SIEMENS

SINAMICS

SINAMICS G130

Line filters

Operating Instructions

Edition 04/2014

Answers for industry.

SIEMENS

SINAMICS

SINAMICS G130
Line filter

Operating Instructions

Control version V4.7

04/2014

A5E00331460A

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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A5E00331460A
℗ 08/2014 Subject to change

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Safety information

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1.1 General safety instructions

⚠ DANGER

Danger to life due to live parts and other energy sources

Death or serious injury can result when live parts are touched.

- Only work on electrical equipment if you are appropriately qualified.
- Always observe the country-specific safety rules for all work.

Generally, six steps apply when establishing safety:

1. Prepare for shutdown and notify all those who will be affected by the procedure.
2. Disconnect the machine from the supply.
   - Switch off the machine.
   - Wait until the discharge time specified on the warning labels has elapsed.
   - Check that it really is in a zero-voltage state, from phase conductor to phase conductor and phase conductor to protective conductor.
   - Check that every auxiliary circuit is de-energized.
   - Ensure that the motors cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems or water.
4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or short-circuiting or closing valves, for example.
5. Take measures to prevent reconnection of the energy sources.
6. Ensure that the correct machine is completely interlocked.

After you have completed the work, restore the operational readiness by following the above steps in the reverse order.

⚠ WARNING

Danger to life through a hazardous voltage when connecting an unsuitable power supply

Death or serious injury can result when live parts are touched in the event of a fault.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠WARNING

Danger to life when live parts are touched on damaged devices

Improper handling of devices can cause damage.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.

⚠WARNING

Danger to life through electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of power cables that are not used at one end at the grounded housing potential.

⚠WARNING

Danger to life due to electric shock when not grounded

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠WARNING

Danger to life due to electric shock when opening plug connections in operation

When opening plug connections in operation, arcs can result in severe injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

⚠WARNING

Danger to life due to fire spreading if the housing is inadequate

Fire and smoke can cause severe injury or material damage.

- Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire inside and outside the device is prevented.
- Ensure that smoke can escape via designated paths.

⚠WARNING

Danger to life through unexpected movement of machines when using mobile wireless devices or mobile phones

Using mobile radios or mobile phones with a transmit power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction, influence the functional safety of machines therefore putting people at risk or cause material damage.

- When close to components, switch off all wireless devices and mobile phones.

⚠WARNING

Danger to life due to the motor catching fire in the event of insulation overload

There is a greater load on the motor insulation as result of a ground fault in an IT system. A possible result is the failure of the insulation with a risk for personnel as a result of fire and smoke.

- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

⚠WARNING

Danger to life due to fire if overheating occurs because of insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating with a risk for personnel as a result of fire and smoke. This can also result in increased downtime and reduced service lives of devices/systems.

- Ensure compliance with the specified minimum clearances as ventilation clearance for the respective component. They can be found in the dimension drawings or in the "Product-specific safety instructions" at the start of the respective section.

⚠WARNING

Danger of an accident occurring due to missing or illegible warning labels

Missing or illegible warning labels can result in death or serious injury.

- Check the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, in the national language if necessary.
- Replace illegible warning labels.

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high-voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

Note

Use of copper cables for a UL-approved system

For a UL-approved system use 60/75° C copper conductors only.

1.2 Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Damage through electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

The necessary ESD protective measures are clearly illustrated in the following diagram:

- a = conductive floor surface
- b = ESD table
- c = ESD shoes
- d = ESD overall
- e = ESD wristband
- f = cabinet ground connection
- g = contact with conductive flooring

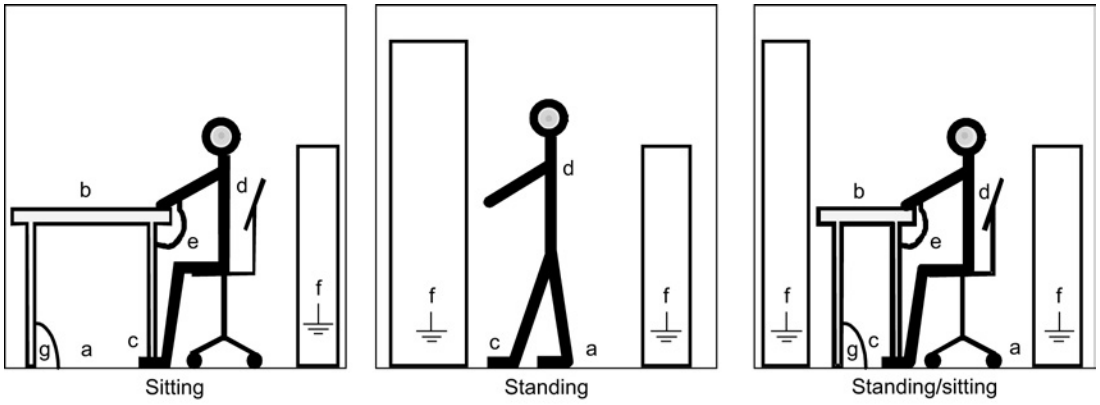

Figure 1-1 ESD protective measures

General

2

Description

The line filters limit the conducted interference emitted by the converter units to permissible values.

To reduce emissions, the Power Modules are equipped as standard with a line filter in accordance with the limit values defined in category C3 (environment 2). The additional line filters described here can be fitted for use in environment 1 (category C2).

In conjunction with line reactors, line filters limit the conducted interference emitted by the Power Modules to the limit values defined in product standard EN 61800-3. Provided that the system has been set up in accordance with the EMC installation guidelines, the limit values at the installation location will be in accordance with the requirements for environment 1.

⚠ WARNING

Danger to life if the fundamental safety instructions and remaining risks are not carefully observed

The non-observance of the fundamental safety instructions and residual risks stated in Chapter 1 can result in accidents with severe injuries or death.

- Adhere to the fundamental safety instructions.
- When assessing the risk, take into account residual risks.

⚠ CAUTION

Risk of burns due to high surface temperatures of the line filter

The line filter can become very hot. You can get seriously burnt when touching the surface.

- Mount the line filter so that contact is not possible. If this is not possible, attach a clearly visible and understandable warning notice at hazardous positions.
- To prevent adjacent components from suffering damage due to these high temperatures, maintain a clearance of 100 mm on all sides of the line filter.

NOTICE

Line filter damage by connecting to impermissible line supplies

The line filters are only suitable for direct connection to TN or TT systems with grounded neutral point. Line filters are designed for connection to systems with a continuous level to voltage harmonics according to EN 61000-2-4, class 3. Connecting the line filter to other systems causes damage.

- Only connect the line filter to TN or TT systems with grounded neutral point and a continuous level to voltage harmonics in accordance with EN 61000-2-4, Class 3.

NOTICE

Line filter damage due to interchanged connections

The line filter will be damaged if the input and output connections are interchanged.

- Connect the incoming line cable to LINE L1, L2, L3.
- Connect the outgoing cable to the line reactor to LOAD L1', L2', L3'.

WARNING

Fire hazard due to overheating because of inadequate ventilation clearances

Insufficient ventilation clearances result in overheating with danger to persons as a result of smoke and fire. Damage can still occur on the line filter.

- For this reason, maintain the 100 mm clearances above and below the line filter.

WARNING

Danger to life due to high leakage currents caused by an interrupted external protective conductor

The drive components conduct a high leakage current via the protective conductor. Touching conductive parts when the protective conductor is interrupted can result in death or serious injury.

- Ensure that the external protective conductor satisfies at least one of the following conditions:
  - It has been laid so that it is protected from mechanical damage. [1)]
  - For an individual core, it has a cross-section of at least 10 mm² Cu.
  - If it is a conductor of a multi-conductor cable, it has a cross-section of at least 2.5 mm² Cu.
  - It has a second protective conductor in parallel with the same cross-section.
  - It complies with the local regulations for equipment with increased leakage current.

[1)] Cables laid within control cabinets or closed machine housings are considered to be adequately protected against mechanical damage.

⚠ CAUTION

Fire hazard due to overheating when the total length of the power cables is exceeded

Overheating of the line filter and fire can result when the total length of the motor cables is exceeded.

- Ensure that the total length of the motor cables does not exceed 100 m.

NOTICE

Destruction or damage to additional loads as a result of undesirable line harmonics

Line harmonics can occur if line filters that differ from those listed in this manual are used. These can disturb or damage other loads connected to the line supply.

- Only use line filters that are listed in this manual.

NOTICE

Destruction or damage to components by incorrectly connecting the line filter

When incorrectly connecting the line filter, these components can be destroyed or damaged.

- Only connect the Line Module to the SINAMICS line filter via the associated line reactor.
- Connect additional loads upstream of the SINAMICS line filter (if required, via a separate line filter).

Note

Disconnect the line filter for a high-voltage test

If a high-voltage test is conducted with alternating voltage in the system, the existing line filters must be disconnected in order to obtain accurate measurements.

The connection clip to the interference suppression capacitor in the Power Module must also be removed for a high-voltage test with direct voltage.

Assignment of line filter and Power Module

Table 2- 1 Assignment of line filter and Power Module

Power Module	Unit rating of the Power Module	Suitable line filter
Line voltage 3-phase 380 – 480 VAC		
6SL3310-1GE32-1AAx	110 kW	**6SL3000-0BE32-5AA0**
6SL3310-1GE32-6AAx	132 kW	**6SL3000-0BE34-4AA0**
6SL3310-1GE33-1AAx	160 kW	**6SL3000-0BE34-4AA0**
6SL3310-1GE33-8AAx	200 kW	**6SL3000-0BE34-4AA0**
6SL3310-1GE35-0AAx	250 kW	**6SL3000-0BE36-0AA0**
6SL3310-1GE36-1AAx	315 kW	**6SL3000-0BE41-2AA0**
6SL3310-1GE37-5AAx	400 kW	**6SL3000-0BE41-2AA0**
6SL3310-1GE38-4AAx	450 kW	**6SL3000-0BE41-2AA0**
6SL3310-1GE41-0AAx	560 kW	**6SL3000-0BE41-2AA0**
Line voltage 3-phase 500 – 600 VAC		
6SL3310-1GF31-8AAx	110 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GF32-2AAx	132 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GF32-6AAx	160 kW	**6SL3000-0BG34-4AA0**
6SL3310-1GF33-3AAx	200 kW	**6SL3000-0BG34-4AA0**
6SL3310-1GF34-1AAx	250 kW	**6SL3000-0BG34-4AA0**
6SL3310-1GF34-7AAx	315 kW	**6SL3000-0BG36-0AA0**
6SL3310-1GF35-8AAx	400 kW	**6SL3000-0BG41-2AA0**
6SL3310-1GF37-4AAx	500 kW	**6SL3000-0BG41-2AA0**
6SL3310-1GF38-1AAx	560 kW	**6SL3000-0BG41-2AA0**
Line voltage 3-phase 660 – 690 VAC		
6SL3310-1GH28-5AAx	75 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GH31-0AAx	90 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GH31-2AAx	110 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GH31-5AAx	132 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GH31-8AAx	160 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GH32-2AAx	200 kW	**6SL3000-0BG32-5AA0**
6SL3310-1GH32-6AAx	250 kW	**6SL3000-0BG34-4AA0**
6SL3310-1GH33-3AAx	315 kW	**6SL3000-0BG34-4AA0**
6SL3310-1GH34-1AAx	400 kW	**6SL3000-0BG34-4AA0**
6SL3310-1GH34-7AAx	450 kW	**6SL3000-0BG36-0AA0**
6SL3310-1GH35-8AAx	560 kW	**6SL3000-0BG41-2AA0**
6SL3310-1GH37-4AAx	710 kW	**6SL3000-0BG41-2AA0**
6SL3310-1GH38-1AAx	800 kW	**6SL3000-0BG41-2AA0**

Mechanical installation 3

When the line filter is installed in a cabinet, it must be positioned directly beside the Power Module.

The line reactor must be positioned between the line filter and Power Module. Cabling must be kept as short as possible.

To prevent interference being injected into the interference-suppressed line cable (this can, in some cases, nullify the effects of the line filter), the line cable to the line filter must be routed separately from other cables.

The housing of the Power Module and line filter must be connected with low resistance for high-frequency interference currents. This can be achieved by installing the Power Module and line filter on the same mounting plate. The Power Module and line filter must be connected to the mounting plate with the greatest possible surface area. The best solution here is to use a metallic, bare, oil-free mounting plate (e.g. made of stainless steel or galvanized sheet-steel) because the entire contact surface establishes the electrical contact.

If a painted mounting plate is used, the screw positions for the Power Module and line filter must free of paint to ensure electrical contact with the mounting plate.

The motor must always be connected using a shielded cable. The shield must be applied to the motor and Power Module with the greatest possible surface area.

The ground wire for the motor must be fed directly back to the Power Module.

Dimension drawing

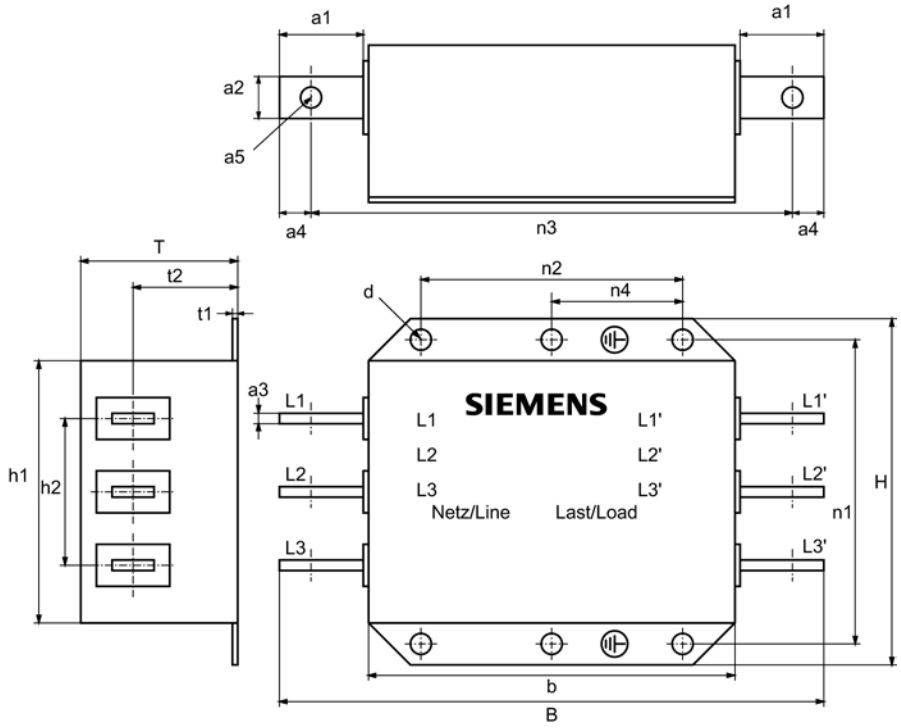

Figure 3-1 Dimension drawing, line filter

Table 3- 1 Dimensions of the line filter (all data in mm)

6SL3000-	0BE32-5AA0 0BG32-5AA0	0BE34-4AA0 0BG34-4AA0	0BE36-0AA0 0BG36-0AA0	0BE41-2AA0 0BG41-2AA0
W	360	360	400	425
H	240	240	265	265
D	116	116	140	145
a1	40	40	40	50
a2	25	25	25	50
a3	5	5	8	10
a4	15	15	15	20
a5	11	11	11	14
b	270	270	310	300
h1	200	200	215	215
h2	100	100	120	142
t1	2	2	3	2.5
t2	78.2	78.2	90	91
n1 [1)]	220	220	240	240
n2 [1)]	210	210	250	255
n3	330	330	370	385
n4	-	-	125	127.5
d	9	9	12	12
[1)] Lengths n1 and n2 correspond to the drill hole spacing				

Electrical installation

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Connection

When connecting the line filter and line reactor, you must take into account the following conditions to ensure that they function correctly:

- Use shielded control cables. The shield must be connected at both ends.
- With analog control cables, connecting the shield at both ends can result in coupled-in noise. To prevent this, the shield must only be connected at one end on the Power Module.
- Control cables must be routed separately from power cables. Power cables are motor cables or connecting cables from the DC link of the Power Module (terminals DCPA/DCNA) to other components (e.g. Braking Module). In particular, you must ensure that control cables and power cables are not routed in parallel in a joint cable raceway, even if all the cables are shielded.
- You must use shielded motor cables. The shield for the motor cable must be attached to the shield plate and motor housing.
- The ground wire for the motor must be fed directly back to the Power Module.

Connection overview

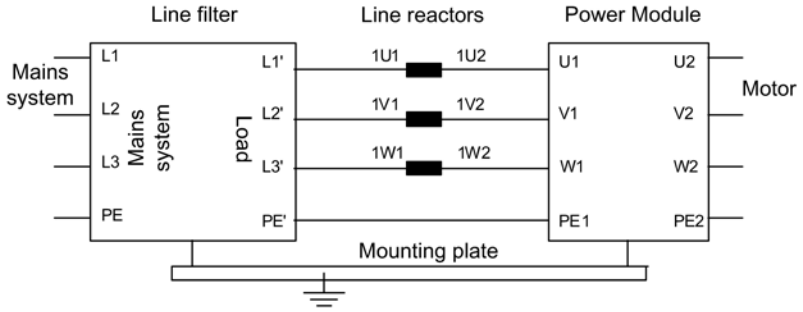

Figure 4-1 Connecting the line filter, line reactor, and Power Module

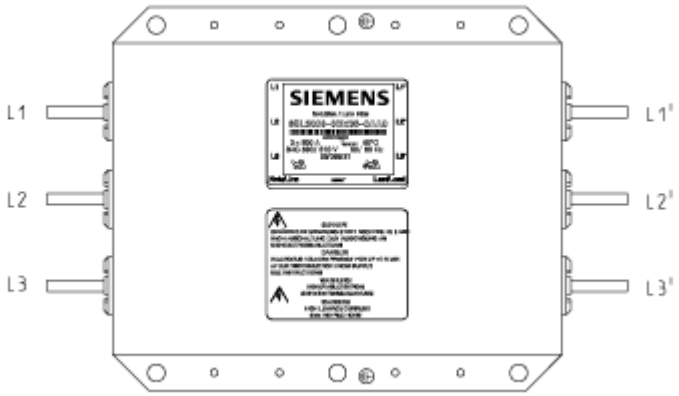

Figure 4-2 Connection overview of the line filter

Technical specifications

5

General technical data

Table 5- 1 General technical data

Line frequency	47 ... 63 Hz		
Product standard	EN 61800-5-1		
Overload capacity	1.60 x I_R for 3 s followed by 1.36 x I_R for 60 s followed by 1.00 x I_R for 240 s		
Ambient conditions	Storage	Transport	Operation
Ambient temperature	-25 ... +70 °C	-25 ... +70 °C	0 ... +50 °C
Relative air humidity [1] (condensation not permissible) corresponds to class	5 ... *95 %* 1K4 acc. to EN 60721-3-1	5 ... 95% at 40 °C 2K3 to EN 60721-3-2	5 ... *95%* 3K3 to EN 60721-3-3
Mechanical strength	Storage	Transport	Operation
Vibrational load [1] - Displacement - Acceleration corresponds to class	 1.5 mm at *5* ... 9 Hz 5 m/s² at > 9 ... 200 Hz 1M2 to EN 60721-3-1	 3.5 mm at *5* ... 9 Hz 10 m/s² at > 9 ... 200 Hz 2M2 to EN 60721-3-2	 0.075 mm at 10 ... 58 Hz 10 m/s² at >58 ... 200 Hz -
Shock load [1] - Acceleration corresponds to class	 40 m/s² at 22 ms 1M2 to EN 60721-3-1	 100 m/s² at 11 ms 2M2 to EN 60721-3-2	 100 m/s² at 11 ms 3M4 to EN 60721-3-3

Deviations from the specified classes are shown in *italics*.

[1] The EN standards specified are the European editions of the international IEC standards with the same designations.

Detailed technical data

Table 5- 2 Technical data of line filter 380 V – 480 V 3 AC

Order number	6SL3000-	0BE32-5AA0	0BE34-4AA0	0BE36-0AA0	0BE41-2AA0
Rated voltage	V	380 V 3 AC –10 % to 480 V 3 AC +10% (-15% < 1 min)			
Rated current I_R	A	250	440	600	1200
Power loss	kW	0.015	0.047	0.053	0.119
Line/load connection		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
PE connection		M8	M8	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 360 240 116	 360 240 116	 400 265 140	 425 265 145
Weight	kg	12.3	12.3	19.0	25.8

Table 5- 3 Technical data of line filter 500 V – 600 V 3 AC

Order number	6SL3000-	0BG32-5AA0	0BG34-4AA0	0BG36-0AA0	0BG41-2AA0
Rated voltage	V	3 AC 500 –10 % to 3 AC 600 +10 % (-15 % < 1 min)			
Rated current I_R	A	250	440	600	1200
Power loss	kW	0.015	0.047	0.053	0.119
Line/load connection		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
PE connection		M8	M8	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 360 240 116	 360 240 116	 400 265 140	 425 265 145
Weight	kg	12.3	12.3	19.0	25.8

Table 5- 4 Technical data of line filter 660 V – 690 V 3 AC

Order number	**6SL3000-**	**0BG32-5AA0**	**0BG34-4AA0**	**0BG36-0AA0**	**0BG41-2AA0**
Rated voltage	V	3 AC 660 –10 % to 3 AC 690 +10 % (-15 % < 1 min)			
Rated current I_R	A	250	440	600	1200
Power loss	kW	0.015	0.047	0.053	0.119
Line/load connection		M10 connecting lugs	M10 connecting lugs	M10 connecting lugs	M12 connecting lugs
PE connection		M8	M8	M10	M10
Degree of protection		IP00	IP00	IP00	IP00
Dimensions Width Height Depth	 mm mm mm	 360 240 116	 360 240 116	 400 265 140	 425 265 145
Weight	kg	12.3	12.3	19.0	25.8

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