Instruction handbook

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be in motion be in motion

BAUMÜLLER

b maXX

BM4-F-IEE-XX
IEE-XX

Incremental encoder emulation

BM4400, BM4400 ES
BM4600, BM4600 ES
BM4700, BM4700 ES

E	5.02020.05

Read instruction handbook before beginning to work!

Preliminary information

Warning Insofar as this document is identified as being preliminary information, the following applies:
this version is regarded as providing advance technical information to users of the described devices and their functions at an early enough time in order to adapt to any possible changes or expanded functionality.
This information must be regarded as being preliminary, as it has not yet passed through Baumüller's internal review process. In particular, this information is still subject to changes, thus no legal liability can be derived from this preliminary information. Baumüller assumes no liability for damages that might arise from this possibly faulty or incomplete version.
If you detect or suspect any content errors and/or major form errors in this preliminary information, we request that you notify the Baumüller support specialist responsible for you. Please provide us, via this employee, with your insights and comments so that we can take them into account and include them when transitioning from the preliminary information to the final information (as reviewed by Baumüller).
The conditions stipulated in the following section under „Obligatory“ are invalid in case of preliminary information.

Obligatory

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

When the present Instruction handbook is handed over, corresponding sets of Instruction handbooks of a previous version are automatically invalidated.
Please note that the specifications/data/information **are current values according to the printing date**. These statements are **not legally binding** with regard to measurements, computation or calculations.
Baumüller Nürnberg GmbH reserves the right, in developing its products further, to change the technical specifications and handling of it products concerned without prior notice.

No liability can be accepted concerning the correctness of this Instruction handbook unless otherwise specified in the General Conditions of Sale and Delivery.

Ostendstr. 80 - 90
90482 Nuremberg
Germany

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

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

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GENERAL

1.1 Information on this Instruction Handbook

The incremental encoder emulation **IEE-XX** or **BM4-F-IEE-XX** can be operated in combination with a **b maXX 4000**, only.

Therefore this Instruction handbook is an addition to the Instruction handbook of **b maXX** BM4400, BM4400 ES, BM4600, BM4600 ES, BM4700, BM4700 ES (short **b maXX 4000**) 5.12008.

The basic prerequisite for safe working is compliance with all the safety and handling instructions stated in the instruction handbook **b maXX 4000**.

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

Read this Instruction handbook and the Instruction handbook **b maXX 4000**, particularly the safety notes chapter, completely before beginning any work on the device. This Instruction handbook is part of the product and must be kept accessible to personnel at all times in the immediate vicinity of the device.

1.2 Key to symbols

Warning notes

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

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

DANGER!

....this indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

....this indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

....this indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

....indicates a hazardous situation which, if not avoided, may cause material damage.

Recommendations

NOTE!

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

1.3 Limitation of liability

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

The manufacturer assumes no liability for damages due to:

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

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

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

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

1.4 Copyright protection

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

NOTE!

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

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EnDat®	is a registered trademark of Dr. Johannes Heidenhain GmbH, 83301 Traunreut, Germany
EtherCAT®	is a registered trademark of Beckhoff Automation GmbH, 33415 Verl, Germany
Hiperface® **SinCos®**	is a registered trademark of SICK STEGMANN GmbH, 78166 Donaueschingen, Germany

NOTE!

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

1.5 Other applicable documents

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

1.6 Spare parts

WARNING!

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

Therefore:

- Only use original spare parts of the manufacturer.

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

1.7 Disposal

Insofar as no take-back or disposal agreement has been made, please disassemble units correctly and properly recycle the constituent parts. See also **b maXX 4000** 5.12008, chapter Disposal.

1.8 Guarantee provisions

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

1.9 Customer service

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

1.10 Used terms

The term function module or the designation IEE-XX (ES controller) or BM4-F-IEE-XX (standard controller) is also used in this documentation for the Baumüller product „**incremental encoder emulation**“. A list of the abbreviations used can be found in **b maXX 4000** 5.12008, Appendix A: Abbreviations.

1.11 List of associated documentations

Instruction handbook

	Doc No.	Part No. German	Part No. English
Instruction Handbook basic unit b maXX 4400, 4600, 4700 (ES)	5.12008	444495	444496

Parameter manual

	Doc No.	Part No. German	Part No. English
Parameter manual basic unit b maXX 4400, 4600, 4700 (ES)	5.03039	376339	377548

Instruction handbook function modules

	Doc No.	Part No. German	Part No. English
Analog I/O module BM4-F-AIO-XX or AIO-XX	5.01045	354844	372665
Digital I/O module BM4-F-DIO/FIO-XX or DIO/FIO-XX	5.01046	354843	372666
Encoder module BM4-F-ENC-XX or ENC-XX	5.01042	354842	372861
Incremental encoder emulation module BM4-F-IEE-XX or IEE-XX	5.02020	354858	376728
SSI encoder emulation module BM4-F-SIE-XX or SIE-XX	5.03056	377123	379049

Instruction handbook option modules

	Doc No.	Part No. German	Part No. English
DISC-NT slave BM4-O-DNT-XX	5.03007	367670	-
CANopen slave BM4-O-CAN-03	5.02014	368692	368693
CANopen slave programming handbook for controller	5.02065	368694	372860
CANopen over EtherCAT programming handbook	5.07017	413208	432414
CANopen slave for b maXX PLC application handbook	5.03057	376486	376487
b maXX drive PLC	5.01051	366197	354845
b maXX drive PLC application handbook	5.02004	366198	372017
BM4-O-ETH-01, BM4-O-ETH-02, BM4-O-CAN-04 for b maXX PLC	5.03001	366202	372042
BM4-O-ETH-01, BM4-O-ETH-02, BM4-O-CAN-04 CANopen master for b maXX PLC application handbook	5.03002	366203	372043
CANsync master for b maXX PLC	5.02056	366199	372025
CANsync slave for b maXX	5.02064	366201	372041
CANsync for b maXX PLC application handbook	5.02066	366200	372039
IEI for b maXX PLC	5.02013	366204	372044
PROFIBUS-DP slave for b maXX	5.03040	376488	376489
PROFIBUS-DP slave for b maXX PLC application handbook	5.03058	376490	376491
PROFIBUS-DP slave for b maXX controller programming handbook	5.03045	376757	377294
SERCOS slave module BM4-O-SER-01	5.04012	380910	381069
SERCOS slave module BM4-O-SER-01 parameter handbook	5.04013	381652	381653
EtherCAT slave module BM4-O-ECT-01/ECT-01	5.06003	394953	394954
Ethernet with EtherCAT master for b maXX drive PLC	5.07001	407996	407997
Ethernet with EtherCAT master for b maXX drive PLC application handbook	5.07002	407998	407999
Ethernet with EtherCAT for b maXX drive PLC	5.10018	433997	
POWERLINK Controlled Node BM4-O-PLK-01/PLK-01 ES	5.12072	444497	444498
POWERLINK Controlled Node BM4-O-PLK-01 ES application handbook	5.13013	445131	445132

1.11 List of associated documentations

2

SAFETY

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

2.1 Contents of the Instruction Handbook

Each person who is tasked with performing work on or with the device must have read and understood this Instruction Handbook and the Instruction Handbook of **b maXX 4000** 5.12008 before working with the device. This also applies if the person involved with this kind of device or a similar one, or has been trained by the manufacturer.

2.2 Changes and modifications to the device

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

2.3 Use, compliant with intended purpose

The **BM4-F-IEE-XX** is used compliant with its intended purpose, if it is built-in/operated within **b maXX 4000** controller, only.

The **incremental encoder module** is considered as being used compliant with its intended purpose if all notes and information of this Instruction handbook and the Instruction handbook **b maXX 4000** 5.12008 are adhered to.

WARNING!

Danger arising from usage for an unintended purpose!

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

Therefore:

- Only use the **incremental encoder module** compliant with its intended purpose.
- Note all specifications of this Instruction handbook and the Instruction handbook **b maXX 4000** 5.12008.
- Ensure that only qualified personnel work with/on the **incremental encoder module**.
- When configuring, ensure that the **incremental encoder module** is always operated within its specifications.
- The **incremental encoder module** may only be operated in a technically flawless condition.
- Only operate the device in combination with components approved by Baumüller Nürnberg GmbH.

2.4 Responsibility of the operating company

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

Along with the notes on work safety in this Instruction handbook and the Instruction handbook **b maXX 4000** 5.12008, the safety, accident prevention and environmental protection regulations valid for the area of application of this device must be complied with. Whereby:

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

2.5 Training of the personnel

WARNING!

Risk of injury due to insufficient qualifications!

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

Therefore:

- Certain activities can only be performed by the persons stated in the respective chapters of this Instruction handbook.

In this Instruction handbook, the following qualifications are stipulated for various areas of activity:

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

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

2.6 Special hazards

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

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

Electrical current

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

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

Danger from residual energy

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

See Instruction handbook **b maXX 4000** 5.12008, chapter Electrical Data.

Therefore:

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

Moving components

WARNING!

Risk of injury from moving components!

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

Therefore:

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

2.7 Fire fighting

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

- Use the following fire-extinguishing agent:

ABC powder / CO_2

2.8 Safety equipment

WARNING!

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

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

Therefore:

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

2.9 Behavior in hazardous situations or at accidents

Preventive measures

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

And if something does happen: respond properly.

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

2.10 Signs and labels

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

WARNING!

Risk of injury due to illegible symbols!

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

Therefore:

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

Electrical voltage

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

Unauthorized persons may not touch working materials marked correspondingly.

DANGER!

Risk of fatal injury from electrical current!

See ▹Danger from residual energy◃ auf Seite 14.

CAUTION!

Risk of injury due to hot surface!

Therefore:

- Wear protective gloves

3

TECHNICAL DATA

3.1 Operation conditions

The operation conditions of **b maXX 4000** are valid, see Instruction Handbook **b maXX 4000** 5.12008.

Transport temperature range	- 25 °C to + 70 °C
Transport climatic class EN 60721-3-2	2 K 3
Storage temperature range	- 25 °C to + 55 °C
Storage climatic class EN 60721-3-1	1 K 4

NOTICE!

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

3.2 Electrical data

Supply voltage (external supply)	5 V ± 5 % (without load)
Supply current (external supply)	max. 100 mA (without load)
Signal level: output high voltage at I_{0H} = - 20 mA	2,5 V
Signal level: output high voltage at I_{0L} = + 20 mA	0,5 V
Output frequency, track signals	IEE-01: max. 1,5625 MHz IEE-02: max. 500 kHz
Switching time: rising time	< 50 ns
Switching time: dropping time	< 50 ns
Delay time	$It_dI = 1 \leq 50$ ns
Power input	0,525 W
Current output driver	max. 15 mA

The mentioned timings are available at the **incremental encoder emulation** output. When selecting a cable in order to transmit the signals to an adequate evaluation unit, it must be considered, that a real cable can reduce the maximum transferable output frequency by its attenuation (change of specified signal performance).

An „adequate evaluation unit“ is an unit, which is able to sense even the smallest possible track signal changes without mistakes. The **incremental encoder emulation** was developed in such a way, that even the smallest position variations or the encoder evaluation noise are converted into track signals. If the evaluation unit is not applicable, it can possibly occur, that the actual encoder signal varies by 1 bit, although the position is kept. The evaluation electronic then adds the variations only in one direction (because it is not in a position to sense quick changes in a correctly manner) and for the connected control the position appears to slow drifting.

4

DESIGN AND OPERATION

A **b maXX BM4000** device consists of power unit and controller part

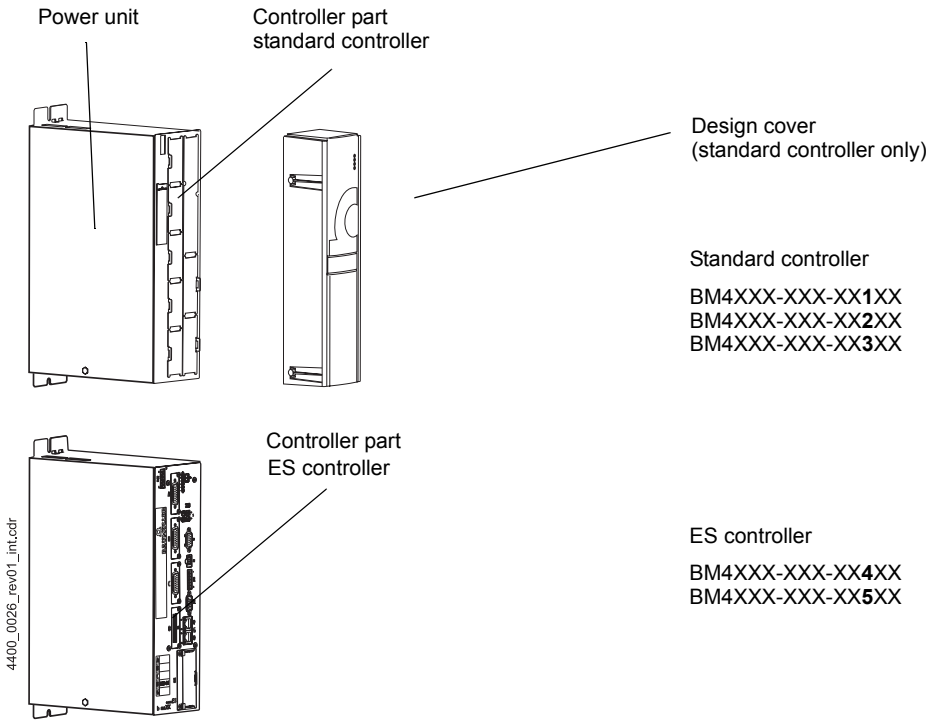


Figure 1: **b maXX** BM4000)

The **BM4-F-IEE-XX** is designed as plug-in module for standard controller and can be replaced or upgraded.

The **IEE-XX** is mounted stationary in the ES controller.

4.1 Function

The incremental encoder emulation generates signals that are typical for a 5V square-wave incremental encoder and gives these as output

Set values for the incremental encoder emulation can be provided from the sources given below:

- Position actual value encoder 1 or encoder 2, see examples 1 and 2 in ▹Connection diagram◃ on page 39.
- Position set value (e.g. provided externally via the bus, see example 3 in ▹Connection diagram◃ on page 39).

The signal generated by the incremental encoder emulation can either be used for synchronization of the following axis, see examples 1 and 3 in ▹Abbildung 7◃ on page 39 or for determination of the location of the axis by a master control, see example 2 in ▹Abbildung 7◃ on page 39.

Technical data of the incremental encoder emulation can be found in chapter ▹Technical Data◃ from page 19.

NOTE!

The operation with ProDrive is described, only. Please contact Baumüller Nürnberg GmbH or visit out website www.baumueller.de for download, if the software is not available.

Standard controller with plug-in slots to enlarge the controller functionality with function and option modules, e.g. encoder modules, analog inputs/outputs or field bus connections.

NOTICE!

Plug-in module, which has not been manufactured from Baumüller Nürnberg GmbH. Modules of other manufacturers can damage/destroy the device.

Only use BM4-F-XXX- and BM4-O-XXX-plug-in modules.

ES controller with not exchangeable function and option modules.

The **incremental encoder emulation** is available as plug-in module **BM4-F-IEE-XX** for standard controller and as **IEE-XX** built-in the ES controller.

4.2 BM-F-IEE-XX for standard controller

The encoder module **BM4-F-IEE-XX** can be plugged in the standard controller of the **b maXX 4000**.

The **BM4-F-IEE-XX** is connected to the controller part with a connector on the back side.

On the front side is a 9-pole Sub-D connector (male).

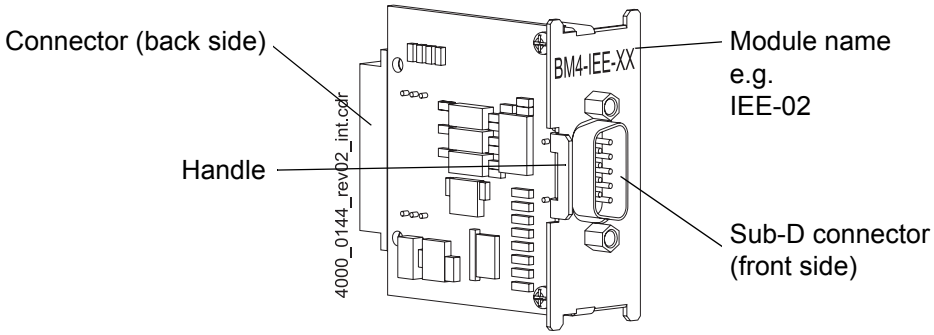
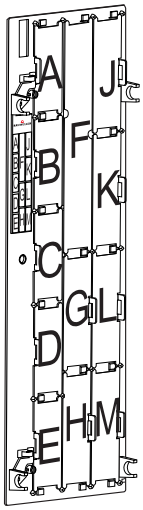


Figure 2: **BM4-F-IEE-XX** for standard controller

4.2.1 Slots BM4-F-IEE-XX for standard controller

Function and option modules can be plugged in the slots of the controller part. Each position is clearly identified by a character.

The incremental encoder emulation must be plugged in slot C.



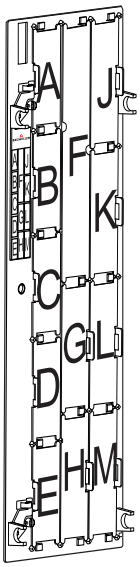
A	
B	
C	**BM4-F-IEE-01/02**
D	
E	
F	
G	
H	
J	
K	
L	
M	

NOTE!

The module IEE-02 is supported only for controllers equipped with „external PWM“ (PWM is realized within the controller FPGA). For information about the controller hardware type please contact Baumüller.

Optional plug-in modules (function or option modules) can be upgraded dependent on the existing controller type.

Possible combinations function modules/option modules



	Function modules									Option modules													
	BM4-F-ENC-XX (encoder 1 for motor control recommended)	BM4-F-ENC-XX (encoder 2)	BM4-F-AIO-01 (analog I/O)	BM4-F-AIO-02/03/04 (analog I/O)	BM4-F-DIO-XX (digital I/O)	BM4-F-FIO-XX (fast digital I/O)	BM4-F-IEE-XX (icremental encoder emulation)	BM4-F-SIE-XX (SSI encoder emulation)	BM4-F-UME-XX (mains voltage measurement)	BM4-O-SER-XX (Sercos slave)	BM4-O-PRO-01 (Profibus slave)	BM4-O-CAN-03 (CANopen slave)	BM4-O-ECT-01 (EtherCAT slave) for controller	BM4-O-PLK-01 (POWERLINK Controlled Node) für Regler	BM4-O-EIP-01 (Ethernet-IP) für Regler	BM4-O-PLC-XX (SPS)	BM4-O-CAN-04* (CANopen master)	BM4-O-IEI-XX* (incremental counter module)	BM4-O-ETH-01* (Ethernet)	BM4-O-ETH-02* (Ethernet + CANopen master)	BM4-O-ECT-01* (EtherCAT slave) for PLC	BM4-O-ECT-02* (Ethernet + EtherCAT master)	BM4-O-ECT-03* (Ethernet + EtherCAT cluster)
A	**X**	-	-	o	o	o	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	-	**X**	-	o	o	o	-	**X**	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	-	-	-	o	o	o	**V**	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	o	**X**	**X**	-	-	**X**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	-	-	**X**	**X**	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	Controller unit																						
G	-	-	-	-	-	-	-	-	-	o	o	o	o	o	o	o	**X**	**X**	**X**	**X**	**X**	**X**	**X**
H	-	-	-	-	-	-	-	-	-	**X**	**X**	**X**	**X**	**X**	**X**	**X**	o	-	o	o	o	o	o
J	-	-	-	-	-	-	-	-	-	-	**P**	**P**	-	-	-	-	o	o	o	o	-	-	-
K	-	-	-	-	-	-	-	-	-	-	**P**	**P**	-	-	-	-	o	o	o	o	**o**	o	o
L	-	-	-	-	-	-	-	-	-	-	**P**	**P**	-	-	-	-	o	o	o	o	**o**	o	o
M	-	-	-	-	-	-	-	-	-	-	**P**	**P**	-	-	-	-	o	o	o	o	**o**	o	o

X: preferred slot
Baumüller Nürnberg GmbH recommends, in order to reach the highest functional range, to insert the plug-in modules into these slots.

o: possible slot
only if the preferred slot is occupied, we recommend in order to reach the highest functional range, to insert the plug-in modules into this slot.

P: only possible, if on slot G or H a PLC module (PLC) is plugged and the PLC (and not the controller) operates the communication to the field bus slave module.

V: dependent on controller hardware

- not possible - card doesn't work in this slot.

***** precondition for these cards is an inserted PLC module.

Steckkarten_Rev20_e

NOTE!

Only 2 analog outputs can be parametrized or linked even more than one AIO module is plugged.

NOTE!

EtherCAT option modules **must not** be plugged in slot **J** of a 3-rowed controller unit, because the module can be damaged.

In case another BM4X-X-XXX plug-in module is plugged in an unsuitable slot, it will not operate. We have made sure, that neither the module nor the device are damaged.

4.2.2 Type plate BM4-F-IEE-XX for standard controller

The type plate can be found on the connector on the back side of the **BM4-F-IEE-XX**.

The type code and the serial No. are printed on the type plate.

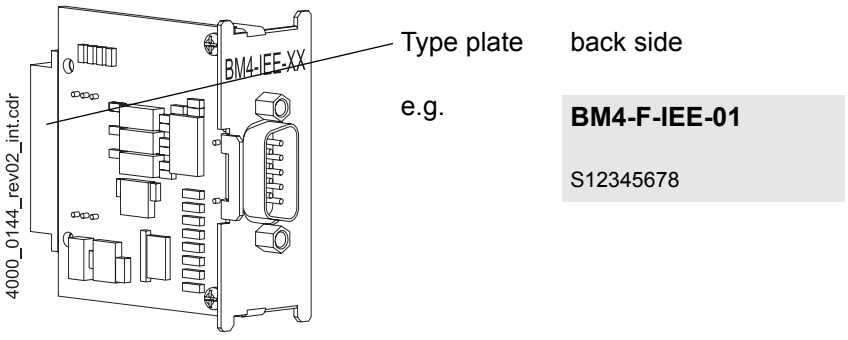


Figure 3: Type plate **BM4-F-IEE-XX** for standard controller

4.2.3 Type code BM4-F-IEE-XX for standard controller

NOTE!

This type code is valid for the encoder modules **BM4-F-IEE-XX** of series b maXX BM4000 exclusively. For other plug-in modules are different type codes available.

Type code:

BM4 - F - IEE - XX	Device family, in which the plug-in module can be built in
BM4 - F - IEE - XX	Type of plug-in module (function module)
BM4 - F - IEE - XX	Name of plug-in module (incremental encoder emulation)
BM4 - F - IEE - XX	Version plug-in module 01: 5 V square-wave incremental encoder emulation 02: 5 V square-wave incremental encoder emulation

NOTE!

The module IEE-02 is supported only for controllers equipped with „external PWM“ (PWM is realized within the controller FPGA). For information about the controller hardware type please contact Baumüller.

4.2.4 Danger areas BM4-F-IEE-XX for standard controller

The **BM4-O-IEE-XX** can be operated in combination with **BM4000**, only. Please note all safety notes of the basic unit **b maXX BM4000**.

4.3 IEE-XX in ES controller

The **IEE-XX** is mounted stationary in the ES controller.

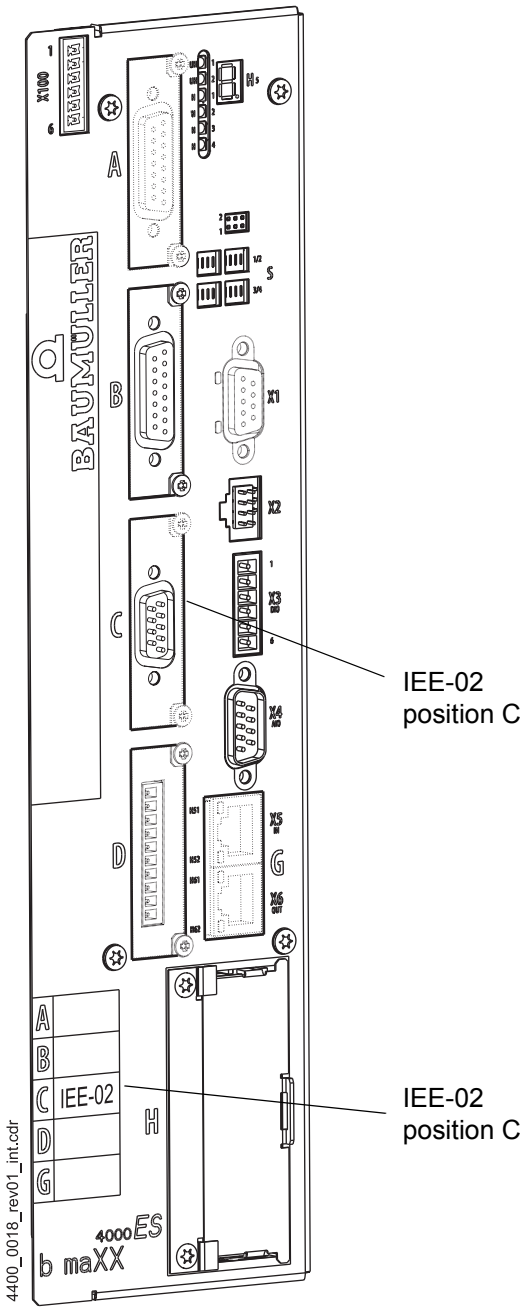


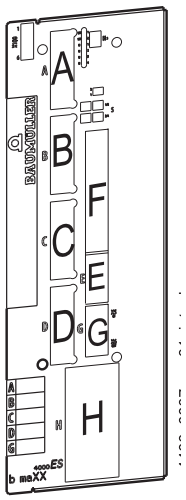
Figure 4: IEE-XX in ES controller

The controller is ordered with the desired function/option modules, these are mounted stationary (exception slot H) and cannot be changed. Only the option module in slot H can be changed/added.

4.3.1 Position IEE-XX in the ES controller

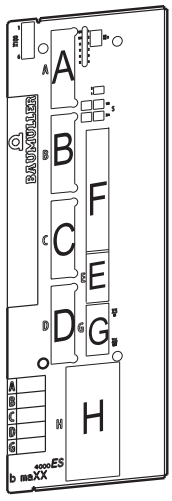
Each position is clearly identified by a character.

The **IEE-XX** can be used at the following position.



A	
B	
C	**IEE-01/02**
D	
F	Controller
G	
H	

Combinations function modules/option modules



	Function modules								Option modules							
	BM4-F-ENC-XX (encoder 1) for motor control recommended	BM4-F-ENC-XX (encoder 2)	BM4-F-AIO-01 (analog I/O)	BM4-F-AIO-02/03/04 (analog I/O)	BM4-F-DIO-XX (digital I/O)	BM4-F-FIO-XX (fast digital I/O)	BM4-F-IEE-XX (incremental encoder emulation)	BM4-F-SIE-XX (SSI encoder emulation)	BM4-O-ECT-01 (EtherCAT slave) for controller	BM4-O-PLK-01 (POWERLINK Controlled Node) for controller	BM4-O-VAR-01 (VARAN slave) for controller	BM4-O-SER-XX (Sercos slave) for controller	BM4-O-PRO-XX (Profibus slave) for controller	BM4-O-CAN-03 (CANopen slave) for controller	BM4-O-EIP-01 (Ethernet-IP) for controller	BM4-O-PLC-XX (SPS)
A	**X**	-	-	o	o	o	-	o	-	-	-	-	-	-	-	-
B	-	**X**	-	o	o	o	-	**X**	-	-	-	-	-	-	-	-
C	-	-	-	o	o	o	**X**	-	-	-	-	-	-	-	-	-
D	-	-	-	**X**	**X**	**X**	-	-	-	-	-	-	-	-	-	-
E	-	-	**F**	-	-	-	-	-	-	-	-	-	-	-	-	-
F	Controller unit with RS232- or Ethernet interface															
G	-	-	-	-	-	-	-	-	**X**	-	-	-	-	-	-	-
H	-	-	-	-	-	-	-	-	-	**X**	**X**	**X**	**X**	**X**	**X**	**X**

Steckkarten_ES_Rev02_e

X: prefered slot
F: permanently installed
o: possible slot, only the prefered slot is occupied
\- not possible

NOTE!

Only 2 analog outputs can be parametrized or linked even more than one AIO module is available.

4.3.2 Type plate IEE-XX in ES controller

The type code of the **IEE-XX** is included in the type plate of the basic unit.

4.3.3 Type code IEE-XX in ES controller

The type code has the form:

BM4XXX - XXX - XXXXX[Ryy] - [XXXXXXXX] - [XXX] - XX.

Directly behind the type code is the version code

(- XXXX - X - XXX - XXX).

Only the shown section is valid for the **IEE-XX** in ES controller.

BM4XXX - XXX - XXXXX[Ryy] - [XXXXXX] - [XXX] - XX Device generation

BM4XXX - XXX - XXXXX[Ryy] - [XXX**X**XX] - [XXX] - XX ES controller function module, position C

R 5 V square-wave incremental encoder emulation see IEE-01
S 5 V square-wave incremental encoder emulation see IEE-02

NOTE!

The module IEE-02 is supported only for controllers equipped with „external PWM“ (PWM is realized within the controller FPGA). For information about the controller hardware type please contact Baumüller.

4.4 Display and operation elements

The encoder module provides neither operation nor display elements.

The LED H4 of the basic unit **b maXX BM4000** respectively the emulation of the LED in ProDrive displays all device errors, including the errors generated concerning the **incremental encoder emulation**.

5

TRANSPORT AND PACKAGING

5.1 What to observe when transporting

For initial transport the **BM4-F-IEE-XX** for standard controller is packed at the manufacturer. If the device is to be further transported, ensure that the following conditions are met throughout the entire transport:

- Climate class 2 K 3 as per EN 60721-3-2
- Temperature range - 25 °C up to + 70 °C
- Vibration, shock, continuous shock class 2 M 1 as in EN 60721-3-2

5.2 Transport inspection

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

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

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

NOTE!

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

5.3 Unpacking

After having received the still packaged device:

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

If no transport damage is visible:

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

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

NOTE!

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

5.4 Disposal of the packaging

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

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

6

MOUNTING

In this chapter we describe the mechanical mounting of the plug-in module **BM4-F-IEE-XX** for BM4400, BM4600, BM4700 with standard controller.

NOTE!

The **incremental encoder emulation** is mounted stationary in the BM4400, BM4600, BM4700 with ES controller and cannot be changed, therefore no mounting is necessary!

6.1 Preparation of mounting

- Check the marking **IEE-XX,** wether the right plug-in module is available.

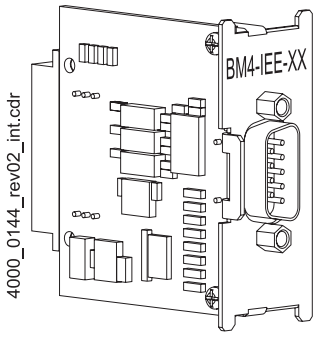


Figure 5: BM4-F-IEE-XX for standard controller

- Determine the suitable slot
  (also refer to ▹Slots BM4-F-IEE-XX for standard controller◃ on page 23).

6.2 Assembly

WARNING!

Danger as a result of faulty mounting!

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

Therefore:

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

1 Switch off the **b maXX BM4000** and assure it against unintentional switching on during mounting.

DANGER!

Risk of fatal injury from electrical current!

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

- Switch off the current when any kind of work is being performed on the electrical system and ensure safety before switching on again.
- Pay attention to the relevant safety instructions when handling electrical equipment carrying high voltages.
- Do not touch electrically live parts before taking into account the discharge time of the capacitors

2 Pull off the design cover towards the front from the controller unit

3 Look at the controller unit for the provided slot

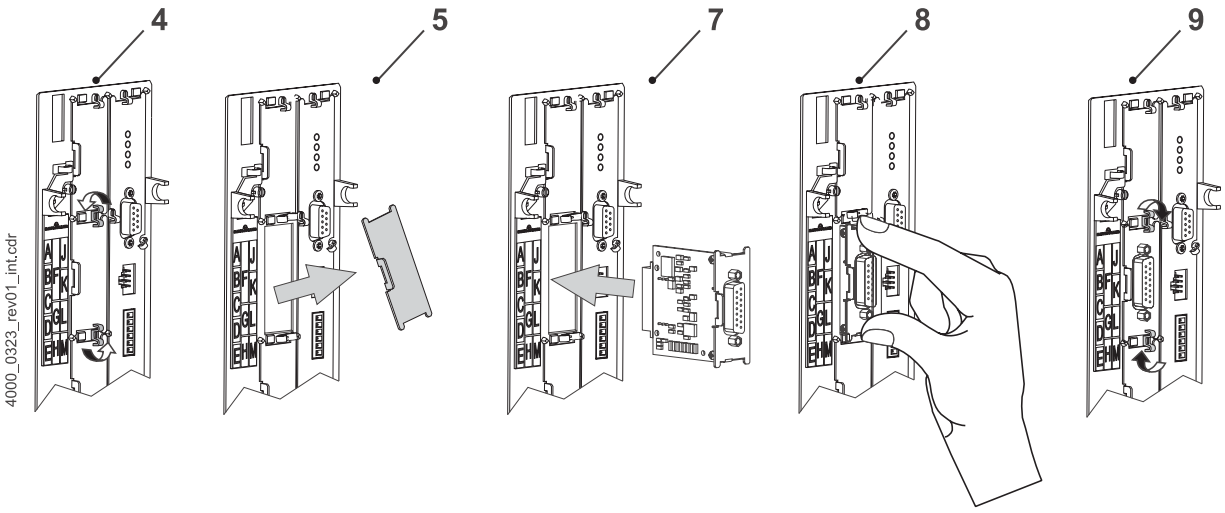


Figure 6: Mounting

4 Turn the twist lock beyond and beneath by 90°.
The twist locks now are standing horizontally.

5 Take the front panel cover towards the front off. Keep this cover.

NOTICE!

Note **electrostatic discharge**!
The **BM4-F-IEE-XX** module contains ESD sensible parts.

Therefore:

- Regard the described ESD procedures when handling the plug-in module.
- Touch the plug-in module only at its handle.

6 Take the **incremental encoder emulation** out of its transport packing. Avoid the contact with electronically parts of the plug-in module.

7 Plug the **incremental encoder emulation** module into the guide supports of the slot. The handle must point to the same side as the other handles in this slot strip (here: right side).

8 Press with two fingers on the front panel until the **incremental encoder emulation** module within the device sensible latches tightly into the end position.

9 Turn the twist lock beyond and beneath by 90° into the vertical position (locking position).

10 Connect cable of the **incremental encoder emulation** module and tighten the connector.

11 Put the design cover on the device again.

NOTE

If you, within the scope of a repair of the **incremental encoder emulation**, simply displace it by a similar plug-in module, you can shorten the further operation, installation, commissioning and so on. Then you simply must put on the connector to the plug-in module, put on the design cover again and you can turn on the device again.

Thus the mounting of the **incremental encoder emulation** is completed.

7

INSTALLATION

In this chapter we describe the electrical installation of the **IEE-XX** or **BM4-F-IEE-XX**. The mechanical mounting is described in ▹Mounting◃ from page 33 and not necessary for BM4400, BM4600 and BM4700 with ES controller.

7.1 Safety notes

DANGER!

Risk of fatal injury from electrical current!

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

- Switch off the current when any kind of work is being performed on the electrical system and ensure safety before switching on again.
- Pay attention to the relevant safety instructions when handling electrical equipment carrying high voltages.
- Do not touch electrically live parts before taking into account the discharge time of the capacitors

WARNING!

Danger because of faulty installation and initial commissioning!

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

Therefore:

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

7.2 Requirements for electrical connections

NOTICE!

The danger is: **Electricity.**
In case you do not ensure the requirements to the electrical connection of the **incremental encoder emulation**, it can be damaged/destroyed.

- Ensure that the electrical power connection parameters as specified in the Technical Data are adhered to and that the connections are made in accordance with the stipulated data.
- Avoid short circuit between different output points. In the event of a short circuit between several output points the **incremental encoder emulation** may get destroyed.

NOTE!

Pay attention to EMC compatible cabling, see instruction handbook **b maXX** BM4400, BM4400 ES, BM4600, BM4600 ES, BM4700, BM4700 ES (5.12008), chapter Installation requirements with regard to EMC.

7.3 Requirements for the connection cables

Assembled cables are not available, assembly of a connection cable see ▹Connection cable◃ on page 40.

7.4 Installation

7.4.1 Connection diagram

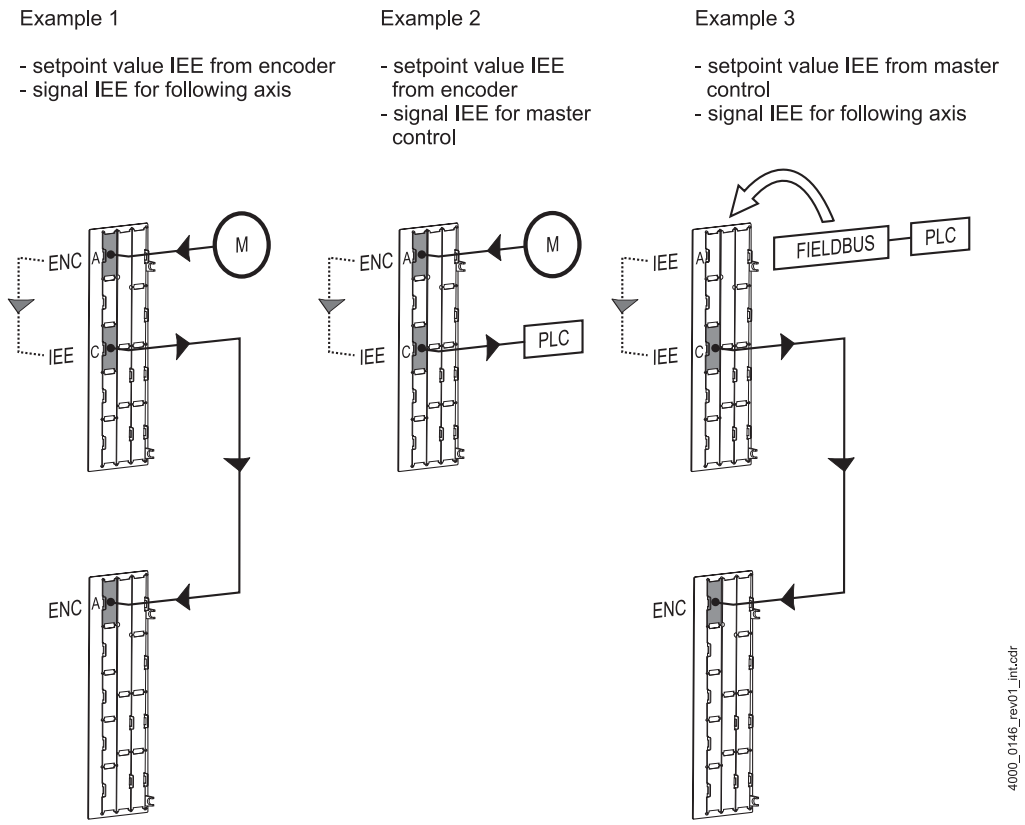
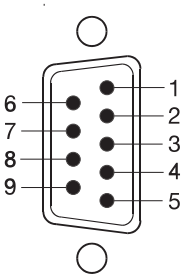


Figure 7: Connection diagram

Pin assignment



Sub-D connector
9-pole, male

Pin No.	Assignment
1	Ground IEE
2	external power supply +5 V IEE
3	IEE track 0
4	IEE track -0
5	IEE track B
6	not assigned
7	IEE track -A
8	IEE track A
9	IEE track -B

7.4.2 Connection cable

The connection cable can be used for following:

1 Use the following materials:

- Cable: LiYCY 5 x (2 x 0,14) + 2 x 0,5 mm Cu braiding.
- Sub-D connector: 9-pole, female (incremental encoder emulation side)
- e.g. Sub-D connector: 15-pole, male (incremental encoder side BM4000)
  for other Baumüller controllers or master controller different connectors and/or pin assignments are required.
- Cable from incremental encoder emulation to further master controls have to provide paired drilled cables per track! (track -0/0, -A/A, -B/B)

2 connect

- the cable shield with the cabinet of the Sub-D male connector/Sub-D female connector
- the female connector (9-pole) of the incremental encoder emulation with the cable

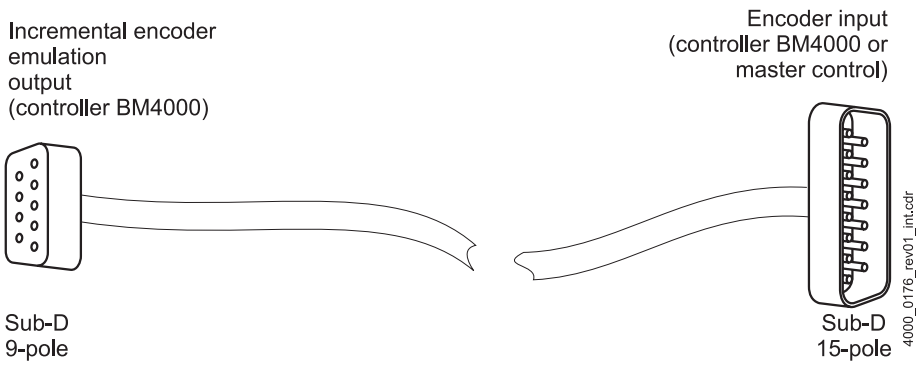


Figure 8: Connection cable with BM4000 controller

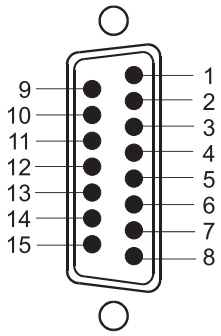
NOTE!

The connetion cable shown above is only applicable for connections with an BM4000 controller.

The connection cable must be made according above mentioned construction guidance with IEE side pin assignment (see ▹Pin assignment◃ on page 39)!

Refer to the corresponding documentation for the encoder input pin assignment of the master control or other Baumüller controllers

- the 15-pole Sub-D connector with the other side of the cable.
  Refer to following table for encoder input pin assignment of the 15-pole connector on controller side:



Sub-D connector
15-pole (male)

Pin No.	Assignment
1	Ground IEE
2	external power supply +5V IEE
3	IEE track 0
4	IEE track -0
5	IEE track B
6	not assigned
7	IEE track -A
8	IEE track A
9	IEE track -B
10	not assigned
11	not assigned
12	not assigned
13	not assigned
14	not assigned
15	not assigned

NOTE!

Refer to the corresponding documentation for the encoder input pin assignment of the master control or other Baumüller controllers

7.4.3 Installation procedure

1 Switch off the b maXX 4400 device and assure it against unintentional switching on during mounting.

DANGER!

Risk of fatal injury from electrical current!

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

- Switch off the current when any kind of work is being performed on the electrical system and ensure safety before switching on again.
- Pay attention to the relevant safety instructions when handling electrical equipment carrying high voltages.
- Do not touch electrically live parts before taking into account the discharge time of the capacitors.

The connection cable for the **incremental encoder emulation** must be made by the user, see ▹Connection cable◃ on page 40.

2 Take off the cover from the controller unit (standard controller only)

- the **incremental encoder emulation** is located in slot/position C.

Depending on the desired application connect the **incremental encoder emulation** with further system components (see ▹Figure 7◃ on page 39).

NOTE!

Follow the connection proposal in ▹Figure 11◃ on page 47 for the test-commissioning.

- Connect the Sub-D plug of the encoder input of the master control unit (see example 2 in ▹Figure 7◃ on page 39) via the incremental encoder emulation cable with the 9-pole Sub-D connector of the **incremental encoder emulation** (cable going downwards).
  Pin assignment see ▹Pin assignment◃ on page 39,
  Connection cable see ▹Connection cable◃ on page 40;
  or
- Connect the encoder input of the following b maXX drive (see example 1 in ▹Figure 7◃ on page 39) via the incremental encoder emulation cable with the 9-pole Sub-D connector of the **incremental encoder emulation** (cable going downwards).
  Pin assignment see ▹Pin assignment◃ on page 39,
  Connection cable see ▹Connection cable◃ on page 40;

3 Firmly tighten the lock screws of the Sub-D plug.

4 Mount back the cover on the device again.

5 Lay the connecting cable(s) according to the data given in the switching cabinet.

8

COMMISSIONING/OPERATION

This test-commissioning assures, that the **incremental encoder emulation** has been correctly recognized. Further information relating to commissioning and parameter settings of the encoder module can be found in parameter manual **b maXX 4000** 5.03039.

Assure, that before commissioning the following preconditions are fulfilled:

1 The **BM4-F-IEE-XX** is correctly mounted (standard controller only).

2 The **incremental encoder emulation** must be correctly cabled (IEE according example 1 or 2 in ▹Connection diagram◃ on page 39).

3 The switching cabinet is properly closed and all safety devices are put into operation.

4 The **b maXX 4000** is ready-for-use.

8.1 Safety notes

Basics

WARNING!

Risk of injury due to improper operation!

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

Therefore:

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

NOTICE!

Environmental conditions that do not meet the requirements.

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

Therefore:

- Ensure that the environmental conditions are kept compliant during operation (see instruction handbook **b maXX 4000**, operation conditions).

WARNING!

Risk of injury due to insufficient qualifications!

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

Therefore:

- Only qualified personnel may work on this device!

8.2 Procedure of the test-commissioning

The test-commissioning is divided into the following sections:

1 Recognition of **incremental encoder emulation**

2 Configuration of **incremental encoder emulation**

3 Function test

8.2.1 Recognition of incremental encoder emulation

During of the start of the device the controller automatically reads out the identification of the incremental encoder emulation.

After that check with ProDrive if the **incremental encoder emulation** has been correctly recognized.

1 Switch on **b maXX BM4000**

2 Wait until the system has started.

Delete upcoming errors/error messages at the device **b maXX 4000**.
These errors can be due to faulty mounting (e. g. defect cables) or faulty installation (e. g. missing power supply). Not until the errors have been removed, you may continue commissioning.

3 Open with ProDrive the window „**Diagnosis**“.

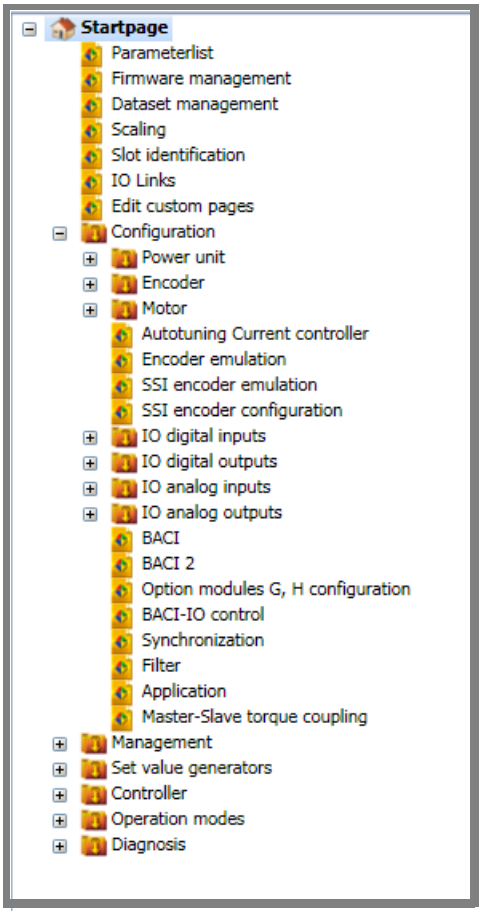


Figure 9: ProDrive navigation

4 Choose sub-menu „Service“
In this window is displayed whether the **incremental encoder emulation** is recognized in slot/position C.

Expectation Slot C:

- Module type: incremental encoder emulation
- Hardware version: dependent, e. g. „Version B“
- Software version IEE-01: > 0, e. g. „1“

5 Decide on the basis of the display:

Figure 10: ProDrive Service

- If the **incremental encoder emulation** has been correctly recognized, the commissioning can be continued, refer to Instruction Handbook b maXX 4000, 5.12008 or Parameter Manual b maXX 4000, 5.03039.
- If the **incremental encoder emulation** has not been correctly recognized, turn off the device, check the mounting and the installation. After removing all errors, switch on the device again.
- If the **incremental encoder emulation** has not been correctly recognized again, it is defect or the controller/controller slot (of standard controller) is defect. Contact Baumüller Nürnberg GmbH for replacement.

8.2.2 Function test

The incremental encoder emulation can be tested only together with the basic device **b maXX 4000**, motor and the encoder. Further additional information on commissioning of the system components can be found in the document Instruction Handbook **b maXX 4000**, 5.12008 and in the document 5.01042 (encoder module).

Prerequisites

1 Drive commissioned, according documentation **b maXX 4000**.

Slot/position **A**: Encoder 1: used for motor control

Slot/position **B**: Encoder 2: incremental encoder module (BM4-F-)ENC-03

NOTE

What is meant here is not the **incremental encoder emulation**, but a function module incremental encoder (BM4-F-ENC-03).

Slot/position **C**: Incremental encoder emulation

2 Basic device switched off again after successful first commissioning.

Procedure

3 Connect output of IEE with input of incremental encoder module, see ▹Connection cable◃ on page 40 and next figure.

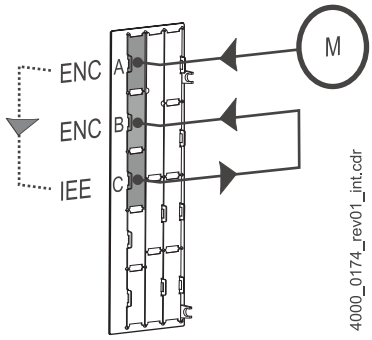


Figure 11: Connect function module ENC with IEE

NOTE

If you want to use some other configuration, please turn to examples 2 and 3 in ▹Connection diagram◃ on page 39. We shall however be describing the above mentioned variant.

4 Switch on **b maXX 4000**

5 Start ProDrive

6 Select in ProDrive Navigation „Configuration/Encoder emulation“.

7 All the values and the selection points must be set in this window as in ▹Figure 12◃ on page 48.
These settings correspond to the signal of a square-wave incremental encoder with 1024 pulses.

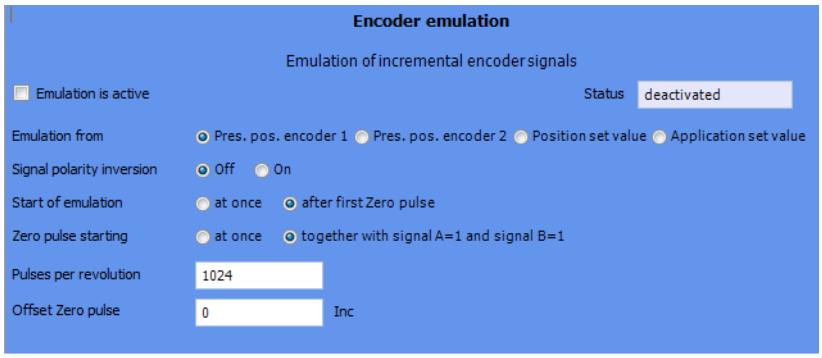


Figure 12: Incremental encoder emulation - window

NOTE

This corresponds with following settings:

Parameter	Value
BM_w_DS0_EncEmuMode	0022_{hex} (34_{dez})
BM_w_DS0_EncEmuOffsetIdxSig	0000_{hex} (0_{dez})
BM_w_DS0_EncEmuPulsesPerRev	1024_{dex}

NOTE

If, at a later date, the set value for the **incremental encoder emulation**, which is different than that taken in the example under commissioning is not to be specified via an encoder, then in contrast to para **8** above**,** the menu point „emulation from set value position“ has to be set in the window encoder-emulation.

8 Click on „Configuration/Encoder/Encoder 2“ in ProDrive Navigation

9 In this window set all values and options according to ▹Figure 13◃ on page 49.

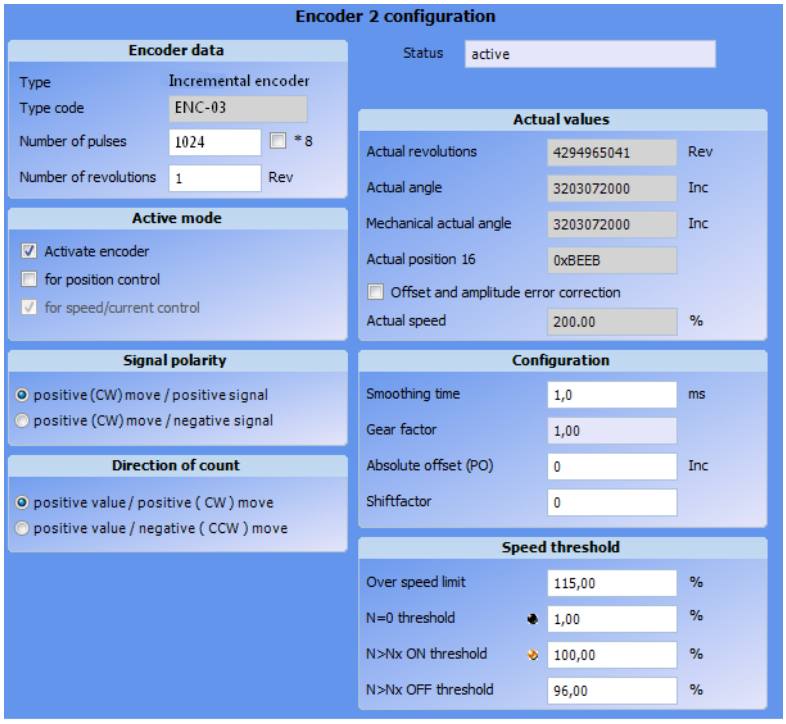


Figure 13: Encoder 2 - Configuration - Window

10 Click in ProDrive Navigation on „Set value generator/Ramp function generator“.

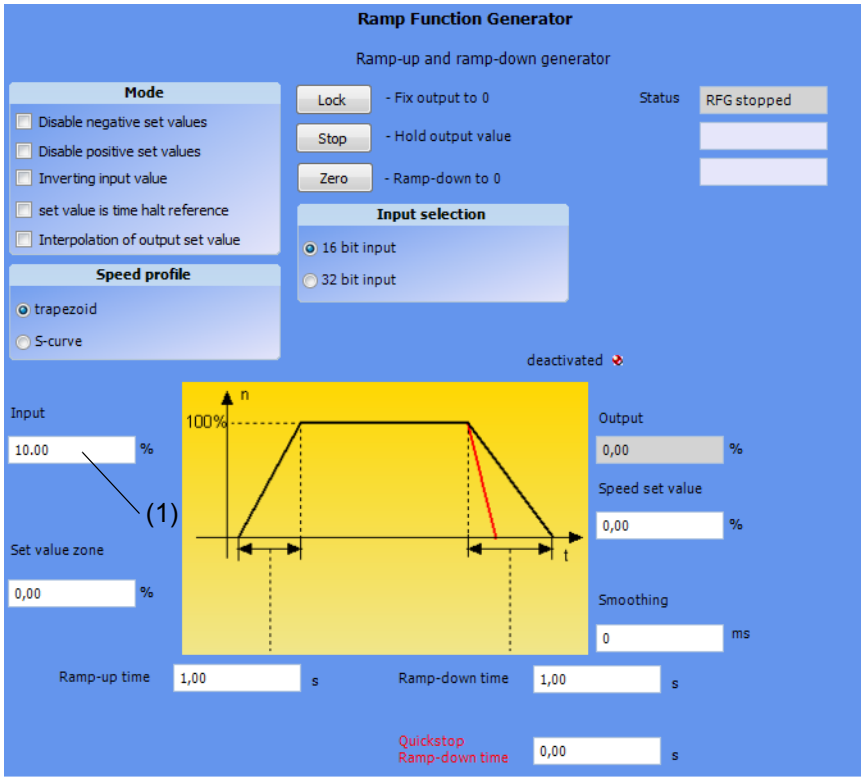


Figure 14: Ramp function generator window

11 Set following parameters

- Ramp function generator input (1)

➲ enter value „10“ beside „Input“, confirm with Enter.

12 Click on icon „Drive manager“ if the window „Drive manager dialog“ has been closed.

Figure 15: ProDrive: Drive manager - Dialog

In addition the window „Drive manager dialog“ is displayed.

Figure 16: ProDrive Drive manager

13 Select the operating mode „speed control“ in the scroll list

14 Switch on the pulse enable and quick stop not active

15 Click on button „Start“ in drive manager dialog

The motor should now be running at 10 % of the maximum RPM. Check this now as follows:

16 Click on „Configuration/Encoder/Encoder 1“ in ProDrive Navigation.

17 In this window: for a motor running in clockwise direction, whereby the value by the side of „actual values/revolutions actual value“ must start rising as soon as the motor starts rotating!

NOTE

Do not click on „Stop“ in the dialog menu „drive manager“. It has still to be checked, whether the value of the RPM gets transmitted to the encoder 2 via the **incremental encoder emulation**.

18 Click on „Configuration/Encoder/Encoder 2“ in ProDrive Navigation.

19 In this window: for a motor running in clockwise direction, whereby the value „actual values/revolution actual value“ must start rising as soon as the motor starts rotating!

HINWEIS

The position values have to be checked in the master control unit if the signal generated by the **incremental encoder emulation** is evaluated in a master control unit.

Stop the drive unit after having got convinced about proper functioning of the **incremental encoder emulation**:

- Click on „Stop“ in dialog menu „Drive manager“.
- Cancel releases for quick stop and pulse enable.
- Switch off the device **b maXX 4000** and all its connections.
- Record the successful commissioning.

9

MAINTENANCE

9.1 Safety notes

Basic information

WARNING!

Risk of injury due to improperly performed maintenance work!

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

Therefore:

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

9.2 Environmental condition

If the prescribed environmental conditions are adhered to, then the device is maintenance-free. For the prescribed environmental conditions see Instruction handbook **b maXX BM4000**.

The most important prescribed environmental conditions are:

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

9.3 Inspection intervals - maintenance notes

Refer to Instruction handbook **b maXX 4000**, 5.12008.

9.4 Repairs

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

Baumüller Nürnberg GmbH

Ostendstr. 80 - 90
90482 Nuremberg
Germany

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

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

10

TROUBLESHOOTING AND FAULT CORRECTION

10.1 Behavior in case of malfunctions

Basic information

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

- Pay heed to areas on the device that could be dangerous.

WARNING!

Risk of injury due to improper fault correction!

Therefore:

- Only qualified personnel may work on this device!
- Personnel that work with the **b maXX** device must be trained in the safety regulations and the handling of the device, and be familiar with the correct operation of it. In particular, reacting to error indications and conditions requires that the operator must have special knowledge.

10.2 Fault detection

The fault can be caused by mechanical or electrical malfunctions.

LED H4

The occurrence of an error state of a device **b maXX 4000** is signalled by the lighting up of the red LED H4 on the front side of the housing.

NOTE!

If warnings or errors occur without error reaction the LED H4 „error“ *flashes*. Only error messages with error reaction are displayed *by constantly lighting up*.

7-segment display

Additionally the error code is shown via the 7-segment display on the front side of the housing (not BM4XXX - XXX - XX**0**XX and BM4XXX - XXX - XX**1**XX).

By the displayed code the error message can be determined. The displayed error is without exception an LEVEL 2 error (P0201 - P0216).

The display of an error code starts therewith, that „F“ is displayed for 1.5 s. Then the four characters of the error code are displayed. The separate characters are displayed for about 0.8 s, interrupted by a short break. If there are other errors, these are displayed in the same manner. The procedure is repeated as soon as all errors were displayed.

Example: Error 125 and 91 are generated:

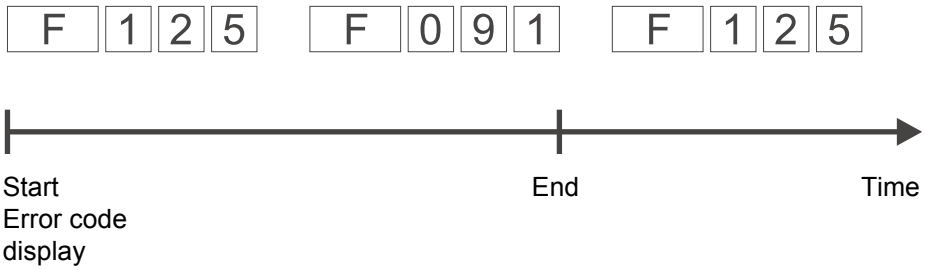


Figure 17: Error messages 7-segment display

Operating software ProDrive

Furthermore the error message is shown in the operating software:

- Start the operating program ProDrive (from FW 3.07), if it isn't running yet.

NOTE!

The controller software version and the operating software version must be compatible to use ProDrive with all functions.

Display the „error message“ in ProDrive:

- Open navigation with click on + in front of „Management“

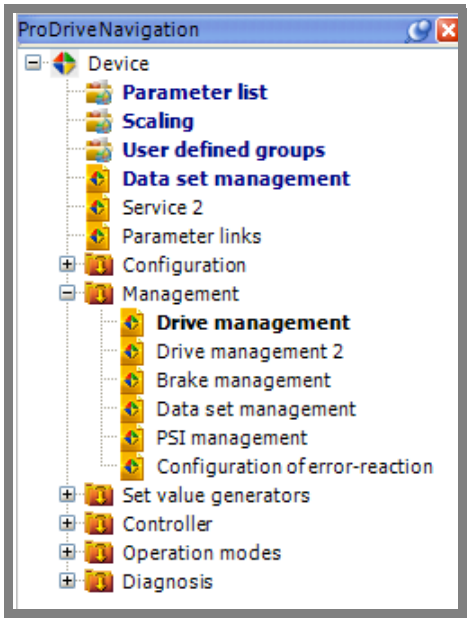


Figure 18: ProDrive navigation

Select „Drive management“

The window „Drive manager“ opens, see below with an exemplary (error) message. Before the communication between controller and PC/laptop is started, the messages in in this list have been arranged in numerical order. The newly occurring messages are added to the end of the list, when communication is active.

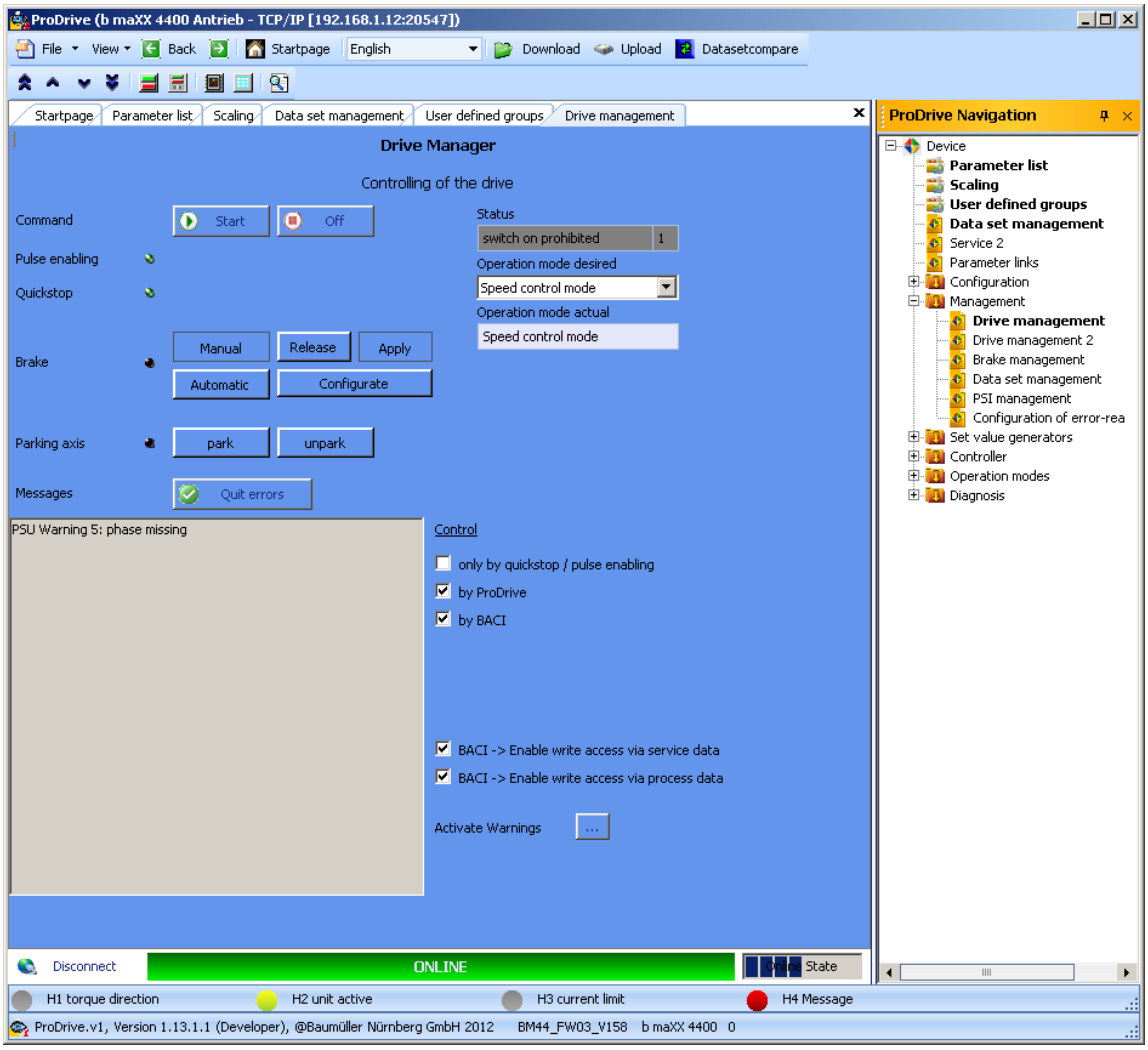


Figure 19: Drive manager ProDrive

NOTE

If you are not able to start the motor, although the red LED H4 isn't lighting up and although the LED H2 is lighting up green, check the parameterization of the **b maXX** 4000 with the parameter list in ProDrive.
Error possibilities are e. g.: torque limit = 0 has been set or notch position is not correct (also see parameter manual **b maXX** 4000).

If no LEDs are lighting up on the front side of the device, check the 24V supply.

10.3 Error handling

The error messages in the system are built up hierarchically.

An error message can result from a beneath in the hierarchic arranged error message. This is why the message „Error“ (level 1) can base on an error, which e. g. has appeared in „ModuleError“ (level 2)., because there is a failure in „Function module1“ (level 3, e. g. sine cosine encoder module).

Error memory

From firmware V03.11 onwards an internal error memory exists to read out errors by a higher-level open-loop control. All occurring errors which lead to an error response of the drive are saved chronologically in this error memory.

A read access to the error memory is done element by element with an index parameter (P0258) and a value parameter (P0259).

The error memory will be deleted completely at error acknowledgment (Bit 7 = 1 in control word).

For a further description see parameter P0257 in the Parameter Manual.

Error display

If an error appears, the according definite error message is displayed within a short time in ProDrive in the menu „device manager’ and on the 7-segment display.

NOTE!

The device is provided with predefined error reactions. You are able to set the error reaction of the device in „Depending on settings“ in the column „Reaction“ marked error messages. An exception here are errors, which have to have an immediate is as a consequence. These can not be changed due to safety reasons.

10.3.1 Error reset

If the red error LED is lighting up, there is at least one error.

There are several methods to reset errors:

- Via ProDrive (from FW 3.07):
  Button “Quit errors” (either in the dialog box “Device manager” or on the page “Device manager“.
  That means, that you inform the device, that you have noted the error, that you have removed it or that you want to pass over it. Due to error reset all error messages are reset. An individual error reset is not possible. The button Quit errors causes a resetting of the error, in case the cause for the error message exists no longer.

Figure 20: ProDrive Drive manager

- Via writing access to control word (P0300):
  Here a rising edge must be generated in bit 7 (generated by the control system or by operating software via input to parameter list).
  Note: The drive control must be active (see parameter P1001 Communication source) for the selected communication source.
- Via a digital input:
  A digital input of a DIO module can be selected via parameter P0575 digital input for error acknowledgement can be selected for error reset. A rising edge on this input resets the error messages.
- Via the pulse enable input:
  Precondition is, that the drive is only controlled via the hardware inputs (that means that the motor guide is neither set via the operating software nor via another communication source). Furthermore the option “Quit error via pulse enable” in parameter P1002 Options device manager must be active. With the first rising edge of pulse enable the errors then are reset. But the drive still does not start. Therefore you then need a second rising edge for the enable.

Additional data according the subject resetting of error messages is available in the „Parameter manual“.

10.3.2 Error messages

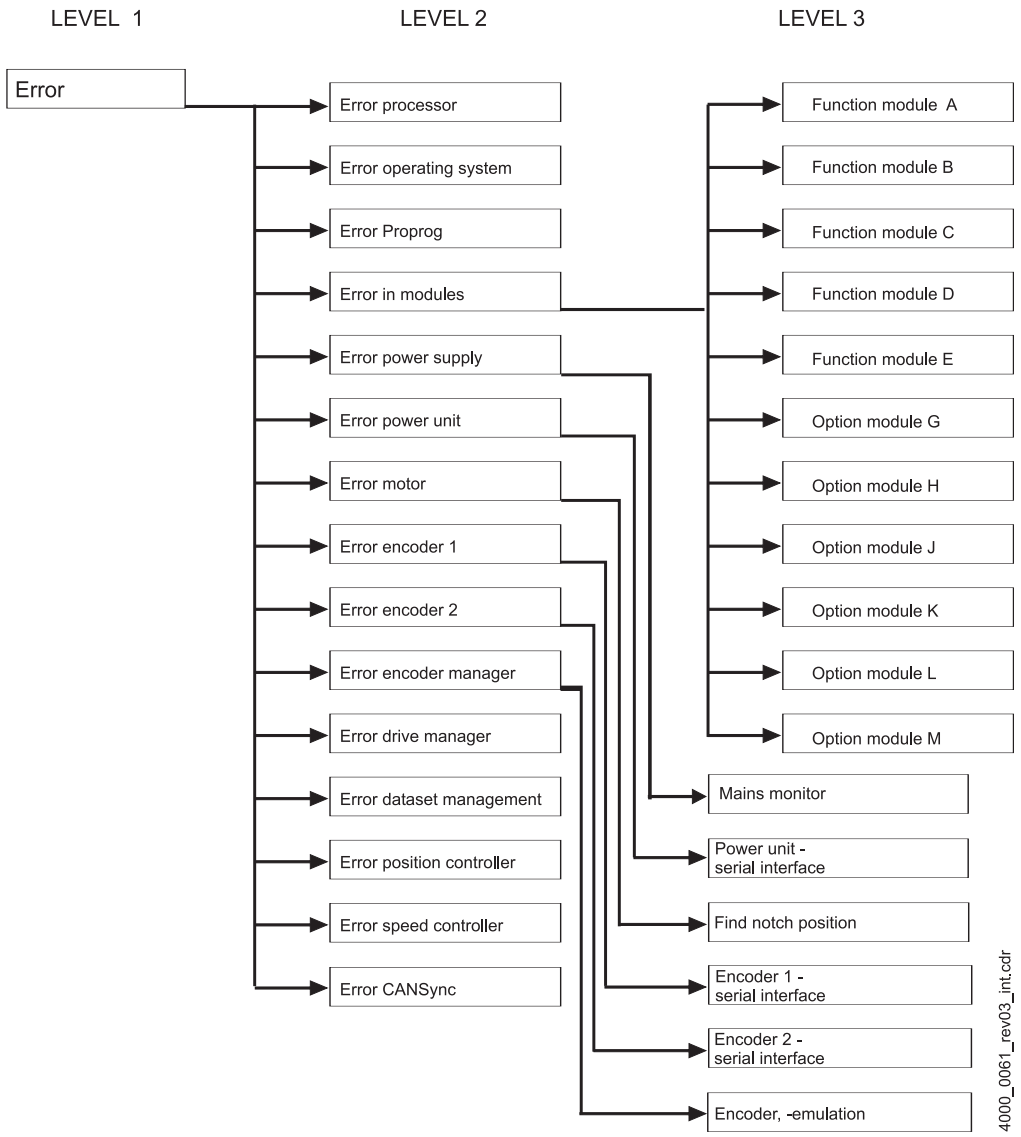


Figure 21: Survey error list

The (error) messages are displayed in ProDrive window „Drive manager“.

1st level

1st level errors are only interesting for the access to errors via parameters, to be used without ProDrive, e. g. at Field bus communication. This errors are not shown in ProDrive/ 7-segment display.

Bit mapping see description of the parameter P0200 in the parameter manual.

2nd level
3rd level

Order of the error messages see survey (▷Abbildung 21◁ auf Seite 61).

2nd level error messages are displayed on the 7-segment display in ProDrive.

NOTE!

3rd level errors are only displayed in ProDrive separated by a decimal point from the corresponding 2nd level error.

e.g.:

Motor error 102: Group error find notch position **(2nd level)**

Find notch position error 102.64: Drive moved more than 4 times delta angle. **(3rd level)**

In the column „Reaction“ the reaction of the system to the error is shown:

- „pulse stop“ = inhibit pulses
- „adjustable“ = the error reaction can be set via ProDrive (Window „Drive management“, toolbar button „Error reaction“).
- „no reaction“ means, the drive is continuing to work and the red error LED is blinking.

Error messages level 2

P0204 Error in function or option modules

Error No.	Meaning	Reaction	Troubleshooting
48	Error in function module A	3rd level error	see ▹Error in function module A to E◃ on page 68 (= 3rd level)
49	Error in function module B		
50	Error in function module C		
51	Error in function module D		
52	Error in function module E		
53	Error in option module G		
54	Error in option module H		
55	Error in option module J		
56	Error in option module K		
57	Error in option module L		
58	Error in option module M		
59	Timeout when waiting for the RST signal of the slaves	pulse stop	Restart **b maXX** 4000
60	CRC error in SPI transmission Module ▸ controller	adjustable	Error indicates high EMC interferences; please reduce these. Contact Baumüller Nürnberg GmbH.
61	CRC error in SPI transmission Controller ▸ module	adjustable	
62 to 63	reserved, not assigned = 0		

P0208 Error encoder 1

Error No.	Bedeutung	Reaktion	Fehlerbehebung
112	Communication error (Hiperface® specification)	pulse stop	see ▹Error encoder 1 serial interface Error encoder 2 serial interface◃ on page 66 (level 3)
113	reserved		
114	Error at overwriting the encoder position information	pulse stop	Execute the command once again. If the error occurs repeatedly, contact Baumüller Nürnberg
115	Cable break encoder 1	pulse stop	Remove the cable break in encoder cable of encoder 1 and/or check assignment of encoder cable
116	Overspeed encoder 1	pulse stop	Check permissible speed of encoder 1
117	Amplitude limit exceeded	pulse stop	Check the cable and the encoder function. Use a different encoder
118	Unknown encoder type	pulse stop	Check, if the correct encoder is connected or use a different encoder
119	Data field for motor data invalid	pulse stop	Use different encoder
120	Invalid motor data	pulse stop	
121	Error at storage of the motor data	pulse stop	
122	Motor data write protected (valid for motors not from Baumüller)	pulse stop	
123	Field angle error	pulse stop	Check the screening of the encoder cable
124	Encoder without temp. measuring	adjustable	Use an encoder module with temperature measuring
125	Encoder memory space for electronic type code too small	adjustable	Use a different encoder with more memory
126 to 127	reserved, not assigned = 0		

P0209 Error encoder 2

Error No.	Meaning	Reaction	Troubleshooting
128	Communication error (Hiperface® specification)	pulse stop	See ▹Error encoder 1 serial interface Error encoder 2 serial interface◃ on page 66
129	reserved		
130	Error at overwriting the encoder position information	pulse stop	Execute the command once again. If the error occurs repeatedly, contact Baumüller Nürnberg
131	Cable break encoder 2	pulse stop	Remove the cable break in encoder cable of encoder 2 and/or check assignment of encoder cable
132	Overspeed encoder 2	pulse stop	Check permissible speed of encoder 2
133	Amplitude limit exceeded	pulse stop	Check the cable and the encoder function. Use a different encoder
134	Unknown encoder type	pulse stop	Check, if the correct encoder is connected or use a different encoder
135	Data field for motor data invalid	pulse stop	Use different encoder
136	Invalid motor data	pulse stop	
137	Error at storage of the motor data	pulse stop	
138	Motor data write protected (valid for motors not from Baumüller)	pulse stop	
139	Field angle error	pulse stop	Check the screening of the encoder cable
140	Encoder without temp. measuring	adjustable	Use an encoder module with temperature measuring
141	Encoder memory space for electronic type code too small	adjustable	Use a different encoder with more memory
142 to 143	reserved, not assigned = 0		

P0210 Error encoder manager

Error No.	Meaning	Reaction	Troubleshooting
144	Absolute position of encoder 1 unknown	pulse stop	Use a different encoder If error occurs at sine incremental encoder, set P0150 bit 9 = 1 (error message „absolute position of encoder 1 unknown“ is suppressed)
145	Absolute position of encoder 2 unknown	pulse stop	
146	Encoder module 1 is missing	pulse stop	Check if the correct encoder is connected.
147	Encoder module 2 is missing	pulse stop	
148	Encoder module for measured value storage is missing	pulse stop	Install the encoder module
149	No measured value storage possible at the resolver	pulse stop	Use a sine cosine or incremental encoder
150	Triggering not possible, because no incremental encoder	pulse stop	Use for this option an incremental encoder
151	Digital I/O module is missing	pulse stop	Install the digital I/O module
152	Incremental encoder emulation module is necessary and is missing	pulse stop	Install the incremental encoder emulation module
153	Encoder module 1 is necessary for incremental encoder emulation and is missing	pulse stop	Install the encoder module on position A
154	Encoder module 2 is necessary for incremental encoder emulation and is missing	pulse stop	Install encoder module on position B
155	Inizialization error of the incremental encoder emulation module	pulse stop	Restart system
156	Incremental encoder emulation module (HW) signals error	pulse stop	Restart system, replace module (standard controller) or replace controller (ES controller) if error message is generated repeatedly
157	Error incremental encoder emulation module	pulse stop	Use for this option an incremental encoder
158	SSI encoder emulation module is missing	pulse stop	Install SSI encoder emulation module
159	Error in setpoint source encoder 1 or encoder 2	pulse stop	See encoder error message

Error messages level 3

NOTE!

3rd level errors are only displayed in ProDrive separated by a decimal point from the corresponding 2nd level error (refer to ▹Abbildung 21◃ auf Seite 61).

e.g.:

Motor error 102: Group error find notch position **(2nd level)**

Find notch position error 102.64: Drive moved more than 4 times delta angle. **(3rd level)**

P0234 **Error encoder 1 serial interface**
P0235 **Error encoder 2 serial interface**

Error encoder 1 112: communication error according Hiperface® specification
Error encoder 2 128: communication error according Hiperface® specification

Error code	Meaning	Troubleshooting
1	Analog signals outside the specification	Check encoder cable and assure the correct encoder installation
2	Internal angle offset error	
3	Data field paritioning table destroyed	
4	Analog threshold value not available	
5	Internal I^2C-bus not functioning	
6	Internal checksum error	
7	Internal watchdog error - encoder reset	
8	Overflow counter	
9	Parity error	
10	Checksum error	
11	Unknown instruction code	
12	Wrong number of data	
13	Invalid argument	
14	Data field is write protected	
15	Wrong access code	
16	Data field size cannot be altered	
17	Stated word address outside data field	
18	Data field not existent	
19 bis 27	reserved	
28	Absolute value monitoring of analog signals	Check encoder cable and assure the correct encoder installation
29	Critical sending current	
30	Critical encoder temperature	Check motor temperature
31	Speed too high - position determination not possible	Check encoder cable and assure the correct encoder installation
32	Position single turn unreliable	Internal encoder error, contact Baumüller Nürnberg GmbH
33	Position error multi turn	
34	Position error multi turn	
35	Position error multi turn	
36	Wrong motor data checksum	Check encoder cable and assure the correct encoder installation
37	Absolutely no response from encoder	
38	Unknown encoder address	
39	Error reading absolute angle position	
40	Wrong checksum of received data	
41	Unknown encoder type	
42 bis 63	reserved	
64	No answer from Hiperface® encoder	Check encoder cable and assure the correct encoder installation
65	No answer from EnDat® encoder	
66	Impracticable answer to encoder command	
67	Encoder type not supported	Use another encoder type
68 bis 79	reserved	

Error code	Meaning	Troubleshooting
80	CRC has located error	Check encoder cable and assure the correct encoder installation
81	Invalid command	
82	Error in response-message	
83	Alarm bit is set	Restart **b maXX** 4000
84	Memory is occupied	Check encoder cable and assure the correct encoder installation
85	Wrong data checksum	
86	Motor data-data length and/or data version of encoder and controller firmware is not identical	
87	No EnDat® interface	
88	Exceeding of evaluable transmission size	Use another type of length measurement system
89	Exceeding of the evaluable measuring step length	
90	Signal period length < measuring step length	
91	EnDat® 2.2: Error when initializing the master chip	Replace module (standard controller) or replace controller (ES controller)
92	EnDat® 2.2: Timeout while measuring the run-time of the signal	Replace encoder cable resp. replace module (standard controller) or replace controller (ES controller)
93	EnDat® 2.2: Error - signal run-time compensation switched off	Replace module (standard controller) or replace controller (ES controller)
94	EnDat® 2.2: Encoder type doesn't support EnDat®2.2 (commands, power supply, cycle clock)	Use compatible encoder type
95	EnDat® 2.2: RM bit is not set → absolute position of the encoder is not referenced	
96	Error lighting	Replace encoder
97	Error signal amplitude	
98	Error position value	
99	Error overvoltage	Replace module (standard controller) or replace controller (ES controller)
100	Error undervoltage	
101	Error overcurrent	
102	Error battery	Replace encoder
103 -111	reserved	
112	Position error detected while multiple request	Check encoder cable and assure the correct encoder installation
113	Error initiated by additional info 1	See encoder dependent definition of additional info 1
114	Error initiated by additional info 2	See encoder dependent definition of additional info 2
115	Error initiated by additional info 3	See encoder dependent definition of additional info 3
116	Error initiated by additional info 4	See encoder dependent definition of additional info 4
117	Error initiated by additional info 5	See encoder dependent definition of additional info 5
118	Error initiated by additional info 6	See encoder dependent definition of additional info 6
119	Error initiated by additional info 7	See encoder dependent definition of additional info 7

P0240 to P0244 Error in function module A to E

Error No.	Meaning	Reaction	Troubleshooting
0	reserved error		
1	Module not identified	no reaction	Check if the right module is plugged at the right position
2	Identified module is not permitted at this position	no reaction	
3	Digital output short-circuited or 24V supply not connected to the DIO module	no reaction	Check the cabling of the digital outputs
4	Invalid target parameter value caused by digital input	no reaction	Check the parameterization of the input channel
5	Direct PLC-IO access for this module not permitted	no reaction	Don’t select the module
6	Required module is missing, only for BM4100 active mains rectifier unit	IS	Connect the required module for operation with active mains rectifier - see operation handbook **b maXX BM4100** active mains rectifier unit
7	Module must not be used for actual active mains rectifier unit mode or controller mode	no reaction	
8	Reserved	no reaction	
9	Too much Analog-IO-Modules connected	no reaction	More than 2 analog modules are not allowed
10	AIO-04: current < 4 mA	no reaction	Current source not connected, disconnection or short-circuit
11	AIO-04: current > 20 mA	no reaction	Current source impress too much current

11

DISPOSAL

NOTE!

Baumüller products are not subject to the scope of application of the EU's Waste Electrical and Electronic Equipment Directive (WEEE, 2002/96/EC). Hence, Baumüller is not obligated to bear any costs for taking back and disposing of old devices.

11.1 Safety notes

DANGER!

Risk of fatal injury from electrical current!

Stored electric charge.

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

Refer to Instruction handbook **b maXX BM4000**, Electrical data.

Therefore:

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

NOTICE!

Avoid polluting the environment as a result of improper disposal.

Therefore:

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

WARNING!

Danger as a result of faulty de-installation!

The de-installation and disposal requires qualified personnel with adequate experience.

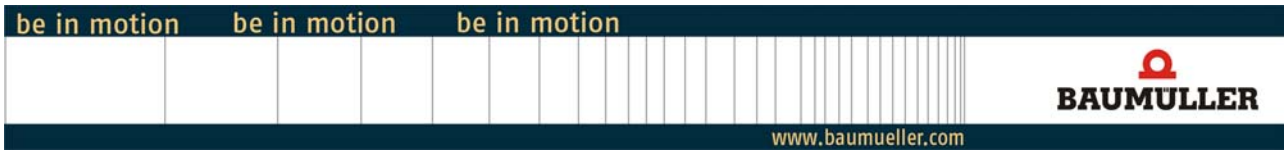
Therefore:

- Only allow de-installation and disposal to be performed by qualified personnel.

11.2 Disposal facilities/authorities

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

APPENDIX A - DECLARATION OF CONFORMITY



EC - Declaration of Conformity

Doc.-No.: 5.14004.00
Date: 18-Mar-2014

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

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

declares, that the product:

Designation: b maXX
Type: Incremental encoder emulation for b maXX 4000 standard controller
BM4-F-IEE-XX
Manufactured since: 24-Oct-2010

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

Applied harmonized standards:

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

The mentioned devices cannot be operated without a BM4000 standard controller.

The products must be installed correctly and all notes and safety notes of the referring instruction handbooks BM4000 and the incremental encoder emulation BM4-F-IEE-XX must be complied with, to guarantee the compliance to the guidelines.

The compliance to the guidelines was verified with a typical configuration of a BM4000 standard controller.

Nuremberg / 18-Mar-2014
Location/Date

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

Table of Figures

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Overview of Revisions

Version	Status	Changes
5.02020.05	14-Nov-2014	Revision because of ES controller

Notes:

be in motion

Baumüller Nürnberg GmbH Ostendstraße 80-90 90482 Nürnberg T: +49(0)911-5432-0 F: +49(0)911-5432-130 **www.baumueller.de**