Instruction Handbook

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be in motion be in motion

BAUMÜLLER

b maXX®
BMC-M-ECT-xx

Ethernet with EtherCAT for b maXX controller PLC

E	5.10017.02

Read the Instruction Handbook before starting any work

Preliminary Information

Note: 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 is 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, these Instruction Handbook must be passed on by the owner together with the equipment/machine.
After any sale of the equipment/machine, this original and all copies must be handed over to the buyer. After disposal or any other end use, this original and all copies must be destroyed.

When the present Instruction Handbook is handed over, corresponding sets of operating instructions 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 these Instruction Handbook unless otherwise specified in the General Conditions of Sale and Delivery.

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GENERAL

1.1 Information on the operating manual

This operating manual provides important information on handling the device. A prerequisite for safe work is compliance with all specified safety notes and procedural instructions.
Additionally, the valid accident prevention regulations and general safety regulations applicable to the scope of application the device must be complied with.

Read the operating manual, particularly the safety notes chapter, completely before beginning any work on the device. The operating manual 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 operating manual. The notes are introduced by signal words that express the extent of the danger.

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

DANGER!

....points out an imminent danger that will lead to severe injuries or death if not avoided.

WARNING!

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

CAUTION!

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

CAUTION!

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

Recommendations

NOTE!

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

1.3 Limitation of liability

All specifications and notes in this operating manual 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 operating manual
- Improper use
- Assignment of unemployed 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 incurring when assembling or connecting the device.

1.4 Copyright protection

The operating manual must be treated confidential. It is exclusively for the personnel, who work with this device. Surrendering the operating manual to third parties without written permission of the manufacturer is not permitted.

NOTE!

The specific contents, text, drawings, images and other representations are copyrighted and subject to industrial property rights. Any improper use shall be liable to prosecution.

b maXX® is a registered trademark of Baumüller Nürnberg GmbH.

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.

Also see ▷Accessories◁ from page 75.

1.7 Disposal

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

Also see ▷Disposal◁ from page 71.

1.8 Warranty provisions

The warranty 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 operating manual, 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, email or the internet.

1.10 Terms used

The terms „Plug-in module EtherCAT-slave“ or „EtherCAT-slave module“ also will be used for the product „EtherCAT-Slave for b maXX controller PLC“(BMC-M-ECT-01)

The terms „Ethernet-module“ and „EtherCAT-master“ or „EtherCAT-Master-Module“ are used for the product „Ethernet with EtherCAT-master for b maXX controller PLC“ (BMC-M-ECT-02).

The terms „Ethernet-module and „EtherCAT-cluster or „EtherCAT-cluster module“are also used for the product „Ethernet with EtherCAT-cluster for b maXX controller PLC“(BMC-M-ECT-03).

If the content refers to the product „BMC-M-ECT-xx“ in general, then the term „module“ will be used.

The term „PLC“ is also used for the product b maXX controller PLC (BMC-M-PLC-0x).

The term „power supply“ is also used for the product „power supply for b maXX controller PLC“ (BMC-M-PSB-0x).

The term „b maXX system“ is also used for the product existing of „B maXX controller PLC“, „power supply for b maXX PLC“ and where appropriate other system components.

Used abbreviations see chapter ▹Appendix A - Abbreviations◃ on page 73.

1.11 Standards

The modules EtherCAT slave for b maXX controller PLC (BMC-M-ECT-01), Ethernet with EtherCAT master for b maXX controller PLC (BMC-M-ECT-02) and Ethernet with EtherCAT cluster for b maXX controller PLC (BMC-M-ECT-03) correspond to the requirements of EN 61131-2.

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 operating manual

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

2.2 Changes and modifications to the device

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

2.3 Usage for the intended purpose

The device is conceived and constructed exclusively for usage compliant with its intended purpose described in this operating manual.

A device is considered as being used compliant with its intended purpose if all notes and information of this operating manual are adhered to.

WARNING!

Danger arising from usage for an unintended purpose!

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

Therefore:

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

2.4 Responsibility of the operator

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 operating manual, the safety, accident prevention and environmental protection regulations valid for the area of application of this device must be complied with. Whereby:

- The proprietor 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 instruction for operation of the device.
- This operating manual must be kept accessible to personnel working with the device at all times in the immediate vicinity of the device.
- The specifications of the operating manual must be adhered to completely and without exception.
- The device may only be operated in a technically faultless and operationally safe condition

2.5 Protective devices

Protection rating	
BMC-M-ETC-0x	IP 20

All devices BMC-M-xxx-xx must be installed in an appropriate control cabinet to meet the protection rating required in EN61800-5-1, chapter 4.2.3.3 (IP22).

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

- The device must be operated inside a control cabinet, that provides protection against direct contact of the devices and that meets at a minimum the requirements of EN 61800-5-1:2007, chapter 4.2.3.3.

2.6 Training of the personnel

WARNING!

Risk of injury due to insufficient qualifications!

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

Therefore:

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

In this operating manual, 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 and replacement may only be performed by trained or familiarized personnel. These persons must be familiar with the operating manual and act accordingly. Commissioning 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 respective locally applicable safety engineering standards for the upkeep and use of appropriate safety equipment.

2.7 Personal protective equipment

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

- The protective equipment necessary for each respective type of work shall always be worn during work.
- Observe the safety signs in each working area to ensure the own personal safety!

Protective clothing

is snug-fitting work clothes with low tearing resistance, narrow sleeves and with no extending parts.

No rings or chains may be worn.

Hard hat

protection against falling and flying objects.

Safety shoes

protection against heavy falling objects.

Protective gloves

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

Wear for special tasks

Protective glasses

protection of the eyes against objects, which are flying around and against splashing liquids.

2.8 Special hazards

In the following section the residual risks are specified, which result from 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.

Electricity

DANGER!

Risk of fatal injury from electricity!

There is an immediate risk of fatal injury if live elctrical 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.
- Allow work on the electrical system to be performed by qualified personnel only.
- Switch off the current when any kind of work is being performed on the electrical system and secure it against being started again.

Danger from residual energy

DANGER!

Risk of fatal injury from electrical current!

After separation of the device from the mains parts under voltage as e.g. power connections may only be touched if the capacitors in the device have been discharged.

Therefore:

- Do not touch before taking the discharge time of the capacitors and the electrically live parts into account.
- Pay attention to corresponding notes on the equipment.
- If additional capacitors are connected to the intermediate circuit, the DC-link discharge can take much longer. In this case, the necessary waiting period must be determined itself or a measurement made as to whether the equipment is de-energized.

Moving components

WARNING!

Risk of injury from moving components!

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

Therefore:

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

2.9 Fire fighting

DANGER!

Risk of fatal injury from electrical current!

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

Therefore:

- Use the following fire-extinguishing agent:

- ABC-powder / CO_2

2.10 Electrical safety

The option module is laid out for degree of pollution 2 accordant to EN 50178. This means, that only non-conductive pollutions may occur during operating time. Short-term conductivity by condensation is permitted only, if the control is out of operation.

WARNING!

Risk of injury due to conductive pollutions!

No conductive pollutions may occur during operating time.

Therefore:

- If necessary, assure with additional measures that the degree of pollution 2 is not exceeded before installing the system.

2.10.1 Notes according to the power supply

WARNING!

Risk of injury from electrical current!

Only those devices may be connected to the control, which ensure a reliable electrical isolation to the 230 V system.

The power-supply unit for the generation of the 24 volt-supply must be in accordance with the requirements for SELF/PELV referring to EN 50178.

2.11 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.

2.12 Rules of conduct in case of danger or accidents

Preventive measures

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

And if something does happen: respond properly

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

2.13 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

The working area, which is marked with this sign, is authorized for qualified personnel to work in it, only

Unauthorized persons may not touch the marked work equipment.

DANGER!

Risk of fatal injury from electrical current!

Discharge time > 1 minute

Stored electrical current!

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 itself or a measurement made as to whether the equipment is de-energized.

3

PACKAGING AND TRANSPORTATION

Every Baumüller unit is packed for shipping in such a way, that a transportation damage is unlikely.

3.1 Transportation

The plug-in modules are packed at the factory in accordance with the order.

- Avoid severe vibrations and jolts (max. 1 g).
- Avoid static discharges to the plug-in module's electronic components.
- Do not remove the plug-in module from its protective packaging until just before you intend to mount it.

3.2 Unpacking

After receiving the unit while it is still packaged:

- Check whether there is any visible damage!

If there is:

- Complain to the delivery company. Have your complaint confirmed in writing and contact your nearest Baumüller Nürnberg GmbH subsidiary immediately.

CAUTION!

Danger from electrostatic discharge

If you touch the plug-in module, and especially its electronic components, and subject them to electrostatic discharges, the module can be damaged or even totally destroyed.

Therefore:

- When handling the plug-in module, always observe the regulations and information on handling electrostatically sensitive components.

If no damage is visible:

- Open the unit's packaging.
- Check the scope of supply against the delivery note.

The scope of supply is:

- Module EtherCAT for b maXX controller PLC (BMC-M-ECT-xx)
- Operating manual

Complain to your local Baumüller subsidiary if you find damage or if the delivery is not complete.

3.3 Disposing of the packaging

The packaging consists of cardboard and plastic.

- Observe local disposal regulations if you intend to dispose of the packaging.

3.4 Observe during transportation

The unit was packaged at the manufacturer's plant for initial transportation. If you have to transport the unit at a later date, please note the following points:

- Use the original packaging material

or

- Use packaging that is suitable for electrostatic sensitive devices.

Ensure that the transportation conditions are fulfilled during the total transportation, see ▹Appendix D - Technical Data◃ on page 81,

4

DESCRIPTION OF THE MODULE ETHERCAT

In this chapter we describe the module EtherCAT for b maXX controller PLC and explain the type key on the module.

4.1 Structure

4.1.1 Module EtherCAT-Slave BMC-M-ECT-01

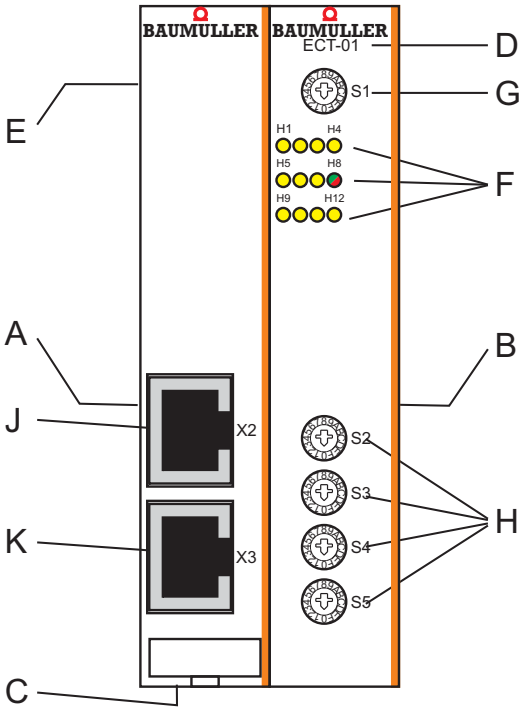


Figure 1: Module EtherCAT-Slave

A - Female connector (to additional system components)
B - Connector (to additional system components
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1 (module address)
H - Switch S2, S3, S4, S5 (IP-address)
J - EtherCAT slave in
K - EtherCAT slave out

4.1.2 Module Ethernet with EtherCAT-Master BMC-M-ECT-02

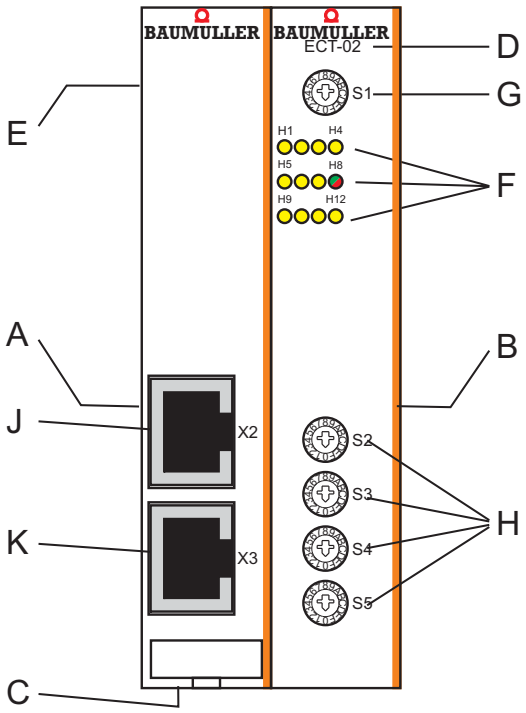


Figure 2: Modul Ethernet with EtherCAT-Master

A - Female connector (to additional system components)
B - Connector (to additional system components)
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1 (module-address)
H - Switch S2, S3, S4, S5 (IP-address)
J - EtherCAT-Master
K - Ethernet

4.1.3 Module Ethernet with EtherCAT-Cluster BMC-M-ECT-03-11-01

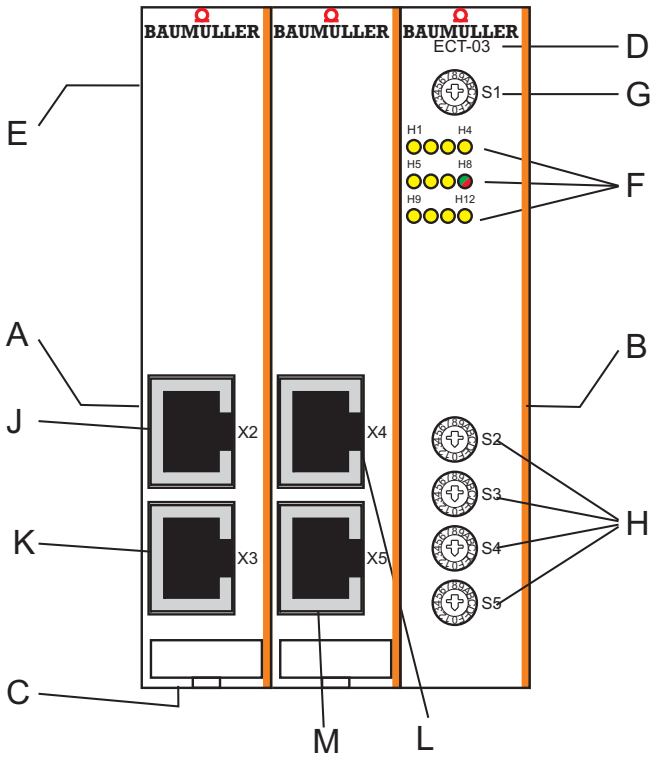
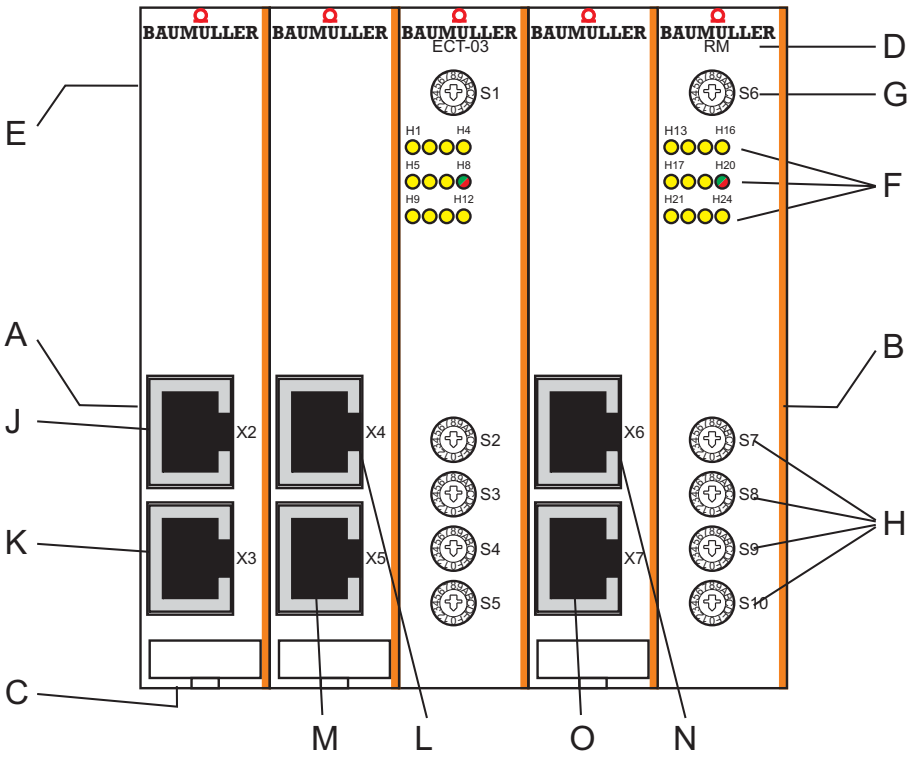


Figure 3: Module Ethernet with EtherCAT-Cluster

A - Female connector (to additional system components)
B - Connector (to additional system components)
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1 (module-address)
H - Switch S2, S3, S4, S5 (IP-address)
J - EtherCAT-Slave in
K - EtherCAT-Slave out
L - EtherCAT-Master
M - Ethernet

4.1.4 Module Ethernet with EtherCAT-Cluster (Redundant Master) BMC-M-ECT-03-12-02



A - Female connector (to additional system components)
B - Connector (to additional system components)
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1 (module-address)
H - Switch S2, S3, S4, S5 (IP-address)
J - EtherCAT-Slave in
K - EtherCAT-Slave out
L - reserved
M - Ethernet
N - EtherCAT-Master out
O - EtherCAT-Master in

Figure 4: Module Ethernet with EtherCAT-Cluster with redundant Master

Example of an assembled b maXX system:

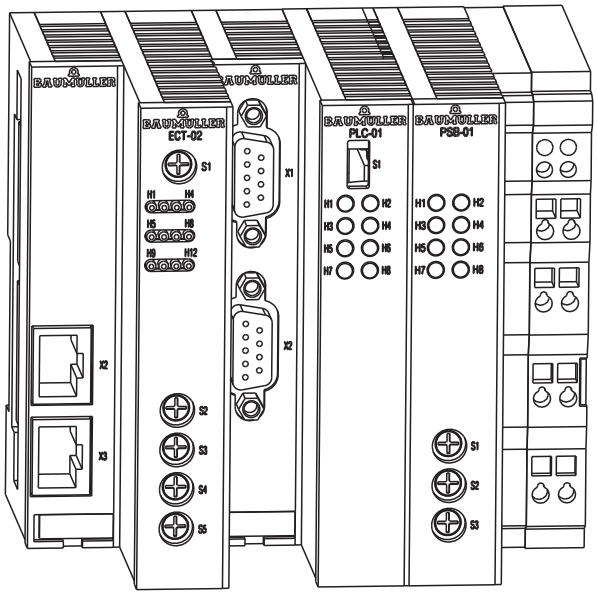


Figure 5: Ethernet with EtherCAT-Master + b maXX controller PLC and power supply

NOTE!

If the module is not plugged to the b maXX controller PLC (or a other system component for b maXX controller PLC) the b maXX system does not operate.

4.2 Danger zones

The following gives an overview of the danger zones of the module.

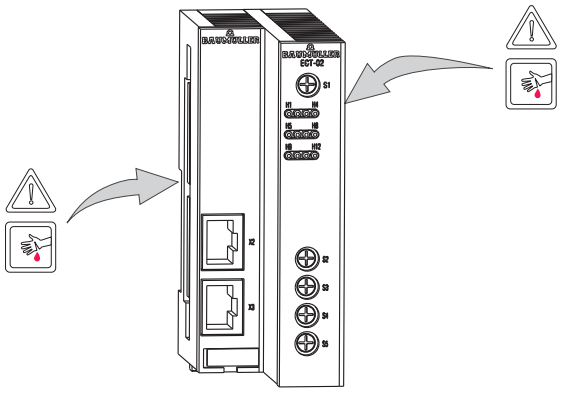


Figure 6: Danger zones

The module can represent a further danger, if an application program on the b maXX controller PLC approaches a machine or an installation and this machine or installation causes unintended or incorrect actions and consequently represents a danger.

4.3 Identification of the option module - type code

This type code is found on the side of the module („E“ in ▹Figure3◃ on page 24).

NOTE!

This type code is for the module „EtherCAT for b maXX controller PLC“ only. Other modules possess an own type code.

BMC - M - ECT - XX - YY- ZZ	Device generation, for which the module can be used
BMC - M - ECT - XX - YY - ZZ	Module
BMC - M - ECT - XX - YY - ZZ	Module type (for b maXX controller PLC)
BMC - M - ECT - XX - YY - ZZ	Version module

01: EtherCAT-slave
02: Ethernet with EtherCAT-master
03: Ethernet with EtherCAT-cluster

BMC - M - ECT - XX - YY - ZZ — Version hardware

10: Standard version
11: Cluster
12: Cluster with redundant master

BMC - M - ECT - XX - YY - ZZ — Version software

00: Standard version
01: Cluster
02: Cluster with redundant master

This type code is found on the side of the module („E“ in ▹Figure3◃ on page 24).The type code contains basic data of the module. A collection of the technical data is found in ▹Appendix D - Technical Data◃ from page 81.

4.3 Identification of the option module - type code

5

ASSEMBLY AND INSTALLATION

In this chapter we describe the mechanical assembly and the electrical installation of the module for b maXX controller PLC.

The assembly/installation consists of the following steps:

1 Mount the module.

2 Connect EtherCAT / Ethernet EtherCAT / Ethernet connecting cables.

5.1 General safety regulations

- Observe the information in the chapter ▹Safety◃ from page 11.
- Observe all areas on the b maXX system that could be dangerous when you are carrying out assembly.

The figure below gives you an overview of the danger zones on the module.

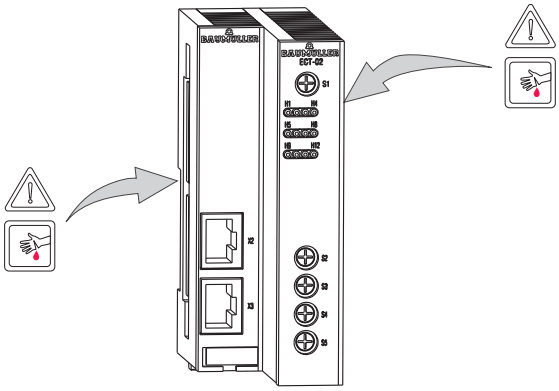


Figure 7: Danger zones

5.2 Requirements to the executing personnel

DANGER!

Risk of fatal injury from electric current!

The b maXX system and the environment in the control cabinet may carry dangerous voltages.

Therefore

- Before starting any work, ensure that the b maXX system and its environment are free of voltage.
- Observe the relevant safety regulation when handling high-voltage devices.
- Ensure that only qualified personnel assembles and installs this module.

Qualified personnel is considered to be persons whose training, experience and knowledge of relevant standards and regulations, accident prevention regulations and conditions in the plant has led to them being authorized by the safety facility manager to carry out activities that are needed in each case while recognizing and avoiding any possible hazards that might arise. The qualifications that are necessary for working with the unit include, for example:

- Trained or instructed in accordance with the safety standards in the care and use of appropriate safety equipment.

5.3 Preparing assembly

The assembly is made on the base of the project planning documents for the facility. On the base of the required mounting space (see ▹Installation space◃ on page 31) the mounting location of the 35 mm C-profile (top hat rail, see ▹Appendix D - Technical Data◃ from page 81) and the dimensions of the mounting holes of the 35 mm C-profile can be determined.

CAUTION!

Eye injury due to catapulting particles!

While executing the drillings and the cut-out metal particles are catapulted.

Therefore:

Wear Safety glasses

to protect the eyes against catapulting particles and splashing liquids.

➲ Carry out the drillings and mount the 35 mm C-profile.

5.4 Installation space

The following drawings show the height dimensions and the depth gauge of the modules of the b maXX system. Use these drawings in order to determine the required space in the control cabinet.

The module's width is variable. In order to determine the width of the b maXX system, the width of the modules, which want to be used must be added. If necessary, pay attention to the restrictions of the number of modules which can be used at one power supply unit

Module	Width if inte-grated	Width if removed
BMC-M-ECT-01/02	38 mm	46 mm
BMC-M-ECT-03-11-01	57 mm	65 mm
BMC-M-ECT-03-12-02	95 mm	103 mm

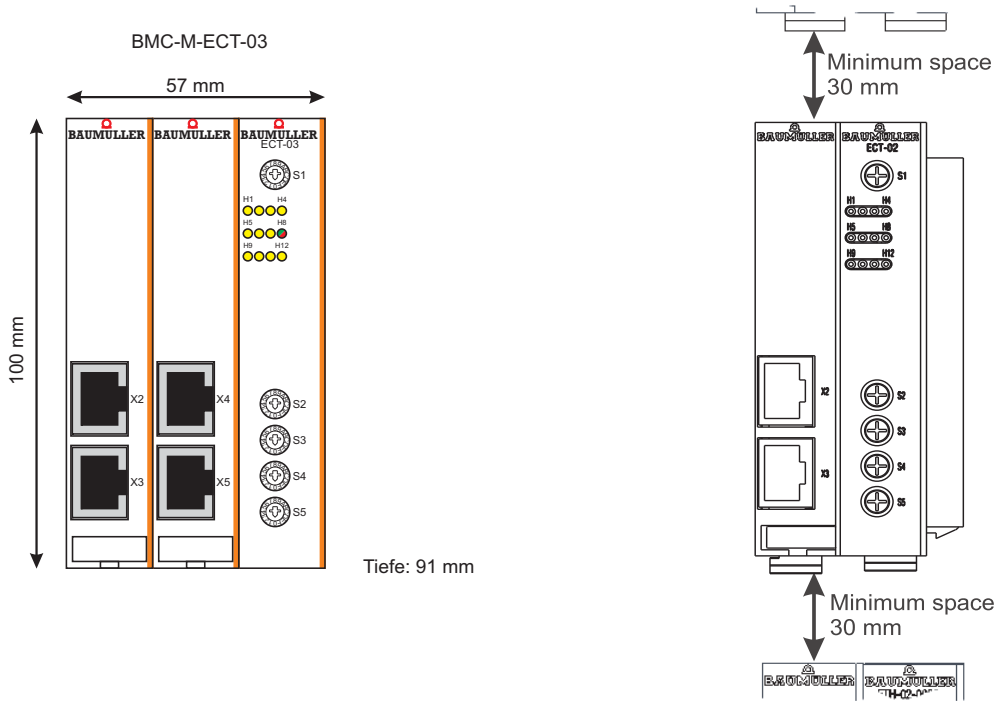


Figure 8: Installation space b maXX system

NOTE!

The specified spaces are minimum clearances. These spaces may increase because of the cable routing (see ▹Installation sequence◃ from page 41).

5.5 Assembly instructions

Please note that the module can be assembled with the b maXX controller PLC only (or with additional system components at b maXX controller PLC).

Therefore, be prepared to keep the b maXX controller PLC with power supply unit and if necessary additional system components for the b maXX controller ready for the assembly of the module.

DANGER!

Danger to life due to electrical voltage!

b maXX system and environment in the control cabinet may cause life-threatening voltages.

Therefore:

- Before starting to work, ensure that the b maXX system and the environment is de-energized.
- Observe to the relevant safety instructions, when handling with high-voltage carrying devices.

The following working materials are necessary:

- Suitable tools to open the spring-force terminals of the electric connections (e.g. screwdriver with a blade width of 2 mm).
- Suitable tools to pull the white grip out at the bottom of the module (e.g. electronic pliers).

➲ By means of the type code on the type plate ensure that the correct module is held in readiness („E“ in the following figures).

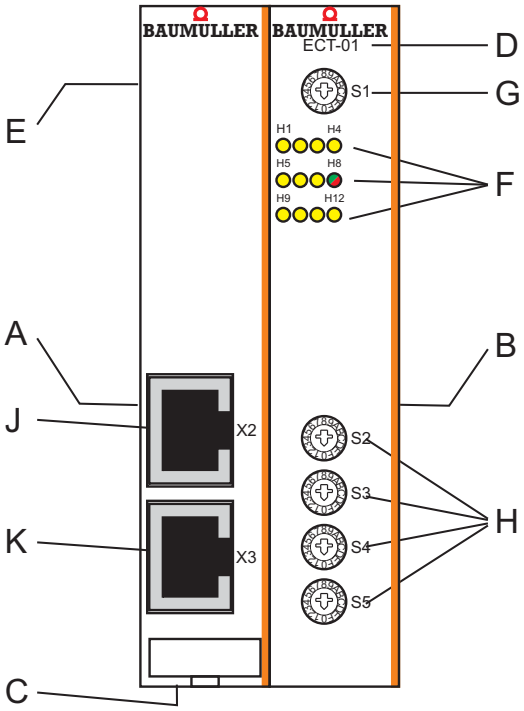


Figure 9: Module EtherCAT-Slave BMC-M-ECT-01

A - Female connector (to additional system components)
B - Connector (to additional system components
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1 (module address)
H - Switch S2, S3, S4, S5 (IP-address)
J - EtherCAT slave in
K - EtherCAT slave out

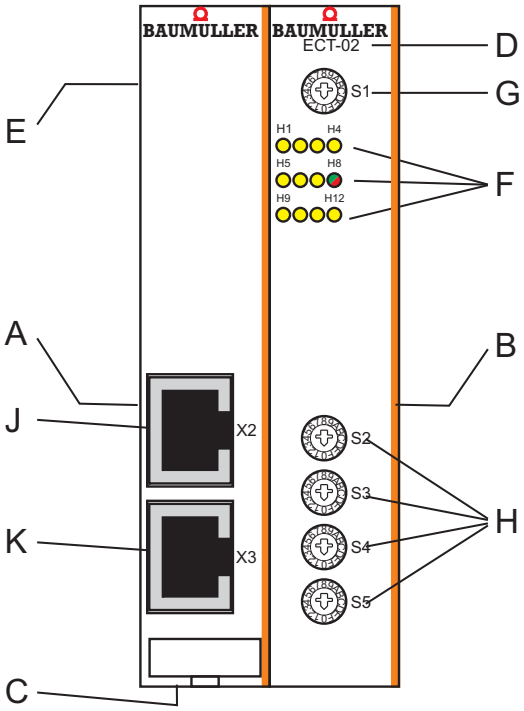
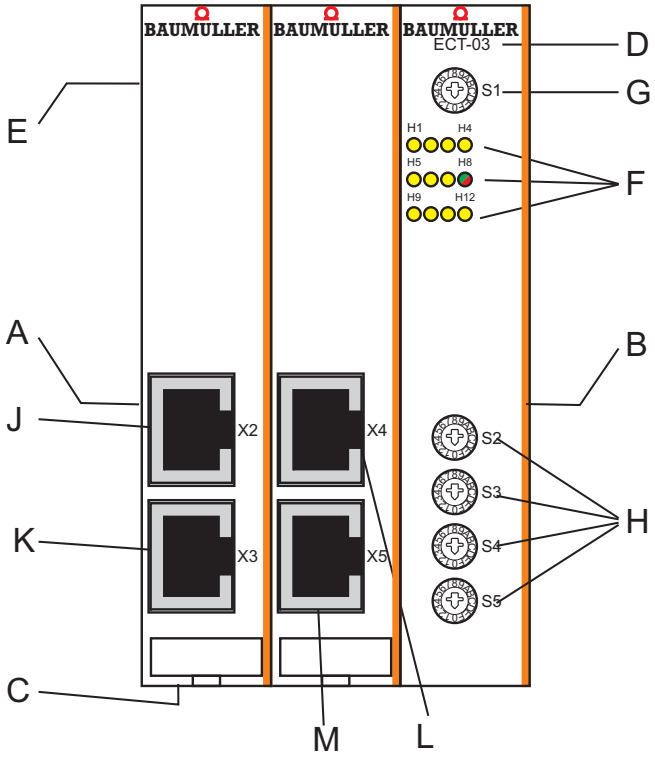


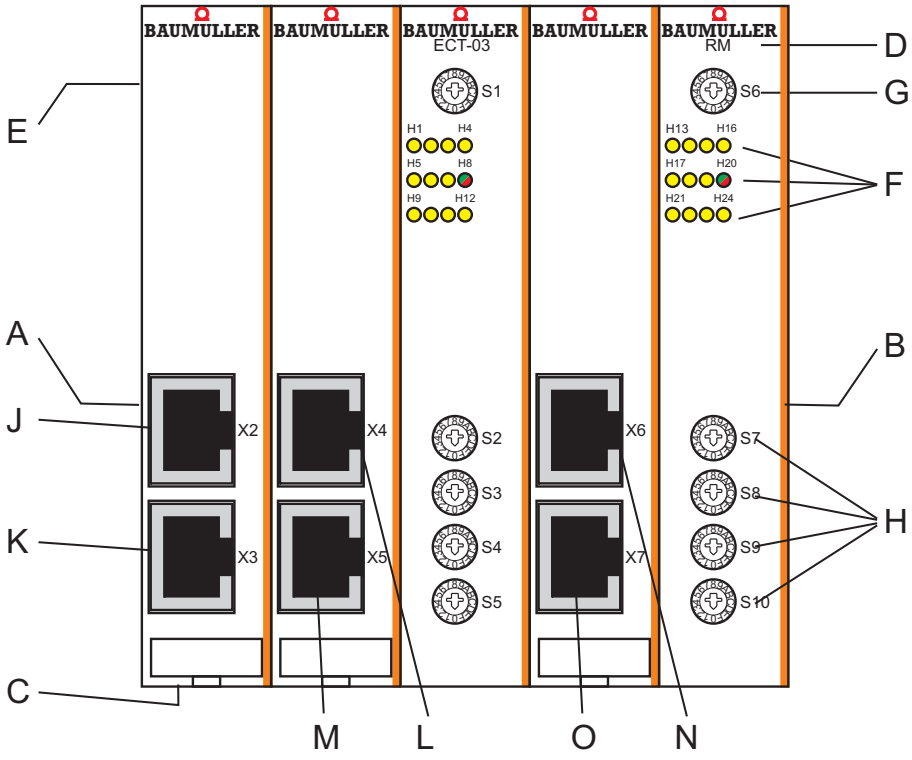
Figure 10: Module Ethernet with EtherCAT-master BMC-M-ECT-02

A - Female connector (to additional system components)
B - Connector (to additional system components
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1 (module address)
H - Switch S2, S3, S4, S5 (IP-address)
J - EtherCAT-master
K - Ethernet



A - Female connector (to additional system components)
B - Connector (to additional system components
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1 (module address)
H - Switch S2, S3, S4, S5 (IP-address)
J - EtherCAT-slave in
K - EtherCAT-slave out
L - EtherCAT-master
M - Ethernet

Figure 11: Module Ethernet with EtherCAT-Cluster BMC-M-ECT-03-11-01



A - female connector (to additional system components)
B - Connector (to additional system components)
C - Release grip (white)
D - Short term
E - Type plate (on the side)
F - LEDs
G - Switch S1, S6 (module address
H - Switch S2, S3, S4, S5 (IP-address for slave)
S7, S8, S9, S10 (IP-address for master)
J - EtherCAT-slave in
K - EtherCAT-slave out
L - reserved
M - Ethernet
N - EtherCAT-master out
O - EtherCAT-master in

Figure 12: Module Ethernet with EtherCAT-Cluster with redundant master BMC-M-ECT-03-12-02

1 If necessary switch off the voltage supply of the power supply unit against accidental switch-on during assembly. If necessary disassemble cables/wires, which already have been connected from the connections.

2 Open the control cabinet

3 Assemble the EtherCAT-module to the b maXX controller PLC and to the power supply unit.

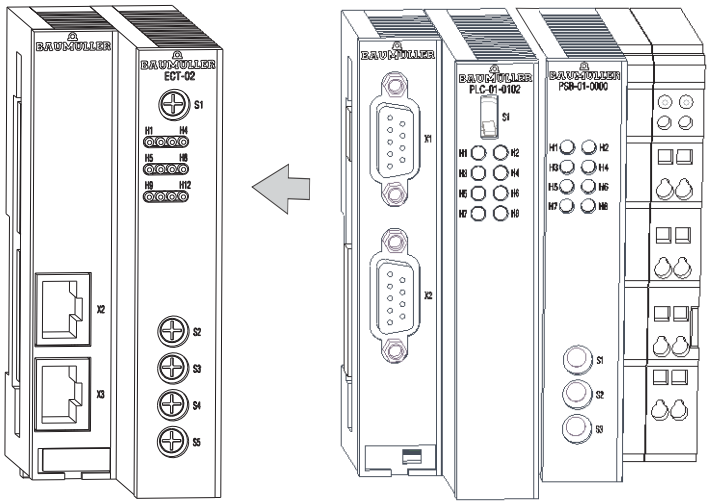


Figure 13: Ethernet with EtherCAT-master + b maXX controller PLC and power supply unit

In case additional system components for the b maXX controller PLC are used, attach these from the left to the EtherCAT module.

NOTE!

If the module is not attached to the b maXX controller PLC (or to an additional system component for the b maXX controller PLC) the b maXX system will not operate.

4 There is a white grip on the bottom of the left part of the power supply unit. Pull this grip downwards and then forwards. The grip engages easily.
Repeat this step at the b maXX controller PLC (depending on the version there are 2 or 3 grips).
Repeat this step at the module for b maXX controller PLC (depending on the version there are 2, 3 or 5 grips).
Repeat this step if necessary at additional system components for the b maXX controller PLC (which also are on the left of the b maXX controller PLC).

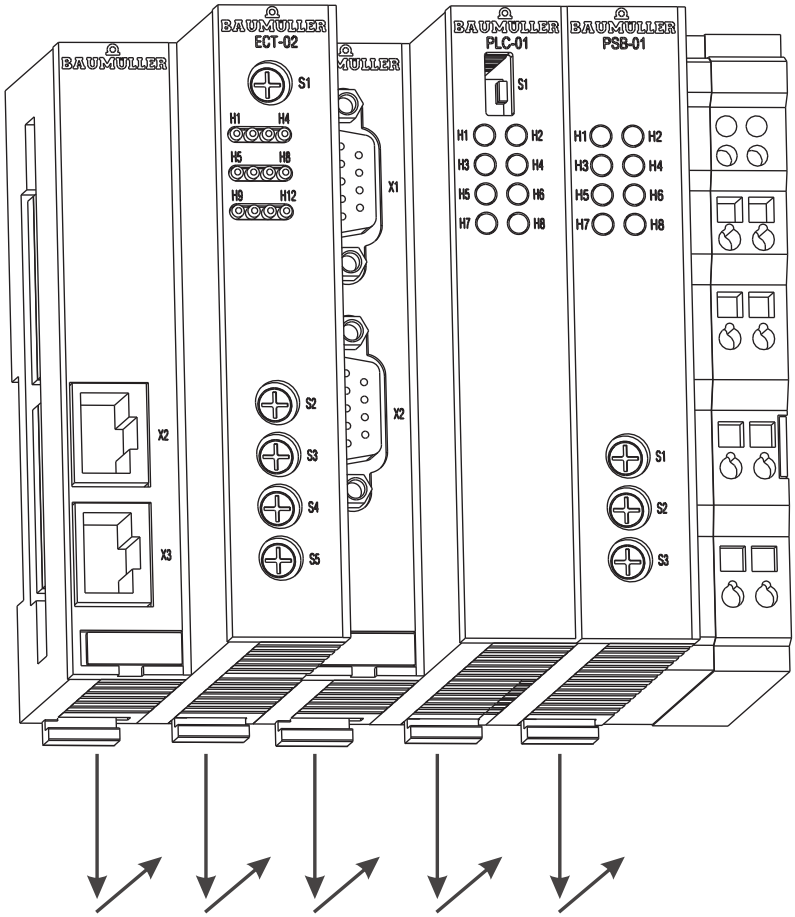


Figure 14: Ethernet with EtherCAT-Master, b maXX controller PLC and power unit supply

5 With a small screwdriver pull the orange-colored grip on the right part of the power supply unit forward, so that the grip can be reached well.

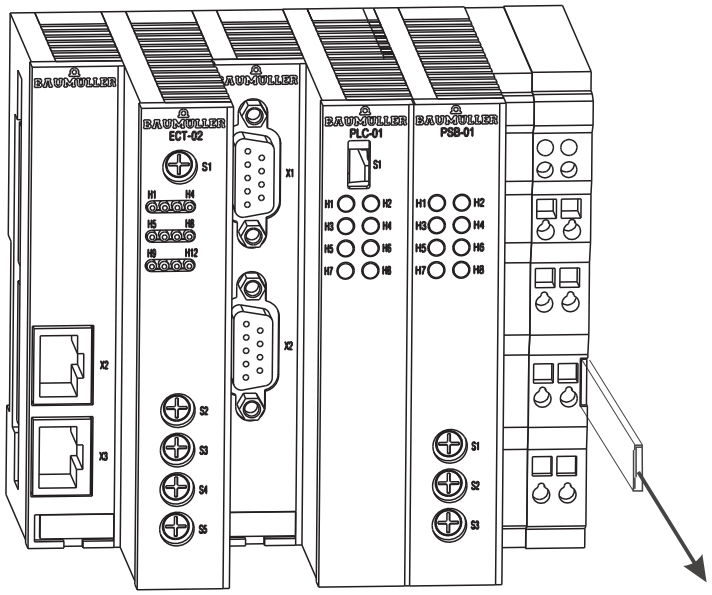


Figure 15: Ethernet with EtherCAT-Master, b maXX controller PLC, power supply unit

6 Now attach the module block to the 35 mm C-profile and hold it.

7 Pull the orange-colored grip forward on the right part of the power supply unit and at the same time push the module block towards the rear.

8 Let the orange-colored grip go. The right part engages on the 35 mm C-profile.

9 Slide the orange-colored grip in the module. Thus an accidental breaking-off of the grip is avoided.

10 Press the white grip at the bottom of the left part of the power supply unit towards the rear. The white grip disengages and the left part of the power supply unit engages on the 35 mm C-profile.
Repeat this step at the b maXX controller PLC (according to the version either 2 or 3 grips). Thereby the b maXX controller PLC engages on the 35 mm C-profile.
Repeat this step at the module for the b maXX controller PLC (according to the version either 2, 3 or 5 grips). Thereby the module engages on the 35 mm C-profile.
Repeat this step if necessary at additional system components for the b maXX controller PLC (which also are attached on the left of the b maXX controller PLC). Thereby the additional system components engage on the 35mm C-profile.

11 Now additional system components (e g I/O modules) can be assembled to the right side of the power supply unit. Observe the according instruction handbooks.

12 Set the module address at the switch S1. This module is necessary in order to exchange data from the b maXX controller PLC with the module.

Figure 16: Example: Setting of the module address 1 (switch S1 to 1)

NOTE!

Two different module addresses must be set at the module EtherCAT cluster with redundant master (BMC-M-ECT-03-12-02) at the switch S1 (for the slave) and at the switch S6 (for the master). Possible addresses: 1 to 4.

13 Set the switches S2 to S5 (S7 to S10) according to your project requirements (your ProMaster project).

Figure 17: Example: Setting of the coding value 16H0009
(switch S2, S3 and S4 to 0, switch S5 to 9)

The switch setting may affect the module's IP address. Also see ▹Switch S2 to S5 (S7 to S10) in order to set the IP-address for Ethernet◃ from page 53.

5.6 Installation

The module Ethernet is cabled with EtherCAT for b maXX controller PLC when installing.

5.6.1 Connection diagrams

BMC-M-ECT-01:

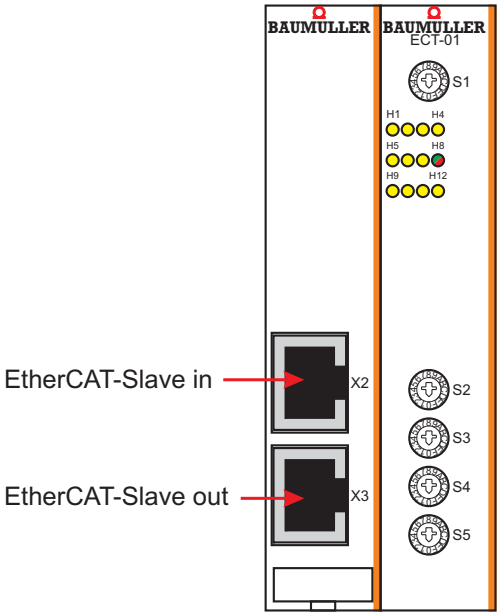


Figure 18: Connection diagram EtherCAT-Slave for b maXX controller PLC

BMC-M-ECT-02:

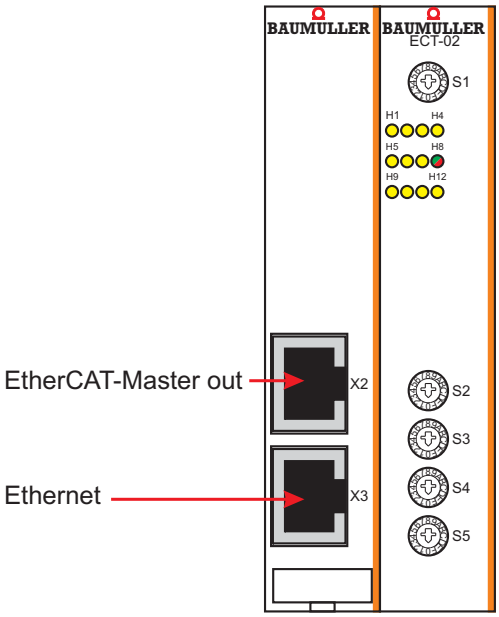


Figure 19: Connection diagram Ethernet with EtherCAT-master for b maXX controller PLC

BMC-M-ECT-03-11-01:

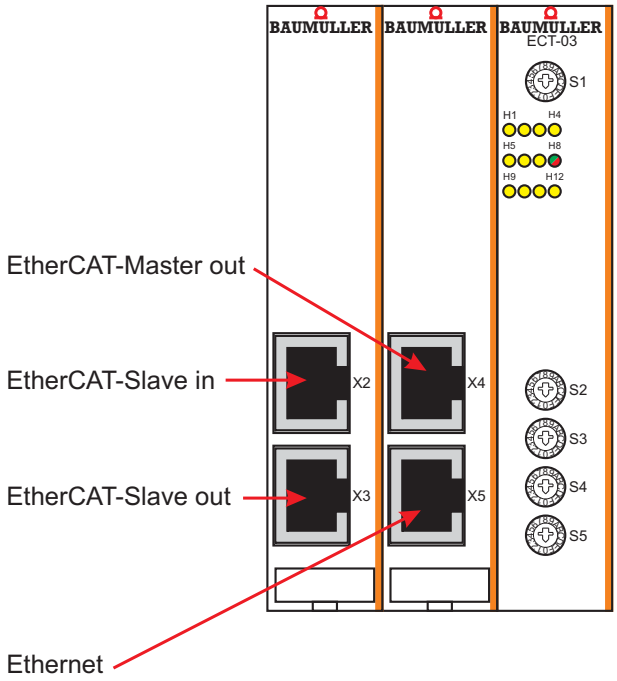


Figure 20: Connection diagram Ethernet with EtherCAT-cluster for b maXX controller PLC

BMC-M-ECT-03-12-02:

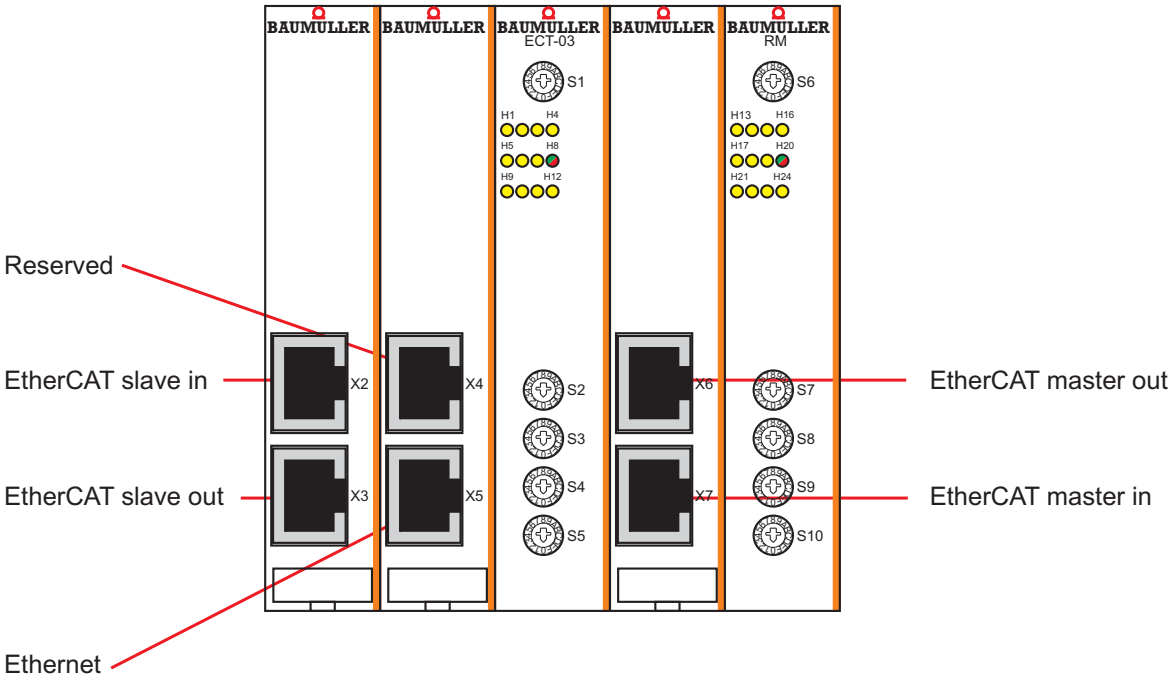


Figure 21: Connection diagram Ethernet with EtherCAT-cluster (redundant master) for b maXX controller PLC

Details for the pin assignment of X2 to X5 see ▹Appendix D - Technical Data◃ from page 81.

5.6.2 Requirement to the electrical connection

CAUTION!

Danger due to electrical voltage!

If you are not able to ensure the module's requirements of the electrical connection, the module can be damaged or destroyed.

Therefore:

- Ensure that the specified connection values in the technical data are complied with and that the connections are made in accordance with the specification.
- Avoid short-circuits between inputs/outputs. In the case of a short-circuit between inputs/outputs, the module can be destroyed.

To be able to comply with Standard EN 60 204-1 (Electrical Equipment of Machines), the cables that are suggested in the standard must be used. The connectors may not fall out, otherwise there is a risk of short-circuits or external voltages, etc.

➲ Ensure EMC-appropriate laying of the connection cables.

5.6.3 Requirements to the Connection cable

The following cables have been released from Baumüller for use:

- EtherCAT-communication cable K-ETH-33-0-xx (see appendix ▹B.1 List of all Accessories◃ on page 75)
- Ethernet-cable K-ETH-33-0-xx and crossover-adapter or coupling (see appendix ▹B.1.2 Ethernet-Cable◃ from page 75)

5.6.4 Installation sequence

➲ Make sure that the b maXX device is de-energized.

➲ Make sure that the external voltage supply is switched off and protected against being restarted again.

5.6.4.1 BMC-M-ECT-01

➲ **EtherCAT-Slave in:**
Connect the 8-pole RJ45-connectors X2 (EtherCAT-slave in) with the EtherCAT communication cable.

➲ **EtherCAT-Slave out:**
Connect the 8-pole RJ45-connectors X3 (EtherCAT-slave out) with the EtherCAT communication cable, pin assignment see ▹Appendix D - Technical Data◃ from page 81.

5.6.4.2 BMC-M-ECT-02

➲ **EtherCAT-Master out:**
Connect the 8-pole RJ45-connector X2 with the EtherCAT communication cable, pin assignment see ▹Appendix D - Technical Data◃ from page 81.

- **Ethernet:**
  Connect the 8-pole RJ45-connector X3 with the Ethernet communication cable (CAT5-twisted pair), pin assignment see ▹Appendix D - Technical Data◃ from page 81.
  The option module Ethernet detects the network types 10BaseT (10 Mbit) and 100BaseTX (100 Mbit) during the running operation and automatically adjusts. The Ethernet module also can be connected directly to a PC optional to the connection with a star coupler (hub or switch). In this case a cross-link cable must be used.

5.6.4.3 BMC-M-ECT-03-11-01

- **EtherCAT-Slave in:**
  Connect the 8-pole-connector X2 (EtherCAT-slave in) with the EtherCAT communication cable.
- **EtherCAT-Slave out:**
  Connect the 8-pole RJ45-connector X3 (EtherCat-slave out) with the EtherCAT communication cable, pin assignment see ▹Appendix D - Technical Data◃ from page 81.
- **EtherCAT-Master out:**
  Connect the 8-pole RJ45-connector X4 with the EtherCAT communication cable, pin assignment see ▹Appendix D - Technical Data◃ from page 81.
- **Ethernet:**
  Connect the 8-pole RJ45-connector X5 with the Ethernet communication cable (CAT5-twisted pair), pin assignment see ▹Appendix D - Technical Data◃ from page 81.
  The Ethernet module detects the network types 10BaseT (10 MBit) and 100BaseTX (100 MBit) during the running operation and automatically adjusts. The Ethernet module also can be connected directly to a PC, optional to the connection with a star coupler (hub or switch). In this case, a cross-link cable must be used.

5.6.4.4 BMC-M-ECT-03-12-02 (redundant master)

- **EtherCAT-Slave in:**
  Connect the 8-pole-connector X2 (EtherCAT slave in) with the EtherCAT communication cable.
- **EtherCAT-Slave out:**
  Connect the 8-pole RJ45-connector X3 (EtherCAT-slave out) with the EtherCAT communication cable, pin assignment see ▹Appendix D - Technical Data◃ from page 81.
- Connector X4 reserved
- **Ethernet:**
  Connect the 8-pole RJ45-connector X5 with the Ethernet communication cable (CAT5-twisted pair), pin assignment see ▹Appendix D - Technical Data◃ from page 81.
  The Ethernet module detects the network types 10BaseT (10 Mbit) and 100BaseTX (100 Mbit) during the running operation and automatically adjusts. The Ethernet module also can be connected directly to a PC, optional to the connection with a star coupler (hub or switch). In this case, a cross-link cable must be used.
- **EtherCAT-Master in and out:**
  Connect the 8-pole RJ45-connectors X6 and X7 with the EtherCAT communication cable, pin assignment see ▹Appendix D - Technical Data◃ from page 81.

5.6.4.5 All Modules

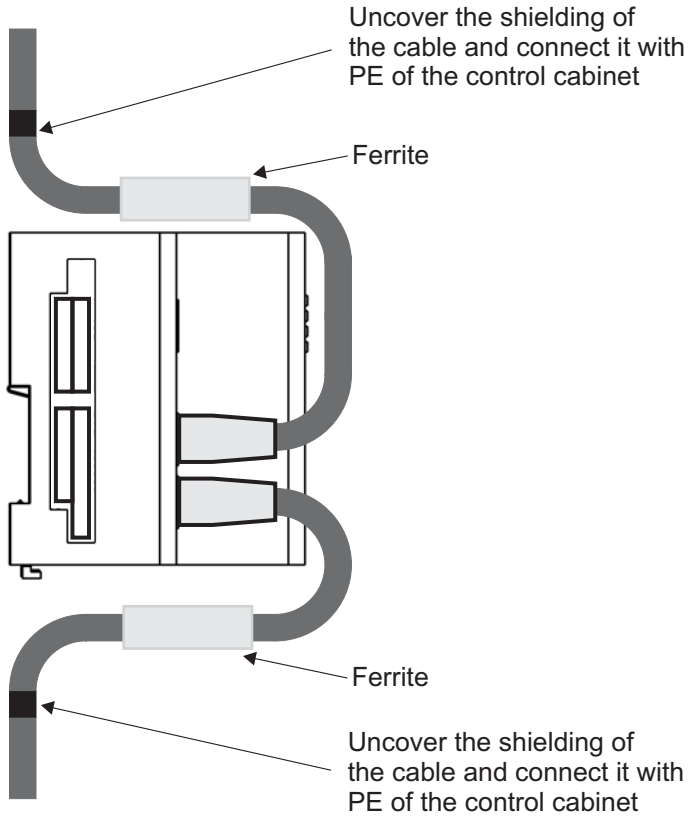


Figure 22: Cable running

Run the cable connection according to the instructions in ▹Figure 22◃. At first uncover the shielding. The length of the uncovered shielding must accord to the width of the mounting clamp. The cable must be fastened with the mounting clamp in such a way that there is a connection between the shielding of the cable and the PE of the control cabinet.

- Apply a ferrite at each cable between the connector and the applying position at the mounting plate (see ▹Figure 22◃ and appendix Accessories ▹B.1.3 Ferrites◃ on page 76).

The installation now is completed.

6

COMMISSIONING

In this chapter we describe the commissioning of the mounted and installed (see ▹Assembly and Installation◃ from page 29) module for b maXX controller PLC. The commissioning assures that the module for b maXX controller PLC operates correctly.

Before starting commissioning assure that the following conditions are fulfilled:

1 Module is mounted correctly.

2 All the safety devices are operating

3 The b maXX device is ready for use.

6.1 General Safety Regulations

➲ Observe to the chapter ▹Safety◃ from page 11.

WARNING!

Risk of injury due to moving parts!

The machine- / installation parts or the total machine / installation can move during commissioning.

Therefore:

- Remain at a safe distance from moving machine parts / installation parts or from the moving machine / installation.
- Observe, that the machine parts / installation parts or the machine / installation can be moved via the (at the b maXX safe PLC) connected additional modules.
- Be sure to activate their safety devices .

6.2 Requirement for the personnel carrying out the work

Commissioning work may be carried out by trained specialists only, who have understood the safety regulations and information and can implement these.

6.3 Description/inspection of the safety and monitoring systems

Before commissioning the module for b maXX controller PLC, it must be assured that the +24 V DC supply at the power supply unit for the b maXX controller PLC is correctly connected and that the +24 V DC supply corresponds to the specifications from the instruction handbook Power supply unit for b maXX controller PLC. Commissioning may not be continued, until this was checked and ensured.

Be aware during commissioning, that the module can only be commissioned together with the b maXX controller PLC, the power supply unit and if necessary additional system components.

6.4 Description and inspection of the controls and displays

6.4.1 Configuration examples

6.4.1.1 Configuration example BMC-M-ECT-01

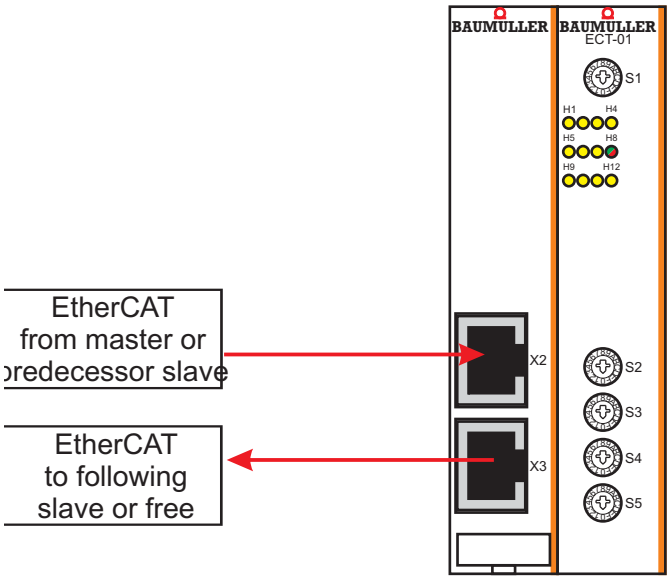


Figure 23: Example of a configuration module EtherCAT slave

6.4.1.2 Configuration example BMC-M-ECT-02

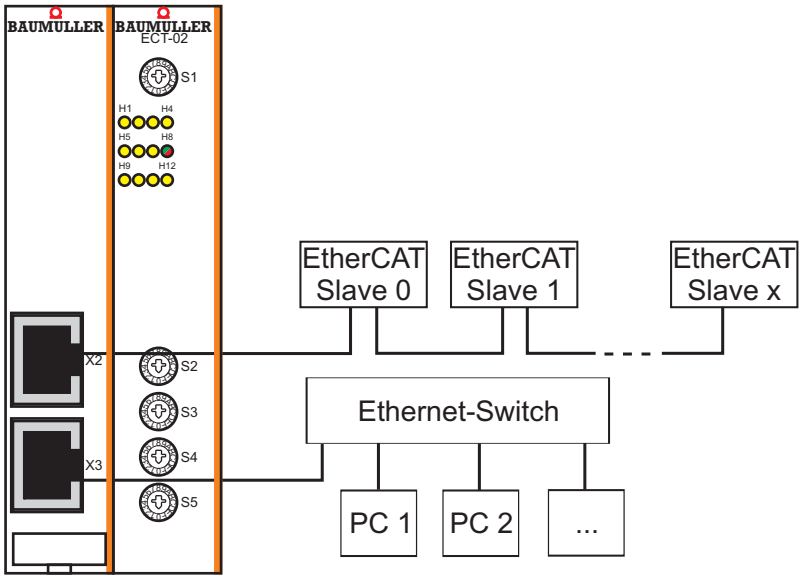


Figure 24: Example of a configuration module Ethernet with EtherCAT master

6.4.1.3 Configuration example BMC-M-ECT-03-11-01

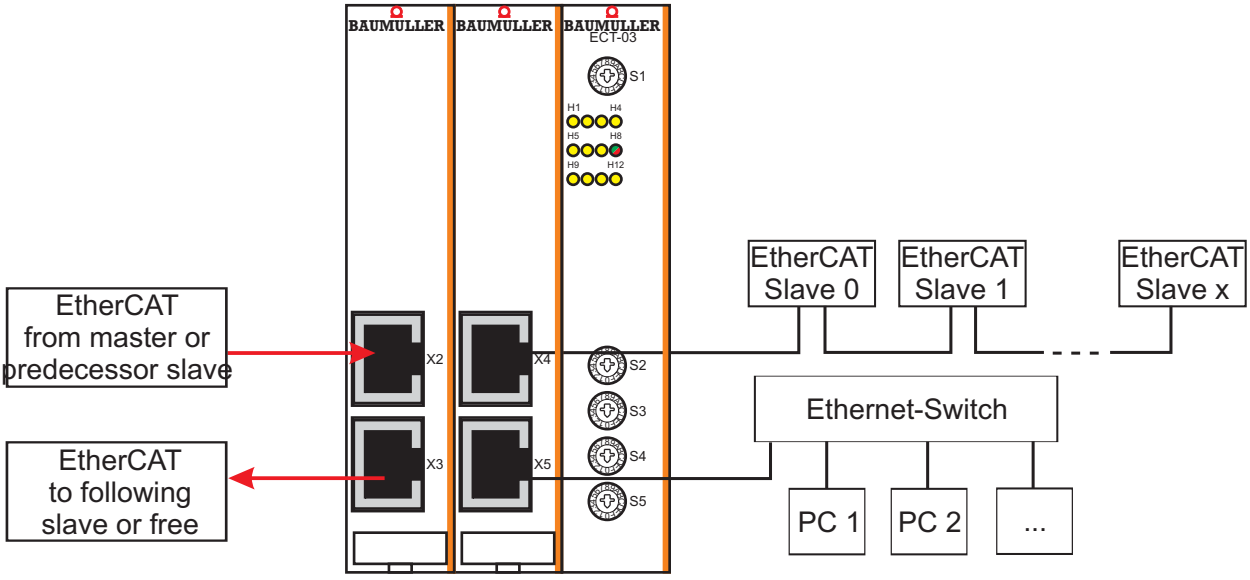


Figure 25: Example of a configuration module Ethernet with EtherCAT cluster

6.4.1.4 Configuration example BMC-M-ECT-03-12-02 (redundant master)

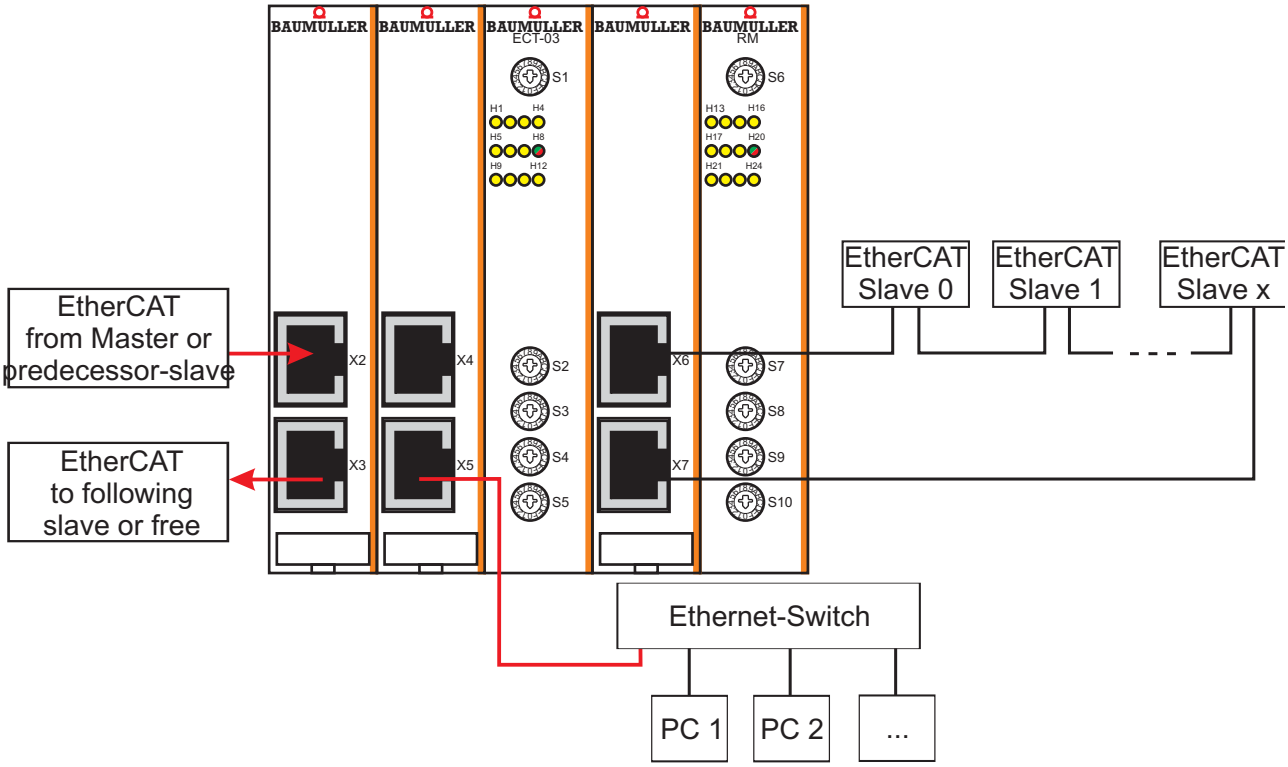


Figure 26: Example of a configuration module Ethernet with EtherCAT-Cluster with redundant master

6.4.2 LEDs for the display of operating states

The module for b maXX controller PLC shows twelve LEDs (eleven orange-colored (H1, …, H7, H9, ..., H12) as display elements and a green/red (H8) (see „F“ in ▹Figure 11◃ on page 34).

During initialization (ramp-up phases) and during the operation (after the ramp-up phase) the LEDs have different meanings.

LEDs

H1 ⊗ orange	⊗ orange	⊗ orange	H4 ⊗ orange
H5 ⊗ orange	⊗ orange	⊗ orange	H8 ⊗/⊗ gr/red
H9 ⊗ orange	⊗ orange	⊗ orange	H12 ⊗ orange

The sequences of the individual LEDs are explained in the following. The blinking sequence have the following time diagrams as a basis:

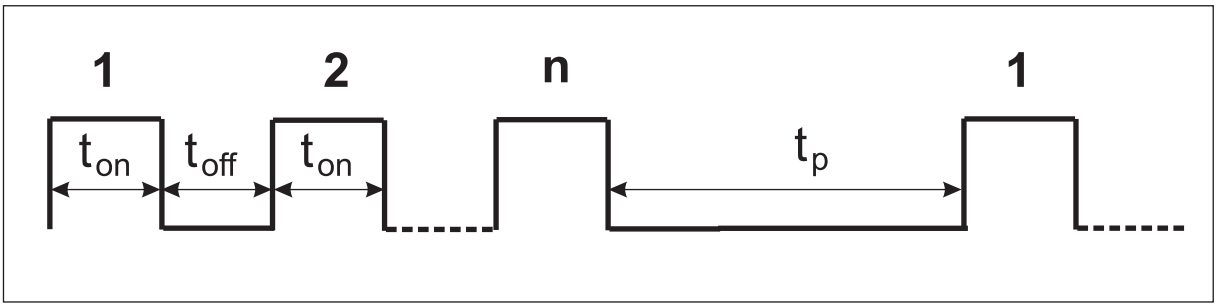


Figure 27: Blinking sequence of the LEDs

6.4.2.1 Power on and startup

After switching on the module runs through an initialization phase. This lasts about 3 s. During the initialization the following sequences are displayed:

Sequence	Meaning
H9 (orange) and H10 (orange): a 3 s-lasting asynchronous blinking	Program is copied from ROM into RAM

After the initialization phase the global „ready indication“ of the module at the b maXX controller PLC takes place (indicated by: H9 = on, H10 = off).

6.4.2.2 Operation

After about 5 s the module is ready-to-operate.

Module with EtherCAT-Slave:

During operation the following LED-sequences are possible:

Sequence	EtherCAT-Slave	Troubleshooting
H5 (orange) ECS IN: H6 (orange) ECS OUT: On	Connection available	
H5 (orange) ECS IN: H6 (orange) ECS OUT: Flash	Data communication	
H11 (orange): On H12 (orange): Off	Operation Mode OPERATIONAL	
H11 (orange): Flash H12 (orange): Off	Operation Mode SAFE-OPERATIONAL	
H11 (orange):Blinking H12 (orange):Off	Operation Mode PRE-OPERATIONAL	

Sequence	EtherCAT-Slave	Troubleshooting
H11 (orange):Off H12 (orange):Off	Operation Mode INIT	
H12 (orange):On	Error	

Module with Ethernet:
The Ethernet communication (transmitted to the b maXX controller PLC) is possible.

Sequence	Ethernet	Troubleshooting
H1 (orange):On H2 (orange):Flashing	Operation with 100 Mbit/s, Data communication is taking place.	
H1 (orange):Off H2 (orange):Flashing	Operation with 10 Mbit/s, Data communication is taking place.	
H1 (orange):On H2 (orange):On	Operation with 100 Mbit/s, there is no data communication.	
H1 (orange):Off H2 (orange):On	Operation with 10 Mbit/s, no data communication.	

Module with EtherCAT-Master:
The initialization of the EtherCAT-master via Motion Control can be carried out by the b maXX controller PLC.

The following LED-sequences are possible during operation:

Sequence	EtherCAT-Master	Troubleshooting
H3 (orange):On H4 (orange):Flashing	Operation with100 Mbit/s, data communication takes place.	
H3 (orange):On H4 (orange):On	Operation with 100 Mbit/s, there is no data communication.	
H7 (orange):Off	Process data status: no process data communication takes place	
H7 (orange):Blinking	Process data status: process data communication takes place	
H8 (green): On (H4, H7 flashing)	The master and accordingly the network is in the „OPERATIONAL“ status	

Sequence	EtherCAT-Master	Troubleshooting
H8 (green): Blinking t_{on} = 200 ms, t_{off} = 1000 ms (H4, H7 flashing)	The EtherCAT-master and accordingly the EtherCAT-network are in the „SAFE-OPERATIONAL“ status	
H8 (green): Blinking t_{on} = 200 ms, t_{off} = 200 ms (H4 flashing)	The master and accordingly the network are in the „PRE-OPERATIONAL“ status	
H8 (green): Off	The master and accordingly the network are in a „STOPPED“, „INIT“ or „RESET“ status	
H8 (green): Blinking t_{on} = 200 ms, t_{off} = 200 ms, t_p = 1000 ms, n = 6	The master is in the status „POWER ON“ and is waiting for initialization by the application	
H8 (red): Blinking t_{on} = 200 ms, t_{off} = 200 ms	Fatal Error	Carry out a bus diagnosis with ProMaster/ProEtherCAT, in order to determine the cause of the error. Remove the cause of the error and restart the system (and accordingly reset via the application)
H9 (orange): On H10 (orange): Off	Module EtherCAT: Module is operating properly	
H9 (orange): On H10 (orange): On	Module EtherCAT: Access to flash-storage	

In order to remove the cause of the error, see ▹Error detection and Troubleshooting◃ from page 59.

6.4.2.3 System Error

System errors are errors, which cause a system stop of the module. A system error is very unlikely to happen. However, if such an error occurs, the module must be replaced.

The communication via Ethernet, EtherCAT and to the PLC is not possible anymore, if there is a system error. If such an error occurs, this is displayed at the LEDs H9 and H10.

The following LED-sequences display system errors:

Sequence		Ethernet with EtherCAT-Master	Troubleshooting
H9 (orange): H10 (orange):	Off Blinking n = 2	Processor: TLB miss exception	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 3	Processor: general exception	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 4	Prozessor: undefined IRP	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 5	Reserved	
H9 (orange): H10 (orange):	Off Blinking n = 6	Processor: Flash error	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 7	Processor: FPGA error	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 8	Processor: FPGA error (only EtherCAT-slave)	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 9	Processor: MAC address port 0 error	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 10	Processor: MAC address port 1 error	Replace module
H9 (orange): H10 (orange):	Off Blinking n > 10	Reserved	

Blinking t_{on} = 300 ms, t_{off} = 300 ms, t_p = 2 s

6.4.3 Switch S1 (S6) for the setting of the module address

The switch S1 (S6) sets the module address. This module address is necessary to replace the b maXX controller PLC from data with the module (also see ▹page 37◃ under point 13 of the chapter Assembly and Installation).

NOTE!

Two **different** module addresses must be set at the module EtherCAT with a redundant master (BMC-M-ECT-03-12-02) at the switches S1 (for the slave) and S6 (for the master). Possible addresses are 1 to 4.

WARNING!

Risk of injury due to moving parts!

At commissioning of the module EtherCAT, the b maXX controller PLC, its power supply unit (as well as additional connected system components), the machine/installation and accordingly parts of the machine/installation can be started, if there is a complete application program. the machine/installation and accordingly parts of the machine/installation could respond with an unexpected behavior, resulting from the incorrect setting of the module address.

Therefore:

- Keep a sufficient distance from moving machine parts / installation parts and accordingly from the moving machine / installation.
- Observe that via the additional modules, which are connected to the b maXX safe PLC, the machine parts / installation parts and accordingly the machine / installation could start to move.
- Be sure to activate their safety devices.

6.4.4 Switch S2 to S5 (S7 to S10) in order to set the IP-address for Ethernet

The turn switches S2 to S5 (or S7 to S10 accordingly) provide a 16 bit value, which may be used as board / device identifier and / or IP address offset. For details of this usage see <Application manual EtherCAT>.

S2 delivers the most significant nibble of the 16 bit value.

S5 delivers the least significant nibble of the 16 bit value.

S3 and S4 deliver the nibbles, which are lying in between.

e.g.

S2 = 1

S3 = 3

S4 = 0

S5 = 9 value = 16#1309 (hexadecimal) = 4873 (decimal)

Please set the value according to your ProMaster project requirements.

You may configure the module ECT0x to use its coding switch settings as an additional offset to a configurable base IP address (e.g. 192.168.1.1). That's the factory default configuration of all ECT0x modules. Both address resolution method and base address are stored in the module's flash EEPROM and may be changed by means of ProMaster tool.

See <Application manual EtherCAT> for a complete description of all features regarding IP addressing.

If you want to use the factory default configuration for IP address setting - please keep in mind:

An IPv4 address is simply a 32 bit value. It is commonly represented in decimal octet notation separated by dots.

e.g. 192.168.1.1 is hexadecimal 16#C0_A8_01_01 (or decimal 10#3232235777)

e.g. 192.168.4.6 is hexadecimal 16#C0_A8_04_06

e.g. 192.168.20.10 is hexadecimal 16#C0_A8_14_0A

(notice: The prefix 16# denotes hexadecimal notification, according to IEC 61131. The prefix 10# denotes decimal notification.)

The resulting effective IP address of the module ECT0x is calculated by an addition of

the preconfigured base address: 16#C0_A8_01_01 (..32 bit value) and

the actual coding switch value: 16#03_05 (..16 bit value)

resulting address= 16#C0_A8_04_06

Please avoid resulting octet values of 0 or 255 which will result in illegal or reserved IP addresses such as

192.168.x.255 or 192.169.255.0 or 192.169.0.0.

Please follow RFC 1918 to use private IP addresses (10.x.x.x = one Class A subnet, 172.16.x.x - 172.31.x.x = 16 Class B subnets, 192.168.x.x = 256 Class C subnets to 255 addresses each).

Please pay attention to the fact that IP addresses must be unique in connected ethernet/ EtherCAT networks.

Please use calculation tools like ProMaster to manage / calculate IP addresses and necessary coding switch settings.

In the example (with a module in the delivery status) the IP-address 192.168.20.10 is set. This means, that the switch S2 is set to 1, the switch S3 to 3, the switch S4 to 0 and the switch S5 to 9.

Figure 28: Example: Setting of the Ethernet-address 192.168.20.10
(switch S2 to 1, switch S3 to 3, switch S4 to 0, switch S5 to 9)

WARNING!

Risk of injury by moving parts!

At commissioning of the module EtherCAT, the b maXX controller PLC, its power supply unit (as well as additional connected system components), the machine/installation and accordingly parts of the machine/installation can be started, if there is a complete application program. the machine/installation and accordingly parts of the machine/installation could respond with an unexpected behavior, resulting from the incorrect setting of the module address.

Therefore:

- Keep a sufficient distance from moving machine parts / installation parts and accordingly from the moving machine / installation.
- Observe that via the additional modules, which are connected to the b maXX safe PLC, the machine parts / installation parts and accordingly the machine / installation could start to move.
- Be sure to activate their safety devices.

6.5 Commissioning sequence

The commissioning covers the following sections:

1 Activation

2 Testing of the function.

NOTE!

Observe the instruction handbook of the b maXX controller PLC and there especially the described sequence of commissioning of the b maXX controller PLC!

6.5.1 Activation

- Read and observe the ▹General Safety Regulations◃ from page 45.
- The section „Mounting and Installation“ must have been carried out correctly
- Set the switch/push button S1 at the b maXX controller PLC to „STOP“ (center position).
- Switch on the +24 V DC of the power supply of the power supply unit.basic unit b maXX 4400.

NOTE!

The module for b maXX controller PLC may not be connected with the b maXX controller PLC and/or with the other system components or may not be separated from the b maXX controller PLC and/or from the additional system components, if the +24 V DC of the voltage supply of the power supply unit is switched on. Prior to that switch off the +24 V DC of the voltage supply of the power supply unit.

6.5.2 Testing the function

The module carries out initialization routines after switching on. After about 5 s the module is ready-to-start and generates a global ready signal to the b maXX controller PLC.

The LEDs now indicate one of the operating status conditions stated in ▹Operation◃ from page 49.

7

OPERATION

Instructions for the operation of the module for b maXX controller PLC are found in the „Application manual EtherCAT for b maXX PLC“, as well as in the application manual b maXX controller PLC and in the programming manual PROPROG wt II and accordingly in the online help of ProProg wt III.

8

ERROR DETECTION AND TROUBLE-SHOOTING

In this chapter we describe the error indications at the option module for b maXX controller PLC. We explain the meaning of each error indication and how to respond on it.

8.1 Safety instructions

➲ Observe to the safety instructions, see ▹Safety◃ from page 11.

8.2 Requirements to the personnel carrying out the work

The personnel who work with the b maXX basic unit must have been instructed in operating the unit and be familiar with the correct handling operation of it. Responding to error displays and status conditions in particular requires special knowledge, which the operators must have. In the following we will advise you of the different errors and the error messages, which result from them. These errors may have mechanical or electrical causes.

8.3 Error messages (error list) - error reactions

The module for the b maXX controller PLC signalizes errors by the flashing of the LEDs H9 (orange) and H10 (orange) as well as by the LED H8 (green/red).

It must be differentiated between operation errors and system errors.

Operation Errors
occur during the normal operation and mostly occur due to incorrect configuration settings.

Sequence		Ethernet with EtherCAT-Master	Correction in the case of error
H8 (rot):	Blinking t_{on} = 200 ms, t_{off} = 200 ms	EtherCAT: Fatal Error	Carry out a bus diagnosis with ProMaster/ProEther-CAT to determine the cause of error. Debug the cause of error and restart the system (or reset the application).

System Errors
indicate an internal error of the module. The module must be replaced.
(blinking): t_{on} = 300 ms, t_{off} = 300 ms, t_p = 2000 ms)

Sequence		Ethernet with EtherCAT-Slave/Master/Cluster	Correction in the case of errors
H9 (orange): H10 (orange):	Off Blinking n = 2	Processor: TLB miss exception	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 3	Processor: general exception	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 4	Processor: undefined IRP	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 5	Reserved	
H9 (orange): H10 (orange):	Off Blinking n = 6	Processor: Flash error	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 7	Processor: FPGA error	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 8	Processor: FPGA error (only EtherCAT-Slave)	Replace module
H9 (orange): H10 (orange):	Off Blinking n = 9	Processor: MAC address port 0 error	Replace module

Sequence		Ethernet with EtherCAT-Slave/Master/Cluster	Correction in the case of errors
H9 (orange): H10 (orange):	Off Blinking n = 10	Processor: MAC address port 1 error	Replace module
H9 (orange): H10 (orange):	Off Blinking n > 10	Reserved	

9

MAINTENANCE

If you comply with the environmental operating conditions specified in ▹Appendix D - Technical Data◃ from page 81, the option module for b maXX controller PLC is maintenance-free. If you find a defect in your b maXX controller PLC or think that it is defective, contact Baumüller Nürnberg GmbH.

10

REPAIR

A defective module for b maXX controller PLC cannot be repaired. For replacement contact Baumüller Nürnberg GmbH.

11

DEMOUNTING, STORAGE

In this chapter the decommissioning and storage for the module for b maXX controller PLC is described.

11.1 Safety instructions

Observe the chapter ▹Safety◃ from page 11.

CAUTION!

Damage due to electrical destruction.

The components may get destroyed electrically, if it is removed with the supply voltage on.

Therefore:

- Assure that all electrical connections have been de-energized and are secured against restarting.
- Before starting work on the electrical connections, use appropriate measuring equipment to ensure that the connections are de-energized.
- Do not demount the connections until you are certain that they are de-energized.

WARNING!

Danger of injury due to uncontrollable behavior of the machine/system.

Removal of the module with switched on supply voltage can change the behavior of the machine/system.

Therefore:

- Assure that all the electrical connections have been de-energized and are secured against restarting
- .Before starting work on the electrical connections, use appropriate measuring equipment to ensure that the connections are de-energized.
- Do not demount the connections until you are certain that they are de-energized.

11.2 Requirements for the personnel carrying out the work

The personnel, who is assigned with the demounting, must have the necessary knowledge and have been trained appropriately to carry out this work. Choose these persons such that they understand and can apply the safety instructions printed on the unit and parts of it and on the connections.

11.3 Demounting

The personnel, who is carrying out the demounting must meet the above mentioned requirements

The module for the b maXX controller PLC is, together with the b maXX controller PLC, the power supply for the b maXX controller PLC and, if necessary, additional system components, mounted to the b maXX controller PLC.

For the demounting first of all the module for the b maXX controller PLC, the b maXX controller PLC and the power supply as well as, if necessary, the additional system components at the b maXX controller PLC are loosened from the 35 mm C-profile (and from the I/O modules, which are on the right of the power supply).

Then the module is removed from the b maXX controller PLC.

The following materials are needed:

- Suitable packing for the module EtherCAT for b maXX controller PLC, if possible use the original packaging material.
  If necessary prepare suitable packaging for the b maXX controller PLC module, if possible use the original packaging.
  If necessary prepare suitable packaging for the b maXX controller PLC module, if possible the original packaging.
  If necessary prepare suitable packaging for the additional system components for b maXX controller PLC, if possible use the original packaging.
- Suitable tools to open the spring energy clamps of the electrical terminals (e.g. 2 mm wide screwdriver).
- Suitable tools for pulling out the white grips at the bottom of the module (e.g. pointed electronic pliers).

Carry out demounting in the following sequence:

1. De-energize and secure from unintentional switch-on.
2. Open the control cabinet.
3. Remove the cables at the b maXX controller PLC module.
4. Remove the cables at the electrical connections of the b maXX controller PLC power unit (for this see ▷ Instruction handbook for b maXX controller PLC power supply unit ◁).
   Loosen the spring energy clamp (e.g. with the screwdriver) and pull out the respective cable.
5. Remove the cable at the b maXX controller PLC (for this see ▷ Instruction handbook b maXX controller PLC ◁)
   If necessary remove the cables of the additional system components, which are mounted to the b maXX controller PLC (for this see the according Instruction handbooks of these system components).
6. There is a white grip on the bottom side of the left part of the supply unit. Pull this grip (e.g. with the pointed electronic pliers) first downwards and then forwards. The grip

easily engages.
Repeat this step with the b maXX controller PLC (according to the version, 2 or 3 grips).
Repeat this step with the b maXX controller PLC module (according to the version 2, 3 or 5 grips).
Repeat this step, if necessary, with additional system components for the b maXX controller PLC (placed on the left side of the power unit or of the b maXX controller PLC).

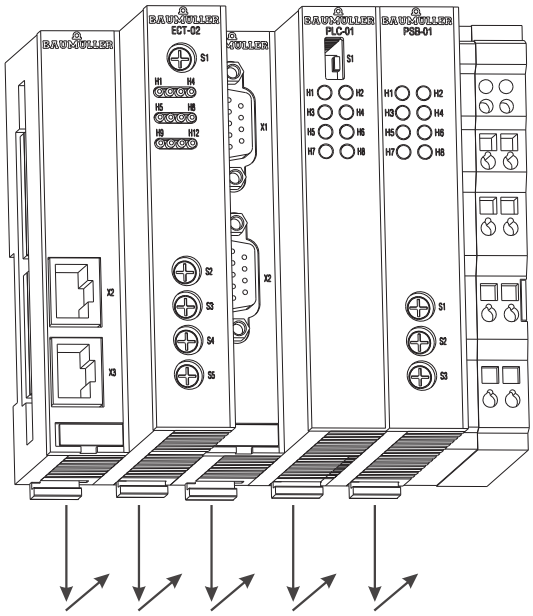


Figure 29: Ethernet with EtherCAT-Master, b maXX controller PLC and power unit

7 Pull the orange grip (e.g. with a screwdriver) on the right hand of the power supply unit forward, so that you can take hold of the grip well.

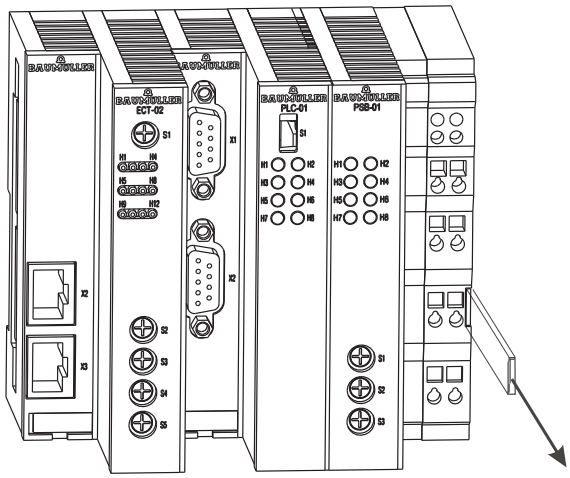


Figure 30: Ethernet with EtherCAT-Master, b maXX controller PLC, power supply unit

8 Pull (manually) the orange grip on the right hand of the power supply unit forward and afterwards pull the module block forward from the 35 mm C-profile away. The module block includes the power supply unit, the b maXX controller PLC, the Ethernet with CANopen-Master module and if necessary the other system components for b maXX controller PLC.

9 Disconnect the module from the b maXX controller PLC (and accordingly from the other system components for b maXX controller PLC), by pressing the extraction mechanism on the back of the module for the b maXX controller PLC with the screwdriver. Insert the screwdriver horizontal in the slot and then press it bottom-up. Now pull the b maXX controller PLC module out of the b maXX controller PLC (and accordingly the other system components for the b maXX controller PLC).

10 Place the b maXX controller PLC module in the prepared packaging.
If necessary place the b maXX controller PLC module in the prepared packaging.
If necessary place the power supply unit in the prepared packaging.
If necessary place the other system components in the prepared packaging.

11 If the b maXX controller PLC module must be replaced, now mount the new b maXX controller PLC module (see ▹Assembly instructions◃ from page 32).

12 Close the control cabinet.

13 Document the demounting (or the replacement) of the b maXX controller PLC module.
If necessary document the demounting (or the replacement) of the b maXX controller PLC.
If necessary document the demounting (or the replacement) of the b maXX controller PLC power supply unit module.
If necessary document the demounting (or replacement) of additional system components for b maXX controller PLC.

If the module EtherCAT was exchanged with the b maXX controller PLC, the total system can be switched on again. If the module shall be disposed of, refer to chapter ▹Disposal◃ from page 71 for further information.

11.4 Storage conditions

Store the b maXX controller PLC EtherCAT module in a suitable packaging and according to the storage conditions, which are specified in ▹Appendix D - Technical Data◃ from page 81.

11.5 Recommissioning

If the b maXX controller PLC EtherCAT module shall be recommissioned again, refer to the information in ▹11.4 Storage conditions◃ from page 70. Then carry out ▹Commissioning◃ from page 45 again.

12

DISPOSAL

In this chapter the correct and safe disposal of the b maXX controller PLC EtherCAT module is described (BMC-M-ECT-xx). Most of the waste is electronic scrap.

- Precondition: Demounting has been made already, see ▷Demounting, Storage◁ from page 67.

12.1 Safety regulations

Disposal may be carried out in accordance with the safety regulations only. Local regulations must be complied to, if necessary. In case a safely disposal cannot be carried out, appoint a suitable disposal company to carry it out on your behalf.

12.2 Requirements of the personnel carrying out work

The personnel that carries out disposal/demounting must have the necessary knowledge and have been trained appropriately to carry out this work. Choose these persons such that they understand and can apply the safety instructions printed on the b maXX system and parts of it.

12.3 Recycling guide

Preconditions

- The module EtherCAT for b maXX controller PLC was removed from the top-hat rail properly.
- The technical devices, which are necessary for demounting are prepared and are in a technically flawless manner.

Sheet Steel

Parts of the module are made of zinc plated sheet steel. Sheet steel must be given to the ferrous metal recycling.

Electronic Scrap

Electronic scrap (PCB), which is not removable, must be disposed of as hazardous waste. Please note in each case the applicable regulations.

Plastic Material

The cabinet is made of plastic material. Plastic material must be given to the plastic material recycling.

12.4 Recycling locations / official authorities

Assure to carry out recycling in accordance with the company's guidelines and with the regulations of the responsible recycling location and official authorities. If in doubt, contact the Trade Supervisory Authority that is responsible for your company or the Environmental Protection Authorities.

APPENDIX A - ABBREVIATIONS

API	Application Program Interface
ARP	Address Resolution Protocol
BACI	Baumüller Component Interface
BUB	Ballast-Unit
BUC	Baumüller Feed-/Feedback- Unit
BUG	Baumüller Converter Basic Feed-Unit
BUM	Baumüller Single Power Unit
BUS	Baumüller Power Module
CAL	CAN Application Layer
CAN	Controller Area Network
CiA	CAN in Automation e. V.
COB	Communication Object
COB-ID	Communication Object Identifier
CSMA/CD	Carrier Sense Multiple Access / Collision Detection
CSMA/CA	Carrier Sense Multiple Access / Collision Avoidance
CPU	Central Processing Unit
DC	Direct Current
DCF	Device Configuration File
DHCP	Dynamic Host Configuration Protocol
DIN	Deutsches Institut für Normung e.V.
DP-RAM	Dual-Port RAM
DR	Draft Recommendation
DS	Draft Standard
DSP	Draft Standard Proposal
EDS	Electronic Data Sheet
EMV	Electromagnetic tolerance
EN	European Standard
EPROM	Erasable Programmable Read Only Memory
ESD	Electrostatic Sensitive Device
FTP	File Transfer Protocol
HD	Hamming Distance
HTML	Hyper Text Markup Language
HTTP	Hypertext Transfer Protocol
I/O	Input/Output
ICMP	Internet Control Message Protocol
IP	Internet Protocol
IRP	Interrupt
ISO	International Standard Organization
LAN	Local Area Network
LSS	Layer Setting Services
MAC	Media Access Control
OSI	Open Systems Interconnect
PDD	Process-Data-Index
PDO	Process Data Object
PELV	Protective Extra Low Voltage (grounded version of SELV)
PLC	Process Loop Controller (SPS)
RAM	Random Access Memory
SAP	Service Access Point
SDO	Service Data Object
SELV	Safety Extra Low Voltage
SMS	Short Message System
SMTP	Simple Mail Transfer Protocol
SPS	Programmable Logic Control
SRD	SDO Requesting Device
SRDO	Safety Relevant Data Object
TCP	Transport Control Protocol

Telnet	Terminal over Network
UDP	User Datagram Protocol
URL	Uniform Resource Locator
VDE	Verband deutscher Elektrotechniker
16#	Prefix for Hexadecimal Number

APPENDIX B - ACCESSORIES

In this appendix all accessories are listed, which are available for the module EtherCAT for b maXX controller PLC from Baumüller Nürnberg GmbH

In case you have questions and suggestions according the accessories, do not hesitate to contact our product management.

B.1 List of all Accessories

B.1.1 EtherCAT-cable

Cable type: K-ETH-33-0-xx (RJ-male connector, RJ-male connector)

Type	Length [m]	Part Number
K-ETH-33-0-0,5	0,5	325160
K-ETH-33-0-01	1	325161
K-ETH-33-0-02	2	325162
K-ETH-33-0-03	3	325163
K-ETH-33-0-04	4	325317
K-ETH-33-0-05	5	325164
K-ETH-33-0-10	10	325165

B.1.2 Ethernet-Cable

Crossover-package consisting of cross coupling (item no.365463) and Cat5-cable 0,5 m (part no. 325160)

Type	Part Number
K-ETH-CROSS-ADAPTER	365464

Modular coupling, RJ45-female connector- RJ45-female connector, Crossover, Cat5, shielded

Type	Part Number
K-ETH-CROSS-COUPLING	365463

Cable type: K-ETH-33-0-xx (RJ-male connector, RJ-male connector)

Type	Length [m]	Part Number
K-ETH-33-0-0,5	0,5	325160
K-ETH-33-0-01	1	325161
K-ETH-33-0-02	2	325162
K-ETH-33-0-03	3	325163
K-ETH-33-0-04	4	325317
K-ETH-33-0-05	5	325164
K-ETH-33-0-10	10	325165

B.1.3 Ferrites

Type	Part Number
Ferrite	00421229

C

APPENDIX C - DECLARATION OF CONFORMITY

In this section we provide general information about EU Directives, the CE symbol and the Declaration by Manufacturer.

C.1 What is an EU Directive

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

An EU directive only contains essential minimum requirements. You will find detailed requirements in standards, to which references are made in the directive.

C.2 What the CE symbol indicates

a) The CE marking symbolizes conformity to all the obligations incumbent on manufacturers for the product by virtue of the Community directives providing for its affixing.

…

b) The CE marking affixed to industrial products symbolizes the fact that the natural or legal person having affixed or been responsible for the affixing of the said marking has verified that the product conforms to all the Community total harmonization provisions which apply to it and has been the subject of the appropriate conformity evaluation procedures.

…

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

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

All control systems of Baumüller Nürnberg GmbH are not affected by the Low Voltage Directive, because its operating voltage is smaller than 60 V DC voltage or 75 V AC voltage. Therefore a Declaration of Conformity on the 2006/95/EG ((Low Voltage Directive) cannot be issued.

The electric control security and functioning is checked by means of the harmonized standard EN 61131-2.

With specified application of this Baumüller equipment in your machinery, you can act on the assumption that the equipment satisfies the requirements of 2006/42/EG (EC Machinery Directive).
Therefore the equipment is developed and constructed in such a way, that the requirements of the harmonized standard EN 60204-1 can be met by the electrical installation.

The controls of Baumüller Nürnberg GmbH comply with the requirements of 2004/108/EG (EMC Directive) by complying with the requirements of the harmonized standard EN 61131-2.

So that the machine can be marketed within the EU, the following must be effective:

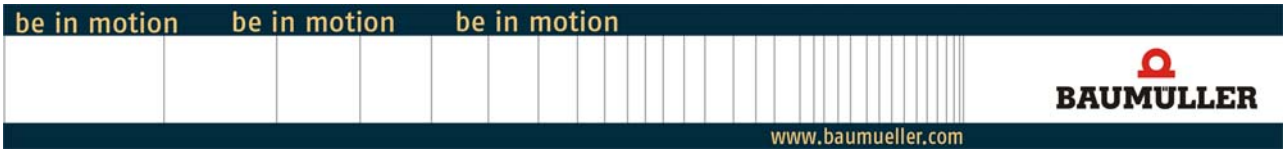
- Mark of Conformity (CE-mark)
- Declaration(s) of Conformity regarding the relevant directive(s) for the machine.

C.3 Definition of the term Declaration of Conformity

A Declaration of Conformity in the sense of this manual is a declaration, that the electric means brought into circulation conform to all the relevant fundamental safety and health requirements.

Baumüller Nürnberg GmbH declares by issuing the Declaration of Conformity, that the device conforms to the relevant fundamental safety and health requirements resulting from the directives and standards, which are listed in the Declaration of Conformity.

C.4 Declaration of Conformity



EC - Declaration of Conformity

Doc.-No.: 5.11009.00
Date: 08.06.2011

according to EMC Directive 2004/108/EC

The manufacturer	Baumüller Nürnberg GmbH
	Ostendstraße 80-90
	90482 Nürnberg, Germany
declares, that the products with the	
designation	EtherCAT-Slave
	EtherCAT-Master
	EtherCAT-Cluster
type	BMC-M-ECT-01
	BMC-M-ECT-02
	BMC-M-ECT-03-11
manufactured since	June 8, 2011

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

Applied harmonized standards:

Standard	Title
DIN EN 61131-2:2007	Programmable Controllers Part 2: Equipment requirements and tests

Attention must be paid to the safety instructions in the manual.

Nuremberg / June 8, 2011
City / Date

Norbert Scholz
Managing Director Sales

Heinrich März
ManagerR&D Electronic

The content of the Declaration of Conformity is subject to changes.The presently valid issue can be obtained on request

D

APPENDIX D - TECHNICAL DATA

Here the technical data for the module EtherCAT for b maXX controller PLC (**BMC-M-ECT-xx**) from Baumüller Nürnberg GmbH is found.

D.1 Connection Values

BMC-M-ECT-xx:

Ethernet network type	100BaseTX
Connector Ethernet	RJ45-female connector
EtherCAT network type	100BaseTX
Connector EtherCAT	RJ45-female connector
Voltage supply	+5 V DC internal
Power input BMC-M-ECT-01-11-11 BMC-M-ECT-02-11-01 BMC-M-ECT-03-11-01 BMC-M-ECT-03-12-02	 typ. 2,75 W (550 mA / 5 V) typ. 2,5 W (500 mA / 5 V) typ. 3,5 W (700 mA / 5 V) typ. 5,25 W (1050 mA / 5 V)
Isolation	720 V DC
Ambient conditions	0°C ... 55°C 95% relative humidity, non-condensing
Storage conditions	-25°C ... 85°C 95% relative humidity, non-condensing
Transport conditions	-25°C ... 85°C 95% relative humidity, non-condensing
Protection	IP 20
Equipment requirements and inspections	conforming to EN 61131-2:2007

Dimensions (W x H x D)	
BMC-M-ECT-01-11-11	38 mm x 100 mm x 91 mm (width when dismantled: 46 mm)
BMC-M-ECT-02-11-01	38 mm x 100 mm x 91 mm (width when dismantled: 46 mm)
BMC-M-ECT-03-11-01	57 mm x 100 mm x 91 mm (width when dismantled: 65 mm)
BMC-M-ECT-03-12-02	95 mm x 100 mm x 91 mm (width when dismantled: 103 mm)
Weight	
BMC-M-ECT-01-11-11	approx. 175 g
BMC-M-ECT-02-11-01	approx. 175 g
BMC-M-ECT-03-11-01	approx. 240 g
BMC-M-ECT-03-12-02	approx. 410 g
Mounting	on a 35 mm C-rail conforming to EN 50022 with interlocking function (also termed as top-hat rail)

D.2 Pin assignment RJ45-female connector for Ethernet

Pin No.	Assignment
1	TX+ (Transmit cable +)
2	TX- (Transmit cable -)
3	RX+ (Receive cable +)
4	Reserved
5	Reserved
6	RX- (Receive cable -)
7	Reserved
8	Reserved

D.3 Pin assignment RJ45-female connector for EtherCAT

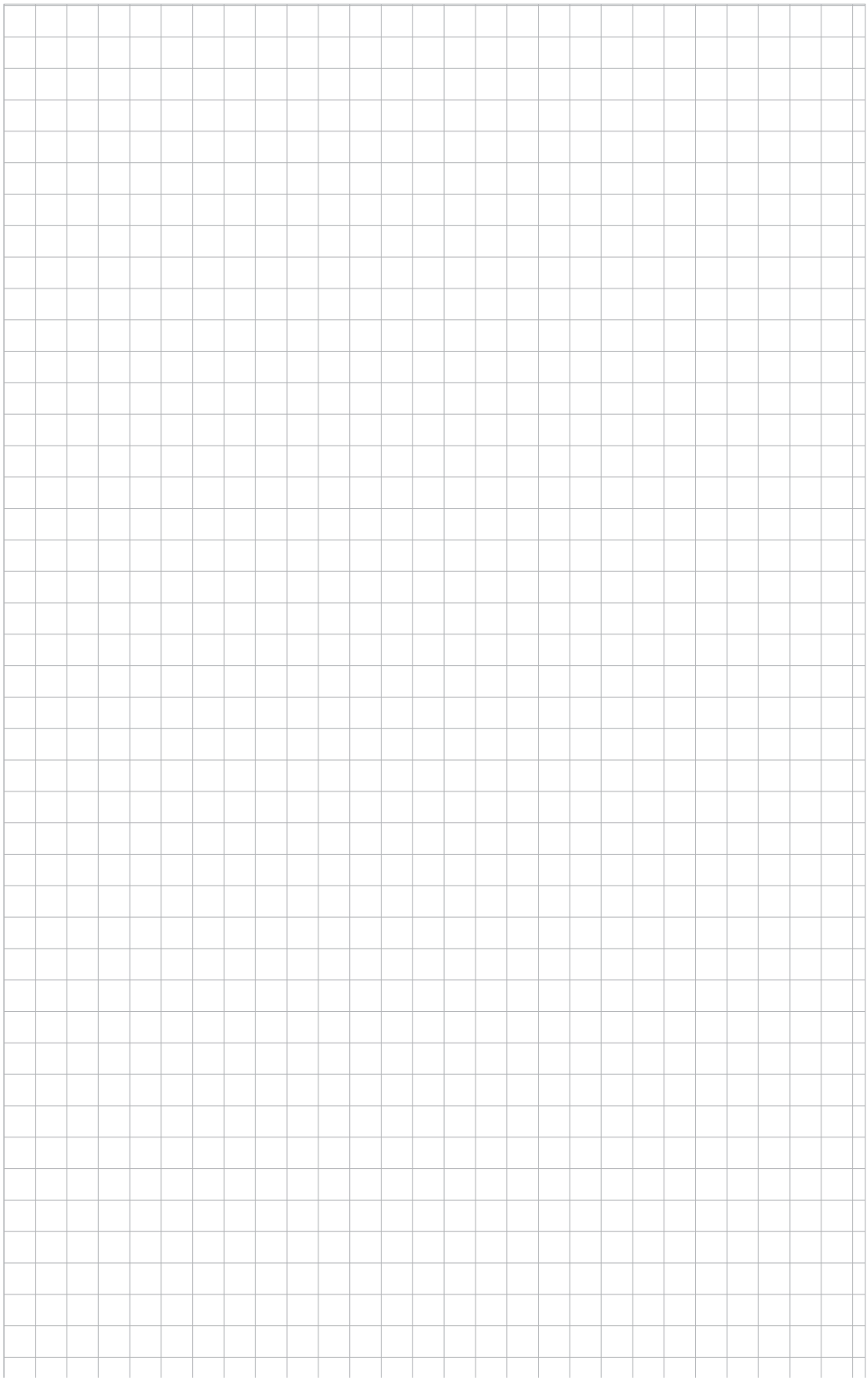
Pin No.	Assignment
1	TX+ (Transmit cable+)
2	TX- (Transmit cable -)
3	RX+ (Receive cable+)
4	Reserved
5	Reserved
6	RX- (Receive cable-)
7	Reserved
8	Reserved

Index

Revision overview

Version	Date	Changes
5.10017.01	15.06.2011	First draft
5.10017.02	13.03.2012	Chap. 5.5 and 6.4.4 Rotary switches changed

Notes:



be in motion

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