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Overview



SINAMICS V60 servo drive

The SINAMICS V60 servo drive is specially designed to control the feed axes in standard machine tool applications. The system is designed primarily for applications where cost effectiveness is the primary consideration. The key performance data of the drive are aligned to perfectly fit to the solution provided by the SINUMERIK 808D.

Benefits

- Compact module with integrated infeed, inverter and closed-loop position control for one feed axis
- No cooling fans needed thanks to large heat sink made of die-cast aluminum
- Coated electronic modules
- Commissioning and configuring without PC-based tools
- Very simple commissioning using keys/7-segment display
- Faster commissioning thanks to pre-configured motor data stored in the drive.
- CE certified

Function

- 4 versions with output currents of 4 A, 6 A, 7 A and 10 A
- Supply voltage 220 V to 240 V 3 AC
- 200 % overload capability
- Pulse/direction interface (5 V difference signals) to the SINUMERIK 808D
- Integrated motor brake switch
- Alarm relay contact

Integration

The following components can be connected to the SINAMICS V60:

- SINUMERIK 808D Turning PPU 141.1 horizontal
- SINUMERIK 808D Milling PPU 141.1 horizontal
- SIMOTICS S-1FL5 feed motor
- TTL encoder in SIMOTICS S-1FL5 feed motor
- Brake in SIMOTICS S-1FL5 feed motor

Selection and ordering data

SINAMICS V60 servo drive		SIMOTICS S-1FL5 feed motor
Rated output current I_{rated}		Static torque M_0 at ΔT = 100 K
A	Article No.	Nm
4	**6SL3210-5CC14-0UA0**	4
6	**6SL3210-5CC16-0UA0**	6
7	**6SL3210-5CC17-0UA0**	7.7
10	**6SL3210-5CC21-0UA0**	10

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Technical specifications

Article No.	6SL3210-5CC14-0UA0	6SL3210-5CC16-0UA0	6SL3210-5CC17-0UA0	6SL3210-5CC21-0UA0
Product name	SINAMICS V60 servo drive			
Input voltage	220 ... 240 V 3 AC - 15 %/+ 10 %			
Input frequency	50 … 60 Hz ± 10 %			
Infeed	Non-stabilized			
Electronics power supply	24 V DC - 15 %/+ 20 %			
24 V DC supply	0.8 A (1.4 A) combined with motors without brake (with brake)			
Input voltage				
Pulse/direction interface				
• Rated value	5 V DC			
• Frequency range	≤ 333 kHz			
Cooling	Natural cooling			
Ambient temperature				
• Storage	-20 ... +80 °C			
• Transport	-20 ... +80 °C			
• Operation	0 ... 45 °C without derating, > 45 ... 55 °C derating to 70 %			
Air humidity	< 95 %			
Site altitude	Up ... 1000 m without derating, > 1000 ... 2000 m derating to 80 %			
Conductor cross-section, max.	2.5 mm^2			
Connectable motors	SIMOTICS S-1FL5			
Degree of protection	IP20			
Encoder evaluation	TTL encoder with 2500 S/R (13 bit resolution through electronic multiplication)			
Output current				
• Rated current I_{rated}	4 A	6 A	7 A	10 A
• Peak current I_{max}	8 A	12 A	14 A	20 A
Rated power P_{rated}	0.8 kW	1.2 kW	1.4 kW	2 kW
Power loss	36 W	47 W	54 W	70 W
Cooling air required	0.005 m^3/s	0.005 m^3/s	0.005 m^3/s	0.005 m^3/s
Sound pressure level L_{pA} (1 m)	< 45 dB	< 45 dB	< 45 dB	< 45 dB
Dimensions[1)]				
• Width	106 mm	106 mm	106 mm	123 mm
• Height	226 mm	226 mm	226 mm	226 mm
• Depth	200 mm	200 mm	200 mm	200 mm
Weight	2.63 kg	2.63 kg	2.63 kg	3.44 kg
Certificate of suitability	CE			

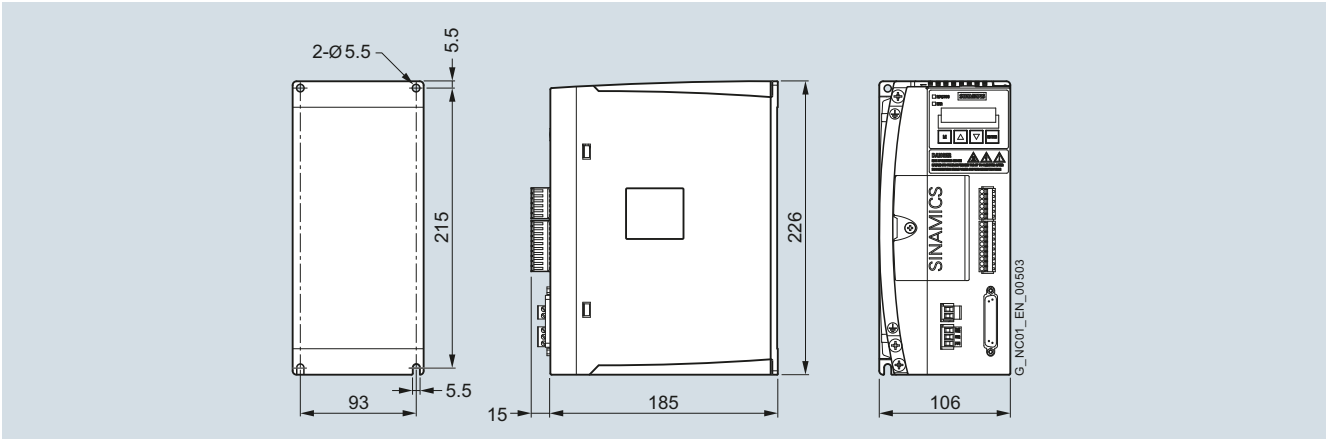
S/R = Signals/Revolution

1) Minimum distances: 25 mm between drive modules, 100 mm from other control cabinet components.

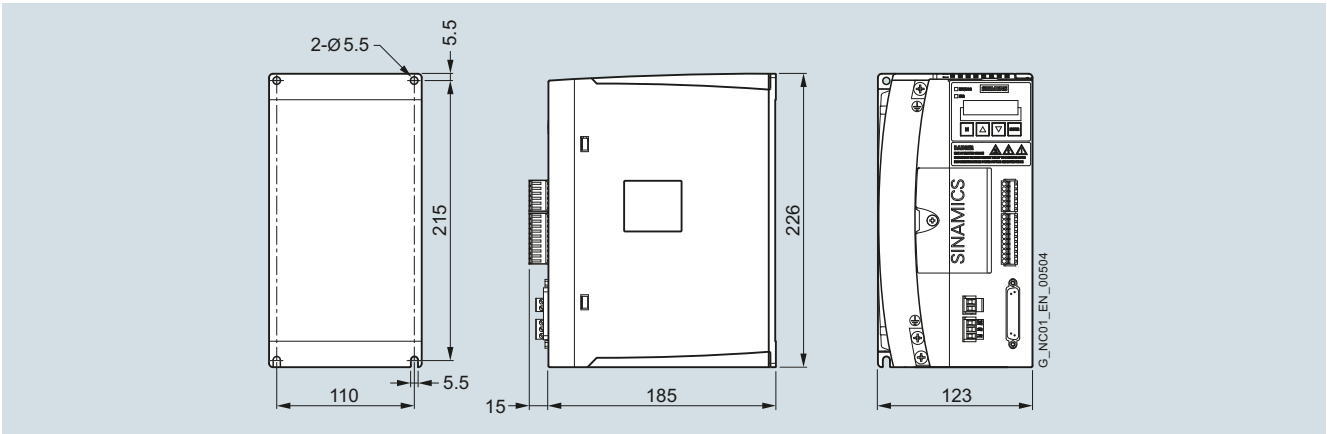
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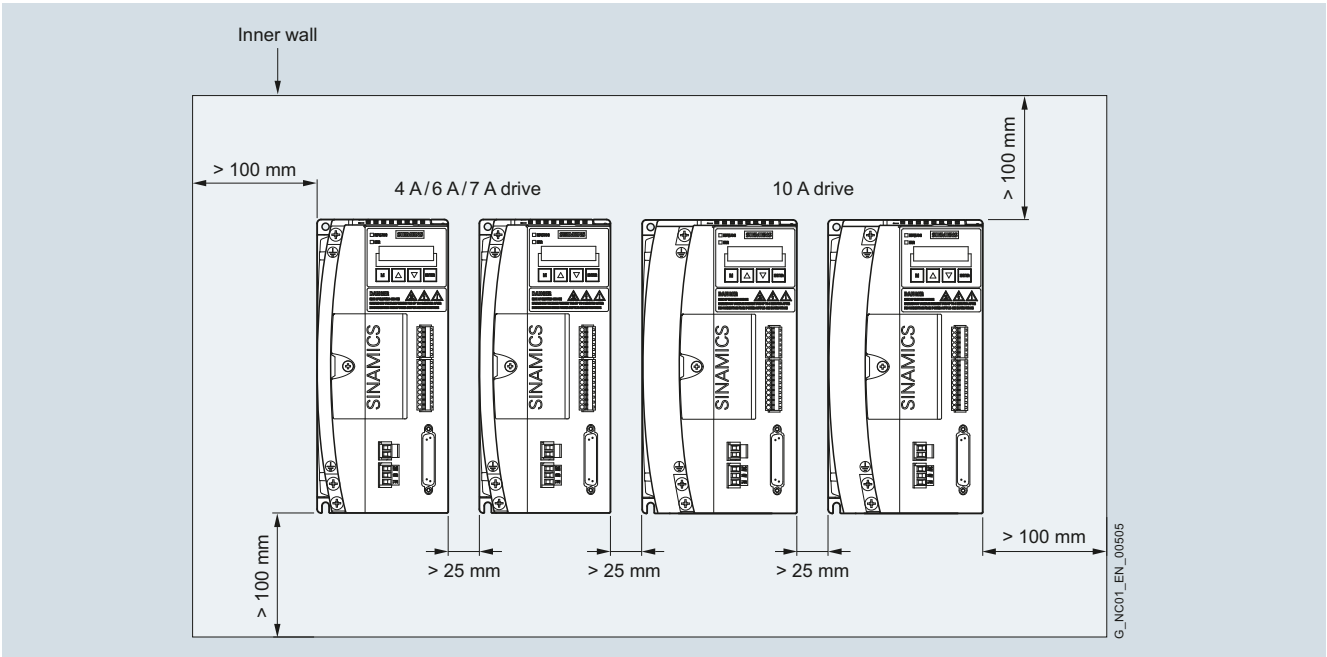
Dimensional drawings



SINAMICS V60 4 A/6 A/7 A



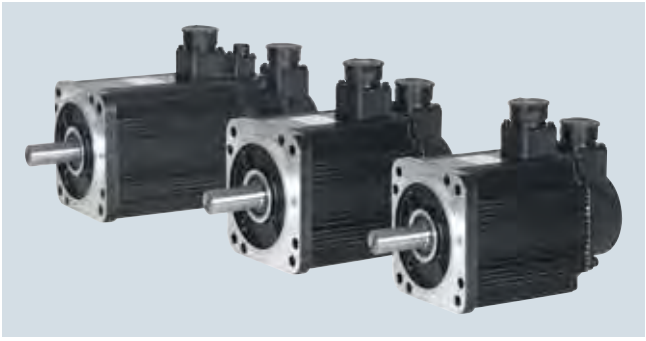
SINAMICS V60 10 A



Mounting clearance

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Overview



SIMOTICS S-1FL5 feed motors

The SIMOTICS S-1FL5 feed motor is optimized for operation with the SINAMICS V60 servo drive and provides the dynamic performance required by machine tools.

Benefits

- High performance rare earth magnet material
- Rugged design with IP54 degree of protection and military style connectors
- Maximum flexibility due to variants with/without brake and plain shaft/feather key

Function

- 4 motor types with 4 Nm, 6 Nm, 7.7 Nm and 10 Nm
- Rated speed of 2000 rpm
- Integrated TTL encoder with 2500 S/R (13 bit resolution through electronic multiplication of the CPM60.1 module)
- Degree of protection IP54, natural cooling
- Optional holding brake
- With plain shaft or feather key, half-key balancing

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Technical specifications

Article No.	1FL5060-…	1FL5062-…	1FL5064-…	1FL5066-…
Product brand name Product type designation Product designation	SIMOTICS S-1FL5 Feed motors			
Type of motor	Synchronous motor			
Rated speed	2000 rpm			
Encoder	TTL encoder with 2500 S/R			
Infeed	Non-stabilized			
Type of construction in accordance with EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)			
Degree of protection in accordance with EN 60034-5 (IEC 60034-5)	IP54			
Cooling	Natural cooling			
Shaft end in accordance with DIN 748-3 (IEC 60072-1)	Plain shaft/Shaft key (C type)			
Paint finish	Black			
Insulation of the stator winding in accordance with EN 600034-1 (IEC 60034-1)	Temperature class 130 (B)			
Ambient temperature • Storage • Transport • Operation	 -20 ... +80 °C -20 ... +80 °C 0 ... 45 °C without derating, > 45 ... 55 °C derating to 70 %			
Torque • Static torque M_{rated} • Torque, max. M_{max} (converter)	 4 Nm 8 Nm	 6 Nm 12 Nm	 7.7 Nm 15.4 Nm	 10 Nm 20 Nm
Rated power	0.8 kW	1.2 kW	1.5 kW	2 kW
Static current	4 A	6 A	7 A	10 A
Rated speed	2000 rpm	2000 rpm	2000 rpm	2000 rpm
Efficiency η	91.1 %	93.3 %	92.0 %	93.7 %
Moment of inertia without brake	11.01×10^{-4} kgm^2	15.44×10^{-4} kgm^2	20.17×10^{-4} kgm^2	25.95×10^{-4} kgm^2
Moment of inertia with brake	12.68×10^{-4} kgm^2	17.11×10^{-4} kgm^2	21.84×10^{-4} kgm^2	27.62×10^{-4} kgm^2
Shaft height	65 mm	65 mm	65 mm	65 mm
Dimensions • Edge dimension • Length - Without brake - With brake	 130 mm 221 mm 263 mm	 130 mm 239 mm 281 mm	 130 mm 253 mm 295 mm	 130 mm 277 mm 319 mm
Weight • Without brake • With brake	 6 kg 8.6 kg	 7.6 kg 10.2 kg	 8.6 kg 11.2 kg	 10.6 kg 13.2 kg
Certificate of suitability	CE			

S/R = Signals/Revolution

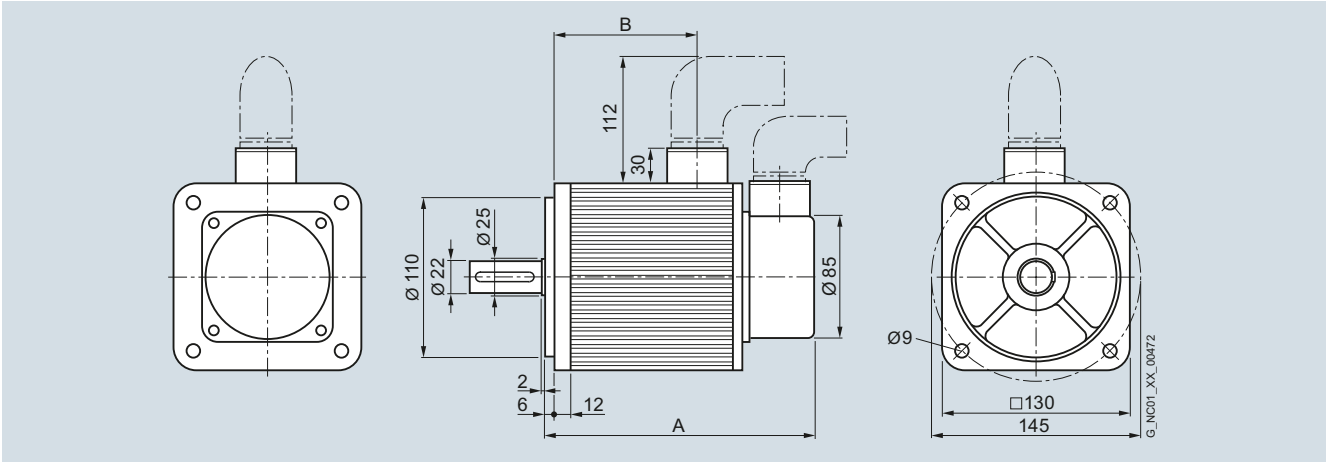
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Selection and ordering data

SIMOTICS S-1FL5 feed motors			SINAMICS V60 servo drive
Static torque	Rated speed		Rated output current
M_0 at ΔT = 100 K	n_{rated}		I_{rated}
Nm	rpm	Article No.	A
4	2000	**1FL5060-0AC21-0A ■ 0**	4
6	2000	**1FL5062-0AC21-0A ■ 0**	6
7.7	2000	**1FL5064-0AC21-0A ■ 0**	7
10	2000	**1FL5066-0AC21-0A ■ 0**	10

Shaft extension:	**Holding brake:**	
Feather key and keyway (half-key balancing)	Without	**A**
Feather key and keyway (half-key balancing)	With	**B**
Plain shaft	Without	**G**
Plain shaft	With	**H**

Dimensional drawings

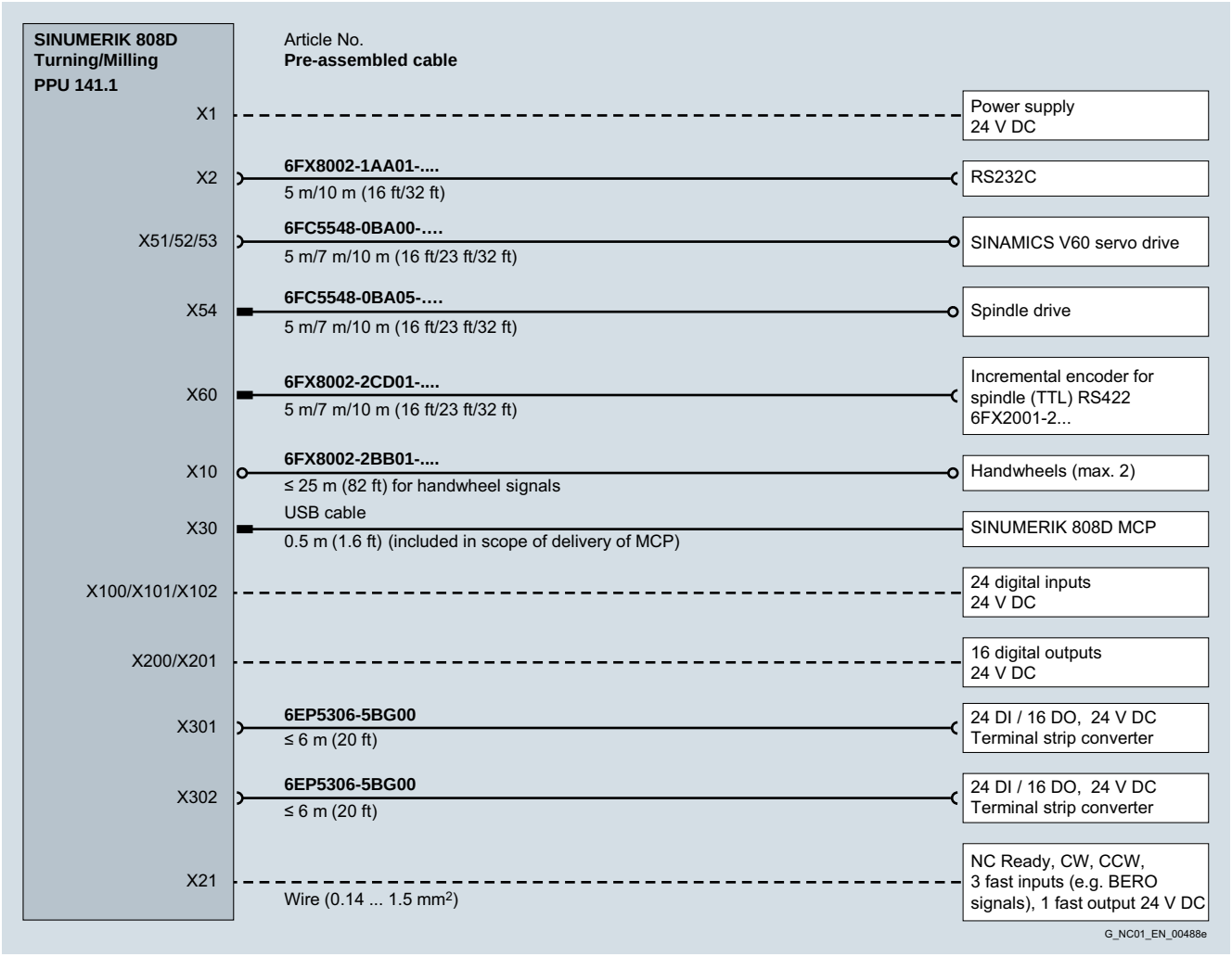


SIMOTICS S-1FL5 feed motor

Motor	Dimensions in mm		
Type	A without brake	A with brake	B
1FL5060	163	205	80
1FL5062	181	223	98
1FL5064	195	237	112
1FL5066	219	261	136

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Integration



Connection overview of SINUMERIK 808D Turning/SINUMERIK 808D Milling PPU 141.1

▬—	Connector with pin contacts
)—	Connector with socket contacts
o—	Exposed core ends
- - - -	Cable is not included in the scope of delivery. It must be provided by the customer.

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Technical specifications

Article No.	6FC5548-0BA00-....	6FC5548-0BA05-....
Product name	Setpoint cable PPU 141.1 - SINAMICS V60 servo drive	Setpoint cable PPU 141.1 - analog spindle drive
No. of cores	15	4
Certificate of suitability		
• cURus or UR/CSA[1)]	UL20276	UL2576
• RoHS conformity	Yes	Yes
Rated voltage	30 V	30 V
Test voltage, rms	500 V	500 V
Operating temperature on the surface		
• Fixed installation	-20 … +80 °C	-20 … +80 °C
• Flexible installation	0 … 60 °C	0 … 60 °C
Smallest bending radius		
• Fixed installation	100 mm	60 mm
• Flexible installation	200 mm	120 mm
Insulation material, incl. jacket	PVC	PVC
Oil resistance	70 °C X 4hr	70 °C X 4hr
Outer jacket	PVC Gray	PVC Gray
Flame-retardant	VW-1	VW-1

Article No.	6FX8002-2CD01-....	6FX8002-2BB01-....	6FX8002-1AA01-....
Product name	Signal cable PPU 141.1 - incremental encoder for spindle (TTL)	Signal cable PPU 141.1 - handwheel	RS232C data cable PPU 141.1 - personal computer
Certificate of suitability			
• cURus or UR/CSA[1)]	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• RoHS conformity	Yes	Yes	Yes
Rated voltage	30 V	30 V	30 V
Test voltage, rms	500 V	500 V	500 V
Operating temperature on the surface			
• Fixed installation	-50 … +80 °C	-50 … +80 °C	-50 … +80 °C
• Flexible installation	-20 … +60 °C	-20 … +60 °C	-20 … +60 °C
Tensile stress, max.			
• Fixed installation	50 N/mm^2	50 N/mm^2	50 N/mm^2
• Flexible installation	20 N/mm^2	20 N/mm^2	20 N/mm^2
Smallest bending radius			
• Fixed installation	35 mm	35 mm	35 mm
• Flexible installation	70 mm	70 mm	70 mm
Torsional stress	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
Bending	10 million	10 million	10 million
Traversing velocity	300 m/min	300 m/min	300 m/min
Acceleration	5 m/s^2	5 m/s^2	5 m/s^2
Insulation material, incl. Jacket	CFC/silicone-free IEC 60754-1/DIN VDE 0472-815	CFC/silicone-free IEC 60754-1/DIN VDE 0472-815	CFC/silicone-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1	EN 60811-2-1	EN 60811-2-1
Outer jacket	PVC DESINA color green RAL 6018	PVC DESINA color green RAL 6018	PVC DESINA color green RAL 6018
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

For general information about MOTION-CONNECT please refer to Introduction.

[1)] The respective registration number is printed on the cable jacket.

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MOTION-CONNECT cables for SINUMERIK 808D

Selection and ordering data

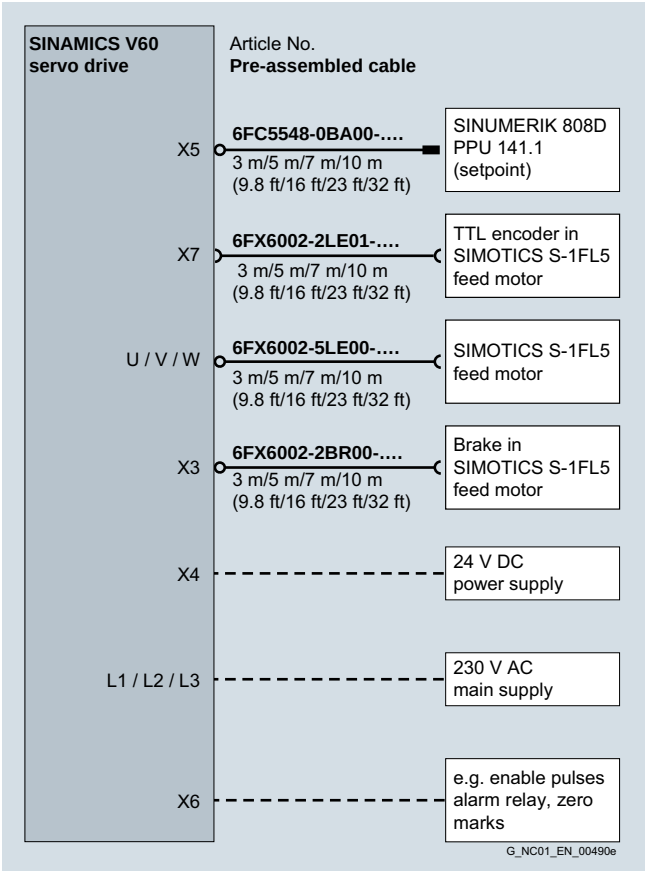
Description	Article No.
Pre-assembled setpoint cable PPU 141.1 - SINAMICS V60	
Length	
• 5 m	**6FC5548-0BA00-1AF0**
• 7 m	**6FC5548-0BA00-1AH0**
• 10 m	**6FC5548-0BA00-1BA0**
Pre-assembled setpoint cable PPU 141.1 - analog spindle drive	
Length	
• 5 m	**6FC5548-0BA05-1AF0**
• 7 m	**6FC5548-0BA05-1AH0**
• 10 m	**6FC5548-0BA05-1BA0**
Pre-assembled signal cable PPU 141.1 - incremental encoder for spindle (TTL)	
Length	
• 5 m	**6FX8002-2CD01-1AF0**
• 7 m	**6FX8002-2CD01-1AH0**
• 10 m	**6FX8002-2CD01-1BA0**

Description	Article No.
Pre-assembled signal cable PPU 141.1 - handwheel	
Length	
• 1 m	**6FX8002-2BB01-1AB0**
• 5 m	**6FX8002-2BB01-1AF0**
• 7 m	**6FX8002-2BB01-1AH0**
• 10 m	**6FX8002-2BB01-1BA0**
Pre-assembled RS232C data cable - personal computer	
Length	
• 5 m	**6FX8002-1AA01-1AF0**
• 10 m	**6FX8002-1AA01-1BA0**

3

MOTION-CONNECT cables for SINAMICS V60 servo drive

Integration



Connection overview of SINAMICS V60 servo drive

▬—	Connector with pin contacts
)—	Connector with socket contacts
o—	Exposed core ends
- - - -	Cable is not included in the scope of delivery. It must be provided by the customer.

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Technical specifications

Article No.	6FX6002-2LE00-….	6FX6002-5LE00-….	6FX6002-2BR00-….
Product name	Encoder cable SINAMICS V60 - TTL encoder in SIMOTICS S-1FL5 feed motor	Power cable SINAMICS V60 - SIMOTICS S-1FL5 feed motor	Brake cable SINAMICS V60 - brake in SIMOTICS S-1FL5 feed motor
Degree of protection (when closed and connected)	IP54	IP54	IP54
Certificate of suitability • VDE[1] /RoHS conformity	Yes RoHS	Yes RoHS	Yes RoHS
Rated voltage U0/U	30 V/30 V	300 V/500 V	30 V/30 V
Test voltage, rms	500 V	2 kV	500 V
Operating temperature on the surface • Fixed installation	-20 … +80 °C	-20 … +80 °C	-20 … +80 °C
Tensile stress, max. • Fixed installation • Flexible installation	50 N/mm^2 20 N/mm^2	50 N/mm^2 20 N/mm^2	50 N/mm^2 20 N/mm^2
Smallest bending radius • Fixed installation • Flexible installation	40 mm 160 mm	50 mm 200 mm	25 mm 100 mm
Torsional stress	Absolute 30°/m	Absolute 30°/m	Absolute 30°/m
Bending	100000	100000	100000
Insulation material, incl. Jacket	PVC	PVC	PVC
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1 (mineral oil only)	EN 60811-2-1 (mineral oil only)
Outer jacket	PVC	PVC	PVC
Flame-retardant	FT1	FT1	FT1

For general information about MOTION-CONNECT please refer to Introduction.

Selection and ordering data

Description	Article No.
Pre-assembled encoder cable SINAMICS V60 - TTL encoder in SIMOTICS S-1FL5 feed motor	
Length	
• 3 m	**6FX6002-2LE00-1AD0**
• 5 m	**6FX6002-2LE00-1AF0**
• 7 m	**6FX6002-2LE00-1AH0**
• 10 m	**6FX6002-2LE00-1BA0**
Pre-assembled power cable SINAMICS V60 - SIMOTICS S-1FL5 feed motor	
Length	
• 3 m	**6FX6002-5LE00-1AD0**
• 5 m	**6FX6002-5LE00-1AF0**
• 7 m	**6FX6002-5LE00-1AH0**
• 10 m	**6FX6002-5LE00-1BA0**
Pre-assembled brake cable SINAMICS V60 - brake in SIMOTICS S-1FL5 feed motor	
Length	
• 3 m	**6FX6002-2BR00-1AD0**
• 5 m	**6FX6002-2BR00-1AF0**
• 7 m	**6FX6002-2BR00-1AH0**
• 10 m	**6FX6002-2BR00-1BA0**

[1] The respective registration number is printed on the cable jacket.

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Example package for Turning

Overview

The following composition of an equipment package is an example of an inclined bed lathe with:

- 2 machining axes (X, Z)
- 1 main spindle with direct spindle encoder
- 24 digital PLC input signals and 16 digital PLC output signals

Designation	Quantity	Article No.
SINUMERIK CNC		
SINUMERIK 808D Turning PPU 141.1 horizontal, English layout	1	6FC5370-1AT00-0AA0
SINUMERIK 808D MCP, English layout	1	6FC5303-0AF35-0AA0
Actuating element, 22 mm, latching mushroom pushbutton, red	1	3SB3000-1HA20
Contact block with 2 contacts, 1 NO + 1 NC, 2-pole screw terminal	1	3SB3400-0A
Electronic handwheel with front panel 120 mm × 120 mm, with setting wheel 5 V DC, RS422	1	6FC9320-5DB01
Stabilized power supply, SITOP PSU200M 24 V, 5 A	1	6EP1333-3BA10
RS422 (TTL) incremental encoder, 1024 S/R	1	6FX2001-2EB02
Spring disk coupling, shaft diameter 6 mm/6 mm	1	6FX2001-7KF10
Clamp strap (1 unit), for encoders with Synchro flange	3	6FX2001-7KP01
Pre-assembled setpoint cable PPU 141.1 - SINAMICS V60, length 5 m	2	6FC5548-0BA00-1AF0
Pre-assembled setpoint cable PPU 141.1 - analog spindle drive, length 5 m	1	6FC5548-0BA05-1AF0
Pre-assembled signal cable PPU 141.1 - handwheel, length 1 m	1	6FX8002-2BB01-1AB0
Pre-assembled signal cable PPU 141.1 - incremental spindle encoder (TTL), length 5 m	1	6FX8002-2CD01-1AF0
SINAMICS V60		
SINAMICS V60, I_{rated} 4 A	1	6SL3210-5CC14-0UA0
SINAMICS V60, I_{rated} 6 A	1	6SL3210-5CC16-0UA0
SIMOTICS S-1FL5		
SIMOTICS S-1FL5 feed motor, 4 Nm, 2000 rpm, plain shaft, without holding brake	1	1FL5060-0AC21-0AG0
SIMOTICS S-1FL5 feed motor, 6 Nm, 2000 rpm, plain shaft, with holding brake	1	1FL5062-0AC21-0AH0
Pre-assembled encoder cable SINAMICS V60 - TTL encoder in SIMOTICS S-1FL5 feed motor, length 5 m	2	6FX6002-2LE00-1AF0
Pre-assembled power cable SINAMICS V60 - SIMOTICS S-1FL5 feed motor, length 5 m	2	6FX6002-5LE00-1AF0
Pre-assembled brake cable SINAMICS V60 - brake in SIMOTICS S-1FL5 feed motor, length 5 m	1	6FX6002-2BR00-1AF0

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Overview

The following composition of an equipment package is an example of a vertical machining center with:

- 3 machining axes (X, Y, Z)
- 1 main spindle with direct spindle encoder
- 35 digital PLC input signals and 22 digital PLC outputs signal

Designation	Quantity	Article No.
SINUMERIK CNC		
SINUMERIK 808D Milling PPU 141.1 horizontal, English layout	1	6FC5370-1AM00-0AA0
SINUMERIK 808D MCP, English layout	1	6FC5303-0AF35-0AA0
Actuating element, 22 mm, latching mushroom pushbutton, red	1	3SB3000-1HA20
Contact block with 2 contacts, 1 NO + 1 NC, 2-pole screw terminal	1	3SB3400-0A
Electronic handwheel with front panel 120 mm × 120 mm, with setting wheel 5 V DC, RS422	1	6FC9320-5DB01
Terminal strip converter 50-pole	1	6EP5406-5AA00
Cable set ribbon cable, 50-pole, with connectors, 50-pole	1	6EP5306-5BG00
Stabilized power supply, SITOP PSU200M 24 V, 5 A	1	6EP1333-3BA10
RS422 (TTL) incremental encoder, 1024 S/R	1	6FX2001-2EB02
Spring disk coupling, shaft diameter 6 mm/6 mm	1	6FX2001-7KF10
Clamp strap (1 unit), for encoders with Synchro flange	3	6FX2001-7KP01
Pre-assembled setpoint cable PPU 141.1 - SINAMICS V60, length 5 m	3	6FC5548-0BA00-1AF0
Pre-assembled setpoint cable PPU 141.1 - analog spindle drive, length 5 m	1	6FC5548-0BA05-1AF0
Pre-assembled signal cable PPU 141.1 - handwheel, length 1 m	1	6FX8002-2BB01-1AB0
Pre-assembled signal cable PPU 141.1 - incremental spindle encoder (TTL), length 7 m	1	6FX8002-2CD01-1AH0
SINAMICS V60		
SINAMICS V60, I_{rated} 7 A	2	6SL3210-5CC17-0UA0
SINAMICS V60, I_{rated} 10 A	1	6SL3210-5CC21-0UA0
SIMOTICS S-1FL5		
SIMOTICS S-1FL5 feed motor, 7.7 Nm, 2000 rpm, plain shaft, without holding brake	2	1FL5064-0AC21-0AG0
SIMOTICS S-1FL5 feed motor, 10 Nm, 2000 rpm, plain shaft, with holding brake	1	1FL5066-0AC21-0AH0
Pre-assembled encoder cable SINAMICS V60 - TTL encoder in SIMOTICS S-1FL5 feed motor, length 10 m	3	6FX6002-2LE00-1BA0
Pre-assembled power cable SINAMICS V60 - SIMOTICS S-1FL5 feed motor, length 10 m	3	6FX6002-5LE00-1BA0
Pre-assembled brake cable SINAMICS V60 - brake in SIMOTICS S-1FL5 feed motor, length 10 m	1	6FX6002-2BR00-1BA0

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Notes