

be in motion be in motion

**Single Power Unit
BUM63(T)S/A/F/I**

POWER CONVERSION EQUIPMENT



Manual

E

5.01054.09



BAUMÜLLER

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Product	Single Power Unit, BUM63(T)S/A/F/I
Version	5.01054.09
Status	2007-01-17
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1

INTRODUCTION

In this chapter we describe the first steps, which have to be done after you have received the device. We will define terms, which are continuously used throughout this manual. We also will be giving you instructions, what should be taken into consideration when handling this device.

1.1 First steps

- 1 check the delivery, see [▶Packing and transportation◀](#) from page 21.
- 2 Forward all data, which was delivered to the responsible places in your company.
- 3 provide capable personnel for mounting and commissioning.
- 4 hand over this manual to the personnel and assure, that in particular the safety instructions, which are stated here are understood and can be followed.

1.2 Used terms

In this manual we will also use the term "device" for the Baumüller-product "Single Power Unit". A list of the abbreviations which are used are to be found in [▶Appendix A - Abbreviations◀](#) from page 85.

1.3 Responsibility and liability

To be able to work with this device in accordance with the safety requirements, you must be familiar with and observe the safety notes and safety instructions in this manual.

1.3.1 Observing the safety notes and safety instructions

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



WARNING

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

- 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.

1.3.2 Dangers when handling this device

The device "Single Power Unit" was developed and manufactured according to the state-of-the-art technology and in compliance with the valid regulations and standards. It is still possible that dangers can arise during use. An overview of possible dangers is to be found in chapter [►Fundamental safety instructions◄](#) from page 11.

We will also warn you of acute dangers at the appropriate locations in this manual.

1.3.3 Warranty and Liability

The "General Conditions of Sale and Conditions of Delivery" of Baumüller Nürnberg GmbH are generally valid. These are available to you since the conclusion of the contract at the latest. Warranty- and liability claims against Baumüller Nürnberg GmbH are excluded if in particular one or more of the causes listed in has/have caused the damage.

- You disregarded the notes in this manual.
- The device has not been specifically applied as a converter in order to control a motor.
- The device has been
 - mounted incorrectly,
 - connected incorrectly,
 - commissioned incorrectly,
 - operated incorrectly,
 - mounted, connected, commissioned, operated and/or maintained by not qualified or inadequately qualified personnel,
 - inappropriately maintained or not maintained (also consider the descriptions of the components),
 - overloaded it,
- operated
 - with defective safety devices,
 - with incorrectly mounted safety devices or without safety devices,
 - with incorrectly working safety- and protection devices,
 - outside the specified environmental conditions.
- You have modified the device.
- You have insufficiently monitored the parts, which are subject to a wearing.
- You have improperly carried out a repair.
- You have combined the device with improper products, which are not enabled for devices described in this manual.

- You have combined the device with faulty and/or faulty documented products of other manufacturers.
- The device has been operated in an explosive environment.

2

FUNDAMENTAL SAFETY INSTRUCTIONS

We have designed and manufactured each Baumüller device in accordance with the strictest safety regulations. Nevertheless the work with the device can be hazardous.

In this chapter we describe the dangers, that can arise when working with the Baumüller-device. Dangers we point up with symbols (icons). All symbols that are used in this manual are listed and explained.

How you can protect yourself against the single hazards in the concrete case, we will not explain in this chapter. This chapter contains only general protective measures. Concrete protective measures we will always give directly in the subsequent chapters after the note to the hazard.

The operation of the described devices is permissible, if the mentioned methods/procedures/measures are obeyed to. Everything else, that means also the operation of devices in installations, which are not shown here, is not permitted and must be checked with the company in each particular case. Any kind of claim to warranty will expire, if the devices are operated other than here described.

2.1 Hazard information and commands



Hazard information shows you the dangers, which can cause injuries or even your death.

Please always consider the hazard information which is given to you in this documentation.

2.1 Hazard information and commands

Each hazard is classified in one of three different hazard classes. Every hazard class has one of the following characteristic signal words:

DANGER

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

WARNING

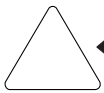
- serious property damage
- serious personal injury
- death - **may** occur

CAUTION

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

2.1.1 Hazard information structure

The following two examples show you how the hazard informations are constructed. The triangle is used when indicating a hazard for human beings. When there is a circle instead of the triangle, the hazard information is only for possible property damage.



A triangle indicates hazard for human beings.
The shade of grey of the outline reflects the severity of the hazard - darker grey means rising hazard.



The icon within the square illustrates the hazard.
The outline's shade of grey reflects the severity of the hazard - darker grey means rising hazard. (Not every hazard information has a square representing the hazard, so we have shown it as draft here)



The icon in the circle represents a command.
(Not every hazard information has a circle representing the hazard, so we have shown it as draft here)



The circle indicates hazard for property.



The icon within the square illustrates the hazard.
The outline's shade of grey reflects the severity of the hazard - darker grey means rising hazard. (Not every hazard information has a square representing the hazard, so we have shown it as draft here)

The text beneath the icons is constructed as follows:

HERE STANDS THE SIGNAL WORD WHICH INDICATES THE DEGREE OF THE HAZARD




Here we tell if one or more of the consequences described lower will occur if this hazard information is not observed.


- here we describe the possible consequences. The worst consequence stands on the right side.

Here we describe the hazard.

Here we describe what you can do to avoid this hazard.


2.1.2 Form of the hazard sign (triangular or round)

If there is a triangle like  or  or  in front of the signal word, the hazard information is referring to personal damage.

If there is a round hazard signal like  in front of the signal word, the hazard information is referring to property damage.

2.1.2.1 Hazard information on personal injury

To distinguish each class of hazard information, we use a characteristic outline for both the triangular hazard signs and the square-form icons

For the hazard class **DANGER** we use the  danger sign. The hazard information of this hazard class we use in this documentation is listed below:

DANGER



The following **will occur**, if you do not observe this danger information:

- serious personal injury
- death

*The hazard is: **electricity**. Here the hazard may be described in detail.*



Here we describe what you can do to avoid the hazard.

DANGER



The following **will occur**, if you do not observe this danger information:


- serious personal injury
- death

*The hazard is: **mechanical influence**. Here the hazard may be described in detail.*



Here we describe what you can do to avoid the hazard.

2.1 Hazard information and commands

For the hazard class **WARNING** we use the warning sign . The following hazard information of this hazard class we will use in this documentation.



WARNING

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

- serious personal injury
- death

*The hazard is: **electricity**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



WARNING

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

- serious personal injury
- death

*The hazard is: **mechanical influence**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



WARNING

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

- serious personal injury
- death

*The hazard is: **electro-conductive liquid together with electricity**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



WARNING

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

- serious personal injury
- death

*The hazard is: **electro-magnetic radiation**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



WARNING




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

- serious personal injury
- death



*The hazard is: **liquid coolant**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.

For the hazard class **CAUTION** we use the caution sign  when there is hazard for persons or of environmental pollution. The following hazard information of this hazard class we will use in this documentation.

CAUTION



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

- minor to medium personal injury.



*The hazard is: **hot surface**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.

CAUTION



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

- minor to medium personal injury.



*The hazard is: **sharp edges**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.

CAUTION



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

- minor to medium personal injury.



*The hazard is: **rotating parts**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



CAUTION

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

- minor to medium personal injury.

*The hazard is: **injury of the eye caused by ricocheting particles.** Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



CAUTION

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

- minor to medium personal injury.

*The hazard is: **noise.** Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



CAUTION

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

- minor to medium personal injury.

*The hazard is: **hazard of sliding caused by liquid.** Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



CAUTION

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


- environmental pollution.

*The hazard is: **unadequate disposal.** Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



2.1.2.2 Hazard information on property damage

If there is a round caution sign  in front of the signal word, the safety information refers to property damage.



CAUTION

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

- property damage.

*The hazard is: **electro-static discharge**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



CAUTION

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

- property damage.

*The hazard is: **damage of the coolant hose**. Here the hazard may be described in detail.*

Here we describe what you can do to avoid the hazard.



2.1.2.3 Command signs used



carry safety gloves



carry safety shoes



carry eye protection



carry ear protection



Use this fire extinguishing agent:
ABC powder

2.2 Information sign



NOTE

This note is a very important information.

2.3 Appropriate use

You must always use this appliance properly. Listed below you will find some important information. The information given is intended to give you some impression on how to operate this appliance according to the terms. The information below is not a complete list; you must always observe the information given throughout this documentation.

- project this application in a way, that the appliance is run within its specifications.
- take care that only qualified personnel is working with or at this appliance.
- mount this appliance only at a reasonable steady wall.
- install this appliance according to the way shown in this documentation.
- take care that the power supply always meets the requested specifications.
- operate this appliance only if it is in a correct technical state.
- operate this appliance always in an environment according to the information given in the "Technical specifications".
- operate this appliance always in the regular condition.
For safety reasons you are not allowed to reconstruct this appliance.
- observe all respective information given if you want to store this appliance.

You are using this appliance according to the terms, if you observe all notes and information given in this operating manual.

2.4 Inappropriate use

Listed below you will find some examples of non-appropriate application. The information below is intended to give you some impression of what non-appropriate application is. However we cannot state all possible non-appropriate applications here. All applications, where the notes and information given in this documentation is disregarded, are non-appropriate and therefore forbidden.

Examples:

- You disregarded the notes in this manual.
- The device has not been specifically applied as a converter in order to control a motor.
- The device has been
 - mounted incorrectly,
 - connected incorrectly,
 - commissioned incorrectly,
 - operated incorrectly,

- mounted, connected, commissioned, operated and/or maintained by not qualified or inadequately qualified personnel,
- inappropriately maintained or not maintained (also consider the descriptions of the components),
- overloaded it,
- operated
 - with defective safety devices,
 - with incorrectly mounted safety devices or without safety devices,
 - with incorrectly working safety- and protection devices,
 - outside the specified environmental conditions.
- You have modified the device.
- You have insufficiently monitored the parts, which are subject to a wearing.
- You have improperly carried out a repair.
- You have combined the device with improper products, which are not enabled for devices described in this manual.
- You have combined the device with faulty and/or faulty documented products of other manufacturers.
- The device has been operated in an explosive environment.
-

2.5 Personnel training



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

Qualified personnel

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.

2.6 Structural changings of the device

Structural changings are forbidden without written agreement of Baumüller Nürnberg GmbH.

2.7 Disposal of the device

The disposal of the device is described in [▶Disposal◀](#) from page 81.

2.8 Fire fighting



WARNING

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

- serious personal injury
- death



The danger is: **Electricity when using a conductive fire fighting device.**



Use this fire extinguishing agent:

ABC powder

3

PACKING AND TRANSPORTATION

Before shipment we have packed every Baumüller device in such a way, that a damage during transportation is nearly impossible.

3.1 Transportation

The devices are packed according to the order in the manufacturing company.

- ▶ Avoid strong transportation vibrations and severe hits, e.g. when setting down.

3.2 Unpacking

After receipt of the device, which is still packed:

- ▶ 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 Nürnberg GmbH, which is in charge for your company.

If there is no transportation damage noticeable:

- ▶ Open the packing of the device.
- ▶ Check the scope of supply by means of the delivery note.

The scope of supply is:

- Produkt
- This operating instruction inclusively the copy of the declaration of conformity/declaration of manufacturer
- Enclosed is fastening material
- ▶ claim at the Baumüller substitution, which is in charge, in case there is a recognizable transportation damage or if the delivery is not complete.

3.3 Dispose packing



WARNING

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

- 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 Nürnberg GmbH.

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.

3.4 To be considered by transportation

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

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

DESCRIPTION OF THE DEVICE

This unit is a power converter for power range up to 100 kW. This unit converts power taken from the mains (line-sided supply unit) and supplies the connected electrical motor, which is connected to this device with converted power (motor-sided power unit). For this control only plug-in controllers of Baumüller Nürnberg GmbH must be used.

- BUS 6 V controller
- BUS 6 M controller

A separate description for the controller with the applicable characteristics and technical data is available.

Dependant of the settings of the controller, which is used you are able to operate asynchronous- as well as synchronous motors with different encoder systems at the single power units BUM63(T)S/A/F/I.



NOTE

Do not use this device in residential areas (see EN 61800-3, 6.4.2.1), because the device can cause RF interferences in residential areas.

4.1 Variants

The single power unit BUM63(T)S/A/F/I is available in eight variants, which differ in power (T) or in method of cooling (S/A/F/I):

- Switching cabinet device **S** (ventilation within the switching cabinet)
- Switching cabinet device **I** (water cooler within the switching cabinet)
- Through-hole variant **A** (air ventilation outside the switching cabinet)
- Through-hole variant **F** (water cooler outside the switching cabinet)

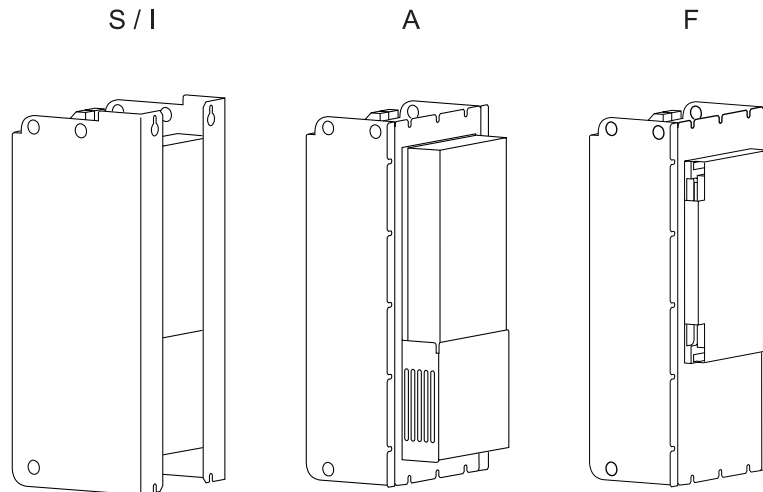


Figure 1: Cooling variants

001_rev01_int.cdr

4.2 Overview of dangerous areas

The following overview shows the existing danger areas on the particular device. Use this survey for an overview of the existing danger areas, if you incorporate into the handling of this device.

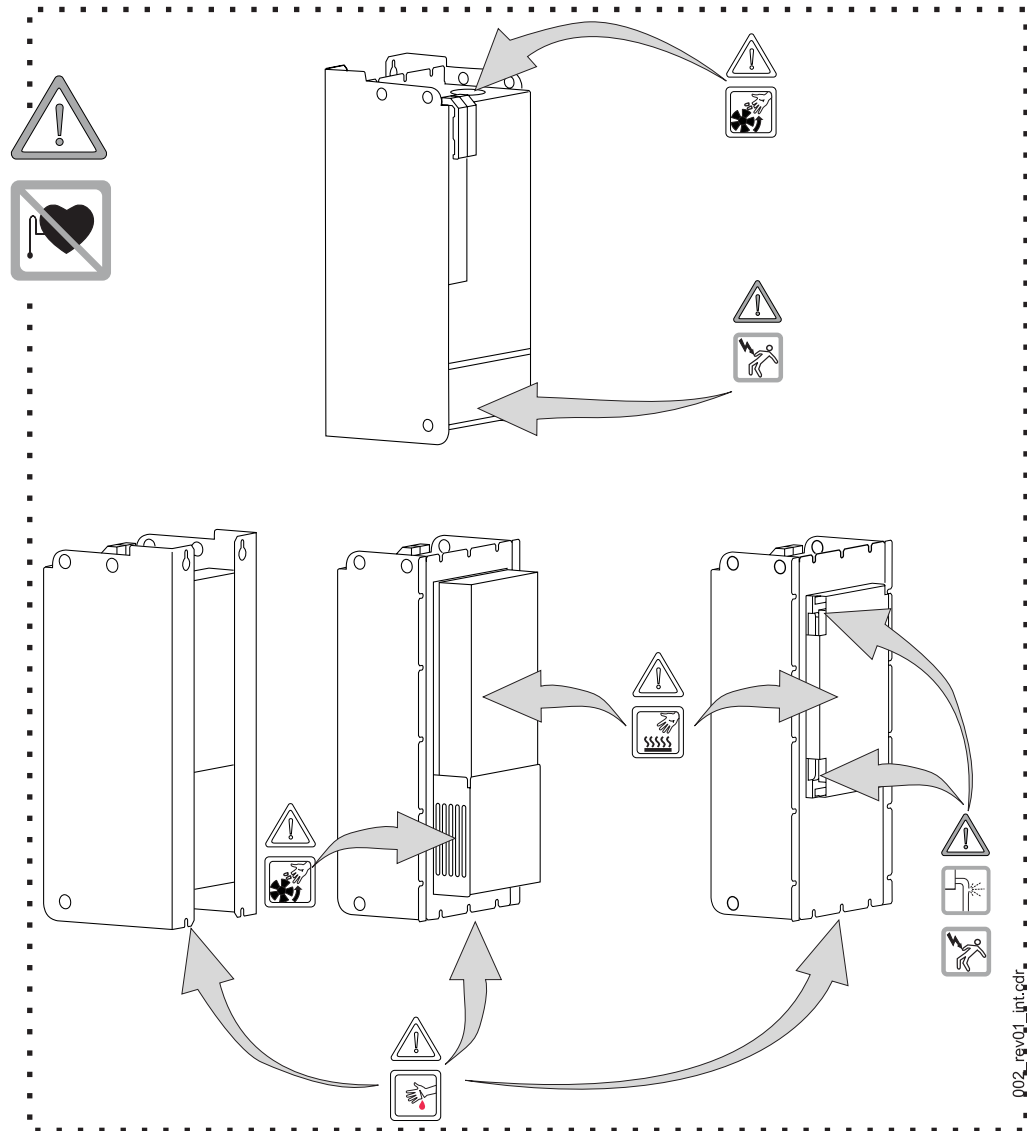


Figure 2: Danger areas

4.3 Marking of the machine - type key

4.3 Marking of the machine - type key

On the label (position on the inner side, see following figure) the type key and the serial number of the device are specified.

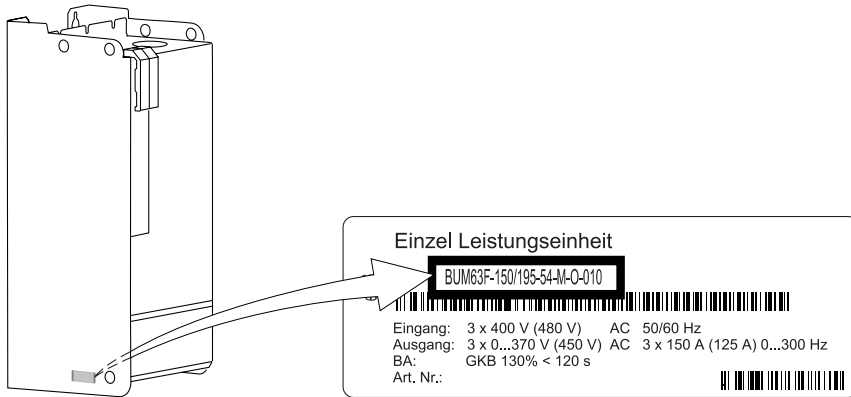


Figure 3: type key

BUM63XX - XXX/X XX - XX - X - X - XXX Baumüller converter single power unit

BUM63XX - XXX/X XX - XX - X - X - XXX Series of type

BUM63XX - XXX/X XX - XX - X - X - XXX Size

BUM63XX - XXX/X XX - XX - X - X - XXX Variant

-: Standard

T: Turbo (approx. 40 % additional power compared to CIA standard)

BUM63XX - XXX/X XX - XX - X - X - XXX Cooling type

S: air-cooled with air supply and with air outlet in the switching cabinet

A: air-cooled with air supply and with air outlet outside the switching cabinet

F: water-cooled with water cooler outside the switching cabinet

I: water-cooled with water cooler within the switching cabinet

BUM63XX - XXX/X XX - XX - X - X - XXX Output rated current in ampere at 40° C environmental- and coolant temperature and 4kHz cycle frequency

BUM63XX - XXX/X XX - XX - X - X - XXX Output peak current in ampere at 40° C environmental- and coolant temperature and 4 kHz cycle frequency, $t \leq 2$ min.

BUM63XX - XXX/X XX - XX - X - X - XXX Rated DC-link voltage x 10 [V]

BUM63XX - XXX/X XX - XX - X - X - XXX Chopper resistor

O: without chopper resistor

E: with chopper resistor, external resistor

BUM63XX - XXX/X XX - XX - X - X - XXX Safety relay

O: without safety relay

M: with safety relay

BUM63XX - XXX/X XX - XX - X - X - XXX Development status/version

On the type plate you will find only a part of the technical data. A survey of all the technical data is to be found in [►Appendix D - Technical data◀](#) from page 99.

4.4 Block diagram

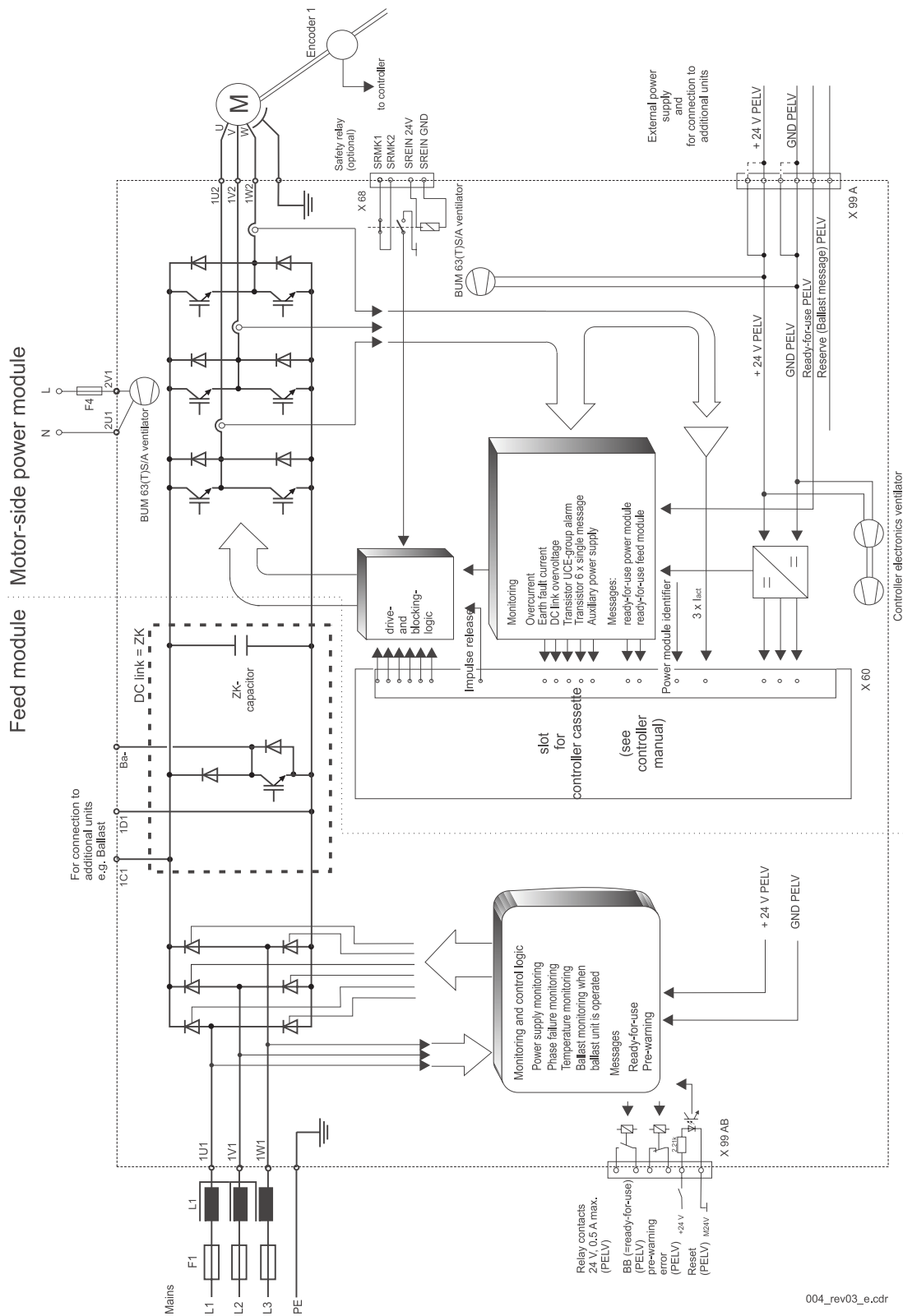


Figure 4: Block diagram BUM 63(T)S/A/F/I

MOUNTING

In case the units shall be mounted in an isolated electrical work shop according to EN 50178/VDE 0160, section 5.2.7, you will in addition have to take additional measures, that the requirements according to EN 50178/VDE 0160, section 5.2.4 and EN 60204-1/VDE 0113 part 1, section 6.2.2 are fulfilled.

5.1 Danger areas at mounting

The following overview shows the existing danger areas at the device, which are important for the mechanical mounting.



Use this survey only for the mechanical mounting. Dangers, which, for example, result from electricity are not shown here. Dangers, which, for example, result from electricity are not shown here [►Danger areas at installation◄](#) on page 41.

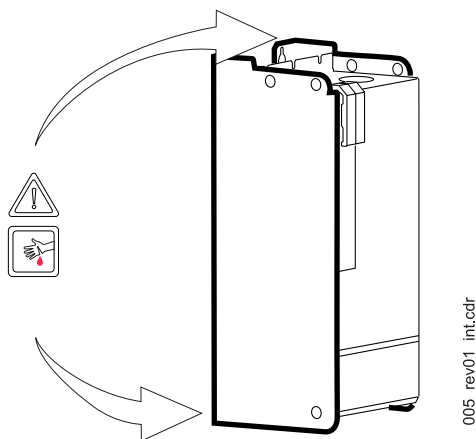


Figure 5: Hazard areas during mounting

5.2 Mounting steps

The mechanical consists of the following steps:

- select the switching cabinet.
- produce the drill holes/threaded holes and the cut-outs (only variant A/F).
- mount the unit.
- connect the cooling circulation (only variant F/I), check on tightness and perform a pressure test.

Further information concerning the single steps are given in the following sections.

5.2.1 Select switching cabinet

BUM63(T)S/A/F/I units are build-in devices with respect to EN 50178/VDE 0160 section 5.2.6. They are intended for mounting into ordinary switching cabinets, which meet the minimum requirements acc. to EN 50178/VDE 0160, section (IP 2X, eventually also IP4X acc. to EN 60529/5.1).



WARNING

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

- serious personal injury
- death



*The danger is: **mechanical effects**. The units weigh between 36 and 54 kg, depending on the model.*

Select a switching cabinet, which can carry this weight permanently.



NOTE

In case you mount a through-hole variant (F/A), the thickness of rear panel must maximum be 6 mm.

5.2.1.1 Mounting space - dimensional drawings

Use the following dimensional drawings, in order to specify mounting space in the switching cabinet.



CAUTION

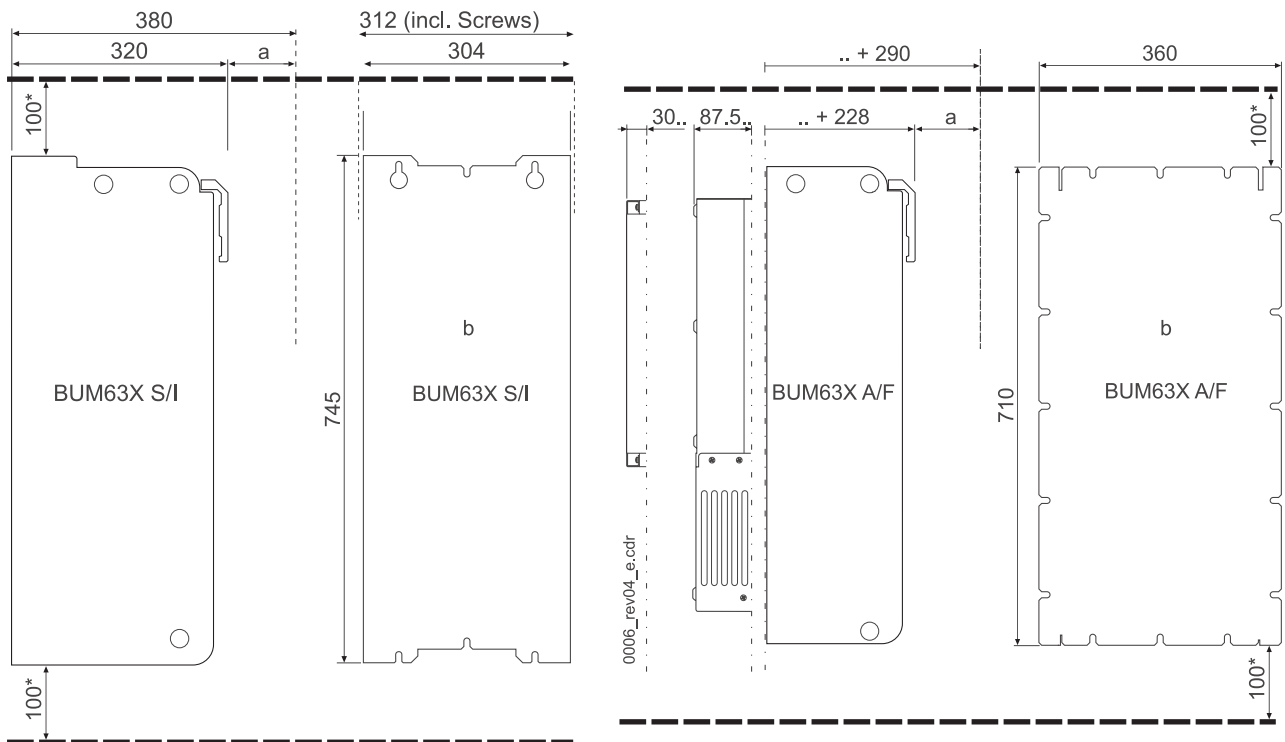
The following **may occur**, if you do not observe this caution information:

- property damage.

The danger is: overheating of device.

Provide output of device waste heat. Assure, that unrestricted coolant input and -output is possible.

provide the required coolant temperature and coolant amount (see [►D.2 Required environmental conditions◄](#) on page 101). If necessary apply an additional fan at the switching cabinet.



a: Free space for controller, connector and cable approx. 60 mm
 b: rear view

Figure 6: Dimensional drawing BUM63(T)S/A/F/I

5.3 Creating of drillings/threads and cut-outs

- Create drillings/thread and cut-outs (only variant A/F) as specified in the following drilling drawings.

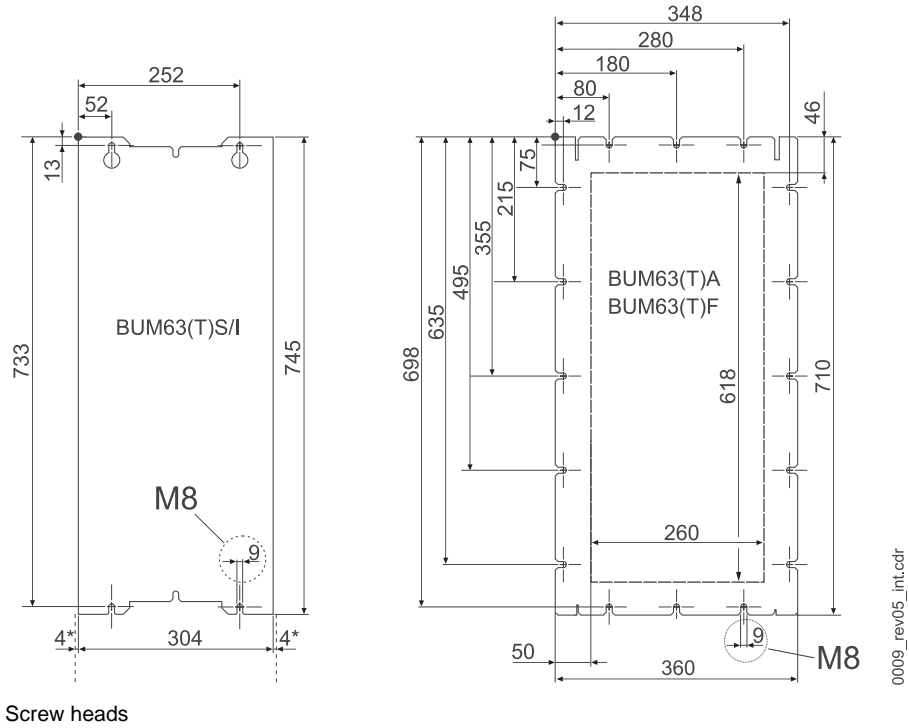


Figure 7: Drill drawing BUM63(T)S/A/F/I

5.4 Mounting the unit

- 1 Screw the rear panel of unit with the rear panel of the switching cabinet together.
- 2 Mount all screws in order to assure the EMC of the unit.

5.4.1 Mount BUM63 S/I

WARNING



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

- serious personal injury
- death



*The danger is: **conductive fluid in connection with electricity**. If cooling water escapes from a water-cooled unit within the switching cabinet, the water may contact parts, which carry hazardous voltage levels.*



Assure, that it is adhered to all safety instructions which are valid for water-cooled devices that are mounted into a switching cabinet.

CAUTION



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

- minor to medium personal injury.



*The danger is: **sharp edges**.*

Consider the weight of unit - the unit weighs at least 49 kg.

Lift the unit only with suitable equipment and/or with the help of qualified personnel.



wear safety gloves

5.4 Mounting the unit

screws (A)	4 x M8			
washers (B)	4 x (8.4 x 17)			
mount spacing (c)	c = 7 mm			

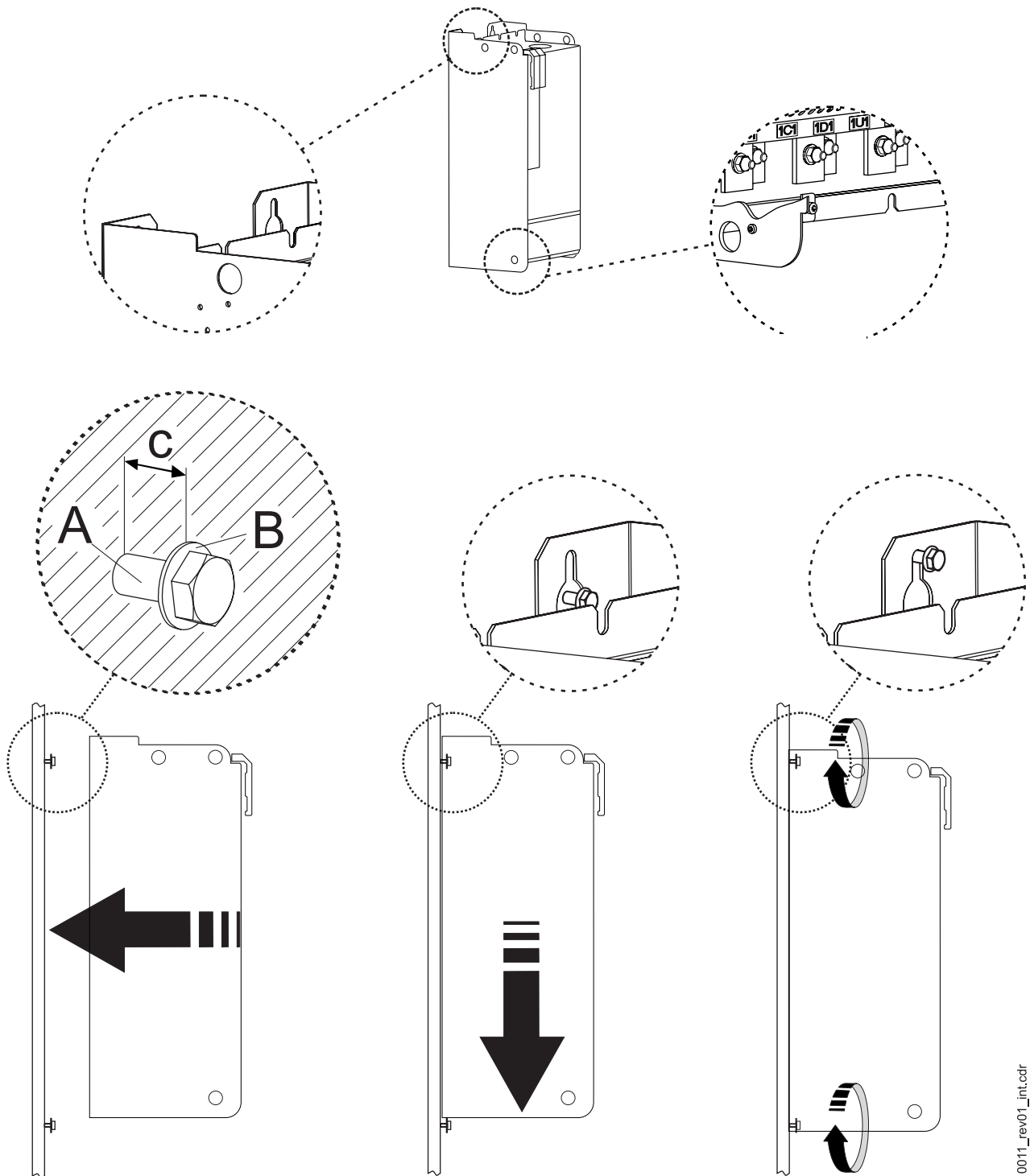


Figure 8: Mounting instruction BUM63(T)S/I

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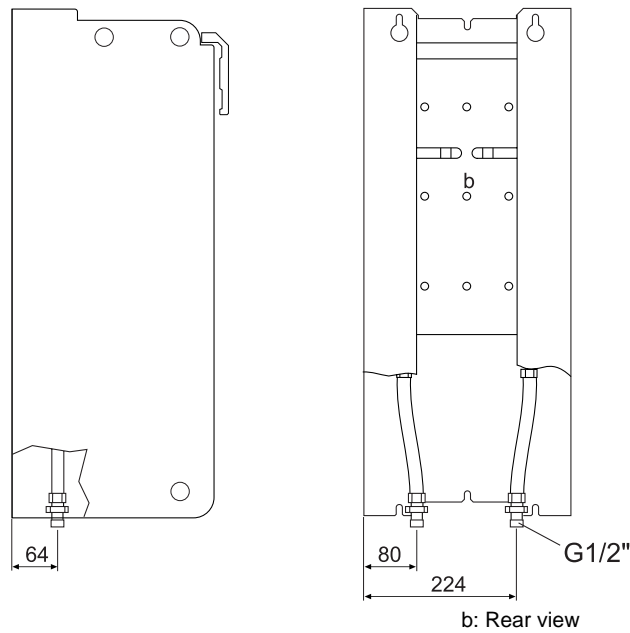


Figure 9: Cooling water connection BUM631

5.4.2 BUM63 mount through-hole variant A/F

CAUTION



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

- minor to medium personal injury.



The danger is: **sharp edges**.

Consider the weight of unit - the unit weighs 42 kg.

Lift the unit only with suitable equipment and/or with the help of qualified personnel.



wear safety gloves

WARNING



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

- serious personal injury
- death



The danger is: **conductive fluid in connection with electricity**. If cooling water escapes from a water-cooled unit, it may happen, if there are faulty seals that water enters the switching cabinet and may contact parts, which carry hazardous voltage levels.



Assure, that seals at the rear side of the unit are not damaged. You may only mount the unit, if the seal is not damaged.

5.4 Mounting the unit

screws (A)	16 x M8				
washers	16 x (8.4 x 17)				
seal	see accessories				

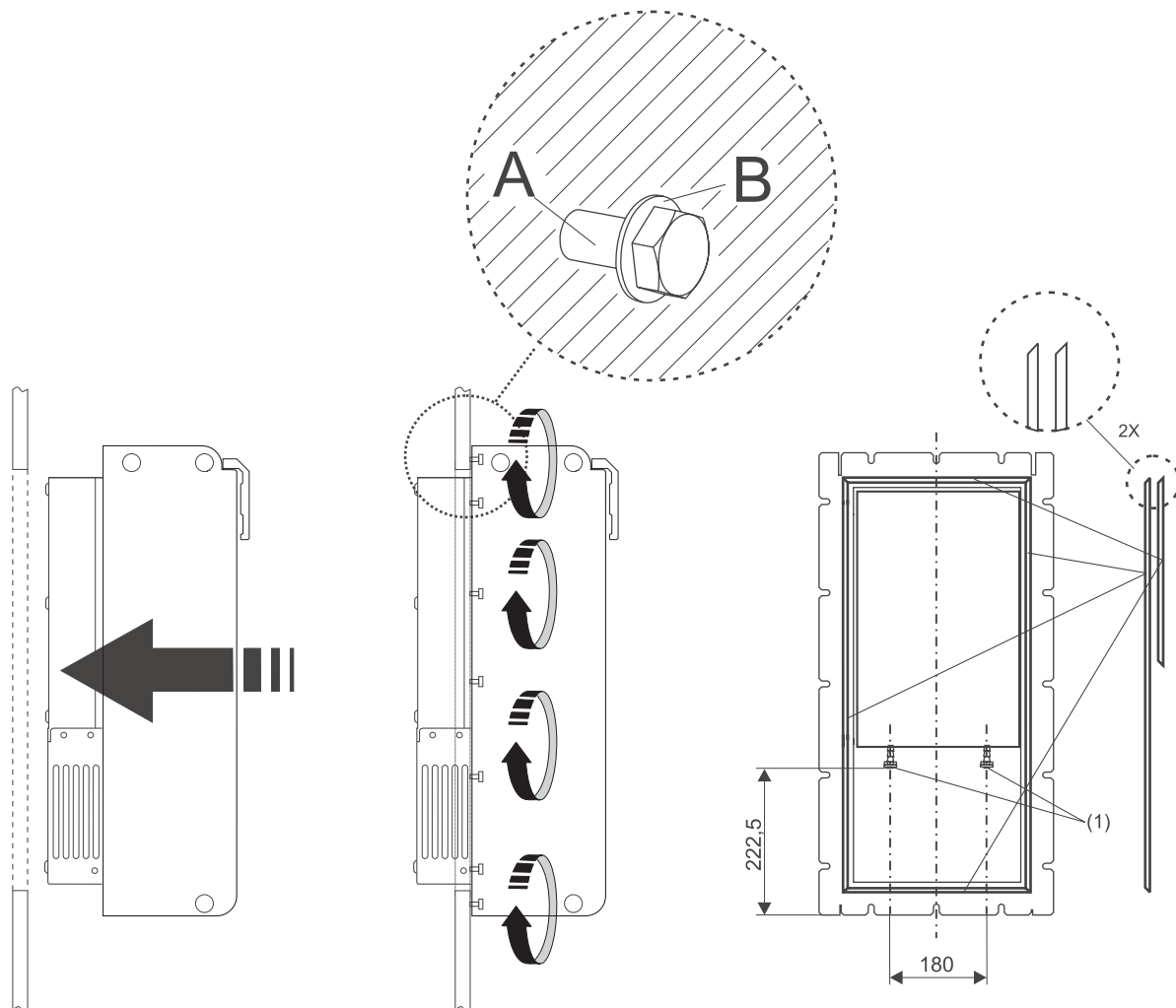


Figure 10: Mounting instruction BUM63 through-hole variant A/F

(1): Screwing 1/2" AG for flat packing

5.4.2.1 Coolants BUM63(T)/I

The coolant must meet certain requirements. The requirements the coolant must have is to be found in [►D.2 Required environmental conditions◄](#) on page 101.

WARNING

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

- serious personal injury
- death



*The danger is: **conductive fluid in connection with electricity**. The heatsink can corrode and become leaky if the wrong coolant is used. If e. g. the heatsink is leaky, the cooling water can escape from the cooling circulation, into the switching cabinet and can contact parts, which carry hazardous voltage levels.*



Do not mix anti corrosives!

Under all circumstances keep the mixture ratio and test the mixture ratio within the stated maintenance intervals (see [►Inspection intervals◀](#) from page 75).

Refer to the safety instructions of the anticorrosive manufacturer and the safety data sheets acc. to EU directive or the common national guidelines of the country, where the device is in operation.

For disposal of the coolant observe the water endangerment classes (WGK) supplied by the manufacturer. Since 1999-05-17 there is no more class 0 within the VwVwS (German regulation about water endangering substances). Beginning from class 1 (weak endangering water, Germany) the water endangering rises with the number. In any case the disposal has to be carried out according to the regulations. The local waste water administration must be consulted. A disposal into the sewer - even thinned - is not allowed.

CAUTION

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

- property damage.

*The danger is: **Damage of the cooling circulation**.*

Do not use coolant lubricants from manufacturing processes as coolant!

Coolant circulations must be kept in a filled state using coolant-water mixtures in order to avoid corrosion at the transition between liquid and air.

Make sure, that there are no air reservoirs within the coolant circulation.

Remainders of coolant can act corrosive, lead to a lowering of the pH-value and act corrosive within the acid pH-value sector.

When exchanging or switching over from one coolant to another observe that the coolant circulation must be thoroughly rinsed with water several times.

If coolant circulations that have been filled with a coolant-water mixture must be emptied and cannot be refilled within a few days, it is essential, that they are rinsed repeatedly with water and after that be emptied completely.

5.4.2.2 Connecting BUM63(T)F/I to coolant circulation

The BUM63(T)F/I-devices have a pre-mounted heatsink at its back. Two connections (G1/2") at the heatsink are destined for the intake and outlet of a coolant circulation system. For the connection to the customer side of the coolant circulation use connectors with an inside thread G1/2", which are screwed with the existing heatsink connections at the device together.

The heatsink connections are at the bottom side of the device.

Connection to cooling circulation:

- 1 provide suitable connections
(material: brass/stainless steel/plastics, thread:G1/2").
- 2 clear internal thread of connections.
- 3 assure, that the seals are undamaged.
- 4 Manually screw on supply cable to the existent connections and tighten with the maximum permissible torque.



CAUTION

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

- property damage.

The danger is: Damage of connecting thread.

Never tighten stronger than with the maximum permissible torque 12 Nm).

- 5 connect outlet with another connection.



NOTE

The flow direction is as desired.

- 6 check tightness of cooling circulation.
- 7 perform cooling circulation with the specified pressure test (12 bar).

6

INSTALLATION

In this chapter we describe the electric installation of the device. Mechanic mounting is described in chapter [▶Mounting◀](#) from page 29.

The installation exists of the following steps:

- 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 connections and configurate the connections accordingly.
- 4 Lay all cables EMC-compatible.
- 5 Is screwing necessary for UL 508C? If so, use a suitable torque spanner (see [▶Screwing in accordance with UL◀](#) on page 60).

6.1 General danger notes

Units BUM63(T)S/A/F/I are devices of protection class I accordant to HD366 S1 chapter 3.2, also see EN 50178/VDE 0160 paragraph 5.2.9.

Devices of protection class I are devices, where the protection against dangerous residual currents dependent of the base insulation and therewith contains additional safety measures. This additional protection is provided by connecting housing and other parts with the PE conductor, so that in case of failure of the base insulation no voltage remains. The insulation at these devices acc. to EN 50178/VDE 0160, paragraph 5.2.9.1 are executed in the entire procedure after base insulation at least.

The control connections of devices have got a protective separation from the mains and are executed for the connection of PELV-/SELV circuits.

When measuring clearance and creepage distance following criteria are considered:

- Degree of pollution 2 acc. to EN 50178/VDE 0160, paragraph 5.2.15.2, table 2, line 3: normally only a non-conductive pollution occurs. Any conductive pollution (for a short period or continuous) is not permitted and can lead to the destruction of the device. The customer is responsible for destructions based on pollution with conductive substance or materials.
- Overvoltage category III acc. to IEC 664-1, table 1 for clearance distances of mains circuits against its environment acc. to EN 50178/VDE 0160, paragraph 5.2.16.1.
- Rating of insulation voltage of mains circuits for TN- and TT mains 849 V acc. to EN 50178/VDE 0160, paragraph 3.64.

The devices BUM63 S/A/F/I are only limited to a certain level short-circuit proof in the sense of EN 50178/VDE 0160, paragraph 6.3.4.

The devices BUM63T S/A/F/I are not short-circuit-proof in the sense of EN 50178/VDE 0160, paragraph 6.3.4.

During operation in the converter and in the motor discharging currents always occur against earth and can result in a premature response to a connected ELCB.

WARNING



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

- serious personal injury
- death



*The danger is: **electricity** At residual currents or at earth fault a direct component in the fault current can occur, which complicates or avoids the release of a higher-level ELCB.*

The connection of power unit to the mains only with the use of the ELCB is forbidden (EN 50178/VDE 0160, paragraph 5.2.11 and 5.3.2.1).

The protection against touching of the units is achieved by the mounting of the converters into conventional switching cabinets, which, regarding the protection type comply with the minimum requirements acc. to EN 50178/VDE 0160, paragraph 5.2.4 and EN 60204-1, chapter 12.4.

Plastic covers on the devices, which cover the control connections, provide additional protection against accidental contact when commissioning or in case of „occasional handling“ of operator control elements, which are nearby. For the power connection additional measures are to be taken.

(IEC 60536-2, chap. 5.1.1, German Accident Prevention Directive „Electrical Installation and Equipment“ BGV A2).

Essential for personal protection are the safety precautions and safety instructions acc. to DIN/VDE.

WARNING



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

- serious personal injury
- death



*The danger is: **electricity***

In case there are missing protective earth connections at the unit or at the motor it must be reckoned on personal injury.

Connect protective conductor. Operate units only at earthed supply systems.

Discharging time of components under voltage is > 1 min.

Check with suitable measuring devices before working, the components which are under voltage. Touch the parts not until you have verified yourself from the safe isolation from supply.

6.1.1 Voltage check

At routine test of these units a voltage check is executed acc. to EN 50178/VDE 0160, paragraph 9.4.5 by Baumüller Nürnberg GmbH.

WARNING

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

- serious personal injury
- death

*The danger is: **electricity***

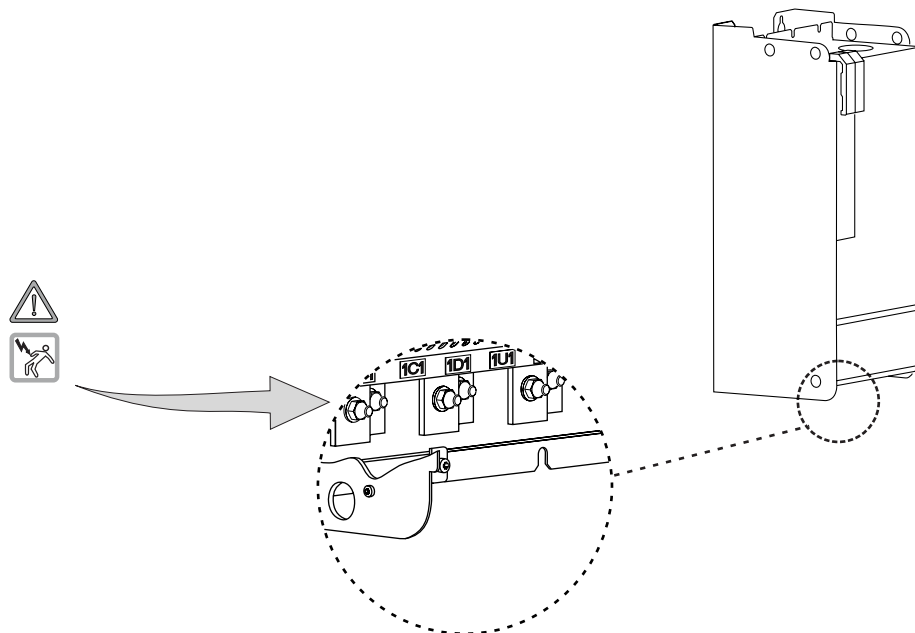
Subsequent checks of unit with high voltages must be executed only by Baumüller Nürnberg GmbH.

If you want to check complete switching cabinet installation with high voltage, you must separate all cable connection from the Baumüller units before checking.



6.2 Danger areas at installation

The following overview shows all areas at the unit, which can be dangerous at the electrical installation.



6.3 Requirements to the electrical mains

The units are intended for the permanent supply connection to the common TN and TT industrial network in star connection with hard or low impedance earthed neutral point according to IEC 364-4-41, chapter EN 413, chapter 413.1.4; they are for industrial networks with non- or high impedance earthed neutral point (IT supply) and for industrial networks with hard or low impedance earthed corner point (earthed delta wye) with a line-to-line voltage from up to $3 \times 480 V_{\text{eff}}$.

6.4 Cable requirements

in case you consider UL 508 C: the maximum short-circuit current of the supply may be 10000A.

A listing of the requirements to the electrical supply is to be found in ([►Requirements on the power supply◄](#) on page 100).

- Assure, that the existing supply fulfills all requirements.

6.4 Cable requirements

In the technical data ([►Appendix D - Technical data◄](#) from page 99) you will find data as for example environmental conditions, electrical connection data a. s. o. which must be observed when choosing a cable. BUM63(T)S/A/F/I comply with the UL requirements, if you use the according cables and if you carry out the tightening of the cables accordingly.



NOTE

If you consider UL508C: only connect 60°C/75° C copper cables. Execute screwing of power connections with the torque as described in [►Connection diagram◄](#) on page 58.

Further information is to be found in appendix [►Circuit mains - device◄](#) on page 107, [►Cable control voltage supply/signals◄](#) on page 108 and [►Cables device-motor◄](#) on page 108.

- Assure, that all cables, which are used accord to the requirements.

6.5 Connection

Here you find detailed information regarding all connections. An overview is to be found in [►Connection diagram◄](#) on page 58.

6.5.1 Power connections

Power connection are on the bottom side of the device (see >Figure 11< on page 43).

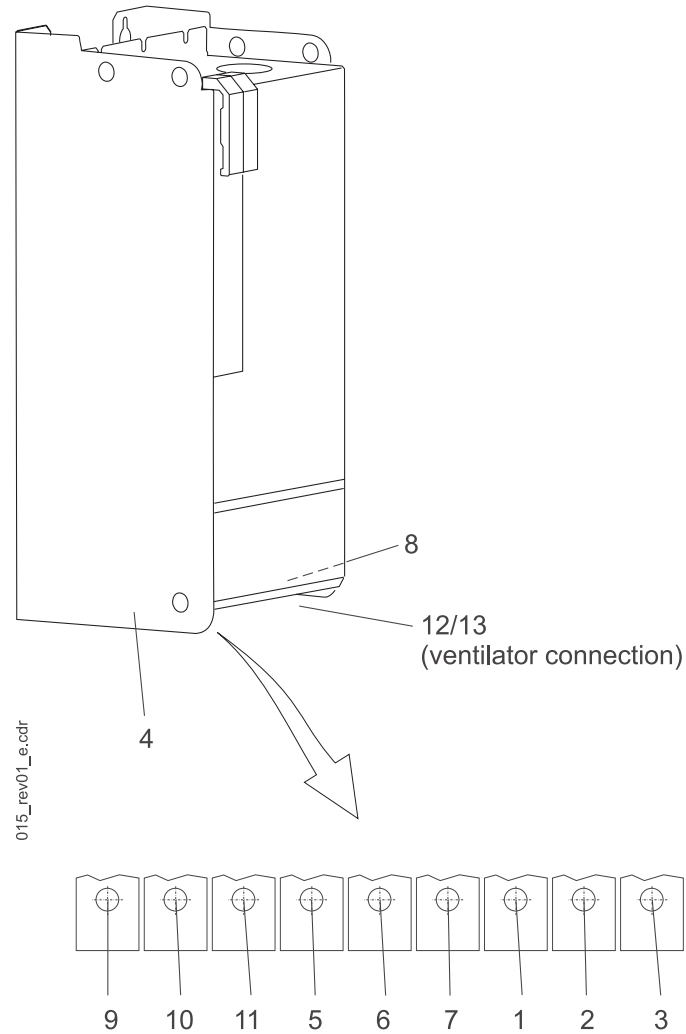


Figure 11: Power connections

Terminal	Pos. 1)	Description	U _{Range} * *	I _{Range} ** **	A ²⁾
1U2	1	Motor connection phase U	0 V (\hat{U}) to 830 V (\hat{U})	0 A (I_{AC}) to 235 A (I_{AC})	depend- ent of cable lug
1V2	2	motor connection phase V			
1W2	3	motor connection phase W			
⊕	4	Earth connection			
1U1	5	Mains connection phase L1	360 V (U_{AC}) to 528 V (U_{AC})	0 A (I_{AC}) to 230 A (I_{AC})	
1V1	6	Mains connection phase L2			
1W1	7	Mains connection phase L3			
⊕	8	Earth connection			
Ba-	9	Connection chopper resistor Ba- is connected with the col- lector of the braking switch Ba+ is 1C1 ⁴⁾	between Ba+ and Ba- 0 to 830 V (U_{DC})	0 A (\hat{I}) to 130 A (\hat{I})	
1D1	10	- connection DC-link	between 1C1 and 1D1 0 to 830 V (U_{DC})	0 A (I_{DC}) to 300 A (I_{DC})	
1C1	11	+ Connection DC-link			
L	12	Fan connection ³⁾	207 V (U_{AC}) to 243 V (U_{AC})	0 A (I_{AC}) to 1 A (I_{AC})	
N	13				

1) Position, see [▶Figure 11◀](#) on page 43.

*: Voltages, which can occur at the terminals

** : Currents, which can flow via the terminals

2) The connection cross-section is selected acc.to the valid standards (e. g. DIN VDE 0100-430) dependent of application.

3) Is only valid for cooling variants S and A. The 2-pole terminals 12/13, N and L for the connection of the fan at 230 V AC are on the right bottom side at the device in the area of the power connections (see [▶Figure 23◀](#) on page 59).

4)



NOTE

The terminals for chopper resistor are not resistant to overload, short-circuit and earth fault. The connection of a resistor of low impedance leads to a destruction of the device. The value for the chopper resistor is to be found in [▶D.3 Electrical data◀](#) from page 103.

6.5.2 Control connections

**WARNING**

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

- serious personal injury
- death



*The danger is: **electricity***

Avoid overload of control connections. The permissible maximum current of 10 A per terminal point may not be exceeded.

Assure that all control voltages meet the PELV or SELV.

6.5.2.1 Control connection X99A

Use the plug-in terminals, which are delivered with the product in order to connect X99A. In case you require further plug-in terminals, you can obtain them at Baumüller Nürnberg GmbH or directly from the manufacturer (see [►B.1 Connector◄](#) on page 89).

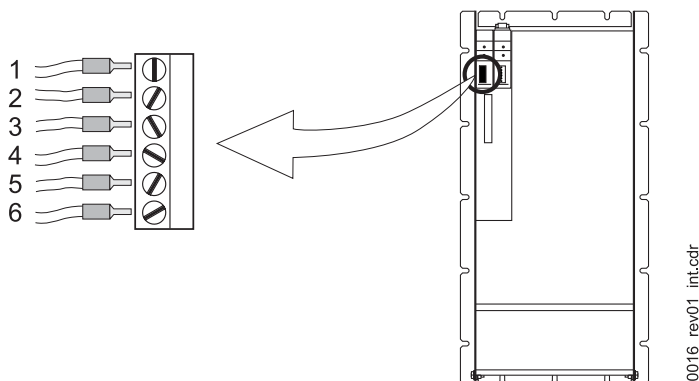
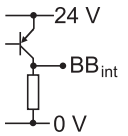


Figure 12: Control connection X99A

Terminal	Pos. ¹⁾	Description	U _{Range} [*]	I _{Range} ^{**}	A ²⁾
+24 V	1	+ 24 V (PELV) ³⁾ Terminals 1 and 2 internally bridged.	21,6 V (U _{DC}) to 28.8 V (U _{DC})	0 (I _{eff}) to 10 A (I _{eff})	0.2 to 2.5 mm ² AWG 24 to 12
+24 V	2				
M 24 V	3	Earth 24 V (PELV) Terminals 3 and 4 internally bridged.	0 V (U _{DC})		
M 24 V	4				
BB _{int.}	5	Message ready-for-use internal ⁴⁾ (PELV) 0 V: supply unit not ready-for-use 24 V: supply unit is ready-for-use  Figure 13: Ready-for-use internal	0 V (U _{DC}) or 24 V (U _{DC}) (PLC level)	0 A (I _{eff}) to 0.2 A (I _{eff})	
ZUS.	6	Reserved (PELV)	-	-	

1) Position, see [►Figure 12◄](#) on page 46.

*: Voltages, which can occur at the terminals

** : Currents, which can flow via the terminals

2) Connection cross-section of conductor. Observe EMC information when you connect the cables (see [►Requirements on the laying \(EMC instructions\)◄](#) from page 51)

3)



NOTE

The power supply has capacitors at the input (250µF), so that when switching the 24 V supply charging currents can occur.

4) This message is only related to BUM63 (T)S/A/F/!! (also see [►"Ready-for-use supply unit"◄](#) on page 67).

6.5.2.2 Control connection X99AB

Use the plug-in terminals, which are attached in order to connect X99AB. In case you require further plug-in terminals, contact Baumüller Nürnberg GmbH or directly at the manufacturers' (see [►B.1 Connector◄](#) on page 89).



WARNING

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

- serious personal injury
- death



*The danger is: **electricity***

Assure that at higher current requirements, that it is supplied separate.

6.5 Connection

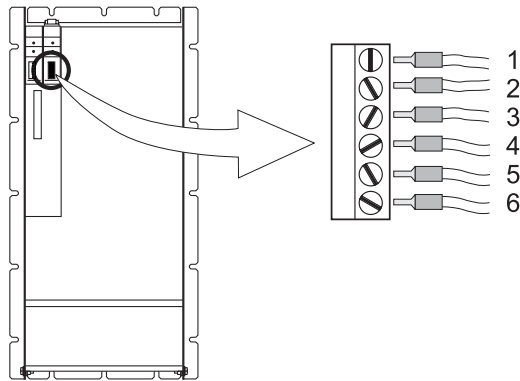
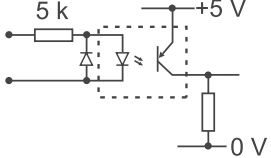


Figure 14: Control connection X99AB

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Terminal	Pos. ¹⁾	Description	U _{Range} [*]	I _{Range} ^{**}	A ²⁾
BB _(ext)	1	Message " ready-for-use external " (PELV) Open contacts: Supply unit not ready for use	0 V (U _{DC}) to 24 V (U _{DC})	0 A (I _{DC}) to 0.5 A (I _{DC})	max. 2.5 mm ²
	2	Closed contacts: Supply unit ready-for-use			
Vorw. Stör.	3	Message " warning " (PELV) Closed contacts: Supply unit - no warning			
	4	Open contacts: Supply unit - warning			
+Reset	5	isolated optocoupler input in order to Reset of error messages: PHASE ERR, POWER ERR, and BRAKE OVERL (PELV). 	0 V (U _{DC}) to 24 V (U _{DC}) (PLC level)	10 mA (I _{DC}) to 25 mA (I _{DC})	
M Reset	6	Ground for input +Reset (PELV)	0 V	-	

¹⁾ Position, see >Figure 14< on page 48.

*: Voltages, which can occur at the terminals

** : Currents, which can flow via the terminals

²⁾ Connection cross-section of conductor.

6.5.2.3 Safety relay X68

With the safety relay the drive can be switched to a torque-free state.

WARNING

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

- serious personal injury
- death

*The danger is: **mechanical influence** by failure of safety relay.*

Assure that the minimum current of the contacts 1 and 2 are not less than 10 mA during operation. Operate the safety relay within its specifications.



Coil side	
Rated voltage	24 V (PELV)
Operating voltage	19 V 37 to 1080 V at $T_U = 20\text{ °C}$ (PELV)
Coil resistance	660 Ω to 905 Ω
Contact side	
Switching voltage U_{AC}	max. 25 V_{AC} (PELV)
Switching voltage U_{DC}	max. 60 V (PELV)
Switching current	max. 5 A
Continuous current	min. 10 mA - max. 6 A
Switching capacity P_{AC}	max. 150 VA
Switching capacity P_{DC}	max. 30 W

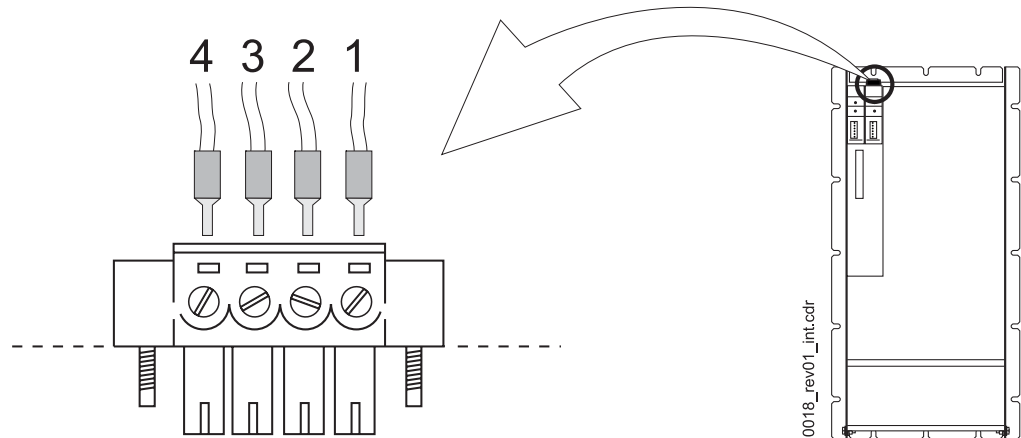



Figure 16: Safety relay X68

Terminal	Pos. ¹⁾	Description	U _{Range} [*]	I _{Range} ^{**}	A ²⁾
	1	NC contact), if safety relay is active (PELV)	0 V (U _{DC}) to 24 V (U _{DC})	0 A (I _{DC}) to 0,5 A (I _{DC})	1.5 mm ²
	2				
+24 V	3	+ 24 V connection to deactivate safety relay (PELV)	0 V (U _{DC}) to 24 V (U _{DC})	0 mA (I _{DC}) to 35 mA (I _{DC})	1.5 mm ²
M 24 V	4	Ground to input +24 V (PELV)	0 V (U _{DC})		

¹⁾ Position see [▶Figure 16◀](#) on page 50.

*: Voltages, which can occur at the terminals

** : Currents, which can flow via the terminals

²⁾ Connection cross-section of conductor.



NOTE

When operating the motor, terminal 3 must be connected to +24 V (U_{DC}) and 4 with 0 V (U_{DC}). „Safety relay off“ is stored as a message and must be reset by the use of the controller.

A detailed description of the safety relay is to be found in [▶Appendix E - Safety relay◀](#) from page 109

6.6 Fuses of the device

To protect the device or the cable connections at an earth fault, fuses must be installed accordingly. Use the fuses, which are listed in [▶D.4 Fuse protection◀](#) on page 105!

6.7 Requirements on the laying (EMC instructions)

In these units semiconductors are used, which minimize the power loss in the unit by fast switching and therewith permits a small size. Due to quick switching, this semiconductor generates electromagnetic waves. This is why you must meet specific requirements when operating, to avoid electromagnetic influences by switching procedures.

Interferences can arise throughout all areas of the drive system and originate in the following:

- capacitive discharge currents. Causes are the high voltage gradients at the switching of semiconductors.
- high currents and current gradients in the motor cables. The disturbance energy bound in magnetic fields reaches frequencies of between a few Hz and about 30 MHz. Due to the high voltage gradients additionally electromagnetic fields with frequencies up to approx. 600 MHz occur.
- high cycle rates and quick logic circuits (electromagnetic field/16 MHz to 1GHz).
- Reaction on system and harmonics. The cause are commutation procedures and not sinusoidal mains loadings especially at line-commutated converters (100 Hz to 20 kHz).

NOTE



In this Manual you will find the most important information according an EMC-compatible mounting. Further notes, which necessarily have to be considered in order to erect a CE-conform installation are to be found in the manual „filters for mains applications“.

6.7.1 EMC regulation (EMVG)

This device complies with § 6 sect. 9 of the EMVG of 18.09.1998:

"Devices, systems and parts in terms of section 3, which exclusively are manufactured and are determined as subcontracting parts or spare parts for the subsequent processing by competent companies or persons in the field of electromagnetic compatibility, must not comply with the protection requirements as well as the requirements of § 4 section 1 no. 1 to 3 and 5.

EMC decisively depends of the assembling of the single components and the components in the switching cabinet. The notes on the following pages shall make it possible to configure the installation according to the latest EMC knowledge level and therewith comply with the appropriate statutory regulations.

6.7 Requirements on the laying (EMC instructions)

6.7.2 Measures for EMC-assurance

In order to assure the EMC the following configuration notes must be regarded.

6.7.2.1 Cabling

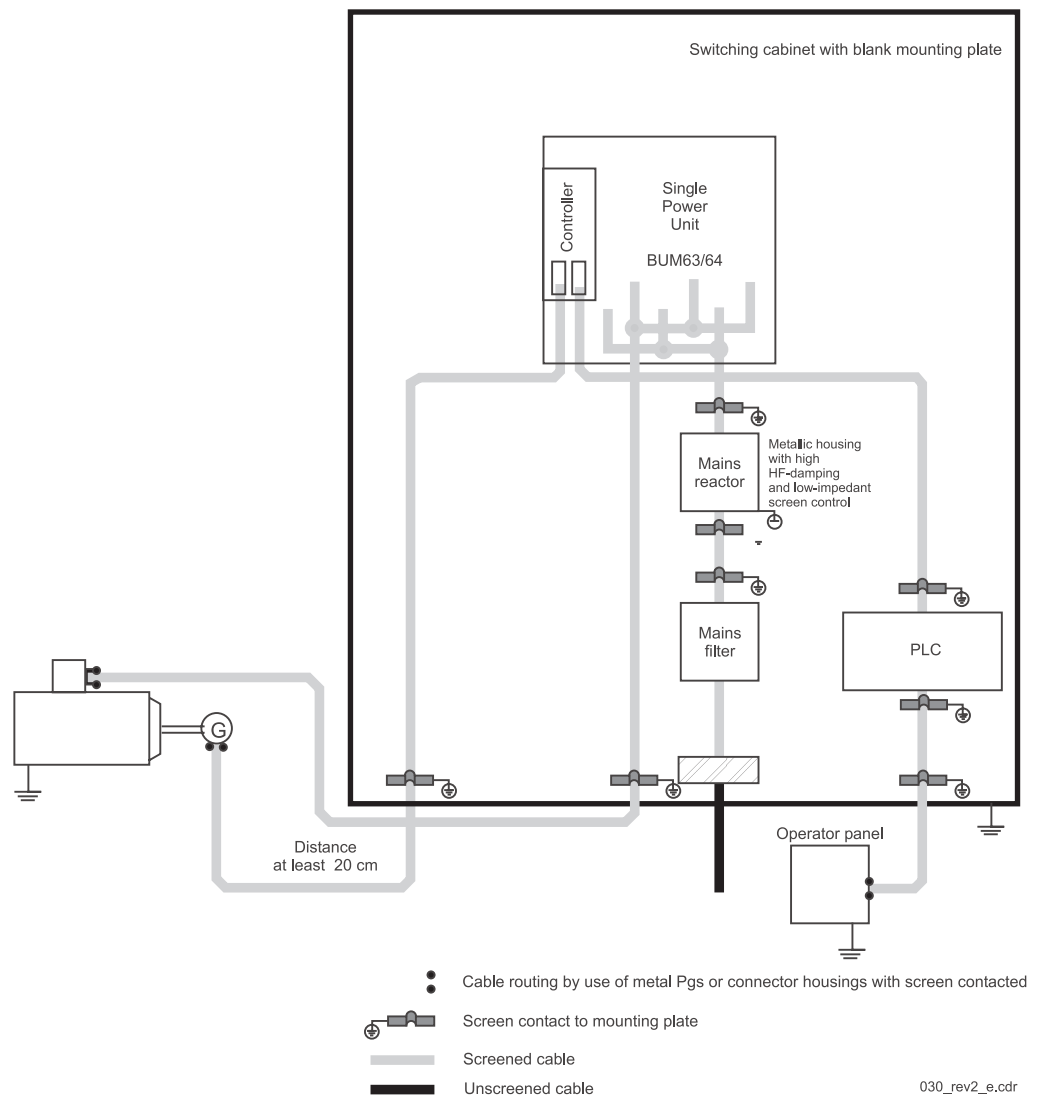


Figure 17: Cabling proposal BUM63(T)S/A/F/I

- Screen **all** connected cables in order to keep cables free from interfering radiation (see [►Screening◄](#) from page 55). You can install unscreened control cables, if the switching cabinet has a sufficiently high screen attenuation (see limit values for noise emission according to EMVG for your installation) and also if the EMC compatibility inside the switching cabinet is guaranteed (this can be assumed if you have observed all configuration instructions given in this manual).

- It can be assumed, that the permissible limit values are observed, if motor cables are used, which where enabled.
- The maximum length of the motor cable is limited. The length is dependent of the cross section of cable.
- The 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.
- You achieve the lowest possible effective aerial height by routing the cable directly alongside the earth of a metallic surface.

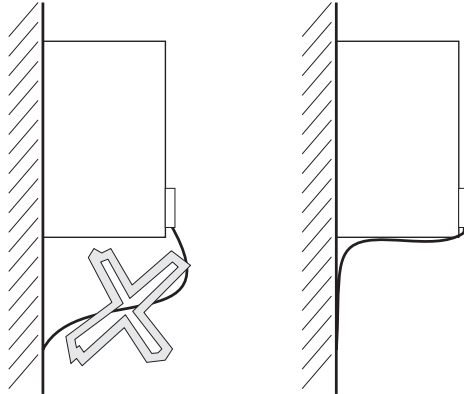


Figure 18: Reducing effective aerial height

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

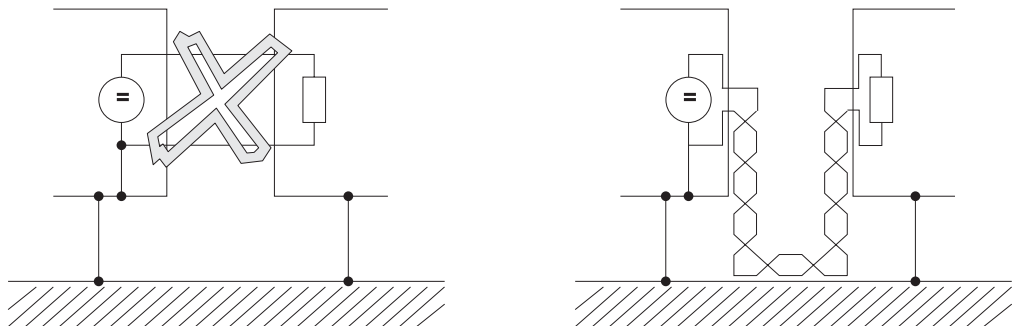


Figure 19: Reducing loop areas

- Keep a minimum clearance of 20 cm between the lines, when parallel-routing signal-/control lines across power cables.
- Cross cables of different EMC categories only in a 90 °angle.
- For symmetrical signal transmission form twisted pair cables and twist those against all other twisted pairs (e. g. for differential amplifier inputs used for speed set value).
- Make an connection between earth connection-converter/earth plate, which is as short as possible (< 30 cm). Use large cross sections (>10 mm²mm).
- The PE-connection on the load side of the filter to the mounting plate should be carried out with low impedance. Ideal is a galvanized metal angle piece or a high frequency earth band.

6.7 Requirements on the laying (EMC instructions)

- ▶ Keep a distance of at least 20 cm between converter and its cabling and
 - disturbance sources as contactors, transformers, reactors and
 - noise-sensitive components as μ Ps, bus systems a. s. o.
- ▶ Avoid reserve loops on cables, which are too long.
- ▶ The earthing of reserve cables is mandatory on both ends (additional screening is achieved, you avoid capacitive coupled hazardous contact voltages).
- ▶ Don't switch mains filters parallel.
- ▶ Don't connect mains filters of the same type of construction in series - the attenuation characteristics are not improved.
- ▶ Use a separate mains filter for each device. If you must suppress all drives together - do not interrupt the screening between the converter and the mains filter, except by the line reactor, which has to be mounted into a earthed metal housing, which is of low impedance.

6.7.2.2 Earthing

From the view of EMC the classical star-connected earthing is inadequate, in order to minimize the influence of interferences with higher frequencies. Better results are achieved by a reference surface which must be linked to the device's earth (e. g. plane metal mounting plate and housing parts).

- ▶ To avoid earth loops, position all earth conductors and screens as close as possible to earth.
- ▶ Execute the connection of controller reference potential - earth with a cross section, which is as large as possible and with a short cable (< 30 cm), as long as there is the possibility to earth the controller reference potential of the device.
- ▶ Remove insulation layers such as paint, adhesives a. s. o. from the earth connections.
- ▶ If necessary use lock washers (DIN 6798) or similar measures to ensure a permanent, conductive contact.
- ▶ Select suitable metal combinations (electro-chemical voltage series), in order to avoid corrosion on earth connections.
- ▶ Keep conductive electrolytes away from the connection by the use of protective coating (e. g. with grease).
- ▶ Connect screens on both ends plane and highly conductive with earth.
Only like this magnetic and accordingly high-frequency interference fields are able to be attenuated in its actions.
- ▶ If there are problems with earth loops (e. g. double earthing of set value conductor), apply the receiver side galvanically and the sender side capacitively.

- ▶ Contact the outer cable screens with the housing, if the cable is passed through the housings, which separate different EMC areas from each other.

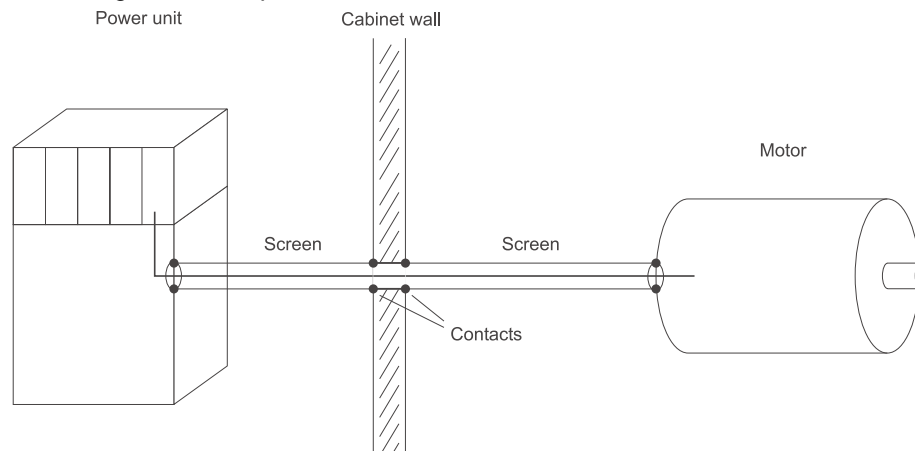


Figure 20: Contact cables when exiting the housing

Cables which exit the walls of screen housings without special precautions (e. g. filtering), may impair the screening effects of these housings.

- ▶ Therewith connect the cable screens also at the exiting point with a well conductive screening.
- ▶ Assure that the distance of the last screen contact point to the housing exit is as short as possible.

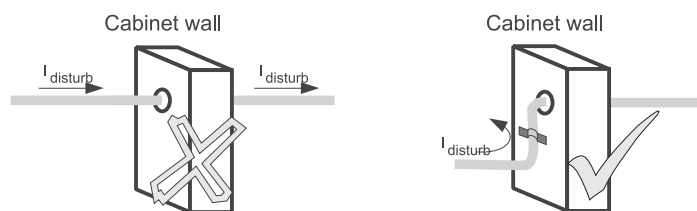


Figure 21: Cable screening at exiting housing

6.7.2.3 Screening

Screening is effective against magnetic fields if the screen is connected to earth on both ends.

With electrical fields a screening effect is already existent, if the screen is connected to earth on one side.

- ▶ Always apply the screen on both sides to the fields with high frequencies (dependent of the cable length), regardless of being an electric or a magnetic field.

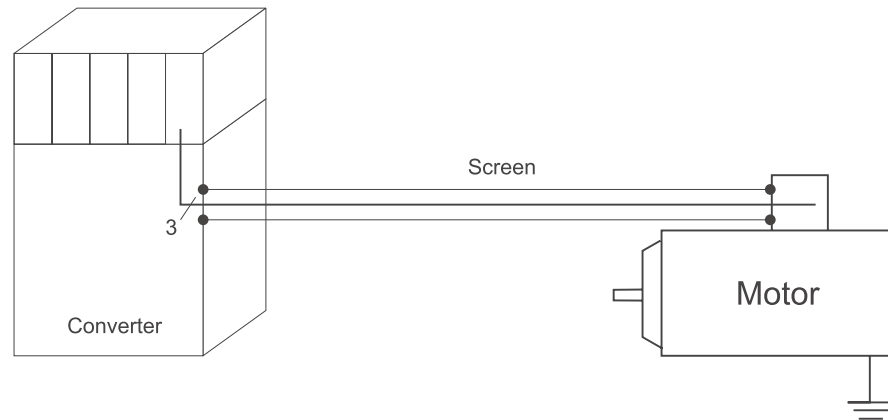


Figure 22: Screen on both sides

With both-sided applying of the screen on earth you reach that the cable doesn't leave the screening system housing.

The both-sided earthing of cable screenings nearly excludes an influence due to earth loops (potential differences on the earth system). These are very rare, if the notes from the sections ([▶Cabling◀](#) from page 52) and ([▶Earthing◀](#) from page 54) are regarded.

The HF-connection of a screen with earth can also follow capacitive. This avoids low-frequency errors due to earth loops.

- ▶ Screened cables that are routed through different EMC areas must not be interrupted at terminals, since screen attenuation would otherwise be reduced considerably.
- ▶ Run the cables without interruption to the next component, if this is possible.
- ▶ Carry out all screen connections by using a wide surface and with a low impedance.
- ▶ Screening connection may not be more than 10 cm from the edge of the device.

Cable tails with a length of only 3 cm (1 cm wire = 10 nH) reduce the screening effect with 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 noise potential:

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

6.7.2.4 Filtering

The functioning of the device requires not filters. But to comply with the limit values of EN 61800-3 input-sided mains filters are necessary.

If you have questions on how to perform filtering you can order manual „Filters for mains application BFN“.

6.7.2.5 Filter mounting

- ▶ Arrange the filter close to the unit.
- ▶ Use a screened mains cable between unit and filter at a cable length greater than 30 cm (earthing on both sides).
- ▶ Separate in- and output cables of the filter (distance > 30cm).
- ▶ Connect the filter housing plane with earth.

6.7.2.6 Leakage currents

Parasitic capacities in filter, power unit, motor cable and motor winding on principle cause leakage currents in the range of 100mA and larger.

Hence it follows that the converters can be incompatible with ELCBs!

- ▶ Pertinent to this refer to the safety instructions in EN50178/VDE 0160/4.98, para. 5.2.11.2.

6.8 Connection diagram

- Install the mains cables EMC compatible and then connect the cables as specified in the connection plan.



WARNING

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

- serious personal injury
- death

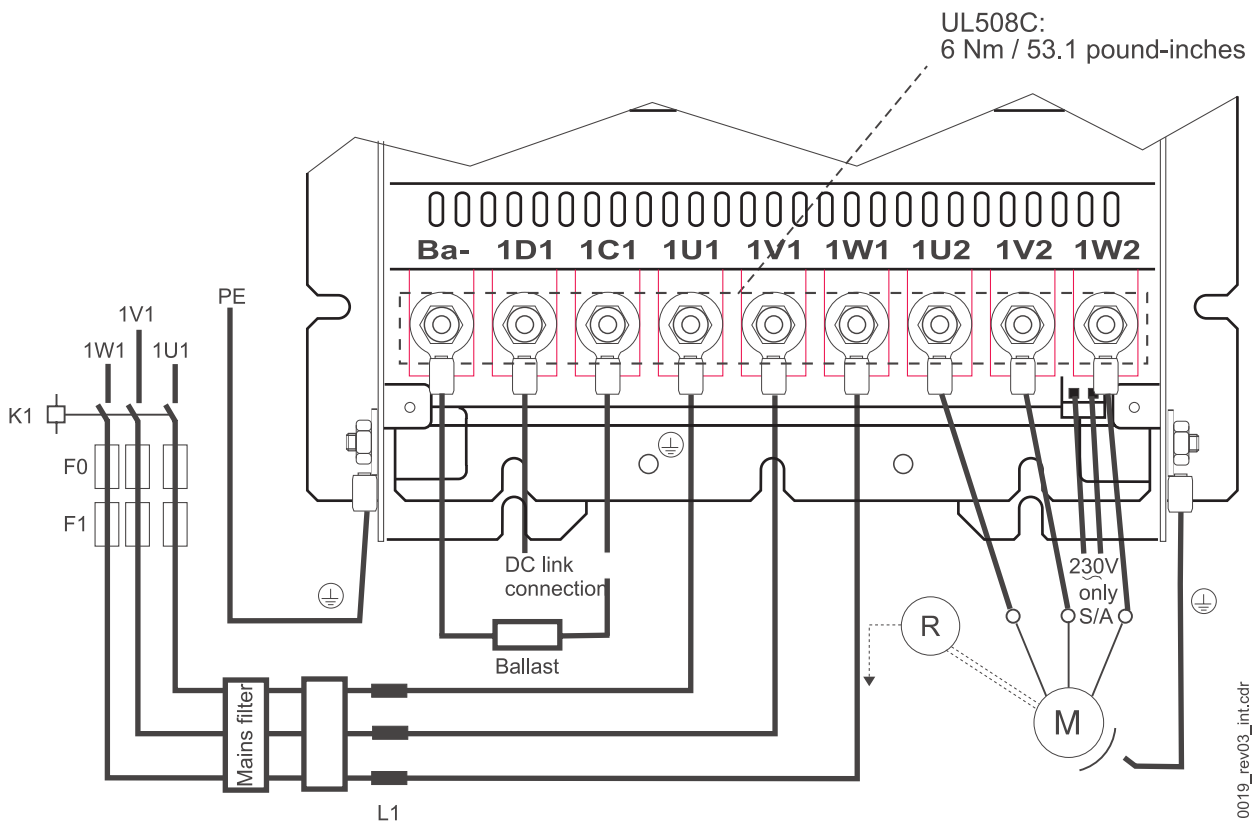
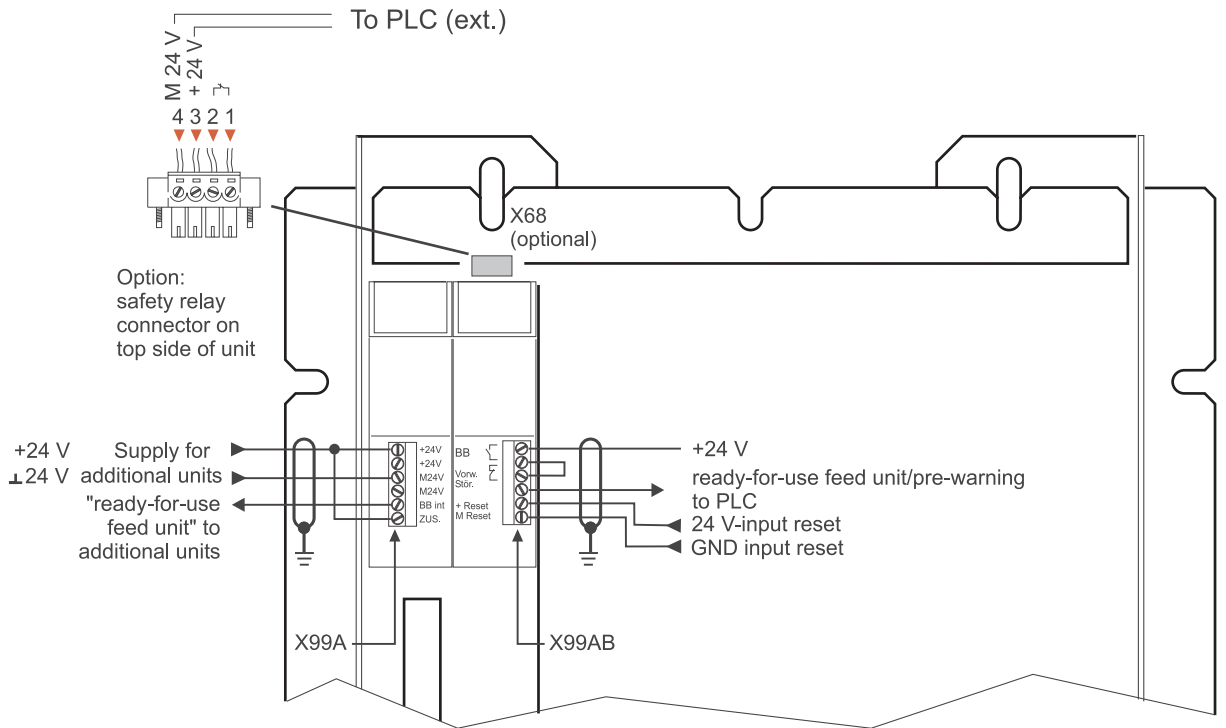
*The danger is: **electricity***



Assure, that the permissible connection value (see [▶Electrical data◀](#) from page 103) never is exceeded!

Again mount the covers, which have been provided and screw on the covers, after the cables have been connected to the power connections.

Assure, that the total power of BUM63(T)S/A/F/I is not higher than the power of the motors which are supplied by the lined up power modules, which the power supply converter can provide the BUM63(T)S/A/F/I.



0019_rev03_int.cdr

Figure 23: Connection plan BUM63(T)S/A/F/I

6.9 Screwing in accordance with UL

Information concerning the individual connections are to be found from section [►Power connections◄](#) from page 43.

Further connection notes are to be found in the following table.

F0	Line protection fuse, protection depends of the cables used (DIN VDE0100-430)
F1	Fuse for protection of semiconductors or full-range protection (see ►D.4 Fuse protection◄ on page 105)
K1	Line contactor (auxiliary contact for controller enable optional, not mandatory)
Mains filter	Mains filter see ►B.5 EMC accessories◄ on page 92.
L	Line reactor (see ►B.4 Line reactors◄ on page 91)
+ 24 V ⊥ 24V	24 V power supply with safe isolation (PELV) acc. to IEC 61131-2; table 7 in order to supply the electronic part

6.9 Screwing in accordance with UL

Use a suitable torque code, in case an UL-relevant screwing acc. to UL508C is necessary.

COMMISSIONING

Commissioning consists of the following steps:

- 1 Check mounting
- 2 Check installation
- 3 Check safety devices
- 4 Check operating- and display elements

Further information concerning the single steps are given in the following sections.

7.1 Requirements to the executing personnel



WARNING

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

- serious personal injury
- death



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

Make sure, that only qualified personnel, who is familiar with the safety- as well as with mounting-, operating- and maintenance instructions, works on this unit.

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 this unit are for example:

- Training or instruction and to have the authorization to operate with circuits and devices according to the standards of the safety engineering, to commission, to earth and to label.
- Training or instruction due to the standards of safety engineering in maintenance and use of appropriate safety equipment.

7.2 Checking the mounting

- ▶ Assure, the unit is properly screwed to the switching cabinet.
- ▶ Assure, that sealing has not been damaged (is only valid for through-hole variants)
- ▶ Assure, that the cooling circulation is dense (only valid for variants I/F).

7.3 Checking the installation



WARNING

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

- serious personal injury
- death

*The danger is: **electricity**. Voltage conducting parts must be protected against direct touch.*

This you can achieve by insulation, model, positioning or stationary devices.

The power connections of power unit are non-isolated!

Essential for personal protection are the safety precautions and safety instructions acc. to DIN/VDE. If protective conductor connections are missing at the device or at the motor it must be reckoned on personal injury, because the surfaces may carry dangerous voltages.

The protective connection is to be executed acc. to DIN EN 60204/VDE 0113 part 1; section 8.2.2 EN 50178/VDE 0160, sections 5.3.2.1 and 8.3.4.4 into account.

During operation in the power unit and in the motor there are discharge currents to earth, which are discharged via the specified protective connection and can result in a release of a connected ELCB.

In case of a fault to frame or an earth fault a direct component in the earth leakage can occur, which complicates or avoids the enable of a higher-level ELCB.

Even if the main contactor is falling the parts of the power unit are under dangerous voltages.

- ▶ Check, if the cables to the power connections have been correctly installed and connected.
- ▶ Check, if the cables to the signal connection have been installed and connected properly.

7.4 Checking the safety devices



WARNING

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

- serious personal injury
- death

This unit is under dangerous voltage and contains dangerous rotating machine parts (fan).

Switching cabinets must be equipped with emergency stops, which are able to switch off all voltages which can cause hazards. Not included are devices, which generate new dangers when switched off. The release for emergency stop must be placed in such a way, that in case of danger it can be reached quickly. During workings, which are associated with a considerable higher danger level the attendance of a further person is necessary.

- Before activating the drive check thoroughly the function of all higher-levelled safety devices, in order to avoid personal hazard.
- Before commissioning assure that the plastic covers are over the parts under voltage (power unit connections) and that the fans are covered with an accordant lattice.
- Assure, that the touch protection has been carried out according to BGV A2.

7.5 Procedure of commissioning



WARNING

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

- serious personal injury
- death

A faulty or uncontrolled movement of the machine parts during the first commissioning cannot be excluded. Therefore act with caution during first commissioning.

Special caution is advisable at direct or indirect touching of drive shaft (manually). This is only permitted at standstill of shaft and disconnected power unit or deactivated safety relay. During operation free accessible machine parts (shafts, fans or similar) must be covered.

At occurrence of an error the drive is switched to a current-free stat, after that the motor coasts non-braked to standstill. This circumstance especially is to be considered at travel drives and lifting drives.

- Assure, that no persons are in the danger range of the operating machine.
- Assure, that the installation immediately is able to be switched off via the emergency stop.
- Switch on the unit and pay attention to faulty or uncontrolled states of installation.

OPERATION

The device is operated only via the controller (see description of controller). The only exception from this is the resetting of errors via the optocoupler input "Reset" of plug-in terminal X99AB.

In this chapter we do not describe the operation but the monitoring and display elements on the device, which are important for the operation.

8.1 Safety instructions



WARNING

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

- serious personal injury
- death

Immediately report changes, which could affect the security.

In order to demount safety devices, to commission or to repair, set the machine/mounting in exact accordance with the instructions out of operation.

Mount the safety devices again and assure their function directly after completion of commissioning or repairing it.

8.2 Monitoring functions and its messages



NOTE

The monitoring functions are only active, if the +24V-supply voltage (X99A) is present.

The monitoring function of the unit are divided into two groups. The first group is "monitoring functions supply part" see [▶Figure 4◀](#) on page 27. The second group is "monitoring functions motor-sided power unit". This division accords to internal structure of unit.

8.3 Ready-to-operate

8.2.1 Monitoring functions supply unit

The messages, generated by "monitoring functions supply unit" are given via the relay contacts towards the outside. The messages at the same time are forwarded and processed by the controller.

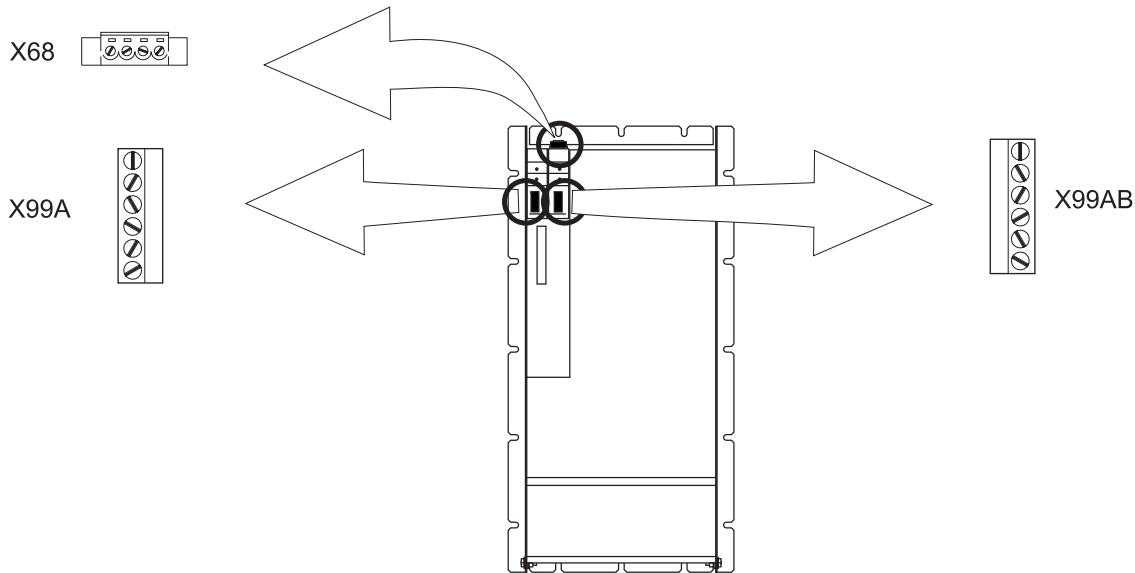


Figure 24: Position of relay contacts

Further information according messages and the involved relay contacts are to be found in [▶Messages via relay contacts◀](#) on page 73.

8.2.2 Monitoring functions motor-sided power unit

The messages, which were generated by "monitoring functions motor-sided power unit" are exclusively forwarded and processed by the controller. Further information is to be found in [▶Monitoring functions◀](#) from page 69.

8.3 Ready-to-operate

The message "ready-for-use" is the most important message to you. If a monitoring function generates a message, which resets the message "ready-for-use" the drive is stopped.

There is only one message "ready-for-use". If, for example, a V-controller is in BUM 63(T)S/A/F/I, there are four different messages "ready-for-use" in one drive.

- Ready-for-use supply unit" (in BUM 63(T)S/A/F/I existent and visible)
 - = Ready-for-use internal(digital output X99A - 5)
 - = Ready-for-use external(relay contacts X99AB - 1.2)
- "Ready-for-use power unit" (in BUM 63(T)S/A/F/I existent and **not** visible)
- "Ready-for-use controller" (existent in the controller)
- "Ready-for-use total(in the controller)

The message "ready-for-use total" is dependent of three other ready-for-use messages. Not until the messages "ready-for-use supply unit", "ready-for-use power unit" and "ready-for-use controller" are available, the message "ready-for-use total" is displayed (see figure [▶Figure 25◀](#) on page 67).

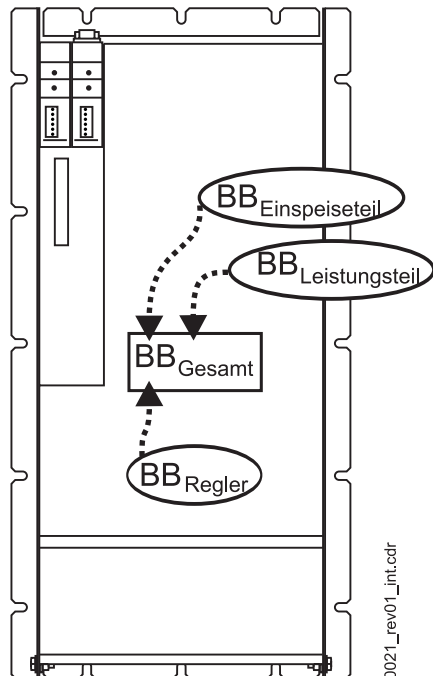


Figure 25: „Ready-for-use“



NOTE

After applying the +24V-supply voltage and the mains voltage, the device is ready-for-use in approximately five seconds.

„Ready-for-use power unit“ after about 0.5 s, „ready-for-use supply unit“ after about 2 s, „ready-for-use controller“ after about 4.5 s.

In the following section you will receive further information according to the different "ready-for-use" messages.

"Ready-for-use supply unit"

If the "monitoring function supply unit" does not locate errors, the monitoring function generates the message "ready-for-use supply unit".

- If the message "**ready-for-use supply unit**" of monitoring function is reset, BUM 63(T)S/A/F/I changes the drive, doesn't supply power anymore.

The BUM 63(T)S/A/F/I shows this message using a LED and at the same time this message is transmitted to the relay contacts. Further information is to be found in [▶Monitoring functions◀](#) on page 69 and [▶Messages via relay contacts◀](#) on page 73.

The "ready-for-use supply unit" also is classified as "ready-for-use internal" (terminal marking BB int) or "ready-for-use external" (terminal marking BB ext).

The distinction is due to only in the construction of the unit.

At the output of the supply unit "ready-for-use supply unit" is also referred to as "ready-for-use internal". After the message has been transmitted within the unit to the power supply, the message "ready-for-use supply unit" is referred to as "ready-for-use external".

"Ready-for-use motor-sided power unit"

If the "monitoring function motor-sided power unit" doesn't locate an error, the monitoring function generates the message "ready-for use motor-sided power unit".

If the message "ready-for-use motor-sided power unit" is reset by the monitoring function, the BUM 63(T)S/A/F/I changes the drive torque-free, e. g. the unit doesn't supply power anymore.

"Ready-for-use controller"

At the beginning of this section we have mentioned the V-controller. In the documentation for the controller, which is used you will find information, if the message "ready-for-use controller" is there and if so, how you can process the message "ready-for-use controller".

"Ready-for-use total"

Here also the above mentioned is valid. In the documentation for the controller, which is used, you will find information, if the message "ready-for-use total" is there and if so, how to process message "ready-for-use total".

8.4 Monitoring functions

The following table lists all the monitoring functions of the power unit. A declaration of every single monitoring function is to be found on the following pages.

Monitoring function		Relay	V-Controller	Reset
Supply unit	Phase failure	- X99AB; 3.4	- F 0110 ¹⁾	- 24 V _{DC} ²⁾
	Power failure	- X99AB; 3.4	- F 0110 ¹⁾	- 24 V _{DC} ²⁾
motor-sided power unit	Overcurrent (motor) e. g. short-circuit	-	F 0202	Reg. ³⁾
	Earth current (motor), e. g. earth fault	-	F 0203	Reg. ³⁾
	Overcurrent DC-link	-	F 0201	Reg. ³⁾
	Overtemperature heatsink	-	F 0205	Reg. ³⁾
	Internal auxiliary supply	-	F 0204	Reg. ³⁾
	Safety relay	X 68; 1.2 ⁴⁾	F 0206	Reg. ^{3) 4)}

1) The V-controller always displays this group error signal if an error appears in the supply unit. Which kind of error has occurred, is shown on the according LED on the front side of the supply unit.

2) Activate reset input (+24V and M24V at X99AB is generated, optocoupler input)
or
switch off +24 supply voltage.

Thus **every** message of the supply unit is reset!

Due to consideration to message WARNING you have the possibility, to bring the drive into a defined operation status, before the power unit resets the message "ready-for-use supply unit" and changes to current-free status.

3) The message must be deleted by a reset of the controller.
Display and reset of the message is described in the manual of the controller.

4) A message only then appears, if the safety relay is switched off. The safety relay is switched off then, if the +24V-supply voltage for the relay is inexistent.
Before you are able to delete the message by a reset of the controller, you must switch on the +24V supply voltage again.



NOTE

Reset: In case the message is not reset, it is in all probability, that the cause of the error still is existent.

8.4.1 Monitoring functions of the supply unit

- **Monitoring function phase failure**

The voltage of all phase conductors is monitored. If the voltage at an phase conductor is missing, BUM 63(T)S/A/F/I generates the message WARNING. If the voltage recovers within 10 seconds, the message WARNING is automatically reset. If the voltage of the phase conductor is missing more than 10 seconds, the message WARNING remains and the message "ready-for-use" supply unit" is reset.



NOTE

If BUM 63(T)S/A/F/I during the phase failure is operated with large motor powers, the input rectifier can be destructed. In order to avoid this use semiconductor fuses.

- **Monitoring function mains failure**

The voltage of all phase conductors is monitored. If the mains voltage is missing at two or three phase conductors, immediately the message „WARNING“ is set. If there is mains voltage again, as long as the DC-link voltage is charged again via 300 V, and the message warning is reset.

If the DC-link voltage falls under 300 V after mains failure or mains failure dips, so the message „ready-for-use supply unit“ is reset. If mains voltage occurs again, specifies circuits of input X99AB-5/6 for further characteristics:

- Shortly connect (> 1 ms) 24 V, the DC-link is charged again, the message warning is reset and the message ready-for-use is set again.
- if you have connected input with permanently 24 V, then automatically after occurrence of mains the DC-link is charged again, the message warning is reset and the message ready-for-use is set again
(precondition for this is that the mains failure time > 0 seconds is set. Hereby see "mains failure time" in the description of controller).

WARNING

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

- serious personal injury
- death

*The danger is: **mechanical effects.***

execute protection on the motor side, if an automatic restarting of the drive is possible - because of the automatic restart the operating personal is subject to potential injury!



8.4.2 Monitoring functions motor-sided power unit

- **Monitoring function overcurrent (motor)**

Each of the three phase currents of the motor are monitored.

In case of an exceeding of the phase current of 30 % of the peak value of the permissible peak current the BUM 63S/A/F/I generates this message. This message is stored in the BUM 63S/A/F/I and is routed onto the controller. The message "ready-for-use motor-sided power unit" is reset.



NOTE

The overcurrent message and the consequential stopping of the drive protects this of damage/destruction. In order to avoid the message „overcurrent (motor)“, you must limit the permissible peak current of the motor phase currents by the control system.

- **Monitoring function earth current (motor)**

The earth fault current of the motor phase current monitored.

A message is generated, if the error current exceeds 20 % of the amplitude of the permissible peak current of the power unit. As a cause of error an earth fault at the motor connection is likely. This message is routed onto the controller. The message "ready-for-use motor-sided power unit" is reset.

- **Monitoring function overcurrent DC-link**

The level of the DC-link voltage is monitored.

If the DC-link voltage reaches 830 V, a message is generated. This message is routed onto the controller. The message "ready-for-use motor-sided power unit" is reset.



NOTE

The DC-link voltage can increase until switch-off takes place, if the drive brakes and if there is no or too little chopper circuit at the DC-link.

- **Monitoring function overtemperature heatsink**

The temperature of the heatsink is monitored.

On the heatsink there is a linear temperature sensor, whose measured value is routed onto the controller. Therewith the controller takes over a temperature monitoring (here-with see description of controller) and this must be set, according to the technical data in the controller description. If the heatsink exceeds the permissible temperature the message "ready-for-use motor-sided power unit" is reset.



CAUTION

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

- property damage.

*The danger is: **temperature of unit too high**. The maximum permissible temperature of the heatsink is 90 °C - if there is a higher temperature the device can be destructed.*

Set the controller in such a way, that the "ready-for-use motor-sided power unit" is reset by the controller at a temperature of heatsink of 85 - 90 °C.

- **Monitoring function internal auxiliary supply**

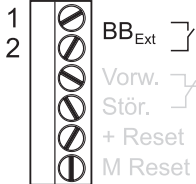
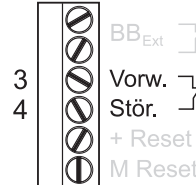
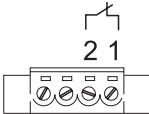
The voltage, which is necessary for the controlling of the power transistors is monitored. If the internal auxiliary supply is missing a message is generated. This message is routed onto the controller. The message "ready -for-use motor-sided power unit" is reset.

- **Safety relay** (option)

The output condition of the safety relay is monitored.

Further information referring to the safety relay you find in [▶Messages via relay contacts◀](#) on page 73 and in [▶Appendix E - Safety relay◀](#) from page 109.

8.4.3 Messages via relay contacts

Plug-in terminal	Description
 <p>Figure 26: BB_Ext, X99AB</p>	<p>"Ready-for-use supply unit"</p> <p>Contact open: The message "ready-for-use supply unit" isn't present.</p> <p>Contact closed: The message "ready-for-use supply unit" is present.</p> <p>Further information acc. message "ready--for-use power unit" you will find in ▶"Ready-for-use supply unit"◀ on page 67.</p>
 <p>Figure 27: Pre-warning/error, X99AB</p>	<p>Pre-warning -error (pre-warning is actually the wrong expression, warning would be correct)</p> <p>Contact closed: The message WARNING isn't present.</p> <p>Contact open: The message WARNING is present.</p> <p>In which case this message is issued, please read in ▶Monitoring functions of the supply unit◀ on page 70.</p>
 <p>Figure 28: X68</p>	<p>With the safety relay you are able to switch off the supply voltage of the transistor control. After the switching-off the motor is zero-torque, but is isn't isolated from the power module. The motor is not off-circuit!</p> <p>A typical application for the safety relay is: ▶ very quick reuptake of the operation after switching off This is possible, because the DC link voltage is not switched off.</p> <p>Acknowledgement safety relay Contact closed: +24V-supply for the safety relay is missing. The output stage and accordingly the inverter is inhibited.</p> <p>Contact open: +24V supply for the safety relay is existing. The output stage and accordingly the inverter can be controlled by the controller.</p> <p>If the +24V-supply for the safety relay is taken away, while the drive is running, then the drive is immediately switched zero-torque (this means the device doesn't supply any power anymore), the motor rotates freely back to zero.</p> <p>In order to start the drive again you must follow the following procedure: Switch on +24V supply for safety relay reset existing message by a reset of the controller</p> <p>Also see ▶Appendix E - Safety relay◀ from page 109.</p>

MAINTENANCE

Maintenance of the devices consist of checkings. If you attentive execute checkings, you can avoid problems in time.

9.1 Inspection intervals

In the case of polluted environmental air, the required cooling air flow rate can not be reached anymore, if dirt deposits block the ventilation slots.

But beforehand dirt deposits in the inside of the device can avoid the necessary heat discharge. Dirt deposits at the ventilation slots are a warning signal, which has to be considered.

- Check the devices at the switching cabinet, which ensure the necessary environmental conditions (e. g. air filters) and maintain, if necessary, according to the indications of the manufacturer.
- Check weekly the specified environmental conditions.

The prescribed environmental conditions are to be found in chapter [►Appendix D - Technical data◀](#) from page 99.

- Check monthly the mixing ratio of anti-corrosion protection (only valid for variant F/I)

REPAIR



DANGER

The following **will occur**, if you do not observe this danger information:

- serious personal injury
- death

Make sure, that only Baumüller personnel, who is familiar with the safety- as well as with mounting-, operating- and maintenance instructions, works on this unit.

This unit is carrying dangerous voltage - all repair workings must be executed if the unit is off-circuit.

Begin workings at the DC-link of the unit, not until it has been assured that neither potential nor voltage (residual charge) is present.

In order to demount safety devices, to commission or to repair, set the machine/installation in exact accordance with the instructions out of operation. Directly after completion of commissioning-, or repair workings you must mount the safety devices again and you must assure their functioning.



NOTE

The operator of the machine must make an acceptance test of the total drive and must document this in a maintenance schedule protocol chronological (maintenance log), after each intervention in the drive, it doesn't matter if in the motor, in the actual value sensing or in the power unit.

If this is disregarded, the operator runs the risk of liability consequences.



SETTING OUT OF OPERATION, STORAGE

In this chapter we describe, how to set BUM63(T)S/A/F/I out of operation and the storage afterwards.

11.1 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.

11.2 Safety instructions

The safety instructions which are valid for commissioning also must be applied to, when setting out of operation.



DANGER

The following **will occur**, if you do not observe this danger information:

- serious personal injury
- death



*The danger is: **electricity***

Assure, that all electrical connections are off-circuit and are well protected against unintentional restart.

*The containing components in the device (e. g. capacitors) can contain dangerous charges! The capacitors, which are used in the device, at the earliest are to be automatically discharged **10 min.** after switching off supply voltage.*

Before workings at the electrical connections with suitable measuring devices check, that the connections are off-circuit and demount the cables not until you are convinced of the isolation of supply.

11.3 Set out of operation

Setting out of operation is divided into the following steps:

- 1 Switch to off-circuit status and assure against unintentional reactivation.
- 2 (approx. 10 min after switching off) check isolation of supply of connections.
- 3 Demount connection and assure them according to safety instructions.
- 4 If necessary: demount and close cooling circuits.
- 5 Document the setting out of operation.

11.4 Demounting

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

For demounting the same regulations and safety instructions are to be considered as for „mounting“. Hereby consider, that a BUM63(T)S/A/F/I weighs between 36 kg and 54 kg and provide for suitable equipment for transportation (hoisting gears, cranes, transportation personnel etc.) after demounting.

Enable all mechanical connections to the switching cabinet not until the device has been protected against dropping/falling out.

Provide suitable packing material, if you intend to store the devices; in doubt contact Baumüller Nürnberg GmbH. During transport observe, that the device is not damaged due to wrong storage or by severe shocks, also see [►Packing and transportation◄](#) from page 21.

11.5 Storage conditions

The duration of storage is unlimited, if you adhere to the following storage conditions:

- 1 K 4 (climatic category)
- - 30 °C to + 70 °C (temperature range)

11.6 Maintenance during storage

During storage no maintenance is required.

11.7 Recommissioning

- 1 Change the seal.
- 2 Execute commissioning as with a new device.

In case you have stored the unit longer than six months, the DC-link capacitors must be reformed before recommissioning. Therefore you must supply the device for at least 48 hours ready-for-use with supply voltage without impulse enable.

12

DISPOSAL

In this chapter we describe the correct and safe disposal of BUM63(T)S/A/F/I devices. During the disposal you will mainly get metal parts (iron- and non-iron metal), electrical scrap and plastics.

12.1 Safety instructions

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



CAUTION

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

- environmental pollution.



*The danger is: **incorrect disposal.***

During a fire dangerous materials may be generated or set free.

Do not expose electronic components to high temperatures.

As an inner insulation of e.g. various power semiconductors beryllium oxide is used. When opened, the beryllium dust is dangerous to your health.

Do not open the electrical components.

12.2 Requirements to the executing personnel

The personnel, whom you instruct to dispose/demount the device must have the knowledge and training to carry out these works properly. The personnel is to be selected in such a way, that the safety instructions on the device and its parts is understood and referred to by the personnel.

12.3 Disposal instructions

- Preconditions**
- The device has already properly been demounted.
 - All technical devices are prepared and are in a technical faultlessly status.

12.3.1 Modules

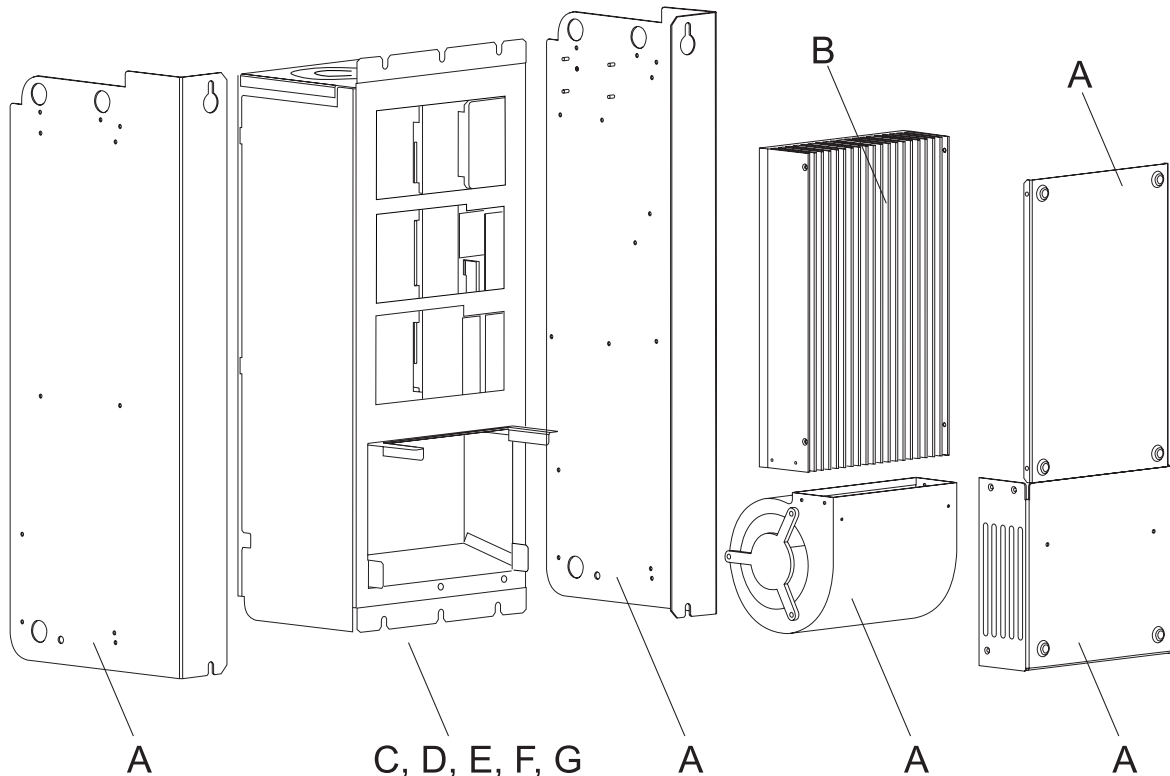


Figure 29: Demounting scheme

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

- | | |
|----------------------------------|--|
| 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. |
| Aluminium/copper compound | (C) Aluminium/copper compound must be given to the non-iron metal recycling. |
| Plastics | (D) The plastic parts of the housing as well as the plastic covers and further small plastic parts must be given to the plastics recycling. |

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**CAUTION**

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

- environmental pollution.

*The danger is: **incorrect disposal.***

The following parts/modules are disposed as special waste.

Capacitors	(E) Capacitors are to be recycled as special waste. Thereby refer to the relevant instructions.
Semiconductor modules	(F) Semiconductor modules are to be recycled as special waste. Thereby refer to the relevant instructions.
Electronic scrap	(G) The electronic scrap from PCBs, which no further can be demounted, must be recycled as special waste. Thereby refer to the relevant instructions.

12.4 Recycling plants/offices

Assure, that the disposal is carried out according to your company's regulations and the regulations of the disposal companies and official administrations. In case of doubt, contact the local business administration, which is responsible for your company or the environmental office.



APPENDIX A - ABBREVIATIONS

A	Current	BUC	Baumüller feed-/feedback unit
Â	Peak current, curve form not defined	BUG	Baumüller converter basic feed unit
AAC	Effective value, sinus form current	BUM	Baumüller single power unit
ADC	Effective value, direct current	BUS	Baumüller power module
Aeff	Current, curve form not defined	CPU	Central processing unit
+ I_{Aist} 	Absolute value of armature current actual value (pos. signal)	DA	Digital/analog
AO	Function module Analog Outputs	DAC	Digital/analog converter
AC	Alternating current	DB	Data byte (8 bit)
ADR	Adress byte	DC	► Direct current ► Drive-Control
AI	Function module Analog Inputs	DE	Function module Digital Inputs
AK	Request-/answer code	DES	Digital input actuator
AM	► Asynchronous motor ► Function module Drive-Manager	DIN	'Deutsches Institut für Normung e.V.', German institution for standardization
ASF	Armature contactor enable	DOPPELW	Double word (32 bit)
BAPS	Baumüller drives parallel interface	DSV	Function module Data Set Management
BASS	Baumüller drives serial interface	DW	Data word (16 bit)
BB	Ready for operation	DWort	Double word (32 bit)
BBext	Readiness for operation (external)	EMK	Electromagnetic constant
BBint	Readiness for operation (internal)	EMC	Electromagnetic compatibility
BCC	Block check character	EN	European standard
BE	► Component (corresp. to "UU") ► Operator's station	EOF	End of file
BEDAS	Operating data memory	ES	Function module Incoming Feeder
BOF	Begin of file	Ext	Function module Current Monitoring
BS	Function module operating system	EXT, ext	External
BSA	Analog reference potential	FBS	BEDAS missing
BSD	Digital reference potential	FI	Fault current
BSE	External reference for 24 V controller inputs	FLG	Error position encoder signal
BUB	Ballast unit		

FPH	Missing phase	M	Function module Drive-Manager
FTO	Error tacho signal	M24	Reference potential 24 V
GL	Technology module Synchronous Operation	MM	► Function module Motor Model ► Torque detector
GRE	Rectifier end position	\$	Prefix for hexadecimal number
HE	Mains contactor ON	Mot	Function module Field Angle Computing
HLG	Function module Ramp-function Generator	MR1	Torque direction 1
HM	Main menu	MR2	Torque direction 2
HS	Mains contactor	MT	Function module Motor Temperature
HSE	Mains contactor ON	mtr.	Medium time-lag fuse
HSF	Mains contactor enable	n = 0	Speed = 0
HW	► High word ► Hardware	N	Function module Speed Controller
I	Function module Current Control	n_{ist}	Speed actual value
I2t	Function module Overload Monitoring	n_{max}	Maximum speed
I_{Aist}	Armature current actual value	n_{min}	Minimum speed
IKG	Function module Incremental encoder	NMX	Maximum speed exceeded
ID-Nr.	Identification number	NN	Altitude above sea level
I_F	field current	n_{SG}	Creep feed speed
I_{Fmax}	Maximum field current (rated current)	n_{soll}	Speed setpoint value
I_{Fmin}	Minimum field current	P	Identification number
I_{Fsoll}	Filed current setpoint value	PBE	Parameter description
Inc	Counting unit of position encoder	PELV	Protective extra-low voltage
IND	Index	PKE	Parameter identifier
Ink	Stroke character number of incremental encoder	PKW	Parameter identifier value
INK.	Incremental	PNU	Parameter number
IPM	Intelligent power module	POS	Technology module Positioning
I_{soll}	Armature current setpoint value	PWE	Parameter value
IW	Actual value	PWM	Function module Pulse-width Modulation
IWK	Actual value channel	PZD	Process data
IxR_{service}	IxR-compensation with "service"	R	Reserved
IxR_{creep speed}	IxR-compensation with "creep speed"	R_A	Armature resistance
IZK	Overcurrent in DC link	RA	Function module Relais Output
KT	Function module Coordinate Transformation	Res	Function module Resolver Evaluation
L	Function module Position Control	RF	Controller enable
LED	Light-emitting diode	RS	Controller blocking
LGE	Telegram length	SE	Screen earthing
LT	Function module Power Module	SELV	separated extra low voltage system
LW	Low word	SF	Following error
		SGR	Current limit reached
		SH	Quick stop

SL	Protective earth conductor
SM	Synchronous motor
STX	Start of text
SV	Function module Service Interface
SW	▶ Setpoint value ▶ Software
SWG	Function module Setpoint Value Generator
SWK	Setpoint value channel
TBA	Overtemperature ballast resistor
TKK	Overtemperature heat sink
TM	Temperature of motor
TMO	Overtemperature of motor
U	Voltage
U_A	Armature voltage
UM	Submenu
USS	Function module USS-protocol
UVS	Supply voltage too low
USS[®]	Siemens trademark universal serial interface
U_{ZK}	DC link voltage, intermediate circuit voltage
V	Voltage
\hat{V}	Peak voltage
V_{AC}	Effective value, sinus form voltage
VBG	“Verwaltungs-Berufsgenossenschaft“, German management occupation-cooperative
V_{DC}	Effective value, direct current voltage
VDE	“Verband deutscher Elektrotechniker“ German electrical engineer connected
VE	Logic element
V_{eff}	Voltage, curve form not defined
WRE	Inverter limit position
X	Terminal strip
ZK	DC link, intermediate circuit





APPENDIX B - ACCESSORIES

B.1 Connector

Article	Article no.	Manufacturer - order no. Type
Connector for X99 A	00309454	Phoenix Contact - MVSTBW 2.5/6-ST
Connector for X99 AB	00309455	Phoenix Contact - MVSTBR 2,5/6-ST
Connector for X68	00309482	Phoenix Contact - MC 1,5/4-STF-3,81-BD:1-4

B.2 Water cooling

Article	Article no.
Sealing tape	00350789
Adaptor set 1/2 " flat-sealing to 3/8 " tube connection	00381044

B.4 Line reactors

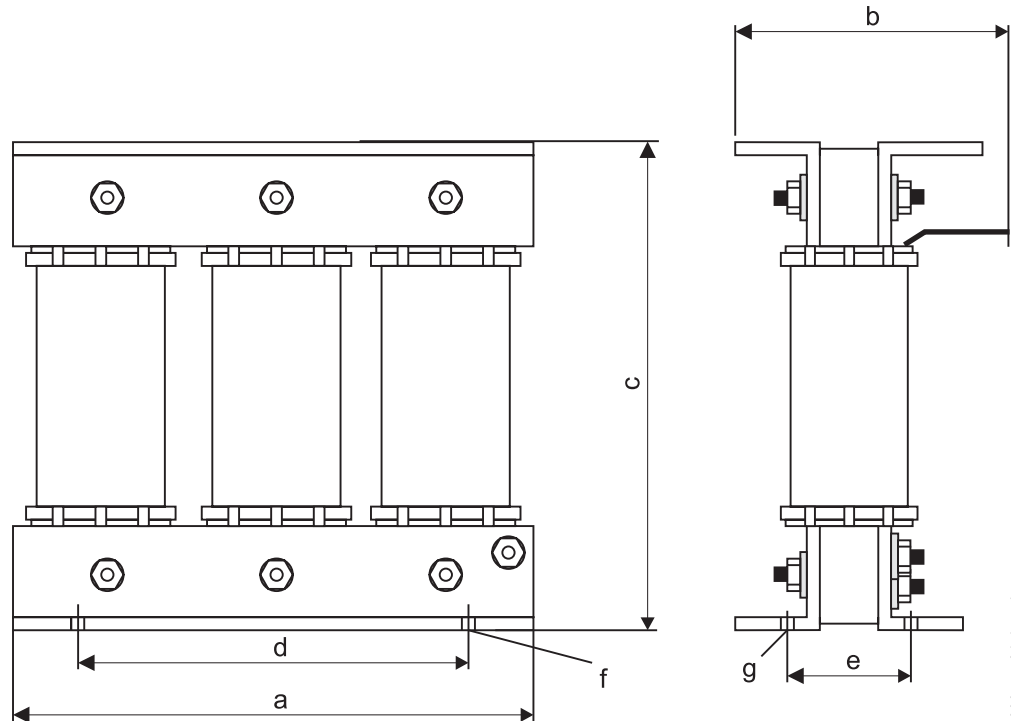


Figure 30: Line reactor

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• Three-phase line reactors

BUM	Reactor BK3-	Type direct current A	Type alternating current A	A mm	b mm	c mm	d mm	e mm	f x g mm	Flat connection for M10 mm x mm	Weight kg	Loss 30 W	Article number
63	- 0165/0200	200	165	240	195	211	190	125	11 x 15	25 x 3	23.0	192	368382
63 T	- 0195/0240	240	195	265	195	230	215	126	11 x 15	25 x 3	28.0	225	368383
63 T	- 0275/0340	340	279	300	225	271	240	145	11 x 15	30 x 5	38.0	306	368384

B.5 EMC accessories

Mains filters for TN-mains

I_{rated AC}¹⁾	Type	Article no.
180 A	BFN 3-1 - 180 - 001	314285
250 A	BFN 3-1 - 250 - 001	373891

Mains filter for IT- and earthed delta mains

I_{rated AC}¹⁾	Type	Article no.
250 A	BFN 3-1 - 250 - 001	373620

¹⁾ Rated temperature = 40° C



APPENDIX C - DECLARATION OF CONFORMITY/ BY MANUFACTURER/ UL-CERTIFICATION

In this section we provide general information about EU directives, the CE symbol and the Declaration of Conformity/by Manufacturer.

C.1 What is an EU directive?

EU directives specify requirements. The directives are written by the relevant bodies within the EU and are implemented by all the member countries of the EU in national law. In this way the EU directives guarantee free trade within the EU.

An EU directive only contains essential minimum requirements. You will find detailed requirements in 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 obligations 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 total harmonization provisions which apply to it and has been the subject of the appropriate conformity evaluation procedures.

...

Council Decision 93/465/EEC, Annex I B. a) + c)

We affix the CE mark to the equipment and to the documentation as soon as we have established that we have satisfied the requirements of the relevant directives.

All converters and control systems supplied by the Baumüller Nürnberg GmbH satisfy the requirements of 73/23/EEC (Low Voltage Directive).

As all converters and control systems comply with the requirements of the harmonized standards EN50178, EN 60204-1, EN 60529 and HD625.1 S1, the protection targets of 73/23/EEC are reached.

With specified application of this Baumüller equipment in your machinery, you can act on the assumption that the equipment satisfies the requirements of 98/37/EG (machinery directive). Therefore the equipment is developed and constructed in such a way, that the requirements of the harmonized standard EN 60204-1 can be met by the electrical installation.

Compliance with 89/336/EEC (EMC Directive) depends on how the equipment is installed. Since you are performing installation yourself, it is you who are responsible for complying with 89/336/EEC.

A declaration of conformity on the EMC directive therefore cannot be issued.

We will provide you with support in the form of EMC information. You will find this information in the operating manual and in “filters for main applications”. When you have complied with all the requirements we impose in this documentation, you can assume that the drive satisfies the requirements of the EMC Directive.

The limit values and requirements for variable-speed electrical drives are determined in the harmonized product standard EN61800-3. If 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. The harmonized product standard EN 61800-3 has to be used with electrical drives.

To enable you to market your machine within the EU, you must be in possession of the following:

- Conformity mark (CE mark)
- Declaration(s) of Conformity regarding the directive(s) relevant to the machine

C.3 Definition of the term Declaration of Conformity

A Declaration of Conformity as defined by this documentation is a declaration that the electrical equipment brought into circulation conforms to all the relevant fundamental safety and health requirements.

By issuing the Declaration of Conformity in this section the Baumüller Nürnberg GmbH declares that the equipment conforms to the relevant fundamental safety and health requirements resulting from the directives and standards which are listed in the Declaration of Conformity.

C.4 Definition of the term Declaration by Manufacturer

A Declaration by Manufacturer as defined by this documentation is a declaration that the machine/safety component brought into circulation conforms to all the relevant fundamental safety and health requirements.

By issuing the Declaration of Conformity in this section the Baumüller Nürnberg GmbH declares that the equipment conforms to the relevant fundamental safety and health requirements resulting from the directives and standards which are listed in the Declaration of Conformity .

The Baumüller equipment is integrated into a machine. For health and safety, of the users for example, it is important for the entire machine to conform to all the relevant fundamental safety and health requirements. For this reason the Baumüller Nürnberg GmbH draws attention in the Declaration by Manufacturer to the fact that it is prohibited to put the machine as a whole into operation before it has been declared that the machine conforms to the provisions of the Machinery Directive.

C.5 Declaration of Conformity

EU-Konformitätserklärung

Declaration of Conformity

gemäß EU-Richtlinie 73/23/EG (Niederspannung) vom 19.02.1973

geändert durch: 93/68/EWG vom 22.07.1993

in accordance with EC directive 73/23/EG (low voltage) dated 19.02.1973

changed by: 93/68/EWG dated 22.07.1993

BUM63A-XXX/XXX-XX-X-X-XXX

BUM63TA-XXX/XXX-XX-X-X-XXX

BUM63F-XXX/XXX-XX-X-X-XXX

BUM63TF-XXX/XXX-XX-X-X-XXX

BUM63I-XXX/XXX-XX-X-X-XXX

BUM63TI-XXX/XXX-XX-X-X-XXX

BUM63S-XXX/XXX-XX-X-X-XXX

BUM63TS-XXX/XXX-XX-X-X-XXX

Das obige Gerät wurde entwickelt und konstruiert sowie anschließend gefertigt in Übereinstimmung mit o.g. EG-Richtlinie und u.g. Normen in alleiniger Verantwortung von:

The unit specified above was developed and constructed as well as manufactured in accordance with the above mentioned directive and the standards mentioned below under liability of:

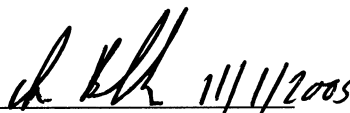
Baumüller Nürnberg GmbH, Ostendstr. 80 - 90, D-90482 Nürnberg

Berücksichtigte Normen - standards complied with:

Norm / standard

EN 50178	Ausrüstung von Starkstromanlagen mit elektrischen Betriebsmitteln Electronic equipment for use in power installations
EN 60204-1	Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen Safety of machinery - Electrical equipment of machines
EN 60529	Schutzarten durch Gehäuse (IP Code) Degrees of protection provided by enclosures (IP Code)
HD 625.1 S1	Isolationskoordination für elektrische Betriebsmittel in Niederspannungsanlagen Insulation coordination for equipment within low-voltage systems

Nürnberg, 10.12.2004


 Andreas Baumüller
 Geschäftsführer
 Head Division


 A. Dr. Heidrich
 Entwicklungsleiter
 Head of development

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C.6 Declaration by Manufacturer

EU-Herstellererklärung

Declaration by Manufacturer

gemäß EU-Richtlinie 98/37/EG (Maschinen) vom 22.06.1998

geändert durch: 98/79/EG vom 27.10.1998

in accordance with EC directive 98/37/EG (machinery) dated 22.06.1998

changed by: 98/79/EC dated 27.10.1998

BUM63A-XXX/XXX-XX-X-X-XXX

BUM63TA-XXX/XXX-XX-X-X-XXX

BUM63F-XXX/XXX-XX-X-X-XXX

BUM63TF-XXX/XXX-XX-X-X-XXX

BUM63I-XXX/XXX-XX-X-X-XXX

BUM63TI-XXX/XXX-XX-X-X-XXX

BUM63S-XXX/XXX-XX-X-X-XXX

BUM63TS-XXX/XXX-XX-X-X-XXX

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.

Bei der Entwicklung und Konstruktion des Geräts wurden folgende Normen beachtet:


The development and construction of the unit is complied with following standards:

Norm / standard

EN 60204-1	Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen Safety of machinery - Electrical equipment of machines
------------	---

Baumüller Nürnberg GmbH, Ostendstr. 80 - 90, D- 90482 Nürnberg

Nürnberg, 10.12.2004


 Andreas Baumüller
 Geschäftsführer
 Head of division


 A. Dr. Heidrich
 Entwicklungsleiter
 Head of development



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C.7 UL-certification





UL is a mark of conformity, which is assigned from **Underwriters Laboratories Inc.** (www.ul.com), an American company. The UL-certification is not statutory regulated, 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.

Line filters of the company **Baumüller Nürnberg GmbH** are checked in accordance of 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 completely carried out the -mark may be attached to the equipments or components. If single tests have not already taken place at the manufacturer's, but are carried out not until at the user's, then only the -mark may be attached.

With products of the **Baumüller Nürnberg GmbH** all tests are already completed at the UL-certification process, so that they may be marked with the -mark.

In case with the UL-certification process also standards of the CSA (Canadian **S**tandard **A**ssociation) are considered, then instead of the - or -mark the  or -mark may be attached to the product.

With products of the company **Baumüller Nürnberg GmbH**. the CSA-standard Norm C 22.2 was considered, that's why they are marked with the -mark.

If products of **Baumüller Nürnberg 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 in the manual with „UL 508C ...“. Only if you follow these notes and apply to them you may go by it, that the installation has been mounted UL-conform.



APPENDIX D - TECHNICAL DATA

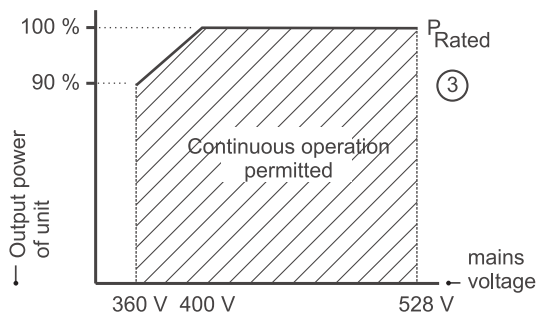
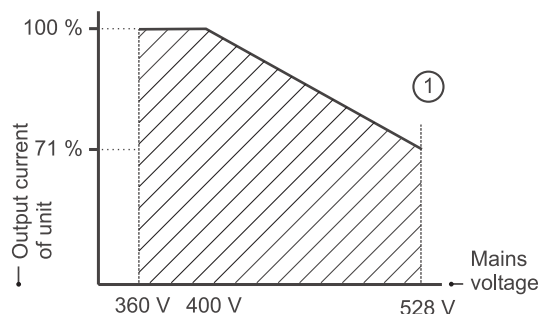
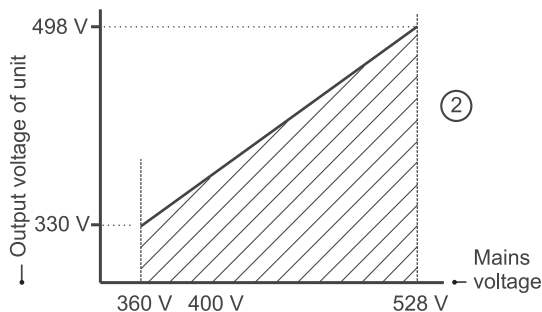
In this appendix you will find a survey of the technical data. Some of this data we have used in previous chapters at the according positions.

D.1 Requirements on the power supply

Mains	Industrial system with direct or low impedance earthed star point (TN-mains or TT-mains) Industrial network with no or high impedance earthed star point (IT mains) Industrial system with direct or low impedance earthed junction of phases (earthed delta wye)
Total inductance at the device connection (sum of mains inductance and mains choke inductance)	min. $U_k = 4\%$ max. $U_k = 6\%$
Mains voltage/-frequency ^{1) 2)} Device (U_{AC}) Fan ⁸⁾ (U_{AC})	min. 3 x 360 V / 48 to 62 Hz max. 3 x 528 V / 48 to 62 Hz min. 207 V / 48 to 62 Hz max. 243 V / 48 to 62 Hz
Harmonics (mains voltage)	THD < 10% ³⁾
Unbalanced mains voltage	max. 3% ⁴⁾
Voltage dip	Depth of dip < 40 %, area < 250 % x degree ⁵⁾
Control voltage ⁶⁾ (U_{DC})	+ 24 V -10 % / +20 % ⁷⁾

¹⁾ At voltage interrupts ($0,7U_B > U > 0,1U_B$ for $t > 0,1$ sec.) (U = mains voltage) the error „Phase failure“ or „Mains failure“ is generated (also see [Monitoring functions](#) from page 69).

²⁾ The rated voltage is 400 V. At mains voltages that are smaller 400 V the output power of the device reduces (see curves).



① Curve „Output current“

② „Curve „Output current“

③ If the output current is multiplied with output voltage the output power is obtained. In order to obtain the specified curve/surface, it is necessary, that the output current is reduced between 400 and 528 volt.

³⁾ EN 61800-3, chapter 5.2.1

⁴⁾ EN 61000-2-4, tab. 1, class 3

⁵⁾ EN 61800-3, chapter 5.2.2

- 6) Supply voltage must accord to PELV (EN 50178, chapter 3.49) or SELV (EN 50178, chapter 3.70).
 At control voltage of < 24 V the ventilation power output is reduced.
 It, therefore, may be necessary, to reduce the output currents as well.
- 7) EN61131-2:1994, table 7
- 8) is only cooling variants S and A

D.2 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⁾
Operational environment	outside of residential areas ²⁾
Operation temperature range	min. 0 °C up to max. 55 °C ³⁾
Operation climatic class	3 K 3 ¹⁾
Mounting height ⁴⁾	absolute altitude up to 2000 m (rated duty at 1000 mm over sea level)
Relative humidity (operation)	5 % to 85 % no condensation ¹⁾
Vibration, shock and repetitive shock	max. 1 g ⁵⁾
Degree of pollution	2 ⁶⁾
Air ventilation temperature ⁸⁾	min. 0 °C to max. 55 °C ³⁾
Cooling water temperature ⁷⁾	min. "cooling air temperature ⁹⁾ " to max. 60 °C
Cooling air requirement (power heat sink) ¹⁰⁾	BUM 63 A/S 450 m ³ / h BUM 63T A/S 400 m ³ / h
Cooling air requirement (interior space of device) ¹⁰⁾	135 m ³ / h
Cooling water flow rate ⁷⁾	min. 4 l/min. to max. 10 L/min.
Cooling water pressure ⁷⁾	max. 6 bar
Temperature difference (cooling water inlet to-outlet)	8.5 K at 4 l/min at rated operation
Pressure loss at water cooler ⁷⁾	variant F: 1.15 bar at 4 l/min variant I: 0.3 bar at 10 l/min

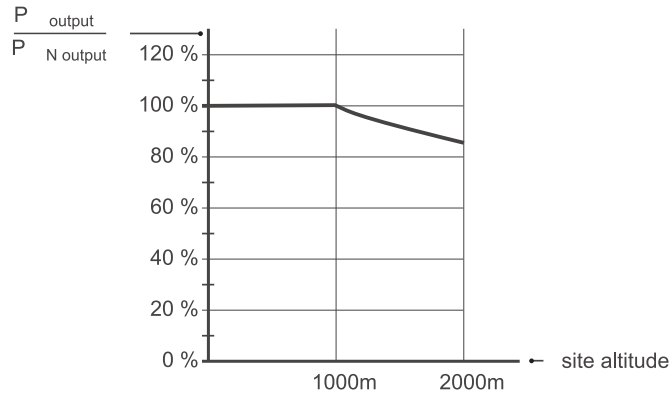
1) EN 50178, table 7

2) at use in residential areas you must reckon that there are high frequency disturbances (EN 61800-3, 6.3.2.3)

3) 40° is the rated temperature

D.2 Required environmental conditions

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



- 5) EN 50178, chapter 9.4.3.2
 6) EN 50178, table 2
 7) The cooling water must meet the following requirements:

pH-value	6.5 to 9.5	Manganese (Mn)	< 0.05 ppm
Conductivity	< 1.8 ppm	Copper (Cu)	< 0.1 ppm
Total water hardness (incl. CaCO ₃)	< 100 ppm	Chlorine (Cl ₂)	< 1 ppm
Suspended matters	< 10 ppm	Chloride (Cl ⁻)	< 500 ppm
Particle size	< 5 µm	Sulfate (SO ₄ ²⁻)	< 500 ppm
Ryznar Stability Index (RSI)	5.0 to 6.0		

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

- 8) The cooling air temperature refers to the total suction area, see [▶Figure 31◀](#) on page 102.
 9) Air inside the switching cabinet.
 10) The cooling air requirement corresponds at least to that of a free-blowing device. Under free blowing an unlimited air inlet and air outlet is to be understood.
 With the mounting of the device into a switching cabinet it therefore can be necessary to use additional fans, so that the necessary cooling air requirement is covered (see [▶Figure 31◀](#) on page 102). If the necessary cooling air requirement of the power heat sink is not provided, then the output power of the device has to be reduced.

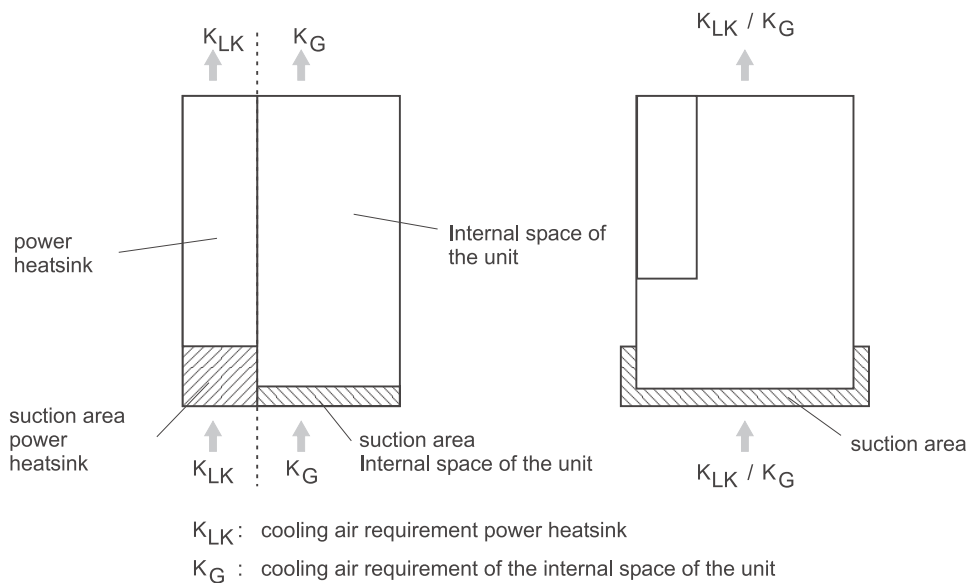


Figure 31: Cooling air requirement

D.3 Electrical data

		BUM63S/A/F/I	BUM63TS/TA/TF/TI
Input power 24V ¹⁾		72 W	
DC-link voltage ¹⁾ (U _{DC})		540 V	
DC link capacity (internal)		3000 µF	6600 µF
DC link capacity (external)		max. 20 mF	
Input current, typical at 4 kHz (I _{eff}) ¹⁾		145 A	205 A
Input power, maximum at 4 kHz ⁸⁾ (I _{eff}) ¹⁾		190 A	230 A
Output voltage ²⁾ (U _{AC})		3 x 0 V to 3 x (supply voltage -30 V)	
Output frequency ³⁾		0 Hz to 300 Hz	
Output frequency ¹⁾	at 4 kHz ⁴⁾	96 kVA	134 kVA
Output frequency ¹⁾	at 8 kHz ⁴⁾	74 kVA	96 kVA
Output peak power ⁸⁾	at 4 kHz ⁴⁾	125 kVA	150 kVA
Output peak power ⁸⁾	at 8 kHz ⁴⁾	96 kVA	108 kVA
Motor power, typical ¹⁾	at 4 kHz ⁴⁾	75 kW	110 kW
Motor power, typical ¹⁾	at 8 kHz ⁴⁾	55 kW	75 kW
Output rated current ¹⁾⁵⁾⁶⁾⁷⁾ (I _{AC})	at 4 kHz ⁴⁾	150 A	210 A
Output rated current ¹⁾⁵⁾⁶⁾⁷⁾ (I _{AC})	at 8 kHz ⁴⁾	115 A	150 A
Output peak current ¹⁾⁵⁾⁶⁾⁸⁾ (I _{AC})	at 4 kHz ⁴⁾	195 A	235 A
Output peak current ¹⁾⁵⁾⁶⁾⁸⁾ (I _{AC})	at 8 kHz ⁴⁾	150 A	168 A
Power supply DC-link (1C1/1D1)		85 kW	125 kW
Chopper resistor current (Î)		max. 130 A	
Fan power ⁹⁾		max. 200 W	
Chopper resistor internal		-	
Chopper resistor external		≥ 6 Ω	
Brake switch on threshold (Â)		780 V	
Power loss „heatsink“ ¹⁾		2000 W	2300 W
Power loss „interior space of device“ (with controller, without fan)		200 W	200 W

¹⁾ All rated values refer to a mains input voltage of 400 V and a rated output current (I_{AC}) a control voltage of 24 V and a switching frequency of 4 kHz.

²⁾ The output voltage is a pulsed d.c. voltage. The operating range refers to the effective value of the fundamental wave.

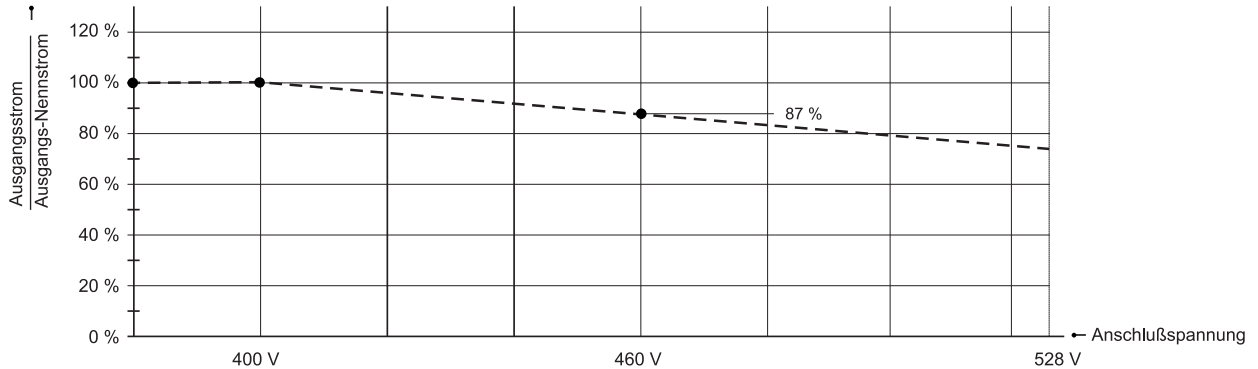
³⁾ The frequency is dependent of the controller, which is used.

⁴⁾ Switching frequency of the inverter. For this see manual of controller.

⁵⁾ Effective value by an environmental temperature of 40 °C.

D.3 Electrical data

- 6) At rated mains input voltage the device enables the rated-/maximum output currents. At input voltages above the rated input voltage the output currents at constantly output power have to be accordingly reduced.
Characteristic curve: Output current dependent of supply voltage.



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

$$I_o = I_{o(40^\circ\text{C})} \cdot \left(1 - \left(\frac{\text{Cooling air temp.}^* - 40^\circ\text{C}}{^\circ\text{C}} \cdot 0.03 \right) \right)$$

* Possibly there are two temperature values (cooling air, which flows through the inner space of the device/cooling air which flows through the heat sink).
Here use the higher value.

Example: output rated current) = 150 A, environmental temperature = 46° C

$$I_o = 150\text{ A} \cdot \left(1 - \left(\frac{46^\circ\text{C} - 40^\circ\text{C}}{^\circ\text{C}} \cdot 0.03 \right) \right) = 150\text{ A} \cdot 0.82$$

Therewith the output current must be reduced: 123 A

- 8) The input peak power, the output peak power and the output peak current are supplied for a maximum of 120 seconds. The duration of time is dependent of the previous motor current and the heat sink temperature. For this see manual of the controller.
9) is only valid for cooling variants S and A

D.4 Fuse protection

NOTE



In case you consider UL 508C, use semiconductor- or full-range fuses.

Also if you do not consider UL 508C, it is recommended to use semiconductor- or full-range fuses.

Overcurrent protection devices mains cable ¹⁾	in accordance to EN 60204-1
Overcurrent protection devices for device ¹⁾	I ² t value ≤ 125,000 A ² s

¹⁾ Use fuses, which **fall in the operating point below** the stated total operating I²t value (i²t).

Consider that there are different types of fuses and that accordant fuse holders must have to be used.

A list of the fuses are to be found in [►B.3.1 Whole range fuses gR \(device and cable\)◄](#) on page 90 and [►B.3.2 Semiconductors aR \(device\)◄](#) on page 90.

D.5 BUM63S - non-electrical data

Dimensions (W x H x D)	312 x 745 x 320 mm
Weight without controller	49kg
Type of protection	IP 00
Fight fire with	ABC powder

D.6 BUM63I - non-electrical data

Dimensions (W x H x D)	312 x 745 x 320 mm
Weight without controller	approx. 50kg
Type of protection	IP 00
Fight fire with	ABC powder

D.7 BUM63A - non-electrical data

Dimensions (W x H x D)	360 x 710 x (228+87.5) ¹⁾ mm
Weight without controller	42kg
Type of protection	IP 00/outside IP 44
Fight fire with	ABC powder

¹⁾ The first value is the depth inside the switching cabinet. The second value is the depth outside the switching cabinet.

D.8 BUM63F - non-electrical data

D.8 BUM63F - non-electrical data

Dimensions (W x H x D)	360 x 710 x (228+87.5) ¹⁾ mm
Weight without controller	36kg
Type of protection	IP 00/outside IP 54
Fight fire with	ABC powder

¹⁾ The first value is the depth inside the switching cabinet. The second value is the depth outside the switching cabinet.

D.9 BUM63TS - non-electrical data

Dimensions (W x H x D)	312 x 745 x 320 mm
Weight without controller	54kg
Type of protection	IP 00
Fight fire with	ABC powder

D.10 BUM63TI - non-electrical data

Dimensions (W x H x D)	312 x 745 x 320 mm
Weight without controller	approx. 50kg
Type of protection	IP 00
Fight fire with	ABC powder

D.11 BUM63TA - non-electrical data

Dimensions (W x H x D)	360 x 710 x (228+87.5) ¹⁾ mm
Weight without controller	47kg
Type of protection	IP 00/outside IP 44
Fight fire with	ABC powder

¹⁾ The first value is the depth inside the switching cabinet. The second value is the depth outside the switching cabinet.

D.12 BUM63TF - non-electrical data

Dimensions (W x H x D)	360 x 710 x (228+87.5) ¹⁾ mm
Weight without controller	approx. 37kg
Type of protection	IP 00/outside IP 54
Fight fire with	ABC powder

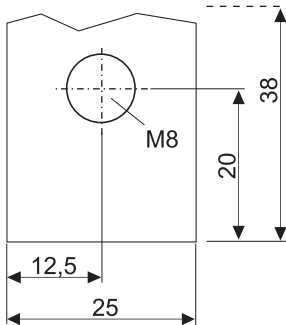
¹⁾ The first value is the depth inside the switching cabinet. The second value is the depth outside the switching cabinet.

D.13 Circuit mains - device

Cross section ¹⁾	dependent of line current
maximum length mains to mains filter	user-defined
maximum length mains filter to reactor	max. 0.3m (unscreened) max. 5 m (unscreened)
maximum length reactor to device	max. 0.3m (unscreened) max. 5 m (unscreened)
Connection to device ³⁾	Cable lug

1) EN 60204-1, table 5, type of installation C
For machines/installations, which are in conformity with UL, you must use certified cables.

2)



Mount two cable lugs at maximum to a lug. Do not mount cable lugs above one another, per side only one cable lug. mount. Use cable lugs, which at a maximum are 25 mm. Consider, that the M8 screw is only to be used for fastening. serves.

D.14 Cable control voltage supply/signals

D.14 Cable control voltage supply/signals

Cross section	2 x 0.2 to 2.5 mm ² (without ferrules) 2 x 0.25 to 2.5 mm ² (with ferrule)
maximum length	user-defined
Connection to device	flexible, with or without ferrules

D.15 Cables device-motor

Cross section ¹⁾	dependent of connection
Type of cable	screened, shield overlapping > 85 %
maximum length ^{2) 3)}	dependent on the used cross section: up to 4x 25mm ² (AWG 10 to 3): 60m 4 x 35 mm ² (AWG 1): 50m > 4x 50mm ² (AWG 1/0): 15m
Connection to device ⁴⁾	Cable lug

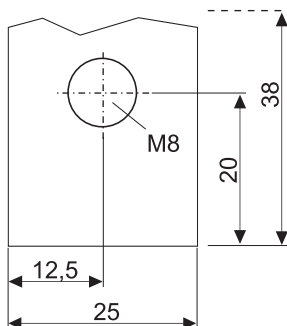
¹⁾ EN 60204, table 5, type of installation C

For UL conform machines/mounting you must use UL certified circuit cables.

²⁾ Only for Baumüller cables with this maximum length you can act on the assumption, that it is complied with the EMC-regulations.

³⁾ In case you use parallel-installed motor cables, the maximum length is to be reduced by the factor 1/n.

⁴⁾



Mount two cable lugs at maximum to a lug. Do not mount cable lugs above one another, per side only one cable lug. mount.

Use cable lugs, which are maximum 25 mm wide. Consider that the M8 screw only is intended for fastening. (screw is not current-carrying).

D.16 Electric motor, which has to be connected

Motor type ¹⁾	AC motor (synchronous, asynchronous)
--------------------------	--------------------------------------

¹⁾ dependent of controller



APPENDIX E - SAFETY RELAY

In this chapter we describe the safety relay.

E.1 Methods to avoid an unexpected starting

In order to avoid hazards against persons, for example operators, service- and maintenance technics, the machine has to be kept in a secure condition (safe stop), while interfering in the hazardous area of the machine. That is why a reliable prevention of an unexpected starting is demanded (amongst other things Machine directive 89/392/EEG, appendix I, 1.6.3, last passage; EN 292-2, 4.1.4; EN 60204-1, 5.4). Under unexpected starting is to be understood every starting that can cause a risk when appearing unexpected for persons (EN 292-1). Moreover, besides the transition of the release- to the operating condition of the machine also the unexpected ramp-up of the machine, this means the transition from the safe stop into an unsafe moving has to 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 maximal acceleration. If an unexpected starting occurs, the operator therefore doesn't have the possibility anymore to remove himself or his hand from the hazard 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 may not have torque and thus cannot generate a dangerous movement.

The prevention of an unexpected starting of the machine can be reached by electrical separated safety devices, e.g. contactors. By some machine types it has to be done without the isolation of the electrical connection of the drive to the mains, if e. g. a drive supplied by a power converter is often stopped and started again. The constant dis- and re-charging of the DC-link represents a big stress for the concerned parts and often leads to disturbing delays and failures of these parts.

The requirement for the starting of a three-phase a. c. motor is the generation of a rotating field, which drives the inductor of the motor. When having variable-speed three-phase current drives, usually in the micro-processors a complex pulse pattern is generated, then the pulses are amplified and are used for the switching of the power semiconductors. If either no defined pulse pattern is available or the amplifying connection is interrupted, e. g. by switching off of the power supply with a relay (safety relay), no rotary field can be generated. An error by the pulse pattern generation therefore cannot lead to a starting of the motor, as long as the second condition, namely the interruption of the amplifying power supply is available and contrary. The protection against unexpected starting is reached by an electromechanical method which is superior to the electronics. It is reached by a safe isolation - elsewhere than in the load circuit.

The power supply to the windings of the motor is reached at a stoppage by inhibiting the power semiconductor. As semiconductors possibly can fail or be started, because of electromagnetic disturbances, the behaviour of the shut down drive has to be considered if such a fault scenario arises. The fail or "accidental" turning on of a single or of more power semiconductors at the same DC-link pole does not lead to an uncontrolled starting, as no current flow is accomplished. Not until additionally a further power semiconductor is enabled at another DC-link pole, current is able to flow through the motor. If, thereby the DC-link is directly short-circuited, the fuses which are upstreamed to the converter are tripped, the motor doesn't start. If the DC-link is "short-circuited" over a winding of the motor, a magnetic field can be set up in the motor. If it is an asynchronous motor, then the generated d. c. magnetic properties cannot cause a lurch of the inductor. By the permanent-magnetic synchronous motor the inductor will rotate into a notch position. The therewith angular movement which is covered is dependable of the inductor's position and the number of pole pairs of the motor. It amounts to maximal $180^\circ/\text{number of pole pairs}$. Subsequently the enabled DC-link operates like a brake, this means after the ending of the lurching movement the drive is in a blocked condition. A starting of the drive is impossible. If a machine with a synchronous motor is planned, the possible sudden movement must be considered, because it can lead to a dangerous movement. Therefore the machinist must carry out a safety evaluation for the residual movement.

The function of the safety relay is limited to the prevention of an unexpected starting. The switching of the safety relay, while the inductor of the motor is rotating, causes an uncontrolled "coasting" of the machine, a braking with help of the converter is not possible anymore.

WARNING



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

- serious personal injury
- death



*The hazard is: **electricity**. Both on the motor and at the unit there can be mains voltage although safety relay is switched off.*

If required, switch the appliance off-circuit like an appliance without a safety relay - the safety relay does not switch the appliance and the motor **off-circuit!**

Turning off the safety relay has no isolation from the supply system as a consequence. Therefore, mains potential can be both at the converter and at the motor. The protection against electric hazards has to be therefore saved with other means (for example master switches) when maintaining, servicing or repairing electrical components of the drive system.

E.2 Safety categories

Dependant of the possible hazards (these are rated due to the consideration of the severity of the injuries, the frequency of the length of stay within the hazard area and possibilities in order to prevent hazards) security relevant components of machines have to meet certain safety criteria. The requirements to safety-based parts are divided into five categories in the standard EN 954-1.

In category B basic demands, in 1 additionally safety-technical proved components and principles are claimed. In category 2 an error between inspection intervals can lead to a loss of the safety function.

Category 3 accords to the level "the single-error-certainty to recognize errors partially". The safety-relevant components must be in such a way, that a single error doesn't lead to a loss of the safety function, whereat not the complete possible errors can be self-contained recognized

by the system. Therefore an accumulation of unrecognized errors can lead to a loss of the safety function.

Category 4 accords to the level "Self-monitoring". This component recognizes self-contained possible errors and signals these in time of the loss of the safety function. Also if up to three from one another independent errors arise the safety function is always maintained.

E.3 The safety relay

The function of the safety relay is executed in fail-safe-technic, also named closed-circuit principle. The safety function "safe stop" is active, as long as no voltage is applied to the input terminals (X68: 3,4). Consequently the functioning of the safety function is guaranteed if power failure takes place. In order to deactivate "safe stop" a voltage of 24 V has to be applied to the terminals, which are intended for this use (X68: 3,4).

For the external error monitoring of the safety relay, the instantaneous control state can be interrogated at its positively driven status signal contact (X68: 1,2). In case there is no voltage applied to the safety relay (X68: 3,4), that means during the "safe stop", then the status signal contact is closed (NC contact). Also a parting of a cable can thusly be recognized as an error.

If the voltage at the input terminals of the relay (X68: 3,4) is switched off, then the converter generates one or two error messages (F0204 and/or F0206), which it displays on the V-controller. The drive can only be taken in operation again, if these messages are deleted after a reset of the safety relay with a reset signal from the controller (for example by X26, pin programmable or over the interface to a bus system).

The closing- and opening sequence of the release signals as well as of the safety relay must be considered in order to assure a faultless operation of the drive.

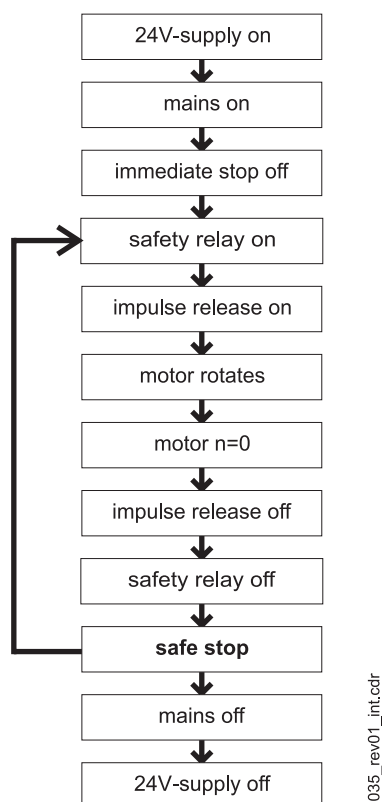


Figure 32: Sequence diagram of the safety relay

Baumüller-devices of the series BUM 6, BUS 6 and BKH, which are made with one safety relay (optional), comply with the requirements of the category 3 (EN 954-1) for the safety-relevant using “protection against unexpected starting”, if the configuring and installation instructions are complied with.

Before the commissioning of the machine, in which the converter with the safety relay is built in, the safety function “protection against unexpected starting” must be checked. For that purpose a safety device must be executed (for example door contact). The motor must now be zero-torque.

If the reliability performance of the “protection of unexpected starting” once has been determined, then this safety function of the converter doesn't have to be checked by an external monitoring, as the device checks itself on possible errors and if necessary displays a message as well as turns off the drive.

E.4 Application example for machine of category 3

Exemplary the following diagram shows the usage and cabling of a Baumüller converter of the series b maXX in a machine tool, at which the safe taking of work pieces at opened barrier is possible according to category 3 (EN 954-1).

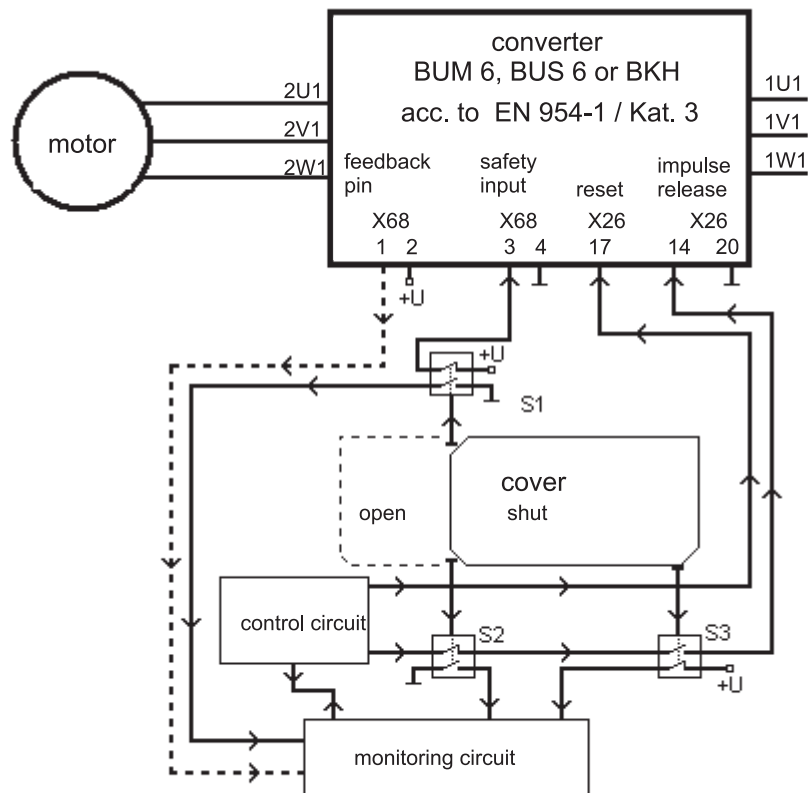


Figure 33: Example for an application for safe stop according to category 3 (EN 954-1)

The switching-off of the electrical drive motor takes place dual-ported.

- S2 (NC contact) and S3 (NO contact) have hardware effects on the pulse release input of the converter (X26: 14). Only if S2 and S3 display a closed cover (and therewith a safe condition) voltage is being applied to the impulse release input of the converter.
- S1 (NC contact) has hardware effects on the safety relay of the converter. Only if S1 displays a closed cover (and therewith a safe condition) voltage is applied to the safety relay input (X68: 3) and therewith allows a torque generation at the shaft of the motor. The NO contact of S1 is connected with the monitoring circuit.
- The monitoring circuit, a fail-safe monitoring control of the category 3 (EN 954-1), checks on its own the directly connected switching contacts of the position switch S1 (NO contact), S2 (NO contact) and S3 (NC contact). If the barrier is not completely closed or a theoretical impossible condition of the position switch contacts is present (for example S1 and S2 show a different switching condition or S2 and S3 show the same switching condition), then the control circuit will not get a release signal from the monitoring circuit. A missing release signal of the monitoring device leads to a direct switching off of the converter by means of the control circuit. If the monitoring circuit has recognized an error (for example different switch condition

of S1 and S2), this is displayed to the operator and a commissioning of the drive is not possible until the error has been repaired.

- The status signal contact of the safety relay (X68: 1,2; NC contact) can additionally be evaluated by the monitoring circuit (not obligatory).
- The position switches, which are used, must unavoidable have actuated and mechanical connected contacts as well as a dual-port connection (NC contact/ NO contact). The mechanical operating at the safety device must take place unavoidable, that means tamper-resistant.

The connection cables between the safety relay input (X68: 3,4) and the control as well as between the impulse release input at the converter (X3:5) and the controller must not be installed outside the control cabinet in a common cable channel.

E.5 Application example for machine of category 4

Additional procedures when configuring a machine make it possible with a converter of the category 3 (EN 954-1) at safety-relevant operations for the "protection against unexpected starting" also category 4 for the complete drive.

A possibility is the usage of a contactor, with which the external conductors of the motor cable is short-circuited.

The diagram shows exemplary the usage and cabling of a Baumüller converter of the series BUM 6, BUS 6 or BKH of a machine tool, at which the safe taking of work pieces at opened barrier according to category 4 (EN 954-1) is possible.

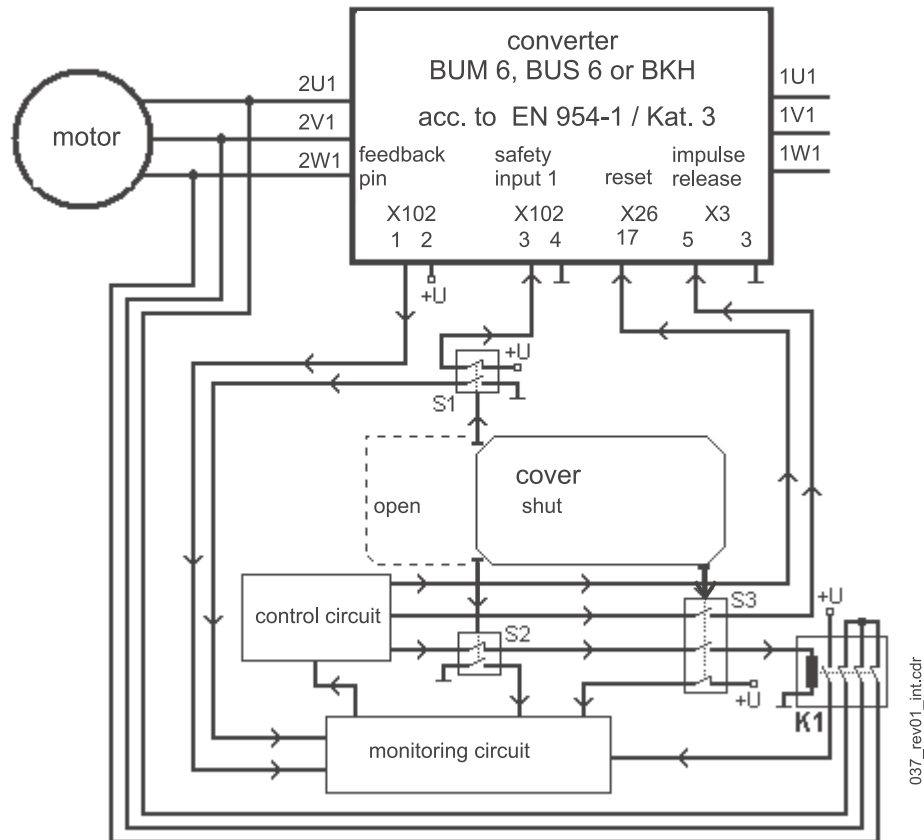


Figure 34: Example for an application for safe stop according to category 4 (EN 954-1)

The switching-off of the electrical drive motor takes place three-ported.

- The contactor K1 with three NC contacts short-circuits the current to the motor in the release state in all poles (closed-circuit current principle), so that no electrical energy of the converter arrives at the motor. S2 (NC contact) and S3 (NO contact) effectuate K1. Only if S2 and S3 display a closed barrier (and therewith a safe condition) K1 starts up and the short-circuit in the motor line is reset. The status signal contact of K1 (NO contact) to the monitoring circuit is constructed with mechanical with the NC contacts connected contacts. The selection of the contactor takes place after its limiting short-time current load capability (10 ms). This must be bigger than the nominal current of the used semiconductor fuses at the mains input of the converter.
- S1 (NC contact) has hardware effects on the safety relay of the converter. Only then if S1 displays a closed barrier (and therewith a safe condition) voltage is applied to the safety relay input (X68: 3) and therewith makes a torque generation at the shaft of the motor. The NO contact of S1 is connected with the monitoring circuit.
- S3 (NO contact) has hardware effects on the impulse release input of the converter (X26: 14). Only if S3 displays a closed barrier (and therewith a safe condition) voltage is applied to the impulse release input of the converter.
- The monitoring circuit, a fail-safe monitoring control of the category 4 (EN 954-1), checks on its own the directly connected switch contacts of the position switches S1 (NO contact), S2

(NO contact), S3 (NC contact) and the status signal contact of the safety relay (X68: 1,2; NC contact) as well as the contactor K1 (NO contact). If the barrier is not completely closed or a theoretic impossible condition of the position switch contacts is present (for example S1 and S2 show a different switch condition or S2 and S3 show the same switch condition or the status signal contact of the safety relay is opened/closed, although the status signal contact of S1 is closed/opened), the control circuit receives no release signal of the monitoring signal. A missing release signal of the monitoring device leads to a direct switching off of the converter by means of the control circuit. If the monitoring circuit has recognized an error (for example different switch condition of S1 and S2), this is displayed to the operator and the commissioning of the drive is not possible until the error has been repaired.

- The position switches, which are used, must unavoidably have actuated and mechanical connected contacts as well as a dual-port connection (NC contact/ NO contact). The mechanical operating at the safety device must take place unavoidably, that means tamper-resistant.

The connection cables between the contactor K1 and the control circuit as well as between the safety relay input at the converter (X68: 3,4) and the control circuit must not be installed outside the switching cabinet in a common cable channel.



NOTE

All information given in the Operation Manual of the converter, especially the chapters safety instruction, installation and commissioning, must absolutely be observed.

For the use and the installation of the safety devices the legal and official requirements of the government safety organizations and of the EU-Directives for safety requirements at installations and machines (for example EN 60204-1, security of machines, electric equipment and EN 292-2 security of machines general configuration directives) are valid.

E.6 Service time

The mechanical service time of the safety relay is at least 1×10^7 cycles of operation.



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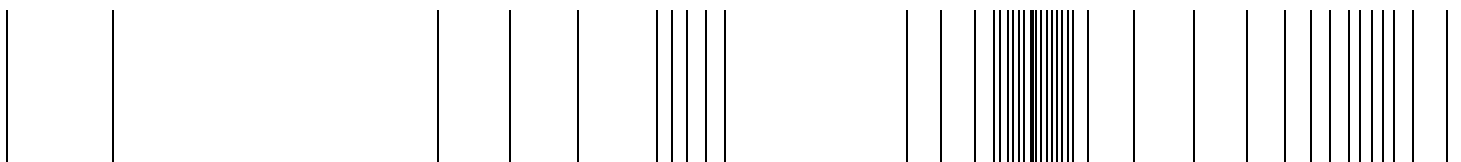
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be in motion



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