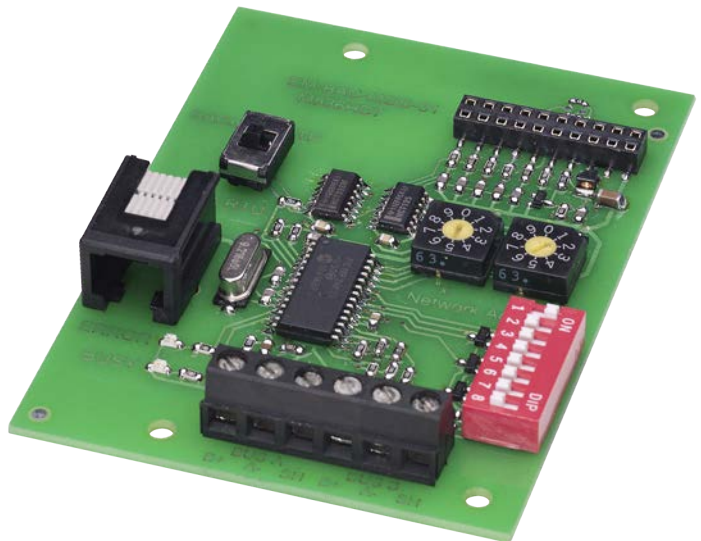




# Expansion module

## EM-BAC-MOD-01

BACnet MS/TP or Modbus RTU interface card  
for EASYLAB Controller TCU3 and adapter module TAM  
Firmware from 4.1



**TROX<sup>®</sup> TECHNIK**

The art of handling air

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## 1 Important notes

### Information on the installation manual

This manual enables operating or service personnel to correctly install EM-BAC-MOD and to use it safely and efficiently.

This manual is intended for use by fitting and installation companies, in-house technicians, technical staff, properly trained persons, and qualified electricians or air conditioning technicians.

It is essential that these individuals read and fully understand this manual before starting any work. The basic prerequisite for safe working is to comply with the safety notes and all instructions in this manual.

The local regulations for health and safety at work and general safety regulations also apply.

This manual must be given to the system owner when handing over the system. The system owner must include the manual with the system documentation. The manual must be kept in a place that is accessible at all times.

Illustrations in this manual are mainly for information and may differ from the actual design.

### Other applicable documentation

In addition to these instructions, the following documents apply:

- Configuration manual for EM-BAC-MOD see [www.troxtechnik.com](http://www.troxtechnik.com)
- Documentation for EASYLAB controller TCU3 or adapter module TAM
- Project-specific wiring documents, if any

### TROX Technical Service

To ensure that your request is processed as quickly as possible, please keep the following information ready:

- Product name
- TROX order number
- Delivery date
- Brief description of the fault

Online	<a href="http://www.troxtechnik.com">www.troxtechnik.com</a>
Phone	+49 2845 202-400

### Limitation of liability

The information in this manual has been compiled with reference to the applicable standards and guidelines, the state of the art, and our expertise and experience of many years.

The actual scope of delivery may differ from the information in this manual for bespoke constructions, additional order options or as a result of recent technical changes.

The obligations agreed in the order, the general terms and conditions, the manufacturer's terms of delivery, and the legal regulations in effect at the time the contract is signed shall apply.

### Defects liability

For details regarding defects liability please refer to Section VI, Warranty Claims, of the Delivery and Payment Terms of TROX GmbH.

The Delivery and Payment Terms of TROX GmbH are available at [www.troxtechnik.com](http://www.troxtechnik.com).

## 2 Security

### Safety notes

Symbols are used in this manual to alert readers to areas of potential hazard. Signal words express the degree of the hazard.



#### **DANGER!**

Imminently hazardous situation which is due to live components and which, if not avoided, will result in death or serious injury due to electrical voltage.



#### **DANGER!**

Imminently hazardous situation which, if not avoided, will result in death or serious injury.



#### **NOTICE!**

Potentially hazardous situation which, if not avoided, may result in property damage.



#### **ENVIRONMENT!**

Environmental pollution hazard.

### Correct use

Expansion module EM-BAC-MOD provides a BACnet MS/TP or Modbus RTU interface for EASYLAB base components as well as for the TROX UNIVERSAL CONTROLLER.

Use the expansion module for the following devices:

- EASYLAB controller TCU3
- EASYLAB adapter module TAM
- TROX UNIVERSAL CONTROLLER

### Incorrect use

Do not use the expansion module for areas of application that are not described in this manual.

Do not use the expansion module:

- outdoors
- in wet areas
- in areas with potentially explosive atmospheres

### Residual risks

Failure of the network interface does not affect the control function of the volume flow controller but does affect data exchange with the central BMS. Safety-related applications require further precautions.

### Safety signs

The following symbols and signs are usually found in the work area. They apply to the very location where they are found.

### Electrical voltage



Location where a hazard due to electrical voltage exists.

### Earthing



This symbol marks all equipotential bonding connection points on EM-BAC-MOD.

## Residual risks

EM-BAC-MOD is a state-of-the-art product and meets current safety requirements. Residual risks cannot be excluded, however, and you should proceed with caution.

Always observe the safety notes in this manual to reduce health hazards and prevent any hazardous situations.

## Electric current



### **DANGER!**

#### **Danger of death due to electric current!**

Danger of death if live components are touched.

- Switch off the supply voltage and secure it against being switched on again before working on the unit.
- Only skilled qualified electricians are allowed to work on live components.
- Equipotential bonding is required.

## Risk of damage to property

### Temperature differences



### **NOTICE!**

#### **Risk of damage to property due to large temperature differences**

If EM-BAC-MOD has been kept in an unheated area, condensation may form and damage the electronic components beyond repair.

- Let EM-BAC-MOD warm up to room temperature before you install it.

## Electrostatic charge



### **NOTICE!**

#### **Risk of damage to property due to electrostatic charge**

Electrostatic charge can damage the electronics of the expansion module.

- Before you remove the expansion module from its protective wrapping, touch an equipotentially bonded metal surface, e.g. a water pipe, for electrical earthing.
- Avoid skin contact with any components or printed circuits on the expansion module or the main PCB.
- Wear conductive footwear and antistatic clothing.

## System owner's responsibility

### System owner's obligations

EM-BAC-MOD is intended for commercial use. The system owner is therefore subject to the legal obligations of occupational health and safety regulations.

In addition to the safety notes in this manual, the applicable regulations for safety, accident prevention and environmental protection must also be complied with.

### Qualified staff

#### Qualification

The work described in this manual has to be carried out by individuals with the qualification, training, knowledge and experience described below:

#### Network administrator

Network administrators design, install, configure and maintain the IT infrastructure in companies or organisations.

**Skilled qualified electrician**

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Any work has to be carried out by individuals who can be expected to carry out their assigned duties reliably. Individuals whose reaction time is delayed due to alcohol, drugs or other medication must not carry out any work.

**Environmental protection**

**The following substances and materials which are hazardous to the environment are used:**

**Electrical and electronic parts**

Electrical and electronic parts may contain toxic materials and substances. These parts have to be disposed of separately from other waste, i.e. taken to your local reuse and recycling centre or disposed of by a specialist disposal company.

**Batteries**

Batteries contain toxic heavy metals. They are hazardous waste and must be taken to a hazardous waste collection point or disposed of by a specialist company.

**3 Structure and functional description**

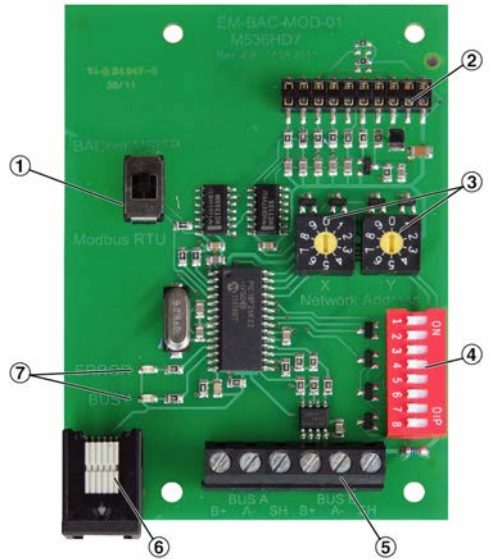


Fig. 1: EM-BAC-MOD-01

- ① Switch to select BACNet MS/TP or Modbus RTU protocol
- ② Plug base for connection with the EASYLAB main PCB
- ③ Switches to set the network addresses, 01-99
- ④ DIP switch to set communication parameters
- ⑤ Network terminals (EIA-485) B+ signal, A- signal, SH = shield
- ⑥ Connection for firmware update
- ⑦ Status LEDs: ERROR = communication error; BUSY = data transmission in progress

**Status LEDs**

There are two LEDs on the expansion module: 7

- BUSY LED green - Power supply OK
- BUSY LED green, blinking - Data transmission in progress
- ERROR LED red - Transmission error

## Functional description

Expansion module EM-BAC-MOD-01 provides the EASYLAB base components (controller TCU3 or adapter module TAM) with a BACnet MS/TP or Modbus RTU interface to link rooms or individual volume flow controllers to the central BMS.

When used on a room controller or adapter module (TAM) with active room management function (RMF), the expansion module provides an interface to access data for the entire room.

When used on a fume cupboard controller, room controller or adapter module (TAM), the expansion module provides an interface to access data for the controller.

The PCB is fitted with terminals for the EIA-485 network, configuration switches, and two LEDs that indicate the operating status. The PCB can be fitted to the TCU3 or TAM main PCB using a header. The configuration switches can be used to adapt the expansion modules to various applications and communication parameters.



#### 4 Technical data

Item	Value	Unit
Dimensions (B x H x T)	65 × 15 × 90	mm
Supply voltage (from the controller TCU3 or adapter module TAM)	5	V DC
Acceptable temperature range for storage	-10 to +70	°C
Acceptable temperature range for operation	+10 to +50	°C
Maximum humidity, no condensation (for storage and operation)	< 90	%
Protection level	IP 20	

#### Communication interface

Physical interface	EIA-485
Protocol	BACnet MS/TP or Modbus RTU
Data transfer speed	<ul style="list-style-type: none"> <li>■ BACnet: 9600/ 19200 / 38400 / 76800 Baud</li> <li>■ Modbus: 9600 / 19200 / 38400 / 57600 Baud</li> </ul>
Parity:	None, odd, even
Network address	01 ...99
Terminal resistor:	from hardware revision 2.0 the terminal resistor can be activated as an option

#### Firmware version

- 4.1

#### Supported groups of devices

- EASYLAB TCU3 / TAM from software version 8.0

#### Network connection

- 6 terminals for cable cross sections of 0.12 – 1.5 mm<sup>2</sup> (B+, A- and shielding, two of each)  
↪ on page 11

#### Displays

- Two indicator lights, BUSY and ERROR ↪ 'Status LEDs' on page 7

## 5 Delivery and storage

### Delivery check

Check delivered items immediately after arrival for transport damage and completeness.

Properly dispose of packaging material.

A complete shipment includes:

- EM-BAC-MOD expansion module
- Pin header
- Mounting material
  - Distance pieces (4x)
  - Fixing screws with washers (4x)
- Ground strap
- Installation manual

### Carrying the expansion module

- If possible, take the module in its transport packaging up to the installation location.
- Do not remove the protective wrapping until just before installation.

### Storage

If you need to store EM-BAC-MOD, make sure that the following conditions apply:

- Store in its original (antistatic) packaging.
- Do not store outdoors.
- Store in a dry and dust free place.
- Store away from direct sunlight.
- Do not expose to any aggressive media.
- Avoid any mechanical impact.
- Storage temperature: -10 °C to +70 °C.
- Relative humidity: < 90 %, no condensation.
- If a product has to be stored for more than 3 months, regularly check the general condition of all parts and of the packaging.

## 6 Installation

### Personnel:

- Skilled qualified electrician

### Materials:

- EM-BAC-MOD expansion module
- Pin header
- Distance pieces (4x)
- Fixing screws with washers (4x)



### DANGER!

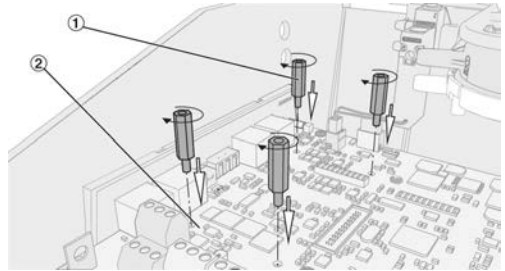
#### Danger of death due to electric current!

Danger of electric shock! Do not touch any live components!

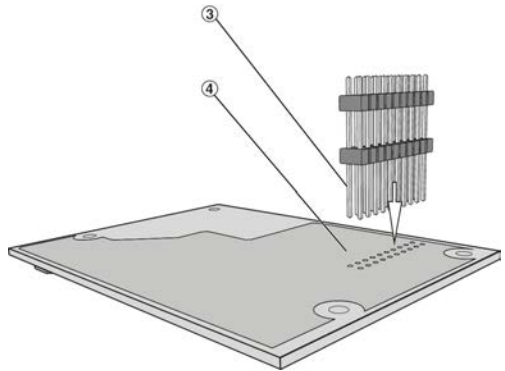
- Switch off the supply voltage and secure it against being switched on accidentally before working on any electrical equipment.
- Only skilled qualified electricians are allowed to work on live components.

Expansion module EM-BAC-MOD is to be fitted into the casing of a TCU3 controller or TAM adapter module.

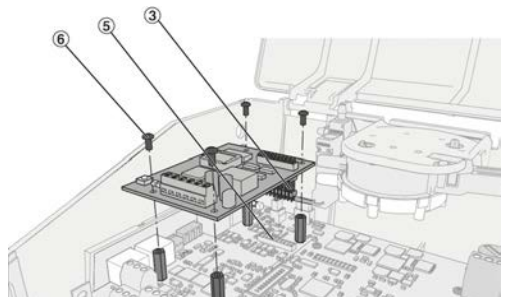
1. ▶ Electrostatic charge can damage the electronics. For this reason, first touch an equipotentially bonded metal surface, e.g. a water pipe, for electrical earthing before you remove the unit from its protective wrapping. Avoid skin contact with any components or printed circuits on the expansion module or the main PCB.
2. ▶ Switch off the supply voltage to the TCU3 controller or TAM adapter module and secure it against being switched on accidentally. Then open the cover of the TCU3 or TAM casing (see instructions for the respective device).



3. ▶ Screw the four distance pieces ① into the corresponding openings in the TCU3 or TAM main PCB ② and tighten them (hand-tight only).



4. ▶ Take the pin header ③ and push it with the longer ends from below through the expansion module ④; push the pin header just far enough such that the pins protrude slightly on the upper side.



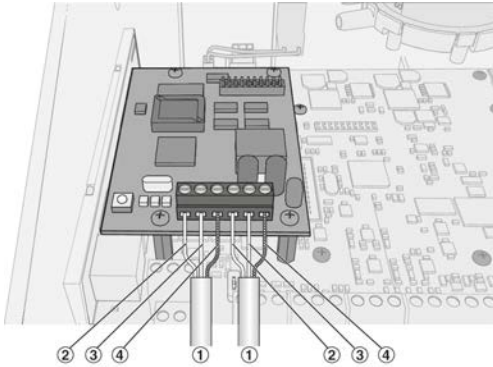
5. ▶ Take the expansion module PCB with the upside up and position it on the TCU3 or TAM main PCB such that the pin header ③ is exactly above the corresponding plug-in base ⑤, and the holes for the distance pieces are above the distance pieces. Then press the PCB onto the distance pieces.

In case the positions do not exactly line up, check whether the pin header is still correctly positioned. Repeat step 2.

If you have pushed the pins too far through the PCB (step 2), the electrical connection may not work properly. Repeat step 2.

6. ▶ Fix the PCB using the four fixing screws ⑥. Tighten the screws only hand-tight.

## Connecting data cables



- ① Data cable
- ② B+ (EIA-485)
- ③ A- (EIA-485)
- ④ SH (shield)

7. ▶ EM-BAC-MOD has terminals for two data cables of an EIA-485 network.

Strip the insulation from the bus cable (at least two wires), insert the bare wires into the terminals and tighten the screws by hand.

Make sure that the polarity of the conductor pairs is correct. Incorrect polarity will result in inverted data signals and hence communication errors.

Fix the data cables to the casing using the wire clamping bracket.

Connect the shield of shielded cables to the SH terminals. Within a bus segment connect the shield only at one point to the earth.

Earthing the shield at every controller will lead to voltage disturbances.

A maximum of 32 units can be operated on one network segment. To avoid cable reflections, network segments must be terminated at both ends with 120Ω bus terminal resistors. PCBs of revision 2 and higher allow you to fit terminal resistors directly onto the PCB. (see page 17)

Connect the shield of shielded cables to the SH terminals. Within a chain (channel) connect the shield only at one point to the earth. Earthing the shield at every controller will lead to voltage disturbances.

## Recommended data cable

Twisted pair, e.g. JY(St)Y 2 × 2 × 0.8 (use only twisted pair for B+ and A-)

8. ▶ Close the cover of the TCU3 or TAM casing (see instructions for the respective device). Then switch on the power supply to TCU3 or TAM again.

## 7 Configuration

Before you use EM-BAC-MOD as a BACnet or Modbus interface module, you have to configure it to the actual application. To do so, use the switches on the interface module.

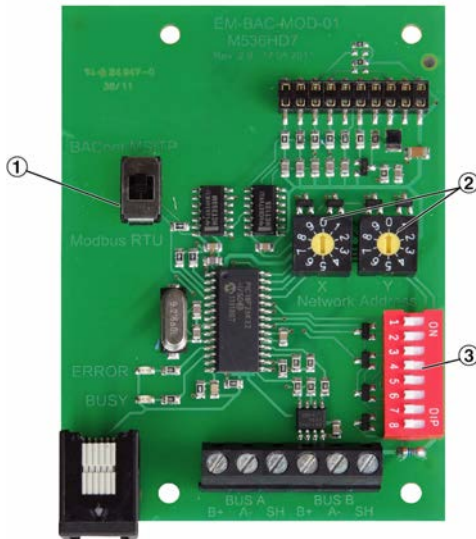


Fig. 2: EM-BAC-MOD

- ① Switch to select BACnet MS/TP or Modbus RTU protocol
- ② Switches to set the network addresses, 01-99
- ③ DIP switch to set communication parameters

### Setting the protocol type

1. ▶ Use the slide switch ① to set the BACnet MS/TP or Modbus RTU protocol.

### Setting the network address

2. ▶ Use the two address code switches X and Y ② to set a network address (01 to 99). Address 00 is reserved for broadcast mode.

A maximum of 32 devices (network addresses) can be operated on one network segment. **Caution:** a different network address must be set for every device.

### Setting the device family

3. ▶ If the device is to be used with an EASYLAB/TROX UNIVERSAL controller or a adapter module TAM, use the DIP switch ③ to set switch S1 to Off.

### Communication parameters

4. ▶ Use the DIP switch ③ to set the following parameters:

S2 + S3 - Transmission speed EIA-485

S5 + S6 - Parity

S8 - Terminal resistor

Ask the responsible specialist consultant for the values to be set.

### Setting the transmission speed for BACnet

BACnet	S2	S3
9600 Bd	Off	Off
19200 Bd	On	Off
38400 Bd	Off	On
76800 Bd	On	On

### Setting the transmission speed for Modbus

Modbus	S2	S3
9600 Bd	Off	Off
19200 Bd	On	Off
38400 Bd	Off	On
57600 Bd	On	On

### Setting parity

Parity	S5	S6
None	Off	Off
None	On	Off

Parity	S5	S6
Odd	Off	On
Even	On	On

**Terminal resistor for EIA-485 network  
from rev. 2**

Terminal resistor	S8
Disabled	Off
Enabled	On

## 8 Commissioning

### Personnel:

- Network administrator

Once you have set the configuration switch to adapt EM-BAC-MOD to the network, the controller and the network can be commissioned.

Commissioning a BACnet or Modbus network requires specialist knowledge as well as special network adapters and software. Only specialist personnel should do the commissioning.

### Required TCU3 software version

The expansion module EM-BAC-MOD with firmware 4.1 requires the following software versions:

- EASYLAB or adapter module TAM
  - Software version 8.0 or higher
- TROX UNIVERSAL CONTROLLER
  - Software version 2.1 or higher

The software version is displayed in the EasyConnect software, 'Diagnosis', 'Basic Device' line.

A product sticker on the main PCB also carries the software version number (only for version 3 or higher).

With earlier software versions there is no data exchange between the expansion module EM-BAC-MOD and controller. This means that the network is not able to read out current values from the controller or to send any values.



*You need not adapt the controller configuration with the EasyConnect configuration software for the expansion module to work.*

## 9 Interface information

For a description of all BACnet and Modbus interface data points refer to the configuration manual for EM-BAC-MOD.

You can download the document from [www.troxtechnik.com](http://www.troxtechnik.com).

## 10 Removal and disposal

If no return or disposal agreement is in place, any disassembled components should be disposed of by an approved specialist disposal company.

### Safety notes regarding removal and disposal

#### Electric current



#### **DANGER!**

##### **Danger of death due to electric current!**

Danger of death if live components are touched.

- Switch off the supply voltage and secure it against being switched on again before working on the unit.
- Only skilled qualified electricians are allowed to work on live components.
- Equipotential bonding is required.

#### Removal

1. ▶ Make sure that the voltage supply has been interrupted.
2. ▶ Unplug the network cable.
3. ▶ Remove ground strap.
4. ▶ Remove the expansion module.

#### Disposal



#### **ENVIRONMENT!**

##### **Risk of harm to the environment due to incorrect disposal of materials.**

Incorrect disposal can harm the environment.

- Have electronic waste and electronic components disposed of by an approved specialist disposal company.
- If you are not sure how to dispose of anything in an environmentally friendly manner, contact your local authorities or a specialist disposal company.