Instruction handbook

Language	**English**
	Translation
Document No.	5.11018.15
Part No.	441839
Status	28-Nov-2019

be in motion be in motion

BAUMÜLLER

b maXX 3000

BM3200 / BM3300
Compact Servo Unit

E	5.11018.15

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

This Instruction handbook are a part of the equipment/machine. This 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, this Instruction handbook must be passed on by the owner together with the equipment/machine.
After any sale of the equipment/machine, this original and all copies must be handed over to the buyer. After disposal or any other end use, this original and all copies must be destroyed.

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1

GENERAL

1.1 Information on this Instruction handbook

This 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 this Instruction handbook, particularly the safety notes chapter, completely before beginning any work on the device. This 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 this 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 a directly 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 can lead to minor or slight injuries, if not avoided.

NOTICE!

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

Recommendations

NOTE!

....highlights useful hints and recommendations, as well as information for the efficient and trouble-free use.

1.3 Limitation of liability

All specifications and notes in this 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 commissioning in accordance with the safety regulations of the applicable standards and all other relevant governmental or local regulations referring to 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, which 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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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 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◃ as from page 171.

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 197.

1.8 Guarantee provisions

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

The devices described herein may only be operated in accordance with the stipulated methods, procedures and conditions. Anything else not presented here, including the operation of devices in mounted positions, is not permitted and must be cleared with the plant on a case-by-case basis. If the devices are operated in any other manner than as described within this 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 technical 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 BM3XXX are also used in this documentation for this Baumüller product „**BM3200, BM3300**“. A list of the abbreviations used can be found in ▹Appendix A - Abbreviations◃ from page 201.

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 Appropriate use

The device is conceived and constructed exclusively for usage compliant with its intended purpose described in this Instruction handbook.

The devices of the model series **BM3200, BM3300** contains of a power converter in combination with a servo controller. Devices are available in graduated design size and performance classes. The device **BM3200, BM3300** 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 this 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 this 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, which is sustainable.
- 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.
- Only operate the devices in secondary surrounding (e.g. an industrial environment). 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. To operate the device in primary surrounding 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. Whether a device described here can itself qualify for category C2/C1 with additional measures cannot be guaranteed.

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.

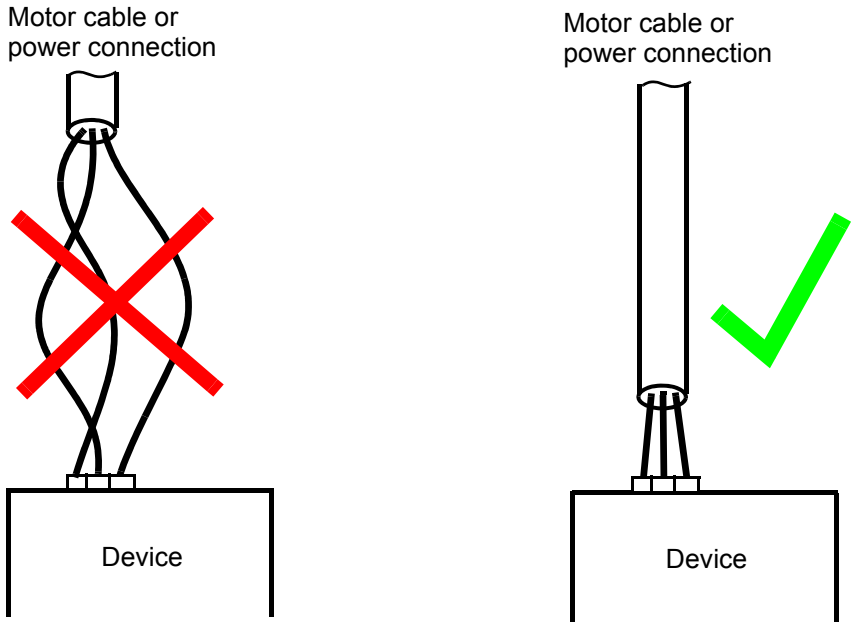


Figure 1: Wiring of the power cables

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 this 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 operating instruction for operation of the device.
- This 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 Protective devices

IP code	
Compact servo unit BM320X, BM330X, BM321X, BM331X	IP 20

All devices **BM3200, BM3300** must be installed in an appropriate control cabinet to meet the IP code required in EN 61800-5-1, chapter 4.2.3.3 (**BM3200, BM3300**: 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 devices **BM3200, BM3300** 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 this Instruction handbook.

In this 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 training may only be performed by qualified personnel.

- **Qualified personnel**
  - Electrical engineers authorized by Baumüller Nürnberg GmbH, and qualified electricians of the customer or a third party who have learned to install and maintain Baumüller drive systems and are authorized to ground and identify electrical power circuits and devices in accordance with the safety engineering standards of the company.
  - Qualified personnel have had occupational training or instruction in accordance with the respective locally applicable safety engineering standards for the upkeep and use of appropriate safety equipment.

2.8 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. When having longer hair use a safety hair net.

No rings or chains should be worn.

Hard hat

to protect against parts falling down and against parts, which are flying around.

Safety shoes

to protect against heavy objects falling down.

Safety gloves

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

Wear for special work.

Safety goggles

to protect the eyes against objects, which are flying around and against splashes.

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 manual to reduce health risks and dangerous situations.

Electrical current

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

- Switch off the 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◃ from page 36.

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 several devices are connected e.g. with a rectifier unit, 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 to ensure the device 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 Behavior in hazardous situations or at 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 signalling systems, first aid equipment and life saving 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 of the site.
- 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 adjacencies, where they were 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◃ from page 36.

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 several devices are connected e.g. with a rectifier unit, 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 to ensure the device 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.

CAUTION!

Risk of injury due to hot surface!

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

Therefore:

- Wear safety gloves

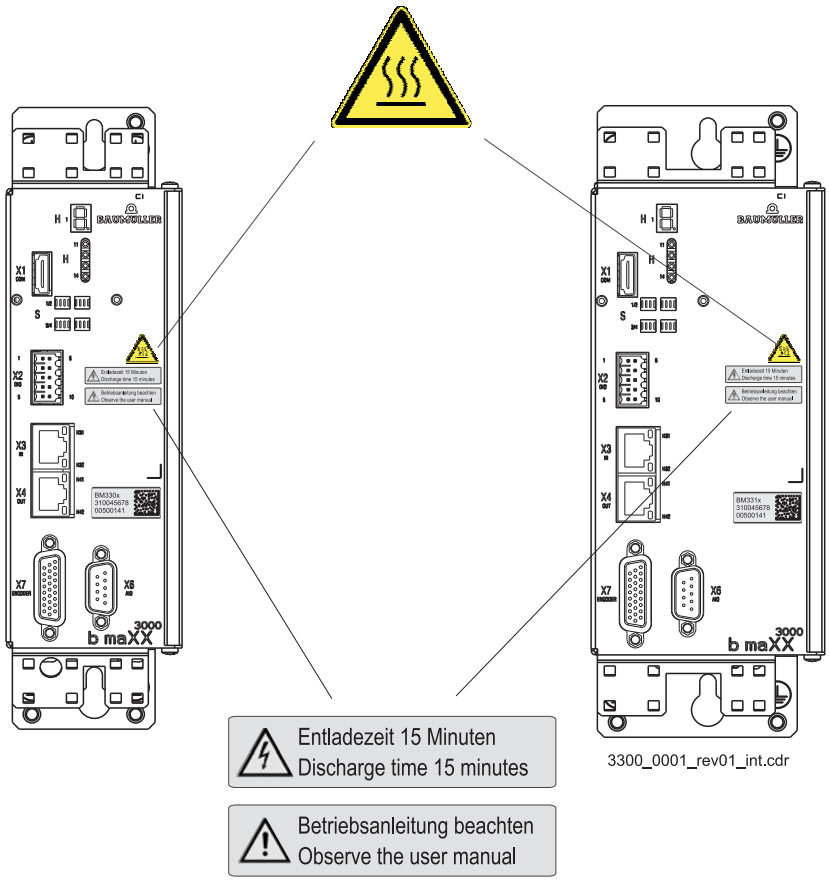


Figure 2: Signs and labels **BM3200, BM3300**

Signs and labels devices with safety level

NOTE!

Only a device 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.

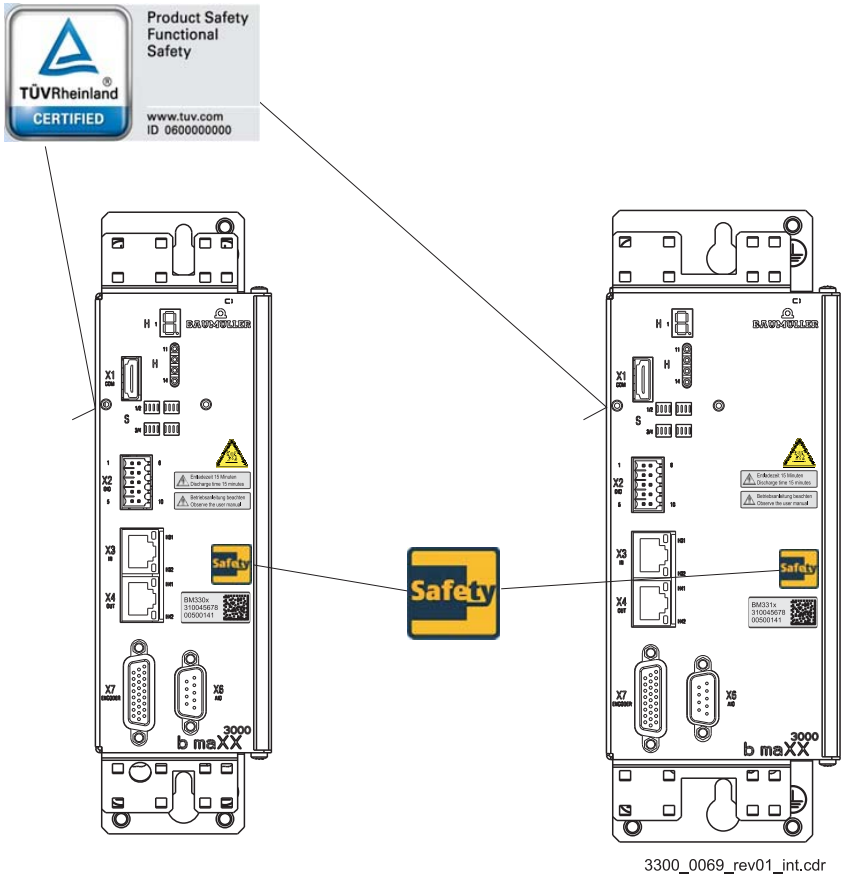


Figure 3: Signs and labels **BM3300** with safety level

3

TECHNICAL DATA

3.1 Dimensions

With the help of the following figures, the space requirements in the control cabinet are determined. In order to execute the necessary drilling/section please refer to ▷Drilling templates◁ from page 77.

NOTE!

All dimensions in mm.

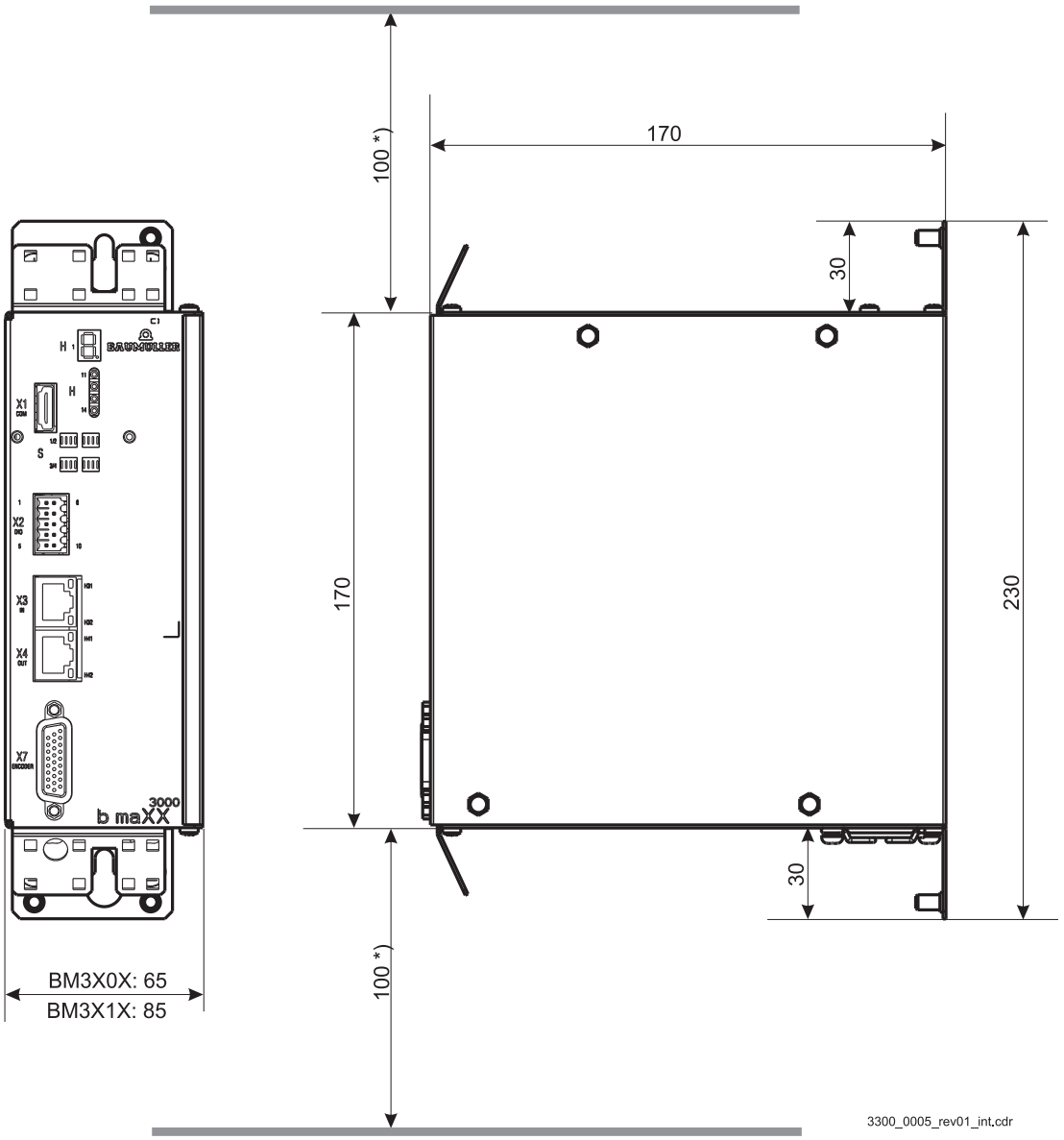


Figure 4: Dimensions **BM3200, BM3300**

*) Consider minimum space, ▹Cooling◃ on page 35.

3.2 Weight

Device	Weight
BM32**0X**, BM33**0X**	approximately 2.2 kg
BM32**1X**, BM33**1X**	approximately 2.5 kg

3.3 Operating conditions

3.3.1 System types

There is a differential structure of current supply networks and it is distinguished between three basic types, referring to their grounding, which is accordant to DIN VDE0100 part 300 and accordingly to IEC 60364:

- In a TN-system one point is directly grounded (main ground). The cabinet of the electrical installation is connected via protective conductors and accordingly PE-conductors with this point.
- In a TT-system a point is directly grounded (main ground). The cabinet of the electric installation is connected to ground connections, which, however, are separated from the main ground.
- In an IT-system there is no direct connection between active conductors (L1, L2, L3, N) and grounded parts (PE). The cabinets of the electrical installation are grounded. The separation is reached, by the use of an isolating transformer or with the use of an independent current source (generator, battery).

If there is an adequate low-impedance grounding within the TN- or the TT-network, then a line-side fuse is activated. A high-impedance grounding does not activate the fuse, so that the ground currents (error current) can be potentially dangerous. For this reason, circuit breakers are used for the error current monitoring.

At a short-circuit to ground, no ground current can flow and the line-side fuses cannot be activated, by which the operation can be kept up. Only a second short-circuit to ground at another phase would cause an current error, which can trigger a fuse. In order to detect the first short-circuit to ground an insulation monitor and for the second short-circuit to ground, a current error monitoring, are necessary.

Supported system types

NOTICE!

The operation of the **BM3200, BM3300** devices is possible with **TT**- and **TN**-networks.

The common network types in the USA are differentiate clearly from the European networks. Besides the Solidly Grounded Wye, which is similar to the TN-S-system, there is also a Corner Grounded Delta (this differs to the description in the IEC). The **BM3200, BM3300** may not be operated here.

An operation with DC-link connection and use of a active mains rectifier is forbidden.

3.3.2 Requirements to the energy supply: power supply

	BM3200, BM3300
Power supply (also refer to ▹System types◃ from page 27)	TN-/TT-system
Inductance (sum of supply inductance and the power choke inductance)	Min. u_k = 0 %, max. u_k = 4 %
Rated supply voltage/frequency [1) 2)] (U_{AC})	1 x 230 V, 50/60 Hz 1 x 400 V, 50/60 Hz 3 x 400 V, 50/60 Hz
Absolute supply voltage minimum[1) 2)] (U_{ACmin}) Absolute supply voltage maximum[1) 2)] (U_{ACmax})	110 V / 50/60 Hz 528 V / 50/60 Hz
Absolute frequency minimum [4)] Absolute frequency maximum [4)]	47 Hz 63 Hz
Overvoltage category EN 61800-5-1, chapt. 4.3.6	III
Harmonic components (power supply voltage) EN 61800-3, chapter 5.2.1, class 3	THD_U ≤ 12 %
Power Supply voltage asymmetry EN 61000-2-4, tab. 1, class 3	Max. 3 %
Commutation notch EN 61800-3, chapter 5.2.1, class 3	Setback depth < 40 %, area < 250 % x degree
Voltage drop EN 61800-3:2004 and A1:2012	10 % to 80 % [1)]
Voltage variations/deviations EN 61200-2-4, Class 3	+/-10 % +10 % to -15 % at a time of ≤ 1 min
Control voltage [3)] (U_{DC}) Complying with EN 61131-2:1994, table 7	+ 24 V -15 % / +20 %
Max. short-circuit strength power supply only necessary to comply with UL508C	5000 A

1) If the voltage falls below U_{ACmin} for t > 0,1 s the error „Power unit not ready-to-operate“ is generated.

2) The rated voltage is 3 x 400 V
At lower supply voltages the output power of the device reduces, refer to correction factor at modified environmental conditions, ▹Supply voltage◃ on page 32.

3) The control voltage must accord to PELV (EN 61800-5-1, chapter 3.21) and accordingly SELV (EN 61800-5-1, chapter 3.35).
At a control voltage < 24 V the ventilator power is reduced. Therefore, it can be necessary, that the output currents also be reduced.

4) Rate of change of system frequency max. 1 Hz/s (EN 61000-2-4, class 3)

3.3.3 Requirements to the control voltage / 24 V-supply

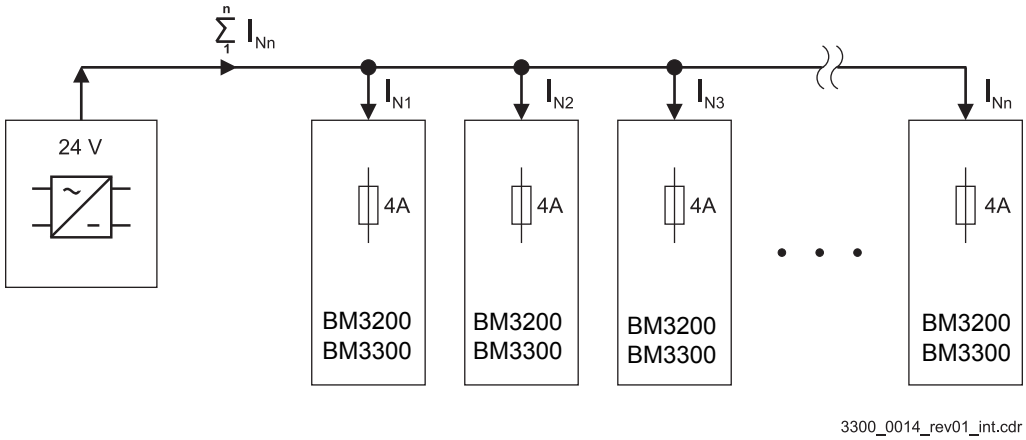


Figure 5: Control voltage / 24V-supply

The power supply for the 24 V supply voltage must provide the rated power, at least, which accords to the sum of the 24 V-supply voltage of all devices.

3.3.4 Requirements to the motor

The **BM3200, BM3300** was prepared for the operation of three-phase motors with a motor terminal voltage of 3 x 350 V (typical for servo motors of Baumüller) or 3 x 400 V (typical for standard asynchronous motors and for customer-specific special motors of Baumüller). The motors are to be operated wye-connected. The rated DC-link voltage is 540 V_{DC}. In braking operation it must be expected, that the DC-link voltage increases to 780 V or 800 V. The connected motor must be constructed for these DC-link voltages.

The use of the devices is also possible at smaller voltages, e.g. 3 x 230 V. However, this implies that the used three-current motors for the operation at inverters with a voltage of up to 800 V DC-link voltage are designed, because the ballast resistor voltage threshold remains unchanged (refer to ▹Electrical data◃ from page 36). Thus, in these cases, three-phase motors with $U_{DC\ rated} \geq 540$ V, must be used, only.

3.3.5 Required environmental conditions

	BM3200, BM3300
Transportation temperature range	-25 °C to +70 °C
Transportation climate classification EN 60721-3-2	2 K 3
Storage temperature range	-25 °C to +55 °C
Storage climate classification EN 60721-3-1	1 K 4
Operating environment	Industrial supply network [1)] Category C2 according EN61800-3 for operation in Second Environment
Operating temperature range	Min. 5 °C to max. 55 °C (with derating above 40 °C) [2)]
Operation climate classification EN 60721-3-3	3 K 3
Installation altitude	Up to 2000 m altitude (with derating above 1000 m) [3)]
Humidity (operation) EN 60721-3-3	Relative humidity: 5 % to 95 % non-condensing 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 operating
Pollution degree EN 61800-5-1, table 6, tab. 2	2

1) For an operation in an environment of category C2 according to IEC 61800-3:2012 additional measures may be required.
In this case the system manufacturer/operator must provide evidence, that these additional measures are effective and that the limit values specified in IEC 61800-3 of category C2 are complied with.

2) Refer to correction factors at modified environment conditions, ▹Environmental temperature◃ on page 32.

3) Refer to correction factors at modified environment conditions, ▹Installation altitude◃ on page 31.

NOTICE!

Normally, only non-conductive pollution occurs. Any conductive pollution, if for a short-term or permanently, is forbidden and can cause the destruction of the device. The customer is responsible for destructions, which are caused by conductive materials.

3.3.6 Correction factors at modified operational conditions

If the devices **BM3200, BM3300** are used at operational conditions, which cause different correction factors, then all correction factors for the permitted output power and accordingly the output current, must be taken into account by multiplication at the same time.

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

NOTE!

The temperature of the cold plate must be higher or equal to the environmental temperature to prevent condensation.

3.3.6.1 Installation altitude

NOTE!

It is no derating necessary while single phase operation of a three phase device **BM3201**-X**T**, **BM3301X**-X**T**.

The output power must be reduced against the rated power, according to the following figure, if the devices **BM3200, BM3300** are used above an altitude of 1000 m, no operation is permitted above an altitude of 2000 m.

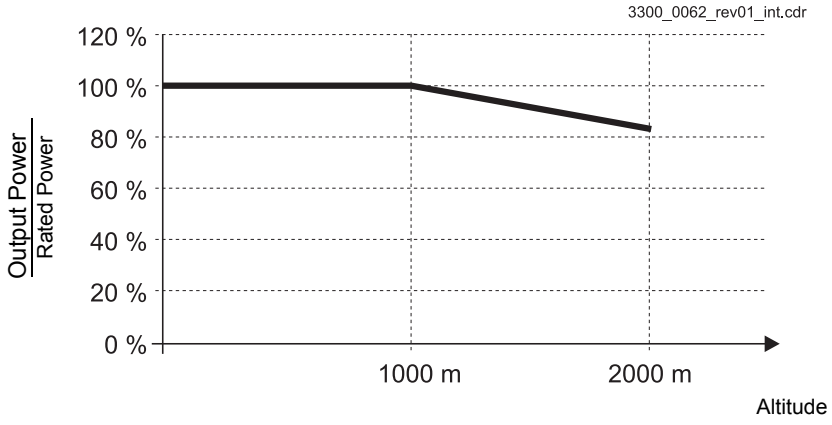


Figure 6: Reducing of output power in dependence of altitude

3.3.6.2 Environmental temperature

NOTE!

It is no derating necessary while single phase operation of a three phase device **BM3201**-X**T**, **BM3301X**-X**T**.

The devices **BM3200, BM3300** are provided for an environmental temperature of T_{rated} = 40 °C. At usage in environments with a temperature between 40 °C and 55 °C the permitted output current (I_O) is to be calculated 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 corresponds to the environmental temperature.

3.3.6.3 Supply voltage

3-phase operation The rated voltage is 3 x 400 V

above rated supply voltage At supply voltages above the rated supply voltage, the output current is to be reduced at constant output power, accordingly.

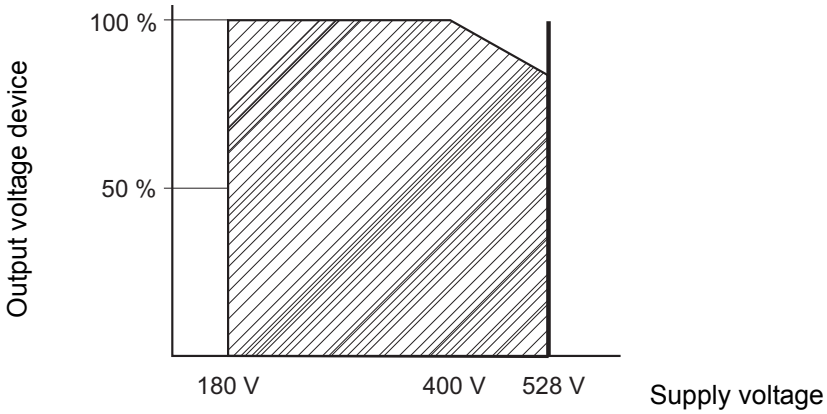


Figure 7: Output current dependent on supply voltage

3-phase operation below rated supply voltage

The rated voltage is 3 x 400 V

At smaller supply voltages the output power of the device reduces.

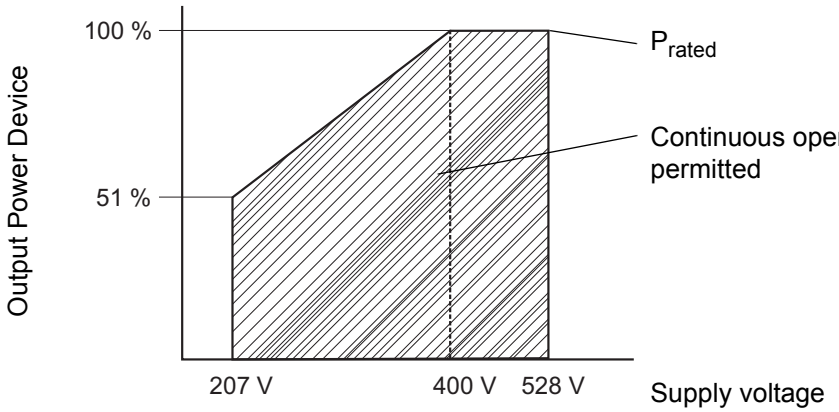


Figure 8: Output power dependent on supply voltage

If the output current is multiplied with the output voltage, the output power of the device is provided.

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

In order to obtain the specified curve/surface, it is necessary, that the output current is reduced to a value between 400 and 528 V.

1-phase operation above rated supply voltage

The rated voltage is 3 x 400 V

At supply voltages above the rated supply voltage, the output current is to be reduced at constant output power, accordingly.

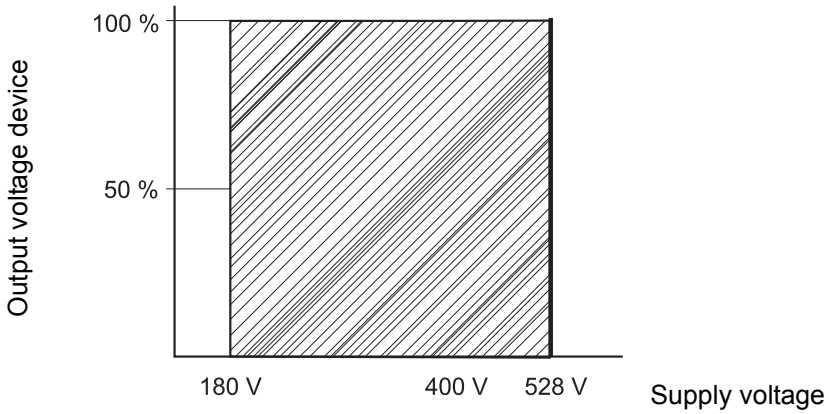


Figure 9: Output current dependent on supply voltage

1-phase operation

The rated voltage is 3 x 400 V

below rated supply voltage

At smaller supply voltages the output power of the device reduces.

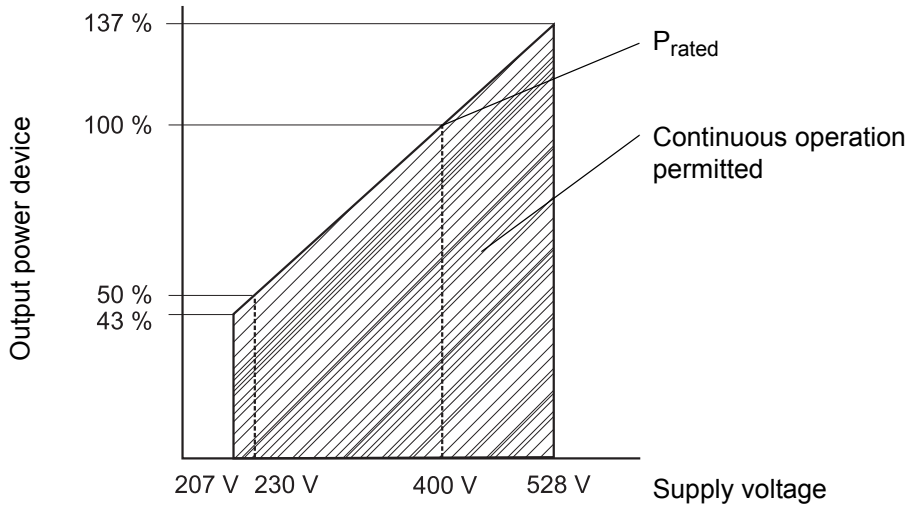


Figure 10: Output power dependent on supply voltage

If the output current is multiplied with the output voltage, the output power of the device is provided.

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

3.3.6.4 DC-link voltage

At DC-link voltages above the rated supply voltage the output current must be reduced at constant output power.

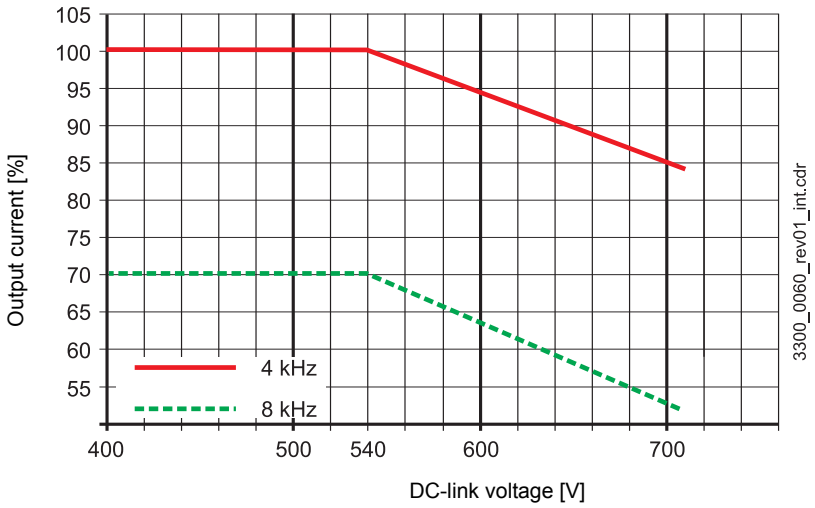


Figure 11: Output current dependent on DC-link voltage
BM3X0X, BM3X12, BM3X13 up to data set version V2.00 (see P129.40)

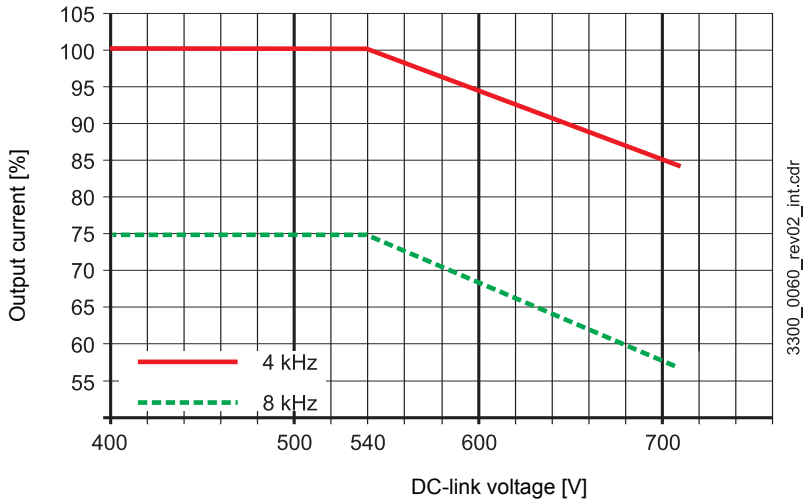


Figure 12: Output current dependent on DC-link voltage
BM3X13 data set version V2.01 and higher (see P129.40)

3.3.7 Cooling

BM3200/BM3300

Cooling air temperature [1)]	Min. 0 °C to max. 55 °C Rated temperature = 40 °C
Cooling air requirement [2)]	Refer to ▹Electrical data◃ from page 36

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

2) The cooling air requirement must at least accord to a free blowing process of a device. A free blowing process means, that the air in- and output can take place unimpeded. At installation of the device into a control cabinet, it may be necessary, to insert additional fans, to cover the necessary cooling air requirement. If the necessary cooling air requirement of the power heat sink is not provided, the output power of the device must be reduced.

3.4 Electrical data

3.4.1 Electrical data BM3X01-XT/BM3X11-XT

With internal ballast resistor **BM3X01**-X**T**XX-XXXXX-**B**-XXXXX-

		BM3X01 3-phase/3 x 400 V	**BM3X01** 1-phase/1 x 400 V
Input rated power output [1]		4.2 kVA	3.9 kVA
Input rated current (I_{eff}) [1) 2) 3)]		6 A	5.6 A
Distortion factor of the input current (THD_I)[1)]		118 %	130 %
Input peak current (I_{eff}) [1) 2) 3)]		10.4 A	5.6 A
DC-link voltage power supply-dependent/rating		540 V_{DC}	
DC-link capacitance (internal)		235 µF	
DC-link capacitance (external)		Refer to DC link connection of additional capacities from ▹Page 110◃	
DC-link discharge time (internal DC-link capacitance)		ca. 450 s	
Output voltage (U_{AC}) [1) 4)]		0 ... 400 V	
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	5 A	2 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	5 A	2 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	3.5 A	2 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	2.5 A	2 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	10 A	2 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	10 A	2 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	7 A	2 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	5 A	2 A
Max. peak current time		60 s	
Ballast resistor start-up voltage		785 V	
Ballast resistor peak power		1200 W for max. 150 ms	
Average ballast resistor power		100 W	
Switch on ready-to-operate after		≤ 4 s	
Max. upload time		≤ 0.5 s	
Power loss referring to power connection		70 W	50 W
Power loss referring to control voltage		Max. 30 W	
Cooling air requirement		11 m^3/h	

Footnotes refer to ▹Page 44◃.

With internal ballast resistor **BM3X11**-X**T**XX-XXXXX-**B**-XXXXX-

		BM3X11 3-phase/3 x 400 V	**BM3X11** 1-phase/1 x 400 V
Input rated power output [1]		6.9 kVA	3.9 kVA
Input rated current (I_{eff}) [1) 2) 3)]		10.4 A	5.6 A
Distortion factor of the input current (THD_I)[1)]		77 %	130 %
DC-link voltage power supply-dependent/rating		540 V_{DC}	
DC-link capacitance (internal)		235 µF	
DC-link capacitance (external)		Refer to DC link connection of additional capacities from ▹Page 110◃	
DC-link discharge time (internal DC-link capacitance)		ca. 450 s	
Output voltage (U_{AC}) [1) 4)]		0 ... 400 V	
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	10 A	2 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	10 A	2 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	7 A	2 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	5 A	2 A
Ballast start-up voltage		785 V	
Ballast peak power		1200 W for max. 150 ms	
Average ballast power		100 W	
Switch on ready-to-operate after		≤ 4 s	
Max. upload time		≤ 0.5 s	
Power loss referring to power connection		100 W	50 W
Power loss referring to control voltage		Max. 30 W	
Cooling air requirement		13 m^3/h	

Footnotes refer to ▹Page 44◃.

3.4.2 Electrical data BM3X02-XT, BM3X03-XT, BM3X04-XT, 400 V

[a] **with** internal ballast resistor **BM3X02**-X**T**XX-XXXXX-**B**-XXXXX-
[b] **without** internal ballast resistor **BM3X02**-X**T**XX-XXXXX-**E**-XXXXX-

		BM3X02 3-phase/3 x 400 V	**BM3X03** 3-phase/3 x 400 V	**BM3X04** 3-phase/3 x 400 V
Input rated power output [1]		1.3 kVA	2.3 kVA	4.2 kVA
Input rated current (I_{eff}) [1) 2) 3)]		1.8 A	3.3 A	6 A
Distortion factor of the input current (THD_I)[1]		118 %		
Input peak current (I_{eff}) [1) 2) 3)]		6.3 A	11.4 A	15.6 A
DC-link voltage power supply-dependent/rating		540 V_{DC}		
DC-link capacitance (internal)		235 µF		
DC-link capacitance (external) (only devices **BM3X0X**-X**T**XX-XXXXX-**B**)		Refer to DC link connection of additional capacities from ▹Page 110◃		
DC-link discharge time (internal DC-link capacitance)		ca. 450 s		
Output voltage (U_{AC}) [1) 4)]		0 ... 400 V		
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz		
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	1.5 A	2.7 A	5 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	1.5 A	2.7 A	5 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	1.1 A	1.9 A	3.5 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	0.8 A	1.3 A	2.5 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	6 A	11 A	15 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	6 A	11 A	15 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	4.2 A	7.7 A	10.5 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	3 A	5.4 A	7.4 A
Max. peak current time		60 s		30 s
Ballast start-up voltage		785 V		
Ballast peak power, internal ballast resistor [a)]		1200 W for max. 150 ms		
Average ballast power, internal ballast resistor [a)]		100 W		
Permitted ballast current (Î), external ballast resistor [b)]		Max. 7.0 A		
Ballast resistor, external ballast resistor [b)]		≥ 111 Ω		≥ 61 Ω
Switch on ready-to-operate after		≤ 4 s		
Max. upload time		≤ 0.5 s		
Power loss referring to power connection		70 W		
Power loss referring to control voltage		Max. 30 W		
Cooling air requirement		11 m^3/h		

Footnotes refer to ▹Page 44◃.

		BM3X02 1-phase/1 x 400 V	BM3X03 1-phase/1 x 400 V	BM3X04 1-phase/1 x 400 V
Input rated power output [1]		1.2 kVA	1.4 kVA	
Input rated current (I_{eff}) [1) 2) 3)]		4.2 A	5.6 A	
Distortion factor of the input current (THD_I)[1]		130 %		
Input peak current (I_{eff}) [1) 2) 3)]		5.6 A		
DC-link voltage power supply-dependent/rating		540 V_{DC}		
DC-link capacitance (internal), external not permitted		235 µF		
DC-link discharge time (internal DC-link capacitance)		ca. 450 s		
Output voltage (U_{AC}) [1) 4)]		0 ... 400 V		
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz		
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	2 A		
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	2 A		
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	2 A		
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	2 A		
Output peak current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	2 A		
Output peak current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	2 A		
Output peak current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	2 A		
Output peak current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	2 A		
Ballast start-up voltage		785 V		
Ballast peak power, internal ballast resistor [a)]		1200 W for max. 150 ms		
Average ballast power, internal ballast resistor [a)]		100 W		
Permitted ballast current (Î), external ballast resistor [b)]		Max. 7.0 A		
Ballast resistor, external ballast resistor [b)]		≥ 111 Ω		
Switch on ready-to-operate after		≤ 4 s		
Max. upload time		≤ 0,5 s		
Power loss referring to power connection		50 W		
Power loss referring to control voltage		Max. 30 W		
Cooling air requirement		11 m^3/h		

Footnotes refer to ▹Page 44◃.

3.4.3 Electrical data BM3X12-XT, BM3X13-XT, 400 V

[a] **with** internal ballast resistor **BM3X02**-X**T**XX-XXXXX-**B**-XXXXX-
[b] **without** internal ballast resistor **BM3X02**-X**T**XX-XXXXX-**E**-XXXXX-

		BM3X12 3-phase/3 x 400 V	**BM3X13** 3-phase/3 x 400 V
Input rated power output [1]		5.4 kVA	6.9 kVA
Input rated current (I_{eff}) [1) 2) 3)]		7.8 A	10.4 A
Distortion factor of the input current (THD_I)[1]		118 %	77 %
Input peak current (I_{eff}) [1) 2) 3)]		20.8 A	20.8 A
DC-link voltage power supply-dependent/rating		540 V_{DC}	
DC-link capacitance (internal)		235 µF	
DC-link capacitance (external) (only devices **BM3X0X**-X**T**XX-XXXXX-**B**)		Refer to DC link connection of additional capacities from ▹Page 110◃	
DC-link discharge time (internal DC-link capacitance)		ca. 450 s	
Output voltage (U_{AC}) [1) 4)]		0 ... 400 V	
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	6.5 A	10 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	6.5 A	10 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	4.8 A	7 A / 7.5 A [11)]
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	3.4 A	5 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	20 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	20 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	14 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	10 A	
Max. peak current time		10 s	
Ballast start-up voltage		785 V	
Ballast peak power, internal ballast resistor [a)]		1200 W for max. 150 ms	
Average ballast power, internal ballast resistor [a)]		100 W	
Permitted ballast current (Î), external ballast resistor [b)]		Max. 12.8 A	
Ballast resistor, external ballast resistor [b)]		≥ 61 Ω	
Switch on ready-to-operate after		≤ 4 s	
Max. upload time		≤ 0.5 s	
Power loss referring to power connection		70 W	
Power loss referring to control voltage		Max. 30 W	
Cooling air requirement		11 m^3/h	

		BM3X12 1-phase/1 x 400 V	BM3X13 1-phase/1 x 400 V
Input rated power output [1]		1.4 kVA	
Input rated current (I_{eff}) [1) 2) 3)]		5.6 A	
Distortion factor of the input current (THD_I)[1]		130 %	
Input peak current (I_{eff}) [1) 2) 3)]		5.6 A	
DC-link voltage power supply-dependent/rating		540 V_{DC}	
DC-link capacitance (internal), external not permitted		235 µF	
DC-link discharge time (internal DC-link capacitance)		Ca. 450 s	
Output voltage (U_{AC}) [1) 4)]		0 ... 400 V	
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	2 A	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	2 A	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	2 A	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	2 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	2 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	2 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	2 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	2 A	
Ballast start-up voltage		785 V	
Ballast peak power, internal ballast resistor [a)]		1200 W for max. 150 ms	
Average ballast power, internal ballast resistor [a)]		100 W	
Permitted ballast current (Î), external ballast resistor [b)]		Max. 12.8 A	
Ballast resistor, external ballast resistor [b)]		≥ 61 Ω	
Switch on ready-to-operate after		≤ 4 s	
Max. upload time		≤ 0.5 s	
Power loss referring to power connection		70 W	
Power loss referring to control voltage		Max. 30 W	
Cooling air requirement		11 m^3/h	

3.4.4 Electrical data BM3XXX-XE, 230 V

[a] **with** internal ballast resistor **BM3X0X**-X**E**XX-XXXXX-**B**-XXXXX-
[b] **without** internal ballast resistor **BM3X0X**-X**E**XX-XXXXX-**E**-XXXXX-

		BM3X02 1-phase/ 1 x 230 V	**BM3X03** 1-phase/ 1 x 230 V	**BM3X04** 1-phase/ 1 x 230 V
Input rated power output [1]		0.8 kVA	1.1 kVA	1.9 kVA
Input rated current (I_{eff}) [1) 2) 3)]		3.5 A	4.5 A	5.6 A
Distortion factor of the input current (THD_I)[1]		95 %		
Input peak current (I_{eff}) [1) 2) 3)]		5.6 A		
DC-link voltage power supply-dependent/rating		300 V_{DC}		
DC-link capacitance (internal), external not permitted		940 µF		
DC-link discharge time (internal DC-link capacitance)		ca. 800 s		
Output voltage (U_{AC}) [1) 4)]		0 ... 230 V		
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz		
Maximum output power		0.6 kW	1.08 kW	1.5 kW [10)]
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	1.5 A	2.7 A	5 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	1.5 A	2.7 A	5 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	1.1 A	1.9 A	3.5 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	0.8 A	1.3 A	2.5 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	6 A	11 A	15 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	6 A	11 A	15 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	4.2 A	7.7 A	10.5 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	3 A	5.4 A	7.4 A
Max. peak current time		60 s		30 s
Ballast start-up voltage		380 V		
Ballast peak power, internal ballast resistor [a)]		1200 W for max. 150 ms		
Average ballast power, internal ballast resistor [a)]		100 W		
Permitted ballast current (Î), external ballast resistor [b)]		Max. 7.0 A		Max. 12.8 A
Ballast resistor, external ballast resistor [b)]		≥ 111 Ω		≥ 61 Ω
Switch on ready-to-operate after		≤ 4 s		
Max. upload time		≤ 0.5 s		
Power loss referring to power connection		50 W		
Power loss referring to control voltage		Max. 30 W		
Cooling air requirement		11 m^3/h		

[a] **with** internal ballast resistor **BM3X1X**-X**E**XX-XXXXX-**B**-XXXXX-
[b] **without** internal ballast resistor **BM3X1X**-X**E**XX-XXXXX-**E**-XXXXX-

		BM3X12 1-phase/ 1 x 230 V	**BM3X13** 1-phase/ 1 x 230 V
Input rated power output [1]		1.9 kVA	
Input rated current (I_{eff}) [1) 2) 3)]		5.6 A	
Distortion factor of the input current (THD_I)[1]		95 %	
Input peak current (I_{eff}) [1) 2) 3)]		5.6 A	
DC-link voltage power supply-dependent/rating		300 V_{DC}	
DC-link capacitance (internal), external not permitted		940 µF	
DC-link discharge time (internal DC-link capacitance)		ca. 800 s	
Output voltage (U_{AC}) [1) 4)]		0 ... 230 V	
Output frequency at 4 kHz [5) 6)]		0 ... 450 Hz	
Maximum output power		1.5 kW [10)]	
Output rated current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	6.5 A	10 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	6.5 A	10 A
Output rated current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	4.8 A	7 A / 7.5 A [11)]
Output rated current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	3.4 A	5 A
Output peak current (I_{AC}) [1)4)7)8)9)]	at 2 kHz [5)]	20 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 4 kHz [5)]	20 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 8 kHz [5)]	14 A	
Output peak current (I_{AC}) [1)4)7)8)9)]	at 16 kHz [5)]	10 A	
Max. peak current time		10 s	
Ballast start-up voltage		380 V	
Ballast peak power, internal ballast resistor [a)]		1200 W for max. 150 ms	
Average ballast power, internal ballast resistor [a)]		100 W	
Permitted ballast current (Î), external ballast resistor [b)]		Max. 12.8 A	
Ballast resistor, external ballast resistor [b)]		≥ 61 Ω	
Switch on ready-to-operate after		≤ 4 s	
Max. upload time		≤ 0.5 s	
Power loss referring to power connection		50 W	
Power loss referring to control voltage		Max. 30 W	
Cooling air requirement		11 m^3/h	

[1] All rated values refer to a supply voltage of 230 V (single phase) and accordingly 400 V (3-phase) at 50 Hz, a control voltage of 24 V and an environmental temperature of 40 °C.

[2] The input current must be reduced be a temperature of 40 °C and 55 °C, refer to correction factors at modified environmental conditions, ▹Environmental temperature◃ on page 32.

[3] At the rated supply voltage, the device takes up the rated-/peak-input current. At the input voltage above the rated supply voltage, the input current must accordingly be reduced at a constant output power, refer to correction factors at modified environmental conditions, ▹Supply voltage◃ on page 32.

[4] The output voltage is a pulsed direct current (DC). The operating range refers to the RMS value of the fundamental wave.

[5] 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
8/16 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 Hz.

[6] Current derating refer to ▹Frequency-output-dependent current derating◃ from page 45.

[7] At a DC-link-rated voltage, the device supplies the rated-/maximum-output current. At DC link input voltages above the rated-supply voltage, the output current must accordingly be reduced at a constant output power, refer to correction factors at modified environmental conditions, ▹DC-link voltage◃ on page 34.

[8] The overload time is dependent of the motor current and of the heat sink temperature and is determined by the Ixt-monitoring of the device.

[9] The continuously permitted output current must be reduced complying with ▹Frequency-output-dependent current derating◃ on page 45, if the statical output frequency is lower than 15 Hz and the frequency remains between 0 and 15 Hz for over 5 seconds.

[10] The output power must not exceed the limit value of 1.5 kW, it is limited by the controller.

[11] An output rated current of 7.5 A is available at data set version V2.01 and higher (see parameter 129.40).

3.4.5 Frequency-output-dependent current derating

All Baumüller devices were developed, so that the specified rated-output current is permanently permitted, i. e. in the S1-operation, at an electrical output frequency of more than 15 Hz. If the statical output frequency of the inverter is smaller than 15 Hz and the frequency is longer than 5 seconds between 0 and 15 Hz, then the permitted, permanent output current must be reduced, conforming to the following characteristic curve.

Among others, in the following a few examples are shown:

- Applications with speed control without positioning or
- Applications, where at standstill current must be applied in order to maintain a torque/ a force or
- Applications, which cause a blocking of the mechanics, e. g. when starting a cold extruder.

Consequently the following operations are not concerned:

- Typical positioning operations
- Applications, where a higher-level control contains a standstill and block monitoring.

As long as the derating range is passed fast enough, the use of I_{rated} is permitted. Passing fast enough, means that the frequency change is ≥ 15 Hz/s.

Derating of the motor-side inverter-output current I against the rating-output current I_{rated}, in dependence on the static inverter-output frequency f.

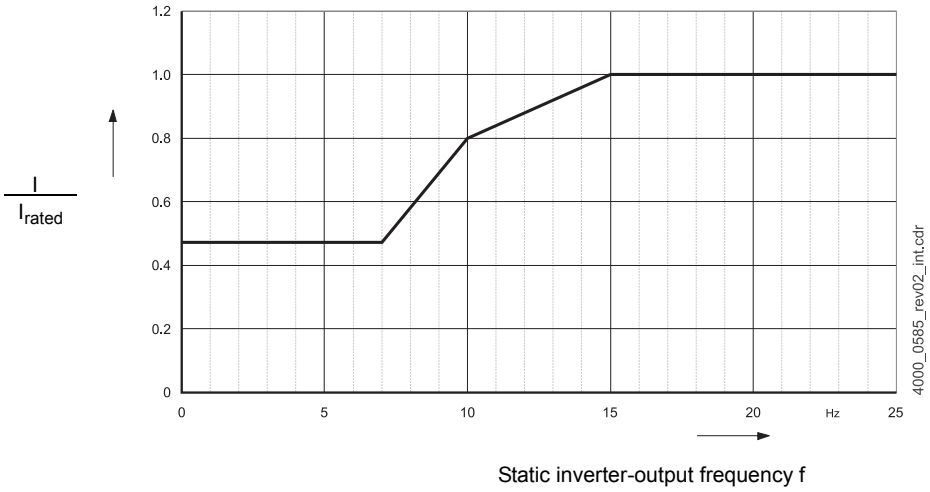


Figure 13: Derating at a static inverter frequency < 15 Hz

3.4.6 Load cycle according to EN61800-6

Operation with constant load

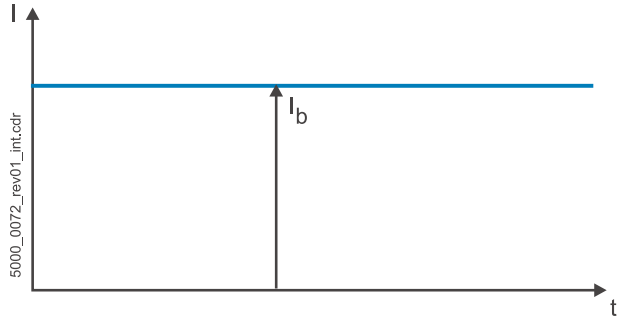


Figure 14: Typical current-time-diagram: Operation at constant load

	I_b at 2 kHz	I_b at 4 kHz	I_b at 8 kHz	I_b at 16 kHz
BM3X01	5 A (I_{rated})	5 A	3.5 A	2.5 A
BM3X11	10 A (I_{rated})	10 A	7 A	5 A
BM3X02	1.5 A (I_{rated})	1.5 A	1.1 A	0.8 A
BM3X03	2.7 A (I_{rated})	2.7 A	1.9 A	1.3 A
BM3X04	5 A (I_{rated})	5 A	3.5 A	2.5 A
BM3X12	6.5 A (I_{rated})	6.5 A	4.8 A	4.8 A
BM3X13	10 A (I_{rated})	10 A	7 A / 7.5 A	5 A

Intermittent load cycle with peak value

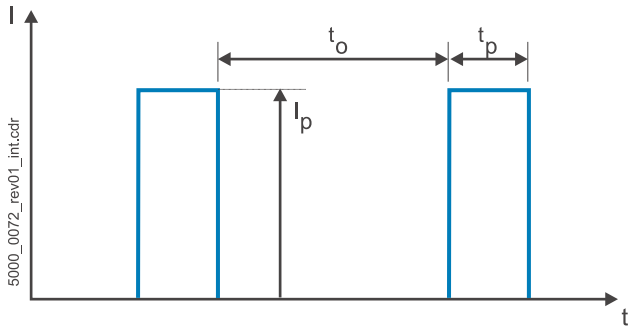


Figure 15: Typical current-time-diagram: Intermittent load cycle with peak value

this term is valid for possible load cycles:

$$(t_p + t_o) \cdot I^2_{rated} = t_p \cdot I^2_p$$

Example load cycles:

	t_o	t_p with I_p = 150 % I_{rated}	t_p with I_p = 200 % I_{rated}
BM3X01	180 s	95 s (I_p=7.5 A)	55 s (I_p=10 A)

Intermittent load cycle

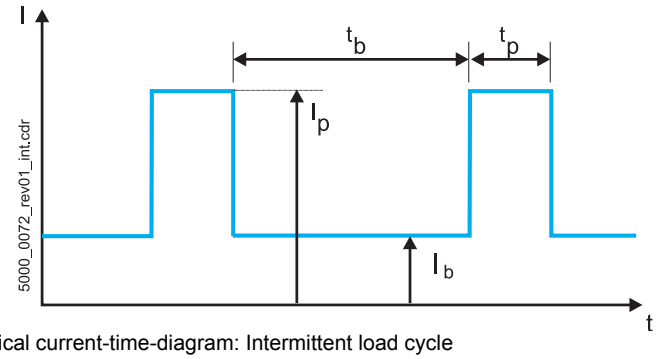


Figure 16: Typical current-time-diagram: Intermittent load cycle

This term is valid for possible load cycles:

$$(t_b + t_o) \cdot I^2_{rated} = t_p \cdot I^2_p + t_b \cdot I^2_b$$

Example load cycles:

	t_b with I_b = 60 % I_{rated}	t_p with I_p = 150% I_{rated}	t_p with I_p = 200 % I_{rated}
BM3X01	120 s (I_b = 3 A)	45 s (I_P = 7.5 A)	25 s (I_P = 10 A)

	t_b with I_b = 100 % I_{rated}	t_p with I_p = 150% I_{rated}	t_p with I_p = 200 % I_{rated}
BM3X01	60 s (I_b = 5 A)	4 s (I_P = 7,5 A)	2 s (I_p = 10 A)

4

Design and Function

In this chapter the basic design of the device **BM3200, BM3300** is described and the type code on the devices is described.

NOTE!

The devices of the **BM3200, BM3300**-series are intended for the use in the „Second environment“ (industrial environment) compliant with EN 61800-3. EMC-interferences can appear, if it is connected to the public supply.

Also see ▹Appropriate use◃ from page 12.

NOTE!

Components of Baumüller Nürnberg GmbH are intended to be installed into commercially available control cabinets

There are a number of reasons, why the components should be operated in commercially available control cabinets. Especially the following points are assured by installing these components into the control cabinet:

- The protection against contact, requested by the user can be implemented.
- The stated thermal environment conditions (temperature, relative air humidity, cleanliness of the coolants,...), in the technical data of the components and devices is assured.
- The stated mechanical environment conditions (technical data of the components and devices (vibration, shocks,....) is assured.
- The stated notes in the technical data for the EMC-compatible configuration and in order to obtain an EMC-compatible design (shielding concepts, installation principles, leadthroughs,...) can be implemented.

4.1 Design

The **BM3200, BM3300** device series are servo converters of Baumüller Nürnberg GmbH. The devices consist of a power unit and a controller unit, which are integrated in a common housing. The rated current of the devices reaches from 5 A to 10 A. The devices differ in size, power and equipment (hard- and software). Variants see ▹Type code◃ from page 54.

The devices **BM3200, BM3300** are part of the Baumüller device series **b maXX** and can be interconnected with other Baumüller devices.

The device series **b maXX** mainly consists of 2 systems:

Module system consisting of a supply unit and of one or several axis units.

- Supply unit

This is a mains rectifier-/active mains rectifier unit for the supply of axis units via the DC-link.

The AC voltage at the three-phase system is converted from the input sided mains rectifier unit into DC voltage. The DC-link capacitors smooth this DC-link voltage. Additionally the active mains rectifier unit can regenerate excess braking energy as sinusoidal current into the power supply.

- Axis unit (with controller)

This is a motor power inverter, which is supplied from the DC-link via a mains rectifier- or a active mains rectifier unit.

The output sided inverter generates a three-phase current system with a variable frequency and voltage for the supply of the connected motor.

The controller part controls the inverter of the power unit. The controller is operated either by an operating software or by a superordinated control.

NOTE!

A device of the series **BM3200, BM3300** can be operated as an axis unit.

NOTICE!

A proper operation of the **BM3200, BM3300** as an axis unit, can be guaranteed at Baumüller **mains rectifier units**. An operation on **active mains rectifiers** is **forbidden**.

The mains rectifier unit must be supplied by a TT- or TN-network.

Compact servo unit

Supply-/axis unit and controller in one housing, these devices can be operated individually also.

The input sided inverter converts the AC current into DC current, which was taken from the power supply. The DC-link capacitors smooth this DC-link voltage. The output sided inverter generates a three-phase system with variable frequency and voltage for the supply of the connected motor.

The controller parts controls the inverter of the power unit. The controller is operated either by operating software or by a master control.

NOTE!

A device of the series **BM3200, BM3300** is a compact servo unit.

4.2 Identification of the device

4.2.1 Part number BM3200, BM3300

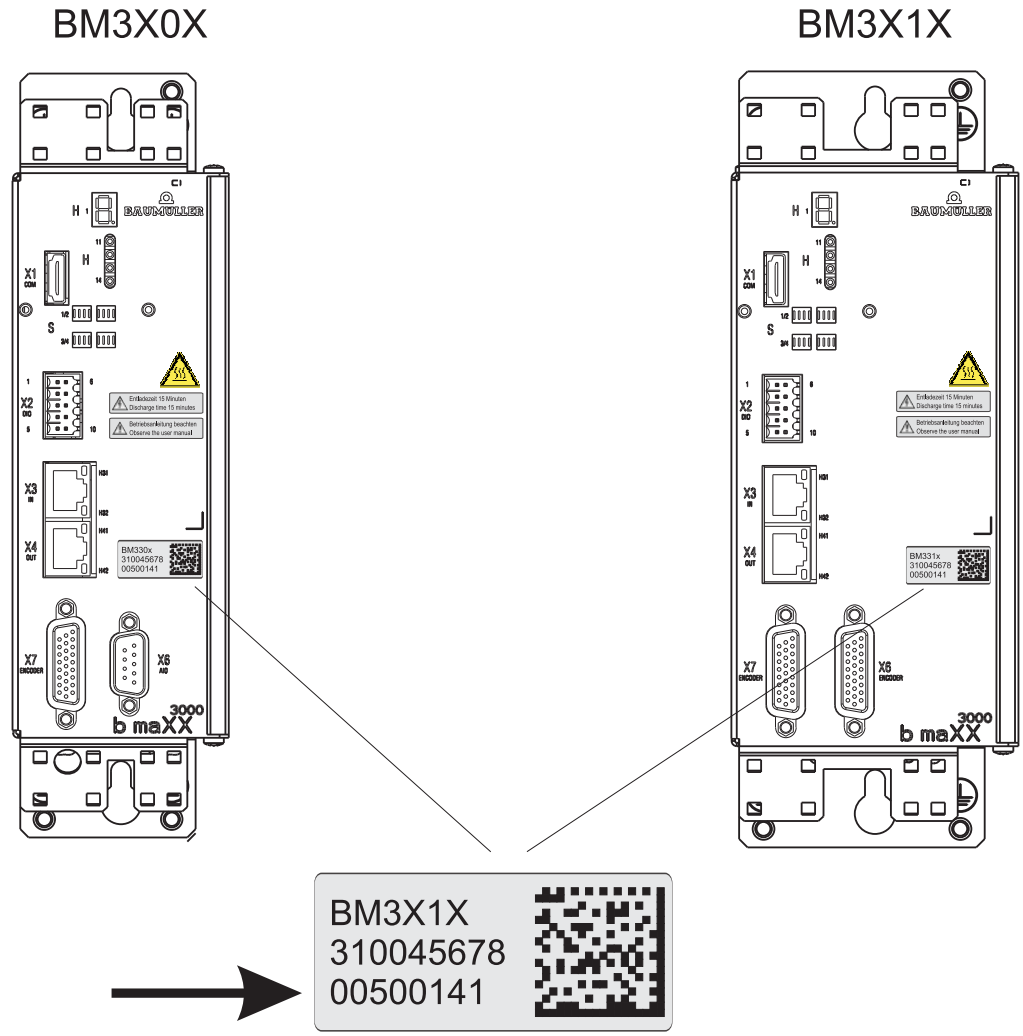


Figure 17: Part number **BM3200, BM3300** - front

4.2.2 Type plate

The figure shows the positions, where the type plate was attached.
On the type plate the type code of the device is found, also.

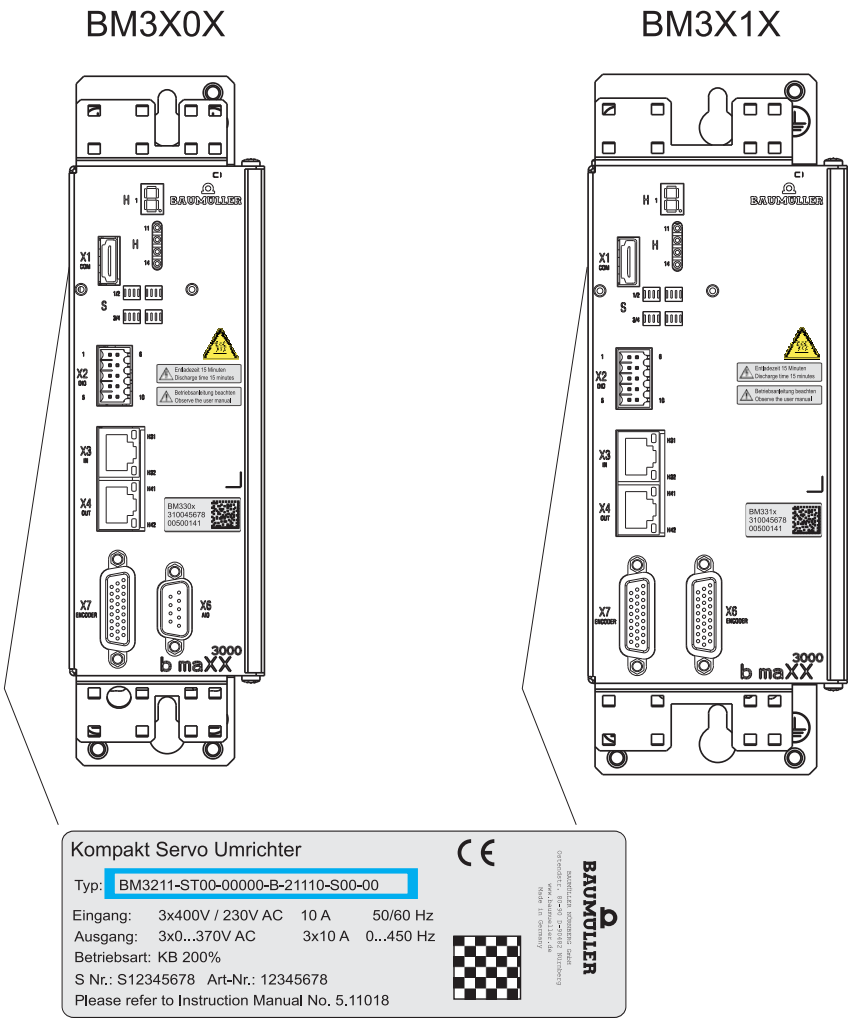


Figure 18: Type plate attachment **BM3200, BM3300**

4.2.3 Type code

The type code has the format:
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX].

The type code is explained in the following table.

BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Device generation
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Device design 2: Compact servo unit 3: Compact servo unit safety
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Housing size 0 to 1: see ▹Dimensions◃ from page 25.
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Current grading (output rated current) see ▹Electrical data◃ from page 36
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Type of cooling S: Air-cooled with air supply and air exhaust in the control cabinet
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Type of power supply T: Grounded TN or TT power supply network E: single phase power supply only G: Grounded delta systems, IT systems, grounded TN or TT systems
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Type of electronic safety relay (only BM3300) 0: No safety relay 2: Double safety relay
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Design 0: Standard
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Hardware design basic unit 0XX: Compact servo unit with ballast transistor, $U_{DC\ link}$ = 540 V
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Special design basic unit 00: Standard
BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-#XX]	Ballast resistor optional B: Ballast resistor integrated E, -: Without internal ballast resistor, connection for external ballast resistor

BM3XXX-XXXX-XXXXX[-X]-**X**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

Fieldbus interface
1: EtherCAT® CoE
2: VARAN
3: CANopen®
4: POWERLINK®
5: ProfiNET RT/IRT
7: EtherCAT® SoE

BM3XXX-XXXX-XXXXX[-X]-X**X**XXX[-S0X]-XX[-XX][-EXX][-#XX]

Encoder interface
1: HIPERFACE®, EnDat® 2.1, SSI, square and sine incremental encoder, resolver
2: EnDat® 2.2
3: HIPERFACE DSL®
4: HIPERFACE®, EnDat® 2.1/2.2, square and sine incremental encoder, resolver
5: 2 encoders: Encoder 1 and encoder 2, see 1
6: 2 encoders: Encoder 1 (see. 1), encoder 2 (see 2)
7: 2 encoders: Encoder 1 (see 1), encoder 2 (see 3)
8: 2 encoders: Encoder 1 (see 2), encoder 2 (see 1)
9: 2 encoders: Encoder 1 and encoder 2, see 2
A: 2 encoders: Encoder 1 (see 2), encoder 2 (see 3)
B: 2 encoders: Encoder 1 (see 3), encoder 2 (see 1)
C: 2 encoders: Encoder 1 (see 3), encoder 2 (see 2)
D: 2 encoders: Encoder 1 and encoder 2, see 3

BM3XXX-XXXX-XXXXX[-X]-XX**X**XX[-S0X]-XX[-XX][-EXX][-#XX]

Digital inputs/outputs
1: 2 digital inputs/ 2 digital outputs

BM3XXX-XXXX-XXXXX[-X]-XXX**X**X[-S0X]-XX[-XX][-EXX][-#XX]

Analog inputs/outputs
0: No analog inputs/outputs
1: 1 analog input/ 2 analog outputs signal bus for max.12 devices
2: 2 analog inputs/2 analog outputs extended signal bus for max. 30 devices

BM3XXX-XXXX-XXXXX[-X]-XXXX**X**[-S0X]-XX[-XX][-EXX][-#XX]

Option inputs/outputs
0: no

BM3XXX-XXXX-XXXXX[-X]-XXXXX[-**S0X**]-XX[-XX][-EXX][-#XX]

Kind of STO function optional (only BM3300)
S00: Safety function STO
Note:
Not conform to Safety Standards.
Permitted for process protection only.
S01: Safety function STO according Safety claim PLe / SIL3 (for replacement only)
S02: Safety function STO according Safety claim PLe / SIL3 with short-circuit detection

BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-**XX**[-XX][-EXX][-#XX]

Incompatible controller software version

BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-**XX**][-EXX][-#XX]

Option compatible controller software version

BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-**EXX**][-#XX]

Software function option

BM3XXX-XXXX-XXXXX[-X]-XXXXX[-S0X]-XX[-XX][-EXX][-**#XX**]

Safety level option (only BM3300)
#00: Used for safety level STO

4.3 UL notes

The notes below must be observed in case you consider UL 508 C.

▹Requirements to the energy supply: power supply◃ on page 28

- For use with grounded wye sources only or equivalent.

▹Required environmental conditions◃ on page 30

- Note the maximum surrounding air temperature.
- Use in a pollution degree 2 environment only.

▹Requirements for the motor temperature sensors◃ on page 91

- Motor over-temperature sensing is required. Drive intended to be used with motors that have thermal sensor mounted in or on the motors.
  Connection see ▹Connecting diagrams◃ from page 93

▹Connections◃ from page 113

- Position of wiring terminals to indicate the proper connections for the power supply, load, control circuit, and similar devices refer to ▹Page 113◃.

Connections from ▹Page 113◃ to ▹Page 139◃

- Note tightening torque values marked for field terminals.

▹Fuses◃ from page 185

- Devices are suitable for use on a circuit capable of delivering not more than 5000 rms symmetrical amperes,480Y/277 V_{AC} maximum
  - when protected by J Class Fuses rated min. 480 V_{AC}, max. 15 A or
  - when protected by a circuit breaker rated min. 480/277 V, max. 20 A.
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code and any additional local codes.

4.4 Display and operating elements BM3200, BM3300

Depending on the variant of the fieldbus connection

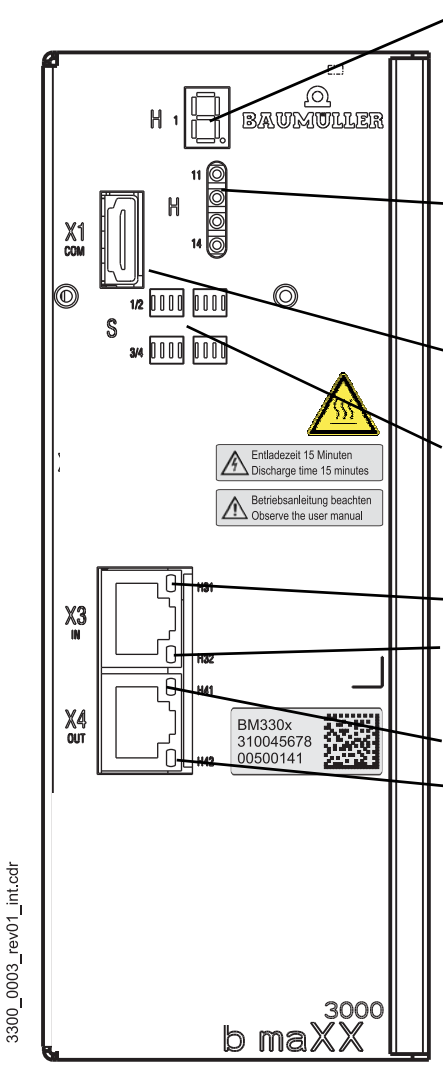
EtherCAT®

Type code **BM3200, BM3300** with EtherCAT® CoE profile:

BM3XXX-XXXX-XXXXX[-X]-**1**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

Type code **BM3200, BM3300** with EtherCAT® SoE profile:

BM3XXX-XXXX-XXXXX[-X]-**7**XXXX[-S0X]-XX[-XX][-EXX][-#XX]



H1: 7-segment display
display status controller
Meaning see: ▹Function of the 7-segment display◃ from page 62

H11 - H14: Status display via LED
Meaning see: ▹Function of the LEDs H11 to H14◃ on page 63

X1: Service interface

S1 - S4: Address switch
Setting: see
▹Settings address switches◃ from page 66

H31: LED EtherCAT®

H32: LED EtherCAT®

H41: LED EtherCAT®

H42: LED EtherCAT®

Meaning: see ▹LEDs EtherCAT®◃ on page 64

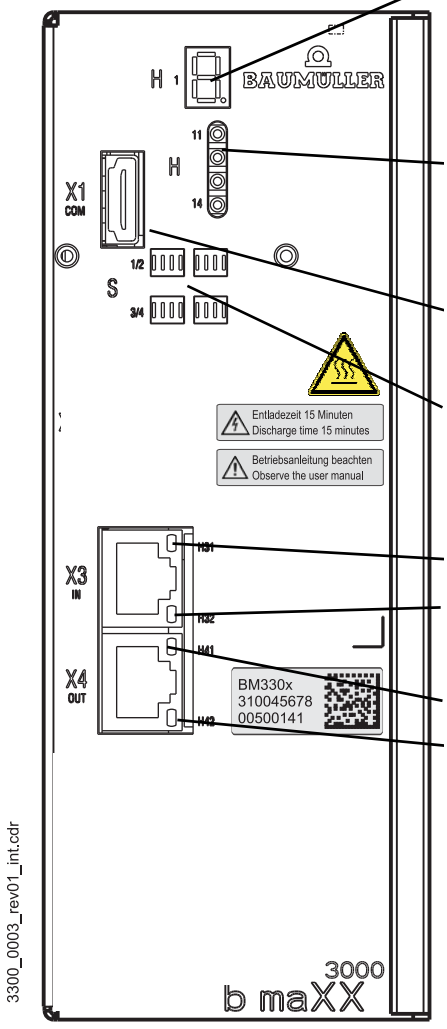
Figure 19: Display and operating elements **BM3200, BM3300** EtherCAT®

NOTE!

The service interface X1 must be used with the service cable BM5-K-USB-XXX only, maximum transmission rate 920 kBaud.

VARAN Type code **BM3200, BM3300** with VARAN:

BM3XXX-XXXX-XXXXX[-X]-**2**XXXX[-S0X]-XX[-XX][-EXX][-#XX]



H1: 7-segment display
display status controller
Meaning see: ▹Function of the 7-segment display◃ from page 62

H11 - H14: Status display via LED
Meaning see: ▹Function of the LEDs H11 to H14◃ on page 63

X1: Service interface

S1 - S4: Address switch
Setting: see
▹Settings address switches◃ from page 66

H31: LED VARAN

H32: LED VARAN

H41: LED VARAN

H42: LED VARAN

Meaning: see ▹LEDs VARAN◃ on page 64

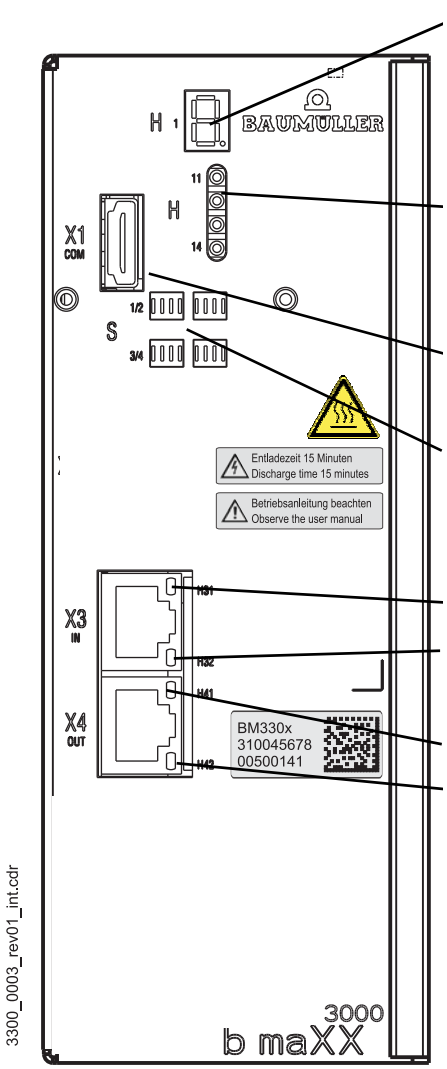
Figure 20: Display and operating elements **BM3200, BM3300** VARAN

NOTE!

The service interface X1 must be used with the service cable BM5-K-USB-XXX only, maximum transmission rate 920 kBaud.

CANopen® Type code **BM3200, BM3300** with CANopen®:

BM3XXX-XXXX-XXXXX[-X]-**3**XXXX[-S0X]-XX[-XX][-EXX][-#XX]



H1: 7-segment display
display status controller
Meaning see: ▹Function of the 7-segment display◃ from page 62

H11 - H14: Status display via LED
Meaning see: ▹Function of the LEDs H11 to H14◃ on page 63

X1: Service interface

S1 Reserved for further functions

S2 Baud rate CANopen®
Refer to address switch ▹CANopen®◃ from page 69.

S3/S4: Address CANopen®
Refer to address switch ▹CANopen®◃ from page 69.

H31/H32: LEDs without function

H41/42: LEDs without function

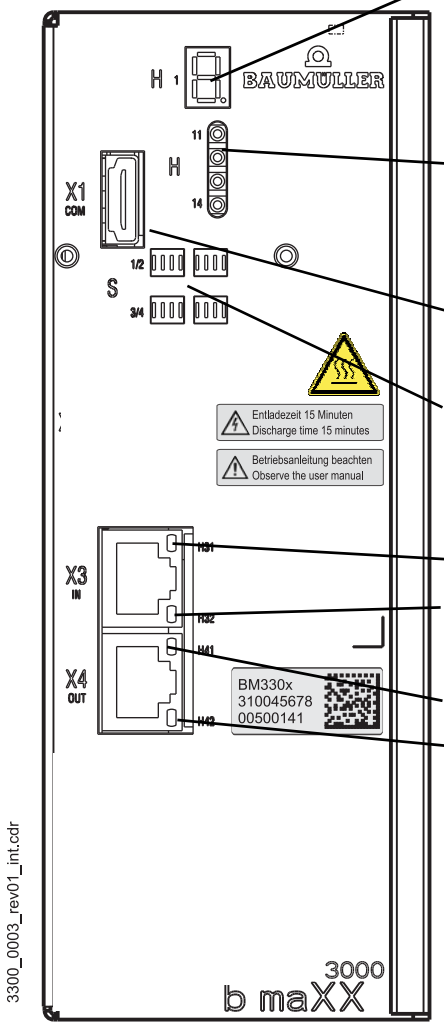
Figure 21: Display and operating elements **BM3200, BM3300** CANopen®

NOTE!

The service interface X1 must be used with the service cable BM5-K-USB-XXX only, maximum transmission rate 920 kBaud.

POWERLINK® Type code **BM3200, BM3300** with POWERLINK®

BM3XXX-XXXX-XXXXX[-X]-**4**XXXX[-S0X]-XX[-XX][-EXX][-#XX]



H1: 7-segment display
display status controller
Meaning see: ▹Function of the 7-segment display◃ from page 62

H11 - H14: Status display via LED
Meaning see: ▹Function of the LEDs H11 to H14◃ on page 63

X1: Service interface

S1 - S4: Address switch
Setting: see
▹Settings address switches◃ from page 66

H31: LED POWERLINK®

H32: LED POWERLINK®

H41: LED POWERLINK®

H42: LED POWERLINK®

Meaning: see ▹LEDs POWERLINK®◃ on page 65

Figure 22: Display and operating elements **BM3200, BM3300** POWERLINK®

NOTE!

The service interface X1 must be used with the service cable BM5-K-USB-XXX only, maximum transmission rate 920 kBaud.

4.4.1 Function of the 7-segment display

An exact description of the drive statuses and transitions can be found in the Parameter manual **b maXX 3000**.

0: Low, 1: High

Display	Condition Drive Manager	Meaning
0	NOT READY-TO-START	Drive signals „not ready for power switch-on“
1	INHIBIT START	Voltage inhibited, e.g. quick stop active
2	READY-TO-START	Drive shut down 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	INHIBIT OPERATION ACTIVE	
6	DRIVE SHUT DOWN ACTIVE	Pulse enable = 0
7	QUICK STOP ACTIVE	Quick stop = 0 (low-active)
E	ERROR REACTION ACTIVE	
F	ERROR	Error message Reset via control word 0xxx xxxx or delete error memory 0 → 1
P	Parking axis	

4.4.2 Function of the LEDs H11 to H14

Designation front plate	Internal designation	Meaning
H11	1.1 green 1.1 red	Torque direction H11 green: positive torque direction H11 red: negative torque direction
H12	1.2 green 1.2 red	Power-On / pulse enable 24 V connected H12 green: power ON H12 red:
H13	1.3 red	Current limit H13 red: device is operating at current limit
H14	1.4 red	Error display H14 red: device signal error

4.4.3 Function of the LEDs H31/H32 and H41/H42

Depending on the variant of the fieldbus connection

LEDs EtherCAT®

Type code **BM3200, BM3300** with EtherCAT® CoE profile:
BM3XXX-XXXX-XXXXX[-X]-**1**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

Type code **BM3200, BM3300** with EtherCAT® SoE profile:
BM3XXX-XXXX-XXXXX[-X]-**7**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

Designation front plate	**Meaning**	**Blinking pattern**	
H31 (green)	X3 Link / Act	Off:	no connection
		On:	connection
		Blinking:	data transmission
H32 (orange)	ERROR	On:	ERROR (recipient error Phy1/Phy2)
H41 (green)	X4 Link / Act	Off:	no connection
		On:	connection
		Blinking:	data transmission
H42 (orange)	RUN	Off:	ERROR/INIT
		500 ms on/ 500 ms off:	PREOPERATIONAL
		200 ms on/ 1 s off:	SAFEOPERATIONAL
		On:	OPERATIONAL

LEDs VARAN

Type code **BM3200, BM3300** with VARAN:
BM3XXX-XXXX-XXXXX[-X]-**2**XXXX[-S0X]-XX[-XX][-EXX][-#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

LEDs CANopen®

Type code **BM3200, BM3300** with CANopen®:

BM3XXX-XXXX-XXXXX[-X]-**3**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

LEDs without function.

LEDs POWERLINK®

Type code **BM3200, BM3300** with POWERLINK®

BM3XXX-XXXX-XXXXX[-X]-**4**XXXX[-S0X]-XX[-XX][-EXX][-#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 Settings address switches

EtherCAT® CoE
EtherCAT® SoE
BM3XXX-XXXX-XXXXX[-X]-**1**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

VARAN
BM3XXX-XXXX-XXXXX[-X]-**2**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

POWERLINK®
BM3XXX-XXXX-XXXXX[-X]-**4**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

IP-Address S1 to S4

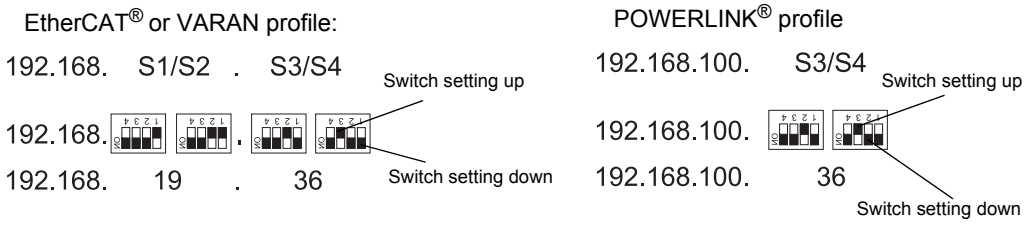
The IP address of the controller consists of 32 bits or 4 bytes (e.g. 192.168.125.203).

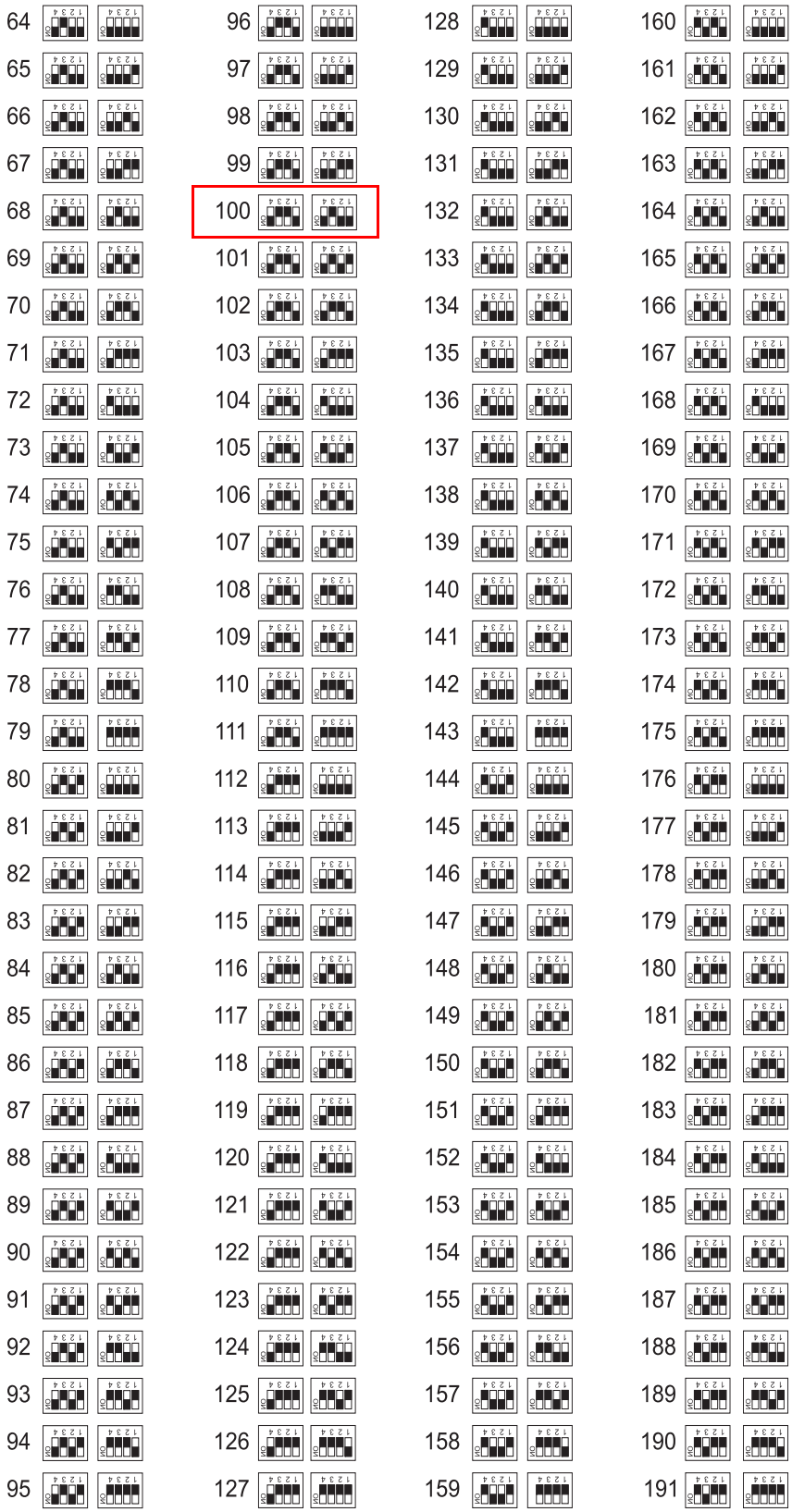
Controller with EtherCAT® or VARAN profile: Both of the first bytes are set with the base address (192.168.) at the factory. Both of the last bytes are set by means of the address switches S1, S2, S3 and S4. In the process, S1 and S2 as well as S3 and S4 each represent an 8 bit value.

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, see the parameter manual.




64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159
160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191

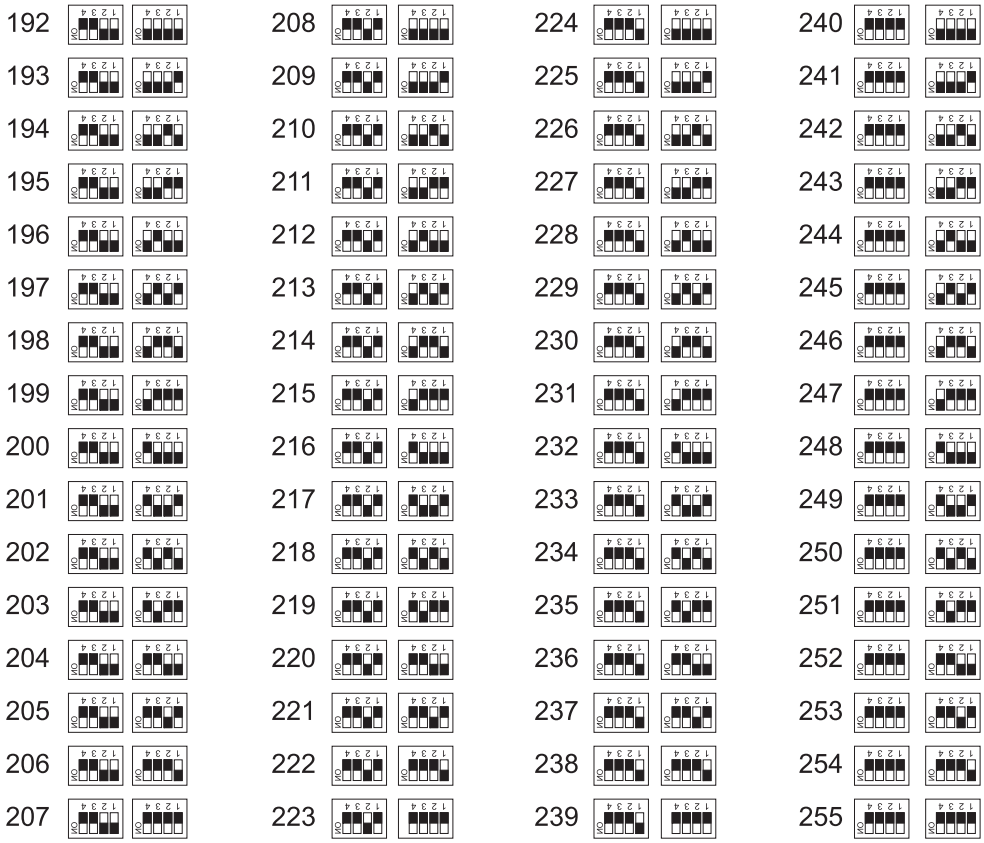
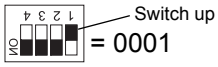


Figure 23: Address switch setting EtherCAT®, POWERLINK®, VARAN

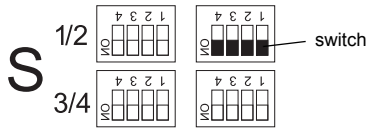
CANopen® BM3XXX-XXXX-XXXXX[-X]-**3**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

NOTE!



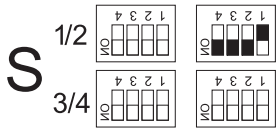
Baud rate S2

20 kBit/s



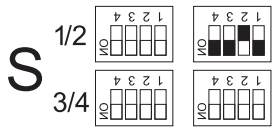
3300_0022_rev01_int

125 kBit/s, default setting



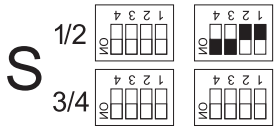
3300_0023_rev01_int

250 kBit/s



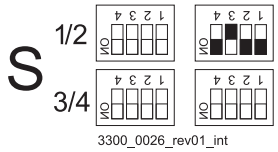
3300_0024_rev01_int

500 kBit/s



3300_0025_rev01_int

1 MBit/s



3300_0026_rev01_int

Address S3/S4

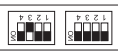
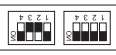
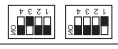
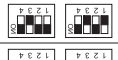
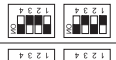
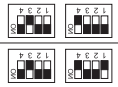
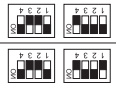
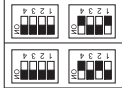
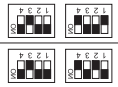
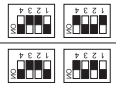
S3/S4	ID	S3/S4	ID	S3/S4	ID	S3/S4	ID
	0		32		64		96
	1		33		65		97
	2		34		66		98
	3		35		67		99
	4		36		68		100
	5		37		69		101
	6		38		70		102
	7		39		71		103
	8		40		72		104
	9		41		73		105
	10		42		74		106
	11		43		75		107
	12		44		76		108
	13		45		77		109
	14		46		78		110
	15		47		79		111
	16		48		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 24: 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.

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

WARNING!

Danger of physical impact!

Secure devices against falling down.

Therefore:

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

5.2 What to observe when transporting

For initial transport of a device, it is packed at the manufacturer's plant. If the device must be 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 per EN 60721-3-2

5.3 Transport inspection

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

If there is visible transport damage on the outside, proceed as follows:

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

NOTE!

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

5.4 Unpacking

After having received the packaged device:

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

If no transport damage is visible:

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

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

NOTE!

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

5.5 Disposal of the packaging

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

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

6

MOUNTING

The device is intended for mounting it into a control cabinet.

Mounting comprises the following steps:

1 Mounting preparation
(for drilling holes, see ▹Drilling templates◃ from page 77)

2 Mounting the device
(for attachment, see ▹Mounting instruction BM3200, BM3300◃ on page 79)

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.

WARNING!

Danger as a result of faulty mounting!

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

Therefore:

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

WARNING!

Danger of physical impact!

Secure devices against falling down.

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 can be injured.

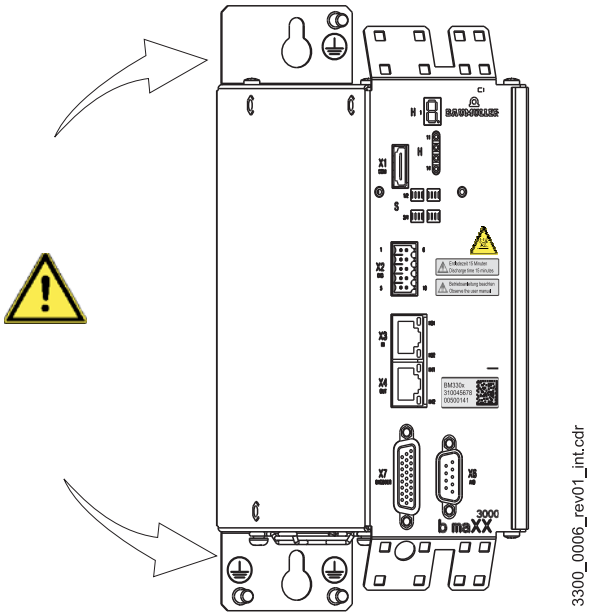


Figure 25: Danger area near the mechanical mounting

Therefore:

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

Wear safety gloves.

Wear safety shoes.

6.2 Preparing for mounting

Based on the project planning and the drilling templates (see ▹Drilling templates◃ from page 77), 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 starting operation without fail!

CAUTION!

Eye injury due to flung particles.

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

Therefore:

Wear safety goggles!

6.3 Drilling templates

How to determine the required space in the control cabinet, see ▹Dimensions◃ from page 25.

Use the drilling templates to make the necessary drill holes.

NOTE!

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

Further notes see ▹Dimensions◃ from page 25 and ▹Cooling◃ from page 35.

NOTE!

- Assembly permitted in the displayed position only (vertical with air cooling from the bottom to the top).
- A lining up of several devices next to each other is possible. Comply with the specified clearance of 100 mm above and below the device, so that the air circulation for heat dissipation is guaranteed.

NOTE!

All dimensions in mm.

Tolerance specifications

Drill hole dimensioning	±0.2 mm
Relative tolerance of discretionary divisions	±0.1 mm

Drilling template
BM3200, BM3300

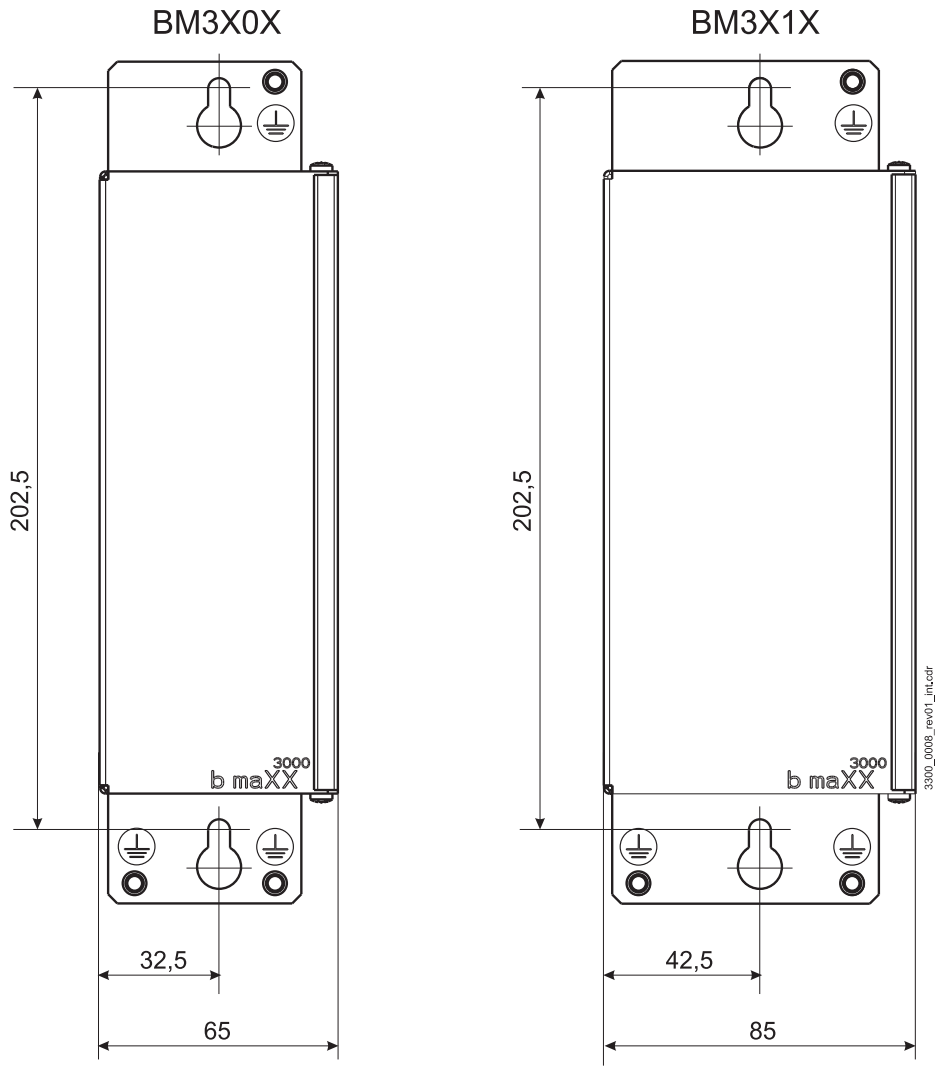


Figure 26: Drilling template **BM3200, BM3300**

6.4 Mounting instruction BM3200, BM3300

The required screws and washers for the mounting are specified below the figure.

Complete mounting as follows:

1 Provide suitable fixing material.

2 Mount device.

Mount device

- On the top and on the bottom insert the fixing screw into the longitudinal holes (1).
- Then let the device glide downwards (2).
- In conclusion, tighten all fixing screws and grounding screws (3).

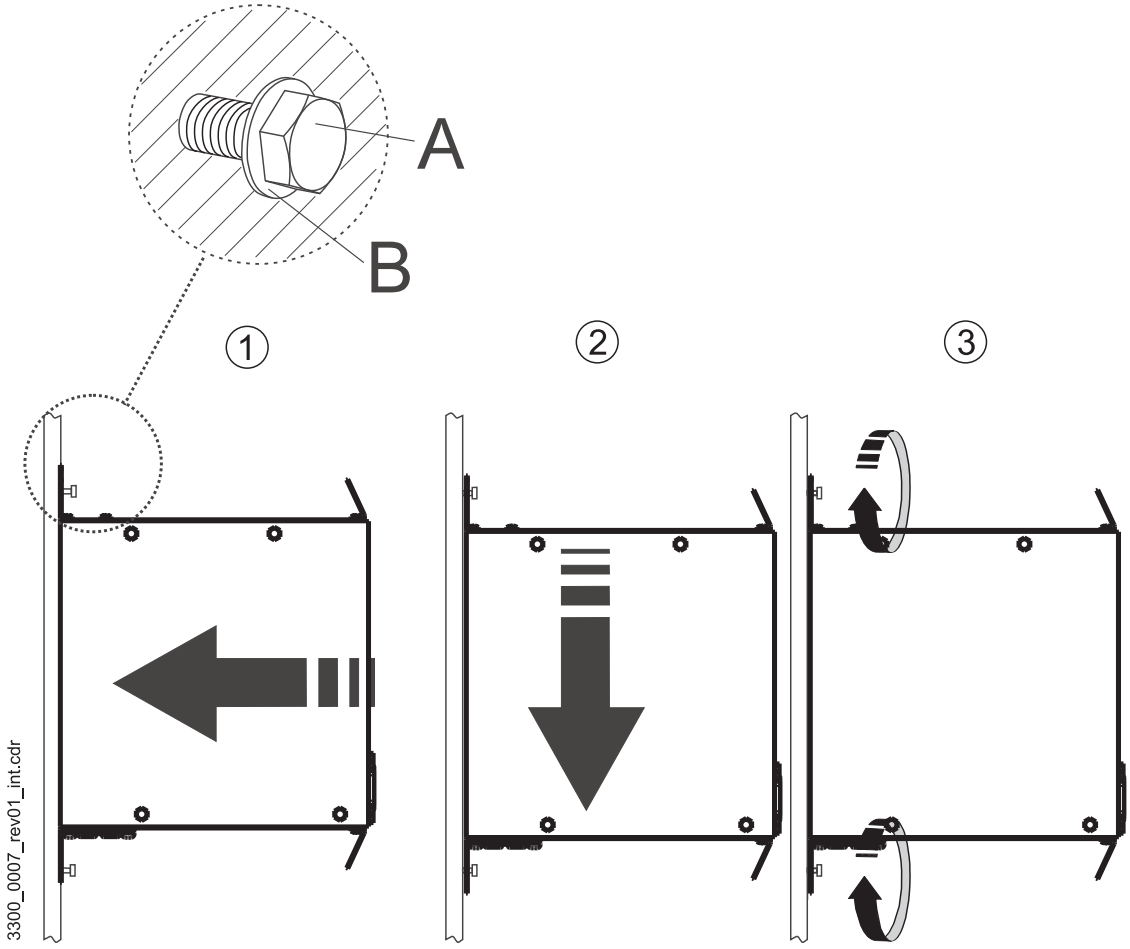


Figure 27: Mounting instruction **BM3200, BM3300**

Device	**BM3200, BM3300**
A - Screws	2 x M5
B - Washers	2 x (5,3 x 10)

7

INSTALLATION

This chapter describes the electrical installation of the device. The mechanical mounting is described in ▹Mounting◃ from page 73.

Assure, that the technical preconditions are fulfilled, before installation:

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.

WARNING!

Danger due to faulty installation and initial commissioning!

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

Therefore:

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

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

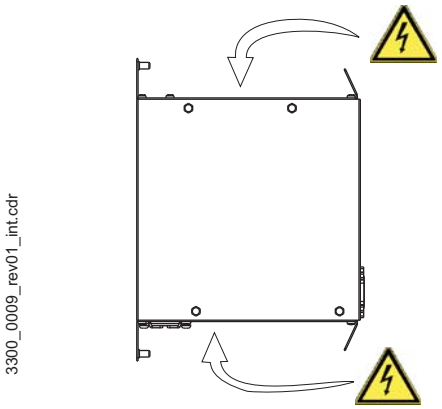


Figure 28: Hazard areas during electrical installation

Danger from residual energy

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Refer to ▹ Electrical Data ◃.

Therefore:

- Do not touch electrically live parts before taking into account the discharge time of the capacitors.
- 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.

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. Thus it is 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 electrical power supply

For all important data, see ▹Requirements to the energy supply: power supply◃ from page 28.

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 secondary surroundings (e.g. an industrial environment).

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 prerequisites for power supply have been fulfilled.

7.4 Requirements for the connection cables

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

For further details (e.g. maximum permissible length), see ▹Cables◃ from page 171.

7.5 Protection of the device and accordingly of the cable

In order to protect this device and accordingly the cables against overload and possible damages / destruction due to the power supply, cable protection fuses **and** device protection fuses must be installed. Data of the required fuses see ▹Fuses◃ from page 185.

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 conductor. Consequently, a PE connection in accordance with EN 61800-5-1 is specified.

DANGER!

Risk of fatal injury from electrical current!

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

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

Therefore:

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

7.7 Installation requirements with regard to EMC stability

NOTE!

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

NOTE!

The important information on EMC-compliant installation can be found in this Instruction handbook. Additional notes on building a CE-compliant system, that are imperative to take heed of, can be found in the Baumüller Instruction handbook „Filters for mains applications“, 5.09010. This manual can be obtained from Baumüller Nürnberg GmbH.

In order to achieve an EMC-compatible and interference-free operation within the framework of legislation, the following aspects must be considered.
Please do not hesitate to contact our sales department or the application department of Baumüller Nürnberg GmbH, if there are any questions.

- Only use Baumüller motor cables and Baumüller components.
- Use suitable line 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
  (refer to ▹PE connections BM3200, BM3300 rear panel◃ on page 139).
- Ensure the correct sequence at installation:
  Power supply - fuse - filter - **BM3200, BM3300** - (motor filter) - motor.

HINWEIS!

A ferrite core (part No. 308293) must be used with a DC link connection longer than 3 m to ensure a reliable EMC interference immunity of the **BM3200, BM3300.** The DC link cables connected with 1C1 and 1D1 must be led through the ferrite core with 3 turns per cable. The ferrite core should be as close as possible to the connection X205 of the **BM3200, BM3300.**

- 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 - line 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 Shielding plan

The shielding of the motor cable as well as of the motor temperature cable must be connected electrically with the mounting plate or with shield sheet (see ▹Accessories kit shielding BM3200, BM3300◃ on page 191).

NOTE!

Baumüller Nürnberg GmbH recommends the shielding connection with shield sheet.

NOTE!

Pay attention to strain relief for all cables!

7.8.1 Shielding connection mounting plate

Establish a large-area contact between the shield and the conductive and grounded mounting plate by means of a conductive clamp.

Refer to ▹Connecting the shield◃ on page 88.

7.8.2 Shielding connection with shield sheet

7.8.2.1 Mounting shield sheet

Refer to ▹Accessories kit shielding BM3200, BM3300◃ from page 191.

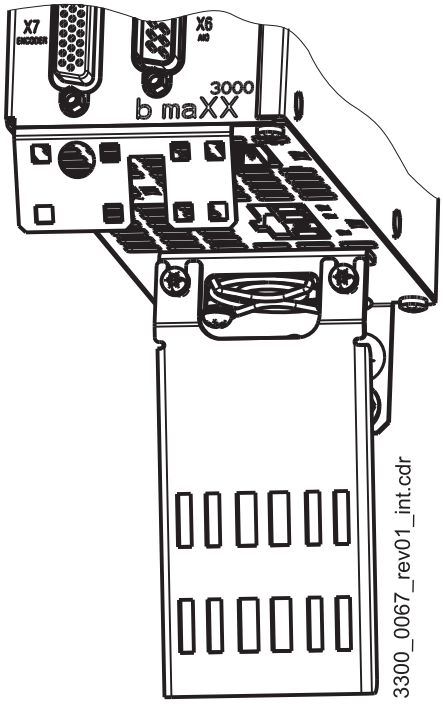


Figure 29: Mounting shield sheet

7.8.2.2 Connecting the shield

It is recommended to connect the shielding according following figure, see also ▷Accessories kit shielding BM3200, BM3300◁ on page 191.

1. Prepare motor cable according figure
2. Remove the motor temperature cable's shield from the cable
3. Wrap motor temperature cable around motor cable at least 1 turn, form no loop.

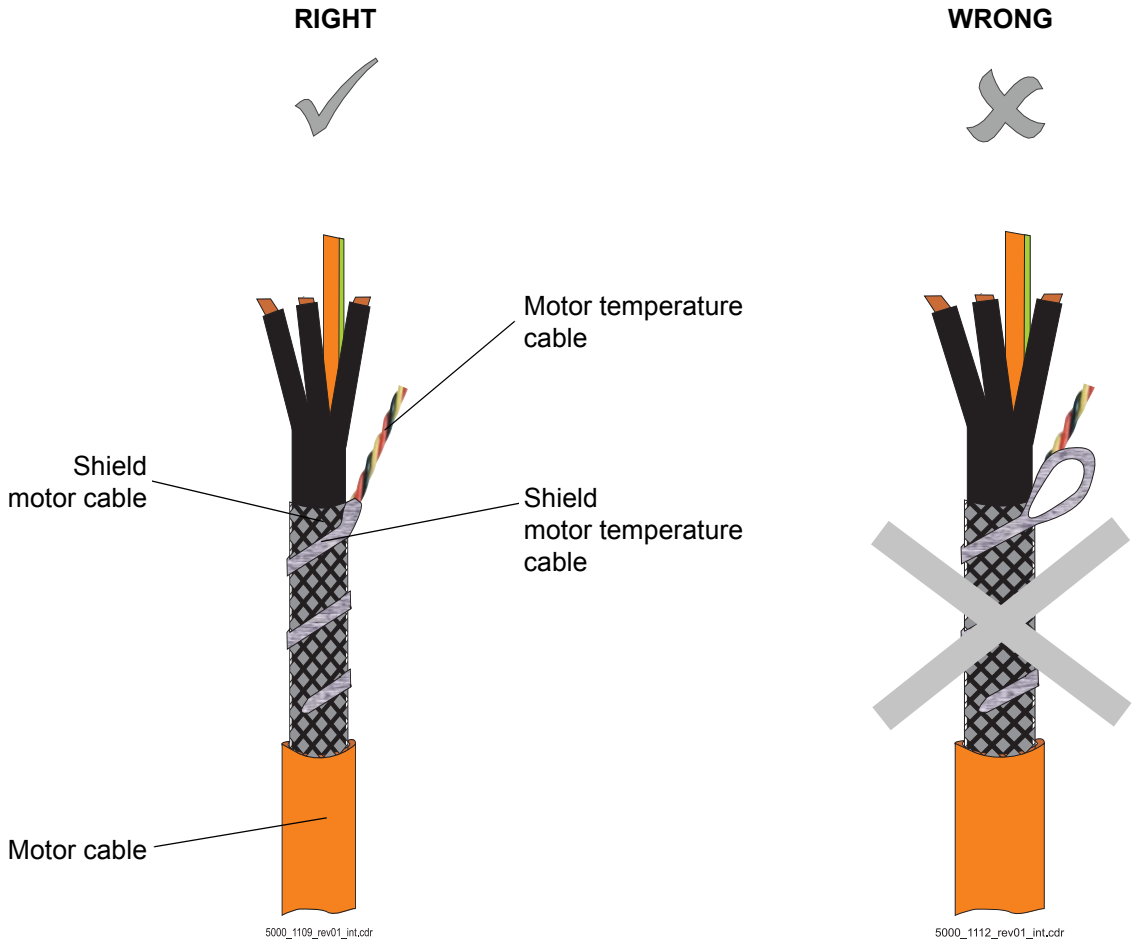


Figure 30: Wrap shield motor temperature cable around motor cable

4 From top wrap conductive metallic adhesive tape around

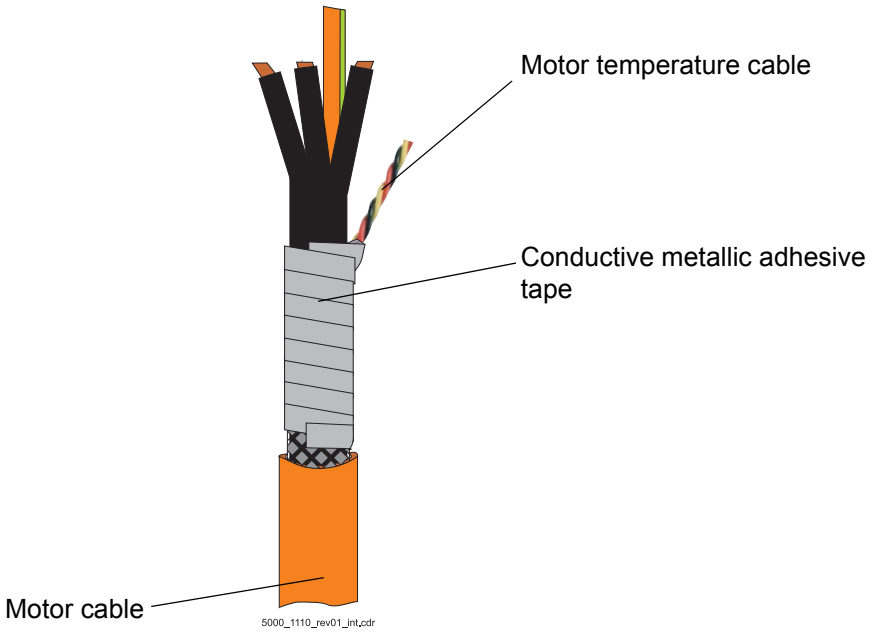


Figure 31: Tape shield motor temperature cable around

NOTE!

The shielding of the motor temperature cable and the shielding of the motor cable is wrapped together with a conductive metallic adhesive tape.

5 Connect both shielding with shield clamp on the shield sheet, note locking torque of the fixing screw!

NOTE!

The shield must be connected to the mounting plate with a metallic clamp, if the optional shield sheet is not used!

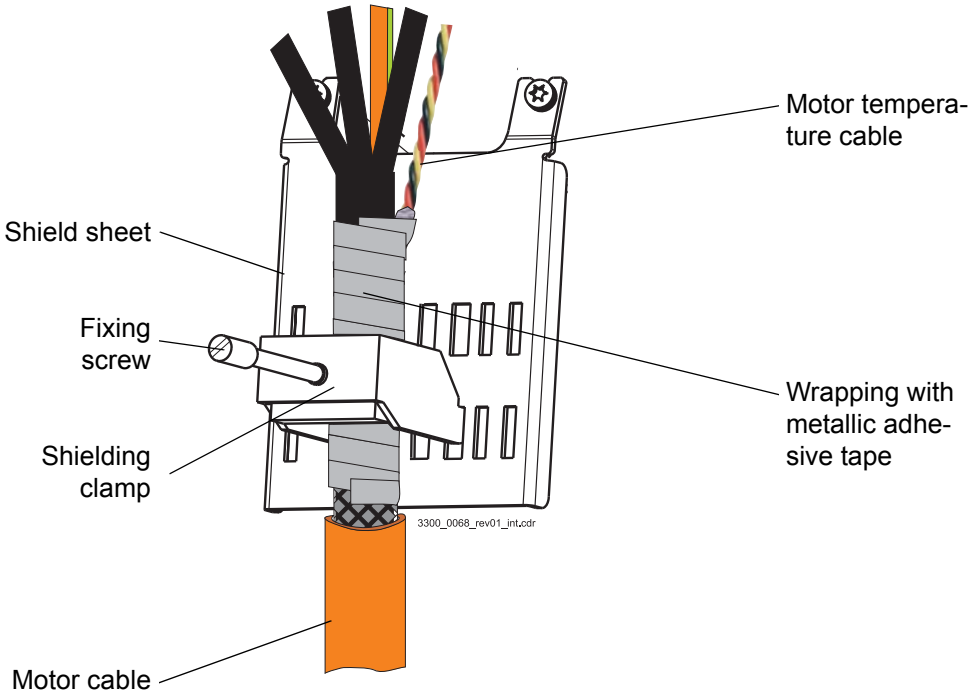


Figure 32: Shield connection motor cable

Locking torque of the fixing screw:

Shielding clamp width	Locking torque
shielding clamp width 24 mm width	0.8 Nm cable diameter 5 - 20 mm
shielding clamp width 17 mm width	0.8 Nm cable diameter 3 - 14 mm

7.9 Requirements for the motor temperature sensors

To protect the motor against impermissible overheating, a motor temperature sensor can be connected to the **BM3200, BM3300** device via the encoder cable or directly. The device switches off of the motor when a settable threshold temperature has been exceeded.

NOTE!

The motor temperature sensor must be connected **either** on the **BM3200, BM3300** directly **or** via the encoder cable, the other input must not be connected.

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

[1] Motor protection thermistor (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 BM3200, BM3300

DANGER!

Risk of fatal injury from electrical current!

Parts under voltage are dangerous to life.

Therefore:

- Assure, that the device and the parts (e. g. power cables), which are mounted as well as the mounting range are de-energized during mounting.

- All cables must be installed EMC-compatible.
- Connect cable (see ▹Connecting diagrams◃ from page 93).
  (Observe the allowable torque!)

The installation consists of the following steps:

1. Connect motor to the terminals 1U2, 1V2, 1W2, PE.
   Consider the appropriate phase connection (rotational direction)
   Consider the allowable torques!
   Connection data see ▹X107 - motor connection◃ on page 138.
2. Connect fuses (F1), also see ▹Fuses◃ from page 185.
3. Connect main contactor (K1, option).
4. Connect line filter (Z1)
5. Connect device via the power supply input terminals
   BM32XX-X**T, BM33XX**-X**T**
   Three-phase: 1U1, 1V1 and 1W1
   at reduced power also single-phase possible: 1U1 and 1W1
   BM32XX-X**E, BM33XX**-X**E**
   Single-phase: L and N
   Connection data see ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132.
6. Connect the protection conductor to the PE connection (a permanent PE connection is compulsory),
   also see ▹PE connections BM3200, BM3300 rear panel◃ on page 139.
7. Connect 24 V-supply via terminals X200 -1, X200 -2
   Connection data see ▹X200 - 24V voltage supply◃ on page 131.
8. Connect signal bus X300 (see ▹X300 - signal bus◃ from page 134)
9. Connect encoder
   (encoder types and pin assignment see ▹X6 / X7 - encoder connection◃ from page 121)

NOTE!

The plugging and pulling of the energized encoder cable is not permitted and can cause a destruction.
Therefore, the 24V-supply voltage must be switched off before and the connector must be interlocked.

10 Connection temperature sensor of motor (consider polarity!)

- Use of encoder cable
- Use of connector ▹X101 - motor temperature◃ on page 137

NOTE!

The motor temperature sensor must be connected **either** on the **BM3200, BM3300** X101 directly **or** via the encoder cable. It is forbidden to use both connections simultaneously.

11 Connect signal generator for pulse enable:
via terminals X2 -5 (IF1), X2 -1 (M24V),
see ▹X2 - Digital inputs/outputs◃ on page 115.

12 **Only** when using devices without internal ballast resistor **BM3XXX**-XXXX-XXXXX-**E**-XXXXX and dependent on the application connect a ballast resistor (R_B) to the terminals 1C1 and Ba-, also see ▹Electrical data◃ from page 36.

NOTE!

The ballast resistor connection is not short-circuit proof.

When using devices **BM3200, BM3300 without internal ballast resistor** an external ballast resistor must be connected in case of braking operation.

7.11 Connecting diagrams

The connecting diagram for the power supply, the motor, the pulse enable a. s. o. are shown from ▹Page 94◃ onwards.

The connection data and the pin assignments are found from ▹Page 113◃ onwards.

NOTE!

In order to ensure an adequate current carrying capacity of the connections, comply to the torques!

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 BM3XXX-XT as a compact servo unit (3-phase)

Devices with internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**B**-XXXXX-

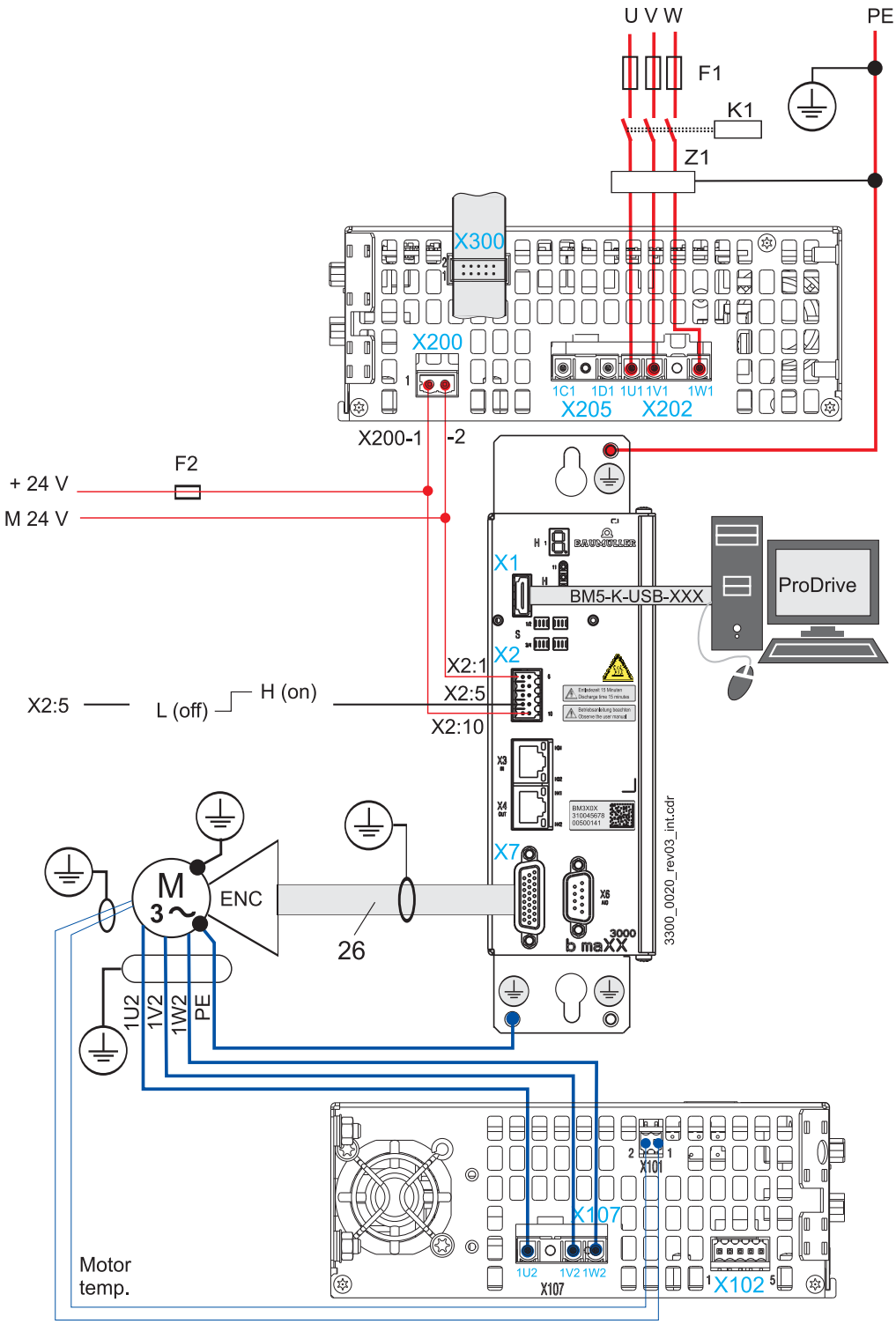


Figure 33: Terminal diagram **BM3XXX-XT** (3-phase connection, internal ballast resistor)

Devices without internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**E**-XXXXX-

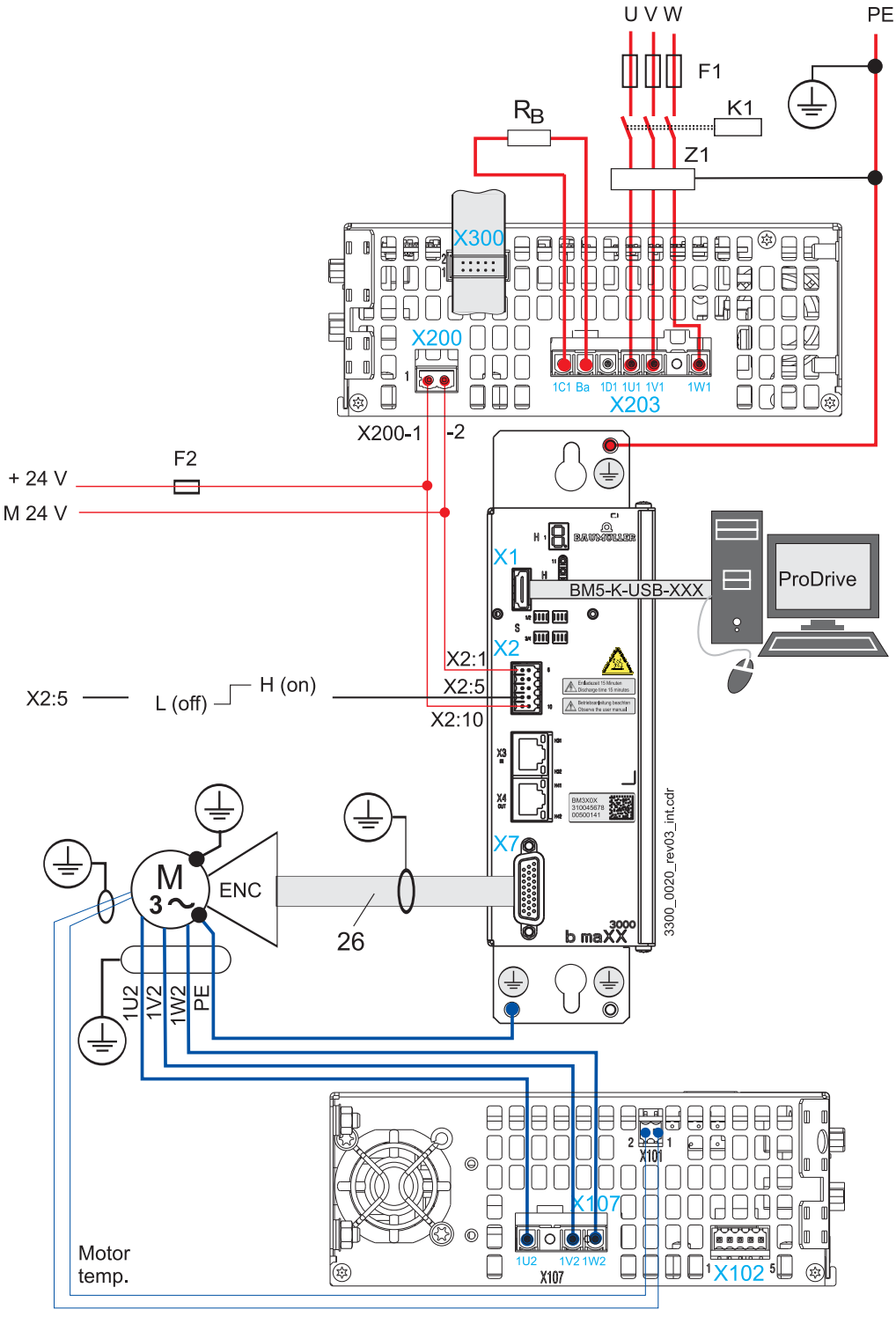


Figure 34: Terminal diagram **BM3XXX-XT** (3-phase connection, no internal ballast resistor)

X1	Service interface, see ▹X1 - Service interface◃ on page 114.
X2	Digital in- and outputs, e.g. pulse enable, see ▹X2 - Digital inputs/outputs◃ on page 115.
X2:5	Input pulse enable, Low: not enabled, High: enabled (operation possible).
X3, X4	Connections for fieldbus EtherCAT®, VARAN, CANopen®, POWERLINK®, according to the version also see ▹X3 / X4 - fieldbus connection◃ on page 116.
X6	Analog in- and outputs, see ▹X6 - analog inputs/outputs◃ on page 120.
X7	Encoder analysis, see ▹X6 / X7 - encoder connection◃ from page 121.
X101	Connection motor temperature, see ▹X101 - motor temperature◃ on page 137.
X102	Connection STO, see ▹X102 - safe torque off - option◃ on page 137.
X107	Motor, also see ▹Requirements to the motor◃ on page 29 and ▹X107 - motor connection◃ on page 138.
X200	Connections for the 24 V-voltage supply (SELV/PELV), see ▹Requirements to the control voltage / 24 V-supply◃ on page 29 and ▹X200 - 24V voltage supply◃ on page 131.
X202	Power supply, see ▹Requirements to the energy supply: power supply◃ from page 28 and ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132.
X203	Power supply and ballast resistor connection, see ▹Requirements to the energy supply: power supply◃ from page 28 and ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132.
X300	Signal bus, connection to further units, see ▹X300 - signal bus◃ on page 134.
PE	PE-connection, see ▹PE connection and RCD compatibility◃ from page 85 and ▹PE connections BM3200, BM3300 rear panel◃ on page 139.
F1	Fuses (cable + device), see ▹Protection of the device and accordingly of the cable◃ from page 84.
F2	Fuse for the 24 V-voltage supply
K1	Power circuit contactor (optional)
Z1	Line filter, see ▹Line filter◃ on page 187.

7.11.2 BM3XXX as an axis unit

Devices with internal ballast resistor **BM3XXX**-XTXX-XXXXX-**B**-XXXXX-

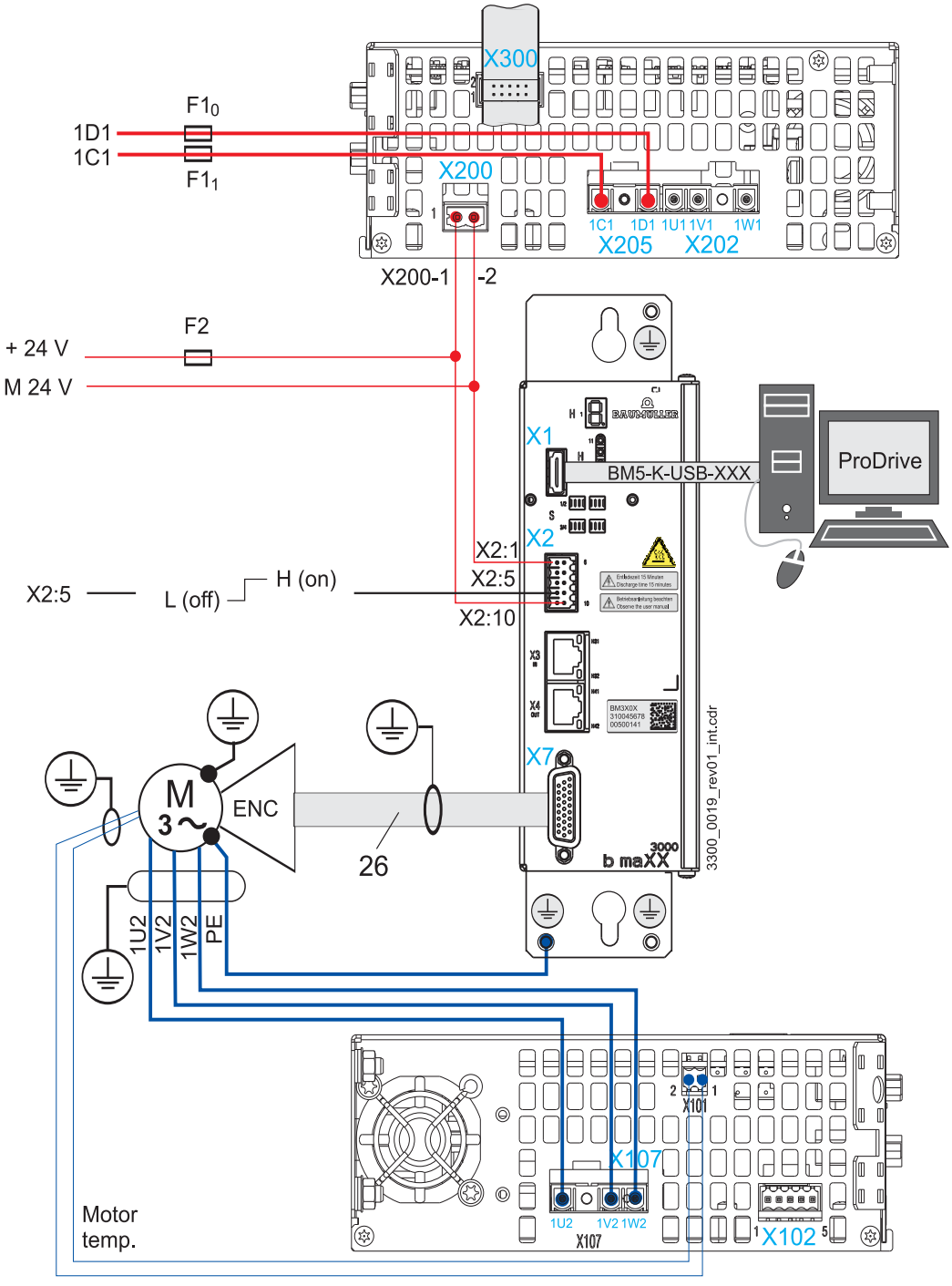


Figure 35: Terminal diagram **BM3XXX-XT** - axis unit with internal ballast resistor

Devices without internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**E**-XXXXX-

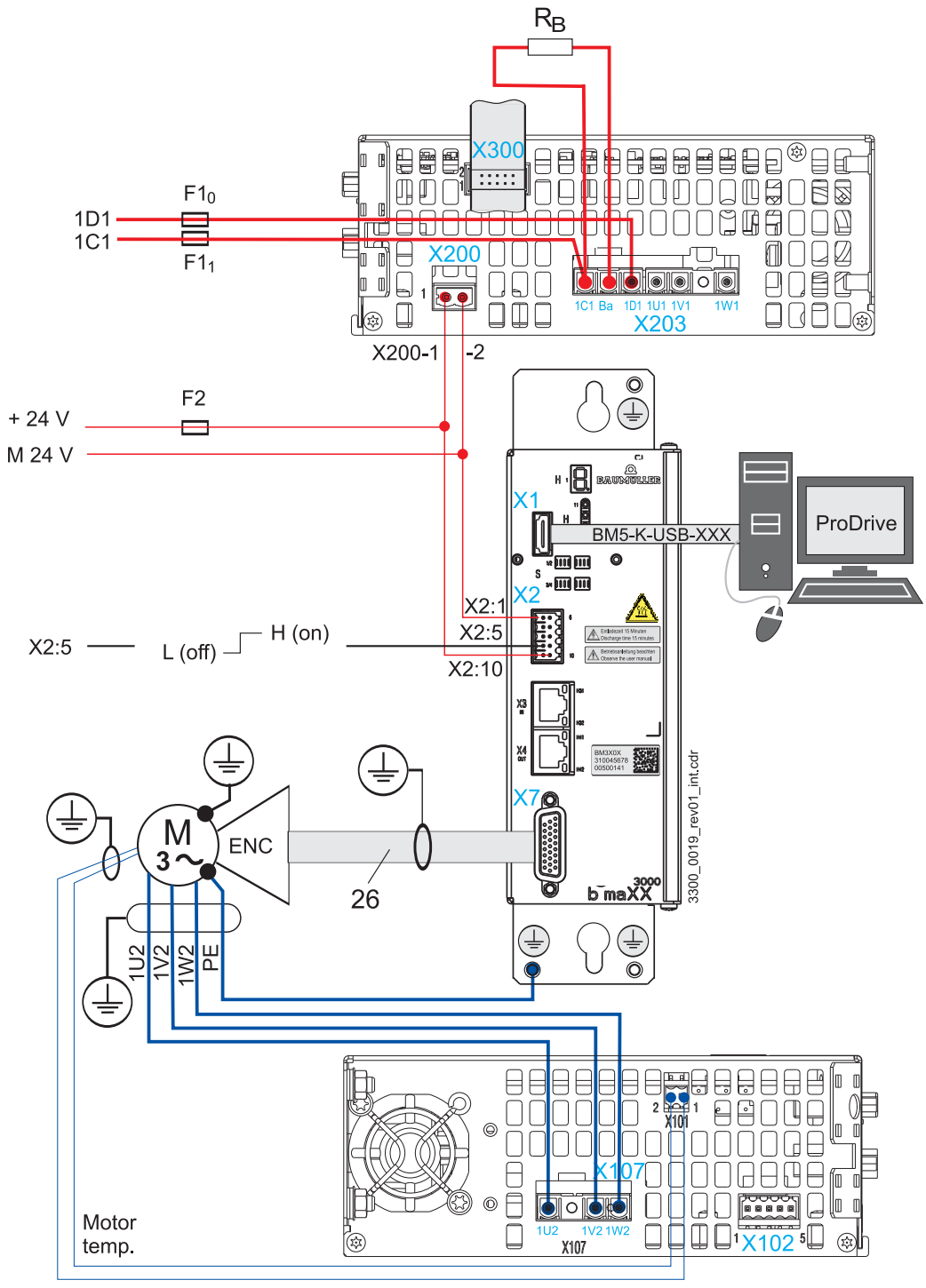


Figure 36: Terminal diagram **BM3XXX** - axis unit, without internal ballast resistor

Devices with internal ballast resistor **BM3XXX**-X**E**XX-XXXXX-**B**-XXXXX-

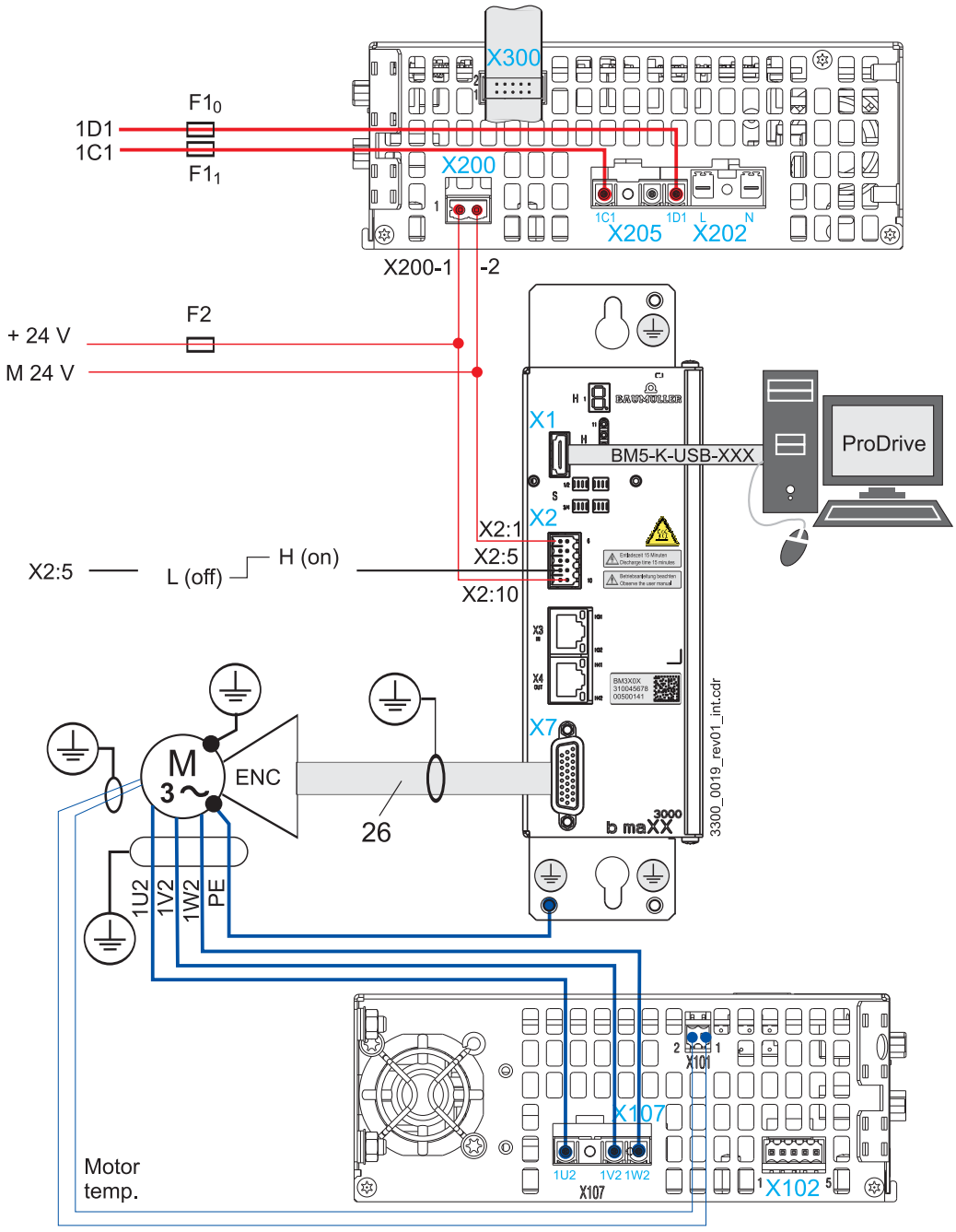


Figure 37: Terminal diagram **BM3XXX-XE** - axis unit with internal ballast resistor

Devices without internal ballast resistor **BM3XXX**-X**E**XX-XXXXX-**E**-XXXXX-

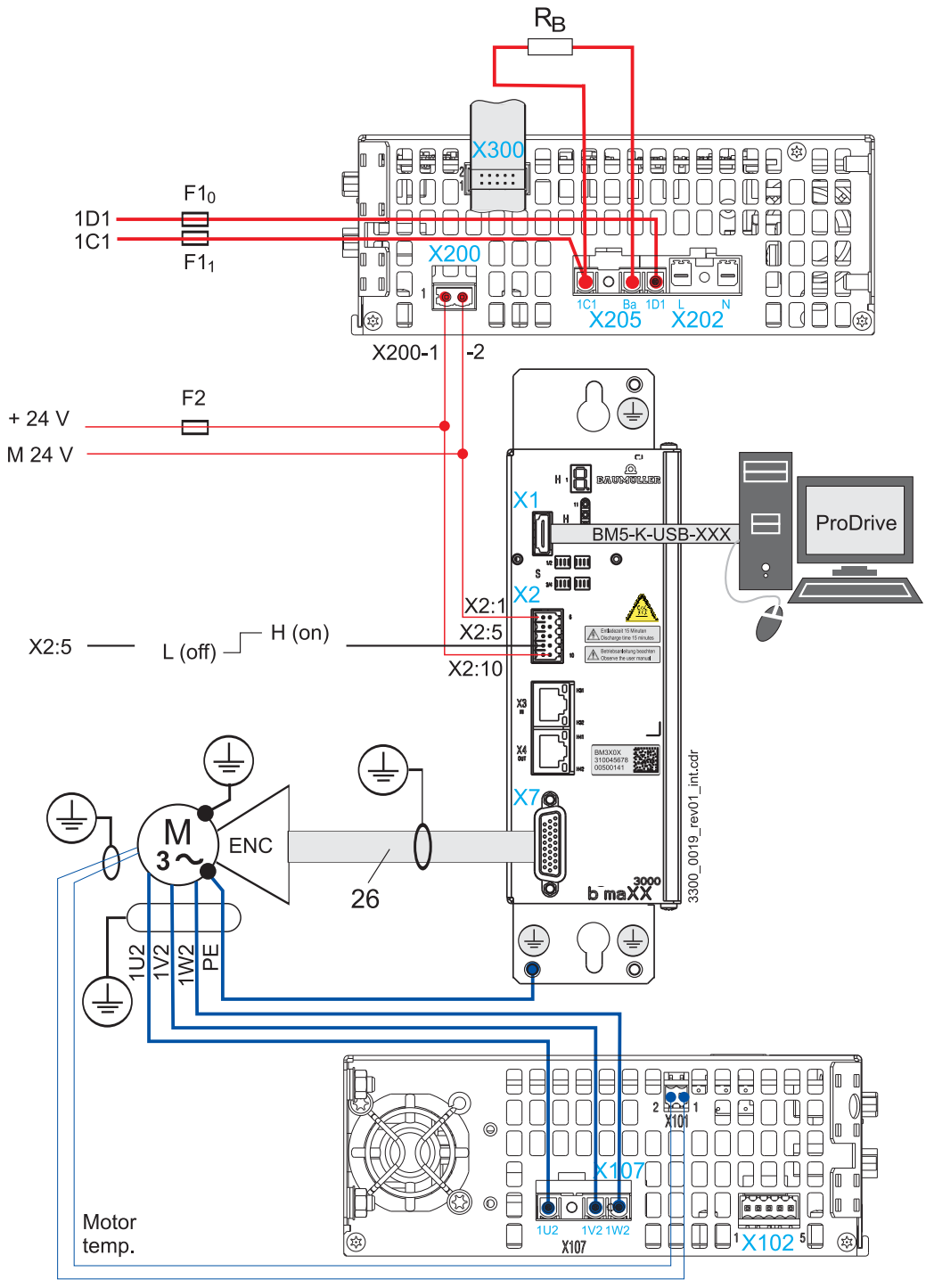


Figure 38: Terminal diagram **BM3XXX-XE** - - axis unit without internal ballast resistor

X1	Service interface, see ▹X1 - Service interface◃ on page 114
X2	Digital in- and outputs e. g. pulse enable, see ▹X2 - Digital inputs/outputs◃ on page 115
X2:5	Input pulse enable, Low: not enabled, High: enabled (operation possible)
X3, X4	Connections for fieldbus EtherCAT®, VARAN, CANopen®, POWERLINK®, according to version, also see ▹X3 / X4 - fieldbus connection◃ on page 116
X6	Analog in- and outputs, see ▹X6 - analog inputs/outputs◃ on page 120
X7	Encoder evaluation, see ▹X6 / X7 - encoder connection◃ from page 121
X101	Connection motor temperature, see ▹X101 - motor temperature◃ on page 137
X102	Connection STO, see ▹X102 - safe torque off - option◃ on page 137
X107	Motor, also see ▹Requirements to the motor◃ on page 29 and ▹X107 - motor connection◃ on page 138
X200	Connections for the 24 V-voltage supply (SELV/PELV), see ▹Requirements to the control voltage / 24 V-supply◃ on page 29 and ▹X200 - 24V voltage supply◃ on page 131
X203	Connection for DC link, see ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132
X205	Connection for the DC-link, see ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132
X300	Signal bus, connection to further units, see ▹X300 - signal bus◃ on page 134
F1	Fuse DC link
F2	Fuse for the 24 V-voltage supply
PE	PE connection, see ▹PE connection and RCD compatibility◃ from page 85 and ▹PE connections BM3200, BM3300 rear panel◃ on page 139

NOTE!

In order to comply with the standard, at the PE connection, per cable lug one nut M5 must be used!

7.11.3 BM3XXX-XT as a compact servo unit (single-phase)

Devices with internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**B**-XXXXX-

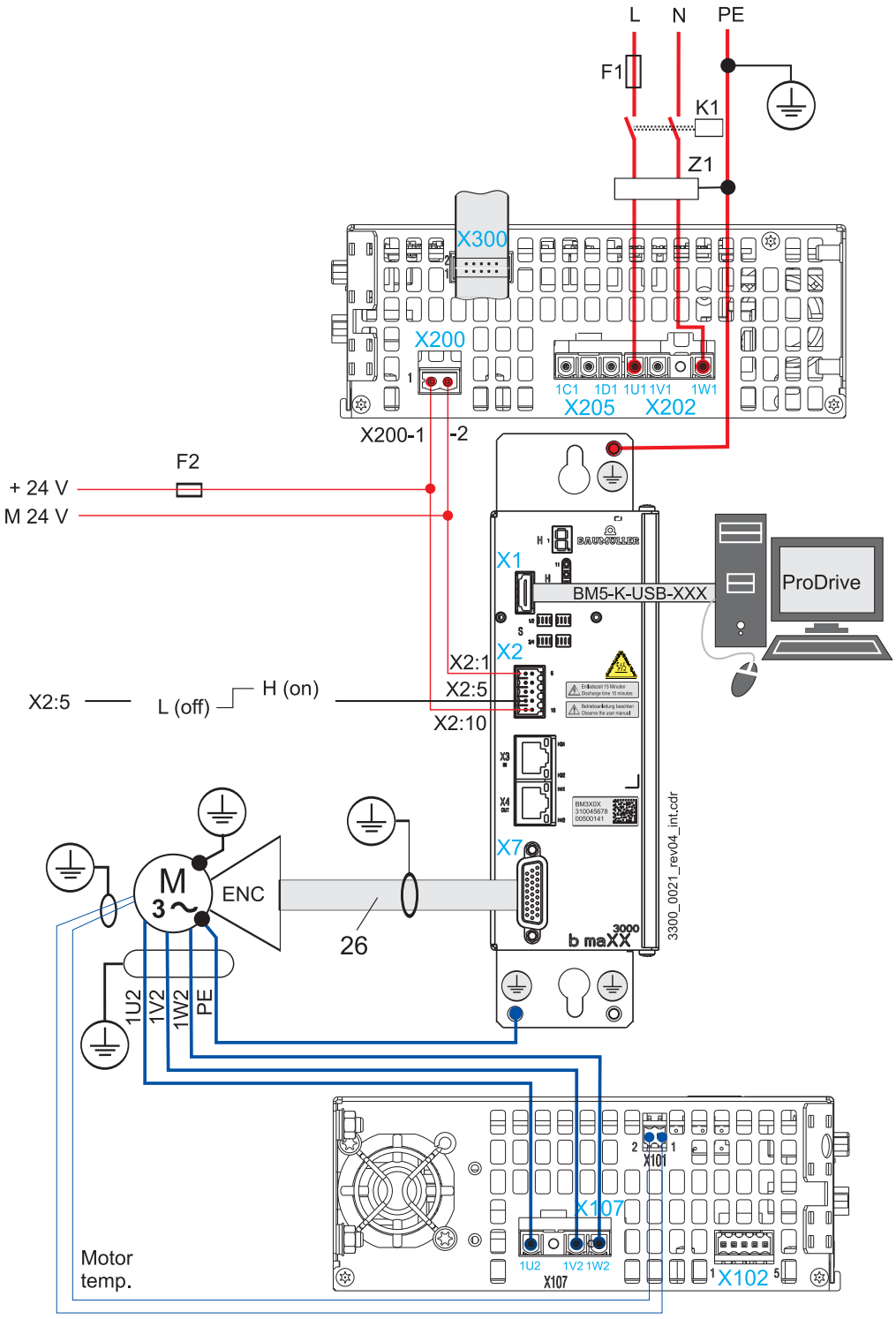


Figure 39: Connection diagram **BM3XXX-XT** (single-phase connection, with internal ballast resistor)

Devices without internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**E**-XXXXX-

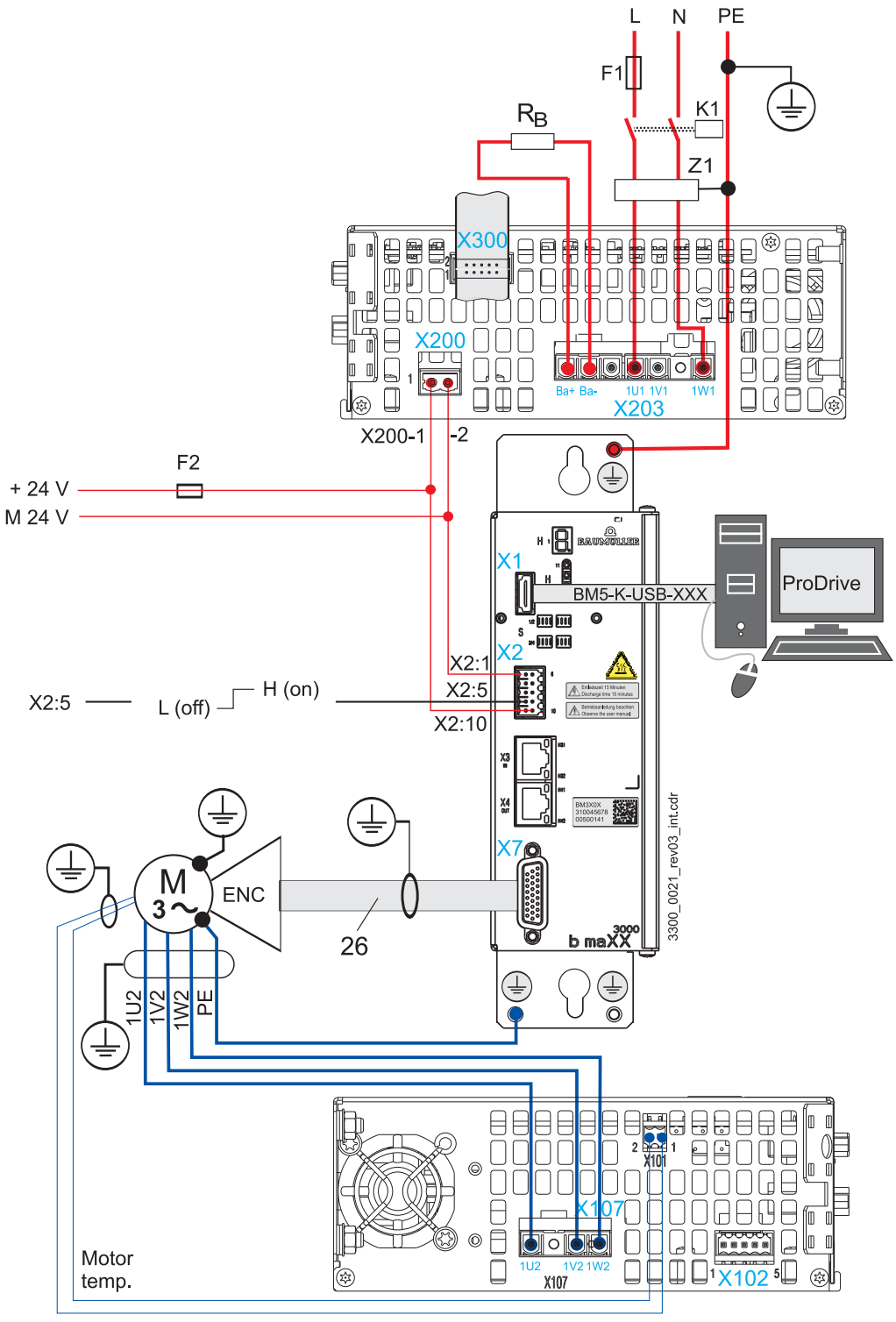


Figure 40: Connection diagram **BM3XXX-XT** (single phase connection, no internal ballast resistor)

X1	Service interface, see ▹X1 - Service interface◃ on page 114
X2	Digital in- and outputs, e.g. pulse enable, see ▹X2 - Digital inputs/outputs◃ on page 115.
X2:5	Input pulse enable, Low: not enabled, High: enabled (operation possible)
X3, X4	Connections for fieldbus EtherCAT®, VARAN, CANopen®, POWERLINK®, according to the version, also see ▹X3 / X4 - fieldbus connection◃ on page 116
X6	Analog in- and outputs, see ▹X6 - analog inputs/outputs◃ on page 120.
X7	Encoder evaluation, see ▹X6 / X7 - encoder connection◃ from page 121.
X101	Connection motor temperature, see ▹X101 - motor temperature◃ on page 137.
X102	Connection STO, see ▹X102 - safe torque off - option◃ on page 137.
X107	Motor, also see ▹Requirements to the motor◃ on page 29 and ▹X107 - motor connection◃ on page 138.
X200	Connections for 24 V-voltage supply (SELV/PELV), see ▹Requirements to the control voltage / 24 V-supply◃ on page 29 and ▹X200 - 24V voltage supply◃ on page 131.
X202	Power supply connection, see ▹Requirements to the energy supply: power supply◃ from page 28 and ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132.
X203	Power supply and ballast resistor connection, see ▹Requirements to the energy supply: power supply◃ from page 28 and ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132.
X300	Signal bus, connection to further units, see ▹X300 - signal bus◃ on page 134.
PE	PE-connection, see ▹PE connection and RCD compatibility◃ from page 85 and ▹PE connections BM3200, BM3300 rear panel◃ on page 139.
F1	Fuses (cable + device), see ▹Protection of the device and accordingly of the cable◃ from page 84.
F2	Fuse for the 24 V-voltage supply
K1	Power circuit contactor (optional)
Z1	Line filter, see ▹Line filter◃ on page 187.

7.11.4 BM3XXX-XE as compact servo unit (1-phase, 230 V)

Devices with internal ballast resistor **BM3XXX**-X**E**XX-XXXXX-**B**-XXXXX-

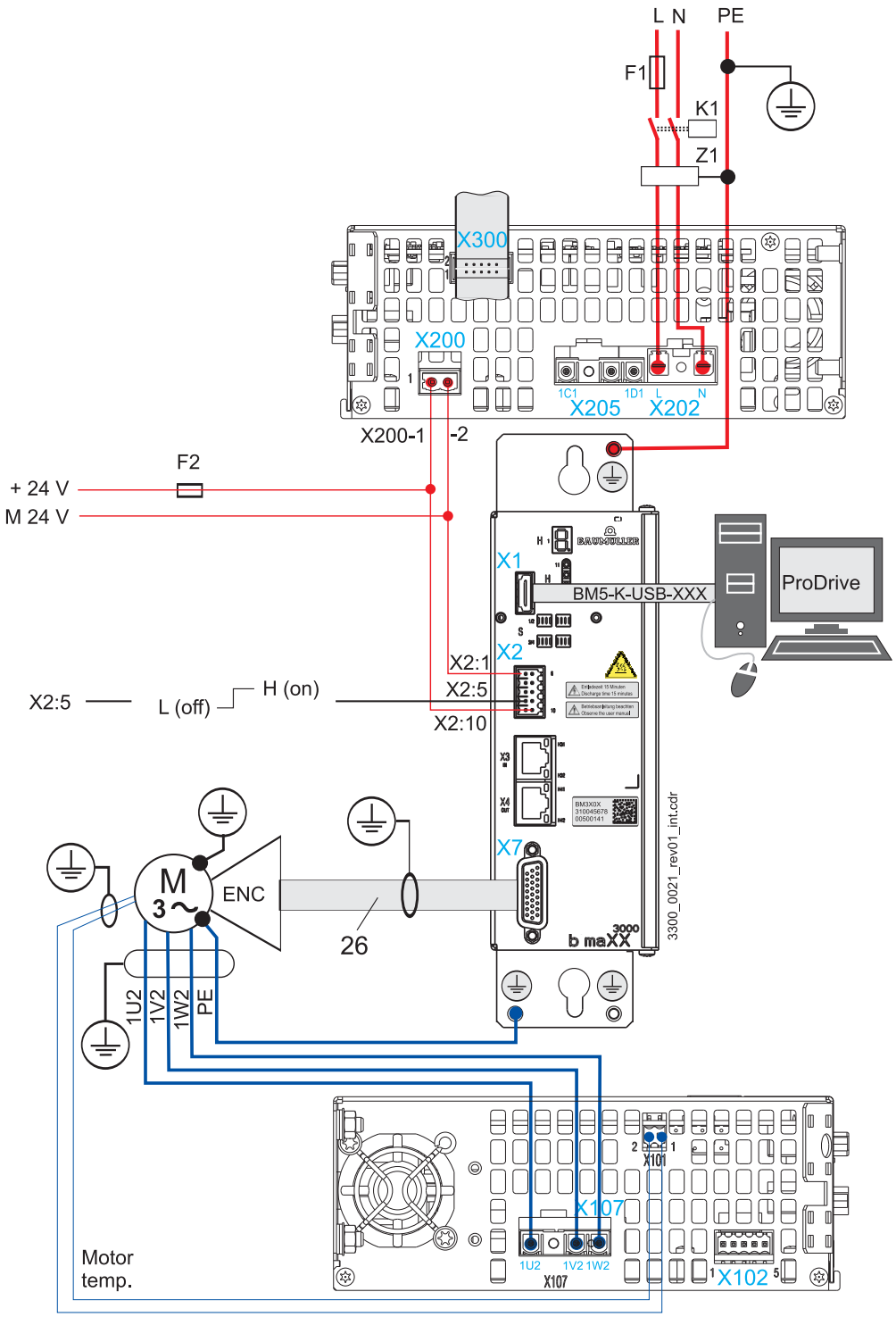


Figure 41: Connection diagram **BM3XXX-XE** (1-phase connection, 230 V, with internal ballast resistor)

Devices without internal ballast resistor **BM3XXX**-X**E**XX-XXXXX-**E**-XXXXX-

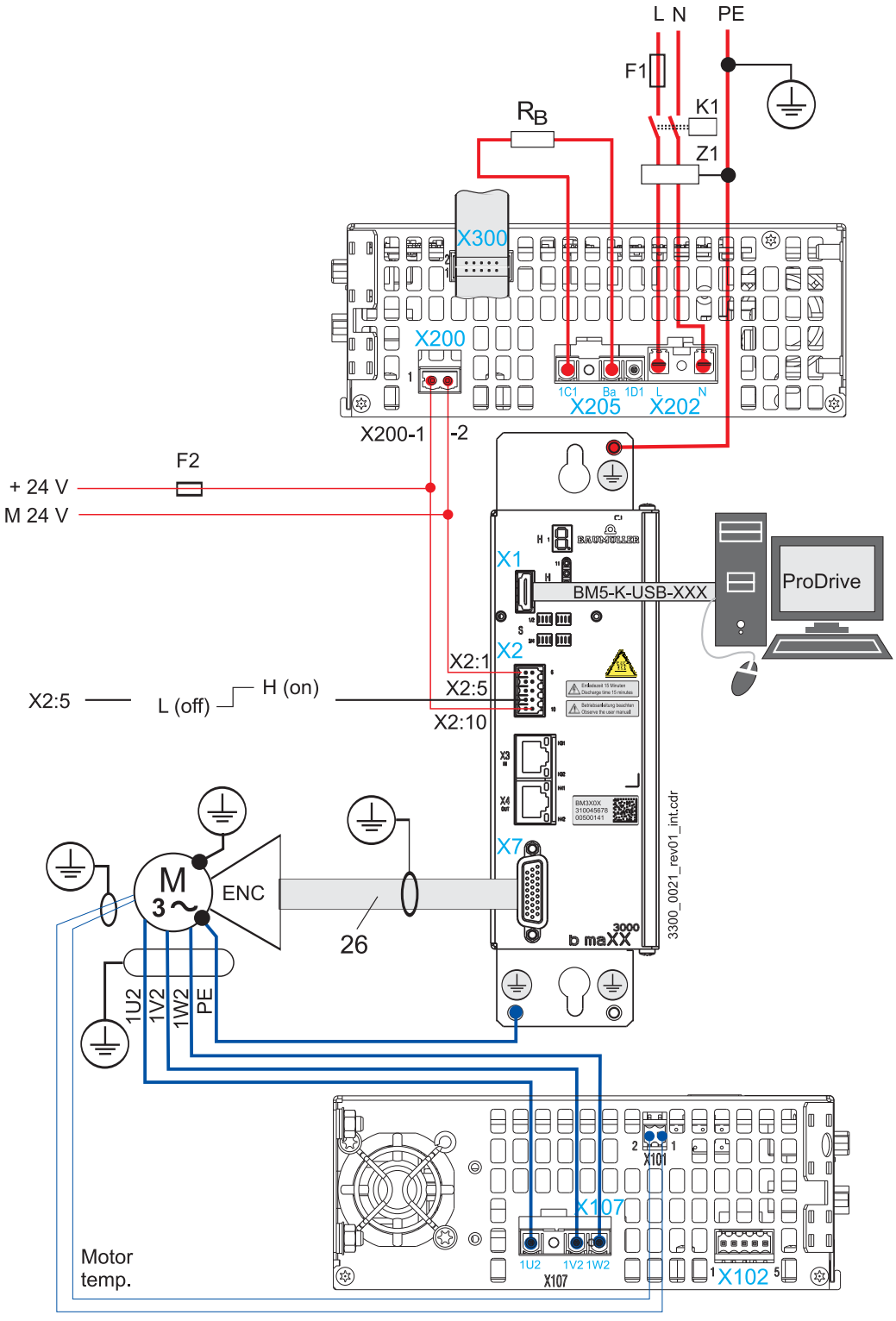


Figure 42: Connection diagram **BM3XXX-XE** (1-phase, 230 V, without internal ballast resistor)

X1	Service interface, see ▹X1 - Service interface◃ on page 114.
X2	Digital in- and outputs, e.g. pulse enable, see ▹X2 - Digital inputs/outputs◃ on page 115.
X2:5	Input pulse enable, Low: not enabled, High: enabled (operation possible)
X3, X4	Connections for fieldbus EtherCAT®, VARAN, CANopen®, POWERLINK®, according to the version, also see ▹X3 / X4 - fieldbus connection◃ on page 116.
X6	Analog in- and outputs, see ▹X6 - analog inputs/outputs◃ on page 120.
X7	Encoder evaluation, see ▹X6 / X7 - encoder connection◃ from page 121.
X101	Connection motor temperature, see ▹X101 - motor temperature◃ on page 137.
X102	Connection STO, see ▹X102 - safe torque off - option◃ on page 137.
X107	Motor, also see ▹Requirements to the motor◃ on page 29 and ▹X107 - motor connection◃ on page 138.
X200	Connections for 24 V-voltage supply (SELV/PELV), see ▹Requirements to the control voltage / 24 V-supply◃ on page 29 and ▹X200 - 24V voltage supply◃ on page 131.
X202	Power supply connection, see ▹Requirements to the energy supply: power supply◃ from page 28 and ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132.
X205	DC link and ballast resistor connection, see ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132.
X300	Signal bus, connection to further units, see ▹X300 - signal bus◃ on page 134.
PE	PE-connection, see ▹PE connection and RCD compatibility◃ from page 85 and ▹PE connections BM3200, BM3300 rear panel◃ on page 139.
F1	Fuses (cable + device), see ▹Protection of the device and accordingly of the cable◃ from page 84.
F2	Fuse for the 24 V-voltage supply
K1	Main contactor (optional)
Z1	Line filter, see ▹Line filter◃ on page 187.

7.11.5 Application: Power supply connection (3-phase) with energy compensation

for devices with internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**B**-XXXXX-

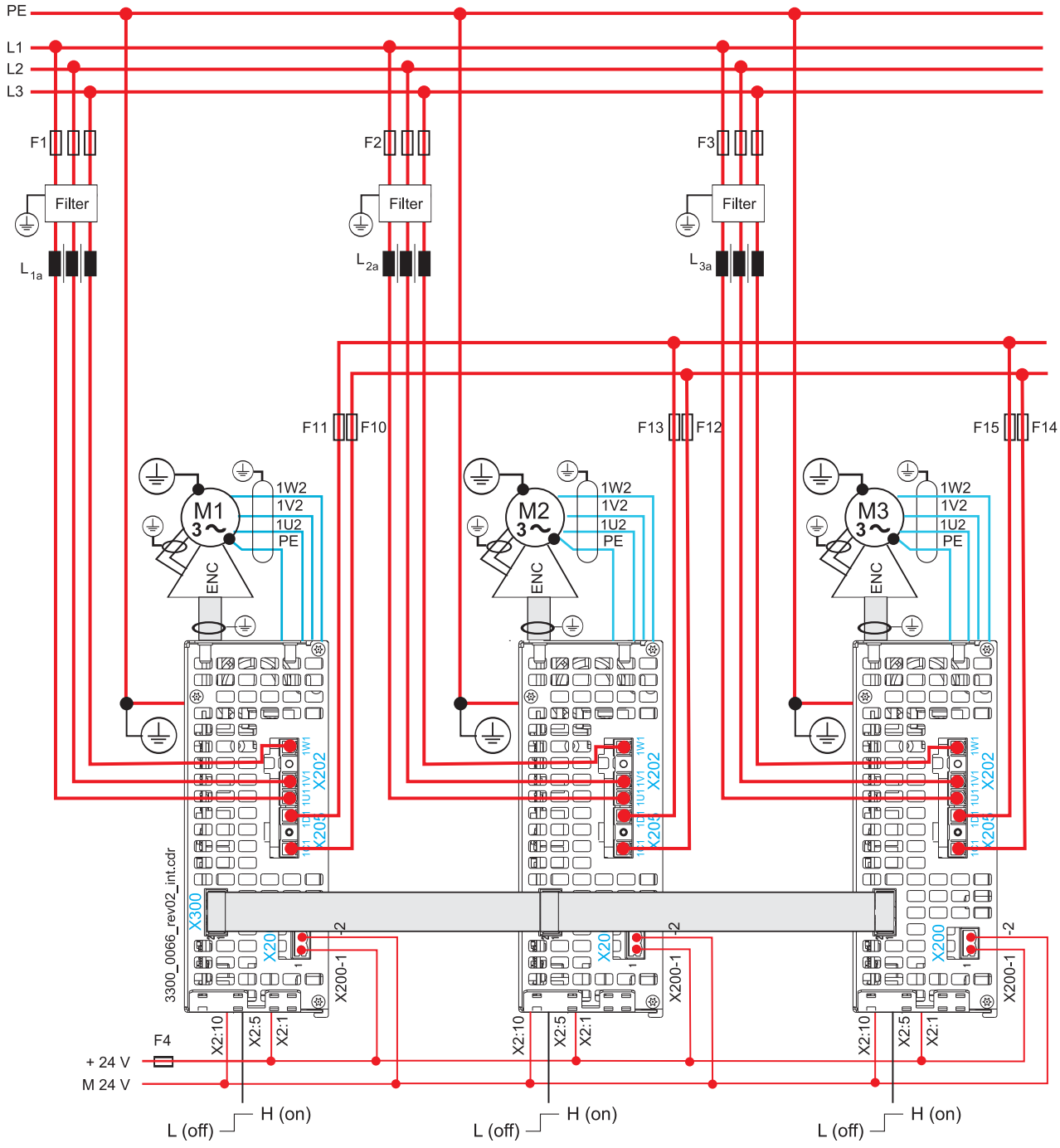


Figure 43: Application: Power supply connection with energy compensation

Installation notes

F1, F2, F2	Fuses (cable protection+ device protection), separate fuse for every device
F10-F15	Option: a destruction of the next devices can be avoided
F4	Fuse for the 24 V-voltage supply
Filter	Separate line filter for every device, (a shared filter can be possible, but its function is not guaranteed)
L_{1a}, L_{2a}, L_{3a},	Line choke, u_K = 2 - 4 %, separate choke for every device, the use of the same type of chokes is required

NOTE!

No chokes are required if the power demand of all devices together is at no time higher than 5 kW.

Additional notes for installation

- All devices must be parametrized „supply via power supply“
- A destruction of a single device can result in secondary damage of the two other devices
- A combined operation on 2 phases and 3 phases is not allowed,
  it is not allowed to enable a single device in case of one or several fuses have been tripped (danger is overload).
- This application is only valid for the following devices
  BM3201, BM3202, BM3203, BM3204, BM3211, BM3212, BM3213,
  BM3301, BM3302, BM3303, BM3304, BM3311, BM3312, BM3313

NOTICE!

Only the following devices can be combined

BM3203, BM3204, BM3212, BM3213, BM3303, BM3304, BM3312 and BM3313

or

BM3201, BM3202, BM3211, BM3301, BM3302 and BM3311.

Other interconnections are forbidden!

- **No** further devices or components (e.g. external DC link capacitors) are allowed to be connected to the DC link

7.11.6 Application: DC link connection of further BM3XXX or of additional capacities

for devices with 3-phase connection and internal ballast resistor
BM3XXX-XTXX-XXXXX-**B**-XXXXX-

NOTE!

Following notes must be considered if additional devices or capacities are connected to the DC link.

The sum of the drawn power of all devices (incl. the supply unit) must be lower than **5 kW**.

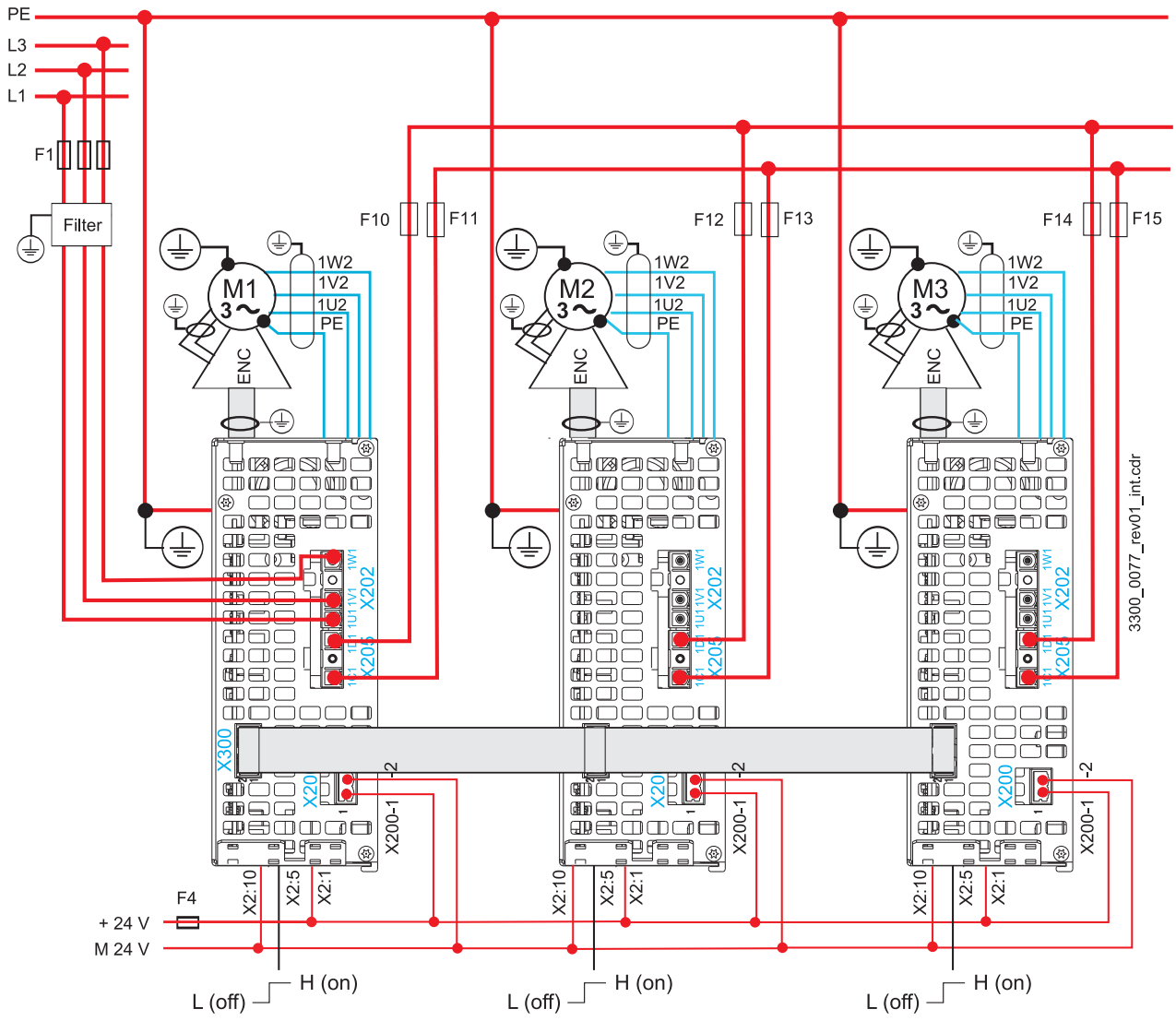


Figure 44: Example: Further devices connected to the DC link

Installation notes

F1	Fuses (cable protection+ device protection)
F10-F15	Option: a destruction of the next device can be avoided
F4	Fuse for the 24 V-voltage supply
Filter	The supplying device must be connected to a filter

CAUTION!

The maximum number of devices or the maximum DC link capacitance that can be connected depend on the power supply voltage, see ▹Figure 45◃ on page 111.

The required waiting time between two charging procedures depends on the external connected DC link capacitance, see ▹Figure 46◃ on page 112

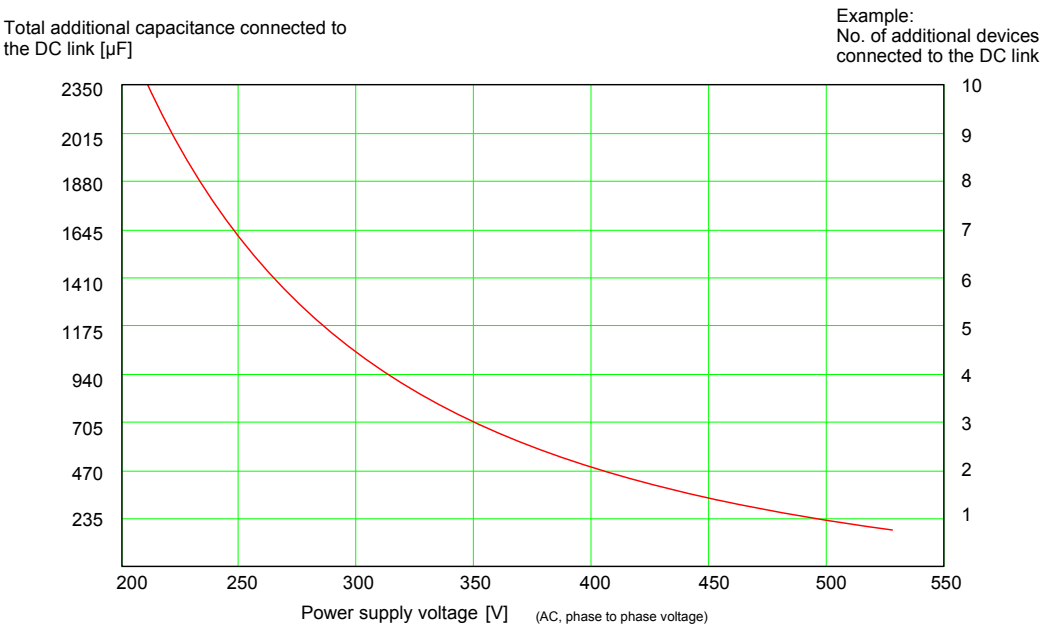


Figure 45: Max. external capacitance that can be connected dependent on the power supply voltage

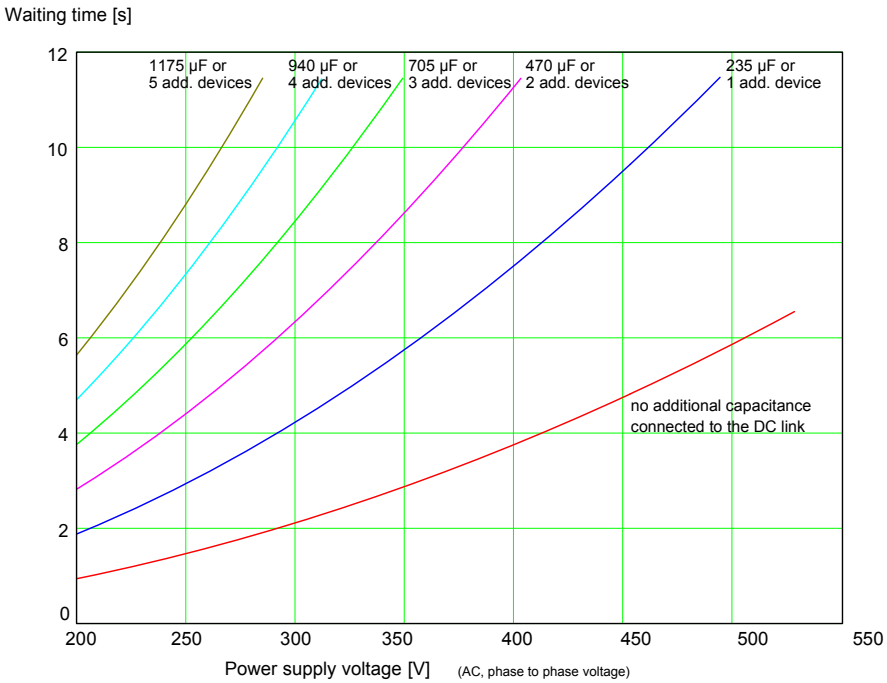


Figure 46: Waiting time between two charging procedures

7.12 Connections

7.12.1 BM3200, BM3300 front side

Version with 1 encoder and analog IOs, see ▹Type code◃ from page 54.

BM3XXX-XXXX-XXXXX[-X]-XXX**1**X
2 analog outputs and 1 analog input are available.

BM3XXX-XXXX-XXXXX[-X]-XXX**2**X
2 analog outputs and 2 analog inputs are available.

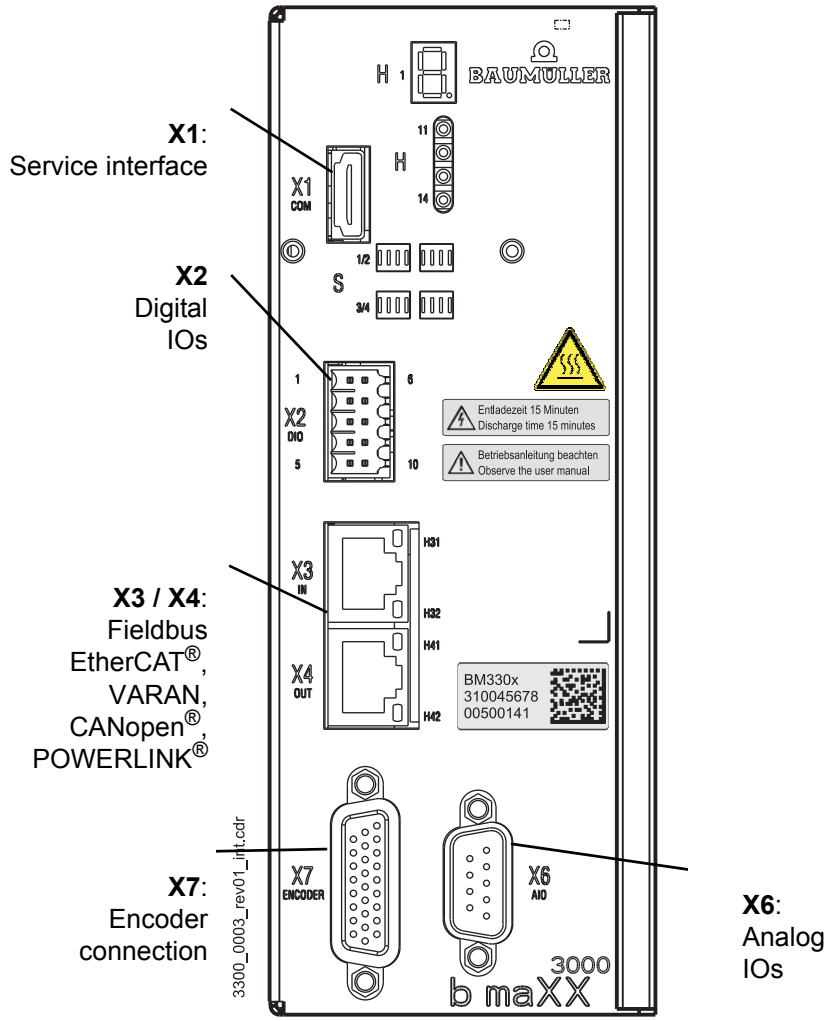


Figure 47: Connections front side with X6 analog IOs

Version with 2 encoders , see ▹Type code◃ from page 54.

BM3XXX-XXXX-XXXXX[-X]-XXX**0**X
No analog IOs are available.

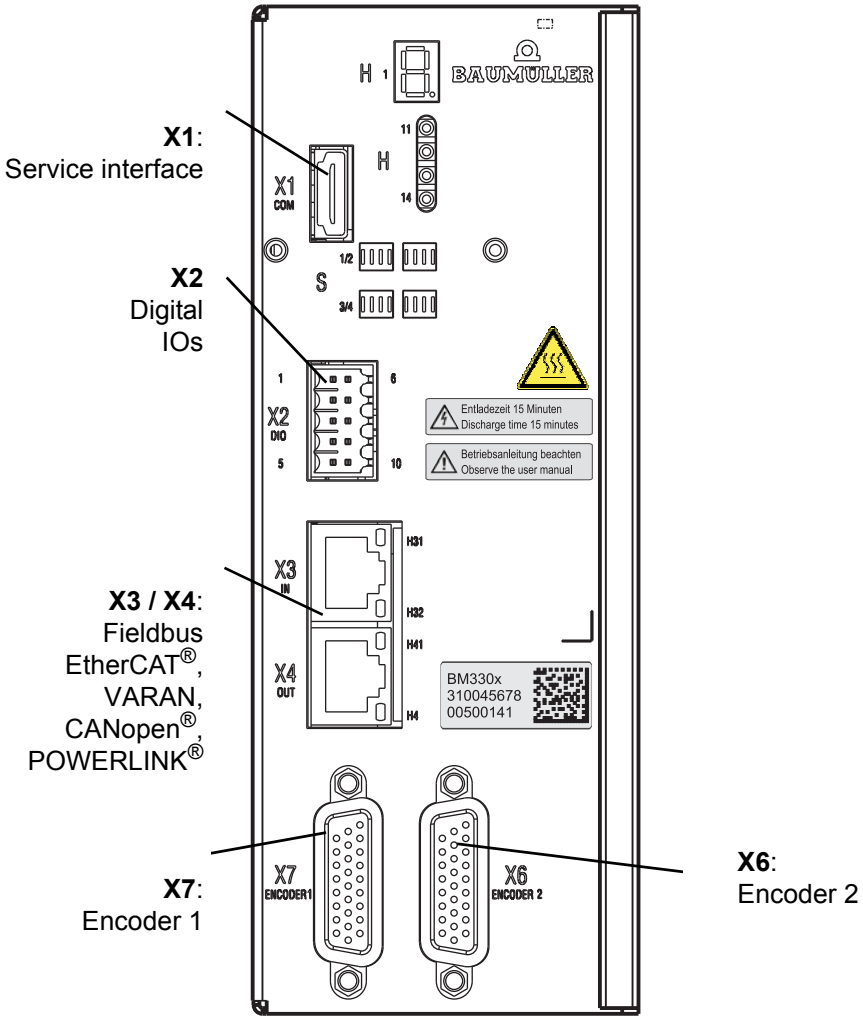


Figure 48: Connections front side with X6 encoder 2

7.12.1.1 X1 - Service interface

X1

X1: Service interface

NOTE!
Only, the service cable BM5-K-USB-XXX must be used with the service interface X1, also see ▹Service interface◃ on page 143, max. transmission rate 920 kBaud.

7.12.1.2 X2 - Digital inputs/outputs

X2 (SELV/PELV)

Inputs:	Evaluation:	Edges, programmable
	Current input according to input:	2 mA digital input, 20 mA fast digital input
	Transit delay input:	Max. 4 ms, 10 µs at fast inputs
	Level:	Low (0 ... 5 V); High (12 ... 28 V)
Outputs:	Output current per output:	500 mA
	Electrical isolation:	Optocoupler
	Short-circuit proof:	Current-limited

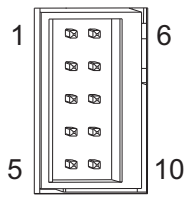
Differing from this are pin No. 6,7: NO contact, ungrounded

Loading capability per NO contact: max. 30 V, max. 100 mA

Max. conductor cross-section	Termination system
1.0 mm²	Connector, spring clamp termination

NOTE!

A relay with varistor protection circuit is required in case the customer connects a relay to a digital output.



1 M24V (supply digital input/output)
2 Digital input 1 (touch probe 1)
3 Digital input 2 (touch probe 2)
4 Digital input 3
5 Digital input 4 (pulse enable)
6 Ready-to-operate
7 Ready-to-operate
8 Digital output 1
9 Digital output 2
10 +24V (supply digital input/output)

7.12.1.3 X3 / X4 - fieldbus connection

Depending on the hardware-version, see ▹Type code◃ from page 54.

EtherCAT®

Type code **BM3200, BM3300** with EtherCAT® CoE profile:

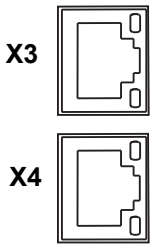
BM3XXX-XXXX-XXXXX[-X]-**1**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

Type code **BM3200, BM3300** with EtherCAT® SoE profile:

BM3XXX-XXXX-XXXXX[-X]-**7**XXXX[-S0X]-XX[-XX][-EXX][-#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 **b maXX 3000**
Data width of parameters	16 / 32 Bit
Baud rates	10 / 100 Mbit/s



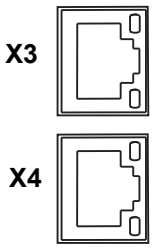
1: TX+
2: TX-
3: RX+
4: Reserved
5: Reserved
6: RX-
7: Reserved
8: Reserved

VARAN Type code **BM3200, BM3300** with VARAN profile:

BM3XXX-XXXX-XXXXX[-X]-**2**XXXX[-S0X]-XX[-XX][-EXX][-#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 **b maXX 3000**
Data width of parameters	16 / 32 Bit
Baud rates	10 / 100 Mbit/s



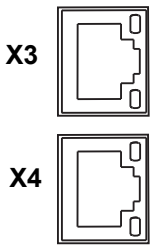
1: TX+
2: TX-
3: RX+
4: Reserved
5: Reserved
6: RX-
7: Reserved
8: Reserved

CANopen® Type code **BM3200, BM3300** with CANopen®:

BM3XXX-XXXX-XXXXX[-X]-**3**XXXX[-S0X]-XX[-XX][-EXX][-#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-pin
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

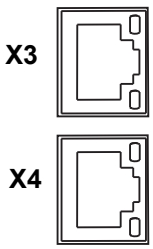
POWERLINK®

Type code **BM3200, BM3300** with POWERLINK®:

BM3XXX-XXXX-XXXXX[-X]-**4**XXXX[-S0X]-XX[-XX][-EXX][-#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 **b maXX 3000**
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

7.12.1.4 X6 - analog inputs/outputs

X6

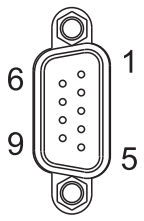
BM3XXX-XXXX-XXXXX[-X]-XXX**0**X
No analog IOs are available.
X6 is encoder input, see ▹X6 / X7 - encoder connection◃ from page 121.

.

BM3XXX-XXXX-XXXXX[-X]-XXX**1**X
Two analog inputs and one analog output are provided.

BM3XXX-XXXX-XXXXX[-X]-XXX**2**X
Two analog inputs and two analog outputs are provided.

Inputs	Resolution	12 Bit
	Version	Differential input
	Input resistance	Approx. 50 kΩ
	Current input max.	200 µA
	Sampling rate	125 µs
	Input voltage	+10 V to -10 V
Outputs	Resolution	12 Bit
	Output voltage	+10 V up to -10 V Tolerance ± 10 % Offset lower than 150 mV
	Output current max.	1 mA
	Update rate	62.5 µs
	Short-circuit proof	Limited, max. 10 s



D-sub-connector
9-pin

1	Analog input 1 +
2	NC or analog input 2+, dependent on type
3	GND
4	Analog output 1 +
5	Analog output 2 +
6	Analog input 1 -
7	NC or analog input 2-, dependent on type
8	GND
9	GND

7.12.1.5 X6 / X7 - encoder connection

X7 Encoder connection, all types.

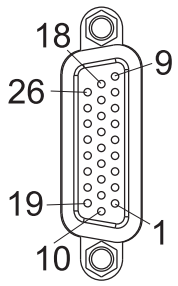
X6 / X7 Encoder connection of type with two encoders
BM3XXX-XXXX-XXXXX[-X]-XXX**0**X

Type of encoder according type code ,
see type code ▷Encoder interface◁ on page 55.

Resolver 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 an integer.
Current input	Max. 160 mA
Excitation frequency	Approx. 8 kHz
Excitation current	160 mA
Ratio	0.5



D-sub-connector
26-pin

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 - (COS -)
23	Reserved *
24	Reserved *
25	Res B + (SIN +)
26	Res B - (SIN -)

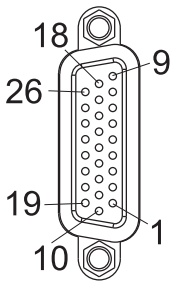
* Do not connect

Encoder evaluation HIPERFACE®

The 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



D-sub-connector
26-pin

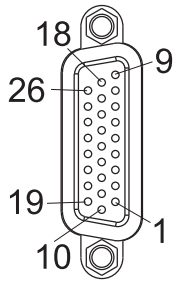
1	GND encoder supply
2	+10 V encoder supply
3	Reserved *
4	COS +
5	COS -
6	SIN +
7	SIN -
8	Reserved *
9	Reserved *
10	Reserved *
11	Reserved *
12	Reserved *
13	Reserved *
14	Reserved *
15	Reserved *
16	Reserved *
17	Temperature +
18	Temperature -
19	RS485 Data +
20	RS485 Data -
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* Do not connect

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



D-sub-connector
26-pin

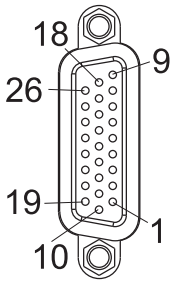
1	GND encoder supply
2	+5 V encoder supply
3	Clock+
4	A + (COS +)
5	A - (COS -)
6	B + (SIN +)
7	B - (SIN -)
8	Reserved *
9	Reserved *
10	Reserved *
11	Sense GND
12	Sense Vcc
13	Clock-
14	Reserved *
15	Reserved *
16	Reserved *
17	Temperature +
18	Temperature -
19	Data +
20	Data -
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* Do not connect

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

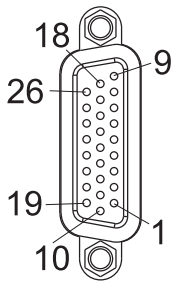
1	GND encoder supply
2	+5 V encoder supply
3	Clock+
4	Reserved *
5	Reserved *
6	Reserved *
7	Reserved *
8	Reserved *
9	Reserved *
10	Reserved *
11	Sense GND
12	Sense Vcc
13	Clock-
14	Reserved *
15	Reserved *
16	Reserved *
17	Reserved *
18	Reserved *
19	Data +
20	Data -
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* Do not connect

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

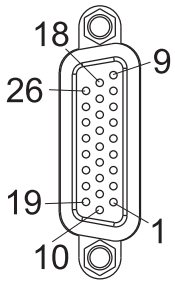
1	GND encoder supply
2	+5 V encoder supply
3	Reserved *
4	RS422 A +
5	RS422 A -
6	RS422 B +
7	RS422 B -
8	RS422 0 +
9	RS422 0 -
10	Reserved *
11	Sense GND
12	Sense V_{CC}
13	Reserved *
14	Reserved *
15	Reserved *
16	Reserved *
17	Temperature +
18	Temperature -
19	Reserved *
20	Reserved *
21	Reserved *
22	Reserved *
21	Reserved *
22	Reserved *
23	Reserved *
24	Reserved *
25	Reserved *
26	Reserved *

* Do not connect

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 connect

NOTE!

The use of the standard accessory connector included in the accessory kit HIPERFACE DSL® (part No. 460219) is required.

7.12.2 Connections BM3200, BM3300 on top

3-phase device with internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**B**-XXXXX-

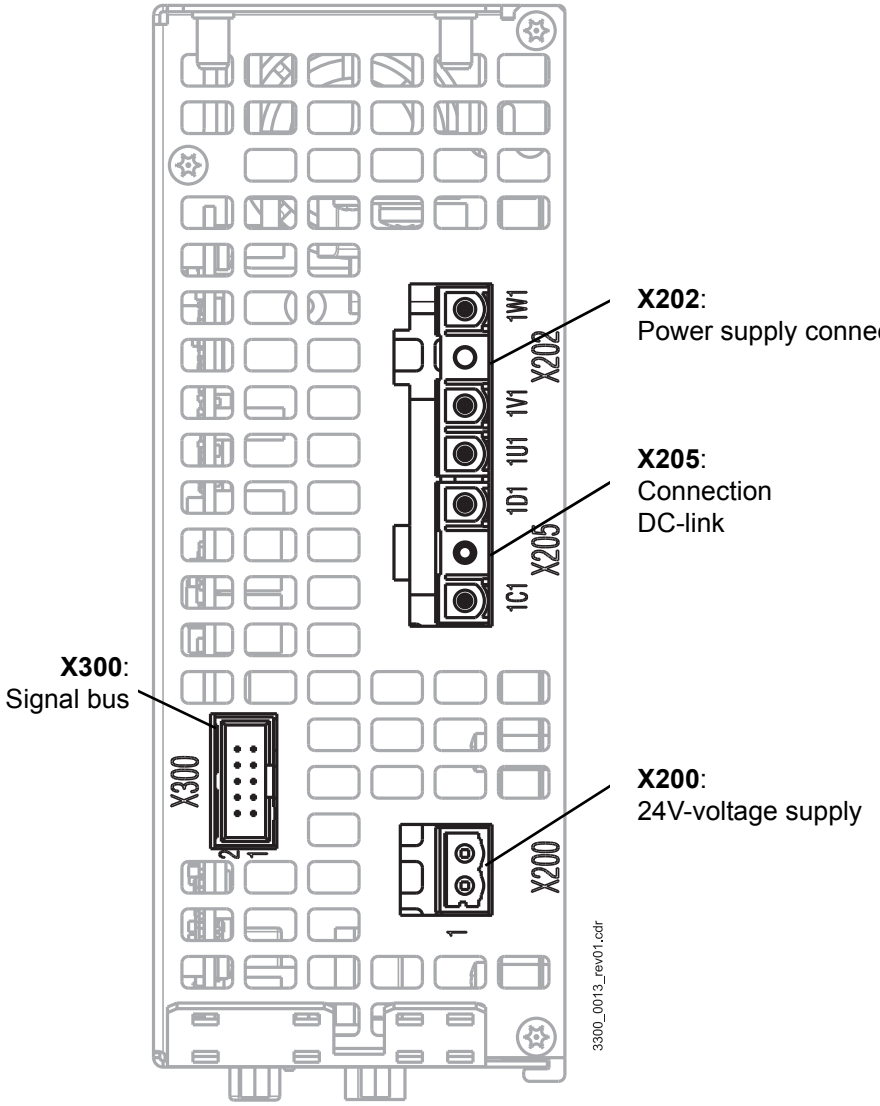


Figure 49: Connections at the top, BM3XXX-XT with internal ballast resistor

3-phase device without internal ballast resistor **BM3XXX**-X**T**XX-XXXXX-**E**-XXXXX-

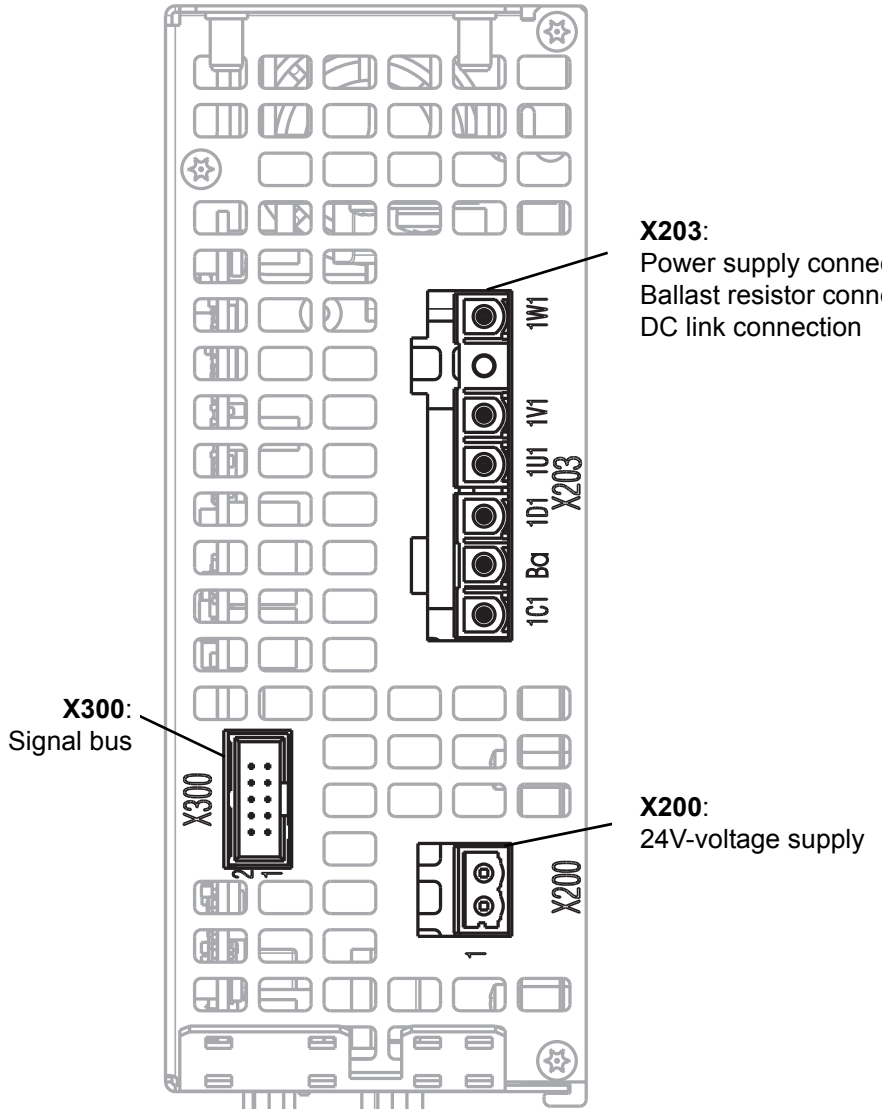


Figure 50: Connections at the top, BM3XXX-XT without internal ballast resistor

NOTE!

The ballast resistor connection is not short-circuit proof.
When using devices **BM3200, BM3300 without internal ballast resistor** an external ballast resistor must be connected in case of braking operation.

1-phase device with internal ballast resistor **BM3XXX**-X**E**XX-XXXXX-**B**-XXXXX-

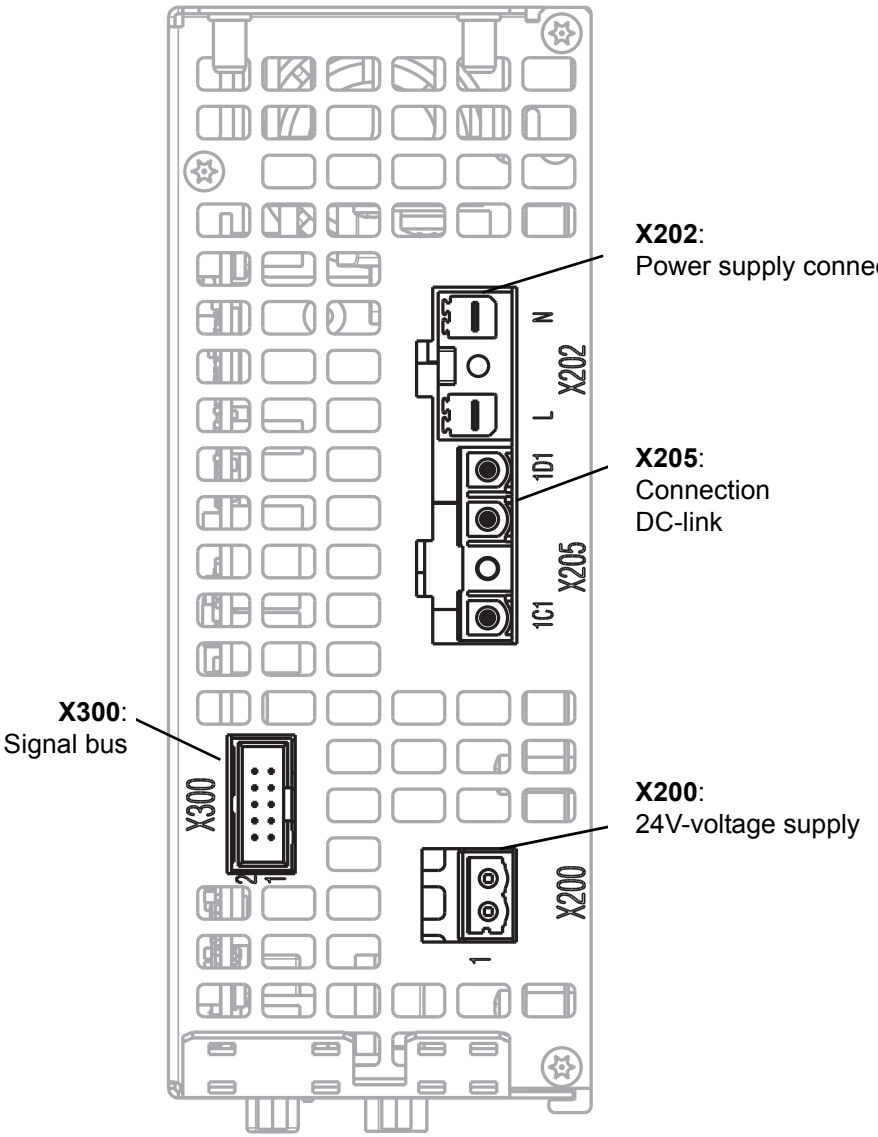


Figure 51: Connections at the top, BM3XXX-**XE** with internal ballast resistor

1-phase device without internal ballast resistor **BM3XXX**-X**E**XX-XXXXX-**E**-XXXXX-

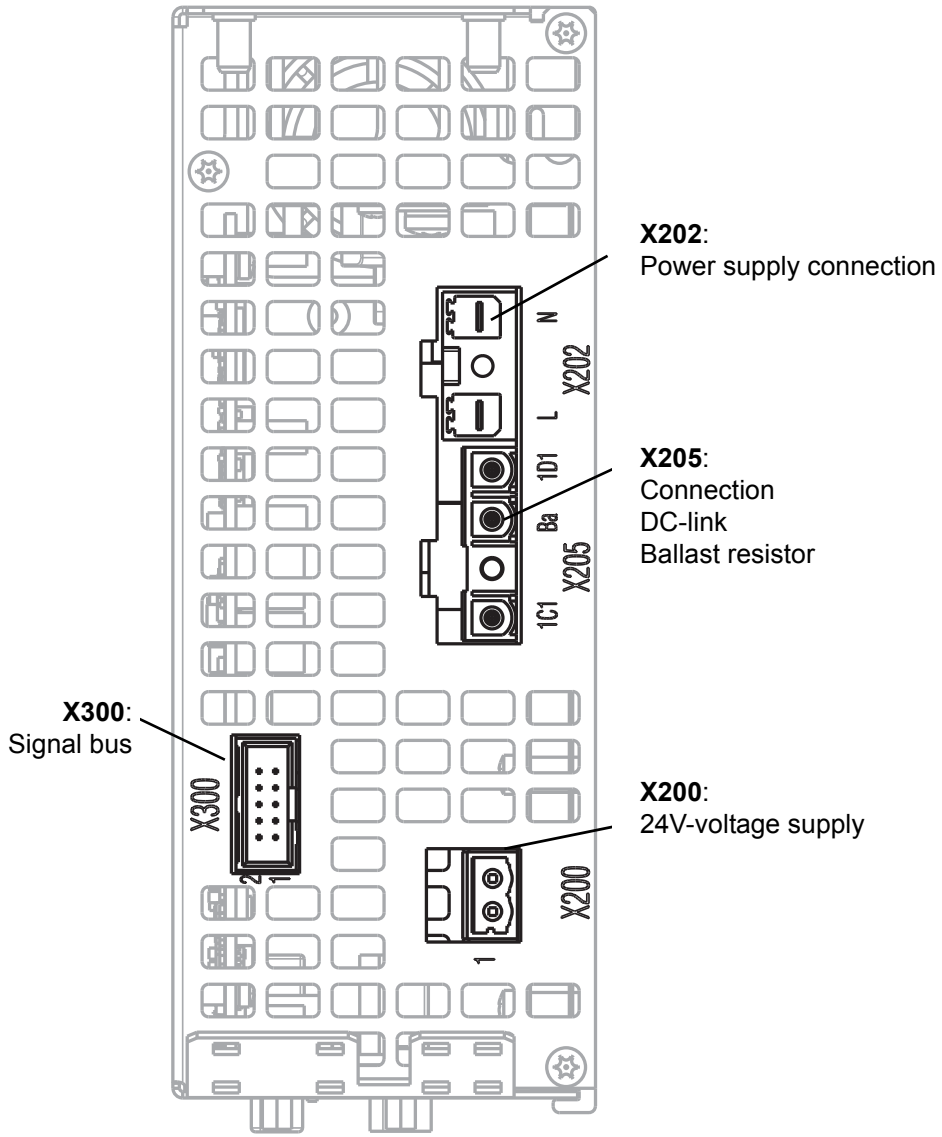


Figure 52: Connections at the top, BM3XXX-**XE** without internal ballast resistor

NOTE!

The ballast resistor connection is not short-circuit proof.
When using devices **BM3200, BM3300 without internal ballast resistor** an external ballast resistor must be connected in case of braking operation.

7.12.2.1 X200 - 24V voltage supply

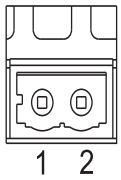
X200 (SELV/PELV)

Control voltage (U_{DC}) according to EN 61131-2:1994, table 7	+ 24 V -15 % / +20 %

Also see ▹Requirements to the control voltage / 24 V-supply◃ on page 29.

The control voltage must accord to PELV (EN 61800-5-1, chapter 3.21) and accordingly to SELV (EN 61800-5-1, chapter 3.35).
At a control voltage of < 24 V the fan power is reduced. Therefore, it can be necessary, to reduce the output current.

Max. conductor cross-section	Termination system	Loading capacity
1,5 mm^2 (2-wire cabling, 2-pin)	Connector, spring clamp termination	Max. **2,0** A Connector max. 20 A



1 +24V
2 M24V

7.12.2.2 X202, X203, X205 - power supply, DC link, ballast resistor connection

NOTE!

A device of the series **BM3200, BM3300** can be operated as a compact servo unit and accordingly as an axis unit.

NOTE!

A proper execution of **BM3200, BM3300** as an axis unit can only be ensured at Baumüller **supply units (mains rectifiers)**.

The DC-link terminal is not protected against overload, polarity reversal or ground fault.

A connection of one or several DC-link terminals of the **BM3200, BM3300** to an active mains rectifier unit is forbidden.

NOTE!

The ballast resistor connection is not short-circuit proof.
When using devices **BM3200, BM3300 without internal ballast resistor** an external ballast resistor must be connected in case of braking operation.

X202

BM3XXX-XTXX-XXXXX-**B**-XXXXX-, device with internal ballast resistor

Power supply
1U1, 1V1, 1W1

X202

BM3XXX-X**E**, device with/without internal ballast resistor

Power supply
L, N

X203

BM3XXX-XTXX-XXXXX-**E**-XXXXX-, device without internal ballast resistor

Power supply
1U1, 1V1, 1W1

DC link connection
1C1, 1D1

Ballast resistor connection
1C1, Ba-

X205

BM3XXX-XTXX-XXXXX-**B**-XXXXX-, device with internal ballast resistor
BM3XXX-XEXX-XXXXX-**B**-XXXXX-, device with internal ballast resistor

DC link connection
1C1, 1D1

X205

BM3XXX-XEXX-XXXXX-**E**-XXXXX-, device without internal ballast resistor

DC link connection
1C1, 1D1

Ballast resistor connection
1C1, Ba-

Connection system	Loading capacity
Connector, screw terminal	Connector max. 20 A

	Minimum	Maximum
Conductor cross-section solid conductor finely stranded with ferrule (with/without protective cover)	 0.08 mm² / AWG28 0.08 mm² / AWG28 0.2 mm²	 4 mm² / AWG12 4 mm² / AWG12 2.5 mm²
Tightening torque	0.4 Nm	0.5 Nm
Screwdriver blade	0.6 x 3.5 mm	
Remove insulation	7 mm / 0.9 in	

PE

Refer to ▹PE connections BM3200, BM3300 rear panel◃ from page 139.

7.12.2.3 X300 - signal bus

If a system of b maXX devices is installed with signal bus connection, then all devices are connected with one another via the signal bus. The bus including the supply unit can be scanned by each participant and individual signals can be set. Via this bus the supply unit can indicate errors to the axes, so that the individual axes can react. Each axis can generate messages to the other axes, for example failures, ballast resistors on or warning signal bus.

NOTE!

Dependent on the type of the used device

BM3XXX-XXXX-XXXXX[-X]-XXX**1**X
up to 12 devices can be connected

or

BM3XXX-XXXX-XXXXX[-X]-XXX**2**X
up to 30 devices can be connected.

Signal bus X300

Notes for the installation of signal bus cables:

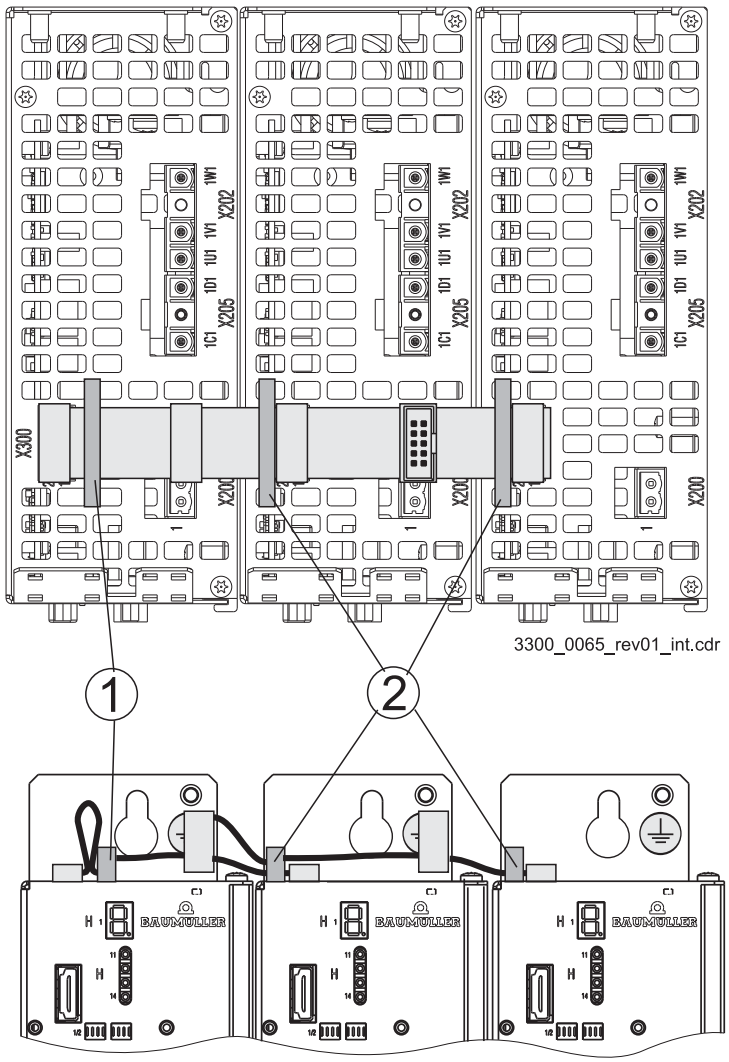


Figure 53: Installation of signal bus cable

1 Always, attach the flat cable holder from the left to the first device and at the same position. Put the leftovers of the flat cable holder as a loop between the flat cable holder and the connector.

2 From the second device onwards, always attach the flat cable holder from the left and always at the same position.

The signal bus cables are not included in the delivery scope and must be ordered separately. Available cables and flat cable holders see ▹Cable signal bus◃ on page 175.

7.12.3 Connections BM3200, BM3300 at the bottom

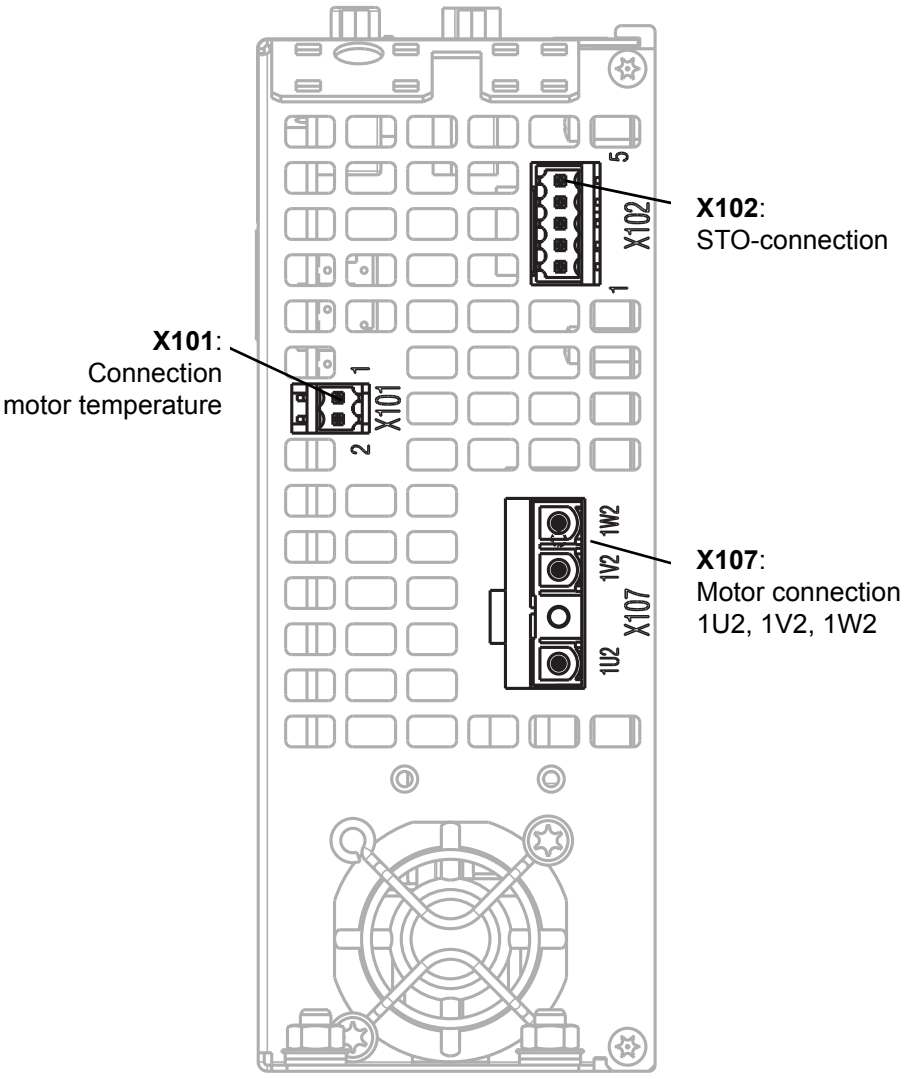


Figure 54: Connections at the bottom

7.12.3.1 X101 - motor temperature

X101 (SELV/PELV)

Termination system
Connector, spring clamp termination

	Minimum	Maximum
Connector cross-section solid conductor finely stranded with ferrule (with/without protective cover)	 0.2 mm² / AWG28 0.2 mm² / AWG28 0.2 mm²	 1.5 mm² / AWG16 1.5 mm² / AWG16 1.5 mm² / 1 mm²

1 Motor temperature +
2 Motor temperature -

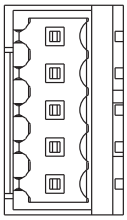
7.12.3.2 X102 - safe torque off - option

X102 (SELV/PELV)

Max. connector cross-section	Termination system
1.0 mm²	Connector, spring clamp termination

STO1: X102-1/2
STO2: X102-4/5

Digital input according EN61131-2 type 2 with following change:	Low Voltage: -0.3 ... 5 V I_L at 5 V: max. 23 mA_{eff} High Voltage: 20 ... 30 V I_L at 20 V: max. 31 mA_{eff} I_L at 30 V: min. 35 mA_{eff}
Max. reaction time	Max. 30 ms



5	STO 2 GND
4	STO 2 24V
3	NC
2	STO 1 GND
1	STO 1 24 V

NOTE!

The used power supply must comply with the defined voltage drop according EN60204-1.

7.12.3.3 X107 - motor connection

X107
1U2, 1V2, 1W2

Connection system	Loading capacity
Connector, screw terminal	Is limited by the device, also see ▹Electrical data◃ from page 36 connector max. 20 A.

	Minimum	Maximum
Max. cross-section solid conductor finely stranded with ferrule (with/without protective cover)	 0.08 mm² / AWG28 0.08 mm² / AWG28 0.2 mm²	 4 mm² / AWG12 4 mm² / AWG12 2.5 mm²
Locking torque	0.4 Nm	0.5 Nm
Screwdriver blade	0.6 x 3.5 mm	
Skinning length	7 mm / 0,9 in	

PE

Refer to ▹PE connections BM3200, BM3300 rear panel◃ from page 139.

7.12.4 PE connections BM3200, BM3300 rear panel

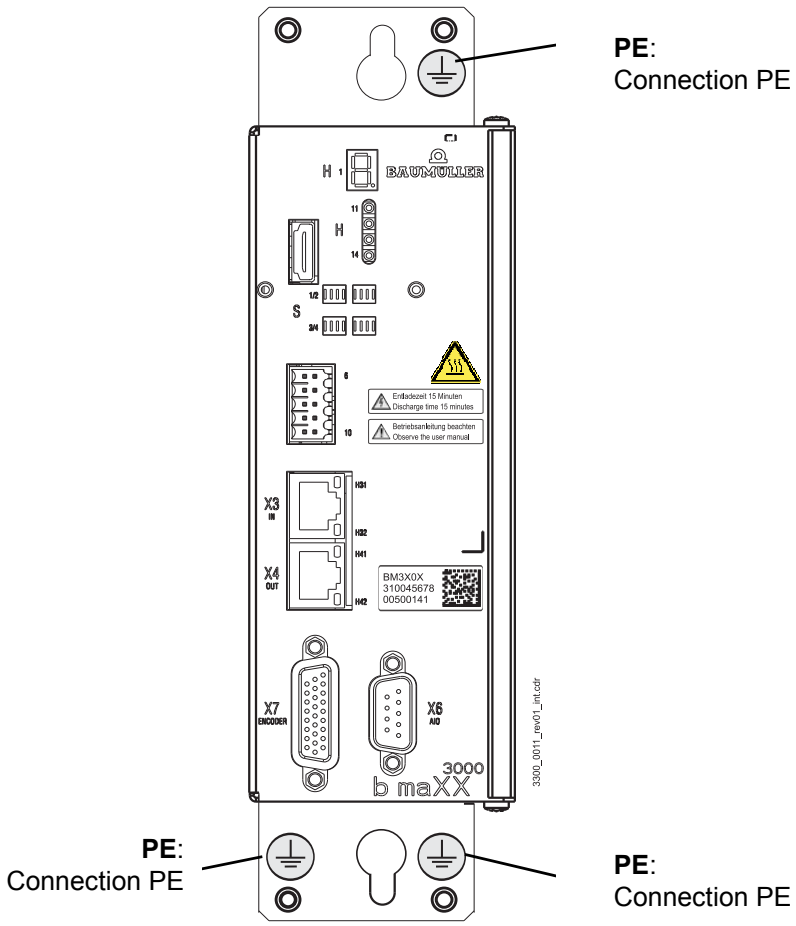


Figure 55: Connections PE

Max. connector cross-section	Connection system	Torque
10 mm^2 copper cables 16 mm^2 aluminum cables	Cable lug for M5	Min. 2.2 Nm Max. 3.0 Nm
2 cables diameter according power supply connection, see ▹X202, X203, X205 - power supply, DC link, ballast resistor connection◃ on page 132 2 x 2.5 mm^2 with wire end ferrule 2 x 4 mm^2 without wire end ferrule		

NOTE!

According to DIN EN 61800-5-1, the following PE connection is required:

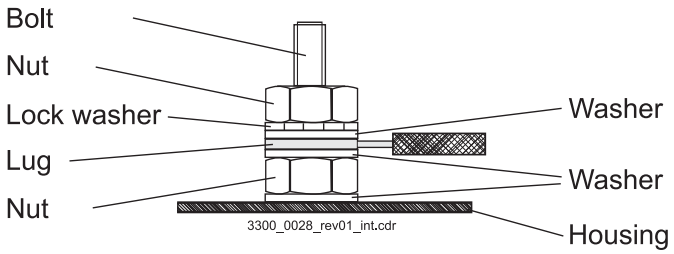


Figure 56: Structure of PE-connection

- Also, without the cable, the screw must be firmly tightened and must have a correct, electrical contact to the cabinet.
- There is **one** line lug between two washers and the pressing nut is protected against loosening by one spring washer.
- The lug must have a large-surfaced contact, which means, that it should be close to the screw.
- The structure must ensure a permanent safe contact.

8

OPERATION

8.1 Safety notes

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 this Instruction handbook.
- Before beginning 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 energized 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 (see ▹Required environmental conditions◃ on page 30).

WARNING!

Risk of injury due to inadequate 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!

8.2 Operating concept

After the device was put into operation, it is parameterized (adapted to the application). If the parameterization is completed the device can be operated either with the pulse enable signal or with pulse enable signal and quick stop signal.

8.2.1 Enable signals

These signals must have a signal level of 24 V_{DC} and must be connected to the terminals (▹X2 - Digital inputs/outputs◃ on page 115), also see ▹Connecting diagrams◃ from page 93.

Pulse enable

During operation the signal „Pulse enable“ always must be activated, so that the device can supply power. A running motor coasts down, if the signal is set to 0 V.

Quick stop (optional)

Only switch off the „quick stop“ signal if the system / the device must be stopped as quickly as possible, the drive reaction can be adjusted (see the parameter manual).

During operation, the „quick stop“ signal must be continuously provided in order for the device to provide output.

Which digital input is used a quick stop input can be parameterized (see parameter manual **b maXX 3000,** 5.12001).

8.2.2 Monitoring

The controller part monitors the device during operation. If the controller part detects a condition, which deviates from normal operation, the device generates a warning/an error message.

Warning

If the controller part detects an operational condition, which exceeds a warning limit, an according warning is either shown by the display or by the control. The device shows the most important warning (current limit reached) via the LED H13 (see ▹Display and operating elements BM3200, BM3300◃ from page 58).

Error message

If the controller part detects, that the device is not operating correctly, this is shown via the 7-segment-display, see ▹Page 62◃ and the LEDs H11 to H14, see ▹Page 63◃.

For further information see ▹Troubleshooting and Fault Correction◃ from page 165.

8.2.3 Service interface

The service interface transfers controller parameters from a PC/laptop to the controller via the parameterization software ProDrive.

- connect a free USB-port of the PC/laptop with the controller.

NOTE!

Only, the service cable BM5-K-USB-XXX must be used for the X1-service interface. Also see ▹Cable service interface◃ on page 176. The maximum transmission rate is 920 kBaud.

The driver for this connection was installed on the PC/laptop with ProDrive. The settings of the connection (baud rate, etc.) are made in ProDrive. Refer to ProDrive Online help.

NOTE!

If the service cable is not used, keep it in its ESD-packaging.

8.3 DC-link load / switch-on frequency of power supply

Switch-on frequency accords to the time between two switch-on procedures. This period cannot be selected freely, as each switch-on procedure is connected with a thermal load of the precharge resistors.

These precharge resistors limit the starting current, when switching on the power supply voltage.

NOTE!

Between two switch-on procedures, there must be at least 3 minutes. If the time, which is required to cool down is under this time, thermal overload and destruction of the precharge resistors can occur.

8.4 Optional safety function STO of BM3300

8.4.1 Safety notes according STO function (Safe Torque Off)

WARNING!

- When STO is activated, the drive is not disconnected from power supply.
- The safety function Safe Torque Off (STO) is not sufficient as the only safety function for drives which are affected by a permanent moment, for example, in case of suspended loads.
- The function STO may only be operated in combination with emergency stop devices according to DIN EN ISO 13850 or safety sensors according to EN 61496.

WARNING!

In the unlikely event of a total failure of an internal driver (IGBT) or a control element, a temporary excitation of the drive can occur (also if STO is active). The angular movement covered depends on the rotor position and the number of pole pairs of the motor. The maximum is 180°/number of pole pairs.

DANGER!

Danger due to moving engine parts!

The supply of the inputs by a connected safety component (emergency stop device, safety light curtain) leads to the immediate supply of the driver stage. A converter failure may lead to an unexpected start-up. Ensure by the use of the external safety components that an unexpected start-up is prevented during commissioning.

Therefore:

- Maintain an adequate distance from moving machine parts/line parts or from the moving machine/line.

8.4.2 Safety levels and safety notes

Type code **BM3300** with safety function STO (Safe Torque Off):

BM33XX-XXXX-XXXXX[-X]-XXXXX[-S00]-XX[-XX][-EXX][-#XX]

Safety version optional

S0**0**: Safety function STO
There is no conformity to the safety standards.
Permitted for process protection only.

S0**1**: Safety function STO
Safety claim PLe / SIL3 (for replacement only)

S0**2**: Safety function STO
Safety claim PLe / SIL3
with short-circuit detection (standard type)

according EN ISO 13849-1 and EN 62061

The Baumüller compact servo unit
BM33XX-XXXX-XXXXX[-X]-XXXXX-**S01/S02**-XX[-XX][-EXX][-#XX]
provides the safety function STO (Safe Torque Off).

- The drive is without torque in STO function.
- The activation of the power amplifier is reliable disabled.
- The STO function fulfills the stop category 0 according EN 60204-1.

If no load is active on the motor shaft, the drive will coast to a standstill. For this reason no active danger is caused by the drive in case of an enabled STO function. A restart of the drive is not possible without a reset of the STO function.

NOTE!

Devices with the approval mark of TÜV Rheinland and the Safety label provide a certified safety function, only, refer to ▹Page 23◃.

The STO function of the devices
BM33XX-XXXX-XXXXX[-X]-XXXXX-**S01/S02**
complies with the following safety levels and standards:

- Characteristic data according IEC 61508-1 to 7 and IEC 62061
  (data for use of the device as a subsystem in safety functions)
  - Safety Integrity Level SIL CL 3
  - PFH: 3.6×10^{-10} 1/h, corresponds to 0.4 % of SIL 3
  - PFD_{av}: 3.2×10^{-5} corresponds to 3.2 % of SIL 3
  - Proof Test interval 20 a

  Remark: At a PFH value, which is < 1 % of the allowed SIL-threshold, the performance of special Proof Tests within the mission time of the product is regarded as not necessary.

- Characteristic data according EN ISO 13849-1
  - Performance Level PL e
  - Category: Cat 4
  - MTTFd: high (751 a)
  - Diagnostic Coverage: high (99 %)

For further information call our application department.

8.4.3 Function

In case of a failure or on request (by activating an emergency stop device, interrupting a safety light curtain), the STO function ensures that the power supply of the converter in the power stage is shut down safely and the pulse inhibitor is activated. Thus, the motor can no longer generate a rotating field. The mains supply is not disconnected from the motor when the shut down function is activated.

The safety relay function is based on the fail-safe principle. The safety function STO „safe torque off“ is active, as long as there is no voltage at the input terminals (X102). Therefore, the functioning of the safety function is ensured at voltage failure, also. In order to deactivate „safe torque off“, a voltage of 24 V must be applied to the terminals (X102).

The error „Shut down because of safety function“, error No. 1013 is generated if the **BM3300** is in state „**Operation enabled**“ and the voltage on the input of the STO function is switched off.

The warning „Safety function“, warning No. 1046 is generated if the **BM3300** is in **another state** except „Operation enabled“ and the voltage on the input of the STO function is switched off. The warning is reset as soon as the voltage is available again.

8.4.4 Timing

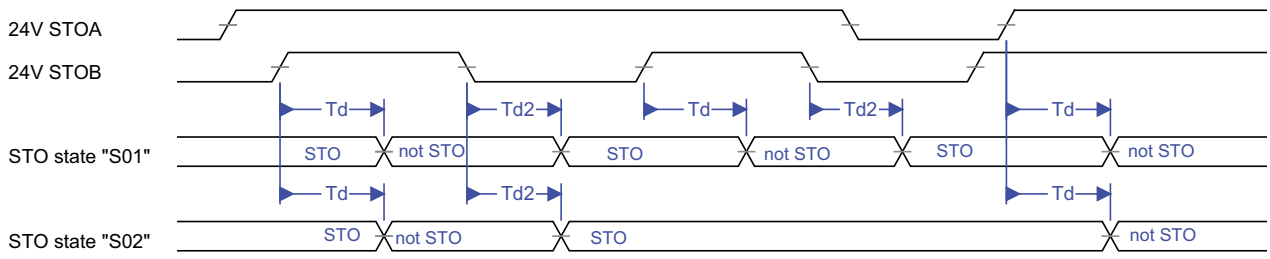


Figure 57: Timing STO function

T_d: < 40 ms

T_{d2}: max. 30 ms

- The controller is enabled after 40 ms, when both voltages are activated
- The controller is disabled after max. 30 ms, when one voltage deactivated

8.4.5 Supply with separate power supplies

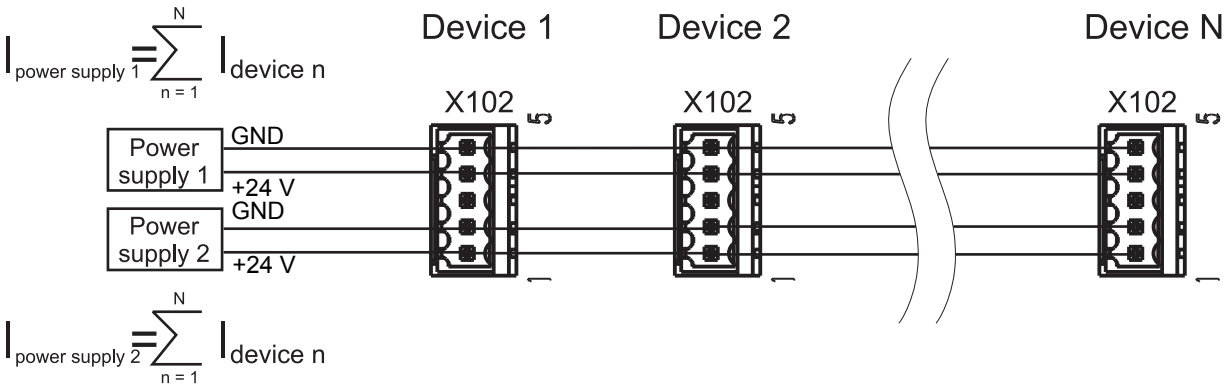


Figure 58: Supply with separate power supplies

8.4.6 Examples for input wiring

Depending on the input wiring of the STO function, it can be operated with different safety components (emergency stop device, electronic safety sensor). The examples in the following sections show the wiring of the STO option for the operation with an emergency stop device, a safety light grid and the Baumüller Safety I/O terminal SO4000.

WARNING!

The power supply unit for generating the 24 Volt electrical supply must meet the requirements for PELV according to EN 60204-1.

Operation with emergency stop device

The following example for the wiring of an emergency stop device with the STO module ensures that short circuits on the input side are detected.

BM33XX-XXXX-XXXXX-X-XXXXX-**S01**

In case of a short circuit on the input side between A ↔ B the converter always switches to the STO (Safe Torque Off) status.

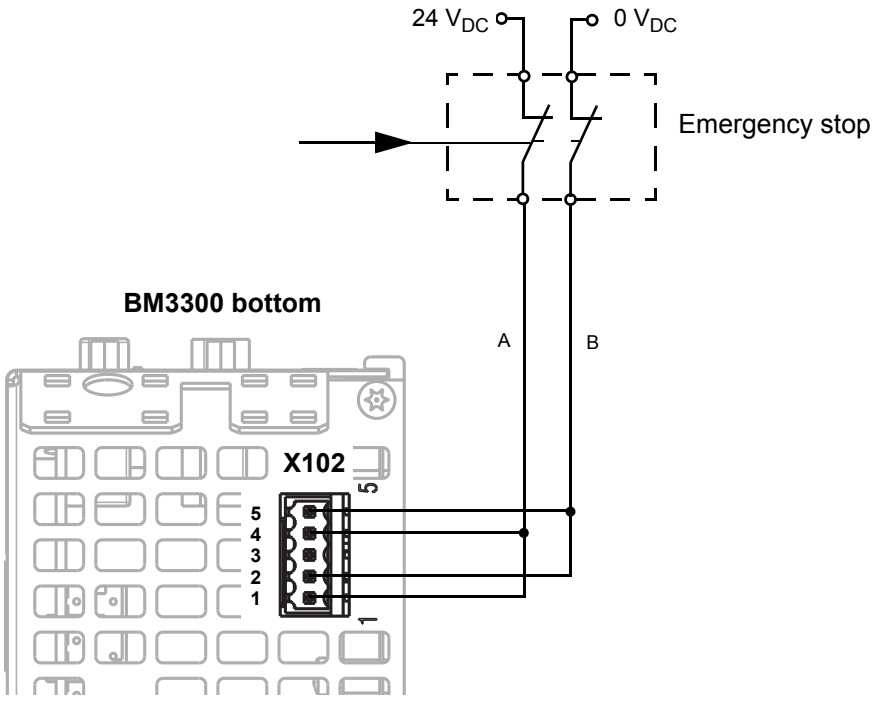


Figure 59: STO function **S01**: Operation with emergency stop device

BM33XX-XXXX-XXXXX-X-XXXXX-**S02**

In case of a short circuit on the input side between A ↔ B or A ↔ 0 V_{DC} or B ↔ 24 V_{DC}, the converter always switches to the STO (Safe Torque Off) status.

A short circuit between A ↔ 24 V_{DC} or B ↔ 0 V_{DC} is detected in state STO, the drive remains in state STO

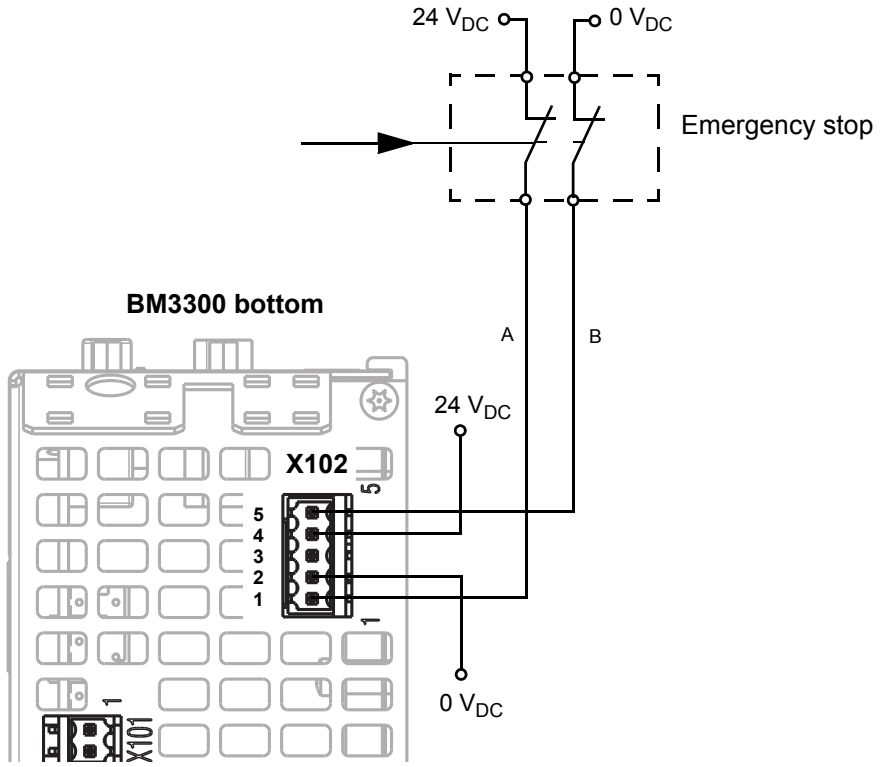


Figure 60: STO function **S02**: Operation with emergency stop device

Operation with safety light grid

If the STO function is operated with a safety light grid or a safety control, the reference potential (0 V) is hard-wired on the input side. The two-channel shut down is then performed by two safety outputs (monitored by the safety sensor) which provide the two-channel supply for the STO function.

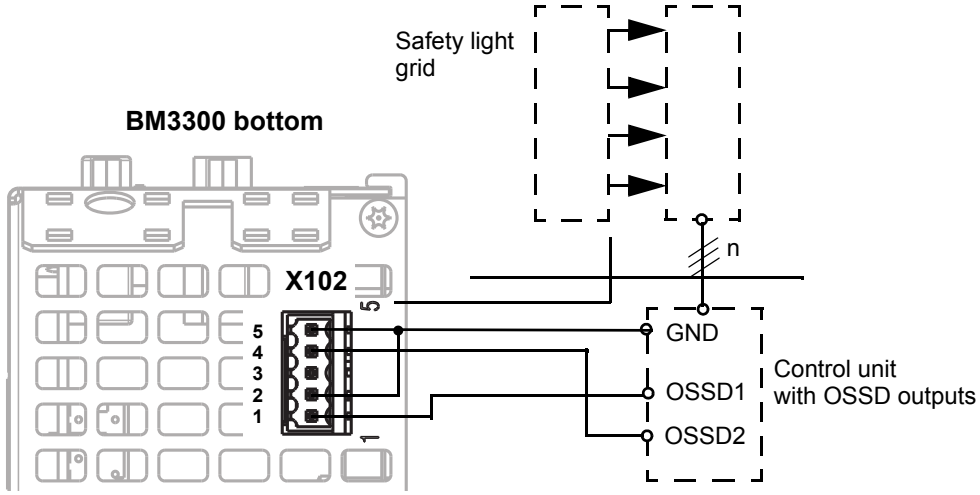


Figure 61: STO function: Operation with safety light grid

Operation with Baumüller Safety I/O terminal SO4000

The output terminal SO4000 shown provides bipolar safety outputs. For connection of the STO function, the 0 V switching output is wired with pin 2/5. The corresponding 24 V switching output is wired with terminal pin 1/4.

Short circuits of the outputs of the Baumüller Safety output terminal SO4000 to supply potentials or between the outputs are detected by the output terminal and lead to the shut down.

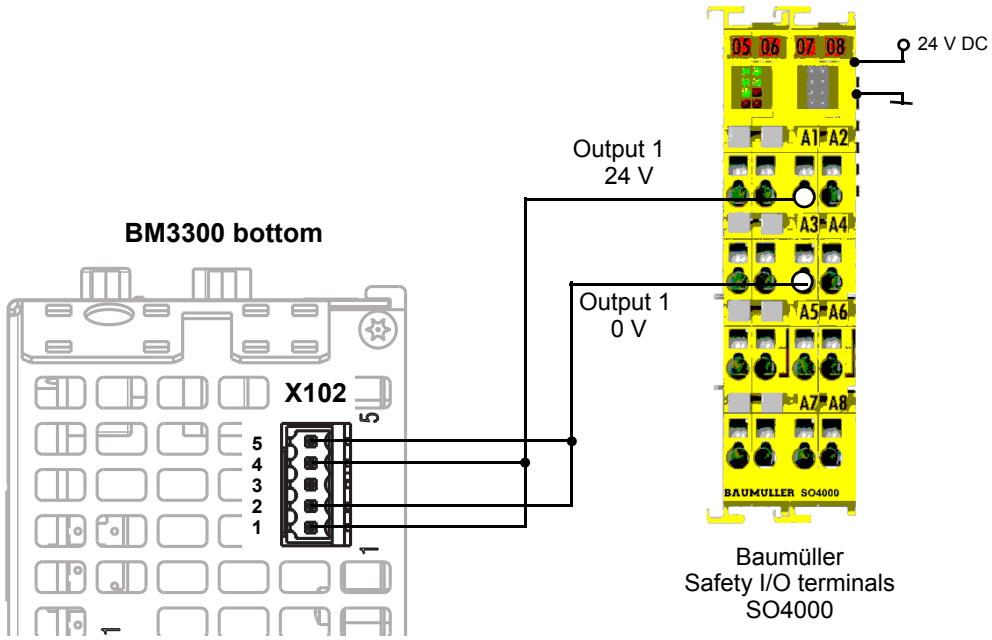


Figure 62: STO function: Operation with SO4000

8.5 Fieldbus communication

Depending on the version of **BM3200, BM3300** (see ▹Type plate◃ on page 53 and accordingly ▹Type code◃ from page 54), communication can be made via different fieldbus systems.

8.5.1 EtherCAT®

Type code **BM3200, BM3300** with EtherCAT® CoE profile:

BM3XXX-XXXX-XXXXX[-X]-**1**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

Type code **BM3200, BM3300** with EtherCAT® SoE profile:

BM3XXX-XXXX-XXXXX[-X]-**7**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

Via the **BM3200, BM3300** 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 see ▹BM3200, BM3300 front side◃ on page 113).

Mounting and installation

The mounting/installation consists of the following steps:

1 De-energize the **BM3200, BM3300** device

2 at the **BM3200, BM3300** IP-address set,
see ▹Settings address switches◃ on page 66

3 Connect **BM3200, BM3300** 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 see ▹Cables - EtherCAT®, VARAN, POWERLINK® .◃ on page 175.

Commissioning

The following preconditions must be fulfilled before commissioning:

1 **BM3200, BM3300** 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 **BM3200, BM3300** device is ready-to-use.

Address switch

By means of the address switches S1 to S4 the IP address is set
(see ▹Settings address switches◃ from page 66).
Further information about the setting possibilities of the EtherCAT® slave see „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 3000,** 5.12001)
  - 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.

8.5.2 VARAN

Type code **BM3200, BM3300** with VARAN:

BM3XXX-XXXX-XXXXX[-X]-**2**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

A **BM3200, BM3300** 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 VARAN (also see ▹BM3200, BM3300 front side◃ on page 113).

Mounting and installation

The mounting/installation consists of the following steps:

1 De-energize the **BM3200, BM3300** device

2 Set the **BM3200, BM3300** IP-address,
see ▹Settings address switches◃ on page 66

3 Connect **BM3200, BM3300** with VARAN bus cables
(Ethernet-LAN cable at least CAT 5).

- X3: VARAN-In, X4: VARAN-Out.
  On the first **BM3200, BM3300** node of a VARAN line X3 is connected with the VARAN master. X4 is connected with X3 of the next **BM3200, BM3300** 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.

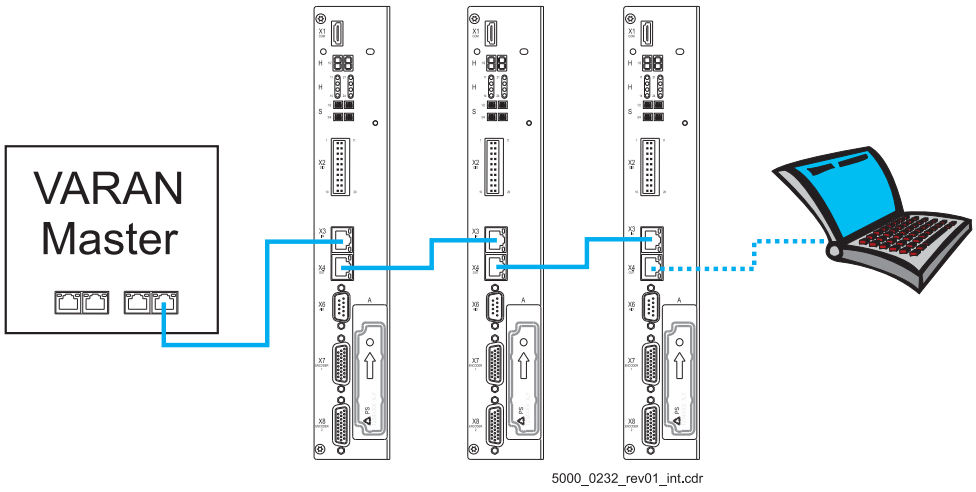


Abbildung 63: VARAN fieldbus connection

NOTE!

A point-to-point connection between PC (ProDrive) and **BM3200, BM3300** VARAN slave X4 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 see ▹Cables - EtherCAT®, VARAN, POWERLINK® .◃ on page 175.

Commissioning

The following preconditions must be fulfilled before commissioning:

1. **BM3200, BM3300** 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 **BM3200, BM3300** device is ready-to-use.
4. Create a Lasal-Class2 project using the driver classes for **BM3200, BM3300** 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 67).

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 **BM3200, BM3300**)
     - set Synchronization to „On“
     - set Fieldbus cycle time according VARAN cycle time (1 ms, 2 ms, 4 ms or 8 ms)

8.5.3 CANopen®

Type code **BM3200, BM3300** with CANopen®:

BM3XXX-XXXX-XXXXX[-X]-**3**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

The data can be transmitted to all the other CAN-users (e g from CANopen® master) via the **BM3200, BM3300**.

X3 and **X4** are the RJ45 connections for CAN bus cables (also see ▹BM3200, BM3300 front side◃ on page 113), which are on the front side of the device.

Mounting and installation

The mounting / installation consists of the following steps:

1 De-energize **BM3200, BM3300** device

2 Set address and baud rate (transfer rate) at the **BM3200, BM3300**, see ▹CANopen®◃ on page 69.

3 Connect **BM3200, BM3300** 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 see ▹Accessories - CANopen®.◃ on page 176.

NOTE!

If the **BM3200, BM3300** device is the last bus node in the line, X4 must be terminated with a terminating connector (see ▹Accessories - CANopen®.◃ on page 176).

Commissioning

The following preconditions must be fulfilled before commissioning can be made:

1 **BM3200, BM3300** 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 **BM3200, BM3300** 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
(see ▹CANopen®◃ on page 69).
Further information about parameter setting of the CANopen® slave, see „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 **BM3200, BM3300** 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 (see Parameter Manual: Drive manager)

5 NMT-Master: Create PDO-Mapping
(see 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 **BM3200, BM3300** 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 **BM3200, BM3300** 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 **BM3200, BM3300** device is in the cyclical operation
- Ensure, that the CANopen® communication source only is able to communicate with the **BM3200, BM3300** 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.

8.5.4 POWERLINK®

Type code **BM3200, BM3300** with POWERLINK®:

BM3XXX-XXXX-XXXXX[-X]-**4**XXXX[-S0X]-XX[-XX][-EXX][-#XX]

BM3200, BM3300 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 see ▹BM3200, BM3300 front side◃ on page 113).

Mounting and installation

The mounting/installation consists of the following steps:

1 De-energize the **BM3200, BM3300** device

2 Set the **BM3200, BM3300** IP-address,
see ▹Settings address switches◃ on page 66.

3 Connect **BM3200, BM3300** 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 see ▹Cables - EtherCAT®, VARAN, POWERLINK® .◃ on page 175.

Commissioning

The following preconditions must be fulfilled before commissioning:

1 **BM3200, BM3300** 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 **BM3200, BM3300** 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 ▹Settings address switches◃ on page 66).
IP address 192.168.100.0 is not allowed.
Further information about the setting possibilities of the POWERLINK® Controlled Node see „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 **BM3200, BM3300**)
  - 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

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 adequate working clearance.
- Make sure that the mounting area is kept clean and orderly. Parts and tools that are loosely stacked or are lying around can cause accidents.

9.2 Environmental conditions

If the stipulated environmental conditions are adhered to, then the device is maintenance-free. For the prescribed environmental conditions, see ▹Required environmental conditions◃ on page 30.

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 requested?
- Is the operating environment normal?
- Is the cooling system working normal?
- Is there an unusual vibration or noise during operation?
- Does the motor overheat during operation?

Regularly scheduled inspection:

Before inspection, 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.
- Insulated tools are permitted, only.

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Refer to ▹ Electrical Data ◃.

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 intermediate circuit, the intermediate circuit discharge can take a much longer time. In this case, the necessary waiting period must itself be determined or a measurement made as to whether the equipment is de-energized. This discharge time must be posted, together with an IEC 60417-5036 (2002-10) warning symbol, on a clearly visible location of the control cabinet.

9.3.1 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 water drops are visible.	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 network 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 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 relays in the main 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 main 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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Ostendstr. 80 - 90
90482 Nuremberg
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	Threshold settable	Warning	Warning reaction	Error	Error reaction
Phase monitoring	Phase failure	-	X	2)	X	2)
	Power supply failure	-	X	-	X	2)
Overcurrent	Overcurrent motor	-	-	-	X	IS
DC-link	DC-link overvoltage	-	-	-	X	IS
	DC-link undervoltage	-	-	-	X	IS
Ixt-threshold	Peak current not possible, at present	-	X	-	-	-
Temperature heat sink	Temperature > threshold 1	X	X	-	-	-
	Temperature > switch-off threshold	-	-	-	X	IS
Temperature Internal space of device	Temperature > threshold 1	X	X	-	-	-
	Temperature > switch-off threshold	-	-	-	X	IS
Temperature motor	I^2t-threshold exceeded	-	-	-	X	IS 1)
	Threshold 1 exceeded 4)	X	X	-	-	-
	Threshold 2 exceeded 4)	X	X	-	-	-
	Short-circuit sensor / T < 30 °C 4)	-	-	-	X	IS 1)
	Sensor is not connected / T > 250 °C 4)	-	-	-	X	IS 1)
	Maximum temperature exceeded 2)	X	-	-	X	IS 1)
Position controller	Position deviation error, dynamic mode	X	-	-	X	-
	Position deviation error, static mode	X	-	-	X	-
Controller synchronization	Controller not synchronous with external signal	-	X	-	X	1)
Encoder	Overspeed	X	-	-	X	IS 3)
Cyclic set value transmission to the fieldbus	Time-out at transmission	X	-	-	X	1)
Block monitoring	Drive blocked	-	-	-	X	IS
Signal bus	Power supply ready	-	-	-	X	1)

1) Monitoring can be switched-off
2) Time/operation until pulse inhibit can be set
3) Threshold can be set
4) Only, if a KTY/PT1000-sensor is used

IS: Pulse inhibit
X: implemented
-: not possible

10.2.1 Monitoring functions

Overcurrent

This monitoring function checks, if the motor- or the power supply current is 1.3 times greater than the output peak current. It serves as a protection against an output-sided short-circuit.

DC-link

This monitoring function checks the voltage in the DC-link. If the voltage falls under a fixed, internal value (about 210 V), then „DC link undervoltage“ is signaled from the controller and a warning is displayed. If the voltage exceeds a fixed, internal value (about 825 V) then “DC link overvoltage“ is signaled from the controller and an immediate pulse inhibit takes place.

Ixt-threshold

This monitoring function checks the heat sink temperature and the current load, whether it can supply the peak current or the max. rated current, at the moment. If peak current is not possible, the message “Ixt-threshold 1 exceeded“ is displayed.

Temperature internal space of device

This monitoring function checks the temperature in the internal space of the device.

- If the temperature is greater than the warning threshold, the controller displays a warning.
- If the temperature is greater than the permitted temperature of the device‘s internal space, an error is generated, the error reaction can be set.

Temperature heat sink

This monitoring function checks the temperature of the heat sink.

- If the temperature is greater than the warning threshold, the controller displays a warning.
- If the temperature is greater than the maximum permitted heat sink temperature of the device‘s internal space, an error is generated, the error reaction can be set.

Temperature motor

This monitoring function checks the temperature of the motor. if the I²t-overload of the controller is displayed.

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.

The error message „position deviation statical“ or „position deviation dynamical“ is set, if the present position deviation statical/dynamical is greater than the set position deviation limit. After the monitoring time (deviation time) has past an additional error message is displayed and an immediate pulse inhibit takes place. The reaction time is settable.

Block monitoring

This monitoring function checks the motor speed and the motor current.
If both of the following conditions are met for the period „block monitoring time“, then the error/the warning „drive blocked“ is signaled to the controller and an immediate pulse inhibit takes place.

- Motor speed = 0
- The motor current output from the device is the same as the set motor limit current (current limit).

Signal bus

All power units at the axis devices are connected with a „signal bus“. Each user can request for and set the bus signals including the supply unit.

Signal bus - supply ready-for-use

Indicates, when the supply unit is in the status „ready-for-use“. This signal is generated after the recognition and identification of the power supply. At a power rectifier „ready-for-use“ is active after about 4 s after switching on the 24 V-supply voltage.

At power supply errors and power supply failure the ready-for-use signal is reset. The axes must react upon this and must change into the error state.

Signal bus - ballast resistor on

The DC-link voltage is monitored independently by each axis. The mode parameter (140.1) bit 0 sets, if the signal for the control of the ballast resistor shall be activated at this warning. If the voltage of the ballast resistor drops below the ballast resistor threshold (P130.29 protected) - 20 V (hysteresis) the axis resets the signal at the bus and deletes the warning.

The ballast resistor threshold is calculated from max. $U_{DC\text{-}link}$ with:

Ballast resistor = max. $U_{DC\text{-}link}$ - 30 V

10.3 Error detection

An error state is signaled by the lighting-up of the red LED H14 on the front side of the cabinet; also see ▹Display and operating elements BM3200, BM3300◃ on page 58 onward.

NOTE!

At warnings or errors without error reaction the LED H14 „error“ **flashes**. Only error messages with error reactions are signaled by a **constant lighting-up**.

Further information according the subjects error messages and error numbers, see „parameter manual **b maXX 3000**“.

10.4 Troubleshooting/error acknowledge

The basis of troubleshooting are the error messages, which also are called error lists.

NOTE!

The device is delivered with predefined error reactions. The error reaction of the device can be set in the marked error messages in „Dependent on setting“ in the column „Reaction . Errors, where an immediate pulse inhibit is executed cannot be changed, due to safety reasons.

If the red error-LED H14 is flashing, then one error occurred, at least.

The error messages are reset by executing an error acknowledge. An individual error acknowledge is not possible. The acknowledge causes a reset of the error, if the reset is possible because of the error situation.

There are three methods to acknowledge errors:

- On the control word via write access.
- Via a digital input
- Via the pulse enable input:
  Precondition is, that the drive can be controlled via the hardware inputs only (this means that the motor control cannot be set via another communication source). Furthermore, the option „error acknowledge via pulse enable“ must be activated. The first rising edge of the pulse enable acknowledges the errors. However, the drive has not started, yet. A second rising edge is necessary for enabling.

Further information referring to the subject error acknowledge is found in „Parameter manual **b maXX 3000**“.

11

ACCESSORIES AND SPARE PARTS

In this appendix the accessory-/spare parts for the devices of the series **BM3200, BM3300** are listed. Do not hesitate to contact our product management for inquiries and suggestions referring to spare parts.

11.1 Cables

11.1.1 Cable power supply-device

Device	Cross-section	Maximum Length [1]	Connection to the device [2]
BM320X BM330X BM321X BM331X	4 x 1 bis 2.5 mm^2 (AWG 18 - 14)	As required	Flexible cable with/without wire end ferrule (screw contact)

[1] The length of the cable between line filter and power supply, in order to comply with the EMC-Guideline, is irrelevant.

[2] The laying procedure is not specified. The DC link connections must be laid DC compliant.

11.1.2 Cable device-motor

Device	Cross-section	Maximum Length [1]	Connection at Device [2]
BM320X BM330X BM321X BM331X	4 x 1 to 4 mm^2 (AWG 28 - 12)	Max. 50 m	Flexible cable with/without wire end ferrule (screw contact)

[1] Only with a Baumüller cable with this maximum length and with a Baumüller line filter it can be expected that the limit values of the EMC-product standard EN_61800-3 can be complied with. If n-parallel-laid motor cables are used, then the maximum length is to be reduced by the factor 1/n.

[2] With Baumüller cables with this maximum length and the use of Baumüller line filters, it can be expected that the limit values of the EMC-regulation is complied with.

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 DSL Hiperface® 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 DSL Hiperface®
	15 A speedtec® M23
	Part No.
3 m	464201
5 m	464202
7 m	464203
10 m	464204
15 m	464205
20 m	464206
25 m	464207
30 m	464208
35 m	464209
40 m	464210
50 m	464211
60 m	464212

- **Motor cable with DSL Hiperface® 15 A**

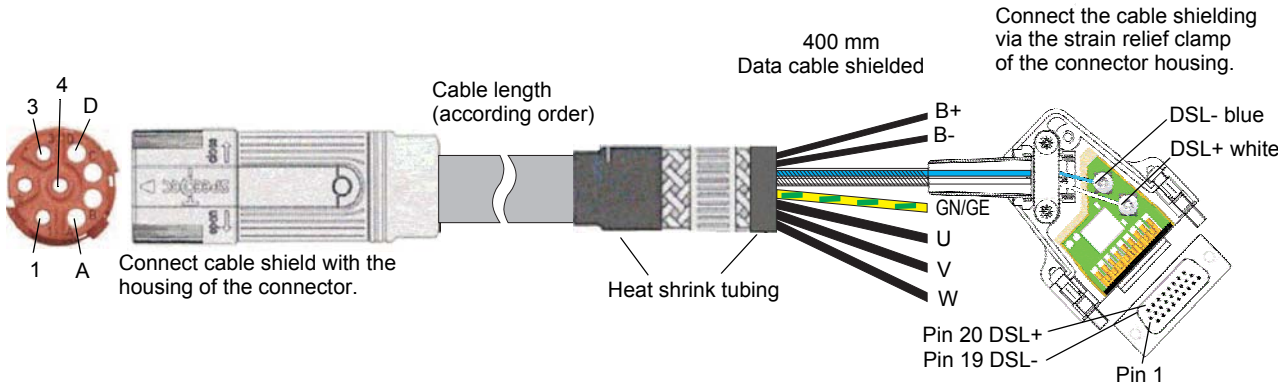
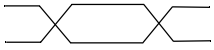


Figure 64: Motor cable with DSL Hiperface® 15 A

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	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		DSL+	22 AWG / white
D		DSL-	22 AWG / blue
Housing		-	Outside shielding
Housing		-	Inside shielding

11.1.4 Cable DC-link

Device	Cross-section	Connection at Device
BM3X0X BM3X1X	2 x 1 to 2.5 mm^2 (AWG 18 - 14)	Flexible cable with/without wire end ferrule (screw contact)

HINWEIS!

A ferrite core (part No. 308293) must be used with a DC link connection longer than 3 m to ensure a reliable EMC interference immunity of the **BM3200, BM3300.** The DC link cables connected with 1C1 and 1D1 must be led through the ferrite core with 3 turns per cable. The ferrite core should be close to the connection X205 of the **BM3200, BM3300.**

11.1.5 Cable control power supply / signals

Cross-section [1)]	$\leq$ 1.5 mm^2
Maximum length (without digital IO) [2)]	As desired
Maximum length digital IO	30 m
Connection at device	Without/with wire end ferrules (plug-in terminal

1) The laying procedure is not specified.

2) The length of the cable in order to comply with the EMC-regulation is irrelevant.

11.1.6 Cable signal bus

NOTE!

The signal bus cables are not included in the delivery scope and must be ordered separately.

Type	Part No.
Signal bus cable 10-pin BM320X, BM330X	426781
Signal bus cable 10-pin BM321X, BM331X	426782

NOTE!

Dependent on the type of the used device

BM3XXX-XXXX-XXXXX[-X]-XXX**1**X
up to 12 devices can be connected

or

BM3XXX-XXXX-XXXXX[-X]-XXX**2**X
up to 30 devices can be connected.

	Part No.
Flat Cable Holder Richco FCCS-2	430152

11.1.7 Cables - EtherCAT®, VARAN, POWERLINK®

- **Ethernet-connection Cables**, Type: Patch cable, STP

Type	Length [mm]	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

other lengths on request

11.1.8 Accessories - CANopen®

- **CANopen®-connection cables**:

Type	Model	Length [m]	Part No.
BM4-CAN-K-31-01	RJ45-connector, D-sub male	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-connector, D-sub female	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

- **Terminating connector RJ45**
  (Terminating terminal CAN, RJ45 with pin assignment according to CIA-standard, 120 Ω, 0.25 W)

Type	Part No.
BM4-CAN-T01	346408

11.1.9 Cable service interface

Type	Length [m]	Part No.
BM5-K-USB-018	1.8	430279

Interface on side of PC:	USB 2.0
Driver installation:	Is executed with the installation of ProDrive
Maximum transmission rate	920 kBaud

11.1.10 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.		see ▹Hybrid cable device-encoder-motor◃ on page 172	
		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		

11.1.10.1 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.

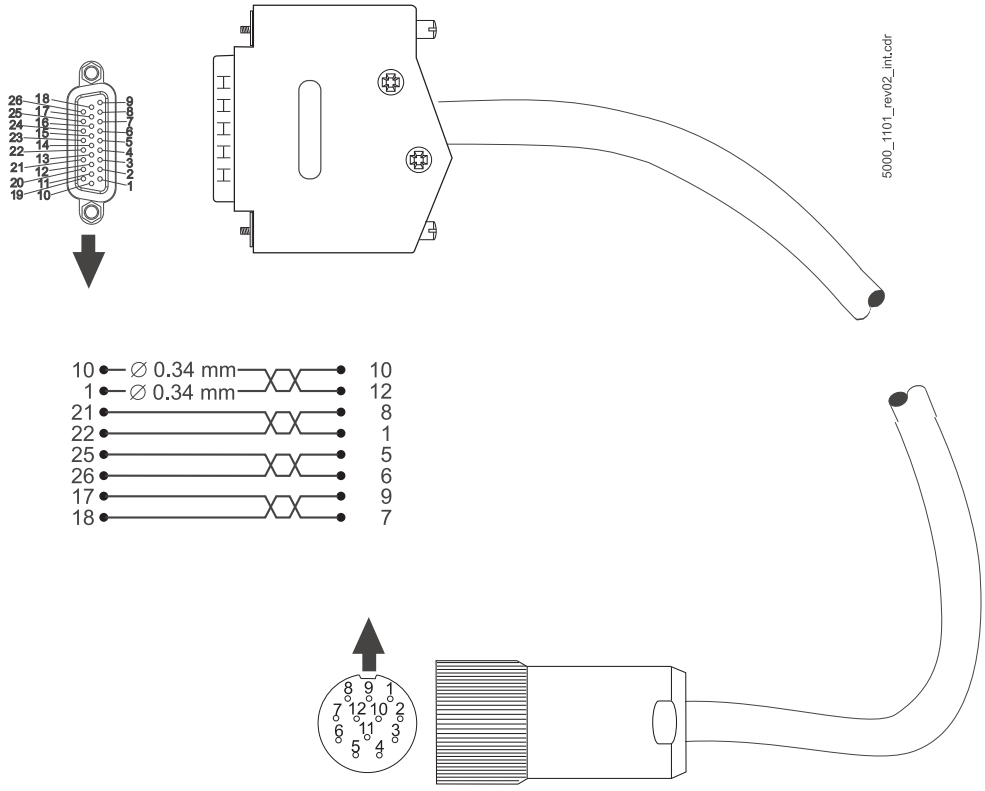


Figure 65: Connecting cable for resolver

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!

11.1.10.2 Connecting cable for encoder 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.

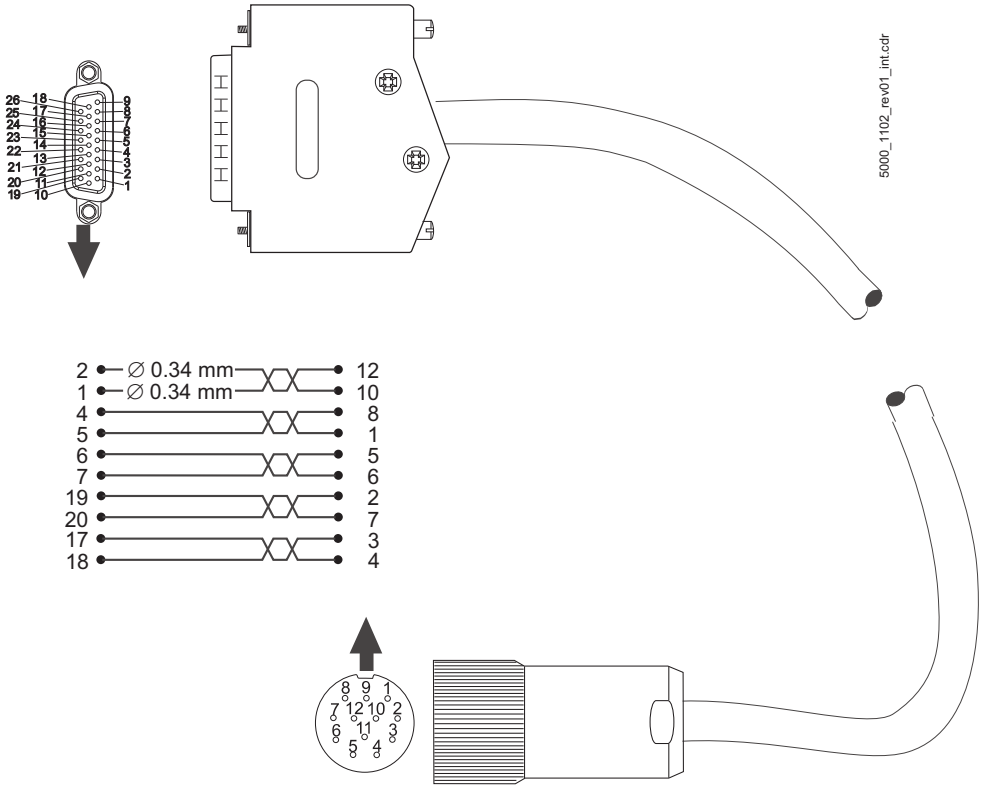


Figure 66: Connecting cable for encoder with HIPERFACE®

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!

11.1.10.3 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.

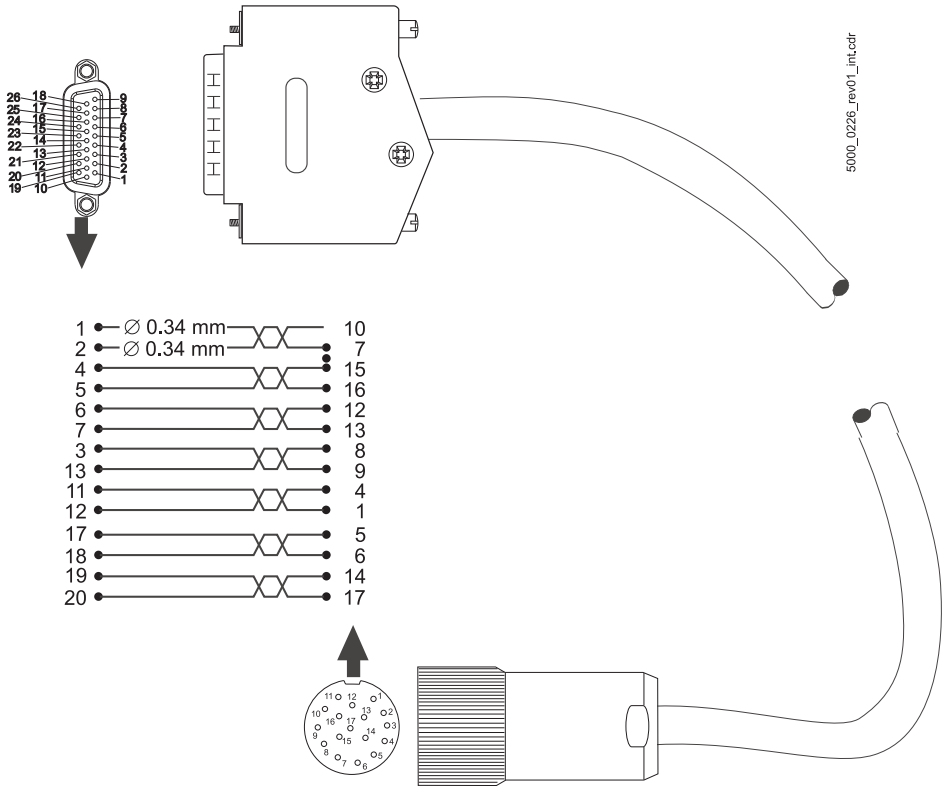


Figure 67: Connecting cable for encoder with EnDat® or SSI

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!

11.1.10.4 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.

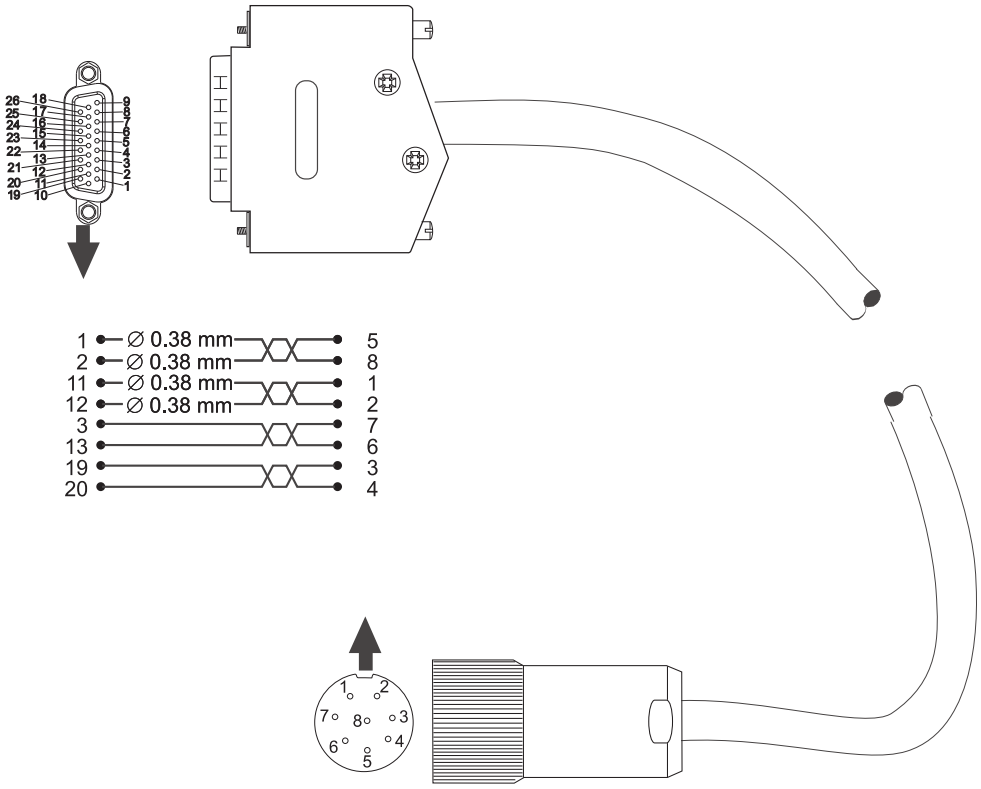


Figure 68: Connecting cable for encoder with EnDat® 2.2 M12

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.

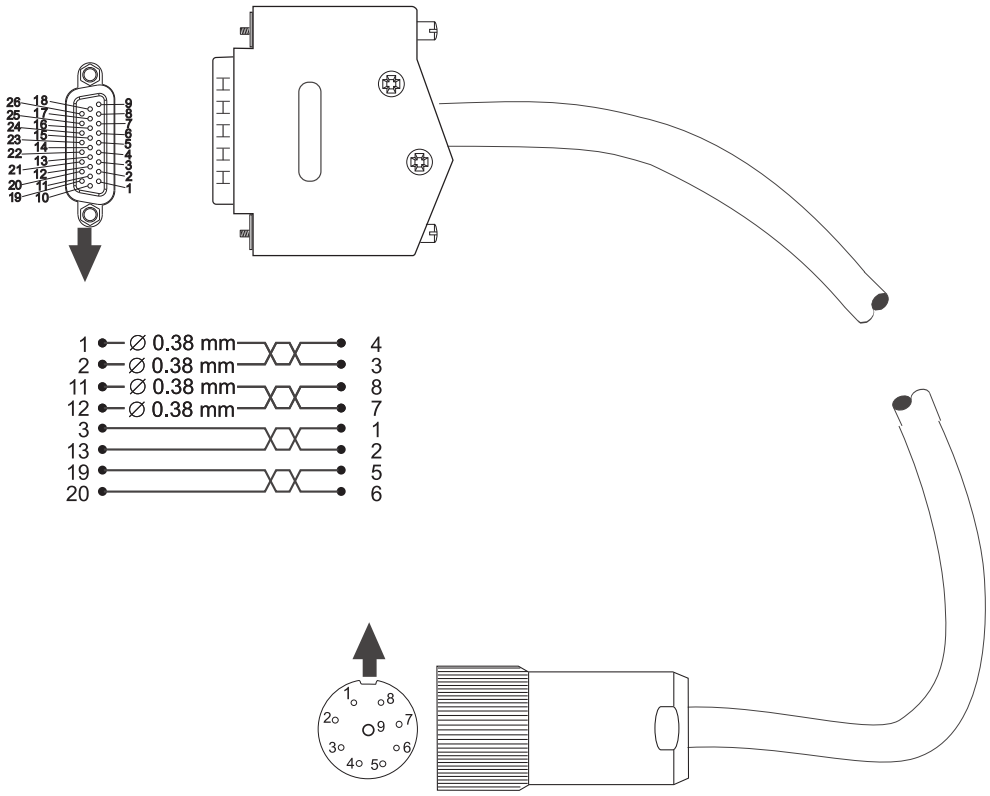


Figure 69: Connecting cable for encoder with EnDat® 2.2 speedtec® M23

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!

11.1.10.5 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.

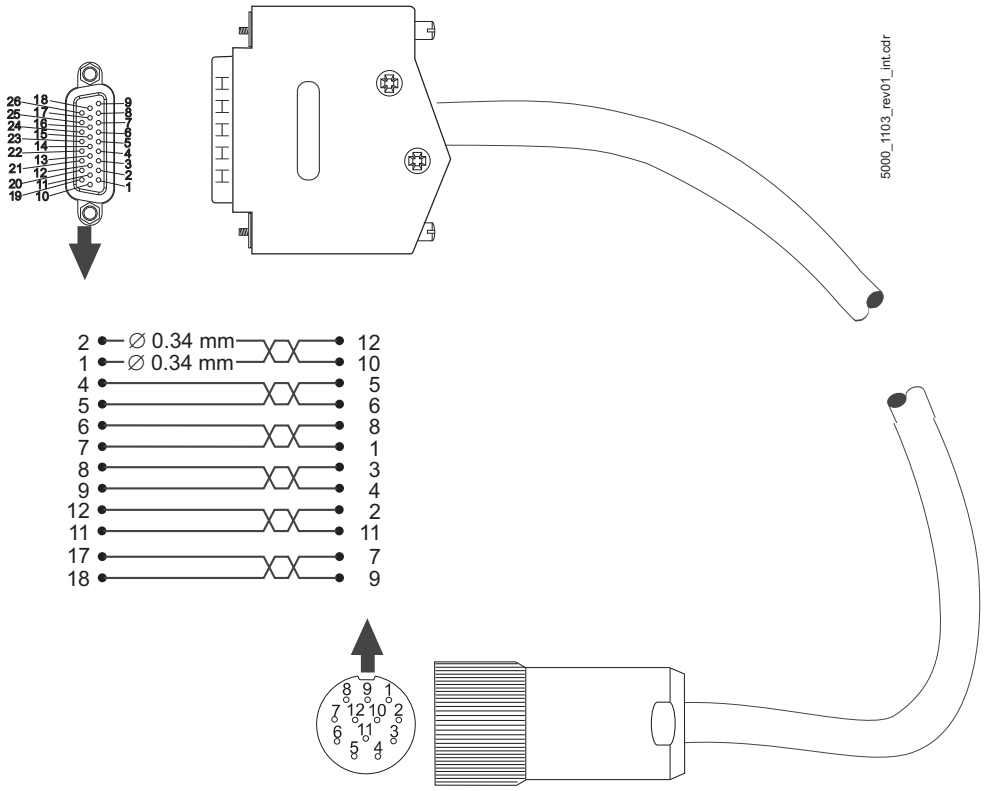


Figure 70: Connecting cable for sine/square wave incremental encoder

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!

11.2 Fuses

There is a difference between the protection of the power supply cables and the protection of the device. Operate the device **BM3200, BM3300** with cable protection **and** device protection fuses, only.

NOTE!

Approved, UL-listed safety fuses must be used in UL-authorized systems, refer to ▹UL notes◃ from page 56.

11.2.1 Cable protection

Use fuses of utilization category gL DIN VDE 0636-201 / IEC 60269-2-1 / HD 630.2.1 54 or circuit-breaker tripping characteristic K according to DIN VDE 0636-201 / IEC 60269-2-1 / HD 630.2.1 54, to protect the cable. These fuses protect against overloads and the consequential damages of faults e. g fire. They cannot avoid, that the device is extensively destructed by a short-circuit or by a ground fault in the DC-link.

Execute protection compliant with EN 60204-1 („Electrical Equipment of Machines“). Dimension the fuses dependent of the used interface of the power supply cable according to the accordantly valid national standard and the local regulations.

The current carrying capacity of fuses is defined in the table 5 of the EN60204-1. The according value must be calculated self in the standard, in order to use it. Here is an extract

Cable interface	Rated fuse current
1.5 mm^2	16.1 A
2.5 mm^2	22 A

Use suitable fuses with a tripping characteristic gL.

11.2.2 Device protection

Use semiconductor fuses with the tripping characteristic aR (DIN VDE 0636-201 / IEC 60269-2-1 / HD 630.2.1 54). Connect in series to the cable protection fuse. They protect the input-sided rectifier circuit in case of a short-circuit against complete destruction, making a repair of the device necessary.

Dimension the device protection fuses dependent on the peak current and the required I^2t value.

Device	Maximum load I^2t value [1)]
BM30XX:	≤ 365 A^2s
BM32XX, BM33XX	≤ 200 A^2s

[1)] Use fuses, which switch off I^2t value is below the maximum load I^2t value of the device.

11.2.3 Cable protection and device protection

There are two possibilities to protect the cable and the device:

- Cable protection fuses and semiconductor fuses, which are connected in series
- Use all-range fuses with a tripping characteristic gR or gS (DIN VDE 0636-201 / IEC 60269-2-1 / HD 630.2.1 54).

The suitable cable and device protection fuses must be dimensioned dependent on the interface of the used power supply cable, the peak current and of the required I^2t_{off} in ▹Device protection◃ on page 185.

In contrast to the fuses, the devices and cables can be protected with listed „Circuit breakers“ complying to UL (DIVQ).

Permitted are circuit breakers without a tripping delay, only. Circuit breakers with only a thermal tripping characteristic are not tested and therefore not permitted. It must be considered that the installation is protected against fire but not against destruction.

Dimension the circuit breaker dependent on the interface of the used power supply cable as well as from the rated and the peak current of the devices.

Producer	Device protection	Device protection and cable protection
SIBA	60 033 05 16A (10 x 38 mm) aR	20 477 34 16A (NH000) gRL gS 20 209 34 16A (NH00) gRL gS 50 124 34 16A (14 x 51 mm) gRL gS
Bussmann	FWP-20A14F 20A 700V 14x51mm aR	170M1560D 20A 690V NH000 gR DFJ-15 (21 x 57 mm) Class J
Mersen (former Ferraz)		NH000GS69V32PV Ref:X322043C (NH000) 32A 690V gS FR10GR69V20 Ref: E1014580 (10 x 38 mm) 20A 690V gR FR22GC69V25 Ref: B220916 (22 x 58 mm) 25A 690V gRC HSJ15 (21 x 57 mm) Class J
Siemens	3NC1415: 15A/690V, (14 x 51 mm) aR 3NC1016: 16A/600V, (10 x 38 mm) aR	3NE1813-0: 16A/690V, NH000 gS 3NE8015-1: 25A/690V, NH00 gR

11.3 Line filter

Line filters are combinations of capacitors, reactors, resistors and voltage limiters, which shall reduce the electromagnetic influence of environment. Further information see line filter, 5.09010.

11.3.1 Required environmental conditions line filter

Transport temperature range	-25 °C up to +85 °C
Storage temperature range	- 25 °C up to +85 °C
Operating environment	industry power supply
Operating temperature range	-25 °C up to +85 °C

11.3.2 Line filter for 3-phase devices BM3XXX-XTXX

- **Block diagram of line filter (simplified)**

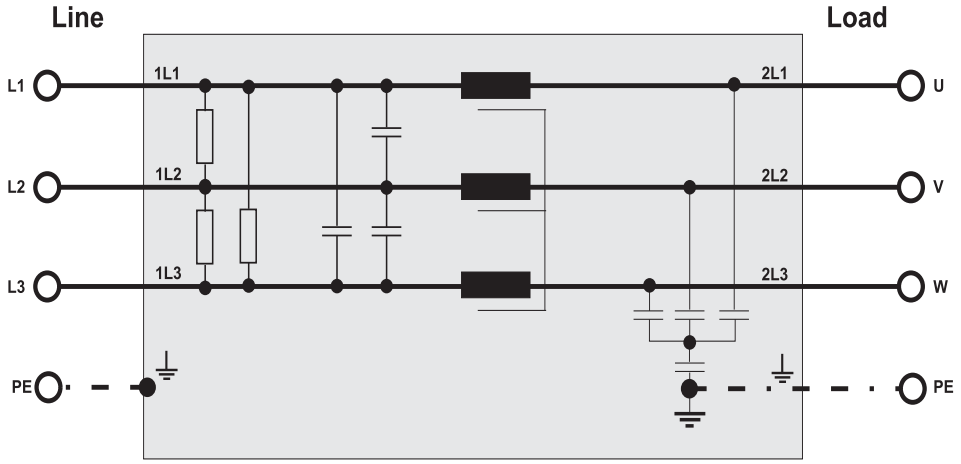


Figure 71: Block diagram line filter

- **Selection of the correct line filter for 3-phase devices**

In dependency of the application install a line filter from the following table:

$I_{rated\ AC}$ 1)	Type	Part No.	Use with devices
5 A	BFN 3-1-0007-001	314277	BM320X-X**T**XX, BM330X-X**T**XX
10 A	BFN 3-1-0016-001	314278	BM321X-X**T**XX, BM331X-X**T**XX

- **Electrical data line filter for 3-phase devices**

BFN 3-1-... -001	0007	0016	0030	0042	0056	0075	HOWCORE NFI-020
Max. supply voltage	3 x 480 V_{AC} +10 %, 50/60 Hz						
Rated current (at T_B = 40 °C)	7,6 A	17,5 A	33 A	46 A	70 A	82 A	20 A
Rated current (at T_B = 50 °C)	7 A	16 A	30 A	42 A	56 A	75 A	
Peak current	1.5 x I_N for < 1 min per hour						
Max. voltage phase conductor/ground neutral point /ground	305 V_{AC} 0 V						
Max. test voltage at 25 °C phase / phase phase / ground	2,1 kV_{DC} for 2 s 2,7 kV_{DC} for 2 s						2,1 kV_{DC} for 2 s
Maximum conductor cross sections	4 mm²	4 mm²	10 mm²	10 mm²	16 mm²	25 mm²	
Power loss (typical)	4 W	8 W	12 W	15 W	18 W	24 W	
Harmonics (power supply voltage)	THD_U < 10 %						
Type of protection	IP 20						
Weight	0,6 kg	1,0 kg	1,3 kg	1,6 kg	1,9 kg	2,6 kg	

DANGER!

Risk of fatal injury from high leakage current!

Therefore:

- Cross-section of the PE conductor see ▹PE connections BM3200, BM3300 rear panel◃ on page 139 (EN 61800-5-1, chapter 4.3.5.5.2).

NOTE!

The rated current of the used filters must be greater or the same RMS value of the actual power supply current (actual power supply current = RMS value of the power supply current during the total cycle time of the drive). At short-time operation (S3) the RMS value is calculated as follows:

$$I_{eff} = \sqrt{\frac{1}{T}\int_0^T i^2 dt}$$

11.3.3 Line filter for 1-phase devices BM3XXX-XEXX

- **Selection of the correct line filter for 1-phase devices**

In dependency of the application install a line filter from the following table:

$I_{Bem\ AC}$ [1)]	Type	Part No.	Use with devices
12 A	LGF line filter FFU 1X12B-SB02	463472	BM32XX-X**E**XX BM33XX-X**E**XX

- **Electrical data line filter for 1-phase devices**

	LGF line filter **FFU 1X12B-SB02**
Max. supply voltage	1 x 250 V_{AC}, 120 Hz
Rated current (at T_B = 40 °C)	12 A
Peak current (at T_B = 40 °C)	1.5 x I_N for < 1 min per hour
Max. test voltage for 2 s at 25 °C	phase / phase: 1.7 kV_{DC} phase / housing: 2.7 kV_{DC}
Maximum conductor cross sections	4 mm^2 fine wire 6 mm^2 rigid wire
Leakage power (typical)	9 W
Ground current	typical 7 mA, at 250 V/50 Hz
Type of protection	IP 20
Weight	0.6 kg

DANGER!

Risk of fatal injury from high leakage current!

Therefore:

- Cross-section of the PE conductor see ▹PE connections BM3200, BM3300 rear panel◃ on page 139 (EN 61800-5-1, chapter 4.3.5.5.2).

NOTE!

The rated current of the used filters must be greater or the same RMS value of the actual power supply current (actual power supply current = RMS value of the power supply current during the total cycle time of the drive). At short-time operation (S3) the RMS value is calculated as follows:

$$I_{eff} = \sqrt{\frac{1}{T}\int_0^T i^2 dt}$$

11.4 Spare parts

11.4.1 Connectors BM3200, BM3300

	Part No.
Connector DIO X2 Weidmüller	479952
Connector STO X102 Weidmüller	479947
Connector motor X107 Weidmüller BLZ 7.62IT/03/180MF2	436300
Connector X200 Wago 231-2302	417197
BM3XXX-X**T**XX-XXXXX-**B**-XXXXX- **Connector power supply X202** Weidmüller BLZ 7.62IT/03/180MF3	436298
BM3XXX-X**T**XX-XXXXX-**B**-XXXXX- **Connector DC link X205** Weidmüller BLZ 7.62IT/02/180MF2	436294
BM3XXX-X**E** **Connector power supply X202** Weidmüller BVF 7.62HP/02/180MF2	449452
BM3XXX-X**E** **Connector DC link, ballast resistor X205** Weidmüller BLZ 7.62IT/03/180MF2	436300
BM3XXX-X**T**XX-XXXXX-**E**-XXXXX- **Connector power supply, DC link, ballast resistor X203** Weidmüller BLZ 7.62IT/06/180MF6	456880
Connector motor temperature X101 Weidmüller BLZ 3.50/02/180	441062

11.4.2 Accessories kit shielding BM3200, BM3300

NOTE!

Optional, not included in delivery!

		Part No.
BM3200, BM3300	Cable shield grounding clamp 24 mm width	437738
	Cable shield grounding clamp 17 mm width	437736

12

SHUTDOWN, STORAGE

In this chapter we describe, how you decommission and store the device.

12.1 Safety instructions

➲ Refer to ▹Safety◃ from page 11 and the information in ▹Transport and Packaging◃ from page 71.

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:

- 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 see ▹What to observe when transporting◃ on page 71.

In case you want to dispose the device, additional data is available in chapter ▹Disposal◃ from page 197.

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 power supply voltage.

12.6 Recommissioning

Execute commissioning as with a new device, see
▹Mounting◃ from page 73, ▹Installation◃ from page 81.

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 power supply voltage.

13

DISPOSAL

NOTE!

Baumüller products are not subject to the scope of the EU's Waste Electrical and Electronic Equipment Directive (WEEE, 2012/19/EU). Hence, Baumüller is not obligated to bear costs for return and disposal of waste electronic equipment.

13.1 Safety regulations

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Refer to ▹Electrical data◃ from page 36.

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 several devices are connected e.g. with a mains rectifier unit, 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 to ensure the device 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.

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 faulty demounting!

The demounting and disposal requires qualified personnel with adequate experience.

Therefore:

- Only allow demounting 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.

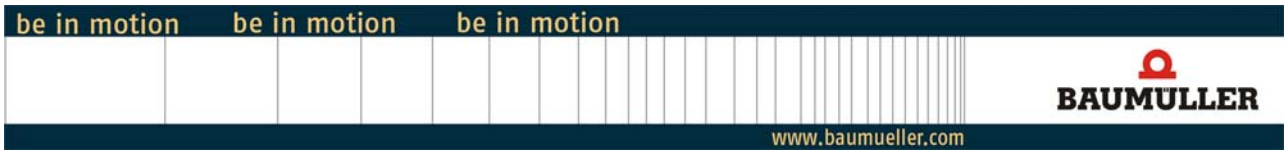
A

APPENDIX A - ABBREVIATIONS

AC	Alternating current
BB	Ready-to-operate
CE	Compliant with the directives of the European Union
DC	Direct current
DIN	Deutsches Institut für Normung e.V (German National Standards Institute).
EMC	Electromagnetic compatibility
EMVG	European EMC law
EN	European standard
ESD	Electrostatic discharge
ext	External
GND	Ground
Î	Peak current
I_{AC}	RMS-value of alternating current
I_{DC}	RMS-value of direct current
IEC	International Electrotechnical Commission
IP	Ingress protection; protection rating
IS	Pulse inhibit
Chap.	Chapter
K_G	Cooling air requirement of device interior
K_{LK}	Cooling air requirement of passive cooling unit
MSKL	Motor protection thermistor
n = 0	Rotational speed = 0
n_{ist}	Rotational speed actual value
n_{max}	Maximum rotational speed
n_{min}	Minimum rotational speed
MSL	Height above mean sea level
n_{soll}	Rotational speed set value
NTC	Negative temperature coefficient thermistor
PE	Protected ground ground conductor connection
PELV	Protective extra-low voltage, with safe isolation, grounded
PLL	Phase Locked Loop
ppm	Parts per million
PTC	Positive temperature coefficient thermistor
R_B	Ballast Resistor
RCD	Residual current protective device / ground fault circuit breaker
SELV	Safety extra-low voltage, with safe isolation
SH	Quick stop
STO	Safe Torque Off
Tab.	Table
U	Voltage
Û	Peak voltage
U_{AC}	RMS-value, AC voltage
U_{DC}	RMS-value, DC voltage
UL	Underwriters Laboratories
$U_{DC\ link}$	DC link voltage
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik (German electrical engineering, electronics and IT association)
ZK	DC link

B

APPENDIX B - DECLARATION OF CONFORMITY



EU - Declaration of Conformity

Doc.-No: **5.12061.03**
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, Deutschland

declares that the product:

Name: **Compact Servo Unit b maXX 3000**

Type: BM3201, BM3202, BM3203, BM3204, BM3211, BM3212, BM3213

manufactured since: 01-Nov-2012

was developed, designed and manufactured in accordance with the EMC Directive 2014/30/EU and the Low Voltage Directive 2014/35/EU.

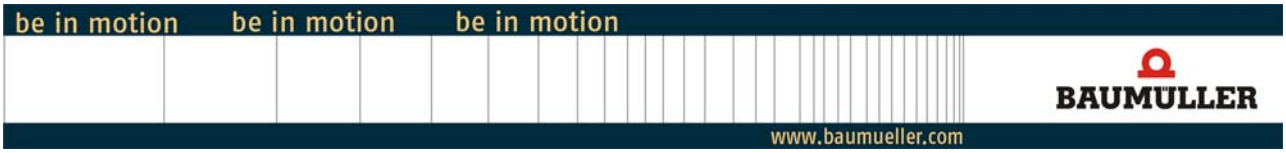
Applied harmonized standards:

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 drives- Part 5-1: Safety requirements - Electrical, thermal and energy
DIN EN 61800-5-2:2008-04	Variable-speed electrical power drives Part 5-2 Safety requirements - Functional
DIN EN 61800-3:2012-09	Variable-speed electrical power drives Part 3: EMC-requirements and specific test methods

Attention must be paid to the safety instructions in the manual.

Nuremberg / 14-Jun-2016
Location / Date

The content of the Declaration of Conformity is subject to change. The current version can be obtained on request.



EC - Declaration of Conformity

Doc.-No: 5.12060.03
Date: 14-Jun-2016

according to Machinery Directive 2006/42/EC

The Manufacturer: Baumüller Nürnberg GmbH
Ostendstraße 80-90
90482 Nürnberg, Germany

declares, that the products:

Designation: **Compact Servo Unit b maXX 3000** with safety relay

Type: BM3301-ST20, BM3302-ST20, BM3302-ST20, BM3304-ST20, BM3311-ST20, BM3312-ST20, BM3313-ST20

manufactured since: 22-Oct-2013

are developed, designed and manufactured in accordance with the Machinery Directive 2006/42/EC. These products comply with the requirements of the EMC Directive 2014/30/EU and the Low Voltage Directive 2014/35/EU.

Applied harmonized standards:

Norm	Title
EN 62061:2016-05	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
EN ISO 13849-1:2008 AC: 2009	Safety of machinery - Safety-related parts of control systems, Part 1: General principles for design
EN 61800-5-1: 2008-04	Adjustable speed electrical power drive systems. Part 5-1: Safety requirements. Electrical, thermal and energy
EN 61800-5-2:2007	Adjustable speed electrical power drive systems. Part 5-2: Safety requirements. Functional
EN 60204-1:2006 A1:2009	Electrical equipment of machines Part 1:General requirements
EN 61800-3:2012-09	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods
IEC 61508, Teil 1-7:2010	Functional safety of safety-related electrical, electronic and programmable electronic control systems

Authorized person to compile the technical files:
Name: Engelbert Meier, Baumüller Nürnberg GmbH, Section AES
Address: Ostendstraße 80-90, 90482 Nürnberg, Germany

Notified body executed the EC type-examination procedures according to Machinery Directive 2006/42/EC:
Name: TÜV Rheinland Industrie Service GmbH
Address: Am Grauen Stein, 51105 Köln / Germany
Identification number: 0035
Registration numbers: 01/205/5354.00/13

Attention should be paid to the safety instructions in the manual.
This product is to be used in machinery and must not put into operation until the machinery, into with it is incorporated, has been declared to be in conformity with the Machinery Directive 2006/42/EC.

Nuremberg / 14-Jun-2016
Location / Date

Subject to change of this declaration of EC conformity without notice. Actual valid edition on request.

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Overview of Revisions

Version	Status	Changes
5.11018.02	26-Oct-2012.	Creation
5.11018.03	22-Apr-2013	Timing safety relay changed, UL notes/UL fuses added, Note „From six months storage period on, the capacitors are destroyed during commissioning, if they are not formed beforehand“ added Electrical data of „Safe Torque Off“ connection changed
5.11018.04	10-Jan-2014	Declaration of Conformity according Machinery Directive Safety Certificate
5.11018.05	11-Nov-2014	Error correction, additions STO, POWERLINK®
5.11018.06	11-Jul-2015	New implemented VARAN, additional power ratings
5.11018.07	24-Sep-2015	New BM3200, 3300 without internal ballast resistor
5.11018.08	04-Jul-.2016	Additional power ratings, devices for 230 V power supply
5.11018.09	09-Aug-.2016	Timing STO module corrected Technical data updated
5.11018.10	24-Apr-2017	Line filter for single-phase devices
5.11018.11	16-Nov-2017	Technical data updated
5.11018.11	01-Mar-2018	Technical data updated Safety function with short-circuit detection New device BM3002 added
5.11018.12	05-Nov-2018	Type with second encoder added Safety function S02 added BM3X13 V2.01 and higher: Output rated current 8 kHz changed to 7.5 A
5.11018.13	10-Dec-2018	BM3002 removed
5.11018.14	22-May-2019	Risk assessment added
5.11018.15	28-Nov-2019	Update

Notes:

be in motion

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