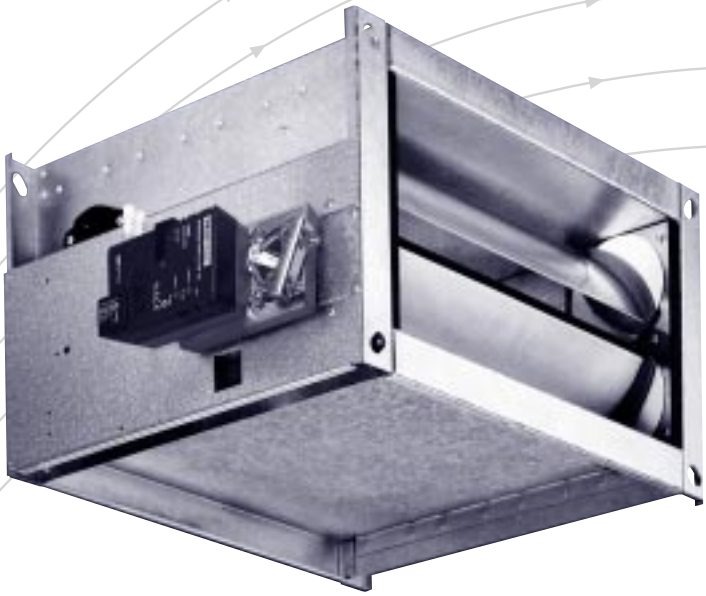
VARYCONTROL®
VAV Control Units

for variable volume systems
Type TVJ · TVT



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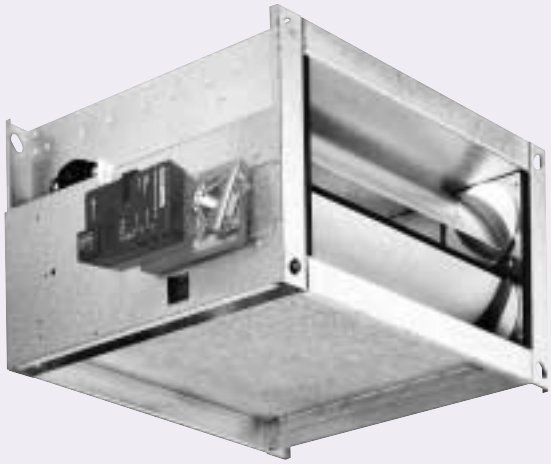
Contents · Description

TVT



TVTD

TROX VARYCONTROL® VAV unit type TVJ and TVT, as well as TVJD and TVTD have been developed for the control of air flow, especially in variable volume flow systems.

TVJ: Rectangular volume flow control unit for supply or extract air
TVJD: Rectangular volume flow control unit for supply or extract air with additional acoustic cladding
TVT: Rectangular volume flow control unit for supply or extract air, very low leakage in the shut-off position
TVTD: Rectangular volume flow control unit for supply or extract air, with additional acoustic cladding, very low leakage in the shut-off position

The mechanical components and electronic control components which are factory fitted, form the controls package. Each unit is set up to the required flow rates and is subjected to an aerodynamic function test.

The units are fitted with an averaging differential pressure grid for measuring the air flow and a multileaf damper to provide the control function.

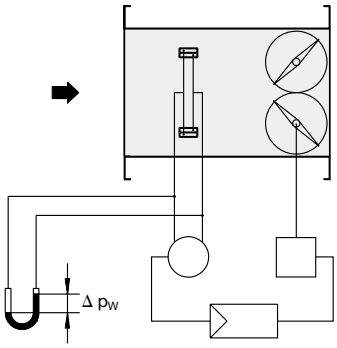
The units have a flange on both ends for connection to the ducting.

For more stringent acoustic requirements, the TVJD or TVTD units with acoustic cladding and/or a TX silencer may be used.

The flow rate control is a closed loop system with external power supply. The pressure transmitter, controller and actuator are selected to meet control requirements and operational conditions. TROX VAV units can be supplied with control components from any reputable manufacturer to suit the project specification.

Further, current information on application, selection as well as control components available can be found in the “Technical Documentation” download area of our website.

Also available on the Internet is the “flow volume controller” online program for the design and selection of our units.



Δp_W in Pa = differential pressure at the differential pressure grid

Characteristics

- Electronic volume flow control
- Suitable for supply or extract air
- Volume flow range (depending on manufacturer and type of controller) approx. 10 : 1
- High level of control accuracy for the volume flow settings, please ensure the most favourable aerodynamic configuration of ductwork is used.
- Differential pressure range 20 to 1000 Pa
- Full shut-off from ductwork system
- On TVT, control damper closed blade airtightness to DIN EN 1751, class 4 (B < 600 class 3)
- On TVJ H > 100 control damper closed blade airtightness to DIN EN 1751, class 1
- Horizontal or vertical installation (when using diaphragm pressure sensors, install according to label on the unit)
- Factory set up of volume flow or programming. This includes aerodynamic testing of each unit using a dedicated test rig. Data covering set up is given on a test label attached to each unit
- Volume flow can be measured and subsequently reset on site; an additional peripheral device may be necessary
- Actual value signal referred to $\dot{V}_{nom}$
- The units are, in terms of their mechanical parts, maintenance-free
- Operating temperature 10 to 50 °C

Constructional features

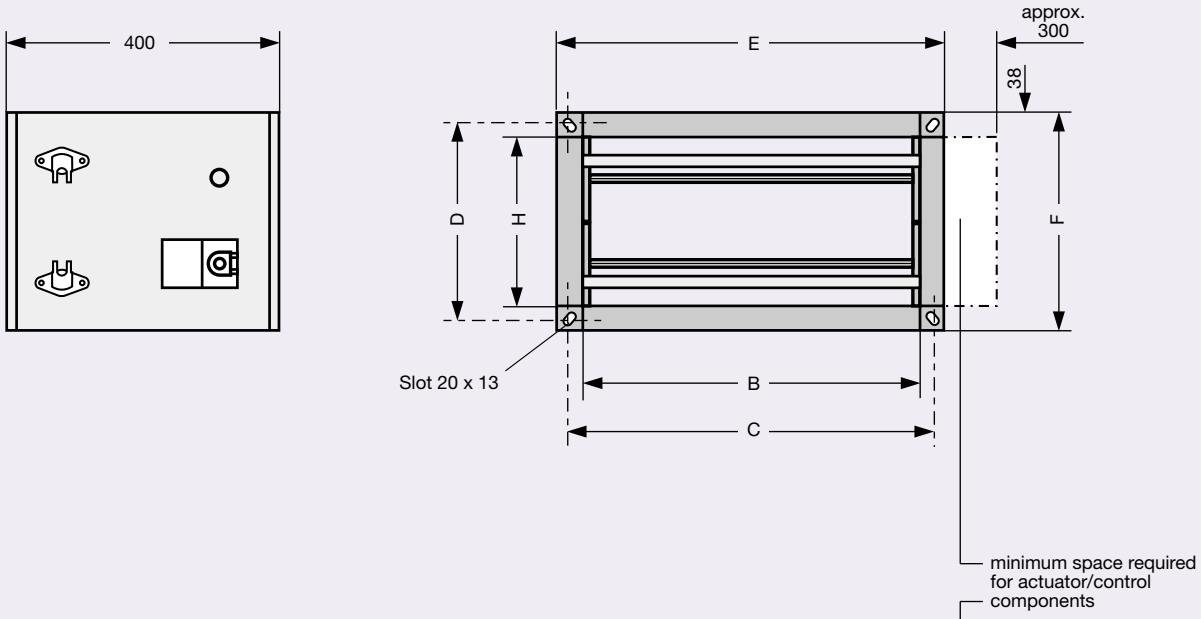
Casing

- Dimensionally stable, multiple-profile frame
- Suitable for attachment of connecting flanges
- Opposed blade action, blades connected by internal gears at both ends
- Bearing inserts sealed with ring O rings

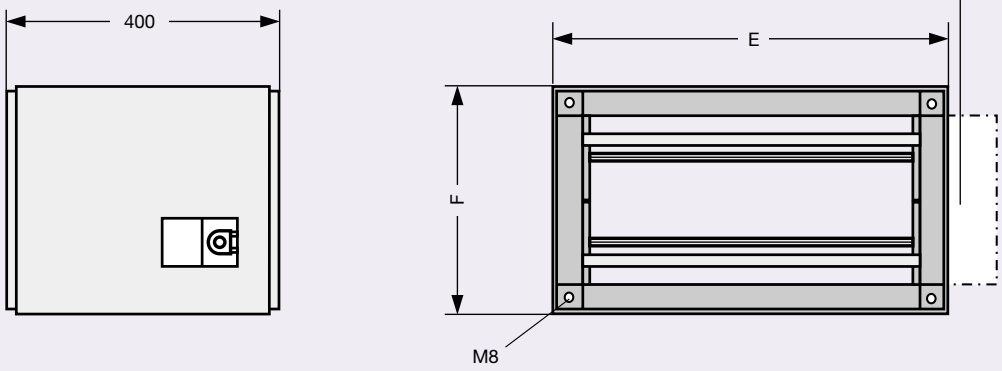
TVT damper

- Replaceable seals
- Totally enclosed internal gears

TVJ/TVT



TVJD/TVTD



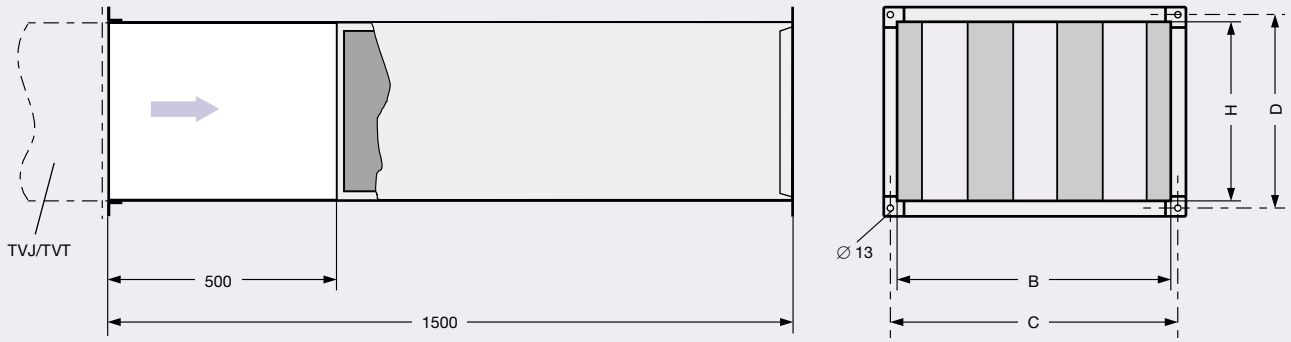
Construction · Dimensions

Acoustic cladding
- Outer cover in galvanized sheet steel
- Sound-absorbent lining
- Structure-borne sound insulation
- Cannot be retro-fitted

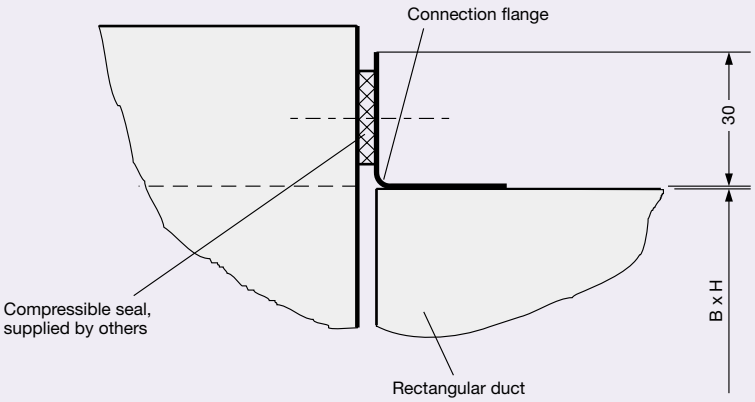
TX silencer
- Casing in galvanized sheet steel
- Mineral wool lining conforming to DIN 4102, fire rating class A2, with RAL quality mark RAL-GZ 388, biodegradable as defined by TRGS 905 as well as EU Directive 97/69/EC
- Mineral wool faced with glass-fibre fabric providing protection against erosion by air flow up to a maximum air velocity of 20 m/s, inert to fungal and bacterial growth
- Suitable for the TVJ/TVT unit

Materials
- Casing, spindles and linkage made of galvanized sheet steel
- Blades and differential pressure grid made from aluminium extruded profiles
- Gears made from antistatic plastic (ABS), heat-resistant to 50 °C

TX



Rectangular duct connection



See leaflet 5/20/EN/... for reheat coil dimensions and technical data

Dimensions · Weights

Dimensions in mm, weights in kg

B x H mm		TVJ/TVT				TVJD/TVTD				Number of control damper blades	Number of sensor tubes	Weights		
		C	D	E	F	C	D	E	F			TVJ/TVT	TVJD/TVTD	TX
200	100	234	134	276	176	234	134	280	180	1	1	6	9	10
300		334	134	376	176	334	134	380	180			7	11	12
400		434	134	476	176	434	134	480	180			8	12	15
500		534	134	576	176	534	134	580	180			9	14	17
600		634	134	676	176	634	134	680	180			10	15	20
200	200	234	234	276	276	234	234	280	280	2	2	9	14	16
300		334	234	376	276	334	234	380	280			10	15	20
400		434	234	476	276	434	234	480	280			11	17	25
500		534	234	576	276	534	234	580	280			12	18	29
600		634	234	676	276	634	234	680	280			13	20	34
700		734	234	776	276	734	234	780	280			14	21	39
800		834	234	876	276	834	234	880	280			15	23	44
300	300	334	334	376	376	334	334	380	380	3	2	10	15	24
400		434	334	476	376	434	334	480	380			11	17	29
500		534	334	576	376	534	334	580	380			12	18	34
600		634	334	676	376	634	334	680	380			13	20	40
700		734	334	776	376	734	334	780	380			15	22	45
800		834	334	876	376	834	334	880	380			16	24	50
900		934	334	976	376	934	334	980	380			18	26	55
1000		1034	334	1076	376	1034	334	1080	380			19	29	60
400	400	434	434	476	476	434	434	480	480	4	2	14	21	34
500		534	434	576	476	534	434	580	480			15	23	39
600		634	434	676	476	634	434	680	480			16	24	45
700		734	434	776	476	734	434	780	480			17	26	50
800		834	434	876	476	834	434	880	480			18	27	56
900		934	434	976	476	934	434	980	480			20	29	61
1000		1034	434	1076	476	1034	434	1080	480			21	32	67
500	500	534	534	576	576	534	534	580	580	5	4	19	28	45
600		634	534	676	576	634	534	680	580			20	30	50
700		734	534	776	576	734	534	780	580			22	32	56
800		834	534	876	576	834	534	880	580			23	35	62
900		934	534	976	576	934	534	980	580			25	37	68
1000		1034	534	1076	576	1034	534	1080	580			26	39	73
		TVJ				TVJD						TVJ	TVJD	TX
600	600	634	634	676	676	634	634	680	680	6	4	19	29	55
800		834	634	876	676	834	634	880	680			23	35	67
1000		1034	634	1076	676	1034	634	1080	680			27	41	80
800	800	834	834	876	876	834	834	880	880	8	4	28	42	79
1000		1034	834	1076	876	1034	834	1080	880			32	48	93
1000	1000	1034	1034	1076	1076	1034	1034	1080	1080	10	4	38	57	107

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Functional Description

Room temperature controller

In VAV systems, the room temperature control takes the form of a cascade control. The primary controlled variable is the room temperature. The output signal of the room temperature controller is not fed directly to the supply air control damper, but alters the setpoint value of the supply air volume flow rate control loop. The volume flow control also generates minimum and maximum limits for the air flow which has benefits in keeping the room temperature constant and for the functioning of the overall room air conditioning system.

Volume flow measurement

A sensor is necessary for the positive measurement of air flows, this is achieved by pressure measurement at several points distributed over the cross-section and provision of the resulting average value. The TROX differential pressure sensor is an optimum solution in terms of economics and product technology. This sensor delivers exact results for most room air conditioning applications based on normal flow entry conditions.

Volume flow control

The volume flow is controlled in a closed control loop, i.e.

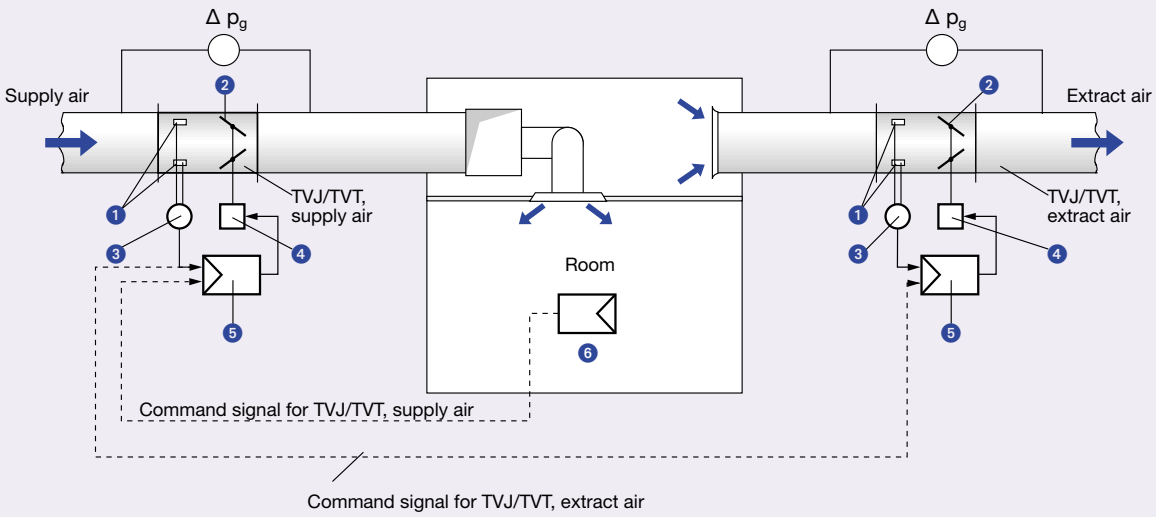
measurement – comparison – control.

A pressure transmitter converts the pressure difference into an electrical signal, which is interpreted as the actual value by the controller. In 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 to the damper actuator in the event of a difference between the two values.

Supply air/extract air tracking control

In single rooms and closed-off office areas, the balance between supply and extract air should be maintained. Otherwise, annoying whistling noises occur at door gaps, and the doors can be difficult to open. For this reason, the extract air should have variable control in a VAV system. The actual value of the supply air is fed as a command signal to the extract air controller (tracking controller). In this way, the extract air automatically follows the supply air, even when this has not reached its set value.

System diagram

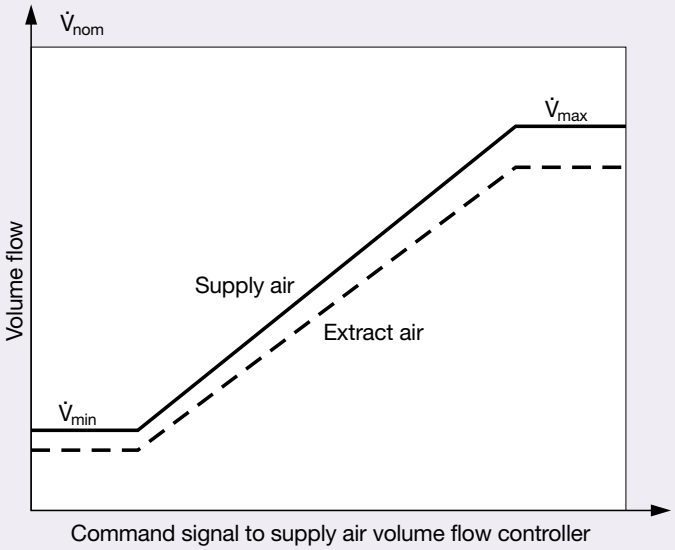


Legend

1. Differential pressure grid
2. Control damper
3. Pressure transmitter
4. Actuator
5. Volume flow controller
6. Room temperature controller (supplied by others)

--- Wiring by others

Control diagram



Nomenclature

f_m in Hz: Octave centre frequency
L_W in dB: Sound power level of air-regenerated noise in the air duct
L_{W1} in dB: Sound power level of air-regenerated noise with TX silencer
L_{W2} in dB: Sound power level of case radiated noise
L_{W3} in dB: Sound power level of case radiated noise with additional acoustic cladding
L_{pA} in dB(A): A-weighted sound pressure level of air-regenerated noise, system attenuation taken into account
L_{pA1} in dB(A): A-weighted sound pressure level of air-regenerated noise with TX silencer, system attenuation taken into account
L_{pA2} in dB(A): A-weighted sound pressure level of case-radiated noise
L_{pA3} in dB(A): A-weighted sound pressure level of case-radiated noise with additional acoustic cladding
L_{WKA} in dB(A): A-weighted sound power level of air-regenerated noise in the connecting duct, control damper in the shut-off position (only on TVJ)
$\dot{V}$ in l/s or m³/h: Volume flow
$\dot{V}_L$ in l/s or m³/h: Leakage flow, TVJ control damper in shut-off position
$\dot{V}_{nom}$ in l/s or m³/h: Nominal volume flow (100 %)
Δp_g in Pa: Static pressure differential
$\Delta p_{g\,min}$ in Pa: Minimum static pressure differential
$\Delta \dot{V}$ in ± %: Volume flow tolerance from set point
B in mm: Width
H in mm: Height
ΔL_W in dB: Correction value for case radiated noise sound power level without additional acoustic cladding
ΔL_{W1} in dB: Correction value for case radiated noise sound power level with additional acoustic cladding

All sound powers levels are based on 1 pW, all sound pressure levels on 20 µPa.

All noise levels measured in a reverberation chamber.
The sound power level data was determined and corrected according to DIN EN ISO 5135, February 1999.

Leakage flow and sound power level, TVJ in shut-off position

Dimensions B x H mm		Δp_g = 100 Pa			Δp_g = 200 Pa			Δp_g = 500 Pa		
		$\dot{V}_L$		L_{WKA}	$\dot{V}_L$		L_{WKA}	$\dot{V}_L$		L_{WKA}
		in l/s	in m³/h	in dB(A)	in l/s	in m³/h	in dB(A)	in l/s	in m³/h	in dB(A)
200	100	9	32	39	13	46	47	20	72	57
300		9	34	41	13	48	49	21	76	59
400		10	35	42	14	50	50	22	79	60
500		11	40	43	16	57	51	25	90	61
600		13	45	44	18	64	52	28	101	62
200	200	10	35	42	14	50	50	22	79	60
300		11	40	44	16	57	52	25	90	62
400		13	45	45	18	64	53	28	101	63
500		14	52	45	20	73	53	32	115	63
600		16	56	46	22	80	54	35	126	64
700		17	63	47	25	89	55	39	140	65
800		19	68	48	27	96	56	42	151	66
300	300	15	53	45	21	75	53	33	119	63
400		17	61	46	24	87	54	38	137	64
500		20	71	47	28	100	55	44	158	65
600		22	79	48	31	112	56	49	176	66
700		24	85	49	34	121	57	53	191	67
800		25	90	50	35	128	58	56	202	68
900		26	95	49	37	134	57	59	212	67
1000		27	98	50	39	139	58	61	220	68
400	400	22	80	48	32	114	56	50	180	66
500		25	90	49	35	128	57	56	202	67
600		27	98	50	39	139	58	61	220	68
700		30	109	49	43	155	57	68	245	67
800		34	121	50	47	171	58	75	270	68
900		35	127	51	50	180	59	79	284	69
1000		37	134	51	52	189	59	83	299	69
500	500	29	105	50	41	148	58	65	234	68
600		32	116	50	46	164	58	72	259	68
700		35	126	50	49	178	58	78	281	68
800		38	135	51	53	191	59	84	302	69
900		40	145	51	57	205	59	90	324	69
1000		43	155	52	61	219	60	96	346	70
600	600	36	129	51	51	182	59	80	288	69
800		44	158	52	62	223	60	98	353	70
1000		51	185	53	73	262	61	115	414	71
800	800	54	193	53	76	273	61	120	432	71
1000		65	233	54	92	330	62	145	522	72
1000	1000	76	274	55	108	387	63	170	612	73