



FMS-1 / FMS-2

Monitoring system



TROX® TECHNIK

The art of handling air

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Translation of the original assembly instructions

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About this manual

This operating and installation manual enables operating or service personnel to correctly install the TROX product described below and to use it safely and efficiently.

This operating and installation 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 facilities manager when handing over the system. The facilities manager 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.

Commissioning

Commissioning the monitoring system requires that it is connected to supply voltage and installed on a fume cupboard (☞ *Chapter 4 'Installation and electrical wiring' on page 12*).

Only skilled qualified electricians are allowed to install the described components.

Usage

The monitoring system can only be used with the BE-SEG-02 or BE-SEG-03 control panel and the EasyConnect configuration software.

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.

Warranty claims

The provisions of the respective delivery terms apply to warranty claims. For purchase orders placed with TROX GmbH, these are the regulations in section "VI. Warranty claims" of the Delivery and Payment Terms of TROX GmbH, see www.trox.de/en/.

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- Publishing content
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Other applicable documentation

In addition to these instructions, the following documents apply:

- Operating and installation manual for EASYLAB control panels BE-SEG-02 and BE-SEG-03
- Installation and operating manual for VS-TRD (face velocity transducer)
- Short description of EasyConnect + adapter B588NF4
- Short description of EasyConnect + BlueCon B588NF5

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

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1 Overview

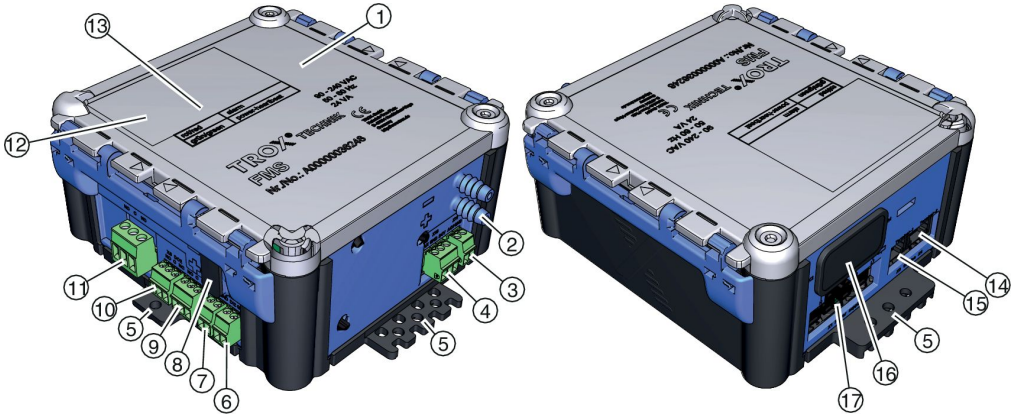


Fig. 1: Monitoring system in detail

- | | |
|--|---|
| <ul style="list-style-type: none"> ① Cover ② Tube connections for differential pressure transducer (only FMS-1) ③ X11 analogue output 0 to 10 VDC ④ X10 analogue input 0 to 10 VDC (only without internal diaphragm pressure transducer MDT) ⑤ Fixing lugs ⑥ X9 digital input 2, e.g. V1/V2 switching ⑦ X8 digital input 1, sash opening ⑧ Cover plate EM-DDT ⑨ X7 changeover contact, e.g. V1/V2 switching | <ul style="list-style-type: none"> ⑩ X6 changeover contact for alarm ⑪ X5 changeover contact, e.g. optional fan connection with EM-VENT ⑫ LED green (on the pc board), display of the supply voltage ⑬ LED red (on the pc board) display of alarm ⑭ X4 service terminal-1, control panel connection, configuration ⑮ X3 service terminal-2, control panel connection, configuration ⑯ X2 light, penetration for lighting connection ⑰ X1 power supply, connection plug for power supply 90 to 240 VAC |
|--|---|

Terminal connections

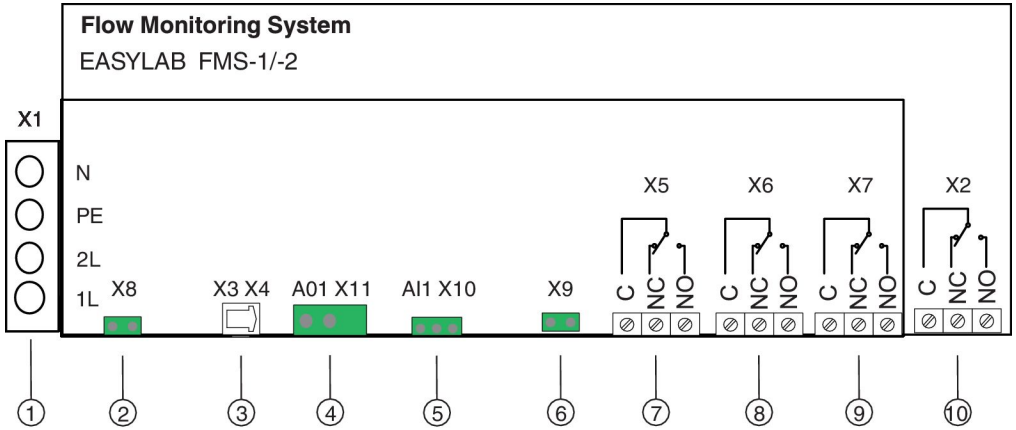


Fig. 2: Terminal connections

Terminal X10 only on FMS-2

No.	Terminal	Name	Connection values
1	X1 - L1	Supply voltage for fume cupboard lighting	90-240 V AC, 50-60Hz, 500 W
	X1 - L2	Supply voltage for monitoring system	90-240 V AC, 50-60Hz, 24 VA
2	X8	500 mm contact – sash monitoring – flip flop switch contact (by others)	5 V DC, 10 mA
3	X3/X4	Terminals 1 and 2 – control panel BE-SEG-XX	24 V DC, 4 VA
4	X11	Analogue output – actual pressure/volume flow rate	0-10 V DC, 10 mA
5	X10	Analogue input – external sensor (pressure/volume flow rate/face velocity) for 0-10 V DC signal and supply voltage 24 V DC for external devices	24 V DC, 85 mA
6	X9	Digital output, volt-free – to deactivate monitoring of 500 mm contact (by others)	5 V DC, 10 mA
7	X5	Digital output, volt-free – e.g. fan release	240 V DC, 2 A
8	X6	Digital output, volt-free – alarm	50 V AC, 2 A
9	X7	Digital output, volt-free – V1/V2 switching	50 V AC, 2 A
10	X2	Digital output – fume cupboard lighting	90-240 V AC, 50-60Hz, 500 W

Technical data

Data	Value	Unit
Supply voltage	90 – 240	VAC
Frequency	50 – 60	Hz
Maximum power consumption	24	VA
Temperature range for operation	10 to 50	°C
Max. relative humidity (no condensation)	90	%
Max. height of installation location	2000	m above mean sea level
Protection level	IP 20	
IEC protection class	II	
Weight	500	g
Max. differential pressure (FMS-1)	300	Pa
Contamination level (EN 61010-1)	2	
Overvoltage category (EN 60664-1)	2	
Impact resistance (IEC 62262)	IK-07	

Under normal operating conditions the unit does not emit any hazardous gases, mists or vapours.

Dimensions and fixing options

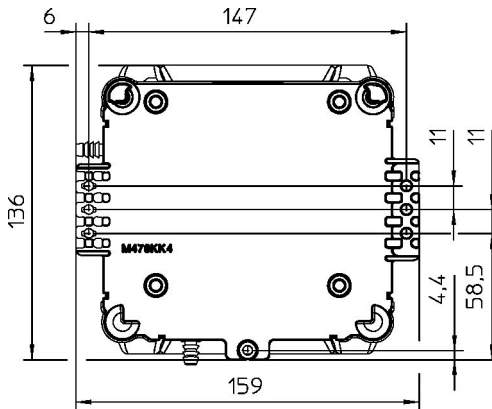


Fig. 3: Dimensions and fixing options

All dimensions are given in mm.

Functional description

The FMS monitoring systems is available in two variants.

Monitoring system FMS-1

Monitoring system FMS-1 monitors the differential pressure or volume flow rate for a fume cupboard by means of its integral diaphragm pressure transducer. Either the supplied measuring probe or any other measurement point may be used.

Monitoring system FMS-2

Monitoring system FMS-2 monitors the electronic signal of the differential pressure, face velocity or volume flow rate received from an external measurement point.

The monitoring system can only be used with the BE-SEG-02 or BE-SEG-03 control panel. It is commissioned with the EasyConnect configuration software (☞ *Chapter 5 'Commissioning the monitoring system' on page 20*). To establish a connection between your PC and the monitoring system it is necessary to either connect the Easylab configuration cable (TROX material no. B588NF4) or use the BlueCon Bluetooth adapter (TROX material no. B588NF5).

Displays

There are two status LEDs (Fig. 1/12) and (Fig. 1/13) on the pc board, which are visible through the transparent area of the housing cover.

Meaning of the LEDs:

- LED green, flashing - Supply voltage present
- LED red, flashing - Alarm display

Expansion modules (optional)

The function of the monitoring system can be expanded with various expansion modules. If any modules have been ordered with the monitoring system, they are factory mounted. If any modules have been ordered at a later stage, refer to ☞ *Chapter 4.6 'Retrofitting optional expansion modules' on page 17* for details on retrofitting.

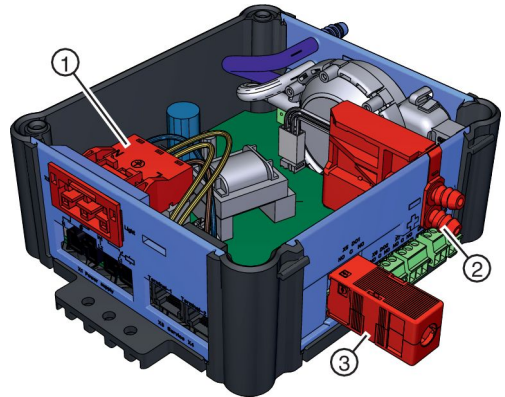


Fig. 4: Expansion modules – overview

EM-LIGHT-F (Fig. 4/1)

The EM-LIGHT-F expansion module provides a WAGO WINSTA-770 socket and is used to connect the fume cupboard lighting to the monitoring system; the lighting can then be switched on or off using the control panel. The 230 V AC socket provides the lighting with 500 W max.

EM-CPL

EM-CPL is the mating connector for EM-LIGHT-F. EM-CPL is used to connect the plug-in lighting cable to the EM-LIGHT-F expansion module.

EM-DDT (Fig. 4/2)

Expansion module EM-DDT is used to connect an additional measurement point for the volume flow rate or differential pressure, e.g for monitoring a supportive flow fan.

EM-VENT (Fig. 4/3)

DO1 is used to connect a fan to the monitoring system and then activate it using the control panel. An additional fan may be used as a supportive flow fan in the fume cupboard.

If the fan is connected to the 230 V AC socket, expansion module EM-VENT functions as an insulation piece and wire clamping bracket.

2 Safety

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.



NOTICE!

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

Dangers and risks



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 the unit.
- Only skilled qualified electricians are allowed to work on live components.

Correct use

Monitoring system FMS is used to monitor the differential pressure, volume flow rate or face velocity (only FMS-2) for a fume cupboard. It is used with control panel BE-SEG-02 or BE-SEG-03. If a value falls below a limit set with the EasyConnect configuration software, the red warning lamp on the control panel lights up. If a set value is exceeded, the yellow lamp on the control panel lights up.

- Use the monitoring system only for the applications described in this manual.
- Ensure the correct installation orientation (FMS-1), otherwise the volume flow rate or differential pressure measurement will not function correctly.

The use of expansion modules extends the usage range of the monitoring system.

EM-LIGHT-F	Connection for fume cupboard lighting
EM-VENT	Combined insulation piece and wire clamping bracket for fan activation 230 V AC
EM-DDT	Monitoring of another differential pressure value, e.g. for a supportive flow fan

Incorrect use

Do not use the monitoring system for areas of application that are not described in this manual or in a different installation orientation.

The monitoring system must not be used in the following areas:

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

Risk of damage to the monitoring system



NOTICE!

Risk of damage to property if connection values are exceeded!

An exceeding of pressure limits and electrical connection values may result in damage to the monitoring system.

- Ensure that permitted values (see Technical Data) are not exceeded.

! NOTICE!

Power failure

Failure of the power supply results in failure of the monitoring system.

Qualified staff

Only skilled qualified electricians are allowed to work on live components.

The monitoring system is typically commissioned with the fume cupboard, either by the laboratory furniture manufacturer or by the system owner.

3 Delivery

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

Properly dispose of packaging material.

FMS-1 supply package

Monitoring system FMS-1
Plug for 230 V supply voltage (WAGO 770-104)
Two tubes, one blue and one transparent, each 1 m long
Measuring probe

FMS-2 supply package

Monitoring system FMS-2
Plug for 230 V supply voltage (WAGO 770-104)

If EM-LIGHT-F has been ordered

EM-LIGHT-F	Socket to facilitate connecting the fume cupboard lighting
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Optional

EM-CPL (WAGO 770-113)	Mating connector for EM-LIGHT-F
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If EM-DDT has been ordered

Pressure transducer	Differential pressure transducer for the monitoring of a supportive flow
---------------------	--

If EM-VENT has been ordered

Insulation piece	230 V insulation piece for connection socket D01, for example to connect a fan contactor
------------------	--

Bearing

Store the product in a dry place so that no condensation can form.

Storage conditions

Temperature range	-10 to 70 °C
Relative humidity	< 90 %

4 Installation and electrical wiring



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 the unit.
- Only skilled qualified electricians are allowed to work on live components.

Installing FMS-1

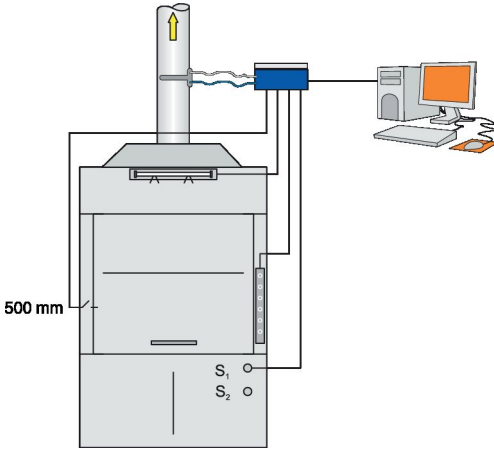


Fig. 5: Installation configuration

Installing the FMS-1 casing

Only install the FMS-1 monitoring system horizontally on the roof of a fume cupboard, or vertically on the side wall of a fume cupboard with the tube connections on the left or right.

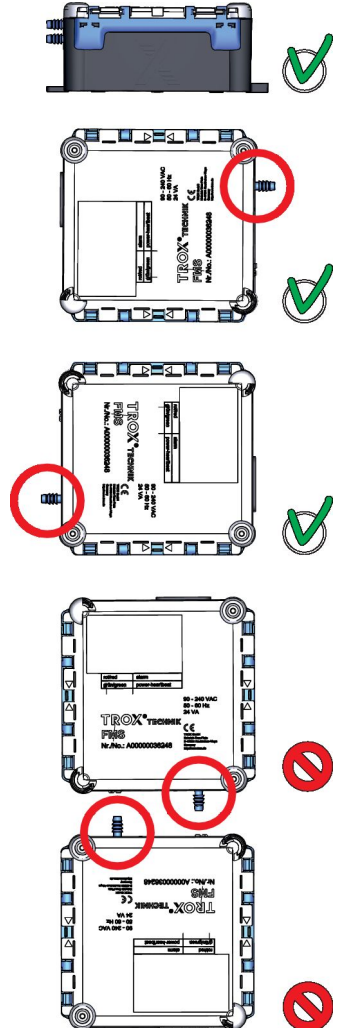


Fig. 6: Monitoring system FMS-1, installation orientation

- Install the monitoring system in such a way that no vibration is transmitted.
- Make sure that no chips, dirt or foreign objects get into the casing or the pressure transducer during installation.
- ▶ Screw the fixing pieces of the FMS-1 casing (Fig. 1/5) with at least two chipboard screws tightly to the fume cupboard so that it cannot be moved.

Fitting the measuring probe in the duct to be monitored



Note the length of the tubes!

When choosing a position for the measuring probe and for the monitoring system, note that the supplied measuring tubes are exactly 1 m long.



Fig. 7: Fitting the measuring probe

- ① Airflow direction (arrow)
- ② Tube connections (+/-)
- ③ Drilled holes (for fixing)

The measuring probe is required for differential pressure measurement in the duct; you may also use a different suitable measurement point.

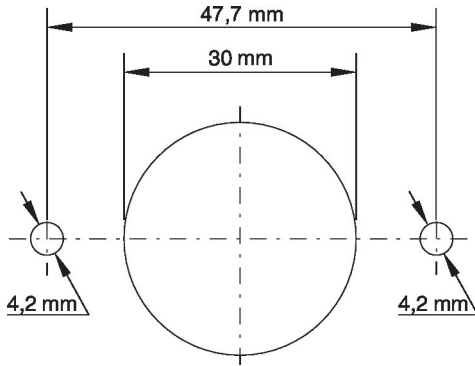


Fig. 8: Drilled holes for the measuring probe

1. ▶ Drill a hole with a diameter of 30 mm into the extract air duct and debur it.
2. ▶ Drill two holes with a diameter of 4.2 mm into the duct for fixing the measuring probe to the duct.
3. ▶ Insert the measuring probe correctly (note the airflow direction, indicated with an arrow).
4. ▶ If the probe is too long for the duct, trim it.
The supplied measuring probe is 240 mm long.
5. ▶ Screw fix the measuring probe.

Connecting the measuring probe to monitoring system FMS-1

When fitting the tubes, note the + and - marks on both components.

- ▶ Fit the tubes so that they are tight, and avoid kinking them.

Installing FMS-2

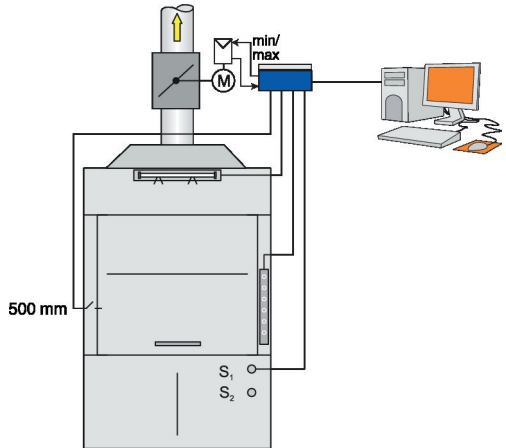


Fig. 9: FMS-2 installation configuration

Installing the FMS-2 casing

Fitting the fixing pieces of monitoring system FMS-2 (Fig. 1/5) to the roof or to the side wall of the fume cupboard.

1. ▶ Fix the FMS-2 casing with at least two chip-board screws tightly to the fume cupboard so that it cannot be moved.
2. ▶ Connect the input signal to the interface.
The input signal must be within the voltage range of 0 to 10 V DC.

Connecting the supply voltage

Plug assignment, terminal X1

1L	Supply voltage for fume cupboard lighting
2L	Supply voltage for monitoring system
N	Neutral conductor
PE	Protective earth

- ▶ Wire the plug for the supply voltage according to the table.

To ensure that the voltage can be switched off safely, it must be connected to a circuit breaker or a nearby plug contact.

- ▶ Connect the plug for the supply voltage to the monitoring system (Fig. 1/15).

Opening the cover of the casing

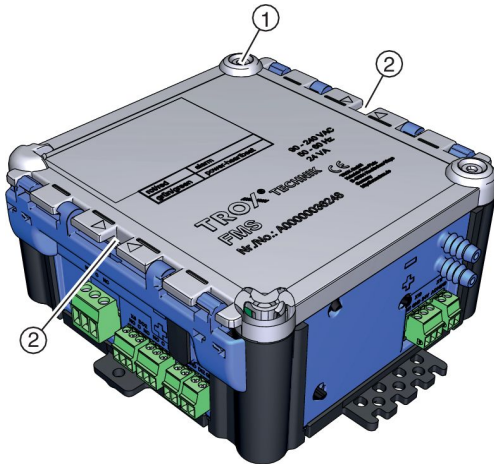


Fig. 10: Gaps that facilitate opening the casing cover

- ▶ Loosen the screw (Fig. 10/1) and insert a screw driver into one of the gaps (Fig. 10/2) to unclip the cover.

Wiring the fume cupboard lighting (optional)

The fume cupboard lighting can be switched on and off using the control panel if the lighting is connected to monitoring system FMS-1 or FMS-2.

- ▶ Open the casing cover (↪ Chapter 4.4 'Opening the cover of the casing' on page 16).
- ▶ Feed the cable through the cover plate (Fig. 11/2) into the casing.

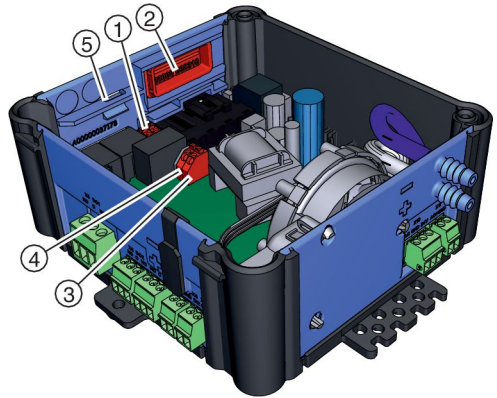


Fig. 11: Wiring the lighting

- ▶



Do not lay the cable for the lighting near the power supply unit in the casing.

Wiring L, N and PE (↪ Chapter 1.1 'Terminal connections' on page 7).

- L (Fig. 11/4)
 - N (Fig. 11/3)
 - Connect PE to double terminal (Fig. 11/1)
- ▶ Use a cable tie to attach the wire to the bracket (Fig. 11/5) to provide strain relief.
 - ▶ Close the casing cover.

Retrofitting optional expansion modules



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 retrofitting any expansion modules.
- Only skilled qualified electricians are allowed to work on live components.

Retrofitting expansion module EM-LIGHT-F

Expansion module EM-LIGHT-F may be used to connect the lighting of a fume cupboard using a WAGO-WINSTA-770 plug.

1. ▶ Open the casing cover (↪ Chapter 4.4 'Opening the cover of the casing' on page 16).

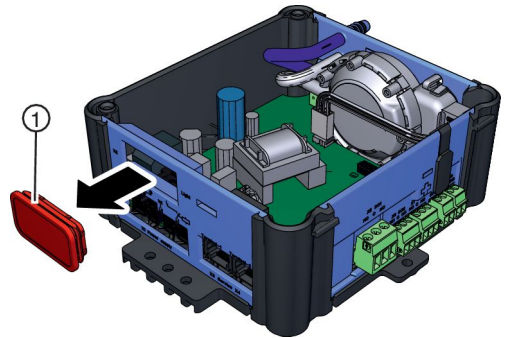


Fig. 12: Removing the cover plate

2. ▶ Remove the cover plate (Fig. 12/1).
3. ▶ Feed the end of the cable for the EM-LIGHT-F expansion module into the casing.

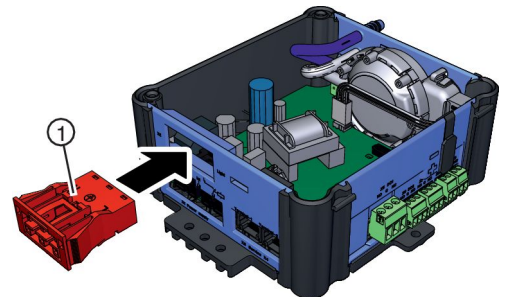
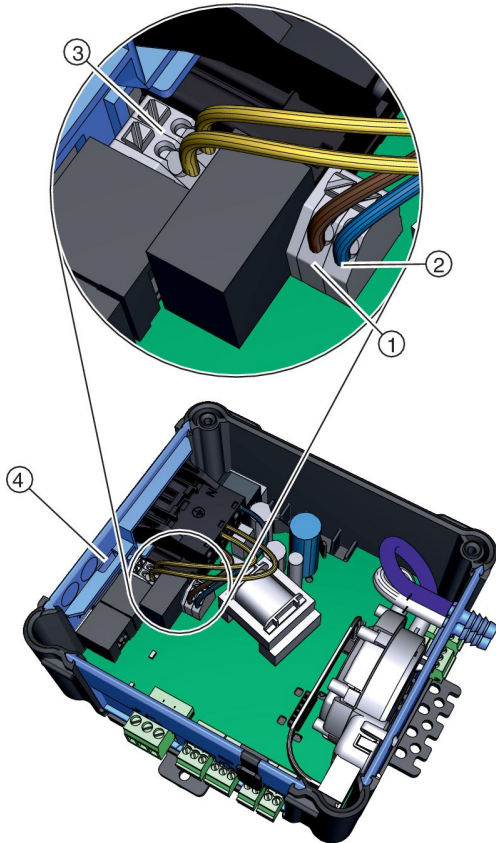


Fig. 13: Pushing EM-LIGHT-F into the casing

4. ▶ Push expansion module EM-LIGHT-F into the casing (Fig. 13/1).



Wiring the mating connector EM WAGO WINSTA 770 for the lighting

1. ▶ Connect L, N and PE to the mating connector (↪ Chapter 1.1 'Terminal connections' on page 7).
2. ▶ Plug the mating connector into the EM-LIGHT-F expansion module.
 - ⇒ The fume cupboard lighting can now be switched on and off using the control panel.

Fig. 14: Connecting expansion module EM-LIGHT-F

5. ▶ Connect expansion module EM-LIGHT-F to the main PCB (↪ Chapter 1.1 'Terminal connections' on page 7).
 - L (Fig. 14/1)
 - N (Fig. 14/2)
 - PE (Fig. 14/3)
6. ▶ Use a cable tie to attach the wire to the bracket (Fig. 14/4) to provide strain relief.
7. ▶ Close the casing cover.

Retrofitting expansion module EM-VENT

Expansion module EM-VENT may be used to connect a fan with up to 240 V to digital output DO-1; the fan can then be controlled using the monitoring system.

EM-VENT is a combined insulation piece and wire clamping bracket.

1. ▶ Connect expansion module EM-VENT (↪ Chapter 1.1 'Terminal connections' on page 7) and attach the wire clamping bracket.
2. ▶ Depending on the fan capacity, connect the digital output DO-1 using a coupling relay.

i
The maximum switch rating is 250 V AC 2 A.

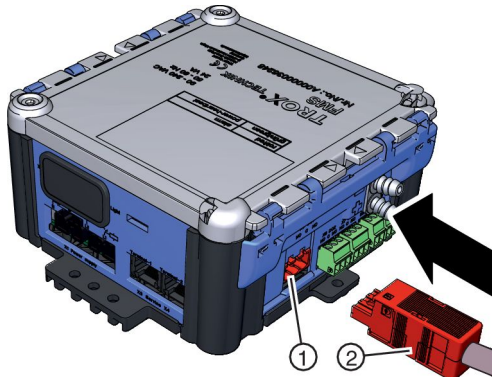


Fig. 15: Plugging EM-VENT

3. ▶ Plug expansion module EM-VENT (Fig. 15/1) into digital output DO-1 (Fig. 15/2).
 - ⇒ The fan is now controlled by the monitoring device.

Retrofitting expansion module EM-DDT

Expansion module EM-DDT is used to monitor an additional measurement point.

i
Operating range of expansion module EM-DDT within pressure range 5 to 300 Pa.

1. ▶ Open the casing cover (↪ Chapter 4.4 'Opening the cover of the casing' on page 16).

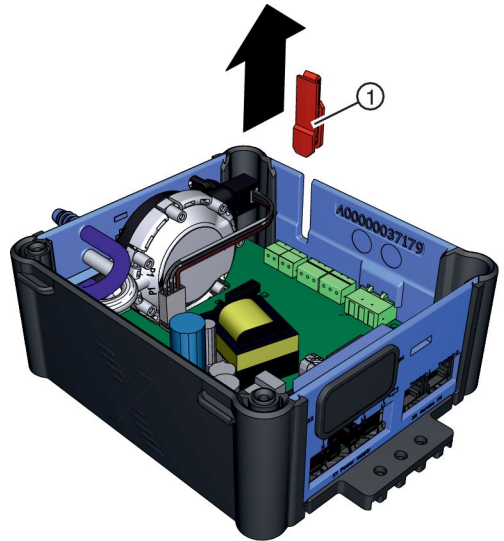


Fig. 16: Removing the cover plate

2. ▶ Remove the cover plate (Fig. 16/1).

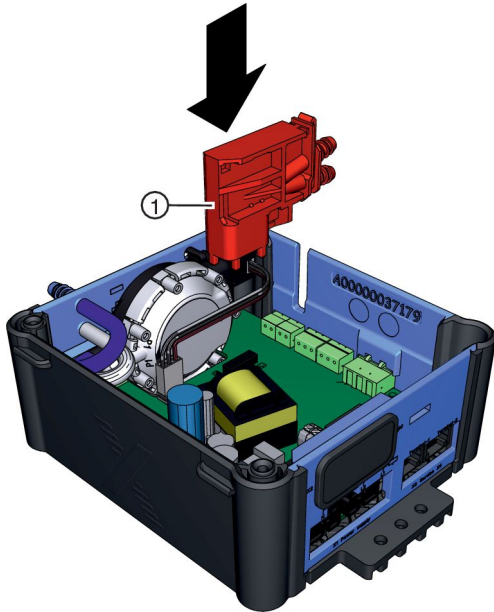


Fig. 17: Plugging expansion module EM-DDT into the PCB.

3. ▶ Plug expansion module EM-DDT into the PCP (Fig. 17/①).
4. ▶ Close the casing cover.

Connecting expansion module EM-DDT with a measurement point

When fitting the tubes, note the + and - marks on both components.

- ▶ Fit the tubes so that they are tight, and avoid kinking them.

5 Commissioning the monitoring system

To commission the monitoring system it is necessary to connect it to a PC on which the EasyConnect configuration software, version 6 or higher, is installed.

To make a connection to the PC, you need one of the following components:

- EASYLAB configuration cable (TROX material no. B588NF4)
- Bluetooth adapter BlueCON (TROX material no. B588NF5) and a computer with Bluetooth interface

Connection setup via EASYLAB configuration cable (to configure the interface according to the short description of EasyConnect + and cable adapter B588NF4):



Fig. 18: EASYLAB configuration cable

1. ▶ Connect the PC and the monitoring system using a USB-RS485 interface adapter and the EASYLAB configuration cable.
2. ▶ Start the EasyConnect configuration software.

Connection setup via Bluetooth adapter BlueCon (to configure the interface according to the short description of EasyConnect + BlueCon B588NF5):



Fig. 19: Bluetooth adapter BlueCon

1. ▶ Plug the Bluetooth adapter BlueCon into the monitoring system.
2. ▶ Activate Bluetooth on the computer.
3. ▶ Start the EasyConnect configuration software.

Configuring the monitoring system

1. ▶ Connect the PC to the monitoring system.
2. ▶ Start the EasyConnect configuration software.
3. ▶ Adjust the configuration settings and save them.

Carry out zero point correction (only FMS-1)

The EasyConnect software recognises the system configuration and guides you through the required steps.

1. ▶ Connect the PC to the monitoring system.
2. ▶ Start the EasyConnect configuration software.
3. ▶ Follow the instructions of the EasyConnect configuration software and disconnect the measuring tubes from the probe, then start the zero point correction.
4. ▶ Follow the instructions of the EasyConnect configuration software.
5. ▶ When the zero point correction is finished, reconnect the measuring tubes.

Functional test

The functional test is done with the EasyConnect configuration software.

1. ▶ Connect the PC to the monitoring system.
2. ▶ Start the EasyConnect configuration software.
3. ▶ Start the functional test and follow the instructions of the EasyConnect configuration software.

⇒ If the functional test with the EasyConnect configuration software completes without any errors, the monitoring system is ready to be used.

If the functional test is unsuccessful, check the wiring and the tube connections, then repeat the functional test.

6 Maintaining the monitoring system

Maintaining the monitoring system

Maintenance has to be carried out by the system owner; maintenance comprises the same steps as commissioning.

Interval	Maintenance work
Every 12 months	Carry out zero point correction (☞ 'Carry out zero point correction (only FMS-1)' on page 21).
	Carry out a functional test (☞ 'Functional test' on page 21).
	Remove any dust deposits on the casing with a lint free cloth or a vacuum cleaner

Fault remedy

Error description	Cause	Remedy
Monitoring system is out of order	Monitoring system is defective	Stop working on the fume cupboard and call service.
	Power failure	
Red lamp on the control panel is illuminated	Monitoring values are lower than the set values	
Yellow lamp on the control panel is illuminated	Monitoring values exceed the set values	Call service

7 Removal and disposal

Remove

Once the period of use of the device has expired, the device must be removed and disposed of in an environmentally friendly manner.

1. ▶ Remove the mains cable.
2. ▶ Remove any other cable and tube connections.
3. ▶ Loosen the screw connection of the monitoring system and the probe and remove them.
4. ▶ Once you have removed the probe, seal off the openings on the fume cupboard.



DANGER!

Danger of death due to electric current!

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

- Switch off the power supply and remove the unit from the power supply before starting to de-install the unit.
- Only skilled qualified electricians are allowed to de-install live components.

Disposal

If no return or disposal agreement is in place, any disassembled components should be recycled:

1. ▶ Have electronic waste and electronic components disposed of by an approved specialist disposal company.
2. ▶ If the probe has been contaminated with chemical substances while in the fume cupboard, have it disposed of by an approved specialist disposal company.

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