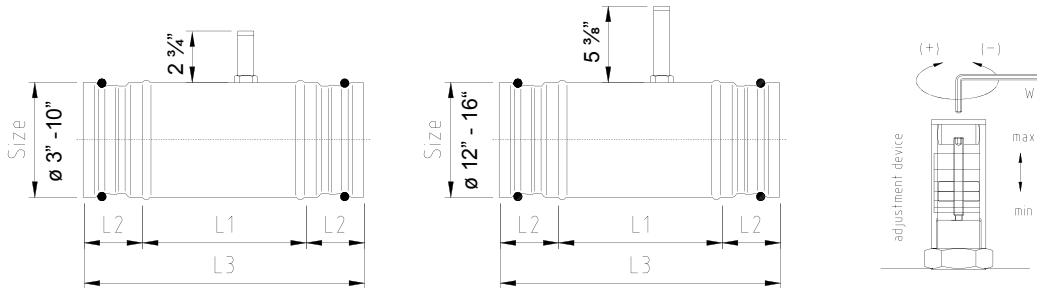


Pressure Independent Volume Flow Controller

Constant volume flow controller, model VRK - circular, self-regulating
with tight push-fit ends or screwless flange-system
collar ends calibrated according to DIN 24147 T1
laser-welded housing



Volume flow controller – for constant volume systems (model VRK)



- mechanical, no external power supply
- push-fit ends with rolling ring seals
- flow rate factory preset and manually adjustable by the customer
- on request: flow rate only factory preset, without manual adjustment device

L1 = installation length

Design variant: flange ends

All controllers version 1 – 6 are also available with new flange ends for fast and economical installation without screws (compared to traditional flange connection with screws).

For installation, additional loose flanges and clamping rings are needed. These flanges have push-fit ends with rolling rubber ring seals and can be installed without any additional sealing or fastening.

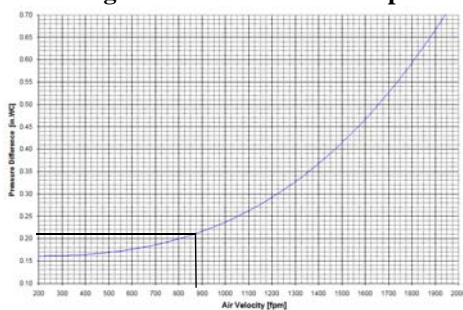
Air flow rate:

The air flow rate for the controllers in versions 2 – 6 can be adjusted in the ratio of 1 to 3.

Minimum pressure difference:

A minimum pressure difference at the controller is needed for the correct service of the controller (see diagram No. 1)

Diagram 1: Minimum static pressure difference at the controller



Example:

Controller: Model 233
 Diameter: Size 6"
 Air velocity: 875 fpm
 Airflow: 190 cfm

Sought: minimum static pressure difference in in WC
 See diagram 1 : 0.21 in WC

Dimension and aerodynamics

Size in inches ø	Volume flow in cfm		Dimensions in inches						
	min.	max.	L ₁	L ₂	L ₃	A ₁	B ₁	A ₂	B ₂
3"	24	74	4 3/4"	1 5/8"	7 7/8"	6 1/8"	4 1/8"	8 7/8"	4"
4"	41	130	5 5/8"	1 5/8"	9 7/8"	6 1/8"	4 1/8"	8 7/8"	4"
5"	59	165	6 5/8"	1 5/8"	9 7/8"	6 1/8"	4 1/8"	8 7/8"	4"
5 1/2"	88	235	6 5/8"	1 5/8"	9 7/8"	6 1/8"	4 1/8"	8 7/8"	4"
6"	106	300	9 1/2"	1 5/8"	12 5/8"	6 1/8"	4 1/8"	8 7/8"	4"
8"	147	530	9 1/2"	1 5/8"	12 5/8"	6 1/8"	4 1/8"	8 7/8"	4"
10"	249	883	9 1/2"	1 5/8"	12 5/8"	6 1/8"	4 1/8"	8 7/8"	4"
12"	471	1648	8 5/8"	2 3/8"	13 3/8"	6 1/8"	4 1/8"	11 7/8"	5 7/8"
16"	589	2395	11 5/8"	2 3/8"	16 3/8"	9"	6 3/8"	11 7/8"	5 7/8"

Sound data

Table 1: Air flow noise generated by the controller

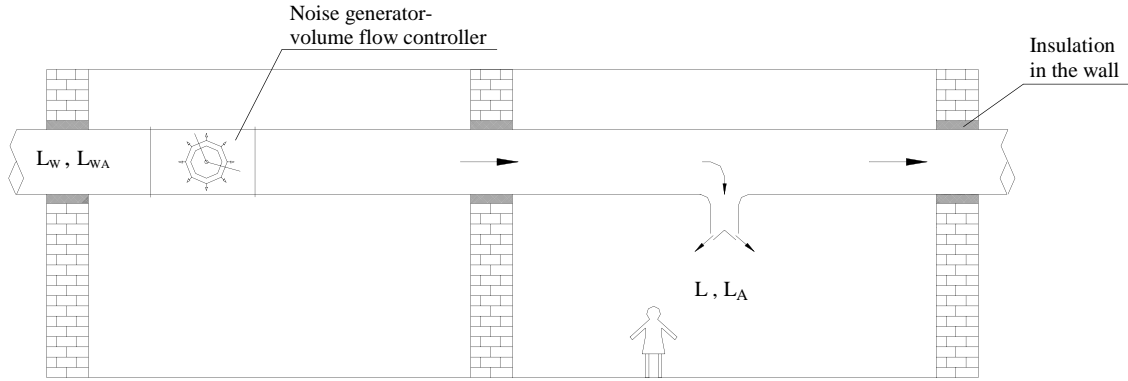
Size in inches	Volume flow in cfm	Static pressure difference at the controller in in WC																										
		0.4 in WC								Summation L _w sum A-weighted dB(A)	1.0 in WC								Summation L _w sum A-weighted dB(A)	2 in WC								Summation L _w sum A-weighted dB(A)
		Octave power level* L _w in dB									Octave power level* L _w in dB									Octave power level* L _w in dB								
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz			
3"	24	37	37	35	33	33	33	28	27	38	39	42	43	44	44	46	41	41	50	46	49	49	50	51	53	48	48	57
	48	49	47	44	41	39	39	33	32	45	51	51	50	49	48	49	44	44	54	58	58	56	55	55	56	51	51	61
	74	52	51	48	45	44	44	38	37	49	61	60	57	54	53	53	47	46	58	68	66	63	61	59	59	53	52	65
4"	41	40	39	38	36	35	36	30	29	41	43	45	46	46	47	49	44	43	53	49	52	52	53	54	55	50	50	60
	80	50	48	45	42	41	40	34	33	46	59	57	54	51	50	49	43	42	55	60	60	58	57	57	58	53	52	63
	118	54	52	49	47	45	45	39	38	51	63	61	58	55	54	54	48	47	59	70	68	65	62	61	60	54	53	66
5"	59	41	40	38	36	35	36	30	29	41	45	47	47	48	48	49	44	43	54	52	54	54	54	55	56	50	49	60
	112	51	49	46	42	41	40	34	32	46	55	54	53	51	51	51	46	45	56	61	61	59	58	57	58	52	52	63
	165	54	53	50	47	45	45	39	37	50	63	61	58	55	54	53	47	46	59	64	64	62	61	61	62	57	56	67
5 1/2"	82	43	42	40	38	37	37	31	30	42	47	49	49	49	50	51	46	45	55	53	56	56	56	56	58	52	51	62
	159	53	51	47	44	43	42	36	34	48	61	59	56	53	51	51	44	43	57	63	63	61	60	59	60	54	54	65
	235	56	55	52	49	47	47	41	39	52	65	63	60	57	56	55	49	48	61	72	70	67	64	62	62	56	55	68
6"	106	44	43	41	39	38	38	32	31	43	48	50	50	50	50	51	46	45	56	55	57	57	57	57	58	53	51	63
	200	53	51	48	44	43	42	36	34	48	62	60	56	53	51	51	44	43	57	64	64	62	60	60	60	55	54	65
	294	57	55	52	49	47	47	40	39	52	66	64	61	58	56	55	49	48	61	72	70	67	64	62	62	56	54	68
8"	147	45	43	41	39	38	37	31	30	43	51	52	52	51	51	51	45	44	56	57	59	58	58	57	58	52	50	63
	338	55	53	50	46	44	44	37	36	50	64	62	58	55	53	53	46	45	59	66	66	64	62	62	62	56	56	67
	530	-	-	-	-	-	-	-	-	-	68	66	63	60	58	58	52	50	64	75	73	70	67	65	65	58	57	70
10"	294	48	47	45	43	41	41	35	34	47	54	56	55	55	54	55	49	48	60	61	62	62	61	61	62	56	54	66
	589	57	55	52	49	47	46	39	38	52	66	64	61	57	55	55	48	47	61	69	68	67	65	64	64	59	58	69
	883	-	-	-	-	-	-	-	-	-	70	68	65	62	60	60	53	52	65	77	75	72	68	67	66	60	58	72
12"	353	48	46	44	41	39	39	32	31	44	55	56	55	54	53	53	46	44	58	62	63	62	61	60	59	53	51	65
	824	57	55	52	48	46	45	39	37	51	66	64	60	57	55	54	47	46	60	70	69	67	65	64	64	58	57	69
	1295	-	-	-	-	-	-	-	-	-	71	69	65	62	60	59	53	51	65	77	75	72	69	67	66	60	58	72
16"	589	50	48	45	42	41	40	33	31	46	58	59	57	56	55	54	47	45	59	65	65	64	62	61	61	54	51	66
	1295	58	56	52	49	47	46	39	37	52	67	65	61	57	55	54	48	46	61	72	71	68	66	65	65	59	57	70
	2237	-	-	-	-	-	-	-	-	-	73	71	67	64	62	61	55	53	67	79	77	74	70	68	68	61	60	74

*: sound level in dB/octave in relation to 10⁻¹² W

If air is blown into a room, additional attenuation will occur as a result of the pipe outlet attenuation and room attenuation, thereby resulting in a reduction in the sound level. The room and outlet attenuation can be calculated according to VDI 2081. As a rough estimate, about 8 dB can be deducted.

The flow noise is heavily dependent on the local conditions, the radiating pipe length behind the sound absorber and the acoustic insulation and therefore the given data, calculated in the laboratory, can provide only a reference figure.

Example 1: Calculation of noise generated by air flow (no attenuator)



f_m	Sound level in dB / octave								Summation A-weighted dB (A)
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Flow noise L_w acc. to table 1	53	51	47	44	43	42	36	34	48
Reflection attenuation	-21	-16	-10	-4	-2	0	0	0	
Room attenuation	-4	-4	-4	-4	-4	-4	-4	-4	
A- weighting	-26	-16	-9	-3	0	+1	+1	-1	
Corrected sound pressure level L_A	2	15	24	33	37	39	33	29	42

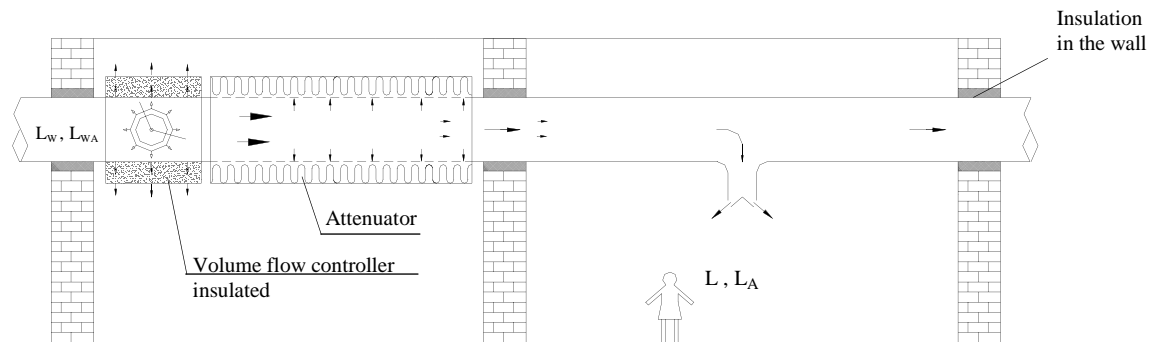
Given: Size 5 1/2"
 Air flow: 159 cfm
 Pressure difference: 0.4 in WC

Specified sound pressure level in room L_A : 42 dB(A)
 With 4 dB/octave room attenuation
 (See e.g. VDI 2081)

Sought: air-generated noise in room

Result = 42 dB (A) , o.k.

Example 2: Calculation of noise generated by air flow with attenuator



f_m	Sound level in dB / octave								Summation A-weighted dB (A)
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Flow noise L_w acc. to table 1	62	60	56	53	51	51	44	43	57
Attenuation by silencer	-1	-2	-5	-10	-25	-34	-17	-12	
Reflection attenuation	-20	-14	-9	-3	-1	0	0	0	
Room attenuation	-4	-4	-4	-4	-4	-4	-4	-4	
A- weighting	-26	-16	-9	-3	0	+1	+1	-1	
Corrected sound pressure level L_A	11	24	29	33	21	14	24	26	35

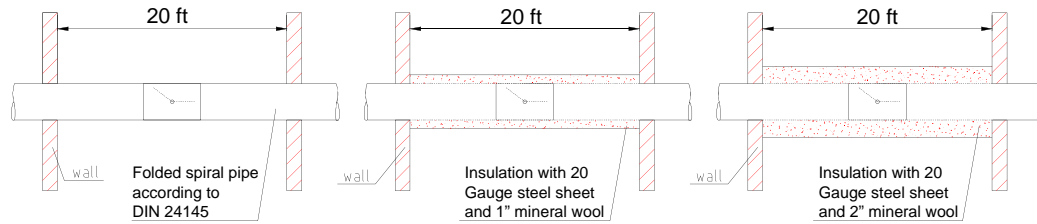
Given: Size 6"
 Air flow: 200 cfm
 Pressure difference: 1.0 in WC

Specified sound pressure level in room: L_A : 38 dB(A)
 With 4 dB/octave room attenuation
 (See e.g. VDI 2081)

Sought: air-generated noise in room

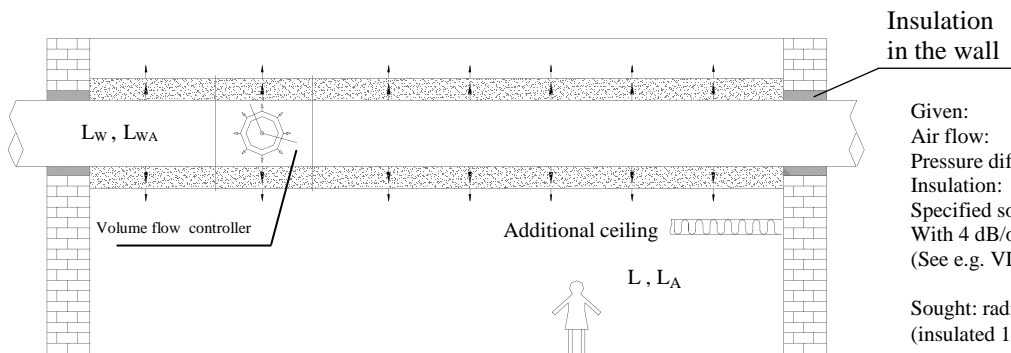
Result of calculation = 35 dB (A) , o.k.

Table 2: Correction data for calculation of the radiating noise of a pipe 6 m in length with built-in volume flow controller



Size in inches	Correction value in dB /octave								Correction value in dB /octave								Correction value in dB /octave							
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
3"	36	33	32	23	17	12	11	11	39	35	39	35	32	33	34	29	42	37	45	46	47	54	56	47
4"	34	32	30	22	16	12	11	10	38	35	38	34	31	33	34	28	41	38	46	45	47	54	57	47
5"	29	29	31	24	21	19	15	11	35	33	37	36	32	33	36	27	35	36	42	48	51	60	58	45
5 1/2"	27	28	27	21	18	14	12	10	29	29	32	32	32	33	33	26	31	30	37	42	45	52	54	44
6"	23	23	20	18	11	10	9	8	27	26	28	29	27	31	31	25	29	28	35	40	44	51	54	44
8"	22	19	16	16	15	11	9	8	23	18	23	26	29	29	29	24	26	22	29	37	42	51	53	43
10"	19	16	13	12	12	10	9	8	23	18	20	24	26	30	28	24	25	20	26	35	41	50	52	42
12"	18	14	12	13	11	11	8	8	22	17	19	23	27	29	28	24	26	18	26	38	42	51	53	45
16"	17	11	10	10	10	9	7	6	19	14	17	22	25	28	27	23	20	16	23	33	39	48	50	40

Example 3: Calculation of the radiating noise of an insulated pipe



Given: Size 6"
 Air flow: 294 cfm
 Pressure difference: 2 in WC
 Insulation: 1"
 Specified sound pressure level in room L_A : 38 dB(A)
 With 4 dB/octave room attenuation
 (See e.g. VDI 2081)

Sought: radiating noise of a pipe 20 ft in length (insulated 1")

Result of calculation = 35 dB (A), o.k.
 (-4 dB(A) if additional ceiling is installed)

f_m	Sound level in dB / octave								Summation A-weighted dB (A)
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Flow noise L_w acc. to table 1	72	70	67	64	62	62	56	54	68
Reflection attenuation	-27	-26	-28	-29	-27	-31	-31	-25	
Room attenuation	-4	-4	-4	-4	-4	-4	-4	-4	
A- weighting	-26	-16	-9	-3	0	+1	+1	-1	
Corrected sound pressure level L_A	15	24	26	28	31	28	22	24	35

Nomenclature:

- L_w in dB sound power level
- L_{wA} in dB(A) A-weighted sound power level
- L in dB sound pressure level
- L_A in dB(A) A-weighted sound pressure level

The Barcol volume flow controller VRK is an independent control element which works without an external power supply. It can be regarded as a self-actuating duct damper, as it delivers a required volume of air regardless of changes in system pressure. In consequence, the controller overcomes the need for system balancing and ensures constant air flow in service.

Variable air volume models are available with electric and pneumatic actuators.

Operating principle: The volume flow controller works with a free-moving control plate, supported by PTFE bearings and connected to an adjustment spring. Aerodynamic forces balance the force of the spring and push the blade to a defined position that finally controls the set volume flow.

Pressure, accuracy and scope of use: The controller operates reliably from a minimum pressure difference, which depends on the air velocity (see diagram 1), to a maximum pressure difference of 4 in WC. The flow rate variation is usually within a tolerance of $\pm 10\%$ (up to 60 cfm ± 6 cfm). If the air velocity is below 780 fpm or the controller is installed horizontally, variations may well be higher than indicated. This will apply also if the air flow profile is not uniform or is distorted by bends, sharp edges or bottlenecks. Furthermore, the recommended air velocity is around 885 fpm and should not be below 530 fpm.

Temperature: The controller operates within a temperature range from -20°F to 210°F . A special, heat-resistant version for temperatures up to 480°F (briefly even 570°F) is available on request. For volume flow controllers with electric or pneumatic actuators, the operating temperatures of the actuators also have to be considered.

Construction: The housing of the controller is made from galvanized and laser-welded metal sheet without any intruding fold. The smooth surface of the housing enables the inclusion of shaped and calibrated spigot ends with rolling rubber ring seals. This sealing system is patented and offers many advantages, such as tightness, ease of installation and removal, and hence reduced installation costs. Additionally and on request, the controller is available with a new flange connection without screws. This connection allows easy maintenance and modification by removing the controller sideways without dismantling the whole ductwork. The control plate of the controller is supported by PTFE bearings and equipped with an attenuator to prevent any oscillation of the plate. The controller is also available in stainless steel or with a PUR coating in all RAL colours on request.

Installation and adjustment: The controller can be used for supply and extract ducts in high or low pressure air systems. Either vertical or horizontal installation is possible thanks to the exactly balanced control plate. All controllers can be adjusted to the required flow rate in the factory. The controller with the manual adjustment device can easily be set or reset by the customer himself. Any given throughput within the respective operating range of the controller can be chosen.

Insulation: On request, the controller is available with insulation in depths of 1" or 2" to reduce noise or heat transfer.