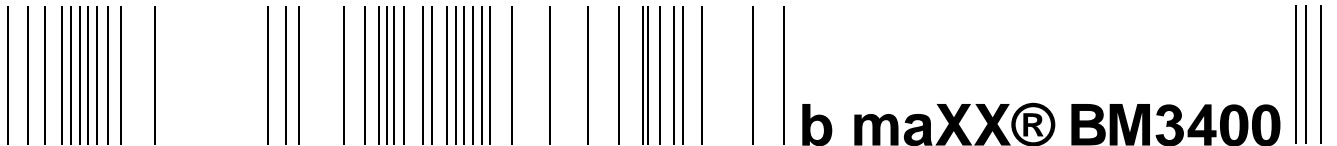




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b maXX® BM3400

Instruction Manual

E 5.07013.03



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Titel Instruction Manual
Product **b maXX® BM3400**
Version 5.07013.03
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Introduction

This manual is an important part of your **b maXX® BM3400** device. Last but not least on behalf of safety reasons, read through the complete manual. In this chapter the first steps are described, which have to be done after you have received the device. Terms will be defined, which are continuously used throughout this manual and you will be informed about duties, which must be considered, when using this device.

1.1 Validity of this documentation

This manual is valid for **b maXX® BM3400** devices with the below mentioned type keys and replaces the manual 5.07013.02

- BM340X-L1XX-XXXX-X (HS0 single phase)
- BM341X-L3XX-XXXX-X (HS1 triple phase)
- BM340X-L1XXX-XXXXXXX-X (-XX-X-XX(.XX.X)) (HS0 single phase)
- BM340X-L3XXX-XXXXXXX-X (-XX-X-XX(.XX.X)) (HS0 triple phase)
- BM341X-L1XXX-XXXXXXX-X (-XX-X-XX(.XX.X)) (HS1 single phase)
- BM341X-L3XXX-XXXXXXX-X (-XX-X-XX(.XX.X)) (HS1 triple phase)
- BM342X-L4XXX-XXXXXXX-X (-XX-X-XX(.XX.X)) (HS2 triple phase)

1.2 Survey of the appliance series **b maXX®** BM3400

A device of the **b maXX® BM3400** series consists of a power unit and a controller, which are in a common housing. The devices are available in graded power and housing sizes. In this manual the Baumüller device series **b maXX® BM3400**, its connection and the commissioning is explained. Further information in order to operate the device and in order to program the controller part is to be found in the **Parameters manual**.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death



All persons, who work at and with these devices of the series **b maXX® BM3400**, must have this manual at hand and the instructions and notes herein - especially the safety notes - must be considered.

1.3 First steps

- Check the delivery, see «Transportation and packing» from page 31.
- Care for suitable personnel for mounting, installation and commissioning.
- Hand over this manual to the personnel being responsible for mounting, installation and commissioning. Assure, that especially the specified safety instructions are understood and complied with.

1.4 Used terms

For the Baumüller product **b maXX® BM3400** in this manual also the term **device** is used. A list of the abbreviations, which are used is to be found in «Appendix A - Abbreviations» from page 153.

1.5 Copyright and trade marks

- **b maXX®** is a registered trade mark of Baumüller Nürnberg GmbH
- **Hiperface®** is a registered trade mark of SICK/Stegmann

2

Fundamental safety instructions

2.1 General notes

In this chapter the dangers are described, that can arise when working with the **b maXX® BM3400** device. Dangers are pointed up with symbols (icons). All symbols that are used in this manual are listed and explained. In this chapter only general protective measures are recommended. Concrete protective measures are always given directly in the subsequent chapters after the accordant note to the danger.

The **b maXX® BM3400** devices may be operated according to the methods, procedures and measures in this manual. Each deviation from the specifications, e. g. also the operation in installation positions, which are not shown here, is prohibited and leads to the termination of any guarantee. In the individual case exceptions can be made after consultation and release by Baumüller Kamenz GmbH.

WARNING



The following **can occur**, if this safety note is not regarded:

- serious personal injury
- death

The safety notes are showing you the dangers, which can lead to injury or even to death.

Always obey the safety notes given in this manual.

2.2 Hazard information and commandments

A danger is always divided into three danger classes. Each danger class is identified by one of the following signal words:

DANGER

- serious damage to property
- grievous personal injury
- death - **will** occur

WARNING

- serious damage to property
- grievous personal injury
- death - **could** occur

CAUTION

- minor to medium personal injury or
- environmental pollution or
- damage to property - **could** occur

2.2.1 Structure of a hazard information

The following examples show the principle construction of a safety note.



A triangle shows that there is a danger for living things. The color of the border shows, how great the danger is - the darker the color the greater the danger is.



The icon in the square describes the danger. The color of the border shows, how great the danger is - the darker the color the greater the danger is. (the square is dashed, because not at every safety note the danger is demonstrated with an icon)



The icon in the circle represents an instruction. Users must observe this command. (The circle is dashed, because not at every safety note a command is existent as icon)



The circle shows that there is a risk of damage to property.



The icon in the square describes the danger. The color of the border shows, how great the danger is - the darker the color the greater the danger is. (The square is dashed, because not at every safety note the danger is demonstrated with an icon)

The text next to the icons is structured as follows:

HERE IS THE SIGNAL WORD, WHICH SHOWS THE LEVEL OF THE DANGER

Here is described, if one or if several of the consequences stated below will occur, if this safety note is disregarded.

- Here the possible results are described. The worst result please always find below.

Here the danger is described.

Here is described, what you can do, to avoid the danger.

2.2.2 Shape of the hazard symbol (triangular or round)

If there is a signal word in front of a triangular danger sign, then the safety note refers to the personnel injury.

If there is a signal word in front of a round danger sign, then the safety note refers to damage to property.

2.2.2.1 Hazard information against personal injuries

To be able to differentiate visually, separate borders for each class of safety notes with triangular and square pictograms are used.

For the danger class **DANGER** the black triangle is used as danger sign. The following safety notes of this danger class are used in this manual.



DANGER

The following **will occur**, if the safety instruction is not complied with:

- serious personal injury
- death



*The danger is: **electricity**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.

For the danger class **WARNING** the grey triangle is used as danger sign. The following safety notes of this danger classification are used in this manual.



WARNING

The following **may occur**, if you disregard these safety notes:

- serious personal injury
- death



*The danger is: **electricity**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.

For the danger class **CAUTION** against danger to personal injury or environmental pollution the white triangle is used as danger sign. The following safety notes of this danger classification are used in this manual.



CAUTION

The following **may occur**, if you disregard these safety notes:

- minor to medium personal injury

*The danger is: **hot surface**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.



CAUTION

The following **may occur**, if you disregard these safety notes:

- minor to medium personal injury

*The danger is: **sharp edges**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.



CAUTION

The following **may occur**, if you disregard these safety notes:

- minor to medium personal injury

*The danger is: **rotating parts**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.



**CAUTION**

The following **may occur**, if you disregard these safety notes:

- minor to medium personal injury



*The danger is: **eye injury due to catapulting particles**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.

**CAUTION**

The following **can occur**, if you disregard this warning instruction:

- Environmental pollution



*The danger is: **improper disposal**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.

2.2.2.2 Hazard information against damage to property

If there is a round danger sign in front of a signal word, then the safety note refers to the damage of property.



CAUTION

The following may occur, if you disregard these safety notes:

- Damage to property



*The danger is: **electrostatic discharge**. If necessary, here the danger is described more exactly.*

Here is described, what you can do, to avoid the danger.

2.2.3 Used mandatory signs



Wear safety gloves



Wear safety shoes



Wear eye protection



Use ear protection



Use the following fire fighting devices: Fire fighting appliances

2.3 Information sign



NOTE

This note is a very important information.

2.4 Legal instructions

This manual is intended for technically qualified personnel that has been specially trained and is completely familiar with all maintenance and repair measures. The devices are made according to the state-of-the-art technology and are fail-safe. They can be installed safe, can be put into operation and they function without problems, if it is assured, that the instructions of the manual are obeyed. The user bears responsibility for the service and commissioning in accordance to the safety instructions of the valid standards and other important national or local regulations, which concern the conductor dimensioning and protection, grounding, circuit breakers, overcurrent protection and so on. For damages, which result from the mounting or from the connection, the one is liable, who has carried out the mounting or the installation.



NOTE

The **b maXX® BM3400** devices are designed to solve the requirements to get the CE sign, if they are mounted in an enclosure system that meets the requirements with respect to protection against accidental contact, degree of protection and environmental conditions.

If the device is operated disregarding the above mentioned requirements, it has to be assumed, that there will no longer persist a CE conformity.

2.5 Appropriate use

Always use the device according to the terms. The notes stated below shall give you a feeling for the specified application of the device. We do not raise any claim to the sufficiency of the notes stated below - obey all instructions given in this manual.

- Configure the application in such a way, that you always operate the device within its specifications.
 - Use this device only as converter for triple phase drives.
 - Make sure, that only qualified personnel work with/at this device.
 - Mount this device only at an adequate carrying wall.
 - Install this device in the way as it is described in the manual.
 - Make sure, that the mains always applies to the given specifications.
 - Only operate the device, if it is technically free of defects.
 - Operate this device only in combination with released components of Baumüller Kamenz GmbH.
 - Operate the device always in an environment, as it is specified in «Appendix D - Technical data» from page 172.
 - Always operate the device as produced in series. Due to safety reasons you may not alter or modify the device.
 - Consider all instructions referring to this, if you are intending to store the device.
-

The device is used according to the terms, if you regard all notes and information in this operating manual.

2.6 Inappropriate use

Below some examples of inappropriate use are listed. The notes below should give you an idea of what is meant by inappropriate use of the device. However, not all possible cases of inappropriate use can be listed here. All usages, in which the instructions of this manual are disregarded are faulty and therewith forbidden, especially in the following cases:

- You disregarded the notes in this manual.
- You have not used the device according to the terms.
- You have
 - mounted the device incorrectly,
 - connected the device incorrectly,
 - brought the device into service incorrectly,
 - operated the device incorrectly,
 - mounted, connected, brought into service, operated and/or maintained the device by not qualified or inadequately qualified personnel,
 - inappropriately or not maintained the device (also refer to description of components),
 - overloaded the device,
 - operated the device
 - * together with defect safety devices,
 - * together with incorrectly installed or without safety devices,
 - * together with not operative safety- and protection devices,
 - * not within the required environmental conditions.
- You have altered or modified the device, without having this authorized in written form from Baumüller Kamenz GmbH.
- You have insufficiently monitored the parts, which are subject to a wearing.
- You have improperly carried out a repair.
- You have improperly combined the device with products of other manufacturers.
- You have combined the device with faulty and/or faulty documented products of other manufacturers.

2.7 Protective devices

The devices **b maXX® BM3400** comply with the protection class IP30. By mounting the device into a switching cabinet you can raise the protection class.



WARNING

The following **may occur**, if you disregard these safety notes:

- serious personal injury
- death

*The danger is: **electricity**.*

Operate the device in a switching cabinet, which provides protection against direct touching of the devices and fulfills at least the demands of the EN 61800-5-1, chap. 4.2.3.3.

2.8 Training of the personnel



WARNING

The following **may occur**, if you disregard this safety note:

- serious personal injury
- death

Devices of Baumüller Kamenz GmbH may only be mounted, installed, operated and maintained by qualified personnel.

Qualified personnel (specialists) are defined as follows:

Qualified personnel

From Baumüller Kamenz GmbH authorized electronic engineers and skilled persons of the customer or third persons, who have learned the installation and commissioning of Baumüller drive systems and who are authorized, to put circuits and devices into operation according to the standards of the safety technology, to ground and to label. Qualified personnel has been trained or instructed in accordance with recognized safety standards in the care and use of appropriate safety equipment.

Requirements to the operating personnel

The operating of the drive system must only be executed by persons, who have had a training, who have been instructed and who have been authorized for this. Troubleshooting, servicing, cleaning, maintenance and replacement must only be carried out by trained or instructed personnel. These persons must be familiar with the manual and act in accordance with this. Commissioning and instruction must only be carried out by qualified personnel.

2.9 Safety precautions in normal operation

- At the installation location of the device observe the safety regulations for the installation, which is installed into this device.
- Provide the device with additional monitoring- and safety devices, in case safety precautions determine this.

2.10 Dangers due to residual energy

Electrical residual energy	After separating the device from the mains, parts under voltage as e.g. power connections may earliest be touched after 10 minutes, because the capacitors in the device are discharged not before 10 minutes. Also pay attention to the instructions on the device. In case you have connected additional capacitors to the DC-link, the DC-link discharging also can last much longer. In this case you must yourself determine the necessary waiting time.
Mechanical residual energy	The mechanical residual energy is dependant upon the application. Driven parts can still rotate or move for a certain time, after the mains supply has been disconnected. Please, provide adequate safety devices.

2.11 Safety categories

Dependent on the possible dangers (these are rated due to the consideration of the severity of the injuries, the frequency of the length of stay within the danger area and possibilities in order to prevent dangers) safety-related components of machines must meet certain safety criteria. The requirements on the safety-related parts are divided into five categories in the standard EN954-1 .

In **category B** basic requirements, in **category 1** additionally safety-technical checked components and principles are required . In **category 2** an error between test intervals can lead to a loss of the safety function.

category 3 accords to the level „single-error-safe with partial error detection“. The safety-related components must be implemented in such a manner, that a single error does not lead to the loss of the safety function, whereat not all possible errors are independently detected by the system. An accumulation of errors therefore can lead to the loss of the safety function.

Category 4 accords to the level „Self-monitoring“. The component self-contained detects possible errors and signals these secure from loss of the safety function on time. Also at occurrence of up to three errors, which are independent from one another the safety function always is maintained.

2.12 Safe stop

In order to exclude dangers for persons, e.g. operators, service- and maintenance technicians, a machine must be brought to a safe stop during operation in its danger range (**safe stop**).

This is why the dependable prevention of an unexpected starting is demanded (amongst others Machine directive 89/392/EWG, attachment I, 1.6.3, last para.; EN 292-2, 4.1.4; EN 60204-1, 5.4). Under unexpected starting one understands each starting that can cause a risk when appearing unexpected for persons (EN 292-1).

Moreover, besides the transition of the enable- to the operating status of the machine also the unexpected ramp-up of the machine, this means the transition from the safe stop into an unsafe moving must be considered. This is necessary, because the unexpected ramp-up usually is to be led back to an interruption of the control loop of the machine. In this case the drive is, because of its control system, anxious to achieve highest speed at maximum acceleration. If an unexpected starting occurs, the operator therefore doesn't have the possibility anymore to remove himself or his hand from the danger area. This is why the drive has to be stopped and has to be kept safe in its 'off-position', when having opened, electrical interlocked safety devices. The motor must not have a torque and therewith cannot generate dangerous movement.

The avoiding of an unexpected starting of the machine can be reached by electrical separated safety devices, e.g. contactors. At some machine types it must be done without the isolation of the drive from the mains. This is necessary, if the drive, which is supplied via a converter is operationally often shut down or started again. The continuous charging and discharging of the DC-link is a great burden for the modules. This leads to interfering waiting times and/or to failures of parts.

The precondition for the starting of a three-phase a.c. motor is the existence of a rotating field. For this at controlled variable-speed triple phase a.c. motors usually a complex pulse pattern is generated in the micro-processor. The pulses are amplified and control the power semiconductor. If there is no defined pulse pattern or the amplifying connection is interrupted, e.g. by switching off the current supply with a relay (**safety relay**), no rotating field can be generated. An error during the pulse pattern generation cannot lead to a starting of the motor, as long as the second precondition, the interruption of the amplifying current supply, is existent and vice versa. The protection against an unexpected starting is reached by an electromechanic measure, which is higher-levelled than the electronics. The measure is a safe isolation outside the load circuit.

A disconnection of the energy supply to the winding of the motor while the motor is in stop state is reached by inhibiting the power semiconductors. As semiconductors under certain circumstances can break down, or because of electromagnetic interferences it is possible, that they switch on, the behavior of a shutdown drive, must be considered ,if such an error appears.

The break down or the „random“ switching on of a single or of several power semiconductors at the same DC-link potential does not lead to a uncontrolled starting, because there no current flow is achieved. Once when an additional power semiconductor is connected to another DC-link potential, current can flow through the motor. If, thereby the DC link is directly short-circuited, the fuses at the input to the converter are tripped. The motor will not start.

If, due to this error, the DC-link is connected to a winding of the motor, in the motor a magnetic field can be build up. At an asynchronous motor, the occuring static magnetic field does not lead to a sudden movement of the inductor.

If a permanently-excited synchronous motor is connected, the inductor will move into a notch position. The angular movement, which thereby is made is dependent of the inductor's position and the number of pole pairs of the motor. It amounts to maximum 180° /number of pole pairs. Then the flowing current effectuates

a blocking of the inductor, that means that after termination of the sudden movement the drive is in a steady-state. A starting of the drive is impossible.

If a machine with synchronous motor is planned, the possible sudden movement must be considered. It can lead to a dangerous movement. The mechanical engineer therefore must make a safety estimation for the residual movement.



NOTE

The only function of the safety relay is the prevention of an unexpected starting. The switching of the safety relay during the rotation of the inductor of the motor causes an uncontrolled „coasting“ of the machine, a braking with the help of the converter is not possible anymore.



WARNING

The following **may occur**, if you disregard these safety notes:

- serious personal injury
- death

*The danger is: **electricity**. At the motor, as well as at the device at a switched-off safety relay there can be mains voltage.*

If necessary put the device off-circuit, just like devices without a safety relay - the safety relay does **not** switch the device and the motor off-circuit!

Turning off the safety relay has no isolation of the motor from the supply system as a consequence. Therefore, mains potential can be both at the converter and at the motor. By maintenance-, service- and repair works with electrical components of the driving system, therefore the protection from electrical dangers has to be assured with other means (e.g. using the mains switch).

2.13 Disposal of the device

The correct disposal of the device is described from page 149.

2.14 Fire fighting

WARNING



The following **may occur**, if you disregard these safety notes:

- serious personal injury
- death



*The danger is: **electricity when using a conductive fire fighting appliance.***



Use the following fire fighting appliance: class ABC fire extinguisher

2.15 Responsibility and liability

To be able to work as safe as possible with this device, you must know and obey the danger notes as well as the safety instructions.

2.15.1 Observing the safety notes and safety instructions

In this manual visually unified safety instructions are used, which are intended to prevent from personal injury or damage to property.



WARNING

The following **may occur**, if you disregard these safety notes:

- serious personal injury
- death

All persons, who work with this device, must know and regard the safety notes and the safety instructions in this manual.

Apart from this, any and all persons who work on this device must additionally know and regard to all regulations and instructions, that are valid at the location.

2.15.2 Dangers when handling this device

The device **b maXX® BM3400** was developed and manufactured according to the state-of-the-art technology and in compliance with the valid directives and standards. Nevertheless, dangers can arise during use. A survey of possible danger are found in chapter «Fundamental safety instructions» from page 13. We warn of acute dangers at the accordant positions in this manual.

2.15.3 Warranty and liability

All information in this manual is non-binding customer information; it is subject to ongoing further development and is updated on a continuous basis by our revision service. Warranty- and liability claims against Baumüller Kamenz GmbH are excluded, if in particular one or more of the causes in «Inappropriate use» from page 23 have effectuated the damages.



Transportation and packing

In this chapter is described, which conditions have to be adhered to at transportation, how you check the device after receipt and what you should have to consider, if you dispose the packing.

3.1 To be considered by transportation

For the first transportation, the module was packed in the manufacturer's company. In case you transport the device, assure, that the following conditions are fulfilled during the whole transportation:

Transportation temperature range	-30°C to +70°C
Transportation climatic category	2 K 3 ¹⁾
Vibration, shock and repetitive shock	max. 1 g ²⁾

¹⁾EN 50178, tab. 7

²⁾EN 50178, chap. 9.4.3.2

3.2 Unpacking

After receipt of the device, which is still packed:

- Avoid strong transportation vibrations and shocks(max. 1 g), e.g. at setting down.
- Check, if transportation damages are visible!

If so:

- Immediately complain to the deliverer. Let the claim be confirmed in writing and immediately contact the substitution of Baumüller Kamenz GmbH, which is in charge of your company.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **electricity**.*

Do not operate the device, if you have recognized a transportation damage or if you assume this. In this case immediately contact Baumüller Kamenz GmbH.

If there is no transportation damage recognizable:

- Open the packing of the device.
- Check the scope of supply with the help of the delivery note.

The minimum scope of supply is:

- **b maXX® BM3400**
- This manual inclusively of the copy of Declaration of Conformity/Declaration by Manufacturer
- Enclosure

Claim at the Baumüller substitution, which is in charge, in case the delivery is not complete.

3.3 Dispose packing

The packing is made of cardboard, plastics, metal parts, corrugated cardboard and/or wood.

- Regard the local disposal instructions, in case you dispose the packing.

4

Description of the device

In this chapter the basic construction of the devices **b maXX® BM3400** with the primary features and particularities are described.

NOTE



The devices of the **b maXX® BM3400** series are intended for use in industrial environment (C3) according to EN61800-3. At connection to the public mains EMC problems can appear. Also see «Appropriate use» from page [21](#).

4.1 Structure

Devices of the **b maXX® BM3400** series are servo converter of Baumüller Kamenz GmbH. The devices consist of a power unit and a controller part, which are installed in a common housing. The rated current of the devices reach from 2.5A to 20A. The devices differ in size, power, equipment (hard- and software) and cooling types. The versions can be found under «Marking of the device - type key» from page 37.

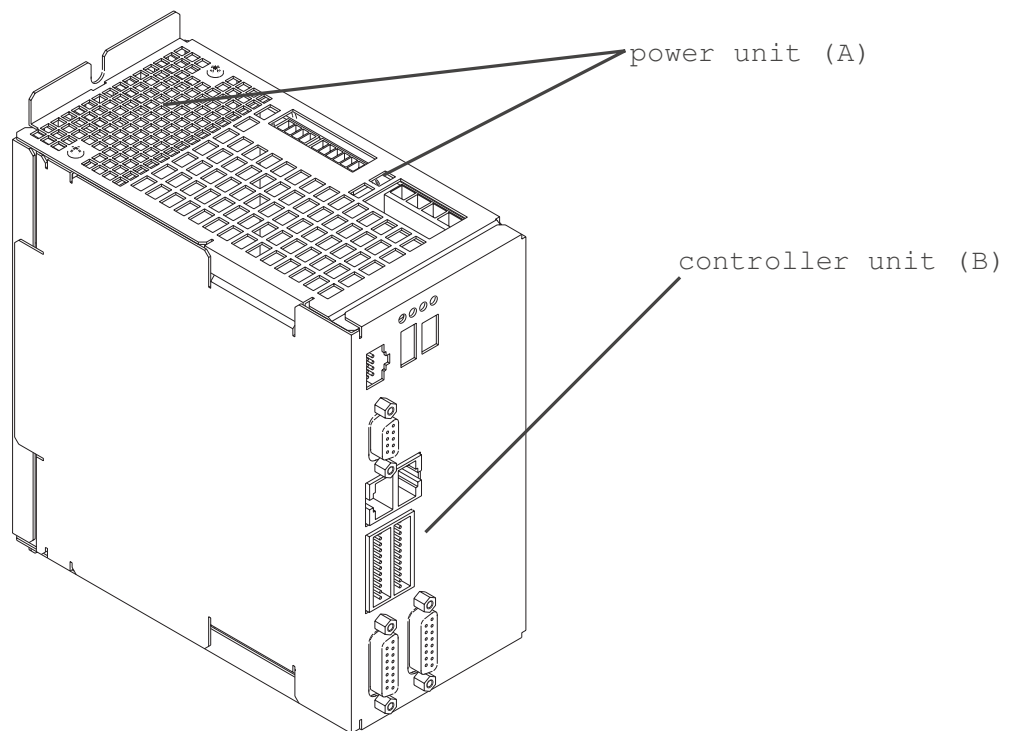


Figure 4.1: power unit (A) - controller unit (B)

A device of the series **b maXX® BM3400** consists of the following parts:

- A: Power unit** (converter) This part is a converter. The power unit changes from the mains taken alternating current into direct current. This d.c. then is converted from the power unit into triple phase current with changeable frequency. The power unit supplies the electric motor with triple phase current, which is connected to this device. Alternatively you can draw d.c. from the device over the DC link connections.
- B: Controller unit** The controller unit controls the power unit. You can operate the controller part either with the operating software WinBASS II (PC) or via a PLC.

4.2 Connect together devices

The device is part of the Baumüller series and can be connected together with other Baumüller devices.

4.3 Overview of dangerous areas

The following overview shows the existing danger areas on the particular device. Use this survey, in order to get an overview about the present danger areas, while you are getting familiar with the handling of this device. The explanation of the symbols, which are used you will find in «Fundamental safety instructions» from page 13.

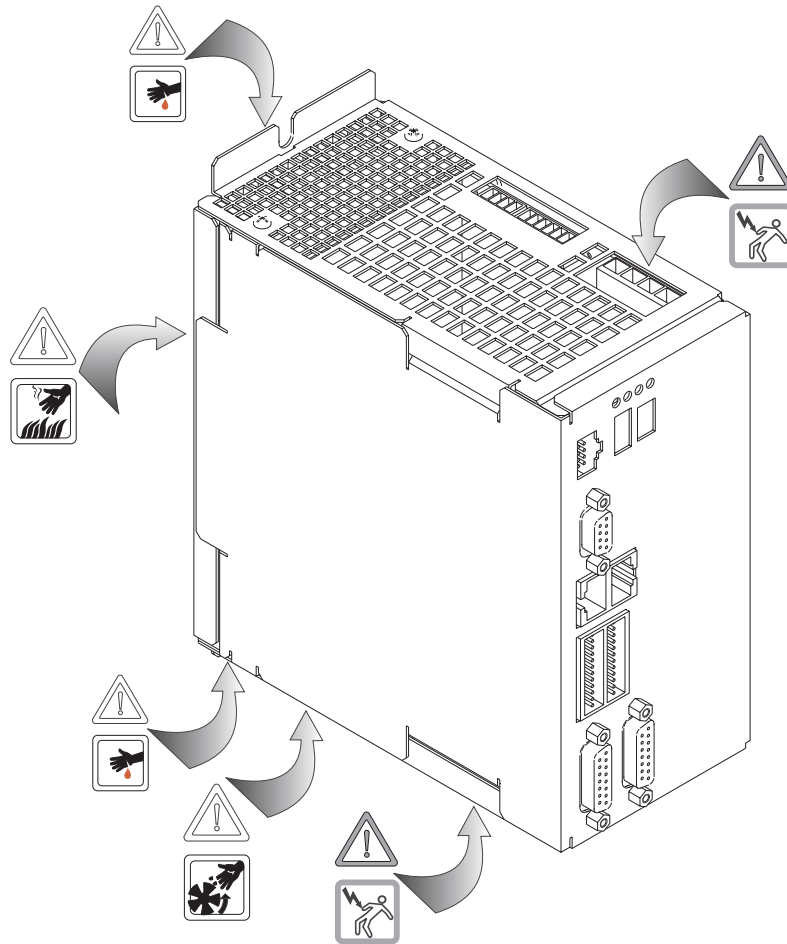


Figure 4.2: Danger areas at **b maXX® BM3400**

4.4 Marking of the device - type key



NOTE

The provided options in the type key can be combined in many different ways however not in any conceivable way. For example the option *fast sampled dig. inputs* is not possible in connection with encoder inputs, which receive zero reference pulses.

4.4.1 Type key version 1

BM3XXX-XXXX-XXXX-X	Device generation
BM3XXX-XXXX-XXXX-X	Controller type
	4 vector controller with encoder feedback (closed loop)
BM446XXX-XXXX-XXXX-X	Size of housing
	0 size 0
	1 size 1
BM3XXX-XXXX-XXXX-X	Current level
	1 current level 1
	2 current level 2
BM3XXX-XXXX-XXXX-X	Cooling type
	L air cooled by int. fan and air supply/lead off in the control cabinet
BM3XXX-XXXX-XXXX-X	Input voltage
	1 230V, single phase, TN or TT-mains
	3 480V, triple phase, TN or TT-mains ¹⁾
BM3XXX-XXXX-XXXX-X	Line filter
	F integrated
	O not integrated
BM3XXX-XXXX-XXXX-X	Chopper resistor
	B integrated
	O not integrated

BM3XXX-XXXX- <u>XXXX</u> -X	Encoder 1
	A Resolver
	B Sine wave incremental encoder, signal 1V _{pp} , supply 5V
	C HIPERFACE absolute encoder, signal 1V _{pp} , supply 8V
	E Square wave incremental encoder, signal RS422, supply 5V
BM3XXX-XXXX- <u>XXXX</u> -X	Encoder 2
	B Sine wave incremental encoder, signal 1V _{pp} , supply 5V
	C HIPERFACE absolute encoder, signal 1V _{pp} , supply 8V
	E Square wave incremental encoder, signal RS422, supply 5V
BM3XXX-XXXX- <u>XXXX</u> -X	internal field bus
	CB CANopen and CANSync
BM3XXX-XXXX-XXXX- <u>X</u>	Extender board
	O without
	G incremental encoder emulation (IEE)

¹⁾ 400V European mains included.

4.4.2 Type key version 2

<u>BM3</u> XXX-XXXXX-XXXXXXXX-X	Device generation
BM3 <u>x</u> XX-XXXXX-XXXXXXXX-X	Controller type
	4 vector controller with encoder feedback (closed loop)
BM3 <u>XX</u> X-XXXXX-XXXXXXXX-X	Size of housing
	0 size 0
	1 size 1
	2 size 2
BM3 <u>XXX</u> -XXXXX-XXXXXXXX-X	Current level
	1 current level 1
	2 current level 2
BM3XXX- <u>XXXX</u> X-XXXXXXXX-X	Cooling type
	L air cooled by int. fan and air supply/lead off in the control cabinet
BM3XXX- <u>XXXXX</u> -XXXXXXXX-X	Input voltage
	1 230V, single phase, TN or TT-mains
	3 480V, triple phase, TN or TT-mains ¹⁾
	4 480V, triple phase, TN, TT or IT-mains ¹⁾
BM3XXX- <u>XXXXX</u> -XXXXXXXX-X	Line filter
	F integrated
	O not integrated
BM3XXX- <u>XXXXX</u> -XXXXXXXX-X	Chopper resistor
	B integrated
	O not integrated
BM3XXX- <u>XXXXX</u> -XXXXXXXX-X	Safety relay
	S integrated
	O not integrated
BM3XXX-XXXXX- <u>XXXXX</u> X-X	Encoder 1
	A Resolver
	B Sine wave incremental encoder, signal 1V _{pp} , supply 5V
	C HIPERFACE absolute encoder, signal 1V _{pp} , supply 8V
	E Square wave incremental encoder, signal RS422, supply 5V

BM3XXX-XXXXX- <u>XXXXXXXX</u> -X	Encoder 2
	B Sine wave incremental encoder, signal 1V _{pp} , supply 5V
	C HIPERFACE absolute encoder, signal 1V _{pp} , supply 8V
	E Square wave incremental encoder, signal RS422, supply 5V
BM3XXX-XXXXX- <u>XXXXXXXX</u> -X	Fast sampled digital inputs
	I DI3 and DI4
	O nonexistent
BM3XXX-XXXXX- <u>XXXXXXXX</u> -X	variable
BM3XXX-XXXXX- <u>XXXXXXXX</u> -X	variable
BM3XXX-XXXXX- <u>XXXXXXXX</u> -X	internal field bus
	CB CANopen and CANsync
BM3XXX-XXXXX- <u>XXXXXXXX</u> - <u>X</u>	Extender board
	O without
	G incremental encoder emulation (IEE)
	E EtherCAT slave

¹⁾ 400V European mains included.

4.4.3 Type key version 3

This type key adds further information to version 2 concerning software options, data sets and special firmware versions.

BM3XXX-XXXXX-XXXXXXXX-X-XX-X-XX (. XX . X)	Device generation
BM3XX <u>X</u> -XXXXX-XXXXXXXX-X-XX-X-XX (. XX . X)	Controller type
	4 vector controller with encoder feedback (closed loop)
BM3XX <u>X</u> -XXXXX-XXXXXXXX-X-XX-X-XX (. XX . X)	Size of housing
	0 size 0
	1 size 1
	2 size 2
BM3XXX-XX <u>X</u> -XXXXXXXX-X-XX-X-XX (. XX . X)	Current level
	1 current level 1
	2 current level 2
BM3XXX- <u>XXXXX</u> -XXXXXXXX-X-XX-X-XX (. XX . X)	Cooling type
	L air cooled by int. fan and air supply/lead off in the control cabinet
BM3XXX-XX <u>XXXX</u> -XXXXXXXX-X-XX-X-XX (. XX . X)	Input voltage
	1 230V, single phase, TN or TT-mains
	3 480V, triple phase, TN or TT-mains ¹⁾
	4 480V, triple phase, TN, TT or IT-mains ¹⁾
BM3XXX-XXX <u>XXX</u> -XXXXXXXX-X-XX-X-XX (. XX . X)	Line filter
	F integrated
	O not integrated
BM3XXX-XXXX <u>X</u> -XXXXXXXX-X-XX-X-XX (. XX . X)	Chopper resistor
	B integrated
	O not integrated
BM3XXX-XXXX <u>X</u> -XXXXXXXX-X-XX-X-XX (. XX . X)	Safety relay
	S integrated
	O not integrated

BM3XXX-XXXXX- <u>XXXXXXXX</u> -X-XX-X-XX (. XX . X)	Encoder 1
	A Resolver
	B Sine wave incremental encoder, signal 1V _{pp} , supply 5V
	C HIPERFACE absolute encoder, signal 1V _{pp} , supply 8V
	E Square wave incremental encoder, signal RS422, supply 5V
BM3XXX-XXXXX- <u>XXXXXXXX</u> -X-XX-X-XX (. XX . X)	Encoder 2
	B Sine wave incremental encoder, signal 1V _{pp} , supply 5V
	C HIPERFACE absolute encoder, signal 1V _{pp} , supply 8V
	E Square wave incremental encoder, signal RS422, supply 5V
BM3XXX-XXXXX- <u>XXXXXXXX</u> -X-XX-X-XX (. XX . X)	Fast sampled digital inputs
	I DI3 and DI4
	O nonexistent
BM3XXX-XXXXX- <u>XXXXXXX</u> -X-XX-X-XX (. XX . X)	variable
BM3XXX-XXXXX- <u>XXXXXXX</u> -X-XX-X-XX (. XX . X)	variable
BM3XXX-XXXXX- <u>XXXXXXX</u> -X-XX-X-XX (. XX . X)	internal field bus
	CB CANopen and CANsync
BM3XXX-XXXXX- <u>XXXXXXXX</u> - <u>X</u> -XX-X-XX (. XX . X)	Extender board
	O without
	G incremental encoder emulation (IEE)
	E EtherCAT slave
BM3XXX-XXXXX- <u>XXXXXXXX</u> -X- <u>XX</u> -X-XX (. XX . X)	Software options

¹⁾ 400V European mains included.

5

Mounting

In this chapter the mechanical mounting of the device into a switching cabinet is described. Information about the «Installation space» are also to be found in this manual from page 47. The mounting consists of the following steps:

1. Prepare mounting (drill holes / cut-out segments)
2. Install device



WARNING

The following **may occur**, if you do not observe this caution information:

- serious personal injury
- death

While executing mounting activities in any particular way, assure that no mechanic particles (e.g. drill spans, copper cord) can intrude into the device. If possible, you should execute drilling before mounting the device into the switching cabinet and prepare the cables outside the switching cabinet. If this is impossible, the device should be covered in an adequate way.

5.1 General safety instructions



CAUTION

The following **may occur**, if you do not observe this caution information:

- property damage



The danger is: **electrostatic discharge**. Terminals of the device are partial dangerous to ESD.

Regard to the corresponding notes.

- Please regard to the information in «Fundamental safety instructions» from page 13.
- Pay attention to all areas at the device, which could be dangerous to you while mounting. Use this survey only for the mechanical mounting. Dangers, which result e.g. from electricity are not shown here.

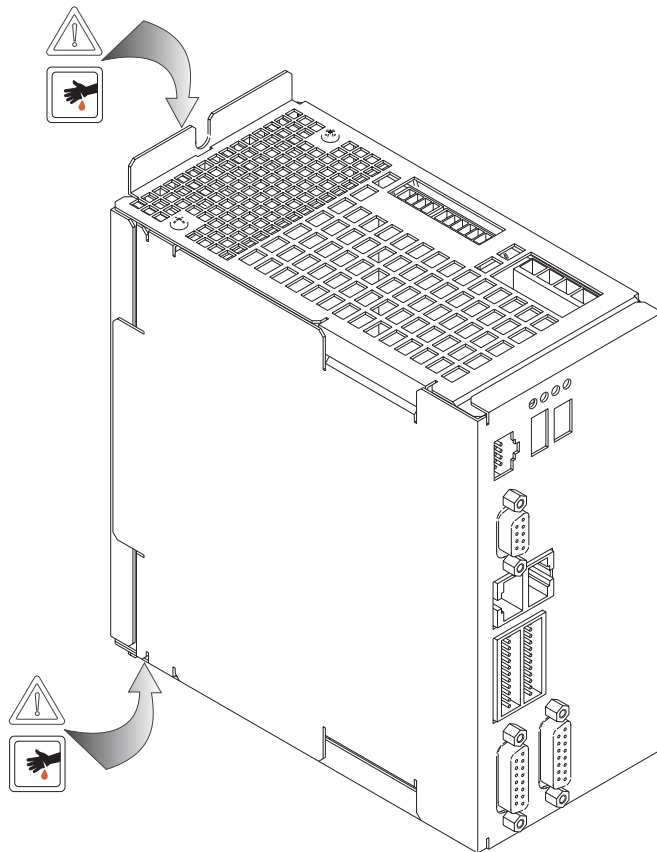


Figure 5.1: Danger areas during the mechanic mounting

**CAUTION**

The following **may occur**, if you do not observe this caution information:

- property damage

*The danger is: **High temperature**. At the heat sink of the **b maXX® BM3400** temperatures of up to 90°C may occur.*

Assure that the mounting plate is able to resist these temperatures without problems.

5.2 Requirements to the executing personnel

**CAUTION**

The following **may occur**, if you do not observe this caution information:

- minor to medium personal injury

*The danger is: **sharp edges**. In case, while installing, you lift a device with unprotected hands, fingers or palm can be cut. If the device falls off, your feet can be cut up.*

Assure, that only qualified personnel, who is familiar with the safety- as well as with the mounting instructions, mount this device.



- wear safety gloves



- wear safety shoes

Qualified personnel are persons, who have been instructed by the responsible person, based on their training, experience, the instructions they were given as well as their knowledge about relevant standards and instructions, knowledge of the accident prevention instructions and of the company, to carry out the necessary operations and thereby are able to recognize and avoid the dangers which could happen. The required qualifications for the work with the device for example are:

- Training or instruction due to the standards of the safety engineering in maintenance and use of appropriate safety equipment.

5.3 Prepare mounting

You can prepare the mounting with the project manual for your facility. With the project manual and the «Drill patterns» from page 49 you can determine the dimensions for the cut-outs and the fastening drills.



CAUTION

The following **may occur**, if you do not observe this caution information:

- minor to medium personal injury

*The danger is: **eye injury due to catapulting particles**. While executing the drillings and the cut-out metal particles are catapulted.*



- wear eye protection

-
- Carry out the drillings and if necessary the cut-outs.

5.4 Installation space

The following drawings show the main dimensions of the devices in mm. Use these drawings, to determine the required space in the switching cabinet. For the construction of the necessary drillings and cut-outs use the drawings from page 49.

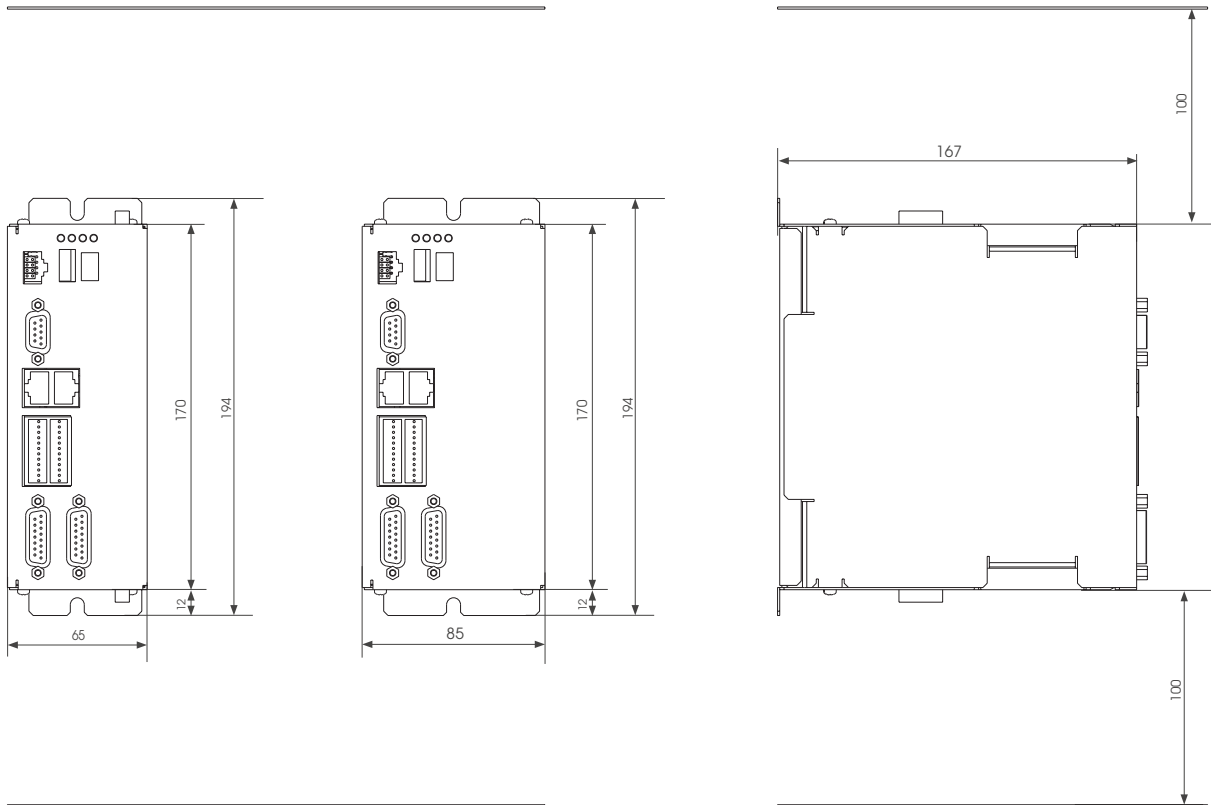


Figure 5.2: Installation space **b maXX® BM3400 HS0 and HS1**

NOTE



Please pay attention, that mounting the devices is only allowed like showed in the drawings (vertically with fresh air flow from bottom to top). Mounting several devices side by side is possible. Assure that the required free space of 100mm on top and below the device is left to avoid blocking the air circulation, which is necessary to cool down the device.

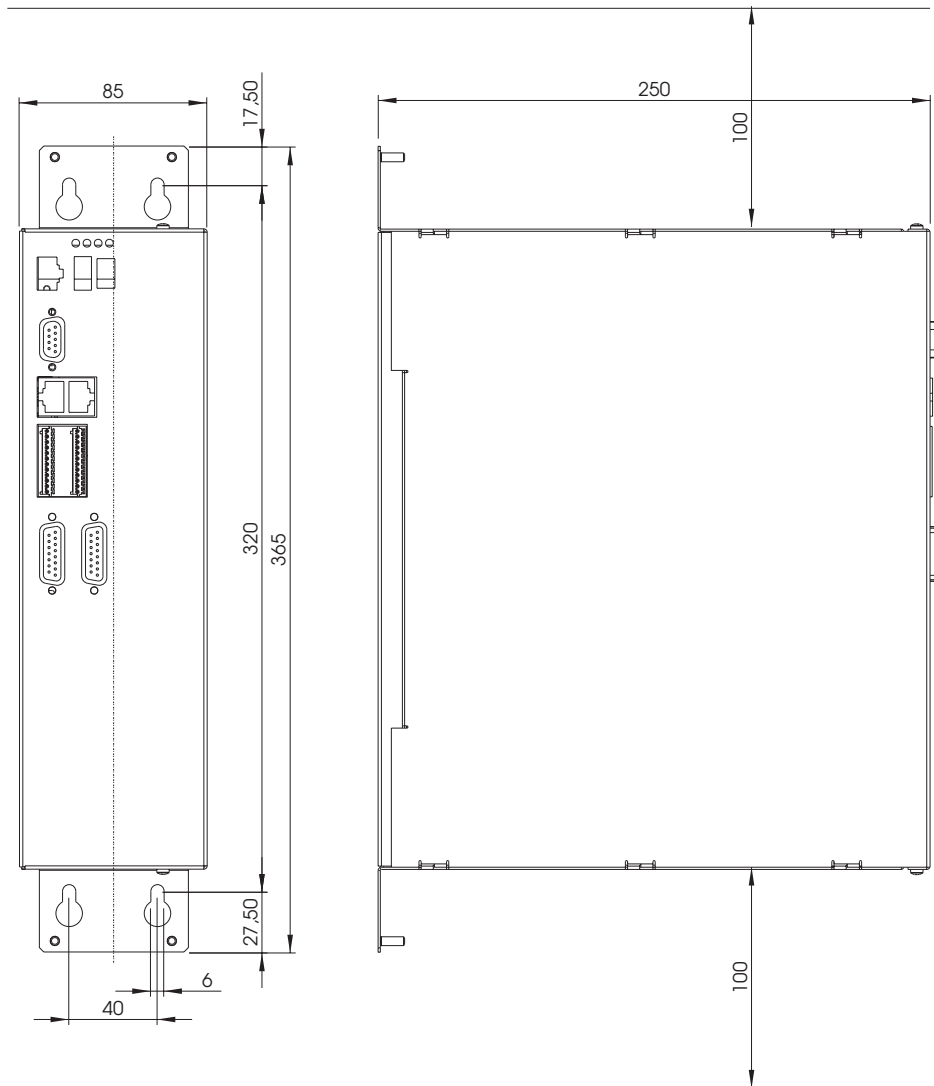


Figure 5.3: Installation space **b maXX® BM3400 HS2**

5.5 Drill patterns

The following drawings show the drilling patterns of the device. Use these drawings, to prepare the necessary drillings / cut-outs. Use the drawings from page 47, to determine the required space in the switching cabinet.

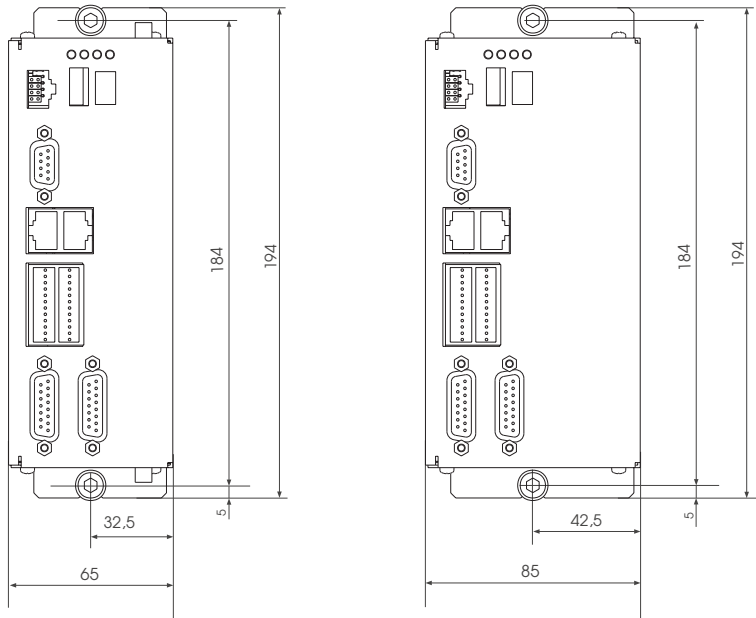


Figure 5.4: Drilling pattern **b maXX® BM3400** HS0 and HS1

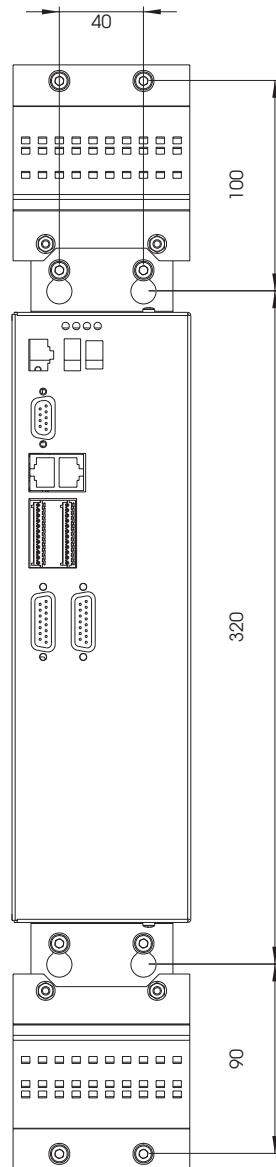


Figure 5.5: Drilling pattern **b maXX® BM3400** HS2 (incl. screening console)

5.6 Mounting instructions

The mounting technic is shown as chart on the following page. Which screws and washers you need for the particular mounting, is also to be found below the drawing.

CAUTION



The following **may occur**, if you do not observe this caution information:

- minor to medium personal injury



*The danger is: **sharp edges**. In case, while installing, you lift a device with unprotected hands, fingers or palms can be cut. If the device falls off, the feet can be cut.*

Assure, that only qualified personnel, who is familiar with the safety- as well as with the mounting instructions, mount this device.



- wear safety gloves



- wear safety shoes

Complete the mounting in the following way:

1. Provide, if necessary, a suitable transportation- / lift equipment.
2. Provide suitable mounting accessories.
3. Mount the device.

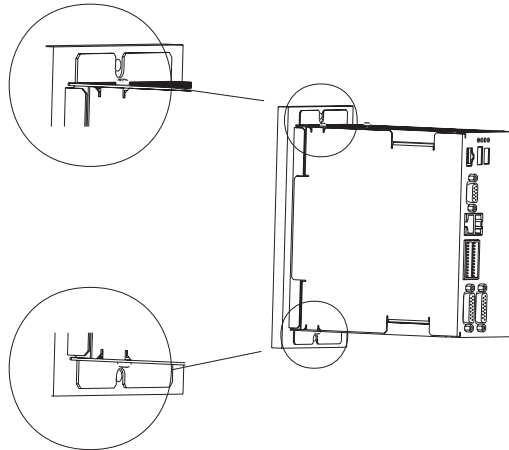


Figure 5.6: Drill patterns

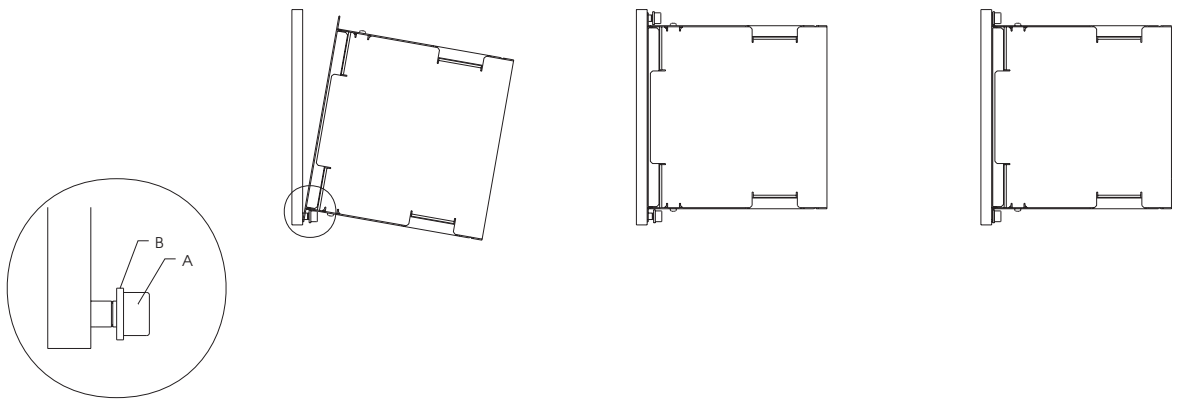


Figure 5.7: Snap in the device

A-screws	2 x M6
B-washers	2 x 6,4 DIN125

6

Installation

In this chapter the electric installation of the device is described. The mechanical mounting was described from page 43. Before installing assure, that the technical preconditions are fulfilled:

1. Check the requirements to the electrical mains and check if the existing mains is suitable.
2. Check the requirements to the electrical cables and provide the according cables.
3. Check the characteristics of the connections and configure the connections accordingly.

6.1 General safety instructions

- Please regard to the information in chapter «Fundamental safety instructions» from page 13.
- Pay attention to all areas at the device, which could be dangerous for you while doing the electric installing.

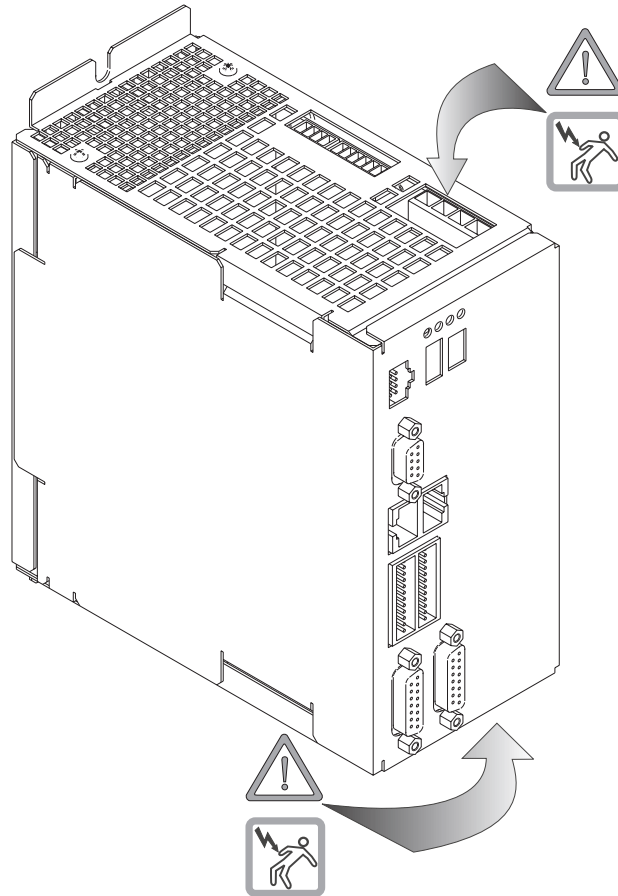


Figure 6.1: Danger areas at electrical installation

6.2 Requirements to the executing personnel



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death



*The danger is: **electricity**. When operating with this electrical device, inevitably certain parts of this device are under dangerous voltage.*

Assure, that only qualified personnel, that is familiar with safety instructions as well as with mounting-, operation- and maintenance instructions, work at this device.

Qualified personnel are persons, who are authorized by the responsible person, to execute the necessary actions and who recognize the possible dangers and who are able to avoid these dangers. They have the training, the experience, they were given instructions as well as knowledge about the relevant standards and instructions, they have knowledge of the accident prevention instructions and of the company conditions. The required qualifications for the work with this unit are for example:

- Education or instruction or to have the authorization to put into operation, ground and label circuits and devices according to the standards of safety engineering.
- Training or instruction due to the standards of the safety engineering in maintenance and use of appropriate safety equipment.

6.3 Voltage check

A voltage check according to EN 61800-5-1/VDE 0160, paragraph 5.2.3.2 and a checking of the protection impedance according to paragraph 5.2.3.4. is made during the routine test of this device at Baumüller Kamenz GmbH.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **electricity**.*

Subsequent tests of the device with high voltages must be carried out only by Baumüller Kamenz GmbH.

If you are intending to check the complete switching cabinet installations with high voltage, you must disconnect all cable connections from the Baumüller units before you start the test.

6.4 Requirements to the electrical mains

All important data is to be found in «Appendix D - Requirements on the power supply» on page 171. Small deviations of the electrical mains from the requirements can lead to malfunctions of the device. If the mains strongly deviates from the requirements, the device can be destroyed. The destruction of the device can cause personnel injury.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **electricity**. In case you do not ensure the requirements to the electrical mains, the device can be damaged/destroyed and can thereby endanger persons severely.*

Assure before installation, that the requirements of the electrical mains are fulfilled.

6.5 Requirements to the connecting cables

- You must consider IEC/EN 60204-1, chapter 13 at selection of connection cables.
- Use a copper cable for 60°C/75°C in case you consider UL 508 C.

Further information (e.g. maximum allowable length) you will find in «Appendix D - Circuit mains - device» from page 189 to «Appendix D - Circuit device - motor» from page 189.

6.6 Protection of the device and the cable respectively

In order to protect the device or the cables against damage/destruction by the mains, you must install fuses. Data of the necessary fuses are found in «Appendix D - Fuse protection» from page 187.

Optimal protection could be reached by adding cable protection and device protection.

Cable protection should be designed primarily to protect cable, that means the used cable determines the protection.

To operate **b maXX® BM3400** devices it is necessary to use cable protection according to «Appendix D - Fuse protection» from page 187.

If several devices parallelly operate at the same mains supply, cable and cable protection have to be selected to drive the sum of all peak currents of all devices during the possible overload duration. In this case, device protection has to be set up for each device separately.

At dimensioning of the fuses pay attention to selectivity, that means, select the fuses in a way that errors of the device or the motor are handled by device protection and errors within the switching cabinet (cables from cable protection to device protection) lead to activation of the cable protection.

The precharge circuit of **b maXX® BM3400** devices uses resistors to limit current. Devices of housing sizes 0 and 1 are equipped with NTC resistors, devices of housing size 2 use normal resistors for current limiting.

Due to heating of the resistors during precharge - especially at devices of housing size 0 and 1 - resistance values drop and following the current rises temporarily.

Control of the precharge relay which will be activated, if an adjustable limit (P1242) is exceeded, is based on measuring the DC link voltage. After activation of the precharge relay only the mains inductivity is effective for current limiting.

**NOTE**

If at the same time control supply (24V) and mains supply are switched on, there is a delay caused by the boot sequence. After the boot sequence, when the first measurement of DC link voltage takes place, the adjustable limit is exceeded by far. If the control supply is switched on long before switching on the mains supply, measurement of DC link voltage can take place in time and activation of the precharge relay occurs just after getting the first value above the limit. That's why there could be current peaks.

At default values and common mains environment a peak of about the peak current of the device for a duration of 2-3ms can be expected. These values are also to be expected in case of returning of the mains supply. Therefore device protection should be dimensioned for the device's peak current.

The following figures show examples of the current values at the DC link circuit (result of overlaying the currents of all three phases) for devices BM3411-L3 (V2) resp. BM3411-L1 (V2) during precharge without activation of the precharge relay. Other **b maXX® BM3400** devices will show similar current values but smaller peak values.

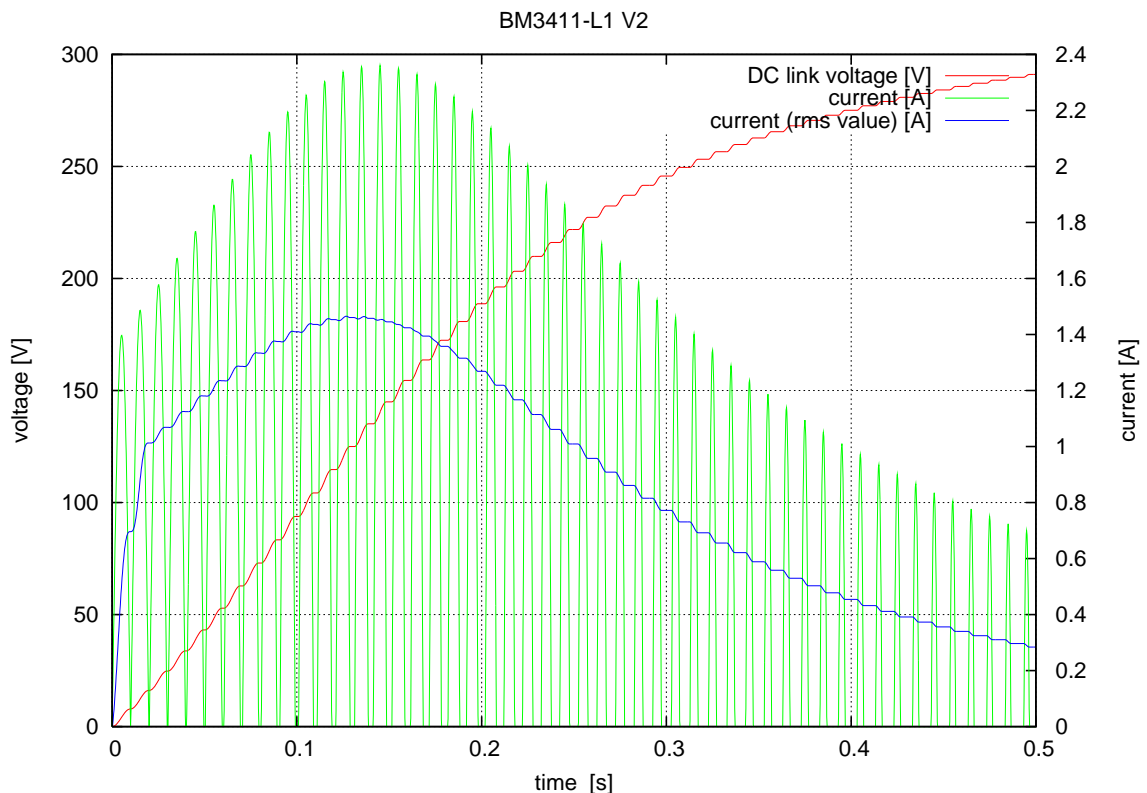


Figure 6.2: Precharge current values single phase (without activation of precharge relay)

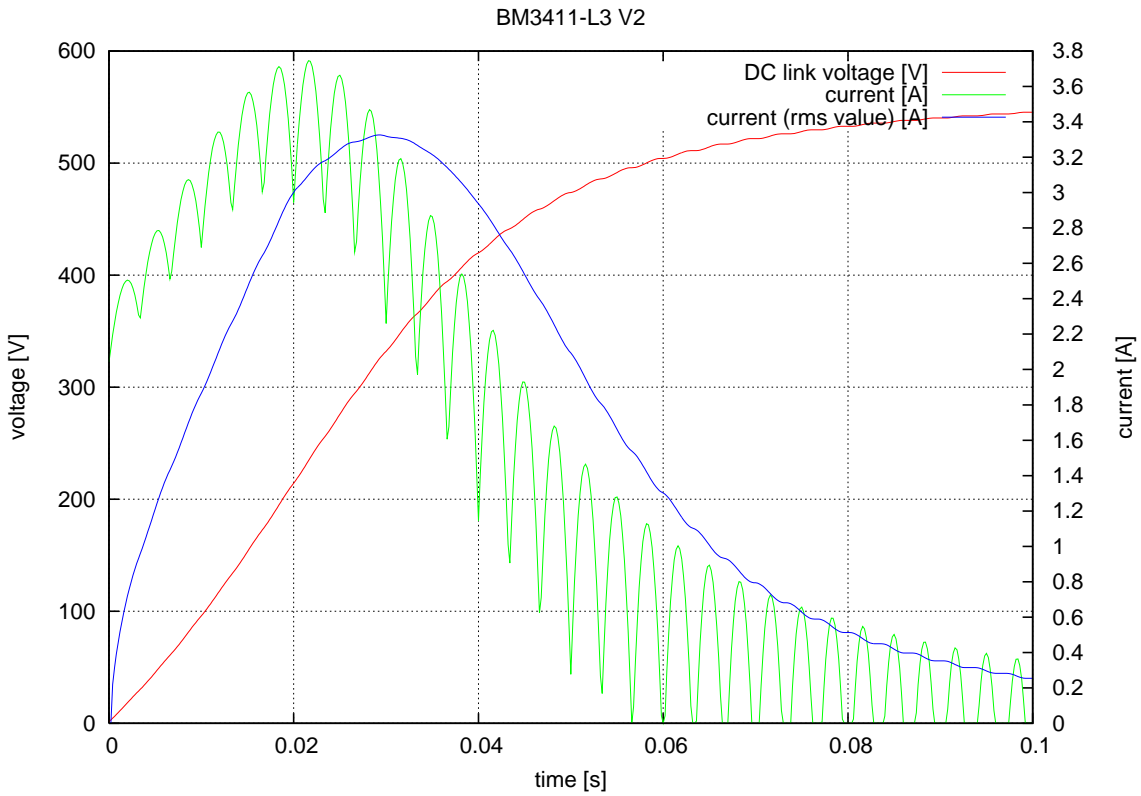


Figure 6.3: Precharge current values triple phase (without activation of precharge relay)

6.7 Protective conductor and compatibility to RCD

Due to the operating principle a leakage current $>3,5 \text{ mA}_{AC}$ or $>10 \text{ mA}_{DC}$ can flow via the protective conductor. On this account a permanent protective conductor is required.

At the **b maXX® BM3400** in addition to the plugged protective connection, the screw terminal, which is marked with "PE" must be connected to the PE.



WARNING

The following **may occur**, if you disregard these safety notes:

- serious personal injury
- death

This device can lead to direct current in the protective conductor. If, in case of a direct or indirect contact a residual-current-operated protective device (RCD) is used, then a RCD of type B is permitted on the power supply side only. Otherwise other safety precautions, as e.g. environmental separation with a double or strengthened insulation or by the separation of the power supply with an isolated transformer must be used.

Due to high leakage currents, which arise due to the operating principle of the device can result in an early enabling of the RCD or generally can avoid an enable.

b maXX® BM3400 devices may only operate in connection to public mains if mains filters are used.

If several **b maXX® BM3400** devices are operated in a switching cabinet, devices without internal mains filter are recommended. In this case a common external mains filter must be used, which has to be selected according to the sum of the currents of all devices used in the switching cabinet. Usually external mains filters are filters of higher order and they produce less leakage current than internal mains filters.

6.8 Measures for EMC assurance

The assembly of the single modules and components in the switching cabinet is decisive for the EMC. The notes on the following pages make it possible to configure the installation due to the latest EMC knowledge and therewith to follow legal regulations.

In the **b maXX® BM3400** semiconductors are used, which minimize the power loss in the unit by quick switching and therewith make a small size possible. These semiconductors generate electromagnetic waves by switching quickly. Therefore, at operation of the **b maXX® BM3400** certain preconditions must be complied with, in order to avoid electromagnetic influences due to switching operations. Interferences can arise throughout all areas of the drive system and originate in the following:

- Capacitive discharge currents, whose cause are the steep switching edges of the semiconductors.
- High currents and steep edges in the motor cables. The bonded interference energy in the magnetic fields covers frequencies of a few hertz up to about 30MHz. Due to the high voltage gradients additionally electromagnetic fields with frequencies up to 600MHz occur.
- High clock-pulse rates and quick logic switchings (electromagnetical field with frequencies of 16MHz to 1GHz).
- Harmonic effects on the supply and harmonics. The cause for these are commutation procedures and not sinusoidal mains loading especially at line-commutated converters (100Hz to 20kHz).



NOTE

The emission of radio interferences is to a high level dependent on the wiring, the volume expansion and the arrangement of the components in the installation. That is why the assurance of the electromagnetic compatibility according to the statutory provisions only is possible on the completed installation and therefore is in the responsibility range of the manufacturer of the installation or of the operating authority (EMVG § 6, sec.9)

6.8.1 Cabling

- For suppression of the interfering radiation outside of the converter you basically must screen **all** connected cables. If the shielding effectiveness of the switching cabinet is high enough (see radio interference limit value according to the EMVG for your installation) and the EMC in the interior space is guaranteed (this may be assumed if you have complied with all configuration notes), you may also mount unscreened control cables. Also refer to the information under «Screening» on page 65.
- Use a Baumüller mains filter BFN provided that the device is not equipped with an internal mains filter.

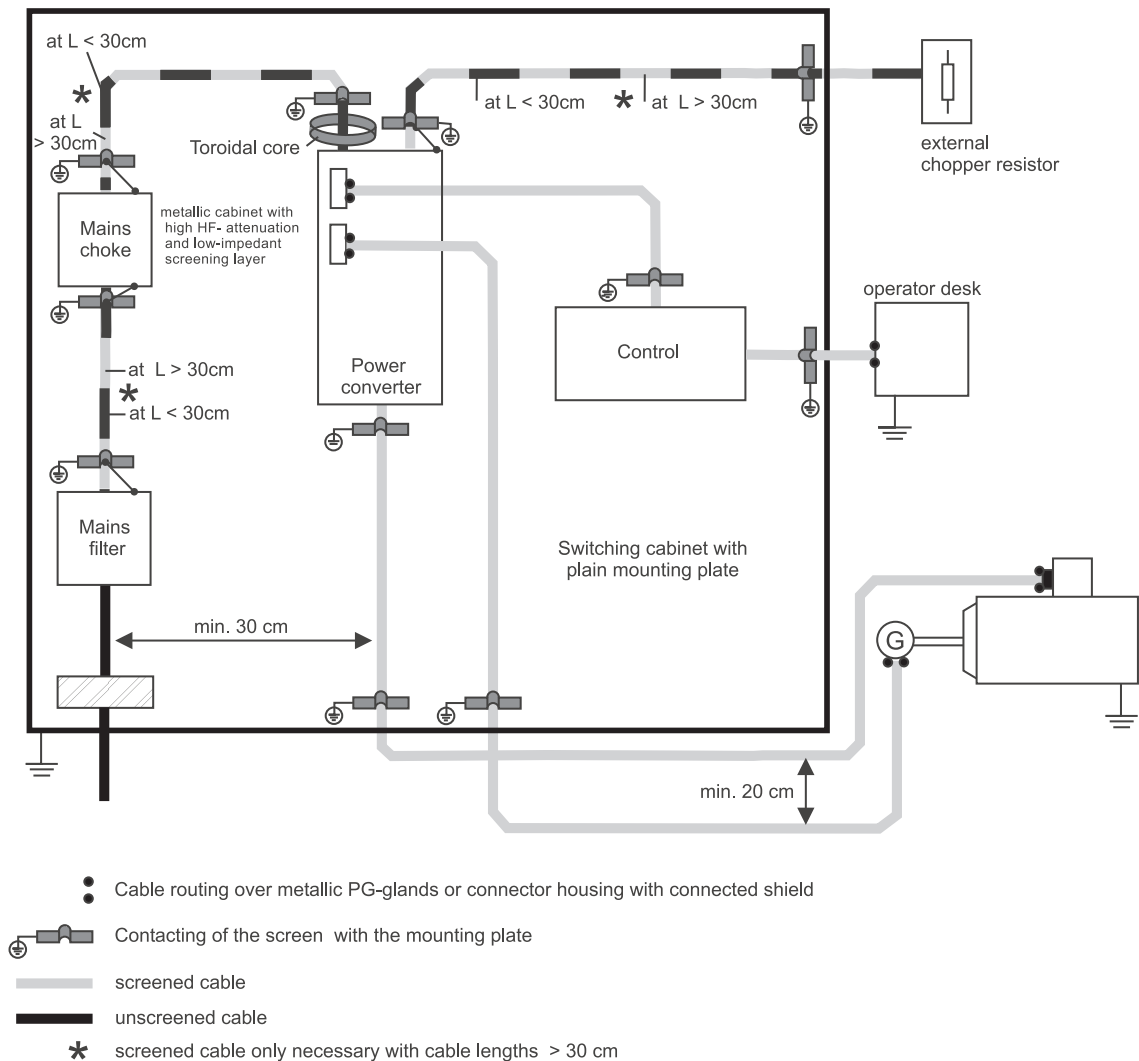


Figure 6.4: Cabling power unit

- When installing, pay attention to the correct order of the components: Mains - Fuse - Mains filter - Mains choke (depending on the converter) - Toroidal core (only at Mains filters $\geq 250\text{A}$) - Converter - Motor.
- The compliance with the permissible limit values of the interference resistance and the interference emission can only be assumed, if you exclusively use Baumüller motor cables and -components.
- The maximum length of motor cable is limited. The length of the motor cable is dependent on the cross section of the cable (e.g. 100m at 1.5mm^2 , 30m at 35mm^2). In case you use n parallel-installed motor cables, the maximum length must be reduced to factor $1/n$.
- The screened motor cable between converter and motor must be made of one piece. Do not interrupt the cable e.g. by terminals, contactors, fuses and so on.

- The smallest possible effective aerial height is reached, if you install the cable directly on the surface of grounded carriers.

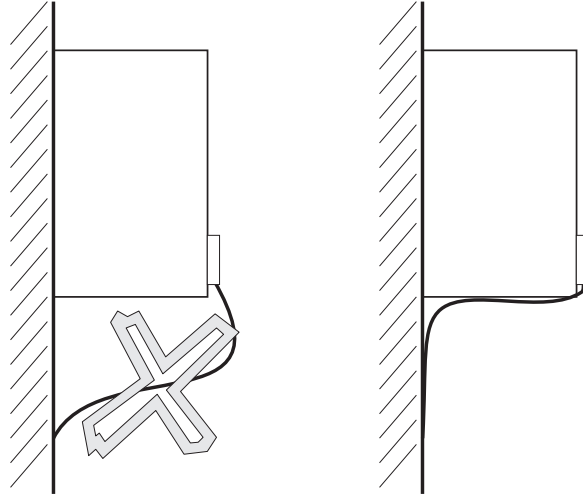


Figure 6.5: Cable laying for minimum aerial height

- All cables should basically be laid as near as possible to the conductors of the chassis ground system, in order to reduce the loop area which is effective for magnetic decoupling.

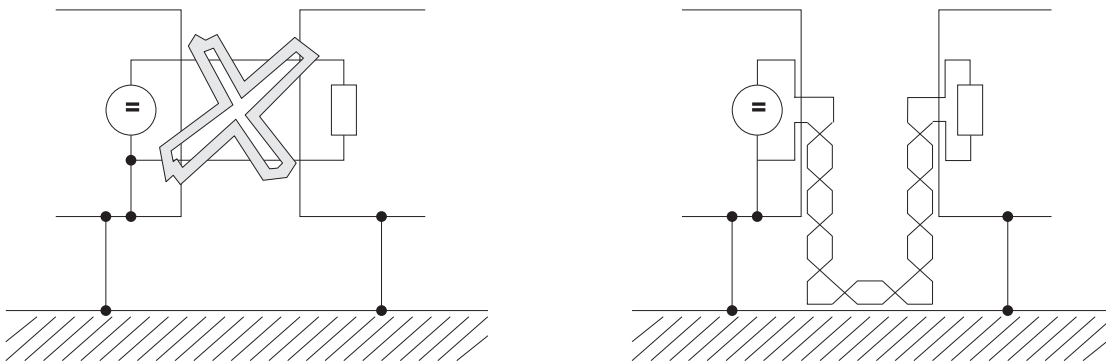


Figure 6.6: Cable laying for minimum loop area

- At parallel laying of signal or control cables compared with power cables you must comply with a minimum clearance of 20cm between the conductors.
- The clearance between cables with especially high interference potential and cables on the mains side of the mains filter must be at least 30cm.
- Cross cables of different EMC categories only in a 90° angle.
- At symmetrical signal transmission (e.g. differential amplifier inputs for the speed setpoint) you must link the conductors of each core pair together, and then link the core pairs one with another.

- The ground connection converter/ground plane must be as short as possible (<30cm) and must be fine-wired. Use great cross-sections (>10mm).
- Connect the PE-connection on the load side of the filter with low-impedance to the mounting board. Ideal is a zinc-plated sheet metal angle or a HF-grounding band.
- Jamming transmitter as relais, transformers, chokes and noise sensitive modules as microcontrollers, bus systems and so on should have at least 20cm clearance to the converter and its cabling.
- Avoid reserve loops at extra-long cables.
- Ground reserve cables always on both ends (additional screening effect, avoid capacitive coupled dangerous contact voltages).
- Don't switch mains filters parallel. If several devices are operated in a switching cabinet, the use of devices without internal mains filters is recommended. In this case a common external mains filter must be used.
- Don't connect mains filters of the same type of construction in series - the attenuation characteristics will not be approved.
- Suppress each drive individually from interferences. In case at all drives interferences must be commonly suppressed, do not interrupt the screens between the converter and the mains filter. This means, that the screened cables may not be interrupted by fuses nor by contactors or others, except of possibly necessary mains chokes.

6.8.2 Earthing

- In order to minimize the influence of interferences with higher frequencies, which arise due to the operation of the converter, for purposes of EMC the classical star-connected grounding is insufficient. A reference surface is necessary, which is connected to the grounding potential of the devices (i.e. metallic bright mounting board and cabinet parts) over a large area.
- Mount the converter, the associated mains filter and the plane screening contact of the motor cable on the same reference surface.
- In order to avoid ground loops you must lead all grounding contactors and screens close to ground.
- Ground the controller reference potential of the converter. Execute the connection with the greatest possible cross section and with a short cable (<30cm).
- Remove insulation layers such as paint, adhesives or the like from the ground connections. If necessary use serrated lock washers (DIN 6798) in order to penetrate the surface and therewith achieve a durable conductive contact. In order to avoid corrosion of ground connections select appropriate metal pairings (consider electromotive series). Keep electrolytes away from the connection by using a protective coating (e.g. grease).
- Always connect the screens on both ends plane and highly conductive with ground. Only like this magnetic or high-frequency interference fields can be attenuated in its actions. When having problems with ground loops (e.g. double-grounding of the setpoint conductor screening) the receiver-side should be connected directly and the transmitter-side capacitively.
- Connect the external cable screens when passing through walls, which separate different EMC ranges. Cables, which are guided through walls of screening cabinets without making provisions for e.g. filter-

ing) can affect the screening effect of the cabinet. Therefore also connect the cable screens at the exiting point with a well conductive screening. The distance of the last screen contact point to the cabinet exit must be as short as possible.

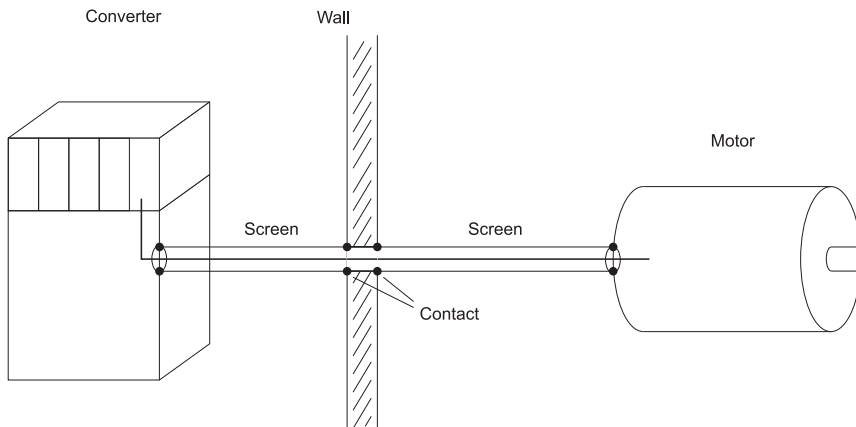


Figure 6.7: Screen layer when exiting the switching cabinet

6.8.3 Screening

- The screening of cables is effective with magnetic fields, if it is connected to ground on both ends.
- With electrical fields a screening effect is already existent if the screen is connected to ground on one side.

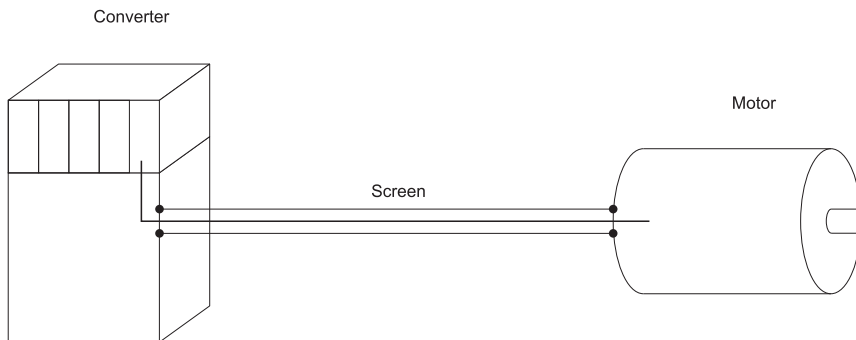


Figure 6.8: Cable laying with two-sided screening plate

- Fields with high frequencies are always electromagnetic fields. Thereby it doesn't matter if it is an electric or magnetic field. At these fields the screening always has to be done on both sides. With two-sided applying of the screen on ground you achieve that the cable doesn't leave the screening „System cabinet“.
- The two-sided grounding of cable screenings nearly excludes an influence due to ground loops (potential differences on the ground system).

- The HF-connection of a screen with ground can also occur capacitively. This avoids low-frequent errors due to ground loops. Screening cables which pass different EMC ranges, may not be opened at the terminals, because the screening attenuation otherwise decreases highly. These must lead to the next module without interruption.
- The screen connection must occur with large surface area and low impedance. Cable tails with a length of only 3cm (1cm wire = 10nH) reduce the screening effect at errors in the MHz range up to 30dB!

**NOTE**

The braided screen must have a coverage of at least 85%. The following cables possess an especially high interference potential :

- Motor cable
- Cable to external chopper resistors
- Cable between mains filter and mains choke
- Cable between mains choke and converter

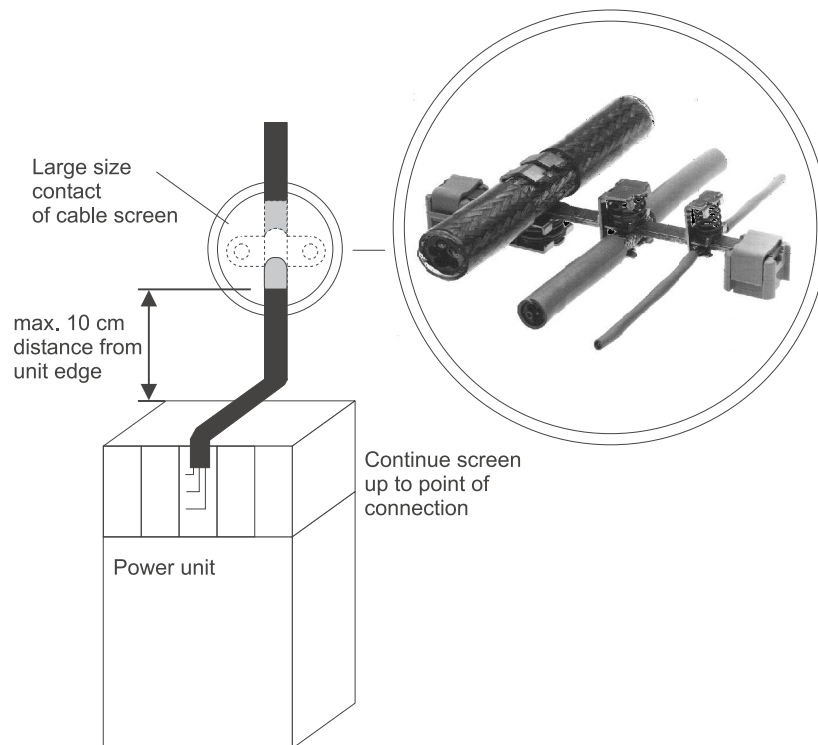


Figure 6.9: Suggestions for the screening plate at the device

6.8.4 Mains filter

Devices of housing size **b maXX® BM340X** resp. **b maXX® BM341X** are optionally provided with integrated mains filter.

If a single **b maXX® BM3400** with integrated mains filter is operated, the limits from DIN EN 61800-3 chapter 6.4.2 are observed. Therefore the device can be operated in C3-environments without restrictions.



NOTE

If several **b maXX® BM3400** devices with integrated mains filter operate combined in a system, the effect of the integrated filter will be compensated by principle partially. If these devices operate without an additional common mains filter, it must be assumed, that limits given in DIN EN 61800-3 chapter 6.4.2 are exceeded and operation in this way is not allowed.

Because finally the plant manufacturer or carrier is responsible to ensure that the norm is observed, at waiver of an additional common mains filter the compliance to the limits must be attested to allow operation of the system in conformity to the norm.

6.9 Requirements to the temperature sensor of the motor

In order to protect the motor against unacceptable overheating a motor temperature sensor can be connected to the **b maXX® BM3400** device. When exceeding an adjusted limit temperature the converter switches off the motor. Requirements to the temperature sensor you will find in «Appendix D - Temperature sensors of the motor» on page 190.



NOTE

The motor temperature sensor is to be executed in such a way, that the Safe electrical separation is guaranteed. The motor temperature sensors in the Baumüller motors are accordant to these requirements. If a motor of another manufacturer is connected the operator must assure, that the motor temperature sensor of the other manufacturer complies with the function Safe electrical separation.

The motor must be built in such a way, that the temperature sensor in the motor is sufficient to the criterion „Safe separation“ according to EN 61800-5-1.

The underlying rated voltage is 300 V or 600 V at operation on an IT-system.

6.10 Operating sequence of installation

WARNING



The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death



*The danger is: **electricity**. Parts, which are under voltage are extremely dangerous.*

Assure, that during the entire mounting the device, the parts, which are to be mounted (e.g. mains lines) and mounting range are off-circuit.

The following steps must be carried out at installation:

1. Lay all cables EMC-compatible.
2. Connect the cables (see «connection diagrams» from page 72)
 - Connect the motor via the terminals X204 (1U2, 1V2, 1W2, PE). Attend to the in-phase connection (rotational direction).
 - Connect the fuses.
 - Connect the 24V-supply via the terminals X100 (former X201). (in case you consider UL 508 C: limit the current to 4A).
 - Connect the mains via the terminals X202 (1U1, 1V1, 1W1, PE).
 - Connect encoder.
 - Connect a signal source for the pulse enable via the terminals X26.
 - Connect a signal source for the quickstop via the terminals X26.
 - Connect, if necessary, a jumper at the terminals X205 (Ba- and Bal) for the activation of the internal chopper resistor.
 - If necessary, connect (dependent on the application) a chopper resistor via the terminals X205 (Ba+ and 1C1).
 - Connect the safety relay (if existent) via X102 (+24V_R and M24V_R).
 - If required, connect the motor temperature sensor via X101 (MT+ and MT-) and the brake via X101.

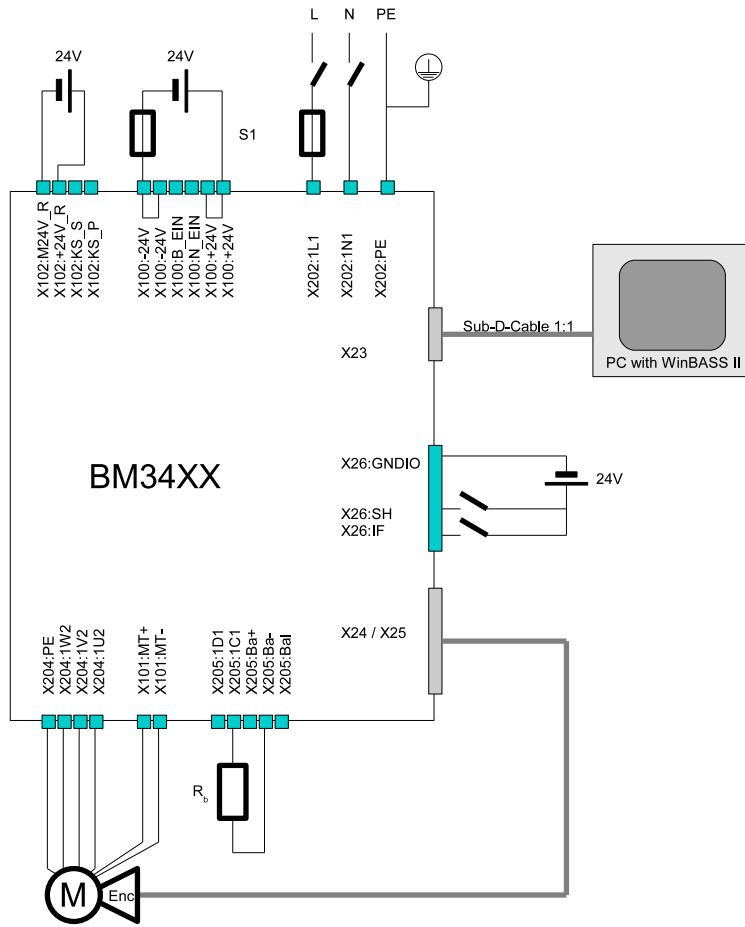


Figure 6.11: Connection diagram **b maXX® BM3400** at a single-phase supply

- X102 Connection of the optional equipable safety relay
- X100 Connection 24V-power supply
- X202 Mains connection (here single phase)
- X23 Communication interface RS232
- X26 Digital inputs (pulse enable, quickstop)
- X24/25 Terminals for encoder 1 and encoder 2
- X204 Connection for motor
- X101 Connection for motor temperature sensor
- X205 Connection for ext. chopper resistor or chopper resistor activation
- R_b External chopper resistor
- S1 Fuses (circuit cable + device)
- Enc Encoder

6.12 Connection diagrams

In the following figures you will find exemplary connection representations for the existing sizes and type key variants.



CAUTION

The following **can occur**, if the safety instruction is not complied with:

- Damage to property

*The danger is: **electricity**. Connector assignments, which do not accord to the device connections, can lead to damage on the device or the installation.*

Assure that the connection cables, which are used accord to the connector assignments of the device. Especially regard, when repairing and exchanging the device, that the additional device perhaps can show a deviating connector assignment from the original device. Connect the new device only, if the connector assignments accord to the connections at the device.

6.12.1 Devices according to type key V1

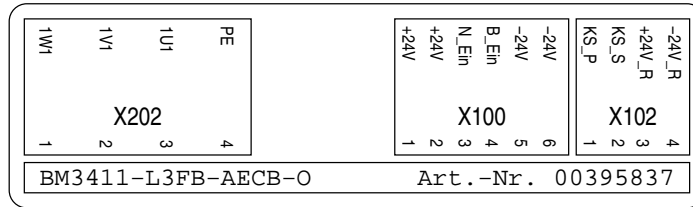


Figure 6.12: Type plate for a device HS1 according to type key V1

The character string **BM3411-L3FB-AECB-0** marks the device accordingly «Type key version 1» from page 37. The middle and the end of the specification contain 4 digits.

Devices, which were delivered from 06/2007 on have a type plate with a 2D-code:

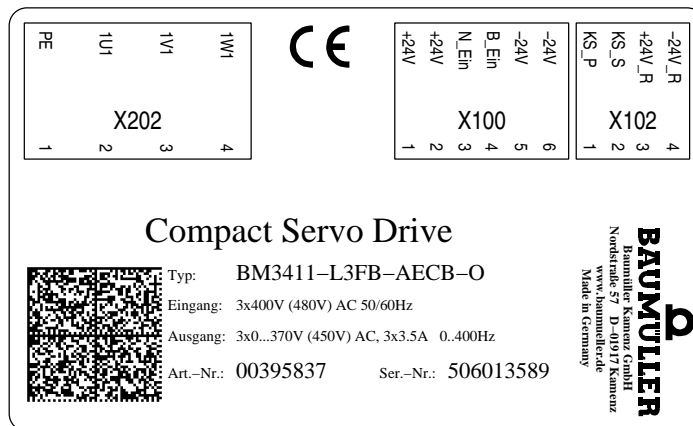


Figure 6.13: Type plate for a device HS1 acc. to type key V1 with 2D-code

CAUTION



The following **can occur**, if the safety instruction is not complied with:

- Damage to property

*The danger is: **electricity.***

Assure yourself at the selection of plug assignments, that the differentiation of both type key versions was considered.

6.12.1.1 HS0 single phase V1 (BM340X-L1XX-XXXX-O)

Connector	Quantity	Usage	Type
X26	2	dig./anal. IO	COMBICON FK-MC 0,5/12-ST-2,5
X102	1	safety relay	COMBICON MC 1.5/4-ST-3.5
X100 (new) X201 (prev.) ¹⁾	1	24V-supply	COMBICON MC 1.5/6-ST-3.5
X202	1	power input	COMBICON MSTB 2.5/3-ST-5.08

¹⁾ X100 (respectively X201) was renamed due to compatibility reasons to the **b maXX® BM4400** devices, function and pin assignment, however, was kept consistent.

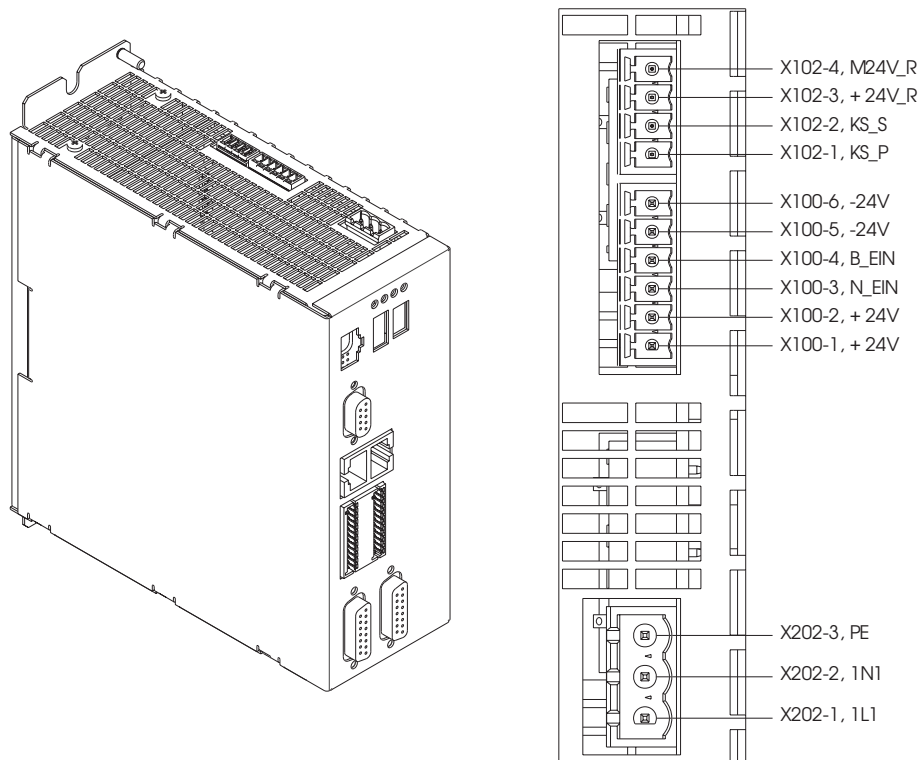


Figure 6.14: Connections on top at HS0 (single phase supply) for type key V1

Connector	Quantity	Usage	Type
X101	1	motor temperature	COMBICON MC 1.5/2-ST-3.5
X205	1	chopper resistor, UDC link connection	COMBICON IC 2.5/4-ST-5.08
X204	1	motor connection	COMBICON IC 2,5/4-ST-5,08

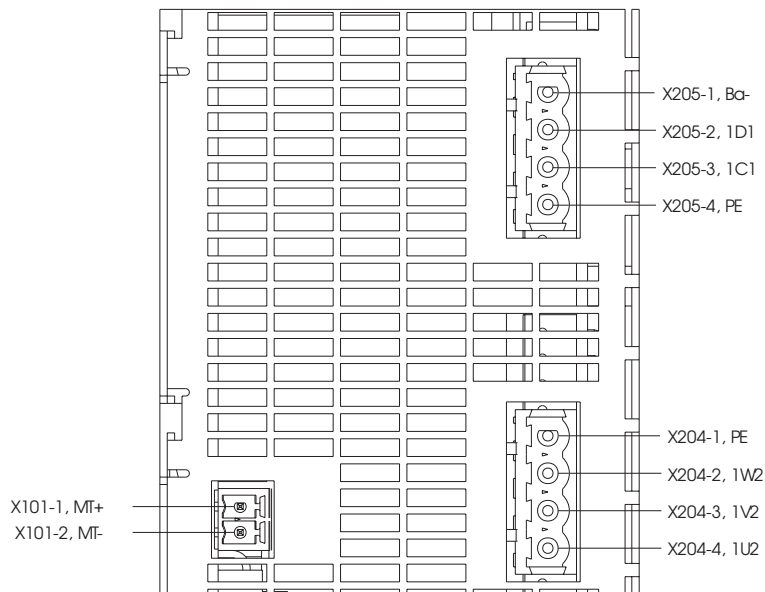


Figure 6.15: Connections at the bottom of HS0 for type key V1

NOTE



If connection X101 is used in order to connect the motor temperature cable, the screen must be applied flat and as near as possible to the housing of the **b maXX® BM3400**. It is necessary to use a cable with **separate screening** for the temperature sensor lines (also see «Appendix B - Spare parts and accessories» from page 159). At an improper or missing screening you may reckon, that there will be great EMC problems!

6.12.1.2 HS1 triple phase V1 (BM341X-L3XX-XXXX-O)

Connector	Quantity	Usage	Type
X26	2	dig./anal. IO	COMBICON FK-MC 0,5/12-ST-2,5
X102	1	safety relay	COMBICON MC 1.5/4-ST-3.5
X100 (new) X201 (prev.) ¹⁾	1	24V-supply	COMBICON MC 1.5/6-ST-3.5
X202	1	power input	COMBICON GMSTB 2,5/4-ST-7,62

¹⁾ X100 (respectively X201) was renamed due to compatibility reasons to the **b maXX® BM4400** devices, function and pin assignment, however, was kept consistent.

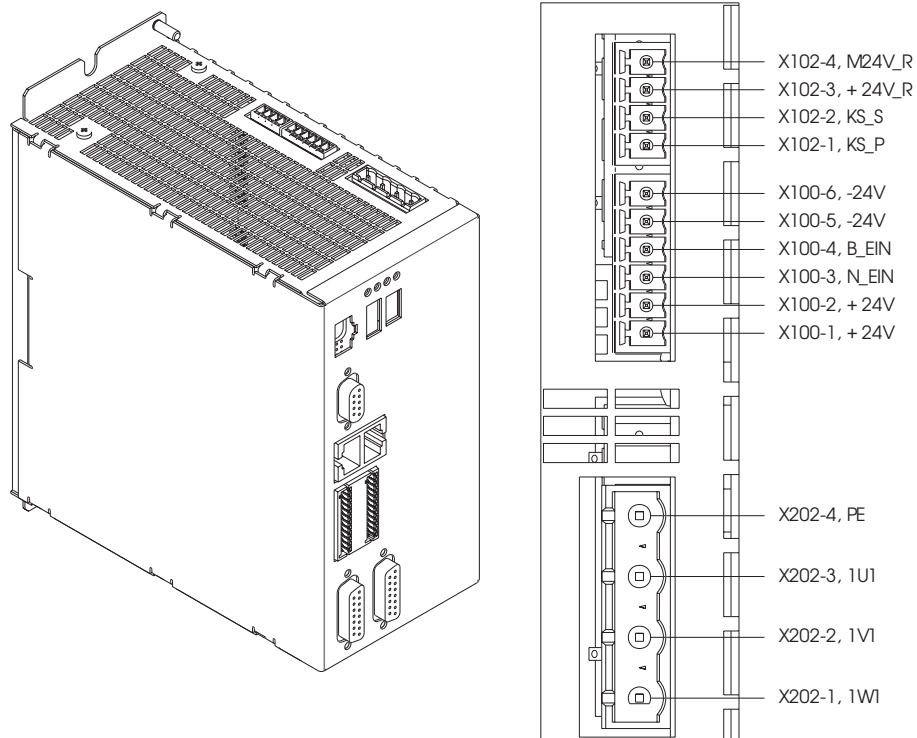


Figure 6.16: Connections on top at HS1 (triple phase supply) for type type V1

Connector	Quantity	Usage	Type
X101	1	motor temperature	COMBICON MC 1.5/2-ST-3.5
X205	1	chopper resistor, UDC link connection	COMBICON GIC 2.5/5-ST-7.62
X204	1	motor connection	COMBICON GIC 2.5/4-ST-7.62

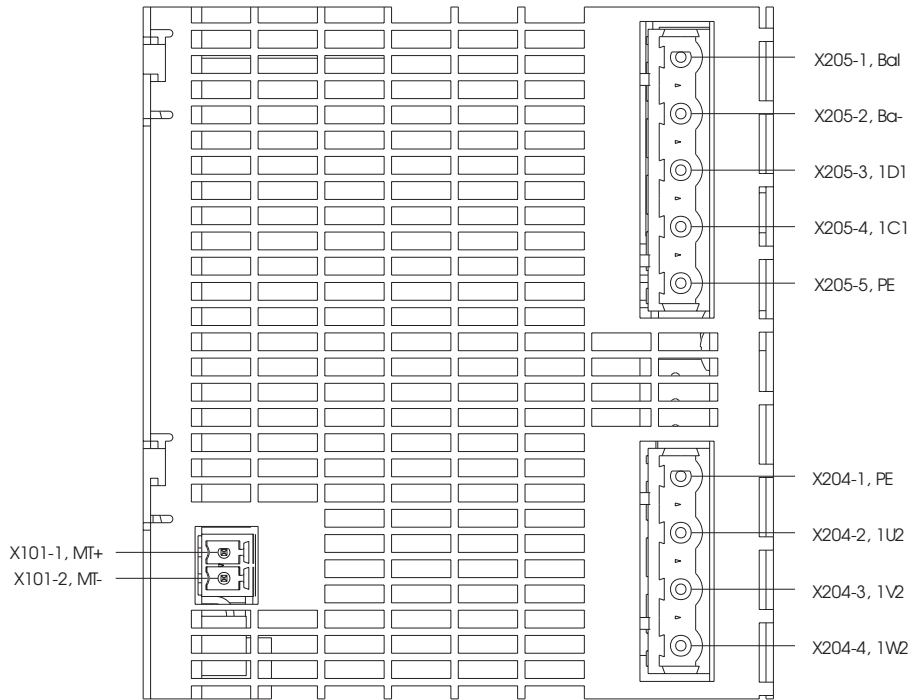


Figure 6.17: Connections at the bottom of HS1 for type key V1

NOTE



If connection X101 is used in order to connect the motor temperature cable, the screen must be applied flat and as near as possible to the housing of the **b maXX® BM3400**. It is necessary to use a cable with **separate screening** for the temperature sensor lines (also see «Appendix B - Spare parts and accessories» from page 159). At an improper or missing screening you may reckon, that there will be great EMC problems!

6.12.2.1 HS0 single phase V2/V3 (BM340X-L1XXX-XXXXXX-O)

Connector	Quantity	Usage	Type
X26	2	dig./anal. IO	COMBICON FK-MC 0,5/12-ST-2,5
X102	1	safety relay	COMBICON MC 1.5/4-ST-3.5
X100	1	24V-supply	COMBICON MC 1,5/6-ST-3,5
X202	1	power input	COMBICON MSTB 2.5/3-ST-5.08

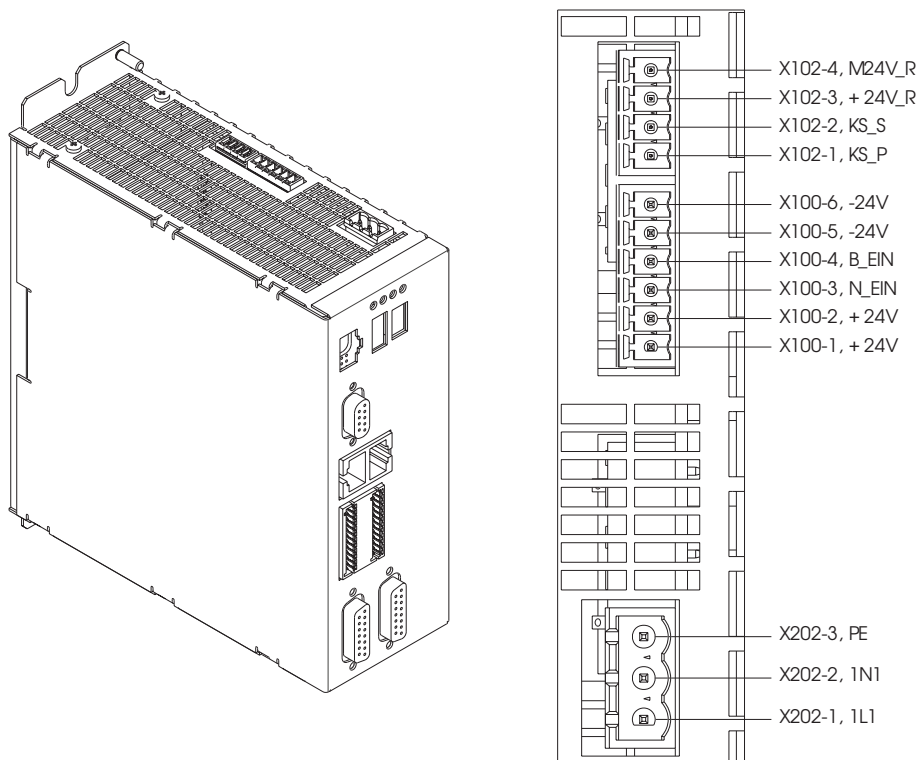


Figure 6.20: Connections on top at HS0 (single phase supply) for type key V2

Connector	Quantity	Usage	Type
X101	1	motor temperature	COMBICON MC 1.5/2-ST-3.5
X205	1	chopper resistor, UDC link connection	COMBICON IC 2,5/5-ST-5,08
X204	1	motor connection	COMBICON IC 2,5/4-ST-5,08

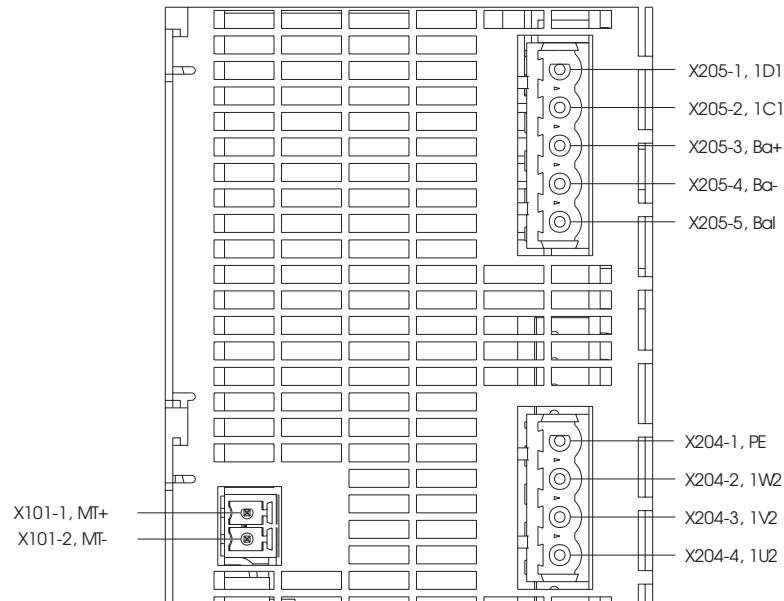


Figure 6.21: Connections at the bottom of HS0 for type key V2



NOTE

If connection X101 is used in order to connect the motor temperature cable, the screen must be applied flat and as near as possible to the housing of the **b maXX® BM3400**. It is necessary to use a cable with **separate screening** for the temperature sensor lines (also see «Appendix B - Spare parts and accessories» from page 159). At an improper or missing screening you may reckon, that there will be great EMC problems!

6.12.2.2 HS0 triple phase V2/V3 (BM340X-L3XXX-XXXXXX-O)

Connector	Quantity	Usage	Type
X26	2	dig./anal. IO	COMBICON FK-MC 0,5/12-ST-2,5
X102	1	safety relay	COMBICON MC 1.5/4-ST-3.5
X100	1	24V-supply	COMBICON MC 1,5/6-ST-3,5
X202	1	power input	COMBICON GMSTB 2,5/4-ST-7,62

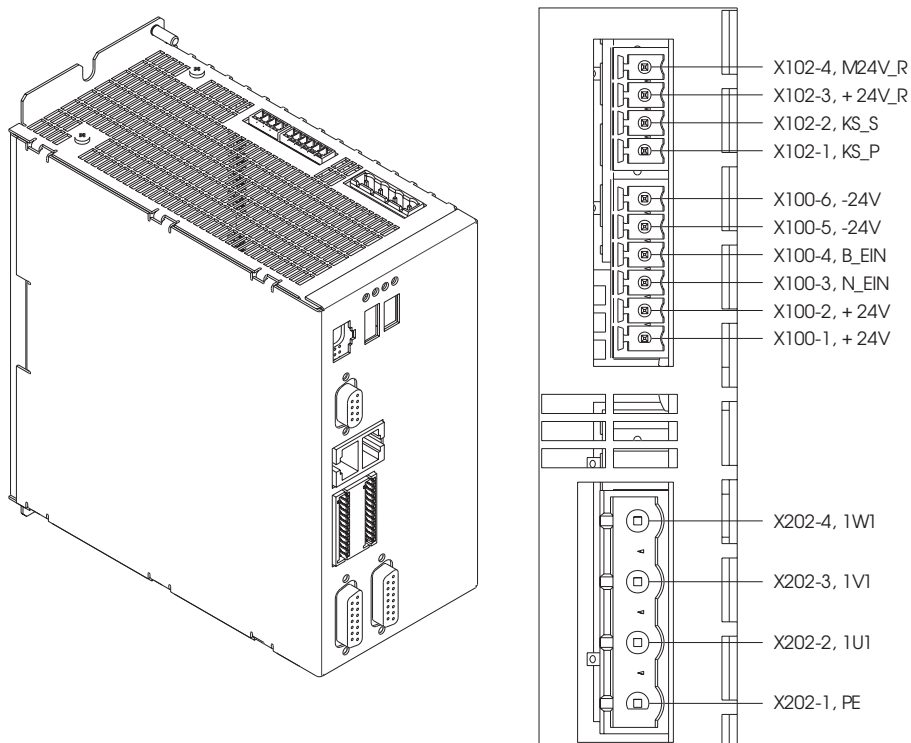


Figure 6.22: Connections on top at HS0 (triple phase supply) for type key V2 acc. to HS1

Connector	Quantity	Usage	Type
X101	1	motor temperature	COMBICON MC 1.5/2-ST-3.5
X205	1	chopper resistor, UDC link connection	COMBICON GIC 2.5/5-ST-7.62
X204	1	motor connection	COMBICON GIC 2.5/4-ST-7.62

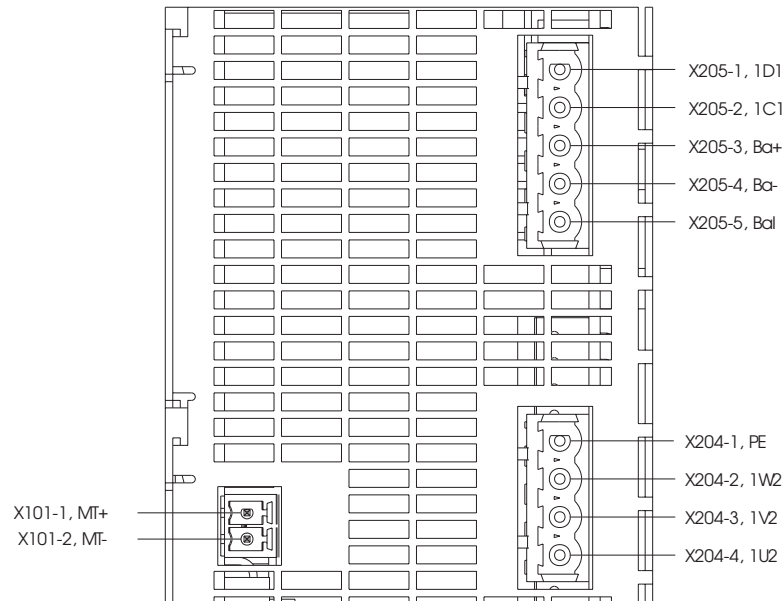


Figure 6.23: Connections at the bottom of HS0 for type key V2



NOTE

If connection X101 is used in order to connect the motor temperature cable, the screen must be applied flat and as near as possible to the housing of the **b maXX® BM3400**. It is necessary to use a cable with **separate screening** for the temperature sensor lines (also see «Appendix B - Spare parts and accessories» from page 159). At an improper or missing screening you may reckon, that there will be great EMC problems!

6.12.2.3 HS1 single phase V2/V3 (BM341X-L1XXX-XXXXXX-O)

Connector	Quantity	Usage	Type
X26	2	dig./anal. IO	COMBICON FK-MC 0,5/12-ST-2,5
X102	1	safety relay	COMBICON MC 1.5/4-ST-3.5
X100	1	24V-supply	COMBICON MC 1,5/6-ST-3,5
X202	1	power input	COMBICON MSTB 2.5/3-ST-5.08

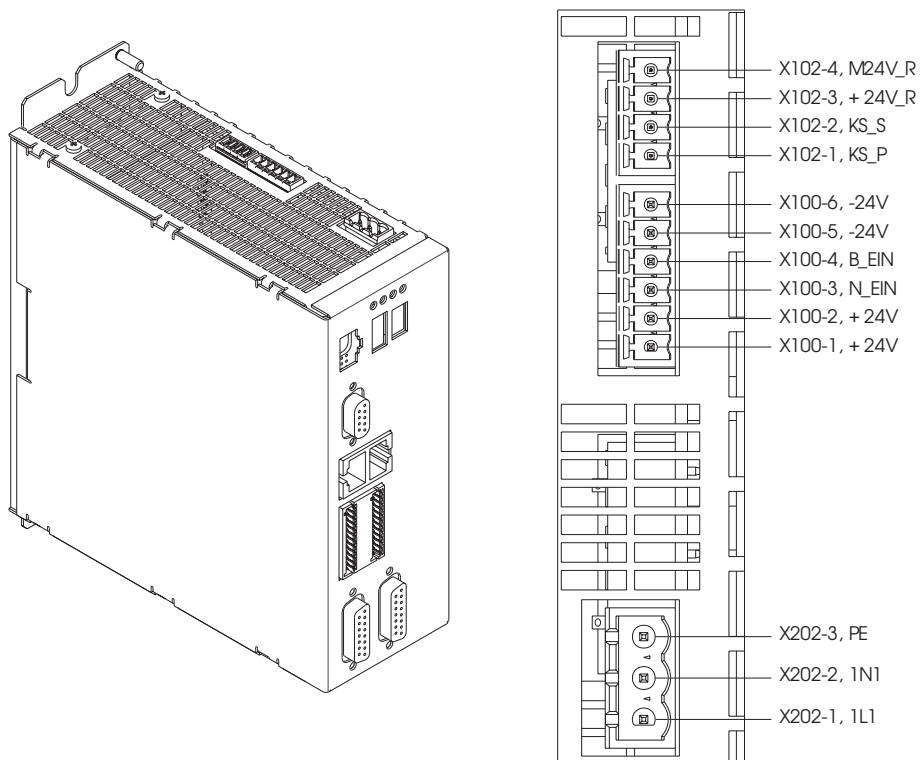


Figure 6.24: Connections on top at HS1 (single phase supply) for type key V2 acc. to HS0

Connector	Quantity	Usage	Type
X101	1	motor temperature	COMBICON MC 1.5/2-ST-3.5
X205	1	chopper resistor, UDC link connection	COMBICON IC 2,5/5-ST-5,08
X204	1	motor connection	COMBICON IC 2,5/4-ST-5,08

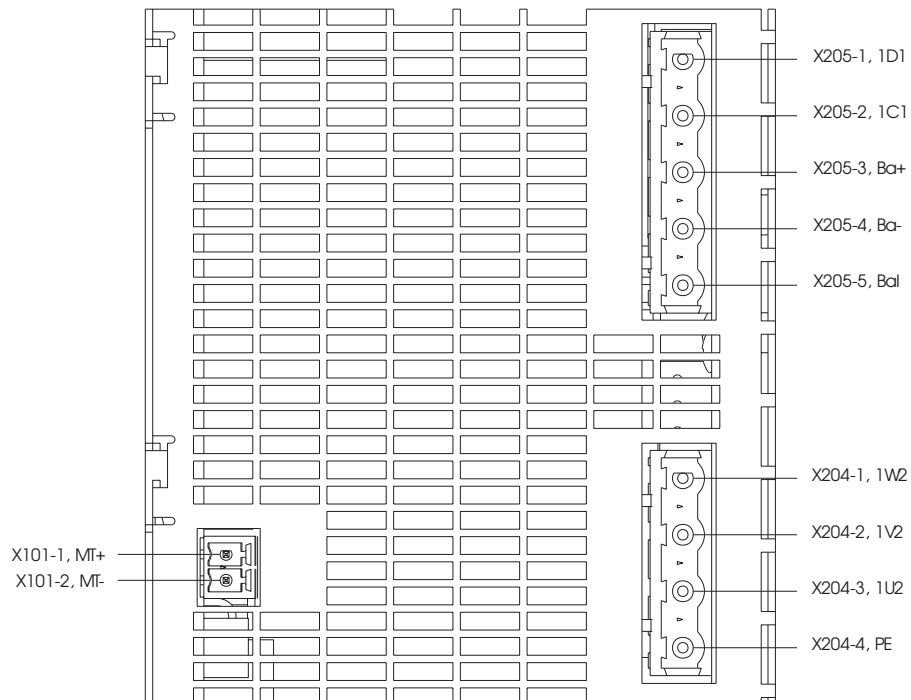


Figure 6.25: Connections at the bottom of HS1 for type key V2



NOTE

If connection X101 is used in order to connect the motor temperature cable, the screen must be applied flat and as near as possible to the housing of the **b maXX® BM3400**. It is necessary to use a cable with **separate screening** for the temperature sensor lines (also see «Appendix B - Spare parts and accessories» from page 159). At an improper or missing screening you may reckon, that there will be great EMC problems!

6.12.2.4 HS1 triple phase V2/V3 (BM341X-L3XXX-XXXXXX-O)

Connector	Quantity	Usage	Type
X26	2	dig./anal. IO	COMBICON FK-MC 0,5/12-ST-2,5
X102	1	safety relay	COMBICON MC 1.5/4-ST-3.5
X100	1	24V-supply	COMBICON MC 1,5/6-ST-3,5
X202	1	power input	COMBICON GMSTB 2,5/4-ST-7,62

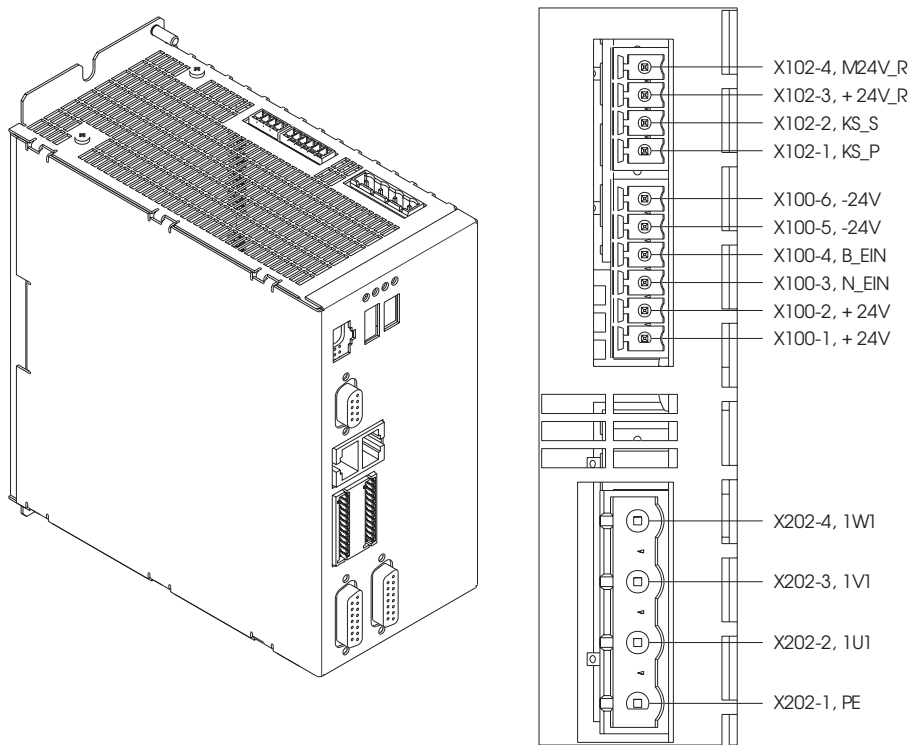


Figure 6.26: Connections on top at HS1 (triple phase supply) for type type V2

Connector	Quantity	Usage	Type
X101	1	motor temperature	COMBICON MC 1.5/2-ST-3.5
X205	1	chopper resistor, UDC link connection	COMBICON GIC 2.5/5-ST-7.62
X204	1	motor connection	COMBICON GIC 2.5/4-ST-7.62

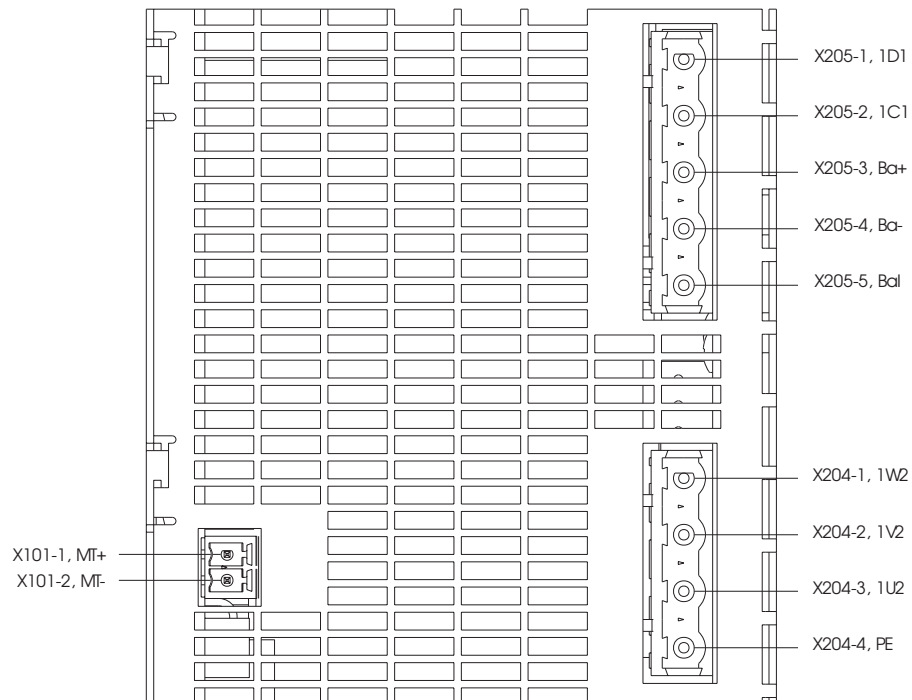


Figure 6.27: Connections at the bottom of HS1 for type key V2



NOTE

If connection X101 is used in order to connect the motor temperature cable, the screen must be applied flat and as near as possible to the housing of the **b maXX® BM3400**. It is necessary to use a cable with **separate screening** for the temperature sensor lines (also see «Appendix B - Spare parts and accessories» from page 159). At an improper or missing screening you may reckon, that there will be great EMC problems!

6.12.2.5 HS2 triple phase V2/V3 (BM342X-L4XXX-XXXXXXX-O)

Connector	Quantity	Usage	Type
X26	2	dig./anal. IO	COMBICON FK-MC 0,5/12-ST-2,5
X202	1	power input	Power COMBICON PC 6-16/4-G1F-10.16
X105	1	checkback pulse enable	COMBICON MC 1.5/2-ST-3.5
X102	1	safety relay	COMBICON MC 1.5/4-ST-3.5
X100	1	24V-supply	COMBICON MC 1,5/6-ST-3,5

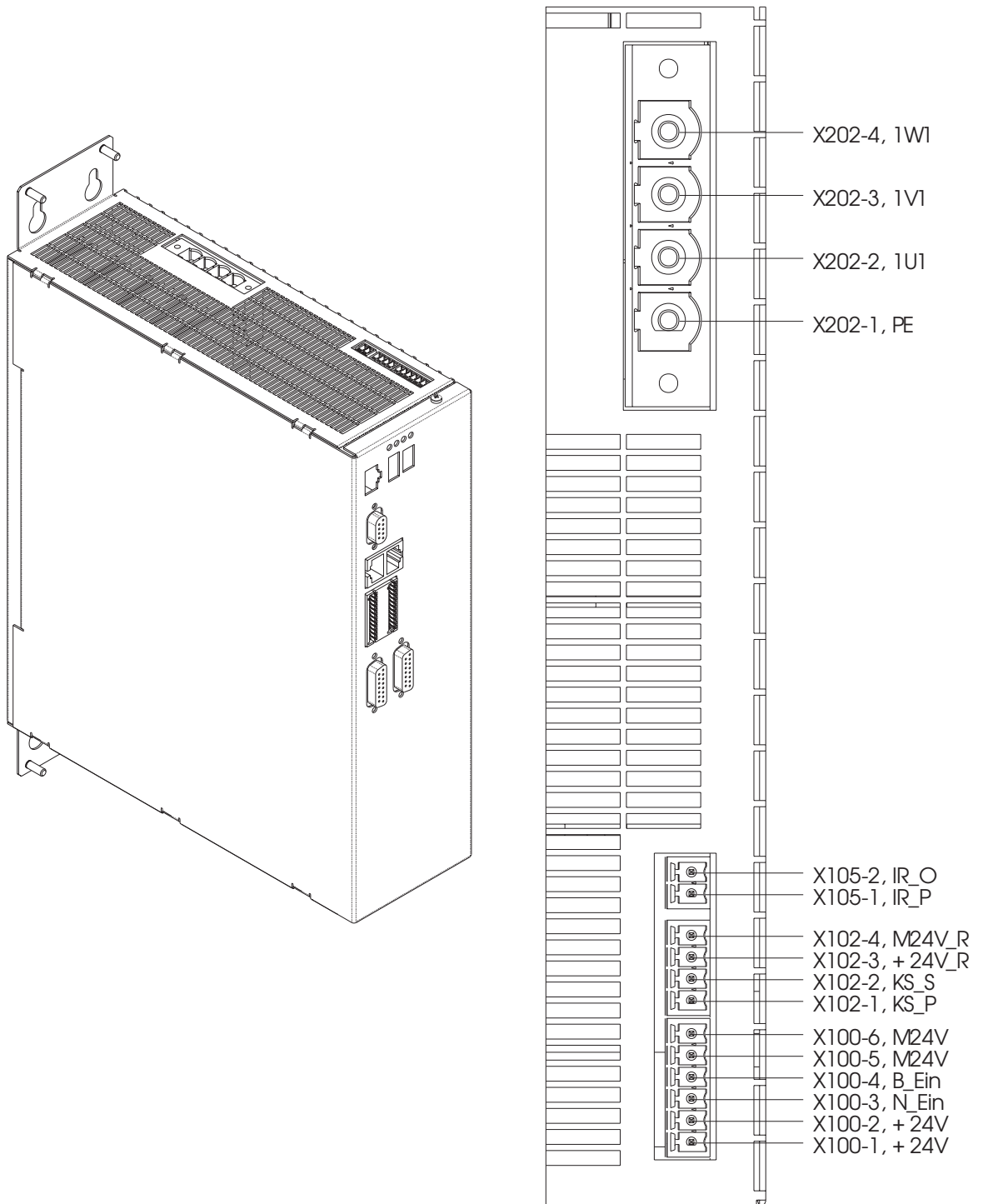


Figure 6.28: Connections on top at HS2 (three-phase supply) for type type V2

Connector	Quantity	Usage	Type
X101	1	motor temperature, Brake	COMBICON MC 1.5/6-ST-3.5
X205	1	chopper resistor, UDC link connection	Power COMBICON IPC 16/5-GF-10.16
X204	1	motor connection	Power COMBICON IPC 16/4-GF-10.16

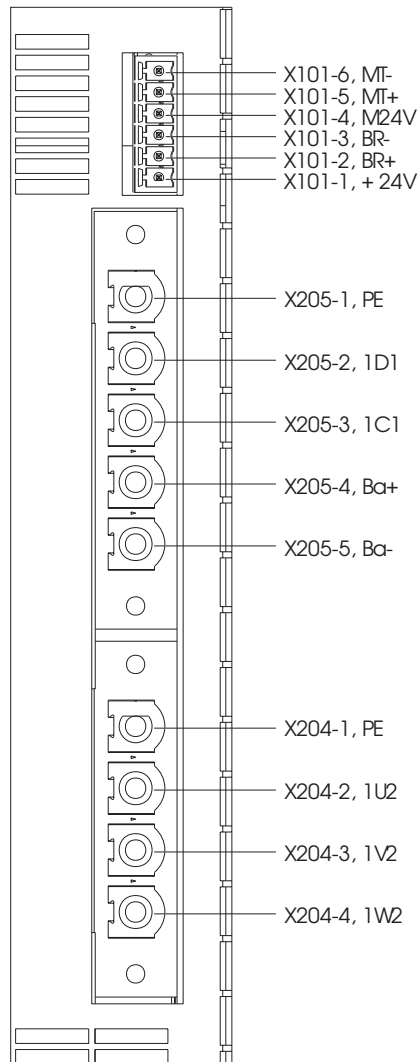


Figure 6.29: Connections at the bottom of HS2 for type key V2

**NOTE**

If connection X101 is used in order to connect the motor temperature cable, the screen must be applied flat and as near as possible to the housing of the **b maXX(R) BM3400**. It is necessary to use a cable with **separate screening** for the temperature sensor lines (also see «Appendix B - Spare parts and accessories» from page 159). At an improper or missing screening you may reckon, that there will be great EMC problems!

6.13 Terminals at the front of the controller board

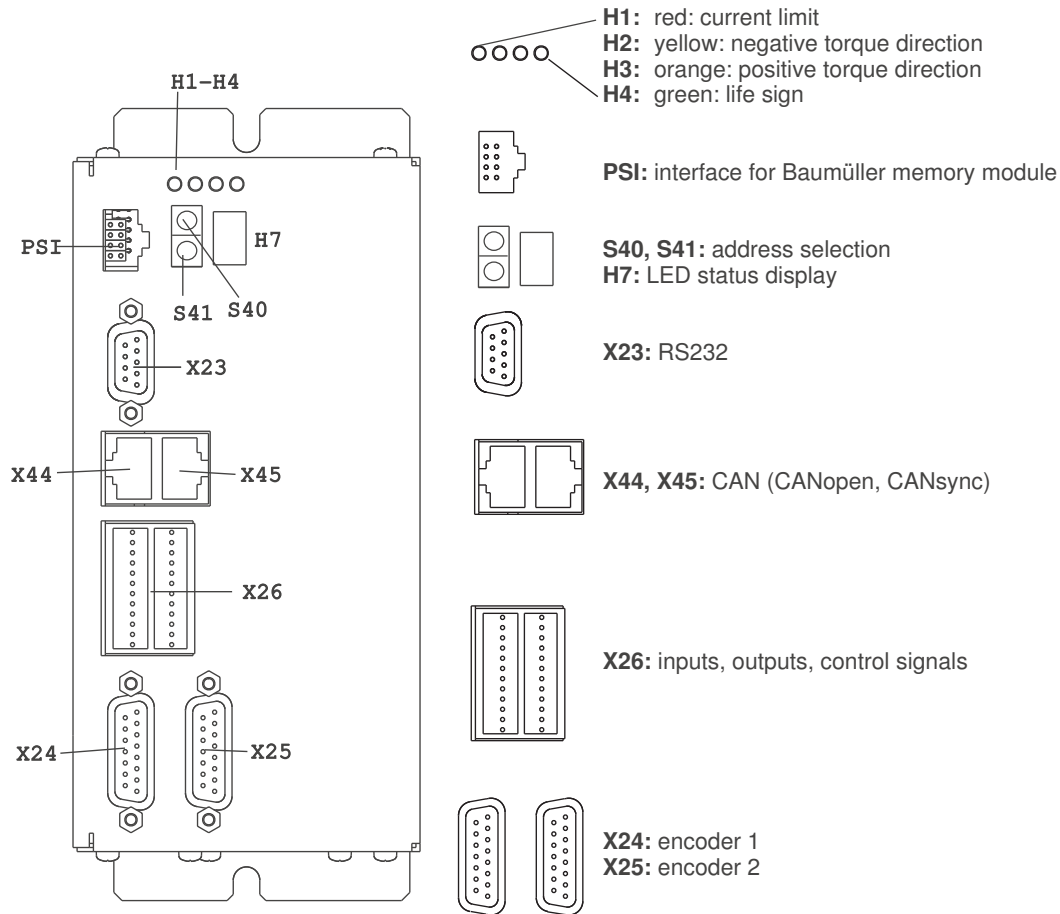


Figure 6.30: connections of the controller board

CAUTION



The following **can occur**, if this safety note is not complied with:

- Damage to property

*The danger is: **Electricity**. Connector assignments, which do not accord to the device connections, can lead to damage on the device or on connected peripherals.*

In the following chapters some pins of connectors are labeled as **Not assigned**. The corresponding counter part **must not be connected**. It can not be assumed, that the corresponding pin is not connected internally. Always use connection cables with connection assignments which exactly accord to the assignments of the device.

6.13.1 Encoder interfaces

The devices of **b maXX® BM3400** series are basically provided with 2 encoder interfaces, which are configured at production and therewith determines the encoder type, which must be connected.

6.13.1.1 Resolver (X24, Coding A)

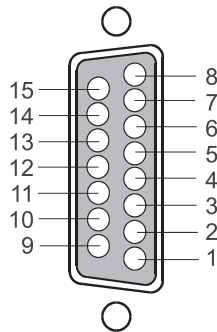


Figure 6.31: Resolver input

Pin no.	Assignment
1	REF -
2	REF +
3	Not assigned
4	Not assigned
5	COS +
6	Not assigned
7	SIN +
8	SIN -
9	COS -
10	Not assigned
11	Not assigned
12	Not assigned
13	Not assigned
14	Motor temperature +
15	Motor temperature -



NOTE

Resolvers are to be used only for motors with maximum ten pole pairs.

6.13.1.2 Sine wave incremental encoder (X24, X25, Coding B)

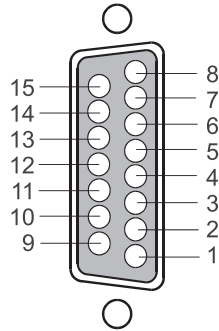


Figure 6.32: Sine wave incremental encoder input

Pin no.	Assignment
1	GND encoder supply
2	+5V encoder supply
3	ZERO +
4	ZERO -
5	COS +
6	Not assigned
7	SIN -
8	SIN +
9	COS -
10	Not assigned
11	Not assigned
12	+5V sense line
13	GND sense line
14	Not assigned
15	Not assigned

NOTE

The function of the encoder input is also then given, if the sense line is not connected. However the operating voltage at the encoder must not imperatively be in the desired tolerance range. Therewith there is not a hazard of the encoder, because independent of the sense cable there is a feedback. A connection of the sense lines preferably closed to the encoder will help to compensate the voltage drop via the cable. If the connection is not possible directly at the encoder, the plug connection should be used, which is closest to the encoder.

As against the encoder module of the **b maXX® BM4400**, for the sine wave incremental encoder a cable according to «encoder connecting cables» from page 96 and not the cable for the EnDat encoder must be used.

6.13.1.3 Hiperface absolute encoder (X24, X25, Coding C)

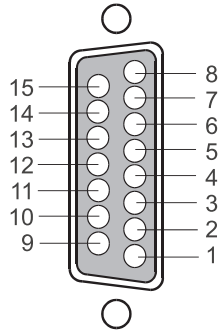


Figure 6.33: HIPERFACE absolut encoder input

Pin no.	Assignment
1	GND encoder supply
2	+8V encoder supply
3	Not assigned
4	Not assigned
5	COS +
6	Not assigned
7	SIN -
8	SIN +
9	COS -
10	Not assigned
11	Not assigned
12	RS485 +
13	Not assigned
14	Not assigned
15	RS485 -

6.13.1.4 Square wave incremental encoder (X24, X25, Coding E)

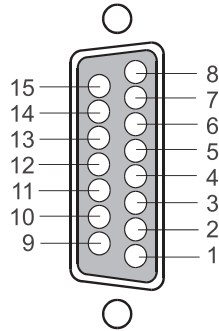


Figure 6.34: Square wave incremental encoder input

Pin no.	Assignment
1	GND encoder supply
2	+5V encoder supply
3	RS422 track + ZERO
4	RS422 track - ZERO
5	RS422 track + B
6	Not assigned
7	RS422 track - A
8	RS422 track + A
9	RS422 track - B
10	Not assigned
11	Not assigned
12	+5V sense line
13	GND sense line
14	Not assigned
15	Not assigned

NOTE



The function of the encoder input is also then given, if the sense line is not connected. However the operating voltage at the encoder must not imperatively be in the desired tolerance range. Therewith there is not a hazard of the encoder, because independent of the sense cable there is a feedback. A connection of the sense lines preferably closed to the encoder will help to compensate the voltage drop via the cable. If the connection is not possible directly at the encoder, the plug connection should be used, which is closest to the encoder.

6.13.1.5 Encoder connecting cables

Encoder connecting cable (or the encoder connection) can be used for the resolver („A“), sine wave incremental encoder („B“), sine wave incremental encoder with HIPERFACE® interface („C“) and square wave incremental encoder („E“). Encoder connecting cable can be obtained as an accessory from Baumüller Nürnberg Electronic GmbH & Co. KG (see «Appendix B - Spare parts and accessories» on page 158). In case the cable is produced self, please use the instructions stated below:

1. Use the following materials:

- Cable: LiYCY 5 x (2 x 0.14) + 2 x 0.5 mm Cu-braid.
- Sub-D connector 15 contacts
- Circular connector: 12 contacts, female (e. g. company Interkonnektron)

2. Apply the cable shield with large surface area onto the circular connector and onto the shielding of the Sub-D-plug.

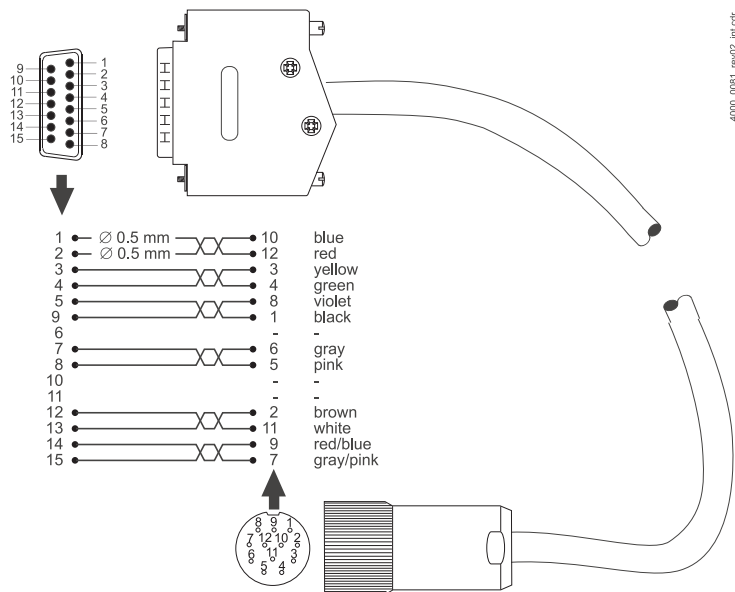


Figure 6.35: Connecting cable for all encoder types



NOTE

The connecting cable must be made according to figure 6.35! With another assignment of the pins the cable is not able to function and defects can occur at the controller as well as at the encoder!

6.13.2 Digital inputs and outputs

The digital in- and outputs are opto-isolated. The supply voltage must externally be provided (24V). In the device the ground of the digital inputs is **not** connected to earth of the supply voltage and must be separately connected.

The following figures show the principle schematic diagram.

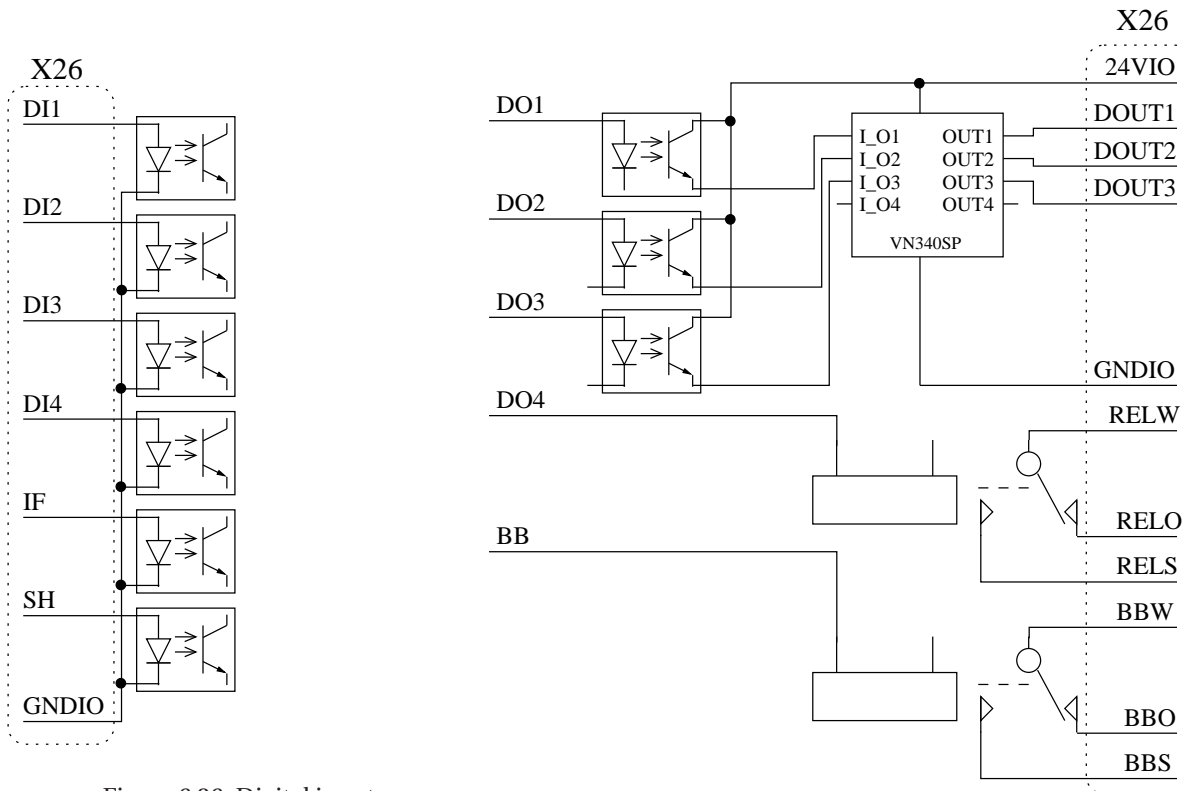


Figure 6.36: Digital inputs

Figure 6.37: Digital outputs

The assignment of the digital in- and outputs at X26 can be seen in the following table.

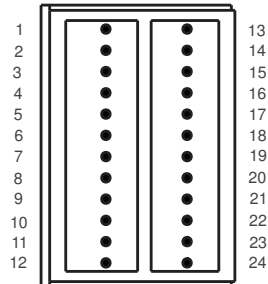


Figure 6.38: Plug-in connector X26

Pin-no.	Connection	Meaning	Limit values
5	24VIO	24V-Supply for digital I/O (PELV/SELV)	
6	DIN1	Digital input 1 (PELV/SELV)	$I_{IN} = 2\text{mA}$
7	DIN2	Digital input 2 (PELV/SELV)	$I_{IN} = 2\text{mA}$
8	DIN3	Digital input 3 (PELV/SELV)	$I_{IN} = 2\text{mA}$
9	DIN4	Digital input 4 (PELV/SELV)	$I_{IN} = 2\text{mA}$
10	SH	Quickstop input (PELV/SELV)	$I_{IN} = 2\text{mA}$
11	IF	Pulse enable input (PELV/SELV)	$I_{IN} = 2\text{mA}$
12	GNDIO	GND for digital I/O (PELV/SELV)	
16	DOUT1	Digital output 1 (PELV/SELV)	$I_a = 0.6\text{A}$
17	DOUT2	Digital output 2 (PELV/SELV)	$I_a = 0.6\text{A}$
18	DOUT3	Digital output 3 (PELV/SELV)	$I_a = 0.6\text{A}$
19	RELS	Relay output, NO contact (PELV/SELV)	60V / 1A
20	RELW	Relay output, center (PELV/SELV)	60V / 1A
21	RELO	Relay output, NC contact (PELV/SELV)	60V / 1A
22	BBO	Ready for use relay output, NC contact (PELV/SELV)	60V / 1A
23	BBS	Ready for use relay output, NO contact (PELV/SELV)	60V / 1A
24	BBW	Ready for use relay output, center (PELV/SELV)	60V / 1A

6.13.3 Analog inputs and outputs

The pin assignment of the analog in- and outputs at X26 is shown in the following table.

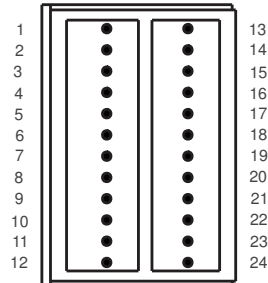


Figure 6.39: Plug-in connector X26

Pin-no.	Connection	Meaning	Limit values
1	AOUT1	Analog output 1 (PELV/SELV)	$I_a = 10\text{mA}$
2	AGND	GND for analog I/O (PELV/SELV)	
3	AOUT2	Analog output 2 (PELV/SELV)	$I_a = 10\text{mA}$
4	REF+	Reference output +10V (PELV/SELV)	$I_a = 10\text{mA}$
13	AIN+	Analog difference input + (PELV/SELV)	$\pm 10\text{V}$
14	AIN-	Analog difference input - (PELV/SELV)	$\pm 10\text{V}$
15	REF-	Reference output -10V (PELV/SELV)	$I_a = 10\text{mA}$

NOTE



For connecting analog inputs and outputs you must absolutely use **shielded cables** with two-sided applying of the screen to PE.

At an improper or missing screening you may reckon, that there will be great EMC problems!

The following figures show some examples how to connect the analog input. While selecting the potentiometer pay attention to the maximum load of the reference voltage output (10mA) and to the input impedance of the analog input (3,5kOhm).

- Providing an analog set value by a control.
 U_{SET} may have values between +10V and -10V related to GND.

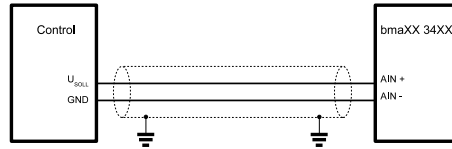


Figure 6.40: Variable voltage from a control at the analog input

- Providing analog set values using a potentiometer and both reference voltages.
 By connecting the potentiometer between REF+ and REF-, voltages in the Range of -10V (REF-) and +10V (REF+) related to AGND can be adjusted at the analog input.

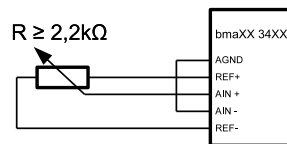


Figure 6.41: Variable voltage from reference voltages at the analog input

- Providing analog set values using a potentiometer and the positive reference voltage.
 By connecting the potentiometer between AGND and REF+, voltages in the Range of 0V (AGND) and +10V (REF+) related to AGND can be adjusted at the analog input.

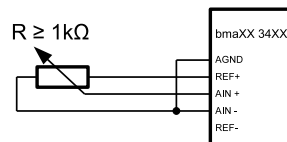


Figure 6.42: Variable voltage from positive reference voltage at the analog input

- Providing analog set values using a potentiometer and the negative reference voltage.
 By connecting the potentiometer between REF- and AGND, voltages in the Range of -10V (REF-) and 0V (AGND) related to AGND can be adjusted at the analog input.

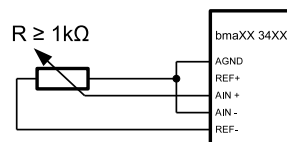


Figure 6.43: Variable voltage from negative reference voltage at the analog input

6.13.4 Communication interface RS232

The front-sided sub-D-socket X23 has the following pin assignment

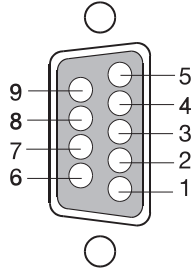


Figure 6.44: Communication connection RS232

Pin no.	Assignment
1	Not assigned
2	TxD
3	RxD
4	Not assigned
5	GND
6	Not assigned
7	RTS
8	CTS
9	Not assigned ¹⁾

¹⁾ At Devices which were delivered until 03/2007, pin 9 of the socket is connected to the +5V supply of the RS232 interface.



NOTE

Use a regular serial connecting cable from the computing equipment shop or a 1:1 connected shielded cable to connect the PC or notebook. Regard, that there are no output signals (especially pin 9), which are short-circuited by deviating pin assignments at wiring the cable.

6.13.5 Fieldbus interface CAN

The front-sided double RJ45 connector X45 has the following assignment

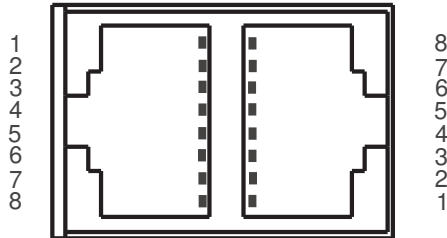


Figure 6.45: Communication connection CAN

Pin no.	Assignment
1	CAN - H
2	CAN - L
3	GND
4	SYNC +
5	SYNC -
6	Not assigned
7	GND
8	Not assigned

The hex-switches S40 and S41 are used to assign node number and baudrate. Both switches provide an 8-bit information, from which 7 bits represent the node number and the MSB for switchover between 125 kBit/s and 500kBit/s is used. The node number results from a (3-bit-)value from S40 * 16 + value of S41.

The following table shows a few configuring examples.

S40	S41	Address	Baudrate
0	1	1	125kBit/s
8	1	1	500kBit/s
7	F	127	125kBit/s
F	F	127	500kBit/s



NOTE

According to the transmission line theory both ends of the bus have to be terminated. For this the CAN terminating resistors in «Appendix B - Spare parts and accessories» on page 157 can be used.

6.13.6 Incremental encoder emulation (optional extender board)

The incremental encoder emulation is based on a PCB option, which allocates the only extension slot of the **b maXX® BM3400** device.

The front-sided sub-D-connector (X27), which is assembled at a device with an integrated incremental encoder emulation to the right of the RS232-connector (X23), has the following pin assignment:

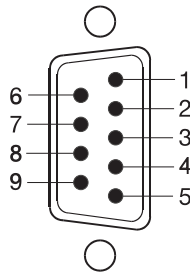


Figure 6.46: Incremental encoder emulation output

Pin no.	Assignment
1	GND encoder supply
2	+5V encoder supply
3	RS422 track + ZERO
4	RS422 track - ZERO
5	RS422 track + B
6	Not assigned
7	RS422 track - A
8	RS422 track + A
9	RS422 track - B

6.13.6.1 Connecting cable for incremental encoder emulation

The connecting cables you must produce yourself.

- Use the following materials:
 - Cable: LiYCY 5 x (2 x 0.14) + 2 x 0.5 mm Cu-braid.
 - Sub-D socket 9 contacts, (connection incremental encoder emulation)
 - Plug-in connector or other connection accordant to encoder input of the target device
- Connect
 - the cable shield plane with the housing of the sub-D-socket
 - the socket (9 contacts) with the cable according to the specifications in paragraph «Incremental encoder emulation (optional extender board)» on page 103. Thereby consider, that the twisted in pairs lines are used for track signals belonging together (+ZERO and -ZERO, +A and -A as well as +B and -B).
- Connect the other end of the cable with the suitable connection or plug-in connector, which fits to the target device. If **b maXX® BM3400** shall be the target device, the assignment is found under «Square wave incremental encoder (X24, X25, coding E)» from page 95.

For the signals „+5V sense line“ and „GND sense line“ within the 9 contacts of the sub-D-plug there are no free pins. In order to adjust the voltage drop via long encoder connecting cables, „+5V sense line“ must be connected to pin 2 and „GND sense line“ to pin 1 of the 9-pole sub-D-socket.

6.13.7 EtherCAT-Slave (optional extender board)

The EtherCAT slave module is based on a PCB option, which allocates the only extension slot of the **b maXX® BM3400** device. With installed EtherCAT slave module the CAN interface is dropped.

The front-sided double RJ45-connector (X1, X2), which is assembled at a device with an integrated EtherCAT slave module to the right of the RS232-connector (X23), has the following connectors and displays:

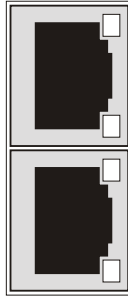


Figure 6.47: EtherCAT connectors

Designation / Meaning	LED colour
Link / Act1 - LED	green
X1 EtherCAT - output	-
RUN - LED	green
Link / Act2 - LED	green
X2 EtherCAT - input	-
ERROR - LED	red

The hex-switches S40 and S41 are used to assign an IP address. Base address is given as 192.168.1.1. The value of S40 provides the High-nibble (upper 4 bit) and the value of S41 provides the Low-nibble (lower 4 bit) of an offset to the base address. The following table shows some examples for various switch positions and resulting IP addresses.

S40	S41	Address
0	0	192.168.1.1
0	1	192.168.1.2
0	2	192.168.1.3
1	0	192.168.1.17
2	0	192.168.1.33
3	3	192.168.1.52
F	F	192.168.1.256

4 LEDs (Link / Act1, Link / Act2, RUN und ERROR) integrated into the connectors are used to display the status of the EtherCAT module.

- Link / Act1 (green)

Display	Meaning
Off	No link at X1
On	Link at X1
Blinking	Data transfer via X1 (Activity)

- Link / Act2 (green)

Display	Meaning
Off	No link at X2
On	Link at X2
Blinking	Data transfer via X2 (Activity)

- RUN (green) / ERROR (red) Status of the state machine and error display

RUN-LED	ERROR-LED	Meaning
X	On	ERROR
Blinking On / Off	Blinking Off / On	INIT
200ms On / 1s Off	Off	PRE-OPERATIONAL
500ms On / 500ms Off	Off	SAVE-OPERATIONAL
On	Off	OPERATIONAL

Further error messages can be displayed using the service tool software.

For this the CAN terminating resistors in «Appendix B - Spare parts and accessories» on page 157 can be used.

For cabling within the switching cabinet the cables described under «Appendix B - Spare parts and accessories» at page 159 can be used.

6.14 Circuit of the chopper transistor

The **b maXX® BM3400** devices have a chopper transistor, which is based on the following image.

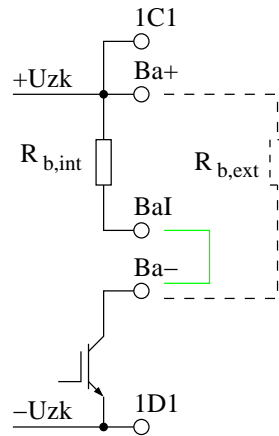


Figure 6.48: Chopper transistor

The activation of the internal chopper resistor (option) or of a connection to an external chopper resistor is made via the connections BA-, BaI and 1C1.

In order to activate the chopper resistor, a wire link between Ba- and BaI is to be connected. At devices according to type key V1 with internal chopper resistor the bridge is already integrated. In this case the internal chopper resistor and the chopper resistor monitoring cannot be deactivated.

The external chopper resistor must be connected between BA- and BA+.

At devices according to type key V2 chopper resistor monitoring is only active, if the internal chopper resistor was activated with a bridge. At response of chopper resistor monitoring an error is released independent of a possibly connected external chopper resistor.



NOTE

The chopper resistor monitoring is activated at recognition of a current flow by the internal chopper resistor and remains active, as long as the 24V-supply is switched on. In case the chopper resistor monitoring shall be deactivated after a changing over to an external chopper resistor, then the 24V-supply must be switched off and the resetting must be operated without the bridge, which was mentioned above.

6.15 Safety relay (option)

The following figure schematically shows the function Safe stop, which is actuated at use of safety relay.

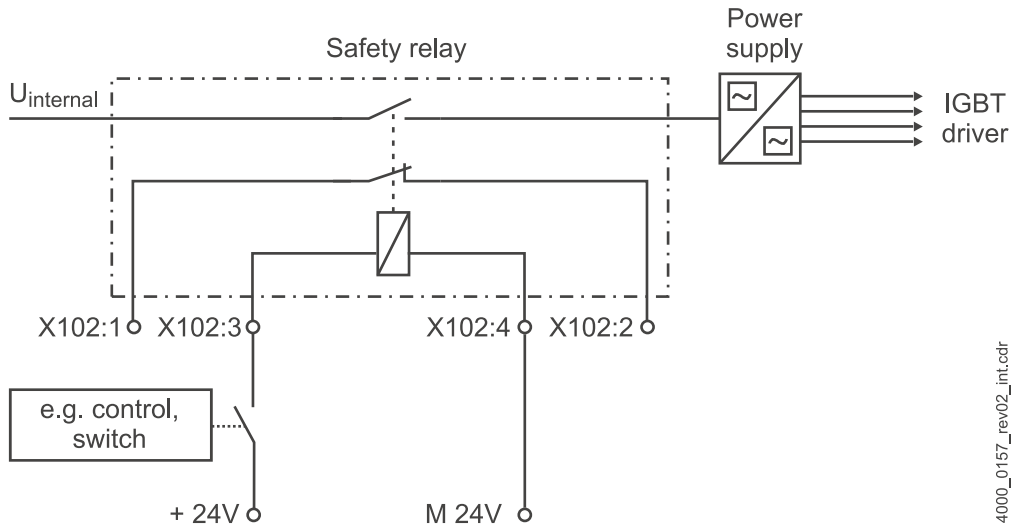


Figure 6.49: Schematic sketch safety relay

WARNING



The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **mechanical influence** because of fail of the safety relay*

Provide that the minimum load of the contacts X102-1 and X102-2 does not fall below during operation. Operate the safety relay within the specification (see «Appendix D - Technical data» from page 178).

The diagram exemplary shows the usage and cabling of a Baumüller converter of the series **b maXX® BM3400** as part of a machine tool, at which the safe access to work pieces at an opened protective cover is assured.

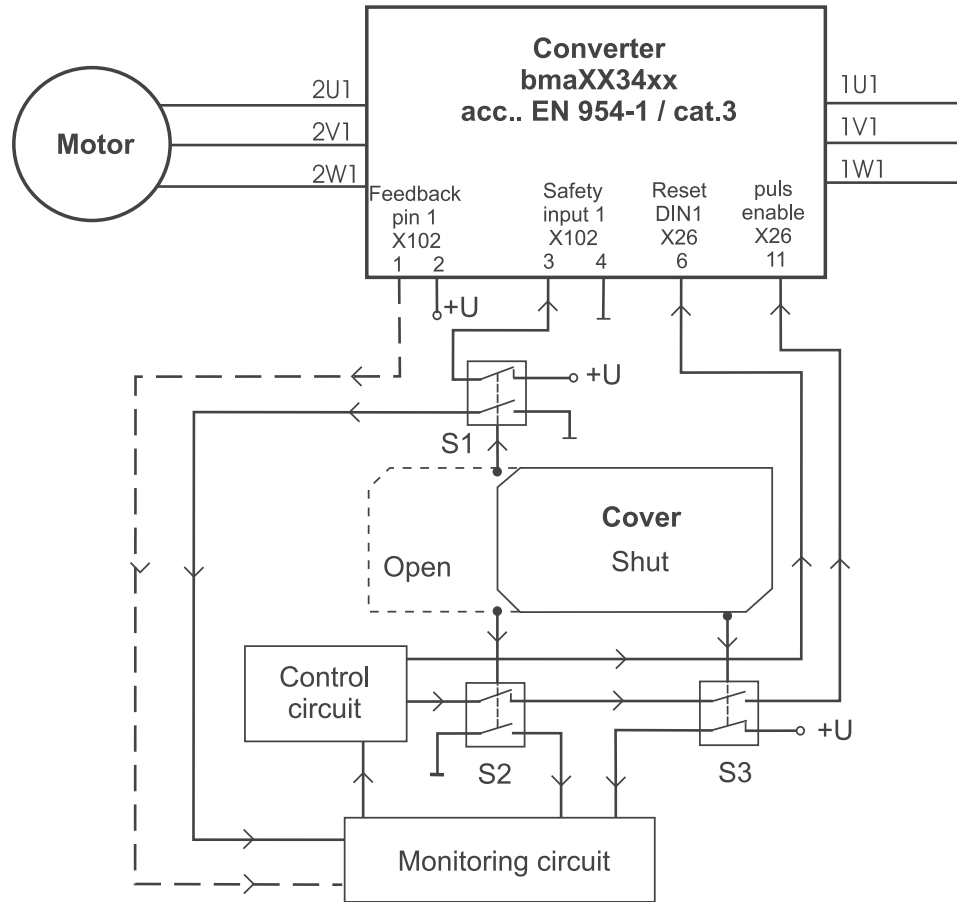


Figure 6.50: Version with a safety relay

The accordance with the use to the EN954-1 acc. to category 3 must be made by the machine engineer and must be confirmed by an authorized certification organization.

The switch-off of the electrical drive motor operates dual-ported.

- S2 (NC) and S3 (NO) have hardware effects on the pulse enable input of the converter (X26:11). Only if S2 and S3 have a closed cover (therewith a safe state), there is voltage at the pulse enable of the converter.
- S1 (NC) has hardware effects on the safety relay of the converter of the converter (X102:3.4). Only if S1 shows a closed cover (and therewith a safe state), there is voltage at the safety relay input (X102:3.4) and therewith makes a torque generation at the shaft of the motor possible. The NO contact of S1 is connected to a monitoring circuit.
- The monitoring circuit is a error-safe monitoring control of category 3 (EN 954-1), checks the directly connected switching contacts of S1 (NO), S2 (NO) and S3 (NC) on its own. If the cover is not completely shut or there is a theoretical impossible state of the positioning switch contacts (e.g. S1 and S2 show a different switch state or S2 and S3 show the same switch state), then the control circuit does not receive an enable signal from the monitoring circuit. A missing release signal of the monitoring equipment leads to a immediate switch-off of the converter with the help of the control circuit. If the monitoring circuit has detected an error (e.g. different switch state of S1 and S2), the machine engineer will be informed about this and the commissioning of the drive is impossible until the error was repaired.
- The status signal contact of the safety relay (X102:1,2 NC) can be additionally evaluated by the monitoring circuit (this is not imperative).
- The positioning switches which are used must have imperatively operated and mechanically connected contacts as well as a two-channel-connection (NC-/NO contact). The mechanical operation at the safety device must take place imperatively, that means tamper-resistant.

The connection cables between the safety relay input (X102:3.4) and of the control as well as between the pulse enable input at the converter (X26: 11) and the control may not be installed together outside of the switching cabinet in one cable channel.

6.16 Connection data for the terminals

- **Mains**

Device	max. Cable- \varnothing	Connection technology
BM340X BM341X	2,5mm ²	Screw connection, provided connectors
BM446X	16mm ²	Screw connection, provided connectors

- **1C1 and 1D1¹⁾, Ba+ und Ba-¹⁾²⁾**

Device	max. Cable- \varnothing	Connection technology
BM340X BM341X	2,5mm ²	Screw connection, provided connectors
BM446X	16mm ²	Screw connection, provided connectors

¹⁾not short-circuit proof

²⁾Consider maximum load! See chopper resistor external at «Appendix-D Technical data» from page 179.

The load capacity of connections is found in «Appendix D - Technical data» from page 179 under connected load DC-link or motor power type at 4kHz. The device is able to brake this power constantly.

- **Motor**

Device	max. Cable- \varnothing	Connection technology
BM340X BM341X	2,5mm ²	Screw connection, provided connectors
BM446X	16mm ²	Screw connection, provided connectors

The connection load is automatically limited by the device.



Operation

In this chapter is described, how the device works during operation and how you handle the device during operation.

7.1 Safety instructions

- Please regard to the information in chapter «Fundamental safety instructions» from page 13.



CAUTION

The following **can occur**, if the safety instruction is not complied with:

- Damage to property

*The danger is: **environmental conditions, which do not refer to the demands.***

Assure, that the environmental conditions are referred to during operation.

**WARNING**

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death



*The danger is: **electricity**. The switching cabinet, in which the device is built in, shall protect against contacts with parts, which are under voltage.*

Assure, that during operation all doors and covers of the switching cabinet are shut.

7.2 Requirements to the executing personnel

**WARNING**

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death



*The danger is: **electricity**. When operating with this electrical device, inevitably certain parts of this device are under dangerous voltage.*

Assure, that only qualified personnel work on this unit.

At each case qualified personnel are persons, who are authorized by the responsible persons, to execute necessary actions and who recognize the possible dangers and who are able to avoid these dangers. They have had the training, the experience, they were given instructions as well as knowledge about the relevant standards and instructions, they have knowledge of the accident prevention regulations and of the operating environments. The required qualifications for the work with this unit are for example:

- Education or instruction or to have the authorization to put into operation, ground and label circuits and devices according to the standards of safety engineering.
- Training or instruction due to the standards of the safety engineering in maintenance and use of appropriate safety equipment.

7.3 Operating concept

After the device has been taken into operation, parametrization of the device takes place (adjusted to the application). After completion of parameterization the settings must be saved in one or several data sets.

According to requirements of application the device now can manually be operated or with the help of a superordinated control system.

At manual operation, you use e.g. switches or actuators at the operating control desk, in order to activate release signals (see «Enable signals» on page 113) and to control digital or analog inputs, which bring the **b maXX® BM3400** into the desired operation status.

For even more complex drive solutions or applications, which e.g. require quick changes of signals during operation, a superordinated control system can be used. This can take over the control of the release signals as well as digital and analog inputs, but using the communication interface or a field bus system like CAN, there are much more possibilities and visualization capabilities.

The operating software WinBASS II is not necessary during operation. It helps the service engineer to search for error causes.

7.3.1 Enable signals

These signals must have a signal level of 24V (DC) and have to be provided in a connected status at the terminals X26-4 and X26-5 (see «Digital in- and outputs» from page 97). During operation the signals pulse enable and quickstop continuously must be valid, to ensure that the device supplies power.

Pulse enable	Switching off the pulse enable signal causes the control of the drive to be disconnected immediately. Mechanical residual energy can lead the drive to come to stand still slowly.
Quickstop	Switching off of the quickstop signal causes the device to stop the drive with active control in the quickest possible way.

7.4 Switch-on frequency

Switch-on frequency is accordant to the time between two consecutive switch-ON operations. This time interval may not be selected arbitrarily, because each switch-ON operation is combined with a thermic load of the precharge resistors.

The purpose of the precharge resistors is to limit power on current when connecting in mains voltage. Due to space limitation, NTC resistors are used, packaging temperature of which increases during the precharge of the DC link electrolytic capacitors. If the DC link voltage has exceeded an adjustable threshold, the resistors are short connected by the precharge relay and can cool down again to environmental temperature.



NOTE

Between two consecutive switch-on events there have to be passed at least three minutes. If time to cool down is shorter than necessary (about 100s), this can result in a thermic overload and destruction of the precharging resistors.

The time between switching off the device and switching it on again is irrelevant in this context, if the time the device lasts in switched-on state is greater than three minutes.

Due to different valid supply voltages at the **b maXX® BM3400** the threshold for the ending of precharge can be set via a parameter in opposition to the **b maXX® BM4400**. If the voltage value was selected small enough, you can avoid, that the precharge circuit can be activated again.



CAUTION

The following **can occur**, if you disregard this warning instruction:

- Damage to property

*The danger is: **electricity**. If the threshold voltage you have assigned is too small, the precharging circuit can be set ineffective.*

- Change the default values of 75% of the supply voltage only in well-founded situations.
- Consider that a threshold value, which is too small causes a great starting current, which can cause damages at the installation (fuse) as well as at the device (input rectifier).

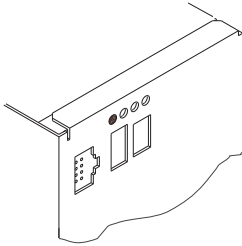
**NOTE**

If you count on short mains failures, the reducing of the switching threshold does not make sense. Instead of that the mains failure reaction delay should be activated via the parameter 486 (AmpNetFailReactDelay). A mains failure effectuates a transition of the controller into status 1 and an activation of the precharge circuit without the output of an error message. A mains error only then is released if the failure time does not exceed the delay time.

7.5 Display elements - LED

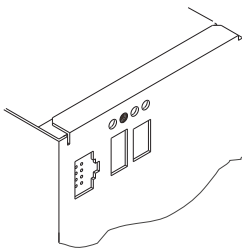
On the front of the device there are 4 LEDs. Within the operating software WinBASSII they are emulated and therewith also can be displayed on a monitor.

7.5.1 Current limit (H1)



The left red LED (H1) shows, if the device is working at the current limit.

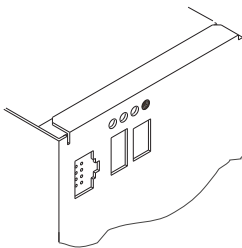
7.5.2 Operating condition (H2, H3)



The LEDs in the middle (H2 and H3) show the torque direction.

- H2 (yellow): negative torque direction
- H3 (orange): positive torque direction

7.5.3 Life sign (H4)



- If the controller is ready-to-operate, the right, green LED (H4) blinks every one second.
- If data sets are read or written (EEPROM accesses), the green LED is blinking with a higher frequency.

7.6 Safety relay (option)

The function of the safety relay is based on the closed-circuit principle. The safety function „Safe stop“ is active, as long as there is no voltage at the input terminals (X102-3/4). Consequently the operation of the safety function is also guaranteed, if there is power failure. In order to deactivate the function „Safe stop“ there must be a voltage of 24V at the terminals (X102-3/4), which are concerned.

For the external error monitoring of the safety relay, the instantaneous control state can be interrogated at its positively driven status signal contacts (X102:1/2). If there is no voltage at the safety relay (X102-3/4), i.e. during the „Safe stop“, then the status signal contacts are closed (NC contact). Also a cable breakage therefore can be recognized as an error.

If the voltage at the input terminals of the relay (X102:3/4) is switched off, the converter either generates the error message „Power unit warning 20: undervoltage safety relay“ or the message „Power unit error 87: error safety relay“. At inhibited pulse enable a warning message is generated and at pulse enable a fault message or error message is generated. A commissioning or enable of the drive is only then possible, if there is no error present. This error memory can e.g. be reset via the digital input X26/6. For this, the input must accordingly be configured. The switch-on pulse length must be at least 5ms.

7.7 Monitorings

During operation there is a steady monitoring for deviations from the normal conditions, at which warnings or error messages are generated if they occur.

Warning If the controller detects an operating status, where an error state preceded, but which has not reached the error limit yet, an according warning text is shown in WinBASS II. The device also shows the most important warning „Current limit reached“ via the LED H1 (see «Current limit (H1)» on page [116](#)).

Error message If the controller detects the exceeding of error limits, an according error text in WinBASS II or the error code via the 7-segment-display of the device is shown. Errors, which result in a shut down of the drive, are signaled via a F, other errors are signaled by a blinking decimal point. The error information begins with a F followed by the error number according to the listing under «Trouble shooting» from page [127](#).

7.8 Error memory

The **b maXX® BM3400** has an internal error memory (in the EEPROM), which contains the following information at a 1s-cycle:

- Error
- Activation of warnings
- Deleting of warnings
- Number of boot procedures
- Active system time
- Time in status ≥ 0 (how long was the controller connected to 24V)
- Time in status 4 (operating hours counter of the power unit)

Furthermore for all error- and warning events the following information is saved:

- Boot count
- PU operation time at occurrence of the event (P2034, P2033)
- Duration in active state at occurrence of the event (P2035, P2033)

At some events additional information is saved (e.g. at error 1 or error 40).

In WinBASS II there is a separate page to play with the error memory .

7.9 Maintenance

Maintenance is first of all the monitoring of the environmental conditions. At accordant planning of your installation the monitoring of the environmental conditions can be carried out during operation and no interrupt for maintenance is necessary. Further information is found under «Maintenance» from page [141](#).



Error detection and trouble shooting

In this chapter the error messages of the device are described: Error- and warning messages, their meanings and how you can react.

8.1 Safety instructions

- Regard to «Fundamental safety instructions» from page 13.

8.2 Requierements to the executing personnel

The personnel, who works with the **b maXX® BM3400** device, must be introduced in the safety instructions and in the operation of the device and must be familiar with the accurate operating of the device. Especially the reaction to error display and error status requires special knowledge, which the operator must have.

8.3 Monitoring functions

A survey of the most important monitoring functions and of the monitoring functions generated warning-/error messages are found in the table below. How to detect errors is explained in «Error detection» from page 123.

Monitoring function	Warning / Error	Warning	Error	Threshold adjustable	Reaction adjustable	Reaction	Setting of limit in parameters	Activation by parameter
Overcurrent	Overcurrent motor SW ⁶⁾	—	X	—	—	PI	P0358	—
	Overcurrent hardware	—	X	—	—	PI	—	—
DC link	DC link overvoltage	—	X	—	—	PI	—	—
	DC link undervoltage ⁴⁾	—	X	X	X	—	P1242	P297
Temperature heat sink	Shutdown threshold exceeded	—	X	—	—	PI	P0019	—
Temperature controller PCB	Threshold 1 exceeded ²⁾	X	—	X	—	—	P0016	—
	Shutdown threshold exceeded	—	X	—	—	PI	P0017	—
I ² t-Model	I ² t-overload ⁷⁾	—	X	—	—	PI	P0073	P0073
	I ² t-threshold exceeded ⁸⁾	X	—	—	—	—	P0092	P0073
Temperature motor KTY84	Threshold 1 exceeded ¹⁾	X	—	X	—	—	P0088	P0093
	Threshold 2 exceeded ¹⁾	X	—	X	—	—	P0089	P0093
	Short circuit sensor or Temp. < -30°C	—	X	—	—	—	—	P0093
	Sensor not connected or Temp. > 260°C	—	X	—	—	—	—	P0093
Position controller	Maximum temperature exceeded ¹⁾	—	X	X	—	PI	P0090	P0093
	Position deviation dynamic	—	X	X	—	SH	P1054	P1050
Encoder 1	Position deviation static	—	X	X	—	SH	P1055	P1050
	Cable break	—	X	—	—	PI	—	—
Encoder 2	Cable break (sin ² + cos ²)	—	X	—	—	PI	—	—
	Overspeed	—	X	X	—	PI	P1072	—
	Cable break	—	X	—	—	PI	—	—
Encoder 2	Cable break (sin ² + cos ²)	—	X	—	—	PI	—	—
	Overspeed	—	X	X	—	PI	P1082	—

Monitoring function	Warning / Error	Warning	Error	Threshold adjustable	Reaction adjustable	Reaction	Setting of limit in parameters	Activation by parameter
Safety relay	Safety relay faulty ³⁾	X	X	—	—	—	—	—
Block monitoring	Drive blocked ⁵⁾	—	X	X	—	PI	P1260	—

SH: Quickstop

PI: Pulse inhibit

X: Implemented

—: not possible

¹⁾ only when using the KTY sensor

²⁾ Warning error text in WinBASS: Printed circuit board temperature > Threshold value

³⁾ Warning error text in WinBASS: Safety relay undervoltage

⁴⁾ Warning error text in WinBASS: PSU-Error 64: Undervoltage U DC link

⁵⁾ Pulse inhibit occurs according to the duration, which was set

⁶⁾ Warning error text in WinBASS: Unknown error 79

⁷⁾ Warning error text in WinBASS: Motor error: I²t-overload

⁸⁾ Warning error text in WinBASS: Motor warning: I²t-threshold exceeded

8.3.1 Monitoring functions - explanations

Overcurrent HW	This monitoring function checks, if the motor current exceeds the output peak current amplitude by more than 30%.
DC link	This monitoring function checks the voltage in the DC link. In case the voltage drops below an adjusted limit value, the error „DC link undervoltage“ is displayed by the controller. In case the voltage exceeds an adjusted value, the error „DC link overvoltage“ is signaled from the controller and there is an immediate pulse inhibit.
Temperature of controller PCB	This monitoring function checks the temperature of the controller PCB. There is a distinction between warning and error thresholds. When exceeding the warning threshold (but falling below the error threshold) a warning is displayed only. When exceeding the error threshold besides the error message there is also an immediate pulse inhibit released.
Temperature heat sink	This monitoring function checks the temperature of the heat sink. If the error threshold is exceeded, an error message is displayed and pulse inhibit is activated immediately.
Temperature motor	This monitoring function checks the temperature of the motor. <ul style="list-style-type: none"> • If the I^2t-threshold is exceeded, the warning „I^2t-threshold“ is displayed by the controller. • If the I^2t-value is exceeded by 100%, the error „I^2t-overload“ is displayed by the controller. • If the temperature threshold 1 is exceeded the warning „temperature threshold 1 exceeded“ is displayed by the controller. • If the temperature threshold 2 is exceeded the warning „temperature threshold 2 exceeded“ is displayed by the controller. • The smallest value the PTC-sensor (KTY84) can provide is -30°C. In case this temperature is exceeded or a short-circuit occurs at the sensor, the error „Short-circuit temperature sensor“ is displayed. • The highest value the PTC-sensor (KTY84) can provide is $+260^{\circ}\text{C}$. If this temperature is exceeded or the sensor is not connected, the error „Temperature sensor not connected“ is signaled by the controller.
Position controller	This monitoring function checks the statical/dynamical position deviation limit. In case the statical/dynamical position deviation error is greater than the adjusted position deviation error limit, there is an error message „position deviation error statical“ or „position deviation error dynamical“. After monitoring time (position deviation time), additionally an error message is displayed and there is an immediate pulse inhibit.

Blocking monitoring

This monitoring function checks motor speed and motor current. If, within the blocking monitoring time motor stop is recognized (motor speed = 0) and operation is detected at the current limit, then the error/warning „Drive blocked“ is signaled by the controller and there is an immediate pulse inhibit.

8.4 Error detection

Below the different errors and the consequential error messages are explained. The errors can either originate from mechanical or from electrical causes. The devices of the series **b maXX® BM3400** signal an error status via the 7-segment-display. The reason and the content of the error message must be determined with the help of the error list in this manual or via the operating software WinBASS II.

- Start the operating program WinBASS II, if it isn't running yet.

NOTE

In order to work with WinBASS II, the software version of the controller and the WinBASS II version must match.

In case the software version of the controller and the WinBASS II version don't match, you will receive the following message:



Figure 8.1: Version warning

Operating in this state is not possible. Break up your work and contact Baumüller in order to receive the right version.

The error message signaled with „Error“ you will find in WinBASS II as follows:

- Open a list in the project tree by clicking on the + in front of Management.

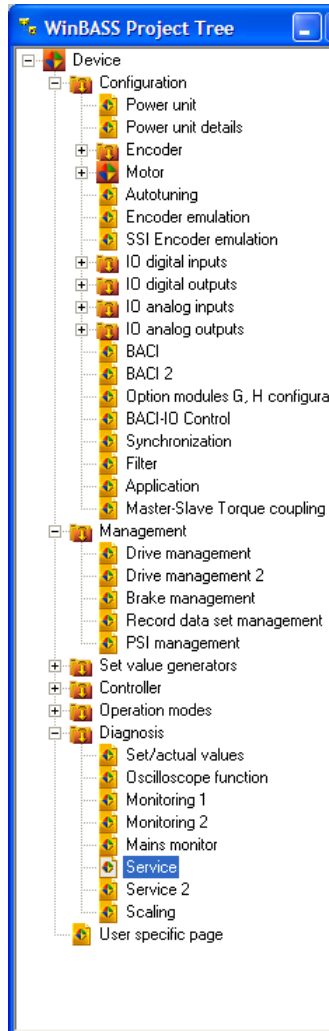


Figure 8.2: Project tree in WinBASS II

- Select from the list „Drive management“.

In the figure below you see a „Drive manager“ window with several exemplary warnings and error messages. The messages in this window demonstrate an internal list, before the communication between controller and pc/laptop with WinBASSII begins, which is arranged according to the error numbers. After take-up of communication the newly occurring messages are added onto the end of the list.

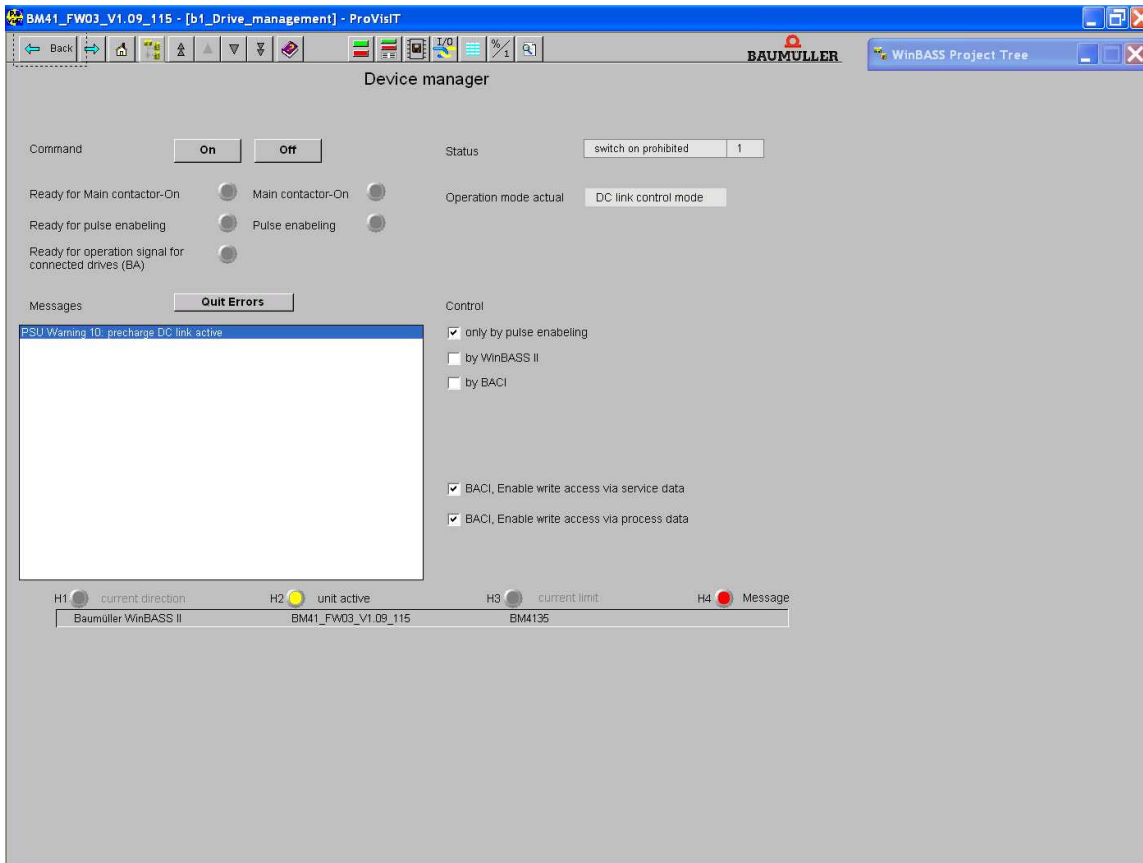


Figure 8.3: Drive manager with error messages

For the error treatment with superimposed control it is important, that the error messages in the system is hierarchically structured (see «Structure of the error list - survey of the error parameter names» from page 126). An error message can result from a beneath in the hierarchic arranged error message. This is why the message SysError1 (level 1) can base on an error, which e. g. occured in ModuleError (level 2), because in the FunctionModule1 (level 3, e. g. Sincos encoder module) a defect has occured. This is why you always have to track an error to the lowest level, in order to detect/remove it.

8.4.1 Structure of the error list - Survey of the error parameters

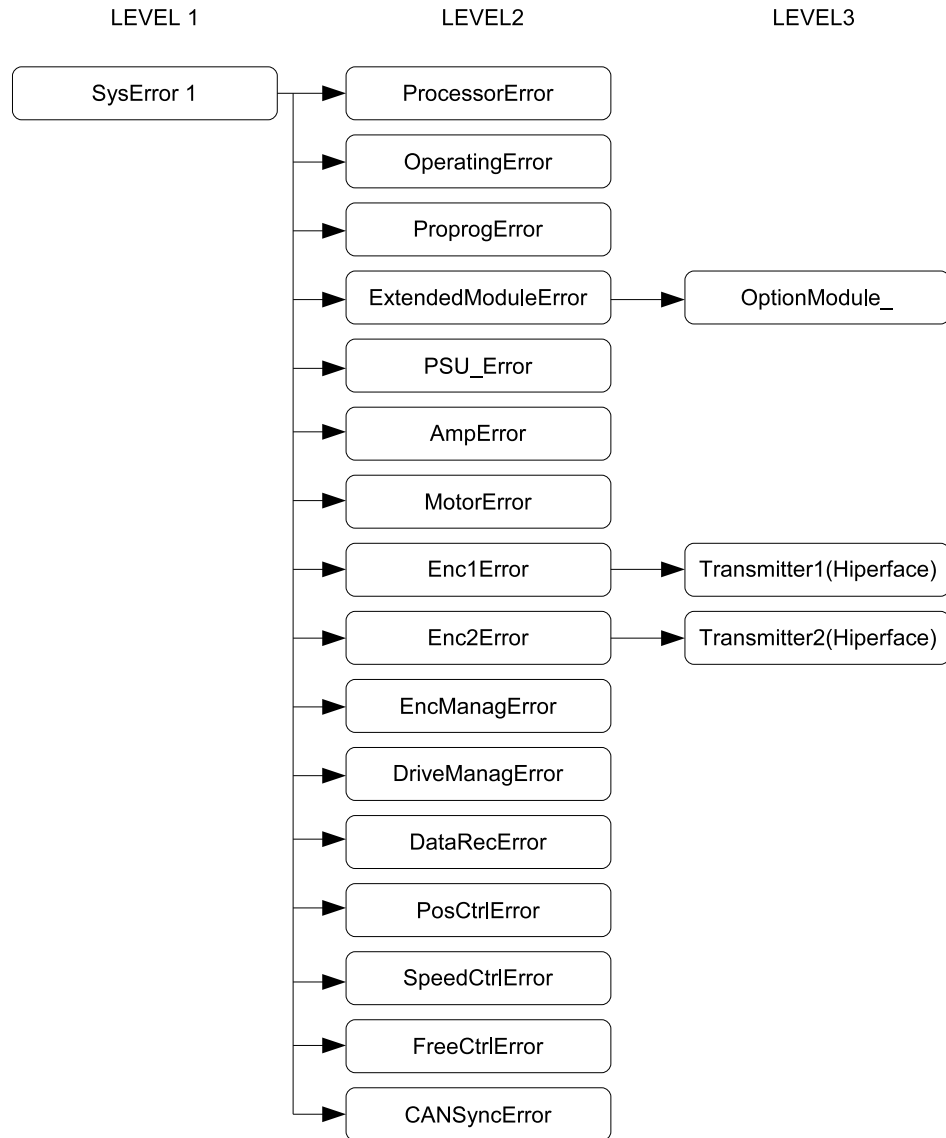


Figure 8.4: Structure of the error list - survey

8.5 Trouble shooting

The base of error treatment in the **b maXX® BM3400** devices are the error messages (see «Error parameters - Error messages (error list) - Error reactions» from page 138). If there is a fault, additionally to displaying the error code an according precise error message in WinBASS II is displayed in the menu Drive manager. The meaning of this message can be looked up in the error list.



NOTE

The device is delivered with predefined error reactions, which can be changed at some errors (marked in the table). Due to safety reasons errors, which have to have an immediate pulse inhibit as a consequence are excluded from this possibility to change reactions.

8.5.1 Reset errors

An existent error message can be reset in WinBASS II. At error reset all error messages, which can be reset under the current error conditions are reset. An individual error reset is not possible.

There are four methods to reset errors:

- Use the WinBASS II button „Reset errors“ (either in the dialog box „drive manager“ or on page „drive manager“).
- Enter in the control word parameter P0300 „BM-w-Control word“ with the value (decimal) 128. This can be made via the parameter list in WinBASS II as well as via field bus.
- If, under device management, the parameter P1001 „BM-w-Ds0-CommSource“ was set to 0 and P1002 „BM-w-Ds0-DrvManagerOptions“ was set to 2 (decimal) or in the WinBASS „Control only with quick-stop/pulse enable“ and „Reset errors via pulse enable“ was activated, errors are reset by activating the pulse enable signal.
- Via the parameter P0575 „Digital input for error reset“ a digital input can be selected for error reset. With the rising edge at this input the errors are reset.

Additional data according the subject „Resetting of error messages“ are found in **Parameter manual**.

8.5.2 Error parameters - error messages (error list) - error reactions

All error messages are listed below. An (error) message is shown in WinBASS II in the window „Drive manager“. In the list field „Messages“ you find the (abbreviated) error names, at HIPERFACE® errors also the device part, the error number (not by errors due to the HIPERFACE® specifications) and, separated by a colon, the meaning of this error, e.g. MotorError 96: Short-circuit temperature sensor. At HIPERFACE® errors e.g. Encoder 1 communication: Parity error.

- 1. Level** SysError1, only interesting for the access to errors via parameters, to be used without WinBASS II, e.g. at field bus communication. This error is not shown in WinBASS II. Bit mapping see description of the parameter P0200.
- 2. Level** Next level below SysError1. Here you find errors, which you can remove directly with help of the displayed information or also information on the next level in which the error could be. The assignment of error messages took place according to «Structure of the error list - survey» from page 126. In the column 'Reaction' the systems reaction of the system to errors is to be found:

- PI = Pulse inhibit
- — = No reaction, the drive is operating and the decimal point is blinking.
- adjustable = The error reaction can be parameterized.

In the column „Troubleshooting“ you will find hints for troubleshooting: Further information can be found in the **Parameter manual**.

- **ProcessorError** (Errors in module processor) P0201

Error no.	Meaning	Reaction	Troubleshooting
0	Reserved		
1	Watchdog-Error	PI	Restart b maXX® BM3400
2-15	Not assigned	—	—

- **OperatingError** (Error in module operating system) P0202

Error no.	Meaning	Reaction	Troubleshooting
16	Not assigned	—	—
17	Software error (e.g. switch)	PI	Restart b maXX® BM3400
18	Error configuration time-slice operating system	PI	Restart b maXX® BM3400
19	Time slot duration error	PI	Restart b maXX® BM3400 ; After repeated occurrence contact Baumüller.
20	No more memory left	PI	Restart b maXX® BM3400
21	Invalid error code	PI	Restart b maXX® BM3400
22	Invalid warning code	PI	Restart b maXX® BM3400
23	Not all required type plates could be loaded	PI	Contact Baumüller.
24	Error at writing on the target parameter two-state controller output	PI	Correct the parameterization of the two-state controller (only if existing)
25–31	Not assigned	—	—

- **ProprogError** (Error in module Proprop communication driver) P0203

Error no.	Meaning	Reaction	Troubleshooting
32	Timeout Proprog protocol	—	Restart b maXX® BM3400
33	Protocol error	—	Restart b maXX® BM3400
34	Incorrect module type	—	Contact Baumüller.
35	Too many data in the list or telegram	—	Contact Baumüller.
36	Not enough data in the list or telegram	—	Contact Baumüller.
37	Invalid operand	—	Contact Baumüller.
38	Invalid memory type	—	Contact Baumüller.
39	Invalid operand address (log. address)	—	Enter a valid address.
40	Value < Minimum value	—	Check the data set and correct the value.
41	Value > Maximum value	—	Check the data set and correct the value.
42	Parameter is read-only	—	Check the data set and adjust it.

Error no.	Meaning	Reaction	Troubleshooting
43	Parameter cannot be changed because of operational status	—	Check operating status and parameterization
44	Invalid parameter value	—	Enter a valid value.
45	WinBASS is not connected anymore or is inactive (Timeout is adjustable)	ad-justable	Establish connection again or set parameter P0290 to 0.
46–47	Not assigned	—	—
48	Error in function module A	—	See error in the function module A P0240

- **ExtendedModuleError** (Error in the module Extension) P0204

Error no.	Meaning	Reaction	Troubleshooting
49–52	Not assigned	—	—
53	CANopen error at node-guarding	ad-justable	Check the CAN-bus (configuration, master, nodeguarding)
54–63	Not assigned	—	—
64	Mains input failure	PI	Re-establish the connection to the mains input again.

- **PSUError** (Error in the module Power input) P0205

Error no.	Meaning	Reaction	Troubleshooting
65–77	Not assigned	—	—
78	Offset of current channels outside the limits	PI	Contact Baumüller.
79	Overcurrent was measured (SW)	PI	Reduce the load and check the current controller settings as well as the cabling and the motor

- **AmpError** (Error in module Power unit) P0206

Error no.	Meaning	Reaction	Troubleshooting
80	Not assigned	—	—
81	Temperature threshold of heatsink exceeded	PI	Let the device cool down and/or reduce the load.
82	Overvoltage DC link (UDC link)	PI	Reduce the DC link voltage.
83	Reduce overcurrent in the power unit	PI	Reduce the load and check the current controller settings as well as the cabling and the motor.
84	Not assigned	—	—
85	Temperature threshold of inside air exceeded	PI	Make sure of a sufficient ventilation in the device.
86	Not assigned	—	—
87	Error/defective safety relay	PI	Check the function of the safety relay.
88–94	Not assigned	—	—
95	Chopper transistor overloaded	PI	Reduce the brake current or use an external chopper resistor.

- **MotorError** (Error in the module motor) P0207

Error no.	Meaning	Reaction	Troubleshooting
96	Motor-temperature sensor short-circuited	—	Remove the short-circuit in the temperature sensor.
97	Motor-temperature sensor not connected	—	Connect the temperature sensor or remove the wire breakage in the temperature sensor cable.
98	Error motor temperature. Shutdown threshold	PI	Let the motor cool down and/or reduce the load
99	Error $I^2t > 100\%$	PI	Leave the drive in inhibited status until the I^2t actual position value has dropped below 100%.
100–111	Not assigned	—	—

- **EnclError** (Error in the module encoder1) P0208

Error no.	Meaning	Reaction	Troubleshooting
112	Communication error Encoder 1	PI	Check the encoder connection. Deactivate the communication, if an HIPERFACE encoder is not connected.
113–114	Not assigned	—	—
115	Cable break encoder 1	PI	Check, if there is cable break or an incorrect assignment at the encoder cable.
116	Overspeed encoder 1	PI	Check the permissible maximum speed for encoder 1.
117	Cable break monitoring with $\sin^2 + \cos^2$	PI	Check, if there is cable break or an incorrect assignment at the encoder cable.
118	Encoder type not known	PI	Check, if the correct encoder is connected or use an appropriate encoder.
119	Data field for motor data in encoder 1 does not match	PI	Use another encoder.
120	Motor data from encoder 1 invalid	PI	Use another encoder.

Error no.	Meaning	Reaction	Troubleshooting
121	Saving error of motor data	PI	Use another encoder.
122	Motor data of motors, which are not from Baumüller are write-protected	PI	Use another encoder.
123	Error field angle monitoring	PI	Check the shielding of the encoder cable.
124–127	Not assigned	—	—

- **Enc2Error** (Error in the module encoder2) P0209

Error no.	Meaning	Reaction	Troubleshooting
128	Communication error encoder 2	PI	Check the encoder connection. Deactivate the communication, if an HIPERFACE encoder is not connected.
129–130	Not assigned	—	—
131	Cable break encoder 2	PI	Check, if there is cable break or an incorrect assignment at the encoder cable.
132	Overspeed encoder 2	PI	Check the permissible maximum speed for encoder 2.
133	Cable break monitoring with $\sin^2 + \cos^2$	PI	Check, if there is cable break or an incorrect assignment at the encoder cable.
134	Encoder type not is not known	PI	Check, if the correct encoder is connected or use a matching encoder
135	Data field for motor data in encoder 2 does not match	PI	Use another encoder.
136	Motor data from encoder 2 invalid	PI	Use another encoder.
137	Saving error of motor data	PI	Use another encoder.
138	Motor data of motors, which are not from Baumüller are write-protected	PI	Use another encoder.
139	Error field angle monitoring	PI	Check the shielding of the encoder cable.
140–143	Not assigned	—	—

- **EncManagError** (Error in module encoder manager and encoder emulation) P0210

Error no.	Meaning	Reaction	Troubleshooting
144	Absolute position encoder 1 unknown	PI, disconnectible	Execute a notch position search if using an incremental encoder or use other encoder type.
145	Absolute position encoder 2 unknown	PI, disconnectible	Execute a notch position search if using an incremental encoder or use other encoder type.
146	Encoder module 1 required and missing	PI	Check the encoder configuration.
147	Encoder module 2 required and missing	PI	Check the encoder configuration.
148–151	Not assigned	—	—
152	Incremental encoder emulation module is required and is missing	PI	Check the device configuration and/or contact Baumüller.
153	Encoder module 1 required and missing	PI	Check the encoder configuration.
154	Encoder module 2 required and missing	PI	Check the encoder configuration.
155–156	Not assigned	—	—
157	Option „Start after first zero pulse“ selected for non-incremental encoder	PI	Use an encoder with zero pulse (square wave incremental encoder).
158–169	Not assigned	—	—

- **DriveManagError** (Error in module Drive manager) P0211

Error no.	Meaning	Reaction	Troubleshooting
160–164	Not assigned	—	—
165	Controller not synchronous to ext. signal	adjustable	Check Sync-source and interval. Adjust tolerances with the offset.
166–175	not assigned	—	—

- **DataRecError** (error in the module data record management) P0212

Error no.	Meaning	Reaction	Troubleshooting
176–177	Not assigned	—	—
178	Checksum error in EEPROM	PI	—
179	Not assigned	—	—
180	Incompatible SW	PI	The data in the EEPROM is invalid. Save all data records.
181	Not assigned	—	—
182	Checksum error in the PSI	PI	Use another PSI module.
183	PSI is reset	PI	Save all data records.
184	PSI data is invalid	PI	The data in the PSI module is invalid. Save all data records.
185	Autotuning tables invalid.	PI	Execute autotuning again
186–191	Not assigned	—	—

- **PosCtrlError** (Error in the module Position controller) P0213

Error no.	Meaning	Reaction	Troubleshooting
192	Position deviation dynamic	ad-justable	Check the mechanical circumstances and perhaps correct the controller settings.
193	Position deviation static	ad-justable	Check the mechanical circumstances and perhaps correct the controller settings.
194	Encoder 1 is used for position control but is not active	PI	Activate encoder 1
195	Encoder 2 is used for position control but is not active	PI	Activate encoder 2
196	Software-limit switch monitoring 1 active	—	Check the target position and the travel range, which was released by the limit switch.
197	Software-limit switch monitoring 2 active	—	Check the target position and the travel range, which was released by the limit switch.

Error no.	Meaning	Reaction	Troubleshooting
198	Hardware-limit switch monitoring 1 active	—	Check the target position and the travel range, which was released by the limit switch.
199	Hardware-limit switch monitoring 2 active	—	Check the target position and the travel range, which was released by the limit switch.
200	Homing necessary and not yet executed	—	Execute homing.
201	Setpoint in the mode Set-of-setpoints didn't arrive in time	—	Assure, that the positioning data is available in time and the Handshake takes place in time (also see parameter manual).
202	Monitoring of modulo position active:target position > modulo position	PI	—
203	Spindle positioning: Error at initialization of the trigger	PI	—
204	Spindle positioning: Timeout at trigger signal (zero pulse/switching input)	PI	—
205–207	Not assigned	—	—

- **SpeedCtrlError** (Error in the module speed controller) P0214

Error no.	Meaning	Reaction	Troubleshooting
208	Drive blocked	PI	Remove the blockade of the drive.
209	Encoder 1 for motor control used, but not active	PI	Activate the encoder (P0150) or set the encoder 2 as encoder for position control (P1030).
210	Encoder 2 for motor control used, but not active	PI	Activate the encoder (P0160) or set the encoder 1 as encoder for position control (P1030).
211	Overspeed Openloop	PI	Check parameterization and reduce speed.
212–223	Not assigned	—	—

- **CANSyncError** (Error in the module CAN-synchronous) P0216

Error no.	Meaning	Reaction	Troubleshooting
240	Initialization of the CAN-controller	—	—
241	Send/receive of telegram	—	—
242	Invalid setpoint position	—	—
243	Invalid parameter numbers of the setpoints	—	—
244	Invalid position of the actual value	—	—
245	Invalid parameter numbers of the actual values	—	—
246– 255	Not assigned	—	—

8.5.3 Parameter description - Warnings (Warning bit list)

- **AmpWarning** (Warning in module power unit) P0262

Warn.-no.	Meaning	Cause removal
0	Reserved	
1–3	Not assigned	—
4	Mains failure	Restore the mains supply
5–15	Not assigned	—
16	Internal air-temp. > Warning threshold	Assure the compliance to the specified environmental conditions (see «Appendix D - Technical data» from page 172). Assure a sufficient ventilation.
17	Heatsink temperature. > Warning threshold	Reduce the power output, check the fans of the device
18–19	Not assigned	—
20	Safety relay off (SR O.K.) but no voltage)	Check the cabling of the safety relay.
21–23	Not assigned	—
24	Ixt Value > Limit value1	Take measures, so that the Ixt value does not exceed 100%.
25–31	Not assigned	—

- **MotorWarning** (Warning in module motor) P0263

Warn.-no.	Meaning	Cause removal
32	Motor-temperature > Threshold1	Reduce the power output of the motor.
33	Motor-temperature > Threshold2	Reduce the power output of the motor.
34	I^2t -value > Limit value1	Reduce the power output of the motor.
35–47	Not assigned	—
48	Drive not synchronous	Check and correct the synchronization parameter.
49	Serial number changed (controller PCB replaced)	Contact Baumüller.
50	SW-version changed (unauthorized SW download)	Contact Baumüller.

Warn.-no.	Meaning	Cause removal
51	Time slice violation in-/outputs	Check the configuration of digital in- and outputs.
52-71	Not assigned	—



Maintenance

In this chapter is described, how you can safely maintain your device.

9.1 Safety instructions

- Regard to «Fundamental safety instructions» from page 13.
- Refer to the danger areas of the devices (see «Overview of dangerous areas» from page 36).

9.2 Environmental conditions

If the demanded environmental conditions are complied with, the device is maintenance-free. The specified environmental conditions are found in «Appendix D - Technical data» from page 172. The most important specified environmental conditions are:

- dustless ambient air
- Temperature: min. 5°C to max. 45°C
- Relative air humidity: 5% to 85%, no condensation
- (Operation-) height: absolute altitude up to 1000 m

9.3 Inspection intervals - maintenance notes

Regular checking of the environmental conditions is recommended. Thus you will receive the possibility, to react immediately, in case the actual conditions deviate from the prescribed conditions.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **electricity**. The unit carries dangerous voltages and currents, as well as residual charges in the DC link.*

While working in the switching cabinet assure, that all devices in the switching cabinet are off-circuit and are safe against re-starting. Await the discharging of the DC link, before maintenance work is carried out. The capacitors of the DC link, which are used in the device are 10 min. after interruption of the supply voltage so far discharged, that the connections can be demounted without danger. If you have additional capacitors connected to the DC link, the discharging also can last much longer. In this case you must determine the necessary waiting time yourself.

- Check the devices, which ensure the environmental air (e.g. air filters) at the switching cabinet at least once a day.
- Maintain the air filters according to the indications of the manufacturer. In the case of polluted environmental air, the required cooling air rate can not be reached anymore, if dirt deposits narrow/block up the ventilation slots. If the devices are dirty, contact Baumüller, in order to initiate a servicing or send the device to the company for inspection.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **electricity**. The device can be damaged by incorrect maintenance in such a way, that a safe operating isn't possible anymore*

Do not maintain the device yourself. Never remove dirt deposits especially in the inside of the device with pointed objects as screwdrivers or by the use of e.g. compressed air, vapor stream equipment/ high pressure cleaners.

10

Repair

In this chapter is described, where the devices are repaired.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **electricity**. After a faulty repair the device doesn't fulfill the safety instructions anymore.*

Have the devices only be repaired by Baumüller Kamenz GmbH or by authorized servicings.



Setting out of operation, storage

In this chapter is described, how you set the device out of operation and store it.

11.1 Safety instructions

- Refer to «Fundamental safety instructions» from page 13 and the information in «Transportation and packing» from page 31.

The shutdown of the device may only be carried out by for this qualified personnel.

11.2 Requierements to the executing personnel

The personnel, who was authorized to set the device out of operation must be provided with the knowledge and intructions, which are necessary for the correct carrying-out of this task. 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 followed.

11.3 Setting out of operation

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 setting out of operation.



WARNING

The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death

*The danger is: **electricity**. Electric connections, which are not in a current-free state, carry hazardous voltage levels. The modules in the device (e.g. capacitors) can contain dangerous charges!*

Assure, that all electric connections are current-free and are safe against re-start. 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. 10min. after interruption of supply voltage the capacitors which are used in the device are discharged enough, that the connections can be demounted without danger. If you have additional capacitors connected to the DC link, the discharging also can last much longer. In this case you must determine the necessary waiting time yourself.

11.4 Demounting

CAUTION



The following **may occur**, if you disregard these safety notes:

- minor to medium personal injury



*The danger is: **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.*



- 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 switching cabinet.
 4. Store the device in a suitable packing.
 5. Take care that at transportation, the device is not damaged by incorrect storage or severe shocks, also see «To be considered by transportation» on page 31.

In case you want to dispose the device, further information is to be found under «Disposal» from page 149.

11.5 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

The following **can occur**, if you disregard this warning instruction:

- Damage to property

*The danger is: **environmental conditions**. Wrong storage can damage/destroy the device.*

Assure, that the environmental conditions are kept during the entire period of storage:

- Climatic category: 1 K 4
- Temperature range: -30°C to +70°C

11.6 Recommissioning

Execute commissioning as with a new device, see «Mounting» from page 43 «Installation» from page 53 and «Operation» from page 111.



CAUTION

The following **can occur**, if you disregard this warning instruction:

- Damage to property

*The danger is: **recommissioning, without forming of the capacitors**. From a six month storage period on, the capacitors are destroyed during commissioning, if they are not reformed beforehand.*

- Form the 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.

12

Disposal

In this chapter the correct and safe disposal of the devices of the series **b maXX® BM3400** is described. During the disposal you will mainly get metal parts (iron- and non-iron metal), electrical scrap and plastics.

12.1 Safety instructions

- Regard to «Fundamental safety instructions» from page 13.

WARNING



The following **can occur**, if the safety instruction is not complied with:

- serious personal injury
- death



*The danger is: **electricity**. The containing components in the device (e.g. capacitors) can contain dangerous charges! The capacitors, which are used, are discharged after 10 min., so that they can be demounted without danger.*

If you have additional capacitors connected to the DC link, the discharging also can last much longer. In this case you must determine the necessary waiting time yourself. Demount the capacitors only then, if you have verified yourself of the isolation from supply.

**CAUTION**

The following **may occur**, if you disregard these safety notes:

- minor to medium personal injury

*The danger is: **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.*



- Wear safety gloves



- Wear safety shoes

**CAUTION**

The following **can occur**, if you disregard this warning instruction:

- Environmental pollution

*The danger is: **improper disposal**.*

You may only dispose under consideration of the safety instructions. If necessary, also refer to the local regulations. In case you cannot execute a secure disposal, contact a certified disposal business.

Dangerous materials may result or may be set free from a fire.

Do not expose electronic components to high temperatures.

Various power semiconductors use e.g. beryllium oxide as an inner insulation. When opened, the beryllium dust is dangerous to your health.

Do not open the electronical components.

12.2 Requirements to the executing personnel

The personnel, which is responsible for the disposal/demounting must have the knowledge and training to execute these works properly. Select the personnel in such a way, that the safety instructions on the device and its parts are understood and are used.

12.3 Disposal instructions

Preconditions

- The device has already properly been demounted.
- All technical appliances for demounting are prepared and are technically in good order and condition.

12.3.1 Modules

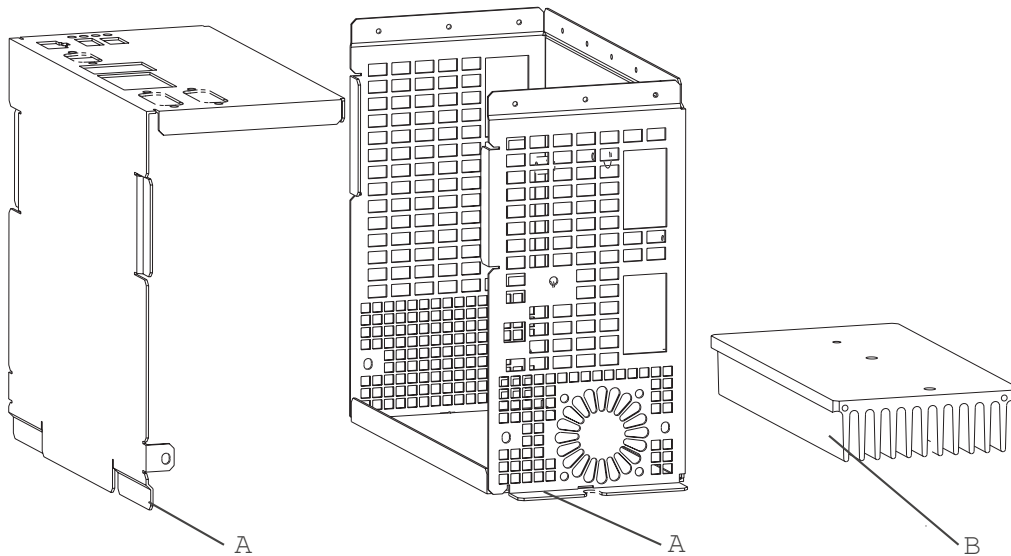


Figure 12.1: Disassembly illustration

The components/modules given in round brackets you will find in the figure mentioned above.

Sheet steel (A)	Sheet steel must be given to the iron metal recycling.
Aluminium (B)	Aluminium must be given to the non-iron metal recycling.
Capacitors (D)	Capacitors must be recycled as hazardous waste. Thereby refer to the relevant instructions.
Semiconductor modules (E)	Semiconductor modules must be recycled as hazardous waste. Thereby refer to the relevant instructions.
Electronic scrap (F)	The electronic scrap from PCBs, which no further can be demounted, must be recycled as hazardous waste. Thereby refer to the relevant instructions.

**CAUTION**

The following **can occur**, if you disregard this warning instruction:

- Environmental pollution



*The danger is: **improper disposal.***

Capacitors, semiconductor modules and electronic scrap must be recycled as hazardous waste.

12.4 Recycling plants / offices

Assure, that the disposal is made in accordance with the disposal guidelines of your company as well as with the responsible disposal locations and offices. In case of doubt, contact the local business administration, which is responsible for your company or the environmental office.



Appendix A - Abbreviations

$ I_{Aist} $	Amount armature current actual value	IF	Pulse enable
AC	Alternating current	I_{Fmax}	Maximum field current (rated current)
AIO	Analog input/output	I_{Fmin}	Minimum field current
BB	Ready-for-use	I_{Fset}	Field current setpoint
CAN	Controller Area Network	IEE	Incremental encoder emulation
Chap.	Chapter	Inc	Counting unit of position
DC	Direct current	Ink	PPR count of incremental encoder
DIN	Deutsches Institut für Normung e.V. (German Institute for Standardization).	INK.	Incremental
DIO	Digital input/output	I_{set}	Armature current setpoint
Dollar sign	Prefix for hexadecimal numbers	LED	Light-emitting diode
DSV	Function module data set management	MSB	Most significant bit
EMC	Electromagnetic compatibility	mtr.	Medium time-lag
EN	European standard	n = 0	Speed = 0
ESD	Electrostatic discharge	n_{act}	Speed actual value
EXT, ext	External	n_{max}	Maximum speed
FI	Residual current	n_{min}	Minimum speed
GND	Ground	NN	Sea level
HS0	Housing Size 0	n_{SG}	Crawl speed
HS1	Housing Size 1	n_{set}	Speed setpoint
HS2	Housing Size 2	NTC	Resistance with neg. temperature coeff.
\hat{I}	Peak current, curve shape not defined	P	Identification number
I^2t	Function module overload monitoring	Para.	Paragraph
I_{AC}	RMS value, alternating current	PC	Personal computer
I_{Aist}	Armature current actual value	PELV	Protective low voltage with safe isolation, grounded
I_{DC}	RMS value, direct current	PLC	Programmable control
I_{eff}	RMS value, alternating current	PI	Pulse inhibit

A

Appendix A - Abbreviations

R_A	Armature resistance	U_{eff}	RMS value, AC voltage
RCD	Differential current device	UZK	DC-link voltage
RF	Controller enable	V1	Version 1 (type key)
RS232	Interface standard	V2	Version 2 (type key)
RS422	Interface standard	VBG	German Administrative Occupation
SELV	Protective low-voltage with safe isolation		Co-operative
SH	Quickstop	VDE	Union of German Electrical Engineers
U	Voltage	V_{pp}	Volt Peak-Peak
\hat{U}	Peak voltage	X	Terminal strip
U_A	Armature voltage	DC	DC-link
U_{AC}	RMS value, AC voltage		
U_{DC}	RMS value, DC voltage		



Appendix B - Spare parts and accessories

In this appendix the spare-/accessory parts for the devices of the **b maXX® BM3400** series are listed. In case you have questions and suggestions according the accessories, do not hesitate to contact our department Product Management.

B.1 Terminal accessories

The following plug-in connector-equipment packs are available for the **b maXX® BM3400** series:

Device	Part no.	Quantity	Plug-in connector	Pos.
BM34XX-L1 version V2 without safety relay	00390076	1	COMBICON MINI RM3,5 2-polig	X101
		2	COMBICON FK-MC 0,5/12-ST-2,5	X26
		1	COMBICON MC 1,5/6-ST-3,5	X201
		1	COMBICON GMSTB 2,5/4-ST-7,62	X202
		1	COMBICON GIC 2,5/4-ST-7,62	X204
		1	COMBICON GIC 2,5/5-ST-7,62	X205
BM3401-L1 version V1 with int. chopper resistor	00390077	1	COMBICON MINI RM3,5 2-pole	X101
		2	COMBICON FK-MC 0,5/12-ST-2,5	X26
		1	COMBICON MC 1,5/6-ST-3,5	X201
		1	COMBICON MSTB 2,5/3-ST-5,08	X202
		1	COMBICON IC 2,5/4-ST-5,08	X204

Device	Part no.	Quantity	Plug-in connector	Pos.
BM34XX-L1 version V2 with safety relay	00407523	1	COMBICON MINI RM3,5 2-pole	X101
		1	COMBICON MINI RM3,5 4-pole	X102
		2	COMBICON FK-MC 0,5/12-ST-2,5	X26
		1	COMBICON MC 1,5/6-ST-3,5	X100
		1	COMBICON MSTB 2,5/3-ST-5,08	X202
		1	COMBICON IC 2,5/4-ST-5,08	X204
		1	COMBICON GIC 2,5/5-ST-5,08 kpl	X205
BM34XX-L3 version V1/V2 without int. chopper resistor	00389308	1	COMBICON MINI RM3,5 2-pole	X101
		2	COMBICON FK-MC 0,5/12-ST-2,5	X26
		1	COMBICON MC 1,5/6-ST-3,5	X201
		1	COMBICON GMSTB 2,5/4-ST-7,62	X202
		1	COMBICON GIC 2,5/4-ST-7,62	X204
		1	COMBICON GIC 2,5/5-ST-7,62	X205
BM3411-L3 version V1 with int. chopper resistor	00389306	1	COMBICON MINI RM3,5 2-polig	X101
		2	COMBICON FK-MC 0,5/12-ST-2,5	X26
		1	COMBICON MC 1,5/6-ST-3,5	X201
		1	COMBICON GMSTB 2,5/4-ST-7,62	X202
		1	COMBICON GIC 2,5/4-ST-7,62	X204
		1	COMBICON GIC 2,5/5-ST-7,62 kpl	X205
BM3411-L3 version V2 with safety relay and int. chopper resistor	00398159	1	COMBICON MINI RM3,5 2-polig	X101
		2	COMBICON FK-MC 0,5/12-ST-2,5	X26
		1	COMBICON MC 1,5/6-ST-3,5	X100
		1	COMBICON GMSTB 2,5/4-ST-7,62	X202
		1	COMBICON GIC 2,5/4-ST-7,62	X204
		1	COMBICON GIC 2,5/5-ST-7,62 kpl	X205

B.2 Memory module

For a quick transfer of data sets between **b maXX® BM3400** devices the memory module „BM4-PSI-01“ can be used, which can be obtained under item no. 350462.

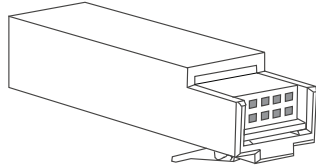


Figure B.1: Memory module BM4-PSI-01

B.3 CAN cable termination resistor

You can obtain terminating resistors for the CAN bus under part no. 00346408 „BM4-CAN-T01“.

B.4 Screening plates

In order to lay the cable screening according to EMC, at the devices screening plates can be used, as shown in the following figure. The plates are available under item no. 409274 (HS0) and 409273 (HS1).

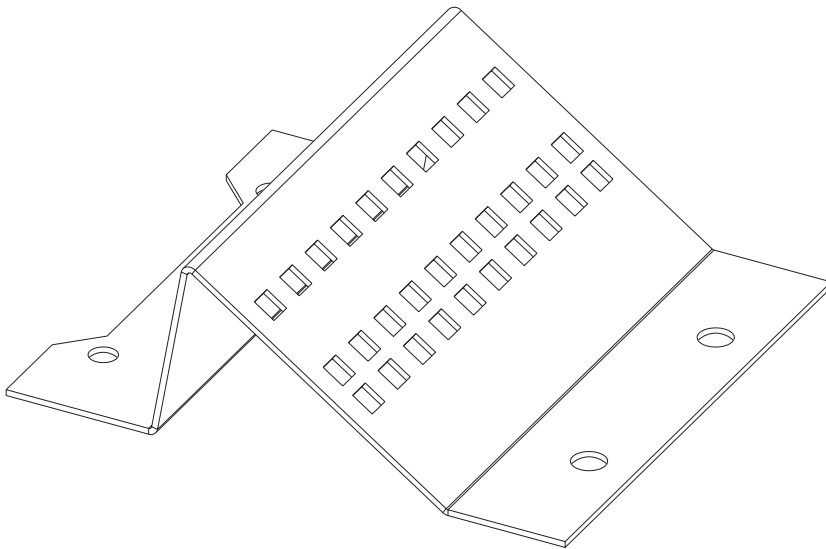


Figure B.2: Screening plate

B.5 Encoder connecting cables

The encoder connecting cable (or the encoder cable) can be used for the resolver („A“), sine wave incremental encoder („B“), sine wave encoder with Hiperface® interface („C“) and square wave incremental encoder („E“).

Encoder cable connection can be obtained as an accessory from Baumüller Nürnberg Electronic GmbH & Co. KG (converted - alternatively deviation-compatible, length see range, further lengths on request, preferred lengths in **bold letters**).

Length [m]	not deviation-compatible part no.	deviation-compatible part no.
1	00243601	-
2	00211338	-
3	00219333	00246658
4	00231166	00243379
5	00209879	00239540
6	00220197	00242954
7	00216455	-
8	00220429	00239541
10	00210052	00239542
15	00215716	00239543
20	00218568	00239544
25	00218569	00239545
30	00217094	00239546
35	00216444	00239547
40	00217095	00240520
45	00217567	00240521
50	00217568	00240522
55	00217569	00244033
60	00217570	00245484
70	00232088	-

B.6 Motor cables

Motor cables always must be screened. Cables, which also, besides the motor cables lead the cable of the motor temperature sensor, must have a separate screening for the signal lines. The accordant motor cable can be obtained from Baumüller.

B.7 EtherCAT- resp. Ethernet-cables

EtherCAT- resp. Ethernet-connection cable of patch cable type (STP) you can get as accessories for cabling within the switching cabinet from Baumüller Nürnberg Electronic GmbH & Co. KG. On request it's possible to get other length as described in the following table.

Type	Length [m]	Article number
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



Appendix C - Declaration of Conformity, Declaration by Manufacturer, UL-certification

In this chapter general information is given according to the EU Directives, the CE-sign and for Declaration of Conformity/Manufacturer's Declaration.

C.1 What is an EU directive

EU Directives specify requirements. The directives are written by the relevant authorities within the EU and are implemented by all the member states of the EU in national law. In this way the EU Directives guarantee free trade within the EU. An EU Directive contains essential minimum requirements. You will find detailed requirements in harmonized standards, to which references are made in the directive.

C.2 What the CE symbol indicates

- a) The CE marking symbolizes conformity to all the mandatory requirements incumbent on manufacturers for the product by virtue of the Community directives providing for its affixing.
 - b) The CE marking affixed to industrial products symbolizes the fact that the natural or legal person having affixed or been responsible for the affixing of the said marking has verified that the product conforms to all the Community harmonization provisions which apply to it and has been the subject of the appropriate conformity evaluation procedures.
-

Council Decision 93/465/EWG, annex I B. a) + c) The CE-marking is applied to the device and to the manual, as soon as we have determined, that the requirements of the relevant directives are complied with.

All converters and controls of Baumüller Kamenz GmbH comply with the requirements from 73/23/EWG (Low-Voltage Directive). By all converters and controls of Baumüller Kamenz GmbH complying with the requirements of harmonized standards EN 50178, EN 60204-1, EN 60529 and HD 625.1 S1, the protective targets of 73/23/EWG are reached. Provide this Baumüller device is subjected to normal use in your machinery you can assume that the device satisfies the requirements of 98/79/EG (Machine directive). Therefore the device was developed and constructed in such a way that the requirements of the harmonized standard EN 60204-1 can be complied with by the electrical installation. Decisive for the compliance of 89/336/EWG (EMC-directive) is the installation of the device. As you execute this installation on your own, you also are responsible for the adherence to 89/336/EWG. A Declaration of Conformity according the EMC-directive we therefore cannot issue. We will support you in the form of EMC instructions. You will find this information in the manuals of the **b maXX® BM3400** basic unit. If all requirements have been fulfilled, which we placed in this manual, it can be assumed, (Directive: assume), that the drive complies with the requirements of the EMC directive. The limit values and requirements for variable-speed electric drives are specified in the harmonized product standard EN 61800-3. In case you are erecting an installation, for which a Declaration of Conformity on the EMC directive must be generated, it may be necessary, to specify several harmonized standards, which you have used for the compliance of the protection targets of the directive. For electric drives the harmonized product standard EN 61800-3 must be used. In order to distribute your machine within the EU, the following must exist:

- Sign of Conformity (CE-sign)
- Declaration(s) of Conformity according to the relevant directive(s) which are important for the machine.

C.3 Definition of the term Declaration of Conformity

A Declaration of Conformity as defined in this manual is a declaration that the electrical equipment brought into circulation conforms to all the relevant fundamental safety- and health requirements. With this Declaration of Conformity in this chapter Baumüller Kamenz GmbH declares, that the device is accordant to the safety- and health requirements, which result from the guidelines and standards, which are listed in the Declaration of Conformity.

C.4 Definition of the term Declaration by Manufacturer

A Manufacturer's Declaration as defined in this manual is a declaration that the machine/safety equipment brought into circulation conforms to all the relevant fundamental safety- and health requirements. and Gesundheitsanforderungen entspricht. Baumüller Kamenz GmbH declares in this chapter with this Manufacturer's Declaration, that the device is accordant with the relevant basic safety- and health requirements, which result from the directives and standards, which are listed in the Manufacturer's Declaration.

C.5 Declaration of Conformity



Konformitätserklärung

gemäß

- Richtlinie 2006/95/EG (betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen)
- Richtlinie 2004/108/EG (über die elektromagnetische Verträglichkeit)

Hersteller

Baumüller Kamenz GmbH
Nordstraße 57
01917 Kamenz
Deutschland

Hiermit erklären wir, dass die nachfolgend genannten Produkte aufgrund ihrer Konzeption, Konstruktion und Bauart in der von uns in Verkehr gebrachten Ausführung den grundlegenden Anforderungen der oben genannten Richtlinie(n) einschließlich der zum Zeitpunkt der Erklärung geltenden Änderungen entsprechen.

Hinweis: Bei Umbau oder Änderungen am Produkt verliert diese Erklärung mit sofortiger Wirkung ihre Gültigkeit.

Angewandte harmonisierte Normen:

- DIN EN 61800-3 Drehzahlveränderbare elektrische Antriebe - EMV-Anforderungen einschließlich spezieller Prüfverfahren
- DIN EN 61800-5-1: Elektrische Leistungsantriebssysteme mit einstellbarer Drehzahl - Anforderungen an die Sicherheit - Elektrische, thermische und energetische Anforderungen

(fortgesetzt)

Declaration of Conformity

according to

- Directive 2006/95/EC (relating to electrical equipment designed for use within certain voltage limits)
- Directive 2004/108/EC (relating to electromagnetic compatibility)

Manufacturer

Baumüller Kamenz GmbH
Nordstrasse 57
01917 Kamenz
Germany

We declare, that the products referred to in the following are conformant in their concept, in their construction and in their design as launched by us with the above mentioned directive(s) and their respective changes which were valid at the point of declaration.

Note: By modifying or altering the device(s) this declaration immediately becomes invalid.

Applied harmonised standards:

- DIN EN 61800-3 Adjustable speed electrical power drive systems - EMC requirements and specific test methods
- DIN EN 61800-5-1: Adjustable speed electrical power drive systems - Safety requirements - Electrical, thermal and energy

(continued)


Handwritten signature and date: 31.11.2009

(abgeschlossen)

(finished)

Produkt / Product	Jahr der erstmaligen Ausstellung der CE- Konformitätserklärung Year in that the CE Declaration of Conformity was issued the first time
BM3401 – XXXX – XXXX – X BM3411 – XXXX – XXXX – X	2005
BM3401 – XXXXX – XXXXXXXX – X BM3411 – XXXXX – XXXXXXXX – X	2006
BM3401 – XXXXX – XXXXXXXX – X – XX – X – XX.XX.X BM3411 – XXXXX – XXXXXXXX – X – XX – X – XX.XX.X BM342X – XXXXX – XXXXXXXX – X – XX – X – XX.XX.X	2008

Kamenz, 28. 10. 2008



 Dipl.-Ing. (FH) Ralf Hopp
 Geschäftsführer
 Managing Director

i. A. Heidrich 3.11.2008

 i. A. Dr.-Ing. Peter Heidrich
 Entwicklungsleiter
 Director Development

C.6 Declaration by Manufacturer

EU-Herstellererklärung

Declaration by Manufacturer

gemäß EG-Richtlinie 89/336/EWG vom 03.05.1989

in accordance with EC directive 89/336/EWG dated 03.05.1989

BM34XX – XXXX – XXXX – X
BM34XX – XXXXX – XXXXXXXX – X

Die Inbetriebnahme der Maschine, in die dieses Gerät eingebaut wird, ist untersagt bis die Konformität der Maschine mit der obengenannten Richtlinie erklärt ist.

The machinery into which this unit is to be incorporated must not be put into service until the machinery has been declared in conformity with the provisions of the directive mentioned.

Baumüller Kamenz GmbH, Nordstr. 57, D-01917 Kamenz

Kamenz, 23.07.2007



ppa. Dr. Peter Heidrich
Entwicklungsleiter
Head of development





i.A. Dr. Jan Schmidt
Gruppenleiter Entwicklung
Team manager development

C.7 UL-Certification






UL is a mark of conformity, which is given by the American company Underwriters Laboratories Inc. (www.ul.com). The UL-certification is not regulated by law, but takes place voluntarily.

In order to be allowed to mark equipments and components with the UL-mark of conformity, tests must have to be done, which are attended and documented by an UL-inspector. Only if all necessary tests have been passed and regular product monitoring at the production process of the equipment or the components has been passed without objections, the UL-mark of conformity may be attached to the equipment under test.

Converters and controls of Baumüller Kamenz GmbH are checked in accordance with the UL-standard UL 508C (UL-Standard for Safety for Power Conversion Equipment) and are recorded under the category control number NMMS. The product- and test description is recorded under file-no. E179860.

Only if all necessary tests have been completed the -mark may be applied to the devices or components. If single tests are not made at production but at the user, then at the product only the -mark may be applied.

At products of the Baumüller Kamenz GmbH all tests already have been completed at UL certification procedure, so that they may be marked with the -mark.

If during UL certification process also standards of CSA (Canadian Standard Association) are regarded, then instead of the - or -marks the - or -mark may be applied to the product. At products of Baumüller Kamenz GmbH the CSA standard C22.2 was regarded, that is why they are marked with the -mark.

If products of Baumüller Kamenz GmbH are mounted into an UL-certified installation, then certain application-, mounting- and installation notices must be considered, which are upon the functioning of the device. We have marked these notes with „UL508C...“. Only if you observe these notes and apply to them you may proceed on the assumption that the installation has been mounted UL-conform.

The following converters of the **b maXX® BM3400** series are certified and have the -mark:

- BM340X-LXXXX-XXXXXXXX-X
- BM341X-LXXXX-XXXXXXXX-X



Appendix D - Technical data

In this chapter you find exact technical data according all sizes of device series **b maXX® BM3400**.

D.1 Supported earthing systems

International standard IEC 60364 resp. DIN VDE0100 distinguishes three families of earthing arrangements, using the two-letter codes TN, TT, and IT.

- Within a **TN system** one point is directly connected with earth, usually the star point in a three-phase system. The body of the electrical device is connected with earth via this earth connection at the transformer.
- Within a **TT system** the protective earth connection of the consumer is provided by a local connection to earth, independent of any earth connection at the generator.
- Within a **IT system** there is no direct connection between active wires (L1, L2, L3, N) and grounded parts (PE). The body of the electric device is connected to earth. Separation is accomplished by the use of an isolating transformer or an independent power source (generator, battery).

Within TN or TT systems a sufficient low impedant earth fault will trigger an overcurrent circuit-breaker or fuse. A higher impedant earth fault however won't trigger the fuse, so an RCD is usually employed.

In IT systems, a single insulation fault is unlikely to cause dangerous currents to flow through a human body in contact with earth, because no low-impedance circuit exists for such a current to flow. However, a first insulation fault can effectively turn an IT system into a TN system, and then a second insulation fault can lead to dangerous body currents. Worse, in a multi-phase system, if one of the live conductors made contact with earth, it would cause the other phase cores to rise to the phase-phase voltage relative to earth rather than the phase-neutral voltage.



NOTE

Operation of **b maXX® BM3400** devices is generally possible at TT and TN systems.

The earthing systems commonly used in the USA clearly distinguish from systems used in european networks. Other than in the IEC there is a corner grounded delta system besides the center grounded system (Solidly Grounded Wye), which is similar to the TN-S system.

Operation on a grounded delta system is only allowed for single-phase devices, because in this case the necessary air and creepage path will be complied with.

With a triple-phase device operation on a grounded delta system is basically **only allowed** for devices, which have a type key like BM34XXX-L4XXX-XXXXX-X.

Operation with DC link connection bar and attendance of an inverter with energetic recovery system is **strictly forbidden**, because in this operation mode the Y capacitors will be overloaded by voltage.

D.2 Requirements to the power supply

- BM34XX-L1

Supply system	industrial system with direct or low grounded star point (TN-sytem or TT-system)
Mains inductance	min. uk = 0% max. uk = 4%
Rated input voltage/-frequency ¹⁾ (U _{AC})	1 x 230V / 50/60Hz
Absolute minimum voltage ¹⁾ (U _{AC})	1 x 110V / 50/60Hz
Absolute maximum voltage ¹⁾ (U _{AC})	1 x 253V / 50/60Hz
Harmonics (mains voltage)	THD < 10% ²⁾
Unbalanced mains voltage	max. 3% ³⁾
Voltage drop	range of drop < 40%, area < 250% x level ²⁾
Control voltage ⁴⁾ (U _{DC})	+24V -15% +20% ⁵⁾

- BM34XX-L3/L4

Supply system	industrial system with direct or low grounded star point (TN-sytem or TT-system)
Mains inductance	min. uk = 0% max. uk = 4%
Rated input voltage/-frequency ¹⁾ (U _{AC})	3 x 400 V / 50/60Hz 3 x 480V / 50/60Hz
Absolute minimum voltage ¹⁾ (U _{AC})	3 x 180V / 50/60Hz
Absolute maximum voltage ¹⁾ (U _{AC})	3 x 528V / 50/60Hz
Harmonics (mains voltage)	THD < 10% ²⁾
Unbalanced mains voltage	max. 3% ³⁾
Voltage drop	range of drop < 40%, area < 250% x level ²⁾
Control voltage ⁴⁾ (U _{DC})	+24V -15% +20% ⁵⁾

¹⁾The rated voltage is 230V or 400V. At input voltages < 230V or <400V the output power of the device reduces (see curves).

²⁾EN 61800-3, chap. 5.2.1

³⁾IEC 3-1000-2, tab. 1, class 3

⁴⁾The control voltage must accord to PELV (EN 50178, chapter 3.49) or SELV (EN 50178, chapter 3.70). At control voltage of < 24V, the fan capacity reduces. It may be necessary to reduce the output current as well. In case you consider UL 508 C: limit the current to 4A.

⁵⁾Referring to EN61131-2:1994, table 7. Output power of the power supply unit: see power loss referring to control voltage in «Appendix D - Electrical data - **b maXX® BM3400**».

D.3 Requirements to the motor

The motor must be build in such a way, that the temperature sensor in the motor is adequate to the criterion safe isolation according to EN 61800-5-1. The underlying rated voltage is 300V or 600V at operation on an IT-Supply.

The **b maXX® BM3400** is designed to work with three-phase a.c. motors with a terminal voltage of 3 x 350V (typical for servo drives from Baumüller company) or 3 x 400V (typical for standard asynchronous machines and for customer specific special drives from Baumüller company). The motors have to be operated in star connection. The nominal DC link voltage is 540V_{DC}. During slowing down operation it is to be considered, that the DC link voltage will rise up to 780V..800V. The connected motor must be designed to work on such a DC link voltage.

Operation of the devices at lower voltages (for instance 3 x 230V) is also possible. Though it is to be assumed, that the three-phase a.c. motors used have to be enabled to operate on inverters with DC link voltages up to 800V, because the chopper start-up voltage (see «Appendix D - Technical Data : Power unit »from page 179) remains unchanged. Hence only three-pase a.c. motors with a nominal DC link voltage of 540V can be used.

D.4 Required environmental conditions

Transportation temperature range	-30°C to +70°C
Transportation climatic category	2 K 3 ¹⁾
Storage temperature range	-30°C to +70°C
Storage climatic class	1 K 4 ¹⁾
Operation environment	outside of residential areas ²⁾
Operation temperature range	min. 5°C to max. 45°C ³⁾
Operation climatic class	3 K 3 ¹⁾
Mounting height ⁴⁾	absolute altitude up to 2000 m (rated operation)
Relative humidity (operation)	5% to 85% not dewed ¹⁾
Vibration, shock and repetitive shock	max. 1g ⁵⁾
Degree of pollution	2 ⁶⁾
Environmental conditions (EN 60721-3-3)	3 K 3, 3 B 1
Cooling air temperature	min. 5°C to max. 45°C ³⁾

¹⁾EN 50178, tab. 7

²⁾at use in residential areas you must assume the risk of high frequency disturbances (EN 2-61800, 3.6.4.2)

³⁾Rated temperature = 40°C

⁴⁾Characteristic curve: Power output of the device in dependence with the mounting height at normal pressure

For the operation at grounded delta or IT-mains provided **b maXX® BM3400** must be operated at TT- or TN-mains from an installation altitude of 2000m on. Such systems, e.g. can be achieved with an isolating transformer with a secondary-sided star point.

⁵⁾EN 50178, chap. 9.4.3.2

⁶⁾EN 50178, tab. 2

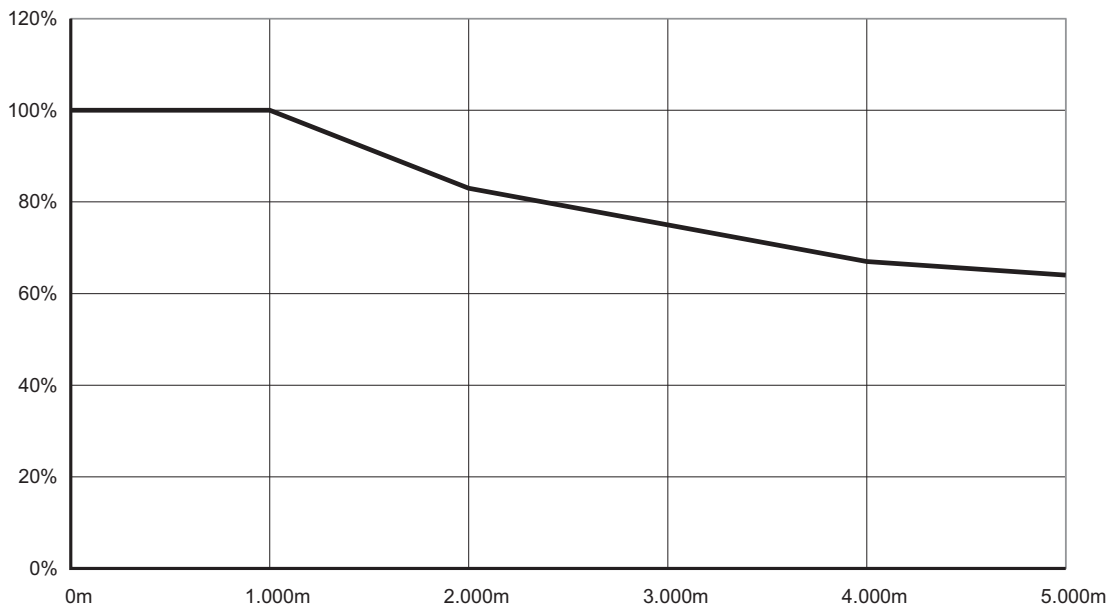


Figure D.1: Derating of output power accordant to installation altitude

D.5 Non-electrical data

Device	Dimensions (H x W x D)	weight
BM340X	170mm x mm x 170mm	1.7kg
BM341X	170mm x 85mm x 170mm	2,0kg
BM3422	365mm x 85mm x 250mm	5,5kg

D.6 Electrical data - b maXX® BM3400

D.6.1 Controller board

The controller PCB contains all modules for digital and analog in- and outputs, encoder sensing and communication. In the following sections you will find details according the modules.

D.6.1.1 Resolver interface

Excitation voltage	max. $10V_{pp}$
Excitation frequency	4kHz
Load	max. 160mA
Input level	max. $1.8V_{pp}$
Cable termination	120Ω

By reason of different transmitting conditions when using resolvers of different manufacturers a software-controlled adaption of the excitation voltage for the optimization of the input level takes place.

The theoretic ascertainable maximum speed results of the max. permissible ratio of excitation frequency towards useful signal frequency, which is specified with 20. Out of this the theoretical maximum permissible speed will be

theoretical maximum speed [RPM] = $n_{max,theoretic} = f_{excitation} * 60 / (20 * \text{pole number resolver})$.

Consequently there is for a 1-pole resolver at 4kHz excitation frequency a functional maximum speed of 12000 RPM.

The ratio between the number of pole pairs of the motor and the number of pole pairs of the resolver must be integer. For example the combination of a motor with 3 pole pairs and a 1-pole resolver is permitted, whereas at the same motor a 2-pole resolver cannot be used.

D.6.1.2 Sine wave incremental encoder interface

Supply	+5V
Load	max. 250mA
Input level	1V _{pp}
Cable termination	120Ω

The maximum possible speed of rotation of an incremental encoder (sine-cosine) is limited by the cut-off frequency of the encoder interface input filter. This lies at 300kHz. Hence it follows that there is a theoretic possible maximum speed according to the formula:

theoretically maximum speed [RPM] = $n_{max,theoretically} = \text{cut-off frequency} * 60 / \text{encoder PPR}$.

Example: Incremental encoder (sine-cosine) with 1024 PPR counts.

$n_{max,theoretically} = 300 \text{ kHz} * 60 / 1024 = 17578 \text{ RPM}$

D.6.1.3 Hiperface absolute encoder interface

Supply	+8V
Load	max. 250mA
Input level	1V _{pp}
Cable termination	120Ω

The maximum possible encoder speed of an HIPERFACE encoder is determined by the same boundary conditions as at the sine wave incremental encoder. Further information is found under «Sine wave incremental encoder interface» from page 175.

D.6.1.4 Square wave incremental encoder interface

Supply	+5V
Load	max. 250mA
Input level	RS422
Cable termination	120Ω

The maximum possible encoder speed of a square wave incremental encoder is determined with the same boundary conditions as with the sine wave incremental encoder. Further information is found under «Sine wave incremental encoder interface» from page 175.

D.6.1.5 Digital inputs and outputs

Power supply	24V (19V...28V)
Current input	max. 500mA
Input voltage	0 (LOW): 0V(open)...5V 1 (HIGH): 12V...28V
Input current	max. 2mA
Sampling rate	DIN1...DIN4 (normal): 2ms DIN3, DIN4 (quick): 250 μ s SH, IF: 4ms
Output current	max. 0.6A per channel
Refresh rate	4ms
Short-circuit rating	yes, by internal current limit and switch-off at overtemperature

D.6.1.6 Analog inputs and outputs

Input voltage	-10V...+10V
Input resistance	3.5k Ω
Sampling rate	250 μ s
Output voltage	-10V...+10V
Output current	max. 10mA
Refresh rate	500 μ s
Cut-off frequency	1kHz

D.6.2 Incremental encoder emulation (option)

There are two square wave pulse sequences $+A$ and $+B$ (phase shifted by 90°) and its inverted pulse sequences $-A$ and $-B$ as well as zero pulse $+ZERO$ with the inverted signal $-ZERO$. These signals are provided separated via optocoupler and have RS422 level. The power supply for the optocoupler and the RS422-line driver occurs via the encoder input of the target device, which is to be connected.

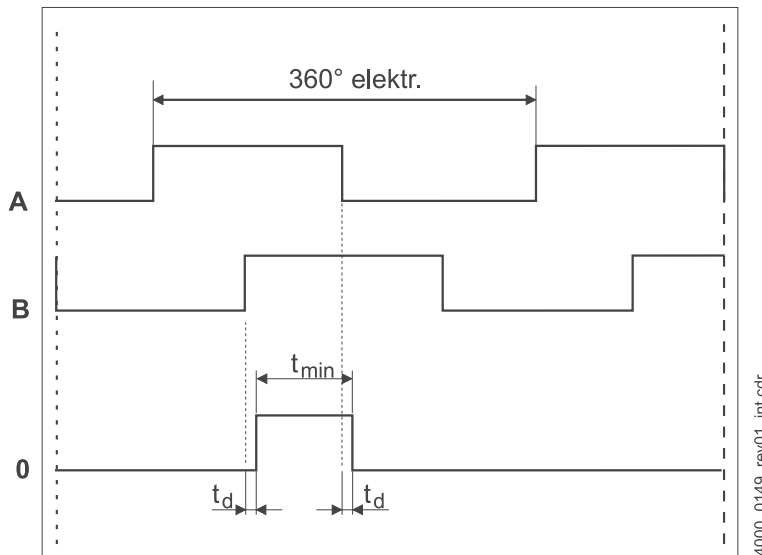


Figure D.2: Pulse sequences incremental encoder emulation

Supply voltage (External supply)	$5V \pm 5\%$ (without load)
Current connection (external supply)	max. 100mA (without load)
Signal level: Output High Voltage at $I_{OH} = -20\text{mA}$	min. 2.5V
Signal level: Output Low Voltage at $I_{OL} = +20\text{mA}$	max. 0.5V
Output frequency track signals	max. 819.2kHz
Switching time: Rise time	$< 50\text{ns}$
Switching time: Fall time	$< 50\text{ns}$
Delay time	$ t_d = 1 \leq 50\text{ns}$
Power consumption	0.525W
Current output driver	max. 50mA

D.6.3 Safety relay (option)

Coil side (X102-3, X102-4)	
Rated voltage U_{DC}	20V
Operating voltage U_{DC}	15V to 28V
Coil resistance	$480\Omega \pm 48\Omega$
Status signal contact (NC contact), (X102-1, X102-2)	
Switching voltage U_{DC}	24V
Switching current I_{DC}	1mA to 300mA
Max. switch-on frequency	10Hz
Switch-ON delay	max. 15ms
Switch-OFF delay	max. 12ms
Electrical durability (switch life time)	at least 100 000
Mechanical durability (cycles of operation)	at least. 5×10^7

D.6.4 Power unit**NOTE**

All values listed in the following tables are valid under rated conditions. If the device is operated under different conditions the values may change accordingly.

- **BM340X-L3**

Input rated power at 8kHz ¹⁾	2,8kVA
Input rated current (I_{eff})	5,0A
Input current max. (I_{eff})	9,1A
DC link rated voltage ¹⁾ (U_{DC})	540V
DC link capacity (internal)	165 μ F
Output voltage ²⁾ (U_{AC})	3 0 x 3 V to 380 x 370 V
Output frequency	0Hz to 400Hz
Max. Output rated current bei 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	7.0A/ 4.5A/ 2.7A
Max. Output peak current at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁷⁾ (I_{AC})	8.1A/ 8.1A/ 8.1A
Max. Peak current time at 4kHz/ 8kHz /16kHz ⁷⁾	120s/ 49s/ 4,1s
Chopper resistor current, valid (I) ⁸⁾	7A
Chopper resistor external (R)	> 115 Ω
Chopper start-up voltage (U)	780V
Chopper shutdown voltage (U)	760V
Chopper peak power	5.4kW
Chopper nominal power	1.0kW
Power loss referring to mains voltage ⁹⁾	max. 100W
Power loss referring to control voltage ¹⁰⁾	max. 30W

- BM340x-L1

Input rated power at 8kHz with/without internal chopper resistor ¹⁾	1,0kVA/ 1,7kVA
Input rated current (I_{eff}) with/without internal chopper resistor	4,5A/ 7,4A
Input current max. (I_{eff})	13,4A
DC link rated voltage ¹⁾ (U_{DC})	310V
DC link capacity (internal)	330 μ F (V1)/ 940 μ F (V2)
Output voltage ²⁾ (U_{AC})	3 x 0V to 3 x 195V
Output frequency	0Hz to 400Hz
Max. Output rated current with internal chopper resistor at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	4.3A/ 2.7A/ 1.1A
Max. Output rated current without internal chopper resistor at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	7.0A/ 4.5A/ 2.7A
Max. Output peak current at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁷⁾ (I_{AC})	8.1A/ 8.1A/ 8.1A
Max. Peak current time with internal chopper resistor at 4kHz/ 8kHz /16kHz ⁷⁾	2,3s/ 1,2s/ 0,44s
Max. Peak current time without internal chopper resistor at 4kHz/ 8kHz /16kHz ⁷⁾	60s/ 24s/ 4,1s
Chopper resistor current, valid (I) ⁸⁾	7A
Chopper resistor internal, (optional) (P)	$P_{cont.} = 30W$
Chopper resistor internal (optional) (R)	100 Ω
Chopper resistor external (R)	> 60 Ω
Chopper start-up voltage (U)	400V
Chopper shutdown voltage (U)	380V
Chopper peak power	2.8kW
Chopper nominal power	1.0kW
Power loss referring to mains voltage ⁹⁾	max. 100W
Power loss referring to control voltage ¹⁰⁾	max. 30W

• BM341X-L1

Input rated power at 8kHz with/without internal chopper resistor ¹⁾	1,3kVA/ 2,1kVA
Input rated current with/without internal chopper resistor (I_{eff})	5,8A/ 9,1A
Input current max. (I_{eff})	17,3A
DC link rated voltage ¹⁾ (U_{DC})	310V
DC link capacity (internal)	1120 μ F
Output voltage ²⁾ (U_{AC})	3 x 0V to 3 x 195V
Output frequency	0Hz to 400Hz
Max. Output rated current with internal chopper resistor at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	5.5A/ 3.5A/ 2.0A
Max. Output rated current without internal chopper resistor at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	8.0A/ 5.5A/ 3.3A
Max. Output peak current at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁷⁾ (I_{AC})	10.5A/ 10.5A/ 10.5A
Max. Peak current time with internal chopper resistor at 4kHz/ 8kHz /16kHz ⁷⁾	7,4s/ 4,1s/ 1,1s
Max. Peak current time without internal chopper resistor at 4kHz/ 8kHz /16kHz ⁷⁾	29s/ 15s/ 3,8s
Chopper resistor current, valid (I) ⁸⁾	8A
Chopper resistor internal, (optional) (P)	$P_{cont.} = 30W$
Chopper resistor internal (optional) (R)	100 Ω
Chopper resistor external (R)	> 50 Ω
Chopper start-up voltage (U)	400V
Chopper shutdown voltage (U)	380V
Chopper peak power	3.2kW
Chopper nominal power	1.0kW
Power loss referring to mains voltage ⁹⁾	max. 100W
Power loss referring to control voltage ¹⁰⁾	max. 30W

- BM341X-L3

Input rated power at 8kHz with/without internal chopper resistor ¹⁾	2,3kVA/ 3,5kVA
Input rated current with/without internal chopper resistor (I_{eff})	3,9A/ 6,2A
Input current max. (I_{eff})	11,8A
DC link rated voltage ¹⁾ (U_{DC})	540V
DC link capacity (internal)	235 μ F (V1)/ 280 μ F (V2)
Output voltage ²⁾ (U_{AC})	3 x 0V to 3 x 380V
Output frequency	0Hz to 400Hz
Max. Output rated current with internal chopper resistor at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	5.5A/ 3.5A/ 2.0A
Max. Output rated current without internal chopper resistor at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	8.0A/ 5.5A/ 3.3A
Max. Output peak current at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁷⁾ (I_{AC})	10.5A/ 10.5A/ 10.5A
Max. Peak current time with internal chopper resistor at 4kHz/ 8kHz /16kHz ⁷⁾	0,74s/ 0,41s/ 0,21s (V1) 7,4s/ 4,1s/ 1,1s (V2)
Max. Peak current time without internal chopper resistor at 4kHz/ 8kHz /16kHz ⁷⁾	86s/ 45s/ 3,8s (V1) 29s/ 15s/ 3,8s (V2)
Chopper resistor current, valid (I) ⁸⁾	8A
Chopper resistor internal, (optional) (P)	$P_{cont.} = 30W$
Chopper resistor internal (optional) (R)	100 Ω
Chopper resistor external (R)	> 100 Ω
Chopper start-up voltage (U)	764V
Chopper shutdown voltage (U)	749V
Chopper peak power	5.4kW (V1)/6.2kW (V2)
Chopper nominal power	1.0kW
Power loss referring to mains voltage ⁹⁾	max. 100W
Power loss referring to control voltage ¹⁰⁾	max. 30W

• BM342X-L4

Input rated power at 4kHz ¹⁾	13,3kVA
Input rated current (I_{eff})	24A
Input current max. (I_{eff})	45A
DC link rated voltage ¹⁾ (U_{DC})	540V
DC link capacity (internal)	705 μ F
Output voltage ²⁾ (U_{AC})	3 x 0V to 3 x 380V
Output frequency	0Hz to 400Hz
Max. Output rated current bei 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁶⁾ (I_{AC})	21.0A/ 15.0A/ 5.0A
Max. Output peak current at 4kHz/ 8kHz/ 16kHz ¹⁾⁴⁾⁵⁾⁷⁾ (I_{AC})	40.0A/ 40.0A/ 40.0A
Max. Peak current time without internal chopper resistor at 4kHz/ 8kHz /16kHz ⁷⁾	7,4s/ 4,7s/ 2,4s
Chopper resistor current, valid (I) ⁸⁾	25A
Chopper resistor external (R)	$> \frac{(U_{Choppertransistor_on}}{I_{Choppertransistor}} \Omega$
Chopper start-up voltage (U)	< 780V (settable via parameter)
Chopper shutdown voltage (U)	settable via parameters
Chopper peak power	20kW
Chopper nominal power	6.8kW
Power loss referring to mains voltage ⁹⁾	max. 270W
Power loss referring to control voltage ¹⁰⁾	max. 35W

¹⁾All rated values refer to an input voltage of 230V or 400V and a control voltage of 24V.

²⁾The output voltage is a pulsated direct-current voltage. The operating range refers to the effective value of the fundamental wave at rated input voltage.

³⁾Switching frequency of the converter (settable).

⁴⁾Effective value at an environmental temperature of 40°C.

⁵⁾At rated input voltage the device generates the rated-/maximum output currents. At input voltages above the rated input voltage the output currents at constant output power have to accordingly be reduced. The characteristic curve output current in dependence with the input voltage is found on the following page.

⁶⁾Between 40°C and 55°C the output current must be reduced. The allowable output current (I_0) is calculated with the following formula:

$$I_0 = I_{0(40^\circ\text{C})} * (1 - ((\text{Coolant temperature} - 40^\circ\text{C}) * 0,03 / ^\circ\text{C}))$$

⁷⁾This overload time is dependent of the motor current and the coolant temperature and is determined from the Ixt-monitoring of the device.

⁸⁾DC-link parallel connection is not permissible at devices according to type key V1!

⁹⁾Maximal value to be expected at full load (internal chopper resistor, 16kHz PWM frequency). If load to the chopper resistor is lower and lower PWM frequency is used, the value to be expected is lower accordingly.

¹⁰⁾Maximal value to be expected at fully equipped device (with extenderboard and 2 connected encoders). If no extenderboard is installed and only 1 encoder is used, the value to be expected is lower accordingly.

¹¹⁾For asynchronous machines the following have to be applied: The output frequency must not exceed a maximum of 10% of the adjusted PWM frequency.

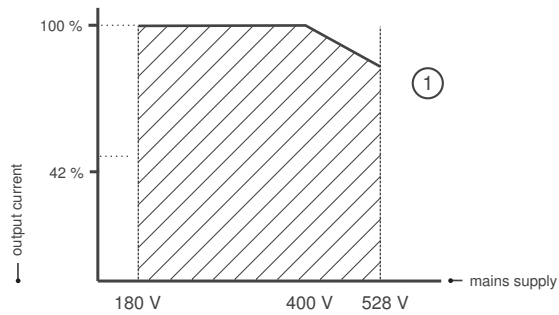


Figure D.3: Output current

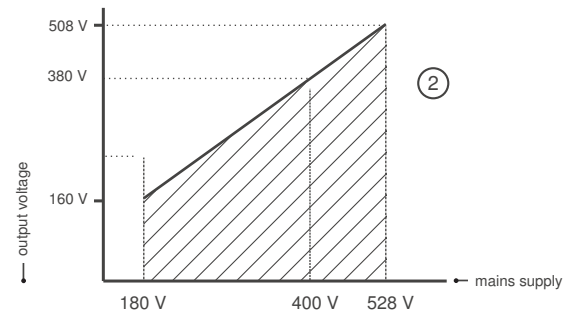


Figure D.4: Output voltage BM34XX_L3

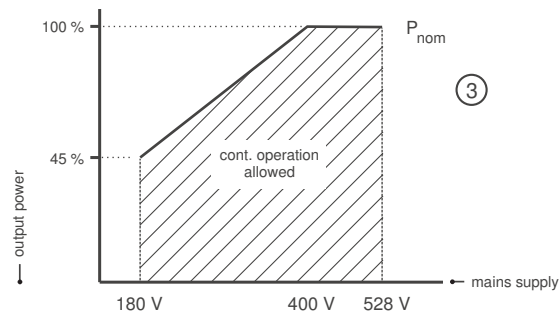


Figure D.5: Output power BM34XX_L3

D.7 Overload durations

For the possible pulse frequencies there are three time constants (see table) in the following parameters:

- P0014 for 4kHz
- P0015 for 8kHz
- P0034 for 16kHz

If the thermal characteristic limit is reached it is automatically limited to the nominal current.

Frequency-dependent nominal currents: The nominal currents for the according pulse frequencies are in:

- P0010 for 4kHz
- P0012 for 8kHz
- P0032 for 16kHz

In the diagram the characteristic limits in dependance with the preloading are shown.

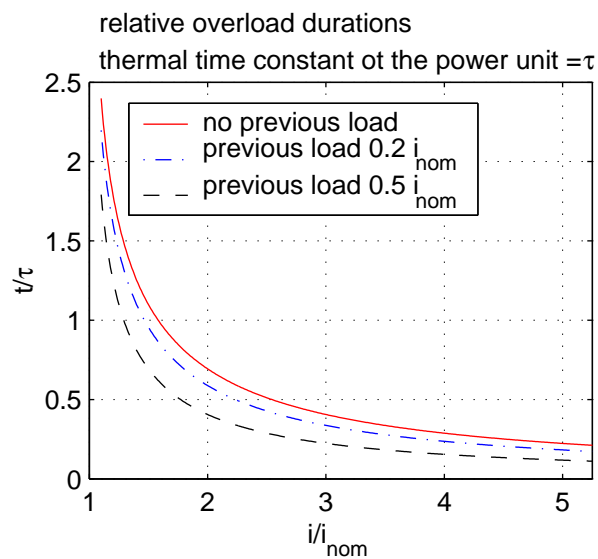


Figure D.6: Overload durations

D.8 Current derating depending on the output frequencies

All **b maXX® BM3400** devices were developed in such a way, that the specified output-rating from an electric output frequency of $>15\text{Hz}$ is continuously permissible, i.e. in the S1 operation. If the static converter output frequency is longer than 5s below 15Hz , the continuously permissible output current must be reduced according to the following characteristic curve.

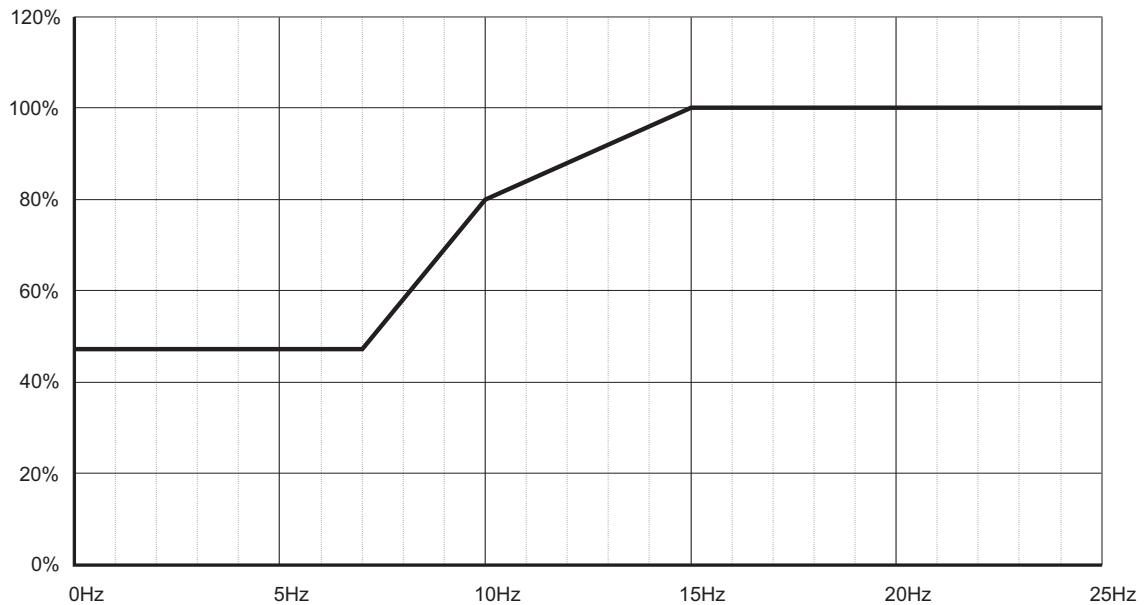


Figure D.7: Derating at output frequencies $<15\text{Hz}$

The following cases of operation can be concerned thereof:

- Applications with speed control without positioning
- Operations with stop control
- Applications, where a mechanic blocking can occur, e.g. when starting cold extruders.

The following applications typically are not concerned:

- Typical positioning applications
- Applications with holding brake instead of a stop control
- Applications with standstill monitoring or block monitoring

If there is a change of output frequency $\geq 15\text{Hz/s}$, derating is not necessary.

D.9 Fuse protection

It is to distinguish between the protection of the supply cables and the protection of the device. In order to fulfill the CE specifications - here especially EN60204-1 - you have to protect the supply cables. Assure the device in UL certificated installations.



NOTE

In UL-approved installations you must use the UL-listed semiconductor- or total-range-fuses.

D.9.1 Cable protection

Place in safety fuses of the operation class gL DIN VDE 0636-201 / IEC 60269-2-1 / HD 630.2.1 54 or cable protection switches with the triggering characteristic K referring to DIN VDE 0636-201 / IEC 60204-1 60269-2-1 / HD 630.2.1 54, to protect the cables. These fuses protect against overloading and from consequential damages from faults e. g. by fire. You cannot prevent, that the device is extensively destroyed, if a short circuit or an ground fault occurs in the DC link.

Execute the protection according to EN 60204-1 (Electrical equipment of machines). Dimension the cable protection fuses, dependent on the used cross section according to the valid national standards and local regulations.

The current-carrying capacity of conductors is determined in table 5 of EN60204-1. For your operation you must determine the accordant value in the standard on yourself, here an extraction:

Cable cross section	Fuse rated current
1.5mm ²	16A
2.5mm ²	22A
4mm ²	30A
6mm ²	37A
10mm ²	52A
16mm ²	70A

Use suitable fuses with the enable characteristic gl.

D.9.2 Device protection

Place in semiconductor fuses with the triggering characteristic gR DIN VDE 0636-201 / IEC 60269-2-1 HD 630.2.1 54. Switch these in series to the cable protection fuses. These protect the input-sided rectifier-triggering, in case of a short circuit, against completely destruction, so that a repair of the device is possible. Execute the protection according to EN 60204-1 (Electrical equipment of machines). Dimension the suitable fuses dependent on the rated current and the limit load integral value.

Device	Limit load integral ¹⁾
BM340X	< 200A ² s
BM341X	< 310A ² s

¹⁾Use fuses, which **in the operation point** fall below the stated tripping integral (i^2t).

D.9.3 Cable protection and device protection

You have two possibilities to protect the cable and the device:

- Connect cable fuse protections and semiconductor fuses in series
- Use total range fuses

At selection of the total range fuses consider the current carrying capacity of the supply cables, which are connected to the device and the permissible and the limit load integral value.

The following total range fuses are recommended for devices of series BM340X resp. BM341X:

- Bussmann 16A/690V: 170M1559
- SIBA 16A/690V: 2047734/16A ¹⁾
- Siemens 16A/690V: 3NE1 813-0 ¹⁾

¹⁾ In the course of certification according to UL 508 C the above mentioned types of SIBA and Siemens were used and checked.

D.9.4 24V-extra-low voltage protection

If you consider UL 508 C, assure by the use of fuses that X201-1,2,5,6 is at the maximum loaded with 4A (valid for **b maXX® BM340X** and **b maXX® BM341X**) resp. 5A (valid for **b maXX® BM342X**) and X26 with maximum 1A.

D.10 Circuit mains - device

device	cross section ¹⁾	maximum length	connection to device
BM340X, BM341X	4 x 1 to 2,5mm ² (AWG 16 - 12) ¹⁾	user-defined	with/without wire end ferrule (plug-in terminal)
BM3422	4 x 8 to 16mm ² (AWG 16 - 12) ¹⁾	user-defined	with/without wire end ferrule (plug-in terminal)

¹⁾Possible cross section: For UL conform machines/installations you must use UL certified circuit cables.

D.11 Circuit device - motor

device	cross section ¹⁾	maximum length ²⁾	connection to device
BM340X, BM341X	4 x 1 to 2,5mm ² (AWG 16 - 12) ²⁾	max. 50m	flexible cable without wire end ferrule (plug-in terminal)
BM3422	4 x 8 to 16mm ² (AWG 16 - 12) ¹⁾	max. 50m	with/without wire end ferrule (plug-in terminal)

¹⁾Possible cross section: Use a screened circuit line, shield coverage > 85%. The installing of the cables is user-defined. For UL conform machines/installations you must use UL certified circuit cables.

²⁾Only for Baumüller cables with this maximum length and by usage of a Baumüller mains filter you can assume, that the limits of the EMC regulations are complied with.

D.12 Cable control voltage supply / signals

device	cross section ¹⁾	maximum length ²⁾	connection to device
BM34XX	≤ 0.5mm ²	user-defined	without wire end ferrule (plug-in terminal)

¹⁾The laying of the cables is user-defined

²⁾Any kind of cable can be used, the length of the cable does not influence the compliance to the EMC regulation.

D.13 Mains filter

An integrated mains filter is optional available in BM340X or BM341X.

D.14 Line reactors

For the devices BM34XX mains chokes are not necessary.

D.15 Temperature sensors of the motor

Type	Additional requirements	Insulation
KTY84	—	SELV/PELV
MSKL ¹⁾ (PTC)	$R = 1\text{k}\Omega$ at $T_{\text{protection}}$, $I_{\text{max}} < 2\text{mA}$	SELV/PELV

¹⁾Motor protection PTC according to DIN 44080-082

D.16 Fire fighting appliances

Fight fire with	class ABC fire extinguisher
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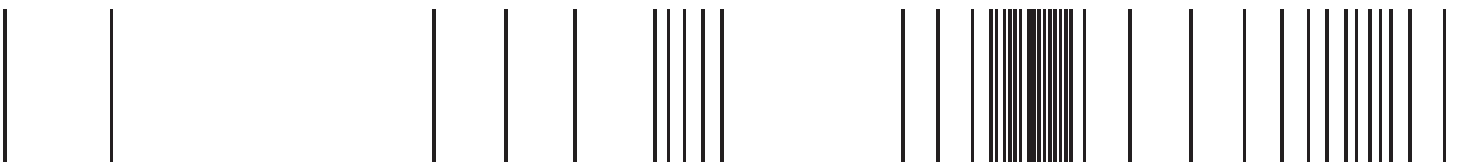
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Appendix G - Revision history

Version	Status	Changes
5.07013.01	2007-09-14	Corrections after internal review and UL pin assignments incorporated, Declaration by Manufacturer and Declaration of Conformity included
5.07013.02	2007-10-16	Corrected limit load integral at Device protection, further remarks to protection and precharging
5.07013.03	2008-12-01	HS2 and EtherCAT-slave added, type key V3, corrections and additions

be in motion



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