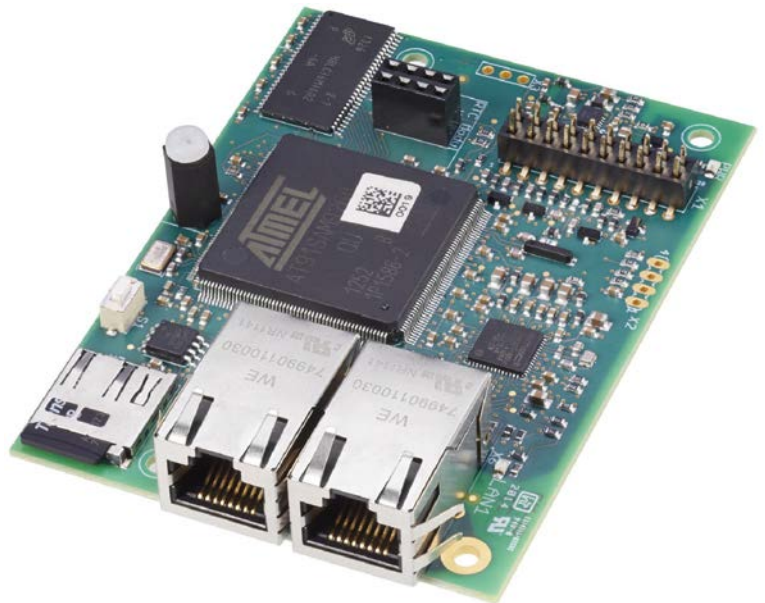# Expansion module

EM-IP

BACnet/IP or Modbus/IP interface for

EASYLAB controller TCU3 and adapter module TAM

Firmware from 2.0

TROX® TECHNIK

The art of handling air

1   Important notes

Information on the installation manual

This manual enables operating or service personnel to correctly install EM-IP 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-IP
  see *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	*www.troxtechnik.com*
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*.

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-IP provides a BACnet/IP or Modbus/IP interface and a web server 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-IP.

Residual risks

EM-IP 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-IP has been kept in an unheated area, condensation may form and damage the electronic components beyond repair.
>
> – Let EM-IP 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-IP 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:

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.

Passwords

Web server setup is password protected to prevent unauthorised individuals from entering or changing data.

↻ *Chapter 9 'Web server settings' on page 19*

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.
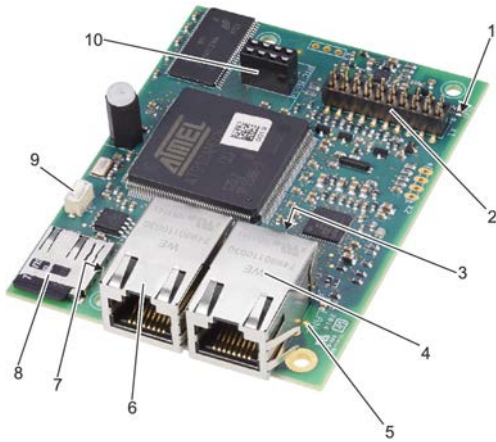
3 Structure and functional description

Overview

Fig. 1: EM-IP expansion module

1 Power LED
2 Plug base for connection with the EASYLAB main PCB
3 Status LED
4 RJ45 sockets for Ethernet cabling (LAN 2)
5 LED LAN 1
6 RJ45 sockets for Ethernet cabling (LAN 1)
7 LED LAN 2
8 Slot for microSD card
9 Reset push button, also for switching the DHCP server on/off
10 Plug base for optional RTC module (real time clock) Ⅎ *Chapter 3.3.3 'Plug base for the optional RTC module' on page 11*

Functional description

EM-IP provides the EASYLAB base components (controller TCU3 or adapter module TAM) with a BACnet/IP or Modbus/IP interface to link rooms or individual volume flow controllers to the central BMS.

In addition, EM-IP includes a webserver (web interface) that can be used to access additional functions.

> Ⅎ *Chapter 9 'Web server settings' on page 19*

To connect EM-IP to the main PCB of TCU3 or TAM, a pin header is fixed to the plug base (Fig. 1/2).

There is also a plug base (Fig. 1/10) for the connection of the optional RTC module (M536EE0).

EM-IP includes two sockets (Fig. 1/4 and 6) for network connection, one multifunctional Reset button (Fig. 1/9) and four LED signal lamps (Fig. 1/1, 3, 5 and 7) that indicate the operating status.

EM-IP also has a slot (Fig. 1/8) for a microSD card with the firmware and for storing statistics.

> *A 2 GB microSD card is part of the supply package.*

To configure EM-IP you have to use the webserver.

Operating and display elements

Reset push button

Fig. 2: Reset push button

Use the Reset push button (Fig. 2/1)

- to reboot EM-IP
- to restore the factory settings
- to switch between two different default IP configurations

ℹ️

Functions of the Reset push button ⇆ Chapter 8.3 'Functions of the Reset push button' on page 17.

Status LEDs

Fig. 3: LEDs

1   Power LED
2   Status LED
3   LED LAN 1
4   LED LAN 2

There are four LEDs on EM-IP.

The LEDs indicate the following:

Power LED (Fig. 3/1)	Operating status
LED green	Voltage is supplied
LED off	No voltage is supplied

Status LED (Fig. 3/2)	Operating status
LED green	Reset button is being pressed
LED green, blinking	Normal operation
LED red/green, blinking	DHCP mode is active
LED orange	Boot phase of EM-IP
LED orange, blinking	No configuration available
LED red	All files are being closed, then the module is rebooted.

LAN 1-/LAN 2-LED (Fig. 3/3 and 4)	Operating status
LED green	Connection to the network
LED green, blinking	Data transmission in progress

Connections and interfaces

Network sockets (RJ45)

Fig. 4: Ethernet sockets

1   Ethernet socket LAN 1
2   Ethernet socket LAN 2

EM-IP has two RJ45-10/100 Mbit Ethernet sockets, LAN 1 and LAN 2 (Fig. 4/1 and 2), which are managed by the integral Ethernet switch.

This allows for establishing a daisy chain on an Ethernet port of the IP network.

Do not connect more than five EM-IP expansion modules (switch function) as otherwise the system performance will be reduced.

If necessary, you can deactivate the switch function (daisy chain) using the webserver Chapter 9 'Web server settings' on page 19.

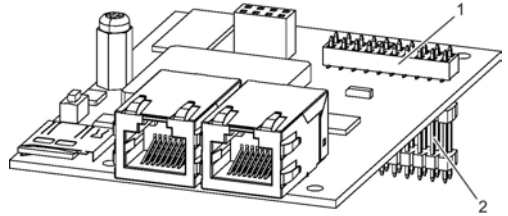### Plug base for connection with the EASYLAB main PCB

Fig. 5: Plug base for connection with the EASYLAB main PCB

Use the plug base (Fig. 5/1) and a pin header (Fig. 5/2) to connect EM-IP to the main PCB of TCU3 or TAM.
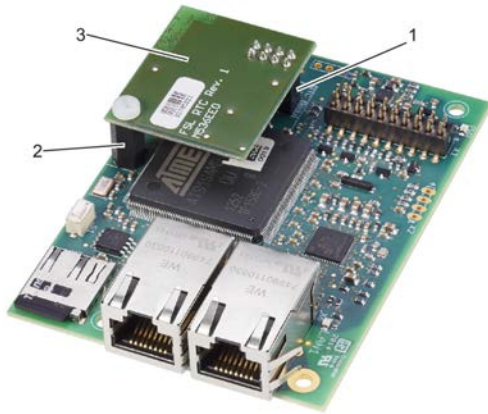
Plug base for the optional RTC module

Fig. 6: Plug base for the RTC module

1   Plug base

2   Distance pieces
3   RTC module (M536EE0)

There is also a plug base (Fig. 6/1) for the connection of the optional RTC module (M536EE0) (Fig. 6/3).

If no time server (NTP or BACnet) is available on the network, you may want to expand EM-IP with the battery-powered RTC module (real time clock).

> *The RTC module is screw-fixed to the distance pieces (Fig. 6/2) on EM-IP ⇘ Chapter 6 'Installation' on page 13.*

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	Ethernet TCP/IP
Protocol	BACnet IP, Modbus IP and HTML
Data transfer speed	■ BACnet: 100 Mbit/s ■ Modbus: 100 Mbit/s
Network address	TCP/IP (Standard: 169.254.0.1)

Firmware version

- 2.0

Supported groups of devices

- EASYLAB TCU3 / TAM from software version 8.1

Network connection

- Two RJ45 sockets for patch cables ⇥ *Chapter 7 'Connecting the network cable' on page 16*

Displays

- Indicator lights for diagnosis, 'Power' and 'Traffic' ⇥ *Chapter 3.2.2 'Status LEDs' on page 9*

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-IP 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-IP, 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

⚠ 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.

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

Personnel:
- Skilled qualified electrician

Materials:
- EM-IP expansion module
- Pin header
- Distance pieces (4x)
- Fixing screws with washers (4x)
- Ground strap

1. ▶ Open the casing cover of the TCU3 controller or TAM adapter module (see installation and operating manual for the TCU3 controller).

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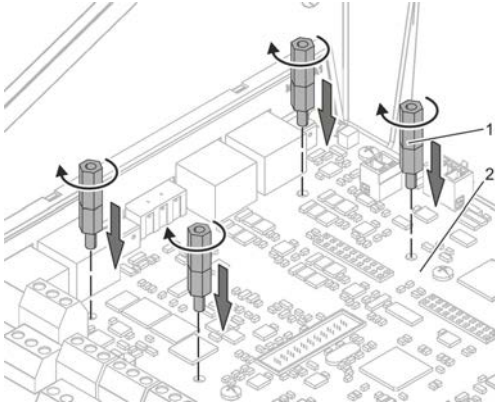
Fixing the distance pieces

Fig. 7: Distance pieces

2. ▶ Screw the four distance pieces (Fig. 7/1) into the corresponding openings in the TCU3 or TAM main PCB (Fig. 7/2) and tighten them (hand-tight).
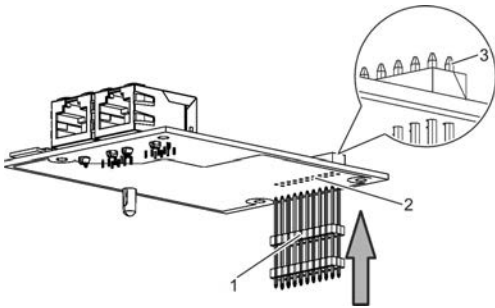
Fitting the pin header

Fig. 8: Fitting the pin header

3. ▶ Take the pin header (Fig. 8/1) and push it with the longer ends from below through the EM-IP expansion module (Fig. 8/2).

ⓘ *Push the pin header just far enough such that the pins protrude slightly on the upper side (Fig. 8/3).*
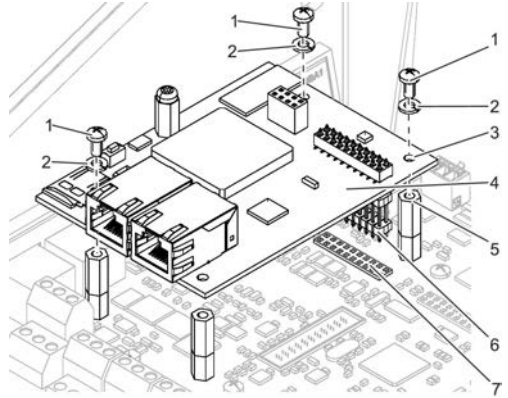
Installing EM-IP

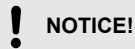*Fig. 9: Installing EM-IP*

4. ▶ Place EM-IP (Fig. 9/4) with the pin header (Fig. 9/6) in the slot (Fig. 9/7) on the TCU3 or TAM main PCB.

ⓘ *Gently push the four corners of EM-IP onto the distance pieces (Fig. 9/5).*

5. ▶ Screw-fix EM-IP with 3 fixing screws (Fig. 9/1) and washers (Fig. 9/2) to the main PCB as shown in Fig. 9.

❗ NOTICE!

Tighten the fixing screws only hand-tight!
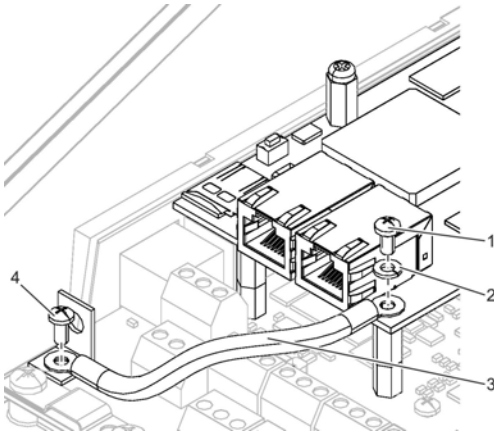
Fixing the ground strap

Fig. 10: Fixing the ground strap

6. ▶ Fix the ground strap (Fig. 10/3) with the fixing screw (Fig. 10/1) and the washer (Fig. 10/2) to EM-IP.

7. ▶ Fix the other end of the ground strap (Fig. 10/3) with a fixing screw (Fig. 10/4) to the earth connection on the main PCB.

❗ NOTICE!

Tighten the fixing screw only hand-tight!

Mounting the RTC module (optional)
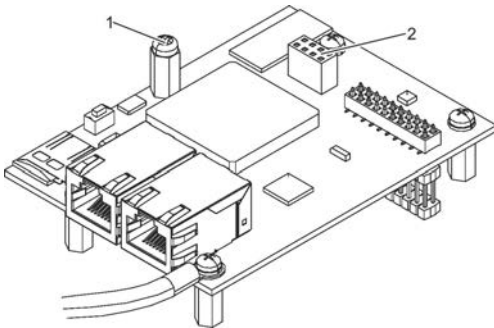
Fig. 11: Fixing screw

8. ▶ Remove the fixing screw (Fig. 11/1).
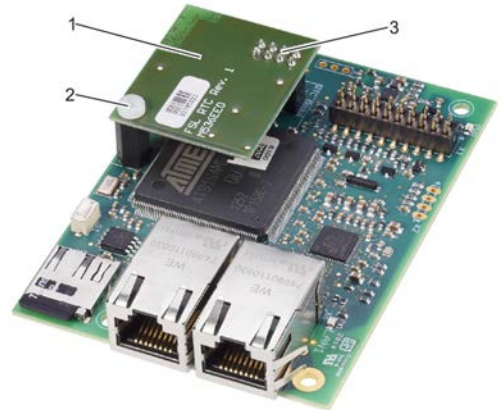
Fig. 12: Mounting the RTC module

9. ▶ Slot the RTC module (Fig. 12/1) with the pins (Fig. 12/3) onto the 8-pole slot (Fig. 11/2) of EM-IP.

10. ▶ Fix the RTC module with the fixing screw (Fig. 12/2) to EM-IP.

Connecting the network cable

11. ▶ Connect the network cable to EM-IP
⭧ *Chapter 7 'Connecting the network cable' on page 16*.

Closing the casing cover

12. ▶ Close the casing cover of the TCU3 controller or TAM adapter module (see installation and operating manual for the TCU3 controller).

7 Connecting the network cable

> ⚡ **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.
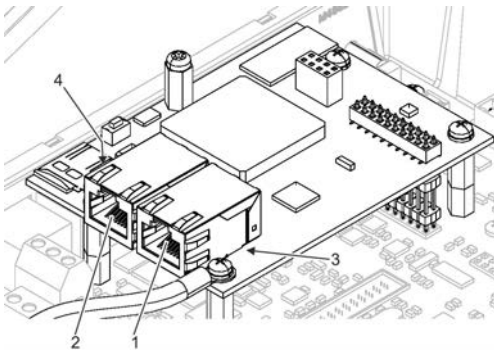> – Equipotential bonding is required.

Connecting the network cable

Fig. 13: Connecting the network cable

1 Ethernet sockets LAN 1
2 Ethernet sockets LAN 2
3 LED status displays LAN 1
4 LED status displays LAN 2

EM-IP has two RJ45-10/100 Mbit Ethernet sockets, LAN 1 and LAN 2 (Fig. 13/1 and 2), which are managed by the integral Ethernet switch.

This allows for establishing a daisy chain on an Ethernet port of the IP network.

> ℹ️
>
> *No more than five EM-IP expansion modules should be connected (switch function) as otherwise the system performance will be reduced.*
>
> *If necessary, you can deactivate the switch function (daisy chain) using the webserver ⇲ Chapter 9 'Web server settings' on page 19.*

Personnel:
■ Skilled qualified electrician

Materials:
■ Network cable

1. ▶
   > ℹ️ *Recommended network cable*
   >
   > *Type SF-UTP (braided and with foil), to ISO IEC 11801 (2002), or preferably a patch cable with RJ45 plugs on both ends.*

   Connect the network cable to an Ethernet socket (Fig. 13/1 or 2) of EM-IP.

2. ▶ Connect the network cable to a PC or switch.

LAN 1/LAN 2 LED (Fig. 13/3 or 4)	Operating status
LED green	Connection to the network
LED green, blinking	Data transmission in progress
LED off	Connection error

8   Configuration

IP configuration

Most configuration settings for EM-IP can be entered using the integral web server ⬧ *Chapter 9 'Web server settings' on page 19*.

ⓘ   *Network conflicts*

The factory set default IP address and IP configuration of EM-IP may not be entirely compatible with the target network. It may hence be better to first connect EM-IP during commissioning with a network patch cable to the PC and to make the required configuration settings explained in section ⬧ Chapter 9 'Web server settings' on page 19.

The Reset button (Fig. 14/1) allows you to choose between two IP configurations and the original state at the time of delivery.

If the connected PC is a DHCP client and if there is no DHCP server, the client should generate its own address within 60 seconds.

As a consequence, EM-IP can access the web server even if the network characteristics of the PC are not changed.

Required software version

The expansion module EM-IP with firmware 2.0 requires the following software versions:

- EASYLAB or adapter module TAM
    – Software version 8.1 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-IP 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.

Functions of the Reset push button

Fig. 14: Reset push button

EM-IP has a Reset push button (Fig. 14/1).

Use the Reset push button for the following actions:

Rebooting EM-IP

▶ Press the Reset push button (Fig. 14/1) briefly (4 seconds max.).

⇨ The status LED (Fig. 14/2) becomes red for 2 seconds, then the module is rebooted.

> *During the start phase, the status LED (Fig. 14/2) is orange.*

Resetting the default IP address

▶ Press the Reset push button (Fig. 14/1) for 5 to 9 seconds (9 seconds max.).

⇨ The status LED (Fig. 14/2) blinks green, and EM-IP is set to the default IP address (169.254.0.1) until the next reboot.

Activating the DHCP server

▶ Press the Reset push button (Fig. 14/1) for 10 to 14 seconds (14 seconds max.).

⇨ The status-LED (Fig. 14/2) blinks green/red (alternating) as soon as the DHCP server is activated.

While the DHCP server is active, it waits for requests from a DHCP client in the network and allocates an IP address to each client that sends a request. This function simplifies the connection from a PC to EM-IP.

Restoring the factory settings

▶ Keep the Reset push button (Fig. 14/1) pressed for more than 15 seconds.

⇨ The status LED (Fig. 14/2) blinks orange.

Once the factory configuration has been set again, the system is rebooted.

9   Web server settings

Supported browsers

Browsers for Mac OS X

The following web browsers may be used with Mac OS-X:

- **Safari** version 6.0.5 or higher
- **Google Chrome** version 70.0.xxx or higher
- **Mozilla Firefox** version 60 or higher

Browser with Microsoft Windows

The following web browsers may be used with Microsoft Windows:

- **Microsoft Internet Explorer** version 8 or higher
- **Google Chrome** version 70.0.xxx or higher
- **Mozilla Firefox** version 60 or higher

Standard IP addresses

> *EM-IP has the following standard IP address:*
>
> **169.254.0.1/16** *(i.e. subnet mask* **255.255.0.0***).*

The integral DHCP client is not active upon delivery. Use the Reset push button or the web server to activate it ⅏ *Chapter 8.3 'Functions of the Reset push button' on page 17*.

If the connected PC is a DHCP client and if there is no DHCP server, the client should generate its own address within 60 seconds. As a consequence, EM-IP can access the web server even if the network characteristics of the PC are not changed.

Supported users

> **! NOTICE!**
>
> **Danger of injury or risk of damage to property due to insufficiently qualified individuals!**
>
> Only network administrators may enter or change data for the web server ⅏ *Chapter 2.6 'Qualified staff' on page 6*.
>
> If unauthorised individuals make changes in the *'Setup'* menu, the warranty becomes void.

The *'Setup'* menu of the web server is password protected to prevent unauthorised individuals from entering or changing data. The Setup menu has been configured for various user groups.

User (group)	Rights	Default password
Guest	Read-only access to *'General settings'*	–
User	Can change operating mode default settings and selected parameters for EM-IP	User
Admin	Can change user and admin passwords as well as all other settings including BACnet/IP and Modbus/IP	Admin

> **! NOTICE!**
>
> **Change your password!**
>
> The password for each user group defaults. The default passwords have to be changed by the network administrator at the time of commissioning.

> ℹ
>
> *User and Admin cannot access the software at the same time.*
>
> *When Admin logs on to the web server, any User connection that may be active at that time is terminated.*
>
> *User will be informed accordingly by a system message.*

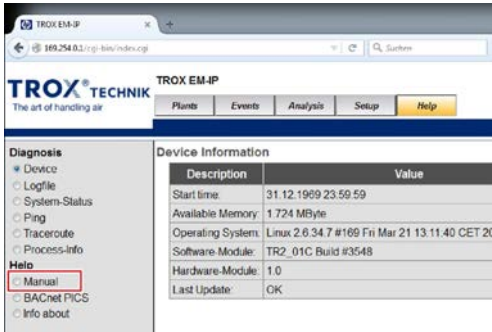**Displaying the configuration manual as PDF document**

Fig. 15: 'Help' menu

To display the configuration manual for EM-IP, go to the *'Help'* menu, then select *'Help/Manual'* on the left side.

10 Interface information

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

You can display the document on the webserver or download it from *www.troxtechnik.com*.

11   Removal and disposal

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.

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