Instruction handbook

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be in motion be in motion

BAUMÜLLER

Mono Power Unit /
Power Module

BUM 60 / BUS 60

E	5.01032.05

Read the Instruction handbook before starting any work!

Preliminary information

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

Obligatory

These Instruction handbook are a part of the equipment/machine. These Instruction handbook must be available to the operator at all times and must be in legible condition. If the equipment/machine is sold or moved another location, these Instruction handbook must be passed on by the owner together with the equipment/machine.
After any sale of the equipment/machine, this original and all copies must be handed over to the buyer. After disposal or any other end use, this original and all copies must be destroyed.

When the present Instruction handbook are handed over, corresponding sets of operating instructions of a previous version are automatically invalidated.
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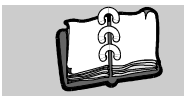

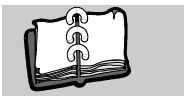

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GENERAL

1.1 Information on the instruction handbook

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

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

Read the instruction handbook, particularly the safety notes chapter, completely before beginning any work on the device. The instruction handbook is part of the product and must be kept accessible to personnel at all times in the immediate vicinity of the device.

1.2 Key to symbols

Warning notes

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

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

DANGER!

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

WARNING!

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

CAUTION!

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

NOTICE!

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

Recommendations

NOTE!

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

1.3 Limitation of liability

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

The manufacturer assumes no liability for damages due to:

- noncompliance with the instruction handbook
- usage for other than the intended purpose
- usage by untrained personnel

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

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

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

1.4 Copyright protection

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

NOTE!

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

1.5 Other applicable documents

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

1.6 Spare parts

WARNING!

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

Therefore:

m Only use original spare parts of the manufacturer.

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

1.7 Disposal

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

See also ZDisposal– ab Seite 69.

1.8 Guarantee provisions

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

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

1.9 Customer service

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

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

1.10 Terms used

The term „device“ or the item designation BM5XXX are also used in this documentation for this Baumüller product. A list of the abbreviations used can be found in ZAppendix A - Abbreviations– ab Seite 73.

2

SAFETY

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

2.1 Contents of the instruction handbook

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

2.2 Changes and modifications to the device

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

2.3 Usage for the intended purpose

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

The devices of the model series Mono Power Unit / Power Module BUM 60 / BUS 60 are either mains rectifier or active mains rectifier in combination with axis units with servo controller. Devices are also available in graduated design size and performance classes.

The device Mono Power Unit / Power Module BUM 60 / BUS 60 is used exclusively as a converter for controlling a motor.

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

WARNING!

Danger arising from usage for an unintended purpose!

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

Therefore:

- Only use the device compliant with its intended purpose.
- Observe all specifications of these instruction handbook.
- Ensure that only qualified personnel work with/on this device.
- When configuring, ensure that the device is always operated within its specifications.
- Mount the device on a wall that can sufficiently bear the load.
- The device must always be operated within a control cabinet.
- Ensure that the power supply complies with the stipulated specifications.
- The device may only be operated in a technically flawless condition.
- Only operate the device in combination with components approved by Baumüller Nürnberg GmbH.
- The device has been developed in such a manner that it fulfills the requirements of the category C3 according to IEC 61800-3:2005.
- The device is not intended to be connected to the public power supply system. To operate the device in primary surroundings of the category C2/C1 (residential, business and commercial areas, directly on a public low-voltage power supply without an intermediate transformer), special measures to reduce the transient emissions (line-internal and radiated) must be provided for and certifiable by the system builder. Otherwise, EMC interference could occur without such additional measures.

2.4 Responsibility of the operating company

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

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

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

2.5 Protective devices

The devices BUM 60 / BUS 60 comply with the protection class IP 20.
All devices BUM 60 / BUS 60 must be installed in an appropriate control cabinet to meet the protection classification required in EN 61800-5-1, chapter 4.2.3.3.

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

2.6 Training of the personnel

WARNING!

Risk of injury due to insufficient qualifications!

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

Therefore:

m Certain activities can only be performed by the persons stated in the respective chapters of these instruction handbook.

In these instruction handbook, the following qualifications are stipulated for various areas of activity:

m Operating personnel

- n The drive system may only be operated by persons who have been specially trained, familiarized and authorized.
- n Troubleshooting, maintenance, cleaning, maintenance and replacement may only be performed by trained or familiarized personnel. These persons must be familiar with the instruction handbook and act accordingly.
- n Initial operation and familiarization may only be performed by qualified personnel.

m Qualified personnel

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

2.7 Personal protective equipment

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

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

Protective work clothing

should be snug-fitting work clothes, with low tearing resistance, narrow sleeves and with no extending parts. It serves to primarily protect against...

No rings or chains should be worn.

Hard hat

to protect against falling down and flying around objects.

Safety shoes

to protect against heavy objects falling down.

Protective gloves

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

Wear for special work.

Protective eye wear

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

2.8 Special hazards

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

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

Electrical current

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

Danger from residual energy

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Therefore:

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

Moving components

WARNING!

Risk of injury from moving components!

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

Therefore:

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

2.9 Fire fighting

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

- Use the following fire-extinguishing agent:

ABC powder / CO_2

2.10 Safety equipment

WARNING!

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

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

Therefore:

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

2.11 Conduct in case of danger or accidents

Preventive measures

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

And if something does happen: respond properly.

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

2.12 Signs and labels

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

WARNING!

Risk of injury due to illegible symbols!

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

Therefore:

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

Electrical voltage

Only qualified personnel may work in work areas that identified with this.

Unauthorized persons may not touch working materials marked correspondingly.

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Therefore:

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

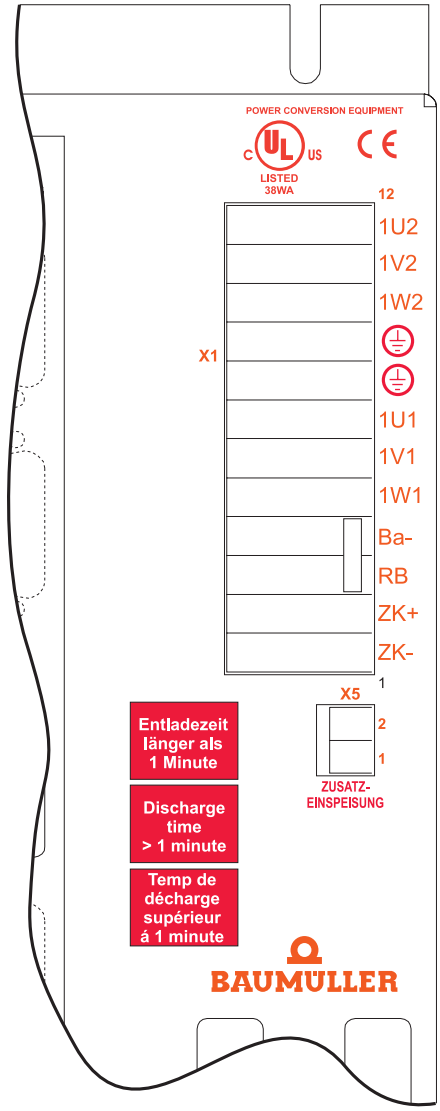


Figure 1: Signs

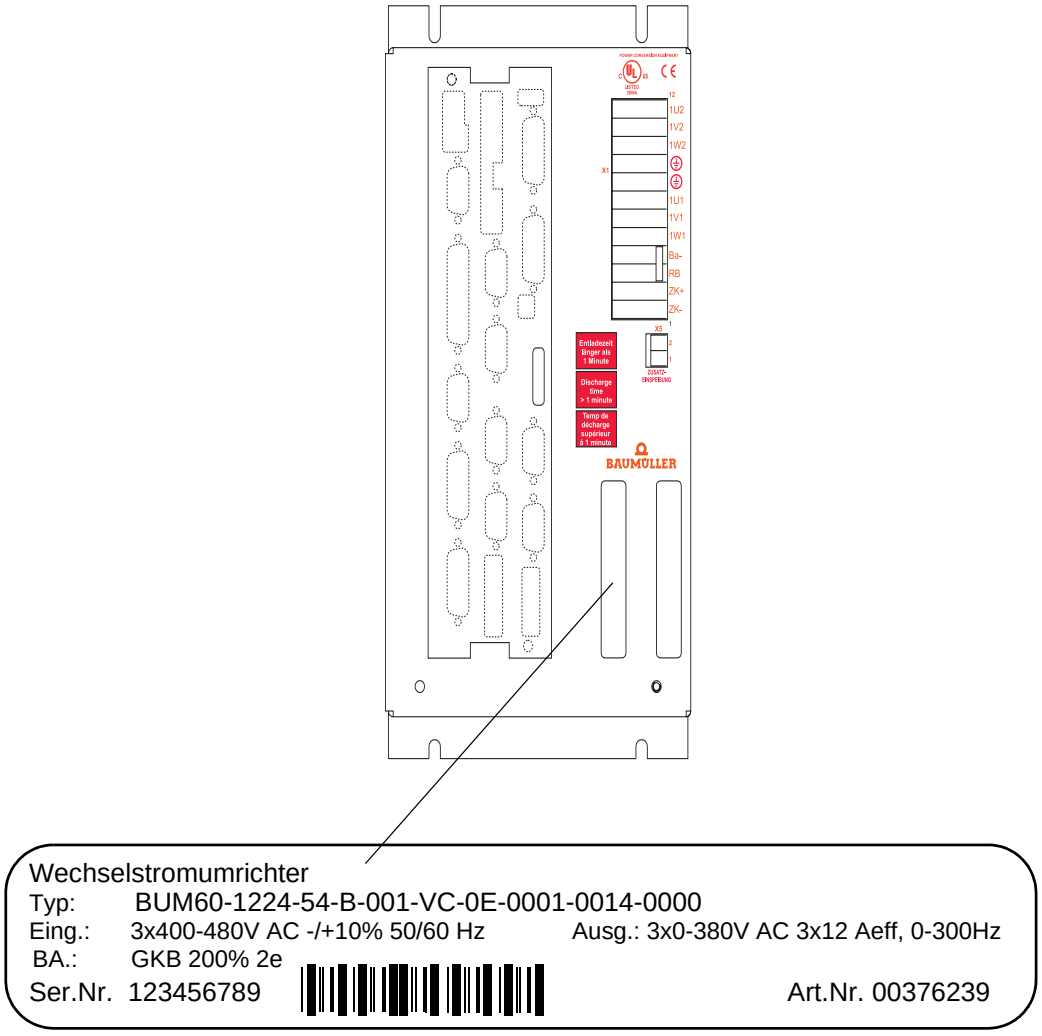


Figure 2: Type plate

3

TECHNICAL DATA

3.1 Dimensions

The following dimension drawings show the main dimensions of the devices. By means of the dimension drawings the space requirements within the control cabinet are determined. The dimension drawings in ZDrilling patterns– from page 40 must be used in order to do the required drillings / segments.

NOTE!

All dimensions in mm.

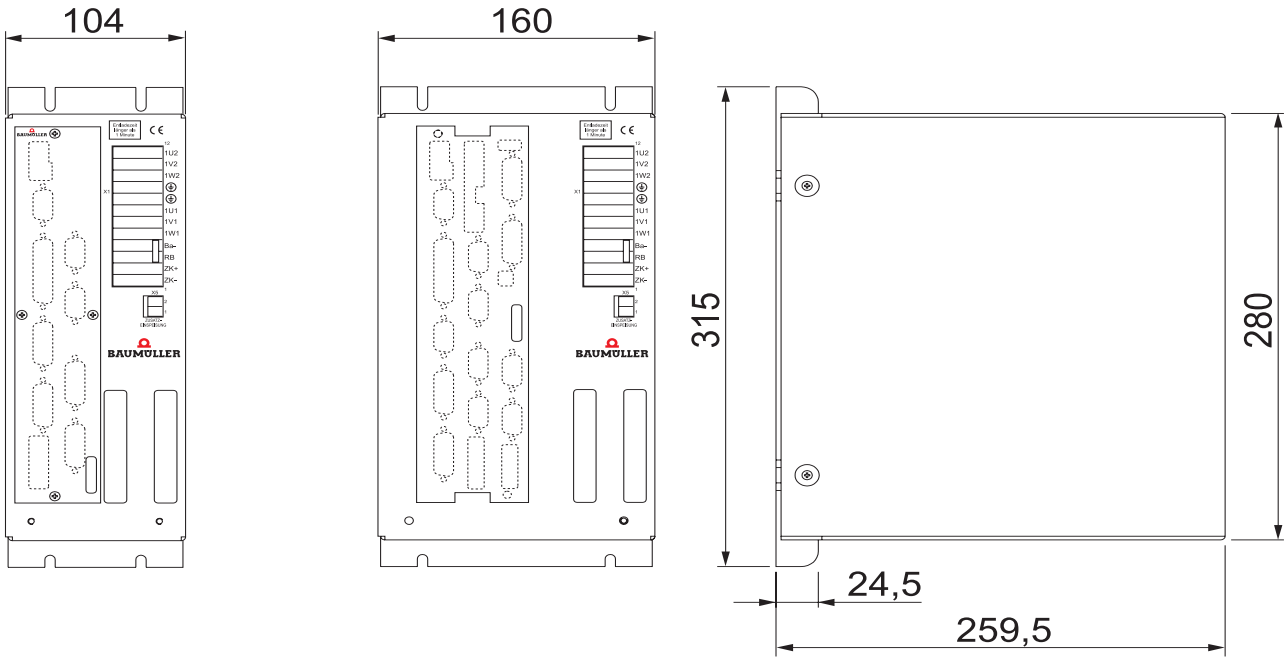


Figure 3: Dimensions

3.2 Weight

Weight without controller cassette	ca. 7 kg

3.3 Operating requirements

3.3.1 System types

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

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

Supported system types

NOTICE!

The operation of the BUM 60 / BUS 60 is possible at TN / TT systems, only.

3.3.2 Requirements to the energy supply / supply system

Supply system (see ZSystem types– from page 24)	Industrienetz mit hart- oder niederimpedant geerdetem Sternpunkt (TN-Netz oder TT-Netz)
Inductance (sum of power supply inductance and choke inductance)	min. u_k = 0,4 % max. u_k = 4 %
Rated power supply voltage/frequency device [1] (U_{AC})	3 x 400 V 50/60 Hz
Absolute minimum supply voltage device[1] (U_{AC}) Absolute maximum supply voltage device[1] (U_{AC})	3 x 207 V / 50/60 Hz 3 x 528 V / 50/60 Hz
Absolute minimum frequency [3] Absolute maximum frequency [3]	47 Hz 63 Hz
Harmonics (power supply voltage) EN 61800-3, chap. 5.2.1, class 3	THD_U b 10 %
Unbalanced power supply voltage EN 61000-2-4, tab. 1, class 3	max. 3 %
Voltage variations/-fluctuations EN 61200-2-4, class 3	+/-10 % +10 % to -15 % at a period of b 1 min
Control voltage [2] (U_{DC}) EN 61131-2:1994, table 7	+ 24 V +/-10 %

[1] Rated voltage is 400 V.
With lower supply voltages the output power of the device is reduced.

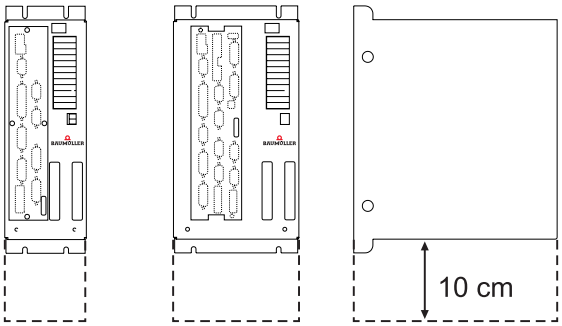
[2] The control voltage must accord to PELV (EN 61800-5-1, chapter 3.21) or SELV (EN 61800-5-1, chap. 3.35).
At control voltage of < 24 V the ventilation power output is reduced. Therefore, it may be necessary, to reduce the output currents as well.
If you comply with UL 508C the current is limited to 4 A with fuses according UL 248 and the voltage is limited to max. 30 V_{DC}.

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

3.3.3 Environmental requirements

Transport temperature range	- 25 °C bis + 70 °C
Transport climatic category EN 60721-3-2	2 K 3
Storage temperature range	- 25 °C bis + 55 °C
Storage climatic class EN 60721-3-1	1 K 4
Operation environment	Industrial system [3]
Operation temperature range [1]	min. 5 °C to max. 45 °C (with power derating 3 %/ °C) up to 55 °C))
Operation climatic class EN 60721-3-3	3 K 3
Mounting height [2]	absolute altitude up to 1000 m
Humidity (operation) EN 60721-3-3	relative humidity: 5 % to 85 % no condensation and absolute humidity: 1 g/m^3 to 25 g/m^3
Ionizing and non-ionizing radiation	< measurable range

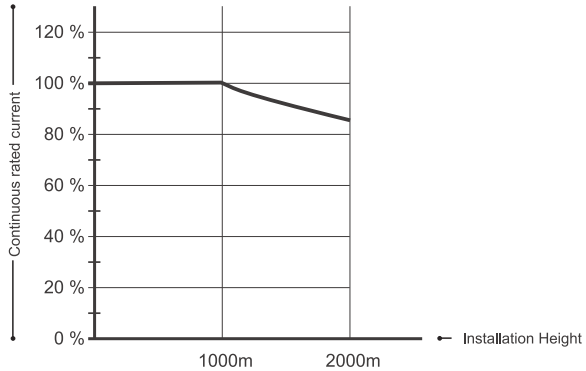
[1] The environmental temperature is measured as follows:



- determine several measurement points, that cover the entire marked range with a space of 10 cm
- measure the temperature at this measurement points

The highest value represents the environmental temperature!

[2] Loading values in dependence on the mounting height for altitudes greater than 1000 m



[3] For the operation in an environment of category C2 according to IEC 61800-3:2005, additional measures may be required.The manufacturer of the installation / user must provide the following evidence in this case: The additional measures are effective. The specified limit values of category C2, which are described in IEC 61800-3, are complied with.

NOTICE!

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

3.4 Electrical data

	3/6	3/6 - 54 - x - xx6	6/12	6/12 - 54 - x - xx6	8/16	12/24
Connection voltages [1]	3 x 400 - 480 V_{AC} 50 - 60 Hz, ± 10 %					
Semiconductor fuses (external) [8]	16 A					
Type of protection	IP 20					
Rated DC Link voltage [2]	540 V_{DC}					
DC Link capacitor	110 µF	330 µF	110 µF	330 µF	220 µF	220 µF
Switch-on: Ready for operation after	≥ 1,5 s					
Frequency to switch on power supply [12]	unlimited					
Output voltage [9] [10]	3 x 0 V_{AC} ... 95 % of input voltage					
Output power [3] [10]	2 kVA	2 kVA	4,5 kVA	4,5 kVA	6 kVA	8 kVA
Typical motor power [3]	1,1 kW	1,1 kW	2,25 kW	2,25 kW	3 kW	4,5 kW
Rated output current [4] [5] [10] [11]	3 A_{eff}	3 A_{eff}	6 A_{eff}	6 A_{eff}	8 A_{eff}	12 A_{eff}
Peak output current [4] [5] [6] [10]	6 A_{eff}	6 A_{eff}	12 A_{eff}	12 A_{eff}	16 A_{eff}	24 A_{eff}
Low-voltage supply	+24 V_{DC} ± 10 % (max. 55 W)					
Ballast resistor R_B (only BUM 60) Peak power of ballast resistor Continuos output External ballast resistor [7]	10 kW / 1 s 250 W min. 60 Ω					
Max. switch-on time / ratio	1,5 s / 1 : 33					
Power loss in rated operation, without low-voltage supply, without ballast	60 W	60 W	110 W	110 W	130 W	170 W

*

WARNUNG!

With a single-phase connection, neither of the two lines must have ground potential!

1) Single-phase connection possible. Voltage difference between phases must not exceed +/- 3,0 %

2) All nominal values refer to a connection voltage of 400 V
With a single-phase connection, the rated DC link voltage is reduced by 35 %

3) With a single-phase connection, the value is reduced by 66%

4) With a single-phase connection, the value is reduced by 50%

5) The current information depends on the controller type
Digital controller: effective value for sinus commutation

6) For a maximum of 200 ms without preloading using E/V-controller
For a maximum of 1 s without preloading using V-controller
The load cycle must be dimensioned, that the effective value of the output current does not exceed the rated current.

7) **If UL508C** has to be observed: the external ballast resistor must protect itself from overheating.

8) Do use fuses, which have a I^2t-value at the working point of max. 510 A^2s .
If UL508C has to be observed: do use fuses 32A/1000V: 3NE4 101 manufactured by Siemens (Item-No. 101 940 Baumüller). The corresponding fuse-carrier is available from Baumüller (Item-No. 101 960). You may even use UL-approved fuses listed in the table below. In the table below we have listed UL-approved fuses and fuses that are not UL-approved. Please observe, that the listed fuses are of different design and that you have to use corresponding fuse-carriers. Not all fuses listed below can be inserted into the above listed fuse-carrier from Baumüller!

Full range fuses (semiconductor and line protection)

Bussmann	00	16A/690V: 170M2692	20A/690V: 170M2693	25A/690V: 170M2694	32A/690V: 170M2695
		40A/690V: 170M2696			
Gould	0	40A/690V: A0-69E40 D8	50A/1250V: A0-125E50 D1		
SIBA	00	16A/690V: 2047734-16	20A/690V: 2047734-20	25A/690V: 2047734-25	
Siemens	000	16A/690V: 3NE1 813-0	20A/690V: 3NE1 814-0	25A/690V: 3NE1 815-0	
	00	**20A/660V: 3NE8 714**	**25A/660V: 3NE8 715**	**25A/660V: 3NE8 015**	25A/690V: 3NE8 015-1
		32A/660V: 3NE8 701	**35A/660V: 3NE8 003**	35A/690V: 3NE8 003-1	
	0	32A/1000V: 3NE4 101	40A/1000V: 3NE4 102		

size **bold: no UL**

9) The output voltage is a pulse-commutated DC. The setting range refers to the r.m.s. value of the fundamental wave.

10) R.m.s. value at an ambient temperature of 45 °C.

11) The rated output current must be reduced between 45 °C and 55 °C. The rated output current is calculated according the following formula::

$$I_A = I_{A(45°C)} \cdot \left(1 - \frac{\text{environmental temperature} - 45°C}{°C} \cdot 0,03\right)$$

For example: rated output current = 30 A, environmental temperature = 47° C:

$$I_A = 30A \cdot \left(1 - \left(\frac{47°C - 45°C}{°C} \cdot 0,03\right)\right) = 30A \cdot 0,94$$

The output current must be reduced to: 28,2 A

12) A minimum break time after switch-off of 2 min.must be observed.

NOTE

The use of the commutating choke BK3-0025/0030, I_{nom} = 25 A, L = 1,18 mH with copper busbar part no. 368377 or with terminals part no. 399136 is recommended, if the device BUM60-12/24 operates at full capacity.

Reason:

The ripple current through the DC link capacitor is high, if the device operates at full capacity. The current can be reduced by connecting ahead a commutating inductance accordingly the DC link capacitor load is reduced and therefore is heated up to a lesser extent and a longer live cycle of the DC link capacitors can be expected than by operating the device on the power limit without using a commutating choke.

4

DESIGN AND OPERATION

4.1 General

The single power unit BUM 60 and the power module BUS 60 complement the Baumüller Modular System in the medium performance range.

Plug-in V-controller cards are supposed to be used for closed-loop control. All V-controller combinations up to three printed circuit levels can be used.

HINWEIS!

The controller is fitted as plug-in card and the description, which is available separately, contains the respective properties and technical data.

The single power unit BUM 60 consists of the feed current converter on the power supply side and the motor-end inverter.
The power module BUS 60 consists only of the motor-end inverter. The power supply is connected via the DC link.

4.1.1 Description of function

The whole unit BUM 60 consists of the three parts feed current converter on the power supply side, motor-end inverter and controller plug-in card. This documentation does not refer to the available controllers. Each controller comes with its own documentation.

- Feed current converter on the power supply side
  The feed current converter is an non-controllable B6 rectifier with starting current load relief and ballast circuit.
- Starting current load relief
  A direct switch-on of the unit would lead to an inadmissibly high level of impulse current, because of the DC link capacity without starting current load relief. To avoid this impulse current, the starting current is limited by a resistor.
- Ballast circuit
  In certain operation modes feeds the motor energy to the unit. This energy is stored and leads to a higher DC link voltage. To avoid reaching the over voltage switch-off threshold, the feedback energy is transformed to heat in an internal or external ballast resistor.
- Motor-end inverter
  The motor-end inverter comprises the IGBT power unit and the accompanying detectors. The detectors supply on the one hand measurement signals and on the other hand the self-protection facilities of the power electronic.
  The control of the inverter is run by the controller.

The power module BUS 60 does not include the parts feed current converter with starting load relief and ballast circuit. The unit consists only of the motor-end inverter and the controller plug-in.
With this power module - in connection with units, containing feed current converters - multi axle systems can be built, that enable a power transfer via the DC link.

4.1.2 Block diagrams

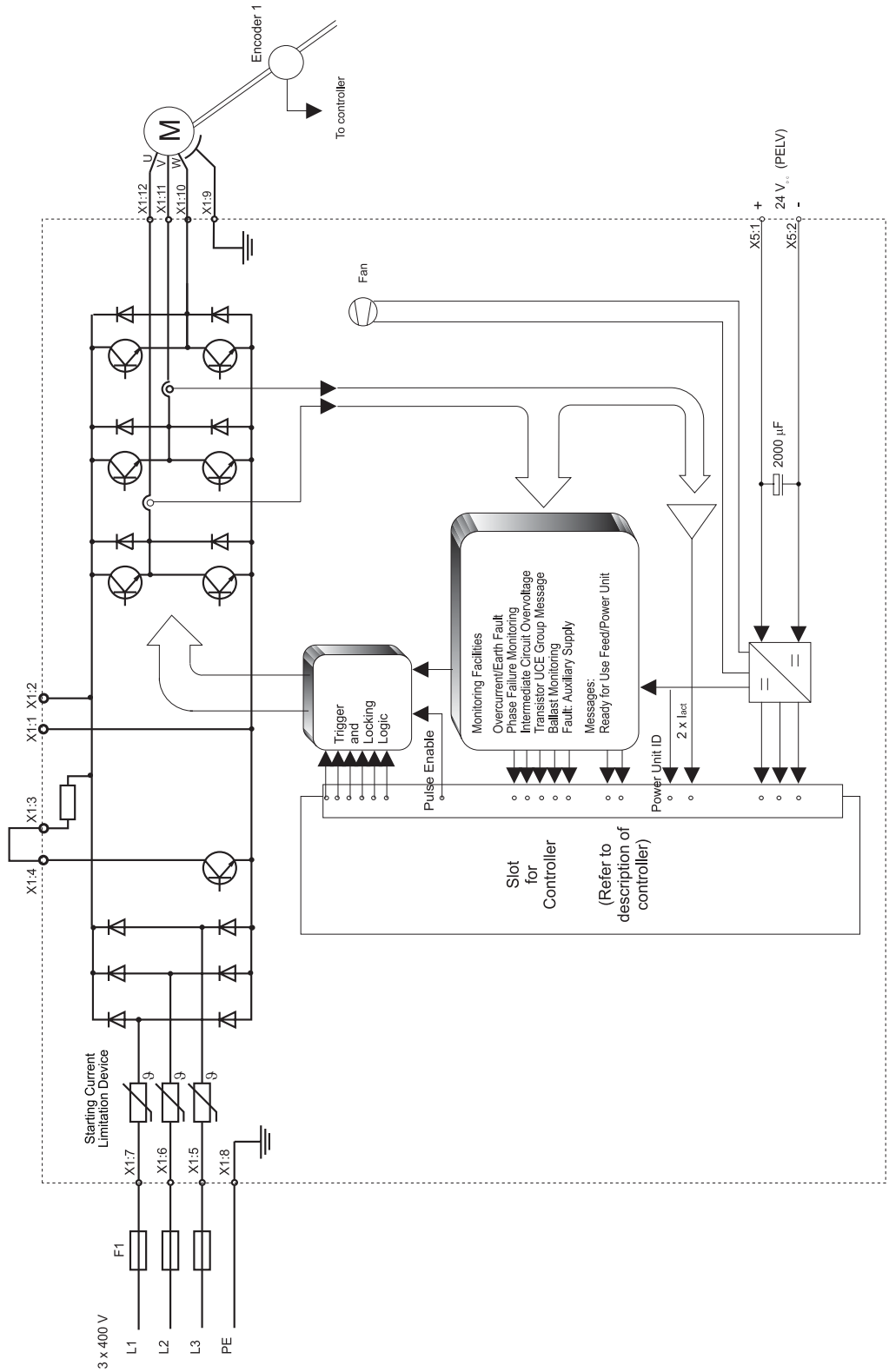


Figure 4: Block Diagram BUM 60 - XX/XX - 54 - X - XXX

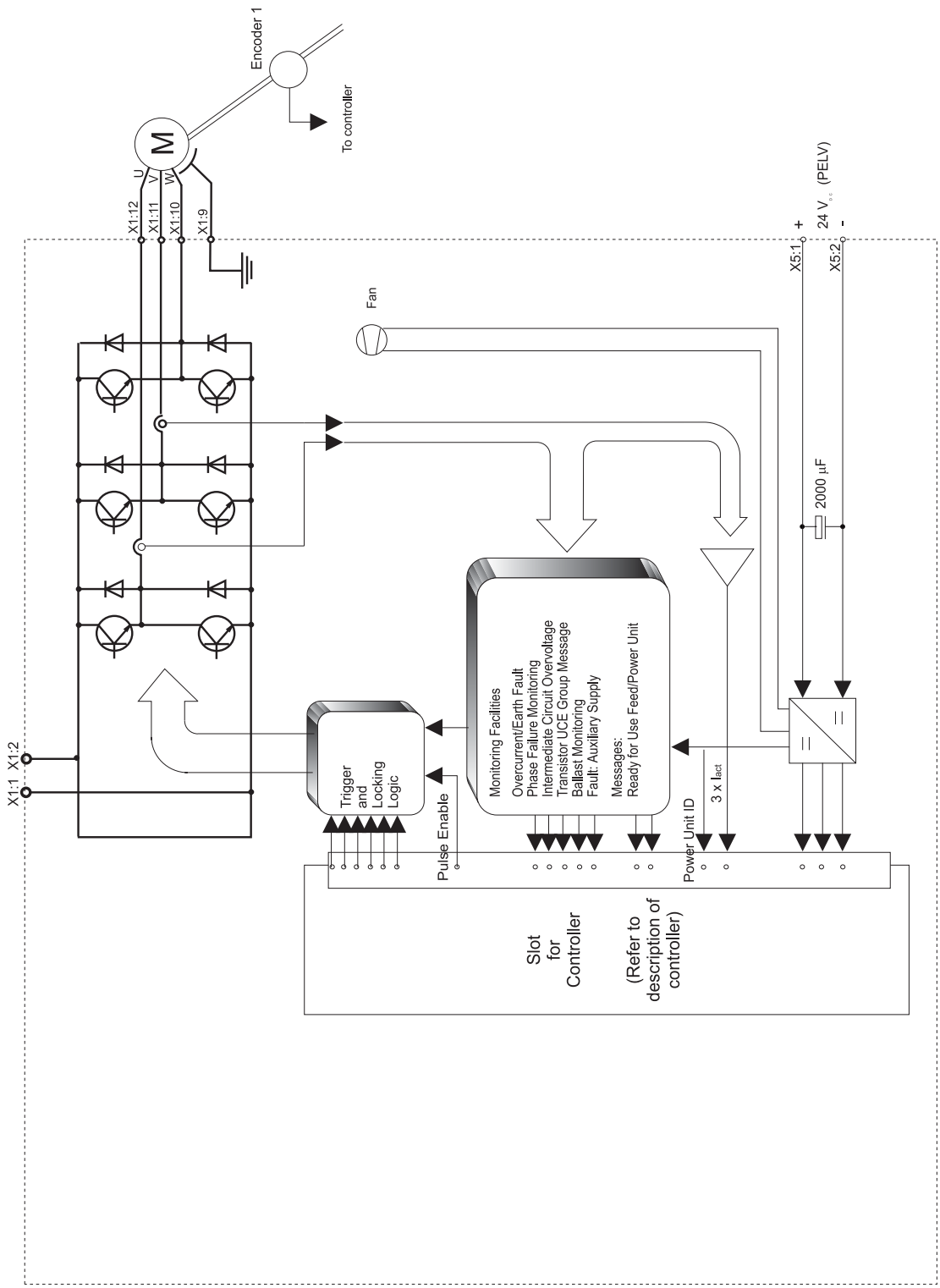


Figure 5: Block diagram BUS 60 - XX/XX - 54 - X - XXX

5

TRANSPORT AND PACKAGING

5.1 Safety notes for transport

NOTICE!

Damage due to unauthorized transport!

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

Therefore:

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

WARNING!

Danger of mechanical hazard!

Secure devices against falling down.

Therefore:

- Use appropriate handling material.

5.2 What to observe when transporting

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

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

5.3 Transport inspection

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

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

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

NOTE!

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

5.4 Unpacking

After having received the still packaged device:

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

If no transport damage is visible:

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

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

NOTE!

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

5.5 Disposal of the packaging

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

- When disposing of the packaging, comply with the national regulations.

6

MOUNTING

In this chapter we describe the mechanical mounting of the device into a control cabinet.

Mounting consists of the following steps:

1 Prepare mounting (drill holes/cut-out segments)

2 Install device

6.1 Safety notes

NOTE!

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

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

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

WARNING!

Danger as a result of faulty mounting!

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

Therefore:

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

WARNING!

Danger of mechanical impact!

Secure devices against falling down.

Therefore:

m Use appropriate means of transport.

NOTICE!

Danger due to electrostatic discharge.

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

Therefore:

Please heed the respective notes.

CAUTION!

Danger due to sharp edges.

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

Therefore:

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

Wear safety gloves.

Wear safety shoes.

6.2 Preparing for mounting

Based on the planning documents and the drilling pattern, the cutout sections and the positions of the attachment drill holes can be determined.

NOTICE!

Property damage due to conductive contamination.

Therefore:

- When performing installation work of any kind, it must be ensured that no foreign material (e.g. drill shavings, copper strands, etc.) gets into the device as a result.
- If possible, the drilling of the holes should be done before mounting the device and the configuring of the cables should take place outside of the control cabinet. If this is not possible, the device must be appropriately covered.
  Remove this covering again prior to start!

CAUTION!

Eye injury due to flung particles.

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

Therefore:

Wear protective eye wear!

h Preparing drill holes and cutout sections.

6.2.1 Drilling patterns

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

NOTE!

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

All dimensions in millimeters [mm].

Further notes see ZDimensions– on page 23 and ZEnvironmental requirements– on page 26.

How to determine the required space in the control cabinet, see ZDimensions– on page 23.

Tolerance specifications

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

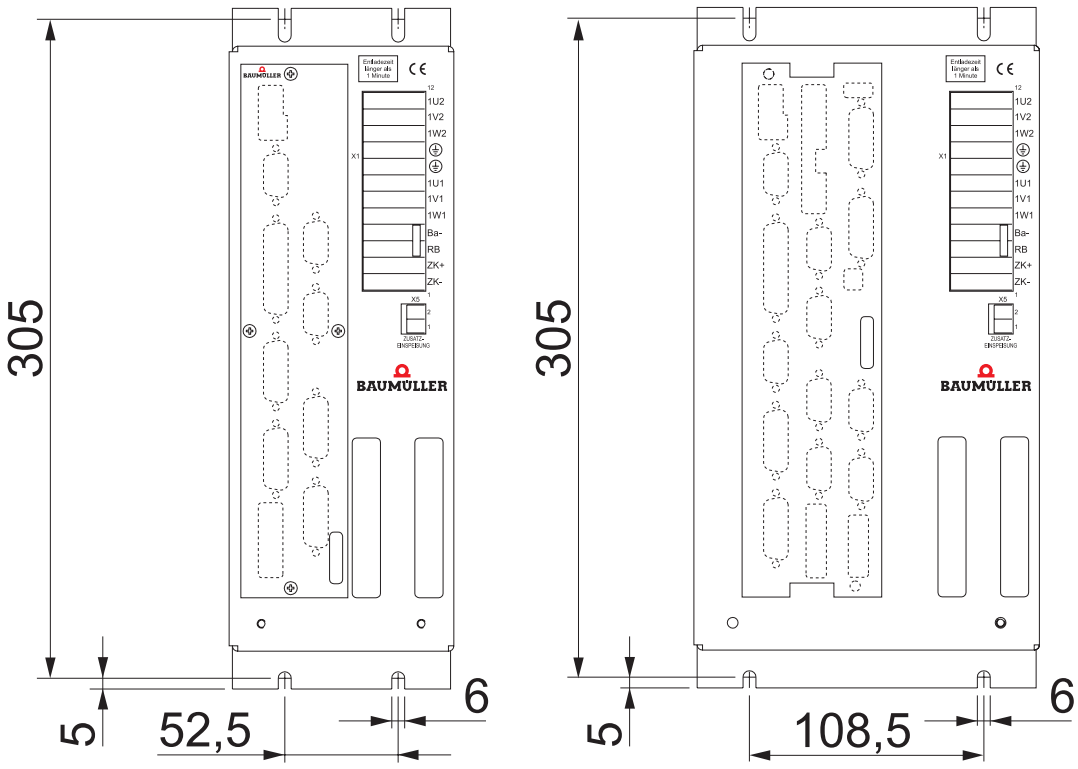


Figure 6: Drilling pattern

6.3 Mounting instructions

h Install the units vertically in a switching cabinet. If there are several units, mount them next to one another.

NOTICE!

It is crucial to comply with the ventilation measures listed below.
Ignoring these measures can lead to the unit overheating.

h Die Belüftung muss von unten nach oben erfolgen.

h Für ungehinderte Luftzufuhr ist zu sorgen.

h Ensure that there is a minimum clearance of at least 100 mm above and below the unit and ensure that there is enough cooling air that can circulate freely!

h The temperature of the coolant 100 mm below the devices may be up to 45° C. At higher temperatures (up to a maximum of 55° C), reduce the power of the devices by 3 % per degree Celsius.

h Do not locate any additional sources of heat above or below the devices.

h Avoid degrees of contamination 3 and 4 according to standard DIN EN 61800-5-1, chapter 4.3.6.1.2, (table 6). The devices are suitable for use in enclosed workshop (VDE0558 Part 1a, Sections 5.4.3.2.1 and 5.4.3.2.2).

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

The discharge time of the device is > 1 min.

7

INSTALLATION

In this chapter we describe the electric installation of the device. The mechanical installation is described in ZMounting– on page 37.

Before installing assure, that the technical preconditions are fulfilled:

1. Check the requirements to the electrical power supply and check if the existing power supply 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.

7.1 Safety instructions

NOTE!

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

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

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

WARNING!

Danger because of faulty installation and initial commissioning!

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

Therefore:

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

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

Danger from residual energy

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Therefore:

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

7.2 Voltage test

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

7.3 Requirements to the supply system

For all important data, see ZRequirements to the energy supply / supply system– from page 25.

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

The devices may only be operated in industrial networks.

The destruction of the device can cause personal injury.

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

7.4 Requirements to the connecting cables

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

7.5 Protection of the device and the cable

Fuses must be installed to protect this device and the cables against overload and possible damage/destruction through the electrical power supply. For data on the required fuses, see ZFull range fuses (semiconductor and line protection)– on page 28.

7.6 PE connection and RCD compatibility

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

DANGER!

Risk of fatal injury from electrical current!

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

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

Therefore:

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

7.7 Installation requirements with regard to EMC

NOTE!

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

HINWEIS!

The important information on EMC-compliant installation can be found in these instruction handbook. Additional notes on building a CE-compliant system, that are imperative to take heed of, can be found in the Baumüller manual „Mains filter BFN“. This manual can be obtained from Baumüller Nürnberg GmbH.

- Use Baumüller motor cables and Baumüller components.
- Use a suitable mains filter of Baumüller Nürnberg GmbH
- Mount all components to one single mounting board with well electroconductive surface (e. g. galvanized steel plate).
- Establish the ground connection converter/ground plane as short as possible (< 30 cm) with fine-wired cables and a great cross section (> 10 mm^2).
- Assure, that the motor cables always consist of one piece.
  Do not interrupt the motor cables e. g. by terminals, conductors, fuses a.s.o.
- Run the cables directly on the surface of the grounded mounting board.
  (smallest possible effective aerial height).
- Keep a minimum clearance of 30 cm between signal/control and 24V-wires towards electric power cables at parallel laying.
- Cross cables with different EMC categories (signal cables - supply cables or motor cables) only in a 90° angle.
- Contact the external cable screens when passing through walls, which separate different EMC ranges.
- Connect the cable shields of the Mono Power Unit / Power Module-devices plane on both ends and highly conductive with ground.
- It is recommended to use protection elements against overvoltage in each 24 V control cabinet sub-distribution (e.g. Phoenix Contact part no. 2839318 type: PT2-PE/S-24AC-ST) when using a peripheral 24 V supply (that means the 24 V power supply is not within the device’s control cabinet).

NOTE

The capacitive coupling of the signals is reduced by factor 5 if a clearance of at least 30 cm is maintained compared with a cable laying directly side by side.

Baumüller has already considered on EMC view that the recommended clearance of 30 cm is not maintained on the supply and the Baumüller devices, therefore this is uncritical and permitted.

7.8 Operating sequence of installation

DANGER!

Risk of fatal injury from electrical current!

Electrically live parts are life-threatening.

Therefore:

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

h Lay all cables EMC-compatible.

h Connect cables (see ZConnection diagrams– from page 49).
(refer to the permissible torque)

The following steps must be carried out at installation:

1 Connect the motor via the terminals 1U2, 1V2, 1W2, PE. Attend to the in-phase connection (rotational direction).
(refer to the permissible torque)

2 Connect the device via the power input terminals 1U1, 1V1 and 1W1 to the power choke output - not necessary for BUS 60.

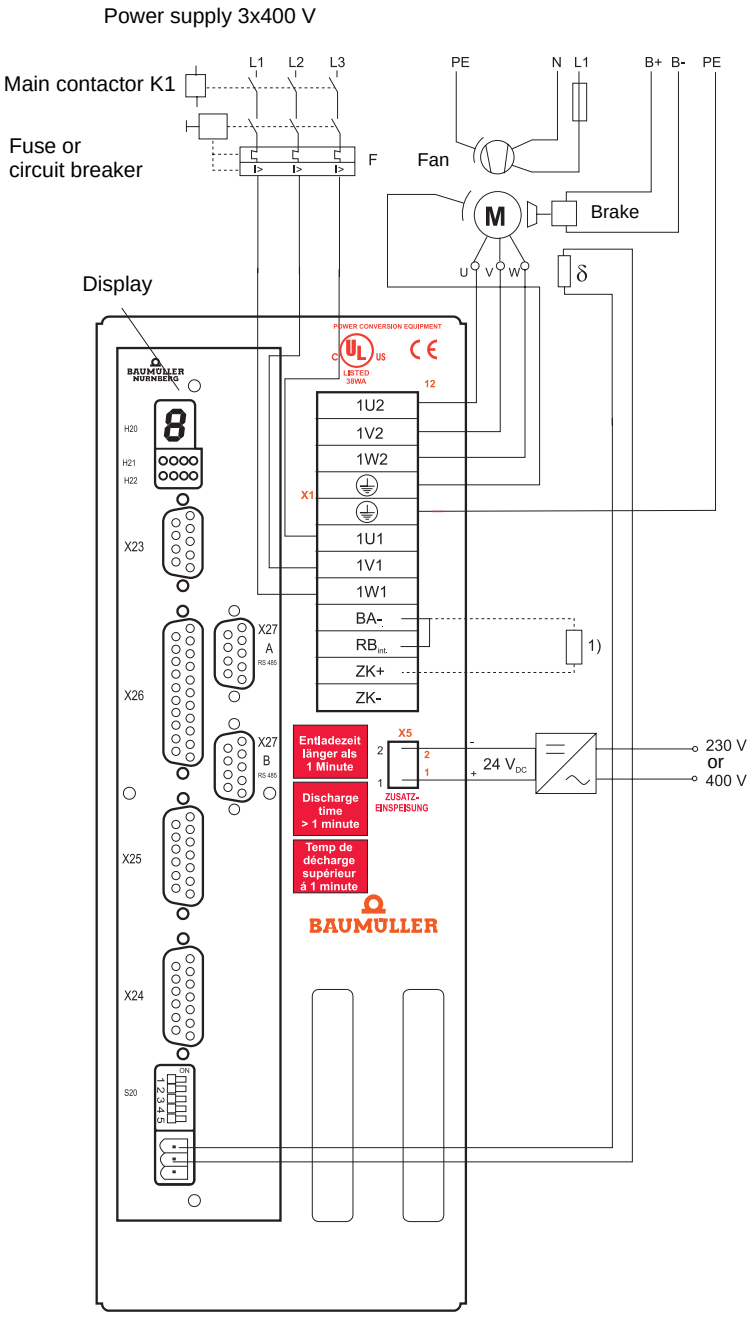
3 Connect the protective conductor to the terminal PE (a permanent PE connection is required imperatively).

4 Connect the 24 V supply
(in case you consider UL 508 C: limit the current to 4 A).

5 Connect the controller (see operation manual controller)

7.9 Connection diagrams

7.9.1 Connection diagram BUM 60



1) When using an external ballast resistor, remove wire bridge between RBint and BA- and connect the external ballast resistor to X1:2 and X1:4
If UL508C has to be observed: the external ballast resistor must protect itself from overheating

Figure 7: Connection diagram BUM 60

7.9.2 Connection diagram BUS 60

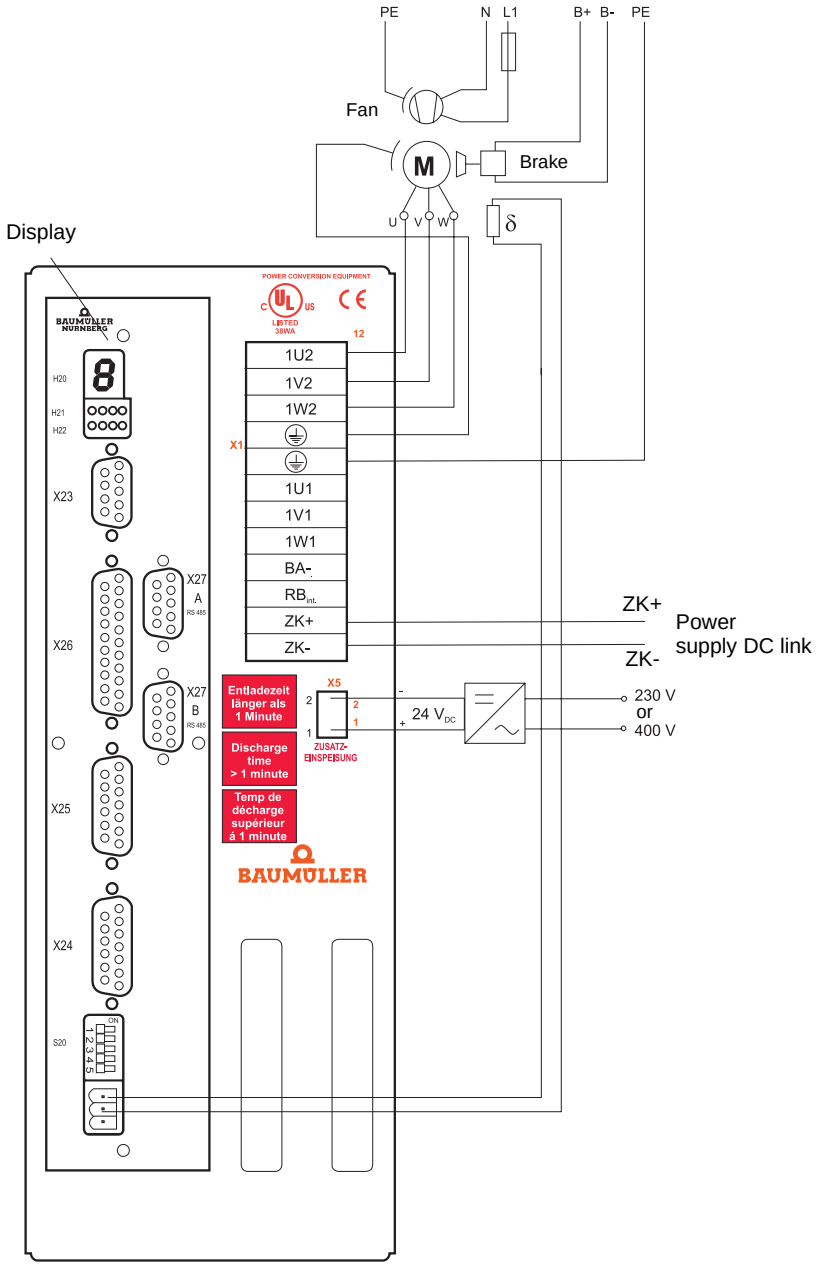


Figure 8: Connection diagram BUS 60

7.10 Connection information

Controller	Refer to separate operation manual controller
K1	Main contactor with auxiliary contact for controller enable

DANGER!

Risk of fatal injury from electrical current!

A controller enable on the controller may not be issued until the DC link capacitors have been completely charged, i.e. 1 s at the earliest after switching on the main contactor.

F	Circuit breaker according to VDE 0100, slow blow fuse, 2...2.3 times the rated current or motor circuit breaker matched to the power requirements of the drive and to the peak switch on current.
1U2, 1V2, 1W2, PE2	Motor connections, cross-section according to VDE 0113/0298. Use shielded cables. For installation, see ZInstallation requirements with regard to EMC– from page 46. Cross-sections: 1,5 mm^2 up to 14 A, 2,5 mm^2 up to 19 A, 4 mm^2 up to 25 A, 6 mm^2 above 25 A rated motor current. Observe the assignment to the connections in the terminal box.
1U1, 1V1, 1W1, PE1	Connection to power supply. Cross-section according to VDE 0113/0298. For installation, see ZInstallation requirements with regard to EMC– from page 46.

NOTE

One of the terminals is not connected when single-phase power supply.

R_{Bint}	Connection of an internal ballast resistor
BA-	Connection of a ballast transistor; Connection of an external ballast resistor between ZK+ and BA- **If UL508C has to be observed**: The external ballast resistor must protect itself from overheating

DANGER!

Risk of fatal injury from electrical current!

When using an external ballast resistor, you must remove the wire bridge between RBint and BA-. Otherwise, the ballast transistor is overloaded and destroyed.

ZK+, ZK- Connections for DC link

BUM 60: Connections for DC link
Discharging the DC Link capacitor takes at least one minute.
If necessary, the DC Link can be rapidly discharged via a resistor.
Connect an external ballast resistor between ZK+ and BA-.

If UL508C has to be observed:
The external ballast resistor must protect itself from overheating.

BUS 60: Connections for DC link power supply

DANGER!

Risk of fatal injury from electrical current!

Parallel switching several devices via the DC Link connections is not allowed. This overloads the starting current limitation device and destroys it.

7.11 Terminal and pin assignments

7.11.1 Power terminals

1U1, 1V1, 1W1, PE (connections: 4 mm^2 maximum)

1U1, 1V1, 1W1	Device input voltage

NOTE

One of the terminals is not connected when single-phase power supply.

PE	Ground switching cabinet

1U2, 1V2, 1W2, PE (connections: 4 mm^2 maximum)

1U2, 1V2, 1W2	Motor connections
PE	Ground connection motor

ZK+, ZK- (connections: 4 mm^2 maximum)

BUM 60:	Connections for DC link Discharging the DC Link capacitor takes at least one minute. If necessary, the DC Link can be rapidly discharged via a resistor. Connect an external ballast resistor between ZK+ and BA-.
BUS 60:	Connections for DC link power supply

R_{Bint}, BA-

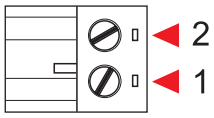
With internal ballast bridge
With external ballast, refer to ZBlock diagrams– from page 33 and ZConnection diagram BUM 60– on page 49.
If UL508C has to be observed:
The external ballast resistor must protect itself from overheating.

7.11.2 Pin assignment

NOTE

All control voltages applied externally must comply with the regulations for PELV or SELV.

Sub-unit terminal X5



BUM 60 - 12 / 24 - 54 - B - ... (required)

Terminal No.	Assignment
1	+ 24 V / 2 A (PELV) - Anschluss für Netzteilversorgung der Geräte
2	Masse 24 V / 2 A (PELV) - Anschluss für Netzteilversorgung der Geräte

7.12 Accessories

EMC Package can be supplied on request:

- EMC filter
- Screened cables
- Connecting pieces

8

OPERATION

8.1 Safety instructions

Basic information

WARNING!

Risk of injury due to improper operation!

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

Therefore:

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

NOTICE!

Environmental conditions that do not meet the requirements.

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

Therefore:

- Ensure that the environmental conditions are kept compliant during operation (see ZEnvironmental requirements– on page 26).

WARNING!

Risk of injury due to insufficient qualifications!

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

Therefore:

m Only qualified personnel may work on this device!

8.2 Operation

The device is operated using the controller (refer to the description of the controller).

Messages stored in the feed current converter / motor-end inverter can be reset by a reset signal from the controller.

8.3 Messages and warnings

8.3.1 Monitoring facilities of the feed current converter

For the monitoring facilities to function, the 24-V auxiliary voltage (at X5) must be available.

Ballast overload monitoring

Ballast overload monitoring prevents inadmissibly high loading of the internal brake resistor (ED < 3 %).

Power supply failure / phase failure monitoring (optional)

Phase failure monitoring detects a single-phase or three-phase failure of the supply voltage and prevents an internal ready for use.
The phase failure monitoring is not activated by default settings. Note derating while single phase operation (see ZElectrical data– from page 27).

NOTE

The message can be reset by a RESET on X1 after 2 s after a renewed connecting of the supply voltage if the 24 V auxiliary voltage or 230 V additional power supply remains.
For a normal switch-on a simultaneously switch-on of the power supplies on X1 and X5 is recommended.

8.3.2 Monitoring on motor-end inverter

The following monitoring facilities exist:

- Overcurrent in motor lines
- Earth-fault current
- DC Link overvoltage
- Fault of power transistors (IPM)
- Auxiliary power supply

Overcurrent message

The system monitors the motor current in two motor phases and generates an overcurrent message if a phase current is 30 % higher than the allowed peak current.
This message is saved and results in a pulse disable.
The monitoring of 2 phases provides a limited short circuit protection.

The overcurrent message can be reset by a reset signal from the controller.
For display and resetting of the message, refer to the description of the controller.

NOTE

The overcurrent message is intended as protection; the controller ensures limitation of the allowed peak current of the motor phase currents.

Earth fault monitoring

To detect a motor earth fault the system has a two-phase monitoring of the earth fault current of the motor-end inverter resp. motor phases. An earth fault current error message is generated if the fault current exceeds 10 % of the allowed peak current of the power unit. By this two-phase monitoring the unit is partly earth leakage resistant.

Earth fault monitoring can be reset by a reset signal from the controller.
For display and resetting of the message, refer to the description of the controller.

DC link monitoring

The system monitors the level of the DC Link voltage in the motor-end inverter. A message is issued if the DC Link voltage reaches a value that is critical for the power unit.

DC Link monitoring can be reset by a reset signal from the controller.
For display and resetting of the message, refer to the description of the controller.

NOTE

The DC Link voltage can rise until switch off if the drive brakes and the ballast power of the ballast circuit on the DC Link is either too small or no ballast circuit exists.

Monitoring power transistors

The junction region temperature is monitored. The system generates a message if the junction region temperature exceeds 110 °C.

This message can be reset by a reset signal from the controller.
For display and resetting of the message, refer to the description of the controller.

Monitoring the auxiliary voltage supply

The system monitors the auxiliary voltage supply of the power unit and issues a message if an undervoltage occurs.

This message can be reset by a reset signal from the controller.
For display and resetting of the message, refer to the description of the controller.

Monitoring the heatsink temperature

The power unit does not have its own temperature monitoring facility, since the temperature of the heatsink is not a time-critical variable.

On the heatsink, there is a linear temperature sensor whose measured value is passed on to the controller. This means that the controller carries out temperature monitoring (refer to the description of the controller).

9

MAINTENANCE

9.1 Safety notes

Basic information

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

WARNING!

Risk of injury due to improperly performed maintenance work!

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

Therefore:

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

9.2 Environmental conditions

If the prescribed environmental conditions are adhered to, then the device is maintenance-free. For the prescribed environmental conditions, see ZEnvironmental requirements– auf Seite 26.

The most important prescribed environmental conditions are:

- Dust-free environmental air
- Temperature: Min. 5 °C to max. +55 °C
- Relative humidity: 5% to 85%, no condensation
- Installation altitude: From 1000 m and higher derating

9.3 Inspection intervals - maintenance notes

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

Daily inspection:

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

- Does the motor work as desired?
- Is the operating environment normal?
- Is the cooling system working normally?
- If an unusual vibration or noise is noticed during operation.
- Does the motor overheat during operation?

Regularly scheduled inspection:

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

DANGER!

Risk of fatal injury from electrical current!

Therefore:

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

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Therefore:

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

9.3.1 Periodic maintenance

- Environmental condition

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Check environmental temperature, humidity and vibrations. Check whether dust, oil or drops of water appear.	Visual inspection and measurement of the environmental conditions, comparison with standard values.	O		
Check whether there are hazardous objects in the vicinity.	Visual inspection	O		

- Voltage

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Check the voltage of the power supply system and the control circuits	Measurement and comparison with standard values.	O		

m Mechanical parts

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any abnormal noises or vibrations?	Visual and audio check		O	
Are there any loose screws?	Tighten the screws.		O	
Are there any bent or damaged parts?	Visual inspection		O	
Have there been any color changes due to overheating?	Visual inspection		O	
Are there any dust or dirt deposits?	Visual inspection		O	

m Power supply

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any missing or loose screws?	Replace the screws or, respectively, tighten them.		O	
Is there any deformation, cracking, damage or color change on the device as a result of overheating or aging?	Visual inspection		O	
Are there any dust or dirt deposits?	Visual inspection		O	

m Connections and circuitry of the mains power supply

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Does the wiring indicate any color or shape changes due to overheating?	Visual inspection		O	
Is the wiring insulation damaged or is it discolored?	Visual inspection		O	
Is there any damage?	Visual inspection		O	

m Transformer and chokes in the main circuit

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any abnormal vibrations or noticeable odors?	Visual inspection, audio check and odor check		O	

m Solenoid switch and relay in the power supply circuit

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any loose screws?	Visual and audio check Tighten screws, if necessary.	O		
Do the switches function correctly?	Visual inspection	O		

m Plug connectors in the power supply circuit

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any loose screws or connectors?	Tighten screws and firmly stick in plug connector.		O	
Are there any noticeable odors or color changes?	Visual inspection and odor check		O	
Is there any cracking, damage, deformation or corrosion?	Visual inspection		O	
Is there any leaking fluid or deformation of the capacitors?	Visual inspection		O	

m Cooling system fans

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any abnormal noises or vibrations?	Visual and audio check			O
Are there any loose screws?	Tighten the screws.			O

m Cooling system ventilation duct

Check points	Methods and criteria	Inspection intervals		
		Daily	Semi-annually	Annually
Are there any obstructions in the heat sink, air supply or air outlet?	Visual inspection	O		

9.4 Repairs

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

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Ostendstr. 80 - 90
90482 Nuremberg
Germany

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

Mail: mail@baumueller.de
Internet: www.baumueller.de

10

SHUTDOWN, STORAGE

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

10.1 Safety instructions

h Refer to ZSafety– from page 11 and the information in ZTransport and Packaging– from page 35.

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

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Therefore:

- m Do not touch electrically live parts before taking into account the discharge time of the capacitors.
- m Assure, that all electric connections are current-free and are safe against switch-on.
- m Before working, check at the electrical connections with suitable measuring devices, that the connections are off-circuit.
- m Remove the connections not until the safe isolation from supply has been checked.
- m If additional capacitors are connected to the DC link, the DC link discharge can take a much longer time. In this case, the necessary waiting period must itself be determined or a measurement made as to whether the equipment is de-energized. This discharge time must be posted, together with an IEC 60417-5036 (2002-10) warning symbol, on a clearly visible location of the control cabinet.

10.2 Requirements to the executing personnel

The personnel, who is appointed to setting out of operation, must have the required knowledge and instructions, which is necessary for an execution according to the rules. Select the personnel in such a way, that the safety instructions, which are mounted to the device and its parts as well as to the connections, are understood and applied to.

10.3 Shutdown

Execute the setting out of operation as follows:

1 put the device off-circuit and assure the device against unintentional restart.

2 check the isolation from supply of all connections (earliest 10 minutes after switching off).

3 demount the connections and protect the connections according to the safety instructions.

4 document the shut down setting.

10.4 Demounting

The demounting assumes a completed, documented setting out of operation.

NOTICE!

Note sharp edges.

In case, while installing, you lift a device with unprotected hands, fingers/palm can be cut. If the device falls off, your feet can be cut up.

Therefore:

Therefore:

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

Wear safety gloves.

fWear safety shoes.

1 secure the device against falling off/out.

2 loosen all mechanical connections.

3 lift the device out of the control cabinet.

4 store the device in a suitable packing.

5 at transportation pay attention to, that the device is not damaged by wrong storage or severe shocks, also see ZWhat to observe when transporting– on page 35.

In case you want to dispose the device, additional data is available in chapter ZDisposal– from page 69.

10.5 Storage conditions

The device is maintenance-free. If you keep to the environmental conditions during the entire period of storage, you can assume, that the device will not be damaged. In case the environmental conditions during storage are not kept, you should assume that the device is damaged after storage.

CAUTION!

Property damage because of incorrect storage conditions

Incorrect storage can damage/destroy the device.

Therefore:

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

- f Climatic category 1K4
- f Temperature range -25 °C to +55 °C

CAUTION!

Recommissioning without forming of the capacitors.

From six months storage period on, the capacitors are destroyed during commissioning, if they are not formed beforehand

- f Reform the DC link capacitors:
  - g by supplying the device ready-to-operate for at least one hour with supply voltage
  - g but do not transmit a pulse enable during this time.
- f Consider, that it is imperative, to connect the accordingly prescribed line commutating reactor for this forming procedure.Devices, where no line commutating reactor is necessary can directly be supplied with mains voltage.

10.6 Recommissioning

Execute commissioning as with a new device, see
ZMounting– from page 37, ZInstallation– from page 43.

CAUTION!

Recommissioning without forming of the capacitors.

From six months storage period on, the capacitors are destroyed during commissioning, if they are not formed beforehand

- f Reform the DC link capacitors:
  - g by supplying the device ready-to-operate for at least one hour with supply voltage
  - g but do not transmit a pulse enable during this time.
- f Consider, that it is imperative, to connect the accordingly prescribed line commutating reactor for this forming procedure.Devices, where no line commutating reactor is necessary can directly be supplied with mains voltage.

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11

DISPOSAL

NOTE

Baumüller products do not belong to the scope of the EU guideline for the disposal of electrical and electronics devices (WEEE, 2002/96/EG). Therefore, no costs are to be carried by Baumüller for the canceling and disposal of old devices.

11.1 Safety notes

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Therefore:

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

CAUTION!

Danger due to sharp edges.

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

Therefore:

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

Wear safety gloves.

Wear safety shoes.

WARNING!

Danger of physical impact!

Secure device against falling down.

Therefore:

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

NOTICE!

Avoid polluting the environment as a result of improper disposal.

Therefore:

- Only dispose in compliance with the health and safety regulations.
- Take heed of any special local regulations. If you are unable to directly ensure safe disposal yourself, commission a suitable disposal contractor.
- In the event of a fire, hazardous substances could possibly be generated or released.
- Do not expose electronic components to high temperatures.
- Beryllium oxide is used as inner insulation, for example for various power semiconductors. The beryllium dust that is generated upon opening is injurious to the health.
  Do not open electronic components.
- Dispose of capacitors, semiconductor modules and electronic scrap as special waste.

WARNING!

Danger as a result of faulty deinstallation!

The deinstallation and disposal requires qualified personnel with adequate experience.

Therefore:

m Only allow deinstallation and disposal to be performed by qualified personnel.

11.2 Disposal facilities/authorities

Ensure that the disposal is handled in compliance with the disposal policies of your company, as well as with all national regulations of the responsible disposal facilities and authorities. In case of doubt, consult the bureau of commerce or environmental protection authority responsible for your company.

11.2 Disposal facilities/authorities

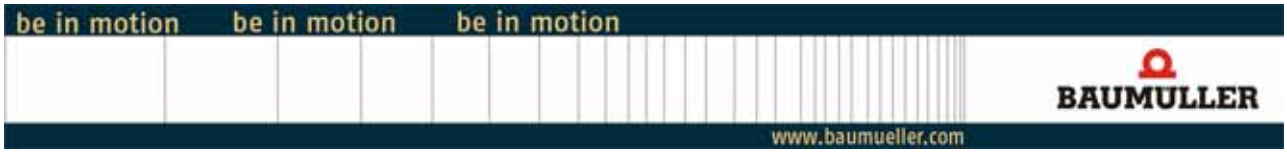
APPENDIX A - ABBREVIATIONS

AC	Alternating current
AM	Asynchronous motor
a.m.s.l.	above mean sea level
BB	Ready for use
BUC	Baumüller Converter Feed/Feed Back Unit
BUG	Baumüller Converter Basic Feed Unit
BUM	Baumüller Mono Power Unit
BUS	Baumüller Power Module
DC	Direct current
DIN	Deutsches Institut für Normung e.V. (German Standardization Authority)
EMC	Electromagnetic compatibility
EN	European Standard
HS	Main contactor
IPM	Intelligent power module
PE	Protective earth
PELV	Protective extra-low voltage
RS	Controller disable
SELV	Safe extra-low voltage
SM	Synchronous motor
U_{ZK}	DC link voltage
ZK	DC link

B

APPENDIX B - DECLARATION OF CONFORMITY

B.1 Declaration of conformity



EG - Declaration of Conformity

Doc.-No.: 5.13007.00
Date: 2013-03-12

according to EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC

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

declares, that the products with the

designation: BUS 60X - X -X - 54 - X - XXX
BUM 60X - X -X - 54 - X - XXX

type: Power module BUS 60 / Mono power unit BUM 60
manufactured since: 2013-03-12

are developed, designed and manufactured in accordance with the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC.

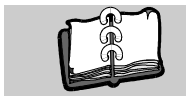
Applied harmonized standards:

Standard	Title
DIN EN 62061:2010-05	Safety of Machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
DIN EN 61800-5-1:2008-04	Variable-speed electrical power drive Part 5-1: Safety requirements - Electrical, thermal and energy
DIN EN 61800-5-2:2008-04	Variable-speed electrical power drive Part 5-2: Safety requirements - Functional
DIN EN 61800-3:2005-07	Variable-speed electrical power drive Part 3: EMC requirements and specific test methods

The products must be installed correctly and all notes and safety notes of the referring instruction handbook must be complied with, to guarantee the compliance of the guidelines.

Nuremberg / 2013-03-12
City / Date

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



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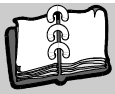

Index

Overview of Revisions

Version	Status	Changes
5.01032.05	18.03.2013	New layout, Chapter overview of revisions added, note for break time after switch-off added, note added: monitoring of 2 lines ensures only limited short circuit protection

Notes:

be in motion

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