

Instruction handbook

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be in motion **be in motion**



b maXX

**BM4-F-AIO-XX
AIO-XX**

Analog IO module

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

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GENERAL

1.1 Information on this Instruction handbook

The **AIO-XX** or **BM4-F-AIO-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.



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1.5 Other applicable documents

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 at all times via telephone, fax, mail or the Internet.

1.10 Used terms

The term function module or the designation **AIO-XX** (ES controller) or **BM4-F-AIO-XX** (standard controller) is also used in this documentation for the Baumüller product „b maXX analog IO module“. 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 IO module BM4-F-AIO-XX or AIO-XX	5.01045	354844	372665
Digital IO 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

1.11 List of associated documentations

	Doc No.	Part No. German	Part No. English
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

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 who is 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

2.3 Use, compliant with intended purpose

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

The **Analog IO 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 **Analog IO 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 this **Analog IO module**.
- When configuring, ensure that the **Analog IO module** is always operated within its specifications.
- The **Analog IO module** may only be operated in a technically flawless condition.
- Only operate the **Analog IO module** 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 / CO₂

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 is 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 signaling 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



TECHNICAL DATA

3.1 Electrical data

	(BM4-F-)AIO-			
	01	02	03	04
Number of inputs	2			
Number of IO-input links	2			
Resolution	10 bit / 12 bit	16 bit	12 bit	16 bit
Design	differential input circuit			
Input resistance	ca. 50 k Ω			ca. 100 Ω
Max. input current	200 μ A			20 mA
Min. input current	-			4 mA
Sample rate inputs, one input used	125 μ s			
Sample rate inputs, both inputs used	250 μ s			
Max. analog input voltage	- 10 V to + 10 V			2 V
Number of outputs	2 ¹⁾			
Number of IO-output links	2			
Max. output current	1 mA			
Resolution	8 bit	16 bit	12 bit	16 bit
Update-rate fast outputs	125 μ s			
Update-rate slow outputs	8 ms			
Short-circuit protection output	limited short-circuit protection (max. 10 s)			
Analog output voltage	- 10 V to + 10 V			

¹⁾ The analog outputs can be changed from „fast output“ to „slow output“ and vice versa by the operation software.

3.2 Power input

3.2 Power input

Voltage	(BM4-F-)AIO-				
	01	02	03 up to (BM4-F-)AIO-03-00 version C*)	03 from (BM4-F-)AIO-03-01 version D*)	04
5,0 V	0,2 mA	4 mA	10 mA	5 mA	4 mA
3,3 V	-	-	160 mA	40 mA	-
+15,0 V	27 mA	37 mA	20 mA	23 mA	37 mA
-15,0 V	26 mA	35 mA	19 mA	22 mA	35 mA
8,0 V	-	-	-	-	-

*) : Displayed in ProDrive navigation „Service“

3.3 Input linearity error

	DNL min	DNL typ	DNL max	INL min	INL typ	INL max	Offset min	Offset typ	Offset max	Gain min	Gain typ	Gain max
AIO-01	0	2	6	0	2	5	0	3	6	0	4	8
AIO-02	0	2	4	0	3	6	0	3	6	0	3	6
AIO-03	0	2	4	0	2	4	0	8	16	0	15	50
AIO-04	0	2	4	0	3	6	0	3	6	0	3	6

Note:

The specifications are related to the LSB of the associated module.

Tolerances of offset and gain can be adjusted within the controller.

3.4 Operation conditions

The operation conditions of the **b maXX 4000 5.12008** are valid.

Transportation temperature range	- 25 °C bis + 70 °C
Transportation climate classification EN 60721-3-2	2 K 3
Storage temperature range	- 25 °C bis + 55 °C
Storage climate classification EN 60721-3-1	1 K 4



NOTICE!

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

DESIGN AND OPERATION

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

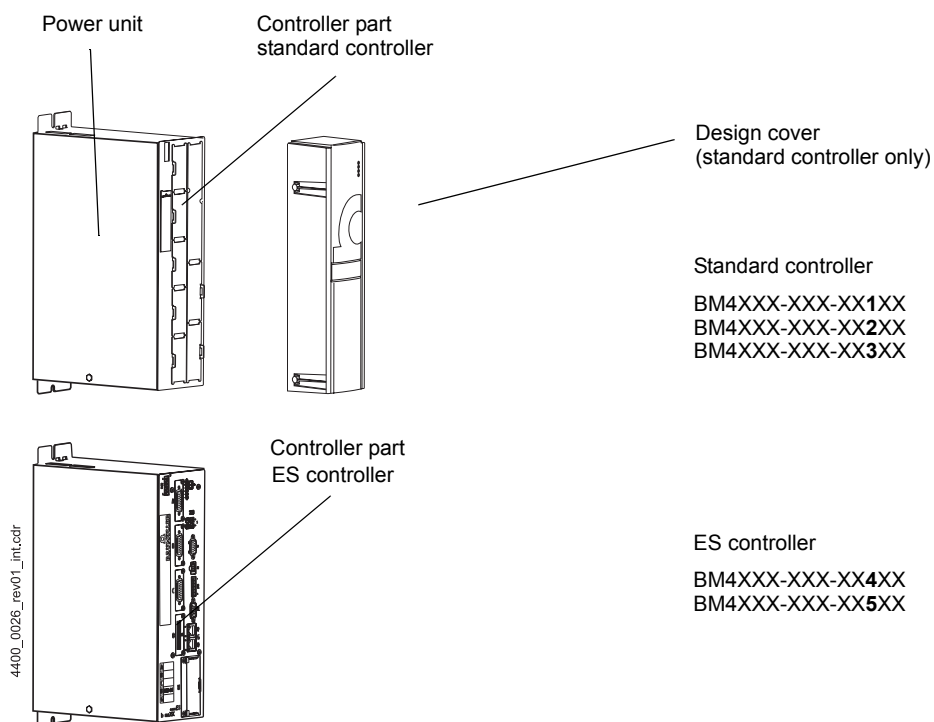


Figure 1: **b maXX BM4000**

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

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

4.1 Function

The **Analog IO module** converts analog input signals in digital signals for control (e.g set value generation) and/or makes available converted analog values (e. g. for RPM display) from internally processed digital signals.

Technical data of the **Analog IO module** can be found in [►Technical Data◄](#) from page 19.



NOTE!

The operation with ProDrive is described, only. Please contact Baumüller Nürnberg GmbH or visit our 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 Analog IO module is available as plug-in module **BM4-F-AIO-XX** for standard controller and as **AIO-XX** built in the ES controller.

4.2 BM-F-AIO-XX for standard controller

The **BM4-F-AIO-XX** is a plug-in module for the controller of **b maXX 4000**-series.

The **BM4-F-AIO-XX** plug-in module is connected to the controller with a plug on its back.

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

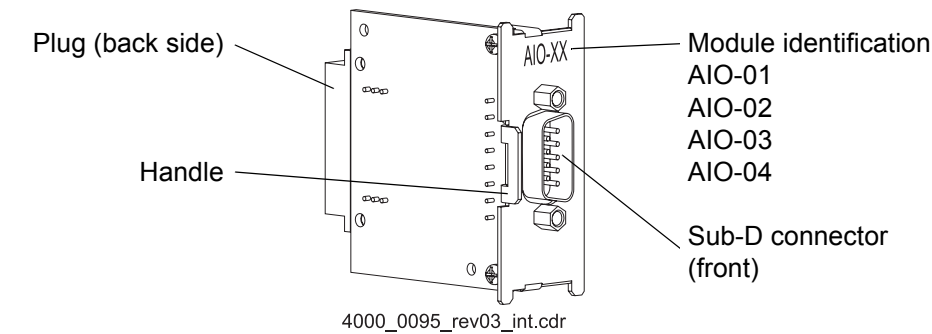
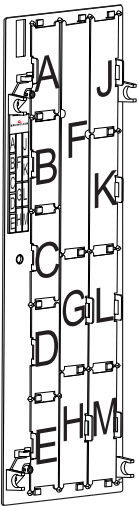


Figure 2: Analog IO module for standard controller

4.2.1 Slots BM4-F-AIO-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 **Analog IO module** can be plugged in following slots:



A		BM4-F-AIO-02	BM4-F-AIO-03	BM4-F-AIO-04
B		BM4-F-AIO-02	BM4-F-AIO-03	BM4-F-AIO-04
C		BM4-F-AIO-02	BM4-F-AIO-03	BM4-F-AIO-04
D		BM4-F-AIO-02	BM4-F-AIO-03	BM4-F-AIO-04
E	BM4-F-AIO-01	BM4-F-AIO-02	BM4-F-AIO-03	BM4-F-AIO-04
F				
G				
H				
J				
K				
L				
M				



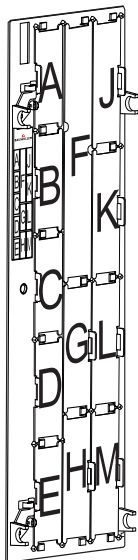
NOTE!

At the most 2 **Analog IO modules** can be used.

4.2 BM-F-AIO-XX for standard controller

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												
</																						

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.

**NOTE!**

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

**NOTE!**

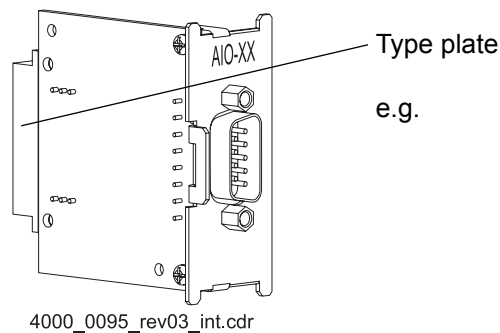
EtherCAT option modules **must not** be plugged in slot **J** of a 3-rowed controller unit, because the module can be damaged.

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-AIO-XX for standard controller

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

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

**BM4-F-AIO-01**

2 analog IN \ 2 analog OUT
S12345678

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

4.2 BM-F-AIO-XX for standard controller

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



NOTE!

This type code is valid for the **BM4-F-AIO-XX** of series **b maXX 4000** exclusively. For other plug-in modules different type codes are available.

Type code:

<u>BM4</u> - F - AIO - XX - YY	Device family, in which the plug-in module can be built in
BM4 - <u>E</u> - AIO - XX - YY	Type of plug-in module (function module)
BM4 - F - <u>AIO</u> - XX - YY	Name of plug-in module (Analog IO module)
BM4 - F - AIO - <u>XX</u> - YY	Version plug-in module (No. of inputs/outputs) 01: 2 x 10 bit input, 2 x 8 bit output 02: 2 x 16 bit input, 2 x 16 bit output 03: 2 x 12 bit input, 2 x 12 bit output 04: 2 x 16 bit input 4 mA...20 mA, 2 x 16 bit output -10 V...+10 V
BM4 - F - AIO - <u>03</u> - <u>YY</u>	Version hardware (AIO-03 only) 00: For BM4000 without Ethernet interface (BM44XX-XXX-XX2XX-03) 01: For all BM4000 - with Ethernet interface, too (BM44XX-XXX-XX3XX-03)



NOTE!

Please use in case of b maXX controller with Ethernet interface (type BM4XXX-XXX-XX3XX-03) only AIO-03 modules with type code BM4-F-AIO-03-**01** and higher.

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

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

4.3 AIO-XX in ES controller

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

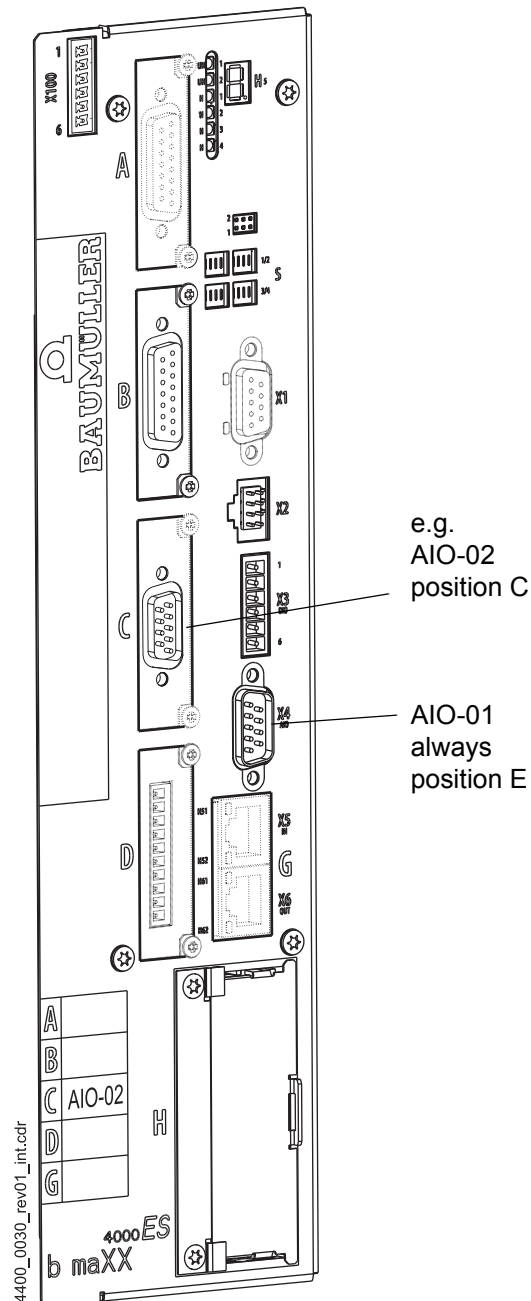


Figure 4: **AIO-XX** for ES controller

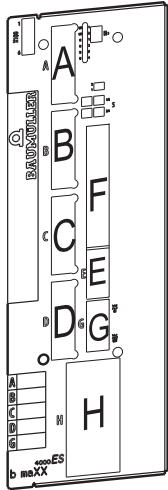
The controller is ordered with the desired function/option modules, these are mounted stationary (exception slot H) and cannot be changed. Only the option module in slot H can be changed/added.

4.3 AIO-XX in ES controller

4.3.1 Position AIO-XX in ES controller

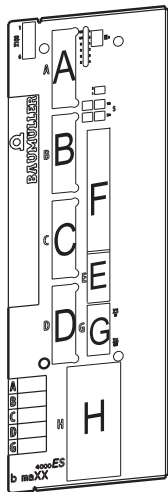
Each position is clearly identified by a character.

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



A	
B	AIO-02
C	AIO-03
D	AIO-04
E	AIO-01
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

X: preferred slot

F: permanently installed

o: possible slot, only the preferred slot is occupied

- not possible

Steckkarten_ES_Rev02_e



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

4.3.2 Type plate AIO-XX in ES controller

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

4.3.3 Type code AIO-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).
 A module AIO-01 is available in position E, always.
 Only the shown section is valid for the **AIO-02/03/04** in ES controller.

BM4 XXX - XXX - XXXXX[Ryy] - [XXXXXXXX] - [XXX] - XX	Device generation
BM4XXX - XXX - XXXXX[Ryy] - [<u>X</u> XXXXX] - [XXX] - XX	ES controller function module, position A
BM4XXX - XXX - XXXXX[Ryy] - [<u>XX</u> XXXX] - [XXX] - XX	ES controller function module, position B
BM4XXX - XXX - XXXXX[Ryy] - [<u>XXX</u> XXX] - [XXX] - XX	ES controller function module, position C
BM4XXX - XXX - XXXXX[Ryy] - [<u>XXXX</u> XX] - [XXX] - XX	ES controller function module, position D
O Analog IO (2 x IN, 2 x OUT), 16 bit	see AIO-02
P Analog IO (2 x IN, 2 x OUT), 12 bit	see AIO-03
Q Analog IO (2x input 16 bit, 4-20mA / 2x output 16 bit)	see AIO-04

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 **Analog IO module**.

TRANSPORT AND PACKAGING

5.1 What to observe when transporting

For initial transport the **BM4-F-AIO-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 - 30 °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.

MOUNTING

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

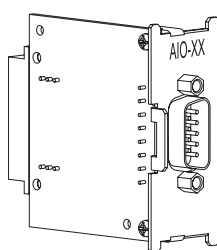


NOTE!

The **AIO-XX** modules are 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 **AIO-XX**, whether the right plug-in module is available.



4000_0095_rev03_int.cdr

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

- Determine the suitable slot
(see ► [Slots BM4-F-AIO-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

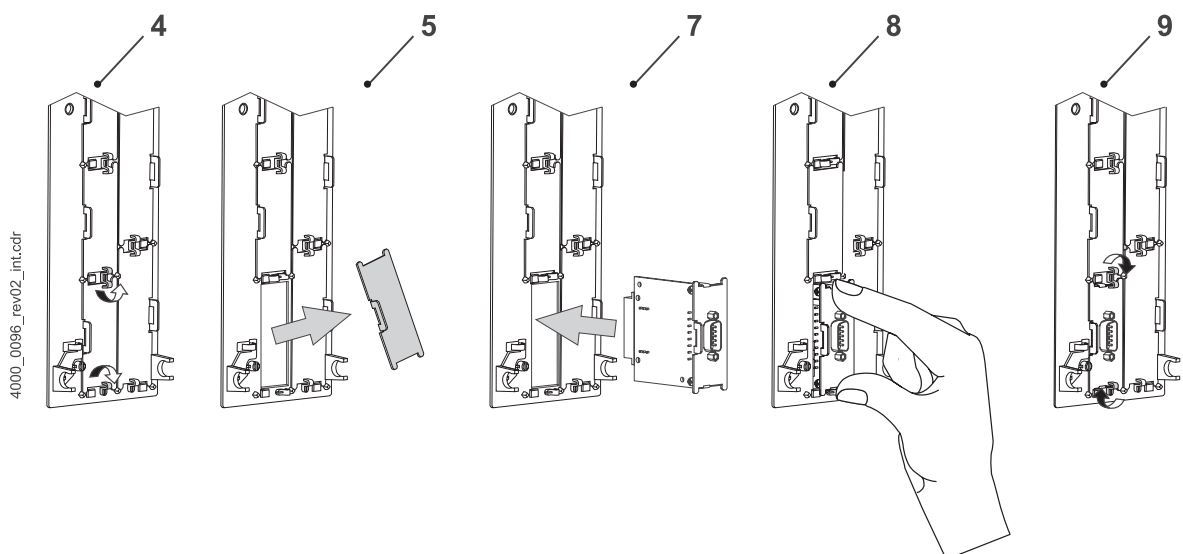


Figure 6: Mounting

- 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-AIO-XX** 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 **BM4-F-AIO-XX** out of its transport packing. Avoid the contact with electronic parts of the plug-in module.
- 7 Plug the **BM4-F-AIO-XX** 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 **BM4-F-AIO-XX** 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 **BM4-F-AIO-XX** module with the Sub-D connector.
- 11 Put the design cover on the device again.

**NOTE**

If you, within the scope of a repair of the **BM4-F-AIO-XX**, 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 **BM4-F-AIO-XX** is completed.

INSTALLATION

In this chapter we describe the electrical installation of the **AIO-XX** or **BM4-F-AIO-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. An 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 on the electrical connection

7.2 Requirements on the electrical connection



NOTICE!

The danger is: **Electricity**.

In case you do not ensure the requirements to the electrical connection of the **Analog IO module**, 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 instructions.
- Avoid short circuit between input points and output points. In the event of a short circuit between input points and output points the **Analog IO module** 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

Following cables are authorized for use by Baumüller:

- Copper cable, screened with cross-section of min. 0,25 mm², screen connected on both sides

Min. cross section	Type of connection
0,25 mm ²	Sub-D 9-pin female, metal or metallized

7.4 Connection diagrams

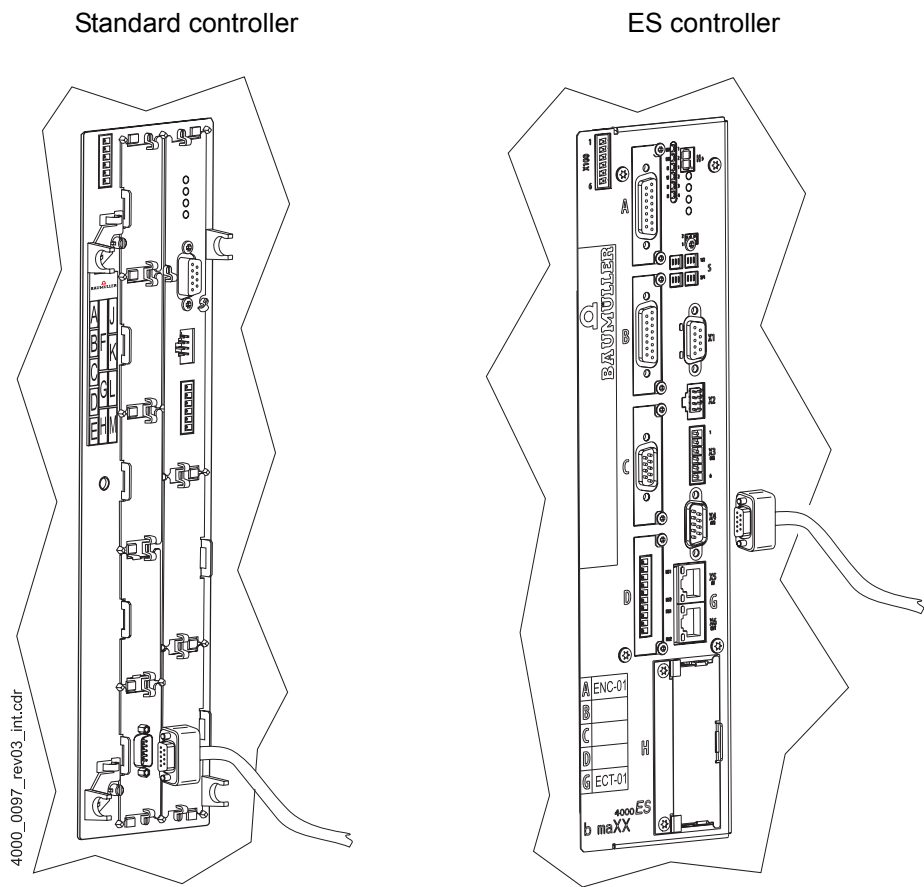
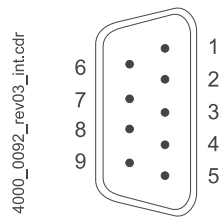


Figure 7: Connection diagram Analog IO module

Pin assignment



Sub-D connector 9-pole

Pin No.	Assignment
1	IN 1 +
2	IN 2 +
3	OUT 1 - , OUT 2 -
4	OUT 1 +
5	OUT 2 +
6	IN 1 -
7	IN 2 -
8	OUT 1 - , OUT 2 -
9	OUT 1 - , OUT 2 -

7.5 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 of the **Analog IO module** must be made by the user, refer to [►Requirements for the connection cables◄](#) auf Seite 38.

- 2 Take off the cover from the controller unit (when necessary)
- 3 Connect the cable with the suitable connector of the **Analog IO module** (cable goes downwards)
- 4 Replace the cover again, if necessary
- 5 Laying of the cable in the control cabinet, refer to [►Requirements on the electrical connection◄](#) auf Seite 38.

7.6 Internal circuit diagram

7.6.1 Internal circuit diagram of Analog-IO-Modules (BM4-F-)AIO-01/-02/-03

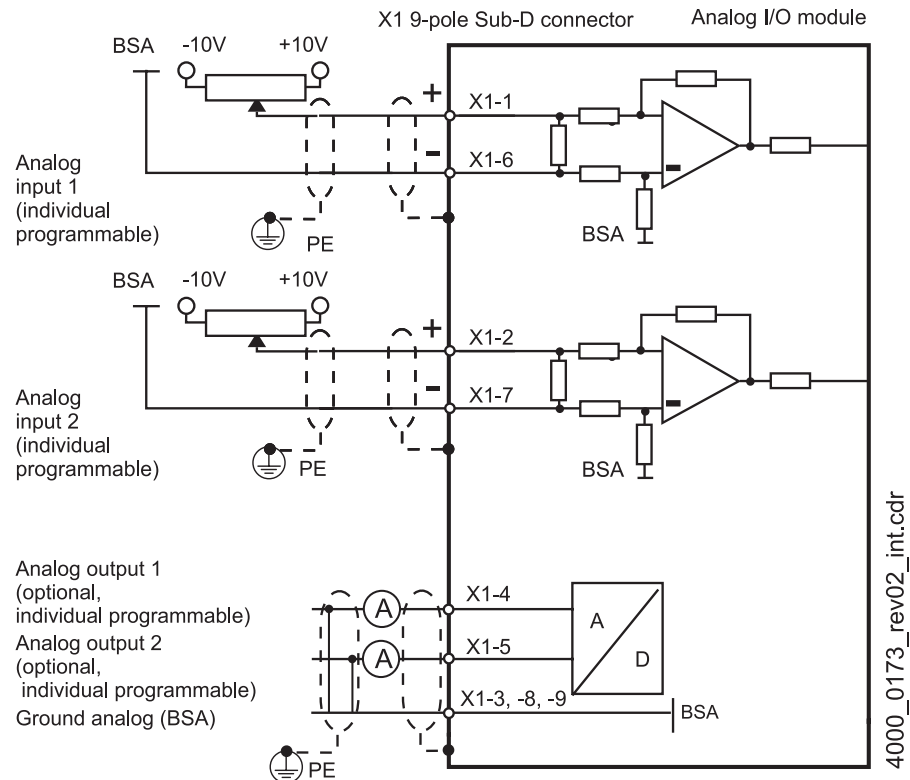


Figure 8: Internal circuit of Analog IO module (BM4-F-)AIO-01/-02/-03

7.6 Internal circuit diagram

7.6.2 Internal circuit diagram of Analog IO module (BM4-F-)AIO-04

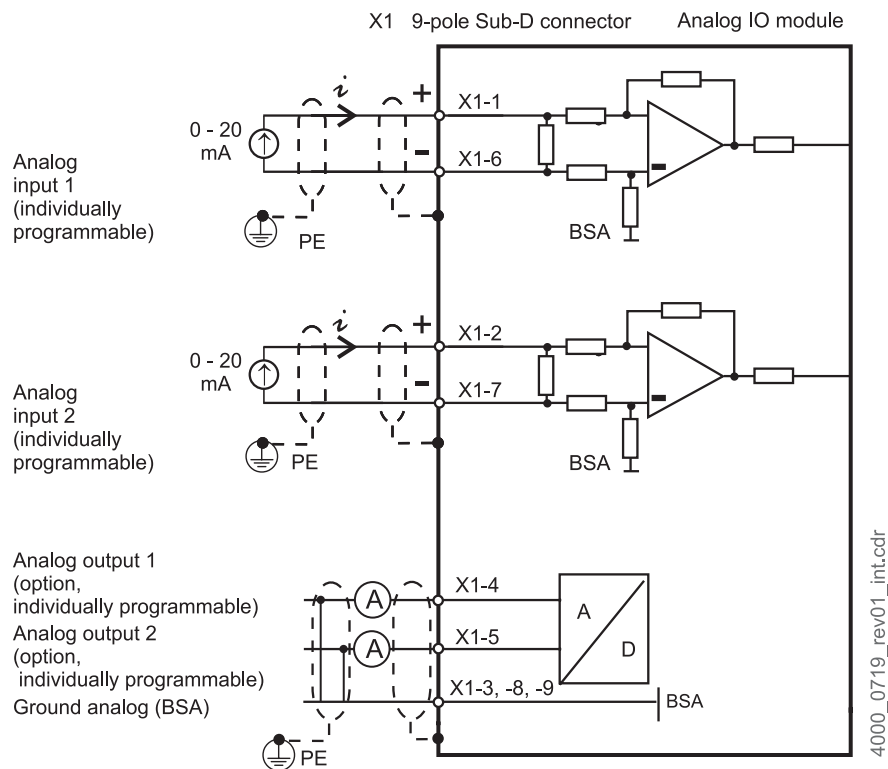


Figure 9: Internal circuit diagram of Analog IO module (BM4-F-)AIO-04

COMMISSIONING/OPERATION

This commissioning assures, that the **Analog IO module** 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-AIO-XX** is correctly mounted (standard controller only).
- 2 The **Analog IO module** is correctly mounted at the motor.
 - The analog IOs must be correctly cabled.
 - The connection must be suitable to the electrical specification of the **Analog IO module**.
- 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 hand-book.
 - 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.

8.2 Procedure of the commissioning



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 commissioning

The test-commissioning is divided into the following sections:

- 1 Recognition of the Analog IO module.
- 2 Function test

8.2.1 Recognition of the Analog IO module

While starting, the control unit reads the identification of the **Analog IO module** automatically.

After that, check with the help of ProDrive, whether the **Analog IO module** has been correctly recognized:

- 1 Switch on the **b maXX BM4000**
- 2 Wait till the system has started

Eliminate any errors / error messages eventually existing in the **b maXX BM4000**.

These errors might have been caused by faulty assembly (e.g. defective cable) or some mistake(s) in installation (e.g. supply voltage absent). Only after having corrected the errors the commissioning can be continued.

3 Open with ProDrive the window „Diagnosis“.

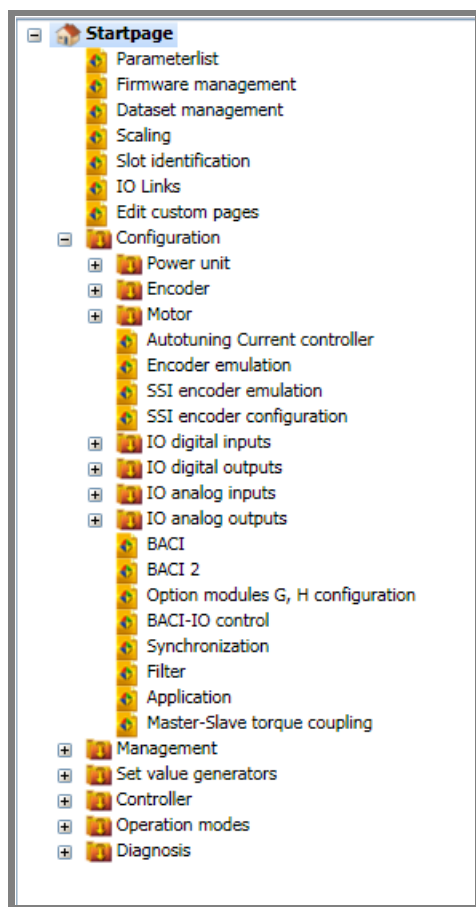


Figure 10: ProDrive navigation

8.2 Procedure of the commissioning

4 Choose submenu „Service“

This window shows the position/slot of the recognized **Analog IO module**.

If the **Analog IO module** is available in position/slot D, then the following is displayed:

„Slot D Analog IO 16 Bit Version X“.

„X“ shows the version of the module.

Always available with the ES controller is the module AIO-01 (position E), a further AIO-02/03/04 can be used additionally.

5 Decide on the basis of the display:

The screenshot displays the 'ProDrive - Service - b maXX 4400' interface. It is divided into several sections:

- Database:** A dropdown menu for 'Version' showing 'V168 (312)'.
- Informations:** A list of system parameters:
 - Controller type: 3
 - Controller firmware type: 1223
 - Controller firmware ID: 1392
 - Controller Firmware version: 3.12
 - Parameter table version: 168
 - Controller FPGA version: 0x5C22
 - Controller bootloader version: 3.04
- Configuration:**
 - Configuration ID: 0
 - Drive name: (empty field)
- Password:** A field for 'Password for service mode' with a lock icon.
- Time informations:**
 - System time: set PC time 0:01
 - Time since last boot: 0 days 0:01
 - Power time: 0 days 0:01
- Functionmodules:** A table listing modules in different slots.

	Module name	Module type	Hardware version	Wire break supervi:	RS-485	Temp.-acquis.
Slot A	SinCos EnDat 2.1	BM4-F-ENC-05	Version C	-	+	+
Slot B	Resolver	BM4-F-ENC-21	Version A	-	-	+
Slot C	not used			-	-	-
Slot D	Analog I/O 16 Bit	BM4-F-AIO-02	Version B	-	-	-
Slot E	Analog I/O 8/10 Bit	BM4-F-AIO-01	Version B	-	-	-

Figure 11: ProDrive Service

- If the **Analog IO module** 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 **Analog IO module** 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 **Analog IO module** 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.

6 Icon „ProDrive Navigation“

7 Configuration / submenu „IO analog inputs“

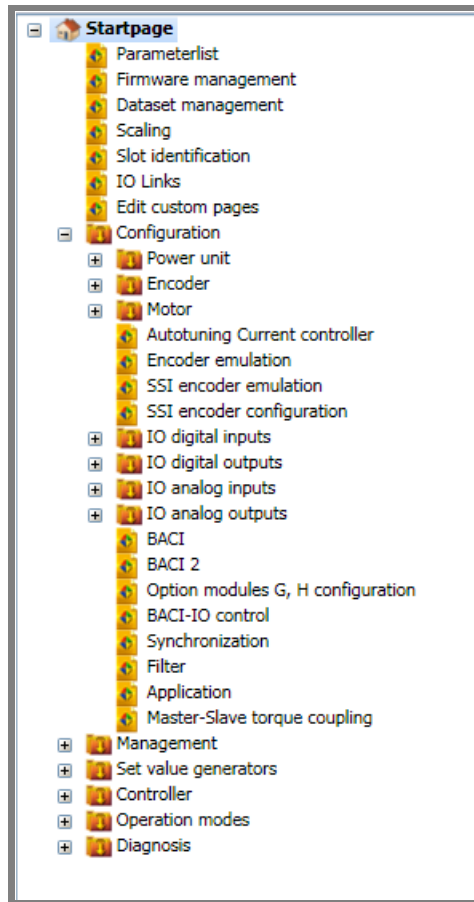


Figure 12: ProDrive navigation, submenu „IO analog inputs“

8 The submenu contains „Analog input link 1 and 2“ e.g. choose „Analog input link 1“

The window „Analog input link 1“ is opened. The inputs can be selected in the center of the window.

- 9 Choose „Input D.1“ in drop down list if the **Analog IO module** is used in position/slot D.

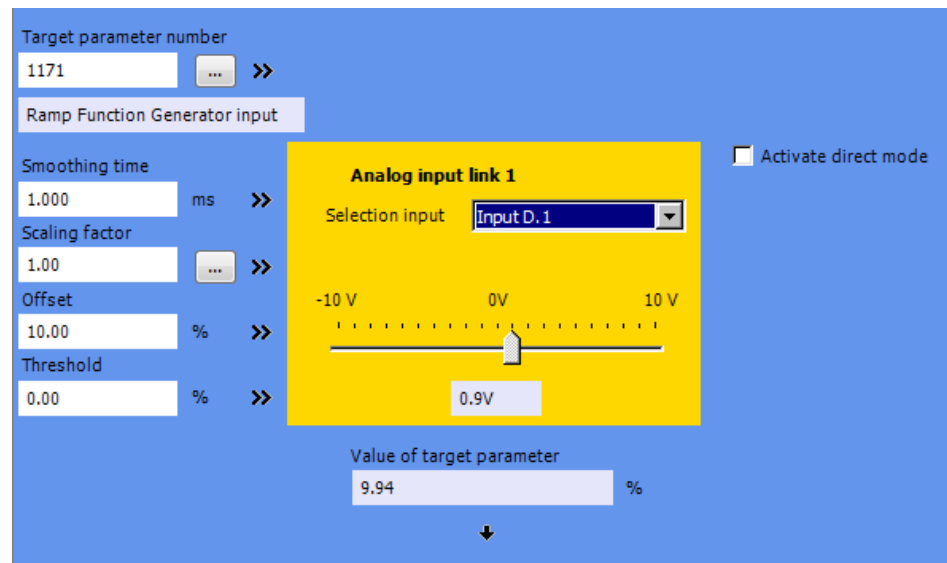


Figure 13: Analog input link 1

- 10 Check whether the text: „**module not existent**“ is displayed directly under the scale. In this case, the module was not recognized.

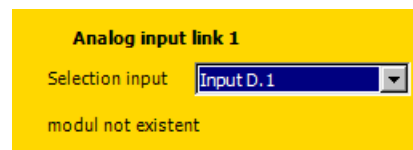


Figure 14: Module not existent

- Only if there is **no** message under the scale, the **AIO-XX** or **BM4-F-AIO-XX** is recognized properly and can be used.
- If the **AIO-XX** or **BM4-F-AIO-XX** is not recognized, then switch off the device and check the assembly/installation. After having removed all errors, restart the device for checking whether the plug-in module gets recognized properly now.
- If the **Analog IO module** is not recognized yet, then it is defective or the controller/controller slot. In that case, contact Baumüller Nürnberg GmbH for replacement.
- Once the **Analog IO module** has been recognized properly following with [▶Testing of the Analog IO module◀](#) from page 49.

**NOTICE!**

Notice electrostatic discharge

The **BM4-F-AIO-XX** or the **b maXX BM4000** may get damaged if the module is plugged or pulled out when the **b maXX BM4000** is energized.

If the plug-in module has still to be pulled out from the **b maXX BM4000** due to an external action, switch off the **b maXX BM4000**.

Try then to push in the **Analog IO module** again as described in the chapter [►Mounting◄](#) from page 33 and [►Installation◄](#) from page 37.

Restart the **b maXX BM4000** again and check for errors/error messages.

8.2.2 Testing of the Analog IO module

Once the plug-in module has been recognized properly, then it can be checked whether the input and outputs are working correctly using ProDrive.

Pre-conditions

Basic unit **b maXX BM4000** has been commissioned,
BM4-F-AIO-XX has been plugged in or **AIO-XX** is available (ES controller).

Analog connections are available/connected and ready for use (pin assignment see [►Connection diagrams◄](#) on page 39), in addition:

- **AIO-01, AIO-02, AIO-03**

Voltage range of $\pm 10 V_{DC}$ can be set by a potentiometer.

- **AIO-04**

Current range of 0 ... 20 mA can be set by a current calibrator

Motor for speed set (clockwise or counter-clockwise) has been connected; shaft ends are rotating freely.

► ProDrive Navigation „Diagnosis“, submenu „Service“.

► Check in the menu „Service“, whether the **Analog-IO-Module** has been correctly recognized, e.g. in the line for the **slot D**

8.2 Procedure of the commissioning

8.2.2.1 Testing of inputs AIO-01, -02 and -03

- 1 ProDrive Navigation „IO analog inputs“.
- 2 Select „Analog input link 1“ in ProDrive.

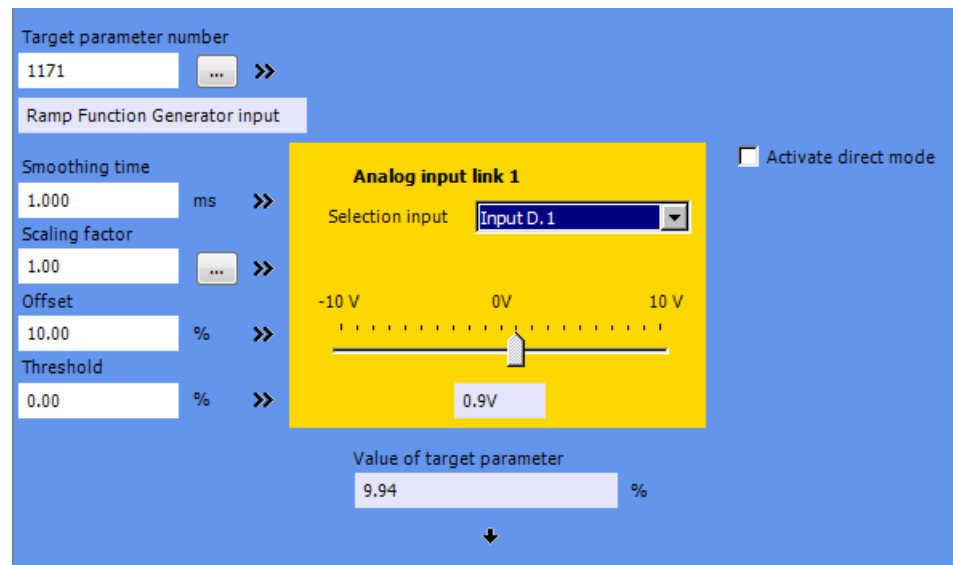


Figure 15: Analog input link 1, AIO-01, -02 and -03

- 3 By clicking on the ▼-symbol, select the entry „Input D.1“ („D“ ⇒ module in position D, „1“ ⇒ input 1) from the drop-down list.

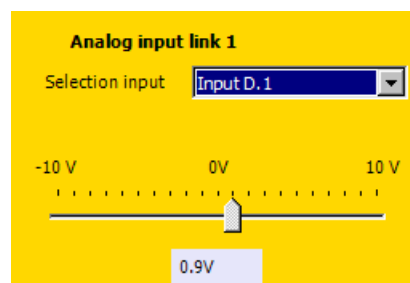


Figure 16: Input selection AIO-01, -02 and -03

- 4 Enter in menu „analog input link 1“:
 - *Target parameter number*: „1171“, (ramp function generator input)
 - *Smoothing time*: „10 ms“,
 - *Scaling factor*: „1“,
 - *Offset*: „0“,
 - *Threshold*: „0“,

A scale is displayed and shows the applied voltage (set by the potentiometer), e. g. +10 V.

5 Check the display in „Analog input link 1“.

The RPM of the motor can be regulated now by potentiometer for instance within limits -10 V and +10 V (clockwise and counter-clockwise running).



NOTE!

If for example, the scale shows 0 V, even though there is an analog voltage applied on input 1 (see pin assignment ► [Connection diagrams](#) ◄ on page 39), then the input is defective. When changing the analog input voltage, the relevant value of the voltage must be displayed on the scale.

6 Repeat the above steps for the input 2.

8.2.2.2 Testing of inputs AIO-04

- 1 ProDrive Navigation „IO analog inputs“.
- 2 Select „Analog input link 1“ in ProDrive.

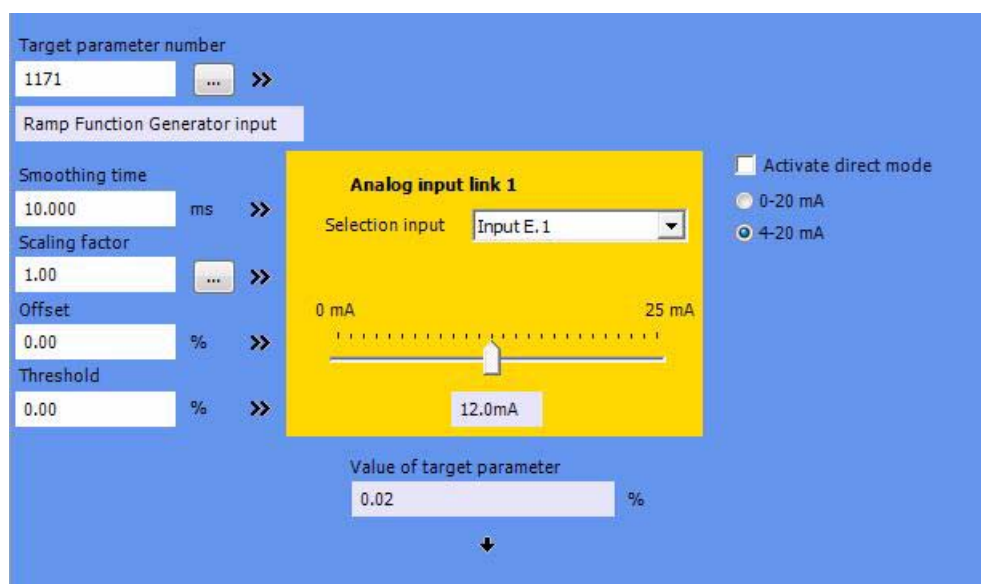


Figure 17: Analog input link 1, AIO-04

8.2 Procedure of the commissioning

- 3 By clicking on the ▼-symbol, select the entry „Input E.1“ („E“ ⇒ module in position E, „1“ ⇒ input 1) from the drop-down list.

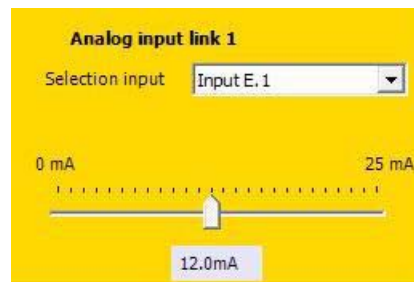


Figure 18: Input selection AIO-04

- 4 Enter in menu „Analog input link 1“ :
- *Target parameter number:* „1171“, (ramp function generator input)
 - *Smoothing time:* „10 ms“,
 - *Scaling factor:* „1“,
 - *Offset:* „0“,
 - *Threshold:* „0“,

A scale is displayed and shows the applied current (set by the current calibrator), e. g. +12 mA.

- 5 Check the display in „Analog input link 1“.

The RPM of the motor can be regulated now by the current calibrator.



NOTE!

If for example, the scale shows 0 mA, even though there is a current applied on input 1 (see pin assignment ► [Connection diagrams](#) ◄ on page 39), then the input is defective. When changing the applied current, the relevant value of the current must be displayed on the scale.

- 6 Repeat the above steps for the input 2.

8.2.2.3 Testing of outputs

Note the [Pre-conditions](#) on page 49.

- 1 Select in ProDrive „IO analog outputs“

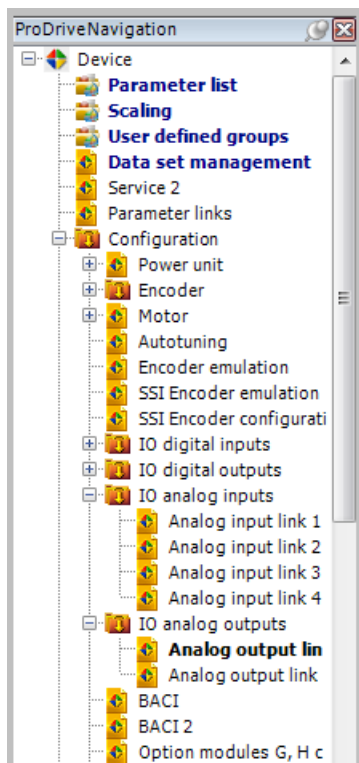


Figure 19: Analog output link

- 2 Select submenu „Analog output link 1“.

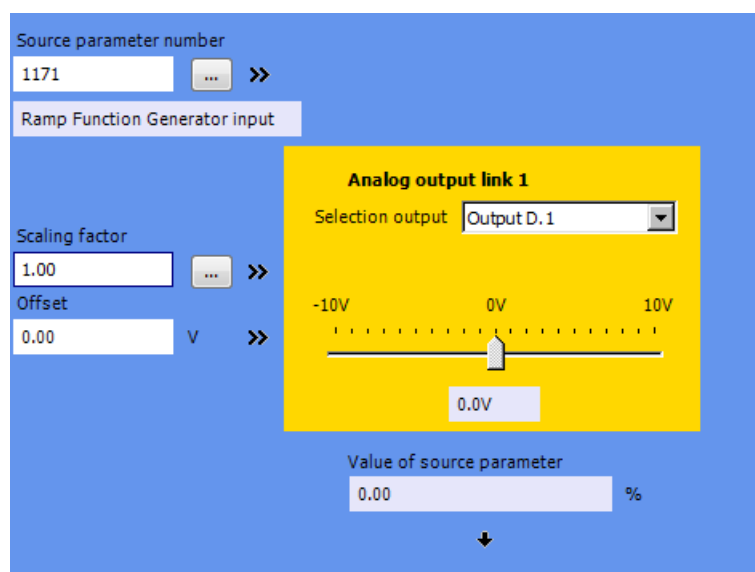


Figure 20: Menu Analog output link 1

8.2 Procedure of the commissioning

- 3 By clicking on the ▼-symbol, select the entry „Output D.1“ („D“ ⇒ **Analog IO module** in position D, „1“ ⇒ output 1) from the drop-down list.

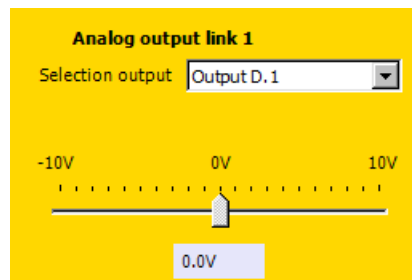


Figure 21: Output selection

- 4 Enter in menu Analog output link 1:

- *Source parameter:* „1171“,
- *Offset:* „0 dig“,
- *Shift factor:* „0“,
- *Scaling factor:* „1638 Dig/V“.

The voltage at the output point D.1 (see pin-assignment, [►Connection diagrams◄](#) on page 39) can be measured now by using the suitable measuring instrument. If +10 V has been applied at the input D.1, then there will also be an output voltage of +10 V at the analog output.



NOTE!

If no voltage can be measured at the output 1 (see pin assignment [►Connection diagrams◄](#) on page 39), even though the voltage is changed at the input 1, then either the **Analog-IO-Module** or the controller/controller unit is defective.

- 5 Repeat the test for output 2

With that, testing of the **Analog-IO-Module** is complete.

8.2.3 Offset adjustment of an analog input channel

Pre-conditions Basic unit **b maXX BM4000** commissioning completed,
Analog IO module available.

8.2.3.1 Offset adjustment of AIO-01, -02, -03

**Required
accessory**

- Voltmeter
- Voltage source (e.g. 9V monobloc battery)
with Sub-D connector (9 pin) for analog inputs 1 and 2 and connection for the voltmeter
- Sub-D connector (9 pin) with inputs 1 and 2 short-circuited
(Pin assignment see [▶Connection diagrams◀](#) on page 39)
- Computer with ProDrive



NOTE!

All settings must be done when controller state is disabled.

Offset adjustment within the analog input link

Set 16 Bit application parameter as target for the analog input link.

Example: Target parameter = **P3333**

Read the value in ProDrive while input is short-circuited.

Example: -179 increments

Offset adjustment: $\frac{\text{read value} \cdot (-100)}{32767}$

Example offset adjustment = $\frac{-179 \cdot (-100)}{32767} = 0,546$

⇒ value to be set: 0,55 %.

Gain adjustment within the analog input link

Connection and measurement of a reference voltage (e.g. 9V monobloc battery)

Measured voltage (voltmeter): 9,235 V

Read value in ProDrive: 29295

Conversion of read value into voltage: $= \frac{\text{read value} \cdot 10 \text{ V}}{32767}$

$$= \frac{29295 \cdot 10 \text{ V}}{32767} = 8,940 \text{ V}$$

$$\begin{aligned} \text{Gain to be set} &= \frac{\text{connected (measured) voltage}}{\text{read voltage}} = \frac{9,235 \text{ V}}{8,940 \text{ V}} = 1,033 \\ &= 1,03 \end{aligned}$$

Check

Input short-circuited \Rightarrow No. of increments < 20

Connect voltage supply

Convert connected voltage to increments:

$$\text{No. of increments} = \frac{32767 \cdot \text{connected (measured) voltage}}{10 \text{ V}} = \frac{32767 \cdot 9,235 \text{ V}}{10 \text{ V}} = 30260$$

The adjustment of an analog input channel of the AIO-01, AIO-02 and AIO-03 is completed now.

8.2.3.2 Offset adjustment AIO-04

Required accessory

- Current calibrator
- Computer with ProDrive
- Amperemeter



NOTE!

All settings must be done when controller state is disabled.

Offset adjustment within the analog input link

Set 16 Bit application parameter as target for the analog input link.

Example: Target parameter = **P3333**

Read the value in ProDrive while input is open (0 mA).

Example: -179 increments

Offset adjustment: $\frac{\text{read value} \cdot (-100)}{65534}$

Example offset adjustment = $\frac{-179 \cdot (-100)}{65534} = 0.273$

⇒ value to be set: 0.273 %.

Gain adjustment within the analog input link

Connection 10 mA

Measured current (amperemeter): 10.000 mA

Read value in ProDrive: 32900

Conversion of read value into current: $= \frac{\text{read value} \cdot 20 \text{ mA}}{65534}$

$$= \frac{32900 \cdot 20 \text{ mA}}{65534} = 10.041 \text{ mA}$$

Gain to be set $= \frac{\text{connected (measured) voltage}}{\text{read voltage}} = \frac{9,235 \text{ V}}{8,940 \text{ V}} = 0.996$

= 0,996

8.3 Operation

Setting of parameters determines the reaction of the **Analog IO module** during operation. These parameters are set by the software ProDrive.

The procedure for “Analog input Link 1” is described below via an example. The procedure for “Analog output Link 2” and the analog outputs is similar.

- 1 Start ProDrive
- 2 Click „ProDrive Navigation“
- 3 Click on + „IO analog inputs“
(path: Device/configuration/IO analog inputs)

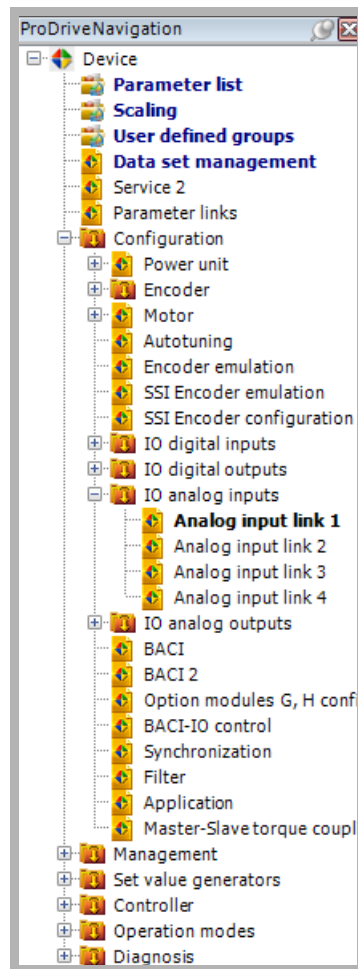




Abbildung 22: ProDrive Navigation

- 4 Click on „Analog input link 1“
- 5 Now open the menu „Analog input 1“ with the data for one of the analog inputs.
In the icon bar the parameter list button  can be found.

- 6 Click on  for opening the parameter list.
- 7 Click on the + -symbol before „Configuration IO analog“ in the window „Parameterliste“. The corresponding parameters of the Analog IO module are displayed.

Parameterliste					
Name	Wert	Min	Max	Beschreibung	
Device type					
Configuration Power Unit					
Configuration Encoder					
Configuration Motor					
Configuration Encoder emulation					
Configuration IO digital					
Configuration IO analog					
BM_i_AI1_Value	-77,83	-100	100	P0420 Analog input 1 actual value	
BM_i_AI2_Value	-96,02	-100	100	P0421 Analog input 2 actual value	
BM_i_Ds0_AI1_Offset	0,00	-100	100	P1134 Offset analog input 1	
BM_i_Ds0_AI1_Scaling	1,00	-2	2	P1132 Scaling factor analog input 1	
BM_i_Ds0_AI2_Offset	0,00	-100	100	P1140 Offset analog input 2	
BM_i_Ds0_AI2_Scaling	1,00	-2	2	P1138 Scaling factor analog input 2	
BM_i_Ds0_AOF1_Offset	0	-32768	32767	P1152 Offset fast analog output 1	
BM_i_Ds0_AOF1_Shiftvalue	2	0	15	P1153 Shift value fast analog output 1	
BM_i_Ds0_AOF2_Offset	0	-32768	32767	P1156 Offset fast analog output 2	
BM_i_Ds0_AOF2_Shiftvalue	12	0	15	P1157 Shift value fast analog output 2	
BM_i_Ds0_AOS1_Offset	0	-32768	32768	P1160 Offset slow analog output 1	
BM_i_Ds0_AOS1_Shiftvalue	1	-24	15	P1161 Shift value slow analog output 1	
BM_i_Ds0_AOS2_Offset	14000	-32768	32768	P1165 Offset slow analog output 2	
BM_i_Ds0_AOS2_Shiftvalue	0	-24	15	P1166 Shift value slow analog output 2	
BM_u_Ds0_AI1_Smoothing	10	0	30	P1131 Smoothing time analog input 1	
BM_u_Ds0_AI1_TargetPxxx	0	0	3376	P1133 Target number: analog input 1	
BM_u_Ds0_AI1_Threshold	0,00	0	100	P1135 Threshold value analog input 1	
BM_u_Ds0_AI2_Smoothing	10	0	30	P1137 Smoothing time analog input 2	
BM_u_Ds0_AI2_TargetPxxx	0	0	3376	P1139 Target number: analog input 2	
BM_u_Ds0_AI2_Threshold	0,00	0	100	P1141 Threshold value analog input 2	
BM_u_Ds0_AOF1_SourcePxxx	300	0	3376	P1151 Source number fast analog output 1	
BM_u_Ds0_AOF2_SourcePxxx	3338	0	3376	P1155 Source number fast analog output 2	
BM_u_Ds0_AOS1_Scaling	1638	1	65535	P1162 Scaling factor slow analog output 1	
BM_u_Ds0_AOS1_SourcePxxx	1171	0	3376	P1159 Source number slow analog output 1	
BM_u_Ds0_AOS2_Scaling	1638	1	65535	P1167 Scaling factor slow analog output 2	
BM_u_Ds0_AOS2_SourcePxxx	0	0	3376	P1164 Source number slow analog output 2	
BM_w_Ds0_AI1_InputChannel	0	0	1282	P1130 Selection analog input 1	
BM_w_Ds0_AI2_InputChannel	0	0	1282	P1136 Selection analog input 2	
BM_w_Ds0_AOF1_OutputChannel	0	0	65535	P1150 Selection fast analog output 1	
BM_w_Ds0_AOF2_OutputChannel	1282	0	65535	P1154 Selection fast analog output 2	
BM_w_Ds0_AOS1_OutputChannel	1281	0	65535	P1158 Selection slow analog output 1	
BM_w_Ds0_AOS2_OutputChannel	0	0	65535	P1163 Selection slow analog output 2	

Figure 23: Configuration, parameter list

**NOTE!**

The error parameters of the Analog-IO-Modules can be found in the chapter [Error messages](#) from page 69.

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.bbaumueller.de

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 - XX0XX and BM4XXX - XXX - XX1XX).

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 by displaying „F“ 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:

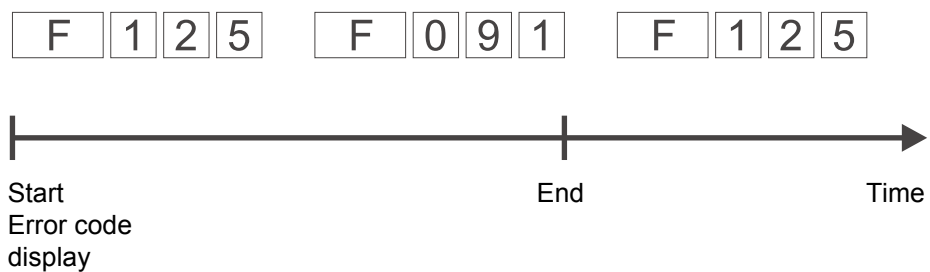


Figure 24: Error messages 7-segment display

4000_0366_rev01_int.cdr

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“

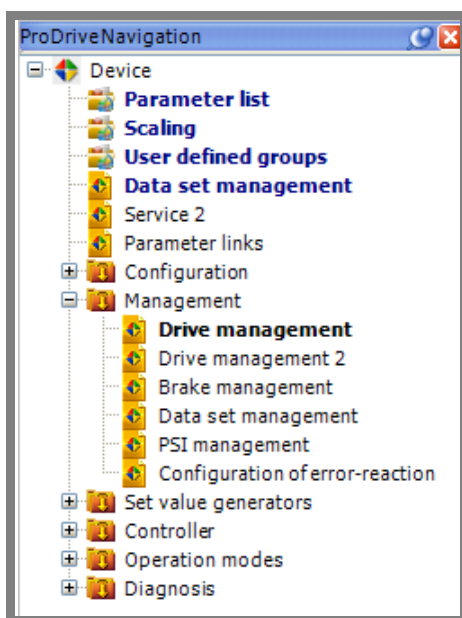


Figure 25: ProDrive navigation

► 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 this list have been arranged in numerical order. The newly occurring messages are added to the end of the list, when communication is active.

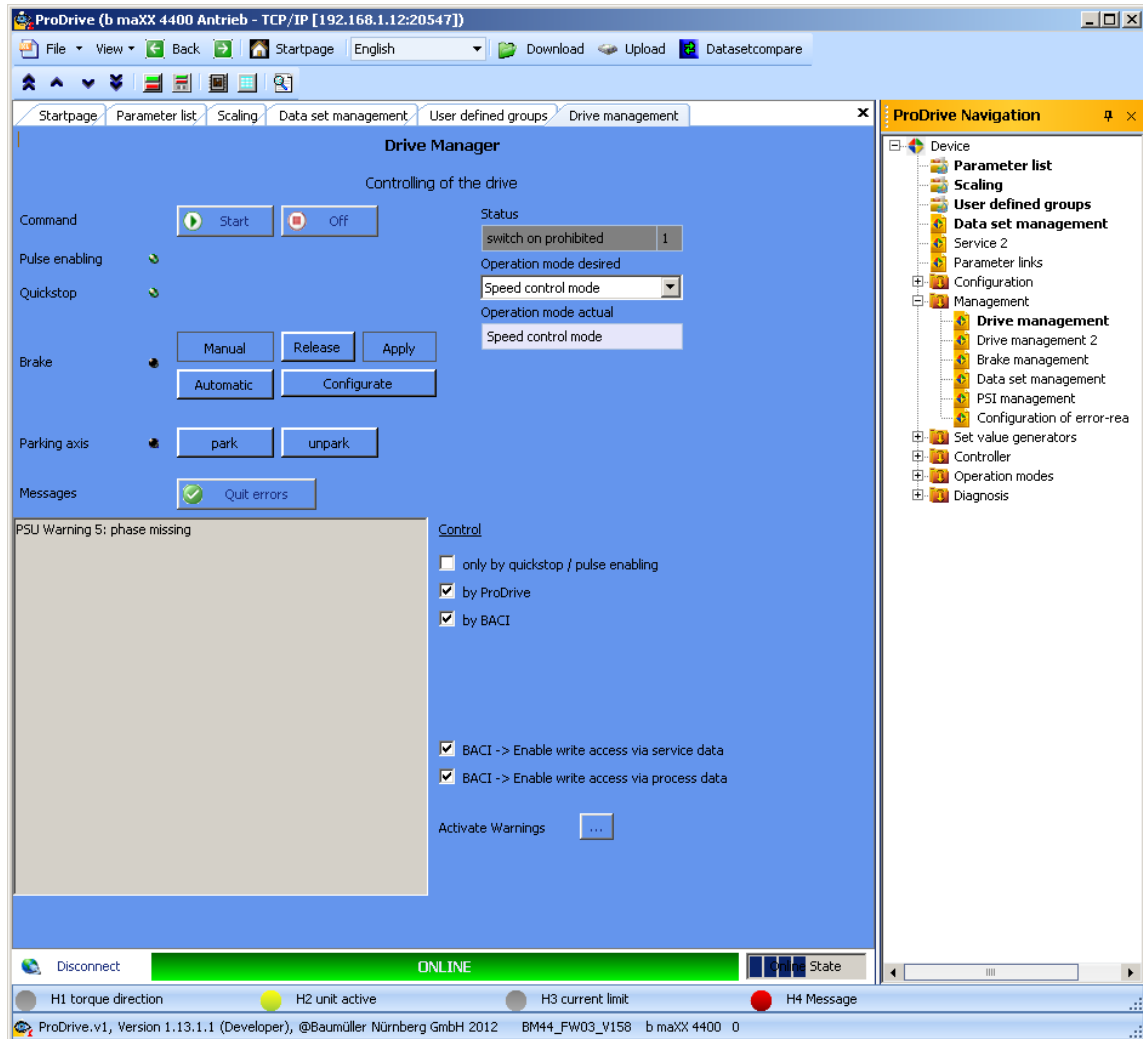


Figure 26: Drive manager ProDrive



NOTE

If you are not able to start the motor, although the red LED H4 is not 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 are errors, which have to have an immediate pulse inhibit 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, 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.

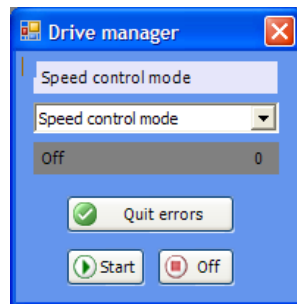


Figure 27: ProDrive Drive manager

- 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“ 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

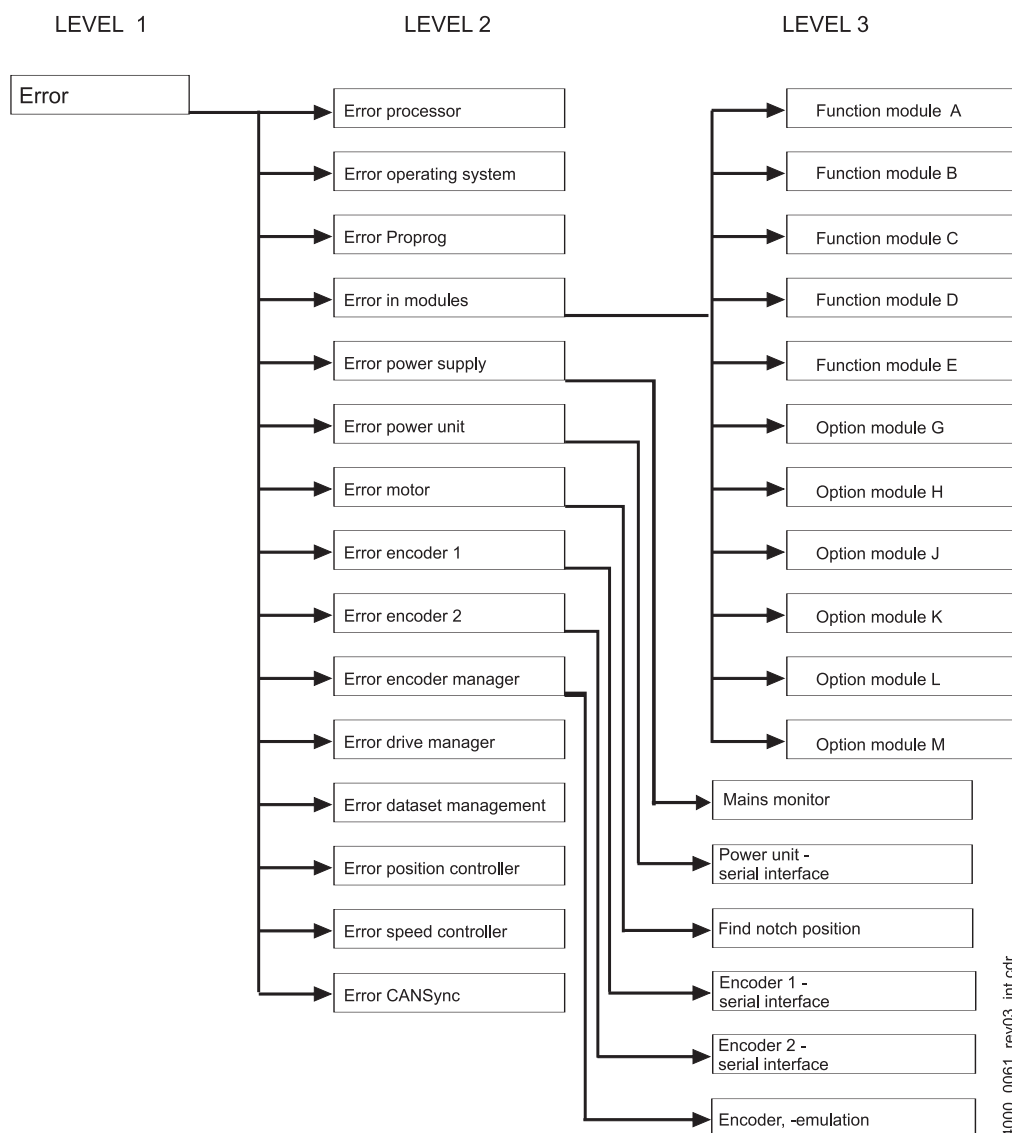


Figure 28: Survey error list

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. These errors are not shown in ProDrive/7-segment display.

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

2nd level Order of the error messages see survey ([►Abbildung 28◄](#) auf Seite 69).

3rd level 2nd level error messages are displayed on the 7-segment display in ProDrive.

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.

2nd level error messages

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 71 (= 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		

3rd level error messages



NOTE!

3rd level errors are only displayed in ProDrive separated by a decimal point from the corresponding 2nd level error (refer to ►Abbildung 28◄ auf Seite 69).

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)**

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	Pulse stop	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

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.

11.2 Disposal facilities/authorities



NOTICE!

Avoid polluting the environment as a result of improper disposal.

Therefore:

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



WARNING!

Danger as a result of faulty deinstallation!

The deinstallation and disposal requires qualified personnel with adequate experience.

Therefore:

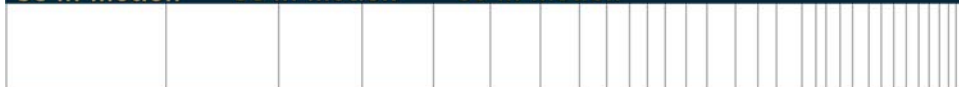
- Only allow deinstallation and disposal to be performed by qualified personnel.

11.2 Disposal facilities/authorities

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



APPENDIX A - DECLARATION OF CONFORMITY



EG - Declaration of Conformity

Doc.-No: 5.12050.00
Date: 25-Sep-2012

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

The Manufacturer:

Baumüller Nürnberg GmbH
Ostendstraße 80-90
90482 Nuremberg, Deutschland

declares that the product:

Name: b maXX

Type: Analog IO module b maXX BM4000
BM4-F-AIO-01, BM4-F-AIO-02, BM4-F-AIO-03, BM4-F-AIO-04

From manufacturing date: 1-Oct-2012

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

Applied harmonized standards:

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

The listed devices cannot be operated without a basic controller unit. The compliance to the guidelines require a correct assembly of the products and the careful attention of the associated instruction handbooks of BM4000 and of BM4-F-AIO-XX Analog-IO-Module.

The compliance to the above mentioned guidelines are checked on the basis of typical BM4000 controller configurations.

Nürnberg / 25-Sep-2012

Place / Date

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



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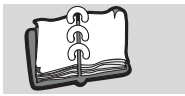


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Overview of Revisions

Version	Status	Changes
5.01045.06	25.09.2012	Revision because of AIO-04, new design
5.01045.07	13.03.2014	Revision ES controller, troubleshooting
5.01045.08	12.12.2014	Troubleshooting

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