

SINAMICS V90 servo drive

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Overview

SINAMICS V90 - optimized servo drive solution for motion control applications



SINAMICS V90 servo drive, 200 ... 240 V 1 AC/3 AC, frame sizes FSA, FSB, FSC and FSD

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SINAMICS V90 can be integrated into a wide range of applications, either using the pulse train version (pulse/direction, analog, USS/Modbus RTU) or the PROFINET version.

The SINAMICS V90 pulse train version features internal positioning, positioning with pulse train as well as speed and torque control modes.

The SINAMICS V90 PROFINET version supports PROFINET for linking the drive to an automation system via PROFIdrive profile.



SINAMICS V90 servo drive, 380 ... 480 V 3 AC, frame sizes FSA, FSB and FSC

With integrated real-time auto tuning and automatic suppression of machine resonances, the system automatically optimizes itself to achieve high dynamic performance and smooth operation.

For selection and ordering data please refer to section "System overview" "SINAMICS V90 basic servo drive system" from page 1/10.

Benefits

Optimized servo performance

- Advanced one-button tuning and real-time auto tuning enable machines to achieve a high dynamic performance
- Automatic suppression of machine resonances
- 1 MHz high-frequency pulse train input
- Different encoder types to address the requirements of your applications

Cost-effective

- Integrated control modes: Pulse train positioning, internal positioning with traversing block or Modbus, speed and torque control modes
- Integrated internal positioning function
- Integrated braking resistor in all frame sizes with max. motor power ≥ 0.2 kW
- Integrated holding brake switch (for the 400 V version), no external relay necessary

Easy to use

- Simple connection to a control system
- Easy, all from a single source
- Easy servo tuning
- Easy machine optimization
- Easy commissioning with SINAMICS V-ASSISTANT
- Parameter cloning
- Easy integration via PTI, PROFINET, USS, Modbus RTU

Reliable operation

- High-quality motor bearings
- All motors have IP65 degree of protection and are equipped with oil seal
- Integrated safe torque off (STO)

Function

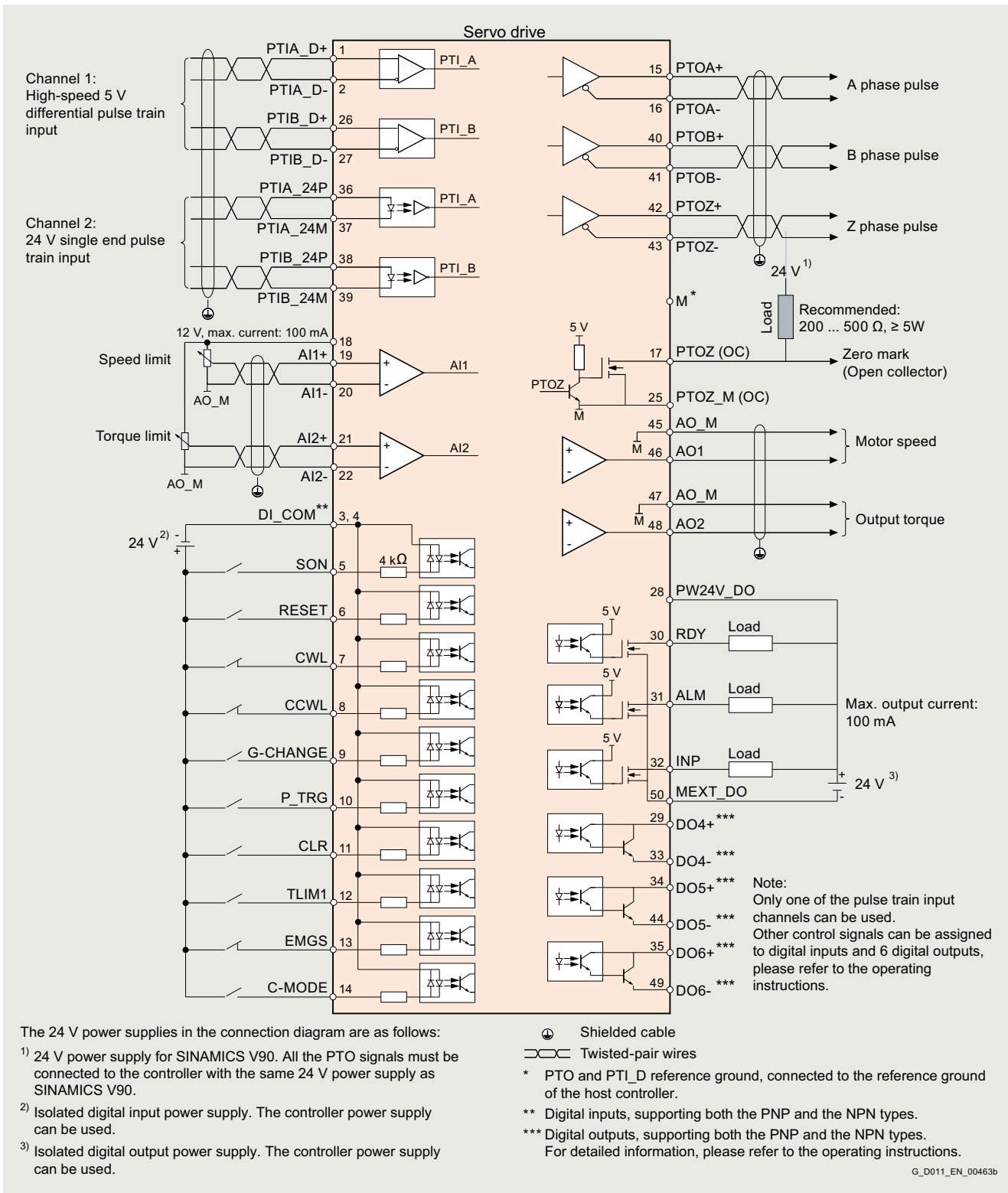
		SINAMICS V90 Pulse train version (PTI)	SINAMICS V90 PROFINET version (PN)
Control modes			
Control modes		<ul style="list-style-type: none"> Pulse train input position control (PTI) Internal position control (IPos), setpoints selected using a combination of digital inputs, or Modbus/US\$ Speed control (S) Torque control (T) Compound controls, switches between position control, speed control, and torque control Jog using buttons on the integrated operator panel Fast PTI control (FAST_PTII) 	<ul style="list-style-type: none"> Speed control mode: position and speed control in combination with a motion function (TO axis) of SIMATIC S7-1500/S7-1200 and PROFINET Basic positioner control (EPos)
Speed control	Speed input	External analog input or internal speed setpoint	PROFINET or internal speed setpoint
	Torque limit	External analog input or set using a parameter	PROFINET or set using a parameter
Pulse train input position control	Max. pulse frequency	<ul style="list-style-type: none"> Differential line driver (5 V), 1 MHz Optical coupler (24 V), 200 kHz 	–
	Multiplying factor	Electronic gear ratio (A/B), A:1-65535, B:1-65535, 1/50<A/B<200	–
	Torque limit	External analog input or set using a parameter	–
Torque control mode	Torque input	External analog input or internal torque setpoint	–
	Speed limit	Prevents speed limits from being violated, set using a parameter for analog input	Set using a parameter
Control features			
Real time auto tuning	Estimates the machine characteristic and sets the closed-loop control parameters (gain, integral time, etc.) continuously in real time without any user intervention		
Resonance suppression	Suppresses mechanical resonance, such as workpiece and foundation vibration		
One-button auto tuning	Estimates the machine load inertia and mechanical characteristics with internal movement command (pre-configured for SINAMICS V90) This feature can be initiated using the SINAMICS V-ASSISTANT engineering tool.		
Gain switch and PI/P switch	Switches between gains or from PI to P control using an external signal or internal operating conditions		
Torque limit	Limits motor speed using an external analog input or internal torque limit		Motor torque is internally limited
Travel to fixed stop	Can be used to move an axis to a fixed stop at a specified torque without a signal fault		
DI/DO parameterization	Freely assigns the control signals to digital inputs and digital outputs		
External braking resistor	An external braking resistor can be used when the internal braking resistor is not capable of handling the regenerative energy.		
Measure machine	The machine frequency characteristics are analyzed using SINAMICS V-ASSISTANT		
Parameter cloning and Firmware update	Optionally via memory card <ul style="list-style-type: none"> For 400 V version: SD card; recommended SINAMICS SD card For 200 V version: Micro SD card Maximum supported capacity: 32 GB 		
Safety functions	Safe Torque Off (STO) via terminal, complies with safety standard SIL 2 according to EN 61508 resp. PL d, Cat 3 according to EN ISO 13849 (activation only via terminals of SINAMICS V90, not supported via PROFINET/PROFIsafe)		
Basic Operator Panel (BOP)	Integrated, 6-digit/7-segment display, 5 buttons		
Engineering PC tool	<ul style="list-style-type: none"> SINAMICS V-ASSISTANT engineering tool exclusively for SINAMICS V90 SINAMICS V90 in combination with S7-1500 and STEP 7 Professional engineering via TIA Portal V14 possible. 		

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Integration

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Standard wiring for pulse train input (PTI) position control mode (for detailed information and connection diagram for other control modes, please refer to the operating instructions). The diagram is given as a reference for selecting the drive type.

When commissioning the selected servo drive system, establish the wiring connections according to the connection diagram and the instructions provided in the operating instructions.

Technical specifications

General technical specifications

SINAMICS V90 servo drive	
Control power supply	
• Voltage	24 V DC (-15 %/+20 %) When SINAMICS V90 controls a motor equipped with brake, the tolerance of the 24 V DC power supply must be -10 % to +10 % to comply with the voltage required by the brake.
• Current ¹⁾	
-without holding brake	1.6 A
-with holding brake	1.6 A + rated current motor holding brake For more information please refer to section „SIMOTICS S-1FL6 servomotors“ „Technical Data“ from page 3/3.
Line supply system	TN, TT, IT, TT earthed line
Overload capacity	300 % × rated current for 300 ms every 10 s
Control system	Servo control
Braking resistor	Integrated for all frame sizes with max. motor power ≥ 0.2 kW
Ambient temperature	
• Operation	0 ... 45 °C (32 ... 113 °F) 45 ... 55 °C (113 ... 131 °F) with derating
• Storage	-40 ... +70 °C (-40 ... +158 °F)
Ambient humidity	
• Operation	<90 % (no condensation)
• Storage	90 % (no condensation)
Pollution class	2
Vibration	
• Operation	Operational area II 10 Hz ... 58 Hz: 0.075 mm deflection 58 Hz ... 200 Hz: 1 g vibration
• Product packaging	2 Hz ... 9 Hz: 3.5 mm deflection 9 Hz ... 200 Hz: 1 g vibration Quantity of cycles: 10 per axis Sweep speed: 1 octave/min
Shock	Operational area II Peak acceleration: 5 g, 30 ms; 15 g, 11 ms Quantity of shocks: 3 per direction × 6 directions Duration of shock: 1 s
Degree of protection	IP20
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 m ... 5000 m (> 3281 ft ... 16405 ft) with derating
Standards	CE, UKCA, KC, EAC, cULus, RCM

¹⁾ SINAMICS V90 PROFINET version requires a 24 V DC supply with max. 1.5 A (without a holding brake), or 3.5 A (with a holding brake). Refer to the operating instructions for detailed information.

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Technical specifications

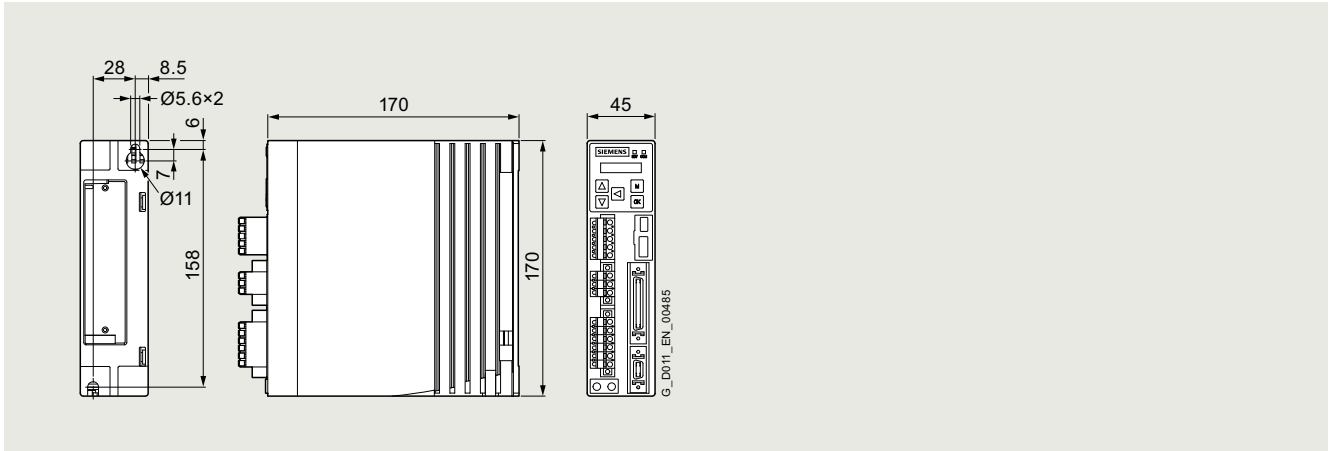
Line voltage 200 ... 240 V 1 AC/3 AC		SINAMICS V90 servo drive						
Pulse train version: 6SL3210-5F...		B10-1UA2	B10-2UA2	B10-4UA1	B10-8UA0	B11-0UA1	B11-5UA0	B12-0UA0
PROFINET version: 6SL3210-5F...		B10-1UF2	B10-2UF2	B10-4UF1	B10-8UF0	B11-0UF1	B11-5UF0	B12-0UF0
Frame size		FSA	FSA	FSB	FSC	FSD	FSD	FSD
Max. motor power	kW	0.1	0.2	0.4	0.75	1	1.5	2
Output current								
• Rated current I_N	A	1.2	1.4	2.6	4.7	6.3	10.6	11.6
• Max. current I_{max}	A	3.6	4.2	7.8	14.1	18.9	31.8	34.8
Line supply voltage		200 ... 240 V 1 AC/3 AC -15 %/+10 %	200 ... 240 V 1 AC/3 AC -15 %/+10 %	200 ... 240 V 1 AC/3 AC -15 %/+10 %	200 ... 240 V 1 AC/3 AC -15 %/+10 %	200 ... 240 V 3 AC -15 %/+10 %	200 ... 240 V 3 AC -15 %/+10 %	200 ... 240 V 3 AC -15 %/+10 %
Line frequency	Hz	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %
Line supply capacity								
• 1 AC	kVA	0.5	0.7	1.2	2	–	–	–
• 3 AC	kVA	0.5	0.7	1.1	1.9	2.7	4.2	4.6
Cooling		Natural cooling	Natural cooling	Natural cooling	Natural cooling	Fan cooling	Fan cooling	Fan cooling
Dimensions								
• Width	mm (in)	45 (1.77)	45 (1.77)	55 (2.17)	80 (3.15)	95 (3.74)	95 (3.74)	95 (3.74)
• Height	mm (in)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)	170 (6.69)
• Depth	mm (in)	170 (6.69)	170 (6.69)	170 (6.69)	195 (7.68)	195 (7.68)	195 (7.68)	195 (7.68)
Weight, approx.	kg (lb)	1.07 (2.4)	1.07 (2.4)	1.20 (2.6)	1.94 (4.3)	2.49 (5.5)	2.49 (5.5)	2.49 (5.5)

Line voltage 380 ... 480 V 3 AC		SINAMICS V90 servo drive							
Pulse train version: 6SL3210-5F...		E10-4UA0	E10-8UA0	E11-0UA0	E11-5UA0	E12-0UA0	E13-5UA0	E15-0UA0	E17-0UA0
PROFINET version: 6SL3210-5F...		E10-4UF0	E10-8UF0	E11-0UF0	E11-5UF0	E12-0UF0	E13-5UF0	E15-0UF0	E17-0UF0
Frame size		FSAA	FSA	FSA	FSB	FSB	FSC	FSC	FSC
Max. motor power	kW	0.4	0.75	1	1.75	2.5	3.5	5	7
Output current									
• Rated current I_N	A	1.2	2.1	3	5.3	7.8	11	12.6	13.2
• Max. current I_{max}	A	3.6	6.3	9	15.9	23.4	33	37.8	39.6
Line supply voltage		380 ... 480 V 3 AC -15 %/+10 %	380 ... 480 V 3 AC -15 %/+10 %	380 ... 480 V 3 AC -15 %/+10 %	380 ... 480 V 3 AC -15 %/+10 %	380 ... 480 V 3 AC -15 %/+10 %	380 ... 480 V 3 AC -15 %/+10 %	380 ... 480 V 3 AC -15 %/+10 %	380 ... 480 V 3 AC -15 %/+10 %
Line frequency	Hz	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %	50/60 -10 %/+10 %
Line supply capacity	kVA	1.7	3	4.3	6.6	11.1	15.7	18	18.9
Cooling		Natural cooling	Natural cooling	Natural cooling	Natural cooling	Fan cooling	Fan cooling	Fan cooling	Fan cooling
Dimensions									
• Width	mm (in)	60 (2.36)	80 (3.15)	80 (3.15)	100 (3.94)	100 (3.94)	140 (5.51)	140 (5.51)	140 (5.51)
• Height	mm (in)	180 (7.09)	180 (7.09)	180 (7.09)	180 (7.09)	180 (7.09)	260 (10.24)	260 (10.24)	260 (10.24)
• Depth	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	220 (8.66)	220 (8.66)	240 (9.45)	240 (9.45)	240 (9.45)
Weight, approx.	kg (lb)	1.45 (3.2)	2.09 (4.6)	2.09 (4.6)	2.73 (6.0)	2.73 (6.0)	5.95 (13.1)	5.95 (13.1)	5.95 (13.1)

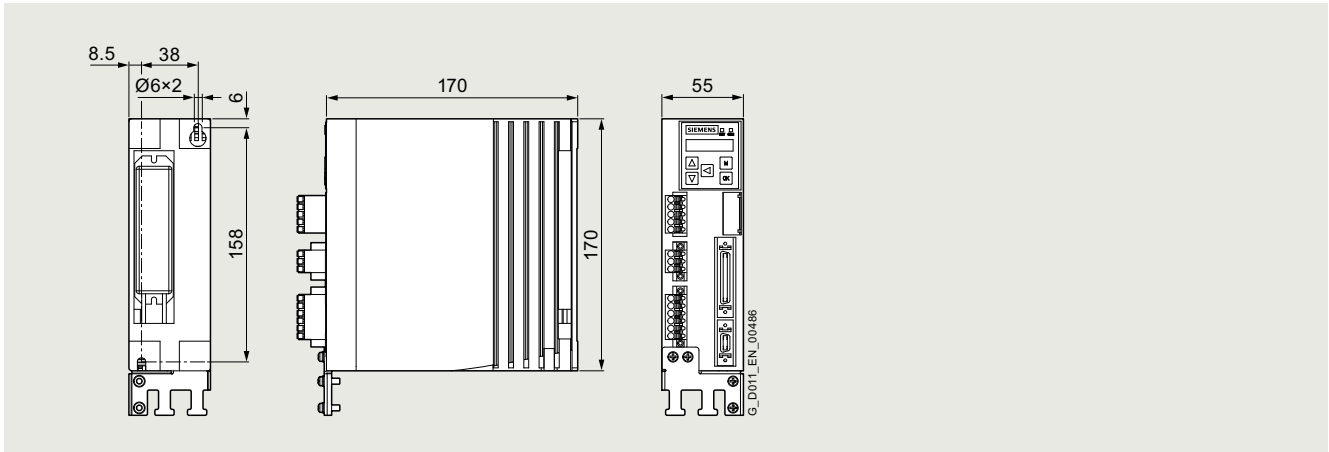
Interfaces		SINAMICS V90 Pulse train version (PTI)	SINAMICS V90 PROFINET version (PN)
USB		Mini USB	Mini USB
Pulse train input		2 channels, one exclusively for 5 V differential signal, one for 24 V single end signal	–
Pulse train encoder output		5 V differential signal, A, B, Z phase	–
Digital inputs/outputs		10 inputs, NPN/PNP; 6 outputs, NPN	4 inputs, NPN/PNP; 2 outputs, NPN/PNP
Analog outputs		2 analog outputs, output voltage range ± 10 V, 10 bit	–
Communication		USS/Modbus RTU (RS485)	PROFINET RT/IRT interface with 2 ports (RJ45 sockets)
SD card slot		<ul style="list-style-type: none"> Standard SD card with 400 V version Micro SD card with 200 V version 	<ul style="list-style-type: none"> Standard SD card with 400 V version Micro SD card with 200 V version
Safety functions		Safe Torque Off (STO) via terminal, SIL 2	Safe Torque Off (STO) via terminal, SIL 2

Dimensional drawings

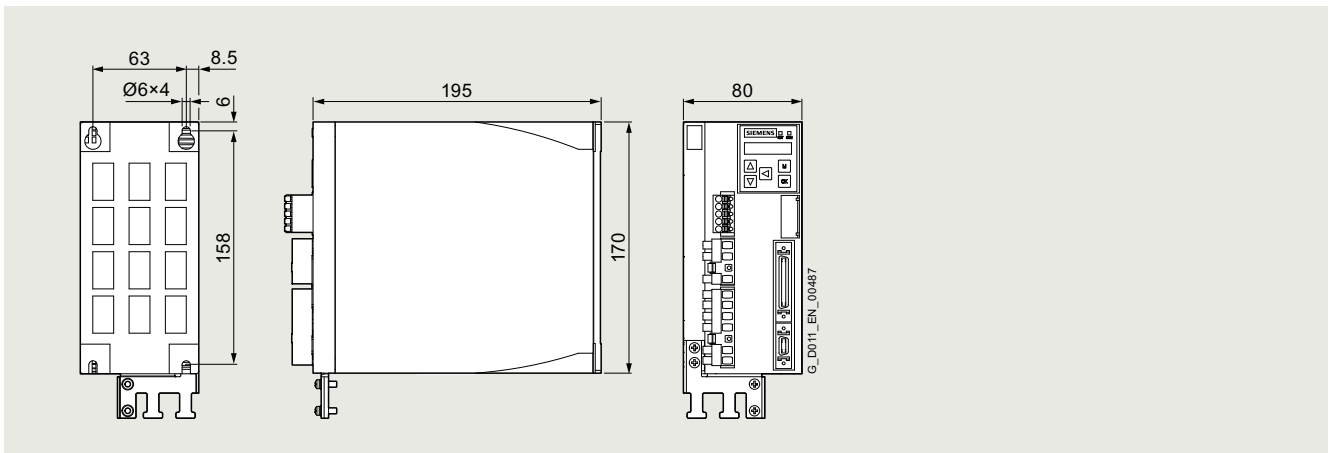
Dimensions in mm



SINAMICS V90, 200 ... 240 V 1 AC/3 AC, frame size FSA



SINAMICS V90, 200 ... 240 V 1 AC/3 AC, frame size FSB

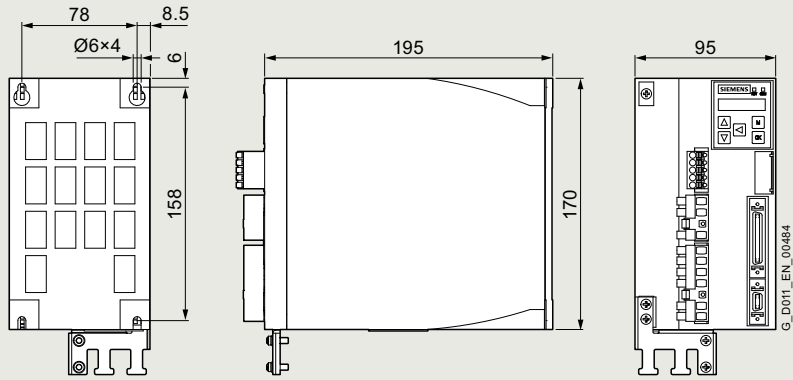


SINAMICS V90, 200 ... 240 V 1 AC/3 AC, frame size FSC

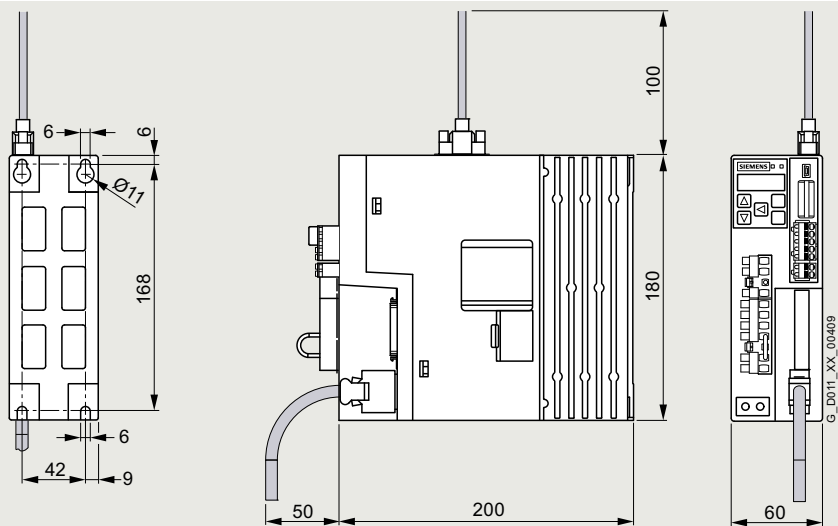
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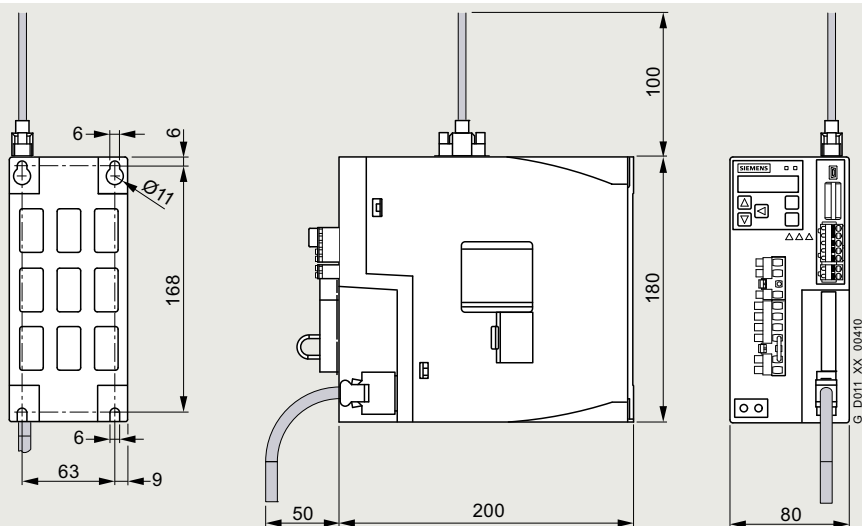
Dimensional drawings



SINAMICS V90, 200 ... 240 V 3 AC, frame size FSD

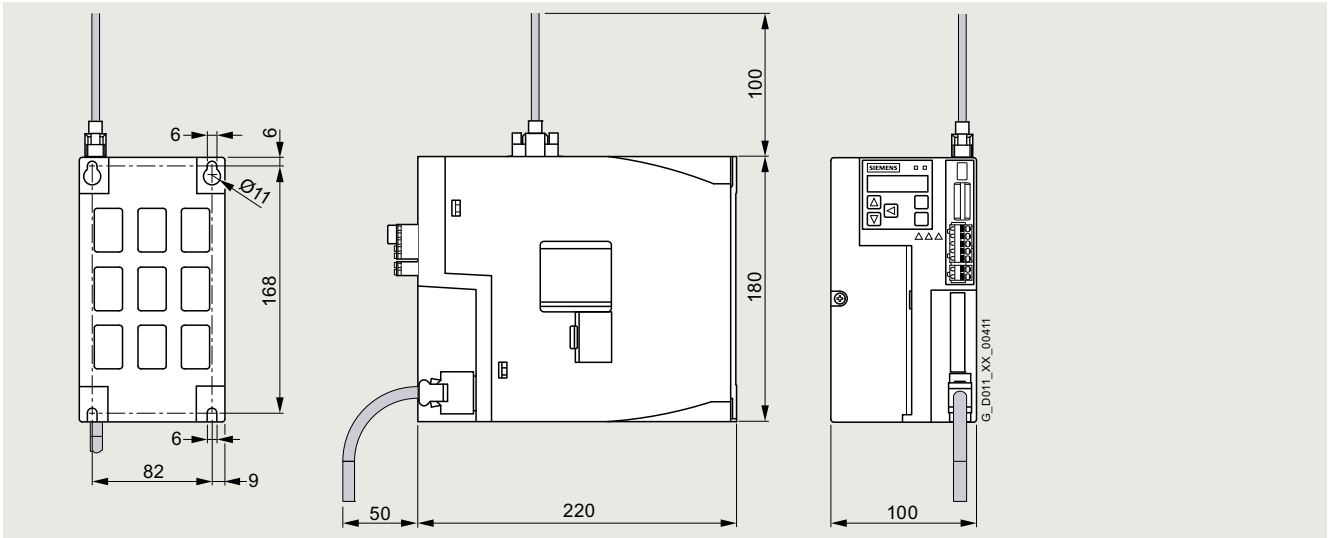


SINAMICS V90, 380 ... 480 V 3 AC, frame size FSAA

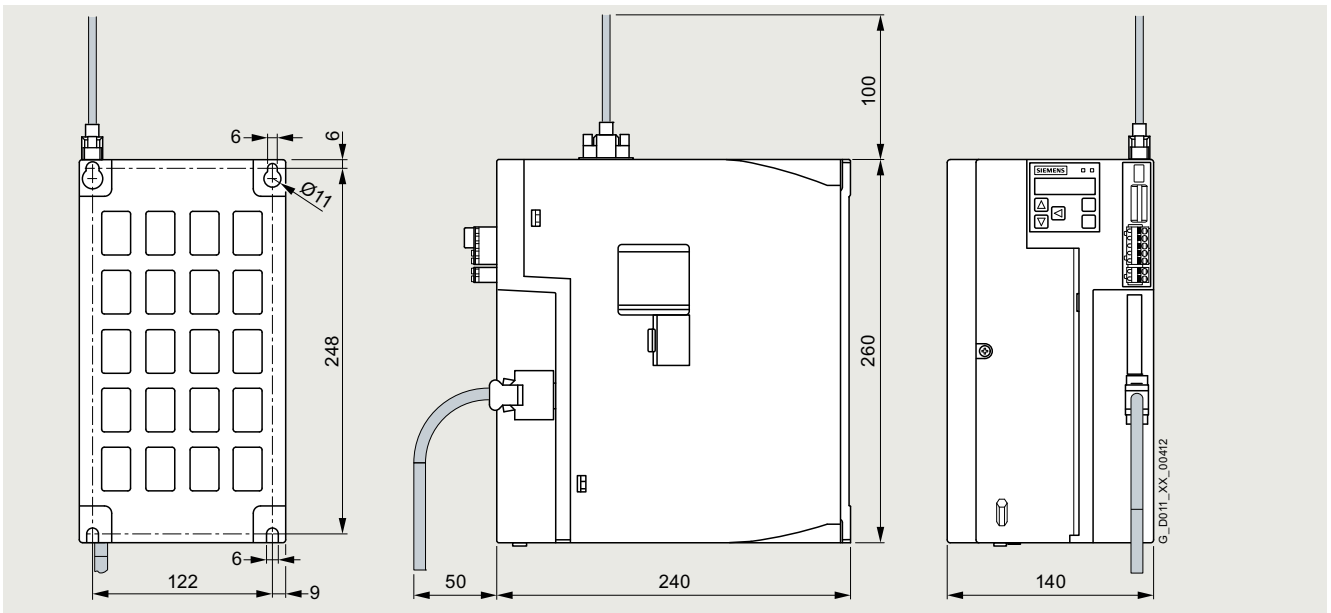


SINAMICS V90, 380 ... 480 V 3 AC, frame size FSA

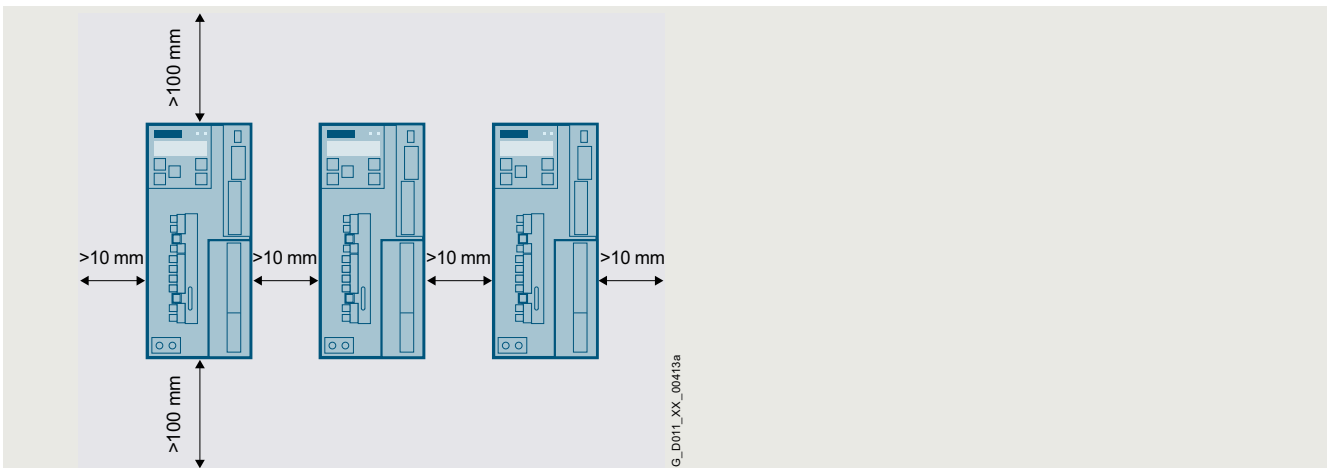
Dimensional drawings



SINAMICS V90, 380 ... 480 V 3 AC, frame size FSB



SINAMICS V90, 380 ... 480 V 3 AC, frame size FSC



Mounting clearances