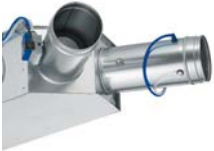




Circular connection on the fan end



Variant TVM-S



Rectangular connection on the room end

Variable volume flow control VAV terminal units

TVM



For dual duct systems

VAV dual duct terminal units for dual duct systems with variable volume flows in buildings with demanding acoustic requirements

- Individual temperature control for each room or zone
- Highly effective integral attenuator
- Electronic control components for various applications
- Closed blade air leakage to EN 1751, up to class 4
- Casing leakage to EN 1751, Class B



Tested to VDI 6022

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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General information

Application

- VAV dual duct terminal unit for use in ventilation and air conditioning systems
- Supply air control in dual-duct volume flow systems
- Closed-loop volume flow control using an external power supply
- For maximum acoustic and thermal comfort
- Demand-based mixing of cold and warm air
- Shut-off by means of switching (by others)

Special features

- Integral effective pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- 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
- Inspection access according to VDI 6022

Nominal sizes

- TVM-S: 125, 160, 200
- TVM: 125, 160, 200, 250, 315, 400

Variants

- TVM-S Dual duct unit, 60° spigot arrangement
- TVM-S-D Dual duct unit with acoustic cladding, 60° spigot arrangement
- TVM: Dual duct unit, 90° spigot arrangement
- TVM-D: Dual duct unit with acoustic cladding, 90° spigot arrangement
- Units with acoustic cladding and/or secondary silencer Type TS for very demanding acoustic requirements
- Acoustic cladding cannot be retrofitted

Parts and characteristics

- Ready-to-commission unit which consists of mechanical parts and control components
- Averaging effective pressure sensors for volume flow rate measurement, one in the cold air flow and in the total air flow respectively
- Damper blade
- Integral attenuator
- Inspection access
- Factory-mounted control components complete with wiring and tubing
- Aerodynamic functional testing on a special test rig before shipping of each unit
- Set-up data is given on a label affixed to the unit
- High control accuracy (even with upstream bend R = 1D)

Attachments

- Compact controller: Compact unit consisting of controller with potentiometers, effective pressure transducer and actuator

Accessories

- Double lip seals (factory-fitted)

Useful additions

- Secondary silencer Type TS

Construction features

- Rectangular casing
- Spigot on the fan end suitable for circular ducts to EN 1506 or EN 13180
- Spigot with groove for double lip seal
- Connection on the room end suitable for ducts
- 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
- Effective pressure sensor made of aluminium
- Plastic plain bearings
- Shaft and linkage made of galvanised steel

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
- Non-hazardous to health thanks to being highly biosoluble in accordance with the Ordinance on Hazardous Substances and Note Q of the European Directive (EC) No. 1272/2008
- Faced with glass fibre fabric as a protection against erosion from airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Standards and guidelines

Fulfils the hygiene requirements of

- EN 16798, Part 3
- VDI 6022
- DIN 1946, Part 4
- Further standards, guidelines in accordance with hygiene certificate

Casing leakage

- EN 1751, Class B

Closed blade leakageNominal sizes 125 and 160

- EN 1751, Class 3
- Fulfilment of the general requirements of DIN 1946, Part 4, with regard to the acceptable closed blade air leakage

Nominal sizes 200 to 400

- EN 1751, Class 4
- Fulfilment of the increased requirements of DIN 1946, Part 4, with regard to the acceptable closed blade air leakage

Maintenance

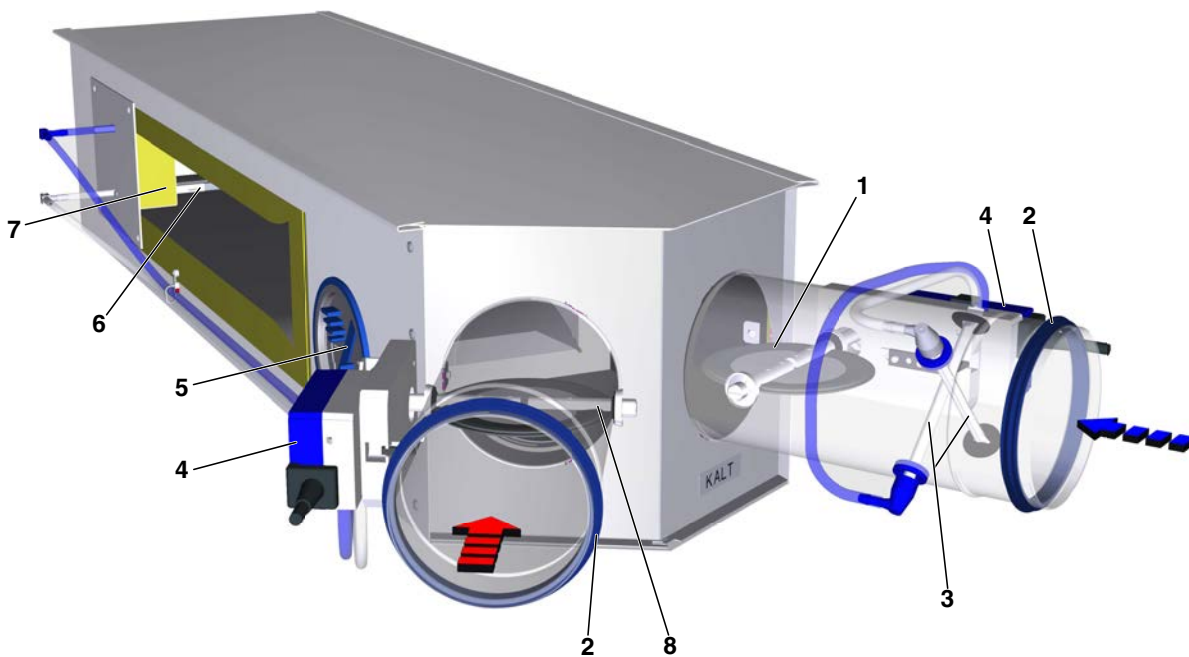
- Maintenance-free as construction and materials are not subject to wear

Function

The VAV terminal unit is fitted with two effective pressure sensors for measuring the volume flow rates, one in the cold air flow and one in the total air flow. The control components (attachments) include two effective pressure transducers that transform the effective pressure into an electric signal, two controllers, and two actuators; as Compact controller or with individual components. In most cases, the setpoint value for the dual duct terminal unit comes from a room temperature controller. The room temperature controller administers the cold air volume flow controller and indicates the setpoint value for the cold air flow rate between 0 and a maximum volume flow $q_{v,max}$.

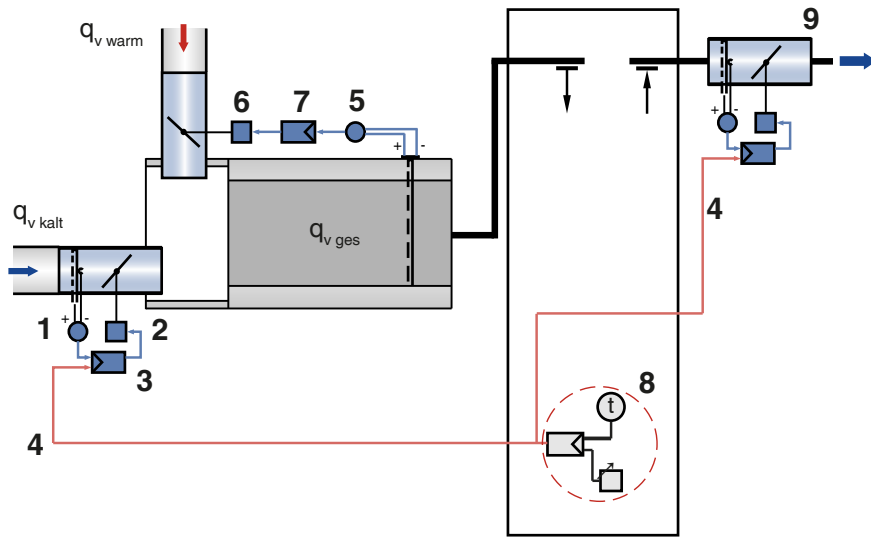
The controller compares the actual value with the setpoint value and alters the control signal of the damper actuator if there is a difference between the two values. The warm/overall controller is set to the minimum volume flow rate $q_{v,min}$ and controls the damper blade in the heat duct. As a consequence, a corresponding proportion of warm air is added. As the demand for cooling increases, the warm air damper blade closes such that eventually only cold air flows. 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 TVM-S



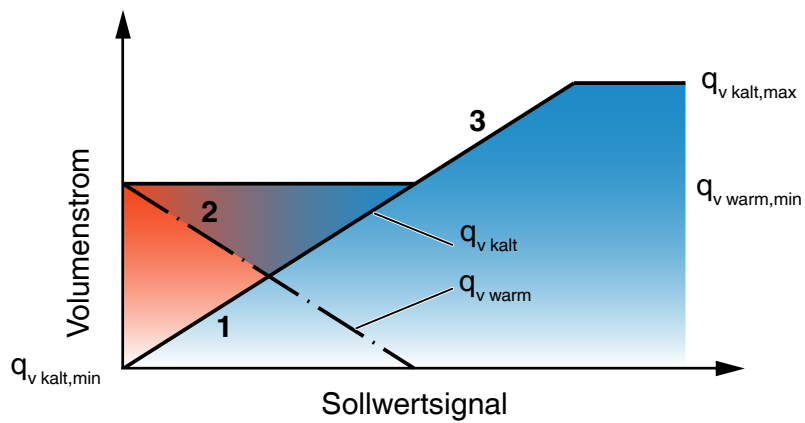
- 1 Damper blade for $q_{v,cold}$
- 2 Double lip seal
- 3 Effective pressure sensor for $q_{v,cold}$
- 4 Control components, e. g. a Compact controller
- 5 Inspection access
- 6 Effective pressure sensor for $q_{v,tot}$
- 7 Noise insulation
- 8 Damper blade for $q_{v,warm}$

Single operation



- 1 Effective pressure transducer for $q_{v,cold}$
- 2 Actuator for $q_{v,cold}$
- 3 Control component for $q_{v,cold}$
- 4 Setpoint value signal
- 5 Effective pressure transducer for $q_{v,tot}$
- 6 Actuator for $q_{v,warm}$
- 7 Control component for $q_{v,tot}$
- 8 Room temperature control loop
- 9 Volume flow controller extract air

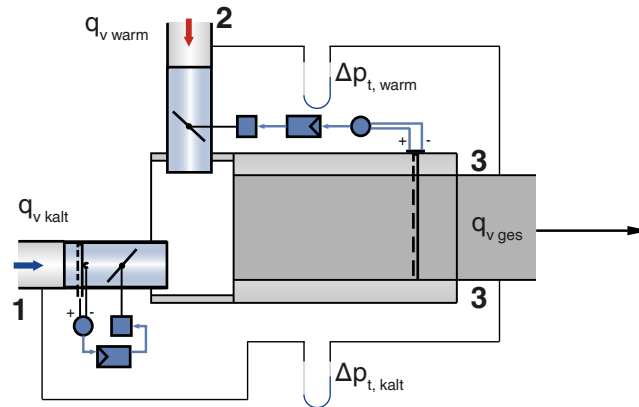
Control diagram



- 1 Cold air supply
- 2 Warm air supply
- 3 Total extract air at the unit outlet

Total differential pressure

$$\Delta p_{t, \text{warm}} = (p_{st2} - p_{st3}) + (p_{dyn2} - p_{dyn3})$$



$$\Delta p_{t, \text{kalt}} = (p_{st1} - p_{st3}) + (p_{dyn1} - p_{dyn3})$$

The total minimum differential pressure is equal to the pressure loss of the VAV controller when the damper blade is open, caused by flow resistance (damper blade). The total differential pressure can vary in the cold and warm air duct, since it is made up of the static differential pressure and the dynamic differential pressure between the cold or warm air duct and the air outlet (total air volume flow rate).

Technical data

Volume flow rate range	50 – 2108 l/s or 210 – 7591 m³/h
Volume flow rate control range	Approx. 30 to 100 % of the nominal volume flow rate
Minimum differential pressure	Up to 202 Pa (without secondary silencer TS)
Maximum differential pressure	1000 Pa
Operating temperature	10 to 50 °C

Quick sizing

Quick sizing tables provide a good overview of the minimum differential pressures, the volume flow rate accuracy and the room sound pressure levels that can be expected. Intermediate values may be achieved by interpolation.

The sound power levels for calculating the sound pressure levels were measured in the TROX laboratory according to DIN EN ISO 5135 - see "Basic information and nomenclature".

Precise results and spectral data for all control components can be calculated with our Easy Product Finder design program. The first selection criteria for the nominal size are the actual volume flow rates q_{vmin} and q_{vmax} .

Volume flow rate ranges and minimum differential pressure values

The minimum differential pressure of VAV terminal units is an important factor in designing the ductwork and in rating the fan including speed control. A sufficient pressure differential must be ensured under all operating conditions across the regulator ($\Delta_{pt,min}$) for all terminal units. The measurement points for fan speed control must be selected accordingly. The volume flow rates given for VAV terminal units depend on the nominal size and on the control component (attachment) that is installed.

Volume flow rate ranges and minimum differential pressure values

Control component dynamic measurement principle - qv Extended

Attachment BC0, BM0, BM0-J6

NS	qv [l/s]	qv [m³/h]	Δ_{pstmin} [Pa]		Δqv [±%]
			①	②	
125	59	210	19	24	9
125	104	373	58	76	6
125	149	536	119	156	5
125	194	699	202	265	4
160	101	363	20	27	9
160	171	616	57	76	6
160	241	869	112	151	5
160	311	1122	187	251	5
200	152	545	17	28	9
200	270	973	54	87	6
200	389	1400	112	179	5
200	507	1828	190	305	4
250	213	765	15	24	9
250	398	1434	51	83	7
250	584	2102	108	178	5
250	769	2771	188	310	5
315	310	1115	11	16	10
315	633	2278	46	66	7
315	956	3440	104	150	5
315	1278	4603	186	269	4
400	501	1803	11	14	10
400	1037	3732	46	59	7
400	1573	5662	106	135	5



NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]		Δqv [±%]
			①	②	
400	2108	7591	190	243	4

① Basic unit

② Basic unit with secondary silencer TS

Volume flow rate ranges and minimum differential pressure values

Control component dynamic measurement principle - q v As standard

Attachment XB0, LN0, LK0

NS	qv [l/s]	qv [m³/h]	Δpstmin [Pa]		Δqv [±%]
			①	②	
125	59	210	19	24	9
125	93	333	46	60	7
125	126	455	86	112	6
125	160	578	139	181	5
160	101	363	20	27	9
160	153	551	45	61	7
160	206	740	82	109	6
160	257	928	128	172	5
200	152	545	17	28	9
200	241	867	43	69	7
200	331	1190	81	130	6
200	420	1512	130	209	5
250	213	765	15	24	9
250	354	1274	40	66	7
250	495	1783	78	128	6
250	636	2292	129	212	5
315	310	1115	11	16	10
315	559	2012	36	52	7
315	808	2910	75	108	6
315	1057	3807	127	184	5
400	501	1803	11	14	10
400	915	3295	36	46	7
400	1330	4787	76	97	6
400	1744	6279	130	166	5

① Basic unit

② Basic unit with secondary silencer TS

Quick sizing table for sound pressure levels

The quick sizing tables are based on generally accepted attenuation levels. If the sound pressure level exceeds the required level, a larger air terminal unit and/or a silencer or acoustic cladding is required. For more information on the acoustic data, see basic information and nomenclature.

Quick sizing table for air-regenerated noise L_{PA}

Controller including sound attenuator variants

(Total flow rate range of the type)

NS	qv [l/s]	qv [m³/h]	250 Pa		500 Pa	
			①	②	①	②
125	59	210	27	17	30	20
125	104	373	34	24	37	26
125	149	536	39	28	41	30
125	194	699	42	n.V.	44	33
160	101	363	29	19	33	23
160	171	616	35	25	39	29
160	241	869	39	29	42	32
160	311	1122	42	n.V.	45	34
200	152	545	27	17	31	21
200	270	973	31	21	35	25
200	389	1400	35	25	38	28
200	507	1828	38	n.V.	41	30
250	213	765	17	< 15	20	< 15
250	398	1434	26	16	28	18
250	584	2102	31	22	33	23
250	769	2771	35	n.V.	37	28
315	310	1115	18	< 15	21	< 15
315	633	2278	28	17	31	19
315	956	3440	34	23	37	24
315	1278	4603	39	n.V.	41	27
400	501	1803	15	< 15	17	< 15
400	1037	3732	27	16	29	17
400	1573	5662	34	25	36	25
400	2108	7591	40	n.V.	41	n.V.

Air-regenerated noise L_{PA} [dB(A)] in the case of total differential pressure Δ_{pt} of 250 or 500 Pa

① Basic unit

② Basic unit with secondary silencer TS

n.a.: specified total differential pressure Δ_{pt} is lower than the minimum differential pressure $\Delta_{pt,min}$

Quick sizing table for case-radiated noise L_{PA}

Controller including acoustic cladding variant

(Total flow rate range of the type)

NS	qv [l/s]	qv [m³/h]	250 Pa		500 Pa	
			①	②	①	②
125	59	210	32	24	38	29
125	104	373	36	29	42	34
125	149	536	40	32	45	37
125	194	699	43	36	48	40
160	101	363	41	32	47	38
160	171	616	44	36	49	42
160	241	869	46	39	51	44
160	311	1122	48	42	53	47
200	152	545	36	28	42	33
200	270	973	40	34	46	38
200	389	1400	44	38	49	42
200	507	1828	47	42	52	45
250	213	765	29	23	34	28
250	398	1434	35	29	41	34
250	584	2102	40	34	45	38
250	769	2771	44	38	48	41
315	310	1115	37	31	44	38
315	633	2278	41	37	48	43
315	956	3440	44	41	50	47
315	1278	4603	47	45	52	50
400	501	1803	30	26	37	32
400	1037	3732	38	33	44	39
400	1573	5662	43	38	48	43
400	2108	7591	47	43	51	47

 Case-radiated noise L_{PA} [dB(A)] in the case of total differential pressure Δ_{pt} of 250 or 500 Pa

① Basic unit

② Basic unit with acoustic cladding

 n.a.: specified total differential pressure Δ_{pt} is lower than the minimum differential pressure $\Delta_{pt,min}$

Note:

Information on case-radiated noise for combinations of basic unit and optional acoustic cladding and secondary silencer can be found in the Easy Product Finder design program.

Specification text

Specification text

Rectangular VAV dual duct terminal units for dual duct systems with variable and constant volume flows, available in 6 nominal sizes. Connecting spigots for warm and cold air arranged at an angle of 90°. Up to nominal size 200, an angle of 60° is also possible and is therefore ideal for the refurbishment of older systems with dual duct units. High control accuracy (even with upstream bend $R = 1D$). Ready-to-commission unit which consists of the mechanical parts and the electronic control components. Each unit contains two averaging effective pressure sensors for volume flow rate measurement, one in the cold air flow and one in the total air flow, two damper blades, and an integral sound attenuator. Factory-mounted control components complete with wiring and tubing. Effective pressure sensor with 3 mm measuring holes, hence resistant to contamination. Spigot on the fan end with groove for double lip seal, suitable for ducts according to EN 1506 or EN 13180. Room end suitable for the connection of flanges. Two baffle plates, one fitted after each damper blade for optimum acoustic and aerodynamic performance. Casing with acoustic and thermal insulation. Position of the damper blade can be seen from the outside at the shaft extension. Closed blade air leakage to EN 1751, class 4 (nominal sizes 125 and 160, class 3). Casing leakage according to EN 1751, class B. Meets the hygiene requirements of VDI 6022, EN 16798, Part 3, VDI 3803 as well as DIN 1946 Part 4.

Special features

- Integral effective pressure sensor with 3 mm measuring holes (resistant to dust and pollution)
- Integral attenuator with at least 26 dB insertion loss at 250 Hz
- 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
- Inspection access according to VDI 6022

Materials and surfaces

- Casing and damper blade made of galvanised sheet steel
- Damper blade seal made of TPE plastic
- Lining is mineral wool
- Aluminium sensor tubes
- Plastic plain bearings

- Shaft and casing made of galvanised steel

Mineral wool:

- To EN 13501, fire rating class A1, non-combustible
- RAL quality mark RAL-GZ 388
- Non-hazardous to health thanks to being highly biosoluble in accordance with the Ordinance on Hazardous Substances and Note Q of the European Directive (EC) No. 1272/2008
- Faced with glass fibre fabric as protection against erosion through airflow velocities of up to 20 m/s
- Inert to fungal and bacterial growth

Connection

- Spigot with groove for double lip seal, suitable for ducts according to EN 1506 or EN 13180
- Room end suitable for the connection of flanges

Technical data

- Nominal sizes: 125 to 400 mm
- Volume flow rate range: 59 – 2108 l/s or 210 – 7591 m³/h
- Volume flow rate control range: approx. 30 – 100 % of the nominal volume flow rate
- Minimum differential pressure: up to 202 Pa (without secondary silencer TS)
- Maximum differential pressure: 1000 Pa

Specification text for attachment

Variable volume flow control with electronic Compact controller to switch an external control signal and an actual value signal for integration into the central BMS.

- Supply voltage 24 V AC/DC
- Signal voltages 0 – 10 V DC or 2 – 10 V DC
- Possible override controls with external, volt-free switches: CLOSE, OPEN, q_{vmin} and q_{vmax}
- Volume flow rate control range: approx. 30 – 100 % of the nominal volume flow rate

Sizing data

- $q_{Vwarm,min} - q_{Vwarm,max}$ (m³/h)
- $q_{Vcold,min} - q_{Vcold,max}$ (m³/h)
- Δ_{pt} Total differential pressure [Pa]
- L_{PA} Air-regenerated noise [dB(A)]
- L_{PA} Case-radiated noise [dB(A)]

Order code

Order code for volume flow control (with VARYCONTROL attachment)

TVM – S – D / 160 / D2 / BC0 / V 0 / 400 – 900 / 0 – 900 [m³/h]
 | | | | | | | | |
 1 2 3 4 5 6 7 8 9

1 Type

TVM Dual duct terminal unit

2 Spigot arrangement

No entry required: 90°

S 60° (only up to nominal size 200)

3 Acoustic cladding

No entry required: none

D With acoustic cladding

4 Nominal size [mm]

125, 160, 200, 250, 315, 400

5 Accessories

No entry required: none

D2 Double lip seal

6 Attachments (control component)

BC0 Compact controller, analogue/MP bus interface

BM0 Compact controller, Modbus/BACnet

BM0-J6 Compact controller, Modbus/BACnet (RJ12)

LN0 Compact controller, analogue interface

LK0 Compact controller, KNX interface

XB0 Compact controller, analogue interface

7 Operating mode

V Variable (setpoint value range)

8 Signal voltage range

For the actual and setpoint value signals

0 0 – 10 V DC

2 2 – 10 V DC

9 Operating values for factory setting

Volume flow rates [m³/h or l/s]

$q_{v,warm,min} - q_{v,warm,max} / q_{v,cold,min} - q_{v,cold,max}$

Order example: TVM/160/BC0/V0/750–1122 m³/h/0–1122 m³/h

Spigot arrangement	90°
Acoustic cladding	None
Nominal size	160 mm
Attachments (control component)	Compact controller
Operating mode	Variable
Signal voltage range	0 – 10 V DC
Operating values warm	$q_{v,warm,min} = 750 \text{ m}^3/\text{h}$ $q_{v,warm,max} = 1122 \text{ m}^3/\text{h}$
Operating values cold	$q_{v,cold,min} = 0 \text{ m}^3/\text{h}$ $q_{v,cold,max} = 1122 \text{ m}^3/\text{h}$

Variants

VAV dual duct terminal unit, variant TVM



- VAV terminal unit for the control of variable supply air volume flows
- Connecting spigots for warm and cold air arranged at an angle of 90°

VAV dual duct terminal unit, variant TVM-D



- VAV terminal unit with acoustic cladding for the control of variable supply air volume flows
- Connecting spigots for warm and cold air arranged at an angle of 90°
- 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
- For an optimal solution, the customer should also insulate the room-side ducts
- Acoustic cladding cannot be retrofitted

VAV dual duct terminal unit, variant TVM-S

- VAV terminal unit for the control of variable supply air volume flows
 - Connecting spigots for warm and cold air arranged at an angle of 60°
-

VAV dual duct terminal unit, variant TVM-S-D

- VAV terminal unit with acoustic cladding for the control of variable supply air volume flows
 - Connecting spigots for warm and cold air arranged at an angle of 60°
 - 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
 - For an optimal solution, the customer should also insulate the room-side ducts
 - Acoustic cladding cannot be retrofitted
 - Note limited selection of control components; attachments LNO and LK0 not possible
-

Materials

Standard construction

Order code detail	Part	Material
-	Casing	Galvanised sheet steel
	Effective pressure sensor (cold)	Aluminium tube
	Effective pressure sensor (total)	Aluminium
	Damper blade	Galvanised sheet steel
	Damper blade seal	Thermoplastic elastomer (TPE)
	Shaft and linkage	Galvanised steel
	Plain bearings	Thermoplastic elastomer (TPE)

With acoustic cladding (optional)

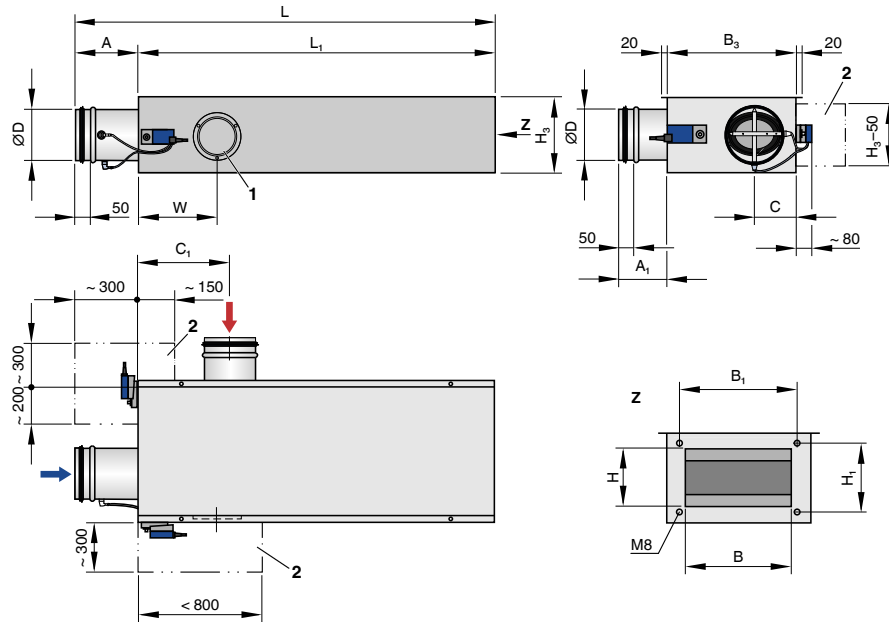
Order code detail	Part	Material
D	Lining	Mineral wool to EN 13501, fire rating class A1, non-combustible
	Acoustic cladding casing	Galvanised sheet steel
	Insulation of structure-borne noise	Polyethylene, PE

Option double lip seal

Order code detail	Part	Material
D2	Double lip seal	Rubber, EPDM

Dimensions and weight

Control unit without acoustic cladding (TVM)



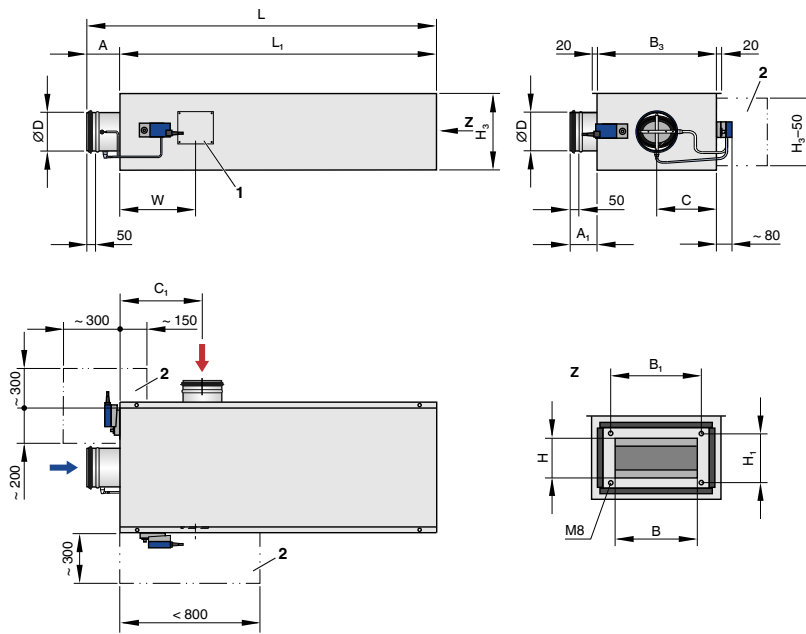
1 Inspection access

2 Keep clear to provide access to attachments

Dimensions/weight for TVM

NS	B	H	L	$\varnothing D$	A	A ₁	B ₁	B ₃	C	C ₁	H ₁	H ₃	L ₁	W	kg
125	198	152	1355	124	150	170	232	300	125	240	186	236	1205	265	28
160	308	152	1455	159	200	150	342	410	145	295	186	236	1255	265	34
200	458	210	1790	199	200	125	492	560	170	350	244	281	1590	265	50
250	598	201	2015	249	250	160	632	700	200	415	235	311	1765	540	65
315	798	252	2090	314	250	130	832	900	240	535	286	361	1840	540	90
400	898	354	2575	399	250	180	932	1000	290	625	388	446	2325	540	130

Control unit with acoustic cladding (TVM-D)



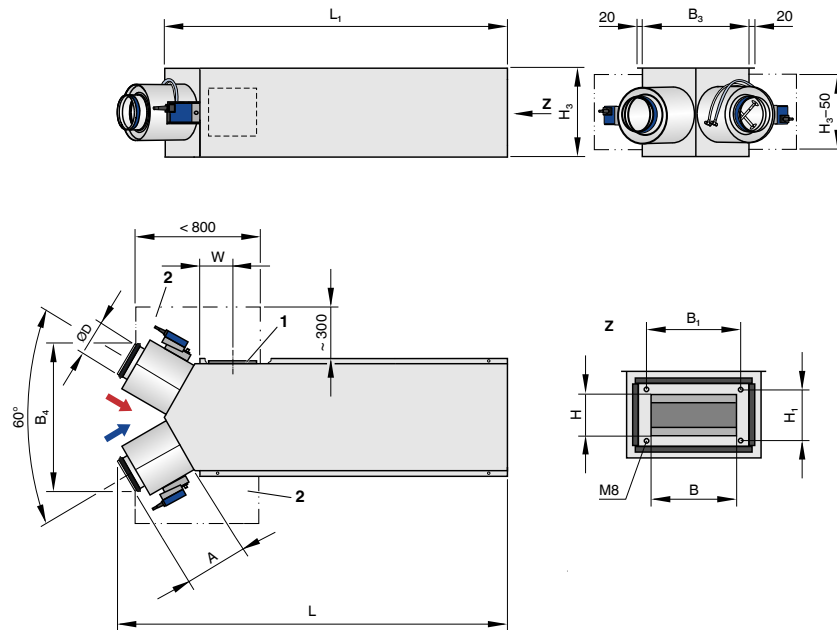
1 Inspection access

2 Keep clear to provide access to attachments

Dimensions/weight for (TVM-D)

NS	B	H	L	$\varnothing D$	A	A ₁	B ₁	B ₃	C	C ₁	H ₁	H ₃	L ₁	W	kg
125	198	152	1355	124	110	130	232	380	165	280	186	316	1245	305	42
160	308	152	1455	159	160	110	342	490	185	335	186	316	1295	305	51
200	458	210	1790	199	160	85	492	640	210	390	244	361	1630	305	78
250	598	201	2015	249	210	120	632	780	240	455	235	391	1805	580	105
315	798	252	2090	314	210	90	832	980	280	575	286	441	1880	580	140
400	898	354	2575	399	210	140	932	1080	330	665	388	526	2365	580	200

Control unit with acoustic cladding and spigot arrangement 60° (TMV-S-D)

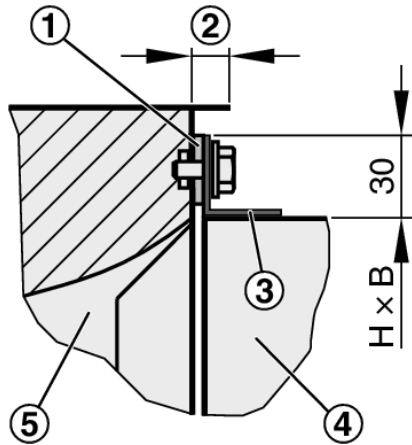


- 1 Inspection access
- 2 Keep clear to provide access to attachments

Dimensions/weight for (TMV-S-D)

NS	B	H	L	∅D	A	B ₁	B ₃	B ₄	H ₁	H ₃	L ₁	W	kg
125	198	152	1385	124	225	232	380	525	186	316	1215	160	45
160	308	152	1630	159	295	342	490	690	186	316	1410	180	55
200	458	210	1920	199	300	492	640	800	244	361	1710	180	80

Flange detail



- 1 Compressible seal, to be provided by others
- 2 Flanges on both ends indented approx. 12 mm
- 3 Flange
- 4 Duct
- 5 VAV terminal unit

Product details

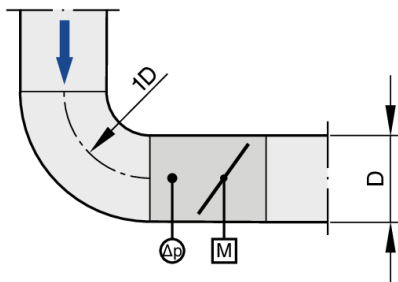
Installation and commissioning

- Horizontal (return edges of the casing with suspension holes at the top) and vertical installation orientation
- Spigots for warm and cold air arranged at an angle of 60° (TVM-S) or 90° (TVM)
- Return edges of the casing with drilled holes suitable for threaded rods

Upstream conditions

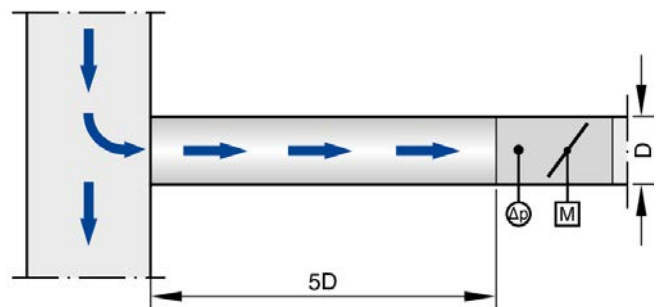
The volume flow rate accuracy Δ_{qv} applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect measurement. Duct connections, e.g. branches off the main duct, must comply with EN 1505. Some installation situations require straight duct sections upstream. The upstream conditions apply primarily to the duct connection at the cold air spigot. Since the hot air spigot does not contain a sensor, the upstream section here has no effect on the volume flow rate accuracy; however, unfavourable upstream sections can also lead to increased sound pressure levels.

Bend



A bend with a centre line curvature radius of at least 1D – without an additional straight duct section upstream of the VAV terminal unit – has only a negligible effect on the volume flow rate accuracy.

Junction



A junction causes strong turbulence. The stated volume flow rate accuracy Δ_{qv} can only be achieved with a straight duct section of at least 5D upstream.

VARYCONTROL control components

Attachment	Controlled variable	Interface	Effective pressure transducer	Actuator	Manufacturer
Compact controller, dynamic					
BC0	qv	0 – 10 V or 2 – 10 V or MP bus interface	integral	Slow running integral	②
LN0	qv	0 – 10 V or 2 – 10 V	integral	Slow running integral	⑤
LK0	qv	KNX interface	integral	Slow running integral	⑤
XB0	qv	0 – 10 V or 2 – 10 V	integral	Slow running integral	①
BM0	qv	Modbus RTU/BACnet MS/TP	integral	Slow running integral	②
BM0-J6	qv	Modbus RTU/BACnet MS/TP with RJ12 socket (for X-AIRCONTROL)	integral	Slow running integral	②

q_v Volume flow rate

② TROX/Belimo, ③ TROX/Gruner, ⑤ Siemens; note restricted availability. LN0 and LK0 not available for variant TVM-S-D

Nomenclature

Dimensions of rectangular units

B [mm]

Duct width

B₁ [mm]

Screw hole pitch of flange (horizontal)

B₂ [mm]

Overall dimension of flange (width)

B₃ [mm]

Casing width

B₄ [mm]

Centre distance between cold and warm air spigots

H [mm]

Duct height

H₁ [mm]

Screw hole pitch of flange (vertical)

H₂ [mm]

Overall dimension of flange (height)

H₃ [mm]

Casing width

Dimensions of circular units

ØD [mm]

Basic units made of sheet steel: Outer diameter of the spigot; basic units made of plastic: Inside diameter of the spigot

ØD₁ [mm]

Pitch circle diameter of flanges

ØD₂ [mm]

Outer diameter of flanges

L [mm]

Length of unit including connecting spigot

L₁ [mm]

Length of casing or acoustic cladding

n []

Number of flange screw holes

T [mm]

Flange thickness

General information

m [kg]

Unit weight including the minimum required attachments (control component)

NS [mm]

Nominal size

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

Note on acoustic data: All sound pressure levels are based on a reference value of 20 µPa.

q_{vNom} [m³/h]; [l/s]

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

q_{vunit,min} [m³/h]; [l/s]

Technically possible minimum volume flow rate. The value depends on product type, nominal size and control component (attachment). Values are published on the internet and in technical leaflets and 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. q_{vmin,unit} defines the lowest value of the mixing zone that can be set.

q_{vcold,min} [m³/h]; [l/s]

Technically possible minimum volume flow rate for the cold air supply. Lower limit of the setting range on the cold air controller. q_{vcold,min} defines the lower limit of the mixing zone. In the standard control strategy (fixed mixing zone with cooling function), it is recommended to select q_{vcold,min} equal to zero.

q_{vcold,max} [m³/h]; [l/s]

Technically possible maximum volume flow rate for the cold air supply. Upper limit of the setting range on the cold air controller. The value for q_{vcold,max} is determined, for example, via the calculation of the cooling load. In the standard control strategy (fixed mixing zone with cooling function), the difference between q_{vwarm,min} and q_{vcold,max} is available for the cooling function.

q_{vwarm,min} [m³/h]; [l/s]

In the standard control strategy (fixed mixing zone with cooling function), the maximum proportion of warm air is supplied in mixed flow air distribution. It is set as a constant value and a selection can be made between $q_{v,unit,min}$ and $q_{v,cold,max}$. If $q_{v,warm,min}$ and $q_{v,cold,max}$ are selected equally, the cooling function is omitted, and the mixing zone is maximised.

$q_{v,warm,max}$ [m³/h]; [l/s]

Technically possible maximum volume flow rate for the warm air supply. Upper limit of the setting range for the warm air supply. In the standard control strategy (fixed mixing zone with cooling function), this value is only indirectly required. It is recommended to select $q_{v,warm,max}$ equal to $q_{v,nom}$.

$q_{v,total}$ [m³/h]; [l/s]

The total volume flow rate is constant within the mixing zone and, depending on the default setpoint value, it is made up of various amounts of cold and warm air. If the default setpoint value exceeds $q_{v,warm,min}$, the damper blade for the warm air supply closes and air only flows via the cold air supply.

q_v [m³/h]; [l/s]

Volume flow rate

Δ_{qv} [%]

Volume flow rate accuracy in relation to the setpoint (tolerance)

Δ_{pt} [Pa]

Total differential pressure

$\Delta_{pt,min}$ [Pa]

The total minimum differential pressure is equal to the pressure loss of the VAV controller when the damper blade is open, caused by flow resistance (damper blade). 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 differential pressure must be ensured for all operating conditions and for all controllers, and the measurement point or points for speed control must have been selected accordingly to achieve this. The total differential pressure can vary in the cold and warm air duct, as it is made up of the static differential pressure and the dynamic differential pressure between the cold or warm air duct and the air outlet (total air volume flow rate).

Lengths

All lengths are given in millimetres [mm] unless stated otherwise.

Basic unit

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

Control component

Electronic unit mounted on the basic device to control the volume flow rate by adjusting the control damper position. The electronic unit essentially consists of a controller with integrated differential pressure transducer and an integrated actuator (Easy and Compact controller). Interface technology: analogue interface or digital bus interface for connection and tapping of signals and information.

VAV terminal unit

Consists of a basic unit with an attached control component.