Instruction handbook

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be in motion be in motion

BAUMÜLLER

b maXX 5500

BM5500
BM5600
BM5700

Basic Units/
Power Modules
with Servo Controller

E	5.13008.11

Read the Instruction handbook before starting any work!

Preliminary information

Warning Insofar as this document is identified as being preliminary information, the following applies:
this version is regarded as providing advance technical information to users of the described devices and their functions at an early enough time in order to adapt to any possible changes or expanded functionality.
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The conditions stipulated in the following section under "Obligatory" are invalid in case of preliminary information.

Obligatory

These Instruction handbook are a part of the equipment/machine. These Instruction handbook must be available to the operator at all times and must be in legible condition. If the equipment/machine is sold or moved another location, these Instruction handbook must be passed on by the owner together with the equipment/machine.
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When the present Instruction handbook are handed over, corresponding sets of instruction handbooks of a previous version are automatically invalidated.
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1

GENERAL

1.1 Information on the instruction handbook

These instruction handbook provides 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 handbook, particularly the safety notes chapter, completely before beginning any work on the device. The instruction handbook is 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 by symbols in these instruction handbook. 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.

CAUTION!

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

NOTICE!

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

Recommendation

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 handbook 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 handbook
- 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 handbook must be treated confidentially. It is to be used exclusively by personnel who work with the device. The consignment of the instruction handbook 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.

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EtherCAT®	is a registered trademark of Beckhoff Automation GmbH, 33415 Verl, Germany
HIPERFACE® **HIPERFACE DSL®**	is a registered trademark of SICK STEGMANN GmbH, 78166 Donaueschingen, Germany
PROFINET®	is a registered trademark of PROFIBUS International
speedtec®	is a registered trademark of INTERCONTEC Produkt GmbH 94559 Niederwinkling, Germany

NOTE!

Please note, that BAUMÜLLER is not responsible to examine whether any (industrial property) rights of third parties are infringed by the application-specific use of the BAUMÜLLER products/components or the execution.

1.5 Other applicable documents

Components of other manufacturers are integrated into the device. For these purchased parts, hazard assessments have 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. Refer to ▷Accessories and Spare Parts◁ from page 245.

1.7 Disposal

Insofar as no take-back or disposal agreement has been made, please disassemble units correctly and properly recycle the constituent parts.
Refer to ▷Disposal◁ on page 301.

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 in other mounted positions, is not permitted and must be cleared. If the devices are operated in any other manner than as described within these instruction handbook, then all guarantee and warranty rights are rendered null and void.

1.9 Customer service

Our customer service is available to provide you with information. Info on the responsible contact persons is available at all times via telephone, fax, mail or the Internet.

1.10 Terms used

The term „device“ or the item designation **BM5500, BM5600, BM5700** are also used in this documentation for this Baumüller product. A list of the abbreviations used can be found in ▷Appendix A - Abbreviations◁ from page 305.

1.11 List of other applicable documents

Instruction handbook

	Doc.-No.	Part No. German	Part No. English
Instruction handbook b maXX 5000, 5100, 5300	5.09021	439682	439682
Instruction handbook b maXX 5500, 5600, 5700	5.13008	446683	446684
Instruction handbook b maXX 5800	5.16027	464134	464136

Parameter manual

	Doc.-No.	Part No. German	Part No. English
Parameter manual b maXX 5000	5.09022	428331	431082
Parameter manual b maXX 5800	5.15029	470715	470716

Instruction handbook safety modules

	Doc.-No.	Part No. German	Part No. English
Safety modules for b maXX 5000 BM5-O-SAF-000/-001	5.09013	428339	432449
Safety modules for b maXX 5000 BM5-O-SAF-002/-003	5.01046	354843	372666

Instruction handbook add-on modules

	Doc.-No.	Part No. German	Part No. English
Add-on module IEE / SIE	5.13030	448189	448190

Application handbooks

	Doc.-No.	Part No. German	Part No. English
CANopen,CoE,POWERLINK for b maXX 2500/3000/5000	5.14006	450924	450925
SoE-Slave for b maXX 2500/3000/5000	5.14010	452983	452984
PROFINET IRT device for b maXX 2500/3000/5000	5.15009	456326	456327
Servo pump function V1 for b maXX 5000	5.17002	-	466346

1.11 List of other applicable documents

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 instruction handbook

Each person who is tasked with performing work on or with the device must have read and understood the instruction handbook 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 instruction handbook.

The devices of the model series **BM5500, BM5600, BM5700** are either mains rectifier or active mains rectifier in combination with power modules with servo controller. Devices are also available in graduated design size and performance classes.

The device **BM5500, BM5600, BM5700** is used exclusively as a converter for controlling a motor.

A device is considered as being used compliant with its intended purpose if all notes and information of these instruction handbook 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 lead to dangerous situations.

Therefore:

- Only use the device compliant with its intended purpose.
- Observe all specifications of these instruction handbook.
- 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.
- Ensure that the power supply complies with the stipulated specifications.
- The device may only be operated in a technically flawless condition.
- Only operate the device in combination with components approved by Baumüller Nürnberg GmbH.
- The device has been developed in such a manner that it fulfills the requirements of the category C3 according to IEC 61800-3:2012.
- The device is not intended to be connected to the public power supply system. To operate the device in primary surroundings of the category C2/C1 (residential, business and commercial areas, directly on a public low-voltage power supply without an intermediate transformer), special measures to reduce the transient emissions (line-internal and radiated) must be provided for and certifiable by the system builder. Otherwise, EMC interference could occur without such additional measures.

2.4 Risk assessment according EU Directive

Earth current

Check the quality of the earth connection:
- before connecting the device to the power supply for the first time and
- within the recommended service intervals

Requirements:

- Cross section of the grounding cable according EN 61800-5-1
- Note the required torque of connection!
- Grounded mounting plate made of metal
- Mains filter, device and shielding of the motor cable are on the same HF potential

Stored electric charge

Do not touch electrically live parts before the discharge time of 15 min runs up, check zero-potential before touching.

Electromagnetic fields

The device causes electromagnetic fields when operating.

Any person with individual device for cardiac assistance (pacemaker, defibrillator) must stay in sufficient distance to the operating device.

Burn injuries

Please note that the surface of the device can heat up considerably.

- Wear safety gloves!

Radiatedemission

The high-frequency electromagnetic fields within the operation environment must not exceed the field strength of the second environment according EN 61800-3.

Internal or external ignition source

Internal or external ignition sources are not allowed within the environment of the devices!

- Use ABC powder for extinguishing a fire!

Gas

Toxic fumes can be released in case of failure.

No flammable fume or dust and no flammable/explosive gases are permitted within the environment of the devices!

In order to avoid damage to persons because of explosions:

- ventilate the area and
- immediate evacuation.

Transportation and mounting

Falling down of the device can cause damage to persons.

Note the weight of the device when selecting the mounting screws!

Select the fastening torques of the mounting screws according the specification of the screw manufacturer!

- Wear safety helmets/shoes!

Mounting

Unprotected hands can be injured at the sharp edges of the device.

- Wear safety gloves!

Unprotected eyes can be injured by thrown up metal particles caused by drilling or making cut-outs.

- Wear safety glasses!

Short-circuit in power cables

In case of a short-circuit high current flows. This current induces a magnetic field in cable loops. The magnetic field can cause failures of the device.

To avoid additional damage in case of a short-circuit in power cables,

- The connection between power supply and device or between device and motor must be laid without loop.

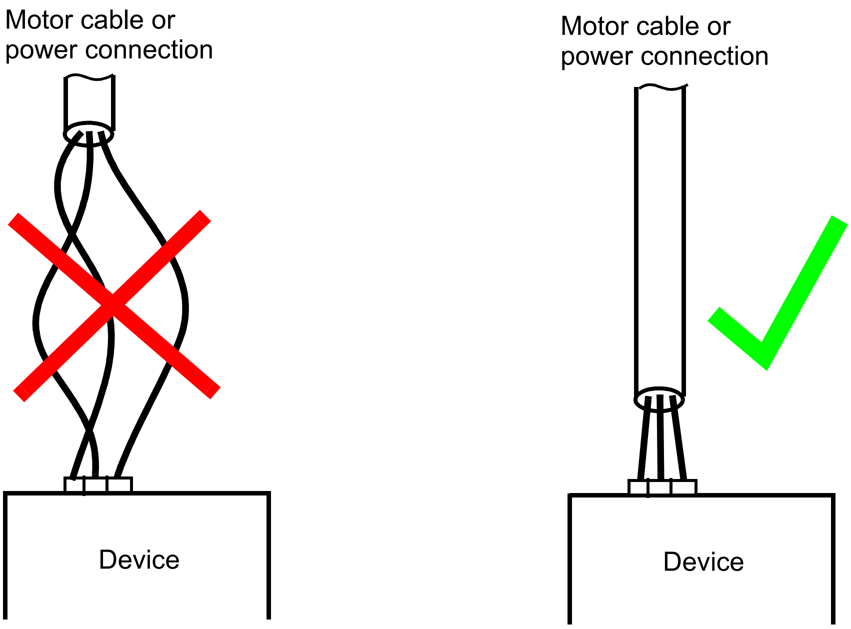


Figure 1: Wiring of the power cables

Installation

If a shielded cable is connected unshielded and this causes failure of the device/danger to persons, the system manufacturer is responsible for.

Brake resistor connection

The dissipation of the heat loss of the external brake resistor must be ensured.

Communication errors

Ensure that a failure of the device will cause no danger to persons.

The safety notes of all further chapters of this documentation need to be carefully observed!

2.5 Responsibility of the operating company

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 instruction handbook, the safety, accident prevention and environmental protection regulations valid for the area of application of this device must be complied with. Whereby:

- The operating company 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 instruction handbook for operation of the device.
- These instruction handbook must be kept accessible to personnel working with the device at all times in the immediate vicinity of the device.
- The specifications of the instruction handbook must be adhered to completely and without exception.
- The device may only be operated in a technically faultless and operationally safe condition.

2.6 Protection devices

Protection classification	
BM5X1X, BM5X2X	IP 20
BM5X3X, BM5X4X	IP 20, with a contact-isolated connection in accordance with IP 20, otherwise IP 10.
BM5X5X, BM5X6X, BM5X7X	IP 00

All devices **BM5500, BM5600, BM5700** must be installed in an appropriate control cabinet to meet the protection classification required in EN 61800-5-1, chapter 4.2.3.3 (IP 30: only upper horizontal surfaces; IP 20: all other surfaces).

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.
- Fault protection according EN 60204-1:2018, section 6.3 is fulfilled by measures of preventing touch voltages.

2.7 Training of the personnel

⚠

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 instruction handbook.

In these instruction handbook, 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 instruction handbook and act accordingly.
  - Initial operation and familiarization 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.

2.8 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 present 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. It serves to primarily protect against...

No rings or chains should be worn.

Hard hat

to protect against falling down and flying around objects.

Safety shoes

to protect against heavy objects falling down.

Protective gloves

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

Wear for special work.

Protective eye wear

to protect the eyes against flying around objects and sprayed liquids.

2.9 Special hazards

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

Observe the safety notes listed here and the warning notes in the further chapters of this Instruction handbook 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 electrical power 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 rack system = discharge time of the device with the longest DC link discharge time in the rack system.

Refer to ▹Electrical data basic units◃ ab Seite 61.

Therefore:

- Do not touch electrically live parts before taking into account the discharge time of the capacitors.
- Pay attention to the corresponding notes on the device.
- If additional capacitors are connected to the DC link, the DC link 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.

Moving components

WARNING!

Risk of injury from moving components!

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

Therefore:

- Do not touch 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.

2.10 Fire fighting

DANGER!

Risk of fatal injury from electrical current!

There is a risk of electric shock if an electrically-conductive, fire-extinguishing agent is used.

Therefore:

- Use the following fire-extinguishing agent:

ABC powder / CO_2

2.11 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 in good working order and properly installed.

2.12 Conduct 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 readily accessible.
- Familiarize 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.

2.13 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 work areas that identified with this.

Unauthorized persons may not touch working materials marked correspondingly.

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 DC link discharge time in the rack system.

Refer to ▷Electrical data basic units◁ ab Seite 61.

Therefore:

- Do not touch before taking into account the discharge time of the capacitors and electrically live parts.
- Heed corresponding notes on the equipment.
- If additional capacitors are connected to the DC link, the DC link 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.

2.13 Signs and labels

CAUTION!

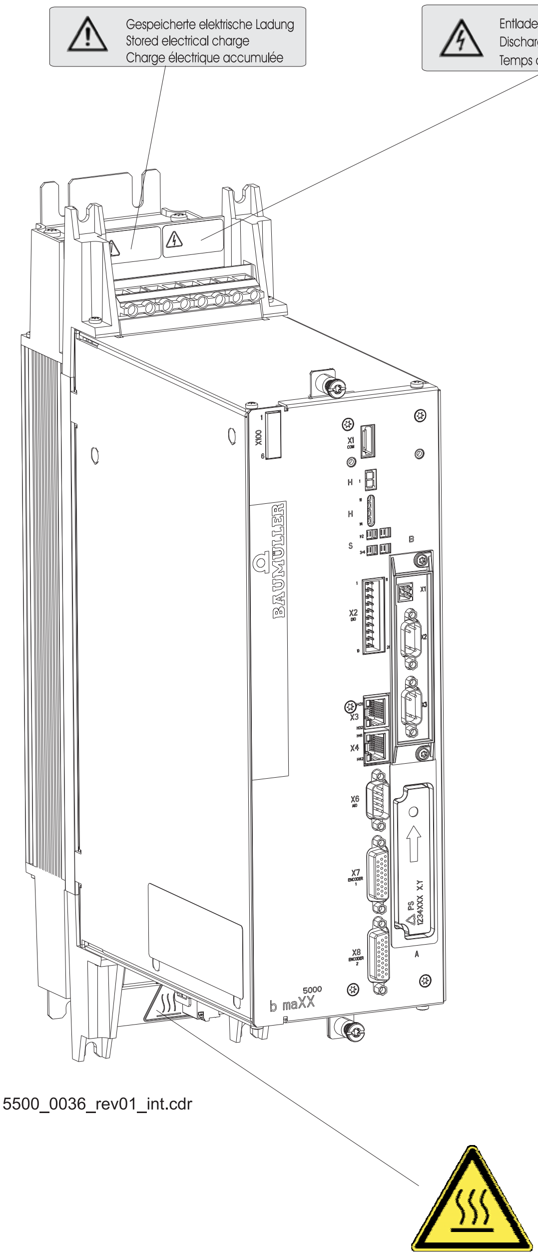
Risk of injury due to hot surface!

Therefore:

- Wear protective gloves

NOTE!

When in operation, the top of the device can heat up to temperatures > 70 °C!



5500_0036_rev01_int.cdr

Figure 2: Signs and labels BM5X3X

2.13 Signs and labels

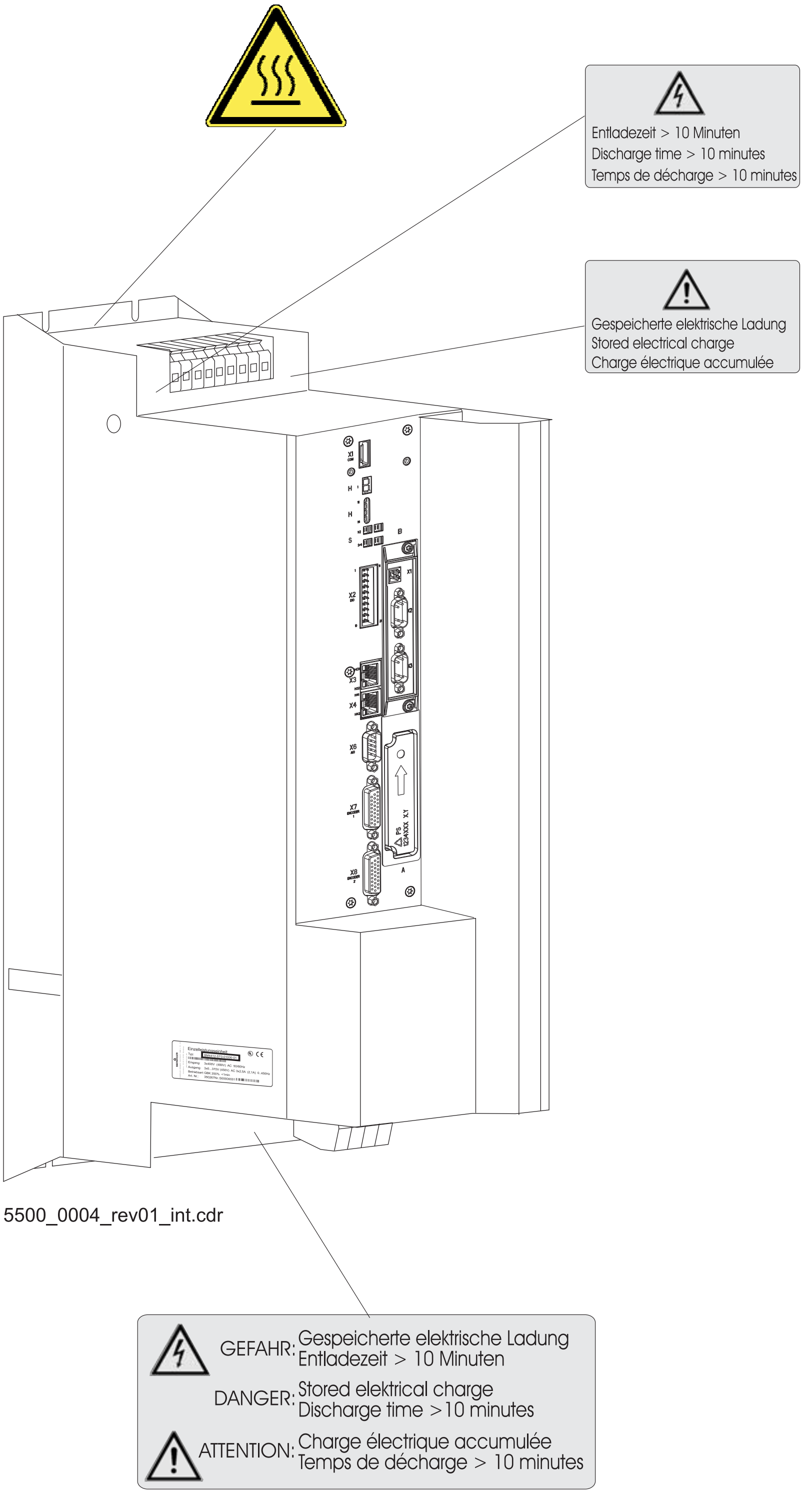
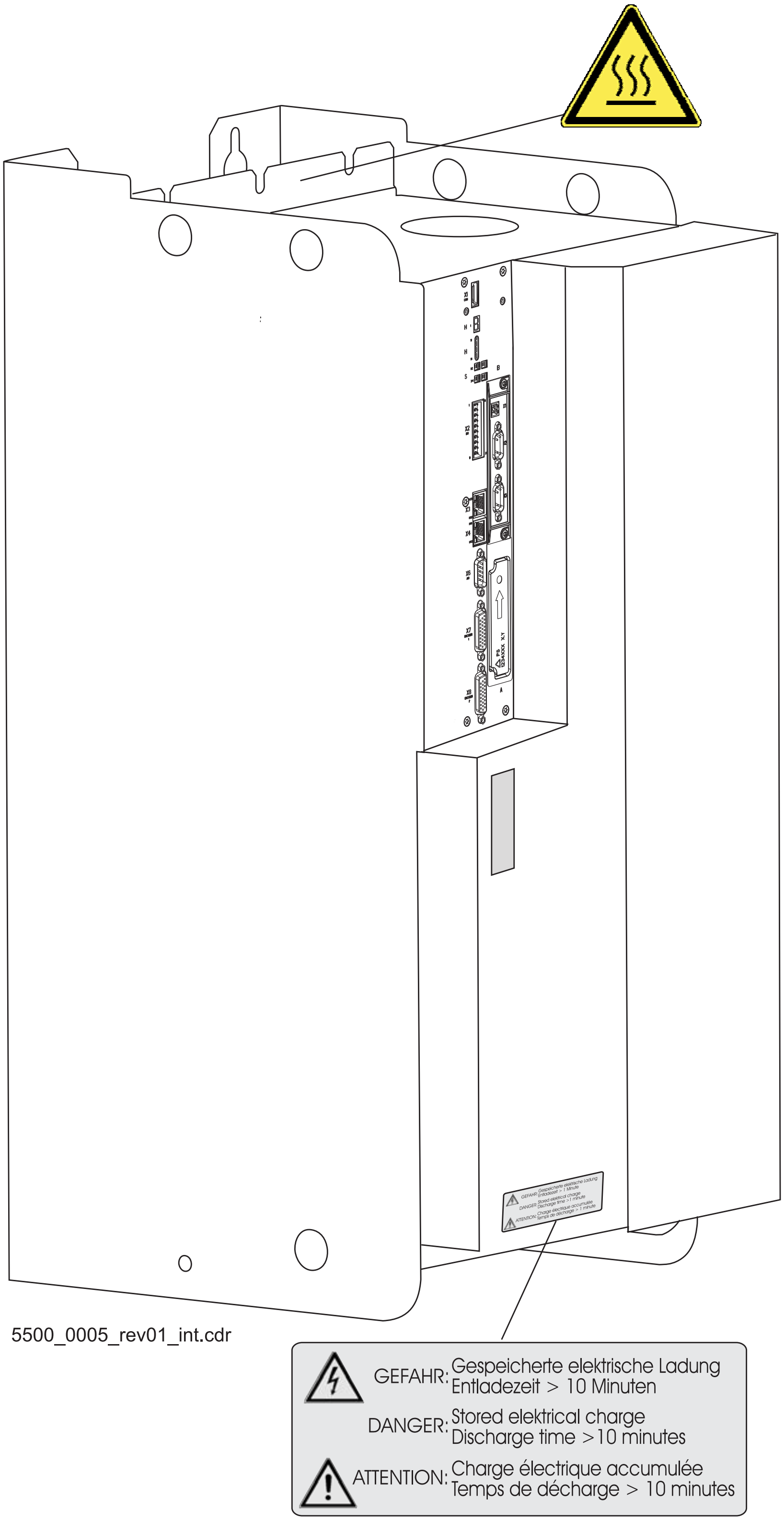


Figure 3: Signs and labels BM5X4X, BM5X5X



5500_0005_rev01_int.cdr

Figure 4: Signs and labels BM5X6X, BM5X7X

2.13 Signs and labels

Signs and labels devices with safety level

NOTE!

Only a device with built in Safety Module SAF XXX, marked with the TÜV Rheinland certification label and the safety label fulfills a certified safety function within the meaning of PL classification according ISO 13849 or SIL according EN 61800..

new logo

former logo

3

TECHNICAL DATA

3.1 Dimensions

The following dimension drawings show the main dimensions of the devices. By means of the dimension drawings the space requirements within the control cabinet are determined. The dimension drawings in ▷Drilling patterns◁ from page 145 must be used in order to do the required drilling / segments.

NOTE!

All dimensions in mm.

3.1 Dimensions

3.1.1 Dimensions BM551X

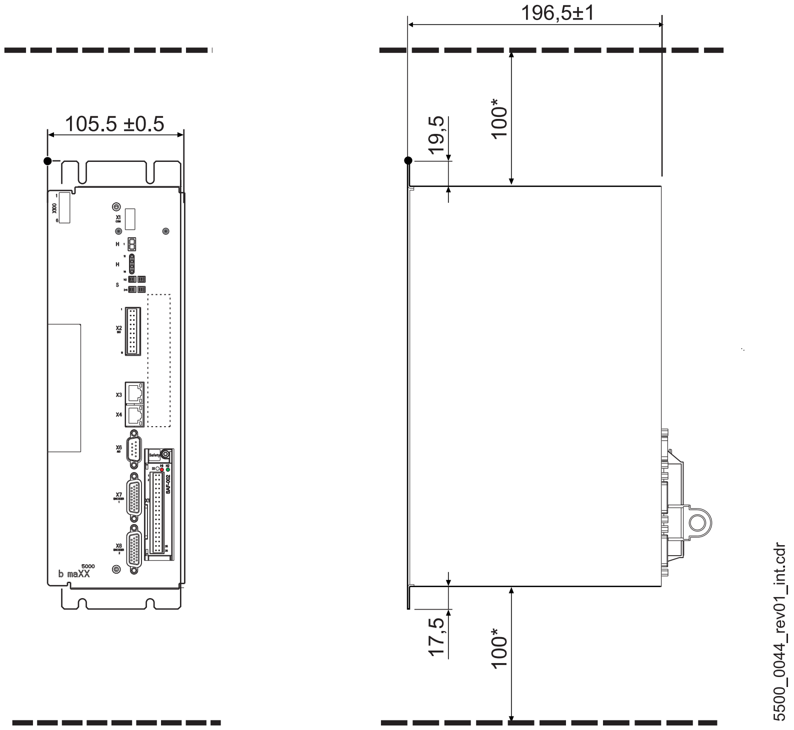


Figure 5: Dimensions BM551X

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59!

3.1.2 Dimensions BM552X

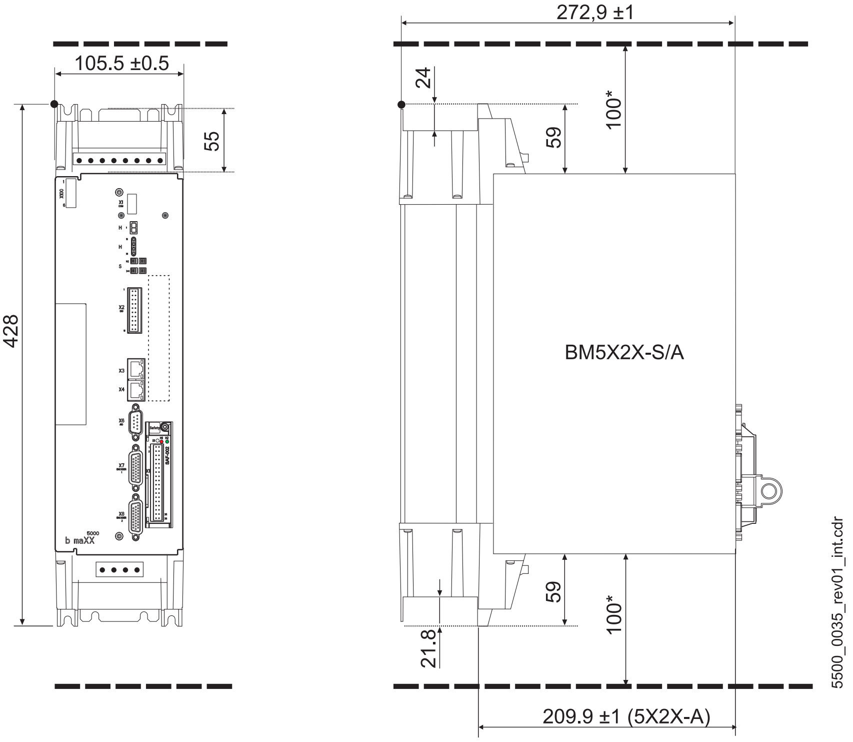


Figure 6: Dimensions BM552X-S/Z

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59!

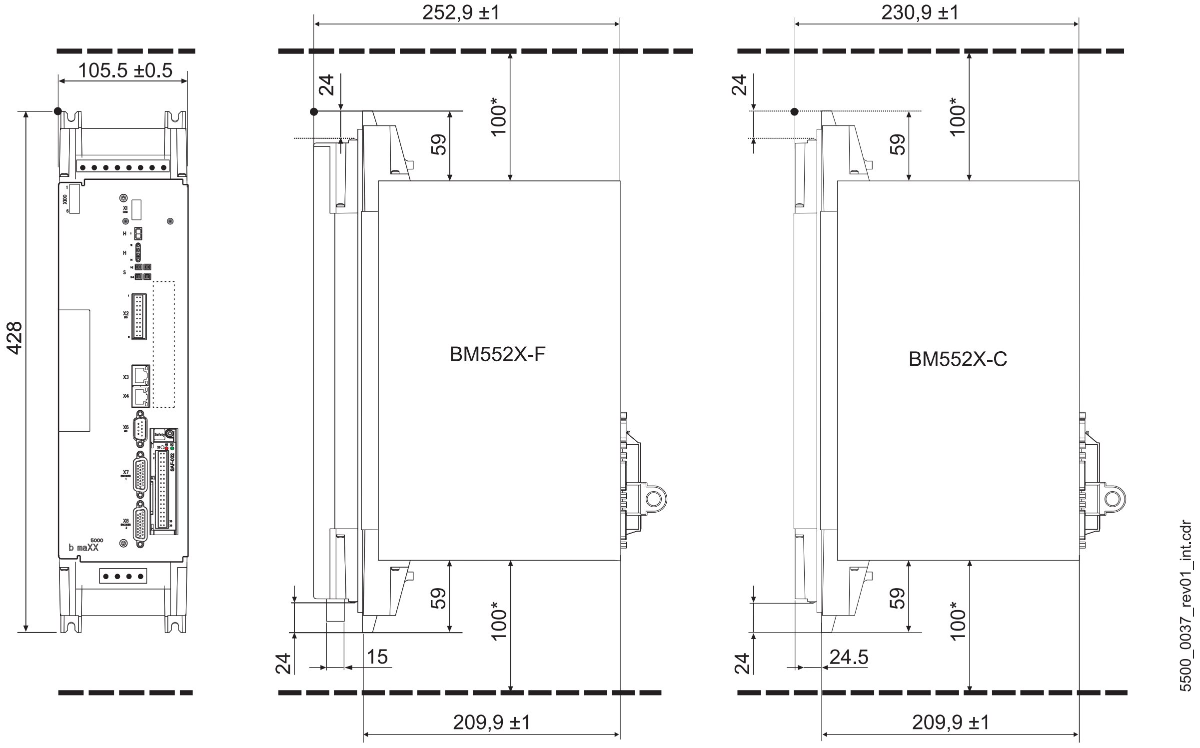


Figure 7: Dimensions BM552X-F/C

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59!

3.1.3 Dimensions BM5X3X

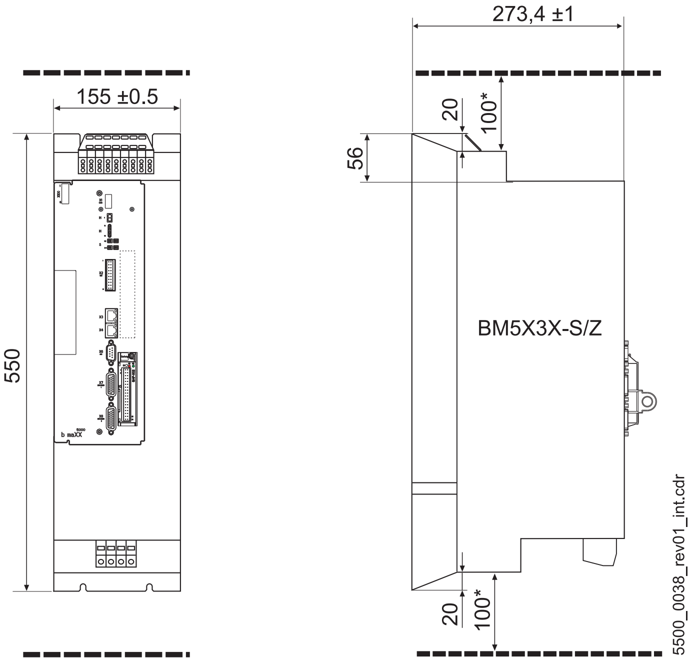


Figure 8: Dimensions BM553X-S/Z

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59!

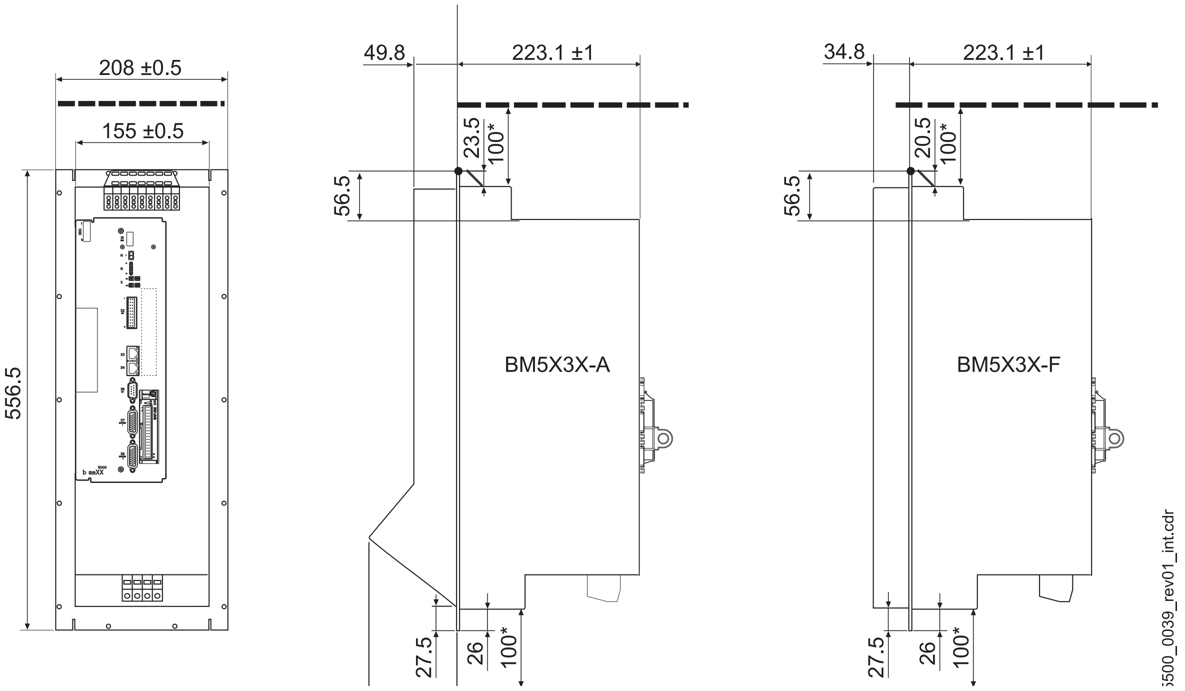


Figure 9: Dimensions BM553X-A/F

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59!

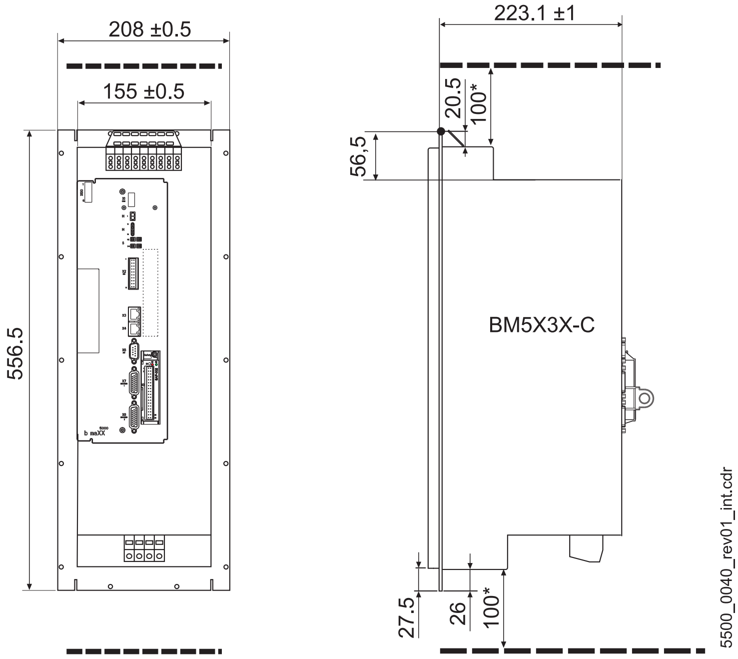


Figure 10: Dimensions BM553X-C

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59.

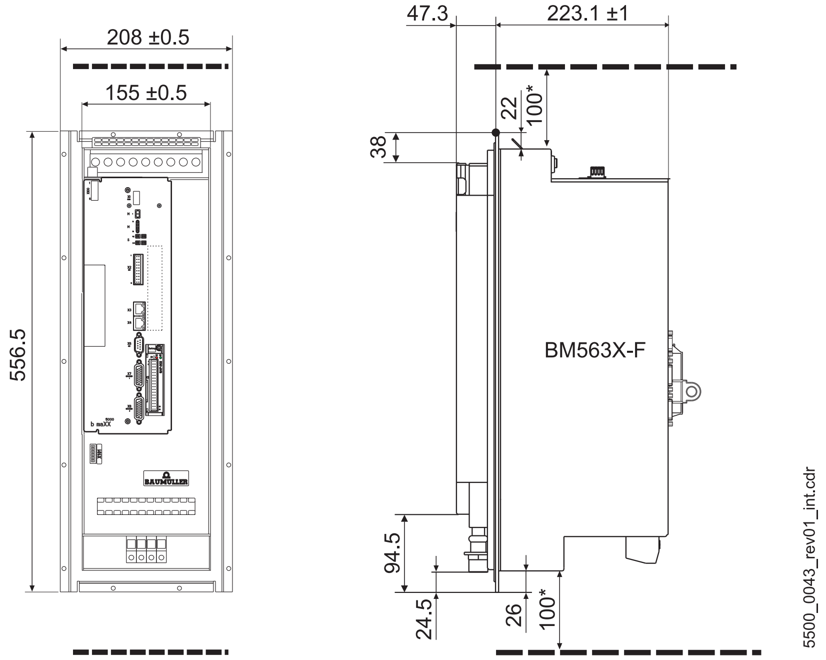


Figure 11: Dimensions BM563X-F

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59.

3.1.4 Dimensions BM5X4X

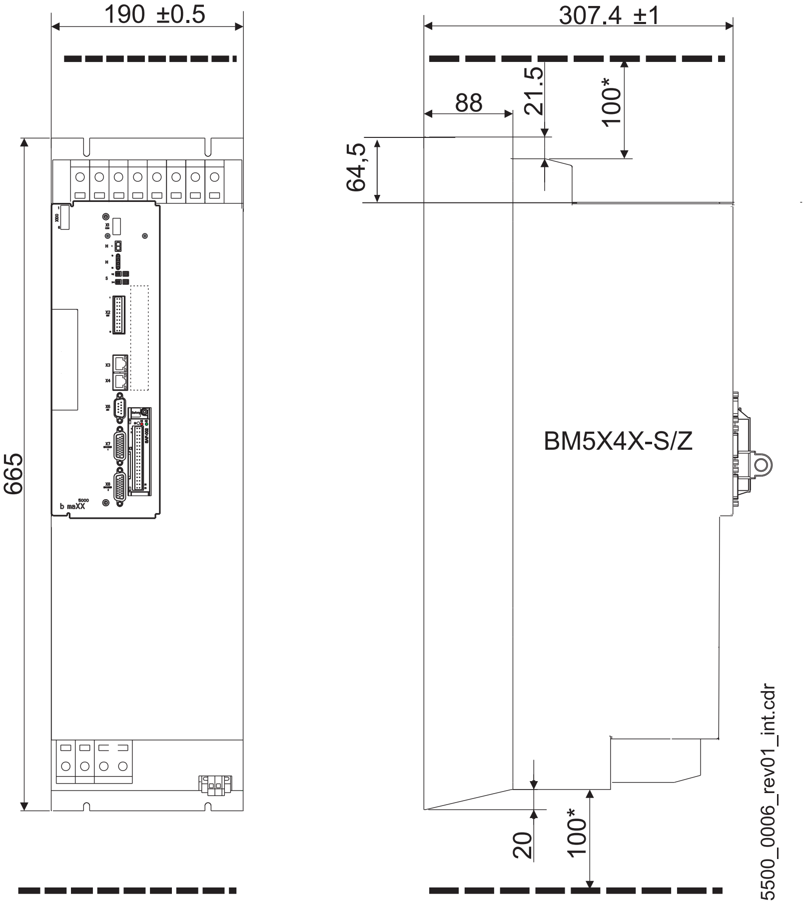


Figure 12: Dimensions BM554X-S/Z

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59.

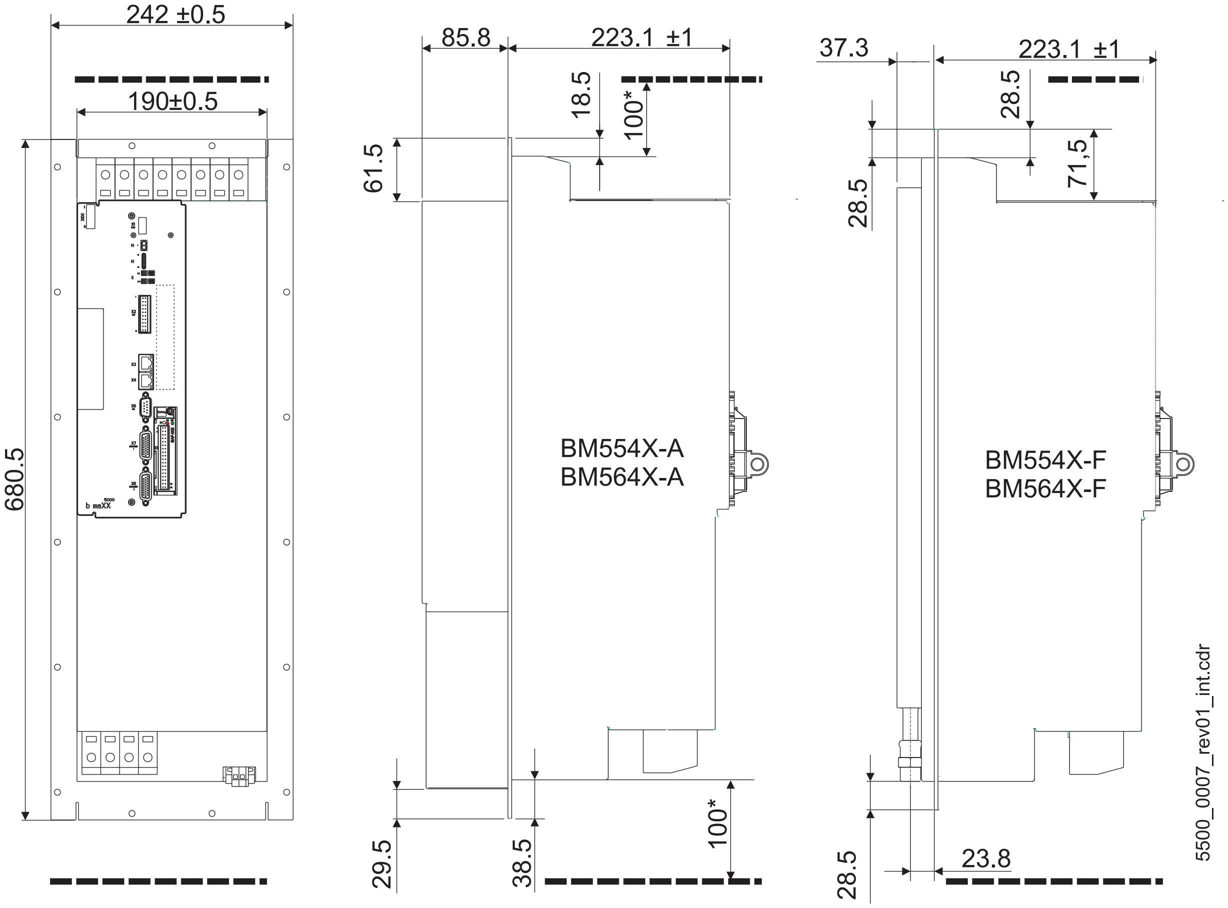


Figure 13: Dimensions BM554X-A/F, BM564X-A/F

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59!

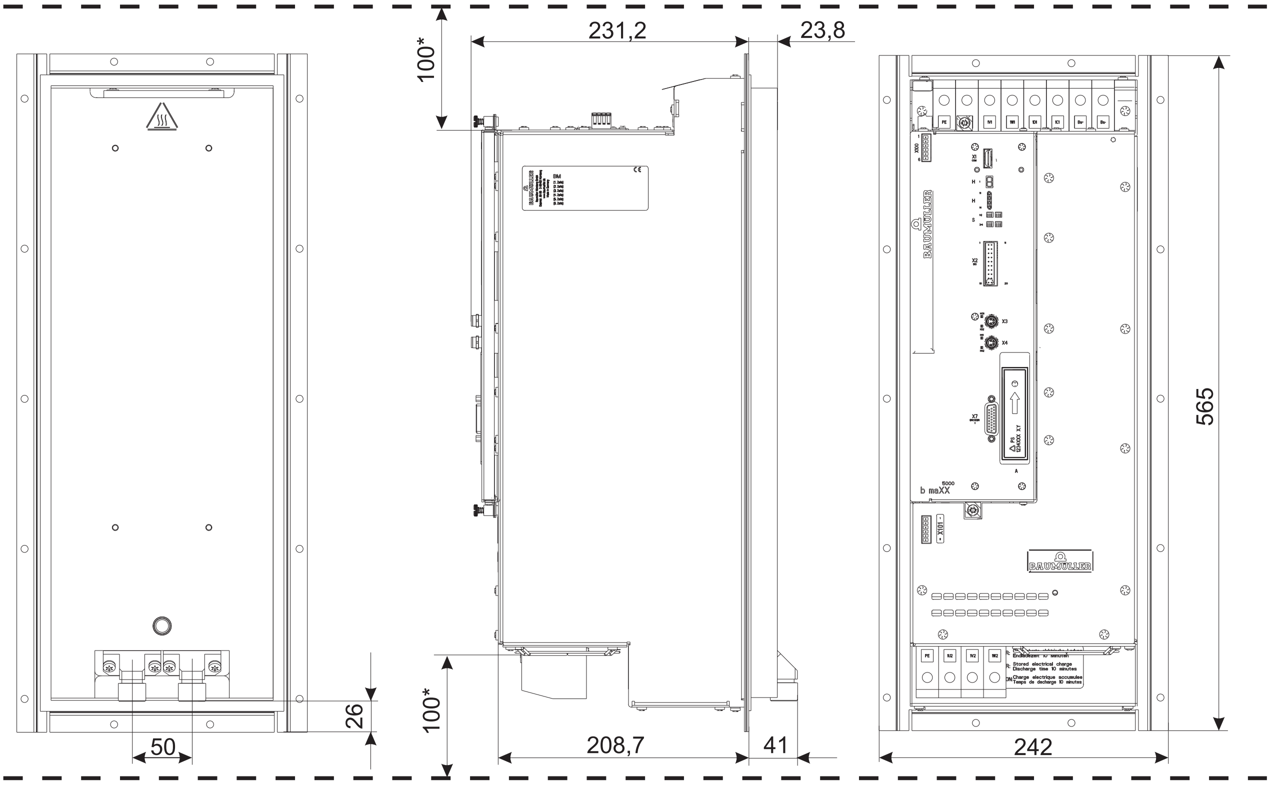


Figure 14: Dimensions BM564X-FXX9

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59!

3.1.5 Dimensions BM5X5X

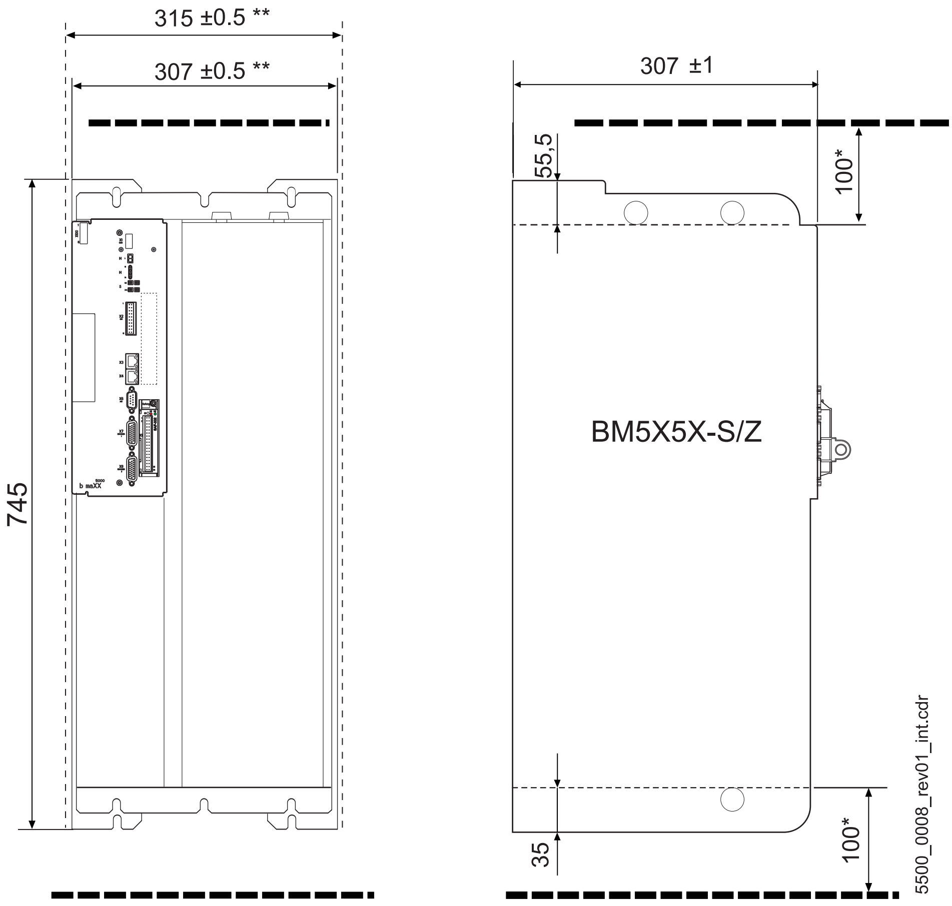


Figure 15: Dimensions BM555X-S/Z

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59.
**: Width including screw heads.

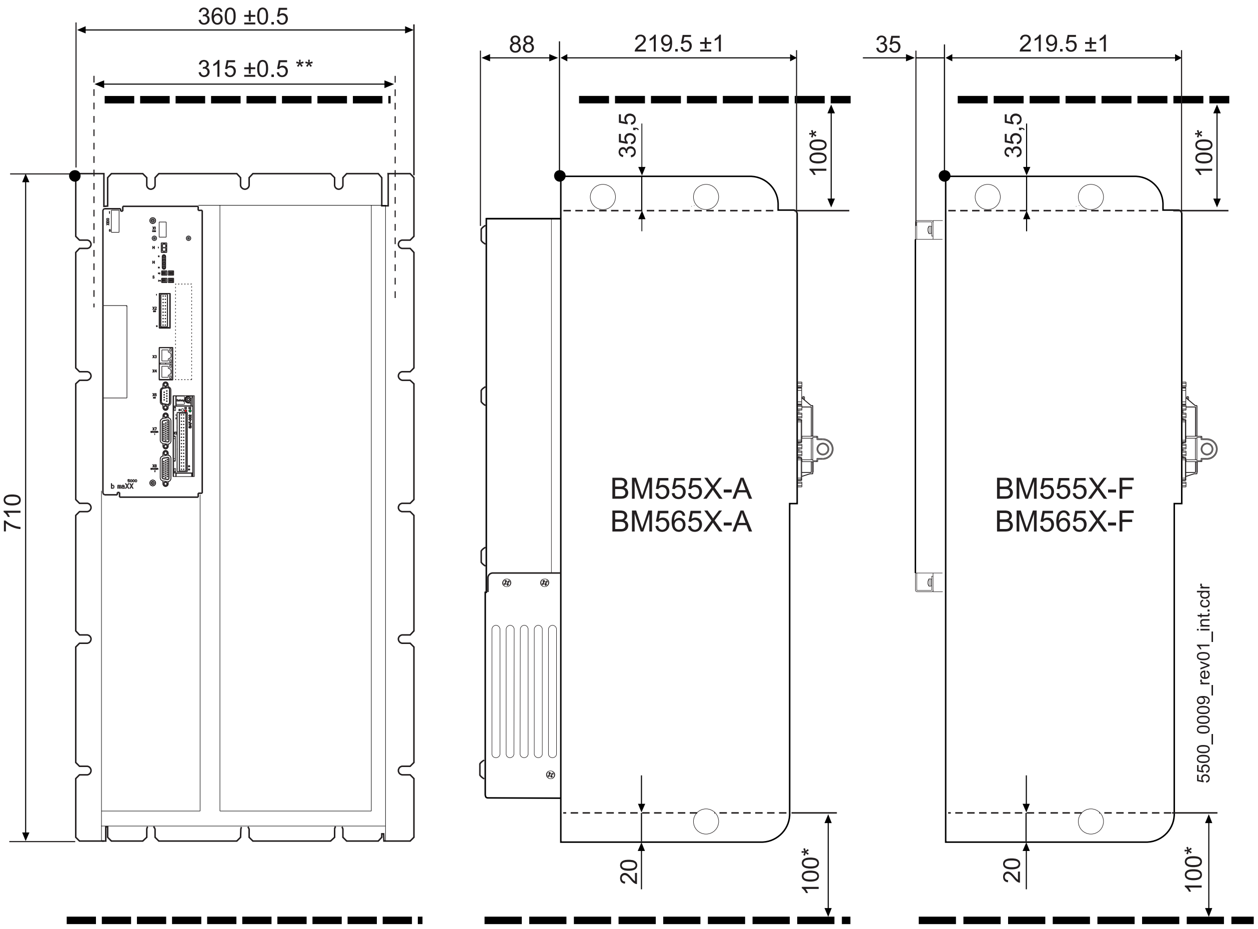


Figure 16: Dimensions BM555X-A/F

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59.
**: Width including screw heads.

NOTE!

The device BM5X5X-AXX**6** was extended by about 70 mm downwards with an additional protective plate against contact.

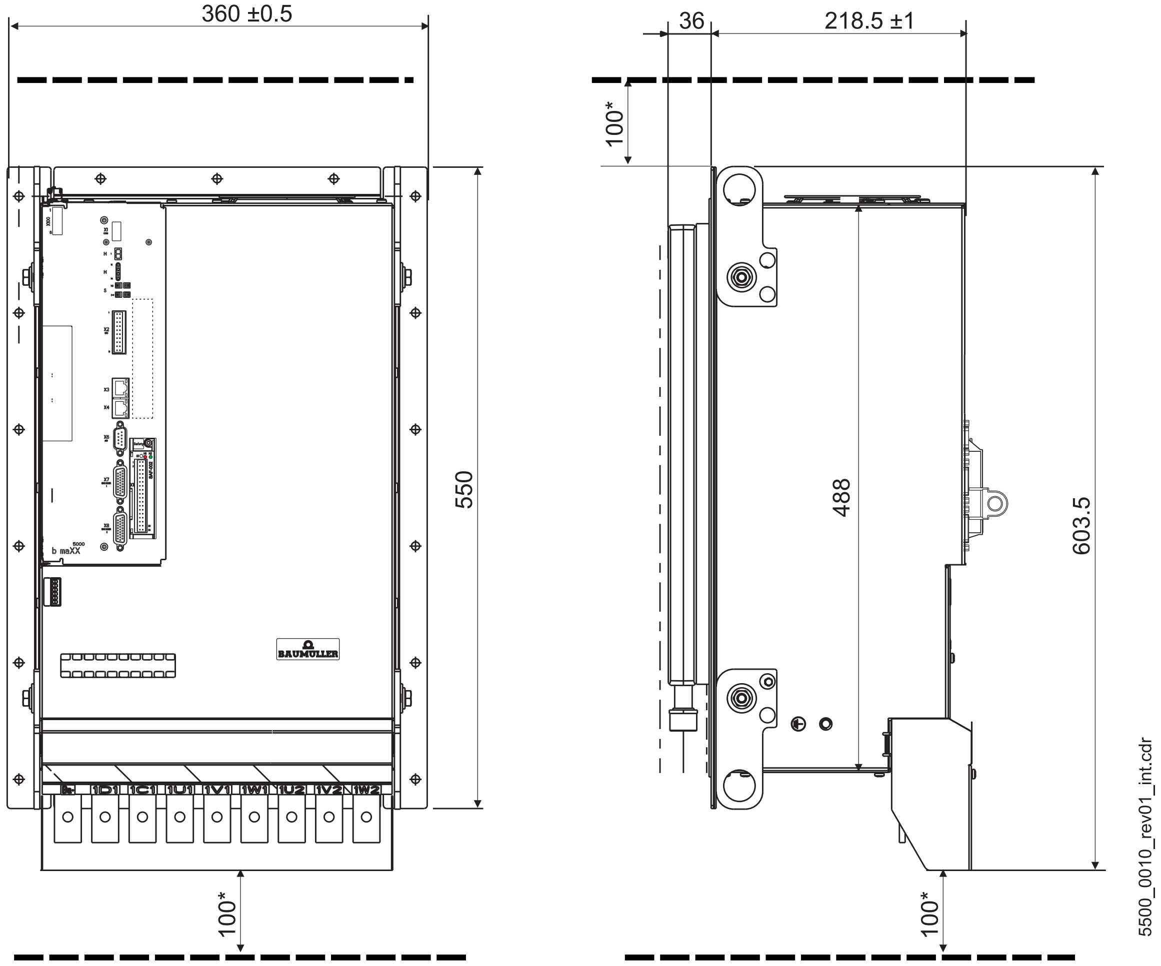


Figure 17: Dimensions BM565X-FXX9, BM575X-FXX9

*: Observe minimum clearance, Observe ▷Cooling◁ from page 59!

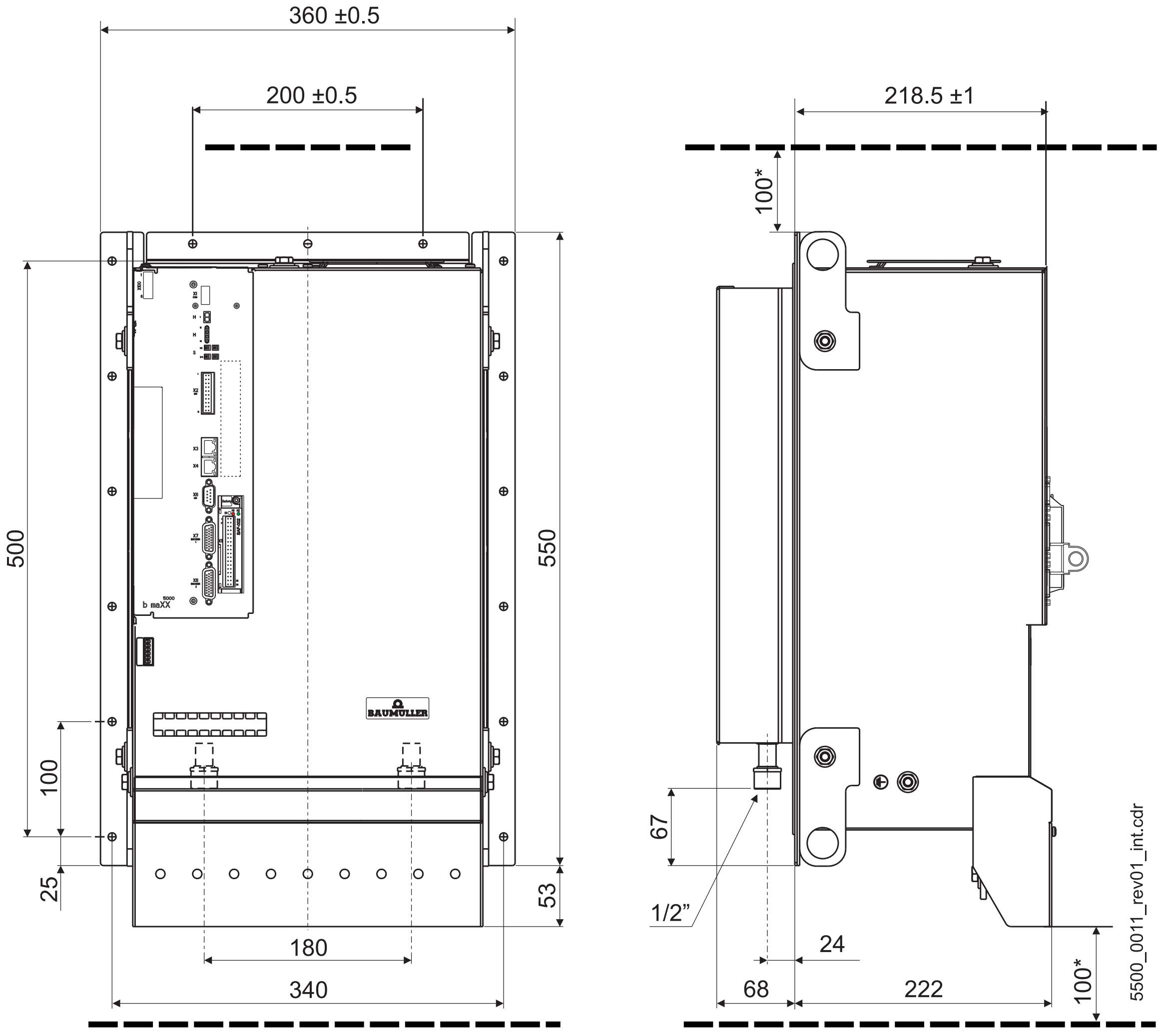


Figure 18: Dimensions BM575X-FXX9-RYY

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59.

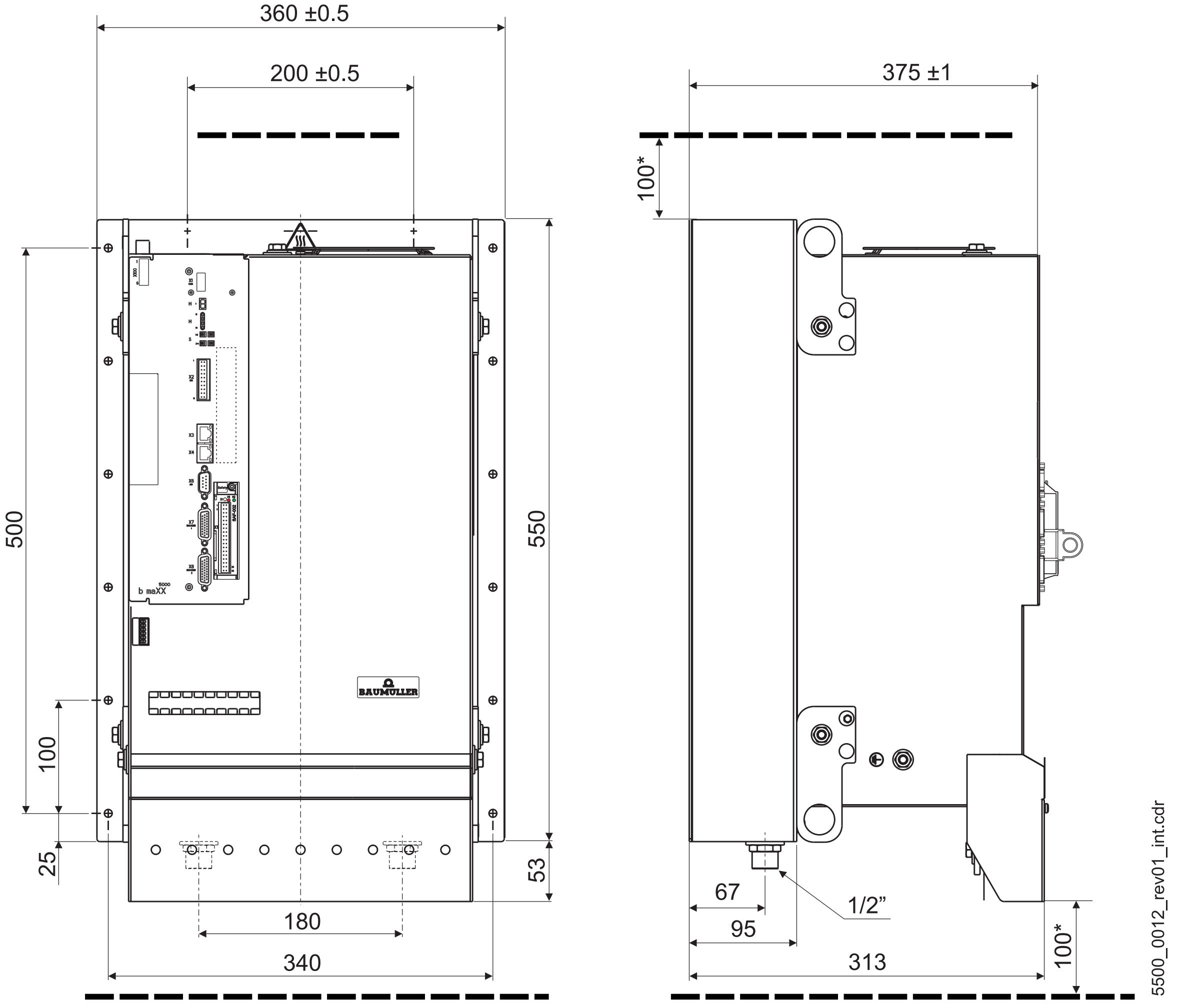


Figure 19: Dimensions BM565X-ZXX9-[RYY], BM575X-ZXX9-[RYY]

*: Observe minimum clearance,
Observe ▹Cooling◃ from page 59!

3.1.6 Dimensions BM5X6X

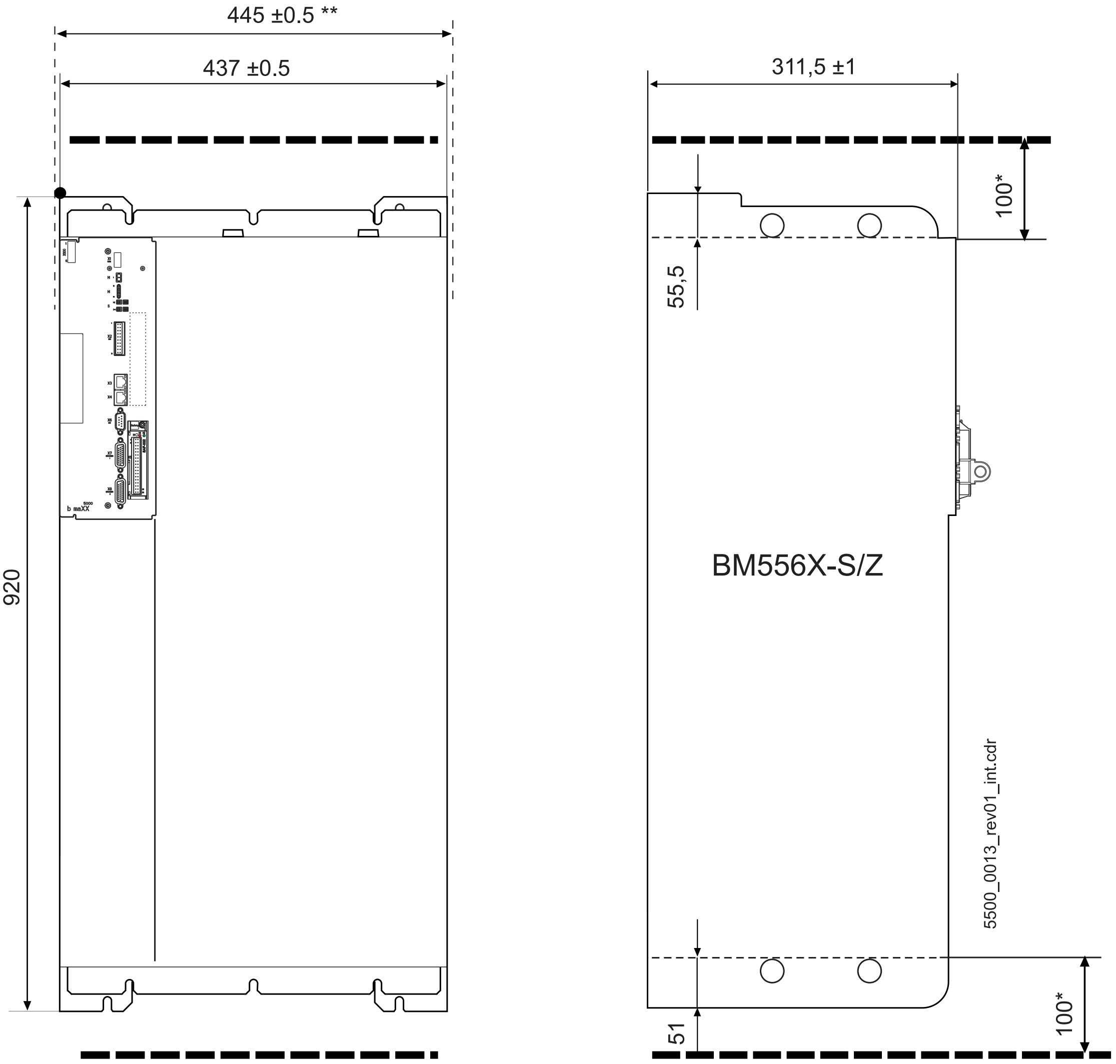


Figure 20: Dimensions BM556X-S/Z

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59!
**: Width including screw heads.

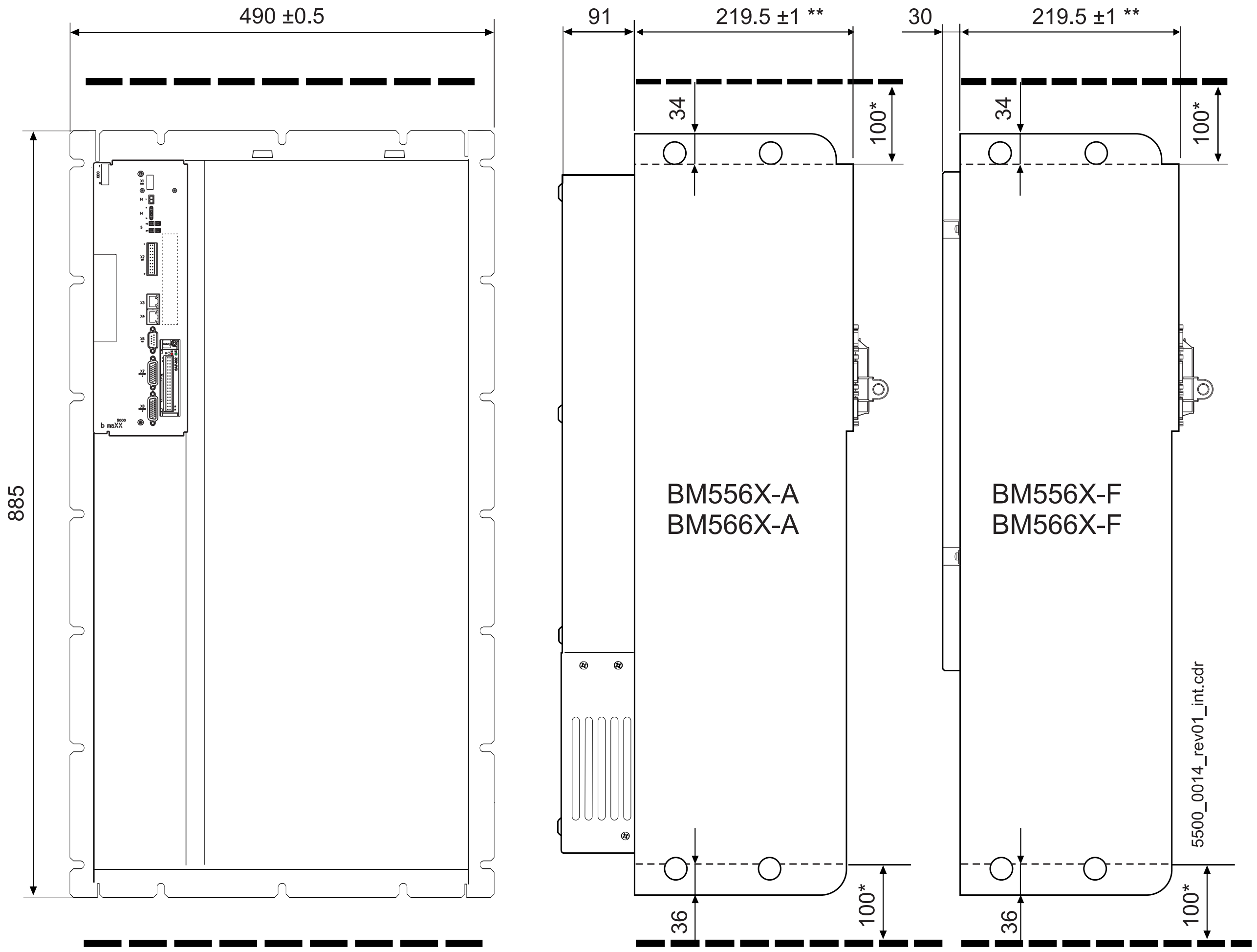


Figure 21: Dimensions BM556X-A/F, BM566X-A/F

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59!
**: Width including screw heads

NOTE!

The device BM5X6X-AXX**6** was extended by about 80 mm downwards by an additional protective plate against contact.

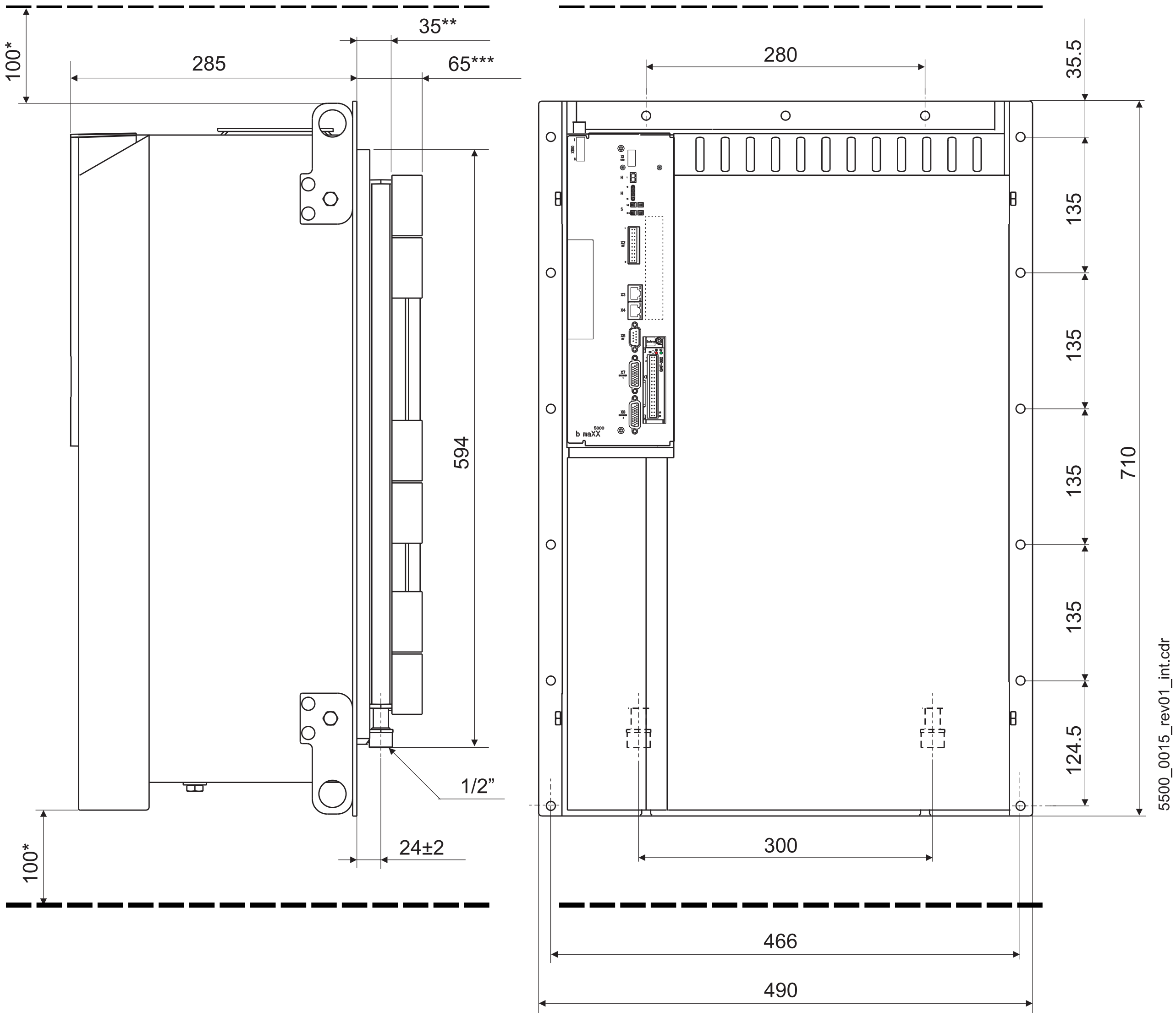


Figure 22: Dimensions BM566X-FXX9, BM576X-FXX9

*: Observe minimum clearance. Observe ▷Cooling◁ from page 59!
**: Without brake resistor
***: With brake resistor

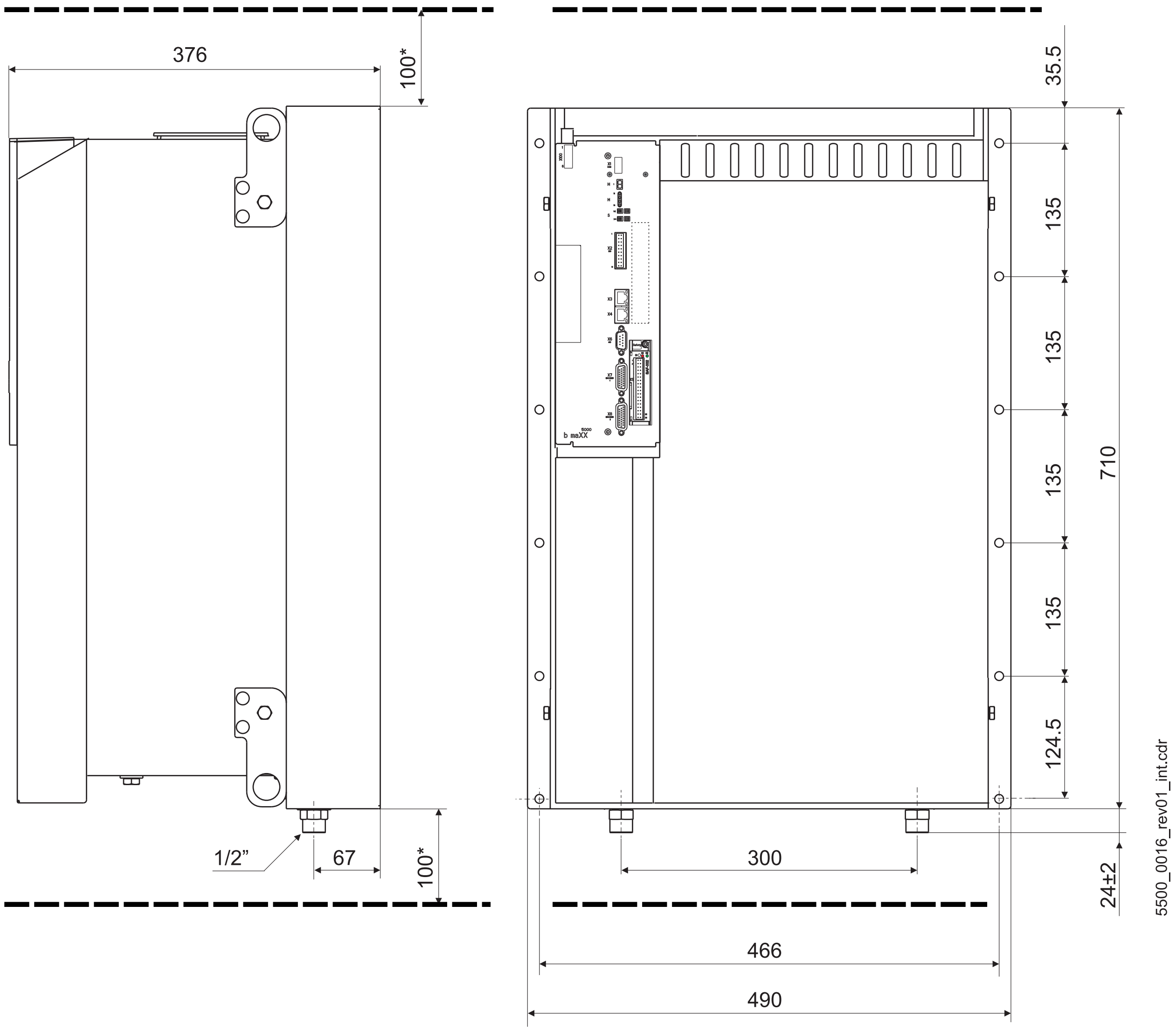


Figure 23: Dimensions BM566X-ZXX9, BM576X-ZXX9

*: Observe minimum clearance. Observe ▹Cooling◃ from page 59.

3.1.7 Dimensions BM5X7X

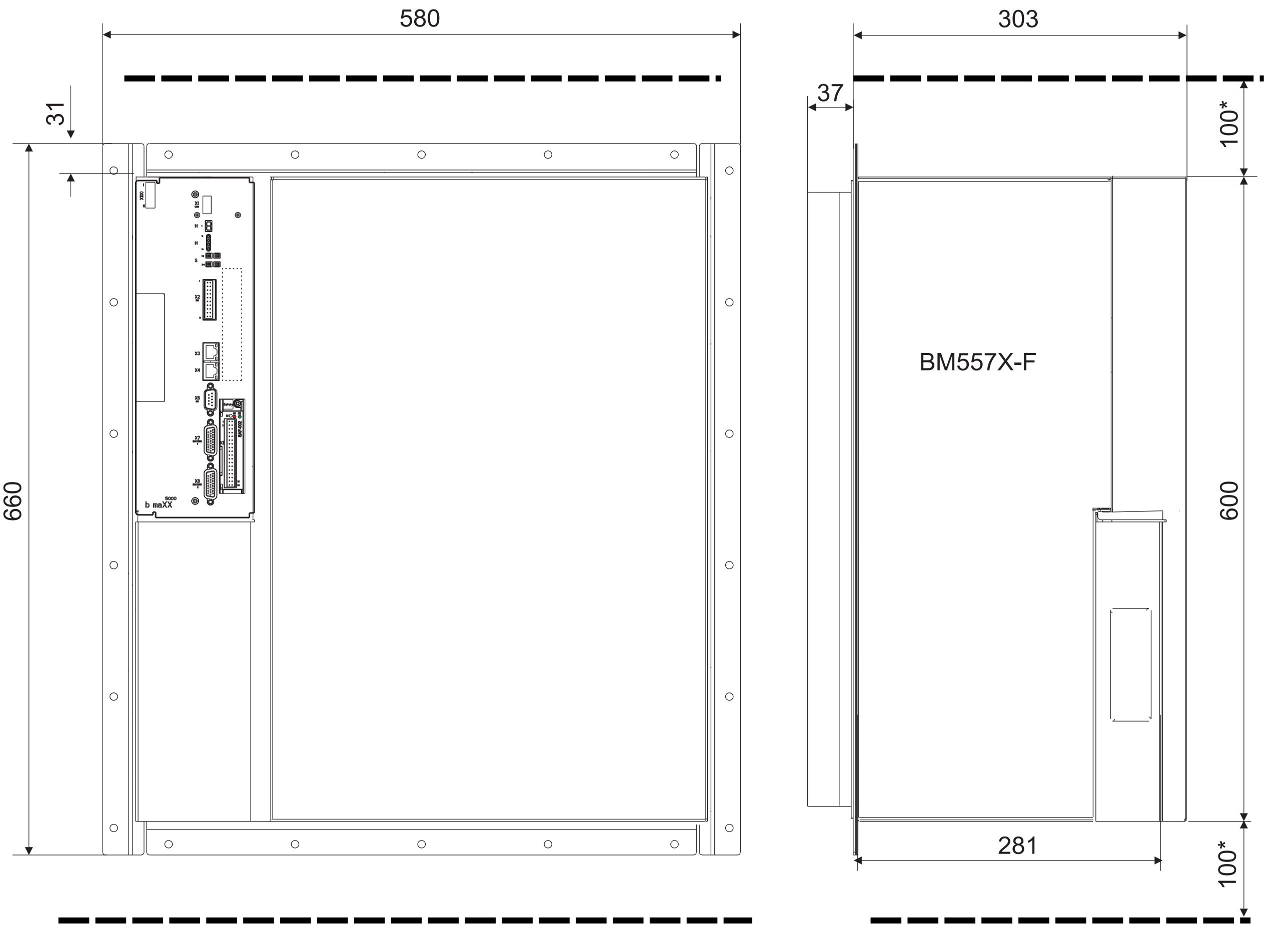


Figure 24: Dimensions BM557X-F, BM577X-F

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59!

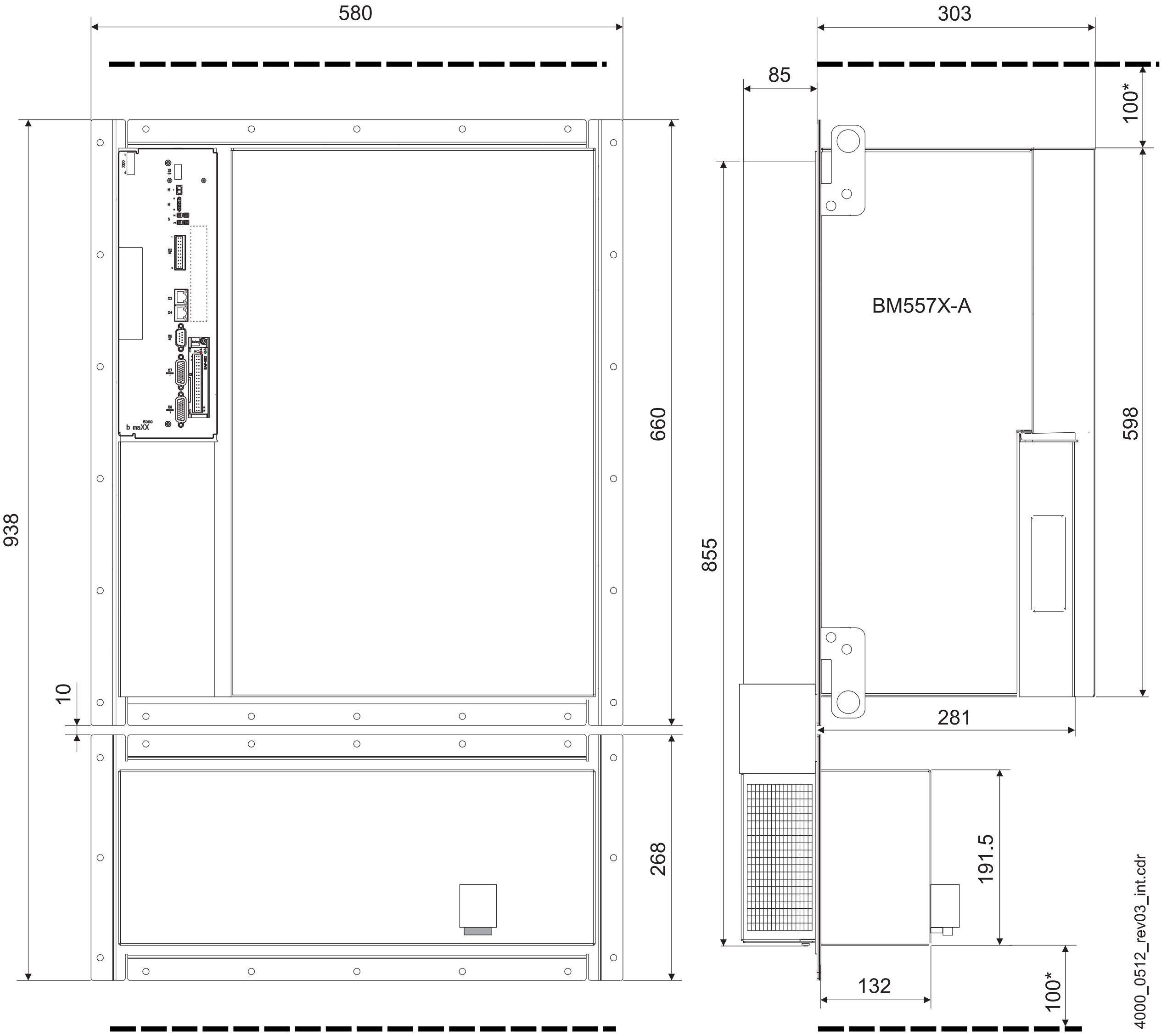


Figure 25: Dimensions BM557X-A

*: Observe minimum clearance, Observe ▹Cooling◃ from page 59!

3.2 Weight

Device	Dimensions Depth without connectors, without safety module, without cables (W x H x D)	Weight with controller
BM551**X**	105.5 x 347 x 197 mm	4.4 kg
BM552**X**	105.5 x 428 x 273 mm	7.0 kg
BM553**X** 1) BM563**X** 1)	155 x 540 x 273 mm	15.7 kg
BM554**X** 1) BM564**X** 1)	190 x 665 x 312 mm	26.4 kg
BM564**X**-FXX9 BM574**X**-FXX9	242 x 565 x 255 mm	
BM555**X** 1) BM565**X** 1)	304 x 745 x 312 mm	50.0 kg
BM565**X**-FXX9 BM575**X**-FXX9	360 x 604 x 255 mm	
BM566**X** 1) BM576**X** 1)	437 x 920 x 312 mm	70.0 kg
BM566**X**-FXX9 BM576**X**-FXX9	490 x 710 x 322 mm	
BM557**X** 2) BM577**X** 2)	580 x 660 x 303 mm	82.0 kg

1) Dimensions for the devices BM55XX-S and BM56XX-S. The deviations of the other cooling versions refer to ▹Dimensions◃ from page 29.

2) The dimensions for the device BM557X-F and BM577X-FXX9 are specified. The specified depth is the total depth of the device. Refer to ▹Figure 25◃ on page 47.

3.3 Operating requirements

3.3.1 System types

There are three basic types of the current supply systems regarding the grounding, which conform with DIN VDE0100 part 300 and IEC 60364:

- The TN system has a directly grounded point (system grounding). The cabinet of the electrical installation is connected via the protective conductors and PE conductors with this point.
- The TT system has a directly grounded point (system grounding). The cabinet of the electrical installation is connected with grounding electrodes. The grounding electrodes are separated from system grounding.
- The IT system has no direct connection between the active conductors (L1, L2, L3, N) and grounded parts (PE). The cabinet of the electrical installation is grounded. The separation is reached by using an isolating transformer or an independent current source (generator, battery).

If the low-impedance ground fault is adequate, an upstream fuse within the TN system or the TT system responds. At a high-impedance ground fault a fuse does not respond. This ground current (residual currents) can be dangerous. Therefore sensitive circuit breakers are used for residual current monitoring.

At a ground fault In an IT system there is no ground current. The upstream fuses do not respond. Therefore the operation procedure is maintained. A second ground fault at another phase leads to residual currents. This can initiate a fuse. In order to detect the first ground fault a ground leakage monitor is required. In order to detect the second ground fault a residual current monitoring is required.

Supported system types

NOTICE!

The operation of the **BM5500, BM5600, BM5700** is possible at **IT** systems and at **TN / TT** systems.

NOTE!

The distortion factor of the input current of following devices
BM55XX-X**R**… /X**S**… /X**W**… ,,
BM56XX-X**R**… /X**S**… /X**W**… , and
BM57XX-X**R**… /X**S**… /X**W** is approx. **twice as much** the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

3.3.2 Requirements to the energy supply / supply system

Supply system (refer to ▹System types◃ from page 49)	BM55XX - X**T**XX / - X**R**XX 6) BM56XX - X**T**XX / - X**R**XX 6) BM57XX - X**T**XX / - X**R**XX 6)	Industrial system with a direct grounded neutral point or with a by a low impedance grounded neutral point (TN system or TT system)
	BM55XX - X**I**XX / - X**S**XX BM56XX - X**I**XX / - X**S**XX BM57XX - X**I**XX / - X**S**XX	Industrial system with a grounded star point (IT-system), which has no or high impedance, TN system, TT system
	BM55XX - X**G**XX / - X**W**XX BM56XX - X**G**XX / - X**W**XX BM57XX - X**G**XX / - X**W**XX	Industrial system with direct or low impedance earthed phase junctions (grounded delta wye), TN system, TT system or IT system
Inductance (sum of power supply inductance and choke inductance)	BM551X, BM552X	Min. u_k = 0.4 % max. u_k = 4 %
	BM5526-, BM553X-, BM563X-, BM554X-, BM564X- X**T**.../X**I**.../X**G**...	Min. u_k = 2.4 % max. u_k = 4 %
	BM555X-, BM565X-, BM575X-, BM556X-, BM566X-, BM576X-, BM557X-, BM577X X**T**.../X**I**.../X**G**...	Min. u_k = 4 % max. u_k = 6 %
Min. power supply impedance	BM554X- X**R**.../X**S**.../X**W**...	38 µH
	BM564X- X**R**.../X**S**.../X**W**...	24 µH
	BM555X- X**R**.../X**S**.../X**W**...	30 µH
	BM5562- X**R**.../X**S**.../X**W**...	14 µH
	BM5563- X**R**.../X**S**.../X**W**...	11.5 µH
	BM5566- X**R**.../X**S**.../X**W**...	7.5 µH
	BM576X- X**R**.../X**S**.../X**W**...	29 µH
Rated supply voltage/-frequency 1) 2) (U_{AC}) device		3 x 400 V 50/60 Hz
Absolute minimum supply voltage device1) 2) (U_{AC}) Absolute maximum supply voltage device1) 2) (U_{AC})		3 x 207 V / 50/60 Hz 3 x 528 V / 50/60 Hz
Absolute minimum frequency5) Absolute maximum frequency 5)		47 Hz 63 Hz
Overvoltage category EN 61800-5-1, chapter 4.3.6		III
Harmonics (power supply voltage) EN 61800-3, chapter 5.2.1, class 3		$THD_U \le 12$ %
Unbalanced power supply voltage EN 61000-2-4, Tab. 1, class 3		Max. 3 %

Commutating dips EN 61800-3, chapter 5.2.1, class 3		Depth of dip < 40 %, area < 250 % x degrees
Voltage dips EN 61800-3:2004 and A1:2012		10 % to 80 % 1)
Voltage variations/-fluctuations EN 61200-2-4, class 3		+/-10 % 10) +10 % to -15 % at a period of ≤ 1 min
Short-circuit Current Rating (SCCR) 4)		65 kA
Rated supply voltage / -frequency (U_{AC}) fan 7)	BM554X-S/A, BM555X-S/A, BM556X-S/A, BM564X-S/A, BM565X-S/A, BM566X-S/A	230 V ± 10 % 50/60 Hz
	BM557X-A	3 x 400 V ± 10 % 50/60 Hz
Control voltage 3) (U_{DC}) EN 61131-2:1994, table 7		+ 24 V -15 % / +20 %

1) Voltage dips of the power supply voltage phase-to-phase down to 0 V are prohibited, no matter how short
The error „power supply not ready-to-operate“ is generated if the supply voltage falls below U_{ACmin} for t > 0.1 s.

2) Rated voltage is 400 V.
With lower supply voltages the output power of the device is reduced. Refer to correction factors, in case the operating conditions were changed ▹Supply voltage◃ on page 55.

3) The control voltage must accord to PELV (EN 61800-5-1, chapter 3.21) or SELV (EN 61800-5-1, chap. 3.35).
At control voltage of < 24 V the ventilation power output is reduced. Therefore, it may be necessary, to reduce the output currents as well.

4) Required for UL 508C, only.

5) Rate of change of the power supply frequency 1 Hz/s at a maximum (EN 61000-2-4, class 3).

6) The connection and operation of a device with the identification BM5XXX-X**T**XX at an IT system or a grounded delta system, is **not** permitted.

7) Valid for BM554X/BM555X/BM556X, BM564X/BM565X/BM566X cooling versions S and A and BM557X cooling version A.

8)

NOTE!
The distortion factor of the input current of following devices
BM55XX-XR… /XS… /XW… ,
BM56XX-XR… /XS… /XW… and
BM57XX-XR… /XS… /XW… is approx. **twice as much** the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

9) The error No. 93 is displayed and a damage of the device is possible if the power supply voltage is higher than the permitted power supply voltage

10) The power supply voltage phase-to-phase must increase or decrease linearly within 800 µs between zero crossing and 150 V.

3.3.3 Motor requirements

b maXX BM5500, BM5600, BM5700 is designed to operate three-phase current motors with a terminal motor voltage of 3 x 350 V (typical for servo motors of Baumüller). **b maXX BM5500, BM5600, BM5700** is designed to operate 3 x 400V (standard asynchronous motors and customer-specific motors of Baumüller). The motors must be operated wye-connected. The nominal DC link voltage is 540 V_{DC}. The DC link voltage may rise up to 780V to 800V in braking operation. The connected motor must be designed for these DC link voltages.

The DC link voltage remains between 640V and 760V continuously (not only in the braking operation) if the **b maXX BM5500, BM5600, BM5700** power modules are operated at a voltage-controlled DC link (e.g. BM51XX). The connected motor must be able to operate at these voltages continuously.

The device can be used at lower voltages, also (e.g. 3 x 230 V). However, here, the three-phase current motors must be released for the operation with power inverters with up to 800V DC link voltage, because the brake resistor threshold remains (refer to ▹Electrical data basic units◃ from page 61). For these reasons three-phase motors with $U_{DC,nom} \geq 540$ V must be used, only.

3.3.4 Required environmental conditions

Transport temperature range	- 25 °C to + 70 °C
Transport climatic category EN 60721-3-2	2 K 3
Storage temperature range	- 25 °C to + 55 °C
Storage climatic class EN 60721-3-1	1 K 4
Operation environment	Industrial system [1)] Category C2 according EN61800-3 for operation in Second Environment
Operation temperature range	Min. 5 °C to max. 55 °C (with derating above 40 °C) [3)]
Operation climatic class EN 60721-3-3	3 K 3
Operating altitude	Up to 4000 m above MSL, except BM551X, BM5526, BM5527 up to 2000 m (with derating above 1000 m) [2)]
Humidity (operation) EN 60721-3-3	Relative humidity: 5 % to 95 % no condensation and absolute humidity: 1 g/m^3 to 29 g/m^3
Ionizing and non-ionizing radiation	< measurable range
Vibration, shock and repetitive shock EN 61800-5-1, section 5.2.6.4 Vibration test	Max. 1 g during operation
Degree of pollution EN 61800-5-1, table 6, Tab. 2	2

[1)] For the operation in an environment of category C2 according to IEC 61800-3:2012, additional measures may be required.The manufacturer of the installation / user must provide the following evidence in this case: The additional measures are effective. The specified limit values of category C2, which are described in IEC 61800-3, are complied with.

[2)] Refer to correction factors at environmental conditions, ▹Operating altitude◃ on page 54.

[3)] Refer to correction factors at environmental conditions, ▹Environmental temperature◃ on page 55

NOTICE!

Normally, non-conductive pollution occurs. Conductive pollution is unacceptable. Conductive pollution can lead to the destruction of the device. The customer is responsible for destructions, which were caused by pollution due to conductive materials or components.

3.3.5 Correction factors if the operating conditions are changed

If the devices **BM5500, BM5600, BM5700** are operated at operating conditions, which lead to different correction factors, then all correction factors must be considered by multiplying them simultaneously to achieve the output power and the output current.

The following correction factors are to be considered if nothing other is specified at the „Technical data“ of the device:

3.3.5.1 Operating altitude

If the devices **BM5500, BM5600, BM5700** are operated above an absolute altitude of 1000 m, then the output power must be reduced against the rated power according to the following curve.

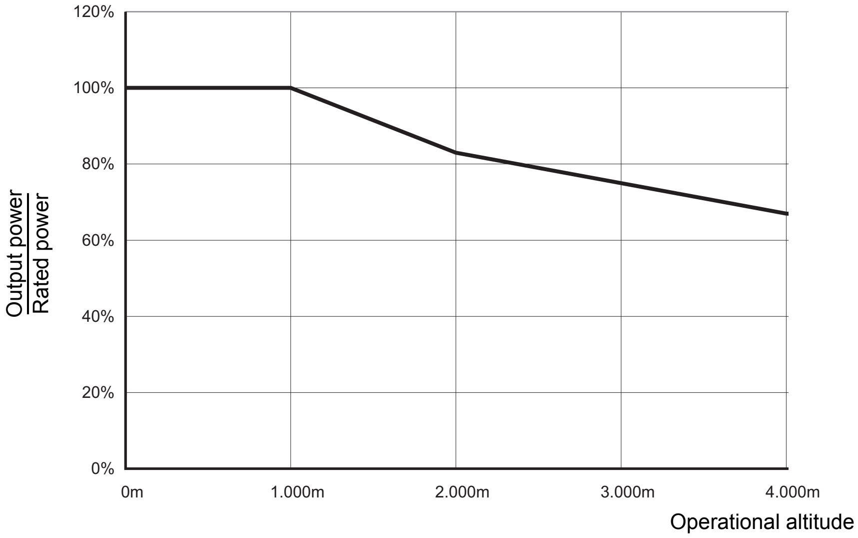


Figure 26: Reducing of the output power in dependence of the absolute altitude

NOTICE!

Devices BM551X, BM5526 and BM5527 have an operating altitude of maximum 2000 m.

NOTE!

Baumüller devices, which are provided for the operation at grounded delta systems or IT supply systems, may have an operating altitude of 2000 m at these systems, only. If the altitude is higher than 2000 m to 4000 m these devices must be operated at TN systems and TT systems. Such systems, e. g. can be achieved by using an isolating transformer with a secondary-sided star point.

3.3.5.2 Environmental temperature

The **BM5500, BM5600, BM5700** were designed to be operated at an environmental temperature of T_{Rated} = 40 °C. If the devices are operated at temperatures between 40 °C and 55 °C the permitted output current (I_O) must be reduced according to the following formula:

$$I_O = I_{O(40°C)} \cdot \left(1 - \left(\frac{\text{Coolant temperature} - 40°C}{°C} \cdot 0,03\right)\right)$$

The coolant temperature complies with the environmental temperature of air-cooled devices and with the water temperature of water-cooled devices.

3.3.5.3 Supply voltage

Above rated supply voltage

The rated voltage is 3 x 400 V

When having input voltages above the rated supply voltage the output currents must accordingly be reduced at a constant output power.

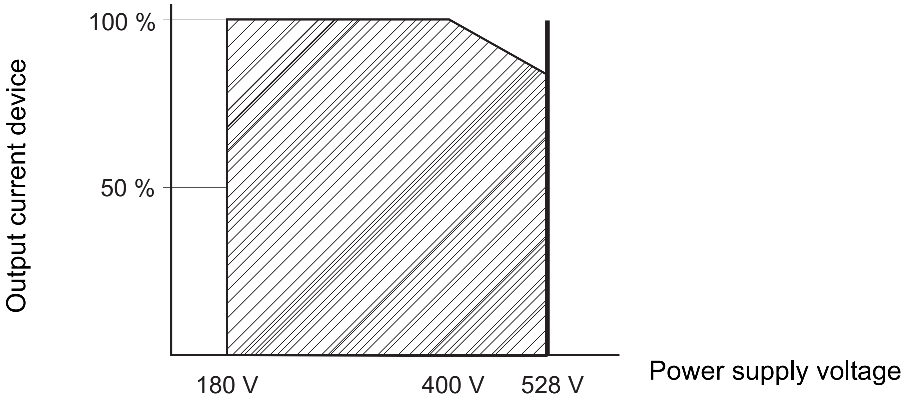


Figure 27: Output current in dependence of the power supply voltage

Below rated supply voltage

The rated voltage is 3 x 400 V
The output power of the device reduces with lower power supply voltages.

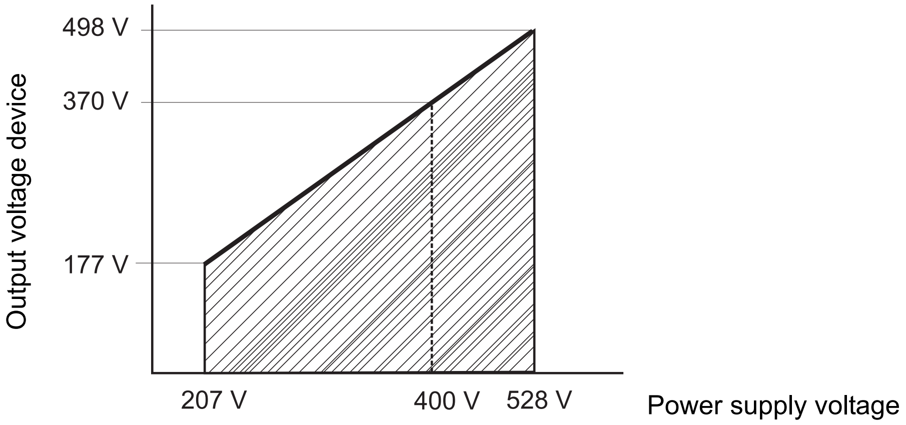


Figure 28: Reducing the output voltage in dependence of the power supply voltage

Output power

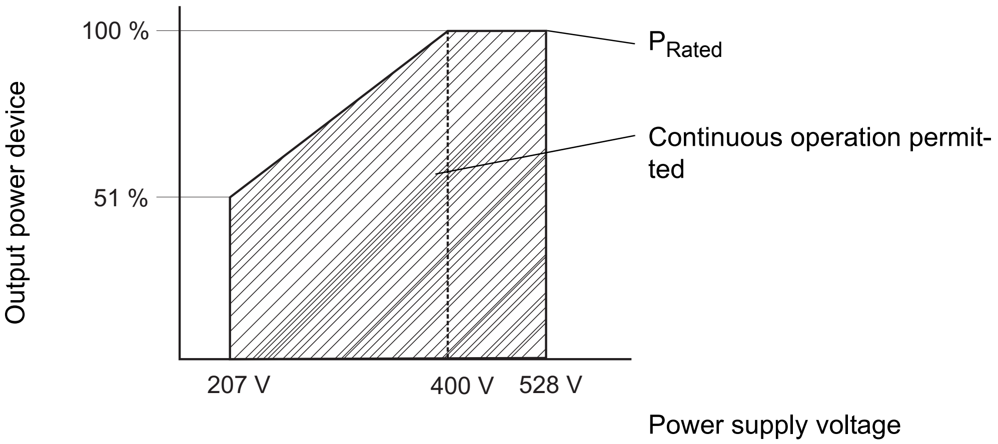


Figure 29: Reducing the output power in dependence of the power supply voltage

The output power of the device is obtained by multiplying the output current with the output voltage.

$$S_{Out} = U_{Out} \times I_{Out} \times \sqrt{3}$$

It is necessary to reduce the output current to a value between 400 V and 528 V, in order to obtain the specified curve / surface.

3.3.6 Coherence between rated current and peak current

- Calculation of the thermal rms current from the dimensioning cycle

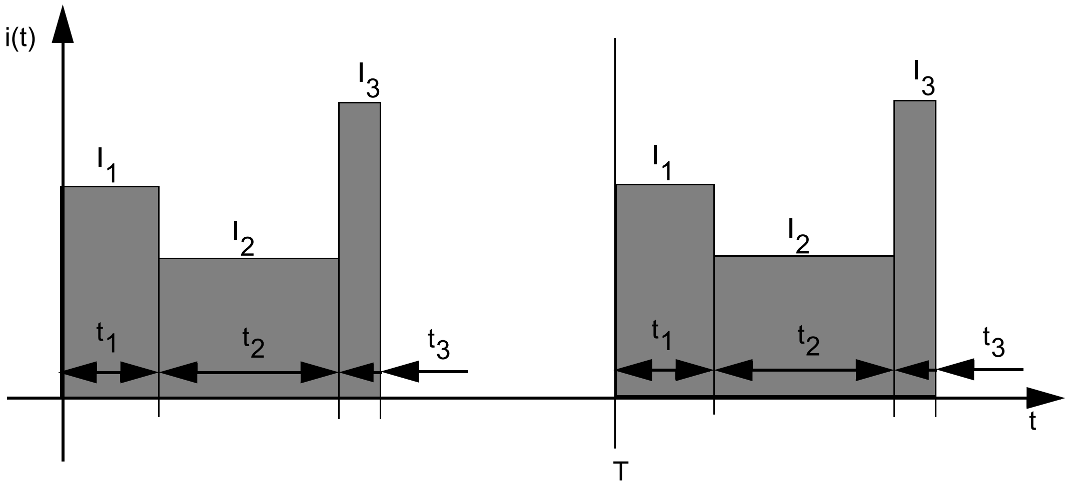


Figure 30: Calculation of the thermal rms current

$$I_{eff} = \sqrt{\sum_{n=1}^{k} I_n^2 \cdot \frac{t_n}{T}} = \sqrt{I_1^2 \cdot \frac{t_1}{T} + I_2^2 \cdot \frac{t_2}{T} + I_3^2 \cdot \frac{t_3}{T}}$$

- Coherence between peak current and rated current
  for the dimensioning of a motion cycle

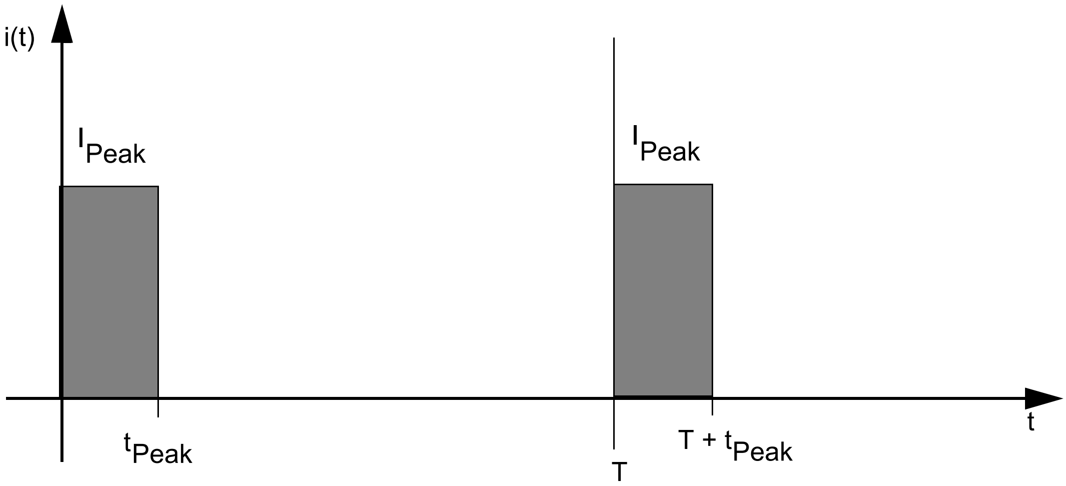


Figure 31: Coherence between peak current and rated current

$$\frac{t_{Peak}}{T} = \left(\frac{I_{rated}}{I_{Peak}}\right)^2$$

- Coherence between peak current of drive and the braking peak current

Assumptions: $P_{\text{Shaft, accelerate}} = P_{\text{Shaft,brake}}$, $\cos\varphi_{\text{ accelerate}} = \cos\varphi_{\text{ Brake}}$

$$\frac{I_{\text{max,phase,accelerate}}}{I_{\text{max,phase, brake}}} = \frac{U_{\text{DC link, brake}}}{U_{\text{DC link, accelerate}}}\left(\frac{1}{\eta_{\text{Motor}}}\right)^2$$

Typical values:

$U_{\text{DC link brake}}$ = 780 V

$U_{\text{DC link, accelerate}}$ = 540 V

$\eta_{\text{ Motor}}$ = 0.9

Typically resulting in:

$$I_{\text{max,phase,brake}} = 0.56 \cdot I_{\text{max,phase,accelerate}}$$

3.3.7 Cooling

Cooling air temperature 1)	Min. 0 °C to max. 55 °C (rated temperature: 40 °C)
Cooling air requirement 2)	Refer to ▷Electrical data basic units◁ from page 61
Cooling water temperature 4)	Min. „Cooling air temperature“ 1) to max. 40 °C at Cold Plate devices BM5XXX-CXXX)
Cooling water flow rate 3) 4) 6)	
BM553X, BM554X, BM555X, BM556X	Min. 4 l/min. up to max. 15 l/min.
BM563X, BM564X, BM565X, BM566X	
BM564X-FXX9, BM565X-FXX9, BM566X-FXX9	Min. 10 l/min. up to max. 15 l/min
BM5755, BM5766	
BM557X, BM577X	Min. 15 l/min. up to max. 25 l/min.
Cooling water pressure 3)	Max. 6 bar
Cooling water hysteresis	Max. 5 K in the static and the dynamic operation
Hot water heating (cooling water inlet to cooling water outlet) 3) [K]	$<14.35 \left[\frac{\text{l/min}}{\text{kW}} \cdot \text{K}\right] \cdot \frac{\text{Power loss[kW]}}{\text{Cooling water flow [l/min]}}$
Pressure loss at the water cooler 3)	0.5 bar at 10 l/min
Mounting board temperature at Cold Plate 5)	Min. „Cooling air temperature“ 1) to max. 55 °C (rated temperature: 40 °C) At water cooling 4): water outlet temperature 40 °C surface temperature 42 °C

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

2) The cooling air requirement corresponds at least to that of a free-blowing device. Free-blowing means, that the air inlet and the air outlet operates unrestricted. With the mounting of the device into a control cabinet it therefore can be necessary to use additional fans, so that the necessary cooling air requirement is covered. If the necessary cooling air requirement of the power heatsink is not provided, then the output power of the device has to be reduced.

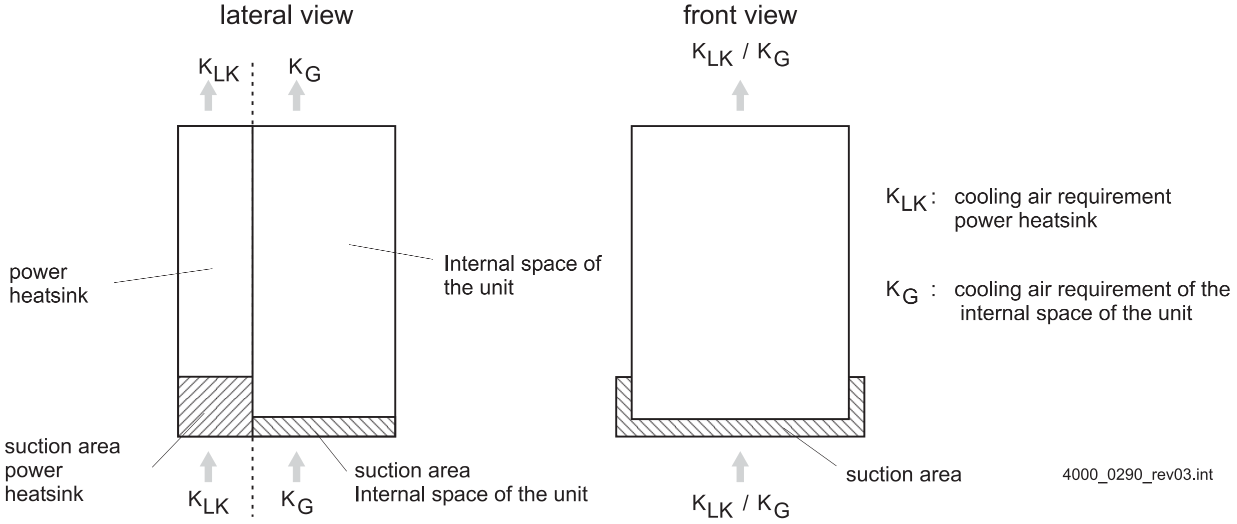


Figure 32: Cooling air requirement

3) Rated flow = 10 l/min
If you have other cooling water flow rates than the ones, which were mentioned above, please contact Baumüller Nürnberg GmbH.
The cooling water must meet the following requirements:

pH-value	6.5... 9.5
Conductivity	50... 600 µS/cm
Water hardness (inclusive $CaCO_3$)	< 100 ppm
Suspended matters	< 10 ppm
Particle size	< 100 µm
Ryznar Stability Index (RSI)	5.0 ... 6.0

Manganese (Mn)	< 0.05 ppm
Copper (Cu)	< 0.1 ppm
Chlorine (Cl_2)	< 1 ppm
Chloride (Cl^-)	< 500 ppm
Sulfate ($SO^{2-}{}_4$)	< 500 ppm

The corrosion-resistant compared with further materials you can take from the DECHEMA-material tables.
Use a corrosion-resistant and a closed cooling circuit.

4) Recommendation:
In order to avoid dew, the temperature of the water inlet is greater or equal to the interior temperature of the device.
With other cooling water temperatures as mentioned above please contact Baumüller Nürnberg.

5) Notes referring to Cold Plate
Cold Plate is an particularly efficient cooling version. Heat dissipation is made via two contact surfaces. One is in the control cabinet as a mounting platform or at the machine base. The other one is a Cold plate on the rear of the unit. In order to have an optimum heat flow, there are high demands to this functional surface referring to the surface roughness and the evenness. A light damage of the surface can lead to a significant deterioration of the heat dissipation to the mounting plate.
The sensitive functional surface therefore must be protected against damage when handling the parts.

6) At BM55XX - FXX, BM55XX - ZXX and BM57XX - FXX9, only

NOTE!

Instead of a continuous flow of the water coolers, it is possible to operate with a temperature-controlled and enabled water supply. In this case the customer must install a control equipment, so that the flow of the water can be enabled or avoided. This control equipment must read and process the available value „heat sink temperature“ in the controller. It is recommended to enable water flow if 58 °C were reached. The water flow also must be possible to be stopped if it reached 57 °C. The maximum permitted hysteresis of 5 K. Therefore, the closing temperature can be set to 60 °C and the opening temperature to 55 °C. It is advantageous to set the hysteresis lower, as the controller is a free parameterizable 2-point controller. The integrated 2-point controller can now directly access the variable „heat sink temperature“.

The temperature controlled and enabled water supply is able to use water, which is significantly colder. The 2-point hysteresis control of the heat sink temperature avoids impermissible condensation. This way, more power can be emitted via the heat sink. This is advantageous if water-cooled devices are used, which have an additionally integrated brake resistor (refer to ▹Additional data referring to water-cooled brake resistors◃ from page 113).

Contact the local Baumüller office for support concerning configuration of alternative cooling water temperature control.

3.4 Electrical data basic units

3.4.1 Electrical data BM55XX universal units

3.4.1.1 Electrical data BM5X1X universal units

		BM55**12**	BM55**13**	BM55**14-STX** 11)
Rated input power 1)		1.9 kVA	3.3 kVA	5.1 kVA
Rated input current 1) (I_{eff})		2.8 A	4.8 A	7.3 A
Total harmonic distortion input current (THD)1)		119 %	110 %	109 %
Max. input current (I_{eff})		5.2 A	9.0 A	20.0 A
Rated DC link voltage 1) (U_{DC})		$540\ V_{DC}$		
DC link capacitance (internal)		110 µF	240 µF	330 µF
DC link discharging time (internal DC link capacitance)		80 s	175 s	240 s
DC link capacitance (external), permitted		Refer to ⊳Figure 34⊲ on page 62		
Period between two power up processes 8)		At least 60 s		
Output voltage 1)2) (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz 10)		0 Hz to 450 Hz		
Rated output current 1)4)5)6) (I_{AC})	at 4 kHz 3)	2.5 A	4.5 A	5.5 A
Rated output current 1)4)5)6) (I_{AC})	at 8 kHz 3)	2.5 A	4.5 A	5.0 A
Output peak current 1)4)5)6) (I_{AC})	at 4 kHz 3)	5.0 A	9.0 A	20.0 A
Output peak current 1)4)5)6) (I_{AC})	at 8 kHz 3)	5.0 A	9.0 A	12.0 A
Max. peak current period 7)		60 s		1 s
Connected load DC link terminals 9)		Max. 2.0 kW		Max. 3.0 kW
Brake resistor current, permitted (Î)		Max. 5.9 A		Max. 12.0 A
Brake resistor external		≥ 130 Ω		≥ 65 Ω
Brake resistor threshold (Û)		780 V		
Peak brake resistor power		4.5 kW	5.0 kW	9.4 kW
Permitted continuous brake resistor power external		1.0 kW	1.5 kW	3.0 kW
Power loss referring to power input		33 W	60 W	80 W
Power input referring to control voltage		39 W		
Current of the integrated brake control		Max. 2.0 A		

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \text{V to}\ 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \text{V}\right) \quad \text{without overmodulation of the PWM.}$$

3) Switching frequency of the inverter (adjustable).

4) RMS at an environmental temperature of 40 °C.

5) At rated input supply voltage the device supplies the rated- / maximum output currents. At input voltages above the rated supply voltage the output currents at constant output power have to be reduced, accordingly.

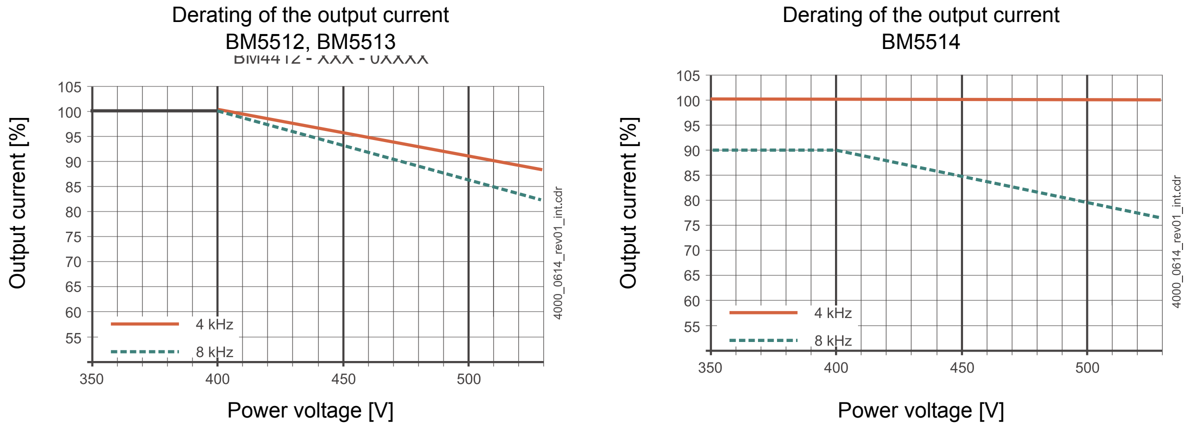


Figure 33: Derating the output current BM551X universal units

6) The input current must be reduced between 40 °C and 55 °C, refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

7) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

8) The specified value is only valid if there is no additional DC link capacitance connected to the DC link terminals. Refer to ▹Power on switching frequency / DC link charging◃ on page 219 and ▹Figure 34◃ on page 62.

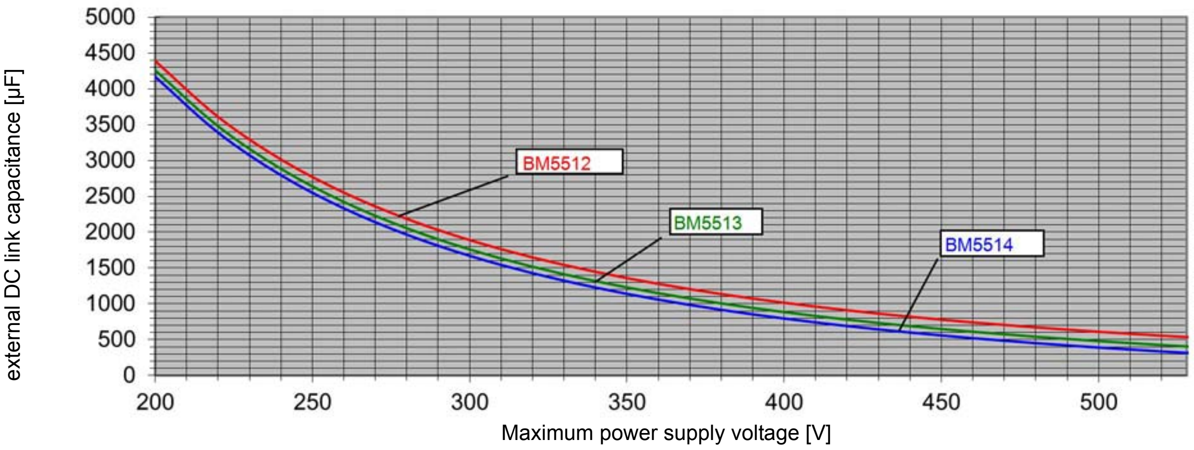


Figure 34: Maximum external DC link capacitance BM551X universal units

9) The sum of the transferred mean effective power via the DC link terminals and the transferred mean effective power via the motor terminals may not exceed the specified value continuously.

[10] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[11]

NOTE!
There are other peak current limits if BM4414 is in braking operation, only.
The following peak currents are possible: 15 A at 4 kHz switching frequency and 10 A at 8 kHz switching frequency

3.4.1.2 Electrical data BM5X2X universal units

		BM55**22**	BM55**23**	BM55**24**
Rated input power 1)		5.6 kVA	8.6 kVA	11.8 kVA
Rated input current 1) (I_{eff})		8.1 A	12.4 A	17.0 A
Total harmonic distortion input current (THD)1)		107 %	109 %	109 %
Max. input current (I_{eff})		15.1 A	23.2 A	31.8 A
Rated DC link voltage 1) (U_{DC})		540 V_{DC}		
DC link capacitance (internal)		470 µF		705 µF
DC link discharging time (internal DC link capacitance)		340 s		510 s
DC link capacitance (external), permitted		Refer to ▹Figure 36◃ on page 66		
Period between two power up processes 9)		At least 60 s		
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz 11)		0 Hz to 450 Hz		
Rated output current 1)5)6)7) (I_{AC})	at 4 kHz 4)	7.5 A	11.0 A	15.0 A
Rated output current 1)5)6)7) (I_{AC})	at 8 kHz 4)	6.0 A	8.8 A	12.0 A
Output peak current 1)5)6)8) (I_{AC})	at 4 kHz 4)	15.0 A	22.0 A	30.0 A
Output peak current 1)5)6)8) (I_{AC})	at 8 kHz 4)	12.0 A	17.6 A	24.0 A
Max. peak current period 8)		60 s		
Connected load DC link terminals		Max. 5.0 kW		
Brake resistor current, permitted ($\hat{I}$)		Max. 9.0 A	Max. 13.0 A	Max. 18.0 A
Brake resistor external		≥ 86 Ω	≥ 60 Ω	≥ 44 Ω
Brake resistor threshold ($\hat{U}$)		780 V		
Peak brake resistor power		7 kW	10 kW	14 kW
Permitted continuous brake resistor power external		3.4 kW	5 kW	6.8 kW
Power loss referring to power input		102 W	150 W	204 W
Power input referring to control voltage		45 W		
Current of the integrated brake control		Max. 2.0 A		

		BM5525	BM5526-XTXX	BM5527-XTXX
Rated input power [1]		11.8 kVA	13.2 kVA [2]	16.6 kVA [2]
Rated input current [1] (I_{eff})		17.0 A	19.0 A [2]	24.0 A [2]
Total harmonic distortion input current (THD)[1]		109 %	54 % [2]	
Max. input current (I_{eff})		34.0 A	37.0 A [2]	
Rated DC link voltage [1] (U_{DC})		540 V_{DC}		
DC link capacitance (internal)		705 µF		1020 µF
DC link discharging time (internal DC link capacitance)		510 s		695 s
DC link capacitance (external), permitted		Refer to ▹Figure 36◃ on page 66		
Period between two power up processes [9]		at least 60 s		
Output voltage [1][3] (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz [11]		0 Hz to 450 Hz		
Rated output current [1][5][6][7] (I_{AC})	at 4 kHz [4]	15.0 A	22.5 A [12]	27.0 A [12]
Rated output current [1][5][6][7] (I_{AC})	at 8 kHz [4]	12.0 A	18.0 A [12]	21.6 A [12]
Output peak current [1][5][6][8] (I_{AC})	at 4 kHz [4]	40.0 A	45.0 A [12]	
Output peak current [1][5][6][8] (I_{AC})	at 8 kHz [4]	32.0 A	36.0 A [12]	
Max. peak current period [8]		1 s	8 s	25 s
Connected load DC link terminals [10]		Max. 5.0 kW		
Brake resistor current, permitted (Î)		Max. 25.0 A		
Brake resistor external		≥ 32 Ω		
Brake resistor threshold (Û)		780 V		
Peak brake resistor power		20 kW		
Permitted continuous brake resistor power external		6.8 kW		
Power loss referring to power input		204 W	300 W	350 W
Power input referring to control voltage		45 W		
Current of the integrated brake control		Max. 2.0 A		

[1] All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

[2] Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,\text{power supply}} = 0.4$ %.

[3] The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\text{ V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\text{ V}\right) \quad \text{without overmodulation of the PWM.}$$

[4] Switching frequency of the inverter (adjustable).

[5] RMS at an environmental temperature of 40 °C.

[6] At rated input supply voltage the device supplies the rated- / maximum output currents. At input voltages above the rated supply voltage the output currents at constant output power have to be reduced, accordingly.

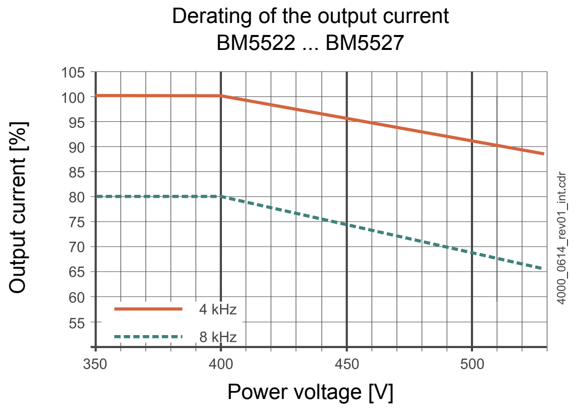


Figure 35: Derating the output current BM552X universal units

[7] The input current must be reduced between 40 °C and 55 °C, refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

[8] The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

[9] The specified value is only valid if there is no additional DC link capacitance connected to the DC link terminals. Refer to ▹Power on switching frequency / DC link charging◃ on page 219 and ▹Figure 36◃ on page 66.

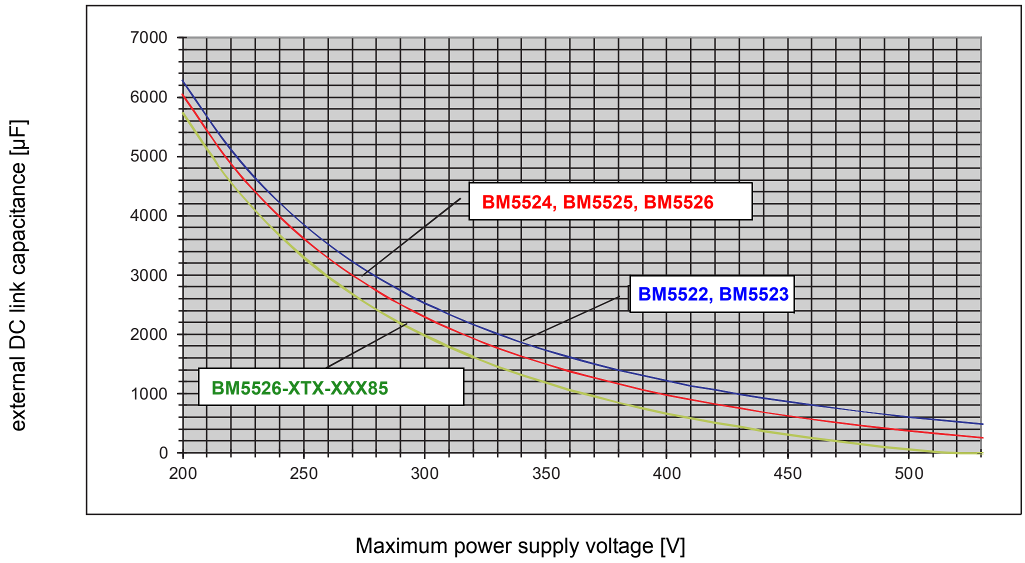


Figure 36: Maximum external DC link capacitance BM552X universal units

[10] The sum of the transferred mean effective power via the DC link terminals and the transferred mean effective power via the motor terminals may not exceed the specified value continuously.

[11] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}} \text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[12] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

3.4.1.3 Electrical data BM553X universal units

- Without charging resistor BM553X-X**T**…/BM553X-X**G**…/BM553X-X**I**…

		BM5**5**3**2**	BM5**5**3**3**	BM5**5**3**4**	BM5**5**3**5**
Rated input power $^{1)2)}$		13.3 kVA	16.8 kVA	26.3 kVA	36.7 kVA
Rated input current $^{1)2)}$ (I_{eff})		19.2 A	24.2 A	38.0 A	53.0 A
Total harmonic distortion input current (THD_I) $^{1)2)}$		60 %	54 %	57 %	57 %
Max. input current $^{2)}$ (I_{eff})		37.0 A	45.0 A	71.0 A	71.0 A
Rated DC link voltage $^{1)}$ (U_{DC})		540 V_{DC}			
DC link capacitance (internal)		940 µF	1230 µF	1640 µF	2000 µF
DC link discharging time (internal DC link capacitance)		140 s	210 s	280 s	340 s
DC link capacitance (external), permitted		Max. 20 mF			
Waiting period between two switching-on operations		None			
Output voltage $^{1)3)}$ (U_{AC})		3 x 0 V to 3 x 370 V			
Output frequency at 4 kHz$^{10)}$		0 Hz to 450 Hz			
Rated output current $^{1)5)6)7)12)}$ (I_{AC})	at 4 kHz $^{4)}$	22.5 A	30.0 A	45.0 A	60.0 A
Rated output current $^{1)5)6)7)12)}$ (I_{AC})	at 8 kHz $^{4)}$	18.0 A	24.0 A	36.0 A	48.0 A
Output peak current $^{1)5)6)8)12)}$ (I_{AC})	at 4 kHz $^{4)}$	45.0 A	60.0 A	90.0 A	90.0 A
Output peak current $^{1)5)6)8)12)}$ (I_{AC})	at 8 kHz $^{4)}$	36.0 A	48.0 A	72.0 A	72.0 A
Max. peak current period $^{8)}$		60 s			
Power supply DC link terminals $^{9)}$		Max. 10.0 kW			
Brake resistor current, permitted ($\hat{I}$)		Max. 36.0 A		Max. 50.0 A	
Brake resistor, external		≥ 22 Ω		≥ 16 Ω	
Brake resistor threshold ($\hat{U}$)		780 V			
Brake resistor peak power		29 kW		40 kW	
Permitted continuous brake resistor power external		10 kW			
Power loss referring to power input		300 W	390 W	600 W	840 W
Power input referring to control voltage		58 W			
Current of the integrated brake control		Max. 8.0 A $^{11)}$			

- With charging resistor BM553X-X**R**.../BM553X-X**S**.../BM553X-X**W**...

		BM5**534**	BM5**535**
Rated input power $^{1)2)}$		38 kVA	62 kVA
Rated input current $^{1)2)}$ (I_{eff})		55.0 A	89.0 A
Total harmonic distortion input current (THD_I) $^{1)2)}$		107 % $^{14)}$	112 % $^{14)}$
Max. input current $^{2)}$ (I_{eff})		99.0 A	162.0 A
Rated DC link voltage $^{1)}$ (U_{DC})		540 V_{DC} $^{15)}$	
DC link capacitance (internal)		1640 µF	2000 µF
DC link discharging time (internal DC link capacitance)		280 s	340 s
Waiting period between two switching-on operations (no external DC link capacitance)		95 s	115 s
Max. permitted DC link capacitance (internal + external)		10810 µF	
Waiting period between two switching-on operations (with max. permitted DC link capacitance)		600 s $^{13)}$	
Output voltage $^{1)3)}$ (U_{AC})		3 x 0 V to 3 x 370 V	
Output frequency at 4 kHz$^{10)}$		0 Hz to 450 Hz	
Rated output current $^{1)5)6)7)12)}$ (I_{AC})	at 4 kHz $^{4)}$	45,0 A	60.0 A
Rated output current $^{1)5)6)7)12)}$ (I_{AC})	at 8 kHz $^{4)}$	36,0 A	48.0 A
Output peak current $^{1)5)6)8)12)}$ (I_{AC})	at 4 kHz $^{4)}$	90,0 A	
Output peak current $^{1)5)6)8)12)}$ (I_{AC})	at 8 kHz $^{4)}$	72,0 A	
Max. peak current period $^{8)}$		60 s	
Power supply DC link terminals		Max. 10,0 kW	
Brake resistor current, permitted (Î)		Max. 50.0 A	
Brake resistor, external		≥ 16 Ω	
Brake resistor threshold (Û)		780 V	
Brake resistor peak power		40 kW	
Permitted continuous brake resistor power external		10 kW	
Power loss referring to power input		600 W	840 W
Power input referring to control voltage		58 W	
Current of the integrated brake control		Max. 8.0 A $^{11)}$	

[1] All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

[2] Using the power choke listed in ▷Power chokes◁ from page 288 at a power supply with $U_{K,\text{power supply}} = 0.4\ \%$.

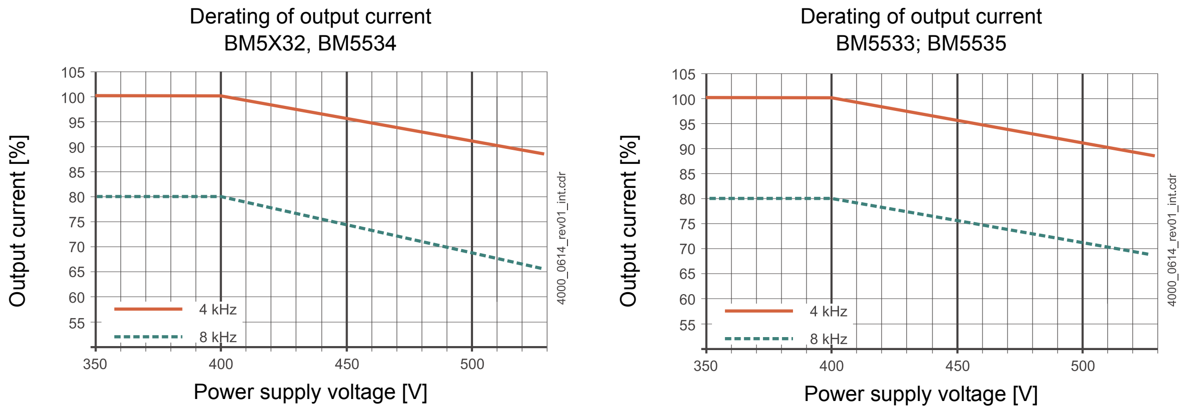
[3] The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$U_{AC} = 3 \times 0\text{ V to }3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\text{ V}\right)$ without overmodulation of the PWM.

[4] Switching frequency of the inverter (adjustable).

[5] RMS at an environmental temperature of 40 °C.

[6] At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.


Derating of output current BM5X32, BM5534

Derating of output current BM5533; BM5535

Figure37: Derating the output current BM553X universal units

[7] The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▷Environmental temperature◁ on page 55.

[8] The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

[9] The sum of the mean effective power, which is transmitted via the DC link terminals and the mean effective power at the motor terminals, may not exceed the specified value continuously.

[10] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[11] At maximum 4 A if UL508 C is complied with.

[12] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

[13] Between the min. waiting time (internal DC link capacitance only) and the max. waiting time (maximum DC link capacitance) can be linearly interpolated depending on the total capacitance value.

[14] The distortion factor of the input current is approx. twice as much the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

[15] Operating the device without power choke causes an increase of the AC component of the DC link voltage compared with the operation using a power choke. As result the minimum DC link voltage can be lower than the value with power choke. Therefore the voltage reserve can be too low at high speed.

3.4.1.4 Electrical data BM554X universal units

- Without charging resistor BM554X-X**T**…/BM554X-X**G**…/BM554X-X**I**…

		BM55**43**	BM55**44**	BM55**45**	BM55**46** 12)
Rated input power 1)2)		48 kVA	58 kVA	73 kVA	94 kVA
Rated input current 1)2) (I_{eff})		70.0 A	84 A	105 A	136 A
Total harmonic distortion input current 1)2) (THD_I)		60 %	59 %	45 %	38 %
Max. input current 2) (I_{eff})		105 A	105 A	133 A	187 A
Rated DC link voltage 1)		540 V_{DC}			
DC link capacitance (internal)		1880 µF	2350 µF	3055 µF	3760 µF
DC link capacitance (external), permitted		Refer to ▹Page 220◃			
DC link discharging time (int. DC link capacitance)		45 s	55 s	70 s	90 s
Waiting period between two switching-on operations		None			
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V			
Output frequency at 4 kHz 14)		0 Hz to 450 Hz			
Rated output current 1)5)6)7)15) (I_{AC})	at 4 kHz 4)	80 A	100 A	130 A	150 A
Rated output current 1)5)6)7)15) (I_{AC})	at 8 kHz 4)	75 A	72 A	94 A	105 A
Output peak current 1)5)6)8)15) (I_{AC})	at 4 kHz 4)	120 A	130 A	170 A	200 A
Output peak current 1)5)6)8)15) (I_{AC})	at 8 kHz 4)	90 A	94 A	130 A	150 A
Max. peak current period 8)9)		60 s			
Power supply DC link terminals 11)		Max. 90 kW			
Brake resistor current, permitted ($\hat{I}$)		Max. 67 A	Max. 100 A		
Brake resistor external		≥ 12 Ω	≥ 7.4 Ω 16)		
Brake resistor threshold ($\hat{U}$)		780 V			
Brake resistor peak power		53 kW	80 kW		
Permitted continuous brake resistor power external		36 kW	45 kW	58 kW	75 kW
Power loss referring to the power input		1080 W	1350 W	1740 W	2000 W
Power loss referring to control voltage		112 W			
Power loss of fan of device referring to 230 V_{AC} 10)		87 W			
Current of integrated brake control		Max. 8.0 A 13)			
Cooling air requirement power heatsinks		260 m^3/h		210 m^3/h	
Cooling air requirement internal space		60 m^3/h			
Requirements to the water cooling		Refer to ▹Page 59◃			

- With charging resistor BM554X-X**R**.../BM554X-X**S**.../BM554X-X**W**...

		BM5**543**
Rated input power 1)2)		66 kVA
Rated input current 1)2) (I_{eff})		96.0 A
Total harmonic distortion input current 1)2) (THD_I)		111 % 18)
Max. input current 2) (I_{eff})		135 A
Rated DC link voltage 1)		540 V_{DC} 19)
DC link capacitance (internal)		3760 µF
DC link discharging time (internal DC link capacitance)		884 s
Waiting period between two switching-on operations (no external DC link capacitance)		210 s
Max. permitted DC link capacitance (internal + external)		10810 µF
Waiting period between two switching-on operations (with max. permitted DC link capacitance)		600 s 17)
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V
Output frequency at 4 kHz 14)		0 Hz to 450 Hz
Rated output current 1)5)6)7)15) (I_{AC})	at 4 kHz 4)	80 A
Rated output current 1)5)6)7)15) (I_{AC})	at 8 kHz 4)	75 A
Output peak current 1)5)6)8)15) (I_{AC})	at 4 kHz 4)	120 A
Output peak current 1)5)6)8)15) (I_{AC})	at 8 kHz 4)	90 A
Max. peak current period 8)9)		60 s
Power supply DC link terminals 11)		Max. 90 kW
Brake resistor current, permitted ($\hat{I}$)		Max. 67 A
Brake resistor external		≥ 12 Ω
Brake resistor threshold ($\hat{U}$)		780 V
Brake resistor peak power		53 kW
Permitted continuous brake resistor power external		36 kW
Power loss referring to the power input		1080 W
Power loss referring to control voltage		Max. 75 W
Power loss of fan of device referring to 230 V_{AC} 10)		112 W
Current of integrated brake control		Max. 8.0 A 13)
Cooling air requirement power heat sink		260 m^3/h
Cooling air requirement internal space		60 m^3/h
Requirements to the water cooling		Refer to ▷Page 59◁

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,\text{power supply}} = 0.4\ \%$.

3) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \text{V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \text{V}\right) \quad \text{without overmodulation of the PWM.}$$

4) Switching frequency of the inverter (adjustable).

5) RMS at an environmental temperature of 40 °C.

6) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

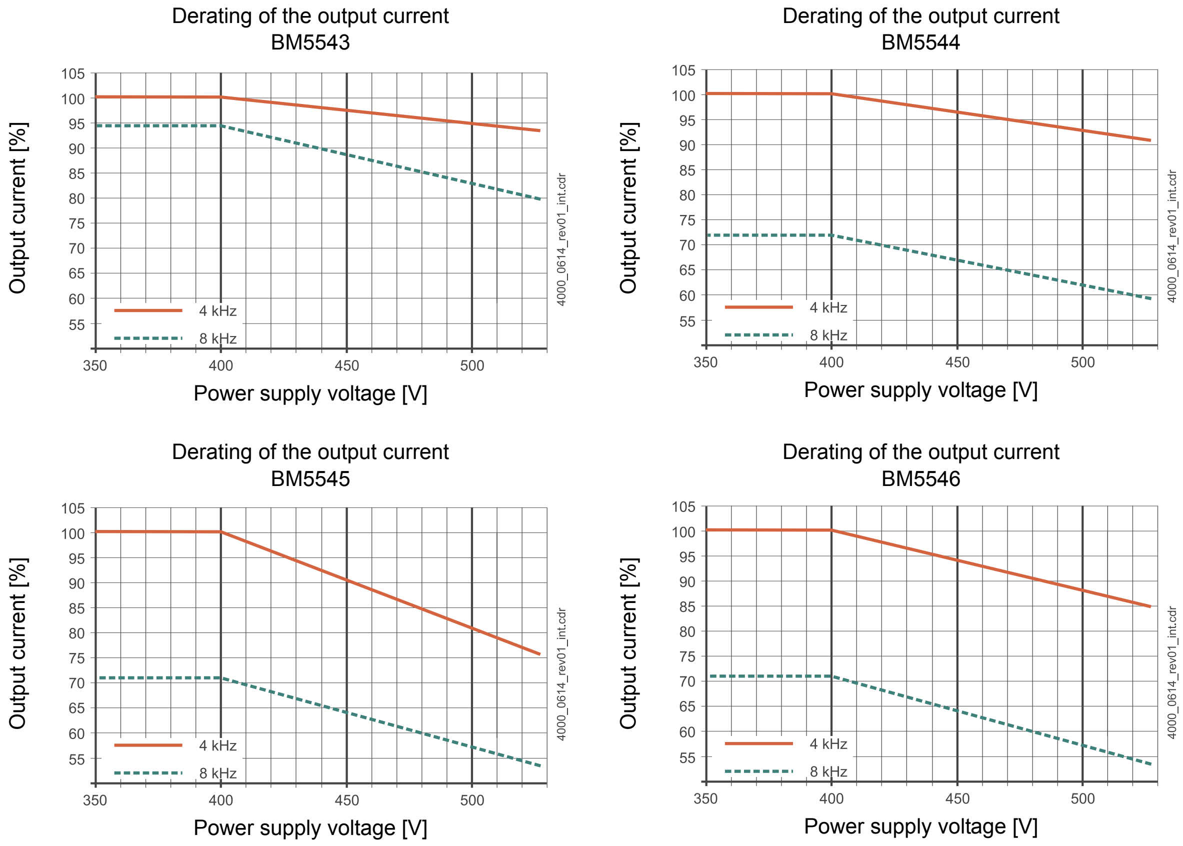


Figure 38: Derating the output current BM554X universal units

7) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

8) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

9) Peak current can be supplied at a heat sink temperature of <75 °C (BM5X43) and <80 °C (BM5X44), only.
If these heat sink temperature thresholds are exceeded, the output current is automatically derated to the rated current.

10) For cooling versions S and A, only.

11) The sum of the transmitted mean effective power via the DC link terminals and the mean effective power at the motor terminals, may not exceed the specified value continuously.

12) The motor connection of the device provides a limited short-circuit protection.

13) At a hardware status of < 4006 or if UL508C is complied with: at maximum 4 A

[14] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{pf}} \text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[15] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

[16] The life time of the brake transistor depends on a large extent on the load cycle, a load cycle (braking period) of shorter than 18 s reduces the brake transistor‘s life time to below 20 000 hours.

[17] Between the min. waiting time (internal DC link capacitance only) and the max. waiting time (max. DC link capacitance) can be linearly interpolated depending on the total capacitance value.

[18] The distortion factor of the input current is approx. twice as much the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

[19] Operating the device without power choke causes an increase of the AC component of the DC link voltage compared with the operation using a power choke. As result the minimum DC link voltage can be lower than the value with power choke. Therefore the voltage reserve can be too low at high speed.

3.4.1.5 Electrical data BM555X universal units

- Without charging resistor BM555X-X**T**…/BM555X-X**G**…/BM555X-X**I**…

		BM5**552**	BM5**553**	BM5**554**
Rated input power 1)2)		75.5 kVA	94.2 kVA	138.6 kVA
Rated input current 1)2) (I_{eff})		109 A	136 A	200 A
Total harmonic distortion input current 1)2) (THD_I)		42 %	38 %	38 %
Max. input current 2) (I_{eff})		146 A	182 A	270 A
Rated DC link voltage 1)		540 V_{DC}		
DC link capacitance (internal)		3055 µF		5170 µF
DC link capacitance (external), permitted		Refer to ▷Page 220◁		
DC link discharging time (internal DC link capacitance)		80 s		120 s
Waiting time between two switching-on operations		None		
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz 13)		0 Hz to 450 Hz		
Rated output current 1)5)6)7) (I_{AC})	at 4 kHz 4)	120 A 14)	150 A 14)	210 A 12)
Rated output current 1)5)6)7) (I_{AC})	at 8 kHz 4)	96 A 14)	116 A 14)	150 A 12)
Output peak current 1)5)6)8) (I_{AC})	at 4 kHz 4)	180 A 14)	195 A 14)	260 A 12)
Output peak current 1)5)6)8) (I_{AC})	at 8 kHz 4)	144 A 14)	150 A 14)	185 A 12)
Max. peak current period 8)		60 s		
Connected load DC link terminals		Max. 110 kW		
Brake resistor current, permitted (Î)		Max. 150 A		
Brake resistor, external		≥ 5.2 Ω		
Brake resistor threshold (Û) 11)		780 V		
Brake resistor peak power		117 kW		
Permitted continuous brake resistor power external		78 kW		
Power loss referring to power input		1800 W	2250 W	3300 W
Power loss referring to control voltage		75 W		
Power loss of the device fan referring to 230 V_{AC} 9)		190 W		
Current of integrated brake control		Max. 8.0 A 10)		
Cooling air requirement referring to power heatsinks		450 m^3/h		
Cooling air requirement device internal space		135 m^3/h		

- With charging resistor BM555X-X**R**…/BM555X-X**S**…/BM555X-X**W**…

		BM55**54**
Rated input power 1)2)		175 kVA
Rated input current 1)2) (I_{eff})		253 A
Total harmonic distortion input current 1)2) (THD_I)		92 % 16)
Max. input current 2) (I_{eff})		305 A
Rated DC link voltage 1)		540 V_{DC} 17)
DC link capacitance (internal)		5640 µF
DC link discharging time (internal DC link capacitance)		1382 s
Waiting period between two switching-on operations (no external DC link capacitance)		315 s
Max. permitted DC link capacitance (internal + external)		10810 µF
Waiting period between two switching-on operations (with max. permitted DC link capacitance)		600 s 15)
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V
Output frequency at 4 kHz 13)		0 Hz to 450 Hz
Rated output current 1)5)6)7) (I_{AC})	at 4 kHz 4)	210 A 12)
Rated output current 1)5)6)7) (I_{AC})	at 8 kHz 4)	150 A 12)
Output peak current 1)5)6)8) (I_{AC})	at 4 kHz 4)	260 A 12)
Output peak current 1)5)6)8) (I_{AC})	at 8 kHz 4)	185 A 12)
Max. peak current period 8)		60 s
Connected load DC link terminals		Max. 110 kW
Brake resistor current, permitted (Î)		Max. 150 A
Brake resistor, external		≥ 5 Ω
Brake resistor threshold (Û) 11)		780 V
Brake resistor peak power		117 kW
Permitted continuous brake resistor power external		78 kW
Power loss referring to power input		3300 W
Power loss referring to control voltage		75 W
Power loss of the device fan referring to 230 V_{AC} 9)		190 W
Current of integrated brake control		Max. 8.0 A 10)
Cooling air requirement referring to power heatsinks		450 m^3/h
Cooling air requirement device internal space		135 m^3/h

[1] All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

[2] Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,\text{power supply}} = 0.4\ \%$.

[3] The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \text{V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \text{V}\right) \quad \text{without overmodulation of the PWM.}$$

[4] Switching frequency of the inverter (adjustable).

[5] RMS at an environmental temperature of 40 °C.

[6] At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

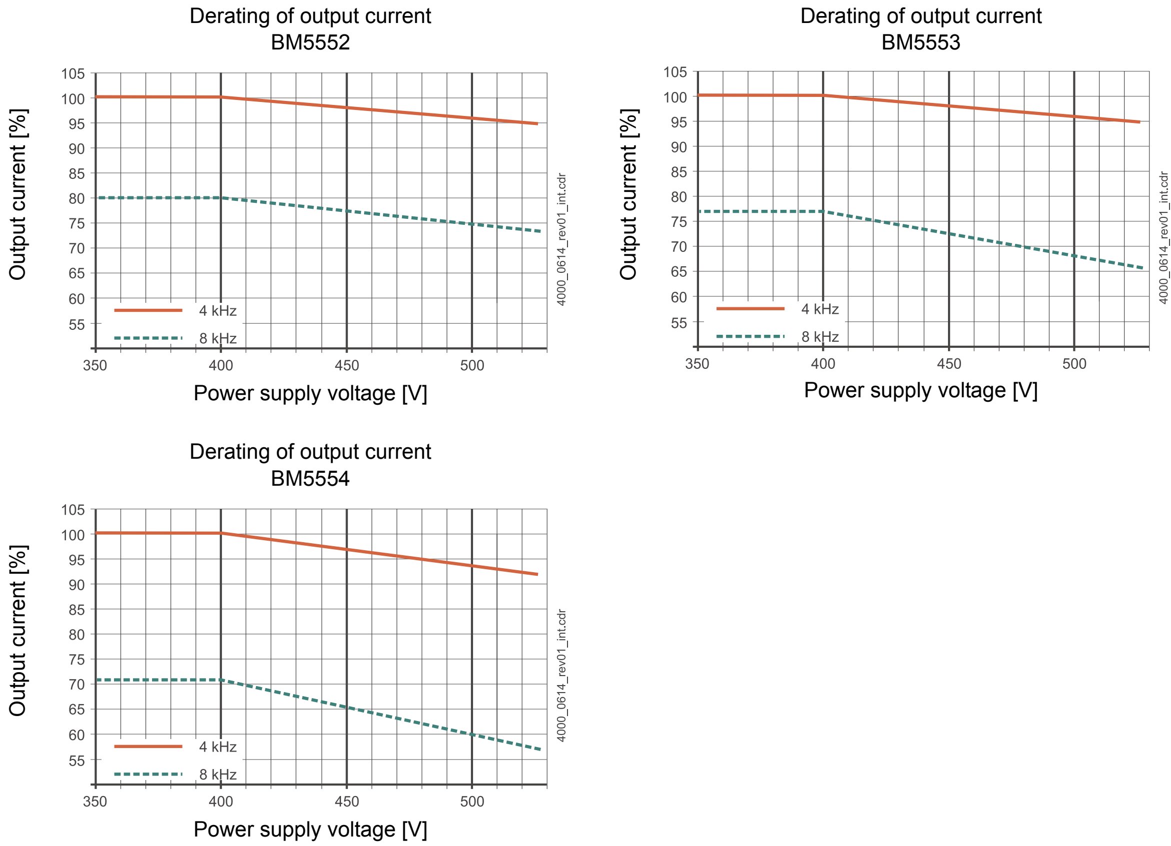


Figure 39: Reducing of output current BM555X universal units

[7] The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

[8] The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

[9] For cooling versions S and A.

[10] UL508C is complied with: max. 4.0 A.

[11] Refer to ▹Motor requirements◃ on page 52.

[12] With an output frequency lower than 0.5 Hz, the output current may be 80 % at maximum of the rated output current.

[13] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{pf}} \text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[14] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

[15] Between the min. waiting time (internal DC link capacitance only) and the max. waiting time (max. DC link capacitance) can be linearly interpolated depending on the total capacitance value.

[16] The distortion factor of the input current is approx. twice as much the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

[17] Operating the device without power choke causes an increase of the AC component of the DC link voltage compared with the operation using a power choke. As result the minimum DC link voltage can be lower than the value with power choke. Therefore the voltage reserve can be too low at high speed.

3.4.1.6 Electrical data BM556X universal units

- Without charging resistor BM556X-X**T**…/BM556X-X**G**…/BM556X-X**I**…

		BM5**562**	BM5**563**	BM5**566** [14]
Rated input power [1][2]		164 kVA	204 kVA	238 kVA
Rated input current [1][2] (I_{eff})		237 A	295 A	344 A
Total harmonic distortion input current [1][2] (THD_I)		43 %	50 %	50 %
Max. input current [2] (I_{eff})		320 A	395 A	455 A
Rated DC link voltage [1]		540 V_{DC}		
DC link capacitance (internal)		5170 µF	6110 µF	8460 µF
DC link capacitance (external), permitted		Refer to ▹Page 220◃		
DC link discharging time (internal DC link capacitance)		120 s	170 s	220 s
Waiting period between two switching-on operations		None		
Output voltage [1][3] (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz[12]		0 Hz to 450 Hz		
Rated output current [1][5][6][7][15] (I_{AC})	at 4 kHz [4]	250 A	300 A	350 A
Rated output current [1][5][6][7][15] (I_{AC})	at 8 kHz [4]	200 A	240 A	240 A
Output peak current [1][5][6][8][15] (I_{AC})	at 4 kHz [4]	325 A	390 A	450 A
Output peak current [1][5][6][8][15] (I_{AC})	at 8 kHz [4]	260 A	312 A	312 A
Max. peak current period [8]		60 s		
Connected load DC link terminals		Max. 160 kW		
Brake resistor current, permitted (Î)		Max. 230 A		Max. 236 A
Brake resistor external		≥ 3.4 Ω		≥ 3.33 Ω
Brake resistor threshold (Û) [11]		780 V		
Brake resistor peak power		179 kW		183 kW
Permitted continuous brake resistor power external		130 kW		
Power loss referring to power input		3960 W	4800 W	
Power loss referring to control voltage		93 W		
Power loss of the device fan referring to 230 V_{AC} [9]		174 W		
Current of integrated brake control		Max. 8.0 A [10]		
Cooling air requirement power heatsink		450 m^3/h		
Cooling air requirement device internal space		200 m^3/h		

- With charging resistor BM556X-X**R**…/BM556X-X**S**…/BM556X-X**W**…

		BM55**62**	BM55**63**	BM55**66** 14)
Rated input power 1)2)		184 kVA	227 kVA	351 kVA
Rated input current 1)2) (I_{eff})		267 A	328 A	506 A
Total harmonic distortion input current 1)2) (THD_I)		110 % 17)	112 % 17)	115 % 17)
Max. input current 2) (I_{eff})		338 A	415 A	628 A
Rated DC link voltage 1)		540 V_{DC} 18)		
DC link capacitance (internal)		10810 µF		
DC link capacitance (external), permitted		Prohibited 16)		
DC link discharging time (internal DC link capacitance)		1850 s		
Waiting period between two switching-on operations		600 s		
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz 12)		0 Hz to 450 Hz		
Rated output current 1)5)6)7)15) (I_{AC})	at 4 kHz 4)	250 A	300 A	350 A
Rated output current 1)5)6)7)15) (I_{AC})	at 8 kHz 4)	200 A	240 A	240 A
Output peak current 1)5)6)8)15) (I_{AC})	at 4 kHz 4)	325 A	390 A	450 A
Output peak current 1)5)6)8)15) (I_{AC})	at 8 kHz 4)	260 A	312 A	312 A
Max. peak current period 8)		60 s		
Connected load DC link terminals		Max. 160 kW		
Brake resistor current, permitted ($\hat{I}$)		Max. 230 A		Max. 236 A
Brake resistor external		≥ 3.4 Ω		≥ 3.33 Ω
Brake resistor threshold ($\hat{U}$) 11)		780 V		
Brake resistor peak power		179 kW		183 kW
Permitted continuous brake resistor power external		130 kW		
Power loss referring to power input		3960 W	4800 W	
Power loss referring to control voltage		93 W		
Power loss of the device fan referring to 230 V_{AC} 9)		174 W		
Current of integrated brake control		Max. 8.0 A 10)		
Cooling air requirement power heatsink		450 m^3/h		
Cooling air requirement device internal space		200 m^3/h		

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,power\ supply} = 0.4\ \%$.

3) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ V \text{ to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ V\right) \quad \text{without overmodulation of the PWM.}$$

4) Switching frequency of the inverter (adjustable).

5) RMS at an environmental temperature of 40 °C.

6) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

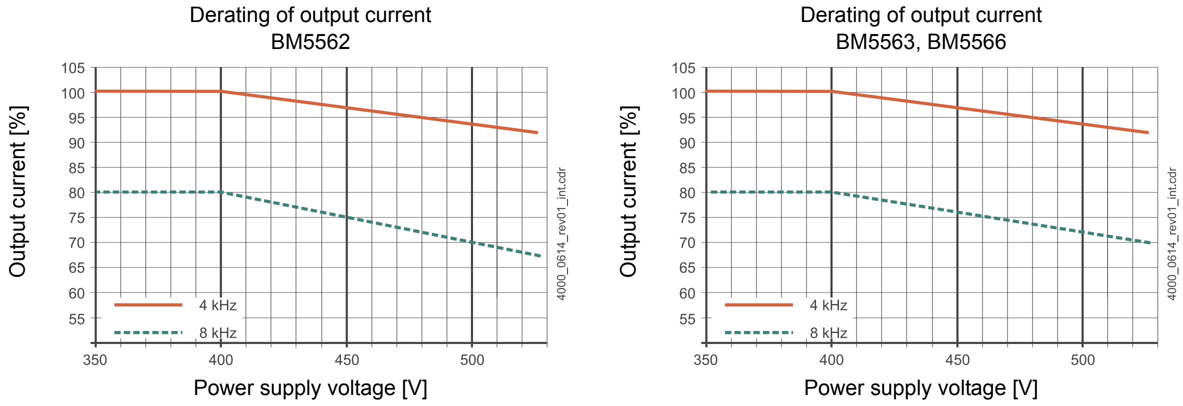


Figure 40: Reducing of output current BM556X universal units

7) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

8) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

9) For cooling versions S and A, only.

10) If UL508C is complied with: max. 4.0 A.

11) Refer to ▹Motor requirements◃ on page 52.

12) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{pf}}\ \text{, typical}\ \ K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

13) Using internal brake resistors, the continuous brake resistor power is 5 kW.

[14] The motor connection of the device provides a limited short-circuit protection.

[15] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

[16] It is prohibited to connect an additional axis unit or an additional capacitance to the DC link.

[17] The distortion factor of the input current is approx. twice as much the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

[18] Operating the device without power choke causes an increase of the AC component of the DC link voltage compared with the operation using a power choke. As result the minimum DC link voltage can be lower than the value with power choke. Therefore the voltage reserve can be too low at high speed.

3.4.1.7 Electrical data BM557X universal units

		BM5**572 - A/F**	BM5**573 - A/F**
Rated input power 1)2)		328 kVA	412 kVA
Rated input current 1)2) (I_{eff})		474 A	594 A
Total harmonic distortion input current 1)2) (THD_I)		54 %	
Max. input current 2) (I_{eff})		602 A	760 A
DC link rated voltage 1)		540 V_{DC}	
DC link capacitance (internal)		19.8 mF	
DC link capacitance (external), permitted		Refer to ▷Page 220◁	
DC link discharging time (internal DC link capacitance)		100 s	120 s
Waiting time between two switching-on operations		None	
Output voltage 1)3) (U_{AC})		3 x 0 V bis 3 x 370 V	
Output frequency at 4 kHz 14)		0 Hz bis 450 Hz	
Rated output current 1)5)6)7)13)15) (I_{AC})	at 4 kHz 4)	450 A	615 A
Rated output current 1)5)6)7)13)15) (I_{AC})	at 8 kHz 4)	338 A	420 A
Output peak current 1)5)6)8)15) (I_{AC})	at 4 kHz 4)	585 A	800 A
Output peak current 1)5)6)8)15) (I_{AC})	at 8 kHz 4)	439 A	545 A
Max. peak current period 9)		60 s	
Connected load DC link terminals		Max. 250 kW	Max. 315 kW
Brake resistor current, permitted ($\hat{I}$)		Max. 300 A	
Brake resistor, external		$\geq 2.6\ \Omega$	
Brake resistor threshold ($\hat{U}$) 12)		780 V	
Brake resistor peak power		234 kW	
Permitted continuous brake resistor power external		180 kW	
Power loss referring to power input		4700 W	6450 W
Power loss referring to control voltage		116 W	
Power loss of the device fan referring to 400 V_{AC}		Max. 540 W	
Current of integrated brake control		Max. 8.0 A 11)	
Cooling air requirement power heatsink		1000 m^3/h	
Cooling air requirement device internal space		250 m^3/h	

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,\text{power supply}}$ = 0.4 %.

3) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\text{ V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\text{ V}\right)$$

without overmodulation of the PWM.

4) Switching frequency of the inverter (adjustable).

5) RMS at an environmental temperature of 40 °C.

6) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power

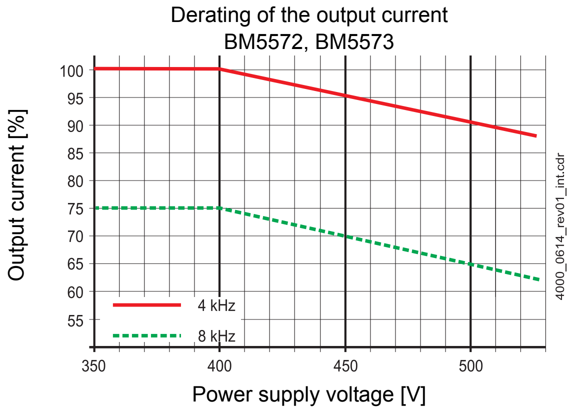


Figure 41: Derating the output current BM557X universal units

7) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55

8) Two temperature values may occur (cooling air, which flows through the internal space of the device / cooling air, which flows through the heatsink). Enter the higher value.
Example: Rated output current = 150 A environmental temperature = 46 °C

$$I_o = 150\text{A} \cdot \left(1 - \left(\frac{46°\text{C - }40°\text{C}}{°\text{C}} \cdot 0,03\right)\right) = 150\text{A} \cdot 0,82$$

The output current must be reduced to: 123 A

9) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

10) The sum of the instantaneously drawn power via the DC link terminals and the input power (motor output / motor efficiency) of the motor at the same time may not exceed the maximum power input of 250 kW and 315 kW.

11) If UL508C is complied with: max. 4.0 A.

12) Refer to ▹Motor requirements◃ on page 52.

13) If UL508C is complied with:
The permitted typical motor output is limited to 295 kW at a maximum. The device BM5573 belongs to the category < 400 HP, < 298 kW ratings complying with table 45.1 of UL508C. Therefore, the short-circuit test using 18k A can be executed. Baumüller does not offer devices in the class 600 HP, 447 kW with 30 kA short-circuit current in accordance with UL508C.

[14] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}} \text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[15] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

3.4.2 Electrical data BM56XX acceleration units

Acceleration units are developed for a cycle with 1.25 s peak current at a total cycle of 5 s, refer to ▹Figure 31◃ on page 57. The units are not developed for using at standstill or output frequencies lower than 10 Hz with peak current. For this units the ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 and the ▹Output frequency dependent maximum current derating BM56XX◃ on page 120.

3.4.2.1 Electrical data BM563X acceleration units

		BM5632
Rated input power 1)2)		36.7 kVA
Rated input current 1)2) (I_{eff})		53.0 A
Total harmonic distortion input current (THD_I) 1)2)		57 %
Max. input current 2) (I_{eff})		128 A
Rated DC link voltage 1) (U_{DC})		540 V_{DC}
DC link capacitance (internal)		3000 µF
DC link discharging time (internal DC link capacitance)		140 s
DC link capacitance (external), permitted		Refer to ▹Page 220◃
Waiting period between two switching-on operations		No
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V
Output frequency at 4 kHz10)		0 Hz to 450 Hz
Rated output current 1)5)6)7)12) (I_{AC})	at 4 kHz 4)	60 A
Rated output current 1)5)6)7)12) (I_{AC})	at 8 kHz 4)	48 A
Output peak current 1)5)6)8)12) (I_{AC})	at 4 kHz 4)	120 A
Output peak current 1)5)6)8)12) (I_{AC})	at 8 kHz 4)	96 A
Max. peak current period 8)		1.25 s
Power supply DC link terminals 9)		Max. 10.0 kW
Brake resistor current, permitted (Î)		Max. 70.0 A
Brake resistor, external		≥ 11 Ω
Brake resistor threshold (Û)		780 V
Brake resistor peak power		56 kW
Permitted continuous brake resistor power external		10 kW
Power loss referring to power input		840 W
Power input referring to control voltage		58 W
Current of the integrated brake control		Max. 8 A 11)

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,power\ supply} = 0.4\ \%$.

3) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ V \text{ to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ V\right) \quad \text{without overmodulation of the PWM.}$$

4) Switching frequency of the inverter (adjustable).

5) RMS at an environmental temperature of 40 °C.

6) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

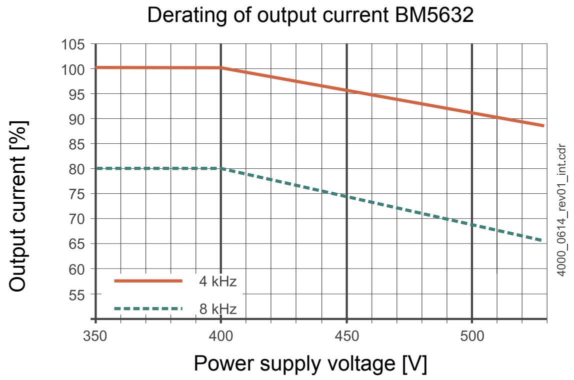


Figure42: Derating the output current BM563X acceleration units

7) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

8) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

9) The sum of the mean effective power, which is transmitted via the DC link terminals and the mean effective power at the motor terminals, may not exceed the specified value continuously.

10) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}}\ , \text{ typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

11) At maximum 4 A if UL508 C is complied with.

12) The permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 and ▹Output frequency dependent maximum current derating BM56XX◃ on page 120 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

3.4.2.2 Electrical data BM564X acceleration units

		BM564**1**	BM564**2**
Rated input power 1)2)		57 KVA	65 kVA
Rated input current 1)2) (I_{eff})		82 A	95 A
Distortion factor of the input current 1)2) (THD_I)		50 %	50 %
Max. input current 2) (I_{eff})		164 A	190 A
DC link rated voltage 1)		540 V_{DC}	
DC link capacitance (internal)		3055 µF	
DC link capacitance (external), permitted		Refer to ▷Page 220◁	
DC link discharging time (internal DC link capacitance)		70 s	
Waiting time between two switching-on operations		None	
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V	
Output frequency at 4 kHz 11)		0 Hz to 450 Hz	
Rated output current 1)5)6)7)13) (I_{AC})	at 4 kHz 4)	85 A	100 A
Rated output current 1)5)6)7)13) (I_{AC})	at 8 kHz 4)	64 A	75 A
Output peak current 1)5)6)8)13) (I_{AC})	at 4 kHz 4)	170 A	200 A
Output peak current 1)5)6)8)13) (I_{AC})	at 8 kHz 4)	128 A	150 A
Max. peak current period 8) 9)		1.25 s	
Connected load DC link terminals 10)		Max. 60 kW / 120 kW (1 s)	
Brake resistor current, permitted (Î)		Max. 100 A	
Brake resistor, external		≥ 7.4 Ω 14)	
Brake resistor threshold (Û)		780 V	
Brake resistor peak power		80 kW	
Permitted continuous brake resistor power external		58 kW	
Power loss referring to power input		1350 W	
Power input referring to control voltage		112 W	
Power input of the fan of the device referring to 230 V_{AC} 9)		87 W	
Current of integrated brake control		Max. 8.0 A 12)	
Cooling air requirement device internal space		60 m^3/h	
Requirements to water cooling		Refer to ▷Page 59◁	

- Without charging resistor BM564X-X**T**…/BM564X-X**G**…/BM564X-X**I**…

		BM5**645-A**	BM5**645-F**
Rated input power 1)2)		73 kVA	78 kVA
Rated input current 1)2) (I_{eff})		105 A	113 A
Distortion factor of the input current 1)2) (THD_I)		45 %	48 %
Max. input current 2) (I_{eff})		170 A	
DC link rated voltage 1)		540 V_{DC}	
DC link capacitance (internal)		3055 μF	
DC link capacitance (external), permitted		Refer to ▹Page 220◃	
DC link discharging time (internal DC link capacitance)		70 s	
Waiting time between two switching-on operations		None	
Output voltage 1)3) (U_{AC})		3 x 0 V up to 3 x 370 V	
Output frequency at 4 kHz 11)		0 Hz bis 450 Hz	
Rated output current 1)5)6)7)13) (I_{AC})	at 4 kHz 4)	130 A	140 A
Rated output current 1)5)6)7)13) (I_{AC})	at 8 kHz 4)	94 A	
Output peak current 1)5)6)8)13) (I_{AC})	at 4 kHz 4)	210 A	
Output peak current 1)5)6)8)13) (I_{AC})	at 8 kHz 4)	130 A	
Max. peak current period 8) 9)		1.25 s	
Connected load DC link terminals 10)		Max. 60 kW/120 kW (1 s)	
Brake resistor current, permitted (Î)		Max. 100 A	
Brake resistor, external		≥ 7.4 Ω 14)	
Brake resistor threshold (Û)		780 V	
Brake resistor peak power		80 kW	
Permitted continuous brake resistor power external		58 kW	
Power loss referring to power input		1350 W	
Power input referring to control voltage		112 W	
Power input of the fan of the device referring to 230 V_{AC} 9)		87 W	
Current of integrated brake control		Max. 8,0 A 12)	
Cooling air requirement device internal space		60 m^3/h	
Requirements to water cooling		Refer to ▹Page 59◃	

- With charging resistor BM564X-X**R**.../BM564X-X**S**.../BM564X-X**W**...

		BM5**645-A** BM5**645-A**	BM5**645-F**
Rated input power 1)2)		109 kVA	119 kVA
Rated input current 1)2) (I_{eff})		156 A	172 A
Distortion factor of the input current 1)2) (THD_I)		116 % 16)	113 % 16)
Max. input current 2) (I_{eff})		239 A	245 A
DC link rated voltage 1)		540 V_{DC} 17)	
DC link capacitance (internal)		3760 µF	
DC link discharging time (internal DC link capacitance)		884 s	
Waiting period between two switching-on operations (no ext. DC link capacitance)		17 s	
Maximum permitted DC link capacitance (internal + external)		10810 µF	
Waiting period between two switching-on operations (with maximum permitted DC link capacitance)		55 s 15)	
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V	
Output frequency at 4 kHz 11)		0 Hz to 450 Hz	
Rated output current 1)5)6)7)13) (I_{AC})	at 4 kHz 4)	130 A	140 A
Rated output current 1)5)6)7)13) (I_{AC})	at 8 kHz 4)	94 A	
Output peak current 1)5)6)8)13) (I_{AC})	at 4 kHz 4)	210 A	
Output peak current 1)5)6)8)13) (I_{AC})	at 8 kHz 4)	130 A	
Max. peak current period 8) 9)		1.25 s	
Connected load DC link terminals 10)		Max. 60 kW/120 kW (1 s)	
Brake resistor current, permitted (Î)		Max. 100 A	
Brake resistor, external		≥ 7.4 Ω 14)	
Brake resistor threshold (Û)		780 V	
Brake resistor peak power		80 kW	
Permitted continuous brake resistor power external		58 kW	
Power loss referring to power input		1350 W	
Power input referring to control voltage		Max. 75 W	
Power input of the fan of the device referring to 230 V_{AC} 9)		87 W	
Current of integrated brake control		Max. 8.0 A 12)	
Cooling air requirement device internal space		60 m^3/h	
Requirements to water cooling		Refer to ▹Page 59◃	

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,power\ supply} = 0.4\ \%$.

3) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\text{ V to }3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\text{ V}\right)$$ without overmodulation of the PWM.

4) Switching frequency of the inverter (adjustable).

5) RMS at an environmental temperature of 40 °C.

6) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

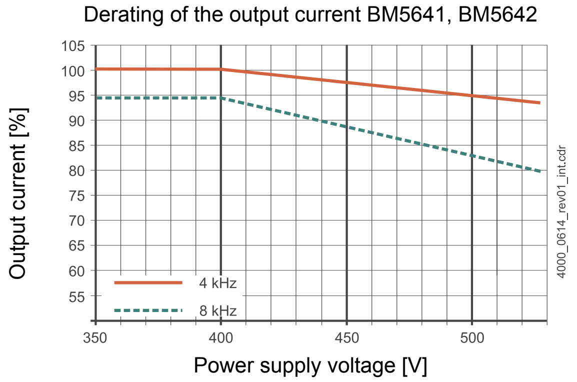


Figure 43: Derating the output current BM564X acceleration units

7) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

8) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

9) For cooling versions S and A, only.

10) The sum of the transmitted mean effective power via the DC link terminals and the mean effective power at the motor terminals, may not exceed the specified value continuously.

11) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{nf}} \text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction). The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

12) At a hardware status of < 4006 or if UL508C is complied with: at maximum 4 A

13) The permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 and ▹Output frequency dependent maximum current derating BM56XX◃ on page 120 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

14) The life time of the brake transistor depends on a large extent on the load cycle, a load cycle (braking period) of shorter than 18 s reduces the brake transistor‘s life time to below 20 000 hours.

15) Between the min. waiting time (internal DC link capacitance only) and the max. waiting time (max. DC link capacitance) can be linearly interpolated depending on the total capacitance value.

16) The distortion factor of the input current is approx. twice as much the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

17) Operating the device without power choke causes an increase of the AC component of the DC link voltage compared with the operation using a power choke. As result the minimum DC link voltage can be lower than the value with power choke. Therefore the voltage reserve can be too low at high speed.

3.4.2.3 Electrical data BM565X acceleration units

		BM5650 14)	BM5651 14)	BM5652 14)
Rated input power 1)2)		86 kVA	110 kVA	139 kVA
Rated input current 1)2) (I_{eff})		125 A	160 A	190 A
Total harmonic distortion input current 1)2) (THD_I)		40 %		
Max. input current 2) (I_{eff})		250 A	320 A	380 A
Rated DC link voltage 1)		540 V_{DC}		
DC link capacitance (internal)		4230 μF	5170 μF	5640 μF
DC link capacitance (external), permitted		Refer to ▹Page 220◃		
DC link discharging time (internal DC link capacitance)		80 s	100 s	120 s
Waiting time between two switching-on operations		no		
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz 13)		0 Hz to 450 Hz		
Rated output current 1)5)6)7)13) (I_{AC})	at 4 kHz 4)	130 A	165 A	200 A
Rated output current 1)5)6)7)13) (I_{AC})	at 8 kHz 4)	97 A	123 A	150 A
Output peak current 1)5)6)8)13) (I_{AC})	at 4 kHz 4)	260 A	330 A	400 A
Output peak current 1)5)6)8)13) (I_{AC})	at 8 kHz 4)	194 A	264 A	300 A
Max. peak current period 8)		1.25 s		
Connected load DC link terminals		Max. 110 kW		
Brake resistor current, permitted (Î)		Max. 150 A		
Brake resistor, external		≥ 5 Ω		
Brake resistor threshold (Û) 11)		780 V		
Brake resistor peak power		120 kW		
Permitted continuous brake resistor power external		80 kW		
Power loss referring to power input		2100 W	2300 W	3000 W
Power loss referring to control voltage		75 W		
Power loss of device fan referring to 230 V_{AC} 9)		190 W		
Current of integrated brake control		Max. 8.0 A 10)		
Cooling air requirement device internal space		135 m^3/h		
Requirement to the water cooling		Refer to ▹Page 59◃		

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,power\ supply}$ = 0.4 %.

3) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \text{V to}\ 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \text{V}\right)$$ without overmodulation of the PWM.

[4] Switching frequency of the inverter (adjustable).

[5] RMS at an environmental temperature of 40 °C.

[6] At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

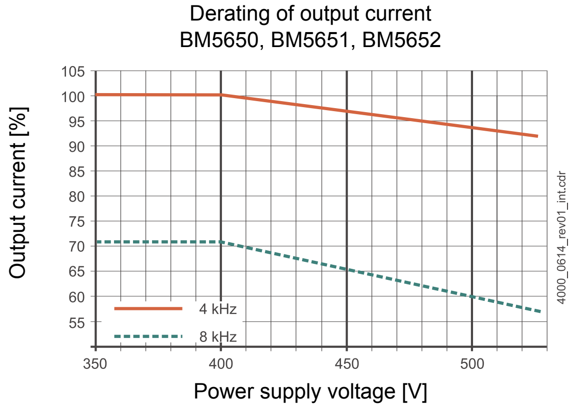


Figure 44: Derating the output current BM565X acceleration units

[7] The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▷Environmental temperature◁ on page 55.

[8] The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

[9] For cooling versions S and A.

[10] UL508C is complied with: max. 4.0 A.

[11] Refer to ▷Motor requirements◁ on page 52.

[12] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}}\text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[13] The permitted output current must be reduced complying with ▷Output frequency dependent continuous current derating BM5XXX◁ on page 119 and ▷Output frequency dependent maximum current derating BM56XX◁ on page 120 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

[14] The device is available only in cooling type „Z“ and „F“ with standard design (BM56XX-XXX6) or short design (BM56XX-XXX9).

3.4.2.4 Electrical data BM566X acceleration units

		BM5661 13)15)	BM5662 13)15)
Rated input power 1)2)		170 kVA	200 kVA
Rated input current 1)2) (I_{eff})		240 A	285 A
Total harmonic distortion input current 1)2) (THD_I)		50%	
Max. input current 2) (I_{eff})		480 A	570 A
Rated DC link voltage 1)		540 V_{DC}	
DC link capacitance (internal)		6110 µF	8460 µF
DC link capacitance (external), permitted		Refer to ▹Page 220◃	
DC link discharging time (internal DC link capacitance)		120 s	170 s
Waiting time between two switching-on operations		None	
Output voltage 1)3) (U_{AC})		3 x 0 V bis 3 x 370 V	
Output frequency at 4 kHz 12)		0 Hz bis 450 Hz	
Rated output current 1)5)6)7)14) (I_{AC})	at 4 kHz 4)	250 A	300 A
Rated output current 1)5)6)7)14) (I_{AC})	at 8 kHz 4)	187 A	225 A
Output peak current 1)5)6)8)14) (I_{AC})	at 4 kHz 4)	500 A	600 A
Output peak current 1)5)6)8)14) (I_{AC})	at 8 kHz 4)	374 A	450 A
Max. peak current period 8)		1.25 s	
Connected load DC link terminals		Max. 160 kW	
Brake resistor current, permitted (Î)		Max. 230 A	
Brake resistor external		≥ 3.4 Ω	
Brake resistor threshold (Û) 11)		780 V	
Brake resistor peak power		179 kW	
Permitted continuous brake resistor power external		130 kW	
Power loss referring to power input		3500 W	4200 W
Power loss referring to control voltage		93 W	
Power loss of the device fan referring to 230 V_{AC} 9)		174 W	
Current of integrated brake control		Max. 8.0 A 10)	
Cooling air requirement power heatsinks		450 m^3/h	
Cooling air requirement device internal space		200 m^3/h	

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,power\ supply} = 0.4$ %.

3) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\text{ V to }3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\text{ V}\right)$$ without overmodulation of the PWM.

4) Switching frequency of the inverter (adjustable).

5) RMS at an environmental temperature of 40 °C.

6) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

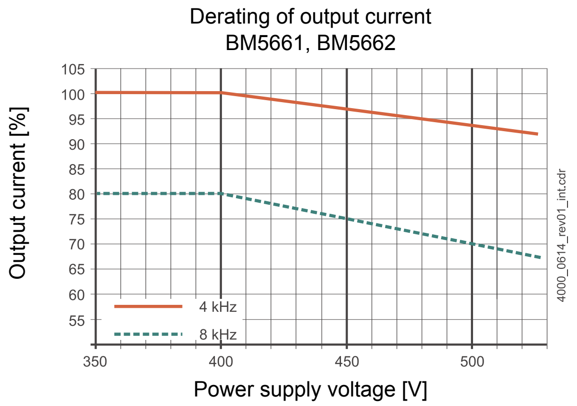


Figure 45: Derating the output current BM566X acceleration units

7) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

8) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

9) For cooling versions S and A, only.

10) If UL508C is complied with: max. 4.0 A.

11) Refer to ▹Motor requirements◃ on page 52.

12) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

13) The motor connection of the device provides a limited short-circuit protection.

14) The permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 and ▹Output frequency dependent maximum current derating BM56XX◃ on page 120 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

15) The device is available only in cooling type „Z“ and „F“ with standard design (BM56XX-XXX6) or short design (BM56XX-XXX9).

3.4.3 Electrical data BM57XX continuous current unit

- Without charging resistor BM57XX-X**T**.../BM57XX-X**G**.../BM57XX-X**I**...

		BM57**55** 15)	BM57**66** 14)	BM57**73**
Rated input power 1)2)		139 kVA	306 kVA	475 kVA
Rated input current 1)2) (I_{eff})		190 A	442 A	685 A
Total harmonic distortion input current 1)2) (THD_I)		40 %	50%	54 %
Max. input current 2) (I_{eff})		380 A	455 A	772 A
Rated DC link voltage 1)		540 V_{DC}		
DC link capacitance (internal)		7140 µF	13.2 mF	19.8 mF
DC link capacitance (external), permitted		Refer to ▹Page 220◃		
DC link discharging time (internal DC link capacitance)		140 s	230 s	150 s
Waiting time between two switching-on operations		no		
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V		
Output frequency at 4 kHz 13)		0 Hz to 450 Hz		
Rated output current 1)5)6)7)14) (I_{AC})	at 4 kHz 4)	260 A	450 A	720 A
Rated output current 1)5)6)7)14) (I_{AC})	at 8 kHz 4)	185 A	305 A	495 A
Output peak current 1)5)6)8)14) (I_{AC})	at 4 kHz 4)	260 A	450 A	800 A
Output peak current 1)5)6)8)14) (I_{AC})	at 8 kHz 4)	185 A	305 A	545 A
Max. peak current period 8)		–	no limit	60 s
Connected load DC link terminals		-	Max. 160 kW	Max. 360 kW
Brake resistor current, permitted (Î)		-	Max. 236 A	Max. 300 A
Brake resistor, external		≥ 5 Ω	≥ 3,33 Ω	≥ 2,6 Ω
Brake resistor threshold (Û) 11)		780 V		
Brake resistor peak power		120 kW	183 kW	234 kW
Permitted continuous brake resistor power external		80 kW	130 kW	180 kW
Power loss referring to power input		3000 W	4800 W	7800 W
Power loss referring to control voltage		75 W	93 W	116 W
Power loss of device fan referring to 230 V_{AC} 9)		190 W	174 W	-
Current of integrated brake control		Max. 8.0 A 10)		
Cooling air requirement device internal space		135 m^3/h	200 m^3/h	-
Requirement to the water cooling		Refer to ▹Page 59◃		

- With charging resistor BM57XX-X**R**…/BM57XX-X**S**…/BM57XX-X**W**…

		BM57**66** [14)
Rated input power 1)2)		363 kVA
Rated input current 1)2) (I_{eff})		523 A
Total harmonic distortion input current 1)2) (THD_I)		73% 16)
Max. input current 2) (I_{eff})		455 A
Rated DC link voltage 1)		540 V_{DC} 17)
DC link capacitance (internal)		10,8 mF
DC link capacitance (external), permitted		prohibited 15)
DC link discharging time (internal DC link capacitance)		1840 s
Waiting time between two switching-on operations		55 s
Output voltage 1)3) (U_{AC})		3 x 0 V to 3 x 370 V
Output frequency at 4 kHz 13)		0 Hz to 450 Hz
Rated output current1)5)6)7)14) (I_{AC})	at 4 kHz 4)	450 A
Rated output current 1)5)6)7)14) (I_{AC})	at 8 kHz 4)	305 A
Output peak current 1)5)6)8)14) (I_{AC})	at 4 kHz 4)	450 A
Output peak current 1)5)6)8)14) (I_{AC})	at 8 kHz 4)	305 A
Max. peak current period 8)		No limit
Connected load DC link terminals		Max. 160 kW
Brake resistor current, permitted (Î)		Max. 236 A
Brake resistor, external		≥ 3,33 Ω
Brake resistor threshold (Û) 11)		780 V
Brake resistor peak power		183 kW
Permitted continuous brake resistor power external		130 kW
Power loss referring to power input		4800 W
Power loss referring to control voltage		93 W
Power loss of device fan referring to 230 V_{AC} 9)		174 W
Current of integrated brake control		Max. 8.0 A 10)
Cooling air requirement device internal space		200 m^3/h
Requirement to the water cooling		Refer to ▹Page 59◃

[1] All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

[2] Using the power choke listed in ▹Power chokes◃ from page 288 at a power supply with $U_{K,power\ supply} = 0.4\ \%$.

[3] The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ V\ \text{to}\ 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ V\right)$$ without overmodulation of the PWM.

[4] Switching frequency of the inverter (adjustable).

[5] RMS at an environmental temperature of 40 °C.

[6] At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power

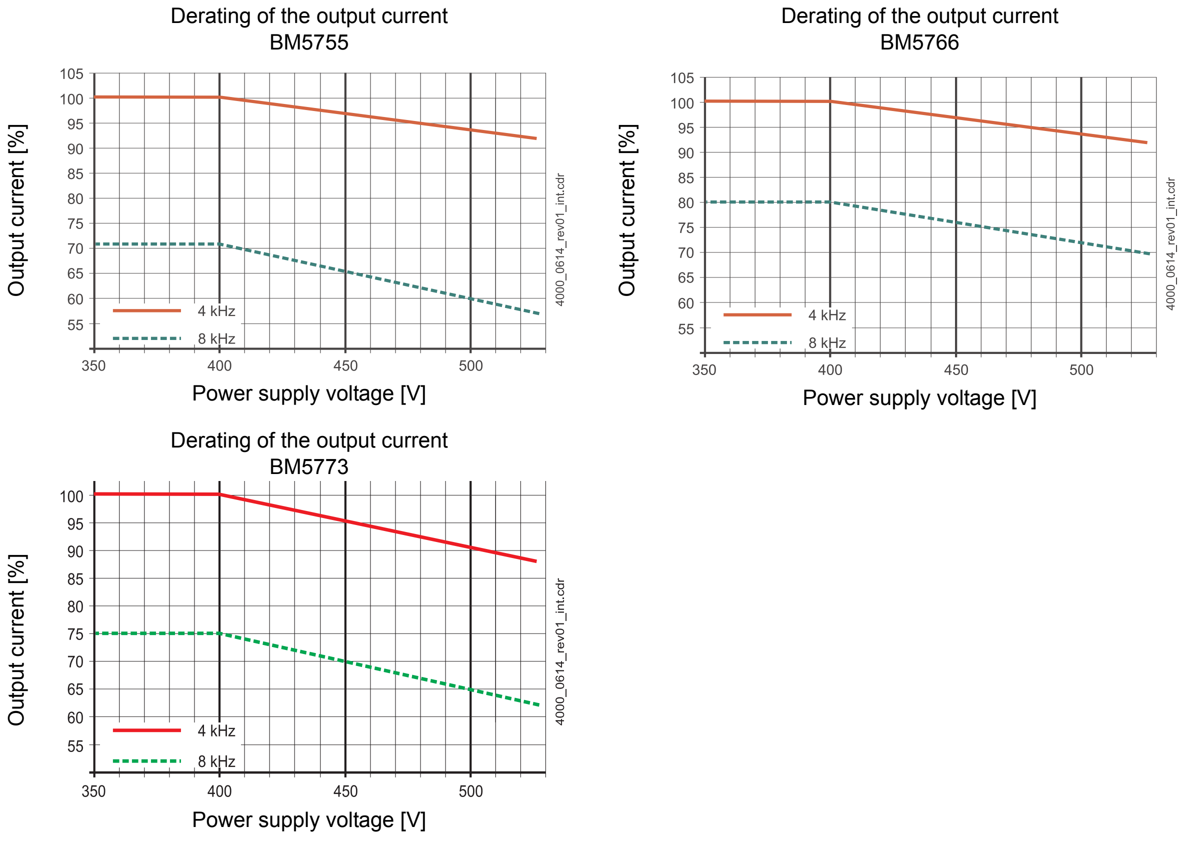


Figure 46: Derating the output current BM57XX continuous current unit

[7] The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55

[8] The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

[9] For cooling versions S and A, only.

[10] If UL508C is complied with: max. 4.0 A.

[11] Refer to ▹Motor requirements◃ on page 52.

[12] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[13] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

[14] The device is available only in cooling type „Z“ and „F“ with standard design (BM57XX-XXX6) or short design (BM57XX-XXX9).

[15] It is prohibited to connect an additional axis unit or an additional capacitance to the DC link.

[16] The distortion factor of the input current is approx. twice as much the factor at operation with power choke.
The user has to check with the local power supplier whether an operation without power choke is allowed.

[17] Operating the device without power choke causes an increase of the AC component of the DC link voltage compared with the operation using a power choke. As result the minimum DC link voltage can be lower than the value with power choke. Therefore the voltage reserve can be too low at high speed.

3.5 Electrical data power modules

3.5.1 Electrical data BM552X power module

		BM552**2**-XXX**8**	BM552**3**-XXX**8**	BM552**4**-XXX**8**	BM552**5**-XXX**8**
Rated input power 1)		4.3 kW	6.2 kW	8.2 kW	8.2 kW
Rated input current 1) (I_{eff})		7.8 A	11.5 A	15.2 A	15.2 A
Max. input current (I_{eff})		15.5 A	23.0 A	30.4 A	40.6 A
Rated DC link voltage 1) (U_{DC})		540 V_{DC}			
DC link capacitance (internal)		470 µF		705 µF	
DC link discharging time (internal DC link capacitance)		340 s		510 s	
Output voltage 1)2) (U_{AC})		3 x 0 V to 3 x 370 V			
Output frequency at 4 kHz 8)		0 Hz to 450 Hz			
Rated output current 1)4)5)6)9) (I_{AC})	at 4 kHz 3)	7.5 A	11.0 A	15.0 A	15.0 A
Rated output current 1)4)5)6)9) (I_{AC})	at 8 kHz 3)	6.0 A	8.8 A	12.0 A	12.0 A
Output peak current 1)4)5)7)9) (I_{AC})	at 4 kHz 3)	15.0 A	22.0 A	30.0 A	40.0 A
Output peak current 1)4)5)7)9) (I_{AC})	at 8 kHz 3)	12.0 A	17.6 A	24.0 A	32.0 A
Max. peak current period 7)		60 s			1 s
Power loss referring to power input		83 W	122 W	166 W	
Power input referring to control voltage		45 W			
Current of the integrated brake control		Max. 2.0 A			

1) All rated values refer to a DC link voltage of 540 V_{DC} and a control voltage of 24 V.

2) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \mathrm{V}\ \text{to}\ 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \mathrm{V}\right)$$ without overmodulation of the PWM.

3) Switching frequency of the inverter (adjustable).

4) RMS at an environmental temperature of 40 °C.

5) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

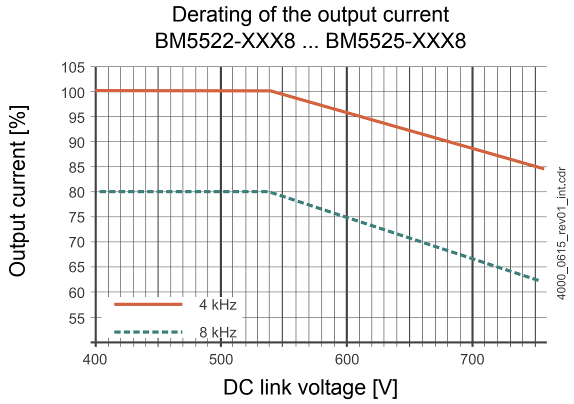


Figure 47: Derating the output current BM552X power modules

6) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

7) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

8) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{pf}} \text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

9) The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

3.5.2 Electrical data BM553X power module

		BM553**2**-XXX**8**	BM553**3**-XXX**8**	BM553**4**-XXX**8**	BM553**5**-XXX**8**
Rated input power [1]		12.0 kW	15.3 kW	23.3 kW	32.3 kW
Rated input current [1] (I_{eff})		22.3 A	28.4 A	43.2 A	59.8 A
Max. input current (I_{eff})		44.7 A	56.8 A	86.4 A	89.7 A
Rated DC link voltage [1] (U_{DC})		540 V_{DC}			
DC link capacitance (internal)		820 µF	1230 µF	1640 µF	2000 µF
DC link discharging time (internal DC link capacitance)		140 s	210 s	280 s	340 s
Output voltage [1][2] (U_{AC})		3 x 0 V to 3 x 370 V			
Output frequency at 4 kHz [8]		0 Hz to 450 Hz			
Rated output current [1][4][5][6][9] (I_{AC})	at 4 kHz [3]	22.5 A	30.0 A	45.0 A	60.0 A
Rated output current [1][4][5][6][9] (I_{AC})	at 8 kHz [3]	18.0 A	24.0 A	36.0 A	48.0 A
Output peak current [1][4][5][7][9] (I_{AC})	at 4 kHz [3]	45.0 A	60.0 A	90.0 A	90.0 A
Output peak current [1][4][5][7][9] (I_{AC})	at 8 kHz [3]	36.0 A	48.0 A	72.0 A	72.0 A
Max. peak current period [7]		60 s			
Power loss referring to the power input		250 W	318 W	490 W	685 W
Power input referring to the control voltage		58 W			
Current of the integrated brake control		Max. 8.0 A			

[1] All rated values refer to a DC link voltage of 540 V_{DC} and a control voltage of 24 V.

[2] The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \text{V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \text{V}\right) \quad \text{without overmodulation of the PWM.}$$

[3] Switching frequency of the inverter (adjustable).

[4] RMS at an environmental temperature of 40 °C.

[5] At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

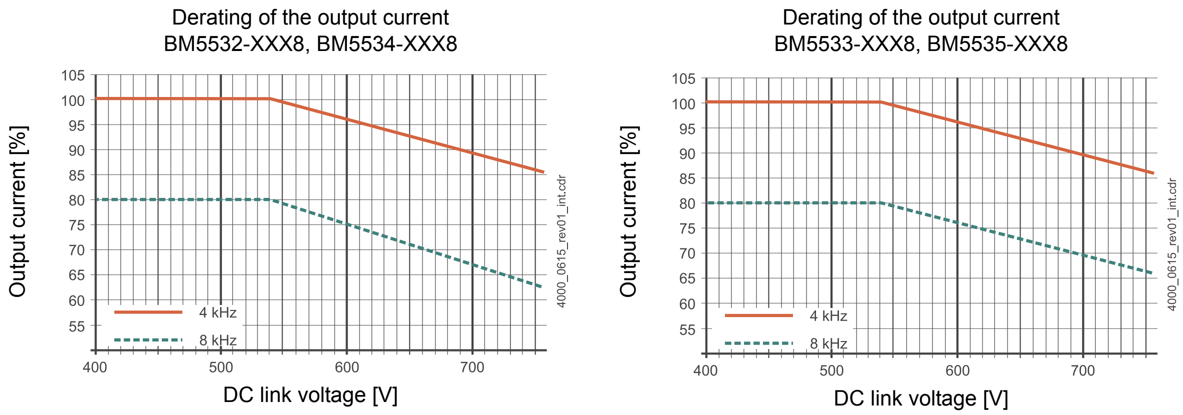


Abbildung 48: Derating the output current BM553X power modules

[6] The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▷Environmental temperature◁ on page 55.

[7] The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

[8] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[9] The continuously permitted output current must be reduced complying with ▷Output frequency dependent continuous current derating BM5XXX◁ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

[10] If UL508C is complied with: at maximum 4 A

3.5.3 Electrical data BM554X power module

		BM554**3**-XXX**8**	BM554**4**-XXX**8**	BM554**5**-XXX**8**	BM554**6**-XXX**8**
Rated input power [1]		41 kW	50 kW	64 kW	84 kW
Rated input current [1] (I_{eff})		76 A	93 A	119 A	155 A
Max. input current (I_{eff})		113 A	120 A	155 A	207 A
Rated DC link voltage [1] (U_{DC})		540 V_{DC}			
DC link capacitance (internal)		1880 µF	2350 µF	3055 µF	3760 µF
DC link discharging time (internal DC link capacitance)		45 s	55 s	70 s	90 s
Output voltage [1][2] (U_{AC})		3 x 0 V to 3 x 370 V			
Output frequency at 4 kHz [9]		0 Hz to 450 Hz			
Rated output current [1][4][5][6][11] (I_{AC})	at 4 kHz [3]	80 A	100 A	130 A	150 A
Rated output current [1][4][5][6][11] (I_{AC})	at 8 kHz [3]	75 A	72 A	94 A	105 A
Output peak current [1][4][6][7][11] (I_{AC})	at 4 kHz [3]	120 A	130 A	170 A	200 A
Output peak current [1][4][6][7][11] (I_{AC})	at 8 kHz [3]	90 A	94 A	130 A	150 A
Max. peak current period [7]		60 s			
Power loss referring to the power input		800 W	1000 W	1300 W	1400 W
Power loss referring to the control voltage		112 W			
Power loss of the device fan referring to 230 V_{AC} [8]		87 W			
Current of the integrated brake control		Max. 8.0 A [10]			
Cooling air requirement power heatsinks		260 m³/h		210 m³/h	
Cooling air requirement internal space		60 m³/h			

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[1] All rated values refer to a DC link voltage of 540 V_{DC} and a control voltage of 24 V.

[2] The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \text{V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \text{V}\right) \quad \text{without overmodulation of the PWM.}$$

[3] Switching frequency of the inverter (adjustable).

[4] RMS at an environmental temperature of 40 °C.

[5] The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

6) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

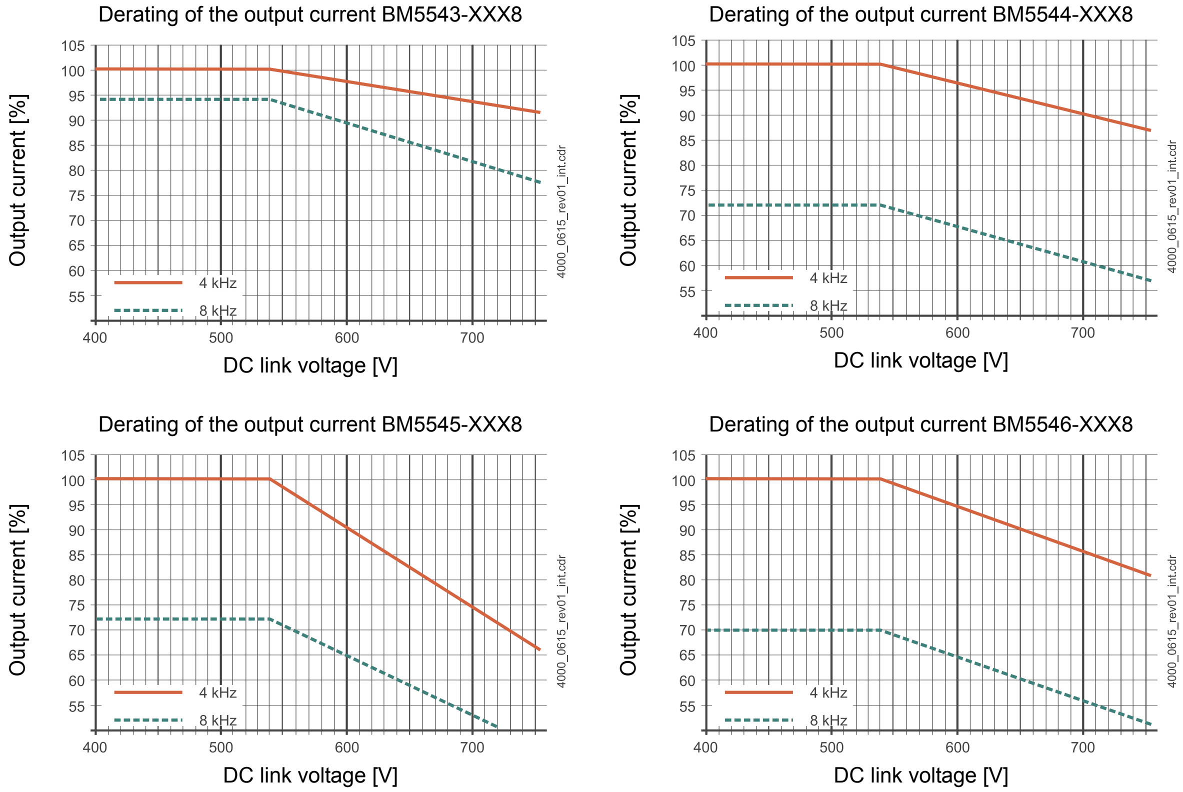


Figure 49: Derating the output current BM554X power modules

7) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

8) For cooling versions S and A, only.

9) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

10) If UL508C is complied with: at maximum 4 A

11) The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

3.5.4 Electrical data BM555X power module

		BM555**2**-XXX**8**	BM555**3**-XXX**8**	BM555**4**-XXX**8**
Rated input power 1)		68 kW	85 kW	125 kW
Rated input current 1) (I_{eff})		126 A	158 A	232 A
Max. input current (I_{eff})		164 A	206 A	302 A
Rated DC link voltage 1) (U_{DC})		540 V_{DC}		
DC link capacitance (internal)		3055 µF		5170 µF
DC link discharging time (internal DC link capacitance)		80 s		120 s
Output voltage 1)2) (U_{AC})		3 x 0 V bis 3 x 370 V		
Output frequency at 4 kHz 9)		0 Hz bis 450 Hz		
Rated output current 1)4)5)6)10) (I_{AC})	at 4 kHz 3)	120 A	150 A	210 A
Rated output current 1)4)5)610)) (I_{AC})	at 8 kHz 3)	96 A	116 A	150 A
Output peak current 1)4)5)7)10) (I_{AC})	at 4 kHz 3)	180 A	195 A	260 A
Output peak current 1)4)5)7)10) (I_{AC})	at 8 kHz 3)	144 A	150 A	185 A
Max. peak current period 7)		60 s		
Power loss referring to the power input		1470 W	1840 W	2690 W
Power input referring to the control voltage		75 W		
Power input of the device fan referring to 230 V_{AC} 8)		190 W		
Current of the integrated brake control		Max. 8.0 A 10)		
Cooling air requirement power heatsinks		450 m³/h		
Cooling air requirement device internal space		135 m³/h		

1) All rated values refer to a DC link voltage of 540 V_{DC} and a control voltage of 24 V.

2) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$U_{AC} = 3 \times 0\text{ V to }3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\text{ V}\right)$ without overmodulation of the PWM.

3) Switching frequency of the inverter (adjustable).

4) RMS at an environmental temperature of 40 °C.

5) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

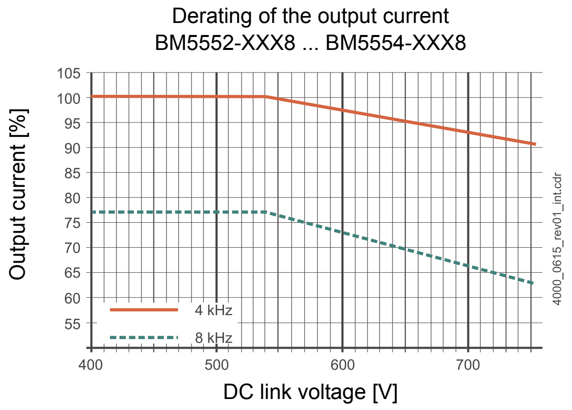


Figure 50: Derating the output current BM555X power modules

6) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

7) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

8) For cooling versions S and A, only.

9) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency f_{I-R} (f_{I-R} = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I-R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

10) If UL508C is complied with: at maximum 4 A

11) The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

3.5.5 Electrical data BM556X power module

		BM556**2**- XXX**8**	BM556**3**- XXX**8**
Rated input power 1)		150 kW	180 kW
Rated input current 1) (I_{eff})		278 A	335 A
Max. input current (I_{eff})		392 A	436 A
Rated DC link voltage 1) (U_{DC})		540 V_{DC}	
DC link capacitance (internal)		5170 µF	6110 µF
DC link discharging time (internal DC link capacitance)		120 s	170 s
Output voltage 1)2) (U_{AC})		3 x 0 V to 3 x 370 V	
Output frequency at 4 kHz 10)		0 Hz to 450 Hz	
Rated output current 1)4)5)6)11) (I_{AC})	at 4 kHz 3)	250 A	300 A
Rated output current 1)4)5)6)11) (I_{AC})	at 8 kHz 3)	200 A	240 A
Output peak current 1)4)5)7)11) (I_{AC})	at 4 kHz 3)	325 A	390 A
Output peak current 1)4)5)7)11) (I_{AC})	at 8 kHz 3)	260 A	312 A
Max. peak current period 7)		60 s	
Power loss referring to the power input		3230 W	3920 W
Power loss referring to the control voltage		93 W	
Power loss of the device fan referring to 230 V_{AC} 8)		174 W	
Current of the integrated brake control		Max. 8.0 A 9)	
Cooling air requirement power heatsinks		450 m³/h	
Cooling air requirement device internal space		200 m³/h	

---

1) All rated values refer to a DC link voltage of 540 V_{DC} and a control voltage of 24 V.

2) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$$U_{AC} = 3 \times 0\ \text{V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10\ \text{V}\right) \quad \text{without overmodulation of the PWM.}$$

3) Switching frequency of the inverter (adjustable).

4) RMS at an environmental temperature of 40 °C.

[5] At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

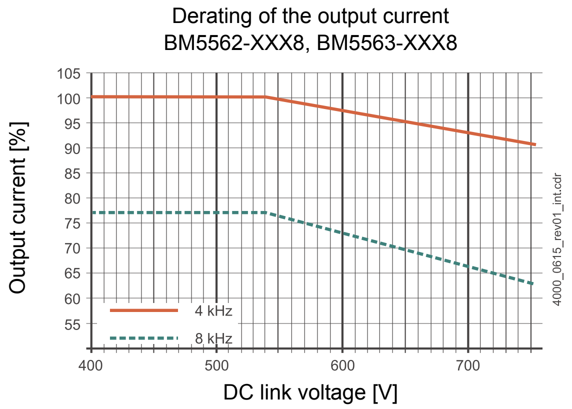


Figure 51: Derating the output current BM556X power modules

[6] The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55.

[7] The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

[8] For cooling versions S and A, only.

[9] If UL508C is complied with: max. 4.0 A.

[10] The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation. The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{pf}} \text{, typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

[11] The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

3.5.6 Electrical data BM557X power module

		BM5**572-** **AXX8/FXX8**	BM5**573-** **AXX8/FXX8** 13)
Rated input power 1)		160 kW	220 kW
Rated input current 1) (I_{eff})		300 A	410 A
Max. input current 2) (I_{eff})		450 A	535 A
Rated DC link voltage 1) (U_{DC})		540 V_{DC}	
DC link capacitance (internal)		19.8 mF	
DC link discharging time (internal DC link capacitance)		150 s	
Output voltage 1)2) (U_{AC})		3 x 0 V to 3 x 370 V	
Output frequency at 4 kHz 11)		0 Hz to 450 Hz	
Rated output current 1)4)5)6)10) (I_{AC})	at 4 kHz 3)	450 A	615 A
Rated output current 1)4)5)6)10) (I_{AC})	at 8 kHz 3)	338 A	420 A
Output peak current 1)4)5)7)12) (I_{AC})	at 4 kHz 3)	585 A	800 A
Output peak current 1)4)5)7)12) (I_{AC})	at 8 kHz 3)	439 A	545 A
Max. peak current period 7)		60 s	
Power loss referring to the power input		4700 W	6450 W
Power loss referring to the control voltage		116 W	
Power loss of the device fan referring to 230 V_{AC} 8)		Max. 540 W	
Current of the integrated brake control		Max. 8,0 A 9)	
Cooling air requirement power heatsinks		1000 m^3/h	
Cooling air requirement device internal space		250 m^3/h	

1) All rated values refer to a DC link voltage of 540 V, a control voltage of 24 V and an environmental temperature of 40 °C.

2) The output voltage is a pulsed DC voltage. The operating range refers to the RMS of the fundamental wave.

$U_{AC} = 3 \times 0 \text{ V to } 3 \times \left(\frac{U_{DC}}{\sqrt{2}} - 10 \text{ V}\right)$ without overmodulation of the PWM.

3) Switching frequency of the inverter (adjustable).

4) RMS at an environmental temperature of 40 °C.

5) At rated power supply voltage the unit supplies rated / maximum output currents. With input voltages above the rated power supply voltage the output currents must be reduced at constant output power.

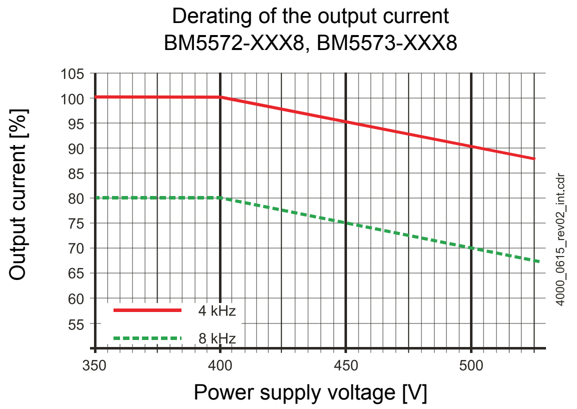


Figure 52: Derating the output current BM557X power modules

6) The input current must be reduced between 40 °C and 55 °C. Refer to correction factors at changed operating conditions ▹Environmental temperature◃ on page 55

7) Two temperature values may occur (cooling air, which flows through the internal space of the device / cooling air, which flows through the heatsink). Enter the higher value.
Example: Rated output current = 150 A environmental temperature = 46 °C

$$I_o = 150\text{A} \cdot \left(1 - \left(\frac{46°\text{C} - 40°\text{C}}{°\text{C}} \cdot 0,03\right)\right) = 150\text{A} \cdot 0,82$$

The output current must be reduced to: 123 A

8) The possible overload time at this moment is dependent of the device load and the heat sink temperature. The device load is determined by the overload monitoring of the device.

9) If UL508C is complied with: max. 4.0 A.

10) If UL508C is complied with:
The permitted typical motor output is limited to 295 kW at a maximum. The device BM5573 belongs to the category < 400 HP, < 298 kW ratings complying with table 45.1 of UL508C. Therefore, the short-circuit test using 18k A can be executed. Baumüller does not offer devices in the class 600 HP, 447 kW with 30 kA short-circuit current in accordance with UL508C.

11) The range of the output frequency is based on a stationary operation in the linear range of the PWM, i. e. without overmodulation.
The quality of the generated output voltages depends on the ratio between output frequency and current controller frequency $f_{I\text{-}R}$ ($f_{I\text{-}R}$ = 1/cycle time current controller).
The maximum output frequency f_{max} , generated with high quality, is calculated as follows:

$$f_{max} = \frac{f_{I\text{-}R}}{K_{nf}}\text{ , typical } K_{Pf} \approx 18$$

Furthermore the controller sets an upper limit for the output frequency of 599 Hz (please contact the responsible Baumüller sales department, keyword: export restriction).
The range of the output frequency is defined as follows:

PWM frequency	Current controller cycle time	Range of the output frequency
2 kHz	250 µs	0 - 225 Hz
4 kHz	125 µs	0 - 450 Hz
8 kHz	62.5 µs	0 - 599 Hz (900 Hz *))

*) 900 Hz could be generated by the controller
The device is able to generate output voltages with frequencies between f_{max} and 599 Hz and the controller allows that, however the quality of this voltages cannot be guaranteed.
Typical the devices are marked with the max output frequency at 4 kHz switching frequency: 0 ... 450 kHz.

12) The continuously permitted output current must be reduced complying with ▹Output frequency dependent continuous current derating BM5XXX◃ on page 119 if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

13) Please contact Baumüller Nürnberg if you need a higher power output.

3.6 Additional data referring to water-cooled brake resistors

Technical data
brake resistors

Device version	Brake resistor	Brake resistor current	Depth of device 1)	Brake peak power P_{Smax} 3)	Brake continuous power P_{Dmax} 2) 3)	Constants for calculation		
						C_1	C_2	C_3
BM5534-ZIXXR16 BM5535-ZIXXR16/FIXXR16 BM5632-ZIXXR16/FIXXR16	16 Ω	49 A	+20 mm	38 kW	2 kW	0.139 K/W	0.05081 K/Ws	-6.7751 s^{-1}
BM5544-ZIXXR10/FIXXR10 BM5545-ZIXXR10/FIXXR10 BM5546-ZIXXR10/FIXXR10 BM5641-ZIXXR10/FIXXR10 BM5642-ZIXXR10/FIXXR10	10 Ω	78 A	+35 mm	61 kW	1.5 kW	0.200 K/W	0.01605 K/Ws	-0.9169 s^{-1}
BM555X-ZIXXR05/FIXXR05 BM565X-ZIXXR05/FIXXR05 BM565X-ZIXXR05/FIXXR05 BM575X-FIXXR05	5 Ω	156 A	+35 mm	122 kW	3 kW	0.100 K/W	0.00802 K/Ws	-0.9169 s^{-1}
BM556X-ZIXXR03/FIXXR03 BM566X-ZIXXR03/FIXXR03 BM566X-ZIXXR03/FIXXR03 BM576X-FIXXR03	3.33 Ω	234 A	+35 mm	183 kW	5 kW	0.067 K/W	0.00535 K/Ws	-0.9169 s^{-1}
BM557X-FIXXR03 BM577X-FIXXR03	3.33 Ω	234 A	+35 mm	183 kW	3.5 kW	0.067 K/W	0.00535 K/Ws	-0.9169 s^{-1}

1) The total depth of the device in the cooling version F increases by the specified value (refer to ▹Dimensions◃ from page 29). At devices of the cooling version Z the dimensions of the device do not change.

2) The DC link voltage must not exceed 800 V.
Calculation of the permitted length of the braking procedure refer to ▹Calculations◃ from page 114.

3) The mentioned continuous power is reached if the water flow amount is at least 10 l/min. The inlet temperature may not be greater than 45 °C.
The brake resistor output power diminishes to a rated value of 0 if the inlet temperature is between >45°C and <60°C.

NOTE!

The water-cooled brake resistors offer the optimum of power loss, which can be dissipated, at a minimum unit volume. However, 10 % of the brake resistor power is not dissipated via the cooling water. It is emitted to the environmental air.
At operation with rated power the brake resistors reach temperatures of 200 °C on the rear side.

Preconditions for the cooling versions F/W (through hole devices):
Provide adequate protection against contact. Install grids around the heat sink and the resistors. Assure, that enough air can circulate and that no heat accumulation can develop under the protective cover.

Preconditions for cooling version Z (mounting into the control cabinet):
Install the devices into the control cabinet, that no heat accumulation can develop above the devices. Air circulation must be possible. In spite of air circulation elevated temperatures can occur above the devices. Do not install cables or cable channels above the devices. At the devices BM553X and BM554X do not install the connection cables directly above the mounting plate of the device, where the hot air rises.

When dimensioning, consider that 10 % of brake resistor power is not dissipated via the cooling water, but is an additional power loss, which heats the cabinet. Provide an adequate fresh air supply.

Calculations

Precondition for calculation:
The brake power of the internal brake resistors must decrease straight proportional from the brake peak power to 0.

The brake power time area A must be converted in an equivalent triangular time area. The resulting parameters P_S and t_{on} must be used for the further calculations.

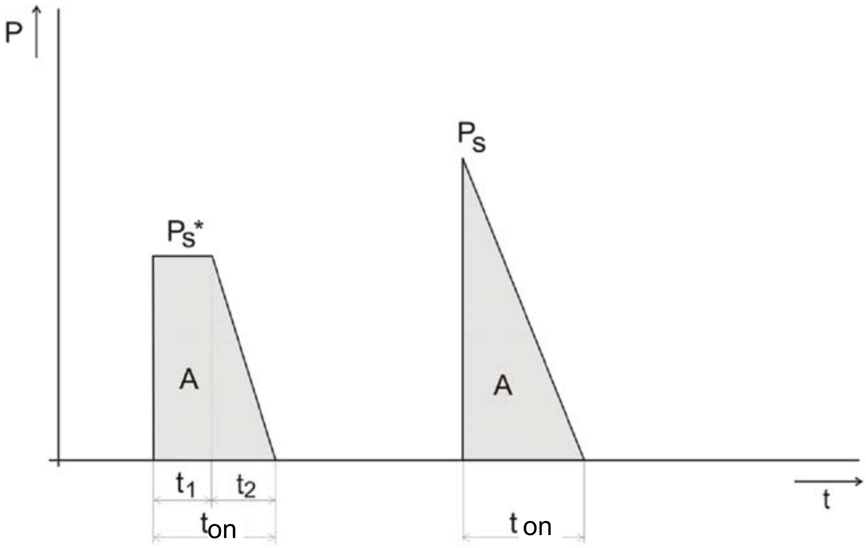


Figure 53: Conversion brake power time area in triangular time area

$$A = t_1 \cdot P^*_S + \frac{1}{2} \cdot t_2 \cdot P^*_S = \frac{1}{2} \cdot t_{on} \cdot P_S$$

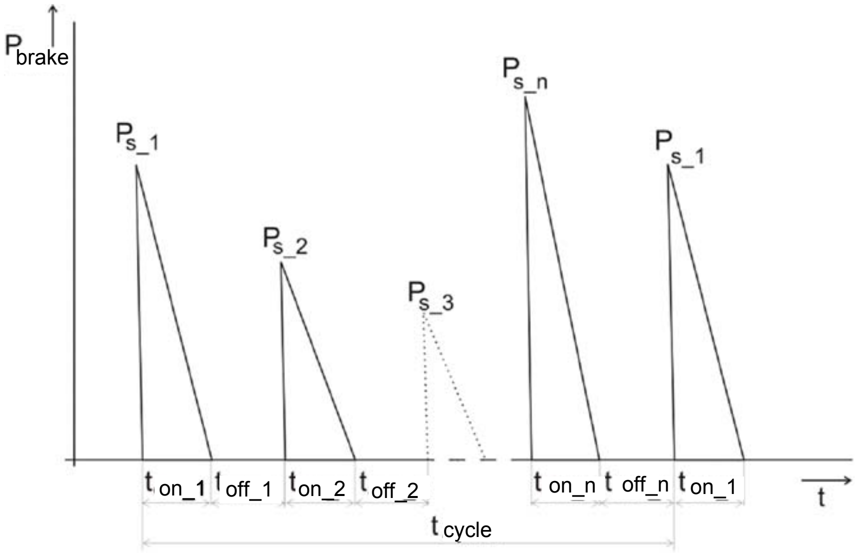
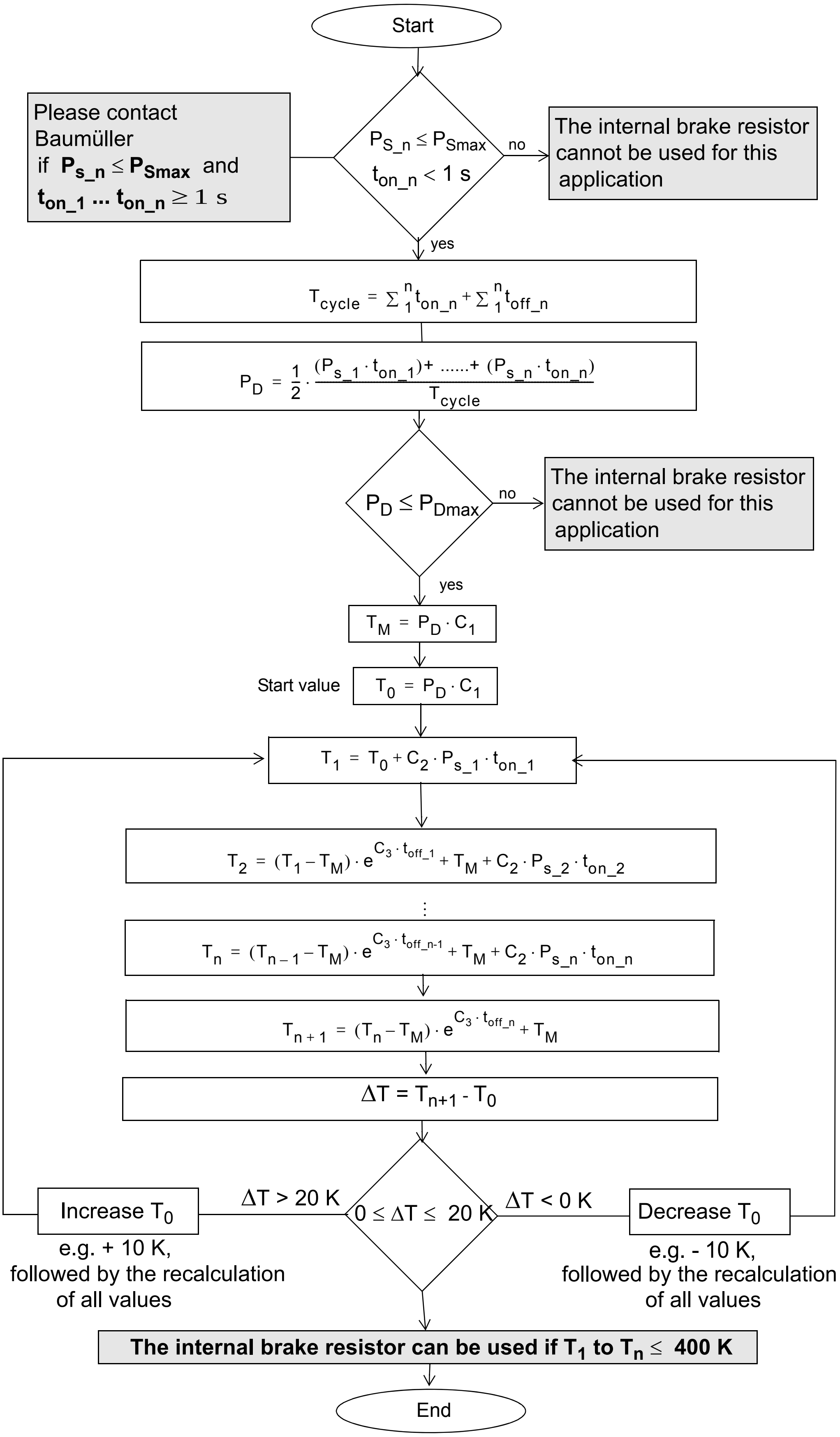


Figure 54: Braking cycle

P_D	Average continuous brake power of one cycle
P_{Dmax}	Maximum continuous brake power, refer to ▹Technical data brake resistors◃ on page 113
n	Number of brake operations within one cycle
P_{S_1} to P_{S_n}	Brake peak power, numbered in chronological order
t_{on_1} bis t_{on_n}	Brake time periods
t_{off_1} bis t_{off_n}	Off time periods, between the brake time periods
T_{cycle}	Total cycle
C_1, C_2, C_3	Constants, refer to ▹Technical data brake resistors◃ on page 113


Start
Please contact Baumüller if $\mathbf{P_{s\_n}} \le \mathbf{P_{Smax}}$ and $\mathbf{t_{on\_1}} \ldots \mathbf{t_{on\_n}} \ge 1\ \mathrm{s}$
$P_{S\_n} \le P_{Smax}$
$t_{on\_n} < 1\ s$
no
The internal brake resistor cannot be used for this application
yes
$T_{cycle} = \Sigma_1^n t_{on\_n} + \Sigma_1^n t_{off\_n}$
$P_D = \frac{1}{2} \cdot \frac{(P_{s\_1} \cdot t_{on\_1}) + \ldots\ldots + (P_{s\_n} \cdot t_{on\_n})}{T_{cycle}}$
$P_D \le P_{Dmax}$
no
The internal brake resistor cannot be used for this application
yes
$T_M = P_D \cdot C_1$
Start value
$T_0 = P_D \cdot C_1$
$T_1 = T_0 + C_2 \cdot P_{s\_1} \cdot t_{on\_1}$
$T_2 = (T_1 - T_M) \cdot e^{C_3 \cdot t_{off\_1}} + T_M + C_2 \cdot P_{s\_2} \cdot t_{on\_2}$
⋮
$T_n = (T_{n-1} - T_M) \cdot e^{C_3 \cdot t_{off\_n-1}} + T_M + C_2 \cdot P_{s\_n} \cdot t_{on\_n}$
$T_{n+1} = (T_n - T_M) \cdot e^{C_3 \cdot t_{off\_n}} + T_M$
$\Delta T = T_{n+1} - T_0$
Increase T_0
$\Delta T > 20\ K$
$0 \le \Delta T \le 20\ K$
$\Delta T < 0\ K$
Decrease T_0
e.g. + 10 K, followed by the recalculation of all values
e.g. - 10 K, followed by the recalculation of all values
The internal brake resistor can be used if T_1 to $T_n \le 400\ K$
End

Example for the calculation of BM5546

Technical data refer to brake resistors on ▹Page 113◃.

Device type	Peak power P_{Smax} 3)	Continuous power P_{Dmax} 2) 3)	Constants for calculation C_1	 C_2	 C_3
BM5546-ZIX/FIX-XXXXXR10	61 kW	1.5 kW	0.2 K/W	0.01605 K/Ws	-0.9169 s^{-1}

n =5, refer to brake cycle ▹Figure 54◃ on page 115

P_S	t_{on}	t_{off}
P_{S_1} = 20 kW < 61 kW	t_{on_1} = 0.15 s < 1 s	t_{off_1} = 1.11 s
P_{S_2} = 13 kW < 61 kW	t_{on_2} = 0.15 s < 1 s	t_{off_2} = 1.79 s
P_{S_3} = 20 kW < 61 kW	t_{on_3} = 0.15 s < 1 s	t_{off_3} = 6.85 s
P_{S_4} = 23 kW < 61 kW	t_{on_4} = 0.15 s < 1 s	t_{off_4} = 1.85 s
P_{S_5} = 24 kW < 61 kW	t_{on_5} = 0.15 s < 1 s	t_{off_5} = 5.65 s

$$\mathbf{T_{cycle}} = \sum_1^n t_{on\_n} + \sum_1^n t_{off\_n} = 5 \cdot 0.15s + 1.11s + 1.79s + 6.85s + 1.85s + 5.65s \mathbf{= 18\ s}$$

$$\mathbf{P_D} = {}_D = \frac{1}{2} \cdot \frac{(P_{s\_1} \cdot t_{ein\_1}) + \ldots\ldots + (P_{s\_n} \cdot t_{off\_n})}{T_{cycle}} = \frac{1}{2} \cdot \frac{(20kW + 13kW + 20kW + 23kW + 24kW) \cdot 0,15s}{18s}$$

= 0.417 kW = 417 W < P_{Dmax} **< 1.5 kW internal brake resistor can be used**

$$\mathbf{T_M =} P_0 \cdot C_1 = 417\ W \cdot 0.2\ K/W \mathbf{= 83.4\ K}$$

Start value: $\mathbf{T_0 =} P_0 \cdot C_1 = 417\ W \cdot 0.2\ K/W \mathbf{= 83.4\ K}$

$$\mathbf{T_1} = T_0 + C_2 \cdot P_{s\_1} \cdot t_{on\_1} = 83.4\ K + 0.01605\ K/Ws \cdot 20\ 000\ W \cdot 0.15\ s \mathbf{= 131.55\ K}$$

$$\mathbf{T_2} = \Gamma_2 = (T_1 - T_M) \cdot e^{C_3 \cdot t_{off\_1}} + T_M + C_2 \cdot P_{s\_2} \cdot t_{on\_2}$$

$$= = (131,55K - 83,4K) \cdot e^{-0,9169s^{-1} \cdot 1,11s} + 83,4K + 0,01605K/Ws \cdot 13000W \cdot 0,15s \quad \mathbf{= 132.1\ K}$$

$$\mathbf{T_3} = T_3 = (T_2 - T_M) \cdot e^{C_3 \cdot t_{off\_2}} + T_M + C_2 \cdot P_{s\_3} \cdot t_{on\_3}$$

$$= = (132{,}06K - 83{,}4K) \cdot e^{-0{,}9169s^{-1} \cdot 1{,}79s} + 83{,}4K + 0{,}01605K/Ws \cdot 20000W \cdot 0{,}15s \quad \mathbf{= 140.98\ K}$$

$$\mathbf{T_4} = T_4 = (T_3 - T_M) \cdot e^{C_3 \cdot t_{off\_3}} + T_M + C_2 \cdot P_{s\_4} \cdot t_{on\_4}$$

$$= = (140{,}92K - 83{,}4K) \cdot e^{-0{,}9169s^{-1} \cdot 6{,}85s} + 83{,}4K + 0{,}01605K/Ws \cdot 23000W \cdot 0{,}15s \quad \mathbf{= 138.88\ K}$$

$$\mathbf{T_5} = {}^{-}{}_{5} = (T_4 - T_M) \cdot e^{C_3 \cdot t_{off\_4}} + T_M + C_2 \cdot P_{s\_5} \cdot t_{on\_5}$$

$$= = (138{,}81K - 83{,}4K) \cdot e^{-0{,}9169s^{-1} \cdot 1{,}85s} + 83{,}4K + 0{,}01605K/Ws \cdot 24000W \cdot 0{,}15s \quad \mathbf{= 151.35\ K}$$

$$\mathbf{T_6} = T_6 = (T_5 - T_M) \cdot e^{C_3 \cdot t_{off\_5}} + T_M = (151{,}29K - 83{,}4K) \cdot e^{-0{,}9169s^{-1} \cdot 5{,}65s} + 83{,}4K$$

$$= = (151{,}29K - 83{,}4K) \cdot e^{-0{,}9169s^{-1} \cdot 5{,}65s} + 83{,}4K \quad \mathbf{= 83.78\ K}$$

Δ**T** = T_6 - T_0 = 83.78 K - 83.4 K **= 0.38 K**

P_D = 0,417 kW < 1.5 kW **and**

0 K ≤ ΔT = 0,38 K ≤ 20 K **and**

T_1 to T_5 ≤ 400 K

> ⇒ **The internal brake resistor can be used for this application.**

3.7 Output frequency dependent continuous current derating BM5XXX

The specified rated currents of all Baumüller devices are permitted continuously. The electrical output frequency in S1 operation is permitted from 15 Hz onwards. The continuously permitted output current must be reduced complying with the following characteristic curve if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for more than 5 seconds.

Examples:

- Speed control operations without positioning.
- Standstill operations if current is required to keep a torque / a force.
- At operations if it is likely that the mechanics block, for example when starting cold extruders.

The following operations are not affected:

- Typical positioning operations.
- Operating motors, which use an operating brake at standstill.
- Operations, where the higher-level control has a standstill and block monitoring.

The use of I_{Rating} is permitted, as long as the derating range is passed through quickly enough. The frequency change must be ≥ 15 Hz/s.

Derating of the motor-sided output current I of the inverter against the rated output current I_{Rating} dependent on the static output frequency f of the inverter.

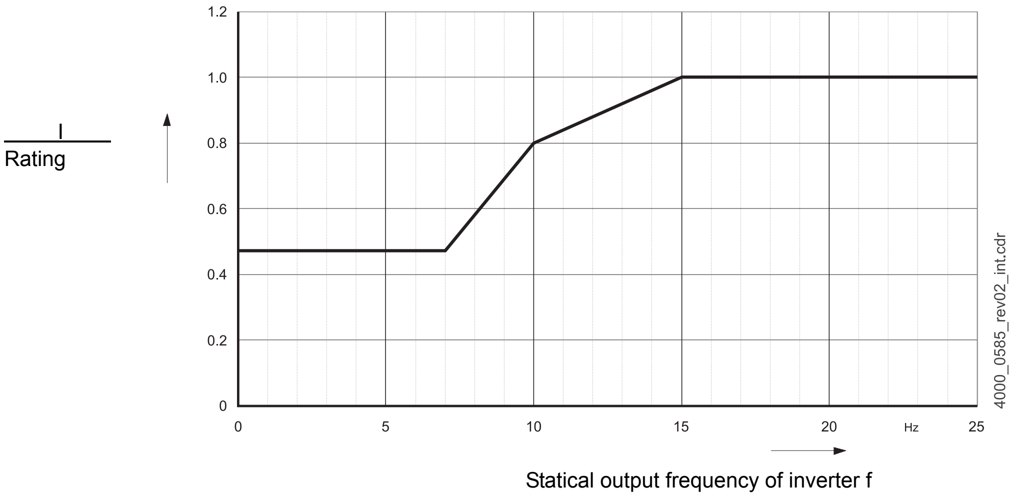


Figure 55: Derating at a statical inverter frequency < 15 Hz

3.8 Output frequency dependent maximum current derating BM56XX

For protection of BM56XX devices (acceleration units) at output frequencies below 10 Hz the maximum current of the drive is limited and the PWM frequency is reduced by half (e. g. from 4 kHz to 2 kHz or from 8 kHz to 4 kHz).

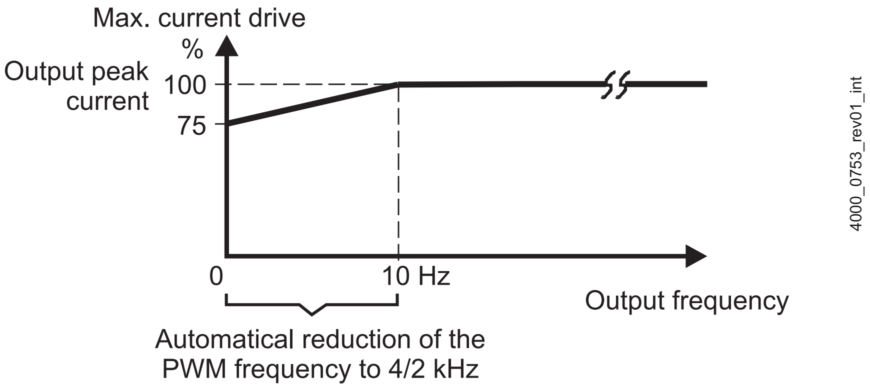


Figure 56: Reduction BM56XX max. current and PWM frequency at output frequencies < 10 Hz

The maximum current of the drive must be limited more severely at output frequencies below 10 Hz if no PWM frequency reduction is possible.

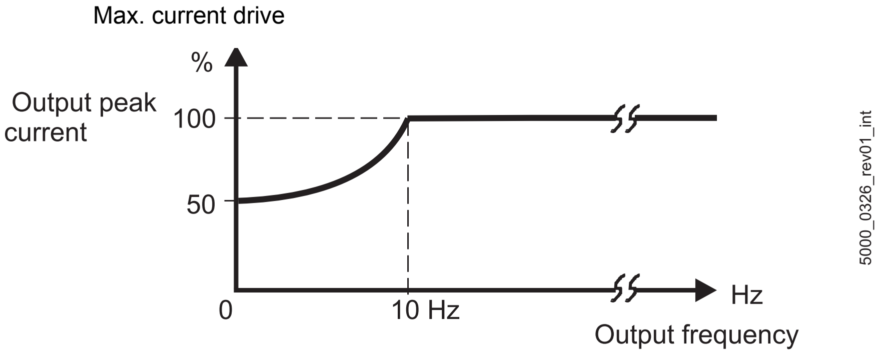


Figure 57: Reduction BM56XX only max. current at output frequencies < 10 Hz

DESIGN AND OPERATION

The devices **b maXX BM5500, BM5600, BM5700** consist of a power unit and a controller part within one housing.

The devices differ in size, power, equipment (hard- and software) and cooling types, for further information refer to ▷Type code◁ from page 124.

4.1 Design

Basic unit

The present alternating voltage at the three-phase system is converted into direct voltage by the input sided rectifier. The DC link capacitors smooth this DC link direct voltage. The output sided inverter generates a three-phase system from the direct voltage with variable frequency and voltage for the supply of the connected motor.
Additionally you can draw d. c. from the device via the DC link connections.

Power module

The output sided inverter generates a three-phase system via the DC link connection from the direct voltage with variable frequency and voltage for the supply of the connected motor.

BM5500

BM5500 are universal units, for achieving electrical drives in industrial applications. BM5500 offers the largest configuration possibilities as well as the most available options.

BM5600

BM5600 (acceleration units) are especially developed servo drives derived from BM5500 for acceleration applications. Characteristic for these devices is, that the peak current is twice as large as the rated current, even at large output currents. The devices were developed for a cycle, which could provide the peak current for 1.25 s at a whole cycle duration of 5 s according to ▷Figure 31◁ on page 57.
This units are not developed for peak current using at standstill or output frequencies lower than 10 Hz. For this units the ▷Output frequency dependent maximum current derating BM56XX◁ from page 120 is valid.

4.1 Design

BM5700

BM5700 (continuous current units) are servo converters especially developed for main drives, derived from BM5500. The devices were developed to maximize the available rated current by water cooling. For this reason these devices are only available with water cooling (cooling type -F and -Z) and with none peak current (only BM5773 with low peak current).

Controller unit

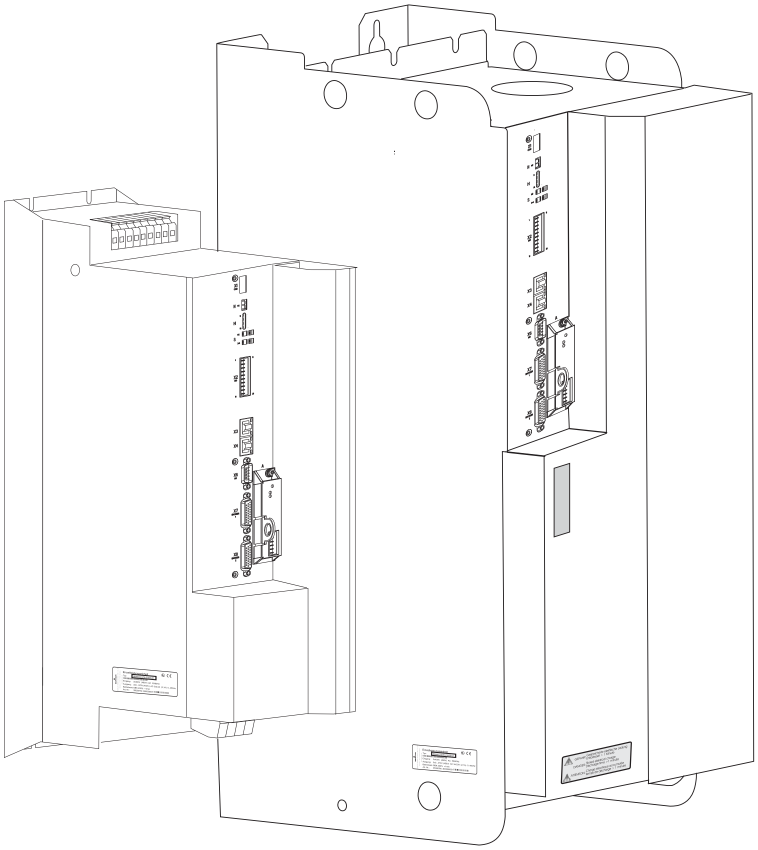
The power unit is controlled by the controller unit. You can operate the controller part with ProDrive or via a PLC or via a field bus and PLC.

NOTE!

Only the operation with ProDrive is described. If the software is not available, please contact Baumüller Nürnberg GmbH or visit our Website www.baumueller.com for download.

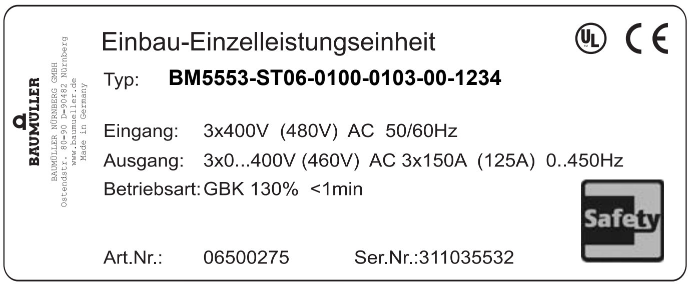
4.2 Type plate

On the type plate you will find, besides others, the type code of the device.



Functional Safety Type Approved

TÜVRheinland FS



BAUMÜLLER
BAUMÜLLER NÜRNBERG GMBH
Ostendstr. 80-90 D-90482 Nürnberg
www.baumueller.de
Made in Germany

Einbau-Einzelleistungseinheit

Typ: **BM5553-ST06-0100-0103-00-1234**

Eingang: 3x400V (480V) AC 50/60Hz
Ausgang: 3x0...400V (460V) AC 3x150A (125A) 0..450Hz
Betriebsart: GBK 130% <1min

Art.Nr.: 06500275 Ser.Nr.:311035532

Safety

Figure 58: Position of type plate

NOTE!

UL certification and a certified safety function within the meaning of PL classification according ISO 13849 or SIL according EN 61800 in preparation.

4.3 Type code

The type code has the form:

BM5XXX - XXXX[Ryy] - XXXX - XXXX - XX - XXXX.

4.3.1 Explanation type code

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX	Device generation
BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX	Device design 0: Mains rectifier 1: Active mains rectifier 3: Axis unit safety 5: Basic unit/power module safety, universal units 6: Basic unit safety, acceleration units 7: Basic unit/power module safety, continuous current unit, water-cooled
BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX	Housing size 1 to 7, refer to ▹Dimensions◃ from page 29.
BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX	Current stages (output rated current) 2 to 8 (current value dependent on the housing size), refer to ▹Electrical data basic units◃ from page 61.
BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX	Type of cooling S: Air-cooled with air supply and with air outlet in the control cabinet A: Air-cooled with air supply and with air outlet outside the control cabinet Z: Water-cooled with water cooler in the control cabinet F: Water-cooled with water cooler outside the control cabinet C: Cooling via mounting wall of the control cabinet (cold plate)s
BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX	Power supply system T: Grounded TN or TT systems I: IT systems, grounded TN or TT systems, except BM551X and BM5526 G: Grounded delta systems, IT systems, grounded TN or TT systems R: Grounded TN or TT systems with load resistor S: IT systems, grounded TN or TT systems with load resistor: W: Grounded delta, IT systems, grounded TN or TT systems with load resistor

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX

SAF-Module

0: no SAF module

BM5-O-SAF

A: -000-000-001	SAF module standard without parameter memory
B: -000-000-000	SAF module with parameter memory
C: -001-000-000	STO controllable via I/O, with parameter memory, without automatic restart
D: -001-000-002	STO controllable via I/O, with parameter memory, with automatic restart
E: -002-000-000	STO controllable via I/O and FSoE, with parameter memory, with daisy-chain inputs, without separated grounds, with 12h encoder test
F: -002-001-000	STO controllable via I/O and FSoE, with parameter memory, without daisy-chain inputs, without separated grounds, with 12h encoder test
G: -003-000-000	STO controllable via I/O and FSoE, with parameter memory, with daisy-chain inputs, without separated grounds, with 12h encoder test
H: -003-001-000	STO controllable via I/O and FSoE, with parameter memory, without daisy-chain inputs, without separated grounds, with 12h encoder test
I: -001-001-000	STO controllable via I/O, without parameter memory, with automatic restart, with short-circuit test
K: -001-001-001	SS1 controllable via I/O (SS1 time is a fixed set value), without parameter memory, with automatic restart, with short-circuit test

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX

Power unit design

BM50XX, BM51XX
  0: X1 inhibit input expects NO contact
  1: X1 inhibit input expects NC contact
BM53XX
  4: With motor brake, new grounding concept, PE screw terminals
  5: Without motor brake, new grounding concept, PE screw terminals

BM55XX/BM56XX/BM57XX
6: Basic unit with ballast transistor U_{DC} = 540 V
7: Basic unit with ballast transistor U_{supply}=230 V ± 10 %, U_{DC}=310 V
8: Power module (only output sided inverter), U_{DC}=540 V
9: Basic unit with ballast transistor, U_{DC}=540 V short design
A: Basic unit without ballast transistor U_{DC} = 540 V
B: Basic unit without ballast transistor U_{supply}=230 V ± 10 %, U_{DC}=310 V
D: Basic unit without ballast transistor, U_{DC}=540 V short design
E: Basic unit with ballast transistor U_{DC} = 540 V, new heat sink
F: Basic unit without ballast transistor U_{DC} = 540 V, new heat sink

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX

Brake resistor option

R16: Brake resistor with 16 Ω
R10: Brake resistor with 10 Ω
R05: Brake resistor with 5 Ω
R03: Brake resistor with 3 Ω

4.3 Type code

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX **Encoder reading**

00: None
01: Encoder 1 and Encoder 2:
HIPERFACE®, EnDat® 2.1, SSI, square and sine incremental encoder, resolver
02: Encoder 1 and Encoder 2: EnDat® 2.2
03: Encoder 1 and Encoder 2: HIPERFCACE DSL®
06: Encoder 1: refer to 01, Encoder 2: EnDat® 2.2
07: Encoder 1: refer to 01, Encoder 2: HIPERFCACE DSL®
08: Encoder 1: EnDat® 2.2, Encoder 2: refer to 01

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX **Add-on module**

00: Without module
01: With option module IEE with external supply
03: With option module SIE with internal supply
04: With option module SVP-001-001, 4 analog inputs (for voltage), 4 analog outputs (voltage)
05: With option module SVP-001-002, 4 analog inputs (2 for voltage, 2 for current), 4 analog outputs (voltage)
06: With option module SVP-001-003, 4 analog inputs (for current) 4 analog outputs (voltage)
07: With option module EIP-001-001 EthernetIP incl. IEE with external supply
08: With option module MOD-001-001 Modbus/TCP incl. IEE with external supply

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX **Fieldbus configuration**

01: EtherCAT® CoE
02: VARAN
03: CANopen®
04: POWERLINK®
05: ProfiNET RT/IRT
07: EtherCAT® SoE

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX **Controller hardware type**

01: Single and double axis unit, fully-equipped with AIO, DIO, EtherCAT® (RJ45)
04: Active mains rectifier, without AIO, without encoder evaluation, without add-on module
06: Single and double axis unit, fully-equipped with AIO, DIO, EtherCAT® (RJ45), with additional +24 V supply for DIO and motor brake
07: Active mains rectifier, without AIO, without encoder evaluation, without add-on module, with additional +24 V supply for DIO
08: BM53XX, BM55XX, BM56XX, BM57XX with AIO, encoder, fieldbus (RJ45), DIO
09: BM53XX, BM55XX, BM56XX, BM57XX with AIO, encoder, fieldbus (RJ45), without DIO
10: BM53XX, BM55XX, BM56XX, BM57XX mit AIO, DIO, encoder, fieldbus (RJ45) both pulse enable always on
61:BM53XX, BM55XX, BM56XX, BM57XX without AIO, DIO, without 2nd encoder, fieldbus (M8), 4 digital inputs only, 2 of them pulse enable
62: BM53XX, BM55XX, BM56XX, BM57XX without AIO, without DIO, without 2nd encoder, fieldbus (M8)

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX **Design**

00: Standard

BM5XXX-XXXX[Ryy]-XXXX-XXXX-XX-XXXX **Software release controller**

The software option SoftDrivePLC is shown in the type code as follows:

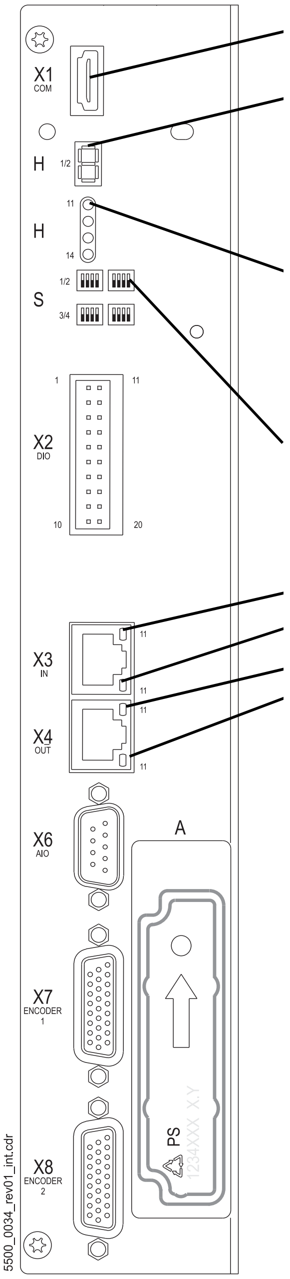
BM5XXX - XXXX - XXXX - XXXX - XX - XXXX-**EXX,** and XX > 01

NOTE!

Only devices with type code BM5XXX-XXXX-XX**01**/**03** and **-**XX**04/05/06** provide an add-on module!

The add-on modules are built-in and cannot be changed.
It is forbidden to remove the yellow front cover.

4.4 Display and operation elements



X1	Service interface
H1	7 segment display Display controller state Meaning refer to: ▹7-segment display controller◃ on page 129
LED **H11 - H14**	LED Meaning: refer to ▹LED display controller◃ on page 130.
Address switch **S1 - S4**	Setting: refer to ▹Setting the IP address with address switches◃ from page 133.
LED **H31** **H32** **H41** **H42**	Fieldbus, depending on type (refer to ▹Type code◃ from page 124) Meaning: BM5XXX-XXXX-XXXX-**01**XX BM5XXX-XXXX-XXXX-**07**XX ▹LED EtherCAT®◃ on page 131 BM5XXX-XXXX-XXXX-**02**XX ▹LED VARAN◃ on page 131 BM5XXX-XXXX-XXXX-**03**XX LED CANopen® without function BM5XXX-XXXX-XXXX-**04**XX ▹LED POWERLINK® .◃ on page 132

Figure 59: Display/operating elements controller BM52XX, BM53XX

NOTE!

Only the service cable BM5-K-USB-XXX is allowed to be used for the service interface X1, refer to ▹Service interface cable◃ on page 293.

4.4.1 7-segment display controller

Refer to parameter manual for detailed description of drive states and state transitions.

0: Low, 1: High

Display	State drive manager	Meaning
0	NOT READY TO SWITCH ON	Drive message „Not ready for switching power on“
1	SWITCH-ON INHIBIT	Inhibit voltage, e.g. quick stop active
2	READY TO SWITCH ON	Drive shutdown Control word: xxxx x110 Pulse enable = 0 Quick stop = 1 (low active)
3	SWITCHED ON	Control word: xxxx x111 Pulse enable = 1 Quick stop = 1
4	OPERATION ENABLED	Control word: xxxx 1111 Pulse enable = 1 Quick stop = 1
5	OPERATION DISABLED ACTIVE	
6	OPERATION INHIBIT ACTIVE	Pulse enable = 0
7	QUICK STOP ACTIVE	Quick stop = 0 (low active)
E	ERROR RESPONSE ACTIVE	
F	ERROR	Error message Reset via control word 0xxx xxxx or reset stored errors 0 → 1
P	Parking axis	

NOTE!

In addition the error No. is displayed, refer to ▹Fault detection◃ from page 243.

4.4.2 LED display controller

Naming on the front plate	Internal identification	Meaning	
H11	1.1 green, 1.1 red	Axis 1:	Torque direction H11 green: positive torque direction H11 red: negative torque direction
H12	1.2 green, 1.2 orange	Axis 1:	Power on (24 V available) / pulse enable H12 green: power ON and pulse enable H12 orange: power ON only
H13	1.3	Axis 1:	Current limit H13 red: device operates on current limit
H14	1.4	Axis 1:	Error display H14 red: device message error

4.4.3 LED display fieldbus

LED EtherCAT® Type code

BM5XXX-XXXX-XXXX-**01**XX
BM5XXX-XXXX-XXXX-**07**XX

Naming on the front plate	**Meaning**	**Blinking pattern**	
H31 (green)	X3 Link / Act	Off:	No connection
		On:	Connection
		Blinking:	Data transfer
H32 (yellow)	ERROR	On:	ERROR (receiver error Phy1/Phy2)
H41 (green)	X4 Link / Act	Off:	No connection
		On:	Connection
		Blinking:	Data transfer
H42 (yellow)	RUN	Off:	ERROR/INIT
		500 ms on / 500 ms off:	PREOPERATIONAL
		200 ms on / 1 s off:	SAFEOPERATIONAL
		On:	OPERATIONAL

LED VARAN Type code

BM5XXX-XXXX-XXXX-**02**XX

Naming on the front plate	**Meaning**	**Blinking pattern**	
H31 (green) H41 (green)	LINK	On:	Connection between 2 PHYs (physical interfaces) is established.
H32 (yellow) H42 (yellow)	ACTIVE	On:	Data is received or transmitted.

LED CANopen® Type code

BM5XXX-XXXX-XXXX-**03**XX

No function

LED POWERLINK®

Type code

BM5XXX-XXXX-XXXX-**04**XX

Naming on the front plate	Meaning	Blinking pattern	
H31 (green)	X3 Link / Act	Off:	No connection
		On:	Connection
		Blinking:	Data transfer
H32 (yellow)	ERROR	Off:	NMT_CT3, NMT_CT7, NMT_GT2
		On:	NMT_CT11, NMT_GT6
		Blinking:	Configuration error (e.g. address setting)
H41 (green)	X4 Link / Act	Off:	No connection
		On:	Connection
		Blinking:	Data transfer
H42 (green)	STATUS	Off:	NMT_GS_OFF, NMT_GS_INITIALISATION, NMT_CS_NOT_ACTIVE
		50 ms off / 50 ms on:	NMT_CS_BASIC_ETHERNET
		200 ms on / 1 s off:	NMT_CS_PRE_OPERATIONAL_1
		2 x 200 ms on / 1 s off:	NMT_CS_PRE_OPERATIONAL_2
		3 x 200 ms on / 1 s off:	NMT_CS_READY_TO_OPERATE
		On:	NMT_CS_OPERATIONAL
		200 ms on / 200 ms off:	NMT_CS_STOPPED

4.4.4 Setting the IP address with address switches

EtherCAT® CoE BM5XXX-XXXX-XXXX-**01**XX
EtherCAT® SoE BM5XXX-XXXX-XXXX-**07**XX

VARAN BM5XXX-XXXX-XXXX-**02**XX

POWERLINK® BM5XXX-XXXX-XXXX-**04**XX

IP-Address S1 to S4

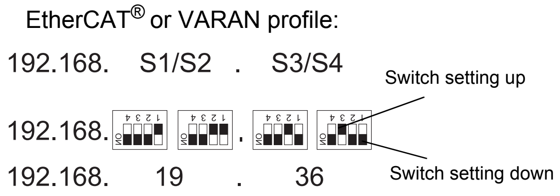
The IP address of the controller consists of 32 bits or 4 bytes (e.g. 192.168.125.203).

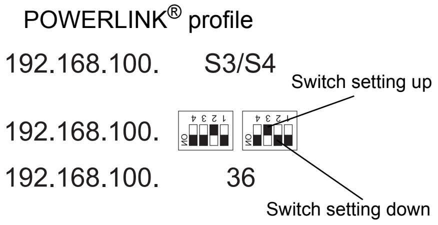
Controller with EtherCAT®-profile: Both of the first bytes are set with the base address (192.168.) at the factory. Both of the last bytes are set by means of the address switches S1, S2, S3 and S4. In the process, S1 and S2 as well as S3 and S4 each represent an 8 bit value.

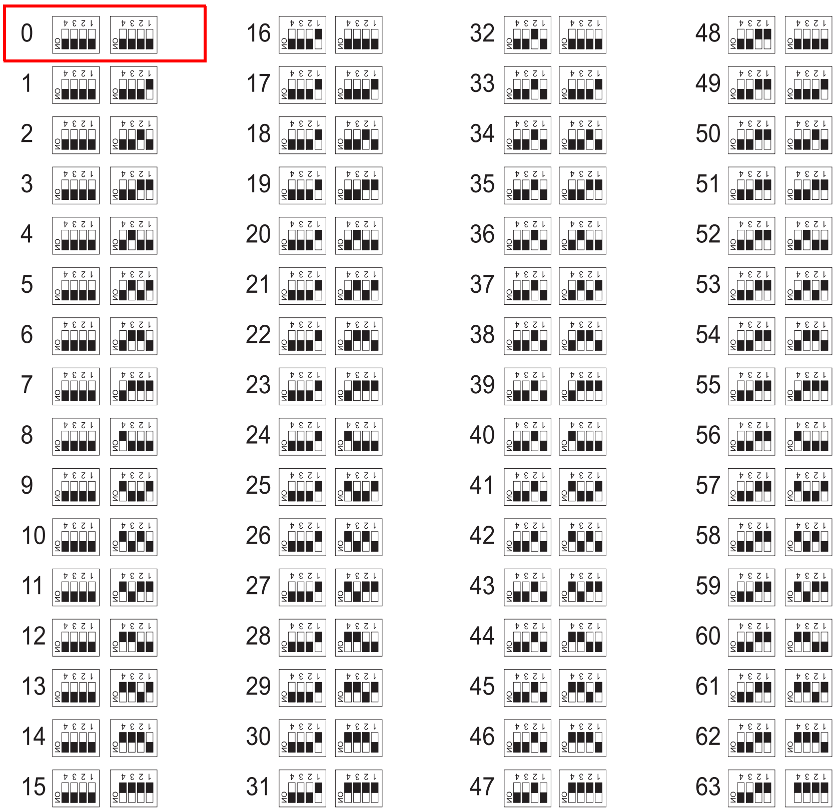
Controller with POWERLINK®-profile: Both of the first bytes are set with the base address (192.168.100) at the factory. Both of the last bytes are set by means of the address switches S3 and S4. In the process, S3 and S4 each represent an 8 bit value.

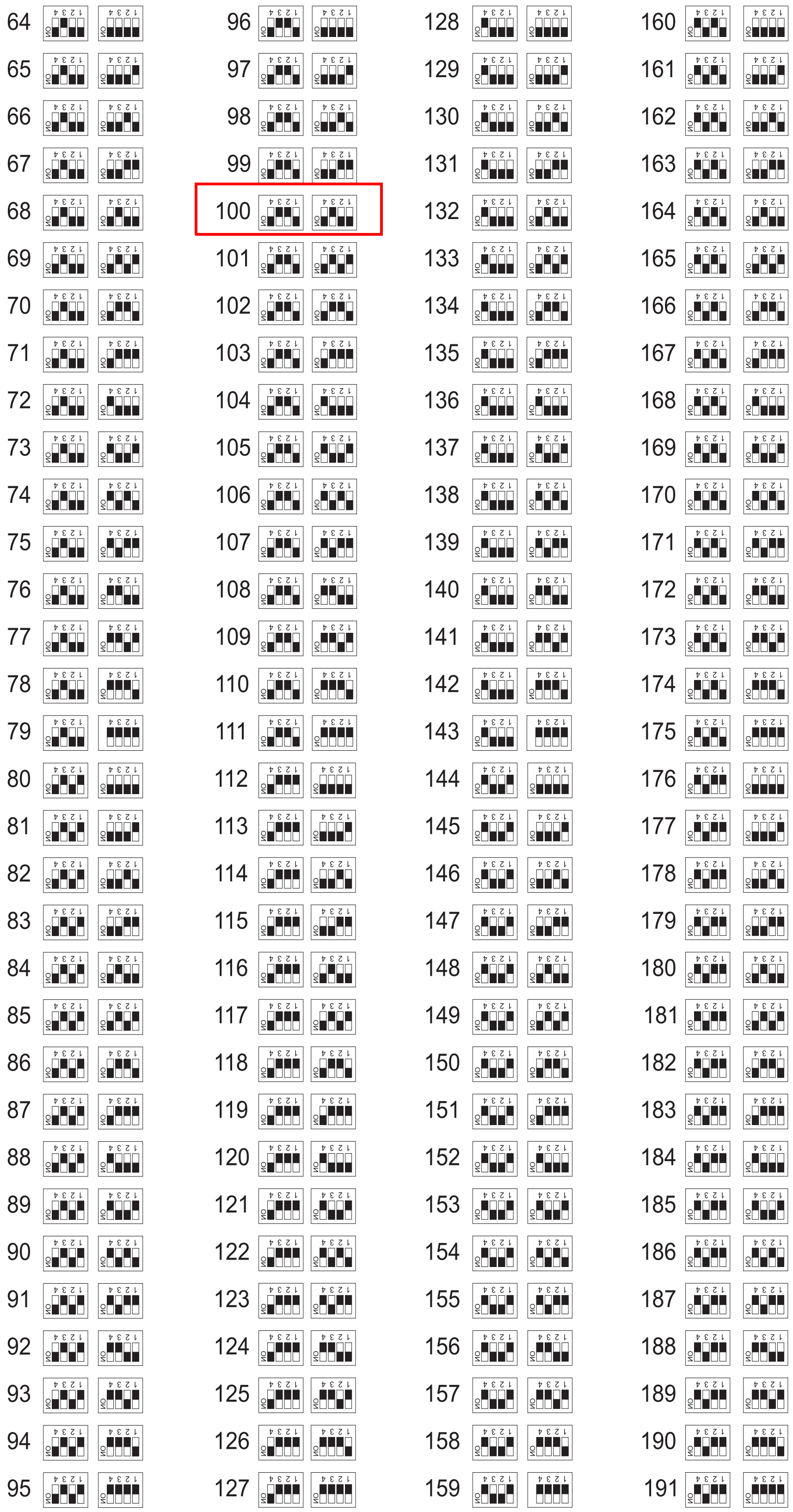
The IP address 192.168.0.0 or 192.168.100.0 is not permitted/reserved.

For information on changing the base address, refer to the parameter manual.





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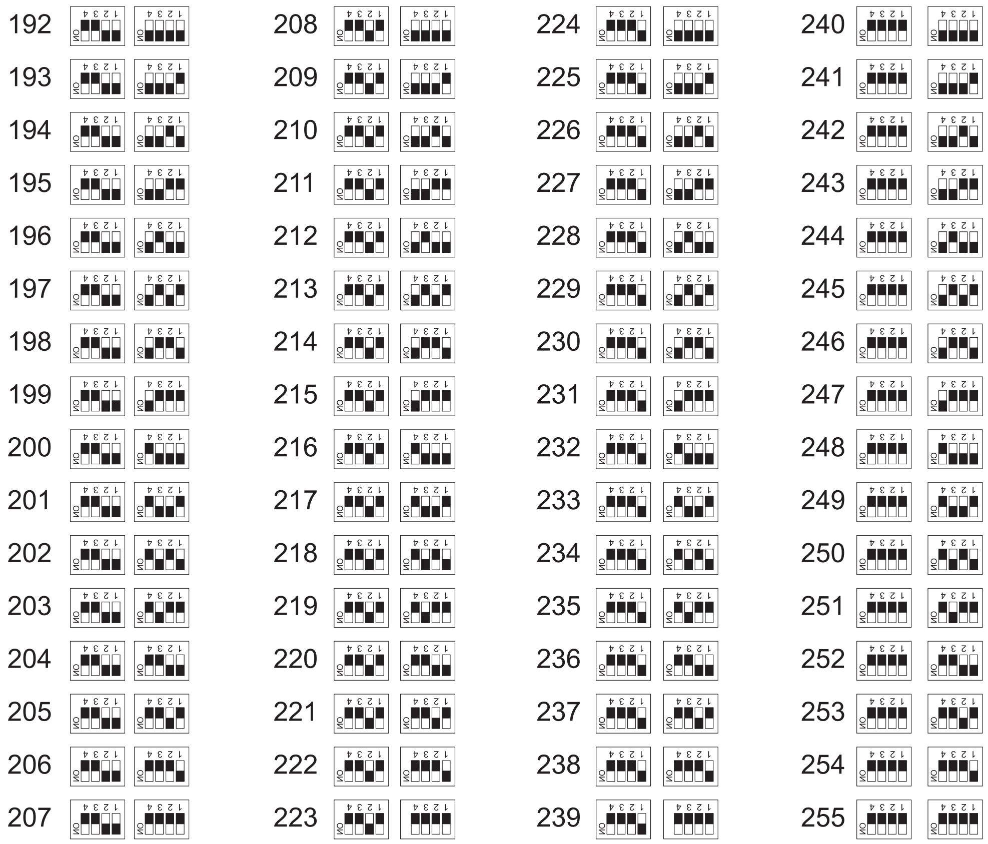
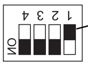


Figure 60: Address switch setting EtherCAT®, POWERLINK®, VARAN

CANopen® BM5XXX-XXXX-XXXX-**03**XX

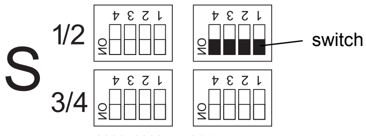
NOTE!



= 0001

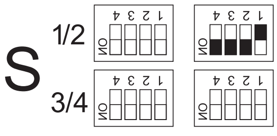
Baud rate S2

20 kBit/s



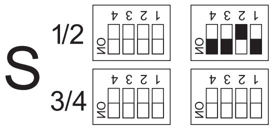
3300_0022_rev01_int

125 kBit/s, default setting



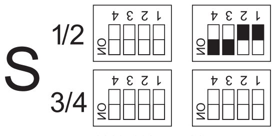
3300_0023_rev01_int

250 kBit/s



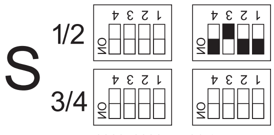
3300_0024_rev01_int

500 kBit/s



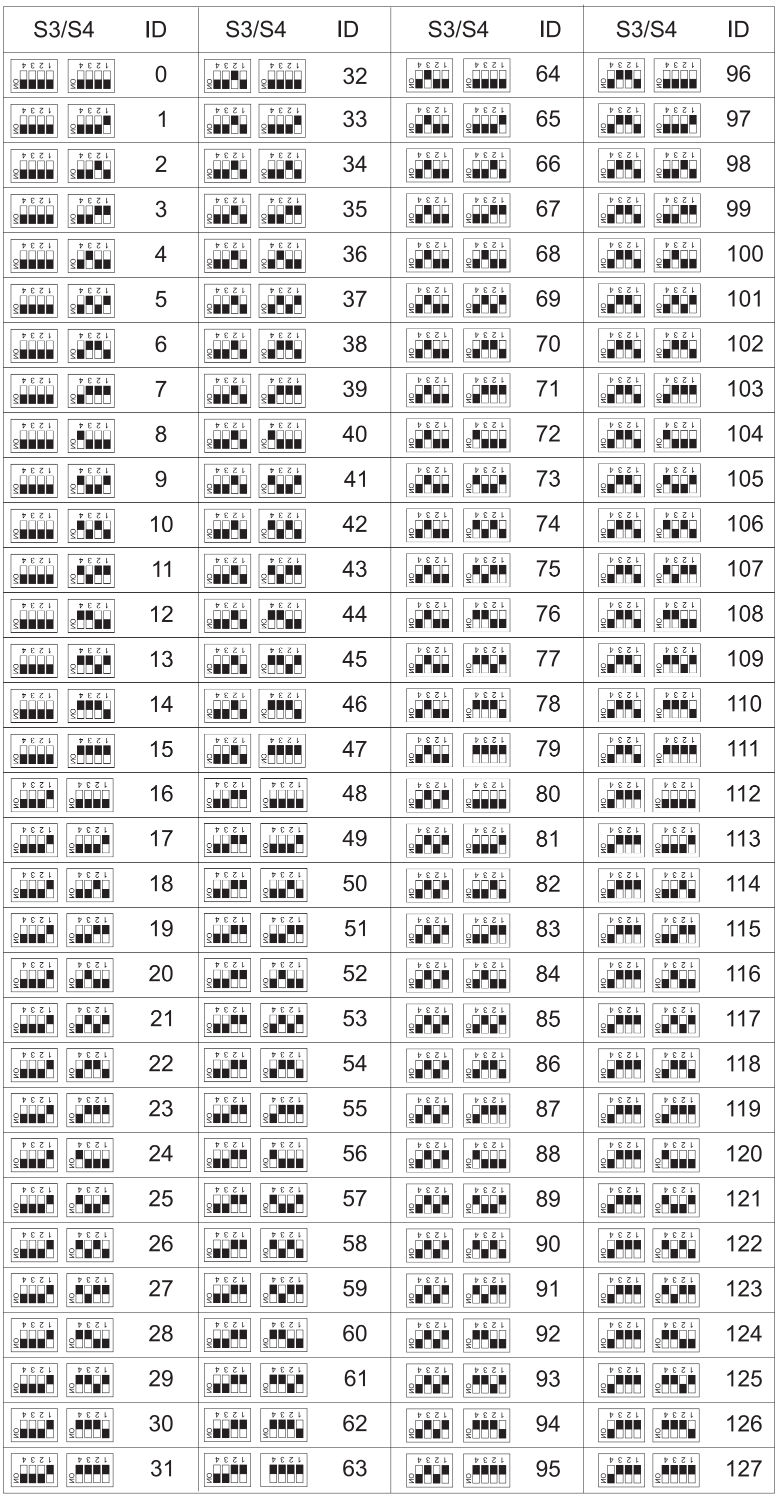
3300_0025_rev01_int

1 MBit/s



3300_0026_rev01_int

Address S3/S4



S3/S4	ID	S3/S4	ID	S3/S4	ID	S3/S4	ID
	0		32		64		96
	1		33		65		97
	2		34		66		98
	3		35		67		99
	4		36		68		100
	5		37		69		101
	6		38		70		102
	7		39		71		103
	8		40		72		104
	9		41		73		105
	10		42		74		106
	11		43		75		107
	12		44		76		108
	13		45		77		109
	14		46		78		110
	15		47		79		111
	16		48		80		112
	17		49		81		113
	18		50		82		114
	19		51		83		115
	20		52		84		116
	21		53		85		117
	22		54		86		118
	23		55		87		119
	24		56		88		120
	25		57		89		121
	26		58		90		122
	27		59		91		123
	28		60		92		124
	29		61		93		125
	30		62		94		126
	31		63		95		127

Figure 61: Address setting CANopen®

5

TRANSPORT AND PACKAGING

5.1 Safety notes for transport

NOTICE!

Damage 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 mechanical hazard!

Secure devices against falling down.

Therefore:

- Take suitable measures, such as supports, hoists, straps, etc., to ensure that devices cannot fall down.
- Use appropriate handling material.

5.2 What to observe when transporting

For initial transport of the device, it is packed at the manufacturer. 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 - 25 °C up to + 70 °C
- Vibration, shock, continuous shock class 2 M 1 as in 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 transport 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 transport damage!

5.4 Unpacking

After having received the still packaged device:

- Avoid transport shocks 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.

6

MOUNTING

The device is designed for mounting in a control cabinet.

Mounting consists of the following steps:

1 Prepare mounting
(for drill holes/cut-out segments, refer to ▷Drilling patterns◁ from page 145)

2 Install
(fixing refer to ▷Mounting instructions◁ on page 151)

6.1 Safety notes

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.

6.1 Safety notes

WARNING!

Danger as a result of incorrect mounting!

The mounting requires qualified personnel with adequate experience. Incorrect 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 mechanical 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.

NOTICE!

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.

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 planning documents and the drilling pattern (refer to ▹Drilling patterns◃ from page 145), the cutout sections and the positions of the attachment drill holes can be determined.

NOTICE!

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 start!

CAUTION!

Eye injury due to flung particles.

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

Therefore:

Wear protective eye wear!

⭘ Preparing drill holes and cutout sections.

6.2.1 Drilling patterns

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

NOTE!

Consider the minimum clearances for cooling when making the drill holes.

All dimensions in millimeters [mm].

Further notes refer to ▹Dimensions◃ from page 29 and ▹Cooling◃ from page 59.

How to determine the required space in the control cabinet, refer to ▹Dimensions◃ from page 29.

Tolerance specifications

Drill hole dimensioning	±0.2 mm
Dimensioning openings	+1.0 mm
Relative tolerance of discretionary divisions	±0.1 mm

6.2.1.1 Drilling patterns BM551X

Figure 62: Drilling pattern BM551X

6.2.1.2 Drilling patterns BM552X

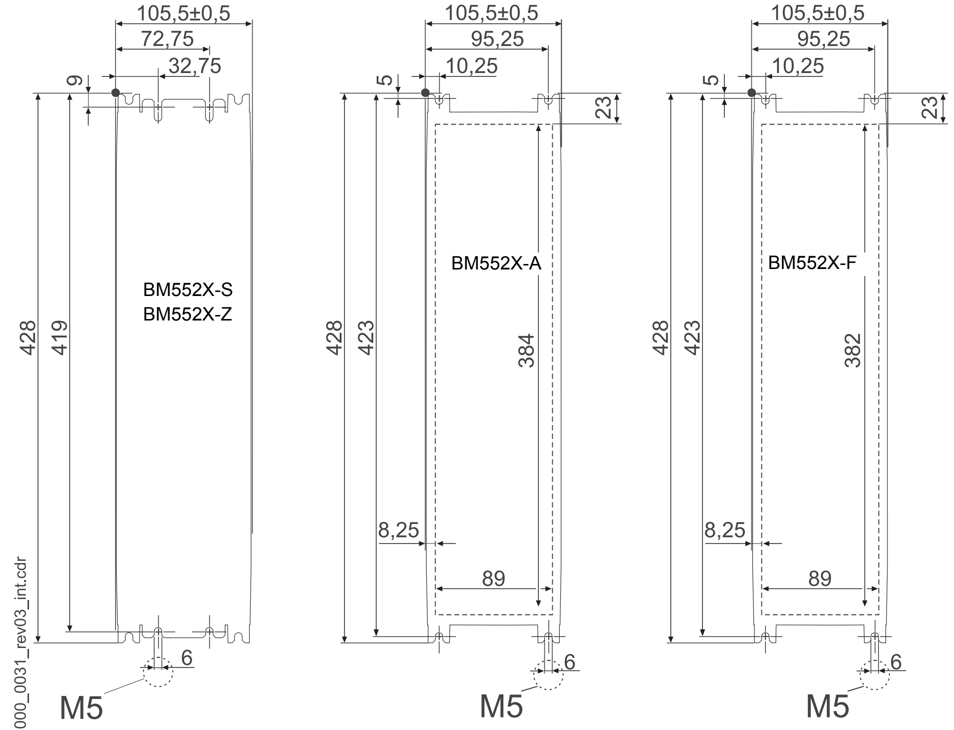


Figure 63: Drilling pattern BM552X

6.2.1.3 Drilling patterns BM553X

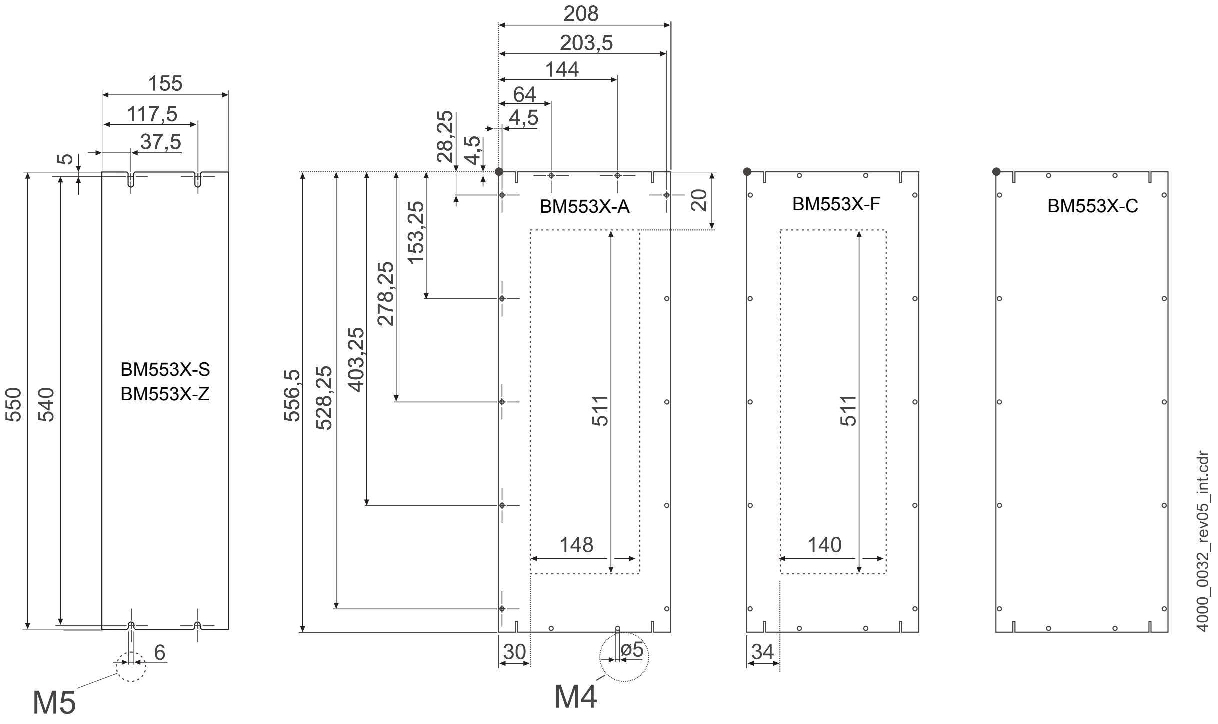


Figure 64: Drilling pattern BM553X, BM563X

6.2.1.4 Drilling patterns BM5X4X

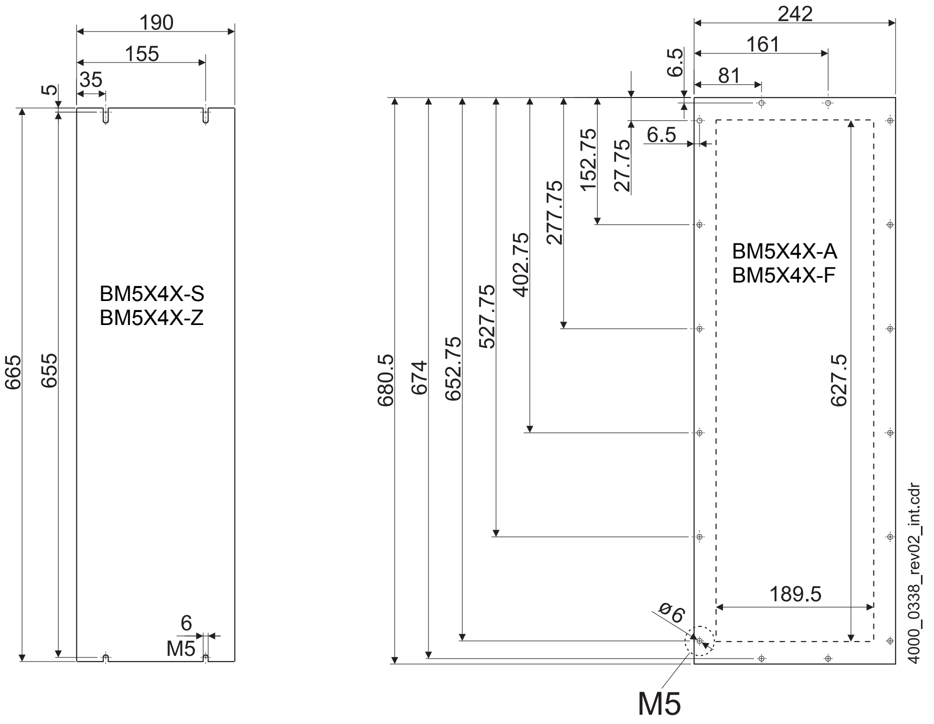


Figure 65: Drilling pattern BM554X, BM564X

6.2.1.5 Drilling patterns BM5X5X

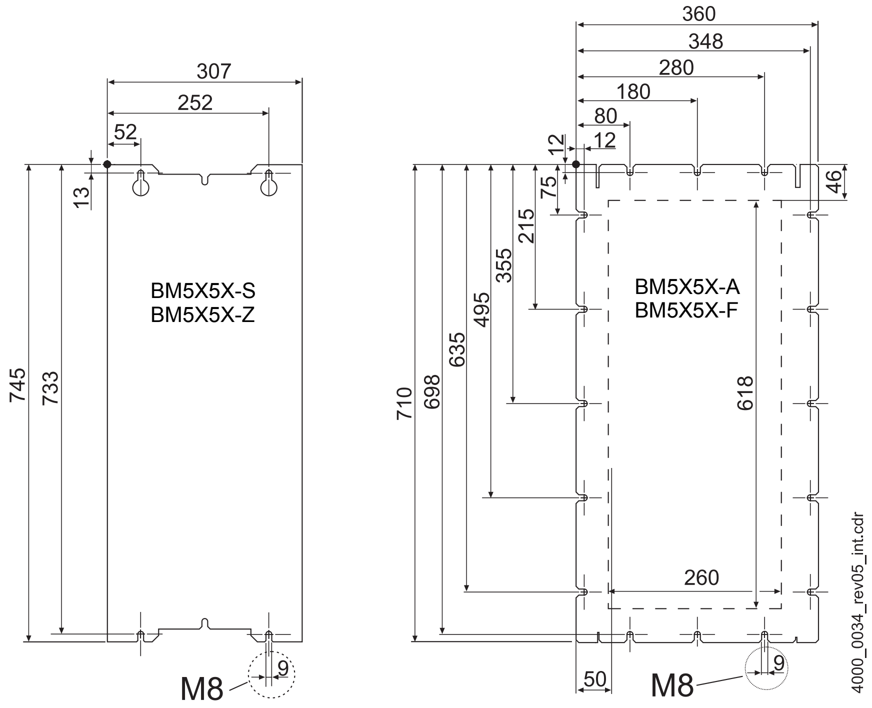


Figure 66: Drilling pattern BM555X, BM565X

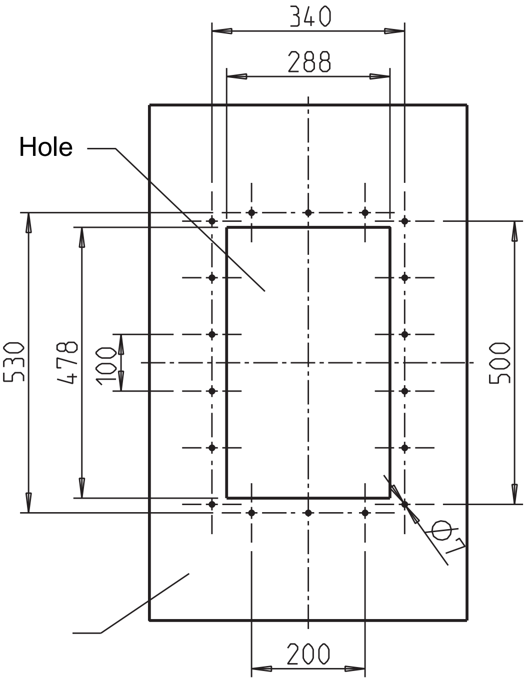


Figure 67: Drilling pattern BM565X-FXX9, BM575X-FXX9

6.2.1.6 Drilling patterns BM5X6X

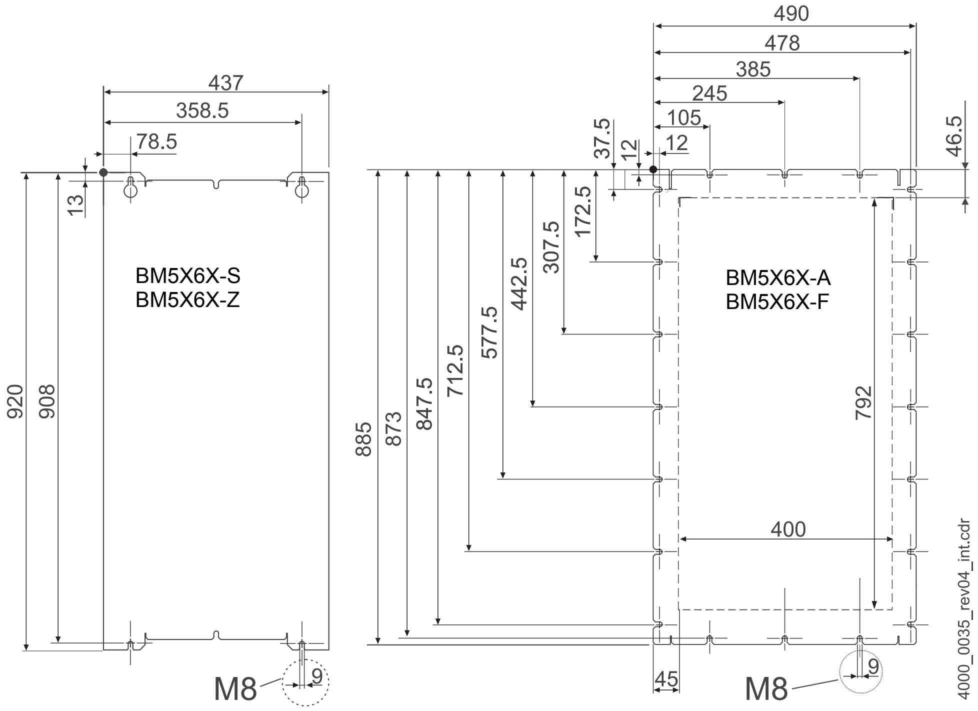


Figure 68: Drilling pattern BM556X, BM565X

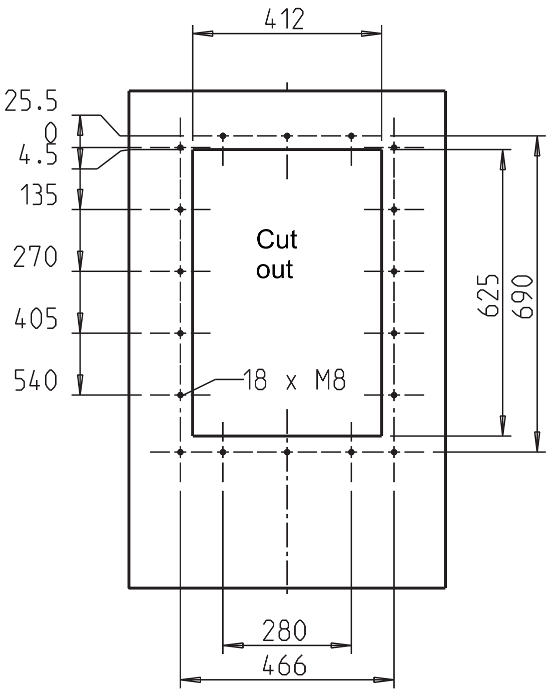


Figure 69: Drilling pattern BM566X-FXX9, BM5766-FXX9

6.2.1.7 Drilling patterns BM5X7X

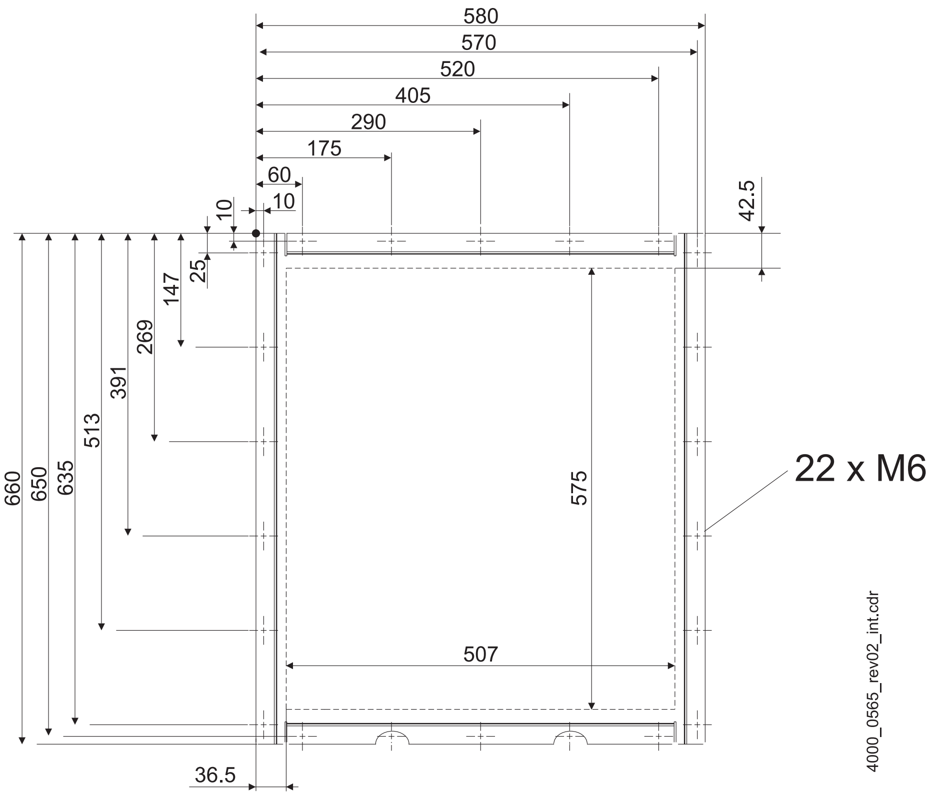


Figure 70: Drilling pattern BM557X-F, BM577X-F

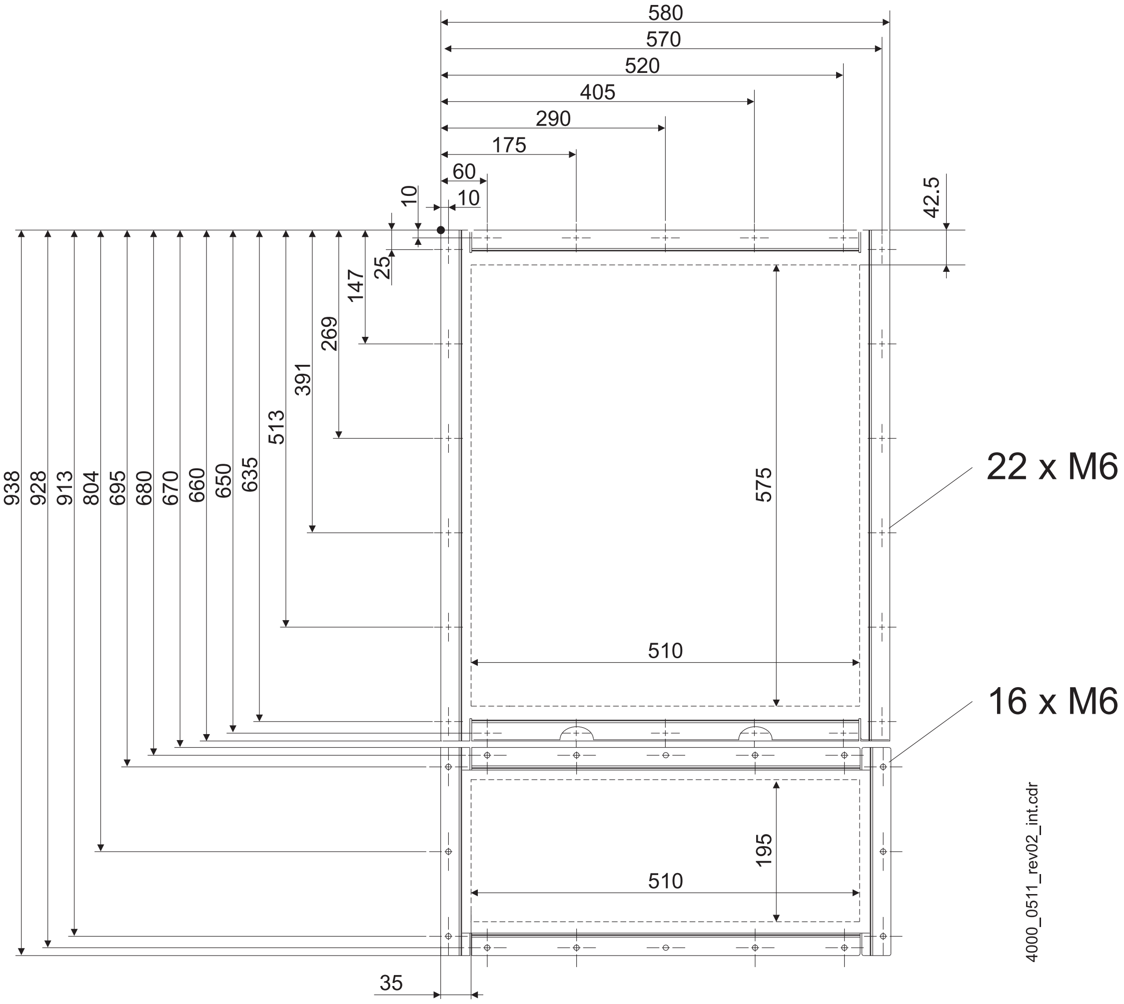


Figure 71: Drilling pattern BM557X-A

6.3 Mounting instructions

There are different kinds of mounting.

Each mounting method is shown in a graphic (refer to ▷Figure 72◁ on page 152 to ▷Figure 75◁ on page 155).

The screws 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 For cold plate devices:

  - Check the surface quality of device’s rear panel/mounting plate, refer to ▷Requirements mounting plate for cold plate◁ on page 158.

4 Mount the device.

5 Subsequently connect the water-cooling unit

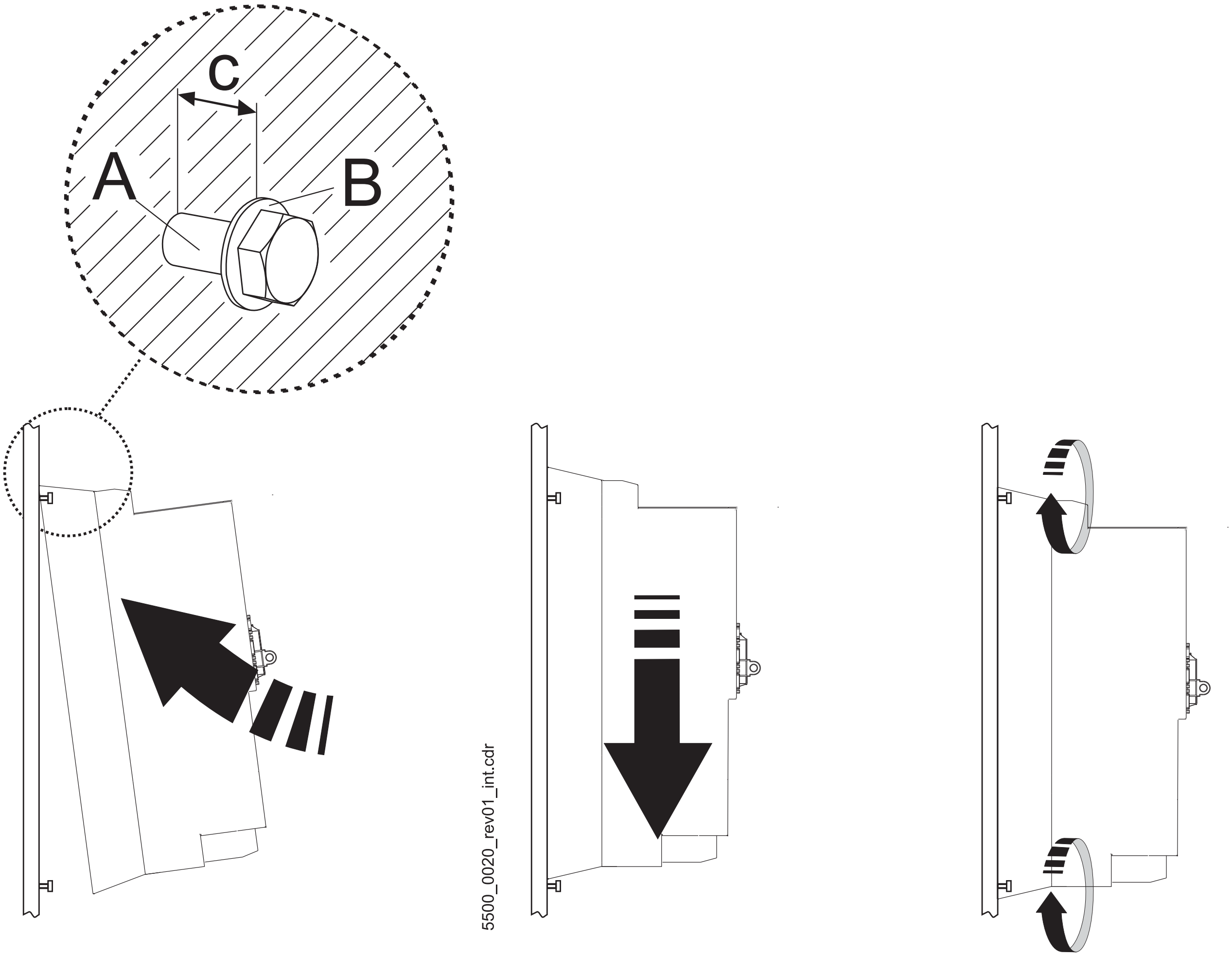


Figure 72: Mounting instruction BM554X-S/Z

Device	**BM552X-S**	**BM553X-S/Z** **BM563X-Z**	**BM554X-S/Z** **BM564X-Z**
A - Screws	4 x M5	4 x M5	4 x M5
B - Washers	4 x (5.3 x 10)	4 x (5.3 x 10)	4 x (5.3x15)
c - Mounting space	c = 5 mm	c = 5 mm	c = 5 mm

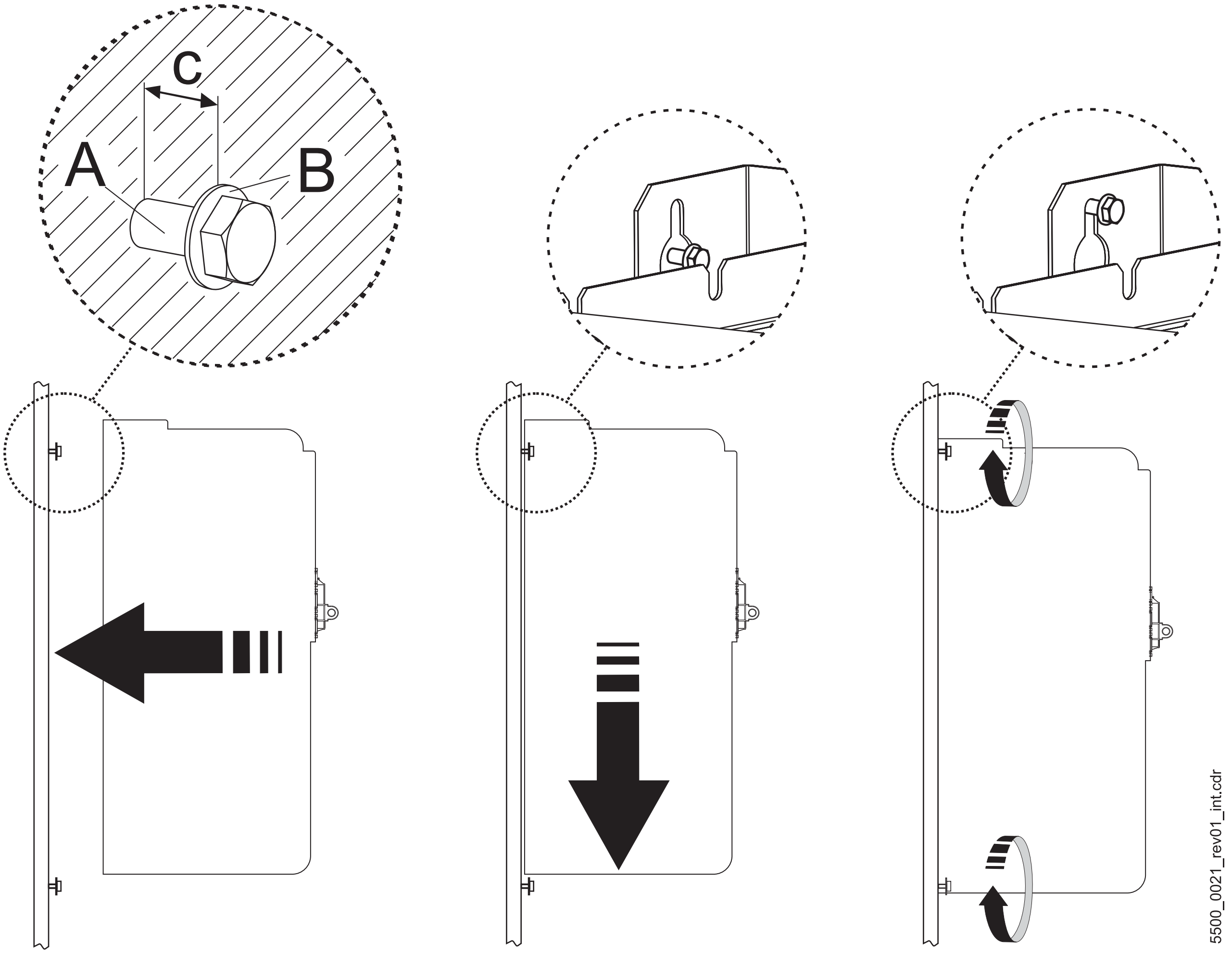


Figure 73: Mounting instruction BM555X-S/Z, BM556X-S/Z

Device	**BM555X-S/Z** **BM565X-Z**	**BM556X-S/Z** **BM566X-Z**
A - Screws	4x M8	4x M8
B - Washers	4x (8.4x21)	4x (8.4x21)
C - Mounting space	c=7 mm	c=7 mm

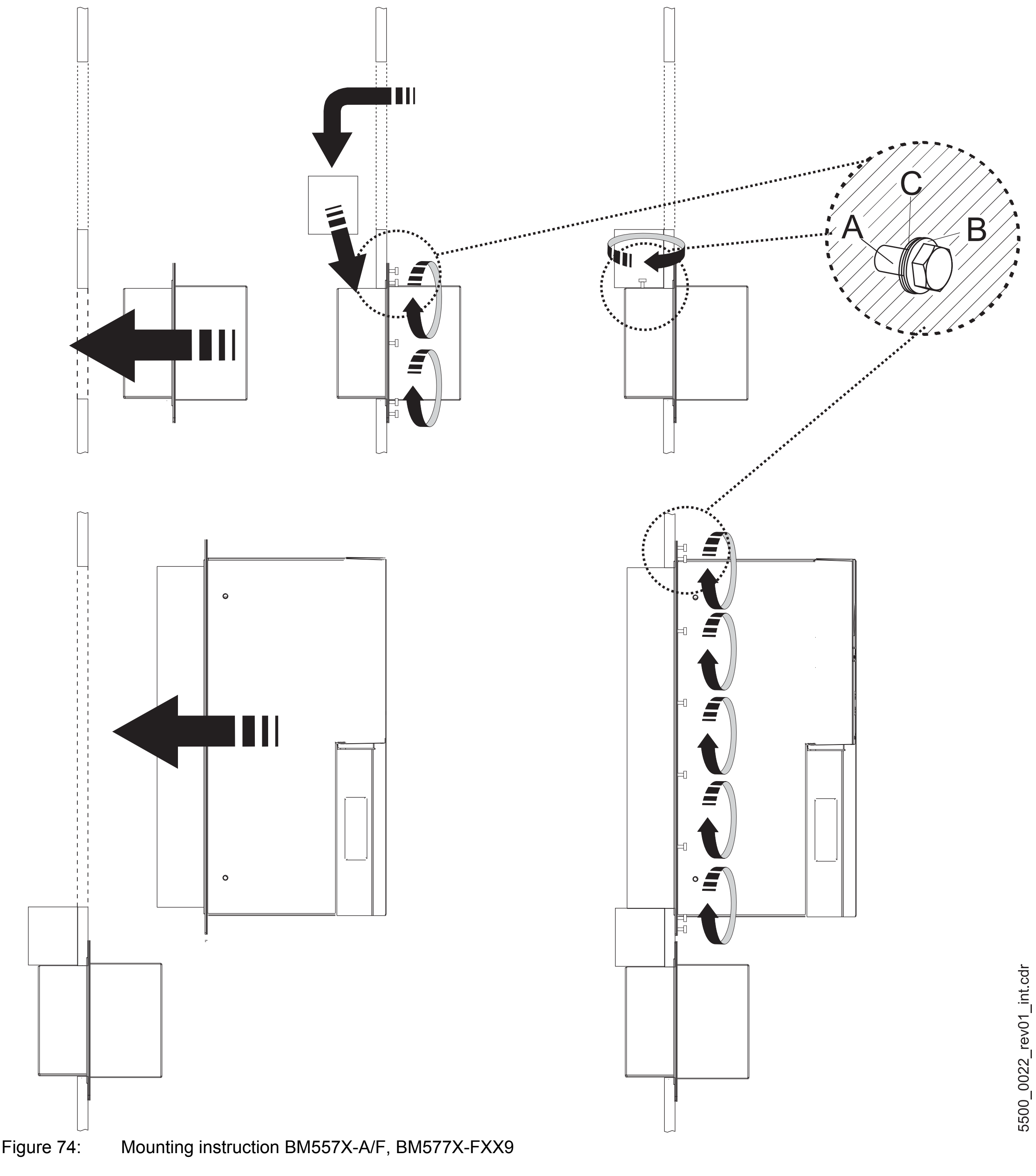


Figure 74: Mounting instruction BM557X-A/F, BM577X-FXX9

Device	**BM557X-A**	**BM557X-F, BM577X-FXX9**
A - Screws	38 x M6	22 x M6
B - Spring washer	38 x DIN6796-6-FST	22 x DIN6796-6-FST
C - Washers	38 x (6.4 x 12.5)	22 x (6.4 x 12.5)

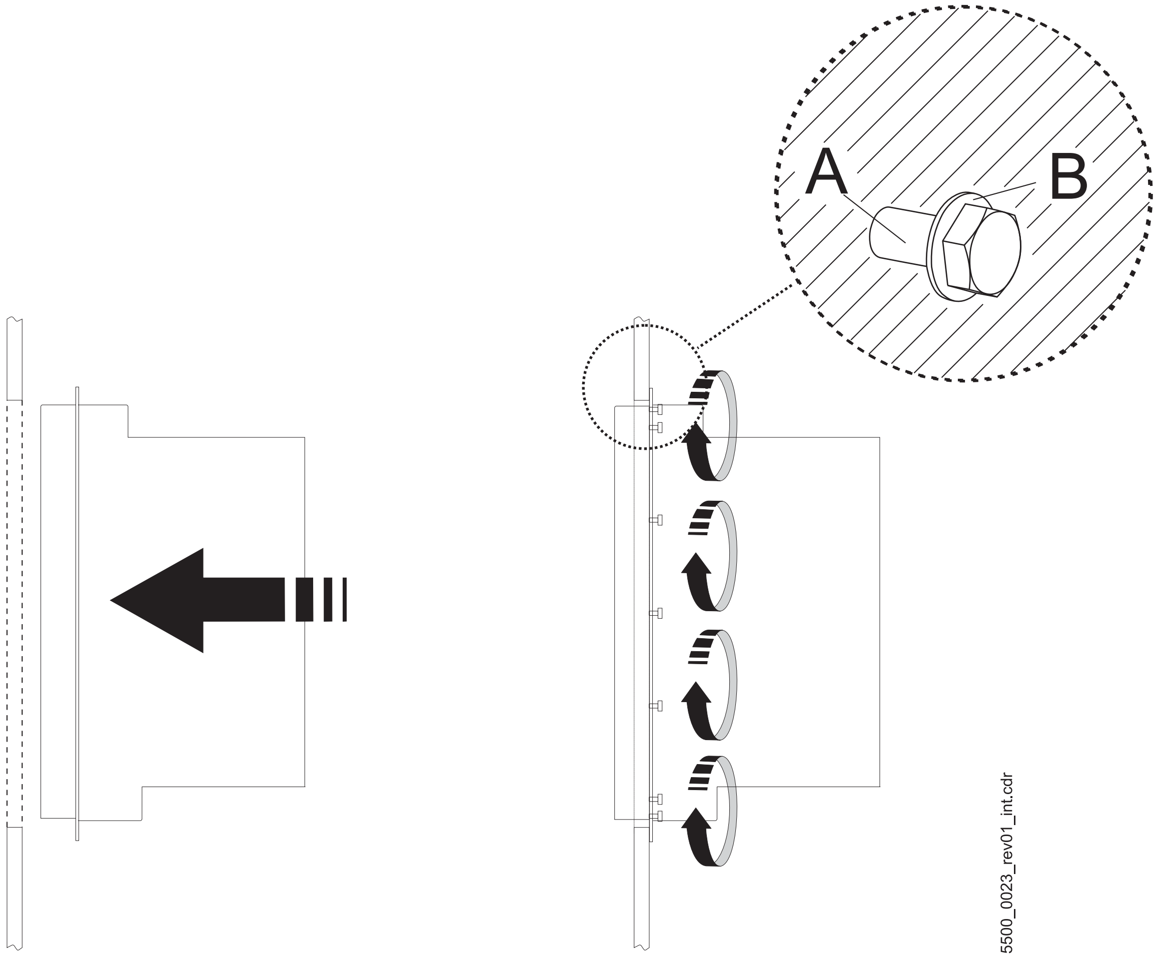


Figure 75: Mounting instruction „diverse“

Device	**BM552X-A/F/Z/C**	**BM553X-A/F/C** **BM563X-F**	**BM554X-A/F** **BM564X-F**	**BM555X-A/F** **BM565X-F**	**BM556X-A/F** **BM566X-F**
A - Screws	4 x M5	14 x M4	16 x M5	16 x M8	20 x M8
B - Washers	4 x (5.3 x 10)	14 x (4.3 x 9)	16 x (5.3 x 15)	16 x (8.4x21)	20 x (8.4x21)

Device	**BM565X-FXX9** **BM575X-FXX9**	**BM566X-FXX9** **BM576X-FXX9**
A - Screws	18x M6	18 x M8
B - Washers	18 x (6.4x17)	18 x (8.4x21)

WARNING!

Danger because of conductive fluid in connection with electricity!

The mounting drills are outside of the gasket. With non-waterproof fastening holes, e. g. the liquid coolant can ingress into the control cabinet.

- Seal the mountings against water. Use, e.g., waterproof draw-in bolts and sealants between screws and bolts.

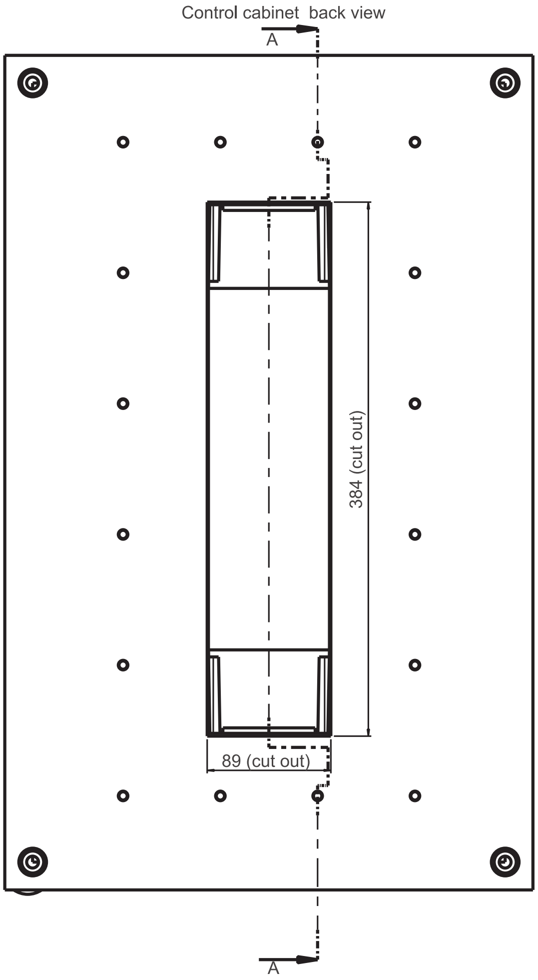
Type of protection: control cabinet with built in through-hole devices BM552X-A/F

NOTE

The following required control cabinet mounting is only valid for control cabinets with protection class IP54 or higher.

☐ IP protection class for air-cooled through-hole devices: IP44

☐ IP protection class for water-cooled through-hole devices: IP54



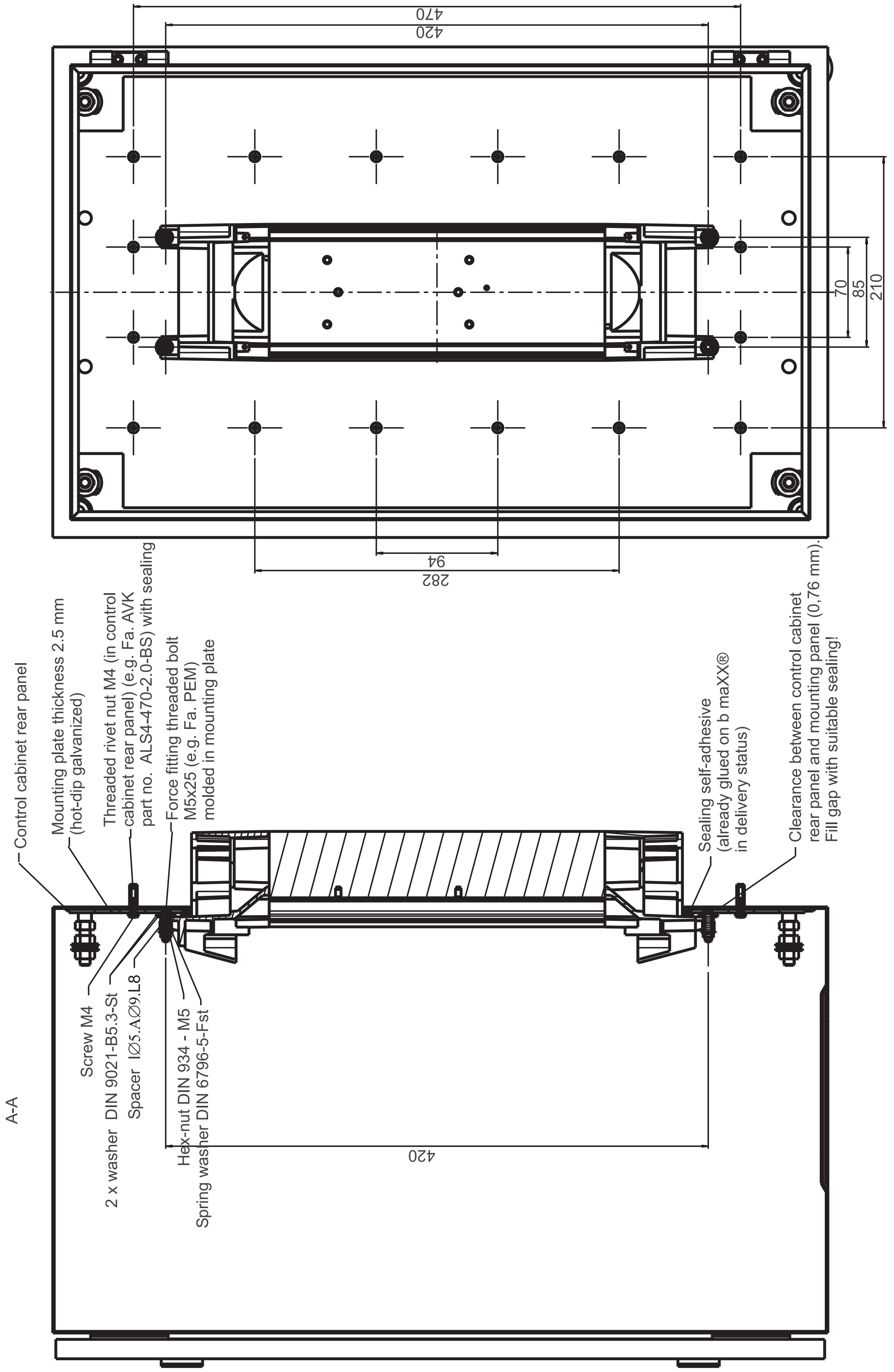


Figure 76: Control cabinet mounting BM552X-A/F

6.3.1 Requirements mounting plate for cold plate

The cooling version cold plate is a particular efficient cooling alternative. The heat dissipation is done via 2 contact surfaces. The first one is the mounting platform within the control cabinet or on the machine base, the other is the cold plate on the device's back. High requirements e.g. to surface roughness and evenness for this surface are specified, to ensure an optimal heat flow. Already a slight damage/pollution of the surface can cause a significant deterioration in heat dissipation to the mounting plate.

For this reason while handle the units protect the sensitive function surface to avoid damage.

Surface flatness (across the entire surface)	0.05 mm
Surface roughness Ra	1.2 µm
Material of the plate (recommendation)	AlMgSi 0.5

NOTICE!

Property damage due to overheating.

Scratches and burrs can inhibit the heat dissipation of cold plate devices.

Therefore

- When mounting cold plate devices, ensure that the surface quality of the mounting plate meets the specifications and ensure that the device's rear panel/mounting plate does not have any scratches or burrs.

6.3.2 Connecting the water cooler

With water cooled devices (BM55XX-F, BM57XX-F and BM55XX-Z, BM57XX-Z) you connect the coolant circulation before electric installation. The water cooler has on its bottom side two pressfitting-transition pieces 15mm x R 1/2 ' AG for flat washers.

➲ Connect the cooling circulation to the water cooler.

Tube material	Outer tube-∅	Screwing
1.4571 X6CrNiMoTi17-12-2	15 mm	1/2' AG for flat washer

In case you refer to UL 508 C: There must be a pressure-relief valve with a threshold pressure of maximum 6 bar in the cooling circulation.

7

INSTALLATION

This chapter describes the electrical installation of the device. The mechanical mounting is described in ▹Mounting◃ from page 141.
Initial commissioning is described in the **Parameter manual b maXX 5000** in chapter Commissioning.

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

1. Check the demands on the electrical power supply.
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 notes

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:

- Occupational training or instruction, and the authorization to commission, ground and mark electrical power circuits and devices in accordance with the standards of the safety engineering.
- Occupational training or instruction, in accordance with the standards of work safety, for the care and use of appropriate safety equipment.

7.1 Safety notes

WARNING!

Danger because of incorrect installation and initial commissioning!

Installation and commissioning require qualified personnel with adequate experience. A installation fault can cause danger situations or large damage of property.

Therefore:

- Only personnel from manufacturer or qualified personnel operate while installation and initial commissioning

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.

Danger from residual energy

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

Discharge time of the system = discharge time of the device with the longest DC link discharge time in the DC link connection.

Refer to ▹Electrical data basic units◃ from page 61.

Therefore:

- Do not touch before taking into account the discharge time of the capacitors and electrically live parts.
- Heed corresponding notes on the equipment.
- If additional capacitors are connected to the DC link, the DC link discharge can take a much longer time. In this case, the necessary waiting period must 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 test

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 Demands on the power supply

For all important data, refer to ▷Requirements to the energy supply / supply system◁ from page 50.

Minor deviations from requirements in the power supply can lead to malfunctioning of the device. If the power supply deviates too much from the requirements, the device can be destroyed.

The devices may only be operated in industrial networks.

The destruction of the device can cause personal injury.

DANGER!

Risk of fatal injury from electrical current!

If the requirements for the power supply are not complied, the device can be damaged or destroyed, thereby greatly endangering individuals.

Therefore:

- Prior to installation, ensure that the demands for power supply have been fulfilled.

NOTE!

Pay attention to connect the basic units without load resistor (BM5XXX-X**T**…/BM5XXX-X**I**…/BM5XXX-X**G**…) to a power supply with **clockwise rotating field**.

Connection to a power supply with clockwise rotating field is **not required** for BM5XXX-X**R**…/BM5XXX-X**S**…/BM5XXX-X**W**… ,.

- **Connection instructions at special power supply systems**

Note: Not valid for **b maXX** power modules.

- ○ Single phase connection (BM551X)

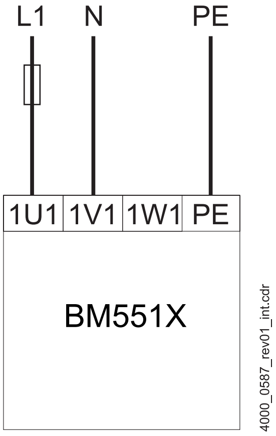


Abbildung 77: Single phase connection BM551X

- ○ Connection to single phase grounded power supply systems (BM552X .. BM5X7X)

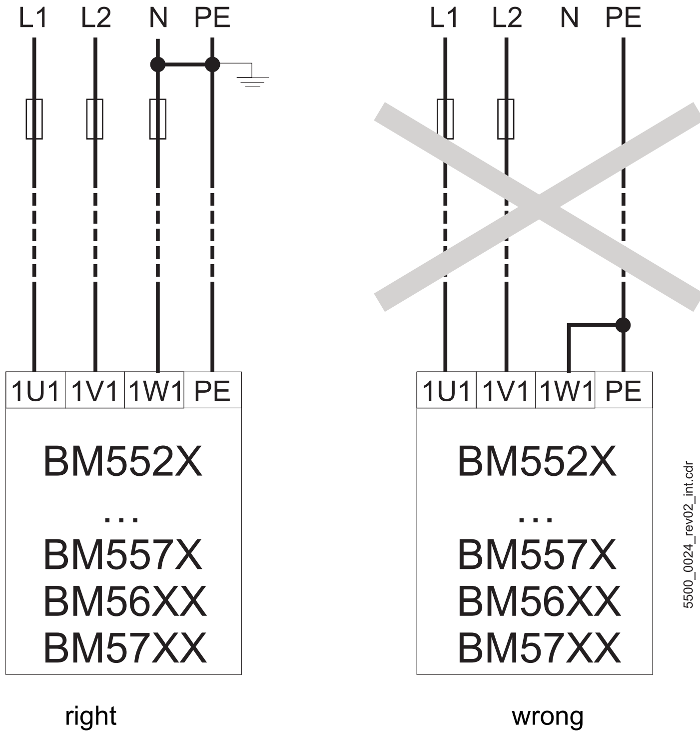


Figure 78: Single phase connection (BM552X ... BM5X7X, basic units)

- Connection to single phase grounded power supply systems with isolated transformer for the following cases
  1) BM552X except for IT power supply systems
  2) BM553X ... BM557X, BM56XX, BM57XX at operating altitude > 2000 m

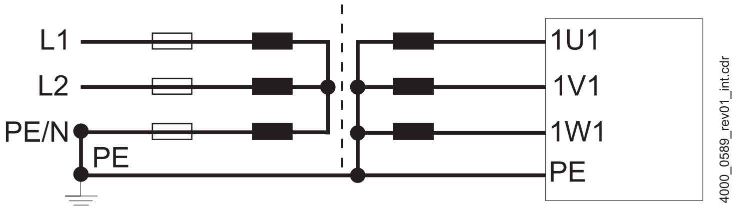


Figure 79: Connection to single phase grounded power supply systems with an isolated transformer

7.4 Requirements to 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 comply with UL 508C.

For further details (e.g. maximum permitted length), refer to ▹Cabling◃ from page 246.

7.5 Protection of the device and the cable

Fuses must be installed to protect this device and the cables against overload and possible damage/destruction through the electrical power supply. For data on the required fuses, refer to ▹Fuses◃ from page 266.

7.6 PE 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 required.

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 permitted on the power supply side of the device.
- 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 system by means of an isolating transformer, for example.

7.7 Installation requirements with regard to EMC

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 handbook. Additional notes on building a CE-compliant system, that are imperative to take heed of, can be found in the Baumüller manual „Mains filter BFN“, 5.09010. This manual 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.

- Only use Baumüller motor cables and Baumüller components.
- Use suitable mains filters recommended by 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 plate as short as possible (< 30 cm), using fine-stranded cables with a large cross section (>10 mm²).
- When installing, be sure to follow the correct sequence:
  power supply system - fuse - filter - choke - (ferrite core) - **BM5500, BM5600, BM5700** - (motor filter) - motor.
- Ensure that the motor cable is continuous, without interruption.
  Do not interrupt motor cables with terminals, contactors or fuses, for example.
- If possible route the cables on the surface of the grounded mounting plate
  (i. e. the least effective antenna height).
- When routing in parallel, minimum clearance of 20 cm should be observed between signal and control cables vis-à-vis the power cables.
- Cables of different EMC categories (e.g. signal cables - mains cables and/or motor cables) should be crossed at a 90 ° angle.
- Contact the major cable shield when laying cables through walls, which separate different EMC areas
- Contact all the cable’s shields on both sides surface-to-surface and also well-conductive with ground.

7.8 Avoid bearing currents

NOTE

The pulsed output voltage of a converter causes additional motor bearing currents.

Bearing currents cause localized melting on ball race and rolling body as well as wear of the lubricant. This leads to a reduced service life of the bearing.

Bearing currents depend on:

- Motor speed
- Switching frequency of the converter
- Grounding

Furthermore the height of the bearing currents depends on:

- The applied bearing voltage
- The dielectric characteristic of the bearing lubrication

Avoid bearing currents

NOTE

The reduction of bearing currents requires the consideration of the **whole speed-variable drive system** and its installation!

Baumüller supports you with on-site measurements and with development and implementation of suitable preventative measures.

Avoiding bearing damage

- Basically the **grounding system** must be installed appropriately to ensure a forced return of the common mode current.
- The cause of bearing current damage, that means the amplitude and slope of the common mode voltage is reduced by using toroidal cores.
  The use of toroidal cores is therefore a **preferred measure**.
- In addition the using of **current-isolated bearings** (standard for AC drives from motor size 180 and higher) can reduce the effects of the common mode voltage.
- The shaft can be grounded (and the bearing currents redirected) by using special grounding rings or grounding brush(es).
- Furthermore modified **motor cables** (for high frequencies, cable shield with low impedance, symmetric cable design) can be used in order to lead the capacitive currents to a large extent back to the converter via the cable shield.

Toroidal cores

NOTE

It is recommended to use toroidal cores in order to reduce/to avoid bearing currents.

Part numbers and the number of recommended toroidal cores, refer to ▷Toroidal cores◁ on page 294 in chapter Accessories and Spare Parts.

- The toroidal cores are made of nanocrystalline material. The toroidal cores cover all three phases of the converter output. The time variable common mode current induces a magnetic field into the toroidal core, which counteracts against the change of the common mode current.
- For this reason the toroidal core operates a current-compensated choke, which limits the rate of change and the amplitude of the common mode voltage and therefore reduces the bearing currents significantly.
- Because of the higher amplitude and frequency of the common mode voltage when using an active mains rectifier unit, there are used toroidal cores with a lower permeability for optimized modulation of the cores (saturation and temperature characteristics).

Installation of toroidal cores

- The three phases **without shielding** and **without PE** must be lead through the cores. The cores must be installed and attached near the motor connection of the **BM5500, BM5600, BM5700 .**
- When using toroidal cores it is further recommended to use current isolated bearings on the nondrive end for synchronous/asynchronous main drives sizes 180 and higher.

Figure 80: Mounting - single ring core

Figure 81: Mounting - several ring cores

7.9 Requirements for the motor temperature sensors

To protect the motor against not permitted overheating, a motor temperature sensor can be connected to the **b maXX** device. The device switches off of the motor when a settable threshold temperature has been exceeded.

Type	Additional requirements:	Isolation
KTY84/PT1000	-	SELV/PELV
MSKL [1] (PTC)	$R = 1\ k\Omega$ at $T_{threshold}$, $I_{max} < 2$ mA	SELV/PELV

[1] Motor protection resistor (PTC) as per DIN 44080-082

NOTE!

The motor temperature sensor should be installed in such a manner that „safe electrical separation“ is ensured. The motor temperature sensors integrated into Baumüller motors meet these requirements. If third-party motors are connected, the proprietor must ensure that the temperature sensors used in the motor of a third-party manufacturer motor comply with the „safe electrical separation“ function.

7.10 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. power supply cables) and the mounting areas are de-energized for the entire duration of mounting the device.

NOTE!

Steps which are not necessary for the installation of **b maXX power modules** are marked.

- Lay all cables EMC-compatible.
- Connect cables (refer to ▹Wiring diagrams◃ from page 170).
  (Observe the torques!)
- For all connections, attentions is to be paid to strain relief

The following steps must be carried out at installation:

1 Connect the motor through terminals 1U2, 1V2, 1W2 and PE.
Ensure the proper phases when connecting (rotational direction).
Use toroidal cores if necessary, refer to ▹Avoid bearing currents◃ from page 165.
Observe the permitted torques!

2 Connect fuses (S1) - **not necessary for power modules**
(in case you consider UL 508 C: use the UL-listed semiconductor- or total-range-fuses in chapter ▹Fuses◃ from page 266).

3 Connect mains filter (L2) - **not necessary for power modules**.

4 Connect the power choke (L1) at the mains filter output
- **not necessary for BM551X, BM5523, BM5524, BM5525**
- **not necessary for** BM5XXX-X**R**.../BM5XXX-X**S**.../BM5XXX-X**W**...
- **not necessary for power modules**

NOTE!

Pay attention to connect the power supply with **clockwise rotating field.**

Connection to a power supply with clockwise rotating field is **not required** for BM5XXX-X**R**.../BM5XXX-X**S**.../BM5XXX-X**W**... ,.

Connect the power modules with the DC link.

Connect devices **BM551X, BM5523, BM5524, BM5525** and BM5XXX-X**R**.../BM5XXX-X**S**.../BM5XXX-X**W**... with the mains filter.

5 Connect the device via the power supply terminals 1U1, 1V1 and 1W1 to the power choke output - **not necessary for power modules**.

6 Connect the protective conductor to the terminal PE (a fixed ground conductor connection is mandatorily specified).

7 Connect 24 V power supply:
Terminals X100-1/2, X100-5/6
(if UL 508C is being considered, then limit the current to 4 A).

8 Connect encoder (refer to ▹Controller terminals◃ from page 193)

NOTE!

Plugging in and pulling out encoder cables while they are energized is prohibited, and could lead to their destruction.
Therefore, always first switch off the 24 V supply voltage and lock the encoder connectors when operating.

9 Connect the temperature sensor of the motor. (Observe the proper polarity!)

10 Connect the signal generator for the pulse enable:
via terminals X2 -20 (IF1), X2 -12 (M24V)

11 Connect the signal generator for the quick stop:
via terminals X2 -13 (SH1), X2 -12 (M24V)

12 Depends on the application - **not necessary for power modules** - connect a brake resistor (R_B) via terminals Ba+, Ba-.

13 Connect the motor brake (option):
Terminals X101-1/2 and X101-3/4
Assignment pre-assembled Baumüller cable see motor documentation.

7.11 Wiring diagrams

The connection diagrams are separated in connection diagrams for the electrical mains, motor etc., ▹Page 183◃ and the controller connections ▹Page 193◃.

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+.

7.11.1 Connection diagrams without controller connections

7.11.1.1 BM55XX, BM56XX, BM57XX (basic units)

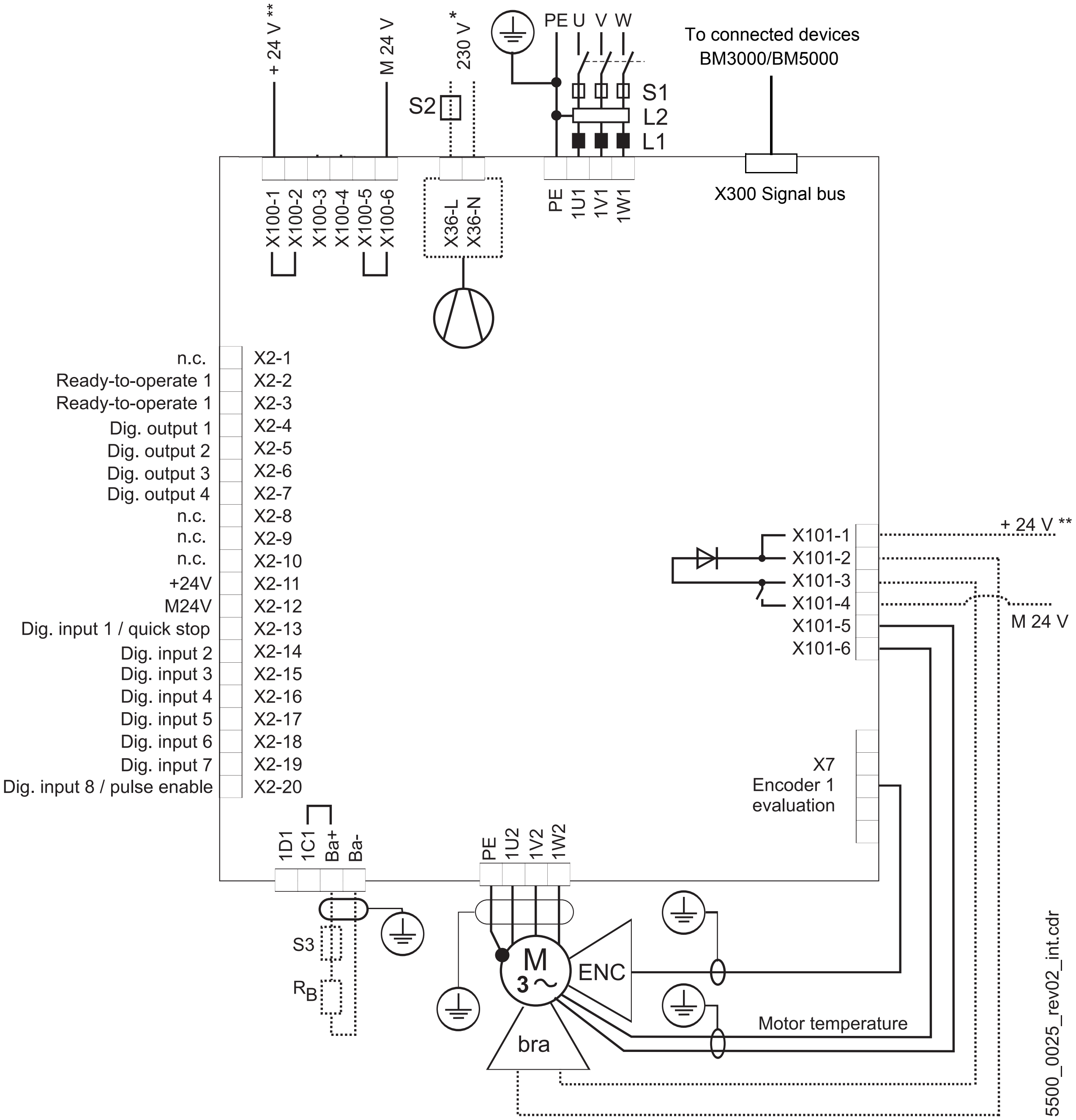


Figure 82: Connection diagram with a directly controlled motor brake - basic units

HINWEIS!

If the motor brake is connected directly via X101-2 and X101-3 (refer to ▷Figure 82◁ on page 171), the shown direct installation is allowed only. It is not allowed within a multi-axis installation e.g. to connect the plus and ground connections of all motor brakes with each other.

An additional relay with varistor protection circuit is necessary if the voltage of the brake is ≠24V, or if the current of the brake is greater than the switching capacity of X101 (refer to ▷X101 (SELV/PELV)◁ on page 192) or if you consider UL508C and the current of the brake is greater 4 A.
Perhaps consider a limited operating voltage range of the brake because of the internal voltage drop up to max. 2.6 V.

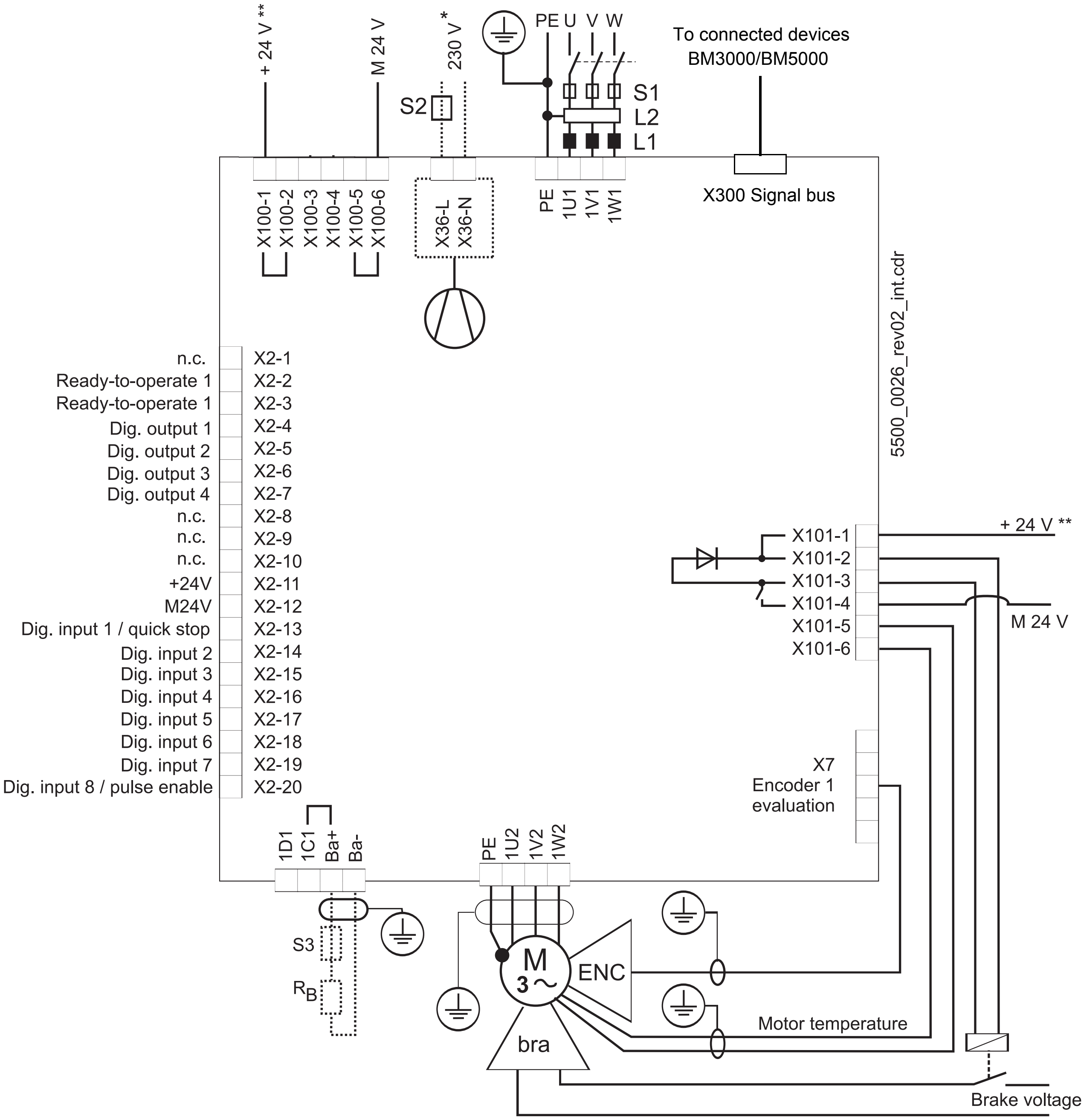


Figure 83: Connection diagram with motor brake controlled via an add. relay - basic units

7.11.1.2 BM55XX, BM56XX, BM57XX power module

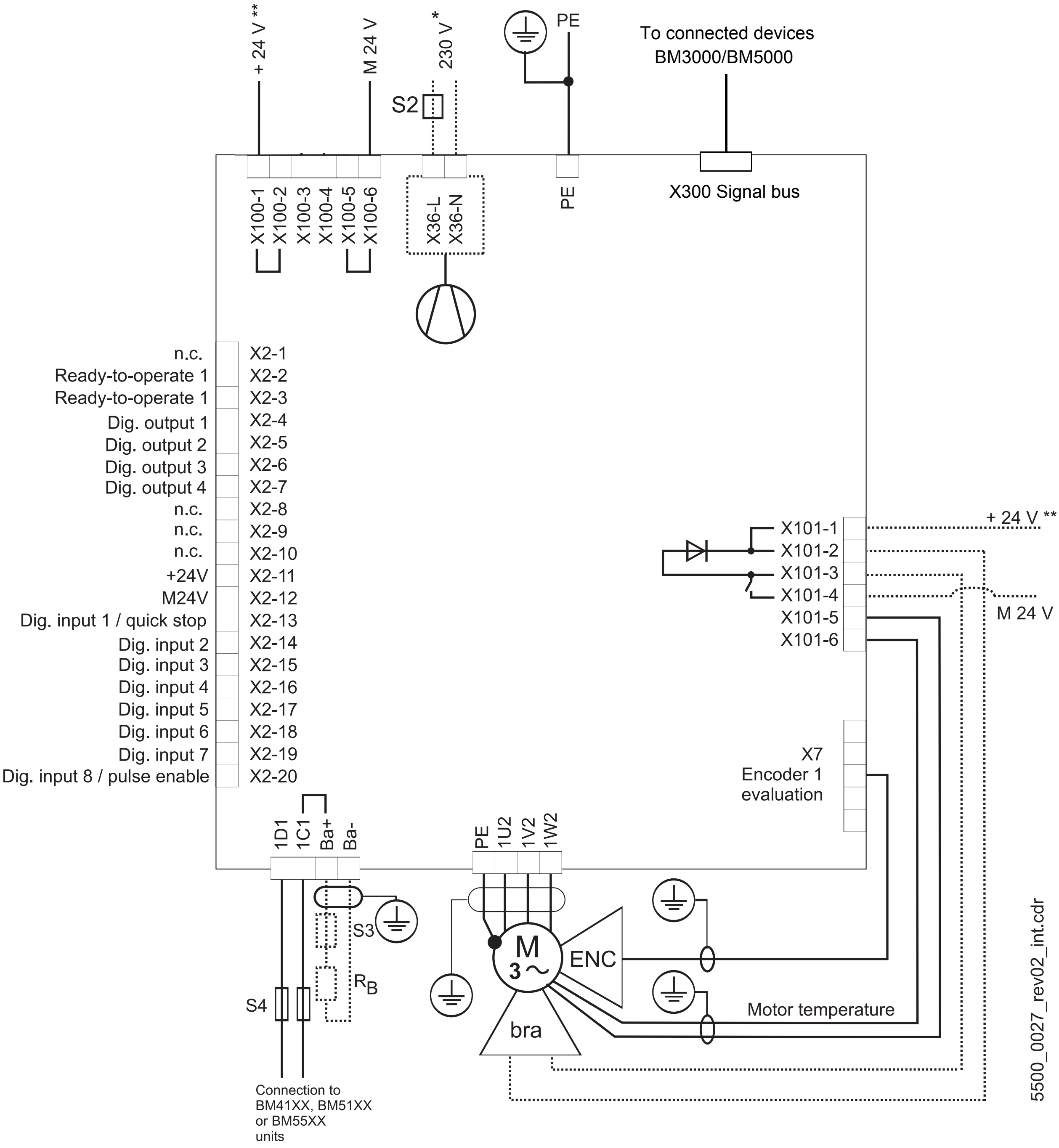


Figure 84: Connection diagram with a directly controlled motor brake - power modules

NOTE

If the motor brake is connected directly via X101-2 and X101-3 (refer to ▹Figure 82◃ on page 171) the shown direct installation is allowed only. It is not allowed within a multi-axis installation e.g. to connect the plus and ground connections of all motor brakes with each other.

An additional relay with varistor protection circuit is necessary if the voltage of the brake is ≠24V, or if the current of the brake is greater than the switching capacity of X101 (refer to ▹X101 (SELV/PELV)◃ on page 192) or if you consider UL508C and the current of the brake is greater 4 A.
Perhaps consider a limited operating voltage range of the brake because of the internal voltage drop up to max. 2.6 V.

7.11 Wiring diagrams

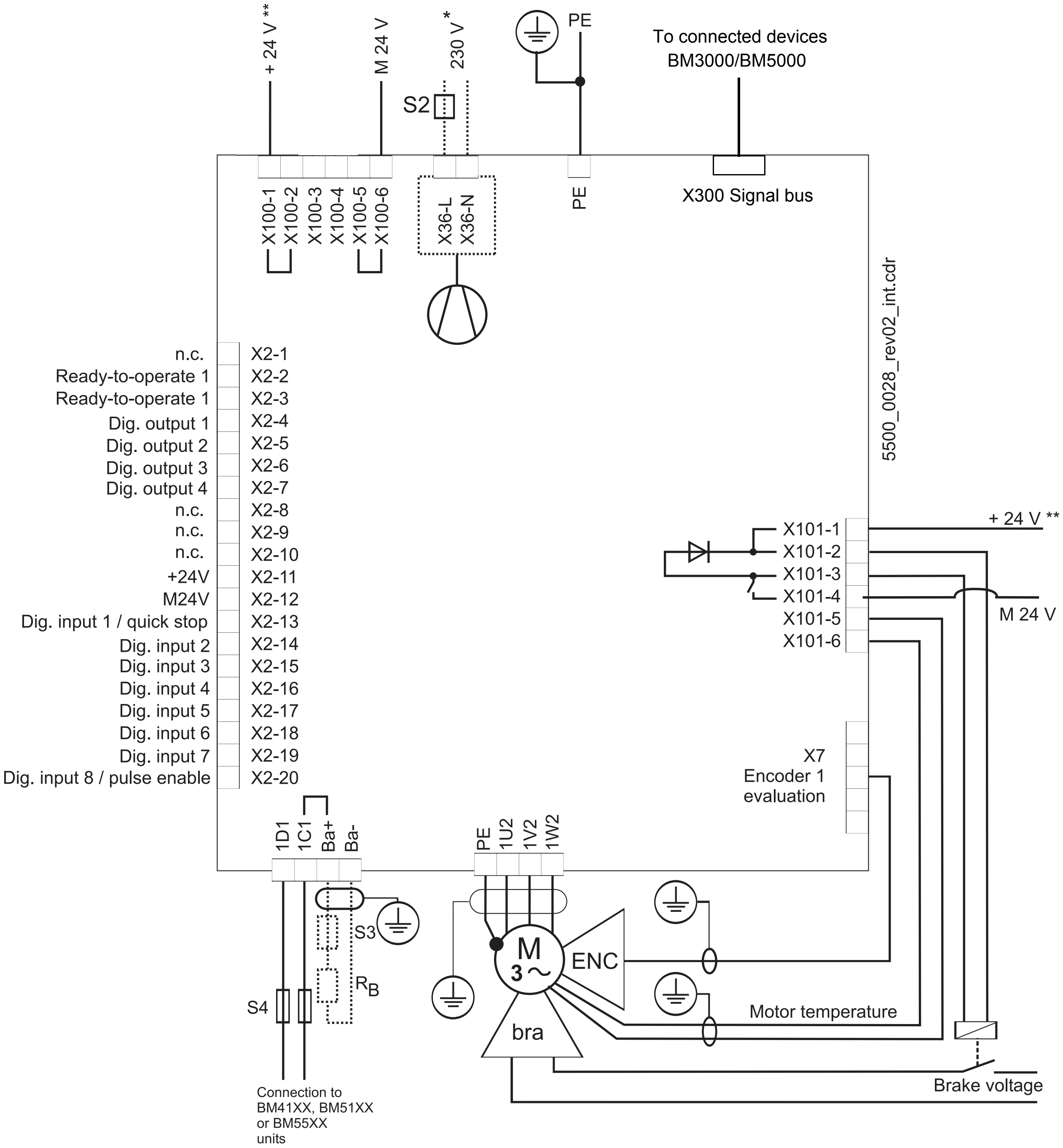


Figure 85: Connection diagram with motor brake controlled via an additional relay - power modules

7.11.1.3 Connection of several devices to the DC link without using the signal bus

There are the following possibilities to connect devices.

Via X300 signal bus

Do **not** connect power supply bus X100:3 and brake resistor bus X100:4!

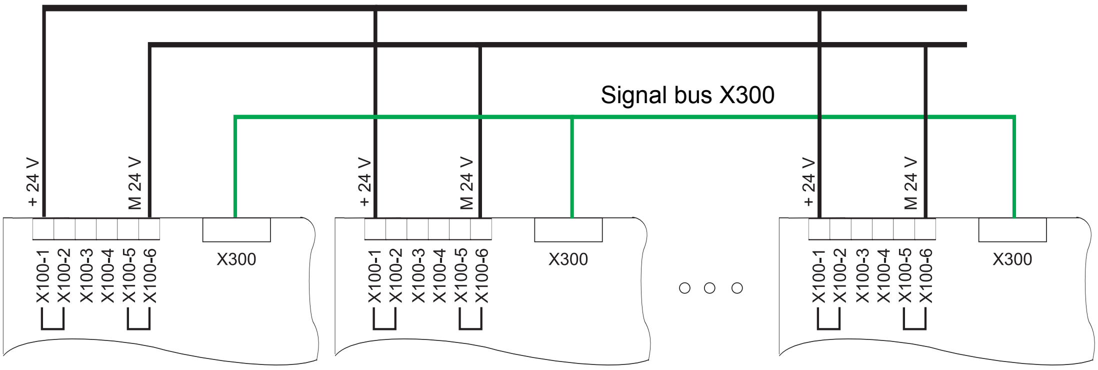


Figure 86: Connection of several devices BM5500 via signal bus

Via X100 power supply bus/ brake resistor bus

Do **not** connect signal bus!

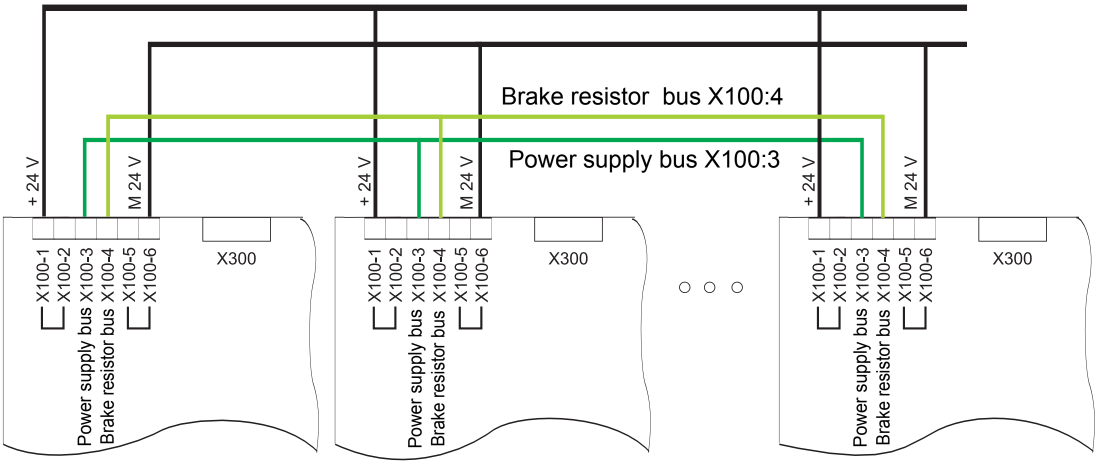


Figure 87: Connection of several devices BM5500 without signal bus

NOTICE!

It is forbidden to connect **both** the signal bus X300 **and** the power supply bus/brake resistor bus X100:3/X100:4. This leads to damage of the devices!

* Is only valid for BM554X, BM555X, BM556X, accordingly the cooling versions S and A, for BM557X cooling version -A:

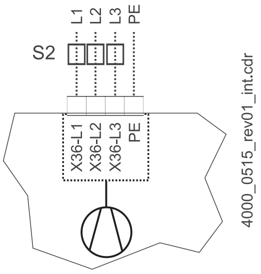


Figure 88: Connection fan BM557X-A

**	The power supply at X100 or X101 must externally be protected. At selection of the fuse you must consider the cross-section of the connecting cable and the maximum allowable load capacity (for X100: refer to X100 on ▹Page 192◃, for X101: refer to X101 on ▹Page 192◃). In case you consider UL 508 C, you must limit the power supply to 100 W or fuse it with a UL-listed 4 A fuse.
Ba- ... 1D1	Connections for brake resistor and DC link, refer to ▹Figure 92◃ on page 183 and the following
R_B	Brake resistor
PE....1W1	Power supply connection, refer to ▹Figure 92◃ on page 183 and the following
S1	Fuse (cable + device), refer to ▹Fuses◃ from page 266
S2	Fuse (fan) *)
S3	Fuses brake resistor circuit (required for BM557X, BM577X), refer to ▹Fuses BM557X◃ on page 282.
S4	Fuses DC link
L1	Power choke (not necessary for BM551X, BM5523; BM5524, BM5525 and BM5XXX-X**R**…/BM5XXX-X**S**…/BM5XXX-X**W**…)
L2	Mains filter
X2	Connections for ready-for-use, quick stop, pulse enable, refer to ▹Figure 97◃ on page 193.
X7/ENC	Encoder
X36	Connections for fans (only BM554X-S/-A, BM555X-S/-A, BM556X-S/-A, BM557X-A)
X100	Connections for 24 V power supply, additional data refer to ▹Terminal overviews◃ from page 179 and table ▹X100 (SELV/PELV)◃ on page 192.
X101	Terminals for brake, motor temperature, refer to ▹Figure 92◃ on page 183 and the following (SELV/PELV) and table X101 from ▹Page 178◃.
X300	Signal bus, connection to further devices, connected to the DC link, connection of further devices without signal bus, refer to ▹Page 177◃.
BRA	Brake
PE....1W2	Connections for motor, refer to ▹Figure 92◃ on page 183 and the following.

7.11.2 Terminal overviews

▷Figure 92◁ on page 183 and the following show the connections for protective conductors, power supply, motor, brake resistor, DC-link and motor temperature sensor (X101). ▷Connections controller◁ from page 193 shows the control voltage and the connections of the controller unit.

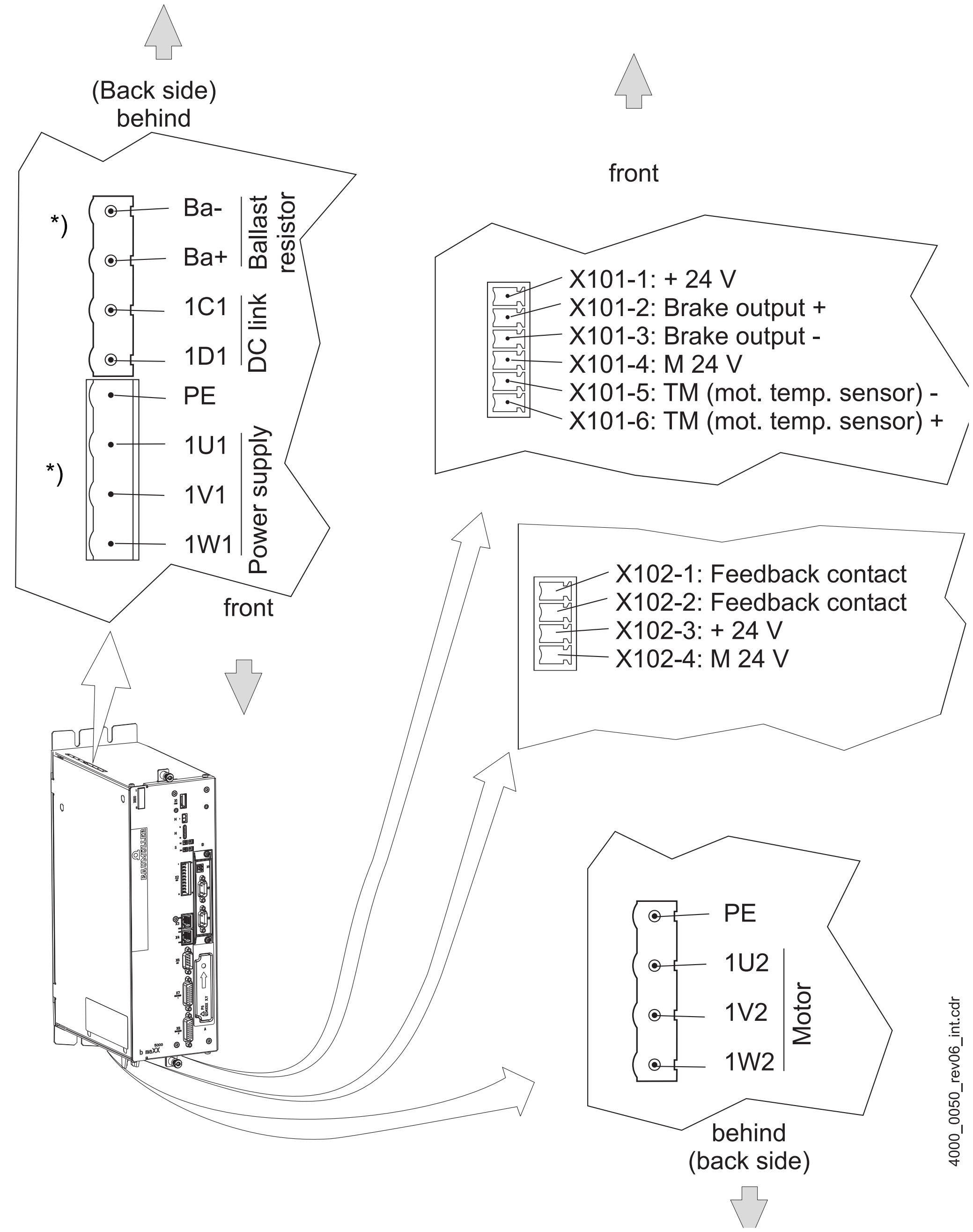
NOTE!

The use of the ballast switch is not possible in combination with a disabled safety relay of a BM551X or BM552X.

NOTE!

The characterization 1C1 and 1D1 is from the standard DIN EN 60445.
1C1 is the connection to the positive DC link cable/current bar and was labeled with ZK+ by Baumüller in the past.
1D1 is the connection to the negative DC link cable/current bar and was labeled with ZK- by Baumüller in the past.

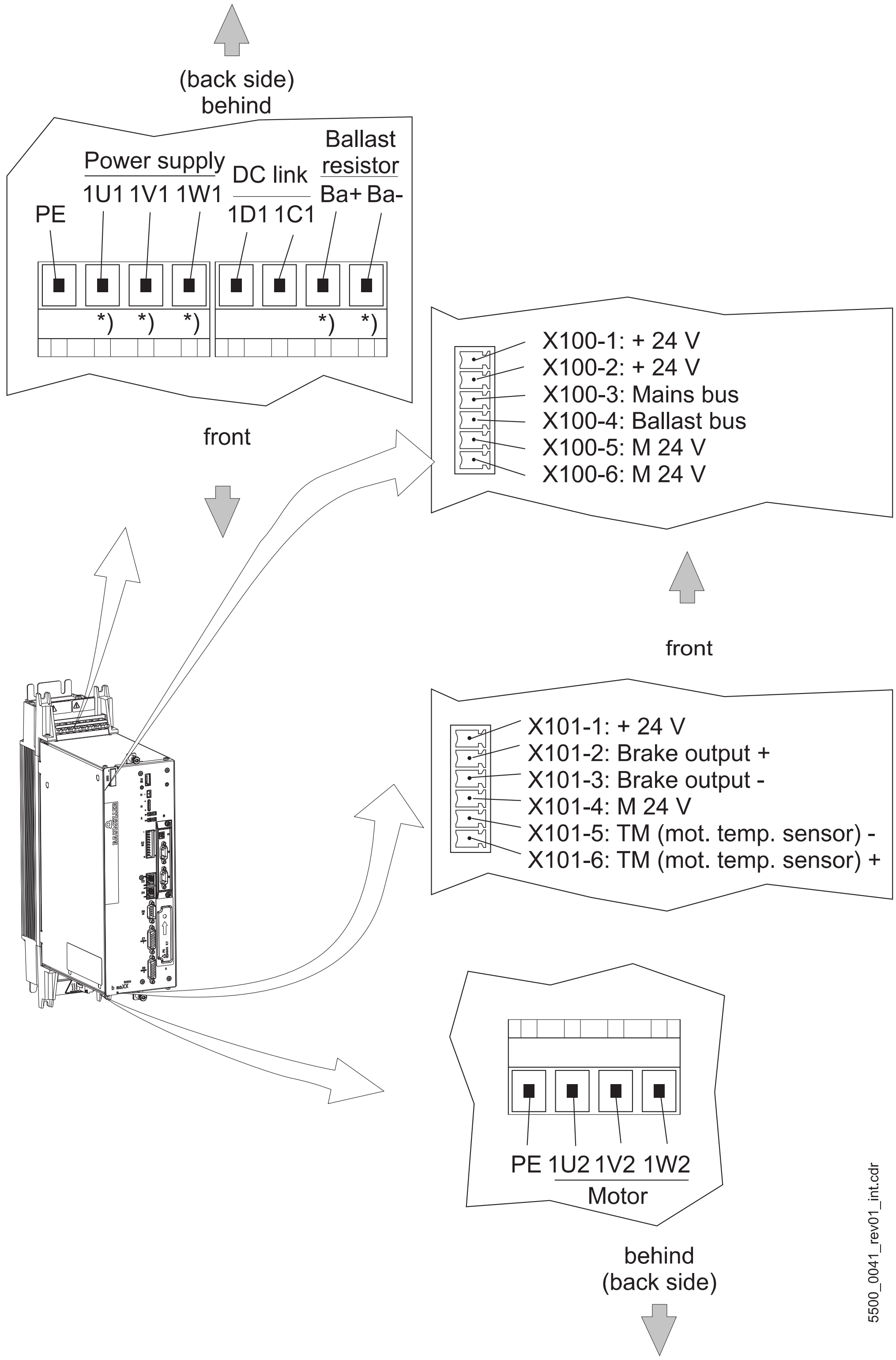
7.11.2.1 Terminals BM551X



*) Do not apply terminals when using a power module!

Figure 89: Electrical connections for power supply, motor, ... for BM551X

7.11.2.2 Terminals BM552X

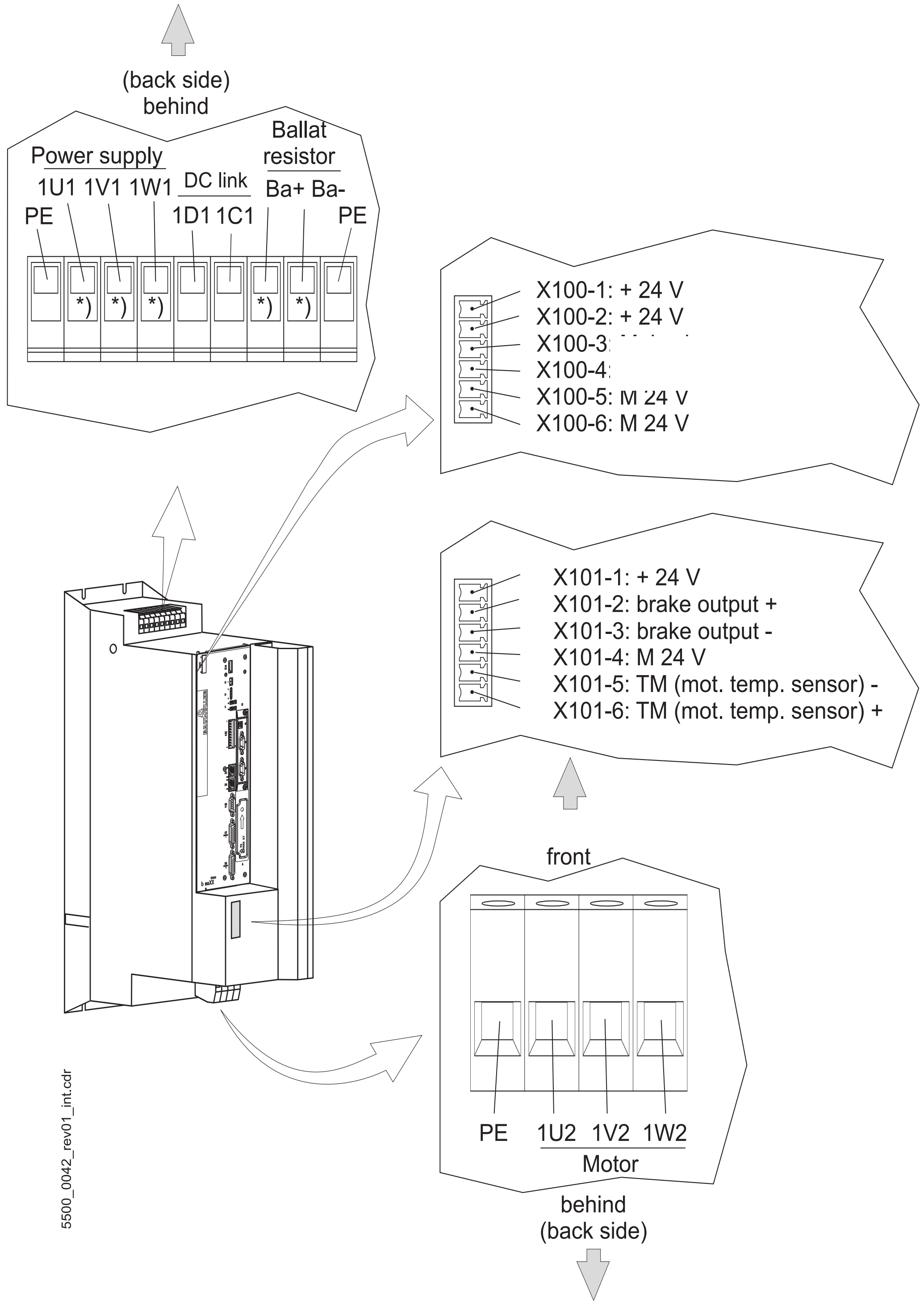


5500_0041_rev01_int.cdr

*) Do not apply terminals when using a power module!

Figure 90: Electrical connections for power supply, motor, ... for BM552X

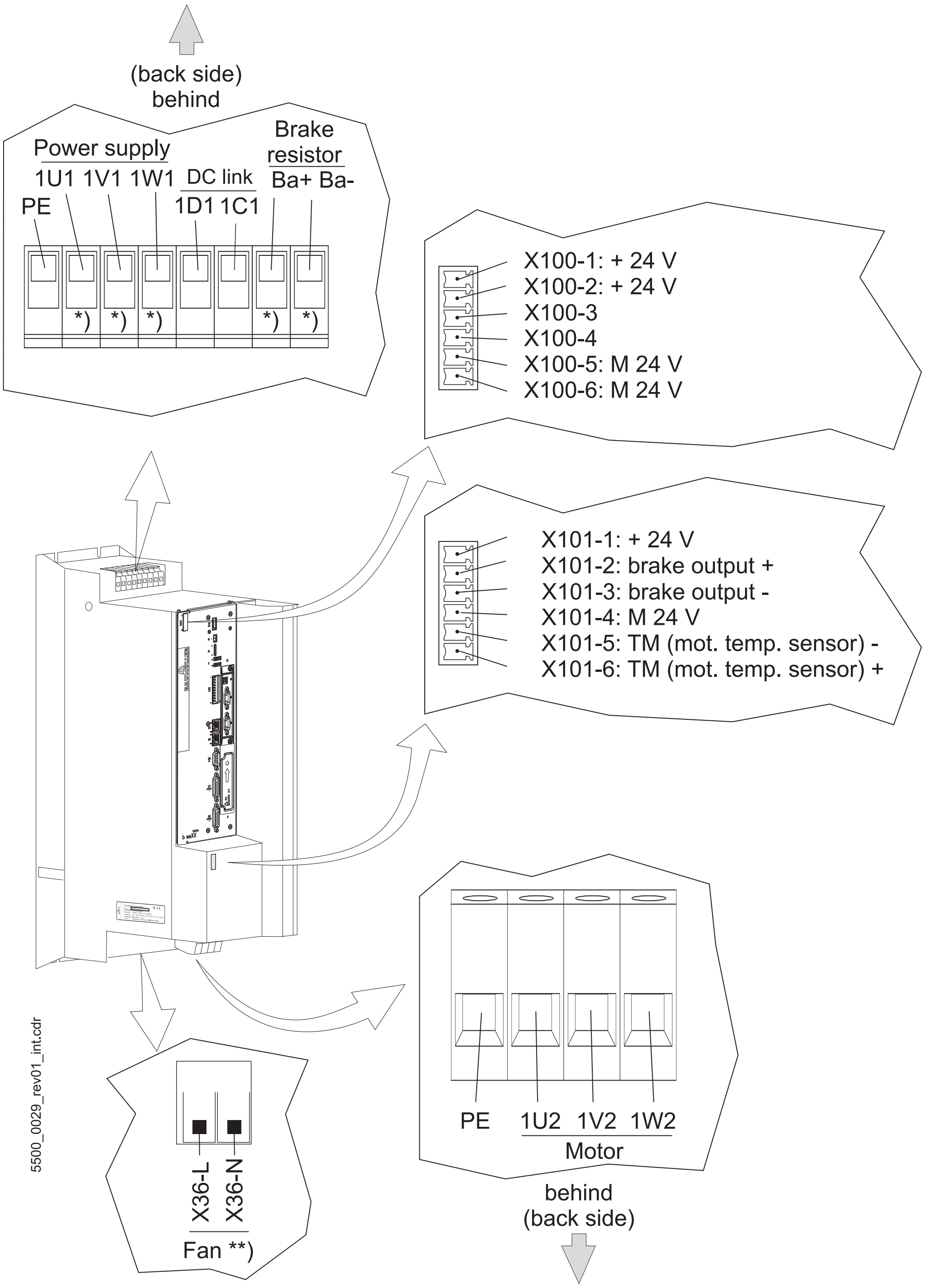
7.11.2.3 Terminals BM553X, BM563X



*) Do not apply terminals when using a power module!

Figure 91: Electrical connections for power supply, motor, ... for BM5X3X

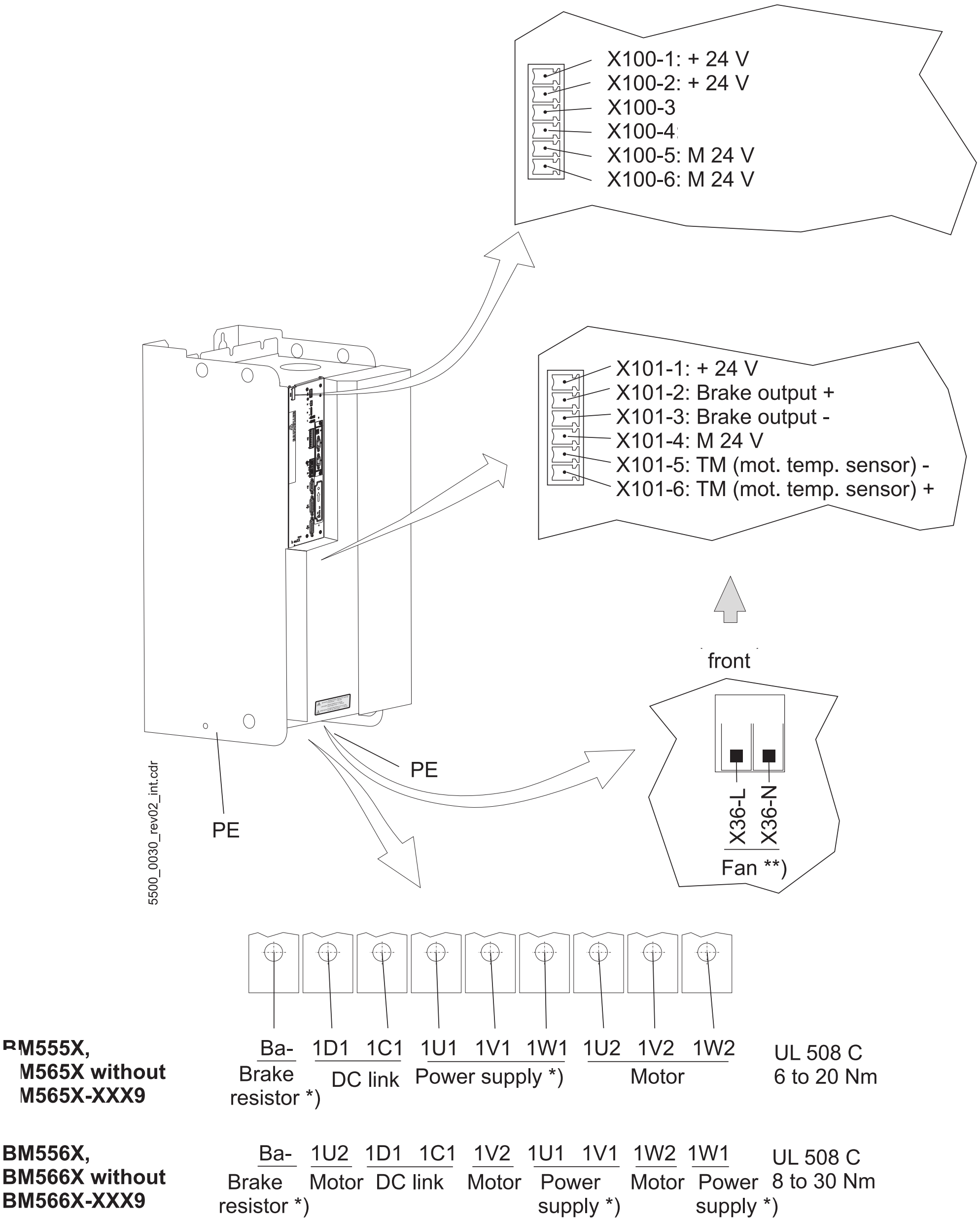
7.11.2.4 Terminals BM554X, BM564X



*) Do not apply terminals when using a power module!
**) only BM554X-S/-A

Figure 92: Electrical connections for power supply, motor, ... for BM5X4X

7.11.2.5 Terminals BM555X, BM556X, BM565X, BM566X



*) Do not apply terminals when using a power module!

**) Only BM555X-S/-A and BM556X-S/-A

Figure 93: Electrical connections for power supply, motor, ... for BM5X5X, BM5X6X

NOTE!

The brake resistor is connected at BM5X5X and BM5X6X between Ba- and 1C1.

Also refer to ▹Figure 82◃ on page 171.

7.11.2.6 Terminals BM566X, BM576X

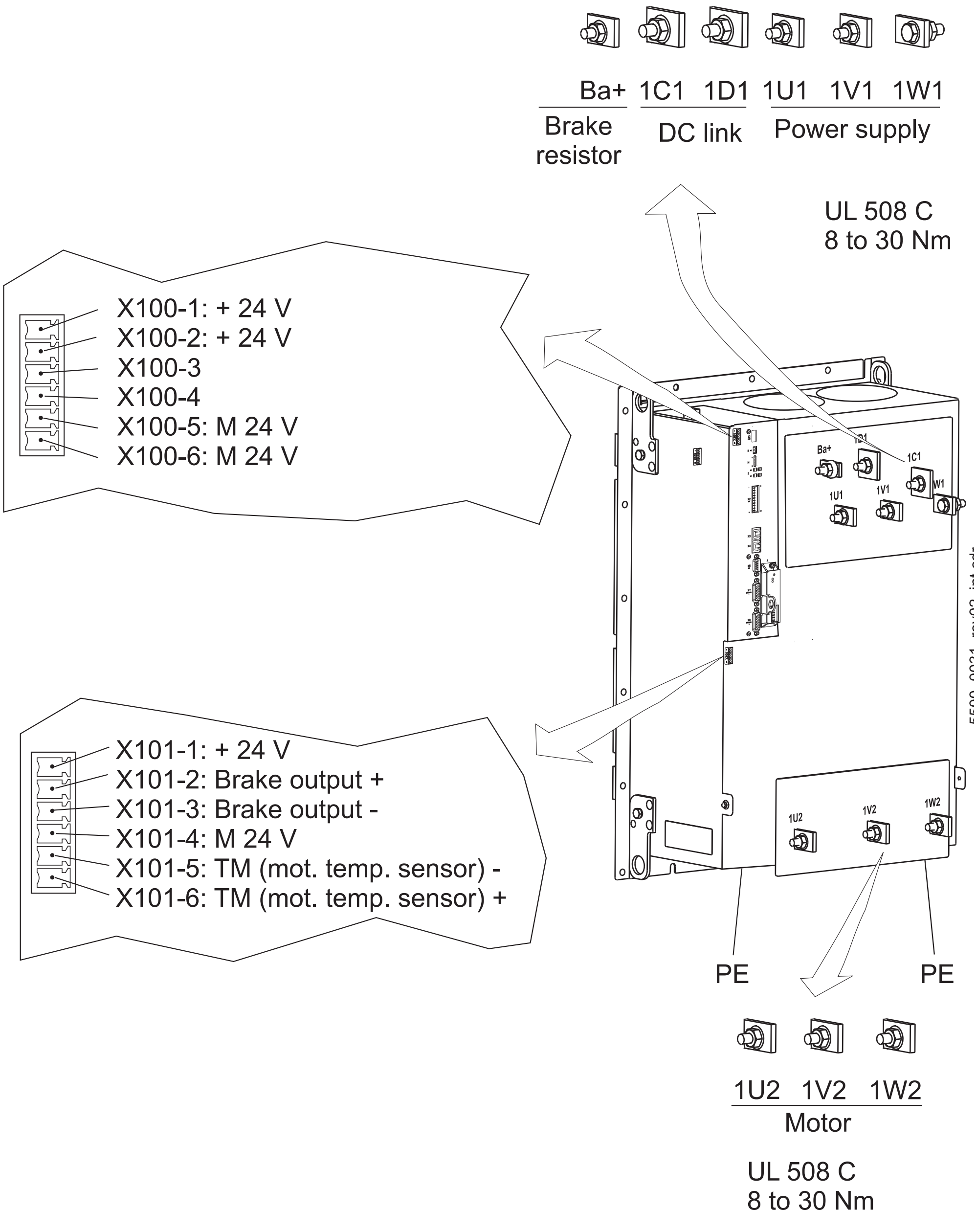


Figure 94: Electrical connections for power supply, motor, ... for BM5X6X

7.11.2.7 Terminals BM5755

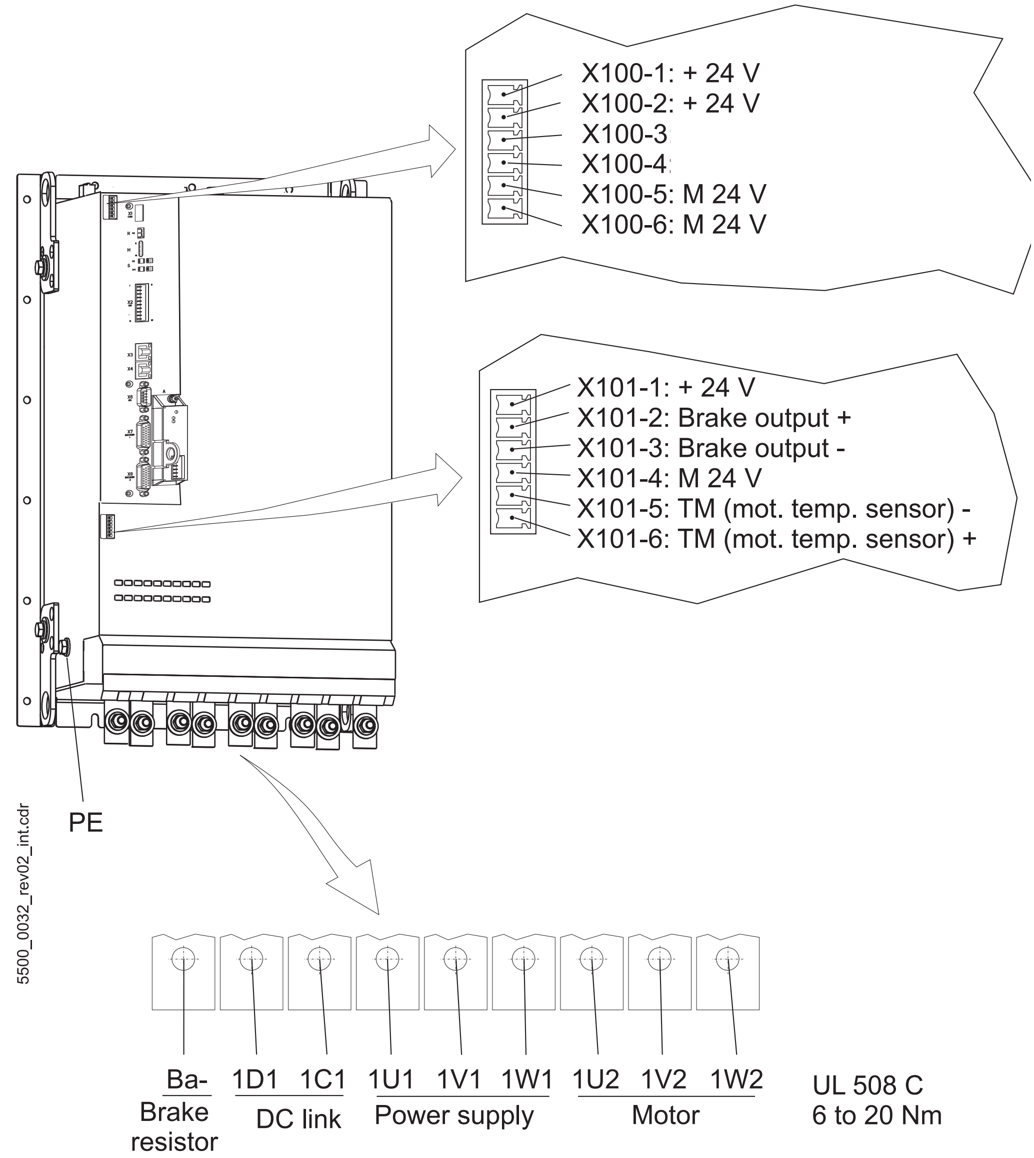
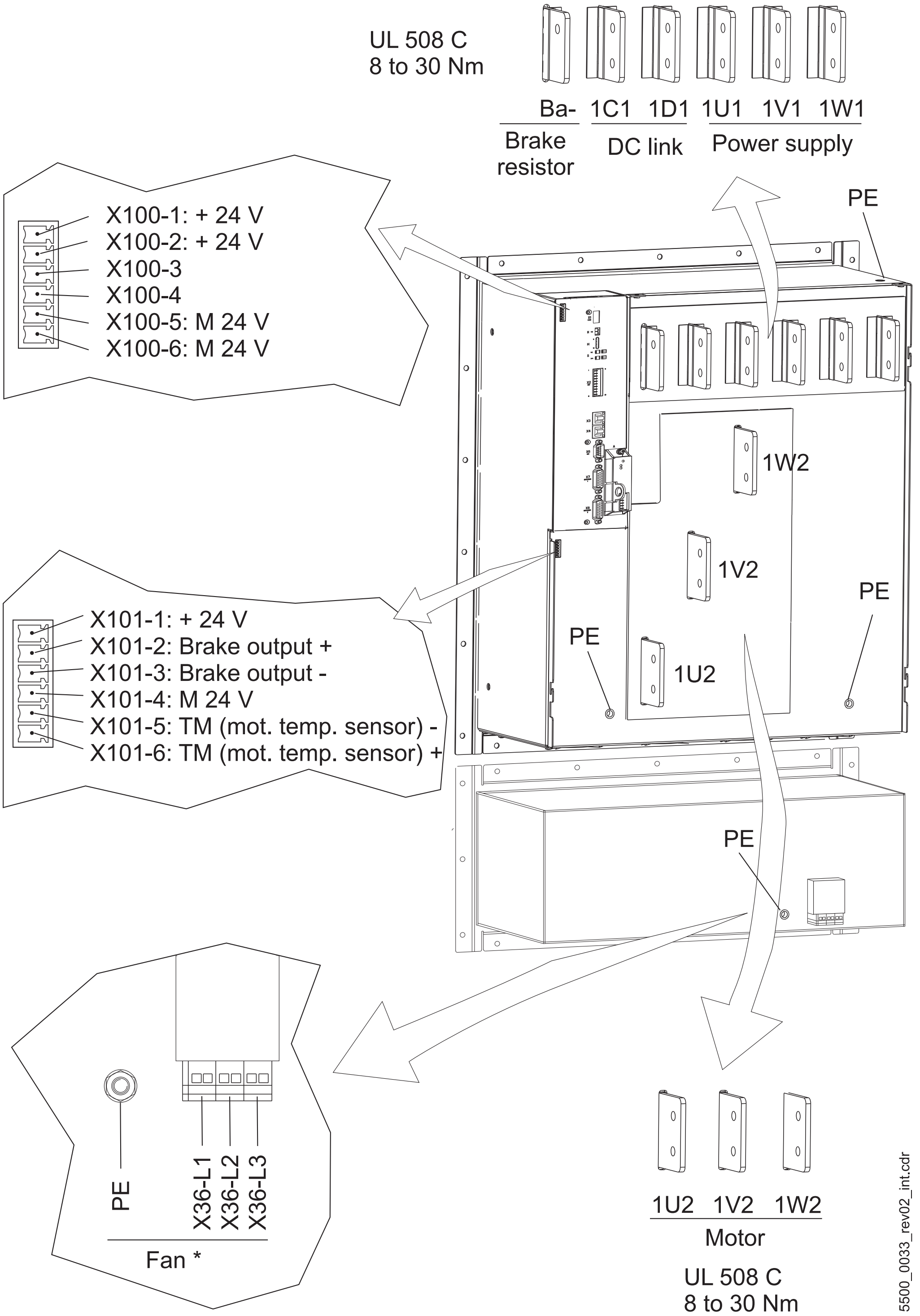


Figure 95: Electrical connections for power supply, motor, .. for BM5755

7.11.2.8 Terminals BM557X, BM5773



*) Only BM557X-A

Figure 96: Electrical connections for power supply, motor, .. for BM557X and BM5773

NOTE!

The brake resistor is connected at the devices BM557X, BM577X between Ba- and 1C1. Also refer to ▷Figure 82◁ on page 171.

DANGER!

Risk of fatal injury from electrical current!

Therefore:

After attaching all power cables to the device BM557X and BM577X, screw on the cover careful to all screwing points by using the enclosed screws (6xM4x12) and washers. The cover only must be able to be removed from the device with use of tools.

The use of semiconductor fuses is obligatory at the power supply connection of BM557X, BM577X devices. Semiconductor fuses are required in the brake resistor circuit except the user assures the short-circuit protection of resistor and cable.

7.11.3 Electrical connection power unit

Power system
1U1, 1V1, 1W1, PE

not valid for power modules

	Max. cross-section of connection	Connection technology	Torque	Load capacity
BM551X	2.5 mm^2	Terminal block	-	Refer to ▷Fuses◁ from page 266
BM552X	4.0 mm^2	Screw terminal	Min. 0.5 Nm Max. 0.6 Nm	
BM553X BM563X	25 mm^2	Screw terminal	Min. 2 Nm Max. 2.3 Nm	
BM554X BM564X	50 mm^2	Screw terminal	Min. 6 Nm Max. 8 Nm	
BM555X BM565X BM575X	2 x 95 mm^2 1)3)	Cable lug for M8	Min. 10 Nm Max. 13 Nm	
BM556X BM566X BM576X	2 x 185 mm^2 2)3)	Cable lug for M10	Min. 12 Nm Max. 25 Nm	
BM557X BM577X	2 x 185 mm^2 2) 4 x 95 mm^2 1)	Cable lug for M10	Min. 12 Nm Max. 25 Nm	

1) The cable lug may be 25 mm wide at most. The maximum cable diameter is dependent on the cable lug. In case the cable lug, which you use, can safely clamp a stronger cable than 95 mm^2, you may also use stronger cables than 95 mm^2. Also refer to ▷Cables power supply-device◁ from page 246.

2) The cable lug may be 35 mm wide at most. The maximum cable diameter is dependent on the cable lug. In case the cable lug, which you use, can safely clamp a stronger cable than 185 mm^2, you may also use stronger cables than 185 mm^2. Also refer to ▷Cables power supply-device◁ from page 246.

3) One cable of the mentioned cross section is sufficient for the operation.

DC link
1C1 and 1D1 2)
Ballast
Ba+ and Ba- 1)

	Max. cross-section of connection	Connection technology	Torque	Load capacity 1C1 and 1D1 2) Ba+ and Ba- 3)
BM551X	2.5 mm^2	Terminal block	-	Refer to ▹Electrical data basic units◃ from page 61
BM552X	4.0 mm^2	Screw terminal	Min. 0.5 Nm Max. 0.6 Nm	
BM553X BM563X	25 mm^2	Screw terminal	Min. 2 Nm Max. 2.3 Nm	
BM554X BM564X	50 mm^2	Screw terminal	Min. 6 Nm Max. 8 Nm	
BM555X BM565X BM575X	2 x 95 mm^2 4)6)	Cable lug for M8	Min. 10 Nm Max. 13 Nm	
BM556X BM566X BM576X	2 x 185 mm^2 5)6)	Cable lug for M10	Min. 12 Nm Max. 25 Nm	
BM557X BM577X	2 x 185 mm^2 5)	Cable lug for M10	Min. 12 Nm Max. 25 Nm	

1) Not short-circuit-proof, consider maximum load! Refer to „Brake resistor external“ in chapter ▹Technical Data◃ from page 29.

2) Not short-circuit-proof, consider maximum load! Refer to „Connected load DC link“ in chapter ▹Technical Data◃ from page 29.

3) Refer to „Permitted brake resistor continuous power“ in chapter ▹Technical Data◃ from page 29.

4) The cable lug may be 25 mm wide at most. The maximum cable diameter is dependent on the cable lug. In case the cable lug, which you use, can safely clamp a stronger cable than 95 mm^2, you may also use stronger cables than 95 mm^2. Also refer to ▹Cables power supply-device◃ from page 246.

5) The cable lug may be 35 mm wide at most. The maximum cable diameter is dependent on the cable lug. In case the cable lug, which you use, can safely clamp a stronger cable than 185 mm^2, you may also use stronger cables than 185 mm^2. Also refer to ▹Cables power supply-device◃ from page 246.

6) One cable of the mentioned cross section is sufficient for the operation.

Motor
1U2, 1V2, 1W2, PE

	Max. cross-section of connection	Connection technology	Torque	Load capacity
BM551X	2.5 mm^2	Terminal block	-	Is limited by the device, also refer to ▹Technical Data◃ from page 29
BM552X	4.0 mm^2	Screw terminal	Min. 0.5 Nm Max. 0.6 Nm	
BM553X BM563X	16 mm^2	Screw terminal	Min. 2 Nm Max. 2.3 Nm	
BM5543 BM5544 BM5641 BM5642	50 mm^2	Screw terminal	Min. 6 Nm Max. 8 Nm	
BM5545 BM5546 BM5645	50 mm^2	Screw terminal	Min. 6 Nm Max. 8 Nm	
	95 mm^2 4)	Screw terminal	Min. 15 Nm 4) Max.20 Nm 4)	
BM555X BM575X	2 x 95 mm^2 1)	Cable lug for M8	Min. 10 Nm Max. 13 Nm	
BM556X BM576X	2 x 185 mm^2 2)3)	Cable lug for M10	Min. 12 Nm Max. 25 Nm	
BM557X BM577X	2 x 185 mm^2 2) 4 x 95 mm^2 1)	Cable lug for M10	Min. 12 Nm Max. 25 Nm	

1) The cable lug may be 25 mm wide at most. The maximum cable diameter is dependent on the cable lug. In case the cable lug, which you use, can safely clamp a stronger cable than 95 mm^2, you may also use stronger cables than 95 mm^2. Also refer to ▹Cables power supply-device◃ from page 246.

2) The cable lug may be 35 mm wide at most. The maximum cable diameter is dependent on the cable lug. In case the cable lug, which you use, can safely clamp a stronger cable than 185 mm^2, you may also use stronger cables than 185 mm^2. Also refer to ▹Cables power supply-device◃ from page 246.

3) One cable of the mentioned cross section is sufficient for the operation.

4) After January 2018 delivery date: The devices provide connection terminals for larger cable cross-section.

Fan
X36

	Max. cross-section of connection	Connection technology	Load capacity
BM5X4X-S/-A BM5X5X-S/-A BM5X6X-S/-A BM5X7X-A	4.0 mm^2	Spring-loaded connector	Max. **1.0** A 1)

1) For fuse protection a fuse with the tripping characteristic „delayed“ must be used.

X100 (SELV/PELV)	Max. cross-section of connection	Connection technology	Load capacity
24 V power supply	1.5 mm^2	Terminal block	X100-1, X100-2, X100-5 and X100-6: max. **8.0** A, if you consider UL508C: max. **4.0** A

NOTICE!

It is forbidden to connect **both** the signal bus X300 **and** the power supply bus/brake resistor bus X100:3/X100:4. This leads to damage of the devices!

Refer to ▹Connection of several devices to the DC link without using the signal bus◃ on page 177.

X101 (SELV/PELV)		Max. cross-section of connection	Connection technology	Load capacity
Brake	BM551X BM552X	1.5 mm^2	Terminal block	X101-1 bis X101-4: Min. **0.1** A, max. **2.0** A
	BM553X BM5X4X BM5X5X BM5X6X BM5X7X BM57XX	1.5 mm^2	Terminal block	X101-1 bis X101-4: Min. **0.1** A, max. **8.0** A if you consider UL508C: max. **4.0** A

NOTE!

A relay with varistor protection circuit is required in case the customer connects an additional relay.

7.11.4 Requirements for the screwing

NOTE!

Follow the mentioned torques to ensure an adequate conductivity.

7.12 Controller terminals

Type code: BM5XXX-XXXX-XX**01** bzw. XX**06**

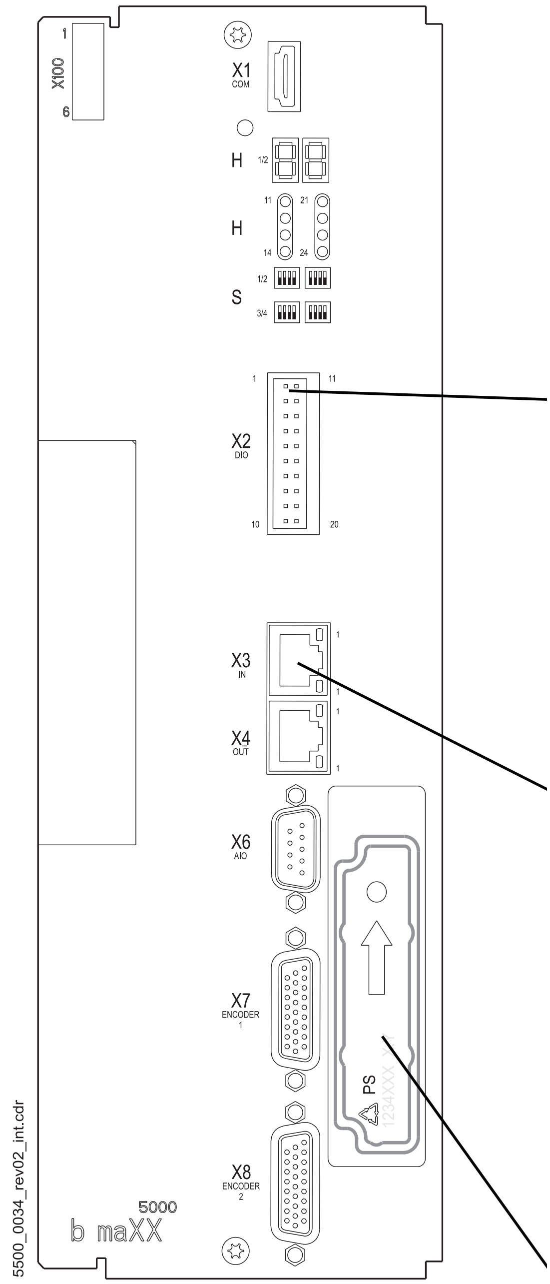
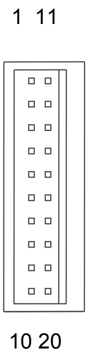


Figure 97: Connections controller

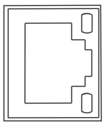
X1: Service interface

NOTE!
Only the service cable BM5-K-USB-XXX is allowed to be used for the service interface X1, refer to ▹Service interface cable◃ on page 293



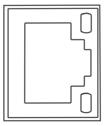
X2 Digital inputs/outputs

1:Refer to ▹Page 195◃
2 to **3**: BB On (SELV/PELV)
4 to **7**: Digital output (SELV/PELV)
8: Refer to ▹Page 195◃
9 to **10**: N.C.
11: +24V (SELV/PELV)
12: M24V (SELV/PELV)
13: Fast dig. input 1 / quick stop (SELV/PELV)
14: Fast dig. input 2 (SELV/PELV)
15 to **19**: Digital input (SELV/PELV)
20: Dig. input 8 / pulse enable



BM5XXX-XXXX-XXXX-**00**XX
No function

BM5XXX-XXXX-XXXX-**01**XX
X3 EtherCAT®-IN **X4** EtherCAT®-OUT



BM5XXX-XXXX-XXXX-**02**XX
X3 VARAN-IN **X4** VARAN-OUT

1: TX+
2: TX-
3: RX+
4 to **5**: Reserved
6: RX-
7 to **8**: Reserved

A: Assembly opening additional module
The delivery status is: empty

The operation is only with an BM5-O-SAF-XXX permitted / possible. (Mounting refer to manual 5.09013 and/or 5.11016). It is not allowed to plug any other modules in.

Controller terminals

Type code: From BM5XXX-XXXX-XXXX-XX**08**

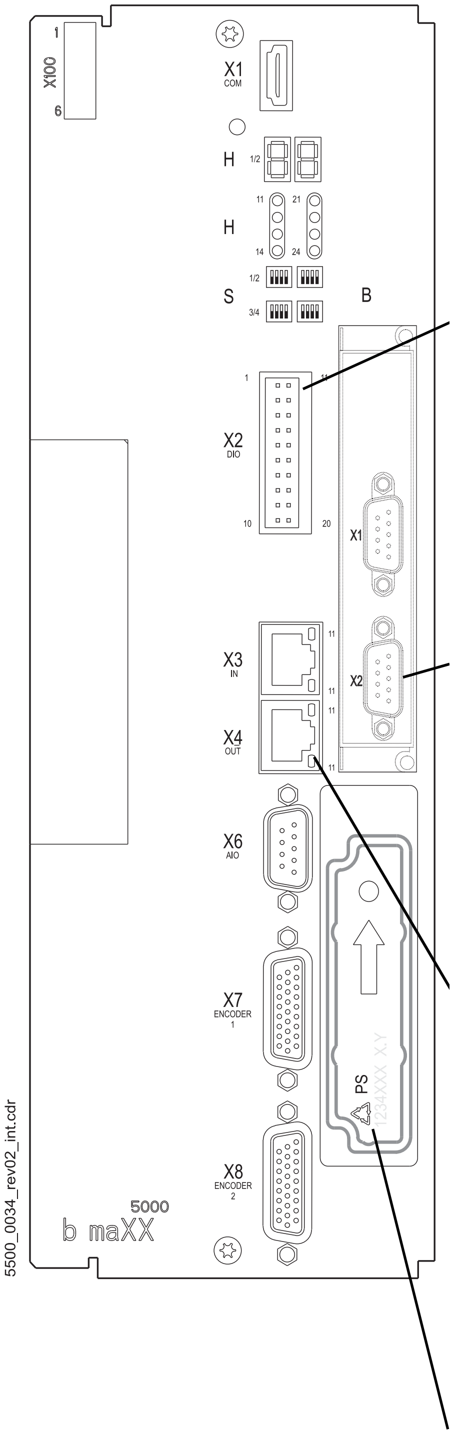
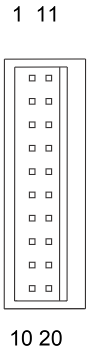


Figure 98: Connections controller

X1: Service interface

NOTE!
Use service cable BM5-K-USB-XXX, refer to ▷Service interface cable◁ on page 293



X2 Digital inputs/outputs

1:+24V (SELV/PELV)
2 to **3**: BB On (SELV/PELV)
4 to **7**: Digital output (SELV/PELV)
8: M24V (SELV/PELV)
9 to **10**: N.C.
11: +24V (SELV/PELV)
12: M24V (SELV/PELV)
13: Fast dig. input 1 / quick stop (SELV/PELV)
14: Fast dig. input 2 (SELV/PELV)
15 to **19**: Digital input (SELV/PELV)
20: Dig. input 8 / pulse enable

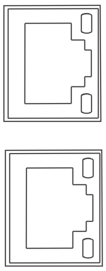
B: Add-on module (option) - not pluggable

BM5XXX-XXXX-XX**00** - No add-on module

BM5XXX-XXXX-XX**01**
Add-on module IEE with external supply

BM5XXX-XXXX-XX**03**
Add-on module SIE with internal supply

Refer to also ▷Add-on modules◁ on page 199



BM5XXX-XXXX-XXXX-**01**XX and
BM5XXX-XXXX-XXXX-**07**XX
X3 EtherCAT®-IN **X4** EtherCAT®-OUT

BM5XXX-XXXX-XXXX-**02**XX
X3 VARAN-IN **X4** VARAN-OUT

BM5XXX-XXXX-XXXX-**03**XX
X3 CANopen®-IN **X4** CANopen®-OUT

BM5XXX-XXXX-XXXX-**04**XX
X3 POWERLINK®-IN **X4** POWERLINK®-OUT

1: TX+	**2**: TX-
3: RX+	**6**: RX-

4, **5**, **7**, **8**: reserved

A: Assembly opening additional module
The delivery status is: empty

The operation is only with an BM5-O-SAF-XXX permitted / possible. (Mounting refer to manual 5.09013 and/or 5.11016). It is not allowed to plug any other modules in.

X2 Digital inputs/outputs

Assessment	Signal edge, programmable
Input current per input	2 mA digital input, 20 mA fast digital input
Input propagation delay	Max. 4 ms Max. 10 µs for fast inputs
Level	Low (0 .. 5 V) High (12 … 28 V)
Output current per output	500 mA
Galvanic separation	Optocoupler
Short-circuit resistant	Current limited

Deviating thereof pin No. 2, 3: NO contact, without a ground reference

Power rating per NO contact:	Max. 30 V, max. 100 mA

Pin assignment **X2**

Pin No.	Assignment
1	N.C. [1]
	+24 V (supply digital IN/OUT) [2]
2	Ready-to-operate 1
3	Ready-to-operate 1
4	Digital output 1
5	Digital output 2
6	Digital output 3
7	Digital output 4
8	N.C. [1]
	M24V (supply digital IN/OUT) [2]
9	N.C.
10	N.C.

Pin No.	Assignment
11	+ 24 V (supply digital IN/OUT)
12	M24V (supply digital IN/OUT)
13	(fast) digital input 1 quick stop
14	(fast) digital input 2
15	Digital input 3
16	Digital input 4
17	Digital input 5
18	Digital input 6
19	Digital input 7
20	Digital input 8 / pulse enable

1) only hardware configuration controller **01**, refer to ▹Type code◃ from page 124.

2) hardware configuration controller from **06**, refer to ▹Type code◃ from page 124.

X3 / X4 - fieldbus connection

EtherCAT® Type code **BM5500, BM5600, BM5700** with EtherCAT® CoE profile:

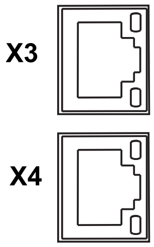
BM5XXX-XXXX-XXXX-**01**XX

Type code **BM5500, BM5600, BM5700** with EtherCAT® SoE profile:

BM5XXX-XXXX-XXXX-**07**XX

X3 EtherCAT® IN
X4 EtherCAT® OUT

Number of bus connections	1 IN / 1 OUT
Bus connection	RJ 45
Number of parameters	Refer to parameter handbook BM5000
Data width of parameters	16 / 32 Bit
Baud rates	10 / 100 Mbit/s



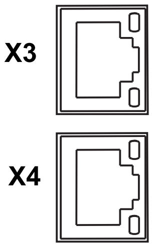
1: TX+
2: TX-
3: RX+
4: Reserved
5: Reserved
6: RX-
7: Reserved
8: Reserved

VARAN Type code **BM5500, BM5600, BM5700** with VARAN profile:

BM5XXX-XXXX-XXXX-**02**XX

X3 VARAN IN
X4 VARAN OUT

Number of bus connections	1 IN / 1 OUT
Bus connection	RJ 45
Number of parameters	Refer to parameter handbook BM5000
Data width of parameters	16 / 32 Bit
Baud rates	10 / 100 Mbit/s



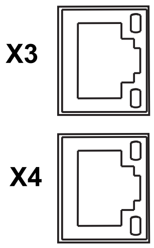
1: TX+
2: TX-
3: RX+
4: Reserved
5: Reserved
6: RX-
7: Reserved
8: Reserved

CANopen® Type code **BM5500, BM5600, BM5700** with CANopen®:

BM5XXX-XXXX-XXXX-**03**XX

X3 CANopen® IN
X4 CANopen® OUT

Memory	4 kByte DP-RAM, 256 kByte RAM, 1 MByte Flash-Eprom
Number of bus connections	2, no slot rules
Bus connection	2 connectors RJ45, 8-pole
Baud rates	20/125/250/500/1000 kBit/s
Address range	7 Bit; address 1 to address 127
Address setting	DIP-switch
Short-circuit proof RJ45-connection	Yes
Isolation	Optocoupler, DC/DC-converter

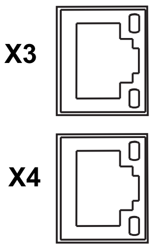


1: CAN_H
2: CAN_L
3: GND
4: Reserved
5: Reserved
6: Reserved
7: GND
8: Reserved

POWERLINK® Type code **BM5500, BM5600, BM5700** with POWERLINK®:
BM5XXX-XXXX-XXXX-**04**XX

X3 POWERLINK® IN
X4 POWERLINK® OUT

Number of bus connections	1 IN / 1 OUT
Bus connection	RJ 45
Number of parameters	Refer to parameter handbook BM5000
Data width of parameters	16 / 32 Bit
Baud rates	10 / 100 Mbit/s



1: TX+
2: TX-
3: RX+
4: Reserved
5: Reserved
6: RX-
7: Reserved
8: Reserved

Add-on modules

NOTE!

Only devices with type code BM5XXX-XXXX-XX**01**/**03**/**04**/**05**/**06** provide an add-on module!

The add-on modules are built-in and cannot be changed.
It is forbidden to remove the yellow front cover.

Add-on module IEE with external supply

Incremental encoder emulation, 2 channels, BM5XXX-XXXX-XX**01**

Set values for incremental encoder emulation can be evaluated from following sources:

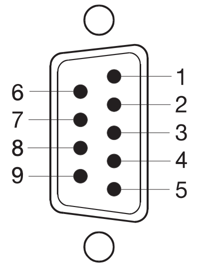
- Position actual values encoder 1 or encoder 2
- Position set values (e. g. internal from positioning)
- Fieldbus set value (external set via bus)

The generated signal can be used either for synchronization of the following axis or for position evaluation of the axis by the master control.

Power supply (external supply)	5 V ± 5 % (without load)
Current (external supply)	Max. 100 mA (without load)
Signal level: output high voltage at I_{0H} = -20 mA	2.5 V
Signal level: output high voltage at I_{0L} = +20 mA	0.5 V
Output frequency track signals	Max. 500 kHz
Switching time: rise time	< 50 ns
Switching time: fall time	< 50 ns
Delay time	$\|t_d\| = 1 \leq 50$ ns
Power input	0.525 W
Current output driver	Max. 15 mA

Pin assignment Sub-D on front side X1 and X2 (male) of incremental encoder emulation:

Pin assignment



Sub-D male connector
9-pole

Pin No.	IEE assignment
1	Ground incremental encoder emulation
2	External power supply +5 V IEE
3	Incremental encoder emulation track 0
4	Incremental encoder emulation track -0
5	Incremental encoder emulation track B
6	Not assigned
7	Incremental encoder emulation track -A
8	Incremental encoder emulation track A
9	Incremental encoder emulation track -B

Connection cable refer to ▷Connection cable add-on modules◁ on page 264.

Further information refer to manual add-on modules IEE/SIE, 5.13030.

Add-on module SIE

SSI encoder emulation, 2 channels, BM5XXX-XXXX-XX**03**

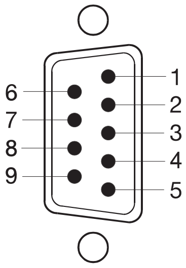
Set values for SSI encoder emulation can be evaluated from following sources:

- Position actual values encoder 1 or encoder 2
- Position set values (e. g. internal from positioning)
- Fieldbus set value (external set via bus)

The generated signal can be used either for synchronization of the following axis or for position evaluation of the axis by the master control.

Signal level: output high voltage at I_{0H} = -20 mA	2.5 V
Signal level: output high voltage at I_{0L} = +20 mA	0.5 V
Output frequency track signals	Min. 200 kHz Max. 2 MHz
Switching time: rise time	< 50 ns
Switching time: fall time	< 50 ns
Delay time	$|t_d|$ = 1 ≤ 50 ns
Power input	0.525 W
Current output driver	Max. 15 mA

Pin assignment Sub-D on front side X1 and X2 (male) of SSI encoder emulation:

Pin assignment	**Pin No.**	**SSI assignment**
 Sub-D male connector 9-pole	1	Ground incremental encoder emulation
	2	Not assigned
	3	Not assigned
	4	Not assigned
	5	DAT +
	6	Not assigned
	7	CLK +
	8	CLK +
	9	DAT +

Connection cable refer to ▹Connection cable add-on modules◃ on page 264.

Further information refer to manual add-on modules IEE/SIE, 5.13030.

Add-on module SVP

Module with additional analog/digital inputs/outputs,

BM5XXX-XXXX-XX**04**
BM5XXX-XXXX-XX**05**
BM5XXX-XXXX-XX**06**

LED display

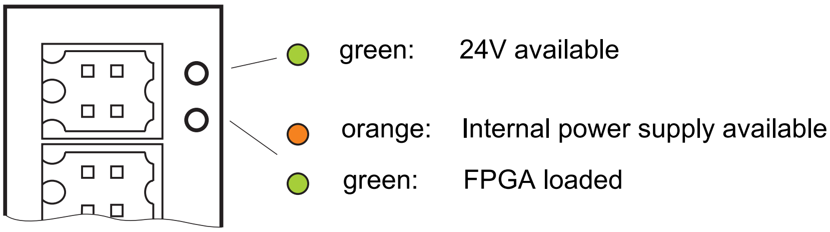


Figure 99: LED display add-on module SVP

Digital inputs/outputs

Evaluation:	Edges, programmable
Input current (per input):	2 mA digital input
Time delay input:	Max. 4 ms,
Level:	Low (0 .. 5 V); High (12 … 28 V)
Output curren (per output):	Max. 500 mA
Electrical isolation:	Optocoupler
short-circuit proof:	Current limited, switch-off via temperature

Analog outputs

Resolution	12 bit
Output voltage	-10 V to +10 V
Max. output current	1 mA
Updating rate	125 µs
short-circuit proof	Limited, max. 10 s

Analog inputs

	Voltage input	Current input
Resolution	14 bit	
Type	Differential input	
Input resistance	ca. 50 kΩ	ca. 100 Ω
Input current	Max. 250 µA	Min. (0) → 4 A, max. 20 mA
Input voltage	-10 V to +10 V	Max. 2 V
Sampling rate	125 µs	
Power supply encoder	Max. 250 mA per connection	

Linearity error inputs in LSB

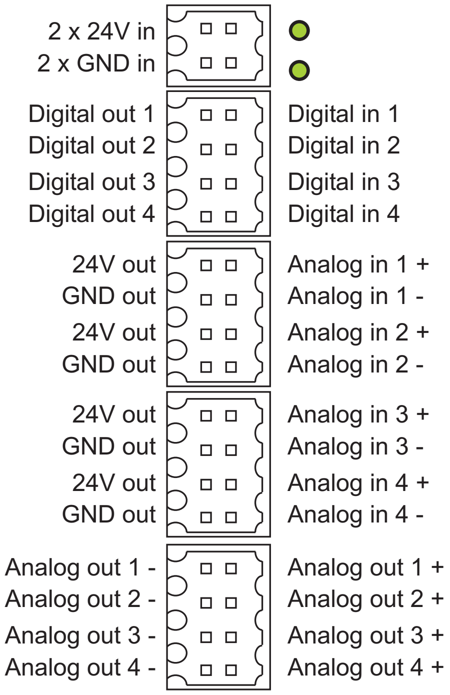
Error	Min	Type	Max
DNL	0	2	4
INL	0	3	6
Offset	0	3	6
Gain	0	3	6

NOTE!

The connections of the cables of the analog channels must be done shielded.

Blade terminals with 6.3 mm width are available for connecting the shields.

Pin assignment front side connectors:



Types

Version	Analog in 1 / 2	Analog in 3 / 4	Analog out 1 ... 4	Digital in 1 ... 4 Digital out 1 ... 4
SVP-001-001 BM5XXX-XXXX-XX**04**	Analog voltage inputs ±10 V Resolution 14 bit	Analog voltage inputs ±10 V Resolution 14 bit	4 analog voltage outputs ±10V Resolution 12 bit	4 digital inputs 24 V / 4 digital outputs 24 V
SVP-001-002 BM5XXX-XXXX-XX**05**	Analog voltage inputs ±10 V Resolution 14 bit	Analog current inputs (0) 4…20 mA Resolution 14 bit		
SVP-001-003 BM5XXX-XXXX-XX**06**	Analog current inputs (0) 4…20 mA Resolution 14 bit	Analog current inputs (0) 4…20 mA Resolution 14 bit		

Connection

- Analog input/output

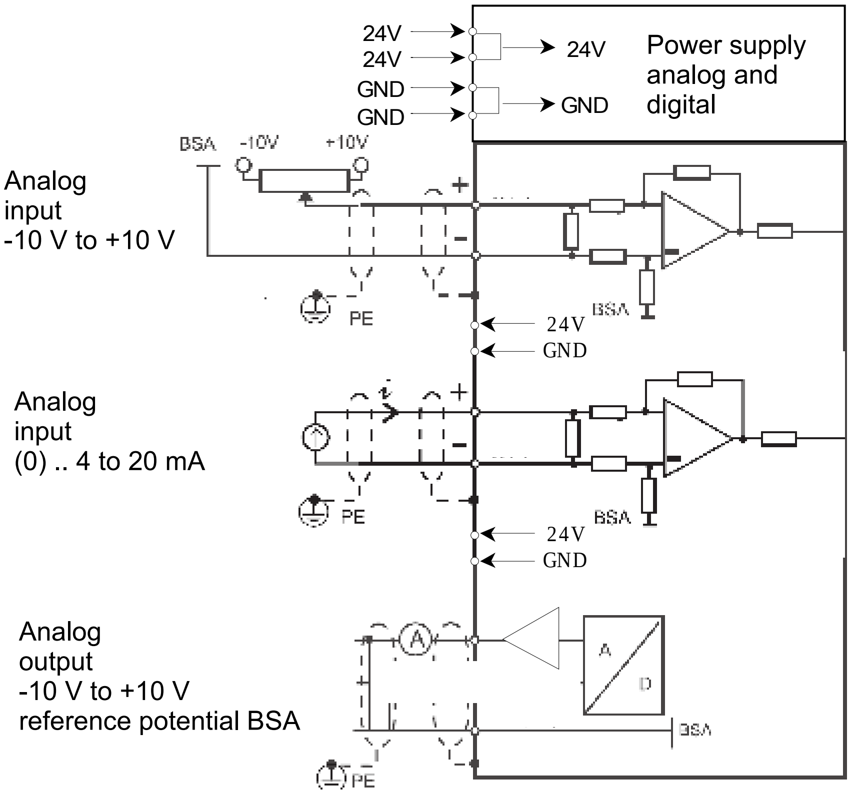


Figure 100: Connection of analog inputs/outputs SVP

- Digital inputs/outputs

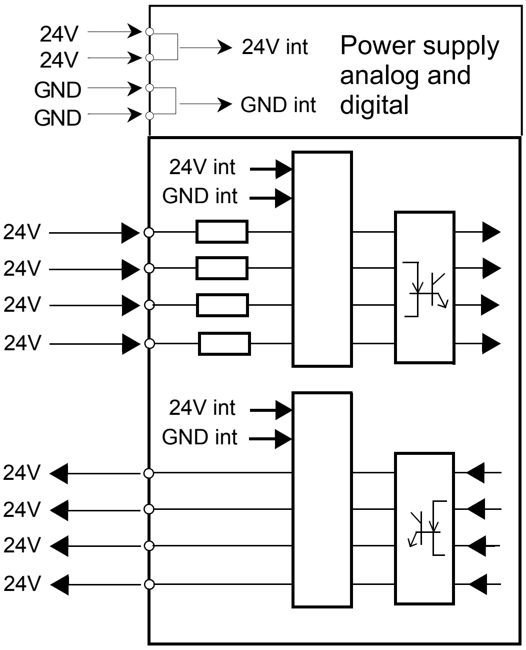
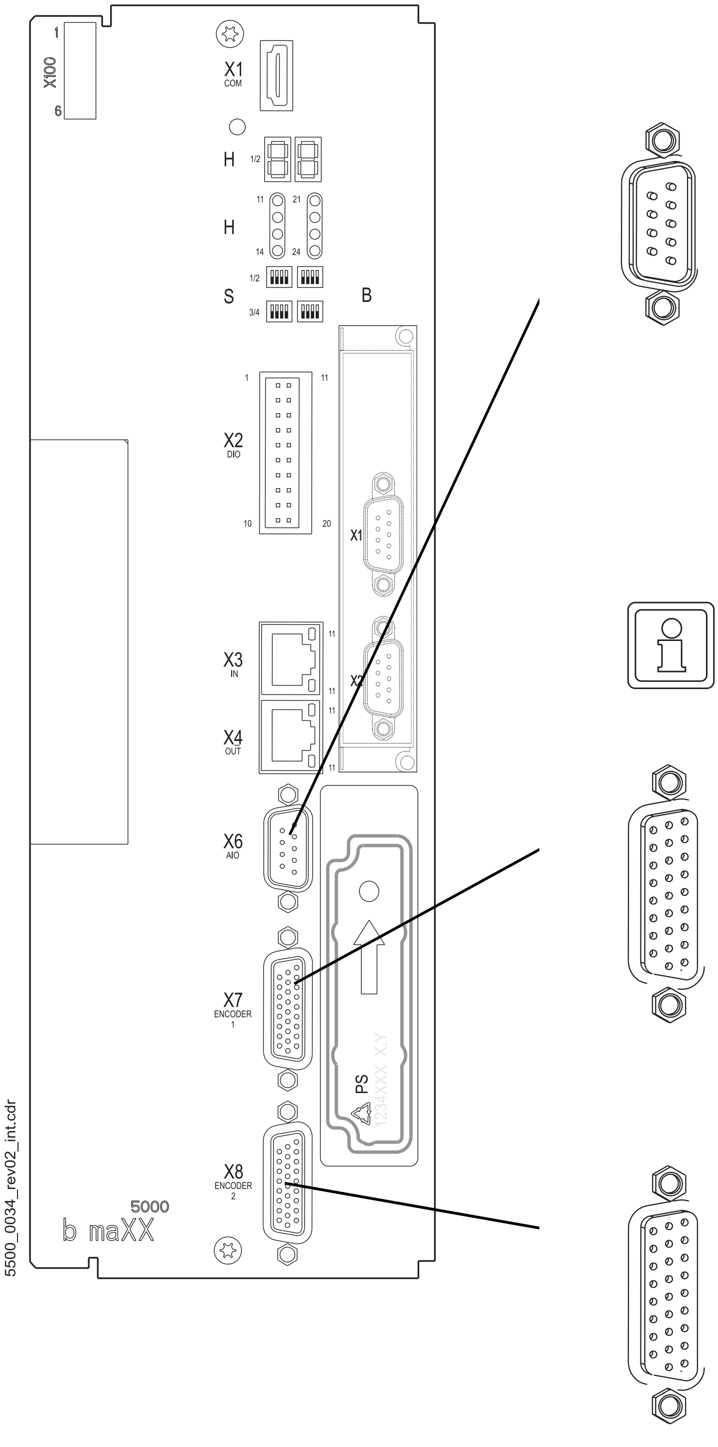


Figure 101: Connection digital inputs/outputs SVP

7.12 Controller terminals



X6 Analog inputs/outputs *)

1: Input 1 +
2: Input 2 +
3: GND
4: Output 1 +
5: Output 2 +
6: Input 1 -
7: Input 2 -
8: Output 1 - (GND)
9: Output 2 - (GND)

Only one encoder can be connected to each encoder connection.

X7 Encoder 1 *)

Switchable:
encoder with HIPERFACE®
Resolver
firmware 1.04 and above
encoder with EnDat® 2.1
Sine/square wave incremental encoder
firmware 1.06 and above
Encoder with SSI, EnDat® 2.2 and
HIPERFACE DSL®

X8 Encoder 2 *)

Switchable:
encoder with HIPERFACE®
Resolver
firmware 1.04 and above
encoder with EnDat® 2.1
Sine/square wave incremental encoder
firmware 1.06 and above
Encoder with SSI, EnDat® 2.2 and
HIPERFACE DSL®

*) Optional, refer to ▹Type code◃ from page 124

Figure 102: Connections, analog inputs/outputs and encoder

X6 Analog inputs/ outputs

There are two analog inputs and outputs available.

Inputs

Resolution	12 bit
Type	Differential input
Input resistance	Approx. 50 kΩ
Max. input current	200 µA
Sampling rate	5 µs
Input voltage	+10 V to -10 V

Outputs

Resolution	12 bit
Output voltage	+10 V to -10 V
Max. output current	1 mA
Update rate	5 µs
Short-circuit-proof	Limited, max. 10 s

Pin assignment **X6**

Pin No.	Assignment
1	Analog input 1 +
2	Analog input 2 +
3	Ground
4	Analog output 1 +
5	Analog output 2 +
6	Analog output 1 -
7	Analog output 2 -
8	Analog output 1 - (GND)
9	Analog output 2 - (GND)

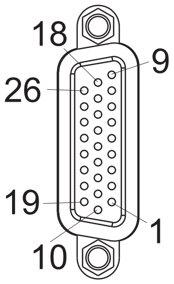
X7 / X8 Encoder evaluation, refer to ▹Figure 102◃ on page 206

Connector assignment depends on encoder selection

Resolver encoder evaluation

All encoders, that comply with the following technical specification, may also be used:

Pole pair number	The ratio between the pole pair number of the motor and the pole pair number of the encoder must be integer.
Current input	Max. 160 mA
Field current	Approx. 8 kHz
Field current	160 mA
Ratio	0.5



Sub-D-connector
26-pole

1	GND encoder supply / Ref -
2	Reserved *
3	Reserved *
4	Reserved *
5	Reserved *
6	Reserved *
7	Reserved *
8	Reserved *
9	Reserved *
10	Resolver Ref +
11	Reserved *
12	Reserved *
13	Reserved *
14	Reserved *
15	Reserved *
16	Reserved *
17	Temperature +
18	Temperature -
19	Reserved *
20	Reserved *
21	Res A + (COS +)
22	Res A - 8COS -)
23	Reserved *
24	Reserved *
25	Res B + (SIN +)
26	Res B - (SIN -)

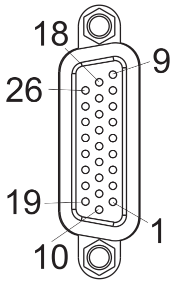
* do not occupy

Sine cosine encoder evaluation Hiperface$^{®}$

The Sine cosine encoder evaluation is provided with a Hiperface$^{®}$-interface.

The encoders, which meet the following technical specifications, can be used:

Voltage supply	10 V_{DC}
Signal level	Hiperface$^{®}$ - specification of the process data channel (~1 V_{SS}; REFSIN/REFCOS 2.5V)
Current input	Max. 250 mA



Sub-D-connector
26-pole

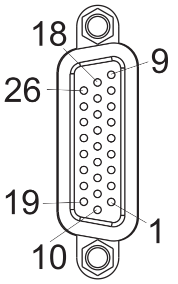
1	GND encoder supply
2	+10 V encoder supply
3	Reserved *
4	COS +
5	COS -
6	SIN +
7	SIN -
8	Reserved *
9	Reserved *
10	Reserved *
11	Reserved *
12	Reserved *
13	Reserved *
14	Reserved *
15	Reserved *
16	Reserved *
17	Temperature +
18	Temperature -
19	RS485 Data +
20	RS485 Data -
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* do not occupy

Encoder evaluation with EnDat® 2.1 or SSI

The encoders, which meet the following technical specifications, can be used:

Voltage supply	5 V_{DC} controlled
Signal level	~1 V_{SS}
Current input	Max. 250 mA



Sub-D-connector
26-pole

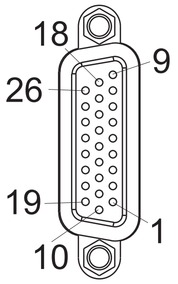
1	GND encoder supply
2	+5 V encoder supply
3	Clock +
4	A + (COS +)
5	A - (COS -)
6	B + (SIN +)
7	B - (SIN -)
8	Reserved *
9	Reserved *
10	Reserved *
11	Sense GND
12	Sense V_{CC}
13	Clock -
14	Reserved *
15	Reserved *
16	Reserved *
17	Temperature +
18	Temperature -
19	Data +
20	Data -
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* do not occupy

Encoder evaluation with EnDat® 2.2

The encoders, which meet the following technical specifications, can be used:

Voltage supply	5 V_{DC} controlled
Signal level	~1 V_{SS}
Current input	Max. 250 mA



D-sub-connector
26-pin

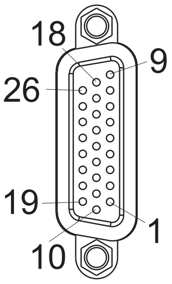
1	GND encoder supply
2	+5 V encoder supply
3	Clock+
4	Reserved *
5	Reserved *
6	Reserved *
7	Reserved *
8	Reserved *
9	Reserved *
10	Reserved *
11	Sense GND
12	Sense Vcc
13	Clock-
14	Reserved *
15	Reserved *
16	Reserved *
17	Reserved *
18	Reserved *
19	Data +
20	Data -
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* do not occupy

Sine or square wave encoder evaluation

The encoders, which meet the following technical specifications, can be used:

Voltage supply	5 V_{DC} controlled
Signal level	RS422 (TTL) for square wave incremental encoders ~1 Vss for sine incremental encoders
Current input	Max. 250 mA



D-sub-connector
26-pin

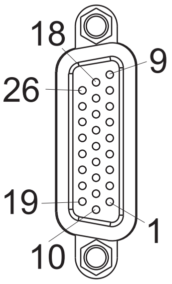
1	GND encoder supply
2	+5 V encoder supply
3	Reserved *
4	RS422 A +
5	RS422 A -
6	RS422 B +
7	RS422 B -
8	RS422 0 +
9	RS422 0 -
10	Reserved *
11	Sense GND
12	Sense V_{CC}
13	Reserved *
14	Reserved *
15	Reserved *
16	Reserved *
17	Temperature +
18	Temperature -
19	Reserved *
20	Reserved *
21	Reserved *
22	Reserved *
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* do not occupy

Encoder evaluation with Hiperface DSL®

The encoders, which meet the following technical specifications, can be used:

Signal level	Hiperface DSL®
Current input	Max. 250 mA



D-sub-connector
26-pin

1	GND encoder supply
2	10 V encoder supply
3	Reserved *
4	Reserved *
5	Reserved *
6	Reserved *
7	Reserved *
8	Reserved *
9	Reserved *
10	Reserved *
11	Reserved *
12	Reserved *
13	Reserved *
14	Reserved *
15	Reserved *
16	Reserved *
17	Reserved *
18	Reserved *
19	DSL-
20	DSL+
21	Reserved *
22	Reserved *
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

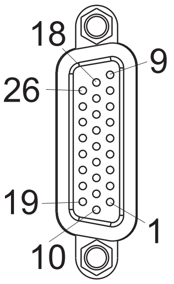
* do not occupy

NOTE!

The use of the standard accessory connector included in the accessory kit HIPERFACE DSL® (part No. 460219) is required.

Sine incremental encoder with commutation signals Encoders with high-resolution incremental signals (sine and cosine signals, e.g. 2048 signal periods per revolution) and in addition commutation signals (sine and cosine track with 1 signal period per revolution), available firmware 1.15 and higher.

Voltage supply	5 V_{DC} controlled	
Signal level	Incremental encoder signals (A and B)	~1 Vss
	Commutation signals (C and D)	~1 Vss
Current input	Max. 250 mA	



D-sub-connector
26-pin

1	GND encoder supply
2	+5 V encoder supply
3	reserved *
4	A +
5	A -
6	B +
7	B -
8	0 + (zero pulse)
9	0 - (zero pulse)
10	reserved *
11	Sense GND
12	Sense V_{CC}
13	reserved *
14	reserved *
15	C + (commutation track)
16	C - (commutation track)
17	Temperature +
18	Temperature -
19	reserved *
20	reserved *
21	reserved *
22	reserved *
21	reserved *
22	reserved *
23	D + (commutation track)
24	D - (commutation track)
25	reserved *
26	reserved *

* do not occupy

NOTE!

There is no continuing monitoring of the commutation signals (C+, C-, D+, D-) and of the reference marks (R+, R-).

NOTE!

The connection cable is not available as a pre-assembled cable by Baumüller. The user has to provide a suitable cable.

X300 signal bus

If a system is constructed of BM50XX, BM51XX, BM5300 and BM55XX, then all devices are linked with each other via the signal bus. This bus can poll every client device, including the mains rectifier unit, and send individual signals. Via this bus, the mains rectifier unit can register errors to the axes so that the individual axes can react to these. Each individual axis can itself send messages to the other axes, such as malfunction, braking resistance on, or a signal bus warning.

NOTE!

To avoid uncontrolled operation of the active mains rectifier unit, the signal bus has to be activated.

NOTE!

A maximum of 12 axis units can be linked via the signal bus.

Pin-Nr.	Assignment	Function
1	BUS_BETRIEBSBEREIT	Ready-to-operate, identically with X1:6
2	BUS_PHASENAUSFALL	0 V means all three power supply phases are available, 7,5 V means at least one power supply phase is not available
3	BUS_RBREMS-EIN	The brake resistor will be switched on if 7.5 V is connected to this input. The mains rectifier remains switched on. This input controls the brake resistor switch of the mains rectifier triggered by the connected axis units BM53XX.
4, 5, 6,7,8		Reserved
9		7.5 V Power supply of the signal bus, for connections to BM5000 devices, only.
10		GND

8

OPERATION

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 handbook.
- 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.

NOTICE!

Environmental conditions that do not meet the requirements.

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

Therefore:

- Ensure that the environmental conditions are kept compliant during operation (refer to ▷Required environmental conditions◁ on page 53).

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!

8.1 Operating concept

After the device has been commissioned it is parameterized (i. e. adapted to the application). Once parameterization has been completed, the device can be operated with one of the two following signal inputs:

- Pulse enable
- Quick stop (optional)

8.1.1 Release signals

These signals must have a signal level of 24 V (DC) and be available via the terminals (▹Controller terminals◃ on page 193) in a switched on state.

Pulse enable

During operation, the „pulse enable“ signal must be continuously generated in order for the device to provide output. A running motor will come to a standstill if the signal is switched to 0V.

Quick stop

Only switch off the „quick stop“ signal if the system / the device must be stopped as quickly as possible. The reaction can be adjusted (refer to the parameter manual)

During operation, the „quick stop“ signal must be continuously provided in order for the device to provide output.

Exactly which digital input can be assessed as a quick stop signal can be parameterized. (Refer to the parameter manual **b maXX BM5000** 5.09022)

8.2 Power on switching frequency / DC link charging

8.2.1 Power supply switch-on frequency BM551X and BM552X

The devices use a rectifier with 6 diodes (B6U circuit). There is a resistor between rectifier and DC link capacitor limiting the charging surge. The resistor is bridged by a relay after the charging. Smaller waiting periods between the DC link discharge and charge reduce the lifetime of the devices. The specified waiting time of the device is increased to at least 90 seconds when an additional external DC link capacitance is connected. The maximum permitted external DC link capacitance depends on the power supply voltage (refer to ▹Figure 36◃ on page 66).

8.2.2 Power supply switch-on frequency BM5X3X to BM5X7X

The devices use a rectifier with 3 diodes and 3 thyristors (B6HK circuit). The circuit measures the voltage on the phase conductor and the DC link. The corresponding thyristor is fired if the phase conductor voltage minus DC link voltage is lower than a fixed threshold. Thereby an almost constant voltage time area is applied to the series connection of phase conductor and DC link capacitor. The charge of the DC capacitor is done with current pulses of approx. same level. This level depends on the inductance of the commutation choke, the impedance of the power supply and the power supply voltage. The thyristors are fired if the DC link is charged to 50 V difference between peak power supply voltage and DC link voltage and there is a potential drop in blocking direction. The thyristor shows a behavior like a diode.

8.2.3 Calculation of the maximum permitted external capacitance

If a maximum allowable external capacitance is specified in the technical characteristics, then it is either a device with diode rectification or one with the „old“ charge circuit (time controlled charging). If, however, it is referred on this chapter the maximum external DC link capacitance is calculated as followed prescribed.

The time for a charge sequence depends on the height of the charging current pulses and also the height of the internal and external capacitance (refer to ▹Table of charging times◃ on page 221). After 20 seconds the charging is discontinued.

For the charging function the device must be connected to a power supply with clockwise rotating field. No charging is started in case of counterclockwise rotating field. In rare cases a counterclockwise rotating field can cause an abrupt charging and a tripped fuse.

No charging is started at failure of one or two mains phases.

The external chargeable capacitance is not limited because the height of the loading current of the DC link capacitor is approx. constant. But the time until the complete charge of the DC link is increased proportional to the capacitance, that has to be charged. Error 089 („power unit not ready-to-operate“ is generated if the charging is not finished after 20 s.

Example: BM5543 on 480 V.

From ▹Table of charging times◃ on page 221 results a charge time of 0.4 s with the built in capacitance of 1880 μF.

$$\text{Maximum external capacity} = \text{built in capacity} \cdot \left(\frac{20\text{s}}{\text{Charging time according table}} - 1\right)$$

$$= 1880\mu\text{F} \cdot \left(\frac{20\text{s}}{0.4\text{ s}} - 1\right) = 92\text{mF}$$

It is recommended to choose the external capacitance 20 % lower, because the charging time can vary depending on the height of the power supply voltage.

8.2.4 Effects of the different charging circuits

Following incompatibilities result because of charging and must be checked by the user operating devices with the new current-controlled charging-method.

- Charging time: Adapt timeout values in master-control to avoid possible error messages because of not in time ready-to-operate signal.
- Ensure clockwise-rotating-field. The device does not identify the direction of the rotating field.
  In case of a counter-clockwise-rotating-field no charging is done, after 20 s the attempt of charging is stopped and error 089 (power unit not ready-to-operate) is generated.
  In rare cases a counterclockwise rotating field can cause an abrupt charging and a tripped fuse.
  For error correction two power supply phases must be exchanged, e. g. the cables connected to 1U1 and 1V1. The error is corrected, assumed there is no other error.

The advantages of the current-controlled charging are (in short):

- The maximum chargeable DC link capacitance is higher than without the current-controlled charging.
- The dependency of the DC link capacitance on the charging current is reduced. The self-protection level of the device against incorrect dimensioning is improved.

8.2.5 Table of charging times

Device	Inductance power choke	Internal capacitance	Typical charging time at 300 V	Typical charging time at 400 V	Typical charging time at 480 V	Typical charging time at 530 V
BM5632	0.19 mH	3000 µF	0.08 s	0.18 s	0.34 s	0.48 s
BM5543	0.36 mH	1880 µF	0.1 s	0.22 s	0.4 s	0.56 s
BM5544	0.26 mH	2350 µF	0.1 s	0.22 s	0.42 s	0.5 s
BM5545 BM5642	0.26 mH	3055 µF	0.11 s	0.26 s	0.47 s	0.65 s
BM5546	0.18 mH	3760 µF	0.09 s	0.22 s	0.4 s	0.57 s
BM5552	0.26 mH	3000 µF	0.11 s	0.25 s	0.47 s	0.66 s
BM5553	0.18 mH	3000 µF	0.08 s	0.18 s	0.32 s	0.45 s
BM5554 BM5652 BM5755	105 µH	6600 µF	0.1 s	0.24 s	0.4 s	0.58 s
BM5562	105 µH	6000 µF	0.09 s	0.22 s	0.38 s	0.52 s
BM5563	80 µH	6000 µF	0.07 s	0.16 s	0.29 s	0.4 s
BM5566 BM5766	80 µH	13.2 mF	0.14 s	0.33 s	0.61 s	0.86 s
BM557X	39 µH	19.8 mF	0.12 s	0.29 s	0.51 s	0.7 s
BM577X	32.6 µH	19.8 mF	0.1 s	0.24 s	0.4 s	0.58 s

8.3 Monitoring

The controller unit monitors the device during operation. If the controller unit detects a state that deviates from the normal operation condition, the device either transmits a warning or an error message.

Warning

If the controller unit detects an operating condition that exceeds a warning threshold, a corresponding warning is shown on the display or, respectively, controller. The most important warning message (Current limit attained) is also shown by the device through the LED H13 or H23 (refer to ▷Display and operation elements◁ from page 128).

Error message

If the controller unit detects that the device is not working error-free, then this is shown via the LED H14 or H24 (refer to ▷Display and operation elements◁ from page 128). A corresponding error code will continue to be shown on the display and/or a controller can read out the error code on the device.

For further information refer to ▷Troubleshooting and fault correction◁ from page 237.

8.4 Fieldbus communication

Depending on the version of **BM5500, BM5600, BM5700** (refer to ▹Type code◃ from page 124), communication can be made via different fieldbus systems.

8.4.1 EtherCAT®

Type code **BM5500, BM5600, BM5700** with EtherCAT®:

BM5XXX-XXXX-XXXX-**01**XX- CoE profile (CANopen® over EtherCAT®)
BM5XXX-XXXX-XXXX-**07**XX- SoE profile (Servodrive profile over EtherCAT®)

Via the **BM5500, BM5600, BM5700** with EtherCAT®-Slave, data can be transmitted to and from other nodes (e. g. from the EtherCAT®-Master).

X3 and X4 on the front side of the device are the RJ45 connections for EtherCAT®-line (also refer to ▹Controller terminals◃ from page 193).

Mounting and installation

The mounting/installation consists of the following steps:

1 De-energize the **BM5500, BM5600, BM5700** device
2 Set the **BM5500, BM5600, BM5700** IP-address, refer to ▹Setting the IP address with address switches◃ from page 133
3 Connect **BM5500, BM5600, BM5700** with Ethernet-connection cables.
   - Please, observe an EMC-compatible laying of the Ethernet connection cables!
   - The following cables were released for use by Baumüller: Ethernet-connection cable; Further information refer to ▹Accessories Ethernet/EtherCAT®/VARAN/ POWERLINK® .◃ on page 292.

Commissioning

The following preconditions must be fulfilled before commissioning:

1 **BM5500, BM5600, BM5700** with EtherCAT® is installed correctly.
   - Ethernet-connection cables are wired correctly.
2 The control cabinet is properly locked and all safety devices are operating.
3 The **BM5500, BM5600, BM5700** device is ready-to-use.

Address switch

By means of the address switches S1 to S4 the IP-address is set
(Refer to settings ▹Setting the IP address with address switches◃ on page 133).
Further information about the setting possibilities of the EtherCAT®-Slave refer to „Application Manual“.

Parameters

The parameter settings determine the behavior of the EtherCAT®-Slave in operation. Parameters are set with the software ProDrive.

1 Start ProDrive

2 Click on „Project Tree“.

3 Communication settings with ProDrive

- Project Tree: Configuration/Fieldbus Slave
  (refer also Parameter manual **b maXX 5000**)
  - Set Synchronization to „On“
  - SYNC time = EtherCAT® cycle time = 125 µs to 8 ms

    This setting is not necessary if using the CoE profile (CoE: CANopen® over EtherCAT®) and the EtherCAT® master has set the parameter 1C32.02 „Cycle Time“ to a valid value or „Distributed Clock“ is set to Sync0.

    When using the SoE profile (Servodrive profile over EtherCAT®) the fieldbus cycle time can be set via S parameter S-0-0002 or directly via controller parameter fieldbus cycle time. In case „Distributed Clock" is activated the set fieldbus cycle time must be identical with the Sync0 Unit cycle. The Sync0 Unit cycle is set via the EtherCAT® master. No synchronous operation is possible if this condition is not fulfilled. The slave inhibits the change from PreOperational to SafeOperational and generates an error message.

8.4.2 VARAN

Type code **BM5500, BM5600, BM5700** with VARAN:

BM5XXX-XXXX-XXXX-**02**XX-

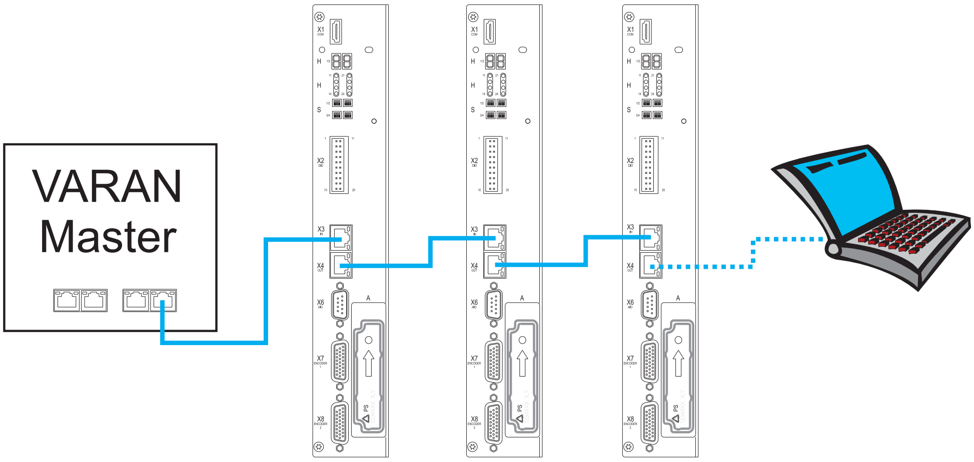
A **BM5500, BM5600, BM5700** with fieldbus option VARAN can communicate with a VARAN master.

X3 and X4 on the front side of the device are the RJ45 connections for EtherCAT®-line (also refer to ▹Controller terminals◃ on page 193).

Mounting and installation

The mounting/installation consists of the following steps:

1. De-energize the **BM5500, BM5600, BM5700** device
2. Set the **BM5500, BM5600, BM5700** IP-address, refer to ▹Setting the IP address with address switches◃ from page 133
3. Connect **BM5500, BM5600, BM5700** with VARAN bus cables (Ethernet-LAN cable at least CAT 5).
   - X3: VARAN-In, X4: VARAN-Out.
     On the first **BM5500, BM5600, BM5700** node of a VARAN line X3 is connected with the VARAN master. X4 is connected with X3 of the next **BM5500, BM5600, BM5700** slave in the line, and so on. The last node of a VARAN line has no connection of X4 or is connected with a PC (tunneling of Ethernet frames via VARAN to the controller, e. g. to communicate with ProDrive).
     Each slave within the VARAN line can be addressed and parametrized via selection of its IP address.



5000_0232_rev01_int.cdr

Figure 103: VARAN fieldbus connection

NOTE!

A point-to-point connection between PC (ProDrive) and **BM5500, BM5600, BM5700** VARAN slave for commissioning is possible even without a VARAN master.

- Please, observe an EMC-compatible laying of the Ethernet connection cables!
- The following cables were released for use by Baumüller:
  Ethernet connection cable;
  Further information refer to ▷Accessories Ethernet/EtherCAT®/VARAN/POWERLINK® .◁ on page 292.

Commissioning

The following preconditions must be fulfilled before commissioning:

1. **BM5500, BM5600, BM5700** with VARAN is installed correctly.
   - Ethernet connection cables are wired correctly.
2. The control cabinet is properly locked and all safety devices are operating.
3. The **b maXX BM5500, BM5600, BM5700** device is ready-to-use.
4. Create a Lasal-Class2 project using the driver classes for **BM5500, BM5600, BM5700** drives for cyclic and service data communication.
5. Start the VARAN control

Address switch

By means of the address switches S1 to S4 the IP-address is set
(Refer to settings ▷Setting the IP address with address switches◁ from page 133).

Parameters

The parameter settings determine the behavior of the VARAN-Slave in operation. Parameters are set with the software ProDrive.

1. Start ProDrive
2. Click on „Project Tree“.
3. Communication settings with ProDrive
   - Project Tree: Configuration/Fieldbus Slave
     (refer also Parameter manual **b maXX BM5500, BM5600, BM5700**)
     - Set Synchronization to „On“
     - Set Fieldbus cycle time according VARAN cycle time (1 ms, 2 ms, 4 ms or 8 ms)
     - Source sync signal = „field bus“

8.4.3 CANopen®

Type code **BM5500, BM5600, BM5700** with CANopen®:

BM5XXX-XXXX-XXXX-**03**XX-

The data can be transmitted to all the other CAN-users (e g from CANopen® master) via the **BM5500, BM5600, BM5700** .

X3 and **X4** are the RJ45 connections for CAN bus cables (also refer to ▷Controller terminals◁ on page 193), which are on the front side of the device.

Mounting and installation

The mounting / installation consists of the following steps:

1. De-energize **BM5500, BM5600, BM5700** device
2. Set address and baud rate (transfer rate) at the **BM5500, BM5600, BM5700** , refer to ▷CANopen®◁ on page 136.
3. Connect **BM5500, BM5600, BM5700** with CANopen®-bus cables (and if necessary, a terminated connector).
   - Comply to EMC-oriented laying of CANopen® connection cables!
   - Baumüller released the following cables for use:
     CANopen® connection cable;
     further information refer to ▷Accessories - CANopen®.◁ on page 293.

NOTE!

If the **BM5500, BM5600, BM5700** device is the last bus node in the line, X4 must be terminated with a terminating connector (refer to ▷Accessories - CANopen®.◁ on page 293).

Commissioning

The following preconditions must be fulfilled before commissioning can be made:

1. **BM5500, BM5600, BM5700** with CANopen® is correctly installed.
   - CANopen®-connection cables are correctly wired.
2. The control cabinet has been locked correctly and the safety devices have been put into operation.
3. The **BM5500, BM5600, BM5700** device is ready-to-use.

Address switch

By means of the address switch S1 to S4 the settings, like e.g. the baud rate (transfer rate) and the address setting (slave No. /ID) are made
(refer to ▷CANopen®◁ on page 136).
Further information about parameter setting of the CANopen® slave, refer to „Application Manual“.

Process of commissioning

The test-commissioning is divided into the following sections:

1. Configuration of the CANopen® slave
2. Testing of the CANopen® slave

Configuring the CANopen® slave

The CANopen® is configured at the running device with ProDrive and a NMT-Master.

1. Switch on **BM5500, BM5600, BM5700** with CANopen®
2. Start ProDrive
3. Ensure, that the CANopen® slave communicates with the NMT-Master (the slave reports to the master with the boot-up telegram), i.e. CAN-telegrams can be send/received.

Make the following settings:

4. ProDrive: Activate communication source (refer to Parameter Manual: Drive manager)
5. NMT-Master: Create PDO-Mapping
   (refer to Programming Manual CANopen®“)
6. NMT-Master: with the NMT-command :=1 into the state „OPERATIONAL change“, then the cyclic communication starts.

Testing of the CANopen®-Slave

The CANopen® slave is tested, by using the total CANopen® network.

ProDrive does not indicate errors, the CANopen® slave was commissioned.

Operation

Avoid a reset of the **BM5500, BM5600, BM5700** in the cyclical operation of the CANopen® slave.

WARNING!

Risk of injury due to moving parts!

Rotating and/or linearly moving parts can cause severe injuries.

If a reset of the **BM5500, BM5600, BM5700** device is released in the running cyclical operation or if the communication source is switched off, this can cause unwanted conditions in the active application.

Therefore:

- Ensure, that the NMT master does not execute a reset, as long as the **BM5500, BM5600, BM5700** device is in the cyclical operation
- Ensure, that the CANopen® communication source only is able to communicate with the **BM5500, BM5600, BM5700** device.

NOTE!

After a reset the booting data set is loaded in the controller. In addition the mapping is set on the CANopen®, which was saved in the controller part before the reset was executed.

8.4.4 POWERLINK®

Type code **b maXX BM5500, BM5600, BM5700** with POWERLINK®:

BM5XXX-XXXX-XXXX-**04**XX-

b maXX BM5500, BM5600, BM5700 devices can communicate with a POWERLINK® Managing Node via the fieldbus connection POWERLINK®.

X3 and **X4** on the front side of the device are the RJ45 connections for POWERLINK® (also refer to ▹Controller terminals◃ on page 193).

Mounting and installation

The mounting/installation consists of the following steps:

1. De-energize the **b maXX BM5500, BM5600, BM5700** device
2. Set the **b maXX BM5500, BM5600, BM5700** IP-address, refer to ▹Setting the IP address with address switches◃ from page 133
3. Connect **b maXX BM5500, BM5600, BM5700** with Ethernet-connection cables.
   - Please, observe an EMC-compatible laying of the Ethernet connection cables!
   - The following cables were released for use by Baumüller: Ethernet-connection cable; Further information refer to ▹Accessories Ethernet/EtherCAT®/VARAN/POWERLINK® .◃ on page 292.

Commissioning

The following preconditions must be fulfilled before commissioning:

1. **b maXX BM5500, BM5600, BM5700** with POWERLINK® is installed correctly.
   - Ethernet-connection cables are wired correctly.
2. The control cabinet is properly locked and all safety devices are operating.
3. The **b maXX BM5500, BM5600, BM5700** device is ready-to-use.

Address switch

By means of the address switches S3 and S4 the last byte of the IP-address is set (Refer to settings ▹Setting the IP address with address switches◃ from page 133).
IP address 192.168.100.0 is not allowed.
Further information about the setting possibilities of the POWERLINK® Controlled Node refer to „Application Manual“.

Parameters

The parameter settings determine the behavior of the POWERLINK® Controlled Node in operation. Parameters are set with the software ProDrive.

1. Start ProDrive
2. Click on „Project Tree“.
3. Communication settings with ProDrive
   - Project Tree: Configuration/Fieldbus Slave (refer also Parameter manual **b maXX BM5500, BM5600, BM5700**)
     - set Synchronization to „On“
     - SYNC time = Fieldbus cycle time = POWERLINK® cycle time = 500 µs to 8 ms

       This setting is not necessary if using the POWERLINK® profile and the POWERLINK® Managing Node sets a valid value in object 0x1006 „Communication cycle period“.

9

MAINTENANCE

9.1 Safety notes

Basic information

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.

WARNING!

Risk of injury due to improperly performed maintenance work!

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

Therefore:

- Before beginning work, make sure that there is enough space 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 condition

If the prescribed environmental conditions are adhered to, then the device is maintenance-free. For the prescribed environmental conditions, refer to ▷Required environmental conditions◁ on page 53.

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:

- Does the motor work as desired?
- Is the operating environment normal?
- Is the cooling system working normally?
- If an unusual vibration or noise is noticed during operation.
- Does the motor overheat during operation?

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 system = discharge time of the device with the longest DC link discharge time in the DC link connection.

Refer to ▹Electrical data basic units◃ from page 61.

Therefore:

- Do not touch before taking into account the discharge time of the capacitors and electrically live parts.
- Heed corresponding notes on the equipment.
- If additional capacitors are connected to the DC link, the DC link discharge can take a much longer time. In this case, the necessary waiting period must 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.

9.3 Inspection intervals - maintenance notes

9.3.1 Periodic maintenance

- Environmental condition

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Check environmental temperature, humidity and vibrations. Check whether dust, oil or drops of water appear.	Visual inspection and measurement of the environmental conditions, comparison with standard values.	O		
Check whether there are hazardous objects in the vicinity.	Visual inspection	O		

- Voltage

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Check the voltage of the power supply system and the control circuits	Measurement and comparison with standard values.	O		

- Mechanical parts

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any abnormal noises or vibrations?	Visual and audio check		O	
Are there any loose screws?	Tighten the screws.		O	
Are there any bent or damaged parts?	Visual inspection		O	
Have there been any color changes due to overheating?	Visual inspection		O	
Are there any dust or dirt deposits?	Visual inspection		O	

- Power supply

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any missing or loose screws?	Replace the screws or, respectively, tighten them.		O	
Is there any deformation, cracking, damage or color change on the device as a result of overheating or aging?	Visual inspection		O	
Are there any dust or dirt deposits?	Visual inspection		O	

- Connections and circuitry of the mains power supply

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Does the wiring indicate any color or shape changes due to overheating?	Visual inspection		O	
Is the wiring insulation damaged or is it discolored?	Visual inspection		O	
Is there any damage?	Visual inspection		O	

- Transformer and chokes in the main circuit

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any abnormal vibrations or noticeable odors?	Visual inspection, audio check and odor check		O	

- Solenoid switch and relay in the power supply circuit

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any loose screws?	Visual and audio check Tighten screws if necessary.	O		
Do the switches function correctly?	Visual inspection	O		

- Plug connectors in the power supply circuit

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any loose screws or connectors?	Tighten screws and firmly stick in plug connector.		O	
Are there any noticeable odors or color changes?	Visual inspection and odor check		O	
Is there any cracking, damage, deformation or corrosion?	Visual inspection		O	
Is there any leaking fluid or deformation of the capacitors?	Visual inspection		O	

- Cooling system fans

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any abnormal noises or vibrations?	Visual and audio check			O
Are there any loose screws?	Tighten the screws.			O

- Cooling system ventilation duct

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any obstructions in the heat sink, air supply or air outlet?	Visual inspection	O		

9.4 Repairs

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

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Germany

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

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

10

TROUBLESHOOTING AND FAULT CORRECTION

10.1 Behavior in case of malfunctions

Basic information

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.

WARNING!

Risk of injury due to improper fault correction!

Therefore:

- Only qualified personnel may work on this device!
- Personnel that work with the **b maXX** device must be trained in the safety regulations and the handling of the device, and be familiar with the correct operation of it. In particular, reacting to error indications and conditions requires that the operator must have special knowledge.

10.2 Monitoring functions

Monitoring function	Warning/error	Warning	Error	Adjustable threshold	Adjustable reaction	Reaction pulse inhibit
Mains voltage	Mains undervoltage	X	X	-	-	X
	Mains overvoltage	X	X	-	-	X
Phase monitoring	Phase failure	X	X	-	-	X
	Mains failure	X	X	X	-	X [1]
Ground fault	Fault current to ground	-	X	-	-	X
Overcurrent	Motor overcurrent	-	X	-	-	X
DC link	DC link overvoltage	-	X	-	-	X
	DC link relative undervoltage	X	X	-	-	X
Overload monitoring	Peak current not possible at this time	X	-	-	-	-
Heat sink temperature	Temperature > threshold 1	X	-	X	-	-
	Temperature > switch-off threshold	-	X	-	-	X
Temperature of device interior	Temperature > threshold 1	X	-	X	-	-
	Temperature > switch-off threshold	-	X	-	-	X
Motor temperature	I^2t threshold exceeded	-	X	X	-	X
	Threshold 1 exceeded [2]	X	-	X	-	-
	Threshold 2 exceeded [2]	X	-	X	-	-
	Sensor short-circuit and/or temperature < -30 °C [2]	-	X	-	-	-
	Sensor not connected and/or temperature > 250 °C [2]	-	X	-	-	-
	Maximum temperature exceeded [2]	-	X	X	-	X
Position controller	Dynamic position deviation	-	X	X	X	-
	Static position deviation	-	X	X	X	-
Encoder 1	Cable break	-	X	X	X	-
	Cable break ($SIN^2 + COS^2$)	-	X	X	X	-
	Excessive rotational speed	-	X	X	X	[3]

[1] Pulse inhibit carried out after a set time interval

[2] Only if KTY/PT1000 sensor used

[3] Adjustable

X: Implemented
-: Not possible

Monitoring function	Warning/error	Warning	Error	Adjustable threshold	Adjustable reaction	Reaction pulse inhibit
Encoder 2	Cable break	-	X	X	X	3)
	Cable break (SIN² + COS²)	-	X	X	X	3)
	Excessive rotational speed	-	X	X	X	3)
Cyclical specified value transmission to the fieldbus	Time-out during transmission	-	X	X	X	3)
Blockage monitoring	Drive blocked	-	X	X	-	X
Signal bus	Feed-in ready-to-operate	X	X	-	X	-
	Phase failure	X	X	-	X	-
	Brake resistance on	X	X	-	X	-
	Malfunction	X	X	-	X	-
	Signal bus warning	X	X	-	X	-
1) Pulse inhibit carried out after a set time interval 2) Only if KTY/PT1000 sensor used 3) Adjustable		X: Implemented -: Not possible				

Power supply voltage

- Not available at power modules

This monitoring function checks if the power supply voltage has a value within the adjusted voltage range.

Phase monitoring

- not available at power modules

This monitoring function checks the three phases of the power supply voltage.

If one phase is missing, the warning "Phase failure" is reported after at most 5 s. The motor can be supplied with nominal current for a limited time (refer to P130.24) or with phase failure error current (refer to P129.25) unlimited.

If all phases are missing the error "Power supply failure" is generated after at most 5 s.

NOTE

If you work without a mains filter a power supply failure or phase failure is recognized after 100 ms. If the device is operated with a mains filter the power supply failure or phase failure can be detected after about 5 s. According to load state the failure can also be detected considerably earlier.

Ground fault

This monitoring function checks if there is a short-circuit between the motor terminals and the ground. If a short-circuit is detected, there is immediately a pulse inhibit.

Overcurrent

This monitoring function checks if the motor current is greater than 1.3 times output peak current. It serves as „Disaster prevention“ in case of an output-sided short-circuit.

DC link

This monitoring function checks the voltage of the DC link. In case the voltage is below a value, which was internally specified, the warning DC link undervoltage is generated by the controller. In case the voltage exceeds an adjusted value (about 820 V), the error „DC link overvoltage“ is signaled by the controller and the pulses are inhibited immediately.

Overload monitoring

This monitoring function controls the present load whether the power unit can supply the peak current at the moment. In case the peak current is not possible, the message „Power unit monitoring active and max. torque current is limited“ (warning 206) is generated.

Temperature device internal space

This monitoring function checks the temperature in the internal space of the device.

- In case the temperature is higher than the warning threshold, the controller generates a warning.
- In case the temperature is too high, the pulses are inhibited immediately.

Temperature heat sink

This monitoring function checks the temperature of the heat sink.

- In case the temperature is higher than the warning threshold, the controller generates a warning.
- In case the temperature is too high, the pulses are inhibited immediately.

Motor temperature

This monitoring function checks the temperature of motor. If the I^2t-threshold is exceeded, then the error message „I^2t overload“ is generated by the controller.

Only for KTY84 and PT1000 sensor

If the set temperature threshold 1 is exceeded, then the warning „Temperature threshold 1 exceeded“ is generated by the controller.

If the set temperature threshold 2 is exceeded, then the warning „Temperature threshold 2 exceeded“ is generated by the controller.

If the temperature falls below the minimum measurable value, or if a short circuit occurs at the sensor, then the error message „Temperature sensor short circuit“ is generated.

If the temperature exceeds the maximum measurable temperature, or if the sensor is not connected, then the error message „Temperature sensor not connected“ is generated by the controller.

For all sensors

If the threshold set (type-specific) in the temperature switch or in the sensor is exceeded, then the error message „Over temperature“ is generated by the controller and the pulses are inhibited immediately.

Position controller

This monitoring function checks the position deviation limit statical/dynamical. In case the position deviation error is statical/dynamical greater than the set position deviation error limit, there is an error message „position deviation error statical“ and „position deviation error dynamical“. After monitoring time (position deviation time), additionally an error message is generated and the pulses are inhibited immediately.

Block monitoring

This monitoring function checks the motor speed and the motor current.
If, for the period of time „block monitoring time“, the following two conditions are fulfilled, the error/warning „drive blocked“ is generated by the controller and the pulses are inhibited immediately.

- Motor speed = 0
- The motor current which is supplied by the device is equal to the set motor limit current (current limit).

Signal bus

The signal bus is a connection between the supply unit and the connected axes in the DC link network. The ready for use signal of the supply is signalized to the connected axes via this connection. Furthermore the signal bus can be used to signalize an error or a warning to the other connected devices.

Signal bus - Supply ready for use

The mains rectifier unit, the active mains rectifier unit and **BM5500, BM5600, BM5700** generate this signal. The connected axes evaluate this signal.

The signal indicates that the supply unit is in the **ready for use** state and the DC link is supplied. In the event of supply errors (e.g. power supply failure), the output of the ready fur use signal is stopped. If the signal is not available, an error is generated at the connected axes units.

Signal bus - Supply not ready for use

This signal indicates also the state of the supply. It is required if axes units will be operated in a DC link network with several **BM5500, BM5600 und BM5700** .

In this case it can only be evaluated by the „**Supply ready for use**“ signals whether at least one supplying device is ready, because the signal is a disjunction of the states of all supplying devices. It can not be recognized whether all supplying devices are ready.

In order to recognize that at least one supply unit is in state not ready for use, the signal **Supply not ready for use** is generated. The evaluation of this signal can be disabled for special applications.

Signal bus - Phase failure

BM5500, BM5600 und BM5700 generate this signal if a phase failure is recognized.

The axes can operate at phase failure only at the mains rectifier unit and at **BM5500, BM5600 und BM5700**. Several options are selectable for further operations, refer to parameter 130.10 Mode.

Signal bus - brake resistor on

This signal activates the brake resistors of several supplying devices simultaneously. Both mains rectifier unit and **BM5500, BM5600 und BM5700** provide a brake resistor connection and an own monitoring of the DC link voltage. If the DC link voltage exceeds a fixed threshold, the brake resistor is switched on.

The axis units monitor also the DC link voltage and can be configured to generate the **Brake resistor on** signal. If this signal is set, the brake resistor is switched on at the mains rectifier unit and/or at the **BM5500, BM5600 und BM5700**.

This signal is not evaluated at the active mains rectifier unit.

Signal bus - error

The axis units and the mono units can be configured to set the **Error** signal on the signal bus as soon as the device is no longer in state ready for use.

Furthermore each axis unit or each mono unit can be configured to generate an error message when detecting an **Error** signal. A simple error reaction for all axes is possible, using this function.

This signal is neither evaluated nor set at the active mains rectifier unit and at the mains rectifier unit.

Signal bus - Signal bus warning

Connected devices can exchange warning states among each other with this signal. The signal is evaluated or set only at axis units and mono units. It is neither evaluated nor set at the active mains rectifier unit and at the mains rectifier unit.

10.3 Fault detection

The fault can be caused by mechanical or electrical malfunctions.

LED

The occurrence of an error state is signalized by the lighting up of the red LED H14 on the front side of the housing.

The meaning of the individual LEDs is explained in ▹LED display controller◃ on page 130.

Essentially, the lowest red LEDs H14 „Malfunction“ are of significance here.

NOTE!

In case of warnings or errors without error reactions, the LEDs H14 **blink** „Malfunction“. Only error messages with error reaction will be signalized by **constant lighting up**.

7-segment display

In the status error the error numbers are shown in the display. Depending on the state of bit No. 16 in parameter **P135.1** (further information refer to parameter handbook **b maXX BM5000**) all error messages (with/without error reaction) or warnings are displayed.

The display of an error code starts therewith, that „F“ is displayed for 1.5 s. Then the four characters of the error code are displayed. The separate characters are displayed for about 0.8 s, interrupted by a short break. If there are other errors, these are displayed in the same manner. The procedure is repeated as soon as all errors were displayed.

Example: Errors 702 and 2418 are detected:

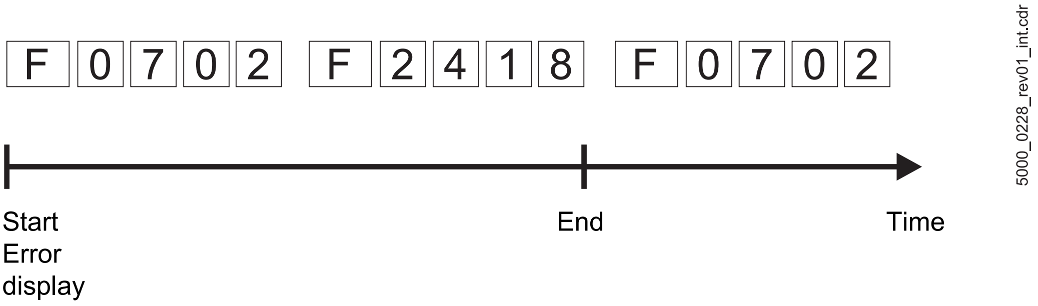


Figure 104: 7-segment display : errors and warnings

For further information on the subjects of error messages and error numbers, refer to „Parameter manual **b maXX 5000**".

10.4 Error handling

NOTE!

The device is shipped with predefined error reactions. With regard to the error messages identified with „depending on the setting“ in the „Reaction“ column, the device's error reaction can be adjusted. Errors that, due to safety reasons, have an immediate pulse inhibit as a consequence, may not be changed.

Error acknowledgment

If the red error LEDs H14 light up, at least one error exists.

Error acknowledgments cause all error messages to be reset. Individual acknowledgment of errors is not possible. An acknowledgment causes deletion of the errors if deletion was possible on account of the error circumstances.

There are three methods of acknowledging an error:

- By means of write access to the control word
- Via a digital input
- Via the pulse enable input
  This is conditional upon the drive only being controlled via the hardware inputs (thus, the control of the motor is not handled via another communications channel). Furthermore, the option „Error acknowledgment by means of pulse enable“ must be activated. The errors are acknowledged with the first rising signal edge of the pulse enable. However, the drive has still not started. A second rising signal edge is then necessary for the release.

For further information on the subject of error acknowledgment, refer to „Parameter manual **b maXX 5000**".

ACCESSORIES AND SPARE PARTS

Accessories/spare parts for devices of the **b maXX** series are listed in this appendix. Product management is happy to handle any queries and suggestions on accessory parts.

11.1 Cabling

11.1.1 Cables power supply-device

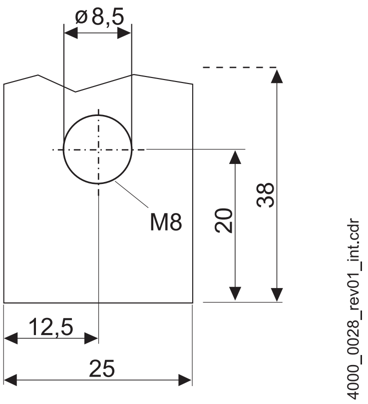
Device	Number of wires x cross section 1)	Connection to device 3)	Maximum length 2)
BM551**X**	4 x 0.5 bis 2.5 mm^2 (AWG 16 - 12)	Flexible cable with/without wire end ferrule (terminal block)	Power supply to mains filter: user-defined mains filter to power choke/ device: max. 30 cm
BM552**X**	4 x 0.5 to 4 mm^2 (AWG 24 - 10)	Flexible cable with wire end ferrule (screw terminal)	
BM55**32** BM55**33** BM55**34**	4 x 0.5 to 10 mm^2 (AWG 20 - 6)	Flexible cable with wire end ferrule (screw terminal)	
BM55**35**4)	4 x 16 mm^2 63 A-fuses must be provided for the cable protection and a cable with 16 mm^2 cross section must be used.	Pin-cable-lugs according to DIN 46230 The terminals at the BM5535 are provided for cross sections up to 10 mm^2, therefore at the BM5535 pin-cable-lugs according to DIN 46230 must be used.	
BM56**32**	4 x 25 mm^2 63 A-fuses must be provided for the cable protection and a cable with 25 mm^2 cross section must be used.	Flexible cable with wire end ferrule (screw terminal)	
BM554**X** BM564**X**	4 x 16 to 50 mm^2 (AWG 6 -0)	Flexible cable with wire end ferrule (screw terminal)	
BM555**X** BM565**X** BM575**X**	4 x 25 to ca. 185 mm^2	Cable lug max. width: 25 mm (current bar) 4)	
BM556**X** BM566**X** BM576**X**		Cable lug max. width: 35 mm (current bar) 5)	
BM557**X** BM577**X**	Max. 4 cables with (4 x 95 mm^2) Max. 2 cables with (4 x 185 mm^2)	Cable lug max. width: 25 mm or 35 mm (current bar) 6)	

1) Possible cross section
For UL conform machines/installations you must use UL certified circuit cables.

2) The length of the cable between mains filter and power supply is not of importance for the compliance to the EMC regulation.

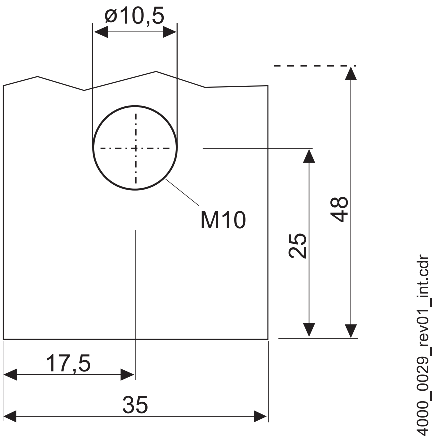
3) The installing of the cables is user-defined.

4)



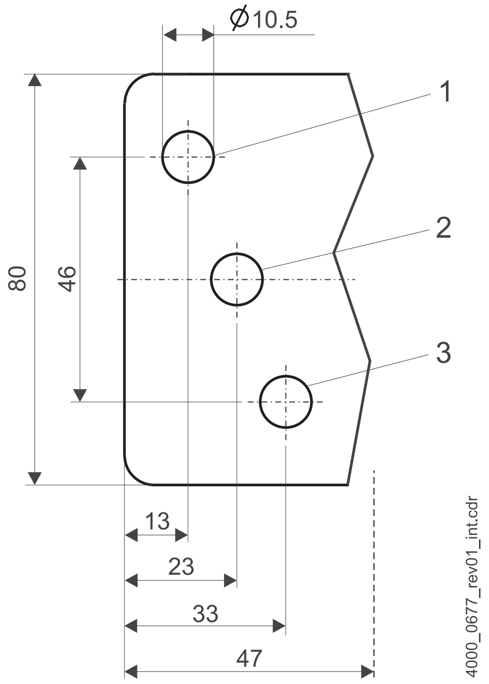
Connection lugs (current bars). Position refer to ▹Figure 93◃ on page 184 .
Screw maximum two cable lugs to the current bar - one on the front side, one on the reverse side of the bar.

5)



Connection lugs (current bars). Position refer to ▹Figure 93◃ on page 184
Screw maximum two cable lugs to the current bar - one on the front side, one on the reverse side of the bar.

6)



Connection lugs (current bars). Position refer to ▹Figure 96◃ on page 187

At connection cross-section 95 mm^2, cable lug width max. 25 mm:
Screw maximum two cable lugs to the current bar - one on the front side, one on the reverse side of the bar.

At connection cross-section 185 mm^2, cable lug width max. 35 mm:
Screw two cable lugs to the current bar at maximum- one on the front side, one on the reverse side of the bar.

11.1.2 Cables device-motor

Device	Number of wires x cross section 1)	Maximum length 2)3)	Connection to device
BM551**X**	4 x 1 bis 2.5 mm^2 (AWG 16 - 12)	100 m	Flexible cable with/without wire end ferrule (terminal block)
BM552**X**	4 x 2 bis 4 mm^2 (AWG 24 -10)	1.5 bis 2.5 mm^2: 100 m From 4 mm^2: 60 m	Flexible cable with wire end ferrule (screw terminal)
BM553**X**	4 x 4 bis 16 mm^2 (AWG 20 - 4)	60 m	
BM554**X**	4 x (16 to 50 mm^2) (AWG 6 - 0)	Up to 25 mm^2: 60 m From 35 mm^2: 50 m	
BM555**X** BM575**X**	4 x (20 to ca. 185 mm^2)	Up to 50 mm^2: 50 m > 50 mm^2: 15 m	Cable lug max. width5 25 mm (current bar) 4)
BM556**X** BM576**X**			Cable lug max. width: 35 mm (current bar) 6)
BM557**X**7) BM577**X**7)	Max. 4 cables each with (4 x 95 mm^2) Max. 4 cables each with (2 x 185 mm^2)	At 95 mm^2: 15 m At 185 mm^2: 30 m	Cable lug max. width: 25 mm or 35 mm (current bar) 7)

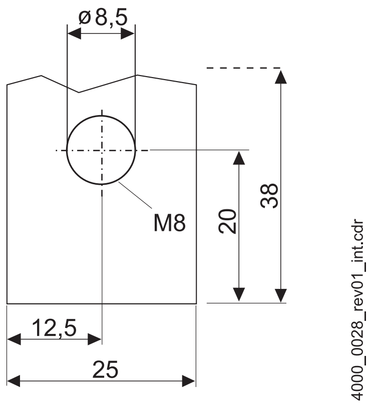
1) Possible cross section
Use a screened circuit Baumüller-line, optical shield coverage > 85%. Do not use single conductors.
For UL conform machines/installations you must use UL certified circuit cables.

2) Only for Baumüller cables with this maximum length and by usage of a Baumüller mains filter you can assume, that the limit values of the EMC product standard EN 61800-3 are complied with.
Available Baumüller cables see Baumüller motor documentation.

3) In case you use parallel-installed motor cables, the maximum length is to be reduced by the factor 1/n.

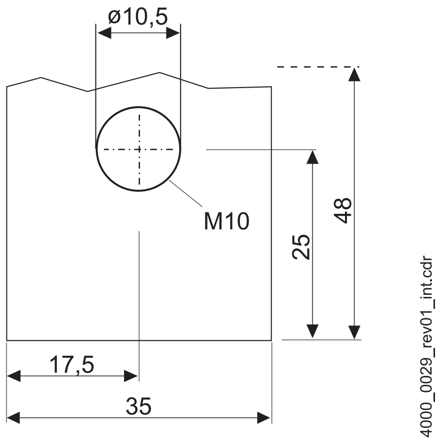
4) After January 2018 delivery date: The devices provide connection terminals for larger cable cross-section.

5)



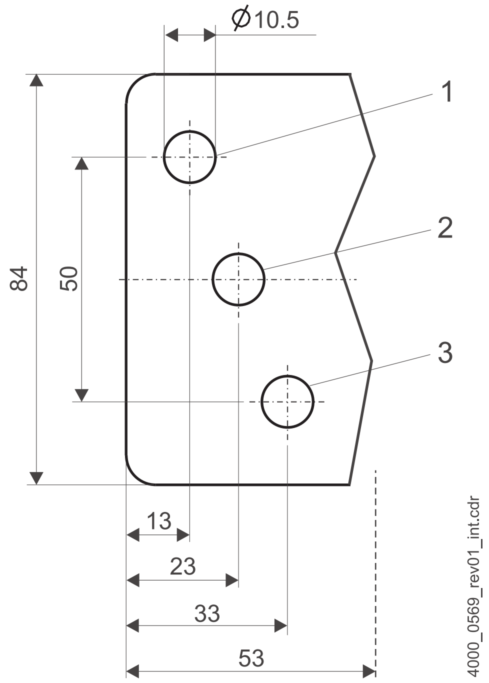
Connection lugs (current bars). Position refer to ▹Figure 93◃ on page 184 .
Screw maximum two cable lugs to the current bar - one on the front side, one on the reverse side of the bar.

6)



Connection lugs (current bars). Position refer to ▹Figure 93◃ on page 184
Screw maximum two cable lugs to the current bar - one on the front side, one on the reverse side of the bar.

7)



Connection lugs (current bars). Position refer to ▹Figure 96◃ on page 187

At a connection cross-section of 95 mm^2, cable lug width max. 25 mm:
Screw maximum two cable lugs to the current bar - one on the front side, one on the reverse side of the bar.

At a connection cross-section of 185 mm^2, cable lug width max. 35 mm:
Screw two cable lugs to the current bar at maximum- one on the front side, one on the reverse side of the bar.

11.1.3 Hybrid cable device-encoder-motor

Selection

The trailing cables are suitable for mobile deployment, for example in mobile cable handlers. In addition, the cable sheath can be used in environments with acids and bases (e.g. coolant).

The encoder wires for HIPERFACE DSL® encoders are connected with the device.

Cables

Pre-assembled - trailing type; CE UL/CSA, halogen-free, silicone-free, FCKW-free, RoHS compliant, additional lengths upon request.

Length	**Hybrid cable motor HIPERFACE DSL®**				
	15 A speedtec® M23	**20 A** speedtec® M23	**21 A** speedtec® M40	**28 A** speedtec® M40	**36 A** speedtec® M40
	Part No.				
3 m	464201	464217	464235	464278	464294
5 m	464202	464218	464236	464279	464295
7 m	464203	464219	464237	464280	464296
10 m	464204	464220	464238	464281	464297
15 m	464205	464221	464239	464282	464298
20 m	464206	464222	464240	464283	464299
25 m	464207	464223	464241	464284	464300
30 m	464208	464224	464242	464285	464301
35 m	464209	464225	464243	464286	464302
40 m	464210	464226	464244	464287	464303
50 m	464211	464227	464245	464288	464304
60 m	464212	464228	464246	464289	464305

- **Motor cable with HIPERFACE DSL® 15 A**

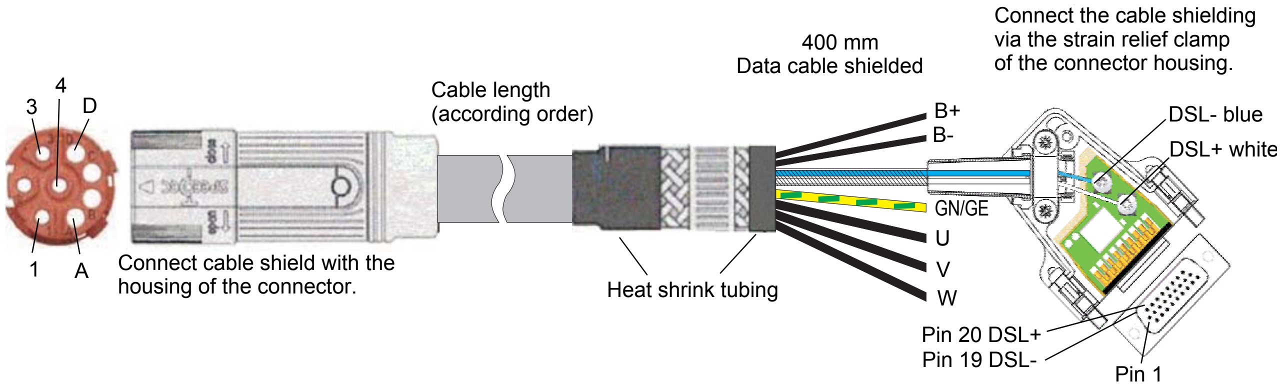


Figure 105: Motor cable with HIPERFACE DSL® 15 A

Cable: 4G1.5+(2x0,75)+(2x22AWG)
Shielding: copper wires, tinned

Motor side:
Circular metal connector speedtec® M23 8-pin
Connect outside shielding and inside shielding with the connector housing.

Device side:
Metal D-sub connector 45°, 26-pin with electronics, part No. 460219
Connect inside shielding with the connector housing.

Circular connector speedtec® M23	Type of stranding	Unconnected wires	Cross section of wire
1	———————	U	1.5 mm² / black / U
3	———————	V	1.5 mm² / black / V
4	———————	W	1.5 mm² / black / W
⏚	———————	GN/GE	1.5 mm² / green-yellow
A		B+	0.75 mm² / black
B		B-	0.75 mm² / black
C		-	22 AWG / white
D		-	22 AWG / blue
Housing		-	Outside shielding
Housing		-	Inside shielding

- **Motor cable with HIPERFACE DSL® 20 A**

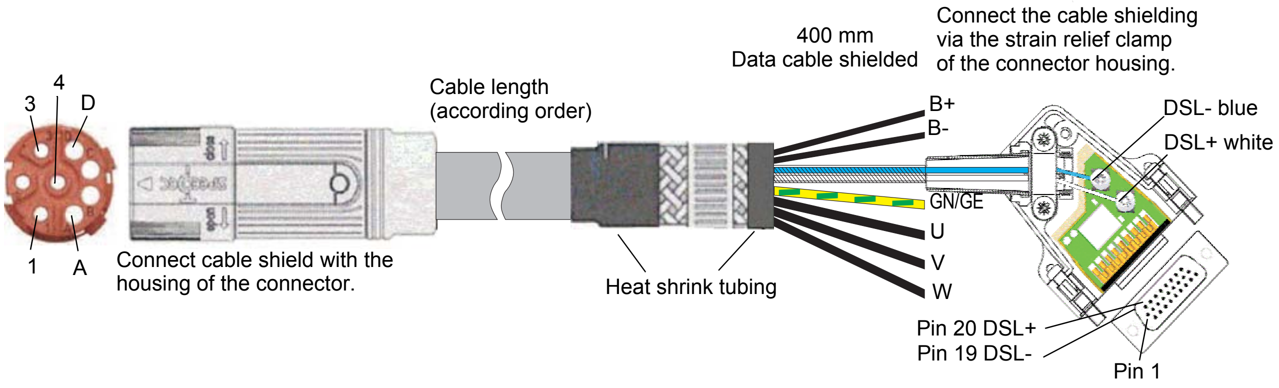


Figure 106: Motor cable with HIPERFACE DSL® 20 A

Cable: 4G2.5+(2x1.0)+(2x22AWG)
Shielding: copper wires, tinned

Motor side:
Circular metal connector speedtec® M23 8-pin
Connect outside shielding and inside shielding with the connector housing.

Device side:
Metal D-sub connector 45°, 26-pin with electronics, part No. 460219
Connect inside shielding with the connector housing.

Circular connector speedtec® M23	Type of stranding	Unconnected wires	Cross section of wire
1	—————————	U	2.5 mm² / black / U
3	—————————	V	2.5 mm² / black / V
4	—————————	W	2.5 mm² / black / W
⏚	—————————	GN/GE	2.5 mm² / green-yellow
A	—><—><—	B+	1.0 mm² / black
B		B-	1.0 mm² / black
C	—><—><—	-	22 AWG / white
D		-	22 AWG / blue
Housing		-	Outside shielding
Housing		-	Inside shielding

- **Motor cable with HIPERFACE DSL® 21 A**

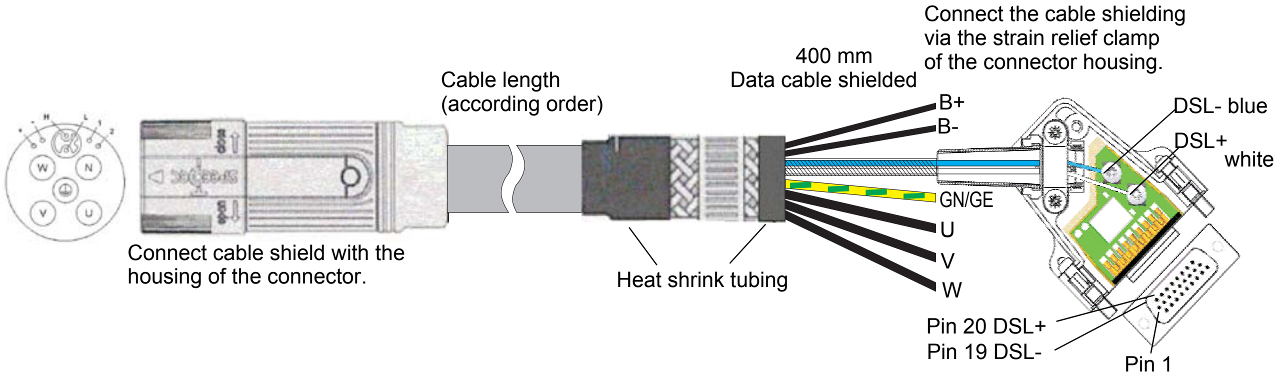


Figure 107: Motor cable with HIPERFACE DSL® 21 A

Cable: 4G2,5+(2x1.0)+(2x22AWG)
Shielding: copper wires, tinned

Motor side:
Circular metal connector speedtec® M40 9-pin
Outside shielding and inside shielding must be wired separately.

Device side:
Metal D-sub connector 45°, 26-pin with electronics, part No. 460219
Connect inside shielding with the connector housing.

Circular connector speedtec® M40	**Type of stranding**	**Unconnected wires**	**Cross section of wire**
U	———————————	U	2.5 mm² / black / U
V	———————————	V	2.5 mm² / black / V
W	———————————	W	2.5 mm² / black / W
⏚	———————————	GN/GE	2.5 mm² / green-yellow
+	—╳——╳—	B+	1.0 mm² / black
-		B-	1.0 mm² / black
H	—╳——╳—	DSL+	22 AWG / white
L		DSL-	22 AWG / blue
Housing		-	Outside shielding
Housing		-	Inside shielding

- **Motor cable with HIPERFACE DSL® 28 A**

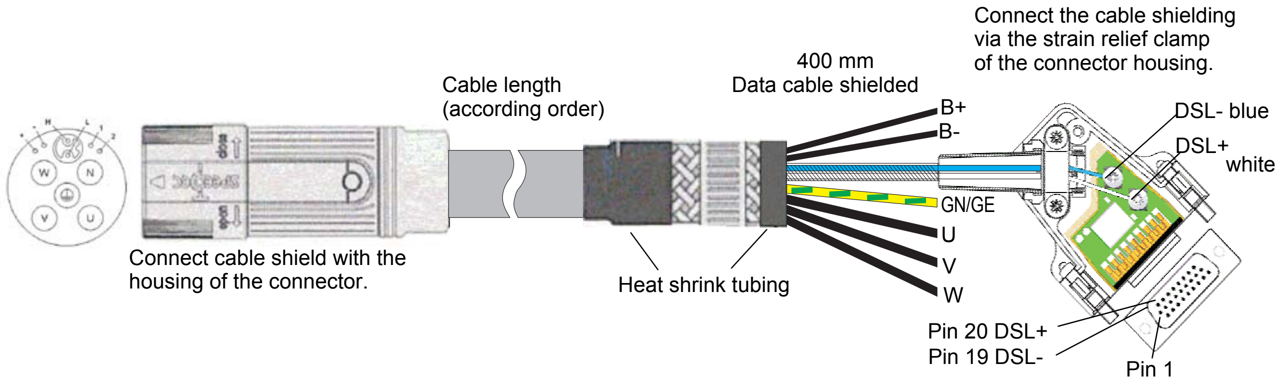


Figure 108: Motor cable with HIPERFACE DSL® 28 A

Cable: 4G4.0+(2x1.0)+(2x22AWG)
Shielding: copper wires, tinned

Motor side:
Circular metal connector speedtec® M40 9-pin
Outside shielding and inside shielding must be wired separately.

Device side:
Metal D-sub connector 45°, 26-pin with electronics, part No. 460219
Connect inside shielding with the connector housing.

Circular connector speedtec® M40	Type of stranding	Unconnected wires	Cross section of wire
U	———————————	U	4 mm² / black / U
V	———————————	V	4 mm² / black / V
W	———————————	W	4 mm² / black / W
⏚	———————————	GN/GE	4 mm² / green-yellow
+	—X——X—	B+	1.0 mm² / black
-		B-	1.0 mm² / black
H	—X——X—	DSL+	22 AWG / white
L		DSL-	22 AWG / blue
Housing		-	Outside shielding
Housing		-	Inside shielding

- **Motor cable with HIPERFACE DSL® 36 A**

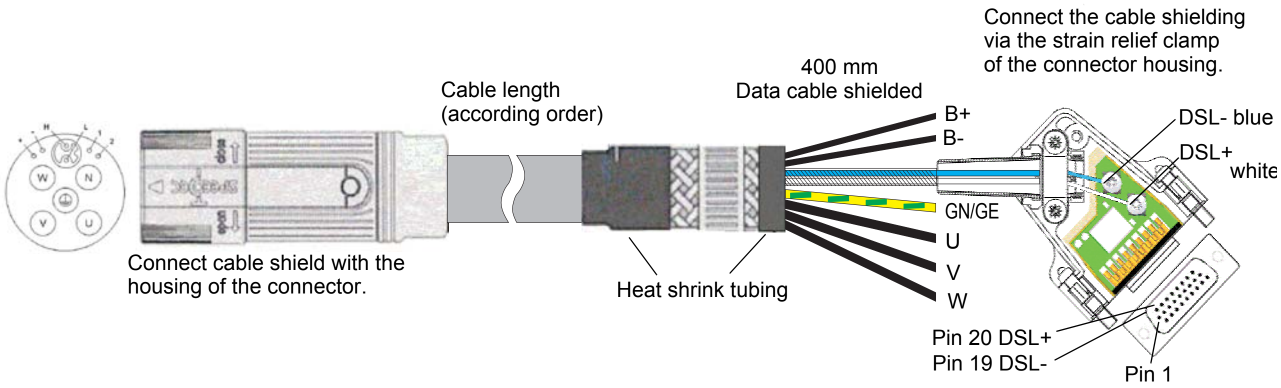
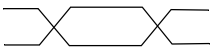
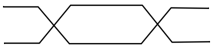


Figure 109: Motor cable with HIPERFACE DSL® 36 A

Cable: 4G6.0+(2x1.0)+(2x22AWG)
Shielding: copper wires, tinned

Motor side:
Circular metal connector-pin speedtec® M40 9-pin
Outside shielding and inside shielding must be wired separately.

Device side:
Metal D-sub connector 45°, 26-pin with electronics, part No. 460219
Connect inside shielding with the connector housing.

Circular connector speedtec® M40	Type of stranding	Unconnected wires	Cross section of wire
U	———————————	U	6 mm² / black / U
V	———————————	V	6 mm² / black / V
W	———————————	W	6 mm² / black / W
⏚	———————————	GN/GE	6 mm² / green-yellow
+		B+	1.0 mm² / black
-		B-	1.0 mm² / black
H		DSL+	22 AWG / white
L		DSL-	22 AWG / blue
Housing		-	Outside shielding
Housing		-	Inside shielding

11.1.4 Control voltage supply/signal cable

Cross-section [1]	≤ 1.5 mm^2
Maximum length (without digital I/O) [2]	Discretionary
Maximum length with digital I/O	30 m
Connection to device	Without/with wire end ferrule (clamp terminal)

[1] The type of routing is discretionary.

[2] The length of the cable has no influence on adherence to the EMC law.

11.1.5 Encoder cables

Selection of the encoder cables

The trailing cables are suitable for mobile deployment, for example in mobile cable handlers. In addition, the cable sheath can be used in environments with acids and bases (e.g. coolant).

With servo motors using the Resolver encoder system, the temperature sensor is connected to the device via the encoder cable. Additional technical data, connector assignments, application notes and Part numbers can be found in the motor documentation.

Cables

Pre-assembled - trailing type; CE UL/CSA, halogen-free, according to IEC 60754-1, silicone-free, FCKW-free, RoHS compliant, additional lengths upon request.

	Resolver		**Encoder with HIPERFACE®**		**Sine-/square wave incremental encoder**	
	Part No.		Part No.		Part No.	
Length		speedtec®		speedtec®		speedtec®
1 m	429914	448746	429958	448761	430015	448777
2 m	429915	448747	429959	448762	430016	448778
3 m	429916	448748	429960	448763	430017	448779
5 m	429917	448749	429961	448764	430018	448780
7 m	429918	448750	429962	448765	430019	448781
10 m	429919	448751	429963	448766	430020	448782
15 m	429920	448752	429964	448767	430021	448783
20 m	429921	448753	429965	448768	430022	448784
25 m	429922	448754	429966	448769	430023	448785
30 m	429923	448755	429967	448770	430024	448786
35 m	429924	448756	429968	448772	430025	448787
40 m	429925	448757	429969	448773	430026	448788
50 m	429926	448758	429970	448774	430027	448789
75 m	429927	448759	429971	448775	430028	448790

Length	Encoder with EnDat®/SSI		Encoder with EnDat® 2.2		Encoder with HIPERFACE DSL®	
	Part No.		Part No.		Refer to ▹Hybrid cable device-encoder-motor◃ on page 250	
		speedtec®	M12	speedtec® M23		
1 m	429986	448796	458805	465906		
2 m	429987	448797	458806	465907		
3 m	429988	448798	458807	465908		
5 m	429989	448799	458808	465909		
7 m	429990	448800	458809	465910		
10 m	429991	448801	458810	465911		
15 m	429992	448802	458811	465912		
20 m	429993	448803	458812	465913		
25 m	429994	448804	458813	465914		
30 m	429995	448805	458814	465915		
35 m	429996	448806	458815	465916		
40 m	429997	448807	458816	465917		
50 m	429998	448808	458817	465918		
75 m	429999	448809	458818	465919		

11.1.5.1 Connecting cable for resolver

The connecting cable is available as accessory part from Baumüller Nürnberg GmbH.

Follow the instructions below if a self-made cable is to be used:

1 Utilize the following materials:
- Cable: Li9YC 1x2x0.25-Li9Y 2x2x0,25-Li9Y C11Y 1x2x0.34GN.
- High-density D-sub connector: 26-pin, male
- Round connector: 12-pin, female (e.g. from Interconnectron)

2 Fully adjoin the cable shield with the housing of the round connector and with the shielding of the D-sub connector.

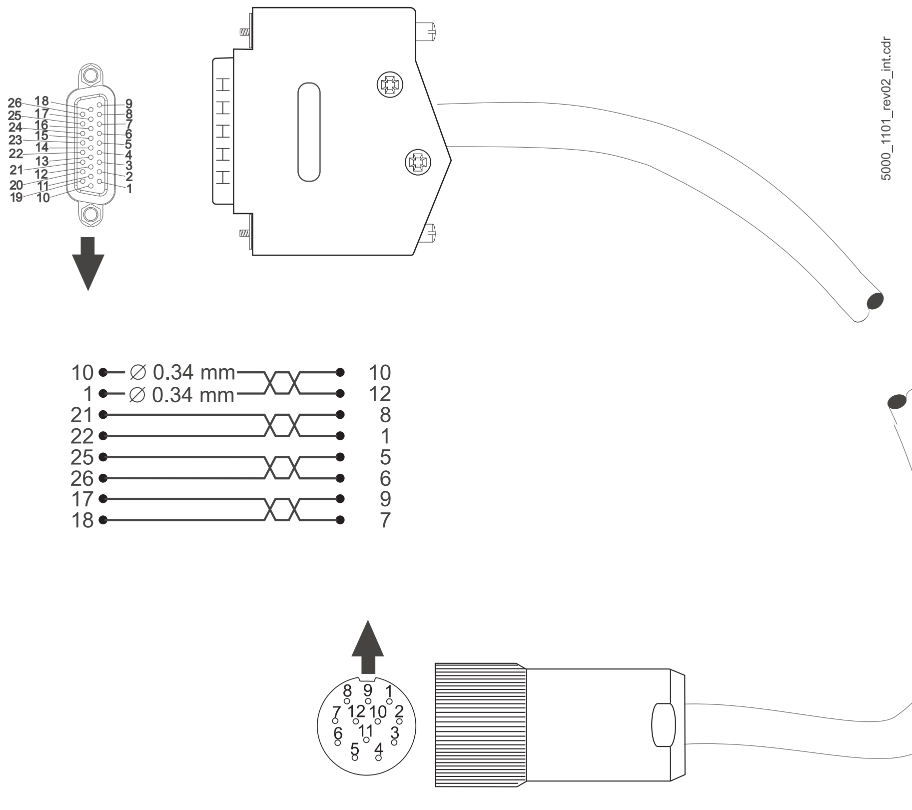


Figure 110: Connecting cable for resolver

NOTE

The connecting cable must be made according to the figure shown above!
If there is a different pin assignment, the cable is not operable and could lead to defects, both in the encoder module and the encoder!

11.1.5.2 Connecting cable for encoders with HIPERFACE®

The connecting cable is available as accessory part from Baumüller Nürnberg GmbH.

Follow the instructions below if a self-made cable is to be used:

1 Utilize the following materials:

- Cable: Li9YC3x2x0.25-Li9Y3x2x0,25-Li9Y C11Y 1x2x0.34GN. Two cable pairs are not needed and also not connected.
- High-density D-sub connector: 26-pin, male
- Round connector: 12-pin, female (e.g. from Interconnectron)

2 Fully adjoin the cable shield with the housing of the round connector and with the shielding of the D-sub connector.

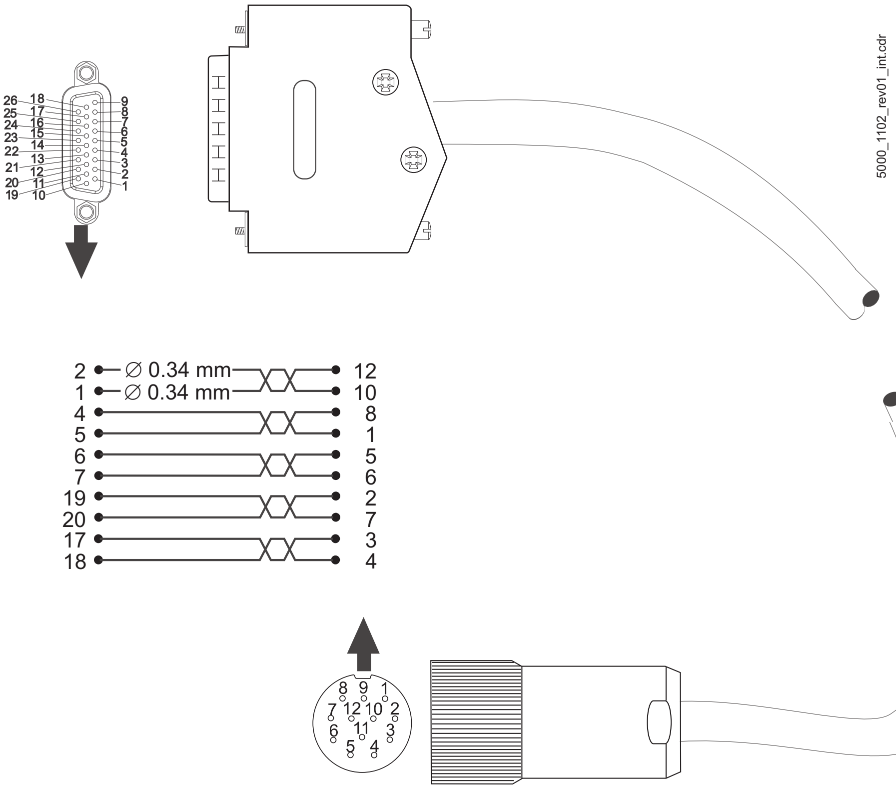


Figure 111: Connecting cable for encoder with HIPERFACE®

NOTE

The connecting cable must be made according to the figure shown above!
If there is a different pin assignment, the cable is not operable and could lead to defects, both in the encoder module and the encoder!

11.1.5.3 Connecting cable for encoder with EnDat® or SSI

The connecting cable is available as accessory part from Baumüller Nürnberg GmbH.

Follow the instructions below if a self-made cable is to be used:

1. Utilize the following materials:
   - Cable: Li9YC3x2x0.25-Li9Y3x2x0,25-Li9Y C11Y 1x2x0.34GN. Two cable pairs are not needed and also not connected.
   - High-density D-sub connector: 26-pin, male
   - Round connector: 17-pin, female (e.g. from Interconnectron)
2. Fully adjoin the cable shield with the housing of the round connector and with the shielding of the D-sub connector.

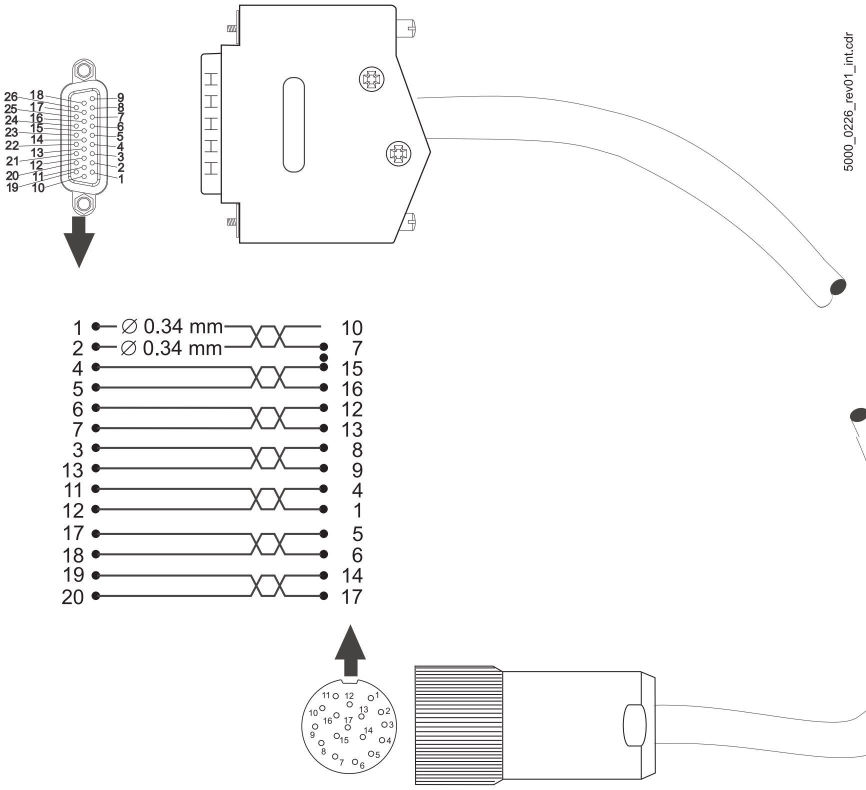


Figure 112: Connecting cable for encoder with EnDat® or SSI

NOTE

The connecting cable must be made according to the figure shown above!
If there is a different pin assignment, the cable is not functionally operable and could lead to defects, both in the encoder module and the encoder!

11.1.5.4 Connecting cable for encoder with EnDat® 2.2

The connecting cable is available as accessory part with M12 or speedtec® M23 from Baumüller Nürnberg GmbH.

M12

Follow the instructions below if a self-made cable with M12 is to be used:

1 Utilize the following materials:

- Cable: 4 x 0,38 + 1 x (4 x 0,14)
- High-density D-sub connector: 26-pin, male
- Round connector: 8-pin M12, female (e.g. from Interconnectron)

2 Fully adjoin the cable shield with the housing of the round connector and with the shielding of the D-sub connector.

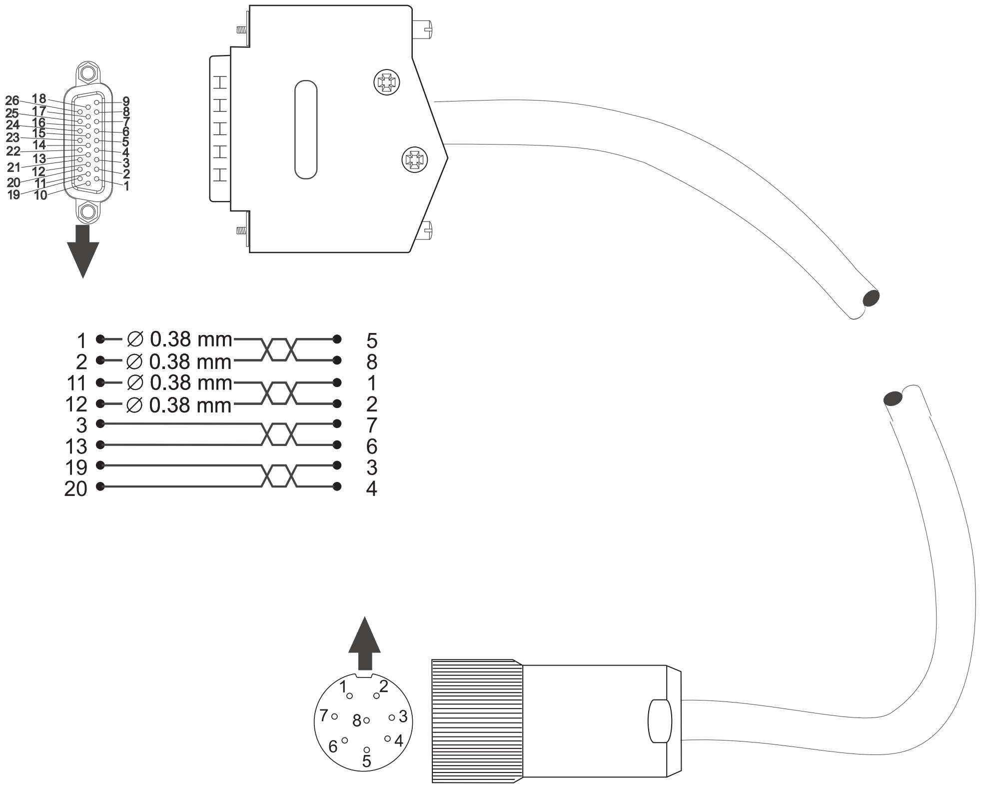


Figure 113: Connecting cable for encoder with EnDat® 2.2 M12

NOTE

The connecting cable must be made according to the figure shown above!
If there is a different pin assignment, the cable is not functionally operable and could lead to defects, both in the encoder module and the encoder!

speedtec® M23

Follow the instructions below if a self-made cable with speedtec® M23 is to be used:

1 Utilize the following materials:
   - Cable: 4 x 0,38 + 1 x (4 x 0,14)
   - High-density D-sub connector: 26-pin, male
   - Round connector: 9-pin speedtec® M23, female (Intercontec)

2 Fully adjoin the cable shield with the housing of the round connector and with the shielding of the D-sub connector.

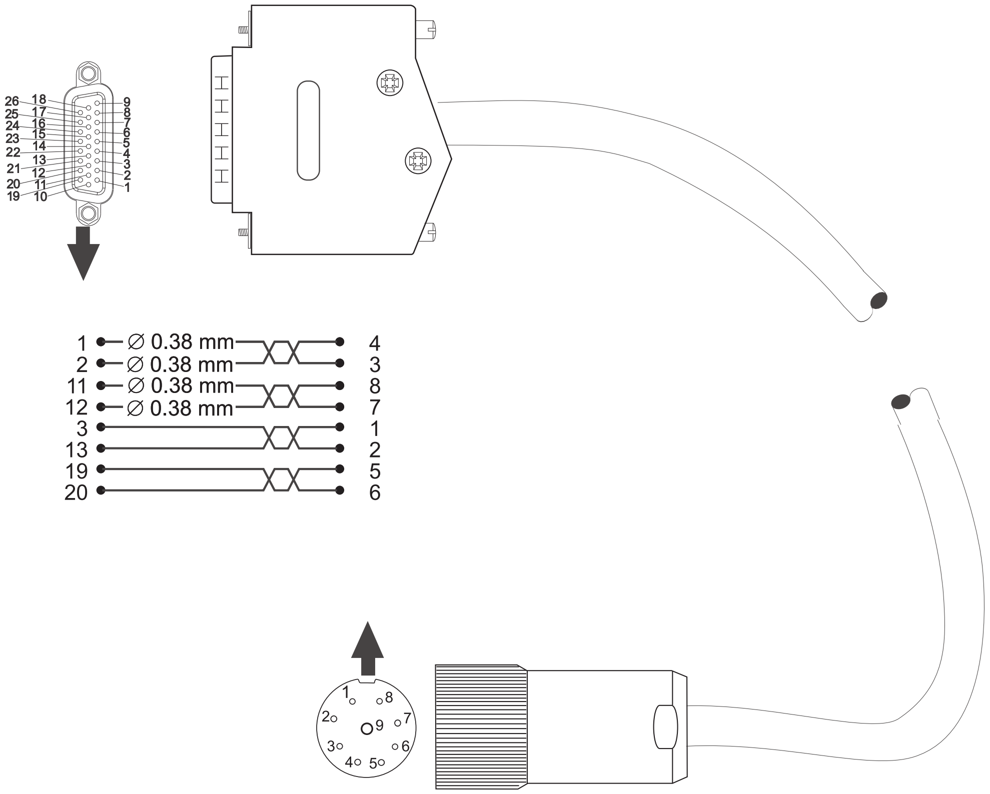


Figure 114: Connecting cable for encoder with EnDat® 2.2 speedtec® M23

NOTE

The connecting cable must be made according to the figure shown above!
If there is a different pin assignment, the cable is not functionally operable and could lead to defects, both in the encoder module and the encoder!

11.1.5.5 Connecting cable for sine/square-wave incremental encoder

The connecting cable is available as accessory part from Baumüller Nürnberg GmbH.

Follow the instructions below if a self-made cable is to be used:

1 Utilize the following materials:
   - Cable: Li9YC3x2x0.25-Li9Y3x2x0,25-Li9Y C11Y 1x2x0.34GN. Two cable pairs are not needed and also not connected.
   - High-density D-sub connector: 26-pin, male
   - Round connector: 12-pin, female (e.g. from Interconnectron)

2 Fully adjoin the cable shield with the housing of the round connector and with the shielding of the D-sub connector.

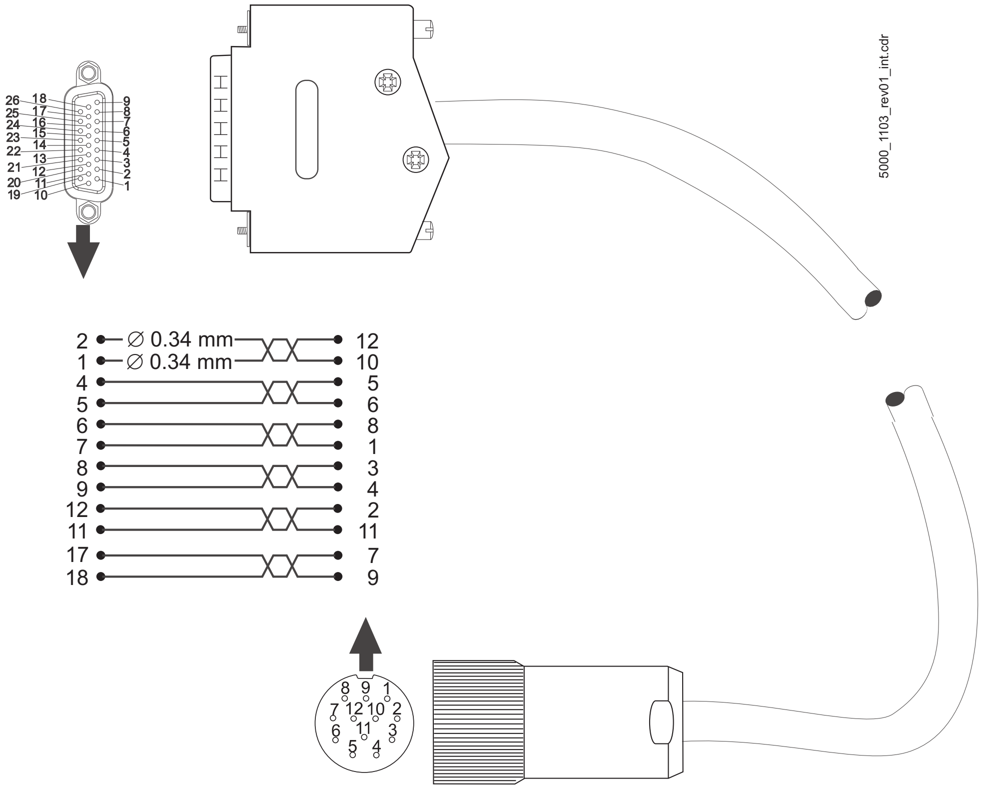


Figure 115: Connecting cable for sine/square wave incremental encoder

NOTE

The connecting cable must be made according to the figure shown above!
If there is a different pin assignment, the cable is not functionally operable and could lead to defects, both in the encoder module and the encoder!

11.1.5.6 Connection cable add-on modules

IEE The connection cable is not offered by Baumüller and must be made by the user:

1 Use the following materials:

- Cable: LiYCY 3 x (2 x 0.14 mm²) + 2 x 0,34 mm² Cu braiding.
- Sub-D connector: 9-pole, female (IEE side)
- E.g. Sub-D connector: 26-pole, male (b maXX 5000 side)
- Cables must be of twisted pair wire (track -0/0, -A/A, -B/B) from incremental encoder emulation to further master control systems

2 Connect

- the cable shield with the plug shell of the Sub-D male/Sub-D female connector
- the 9-pole female connector (IEE side) with the cable
- e.g. the 26-pole Sub-D male connector (b maXX 5000 side, pin assignment refer to ▹Connecting cable for sine/square-wave incremental encoder◃ on page 263) with the other cable ending.

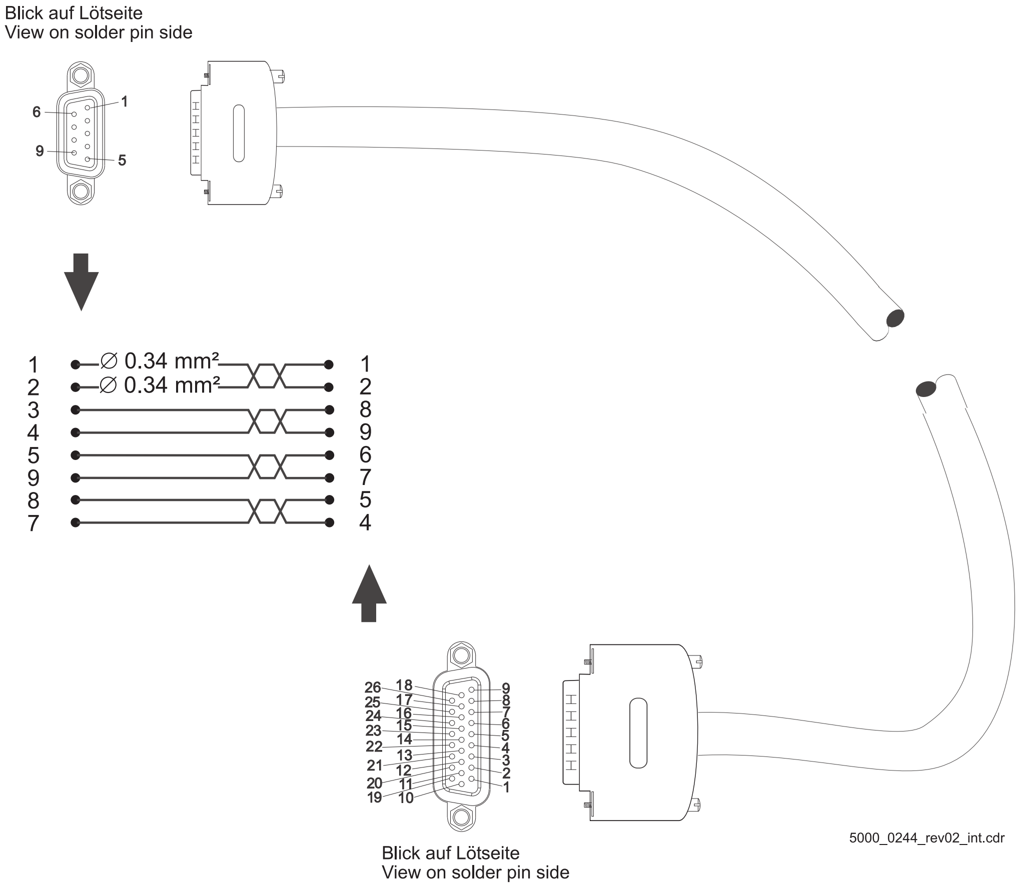


Figure 116: Connection cable IEE with b maXX 5500

NOTE!

The connection cable must be made according above mentioned instruction, pin assignment IEE refer to ▹Add-on modules◃ on page 199!
The cable is inoperable with changed assignment of the pins!

SIE

The connection cable is not offered by Baumüller and must be made by the user:

1 Use the following materials:
- Cable: LiYCY 2 x (2 x 0.14 mm²) + 1 x 0,34 mm² Cu braiding.
- Sub-D connector: 9-pole, female (SIE side)
- Cables must be of twisted pair wire (track DAT+/DAT-, CLK+/CLK-) from SSI encoder emulation to further master control systems

2 Connect
- the cable shield with the plug shell of the Sub-D male/Sub-D female connector
- the 9-pole female connector (SIE side) with the cable

11.2 Fuses

NOTE!

The fuse specification are valid for basic units, only.

A distinction is made between protecting the power supply cables and protecting the device. To fulfill CE specifications – here in particular EN 60204-1 – fuse the power supply cables.

NOTE!

Approved, UL-listed safety fuses and/or circuit breakers must be used in UL-authorized systems.

Cable protection

Use safety fuses of the operating class gL VDE 0636-201 / DIN EN 60269-2-1 / HD 630.2.1 54 or circuit breaker triggering characteristic K, in accordance with VDE 0636-201 / DIN EN 60269-2-1 / HD 630.2.1 54, to protect the cable. These fuses protect against overloads and consequential damage from defects, for example as a result of fire. However, they cannot prevent a device from being extensively destroyed in case of a short-circuit or ground fault in the DC link.

Carry out the fusing in accordance with EN 60204-1 („Electrical Equipment of Machines“). Dimension the cable fuse based on the cross-section of the power supply cable used, and in accordance with the respective applicable national standards and local regulations.

The current-carrying capacity of the cables is specified in Table 5 of EN 60204-1. For your application, the corresponding value must still be determined based on the standard itself, i. e. taking into account the cable routing.

NOTE!

Use suitable fuses with the tripping characteristic gL or gR.

Device protection Use semiconductor fuses with the tripping characteristic aR (DVDE 0636-201 / DIN EN 60269-2-1 / HD 630.2.1 54). Connect these in series with the cable protection fuses. In the event of a short-circuit, these protect the line-side rectifier unit circuit on the input side against complete destruction, in order that it is possible to repair the device.

Dimension suitable device protection fuses depending on peak current and the maximum load integral i^2t_{off}.

Device	Maximum load integral 1)
BM551**X**	$\leq$ 310 A^2s
BM55**22**	$\leq$ 400 A^2s
BM55**23**	$\leq$ 450 A^2s
BM55**24** BM55**25** BM55**26** BM55**27**	$\leq$ 800 A^2s
BM553**X** BM563**X**	$\leq$ 9 500 A^2s
BM554**X** BM564**X**	$\leq$ 15.000 A^2s
BM555**X** BM565**X** BM575**X**	$\leq$ 97.000 A^2s
BM556**X** BM566**X** BM576**X**	$\leq$ 245.000 A^2s
BM557**X** BM577**X**	$\leq$ 1.125.000 A^2s

1) Use fuses that fall below the specified cutoff integral (i^2t_{aus}) **in the operating point**.

Cable protection + device protection There are two alternatives for protecting cable and devices:

- Connecting cable protection fuses and semiconductor fuses in series
- Using full-range fuses with the tripping characteristic gR and gS (DVDE 0636-201 / DIN EN 60269-2-1 / HD 630.2.1 54).

Dimension the suitable cable and devices protection fuses based on the cross-section of the power supply cable used, the peak current and the maximum load integral i^2t_{off}.

In contrast to safety fuses, the device and cables may also be fused with the listed circuit breakers according to UL (DIVQ).
Only circuit breakers without trip delay are approved. Circuit breakers with only a thermal tripping characteristic are not tested and thus not approved. A particular point to consider is that, in case of an error, the device is not protected against destruction; instead, only the system is protected against the risk of fire.

The suitability of circuit breakers depends on the cross-section of the power supply cable used and the dimensioning of the rated and peak current of the devices.

11.2 Fuses

11.2.1 Fuses BM551X

- Full-range fuses gR and gS
  BM5512, BM5513, design type NH

Bussmann	000	16A/690V: 170M1559 RU	20A/690V: 170M1560 RU
		25A/690V: 170M1561 RU	
SIBA	000	16A/690V: 2047734/16A cRUus	
	00	20A/690V: 2047720/20A	25A/690V: 2047720/25A
	0	16A/1000V: 2038404/16A	20A/1000V: 2038404/20A
		25A/1000V: 2038404/25A	32A/1000V: 2038404/32A
Siemens	000	16A/690V: 3NE1 813-0 cRUus	
	00	25A/690V: 3NE8 015-1 cRUus	20A/690V: 3NE8 714-1
		25A/690V: 3NE8 715-1	
	0	32A/1000V: 3NE4 101	

Baugröße ↑

11.2.2 Fuses BM552X

- Full-range fuses gR and gS
  BM5522, design type NH

Bussmann	000	16A/660V: 170M1559 RU	20A/660V: 170M1560 RU
		25A/660V: 170M1561 RU	32A/660V: 170M1562 RU
	00	16A/690V: 170M2692	20A/690V: 170M2693
		25A/690V: 170M2694	32A/690V: 170M2695
SIBA	000	16A/690V: 2047734/16A cRUus	
	00	20A/690V: 2047720/20A	25A/690V: 2047720/25A
Siemens	00	16A/690V: 3NE1 813-0 cRUus	20A/660V: 3NE8 714
		25A/660V: 3NE8 715	25A/660V: 3NE8 015
		32A/660V: 3NE8 701	
	0	32A/1000V: 3NE4 101 cRUus	

Size ↑

- Semiconductor fuses aR (device)
  BM5522, design type NH

Bussmann	00	20A/1000V: 170M2673	25A/1000V: 170M2674
		32A/1000V: 170M2675	
	1	40A/660V: 170M3808	
Ferraz Shawmut	000	16A/690V: 6,9 URD 000 PV 016	20A/690V: 6,9 URD 000 PV 020
		25A/690V: 6,9 URD 000 PV 025	32A/690V: 6,9 URD 000 PV 032

Size

- Full-range fuses gR and gS
  BM5523, design type NH

Bussmann	000	20A/660V: 170M1560 RU	25A/660V: 170M1561 RU
		32A/660V: 170M1562 RU	
	00	20A/690V: 170M2693	25A/690V: 170M2694
		32A/690V: 170M2695	
Ferraz Shawmut	000	20A/690V: 6,9 GGR 000 PV 020	
	00	20A/690V: 6,9 GGR 00 PV 020	
SIBA	000	20A/690V: 2047734/20A cRUus	
	00	20A/690V: 2047720/20A	25A/690V: 2047720/25A
Siemens	00	20A/660V: 3NE8 714	20A/690V: 3NE1 814-0 cRUus
		25A/660V: 3NE8 715	25A/660V: 3NE8 015
		32A/660V: 3NE8 701	
	0	32A/1000V: 3NE4 101 cRUus	

Size

- Semiconductor fuses aR (device) BM5523, design type NH

Bussmann	00	20A/1000V: 170M2673	25A/1000V: 170M2674
		32A/1000V: 170M2675	
	1	40A/660V: 170M3808	
Ferraz Shawmut	000	20A/690V: 6,9 URD 000 PV 020	25A/690V: 6,9 URD 000 PV 025
		32A/690V: 6,9 URD 000 PV 032	40A/690V: 6,9 URD 000 PV 040

Size

- Full-range fuses gR and gS
  BM5524, BM5525 and BM5526, design type NH

Bussmann	000	25A/660V: 170M1561 UR	32A/660V: 170M1562 UR
	00	25A/690V: 170M2694	32A/690V: 170M2695
Ferraz Shawmut	000	25A/690V: 6,9 GGR 000 PV 025	
	00	25A/690V: 6,9 GGR 00 PV 025	
SIBA	000	25A/690V: 2047734/25A cURus	
	00	25A/690V: 2047720/25A	
Siemens	00	25A/660V: 3NE8 715	25A/660V: 3NE8 015
		25A/690V: 3NE1 815-0 cURus	32A/660V: 3NE8 701
	0	32A/1000V: 3NE4 101 cURus	

Size ↑

- Semiconductor fuses aR (device)
  BM5524, BM5525 and BM5526, design type NH

Bussmann	00	25A/1000V: 170M2674	32A/1000V: 170M2675
		40A/1000V: 170M2676	
	1	40A/660V: 170M3808	50A/660V: 170M3809
		63A/660V: 170M3810	
Ferraz Shawmut	000	25A/690V: 6,9 URD 000 PV 025	32A/690V: 6,9 URD 000 PV 032
		40A/690V: 6,9 URD 000 PV 040	50A/690V: 6,9 URD 000 PV 050
Siemens	00	40A/660V: 3NE8 702	

Size ↑

- Full-range fuses gR and gS
  BM5527, design type NH

Bussmann	000	32A/660V: 170M1562 UR	
	00	32A/690V: 170M2695	
Siemens	00	32A/660V: 3NE8 701	
	0	32A/1000V: 3NE4 101 cURus	

Size ↑

- Semiconductor fuses aR (device)
  BM5527, design type NH

Bussmann	00	32A/1000V: 170M2675	40A/1000V: 170M2676
	1	40A/660V: 170M3808	50A/660V: 170M3809
		63A/660V: 170M3810	
Ferraz Shawmut	000	32A/690V: 6,9 URD 000 PV 032	40A/690V: 6,9 URD 000 PV 040
		50A/690V: 6,9 URD 000 PV 050	
Siemens	00	40A/660V: 3NE8 702	
Bussmann	00	32A/1000V: 170M2675	40A/1000V: 170M2676

Size ↑

11.2.3 Fuses BM5X3X

- Full-range fuses gR and gS
  BM553X, BM563X, design type NH

SIBA	1	80A/690V: 2021134.80 cULus
Siemens	000	80A/690V: 3NE1820-0 cULus
	00	100A/690V: 3NE1021-2 cULus

Size ↑

- Semiconductor fuses aR (device) BM553X, BM563X , design type NH

Bussmann	000	125A/690V: 170M1568D cULus	
SIBA	000/80	125A/690V: 2028220.125 cULus	
Siemens	0	100A/1000V: 3NE4 121 cULus	
	00	100A/690V: 3NE8021-1 cULus	125A/690V: 3NE8022-1 cULus
	000/80	125A/690V: 3NE8 722-1 cULus	
	1/110	125A/1000V: 3NE3 222 cULus	

Size ↑

11.2.4 Fuses BM5X4X

- Full-range fuses gR, gRL, gR/gS, gGR
  BM554X

Bussmann	00	80A/690V: 170M2699	100A/690V: 170M2700
		125A/690V: 170M2701 [1]	
	1	80A/690V: 170M4178	100A/690V: 170M4179
		125A/690V: 170M4180	160A/690V: 170M4181
Ferraz Shawmut	000	80A/690V: 6,9 GGR 000 PV 080/6,9 GGR 000 D08L 080	
	00	80A/690V: 6,9 GGR 00 PV 080/6,9 GGR 00 D08L 080	
SIBA	1	80A/690V: 2021120-80A	100A/690V: 2021120-100A
		80A/690V: 2021134-80A cURus	100A/690V: 2021134-100A cURus [1]
Siemens	000	80A/690V: 3NE1 820-0 cURus	

Size

[1] For the connection of an additional DC link capacitance or the parallel operation of up to five devices suitable, that means the DC link of several devices is connected with at the same time existent power supply connection of every device.

- Semiconductor fuses aR (device)
  BM554X, design type NH

Bussmann	000	80A/690V: 170M1566 cURus	100A/690V: 170M1567 cURus
		125A/690V: 170M1568 cURus	160A/690V: 170M1569 cURus
	00	80A/1000V: 170M2680	100A/1000V: 170M2681
		125A/1000V: 170M2682	
	1	80A/690V: 170M3811 cURus	100A/690V: 170M3812 cURus
		125A/690V: 170M3813 cURus	160A/690V: 170M3814 cURus [1]
SIBA	1	125A/690V: 2021120/125A [1]	

Siemens	000	80A/690V: 3NE8 720-1 cURus	100A/690V: 3NE8 721-1 cURus
		125A/690V: 3NE8 722-1 cURus	160A/690V: 3NE8 724-1 cURus
	00	80A/690V: 3NE8 020-1 cURus	100A/690V: 3NE8 021-1 cURus
		125A/690V: 3NE8 022-1 cURus	160A/690V: 3NE8 024-1 cURus
	0	80A/1000V: 3NE4 120 cURus	100A/1000V: 3NE4 121 cURus
		125A/1000V: 3NE4 122 cURus	
	1	100A/1000V: 3NE3 221 cURus	125A/1000V: 3NE3 222 cURus
		160A/1000V: 3NE3 224 cURus	

Size

[1] For the connection of an additional DC link capacitance or the parallel operation of up to five devices suitable, that means the DC link of several devices is connected with at the same time existent power supply connection of every device.

- Full-range fuses gR and gS
  BM5641, design type NH

SIBA	1	100A/690V: 2021134.100 cURus
Siemens	00	125A/690V: 3NE1022-2 cURus

Size

- Semiconductor fuses aR (device)
  BM5641, design type NH

Bussmann	000	200A/690V: 170M1570D cURus
Ferraz Shawmut	00	160A/690V: NH00GS69V16PV
SIBA	00C/80	160A/690V: 2028220.160 cURus
Siemens	00	125A/690V: 3NE8022-1 cURus

Size

- Full-range fuses gR and gS
  BM5642, design type NH

Siemens	00	125A/690V: 3NE1022-2 cURus

Size

- Semiconductor fuses aR (device)
  BM5642, design type NH

Bussmann	000	200A/690V: 170M1570D cULus
Ferraz Shawmut	00	160A/690V: NH00GS69V16PV
SIBA	00C/80	200A/690V: 2028220.200 cULus
	1	250A/690V: 2021120.250 cULus
Siemens	00	160A/690V: 3NE8024-1 cULus

Size

11.2.5 Fuses BM5X5X

- Full-range fuses gR and gS
  BM555X, design type NH

Bussmann	00	100A/690V: 170M2700	125A/690V: 170M2701
		160A/690V: 170M2702	
	1	125A/690V: 170M4180	160A/690V: 170M4181
		200A/690V: 170M4182 1)	250A/690V: 170M4183 1)
	2	200A/690V: 170M5881	250A/690V: 170M5882 1)
		315A/690V: 170M5883 1)	
	3	350A/690V: 170M6080 1)	
Ferraz Shawmut	000	100A/690V: 6,9 GGR 000 PV 100	
	00	100A/690V: 6,9 GGR 00 PV 100	
		125A/690V: 6,9 GGR 00 PV 125 1)	
		160A/690V: 6,9 GGR 00 PV 160 1)	
SIBA	00	100A/690V: 2020934/100AcULus	125A/690V: 2020934/125AcULus 1)
	1	100A/690V: 2021134/100AcULus	125A/690V: 2021134/125AcULus 1)
		160A/690V: 2021134/160AcULus 1)	200A/690V: 2021134/200AcULus 1)
	2	160A/690V: 2021234/160AcULus 1)	200A/690V: 2021234/200AcULus 1)
Siemens	00	100A/690V: 3NE1 021-0 cULus	125A/690V: 3NE1 022-0 cULus 1)
	1	160A/690V: 3NE1 224-0 cULus 1)	200A/690V: 3NE1 225-0 cULus 1)

Size

1) For the connection of an additional DC link capacitance or the parallel operation of up to five devices suitable, that means the DC link of several devices is connected with at the same time existent power supply connection of every device.

- Semiconductor fuses aR (device)
  BM555X, design type NH

Bussmann	000	125A/660V: 170M1568 RU	160A/660V: 170M1569 RU
		200A/660V: 170M1570 RU	250A/660V: 170M1571 RU 1)
		315A/660V: 170M1572 RU 1)	
	00	125A/1000V: 170M2682	160A/1000V: 170M2683 1)
		200A/900V: 170M2684 1)	225A/900V: 170M2685 1)
	1	160A/660V: 170M3814	200A/660V: 170M3815
		250A/660V: 170M3816	315A/660V: 170M3817 1)
		350A/660V: 170M3818 1)	400A/660V: 170M3819 1)
	2	400A/660V: 170M5808 1)	450A/660V: 170M5809 1)
	3	500A/660V: 170M6808 1)	
Ferraz Shawmut	000	125A/690V: 6,9 URD 000 PV 0125	
		160A/690V: 6,9 URD 000 PV 0160	
		200A/690V: 6,9 URD 000 PV 0200	
		250A/690V: 6,9 URD 000 PV 0250 1)	
		315A/690V: 6,9 URD 000 PV 0315 1)	
Siemens	00	125A/660V: 3NE8 022 cRUus	125A/660V: 3NE8 722
		160A/660V: 3NE8 024	160A/660V: 3NE8 724
		200A/660V: 3NE8 725	250A/660V: 3NE8 727 1)
		315A/660V: 3NE8 731 1)	
	0	100A/1000V: 3NE4 121 cRUus	125A/1000V: 3NE4 122 cRUus
		160A/1000V: 3NE4 124 cRUus	
	1	125A/1000V: 3NE3 222 cRUus	160A/1000V: 3NE3 224 cRUus
		200A/1000V: 3NE3 225 cRUus	250A/1000V: 3NE3 227 cRUus 1)
		315A/1000V: 3NE3 230-0B cRUus 1)	350A/1000V: 3NE3 231 cRUus 1)
		400A/1000V: 3NE3 232-0B cRUus 1)	
	2	400A/1000V: 3NE3 332-0B cRUus 1)	

Size

1) For the connection of an additional DC link capacitance or the parallel operation of up to five devices suitable, that means the DC link of several devices is connected with at the same time existent power supply connection of every device.

- Full-range fuses gR and gS
  BM5650, design type NH

SIBA	1	160A/690V: 2021134.160 cURus
Siemens	1	200A/690V: 3NE1225-2 cURus

Size

- Semiconductor fuses aR (device)
  BM5650, design type NH

Bussmann	00	315A/690V: 170M1572D cURus
Ferraz Shawmut	1	250A/690V: NH1GS69V250PV
SIBA	00C/80	315A/690V: 2028220.315 cURus
Siemens	1/110	200A/1000V: 3NE3225 cURus

Size

- Full-range fuses gR and gS
  BM5651, design type NH

SIBA	1	200A/690V: 2021134.200 cURus
Siemens	1	250A/690V: 3NE1227-2 cURus

Size

- Semiconductor fuses aR (device)
  BM5651, design type NH

Bussmann	00	315A/690V: 170M1572D cURus
Ferraz Shawmut	1	250A/690V: NH1GS69V250PV
SIBA	00C/80	350A/690V: 2018920.350 cURus
Siemens	1/110	250A/1000V: 3NE3227 cURus

Size

- Full-range fuses gR and gS
  BM5652, design type NH

Siemens	1	250A/690V: 3NE1227-2 cRUus

Size

- Semiconductor fuses aR (device)
  BM5652, design type NH

Bussmann	00	315A/690V: 170M1572D cRUus	
Ferraz Shawmut	2	315A/690V: NH2GS69V315PV	
SIBA	1	315A/690V: 2021120.315 cRUus	
	00C/80	400A/690V: 2018920.400 cRUus	
Siemens	1/110	315A/1000V: 3NE3230-0B cRUus	450A/1000V: 3NE3233 cRUus

Size

- Semiconductor fuses aR (device)
  BM5755, design type NH

NOTE!

The semiconductor fuses can be used for the device BM5755 provided that:

- The total DC link capacitance of all connected devices is lower than 20 mF
- The used mains filter and power choke fulfill the Baumüller specifications.

Bussmann	1	350A/660V: 170M3818 cRUus	
	2	400A/660V: 170M5808 cRUus	450A/660V: 170M5809 cRUus
	3	500A/660V: 170M6808 cRUus	
SIBA	00	350A/690V: 2018920.350 cRUus	
Siemens	00	315A/1000V: 3NE8731-1 cRUus	
	1	315A/1000V: 3NE3230-0B cRUus	350A/1000V: 3NE3231 cRUus

Size

11.2.6 Fuses BM5X6X

- Full-range fuses gR and gS
  BM556X, design type NH

Bussmann	1	250A/690V: 170M4183	315A/690V: 170M4184 1)
		350A/690V: 170M4185 1)	400A/690V: 170M4186 1)
	2	250A/690V: 170M5882	315A/690V: 170M5883 1)
		350A/690V: 170M5884 1)	400A/690V: 170M5885 1)
		450A/690V: 170M5886 1)	
	3	350A/690V: 170M6080 1)	400A/690V: 170M6081 1)
		450A/690V: 170M6082 1)	
SIBA	1	250A/690V: 2021134/250A cURus 1)	315A/690V: 2021134/315A cURus 1)
	2	250A/690V: 2021234/250A cURus 1)	315A/690V: 2021234/315A cURus 1)
		350A/690V: 2021234/350A cURus 1)	
	3	315A/690V: 2021334/315A 1)	350A/690V: 2021334/350A 1)
Siemens	1	250A/690V: 3NE1 227-0 cURus 1)	315A/690V: 3NE1 230-0 cURus 1)

Size ↑

1) For the connection of an additional DC link capacitance or the parallel operation of up to five devices suitable, that means the DC link of several devices is connected with at the same time existent power supply connection of every device.

- Semiconductor fuses aR (device) BM556X, design type NH

Bussmann	000	250A/660V: 170M1571 UR	315A/660V: 170M1572 UR
	00	225A/900V: 170M2685 1)	
	1	250A/660V: 170M3816	315A/660V: 170M3817
		350A/660V: 170M3818	400A/660V: 170M3819 1)
	2	400A/660V: 170M5808	450A/660V: 170M5809 1)
		500A/660V: 170M5810 1)	550A/660V: 170M5811 1)
		630A/660V: 170M5812 1)	
	3	500A/660V: 170M6808	550A/660V: 170M6809 1)
		630A/660V: 170M6810 1)	700A/660V: 170M6811 1)

Size ↑

Ferraz Shawmut	000	250A/690V: 6,9 URD 000 PV 0250	
		315A/690V: 6,9 URD 000 PV 0315	
	00	250A/690V: 6,9 URD 00 PV 0250	315A/690V: 6,9 URD 00 PV 0315
	0	250A/690V: 6,9 URD 0 PV 0250	315A/690V: 6,9 URD 0 PV 0315
	1	250A/690V: 6,9 URD 1 PV 0250	315A/690V: 6,9 URD 1 PV 0315
		350A/690V: 6,9 URD 1 PV 0350	400A/690V: 6,9 URD 1 PV 0400 1)
	2	250A/690V: 6,9 URD 2 PV 0250	315A/690V: 6,9 URD 2 PV 0315
		350A/690V: 6,9 URD 2 PV 0350	400A/690V: 6,9 URD 2 PV 0400
		450A/690V: 6,9 URD 2 PV 0450 1)	500A/690V: 6,9 URD 2 PV 0500 1)
		560A/690V: 6,9 URD 2 PV 0560 1)	630A/690V: 6,9 URD 2 PV 0630 1)
	3	315A/690V: 6,9 URD 3 PV 0315	350A/690V: 6,9 URD 3 PV 0350
		400A/690V: 6,9 URD 3 PV 0400	450A/690V: 6,9 URD 3 PV 0450
		500A/690V: 6,9 URD 3 PV 0500 1)	560A/690V: 6,9 URD 3 PV 0560 1)
		630A/690V: 6,9 URD 3 PV 0630 1)	700A/690V: 6,9 URD 3 PV 0700 1)
Siemens	00	250A/660V: 3NE8 727	315A/660V: 3NE8 731
	1	250A/1000V: 3NE3 227 cULus	315A/1000V: 3NE3 230-0B cULus
		350A/1000V: 3NE3 231 cULus 1)	400A/1000V: 3NE3 232-0B cULus 1)
		450A/1000V: 3NE3 233 cULus 1)	
	2	400A/1000V: 3NE3 332-0B cULus 1)	450A/1000V: 3NE3 333 cULus 1)
		500A/1000V: 3NE3 334-0B cULus 1)	560A/1000V: 3NE3 335 cULus 1)

Size

[1] For the connection of an additional DC link capacitance or the parallel operation of up to five devices suitable, that means the DC link of several devices is connected with at the same time existent power supply connection of every device.

- Full-range fuses gR and gS
  BM5661, design type NH

SIBA	1	315A/690V: 2021134.315 cRUus
Siemens	1	315A/690V: 3NE1230-2 cRUus

Size

- Semiconductor fuses aR (device)
  BM5661, design type NH

Bussmann	1	500A/690V: 170M4864D cRUus
		550A/690V: 170M5811D cRUus
Ferraz Shawmut	2	350A/690V: NH2GS69V350PV
SIBA	1/110	500A/690V: 2061331.500 cRUus
Siemens	1/110	400A/1000V: 3NE3232-0B cRUus

Size

- Full-range fuses gR and gS
  BM5662, design type NH

SIBA	1	315A/690V: 2021134.315 cRUus	
	2	350A/690V: 2021134.350 cRUus	
Siemens	2	400A/690V: 3NE1332-2 cRUus	500A/690V: 3NE1334-2 cRUus

Size

- Semiconductor fuses aR (device)
  BM5662, design type NH

Bussmann	2	550A/690V: 170M5811D cRUus
Ferraz Shawmut	2	400A/690V: NH2GS69V400PV
SIBA	1/110	630A/690V: 2061331.630 cRUus
Siemens	1/110	450A/1000V: 3NE3233 cRUus
	2/110	560A/1000V: 3NE3335 cRUus

Size

- Semiconductor fuses aR (device)
  BM5766, design type NH

HINWEIS!

The semiconductor fuses can be used for the device BM5766 provided that:

- The total DC link capacitance of all connected devices is lower than 20 mF
- The used mains filter and power choke fulfill the Baumüller specifications.

Bussmann	2	500A/660V: 170M5810 cRUus
	3	550A/660V: 170M6809 cRUus
Ferraz Shawmut	2	500A/690V: 6,9URD2PV0500
	3	560A/690V: 6,9URD2PV0560
SIBA	1 / 110 mm	500A/690V: 2061331.500 cRUus
Siemens	1 / 110 mm	450A/1000V: 3NE3233 cRUus
	2	450A/1000V: 3NE3333 cRUus

Size

11.2.7 Fuses BM557X

DANGER!

Danger to life from electric current!

Parts, which are under tension are perilous. Damage in isolation or damage of single parts can be can be highly dangerous.

Therefore:

The use of semiconductor fuses is obligatory at the power supply connection of BM557X devices. Semiconductor fuses are required in the connection between brake resistor and device except the user assures the short-circuit protection of resistor and cable.

- Semiconductor fuses aR (device)
  BM557X, design type NH

BM5572:

Siemens	2	500A/1000V: 3NA3 334-0B	560A/1000V: 3NA3 335
		710A/900V: 3NE3 337-8	

Size

NOTE

The 710 A fuse is recommended if the BM5572 is operated constantly at nominal power and/or peak power is required frequently, because the 710 A fuse provides higher thermal reserve compared with 500 A/560 A fuses and therefore the risk of fuse tripping at normal run (without real error) is reduced.

BM5573, BM5773:

Siemens	2	800A/800V: 3NE3 338-8

Size

11.2.8 UL fuse in the ballast circuit

BM555X, BM565X and BM5755:

Siemens	160A/700V: 3NE8 724-1

BM556X, BM566X and BM5766:

Siemens	250A/700V: 3NE8 727-1

BM557X, BM577X

Siemens	1	350A/1000V: 3NE3 231

Size

11.2.9 24V extra-low voltage protection

In case you refer to UL 508 C:

Assure, that all marked e.l.v. connections (24 V) at the device have a maximum voltage of 30 V_{DC}. Additionally these connections must be protected with fuses which are in accordance with UL 248 with a triggering current of maximum 4 A.

HINWEIS!

If the current consumption is lower than 4 A, several connections can be protected together with a UL-listed fuse (release current max. 4 A).

11.3 Mains filters

Line filters are combinations of capacitors, chokes, resistors and voltage limiters, which reduce the electromagnetic influence of environment. Further information refer to Instruction handbook Mains filter BFN, 5.09010.

11.3.1 Block diagram of filter for mains applications (simplified)

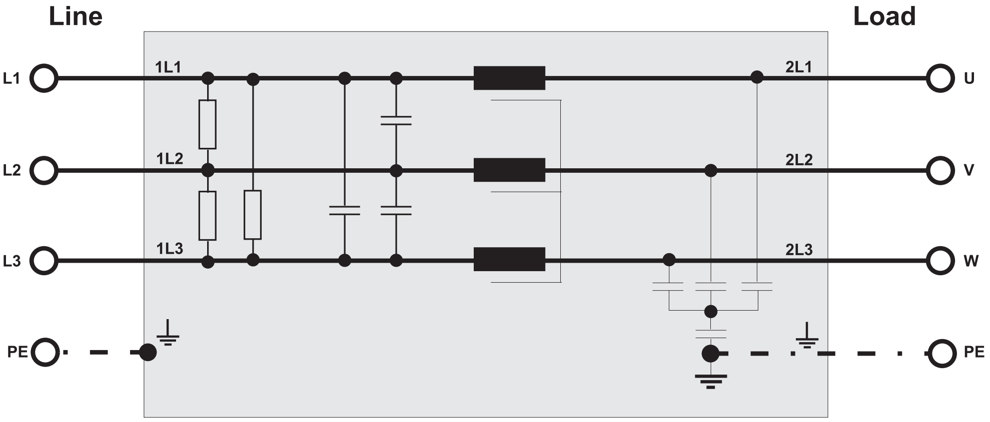


Figure 117: Block diagram

11.3.2 Baumüller mains filter type code

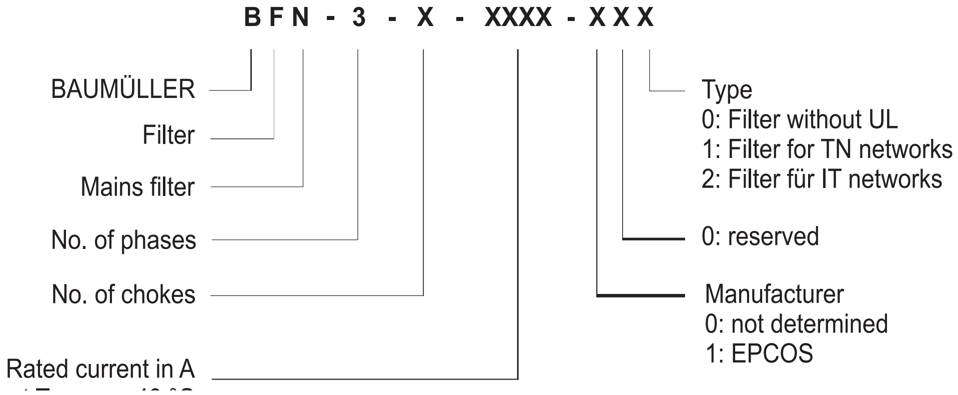


Figure 118: Mains filter type code

11.3.3 Required mains filter environmental conditions

Transport temperature range	-25 °C to +85 °C
Storage temperature range	- 25 °C to +85 °C
Operating environment	Outside of residential areas
Operating temperature range	-25 °C to +85 °C (rated temperature 50 °C)

11.3.4 Electrical data mains filter

TN/TT systems

BFN 3-1-... -001	0007	0016	0030	0042	0056	0075	0100	0130	0180
Max. input supply voltage	3 x 480 V_{AC} +10 %, 50/60 Hz								
Rated current (at T_B = 50 °C)	7 A	16 A	30 A	42 A	56 A	75 A	100 A	130 A	180 A
Peak current (at T_B = 50 °C)	1.5 x I_N for < 1 min per hour								
Current derating	$I = I_{rated} \cdot \sqrt{85 - \frac{\vartheta_{ambient}}{35°C}}$								
Test voltage	Line - line: 2125 V_{DC} / 2 s Line - housing: 2125 V_{DC} / 2 s								
Connection	L1/L2/L3: safe-to-touch screw terminals PE connection: bolt M5 / M6 / M10								
Maximum connection cross-section	4 mm^2	4 mm^2	10 mm^2	10 mm^2	16 mm^2	25 mm^2	50 mm^2	50 mm^2	50 mm^2
Power loss (typical)	4 W	8 W	12 W	15 W	18 W	24 W	24 W	30 W	35 W
Protection class	IP 20								

EPCOS	B84143A0150R410
Max. input supply voltage	3 x 480 V_{AC} +10 %, 50/60 Hz
Rated current (at T_B = 50 °C)	150 A
Peak current (at T_B = 50 °C)	1.5 x I_N for < 1 min per hour 2.5 x I_N for < 1 min per hour
Test voltage	Line - line: 2240 V_{DC} / 2 s Line - housing: 2720 V_{DC} / 2 s
Connection	L1/L2/L3: safe-to-touch screw terminals PE: bolt M10
Maximum connection cross-section	95 mm^2
Protection class	IP 20

BFN 3-1-... -001	0250	0320	0400	0600
Max. input supply voltage	3 x 480 V_{AC} +10 %, 50/60 Hz			
Rated current (at T_B = 50 °C)	250 A	320 A	400 A	600 A
Peak current (at T_B = 50 °C)	4 x I_N when switching on 1.5 x I_N for < 1 min / once per hour			
Test voltage	Line - line: 2150 V_{DC} / 2 s Line - housing: 2700 V_{DC} / 2 s			
Connection	Bolt M10	Bar with hole ∅ 11mm PE: bolt M12		
Power loss (typical)	60 W	40 W	50 W	65 W
Protection class	IP 00			

BFN 3-1-... -101	0320	0400	0600	1000
Max. input supply voltage	3 x 480 V_{AC} +10 %, 50/60 Hz			
Rated current (at T_B = 50 °C)	250 A	320 A	400 A	1000 A
Peak current (at T_B = 50 °C)	1.5 x I_N for < 3 min per hour or 2.5 x I_N for 30 s per hour			
Test voltage	Line - line: 2280 V_{DC} / 2 s Line - housing: 2690 V_{DC} / 2 s			
Connection	Bar with hole ∅ 11mm PE: bolt M10			Bar with hole ∅ 14mm PE: bolt M12
Power loss (typical)	31 W	48 W	84 W	
Protection class	IP 00			

DANGER!

Risk of fatal injury due to high leakage current!

Therefore:

- The cross-section of the protective ground conductor must be at least 10 mm^2 (EN 61800-5-1, Chapter 4.3.5.5.2).

11.3.5 Mains filter selection

NOTE!

The rated current of the filters that are used must be larger than or have same RMS-value as the actual power suppl.y current (actual power supply current = RMS-value of the power supply current during the entire cycle time of the drive). During short-time operation (S3), the RMS-value is calculated as follows:

$$I_{rms} = \sqrt{\frac{1}{T}\int_{0}^{T} i^2 dt}$$

TT/TN system

$I_{rated\ AC}$ 1)	Type	Part No.
7 A	BFN-3-1 - 0007 - 001	314277
16 A	BFN-3-1 - 0016 - 001	314278
30 A	BFN-3-1 - 0030 - 001	314279
42 A	BFN-3-1 - 0042 - 001	314280
56 A	BFN-3-1 - 0056 - 001	314281
75 A	BFN-3-1 - 0075 - 001	314282
100 A	BFN-3-1 - 0100 - 001	314283
130 A	BFN-3-1 - 0130 - 001	314284
150 A	EPCOS B84143A0150R410	437618
180 A	BFN-3-1 - 0180 - 001	314285
250 A	BFN-3-1 - 0250 - 001	373891
320 A	BFN-3-1 - 0320 - 001	439384
	BFN-3-1 - 0320 - 101	373896
400 A	BFN-3-1 - 0400 - 101	373900
600 A	BFN-3-1 - 0600 - 001	373901
	BFN-3-1 - 0600 - 101	419997
1000 A	BFN-3-1 - 1000 - 101	423683

1) Rated temperature = 50° C

IT system

NOTE!

EMC limit values are not defined for transient emission in power systems without grounded star point (IT system). A fault state (motor ground fault) can lead to the damage of the mains filter.

It is not recommended to use mains filter in IT systems. The transient emission can exceed the limit values of category C3.

11.4 Power chokes

ℹ **NOTE!**

UL certified power chokes must be used in UL compliant machines/systems.

Current	Select the power chokes dependent upon your application and based on the input rated current. Take into account that the max. input current of the chokes may not lead to saturation.
Inductance	Select the power chokes depending on the short-circuit voltage of the power supply, so that the required inductance of the power supply refer to ▹Requirements to the energy supply / supply system◃ on page 50 is adhered to.

ℹ **NOTE**

There is a different short-circuit voltage with the same choke at 60 Hz than there is at 50 Hz; according to the formula $u_k = (\omega L \cdot I_N \cdot \sqrt{3}) / U_N$ (with $\omega = 2\pi \cdot f$) the short-circuit voltage that would result at another power supply frequency can be calculated.

ℹ **NOTE**

The nominal inductance is constant up to 1.1 times of nominal current. You can expect that the inductance is reduced if the current flow through the commutation choke is higher than this value. If it is important for the application, that the commutation inductance is equal its nominal value when for longer time (e. g. with 30 s or 60 s) peak current at peak power is needed, chose a commutation choke with a peak current smaller or equal of the 1.1 times of the nominal value of the commutation choke.

If you have any doubt selecting a commutation choke for a specific application, please contact the responsible sales representative of Baumüller.

ℹ **NOTE**

At installation heights higher than 1000 m above MSL the current must be reduced for 10 % per 1000 m.

At operation temperatures from 40 °C up to 55 °C the current must be reduced for 1 % per °C

Type code

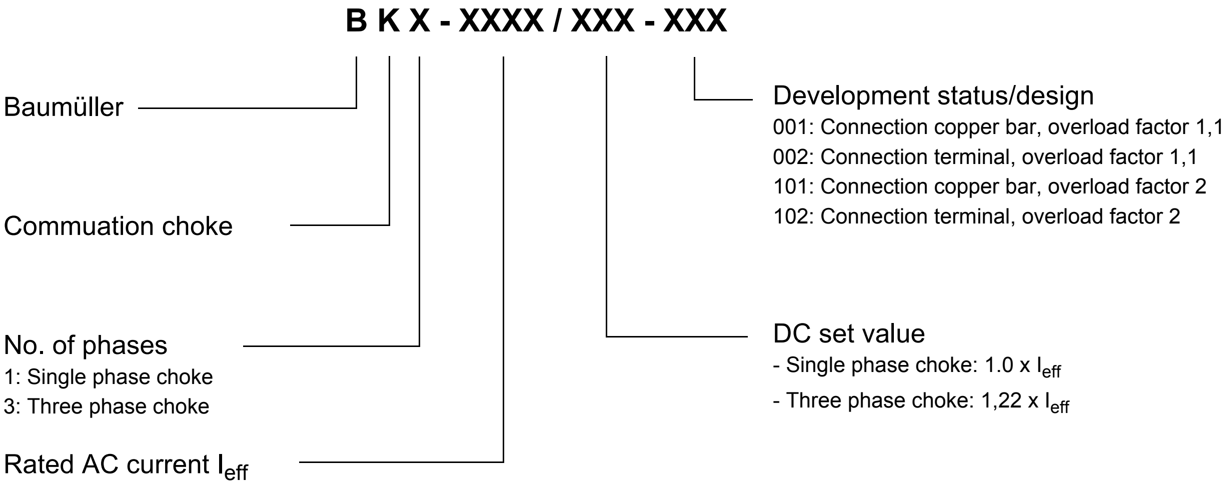


Figure 119: Type code power choke

The listed chokes are specified for the operation at 400 V /50 Hz or 480 V / 60 Hz. At a power supply voltage of 400 V and a frequency of 50 Hz at rated current the chokes have a short-circuit voltage > 3% of the power supply voltage.

UL approval

The chokes are design-tested in accordance with UL (e.g. UL1561) and signified by the „ЯU" symbol.

NOTE

Power chokes are not necessary for following devices: **BM551X, BM5523, BM5524, BM5525** and BM5XXX-X**R**.../BM5XXX-X**S**.../BM5XXX-X**W**....

$I_{rated\ AC}$	**Induc-tance**	**Type code**	**Part No.** type -101, connection copper bar	**Part No.** type -102, connection terminal	For devices
24 A	1,22 mH	BK3-0024/0029	-	456715	BM5526
53 A	0,55 mH	BK3-0053/0070	-	456717	BM5632
82 A	0,36 mH	BK3-0082/0100	-	456718	BM5641
95 A	0,31 mH	BK3-0095/0116	-	456720	BM5642
125 A	0,23 mH	BK3-0125/0153	-	456722	BM5650
160 A	0,18 mH	BK3-0160/0196	-	456723	BM5651
190 A	0,15 mH	BK3-0190/0232	456725	-	BM5652
240 A	0,12 mH	BK3-0240/0294	456728	-	BM5661
285 A	0,10 mH	BK3-0285/0350	456729	-	BM5662

$I_{rated\ AC}$	**Induc-tance**	**Type code**	**Part No.** Type -001, connection copper bar	**Part No.** Type -002, connection terminal	For devices operated with **peak current**	For devices operated with **nominal current**
25 A	1.18 mH	BK3-0025/0030	368377	399136	-	BM5532, BM5533
40 A	0.72 mH	BK3-0040/0050	368378	399137	BM5532, BM5533	BM5534
65 A	0.45 mH	BK3-0065/0080	368379	399138	BM5534, BM5535	BM5535
80 A	0.36 mH	BK3-0080/0100	368380	399139	-	BM5543
115 A	0.26 mH	BK3-0115/0140	368381	399140	BM5543, BM5544	BM5544, BM5545, BM5552
165 A	0.18 mH	BK3-0165/0200	368382	399141	BM5545, BM5552	BM5546, BM5553
195 A	0.15 mH	BK3-0195/0240	368383	-	BM5546, BM5553	BM5755
275 A	105 µH	BK3-0275/0340	368384	-	BM5554	BM5554, BM5562
365 A	80 µH	BK3-0365/0450	368385	-	BM5562, BM5563, BM5755	BM5563, BM5566, BM5766
450 A	65 µH	BK3-0450/0550	368386	-	BM5566, BM5766	-
530 A	55 µH	BK3-0530/0650	368387	-	-	BM5572
615 A	48 µH	BK3-0615/0750	368388	-	BM5572	-
750 A	39 µH	BK3-0750/0920	368389	-	-	BM5573, BM5773
920 A	32.6 µH	BK3-0900/1100	368390	-	BM5573, BM5773	-
1020 A	28 µH	BK3-1020/1250	395020	-	-	-

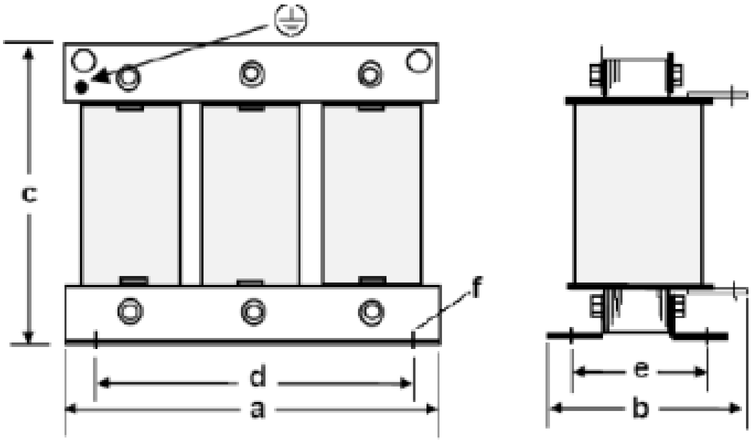


Figure 120: Figure power choke

BK3- ... - 001	Part No.	I_{AC} [A]	I_{DC} [A]	a mm	b mm	c mm	d mm	e mm	f × g mm	Weight kg	Flat connection Ø mm × mm
0024/0029-102	456715	24	29	155	95	155	130	72	8x12	6	Spring-loaded connector 4 mm²
0025/0030-001	368377	25	30	155	130	132	130	72	8×12	6	20×2 for M6
0040/0050-001	368378	41	50	190	120	158	170	58	8×12	7	20×2 for M6
0053/0070-102	456717	53	70	230	130	285	180	98	9×12	13	Spring-loaded connector 10 mm²
0065/0080-001	368379	66	80	190	140	158	170	78	8×12	10	20×2 for M6
0080/0100-001	368380	82	100	230	165	202	180	98	8×12	12	25×3 for M8
0082/0100-102	456718	82	100	230	175	225	180	122	9×12	20	20x3 for M8
0095/0116-102	456720	95	116	240	180	225	190	125	11×15	25	20x3 for M8
0115/0140-001	368381	115	140	230	190	202	180	122	8×12	18	25×3 for M10
0125/0153-102	456722	125	153	265	190	250	215	126	11×15	31	25×4 for M10
0160/0196-102	456723	160	196	300	210	285	240	123	11×25	37	25×4 for M10
0165/0200-001	368382	164	200	240	195	211	190	125	11×15	23	25×3 for M10
0190/0232-101	456725	190	232	300	220	285	240	135	11x25	42	25×4 for M10
0195/0240-001	368383	197	240	265	195	230	215	126	11×15	28	25×3 for M10
0240/0294-101	456728	240	294	360	225	330	310	125	11×30	52	40×5 for M12
0275/0340-001	368384	297	340	300	225	271	240	145	11x15	38	30×5 for M10
0285/0350-101	456729	285	350	360	255	330	310	155	11x30	69	40×5 for M12
0365/0450-001	368385	369	450	360	220	320	310	125	11×15	47	40×5 for M12
0450/0550-001	368386	451	550	360	260	320	310	140	11×15	58	50×5 for M12
0530/0650-001	368387	533	650	360	260	320	310	140	11×15	63	50×5 for M12
0615/0750-001	368388	615	750	420	285	375	370	151	11×15	68	60×5 for M12
0750/0920-001	368389	754	920	420	285	375	370	151	11×15	78	60×5 for M12
0900/1100-001	368390	902	1100	420	285	380	370	166	11×15	90	60×10 for M12
1020/1250-001	395020	1020	1250	420	330	380	370	181	11×15	115	60×10 for M12
1150/1400-001	408679	1150	1400	420	330	380	370	181	11x15	130	60×10 for M12
1270/1550-001	408698	1270	1550	480	350	430	430	210	13x18	135	60x10 for M12
1350/1650-001	408699	1350	1650	480	350	430	430	210	13x18	145	60x10 for M12
1430/1750-001	408700	1430	1750	480	350	430	430	210	13x18	150	60x10 for M12
1680/2050-001	408701	1680	2050	480	350	430	430	210	13x18	170	60x10 for M12

11.5 Baumüller accessories

11.5.1 Shielding clamp

Type	Part No.
Width 11 mm, for cable diameter up to 8 mm	312171
Width 19 mm, for cable diameter 7 mm to 16 mm	397366
Width 27 mm, for cable diameter 6 mm to 24 mm	397375
Width 43 mm, for cable diameter 22 mm to 40 mm	397376

11.5.2 Accessories Ethernet/EtherCAT®/VARAN/POWERLINK®

- Available Ethernet connecting cables:
  type: patch cable, STP

Type	Length [m]	Part No.
K-ETH-33-0-0,5	0.5	325160
K-ETH-33-0-01	1	325161
K-ETH-33-0-02	2	325162
K-ETH-33-0-03	3	325163
K-ETH-33-0-04	4	325317
K-ETH-33-0-05	5	325164
K-ETH-33-0-10	10	325165

Additional lengths upon request

Crossover package consisting of cross connector (part No. 365463) and Cat5 cable 0.5 m (part No. 325160)

Type	Part No.
K-ETH-CROSS-ADAPTER	365464

Modular connector, RJ45 female - RJ45 female, crossover, Cat5, shielded

Type	Part No.
K-ETH-CROSS-KUPPLUNG	365463

11.5.3 Accessories - CANopen®

- **CANopen®-connection Cables**:

Type	Model	Length [m]	Part No.
BM4-CAN-K-31-01	RJ45, male sub D connector	1	346568
BM4-CAN-K-31-02		2	on request
BM4-CAN-K-31-03		3	346571
BM4-CAN-K-31-05		5	on request
BM4-CAN-K-31-10		10	on request
BM4-CAN-K-32-01	RJ45, female sub D connector	1	346572
BM4-CAN-K-32-02		2	on request
BM4-CAN-K-32-03		3	346573
BM4-CAN-K-32-05		5	on request
BM4-CAN-K-32-10		10	on request
BM4-CAN-K-33-01	RJ45-connector, RJ45-connector	1	346577
BM4-CAN-K-33-02		2	on request
BM4-CAN-K-33-03		3	on request
BM4-CAN-K-33-05		5	on request
BM4-CAN-K-33-10		10	on request

- **Termination connector RJ45**
  (Termination connector CAN, RJ45 with pin assignment according to CIA-standard, 120 Ω, 0.25 W)

Type	Part No.
BM4-CAN-T01	346408

11.5.4 Service interface cable

Type	Length [m]	Part number
BM5-K-USB-018	1.8	430279

PC side interface	USB 2.0
Driver installation	is done with the installation of ProDrive

11.5.5 Toroidal cores

NOTE

The number of the toroidal cores must be increased depending on the core temperature when using the converter at low speed (<100 rpm) for a longer period or in case the motor is supplied at standstill.

The data sheets of the toroidal core are available as an internal download.

The cores are added to the corresponding converter when ordered.
Please contact Baumüller in case of not-listed combinations or motor types.

Following toroidal cores are recommended for combinations of motors and mono/axis units series **BM5500, BM5600, BM5700** :

- **Without** active mains rectifier unit BM41XX/BM51XX

Type motor	Type toroidal core	Part No.	Number of recommended cores
DS/DA 160	M113	432023	2 cores
DA 180	M114	432022	2 cores
DS 200	M114	432022	3 cores
DA 225	M114	432022	3 cores
DA 280	M114	432022	4 cores

- **With** active mains rectifier unit BM41XX/BM51XX

Type motor	Type toroidal core	Part No.	Number of recommended cores
DS/DA 160	M683	434203	3 cores
DA 180	M684	434204	3 cores
DS 200	M684	434204	3 cores
DA 225	M684	434204	3 cores
DA 280	M684	434204	3 cores

11.5.6 Spare parts

	BM551X,	BM552X,	BM5X3X,	BM5X4X,	BM5X5X	BM5X6X	BM5X7X	Part No.
Connector X3 Phoenix: FK-MCP 1,5/6-ST-3,81, 1851083	X	X	X	X	X	X	X	354874
Connector X100 and X101 Wieland: 8513 BFK, 25.630.3653.0	X	X	X	X	X	X	X	354810

12

SHUTDOWN, STORAGE

In this chapter we describe, how you decommission and store the device.

12.1 Safety instructions

➲ Refer to ▹Safety◃ from page 13 and the information in ▹Transport and Packaging◃ from page 139.

The shutdown of the device may only be carried out by for this qualified personnel.

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Therefore:

- Do not touch electrically live parts before taking into account the discharge time of the capacitors.
- Assure, that all electric connections are current-free and are safe against switch-on.
- Before working, check at the electrical connections with suitable measuring devices, that the connections are off-circuit.
- Remove the connections not until the safe isolation from supply has been checked.
- If additional capacitors are connected to the DC link, the DC link 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.

12.2 Requirements to the executing personnel

The personnel, who is appointed to setting out of operation, must have the required knowledge and instructions, which is necessary for an execution according to the rules. Select the personnel in such a way, that the safety instructions, which are mounted to the device and its parts as well as to the connections, are understood and applied to.

12.3 Shutdown

Execute the setting out of operation as follows:

1. put the device off-circuit and assure the device against unintentional restart.
2. check the isolation from supply of all connections (earliest 10 minutes after switching off).
3. demount the connections and protect the connections according to the safety instructions.
4. document the shut down setting.

12.4 Demounting

The demounting assumes a completed, documented setting out of operation.

NOTICE!

Note sharp edges.

In case, while installing, you lift a device with unprotected hands, fingers/palm can be cut. If the device falls off, your feet can be cut up.

Therefore:

Therefore:

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

Wear safety gloves.

- Wear safety shoes.

1. secure the device against falling off/out.
2. loosen all mechanical connections.
3. lift the device out of the control cabinet.
4. store the device in a suitable packing.
5. at transportation pay attention to, that the device is not damaged by wrong storage or severe shocks, also refer to ▷What to observe when transporting◁ on page 139 .

In case you want to dispose the device, additional data is available in chapter ▷Disposal◁ from page 301.

12.5 Storage conditions

The device is maintenance-free. If you keep to the environmental conditions during the entire period of storage, you can assume, that the device will not be damaged. In case the environmental conditions during storage are not kept, you should assume that the device is damaged after storage.

CAUTION!

Property damage because of incorrect storage conditions

Incorrect storage can damage/destroy the device.

Therefore:

Assure, that the environmental conditions are kept during the entire period of storage:

- Climatic category 1K4
- Temperature range -25 °C to +55 °C

CAUTION!

Recommissioning without forming of the capacitors.

From six months storage period on, the capacitors are destroyed during commissioning if they are not formed beforehand

- Reform the DC link capacitors:
  - by supplying the device ready-to-operate for at least one hour with supply voltage
  - but do not transmit a pulse enable during this time.
- Consider, that it is imperative, to connect the accordingly prescribed line commutating reactor for this forming procedure. Devices, where no line commutating reactor is necessary can directly be supplied with mains voltage.

12.6 Recommissioning

Execute commissioning as with a new device, refer to ▷Mounting◁ from page 141, ▷Installation◁ from page 159.

CAUTION!

Recommissioning without forming of the capacitors.

From six months storage period on, the capacitors are destroyed during commissioning if they are not formed beforehand

- Reform the DC link capacitors:
  - by supplying the device ready-to-operate for at least one hour with supply voltage
  - but do not transmit a pulse enable during this time.
- Consider, that it is imperative, to connect the accordingly prescribed line commutating reactor for this forming procedure. Devices, where no line commutating reactor is necessary can directly be supplied with mains voltage.

.

13

DISPOSAL

NOTE!

Baumüller products are not subject to the scope of application of the EU's Waste Electrical and Electronic Equipment Directive (WEEE, 2012/19/EU). Hence, Baumüller is not obligated to bear any costs for taking back and disposing of old devices.

13.1 Safety notes

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

Discharge time of the system = discharge time of the device with the longest DC link discharge time in the DC link connection.

Refer to ▹Electrical data basic units◃ ab Seite 61.

Therefore:

- Do not touch before taking into account the discharge time of the capacitors and electrically live parts.
- Heed corresponding notes on the equipment.
- If additional capacitors are connected to the DC link, the DC link discharge can take a much longer time. In this case, the necessary waiting period must 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.

13.1 Safety notes

CAUTION!

Danger due to sharp edges.

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

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.

WARNING!

Danger of physical impact!

Secure device 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.

NOTICE!

Avoid polluting the environment as a result of improper disposal.

Therefore:

- Only dispose in compliance with the health and safety regulations.
- Take heed of any special local regulations. If you are unable to directly ensure safe disposal yourself, commission a suitable disposal contractor.
- In the event of a fire, hazardous substances could possibly be generated or released.
- Do not expose electronic components to high temperatures.
- Beryllium oxide is used as inner insulation, for example for various power semiconductors. The beryllium dust that is generated upon opening is injurious to the health.
  Do not open electronic components.
- Dispose of capacitors, semiconductor modules and electronic scrap as special waste.

WARNING!

Danger as a result of incorrect deinstallation!

The deinstallation and disposal requires qualified personnel with adequate experience.

Therefore:

- Only allow deinstallation and disposal to be performed by qualified personnel.

13.2 Disposal facilities/authorities

Ensure that the disposal is handled in compliance with the disposal policies of your company, as well as with all national regulations of the responsible disposal facilities and authorities. In case of doubt, consult the bureau of commerce or environmental protection authority responsible for your company.

APPENDIX A - ABBREVIATIONS

A	Ampere
AC	Alternating current
AIO	Function module analog input/output
ASCII	American Standard Code for Information Interchange
BACI	Baumüller drives communication interface
BB	Ready-to-operate
BBext	Ready-to-operate (external)
BBint	Ready-to-operate (internal)
BSA	Reference potential analog
BSD	Reference potential digital
CAN	Network for controller ambience
CiA	CAN in Automation
CPU	Central processing unit
DC	Direct current
DIN	Deutsches Institut für Normung e.V. (German Institute for Standardization)
DIO	Function module digital input/output
EDS	Electronic data sheet
EMF	Electromotive force
EMC	Electromagnetic compatibility
EN	European standard
ENC	Function module incremental encoder
ESD	Electrostatic discharge
EXT, ext	external
FI	Residual current
HS	Main contactor
HSE	Main contactor on
HSF	Main contactor enable
Î	Peak current, curve shape not defined
I_{AC}	Effective value, alternating current
I_{Aist}	Armature current actual value
I_{DC}	Effective value, direct current
I_{eff}	Effective value, alternating current
IF	Pulse enable
I_F	Field current
I_{Fmax}	Maximum field current (nominal current)
I_{Fmin}	Minimum field current
I_{Fsoll}	Field current set value
ID No.	Identification number
Ink	PPR count of incremental encoder
IS	Impulse inhibit
ISO	International Organization for Standardization
I_{set}	Current set value
LT	Power unit
M24	Reference potential 24 V
MR1	Torque direction 1
MR2	Torque direction 2
n = 0	Speed = 0
n_{ist}	Speed actual value
n_{max}	Maximum speed
n_{min}	Minimum speed
NN	Altitude over sea level
n_{soll}	Speed set value
PE	Protective conductor
PELV	Protective extra-low voltage with safety separation, earthed

PSI	Program Storage Interface
PZD	Process data
RF	Controller enable
SELV	Safety extra-low voltage with safety separation
SH	Quick stop
SM	Synchronous motor
SYNC	Synchronization message
TM	Motor temperature sensor
U	Voltage
Û	Peak voltage
U_A	Armature voltage
U_{AC}	Effective value, alternating voltage
U_{DC}	Effective value, direct-current voltage
U_{eff}	Effective value, alternating voltage
U_{ZK}	DC-link voltage
V	Volt
VDE	Association for Electrical, Electronic & Information Technologies
ZK	DC-link

B

APPENDIX B - DECLARATION OF CONFORMITY

be in motion be in motion be in motion
BAUMÜLLER
www.baumueller.com

EU - Declaration of Conformity

Doc.-No.: 5.13015.01
Date: 14-Jun-2016

according to EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU

The Manufacturer: Baumüller Nürnberg GmbH
Ostendstraße 80-90
90482 Nuremberg, Germany

declares, that the products

Brand name Baumüller

Type: b maXX basic unit, power module with servo controller

b maXX 5500 universal units:	BM55XX
b maXX 5600 acceleration units:	BM56XX
b maXX 5700 continuous current units:	BM57XX

Manufactured since 20-Jun-2013

are developed, designed and manufactured in accordance with the EMC Directive 2014/30/EU and the Low Voltage Directive 2014/35/EU.

Applied harmonized standards:

Standard	Title
DIN EN 62061:2010-05	Safety of Machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
DIN EN 61800-5-1:2008-04	Variable-speed electrical power drive Part 5-1: Safety requirements - Electrical, thermal and energy
DIN EN 61800-5-2:2008-04	Variable-speed electrical power drive Part 5-2: Safety requirements - Functional
DIN EN 61800-3:2012-09	Variable-speed electrical power drive Part 3: EMC requirements and specific test methods

The products must be installed correctly and all notes and safety notes of the referring instruction handbook must be complied with, to guarantee the compliance to the guidelines.

Nuremberg / 14-Jun-2016
City / Date

Subject to change of this declaration of EC conformity without notice. Actual valid edition on request.

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Version	Status	Changes
5.13008.02	9-Sep-2013	First issue
5.13008.03	6-Nov-2014	Size 2 and 3 added, new controller version BSC Safe Step 2
5.13008.04	13-Jul-2015	Chapter Fieldbus completed with CANopen®
5.13008.05	24-Sep-2015	New add-on module SVP, update power unit electrical data
5.13008.06	5-Jul-.2016	BM5527, BM5645 added
5.13008.07	3-May-2017	New device type R, S, W added
5.13008.08	1-Mar-2018	New device type BM551X added Chapter bearing currents added
5.13008.09	5-Nov-2018	Revision
5.13008.10	22-May-2019	Risk assessment added Power modules BM5572, BM5573 added
5.13008.11	28-Nov-2019	Revision

Notes:

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