

Control components for VAV terminal units

Universal, static



For contaminated extract air or for pressure control

Modular control components for VAV terminal units, especially for aggressive media in extract air systems

- Module selection based on application
- Actuators with selected actuator forces

Options

- Actuators with safety function for 'damper blade OPEN' and 'damper blade CLOSED' (spring return actuators)

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Application

Application

- Electronic volume flow controllers of Type Universal (static) are designed for use with VAV terminal units.
 - Volume flow control or differential pressure control based on static differential pressure measurement
 - Dynamic differential pressure transducer and electronic controller can be fitted together in one casing or in separate casings
 - Actuator or spring return actuator is separate
 - The output signals of the room temperature controller, central BMS, air quality controller or similar units control the volume flow rate
- setpoint
 - Override control by means of switches or relays
 - Volume flow rate actual value or differential pressure actual value is available as linear voltage signal
 - Controller parameters are factory set
 - On-site adjusting is not required
 - Please note that in critical cases, material compatibility testing must be carried out on the air terminal unit and the differential pressure transducer, taking into consideration the harmful substances involved and the concentrations in which they occur.

Description

Parts and characteristics

- Sensor for static differential pressure measurements
- Separate actuator
- Mechanical stops for limiting the damper blade positions
- Actuators with overload protection
- Release button to allow for manual operation

Maintenance

- Zero point correction of the static differential pressure transducer should be carried out once per year (recommendation)

Functional description

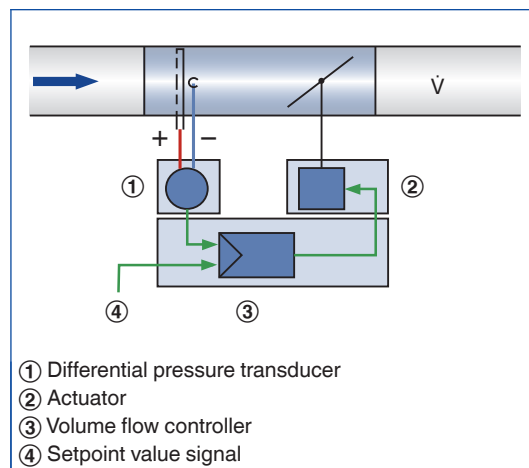
VAV terminal units control the volume flow in a closed loop, i.e. measurement – comparison – control.

The volume flow rate is determined by measuring the differential pressure (effective pressure). For this purpose the VAV terminal unit is fitted with a differential pressure sensor.

The static differential pressure transducer transforms the effective pressure into a voltage signal. The volume flow rate actual value is hence available as a voltage signal. The factory setting is such that 10 V DC always corresponds to the nominal volume flow rate (\dot{V}_{nom}).

The volume flow rate setpoint value comes from a higher-level controller (e.g. room temperature controller, air quality controller, central BMS) or from switch contacts. Variable volume flow control results in a value between \dot{V}_{min} and \dot{V}_{max} . It is possible to override the room temperature control, e.g. by a complete shut-off of the duct.

Principle of operation – Universal TROX/ Belimo



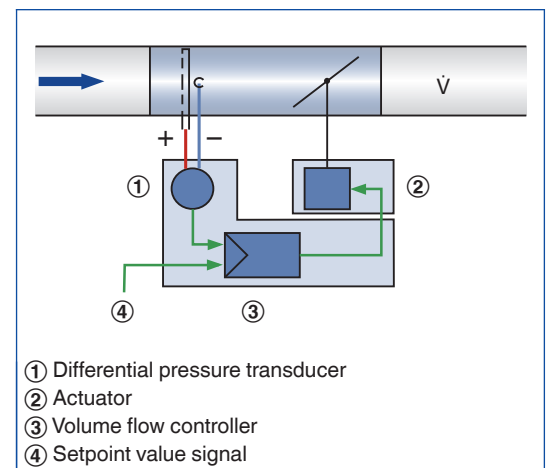
The controller compares the volume flow rate setpoint value to the actual value and controls the actuator accordingly if there is a difference.

The volume flow rate parameters \dot{V}_{min} and \dot{V}_{max} are set on potentiometers (VRP) or stored in the controller. Voltage ranges are factory stored in the controller. Changes on the customer's site can easily be carried out using a potentiometer, an adjustment device or a notebook with service tool.

Volume flow control

- 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 within which the damper blade does not move.
- The factory set volume flow rate parameters can be altered by the customer

Principle of operation – Universal TROX/ Gruner



Any attachments are to be defined with the order code of the VAV terminal unit.

Universal controller, static, for VAV terminal units, volume flow control

Order code detail	Controller		Static differential pressure transducer		Actuator		VAV terminal units
	Part number	Type	Part number	Type	Part number	Type	
BP3	M466EN6	VRP-M	M546EJ1	VFP-300	M466EQ9	NM24A-V-ST	① ② ③ ⑤ ⑥ ⑦ ⑧
BP1	M466EN6	VRP-M	M546EJ1	VFP-300	M466ER0	SM24A-V-ST	④
BPB	M466EN6	VRP-M	M546EJ1	VFP-300	M466DR2	NF24A-V-ST spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦
BPG	M466EN6	VRP-M	M546EJ1	VFP-300	M466EQ2	LMQ24A-SRV-ST fast-running actuator	① ⑥ ⑧
BPG	M466EN6	VRP-M	M546EJ1	VFP-300	M466EQ3	NMQ24A-SRV-ST fast-running actuator	② ③ ④ ⑤ ⑦
BB3	M546EG2	VRP	M546EJ1	VFP-300	M466DJ8	NM24A-V	① ② ③ ⑤ ⑥ ⑦ ⑧
BB1	M546EG2	VRP	M546EJ1	VFP-300	M466DG8	SM24A-V	④
BBB	M546EG2	VRP	M546EJ1	VFP-300	M466DR1	NF24A-V spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦
XD1	M546ED5	GUAC-S3		Included with GUAC-S3	M466EL7	227-024-08-V	① ② ③ ④ ⑤ ⑥ ⑦
XD3	M546ED5	GUAC-S3		Included with GUAC-S3	A00000051738	361C-024-20-V/ST07 spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦

- ① TVR, TVZ, TVA up to nominal size 250
- ② TVR, TVZ, TVA from nominal size 315
- ③ TVJ
- ④ TVT
- ⑤ TZ-Silenzio, TA-Silenzio
- ⑥ TVRK up to nominal size 250
- ⑦ TVRK from nominal size 315
- ⑧ TVLK

Universal controller, static, for VAV terminal units, differential pressure control

Order code detail	Controller		Static differential pressure transducer		Actuator		VAV terminal units
	Part number	Type	Part number	Type	Part number	Type	
BR3	M466EN6	VRP-M	M546EJ6	VFP-100	M466EQ9	NM24A-V-ST	① ② ③ ⑤ ⑥ ⑦ ⑧ ⑨
BR1	M466EN6	VRP-M	M546EJ6	VFP-100	M466ER0	SM24A-V-ST	④
BRB	M466EN6	VRP-M	M546EJ6	VFP-100	M466DR2	NF24A-V-ST spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
BRG	M466EN6	VRP-M	M546EJ6	VFP-100	M466EQ2	LMQ24A-SRV-ST fast-running actuator	① ⑥ ⑧
BRG	M466EN6	VRP-M	M546EJ6	VFP-100	M466EQ3	NMQ24A-SRV-ST fast-running actuator	② ⑤ ⑦ ⑨
BS3	M466EN6	VRP-M	M546EJ7	VFP-600	M466EQ9	NM24A-V-ST	① ② ③ ⑧ ⑨
BS1	M466EN6	VRP-M	M546EJ7	VFP-600	M466ER0	SM24A-V-ST	④
BSB	M466EN6	VRP-M	M546EJ7	VFP-600	M466DR2	NF24A-V-ST spring return actuator	① ② ③ ④ ⑧ ⑨
BSG	M466EN6	VRP-M	M546EJ7	VFP-600	M466EQ2	LMQ24A-SRV-ST fast-running actuator	① ⑧
BSG	M466EN6	VRP-M	M546EJ7	VFP-600	M466EQ3	NMQ24A-SRV-ST fast-running actuator	② ③ ④ ⑨
BG3	M546ED1	VRP-STP	M546EJ6	VFP-100	M466DJ8	NM24A-V	① ② ③ ⑤ ⑥ ⑦ ⑧ ⑨
BG1	M546ED1	VRP-STP	M546EJ6	VFP-100	M466DG8	SM24A-V	④
BGB	M546ED1	VRP-STP	M546EJ6	VFP-100	M466DR1	NF24A-V spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
BH3	M546ED1	VRP-STP	M546EJ7	VFP-600	M466DJ8	NM24A-V	① ② ③ ⑧ ⑨
BH1	M546ED1	VRP-STP	M546EJ7	VFP-600	M466DG8	SM24A-V	④
BHB	M546ED1	VRP-STP	M546EJ7	VFP-600	M466DR1	NF24A-V spring return actuator	① ② ③ ④ ⑧ ⑨
XE1	M546ED6	GUAC-P1	–	Included with GUAC-P1	M466EL7	227-024-08-V	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
XE3	M546ED6	GUAC-P1	–	Included with GUAC-P1	A0000005173 8	361C-024-20-V/ ST07 spring return actuator	① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
XF1	M546ED7	GUAC-P6	–	Included with GUAC-P6	M466EL7	227-024-08-V	① ② ③ ④ ⑧ ⑨
XF3	M546ED7	GUAC-P6	–	Included with GUAC-P6	A0000005173 8	361C-024-20-V/ ST07 spring return actuator	① ② ③ ④ ⑧ ⑨

- ① TVR up to nominal size 250
- ② TVR from nominal size 315
- ③ TVJ
- ④ TVT
- ⑤ TZ-Silenzio, TA-Silenzio
- ⑥ TVZ, TVA up to nominal size 250
- ⑦ TVZ, TVA from nominal size 315
- ⑧ TVRK up to nominal size 250
- ⑨ TVRK from nominal size 315

Any attachments must be defined with the order code of the VAV terminal unit.

Application

- Electronic volume flow controller VRP-M, combined with a static differential pressure transducer VFP-300, as Universal controller
- Variable air or constant air volume flow control
- The flow rate is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers
- With MP bus interface: Up to eight users, such as VRP-M, can be addressed on an MP bus (LAN). This allows for the integration with higher-level systems. DDC controller with MP bus interface to control the Universal controller. Belimo interface UK24LON for LonWorks systems; UK24EIB for EIB systems; UK24MOD for Modbus systems; UK24BAC for BACnet
- When the MP bus interface is used, the analog 0 – 10 V or 2 – 10 V interface cannot be used at the same time.
- The MP bus interface cannot be used with fast-running actuators

Construction

Volume flow controller VRP-M with static differential pressure transducer VFP-300

- BP3: Actuator NM24A-V-ST for TVR, TVJ, TZ-Silenzio, TA-Silenzio TVZ, TVA, TVLK
- BP1: Actuator SM24A-V-ST for TVT
- BPB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio TVZ, TVA, TVRK
- BPG: Fast-running actuator LMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK up to nominal size 250, and TVLK or NMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK from nominal size 315

and TVJ, TVT, TZ-Silenzio, TA-Silenzio

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.1 V DC)

Operating modes

E: Single and M: Master

- \dot{V}_{\min} : Minimum volume flow rate
- \dot{V}_{\max} : Maximum volume flow rate

S: Slave operation

- \dot{V}_{\min} : 0 %
- \dot{V}_{\max} : Volume flow rate ratio to the master controller

F: Constant value

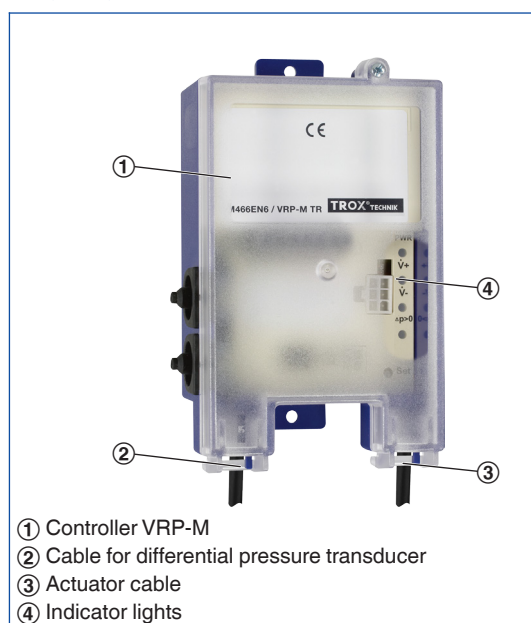
- \dot{V}_{\min} : constant volume flow rate
- \dot{V}_{\max} : 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator.
- The volume flow rate parameters \dot{V}_{\min} and \dot{V}_{\max} can be adjusted at a later stage using an adjustment device

BP*, BR*, BS*



- ① Controller VRP-M
- ② Cable for differential pressure transducer
- ③ Actuator cable
- ④ Indicator lights



Universal controller VRP-M

Volume flow and differential pressure controller VRP-M

Supply voltage (AC)	24 V AC ± 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC ± 10 %
Power rating (AC)	including differential pressure transducer, without actuator max. 2.6 VA
Power rating (DC)	including differential pressure transducer, without actuator max. 1.1 VA
Setpoint value signal input	0 – 10 V DC, $R_a > 200 \text{ k}\Omega$
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Static differential pressure transducer VFP-300

Static differential pressure transducer VFP-300

Supply voltage	from the controller
Measuring range	0 – 300 Pa
Linearity	± 3 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Actuator NM24A-V

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	3.5 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.710 kg



Actuator NM24A-V

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.910 kg



Spring return actuator
NF24A

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	200 – 300 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	1.91 kg



Fast-running actuator
LMQ24A-SRV-ST

Fast-running actuator LMQ24A-SRV-ST

Supply voltage	from controller VRP-M
Power rating (AC)	23 VA max.
Power rating (DC)	13 W max.
Torque	4 Nm
Running time for 90°	2.5 s
Control signal	from controller VRP-M
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.810 kg

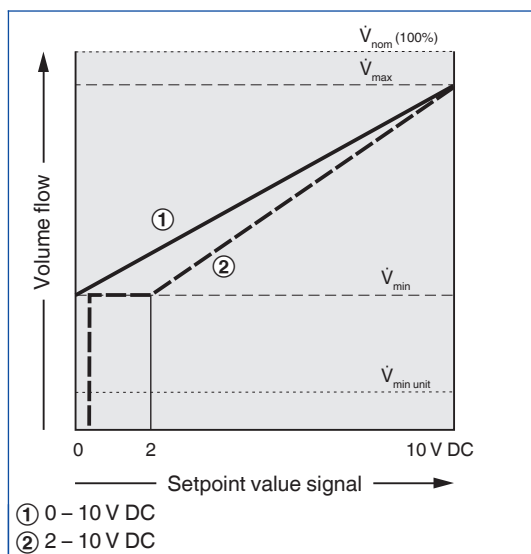


Fast-running actuator
NMQ24A-SRV-ST

Fast-running actuator NMQ24A-SRV-ST

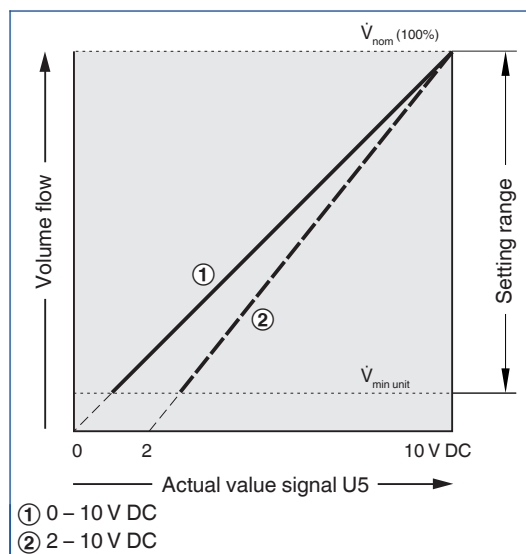
Supply voltage	from controller VRP-M
Power rating (AC)	23 VA max.
Power rating (DC)	13 W max.
Torque	8 Nm
Running time for 90°	4 s
Control signal	from controller VRP-M
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.970 kg

BC0, BP*, B1*, Characteristic of the setpoint value signal



LMV-D3-MP, NMV-D3-MP, VRD3, VRP-M

BC0, BP*, B1*, Characteristic of the actual value signal



LMV-D3-MP, NMV-D3-MP, NMV-D3LON, VRD3, VRP-M

Volume flow rate setpoint value

0 – 10 V DC

$$\dot{V}_{\text{setpoint}} = \frac{w}{10} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}}$$

BC0, BP*, B1*

Volume flow rate actual value

0 – 10 V DC

$$\dot{V}_{\text{actual}} = \frac{U5}{10} \dot{V}_{\text{nom}}$$

BC0, BL0, BP*, B1*

Volume flow rate setpoint value

2 – 10 V DC

$$\dot{V}_{\text{setpoint}} = \frac{w-2}{8} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}}$$

BC0, BP*, B1*

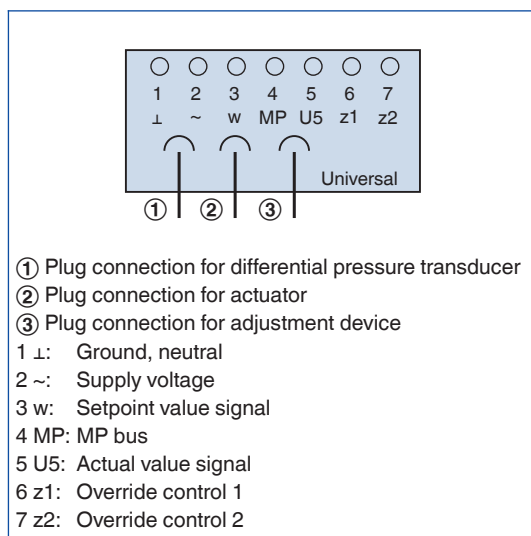
Volume flow rate actual value

2 – 10 V DC

$$\dot{V}_{\text{actual}} = \frac{U5-2}{8} \dot{V}_{\text{nom}}$$

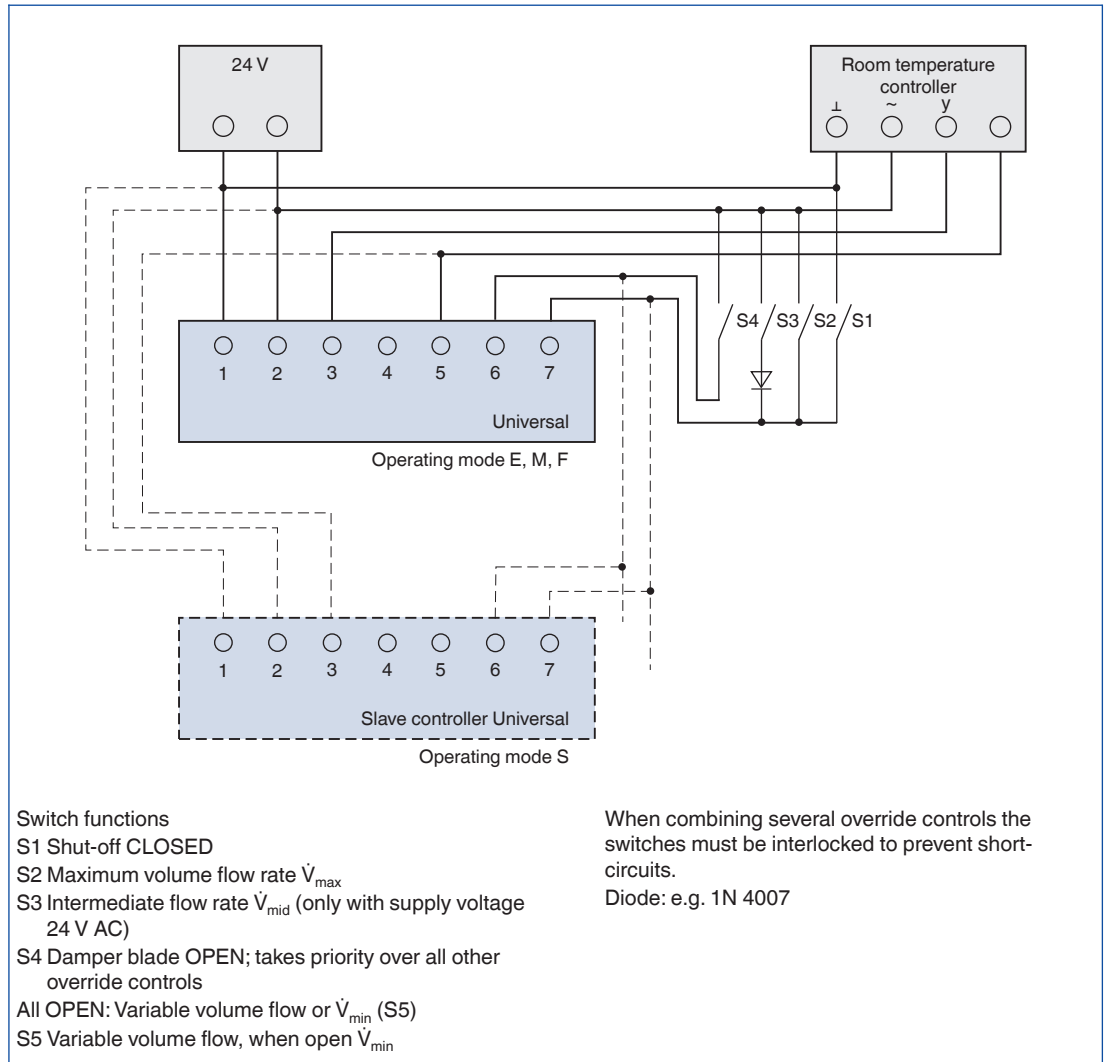
BC0, BL0, BP*, B1*, BB*

BP*, BR*, BS*, Terminal connections



Universal: VRP-M

BP*, Variable volume flow control and override control



Universal: VRP-M

Application

- Electronic volume flow controller VRP, combined with a static differential pressure transducer VFP-300, as Universal controller
- Variable air or constant air volume flow control
- The flow rate is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers

Construction

Volume flow controller VRP with static differential pressure transducer VFP-300

- BB3: Actuator NM24A-V-ST for TVR, TVJ, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK, TVLK
- BB1: Actuator SM24A-V-ST for TVT
- BBB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK

Signal voltage range

- 2: 2 – 10 V DC

Operating modes

E2: Single and M2: Master

- \dot{V}_{\min} : Minimum volume flow rate
- \dot{V}_{\max} : Maximum volume flow rate

S2: Slave operation

- \dot{V}_{\min} : 0 %
- \dot{V}_{\max} : Volume flow rate ratio to the master controller

F2: Constant value

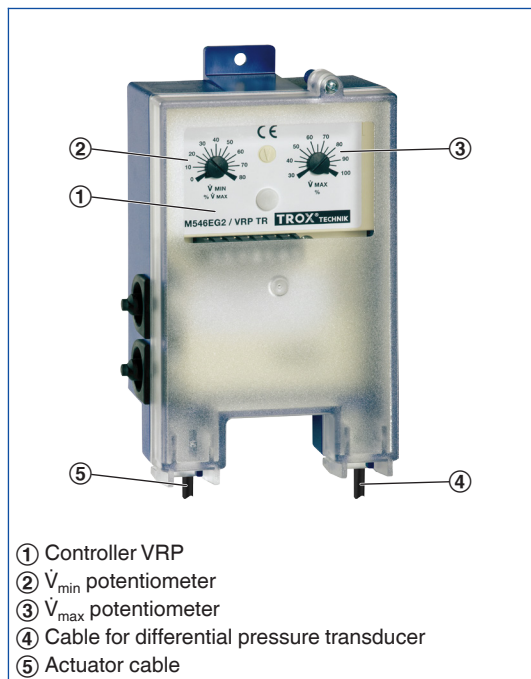
- \dot{V}_{\min} : constant volume flow rate
- \dot{V}_{\max} : 100 %

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator.
- The volume flow rate parameters \dot{V}_{\min} and \dot{V}_{\max} can be adjusted at a later stage using potentiometers

BB*



- ① Controller VRP
- ② \dot{V}_{\min} potentiometer
- ③ \dot{V}_{\max} potentiometer
- ④ Cable for differential pressure transducer
- ⑤ Actuator cable



Universal controller VRP

Volume flow controller VRP

Supply voltage (AC)	24 V AC \pm 20 %, 50/60 Hz
Power rating (AC)	without actuator max. 2.6 VA
Setpoint value signal input	2 – 10 V DC, $R_a > 100 \text{ k}\Omega$
Actual value signal output	2 – 10 V DC linear, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Static differential pressure transducer VFP-300

Static differential pressure transducer VFP-300

Supply voltage	from the controller
Measuring range	0 – 300 Pa
Linearity	\pm 3 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Actuator NM24A-V

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	3.5 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.710 kg



Actuator NM24A-V

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.910 kg

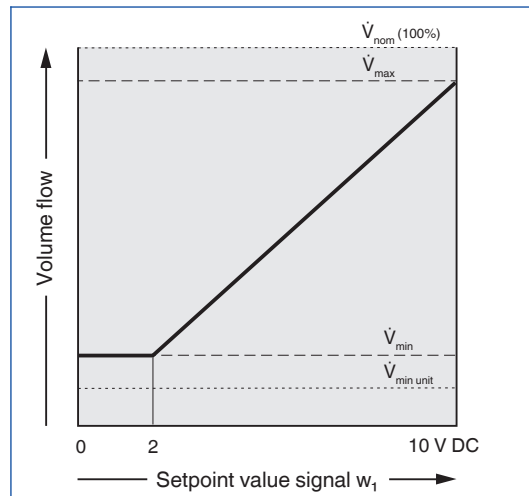


Spring return actuator
NF24A

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	200 – 300 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	1.91 kg

BB*, Characteristic of the setpoint value signal



VRP

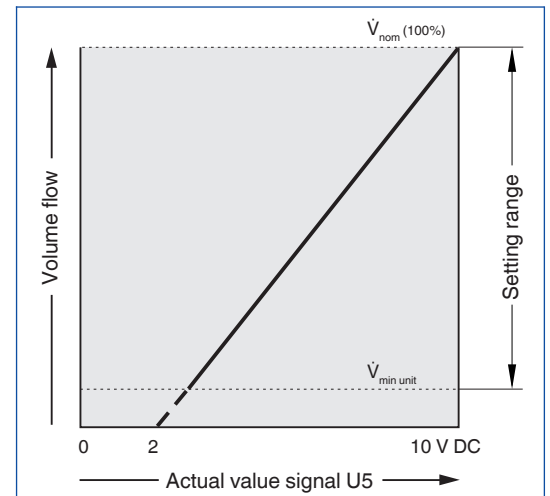
Volume flow rate setpoint value

2 – 10 V DC

$$\dot{V}_{\text{setpoint}} = \frac{w_1 - 2}{8} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}}$$

BB*

BL0, BB*, Characteristic of the actual value signal



LMV-D3LON, VRP

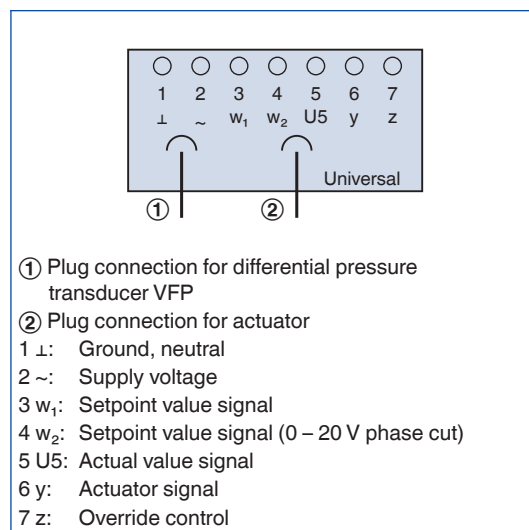
Volume flow rate actual value

2 – 10 V DC

$$\dot{V}_{\text{actual}} = \frac{U5 - 2}{8} \dot{V}_{\text{nom}}$$

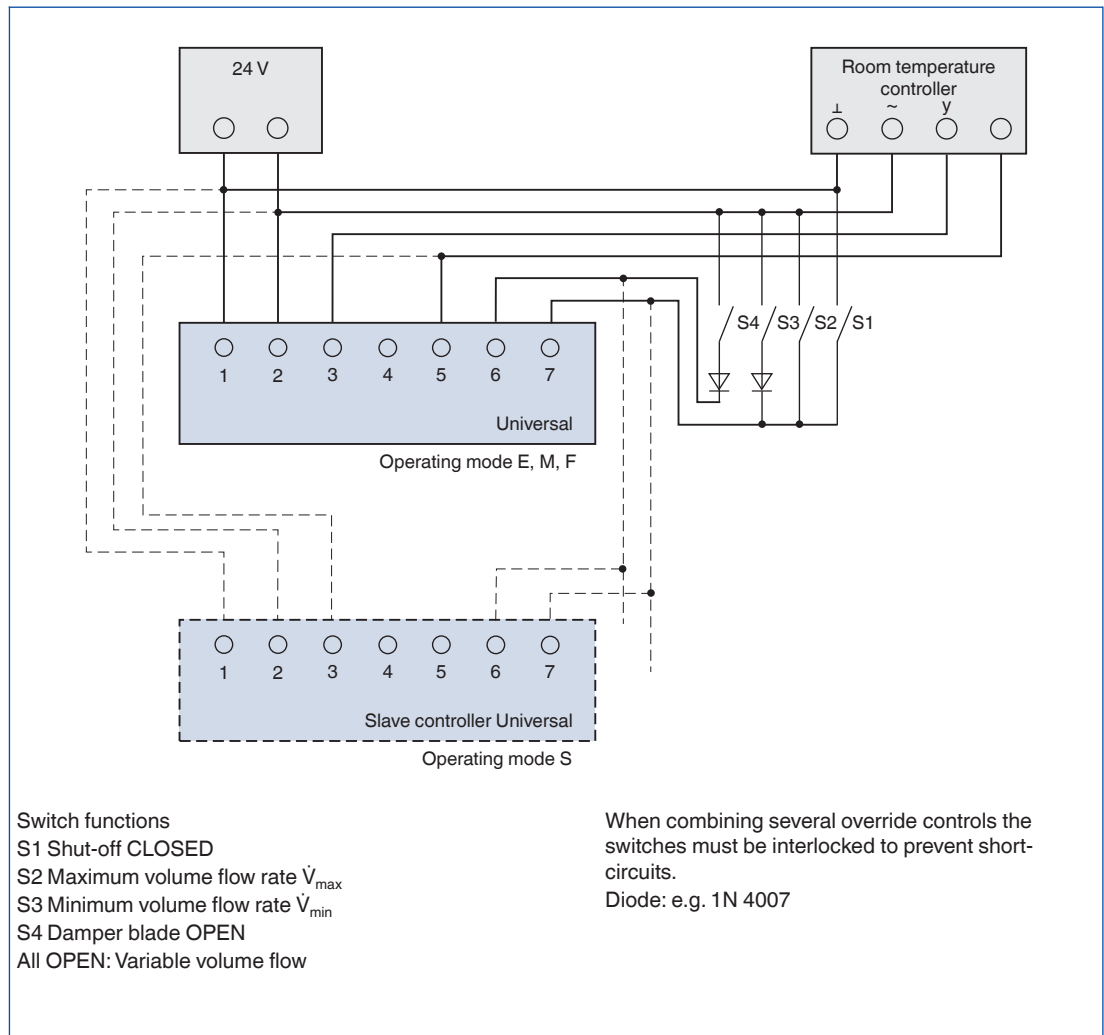
BC0, BL0, BP*, B1*, BB*

BB*, Terminal connections



Universal: VRP

BB*, Variable volume flow control and override control (voltage signal 2 – 10 V DC)



Universal: VRP

Application

- Electronic volume flow controller GUAC-S3 as Universal controller with integral differential pressure transducer
- Variable air or constant air volume flow control
- The flow rate is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC

S: Slave operation

- \dot{V}_{\min} : 0 %
- \dot{V}_{\max} : Volume flow rate ratio to the master controller

F: Constant value

- \dot{V}_{\min} : constant volume flow rate
- \dot{V}_{\max} : 100 %

Construction

Volume flow controller GUAC-S3

- XD1: Actuator 227-024-08-V for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- XD3: Spring return actuator 361C-024-20-V/ST07 for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.8 V DC)

Operating modes

E: Single and M: Master

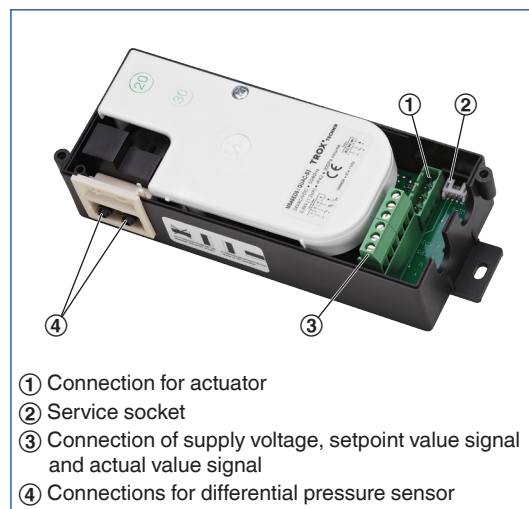
- \dot{V}_{\min} : Minimum volume flow rate
- \dot{V}_{\max} : Maximum volume flow rate

Parameters are factory set. The customer defines the required operating mode and the volume flow rates in the order code at the time of ordering.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered volume flow rates
- After successful installation and wiring the controller is ready for use
- Carry out zero point correction for the controller using adjustment device AT-VAV-G
- The volume flow rate parameters \dot{V}_{\min} and \dot{V}_{\max} can be adjusted at a later stage using an adjustment device

XD*



Universal controller
GUAC-S3

Volume flow controller GUAC-S3

Supply voltage (AC)	24 V AC \pm 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC \pm 20 %
Power rating (AC)	without actuator max. 1.2 VA
Power rating (DC)	without actuator max. 0.6 W
Setpoint value signal input	0 – 10 V DC, $R_a >$ 100 k Ω
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Actuator 227-024-08-V

Actuator 227-024-08-V

Supply voltage	from the controller
Power rating (AC)	3 VA max.
Power rating (DC)	2 W max.
Torque	8 Nm
Running time for 90°	60 – 120 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2014/30/EU
Weight	0.530 kg

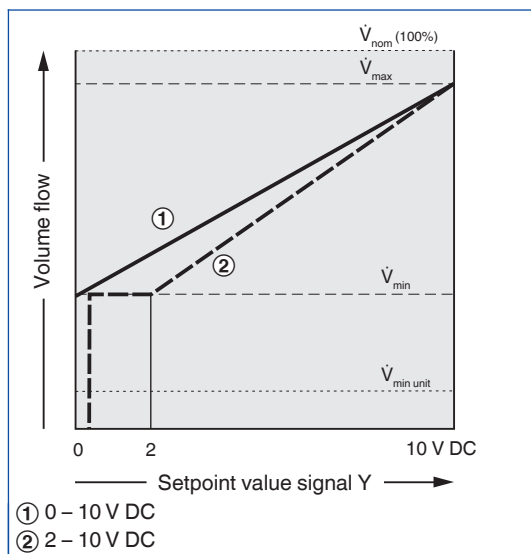


Spring return actuator
361C-024-20-V/ST07

Spring return actuator 361C-024-20-V

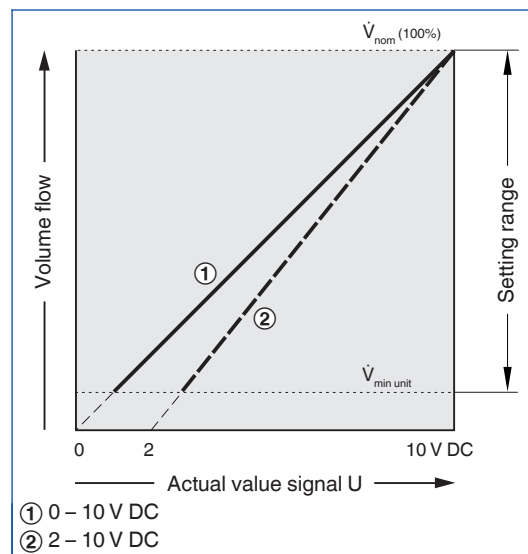
Supply voltage	from the controller
Power rating (AC)	10 VA max.
Power rating (DC)	8 W max.
Torque	20 Nm
Running time for 90°	150 s
Spring return time	< 15 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2014/30/EU
Weight	1.8 kg

XC*, XD*, Characteristic of the setpoint value signal



GUAC-D3, GUAC-S3

XB0, XC*, XD*, Characteristic of the actual value signal



227V-024-10, GUAC-D3, GUAC-S3

Volume flow rate setpoint value

$$0 - 10 \text{ V DC}$$

$$\dot{V}_{\text{setpoint}} = \frac{Y}{10} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}}$$

XB0

Volume flow rate actual value

$$0 - 10 \text{ V DC}$$

$$\dot{V}_{\text{actual}} = \frac{U}{10} \dot{V}_{\text{nom}}$$

XB0, XC*, XD*, LN0

Volume flow rate setpoint value

$$2 - 10 \text{ V DC}$$

$$\dot{V}_{\text{setpoint}} = \frac{Y-2}{8} (\dot{V}_{\text{max}} - \dot{V}_{\text{min}}) + \dot{V}_{\text{min}}$$

XB0

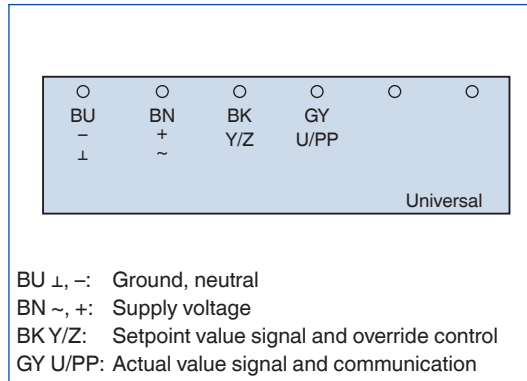
Volume flow rate actual value

$$2 - 10 \text{ V DC}$$

$$\dot{V}_{\text{actual}} = \frac{U-2}{8} \dot{V}_{\text{nom}}$$

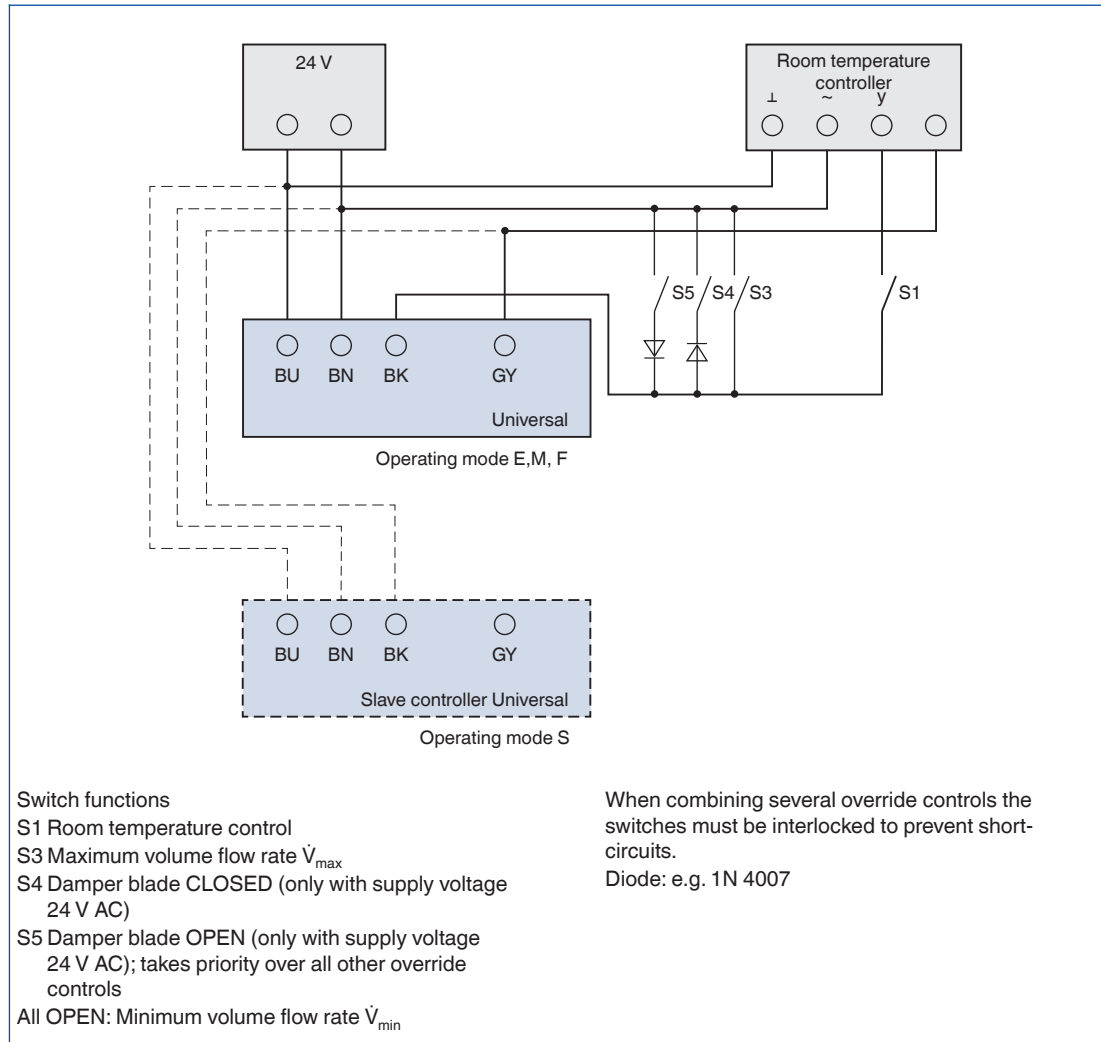
XB0, XC*, XD*

XC*, XD*, XE*, XF*, Terminal connections



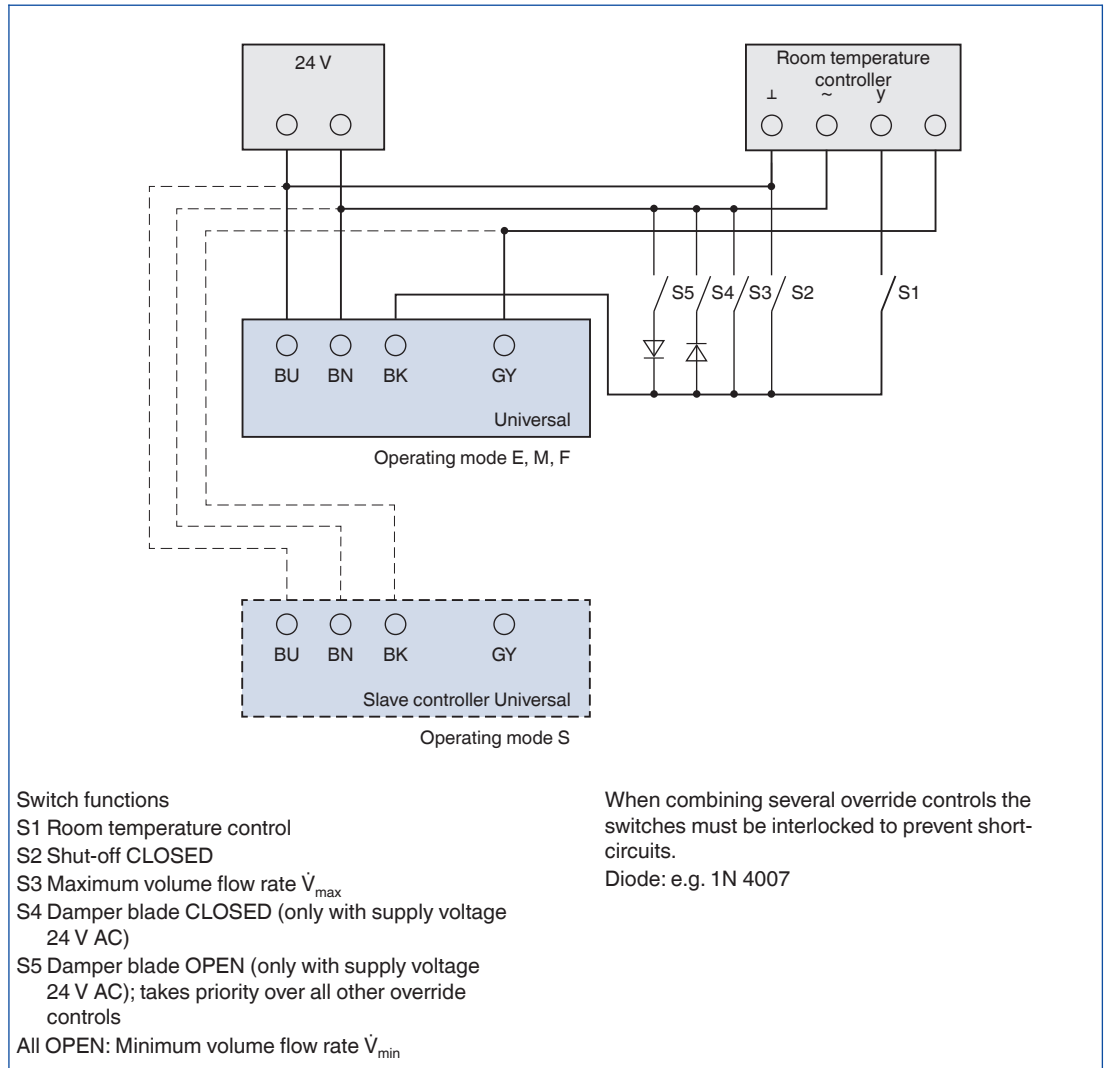
Universal: GUAC-D3, GUAC-S3, GUAC-P1, GUAC-P6

XC*, XD*, Variable volume flow control and override control, voltage signal 0 – 10 V DC



Universal: GUAC-D3, GUAC-S3

XC*, XD*, Variable volume flow control and override control, voltage signal 2 – 10 V DC



Universal: GUAC-D3, GUAC-S3

Functional description

The static differential pressure transducer transforms the differential 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 (Δp_{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.

The differential pressure parameters are set on a potentiometer (VRP-STP) or stored in the controller. Voltage ranges are factory stored in the controller. Changes on the customer's site can easily be carried out using a potentiometer, an

adjustment device or a notebook with service tool.

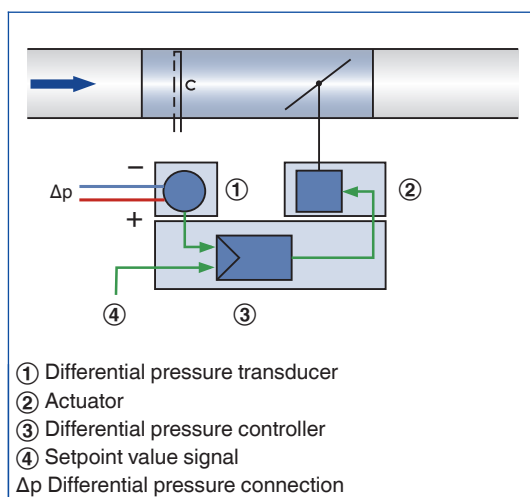
Constant pressure control

- The differential pressure controller works independent of the duct pressure
- Pressure fluctuations do not result in permanent differential pressure changes
- To prevent the control from becoming unstable, a dead band is allowed within which the damper blade does not move.
- The factory set differential pressure parameters can be altered by the customer

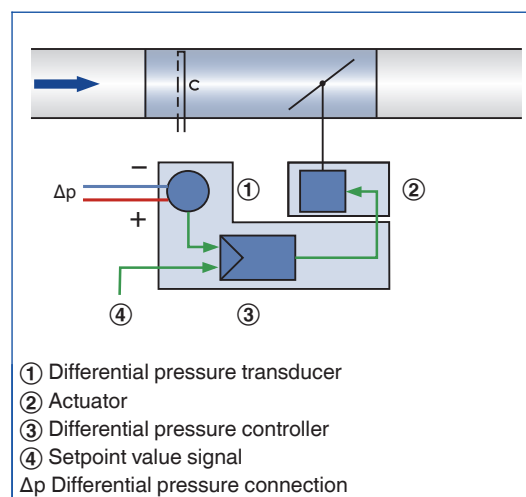
Variable pressure control

- Relays or switch contacts connected to the control signal input Y/Z can be used to achieve constant pressures Δp_{min} and Δp_{max} or to override various control settings.

Principle of operation – Universal TROX/ Belimo



Principle of operation – Universal TROX/ Gruner



Application

- Electronic differential pressure controller VRP-M, combined with a static differential pressure transducer VFP-100 or VFP-600, as Universal controller
- Variable or constant differential pressure control
- The differential pressure is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers
- With MP bus interface: Up to eight VRP-M users can be addressed on an MP bus (LAN); Belimo-Interface UK24LON for LonWorks systems; UK24EIB for EIB systems; UK24MOD for Modbus systems; UK24BAC for BACnet; DDC controllers with MP bus interface can control the Universal controller via data transfer
- When the MP bus interface is used, the analog 0 – 10 V or 2 – 10 V interface cannot be used at the same time.
- The MP bus interface cannot be used with fast-running actuators

Construction

Differential pressure controller VRP-M with static differential pressure transducer VFP-100

- BR3: Actuator NM24A-V-ST for TVR, TVJ, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- BR1: Actuator SM24A-V-ST for TVT
- BRB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- BRG: Fast-running actuator LMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK up to nominal size 250, and TVLK or NMQ24A-SRV-ST for TVR, TVZ, TVA, TVRK from nominal size 315

Volume flow controller VRP-M with static differential pressure transducer VFP-600

- BS3: Actuator NM24A-V-ST for TVR, TVJ, TVRK
- BS1: Actuator SM24A-V-ST for TVT

- BSB: Spring return actuator NF24A-V-ST for TVR, TVJ, TVT, TVRK
- BSG: Fast-running actuator LMQ24A-SRV-ST for TVR, TVRK up to nominal size 250, or NMQ24A-SRV-ST for TVJ, TVT and TVR, TVRK from nominal size 315

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.1 V DC)

Operating modes

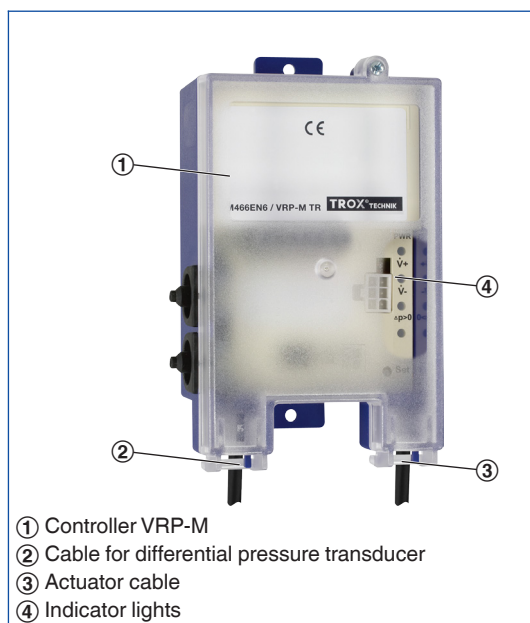
- Z: Supply air
- A: Extract air

Factory settings are as follows: Differential pressure Δp_{\min} as ordered and for room pressure controllers the adequate Δp_{nom} . The effective pressure sensor of the VAV terminal unit is short circuited.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered differential pressures
- Tubing of the static differential pressure transducer by others
- For positive room pressure: Connect room pressure to Plus, reference room to Minus
- For negative room pressure: Connect room pressure to Minus, reference room to Plus
- For supply air duct pressure: Connect static pressure of the duct to Plus
- For extract air duct pressure: Connect static pressure of the duct to Minus
- After successful installation, tubing and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator.
- The differential pressure settings can be adjusted at a later stage using an adjustment device

BP*, BR*, BS*



Universal controller VRP-M

Volume flow and differential pressure controller VRP-M

Supply voltage (AC)	24 V AC \pm 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC \pm 10 %
Power rating (AC)	including differential pressure transducer, without actuator max. 2.6 VA
Power rating (DC)	including differential pressure transducer, without actuator max. 1.1 VA
Setpoint value signal input	0 – 10 V DC, $R_a > 200 \text{ k}\Omega$
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Static differential pressure transducer VFP-100

Static differential pressure transducer VFP-100

Supply voltage	from the controller
Measuring range	0 – 100 Pa
Linearity	\pm 1 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Static differential pressure transducer VFP-600

Static differential pressure transducer VFP-600

Supply voltage	from the controller
Measuring range	0 – 600 Pa
Linearity	\pm 6 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Actuator NM24A-V

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	3.5 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.710 kg



Actuator SM24A-V

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.910 kg



Spring return actuator
NF24A

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	200 – 300 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	1.91 kg



Fast-running actuator
LMQ24A-SRV-ST

Fast-running actuator LMQ24A-SRV-ST

Supply voltage	from controller VRP-M
Power rating (AC)	23 VA max.
Power rating (DC)	13 W max.
Torque	4 Nm
Running time for 90°	2.5 s
Control signal	from controller VRP-M
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.810 kg



Fast-running actuator
NMQ24A-SRV-ST

Fast-running actuator NMQ24A-SRV-ST

Supply voltage	from controller VRP-M
Power rating (AC)	23 VA max.
Power rating (DC)	13 W max.
Torque	8 Nm
Running time for 90°	4 s
Control signal	from controller VRP-M
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.970 kg

VRP-M

Constant pressure control

The differential pressure setpoint value as given in the order code is stored as Δp_{\min} in the controller. The nominal differential pressure Δp_{nom} is the reference unit.

To maximise the control accuracy, different pressure ranges with the corresponding nominal

differential pressures are used. The correct range is factory set. It is possible to change Δp_{\min} at a later stage but only within the factory set pressure range.

Variable pressure control

A setpoint value signal enables variable pressure control. The control range is Δp_{\min} to Δp_{\max} , based on the setpoint value signal 0 (2) – 10 V.

VRP-M, Pressure ranges

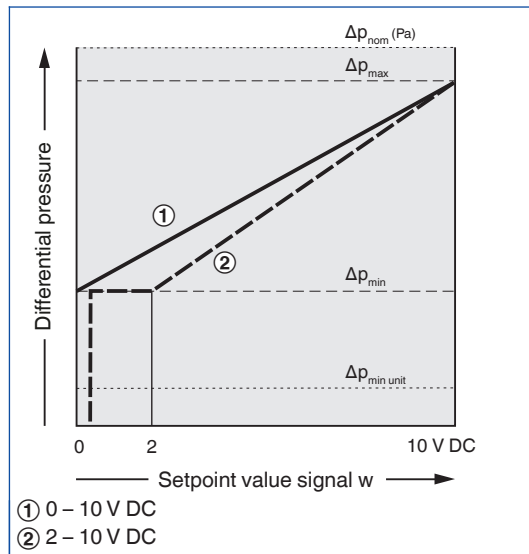
Differential pressure transducer	Δp_{limit}	Min	Max	Δp_{nom}
		①	②	
Room				
VFP 100	2.5	30	80	100
VFP 100	2.5	15	40	50
VFP 100	2.5	7.5	20	25
Duct				
VFP 600	15	180	480	600
VFP 600	7.5	90	240	300

① Min: Minimum value for Δp_{\min} and Δp_{\max}

② Max: Maximum value for Δp_{\min} and Δp_{\max}

Using a control signal also setpoint values < 30 % of Δp_{nom} can be set. Pressure values smaller than Δp_{limit} will be set to zero because they cannot be precisely controlled.

BR*, BS*, Characteristic of the setpoint value signal



GUAC-P1, GUAC-P6

Differential pressure setpoint value

0 – 10 V DC

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

BR*, BS*

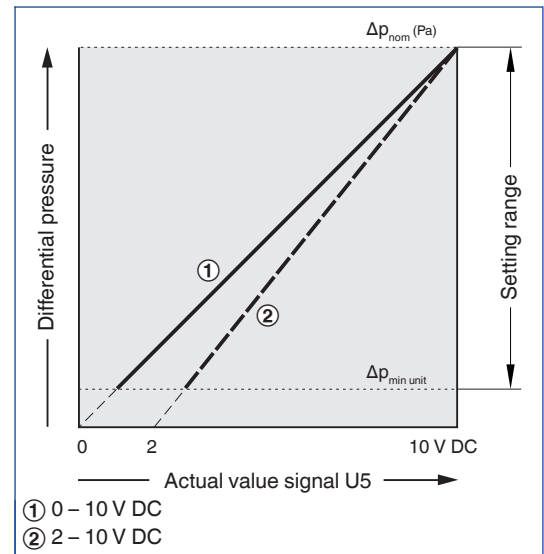
Differential pressure setpoint value

2 – 10 V DC

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

BR*, BS*

BR*, BS*, Characteristic of the actual value signal



GUAC-P1, GUAC-P6

Differential pressure actual value

0 – 10 V DC

$$\Delta p_{\text{actual}} = \frac{U5}{10} \Delta p_{\text{nom}}$$

BR*, BS*

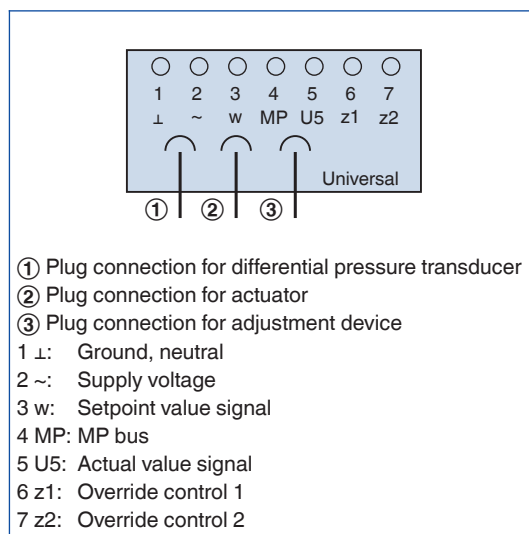
Differential pressure actual value

2 – 10 V DC

$$\Delta p_{\text{actual}} = \frac{U5-2}{8} \Delta p_{\text{nom}}$$

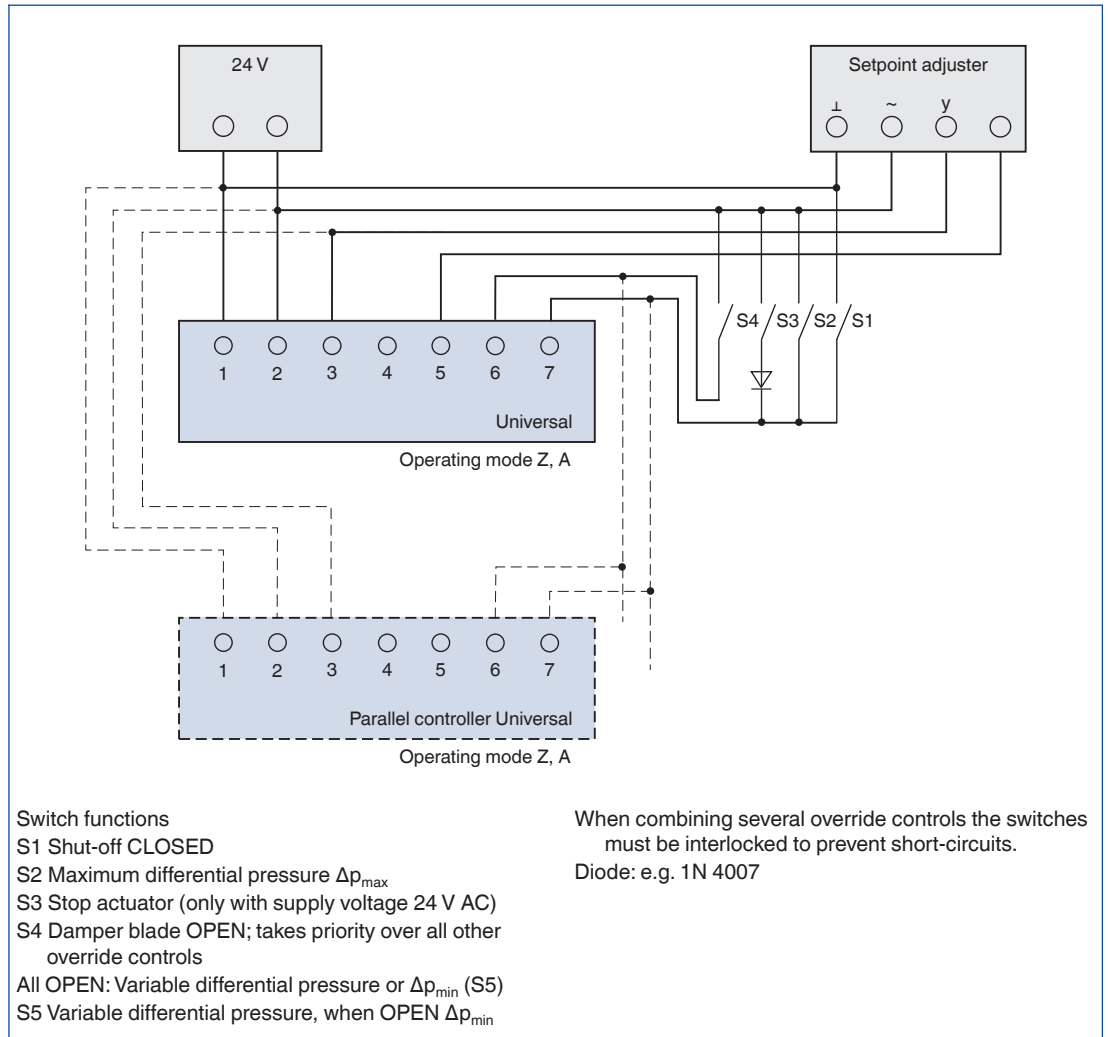
BR*, BS*

BP*, BR*, BS*, Terminal connections



Universal: VRP-M

BR*, BS*, Differential pressure control and override control



Universal: VRP-M

Application

- Electronic differential pressure controller VRP-STP, combined with a static differential pressure transducer VFP-100 or VFP-600, as Universal controller
- Variable or constant differential pressure control
- The differential pressure is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 2 – 10 V DC
- Separate inputs for override controls enable the centralised switching of groups of controllers

Construction

Differential pressure controller VRP-STP with static differential pressure transducer VFP-100

- BG3: Actuator NM24A-V for TVR, TVJ, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK
- BG1: Actuator SM24A-V-ST for TVT
- BGB: Spring return actuator NF24A-V for TVR, TVJ, TVT, TZ-Silenzio, TA-Silenzio, TVZ, TVA, TVRK

Differential pressure controller VRP-STP with static differential pressure transducer VFP-600

- BH3: Actuator NM24A-V for TVR, TVJ, TVRK
- BH1: Actuator SM24A-V-ST for TVT
- BHB: Spring return actuator NF24A-V for TVR, TVJ, TVT, TVRK

Signal voltage ranges

- 2: 2 – 10 V DC

Operating modes

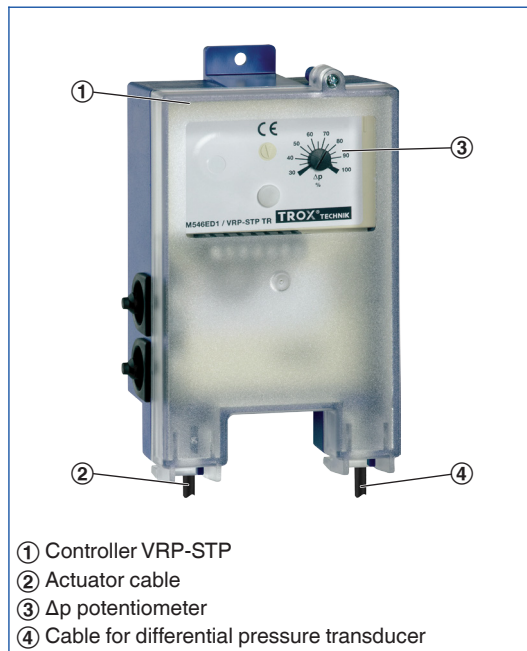
- Z: Supply air
- A: Extract air

Factory settings are as follows: Differential pressure Δp_{\min} as ordered and for room pressure controllers the adequate Δp_{nom} . The effective pressure sensor of the VAV terminal unit is short circuited.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered differential pressures
- Tubing of the static differential pressure transducer by others
- For positive room pressure: Connect room pressure to Plus, reference room to Minus
- For negative room pressure: Connect room pressure to Minus, reference room to Plus
- For supply air duct pressure: Connect static pressure of the duct to Plus
- For extract air duct pressure: Connect static pressure of the duct to Minus
- After successful installation, tubing and wiring the controller is ready for use
- Carry out zero point correction for the controller and adapt the actuator.
- The differential pressure settings can be adjusted at a later stage using a potentiometer

BG*



Setting Δp

The Δp potentiometer is used to set the required differential pressure. For variable control the pressure can be limited to the maximum value Δp ; this value is maintained as long as the input signal is 10 V DC.

The percentages relate to the nominal differential pressure (Δp_{nom}). The setting range is from 30 – 80 %.



Differential pressure controller VRP-STP

Differential pressure controller VRP-STP

Supply voltage (AC)	24 V AC \pm 20 %, 50/60 Hz
Power rating (AC)	including static differential pressure transducer, without actuator max. 2.6 VA
Setpoint value signal input	2 – 10 V DC, $R_a > 100$ k Ω
Actual value signal output	2 – 10 V DC linear, max. 0.5 mA
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Static differential pressure transducer VFP-100

Static differential pressure transducer VFP-100

Supply voltage	from the controller
Measuring range	0 – 100 Pa
Linearity	\pm 1 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Static differential pressure transducer VFP-600

Static differential pressure transducer VFP-600

Supply voltage	from the controller
Measuring range	0 – 600 Pa
Linearity	± 6 Pa
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Actuator NM24A-V

Actuators NM24A-V and NM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	3.5 W max.
Torque	10 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.710 kg



Actuator SM24A-V

Actuators SM24A-V and SM24A-V-ST

Supply voltage	from the controller
Power rating (AC)	6 VA max.
Power rating (DC)	4 W max.
Torque	20 Nm
Running time for 90°	150 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	0.910 kg



Spring return actuator
NF24A

Spring return actuators NF24A-V and NF24A-V-ST

Supply voltage	from the controller
Power rating (AC)	9 VA max.
Power rating (DC)	6.5 W max.
Torque	10 Nm
Running time for 90°	200 – 300 s
Spring return time	< 20 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54
EC conformity	EMC according to 2014/30/EU
Weight	1.91 kg

VRP-STP

Constant pressure control

The differential pressure setpoint value that has been ordered (order code) is factory set as Δp in the controller. The nominal differential pressure Δp_{nom} is the reference unit. To maximise the control accuracy, different pressure ranges with the corresponding nominal

differential pressures are used. The correct range is factory set. It is possible to change Δp at a later stage but only within the factory set pressure range.

Variable pressure control

A setpoint value signal enables variable pressure control. The control range is from Δp_{limit} to Δp_{max} .

VRP-STP, Pressure ranges

Differential pressure transducer	Δp_{limit}	Min	Max	Δp_{nom}
		①	②	
Room				
VFP 100	2.5	30	80	100
VFP 100	2.5	15	40	50
VFP 100	2.5	7.5	20	25
Duct				
VFP 600	15	180	480	600
VFP 600	7.5	90	240	300

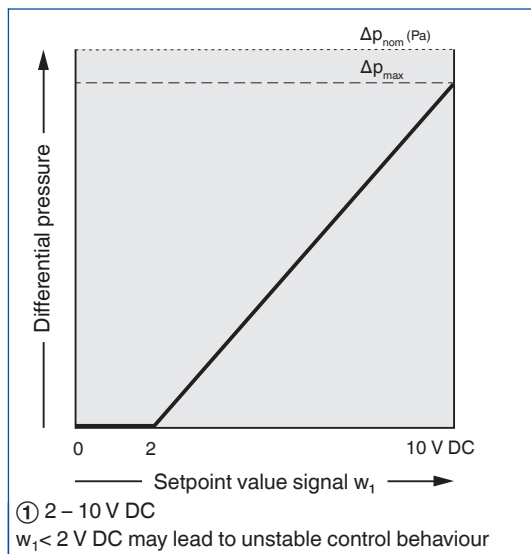
① Min: Minimum value (10 V) for Δp

② Max: Maximum value (10 V) for Δp

Using a control signal also setpoint values < 30 % of Δp_{nom} can be set. Pressure values smaller than Δp_{limit} will be set to zero because they cannot be precisely controlled.

Variable pressure control requires that the link between terminals 2 and 4 is removed.

BG*, BH*, Characteristic of the setpoint value signal



VRP-STP

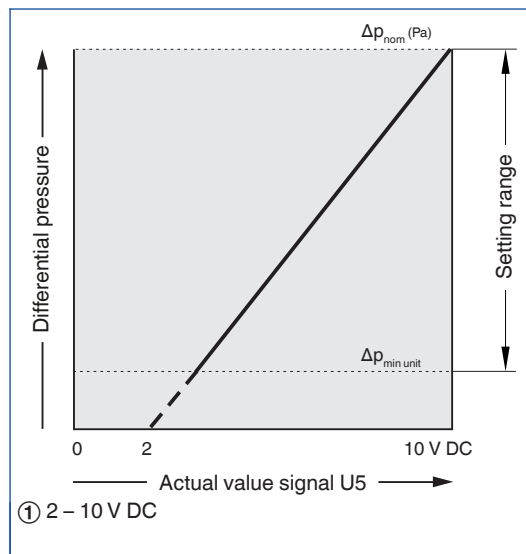
Differential pressure setpoint value

2 – 10 V DC

$$\Delta p_{\text{setpoint}} = \frac{w_1 - 2}{8} \Delta p_{\text{max}}$$

BG*, BH*

BG*, BH*, Characteristic of the actual value signal



VRP-STP

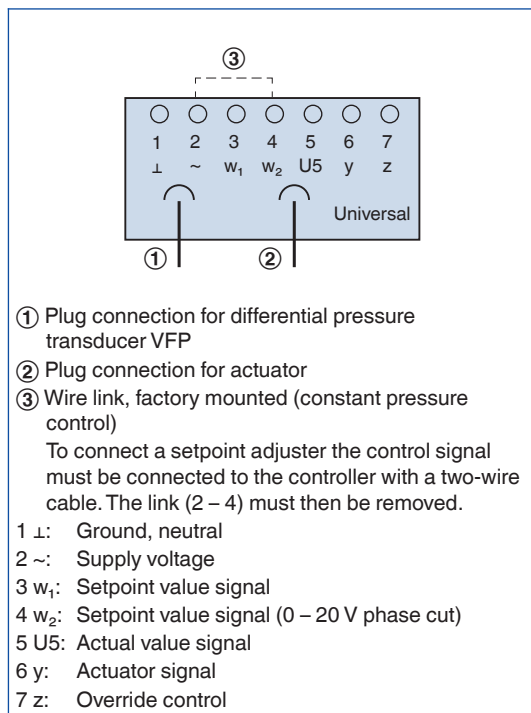
Differential pressure actual value

2 – 10 V DC

$$\Delta p_{\text{actual}} = \frac{U5 - 2}{8} \Delta p_{\text{nom}}$$

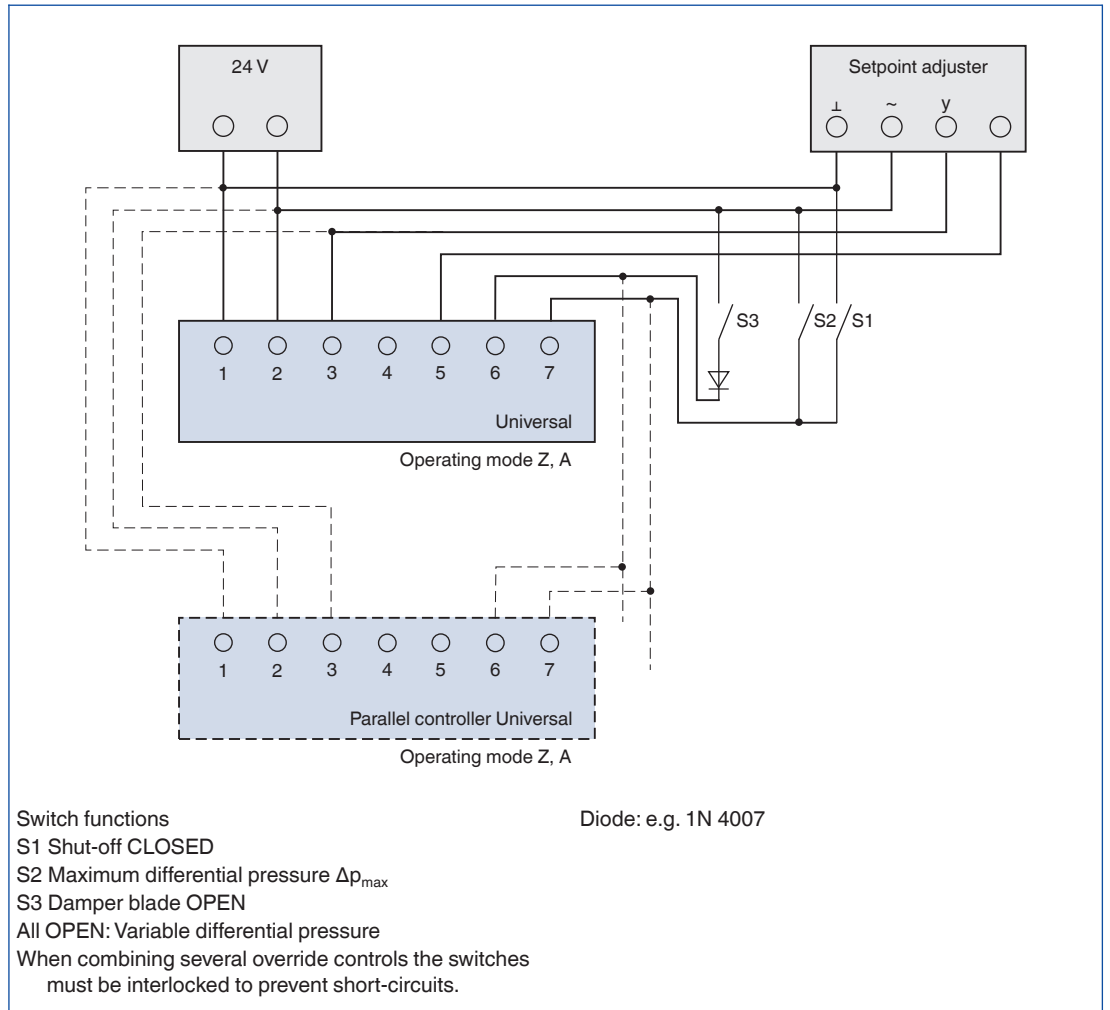
BR*, BS*

BG*, BH*, Terminal connections



Universal: VRP-STP

BG*, BH*, Differential pressure control including parallel control and override control



Universal: VRP-STP

Application

- Electronic volume flow controller GUAC-S3 with integral static differential pressure transducer
- Variable or constant differential pressure control
- The differential pressure is measured using the static measurement principle
- Voltage range for the actual and setpoint value signals 0 – 10 V DC or 2 – 10 V DC

Construction

Volume flow controller GUAC-P1

- XE1: Actuator 227-024-08-V for TVR, TVJ, TVT, TVRK
- XE3: Spring return actuator 361C-024-20-V/ST07 for TVR, TVJ, TVT, TVRK

Volume flow controller GUAC-P6

- XF1: Actuator 227-024-08-V for TVR, TVJ, TVT, TVRK
- XF3: Spring return actuator 361C-024-20-V/ST07 for TVR, TVJ, TVT, TVRK

Signal voltage ranges

- 0: 0 – 10 V DC
- 2: 2 – 10 V DC with shut-off function (< 0.8 V DC)

Operating modes

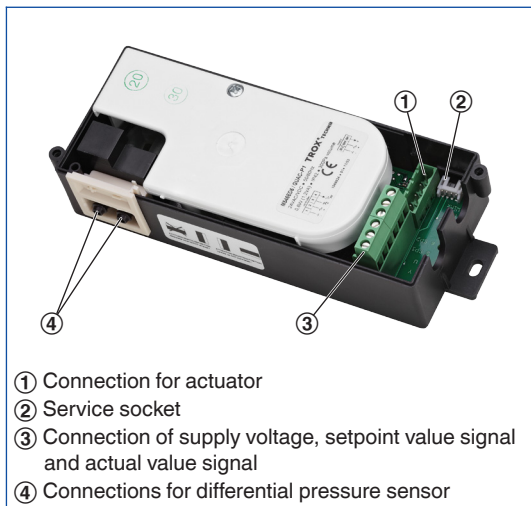
- Z: Supply air
- A: Extract air

The required differential pressure is set at the factory. The effective pressure sensor of the VAV terminal unit is short circuited.

Commissioning

- On-site adjusting is not required
- When installing the VAV terminal units it is important to assign each room the correct unit based on the ordered differential pressures
- Tubing of the static differential pressure transducer by others
- For positive room pressure: Connect room pressure to Plus, reference room to Minus
- For negative room pressure: Connect room pressure to Minus, reference room to Plus
- For supply air duct pressure: Connect static pressure of the duct to Plus
- For extract air duct pressure: Connect static pressure of the duct to Minus
- After successful installation, tubing and wiring the controller is ready for use
- Carry out zero point correction for the controller using adjustment device AT-VAV-G
- The differential pressure settings can be adjusted at a later stage using an adjustment device

XE*, XF*





Differential pressure controller GUAC-P1

Differential pressure controller GUAC-P1

Supply voltage (AC)	24 V AC \pm 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC \pm 20 %
Power rating (AC)	without actuator max. 1.2 VA
Power rating (DC)	without actuator max. 0.6 W
Measuring range	0 – 100 Pa
Linearity	\pm 1 Pa
Setpoint value signal input	0 – 10 V DC, $R_a >$ 100 k Ω
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Differential pressure controller GUAC-P6

Differential pressure controller GUAC-P6

Supply voltage (AC)	24 V AC \pm 20 %, 50/60 Hz
Supply voltage (DC)	24 V DC \pm 20 %
Power rating (AC)	without actuator max. 1.2 VA
Power rating (DC)	without actuator max. 0.6 W
Measuring range	0 – 600 Pa
Linearity	\pm 6 Pa
Setpoint value signal input	0 – 10 V DC, $R_a >$ 100 k Ω
Actual value signal output	0 – 10 V DC, 0.5 mA max.
IEC protection class	III (protective extra-low voltage)
Protection level	IP 42
EC conformity	EMC according to 2014/30/EU



Actuator 227-024-08-V

Actuator 227-024-08-V

Supply voltage	from the controller
Power rating (AC)	3 VA max.
Power rating (DC)	2 W max.
Torque	8 Nm
Running time for 90°	60 – 120 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2014/30/EU
Weight	0.530 kg



Spring return actuator 361C-024-20-V/ST07

Spring return actuator 361C-024-20-V

Supply voltage	from the controller
Power rating (AC)	10 VA max.
Power rating (DC)	8 W max.
Torque	20 Nm
Running time for 90°	150 s
Spring return time	< 15 s
Control signal	from the controller
IEC protection class	III (protective extra-low voltage)
Protection level	IP 54 (cable entry at the bottom)
EC conformity	EMC according to 2014/30/EU
Weight	1.8 kg

GUAC-P1, GUAC-P6

Constant pressure control

The differential pressure setpoint value as given in the order code is stored as Δp_{\min} in the controller. The nominal differential pressure Δp_{nom} is the reference unit.

To maximise the control accuracy, different pressure ranges with the corresponding nominal

differential pressures are used. The correct range is factory set. It is possible to change Δp_{\min} at a later stage but only within the factory set pressure range.

Variable pressure control

A setpoint value signal enables variable pressure control. The control range is Δp_{\min} to Δp_{\max} , based on the setpoint value signal 0 (2) – 10 V.

GUAC-P*, Pressure ranges

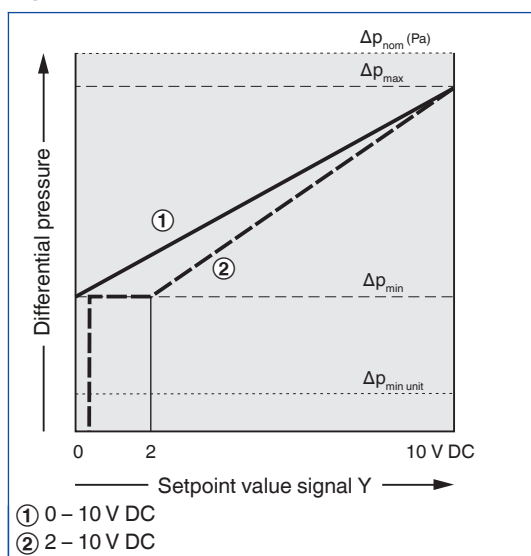
Differential pressure transducer	Δp_{limit}	Min	Max	Δp_{nom}
		①	②	
Room				
GUAC-P1	2.5	30	80	100
GUAC-P1	2.5	15	40	50
GUAC-P1	2.5	7.5	20	25
Duct				
GUAC-P6	15	180	480	600
GUAC-P6	7.5	90	240	300

① Min: Minimum value for Δp_{\min}

② Max: Maximum value for Δp_{\min} and Δp_{\max}

Using a control signal also setpoint values < 30 % of Δp_{nom} can be set. Pressure values smaller than Δp_{limit} will be set to zero because they cannot be precisely controlled.

XE*, XF*, Characteristic of the setpoint value signal



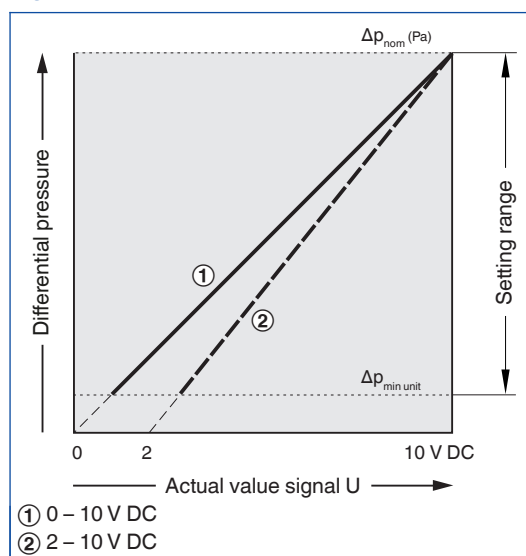
GUAC-P1, GUAC-P6

Differential pressure setpoint value

$$\Delta p_{\text{setpoint}} = \frac{Y}{10} (\Delta p_{\max} - \Delta p_{\min}) + \Delta p_{\min}$$

XE*, XF*

XE*, XF*, Characteristic of the actual value signal



GUAC-P1, GUAC-P6

Differential pressure actual value

$$\Delta p_{\text{actual}} = \frac{U}{10} \Delta p_{\text{nom}}$$

XE*, XF*

Differential pressure setpoint value

2 – 10 V DC
$\Delta p_{\text{setpoint}} = \frac{U - 2}{8} (\Delta p_{\text{max}} - \Delta p_{\text{min}}) + \Delta p_{\text{min}}$

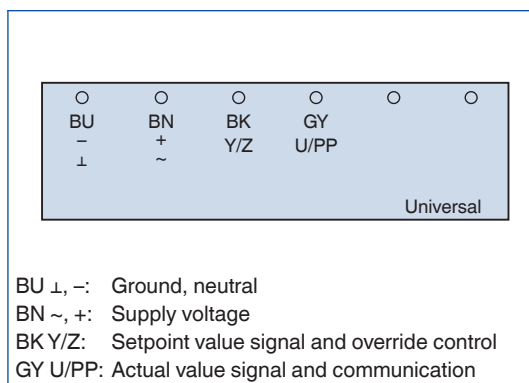
XE*, XF*

Differential pressure actual value

2 – 10 V DC
$\Delta p_{\text{actual}} = \frac{U - 2}{8} \Delta p_{\text{nom}}$

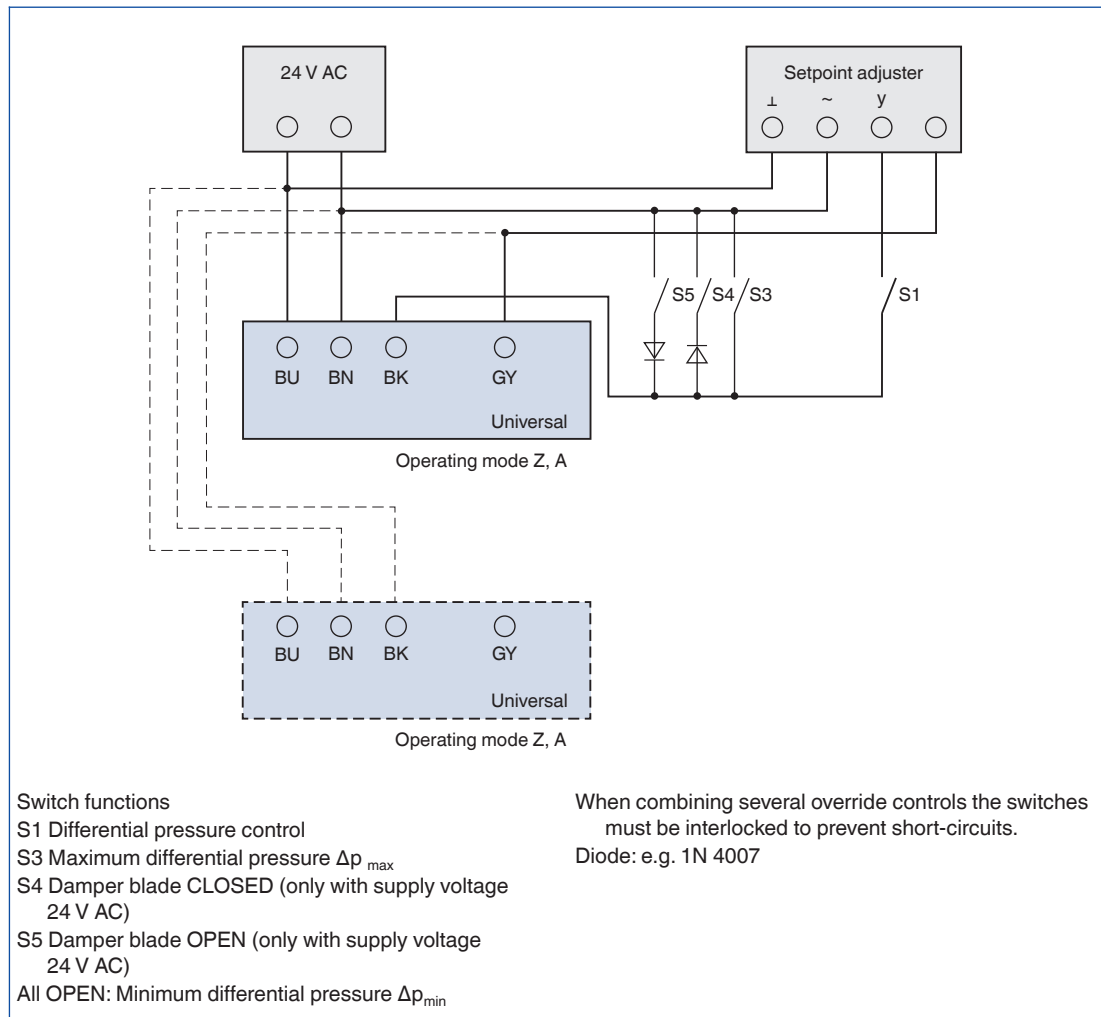
XE*, XF*

XC*, XD*, XE*, XF*, Terminal connections



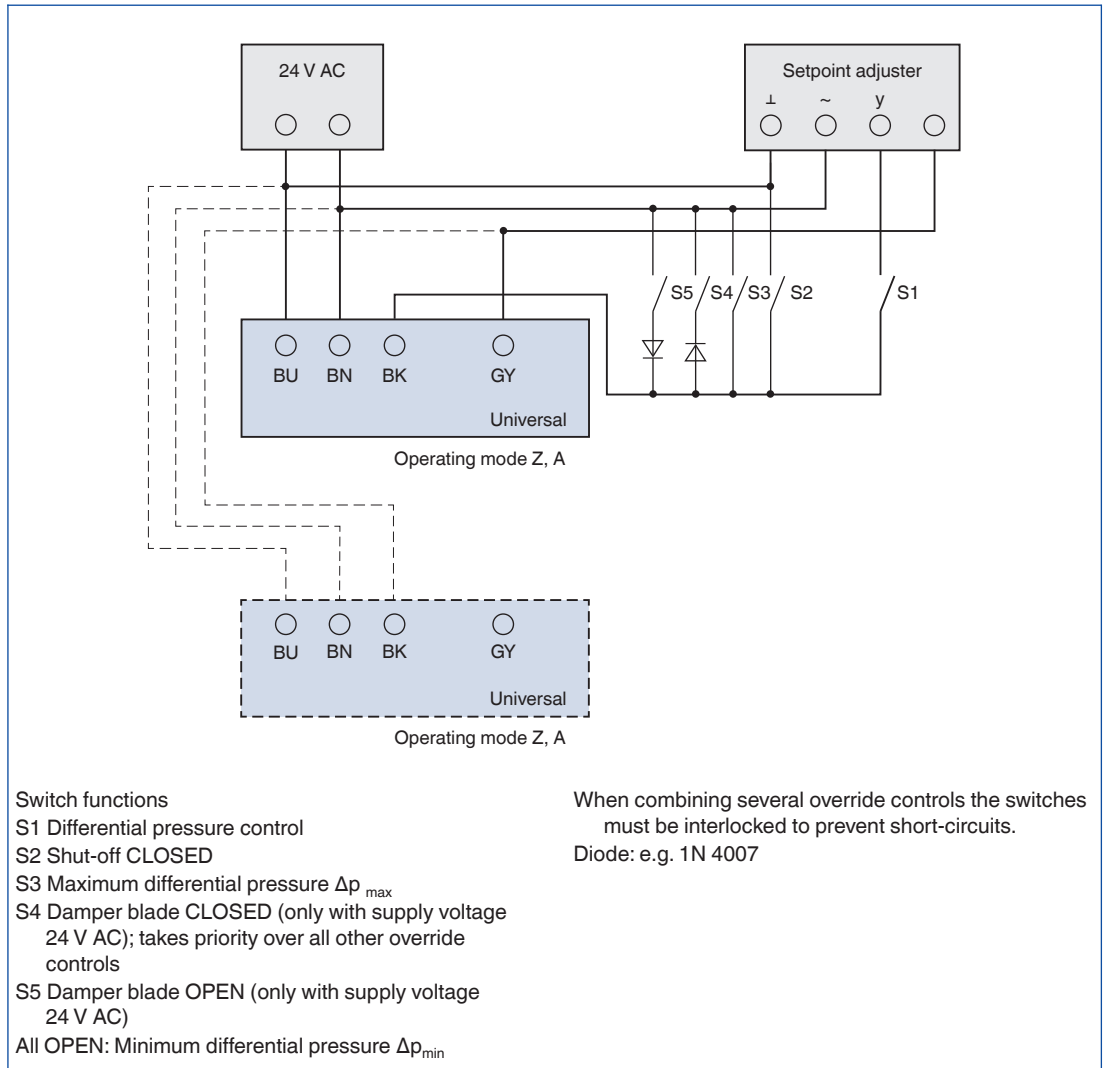
Universal: GUAC-D3, GUAC-S3, GUAC-P1, GUAC-P6

XE*, XF*, Differential pressure control and override control, voltage signal 0 – 10 V DC



Universal: GUAC-P1, GUAC-P6

XE*, XF*, Differential pressure control and override control, voltage signal 2 – 10 V DC



Universal: GUAC-P1, GUAC-P6