




Filter RFI suppression filter

System Manual

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Safety Guidelines

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
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.
CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.
NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.


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 device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

 WARNING
This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

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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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Introduction

1.1 Structure and content of the manual

Purpose of the manual

This manual contains all the information required for connecting and using the 4EF15 RFI suppression filter. The 4EF15 RFI suppression filter is a converter component.

This manual describes EMC-compliant connection of the 4EF15 RFI suppression filter, as well as its functions.

Target group

This manual is intended for any user involved in:

- Installing
- Servicing and maintaining
- Planning and configuring systems

Required basic knowledge

A general knowledge of the field of electrical engineering is required to understand this manual.

Standards and certifications

EN133200 is the standard that applies to the RFI suppression filter.

Correction sheet

The Appendix contains a correction sheet. Please use it to record your suggestions for improvements, additions and corrections, and return the sheet to us. This will help us to improve the next edition of the manual.

1.2 Laws and directives

Disclaimer of liability

It is the responsibility of the manufacturer to ensure that a system or machine is functioning properly as a whole. SIEMENS AG, its regional offices, and associated companies (hereinafter referred to as "SIEMENS") cannot guarantee all the properties of a whole plant system or machine that has not been designed by SIEMENS.

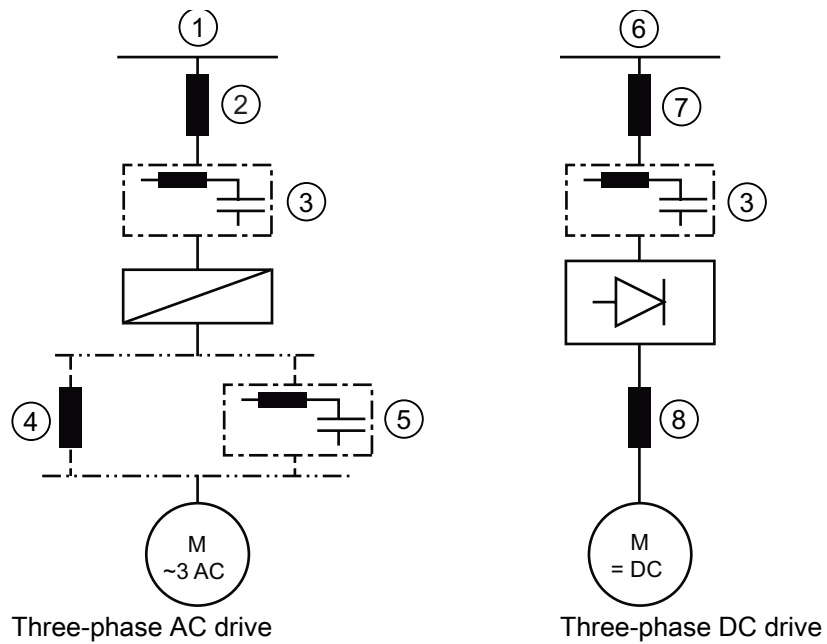
Nor can SIEMENS assume liability for recommendations that appear or are implied in the following description. No new guarantee, warranty, or liability claims beyond the scope of the SIEMENS general terms of supply are to be derived or inferred from the following description.

Product line

2.1 Components

Reactors and filters

SIDAC reactors and filters are drive components. SIDAC reactors and filter components are used with AC and DC drives.



- 1 AC drive 3-ph. supply
- 2 Line reactor
- 3 RFI suppression filter
- 4 Output reactor
- 5 Sine-wave filter
- 6 DC drive 3-ph. supply
- 7 Commutating reactor
- 8 Smoothing reactor

SIDAC line reactors/commutating reactors

SIDAC line reactors and commutating reactors have the following properties:

- SIDAC line reactors/commutating reactors are installed upstream of the three-phase DC drive or three-phase AC drive.
- Line reactors/commutating reactors reduce the proportion of low-frequency harmonics on the line, thereby improving the power factor.
- Line reactors/commutating reactors avoid mutual interference caused by low-frequency noise and protect the converter input. The capacitive DC link of frequency converters is protected.

SIDAC RFI suppression filters

SIDAC RFI suppression filters have the following properties:

- SIDAC RFI suppression filters are installed upstream of the three-phase DC drive or three-phase AC drive.
- RFI suppression filters avoid mutual interference caused by high-frequency interference currents.

SIDAC output reactors and sine-wave filters

SIDAC output reactors and sine-wave filters have the following properties:

- SIDAC output reactors and sine-wave filters are installed downstream of the three-phase AC drive (frequency converter).
- SIDAC output reactors and sine-wave filters increase the service life of the motor and improve system reliability.

SIDAC smoothing reactors

SIDAC smoothing reactors have the following properties:

- SIDAC smoothing reactors are used in the load circuit of DC drives.
- SIDAC smoothing reactors reduce the harmonic content for the DC motor as well as the rate of current rise, thereby enabling the use of DC high-speed circuit breakers.

2.2 Device description

Device versions

RFI suppression filters are available in single-phase and three-phase versions. Each device is assigned to a converter requiring radio-interference suppression in respect of the line. Most devices are equipped with finger-safe terminals and these filters offer IP20 degree of protection. All filters with flat connectors are designed for IP00 degree of protection.

Application

RFI suppression filters are installed in the line-side supply, upstream of a converter. AC currents with the mains frequency as the fundamental frequency flow through them.

EMC regulations

Compliance with EMC regulations must be ensured in individual cases by means of an application-specific measurement. The converter's rating data must be taken into account when selecting a filter.

Capacitor discharge

The filters feature built-in discharge resistors so that the energy stored in the capacitors can be quickly reduced, thereby ensuring that the voltage at the terminals drops to within permissible levels.

However, before carrying out any work on the filter, check that it is safely isolated from the supply.

Product combination

3.1 Functional optimization

You can make the most of RFI suppression filters by combining them with other products from the same product line.

Line reactors

To benefit from an additional reduction in phase effects on the system, combine the RFI suppression filter with a SIDAC line reactor/commutating reactor.

SIDAC output reactors/sine-wave filters

To ensure optimum operation of the RFI suppression filter, a motor-cable length of 50 m is recommended as the absolute maximum. When using an RFI suppression filter, the maximum possible motor-cable length can be increased by using SIDAC output reactors or sine-wave filters.

Application-specific measurement is required

Ensure compliance with EMC regulations in individual cases by means of an application-specific measurement. This measurement must be requested and ordered separately. The converter's rating data must be taken into account when selecting a filter.

For more detailed advice, please send an e-mail to: MD_Anfrage@brmr.siemens.de

Functions

4.1 Method of operation

Functions

RFI suppression filters support the following functions:

- RFI suppression filters damp and limit conducted high-frequency (>150 kHz ... 30 MHz) interference voltages.
- Line filters for compliance with EN 55011 Class A are designed to reduce converter interference voltages to within the limit values for industrial supplies.
- Line filters for compliance with EN 55011 Class B are designed to reduce converter interference voltages to within the limit values for public supplies.
 - Radio interference level B can generally only be achieved through the additional use of a line reactor.
 - These filters also ensure compliance with Class A limit values.
- Ensure compliance with EMC regulations in individual cases by means of an application-specific measurement.

Operation planning

5.1 Transport

Transport

Products must be transported with care and if possible in their original packaging. If necessary, suitable and sufficiently dimensioned transport equipment (e.g., rope guides, lifting beams, etc.) must be used.

5.2 Storage

Storage

If the devices are not going to be assembled and put into operation immediately, they must be stored in a dry and dust-free location in accordance with the permissible storage conditions below:

Storage temperature	-25°C to +85°C
Transport temperature range	-25°C to +85°C

5.3 Configuration

Use the following flowchart to configure use of a RFI suppression filter.

RFI-suppression-filter decision chart

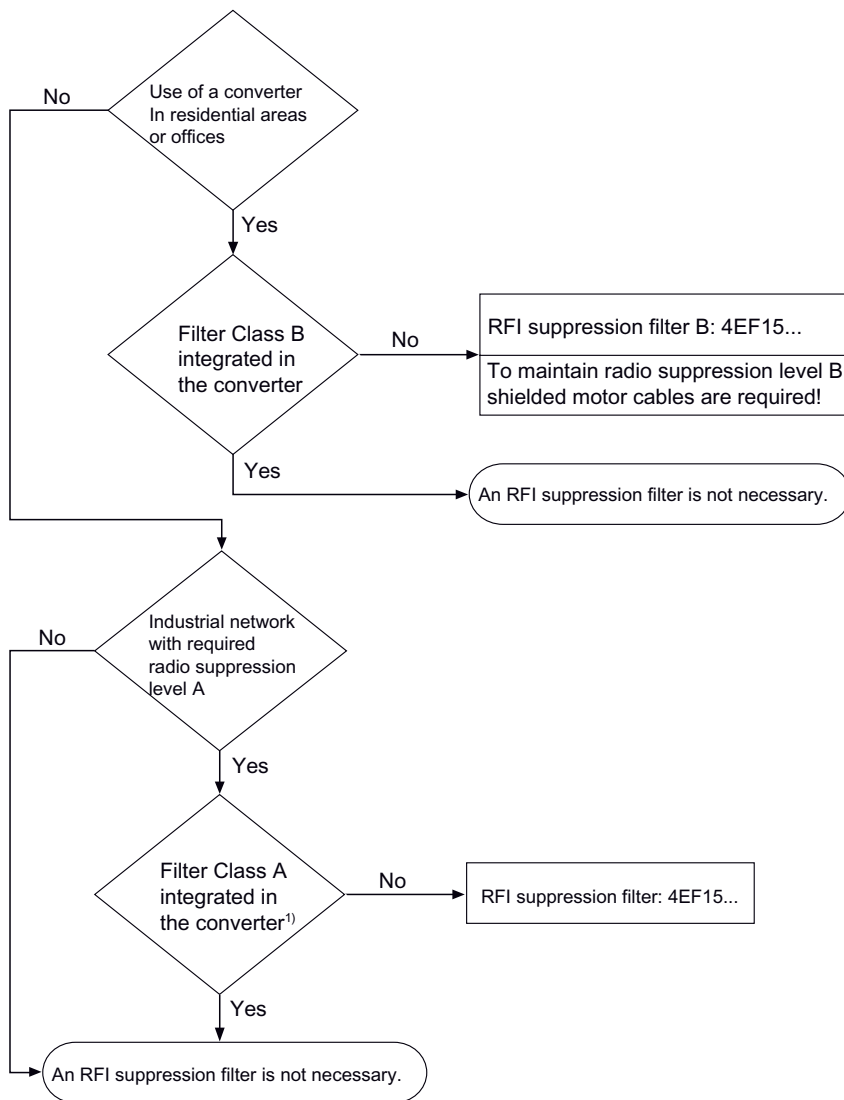


Figure 5-1 Configuring, RFI suppression filter

1) If a Class A RFI suppression filter is already integrated into the converter, it is not possible to connect another RFI suppression filter in series. This could result in the malfunction of the converter system and in turn damage the converter or individual components.

5.4 EMC-compliant configuration of drive systems

The basic rules of EMC

The following 20 rules must be adhered to for the configuration of EMC-compliant drive systems. Rules 1 to 13 apply on a general level. Rules 14 to 20 are particularly important for limiting emitted interference.

General rules

Rule 1

- Ensure that all metal parts of the control cabinet are surface-connected with good conductivity (not paint on paint). If necessary, use contact washers or serrated lock washers.
- When connecting the control-cabinet door to the control cabinet, use bonding strips that are as short as possible (also see Rule 20).
- Suitable line/commutating reactors are recommended as a means of counteracting low-frequency phase effects on the system and protecting the converter. You must install these between the line connection and the RFI suppression filter inside a metal cabinet. Ensure that the control-cabinet configuration, system configuration and wiring are carried out in compliance with the rules of EMC-compliant configuration.
- On the line side, route the grounding to the motor via the reactor, filter and converter.

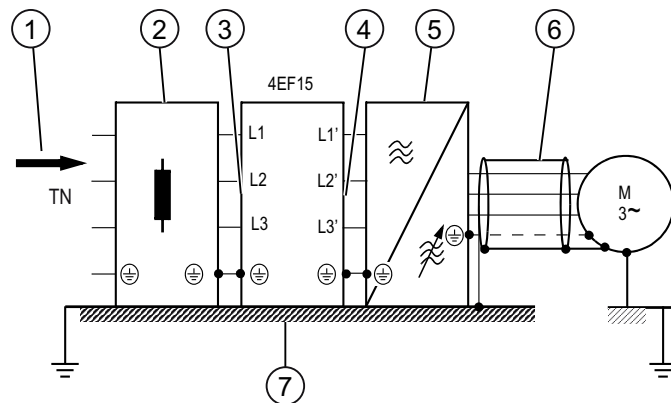


Figure 5-2 Mounting on mounting plate

1	TN system
2	Line reactor
3	Supply system
4	Load
5	Frequency converter
6	Shielded motor cable
7	Metal mounting plate

Grounding systems/machines and grounding drives

- The grounding of systems/machines is a protective measure.
- In the case of drives, grounding affects emitted interference and interference immunity.
- System grounding can be carried out point-to-point or two-dimensionally.
- For drives, select two-dimensional grounding, i.e. all the parts of the system that need to be grounded are connected two-dimensionally or as a mesh.
 - The motor must be connected using a shielded cable.
 - Unshielded motor cables must only be used in conjunction with a sine-wave filter.
 - The shield must be applied to the surface of the motor and converter.

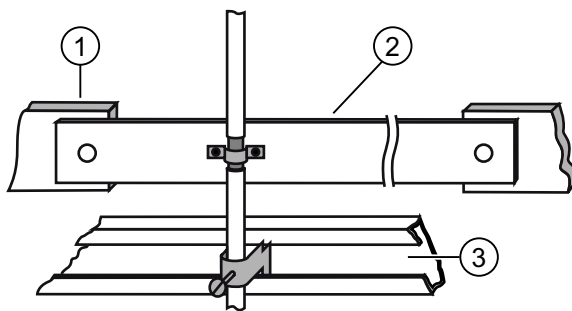


Figure 5-3 Shield connection of motor cables inside control cabinet

- 1 Connect to cabinet enclosure on both sides ensuring good conductivity and maximum contact area
- 2 Shielding bus
- 3 Cable propping bar

Rule 2

- When laying the signal cables and power cables, ensure that sufficient space is left between them (minimum distance: 20 cm).
- Avoid data links
- Provide separators between electric power cables and signal cables.
- Ensure multiple grounding of separators

Rule 3

Connect contactors, relays, solenoid valves, electromechanical hours counters, etc., inside control cabinet using interference suppression combination, e.g. RC elements, diodes, varistors. Install the protective circuit directly on the relevant coil.

Rule 4

Twist unshielded cables from the same electric circuit (go and return conductors) or ensure that the surface area between the go and return conductors is as small as possible to avoid unnecessary frame antennae.

Rule 5

Avoid unnecessarily long cables. Thus coupling capacities and coupling inductivities are kept small.

Rule 6

Ground spare cores at both ends. This achieves an additional shielding effect.

Rule 7

Lay cables close to grounded plates to reduce interference injection. You should not, therefore, route wiring and spare cables randomly within the cabinet; instead, keep them close to the cabinet enclosure/mounting plates.

Rule 8

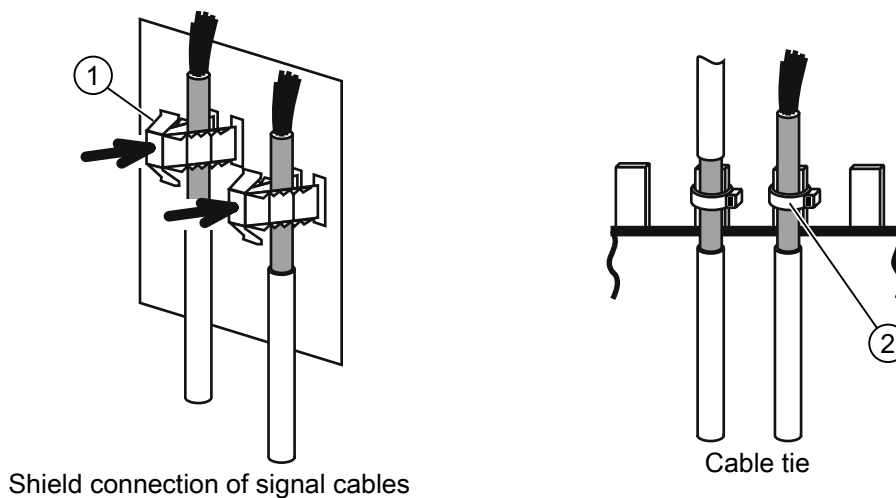
Use a shielded cable to connect tachometers, encoders and resolvers. Connect the shield to the tachometer, encoder or resolver and to the converter, ensuring maximum contact area. The shield must not be broken at any point, e.g. by intermediate terminals.

Rule 9

- Ground the shields of digital signal cables on both sides (sender and receiver), ensuring maximum contact area and good conductivity.
- In the event of poor equipotential bonding between the shield connections, run an additional equalizing conductor with a cross-section of at least 10 mm² parallel to the shield for the purpose of reducing the shield current.
- Multiple grounding of the shields (= connection to cabinet enclosure) is possible. Multiple grounding of the shields is even possible outside the control cabinet.
- Foil shields are at least 5 times less effective than braided shields.

Rule 10

- Ground the shields of analog signal cables with good equipotential bonding on both sides. Good equipotential bonding is achieved if Rule 1 is followed.
- If low-frequency interference occurs on the analog lines, e.g.: Speed/measured value fluctuations as a result of equalizing currents (hum) then connect the analog signal shield to the signal sink on one side, e.g. analog input of the converter. Ground the other side of the shield via a capacitor (e.g. 10 nF/100 V Type MKT). The use of the capacitor means that the shield is connected for high frequencies on both sides.



- 1 Shield clip
- 2 Cable tie

Rule 11

Only route signal cables into the cabinet from one side

Rule 12

- If converters are to be operated by means of an external 24 V power supply, this supply must not be connected to a number of loads that have been installed separately inside different control cabinets (hum loops!).
- Ensure that there is a separate power supply for each converter.

Rule 13

- Avoid interference injection via the line connection.
- Connect the converter and PLCs/control electronics to different line supplies.
- If only one common line supply is available, isolate the PLCs/control electronics from the line supply by means of an isolating transformer.

Rules for limiting emitted interference

Rule 14

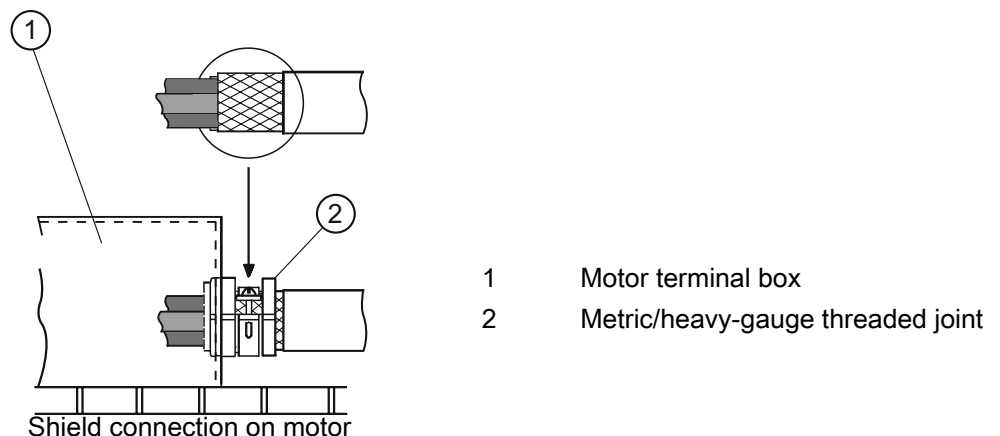
- An RFI suppression filter must be used to ensure compliance with limit class A or B (EN 55011) even in cases where sine-wave filters or dv/dt filters have been installed between the motor and the converter.
- The issue of whether an additional filter is required for further loads depends on the controller used and how the rest of the control cabinet is wired.

Rule 15

- Ensure that the RFI suppression filter is located in the vicinity of the source.
- Ensure that the filter is surface-connected to the control-cabinet enclosure, mounting plate, etc. A bright, metallic mounting plate is preferable (e.g. stainless steel, galvanized steel), since the entire contact surface establishes the electrical contact. If a painted mounting plate is used, the screw positions for mounting the frequency converter and and RFI suppression filter must be paint-free to ensure electrical contact with the mounting plate.
- Physically separate the input and output cables of the RFI suppression filter.

Rule 16

- Use shielded cables to connect all variable-speed motors in order to limit emitted interference.
- Connect both sides of the shields to the relevant enclosures in a manner that ensures low inductance (short and maximum possible contact area).
- Shield the motor cables inside the control cabinet or shield them by means of grounded separators. Suitable motor cables include, for example, Siemens PROTOFLEX-EMV-CY (4 x 1.5 mm² ... 4 x 120 mm²) with Cu shield. Cables with steel shields are not suitable.
- Use a suitable screwed joint with shield contact on the motor for the shield connection. Make sure that there is a low-impedance connection between the motor terminal box and motor housing. If necessary, use an additional flexible grounding wire. The motor terminal box must not be made of plastic.



Rule 17

Install a line reactor between the RFI suppression filter and the line supply.

Rule 18

Physically separate the power supply cable and motor cables, e.g. by using grounded separators.

Rule 19

The shield between the motor and converter must not be broken at any point as a result of integrating components such as output reactors, sine-wave filters, dv/dt filters, fuses and contactors. Assemble the components on a mounting plate, which will simultaneously serve as the shield connection for the incoming and outgoing motor cables. It may be necessary to use grounded separators for the purpose of shielding the components.

Rule 20

- To limit interference radiation (particularly in the case of limit class B), all cables connected to the control cabinet from the outside must be shielded in addition to the power supply cable.
- When mounting inside a cabinet, install the RFI suppression filter (and if necessary a reactor) in the direct vicinity of the converter.
- When laying cables, keep them as short as possible.
- When connecting the power supply cable to the RFI suppression filter (or reactor), ensure that it is kept separate from other cables so that no interference can be injected into the interference-suppressed power supply cable that would partially cancel out the effects of the RFI suppression filter.
- Connect the housing of the converter and RFI suppression filter with low resistance for high-frequency interference currents. This can be achieved by placing the converter and RFI suppression filter on the same mounting plate. Ensure that the converter and RFI suppression filter are surface-connected to this mounting plate. The best solution here is to use a bare metal mounting plate (e.g. made of stainless steel or galvanized sheet-steel), since the total contact surface establishes the electrical contact. If a painted mounting plate is used, the screw positions for the converter and RFI suppression filter must be paint-free to ensure electrical contact with the mounting plate.

Assembly

6.1 Assembly

Assembly/Installation

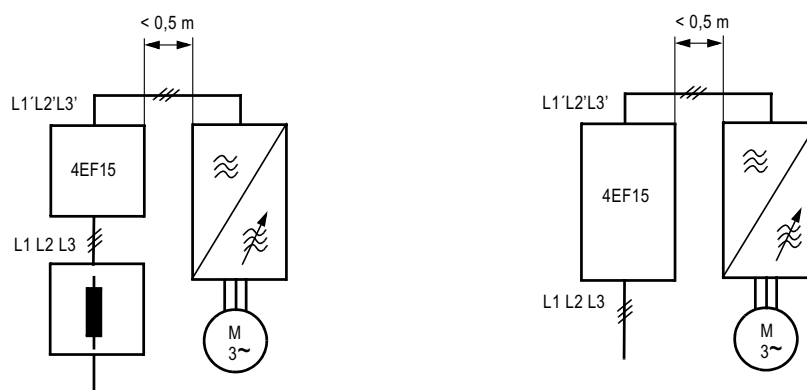
Install the RFI suppression filter on a bare metal plate.

Proceed as follows to install the RFI suppression filter inside a control cabinet:

- Install the RFI suppression filter (and reactor, if required) directly upstream of or next to the converter.
- When laying cables, keep them as short as possible.

When connecting the power supply cable to the RFI suppression filter (or reactor), ensure that it is kept separate from other cables so that no interference can be injected into the interference-suppressed power supply cable that would partially cancel out the effects of the RFI suppression filter.

Some installation examples are illustrated below:



Boring dimensions

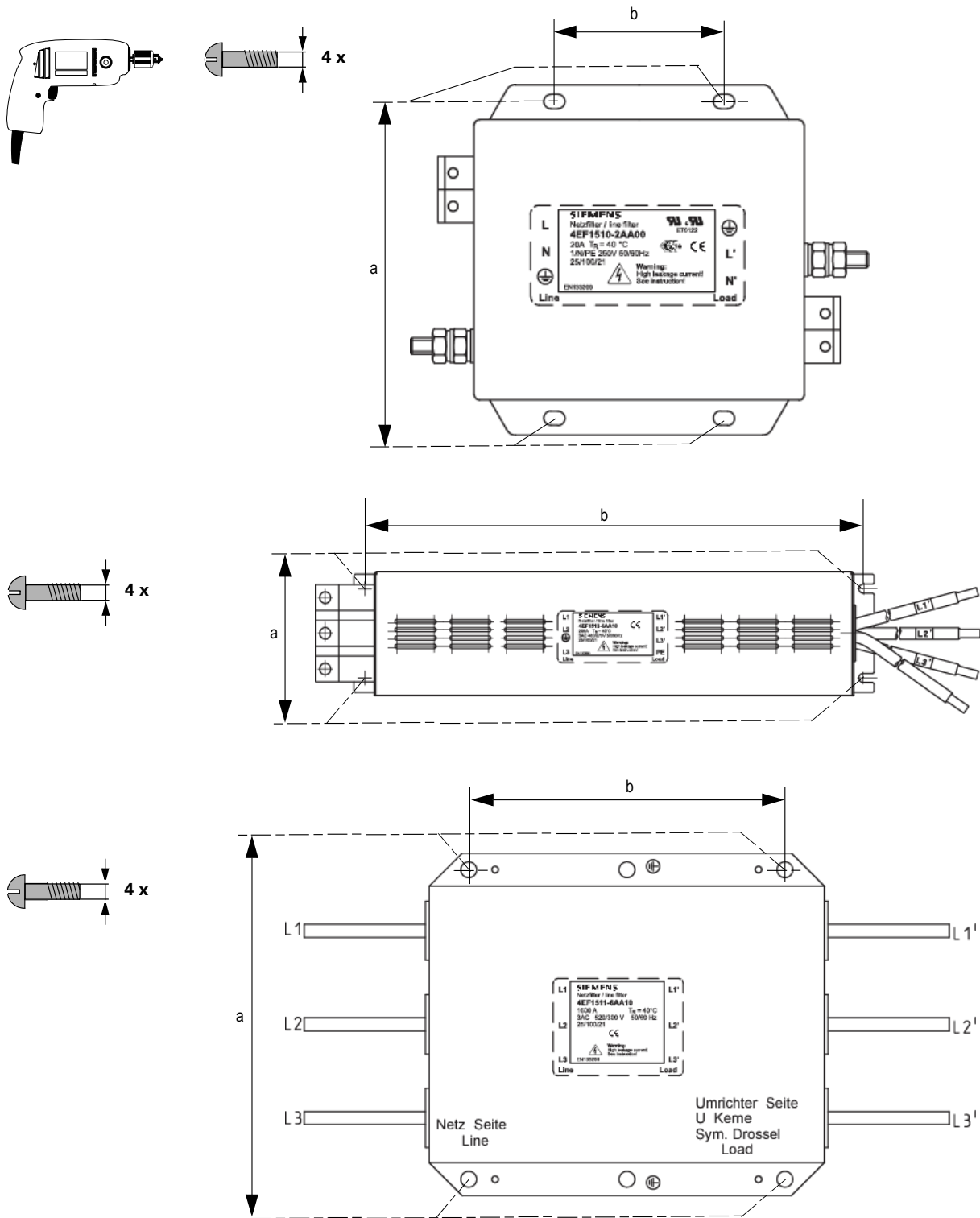


Figure 6-1 Boring dimensions

MLFB	Dimensions (mm)	a (mm)	b (mm)
4EF1510-1AA00	133 x 50.8 x 44.5	60.4	101.6
4EF1510-2AA00	99 x 84.0 x 68.0	95.2	50.8
4EF1510-3AA00	121 x 86.0 x 61.0	100	70
4EF1510-4AA00			
4EF1510-5AA00			
4EF1510-6AA00	156 x 86.0 x 81.0	100	70
4EF1510-1AA10	133.7 x 51.4 x 63	38	155
4EF1510-2AA10	199.5 x 46.4 x 70	38	221
4EF1510-3AA10	199.5 x 46.4 x 83	38	221
4EF1510-4AA10	200.0 x 57.0 x 90	35	255
4EF1510-5AA10			
4EF1510-6AA10	200.0 x 58.0 x 141.5	35	255
4EF1510-7AA10	240.0 x 80.0 x 135	60	255
4EF1510-8AA10	240.0 x 90.0 x 150	60	255
4EF1512-7AA10	240.0 x 90.0 x 150	65	255
4EF1511-0AA10	400 x 110 x 220	85	415
4EF1511-1AA10	200 x 140 x 110	155	145
4EF1511-2AA10	230 x 140 x 116	165	170
4EF1511-3AA10			
4EF1511-4AA10			
4EF1511-5AA10	300 x 210 x 140	235	240
4EF1511-6AA10			
4EF1511-7AA10	200 x 50 x 80	25	215
4EF1511-8AA10			
4EF1512-8AA10	250 x 60 x 150	35	265
4EF1512-0AA10			
4EF1512-1AA10	300 x 60 x 150	35	315
4EF1512-2AA10	300 x 80 x 150	55	315
4EF1512-3AA10	300 x 80 x 200	55	315
4EF1512-4AA10	350 x 90 x 200	65	365
4EF1512-5AA10			
4EF1512-6AA10	400 x 110 x 220	85	415

6.2 Installation instructions

EMC-compliant configuration

To ensure problem-free operation of the filter, the configuration of the drive system must be EMC-compliant. The basic rules for the EMC-compliant configuration of drive systems are outlined in the previous section.

Mounting and interference suppression

RFI suppression filters feature a metallic housing. The 4 screws used for screw mounting ensure:

- Mechanical fastening
- That the RFI suppression filter is shielded by means of a generous contact-area connection to the reference ground.

High-frequency interference currents

The housing of the converter and RFI suppression filter must be connected with low resistance for high-frequency interference currents. To achieve this, proceed as follows:

- Install the converter and RFI suppression filter on a single bare metal mounting plate (stainless steel or galvanized sheet-steel). The total contact surface establishes the electrical contact.
- If a painted mounting plate is used, ensure that the screw positions for the converter and RFI suppression filter are paint-free so that electrical contact with the mounting plate can be ensured.

Note

Shielded cable for motor connection

If an output filter is not used in conjunction with a frequency converter, the motor must be connected by means of a shielded cable. Ensure that the shield makes full surface contact with the motor and converter.

Connection

7.1 Prerequisites and definitions

Use in TN systems

RFI suppression filters must only be used in TN systems (grounded neutral point).

Definition: TN system

TN systems have one point directly grounded. The exposed conductive parts of the electrical installation are connected to this point by protective conductors.

There are 3 different subsystems:

- TN-S system
- TN-C system
- TN-C-S system

Distribution systems

The figure below shows the naming structure used for distribution systems:

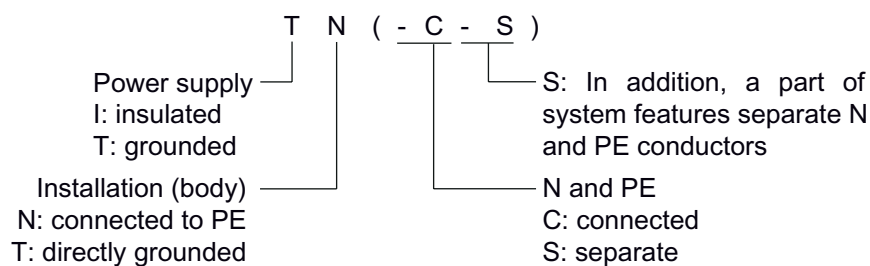


Figure 7-1 Naming of distribution systems

PE connection

For details about this and grounding, please see "EMC-compliant configuration of drive systems".

Materials to be used

The following materials must be used for the connection:

- Busbar material: Copper
- Bolt: Strength class 8.8 or higher in accordance with ISO 898 Part 1, tZn (hot-galvanized) anti-corrosion protection
- Nut: Strength class 8 or higher in accordance with ISO 898 Part 2, tZn (hot-galvanized) anti-corrosion protection
- Spring element on bolt and nut side:
Clamping washer to DIN 6796 Part 2, with anti-corrosion protection
- Lubricant: based on MoS₂

7.2 Connection options

Connection via connection bolts

The tightening torques given in the following table apply to current-carrying and PE connections to the filter, in cases where contact is made via threaded pins:

Nominal size: Threaded pins	Tightening torque in Nm (Tolerance details for set values)
M4	1.2 (1.10 ... 1.30)
M5	2.0 (1.9 0... 2.10)
M6	3.0 (2.85 ... 3.15)
M8	6.0 (5.70 ... 6.30)
M10	10.0 (9.0 ... 11.0)
M12	15.5 (14.0 ... 17.0)

Connection via terminal blocks

Use terminal blocks for the line-supply connection and the connection on the load side of the filter. The tightening torques given in the following table apply:

Cross-section of connecting terminals	Tightening torque in Nm
Up to 4 mm ²	0.5 ... 0.8
Up to 10 mm ²	1.2 ... 1.5
Up to 16 mm ²	2.0 ... 2.3
Up to 25 mm ²	4.0 ... 4.5
Up to 35 mm ²	3.2 ... 3.7
Up to 50 mm ²	6.0 ... 8.0
Up to 95 mm ²	15 ... 20

Connection via busbars

Copper busbars sometimes have to be used as connection elements in conjunction with EMC filters with rated currents >100 A. To ensure the necessary surface pressure with the busbars, the tightening torques given in the following table apply:

Nominal size: Bolt/nut	Tightening torque in Nm
M8	15
M10	30
M12	60

Flat connectors

The following graphic illustrates a flat connector:

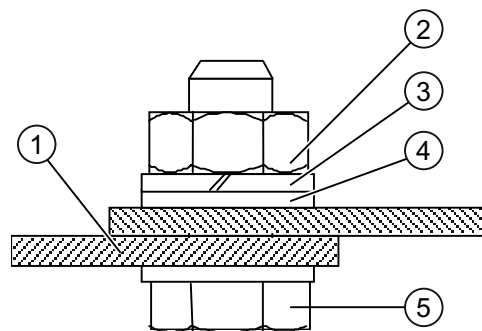


Figure 7-2 Flat connector

		Current A/Current I _{thmax}		
		Up to 250 A	Up to 600 A	Up to 1600 A
1	Hexagon bolt, DIN EN ISO 4017, strength class 8.8	M8	M10	M12
2	Hexagon bolt, DIN EN 24032, strength class 8	M8	M10	M12
3	Clamping washer, DIN 6796	8.4 x 16	10.5 x 20	13 x 29
4	Spring lock washer, DIN 128	8.2 x 14.4	10.5 x 17.4	12.7 x 21.1
5	Flat connector	—	—	—
Without	Tightening torque, Nm	15	30	60

Commissioning

8.1 Operation

Operation

The following must be observed when operating the RFI suppression filter:

- Compliance with the rating data on the rating plate is necessary if proper use of the RFI suppression filter is to be ensured.
- If you notice any deviations from normal operation (increased power consumption, temperature or levels of vibration, unusual noises or odors, monitoring devices tripping, etc.), the device is probably no longer functioning correctly.

In such an event, you must notify the responsible service personnel immediately to prevent faults that could result in personal injury or material damage.

- If in doubt, shut down the equipment concerned immediately.


Service and maintenance

9.1 Service/Maintenance

You must comply with the following safety regulations before commencing work on electrical installations:

1. Isolate from the supply
2. Secure against accidental restart
3. Check safe isolation from supply
4. Grounding and short-circuiting
5. Cover all nearby live parts

Checking safe isolation from supply

 WARNING
Danger, high voltage Danger of death or serious injury. Before commencing work on a RFI suppression filter, you must check that it is safely isolated from the supply (e.g., using a meter).

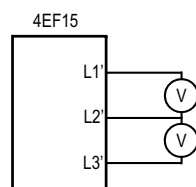


Figure 9-1 Measuring voltage levels

Service

The following service operations should be carried out regularly (preferably on an annual basis):

- General visual check
- Remove excessively large dust deposits using compressed air (max. 2.5 bar) and a suitable vacuum cleaner.
- Tighten up connection elements in accordance with the specified torques.

Technical specifications

10.1 Rating data

Rating data

Operating voltages	1 AC 250 V, 50/60 Hz 3 AC 480 V, 50/60 Hz 3 AC 520 V, 50/60 Hz
Rated frequency	50/60 Hz
Operating ambient air temperature	40°C

10.2 Additional technical specifications

Additional technical specifications

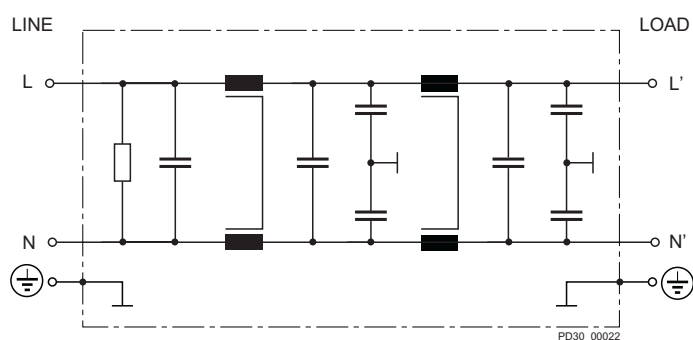
Test voltage	1770 V (2240 V) DC, 2 s phase/phase 2700 V DC, 2 s phase/housing
Overload	1.5 I _{Ln} for 3 mins/hour or 2.5 I _{Ln} for 30 s/hour
Climatic category	25/100/21 (–25°C/+100 °C/21 days humidity test) The following applies to filters 4EF15 10-1AA10 ... 4EF15 10-8AA10, 4EF15 12-7AA10: 25/85/21 (–25°C/+85 °C/21 days humidity test) Environmental testing in accordance with EN 60068-1

Applicable standards

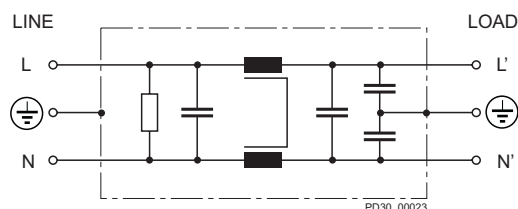
EN133200

Circuit diagrams and damping curves

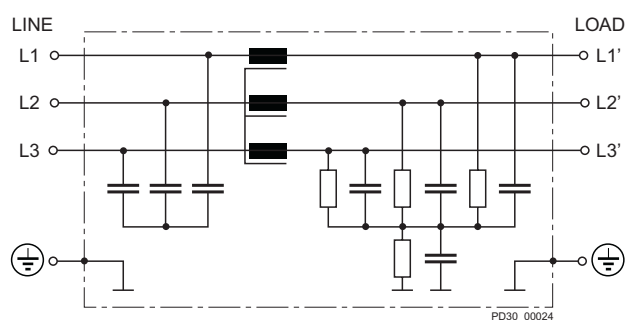
11.1 Circuit diagrams



4EF1510-3AA00 4EF1510-5AA00
 4EF1510-4AA00 4EF1510-6AA00

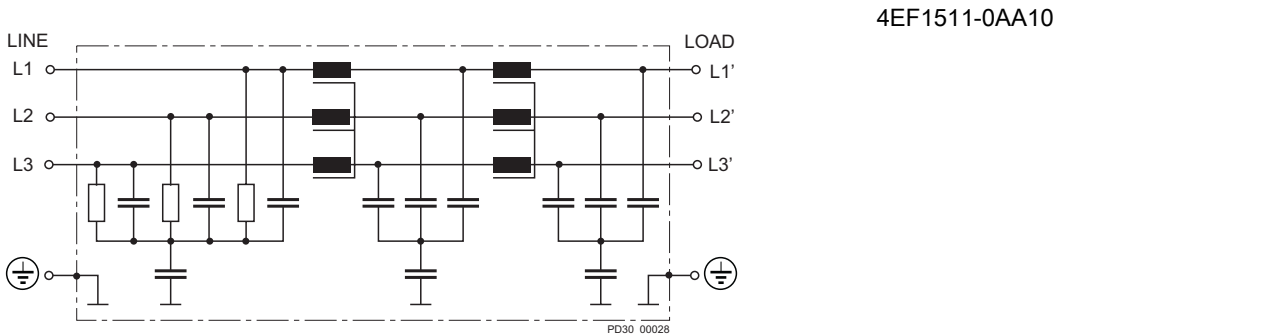
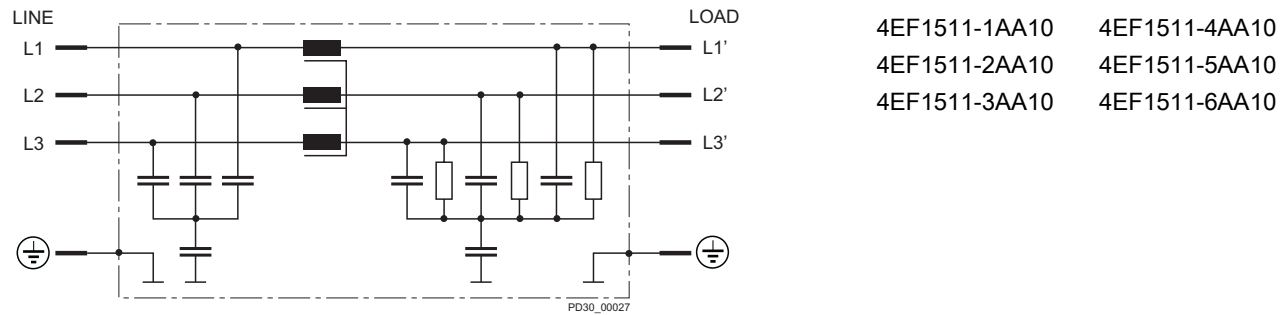
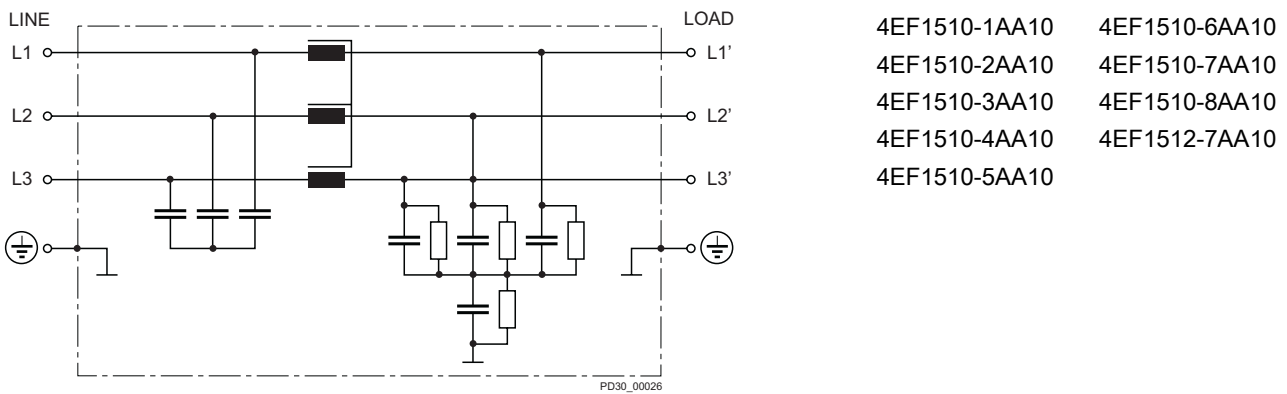
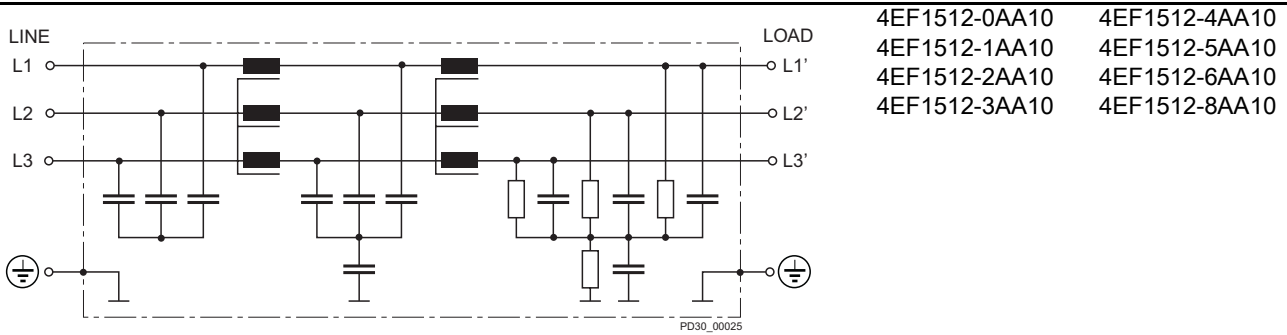


4EF1510-1AA00 4EF1510-2AA00



4EF1511-7AA10 4EF1511-8AA10

11.1 TT Circuit diagrams TT



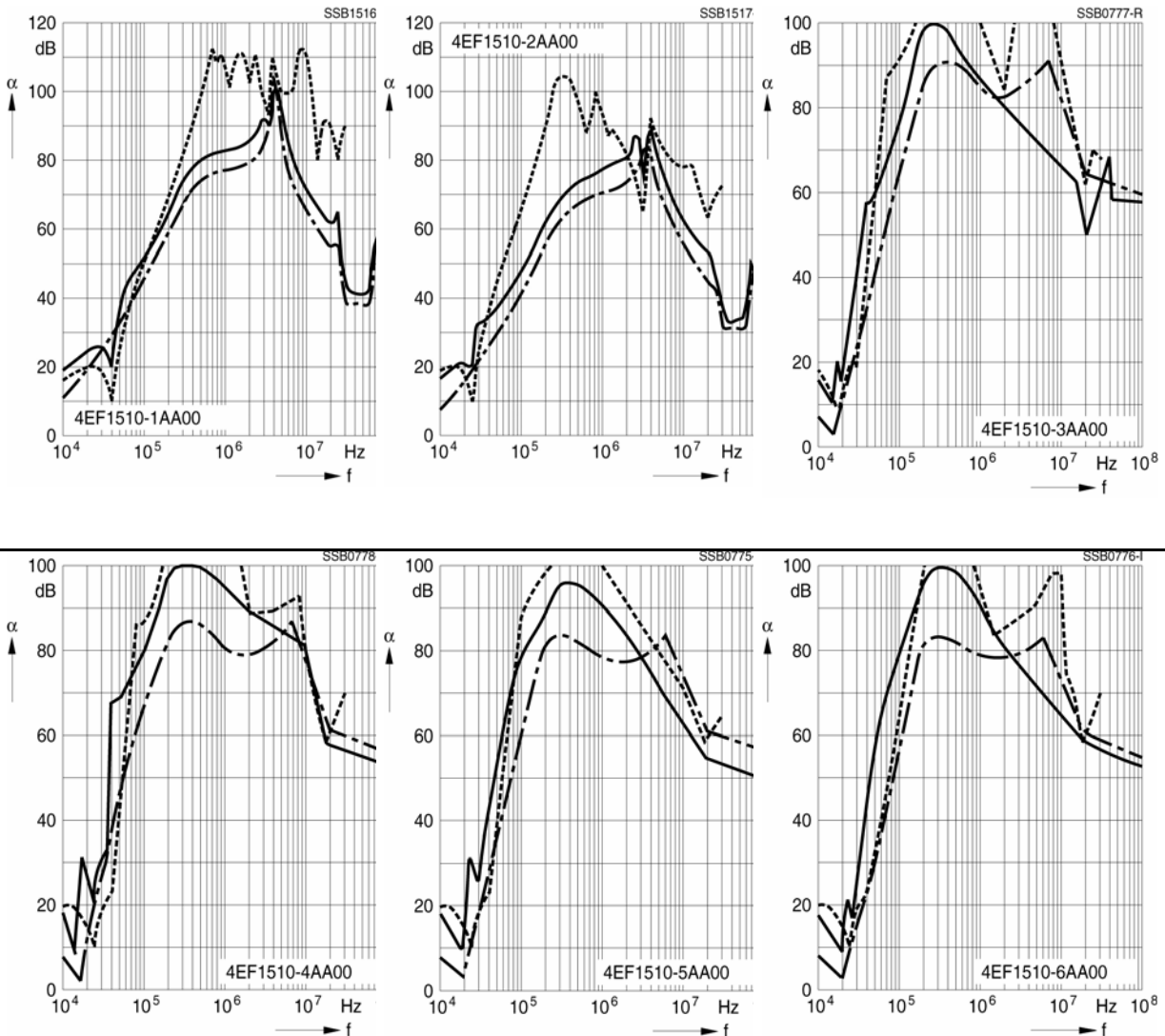
11.2 Damping curves

Insertion loss (CISPR 17, typical values at $Z = 50 \Omega$)

—————: unsymmetrical, adjacent branches terminated

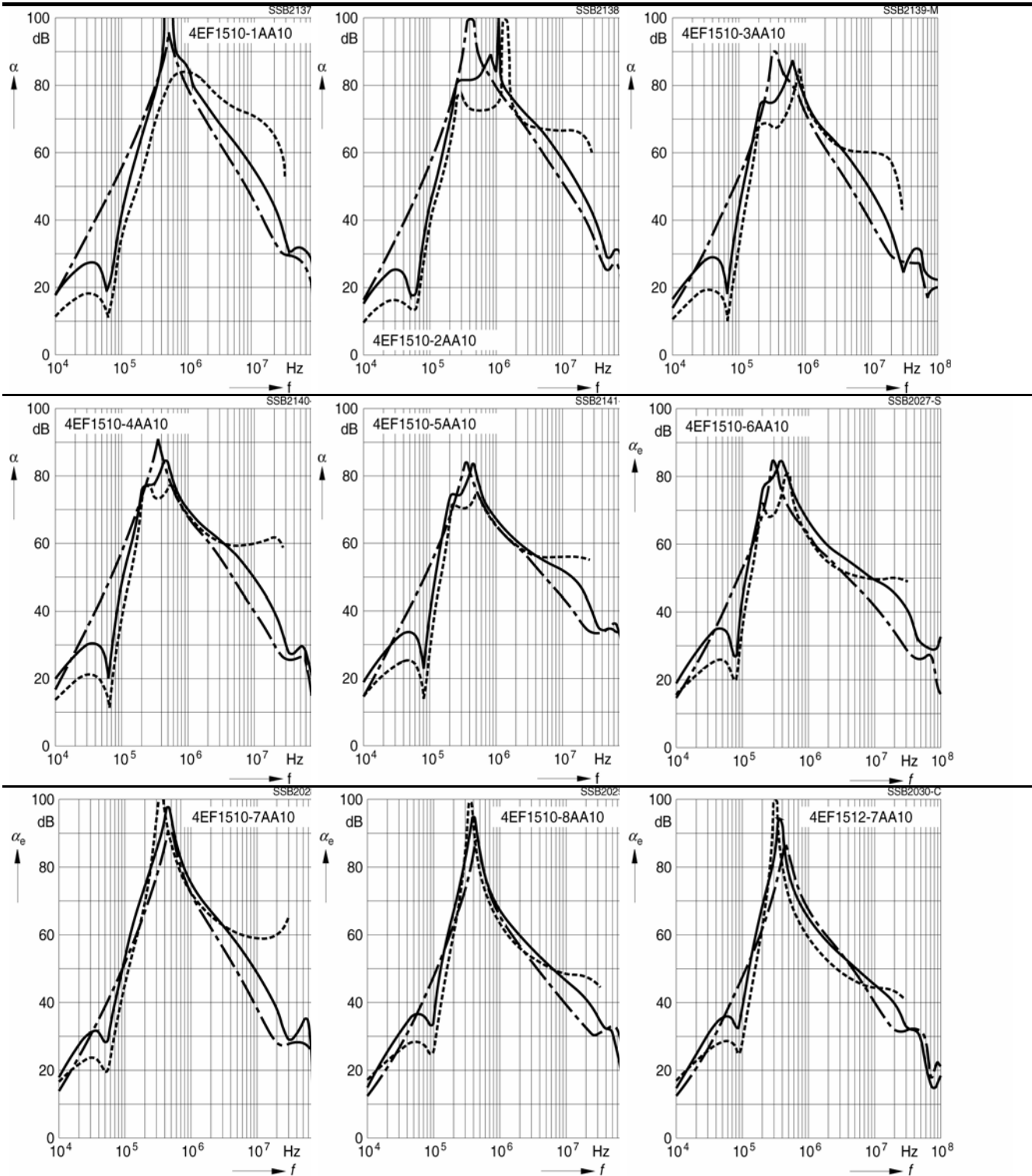
-----: common mode, all branches in parallel (asymmetrical)

-----: differential mode (symmetrical)



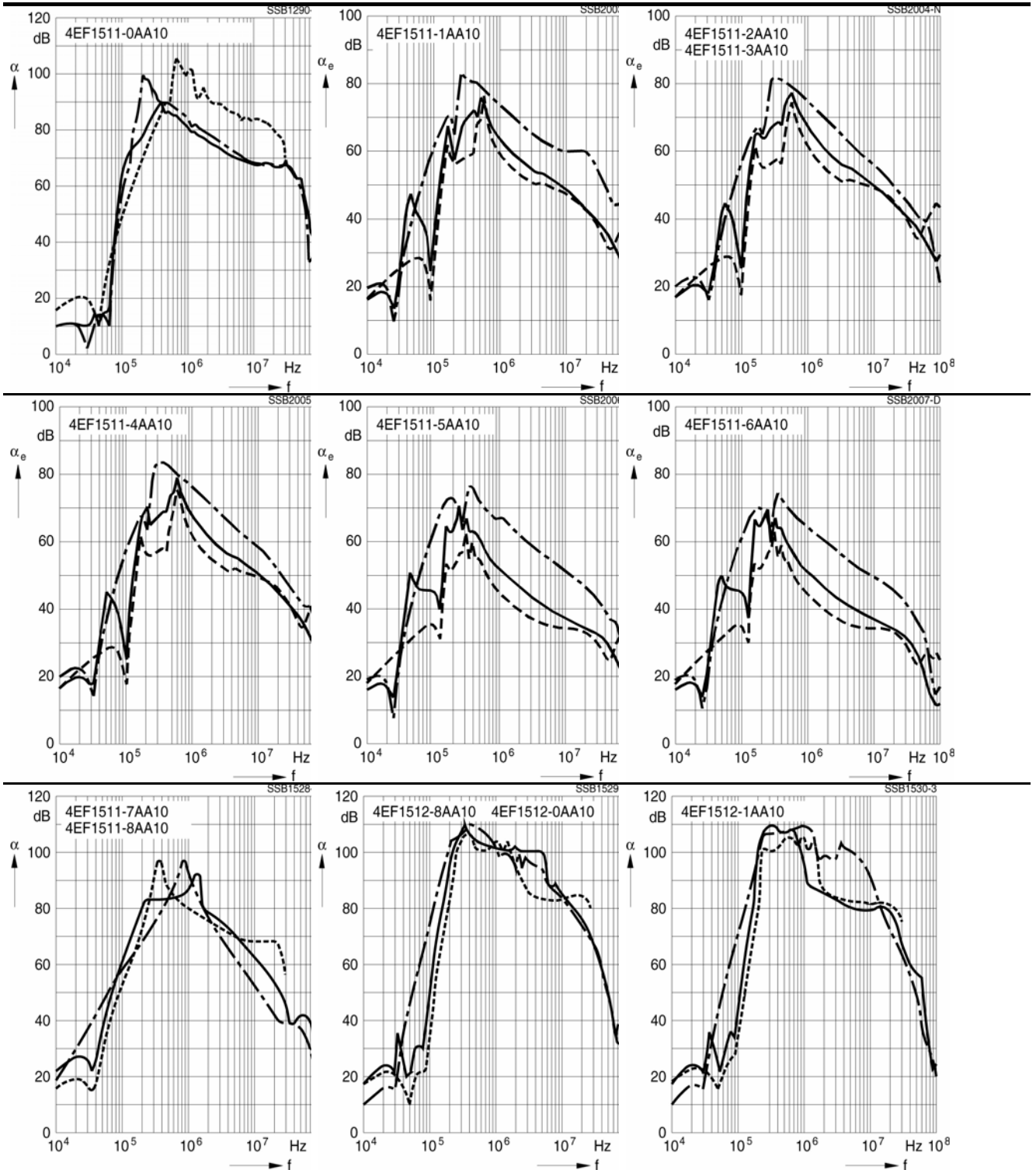
Insertion loss (CISPR 17, typical values at $Z = 50 \Omega$)

- _____ : unsymmetrical, adjacent branches terminated
- - - - - : common mode, all branches in parallel (asymmetrical)
- _____ : differential mode (symmetrical)



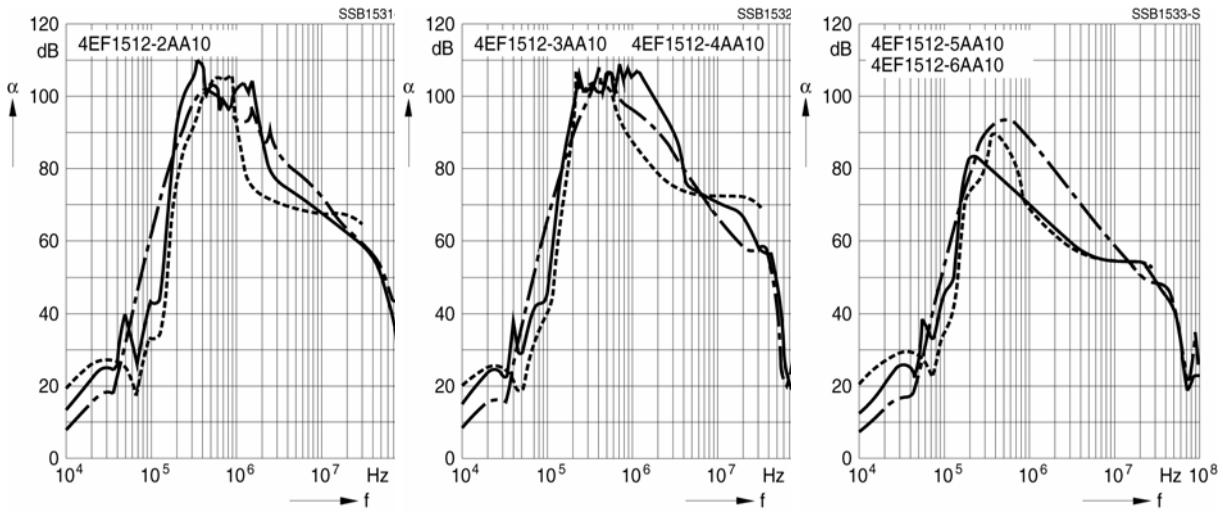
Insertion loss (CISPR 17, typical values at $Z = 50 \Omega$)

- _____ : unsymmetrical, adjacent branches terminated
- . - . - . : common mode, all branches in parallel (asymmetrical)
- - - - - : differential mode (symmetrical)



Insertion loss (CISPR 17, typical values at $Z = 50 \Omega$)

- _____ : unsymmetrical, adjacent branches terminated
- . - . - . : common mode, all branches in parallel (asymmetrical)
- : differential mode (symmetrical)



Appendix

A.1 Latest information

Your regional contact for low-voltage switchgear will be happy to help you with any queries you have regarding RFI suppression filters. A list of contacts and the latest version of the manual are available on the Internet at:

<http://www.siemens.de/lowvoltage/manuals>

Contacts

For all technical queries, please contact:

Technical Assistance:

Telephone: +49 (0) 911-895-5900 (8[°] - 17[°] CET)

Fax: +49 (0) 911-895-5907

E-mail: technical-assistance@siemens.com

Internet: www.siemens.de/lowvoltage/technical-assistance

Technical Support:

Telephone: +49 (0) 180 50 50 222

A.2 Correction sheet

Correction sheet

TO:
SIEMENS AG
A&D CD MM 3
92220 Amberg

Fax: 09621 / 80-3337

FROM (please complete):

Name

Company/Department

Address

Phone

Fax

4EF15 RFI Suppression Filter Manual

Have you noticed any errors while reading this manual?
If so, please use this form to tell us about them.

We welcome comments and suggestions for improvement.

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