



TROX GmbH TCU3 Lab Control Easy Lab Instruction Manual

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TROX[®] TECHNIK

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General

Wiring Notes

EASYPAC Controller TCU3



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TCU3 Lab Control Easy Lab

Notes

The options contained in these wiring instructions can be activated and parameterized with the EasyConnect software. It is not possible to set the controller parameters individually at the factory.

Applicable documents

Leaflets and assembly instructions of

- EASYLAB Controller TCU3
- EASYLAB Expansion modules EM-TRF or EM-TRF-USV, EM-LON, EM-AUTOZERO, EM-LIGHT, EM-BAC-MOD-01, EM-IP
- Sensors/Transducers for fume cupboard control VS-TRD or DS-TRD-02
- EASYLAB Control panels BE-SEG-02, BE-LCD, CP-TOUCH

General safety instructions

Recognised codes of engineering practice, especially the safety requirements and accident prevention regulations

must be observed when performing all assembly, wiring and commissioning procedures.

Only specially trained and qualified personnel are permitted to perform the assembly, wiring and commissioning. The electrical installations must be implemented in compliance with the current valid EN / VDE / DIN and local electrical regulations.

Danger:

Electric shock by touching live parts.

Electrical devices may cause electrical hazards during operation

Before installation/assembly works begin:

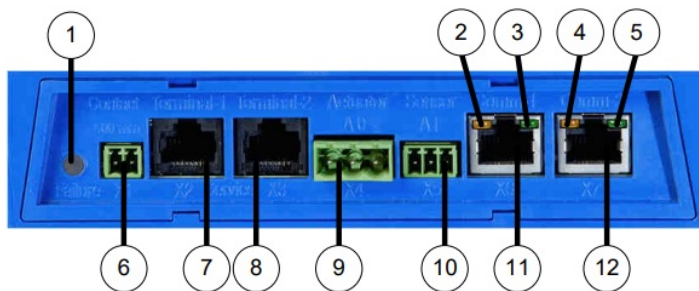
Disconnect all poles or switch off supply voltage of EASYLAB controller.

Protect power supply against unauthorised or unintended restart.

All installation operations may only start after these safety operations.

Exterior sockets / Indicators:

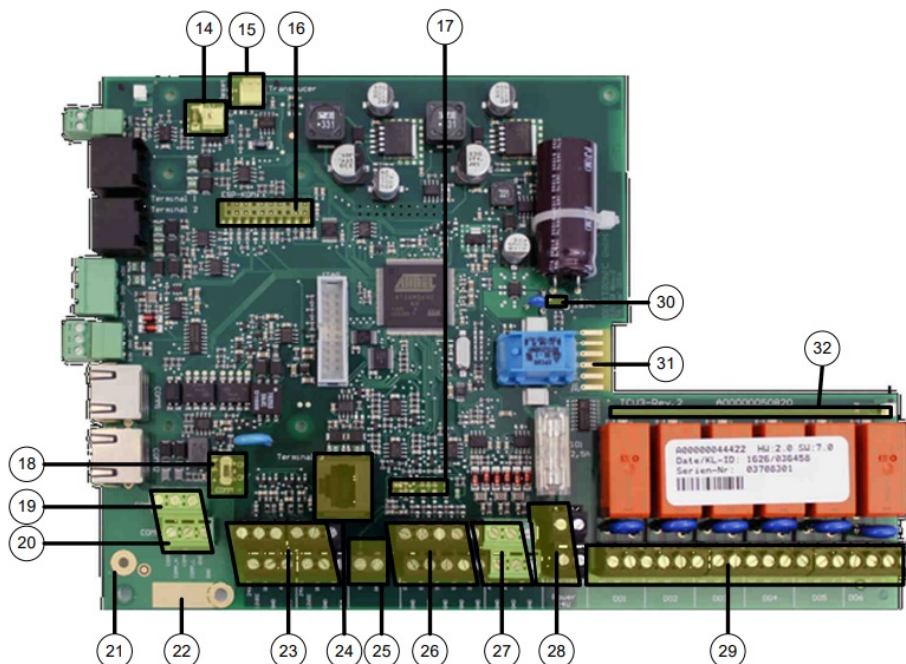
Left box side



Right box side

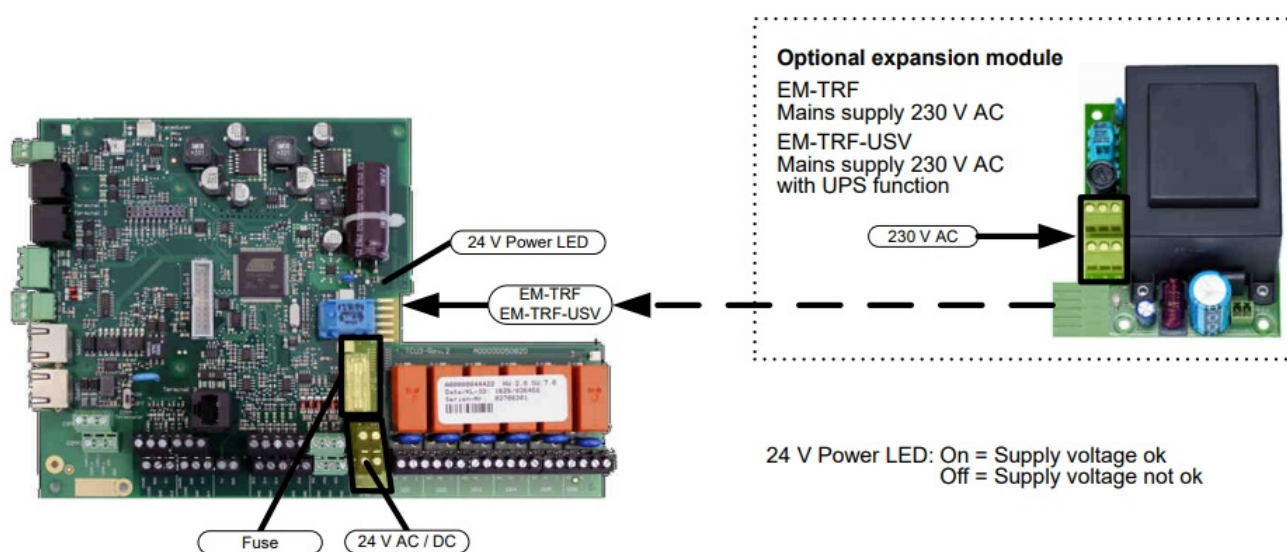


Interior sockets / Indicators:

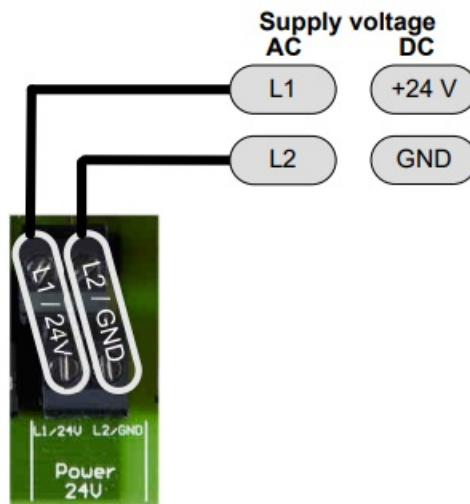


1 Red error indicator 2 Yellow indicator – Network termination activated 3 Green indicator (Reserved) 4 Yellow indicator CL-Network data received 5 Green indicator Controller operation (Heartbeat) 6 Socket X1 DI1 – Sash contact 500 mm 7 Socket X2 Control panel 1 8 Socket X3 Control panel 2 9 Socket X4 A04 Actuator 10 Socket X5 AI5 – Face velocity transducer 11 Socket X6 Communication line 1 – RJ45 12 Socket X7 Communication line 2 – RJ45	13 Socket Fume cupboard lights via connector from Wago Winsta Midi Series 770-113 (only with EM-LIGHT expansion module) 14 Socket Magnetic valve EM-AUTOZERO 15 Socket AI1 for internal volume flow transducer 16 Expansion slot for LonWorks®, BACnet, Modbus interface with EM-LON, EM-BAC-MOD-01 or EM-IP 17 Optical status indicators of digital inputs 18 Activation switch for CL network termination 19 Screw terminals for communication line 1 20 Screw terminals for communication line 2	21 PE connection 22 Clamp / Connection pad for cable shield 23 Screw terminals Analogue inputs AI1...AI4 24 connection digital actuator 25 Screw terminals temperature sensor PT1000 TI1 26 Screw terminals Digital inputs DI2...DI6 27 Screw terminals Analogue outputs AO1...AO3 28 Screw terminals Power supply 24 V AC / DC 29 Screw terminals Digital outputs DO1...DO6 30 Green indicator 24 V ok 31 Connection pad for Expansion module mains supply 32 Optical indicators for switching state of digital outputs
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Power supply



Supply voltage 24 V AC / DC



Technical data:

- Supply voltage 24 V AC \pm 15% 50-60 Hz
- Supply voltage 24 V DC \pm 15%
- Fuse 2,5 A slow, 250 V; glass tube fuse 5×20 mm
- Power consumption up to 40 VA (Maximum configuration) inrush current actuator: I_{max} 20 A for 5 ms

Only TCU3 without additional configuration:5 VA

Maximum power consumption is determined by the individual controller configuration.

Typical configurations will lead to following values:

Fume cupboard controller with control panelup to 35 VA

Room controller with room control panel CP-TOUCH..... up to 33 VA

Room controller without room control panel up to 29 VA

Supply air/extract air controller without room control panelup to 29 VA

! Important wiring instructions:

Observe polarity

Polarity of DC and AC supply voltage has to be strictly complied for all controllers during wiring.

Limited wiring in a row

Power supply wiring in a row (via double terminals) is only approved for a maximum of 5 EASYLAB controllers!

Supply voltage at analogue inputs for supply of sensor/transducer

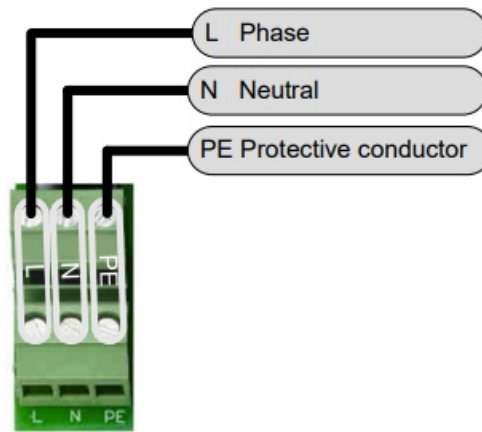
Type of used controller power supply (AC/DC) will influence type of provided power supply at analogue inputs:

TCU3 Power supply 24 V AC → Provided sensor supply at AI1-AI5 is 24 V AC

TCU3 Power supply 24 V DC → Provided sensor supply at AI1-AI5 is 24 V DC

This may require attention for connected sensors

Mains supply voltage 230 V AC



Alternative power supply

(only with expansion module EM-TRF or EM-TRF-USV)



Technical data:

- Supply voltage 230 V AC \pm 20% 50-60 Hz
- Fuse 500 mA slow, 250 V
- Power consumption up to 40 VA (Maximum configuration)



Important wiring instruction:

- Never connect 230 V and 24 V supply voltage simultaneous at one controller.
 - Never connect 24 V supply voltage at controller with built in expansion module EM-TRF or EM-TRF-USV
- Supply voltage at analogue inputs for supply of sensor/transducer
- TCU3 Power supply 230V AC → Provided sensor supply at AI1-AI5 is 24 V DC (with EM-TRF, EM-TRF-USV)
- This may require attention for connected sensors

Communication line (CL)

For Plug- & Play data exchange between the controllers within one EASYLAB system



Note:

Use always green patch cables for the communication line CL

Aim: Simple determination of communication line cable (green) and control panel connecting cable (blue)

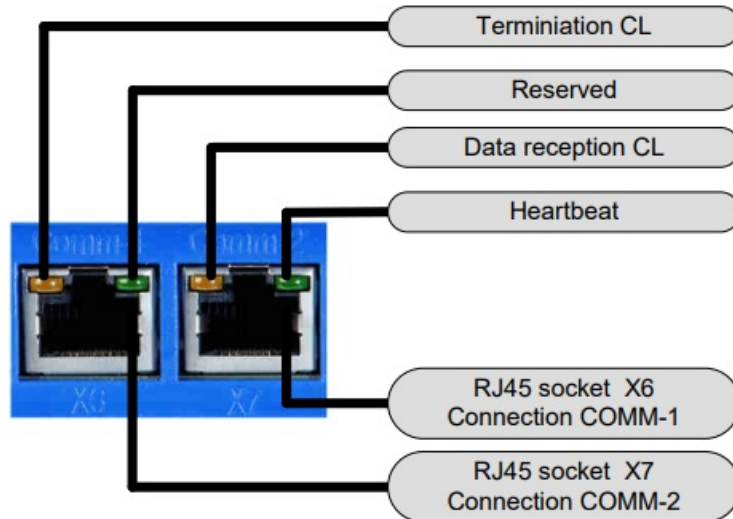
Technical data:

- Maximum device no. within one system: 24
- Maximum total length: 300 m
- Network cable type SF-UTP (braid + foil shield) according ISO IEC 11801 (2002) patch cable with RJ45 plug

connectors on both sides or cable from a reel; e.g. Cat 5

- Activate termination resistor at the beginning and the end of the EASYLAB communication line CL.
- 5 m connection cable for communication line CL included in the delivery (only for fume cupboard controller with device function FH-xxx and TAM)

CL – Connection sockets and indicators



Termination indicator

Yellow = Termination active Off = Termination inactive

Data reception CL

Yellow / blinking = Data received

Heartbeat

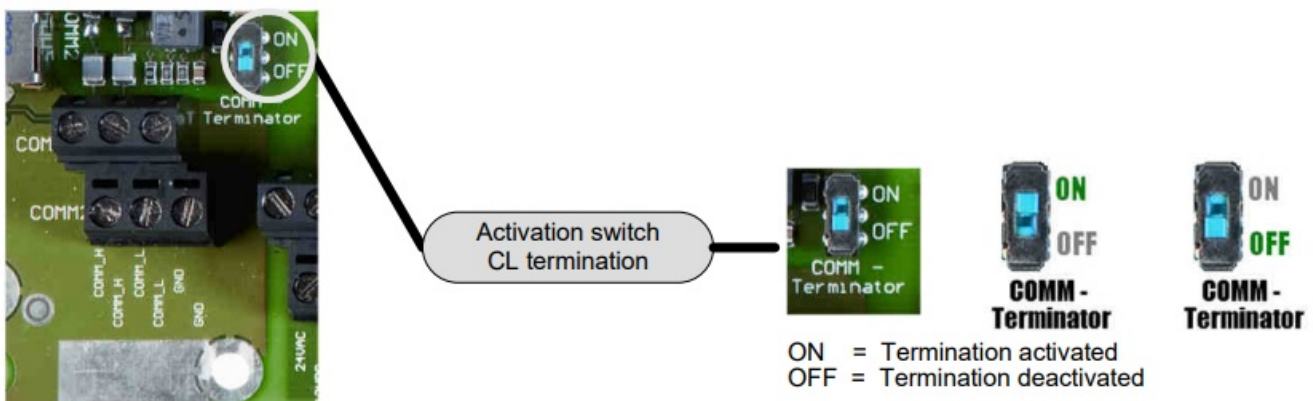
Green slow blinking = Normal controller operation

Green off = Device not operable

Default socket communication line 1

Default socket communication line 2

CL – Termination resistor



! Termination of communication line CL

For a correct data exchange of the controllers is a termination on both ends of the communication line required.

Communication line (CL)

CL – Screw terminals as an alternative wiring option:

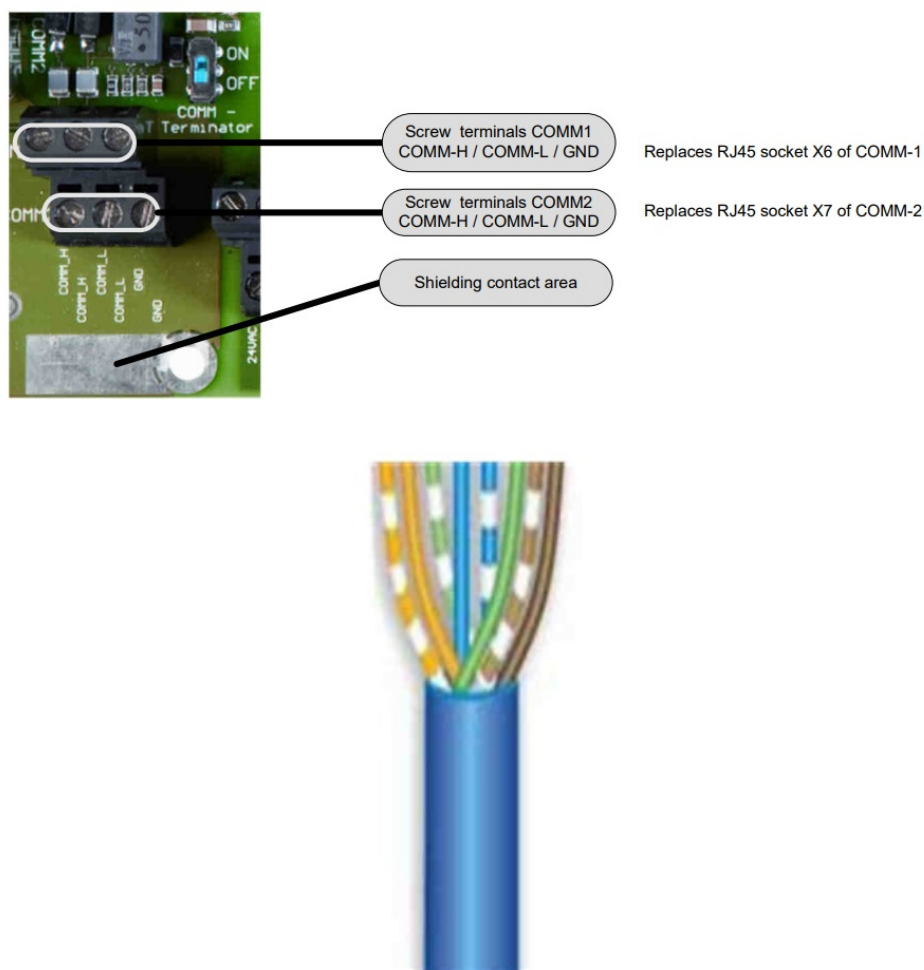
For data exchange via network cable from a reel as an alternative to patch cables

! Important wiring note:

For port COMM1 or COMM2 on one EASYLAB controller use either the RJ45 sockets with patch cable or the screw terminals with network cable from a reel to built up the communication line CL.

Technical data:

- Maximum device no. within one system: 24
- Maximum total length: 300 m
- Network cable type SF-UTP (braid + foil shield) according ISO IEC 11801 (2002) cable on a reel; e.g. Cat 5
- Activate termination resistor at the beginning and the end of the EASYLAB communication line CL.



Wiring notes:

- Uses either screw terminals or RJ45 sockets of one EASYLAB controller.
- Use always two cores for each signal
- Use clamp to contact cable shielding with shielding contact area on the controller PCB

Wire assignment as follows:

Screw terminal TCU3	Cable core (Color coding according EIA/TIA568B)		
GND	blue	and	white/blue
COMM_H	white/orange	and	white/green
COMM_L	orange	and	green

Communication system – Communication line (CL) and it's termination

! Important notes for system design

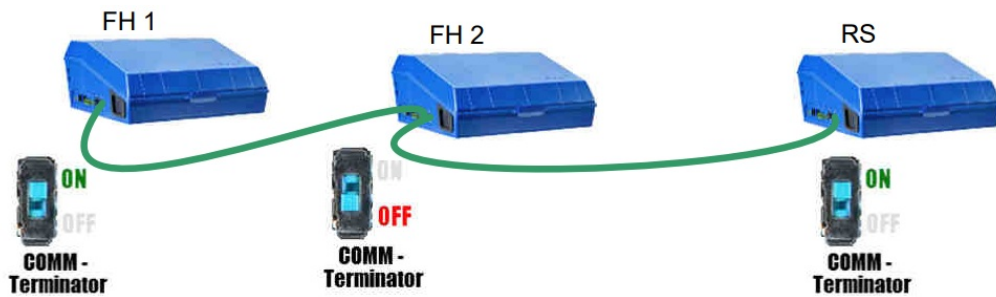
- Up to 24 EASYLAB controller can be connected together
FH: Fume cupboard controller SC: Supply air controller EC: extract air controller RS: Room supply air controller
RE: Room extract air controller, PC: pressure controller, TAM: TROX Adaption module
- Any order of devices at communication line is allowed
- Only controller types (RS, RE, PC, TAM) of one system type can work within one EASYLAB communication system; that means either controller types of an extract air controller system (LAB Laboratory) or controller types of a supply air controlled system (CLR CleanRoom)
- Maximum length of the communication line CL: 300m.
- Use network cable type SF-UTP acc. ISO IEC 11801 (braid+foil shielded e.g. CAT 5)
- 5 m connection cable for communication line CL included in the delivery (only for fume cupboard controller with device function FH-xxx)
- Communication line termination at the beginning and the end by activating the switch COMM-Terminator on the EASYLAB main board (see examples below)



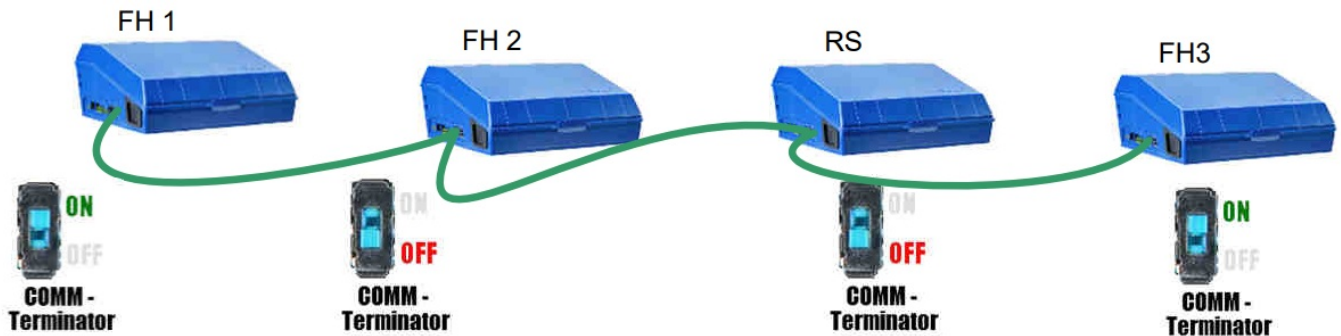
Example 1: Two fume cupboard controller or two room controller



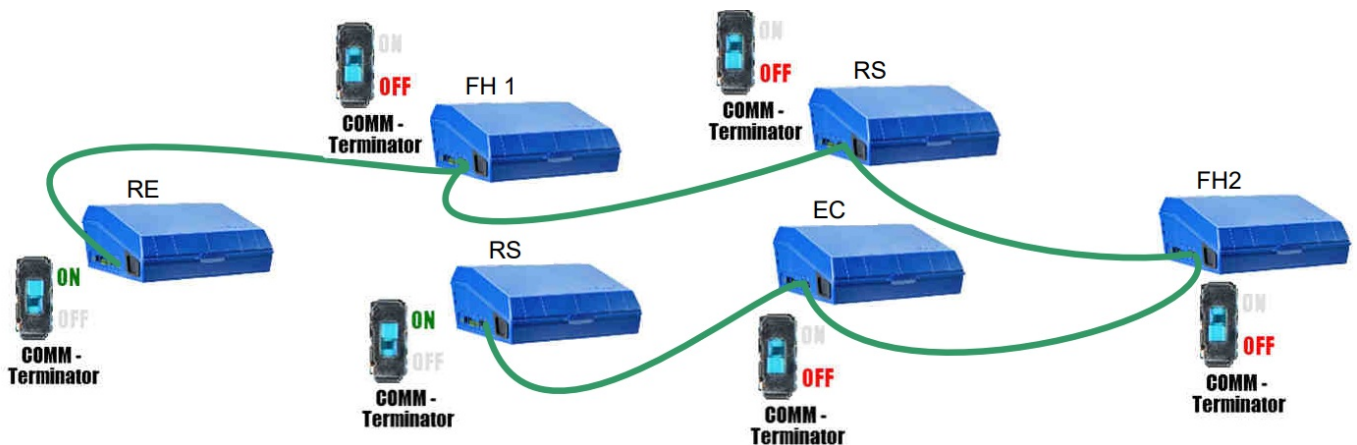
Example 2: Two fume cupboard controller and one room supply air controller



Example 3: Three fume cupboard controller and one room supply air controller



Example 4: Two fume cupboard controller, one extract air controller, two room supply air controller and one room extract air controller



Room-Management-Function

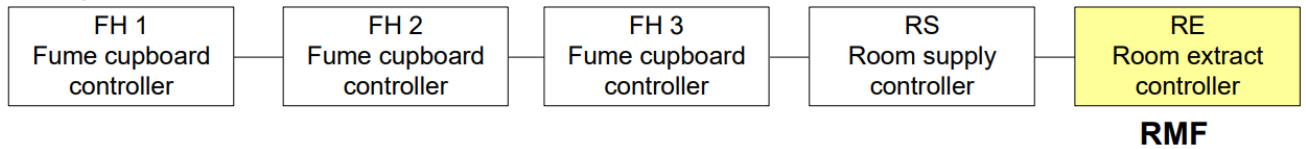
The Room-Management-Function (RMF) is a software option to realize room based functions with the EASYLAB System:

- Centralized interchange point for wiring of room functions
- Connection of room control panels
- Centralized configuration of room parameters and functions
- Monitoring of room functions

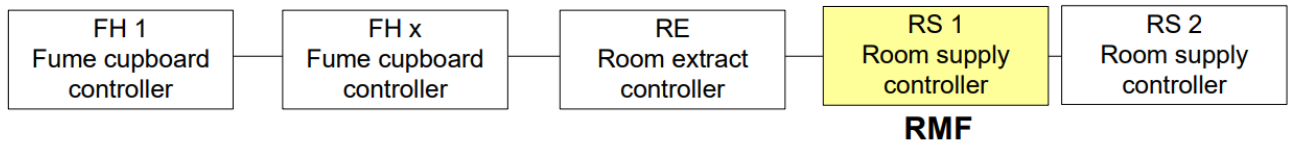
! Technical data:

- RMF can be activated on any room controller (Supply or Extract air) or on a TROX Adaptations module.
- RMF activation is only allowed on exactly one EASYLAB controller in a system of max. 24 controller.
- RMF can be activated with the EASYLAB configuration software EasyConnect.

Example 1:



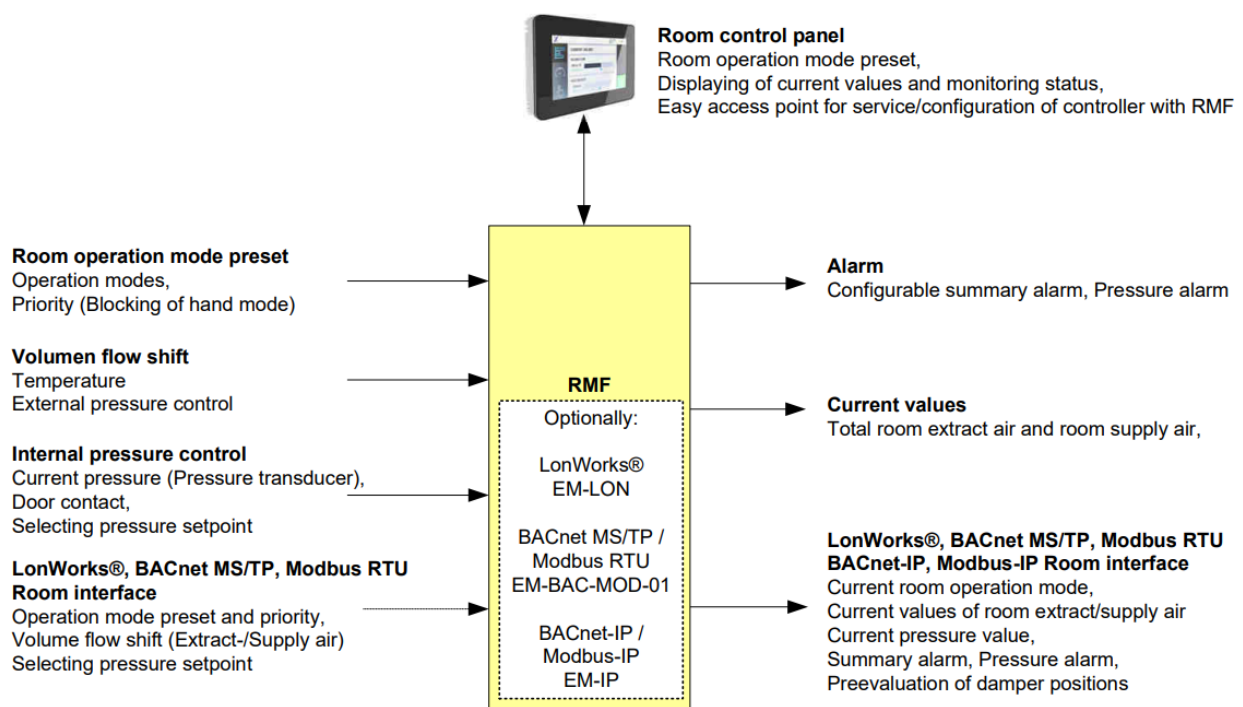
Example 2:



RMF relevance for wiring

The selection of the controller with RMF is relevant for the wiring of room based functions and signals.

Following signals and the room control panel have to be connected at the controller with the RMF:



Connection of control panels



Note:

Use always blue patch cables for the control panels

Aim:

Simple determination of communication line cable (green) and control panel connecting cable (blue)



RJ45 socket X3
Control panel #2

RJ45 socket X2
Control panel #1

Control panel for fume cupboard controllers:



BE-SEG-02



CP-TOUCH

Technical data:

- Admitted are control panel types BE-SEG-01 and -02, BE-LCD and CP-TOUCH
- Up to two control panels can be connected to one controller
- 5 m connection cable blue included in the delivery
- Optionally connection cable up to 40 m overall length useable:
Network cable type SF-UTP acc. ISO IEC 11801 (braid+foil shielded) with RJ45 connectors on both sides, e.g. patch cable Cat 5
- Plug in connection cable on back side of control panel

Room control panel:



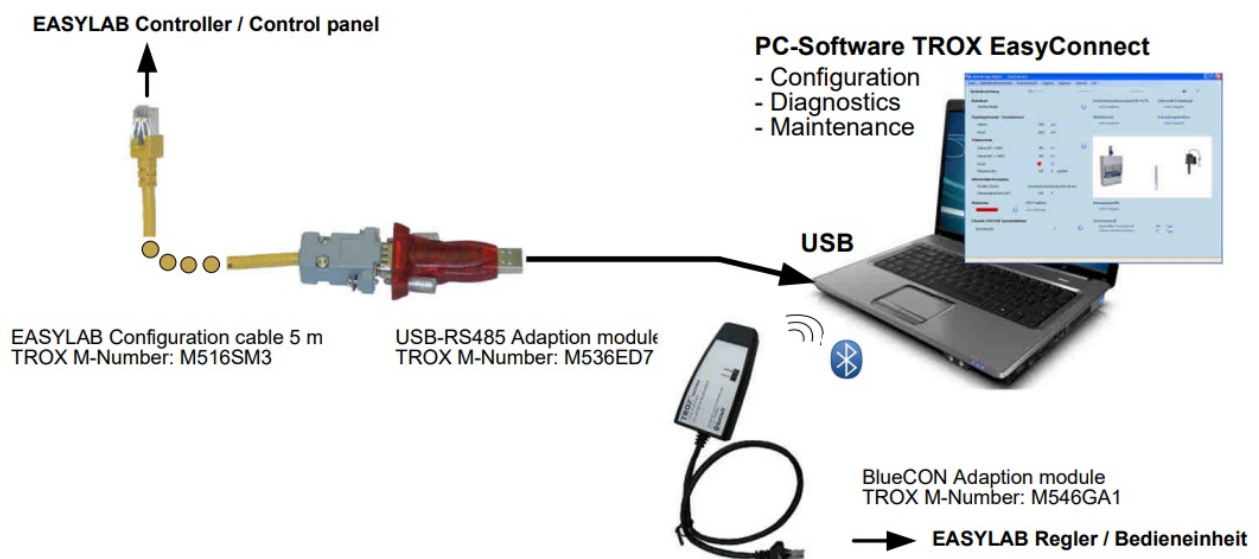
CP-TOUCH

Technical data:

- Useable only at room controllers with activated Room-Management-Function
- Admitted is only control panel type BE-LCD and CP-TOUCH
- Up to two control panels can be connected to one controller
- 5 m connection cable blue included in the delivery
- Optionally connection cable up to 40 m overall length useable:
Network cable type SF-UTP acc. ISO IEC 11801 (braid+foil shielded) with RJ45 connectors on both sides, e.g. patch cable Cat 5
- Plug in connection cable on back side of control panel

! Note: Room control panels can only be used at room controllers with activated Room-Management-Function (RMF).

Connection of TCU3 and PC for TROX EasyConnect-Software



Complete package 1:

Order Code: EasyConnect-CAB

EasyConnect Software +

Configuration cable + USB-RS485 Adaption module + programing adapter

TROX Number: B588NF4

Complete package 2:

Order Code: EasyConnect-BC

Alternatively you can use the Bluetooth Adaption module BlueCON for a wireless connection between TCU3 and PC with Easy Connect software. The BlueCON module replaces the USB-RS485 Adaption module and the cable.

EasyConnect Software + Bluetooth Adaption module BlueCON + programming adapter

TROX Number: B588NF5

Connection via control panels

BE-SEG-02



Programming adapter
Trox number: A00000043797

Control panel of fume cupboard controller

CP-TOUCH



Fume cupboard or room control panel

Connection directly at EASYLAB controller



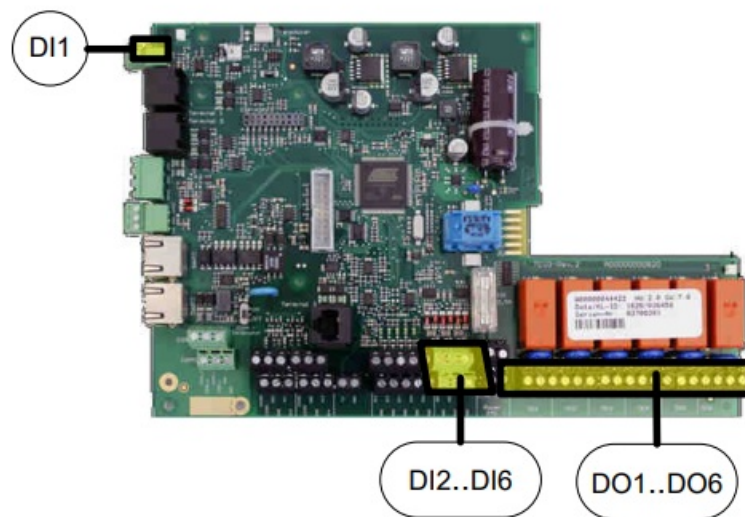
Use connection socket of control panels

RJ45 socket X3

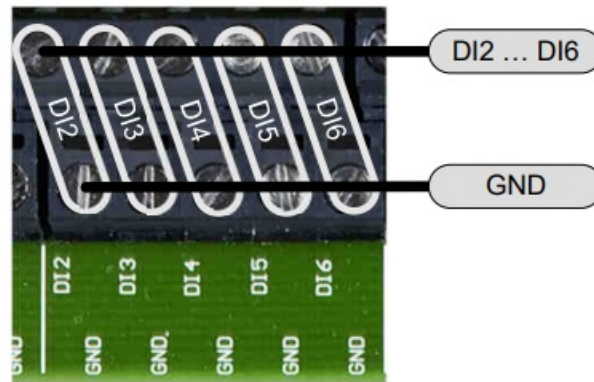
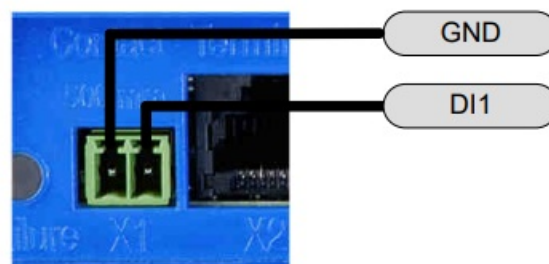
RJ45 socket X2



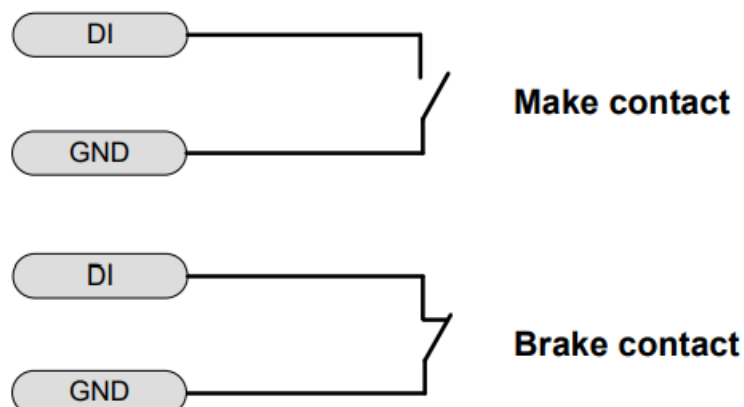
Digital inputs (DI) / Digital outputs (DO)



Digital inputs DI1 ... DI6



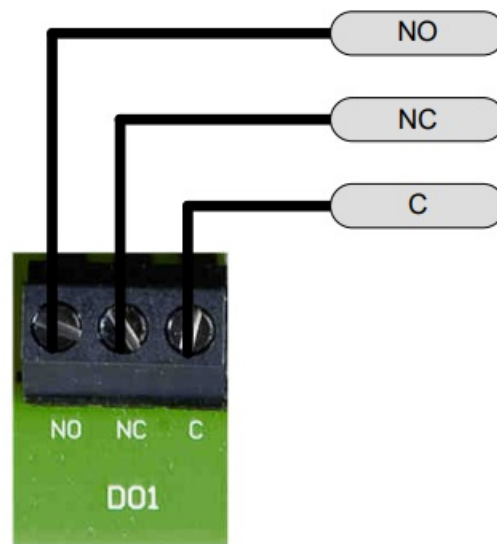
Typical applications: Reading of switch contacts



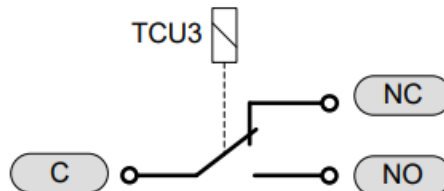
The contact effect (Make/Brake contact) can be configured within the EasyConnect software Connector for DI1:

- Phoenix MC 1,5/ 2-ST-3,5 Phoenix-No. 1840366 (included in the delivery) Trox material number: A00000040301
- Phoenix MCVR 1,5/ 2-ST-3,5 Phoenix-No. 1863152 (by customer)
- Phoenix MCVW 1,5/ 2-ST-3,5 Phoenix-No. 1862852 (by customer)

Digital outputs DO1 ... DO6



Typical application: Special functions / Alarm relay



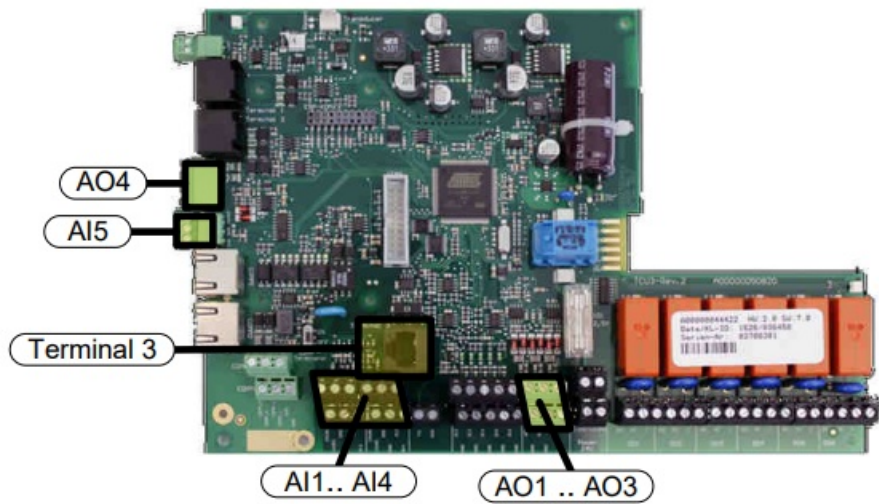
Technical data:

Electrical rating of contacts and pcb: 230 V AC max. 8 A Additional note to alarm relay effect:

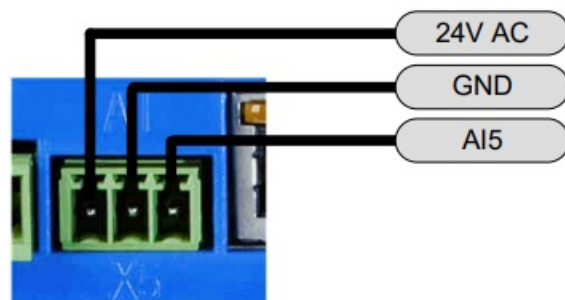
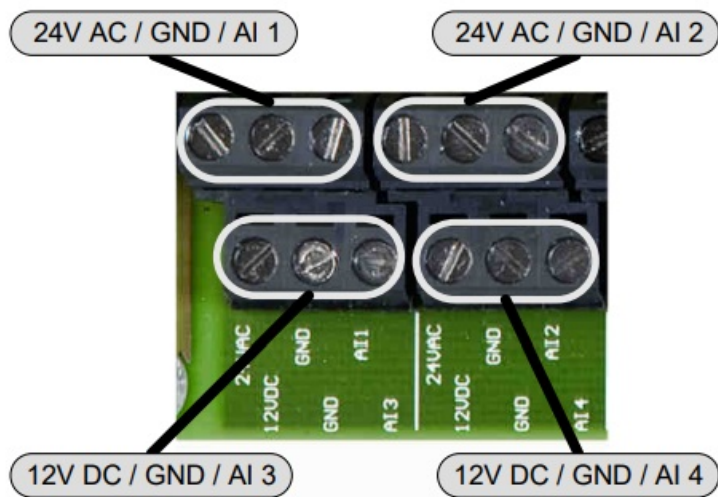
Alarm relay released → Alarm state

Alarm relay activated → No alarm state

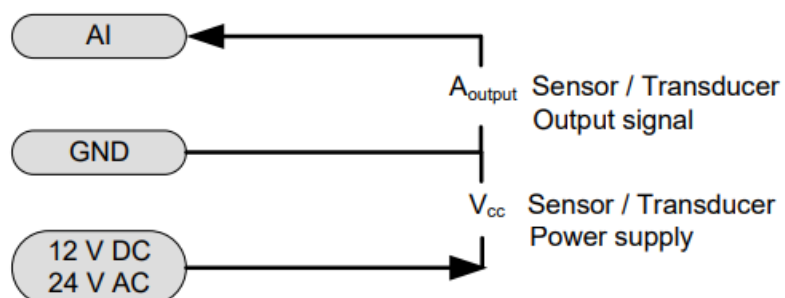
Analogue inputs (AI) / Analogue outputs (AO) / Terminal 3



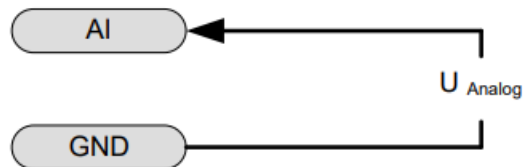
Analogue inputs AI1 ... AI5



Typical application: Sensor/Transducer integration



Typical application: Signal integration



Technical data:

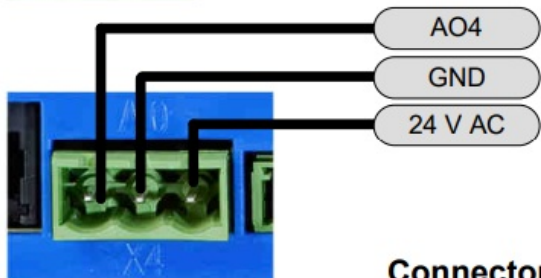
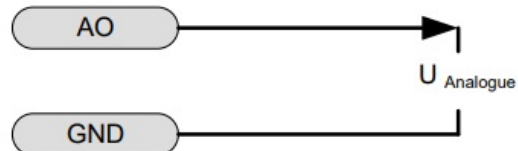
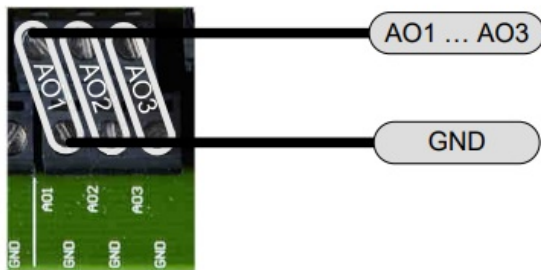
- Input voltage range 0-10 V DC
- Characteristic freely configurable
- Input resistance > 100kOhm

Connector for AI5:

- Phoenix MC 1,5/ 3-ST-3,5 Phoenix-No. 1701879 (included in the delivery) Trox material number: A00000040302
- Phoenix MCVR 1,5/ 3-ST-3,5 Phoenix-No. 1863165 (by customer)
- Phoenix MCVW 1,5/ 3-ST-3,5 Phoenix-No. 1862865 (by customer)

Analogue outputs AO1 ... AO4

Typical application: Signal transmission output



Technical data:

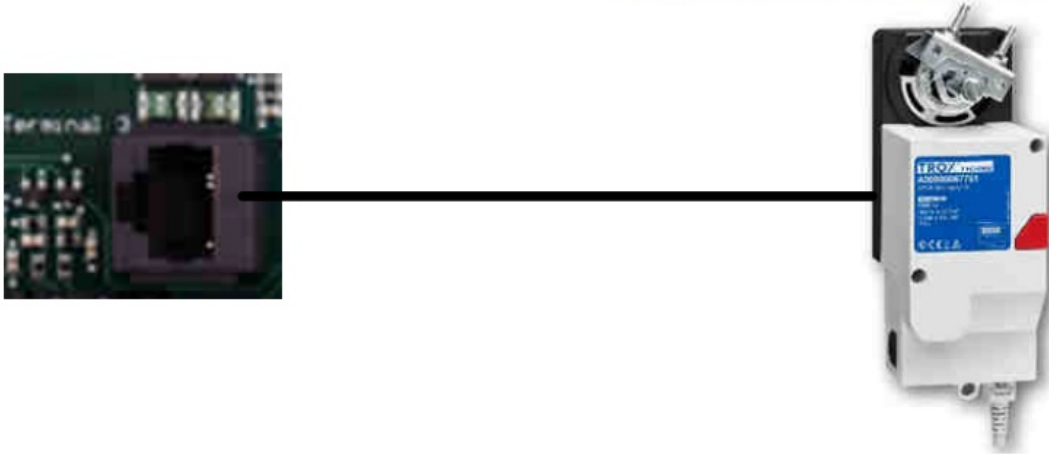
- Output voltage range 0-10 V DC
- Characteristic freely configurable
- Maximum output load 10 mA

Connector for AO4:

- Phoenix MVSTBR 2,5 /3-ST-5,08 Phoenix-No. 1792252 (included in the delivery)
Trox material number: M516EE1

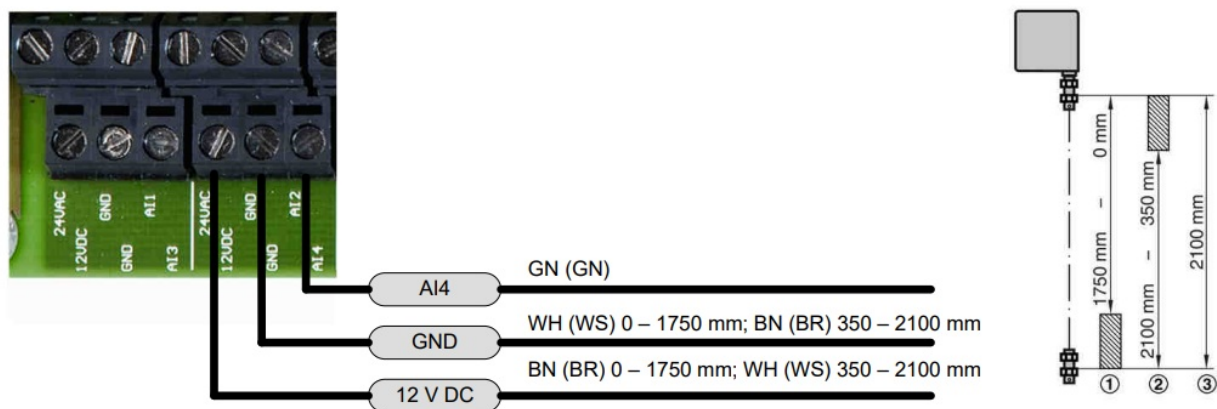
Terminal 3 (connection TROX HPD)

use: connection off digital actuator TROX HPD



! Important note: Actuator TROX HPD may be connected only to terminal 3!

Sash distance sensor DS-TRD



Input / Output assignment – Fume cupboard controller (FH)

Digital inputs DI		
DI 1	Sash monitoring EN14175	(only if configured; else unused)
DI 2	Switch contact of 2/3-point control	(only if device function is FH-2P or FH-3P, else unused)
DI 3	Switch contact of 3-point control	(only if device function is FH-3P, else unused)
DI 4	Fume scrubber operation request	(only if fume scrubber function configured; else unused)
DI 5	Support flow fan – Error unused)	(only if supportive flow technology configured, else
DI 6	not used	

Unused inputs can be configured with the EasyConnect software for the usage of following functions:

- Integration of switchable constant volume flows into room balance
- Integration of motion detector for special functions
- Smoke extraction function
- Operation mode preset High Mode, Low Mode, Shut off mode, Hand mode

(only available for fume cupboard controllers which do not follow the room operation mode due to special configuration) Operating mode changeover possible via control panel with configured keys

The state of the not used inputs could be transmitted by the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 4.x)

Digital outputs D0	
DO 1	Alarm relay (1)
DO 2	Fume scrubber – Enable (if configured, else unused)
DO 3	Supportive flow technology fan – On/Off (if configured, else unused)
DO 4	Automatic sash window closing – Open sash / Operation mode dependent switching e.g. fans (2) (if configured, else unused)
DO 5	Automatic sash window closing – Close sash / Operation mode dependent switching e.g. fans (2) (if configured, else unused)
DO 6	Fume cupboard interior light – On / Off (if configured, else unused)
<p>(1) Alarm state = Relay released</p> <p>(2) From release 5.x : DO4 Standard, high, open, red. mode; b: DO4 Standard, high, open mode, DO5 red. mode Unused outputs relays could be energized via the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 5.x).</p>	

Analogue inputs AI		
AI 1	Internal volume flow transducer	(optionally external volume flow transducer)
AI 2	Temperature sensor ⁽²⁾	(if temperature alarm is activated, else unused ⁽¹⁾)
AI 3	unused ⁽¹⁾	
AI 4	Sash distance sensor	(only if device function is FH-DS or FH-DV, else unused)
AI 5	Face velocity transducer	(only if device function is FH-VS, else unused)
TI1	Temperature sensor PT1000 ⁽²⁾	(if temperature alarm is activated)
<p>Unused inputs can be configured with EasyConnect software for integration of variable volume flow into room balance</p> <p>⁽¹⁾ from TCU V7.0 and EM-LON / EM-BAC-MOS-01 V4 or EM-IP V2 the voltage value could be transmitted via the communication card</p> <p>⁽²⁾ from TCU V8.0</p>		

Analogue outputs AO	
AO 1	Current volume flow of controller
AO 2	Total extract air room/Total supply air room/Set point supply air/voltage value via bus ⁽¹⁾ (<i>configurable</i>)
AO 3	Damper position of controller
AO 4	Damper actuator
⁽¹⁾ from Version 7.0	

Input / Output assignment – supply air / extract air control (SC/EC)

Digital inputs DI	
DI 1	not used, without function
DI 2	Switch contact of 2/3-point control (only if device function is SC/EC-2P or SC/EC-3P, else without function)
DI 3	Switch contact of 3-point control (only if device function is SC/EC-3P, else without function)
DI 4	Shut off mode (configurable; else without function)
DI 5	without function
DI 6	without function
The state of the inputs could be transmitted by the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 4.x).	

Digital outputs D0	
DO 1	Alarm relay (1)
DO 2	Alarm relay, time dependent (2) <i>(configurable; else without function)</i>
DO 3	without function
DO 4	without function
DO 5	without function
DO 6	without function
(1) Alarm state = Relay released (2) Alarm relay time dependent: after release of an alarm the relay is energized for a settable time Outputs without function could be energized via the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 5.x).	

Analogue inputs AI	
AI 1	Internal volume flow transducer(optionally external volume flow transducer)
AI 2	without function ⁽¹⁾
AI 3	without function ⁽¹⁾
AI 4	setpoint volume flow (only if device function is SC/EC E0/E2, else not used, without function)
AI 5	not used, without function
⁽¹⁾ from TCU V7.0 and EM-LON / EM-BAC-MOS-01 V4 or EM-IP V2 the voltage value could be transmitted via the communication card	

Analogue outputs AO	
AO 1	Current volume flow of controller
AO 2	Total extract air room/Total supply air room/Set point supply air/voltage value via bus ⁽¹⁾ (<i>configurable</i>)
AO 3	Damper position of controller
AO 4	Damper actuator
⁽¹⁾ from Version 7.0	

Input / Output assignment – Room Controller (RS/RE/PC)

Note:

Some assignments are only available on room controllers with activated Room-Management-Function (RMF)

Digital inputs DI		
DI 1	unused	
DI 2	unused	(Default at RMF: Room operation mode – Shut off mode)
DI 3	unused	(Default at RMF: Room operation mode – Low mode)
DI 4	unused	(Default at RMF: Room operation mode – High mode)
DI 5	Pressure control – Door contact	(only at RMF, if internal pressure control is configured; else unused)
DI 6	Pressure control – Changing setpoint (only at RMF, if internal pressure control is configured; else unused)	
<p>Unused inputs can be configured with the EasyConnect software for the usage of following functions:</p> <ul style="list-style-type: none">– Integration of switchable constant volume flows into room balance– Operation mode preset for the room: High Mode, Low Mode, Shut off mode, Hand mode (only at RMF) <p>The state of the not used inputs could be transmitted by the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 4.x).</p>		
Digital outputs DO		
DO 1	Alarm relay (1)	
DO 2	Switchable output (On/Off)	(only at RMF; else unused)
DO 3	Pressure alarm (1)	(only at RMF, if internal pressure control is configured; else unused)
DO 4	Summary alarm (1)	(only at RMF; else unused)
DO 5	Diffuser control / Sun blind – Open (2) / Room mode dependent (3) (only at RMF, if configured; else unused)	
DO 6	Diffuser control / Sun blind – Close (2) / Room mode dependent (3) (only at RMF, if configured; else unused)	
<p>(1) Relevant for alarm relay DO1, DO3, DO4: Alarm state = Relay released.</p> <p>(2) From release 3.x; (3) From release 5.x, relay individual selectable</p> <p>Unused outputs relays could be energized via the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 5.x).</p>		
Analogue inputs AI		
AI 1	Internal volume flow transducer	(optionally external volume flow transducer)
AI 2	unused (1)	
AI 3	Volume flow offset – Temperature (1)	(only at RMF, if function is configured; else unused)
AI 4	Volume flow offset – Pressure	(only at RMF, if function is configured; else unused)
AI 5	Press.Tranducer – Current pressure	(only at RMF, if internal pressure control is configured; else unused)
<p>Unused inputs can be configured with EasyConnect software for integration of variable volume flow into room balance</p> <p>(1) from TCU V7.0 and EM-LON / EM-BAC-MOS-01 V4 or EM-IP V2 the voltage value could be transmitted via the communication card</p>		

Analogue outputs AO	
AO 1	Current volume flow of controller
AO 2	Total extract air room/Total supply air room/Set point supply air/voltage value via bus ⁽¹⁾ (configurable)
AO 3	Damper position of controller
AO 4	Damper actuator
⁽¹⁾ from Version 7.0	

Input / Output assignment – TROX Adaption Module (TAM)

Note:

Some assignments are only available on TAM's with activated Room-Management-Function (RMF)

Digital inputs DI		
DI 1	unused	
DI 2	unused	(Default at RMF: Room operation mode – Shut off mode)
DI 3	unused	(Default at RMF: Room operation mode – Low mode)
DI 4	Unused	(Default at RMF: Room operation mode – Hi mode)
DI 5	Pressure control – Door contact	(only at RMF, if internal pressure control is configured; else unused)
DI 6	Pressure control – Changing setpoint (only at RMF, if internal pressure control is configured; else unused)	

Unused inputs can be configured with the EasyConnect software for the usage of following functions:

- Integration of switchable constant volume flows into room balance
- Operation mode preset for the room: High Mode, Low Mode, Shut off mode, Hand mode (only at RMF)

The state of the not used inputs could be transmitted by the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 4.x).

Digital outputs DO		
DO 1	Alarm relay (1)	
DO 2	Switchable output (On/Off)	(only at RMF, else unused)
DO 3	Pressure alarm (1)	(only at RMF, if internal pressure control is configured, else unused)
DO 4	Summary alarm (1)	(only at RMF, else unused)
DO 5	Diffuser control / Sun blind – Open (2) / Room mode dependent (3) (only at RMF, if configured; else unused)	
DO 6	Diffuser control / Sun blind – Close (2) / Room mode dependent (3) (only at RMF, if configured; else unused)	
<p>(1) Relevant for alarm relay DO1, DO3, DO4: Alarm state = Relay released.</p> <p>(2) From release 3.x; (3) From release 5.x, relay individual selectable</p> <p>Unused outputs relays could be energized via the expansion module LON / BACnet / MODBUS (available from TCU3 Software Release 5.x).</p>		
Analogue inputs AI		
AI 1	unused	
AI 2	unused ⁽¹⁾	
AI 3	Volume flow offset – Temperature ⁽¹⁾	(only at RMF, if function is configured; else unused)
AI 4	Volume flow offset – Pressure	(only at RMF, if function is configured; else unused)
AI 5	Press.Transducer – Current pressure (only at RMF, if internal pressure control is configured; else unused)	
<p>Unused inputs can be configured with EasyConnect software for integration of variable volume flow into room balance</p> <p>⁽¹⁾ from TCU V7.0 and EM-LON / EM-BAC-MOS-01 V4 or EM-IP V2 the voltage value could be transmitted via the communication card</p>		

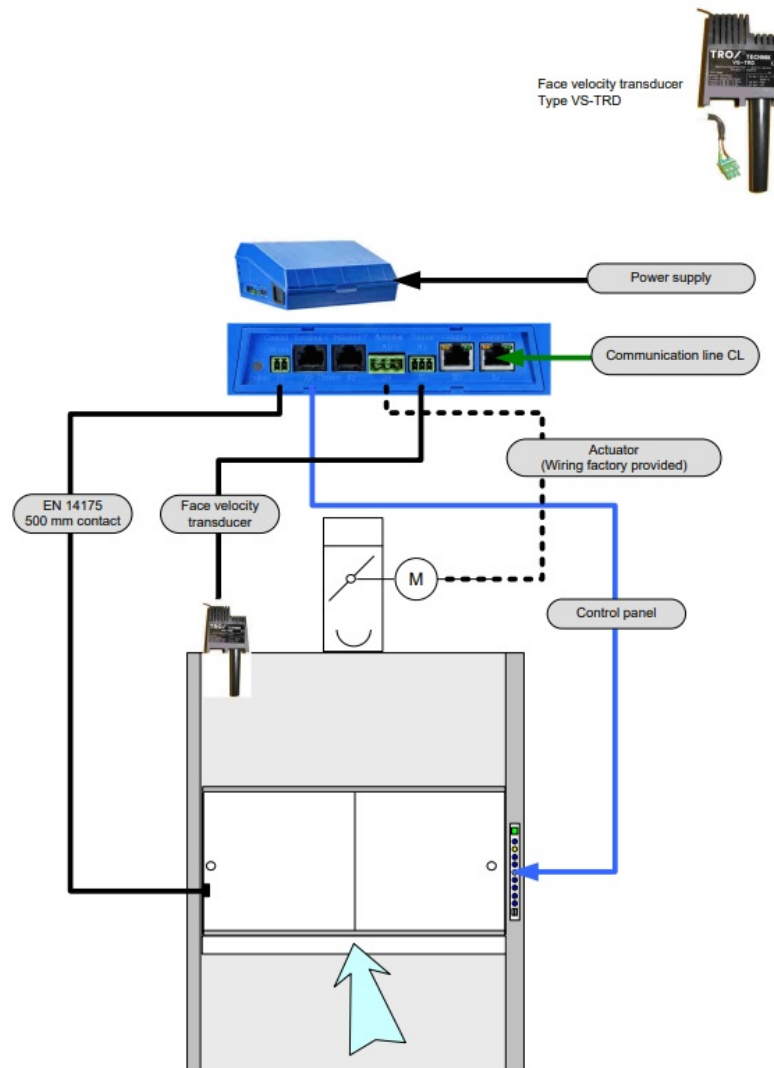
Analogue outputs AO	
AO 1	
AO 2	Total extract air room/Total supply air room/Set point supply air/voltage value via bus ⁽¹⁾ (configurable)
AO 3	
AO 4	
⁽¹⁾ from Version 7.0	

Fume cupboard controller with face velocity transducer

Device function FH-VS

Technical data – transducer

- Supply voltage 24 V AC $\pm 15\%$ (via controller)
- Analogue output signal 2..10 V DC according to 0..1 m/s
- Connection cable approx. 3 m;
- Optionally, extension cable approx. 5 m; TROX Article-No. M536BA9



EN14175 Sash monitoring:

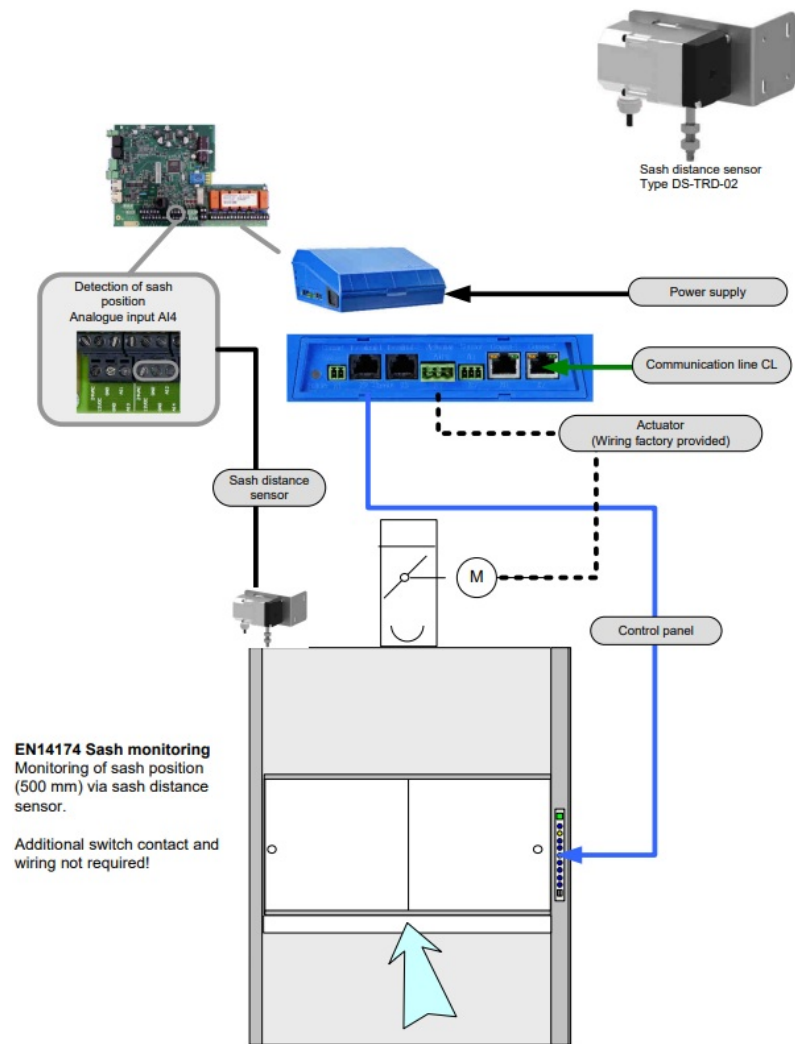
Bistable switch contact must be provided on site.

Fume cupboard controller with sash distance sensor

Device function FH-DS or FH-DV

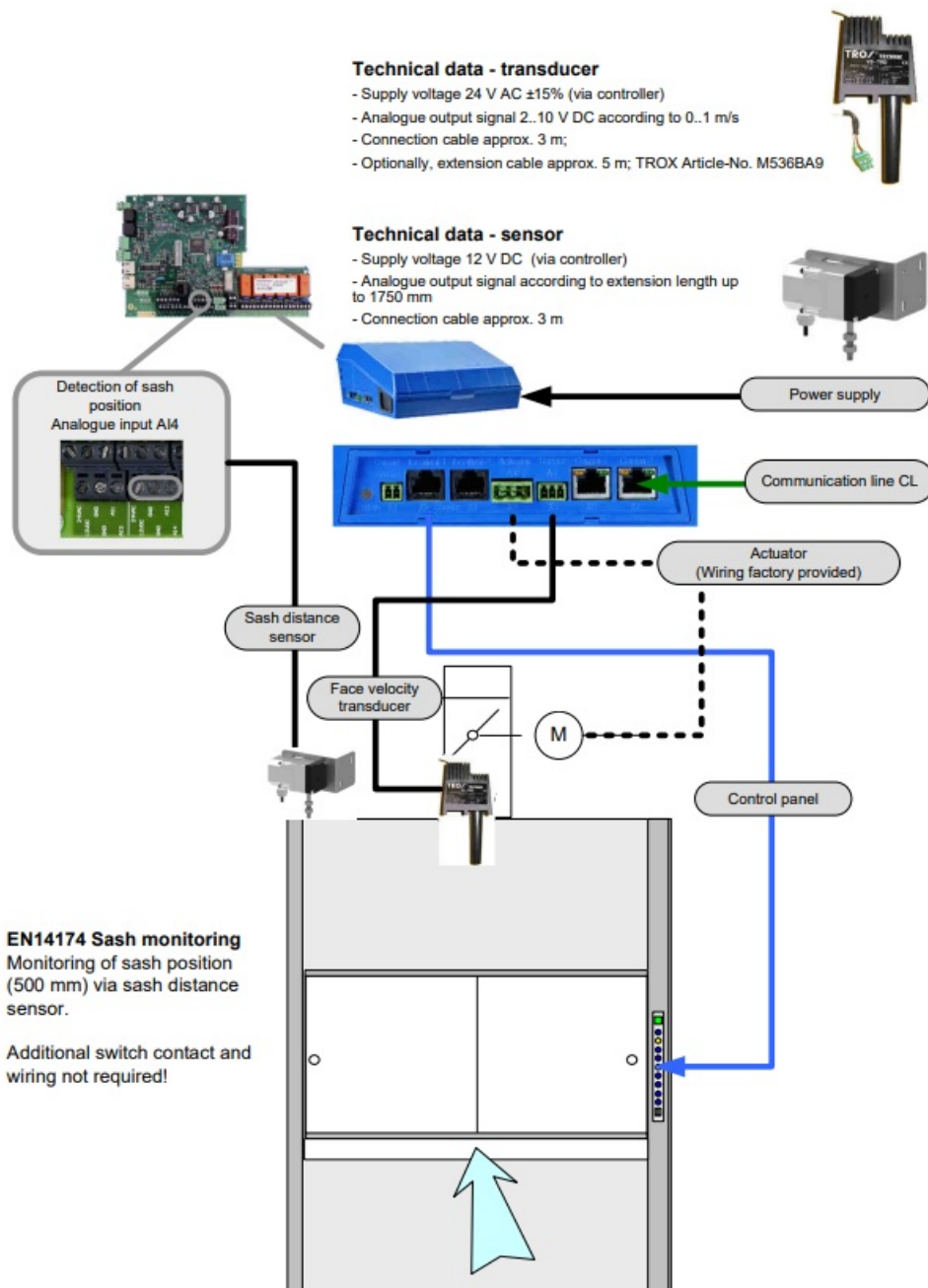
Technical data – sensor

- Supply voltage 12 V DC (via controller)
- Analogue output signal according to extension length up to 1750 mm
- Connection cable approx. 3 m



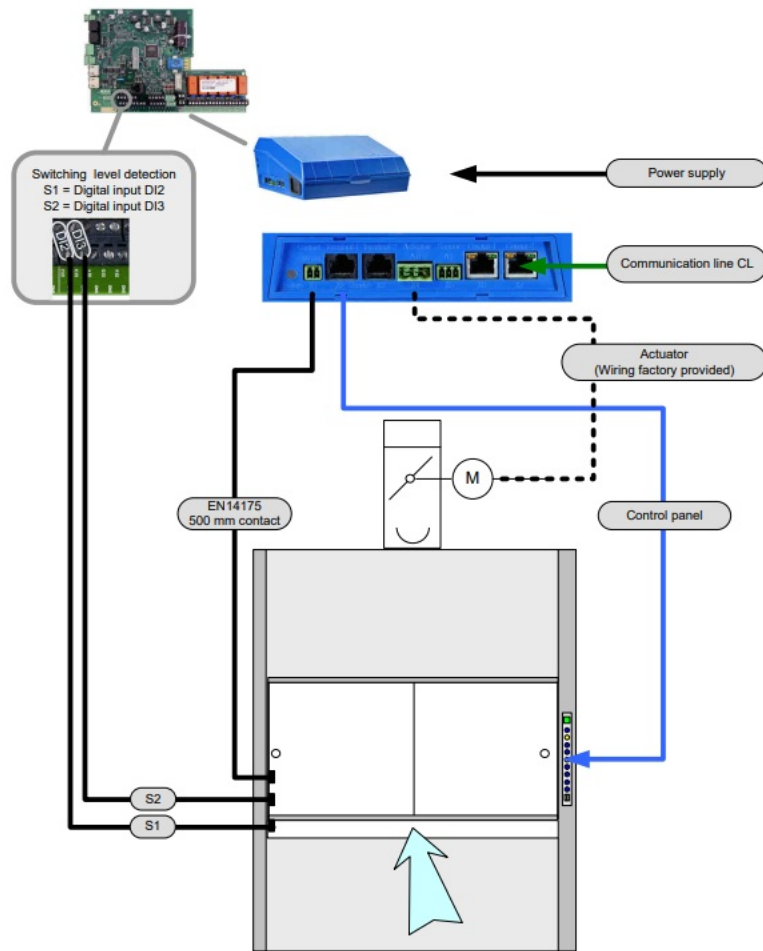
Fume cupboard controller with face velocity transducer & sash distance sensor

Device function FH-VD



Fume cupboard controller with 3 switching levels

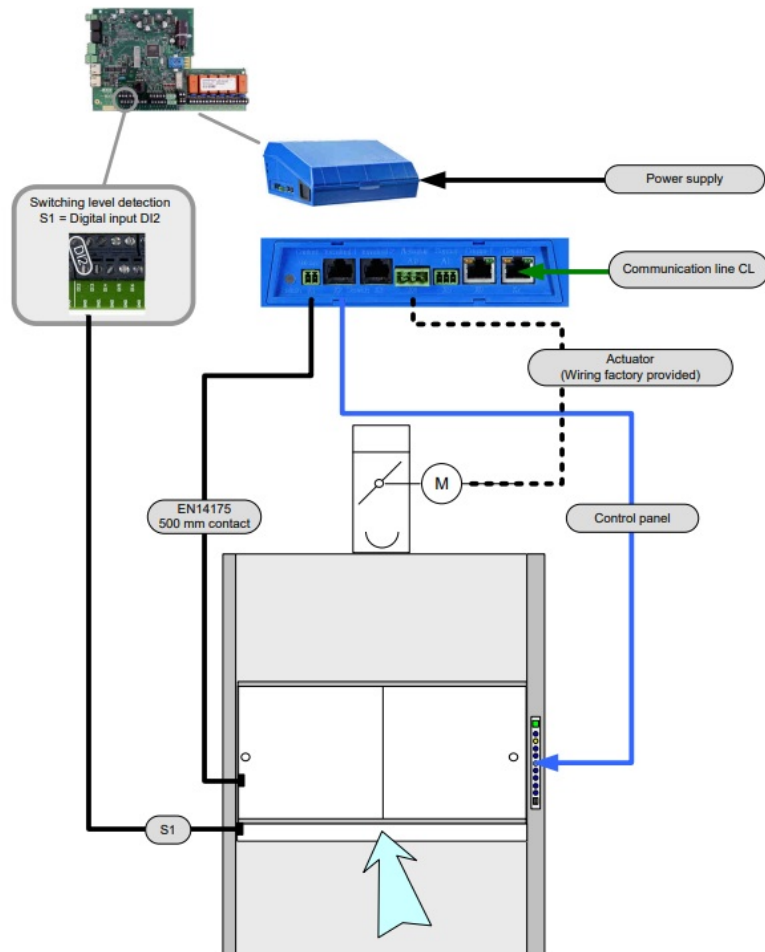
Device function FH-3P



S1, S2 and EN14175 sash monitoring:
Bistable switch contacts must be provided on site.

Fume cupboard controller with 2 switching levels

Device function FH-2P

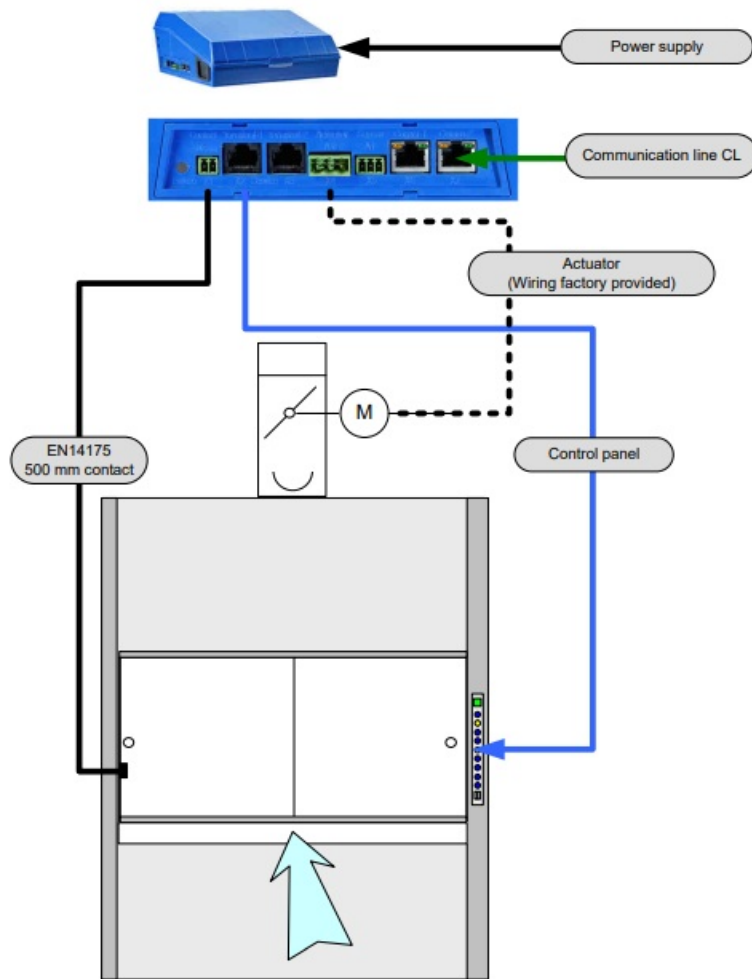


S1, S2 and EN14175 sash monitoring:

Bistable switch contacts must be provided on site.

Fume cupboard controller with fixed value control

Device function FH-F

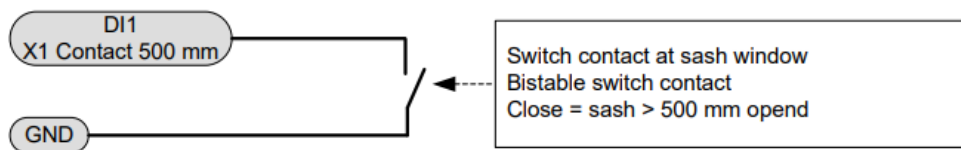


EN14175 sash monitoring:

Bistable switch contact must be provided on site.

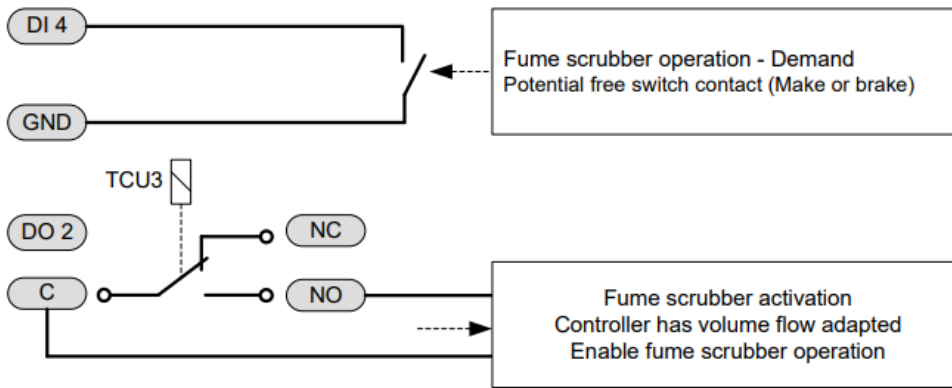
Special functions – Fume cupboard controller Part 1

Sash window monitoring EN 14175



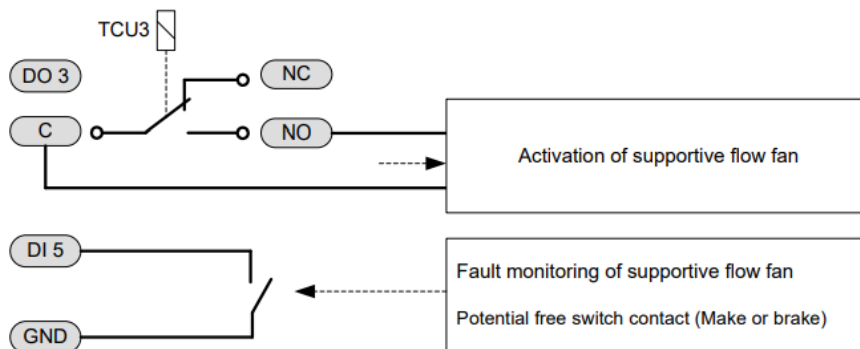
Activation of function with EasyConnect configuration software

Activation of fume scrubber



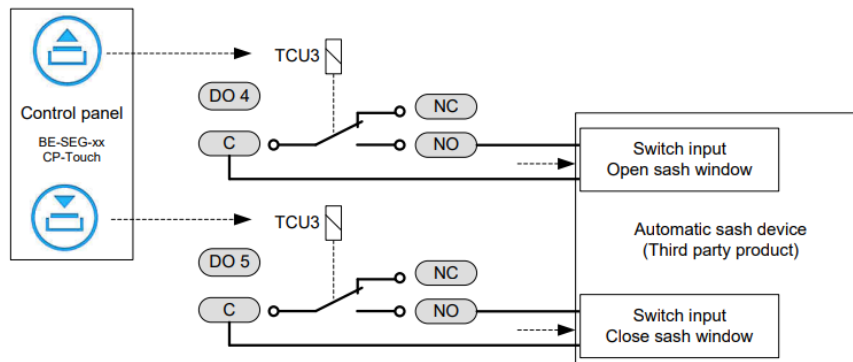
Control of supportive flow technology

Activation / configuration of function with EasyConnect configuration software



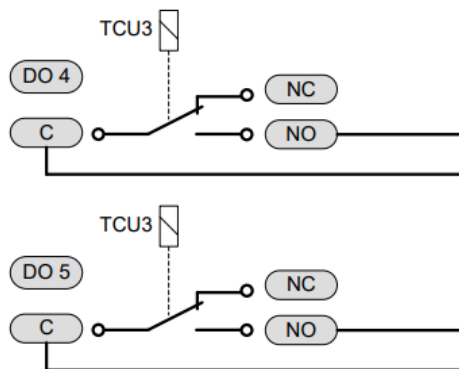
Control of automatic sash device

Activation of function with EasyConnect configuration software



Special functions – Fume cupboard controller Part 2

Operation mode dependent switching

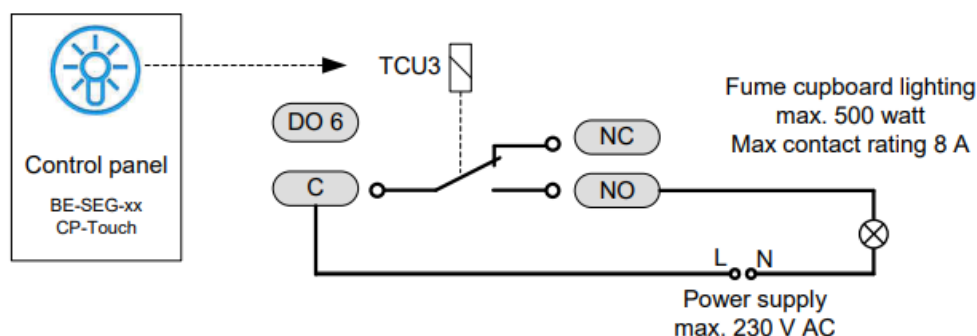


2 variants possible:

a:
DO4 switches by Standard mode, High mode, Open mode, Low mode
DO5 not used

b:
DO4 switches by Standard mode, High mode, Open mode
DO5 switches by Low mode

Control of fume cupboard lighting



Notes: Activation of function with EasyConnect configuration software

For safety reasons the TCU3 casing must be locked in such a way that it can only be opened with a tool when a 230 V power supply is connected.

A safety latch with a sticker is available, which can be ordered under EM-TRF-Zubehoer (A00000055540). When delivered with transformer module EM-TRF or EM-TRF-USV, this is installed and is not required additionally.



Control of fume cupboard lighting with expansion module EM-LIGHT

Expansion module EM-LIGHT ready to plug in of a 230 V AC fume cupboard lighting (no external wiring needed if transformer module is installed)

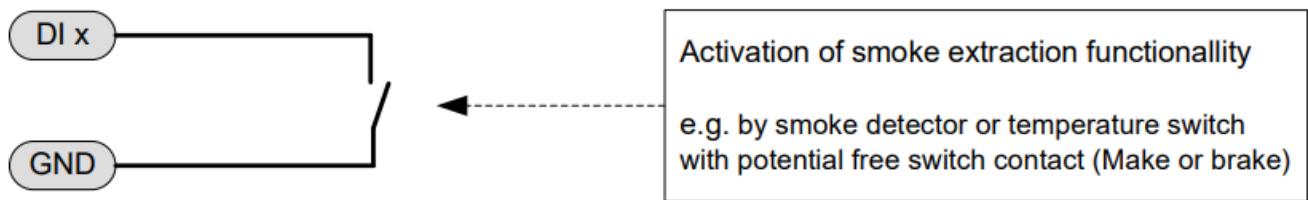


Mating connector not in scope of delivery of EM-LIGHT
type: WAGO WINSTA MIDI 770-113
Can be ordered under EM-CPL

Notes: Activation of function with EasyConnect configuration software. By delivered regulator with EM-LIGHT the function fume cupboard lighting is activated

Further details can be found in the installation and operating manual of the EM-LIGHT expansion module.

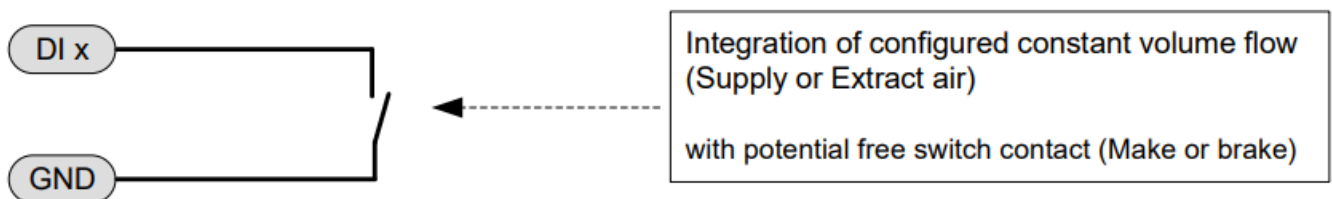
Activation of smoke extraction function



Notes: DIx: Function is available on all unused digital inputs DI1..DI6 by using Make or Brake switch contact. Configuration of function with EasyConnect configuration software
Digital input, activation direction and EASYLAB Smoke extraction functionality (Damper open mode or damper shut off mode) must be configured

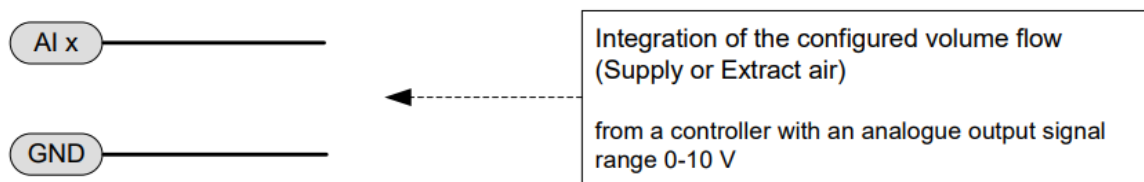
Special functions – Fume cupboard controller Part 3

Integration of constant volume flows into room balance



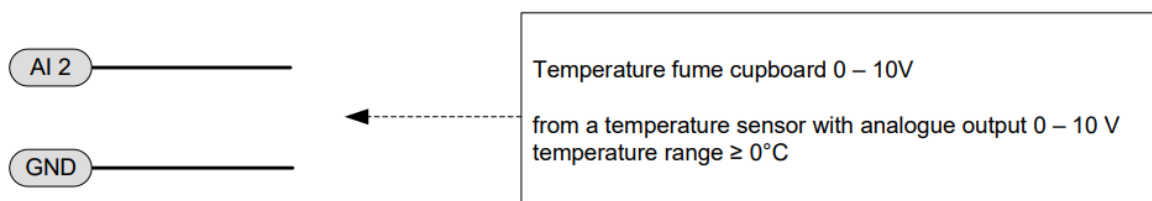
Notes: DIx: Function is available on all unused digital inputs DI1..DI6 by using Make or Brake switch contact. Configuration of function settings with EasyConnect configuration software
Digital input, activation direction and required volume flow which should be integrated into the room balance during contact activation must be configured.

Integration of variable volume flows into room balance

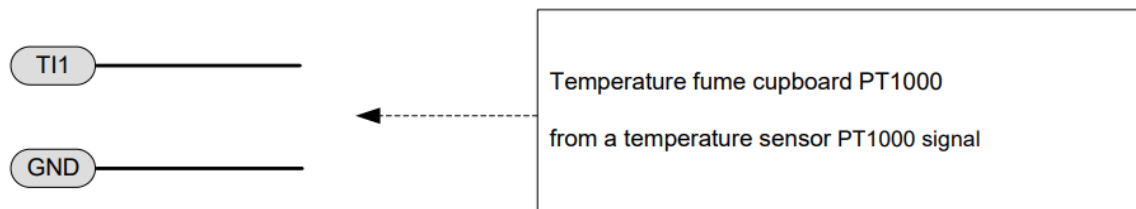


Notes: AIx: Function is available on all unused analogue inputs AI by connecting an analogue signal with 0-10 V. Configuration of function setting with Easy Connect configuration software
Analogue input, characteristic and required volume flow values (Extract or supply air) which should be integrated into the room balance must be configured .

Temperature alarm activ



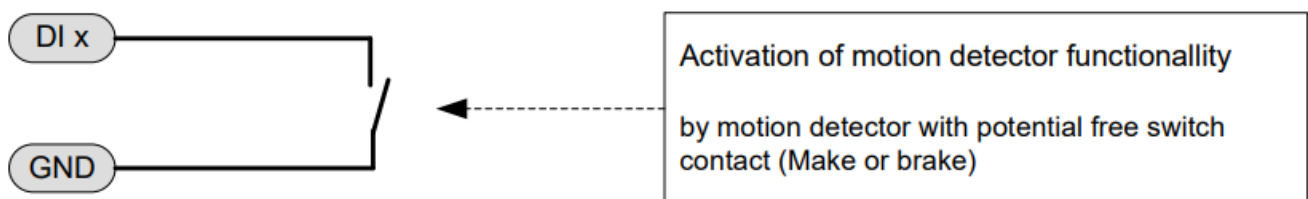
Temperature alarm passiv



note: The function could be parametrized with the configuration software EasyConnect alternative as an active or a passive signal.

The temperature alarm is available from Version 8.0 of EASYLAB

Activation of motion detector functions



Notes: DIx: Function is available on all unused digital inputs DI1..DI6 by using Make or Brake switch contact.

Configuration of function with EasyConnect configuration software

Digital input, activation direction and EASYLAB Motion detector functionality with parameters must be configured

Supply air- / Extract air controller 0-10 V / 2-10 V

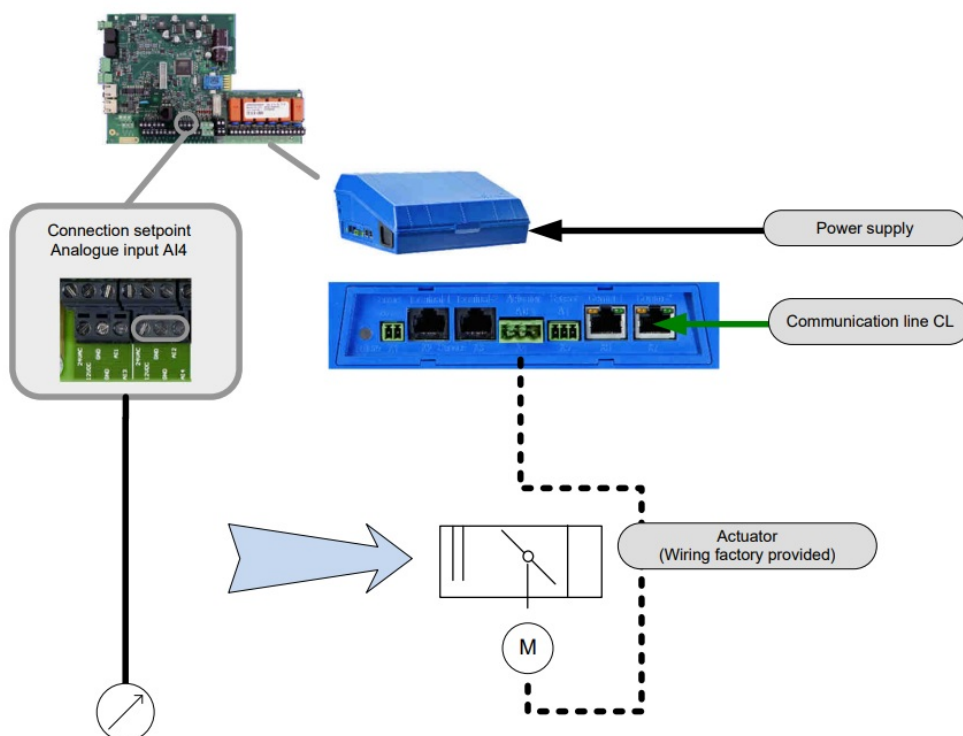
Device function SC-E0; SC-E2; EC-E0; EC-E2

Setpoint volume flow via 0 – 10 V (E0) or 2 – 10 V (E2)

Difference SC / EC:

SC: actual volume flow as supply via CL to room regulation system

EC: actual volume flow as exhaust via CL to room regulation system



Supply air- / Extract air controller 3-point-regulation -3P

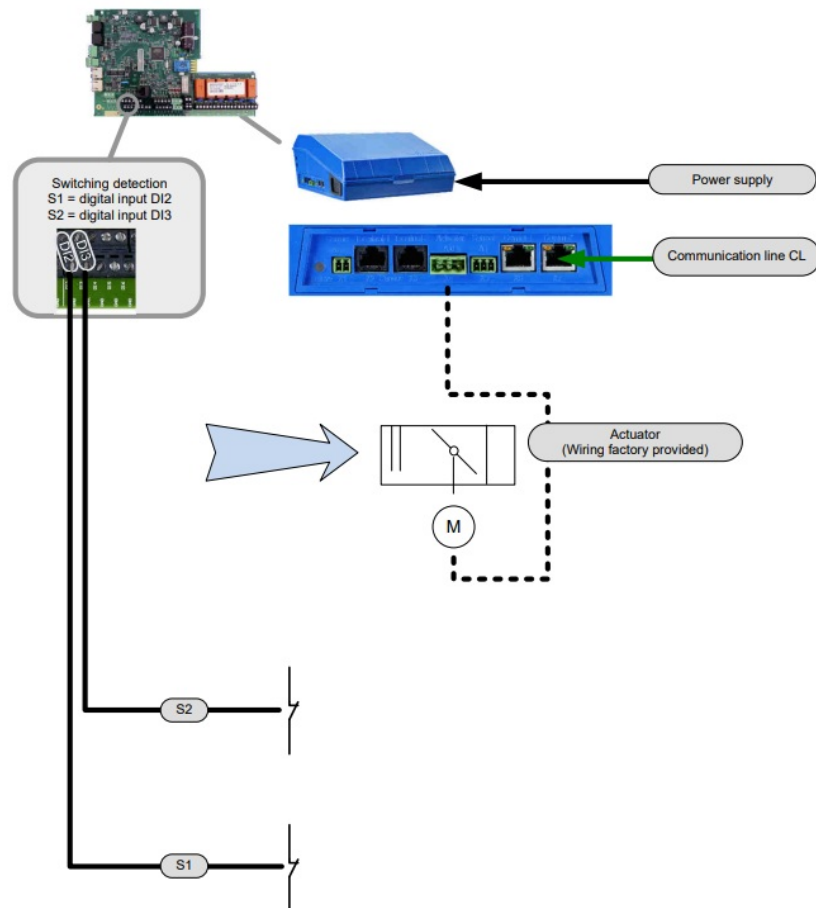
Device function SC-3P; EC-3P

Setpoint volume flow via 2 switch inputs, 3 setpoints

Difference SC / EC:

SC: actual volume flow as supply via CL to room regulation system

EC: actual volume flow as exhaust via CL to room regulation system



Supply air- / Extract air controller 2-point-regulation -2P

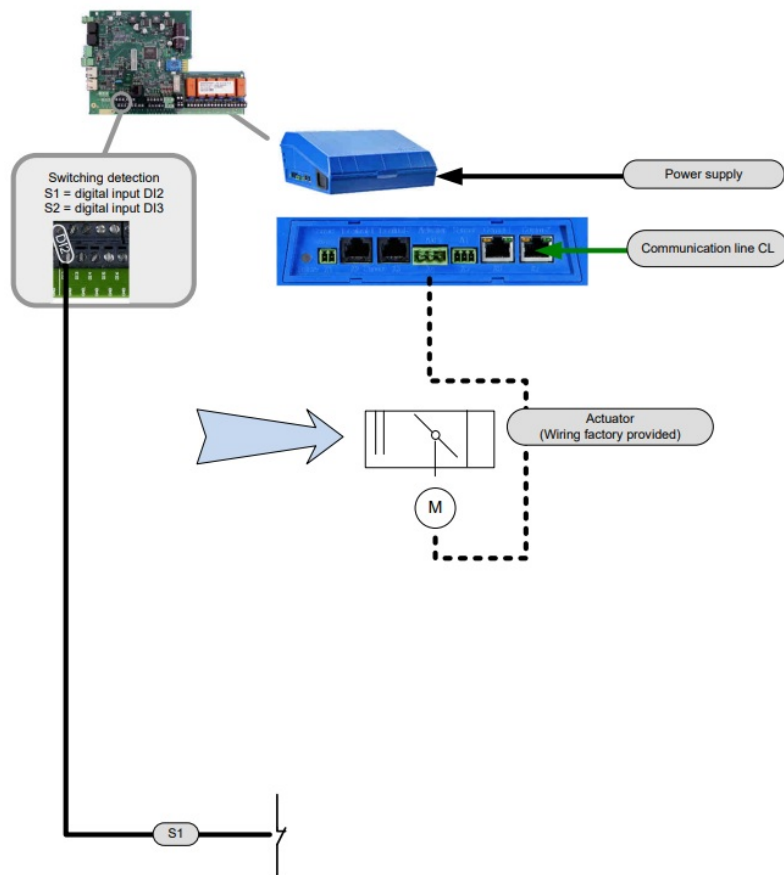
Device function SC-2P; EC-2P

Setpoint volumeflow via 1 switch inputs, 2 setpoints

Difference SC / EC:

SC: actual volume flow as supply via CL to room regulation system

EC: actual volume flow as exhaust via CL to room regulation system



Supply air- / Extract air controller Fixed volume flow -F

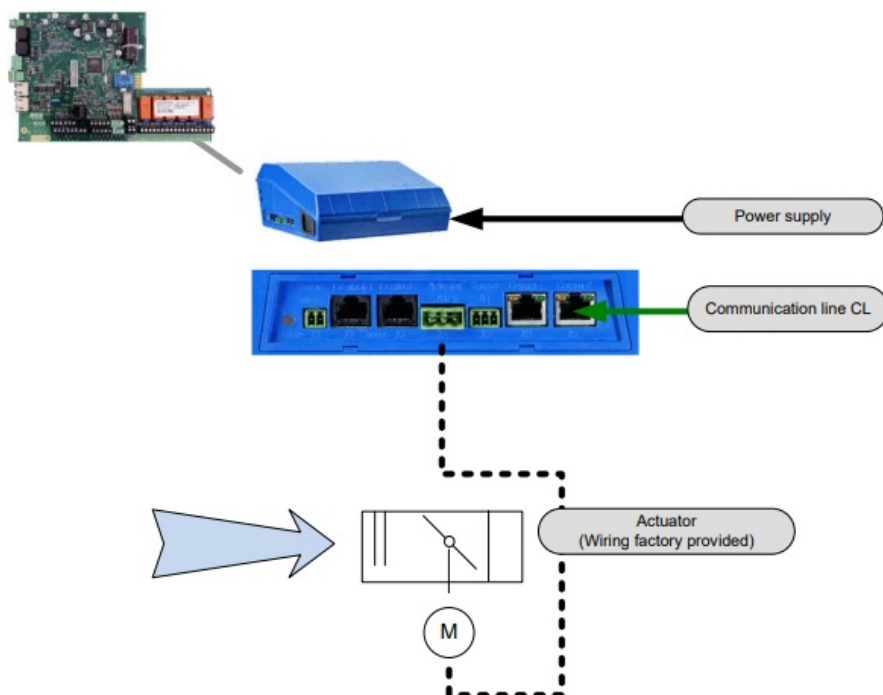
Device function SC-F; EC-F

Setpoint volumeflow fix parameterized

Difference SC / EC:

SC: actual volume flow as supply via CL to room regulation system

EC: actual volume flow as exhaust via CL to room regulation system



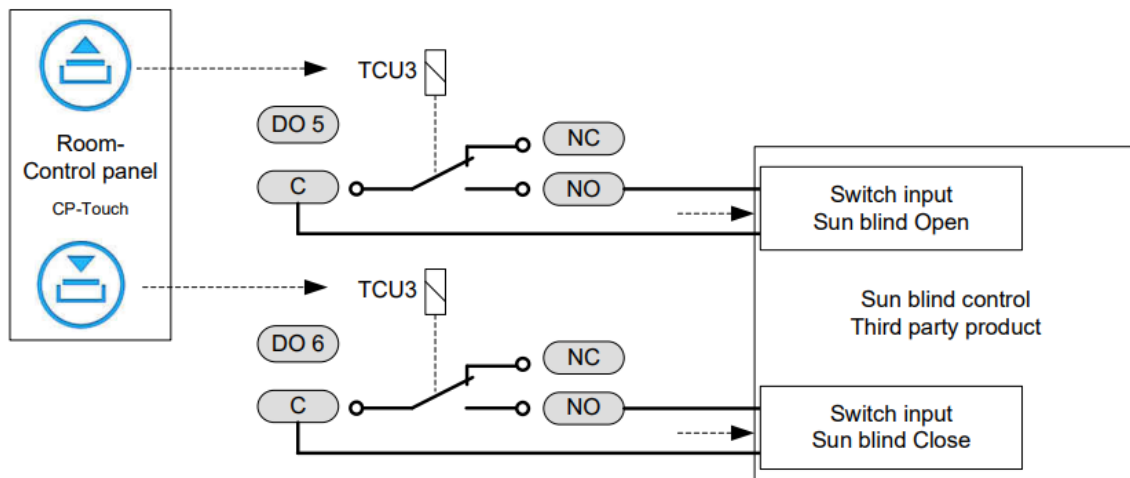
Special functions – Room controller Part 1

Control of on-site provided sun blind control device

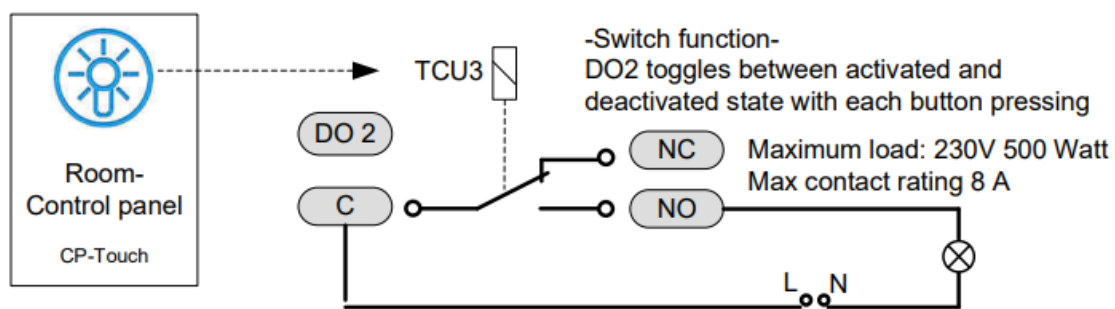
(only at room controller with activated RMF and alternative to Activation/Deactivation of supply air diffusers and Operation mode dependent switching)

-Button function-

DO5 or DO6 activated as long as button is pressed



Control of on-site provided lighting / device (only at room controller with activated RMF)



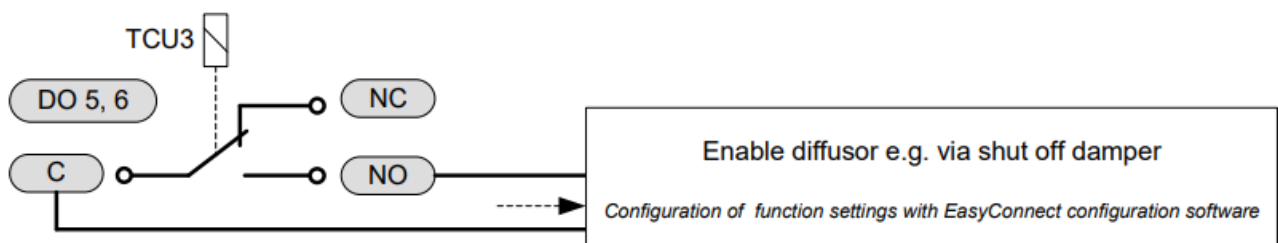
For safety reasons the TCU3 casing must be locked in such a way that it can only be opened with a tool when a 230 V power supply is connected.

A safety latch with a sticker is available, which can be ordered under EM-TRF-Zubehoer (A00000055540).

When delivered with transformer module EM-TRF or EM-TRF-USV, this is installed and is not required additionally.

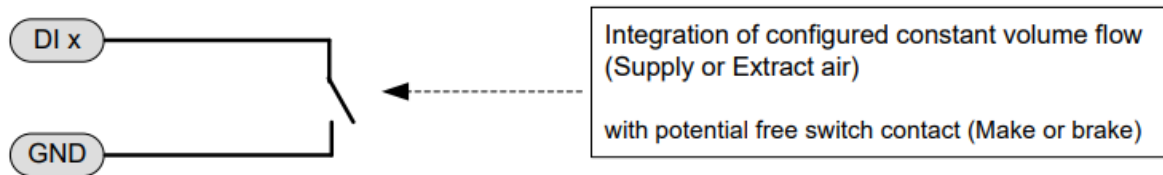
Activation/Deactivation of supply air diffusers

(only at supply air controller and alternative to sun blind control and Operation mode dependent switching)



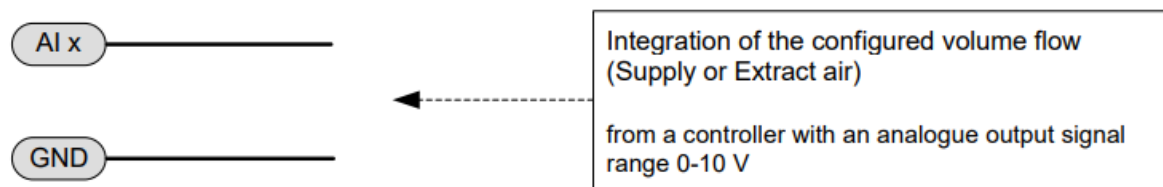
Notes: Function is only available if sun blind control is not activated Configuration of function settings with EasyConnect configuration software

Integration of constant volume flows into room balance



Notes: Dix: Function is available on all unused digital inputs DI1..DI6 by using Make or Brake switch contact. Configuration of function settings with EasyConnect configuration software
Digital input, activation direction and required volume flow which should be integrated into the room balance during contact activation must be configured.

Integration of variable volume flows into room balance

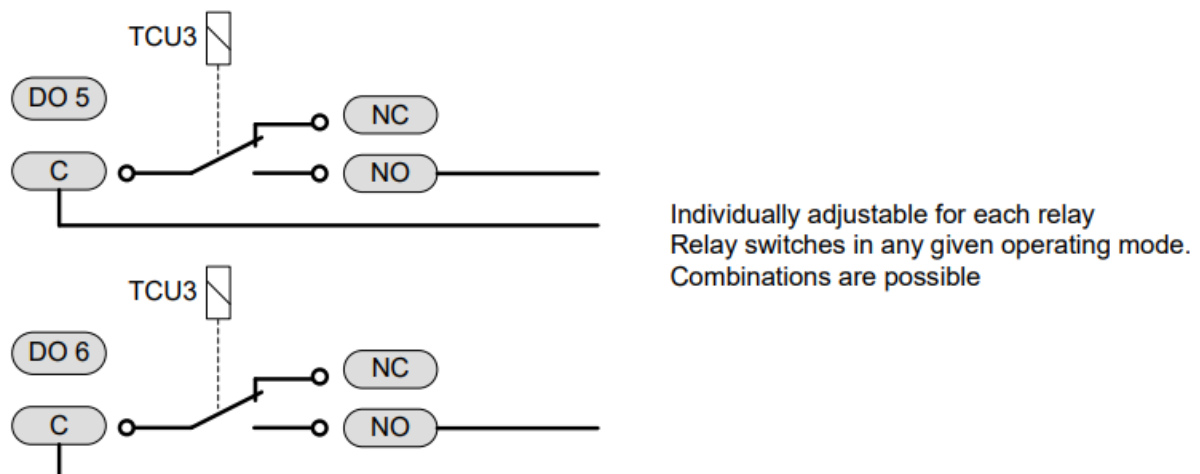


Notes: Aix: Function is available on all unused analogue inputs AI by connecting an analogue signal with 0-10 V. Configuration of function setting with EasyConnect configuration software
Analogue input, characteristic and required volume flow values (Extract or supply air) which should be integrated into the room balance must be configured .

Special functions – Room controller Part 2

Operation mode dependent switching

(alternative to sun blind control and Activation/Deactivation of supply air diffusers)



Internal pressure control

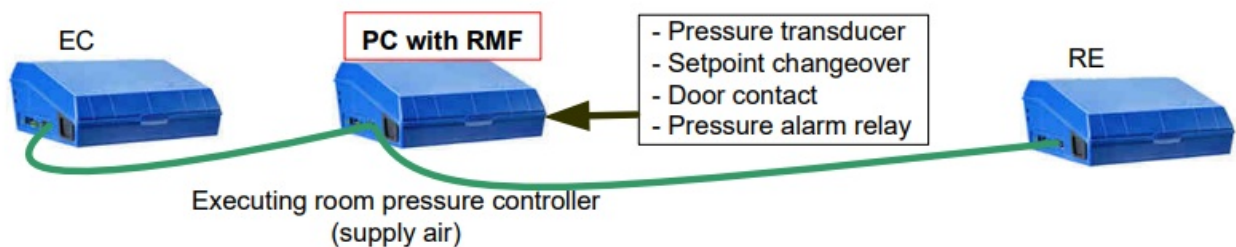
- Pressure control via supply air controller; (Extract air controlled system – Laboratory)
- Prepressure control via extract air controller (Supply air controlled system – Clean room)
- available as of TCU3 controller with Software Version 3.0
- Current pressure signal integrateable via analogue signal 0-10V; Characteristic configurable
- 2 independent setpoints with related parameters configurable
- Setpoint changeover via switch contact at DI6 configurable alternatively via Expansion Modul via LonWorks®, BACnet MS/TP, Modbus-RTU, BACnet IP, Modbus IP
- Special functions via door switch contact at DI5 configurable (Alarm handling, Control behaviour en)
- All connections and settings for pressure control within controller with Room-Management-Function (RMF)
- Seperate alarm output DO3 for pressure control loop

1. System design – Pressure control within extract air controlled room (e.g. Laboratory)

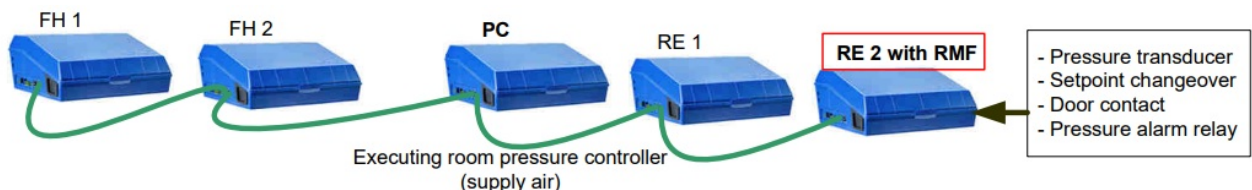
FH: Fume cupboard controller EC: extract air controller RE: Room extract air controller

PC: Executing pressure controller – Supply air

Example 1.1: RMF-Function activated on executing pressure controller



Example 1.2: RMF-Function activated on other room controller (not recommended)

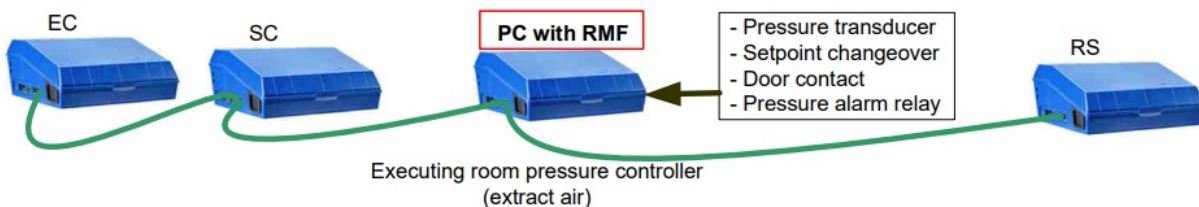


2. System design – Pressure control within supply air controlled room (e.g. Clean room)

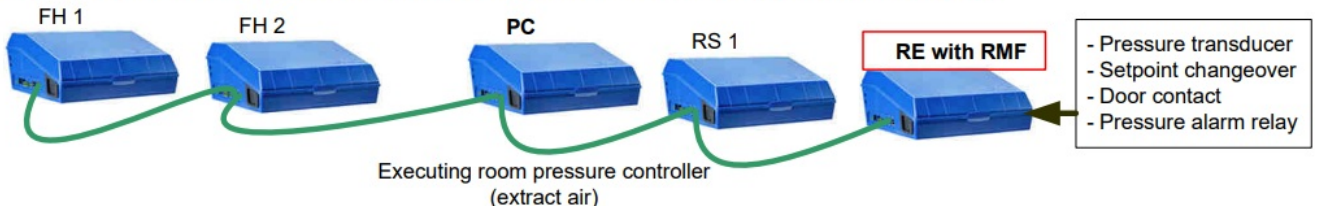
FH: Fume cupboard controller SC: Supply air controller RS: Room supply air controller

PC: Executing pressure controller – Extract air

Example 2.1: RMF-Function activated on executing pressure controller



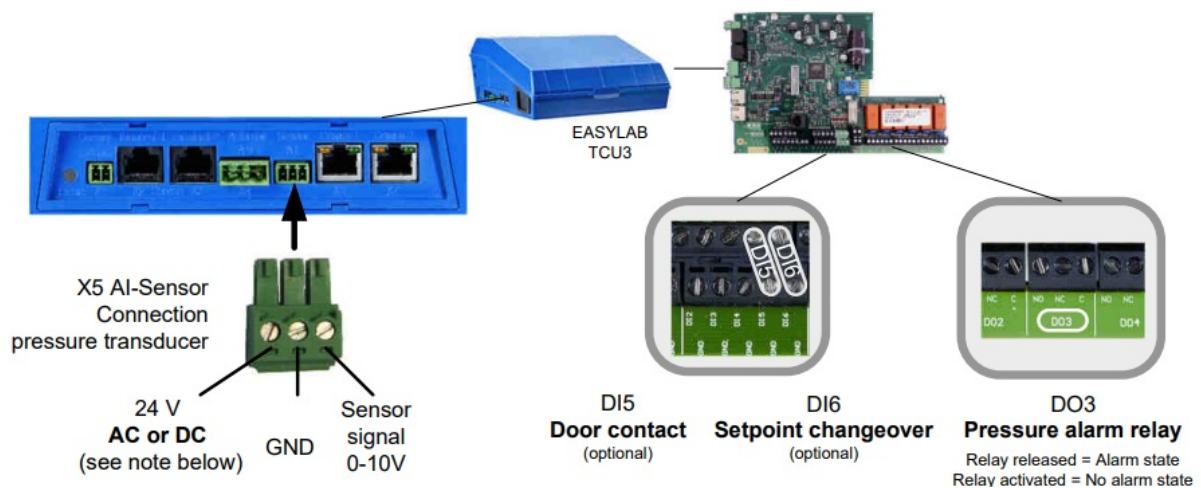
Example 2.2: RMF-Function activated on other room controller (not recommended)



Recommendation:

In tight rooms and for optimal use of the diagnostic functions, the room management function (RMF) should be activated on the operating pressure controller (PC) .

Pressure control connections:



Power supply for pressure transducer

The power supply of the pressure transducer can be provided by the EASYLAB TCU3 via 24V connector of analogue input X5 AI Sensor.

Important:

TCU3 supplied with 24 V AC → Connector 24V of X5 AI Sensor provides 24V AC

TCU3 supplied with 24 V DC → Connector 24V of X5 AI Sensor provides 24V DC

TCU3 supplied with 230V AC → Connector 24V of X5 AI Sensor provides 24V DC.

The above mentioned different supply voltage types must be observed depending on selected pressure transducer type.

Huba Pressure transducer type 699

This transducer is approved for AC and DC power supply type.

Therefore no adaption is required.



Briem Pressure transducer type GB604 MF 0,75

This transducer is approved for AC and DC power supply type.

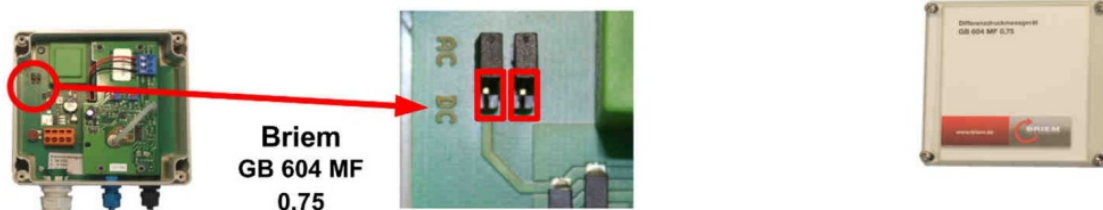
Therefore no adaption is required.

Old Briem transducer must be manually adapted to the power supply type.

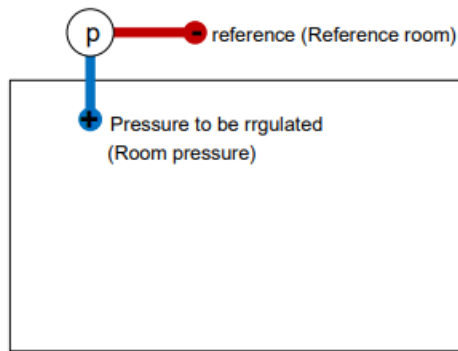
Default delivery setting ist AC supply.

Using a 230 V AC supply for the TCU3 via EM-TRF or EM-TRF-USV or 24 V DC supply implies a manual change of the supply to DC type.

Therefore change jumper setting from AC to DC within the Briem transducer casing.



Tubing



LonWorks®-Interface



(Expansion module EM-LON)

Technical data:

- LonWorks®-Interface FT10
- Network structure: Free Topology / Twisted Pair
- Simple network integration via internal connected double terminals
- Service-Key
- Status-LED for Service key, data transmission and data reception
- Mounting of expansion module within EASYLAB TCU3 controller box
- Supply voltage 5 V DC provided by EASYLAB controller TCU3
- Each network segment must be terminated with network terminator
- The maximum number of network devices is based on the LonWorks® specifications from Echelon. There are no additional restrictions by TROX.

Data interface: Standard Network Variable Types (SNVT)

- Different data points according to controller device type:

Room controller / TAM with activated Room-Management-Function (RMF) or Fume cupboard controller / Room controller / TAM without RMF

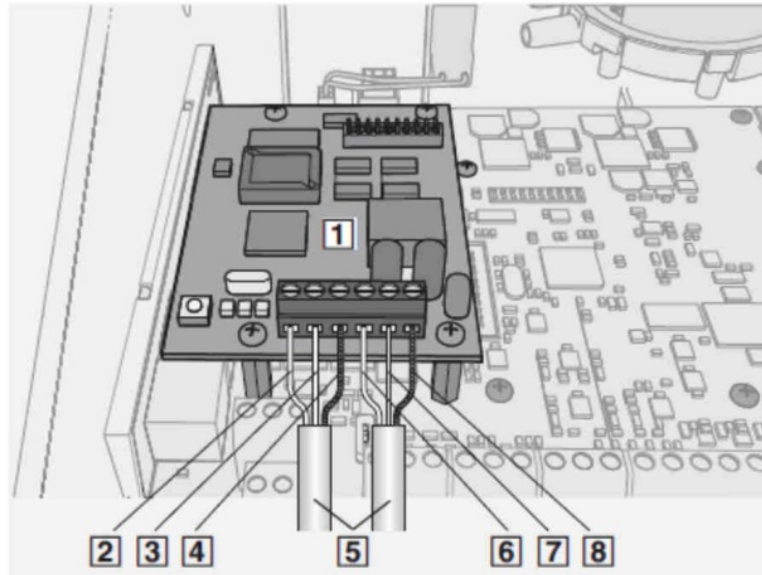
Usage on controller with activated RMF

-> Access to datapoints of room

Usage on controller without RMF

-> Access to datapoints of single controller

Connection assignment:



- 1 Expansion module EM-LON
- 2 LON-B
- 3 LON-A
- 4 Shielding
- 5 Network cables
- 6 LON-B
- 7 LON-A
- 8 Shielding

Expansion module built into EASYLAB TCU3 controller box

Network cable types:

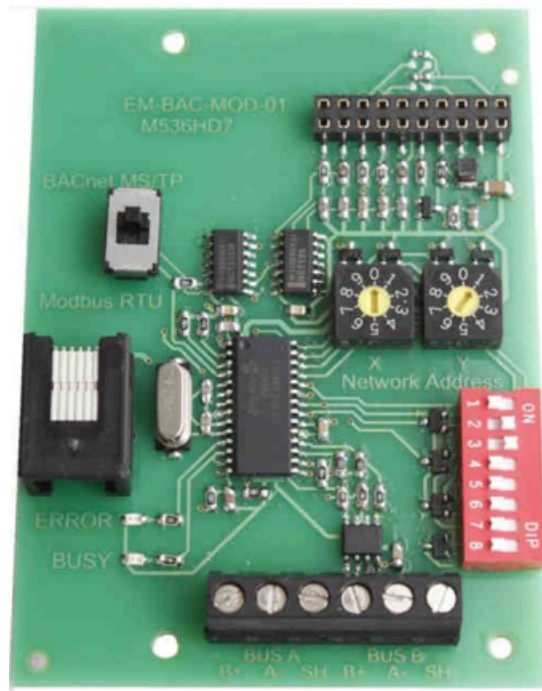
Following cable types are recommended for LonWorks®-networks by Echelon:
TIA 568A Category 5

- 8471 oder 85102 (Belden)
- Level IV cable
- JY(St)Y 2x2x0,8 (use only twisted wire pairs for LON-A and LON-B)

For more details see assembly and operating instruction manual of EM-LON.

The EM-LON extension module is only available as a spare part since 2022 (note availability of goods).

BACnet MS/TP interface Modbus RTU interface



(Expansion module EM-BAC-MOD-01)

Technical data:

- BACnet MS/TP interface or Modbus RTU interface selectable via configuration switch
- Configurable network address and communication parameter
- Simple network integration via internal connected double terminals
- Status-LED for display of data transfer and communication error
- Mounting of expansion module within EASYLAB TCU3 controller box
- Supply voltage 5 V DC provided by EASYLAB controller TCU3
- Current regulations for network design and number of network device must be observed: BACnet Standard 135-2004 Modbus according EIA-485

In particular this includes:

- Network topology with simple line structure
- Usage of twisted pair copper cables with shielding
- Compliance of polarity A- and B+ for all network devices
- 120 Ohm resistor for network termination at first and last network device
- Network BIAS resistor for BACnet networks
- Max. 32 network devices in each network segment
- Configuration of individuell network address for each device

Data interface:

- BACnet objects according PICS documentation or Modbus data registers
- Different data points according to controller device type:
Room controller / TAM with activated Room-Management-Function (RMF) or Fume cupboard controller / Room

controller / TAM without RMF

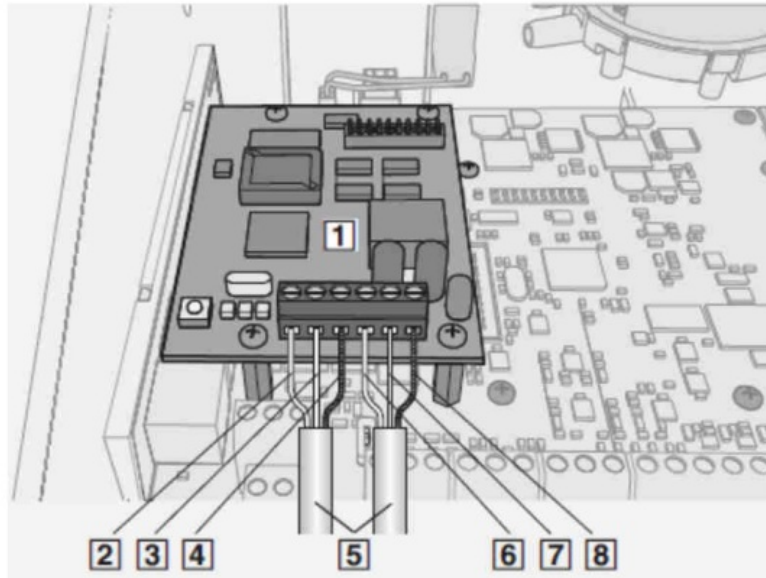
Usage on controller with activated RMF

-> Access to datapoints of room

Usage on controller without RMF

-> Access to datapoints of single controller

Connection assignment:



Expansion module built into EASYLAB TCU3 controller box

1. Expansion module EM-BAC-MOD-01

PCB illustration differs a little from original;

(Screw terminal representation is correct, see photo above)

- 2. B+ EIA-485
- 3. A- EIA-485
- 4. Shielding
- 5. Network cables
- 6. B+ EIA-485
- 7. A- EIA-485
- 8. Shielding

For more details see assembly and operating instruction manual of EM-BAC-MOD-01.

BACnet IP-interface Modbus IP-interface

(Expansion module EM-IP)

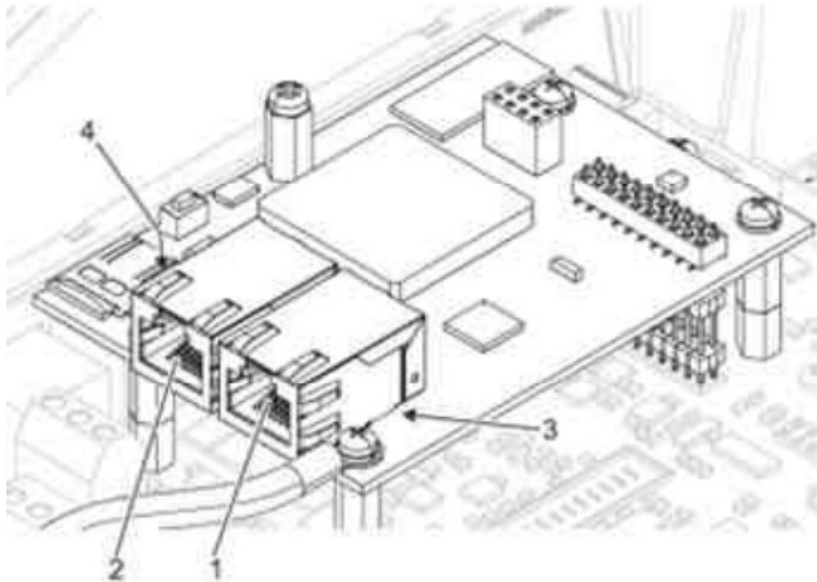


Technical data:

- BACnet interface Schnittstelle IP or Modbus interface IP, switchable via integral webserver
- Configurable network address and transmission parameter – Two RJ45 10/100 Mbit Ethernet connections (up to five EM-IP modules can be linked by a daisy chain)
- Status LED for indication of data transmission and errors
- Mounting of expansion module within EASYLAB TCU3 controller box
- Supply voltage 5 V DC provided by EASYLAB controller TCU3

Data interface:

- BACnet objects according PICS documentation or Modbus data registers
- Different data points according to controller device type:
Room controller / TAM with activated Room-Management-Function (RMF) or Fume cupboard controller / Room controller / TAM without RMF
Usage on controller with activated RMF
-> Access to datapoints of room
Usage on controller without RMF
-> Access to datapoints of single controller



Connection assignment:


Expansion module EM-IP

1. Ethernet-socket LAN 1
2. Ethernet-socket LAN 2
3. LED-state indicator LAN 1
4. LED-state indicator LAN 2

Expansion module built into EASYLAB TCU3 controller box

For more details see assembly and operating instruction manual of EM-IP.

Documents / Resources

	<p>TROX GmbH TCU3 Lab Control Easy Lab [pdf] Instruction Manual TCU3 Lab Control Easy Lab, TCU3, Lab Control Easy Lab, Control Easy Lab, Easy Lab</p>
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References

- [User Manual](#)

[Manuals+](#), [Privacy Policy](#)

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