

Instruction handbook

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be in motion

be in motion

The logo for BAUMÜLLER, featuring a red Greek letter Omega symbol (Ω) above the word "BAUMÜLLER" in a bold, black, sans-serif font. The logo is positioned to the right of a barcode and above the product name.

BAUMÜLLER

BFD-2-540-XXX

DC-Link Filter

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Read the instruction handbook before starting work!

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Ostendstr. 80 - 90
90482 Nürnberg
Germany

Tel. +49 9 11 54 32 - 0
+49 9 11 54 32 - 0 Fax: +49 9 11 54 32 - 1 30

E-Mail: mail@baumueller.com
Internet: www.baumueller.com



Table of Contents

1	General information	5
1.1	Information on the instruction handbooks	5
1.2	Key to symbols	6
1.3	Limitation of liability	7
1.4	Copyright protection	7
1.5	Other applicable documents	7
1.6	Spare parts	8
1.7	Disposal	8
1.8	Guarantee provisions	8
1.9	Customer service	8
2	Safety	9
2.1	Contents of the operating instructions	9
2.2	Changes and modifications to the device	9
2.3	Usage for the intended purpose	10
2.4	Responsibility of the operator	11
2.5	Safety devices	11
2.6	Personnel training	12
2.7	Personal protective equipment	13
2.8	Special hazards	14
2.9	Fire fighting	15
2.10	Safety equipment	16
2.11	Behavior in case of danger or accidents	16
2.12	Signs and labels	16
2.12.1	Signs and labels BFD-2-540-XXX	18
3	Technical data	19
3.1	Dimensions	19
3.1.1	Dimensions BFD-2-540-XXX	19
3.2	Weight	20
3.3	Operating conditions	20
3.3.1	Supply requirements of the drive	20
3.3.2	Required environmental conditions	20
3.3.3	Cooling	21
3.4	Electrical data	21
3.4.1	Electrical data BFD-2-540-XXX	21
4	Design and Function	23
4.1	Function	23
4.2	Identification of the device	24
4.2.1	Part number	24
4.2.2	Type plate	25
4.2.3	Type designation code	26
4.3	UL notes	27



Table of Contents

5	Transportation and packing	31
5.1	Safety notes for transport	31
5.2	What to observe when transporting	31
5.3	Transport inspection	32
5.4	Unpacking	32
5.5	Disposal of the packaging	32
6	Mounting	33
6.1	Safety instructions	33
6.2	Preparing for mounting	36
6.3	Drilling templates	37
6.4	Mounting instructions	38
7	Installation	39
7.1	Safety instructions	39
7.2	Voltage check	41
7.3	Requirements for the connecting cables	42
7.4	Ground conductor connection and RCD compatibility	42
7.5	Installation requirements with regard to the EMC-stability	43
7.6	Installation procedure	44
7.7	Connection diagrams	45
7.7.1	Connection diagram BFD-2-540-XXX	45
7.8	Electrical connections	45
7.8.1	Electrical connections BFD-2-540-XXX	46
7.8.2	Connection data BFD-2-540-XXX	46
8	Operation	47
8.1	Safety instructions	47
9	Maintenance	49
9.1	Safety instructions	49
9.2	Environmental conditions	49
9.3	Inspection intervals - maintenance notes	49
9.4	Repairs	50
10	Accessories and spare parts	51
10.1	Connector	51
10.2	UL-Fuse	51
11	Disposal	53
11.1	Safety instructions	53
11.2	Recycling plants / offices	54
	Revision survey	55

1

GENERAL INFORMATION

1.1 Information on the instruction handbooks

These instruction handbooks provide important information on handling the device. A prerequisite for safe work is compliance with all specified safety notes and procedural instructions.

Additionally, the valid accident prevention regulations and general safety regulations applicable to the scope of application the device must be complied with.

Read the instruction handbooks, particularly the Safety Notes chapter, completely before beginning any work on the device. The instruction handbooks are part of the product and must be kept accessible to personnel at all times in the immediate vicinity of the device.

1.2 Key to symbols

Warning notes

Warning notes are identified as symbols in these instruction handbooks. The notes are introduced by signal words that express the extent of the danger.

It is imperative that these notes be complied with and are conscientiously regarded in order to prevent accidents, personal injury and material damage.



DANGER!

...points out an immediately dangerous situation that will lead to severe injuries or death if not avoided.



WARNING!

...points out a potentially dangerous situation that could lead to severe injuries or death if not avoided.



ATTENTION!

...points out a potentially dangerous situation that could lead to minor or slight injuries if not avoided.



ATTENTION!

...points out a potentially dangerous situation that could lead to material damage if not avoided.

Recommendations



NOTE!

...highlights useful tips and recommendations, as well as information for efficient and problem-free use.

1.3 Limitation of liability

All specifications and notes in these instruction handbooks were compiled taking into account the applicable standards and regulations, the state of the art and our knowledge and experience of many years.

The manufacturer assumes no liability for damages due to:

- Noncompliance with the instruction handbooks
- Usage for other than the intended purpose
- Usage by untrained personnel

The actual scope of delivery can vary in case of optional equipment, laying claim to additional order options, or on account of the latest technical changes to the explanations and representations described herein.

The user bears the responsibility for performing service and initial operation in accordance with the safety regulations of the applicable standards and all other relevant governmental or local regulations concerning the dimensioning and protection of conductors, grounding, disconnectors, overcurrent protection, etc.

The person who carried out the mounting or installation is liable for any damage incurred when assembling or connecting the device.

1.4 Copyright protection

The instruction handbooks must be treated confidentially. It is to be used exclusively by personnel who work with the device. The consignment of the instruction handbooks to third persons without the written permission of the manufacturer is prohibited.

**NOTE!**

The specific contents, text, drawings, images and other representations are copyrighted and subject to industrial property rights. Any prohibited usage is punishable by law.

1.5 Other applicable documents

Components of other manufacturers are integrated into the device. For these purchased parts a risk analysis has been performed by the respective manufacturers. The compliance of the design construction with the applicable European and national regulations has been declared for the components by the respective manufacturers.

1.6 Spare parts



WARNING!

False or flawed spare parts can lead to damage, malfunction or complete failure, thus endangering safety.

Therefore:

- Only use original spare parts of the manufacturer.

Procure spare parts through an authorized dealer or directly from the manufacturer.

See also [▶Accessories and spare parts◀](#) from page 51.

1.7 Disposal

Insofar as no take-back or disposal agreement has been made, please disassemble units correctly and properly recycle the constituent parts.

See also [▶Disposal◀](#) on page 53.

1.8 Guarantee provisions

The guarantee provisions are stated in a separate document of the sales documents.

The devices described herein may only be operated in accordance with the stipulated methods, procedures and conditions. Anything else not presented here, including the operation of devices in mounted positions, is not permitted and must be cleared with the plant on a case-by-case basis. If the devices are operated in any other manner than as described within these instruction handbooks, then all guarantee and warranty rights are rendered null and void.

1.9 Customer service

Our customer service is available to provide you with technical information.

Info on the responsible contact persons is available at all times via telephone, fax, e-mail or the internet.

2

SAFETY

This section provides an overview of all of the important safety aspects for optimum protection of personnel as well as for the safe and problem-free operation.

2.1 Contents of the operating instructions

Each person who is tasked with performing work on or with the device must have read and understood the operating instructions before working with the device. This also applies if the person involved with this kind of device or a similar one, or has been trained by the manufacturer.

2.2 Changes and modifications to the device

In order to prevent hazards and to ensure optimum performance, no changes, additions or modifications may be undertaken on the device that have not been explicitly approved by the manufacturer.

2.3 Usage for the intended purpose

The device is conceived and constructed exclusively for usage compliant with its intended purpose described in these operating instructions.

The device BFD-2-540-XXX is used only then, if the mains perturbation is too great, because of a high number of axes. A typical application for this is a Baumüller converter, which feeds several coupled axes at its DC-link.

The device only may be used with a Baumüller converter, which is connected to a TT or TN mains. The device may not be used, if a mains inverter (BMx1xx) is used as supply.

A device is considered as being used compliant with its intended purpose, if all notes and information of these operating instructions are adhered to.



WARNING!

Danger arising from usage for an unintended purpose!

Any usage that goes beyond the intended purpose and/or any non-compliant use of the device can cause dangerous situations.

Therefore:

- Only use the device compliant with its intended purpose.
- Observe all specifications of these operating instructions.
- Ensure that only qualified personnel work with/on this device.
- When configuring, ensure that the device is always operated within its specifications.
- Mount the device on a wall that can sufficiently bear the load.
- The device must always be operated within a control cabinet.
- The device may only be operated in a technically flawless condition.
- Only operate the device in combination with components approved by Baumüller Nürnberg GmbH.

2.4 Responsibility of the operator

The device will be used in commercial areas. Thus, the proprietor of the device is subject to the legal work safety regulations.

Along with the notes on work safety in these operating instructions, the safety, accident prevention and environmental protection regulations valid for the area of application of this device must be complied with. Whereby:

- The proprietor must inform himself about the applicable work health and safety regulations and ascertain, in a hazard assessment, any additional hazards that could arise from the special working conditions in the use area of the device. These must then be implemented in the form of operating instruction for operation of the device.
- These operating instructions must be kept accessible to personnel working with the device at all times in the immediate vicinity of the device.
- The specifications of the operating instructions must be adhered to completely and without exception!
- The device may only be operated in a technically faultless and operationally safe condition

2.5 Safety devices

Protection class	
BFD-2-540	IP 20

All devices must be installed in an appropriate control cabinet to meet the protection ratings required in EN 61800-5-1, Chapter 4.2.3.3 .



DANGER!

Risk of fatal injury from electrical current!

There is an immediate risk of fatal injury if live electrical parts are contacted.

Therefore:

- The device must be in operated inside of a control cabinet that provides protection against direct contact of the devices and at least meets the requirements of EN 61800-5-1, Chapter 4.2.3.3.

2.6 Personnel training



WARNING!

Risk of injury due to insufficient qualifications!

Improper handling can lead to significant personal injury and material damage.

Therefore:

- Certain activities can only be performed by the persons stated in the respective chapters of these operating instructions.

In these operating instructions, the following qualifications are stipulated for various areas of activity:

- **Operating personnel**
 - The drive system may only be operated by persons who have been specially trained, familiarized and authorized.
 - Troubleshooting, maintenance, cleaning, maintenance and replacement may only be performed by trained or familiarized personnel. These persons must be familiar with the operating instructions and act accordingly.
 - Commissioning and training may only be performed by qualified personnel.
- **Qualified personnel**
 - Electrical engineers authorized by Baumüller Nürnberg GmbH, and qualified electricians of the customer or a third party who have learned to install and maintain Baumüller drive systems and are authorized to ground and identify electrical power circuits and devices in accordance with the safety engineering standards of the company.
 - Qualified personnel have had occupational training or instruction in accordance with the respective locally applicable safety engineering standards for the upkeep and use of appropriate safety equipment.

2.7 Personal protective equipment

The wearing of personal protective equipment is required when working in order to minimize health and safety risks.

- The protective equipment necessary for each respective type of work shall always be worn during work.
- The personal safety signs presented in each working area must be observed.



Protective work clothing

should be snug-fitting work clothes, with low tearing resistance, narrow sleeves and with no extending parts. Wear hair net.

No rings or necklaces.



Hard hat

Protects against objects falling down and flying around objects..



Safety shoes

Protects against heavy objects falling down.



Protective gloves

Protects hands against friction, abrasion, puncturing or more severe injuries, as well as contact with hot objects.

Wear for special work.



Protection eyewear

Protect the eyes against flying around objects and splashing liquids.

2.8 Special hazards

In the following section, the remaining marginal risks will be stated that have been identified as a result of the risk analysis.

Observe the safety notes listed here and the warning notes in the further chapters of this manual to reduce health risks and dangerous situations.

Electrical current



DANGER!

Risk of fatal injury from electrical current!

There is an immediate risk of fatal injury if live electrical parts are contacted. Damage to the insulation or individual components can be life-threatening.

Therefore:

- Switch off the power supply immediately in case of damage to the power supply insulation.
- Only allow work on the electrical system to be performed by qualified personnel.
- Switch off the current when any kind of work is being performed on the electrical system and ensure safety before switching on again.

Danger from residual energy



DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

Discharge time of the drive system = discharge time of the device with the longest DC-link discharging time.

See [▶Electrical data◀](#) from page 21.

Therefore:

- Consider discharge time of the capacitor and do not touch energized parts.
- The instructions on the device must be observed.
- If additional capacitors are connected to the DC-link, the DC-link discharge can take much longer. In this case, the necessary wait period must be determined or detected by oneself, if the device is off load. This discharge time must be placed clearly visible with a warning symbol IEC 60417-5036 (2002-10) to the control cabinet.

Moving components



WARNING!

Risk of injury from moving components!

Rotating components and/or those moving linearly can result in severe injury.

Therefore:

- Do not intervene in moving components during operation.
- Do not open any covering during operation.
- The amount of residual mechanical energy depends on the application. Powered components still turn/move for a certain length of time even after the power supply has been switched off. Ensure that adequate safety measures are taken.

2.9 Fire fighting



DANGER!

Risk of fatal injury from electrical current!

Electricity when using a conductive fire fighting appliance.

Therefore:

- Use the following fire fighting device:



ABC powder / CO₂

2.10 Safety equipment



WARNING!

Risk of fatal injury due to non-functional safety equipment!

Safety equipment provides for the highest level of safety in a facility. Even if safety equipment makes work processes more awkward, under no circumstances may they be circumvented. Safety can only be ensured by intact safety equipment.

Therefore:

- Before starting to work, check whether the safety equipment is in good working order and properly installed.

2.11 Behavior in case of danger or accidents

Preventive measures

- Always be prepared for accidents or fire!
- Keep first-aid equipment (e.g. first-aid kits, blankets, etc.) and fire extinguishers handy.
- Acquaint personnel with accident alarm, first aid and rescue equipment.

And if something does happen: respond properly

- Stop operation of the device immediately with an EMERGENCY Stop.
- Initiate first aid measures.
- Evacuate persons from the danger zone
- Notify the responsible persons at the scene of operations.
- Alarm medical personnel and/or the fire department.
- Keep access routes clear for rescue vehicles.

2.12 Signs and labels

The following symbols and information signs are located in the working area. They refer to the immediate vicinity in which they are affixed.



WARNING!

Risk of injury due to illegible symbols!

Over the course of time, stickers and symbols on the device can become dirty or otherwise unrecognizable.

Therefore:

- Maintain all safety, warning and operating labels on the device in easily readable condition.

**Electrical voltage**

Only qualified personnel may work in the marked workspace.

Unauthorized persons may not touch the marked working materials.

**DANGER!****Risk of fatal injury from electrical current!**

Stored electric charge.

Discharge time of the rack system = discharge time of the device with the longest intermediate circuit discharge time in the rack system.

See [▶Electrical data◀](#) from page 21.

Therefore:

- Consider discharge time of the capacitor and do not touch live parts.
- The instructions on the device must be observed.
- If additional capacitors are connected to the DC-link, the DC-link discharge can take much longer. In this case, the necessary wait period must be determined or detected by oneself, if the device is off load. This discharge time must be placed clearly visible with a warning symbol IEC 60417-5036 (2002-10) to the control cabinet.

**DANGER!****Risk of injury due to hot surface!**


Therefore:

- Wear protective gloves



2.12 Signs and labels

2.12.1 Signs and labels BFD-2-540-XXX

	<p>NOTE! During operation, the top of the device can heat up to temperatures $> 70\text{ °C}$!</p>
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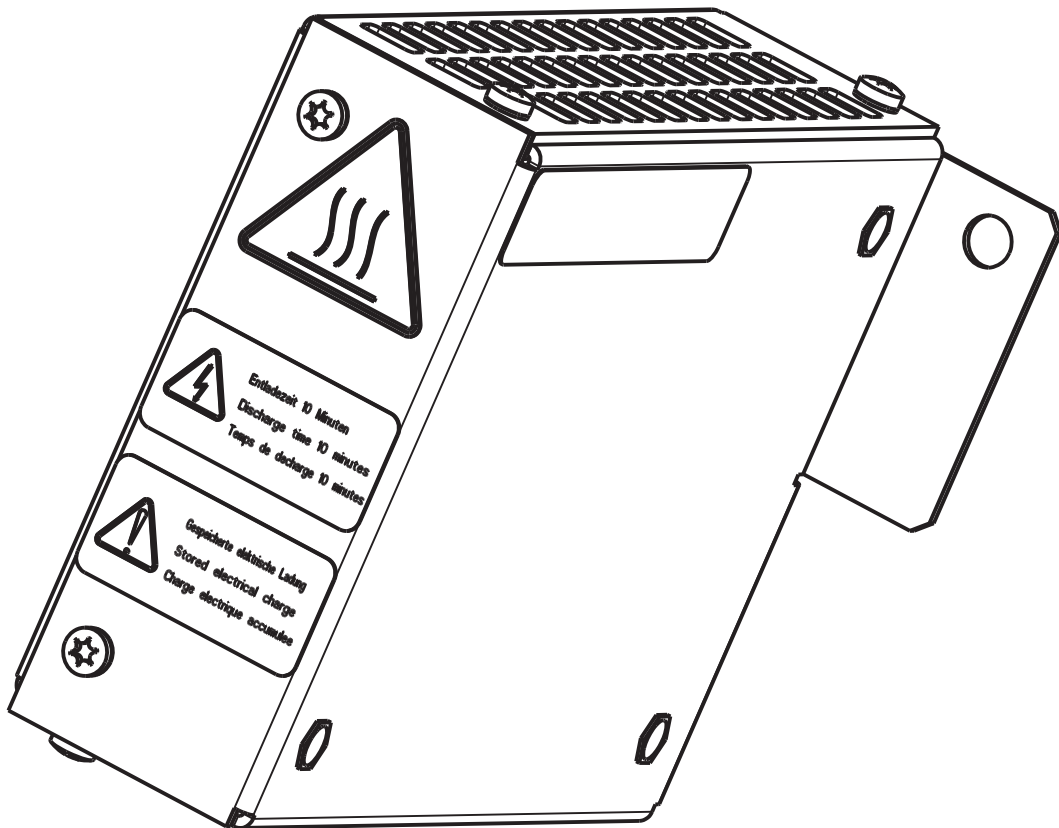


Figure 1: Signs and labels BFD-2-540-XXX

TECHNICAL DATA

3.1 Dimensions

The following drawings show the main dimensions of the devices. The space requirements in the control cabinet are also determined based on these drawings. To make the necessary drill holes/cutout sections, use the drawings in [▶Drilling templates◀](#) from page 37.

3.1.1 Dimensions BFD-2-540-XXX

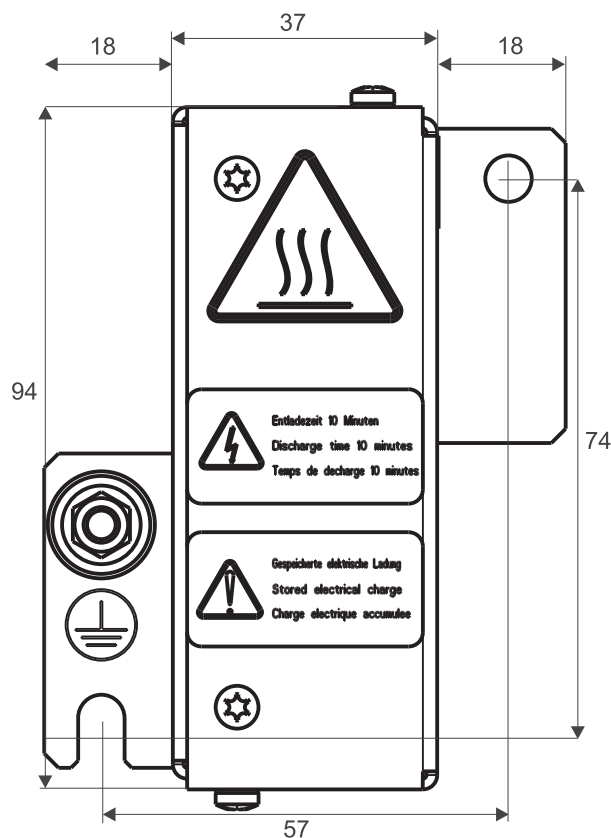


Figure 2: Dimensions BFD-2-540-XXX

3.2 Weight

3.2 Weight

Device	Weight
BFD-2-540-XXX	about 0.5 kg

3.3 Operating conditions

3.3.1 Supply requirements of the drive

Drive supply	BMXXXX-XTXX ¹⁾	Industrial system with direct or low impedance grounded neutral point (TN-mains or TT-mains)
--------------	---------------------------	--

¹⁾ The device only may be used with a Baumüller converter, which is connected to a TT or TN mains. The device may not be used, if a mains inverter (BMx1xx) is used as supply..

3.3.2 Required environmental conditions

Transportation temperature range	- 25 °C to + 70 °C
Transportation climatic category	2 K 3 ¹⁾
Storage temperature range	- 25 °C to + 70 °C
Storage climatic class	1 K 4 ¹⁾
Operating environment	Outside of residential areas ²⁾
Operational temperature range	min. 5 °C to max. 55 °C ³⁾
Operational climate class	3 K 3 ¹⁾
Installation altitude	Absolute altitude up to 2000 m above MSL
Humidity (operating) ¹⁾	Relative humidity: 5 % bis 85 % non condensing and absolut humidity: 1G/M ³ to 25G/M ³
Ionizing and non-ionized radiation	< measurable range
Vibration, shock and continuous shock ⁴⁾	Max. 0.5 G when operating (1G tested)
Degree of contamination	2 ⁵⁾

¹⁾ EN 50178, tab. 7

²⁾ When used in residential areas, stringent limit values for the electromagnetic emission are valid. Additionally, filter measures may be necessary.

³⁾ Rated temperature = 40° C

⁴⁾ EN 50178, Kap. 9.4.3.2

⁵⁾ EN 50178, tab. 2



ATTENTION!

Normally only a non-conductive dirt buildup occurs. Any conductive dirt buildup, whether short-term or permanent, is prohibited and could lead to destruction of the device. The customer is responsible for destruction resulting from dirt buildup of conductive materials or matter.

3.3.3 Cooling

Cooling air temperature ¹⁾	min. 0 °C to max. 55 °C ²⁾
Cooling air requirement ³⁾	see electrical data

¹⁾ Air temperature in the entire intake area of the device.

²⁾ Rated temperature = 40° C

³⁾ The cooling air requirement corresponds to at least that of a freely-blowing device. Freely-blowing means that the air intake and discharge are unobstructed. Therefore, when installing the device in a control cabinet, it could be necessary to make use of additional fans in order that the necessary cooling air requirement is covered.

3.4 Electrical data

3.4.1 Electrical data BFD-2-540-XXX

DC link voltage / measurement ¹⁾	540 V _{DC} at U _{Mains} = 3 x 400 V
DC link capacitance (internal, DC link+/PE))	893 nF
DC link capacitance (internal, DC link-/PE))	893 nF
DC link discharge time (internal DC link capacitance) ²⁾	< 1 s

¹⁾ The device only may be used with a BM converter at the TN / TT mains.

²⁾ Discharge time of drive system = Discharge time of the device with the greatest DC-link discharge time in the drive system.

DESIGN AND FUNCTION

4.1 Function

BFD-2-540-XXX **DC-link filter (EMC)**

This is a DC-link filter, which is connected via a DC-link to a drive system.

The device BFD-2-540-XXX is used only then, if the system perturbation is too great, because of a high number of axes. A typical application for this is a Baumüller converter, which feeds several coupled axes at its DC-link.

4.2 Identification of the device

4.2 Identification of the device

4.2.1 Part number

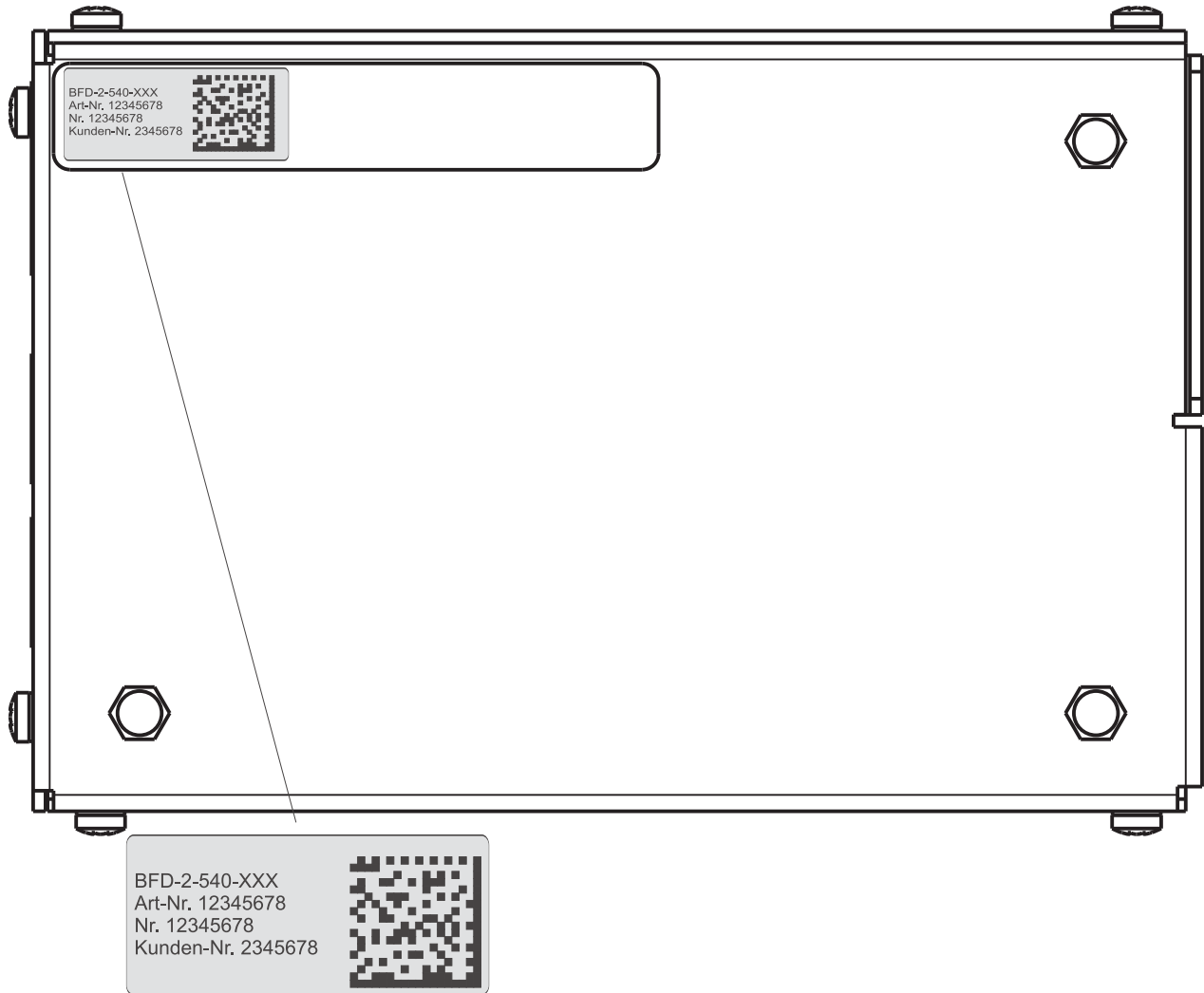


Figure 3: Part number

4.2.2 Type plate

Examples of the locations where the type plate is affixed are shown in the figure. Among other things, the type plate also states the type designation code of the device.

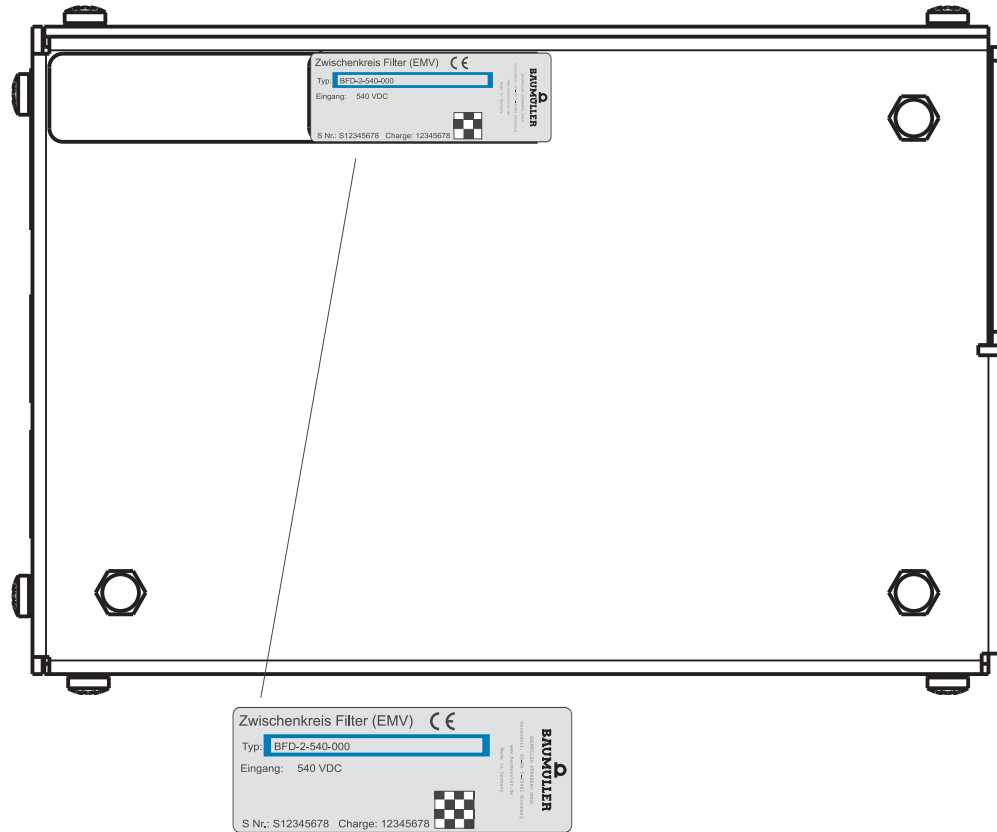
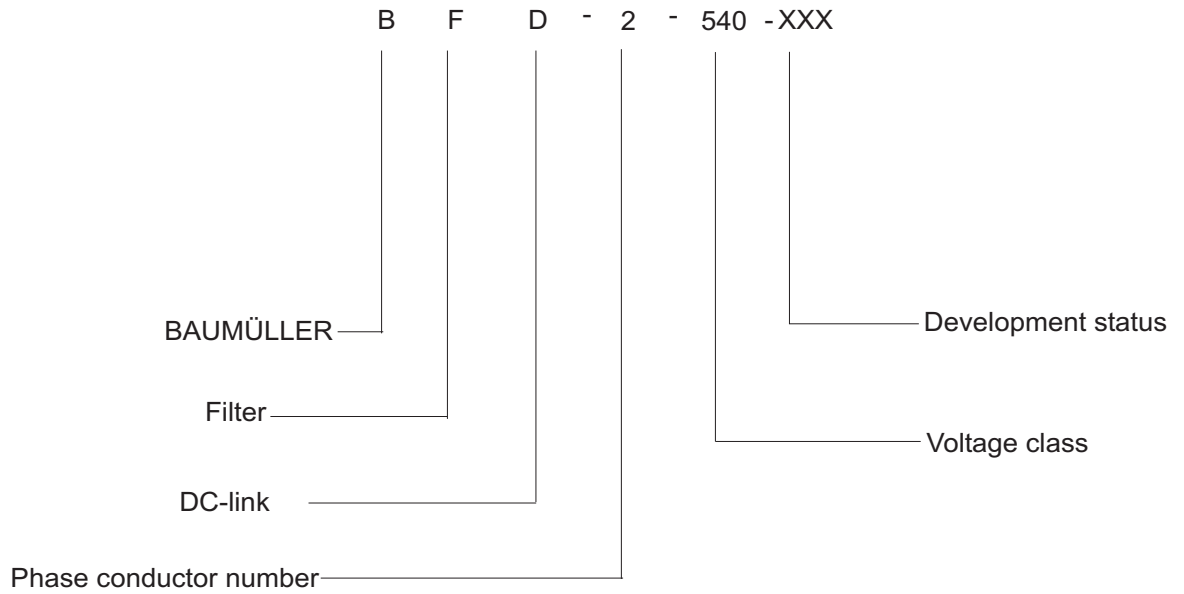


Figure 4: Affixing the type plate

4.2 Identification of the device

4.2.3 Type designation code

The type designation code has the form: BXX - X-XXX - XXX.



4.3 UL notes

The notes below must be observed in case you consider UL 61800-5-1 and/or C22.2 No. 274.

This DC-link filter is intended for use with BM5000 and BM4000 series power conversion equipment manufactured by Baumüller.

Mechanical data using SI units.

Dimensional drawing, mass information, packing, unpacking, moving, lifting, handling and mounting instructions including warnings of any hazards which can be experienced during installation.

- [▶Technical data◀](#) from page 19
- [▶Transportation and packing◀](#) from page 31
- [▶Mounting◀](#) from page 33

Marking for proper electrical connections, interconnection and wiring diagrams; range of values or a nominal value of tightening torque in Nm to be applied to the clamping screws of field wiring located in the motor circuit.

- [▶Installation◀](#) from page 39
- [▶Electrical connections◀](#) from page 45

Instructions for safe earthing the equipment refer to:

- [▶Ground conductor connection and RCD compatibility◀](#) on page 42

[▶Electrical data◀](#) on page 21

- Electrical ratings: Input: 650 V_{DC} (780 V_{DC} max)

[▶Required environmental conditions◀](#) on page 20

- Max. surrounding air temperature:
55 °C
- For use in Pollution Degree 2 environment only

► [Electrical connections BFD-2-540-XXX](#)◄ on page 46

- The product is provided with terminal suitable for field wiring.
- Use 75 °C copper conductors

- Note tightening torque values marked for field terminals.

► [UL-Fuse](#)◄ on page 51

TRANSPORTATION AND PACKING

5.1 Safety notes for transport



ATTENTION!

Damages due to unauthorized transport!

Transport handled by untrained personnel can lead to a substantial amount of material damage.

Therefore:

- The unloading of the packages upon delivery as well as the in-house transport should only be done by trained personnel.
- Contact Baumüller Nürnberg GmbH sales office if necessary.



WARNING!

Danger of physical impact!

Secure devices against falling down.

Therefore:

- Take suitable measures, such as supports, hoists, straps, etc., to ensure that device cannot fall down.
- Use appropriate means of transport.

5.2 What to observe when transporting

For initial transport of a device, it is packed at the manufacturer's plant. If the device is to be further transported, ensure that the following conditions are met throughout the entire transport:

- Climate class 2 K 3 as per EN 60721-3-2
- Temperature range - 30 °C to + 70 °C
- Vibration, shock, continuous shock class 2 M 1 as per EN 60721-3-2

5.3 Transport inspection

Upon receiving the delivered goods, immediately examine them for completeness and transport damage.

If there is outwardly visible transport damage, proceed as follows:

- Do not accept the delivery or conditionally accept it with reservations.
- Note the extent of the damage on the transport documents or on the delivery note of the shipping agent.
- Immediately file a complaint with the freight carrier. Have the complaint confirmed in writing and immediately contact the responsible representative of Baumüller Nürnberg GmbH.



NOTE!

The device may not be operated if there is visible shipping damage!

5.4 Unpacking

After having received the still packaged device:

- Avoid forceful transport agitation and hard jolts, e.g. when putting an item down.

If no transport damage is visible:

- Open the packaging of the device.
- Verify the delivery scope based on the delivery note.

File a claim with the responsible Baumüller representative if the delivery is incomplete.



NOTE!

Claim each individual deficiency as soon as it has been detected. Damage claims can only be validly asserted within the claim registration period.

5.5 Disposal of the packaging

The packaging consists of cardboard, plastic, metal parts, corrugated cardboard and/or wood.

- When disposing of the packaging, comply with the national regulations valid at the use area.

6

MOUNTING

The device is intended for mounting in a control cabinet.

Mounting comprises the following steps:

- 1 Mounting preparation
(for drilling holes/cutting out sections, see [▶Drilling templates◀](#) from page 37)
- 2 Install device
(for attachment, see [▶Mounting instructions◀](#) on page 38)

6.1 Safety instructions



NOTE!

Mounting shall only be performed by employees of the manufacturer or by other qualified personnel.

Qualified personnel are persons who – on account of their occupational training, experience, instruction and knowledge of relevant standards and stipulations, accident prevention regulations and operating conditions – are authorized by the persons responsible for the safety of the facilities to perform the respective activities that are necessary, while at the same time recognizing and preventing any potential risks. The qualifications necessary for working with the device are, for example:

- Occupational training or instruction in accordance with the standards of safety engineering for the care and use of appropriate safety equipment.



WARNING!

Danger as a result of faulty mounting!

The mounting requires qualified personnel with adequate experience. Faulty mounting can lead to life-threatening situations or substantial material damage.

Therefore:

- Only allow mounting to be performed by employees of the manufacturer or by other qualified personnel.



WARNING!

Danger of physical impact!

Secure devices against falling down.

Therefore:

- Take suitable measures, such as supports, hoists and assisting personnel, to ensure that device cannot fall down.
- Use appropriate means of transport.



CAUTION!

Danger due to electrostatic discharge.

The connecting terminals of the device are partially at risk due from ESD.

Therefore:

Please heed the respective notes.

**CAUTION****Danger due to sharp edges.**

If the device is lifted with unprotected hands during mounting, palms or fingers can be cut. If the device falls, feet could be injured.

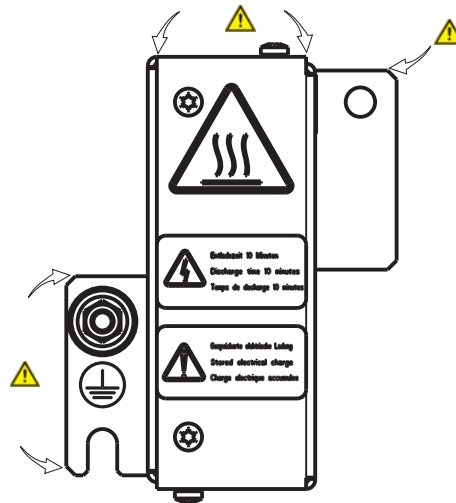


Figure 5: Danger area near the mechanical mounting

Therefore:

- Ensure that only qualified personnel, who are familiar with the safety notes and assembly instructions, mount this device.



Wear safety gloves.



Wear safety shoes.

6.2 Preparing for mounting

Based on the configuration documents and the drilling templates (see [▶Drilling templates◀](#) from page 37), the deviations of the cutout sections and the positions of the attachment drill holes can be determined.



CAUTION!

Property damage due to conductive contamination.

Therefore:

- When performing installation work of any kind, it must be ensured that no foreign material (e.g. drill shavings, copper strands, etc.) gets into the device as a result.
- If possible, the drilling of the holes should be done before mounting the device and the configuring of the cables should take place outside of the control cabinet. If this is not possible, the device must be appropriately covered.
Remove this covering again prior to starting operation without fail!



CAUTION!

Eye injury due to flung particles.

Metal particles are flung when making the drill holes and the cutout sections.

Therefore:



Wear protective eyewear!

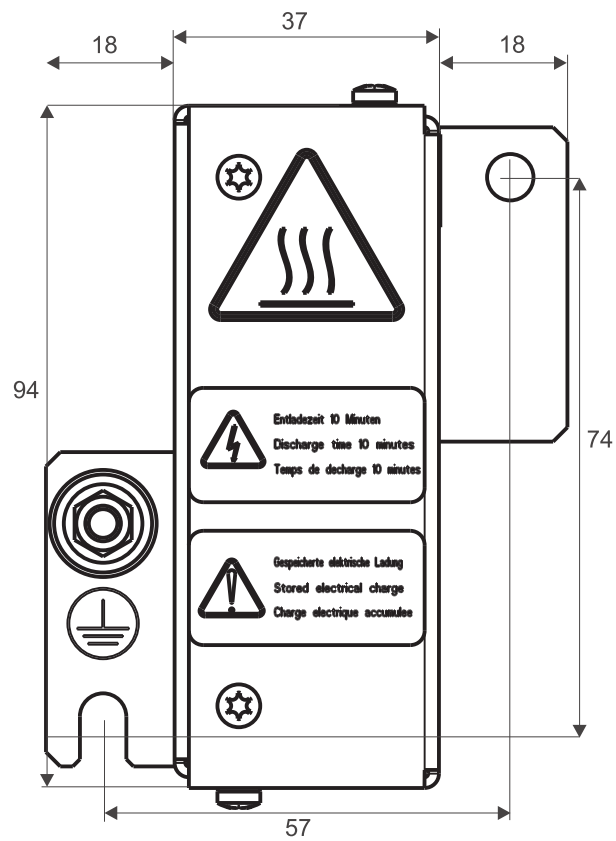
- ▶ Preparing drill holes and cutout sections.

6.3 Drilling templates

Use the drilling templates to make the necessary drill holes/cutout sections.

Tolerance for the drilling templates

Drill hole dimensioning	$\pm 0.2\text{mm}^2$
Dimensioning openings	$+1.0\text{mm}^2$
Relative tolerance of discretionary divisions	$\pm 0.1\text{mm}^2$



*: Relative tolerance of discretionary divisions : $\pm 0.1\text{mm}$

Figure 6: Drilling template BFD-2-540-XXX

6.4 Mounting instructions

The mounting procedure is presented in a graphic (see ▶[Figure 7](#)◀ on page 38)

The bolts and washers required for mounting are listed beneath the respective graphic.

Carry out mounting as follows:

- 1 Provide suitable transport/lifting equipment as needed.
- 2 Keep suitable fastening components readily available.
- 3 Mount the device.

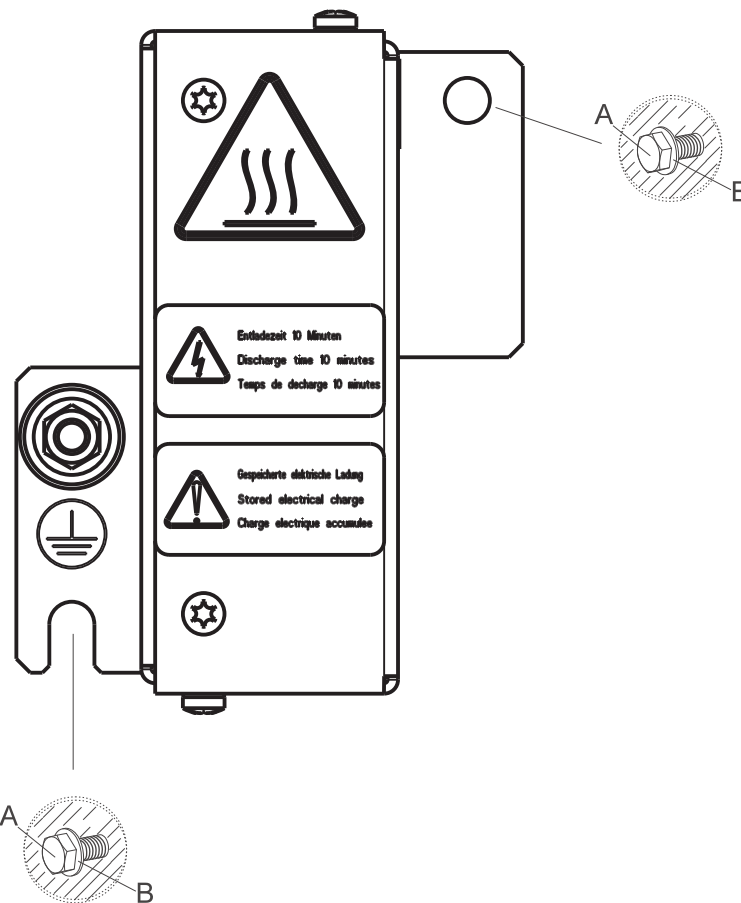


Figure 7: Mounting instruction BFD-2-540-XXX

Device	BFD-2-540-XXX
A - bolts	2 x M6
B - washers	2 x (5.4 x 12)

Push the device from the top to the fastening bolts below. Then tighten all fastening and grounding bolts.

7

INSTALLATION

This chapter describes the electrical installation of the device. The mechanical mounting is described in [►Mounting◄](#) from page 33.

Prior to installation, ensure that the technical prerequisites have been fulfilled:

- 1 Check the demands on the electrical mains ([►Technical data◄](#) from page 19).
- 2 Check the requirements for the electrical cables and the provision of corresponding cables.
- 3 Check the properties of the connections and the specified configuration of the respective cables.

7.1 Safety instructions



NOTE!

Installation shall only be performed by employees of the manufacturer or by other qualified personnel.

Qualified personnel are persons who – on account of their occupational training, experience, instruction and knowledge of relevant standards and stipulations, accident prevention regulations and operating conditions – are authorized by the persons responsible for the safety of the facilities to perform the respective activities that are necessary, while at the same time recognizing and preventing any potential risks. The qualifications necessary for working with the device are, for example:

- Training or instruction or to have the authorization to put into operation, ground and label circuits and devices as per the standards of safety engineering.
- Occupational training or instruction, in accordance with the standards of work safety, for the care and use of appropriate safety equipment.



WARNING!

Danger due to faulty installation and initial commissioning!

Installation and initial commissioning require qualified personnel with adequate experience. Faulty installation can lead to life-threatening situations or substantial material damage.

Therefore:

- Only allow installation and initial commissioning to be performed by employees of the manufacturer or by other qualified personnel.



DANGER!

Risk of fatal injury from electrical current!

Inevitably, when operating this electrical device, certain parts of it are energized with hazardous voltage.

Therefore:

- Pay heed to areas on the device that could be dangerous during the electrical installation.
- Pay heed to areas on the device that could still be electrically energized after operation.



Figure 8: Hazard areas during electrical installation

Danger from residual energy

**DANGER!****Risk of fatal injury from electrical current!**

Stored electric charge.

Discharge time of the rack system = discharge time of the device with the longest intermediate circuit discharge time in the rack system.

Refer to [►Electrical data◄](#) from page 21.

Therefore:

- Do not touch before taking into account the discharge time of the capacitors and electrically live parts.
- Read corresponding notes on the equipment.
- In additional capacitors are connected to the intermediate circuit, the intermediate circuit discharge can take a much longer time. In this case, the necessary waiting period must itself be determined or a measurement made as to whether the equipment is de-energized. This discharge time must be posted, together with an IEC 60417-5036 (2002-10) warning symbol, on a clearly visible location of the control cabinet.

7.2 Voltage check

**DANGER!****Risk of fatal injury from electrical current!**

During the routine test of these devices, a voltage test is performed by Baumüller Nürnberg GmbH in accordance with EN 61800-5-1, Section 5.2.3.2. It is thus unnecessary for the customer to do this.

Therefore:

- Subsequent tests of the devices using high voltages may only be performed by Baumüller Nürnberg GmbH.
- Disconnect the converter from the system during high-voltage testing!

7.3 Requirements for the connecting cables

- Take into account IEC/EN 60204-1, Chapter 13 when selecting the cable.
- The protective ground cross-section of the cable must be compliant with IEC/EN 60204-1, Section 5.2, Tab. 1.
- A fixed connection for the protective ground conductor is mandatorily specified for operation of the device.
- Use copper cable approved for a minimum of 60 °C (drives < 3 x 100 A) or 75 °C (drives = 3 x 100 A), if UL 508C is in consideration.

Cable must be suitable for 800 Vdc-use.

Device	Cross section	maximum length
BFD-2-540-XXX	1.5 mm ² bis 2.5 mm ²	Filter must be placed as near as possible to the converter.

7.4 Ground conductor connection and RCD compatibility

Depending on the functional principle, leakage current >3.5 mA_{AC} or >10 mA_{DC} can flow through the protective ground conductor. Consequently, a stationary ground conductor connection in accordance with EN 61800-5-1 is specified.



DANGER!

Risk of fatal injury from electrical current!

This product can cause direct and/or alternating current in the protective ground conductor.

The leakage current, due to the functional principle of the device, can lead to premature triggering of the fault current protective device or generally prevent triggering of it.

Therefore:

- Wherever a differential current device (RCD) is used for protection in case of direct or indirect contact, only an RCD of the type B is permissible to provide current to this product.
- Otherwise a different protective measure must be utilized, such as separation from the surroundings by means of double or enhanced isolation, or separation from the power supply network by means of an isolating transformer, for example.

7.5 Installation requirements with regard to the EMC-stability

**NOTE!**

The emission of radio frequency interference (RFI) is to a great extent dependent on the wiring, spatial expansiveness and the arrangement of the components in the system. Ensuring electromagnetic compatibility compliance in accordance with legal requirements is therefore only possible on the completely assembled system and is thus the responsibility of the system manufacturer or proprietor (re Art. 6, Par. 9 of the EMVG; European EMC law).

**NOTE!**

The important information on EMC-compliant installation can be found in these instruction handbooks. Additional notes on building a CE-compliant system, that are imperative to take heed of, can be found in the Baumüller instruction handbooks "Filters for Mains Applications". This Instruction handbook can be obtained from Baumüller Nürnberg GmbH.

In order to have EMC-compliant and problem-free use within the framework of the legislation, the following aspects must be taken into account.

In case of any questions, please contact Sales or the Applications department of Baumüller Nürnberg GmbH.

- Use suitable mains filters from Baumüller Nürnberg GmbH.
- Mount all components on a single mounting plate with a continuously good electrically conductive surface (e.g. galvanized steel plate).
- Keep the ground connection device/ground plane as short (< 30 cm) as possible, using fine-stranded cables with a large cross-section (>10 mm²).
- Route the cables directly on the surface of the grounded mounting plate (i.e. the least effective antenna height).
- When routing in parallel, maintain a minimum clearance of 20 cm between signal and control cables vis-à-vis the power cables.
- Only cross cables of different EMC categories (e.g. signal cables - mains cables and/or motor cables) at a 90 ° angle.
- With cable shielding in apertures through walls, keep contact separate between different EMC areas.
- Fully adjoin the shielding of all cables on both ends so that they conduct well with grounding.

7.6 Installation procedure



DANGER!

Risk of fatal injury from electrical current!

Electrically live parts are life-threatening.

Therefore:

- Make certain that the parts to be mounted (e.g. mains cables) and the mounting areas are de-energized for the entire duration of mounting the device.

- Route all cables in an EMC-compatible manner.
- Connect cables (see [▶Connection diagrams◀](#) from page 45).
(Observe the permissible torques!)

The installation comprises the following steps:

- 1 Connect the device through terminals X1 to the DC-link.
- 2 Connect the protective ground conductor to the PE terminal (a fixed ground conductor connection is mandatorily specified).

7.7 Connection diagrams

7.7.1 Connection diagram BFD-2-540-XXX

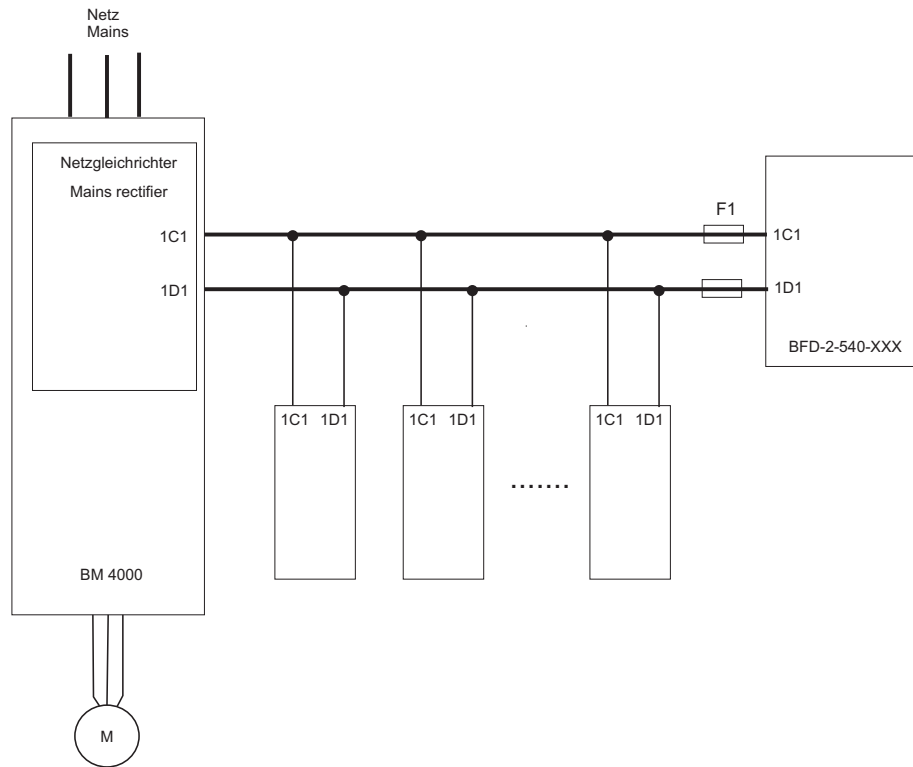


Figure 9: Connection diagram BFD-2-540-XXX

- 1C1, 1D1 Connections for the DC link, see [▶Figure 10◀](#) on page 46.
- PE PE-connection, see [▶Figure 10◀](#) on page 46.
- F1 Fuse, see [▶UL-Fuse◀](#) on page 51.

7.8 Electrical connections



NOTE!

The identifiers 1C1 and 1D1 were taken over from DIN EN 60445. 1C1 is the connection to the positive DC link cable/rail, and in the past was identified by Baumüller in some devices as ZK+. 1D1 is the connection to the negative DC link cable/rail, and in the past was identified by Baumüller in some devices as ZK+.

7.8 Electrical connections

7.8.1 Electrical connections BFD-2-540-XXX

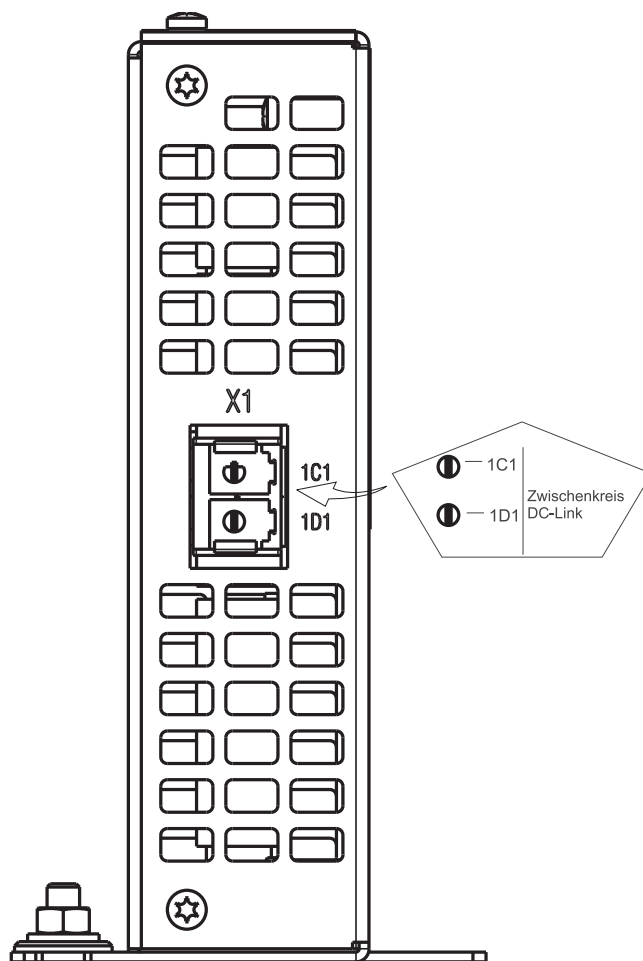


Figure 10: Electrical connections BFD-2-540-XXX

7.8.2 Connection data BFD-2-540-XXX

PE	Min. connection cross-section	Connection technology	Torque
	16 mm ²	Cable lug for M5	Min. 2.2 Nm Max. 3.0 Nm

DC-link 1C1 and 1D1	Connection cross-section	Connection technology
	1.5 mm ² to 2.5 mm ²	Connector, spring force connection

OPERATION

8.1 Safety instructions

Basic information

**WARNING!****Risk of injury due to improper operation!**

Improper operation can lead to severe personal injury or material damage.

Therefore:

- Perform all operational steps according to the details of these instruction handbooks.
- Before beginning any work, ensure that all coverings and protective devices are installed and are functioning properly.
- The control cabinet in which the device is installed should be protected against contact with electrically live parts.
Keep all doors of the control cabinet closed during operation.

**CAUTION!****Ambient conditions that do not meet the requirements.**

Ambient conditions that are non-compliant can lead to property damage.

Therefore:

- Assure, that the environmental conditions are referred to during operation (see [►Required environmental conditions◄](#) on page 20).



WARNING!

Risk of injury due to insufficient qualifications!

Inevitably, when operating this electrical device, certain parts of this device are energized with hazardous voltage. Improper handling can lead to significant personal injury and material damage.

Therefore:

- Only qualified personnel may work on this device!

MAINTENANCE

9.1 Safety instructions

Basic information



WARNING!

Risk of injury due to improperly performed maintenance work!

Improper maintenance can lead to severe personal injury and material damage.

Therefore:

- Before beginning any work, make sure that there is sufficient freedom of movement for mounting.
- Make sure that the mounting area is kept clean and orderly. Parts and tools that are loosely stacked or lying around are a potential accident source.

9.2 Environmental conditions

If the prescribed ambient conditions are adhered to, then the device is maintenance-free. For the prescribed ambient conditions, see [►Required environmental conditions◄](#) on page 20.

9.3 Inspection intervals - maintenance notes

Preventive maintenance is prescribed to keep the device in an optimum operating condition and ensure a long service life. It is recommended to have inspections performed regularly by qualified personnel.

Daily inspection:

Basic check points as to whether discrepancies have occurred during operation:

- Is the operating environment normal?
- If an unusual vibration or noise is noticed during operation.
- Visual inspection

Regularly scheduled inspection:

Before checking, switch off the input voltage and wait until the device's capacitors have discharged.



DANGER!

Risk of fatal injury from electrical current!

Therefore:

- Switch off voltage before performing work!
- Only qualified personnel may mount, install and maintain the devices.
- Please remove all metallic objects worn, such as watches or rings, for example, before beginning to work on the device.
- Only insulated tools are permitted.



DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

Discharge time of the rack system = discharge time of the device with the longest intermediate circuit discharge time in the rack system.

See [▶Electrical data◀](#) from page 21.

Therefore:

- Do not touch before taking into account the discharge time of the capacitors and electrically live parts.
- Read corresponding notes on the equipment.
- In additional capacitors are connected to the intermediate circuit, the intermediate circuit discharge can take a much longer time. In this case, the necessary waiting period must itself be determined or a measurement made as to whether the equipment is de-energized. This discharge time must be posted, together with an IEC 60417-5036 (2002-10) warning symbol, on a clearly visible location of the control cabinet.

9.4 Repairs

In case of device damage, please inform your sales office or:

Baumüller Nürnberg GmbH

Ostendstr. 80 - 90
90482 Nürnberg
Germany

Tel.: +49 9 11 54 32 - 0
Fax: +49 9 11 54 32 - 1 30

E-Mail: mail@baumueller.com
Internet: www.baumueller.com

ACCESSORIES AND SPARE PARTS

Accessories/spare parts for the device BFD-2-250-XXX are listed in this appendix. Product management is happy to handle any queries and suggestions on accessory parts.

10.1 Connector

Connector X1 Phoenix: SPC 5 / 2-STCL-7.62 Part No.: 425794

10.2 UL-Fuse

Siemens 3NC1420
Size: SITOR cylinder fuse cartridge, 14x51 mm
Current: 20 A
Voltage: 700 Vdc
Operation class: aR

11

DISPOSAL



NOTE!

Baumüller products do not belong to the scope of the EU-Directive for the disposal of waste electrical and electronic equipment (WEEE, 2002/96/EG). Therefore, Baumüller does not bear the costs for repurchase and disposal of WEEE.

11.1 Safety instructions



DANGER!

Risk of fatal injury from electrical current!

Stored electrical charge.

Discharge time of the rack system = discharge time of the device with the longest intermediate circuit discharge time in the rack system.

See [▶Electrical data◀](#) from page 21.

Therefore:

- Consider discharge time of the capacitor and do not touch live parts.
- The instructions on the device must be observed.
- If additional capacitors are connected to the DC-link, the DC-link discharge can take much longer. In this case, the necessary wait period must be determined or detected by oneself, if the device is off load. This discharge time must be placed clearly visible with a warning symbol IEC 60417-5036 (2002-10) to the control cabinet.

11.2 Recycling plants / offices



ATTENTION!

Danger of injury owing to the sharp edges

If the device is lifted with unprotected hands during dismantling, fingers / palms can be cut. If the device drops, feet can be injured.



WARNING!

Danger by mechanical acting!

Prevent devices against dropping.



ATTENTION!

Avoid environmental pollution due to inappropriate disposal.

Therefore:

- Disposal with consideration to the safety instructions only.
- Observance to the local regulations. If the safe disposal cannot be carried out, assign a suitable waste disposal company.
- Dangerous materials may result or may be set free from a fire.
- Do not expose electronic components to high temperatures.
- For an inner insulation, e.g. at various power semiconductors beryllium oxide is used. When opened, the beryllium dust is dangerous to your health. Do not open electronic components.
- Capacitors, semiconductor modules and electronic scrap must be recycled as special waste.



WARNING!

Danger due to faulty demounting!

The demounting and disposal requires qualified personnel with sufficient experience.

Therefore:

- Demounting and disposal, to be performed by qualified personnel only.

11.2 Recycling plants / offices

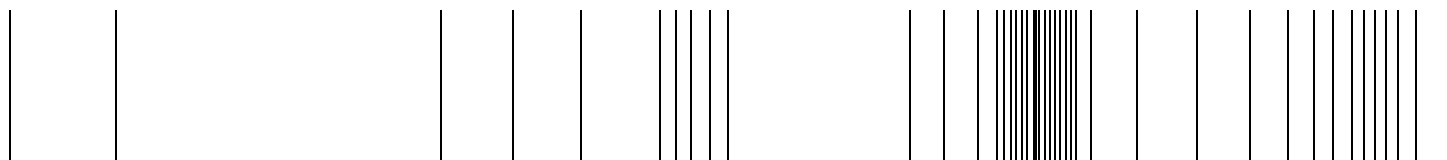
Assure, that the disposal is made in accordance with the disposal guidelines of your company as well as with the national regulations of the responsible disposal locations and offices. In case of doubt, consult the bureau of commerce or environmental protection authority responsible for your company.



Revision survey

Version	Date of issue	Changing
5.11014.00	21-Sep-2011	First edition
5.11014.01	20-May-2020	Changing DC link capacitance
5.11014.02	14-Oct-2021	Revision because of UL

be in motion



Baumüller Nürnberg GmbH Ostendstraße 80-90 90482 Nürnberg T: +49(0)911-5432-0 F: +49(0)911-5432-130 www.baumueller.com

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