

# 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

<b>Line connection voltage</b> Up to 2000 m (6562 ft) above sea level	380 ... 480 V 3 AC $\pm 10\%$ (-15% < 1 min)
<b>Line frequency</b>	47 ... 63 Hz
<b>Line power factor at rated power</b>	
• Fundamental power factor (cos $\phi$ 1)	> 0.96
• Total ( $\lambda$ )	0.65 ... 0.90
<b>Overvoltage category</b>	Class III to EN 60664-1
<b>DC link voltage, approx.</b>	1.35 x line voltage <sup>1)</sup>
<b>Electronics power supply</b>	24 V DC, -15%/+20%
<b>Radio interference suppression</b>	
• Standard	no radio interference suppression
• With line filter	Class A1 to EN 55011 and Category C2 to EN 61800-3
<b>Type of cooling</b>	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))
<b>Permissible ambient or coolant temperature (air)</b> 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
<b>Installation altitude</b>	Up to 1000 m (3281 ft) above sea level without derating, > 1000 ... 4000 m (3281 ... 13124 ft) above sea level, see derating characteristics
<b>Conformity</b>	CE (low-voltage and EMC directives)
<b>Approvals</b>	cULus (File No.: E192450)

<sup>1)</sup> 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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**Smart Line Modules in booksize 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 booksize format

**Feed/feedback power**

- Rated power  $P_{\text{rated}}$ 
  - with 380 V 3 AC
  - with 460 V 3 AC<sup>3)</sup>
- for S6 duty (40%)  $P_{\text{S6}}$
- $P_{\text{max}}$

	kW	5	10	16	36
(HP)	(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  $\eta$** 

		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 <sup>3</sup> /s (ft <sup>3</sup> /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

- Conductor cross-section

	Screw-type terminals (X1)	Screw-type terminals (X1)	Screw-type terminals (X1)	Screw studs for ring terminal ends, M6 (X1)
	mm <sup>2</sup>	2.5 ... 6	2.5 ... 10	2.5 ... 50

**Shield connection**

Cable shield connection plate integrated into the connector

Cable shield connection plate integrated into the connector

Cable shield connection plate integrated into the connector

See Accessories

**PE connection**

On housing with M5 screw

On housing with M5 screw

On housing with M5 screw

On housing with M6 screw

**Cable length, max.**(total of all motor cables and DC link)<sup>2)</sup>

- 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

	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)	–	–

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

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

<sup>3)</sup> 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.

# SINAMICS S120 drive system

## Booksize format for Line and Motor Modules

### Smart Line Modules in booksize format

#### Selection and Ordering Data

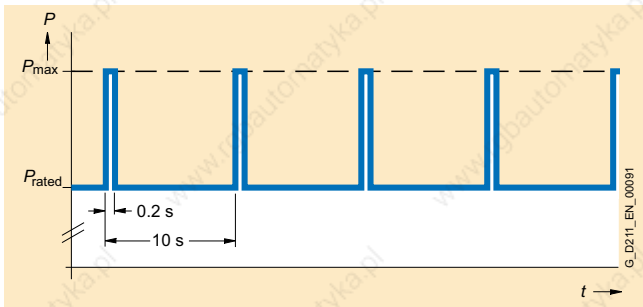
Rated infeed power	Smart Line Module in booksize format	
	Internal air cooling	External air cooling
	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC		
5 kW (5 HP)	<b>6SL3130-6AE15-0AB0</b>	<b>6SL3131-6AE15-0AA0</b>
10 kW (10 HP)	<b>6SL3130-6AE21-0AB0</b>	<b>6SL3131-6AE21-0AA0</b>
16 kW (18 HP)	<b>6SL3130-6TE21-6AA3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

#### Accessories

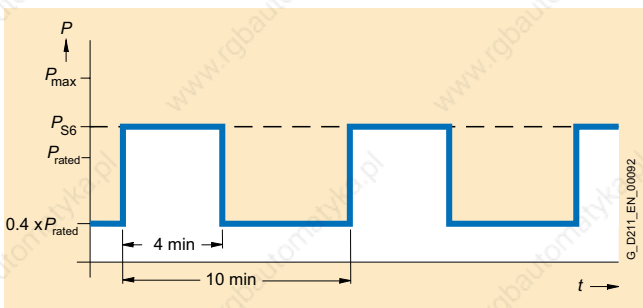
Designation	Order No.
<b>Shield connection plate</b> For Line/Motor Modules in booksize format with a width of 150 mm (5.91 in)	<b>6SL3162-1AF00-0AA0</b>
<b>DC link rectifier adapter</b> For direct infeed of DC link voltage <ul style="list-style-type: none"> <li>Screw-type terminals 0.5 ... 10 mm<sup>2</sup> for Line Modules and Motor Modules in booksize format with a width of 50 mm (1.97 in) or 100 mm (3.94 in)</li> <li>Screw-type terminals 35 ... 95 mm<sup>2</sup> 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)</li> </ul>	<b>6SL3162-2BD00-0AA0</b>  <b>6SL3162-2BM00-0AA0</b>
<b>DC link adapters</b> (2 units) For multi-tier configuration Screw-type terminals 35 ... 95 mm <sup>2</sup> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2BM01-0AA0</b>
<b>24 V terminal adapter</b> For all Line Modules and Motor Modules in booksize format	<b>6SL3162-2AA00-0AA0</b>
<b>24 V jumper</b> For connection of the 24 V busbars for booksize format	<b>6SL3162-2AA01-0AA0</b>
<b>Warning signs in foreign languages</b> 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.	<b>6SL3166-3AB00-0AA0</b>

### Characteristic curves

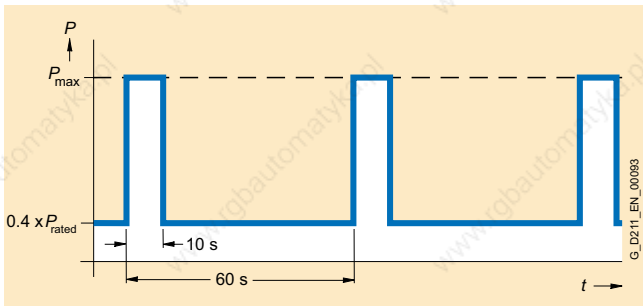
#### Overload capability



Duty cycle with previous load

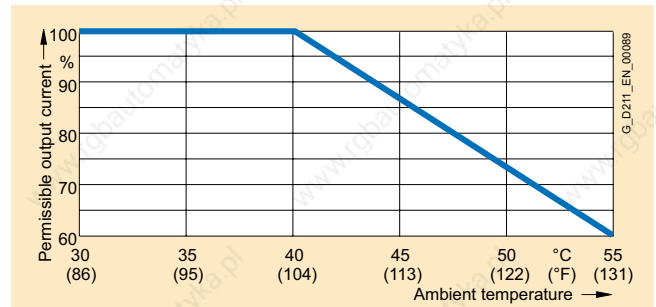


S6 duty cycles with previous load

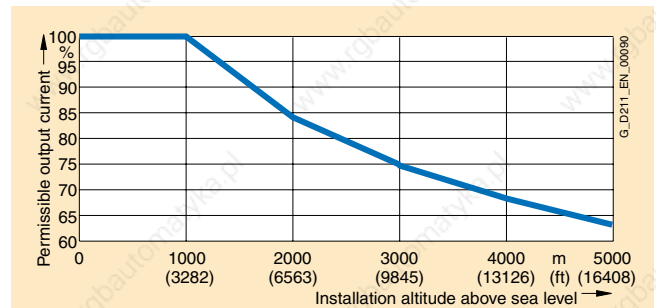


S6 duty cycles with previous load

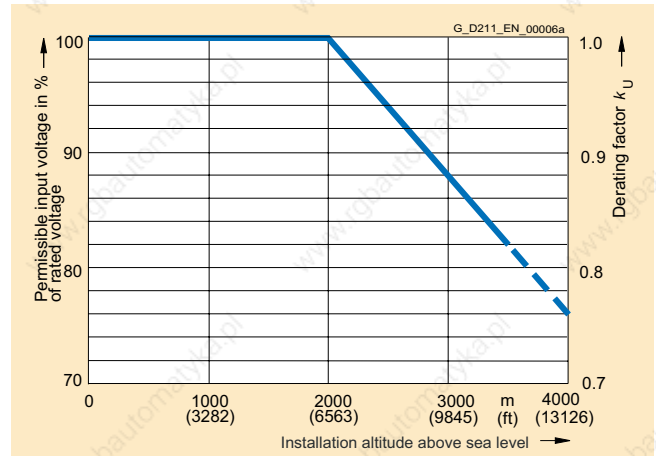
#### Derating characteristics



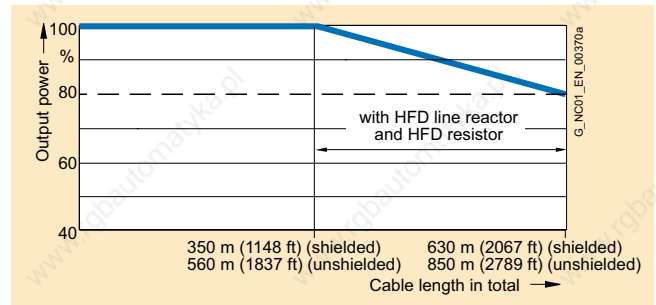
Output power dependent on ambient temperature



Output power dependent on installation altitude



Voltage derating dependent on installation altitude



Output power dependent on total cable length

# SINAMICS S120 drive system

## Booksize format for Line and Motor Modules

### 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	<b>6SL3000-OCE15-0AA0</b>
10 kW (10 HP)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	<b>6SL3000-OCE21-0AA0</b>
16 kW (18 HP)	6SL3130-6TE21-6AA3	<b>6SL3000-OCE21-6AA0</b>
36 kW (40 HP)	6SL3130-6TE23-6AA3	<b>6SL3000-OCE23-6AA0</b>

#### Technical specifications

Line voltage 380 ... 480 V 3 AC

Order No.	6SL3000-OCE15-0AA0	6SL3000-OCE21-0AA0	6SL3000-OCE21-6AA0	6SL3000-OCE23-6AA0
<b>Product name</b>	Line reactor			
<b>Rated current</b>	A 14	28	35	69
<b>Power loss</b>	kW 0.062	0.116	0.11	0.17
<b>Line/load connection</b> 1U1, 1V1, 1W1/ 1U2, 1V2, 1W2	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm <sup>2</sup> 4	10	10	16
<b>PE connection</b> • Conductor cross-section	mm <sup>2</sup> 4	10	10	16
<b>Degree of protection</b>	IP20	IP20	IP20	IP20
<b>Dimensions</b>				
• 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)
<b>Weight, approx.</b>	kg (lb) 3.7 (8)	7.5 (17)	9.5 (21)	17 (38)
<b>Approvals</b>	cURus	cURus	cURus	cURus
<b>Suitable for Smart Line Module in booksize format</b>	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)

# SINAMICS S120 drive system

## Booksize format for Line and Motor Modules

### 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	<b>6SL3000-0HE15-0AA0</b>
10 kW (10 HP)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	<b>6SL3000-0HE21-0AA0</b>
16 kW (18 HP)	6SL3130-6TE21-6AA3	<b>6SL3000-0BE21-6DA0</b>
36 kW (40 HP)	6SL3130-6TE23-6AA3	<b>6SL3000-0BE23-6DA0</b>

#### Technical specifications

Line voltage 380 ... 480 V 3 AC

Order No.		6SL3000-0HE15-0AA0	6SL3000-0HE21-0AA0	6SL3000-0BE21-6DA0	6SL3000-0BE23-6DA0
<b>Product name</b>		Line filter			
<b>Rated current</b>	A	16	25	36	65
<b>Power loss</b>	W	20	20	6	10
<b>Line/load connection</b>		Screw-type terminals			
L1, L2, L3/U, V, W					
• Conductor cross-section	mm <sup>2</sup>	10	10	10	35
<b>PE connection</b>		On housing with M6 bolt			
<b>Degree of protection</b>		IP20			
<b>Dimensions</b>					
• 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)
<b>Weight, approx.</b>	kg (lb)	3.8 (8)	5.7 (13)	5.0 (11)	6.5 (14)
<b>Approvals</b>		cURus (File No.: E70122)			
<b>Suitable for Smart Line Module in booksize format</b>	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)

# SINAMICS S120 drive system

## 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	Circuit-breaker	Main switch	Fuse switch disconnector
		Order No.	Order No.	Order No.	Order No.
Line voltage 380 ... 480 V 3 AC					
5 kW (5 HP)	6SL3130-6AE15-0AB0 6SL3131-6AE15-0AA0	<b>3RT1023-1BB40</b>	<b>3RV1031-4BA10</b>	<b>3LD2003-0TK51</b>	<b>3NP4010-0CH01</b>
10 kW (10 HP)	6SL3130-6AE21-0AB0 6SL3131-6AE21-0AA0	<b>3RT1026-1BB40</b>	<b>3RV1031-4FA10</b>	<b>3LD2203-0TK51</b>	<b>3NP4010-0CH01</b>
16 kW (18 HP)	6SL3130-6AE21-6AA3	<b>3RT1035-1AC24</b>	<b>3RV1031-4FA10</b>	<b>3LD2504-0TK51</b>	<b>3NP4010-0CH01</b>
36 kW (40 HP)	6SL3130-6AE23-6AA3	<b>3RT1045-1AP04</b>	<b>3RV1041-4LA10</b>	<b>3LD2704-0TK51</b>	<b>3NP4010-0CH01</b>

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