



Easy controller



Compact controller



Circular connection
on the fan end



Rectangular connection
on the room end



Tested to VDI 6022

VAV terminal units

Type TVA



For extract air systems with demanding acoustic requirements

VAV terminal units for the extract air control in buildings with variable air volume systems and demanding acoustic requirements

- Highly effective integral attenuator
- Box style construction for the reduction of the airflow velocity
- Electronic control components for different applications (Easy, Compact, Universal, and LABCONTROL)
- Suitable for airflow velocities up to 13 m/s
- Closed blade air leakage to EN 1751, class 4
- Casing air leakage to EN 1751, class A

Optional equipment and accessories

- Acoustic cladding for the reduction of case-radiated noise
- Secondary silencer Type TS for the reduction of air-regenerated noise

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Variants

Product examples

VAV terminal unit, variant TVA



VAV terminal unit, variant TVA-D



Description

For detailed information on control components see Chapter K5 – 1.3.

For detailed information on the LABCONTROL control system see the Control Systems catalogue.

Application

- VARYCONTROL VAV terminal units of Type TVA for the extract air flow control in variable air volume systems
- Closed-loop volume flow control using an external power supply
- Integral attenuator for demanding acoustic requirements
- Shut-off by means of switching (equipment supplied by others)

Variants

- TVA: Extract air unit
- TVA-D: Extract air unit with acoustic cladding
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Nominal sizes

- 125, 160, 200, 250, 315, 400

Attachments

- Easy controller: Compact unit consisting of controller with potentiometers, differential pressure transducer and actuator
- Compact controller: Compact unit consisting of controller, differential pressure transducer and actuator
- Universal controller: Controller, differential pressure transducer and actuators for special applications
- LABCONTROL: Control components for air management systems

Accessories

- Lip seal (factory fitted)

Useful additions

- Secondary silencer Type TS

Special features

- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary

Parts and characteristics

- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging differential pressure sensor for volume flow rate measurement
- Damper blade
- Integral attenuator
- Factory-assembled control components complete with wiring and tubing
- Aerodynamic function testing on a special test rig prior to shipping of each unit
- Set-up data is given on a label or volume flow rate scale affixed to the unit
- High control accuracy even in case of unfavourable upstream conditions

Construction features

- Rectangular casing
- Spigot on the fan end suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for lip seal
- Connection on the room end suitable for air duct profiles
- Baffle plate is fitted after the damper blade for optimum aerodynamic performance
- Position of the damper blade indicated externally at shaft extension
- Thermal and acoustic insulation (lining)

Materials and surfaces

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)

- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

Mineral wool

- To EN 13501, fire rating class A1, non-combustible
- RAL quality mark RAL-GZ 388
- Biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Installation and commissioning

- Any installation orientation (except units with static differential pressure transducer)
- Return edges of the casing with drilled holes suitable for M10 threaded rods
- TVA-D: For constructions with acoustic cladding, ducts on the room side should have cladding up to the acoustic cladding of the controller

Standards and guidelines

- Hygiene conforms to VDI 6022
- VDI 2083, air cleanliness class 3, and US standard 209E, class 100
- Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3).
- Nominal sizes 125 and 160 meet the general requirements, nominal sizes 200 – 400 meet the increased requirements of DIN 1946, part 4, with regard to the acceptable closed blade air leakage
- Casing air leakage to EN 1751, class A

Maintenance

- Maintenance-free as construction and materials are not subject to wear

Attachments: VARYCONTROL control components for Type TVA

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
Easy controller				
Easy	Volume flow rate	Easy controller TROX	Dynamic, integral	Integral
Compact controller				
BC0	Volume flow rate	Compact controller with MP bus interface TROX/Belimo	Dynamic, integral	Integral
BL0		Compact controller with LonWorks interface TROX/Belimo		
XB0		Compact controller TROX/Gruner		
LN0		Compact controller Siemens		
Universal controller, dynamic				
B13	Volume flow rate	Universal controller TROX/Belimo	Dynamic, integral	Actuator
B1B		Universal controller TROX/Belimo		Spring return actuator
XC3		Universal controller TROX/Gruner		
Universal controller, static				
BP3	Volume flow rate	Universal controller with MP bus interface TROX/Belimo	Static	Actuator
BPB				Spring return actuator
BPG				Fast-running actuator
BB3		Universal controller TROX/Belimo	Static	Actuator
BBB				Spring return actuator
XD1		Universal controller TROX/Gruner	Static, integral	Actuator
XD3	Spring return actuator			
BR3	Differential pressure	Universal controller with MP bus interface TROX/Belimo	Static, 100 Pa	Actuator
BRB				Spring return actuator
BRG				Fast-running actuator
BS3		Differential pressure controller TROX/Belimo	Static, 100 Pa	Actuator
BG3				Spring return actuator
BGB		Differential pressure controller TROX/Gruner	Static, integral 100 Pa	Actuator
XE1				Spring return actuator
XE3				Spring return actuator

Attachments: LABCONTROL control components for Type TVA

Order code detail	Control function	Controller	Differential pressure transducer	Actuator
EASYLAB				
ELAB	Room extract air Room pressure Single controller	EASYLAB controller TCU3	Static, integral	Fast-running actuator
TCU-LON-II				
TMA	Room extract air Room pressure	Electronic controller TCU-LON-II with LonWorks interface	Static, integral	Fast-running actuator
TMB				Fast-running actuator (brushless motor)

Technical data

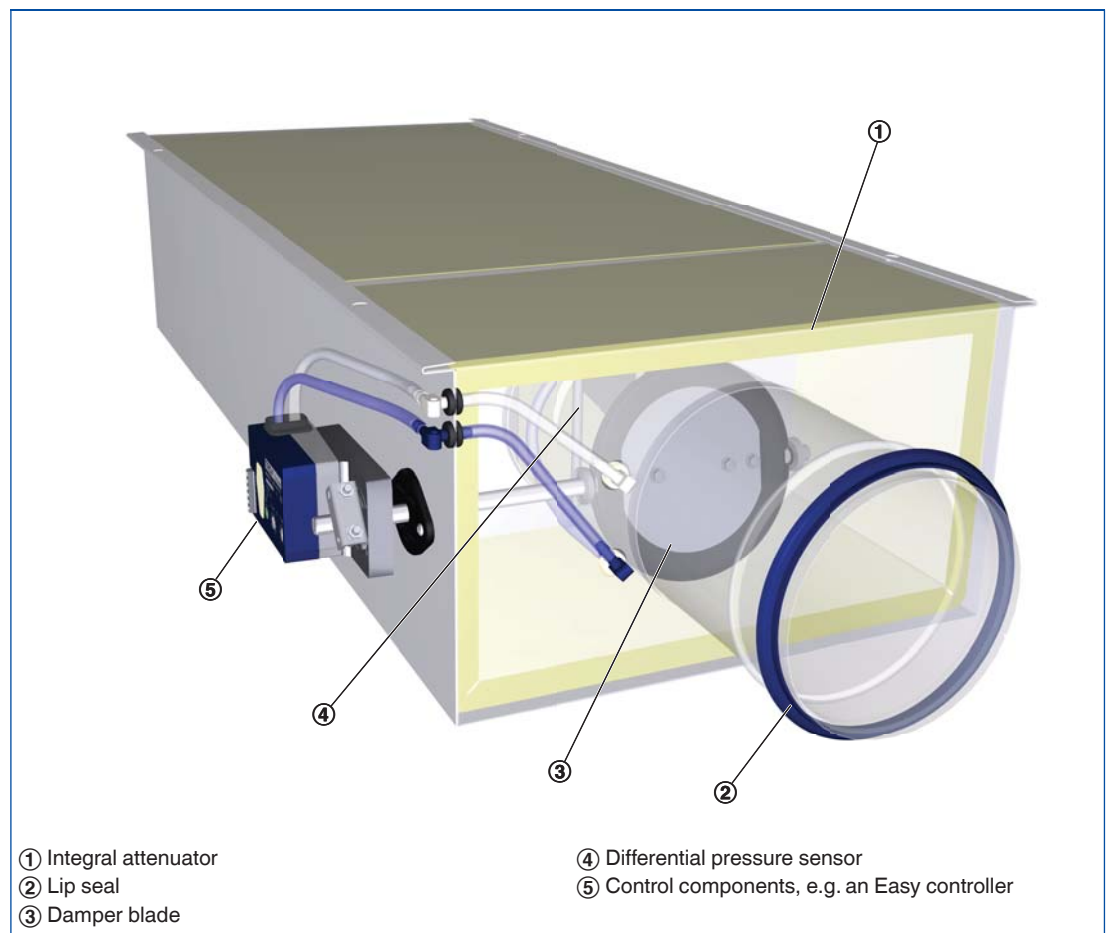
Nominal sizes	125 – 400 mm
Volume flow rate range	15 – 1680 l/s or 54 – 6048 m³/h
Volume flow rate control range (unit with dynamic differential pressure measurement)	Approx. 10 to 100 % of the nominal volume flow rate
Minimum differential pressure	5 – 190 Pa
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Function

Functional description

The VAV terminal unit is fitted with a differential pressure sensor for measuring the volume flow rate. The control components (attachments) include a differential pressure transducer that transforms the differential pressure (effective pressure) into an electric signal, a controller, and an actuator; the control functions can be achieved with an Easy controller, with a Compact controller, or with individual components (Universal or LABCONTROL). 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 control signal of the actuator if there is a difference between the two values. An integral attenuator reduces the noise that is created by the restriction of the airflow. The airflow velocity at the room end is, due to the larger rectangular cross section, about half the velocity in the circular duct.

Schematic illustration of the TVA



Volume flow rate ranges

The minimum differential pressure of VAV terminal units is an 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 control units. The measurement points for fan speed control must be selected accordingly.

Volume flow rate ranges and minimum differential pressure values

Nominal size	Ṡ		①	②	ΔṠ
			Δp _{st min}		
	l/s	m³/h	Pa		± %
125	15	54	5	5	19
	60	216	25	35	8
	105	378	75	95	7
	150	540	150	190	5
160	25	90	5	5	19
	100	360	25	30	8
	175	630	75	85	7
	250	900	150	170	5
200	40	144	5	5	19
	160	576	30	35	8
	280	1008	95	105	7
	405	1458	190	210	5
250	60	216	5	5	19
	250	900	25	30	8
	430	1548	75	85	7
	615	2214	150	170	5
315	100	360	5	5	19
	410	1476	30	35	8
	720	2592	90	110	7
	1030	3708	180	220	5
400	170	612	5	5	19
	670	2412	25	35	8
	1175	4230	75	95	7
	1680	6048	150	190	5

① TVA

② TVA with secondary silencer TS

The volume flow rates given for VAV terminal units depend on the nominal size and on the control component (attachment) that is installed. The table gives the minimum and maximum values for a VAV terminal unit. Some control components may only have a limited volume flow rate range. This applies in particular to control components with a static differential pressure transducer. For volume flow rate ranges for all control components refer to our Easy Product Finder design programme.

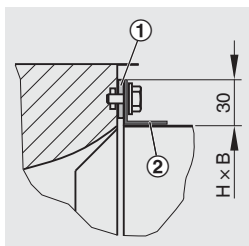
Description

- VAV terminal unit for the control of variable extract air volume flows



VAV terminal unit,
variant TVA

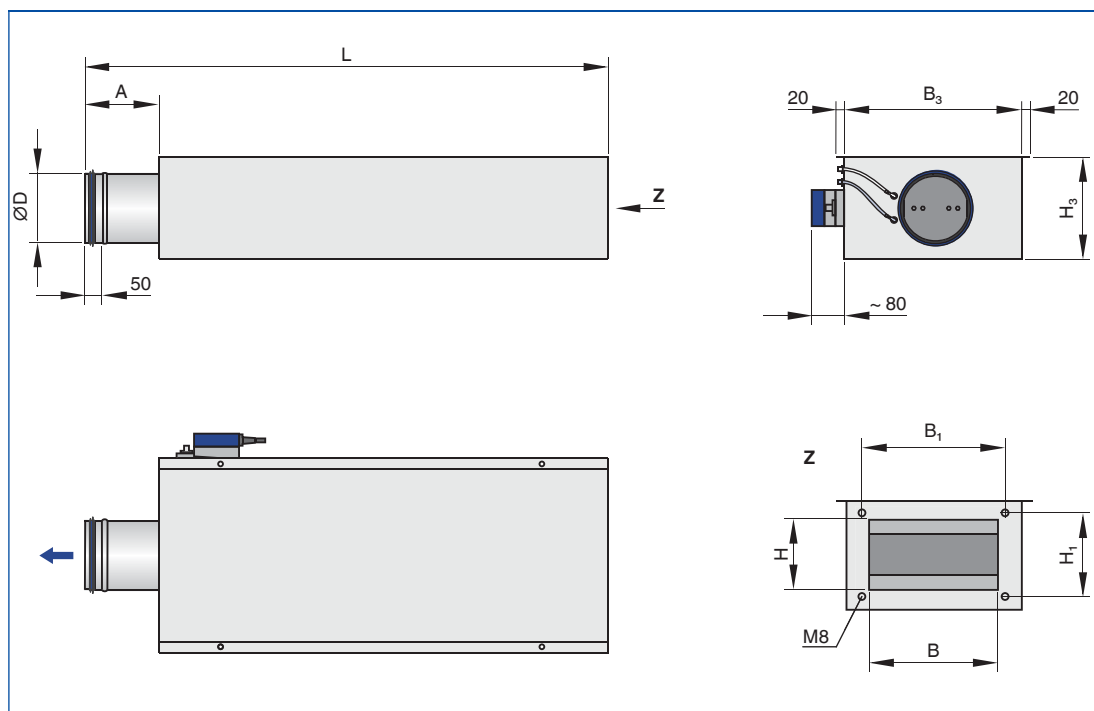
Dimensions



Detail of flange

- ① Compressible seal,
to be provided by others
- ② Air duct profile

TVA



Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B ₃	H ₃	B	B ₁	H	H ₁	A	m
	mm									kg
125	124	1220	300	236	198	232	152	186	185	21
160	159	1205	410	236	308	342	152	186	170	25
200	199	1460	560	281	458	492	210	244	138	33
250	249	1540	700	311	598	632	201	235	97	55
315	314	1685	900	361	798	832	252	286	245	73
400	399	1995	1000	446	898	932	354	388	176	118

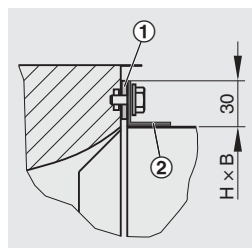
Description



VAV terminal unit,
variant TVA-D

- VAV terminal unit with acoustic cladding for the control of variable extract air volume flows
- For rooms where the case-radiated noise of the unit is not sufficiently reduced by a false ceiling
- The circular ducts for the room under consideration must have adequate acoustic insulation (provided by others) on the fan end
- Acoustic cladding cannot be retrofitted

Dimensions

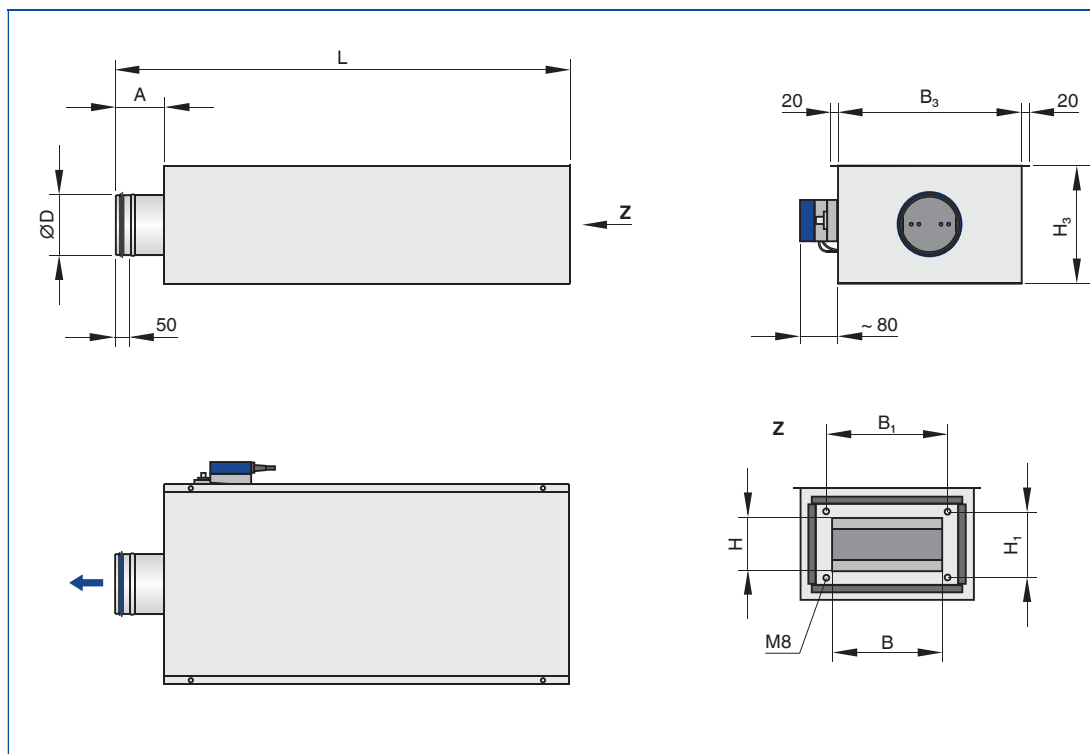


Detail of flange

① Compressible seal,
to be provided by others

② Air duct profile

TVA-D



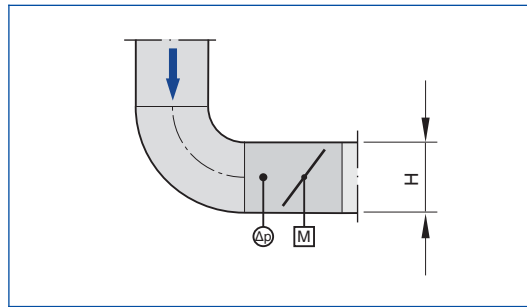
Dimensions [mm] and weight [kg]

Nominal size	ØD	L	B ₃	H ₃	B	B ₁	H	H ₁	A	m
	mm									kg
125	124	1220	380	316	198	232	152	186	145	41
160	159	1205	490	316	308	342	152	186	130	50
200	199	1460	640	361	458	492	210	244	98	63
250	249	1540	780	391	598	632	201	235	57	95
315	314	1685	980	441	798	832	252	286	205	133
400	399	1995	1080	526	898	932	354	388	136	193

Upstream conditions

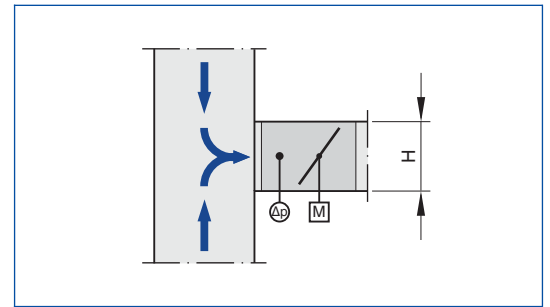
The volume flow rate accuracy $\Delta\dot{V}$ applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require straight duct sections upstream.

Bend, vertical



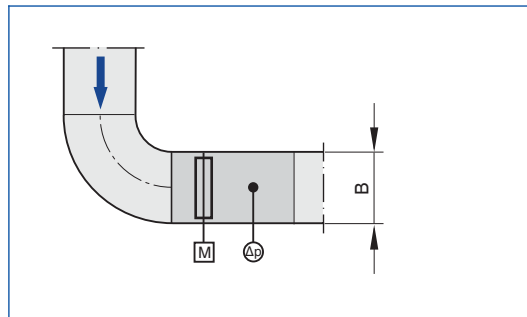
A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Convergence of two airflows, vertical



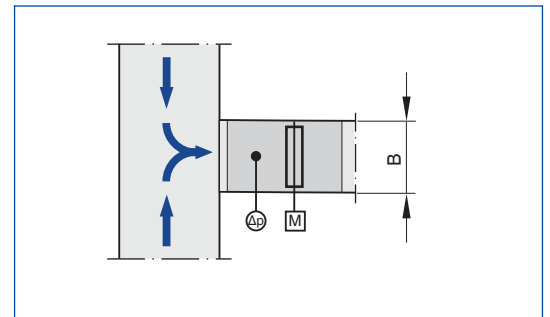
The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed at a junction and at the point of convergence of two airflows.

Bend, horizontal



A bend – without a straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Convergence of two airflows, horizontal

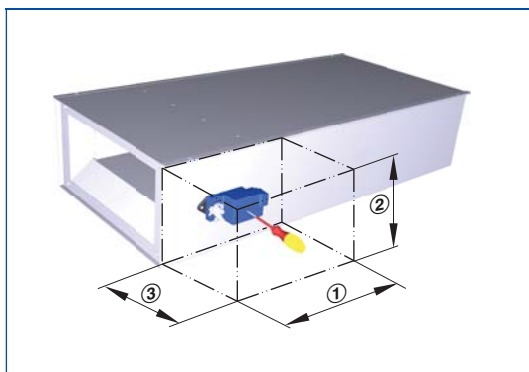


The stated volume flow rate accuracy $\Delta\dot{V}$ will be achieved even when the VAV terminal unit is installed at a junction and at the point of convergence of two airflows.

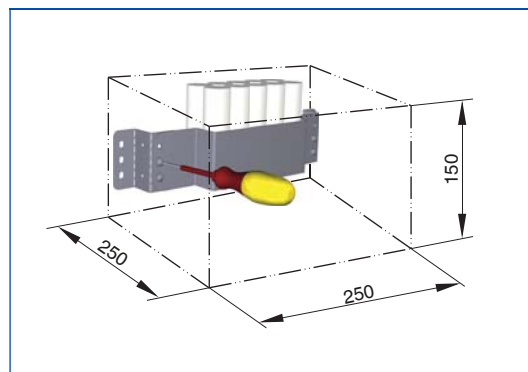
1 Space requirement for commissioning and maintenance

Sufficient space must be kept clear near any attachments to allow for commissioning and maintenance. It may be necessary to provide sufficiently sized inspection access openings.

Access to attachments



Access to attachments



Separate space for fixing and accessing the battery pack (LABCONTROL EASYLAB accessory)

Space required

Attachments	①	②	③
	mm		
VARYCONTROL			
Easy controller	400	300	300
Compact controller	400	300	300
Universal controller	700	300	300
LABCONTROL			
EASYLAB	900	350	400
TCU-LON-II	700	300	300

Standard text

This specification text describes the general properties of the product. Texts for variants can be generated with our Easy Product Finder design programme.

Rectangular VAV terminal units for variable and constant air volume systems, suitable for extract air, available in 6 nominal sizes. High volume flow rate control accuracy. Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains an averaging differential pressure sensor for volume flow rate measurement, a damper blade, and an integral attenuator. Factory-assembled control components complete with wiring and tubing. Differential pressure sensor with 3 mm measuring holes (resistant to dust and pollution) On the fan end, spigot with groove for lip seal, suitable for connecting ducts to EN 1506 or EN 13180. Room end suitable for the connection of air duct profiles. Baffle plate is fitted after the damper blade for optimum acoustic and aerodynamic performance. Casing with acoustic and thermal insulation. Position of the damper blade indicated externally at shaft extension. Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3). Casing air leakage to EN 1751, class B. Complies with VDI 2083, clean room class 3, and US standard 209E, class 100. Hygiene complies with VDI 6022, DIN 1946, part 4, as well as EN 13779 and VDI 3803.

Special features

- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- Hygiene tested and certified
- Factory set-up or programming and aerodynamic function testing
- Volume flow rate can later be measured and adjusted on site; additional adjustment device may be necessary

Materials and surfaces

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Differential pressure sensor made of aluminium
- Plastic bearings

Variant with acoustic cladding (-D)

- Acoustic cladding made of galvanised sheet steel
- Lining is mineral wool
- Rubber elements for the insulation of structure-borne noise

Mineral wool

- To EN 13501, fire rating class A1, non-combustible
- RAL quality mark RAL-GZ 388
- Biosoluble and hence hygienically safe according to the German TRGS 905 (Technical Rules for Hazardous Substances) and EU directive 97/69/EG
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 15 to 1680 l/s or 54 to 6048 m³/h
- Volume flow rate control range (unit with dynamic differential pressure measurement): approx. 10 to 100 % of the nominal volume flow rate
- Minimum differential pressure: 5 – 190 Pa
- Maximum differential pressure: 1000 Pa

Attachments

Variable volume flow control with electronic Easy controller to connect an external control signal; actual value signal can be integrated into the central BMS.

- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC
- Possible override controls with external switches using volt-free contacts: CLOSED, OPEN, $\dot{V}_{\min}$ and $\dot{V}_{\max}$
- Potentiometers with percentage scales to set the volume flow rates $\dot{V}_{\min}$ and $\dot{V}_{\max}$
- The actual value signal relates to the nominal volume flow rate such that commissioning and subsequent adjustment are simplified
- Volume flow rate control range: approx. 10 – 100 % of the nominal volume flow rate
- Clearly visible external indicator light for signalling the functions: Set, not set, and power failure

Electrical connections with screw terminals.

Double terminals for looping the supply voltage, i.e. for the simple connection of voltage transmission to the next controller.

Sizing data

- $\dot{V}$ _____ [m³/h]
- Δp_{st} _____ [Pa]
- L_{PA} air-regenerated noise _____ [dB(A)]
- L_{PA} Case-radiated noise _____ [dB(A)]

1

Order options
VARYCONTROL

1 Type

TVA VAV terminal unit, extract air

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Nominal size [mm]

☐ **125**

☐ **160**

☐ **200**

☐ **250**

☐ **315**

☐ **400**

4 Accessories

No entry: none

☐ **D1** Lip seal

5 Attachments (control component)

Example

☐ **Easy** Easy controller

☐ **BC0** Compact controller

☐ **B13** Universal controller

6 Operating mode

☐ **E** Single

☐ **M** Master

☐ **S** Slave

☐ **F** Constant value

☐ **A** Differential pressure control – extract air

7 Signal voltage range

For the actual and setpoint value signals

☐ **0** 0 – 10 V DC

☐ **2** 2 – 10 V DC

**8 Volume flow rates [m³/h or l/s],
differential pressure [Pa]**

$\dot{V}_{\min} - \dot{V}_{\max}$ for factory setting

$\Delta p_{\min}$ for factory setting
(operating mode A)

9 Damper blade position

Only with spring return actuators

☐ **NO** Power off to OPEN

☐ **NC** Power off to CLOSE

Order options

LABCONTROL

EASYLAB

1 Type

TVA VAV terminal unit, extract air

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Nominal size [mm]

☐ **125**

☐ **160**

☐ **200**

☐ **250**

☐ **315**

☐ **400**

4 Accessories

No entry: none

☐ **D1** Lip seal

5 Attachments (control component)

ELAB EASYLAB controller TCU3
with fast-running actuator

6 Equipment function

Room control

☐ **RE** Extract air control (Room Exhaust)

☐ **PC** Differential pressure control

Single operation

☐ **EC** Extract air controller

7 External volume flow rate setting

Only for single operation

☐ **E0** Voltage signal 0 – 10 V DC

☐ **E2** Voltage signal 2 – 10 V DC

☐ **2P** On-site switch contacts
for 2 switching steps

☐ **3P** On-site switch contacts
for 3 switching steps

☐ **F** Volume flow rate constant value,
without signalling

8 Module expansions

Option 1: Power supply

No entry: 24 V AC

☐ **T** EM-TRF for 230 V AC

☐ **U** EM-TRF-USV for 230 V AC, provides
uninterruptible power supply (UPS)

Option 2: Communication interface

No entry: none

☐ **L** EM-LON for LonWorks FTT-10A

☐ **B** EM-BAC-MOD-01 for BACnet MS/TP

☐ **M** EM-BAC-MOD-01 for Modbus RTU

☐ **I** EM-IP for BACnet/IP,
Modbus/IP and webserver

☐ **R** EM-IP with real time clock

Option 3:

Automatic zero point correction

No entry: none

☐ **Z** EM-AUTOZERO Solenoid valve
for automatic zero point correction

9 Additional functions

Only for room control

(equipment function)

Raum management function

has been deactivated

☐ **LAB** Extract air led system (laboratories)

☐ **CLR** Supply air led system (clean rooms)
Raum management function is active

☐ **LAB-RMF** Extract air led system (LAB)

☐ **CLR-RMF** Supply air led system (CLR)

10 Operating values [m³/h or l/s, Pa]

For equipment function 'room control'
with additional function RMF

Total room extract air/supply air

$\dot{V}_1$: Standard mode

$\dot{V}_2$: Reduced operation

$\dot{V}_3$: Increased operation

$\dot{V}_4$: Constant room supply air

$\dot{V}_5$: Constant room extract air

$\dot{V}_6$: Supply air/extract air difference

$\Delta p_{\text{setpoint}}$: Setpoint pressure

(only with differential pressure control)

For equipment function

'single operation'

E0, E2: $\dot{V}_{\min} / \dot{V}_{\max}$

2P: $\dot{V}_1 / \dot{V}_2$

3P: $\dot{V}_1 / \dot{V}_2 / \dot{V}_3$

F: $\dot{V}_1$

Useful additions

Room control panel

☐ **BE-LCD-01** 40-character display

1

Order options

LABCONTROL

TCU-LON-II

1 Type

TVA VAV terminal unit, extract air

2 Acoustic cladding

No entry: none

☐ **D** With acoustic cladding

3 Nominal size [mm]

☐ **125**

☐ **160**

☐ **200**

☐ **250**

☐ **315**

☐ **400**

4 Accessories

No entry: none

☐ **D1** Lip seal

5 Attachments (control component)

☐ **TMA** TCU-LON-II with fast-running actuator

☐ **TMB** TCU-LON-II with fast-running actuator (brushless motor)

6 Equipment function

☐ **RE** Room extract air

☐ **PE** Differential pressure control – extract air (Pressure Extract)

7 Operating values [m³/h or l/s, Pa]

Depending on equipment function

RE: $\dot{V}_{\text{day}} / \dot{V}_{\text{night}} / \dot{V}_{\text{constant}}$

PE: $\dot{V}_{\text{day}} / \dot{V}_{\text{night}} / \dot{V}_{\text{constant}} / \Delta p_{\text{setpoint}}$

The room control volume flow rates are related to the total extract air volume flow rate for the room