

SINAMICS S120 drive system

Booksize format for Line and Motor Modules

Smart Line Modules in booksize format

Overview



Smart Line Modules are unregulated feed/feedback units (diode bridge for the infeed; stable, line-commutated feedback via IGBTs) with 100% regenerative feedback power. The regenerative feedback capability of the modules can be deactivated via a digital input (Smart Line Modules 5 kW and 10 kW) or by parameter setting (Smart Line Module 16 kW and 36 kW). Smart Line Modules are designed for connection to grounded-neutral (TN, TT) and non-grounded (IT) supply systems.

The DC link is pre-charged via integrated precharging resistors.

Design

Smart Line Modules in booksize format feature the following interfaces as standard:

- 1 power connection via screw-type terminals
- 1 connection for the 24 V DC electronics power supply via the 24 V terminal adapter included in the scope of supply
- 1 DC link connection via integrated DC link busbars
- 2 PE (protective earth) connections
- 2 digital inputs (5 kW (5 HP) and 10 kW (10 HP) Smart Line Modules only)
- 1 digital output (5 kW (5 HP) and 10 kW (10 HP) Smart Line Modules only)
- 3 DRIVE-CLiQ sockets (16 kW (18 HP) and 36 kW (40 HP) Smart Line Modules only)

The status of the Smart Line Modules is indicated via two multi-color LEDs.

The signal cable shield can be connected to the Line Module by means of a shield connection terminal, e.g. type KLBÜ 3-8 SC by Weidmüller.

The scope of supply of the Smart Line Modules includes:

- DRIVE-CLiQ cable for connection to the Control Unit on the immediate left for drive control (on 16 kW (18 HP) and 36 kW (40 HP) Smart Line Modules only)
- 2 blanking plugs for sealing unused DRIVE-CLiQ sockets (on 16 kW (18 HP) and 36 kW (40 HP) Smart Line Modules only)
- DRIVE-CLiQ cable (length depends on module width) to connect Smart Line Modules to adjacent Motor Module

Design (continued)

- Jumper for connecting the 24 V DC busbar to the adjacent Motor Module
- 24 V terminal adapter
- Connector X21 for digital inputs/outputs
- Connector X22 for digital inputs and outputs (on 5 kW (5 HP) and 10 kW (10 HP) Smart Line Modules only)
- Connector X1 for line supply connection (on 5 kW (5 HP) and 10 kW (10 HP) Smart Line Modules only)
- 1 set of warning signs in foreign languages

Technical specifications

General technical specifications

Line connection voltage Up to 2000 m (6562 ft) above sea level	380 ... 480 V 3 AC $\pm 10\%$ (-15% < 1 min)
Line frequency	47 ... 63 Hz
Line power factor at rated power	
• Fundamental power factor (cos ϕ 1)	> 0.96
• Total (λ)	0.65 ... 0.90
Overvoltage category	Class III to EN 60664-1
DC link voltage, approx.	1.35 x line voltage ¹⁾
Electronics power supply	24 V DC, -15%/+20%
Radio interference suppression	
• Standard	no radio interference suppression
• With line filter	Class A1 to EN 55011 and Category C2 to EN 61800-3
Type of cooling	Internal air cooling, power sections with increased air cooling by built-in fans Cold-plate cooling on request (5 kW (5 HP) and 10 kW (10 HP))
Permissible ambient or coolant temperature (air) in operation for line-side components, Line Modules and Motor Modules	0 ... 40 °C (32 ... 104 °F) without derating, > 40 ... 55 °C (104 ... 131 °F), see derating characteristics
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
Conformity	CE (low-voltage and EMC directives)
Approvals	cULus (File No.: E192450)

¹⁾ The DC link voltage is regulated to the mean rectified line voltage value. See system description on the CD-ROM supplied for further information.

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Booksized format for Line and Motor Modules

Smart Line Modules in booksized format

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC

Order No.

- Internal air cooling
- External air cooling

6SL3130-6AE15-0AB0
6SL3131-6AE15-0AA0
6SL3130-6AE21-0AB0
6SL3131-6AE21-0AA0
6SL3130-6TE21-6AA3
–
6SL3130-6TE23-6AA3
–
Product name

Smart Line Modules in booksized format

Feed/feedback power

- Rated power P_{rated}
- with 380 V 3 AC
- with 460 V 3 AC³⁾
- for S6 duty (40%) P_{S6}
- P_{max}

kW	5	10	16	36
(HP)	(5)	(10)	(18)	(40)
kW	6.5	13	21	47
kW	10	20	35	70

DC link current

- with 600 V DC
- for S6 duty (40%)
- Maximum

A	8.3	16.6	27	60
A	11	22	35	79
A	16.6	33.2	59	117

Input current

- Rated current with 380 V 3 AC
- for S6 duty (40%)
- Maximum

A	12	24	26	60
A	15.6	31.2	35	79
A	22	44	59	117

Current requirement

24 V DC electronics power supply, max.

A	1.0	1.3	1.1	1.5
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Current capacity

- 24 V DC busbars
- DC link busbars

A	20	20	20	20
A	100	100	100	200

DC link capacitance

- Smart Line Module
- Drive group, max.

μF	220	330	710	1410
μF	6000	6000	20000	20000

Efficiency η

	0.98	0.98	0.99	0.99
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Power loss

- with internal air cooling
- with external air cooling int./ext.

kW	0.09	0.17	0.17	0.37
kW	0.04/0.05	0.065/0.105	–	–

Cooling air requirement

m ³ /s (ft ³ /s)	0.008 (0.283)	0.008 (0.283)	0.016 (0.565)	0.031 (1.095)
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Sound pressure level

dB (A)	< 60	< 60	< 60	< 60
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Line connection

U1, V1, W1

Screw-type terminals
(X1)Screw-type terminals
(X1)Screw-type terminals
(X1)Screw studs for ring
terminal ends, M6 (X1)

- Conductor cross-section

mm ²	2.5 ... 6	2.5 ... 10	2.5 ... 10	2.5 ... 50
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Shield connection
Cable shield connection
plate integrated into the
connectorCable shield connection
plate integrated into the
connectorCable shield connection
plate integrated into the
connector

See Accessories

PE connection
On housing with M5
screwOn housing with M5
screwOn housing with M5
screwOn housing with M6
screw
Cable length, max.
(total of all motor cables and DC link)²⁾

- Shielded
- Unshielded

m (ft)	350 (1150)	350 (1150)	350 (1150)	350 (1150)
m (ft)	560 (1838)	560 (1838)	560 (1838)	560 (1838)

Degree of protection

	IP20	IP20	IP20	IP20
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Dimensions

- Width
- Height
- Depth
- with internal air cooling
- with external air cooling on/behind mounting surface

mm (in)	50 (1.97)	50 (1.97)	100 (3.94)	150 (5.91)
mm (in)	380 (14.96)	380 (14.96)	380 (14.96)	380 (14.96)
mm (in)	270 (10.63)	270 (10.63)	270 (10.63)	270 (10.63)
mm (in)	226/66.5 (8.9/2.6)	226/66.5 (8.9/2.6)	–	–

Weight

- with internal air cooling
- with external air cooling

kg (lb)	4.7 (11)	4.8 (11)	7 (15)	10.3 (23)
kg (lb)	5.3 (12)	5.4 (12)	–	–

¹⁾ Power loss of Smart Line Module at rated power without losses of 24 V DC electronics power supply.

²⁾ Max. cable lengths in conjunction with HFD line reactors, see derating characteristics.

³⁾ Nominal HP ratings are provided for ease of assigning components only. The Line Module power is dependent on the Motor Module loading and is to be dimensioned accordingly.

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Booksize format for Line and Motor Modules

Smart Line Modules in booksize format

Selection and Ordering Data

Rated infeed power	Smart Line Module in booksize format	
	Internal air cooling	External air cooling
	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC		
5 kW (5 HP)	6SL3130-6AE15-0AB0	6SL3131-6AE15-0AA0
10 kW (10 HP)	6SL3130-6AE21-0AB0	6SL3131-6AE21-0AA0
16 kW (18 HP)	6SL3130-6TE21-6AA3	—
36 kW (40 HP)	6SL3130-6TE23-6AA3	—

Accessories

Designation	Order No.
Shield connection plate For Line/Motor Modules in booksize format with a width of 150 mm (5.91 in)	6SL3162-1AF00-0AA0
DC link rectifier adapter For direct infeed of DC link voltage - Screw-type terminals 0.5 ... 10 mm² for Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in) - Screw-type terminals 35 ... 95 mm² for Line Modules and Motor Modules in booksize format with a width of 150 mm, 200 mm and 300 mm (5.91 in, 7.87 in and 11.8 in)	6SL3162-2BD00-0AA0 6SL3162-2BM00-0AA0
DC link adapters (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm ² For all Line Modules and Motor Modules in booksize format	6SL3162-2BM01-0AA0
24 V terminal adapter For all Line Modules and Motor Modules in booksize format	6SL3162-2AA00-0AA0
24 V jumper For connection of the 24 V busbars for booksize format	6SL3162-2AA01-0AA0
Warning signs in foreign languages This set of foreign language warning signs can be placed on top of the standard English or German signs. A set of signs is supplied with the units. One sign in each of the following languages is provided in each set: Chinese, Czech, Danish, Dutch, Finnish, French, Greek, Italian, Japanese, Korean, Polish, Portuguese, Russian, Spanish, Swedish and Turkish.	6SL3166-3AB00-0AA0

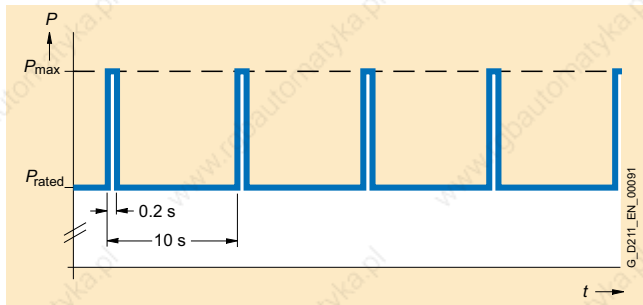
SINAMICS S120 drive system

Booksize format for Line and Motor Modules

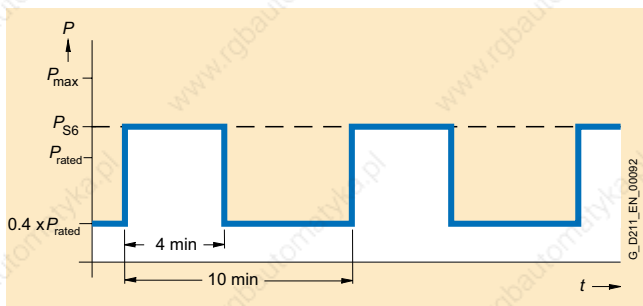
Smart Line Modules in booksize format

Characteristic curves

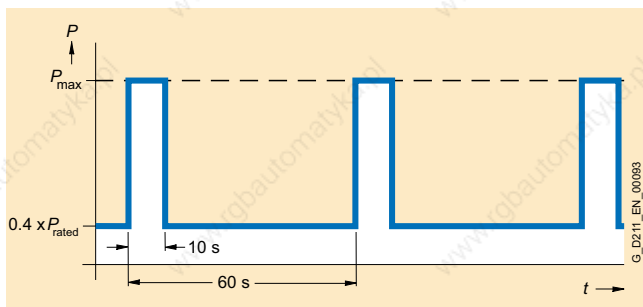
Overload capability



Duty cycle with previous load

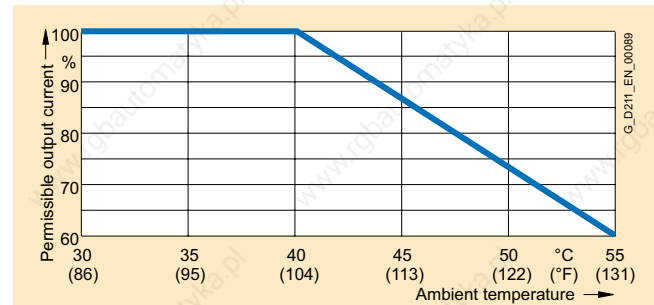


S6 duty cycles with previous load

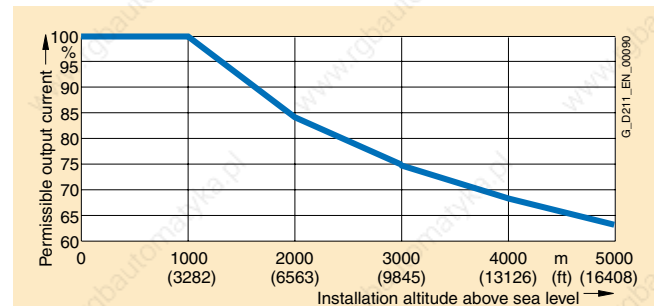


S6 duty cycles with previous load

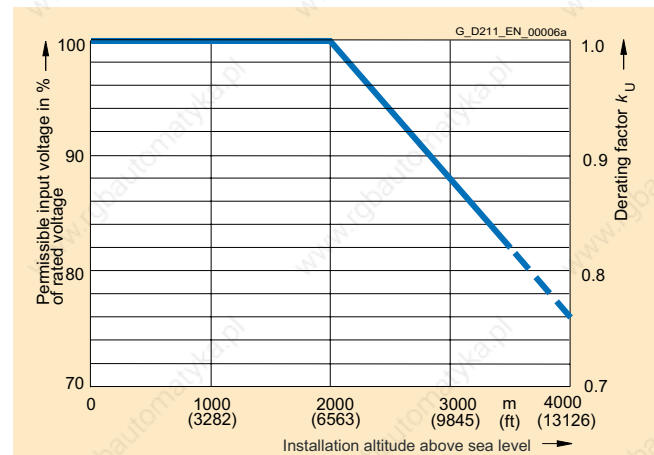
Derating characteristics



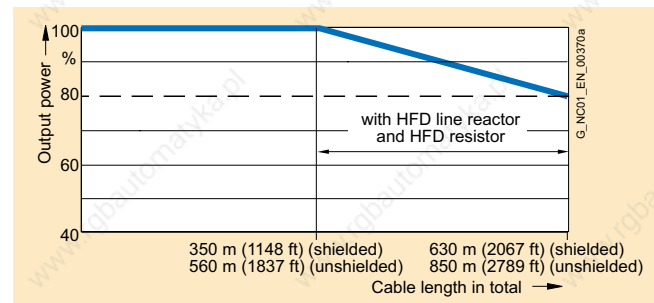
Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude



Output power dependent on total cable length

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Smart Line Modules in booksize format

Line reactors

Overview



In order to operate Smart Line Modules, it is absolutely essential to use the line reactors. The use of other makes of line reactor can lead to malfunctions or irreparable damage to equipment.

Selection and Ordering Data

Rated infeed power of the Smart Line Module	Suitable for Smart Line Module	Line reactor
	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC		
5 kW (5 HP)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0	6SL3000-0CE15-0AA0
10 kW (10 HP)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	6SL3000-0CE21-0AA0
16 kW (18 HP)	6SL3130-6TE21-6AA3	6SL3000-0CE21-6AA0
36 kW (40 HP)	6SL3130-6TE23-6AA3	6SL3000-0CE23-6AA0

Technical specifications

Line voltage 380 ... 480 V 3 AC

Order No.		6SL3000-0CE15-0AA0	6SL3000-0CE21-0AA0	6SL3000-0CE21-6AA0	6SL3000-0CE23-6AA0
Product name		Line reactor			
Rated current	A	14	28	35	69
Power loss	kW	0.062	0.116	0.11	0.17
Line/load connection 1U1, 1V1, 1W1/ 1U2, 1V2, 1W2		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm ²	4	10	10	16
PE connection		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm ²	4	10	10	16
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	150 (5.91)	177 (6.97)	219 (8.62)	228 (8.98)
• Height	mm (in)	175 (6.89)	196 (7.72)	180 (7.09)	235 (9.25)
• Depth	mm (in)	70 (2.76)	110 (4.33)	144 (5.67)	224 (8.82)
Weight, approx.	kg (lb)	3.7 (8)	7.5 (17)	9.5 (21)	17 (38)
Approvals		cURus	cURus	cURus	cURus
Suitable for Smart Line Module in booksize format	Type	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	6SL3130-6TE21-6AA3	6SL3130-6TE23-6AA3
• Rated infeed power of the Smart Line Module	kW (HP)	5 (5)	10 (10)	16 (18)	36 (40)

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Smart Line Modules in booksize format

Line filters

Overview



In plants with strict EMC requirements, line filters work together with line reactors to restrict the conducted interference emanating from the power modules to the limit values of Class A1 as defined in EN 55011 and Category C2 as defined in EN 61800-3. Line filters are suited only for direct connection to TN (grounded) systems.

Selection and Ordering Data

Rated infeed power of the Smart Line Module	Suitable for Smart Line Module	Line filter
	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC		
5 kW (5 HP)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0	6SL3000-0HE15-0AA0
10 kW (10 HP)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	6SL3000-0HE21-0AA0
16 kW (18 HP)	6SL3130-6TE21-6AA3	6SL3000-0BE21-6DA0
36 kW (40 HP)	6SL3130-6TE23-6AA3	6SL3000-0BE23-6DA0

Technical specifications

Line voltage 380 ... 480 V 3 AC					
Order No.		6SL3000-0HE15-0AA0	6SL3000-0HE21-0AA0	6SL3000-0BE21-6DA0	6SL3000-0BE23-6DA0
Product name		Line filter			
Rated current	A	16	25	36	65
Power loss	W	20	20	6	10
Line/load connection		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
L1, L2, L3/U, V, W					
• Conductor cross-section	mm ²	10	10	10	35
PE connection		On housing with M6 bolt	On housing with M6 bolt	On housing with M6 bolt	On housing with M6 bolt
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	60 (2.36)	60 (2.36)	50 (1.97)	75 (2.95)
• Height	mm (in)	285 (11.22)	285 (11.22)	420 (16.54)	420 (16.54)
• Depth	mm (in)	122 (4.8)	122 (4.8)	226 (8.9)	226 (8.9)
Weight, approx.	kg (lb)	3.8 (8)	5.7 (13)	5.0 (11)	6.5 (14)
Approvals		cURus (File No.: E70122)	cURus (File No.: E70122)	cURus (File No.: E70122)	cURus (File No.: E70122)
Suitable for Smart Line Module in booksize format	Type	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	6SL3130-6TE21-6AA3	6SL3130-6TE23-6AA3
• Rated infeed power of the Smart Line Module	kW (HP)	5 (5)	10 (10)	16 (18)	36 (40)

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Booksized format for Line and Motor Modules

Smart Line Modules in booksized format Recommended line-side components

Overview

Suitable line-side power components are assigned depending on the power rating of the Smart Line Module.

The tables below list recommended components.

Further information about the main contactors, switch disconnectors, fuses and circuit-breakers specified in the tables can be found in Catalogs LV 1 and LV 1 T.

Assignment of line-side power components to Smart Line Modules in booksized format

Rated infeed power	Assignment to Smart Line Module	Main contactor Order No.	Circuit-breaker Order No.	Main switch Order No.	Fuse switch disconnecter Order No.
Line voltage 380 ... 480 V 3 AC					
5 kW (5 HP)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0	3RT1023-1BB40	3RV1031-4BA10	3LD2003-0TK51	3NP4010-0CH01
10 kW (10 HP)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	3RT1026-1BB40	3RV1031-4FA10	3LD2203-0TK51	3NP4010-0CH01
16 kW (18 HP)	6SL3130-6AE21-6AA3	3RT1035-1AC24	3RV1031-4FA10	3LD2504-0TK51	3NP4010-0CH01
36 kW (40 HP)	6SL3130-6AE23-6AA3	3RT1045-1AP04	3RV1041-4LA10	3LD2704-0TK51	3NP4010-0CH01

Rated infeed power	Assignment to Smart Line Module	Switch disconnector with fuse holders Order No.	LVHRC fuse (gL/gG) Order No.	Rated current	Size
Line voltage 380 ... 480 V 3 AC					
5 kW (5 HP)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0	3KL5030-1EB01	3NA3805	16 A	000
10 kW (10 HP)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	3KL5030-1EB01	3NA3814	35 A	000
16 kW (18 HP)	6SL3130-6AE21-6AA3	3KL5030-1EB01	3NA3814	35 A	000
36 kW (40 HP)	6SL3130-6AE23-6AA3	3KL5230-1EB01	3NA3824	80 A	000