SIEMENS

SINAMICS

SINAMICS V20 Inverter

Getting Started

07/2012
A5E03728127

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

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

CAUTION

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

NOTICE

indicates that an unintended result or situation can occur if the relevant information is not taken into account.

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.

Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

Purpose of this manual

This manual provides you with information about the proper installation, quick commissioning and basic operation of SINAMICS V20 inverters.

SINAMICS V20 user documentation components

Document	Product	Language
Inverter system		
Operating Instructions	SINAMICS V20 Inverters	Chinese (available as a printed *manual*) English
Getting Started [1]	SINAMICS V20 Inverters	Chinese - English bilingual
Options [2]		
Product Information	Parameter Loaders	Chinese - English bilingual
Product Information	Dynamic Braking Modules	Chinese - English bilingual
Product Information	External Basic Operator Panels (BOPs)	Chinese - English bilingual
Product Information	BOP Interface Modules	Chinese - English bilingual
Product Information	Screening Plate Kits	Chinese - English bilingual
Spare parts [2]		
Product Information	Replacement Fans	Chinese - English bilingual

[1] The Getting Started is included in the delivery of the inverter.

[2] The Product Information is included in the delivery of individual options or spare parts.

Technical support

Country	Hotline
China	+86 400 810 4288
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)	

For ordering information, see Chapter "Ordering data (Page 65)".

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Safety instructions

1

Before installing and putting this equipment into operation, read the following safety instructions and all warning labels attached to the equipment carefully. Make sure the warning labels are kept in a legible condition and replace missing or damaged labels.

General

DANGER

Dangerous voltage

Do not touch any terminals within five minutes after the power supply for the inverter has been switched off. Hazardous voltage remains present in the internal DC link capacitors when the power is removed. Failure to follow this instruction could cause electric shocks.

Protective earthing conductor current

As the earth leakage for the inverter can be greater than AC 3.5 mA, 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 inverter can cause a DC current in the protective earthing conductor.

WARNING

This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Loss of life, severe personal injury, or property damage could result if the instructions contained in this manual are not followed.

Only suitable qualified personnel should work on this equipment, and only after becoming familiar with all safety instructions, installation, commissioning, operation, and maintenance procedures contained in this manual.

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 e.g. protective insulation.

The inverter must always be grounded. If the inverter is not correctly grounded, this can lead to extremely hazardous conditions which, under certain circumstances, can result in death.

The device must be disconnected from the electrical power supply before any connections with the device are established or in any way altered.

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.

Take particular notice of the general and regional installation and safety regulations regarding work on dangerous voltage installations (e.g. 61800-5-1) as well as the relevant regulations regarding the correct use of tools and personal protective equipment (PPE).

CAUTION
Static discharges on surfaces or interfaces (e.g. terminal or connector pins) can cause malfunctions or defects. Therefore, when working with inverters or inverter components, ESD protective measures should be observed.

Transport and storage

⚠ CAUTION
Protect the equipment from physical shocks or vibration during transport and storage. It is important that the equipment is protected from water (rainfall) and excessive temperatures.

Installation

⚠ WARNING
Only permanently-wired input power connections are allowed. The equipment must be earthed (IEC 536 Class 1, NEC and other applicable standards). Wherever faults occurring in the control equipment can lead to substantial material damage or even grievous bodily injury (that is, potentially dangerous faults), additional external precautions must be taken or facilities provided to ensure or enforce safe operation, even when a fault occurs (e.g. independent limit switches, mechanical interlocks, etc.). Make sure the motor is configured for the correct supply voltage. Mount the inverter vertically to a flat and non-combustible surface. **Requirements for United States / Canadian installations (UL/cUL)** Suitable for use on a circuit capable of delivering not more than 40000 rms Symmetrical Amperes, 480 Vac maximum, when protected by UL/cUL-certified Class J fuses only. For each frame size A to D use class 1 75 °C copper wire only. 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. For applications where UL approval is required, only AC voltage can be applied to the Relay Output (DO2) terminals (maximum 250 V). For Canadian (cUL) installations the inverter mains supply must be fitted with any external recommended suppressor with the following features: • Surge-protective devices; device shall be a Listed Surge-protective device (Category code VZCA and VZCA7) • Rated nominal voltage 480/277 VAC, 50/60 Hz, 3-phase • Clamping voltage VPR = 2000 V, IN = 3 kA min, MCOV = 550 VAC, SCCR = 40 kA • Suitable for Type 1 or Type 2 SPD application • Clamping shall be provided between phases and also between phase and ground

WARNING

The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and the controller replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

CAUTION

Separate the control cables from the power cables as much as possible.

Keep the connecting cables away from rotating mechanical parts.

Commissioning

WARNING

The following terminals can carry dangerous voltages even if the inverter is not operating:

- The mains input terminals L1, L2, L3, and PE
- The motor terminals U, V, W, and output earth terminal
- The DC link terminals DC+ and DC-
- The braking resistor terminals R1 and R2 (Frame size D only)

This equipment must not be used as an "emergency stop" mechanism (*see EN 60204, 9.2.5.4*).

It is not allowed to open, connect or disconnect the equipment during its operation.

Operation

WARNING

Certain parameter settings may cause the inverter to restart automatically after an input power failure, for example, the automatic restart function.

Motor parameters must be accurately configured for motor overload protection to operate correctly.

Use of mobile radio devices (e.g. telephones, walkie-talkies) in the immediate vicinity of the devices (< 1.8 m) can interfere with the functioning of the equipment.

Risk of fire

If an unsuitable braking resistor is used, this could result in a fire and severely damage, people, property and equipment. Use the adequate 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

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.

CAUTION

This equipment is suitable for use in a power system up to 40,000 symmetrical amperes (rms), for the maximum rated voltage + 10 % when protected by an appropriate standard fuse.

Repair

WARNING

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.

Dismantling and disposal

CAUTION

The packaging of the inverter is re-usable. Retain the packaging for future use.

Easy-to-release screw and snap connectors allow you to break the unit down into its component parts. You can recycle these component parts, dispose of them in accordance with local requirements or return them to the manufacturer.

Residual risks

⚠ CAUTION

The control and drive components of a power drive system (PDS) are approved for industrial and commercial use in industrial line supplies. Their use in public line supplies requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety information and instructions on the components and in the associated technical user documentation.

When carrying out a risk assessment of a machine in accordance with the EU Machinery Directive, the machine manufacturer must consider the following residual risks associated with the control and drive components of a PDS.

1. Unintentional movements of driven machine components during commissioning, operation, maintenance, and repairs caused by, for example:
   - Hardware defects and / or software errors in the sensors, controllers, actuators, and connection technology
   - Response times of the controller and drive
   - Operating and/or ambient conditions not within the scope of the specification
   - Condensation / conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices / cellular phones in the immediate vicinity of the controller
   - External influences / damage
2. Exceptional temperatures as well as emissions of noise, particles, or gas caused by, for example:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions not within the scope of the specification
   - External influences / damage
3. Hazardous shock voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions not within the scope of the specification
   - Condensation / conductive contamination
   - External influences / damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc. if they are too close.
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly.

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Mechanical installation

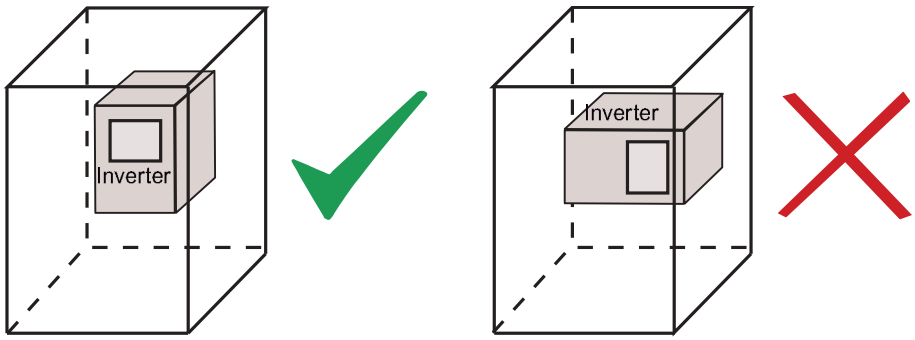
2

2.1 Mounting orientation and clearance

The inverter must be mounted in an enclosed electrical operating area or a control cabinet.

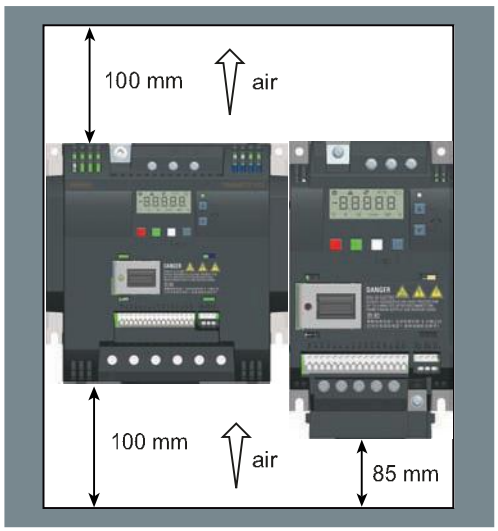
Mounting orientation

Always mount the inverter in an upright position.



Mounting clearance

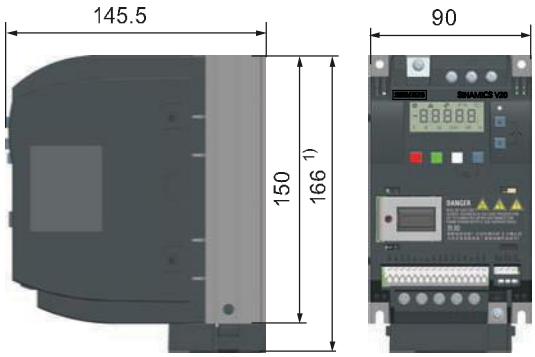
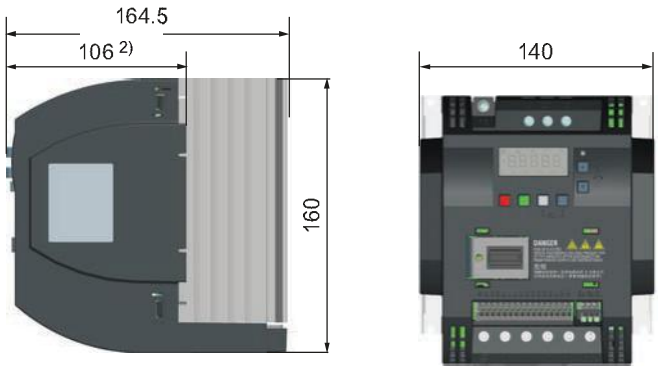
Top	≥ 100 mm
Bottom	≥100 mm (for frame sizes B ... D, and frame size A without fan) ≥ 85 mm (for fan-cooled frame size A)
Side	≥ 0 mm

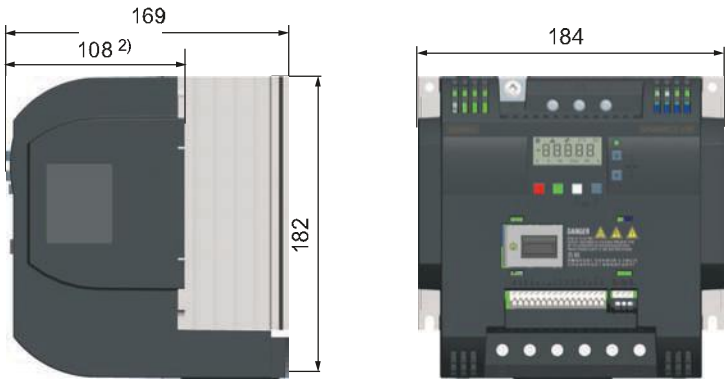
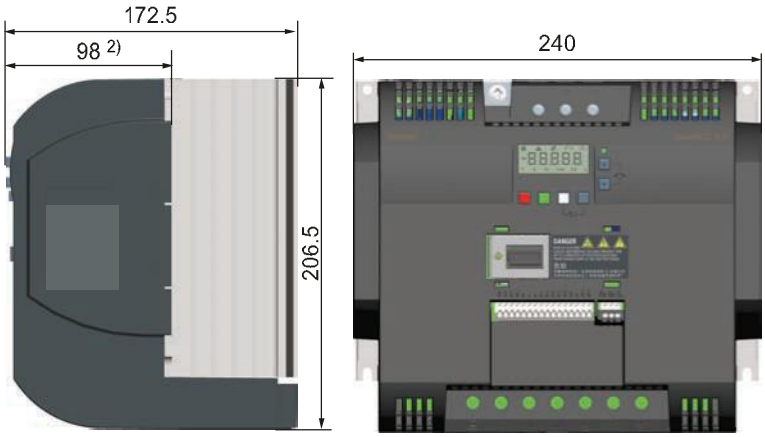


2.2 Mounting

Mounting methods	Applicable frame sizes	Remarks
Cabinet panel mounting	Frame sizes A ... D	The inverter is mounted directly on the surface of the cabinet panel.
Push-through mounting	Frame sizes B ... D	The inverter is mounted with the heatsink extended through the back of the cabinet panel.

Outline dimensions

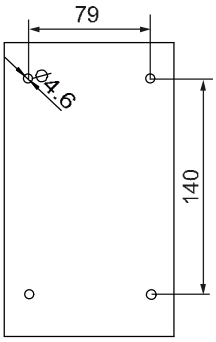
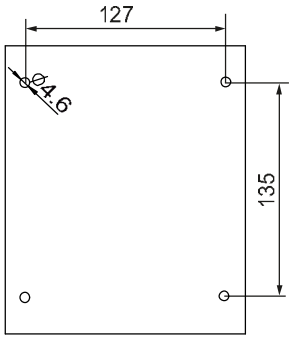
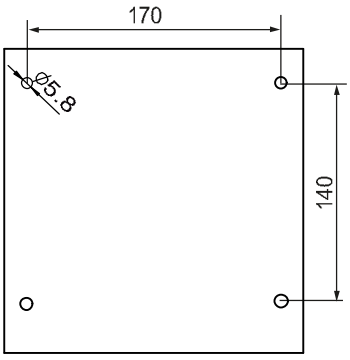
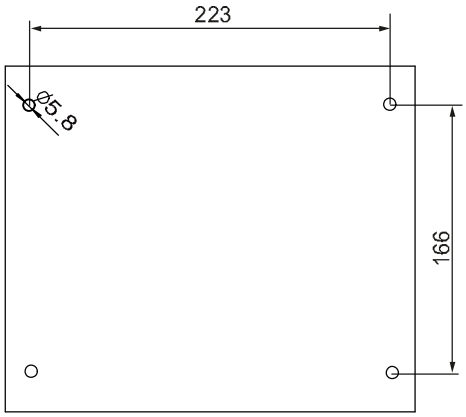
Frame size	Dimensions (mm)
A	
B	

Frame size	Dimensions (mm)
C	
D	

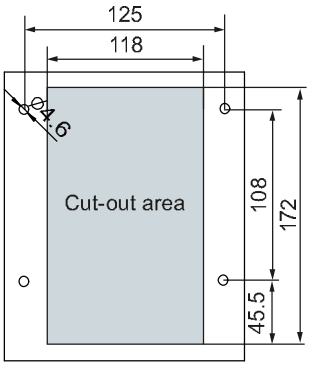
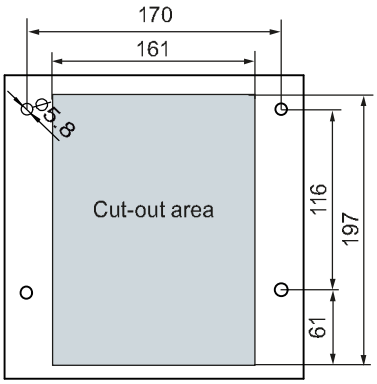
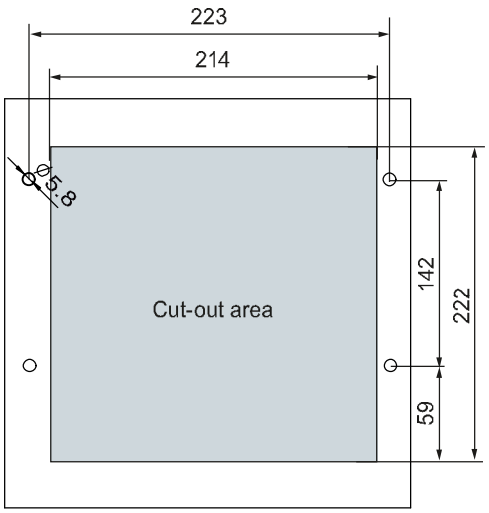
1) Height of frame size A with fan

2) Depth inside the cabinet for push-through mounting

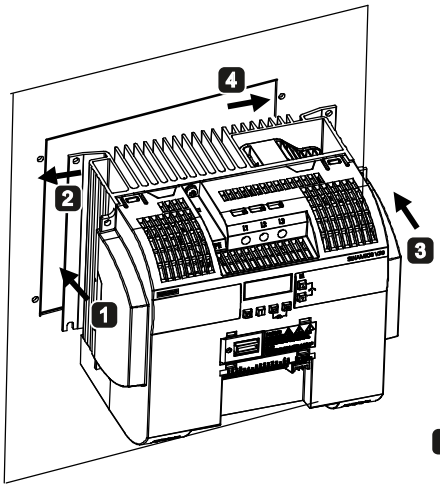
Drill patterns (cabinet panel mounting)

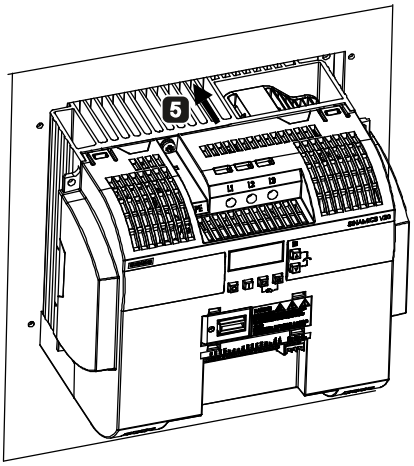
Drill pattern (mm)	
Frame size A	**Frame size B**
 Fixings: 4 x M4 screws 4 x M4 nuts 4 x M4 washers Tightening torque: 1.8 Nm ± 10%	 Fixings: 4 x M4 screws 4 x M4 nuts 4 x M4 washers Tightening torque: 1.8 Nm ± 10%
Frame size C	**Frame size D**
 Fixings: 4 x M5 screws 4 x M5 nuts 4 x M5 washers Tightening torque: 2.5 Nm ± 10%	 Fixings: 4 x M5 screws 4 x M5 nuts 4 x M5 washers Tightening torque: 2.5 Nm ± 10%

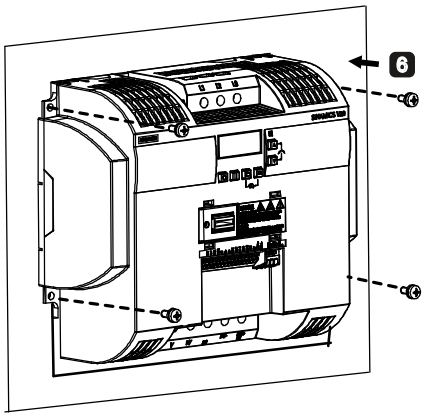
Drill patterns and cut-outs (push-through mounting)

Drill pattern and cut-out (mm)		
Frame size B	**Frame size C**	**Frame size D**
 Fixings: 4 x M4 screws Tightening torque: 1.8 Nm ± 10%	 Fixings: 4 x M5 screws Tightening torque: 2.5 Nm ± 10%	 Fixings: 4 x M5 screws Tightening torque: 2.5 Nm ± 10%

Mounting steps (push-through mounting)

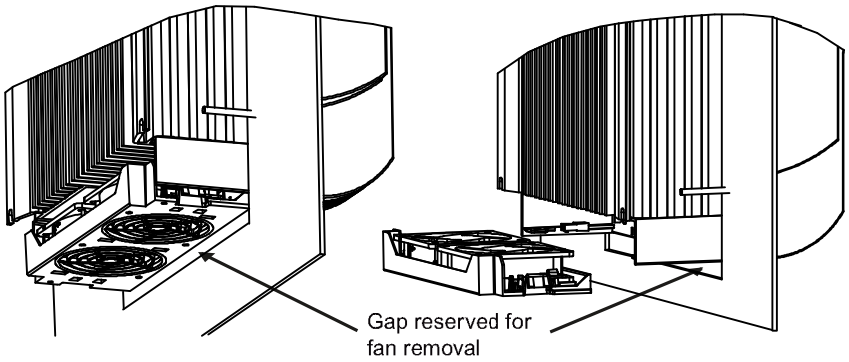






1. Push one side of the heatsink through the back of the cabinet panel.
2. Move the heatsink towards the edge of the cut-out area until the concaved slot of the heatsink engages with the edge of the cut-out area.
3. Push the other side of the heatsink through the back of the cabinet panel.
4. Move the heatsink towards the edge of the cut-out area until sufficient space for pushing the entire heatsink through the back of the cabinet panel is left.
5. Push the entire heatsink through the back of the cabinet panel.
6. Align the four mounting holes in the inverter with the correspondi-ng holes in the cabinet panel. Fix the aligned holes with four screws.

NOTICE
A gap is reserved at the bottom of the cut-out area to allow fan removal from outside the cabinet without removing the inverter.

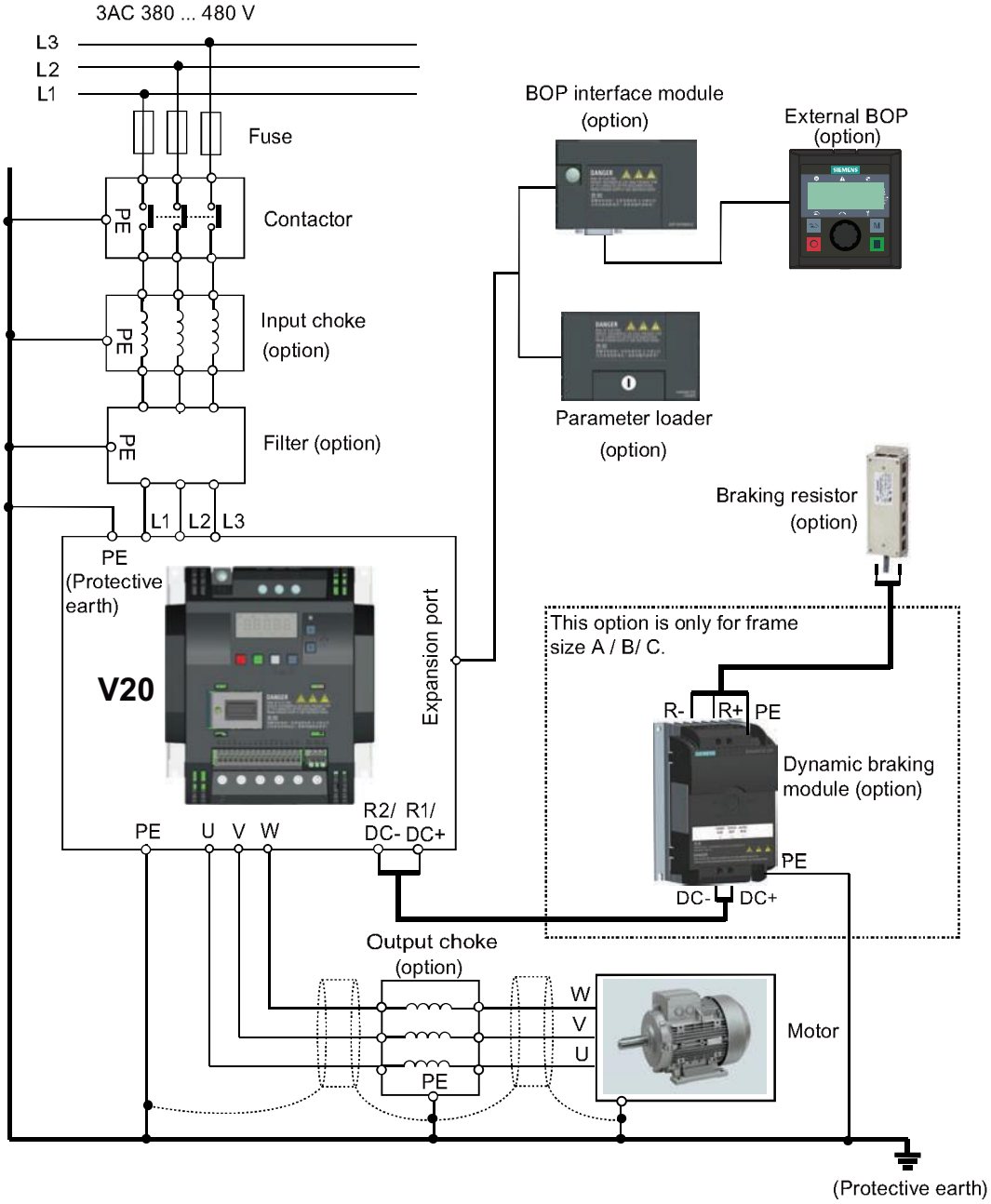


Electrical installation

3

3.1 Typical system connections

Typical system connections for 400 V variants

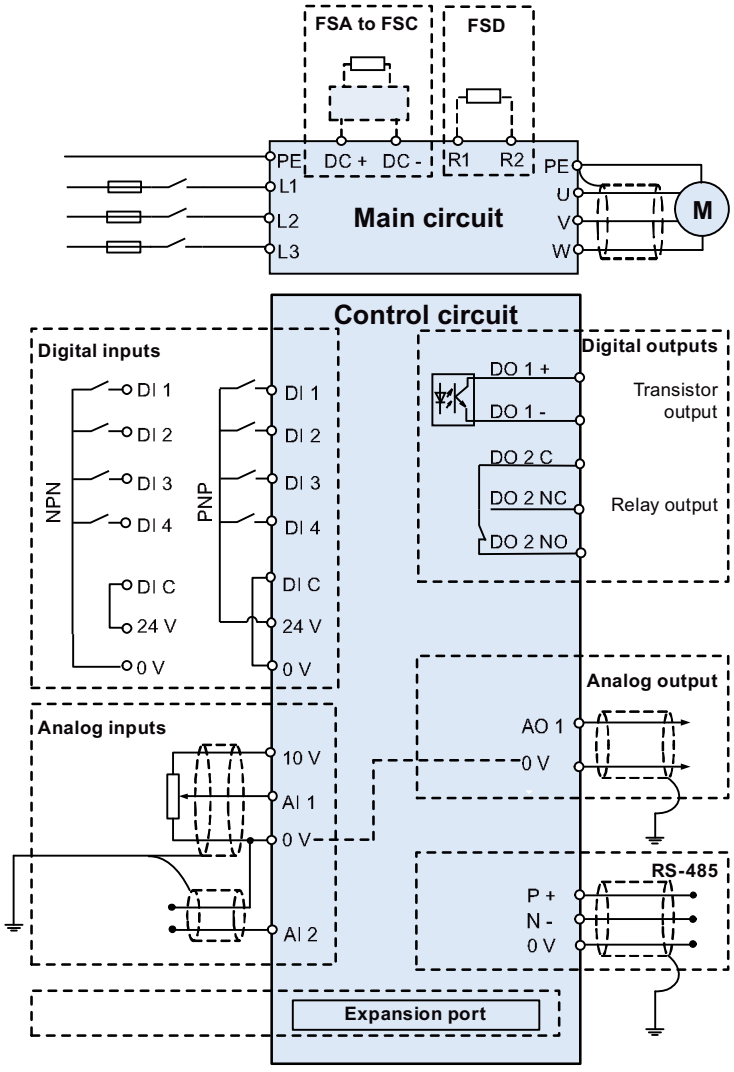


For ordering information of available options and spare parts, see Chapter "Ordering data (Page 65)".

Recommended fuse types

Frame size	Recommended fuse type	
	CE-compliant (Siba URZ)	UL-compliant
400 V		
A	50 124 34 (16 A)	15 A 600 VAC, class J
B	50 124 34 (20 A)	20 A 600 VAC, class J
C	50 140 34 (30 A)	30 A 600 VAC, class J
D	50 140 34 (63 A)	60 A 600 VAC, class J

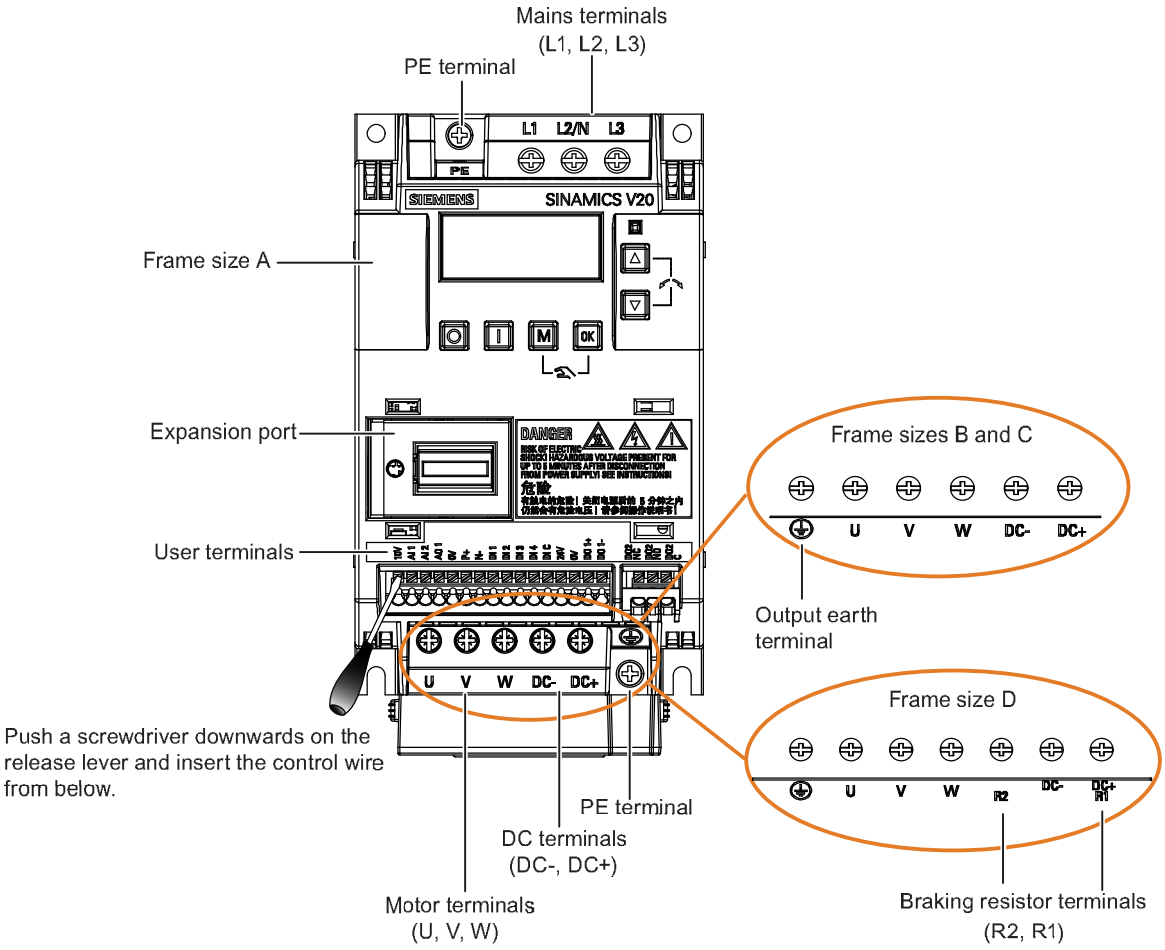
Wiring diagram



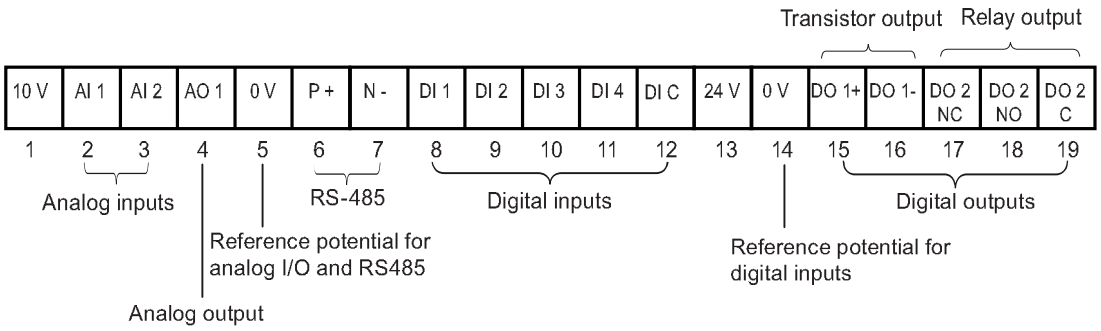
See also

Setting connection macros (Page 32)

3.2 Terminal description



User terminals:



Recommended cable cross-sections and screw tightening torques

Frame size	Rated output power	Cable cross-section	Screw tightening torque (tolerance: ± 10%)	
			Mains and PE terminals	Motor / DC / braking resistor / output earth terminals
400 V				
A	0.37 ... 0.75 kW	1.0 mm²	1.0 Nm	1.0 Nm
	1.1 ... 2.2 kW	1.5 mm²		
B	3.0 ... 4.0 kW	2.5 mm²		1.5 Nm
C	5.5 kW	4.0 mm²	2.4 Nm	
D	7.5 ... 15 kW	6.0 mm²		

Maximum motor cable lengths

Frame size	Maximum cable length	
	Unshielded cable	Shielded cable
A, unfiltered	50 m	25 m
A, filtered	50 m	10 m
B	50 m	25 m
C	50 m	25 m
D	50 m	25 m

Permissible I/O terminal cable cross sections

Cable type	Permissible cable cross section
Solid or stranded cable	0.5 ... 1.5 mm²
Ferrule without insulating sleeve	0.5 ... 1.0 mm²
Ferrule with insulating sleeve	0.5 mm²

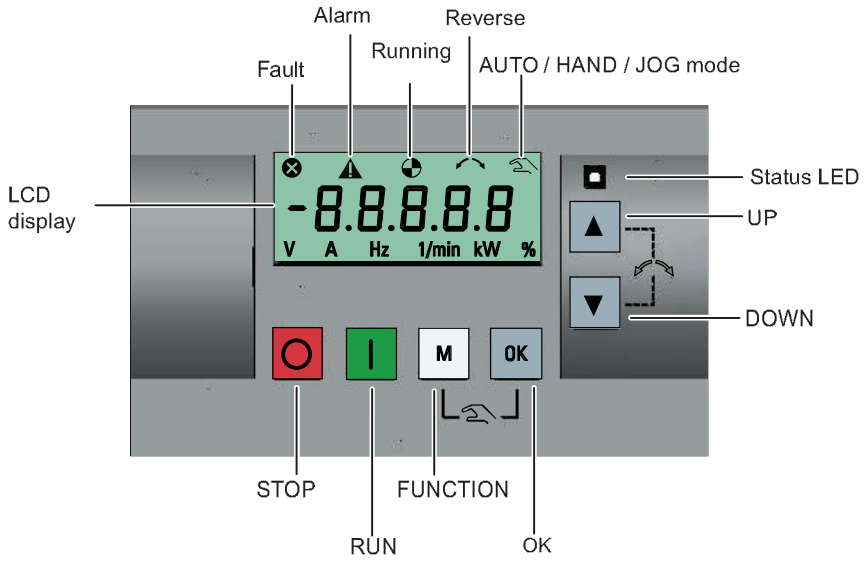
Commissioning

4

NOTICE
For a detailed description of parameter settings for the quick commissioning, refer to the topic "Quick commissioning (Page 29)".

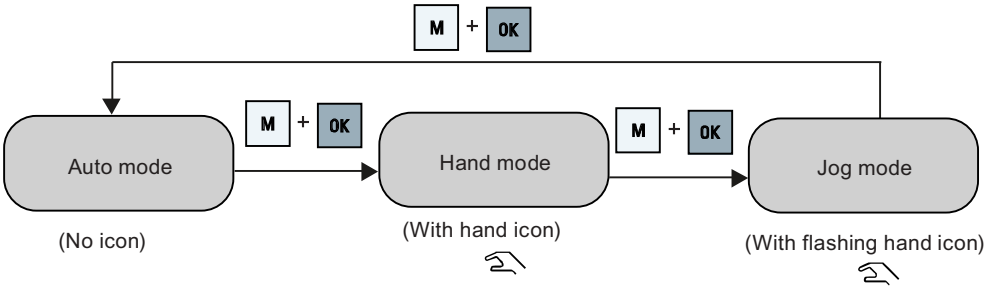
4.1 The built-in Basic Operator Panel (BOP)

4.1.1 Introduction to the built-in BOP



Button functions

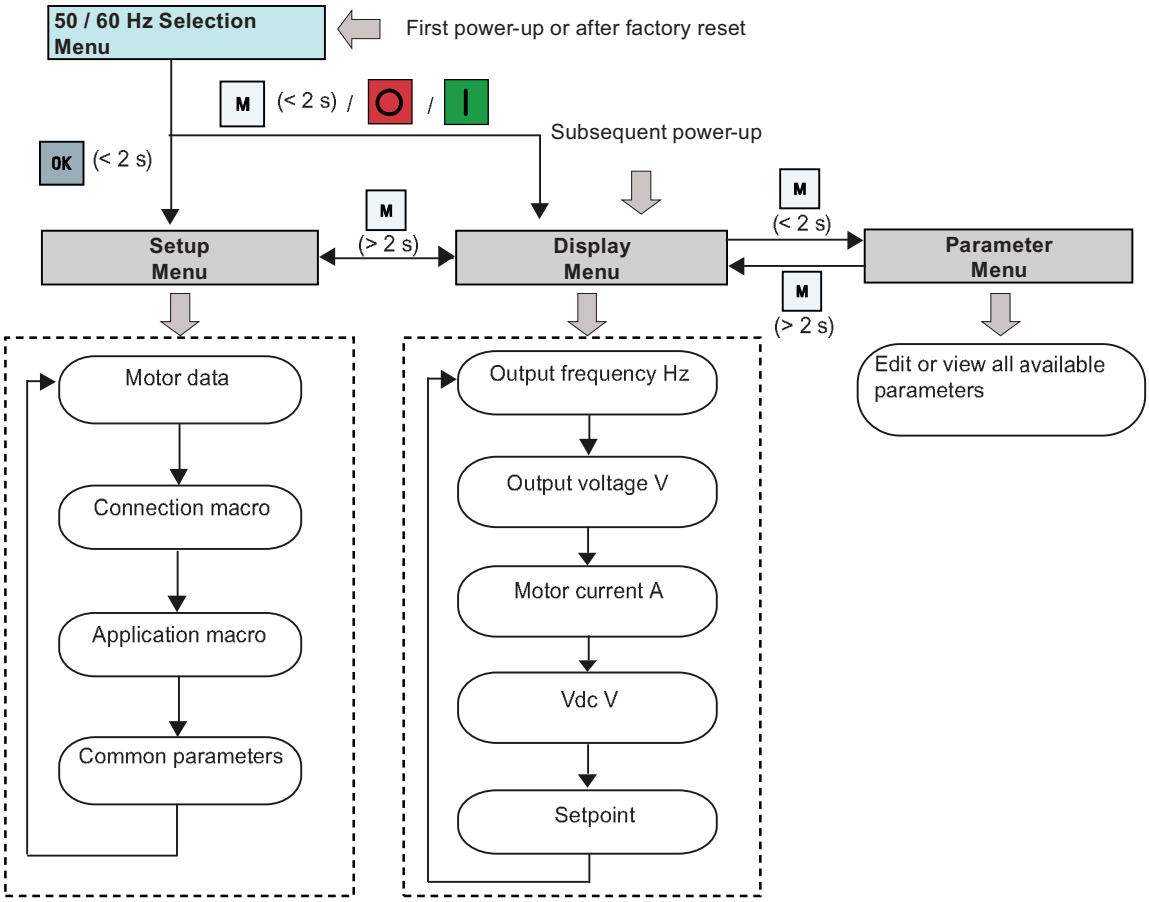
O	**Stops the inverter**	
	Single press	OFF1 stop reaction: the inverter brings the motor to a standstill in the ramp-down time set in parameter P1121. **Note:** If configured to be an OFF1 stop, this button is inactive in AUTO mode.
	Double press (< 2 s) or long press (> 3 s)	OFF2 stop reaction: the inverter allows the motor to coast to a standstill without using any ramp-down timings.

I	**Starts the inverter** If the inverter is started in HAND / JOG mode, the inverter running icon (◔) displays. **Note**: This button is inactive if the inverter is configured for control from terminals (P0700 = 2, P1000 = 2) and is in AUTO mode.	
M	**Multi-function button**	
	Short press (< 2 s)	• Enters the parameter setting menu or moves to the next screen • Restarts the digit by digit editing on the selected item • If pressed twice in digit by digit editing, returns to the previous screen without changing the item being edited
	Long press (> 2 s)	• Returns to the status screen • Enters the setup menu
OK	Short press (< 2 s)	• Switches between status values • Enters edit value mode or change to the next digit • Clears faults
	Long press (> 2 s)	• Quick parameter number or value edit
M + OK	**Hand / Jog / Auto** Press to switch between different modes:  Note: Jog mode is only available if the motor is stopped.	
▲	• When navigating a menu, it moves the selection up through the screens available. • When editing a parameter value, it increases the displayed value. • When the inverter is in RUN mode, it increases the speed. • Long press (> 2 s) of the key quickly scrolls up through parameter numbers, indices, or values.	
▼	• When navigating a menu, it moves the selection down through the screens available. • When editing a parameter value, it decreases the displayed value. • When the inverter is in RUN mode, it decreases the speed. • Long press (> 2 s) of the key quickly scrolls down through parameter numbers, indices, or values.	
▲ + ▼	Reverses the direction of rotation of the motor. Pressing the two keys once activates reverse motor rotation. Pressing the two keys once again deactivates reverse rotation of the motor. The reserve icon (↶↷) on the display indicates that the output speed is opposite to the setpoint.	

Inverter status icons

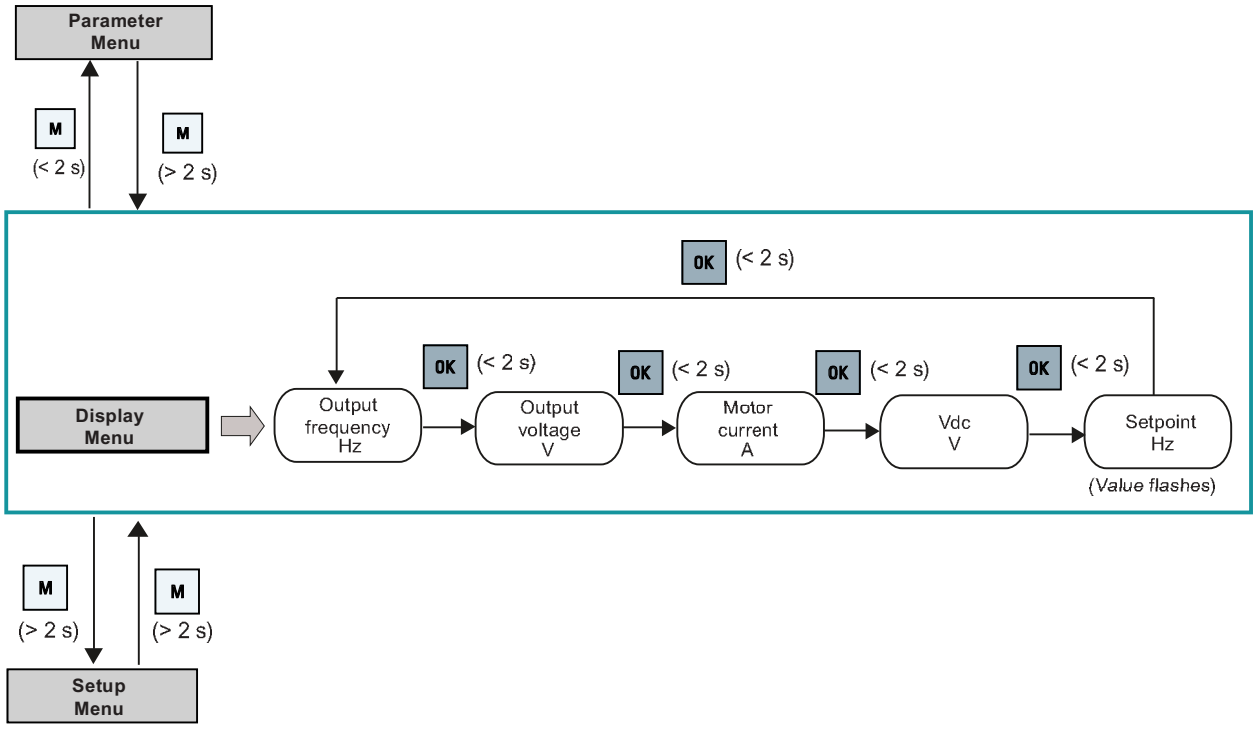
⊗	Inverter has at least one pending fault.	
⚠	Inverter has at least one pending alarm.	
◔	◔ :	Inverter is running (motor frequency may be 0 rpm).
	◔ (flashing):	Inverter may be energized unexpectedly (for example, in frost protection mode).
↶	Motor rotates in the reversed direction.	
☜	☜ :	Inverter is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

4.1.2 Inverter menu structure



4.1.3 Viewing inverter status

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



4.1.4 Editing parameters

Normal editing of parameters

NOTICE
Pressing ▲ or ▼ for longer than two seconds to quickly increase or decrease the parameter numbers or indexes is only possible in the parameter menu.

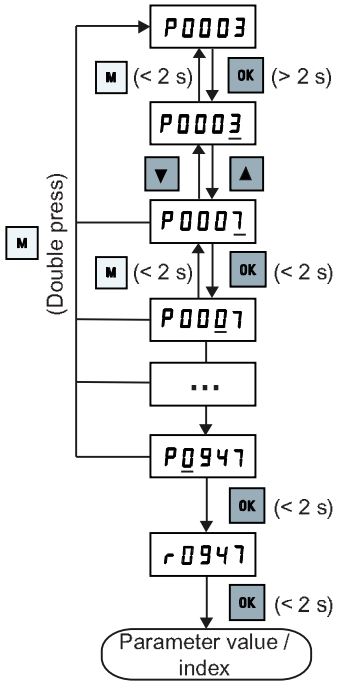
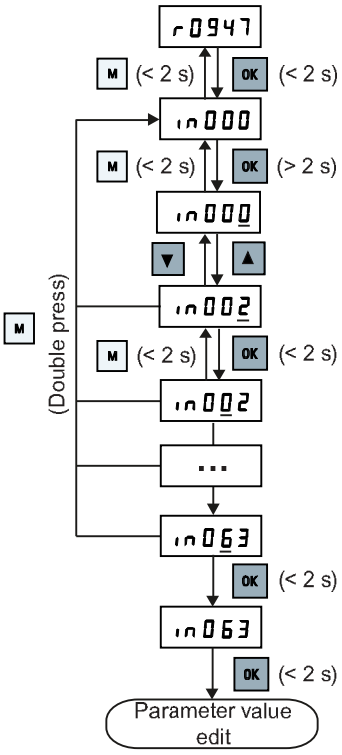
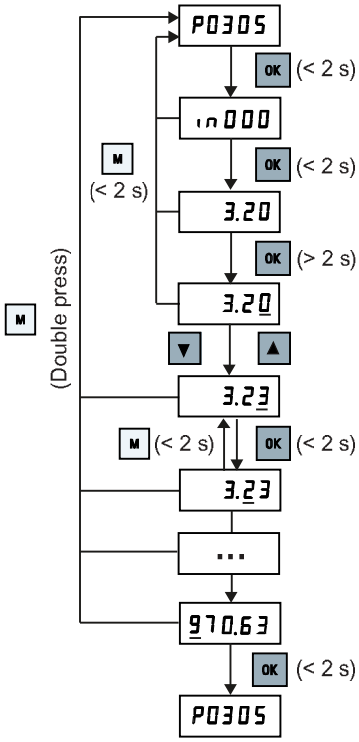
This editing method is best suited when small changes are required to parameter numbers, indexes, or values.

- To increase or decrease the parameter number, index, or value, press ▲ or ▼ for less than two seconds.
- To quickly increase or decrease the parameter number, index, or value, press ▲ or ▼ for longer than two seconds.
- To confirm the setting, press OK.
- To cancel the setting, press M.

Digit-by-digit editing

NOTICE
Digit-by-digit editing of parameter numbers or indexes is only possible in the parameter menu.

Digit-by-digit editing can be performed on parameter numbers, parameter indexes, or parameter values. This editing method is best suited when large changes are required to parameter numbers, indexes, or values. For information about the inverter menu structure, refer to Section "Inverter menu structure (Page 25)".

Example 1: Editing parameter numbers	Example 2: Editing parameter indices If a parameter is an array, edit indices as illustrated below:	Example 3: Editing parameter values
		

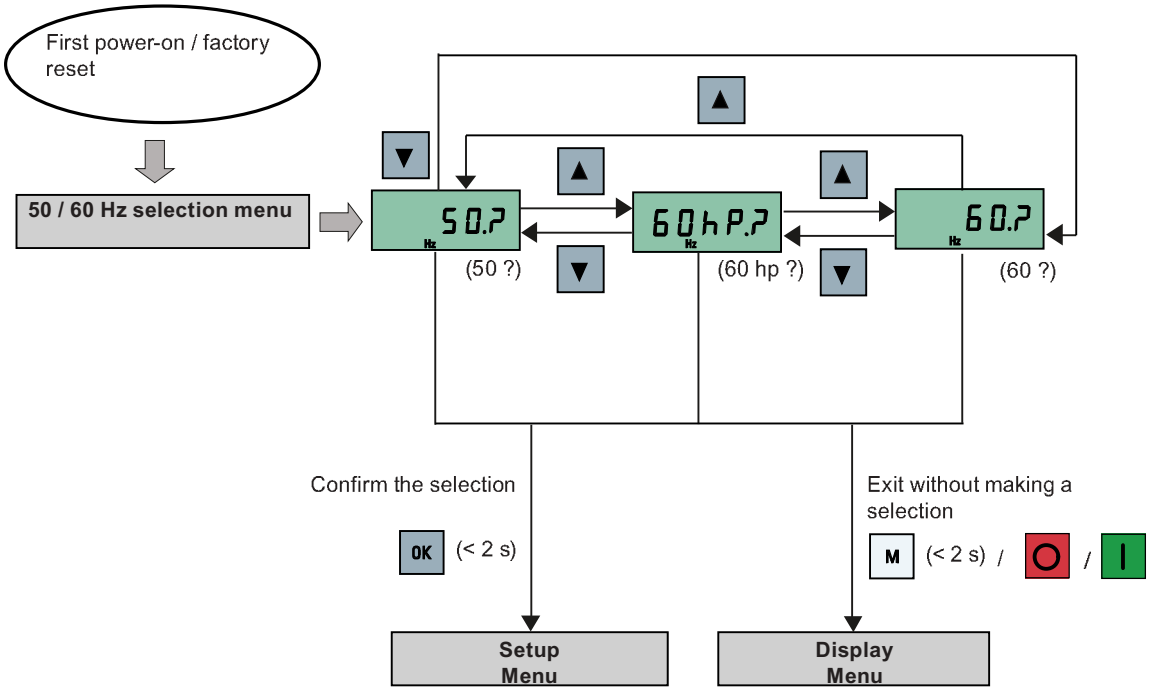
4.2 Setting the 50 / 60 Hz selection menu

This menu is used to set the motor base frequency according to which region of the world that the motor is used. The menu determines whether power settings (for example, rated motor power P0307) are expressed in [kW] or [hp].

The 50 / 60 Hz selection menu is visible only on first power-up or after a factory reset (P0970). You can make a selection using the BOP or exit the menu without making a selection and the menu will not be displayed unless a factory reset is performed.

The motor base frequency can also be selected by changing P0100 to the desired value.

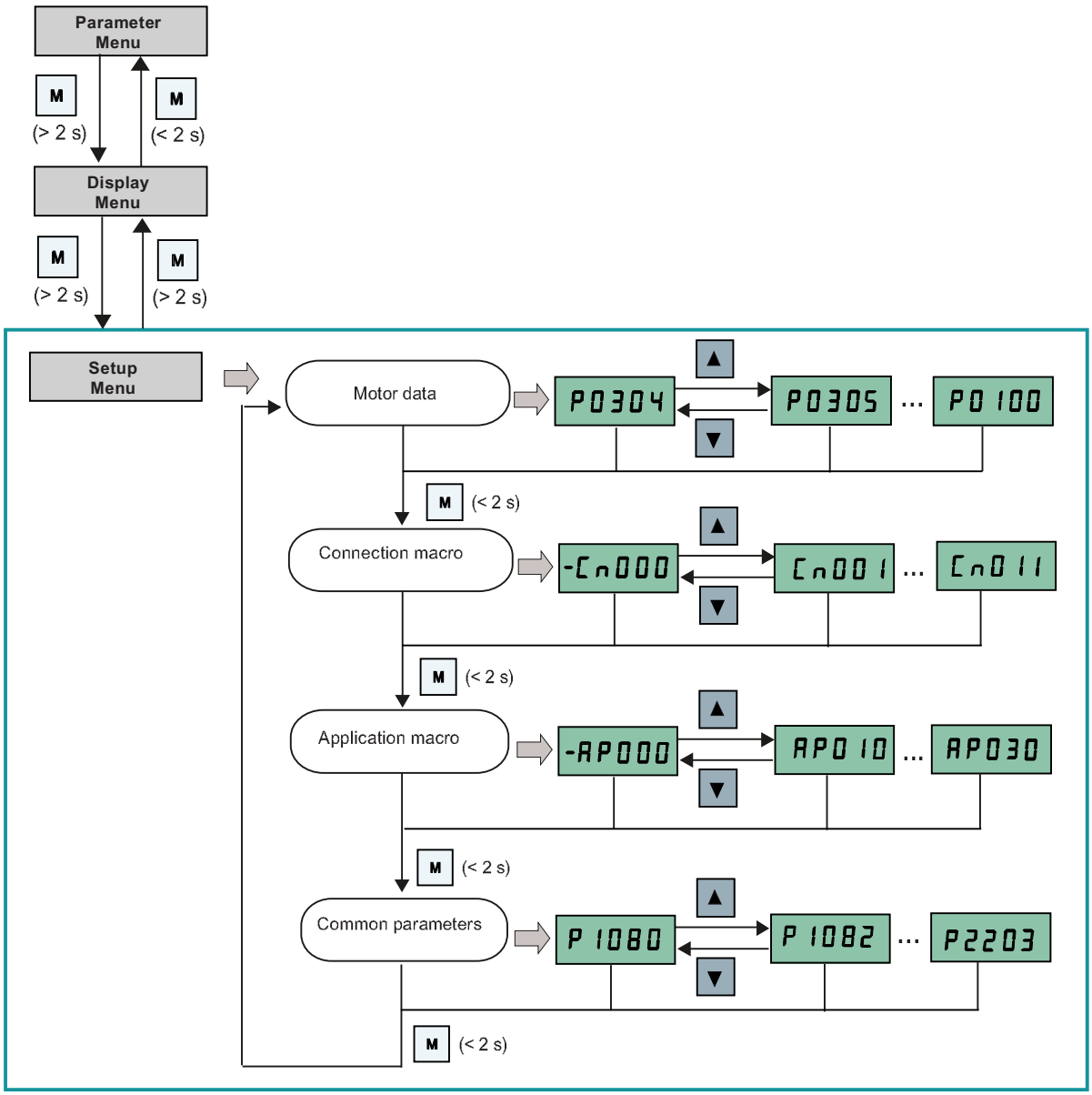
Parameter	Value	Description
P0100	0	Motor base frequency is 50 Hz (**default**) → Europe [kW]
	1	Motor base frequency is 60 Hz → United States / Canada [hp]
	2	Motor base frequency is 60 Hz → United States / Canada [kW]



4.3 Quick commissioning

NOTICE
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.

4.3.1 Structure of the setup menu



4.3.2 Setting motor data

Functionality

This menu is designed for easy setup of nominal motor nameplate data.

Text menu

If you set P8553 to 1, parameter numbers in this menu are replaced with short text.

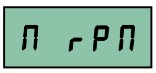
Parameter access level

Access level	Description	Remarks
0	User-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.

Setting parameters

NOTICE
In the table below, "•" indicates that the value of this parameter must be entered according to the rating plate of the motor.

Parameter	Access level	Function	Text menu (if P8553 = 1)
P0100	1	**50 / 60 Hz selection** =0: Europe [kW], 50 Hz (factory default) =1: North America [hp], 60 Hz =2: North America [kW], 60 Hz	 (EU - US)
P0304[0] •	1	**Rated motor voltage [V]** Note that the input of rating plate data must correspond with the wiring of the motor (star / delta)	 (MOT V)
P0305[0] •	1	**Rated motor current [A]** Note that the input of rating plate data must correspond with the wiring of the motor (star / delta)	 (MOT A)

Parameter	Access level	Function	Text menu (if P8553 = 1)
P0307[0] •	1	**Rated motor power [kW / hp]** If P0100 = 0 or 2, motor power unit = [kW] If P0100 = 1, motor power unit = [hp]	P0100 = 0 or 2:  (MOT P) P0100 =1:  (MOT HP)
P0308[0] •	1	**Rated motor power factor (cosφ)** Visible only when P0100 = 0 or 2	 (M COS)
P0309[0] •	1	**Rated motor efficiency [%]** Visible only when P0100 = 1 Setting 0 causes internal calculation of value.	 (M EFF)
P0310[0] •	1	**Rated motor frequency [Hz]**	 (M FREQ)
P0311[0] •	1	**Rated motor speed [RPM]**	 (M RPM)
P1900	2	**Select motor data identification** = 0: Disabled = 2: Identification of all parameters in standstill	 (MOT ID)

See also

Parameter list (Page 49)

4.3.3 Setting connection macros

CAUTION
When commissioning the inverter, the connection macro setting is a one-off setting. Make sure that you proceed as follows before you change the connection macro setting to a value different from your last setting: 1. Do a factory reset (P0010 = 30, P0970 = 1) 2. Repeat the quick commissioning and change the connection macro Failure to observe may cause the inverter to accept the parameter settings from both the currently and the previously selected macros, which may lead to undefined and unexplainable inverter operation. However, communication parameters P2010, P2011, P2021 and P2023 for connection macros Cn010 and Cn011 are not reset automatically after a factory reset. If necessary, reset them manually. After changing P2023 setting for Cn010 or Cn011, power-cycle the inverter. During the power-cycle, wait until LED has gone off or the display has gone blank (may take a few seconds) before re-applying power.

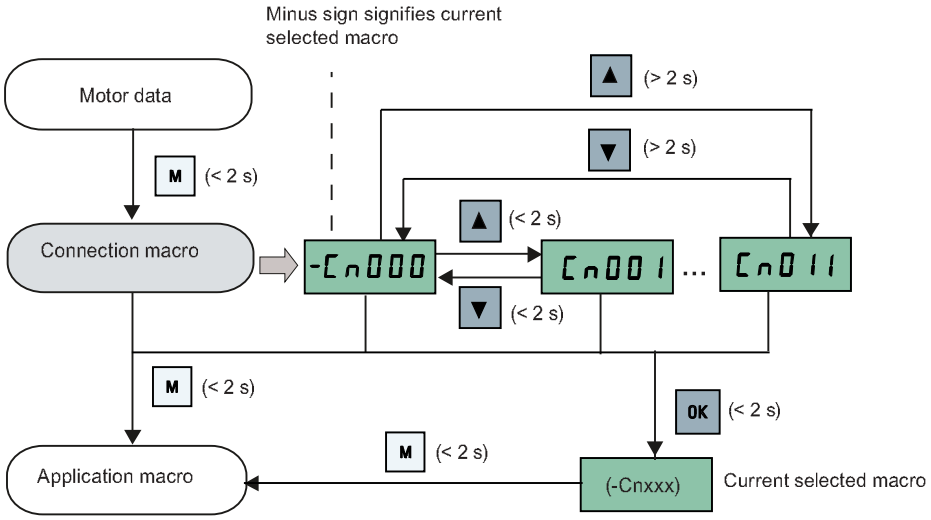
Functionality

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

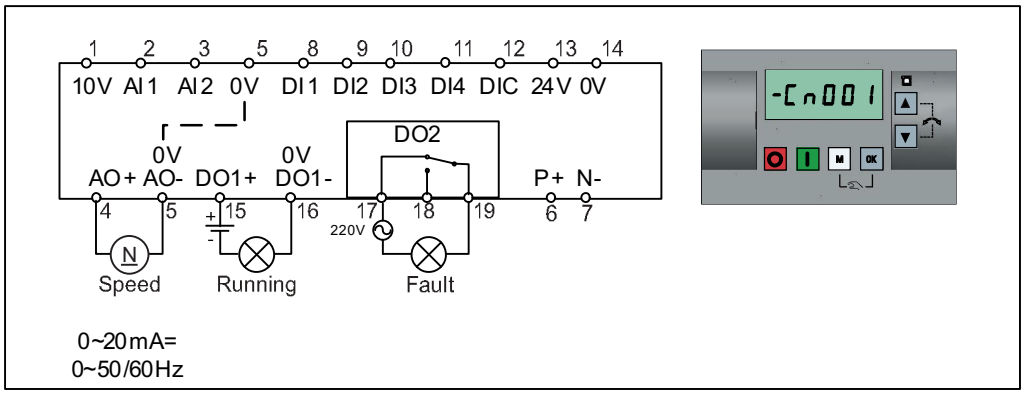
All connection macros only change the CDS0 (command data set 0) parameters. The CDS1 parameters are used for the BOP control. For more information about the CDS parameters, see SINAMICS V20 Inverter Operating Instructions.

Connection macro	Description	Display example
Cn000	Factory default setting. Makes no parameter changes.	  The minus sign indicates that this macro is the currently selected macro.
Cn001	BOP as the only control source	
Cn002	Control from terminals (PNP / NPN)	
Cn003	Fixed speeds	
Cn004	Fixed speed binary mode	
Cn005	Analog input and fixed frequency	
Cn006	External push button control	
Cn007	External push button 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	

Setting connection macros



Connection macro Cn001 - BOP as the only control source



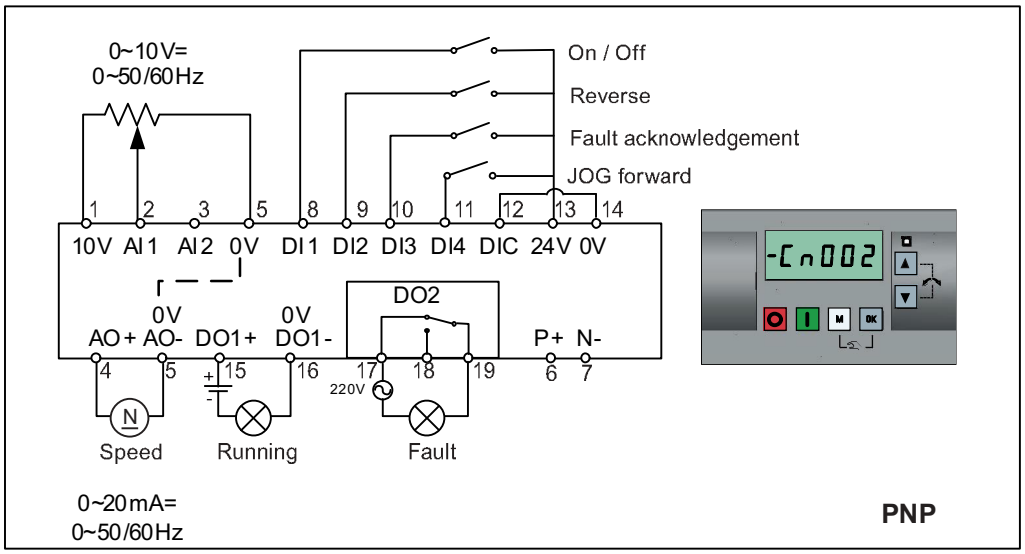
Connection macro settings:

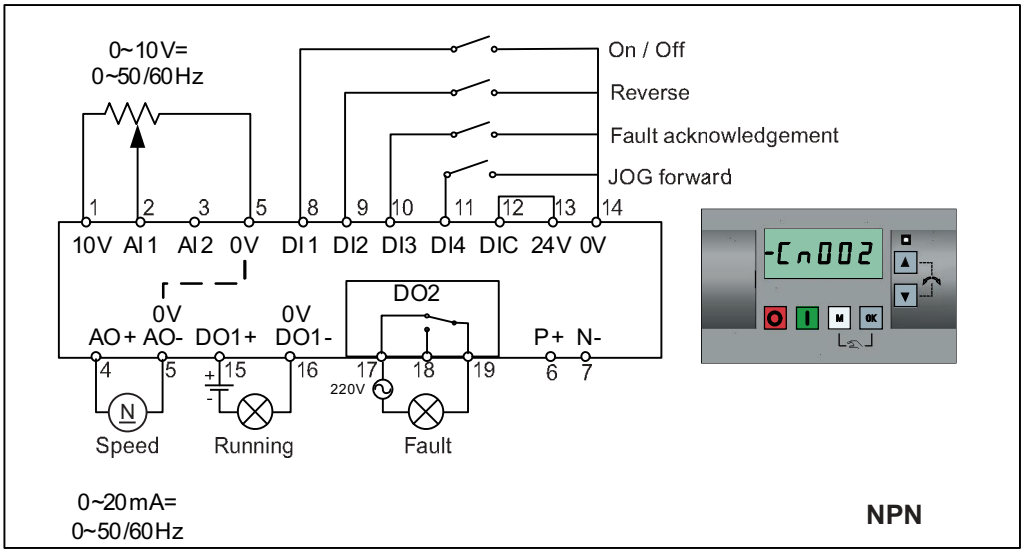
Parameter	Description	Factory default	Default for Cn001	Remarks
P0700[0]	Selection of command source	1	1	BOP
P1000[0]	Selection of frequency	1	1	BOP MOP
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active
P0771[0]	CI: Analog output	21	21	Actual frequency
P0810[0]	BI: CDS bit 0 (Hand/Auto)	0	0	Hand mode

Connection macro Cn002 - Control from terminals (PNP / NPN)

External control - Potentiometer with setpoint

- Hand / Auto switch between the BOP and terminals by pressing M + OK
- 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.





Connection macro settings:

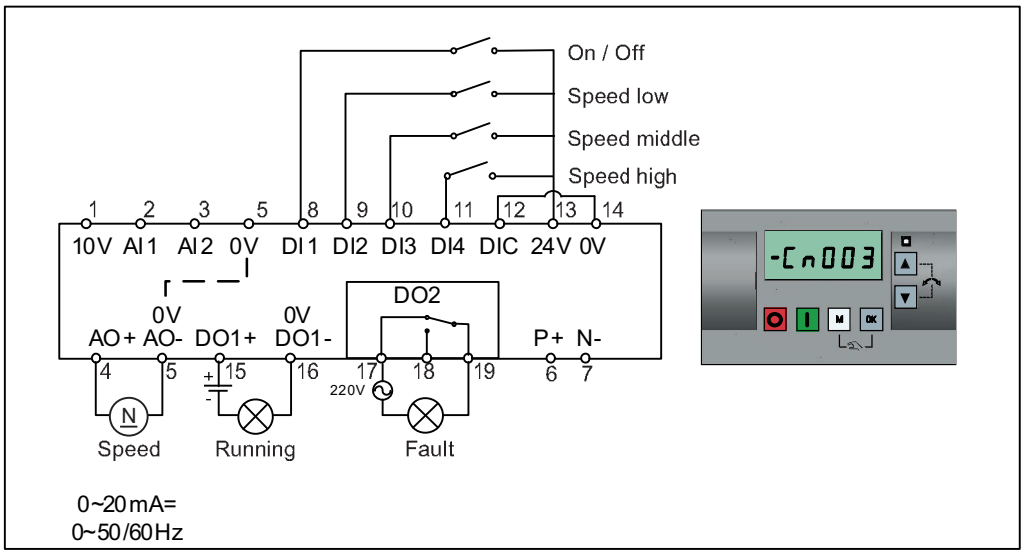
Parameter	Description	Factory default	Default for Cn002	Remarks
P0700[0]	Selection of command source	1	2	Terminal as command source
P1000[0]	Selection of frequency	1	2	Analog as speed setpoint
P0701[0]	Function of digital input 1	0	1	ON / OFF

Parameter	Description	Factory default	Default for Cn002	Remarks
P0702[0]	Function of digital input 2	0	12	Reverse
P0703[0]	Function of digital input 3	9	9	Fault acknowledgement
P0704[0]	Function of digital input 4	15	10	JOG forward
P0771[0]	CI: Analog output	21	21	Actual frequency
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active

Connection macro Cn003 - Fixed speeds

Three fixed speeds with ON / OFF

- Hand / Auto switch between the BOP and terminal by pressing M + OK
- If several digital inputs are active at the same time, the selected frequencies are summed, e.g. FF1 + FF2 + FF3



Connection macro settings:

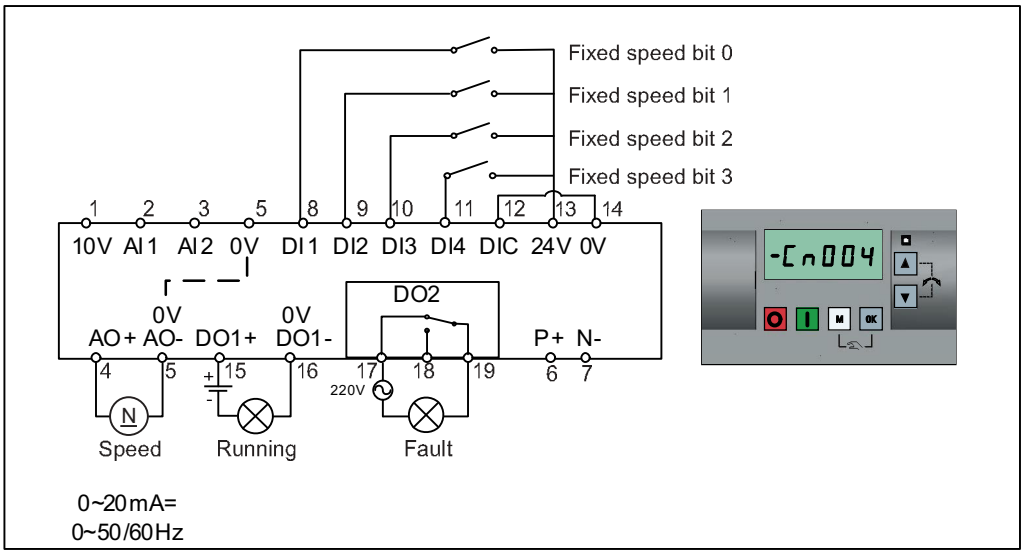
Parameter	Description	Factory default	Default for Cn003	Remarks
P0700[0]	Selection of command source	1	2	Terminal as command source
P1000[0]	Selection of frequency	1	3	Fixed frequency
P0701[0]	Function of digital input 1	0	1	ON / OFF
P0702[0]	Function of digital input 2	0	15	Fixed speed bit 0
P0703[0]	Function of digital input 3	9	16	Fixed speed bit 1
P0704[0]	Function of digital input 4	15	17	Fixed speed bit 2
P1016[0]	Fixed frequency mode	1	1	Direct selection mode
P1020[0]	BI: Fixed frequency selection bit 0	722.3	722.1	DI2
P1021[0]	BI: Fixed frequency selection bit 1	722.4	722.2	DI3

Parameter	Description	Factory default	Default for Cn003	Remarks
P1022[0]	BI: Fixed frequency selection bit 2	722.5	722.3	DI4
P1001[0]	Fixed frequency 1	10	10	Speed low
P1002[0]	Fixed frequency 2	15	15	Speed middle
P1003[0]	Fixed frequency 3	25	25	Speed high
P0771[0]	CI: Analog output	21	21	Actual frequency
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active

Connection macro Cn004 - Fixed speeds in binary mode

Fixed speeds with ON command in binary mode

- Up to 16 different fixed frequency values (0 Hz, P1001 ... P1015) can be selected by the fixed frequency selectors (P1020 ... P1023)



Connection macro settings:

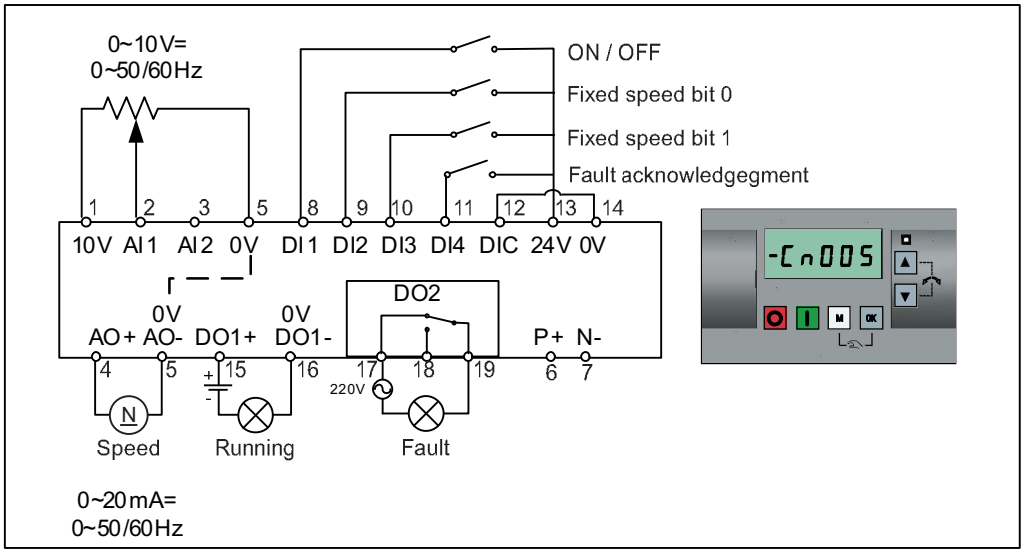
Parameter	Description	Factory default	Default for Cn004	Remarks
P0700[0]	Selection of command source	1	2	Terminals as command source
P1000[0]	Selection of frequency	1	3	Fixed frequency
P0701[0]	Function of digital input 1	0	15	Fixed speed bit 0
P0702[0]	Function of digital input 2	0	16	Fixed speed bit 1
P0703[0]	Function of digital input 3	9	17	Fixed speed bit 2
P0704[0]	Function of digital input 4	15	18	Fixed speed bit 3
P1016[0]	Fixed frequency mode	1	2	Binary mode
P0840[0]	BI: ON / OFF1	19.0	1025.0	Inverter starts at the fixed speed selected

Parameter	Description	Factory default	Default for Cn004	Remarks
P1020[0]	BI: Fixed frequency selection bit 0	722.3	722.0	DI1
P1021[0]	BI: Fixed frequency selection bit 1	722.4	722.1	DI2
P1022[0]	BI: Fixed frequency selection bit 2	722.5	722.2	DI3
P1023[0]	BI: Fixed frequency selection bit 3	722.6	722.3	DI4
P0771[0]	CI: Analog output	21	21	Actual frequency
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active

Connection macro Cn005 - Analog input and fixed frequency

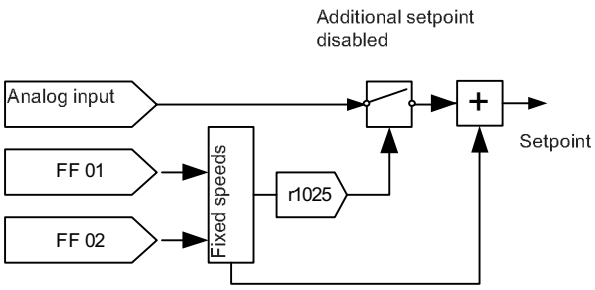
The analog input works as an additional setpoint.

- If DI2 and DI3 are active together, the selected frequencies are summed, i.e. FF1 + FF2



Function diagram

When the fixed speed is selected, the additional setpoint channel from the analog is disabled. If there is no fixed speed setpoint, the setpoint channel connects to the analog input.

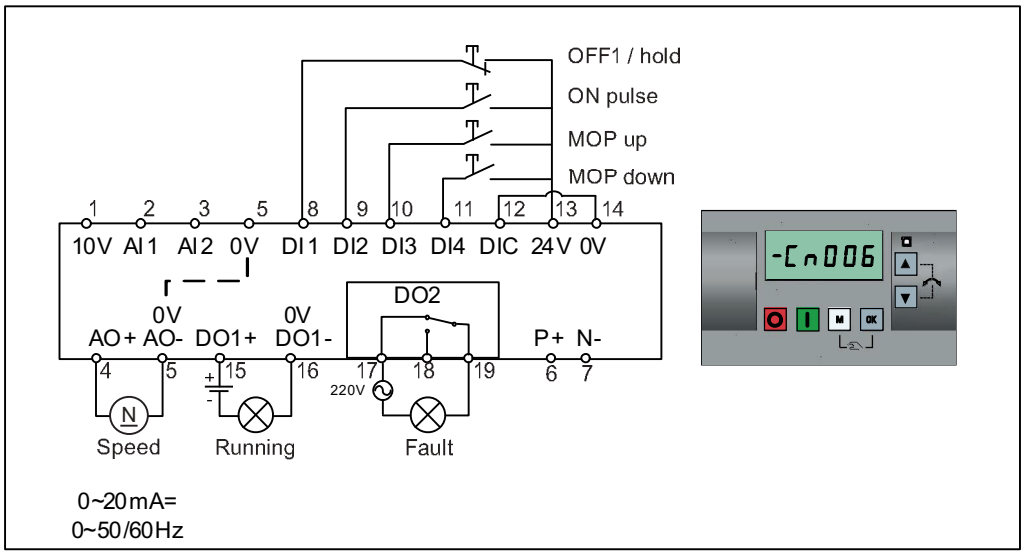


Connection macro settings:

Parameter	Description	Factory default	Default for Cn005	Remarks
P0700[0]	Selection of command source	1	2	Terminals as command source
P1000[0]	Selection of frequency	1	23	Fixed frequency + analog setpoint
P0701[0]	Function of digital input 1	0	1	ON / OFF
P0702[0]	Function of digital input 2	0	15	Fixed speed bit 0
P0703[0]	Function of digital input 3	9	16	Fixed speed bit 1
P0704[0]	Function of digital input 4	15	9	Fault acknowledgement
P1016[0]	Fixed frequency mode	1	1	Direct selection mode
P1020[0]	BI: Fixed frequency selection bit 0	722.3	722.1	DI2
P1021[0]	BI: Fixed frequency selection bit 1	722.4	722.2	DI3
P1001[0]	Fixed frequency 1	10	10	Fixed speed 1
P1002[0]	Fixed frequency 2	15	15	Fixed speed 2
P1074[0]	BI: Disable additional setpoint	0	1025.0	FF disables the additional setpoint
P0771[0]	CI: Analog output	21	21	Actual frequency
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active

Connection macro Cn006 - External push button control

Note that the command sources are pulse signals.

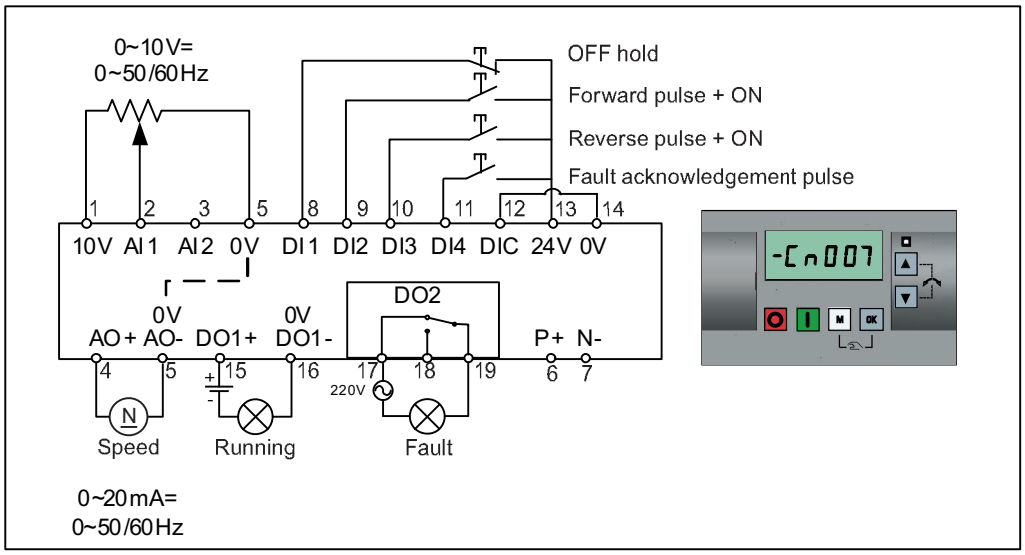


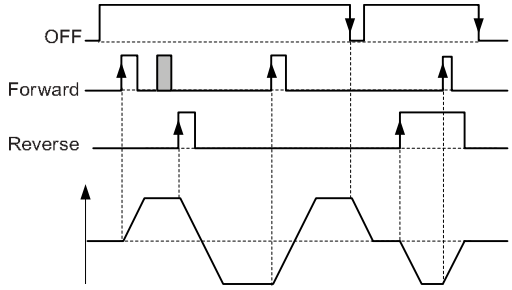
Connection macro settings:

Parameter	Description	Factory default	Default for Cn006	Remarks
P0700[0]	Selection of command source	1	2	Terminals as command source
P1000[0]	Selection of frequency	1	1	BOP MOP
P0701[0]	Function of digital input 1	0	2	OFF1 / hold
P0702[0]	Function of digital input 2	0	1	ON pulse
P0703[0]	Function of digital input 3	9	13	MOP up pulse
P0704[0]	Function of digital input 4	15	14	MOP down pulse
P0727[0]	Selection of 2 / 3-wire method	0	3	3-wire ON pulse + OFF1 / HOLD + Reverse
P0771[0]	CI: Analog output	21	21	Actual frequency
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active
P1040[0]	Setpoint of the MOP	5	0	Initial frequency
P1047[0]	MOP ramp-up time of the RFG	10	10	Ramp-up time from zero to *maximum* frequency
P1048[0]	MOP ramp-down time of the RFG	10	10	Ramp-down time from maximum frequency to zero

Connection macro Cn007 - External push buttons with analog control

Note that the command sources are pulse signals.

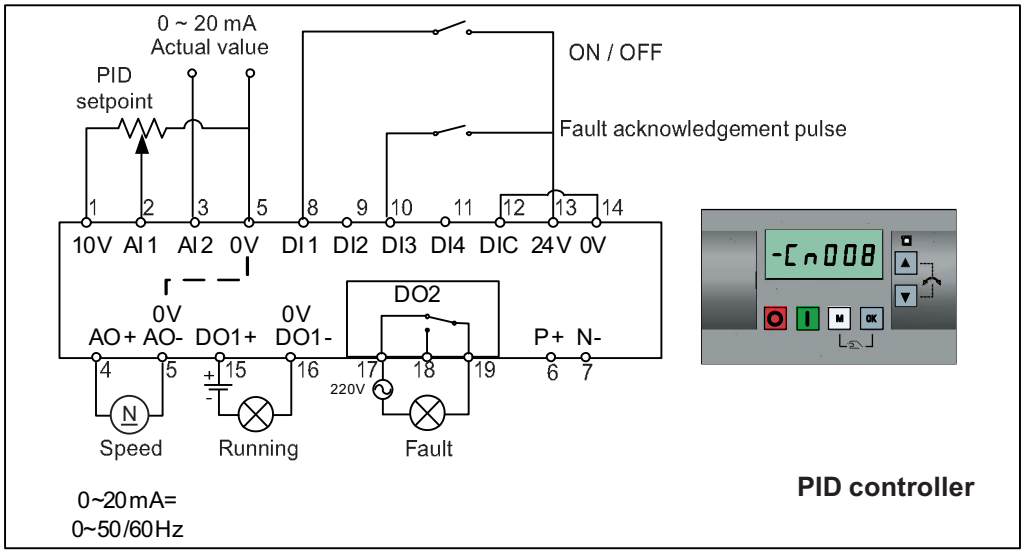




Connection macro settings:

Parameter	Description	Factory default	Default for Cn007	Remarks
P0700[0]	Selection of command source	1	2	Terminals as command source
P1000[0]	Selection of frequency	1	2	Analog
P0701[0]	Function of digital input 1	0	1	OFF hold
P0702[0]	Function of digital input 2	0	2	Forward pulse + ON
P0703[0]	Function of digital input 3	9	12	Reverse pulse + ON
P0704[0]	Function of digital input 4	15	9	Fault acknowledgement
P0727[0]	Selection of 2 / 3-wire method	0	2	3-wire STOP + Forward pulse + Reverse pulse
P0771[0]	CI: Analog output	21	21	Actual frequency
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active

Connection macro Cn008 - PID control with analog reference

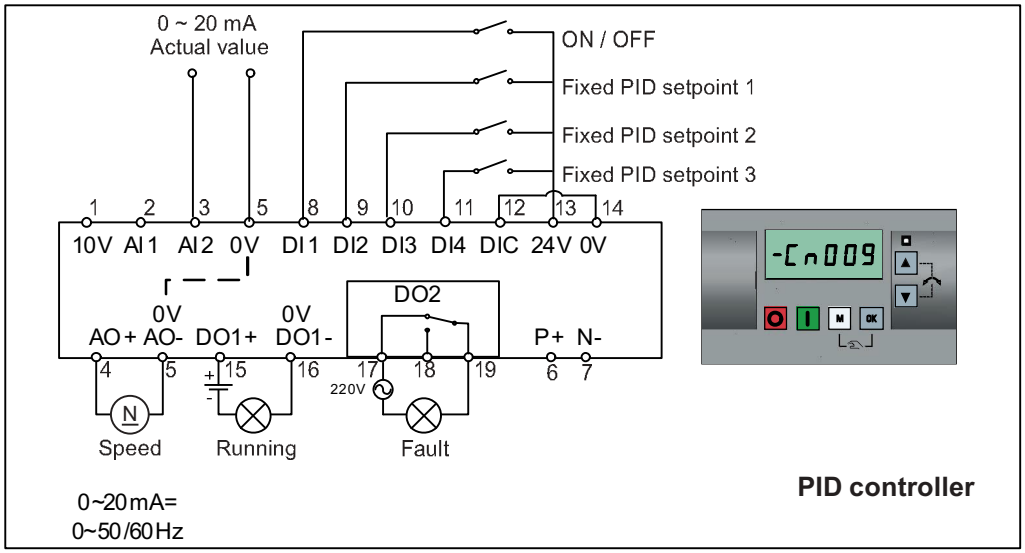


NOTICE
If a negative setpoint for the PID control is desired, change the setpoint and feedback wiring as needed. When you switch to Hand mode from PID control mode, P2200 becomes 0 to disable the PID control. When you switch it back to Auto mode, P2200 becomes 1 to enable the PID control again.

Connection macro settings:

Parameter	Description	Factory default	Default for Cn008	Remarks
P0700[0]	Selection of command source	1	2	Terminals as command source
P0701[0]	Function of digital input 1	0	1	ON / OFF
P0703[0]	Function of digital input 3	9	9	Fault acknowledgement
P2200[0]	Enable PID controller	0	1	Enable PID
P2253[0]	CI: PID setpoint	0	755.0	PID Setpoint = Analog input 1
P2264[0]	CI: PID feedback	755.0	755.1	PID feedback = Analog input 2
P0756[1]	Type of AI	0	2	Analog input 2 0 ... 20 mA
P0771[0]	CI: Analog output	21	21	Actual frequency
P0731[0]	BI: Function of digital output 1	52.3	52.2	Inverter running
P0732[0]	BI: Function of digital output 2	52.7	52.3	Inverter fault active

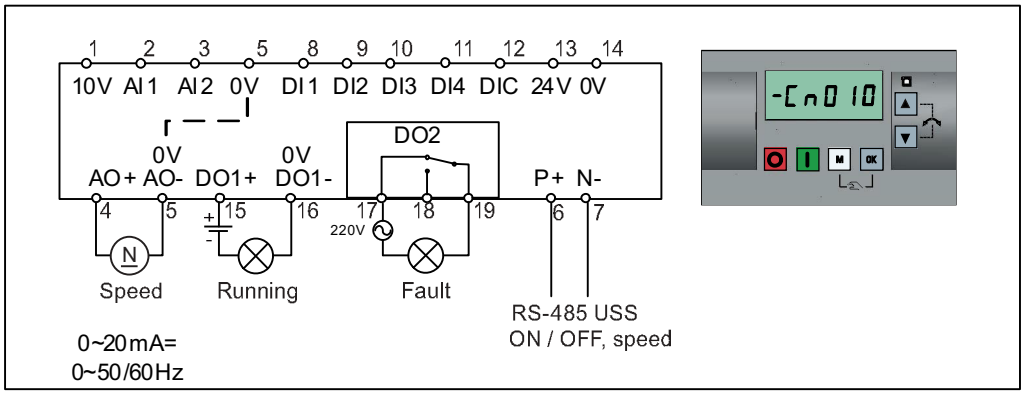
Connection macro Cn009 - PID control with the fixed value reference



Connection macro settings:

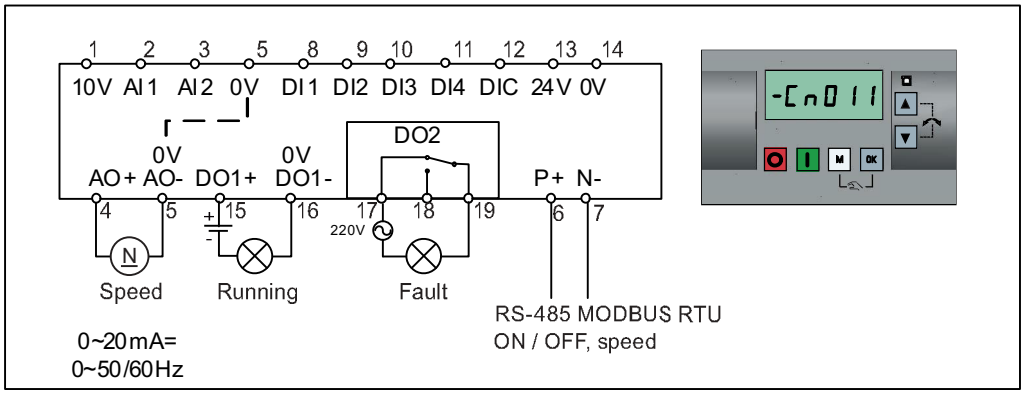
Parameter	Description	Factory default	Default for Cn009	Remarks
P0700[0]	Selection of command source	1	2	Terminals as command source
P0701[0]	Function of digital input 1	0	1	ON / OFF
P0702[0]	Function of digital input 2	0	15	DI2 = PID fixed value 1
P0703[0]	Function of digital input 3	9	16	DI3 = PID fixed value 2
P0704[0]	Function of digital input 4	15	17	DI4 = PID fixed value 3
P2200[0]	Enable PID controller	0	1	Enable PID
P2216[0]	Fixed PID setpoint mode	1	1	Direct selection
P2220[0]	BI: Fixed PID setpoint select bit 0	722.3	722.1	BICO connection DI2
P2221[0]	BI: Fixed PID setpoint select bit 1	722.4	722.2	BICO connection DI3
P2222[0]	BI: Fixed PID setpoint select bit 2	722.5	722.3	BICO connection DI4
P2253[0]	CI: PID setpoint	0	2224	PID setpoint = fixed value
P2264[0]	CI: PID feedback	755.0	755.1	PID feedback = AI2

Connection macro Cn010 - USS control



Parameter	Description	Factory default	Default for Cn010	Remarks
P0700[0]	Selection of command source	1	5	RS485 as the command source
P1000[0]	Selection of frequency	1	5	RS485 as the speed setpoint
P2023[0]	RS485 protocol selection	1	1	USS protocol
P2010[0]	USS / MODBUS baudrate	8	8	Baudrate 38400 bps
P2011[0]	USS address	0	1	USS address for inverter
P2012[0]	USS PZD length	2	2	Number of PZD words
P2013[0]	USS PKW length	127	127	Variable PKW words
P2014[0]	USS / MODBUS telegram off time	2000	500	Time to receive data

Connection macro Cn011 - MODBUS RTU control



Connection macro settings:

Parameter	Description	Factory default	Default for Cn011	Remarks
P0700[0]	Selection of command source	1	5	RS485 as the command source
P1000[0]	Selection of frequency	1	5	RS485 as the speed setpoint

Parameter	Description	Factory default	Default for Cn011	Remarks
P2023[0]	RS485 protocol selection	1	2	MODBUS RTU protocol
P2010[0]	USS / MODBUS baudrate	8	6	Baudrate 9600 bps
P2021[0]	MODBUS address	1	1	MODBUS address for inverter
P2022[0]	MODBUS reply timeout	1000	1000	Maximum time to send reply back to the master
P2014[0]	USS / MODBUS telegram off time	2000	100	Time to receive data

4.3.4 Setting application macros

CAUTION
When commissioning the inverter, the application macro setting is a one-off setting. Make sure that you proceed as follows before you change the application macro setting to a value different from your last setting: 1. Do a factory reset (P0010 = 30, P0970 = 1) 2. Repeat the quick commissioning and change the application macro Failure to observe may cause the inverter to accept the parameter settings from both the currently and the previously selected macros, which may lead to undefined and unexplainable inverter operation.

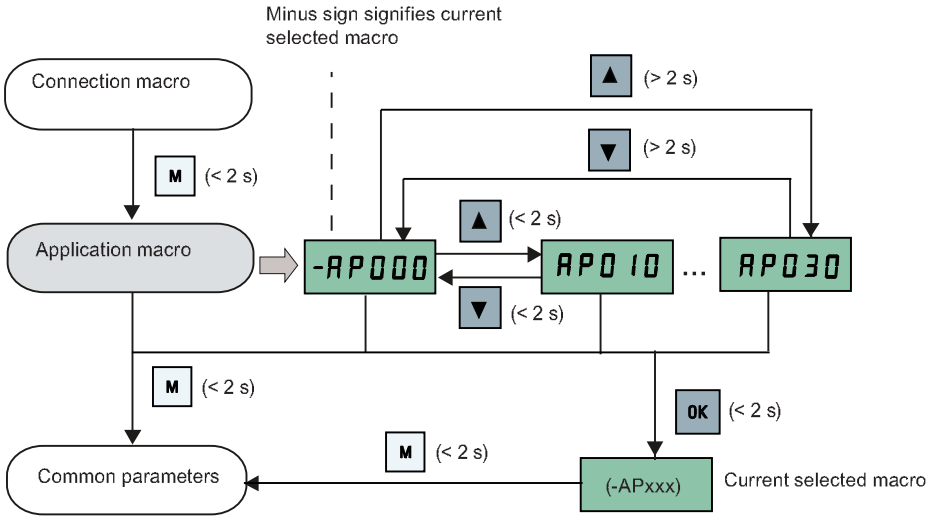
Functionality

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.

The default application macro is "AP000" for application macro 0. If none of the application macros fits your application, select the one that is the closest to your application and make further parameter changes as desired.

Application macro	Description	Display example
AP000	Factory default setting. Makes no parameter changes.	  The minus sign indicates that this macro is the currently selected macro.
AP010	Simple pump applications	
AP020	Simple fan applications	
AP021	Compressor applications	
AP030	Conveyor applications	

Setting application macros



Application macro AP010 - Simple pump applications

Parameter	Description	Factory default	Default for AP010	Remarks
P1080[0]	Minimum frequency	0	15	Inverter running at a lower speed inhibited
P1300[0]	Control mode	0	7	Quadratic V/f
P1110[0]	BI: Inhibit negative frequency setpoint	0	1	Reverse pump rotation inhibited
P1210[0]	Automatic restart	1	2	Fault acknowledgement at power-on
P1120[0]	Ramp-up time	10	10	Ramp-up time from zero to *maximum* frequency
P1121[0]	Ramp-down time	10	10	Ramp-down time from maximum frequency to zero

Application macro AP020 - Simple fan applications

Parameter	Description	Factory default	Default for AP020	Remarks
P1110[0]	BI: Inhibit negative frequency setpoint	0	1	Reverse fan rotation inhibited
P1300[0]	Control mode	0	7	Quadratic V/f
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	Fault acknowledgement at power-on

Parameter	Description	Factory default	Default for AP020	Remarks
P1080[0]	Minimum frequency	0	20	Inverter running at a lower speed inhibited
P1120[0]	Ramp-up time	10	10	Ramp-up time from zero to *maximum frequency*
P1121[0]	Ramp-down time	10	20	Ramp-down time from maximum *frequency* to zero

Application macro AP021 - Compressor applications

Parameter	Description	Factory default	Default for AP021	Remarks
P1300[0]	Control mode	0	0	Linear V/f
P1080[0]	Minimum frequency	0	10	Inverter running at a lower speed inhibited
P1312[0]	Starting boost	0	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
P1120[0]	Ramp-up time	10	10	Ramp-up time from zero to *maximum frequency*
P1121[0]	Ramp-down time	10	10	Ramp-down time from maximum *frequency* to zero

Application macro AP030 - Conveyor applications

Parameter	Description	Factory default	Default for AP030	Remarks
P1300[0]	Control mode	0	1	V/f with FCC
P1312[0]	Starting boost	0	30	Boost only effective when accelerating for the first time (standstill)
P1120[0]	Ramp-up time	10	5	Ramp-up time from zero to *maximum frequency*
P1121[0]	Ramp-down time	10	5	Ramp-down time from maximum *frequency* to zero

4.3.5 Setting common parameters

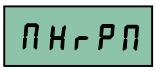
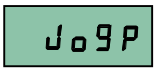
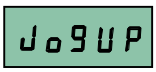
Functionality

This menu provides some common parameters for inverter performance optimization.

Text menu

If you set P8553 to 1, parameter numbers in this menu are replaced with short text.

Setting parameters

Parameter	Access level	Function	Text menu (if P8553 = 1)
P1080[0]	1	Minimum motor frequency	 (MN RPM)
P1082[0]	1	Maximum motor frequency	 (MX RPM)
P1120[0]	1	Ramp-up time	 (RMP UP)
P1121[0]	1	Ramp-down time	 (RMP DN)
P1058[0]	2	JOG frequency	 (JOG P)
P1060[0]	2	JOG ramp-up time	 (JOG UP)
P1001[0]	2	Fixed frequency setpoint 1	 (FIX F1)
P1002[0]	2	Fixed frequency setpoint 2	 (FIX F2)

Parameter	Access level	Function	Text menu (if P8553 = 1)
P1003[0]	2	Fixed frequency setpoint 3	 (FIX F3)
P2201[0]	2	Fixed PID frequency setpoint 1	 (PID F1)
P2202[0]	2	Fixed PID frequency setpoint 2	 (PID F2)
P2203[0]	2	Fixed PID frequency setpoint 3	 (PID F3)

4.4 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: parameter reset to factory defaults deleting user defaults if stored

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: parameter reset to user defaults if stored, else factory defaults

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

Parameter list

Parameter	Description		Range	Factory default	Acc. level
r0002	Inverter state		-	-	2
P0003	User access level		0 - 4	1	1
	0	User defined parameter list			
	1	Standard			
	2	Extended			
	3	Expert			
	4	Service			
P0004	Parameter filter		0 - 22	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			
P0010	Commissioning parameter		0 - 30	0	1
	0	Ready			
	1	Quick commissioning			
	2	Inverter			
	29	Download			
	30	Factory setting			
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
Index:	[0]	Factor for kWh to currency conversion			
	[1]	Factor for kWh to CO2 conversion			

Parameter	Description		Range	Factory default	Acc. level
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
r0053.0...15	CO / BO: Active status word 2		-	-	2
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
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 - 599.00	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			
	1	Complete parameterization			
	2	Calculation of equivalent circuit data			
	3	Calculation of V/f control data			
	4	Calculation of controller settings only			
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			
	1	Operator panel (keypad)			
	2	Terminal			
	5	USS / MBUS on RS485			
P0701[0...2]	Function of digital input 1		0 - 99	0	2
	0	Digital input disabled	16	Fixed frequency selector bit1	

Parameter	Description		Range	Factory default	Acc. level
	1	ON / OFF1	17	Fixed frequency selector bit2	
	2	ON reverse / OFF1	18	Fixed frequency selector bit3	
	3	OFF2 - coast to standstill	22	QuickStop Source 1	
	4	OFF3 - quick ramp-down	23	QuickStop Source 2	
	9	Fault acknowledge	24	QuickStop Override	
	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	
	15	Fixed frequency selector bit0			
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)			
	1	2-wire (fwd / rev)			
	2	3-wire (fwd / rev)			
	3	3-wire (start / dir)			
P0731[0...2]	BI: Function of digital output 1		-	52.3	2
P0732[0...2]	BI: Function of digital output 2		-	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 - 99999	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 - 99999	100.0	2
P0761[0...1]	Width of analog input deadband		0 - 20	0	2
P0771[0]	CI: Analog output		-	21[0]	2
P0773[0]	Smooth time analog output [ms]		0 - 1000	2	2
r0774[0]	Actual analog output value [V] or [mA]		-	-	2

Parameter	Description		Range	Factory default	Acc. level
P0775[0]	Permit absolute value		0 - 65535	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
Index:	[0]	Copy from CDS			
	[1]	Copy to CDS			
	[2]	Start copy			
P0810	BI: command data set bit 0 (Hand / Auto)		-	0	2
P0811	BI: command data set bit 1		-	0	2
P0819[0...2]	Copy inverter data set (DDS)		0 - 2	[0] 0 [1] 1 [2] 0	2
Index:	[0]	Copy from DDS			
	[1]	Copy to DDS			
	[2]	Start copy			
P0927	Parameter changeable via		-	1111 bin	2
r0947[0...63]	CO: Last fault code		-	-	2
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 on RS485	35	USS 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 on RS485	
	11	MOP setpoint + MOP setpoint	51	MOP setpoint + USS on RS485	
	12	Analog setpoint + MOP setpoint	52	Analog setpoint + USS on RS485	
	13	Fixed frequency + MOP setpoint	53	Fixed frequency + USS on RS485	
	15	USS on RS485 + MOP setpoint	55	USS on RS485 + USS on RS485	
	17	Analog setpoint 2 + MOP setpoint	57	Analog setpoint 2 + USS 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 on RS485 + Analog setpoint	75	USS on RS485 + Analog setpoint 2	
	27	Analog setpoint 2 + Analog setpoint	77	Analog setpoint 2 + Analog setpoint 2	

Parameter	Description		Range	Factory default	Acc. level
P1001[0...2]	Fixed frequency 1 [Hz]		-599.00 - 599.00	10.00	2
P1002[0...2]	Fixed frequency 2 [Hz]		-599.00 - 599.00	15.00	2
P1003[0...2]	Fixed frequency 3 [Hz]		-599.00 - 599.00	25.00	2
P1004[0...2]	Fixed frequency 4 [Hz]		-599.00 - 599.00	50.00	2
P1005[0...2]	Fixed frequency 5 [Hz]		-599.00 - 599.00	0.00	2
P1006[0...2]	Fixed frequency 6 [Hz]		-599.00 - 599.00	0.00	2
P1007[0...2]	Fixed frequency 7 [Hz]		-599.00 - 599.00	0.00	2
P1008[0...2]	Fixed frequency 8 [Hz]		-599.00 - 599.00	0.00	2
P1009[0...2]	Fixed frequency 9 [Hz]		-599.00 - 599.00	0.00	2
P1010[0...2]	Fixed frequency 10 [Hz]		-599.00 - 599.00	0.00	2
P1011[0...2]	Fixed frequency 11 [Hz]		-599.00 - 599.00	0.00	2
P1012[0...2]	Fixed frequency 12 [Hz]		-599.00 - 599.00	0.00	2
P1013[0...2]	Fixed frequency 13 [Hz]		-599.00 - 599.00	0.00	2
P1014[0...2]	Fixed frequency 14 [Hz]		-599.00 - 599.00	0.00	2
P1015[0...2]	Fixed frequency 15 [Hz]		-599.00 - 599.00	0.00	2
P1016[0...2]	Fixed frequency mode		1 - 2	1	2
	1	Direct selection			
	2	Binary selection			
P1031[0...2]	MOP mode		-	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]		-599.00 - 599.00	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 - 599.00	5.00	2
P1059[0...2]	JOG frequency left [Hz]		0.00 - 599.00	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 - 599.00	0.00	1
P1082[0...2]	Maximum frequency [Hz]		0.00 - 599.00	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

Parameter	Description		Range	Factory default	Acc. level
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			
P1210	Automatic restart		0 - 7	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 expires			
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 - 599.00	599.00	2
P1236[0...2]	Compound braking current [%]		0 - 250	0	2
P1237	Dynamic braking		0 - 5	0	2
	0	Disabled			
	1	5 % duty cycle			
	2	10 % duty cycle			
	3	20 % duty cycle			
	4	50 % 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

Parameter	Description		Range		Factory default	Acc. level
P1312[0...2]	Starting boost [%]		0.0 - 250.0		0.0	2
P1335[0...2]	Slip compensation [%]		0.0 - 600.0		0.0	2
P1336[0...2]	Slip limit [%]		0 - 600		250	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				
r1926	Identified gating unit dead time [µs]		-		-	2
P2010[0...1]	USS / MODBUS baudrate		6 - 12		8	2
	6	9600 bps	10	76800 bps		
	7	19200 bps	11	93750 bps		
	8	38400 bps	12	115200 bps		
	9	57600 bps				
Index:	[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				
Notice:	After changing P2023, a power-cycle of the inverter (which may take several seconds) is required.					
r2110[0...3]	CO: Warning number		-		-	2
P2157[0...2]	Threshold frequency f_2 [Hz]		0.00 - 599.00		30.00	2
P2158[0...2]	Delay time of threshold freq f_2 [ms]		0 - 10000		10	2
P2159[0...2]	Threshold frequency f_3 [Hz]		0.00 - 599.00		30.00	2
P2160[0...2]	Delay time of threshold freq f_3 [ms]		0 - 10000		10	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 [%]		-200.00 - 200.00		0.00	2
P2206[0...2]	Fixed PID setpoint 6 [%]		-200.00 - 200.00		0.00	2
P2207[0...2]	Fixed PID setpoint 7 [%]		-200.00 - 200.00		0.00	2
P2208[0...2]	Fixed PID setpoint 8 [%]		-200.00 - 200.00		0.00	2
P2209[0...2]	Fixed PID setpoint 9 [%]		-200.00 - 200.00		0.00	2
P2210[0...2]	Fixed PID setpoint 10 [%]		-200.00 - 200.00		0.00	2

Parameter	Description		Range	Factory default	Acc. level
P2211[0...2]	Fixed PID setpoint 11 [%]		-200.00 - 200.00	0.00	2
P2212[0...2]	Fixed PID setpoint 12 [%]		-200.00 - 200.00	0.00	2
P2213[0...2]	Fixed PID setpoint 13 [%]		-200.00 - 200.00	0.00	2
P2214[0...2]	Fixed PID setpoint 14 [%]		-200.00 - 200.00	0.00	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			
r2224	CO: Actual fixed PID setpoint [%]		-	-	2
P2231[0...2]	PID-MOP mode		-	0	2
P2232	Inhibit reverse direction of PID-MOP		0 - 1	1	2
	0	Reverse direction is allowed			
	1	Reverse direction inhibited			
P2240[0...2]	Setpoint of PID-MOP [%]		-200.00 - 200.00	10.00	2
P2247[0...2]	PID-MOP ramp-up time of the RFG [s]		0.00 - 1000.0	10.00	2
P2248[0...2]	PID-MOP ramp-down time of the RFG [s]		0.00 - 1000.0	10.00	2
r2250	CO: Output setpoint of PID-MOP [%]		-	-	2
P2253[0...2]	CI: PID setpoint		-	0	2
P2257	Ramp-up time for PID setpoint [s]		0.00 - 650.00	1.00	2
P2258	Ramp-down time for PID setpoint [s]		0.00 - 650.00	1.00	2
r2260	CO: PID setpoint after PID-RFG [%]		-	-	2
P2264[0...2]	CI: PID feedback		-	755[0]	2
P2265	PID feedback filter time constant [s]		0.00 - 60.00	0.00	2
r2266	CO: PID filtered feedback [%]		-	-	2
P2271	PID transducer type		0 - 1	0	2
	0	Disabled			
	1	Inversion of PID feedback signal			
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
P2350	PID autotune enable		0 - 4	0	2
	0	PID autotuning disabled			
	1	PID autotuning via Ziegler Nichols (ZN) standard			
	2	PID autotuning as 1 plus some overshoot (O/S)			
	3	PID autotuning as 2 little or no overshoot (O/S)			
	4	PID autotuning PI only, quarter damped response			
P2360[0...2]	Enable cavitation protection		0 - 2	0	2

Parameter	Description		Range	Factory default	Acc. level
	0	Disable			
	1	Fault			
	2	Warn			
P2361[0...2]	Cavitation threshold [%]		0.00 - 200.00	40.00	2
P2362[0...2]	Cavitation protection time [s]		0 - 65000	30	2
P2365[0...2]	Hibernation enable / disable		0 - 1	0	2
	0	Disabled			
	1	Enabled			
P2940	BI: Release wobble function		-	0.0	2
P2945	Wobble signal frequency [Hz]		0.001 - 10.000	1.000	2
P2946	Wobble signal amplitude [%]		0.000 - 0.200	0.000	2
P2947	Wobble signal decrement step		0.000 - 1.000	0.000	2
P2948	Wobble signal increment step		0.000 - 1.000	0.000	2
P2949	Wobble signal pulse width [%]		0 - 100	50	2
r2955	CO: Wobble signal output [%]		-	-	2
r3113.0...15	CO / BO: Fault bit array		-	-	1
P3350[0...2]	Super torque mode		0 - 3	0	2
	0	Super torque modes disabled			
	1	Super torque enabled			
	2	Hammer start enabled			
	3	Blockage clearing enabled			
Index:	[0]	Inverter data set 0 (DDS0)			
	[1]	Inverter data set 1 (DDS1)			
	[2]	Inverter data set 2 (DDS2)			
P3351[0...2]	BI: Super torque enable		-	0	2
P3352[0...2]	Super torque startup mode		0 - 2	1	2
	0	Enabled on first run after power-up			
	1	Enabled on every run			
	2	Enabled by digital input			
P3353[0...2]	Super torque ramp time [s]		0.0 - 650.0	5.0	2
P3354[0...2]	Super torque frequency [Hz]		0.0 - 599.0	5.0	2
P3355[0...2]	Super torque boost level [%]		0.0 - 200.0	150.0	2
P3356[0...2]	Super torque boost time [s]		0.0 - 20.0	5.0	2
P3357[0...2]	Hammer start boost level [%]		0.0 - 200.0	150.0	2
P3358[0...2]	Number of hammer cycles		1 - 10	5	2
P3359[0...2]	Hammer on time [ms]		0 - 1000	300	2
P3360[0...2]	Hammer off Time [ms]		0 - 1000	100	2
P3361[0...2]	Blockage clearing frequency [Hz]		0.0 - 599.0	5.0	2
P3362[0...2]	Blockage clearing reverse time [s]		0.0 - 20.0	5.0	2
P3363[0...2]	Enable rapid ramp		0 - 1	0	2
	0	Disable rapid ramp for blockage clearing			
	1	Enable rapid ramp for blockage clearing			

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Parameter	Description		Range	Factory default	Acc. level
P3364[0...2]	Number of blockage clearing cycles		1 - 10	1	2
r3365	Status word: super torque		-	-	2
P3852[0...2]	BI: Enable frost protection		-	0	2
P3853[0...2]	Frost protection frequency [Hz]		0.00 - 599.00	5.00	2
P3854[0...2]	Condensation protection current [%]		0 - 250	100	2
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			

6 Fault and warning codes

Fault code list

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

Acknowledging / clearing faults

- To navigate through the current list of faults, press ▲ or ▼.
- To clear / acknowledge the fault, press OK or acknowledge externally if the inverter has been set up so.
- To ignore the fault, press M.

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

Alarm code list

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

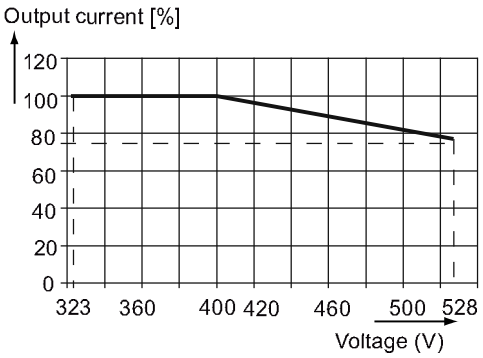
Acknowledging / clearing alarms

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

Technical specifications

7

Line supply characteristics

Three phase 400 V inverters	
Voltage range	380 ... 480 V AC (tolerance: -15 % ... +10 %) 47 ... 63 Hz Current derating at high input voltages: 
Overvoltage category	EN 60664-1 Category III
Permissible supply configuration	TN, TT, IT[1)], TT earthed line
Supply environment	Second environment (private power network)

1) Note that only unfiltered inverters can be operated on IT power system.

Overload capability

Average output current	100 % rated
Overload current	150 % rated for 60 seconds
Maximum overload cycle	150 % rated for 60 seconds followed by 94.5 % rated for 540 seconds (average 100 % rated)

EMC requirements

NOTICE
Install all inverters in accordance with the manufacturer's guidelines and in accordance with good EMC practices. Use screened cable type CY. The maximal cable length is 10 m for frame size A or 25 m for frame size B...D. Do not exceed the default switching frequency 4 kHz.

Three phase 400 V inverters	
ESD	EN 61800-3 Category C3
Radiated immunity	
Burst	
Surge	
Conducted immunity	
Voltage distortion immunity	
	Three phase 400 V filtered inverters
Conducted emissions	EN 61800-3 Category C3
Radiated emissions	

Output current deratings at different PWM frequencies and ambient temperatures

Three phase 400 V inverters													
Frame size	Power rating [kW]	Current rating [A] at PWM frequency PWM frequency range: 2 ... 16 kHz (default: 4 kHz)											
		2 kHz			4 kHz			6 kHz			8 kHz		
		40 °C	50 °C	60 °C	40 °C	50 °C	60 °C	40 °C	50 °C	60 °C	40 °C	50 °C	60 °C
A	0.37	1.3	1.0	0.7	**1.3**	1.0	0.7	1.1	0.8	0.5	0.9	0.7	0.5
A	0.55	1.7	1.3	0.9	**1.7**	1.3	0.9	1.4	1.0	0.7	1.2	0.9	0.6
A	0.75	2.2	1.8	1.1	**2.2**	1.8	1.1	1.9	1.3	0.9	1.5	1.1	0.8
A	1.1	3.1	2.6	1.6	**3.1**	2.6	1.6	2.6	1.9	1.3	2.2	1.6	1.1
A	1.5	4.1	3.4	2.1	**4.1**	3.4	2.1	3.5	2.5	1.7	2.9	2.1	1.4
A	2.2	5.6	4.6	2.8	**5.6**	4.6	2.8	4.8	3.4	2.4	3.9	2.8	2.0
B	3.0	7.3	6.3	3.7	**7.3**	6.3	3.7	6.2	4.4	3.1	5.1	3.7	2.6
B	4.0	8.8	8.2	4.4	**8.8**	8.2	4.4	7.5	5.3	3.7	6.2	4.4	3.1
C	5.5	12.5	10.8	6.3	**12.5**	10.8	6.3	10.6	7.5	5.3	8.8	6.3	4.4
D	7.5	16.5	14.5	8.3	**16.5**	14.5	8.3	14.0	9.9	6.9	11.6	8.3	5.8
D	11	25.0	21.0	12.5	**25.0**	21.0	12.5	21.3	15.0	10.5	17.5	12.5	8.8
D	15	31.0	28.0	15.5	**31.0**	28.0	15.5	26.4	18.6	13.0	21.7	15.5	10.9

Three phase 400 V inverters													
Frame size	Power rating [kW]	Current rating [A] at PWM frequency PWM frequency range: 2 ... 16 kHz (default: 4 kHz)											
		10 kHz			12 kHz			14 kHz			16 kHz		
		40 °C	50 °C	60 °C	40 °C	50 °C	60 °C	40 °C	50 °C	60 °C	40 °C	50 °C	60 °C
A	0.37	0.8	0.5	0.4	0.7	0.5	0.3	0.6	0.4	0.3	0.5	0.4	0.3
A	0.55	1.0	0.7	0.5	0.9	0.6	0.4	0.8	0.5	0.4	0.7	0.5	0.3
A	0.75	1.3	0.9	0.7	1.1	0.8	0.6	1.0	0.7	0.5	0.9	0.6	0.4
A	1.1	1.9	1.3	0.9	1.6	1.1	0.8	1.4	1.0	0.7	1.2	0.9	0.6
A	1.5	2.5	1.7	1.2	2.1	1.4	1.0	1.8	1.3	0.9	1.6	1.1	0.8
A	2.2	3.4	2.4	1.7	2.8	2.0	1.4	2.5	1.7	1.2	2.2	1.6	1.1
B	3.0	4.4	3.1	2.2	3.7	2.6	1.8	3.3	2.3	1.6	2.9	2.0	1.5
B	4.0	5.3	3.7	2.6	4.4	3.1	2.2	4.0	2.7	1.9	3.5	2.5	1.8
C	5.5	7.5	5.3	3.8	6.3	4.4	3.1	5.6	3.9	2.8	5.0	3.5	2.5
D	7.5	9.9	6.9	5.0	8.3	5.8	4.1	7.4	5.1	3.6	6.6	4.6	3.3
D	11	15.0	10.5	7.5	12.5	8.8	6.3	11.3	7.8	5.5	10.0	7.0	5.0
D	15	18.6	13.0	9.3	15.5	10.9	7.8	14.0	9.6	6.8	12.4	8.7	6.2

Motor control

Control methods	Linear V/F, quadratic V/F, multi-point V/F, V/F with FCC
Output frequency range	Default range: 0 ... 599 Hz Resolution: 0.01 Hz
Maximum overload cycle	150 % rated for 60 seconds followed by 94.5 % rated for 540 seconds (average 100 % rated)

Mechanical specifications

		3 AC 400 V						
		Frame size A		Frame size B	Frame size C	Frame size D		
		With fan	Without fan			7.5 kW	11 kW	15 kW
Outline dimensions (mm)	W	90	90	140	184	240		
	H	166	150	160	182	206.5		
	D	145.5	145.5	164.5	169	172.5		
Net weight (kg)	unfiltered	1.0	0.9	1.6	2.4	3.7	3.7	3.9
	filtered	1.1	1.0	1.8	2.6	4.0	4.1	4.3
Gross weight (kg)		1.4		2.1	3.0	5.0		
Mounting methods		• Cabinet panel mounting (frame sizes A ... D) • Push-through mounting (frame sizes B ... D)						

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Environmental conditions

Ambient temperature	0 ... 40 °C: without derating 40 ... 60 °C: with derating
Storage temperature	-40 ... + 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 ... 4000 m: output current derating 2000 ... 4000 m: input voltage derating
Environmental classes	Pollution class: 3S2 Gas class: 3C2 (SO_2, H_2S) Climate class: 3K3
Minimum mounting clearance	Top: 100 mm Bottom: 100 mm (85 mm for fan-cooled frame size A) Side: 0 mm

Standards

CE marking	European Low Voltage Directive (EN61800 -5-1 and EN 60204-1)
	European EMC Directive (EN 61800 - 3)
UL certification (UL508C)	
CTick marking	
ISO 9001	