ /h] 350.0 [°C]						
3-6-21-8 Delay before stop [c]		Delay for stopping the controlled drive [s]. The count starts the moment the drive reaches the minimum reference set in parameter 3-6-18 “Minimum output value”.	Default: 3.0 [sec]			
Min.: 0.0 [sec]						
Max.: 600 [sec]						

Section 3-7: Positioning controller

With “Positioning mode” (par. 3-7-1) enabled, the drive can control the motor in position control mode. This mode can be selected only if the motor control type is set to “Synchronous Reluctance Motor [SRM]”

It is necessary to define the permissible area for the movements in the “Positioning range” (par. 3-7-2-1) if limited by the physical nature of the structure (**Figure 13**) or unlimited, as in the case, for example, of conveyor belts, rotating axes, etc. (**Figure 14**).

Figure 13: Limited axis

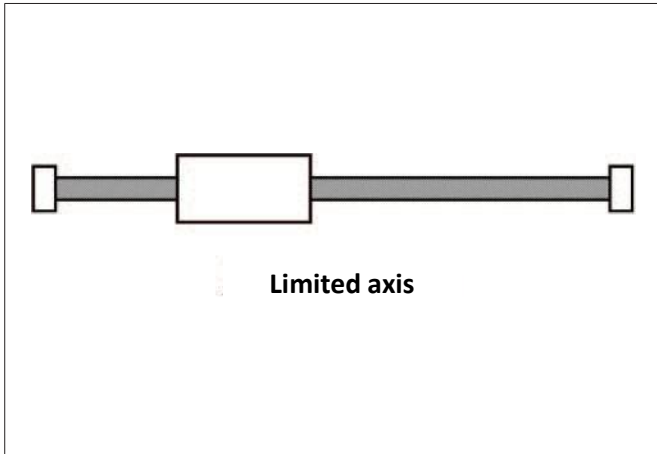
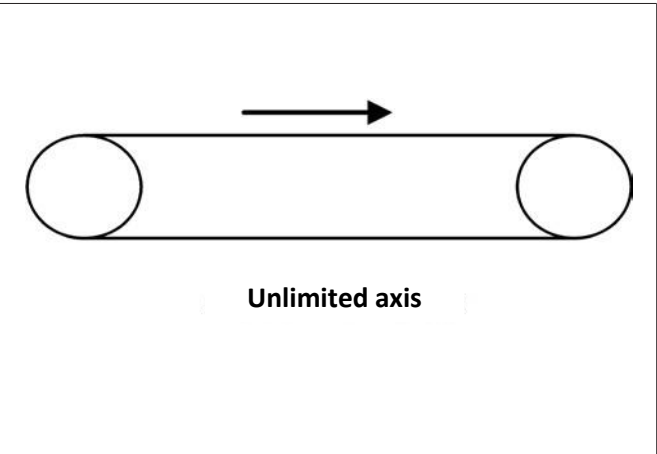


Figure 14: Unlimited axis

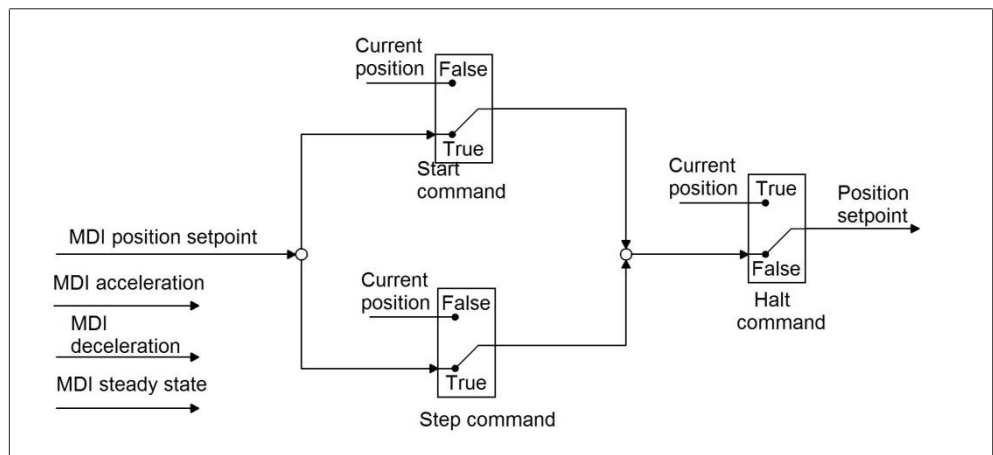


To control the position it is necessary to acquire the HOME reference point (menu 3-7-3).

There are two possible modes of use:

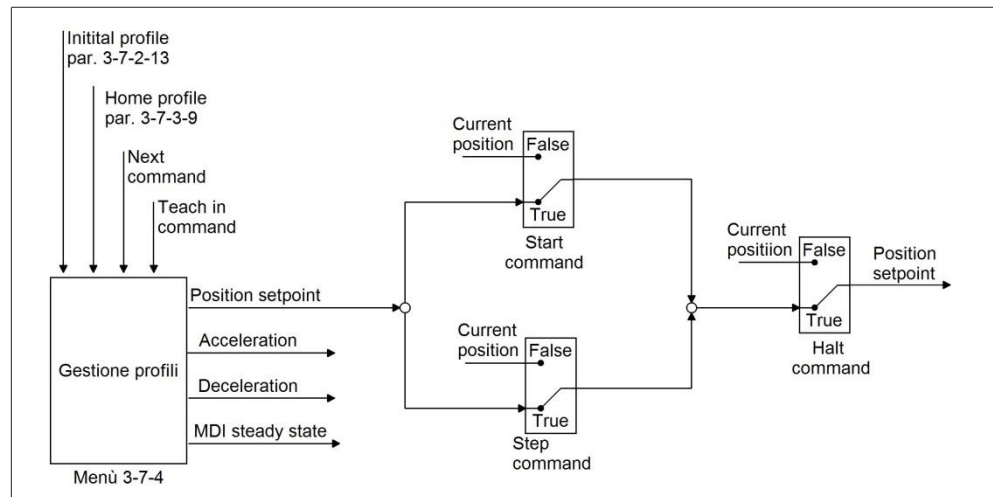
- MDI (Manual Data Input) submode:

Figure 15: Position reference - MDI submode



The positioning parameters (steady state speed, acceleration, deceleration, position to reach) are entered “manually” via Fieldbus in the case of PROFIDrive standard telegram 9 and if using the Reel-specific command word.

- Program submode:

Figure 16: Position reference - program submodule


The position to reach and the method for reaching it are described in a block of parameters that define a profile (menu 3-7-4). There are 8 profiles that can be memorised and it is possible to program positioning sequences by cascading several profiles. To execute a profile the commands from digital inputs “Posi commands...” are used or from Fieldbus only in the case of a PROFIDrive standard telegram 7 module.

The commands available to execute the positioning sequences are:



INFORMATION

The commands are active on the rising edge, with the exception of “Halt/Step”.

The commands are active on the rising edge, with the exception of “Halt/Step”.

- Posi Start: starts the positioning profile selected in Par. 3-7-2-12 “Initial profile selection”. The “Start” command, given during a positioning sequence, interrupts the sequence and restarts the profile from the beginning.
- Posi Step: in a chain of profiles, enables switching to the next profile without any interruptions to the profile in progress. Par. 3-7-4-x-8 “Activation mode” must be set in “Step command”.

If the positioner is not executing any sequences, the “Posi Step” command starts the profile that is currently selected, exactly like the “Posi Start” command.

Any “Wait” delays programmed between two successive profiles can be interrupted by the “Posi Step” command: the next programmed profile starts immediately.

If the positioning sequence is interrupted by a “Posi Halt” command or by the fact that the drive is disabled, it can be completed with the “Posi Step” command.

- Posi Next: in a chain of profiles, interrupts the profile in progress to execute the next profile in the chain. Par. 3-7-4-x-8 “Activation mode” must be set at “Next Command”.

- Posi Halt: interrupts the positioning sequence in progress. The profile can be completed with a “Step” command. The “Start” command, vice versa, re-starts the sequence from the beginning, starting with the selected profile.
- Quick stop: completes the current positioning with maximum deceleration.
- Posi Tip+/Posi Tip-: execute a manual movement of the motor at the speed set in par. 3-7-2-11 “Fixed speed” in a positive or negative direction. The ramp specified in menu 3-3-2 is used. This function is useful for shifting the axis manually.
 - If par. 3-7-2-11 “Fixed speed” is set at zero, as speed reference the main variable speed reference calculated according to the settings in menu 3-5 “References” is used.
 - The movement occurs as long as Tip+ or Tip- are active.
 - It is possible to activate control with Tip+ or Tip- if no profile is in progress and the positioner is in the HALTED state.

Start homing: starts the zero acquisition sequence (HOME). See menu 3-7-3.

- Teach in: the current position is saved in the selected profile through par. 3-7-2-12 “Initial profile selection ” 1\o Fieldbus, as position setpoint.

Halt/Step: combines the separate commands “Halt” and “Step” in a single input.

1 = Step

0 = Halt

Menu only visible in “SRM” control.

Parameter	Description		Setting
3-7-1 Positioning mode [c]	Parameter for selecting the type of positioning.		Default: Off
	Function	Description	Min.: /
	Off	Positioner function disabled.	Max.: /
	Sensorless	Positioning is executed using a calculated position as feedback.	

Section 3-7-2: Configuration

Parameter	Description	Setting								
3-7-2-1 Positioning range [c]	Positioning range:	Default: Limited								
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Limited</td> <td>It is necessary to set the limits in parameters 3-7-2-6 "Maximum limit", 3-7-2-7 "Minimum limit"; that describe the axis travel limits. The movement area can also be limited by the limit switches (programmable as digital inputs, in menu 3-4-2-1 "Digital input functions", "Posi limit switch +", "Posi limit switch -") functions.</td> </tr> <tr> <td>Unlimited</td> <td>There is no physical limit (rotary axis function). The current position value repeats cyclically after a gap which is set in par. 3-7-2-9 "Circular length".</td> </tr> </tbody> </table>	Function	Description	Limited	It is necessary to set the limits in parameters 3-7-2-6 "Maximum limit", 3-7-2-7 "Minimum limit"; that describe the axis travel limits. The movement area can also be limited by the limit switches (programmable as digital inputs, in menu 3-4-2-1 "Digital input functions", "Posi limit switch +", "Posi limit switch -") functions.	Unlimited	There is no physical limit (rotary axis function). The current position value repeats cyclically after a gap which is set in par. 3-7-2-9 "Circular length".	Min.: / Max.: /		
	Function	Description								
Limited	It is necessary to set the limits in parameters 3-7-2-6 "Maximum limit", 3-7-2-7 "Minimum limit"; that describe the axis travel limits. The movement area can also be limited by the limit switches (programmable as digital inputs, in menu 3-4-2-1 "Digital input functions", "Posi limit switch +", "Posi limit switch -") functions.									
Unlimited	There is no physical limit (rotary axis function). The current position value repeats cyclically after a gap which is set in par. 3-7-2-9 "Circular length".									
3-7-2-2 Move direction [c]	Selection of the permissible motion direction for unlimited positioning (par. 3-7-2-1 "Positioning range" set at "Unlimited").	Default: Both								
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Both</td> <td>The movement is permitted in both rotating directions.</td> </tr> <tr> <td>Positive</td> <td>The movement is only permitted in a negative direction (clockwise rotation of the motor axis - CW). A positive movement corresponds to an increment in the current position.</td> </tr> <tr> <td>Negative</td> <td>The movement is only permitted in a positive direction (counterclockwise rotation of the motor axis -CCW). A negative movement corresponds to a decrement in the current position.</td> </tr> </tbody> </table>	Function	Description	Both	The movement is permitted in both rotating directions.	Positive	The movement is only permitted in a negative direction (clockwise rotation of the motor axis - CW). A positive movement corresponds to an increment in the current position.	Negative	The movement is only permitted in a positive direction (counterclockwise rotation of the motor axis -CCW). A negative movement corresponds to a decrement in the current position.	Min.: / Max.: /
	Function	Description								
	Both	The movement is permitted in both rotating directions.								
Positive	The movement is only permitted in a negative direction (clockwise rotation of the motor axis - CW). A positive movement corresponds to an increment in the current position.									
Negative	The movement is only permitted in a positive direction (counterclockwise rotation of the motor axis -CCW). A negative movement corresponds to a decrement in the current position.									
3-7-2-3 Unit [c]	Unit of measurement to express positions:	Default: User unit								
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>User's unit</td> <td>The unit of measurement is chosen by the user.</td> </tr> <tr> <td>Millimetres [mm]</td> <td>Unit of measurement for linear positions.</td> </tr> <tr> <td>Degrees [deg]</td> <td>Unit of measurement for angular positions.</td> </tr> </tbody> </table>	Function	Description	User's unit	The unit of measurement is chosen by the user.	Millimetres [mm]	Unit of measurement for linear positions.	Degrees [deg]	Unit of measurement for angular positions.	Min.: / Max.: /
	Function	Description								
	User's unit	The unit of measurement is chosen by the user.								
Millimetres [mm]	Unit of measurement for linear positions.									
Degrees [deg]	Unit of measurement for angular positions.									
3-7-2-4 Unit revolution numerator [c]	This is the numerator for the unit/rev p.u. It defines, together with parameter 3-7-2-5, the resolution for the position count. In one mechanical revolution of the motor, the actual position variable (par. 1-2-2-2) will adopt the value set in "Numerator revolution unit / Denominator revolution unit". The unit of measurement depends on par. 3-7-2-3 [unit/rev] or [mm/rev] or [deg/ rev].	Default: 1024 Min.: 0 [units/ rev] 0 [mm/ rev] 0 [deg/ rev] Max.: 16384 [units/rev] 16384 [mm/rev] 16384 [deg/rev]								

Parameter	Description	Setting
3-7-2-5 Unit revolution denominator [c]	This is the denominator of the unit/rev p.u.. It defines, together with parameter 3-7-2-4, the resolution for the position count.	Default: 1
		Min.: 0
		Max.: 16384
3-7-2-6 Maximum limit [c]	Upper limit of the settable position setpoint. The unit of measurement depends on par. 3-7-2-3 [units] or [mm] or [deg].	Default: 65000000 [units]
		Min.: par. 3-7-2-7
		Max.: 65000000 [units] 65000000 [mm] 65000000 [deg]
3-7-2-7 Minimum limit [c]	Lower limit of the settable position setpoint. The unit of measurement depends on par. 3-7-2-3 [units] or [mm] or [deg].	Default: -65000000 [units]
		Min.: -65000000 [units] -65000000 [mm] -65000000 [deg]
		Max.: par. 3-7-2-6
3-7-2-8 Circular length [c]	The position zeroes if it reaches this maximum position value in the event of unlimited positioning. The unit of measurement depends on par. 3-7-2-3 [units] or [mm] or [deg]. Parameter visible with par. 3-7-2-1 "Positioning range" set at "Unlimited".	Default: 10000 [units]
		Min.: 0 [units] 0 [mm] 0 [deg]
		Max.: 3200000 [units] 3200000 [mm] 3200000 [deg]
3-7-2-9 Target window [c]	Range within which the "position reached" message is given (Bit 6 of par. 1-2-2-3). The unit of measurement depends on par. 3-7-2-3 [units] or [mm] or [deg].	Default: 5 [units]
		Min.: 2 [units] 2 [mm] 2 [deg]
		Max.: 10000 [units] 10000 [mm] 10000 [deg]
3-7-2-10 K soft positioning [c]	This is the speed percentage, with respect to the one defined in the active profile, at which the position control acts during positioning to soften the approach to the position setpoint to be reached.	Default: 5.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]

Parameter	Description	Setting																				
3-7-2-11 Tip speed [c]	This is the fixed speed in Tip Mode, it is used when “Posi Tip+” or “Posi Tip-” are active. If set to zero the main speed reference is used as the Tip speed. The unit of measurement depends on parameter 3-1-1 “Unit of measurement selection”.	Default: 0.0 [Hz]																				
		Min.: 0.0 [Hz] 0 [rpm]																				
3-7-2-12 Initial profile selection [c]	Number of the profile that starts after the START command:																					
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Digital input</td> <td>The initial profile number is expressed as a binary number by the digital inputs set with the profile selection functions bit 0, 1, 2. Profiles 1 to 8 are allocated to the number expressed as a binary number from 0 to 7.</td> </tr> <tr> <td>Profile 1</td> <td>Profile 1 is executed.</td> </tr> <tr> <td>Profile 2</td> <td>Profile 2 is executed.</td> </tr> <tr> <td>Profile 3</td> <td>Profile 3 is executed.</td> </tr> <tr> <td>Profile 4</td> <td>Profile 4 is executed.</td> </tr> <tr> <td>Profile 5</td> <td>Profile 5 is executed.</td> </tr> <tr> <td>Profile 6</td> <td>Profile 6 is executed.</td> </tr> <tr> <td>Profile 7</td> <td>Profile 7 is executed.</td> </tr> <tr> <td>Profile 8</td> <td>Profile 8 is executed.</td> </tr> </tbody> </table>		Function	Description	Digital input	The initial profile number is expressed as a binary number by the digital inputs set with the profile selection functions bit 0, 1, 2. Profiles 1 to 8 are allocated to the number expressed as a binary number from 0 to 7.	Profile 1	Profile 1 is executed.	Profile 2	Profile 2 is executed.	Profile 3	Profile 3 is executed.	Profile 4	Profile 4 is executed.	Profile 5	Profile 5 is executed.	Profile 6	Profile 6 is executed.	Profile 7	Profile 7 is executed.	Profile 8	Profile 8 is executed.
	Function	Description																				
	Digital input	The initial profile number is expressed as a binary number by the digital inputs set with the profile selection functions bit 0, 1, 2. Profiles 1 to 8 are allocated to the number expressed as a binary number from 0 to 7.																				
	Profile 1	Profile 1 is executed.																				
	Profile 2	Profile 2 is executed.																				
	Profile 3	Profile 3 is executed.																				
	Profile 4	Profile 4 is executed.																				
	Profile 5	Profile 5 is executed.																				
	Profile 6	Profile 6 is executed.																				
Profile 7	Profile 7 is executed.																					
Profile 8	Profile 8 is executed.																					
Default: Profile 1																						
Min.: /																						
Max.: /																						

Section 3-7-3: Homing

In this section several modes for acquiring the reference point are defined and selected in par 3-7-3-3:

- Home switch:

This means that the zero position (HOME) is identified by the rising edge of the digital input by the “Posi home switch” function (see menu 3-4-2-1 “Digital input functions”). The position defined in parameter 3-7-3-5 “Home position” is loaded at this point.

The rising edge of this signal identifies the zero position: the rising edge concerned relates to the preset zero search direction (par. 3-7-3-8 “Homing start direction”).

Let's assume, for example, we have a positive direction, the following cases are possible:

Figure 17: Home switch - Positive homing start direction

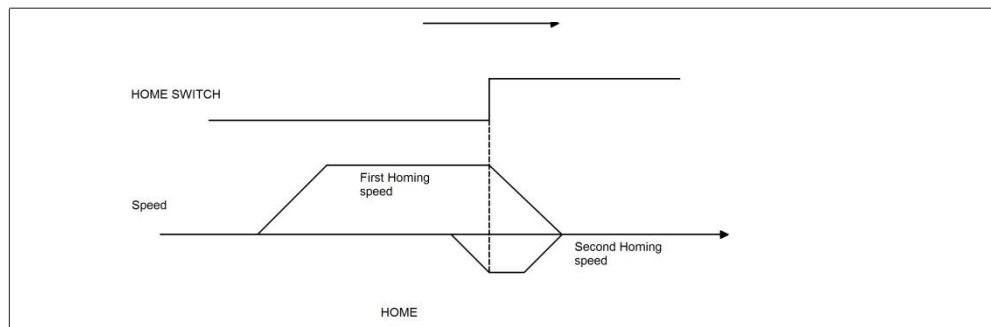
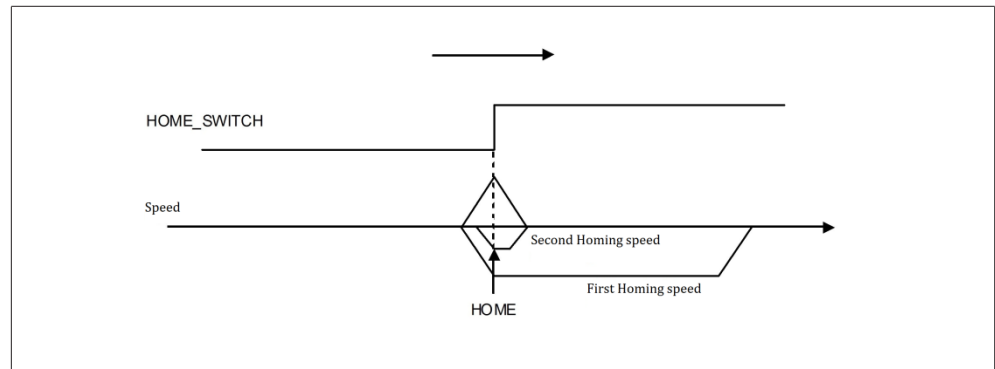
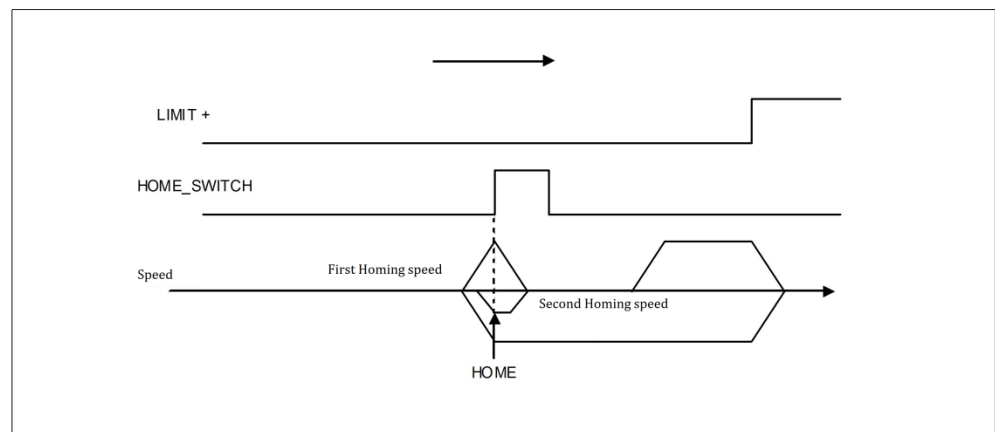


Figure 18: Home switch - Negative homing start direction


In the following case, with a microswitch, a HW limit switch at least is also necessary, connected to a digital input programmed with “Posi limit switch +” or “Posi limit switch -” function (see menu 3-4-2-1 “Digital input functions”) according to whether the search direction is positive or negative.

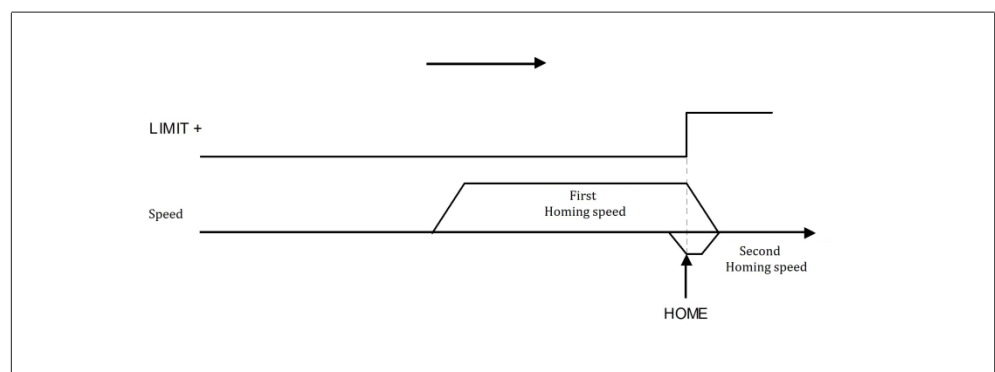
Figure 19: Home switch - Microswitch


- Limit switch:

This means that the zero position (HOME) is identified by the rising edge of a limit switch connected to a digital input programmed with the “Posi limit switch +” or “Posi limit switch -” function (see menu 3-4-2-1 “Digital input functions”).

When the limit switch DIN is reached the position defined by parameter 3-7-3-5 “Home position” is loaded.

Management is similar to the previous one:

Figure 20: Limit switch


The search mode that can be selected in the case of limited positioning (par. 3-7-2-1 “Positioning range” set at “Limited”).

- Mechanical stop:

This means that the zero position (HOME) is identified by a mechanical stop. When the end is reached the position setpoint in 3-7-3-5 “Home position” is loaded. For this type of search it is important to appropriately set parameter 3-7-3-4 “Mechanical stop current”.

- Define home:

The “Start homing” command ensures that the value defined in parameter 3-7-3-5 “Home position” is adopted as the current position.

The drive must in any case be enabled.

It is important to also define the direction of the reference search, given in parameter 3-7-3-8 “Homing start direction”, the coarse search speed par. 3-7-3-6 “First homing speed” and the fine speed par 3-7-3-7 “Second homing speed”.

Note that if an unlimited type movement (par.3-7-2-1 “Positioning range” set at “Unlimited”) is defined and only one motion direction (par. 3-7-2-2 “Motion direction” set on any other than “Both”) is permitted, the reference search is carried out in the permitted direction, whatever the parameter 3-7-3-8 “Homing start direction”, at the speed defined in par 3-7-3-7 “Second homing speed”.

Parameter	Description		Setting
3-7-3-1 Power-On Homing [c]	Activation mode for the zero acquisition procedure:		Default: Disabled
	Function	Description	Min.: /
	Disabled	Resetting only takes places manually with a “start homing” command via digital inputs or fieldbus.	Max.: /
	After start command	Resetting takes place after a START or STP command at the start.	
	After enabling	Resetting takes place automatically after the drive PWM has been enabled.	
3-7-3-2 Homing request mode [c]	Modes for requesting the zero acquisition procedure:		Default: Off
	Function	Description	Min.: /
	Off	The reset request only takes place manually with a “start homing” request via digital inputs or fieldbus.	Max.: /
	After disabling	The zero acquisition request takes place every time the drive is disabled.	

Parameter	Description	Setting	
3-7-3-3 Homing mode [c]	Modes for requesting the zero acquisition procedure:		
	Function	Description	
	Home switch	Mode for "Home switch" zero acquisition procedure.	
	Limit switch	Mode for "Limit switch" zero acquisition procedure.	
	Mechanical stop	Mode for "Mechanical stop" zero acquisition procedure.	
	Define home	Mode for "Define home" zero acquisition procedure.	
		Default: Home switch	
		Min.: /	
		Max.: /	
3-7-3-4 Mechanical block current [c]	The current limit for identifying the mechanical stop expressed in [A].		
			Default: 0.01 [A]
			Min.: 0.00 [A]
		Max.: par. 3-2-3-2	
3-7-3-5 Home position [c]	Value loaded as reference position after the acquisition of the home point. The unit of measurement depends on par. 3-7-2-3 [units] or [mm] or [deg].		
			Default: 0 [unità]
			Min.: par. 3-7-2-7
		Max.: par. 3-7-2-6	
3-7-3-6 Homing speed fast [c]	This is the speed for the first phase for the coarse search of the zero position. Parameter only valid and visible if par. 3-7-2-2 "Motion direction" is set at "Both". The unit of measurement depends on parameter 3-1-1 "Speed unit of measurement".		
			Default: 3.0 [Hz]
			Min.: 0.0 [Hz] 0 [rpm]
			Max.: par. 3-2-3-4
3-7-3-7 Homing speed slow [c]	The approaching speed to the zero position, for the fine acquisition. The unit of measurement depends on parameter 3-1-1 "Speed unit of measurement".		
			Default: 1.0 [Hz]
			Min.: 0.0 [Hz] 0 [rpm]
			Max.: par. 3-2-3-4
3-7-3-8 Homing start direction [c]	Direction to start searching for zero.		
	Function	Description	
	Digital input	The initial profile number is expressed as a binary number by the digital inputs set with the profile selection functions bit 0, 1, 2. Profiles 1 to 8 are allocated to the number expressed as a binary number from 0 to 7.	
	Profile 1	Unit of measurement for linear positions.	
		Default: Positive	
		Min.: /	
		Max.: /	

Parameter	Description	Setting				
3-7-3-9 Home profile [c]	Number of the profile that is automatically started after the reference acquisition step. It is useful for moving the system to the predefined position.	Default: Disabled				
	<table border="1"> <thead> <tr> <th data-bbox="403 324 544 362">Function</th> <th data-bbox="544 324 1230 362">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="403 362 544 465">Disabled</td> <td data-bbox="544 362 1230 465">No profile is executed. At the end of the procedure the drive remains halted waiting for a "Start" or "Step" command.</td> </tr> </tbody> </table>	Function	Description	Disabled	No profile is executed. At the end of the procedure the drive remains halted waiting for a "Start" or "Step" command.	Min.: /
	Function	Description				
	Disabled	No profile is executed. At the end of the procedure the drive remains halted waiting for a "Start" or "Step" command.				
	Profile 1	Executes profile 1 at the end of the homing procedure.	Max.: /			
	Profile 2	Executes profile 2 at the end of the homing procedure.				
	Profile 3	Executes profile 3 at the end of the homing procedure.				
	Profile 4	Executes profile 4 at the end of the homing procedure.				
	Profile 5	Executes profile 5 at the end of the homing procedure.				
	Profile 6	Executes profile 6 at the end of the homing procedure.				
Profile 7	Executes profile 7 at the end of the homing procedure.					
Profile 8	Executes profile 8 at the end of the homing procedure.					

Section 3-7-3-10: Continuous referencing

Function that enables the cyclical correction of the current position value with the value contained in parameter 3-7-3-10-4 “Switch position” at the rising edge of a digital input set with the “Posi Continuous ref. switch” function (see menu 3-4-2-1 “Digital input functions”).

To enable this function it is necessary to:

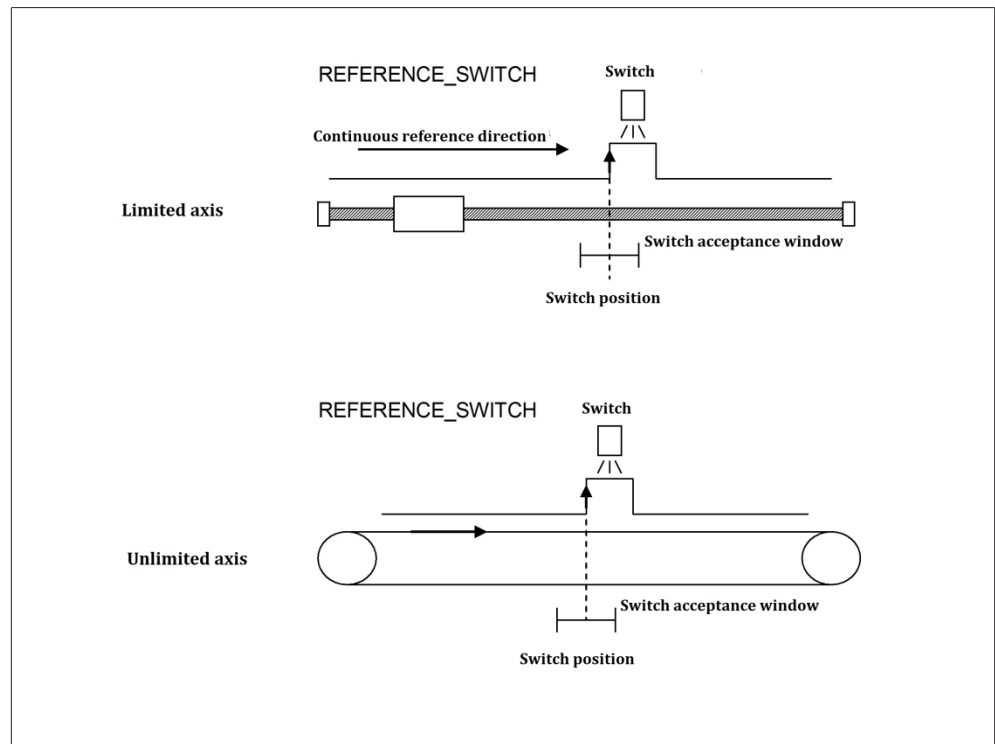
- program a digital input with the “Posi Continuous ref. switch” function;
- enable the function through parameter 3-7-3-10-1 “Enable continuous reference”;
- set parameter 3-7-3-10-4 “Switch position” with the desired real value to be loaded on the current position when “reference switch” DIN is reached.

In the case of a limited axis (par. 3-7-2-1 “Positioning range” set at “Unlimited”), it is important to also define the direction that you want the rising edge of the digital input to be intercepted; set this information in parameter 3-7-3-10-3 “Continuous reference direction”.

Define the permissible tolerance window in parameter 3-7-3-10-2 “Switch acceptance window”. If at the transition to the digital input, the value calculated by the positioner differs from the position set in par. 3-7-3-10-4 “Switch position” by a value that is greater than the parameter 3-7-3-10-2 “Switch acceptance window”, then alarm A23 “Position error out of range” is generated.

Keep in mind that the reference microswitch must be positioned approximately 1/2 way along the target position and in any case before the point at which the ramp stops when the position is reached.

Figure 21: Continuous referencing



Parameter	Description	Setting						
3-7-3-10-1 Continuous reference enable [c]	Enabling of the “Continuous referencing” function.	Default: Off						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>“Continuous reference” function disabled.</td> </tr> <tr> <td>On</td> <td>“Continuous reference” function enabled.</td> </tr> </tbody> </table>	Function	Description	Off	“Continuous reference” function disabled.	On	“Continuous reference” function enabled.	Min.: /
	Function	Description						
Off	“Continuous reference” function disabled.							
On	“Continuous reference” function enabled.							
		Max.: /						
3-7-3-10-2 Continuous reference window [c]	If at the rising edge of the digital input, programmed with “Posi continuous reference switch” function, the real position is beyond the range expressed by this parameter, then alarm A23 “Position error out of range” is generated. Unit of measurement depends on parameter 3-7-2-3 [units] or [mm] or [deg]. Parameter visible “Continuous reference” function enabled.	Default: 100 [units]						
		Min.: 0 [units] 0 [mm] 0 [deg]						
		Max.: 32000 [units] 32000 [mm] 32000 [deg]						
3-7-3-10-3 Continuous reference direction [c]	Direction in which the rising edge of the digital input is intercepted.	Default: Positive						
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Positive</td> <td>The rising edge of the digital input is intercepted during a positive movement. (CW rotation of the motor).</td> </tr> <tr> <td>Negative</td> <td>The rising edge of the digital input is intercepted during a negative movement. (CCW rotation of the motor).</td> </tr> </tbody> </table>	Function	Description	Positive	The rising edge of the digital input is intercepted during a positive movement. (CW rotation of the motor).	Negative	The rising edge of the digital input is intercepted during a negative movement. (CCW rotation of the motor).	Min.: /
	Function	Description						
Positive	The rising edge of the digital input is intercepted during a positive movement. (CW rotation of the motor).							
Negative	The rising edge of the digital input is intercepted during a negative movement. (CCW rotation of the motor).							
Parameter visible with par. 3-7-2-1 “Positioning range” set at “Limited” and “Continuous reference” function enabled.	Max.: /							
3-7-3-10-4 Continuous reference position [c]	The value of the position that is loaded as current position at the rising edge of the digital input programmed with the “Posi continuous reference switch” function. The unit of measurement depends on parameter 3-7-2-3 [units] or [mm] or [deg]. Parameter visible with “Continuous reference enabled”.	Default: 0 [units]						
		Min.: par. 3-7-2-7						
		Max.: par. 3-7-2-6						

Section 3-7-4: Profiles

8 memorisable profiles are available.

It is possible to program positioning sequences by cascading several profiles.

Section 3-7-4-x: Profile x (with “x” from 1 to 8)

Parameter	Description	Setting
3-7-4-x-1 Positioning mode [c]	Enabling of the “Continuous reference” function.	
	Function	Description
	Relative	The position entered in parameter 3-7-4-x-2 “Position setpoint” refers to the current position.
	Absolute	The position entered in parameter 3-7-4-x-2 “Position setpoint” refers to the absolute zero, determined during calibration.
	Positive continuous	Only speed control is executed; the axis always moves in a positive direction (CW).
Negative continuous	Only speed control is executed; the axis always moves in a negative direction (CCW).	
		Default: Relative
		Min.: /
		Max.: /
3-7-4-x-2 Position set [c]	Position setpoint to reach. Unit of measurement depends on parameter 3-7-2-3 [units] or [mm] or [deg].	
		Default: 0 [units]
		Min.: par. 3-7-2-7
		Max.: par. 3-7-2-6
3-7-4-x-3 Speed [c]	Positioning steady state speed in [Hz] or [rpm]. The unit of measurement depends on parameter 3-1-1 “Speed unit of measurement”.	
		Default: 0.0 [Hz]
		Min.: 0.0 [Hz] 0 [rpm]
		Max.: par. 3-2-3-4
3-7-4-x-4 Acceleration time [c]	Acceleration ramp time. The motor will employ the time expressed in this parameter to go from zero to the maximum speed expressed in the parameter 3-2-3-4 “Maximum motor speed”.	
		Default: 3.0 [sec]
		Min.: 0.0 [sec]
		Max.: 600 [sec]
3-7-4-x-5 Deceleration time [c]	Deceleration ramp time. The motor will employ the time expressed in this parameter to go from the maximum speed expressed in parameter 3-2-3-4 “Maximum motor speed” to zero.	
		Default: 3.0 [sec]
		Min.: 0.0 [sec]
		Max.: 600 [sec]
3-7-4-x-6 Number of repetitions [c]	Number of times that this profile is repeated. If set at 1 the profile will be executed twice. Parameter visible with par. 3-7-4-x-1 “Positioning mode” set at “Relative”.	
		Default: 0
		Min.: 0
		Max.: 16

Parameter	Description	Setting																					
3-7-4-x-7 Next profile [c]	Contains the number of the profile that must follow the current one to execute the chain of several profiles.	Default: None																					
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>The chain interrupts. The drive remains stopped in position.</td> </tr> <tr> <td>Profile 1</td> <td>The next profile in the chain will be profile 1.</td> </tr> <tr> <td>Profile 2</td> <td>The next profile in the chain will be profile 2.</td> </tr> <tr> <td>Profile 3</td> <td>The next profile in the chain will be profile 3.</td> </tr> <tr> <td>Profile 4</td> <td>The next profile in the chain will be profile 4.</td> </tr> <tr> <td>Profile 5</td> <td>The next profile in the chain will be profile 5.</td> </tr> <tr> <td>Profile 6</td> <td>The next profile in the chain will be profile 6.</td> </tr> <tr> <td>Profile 7</td> <td>The next profile in the chain will be profile 7.</td> </tr> <tr> <td>Profile 8</td> <td>The next profile in the chain will be profile 8.</td> </tr> </tbody> </table>		Function	Description	None	The chain interrupts. The drive remains stopped in position.	Profile 1	The next profile in the chain will be profile 1.	Profile 2	The next profile in the chain will be profile 2.	Profile 3	The next profile in the chain will be profile 3.	Profile 4	The next profile in the chain will be profile 4.	Profile 5	The next profile in the chain will be profile 5.	Profile 6	The next profile in the chain will be profile 6.	Profile 7	The next profile in the chain will be profile 7.	Profile 8	The next profile in the chain will be profile 8.	Min.: /
	Function	Description																					
	None	The chain interrupts. The drive remains stopped in position.																					
	Profile 1	The next profile in the chain will be profile 1.																					
	Profile 2	The next profile in the chain will be profile 2.																					
	Profile 3	The next profile in the chain will be profile 3.																					
	Profile 4	The next profile in the chain will be profile 4.																					
	Profile 5	The next profile in the chain will be profile 5.																					
	Profile 6	The next profile in the chain will be profile 6.																					
Profile 7	The next profile in the chain will be profile 7.																						
Profile 8	The next profile in the chain will be profile 8.																						
		Max.: /																					
3-7-4-x-8 Start mode [c]	Contains the number of the profile that must follow the current one to execute the chain of several profiles.	Default: Step command																					
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Step command</td> <td>Execution of the next profile is activated by the "Step" command.</td> </tr> <tr> <td>Delay</td> <td>Execution of the next profile is activated after a delay from the end of the execution of the current profile, set in parameter 3-7-4-x-9 "Delay next profile".</td> </tr> <tr> <td>Next command</td> <td>Execution of the next profile is activated by the "Next" command.</td> </tr> </tbody> </table>		Function	Description	Step command	Execution of the next profile is activated by the "Step" command.	Delay	Execution of the next profile is activated after a delay from the end of the execution of the current profile, set in parameter 3-7-4-x-9 "Delay next profile".	Next command	Execution of the next profile is activated by the "Next" command.	Min.: /												
	Function	Description																					
	Step command	Execution of the next profile is activated by the "Step" command.																					
	Delay	Execution of the next profile is activated after a delay from the end of the execution of the current profile, set in parameter 3-7-4-x-9 "Delay next profile".																					
Next command	Execution of the next profile is activated by the "Next" command.																						
Parameter visible with par. 3-7-4-x-7 "Next profile" with a setting other than "None".		Max.: /																					
3-7-4-x-9 Next profile delay [c]	Defines the delay in the activation of the next profile in [sec]. Parameter visible with par. 3-7-4-x-8 "Activation mode" set at "Delay".	Default: 0.0 [sec]																					
			Min.: 0.0 [sec]																				
			Max.: 600 [sec]																				

Section 3-8: Fieldbus

Section 3-8-1: ModBus

Parameter	Description	Setting						
3-8-1-1 Slave address [c]	Parameter for setting the Modbus communication baud rate. Parameter expressed in [bit/s].	Default: 246						
		Min.: 1						
		Max.: 246						
3-8-1-2 Baud rate [c]	Parameter for setting the Modbus communication baud rate. Parameter expressed in [bit/s].	Default: 115200						
		Min.: 9600						
		Max.: 115200						
3-8-1-3 Enable timeout alarm [c]	Parameter for enabling the modbus communication timeout alarm. <table border="1" data-bbox="408 837 1225 1025"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>No alarms are triggered.</td> </tr> <tr> <td>On</td> <td>If in the time set in par. 3-8-1-4 no exchange of information occurs on the modbus line the drive will stop and signal "A21".</td> </tr> </tbody> </table>	Function	Description	Off	No alarms are triggered.	On	If in the time set in par. 3-8-1-4 no exchange of information occurs on the modbus line the drive will stop and signal "A21".	Default: 0
		Function	Description					
		Off	No alarms are triggered.					
		On	If in the time set in par. 3-8-1-4 no exchange of information occurs on the modbus line the drive will stop and signal "A21".					
Min.: /								
Max.: /								
3-8-1-4 Communication timeout [c]	Parameter for setting the modbus communication timeout time, expressed in [sec]. Parameter only visible if par. 3-8-1-3 is set at "On".	Default: 5.0 [sec]						
		Min.: 1.0 [sec]						
		Max.: 10.0 [sec]						

Section 3-8-2: Profibus / Profinet

The parameters relevant to the operation of the optional fieldbus modules are described in the manuals listed at the beginning of this document.

Section 3-9: Safety functions

Section 3-9-1: STO Safe-Torque-Off

Parameter	Description	Setting						
3-9-1-1 STO check request [c]	Parameter for enabling the request (Warning and Alarm) of the STO HW chain control. <table border="1" data-bbox="408 1760 1225 2033"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Off</td> <td>Function disabled.</td> </tr> <tr> <td>On</td> <td>The frequency converter will count the hours between one STO intervention and the next. When this interval exceeds the time indicated in parameter 3-9-1-2 alarm A27 is triggered. However, roughly one month before this expiry, warning W20 is signalled.</td> </tr> </tbody> </table>	Function	Description	Off	Function disabled.	On	The frequency converter will count the hours between one STO intervention and the next. When this interval exceeds the time indicated in parameter 3-9-1-2 alarm A27 is triggered. However, roughly one month before this expiry, warning W20 is signalled.	Default: Off
		Function	Description					
		Off	Function disabled.					
		On	The frequency converter will count the hours between one STO intervention and the next. When this interval exceeds the time indicated in parameter 3-9-1-2 alarm A27 is triggered. However, roughly one month before this expiry, warning W20 is signalled.					
Min.: /								
Max.: /								

Parameter	Description	Setting
3-9-1-2 STO interval check [c]	Indicates the time limit between one STO activation and the next. Once this time is exceeded the drive stops and signals alarm A27. Expressed in [h].	Default: 8760 [h]
		Min.: 744 [h]
		Max.: 1200000 [h]

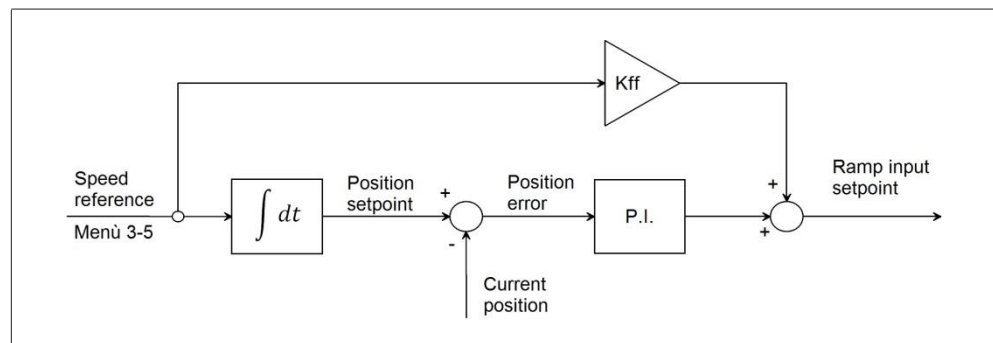
Section 3-10: Electric gearbox

The macro controls the motor's angular position (phase control) by receiving externally a position setpoint to reach (electric gearbox master).

It is possible to set a reduction ratio between the master speed and the drive (electronic gearbox) through par. 3-10-2-2, 3-10-2-3 and par. 3-10-2-4 that specifies the direction of the slave shaft with respect to the mastershaft.

The "Virtual master" electric gearbox mode, selectable through par. 3-10-1, is implemented. In this mode the internal position reference is obtained from the integration of the speed reference "Speed reference" of the drive itself (a virtual master is generated in the drive itself). In less critical applications, the same speed reference can be given to several drives, in this case, the only possible error can be caused by the precision of the internal clock of the control board. The figure below shows the diagram of the drive's position loop control. A description of the parameters that appear in the figure is given in the following paragraph.

Figure 22: Electric gearbox - Virtual master mode



Parameter	Description	Setting
3-10-1 Mode [c]	Operating mode.	Default: Off
	Function	Description
	Off	Function disabled.
	Virtual master (speed ref.)	Enabling of "Virtual master" electric shaft mode.
		Min.: / Max.: /

Section 3-10-2: Configuration

Parameter	Description	Setting						
3-10-2-2 Speed ratio numerator [c]	Numerator of the reduction ratio between the master speed and the slave speed.	Default: 1						
		Min.: 0						
		Max.: 16384						
3-10-2-3 Speed ratio denominator [c]	Denominator of the reduction ratio between the speed of the master shaft and the speed of the slave shaft.	Default: 1						
		Min.: 0						
		Max.: 16384						
3-10-2-4 Tracking direction [c]	Master position reference tracking direction.							
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>Concordant</td> <td>A positive reference will correspond to a positive motor rotation (CW).</td> </tr> <tr> <td>Contrary</td> <td>A negative reference will correspond to a negative motor rotation (CCW) and vice versa.</td> </tr> </tbody> </table>		Function	Description	Concordant	A positive reference will correspond to a positive motor rotation (CW).	Contrary	A negative reference will correspond to a negative motor rotation (CCW) and vice versa.
	Function	Description						
	Concordant	A positive reference will correspond to a positive motor rotation (CW).						
Contrary	A negative reference will correspond to a negative motor rotation (CCW) and vice versa.							
Default: Concorde								
Min.: /								
3-10-2-5 Maximum position error [c]	Maximum position error calculated as: "Position setpoint" - "Current position".	Default: 30 [deg]						
		Min.: 0 [deg]						
		Max.: 360 [deg]						
3-10-2-6 Reaction due to tracking error [c]	Defines the response to a tracking error (error: par. 3-10-2-5 "Maximum position error").							
	<table border="1"> <thead> <tr> <th>Function</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>The error is ignored and the drive continues to modulate while attempting to reduce it.</td> </tr> <tr> <td>Alarm</td> <td>The drive stops and signals alarm A29 "Electric gearbox tracking error".</td> </tr> </tbody> </table>		Function	Description	None	The error is ignored and the drive continues to modulate while attempting to reduce it.	Alarm	The drive stops and signals alarm A29 "Electric gearbox tracking error".
	Function	Description						
	None	The error is ignored and the drive continues to modulate while attempting to reduce it.						
Alarm	The drive stops and signals alarm A29 "Electric gearbox tracking error".							
Default: None								
Min.: /								
3-10-2-7 JOG rate [c]	Position JOG correction rate. The JOG can be activated through the digital inputs configured in "Gearbox JOG +" or "Gearbox JOG -".	Default: 0.01 [deg/s]						
		Min.: 0.01 [deg/s]						
		Max.: 30.00 [deg/s]						

Section 3-10-3: Controller settings

Parameter	Description	Setting
3-10-3-1 Kp [c]	Proportional coefficient of the PI controller.	Default: 1000
		Min.: 0
		Max.: 9999
3-10-3-2 Ki [c]	Integral coefficient of the PI controller.	Default: 10
		Min.: 0
		Max.: 9999
3-10-3-3 Kff [c]	Coefficient as a percentage of the Feed Forward branch of the position controller. [%]	Default: 100.0 [%]
		Min.: 0.0 [%]
		Max.: 100.0 [%]

Section 4: Information

Section 4-1: Inverter

Parameter	Description	Setting
4-1-1 Serial number	Display string containing the converter's serial number.	Default: /
		Min.: /
		Max.: /
4-1-2 Firmware version	Display string containing the converter's application firmware version.	Default: /
		Min.: /
		Max.: /
4-1-3 Firmware revision	Display string containing the converter's application firmware revision.	Default: /
		Min.: /
		Max.: /
4-1-4 Drive size	Display string containing the converter size, expressed in [kW].	Default: /
		Min.: /
		Max.: /
4-1-5 Maximum current size	Display string containing the maximum current for the size of the converter, expressed in [A].	Default: /
		Min.: /
		Max.: /
4-1-6 Nominal current size	Display string containing the rated current for the size of the converter, expressed in [A].	Default: /
		Min.: /
		Max.: /
4-1-7 MotionControl firmware version	Display string containing the firmware version of the converter's motor control.	Default: /
		Min.: /
		Max.: /
4-1-8 MotionControl firmware revision	Display string containing the firmware revision of the converter's motor control.	Default: /
		Min.: /
		Max.: /

Section 4-2: LCP

Menu only visible with an LCP module connected.

Parameter	Description	Setting
4-2-1 LCP serial number	Display string containing the LCP module's serial number.	Default: /
		Min.: /
		Max.: /
4-2-2 LCP firmware version	Display string containing the LCP module's firmware version.	Default: /
		Min.: /
		Max.: /
4-2-3 LCP firmware revision	Display string containing the LCP module's firmware revision.	Default: /
		Min.: /
		Max.: /

Section 4.3: Fieldbus

Menu only visible with a fieldbus module connected.

Parameter	Description	Setting
4-3-1 Slot 1 connected module	Display string containing the type of module connected in slot 1 on the converter.	Default: Not connected
		Min.: /
		Max.: /
4-3-2 Slot 2 connected module	Display string containing the type of module connected in slot 2 on the converter.	Default: Not connected
		Min.: /
		Max.: /

Section 4-3-3: Modbus module

Menu only visible with modbus module connected.

Parameter	Description	Setting
4-3-3-1 Firmware version	Display string containing the Modbus module's firmware version.	Default: /
		Min.: /
		Max.: /
4-3-3-2 Firmware revision	Display string containing the Modbus module's firmware revision.	Default: /
		Min.: /
		Max.: /

Section 4-3-4: Profibus module

Menu only visible with Profibus module connected.

Parameter	Description	Setting
4-3-4-1 Firmware version	Display string containing the Profibus module's firmware version.	Default: /
		Min.: /
		Max.: /
4-3-4-2 Firmware revision	Display string containing the Profibus module's firmware revision.	Default: /
		Min.: /
		Max.: /
4-3-4-3 Protocol type	Display string containing the type of CPU module used.	Default: /
		Min.: /
		Max.: /
4-3-4-4 ASIC firmware version	Display string containing the CPU module's firmware version.	Default: /
		Min.: /
		Max.: /

Section 4-3-5: Profinet module

Menu only visible with Profinet module connected.

Parameter	Description	Setting
4-3-5-1 Firmware version	Display string containing the Profinet module's firmware version.	Default: /
		Min.: /
		Max.: /
4-3-5-2 Firmware revision	Display string containing the Profinet module's firmware revision.	Default: /
		Min.: /
		Max.: /
4-3-5-3 Protocol type	Display string containing the type of CPU module used.	Default: /
		Min.: /
		Max.: /
4-3-5-4 ASIC firmware version	Display string containing the CPU module's firmware version.	Default: /
		Min.: /
		Max.: /

4 LCP interface

Figure 23: LCP interface

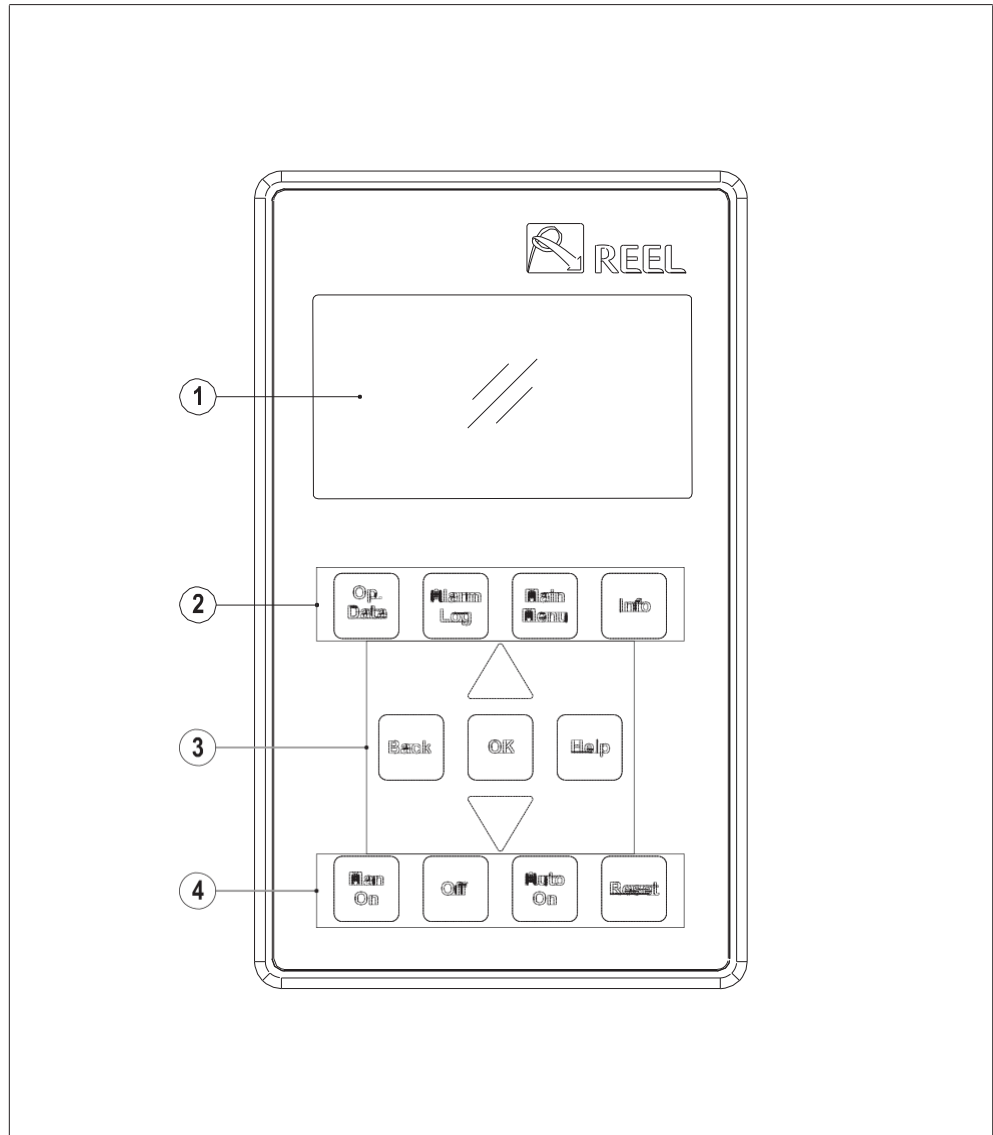


Table 1: Description of the graphic control unit

Position	Denomination	Function
1	Graphic display	Display provides information concerning the operation of the frequency converter.
2	Menu buttons	Go to the elements of the first menu level: Operation, Diagnosis, Settings and Information.
3	Navigation buttons	Navigation and setting of the parameters.
4	Function buttons	Switching between operating modes.

4.1 Graphic display

The main screen is divided into six sections.

Figure 24: Graphic display

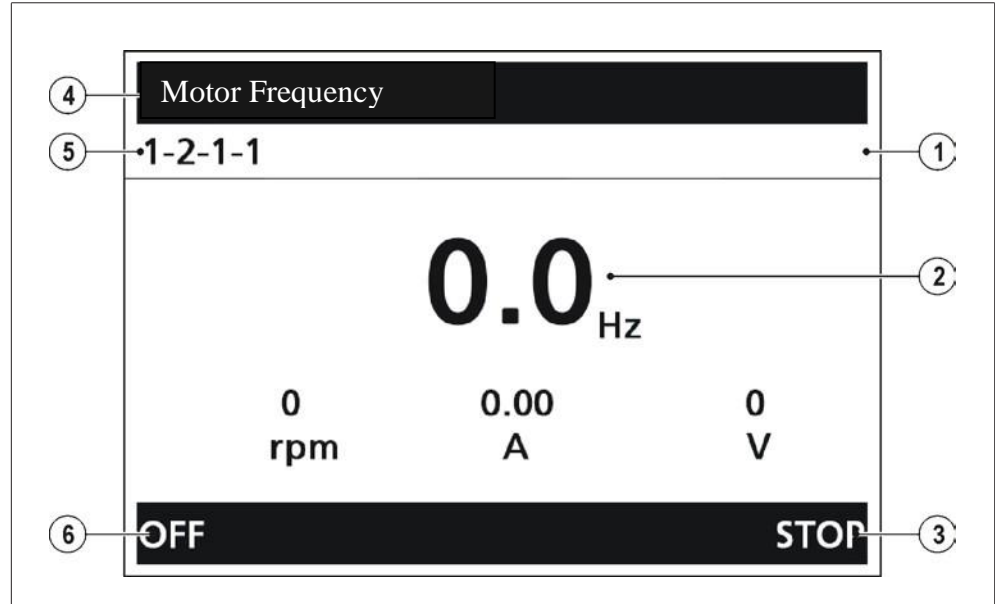



Table 2: Description of the graphic control unit

Section - Ref.	Function
1	Macro/Functions enabled and operating details: PS: Position control active. PD: Process PID controller active. T: Torque control active. A: AMA procedure in progress. R: Drive in remote control mode (Fieldbus).
2	Display of MAX. 4 operating values: one operating value is displayed in large font. 3 operating values are displayed in small font. The operating values scroll cyclically.
3	Display of the operating status: LOCKED: Drive locked, enabling not possible. This occurs when an alarm has tripped or during the lock time following a disabling. STOP: PWM disabled, motor stopped. READY TO RUN: PWM enabled, motor stopped. RUN: PWM enabled, motor running. TUNING: AMA procedure in progress.
4	Name of the parameter of the operating value displayed in the centre.
5	Reference of the operating value parameter displayed in the centre.
6	Operating mode.

The graphic control unit contains the buttons described in the following table:

Table 3: Description of the graphic control unit

Button	Denomination	Function
Op. Data	Op. Data menu button	Displays the operating data.
Alarm Log	Alarm Log menu button	<ul style="list-style-type: none"> ▪ Performs a diagnosis of the alarms. ▪ Displays the alarm history log.
Main Menu	Main Menu button	Enables the main settings.
Info	Information menu button	Displays the information menu.
	Arrow buttons	<p>Press and hold to:</p> <ul style="list-style-type: none"> ▪ Enable you to scroll to select the various menus. ▪ Increase (up arrow) or reduce (down arrow) the value of the digits displayed (if an arrow button is held down for long enough the reaction repeats at increasingly shorter intervals).
Back	Back button	<ul style="list-style-type: none"> ▪ Deletes/restores an entry (if it is not saved the entry is lost). ▪ Enables switching to a higher menu level.
OK	OK button	<ul style="list-style-type: none"> ▪ Confirms the settings. ▪ Confirms the menu selection. ▪ Goes to the next letter after a digit has been entered. ▪ Displays the message: "Silence alarm". ▪ Displays the measurement value: "Go to favourites menu".
Help	Help button	Displays the help text relating to the selected menu item.
Man On	Man operation On button	Starts the frequency converter in "Manual" operating mode.
Off	OFF button	Stops the frequency converter.
Auto On	Auto operation On button	Switches to "Automatic" operating mode.
Reset	Reset button	Resets the pending alarms.


4.2 Manual operation via LCP



INFORMATION

After a power outage, the product switches to “Off” mode. Restart in manual operating mode.

Table 4: Description of the graphic control unit

Button	Denomination	Function
Man On	Man operation On button	<ul style="list-style-type: none"> ▪ When switching from “Auto On” operating mode to “Man On” mode the present speed of the current operation is confirmed and displayed as the speed reference (manual) 1-3-2. ▪ When switching form “Off” to “Man On” operating mode the frequency converter operates at minimum speed.
	Arrow button	When the arrow buttons are depressed the speed reference (manual) 1-3-2 is modified and confirmed immediately. The speed can only be modified between the preset minimum and maximum speed values.
Back OK	ESC/OK button	<ul style="list-style-type: none"> ▪ The OK or Back buttons enable you to move from one character to another. ▪ Press the “Back” button to go back to the preceding character. ▪ Press the “Ok” button on the right digit to return to the main screen.

4.3 Menu buttons

The menu buttons enable direct access to the first menu level:

- Operating data 1-x-x-x.
- Alarm log 2-x-x-x.
- Main menu 3-x-x-x.
- Information 4-x-x-x.

The parameter numbers contain the navigation path for quick and easy identification of a parameter. The first digit of the parameter number corresponds to the first menu level and is recalled directly via the menu buttons.

Figure 25: LCP module - Main menu

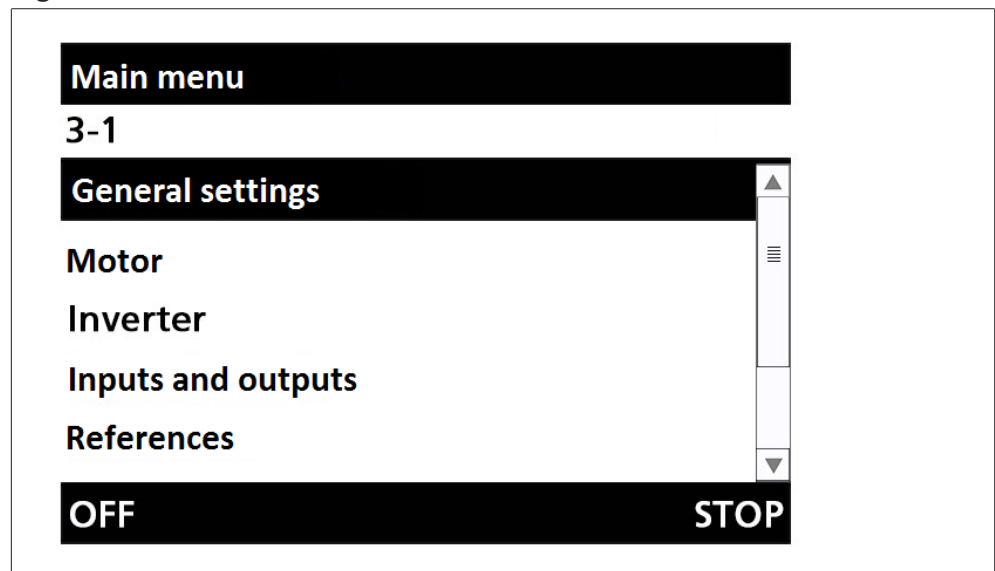


Table 5: LCP module - Main menu

Ref.	Function
1	Name of current menu/parameters.
2	Parameter reference for the parameter selected in the list.
3	Submenu parameters/items selection list.

4.3.1 Menu: Operating data

The “Operating data” section includes all the information necessary for the operation of the machine and the processes:

- Registration on the device with a password.
- Operating and measuring values for motor, pump and system frequency converter.
- Nominal values, control values and setting values.
- Hours of operation.

4.3.2 Menu: Alarm log

In the “Alarm log” section the operator can obtain information relating to fault alerts and alarm warnings in the inverter or process. The product can be stopped (faults) or running (warnings). All the previous messages can also be found in the Alarm history.

All the monitoring and protection functions generate warning or alarm messages which are signalled by red and yellow LEDs on the LED signal strip.

The corresponding message appears on the display of the control unit. If there are several messages present only the most recent is displayed. Alarms have priority over warnings.

Figure 26: LCP module - Alarms display

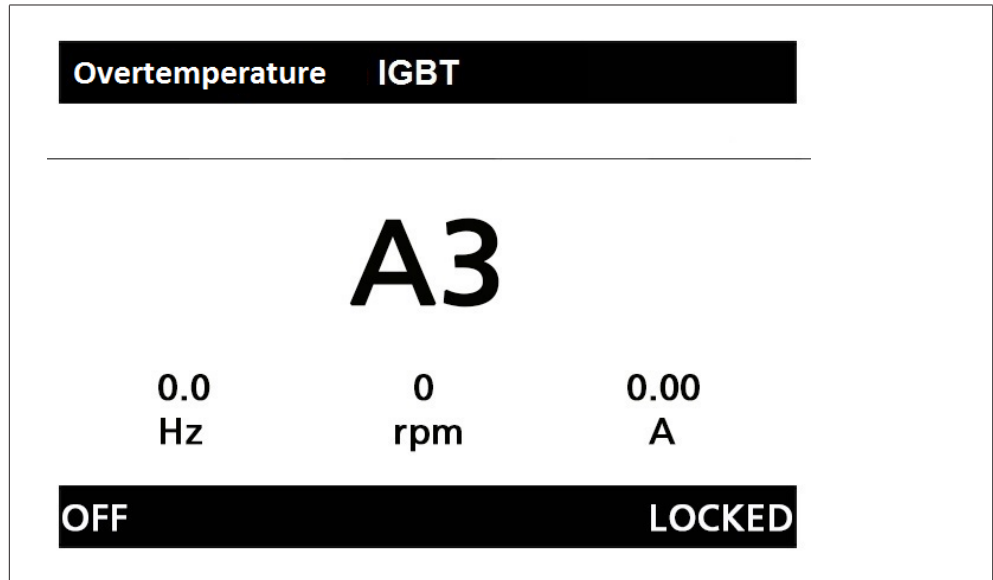


Table 6: LCP module - Alarm display

Ref.	Function
1	Name of the message displayed in the centre.
2	Message display: the last message is displayed in large font on the main screen. The operating values are displayed in small font.

Active alarms

If a message has appeared it can be found in the “Alarm history” menu in 2-1 “Active alarms”. Any information relating to alarms and alerts can also be switched to the relay outputs.

Alarm history

Only the reset and obsolete alerts can be found in the Alarm History. The alarms chronology can be displayed by selecting parameter 2-2 “Alarm history”. The last 100 messages are listed here. Use the arrow keys and the OK button to, select an item from the list.

Reset Alarms

If the cause that generated the alert is no longer present then it can be reset. The alerts can be reset separately in menu 2 “Alarm log”. The alert can also be reset through a digital input. Digital input 2 has been provided for this purpose. For an overview of the alarm and warning alerts (see chap. 5). The alerts can be reset as indicated in Table 7.

Table 7: Alert silencing methods

Alert property	Type of reset
Automatic Reset	The alert is reset automatically when the condition that generated it is no longer present.
Configurable Reset	Select either manual or automatic reset with configurable times in 2-4.
Manual Reset	Reset action must be manual.

4.3.3 Main menu

Basic process settings can be set or optimised in the “Main menu” section.

Up to 4 operating values can be displayed simultaneously on the main screen:

- 1 operating value, in large font, is displayed with the name and the number of the parameter and the unit of measurement.
- 3 operating values, in small font, displayed with the corresponding unit of measurement.

The arrow buttons enable rotation of the operating values.

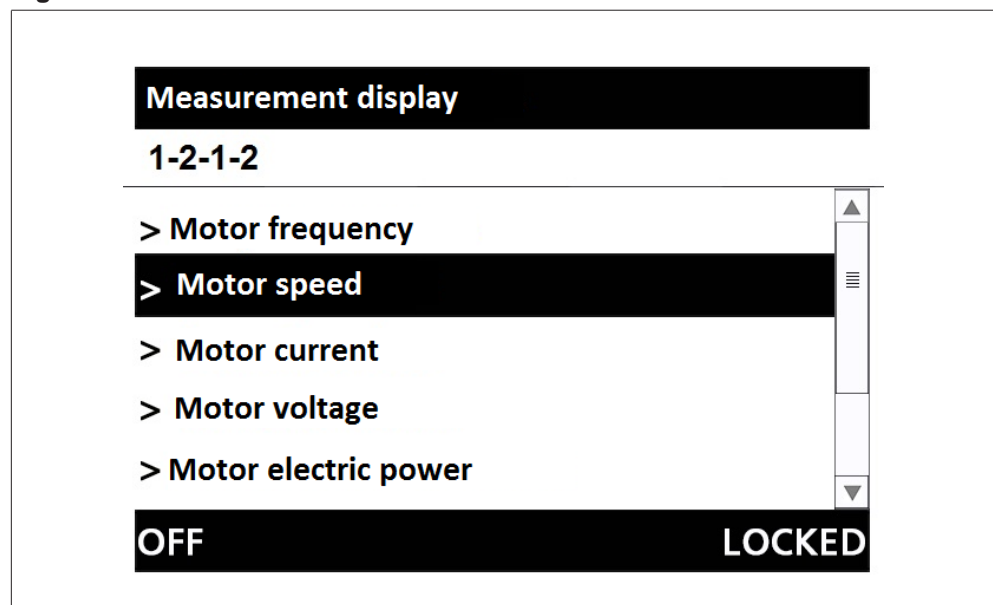
Each operating value passes through all the display positions.

Up to a maximum of 10 operating values can be defined for display from the predetermined list.

The sequence of the selection list determines the sequence of the operating values on the main screen. If more than 4 parameters are selected, the parameters that are not visible rotate in the background.

You can set the variables to be displayed:

- 1) In the Settings menu, open parameters 3-1-10.
- 2) With the arrow buttons select the operating value to reproduce.
- 3) Press the **OK button**.
- 4) Select the other desired operating values in the list and confirm by pressing **OK**.

Figure 27: Main menu


4.3.4 Information menu

All the information on the product and important information on the firmware version can be found in the “Info” section.

4.4 Service Interface and LED Coding

Figure 28: Service interface and LED coding

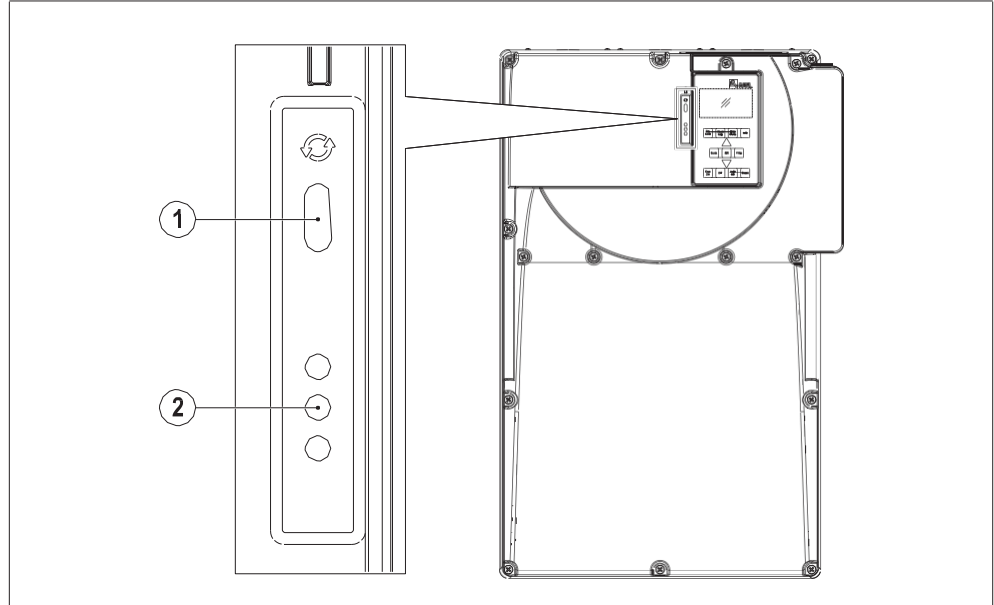


Table 8: LED coding

Ref.	Denomination	Function
1	Service interface	Optical interface.
2	LED signal lights	The lights indicate the operating state of the Inverter.

The unit can be connected to a PC or notebook with a special cable (USB - optical) using the Service interface.

The following operations are possible:

- Configuration and programming of the frequency converter with the support software.
- Updating of software.
- Saving and downloading parameters.
- Data Logger.

The special function enables the LEDs to indicate the operating state of the **FlexiMova® mm**.

Table 9: Description LED colours

Light colour	Description
Red	Indicates the presence of one or more fault messages (Alarm).
Yellow	Indicates the presence of one or more warning messages (Warning).
Green	Steady light: working correctly (Drive ok). Flashing light: motor running.

5 Troubleshooting

A Warning or Alarm is signalled by the LEDs installed on the Inverter body and by a code on the LCP.

The Warning remains active until the cause that generated it is no longer present. In Warning state the inverter can operate normally but it signals that operation is approaching the limits of an Alarm state.

If an Alarm is triggered the inverter disables the modulation. The alarms can be reset manually through the LCP, digital inputs or fieldbus. Alternatively, the inverter can be configured to automatically reset the alarms in the mode described in parameter “2-4 Alarm reset mode”.

If an alarm cannot be reset it may be because the cause that generated it is still present or it is the type of alarm that requires the inverter to be re-booted.

5.1 Alarms

Table 10: Alarms

Message	Denomination	Description	Type of reset
A1	Short circuit	Signals the presence of an inverter output short circuit, phase-phase or phase-earth.	Manual Reset (Default) or Configurable automatic reset. After the fourth consecutive reset in a period of 30 s a restart is necessary.
A2	Overcurrent	Inverter output overcurrent. Refers to parameter 3-2-3-2 “Maximum motor current”.	Manual Reset (Default) or Configurable automatic reset. After the fourth consecutive reset in a period of 30 s a restart is necessary.
A3	IGBT overtemperature	Signals the Power circuitry is overheated.	Automatic reset.
A4	Control board Overtemperature	Signals the interior of the inverter is overheated.	Automatic reset.
A5	I2T overload protection	Signals that the preset I2T limit has been reached or the minimum speed limit (3-2-2-5) in the case that the speed reduction mode was selected.	Manual Reset (Default) or Configurable reset.
A6	PTC motor protection	Signals that the OHM threshold set in parameter 3-2-2-2 has been exceeded. The PTC sensor is read via the special terminal block and its value is visible in parameter 1-2-1-9.	Manual Reset (Default) or Configurable reset.
A7	External alert	Signals a digital input alarm.	Manual Reset (Default) or Configurable reset.
A8	Undervoltage	Signals undervoltage of the mains power.	Manual Reset (Default) or Configurable reset.

Message	Denomination	Description	Type of reset
A9	Overvoltage	Signals overvoltage of the mains power.	Manual Reset (Default) or Configurable reset.
A10	AMA error	Signals an error during the motor parameter auto-learning procedure.	Automatic reset.
A11	Brake resistor overload	Signals the out-of-range use of the dynamic braking resistor (if enabled).	Manual Reset (Default) or Configurable reset.
A12	Motor side phase loss	Signals an inverter output phase loss.	Manual Reset (Default) or Configurable reset.
A13	Line side phase loss	Signals an inverter input phase loss. This condition is only recognised on sizes 37 kW to 55 kW.	Manual Reset (Default) or Configurable reset.
A14	Broken signal cable	Signals no/broken analog input connection.	Automatic reset.
A15	Safety STO chain fault	Signals a serious fault in the STO safety chain.	Requires restarting the inverter.
A16	Lack of adequate motor data	Signals inconsistency in the configuration parameters of the REEL SuPremE®/SSP motors control.	Automatic reset.
A17	No advanced motor configuration	Signals the lack of advanced configuration for REEL SuPremE®/SSP motors.	Automatic reset.
A18	Hardware fault	Signals a generic alarm for the interior of the inverter.	Requires restarting the inverter.
A19	Undervoltage 24 V	Signals an internal power supply fault 24 V/24 V USR.	Automatic reset.
A20	Internal voltage fault	Signals a fault in other internal power supplies of the inverters.	Automatic reset.
A21	Process PID congruence	Signals a failure in the process PID so that it is not possible to reach the desired Setpoint.	Manual Reset (Default) or Configurable reset.
A22	Positioner limit reached	Signals the detection of a digital input rising edge with positioner limit switch function.	Manual Reset.
A23	Out-of-range position error	Signals an out-of-range error for the position set in "Continuous reference of the positioner" mode.	Manual Reset.
A24	Fieldbus error	Signals an incorrect configuration or a generic fault of the fieldbus modules.	Automatic reset.
A25	Fieldbus communication timeout	Signals the detection of a communication timeout with the master.	Automatic reset.

Message	Denomination	Description	Type of reset
A26	Flying start error	Signals a fault during the procedure for the auto-recognition of the motor's initial rotating speed.	Automatic reset.
A27	STO control time elapsed	Signals that the time elapsed since the last STO activation has exceeded the permitted maximum and that it is necessary to command the activation of STO to reset the alarm.	Automatic reset.
A28	Multi-Drive communication timeout	Signals timeout of the Multi-Drive communication in the "slave" drive has elapsed.	Automatic reset.
A29	Electric shaft tracking error	Signals that the position error has exceeded the threshold set in parameter "3-10-2-5 Maximum position error".	Automatic reset.
A50	Firmware update required	Signals an inconsistency between the FW versions of the boards on the inverter.	Automatic reset.

5.2 Warning

Table 11: Warning

Message	Denomination	Function
W1	I2T overload protection	Signals that the I2T count has exceeded 5% of the total count. The warning is removed when the count returns to zero.
W2	IGBT overtemperature	Signals that the power circuitry is overheated. It activates when the detected temperature is 10 degrees below the alarm threshold.
W3	Control board overtemperature	Signals that the control circuitry is overheated. It activates when the detected temperature is 10 degrees below the alarm threshold.
W4	Motor overtemperature	Indicates that the motor is overheated. The warning trips when it reaches 80% of the threshold in [Ohm] set in par. 3-2-2-2 and reset when it returns 50% of the threshold in [Ohm] set in par. 3-2-2-2. The reading of the PTC probe is carried out through the special terminal block and its value is displayed in parameter 1-2-1-9.
W5	Deceleration ramp limit	Signals that the time set for the deceleration ramp has been exceeded.
W6	Active speed reduction	Signals the motor speed reduction when required to reduce the delivered power.
W7	Undervoltage	Signals the undervoltage of the mains supply.
W8	Overvoltage	Signals the overvoltage of the mains supply.
W9	STO active	Signals the Safety STO status.
W10	High current	Signals that the inverter is at the controlled current limit.
W11	/	/

Message	Denomination	Function
W12	Default settings loaded	Signals default parameters downloaded to the inverter.
W13	Fieldbus communication timeout	Signals no communication with the Master.
W14	Process PID standby controller	Signals the process PID is in standby.
W15	Waiting for Homing procedure	Signals that there is no home position for the positioner. Perform a homing procedure to eliminate the warning. With the warning active the position controller is disabled.
W16	LCP 24 V overload	Signals an anomalous and persistent current draw from the LCP module power supply. The warning must be reset manually. The power supply is deactivated when the warning trips and re-activated after the warning has been reset.
W17	Fieldbus 24 V overload	Signals an anomalous and persistent current draw from one of the fieldbus modules' power supply. The warning must be reset manually. The power supply deactivates when the warning trips and re-activates after the warning has been reset.
W18	IO-Expander terminal block 24 V overload	Signals an anomalous and persistent current draw from the 24 V terminal on the terminal block of the IO-Expander. The warning must be reset manually. The power supply deactivates when the warning trips and re-activates after the warning has been reset.
W19	Control board terminal block 24 V overload	Signals an anomalous and persistent current draw from the 24 V terminal on the terminal block of the control board. The warning must be reset manually. The power supply deactivates when the warning trips and re-activates after the warning has been reset.
W20	STO control request	Signals a request to stop the STO to verify the correct functioning of the safety chain. An automatic auto-control is carried out and then the warning is reset. If this procedure is not carried out within a month from the appearance of the warning, alarm A27 will trip.
W21	Multi-Drive communication timeout	Multi-Drive communication timeout has elapsed in the "master" drive.
W22	Broken signal cable	No/broken 4 - 20 mA analog input connection, in the "Slave" drive of the Multi-Drive communication.

**REEL**

REEL S.r.l. A Socio Unico
Via Riviera Berica 40/42
36024 Ponte di Nanto (VI) Italy
www.reel.it

A KSB Company • 