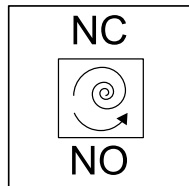


Duct pressure control -
static transducer



Safe position - spring
return



Control component BUPNF



Control component with static transducer and separate spring return actuator for VAV terminal units for duct pressure control

Universal device for use with VAV terminal units

- Controller and static differential pressure transducer in one casing
- Separate actuator with spring return for safe position
- Use in ventilation and air conditioning systems, with clean and contaminated air
- Duct pressure control up to 450 Pa, e.g. duct pressure control
- Constant value control Δ_{pmin} or variable control $\Delta_{pmin} - \Delta_{pmax}$
- Operating parameters Δ_{pmin} and Δ_{pmax} are set in the factory and saved in the controller
- Activation of override controls via external wiring
- Modification of operating parameters by PC software as well as smartphone and tablet app (TROX FlowCheck app)
- Service access for PC configuration software
- Smartphone access via NFC interface and Bluetooth
- Setpoint value settings, override controls and parameter adjustment via analogue interface or bus communication
- High data transparency through standardised bus communication Modbus RTU, BACnet MS/TP or MP bus

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General information

Application

- All-in-one control engineering device for VAV terminal units for duct pressure control up to 450 Pa in ventilation and air conditioning systems
- Static differential pressure transducer and controller electronics combined in one casing
- Separate actuator with spring return
- Safe position can be defined upon failure of the supply voltage or wire breakage in the order code: NC = damper closed, NO = damper in OPEN position
- For use with clean and contaminated air
- Variable duct pressure control by presetting setpoint values via communication interfaces or analogue signal e.g. from the central building management system
- Duct pressure control with constant value through a set operating value
- Override controls for activating Δ_{pmax} , Δ_{pmin} , shut-off, control stop, OPEN position via Modbus/BACnet register or partly with switch or relay possible
- Duct pressure actual value is available as network data point or linear voltage signal
- Damper blade position is available as a network data point
- Use TROX FlowCheck app and PC tool to configure the controller and the communication parameters

Control concept

- Duct pressure fluctuations are compensated, e.g. due to changing volume flow rate requirements
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.
- Δ_{pmin} : selected operating value of minimum duct pressure or constant value
- Δ_{pmax} : selected operating value of maximum duct pressure
- Operating parameters are specified via the order code and set in the factory

Interface

Analogue interface

- Analogue interface with adjustable signal voltage range
- Analogue signal for pressure setpoint value
- Analogue signal for actual pressure value

Digital communication interface (Bus)

- Modbus RTU, RS485
- BACnet MS/TP, RS485
- MP bus
- Data points, see bus lists

Hybrid mode

- Mixed mode of analogue and digital interface

Factory setting

- Setpoint value setting via analogue interface
- Actual value output via analogue interface and Modbus communication interface

Operating modes

Variable operation (V)

- Setpoint value setting via analogue signal, Modbus, BACnet or MP-Bus
- Work area corresponds to $\Delta_{pmin} - \Delta_{pmax}$

Constant value mode (F)

- A setpoint signal is not required, setpoint value corresponds to Δ_{pmin}

Operating parameters

- Nominal pressure $\Delta_{pNom} = 500$ Pa
- Volume flow rate range in the controller set in the factory
 Δ_{pmin} : minimum pressure, 0 – 100 % of Δ_{pNom} adjustable
 Δ_{pmax} : maximum pressure, 20 – 100 % of Δ_{pNom} adjustable
- Reference point for the output signal: Δ_{pNom}
- Δ_{pmin} and Δ_{pmax} at factory up to 90 % from Δ_{pNom} adjustable, so that adjustment behaviour is fully visible in the output signal
- Note the adjustable duct pressure range of 25 - 450 Pa

Signal voltage ranges

- 0 – 10 V DC
- 2 – 10 V DC

Parts and characteristics

- Transducer for static measurement principle
- Separate overload protection
- Plug-in terminal for supply line and controls including cover
- Socket for the actuator
- NFC and service interface
- Crank handle for manual winding of the spring return actuator
- Release button to allow for manual operation
- Indicator lights for displaying the operating mode
- Addressing key for setting user addresses in bus mode
- Controller casing prepared with 4 openings for threaded connections, 2 cable glands M16x1.5 for connecting cable in the supply package
- Duct pressure tapping set with duct pressure tapping nipple and measuring hose included in delivery
- Controller casing can be opened without tools

Construction

BUPNF with actuator NF24A-VST for:

- TVR, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK and TVJ
- TVT up to dimensions 1000 × 300 or 800 × 400

Commissioning

- Due to the factory set operating values of the duct pressure, it must always be ensured that the control units are only installed at the intended locations
- Modbus/BACnet/MP bus interface: additional commissioning steps required
- Operating parameters can be adjusted using the TROX FlowCheck app

Useful additions

- Smartphone app for Android and iOS
- Adjustment device type ZTH-EU (order code AT-VAV-B)
- Belimo PC-Tool
- NFC Bluetooth converter ZIP-BT-NF

Function

Application area duct pressure controller (string pressure controller)

The ventilation planning of a larger building often requires an extensive duct network in which individual areas of the building are supplied via side ducts of the main duct. Sufficient air supply to the various side ducts must be ensured in all (use-dependent) operating situations, so that the planned ventilation of the respective zones or rooms is guaranteed by the volume flow controllers used.

In the easiest implementation, (high) volume flow rates are reduced here exclusively by terminal volume flow controllers in the zones or rooms. In this way, high pressure differences can be reduced close to the room - but this leads to acoustic and control engineering disadvantages.

A sensible alternative is to regulate the air demand of the side duct with an additional control unit according to demand and thus to run in the duct only as much differential pressure as is really necessary to supply the volume flow controllers in this duct. This means that only small pressure differences need to be adjusted at the terminal volume flow controllers, which benefits the accuracy and acoustic performance.

The use of volume flow controllers is not possible for this purpose. In the case of series-connected volume flow controllers in a line and zone or in a room, only one controller takes over volume flow control at a time (limiting variable) - all others are in the OPEN position. In this way only a volume flow limitation is realised.

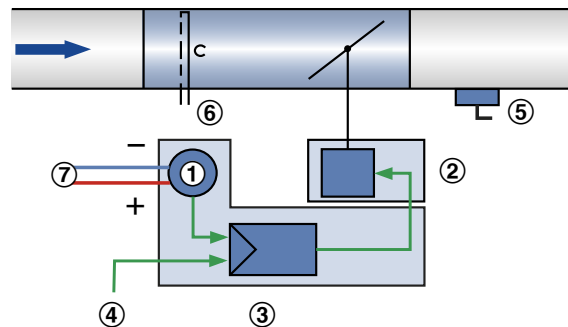
Duct pressure controllers should always be used where parallel ducts have different static pressure requirements. To ensure that

sufficient pressure is always available as required and to avoid unnecessary throttling, the static pressure in the individual air duct sections / ducts should be regulated. The duct pressure controller is set so that it regulates the duct pressure only to the same level that the volume flow controllers can operate and the outlet resistances in the zones behind them are overcome. Overall, the use of a duct pressure controller in the line and the use of a terminal volume flow controller for zone or room leads to a more stable system performance that is improved acoustically and energetically.

Functionality of a duct pressure controller

A static differential pressure transducer converts the duct pressure into a voltage signal. The differential pressure actual value is available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal differential pressure ($\Delta_{p,nom}$). The differential pressure setpoint value is either a constant value or it comes from a setpoint adjuster or from switch contacts. The controller compares the differential pressure setpoint value to the actual value and controls the actuator accordingly. Differential pressure parameters and signal voltage range are stored in the control component. Changes made by the customer can easily be made with the TROX FlowCheck App, adjustment device or a notebook. If the supply voltage is interrupted or there is a wire breakage, the spring return actuator moves to the OPEN (NO) or CLOSED (NC) position that was set at the factory via the order code.

Principle of operation Universal controller for duct pressure control: TVR, TVJ, TVT, TZ-/TA-Silenzio, TVZ, TVA, TVRK



- ① Differential pressure transducer
- ② Actuator
- ③ Differential pressure controller
- ④ Setpoint value signal or programmed fixed constant value
- ⑤ Duct pressure tapping point
- ⑥ Differential pressure sensor of the VAV terminal unit (unused,

depending on types and variant possibly not accessible or not available)

⑦ Differential pressure connection at the transducer of the control component, depending on the installation situation (supply air/exhaust air):

- One connection side for duct pressure measurement - see ⑥
- Other connection side open as reference value

Specification text

This specification text describes the general properties of the product.

Category

- Universal controller for duct pressure with safe position

Application

- Control of a constant or variable duct pressure setpoint.
- Electronic controller for connecting a reference value and tapping an actual value signal
- The actual value signal relates to the nominal pressure such that commissioning and subsequent adjustment are simplified
- Stand-alone operation or integration in central building management system.

Area of application

- Duct pressure control for ventilation and air conditioning systems in the range of 25-450 Pa (Static transducer integrated)

Actuator

- Spring return actuator for defined safe position of the damper blade in case of power failure
- Run time 120s for 90°; run time spring return <20s for 90°

Installation orientation

- Either direction

Connection

- Pluggable connection terminals; no additional terminal box required

Supply voltage

- 24 V AC/DC

Interface/Control

Analogue signal:

- 0 – 10 V DC or 2 – 10 V DC,

Bus interface:

- Modbus RTU
- BACnet MS/TP

- MP bus

Interface information

Analogue signal:

- Duct pressure setpoint and actual value

Bus interface:

- Duct pressure setpoint and actual value
- Damper blade position
- Fault status

System connections

MP-Bus for optional extensions

- Gateways for LonWorks, Modbus, BACnet, KNX e.g. Belimo UK24xxx
- Fan optimiser e.g. Belimo COU24-A-MP

Special functions

- Activation Δ_{pmin} , Δ_{pmax} , Closed, Open, Control Stop by means of external switch contacts/wiring or bus communication

Parameter settings

Parameters specific to VAV terminal unit set at the factory

- Nominal pressure factory set
- Operating values Δ_{pmin} , Δ_{pmax} factory set
- Signal characteristic factory set
- Subsequent adjustment possible with
- TROX FlowCheck app (NFC or Bluetooth with optional adapter)
- PC software

Factory settings

- Electronic controller factory set on control unit
- Factory setting, certified with sticker
- Controller in OPEN position
- Duct pressure tapping set with duct pressure tapping nipple and measuring hose included in supply package

Order code

TVR – D / 200 / D2 / BUPNF / PDS / V 0 / Pmin – Pmax Pa / NC
 | | | | | | | | | | |
 1 2 5 6 7 8 9 10 11 12

1 Type

TVR VAV terminal unit

2 Acoustic cladding

No entry: none

D with acoustic cladding

3 Material

Galvanised sheet steel (Standard construction)

P1 Powder-coated RAL 7001, silver grey

A2 Stainless steel construction

4 Duct connection
5 Nominal size [mm]

100, 125, 160, 200, 250, 315, 400

6 Accessories

No entry: none

D2 Double lip seal both sides

G2 Matching flanges for both ends

7 Attachments (control component)

BUPNF Universal controller with static transducer and separate spring return actuator for duct pressure control

8 Equipment function/Installation location

PDE Duct pressure control, extract air

PDS Duct pressure control, supply air

9 Operating mode

F Constant value (a setpoint value)

V variable (setpoint value range)

10 Signal voltage range

0 0 – 10 V DC

2 2 – 10 V DC

11 Operating values for factory setting

Duct pressure [Pa]

Δ_{pconst} (only with operating mode F)

Δ_{pmin} (only with operating mode V)

Δ_{pmax} (only with operating mode V)

12 Damper blade position

Spring return only

NO power off to OPEN

NC power off to CLOSE

Order example: TVR/100/D2/BUPNF/PDS/V0/50-350 Pa/NC

Acoustic cladding

None

Material

galvanised sheet steel

Nominal size

100

Accessories

Double lip seal both sides

Attachment

VARYCONTROL Universal controller duct pressure, static transducer and separate spring return actuator

Equipment function/installation location

Duct pressure control, supply air

Operating mode

variable operation – signal voltage range 0 –10 V DC

Operating values

$\Delta_{pmin} = 50$ Pa

$\Delta_{pmax} = 350$ Pa

Damper blade position

NC Power off to CLOSE

Order example: TVJ-D/600x300/BUPNF/PDE/F2/450 Pa/NO

Acoustic cladding

with

Material

galvanised sheet steel

Nominal size

600 × 300

Accessories

Double lip seal both sides

Attachment

VARYCONTROL Universal controller duct pressure, static transducer and separate spring return actuator

Equipment function/installation location

Duct pressure control, extract air

Operating mode

Constant value mode, signal voltage range 2 – 10 V DC

Operating values

450 Pa

Damper blade position

NO Power off to OPEN

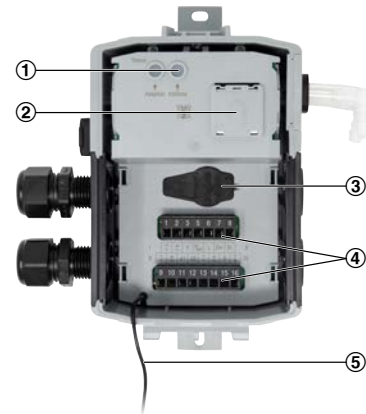
Variants

Universal controller, Type VRU-M1-M/B TR



- ① Adaptation key
- ② Actuator connection socket
- ③ NFC interface
- ④ Dummy cover (not in use)
- ⑤ Cable glands (separate supply and control)
- ⑥ Fixing holes
- ⑦ Differential pressure connection

Universal controller, type VRU-***-M/B TR (terminal cover opened)



- ① Addressing key including yellow status LED
- ② Magnetic holder for ZIP-BT-NFC
- ③ Service socket
- ④ Pluggable terminal strips
- ⑤ Cover fixing (safety cable)

Actuator with spring return NF24A-VST TR



- ① Axis socket
- ② Actuator complete
- ③ Position lock spring return (e.g. after manual winding with crank handle)
- ④ Socket for the crank handle
- ⑤ Connecting cable
- ⑥ Plug connection to the controller
- ⑦ Function not existing
- ⑧ Mechanical end stop for angle of rotation

Technical data

Universal controller for VAV terminal units

	Controller		Actuator		
Order code detail	Part number	Type	Part number	Type	VAV terminal units
BUPNF	A00000073652	VRU-M1-M/B TR	A00000073648	NF24A-VST TR	①

①

TVR, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK

TVJ, TVT up to dimensions of 1000 × 300 or 800 × 400

Universal controller Type VRU-M1-M/B TR

Universal controller Type VRU-M1-M/B TR

Measurement principle	static transducer type, independent of position
Nominal pressure	500 Pa
pressure control range	25 – 450 Pa
Nominal voltage	AC/DC 24 V
Nominal voltage frequency	50/60 Hz
Functional range	AC 19.2 – 28.8 V/DC 21.6 – 28.8 V
Power requirement (operation/resting state)	1.5 W
Power requirement rating	2 VA plus connected VST drive
Power consumption rating note	I_{max} 20 A @ 5 ms
Actuator connection	AC/DC supply from controller, PP link VST drive
bus connection	Modbus RTU* , BACnet MS/TP, MP-Bus
Adjustable communication parameters Modbus RTU	Baud rate: 9600, 19200, 38400* , 76800, 115200; Address: 1* , 2.3 – 247; Parity: 1-8-N-2* , 1-8-N-1, 1-8-E-1, 1-8-O-1; Number of nodes: max. 32 (without repeater) Terminal resistor: 120 Ω ;
Adjustable communication parameters BACnet MS/TP	Baud rate: 9600, 19200, 38400* , 76800, 115200; Address: 1* , 2.3 – 127; Number of nodes: max. 32 (without repeater) Terminal resistor: 120 Ω ;
Addressing	Required on-site: by Smartphone app

Setpoint value signal input (analogue optional)	0 – 10 V, 2 – 10 V Input resistance 100 k Ω
IEC/EN protection class	III (protective extra-low voltage)
Protection level	IP 42
EMC	CE according to 2014/30/EU

* Factory setting.

Actuator with spring return NF24A-VST TR

Actuator with spring return NF24A-VST TR

Supply voltage	from the controller
Power requirement (operation)	5 W
Power requirement rating	8 VA
Self-consumption (idle state)	2.5 W
Torque	10 Nm
Running time for 90°	120 s/90°
Run time of emergency setting function	<20 s/90°
Setpoint value signal input	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP54
EMC	EMC to 2014/30/EU
Weight	2.3 kg
Manual adjustment	using crank handle and position lock

Commissioning

- On-site adjusting is not required
- Due to the operating values set at the factory, it must always be ensured that the control units are only installed at the intended locations
- Install control unit in the duct range to be controlled
- Set up pressure tap for duct pressure
 - For supply air:
 - + Connect the connection side of the controller to the duct being controlled
 - Leave the connection of the controller open
 - For extract air:
 - Connect the connection side of the controller to the duct being controlled
 - + Leave the connection of the controller open
- The duct must always be connection on the side remote from the fan.
 - Note the duct pressure control range stipulated in the technical data
 - Establish electrical wiring connection
 - The controller is then ready to use
- Only briefly remove the protective cap of the control component during wiring
- For operation with the Modbus/BACnet/MP-Bus interface: additional commissioning steps such as user addressing and setting of the communication parameters are required
- For operation with the MP-Bus interface in existing systems as a replacement for the VRP-M controller: activation of the VRP-M compatibility mode is required

Functional scope of service tools

Function/parameterisation	Smartphone app	PC-Tool	ZTH-EU
Setting Δp_{\min} , Δp_{\max}	R, W	R, W	R, W
Mode, control signals 0 – 10 V, 2 – 10 V DC	R, W	R, W	-
Setpoint value setting analogue, Bus	R, W	-	-
Modbus, BACnet	R, W	-	-
MP bus	R, W	R, W	-
Setting bus parameters	R, W	-	-
carry out override controls	No	No	No
Trend display	Yes	Yes	-

Communication interface Modbus RTU

Number	Register Address	Description	Range Enumeration	Unit	Scaling	Access
1	0	Setpoint value between $q_{vmin}/\Delta p_{min}$ (reg. address 105) and $q_{vmax}/\Delta p_{max}$ (reg. address 106). (*1) (*2) (*3) (*4)	0 – 10,000 Factory setting: 0	%	0.01	[R / W]
2	1	Override control Overwrites the setpoint value with override control.	0: None 1: OPEN 2: CLOSED 3: $q_{vmin}/\Delta p_{min}$ 5: $q_{vmax}/\Delta p_{max}$ Factory setting: None	–	–	WR
3	2	Command triggering Triggering of functions for service and test purposes. Command ends automatically with 0.	0: None 1: Adapting 3: Synchronisation Factory setting: None	–	–	WR
4	3	Type of actuator (*5)	0: Actuator not connected/not known 1: Actuator Air/Water with/without safety function 2: Volume flow controller VAV/EPIV 3: Fire damper 4: Energy Valve 5: 6way EPIV	–	–	RD
5	4	Current damper blade position acc. to mechanical limits. (*5)	0 – 10,000	%	0.01	RD
6	5	Blade angle acc. to angle range. (*5)	0 – 9,600	°	0.01	RD
7	6	Relative volume flow rate related to q_{vnom} (reg. address 110). (*6)	0 – 15,000	%	0.01	RD
8	7	Absolute volume flow rate (*6)	0 – q_{vnom}	m ³ /h	1	RD
9	8	Sensor value (voltage, resistance, switch) Value dependent on the setting of the sensor type (reg. address 107).	0 – 65,535	mV, Ω, 0/1,	0.1	RD
10	9	–	–	–	–	[–]
11	10	Absolute volume flow rate in selected volume flow unit acc. to (reg. address 117). (Low word) < 16 of 32 bit. (*6)	0 – 500,000,000	UnitSel	0.001	RD
12	11	Absolute volume flow rate in selected volume flow unit acc. to (reg. address 117).	0 – 500,000,000	UnitSel	0.001	RD

Number	Register Address	Description	Range Enumeration	Unit	Scaling	Access
		(High word) > 16 of 32 bit. (*6)				
13	12	Analogue setpoint value Shows the setpoint value in % with analogue control input signal. Active if reg. address 118 = 0 (analogue)	0 – 10,000	%	0.01	RD
51	50	Relative differential pressure According to application case as per (reg. address 128).	0 – 20,000	%	0.01	RD
52	51	Absolute differential pressure	-1,000 – 15,000	[Pa]	0.1	RD
53	52	–	–	–	–	[-]
54	53	Absolute differential pressure in selected unit (reg. address 145) (Low word) < 16 of 32 bit.	-10,000,000 – 100,000,000	UnitSel	0.001	RD
55	54	Absolute differential pressure in selected unit as per (reg. address 145) (High word) > 16 of 32 bit.	-10,000,000 – 100,000,000	UnitSel	0.001	RD
100	99	Bus terminal resistor Indicates whether the terminal resistor (120 Ω) is active or deactivated. Can only be set using service tools.	0: Not active 1: active Factory setting: Not active	–	–	RD
101	100	Serial number, part 1 Example: 00839-31324-064-008. 1 st part: 00839 2 st part: 31324 3 st part: 008	–	–	–	RD
102	101	Serial number, part 2	–	–	–	RD
103	102	Serial number, part 3	–	–	–	RD
104	103	Firmware version Example: 101, version 01.01.	–	–	–	RD
105	104	Malfunctions and service information – automatic reset if status has ceased.	Bit 0: – Bit 1: Mechanical travel too high Bit2: Actuator cannot be moved (e.g. mechanical overload) Bit 3: – Bit 4: Error of dP sensor Bit 5: Return air flow detected Bit 6: Volume flow rate too low Bit 7: Flow rate in closed position Bit 8: Internal activity (e.g. test run, adaptation) Bit9: Gear release active Bit10: Bus monitoring triggered Bit 11: Actuator not suitable for application Bit 12: Pressure sensor incorrectly connected Bit 13: Pressure sensor not reached	–	–	RD

Number	Register Address	Description	Range Enumeration	Unit	Scaling	Access
			Bit 14: Error in dP sensor outside of measuring range			
106	105	Setting work areas $q_{vmin}/\Delta p_{min}$ Requirements: $q_{vmin}/\Delta p_{min} < q_{vmax}/\Delta p_{max}$ Vmax in the area 0 – 100 % of $q_{vnom}/\Delta p_{nominal}$	0 – $q_{vmax}/\Delta p_{max}$	%	0.01	WR
107	106	Setting work areas $q_{vmax}/\Delta p_{max}$ Requirements: $q_{vmax}/\Delta p_{max} < q_{vmin}/\Delta p_{min}$ Vmax in the area 20 – 100 % of $q_{vnom}/\Delta p_{nominal}$	2,000–10,000	%	0.01	WR
108	107	Type of sensor If reg. address 118 = 0 (analogue), then reg. address 107 = 1 (active) for mV.	0: None 1: active 2: Passive 3: – 4: Switch Factory setting: None	–	–	WR
109	108	Bus timeout monitoring If there is a bus timeout, the actuator moves into a position specified here. The position is mech. limited, $q_{vmin}/\Delta p_{min}$ and $q_{vmax}/\Delta p_{max}$ have no impact. Release if no change takes place in reg. address 1 or reg. address 2 in the specified time for reg. address 109. Display of release in reg. address 104. In hybrid mode, bus timeout activation is deactivated. Bus timeout time: acc. to reg. address 109	0 – 10,000 Factory setting: 0	%	0.01	WR
110	109	Time until release bus timeout monitoring If reg. 108 \neq 0, then the initial automatic status is reg. 108 = 120 s.	0 – 3,600 0: inactive Factory setting: deactivated	s	1	WR
113	112	Nominal volume flow rate in selected volume flow unit acc. (reg. address 117) (Low word) < 16 of 32 bit.	0 – 60,000,000	UnitSel	0.001	RD
114	113	Nominal volume flow rate in selected volume flow unit acc. (reg. address 117) (High word) > 16 of 32 bit.	0 – 60,000,000	UnitSel	0.001	RD
115	114	–	–	–	–	[–]

Number	Register Address	Description	Range Enumeration	Unit	Scaling	Access
116	115	–	–	–	–	[–]
117	116	Control mode	0: Position control (open loop) 1: Volume flow control Factory setting: Volume flow control	–	–	[R]
118	117	Unit selection – Unit selection for reg. address 11 and 12.	0: – 1: m ³ /h 2: l/s 3: – 4: – 5: – 6: cfm	–	–	WR
119	118	Setpoint value setting If reg. address 118 = 0 (analogue), then reg. address 12 = active. If reg. address 118 = 1 (Bus), then reg. address 1 = active.	0: Analogue (0 – 10 V, 2 – 10 V) 1: Bus (Modbus, BACnet, MP-Bus) Factory setting: Analogue	–	–	WR
120	119	Pressure operating mode Only for VRU-M1R-M/B TR.	0: Negative pressure 1: Positive pressure	–	–	WR
121	120	–	–	–	–	[–]
122	121	–	–	–	–	[–]
123	122	–	–	–	–	[–]
124	123	Room pressure cascade release Only available if reg. address 124 = 0 (volume flow control) or 2 (room pressure control).	0: inactive 1: active 2: active fast (only for VRU-M1R-M/B TR)	–	–	RD
125	124	Applications	0: Volume flow control 1: Pressure control 2: Room pressure control 3: Flow measurement	–	–	RD
126	125	Unit height	0 – 3,000 Factory setting: 0	m	1	WR
127	126	Nominal differential pressure in the selected unit as per (reg. address 145) More info in (reg. address 128)	D3: 0 – 50000 M1: 0 – 60000 M1R: 0 – 60000	UnitSel	–	RD
128	127	–	–	–	–	[–]
129	128	Nominal differential pressure in Pa If reg. address 124 = 0 (volume flow control), then reg. address 110 as q_{vnom} . If reg. address 124 = 1 (differential pressure control) or 2 (room pressure control), then the maximum is defined by the diff. pressure.	D3: 0 – 500 M1: 0 – 600 M1R: 0 – 750	Pa	0.1	RD

Number	Register Address	Description	Range Enumeration	Unit	Scaling	Access
146	145	Selection of the pressure unit The selected unit is displayed in (reg. address 126).	0: pascal 1: – 2: water column Factory setting: pascal	–	–	[–]
147	146	Selection of temperature unit	0: K 1: °C 2: °F Factory setting: °C (2)	–	–	WR

RD = Register can only be read

WR = Register can be read and written

(*1) If reg. address 118 = 1 (Bus), then reg. address 0 = active.

(*2) If reg. address 124 = 0 (volume flow control), then reg. address 0 = volume flow rate.

(*3) If reg. address 124 = 0 (volume flow control) and reg. address 116 = 0 (position control), then reg. address = damper blade position.

(*4) If reg. address 124 = 1 (differential pressure control) or 2 (room pressure control), then reg. address = pressure.

(*5) If reg. address 124 = 2 (room pressure control) or 3 (volume flow rate measurement), then reg. address = deactivated 65.535.

(*6) If reg. address 124 = 1 (differential pressure control) or 2 (room pressure control), then reg. address = deactivated 65.535.

Protocol Implementation Conformance Statement – PICS (general information)

Date	2020-06-11
Vendor name	TROX GmbH
Vendor ID	329
Product name	VRU-D3-BAC, VRU-M1-BAC, VRU-M1R-BAC
Product model number	VRU – BAC
Application software version	01.02.0001
Firmware revision	10.02.0000
BACnet Protocol Revision	12
Product description	Controller for VAV/CAV and pressure applications
BACnet Standard Device Profile	BACnet Application Specific Controller (B-ASC)
BACnet Interoperability Building Blocks Supported	Data Sharing – ReadProperty-B (DS-RP-B) Data Sharing – ReadPropertyMultiple-B (DS-RPM-B) Data Sharing – WriteProperty-B (DS-WP-B) Data Sharing – WritePropertyMultiple-B (DS-WPM-B) Data Sharing – COV-B (DS-COV-B) Device Management – DynamicDeviceBinding-B (DM-DDB-B) Device Management – DynamicObjectBinding-B (DM-DOB-B) Device Management – DeviceCommunicationControl-B (DM-DCC-B)
Segmentation Capability	No
Data Link Layer Options	MS/TP master, baud rates: 9600, 19200, 38400, 76800, 115200
Device Address Binding	No static device binding supported
Networking Options	None
Character Sets Supported	ISO 10646 (UTF-8)
Gateway Options	None
Network Security Options	Non-secure Device

Object processing

Object type	Optional properties	Writeable properties
Analogue input [AI]	Description COV Increment	COV Increment
Analogue Output [AO]	Description COV Increment	Present Value COV Increment Relinquish Default
Analogue Value [AV]	Description COV Increment	Present Value COV Increment
Binary Input [BI]	Description Active Text Inactive Text	
Device	Description Location Active COV Subscriptions Max Master Max Info Frames Profile Name	Object identifier Object Name Location Description APDU Timeout (1000 – 60000) Number Of APDU Retries (0 – 10) Max Master (1 – 127) Max Info Frames (1 – 255)
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 (if marked)

Processing of services

- The device does not support the services "Create object" and "Delete object"
- The specified maximum length of the writable character strings is based on single-byte characters
 1. Object name 32 characters
 2. Location 64 characters
 3. Description 64 characters
- The device supports the DeviceCommunicationControl Services, no password necessary
- A maximum of 6 active COV subscriptions with a run time of 1 – 28800 s (maximum of 8 h) is supported

Communication interface BACnet MS/TP

Object Name	Object Type	Description	Values	COV Increment	Access
Device	Device [Inst.No]		0 – 4,194,302 Factory setting: 1	–	WR
RelPos	AI[1]	Damper blade position in % <u>Status flags:</u> (*1), (*2)	0 – 100	0.01 – 100 Factory setting: 1	RD
AbsPos	AI[2]	Absolute position in ° Angular position corresponding to the entire rotation range. <u>Status flags:</u> (*1), (*2)	0 – max. angle	0.01 – 90 Factory setting: 1	RD
SpAnalogue	AI[6]	Analogue setpoint value in % Shows the analogue setpoint value according to the selected application flow rate, pressure, damper blade position as per ApplicationSel MV[2]. If setpoint value setting in SpSource MV[122] = 1 (analogue), then SpAnalog AI[6] = active. The analogue setpoint value is limited by Min AV[97] and Max AV[98]. <u>Status flags:</u> (*1), (*3)	0 – 100	0.01 – 100 Factory setting: 1	RD
RelDeltaP	AI[9]	Relative differential pressure in % with respect to DeltaPnom_Pa AV[122]	0 – 150	0.01 – 150 Factory setting: 1	RD
RelFlow	AI[10]	Relative volume flow rate in % related to Vnom_m3h AV[112] <u>Status flags:</u> (*4)	0 – 150	0.01 – 150 Factory setting: 1	RD
AbsFlow_m3h	AI[12]	Absolute volume flow rate in m³/h <u>Status flags:</u> (*4)	0 – 60,000	1 – 60,000 Factory setting: 10	RD
DeltaP_UnitSel	AI[18]	Absolute differential pressure in selected unit as per UnitSelPressure MV[127]	-10,000 – 100,000	0.001 – 100,000 Factory setting: 1	RD
AbsFlow_UnitSel	AI[19]	Absolute volume flow rate in selected unit as per UnitSelAirFlow MV[121] <u>Status flags:</u> (*4)	0 – 500,000	0.01 – 500,000 Factory setting: 1	RD
Sens1Analogue	AI[20]	Sensor 1 as analogue value If Sensor1Type MV[220] = 2 (active), then display = analogue value in 0 – 10 V. If Sensor1Type MV[220] = 3 (passive), then display = resistance value. If RmPCascade MV[10] = 2 (enabled) or 3 (quickly enabled), then the sensor input is not available. <u>Status flags:</u> (*5)	0 – 65535	0.01 – 1000 Factory setting: 1	RD

Object Name	Object Type	Description	Values	COV Increment	Access
DeltaP_Pa	AI[29]	Absolute differential pressure in Pa	0 – 600	0.01 – 600 Factory setting: 10	RD
SpRel	AO[1]	Relative setpoint value in % The rel. setpoint value depends on the application (flow rate/pressure/damper blade position). If SpSource MV[122] = 2 (bus), then SpRel AO[1] = active. The analogue setpoint value is limited by Min AV[97] and Max AV[98]. <u>Status flags: (*1), (*2)</u>	0 – 100 Factory setting: 0	0.01 – 100 Factory setting: 1	C
Min	AV[97]	Minimum setpoint value in % (q_{vmin}/P_{min}) Requirement: $q_{vmin}/\Delta p_{min} < q_{vmax}/\Delta p_{max}$ $q_{vmin}/\Delta p_{min}$ in the range 0 - 100 & $q_{vnom}/\Delta p_{nom}$	$0 - q_{vmax}/\Delta p_{max}$	0.01 – 100 Factory setting: 1	WR
Max	AV[98]	Maximum setpoint value in % (q_{vmax}/P_{max}) Requirement: $q_{vmax}/\Delta p_{max} > q_{vmin}/\Delta p_{min}$ q_{vmax}/P_{max} in the range 20 - 100 % of q_{vnom}/P_{nom}	$q_{vmin}/\Delta p - 100$	0.01 – 100 Factory setting: 1	WR
Vnom_m3h	AV[112]	Nominal volume flow rate in m ³ /h	0 – 50,000	0.01 – 50,000 Factory setting: 1	RD
Vnom_UnitSel	AV[119]	Nominal volume flow rate in selected unit as per UnitSel MV[121]	0 – 250,000	0.01 – 1,000: Factory setting: 1	RD
SystemAltitude	AV[120]	System altitude in metres above sea level	0 – 3,000	1 – 3,000 Factory setting: 10	WR
DeltaPnom_Pa	AV[122]	Nominal differential pressure in Pa The nominal differential pressure depends on the selected pressure sensor (D3, M1, M1R). Depending on the selected application, the nominal differential pressure serves as dp@Vnom or as the maximum pressure limitation If ApplicationSel MV[2] = 1 (flow control), then display = nominal differential pressure If ApplicationSel MV[2] = 2 (pressure control) or 3 (room pressure control), then display = max. pressure limitation	D3: 0 – 500 M1: 0 – 600 M1R: 0 – 75	1 – 600 Factory setting: 1	RD
DeltaPnom_UnitSel	AV[129]	Nominal differential pressure in selected unit as per UnitSelPressure MV[127] More infos: see AV[122].		0.01 – 1000 Factory setting: 1	RD

Object Name	Object Type	Description	Values	COV Increment	Access
BusWatchdog	AV[130]	Time until the release bus timeout monitoring in s If BusWatchdog AV[130] ≠ 0, then monitoring of SpRel AO[1] and override MO[1] for change. If changes in SpRel AO[1] and override MO[1], then reset the bus timeout monitoring. If SpSource MV[122] = 1 (analogue), then BusWatchdog AV[130] only takes account of override MO[1].	0 – 3600 s Factory setting: 0 (bus timeout monitoring deactivated)	0.01 – 1000 Factory setting: 1	WR
Sens1Switch	BI[20]	Switch status of the switch at the sensor input If SenType MV[220] = 5 (switch), then Sens1Switch BI[20] = active. <u>Status flags: (*6)</u>	0: Inactive 1: Active	–	RD
BusTermination	BI[99]	Terminal resistor Shows whether the terminal resistor (120 Ω) has been activated via the service tools.	0: Deactivated 1: Activated	–	RD
SummaryStatus	BI[101]	Condensed status Groups together the status of the objects: "StatusSensor" MI[103] "StatusFlow" MI[104] "StatusActuator" MI[106] "StatusPressure" MI[109] "StatusDevice" MI[110]	Not equal to 1: OK 1: Not OK	–	RD
RmPCasacade	MV [10]	Room pressure cascade If RmPCascade MV[10] = 2 (active) or 3 (active fast), then sensor1 is the input for the room cascade (0 – 10 V). If ApplicationSel MV[2] = 1 (volume flow control) or 3 (room pressure control), then RmPCascade MV [10] = active. <u>Status flags: (*7)</u>	1: Inactive 2: Active 3: Active fast (for M1R only)	–	RD
InternalActivity	MI[100]	Internal status	1: None 2: – 3: Adaption 4: Synchronisation	–	RD
StatusSensor	MI[103]	Status of the differential pressure sensor If status end = automatic reset	1: OK 2: dP sensor not OK 3: dP sensor outside of measuring range 4: dP sensor incorrectly connected	–	RD
StatusFlow	MI[104]	Volume flow rate status	1: OK	–	RD

Object Name	Object Type	Description	Values	COV Increment	Access
		If there is no volume flow rate within 600 s, then StatusFlow MI[104] = 3.	2: – 3: No airflow detected		
StatusActuator	MI[106]	Status of the actuator <u>Status flags:</u> (*2)	1: OK 2: Actuator cannot be moved 3: Gear release active 4: Mechanical travel exceeded 5: Actuator not suitable for application	–	RD
StatusPressure	MI[109]	Differential pressure status If the differential pressure is not reached within 180 s, then StatusPressure MI[109] = 3.	1: OK 2: – 3: Pressure not reached	–	RD
StatusDevice	MI[110]	Status of the device during bus monitoring According to BusWatchdog AV[130].	1: OK 2: Bus timeout monitoring activated	–	RD
Override	MO[1]	Override control Overwrites the setpoint value with a forced command. <u>Status flags:</u> (*8)	1: None 2: OPEN 3: CLOSED 4: $q_{vmin}/\Delta p_{min}$ 5: – 6: $q_{vmax}/\Delta p_{max}$ Factory setting: None (1)	–	C
ApplicationSel	MV[2]	Display of application VRU-D3-M/B TR, VRU-M1-M/B TR - Flow control - Pressure control - Flow measurement VRU-M1R-M/B TR - Room pressure control	1: Flow control 2: Pressure control 3: Room pressure control 4: Flow measurement	–	RD
ControlMode	MV[100]	Control mode <u>Status flags:</u> (*9)	1: PosCtrl 2: FlowCtrl Factory setting: FlowCtrl	–	RD
OperationMode	MV[102]	Operating mode Only relevant for VRU-M1R-BAC. <u>Status flags:</u> (*10)	1: Negative pressure 2: Positive pressure	–	WR
Command	MV[120]	Release test functions <u>Status flags:</u> (*2)	1: None 2: Adaption 3: – 4: Reset Factory setting: None	–	WR
UnitSelAirFlow	MV[121]	Selection of the volume flow unit The selected unit is indicated in AI[19] and AV[104]	1: – 2: m ³ /h 3: l/s 4: – 5: – 6: – 7: cfm	–	WR

Object Name	Object Type	Description	Values	COV Increment	Access
SpSource	MV[122]	Selection of the setpoint value setting If SpSource MV[122] = 1 (analogue), then SpAnalog AI[6] = active. If SpSource MV[122] = 2 (bus), then SpRel AO [1] = active.	1: Analogue (0 – 10 V, 2 – 10 V) 2: Bus (Modbus, BACnet, MP-Bus) Factory setting: Analogue	–	WR
UnitSelPressure	MV[127]	Selection of the pressure unit The selected unit is indicated in DeltaP_UnitSel AI[18] and DeltaPnom_UnitSel AV[129].	1: Pascal 3: Water column Factory setting: pascal	–	WR
UnitSelTemp	MV[128]	Selection of temperature unit The selected unit is located in AI[20].	1: K 2: °C 3: °F Factory setting: °C (2)	–	W
Sens1Type	MV[220]	Definition of the sensor type If Sens1Type MV[220] = 2 (active) or 3 (passive), then Sens1Analog AI[20] active. If Sens1Type MV [220] = 5 (switch), then Sens1Schalter BI[20] active.	1: None 2: Active sensor (in hybrid mode) 3: Passive sensor 4: – 5: Switch Factory setting: None	–	WR

RD = Register can only be read

WR = Register can be read and written

C = Commendable with priority array.

Status flags:

(*1) If the gear latch is pressed, then Overridden = 1.

(*2) If ApplicationSel MV[2] = 3 (room pressure control) or 4 (flow measurement), then Out of Service = 1.

(*3) If SpSource MV[122] = 2 (Bus), then Out of Service = 1.

(*4) If ApplicationSel MV[2] = 2 (pressure control) or 3 (room pressure control), then Out of Service = 1.

(*5) If Sens1Type MV[220] = 1 (none), then Out of Service = 1.

(*6) If Sens1Type MV[220] ≠ 5, then Out of Service = 1.

(*7) If ApplicationSel MV[2] = 2 (pressure control) or 4 (flow measurement), then Out of Service = 1.

(*8) If ApplicationSel MV[2] = 4 (flow measurement), then Out of Service = 1.

(*9) If ApplicationSel MV[2] ≠ 1 (volume flow control), then Out of Service = 1.

(*10) If ApplicationSel MV[2] ≠ 3 (room pressure control), then Out of Service = 1.

Product details

Analogue interface 0 – 10 V DC or 2 – 10 V DC

In the delivered state, the setpoint value must be set via the analogue interface. If the setpoint value is to be set via a digital communication interface, this can be changed at any time to Modbus, BACnet or MP Bus using the TROX FlowCheck app. The analogue interface can be set for the signal voltage range of 0 – 10 V DC or 2 – 10 V DC by means of the TROX FlowCheck app. The assignment of the setpoint value or actual value of the duct pressure to the voltage signal is shown in the characteristic line displays.

Setpoint value setting

Variable operation

- In the variable operating mode, setpoint values are set using an analogue signal at terminal 3. Setpoint value settings via the respective bus system are rejected.
- The selected signal voltage range 0 – 10 V or 2 – 10 V DC is assigned to the set pressure range Δp_{\min} – Δp_{\max} a change packet
- Pressure range Δp_{\min} – Δp_{\max} preset at the factory as per the order key data
- Subsequent adjustment of Δp_{\min} or Δp_{\max} is possible using an adjustment device, the TROX FlowCheck app or PC-Tool

Constant value mode

- In the constant value operating mode, no analogue signal is required at terminal 3
- The room pressure constant value set by Δp_{\min} is controlled
- Pressure value Δp_{\min} preset at the factory as per the order key data
- Subsequent adjustment of Δp_{\min} is possible using an adjustment device, the TROX FlowCheck app or PC tool

Override control

For special operating situations, the duct pressure controller can be put in a special operating mode (override control). The following are possible: control Δp_{\min} , control Δp_{\max} , control valve open (OPEN), control valve closed (CLOSED) or control stop.

Override controls via signal input Y or override control inputs Z1, Z2

By means of a suitable connection of the inputs Y, Z1, Z2, the override controls can be activated as per the connection diagrams through connection with external switching contacts/relays (see wiring examples).

Override control CLOSED via control signal on control signal Y

With signal voltage range 0 - 10 V DC and setting value $\Delta p_{\min} = 0$

- Damper CLOSED = $Y < 0.45$ V DC
- Damper OPEN = $Y > 0.55$ V DC

For signal voltage range 0 - 10 V DC and $\Delta p_{\min} > 0$

- If no override control CLOSED is possible via the control signal. The control process takes place over the entire signal voltage range

With signal voltage range 2 - 10 V DC and setting value $\Delta p_{\min} = 0$

- Damper CLOSED = $Y < 2.36$ V DC
- Damper OPEN = $Y > 2.44$ V DC

With signal voltage range 2 - 10 V DC and setting value $\Delta p_{\min} > 0$

- Damper CLOSED = $Y < 0.3$ V DC
- Damper OPEN = $Y > 0.3$ V DC

Actual value as feedback for monitoring or tracking control

- The actual pressure measured by the controller can be picked up at terminal 5 as a voltage signal
- The selected signal voltage range 0 – 10 V DC or 2 – 10 V DC is mapped onto the pressure range 0 – $\Delta p_{\text{nominal}}$ Pa
- Reference point $\Delta p_{\text{nominal}} = 500$ Pa
- In analogue mode, the operating data can be picked up from the Modbus interface (hybrid mode) in parallel.

Override controls in analogue mode via the Modbus or BACnet interface

If the bus interface is additionally connected in analogue mode, an override control can also be set via Modbus register 1 or BACnet object MO[1].

Override control for diagnostic purposes

Activation via the TROX FlowCheck app

Prioritisation of various setting options

- Settings for override controls via analogue have priority over Modbus/BACnet settings
- Highest priority: setting via an analogue override control
- Medium priority: settings via the service connector (adjustment device, PC software) for test purposes
- Lowest priority: setting via Modbus/BACnet/MP-Bus

Analogue hybrid mode

- Even if the analogue setpoint value is set via terminal 3 and the analogue feedback is available on terminal 5, a feedback via BACnet MS/TP or Modbus RTU is still possible
- Modbus RTU is preset at the factory as the bus interface; this setting can be changed using the TROX FlowCheck app or PC-Tool
- Various operating parameters as per the bus interface list can be called up via Modbus RTU or BACnet MS/TP
- Override controls Δp_{\min} , Δp_{\max} , control valve open (OPEN) or control valve closed (CLOSED) via bus interface are possible

Digital communication interface

To output a setpoint value setting via the bus interface, an on-site change using the TROX FlowCheck app is necessary. The bus interface can be set to Modbus, BACnet or MP-Bus. For a smooth exchange of data in the on-site bus network, the communication parameters and the user address for the bus interface are required. The communication parameters of the bus systems (address, baud rate, etc.) can be set using the TROX FlowCheck app. The interface offers standardised bus register/object accesses to the available data points.

Setpoint value setting

- In the operating mode Modbus RTU (factory setting), the setpoint value setting is set by means of the pressure setpoint [%] in the Modbus register 0
- In the operating mode BACnet MS/TP, the setpoint value setting is set by means of the pressure setpoint [%] in BACnet object AI[1]
- The transferred percentage pertains to the pressure range specified by $\Delta p_{\min} - \Delta p_{\max}$
- Pressure ranges $\Delta p_{\min} - \Delta p_{\max}$ preset at the factory as per the order key data
- Subsequent adjustment of Δp_{\min} or Δp_{\max} is possible using an adjustment device, the TROX FlowCheck app, PC-Tool or via the Modbus/BACnet interface

Actual value as feedback for monitoring or tracking control

- The actual values can be read out in Pa (factory setting) both in Modbus and in BACnet
- In addition to the pressure value, further information about other Modbus registers/BACnet objects can be read out.
- Overview of the registers/objects in the communication tables
- For diagnostic purposes, the actual pressure value can be picked up at terminal 5 in bus mode.
- The pressure range $0 - \Delta p_{\text{nom}}$ always corresponds to the signal voltage range of (0)2 – 10 V DC
- Reference point $\Delta p_{\text{nom}} = 500$ Pa

Override control

For special operating situations, the duct pressure controller can be put in a special operating mode (override control). The following are possible: control Δp_{\min} , control Δp_{\max} , control valve open (OPEN), control valve closed (CLOSED) or control stop.

Override control via the bus

Settings are made via the Modbus register 1 or via BACnet object type MO[1],

Override control via bus timeout monitoring (Modbus)

If the Modbus communication fails for a specified period, a predefined operating state Δp_{\min} , Δp_{\max} , OPEN or CLOSED can be activated.

- The override control that is to be activated in the event of a bus timeout is defined in Modbus register 108 or 109.
- The bus timeout period after which the override control is activated is defined in Modbus register 109 and 110.
- Every Modbus communication resets the timeout of the bus timeout monitoring

Override control via bus timeout monitoring (Modbus)

If the BACnet communication fails for a specified period, a predefined operating state can be activated.

- The setpoint value to be activated upon bus timeout is specified via Relinquish_Default from SpRel (object AO1)
- Bus timeout period is defined via BusWatchdog (object type AV [130])
- Communication on the data points SpRel (object AO[1]) and Override (object MO[1]) resets the timeout of the bus timeout monitoring

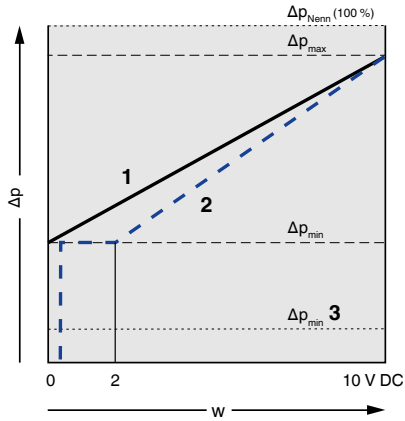
Override controls for diagnostic purposes

Activation via bus systems, external/on-site switching contacts (bridges), and the TROX FlowCheck app.

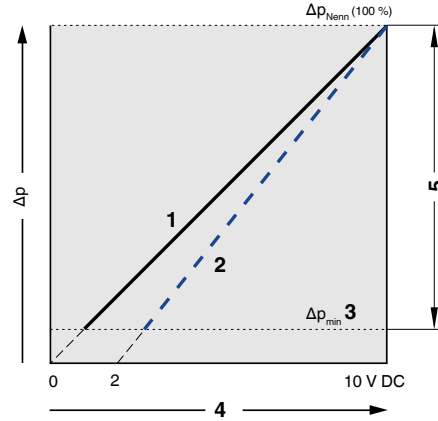
Prioritisation of various setting options

Settings for override controls via switching contacts have a higher priority than Modbus/BACnet settings.

- Highest priority: setting via an analogue override control
- Medium priority: settings via the service plug (TROX FlowCheck app) for test purposes
- Lowest priority: setting via Modbus/BACnet/MP-Bus

Characteristic of the setpoint value signal


- 1: 0 – 10 V DC
- 2: 2 – 10 V DC
- 3: Unit

Characteristic of the actual value signal


- 1: 0 – 10 V DC
- 2: 2 – 10 V DC
- 3: Unit

Differential pressure setpoint value 0 - 10 V DC

$$\Delta p_{Soll} = \frac{w}{10} (\Delta p_{max} - \Delta p_{min}) + \Delta p_{min}$$

Differential pressure actual value 0 - 10 V DC

$$\Delta p_{ist} = \frac{U5}{10} \Delta p_{Nenn}$$

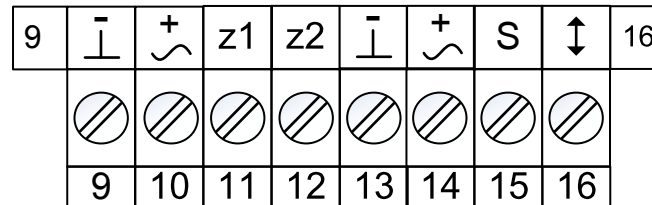
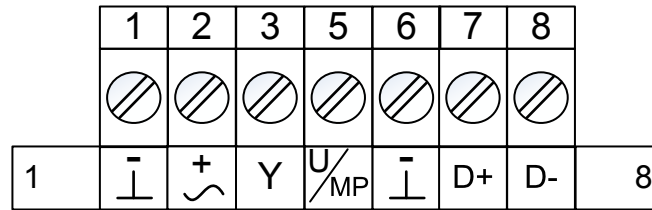
Differential pressure setpoint value 2 - 10 V DC

$$\Delta p_{Soll} = \frac{w - 2}{8} (\Delta p_{max} - \Delta p_{min}) + \Delta p_{min}$$

Differential pressure actual value 2 - 10 V DC

$$\Delta p_{ist} = \frac{U5 - 2}{8} \Delta p_{Nenn}$$

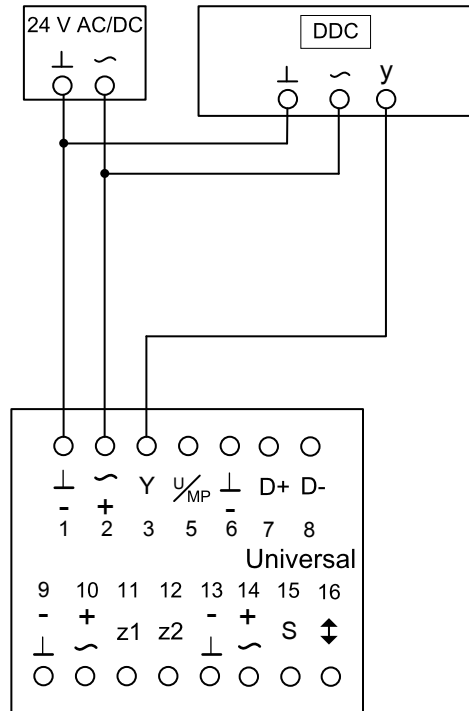
View of pluggable terminal strips on the VRU



Universal

- 1, 6, 9, 13: \perp , $-$ = Ground, neutral
- 2, 10, 14: \sim , $+$ = Supply voltage 24 V
- 3: Y = Setpoint value signal Y and override controls
- 5: U/MP = Actual value signal U or MP-bus
- 7: D- = Modbus/BACnet A, C1
- 8: D+ = Modbus/BACnet B, C2
- 11, 12: Override controls
- 15: Expansion for external sensor
- 16: Not used

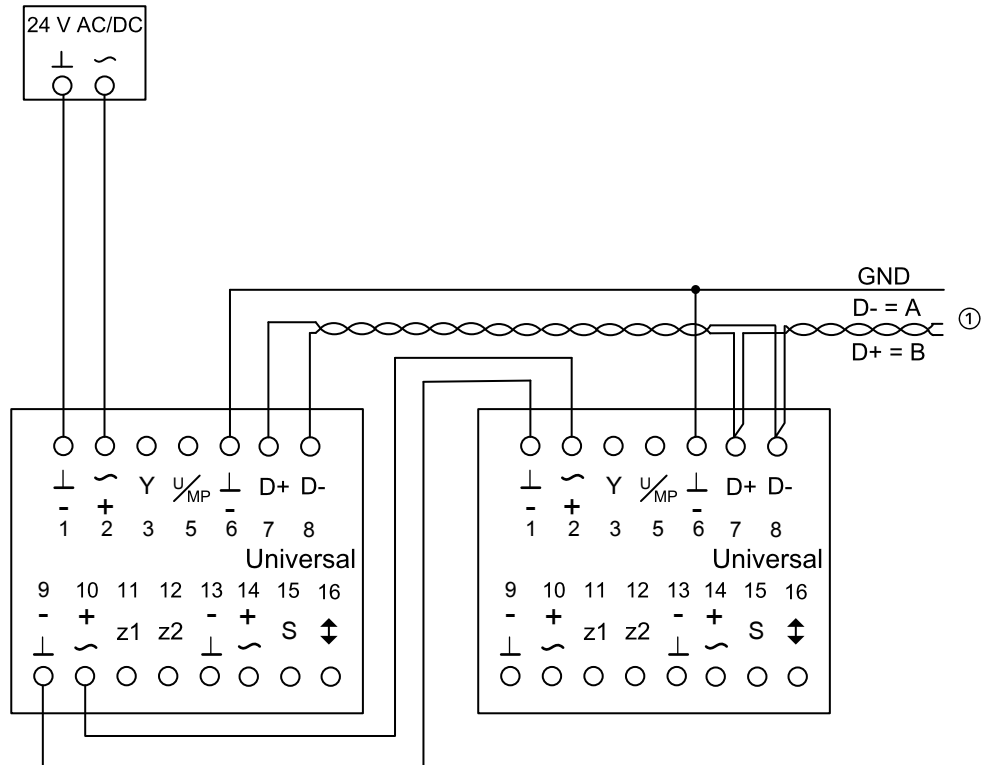
Connection diagram analogue control input signal



- 1: ⊥, - = Ground, neutral
- 2: ~, + = Supply voltage 24 V AC/DC
- 3: Y = Analogue input 0 – 10 V DC or 2 – 10 V DC
- 5: U: Actual value signal 0 – 10 V DC or 2 – 10 V DC

Note:
DDC = Setpoint value setting

Connection diagram Modbus, BACnet operation

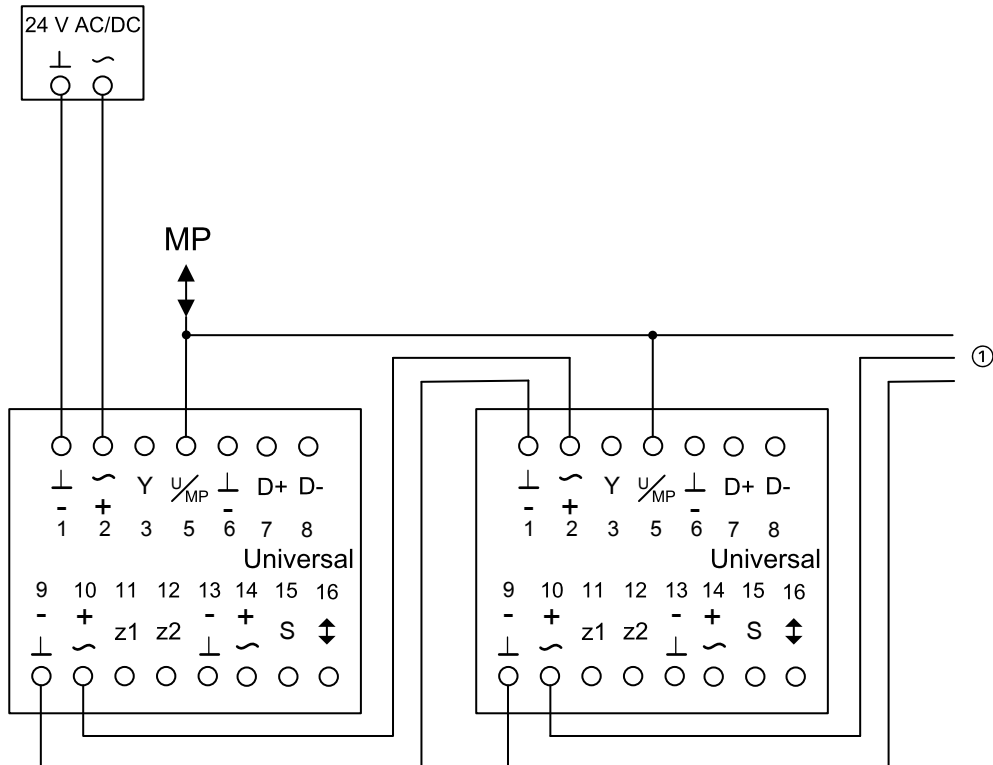


- 1: ⊥, - = Ground, neutral
- 2: ~, + = Supply voltage 24 V AC/DC
- 7: D- = Modbus/BACnet A, C1
- 8: D+ = Modbus/BACnet B, C2
- 6: GND = Common ground potential

Note:

① Other Modbus or BACnet network devices (up to 32)

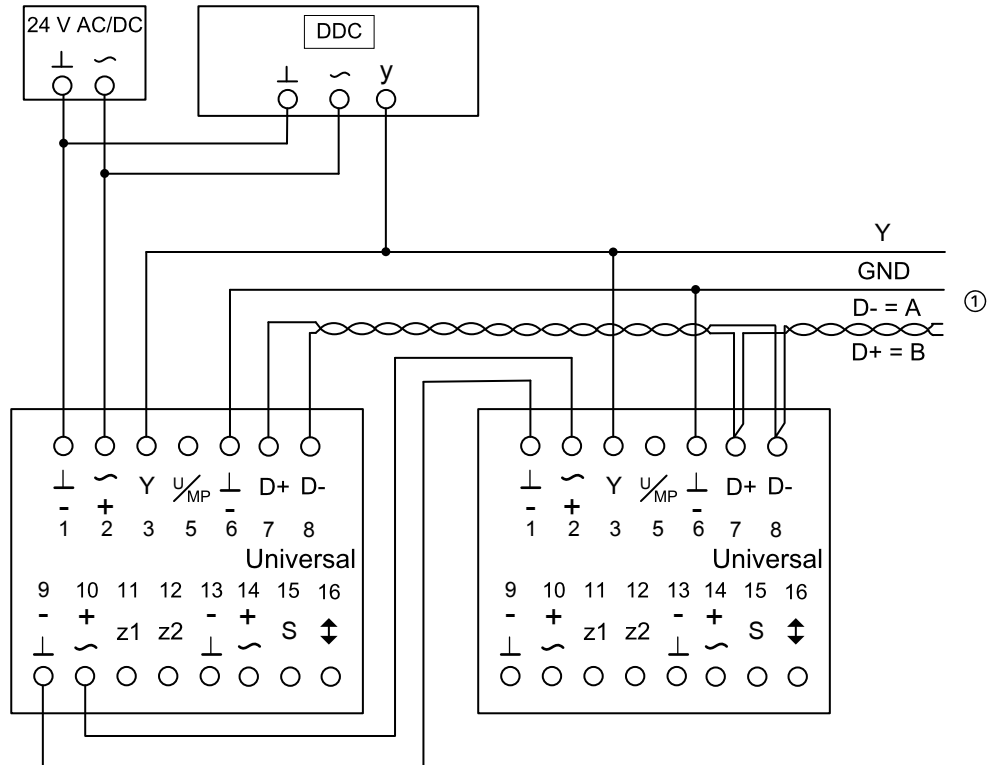
MP bus wiring diagram



- 1: ⊥, - = Ground, neutral
- 2: ~, + = Supply voltage 24 V AC/DC
- 5: U/MP = MP-bus integration

Note:
 ① Other devices on an MP bus (up to 16, including up to 8 MP devices such as volume flow controllers and another 8 MPL actuators such as valve actuators)

Connection diagram Modbus, BACnet operation

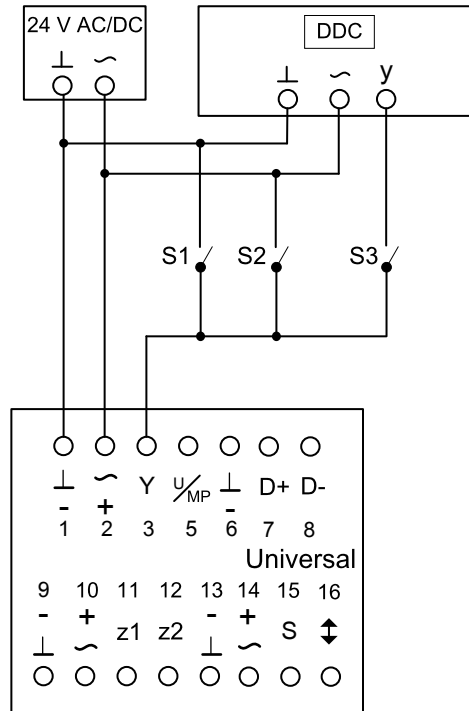


- 1: ⊥, - = Ground, neutral
- 2: ~, + = Supply voltage 24 V AC/DC
- 7: D- = Modbus/BACnet A, C1
- 8: D+ = Modbus/BACnet B, C2
- 6: GND = Common ground potential

Note:

DDC = Setpoint value setting

① Other Modbus or BACnet network devices (up to 32)

Connection diagram override controls


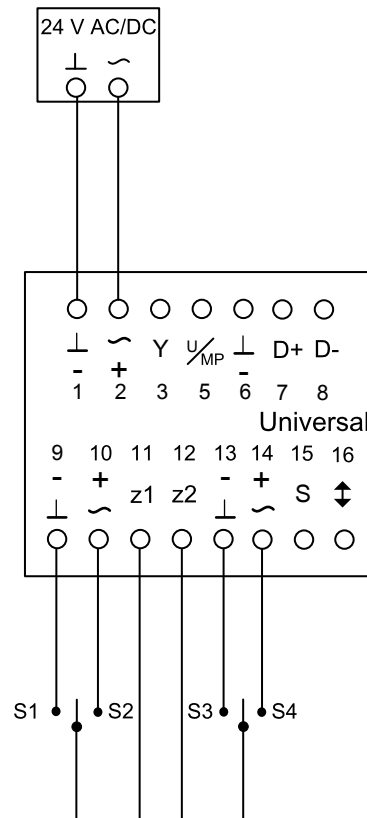
- 1: ⊥, - = Ground, neutral
- 2: ~, + = Supply voltage 24 V AC/DC
- 3: Y = Analogue input 0 - 10 V DC or 2 - 10 V DC and override control
- 5: U: Actual value signal 0 - 10 V DC or 2 - 10 V DC

Switching functions (S1 – S3 closed)

- S1: at 2 – 10 V: damper CLOSED; at 0 – 10 V: Δ_{pmin}
- S2: Δ_{pmax}
- S3: analogue setpoint value setting

Note:

DDC = Setpoint value setting When combining several override controls the switches must be interlocked to prevent short-circuits.

Connection diagram z1/z2 alternative override controls


- 9: \perp , - = Ground, neutral
 10: \sim , + = Supply voltage 24 V AC/DC
 11: Override control z1
 12: Override control z2
 13: \perp , - = Ground, neutral
 14: \sim , + = Supply voltage 24 V AC/DC

Switching functions (S1 – S4 closed)

- S1: Stop control
 S2: OPEN damper
 S3: CLOSE damper
 S4: Δ_{pmax}

Note:

When combining several override controls the switches must be interlocked to prevent short-circuits.

Explanation

Δ_{pNom} [Pa]

Nominal pressure (100 %): Maximum differential pressure that can be detected by the pressure transducer and converted into an electrical signal. Please note that the adjustable differential pressure range is only a range of the nominal pressure and cannot be fully utilised (see technical data). Δ_{pNom} is the reference value for defining Δ_{pmin} and Δ_{pmax} .

Δ_{pmax} [Pa]

Upper limit of the operating range of the duct pressure regulator adjustable by the customer (note usable control range see technical data). For analogue control of duct pressure controllers (typically used), the maximum value of the setpoint signal (10 V) is assigned the set maximum value (Δ_{pmax}) is allocated to the minimum setpoint signal (0 or 2 V) (see characteristic).

Δ_{pmin} [Pa]

Customer-adjustable lower limit of the operating range of the duct pressure controller: Δ_{pmin} should be set to less than or equal to Δ_{pmax} can be set. Δ_{pmin} should not be set lower than the lower control range, otherwise the control is unstable. With analogue control, the minimum value of the setpoint signal (0 or 2 V) is assigned the set minimum value Δ_{pmin} assigned (see characteristic).

Δ_p [Pa]

Differential pressure

Duct pressure controller

Consisting of a basic device and an attached control component for duct pressure control

Basic unit (for duct pressure controller)

Control device without attached control component. The main components are the casing and the damper blade to control the differential pressure in the relevant section of the air duct.

Important distinguishing features:

Geometry or unit shape, material and types of connection, acoustic characteristics (e.g. acoustic cladding option or integrated silencers).

For manufacturing reasons, the basic device is based on the basic devices for volume flow control and is therefore also referred to as a VAV terminal unit. Sensor elements of the VAV terminal unit are therefore usually present, but are not accessible in all construction variants, e.g. acoustic cladding.

The pressure tapping point for duct pressure control is typically placed in the air duct behind the terminal unit.

Control component (for duct pressure controller)

Electronic unit(s) mounted on the basic device to control the pressure in an air duct section (e.g. side duct) by adjusting the control damper position.

The electronic unit essentially consists of a controller with differential pressure transducer (integrated or external) and an actuator, which is integrated in the compact controllers and combined separately in the universal controllers, e.g. to define additional functions such as a safety position.

Important distinguishing features:

- Transducers: Measuring and control range
- Actuator variants VARYCONTROL universal controller:
 - Standard actuator slow running
 - Spring return actuator for damper blade safety function
- Actuator variants TROX UNIVERSAL:
 - Standard actuator slow running
 - Spring return actuator for damper blade safety function
 - Fast-running actuator
- Interface technology:
 - Analogue interface or digital bus interface for connection and tapping of signals and information only with TROX UNIVERSAL:
 - various expansion modules, e.g. parallel volume flow rate measurement, possible.