

iC7 Series Air-cooled LCL Filter OF7Z3

1 Overview

1.1 LCL Filter

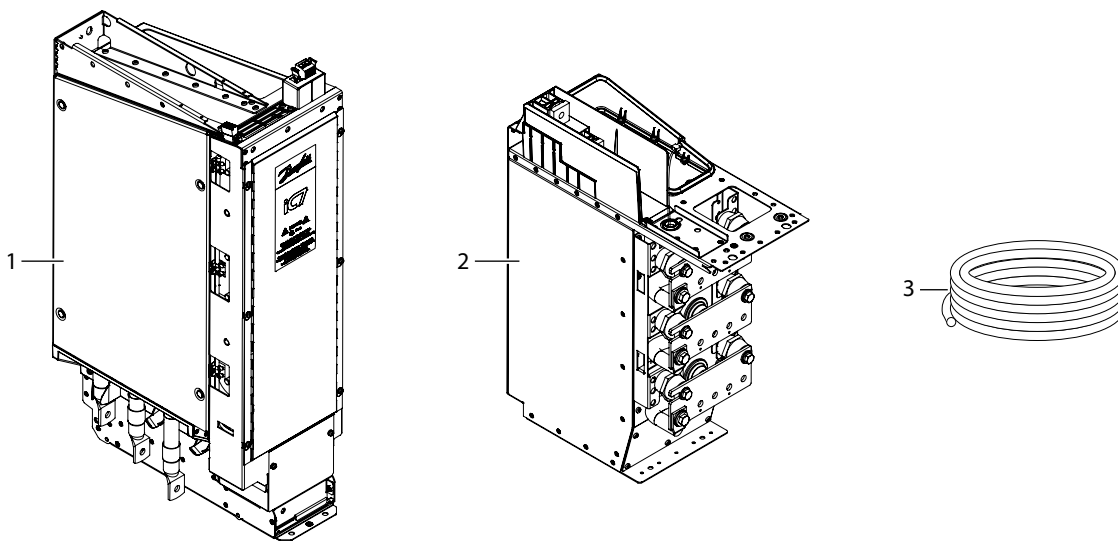
The LCL Filter is used as an input filter with AFE or grid converter modules in applications where regenerative or low-harmonic functionality is required. The LCL Filter reduces switching noise, and ensures correct power quality and minimal interruption to the grid.

There are 2 electrical sizes of the filter: LCL10 (514 A) and LCL11 (816 A).

Both filter sizes are available with protection ratings IP00 and IP54.

1.2 Contents of the Delivery

The LCL Filter consists of 2 parts. The LC Filter and L Filter are delivered on separate wooden pallets.



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Illustration 1: Items Included in the Delivery

1	LC Filter	3	AuxBus cable, 3 m (9.8 ft)
2	L Filter		

2 Mechanical Installation

2.1 Safety Information

⚠ WARNING ⚠

SHOCK HAZARD FROM THE COMPONENTS

The components of the drive are live when the drive is connected to mains.

- Do not make changes in the AC drive when it is connected to mains.

⚠ CAUTION ⚠

BURN HAZARD

The filter is hot during operation.

- Do not install the filter on a combustible surface.
- Do not touch the filter when hot.

Only qualified personnel are allowed to perform the installation described in this guide.

Follow the instructions in this guide and relevant local regulations.

Also read the instructions and safety information in the operating guide for the iC7 Series System Modules.

2.2 Installation Requirements

The products that are described in this guide have the protection rating IP00/UL Open Type. Install them in a cabinet or other enclosure that has a correct level of protection against the ambient conditions in the installation area. Make sure that the cabinet gives protection against water, humidity, dust, and other contaminations.

The cabinet must also be sufficiently strong for the weight of the system modules and other devices.

The protection rating of the cabinet must be at least IP21/UL Type 1. When preparing the installation, obey the local regulations.

2.3 Installing the LCL Filter into the Cabinet

This is the recommended installation procedure for iC7 Series Air-cooled LCL Filters and AFE modules with an integration unit.

See the installation dimension in [2.5 Dimensions of the LCL Filter](#).

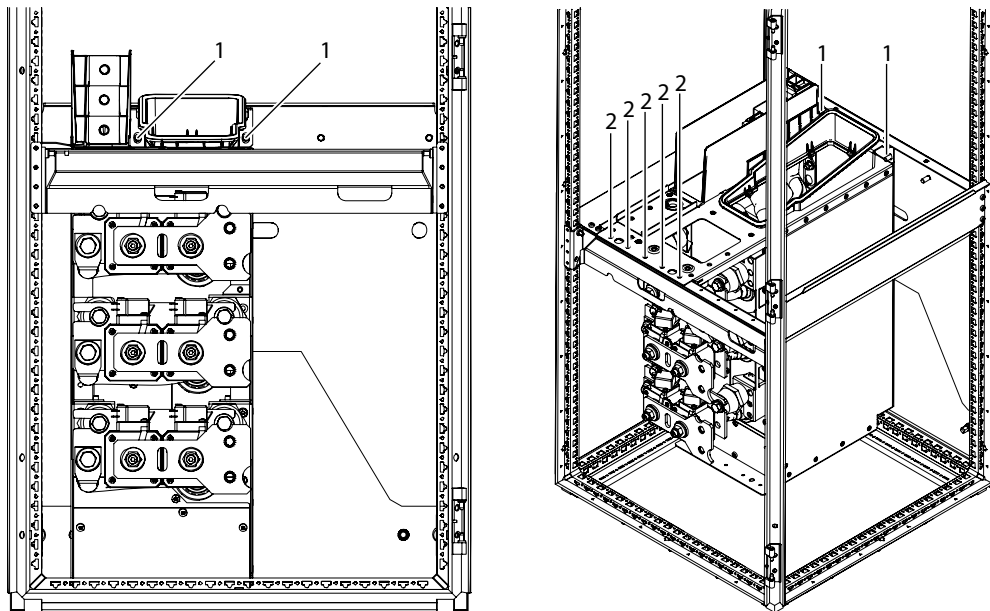
Procedure

1. Install mounting brackets to the cabinet.

Mounting brackets are not included in the delivery.

2. Install the L Filter into the cabinet.
 - a. Mount the L Filter to the back wall of the cabinet.
 -

b. Mount the front of the L Filter to a mounting bracket.

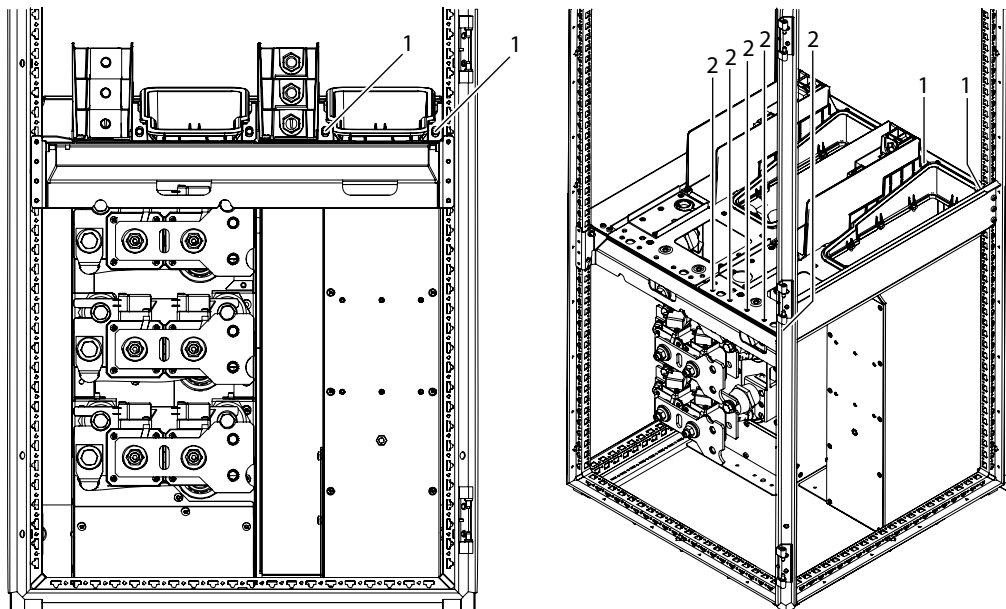


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Illustration 2: Installing the L Filter

- | | |
|---|---------------------------------|
| 1 | The mounting holes at the back |
| 2 | The mounting holes in the front |

3. Install the integration unit of the AFE module into the cabinet.



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Illustration 3: Installing the Integration Unit of the AFE Module

- | | |
|---|---------------------------------|
| 1 | The mounting holes at the back |
| 2 | The mounting holes in the front |

4. Push and slide the LC Filter into the cabinet, on top of the L Filter.

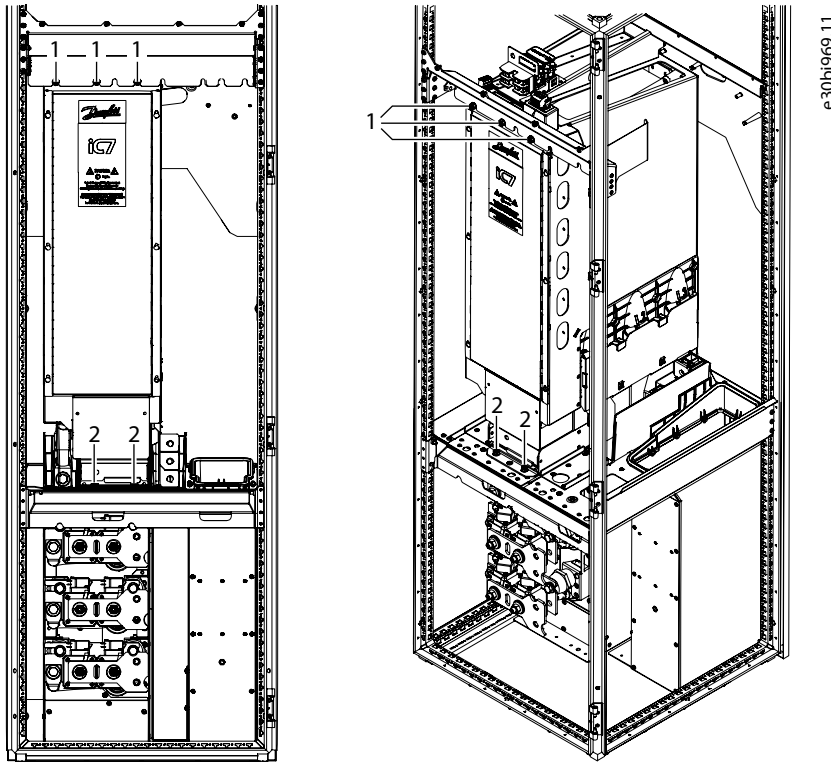


Illustration 4: Installing the LC Filter

- | | |
|---|---------------------------------------|
| 1 | The upper mounting holes in the front |
| 2 | The lower mounting holes in the front |

5. Push and slide the AFE module into the cabinet.

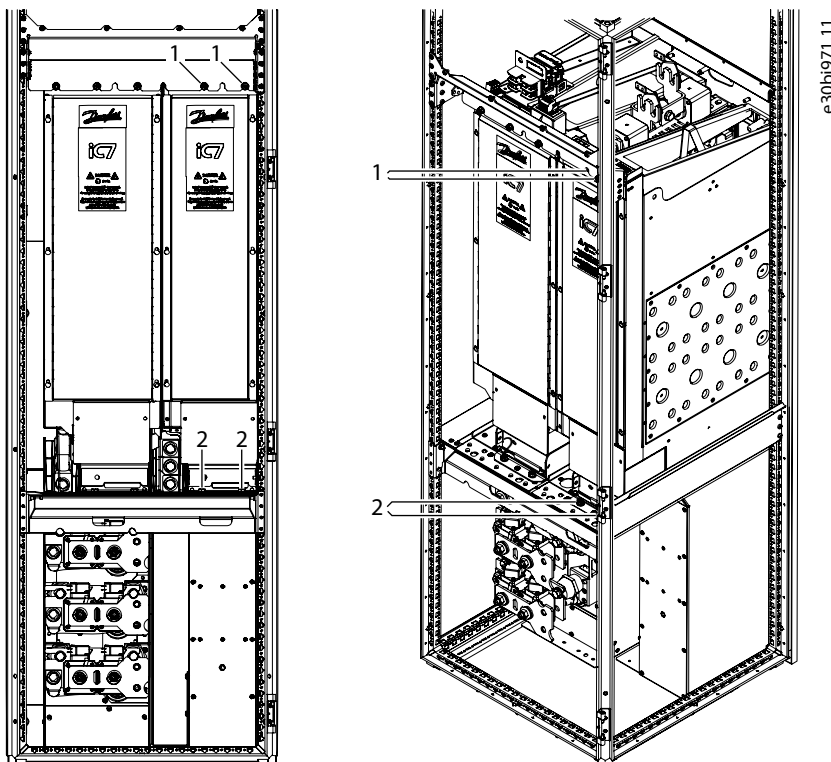


Illustration 5: Installing the AFE Module

- | | |
|---|---------------------------------------|
| 1 | The upper mounting holes in the front |
| 2 | The lower mounting holes in the front |

6. Mount the top front bracket.
7. Attach the LC Filter and AFE module to the front brackets at the top and bottom.

2.4 Cooling Requirements

The maximum ambient operating temperature of the LCL Filter is 40 °C (104 °F), with derating up to 55 °C (131 °F).

The product requires forced air cooling. Make sure that the cooling airflow through the filter is sufficient. The minimum airflow is 3 m/s (10 ft/s).

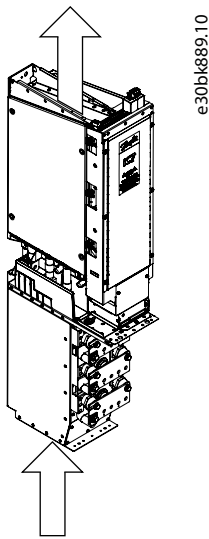
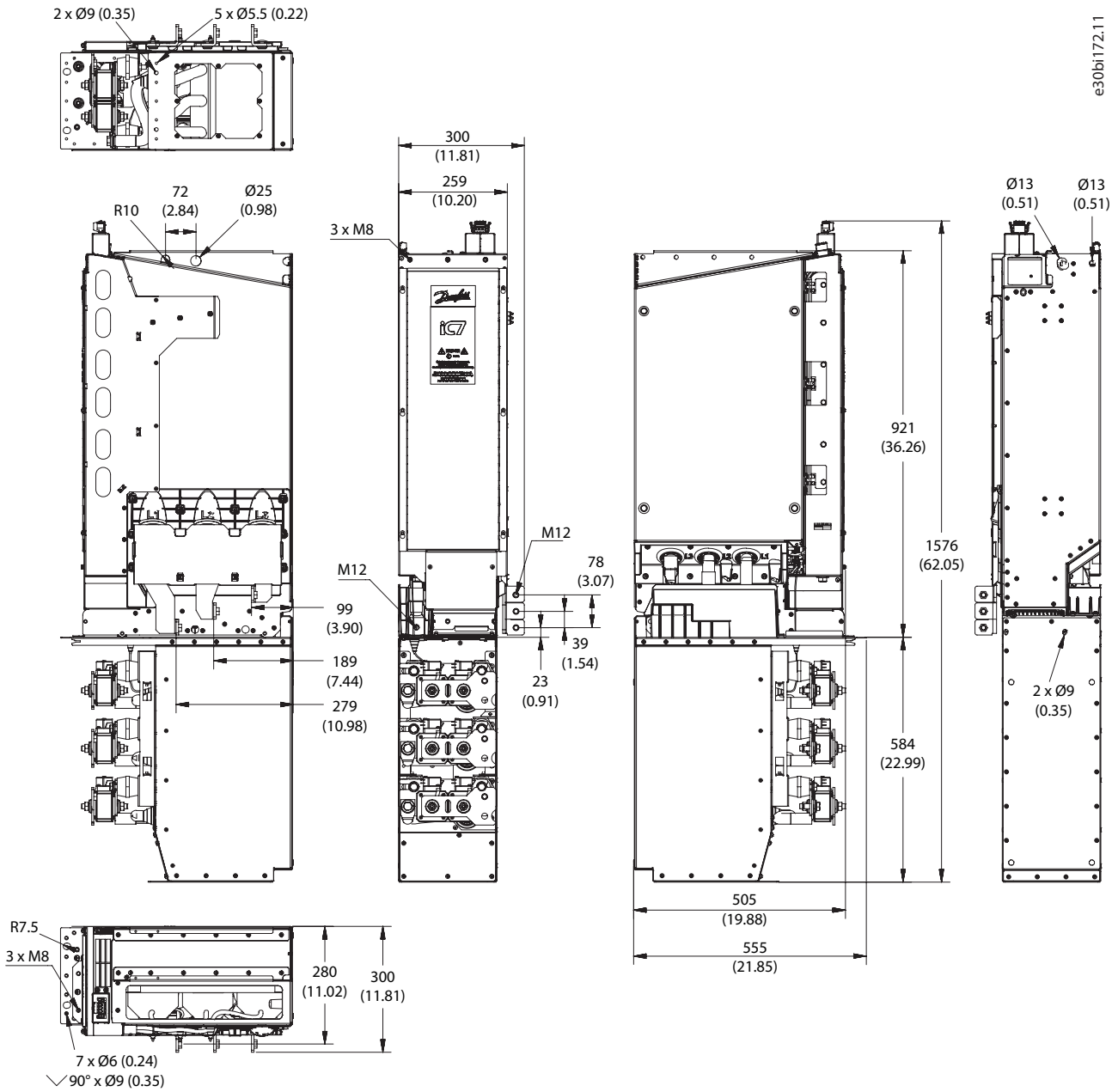


Illustration 6: Airflow Through the LCL Filter

2.5 Dimensions of the LCL Filter



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Illustration 7: Dimensions of the LCL Filter in mm (in)

3 Electrical Installation

3.1 Power Cabling

Install the LCL Filter at the input of the active front-end. If the AFE has parallel power units, install a separate LCL Filter at the input of each power unit.

See [3.10 Wiring Diagrams](#).

3.2 Cable Requirements

For information about recommended cable types and required cable sizes, see the iC7 Series Air-cooled System Modules Operating Guide.

3.3 Grounding

Ground the LCL Filter in accordance with applicable standards and directives.

Unless local wiring regulations state otherwise, the cross-sectional area of the protective grounding conductor must be at least ½ times of the phase conductor and made of the same material when the phase conductor cross-section is above 35 mm² according to IEC 60364-5-54; 543.1.

The connection must be fixed.

3.4 AC Fuses

The front-end modules in the drive system must be equipped with fast-acting AC fuses to limit the damage of the drive system. Install AC fuses at the input terminals of the LCL Filter.

The AC fuses are not included in the LCL Filter delivery. For the recommended fuse types and required fuse sizes, see the iC7 Series Air-cooled System Modules Operating Guide.

3.5 Installing the Cables

1. Connect the input cables of the LC Filter to the output terminals of the L Filter.

Use M12 bolts and tightening torque 70 Nm (620 in-lb).

2. Connect the mains cables to the mains terminals of the L Filter with internal cables or busbars.

Use M12 bolts and tightening torque 70 Nm (620 in-lb).

3. Connect the output terminals of the LC Filter to the input terminals of the power unit.

Use M12 bolts and tightening torque 70 Nm (620 in-lb).

4. Connect the grounding cable to the PE terminal.

Use M8 screws and tightening torque 20 Nm (177 in-lb).

3.6 Terminals

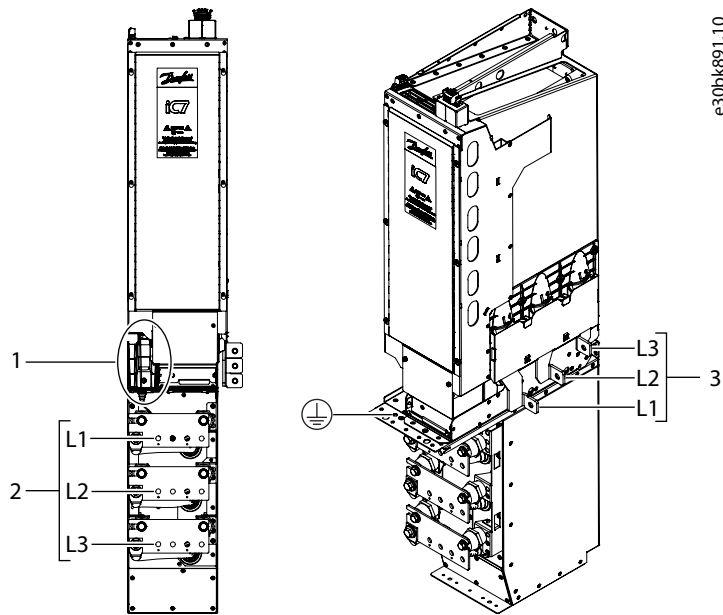


Illustration 8: Terminals of the LCL Filter

<p>1 Terminals between L Filter and LC Filter</p>	<p>3 LC Filter output terminals L1, L2, L3</p>
<p>2 L Filter input terminals L1, L2, L3</p>	

3.7 Connecting the LCL Filter Fan Supply

To enable the functioning of the LCL Filter fan, do these steps.

Table 1: DC-link Voltage Supply

Item	Value
Maximum load current	2 A
Maximum voltage	800 V DC

Table 2: Connector X121

Item	Value
Connector	Wago, 831-3103/037-000
Maximum wire insulation diameter	7 mm (0.3 in)
Wire stripping length	14 mm (0.6 in)
Conductor size	maximum 10 mm ² /AWG8
Fine-stranded conductor	ferrule maximum 6 mm ²

Table 3: Cable Requirements

Area	Requirements	Example wire
IEC	Minimum 800 V DC voltage Minimum 2 A current	Leoni BETrans® 4 GKW-ENX R 1800 V M, 1x2.5 mm ² , order number 312474
UL	Minimum 600 V Minimum size AWG14 Minimum rated for 80 °C (176 °F)	UL AWM style 10269, AWG14

N O T I C E

The LCL Filter fan supply is protected with internal fuses. Use external fuses if the local safety regulations or installation conditions require fuse protection.

⚠ W A R N I N G ⚠

SHOCK HAZARD FROM THE COMPONENTS

The components of the drive are live when the drive is connected to mains.

- Do not make changes in the AC drive when it is connected to mains.

Procedure (LCL Filter and AFE in an enclosure)

1. Consider ambient temperature and other installation conditions.
2. Refer to the local safety regulations.
3. Protect the installation against mechanical and environmental damage and use strain relief when necessary.
4. Connect the DC-link voltage supply from the DC link to the LCL Filter connector X121.

Pay attention to the correct polarity.

Do not connect the supply between the AFE module and the DC fuses. The supply connection point is after the AFE module fuses.

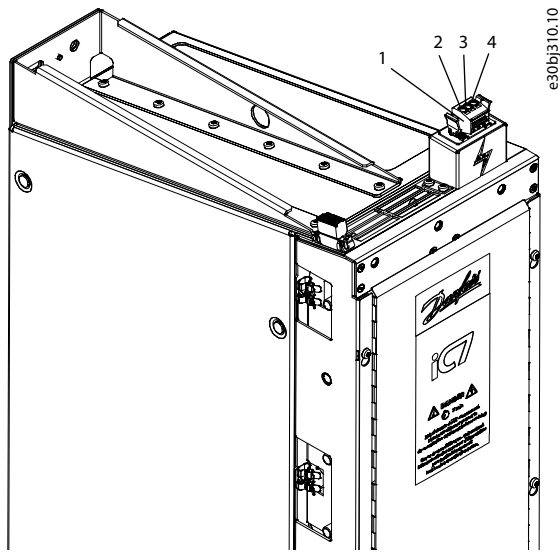


Illustration 9: Fan Supply Connector of the LCL Filter

1	Fan supply (X121)	3	Empty
2	465–800 V DC (+)	4	0 V DC (-)

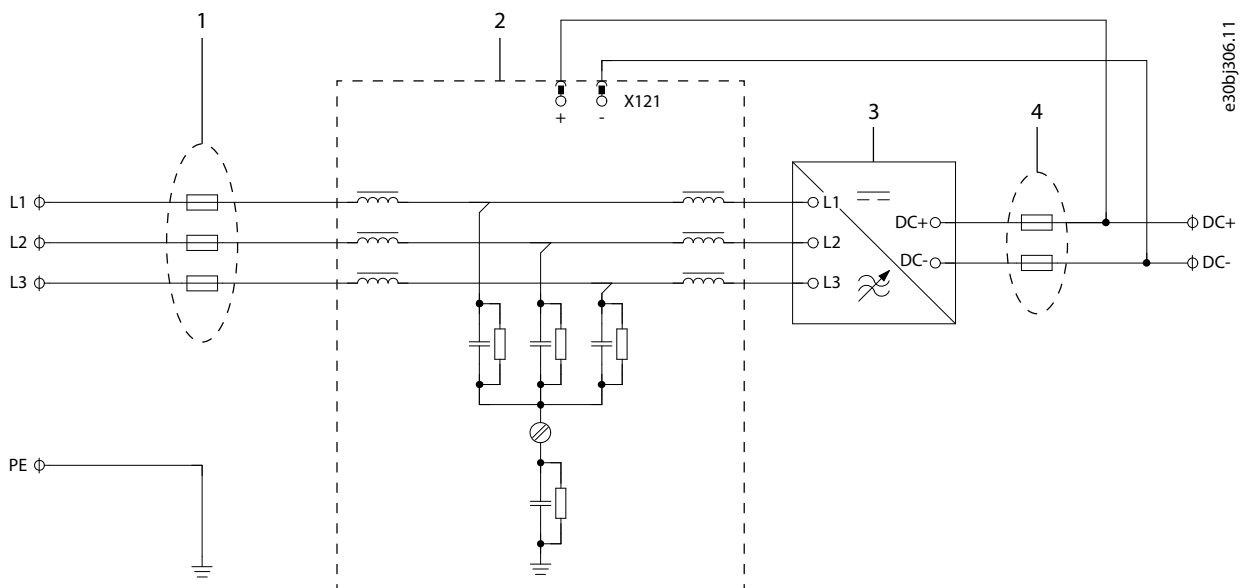


Illustration 10: Diagram of the LCL Filter Fan Supply

1	AC fuses	3	AFE module
2	LCL Filter	4	DC fuses

3.8 Preparing the AuxBus Cable

1. Cut the cable to the required length.
2. To reveal the wires, strip the cable at both ends.
3. At 1 end of the cable, remove approximately 15 mm (0.59 in) of the insulation of the cable.
4. Strip the wires 7 mm (0.28 in).

- Connect the wires to the terminals included in the delivery. Use the tightening torque 0.22–0.25 Nm (1.9–2.2 in-lb).

Table 4: Wiring of the AuxBus Terminals

Pin	Wire color	Signal
1	White	+24 V
2	Brown	GND
3	Green	CAN_H
4	Yellow	CAN_L
5	Grey	+24 V

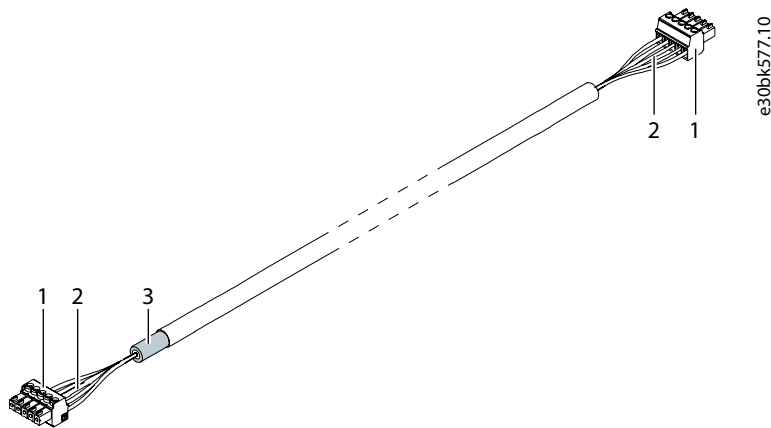


Illustration 11: The Ready AuxBus Cable

1	Terminals	3	Shield removed
2	Wires		

3.9 AuxBus Connections

NOTICE

For the drive to be able to protect the filters, AuxBus must be connected.

For more information about AuxBus, see the iC7 Series System Module operating guides.

- Connect the thermocouple wire from the L Filter to terminal X205 on the AuxBus temperature measurement board of the LC Filter.

The thermocouple wire of the LC Filter is connected to terminal X206.

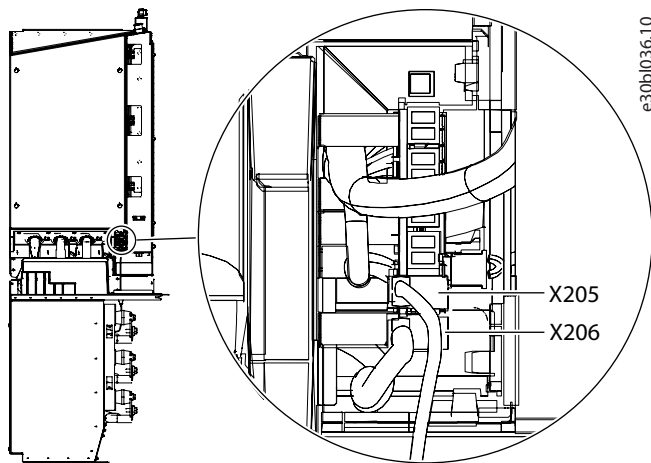


Illustration 12: Thermocouple Wiring in the LCL Filter

2. Connect the AuxBus cable between the filter and the power unit. If there are several power units and filters, connect each filter to the power units individually.
 - a. Connect the end of the AuxBus cable where the insulation was removed to terminal X25 on the power unit.
 - b. Connect the other end of the AuxBus cable to terminal X86 on the LCL.

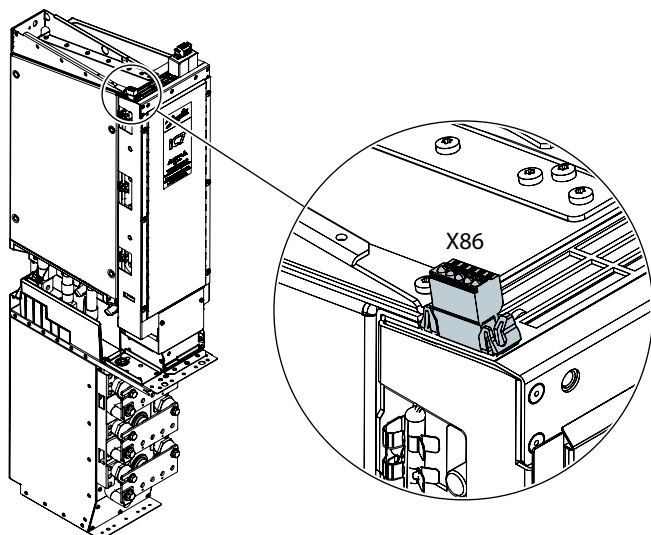
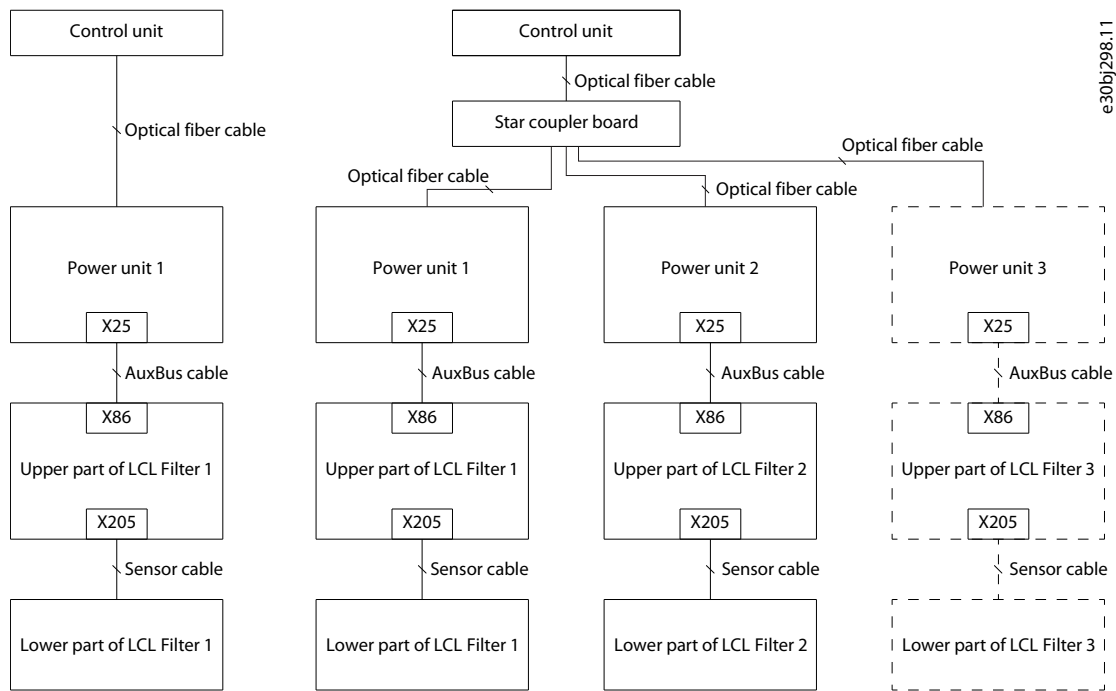


Illustration 13: Location of the X86 Terminal on the LCL Filter

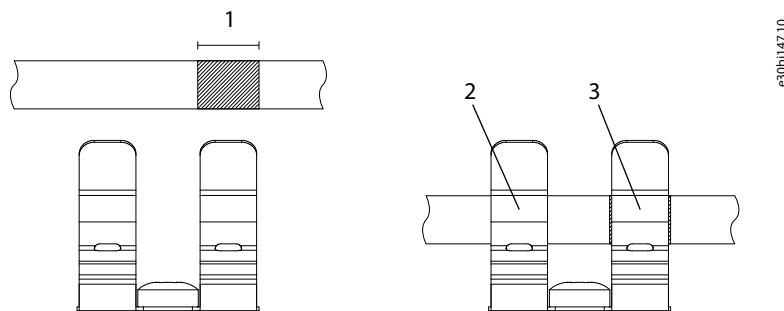


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Illustration 14: AuxBus Topology

3. Route the cable so that there is no risk of getting in touch with bare busbars or terminals.
4. Ground each AuxBus cable at 1 end, at the X25 terminal. To make the grounding connection, attach the shield of the cable to the frame with a cable clamp.

The lower part of the cable clamp fixes the cable to the plate and provides strain relief. The upper part provides ~360° grounding for the cable shield.



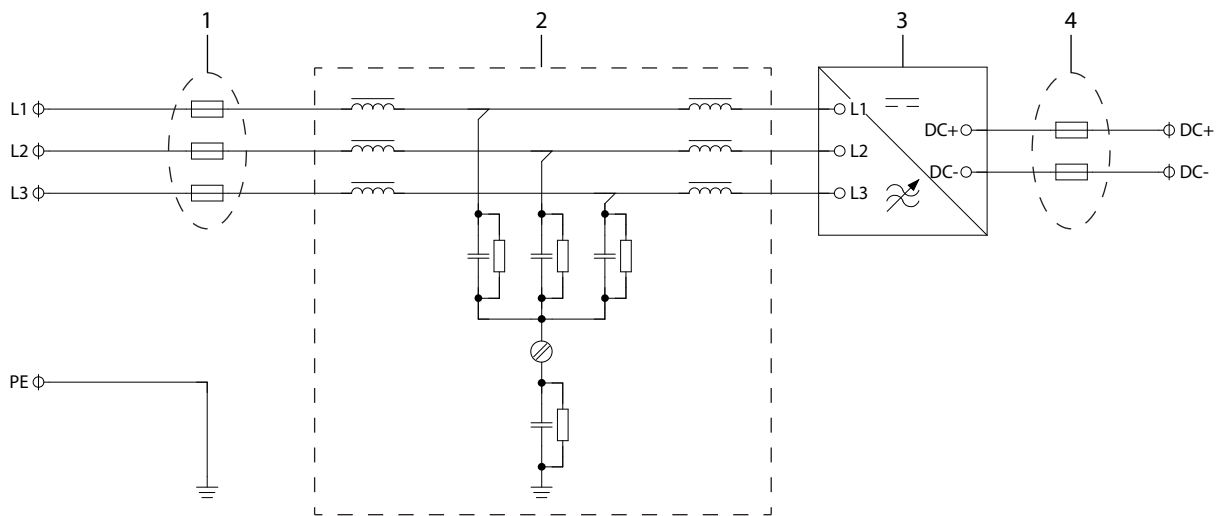
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Illustration 15: Using the Cable Clamps

1	Stripping length, 15 mm (0.59 in)	3	Grounding
2	Strain relief		

5. At the terminal X86 end of the cable, place the cable in a cable clamp for strain relief.

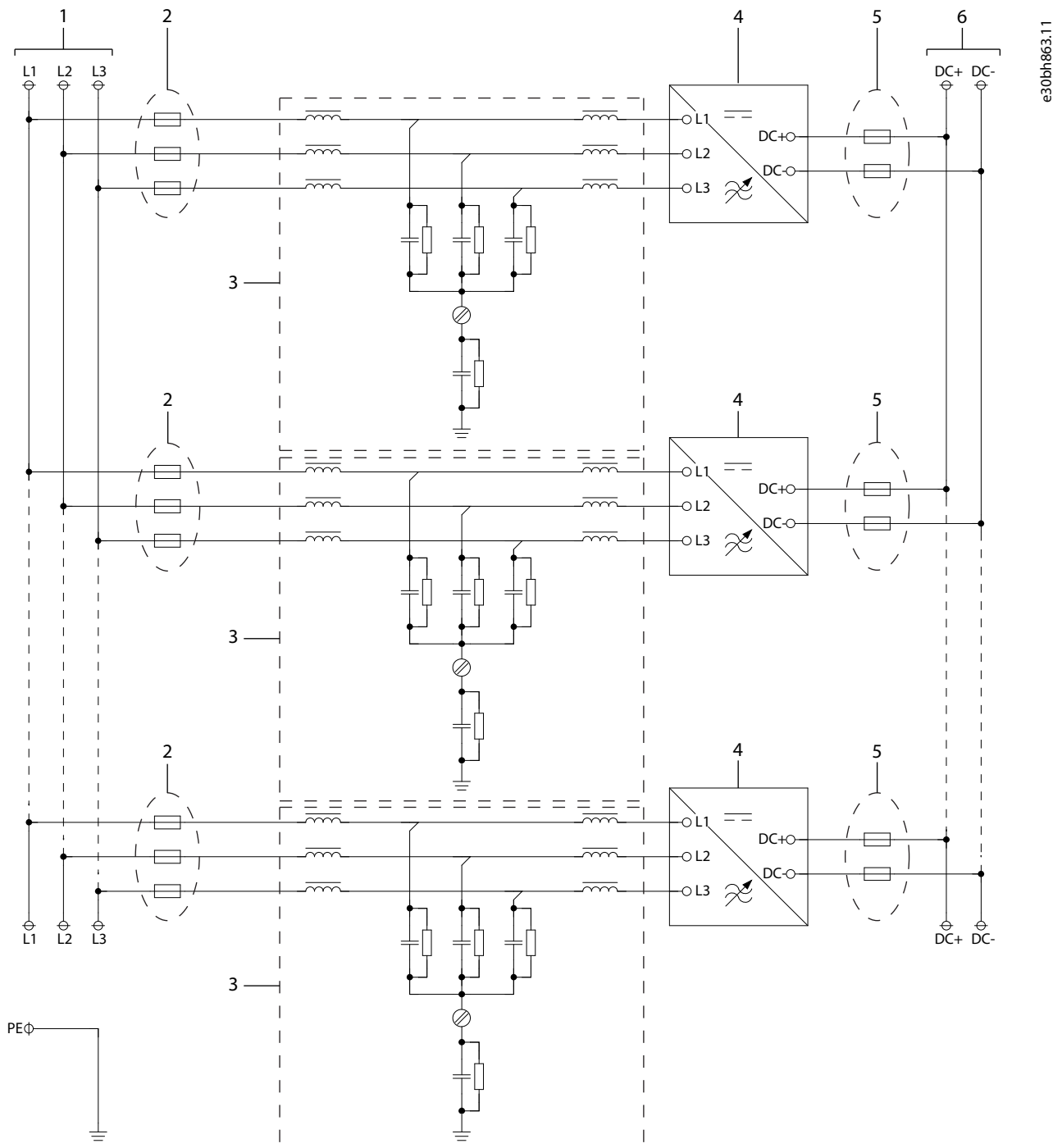
3.10 Wiring Diagrams



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Illustration 16: Wiring Diagram, AFE Module and LCL Filter

1	AC fuses (option)	3	AFE module
2	LCL Filter	4	DC fuses (option)



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Illustration 17: Wiring Diagram, AFE Modules with Parallel Power Units and LCL Filters

1	Common AC bus	4	AFE modules
2	AC fuses (option)	5	DC fuses (option)
3	LCL Filters	6	Common DC bus

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