



Edition

12/2024

COMPACT OPERATING INSTRUCTIONS

SINAMICS

V20

Low voltage converters
www.siemens.com

SIEMENS

SINAMICS V20 Converter

Compact Operating Instructions

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

 WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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1 Safety notes

 DANGER
Danger to life if the safety instructions and operating instructions are not observed The compact operating instructions only contain the most important information for operating the converter. If the safety instructions and operating instructions in the associated documentation are not observed, accidents involving severe injuries or death can occur. Observe the safety instructions and operating instructions given in the associated documentation.

2 Technical data

Line supply characteristics

	Three phase AC 400 V converters	Single phase AC 230 V converters
Voltage range	380 V AC ... 480 V AC ¹⁾ (tolerance: -15% ... +10%)	200 V AC ... 240 V AC ¹⁾ (tolerance: -15% ... +10%)

¹⁾ When the input voltage is below the rated value, current deratings are permissible and therefore the voltage-dependent speed and/or torque may be reduced.

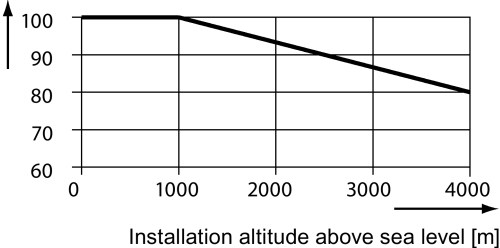
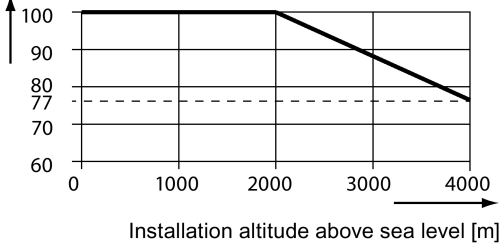
Overload capability

Power rating (kW)	Average output current	Overload current	Maximum overload cycle
0.12 ... 15	100% rated	150% rated for 60 seconds ¹⁾	150% rated for 60 seconds followed by 94.5% rated for 240 seconds ¹⁾
18.5 (HO)/22 (HO)			
22 (LO)/30 (LO)		110% rated for 60 seconds	110% rated for 60 seconds followed by 98% rated for 240 seconds

¹⁾ For 230 V converters with 0.75 kW power rating, make sure that you set P1800 to a value between 2 k and 10 k to fulfil the specified overload capabilities.

Environmental conditions

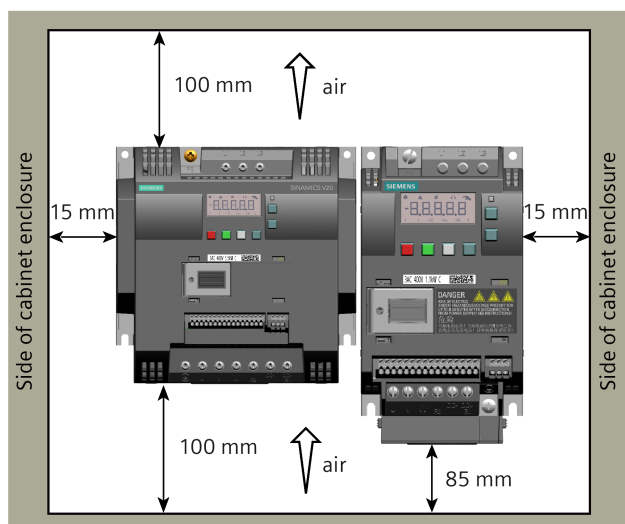
Surrounding air temperature		-10 °C ... +60 °C > 40 °C with derating
Storage temperature		-40 °C ... +70 °C
Protection class		IP 20
Maximum relative humidity		95% (non-condensing)
Shock and vibration		
Operation	Shock	Peak acceleration: • 5 g, 30 ms • 15 g, 11 ms Quantity of shocks: 3 per direction × 6 directions Duration of shock: 1 s
	Vibration	Vibration during operation according to EN 60721-3-3: 2002 Class 3M2 • 230 V converters 9 Hz ... 29 Hz: 0.3 mm deflection 29 Hz ... 200 Hz: 1 g vibration • 400 V converters 10 Hz ... 58 Hz: 0.075 mm deflection 58 Hz ... 200 Hz: 1 g vibration
Product packaging	Vibration	Transport in the transport packaging according to EN 60721-3-2 Class 2M3
		Long-term storage in the transport packaging according to EN 60721-3-1 Class 1M2

Installation altitude	Up to 4000 m above sea level: - For the installation altitude lower than or equal to 2000 m above sea level, it is permissible to connect a V20 converter to any of the mains supply systems that are specified for it. - For the installation altitude higher than 2000 m and lower than or equal to 4000 m above sea level, you must connect a V20 converter to any of the specified mains supply systems either via an isolating transformer or with a grounded neutral point. 1000 m ... 4000 m: output current derating Permissible output current [%]  <table border="1"> <caption>Data for Output Current Derating</caption> <thead> <tr> <th>Installation altitude above sea level [m]</th> <th>Permissible output current [%]</th> </tr> </thead> <tbody> <tr><td>0</td><td>100</td></tr> <tr><td>1000</td><td>100</td></tr> <tr><td>2000</td><td>95</td></tr> <tr><td>3000</td><td>88</td></tr> <tr><td>4000</td><td>82</td></tr> </tbody> </table> 2000 m ... 4000 m: input voltage derating Permissible input voltage [%]  <table border="1"> <caption>Data for Input Voltage Derating</caption> <thead> <tr> <th>Installation altitude above sea level [m]</th> <th>Permissible input voltage [%]</th> </tr> </thead> <tbody> <tr><td>0</td><td>100</td></tr> <tr><td>1000</td><td>100</td></tr> <tr><td>2000</td><td>100</td></tr> <tr><td>3000</td><td>90</td></tr> <tr><td>4000</td><td>77</td></tr> </tbody> </table>	Installation altitude above sea level [m]	Permissible output current [%]	0	100	1000	100	2000	95	3000	88	4000	82	Installation altitude above sea level [m]	Permissible input voltage [%]	0	100	1000	100	2000	100	3000	90	4000	77
Installation altitude above sea level [m]	Permissible output current [%]																								
0	100																								
1000	100																								
2000	95																								
3000	88																								
4000	82																								
Installation altitude above sea level [m]	Permissible input voltage [%]																								
0	100																								
1000	100																								
2000	100																								
3000	90																								
4000	77																								
Environmental classes	Pollution degree: 2 Solid particles: class 3S2 Chemical gases: class 3C2 (SO₂, H₂S) Climate class: 3K3																								

3 Mounting

Mounting clearance

Minimum clearance at top	100 mm
Minimum clearance at bottom	100 mm (for frame sizes AA ... AD, B ... E, and frame size A without fan) 85 mm (for fan-cooled frame size A)
Minimum lateral clearance between multiple converters	0 mm
Minimum lateral clearance to the side of cabinet enclosure	15 mm



Drill pattern

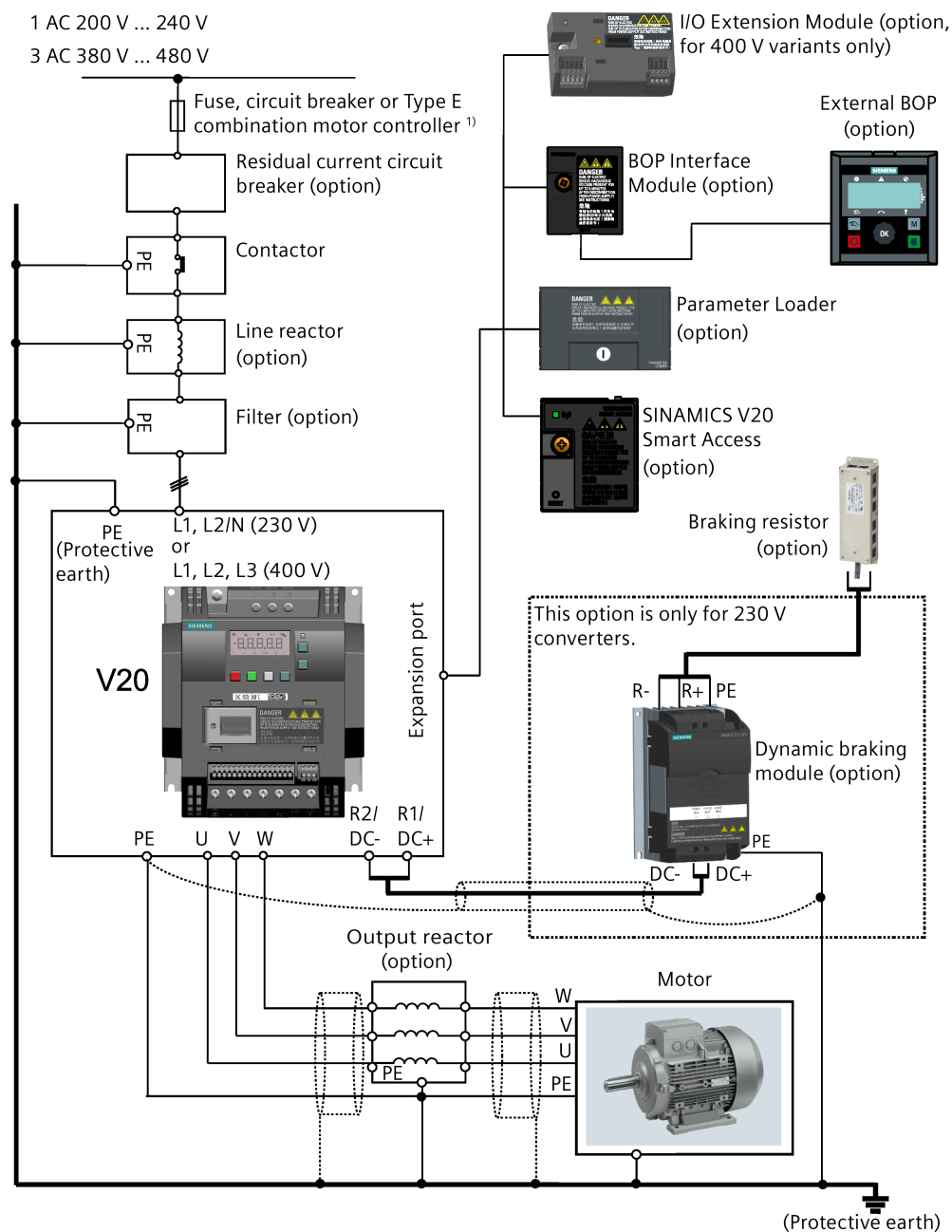
	Frame size	Power range (kW)	Voltage (V)	W (mm)	H (mm)	W1 (mm)	H1 (mm)	H2 (mm)	Ø (mm)	Tightening torque (Nm)
	FSAA/FSAB	0.12 ... 0.75	230	58	132	-	-	-	4.6	1.8
	FSAC	1.1 ... 1.5	230	79	140	-	-	-	4.6	1.8
	FSAD	2.2 ... 3.0	230	122	159	-	-	-	4.6	1.8
	FSA	0.37 ... 2.2	400	79	140	-	-	-	4.6	1.8
	FSB	3.0 ... 4.0	400	127	135	-	-	-	4.6	1.8
				125 ²⁾	108 ²⁾	118 ²⁾	172 ²⁾	45.5 ²⁾	4.6	1.8
	FSC	5.5	400	170	140	-	-	-	5.8	2.5
				170 ²⁾	116 ²⁾	161 ²⁾	197 ²⁾	61 ²⁾	5.8	2.5
	FSD	7.5 ... 15	400	223	166	-	-	-	5.8	2.5
				223 ²⁾	142 ²⁾	214 ²⁾	222 ²⁾	59 ²⁾	5.8	2.5
	FSE	18.5 ... 30	400	228	206	-	-	-	5.8	2.5
				228 ²⁾	182 ²⁾	219 ²⁾	282 ²⁾	83 ²⁾	5.8	2.5

1) When mounting an FSAA/FSAB in a control cabinet, drill these two holes only.

2) For push-through mounting only.

4 Connecting

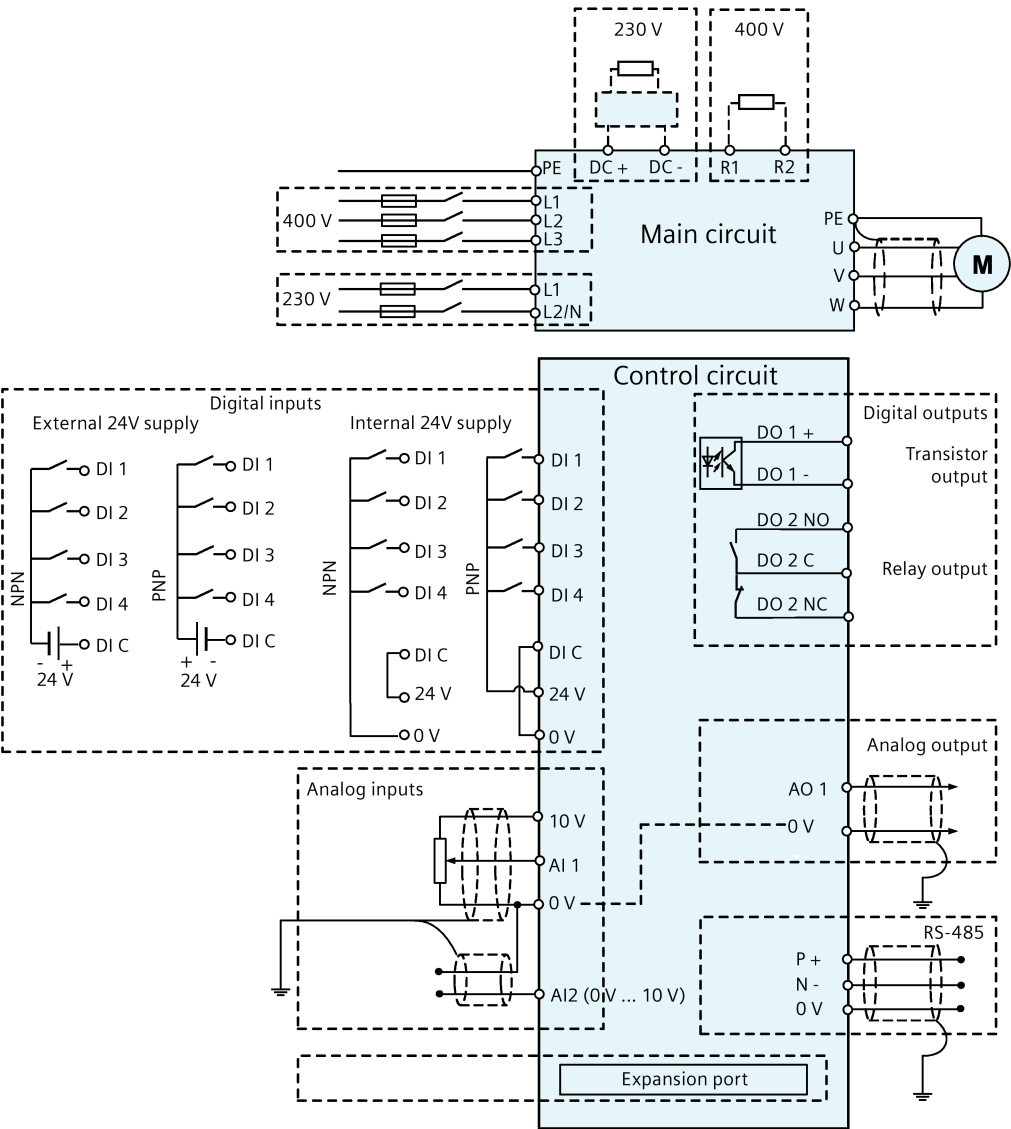
4.1 Typical system connections



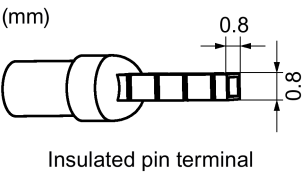
¹⁾ For more information on the permissible types for these branch circuit protection devices, see the Product Information of Protective Devices for SINAMICS V20 Converter (<https://support.industry.siemens.com/cs/ww/en/view/109799776>).

4.2 Wiring diagram

Wiring diagram



Recommended crimp terminal type and cable cross-sections



Cable type	Recommended cable cross-section
Solid or stranded cable	0.5 mm ² ... 1 mm ² (AWG: 20 ... 18)
Ferrule with insulating sleeve	0.25 mm ² (AWG: 24)

For more information about the recommended cable cross-sections, crimp types and screw tightening torques, see Section 4.2 "Terminal description" in the *SINAMICS V20 Converter Operating Instructions*.

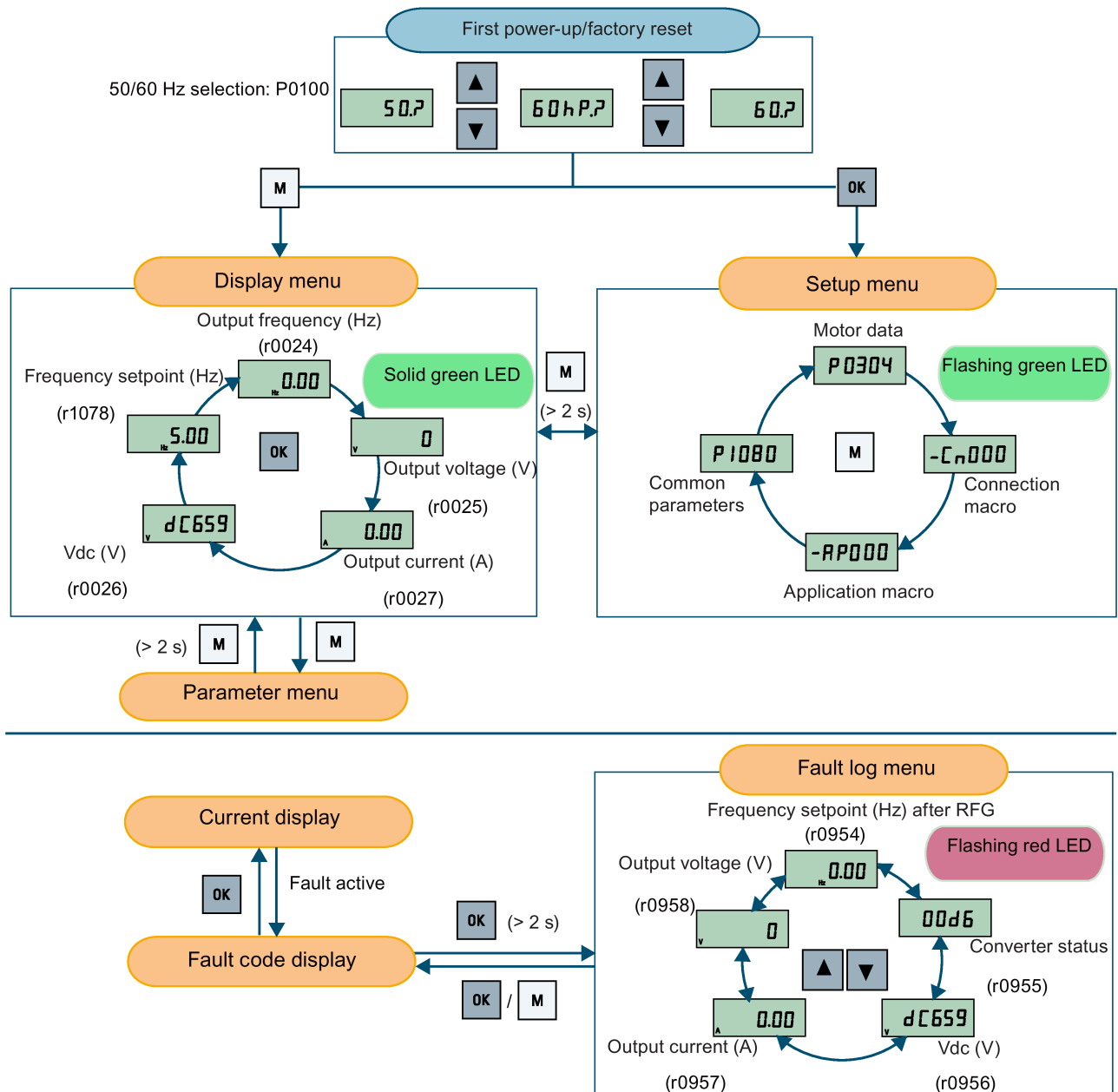
5 Operating the built-in BOP

5.1 Introduction to the built-in BOP

	Stops the converter Single press OFF1 stop reaction in HAND mode Double press (< 2 s) or long press (> 3 s) OFF2 stop reaction: the converter allows the motor to coast to a standstill without ramp-down times
	Starts the converter in HAND/JOE mode
	Multi-function button Short press (< 2 s) • Enters parameter menu or moves to next screen • Restarts digit by digit editing on selected item • Returns to the fault code display • Press twice in digit by digit editing to discard change and return Long press (> 2 s) • Returns to the status screen • Enters the setup menu
	Short press (< 2 s) • Switches between status values • Enters edit value mode or change to the next digit • Clears faults • Returns to the fault code display Long press (> 2 s) • Quick parameter number or value edit • Accesses fault information data
+	Press to switch between HAND (with hand icon)/JOE (with flashing hand icon)/AUTO (no icon) mode Note: Jog mode is only available if the motor is stopped.
	Moves the selection up through a menu, increases a value or a setpoint Long press (> 2 s): To quickly scroll up the values

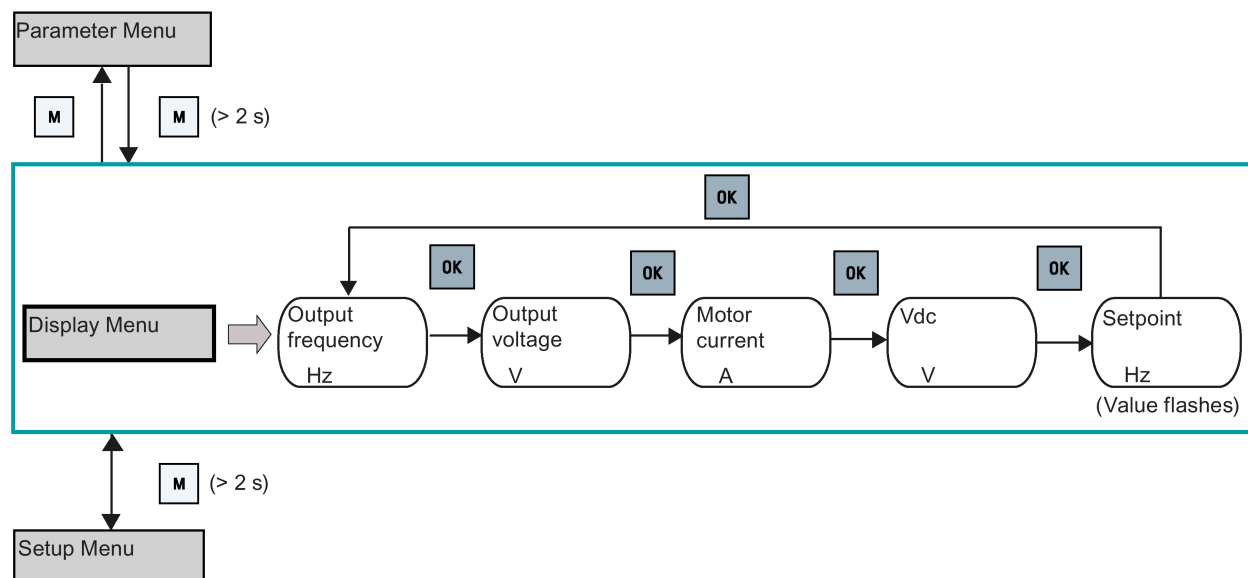
	Moves the selection down through a menu, decreases a value or a setpoint Long press (> 2 s): To quickly scroll down the values
 + 	Reverses the direction of rotation of the motor Note: In AUTO mode, if P1113 (BI: Reverse) is not connected to the default BICO parameter r0019.11, the UP + DOWN button combination becomes invalid.

5.2 Converter menu structure



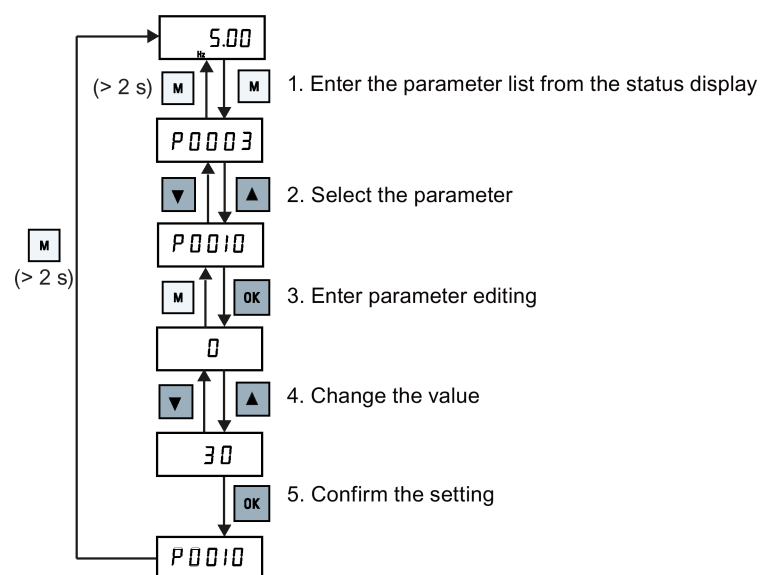
5.3 Viewing converter status

The display menu provides a basic monitoring view of some key parameters such as frequency, voltage, current, and so on.

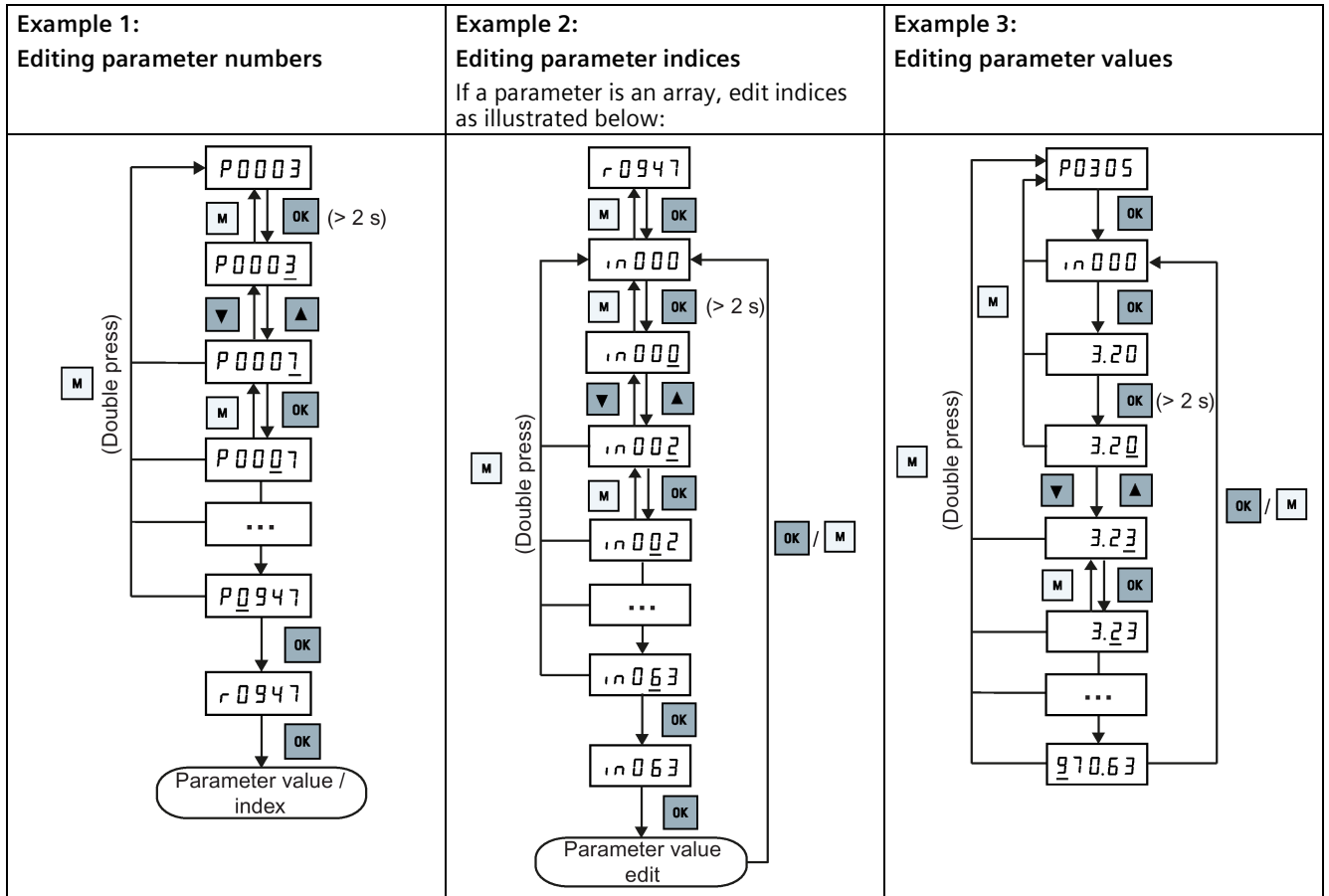


5.4 Editing parameters

Normal editing of parameters



Digit-by-digit editing



5.5 Restoring to defaults

Restoring to factory defaults

Parameter	Function	Setting
P0003	User access level	= 1 (standard user access level)
P0010	Commissioning parameter	= 30 (factory setting)
P0970	Factory reset	= 21: Resets all parameters and user defaults to factory defaults = 31: Special factory reset. Resets all user defaults in EEPROM to factory defaults. The converter will then restart. (Note that this value setting is used only as one remedy for clearing the fault F51.)

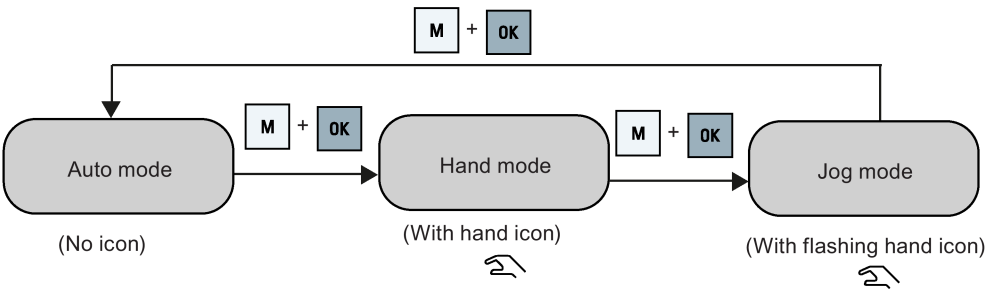
Restoring to user defaults

Parameter	Function	Setting
P0003	User access level	= 1 (standard user access level)
P0010	Commissioning parameter	= 30 (factory setting)
P0970	Factory reset	= 1: Resets all parameters (not user defaults) to user defaults if they have been previously stored with P0971 = 21; otherwise, resets all parameters to factory defaults

After setting the parameter P0970, the converter displays "8 8 8 8" and then the screen shows "P0970". P0970 and P0010 are automatically reset to their original value 0.

5.6 Hand/Auto/Jog

Press **M** + **OK** to switch between different modes:



Note
Jog mode is only available if the motor is stopped.

5.7 Setting connection macros

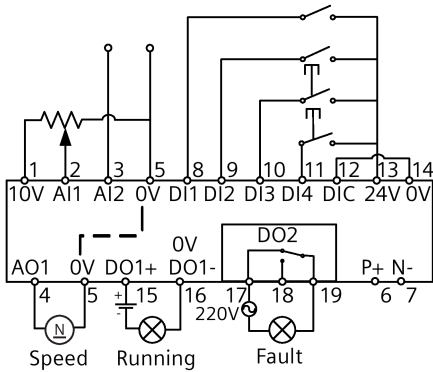
Select the following connection macros for standard wiring arrangements. The default connection macro is "Cn000" (connection macro 0).

Connection macro	Function	Display example
Cn000	Factory default setting. Makes no parameter changes.	
Cn001	BOP as the only control source	
Cn002	Control from terminals (PNP/NPN)	
Cn003	Fixed speeds	
Cn004	Fixed speeds in binary mode	The minus sign indicates that this macro is the currently selected macro.
Cn005	Analog input and fixed frequency	
Cn006	External push button control	
Cn007	External push buttons with analog setpoint	
Cn008	PID control with analog input reference	
Cn009	PID control with the fixed value reference	
Cn010	USS control	
Cn011	MODBUS RTU control	

5.8 Wiring diagram of connection macros

The following figure provides a general wiring method for all connection macros in the PNP mode. Both PNP and NPN can be realized with the same parameters. You can switch to the NPN mode by connecting the digital input common (DIC) to 24 V. The signal functions of I/O terminals in different macros may vary except for analog output (AO1), digital output 1 (DO1), and digital output 2 (DO2). For more information about signal differences, see Section "Function description of I/O signals in different connection macros (Page 13)".

PNP: 0~20 mA = 0~50/60 Hz



5.9 Function description of I/O signals in different connection macros

Cn	AI1	AI2	DI1	DI2	DI3	DI4	P+ N-
001	-	-	-	-	-	-	-
002	Analog input	-	ON/OFF1	Reverse	Fault acknowledgement	JOG forward	-
003	-	-	ON/OFF1	Speed low	Speed middle	Speed high	-
004	-	-	Fixed speed bit 0 (ON)	Fixed speed bit 1 (ON)	Fixed speed bit 2 (ON)	Fixed speed bit 3 (ON)	-
005	Analog input	-	ON/OFF1	Fixed speed bit 0 (ON)	Fixed speed bit 1 (ON)	Fault acknowledgement	-
006	-	-	OFF1/hold	ON pulse	MOP up	MOP down	-
007	Analog input	-	Hold OFF	Forward pulse + ON	Reverse pulse + ON	Fault acknowledgement	-
008	PID setpoint	Actual value	ON/OFF1	-	Fault acknowledgement	-	-
009	-	Actual value	ON/OFF1	Fixed PID setpoint 1	Fixed PID setpoint 2	Fixed PID setpoint 3	-
010	-	-	-	-	-	-	RS-485 USS ON/OFF1, speed
011	-	-	-	-	-	-	RS-485 MODBUS RTU ON/OFF1, speed

6 Quick commissioning

6.1 Quick commissioning via the built-in BOP

Both the setup menu and the parameter menu on the built-in BOP provide you the way to complete quick commissioning of the converter with the motor data and common parameters.

Operating sequence

1. Enable motor data editing (P0010 = 1).

Parameter	Function	Setting
P0010	Commissioning parameter	Range: 0 ... 30 = 0: Ready = 1: Quick commissioning = 2: Converter = 29: Download = 30: Factory setting

2. Select motor frequency (P0100) and configure motor parameters (P0304 ... P0311).

Parameter	Function	Setting
P0100	50/60 Hz selection	Range: 0 ... 2 = 0: Europe [kW], 50 Hz = 1: North America [hp], 60 Hz = 2: North America [kW], 60 Hz
P0304[0]	Rated motor voltage [V]	Range: 10 ... 2000
P0305[0]	Rated motor current [A]	Range: 0.01 ... 10000
P0307[0]	Rated motor power [kW/hp]	Range: 0.01 ... 2000.0
P0310[0]	Rated motor frequency [Hz]	Range: 12.00 ... 550.00
P0311[0]	Rated motor speed [RPM]	Range: 0 ... 40000

3. Set common parameters.

Parameter	Function	Setting
P0700[0]	Selection of command source	Range: 0 ... 5 = 1: Operator panel (factory default) = 2: Terminal = 5: USS/MODBUS on RS485 Note: Changing this parameter resets all settings on the command source selected and all BI parameters to the factory default value. For more information about this parameter, see Section 8.2 "Parameter list" in the <i>SINAMICS V20 Converter Operating Instructions</i> .
P1000[0]	Selection of frequency setpoint	Range: 0 ... 77 = 0: No main setpoint = 1: MOP setpoint (factory default) = 2: Analog setpoint 1 = 3: Fixed frequency = 5: USS/MODBUS on RS485 = 7: Analog setpoint 2 Note: For additional settings, see Section 8.2 "Parameter list" in the <i>SINAMICS V20 Converter Operating Instructions</i> .
P1080[0]	Minimum frequency [Hz]	Range: 0.00 ... 550.00 (factory default: 0.00)
P1082[0]	Maximum frequency [Hz]	Range: 0.00 ... 550.00 (factory default: 50.00)
P1120[0]	Ramp-up time [s]	Range: 0.00 ... 650.00 (factory default: 10.00)
P1121[0]	Ramp-down time [s]	Range: 0.00 ... 650.00 (factory default: 10.00)

4. Complete the quick commissioning (P3900 = 3).

Parameter	Function	Setting
P3900	End of quick commissioning	Range: 0 ... 3 = 0: No quick commissioning = 1: End quick commissioning with factory reset = 2: End quick commissioning = 3: End quick commissioning and initiate motor data calculation

For more information about the quick commissioning, see Section 5.5 "Quick commissioning" in the *SINAMICS V20 Converter Operating Instructions*.

6.2 Quick commissioning via the SINAMICS V20 Smart Access

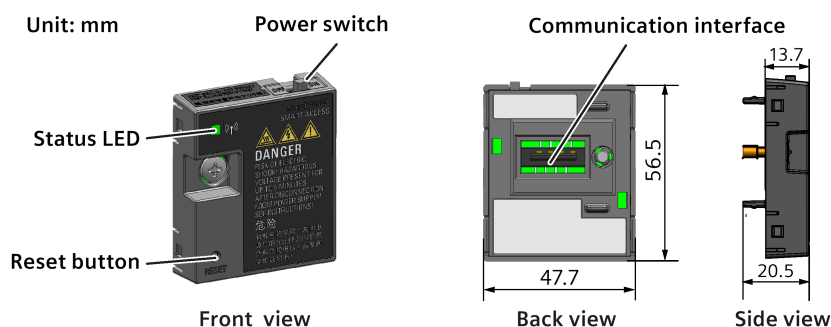
6.2.1 Overview

Description

The SINAMICS V20 Smart Access is a Web server module with integrated Wi-Fi connectivity. This module is only for commissioning and thus cannot be used with the converter permanently. It allows Web-based access to the converter from a connected device (conventional PC with wireless network adapter installed, tablet or smart phone) to realize converter operations including quick commissioning, converter parameterization, JOG, monitoring, diagnostics, backup and restore, etc.

Interface and outline dimensions

Article number: 6SL3255-0VA00-5AA0



Mounting and connecting

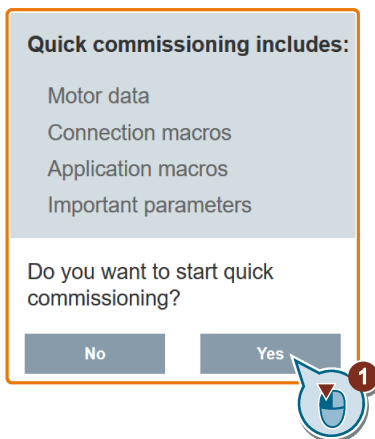
For information about fitting SINAMICS V20 Smart Access to the converter and establishing the wireless network connection, see Section 6.2 "Accessing the SINAMICS V20 Web pages" in the *SINAMICS V20 Converter Operating Instructions*.

6.2.2 Quick commissioning

The quick commissioning function of the SINAMICS V20 Smart Access enables you to set motor parameters, connection macros, application macros, and important parameters of the SINAMICS V20 converter.

Operating sequence

1. Open the quick commissioning Web page by selecting the quick commissioning icon from either the home page or the navigation sidebar.
2. Proceed as follows. Quick commissioning will change the following four groups of parameters at a time.



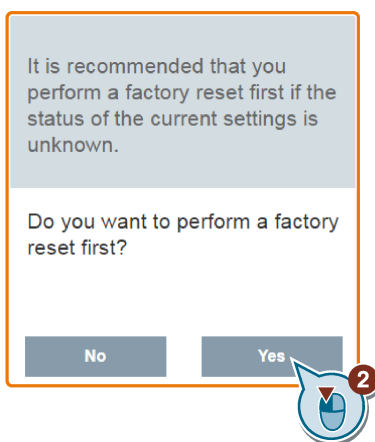
Quick commissioning includes:

- Motor data
- Connection macros
- Application macros
- Important parameters

Do you want to start quick commissioning?

No Yes

3. Perform a factory reset of the converter if the current settings of the converter are unknown.

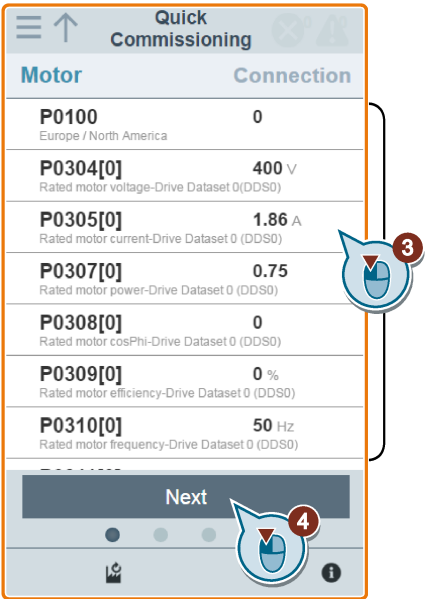


It is recommended that you perform a factory reset first if the status of the current settings is unknown.

Do you want to perform a factory reset first?

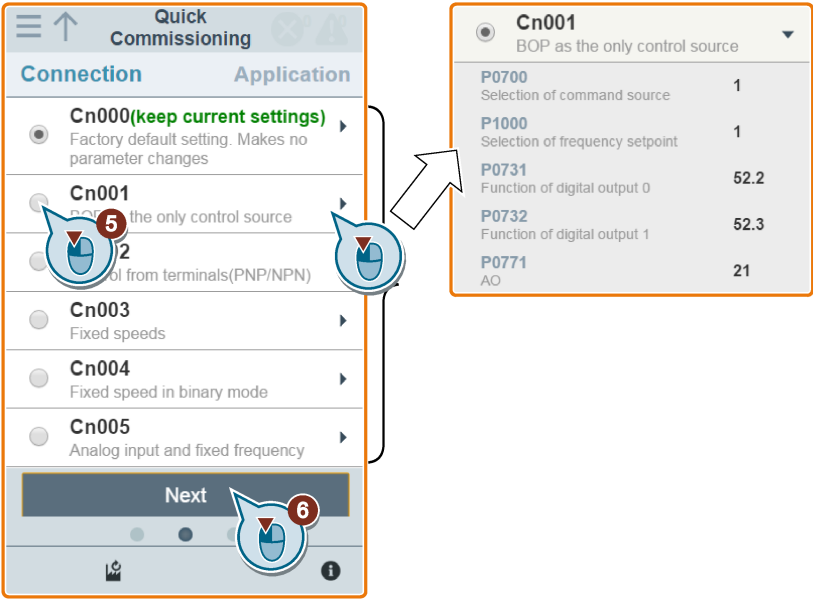
No Yes

4. Change the motor parameters settings, if desired.

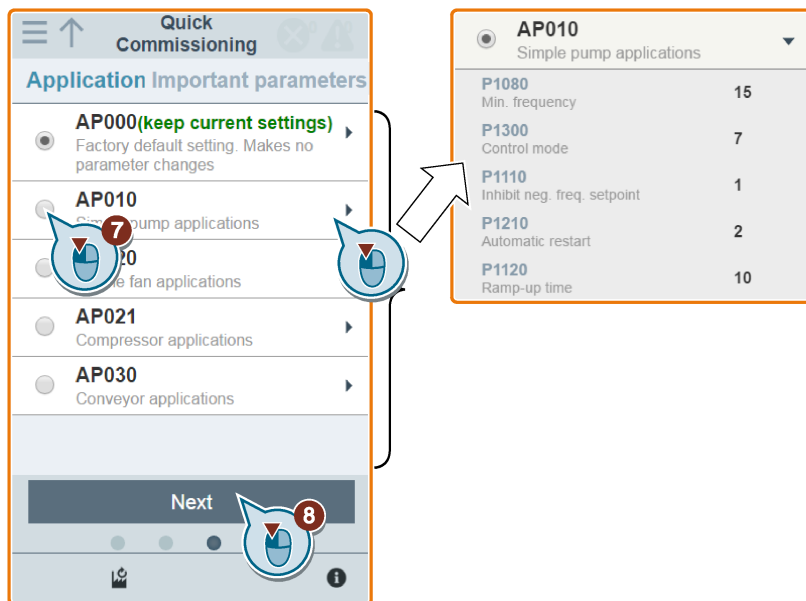


Note that in this step, if you set P1900 = 2, you must perform motor data identification.

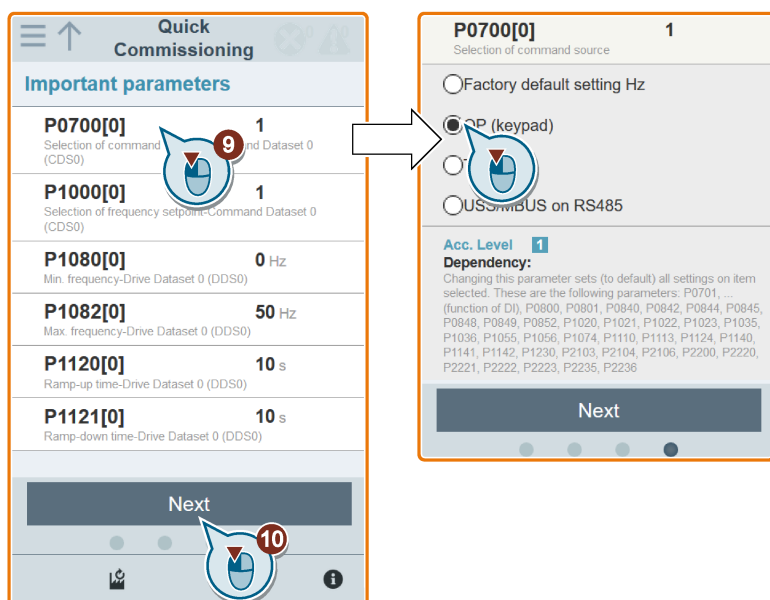
5. Select the desired connection macro.



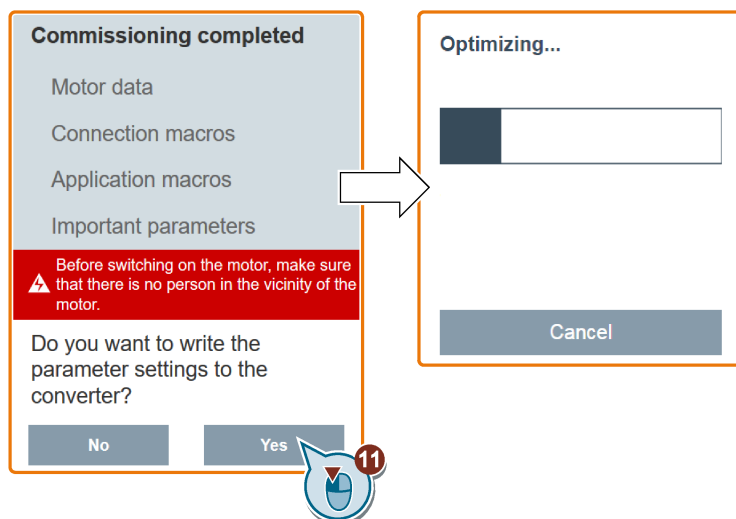
- Select the desired application macro.



- Set the following parameters based on your particular application.



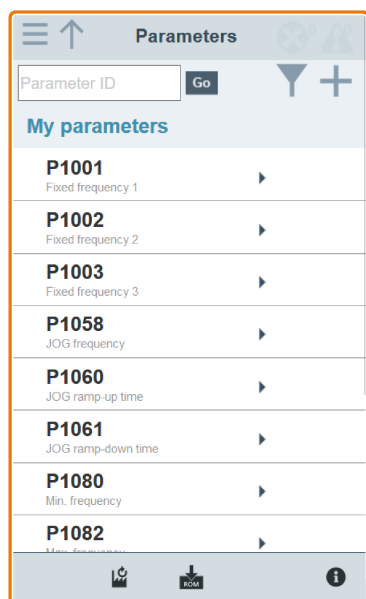
8. Confirm to start writing the parameter settings to the converter.



9. Confirm completion of the quick commissioning when the following window appears. If the Web page indicates that the optimization fails, you can select to try optimization again.



After your confirmation of completion, the Web page automatically switches to my parameters Web page.



7 Parameter list

7.1 Basic drive parameters

Parameter	Function	Setting
P0003	User access level	Range: 0 ... 4 = 0: User defined parameter list - see P0013 for details on use = 1: Standard: Allows access into most frequently used parameters = 2: Extended: Allows extended access, for example, to converter I/O functions = 3: Expert: For expert use only = 4: Service: Only for use by authorized service, password protected
P0005	Parameter display selection	Range: 0 ... 9580
	Selects default display parameter (converter display).	
	Example: The converter displays the value of the parameter selected here by default.	
P0010	Commissioning parameter	Range: 0 ... 30 = 0: Ready = 1: Quick commissioning = 2: Converter = 29: Download = 30: Factory setting
P0304[0...2]	Rated motor voltage [V]	Range: 10 ... 2000
P0305[0...2]	Rated motor current [A]	Range: 0.01 ... 10000.00 Note: Default value is depending on converter type and its rating data.
P0307[0...2]	Rated motor power	Range: 0.01 ... 2000.00 Note: Default value is depending on converter type and its rating data.
P0308[0...2]	Rated motor cosφ	Range: 0.000 ... 1.000
P0309[0...2]	Rated motor efficiency [%]	Range: 0.0 ... 99.9
P0310[0...2]	Rated motor frequency [Hz]	Range: 12.00 ... 550.00 Note: Changes to P0310 can influence the maximum motor frequency. For further information, see the description of P1082 in the <i>SINAMICS V20 Converter Operating Instructions</i> .
P0311[0...2]	Rated motor speed [RPM]	Range: 0 ... 40000 Note: Default value is depending on converter type and its rating data.
P0335[0...2]	Motor cooling	Range: 0 ... 3 = 0: Self-cooled: Shaft mounted fan attached motor = 1: Force-cooled: Separately powered cooling fan = 2: Self-cooled and internal fan = 3: Force-cooled and internal fan
P0340[0...2]	Calculation of motor parameters	Range: 0 ... 4 = 0: No calculation = 1: Complete parameterization = 2: Calculation of equivalent circuit data = 3: Calculation of V/f control data = 4: Calculation of controller settings only
P0604[0...2]	Threshold motor temperature [°C]	Range: 0.0 ... 200.0

Parameter	Function	Setting
P0640[0...2]	Motor overload factor [%]	Range: 10.0 ... 400.0 Note: Changes to P0640 will be effective only after the next off state.
P1031[0...2]	MOP mode	Range: 0 ... 3 Note: Defines the operation mode of the motorized potentiometer. For further information, see the description of P1040 in the <i>SINAMICS V20 Converter Operating Instructions</i> .
	Bit	Signal name
	00	Setpoint store active
	01	No On-state for MOP necessary
P1032	Inhibit reverse direction of MOP	Range: 0 ... 1 = 0: Reverse direction is allowed = 1: Reverse direction inhibited
P1040[0...2]	Setpoint of the MOP [Hz]	Range: -550.00 ... 550.00
r1050	CO: Actual output freq. of the MOP [Hz]	-
P1055[0...2]	BI: Enable JOG right	Range: 0 ... 4294967295
	Defines source of JOG right when P0719 = 0 (Auto selection of command/setpoint source).	
P1056[0...2]	BI: Enable JOG left	Range: 0 ... 4294967295
	Defines source of JOG left when P0719 = 0 (Auto selection of command/setpoint source).	
P1058[0...2]	JOG frequency [Hz]	Range: 0.00 ... 550.00
P1059[0...2]	JOG frequency left [Hz]	Range: 0.00 ... 550.00
P1080[0...2]	Minimum frequency [Hz]	Range: 0.00 ... 550.00
P1082[0...2]	Maximum frequency [Hz]	Range: 0.00 ... 550.00
P1135[0...2]	OFF3 ramp-down time [s]	Range: 0.00 ... 650.00 Note: This time may be exceeded if the Vdc_max level is reached.
P1310[0...2]	Continuous boost [%]	Range: 0.0 ... 250.0 Note: P1310[0...2], P1311[0...2] and P1312[0...2] are relative to P0305 (rated motor current). For more information about the parameters, see Section 8.2 "Parameter list" in the <i>SINAMICS V20 Converter Operating Instructions</i> .
P1311[0...2]	Acceleration boost [%]	Range: 0.0 ... 250.0
P1312[0...2]	Starting boost [%]	Range: 0.0 ... 250.0
P1800[0...2]	Pulse frequency [kHz]	Range: 2 ... 16
P1900	Select motor data identification	Range: 0 ... 2 = 0: Disabled = 2: Identification of all parameters in standstill
P8553	Menu type	Range: 0 ... 1 = 0: Menus with no text = 1: Menus with some text
	Selects whether to have menus with no text or menus with some text on the BOP.	

7.2 Drive monitoring parameters

Parameter	Function
r0018	Firmware version
r0021	CO: Actual filtered frequency [Hz]
r0025	CO: Actual output voltage [V]
r0026[0]	CO: Actual filtered DClink voltage [V]
	Index: [0] Compensation DC voltage channel
	Note: r0026[0] = Main DC-link voltage
r0027	CO: Actual output current [A]
r0031	CO: Actual filtered torque [Nm]
	Note: The electrical torque is not the same as the mechanical torque, which can be measured on the shaft. Due to windage and friction a part of the electrical torque is lost in the motor.
r0032	CO: Actual filtered power
r0035[0...2]	CO: Actual motor temperature [°C]
r0067	CO: Actual output current limit [A]
	Note: A reduction of r0067 may indicate a converter overload or a motor overload.
r0206	Rated converter power [kW]/[hp]
r0207[0...2]	Rated converter current [A]
	Index:
	[0] Rated converter current
	[1] Rated LO current
r0208	Rated converter voltage [V]
	Maximum converter current [A]
r0209	Maximum converter current [A]
r0752[0...1]	Actual analog input [V] or [mA]
	Index:
	[0] Analog input 1 (AI1)
r0754[0...1]	Actual analog input value after scaling [%]
	CO: Actual analog input after scaling [4000h]
r0755[0...1]	Note: This value is used as an input to analog BICO connectors. ASPmax represents the highest analog setpoint (this may be at 10 V). ASPmin represents the lowest analog setpoint (this may be at 0 V). For further information, see the description of P0757 to P0760 (analog input scaling) in the <i>SINAMICS V20 Converter Operating Instructions</i> .
r0774[0]	Actual analog output value [V] or [mA]
	Index: [0] Analog output 1 (AO1)
	Note: The analog output is only a current output. By connecting an external resistor of 500 Ω to the terminals (4/5) a voltage output with a range of 0 V to 10 V can be created.

7.3 Acceleration and deceleration parameters

Parameter	Function	Setting
P1120[0...2]	Ramp-up time [s]	Range: 0.00 ... 650.00 Note: If an external frequency setpoint with set ramp rates is used (e.g. from a PLC), the best way to achieve optimum converter performance is to set ramp times in P1120 and P1121 slightly shorter than those of the PLC. Changes to P1120 will be immediately effective.
P1121[0...2]	Ramp-down time [s]	Range: 0.00 ... 650.00 Note: Changes to P1121 will be immediately effective.
P1138[0...2]	Ramp-up time scaling factor	Range: 1.00 ... 10.00 Note: This time may be exceeded if the Vdc_max level is reached.
P1139[0...2]	Ramp-down time scaling factor	Range: 1.00 ... 10.00 Note: This time may be exceeded if the Vdc_max level is reached.

7.4 Fixed frequency parameters

Parameter	Function	Setting																																																																																																												
P1016[0...2]	Fixed frequency mode	Range: 1 ... 2 = 1: Direct selection = 2: Binary selection																																																																																																												
There are 2 types of fixed frequencies: • Direct selection (P1016 = 1): – In this mode, 1 fixed frequency selector (P1020 ... P1023) selects 1 fixed frequency (P1001 ... P1004). – If several inputs are active together, the selected frequencies are summed. Example: fixed frequency 1 (P1001) + fixed frequency 2 (P1002) + fixed frequency 3 (P1003) + fixed frequency 4 (P1004). • Binary coded selection (P1016 = 2): – Up to 16 different fixed frequency values can be selected using this method.																																																																																																														
<table><tr><th colspan="4">Fixed frequency selection bit</th><th>Binary code</th><th>Fixed frequency 1 to 15 (Hz)</th></tr><tr><th>P1023</th><th>P1022</th><th>P1021</th><th>P1020</th><th></th><th></th></tr><tr><td>-</td><td></td><td></td><td></td><td>0</td><td>0</td></tr><tr><td></td><td></td><td></td><td>1</td><td>1</td><td>P1001</td></tr><tr><td></td><td></td><td>1</td><td></td><td>2</td><td>P1002</td></tr><tr><td></td><td></td><td>1</td><td>1</td><td>3</td><td>P1003</td></tr><tr><td></td><td>1</td><td></td><td></td><td>4</td><td>P1004</td></tr><tr><td></td><td>1</td><td></td><td>1</td><td>5</td><td>P1005</td></tr><tr><td></td><td>1</td><td>1</td><td></td><td>6</td><td>P1006</td></tr><tr><td></td><td>1</td><td>1</td><td>1</td><td>7</td><td>P1007</td></tr><tr><td>1</td><td></td><td></td><td></td><td>8</td><td>P1008</td></tr><tr><td>1</td><td></td><td></td><td>1</td><td>9</td><td>P1009</td></tr><tr><td>1</td><td></td><td>1</td><td></td><td>10</td><td>P1010</td></tr><tr><td>1</td><td></td><td>1</td><td>1</td><td>11</td><td>P1011</td></tr><tr><td>1</td><td>1</td><td></td><td></td><td>12</td><td>P1012</td></tr><tr><td>1</td><td>1</td><td></td><td>1</td><td>13</td><td>P1013</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td><td>14</td><td>P1014</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>15</td><td>P1015</td></tr></table>			Fixed frequency selection bit				Binary code	Fixed frequency 1 to 15 (Hz)	P1023	P1022	P1021	P1020			-				0	0				1	1	P1001			1		2	P1002			1	1	3	P1003		1			4	P1004		1		1	5	P1005		1	1		6	P1006		1	1	1	7	P1007	1				8	P1008	1			1	9	P1009	1		1		10	P1010	1		1	1	11	P1011	1	1			12	P1012	1	1		1	13	P1013	1	1	1		14	P1014	1	1	1	1	15	P1015
Fixed frequency selection bit				Binary code	Fixed frequency 1 to 15 (Hz)																																																																																																									
P1023	P1022	P1021	P1020																																																																																																											
-				0	0																																																																																																									
			1	1	P1001																																																																																																									
		1		2	P1002																																																																																																									
		1	1	3	P1003																																																																																																									
	1			4	P1004																																																																																																									
	1		1	5	P1005																																																																																																									
	1	1		6	P1006																																																																																																									
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1	1	1		14	P1014																																																																																																									
1	1	1	1	15	P1015																																																																																																									
For more information about other fixed frequency bits and assigning desired digital inputs to the fixed frequency bits, see the description of P1001 in the <i>SINAMICS V20 Converter Operating Instructions</i>.																																																																																																														

You can use r1024 (actual fixed frequency) to view the sum of the selected fixed frequencies.

7.5 Braking parameters

DC braking

Parameter	Function	Setting
P1230[0...2]	BI: Enable DC braking	Range: 0 ... 4294967295
P1232[0...2]	DC braking current [%]	Range: 0 ... 250
P1233[0...2]	Duration of DC braking [s]	Range: 0.00 ... 250.00 Note: P1233 = 0 means that DC braking is not activated.
P1234[0...2]	DC braking start frequency [Hz]	Range: 0.00 ... 550.00
P0347[0...2]	Demagnetization time [s]	Range: 0.000 ... 20.000 Note: The demagnetization time is approximately 2.5 x rotor time constant in seconds. Default value is depending on converter type and its rating data.

Compound braking

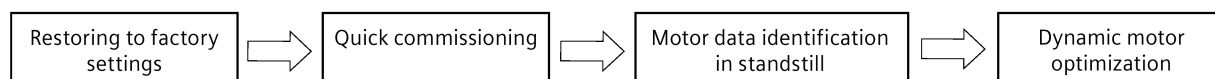
Parameter	Function	Setting
P1236[0...2]	Compound braking current [%]	Range: 0 ... 250 Note: P1236 = 0 means that compound braking is not activated.
P1254	Auto detect Vdc switch-on levels	Range: 0 ... 1 = 0: Disabled = 1: Enabled

Dynamic braking

Parameter	Function	Setting
P1237	Dynamic braking	Range: 0 ... 5 = 0: Disabled = 1: 5 % duty cycle = 2: 10 % duty cycle = 3: 20 % duty cycle = 4: 50 % duty cycle = 5: 100 % duty cycle Note: This parameter is only applicable for three phase AC 400 V converters. For single phase AC 230 V converters, the duty cycle of the braking resistor can be selected with the dynamic braking module (see Appendix "Dynamic braking module" in the <i>SINAMICS V20 Converter Operating Instructions</i> .)
P1240[0...2]	Configuration of Vdc controller	Range: 0 ... 3 = 0: Vdc controller disabled = 1: Vdc_max controller enabled = 2: Kinetic buffering (Vdc_min controller) enabled = 3: Vdc_max controller and kinetic buffering (KIB) enabled Note: This parameter must be set to 0 (Vdc controller disabled) to activate the dynamic braking.
P1254	Auto detect Vdc switch-on levels	Range: 0 ... 1 = 0: Disabled = 1: Enabled

7.6 Motor control parameters

The following figure shows the steps required to achieve better motor control results:

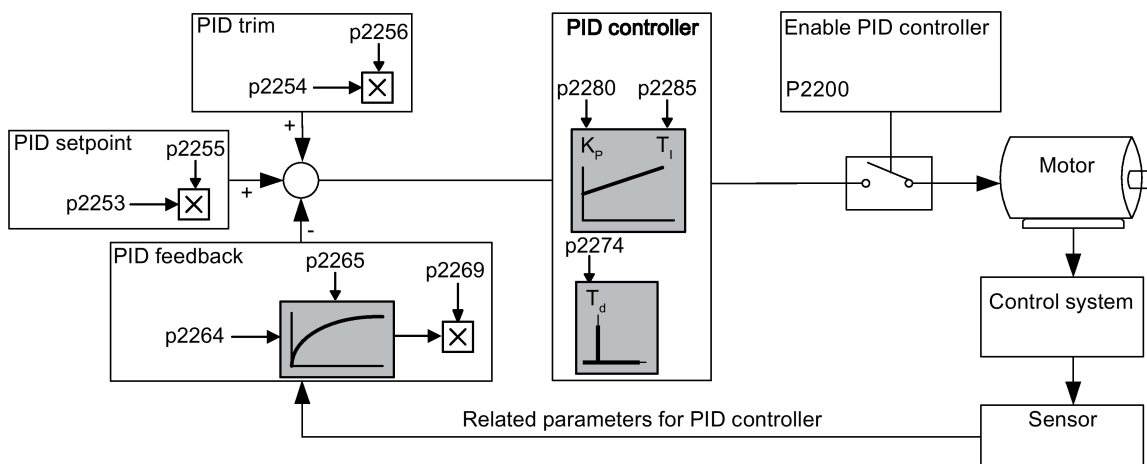


Parameter	Function	Setting
P1900	Select motor data identification	Range: 0 ... 2 = 0: Disabled = 2: Identification of all parameters in standstill Note: Before selecting motor data identification, "Quick commissioning" has to be performed in advance. Once enabled (P1900 > 0), A541 generates a warning that the next ON command will initiate measurement of motor parameters.
P1909[0...2]	Control word of motor data identification	Range: 0 ... 65519

7.7 Automatic restart and flying start parameters

Parameter	Function	Setting
P1200	Flying start	Range: 0 ... 6 = 0: Flying start disabled = 1: Flying start always active; searches in both directions = 2: Flying start active after power on, fault, OFF2; searches in both directions = 3: Flying start active after fault, OFF2; searches in both directions = 4: Flying start always active; searches in direction of setpoint only = 5: Flying start active after power on, fault, OFF2; searches in direction of setpoint only = 6: Flying start active after fault, OFF2; searches in direction of setpoint only Note: Useful for motors with high inertia loads. Settings 1 ... 3 search in both directions. Settings 4 ... 6 search only in direction of setpoint.
	Notice: Flying start must be used in cases where the motor may still be turning (e.g. after a short mains break) or can be driven by the load. Otherwise, overcurrent trips will occur.	
P1210	Automatic restart	Range: 0 ... 11 = 0: Disabled = 1: Trip reset after power on, P1211 disabled = 2: Restart after mains blackout, P1211 disabled = 3: Restart after mains brownout or fault, P1211 enabled = 4: Restart after mains brownout, P1211 enabled = 5: Restart after mains blackout and fault, P1211 disabled = 6: Restart after mains brownout/blackout or fault, P1211 enabled = 7: Restart after mains brownout/blackout or fault, trip when P1211 expires = 8: Restart after mains brownout/blackout with F3 and leave an interval in seconds determined by P1214, P1211 disabled = 9: Restart after mains brownout/blackout with F3 during the attempt time determined by P1214, P1211 disabled = 10: Restart after mains brownout/blackout with F3 during the attempt time determined by P1214 or manual fault acknowledgment, P1211 disabled = 11: Trip reset at power on after mains brownout/blackout with F3 and if no ON command is active; P1211 disabled
	Dependency: Automatic restart requires constant ON command via a digital input wire link.	
Caution: Setting P1210 =2 ... 10 can cause the motor to restart automatically without toggling the ON command!		

7.8 PID control parameters



Parameter	Function	Setting
P2200[0...2]	BI: Enable PID controller	Range: 0 ... 4294967295
P2253[0...2]	CI: PID setpoint	Range: 0 ... 4294967295
P2254[0...2]	CI: PID trim source	Range: 0 ... 4294967295
P2255	PID setpoint gain factor	Range: 0.00 ... 100.00
P2256	PID trim gain factor	Range: 0.00 ... 100.00
P2264[0...2]	CI: PID feedback	Range: 0 ... 4294967295 Note: When analog input is selected, offset and gain can be implemented using P0756 ... P0760 (analog input scaling).
P2265	PID feedback filter time constant [s]	Range: 0.00 ... 60.00
P2269	Gain applied to PID feedback	Range: 0.00 ... 500.00
P2274	PID derivative time [s]	Range: 0.000 ... 60.000
P2280	PID proportional gain	Range: 0.000 ... 65.000
P2285	PID integral time [s]	Range: 0.000 ... 60.000

7.9 I/O commands and binary I/O parameters

Parameter	Function	Setting		
r0050	CO/BO: Active command data set (CDS)	= 0: Command data set 0 (CDS) = 1: Command data set 1 (CDS) = 2: Command data set 2 (CDS)		
r0051[0...1]	CO: Active drive data set (DDS)	= 0: Drive data set 0 (DDS0) = 1: Drive data set 1 (DDS1) = 2: Drive data set 2 (DDS2)		
	Index: [0] Selected drive data set [1] Active drive data set			
r0052.0...15	CO/BO: Active status word 1			
	Displays first active status word of converter (bit format) and can be used to diagnose converter status.			
	Bit	Signal name	1 signal	0 signal
	00	Converter ready	Yes	No
	01	Converter ready to run	Yes	No
	02	Operation enabled	Yes	No
	03	Converter fault active	Yes	No
	04	OFF2 active	No	Yes
	05	OFF3 active	No	Yes
	06	ON inhibit active	Yes	No
	07	Converter warning active	Yes	No
	08	Deviation setpoint/act. value	No	Yes
	09	PZD control	Yes	No
	10	f_act ≥ P1082 (f_max)	Yes	No
	11	Warning: Motor current/torque limit	No	Yes
	12	Brake open	Yes	No
	13	Motor overload	No	Yes
	14	Motor runs right	Yes	No
	15	Converter overload	No	Yes
	Dependency: r0052 bit 03 "Converter fault active": Output of bit 3 (Fault) will be inverted on digital output (Low = Fault, High = No Fault).			
	Note: See r2197 and r2198 in the SINAMICS V20 Converter Operating Instructions. For information about the state diagram after power-on and the ON/OFF1 command, see the FAQ (https://support.industry.siemens.com/cs/ww/en/view/109795851) provided on the Internet.			

Parameter	Function	Setting	
P0701[0...2]	Function of digital input 1	Range: 0 ... 99 = 0: Digital input disabled = 1: ON/OFF1 = 2: ON reverse/OFF1 = 3: OFF2 - coast to standstill = 4: OFF3 - quick ramp-down = 5: ON/OFF2 = 9: Fault acknowledge = 10: JOG right = 11: JOG left = 12: Reverse = 13: MOP up (increase frequency) = 14: MOP down (decrease frequency) = 15: Fixed frequency selector bit0 = 16: Fixed frequency selector bit1 = 17: Fixed frequency selector bit2 = 18: Fixed frequency selector bit3 = 22: QuickStop Source 1 = 23: QuickStop Source 2 = 24: QuickStop Override = 25: DC brake enable = 27: Enable PID = 29: External trip = 33: Disable additional freq setpoint = 99: Enable BICO parameterization	
	Selects function of digital input 1.		
P0702[0...2]	Function of digital input 2	Range: 0 ... 99	
P0703[0...2]	Function of digital input 3	Range: 0 ... 99	
P0704[0...2]	Function of digital input 4	Range: 0 ... 99	
P0712 [0...2]	Analog/digital input 1	Range: 0 ... 99	
P0713[0...2]	Analog/digital input 2	Range: 0 ... 99	
r0722.0...12	CO/BO: Digital input values	Note: Segment is lit when signal is active. The digital input 5 and 6 are provided by the optional I/O Extension Module.	
P0731[0...2]	Bl: Function of digital output 1	Range: 0 ... 4294967295 Note: 52.3 (factory default): Converter fault active, which is the bit 03 of r0052 52.2: Operation enabled P0731 can connect to a status bit of r0052 or of another status signal.	
P0732[0...2]	Bl: Function of digital output 2	Range: 0 ... 4294967295 Note: The factory default of P0732 is 52.7. The meaning of this factory default is the same as that of P0731. For more information, see P0731.	
r0747.0...1	CO/BO: State of digital outputs		
	Bit	Signal name	1 signal0 signal
	00	Digital output 1 energized	YesNo
	01	Digital output 2 energized	YesNo
	02	Digital output 3 energized	YesNo
	03	Digital output 4 energized	YesNo
	Dependency: Bit = 0 signal: Contacts open Bit = 1 signal: Contacts closed Note: The digital output 3 and 4 are provided by the optional I/O Extension Module.		

7.10 Analog input and output parameters

Parameter	Function	Setting
r0752[0...1]	Actual analog input [V] or [mA] Index: [0] Analog input 1 (AI1) [1] Analog input 2 (AI2)	
P0756[0...1]	Type of analog input	Range: 0 ... 4 = 0: Unipolar voltage input (0 V ... 10 V) = 1: Unipolar voltage input with monitoring (0 V ... 10 V) = 2: Unipolar current input (0 mA ... 20 mA) = 3: Unipolar current input with monitoring (0 mA ... 20 mA) = 4: Bipolar voltage input (-10 V ... 10 V)
P0757[0...1]	Value x1 of analog input scaling	Range: -20 ... 20
P0758[0...1]	Value y1 of analog input scaling [%]	Range: -99999.9 ... 99999.9
P0759[0...1]	Value x2 of analog input scaling	Range: -20 ... 20
P0760[0...1]	Value y2 of analog input scaling [%]	Range: -99999.9 ... 99999.9
P0761[0...1]	Width of analog input deadband	Range: 0 ... 20 Note: P0761[x] = 0: No deadband active.
P0771[0]	CI: Analog output	Range: 0 ... 4294967295
P0773[0]	Smooth time analog output [ms]	Range: 0 ... 1000
P0775[0]	Permit absolute value of the analog output	Range: 0 ... 1
P0777[0]	Value x1 of analog output scaling [%]	Range: -99999 ... 99999
P0778[0]	Value y1 of analog output scaling	Range: 0 ... 20
P0779[0]	Value x2 of analog output scaling [%]	Range: -99999 ... 99999
P0780[0]	Value y2 of analog output scaling	Range: 0 ... 20
P0781[0]	Width of analog output deadband	Range: 0 ... 20

7.11 Hand/auto parameters

Parameter	Function	Setting
P0809[0...2]	Copy command data set (CDS)	Range: 0 ... 2
	Index: [0] Copy from CDS [1] Copy to CDS [2] Start copy	
	Example: Copying of all values from CDS0 to CDS2 can be accomplished by the following procedure: P0809[0] = 0 Copy from CDS0 P0809[1] = 2 Copy to CDS2 P0809[2] = 1 Start copy	
P0810	BI: command data set bit 0 (Hand/Auto)	Range: 0 ... 4294967295
	Dependency: CDSs are changed over by changing the values of P0810 and P0811, whereby the active CDS is displayed in r0050. Changeover is possible in both the "Ready" and the "Run" state.	
P0811	BI: command data set bit 1	Range: 0 ... 4294967295
	Dependency: See P0810.	
	CDS	P0811 P0810
	CDS0	0 0
	CDS1	0 1
	CDS2	1 0/1
P0819[0...2]	Copy drive data set (DDS)	Range: 0 ... 2
	Index: [0] Copy from DDS [1] Copy to DDS [2] Start copy	
	Example: Copying of all values from DDS0 to DDS2 can be accomplished by the following procedure: P0819[0] = 0 Copy from DDS0 P0819[1] = 2 Copy to DDS2 P0819[2] = 1 Start copy	
P0820	BI: drive data set bit 0	Range: 0 ... 4294967295
	Dependency: DDSs are changed over by changing the values of P0820 and P0821, whereby the active DDS is displayed in r0051. Changeover is possible in the "Ready" state.	
P0821	BI: drive data set bit 1	Range: 0 ... 4294967295
	Dependency: See P0820.	
	DDS	P0821 P0820
	DDS0	0 0
	DDS1	0 1
	DDS2	1 0/1

7.12 Communication parameters

Parameter	Function	Setting
P0700[0...2]	Selection of command source	Range: 0 ... 5 = 5: USS/MODBUS on RS485 Note: RS485 also supports MODBUS protocol as well as USS. All USS options on RS485 are also applicable to MODBUS.
P1000[0...2]	Selection of frequency setpoint	Range: 0 ... 77 = 5: USS/MODBUS on RS485 Note: See P0700.
P2000[0...2]	Reference frequency [Hz]	Range: 1.00 ... 550.00
P2002[0...2]	Reference current [A]	Range: 0.10 ... 10000.0
P2010[0...1]	USS/MODBUS baudrate	Range: 6 ... 12 = 6: 9600 bps = 7: 19200 bps = 8: 38400 bps = 9: 57600 bps = 10: 76800 bps = 11: 93750 bps = 12: 115200 bps Note: This parameter, index 0, will alter the baudrate on RS485 regardless of the protocol selected in P2023.
	Sets baudrate for USS/MODBUS communication.	
Index: [0] USS/MODBUS on RS485 [1] USS on RS232 (reserved)		
P2011[0...1]	USS address	Range: 0 ... 31 Note: You can connect up to a further 30 converters via the serial link (i.e. 31 converters in total) and control them with the USS serial bus protocol.
P2014[0...1]	USS/MODBUS telegram off time [ms]	Range: 0 ... 65535 Note: The telegram off time will function on RS485 regardless of the protocol set in P2023.
	Index: [0] USS/MODBUS on RS485 [1] USS on RS232 (reserved)	
	Notice: If time set to 0, no fault is generated (i.e. watchdog disabled).	
P2021	Modbus address	Range: 1 ... 247
P2023	RS485 protocol selection	Range: 0 ... 3 = 0: None = 1: USS = 2: Modbus = 3: Script terminal Note: After changing P2023, a power-cycle of the converter (which may take several seconds) is required.
	Selects the protocol which runs on the RS485 link.	
P2034	MODBUS parity on RS485	Range: 0 ... 2 = 0: No parity = 1: Odd parity = 2: Even parity Note: Also see P2010 for baudrate and P2035 for stop bit settings. You must set P2034 to 0 if P2035=2.
P2035	MODBUS stop bits on RS485	Range: 1 ... 2 = 1: 1 stop bit = 2: 2 stop bits Note: Also see P2010 for baudrate and P2034 for parity settings. You must set P2035 to 2 if P2034=0.

Mapping table

The table below shows common registers. "R", "W", and "R/W" in the "Access" column stand for read, write, and read/write respectively. Registers with * are available only when the optional I/O Extension Module is connected.

MODBUS register No.	Description	Access	Unit	Scaling factor	Range or On/Off text		Read	Write
40026	Current filtered	R	A	100	0 ... 163.83		r0027	r0027
40100	STW	R/W	-	1	-		PZD 1	PZD 1
40101	HSW	R/W	-	1	-		PZD 2	PZD 2
40110	ZSW	R	-	1	-		PZD 1	PZD 1
40111	HIW	R	-	1	-		PZD 2	PZD 2
40200	Digital output 1	R/W	-	1	HIGH	LOW	r0747.0	(BICO) P0731
40201	Digital output 2	R/W	-	1	HIGH	LOW	r0747.1	(BICO) P0732
40202	Digital output 3*	R/W	-	1	HIGH	LOW	r0747.2	(BICO) P0733
40203	Digital output 4*	R/W	-	1	HIGH	LOW	r0747.3	(BICO) P0734
40220	Analog output 1	R	%	100	-100.0 ... 100.0		r0774[0]	r0774[0]
40240	Digital input 1	R	-	1	HIGH	LOW	r0722.0	r0722.0
40241	Digital input 2	R	-	1	HIGH	LOW	r0722.1	r0722.1
40242	Digital input 3	R	-	1	HIGH	LOW	r0722.2	r0722.2
40243	Digital input 4	R	-	1	HIGH	LOW	r0722.3	r0722.3
40244	Digital input 5*	R	-	1	HIGH	LOW	r0722.4	r0722.4
40245	Digital input 6*	R	-	1	HIGH	LOW	r0722.5	r0722.5
40260	Analog input 1	R	%	100	-300.0 ... 300.0		r0754[0]	r0754[0]
40261	Analog input 2	R	%	100	-300.0 ... 300.0		r0754[1]	r0754[1]
40322	Acceleration time	R/W	s	100	0.00 ... 650.0		P1120	P1120
40323	Deceleration time	R/W	s	100	0.00 ... 650.0		P1121	P1121
40342	Frequency output	R	Hz	100	-327.68 ... 327.67		r0024	r0024
40343	Voltage output	R	V	1	0 ... 32767		r0025	r0025
40344	DC bus voltage	R	V	1	0 ... 32767		r0026	r0026
40345	Current filtered	R	A	100	0 ... 163.83		r0027	r0027
40346	Torque	R	Nm	100	-325.00 ... 325.00		r0031	r0031
40347	Actual power	R	kW	100	0 ... 327.67		r0032	r0032
40348	Total kWh	R	kWh	1	0 ... 32767		r0039	r0039
40369	JOG frequency	R/W	Hz	100	0.00 ... 650.00		P1058[0]	P1058[0]
40370	JOG frequency	R/W	Hz	100	0.00 ... 650.00		P1058[1]	P1058[1]
40371	JOG frequency	R/W	Hz	100	0.00 ... 650.00		P1058[2]	P1058[2]
40372	JOG frequency left	R/W	Hz	100	0.00 ... 650.00		P1059[0]	P1059[0]
40373	JOG frequency left	R/W	Hz	100	0.00 ... 650.00		P1059[1]	P1059[1]
40374	JOG frequency left	R/W	Hz	100	0.00 ... 650.00		P1059[2]	P1059[2]
40400	Fault 1	R	-	1	0 ... 32767		r0947[0]	r0947[0]
40401	Fault 2	R	-	1	0 ... 32767		r0947[1]	r0947[1]
40402	Fault 3	R	-	1	0 ... 32767		r0947[2]	r0947[2]
40403	Fault 4	R	-	1	0 ... 32767		r0947[3]	r0947[3]
40404	Fault 5	R	-	1	0 ... 32767		r0947[4]	r0947[4]
40405	Fault 6	R	-	1	0 ... 32767		r0947[5]	r0947[5]
40406	Fault 7	R	-	1	0 ... 32767		r0947[6]	r0947[6]
40407	Fault 8	R	-	1	0 ... 32767		r0947[7]	r0947[7]
40408	Warning	R	-	1	0 ... 32767		r2110[0]	r2110[0]
40512	Proportional gain	R/W	-	1000	0.000 ... 65.000		P2280	P2280
40513	Integral gain	R/W	s	1	0 ... 60		P2285	P2285

7.13 Fault and warning specific parameters

Parameter	Function			
r0947[0...63]	CO: Last fault code			
	Displays fault history.			
	Index: [0] Recent fault trip --, fault 1 [7] Recent fault trip --, fault 8 [8] Recent fault trip -1, fault 1 [15] Recent fault trip -1, fault 8 [16] Recent fault trip -2, fault 1 [23] Recent fault trip -2, fault 8 [63] Recent fault trip -7, fault 8			
r0949[0...63]	CO: Fault value			
	Displays converter fault values. It is for service purposes and indicates the type of fault reported. The values are not documented. They are listed in the code where faults are reported.			
	Index: [0] Recent fault trip --, fault value 1 [7] Recent fault trip --, fault value 8 [8] Recent fault trip -1, fault value 1 [15] Recent fault trip -1, fault value 8 [16] Recent fault trip -2, fault value 1 [23] Recent fault trip -2, fault value 8 [63] Recent fault trip -7, fault value 8			
r2110[0...3]	CO: Warning number			
	Index: [0] Recent Warnings --, warning 1 [1] Recent Warnings --, warning 2 [2] Recent Warnings -1, warning 3 [3] Recent Warnings -1, warning 4			
	Note: The LED indicates the warning status in this case. The keypad will flash while a warning is active.			
r3113.0...15	CO/BO: Fault bit array			
	Bit	Signal name	1 signal	0 signal
	00	Converter error	Yes	No
	01	Power line failure	Yes	No
	02	Intermediate circuit power voltage	Yes	No
	03	Error power electronics	Yes	No
	04	Converter overtemperature	Yes	No
	05	Earth leakage	Yes	No
	06	Motor overload	Yes	No
	07	Bus fault	Yes	No
	09	Reserved	Yes	No
	10	Fault internal communication	Yes	No
	11	Motor current limit	Yes	No
	12	Supply failure	Yes	No
	13	Reserved	Yes	No
	14	Reserved	Yes	No
	15	Other error	Yes	No

8 Faults and alarms

8.1 Fault list

Fault	Description	Remedy
F1	Overcurrent	Check the following: • Motor power (P0307) must correspond to converter power (r0206). • Cable length limits must not be exceeded. • Motor cable and motor must have no short-circuits or earth faults. • Motor parameters must match the motor in use. • Value of stator resistance (P0350) must be correct. • Motor must not be obstructed or overloaded. • Increase ramp-up time (P1120) • Reduce starting boost level (P1312)
F2	Overvoltage	Check the following: • Supply voltage (P0210) must lie within limits indicated on rating plate. • Ramp-down time (P1121) must match inertia of load. • Required braking power must lie within specified limits. • Vdc controller must be enabled (P1240) and parameterized properly. Note: Regenerative mode can be caused by fast ramp downs or if the motor is driven by an active load. Higher inertia requires longer ramp times; otherwise, apply braking resistor.
F3	Undervoltage	Check supply voltage.
F4	Converter overtemperature	Check the following: • Load or load cycle too high? • Motor power (P0307) must match converter power (r0206) • Pulse frequency must be set to default value • Surrounding temperature too high? • Fan must turn when converter is running
F5	Converter I ² t	Check the following: • Load cycle must lie within specified limits. • Motor power (P0307) must match converter power (r0206) Note: F5 cannot be cleared until the converter overload utilization (r0036) is lower than the converter I²t warning (P0294).
F6	Chip temperature rise exceeds critical levels	Check the following: • Load or load step too high? • Increase ramp-up time (P1120). • Motor power (P0307) must match converter power (r0206). • Use setting P0290 = 0 or 2 for preventing F6.
F11	Motor overtemperature	If the cause is motor overloaded, check the following: • Load or load step too high? • Motor nominal overtemperatures (P0626 - P0628) must be correct • Motor temperature warning level (P0604) must match This fault may occur if small motors are used and run at a frequency below 15 Hz, even though the motor temperature is within limits. Check the following: • Motor current is not in excess of the motor nominal current as indicated by the motor rating plate • Physical temperature of the motor lies within limits If these two conditions are satisfied, then set parameter P0335 = 1.

Fault	Description	Remedy
F12	Converter temperature signal lost	Contact service department or change converter.
F20	DC ripple too high	Check the mains supply wiring.
F23	Output current ripple too high	- Check the output wiring. - Check the mechanical vibration of the motor. - Check whether the setting of converter response to high output current ripple (P0296) is correct.
F26	Internal error	- Power-cycle converter. - Contact service department or change converter.
F35	Maximum number of auto restart attempts exceeded	Increase the number of restart attempts (P1211).
F41	Motor data identification failure	Check the following: - r0949 = 0: is the motor connected to the converter? - r0949 = 1 ... 49: are the motor data in P0304 ... P0311 correct? - Check what type of motor wiring is required (star, delta).
F51	Parameter EEPROM fault	- Must be power-cycled to cancel this bug as some parameters may not be read correctly. - Factory reset (P0970 = 31) and new parameterization, if power-cycle does not remove fault. - Change some parameters back to default values if the EEPROM is full, then power-cycle. - Change converter.
F52	Converter software fault	- Power-cycle converter. - Contact service department or change converter.
F60	Asic timeout	If the fault appears sporadically due to communication failure with EMC problems: - Check and if necessary improve EMC - Use EMC filter If the fault appears immediately when mains voltage is applied and ON command is given: - Contact service department or change converter
F61	SD card parameter cloning failed	Take the respective actions depending on the fault value in r0949: - r0949 = 0: Use an SD card with FAT16 or FAT32 format, or fit an SD card to the converter. - r0949 = 1: Check the SD card (for example, is the card memory full?) - format the card again to FAT16 or FAT32. - r0949 = 2: Put the correct named file in the correct directory /USER/SINAMICS/DATA. - r0949 = 3: Make sure file is accessible - recreate file if possible. - r0949 = 4: File has been changed - recreate file.
F62	Parameter cloning contents invalid	Recopy and ensure operation completes.
F63	Parameter cloning contents incompatible	Ensure clone from compatible converter type.
F64	Converter attempted to do an automatic clone during startup	If an automatic clone is required: - Insert the SD card with correct file and power-cycle. If no automatic clone is required: - Remove the card if not needed and power-cycle. - Reset P8458 = 0 and power-cycle. Note: Fault can only be cleared by a power-cycle.
F70	I/O Extension Module communication fault	Reconnect the module and check whether it is operating correctly. Acknowledge the fault. If the fault persists, replace the module.
F71	USS setpoint fault (on RS232)	Check USS master on RS232.
F72	USS/MODBUS setpoint fault (on RS485)	Check USS/MODBUS master on RS485.

Fault	Description	Remedy
F80	Signal lost on analog input	- Check the wiring. - Check whether the analog inputs exceed voltage and current limits. - Contact service department or change converter.
F85	External fault	- Check P2106. - Disable control word 2 bit 13 as command source. - Disable terminal input for fault trigger.
F100	Watchdog reset	Contact service department or change converter.
F101	Stack overflow	Contact service department or change converter.
F200	Script error	Check the script and make necessary corrections.
F221	PID feedback below minimum value	- Change value of P2268. - Adjust feedback gain.
F222	PID feedback above maximum value	- Change value of P2267. - Adjust feedback gain.
F350	Configuration vector for the converter failed	Take the respective actions depending on the fault value in r0949: - r0949 = 1, 2, 11, 12, or r0949 > 1000: Internal failures that cannot be fixed. Contact service department. - r0949 = 13: Make sure the right power module is fitted. Note: Fault needs power-cycle to be acknowledged.
F395	Acceptance test/confirmation pending	The current parameter set needs to be checked and confirmed by clearing the fault.
F410	Cavitation protection failure	If cavitation is not occurring, reduce the cavitation threshold P2361, or increase the cavitation protection delay. Ensure sensor feedback is working.
F452	Load monitoring trip	Check the following: - No breakage, seizure or obstruction of converter train. - Apply lubrication if required. If using an external speed sensor, check the following parameters for correct function: - P2192 (delay time for permitted deviation) - P2182 (threshold frequency f1) - P2183 (threshold frequency f2) - P2184 (threshold frequency f3) If using a specific torque/speed range, check parameters: - P2182 (threshold frequency 1) - P2183 (threshold frequency 2) - P2184 (threshold frequency 3) - P2185 (upper torque threshold 1) - P2186 (lower torque threshold 1) - P2187 (upper torque threshold 2) - P2188 (lower torque threshold 2) - P2189 (upper torque threshold 3) - P2190 (lower torque threshold 3) - P2192 (delay time for permitted deviation)

8.2 Alarm list

Alarm	Description	Remedy
A501	Current limit	If it is one of the following causes, see F1: • Motor power does not correspond to the converter power • Motor leads are too long • Earth faults If small motors (120 W) under FCC and light load cause a high current, use V/f operation for very small motors.
A502	Overvoltage limit	If this warning is displayed permanently, check converter input voltage.
A503	Undervoltage limit	Check main supply voltage.
A504	Converter overtemperature	Check the following: • Surrounding temperature must lie within specified limits • Load conditions and load steps must be appropriate • Fan must turn when converter is running
A505	Converter I ² t	Check that load cycle lies within specified limits.
A506	IGBT junction temperature rise warning	Check that load steps and shock loads lie within specified limits.
A507	Converter temperature signal lost	Contact service department or change converter.
A511	Motor overtemperature I ² t	Independently of the kind of temperature determination check: • P0604 motor temperature warning threshold • P0625 motor surrounding temperature • Check if name plate data is correct. If not, perform quick commissioning. Accurate equivalent circuit data can be found by performing motor identification (P1900 = 2). • Check if motor weight (P0344) is reasonable. Change if necessary. • With P0626, P0627, and P0628 the standard overtemperature can be changed, If the motor is not a SIEMENS standard motor.
A523	Output current ripple too high	• Check the output wiring. • Check the mechanical vibration of the motor.
A535	Braking resistor overload	Reduce the braking energy. Use a braking resistor with a higher rating.
A541	Motor data identification active	Complete the motor data identification.
A600	RTOS overrun warning	Contact service department.
A910	Vdc_max controller de-activated	Check the following: • Input voltage must lie within range. • Load must be match. • In certain cases apply braking resistor.
A911	Vdc_max controller active	Check the following: • Supply voltage must lie within limits indicated on rating plate. • Ramp-down time (P1121) must match inertia of load. Note: Higher inertia requires longer ramp times; otherwise, apply braking resistor.
A912	Vdc_min controller active	• Check converter input voltage. • If Vdc_min controller activates during ramp-up, increase the ramp-up time (P1120). • Check shock load (see F3).
A921	Analog output parameters not set properly	Check the following: • Parameter settings for output identical • Parameter settings for input identical • Parameter settings for output do not correspond to analog output type Set P0777 and P0779 to different values.
A922	No load applied to converter	Check that motor is connected to converter.

Alarm	Description	Remedy
A923	Both JOG left and JOG right are requested	Do not press JOG right and left simultaneously.
A930	Cavitation protection warn	See F410.
A936	PID autotuning active	Warning disappears when PID autotuning has finished.
A952	Load monitoring warning	See F452.

9 Additional information

Operating Instructions

You can download the SINAMICS V20 Converter Operating Instructions from the following Internet link: Operating Instructions (<https://support.industry.siemens.com/cs/ww/en/view/109811111>)

Firmware versions for downloading

You can find the latest firmware versions of the V20 converter and the V20 Smart Access on the Internet below:

Firmware downloading (<https://support.industry.siemens.com/cs/ww/en/ps/13208/pm>)

Getting information about the product

The QR code on the converter rating plate and on the product packaging contains the ID link.

ID link is a globally unique identifier according to IEC 61406-1.

You can use the ID link to access product data, manuals, Declarations of Conformity, certificates and other information about your product.



The ID link is characterized by a frame with a black frame corner at the bottom right.

In addition, there is another QR code on the product packaging that allows quick access to the Compact Operating Instructions. Scan the QR code using a QR code scanner on your mobile device to open the Compact Operating Instructions in an Internet browser.

Technical support

Your routes to technical support (<https://support.industry.siemens.com/cs/ww/en/sc/4868>):

- Support Request (<https://www.siemens.com/SupportRequest>)
- Contact person database (https://www.automation.siemens.com/aspa_app)
- "Industry Online Support" mobile app

The Support Request is the most important input channel for questions relating to products from Siemens Industry. This will assign your request a unique ticket number for tracking purposes. The Support Request offers you:

- Direct access to technical experts
- Recommended solutions for various questions (e.g. FAQs)
- Status tracking of your requests

Technical support also assists you in some cases via remote support

(<https://support.industry.siemens.com/cs/ww/en/view/106665159>) to resolve your requests. A Support representative will assist you in diagnosing or resolving the problem through screen transfer.

More information on the Support service packages is available on the Internet via the following address (<https://support.industry.siemens.com/cs/ww/en/sc/4869>).

Data regarding the power loss in accordance with Ecodesign Regulation (EU) 2019/1781 and IEC 61800-9-2

You can find data regarding power loss of our products on the Internet (<https://support.industry.siemens.com/cs/ww/en/view/94059311>).



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