

Control Units

XDMB0



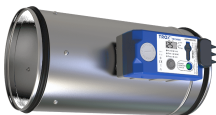
Bus interface BACnet MS/TP



Bus interface Modbus RTU



Control component for type TVE-Q



Control component for type TVE

Control component with dynamic transducer and Modbus RTU interface

Compact unit for VAV control unit TVE and TVE-Q

- Controller, dynamic differential pressure transmitter and actuator in one housing
- Use in ventilation and air conditioning systems, only with clean air
- Simple terminal connection without the use of additional junction boxes
- Volume flows q_{vmin} and q_{vmax} parameterised at the factory and stored in the controller as variable parameters
- High data transparency thanks to standardised RS485 digital bus communication
 - BACnet MS/TP: object access
 - Modbus RTU: register access
- Setpoint specifications, override controls depending on configuration via bus interface or analogue wiring
- Integrated display for volume flow rate display, operating status display and setting of operating parameters
- Service access for manual setting devices and PC configuration software

General information	2	Commissioning	10
Function	3	Display function	11
Specification text	4	Modbus operation	14
Order code	5	BACnet interface	18
Variants	6	Analogue interface	23
Technical data	7	Nomenclature	32
Interface selection	9		

General information

Application

- All-in-one control device for VAV terminal units type TVE and TVE-Q
- Dynamic effective pressure transducer, electronic controller and actuator are fitted together in one casing
- For clean air in ventilation and air-conditioning systems; the standard filtering enables use in the supply air without additional dust protection measures
- Application examples: Offices and classrooms
- In the event of a strong occurrence of dust, install appropriate extract air filters upstream, as a partial volume flow is routed through the transducer for volume flow rate measurement.
- If the air is heavily contaminated with dust, fluff, sticky, moist components, use attachment group with static differential pressure transducer, e.g. XSMB0
- Application examples: Extract air from changing rooms and shower areas, hospital bed rooms
- Various control options based on setpoint value default setting
- Volume flow rate control is based on setpoint values received from room temperature controller, MCE, air quality controller or other devices as an analogue signal or via communication interface
- Override controls for activating q_{vmin} , q_{vmax} , shut-off, open position via Modbus/BACnet register or switch or relay possible
- The actual volume flow rate is available as a network data point or as a linear voltage signal
- Damper position, e.g. for fan optimisation, is available as a network data point

Control strategy

- The volume flow controller works independent of the duct pressure
- Differential pressure fluctuations do not result in permanent volume flow rate changes
- To prevent the control from becoming unstable, a dead band is allowed which is not moved by the damper blade
- The flow rate range for the controller is set in the factory (q_{vmin} : minimum volume flow rate, q_{vmax} : maximum volume flow rate)
- Operating parameters are set at the factory according to the order code

Operating modes

BACnet (B):

- Setpoint value specification via BACnet objects

Analogue - variable operation (V):

- The setpoint value is set via the analogue interface, the signal voltage range corresponds to $q_{vmin} - q_{vmax}$

Analogue - fixed value operation (F):

- A setpoint signal is not required, setpoint value corresponds to q_{vmin}

Alternative adjusting possible on site:

- Modbus: Setpoint specification via Modbus registers

Interface

Communication interfaces

- BACnet MS/TP, RS485, data points see [Tables BACnet PICS](#)
- Modbus RTU, RS485, see Modbus register list for data points

Analogue interface with adjustable signal voltage range

- Analogue signal for volume flow setpoint
- Analogue signal for actual volume flow rate (factory setting)
- Alternatively: analogue signal for damper position (on-site conversion required)

Note:

- Interface type according to order code detail
- Operating mode parameterised at the factory, changeover possible on site

Signal voltage ranges

When using the analogue interface:

- 0 – 10 V DC
- 2 – 10 V DC

Parts and characteristics

- Transducer for dynamic pressure measurements
- Overload proof actuator
- Terminals with cover
- Display and control elements for easy menu navigation
- Menu navigation for adjusting operating parameters
- Menu navigation for customising the communication interface
- Service interface

Construction

- TR0VM-024T-10I-DD15-BN
- Can only be used for type TVE and TVE-Q

Commissioning

- As the volume flow rates are factory set, the terminal units have to be installed at the specified locations
- Analogue interface: ready for use after installation and wiring
- BACnet and Modbus interface: additional commissioning steps required after installation and wiring
- Operating parameters can be customised on site (via bus interface, display operation, setting device or PC software)

Useful additions

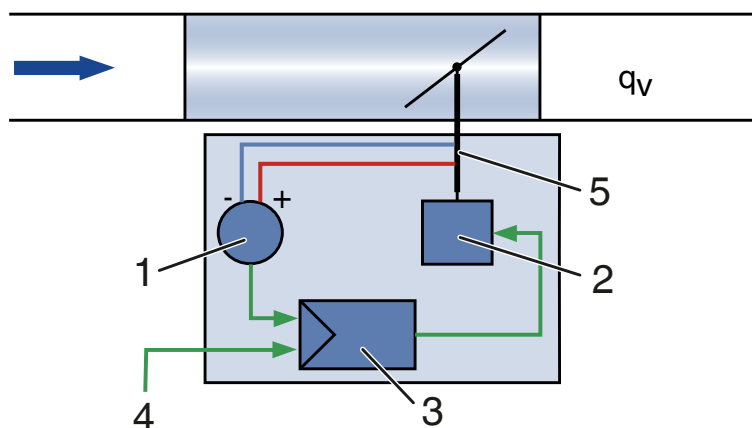
- Adjustment device type GUIV3-M (order code AT-VAV-G3)
- PC software

Function

VAV terminal units control the volume flow in a closed loop, i.e. measurement – comparison – correction.

For volume flow rate measurement the effective pressure is measured first. This is done with a differential pressure sensor. The integral differential pressure transducer transforms the effective pressure into a voltage signal. The actual volume flow rate is available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal flow rate (q_{vnom}).

The volume flow rate setpoint value comes from a higher-level controller (e.g. room temperature controller, air quality controller, central BMS). Variable volume flow control results in a value between q_{vmin} and q_{vmax} . It is possible to override the room temperature control, e.g. by a complete shut-off of the duct. The controller compares the differential pressure setpoint value to the actual value and controls the actuator accordingly if there is a difference.



- 1 Differential pressure transducer
- 2 Actuator
- 3 Control component
- 4 Setpoint value via Modbus or analogue signal
- 5 Shaft with effective pressure channel

Specification text

This specification text describes the general characteristics of the product.

Category

- Compact controller for volume flow rate

Application

- Control of a constant or variable volume flow rate setpoint
- Electronic controller for connecting a reference variable and tapping an actual value for integration into a BACnet- or Modbus-based MCE
- The actual value relates to the nominal volume flow rate so that commissioning and subsequent adjustment are simplified

Area of application

- Dynamic transducer for clean air in ventilation and air conditioning systems

Actuator

- Integrated; slow-running (run time 100 s for 90°)

Installation orientation

- Either direction

Connection

- Terminals with cover by rubber cap, therefore no additional terminal box required
- Double terminal for supply voltage for easy wiring of up to 3 controllers

Supply voltage

- 24V AC/DC

Interface/signalling

- BACnet MS/TP (RS485) or analogue signal 0 - 10 V DC or 2 - 10 V DC parameterised at the factory depending on the order option
- Optional on-site alternative: Modbus RTU (RS485)

Interface information

- BACnet or Modbus: among other things, volume flow setpoint and actual value signal, damper position, override control
- Alternatively: Volume flow setpoint and actual value signal as analogue signal

Special functions

- Clearly visible external indicator light for signalling the functions: Set, not set, and power failure
- Display for actual values, parameterisation and for test functions
- Activation of override control functions q_{vmin} , q_{vmax} closed, Open via bus interface
- External switching contacts/wiring (with analogue interface)

Parameter setting

- Specific parameters for VAV terminal unit are factory-set
- Operating values: q_{vmin} , q_{vmax} ; factory-set BACnet interface type
- Subsequent customisation via display and control element directly on the device or with optional tools:
 - Adjustment device, PC software (cable connection in each case)

Factory condition

- Functional test under air using reference measurement on a regularly validated test bench in accordance with EN ISO 9001 to check the function and control accuracy of the complete volume flow controller
- Adjustment of the device-specific parameters under air by reference measurement on a regularly validated test bench in accordance with EN ISO 9001
- The test report of the factory parameterisation, functional test and adjustment must be made available after delivery of the volume flow controller

Equivalence criteria

- Electrical connections with screw terminals, no additional terminal boxes required
- The test report of the factory parameterisation, functional test and adjustment under air by reference measurement on a regularly validated test bench in accordance with EN ISO 9001 is made available

Order code

TVE – D / P1 / 4 / D2 / XDMB0 / V0 / 11.7-206.12 [cfm]

1 2 3 5 6 7 8 9 10

1 Type

TVE VAV air terminal unit

XDMB0 Volume flow controller with display, Modbus RTU or BACnet MS/TP interface

2 Acoustic cladding

No entry: without acoustic cladding

D with acoustic cladding

8 Operating mode

F Constant value mode, one setpoint value (no external switch contact)

V Variable operation (default setpoint value from analogue signal)

B BACnet MS/TP interface, variable operation (setpoint specification via BACnetObject)

3 Material

No entry: galvanised sheet steel

P1 Powder-coated RAL 7001 (silver grey)

A2 Stainless steel construction

9 Signal voltage range

(only with operating mode F, V)

0 0 – 10 V DC

2 2 – 10 V DC

5 Nominal size [in.]

4, 5, 6, 8, 10, 12, 16

10 Operating values for factory setting

Volume flow rate [m³/h or l/s]

q_{vconst} (with operating mode F)

$q_{vmin} - q_{vmax}$ (with operating mode V, B)

6 Accessories

No entry: without accessories

D2 Double lip seal both ends

G2 Matching flanges both ends

7 Attachment (control component)

Order example: TVE-D/P1/4/D2/XDMB0/V0/11.77-206.12[cfm]

Type	TVE: VAV terminal unit
Acoustic cladding	with acoustic cladding
Material	Powder-coated RAL 7001 (silver grey)
Nominal size [in.]	4
Accessories	Double lip seal both ends
Attachment (control component)	Volume flow controller with dynamic measuring principle, display and digital Bus interface for BACnet MS/TP, Modbus RTU and analogue interface
Operating mode	variable operation, control with analogue signal
Signal voltage range	0 – 10 V DC
Operating values for factory setting	11.77 - 206.12 [cfm]

Order example: TVE-Q/12x4/XDMB0/B/58.86x470.86[cfm]

Type	TVE-Q - VAV terminal unit
Acoustic cladding	without
Material	Galvanised sheet steel
Nominal size [in.]	12 x 4
Attachment (control component)	Volume flow controller with dynamic measuring principle, display and digital Bus interface for BACnet MS/TP, Modbus RTU and analogue interface
Operating mode	BACnet MS/TP
Signal voltage range	-
Operating values for factory setting	58.86 x 470.86 [cfm]

Note:

The XDMB0 control component described here is reserved for the factory order option for BACnet bus operation.

Conversion to Modbus operation can be carried out on site in the event of project changes.

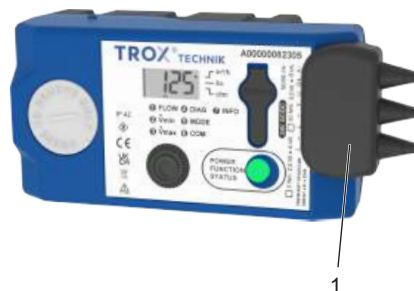
The control component XM0 must be used for factory parameterisation of the Modbus operating mode.

Variants

Compact controller XDMB0 for TVE and TVE-Q



Compact controller XDMB0 for TVE and TVE-Q (with attached terminal cover)



- 1 Compact controller
- 2 Damper blade position indicator and release button
- 3 Display
- 4 Rotary selector switch - Selection of options/setting values
- 5 LED button - Selection of menu entry
- 6 Connection terminal

- 1 Terminal cover (part of the supply package)

Technical data

Compact controller for VAV terminal units

Part number	Type of installation component	VAV terminal units
A00000082305	TR0VM-024T-10I-DD15-BN	TVE, TVE-Q

Compact controller XDMB0 for TVE and TVE-Q



TR0VM-024T-10I-DD15-BN

Type of measurement/installation orientation	Dynamic measurements, any installation orientation
Supply voltage (AC)	24 V AC, $\pm 20\%$, 50/60 Hz
Supply voltage (DC)	24 V DC $\pm 20\%$
Power rating (AC)	TVE NW 4 - 6: maximum 4 VA TVE NW 4 - 16: maximum 6 VA TVE-Q up to height 4: maximum 4 VA TVE-Q from height 12: maximum 6 VA
Power rating (DC)	TVE NW 4 - 6: maximum 2.5 W TVE NW 4 - 16: maximum 3 W TVE-Q up to height 4: maximum 2.5 W TVE-Q from height 12: maximum 3 W
Power consumption (when running/when idle)	1 W
Setpoint value signal input (analogue optional)	0 - 10 V DC, input resistance $> 100\text{ k}\Omega$ or 2 - 10V DC $R_a > 50\text{ k}\Omega$
Actual value signal output	0 - 10 V DC or 2 - 10 V DC; maximum 5 mA
IEC protection class	III (Protective extra-low voltage)
Protection level	IP 42 (with attached terminal cover)
EC conformity	EMC to 2014/30/EU
Bus connection	RS485, BACnet MS/TP or Modbus RTU
Number of nodes (bus participants)	128
BACnet communication parameters to be set	Baud rate adjustable: 9600, 19200, 38400, 57600, 76800, 115200 baud Start bit: 1 Data bits: 8 Stop bits: 1 no parity
Adjustable communication parameters for Modbus	Baud rate adjustable: 1200, 2400, 4800, 9600, 19200, 38400, 76800, 115200 baud Start bit: 1 Data bits: 8 Stop bits adjustable: 1 or 2 Parity: adjustable: None, Even, Odd



Setpoint / actual value interface	BACnet operation: via BACnet objects Modbus operation: via Modbus register list
Bus termination	externally required (120 Ω)

Interface selectionI

Interface configuration of the control component

Depending on the setting, the Modbus RTU communication interfaces or the analogue interface are available for the setpoint specification of volume flow rates.

The parameterisation can be selected via the order code.

On-site adjustment is possible both via the integrated display menu, the Modbus interface and via the setting device or PC software.

	Setpoint value default setting via:	Actual values via:	order code option	Configuration via display (MODE, COM)
Analogue operation (0 – 10 V)	Analogue input Y (0 - 10 V DC) and bus interface	Analogue output U (0 - 10 V DC) and Bus interface	V or F	CA0
Analogue operation (2 – 10 V)	Analogue input Y (2 - 10 V DC) and bus interface	Analogue output U (2 - 10 V DC) and bus interface	V or F	CA2
BACnet operation	BACnet object	BACnet object and analogue output U (2 – 10 V)	B	MODE = Cb2 COM = bc1 - bc6
Modbus operation	Modbus register	Modbus register and analogue output U (2 – 10 V)	activated by others	Mode = Cb2 COM = b1 - b32

Through special configuration of the Modbus register Interface-Mode, mixed operations of Modbus and analogue operation can be configured. See the description of the interface mode in Modbus register 122.

Supplementary use of the bus interface in analogue mode (hybrid mode)

In analogue mode, only the setpoints at the analogue input are evaluated by the controller. Setpoint specification via the bus interface via Modbus register 0 or 20 or BACnet object RelSpAnalog AI[1] is then not possible. Any write attempts are acknowledged with an error response.

Regardless of the selected interface configuration, however, other bus data points can also be used for analogue operation (CA0, CA2). In this way, the operating values of the actual volume flow rate (register 6,7) and damper position (register 4) or central override controls (register 1) can be read out from a higher-level MCE, with local control using an analogue signal via a connected Modbus. The prerequisite for this is that the communication settings of the Modbus interface (address, baud rate, etc.) are configured appropriately for the on-site network, e.g. via the COM b1-b32 display setting.

Commissioning

Commissioning

After installation, wiring and connection of the supply voltage

When using the analogue interface:

- Air terminal unit immediately ready for operation

Additional commissioning steps are required when using bus communication:

- E.g. assigning the subscriber address and, if necessary, adjusting the communication settings via the integrated display menu
- Setpoint specification via BACnet objects or Modbus registers, depending on the bus communication setting

Note:

Remove terminal cover of the control component only for wiring

Observe volume flow control ranges

- TVE: 4 - 100 % of q_{vnom}
- TVE-Q: 10 - 100 % of q_{vnom}
- In particular, do not set values below the minimum volume flow of the control unit

Setting options / service tools

Function	Display menu	Modbus register	BACnet object	Adjustment device	PC-Tool
Adjustment operating range q_{vmin} - q_{vmax}	R, W	R, W	R, W	R, W	R, W
Setting channel for setpoint value specification (bus or analogue signal)	R, W	R, W	R, W	R, W	R, W
Setting Protocol for bus communication (Modbus RTU or BACnet MS/TP)	R, W	R, W	–	R, W	R, W
Setting communication parameters e.g. baud rate	R, W	R, W	–	R, W	R, W
Setting the Modbus/BACnet subscriber address	R, W	R, W	–	R, W	R, W
Trend display	–	–	–	–	R, W
Implement override control	R, W	R, W	R, W	R, W	R, W
de-energised parameterisation	–	–	–	R, W	R, W

R, W = function is readable and writable

– = register is not available for the service tool

Note: The nominal volume flow rate q_{vnom} cannot be adapted on site.

Display function

Range of display functions

Display functions

- Actual volume flow rate (unit optionally m³/h, l/s, cfm)
- Displayed on a 3-character display with labelling of the digit value and volume flow unit
- Status and error display for various operating states, including display of activated override control, display of nominal volume flow, firmware version and diagnostic function

Parameter settings

- Adjustment option for the unit of the volume flow rate display m³/h, l/s, cfm
- Adjustment option for the operating range q_{vmin} , q_{vmax}
- Selection of the signal source for setpoint specification (interface mode)
 - Setpoint value specification via bus (BACnet or Modbus depending on the communication parameter setting)
 - Setpoint value specification via analogue signal (0 - 10 V DC or 2 - 10 V DC depending on characteristic curve setting)
- Setting option for communication parameters for bus operation:
 - for Modbus: address, baud rate, stop bits, parity
 - for BACnet: Address, baud rate

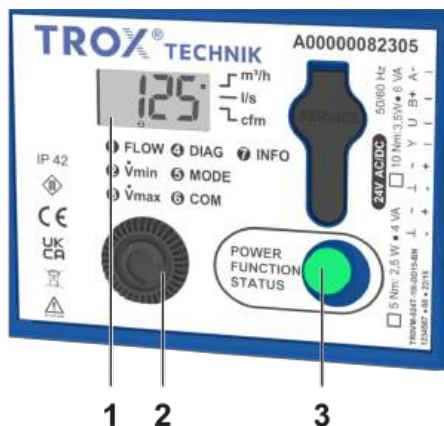
Diagnostic functions

- Activation of a test run
- Activation of override controls Open, Closed, q_{vmin} , q_{vmax} , motor stop (observe prioritisation)
- Display of the voltage value at the analogue input and analogue output

Use and description of the display

Menu items 1 - 7 are selected in sequence by pressing the LED button (< 3 s). The selected menu item can be changed by pressing the LED push button for more than 3 s. Changing is done with the rotary selector switch. Pressing the LED push button again (< 3 s) confirms the selected value. If no entry is made for ≥ 60 s, the system returns to menu item 1.

Section of the controls

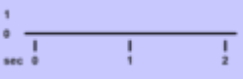
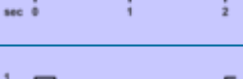
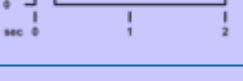


- 1: Display
- 2: Rotary selector switch
- 3: LED push button

Table 1: Description of the menu items

1 Flow	Display of actual values or operating states. Setting of Volume flow unit m³/h, l/s, cfm
2 Vmin	Setting of q_{vmin}
3 Vmax	Setting of q_{vmax}
4 DIAG	Display of control signal and feedback signal alternately in [V], Activation of override controls for testing and diagnosis: tst = test drive oP = damper open cL = damper closed Lo = q_{vmin} Hi = q_{vmax} St = motor stop oFF = override control off
5 MODE	Signal source selection (interface mode) CA0 = Setpoint specification and actual value return via Analogue interface (0 – 10 V) CA2 = Setpoint specification and actual value return via Analogue interface (2 – 10 V) Cb2 = Write setpoint value and read actual value via bus interface; additional actual value signal analogue 2 - 10 V DC
6 COM	Setting the bus address and communication parameters Device address - Modbus: Address 1 – 247 - BACnet: Address 1 – 127 Selection of protocol and communication settings: Communication parameter set b1 to b32: Modbus RTU protocol with 32 different parameter sets for baud rate, parity, stop bits Communication parameter set bc1 - bc6: BACnet-MS/TP protocol with 6 different parameter sets for the baud rate. Parity (None) and number of stop bits (1) are fixed. Communication parameters (factory setting): bc3: BACnet MS/TP with 38400 baud Communication parameters (detailed description): Description of b1 - b32 see register 568
7 Info	Pos = Fan request signal corresponds to Damper blade position in per cent. ¹ qno = nominal volume flow rate Fir = Display of the firmware version of the control component ¹ Compared to standard controllers such as TVR, TVE and TVE-Q controllers use restricted damper opening angles in order to realise the measurement of the volume flow with the damper. A damper position of 100 % therefore does not correspond to a damper opening angle of 90°.

Description of status LEDs and error messages

LED flashing signal	Status	Display
	no power supply connected	
	Service tool plugged in. On-site network connection deactivated. Forced controls from the service tool have priority	
	Undervoltage detected. Supply voltage outside the tolerance range. Control function not guaranteed	
	TROX service technicians provide information. Incomplete parameterisation was detected during power-on/reset *	
	Drive overload detected (block) *	
	Synchronisation drive after Power Up *	
	Test mode enabled *	
	Overpressure sensor (Overpressure) *	
	Setpoint or forced control position not yet reached (display changes between e.g. Hi = high and actual value) *	
	Forced control position reached (display changes between e.g. Hi = High and actual value) *	
	Offset: Is signalled as long as the drive does not rotate to readjust the setpoint value *	

Notes:

The flashing signal always describes a 2-second interval. 1 = LED lights up, 0 = LED does not light up.

For service tool plugged in (display: Pc) and undervoltage detected (display: Lou), no special flashing signal appears on the LED button. Instead, one of the operating states marked with an asterisk (*) is displayed.

Modbus operation

Modbus operation

For smooth data exchange in the on-site Modbus RTU network, it is necessary to set the communication parameters and the participant address for the Modbus interface.

The interface offers standardised Modbus register access to the available data points via the functions ReadHoldingRegister (3) and WriteSingleRegister (6).

Setpoint specification

- For setpoint specification via Modbus: Set the signal source in register 122 to the value 1 or 2
- In Modbus mode, the setpoint value is only specified by setting the volume flow setpoint [%] in Modbus register 0
- The transferred percentage value refers to the volume flow range specified by $q_{vmin} - q_{vmax}$
- Volume flow range $q_{vmin} - q_{vmax}$ is factory-set according to the order code specification
- Subsequent adjustment of q_{vmin} or q_{vmax} is possible in the settings menu on the display, with an adjustment device, PC software, or via Modbus interface

Actual value as feedback for monitoring or feedback control

- In Modbus register 7, the current actual volume flow is retrievable in the set volume flow unit (register 201)
- In addition to the actual volume flow rate, further information can be read out via other Modbus registers; Overview see register list
- For diagnostic purposes, the actual volume flow rate can be tapped as an analogue signal at terminal U in Modbus mode
- The volume flow range $0 - q_{vnom}$ always corresponds to the signal voltage range of 2 - 10 V DC

Override control

For special operating situations, the volume flow controller can be put in a special operating mode (override control). Possible modes: Control q_{vmin} , control q_{vmax} , damper blade in open position (OPEN) or damper blade closed (CLOSED).

Override control via the Modbus

Settings are made via Modbus register 1.

Override control via local analogue circuit

Analogue override controls can be detected and evaluated via Modbus registers, see also operating instructions.

Override control via bus failure monitoring

If Modbus communication fails for a specified period of time, a predefined operating state q_{vmin} , q_{vmax} , OPEN or CLOSED can be activated.

- The override control to be activated in case of bus failure is defined via register 108
- The setting after which bus failure time the override control is activated, is made via register 109
- Any Modbus communication resets the bus failure monitoring timeout
- The bus failure monitoring timeout is reset by a setpoint change (register 0) or an override control command (register 1)

Override controls for diagnostic purposes

Activation via the diagnostic menu on the controller display or the service tools (adjustment device, PC software).

Prioritisation of different setting options

Specifications for override controls via service tools are prioritised over Modbus specifications.

- Highest priority: settings via the service connector (adjustment device, PC software) for testing purposes
- Lowest priority: Specification via Modbus register 1 or the diagnostics menu on the control component

Note:

Cyclic writing to registers with storage in the EEPROM is not permitted. This applies in particular to the basic setting parameters for the working range q_{vmin} (register 105 or 120), q_{vmax} (register 106 or 121), the definition of the signal source for setpoint specification

(interface mode, register 122) and all other registers from number 100 onwards.
See also notes on writeability at the end of the Modbus register description.

Communication interface Modbus RTU (operating mode M)

Register	Meaning	Access right	Storage
0	Volume flow setpoint [%] Reference: $q_{vmin} - q_{vmax}$ Resolution: 0 – 10000 Volume flow setpoint: 0.00 – 100.00%	R, W	RAM
1	Activation of an override control; 0 = none; 1 = open; 2 = closed; 3 = q_{vmin} ; 4 = q_{vmax}	R, W	RAM
2	Command triggering 0 = none; 1 = adaptation; 2 = test run; 4 = controller reset	R, W	RAM
4	Current damper blade position [%] Resolution: 0 – 10000 Damper blade position: 0.00 - 100.00 % (0 % = closed, 100 % = maximum open)	R	RAM
5	Current damper blade position [°] Reference: without decimal places Note: With a TVE or TVE-Q control device, 100 % opening does not correspond to a damper blade angle of approx. 90° as with conventional control devices, as the damper blade does not exceed a certain angle of attack due to its design. The damper position in per cent in register 4 must therefore always be used for ventilation optimisation.	R	RAM
6	Current actual volume flow [%] Reference: q_{vnom} Resolution: 0 – 10000 Actual volume flow rate: 0.00 - 100.00 %	R	RAM
7	Actual volume flow rate in volume flow rate unit [m³/h], [l/s], [cfm] according to register 201	R	RAM
8	Voltage at analogue input Y [mV]	R	RAM
20	Volume flow setpoint in volume flow unit [m³/h], [l/s], [cfm] according to Register 201	R, W	RAM
103	Firmware version	R	Flash
104	Status information Bit 5 mechanical overload Bit 8 internal activity e.g. test run, adaptation Bit 10 bus timeout monitoring triggered	R	RAM
105	Upper limitation of operating range: Operating parameters q_{vmin} [%] Reference: q_{vnom} Resolution: 0 – 10000 Vmin: 0.00 – 100.00 %	R, W	EEPROM
106	Upper limitation of operating range: Operating parameters q_{vmax} [%] Reference: q_{vnom} Resolution: 0 – 10000 Vmax: 0.00 – 100.00 %	R, W	EEPROM
108	Behaviour in case of bus failure (bus time-out); 0 = nothing; 1 = closed; 2 = open; 3 = q_{vmin} ; 5 = q_{vmax}	R, W	EEPROM
109	Definition of timeout for bus failure detection [s]	R, W	EEPROM
120	Definition of operating range: Operating parameters q_{vmin} in volume flow unit [m³/h], [l/s], [cfm] according to register 201	R, W	EEPROM

Register	Meaning	Access right	Storage
121	Definition of operating range: Operating parameters q_{vmax} in volume flow unit [m³/h], [l/s], [cfm] according to register 201	R, W	EEPROM
122	Definition of signal source for setpoint value specification (interface mode); see separate table for assignment	R, W	EEPROM
130	Subscriber address (bus communication); factory parameterisation: address 1	R, W	EEPROM
201	Volume flow rate unit 0 = l/s; 1 = m³/h; 6 = cfm	R, W	EEPROM
231	Setting of mode: Bit 0 defines the characteristic of the analogue interface: Bit 0 = 0 characteristic: 0 – 10 V Bit 0 = 1 characteristic: 2 – 10 V Bit 4 defines the actual value signal as an actual volumetric flow value or damper blade position: Bit 4 = 0 Actual volume flow rate Bit 4 = 1 Damper blade position All other bits may not be changed	R, W	EEPROM
233	Nominal flow rate [m³/h] q_{vnom} of the terminal unit	R	EEPROM
568	Parameter set for bus communication (protocol, baud rate, etc.); see separate table for description	R, W	EEPROM
569	Modbus communication settings: Modbus Response Time = 10 ms + delay; with delay = 3 ms × register value 0 – 255	R, W	EEPROM

R = register readable

R,W = register readable and writeable

RAM = register value volatile

EEPROM = register value not volatile, but permanently stored (maximum 1 million write operations)

FLASH = unchangeable programme memory

Note:

All registers with storage in the EEPROM are **not** designed for cyclical write access, e.g. by the MCE. Cyclical write accesses are only permitted on registers with storage in RAM.

Detailed information on register 122 - Specification of signal source for setpoint value specification (interface mode)

Interface mode		
Register value	Signal input	Feedback signal
0	Setpoint value specification via analogue input Y (0) 2 – 10 V DC ²	(0)2 – 10 V
1	Setpoint value specification via bus interface Modbus or BACnet ³	(0)2 – 10 V
2 ¹	Setpoint value specification via Modbus register 0	Modbus register 10
3 ¹	Setpoint value specification via analogue input Y (0) 2 – 10 V DC ²	Modbus register 10

¹ Only with activated Modbus communication

² Setting characteristic curve 0 - 10 V or 2 - 10 V separately with register 231

³ Setpoint value specification for Modbus communication via register 0 or for BACnet communication via object RelSpBus AO[0]

Detailed information on register 568 (communication parameters/display setting in the COM menu)

Register value	Display setting value	Communication	Baud rate	Parity	Stop bits
0	b1	Modbus RTU	1200	None	2



Register value	Display setting value	Communication	Baud rate	Parity	Stop bits
1	b2	Modbus RTU	1200	even	1
2	b3	Modbus RTU	1200	odd	1
3	b4	Modbus RTU	2400	None	2
4	b5	Modbus RTU	2400	even	1
5	b6	Modbus RTU	2400	odd	1
6	b7	Modbus RTU	4800	None	2
7	b8	Modbus RTU	4800	even	1
8	b9	Modbus RTU	4800	odd	1
9	b10	Modbus RTU	9600	None	2
10	b11	Modbus RTU	9600	even	1
11	b12	Modbus RTU	9600	odd	1
12	b13	Modbus RTU	19200	None	2
13	b14	Modbus RTU	19200	even	1
14	b15	Modbus RTU	19200	odd	1
15	b16	Modbus RTU	38400	None	2
16	b17	Modbus RTU	38400	even	1
17	b18	Modbus RTU	38400	odd	1
18	b19	Modbus RTU	1200	None	1
19	b20	Modbus RTU	2400	None	1
20	b21	Modbus RTU	4800	None	1
21	b22	Modbus RTU	9600	None	1
22	b23	Modbus RTU	19200	None	1
23	b24	Modbus RTU	38400	None	1
24	b25	Modbus RTU	76800	None	1
25	b26	Modbus RTU	115200	None	1
26	b27	Modbus RTU	76800	None	2
27	b28	Modbus RTU	76800	even	1
28	b29	Modbus RTU	76800	odd	1
29	b30	Modbus RTU	115200	None	2
30	b31	Modbus RTU	115200	even	1
31	b32	Modbus RTU	115200	odd	1
32	bc1	BACnet MS/TP	9600	None	1
33	bc2	BACnet MS/TP	19200	None	1
34¹	bc3	BACnet MS/TP	38400	None	1
35	bc4	BACnet MS/TP	57600	None	1
36	bc5	BACnet MS/TP	76800	None	1
37	bc6	BACnet MS/TP	115200	None	1

¹ Factory setting: BACnet communication parameters

BACnet interface

BACnet operation (order code operating mode B)

For smooth data exchange in the on-site BACnet-MS/TP network, it is necessary to set the communication parameters and the subscriber address for the BACnet interface.

The interface offers standardised BACnet object access in accordance with the BACnet PICS description.

Setpoint value setting

- For setpoint value specification via BACnet, the signal source in the BACnet object MV[122] is parameterised to bus at the factory
- In operating mode B, the setpoint value is specified only by specifying the volume flow rate setpoint [%] in the BACnet object AI[0]
- The transferred percentage value refers to the volume flow rate range specified by q_{vmin} - q_{vmax} defined volume flow rate range
- Volume flow rate range q_{vmin} - q_{vmax} is parameterised at the factory according to the order code specification
- Subsequent adjustment of q_{vmin} or q_{vmax} possible in the setting menu on the display, with adjustment device or via Modbus interface

Actual value as feedback for monitoring or tracking control

- The current actual volume flow in the set volume flow unit object MV[201] can be called up in object AI[7]
- In addition to the volume flow rate actual value, other information can be read out using other Modbus registers/BACnet objects
For an overview, see BACnet objects in the PICs description
- For diagnostic purposes, the actual volume flow rate can be tapped at terminal U in BACnet mode
- The volume flow rate range $0 - q_{vnom}$ always corresponds to the signal voltage range of 2 - 10 V DC

Override control

For special operating situations, the volume flow controller can be put in a special operating mode (override control). Possible modes: Control q_{vmin} , control q_{vmax} , damper in open position (OPEN) or damper closed (CLOSED).

Override control BACnet

Specifications are made via the BACnet object MO[1]

Override control through bus failure monitoring

If bus communication fails for a defined period of time, a predefined operating state q_{vmin} , q_{vmax} , OPEN or CLOSED can be activated.

- The override control to be activated in the event of bus failure can only be defined via the PC software in register 108; factory setting: no override control
- The bus failure time after which the override control is activated is defined via the MI object [109]
- The bus failure monitoring timeout is reset by a setpoint change with object AI[0] or an override control command with object MO[1]

Override controls for diagnosis

Activation via the diagnostic menu on the controller display or the service tools (setting device, PC software).

Prioritisation of different default options

Specifications for override controls via service tools are prioritised over Modbus specifications.

- Highest priority: Default setting via the service plug (adjustment device, PC software), for testing purposes
- Lowest priority: Specification via BACnet object MO[1]

Note:

The cyclical writing of subsequent BACnet objects is not approved.

The associated setting data is stored in the EEPROM memory and allows a maximum of 1 million write operations.

- Definition of operating range q_{vmin} AV[105] and q_{vmax} AV[106]
- Setting timeout busfail watchdog AV[109]
- Definition of signal source for setpoint specification MV[122]
- Definition of ControlMode MV[123]

- Definition of volume flow unit MV[201]

BACnet interface - general information

General Information

Date	4.12.2023
Vendor Name	Trox GmbH
Vendor ID	329
Description/Name for Model/Product	Controller for VAV/CAV application
Object/Device Name	for TROX Attachments as follows ▪ XDMB0: Object/Device Name = TR0VM-024T-10I-DD10-BN ▪ XSMB0: Object/Device Name = TR0VM-024T-10I-DS10-BN
Application software version	SW 116.955.11.2022
Firmware revision	FW 101.1.10.2020/GR
BACnet Protocol Revision	15
BACnet Standard Device Profile	BACnet Application Specific Controller (B-ASC)
Segmentation capability	No
Data Link Layer Options	MS/TP Master; Communication speed configurable to: 9600, 19200, 38400, 57600, 76800, 115200 Baud
Adress range	0 – 127 (Default = 1)
Number of nodes	max. 128 (1/4 unit load)
Termination	120 Ω (external)
Device Address Binding	No static device binding supported
Gateway Options	None
Network Security Options	Non-secure device
Character set supported	ISO 10646 (UTF-8)
Write Cycles Peristent Objects	max. 1.000.000
Parameterisation	Display, PC software tool WIN-VAV2

BACnet - compatible function blocks (BIBBs)

BACnet Interoperability Building Blocks (BIBBs)

Data Sharing	ReadProperty-B (DS-RP-B) ReadPropertyMultiple-B (DS-RPM-B) WriteProperty-B (DS-WP-B) WritePropertyMultiple-B (DS-WPM-B) Change Of Value-B (DS-COV-B)
Device Managment	Dynamic Device Binding-B (DM-DOB-B) Dynamic Object Binding-B (DM-DOB-B) DeviceCommunicationControl-B (DM-DCC-B) ReinitialiseDevice-B (DM-RD-B)

Protocol implementation (PICS) - Supported Objects

Protocol Implementation Conformance Statement (PICS) - Supported Objects

Object type	Optional properties	Writeable properties
Device	Description Location Active COV Subscriptions Max. Master	Object Identifier Object Name Location Description

Object type	Optional properties	Writeable properties
	Max. Info Frames Profile Name	AAPDU Timeout (1000 – 60.000) Number of APDU Retires (0 - 10) Max. Master (1 – 127) Max. Info Frames (1 – 55)
Analog Input [AI]	Description COV Increment	COV Increment
Analog Output [AO]	Description COV Increment	Present Value COV Increment Relinquish Default
Analog Value [AV]	Description COV Increment	Present Value COV Increment
Binary Input [BI]	Active Text Inactive Text	
Multi-state Input [MI]	Description State Text	
Multi-state Output [MO]	Description State Text	Present Value Relinquish Default
Multi-state Value [MV]	Description State Text	Present Value

Notes: The device does not support the services CreateObject (create object) and DeleteObject (delete object). Maximum length of writable strings based on single-byte character

- Object name: 32 char
- Location: 64 char
- Description: 64 char

Service processing

- The device supports the DeviceCommunicationControl and ReinitialiseDevice service functions
- A password is not required
- A maximum of 6 active COV subscriptions (logins) with a runtime of 1 - 28800 s (8 h) are supported

Protocol implementation (PICS) - object details

Protocol Implementation Conformance Statement (PICS) - Object details

Object Name	Object Type [Instance]	Description Comment Status_Flags	Values	COV Increment	Access
Device	Device [Inst. Nr.]		0 – 4194302 Default: 1	-	W
RelSpAnalogue	AI[0]	only if setpoint value specification by SpSource MV[122] = analogue: volume flow rate setpoint detected at analogue input Y [%] if setpoint value specification by SpSource MV[122] = Bus, then Out_of_Service = TRUE	0 – 100.00	0.01 – 100.00 Default: 1	R
RelPos	AI[4]	Fan request signal Degree of opening of the damper between 0 - 100 %, whereby 0 % corresponds to the closed position and 100 % to maximum opening. Note: With a TVE or TVE-Q control device, 100 % opening does not correspond to a damper angle of approx. 90° as with conventional control devices, as the damper does not exceed a certain angle of attack due to its design.	0 – 100.00	0.01 – 100.00 Default: 1	R
AbsPos	AI[5]	Damper movement [°] from closed position Note: The readable value can only be used	0 - maximum angle of rotation of the TVE(-Q) damper movement range	0.01 – 655.35 Default: 1	R

Object Name	Object Type [Instance]	Description Comment Status_Flags	Values	COV Increment	Access
		for service and diagnostic purposes. The RelPos data point must be used to evaluate the open and closed position.			
RelActual_Value	AI[6]	Current actual volume flow [%]; reference: q_{vnom} Nominal volume flow see object AbsNomValue AV[233]	0 – 100.00	0.01 – 100.00 Default: 1	R
AbsActual_Value	AI[7]	Current actual volume flow as an absolute value in the set volume flow unit; Unit see object UnitSet MV[201]	0 – $q_{vNominal}$	0 – 65535 Default: 1	R
Sens1Analog	AI[8]	Signal voltage [mV] at input Y; the prerequisite is that object Sens1Typ [MV107] is set to the value 2 (Active/Hybrid). If setpoint value specification with object SpSource[MV122] is set to analogue (1), then Out_Of_Service = TRUE	0 – 65535	Default: 1	R
RelSpBus	AO[0]	Volume flow rate setpoint via bus specification as a percentage of the set operating range from Min [AV105] to Max [AV106]. [AV106]. If setpoint value specification with object SpSource[MV122] is set to analogue (1), then Out_Of_Service = TRUE	0 – 100.00 Default: 0	0.01 – 100 Default: 1	C
Min	AV[105]	Limitation of operating range q_{vmin} [%]: Lower limit for setpoint value in per cent of the nominal volume flow q_{vnom} ; see object AbsNomValue AV[233]	0 – 100.00 Default: 0	0,01 – 100,00 Default: 1	W ¹
Max	AV[106]	Limitation of operating range q_{vmax} [%]: Upper limit operating range for setpoint [%] of the nominal volume flow q_{vnom} ; see object AbsNomValue AV[233]	0 – 100.00 Default: 100	0.01 – 100 Default: 1	W ¹
Mid	AV[118]	Object visible but not fully supported	-	-	-
AbsNomValue	AV[233]	Nominal volume flow of the control device (depending on series and dimensions) in set volume flow unit; see object UnitSet MV[201]	0 – 65535	0.01 – 100 Default: 1	R
BusFailWatchdog	AV[109]	Definition of timeout (watchdog) for bus failure in seconds. 0 = Watchdog deactivated Timeout is active after switching on until the first write access to object RelSpBus AO[0] or override MO[1] takes place. The watchdog is reset with every successful write access to a setpoint or override. Relinquish_Default becomes valid if bus failure watchdog is active. The bus failure watchdog is deactivated if the setpoint value specification via object	0 – 65535 Default: 120	0 – 65535 Default: 1	W ¹



Object Name	Object Type [Instance]	Description Comment Status_Flags	Values	COV Increment	Access
		SpSource MV[122] is set to analogue (1).			
SummaryStatus	BI[0]	Error flag - collective error message; contains the objects StatusActuator MI[104] and Status Device MI[109]	Inactive_Text: OK Active_Text: Not_OK	-	R
Sens1Switch	BI[8]	Object visible, but not supported	-	-	-
InternalActivity	MI[2]	Identification of an internal activity of the controller, e.g. during a running test function or adaptation drive	1: None 2: Test 3: Adaptation	-	R
StatusActuator	MI[104]	Status of the control component: - Failure Program memory - Supply voltage too low - Mechanical blockage - Drive was moved outside the adapted operating range	1: OK 2: EEPROM Error 3: Under voltage 4: Actuator cannot move (actuator blocked)	-	R
StatusDevice	MI[109]	Bus failure monitoring status: Bus failure watchdog triggered because timeout has expired	1: OK 2: Bus watchdog triggered	-	R
Override	MO[1]	Activation of override control (overrides the setpoint specification) In bus mode, the setpoint specification is overridden via the RelSpBus AO[0] object. In analogue mode, the setpoint specification at analogue input Y is overridden by the override control via the bus.	1: None 2: Open (move to open position) 3: Close (move to closed position) 4: Min. (setpoint value q_{vmin} enable) 5: Max. (setpoint value q_{vmax} enable) 6, 7, 8: not in use: Use not authorised for this platform! 9: Stop (stop drive in active position; for diagnostic purposes only) Default: None (1)	-	C
Command	MV[2]	Triggering commands for service and test Triggers a power-up (switch-on) sequence Note: After transmission of the command, the current value of the object changes back to None (1)	1: None 2: Adaptation (adapt angle of rotation range) 3: Test (trigger test drive) 4: Reset (restart controller) Default: None (1)	-	W
Sens1Type	MV[107]	Object only partially supported	Default: None (1) To read out the analogue value at input Y via object Sens1Analog AI[8], Sens1Type must first be set to the value 2 (Active/Hybrid). All other values are not supported.	-	-
SpSource	MV[122]	Setpoint Source Selection of the signal source for setpoint value specifications: Analogue: Setpoint value specifications at connection Y via analogue signal with set characteristic 0 - 10 V or 2 - 10	1: Analogue (setpoint specification only via analogue input) 2: Bus (setpoint specification only via bus interface) Default: Setpoint via bus (2)	-	W ¹

Object Name	Object Type [Instance]	Description Comment Status_Flags	Values	COV Increment	Access
		V. Bus specifications via RelSpBus AI[0] are ignored. Bus: Setpoint value specifications via BACnet Object RelSpBus AI[0] Specifications at the analogue input (connection Y) are ignored.			
ControlMode	MV[123]	Object visible but only ClosedLoop (normal operation) permitted	Default: Normal operation (2) do not change	-	-
UnitSel	MV[201]	Setting of the volume flow unit	Volume flow unit: 1: l/s 2: m³/h 5 cfm Default: m³/h (2)	-	W¹

Note:

Access: Access right

R = Read: Read access

W = Write: Write and read access

C = Commandable with priority array: Command with prioritisation

¹Cyclical writing of labelled BACnet objects is not permitted due to storage of the setting data in the EEPROM.

Analogue interface

Analogue operation 0 - 10V DC or 2 - 10V DC (order code, operating mode V, F)

For analogue operation, the signal source (interface mode) in operating mode V,F is parameterised to analogue at the factory.

The analogue interface can be set for the signal voltage range 0 - 10V DC or 2 - 10V DC.

The assignment of volume flow setpoint or actual value to voltage signals is shown in the characteristic curves.

- The set signal voltage range applies to both setpoint value and actual value signals.
- Signal voltage range parameterised at the factory according to order code specifications
- Signal voltage range can be adjusted on site in the setting menu on the display or with a setting device

Setpoint value setting

- In operating mode V (variable operation), the setpoint value is only specified with an analogue signal at terminal Y Setpoint value specifications via Modbus registers or BACnet objects are rejected
- The selected signal voltage range 0 – 10V or 2 – 10V DC is mapped to the volume flow rate range $q_{vmin} - q_{vmax}$ assigned to
- Volume flow rate range $q_{vmin} - q_{vmax}$ is parameterised at the factory according to the order code specification
- Subsequent adjustment of q_{vmin} or q_{vmax} possible in the setting menu on the display or with the setting device
- In operating mode F (fixed value operation), no analogue signal is required at terminal Y
- The value given by q_{vmin} is controlled through the fixed volume flow rate
- Volume flow rate q_{vmin} is parameterised at the factory according to the order code specification
- Subsequent adjustment of q_{vmin} possible in the setting menu on the display or with the setting device

Actual value as feedback for monitoring or tracking control

- The actual volume flow rate measured by the controller can be captured as a voltage signal at terminal U
- The selected signal voltage range 0 – 10 V DC or 2 – 10 V DC is mapped to the volume flow rate range 0 – q_{vnom} shown
- In analogue mode (operating mode V, F), it is also possible to request operating data via the set bus interface

Override control

For special operating situations, the volume flow controller can be set to a special operating state (override control). Possible modes: Control q_{vmin} , control q_{vmax} , damper in open position (OPEN) or damper closed (CLOSED).

Override controls via signal input Y

With suitable wiring at signal input Y, the override controls can be activated according to the wiring diagrams by wiring with external switching contacts/relays (see wiring examples). OPEN and CLOSED are only available if the controller is supplied with alternating current (AC).

Override control CLOSED via command signal at signal input Y

- With signal voltage range 0 - 10 V DC and $q_{vmin} = 0$: CLOSE is activated when command signal $Y < 0.3$ V DC
- With signal voltage range 0 - 10 V DC and $q_{vmin} > 0$: no shut-off possible
- With signal voltage range 2 - 10 V DC and $q_{vmin} = 0$: CLOSE is activated when command signal $Y < 2.3$ V DC
- With signal voltage range 2 - 10 V DC and $q_{vmin} > 0$: CLOSE is activated when command signal $Y < 0.8$ V DC. Between 0.9 V and 2 V, q_{vmin} is regulated.

Override controls in analogue mode via bus interface

If the bus interface is also connected in analogue mode, override control can also be specified via it.

- For BACnet operation (add-on parts XDMB0, XSMB0) via multistate object MO[1] (OverrideControl)
- For Modbus operation (add-on parts XM0, XS0, XDMB0, XSMB0) via register 1 (override command)

Override control for diagnosis

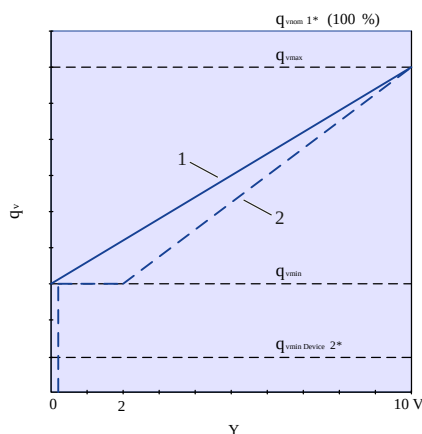
Activation via the diagnostic menu on the controller display or the service tools (setting device, PC software).

Prioritisation of different default options

Various override options are prioritised by the controller as follows:

- Highest priority: Default setting via the service plug (adjustment device, PC software), for testing purposes
- Medium priority: Settings via bus interface or the diagnostics menu on the control component
- Lowest priority: Specifications via wiring at the Y-signal input of the controller

Characteristic of the setpoint value signal



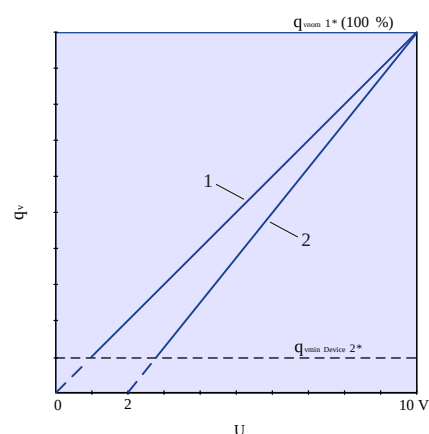
1 Signal voltage range 0 – 10 V

2 Signal voltage range 2 – 10 V

1* = q_{vnom} Nominal volume flow rate

2* = $q_{vmin \text{ unit}}$, acceptable minimum volume flow rate

Characteristic of the actual value signal



1 Signal voltage range 0 – 10 V

2 Signal voltage range 2 – 10 V

1* = q_{vnom} Nominal volume flow rate

2* = $q_{vmin \text{ unit}}$, acceptable minimum volume flow rate

Calculation of volume flow rate setpoint value at 0 – 10 V

Calculation of actual volume flow rate at 0 – 10 V

$$q_{vset} = \frac{Y}{10 V} \times (q_{vmax} - q_{vmin}) + q_{vmin}$$

$$q_{vact} = \frac{U}{10 V} \times q_{vnom}$$

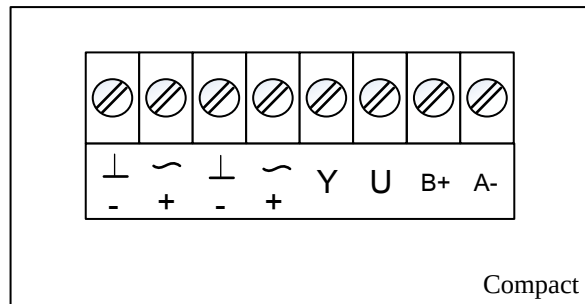
Calculation of volume flow setpoint value at 2 – 10 V

Calculation of actual volume flow value at 2 – 10 V

$$q_{vset} = \frac{Y - 2 V}{(10 V - 2 V)} \times (q_{vmax} - q_{vmin}) + q_{vmin}$$

$$q_{vact} = \frac{U - 2}{10 V - 2 V} \times q_{vnom}$$

Terminal assignment for bus communication



⊥, - = Ground, zero

~, + = Supply voltage 24 V AC/DC

Y = Analogue input

U = Actual value signal

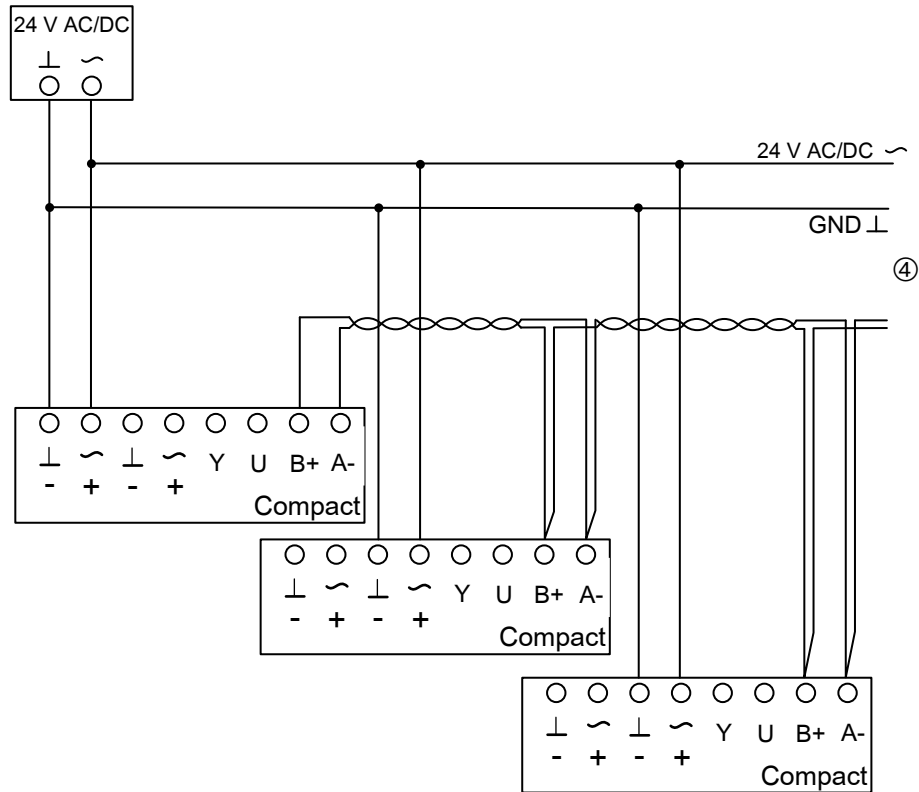
B+ = RS-485 Bus (Modbus RTU or BACnet MS/TP)

A- = RS-485 Bus (Modbus RTU or BACnet MS/TP)

Notes

- Analogue input Y is ignored in operating mode M or B (complete bus operation).
For on-site alternative configuration, see description for interface configuration
- Actual value signal in bus mode 2 - 10 V DC (signal voltage range parameterised at the factory and cannot be changed)
- Supply and bus connections are **not** galvanically isolated

Bus system connection diagram - with one supply voltage



$\perp$, $-$ = Ground, neutral

$\sim$, $+$ = Supply voltage 24 V AC/DC

B+ = RS-485-Bus (Modbus RTU or BACnet MS/TP)

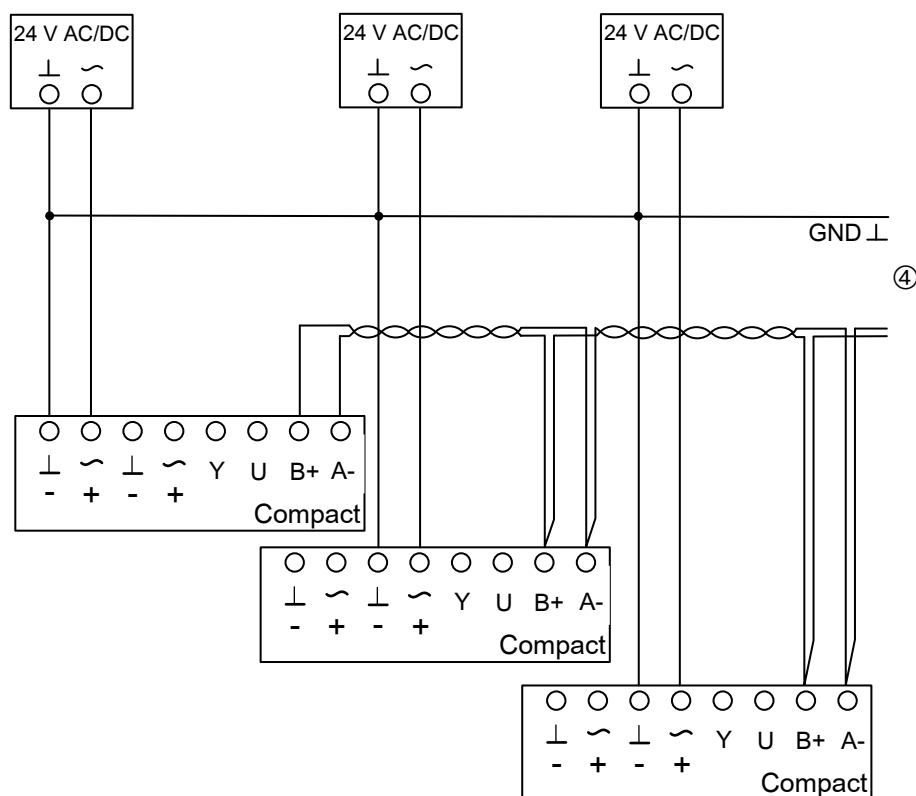
A- = RS-485-Bus (Modbus RTU or BACnet MS/TP)

4 = other network devices

Note:

- Electrical connection only with safety transformer
- Modbus and BACnet network structure and wiring only in accordance with the relevant RS485 guidelines
- Supply and bus connections are **not** galvanically isolated
- Voltage supply: Make sure that all devices on the bus have the same GND reference point
- Use bus terminating resistors at the ends of the bus line

Bus system connection diagram - with multiple supply voltages



⊥, - = Ground, neutral

~, + = Supply voltage 24 V AC/DC

B+ = RS-485-Bus (Modbus RTU or BACnet MS/TP)

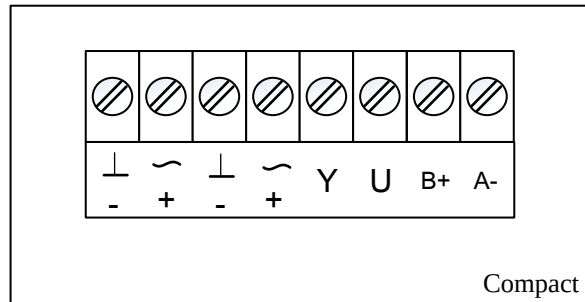
A- = RS-485-Bus (Modbus RTU or BACnet MS/TP)

4 = other network devices

Note:

- Electrical connection only with safety transformer
- Modbus and BACnet network configuration and wiring only in accordance with the relevant RS485 guidelines
- Supply and bus connections are **not** galvanically isolated
- Voltage supply: Make sure that all devices on the bus have the same GND reference point
- Use bus terminating resistors at the ends of the bus line

Terminal assignment for analogue operation 0 - 10 V DC or 2 - 10 V DC



⊥, - = Ground, neutral

~, + = Supply voltage 24 V AC/DC

Y = Setpoint signal and local override control

U = Actual value signal

B+ = RS-485-Bus (Modbus RTU or BACnet MS/TP)

A- = RS-485-Bus (Modbus RTU or BACnet MS/TP)

Notes

- Electrical connection only with safety transformer
- Setpoint and actual value signal depending on selected signal voltage range 0 - 10 V DC or 2 - 10 V DC
- Setpoint value specification via Modbus/BACnet is ignored in operating mode F or V (complete analogue operation). For on-site alternative configuration, see description for interface configuration and register 122
- Parallel operating value query via Modbus/BACnet also possible in analogue mode
- Supply and bus connections are **not** galvanically isolated
- Voltage supply: Make sure that all devices on the bus have the same GND reference point
- Use bus terminating resistors at the ends of the bus line

Analogue control and override control, voltage signal 0 - 10 V DC

When combining several override controls, the switches must be interlocked to prevent short-circuits. Diode: e.g. 1N 4007

Notes

- T, VOC, CO₂, DDC = Setpoint value default setting q_v
- D1 = Diode for override connection, e.g. 1N4007
- Electrical connection only with safety transformer
- If several override controls are combined, lock the switches against each other to avoid short circuits
- Setpoint and actual value signal 0 - 10 V DC

Switch settings**Regular operation $q_{vmin} - q_{vmax}$**

- E.g. for room temperature control
- Only switch (connection) S1 may be closed

Override control q_{vmin}

- All switches open, only supply voltage connected

Override control, damper blade OPEN

- Only switch (connection) S3 may be closed
- Only with AC voltage supply

Override control, damper blade CLOSED

- Only switch (connection) S2 may be closed

Or:

- Only switch (connection) S4 may be closed; works only with AC voltage supply

Control damper closed per setpoint value signal CLOSED

- Only switch (connection) S1 may be closed
- For other conditions, e.g. signal voltage range, q_{vmin} For setting and shut-off voltage, see description Product details Analogue operation

Analogue control and override control, voltage signal 2 - 10 V DC

When combining several override controls, the switches must be interlocked to prevent short-circuits. Diode: e.g. 1N 4007

Notes

- T, VOC, CO₂, DDC = Setpoint value default setting q_v
- D1 = Diode for override connection, e.g. 1N4007
- Electrical connection only with safety transformer
- If several override controls are combined, lock the switches against each other to avoid short circuits
- Setpoint and actual value signal 2 - 10 V DC

Switch settings**Regular operation $q_{vmin} - q_{vmax}$**

- E.g. for room temperature control
- Only switch (connection) S1 may be closed

Override control q_{vmin}

- All switches open, only supply voltage connected

Override control, damper blade OPEN

- Only switch (connection) S3 may be closed
- Only with AC voltage supply

Override control, damper blade CLOSED

- Only switch (connection) S2 may be closed

Or:

- Only switch (connection) S4 may be closed; works only with AC voltage supply

Control damper closed per setpoint value signal CLOSED

- Only switch (connection) S1 may be closed
- For other conditions, e.g. signal voltage range, q_{vmin} for setting and shut-off voltage, see description Product details Analogue operation

Nomenclature

q_{vNom} [cfm]

Nominal flow rate (100 %): The value depends on product type, nominal size and control component (attachment). Values are published on the internet and in technical leaflets and defined in the Easy Product Finder design programme. Reference value for calculating percentages (e.g. q_{vmax}). Upper limit of the setting range and maximum volume flow rate setpoint value for the VAV terminal unit.

$q_{vmin Unit}$ [cfm]

Technical minimum volume flow: The value depends on product type, nominal size and control component (attachment). Values are defined in the Easy Product Finder design programme Lower limit of the setting range and minimum volume flow rate setpoint value for the VAV terminal unit. Setpoint values below $q_{vmin unit}$ (if q_{vmin} equals zero) may result in unstable control or shut-off.

q_{vmax} [cfm]

Adjustable by others at upper limit of the operating range for the VAV terminal unit: q_{vmax} can be set to less than or equal to q_{vnom} on the terminal unit. In case of analogue control of volume flow controllers (typically used), the maximum value of the setpoint signal (10 V) is assigned to the set maximum value (q_{vmax}) (see characteristics).

q_{vmin} [cfm]

Adjustable by others at lower limit of the operating range for the VAV terminal unit: q_{vmin} should be set to less than or equal to q_{vmax} to less than $q_{vmin unit}$, as the control may become unstable or the damper blade may close. q_{vmin} may equal zero. In case of analogue control of volume flow controllers (typically used), the minimum value of the setpoint signal (0 or 2 V) is assigned to the set minimum value (q_{vmin}) (see characteristics).

q_v [cfm]

Volume flow rate

Volume flow controller

Consists of a basic unit with an attached control component.

Basic unit

Unit for controlling volume flow rates without an attached control component. The main components include the casing with sensor(s) to measure the differential pressure and the damper blade to restrict the volume flow. The basic unit is also referred to as a VAV terminal unit. Important distinguishing features: Geometry or unit shape, material and connection variants, acoustic characteristics (e.g. optional acoustic cladding or integrated silencers), range of volume flow.

Control component

Electronic unit(s) mounted on the basic unit to control the volume flow rate, or the duct pressure, or the room pressure by adjusting the damper blade position. The electronic unit essentially consists of a controller with differential pressure transmitter (integrated or external) and an integrated actuator (Easy and Compact controller).

Important distinguishing features:

- Transmitter: dynamic transmitter for clean air or static transmitter for contaminated air
- Actuator: Standard actuator, slow-running
- Interface technology: analogue interface or digital bus interface for connecting and recording signals and data

MCE

Management and control equipment (MCE)