

### SINAMICS V20 Inverter

#### Compact Operating Instructions

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# 1 Safety instructions

Before installing and putting this equipment into operation, read the following safety instructions and all the warning labels attached to the equipment carefully. For more information, refer to the SINAMICS V20 Operating Instructions.

## 1.1 Fundamental safety instructions

### 1.1.1 General safety instructions

#### WARNING

##### **Risk of death if the safety instructions and remaining risks are not carefully observed**

If the safety instructions and residual risks are not observed in the associated hardware documentation, accidents involving severe injuries or death can occur.

- Observe the safety instructions given in the hardware documentation.
- Consider the residual risks for the risk evaluation.

#### WARNING

##### **Danger to life or malfunctions of the machine as a result of incorrect or changed parameterization**

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization (parameter assignments) against unauthorized access.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

### 1.1.2 Industrial security

#### Note

##### **Industrial security**

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit this address (<http://www.siemens.com/industrialsecurity>).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit this address (<http://support.automation.siemens.com>).

#### WARNING

##### **Danger as a result of unsafe operating states resulting from software manipulation**

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Keep the software up to date.  
You will find relevant information and newsletters at this address (<http://support.automation.siemens.com>).
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.  
You will find further information at this address (<http://www.siemens.com/industrialsecurity>).
- Make sure that you include all installed products into the holistic industrial security concept.

## 1.2 Additional safety instructions

### General



#### **DANGER**

##### **Protective earthing conductor current**

The earth leakage current of the SINAMICS V20 inverter may exceed 3.5 mA AC. Therefore, a fixed earth connection is required and the minimum size of the protective earth conductor shall comply with the local safety regulations for high leakage current equipment.

The SINAMICS V20 inverter has been designed to be protected by fuses; however, as the inverter can cause a DC current in the protective earthing conductor, if a Residual Current Device (RCD) is to be used upstream in the supply, observe the following:

- All SINAMICS V20 single phase AC 230 V inverters (filtered or unfiltered) can be operated on a type A<sup>1)</sup> 30 mA, type A(k) 30 mA, type B(k) 30 mA or type B(k) 300 mA RCD.
- All SINAMICS V20 three phase AC 400 V inverters (unfiltered) can be operated on a type B(k) 300 mA RCD.
- SINAMICS V20 three phase AC 400 V inverters (unfiltered) FSA to FSD and FSA (filtered) can be operated on a type B(k) 30 mA RCD.

<sup>1)</sup> To use a type A RCD, the regulations in the following FAQ must be observed: Siemens Web site (<http://support.automation.siemens.com/WW/view/en/49232264>)



#### **WARNING**

##### **Safe use of inverters**

Any unauthorized modifications of the equipment are not allowed.

Protection in case of direct contact by means of voltages < 60 V (PELV = Protective Extra Low Voltage according to EN 61800-5-1) is only permissible in areas with equipotential bonding and in dry indoor rooms. If these conditions are not fulfilled, other protective measures against electric shock must be applied, for example, protective insulation.

Install the inverter on a metal mounting plate in a control cabinet. The mounting plate has to be unpainted and with a good electrical conductivity.

It is strictly prohibited for any mains disconnection to be performed on the motor-side of the system, if the inverter is in operation and the output current is not zero.

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

### Operation

#### **WARNING**

##### **Use of braking resistor**

If an unsuitable braking resistor is used, this could result in a fire and severe damage to people, property and equipment. Use an appropriate braking resistor and install it correctly.

The temperature of a braking resistor increases significantly during operation. Avoid coming into direct contact with braking resistors.



#### **WARNING**

##### **Hot surface**

During operation and for a short time after switching-off the inverter, the marked surfaces of the inverter can reach a high temperature. Avoid coming into direct contact with these surfaces.

### Repair

#### **WARNING**

##### **Repair and replacement of equipment**

Repairs on equipment may only be carried out by Siemens Service, by repair centers authorized by Siemens or by authorized personnel who are thoroughly acquainted with all the warnings and operating procedures contained in this manual.

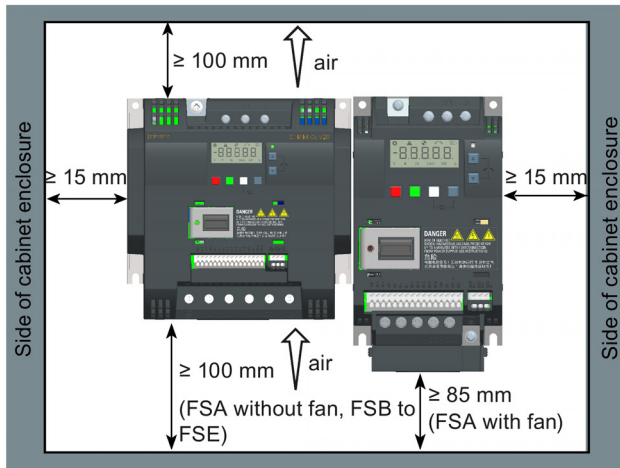
Any defective parts or components must be replaced using parts contained in the relevant spare parts lists.

Disconnect the power supply before opening the equipment for access.

## 2 Installation

### 2.1 Mechanical installation

#### Mounting orientation and clearance



The inverter must be mounted vertically to a flat and non-combustible surface in an enclosed electrical operating area or a control cabinet.

#### Outline dimensions

(Unit: mm)		W	H	H1 <sup>1)</sup>	D	D1 <sup>2)</sup>
	FSAA	68	142	-	107.8	-
	FSAB	68	142	-	127.8	-
	FSA	90	150	166	145.5 (114.5 <sup>3)</sup> )	-
	FSB	140	160	-	164.5	106
	FSC	184	182	-	169	108
	FSD	240	206.5	-	172.5	98
	FSE	245	216	264.5	209	118.5

- 1) Height of frame sizes with fan(s)
- 2) Depth inside the cabinet for push-through mounting
- 3) Depth of Flat Plate inverter (400 V 0.75 kW variant only)

## Drill patterns

(Unit: mm)	W	H	W1	H1	H2	Ø	Screw	Tightening torque	
	FSAA/FSAB	58	132	-	-	-	4.6	2 × M4	1.8 Nm ± 10%
	FSA	79	140	-	-	-	4.6	4 × M4	1.8 Nm ± 10%
	FSB	127	135	-	-	-	4.6	4 × M4	1.8 Nm ± 10%
	FSB <sup>2)</sup>	125	108	118	172	45.5	4.6	4 × M4	1.8 Nm ± 10%
	FSC	170	140	-	-	-	5.8	4 × M5	2.5 Nm ± 10%
	FSC <sup>2)</sup>	170	116	161	197	61	5.8	4 × M5	2.5 Nm ± 10%
	FSD	223	166	-	-	-	5.8	4 × M5	2.5 Nm ± 10%
	FSD <sup>2)</sup>	223	142	214	222	59	5.8	4 × M5	2.5 Nm ± 10%
	FSE	228	206	-	-	-	5.8	4 × M5	2.5 Nm ± 10%
	FSE <sup>2)</sup>	228	182	219	282	83	5.8	4 × M5	2.5 Nm ± 10%

1) For FSAA/FSAB, you only need to drill these two holes for cabinet mounting.

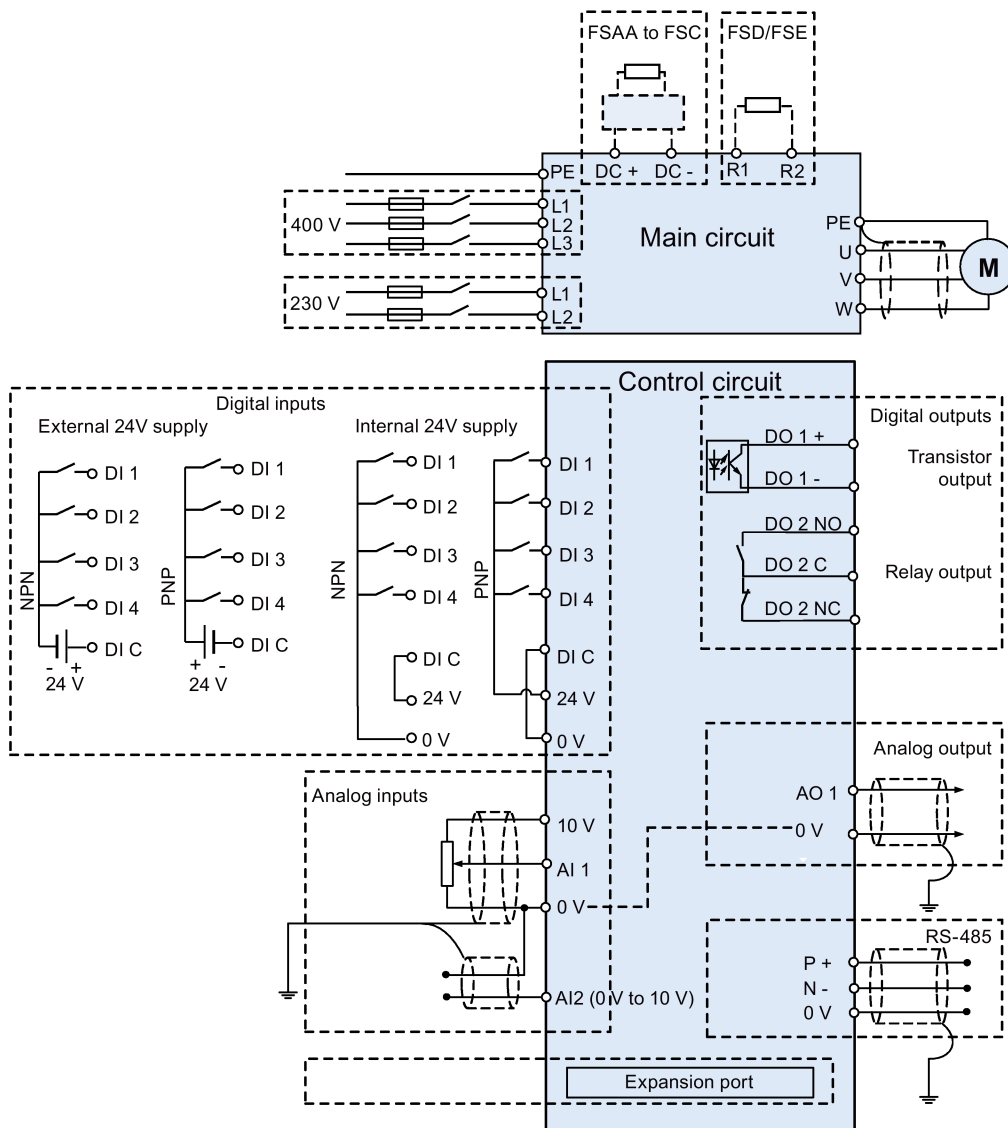
2) For push-through mounting only.

For more information about the push-through mounting and the installation of the Flat Plate inverter, refer to the SINAMICS V20 Inverter Operating Instructions.

## 2.2 Electrical installation

<p><b>⚠ WARNING</b></p> <p><b>Requirements for United States/Canadian installations (UL/cUL)</b></p> <p>Suitable for use on a circuit capable of delivering not more than 40000 rms Symmetrical Amperes, 480 VAC maximum for 400 V variants of inverters or 240 VAC maximum for 230 V variants of inverters, when protected by UL/cUL-certified Class J fuses, type E combination motor controllers or circuit breakers. For each frame size, use 75 °C copper wire only.</p> <p>This equipment is capable of providing internal motor overload protection according to UL508C. In order to comply with UL508C, parameter P0610 must not be changed from its factory setting of 6.</p> <p>For Canadian (cUL) installations the inverter mains supply must be fitted with any external recommended suppressor with the following features:</p> <ul style="list-style-type: none"> <li>• Surge-protective devices; device shall be a Listed Surge-protective device (Category code VZCA and VZCA7)</li> <li>• Rated nominal voltage 480/277 VAC (for 400 V variants) or 240 VAC (for 230 V variants), 50/60 Hz, three phase (for 400 V variants) or single phase (for 230V variants)</li> <li>• Clamping voltage VPR = 2000 V (for 400 V variants) / 1000 V (for 230 V variants), IN = 3 kA min, MCOV = 508 VAC (for 400 V variants) / 264 VAC (for 230V variants), SCCR = 40 kA</li> <li>• Suitable for Type 1 or Type 2 SPD application</li> <li>• Clamping shall be provided between phases and also between phase and ground</li> </ul>
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## Wiring diagram



### Note

The resistance of the potentiometer for each analog input must be  $\geq 4.7 \text{ k}\Omega$ .

### Recommended fuse types

SINAMICS V20 is suitable for use in a power system up to 40000 symmetrical amperes (rms), for the maximum rated voltage +10% when protected by an appropriate standard fuse.

Frame size		Inverter power rating (kW)	Recommended fuse type		Frame size		Inverter power rating (kW)	Recommended fuse type	
			CE-compliant (Siemens)	UL/cUL-compliant				CE-compliant (Siemens)	UL/cUL-compliant
400 V	A	0.37 to 1.1	3NA3801 (6 A)	15 A 600 VAC, class J	230 V	AA/AB	0.12 to 0.55	3NA3803 (10 A)	-
		1.5	3NA3803 (10 A)				0.75	3NA3805 (16 A)	
		2.2	3NA3805 (16 A)						
	B	3.0	3NA3805 (16 A)	20 A 600 VAC, class J		A	0.12 to 0.55	3NA3803 (10 A)	15 A 600 VAC, class J
		4.0	3NA3807 (20 A)				0.75	3NA3805 (16 A)	
	C	5.5	3NA3812 (32 A)	30 A 600 VAC, class J		B	1.1	3NA3807 (20 A)	30 A 600 VAC, class J
		D	7.5 to 15				3NA3822 (63 A)	60 A 600 VAC, class J	
	E		18.5	3NA3022 (63 A)		70 A 600 VAC, class J	C		2.2
		22	3NA3024 (80 A)	80 A 600 VAC, class J				3.0	

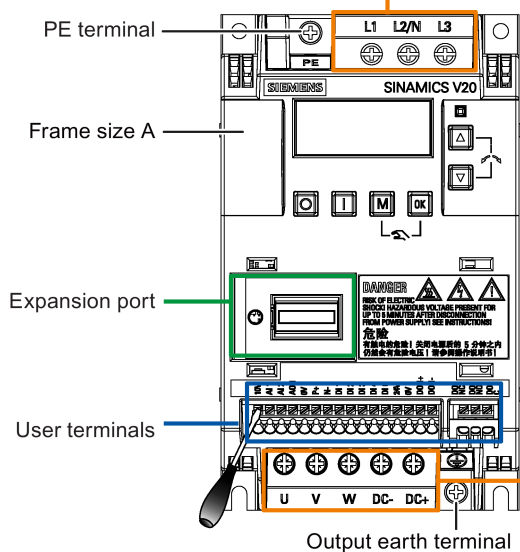
### Recommended types for motor controllers and circuit breakers

Frame size		Inverter power rating (kW)	Type E combination motor controllers (for 400 V FSA to FSC variants and all 230 V variants) Circuit breakers (for 400 V FSD and FSE only) <sup>1)</sup>			
			Order number (Siemens)	Voltage (V)	Current (A)	Power (hp)
400 V	A	0.37	3RV20 11-1CA10	480	1.8 to 2.5	1.0
		0.55	3RV20 11-1DA10	480	2.2 to 3.2	1.5
		0.75	3RV20 11-1EA10	480	2.8 to 4.0	2.0
		1.1	3RV20 11-1FA10	480	3.5 to 5.0	3.0
		1.5	3RV20 11-1HA10	480	5.5 to 8.0	5.0
		2.2	3RV20 11-1JA10	480	7.0 to 10.0	5.0
	B	3.0	3RV20 11-1KA10	480	9.0 to 12.5	7.5
		4.0	3RV20 21-4AA10	480	11.0 to 16.0	10.0
	C	5.5	3RV20 21-4BA10	480	14.0 to 20.0	10.0
	D	7.5	3VL11 03-1KM30-0AA0	600	30	-
		11	3VL11 04-1KM30-0AA0	600	40	-
		15	3VL11 05-1KM30-0AA0	600	50	-
	E	18.5	3VL11 08-1KM30-0AA0	600	80	-
		22	3VL11 08-1KM30-0AA0	600	80	-
230 V	AA/AB/A	0.12	3RV20 11-1DA10	230/240	2.2 to 3.2	0.75
		0.25	3RV20 11-1FA10	230/240	3.5 to 5.0	1.0
		0.37	3RV20 11-1HA10	230/240	5.5 to 8.0	2.0
		0.55	3RV20 11-1JA10	230/240	7.0 to 10.0	3.0
		0.75	3RV20 11-1KA10	230/240	9.0 to 12.5	3.0
	B	1.1	3RV20 21-4BA10	230/240	14.0 to 20.0	5.0
		1.5	3RV20 21-4CA10	230/240	17.0 to 22.0	7.5
	C	2.2	3RV20 21-4EA10	230/240	27.0 to 32.0	10.0
		3.0	3RV10 31-4FA10	230/240	28.0 to 40.0	20.0

<sup>1)</sup> The types for the motor controllers and circuit breakers are listed in compliance with both CE and UL/cUL standards with one exception: FSAA/FSAB relevant information above is in compliance only with the CE standard.

## Terminal description

Mains terminals		Supported cable types:				
3AC 400 V L1 L2/N L3	1AC 230 V L1 L2/N	FSAA to FSB	FSC/FSD	FSE		Cable with UL/cUL-certified fork crimp
FSA to FSD		✓	✓	✗		Stranded cable
3AC 400 V EMC L1 L2/N L3		✓	✓	✗		Cable with pin crimp
FSE		✗	✓	✗		Solid cable
Upper cover (FSE only)		✗	✓	✗		Cable with UL/cUL-certified ring crimp
To open the upper cover, push the locking latch of the cover downwards with a flat-bit screwdriver.		✗	✗	✓		

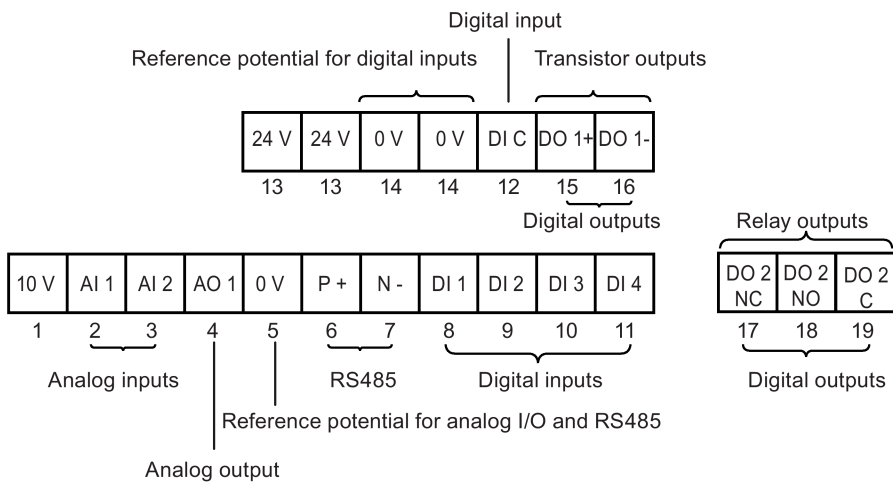


Align a flat-bit screwdriver (bit size: 0.4 x 2.5 mm) with the terminal. Push it downwards on the release lever with a maximum force of 12 N and insert the control wire from below.

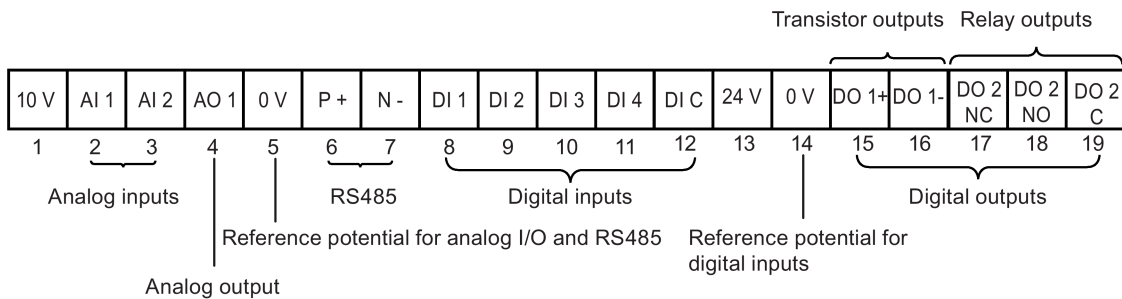
Motor terminals		DC terminals					
FSAA/FSAB/FSA		U	V	W	DC-	DC+	
FSB/FSC		U	V	W	DC-	DC+	
FSD/FSE		U	V	W	R2	DC-	DC+ R1
	Ground	Braking resistor terminals (R1, R2)					
Lower cover (FSE only)							
To open the lower cover, pull the locking latch of the cover upwards with a flat-bit screwdriver.							



**User terminals for FSAA/FSAB:**



**User terminals for FSA to FSE:**



**Note**

To disconnect the built-in EMC filter on FSE, you can use a Pozidriv or flat-bit screwdriver to remove the EMC screw.

<b>NOTICE</b>	
<b>Damage to the mains terminals</b>	
During electrical installation of the inverter frame sizes A and B, use stranded cables or cables with UL/cUL-certified, suitable fork crimps rather than solid cables or cables with pin crimps for mains terminal connection; for frame size E, use cables with UL/cUL-certified ring crimps for the mains terminal connections.	

**Recommended cable cross-sections and screw tightening torques**

Frame size	Rated output power	Mains and PE terminals		Motor / DC / braking resistor / output earth terminals	
		Cable cross-section*	Screw tightening torque (tolerance: ± 10%)	Cable cross-section*	Screw tightening torque (tolerance: ± 10%)
400 V					
A	0.37 kW to 0.75 kW	1.0 mm <sup>2</sup> (12)	1.0 Nm	1.0 mm <sup>2</sup> (12)	1.0 Nm
	1.1 kW to 2.2 kW	1.5 mm <sup>2</sup> (12)		1.5 mm <sup>2</sup> (12)	
B	3.0 kW to 4.0 kW	6 mm <sup>2</sup> (10)	2.4 Nm	6 mm <sup>2</sup> (10)	1.5 Nm
C	5.5 kW	6 mm <sup>2</sup> (10)		6 mm <sup>2</sup> (10)	2.4 Nm
D	7.5 kW	6 mm <sup>2</sup> (10)		6 mm <sup>2</sup> (10)	
	11 kW to 15 kW	10 mm <sup>2</sup> (6)		10 mm <sup>2</sup> (6)	
E	18.5 kW (HO)	10 mm <sup>2</sup> (6)	16 mm <sup>2</sup> (4)	6 mm <sup>2</sup> (8)	
	22 kW (LO)	16 mm <sup>2</sup> (4)		10 mm <sup>2</sup> (6)	
	22 kW (HO)	16 mm <sup>2</sup> (4)		10 mm <sup>2</sup> (6)	
	30 kW (LO)	25 mm <sup>2</sup> (3)		16 mm <sup>2</sup> (4)	

Frame size	Rated output power	Mains and PE terminals		Motor / DC / braking resistor / output earth terminals	
		Cable cross-section*	Screw tightening torque (tolerance: ± 10%)	Cable cross-section*	Screw tightening torque (tolerance: ± 10%)
230 V					
AA/AB/A	0.12 kW to 0.25 kW	1.5 mm <sup>2</sup> (12)	1.0 Nm	1.0 mm <sup>2</sup> (12)	1.0 Nm
	0.37 kW to 0.55 kW	2.5 mm <sup>2</sup> (12)			
	0.75 kW	4.0 mm <sup>2</sup> (12)			
B	1.1 kW to 1.5 kW	6.0 mm <sup>2</sup> ** (10)	1.0 Nm	2.5 mm <sup>2</sup> (10)	1.5 Nm
C	2.2 kW to 3.0 kW	10 mm <sup>2</sup> (6)	2.4 Nm	4.0 mm <sup>2</sup> (8)	2.4 Nm

\* Data in brackets indicates the corresponding AWG values.

\*\* With a UL/cUL-certified, suitable fork crimp

#### Maximum motor cable lengths

Inverter variant	Maximum cable length					
	Without output reactor or external EMC filter			With output reactor		With external EMC filter <sup>1)</sup>
<b>400 V</b>	<b>Unshielded</b>	<b>Shielded</b>	<b>EMC compliant (RE/CE C3) <sup>2)</sup></b>	<b>Unshielded</b>	<b>Shielded</b>	<b>EMC compliant (RE/CE C2) <sup>3)</sup></b>
FSA	50 m	25 m	10 m	150 m	150 m	25 m
FSB to FSD	50 m	25 m	25 m	150 m	150 m	25 m
FSE	100 m	50 m	50 m	300 m	200 m	25 m
<b>230 V</b>	<b>Unshielded</b>	<b>Shielded</b>	<b>EMC compliant (RE/CE C2) <sup>2)</sup></b>	<b>Unshielded</b>	<b>Shielded</b>	<b>EMC compliant (RE/CE C2) <sup>3)</sup></b>
FSAA/FSAB	50 m	25 m	5 m	200 m	200 m	5 m
FSA	50 m	25 m	10 m	200 m	200 m	5 m
FSB to FSC	50 m	25 m	25 m	200 m	200 m	5 m

<sup>1)</sup> As specified in Section B.1.8 of the SINAMICS V20 Inverter Operating Instructions.

<sup>2)</sup> For filtered variants only. RE/CE C3 refers to EMC compliance to EN61800-3 Category C3 for Radiated and Conducted Emissions; RE/CE C2 refers to EMC compliance to EN61800-3 Category C2 for Radiated and Conducted Emissions.

<sup>3)</sup> For unfiltered variants only.

#### Permissible I/O terminal cable cross-sections

Cable type	Permissible cable cross-section
Solid or stranded cable	0.5 mm <sup>2</sup> to 1.5 mm <sup>2</sup>
Ferrule with insulating sleeve	0.25 mm <sup>2</sup>

## 2.3 Technical specifications

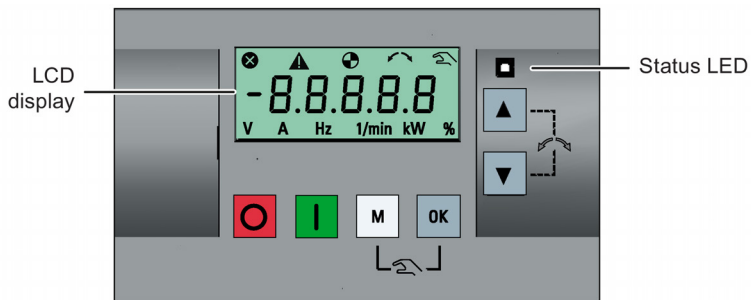
	Three phase AC 400 V inverters	Single phase AC 230 V inverters
<b>Line supply characteristics</b>		
Voltage range	380 V to 480 V AC (tolerance: -15 % to +10 %) 47 Hz to 63 Hz Current derating exists at the input voltages / switching frequencies higher than 400 V / 4kHz. *	200 V to 240 V AC (tolerance: -15 % to +10 %) 47 Hz to 63 Hz Current derating exists at the input voltages / switching frequencies higher than 230 V / 8kHz. *
Overvoltage category	EN 60664-1 Category III	
Permissible supply configuration	TN, TT, IT **, TT earthed line	TN, TT
Supply environment	Second environment (private power network) *	First environment (public power network)
Overload current	Rated power 0.12 kW to 15 kW	150% rated for 60 seconds
	Rated power 18.5 kW (HO)/22 kW (HO)	
	Rated power 22 kW (LO)/30 kW (LO)	110% rated for 60 seconds
<b>Environmental conditions</b>		
Surrounding air temperature	- 10 °C to 40 °C: without derating 40 °C to 60 °C: with derating (UL/cUL-compliant: 40 °C to 50 °C, with derating)*	
Storage temperature	- 40 °C to + 70 °C	
Protection class	IP 20	
Maximum humidity level	95% (non-condensing)	
Shock and vibration	Long-term storage in the transport packaging according to EN 60721-3-1 Class 1M2	
	Transport in the transport packaging according to EN 60721-3-2 Class 2M3	
	Vibration during operation according to EN 60721-3-3 Class 3M2	
Operating altitude	Up to 4000 m above sea level 1000 m to 4000 m: output current derating * 2000 m to 4000 m: input voltage derating *	
Environmental classes	Pollution degree: 2 Solid particles: class 3S2 Chemical gases: class 3C2 (SO <sub>2</sub> , H <sub>2</sub> S) Climate class: 3K3	

\* For more information, refer to the SINAMICS V20 Inverter Operating Instructions.

\*\* Note that for three phase AC 400 V inverters FSA to FSD, only unfiltered variants can be operated on IT power system; to operate FSE (filtered/unfiltered) on IT power supply, make sure you remove the screw for the EMC filter.

## 3 Commissioning

### 3.1 The built-in Basic Operator Panel (BOP)



#### Button functions

	<b>Stops the inverter</b>	
	Single press	OFF1 stop reaction in HAND mode. <b>Exception:</b> This button is inactive if the inverter is configured for control from terminals or USS/MODBUS on RS485 (P0700=2 or P0700=5) in AUTO mode.
	Double press (< 2 s) or long press (> 3 s)	OFF2 stop reaction: the inverter allows the motor to coast to a standstill without using any ramp-down timings.
	Starts the inverter in HAND / JOG / AUTO mode. <b>Exception:</b> This button is inactive if the inverter is configured for control from terminals or USS/MODBUS on RS485 (P0700=2 or P0700=5) in AUTO mode.	
	<b>Multi-function button</b>	
	Short press (< 2 s)	<ul style="list-style-type: none"> <li>Enters the parameter setting menu or moves to the next screen in the setup menu</li> <li>Restarts the digit by digit editing on the selected item</li> <li>Returns to the fault code display</li> <li>Press twice in digit by digit editing to discard change and return</li> </ul>
	Long press (> 2 s)	<ul style="list-style-type: none"> <li>Returns to the status screen</li> <li>Enters the setup menu</li> </ul>
	Short press (< 2 s)	<ul style="list-style-type: none"> <li>Switches between status values</li> <li>Enters edit value mode or change to the next digit</li> <li>Clears faults</li> <li>Returns to the fault code display</li> </ul>
	Long press (> 2 s)	<ul style="list-style-type: none"> <li>Quick parameter number or value edit</li> <li>Accesses fault information data</li> </ul>
+	Press to switch between HAND (with hand icon) / JOG (with flashing hand icon) / AUTO (no icon) mode. <b>Note:</b> Jog mode is only available if the motor is stopped.	
	<ul style="list-style-type: none"> <li>Moves the selection up through a menu, increases a value or a setpoint.</li> <li>Long press (&gt;2 s) to quickly scroll up the values.</li> </ul>	
	<ul style="list-style-type: none"> <li>Moves the selection down through a menu, decreases a value or a setpoint.</li> <li>Long press (&gt;2 s) to quickly scroll down the values.</li> </ul>	
+	Reverses the direction of rotation of the motor.	

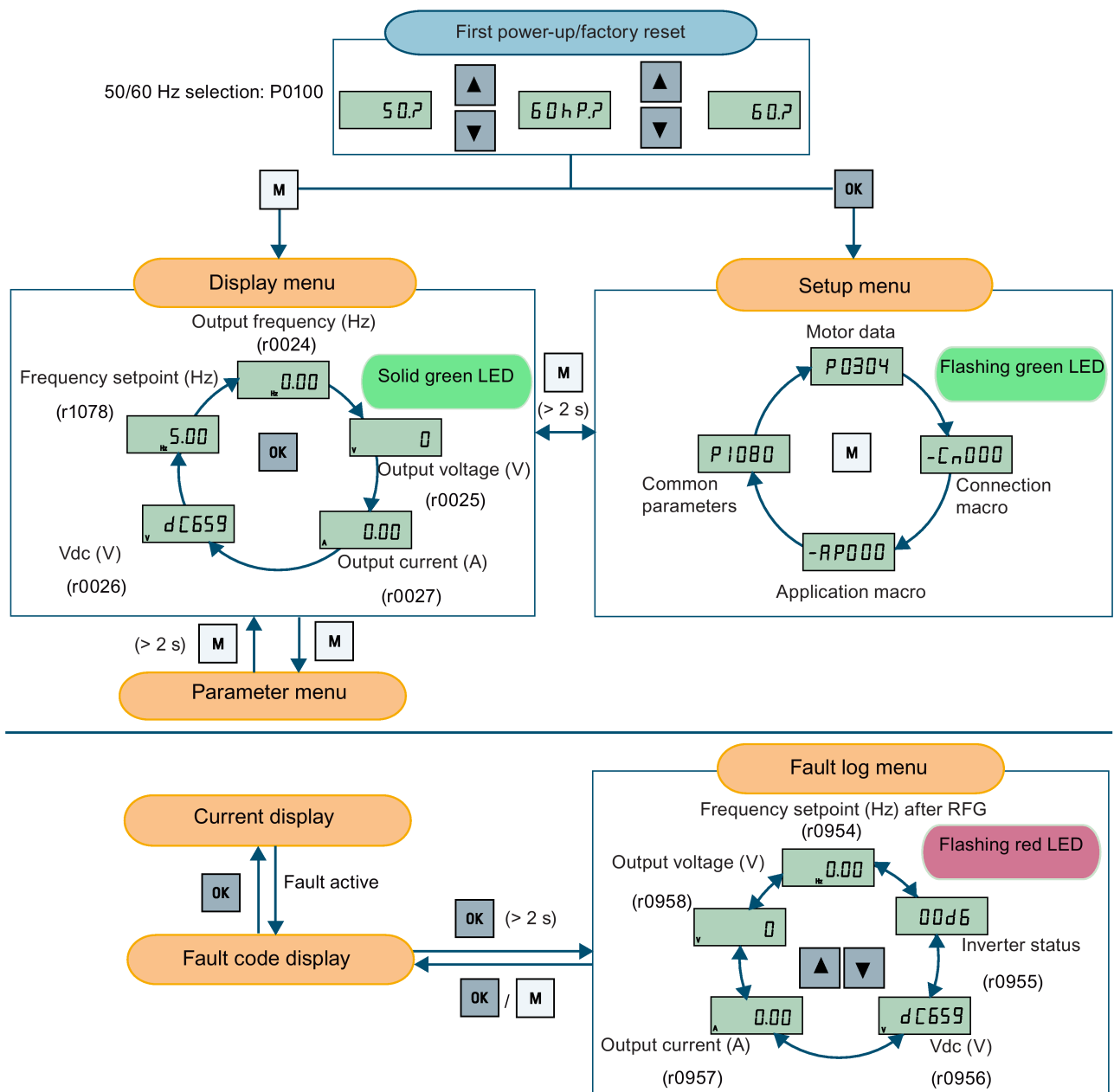
**Note**

Unless otherwise specified, operations of the above keys always indicate short press (< 2 s).

**Inverter status icons**

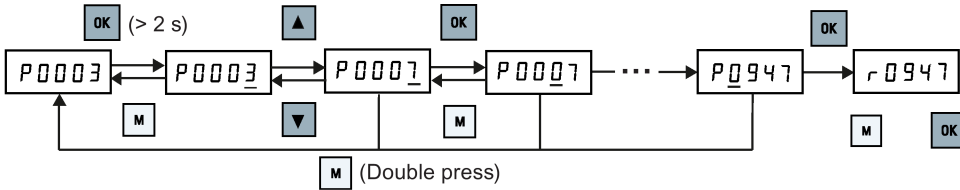
⊗	Inverter has at least one pending fault.	
⚠	Inverter has at least one pending alarm.	
⦿	⦿ :	Inverter is running (motor frequency may be 0 rpm).
	⦿ (flashing):	Inverter may be energized unexpectedly (for example, in frost protection mode).
↺	Motor rotates in the reversed direction.	
👁	👁 :	Inverter is in HAND mode.
	👁 (flashing):	Inverter is in JOG mode.

**Menu structure**



## Digit-by-digit editing of parameters

Example: editing parameter numbers



## 3.2 Quick commissioning

### 3.2.1 Powering up and setting to factory defaults

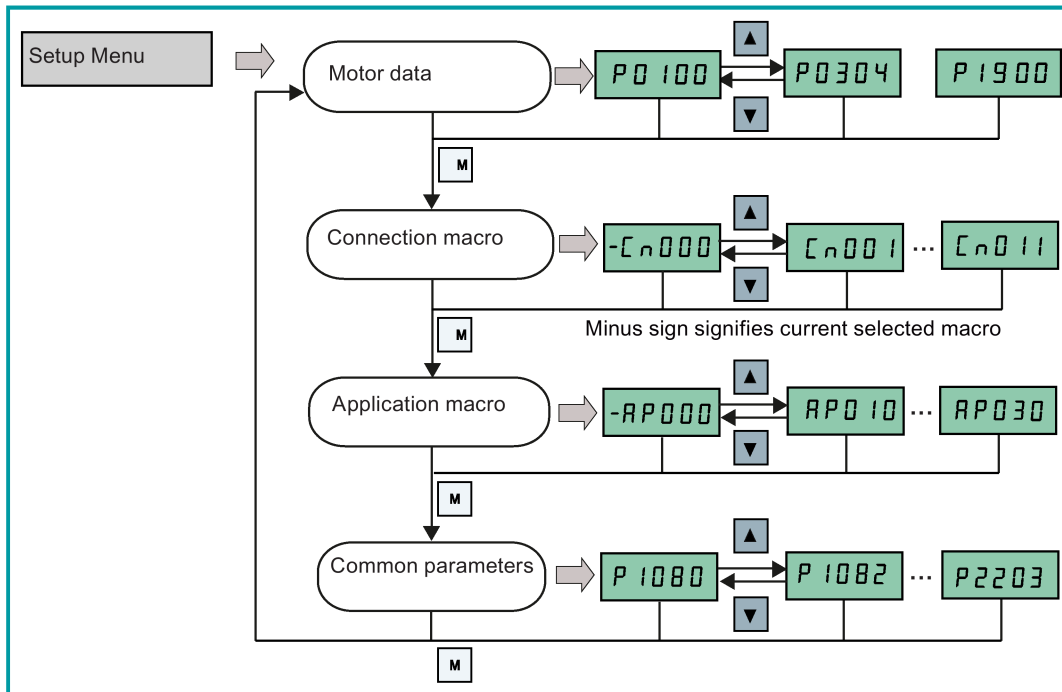
#### Operating sequence

1. Switch on the inverter and then start from the display menu.
2. Press **M** for less than 2 s to switch to the parameter menu.
3. Press **▲** or **▼** to select P0010 and set P0010 = 30 with **OK**.
4. Press **▲** to select P0970 and set P0970 = 1 or P0970 = 21 with **OK**.

#### Note

This section describes how to perform the quick commissioning through the setup menu. If you are used to commissioning the inverter by setting parameters of your choice in the parameter menu, refer to the SINAMICS V20 Inverter Operating Instructions for a detailed description.

#### Structure of the setup menu



## Overview of connection and application macros

Connection macros (Page 16)				Application macros (Page 19)	
Cn000	No chosen connection macro	Cn006	External push button control	AP000	Factory default setting
Cn001	BOP as the only control source	Cn007	External push buttons with analog control	AP010	Simple pump applications
Cn002	Control from terminals (PNP/NPN)	Cn008	PID control with analog reference	AP020	Simple fan applications
Cn003	Fixed speeds	Cn009	PID control with the fixed value reference	AP021	Compressor applications
Cn004	Fixed speeds in binary mode	Cn010	USS control	AP030	Conveyor applications
Cn005	Analog input and fixed frequency	Cn011	MODBUS RTU control		

### 3.2.2 Setting motor data

Parameter	Description	Parameter	Description
P0100	50/60 Hz selection =0: Europe [kW], 50 Hz (factory default) =1: North America [hp], 60 Hz =2: North America [kW], 60 Hz	P0309[0] •	Rated motor efficiency [%]
P0304[0] •	Rated motor voltage [V]	P0310[0] •	Rated motor frequency [Hz]
P0305[0] •	Rated motor current [A]	P0311[0] •	Rated motor speed [RPM]
P0307[0] •	Rated motor power [kW/hp]	P1900	Select motor data identification = 0: Disabled = 2: Identification of all parameters in standstill
P0308[0] •	Rated motor power factor (cosφ)		

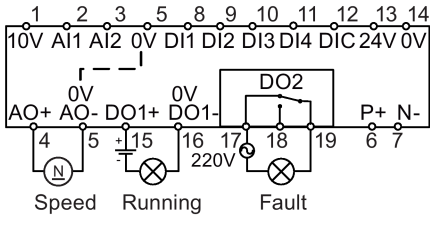
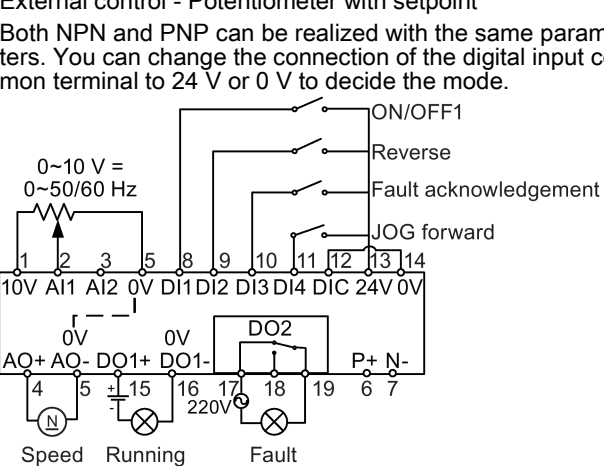
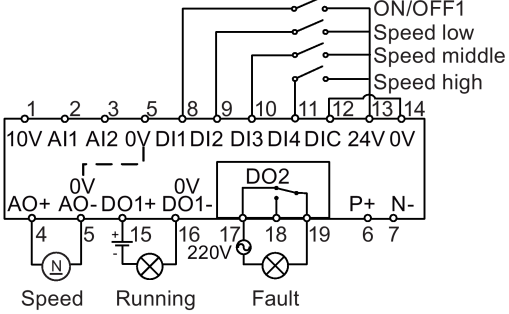
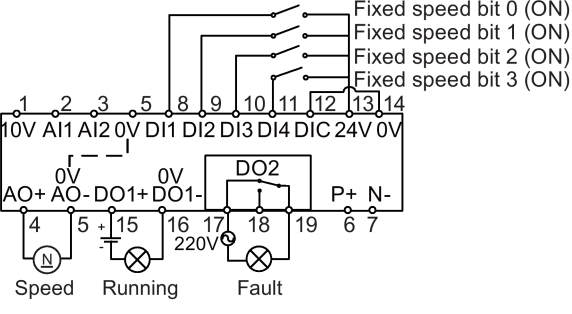
Note: "•" indicates that the value of this parameter must be entered according to the rating plate of the motor. If P0100 = 1 (60 Hz [hp]), P0308[0] is invisible which indicates that this parameter is unnecessary for configuration.

### 3.2.3 Setting connection macros

#### Functionality

This menu selects which macro is required for standard wiring arrangements. The default one is "Cn000" for connection macro 0.

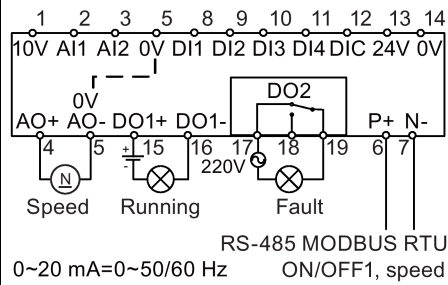
#### Connection macros

<p><b>Cn001 - BOP as the only control source</b></p>  <p>Speed Running Fault</p> <p>0~20 mA=0~50/60 Hz</p>	<p><b>Cn002 - Control from terminals (PNP/NPN)</b></p> <p>External control - Potentiometer with setpoint</p> <p>Both NPN and PNP can be realized with the same parameters. You can change the connection of the digital input common terminal to 24 V or 0 V to decide the mode.</p>  <p>ON/OFF1 Reverse Fault acknowledgement JOG forward</p> <p>Speed Running Fault</p> <p>0~20 mA = 0~50/60 Hz</p> <p style="text-align: right;"><b>PNP</b></p>
<p><b>Cn003 - Fixed speeds</b></p> <p>Three fixed speeds with ON/OFF</p> <p>If several digital inputs are active at the same time, the selected frequencies are summed, for example, FF1 + FF2 + FF3.</p>  <p>ON/OFF1 Speed low Speed middle Speed high</p> <p>Speed Running Fault</p> <p>0~20 mA=0~50/60 Hz</p>	<p><b>Cn004 - Fixed speeds in binary mode</b></p> <p>Fixed speeds with ON command in binary mode</p> <p>Up to 16 different fixed frequency values (0 Hz, P1001 ... P1015) can be selected by the fixed frequency selectors (P1020 ... P1023).</p>  <p>Fixed speed bit 0 (ON) Fixed speed bit 1 (ON) Fixed speed bit 2 (ON) Fixed speed bit 3 (ON)</p> <p>Speed Running Fault</p> <p>0~20 mA=0~50/60 Hz</p>



<p><b>Cn005 - Analog input and fixed frequency</b></p> <p>The analog input works as an additional setpoint. If digital input 2 and digit input 3 are active together, the selected frequencies are summed, that is, FF1 + FF2.</p> <p>0~10 V = 0~50/60 Hz</p> <p>ON/OFF1 Fixed speed bit 0 Fixed speed bit 1 Fault acknowledgement</p> <p>10V AI1 AI2 0V DI1 DI2 DI3 DI4 DIC 24V 0V</p> <p>AO+ AO- DO1+ DO1- DO2 P+ N-</p> <p>Speed Running Fault</p> <p>0~20 mA = 0~50/60 Hz</p>	<p><b>Cn006 - External push button control</b></p> <p>Note that the command sources are pulse signals.</p> <p>OFF1/hold ON pulse MOP up MOP down</p> <p>1 2 3 5 8 9 10 11 12 13 14</p> <p>10V AI1 AI2 0V DI1 DI2 DI3 DI4 DIC 24V 0V</p> <p>AO+ AO- DO1+ DO1- DO2 P+ N-</p> <p>Speed Running Fault</p> <p>0~20 mA=0~50/60 Hz</p>
<p><b>Cn007 - External push buttons with analog control</b></p> <p>Note that the command sources are pulse signals.</p> <p>0~10 V = 0~50/60 Hz</p> <p>OFF hold Forward pulse + ON Reverse pulse + ON Fault acknowledgement pulse</p> <p>1 2 3 5 8 9 10 11 12 13 14</p> <p>10V AI1 AI2 0V DI1 DI2 DI3 DI4 DIC 24V 0V</p> <p>AO+ AO- DO1+ DO1- DO2 P+ N-</p> <p>Speed Running Fault</p> <p>0~20 mA=0~50/60 Hz</p>	<p><b>Cn008 - PID control with analog reference</b></p> <p>If a negative setpoint for the PID control is desired, change the setpoint and feedback wiring as needed.</p> <p>0 ~ 20 mA Actual value</p> <p>PID setpoint</p> <p>ON/OFF1 Fault acknowledgement pulse</p> <p>1 2 3 5 8 9 10 11 12 13 14</p> <p>10V AI1 AI2 0V DI1 DI2 DI3 DI4 DIC 24V 0V</p> <p>AO+ AO- DO1+ DO1- DO2 P+ N-</p> <p>Speed Running Fault</p> <p>0~20 mA=0~50/60 Hz</p>
<p><b>Cn009 - PID control with the fixed value reference</b></p> <p>0 ~ 20 mA Actual value</p> <p>ON/OFF1 Fixed PID setpoint 1 Fixed PID setpoint 2 Fixed PID setpoint 3</p> <p>1 2 3 5 8 9 10 11 12 13 14</p> <p>10V AI1 AI2 0V DI1 DI2 DI3 DI4 DIC 24V 0V</p> <p>AO+ AO- DO1+ DO1- DO2 P+ N-</p> <p>Speed Running Fault</p> <p>0~20 mA=0~50/60 Hz</p>	<p><b>Cn010 - USS control</b></p> <p>1 2 3 5 8 9 10 11 12 13 14</p> <p>10V AI1 AI2 0V DI1 DI2 DI3 DI4 DIC 24V 0V</p> <p>AO+ AO- DO1+ DO1- DO2 P+ N-</p> <p>Speed Running Fault</p> <p>RS-485 USS ON/OFF1, speed</p> <p>0~20 mA=0~50/60 Hz</p>

### Cn011 - MODBUS RTU control



### Parameters for setting the connections macros

	Description	Default values for connection macros (Cn...)										
		001	002	003	004	005	006	007	008	009	010	011
P0700[0]	Selection of command source	1	2	2	2	2	2	2	2	2	5	5
P0701[0]	Function of digital input 1	-	1	1	15	1	2	1	1	1	-	-
P0702[0]	Function of digital input 2	-	12	15	16	15	1	2	-	15	-	-
P0703[0]	Function of digital input 3	-	9	16	17	16	13	12	9	16	-	-
P0704[0]	Function of digital input 4	-	10	17	18	9	14	9	-	17	-	-
P0727[0]	Selection of 2/3-wire method	-	-	-	-	-	3	2	-	-	-	-
P0731[0]	BI: Function of digital output 1	52.2	52.2	52.2	52.2	52.2	52.2	52.2	52.2	-	-	-
P0732[0]	BI: Function of digital output 2	52.3	52.3	52.3	52.3	52.3	52.3	52.3	52.3	-	-	-
P0756[1]	Type of analog input	-	-	-	-	-	-	-	2	-	-	-
P0771[0]	CI: Analog output	21	21	21	21	21	21	21	21	-	-	-
P0810[0]	BI: CDS bit 0 (Hand/Auto)	0	-	-	-	-	-	-	-	-	-	-
P0840[0]	BI: ON/OFF1	-	-	-	1025.0	-	-	-	-	-	-	-
P1000[0]	Selection of frequency	1	2	3	3	23	1	2	-	-	5	5
P1001[0]	Fixed frequency 1	-	-	10	-	10	-	-	-	-	-	-
P1002[0]	Fixed frequency 2	-	-	15	-	15	-	-	-	-	-	-
P1003[0]	Fixed frequency 3	-	-	25	-	-	-	-	-	-	-	-
P1016[0]	Fixed frequency mode	-	-	1	2	1	-	-	-	-	-	-
P1020[0]	BI: Fixed frequency selection bit 0	-	-	722.1	722.0	722.1	-	-	-	-	-	-
P1021[0]	BI: Fixed frequency selection bit 1	-	-	722.2	722.1	722.2	-	-	-	-	-	-
P1022[0]	BI: Fixed frequency selection bit 2	-	-	722.3	722.2	-	-	-	-	-	-	-
P1023[0]	BI: Fixed frequency selection bit 3	-	-	-	722.3	-	-	-	-	-	-	-
P1040[0]	Setpoint of the MOP	-	-	-	-	-	0	-	-	-	-	-
P1047[0]	MOP ramp-up time of the RFG	-	-	-	-	-	10	-	-	-	-	-
P1048[0]	MOP ramp-down time of the RFG	-	-	-	-	-	10	-	-	-	-	-
P1074[0]	BI: Disable additional setpoint	-	-	-	-	1025.0	-	-	-	-	-	-
P2010[0]	USS/MODBUS baudrate	-	-	-	-	-	-	-	-	-	8	6
P2011[0]	USS address	-	-	-	-	-	-	-	-	-	1	-
P2012[0]	USS PZD length	-	-	-	-	-	-	-	-	-	2	-
P2013[0]	USS PKW length	-	-	-	-	-	-	-	-	-	127	-
P2014[0]	USS/MODBUS telegram off time	-	-	-	-	-	-	-	-	-	500	100
P2021[0]	MODBUS address	-	-	-	-	-	-	-	-	-	-	1
P2022[0]	MODBUS reply timeout	-	-	-	-	-	-	-	-	-	-	1000
P2023[0]	RS485 protocol selection	-	-	-	-	-	-	-	-	-	1	2
P2034	MODBUS parity on RS485	-	-	-	-	-	-	-	-	-	-	2
P2035	MODBUS stop bits on RS485	-	-	-	-	-	-	-	-	-	-	1

	Description	Default values for connection macros (Cn...)										
		001	002	003	004	005	006	007	008	009	010	011
P2200[0]	Enable PID controller	-	-	-	-	-	-	-	1	1	-	-
P2216[0]	Fixed PID setpoint mode	-	-	-	-	-	-	-	-	1	-	-
P2220[0]	Bl: Fixed PID setpoint select bit 0	-	-	-	-	-	-	-	-	722.1	-	-
P2221[0]	Bl: Fixed PID setpoint select bit 1	-	-	-	-	-	-	-	-	722.2	-	-
P2222[0]	Bl: Fixed PID setpoint select bit 2	-	-	-	-	-	-	-	-	722.3	-	-
P2253[0]	Cl: PID setpoint	-	-	-	-	-	-	-	755.0	2224	-	-
P2264[0]	Cl: PID feedback	-	-	-	-	-	-	-	755.1	755.1	-	-

### 3.2.4 Setting application macros

#### Functionality

This menu defines certain common applications. Each application macro provides a set of parameter settings for a specific application. After you select an application macro, the corresponding settings are applied to the inverter to simplify the commissioning process.

#### Application macro specific parameters

Parameter	Description	Factory default	Default for application macro				Remarks
			AP010	AP020	AP021	AP030	
P1080[0]	Minimum frequency	0	15	20	-	-	Inverter running at a lower speed inhibited
P1300[0]	Control mode	0	7	7	0	1	=7: Quadratic V/f =0: Linear V/f =1: V/f with FCC
P1110[0]	Bl: Inhibit negative frequency setpoint	0	1	-	-	-	Reverse rotation inhibited
P1200[0]	Flying start	0	-	2	-	-	Search for the speed of the running motor with a heavy inertia load so that the motor runs up to the setpoint
P1210[0]	Automatic restart	1	2	2	-	-	Restart after mains blackout
P1120[0]	Ramp-up time	10	10	10	10	5	Ramp-up time from zero to maximum frequency
P1121[0]	Ramp-down time	10	10	20	10	5	Ramp-down time from maximum frequency to zero
P1312[0]	Starting boost	0	-	-	30	30	Boost only effective when accelerating for the first time (standstill)
P1311[0]	Acceleration boost	0	-	-	0	-	Boost only effective when accelerating or braking
P1310[0]	Continuous boost	50	-	-	50	-	Additional boost over the complete frequency range

### 3.2.5 Setting common parameters

Parameter	Description	Parameter	Description
P1080[0]	Minimum motor frequency	P1001[0]	Fixed frequency setpoint 1
P1082[0]	Maximum motor frequency	P1002[0]	Fixed frequency setpoint 2
P1120[0]	Ramp-up time	P1003[0]	Fixed frequency setpoint 3
P1121[0]	Ramp-down time	P2201[0]	Fixed PID frequency setpoint 1
P1058[0]	JOG frequency	P2202[0]	Fixed PID frequency setpoint 2
P1060[0]	JOG ramp-up time	P2203[0]	Fixed PID frequency setpoint 3
P1061[0]	JOG ramp-down time		

### 3.3 Restoring to defaults

Parameter	Function	Setting
P0003	User access level	= 1 (standard user access level)
P0010	Commissioning parameter	= 30 (factory setting)
P0970	Factory reset	= 1: parameter reset to user defaults if stored, else factory defaults (restoring to user defaults) = 21: parameter reset to factory defaults deleting user defaults if stored (restoring to factory defaults)

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

## 4 Technical support information

Country	Hotline
China	+86 400 810 4288
France	+33 0821 801 122
Germany	+49 (0) 911 895 7222
Italy	+39 (02) 24362000
Brazil	+55 11 3833 4040
India	+91 22 2760 0150
Korea	+82 2 3450 7114
Turkey	+90 (216) 4440747
USA	+1 423 262 5710

Further service contact information: Support contacts (<http://support.automation.siemens.com/WW/view/en/16604999>)

## A Parameters, faults, and alarms

### A.1 Parameter list

Parameter	Description	Range	Factory default	Acc. level
P0003	User access level	0 - 4	1	1
	0	Use-defined parameter list (defines a limited set of parameters to which the end user has access. See P0013 for details on use.)		
	1	Standard (allows access into most frequently used parameters)		
	2	Extended (allows extended access to more parameters)		
	3	Expert (for expert use only)		
	4	Service (only for use by authorized service personnel, password protected)		
P0004	Parameter filter	0 - 24	0	1
	0	All parameters	12	Inverter features
	2	Inverter	13	Motor control
	3	Motor	19	Motor identification
	5	Technology application / units	20	Communication
	7	Commands, binary I/O	21	Warnings / faults / monitoring
	8	Analog input and analog output	22	Technology controller
	10	Setpoint channel / RFG	24	List of modified parameters

Parameter	Description	Range	Factory default	Acc. level
P0005	Parameter display selection	0 - 9580	0	2
	Selects default display parameter (inverter display).			
<b>Example:</b>	The inverter displays the value of the parameter selected here by default.			
P0010	Commissioning parameter	0 - 30	0	1
	0 Ready	29	Download	
	1 Quick commissioning	30	Factory setting	
	2 Inverter			
r0018	Firmware version	-	-	1
r0021	CO: Actual filtered frequency [Hz]	-	-	2
r0025	CO: Actual output voltage [V]	-	-	2
r0026[0]	CO: Actual filtered DC-link voltage [V]	-	-	2
r0027	CO: Actual output current [A]	-	-	2
r0031	CO: Actual filtered torque [Nm]	-	-	2
r0032	CO: Actual filtered power	-	-	2
r0035[0...2]	CO: Actual motor temperature [°C]	-	-	2
r0039	CO: Energy consumpt. meter [kWh]	-	-	2
P0040	Reset energy consumpt. and energy saved meter	0 - 1	0	2
	0 No reset			
	1 Reset r0039 to 0			
P0042[0...1]	Energy saving scaling	0.000 - 100.00	0.000	2
<b>Index:</b>	[0] Factor for kWh to currency conversion			
	[1] Factor for kWh to CO2 conversion			
r0043[0...2]	Energy saved [kWh]	-	-	2
r0050	CO / BO: Active command data set	-	-	2
r0051[0...1]	CO: Active inverter data set (DDS)	-	-	2
r0052.0...15	CO / BO: Active status word 1	-	-	2
	Bit Signal	1 signal	Bit Signal	1 signal
	00 Inverter ready	Yes	01 Inverter ready to run	Yes
	02 Inverter running	Yes	03 Inverter fault active	Yes
	04 OFF2 active	No	05 OFF3 active	No
	06 ON inhibit active	Yes	07 Inverter warning active	Yes
	08 Deviation setpoint / act. value	No	09 PZD control	Yes
	10 $ f_{act}  \geq P1082 (f_{max})$	Yes	11 Warning: Motor current / torque limit	No
	12 Brake open	Yes	13 Motor overload	No
	14 Motor runs right	Yes	15 Inverter overload	No
r0053.0...15	CO / BO: Active status word 2	-	-	2
	Bit Signal name	1 signal	Bit Signal name	1 signal
	00 DC brake active	Yes	01 $ f_{act}  > P2167 (f_{off})$	Yes
	02 $ f_{act}  > P1080 (f_{min})$	Yes	03 Act. current $ r0068  \geq P2170$	Yes
	04 $ f_{act}  > P2155 (f_1)$	Yes	05 $ f_{act}  \leq P2155 (f_1)$	Yes
	06 $f_{act} \geq \text{setpoint} (f_{set})$	Yes	07 Act. unfilt. Vdc $< P2172$	Yes

Parameter	Description	Range	Factory default	Acc. level
	08 Act. unfilt. Vdc > P2172	Yes	09 Ramping finished	Yes
	10 PID output r2294 == P2292 (PID_min)	Yes	11 PID output r2294 == P2291 (PID_max)	Yes
	14 Download Data set 0 from external storage	Yes	15 Download Data set 1 from external storage	Yes
P0100	Europe / North America	0 - 2	0	1
	0 Europe [kW], motor base frequency is 50 Hz			
	1 North America [hp], motor base frequency is 60 Hz			
	2 North America [kW], motor base frequency is 60 Hz			
r0206	Rated inverter power [kW] / [hp]	-	-	2
r0207[0...2]	Rated inverter current [A]	-	-	2
r0208	Rated inverter voltage [V]	-	-	2
r0209	Maximum inverter current [A]	-	-	2
P0301[0...2]	Easy motor data, rated motor power [kW]	0 - 2000	0	1
P0304[0...2]	Rated motor voltage [V]	10 - 2000	400	1
P0305[0...2]	Rated motor current [A]	0.01 - 10000.00	1.86	1
P0307[0...2]	Rated motor power	0.01 - 2000.00	0.75	1
P0308[0...2]	Rated motor cosφ	0.000 - 1.000	0.000	1
P0309[0...2]	Rated motor efficiency [%]	0.0 - 99.9	0.0	1
P0310[0...2]	Rated motor frequency [Hz]	12.00 - 550.00	50.00	1
P0311[0...2]	Rated motor speed [RPM]	0 - 40000	1395	1
P0335[0...2]	Motor cooling	0 - 3	0	2
	0 Self-cooled: Shaft mounted fan attached motor (IC410 or IC411)			
	1 Force-cooled: Separately powered cooling fan (IC416)			
	2 Self-cooled and internal fan			
	3 Force-cooled and internal fan			
P0340[0...2]	Calculation of motor parameters	0 - 4	0	2
	0 No calculation	3	Calculation of V/f control data	
	1 Complete parameterization	4	Calculation of controller settings only	
	2 Calculation of equivalent circuit data			
P0507	Application macro	0 - 255	0	1
r0512	CO: Scaled filtered frequency	-	-	2
P0604[0...2]	Threshold motor temperature [°C]	0.0 - 200.0	130.0	2
P0640[0...2]	Motor overload factor [%]	10.0 - 400.0	150.0	2
P0700[0...2]	Selection of command source	0 - 5	1	1
	0 Factory default setting	2	Terminal	
	1 Operator panel (keypad)	5	USS / MODBUS on RS485	
P0701[0...2]	Function of digital input 1	0 - 99	0	2
	0 Digital input disabled	15	Fixed frequency selector bit0	
	1 ON / OFF1	16	Fixed frequency selector bit1	
	2 ON reverse / OFF1	17	Fixed frequency selector bit2	
	3 OFF2 - coast to standstill	18	Fixed frequency selector bit3	
	4 OFF3 - quick ramp-down	22	QuickStop Source 1	
	5 ON / OFF2	23	QuickStop Source 2	
	9 Fault acknowledge	24	QuickStop Override	

Parameter	Description	Range	Factory default	Acc. level
	10 JOG right	25	DC brake enable	
	11 JOG left	27	Enable PID	
	12 Reverse	29	External trip	
	13 MOP up (increase frequency)	33	Disable additional freq setpoint	
	14 MOP down (decrease frequency)	99	Enable BICO parameterization	
P0702[0...2]	Function of digital input 2	0 - 99	0	2
P0703[0...2]	Function of digital input 3	0 - 99	9	2
P0704[0...2]	Function of digital input 4	0 - 99	15	2
P0712 [0...2]	Analog / digital input 1	0 - 99	0	2
P0713[0...2]	Analog / digital input 2	0 - 99	0	2
P0717	Connection macro	0 - 255	0	1
r0722.0...12	CO / BO: Digital input values	-	-	2
P0727[0...2]	Selection of 2 / 3-wire method	0 - 3	0	2
	0 Siemens (start / dir)	2	3-wire (fwd / rev)	
	1 2-wire (fwd / rev)	3	3-wire (start / dir)	
P0731[0...2]	BI: Function of digital output 1	0 - 4294967295	52.3	2
P0732[0...2]	BI: Function of digital output 2	0 - 4294967295	52.7	2
r0752[0...1]	Actual analog input [V] or [mA]	-	-	2
r0754[0...1]	Actual analog input value after scaling [%]	-	-	2
r0755[0...1]	CO: Actual analog input after scaling [4000h]	-	-	2
P0756[0...1]	Type of analog input	0 - 4	0	2
	0 Unipolar voltage input (0 to +10 V)			
	1 Unipolar voltage input with monitoring (0 to 10 V)			
	2 Unipolar current input (0 to 20 mA)			
	3 Unipolar current input with monitoring (0 to 20 mA)			
	4 Bipolar voltage input (-10 V to +10 V)			
P0757[0...1]	Value x1 of analog input scaling	-20 - 20	0	2
P0758[0...1]	Value y1 of analog input scaling [%]	-99999.9 - 99999.9	0.0	2
P0759[0...1]	Value x2 of analog input scaling	-20 - 20	10	2
P0760[0...1]	Value y2 of analog input scaling [%]	-99999.9 - 99999.9	100.0	2
P0761[0...1]	Width of analog input deadband	0 - 20	0	2
P0771[0]	CI: Analog output	0 - 4294967295	21[0]	2
P0773[0]	Smooth time analog output [ms]	0 - 1000	2	2
r0774[0]	Actual analog output value [V] or [mA]	-	-	2
P0775[0]	Permit absolute value	0 - 1	0	2
P0777[0]	Value x1 of analog output scaling [%]	-99999 - 99999	0.0	2
P0778[0]	Value y1 of analog output scaling	0 - 20	0	2
P0779[0]	Value x2 of analog output scaling [%]	-99999 - 99999	100.0	2
P0780[0]	Value y2 of analog output scaling	0 - 20	20	2
P0781[0]	Width of analog output deadband	0 - 20	0	2
r0785.0	CO / BO: Status word of analog output	-	-	2
P0809[0...2]	Copy command data set (CDS)	0 - 2	[0] 0 [1] 1 [2] 0	2
<b>Index:</b>	[0] Copy from CDS			
	[1] Copy to CDS			

Parameter	Description	Range	Factory default	Acc. level
	[2] Start copy			
P0810	BI: command data set bit 0 (Hand / Auto)	0 - 4294967295	0	2
P0811	BI: command data set bit 1	0 - 4294967295	0	2
P0819[0...2]	Copy inverter data set (DDS)	0 - 2	[0] 0 [1] 1 [2] 0	2
<b>Index:</b>	[0] Copy from DDS			
	[1] Copy to DDS			
	[2] Start copy			
P0927	Parameter changeable via specified interfaces	0 - 15	15	2
r0947[0...63]	CO: Last fault code	-	-	2
	Displays fault history.			
P0970	Factory reset	0 - 21	0	1
	0 Disabled			
	1 Parameter reset			
	21 User Default Parameter Reset			
P1000[0...2]	Selection of frequency setpoint	0 - 77	1	1
	0 No main setpoint	30	No main setpoint + Fixed frequency	
	1 MOP setpoint	31	MOP setpoint + Fixed frequency	
	2 Analog setpoint	32	Analog setpoint + Fixed frequency	
	3 Fixed frequency	33	Fixed frequency + Fixed frequency	
	5 USS/MODBUS on RS485	35	USS/MODBUS on RS485 + Fixed frequency	
	7 Analog setpoint 2	37	Analog setpoint 2 + Fixed frequency	
	10 No main setpoint + MOP setpoint	50	No main setpoint + USS/MODBUS on RS485	
	11 MOP setpoint + MOP setpoint	51	MOP setpoint + USS/MODBUS on RS485	
	12 Analog setpoint + MOP setpoint	52	Analog setpoint + USS/MODBUS on RS485	
	13 Fixed frequency + MOP setpoint	53	Fixed frequency + USS/MODBUS on RS485	
	15 USS/MODBUS on RS485 + MOP setpoint	55	USS/MODBUS on RS485 + USS/MODBUS on RS485	
	17 Analog setpoint 2 + MOP setpoint	57	Analog setpoint 2 + USS/MODBUS on RS485	
	20 No main setpoint + Analog setpoint	70	No main setpoint + Analog setpoint 2	
	21 MOP setpoint + Analog setpoint	71	MOP setpoint + Analog setpoint 2	
	22 Analog setpoint + Analog setpoint	72	Analog setpoint + Analog setpoint 2	
	23 Fixed frequency + Analog setpoint	73	Fixed frequency + Analog setpoint 2	
	25 USS/MODBUS on RS485 + Analog setpoint	75	USS/MODBUS on RS485 + Analog setpoint 2	
	27 Analog setpoint 2 + Analog setpoint	77	Analog setpoint 2 + Analog setpoint 2	
P1001[0...2]	Fixed frequency 1 [Hz]	-550.00 - 550.00	10.00	2
P1002[0...2]	Fixed frequency 2 [Hz]	-550.00 - 550.00	15.00	2
P1003[0...2]	Fixed frequency 3 [Hz]	-550.00 - 550.00	25.00	2
P1004[0...2]	Fixed frequency 4 [Hz]	-550.00 - 550.00	50.00	2



Parameter	Description	Range	Factory default	Acc. level
P1005[0...2] - P1014[0...2]	Fixed frequency 5 - 14 [Hz]	-550.00 - 550.00	0.00	2
P1015[0...2]	Fixed frequency 15 [Hz]	-550.00 - 550.00	0.00	2
P1016[0...2]	Fixed frequency mode	1 - 2	1	2
	1   Direct selection			
	2   Binary selection			
P1031[0...2]	MOP mode	0 - 3	1	2
P1032	Inhibit reverse direction of MOP	0 - 1	1	2
	0   Reverse direction is allowed			
	1   Reverse direction inhibited			
P1040[0...2]	Setpoint of the MOP [Hz]	-550.00 - 550.00	5.00	2
P1047[0...2]	MOP ramp-up time of the RFG [s]	0.00 - 1000.00	10.00	2
P1048[0...2]	MOP ramp-down time of the RFG [s]	0.00 - 1000.0	10.00	2
r1050	CO: Actual output freq. of the MOP [Hz]	-	-	2
P1058[0...2]	JOG frequency [Hz]	0.00 - 550.00	5.00	2
P1059[0...2]	JOG frequency left [Hz]	0.00 - 550.00	5.00	2
P1060[0...2]	JOG ramp-up time [s]	0.00 - 650.00	10.00	2
P1061[0...2]	JOG ramp-down time [s]	0.00 - 650.00	10.00	2
P1080[0...2]	Minimum frequency [Hz]	0.00 - 550.00	0.00	1
P1082[0...2]	Maximum frequency [Hz]	0.00 - 550.00	50.00	1
P1120[0...2]	Ramp-up time [s]	0.00 - 650.00	10.00	1
P1121[0...2]	Ramp-down time [s]	0.00 - 650.00	10.00	1
P1130[0...2]	Ramp-up initial rounding time [s]	0.00 - 40.00	0.00	2
P1131[0...2]	Ramp-up final rounding time [s]	0.00 - 40.00	0.00	2
P1132[0...2]	Ramp-down initial rounding time [s]	0.00 - 40.00	0.00	2
P1133[0...2]	Ramp-down final rounding time [s]	0.00 - 40.00	0.00	2
P1134[0...2]	Rounding type	0 - 1	0	2
	0   Continuous smoothing			
	1   Discontinuous smoothing			
P1135[0...2]	OFF3 ramp-down time [s]	0.00 - 650.00	5.00	2
P1200	Flying start	0 - 6	0	2
	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			
P1202[0...2]	Search rate: flying start [%]	10 - 200	100	3
P1203[0...2]	Search rate: flying start [%]	10 - 500	100	3
r1204	Status word: flying start V/f	-	-	4
	Bit   Signal	1 signal	Bit   Signal name	1 signal
	00   Voltage reduced	Yes	01   Current could not be applied	Yes

Parameter	Description	Range	Factory default	Acc. level
	02 Voltage reduced	Yes	03 Slope-filter started	Yes
	04 Current less threshold	Yes	05 Current-minimum	Yes
	07 Speed could not be found	Yes		
P1210	Automatic restart	0 - 8	1	2
	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 brown- /blackout or fault, P1211 enabled			
	7 Restart after mains brown- /blackout or fault, trip when P1211 expire			
	8 Restart after mains brown- /blackout with F3 and leave an interval in seconds determined by P1214, P1211 disabled			
P1215	Holding brake enable	0 - 1	0	2
	0 Motor holding brake disabled			
	1 Motor holding brake enabled			
P1216	Holding brake release delay [s]	0.0 - 20.0	1.0	2
P1217	Holding time after ramp down [s]	0.0 - 20.0	1.0	2
P1227[0...2]	Zero speed detection monitoring time [s]	0.0 - 300.0	4.0	2
P1232[0...2]	DC braking current [%]	0 - 250	100	2
P1233[0...2]	Duration of DC braking [s]	0.00 - 250.00	0.00	2
P1234[0...2]	DC braking start frequency [Hz]	0.00 - 550.00	550.00	2
P1236[0...2]	Compound braking current [%]	0 - 250	0	2
P1237	Dynamic braking	0 - 5	0	2
	0 Disabled	3	20 % duty cycle	
	1 5 % duty cycle	4	50 % duty cycle	
	2 10 % duty cycle	5	100 % duty cycle	
P1300[0...2]	Control mode	0 - 19	0	2
	0 V/f with linear characteristic	5	V/f for textile applications	
	1 V/f with FCC	6	V/f with FCC for textile applications	
	2 V/f with quadratic characteristic	7	V/f with quadratic eco	
	3 V/f with programmable characteristic	19	V/f control with independent voltage setpoint	
	4 V/f with linear eco			
P1310[0...2]	Continuous boost [%]	0.0 - 250.0	50.0	2
P1311[0...2]	Acceleration boost [%]	0.0 - 250.0	0.0	2
P1312[0...2]	Starting boost [%]	0.0 - 250.0	0.0	2
r1348	Economy mode factor [%]	-	-	2
P1800[0...2]	Pulse frequency [kHz]	2 - 16	4	2
P1820[0...2]	Reverse output phase sequence	0 - 1	0	2
	0 Forward			
	1 Reverse the Motor			
P1900	Select motor data identification	0 - 2	0	2
	0 Disabled			
	2 Identification of all parameters in standstill			







Parameter	Description	Range	Factory default	Acc. level
P2000[0...2]	Reference frequency [Hz]	1.00 - 550.00	50.00	2
P2010[0...1]	USS / MODBUS baudrate	6 - 12	[0] 6 [1] 8	2
	6   9600 bps	10	76800 bps	
	7   19200 bps	11	93750 bps	
	8   38400 bps	12	115200 bps	
	9   57600 bps			
<b>Index:</b>	[0] USS / MODBUS on RS485			
	[1] USS on RS232 (reserved)			
P2011[0...1]	USS address	0 - 31	0	2
P2021	Modbus address	1 - 247	1	2
P2023	RS485 protocol selection	0 - 2	1	1
	0   None			
	1   USS			
	2   Modbus			
<b>Note:</b>	After changing P2023, a power-cycle of the inverter (which may take several seconds) is required.			
P2034	MODBUS parity on RS485	0 - 2	2	2
P2035	MODBUS stop bits on RS485	1 - 2	1	2
r2110[0...3]	CO: Warning number	-	-	2
P2200[0...2]	BI: Enable PID controller	-	0	2
P2201[0...2]	Fixed PID setpoint 1 [%]	-200.00 - 200.00	10.00	2
P2202[0...2]	Fixed PID setpoint 2 [%]	-200.00 - 200.00	20.00	2
P2203[0...2]	Fixed PID setpoint 3 [%]	-200.00 - 200.00	50.00	2
P2204[0...2]	Fixed PID setpoint 4 [%]	-200.00 - 200.00	100.00	2
P2205[0...2]	Fixed PID setpoint 5 - 14 [%]	-200.00 - 200.00	0.00	2
- P2214[0...2]				
P2215[0...2]	Fixed PID setpoint 15 [%]	-200.00 - 200.00	0.00	2
P2216[0...2]	Fixed PID setpoint mode	1 - 2	1	2
	1   Direct selection			
	2   Binary selection			
P2240[0...2]	Setpoint of PID-MOP [%]	-200.00 - 200.00	10.00	2
r2250	CO: Output setpoint of PID-MOP [%]	-	-	2
P2253[0...2]	CI: PID setpoint	0 - 4294967295	0	2
P2264[0...2]	CI: PID feedback	0 - 4294967295	0	2
r2266	CO: PID filtered feedback [%]	-	-	2
r2272	CO: PID scaled feedback [%]	-	-	2
r2273	CO: PID error [%]	-	-	2
P2274	PID derivative time [s]	0.000 - 60.000	0.000	2
P2280	PID proportional gain	0.000 - 65.000	3.000	2
P2285	PID integral time [s]	0.000 - 60.000	0.000	2
P2291	PID output upper limit [%]	-200.00 - 200.00	100.00	2
P2292	PID output lower limit [%]	-200.00 - 200.00	0.00	2
r2294	CO: Actual PID output [%]	-	-	2
P2365[0...2]	Hibernation enable / disable	0 - 1	0	2

Parameter	Description	Range	Factory default	Acc. level
	0	Disabled		
	1	Enabled		
r3113.0...15	CO / BO: Fault bit array	-	-	1
P3900	End of quick commissioning	0 - 3	0	1
	0	No quick commissioning		
	1	End quick commissioning with factory reset		
	2	End quick commissioning		
	3	End quick commissioning only for motor data		
P8553	Menu type	0 - 1	0	1
	0	Menus with no text		
	1	Menus with some text		

## A.2 Faults and alarms

### Fault code list

Fault	Description	Fault	Description
F1	Overcurrent	F63	Parameter cloning contents incompatible
F2	Overvoltage	F64	Inverter attempted to do an automatic clone during startup
F3	Undervoltage	F71	USS setpoint fault
F4	Inverter overtemperature	F72	USS/MODBUS setpoint fault
F5	Inverter I <sup>2</sup> t	F80	Signal lost on analog input
F6	Chip temperature rise exceeds critical levels	F85	External fault
F11	Motor overtemperature	F100	Watchdog reset
F12	Inverter temperature signal lost	F101	Stack overflow
F20	DC ripple too high	F200	Script error
F35	Maximum number of auto restart attempts exceeded	F221	PID feedback below minimum value
F41	Motor data identification failure	F222	PID feedback above maximum value
F51	Parameter EEPROM fault	F350	Configuration vector for the inverter failed
F52	Inverter software fault	F395	Acceptance test / confirmation pending
F60	Asic timeout	F410	Cavitation protection failure
F61	MMC/SD card parameter cloning failed	F452	Belt failure
F62	Parameter cloning contents invalid		

- To navigate through the current list of faults, press  or .
- To view the inverter status at fault, press  (> 2 s); to return to the fault code display, press  (< 2 s).
- To clear/acknowledge the fault, press  or acknowledge externally if the inverter has been set up so; to ignore the fault, press .

After you acknowledge or ignore the fault, the screen returns to the previous display. The fault icon remains active until the fault is cleared/acknowledged.

## Alarm code list

Alarm	Description	Alarm	Description
A501	Current limit	A600	RTOS overrun warning
A502	Overvoltage limit	A910	Vdc_max controller deactivated
A503	Undervoltage limit	A911	Vdc_max controller active
A504	Inverter overtemperature	A912	Vdc_min controller active
A505	Inverter I <sup>2</sup> t	A921	Analog output parameters not set properly
A506	IGBT junction temperature rise warning	A922	No load applied to inverter
A507	Inverter temperature signal lost	A923	Both JOG left and JOG right are requested
A511	Motor overtemperature I <sup>2</sup> t	A930	Cavitation protection warn
A535	Braking resistor overload	A936	PID autotuning active
A541	Motor data identification active	A952	Belt failure detected

Note that alarms cannot be acknowledged. They are cleared automatically once the warning has been rectified.

## B General license conditions

**For Resellers:** In order to avoid infringements of the license conditions by the reseller or the buyer these instructions and license conditions and accompanying CD – if applicable - have to be forwarded to the buyers.

### 1) Siemens License Conditions

#### General License Conditions for Software Products for Automation and Drives

(2011-08-01)

#### 1 Supply of Software to Licensee and Granting of Rights to use the Software

1.1 These General License Conditions shall exclusively apply to the delivery of Software for Automation and Drives to the Licensee. General terms and conditions of the Licensee shall apply only where expressly accepted in writing by us. The scope of delivery of the Software shall be determined by the congruent mutual written declarations of both parties. We shall grant the Licensee rights to use the software specified in the Confirmation of Order or, if the Licensee does not receive a Confirmation of Order, the software specified in the Certificate of License or that specified in the Software Product Sheet, if the Licensee is instead submitted a Software Product Sheet (hereinafter referred to as "SW"). The Certificate of License and the Software Product Sheet shall be collectively referred to as "CoL" hereinafter. The Licensee shall be submitted the CoL when the SW is supplied or in conjunction with the delivery bill. The way in which the SW is supplied is also derived directly from the Confirmation of Order or from the SW purchase order number contained in the Confirmation of Order, in conjunction with the associated order data of our catalog valid at the time of the Confirmation of Order (hereinafter collectively referred to as "Order Data"), or from the CoL. If the Licensee does not receive a data medium, it shall be authorized to copy the SW already available to it to the extent necessary to exercise the rights to use the SW granted to it. The aforesaid shall apply, mutatis mutandis, to electronic supply of the software (downloading). Where reference is made to the Order Data or the CoL in these General License Conditions, the reference to the CoL is of significance if the Licensee has not received a Confirmation of Order. In any case, the data contained in the Order Data is also contained in the CoL.

1.2 The Documentation relating to the SW (hereinafter referred to as "Documentation") shall be purchased separately, unless either the Order Data or CoL contains a stipulation stating that it belongs to the scope of delivery. If the Licensee is authorized to copy the SW in accordance with Clause 1.1, this shall also apply to the Documentation provided that it is included in the scope of delivery.

1.3 In the event that we submit a License Key to the Licensee, which unlocks the SW (hereinafter referred to as "License Key"), this License Key must also be installed.

1.4 The rights granted to the Licensee with respect to the SW are based on the License Type (see Section 2) and the Software Type (see Section 3). The license and Software Types are detailed in the Order Data or CoL. If the SW is supplied electronically or if copying rights are granted for it, the rights and duties specified in these General License Conditions shall apply to the legitimately generated copies.

1.5 If the Licensee is legitimately in possession of a previous SW version/release (hereinafter referred to as "Previous Version"), the Licensee shall be authorized to exercise the rights to use the SW granted to it either with respect to the SW or - if this is intended from a technical point of view - to the Previous Version, at its own discretion (downgrading). If the SW is an Upgrade or PowerPack in accordance with Section 4, Section 4 shall apply additionally.

1.6 If Previous Versions are listed in the Readme file of the SW under the category "parallel use", the Licensee has the right to exercise, alternatively to the user rights granted to him for the SW, the user rights for the listed Previous Versions in one (1) Instance. If the "Type of use" named in the Order Data or the CoL is: "Installation" or "User", the Licensee is entitled to the previously described right additionally to and at the same time as the Previous Versions listed in one Instance. An "Instance" in the context of these General License Conditions is either an instance in a physical operating system environment or an instance in a virtual operating system environment. The transferability of the user rights onto Previous Versions is only permissible in conjunction with the user rights for the SW in accordance with Clause 5.3.

1.7 In case the Licensee obtains only the data media but no license as per the Order Data or the CoL, any use of the SW by the Licensee is subject to the acquisition of a license according to Section 2. Up to the acquisition of the license, the Licensee is not entitled to supply the SW to third parties.

1.8 In case the SW contains Open Source Software or any similar software of a third party (hereinafter referred to as "OSS") the OSS is listed in the Readme\_OSS-file of the SW. The Licensee is entitled to use the OSS in accordance with the respective license conditions of the OSS. The license conditions are provided on the same data carrier as the SW. The license conditions of the respective OSS shall prevail over these General License Conditions with respect to the OSS. If the license conditions of the OSS require the distribution of the source code of such OSS we shall provide such source code on request against payment of the shipping and handling charges.

1.9 The SW may be or contain licensed software other than OSS, i.e. software which has not been developed by us itself but which has been licensed to us by a third party (hereinafter referred to as the "Licensor"), e.g. Microsoft Licensing Inc. If the Licensee receives the terms and conditions stipulated by the relevant Licensor together with the SW in the Readme\_OSS file in this case, such terms and conditions shall apply with respect to the Licensor's liability vis-à-vis the Licensee. Our own liability vis-à-vis the Licensee shall be governed in any case by these General License Conditions.

## **2 License Type**

Depending on the License Type, the Licensee shall be granted the following rights to the SW:

### **2.1 Single License (One Off License, Copy License)**

The term "One Off License" or "Copy License" which may be used in the Software Product Sheet corresponds to the term "Single License". The following regulation shall apply to the full scope of the One Off License / Copy License. The Licensee shall be granted the non-exclusive right, transferable in accordance with Clause 5.3 and valid for an unlimited period of time, to install the SW in one (1) Instance and to utilize the SW thus installed in the manner specified in the Order Data or CoL (see "Type of Use").

### **2.2 Floating License**

The Licensee shall be granted the non-exclusive right, transferable in accordance with Clause 5.3 and valid for an unlimited period of time, to install the SW on any desired number of the Licensee's hardware devices. The number of objects (for example, users or devices) permitted to utilize the SW at the same time can be derived from the Order Data or CoL (see "Type of Use").

### **2.3 Rental License**

The Licensee shall be granted the non-exclusive right, transferable in accordance with Clause 5.3 and limited in time as stipulated in the Order Data or CoL (see "Type of Use"), to install and use the SW in one (1) Instance. If the period of use is specified in hours, the usage decisive for the calculation of the time limit commences with the software start-up and finishes with its shut-down. If the period of usage is specified in days, weeks or months, the specified period, which commences in conjunction with the first SW start-up, shall apply independently of the actual time of usage. If the period of use is specified with a date, the right of use ends on this date – regardless of the actual period of use.

### **2.4 Rental Floating License**

The Licensee shall be granted the non-exclusive right, transferable in accordance with Clause 5.3 and limited in time as stipulated in the Order Data or the CoL (s. "Type of use"), to install the SW on any desired number of the Licensee's hardware devices. The number of objects (for example, users or devices) permitted to utilize the SW at the same time can be derived from the Order Data or CoL (see "Type of Use) as well. If the period of use is specified in hours, the usage decisive for the calculation of the time limit commences with the software start-up and finishes with its shut-down. If the period of usage is specified in days, weeks or months, the specified period, which commences in conjunction with the first SW start-up, shall apply independently of the actual time of usage. If the period of use is specified with a date, the right of use ends on this date – regardless of the actual period of use.

### **2.5 Demo License**

The Licensee shall be granted the non-exclusive right, transferable in accordance with Clause 5.3 and limited in time as stipulated in the Order Data or the CoL (s. "Type of use"), to install the SW in one (1) Instance and to use it for validation purposes. If the period of usage is specified in days, weeks or months, the specified period, which commences in conjunction with the first SW start-up, shall apply independently of the actual time of usage. If the period of use is specified with a date, the right of use ends on this date – regardless of the actual period of use.

## 2.6 Demo Floating License

The Licensee shall be granted the non-exclusive right, transferable in accordance with Clause 5.3 and limited in time as stipulated in the Order Data or the CoL (s. "Type of use"), to install the SW on any desired number of the Licensee's hardware devices. The number of objects (for example, users or devices) permitted to utilize the SW at the same time can be derived from the Order Data or CoL (see "Type of Use") as well. If the period of usage is specified in days, weeks or months, the specified period, which commences in conjunction with the first SW start-up, shall apply independently of the actual time of usage. If the period of use is specified with a date, the right of use ends on this date – regardless of the actual period of use.

## 2.7 Trial License

The Licensee shall be granted the non-exclusive and non-transferable right to install the SW in one (1) Instance and to use it for validation purposes in the manner specified in the Order Data or CoL (see "Type of Use"). The period of usage is limited to 14 days and commences with the SW start-up, unless a different period of usage is specified in the Order Data or CoL.

## 3 Software Type

If the Software Type is not specified in the Order Data or CoL, the rights specified in Clause 3.2 (Runtime Software) shall apply to the SW.

### 3.1 Engineering Software (hereinafter referred to as "E-SW")

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### 3.2 Runtime Software (hereinafter referred to as "R-SW")

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