

This document only provides basic installation and commissioning information of the SINAMICS V20 converter. For more information, see the *SINAMICS V20 Converter Operating Instructions*.

Scan the QR code to download the "SINAMICS V20 Converter Operating Instructions".



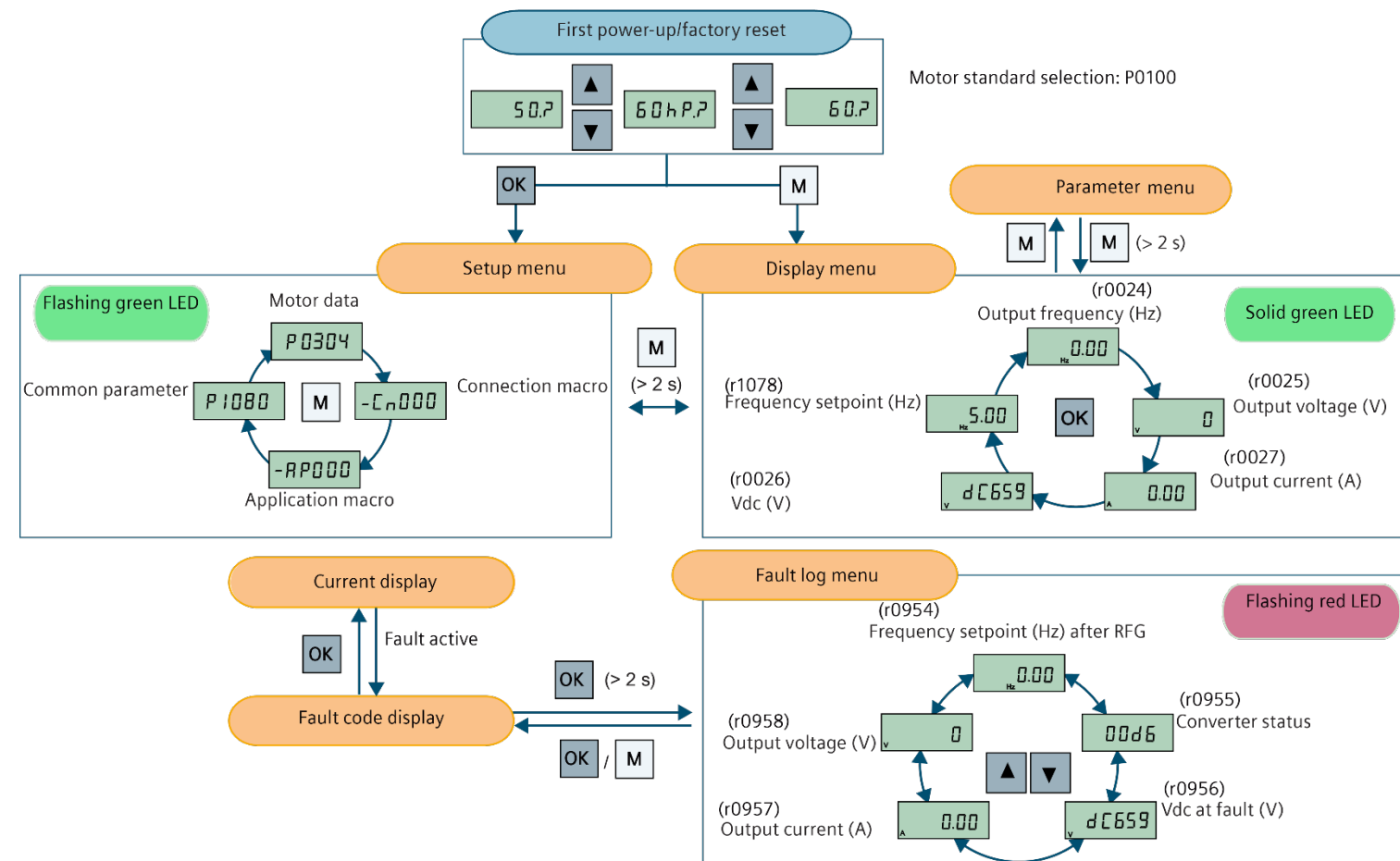
Drill pattern

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

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

²⁾ For push-through mounting only.

BOP menu structure



Setting connection macros

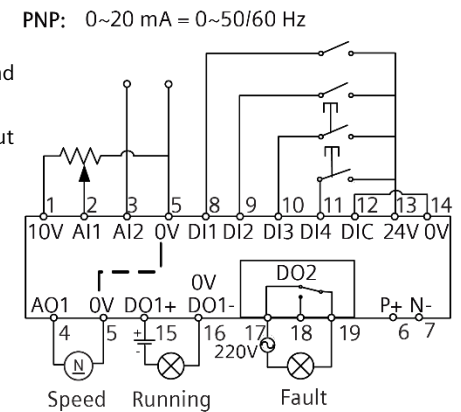
Select the following connection macros for standard wiring arrangements. The default connection macro is "Cn000" (connection macro 0).

Connection macro	Description	Display example
Cn000	Factory default setting.No parameter setting change is required.	-[Cn000]
Cn001	BOP as the only control source	[Cn001]
Cn002	Control from terminals (PNP/NPN)	
Cn003	Fixed speeds	
Cn004	Fixed speeds in binary mode	
Cn005	Analog input and fixed frequency	
Cn006	External push button control	
Cn007	External push buttons with analog setpoint	
Cn008	PID control with analog input reference	
Cn009	PID control with the fixed value reference	
Cn010	USS control	
Cn011	MODBUS RTU control	

The minus sign indicates that this macro is the currently selected macro.

Wiring diagram of connection macros

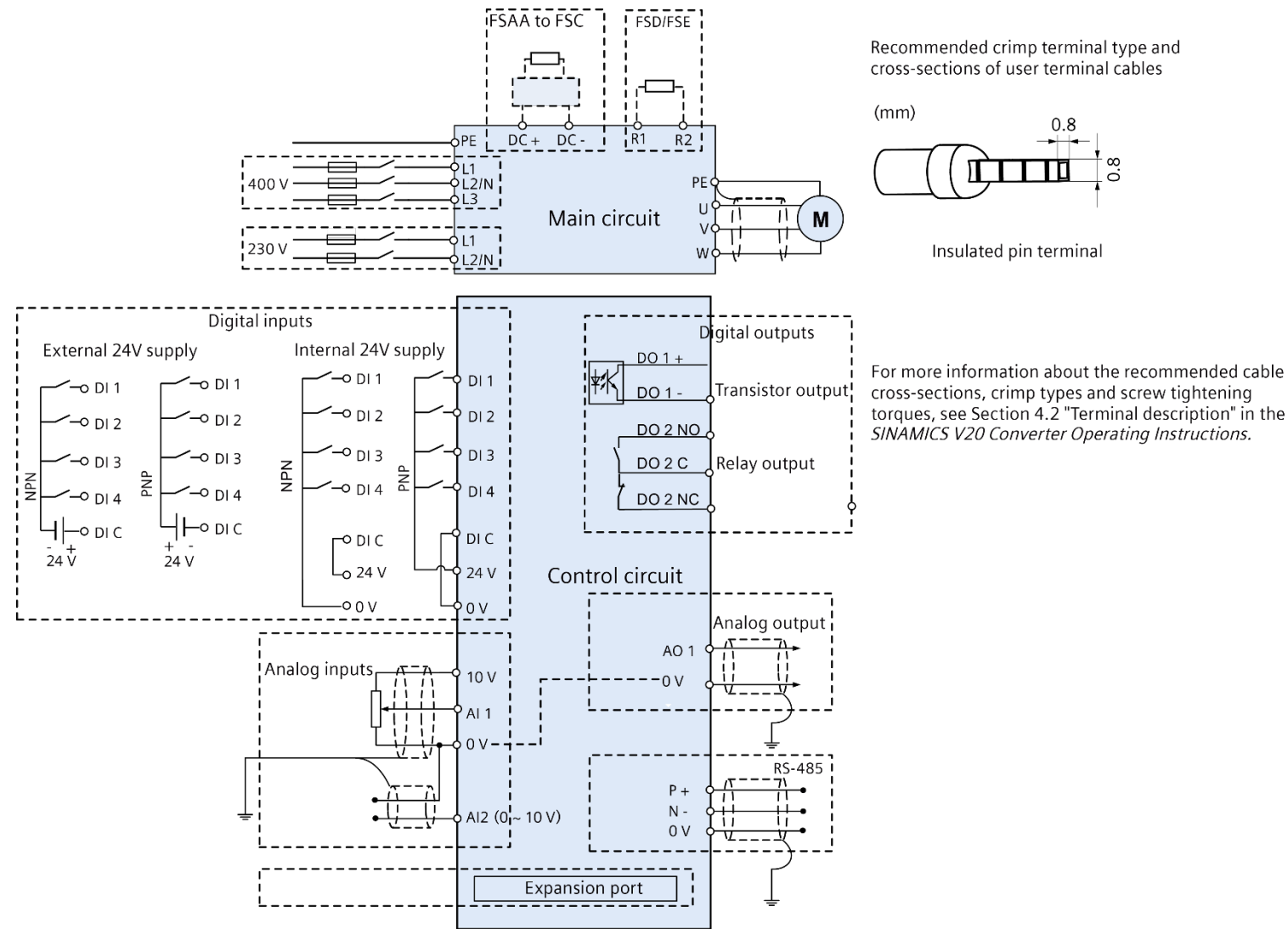
The figure to the right provides a general wiring method for all connection macros in the PNP mode. Both PNP and NPN can be realized with the same parameters. You can switch to the NPN mode by connecting the digital input common (DIC) to 24 V. The signal functions of I/O terminals in different macros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



Function description of I/O signals in different connection macros

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

Typical system connections



Parameters list

Quick commissioning parameters

Step	Parameter	Description	Setting
1. Enable motor data editing (P0010 = 1)	P0010 = 1	Commissioning parameter	= 0: Ready = 1: Quick commissioning = 2: Converter = 29: Download = 30: Factory setting
2. Select motor frequency (P0100) and configure motor parameters (P0304 to P0311)	P0100	50/60 Hz selection	= 0: Europe [kW], 50 Hz = 1: North America [hp], 60 Hz = 2: North America [kW], 60 Hz
	P0304[0]	Rated motor voltage [V]	Range: 10 to 2000
	P0305[0]	Rated motor current [A]	Range: 0.01 to 10000
	P0307[0]	Rated motor power [kW/hp]	Range: 0.01 to 2000.0
	P0310[0]	Rated motor frequency [Hz]	Range: 12.00 to 550.00
3. Set common parameters	P0311[0]	Rated motor speed [RPM]	Range: 0 to 40000
	P0700[0]	Selection of command source	= 1: Operator panel (factory default) = 2: Terminal = 5: USS/MODBUS on RS485 Note: Changing this parameter resets all settings on the command source selected and all BI parameters to the factory default value. For more information about this parameter, see Section 8.2 "Parameter list" in the <i>SINAMICS V20 Converter Operating Instructions</i> .

	P1000[0]	Selection of frequency setpoint	Range: 0 to 77 = 0: No main setpoint = 1: MOP setpoint (factory default) = 2: Analog setpoint 1 = 3: Fixed frequency = 5: USS/MODBUS on RS485 = 7: Analog setpoint 2 For additional settings, see Section 8.2 "Parameter list" in the <i>SINAMICS V20 Converter Operating Instructions</i> .
	P1080[0]	Minimum frequency [Hz]	Range: 0.00 to 550.00 (factory default: 0.00)
	P1082[0]	Maximum frequency [Hz]	Range: 0.00 to 550.00 (factory default: 50.00)
	P1120[0]	Ramp-up time [s]	Range: 0.00 to 650.00 (factory default: 10.00)
	P1121[0]	Ramp-down time [s]	Range: 0.00 to 650.00 (factory default: 10.00)
4. Complete the quick commissioning (P3900 = 3).	P3900 = 3	End of quick commissioning	= 0: No quick commissioning = 1: End quick commissioning with factory reset = 2: End quick commissioning = 3: End quick commissioning and initiate motor data calculation

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

Other converter and motor feature parameters

Parameter	Description	
P0003	User access level = 1: Standard (allows access into most frequently used parameters) = 2: Extended (allows extended access to more parameters) = 3: Expert (for expert use only)	
P0005	Parameter display selection Selects default display parameter (converter display).	
Example:	The converter displays the value of the parameter selected here by default.	
P0308[0...2]	Rated motor cosφ	
P0309[0...2]	Rated motor efficiency [%]	
P0335[0...2]	Motor cooling 0 Self-cooled: Shaft mounted fan attached motor (IC410 or IC411) 1 Force-cooled: Separately powered cooling fan (IC416)	
P0340[0...2]	Calculation of motor parameters 0 No calculation 1 Complete parameterization	
P0604[0...2]	Threshold motor temperature [°C]	
P0640[0...2]	Motor overload factor [%]	
P1031[0...2]	MOP mode	
P1032	Inhibit reverse direction of MOP 0 Reverse direction is allowed 1 Reverse direction inhibited	
P1040[0...2]	Setpoint of the MOP [Hz]	
r1050	CO: Actual output freq. of the MOP [Hz]	
P1055[0...2]	BI: Enable JOG right	Defines source of JOG right/left when P0719 = 0 (auto selection of command/setpoint source).
P1056[0...2]	BI: Enable JOG left	
P1058[0...2]	JOG frequency [Hz]	
P1059[0...2]	JOG frequency left [Hz]	
P1135[0...2]	OFF3 ramp-down time [s]	
P1310[0...2]	Continuous boost [%]	The three parameters are relative to P0305 (rated motor current). For more information about the parameters, see Section 8.2 "Parameter list" in the <i>SINAMICS V20 Converter Operating Instructions</i> .
P1311[0...2]	Acceleration boost [%]	
P1312[0...2]	Starting boost [%]	
P1800[0...2]	Pulse frequency [kHz]	
P1900	Select motor data identification 0 Disabled 2 Identification of all parameters in standstill	
P8553	Menu type Selects whether to have menus with no text or menus with some text on the BOP. 0 Menus with no text 1 Menus with some text	

● Converter and motor monitoring parameters

Parameter	Description
r0018	Firmware version
r0021	CO: Actual filtered frequency [Hz]
r0025	CO: Actual output voltage [V]
r0026[0]	CO: Actual filtered DC-link voltage [V]
r0027	CO: Actual output current [A]
r0031	CO: Actual filtered torque [Nm]
r0032	CO: Actual filtered power
r0035[0...2]	CO: Actual motor temperature [°C]
r0067	CO: Actual output current limit [A]
r0206	Rated converter power [kW]/[hp]
r0207[0...2]	Rated converter current [A]
r0208	Rated converter voltage [V]
r0209	Maximum converter current [A]
r0752[0...1]	Actual analog input [V] or [mA]
r0754[0...1]	Actual analog input value after scaling [%]
r0755[0...1]	CO: Actual analog input after scaling [4000h]
r0774[0]	Actual analog output value [V] or [mA]

● I/O commands/binary I/O parameters

Parameter	Description																																																																								
r0050	CO/BO: Active command data set (CDS)																																																																								
r0051[0...1]	CO: Active drive data set (DDS)																																																																								
Index:	[0] Selected drive data set [1] Active drive data set																																																																								
r0052.0...15	CO/BO: Active status word 1																																																																								
	Displays first active status word of converter (bit format) and can be used to diagnose converter status.																																																																								
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Dependency:	r0052 bit 03 "Converter fault active": Output of bit 3 (Fault) will be inverted on digital output (Low = Fault, High = No Fault).																																																																								
P0701[0...2]	Function of digital input 1																																																																								
	Selects function of digital input 1.																																																																								
0	Digital input disabled																																																																								
1	ON/OFF1																																																																								
2	ON reverse/OFF1																																																																								
3	OFF2 - coast to standstill																																																																								
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22	Quick Stop source 1																																																																								
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24	Quick Stop override																																																																								
25	DC brake enable																																																																								
27	Enable PID																																																																								
29	External trip																																																																								
33	Disable additional frequency setpoint																																																																								
99	Enable BICO parameterization																																																																								
P0702[0...2]	Function of digital input 2 to 4																																																																								
~P0704[0...2]	See P0701.																																																																								
P0712 [0...2]	Analog/digital input 1																																																																								
P0713[0...2]	Analog/digital input 2																																																																								
r0722.0...12	CO/BO: Digital input values																																																																								
P0731[0...2]	Bl: Function of digital output 1																																																																								
	52.3 (factory default): Converter fault active, which is the bit 03 of r0052 52.2: Operation enabled P0731 can connect to a status bit of r0052 or of another status signal.																																																																								
P0732[0...2]	Bl: Function of digital output 2																																																																								
	The factory default of P0732 is 52.7. The meaning of this factory default is the same as that of P0731. For more information, see P0731.																																																																								

● Analog input and output parameters

Parameter	Description
P0756[0...1]	Type of analog input
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
P0758[0...1]	Value y1 of analog input scaling [%]
P0759[0...1]	Value x2 of analog input scaling
P0760[0...1]	Value y2 of analog input scaling [%]
P0761[0...1]	Width of analog input deadband
P0771[0]	Cl: Analog output
P0773[0]	Smooth time analog output [ms]
P0775[0]	Permit absolute value of the analog output
P0777[0]	Value x1 of analog output scaling [%]
P0778[0]	Value y1 of analog output scaling
P0779[0]	Value x2 of analog output scaling [%]
P0780[0]	Value y2 of analog output scaling
P0781[0]	Width of analog output deadband

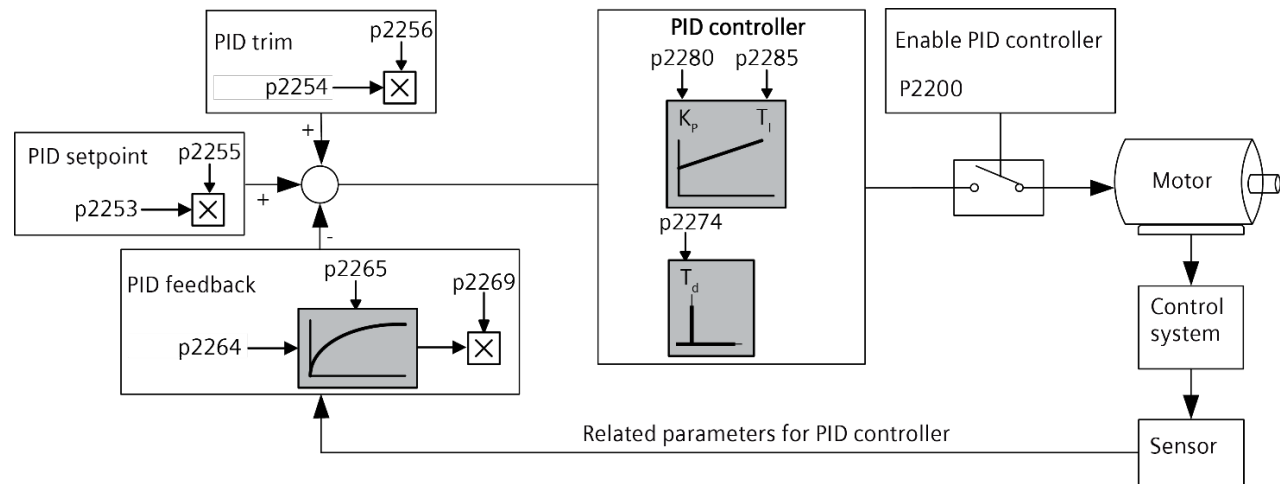
● Communication parameters

Parameter	Description
P2000[0...2]	Reference frequency [Hz]
P2002[0...2]	Reference current [A]
P2010[0...1]	USS/MODBUS baudrate
	Sets baudrate for USS/MODBUS communication.
6	9600 bps
7	19200 bps
8	38400 bps
9	57600 bps
10	76800 bps
11	93750 bps
12	115200 bps
Index:	[0] USS/MODBUS on RS485 [1] USS on RS232 (reserved)
Note:	This parameter, index 0, will alter the baudrate on RS485 regardless of the protocol selected in P2023.
P2011[0...1]	USS address
P2021	Modbus address
P2023	RS485 protocol selection
	Selects the protocol which runs on the RS485 link.
0	None
1	USS
2	Modbus
Note:	After changing P2023, a power-cycle of the converter (which may take several seconds) is required.
P2034	MODBUS parity on RS485
0	No parity
1	Odd parity
2	Even parity
P2035	MODBUS stop bits on RS485
1	1 stop bit
2	2 stop bits

● Faults/warning/monitoring parameters

Parameter	Description																																																																								
r0947[0...63]	CO: Last fault code																																																																								
	Displays fault history.																																																																								
r2110[0...3]	CO: Warning number																																																																								
r3113.0...15	CO/BO: Fault bit array																																																																								
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● PID control parameters



Related parameters for PID controller

Parameter	Description
P2200[0...2]	BI: Enable PID controller
P2253[0...2]	CI: PID setpoint
P2254[0...2]	CI: PID trim source
P2255	PID setpoint gain factor
P2256	PID trim gain factor
P2264[0...2]	CI: PID feedback
P2265	PID feedback filter time constant [s]
P2269	Gain applied to PID feedback
P2274	PID derivative time [s]
P2280	PID proportional gain
P2285	PID integral time [s]

● Fixed frequency parameters

Selection mode	Description																																	
Direct selection (P1016 = 1)	<ul style="list-style-type: none"> In this mode, 1 fixed frequency selector (P1020 to P1023) selects 1 fixed frequency (P1001 to P1004). If several inputs are active together, the selected frequencies are summed. <p>Example: fixed frequency 1 (P1001) + fixed frequency 2 (P1002) + fixed frequency 3 (P1003) + fixed frequency 4 (P1004).</p>																																	
Binary coded selection (P1016 = 2)	<p>Up to 16 different fixed frequency values can be selected using this method.</p> <table border="1"> <thead> <tr> <th>Fixed frequency selection bit</th> <th>Binary code</th> <th>Fixed frequency 1 to 15 (Hz)</th> </tr> </thead> <tbody> <tr> <td>P1023 P1022 P1021 P1020</td> <td></td> <td></td> </tr> <tr> <td>- - - -</td> <td>0</td> <td>0</td> </tr> <tr> <td>- - - 1</td> <td>1</td> <td>P1001</td> </tr> <tr> <td>- - 1 -</td> <td>2</td> <td>P1002</td> </tr> <tr> <td>- - 1 1</td> <td>3</td> <td>P1003</td> </tr> <tr> <td>- 1 - -</td> <td>4</td> <td>P1004</td> </tr> <tr> <td>- - - -</td> <td>-</td> <td>-</td> </tr> <tr> <td>- - - -</td> <td>-</td> <td>-</td> </tr> <tr> <td>- - - -</td> <td>-</td> <td>-</td> </tr> <tr> <td>1 1 1 1</td> <td>15</td> <td>P1015</td> </tr> </tbody> </table> <p>For more information about other fixed frequency bits and assigning desired digital inputs to the fixed frequency bits, see the description of P1001 in the <i>SINAMICS V20 Converter Operating Instructions</i>.</p>	Fixed frequency selection bit	Binary code	Fixed frequency 1 to 15 (Hz)	P1023 P1022 P1021 P1020			- - - -	0	0	- - - 1	1	P1001	- - 1 -	2	P1002	- - 1 1	3	P1003	- 1 - -	4	P1004	- - - -	-	-	- - - -	-	-	- - - -	-	-	1 1 1 1	15	P1015
Fixed frequency selection bit	Binary code	Fixed frequency 1 to 15 (Hz)																																
P1023 P1022 P1021 P1020																																		
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- - - 1	1	P1001																																
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- - 1 1	3	P1003																																
- 1 - -	4	P1004																																
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1 1 1 1	15	P1015																																

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

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

You can find data regarding power loss of our products on the Internet:

<https://support.industry.siemens.com/cs/ww/en/view/94059311>



● CDS and DDS parameters

Function	Parameter	Description	Setting	Example												
Parameter set copying	P0809[0...2]	Copy CDS	Index: [0]: Copy from a CDS/DDS (source data set) [1]: Copy to another CDS/DDS (target data set) [2]: Start copying (1: start copying; 0: copying completed)	Copying CDS0 to CDS2 : 1. Set P0809[0] = 0: copy from CDS0 2. Set P0809[1] = 2: copy to CDS2 3. Set P0809[2] = 1: start copying The copying procedure of a DDS and that of a CDS is the same. Refer to the example above.												
	P0819[0...2]	Copy DDS														
Parameter set changeover	P0810 & P0811	CDS changeover	CDSs are changed over by changing the values of P0810 and P0811, whereby the active CDS is displayed in r0050. Changeover is possible in both the "Ready" and the "Run" states.	<table border="1"> <thead> <tr> <th>CDS</th> <th>P0811</th> <th>P0810</th> </tr> </thead> <tbody> <tr> <td>CDS0</td> <td>0</td> <td>0</td> </tr> <tr> <td>CDS1</td> <td>0</td> <td>1</td> </tr> <tr> <td>CDS2</td> <td>1</td> <td>0/1</td> </tr> </tbody> </table>	CDS	P0811	P0810	CDS0	0	0	CDS1	0	1	CDS2	1	0/1
	CDS	P0811	P0810													
CDS0	0	0														
CDS1	0	1														
CDS2	1	0/1														
	P0820 & P0821	DDS changeover	DDSs are changed over by changing the values of P0820 and P0821, whereby the active DDS is displayed in r0051. Changeover is possible in the "Ready" state.	<table border="1"> <thead> <tr> <th>DDS</th> <th>P0821</th> <th>P0820</th> </tr> </thead> <tbody> <tr> <td>DDS0</td> <td>0</td> <td>0</td> </tr> <tr> <td>DDS1</td> <td>0</td> <td>1</td> </tr> <tr> <td>DDS2</td> <td>1</td> <td>0/1</td> </tr> </tbody> </table>	DDS	P0821	P0820	DDS0	0	0	DDS1	0	1	DDS2	1	0/1
DDS	P0821	P0820														
DDS0	0	0														
DDS1	0	1														
DDS2	1	0/1														

Faults and alarms

● Fault list

Fault	Description	Fault	Description
F1	Overcurrent	F2	Overvoltage
F3	Undervoltage	F4	Converter overtemperature
F5	Converter I ² t	F6	Chip temperature rise exceeds critical levels
F11	Motor overtemperature	F12	Converter temperature signal lost
F20	DC ripple too high	F35	Maximum number of auto restart attempts exceeded
F41	Motor data identification failure	F51	Parameter EEPROM fault
F52	Power stack software fault	F60	Asic timeout
F61	MMC/SD card parameter cloning failed	F62	Parameter cloning contents invalid
F63	Parameter cloning contents incompatible	F64	Converter attempted to do an automatic clone during startup
F70	I/O Extension Module communication fault	F71	USS setpoint fault
F72	USS/MODBUS setpoint fault	F80	Signal lost on analog input
F85	External fault		

● Alarm list

Alarm	Description	Alarm	Description
A501	Current limit	A502	Overvoltage limit
A503	Undervoltage limit	A504	Converter overtemperature
A505	Converter I ² t	A506	IGBT junction temperature rise warning
A507	Converter temperature signal lost	A511	Motor overtemperature I ² t
A523	Output current ripple too high	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	Analog output parameters not set properly
A922	No load applied to converter	A923	Both JOG left and JOG right are requested
A930	Cavitation protection warning	A936	PID autotuning active
A952	Belt failure detected		