

Adjustment devices for VAV terminal units

Type Adjustment devices



For service and commissioning

Adjustment devices for the service and commissioning of VAV terminal units. For the display of actual values and parameters, and for functional tests.

- Display of actual and setpoint values
- Display and changing of parameters and operating modes
- Easy plug connection to the controller or terminal connection to the switch cabinet
- Easy operation
- Portable devices for use on site

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Description

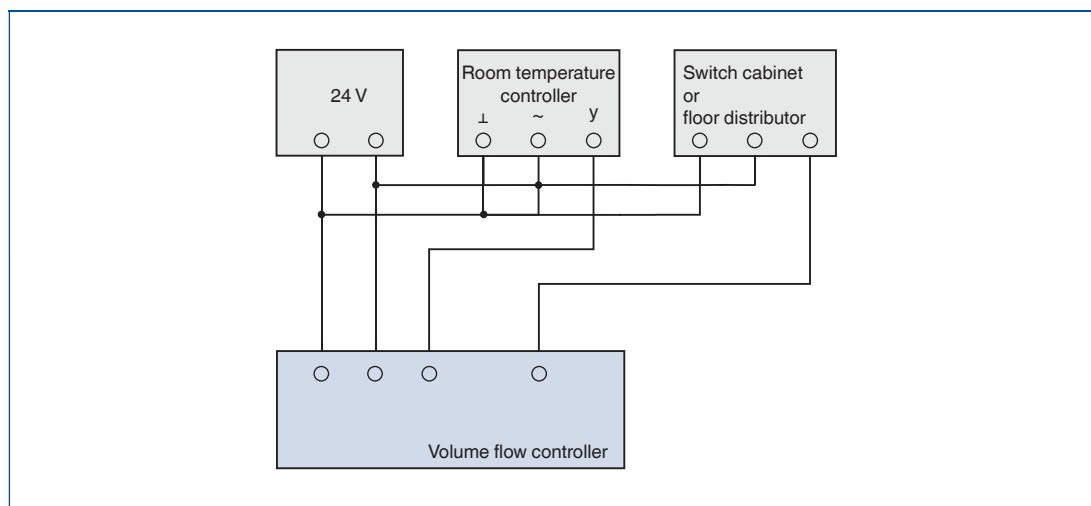
Application

- Adjustment devices for VAV terminal units, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change parameters
- Read and set operating modes
- Functional test

Installation and commissioning

- Recommendation: The signal line for the individual adjustment devices should be connected in an easily accessible place; this avoids having to open any false ceilings for inspection or service at a later stage
- Easily accessible places include: switch cabinet, floor distribution box, or an unused terminal on the room temperature controller
- Important: The ground (and perhaps 24 V) must also be available.

Wire connection to an additional service terminal in the switch cabinet



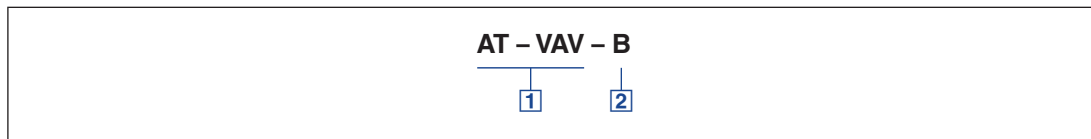
Function

Functional description

The adjustment device communicates with the controller using the voltage signal line for the actual value or setpoint value. The adjustment device recognises the controller type and allows access to the available operating values and parameters. The values are displayed. Operation is with push buttons.

Order code

AT



1 Type

AT-VAV Adjustment devices
for VAV terminal units

2 Variants

- B** ZTH-EU for TROX/Belimo
volume flow controllers
- G** for TROX/Gruner volume flow controllers
- S** AST10 for Siemens volume flow controllers

Order example

AT-VAV - S

Adjustment device for volume flow controllers

Siemens

Description

1

Application

- Adjustment device ZTH-EU for VAV terminal units with TROX/Belimo volume flow controllers, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change \dot{V}_{\min} and \dot{V}_{\max}
- Read and change signal voltage ranges
- Read and change the operating mode
- Reset parameters to the factory settings
- MP bus test
- Measure and display the supply voltage
- Integral ZIP-USB interface to connect the device to a notebook on which the Belimo PC tool is installed

Compatible volume flow controllers

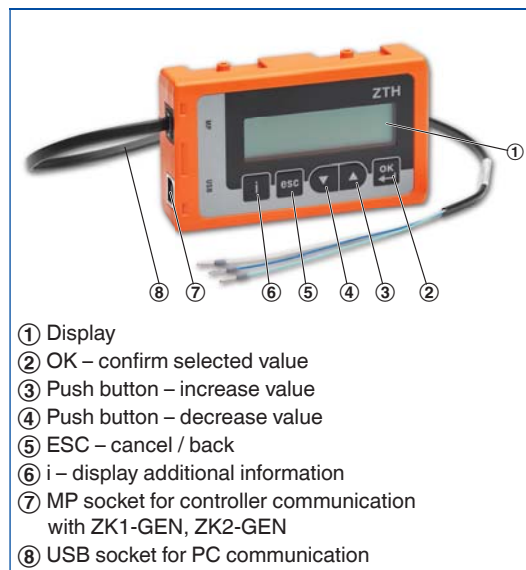
The volume flow controllers are attachments for VAV terminal units.

- BC0; BF0: LMV-D*-MP, NMV-D*-MP
- BL0: LMV-D3LON
- BM0: LMV-D3-MOD*, NMV-D3-MOD*
- BP1, BP3, BPB, BPG; BR1, BR3, BRB, BRG; BS1, BS3, BSB, BSG: VRP-M
- B11, B13, B1B; B27: VRD3

Parts and characteristics

- Adjustment device ZTH-EU
- Cable 1 (ZK1-GEN) with Belimo plug, for the controller
- Cable 2 (ZK2-GEN) with bare wire ends that can be connected to terminals
- Cable with USB 2.0 plug that can be connected to PCs with the Belimo PC tool

AT-VAV-B

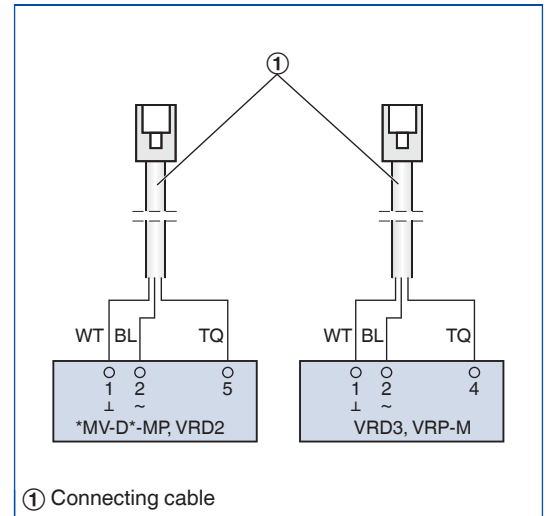


Electrical connection

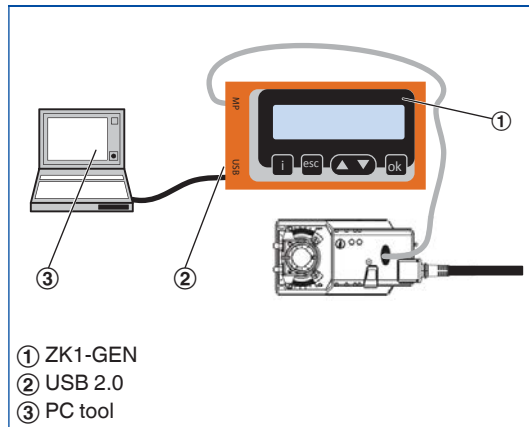
Plug connection to the controller



Terminal connection to the controller or switch cabinet



Connection to the PC tool



Description

1

Application

- Adjustment device GUIV-A for VAV terminal units with TROX/Gruner volume flow controllers, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change V_{\min} and V_{\max}
- Read and change signal voltage ranges
- Read and change the operating mode
- Reset parameters to the factory settings
- Integral interface (replaces GUIV-S) for the connection to a notebook with Gruner VAV Tool Software installed

Compatible volume flow controllers

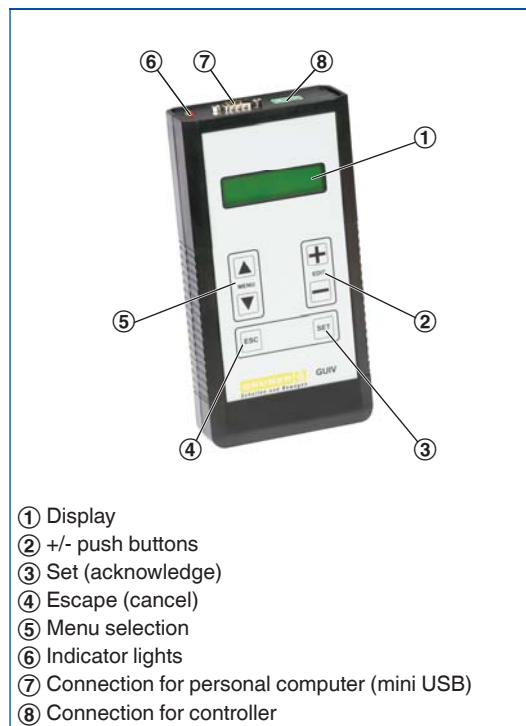
The volume flow controllers are attachments for VAV terminal units.

- XB0, XG0: 227V-024-**, 227P-024-**
- XC3: GUAC-D3, GUAC-DM3
- XD1, XD3: GUAC-S3, GUAC-SM3
- XE1, XE3: GUAC-P1, GUAC-PM1
- XF1, XF3: GUAC-P6, GUAC-PM6

Parts and characteristics

- Adjustment device
- Cable 1 with plug for the controller
- Connecting cable 2 with two bare wire ends that can be connected to terminals

AT-VAV-G

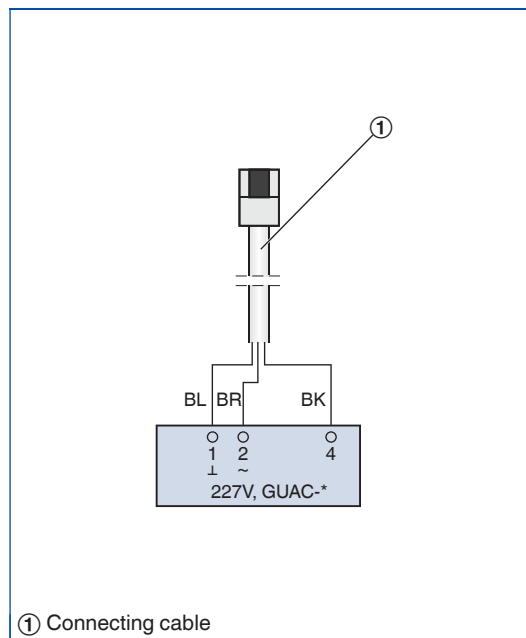


Electrical connection

Plug connection to the controller



Terminal connection to the controller or switch cabinet



Description

Application

- Adjustment device Type AST10 for VAV terminal units with Siemens volume flow controllers, used to facilitate service and commissioning
- Read actual values and setpoint values
- Read and change \dot{V}_{\min} and \dot{V}_{\max}
- Read and change the operating mode
- Reset parameters to the factory settings

Compatible volume flow controllers

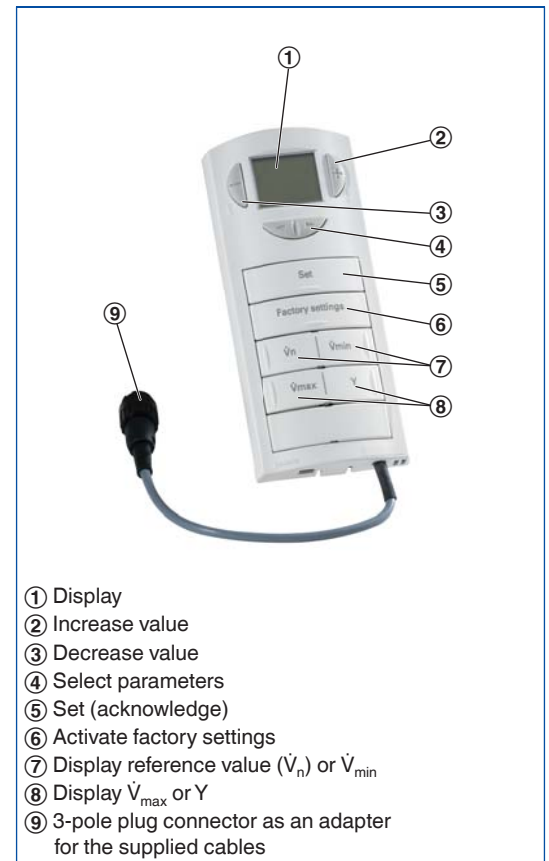
The volume flow controllers are attachments for VAV terminal units.

- LN0, LY0: GLB181.1E/3
- LK0: GLB181.1E/KN

Parts and characteristics

- Adjustment device
- Cable 1 with 3-pole socket and 6-pole plug connector for controllers up to Type D
- Cable 2 with 3-pole socket and 7-pole plug connector for controllers from Type E
- Cable 3 with 3-pole socket and bare wire ends that can be connected to terminals

AT-VAV-S



- ① Display
- ② Increase value
- ③ Decrease value
- ④ Select parameters
- ⑤ Set (acknowledge)
- ⑥ Activate factory settings
- ⑦ Display reference value (\dot{V}_n) or \dot{V}_{\min}
- ⑧ Display \dot{V}_{\max} or Y
- ⑨ 3-pole plug connector as an adapter for the supplied cables

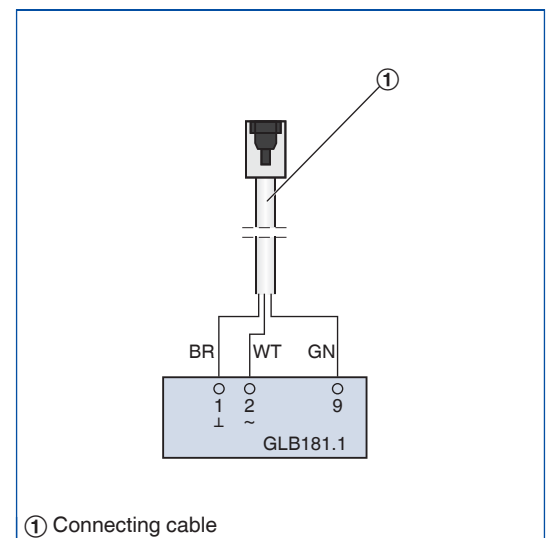
Electrical connection

Plug connection to the controller



① Individual cables

Terminal connection to the controller or switch cabinet



① Connecting cable

Variable volume flow control – VARYCONTROL 1

Basic information and nomenclature



- Product selection
- Principal dimensions
- Nomenclature
- Construction
- Correction values for system attenuation
- Measurements
- Sizing and sizing example
- Function
- Operating modes

Variable volume flow control – VARYCONTROL

Basic information and nomenclature

Product selection

1

	Type											
	LVC	TVR	TVJ	TVT	TZ-Silenzio	TA-Silenzio	TVZ	TVA	TVM	TVRK	TVLK	TVR-Ex
Type of system												
Supply air	●	●	●	●	●		●			●		●
Extract air	●	●	●	●		●		●		●	●	●
Dual duct (supply air)									●			
Duct connection, fan end												
Circular	●	●					●	●	●	●	●	●
Rectangular			●	●	●	●						
Volume flow rate range												
Up to [m ³ /h]	1080	6050	36360	36360	3025	3025	6050	6050	6050	6050	1295	6050
Up to [l/s]	300	1680	10100	10100	840	840	1680	1680	1680	1680	360	1680
Air quality												
Filtered	●	●	●	●	●	●	●		●	●	●	●
Office extract air	●	●	●	●		●		●		●	●	●
Polluted		○	○	○		○		○		●	●	○
Contaminated										●	●	
Control function												
Variable	●	●	●	●	●	●	●	●	●	●	●	●
Constant	●	●	●	●	●	●	●	●	●	●	●	●
Min/Max	●	●	●	●	●	●	●	●	●	●	●	●
Pressure control		○	○	○	○	○	○	○		○		○
Master/Slave	●	●	●	●	●	●	●	●	Master	●	●	●
Shut-off mode												
Leakage			●									
Low leakage	●	●		●	●	●	●	●	●	●	●	●
Acoustic requirements												
High < 40 dB(A)			○	○	●	●	●	●	○			
Low < 50 dB (A)	●	●	●	●	●	●	●	●	●	●	●	●
Other functions												
Volume flow rate measurement	●	●	●	●	●	●	●	●	●	●	●	●
Special areas												
Areas with explosive atmospheres												●
Labs, clean rooms, operating theatres (EASYLAB, TCU-LON II)		●	●	●			●	●		●	●	
●	Possible											
○	Possible under certain conditions: Robust unit variant and/or specific control component (attachment) or useful additional product											
	Not possible											

Variable volume flow control – VARYCONTROL

Basic information and nomenclature

Principal dimensions

ØD [mm]

VAV terminal units made of stainless steel:
Outside diameter of the spigot
VAV terminal units made of plastic:
Inside diameter of the connecting spigot

ØD₁ [mm]

Pitch circle diameter of flanges

ØD₂ [mm]

Outside diameter of flanges

ØD₄ [mm]

Inside diameter of the screw holes of flanges

L [mm]

Length of unit including connecting spigot

L₁ [mm]

Length of casing or acoustic cladding

B [mm]

Duct width

B₁ [mm]

Screw hole pitch of flange (horizontal)

B₂ [mm]

Outside dimension of flange (width)

B₃ [mm]

Width of device

H [mm]

Duct height

H₁ [mm]

Screw hole pitch of flange (vertical)

H₂ [mm]

Outside dimension of flange (height)

H₃ [mm]

Unit height

n []

Number of flange screw holes

T [mm]

Flange thickness

m [kg]

Unit weight including the minimum required attachments (e.g. Compact controller)

Nomenclature

Acoustic data

f_m [Hz]

Octave band centre frequency

L_{PA} [dB(A)]

A-weighted sound pressure level of air-regenerated noise of the VAV terminal unit, system attenuation taken into account

L_{PA1} [dB(A)]

A-weighted sound pressure level of air-regenerated noise of the VAV terminal unit with secondary silencer, system attenuation taken into account

L_{PA2} [dB(A)]

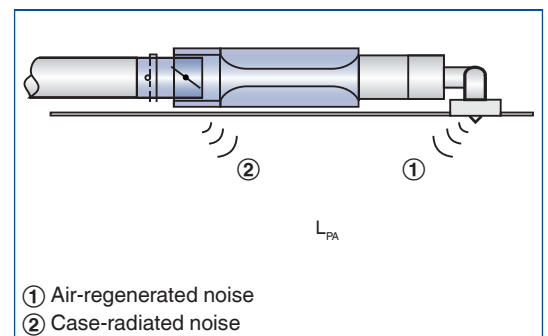
A-weighted sound pressure level of case-regenerated noise of the VAV terminal unit, system attenuation taken into account

L_{PA3} [dB(A)]

A-weighted sound pressure level of case-regenerated noise of the VAV terminal unit with acoustic cladding, system attenuation taken into account

All sound pressure levels are based on 20 µPa.

Definition of noise



Volume flow rates

\dot{V}_{nom} [m³/h] and [l/s]

Nominal volume flow rate (100 %)

- The value depends on product type and nominal size
- Values are published on the internet and in technical leaflets, and stored in the Easy Product Finder design software.
- Reference value for calculating percentages (e.g. \dot{V}_{max})
- Upper limit of the setting range and maximum volume flow rate setpoint value for the VAV terminal unit

$\dot{V}_{min unit}$ [m³/h] and [l/s]

Technically possible minimum volume flow rate

- The value depends on product type, nominal size and control component (attachment)
- Values are stored in the Easy Product Finder design software
- Lower limit of the setting range and minimum volume flow rate setpoint value for the VAV terminal unit
- Depending on the controller, setpoint values below $\dot{V}_{min unit}$ (if \dot{V}_{min} equals zero) may result in unstable control or shut-off

\dot{V}_{max} [m³/h] and [l/s]

Upper limit of the operating range for the VAV terminal unit that can be set by customers

- \dot{V}_{max} can only be smaller than or equal to \dot{V}_{nom}
- In case of analog signalling to volume flow controllers (which are typically used), the set maximum value (\dot{V}_{max}) is allocated to the setpoint signal maximum (10 V)

\dot{V}_{min} [m³/h] and [l/s]

Lower limit of the operating range for the VAV terminal unit that can be set by customers

- \dot{V}_{min} should be smaller than or equal to \dot{V}_{max}
- Do not set \dot{V}_{min} smaller than $\dot{V}_{min unit}$, otherwise the control may become unstable or the damper blade may close
- \dot{V}_{min} may equal zero
- In case of analog signalling to volume flow controllers (which are typically used), the set minimum value (\dot{V}_{min}) is allocated to the setpoint signal minimum (0 or 2 V) (see characteristic)

\dot{V} [m³/h] and [l/s]

Volume flow rate

$\Delta\dot{V}$ [± %]

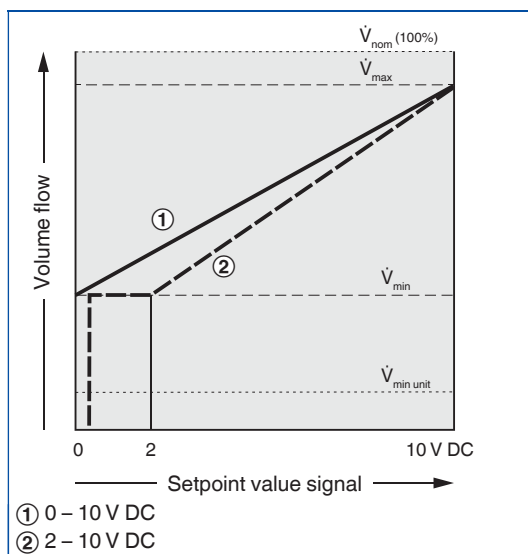
Volume flow rate tolerance from setpoint value

$\Delta\dot{V}_{warm}$ [± %]

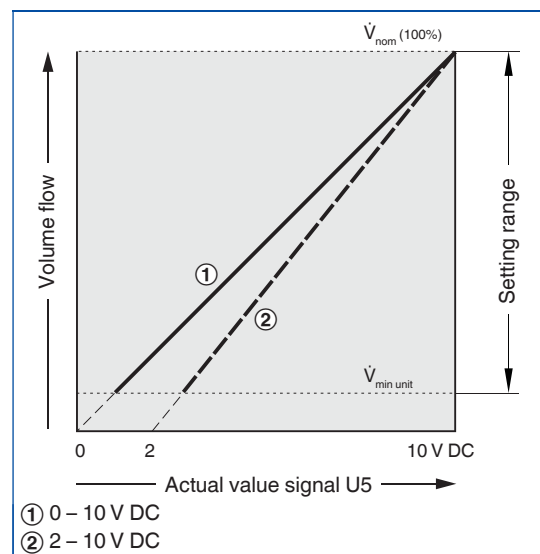
Volume flow rate tolerance

for the warm air flow of dual duct terminal units

Characteristic of the setpoint value signal



Characteristic of the actual value signal



Differential pressure

Δp_{st} [Pa]

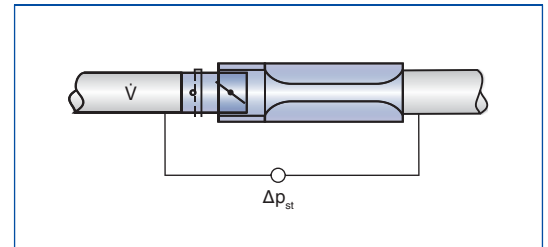
Static differential pressure

$\Delta p_{st \min}$ [Pa]

Static differential pressure, minimum

- The static minimum differential pressure is equal to the pressure loss of the VAV terminal unit when the damper blade is open, caused by flow resistance (sensor tubes, damper mechanism)
- If the pressure on the VAV terminal unit is too low, the setpoint volume flow rate may not be achieved, not even when the damper blade is open
- Important factor in designing the ductwork and in rating the fan including speed control
- Sufficient duct pressure must be ensured for all operating conditions and for all terminal units, and the measurement point or points for speed control must have been selected accordingly to achieve this

Static differential pressure



Constructions

Galvanised sheet steel

- Casing made of galvanised sheet steel
- Parts in contact with the airflow as described for the product type
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

Powder-coated surface (P1)

- Casing made of galvanised sheet steel, powder-coated RAL 7001, silver grey
- Parts in contact with the airflow are powder-coated or made of plastic
- Due to production, some parts that come into contact with the airflow may be stainless steel or aluminium, powder-coated
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

Stainless steel (A2)

- Casing made of stainless steel 1.4201
- Parts in contact with the airflow are powder-coated or made of stainless steel
- External parts, e.g. mounting brackets or covers, are usually made of galvanised sheet steel

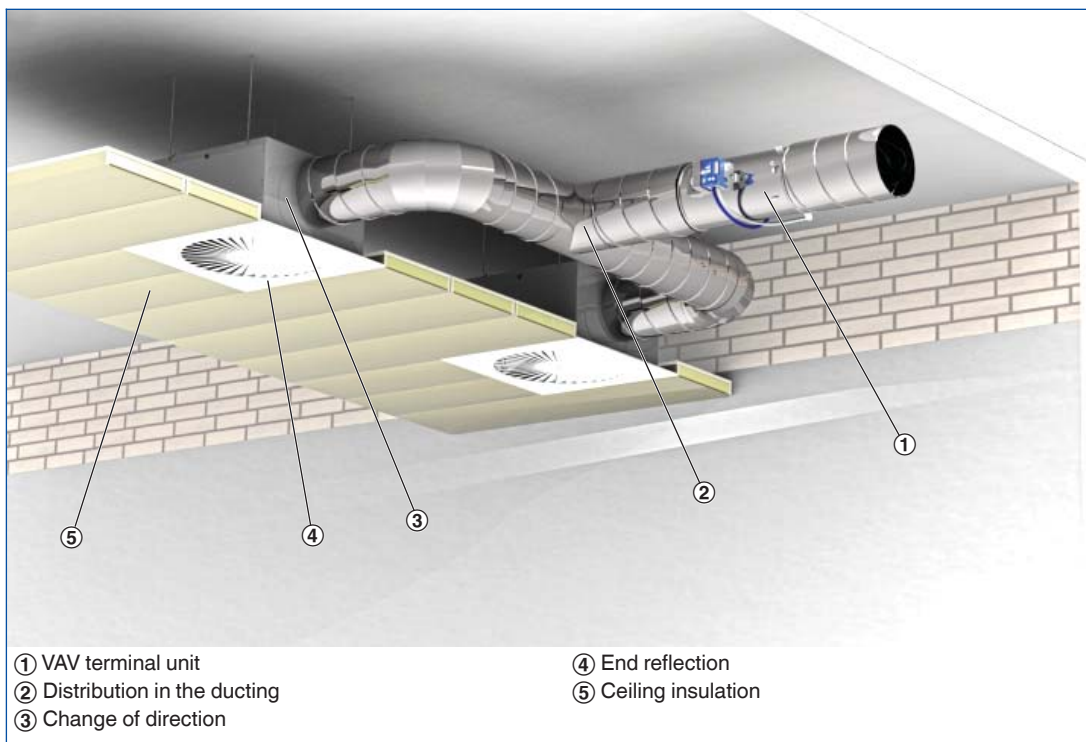
Variable volume flow control – VARYCONTROL

Basic information and nomenclature

1

The quick sizing tables show the sound pressure levels that can be expected in a room both for the air-regenerated noise and for the case-radiated noise. The sound pressure level in a room results from the sound power level of the products – for a given volume flow rate and differential pressure – and the attenuation and insulation on site. Generally accepted attenuation and insulation values have been taken into account. The distribution of air across the ductwork, changes of direction, end reflection, and room attenuation all affect the sound pressure level of the air-regenerated noise. Ceiling insulation and room attenuation influence the sound pressure level of the case-radiated noise.

Reducing the sound pressure level of the air-regenerated noise



Correction values for acoustic quick sizing

The correction values for the distribution in the ducting are based on the number of diffusers assigned to any one air terminal unit. If there is just one diffuser (assumption: 140 l/s or 500 m³/h), no correction is necessary.

Octave correction for the distribution in the ducting, used to calculate the air-regenerated noise

\dot{V} in [m ³ /h]	500	1000	1500	2000	2500	3000	4000	5000
[l/s]	140	280	420	550	700	840	1100	1400
[dB]	0	3	5	6	7	8	9	10

One change of direction, e.g. at the horizontal connection of the diffuser plenum box, has been taken into consideration for the system attenuation values. Vertical connection of the plenum box does not result in a system attenuation. Additional bends result in lower sound pressure levels.

System attenuation per octave to VDI 2081 for the calculation of the air-regenerated noise

Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
dB								
Change of direction	0	0	1	2	3	3	3	3
Mündungsreflexion	10	5	2	0	0	0	0	0
Room attenuation	5	5	5	5	5	5	5	5

The calculation is based on the end reflection for nominal size 250

Octave correction for the calculation of case-radiated noise

Centre frequency [Hz]	63	125	250	500	1000	2000	4000	8000
	ΔL							
dB								
Ceiling insulation	4	4	4	4	4	4	4	4
Room attenuation	5	5	5	5	5	5	5	5

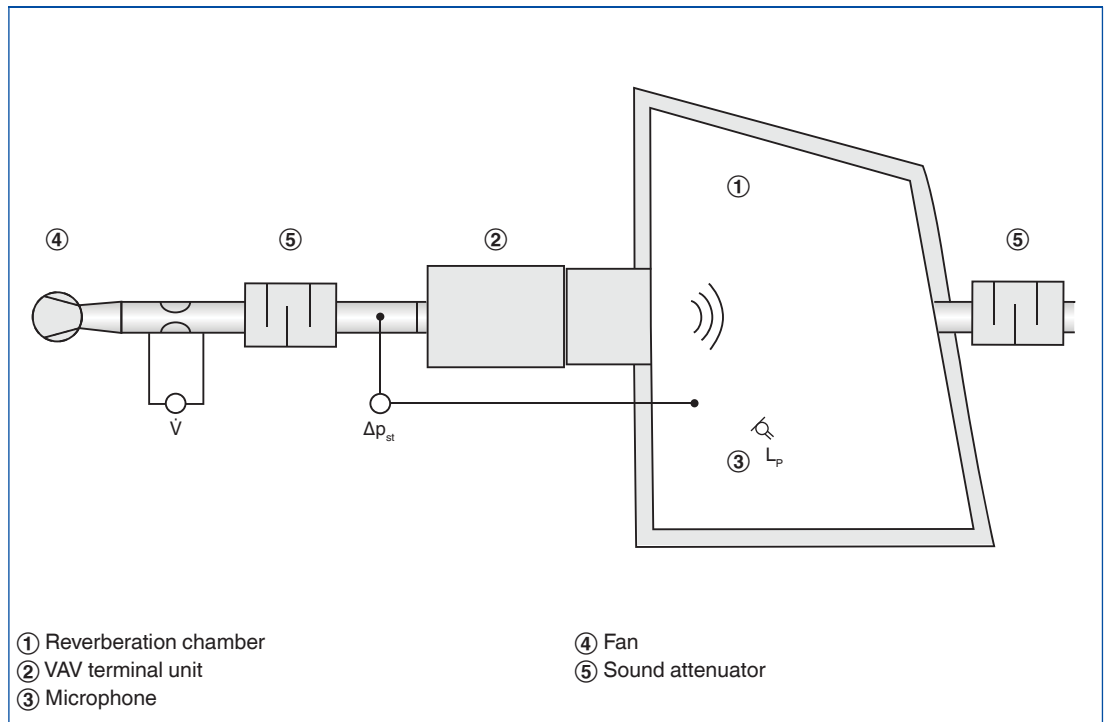
Variable volume flow control – VARYCONTROL

Basic information and nomenclature

Measurements

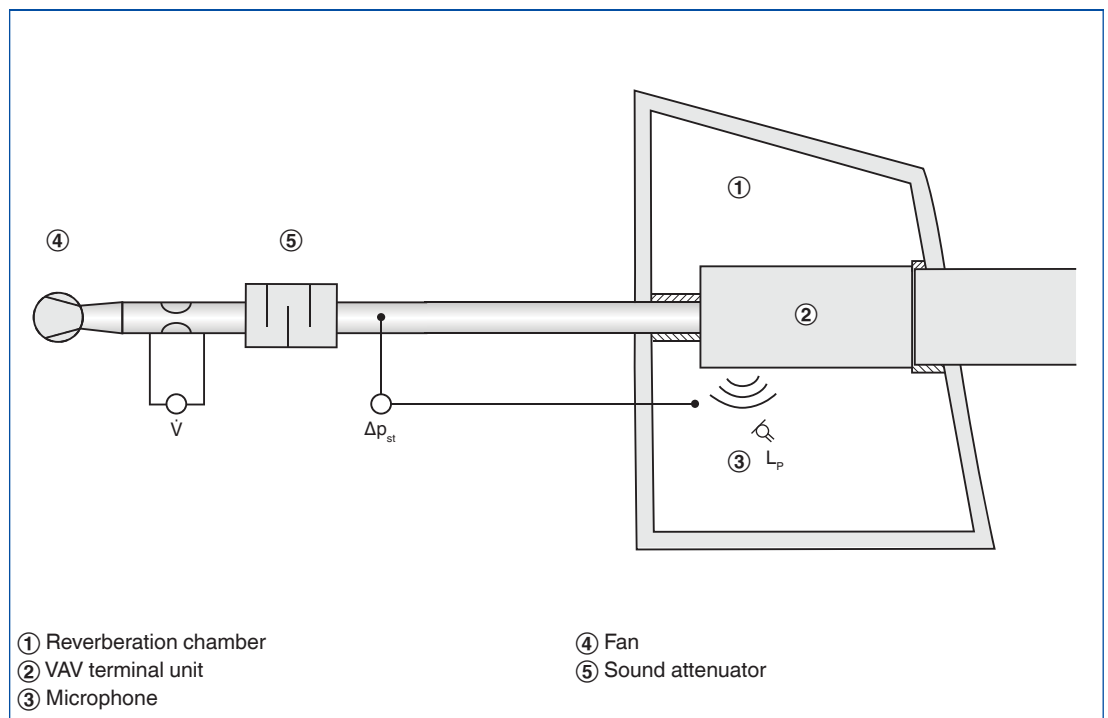
The acoustic data for the air-regenerated noise and case-radiated noise are determined according to EN ISO 5135. All measurements are carried out in a reverberation chamber to EN ISO 3741.

Measuring the air-regenerated noise



The sound pressure levels for air-regenerated noise L_{PA} given by us result from measurements in a reverberation chamber. The sound pressure L_p is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA} .

Measuring the case-radiated noise



The sound pressure levels for case-radiated noise L_{PA2} given by us result from measurements in a reverberation chamber. The sound pressure L_p is measured for the entire frequency range. The evaluation of the measurements, including system attenuation and A-weighting, results in the sound pressure level L_{PA2} .

Variable volume flow control – VARYCONTROL

Basic information and nomenclature

Sizing with the help of this catalogue

This catalogue provides convenient quick sizing tables for VAV terminal units. The sound pressure levels for air-regenerated noise and for case-radiated noise are provided for all nominal sizes. In addition, generally accepted attenuation and insulation values have been taken into account. Sizing data for other volume flow rates and differential pressures can be determined quickly and precisely using the Easy Product Finder design programme.

Sizing example

Given data

$\dot{V}_{max} = 280 \text{ l/s (1010 m}^3\text{/h)}$
 $\Delta p_{st} = 150 \text{ Pa}$
 Required sound pressure level in the room 30 dB(A)

Quick sizing

TVZ-D/200
 Air-regenerated noise $L_{PA} = 23 \text{ dB(A)}$
 Case-radiated noise $L_{PA3} = 24 \text{ dB(A)}$

Sound pressure level in the room = 27 dB(A)
 (logarithmic addition since the terminal unit is installed in the suspended ceiling of the room)

Easy Product Finder



The Easy Product Finder allows you to size products using your project-specific data.

You will find the Easy Product Finder on our website.

Berechnung | Zeichnung | Bestelldetails

Bestellschlüssel (Anklicken zum Ändern): TVZ / 200 / BCO / E0 / 144-1010 m³/h

Regelkomponente

Luftqualität: nicht belastet (verzinktes Stahlblech)
 Betriebsmedium: elektrisch
 Betriebsfunktion: stetig / analoge Ansteuerung VAV
 Ansteuerung: 0-10 VDC
 Schnelllaufend: ohne
 Sicherheitsfunktion: ohne

Regelung: BCO[VAV-Compact(0-10VDC)]LMV-D2MP

Volumenstrom

variabel | konstant

$V_{min} <$ m³/h (54...6048)
 $V_{max} <$ 1.010 m³/h (162...6048)

Volumenstrom-Regelgerät

Filter: ohne Dämmschale
 Dämmschale: ohne Dämmschale
 Schalldämpfer: ohne und mit

Serie	Abmessung	V_{min} [m³/h]		V_{max} [m³/h]		L_p [dB(A)]	
		von	bis	von	bis	Strömungsgeräusch	Abstrahlgeräusch
▶ TVZ	200	144	1458	432	1458	23	31
TVZ+TS	200	144	1458	432	1458	18	31
TVZ	250	216	2214	666	2214	18	26
TVZ+TS	250	216	2214	666	2214	<15	26

Anwendung/Foto/Video

Produktfoto:

Akustische Eingabedaten

L_p Strömung $<$ 23 dB(A)
 L_p Abstrahlung $<$ 31 dB(A)
 Δp_{st} 150 Pa (100...1000)

Akustische Ergebnisse

Daten | Lw Strö... | Lw Abst... | De

Variable volume flow control – VARYCONTROL

Basic information and nomenclature

Function

1

Volume flow control

The volume flow rate is controlled in a closed loop. The controller receives from the transducer the actual value that results from the effective pressure. For most applications, the setpoint value comes from a room temperature controller. The controller compares the actual value with the setpoint value and alters the command signal of the actuator if there is a difference between the two values.

Correction of duct pressure changes

The controller detects and corrects changes of the duct pressure that may occur, for example, due to volume flow rate changes from other units. Pressure changes will therefore not affect the room temperature.

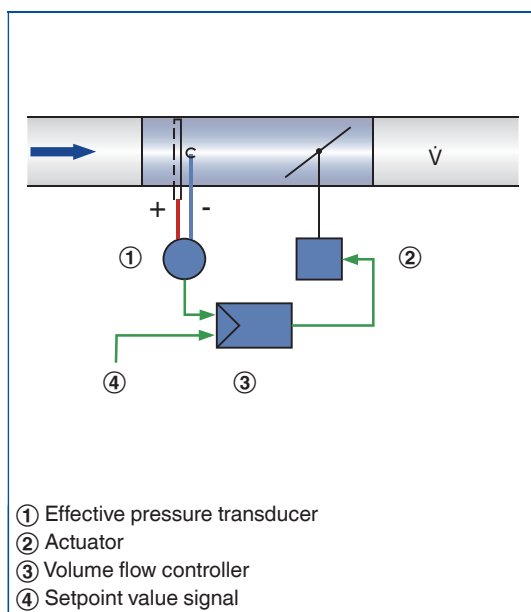
Variable volume flow

If the input signal is changed, the controller adjusts the volume flow rate to the new setpoint. The variable volume flow rate range is limited, i.e. there is a minimum value and a maximum value. This control strategy can be overridden, e.g. by shutting off the duct.

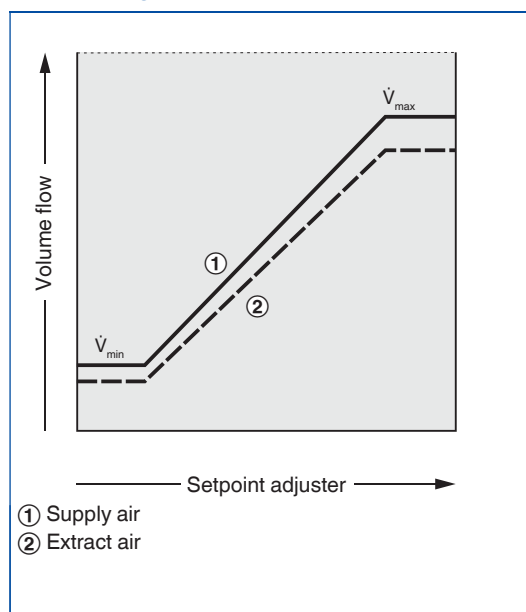
Supply/extract air tracking control

In individual rooms and closed-off office areas, where the balance between supply and extract air flow rate has to be maintained. Otherwise, annoying whistling noises can occur at door gaps, and the doors can be difficult to open. For this reason, the extract air should also have variable control in a VAV system. The supply air actual value (for dual duct terminal units the actual value signal of the warm air controller) is signalled to the extract air controller (slave controller) as setpoint signal. As a consequence, the extract air always follows the supply air.

Control loop



Control diagram

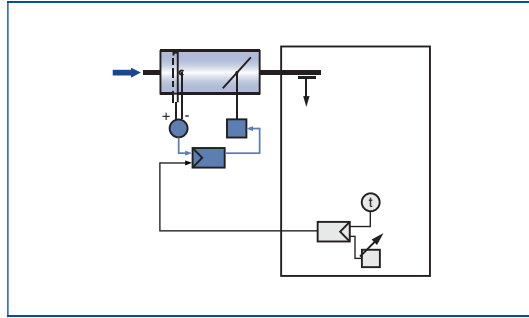


Variable volume flow control – VARYCONTROL

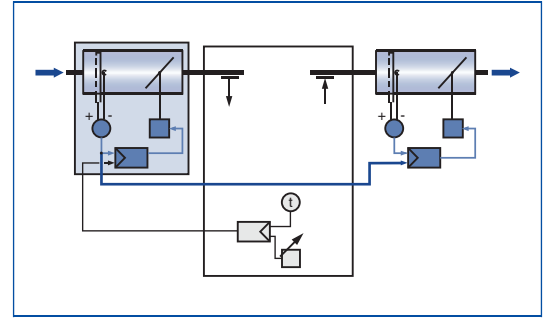
Basic information and nomenclature

Operating modes

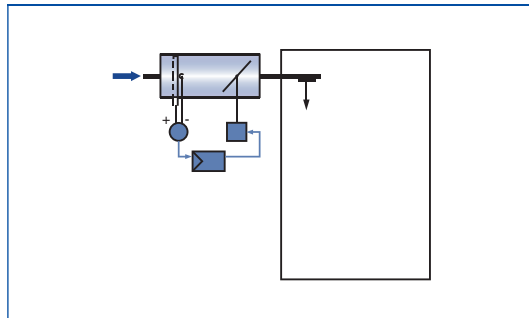
Single operation



Slave operation (master)



Constant value



Slave operation (slave)

