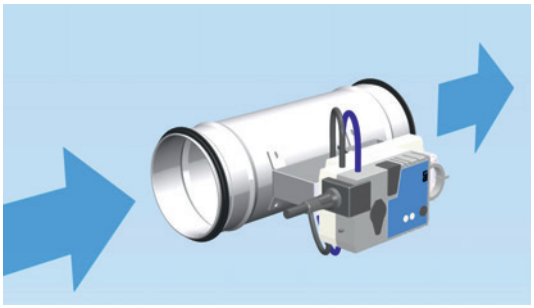
AIR TECH SYSTEMS

Technical Brochure

LTG Air Distribution

Variable flow rate controllers VRE*active*

active control



Round, with LTG map control
For comfort ventilation applications (e.g. office rooms)

www.LTG.net

Technical brochure • Variable flow rate controllers VRE*active*, round

LTG Comfort Air Technology

Air-Water Systems

Air Diffusers

Air Distribution

Content

Notes

Dimensions stated in this brochure are in mm.

Dimensions stated in this brochure are subject to General Tolerances according to DIN ISO 2768-vL.

The actual specifications are available as a word document at your local distributor or at www.LTG.net.

The flow rate controllers VRE, VRF, VRE*active* and VRF*active* are designed to be installed in air-conditioning systems in accordance with VDI 2066 Sheets 1+2 and DIN 1946 Sheet 2.

The aforementioned standards, in particular DIN 1946-2 which has been superseded by DIN EN 13779, relate to DIN EN 13779, which in turn refer to the standards DIN EN 12237 and DIN EN 1507. The tightness classes quoted in the standards must be enquired depending on the product design.

Flow Rate Control Basics – Which Product for which Application?

Plant Types

Variable Flow Rate

Plants with variable flow rates (VVS) use electronic flow rate controllers providing the room with exactly the required air volume – according to function and energy efficency.

Constant Flow Rate

Plants with constant flow rates (KVS) use flow rate controllers maintaining a constant flow rate mechanically system-powered. Working with no wiring or external power supply, they provide convenient and cost-saving solutions.

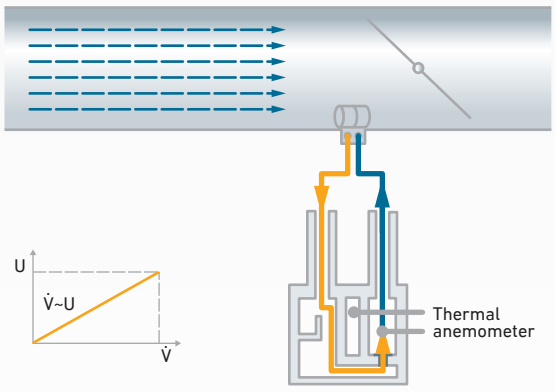
Measuring Methods

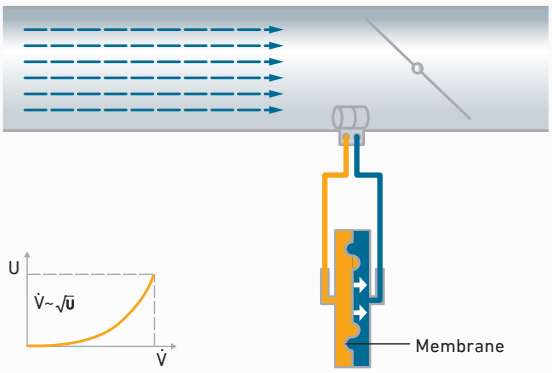
Dynamic Differential Pressure Management

Dynamic methods measure part of the air that is guided through the differential pressure transducer. Dynamic differential pressure measuring makes economical sense in plants where no dust and/or chemical pollution of the air is expected, potentially leading to the contamination of sensors (e. g. administration and office buildings, museums, etc.).

Static Differential Pressure Management

Static differential pressure measurement uses a diaphragm pressure transducer. With this method, no air is guided through the sensor, so no dust or chemical pollution by the air is possible and hence, may well be used in such environments.



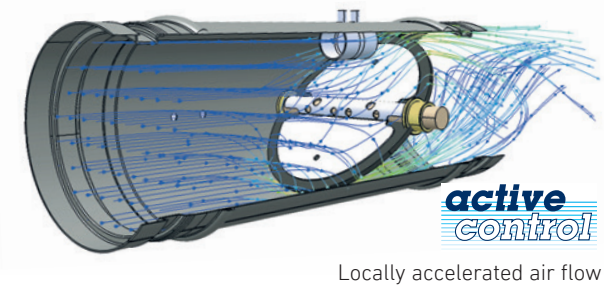


Both principles are applied in our products of VR... series: VR*active* (dynamic) und VR*active-s* (static).

LTG Map Control

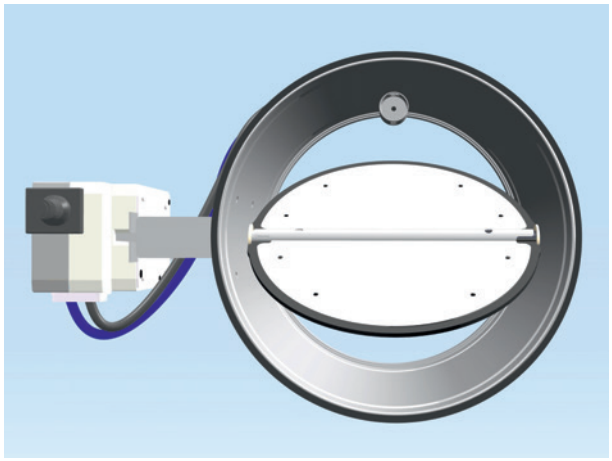
Differential pressure + Damper setting = Flow rate

Contrary to common measuring techniques, the differential pressure is not measured using an upstream element such as orifice plate or differential pressure sensor. Flow rate controllers VR.*active* measure the differential pressure directly in the damper blade area (stronger signal due to locally accelerated air flow).



Locally accelerated air flow at the measuring point

Views of unit



Inside view in direction of air flow

Application

The round flow rate controller VRE*active* is designed to control an initial pressure-independent constant or variable flow rate. Complete shut-off is also possible.

Depending on the model size and flow rate, the minimum initial pressure difference is approx. 5...approx. 50 Pa, based on duct air speeds of 1...10 m/s.

The casing is provided with plug-in end pieces with lip-seal gasket to fit air ducts acc. to DIN EN 1506. All components are factory-wired and hose-connected.

For sound and heat insulation, a 50 mm mineral wool insulating shell with sheet steel jacket is available.

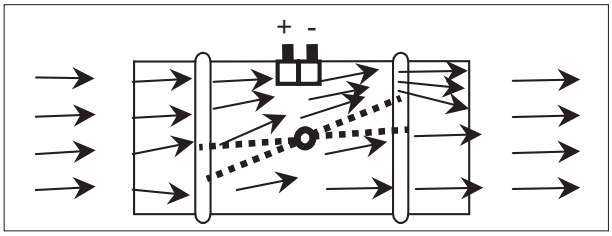
Measuring principle

Contrary to conventional measuring techniques, the differential pressure is not measured through a upstream element such as an orifice plate or sensor. Instead, the differential pressure is measured by two cup-shaped elements mounted in the damper blade area.

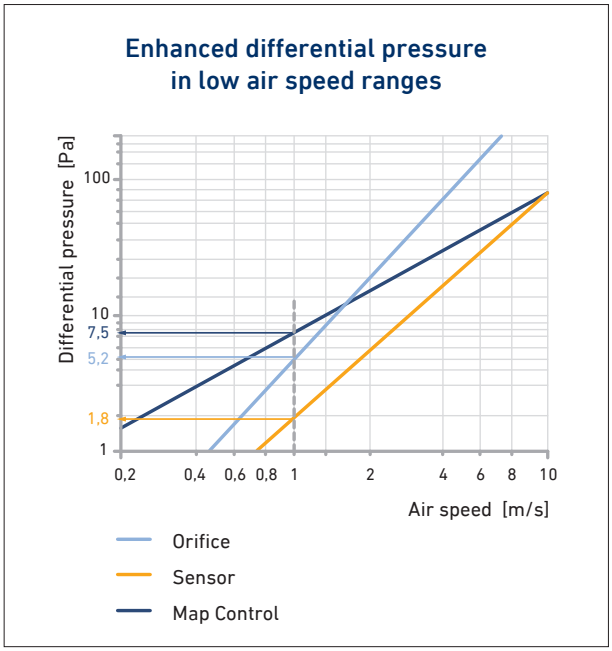
Placing the damper blade in the throttle position creates a „jet effect", which is concentrated with reduced flow rates and higher throttle settings. This results in increased air speeds at the measuring point even with lower duct air speeds allowing for relatively high and very precisely measurable differential pressures.

With this measuring principle, the highest control accuracy of all known systems is achieved even with very low air speeds.

Using this technique, flow rate control depends on two values, the differential pressure and the damper blade position.



Flow pattern inside the housing



Output comparison of different measuring principles

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Characteristics

- Excellent control accuracy from ± 5 % (V_{nom}) up to ± 15 % (V_{min})
- Short installation length thanks to differential pressure measurement in the damper blade area. Thus, perfect for retrofitting and limited-space installation conditions.
- High control ratio of 10:1 (air speeds 1...10 m/s)
- Low minimum pressure loss, resulting in energy savings during operation and lower noise generation.
- Very low air leakage rate via the closed damper blade acc. to DIN EN 1751 Class 4 (Ø D 100 and 125: Class 3)
- Good control accuracy even in case of unfavourable entry conditions, due to "jet effect".
- Plug-in end pieces with lip-seal gasket by default.

Materials, finishes

- Housing, damper blade, axle and measuring probes of galvanized steel
- Damper bearings of POM plastic
- Sealings of EPDM

Accessories, special versions

- All metal parts within the air flow are made of V4A
- Insulating shell for sound and heat insulation (retrofit)
- Flanges acc. to DIN 24154 R1 at both ends
- Counterflanges (loose)
- Pipe ends with bord at both ends
- Clamping rings with ring seal (loose)
- Flexible sound absorber SDE-AO made of aluminium
- Rigid sound absorber SDE-SO made of galvanized sheet steel
- Compact controller with static measuring method
- Compact controller compatible with MP-Bus, Modbus or BACnet
- Integrated NFC interface for diagnostic and parametrization via smartphone/app
- Service tool ZTH for diagnostic and parametrization

Additional accessories and special versions on request.

Connection

Notes and circuit diagrams for regulating the flow rate can be found in the operating and maintenance instructions.

Flow rate ranges, minimum pressure differences

	at1 m/s	at 2 m/s		at 4 m/s		at 7 m/s		at 10 m/s	
Nominal size Ø D [mm]	V_{min} [m³/h]	V [m³/h]	Δp_{min} [Pa]	V [m³/h]	Δp_{min} [Pa]	V [m³/h]	Δp_{min} [Pa]	V [m³/h]	Δp_{min} [Pa]
100	27	54	10	109	15	190	20	272	50
125	43	86	10	171	15	300	20	428	40
160	71	141	10	282	15	494	20	706	40
200	111	222	10	443	15	776	20	1108	40
250	174	348	10	696	15	1217	20	1739	25
315	277	554	10	1108	15	1939	20	2770	25
400	448	896	10	1792	15	3135	20	4479	25

V - flow rate

V_{min} - minimum flow rate = lower limit of control

V_{nom} - nominal flow rate

Δp_{min} - minimum pressure loss

Recommendation for selection

- Air speed up to 7 m/s
- Flow rate controller pressure loss up to 500 Pa
- If sound emission via air duct surfaces is critical, all ducts including the flow rate controller must be sound insulated up to the sound absorber
- For sound absorbers, the flow noise downstream of the splitters and the noise created by the increased outflow air speed in the connected fittings must be considered

Application ranges and limits

- Minimum air speed 1 m/s
- Nominal air speed 10 m/s
- Maximum air speed in the free case section 12 m/s with specific factory-set adjustment
- Static over-pressure in the air duct up to based on ambient pressure up to 1000 Pa
- Static under-pressure in the air duct based on ambient pressure 750 Pa max.
- Leakage flow rate via closed damper blade Class 4 acc. to DIN EN 1751 (Ø D 100 and 125: Class 3)
- Leakage flow rate via casing Class A acc. to DIN EN 1751 (Class C optionally)
- Ambient temperature range 0...+50 °C at 5...95 % rH, non-condensing (acc. to EN 60730-1)
- Suitable for low-pollution air flows (e. g. ETA1, ETA2 acc. to DIN EN 13779), non-corrosive, aggressive air, without solvents that may affect the EPDM damper sealing
- Installation with horizontal damper axle only
- Free suction with upstream air duct or via fitting only
- Running time of actuator with open control circuit 150 s (control component Belimo) resp. 100 s (control component Gruner)

Control accuracy

Deviations from the set value

± 5 % at V_{nom} (equates to 10 m/s) up to

± 15 % at V_{min} (equates to 1 m/s).

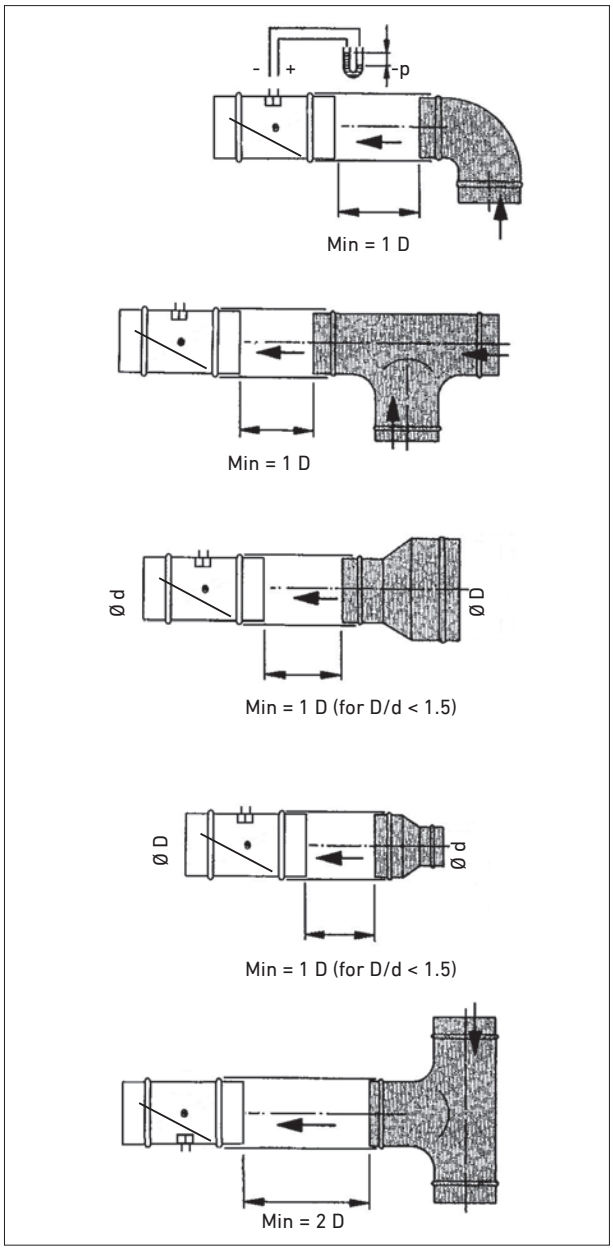
Required straight inflow distances

A straight, undisturbed inflow distance of approx. 0.5...3 x D in front of the flow rate controller is required. There are, however, no restrictions regarding the outflow side.

Please ensure a perfect positioning of the measuring nipples with respect to the air flow. Avoid turbulent air flow and short radius bends or T-branches before the damper.

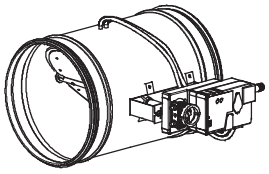
Min = Minimum distance.

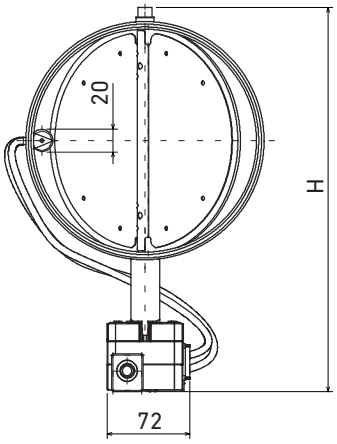
If a combination of fittings that is unfavourable with view to the air flow is unavoidable, the minimum distance is several times the given Min.

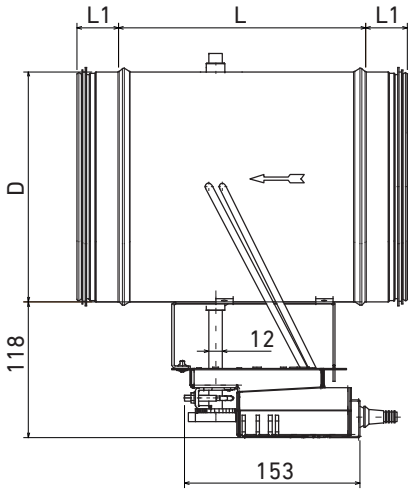


Dimensions, weight

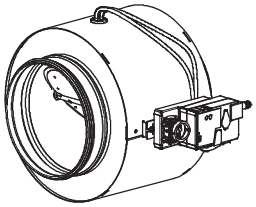
Without insulating shell

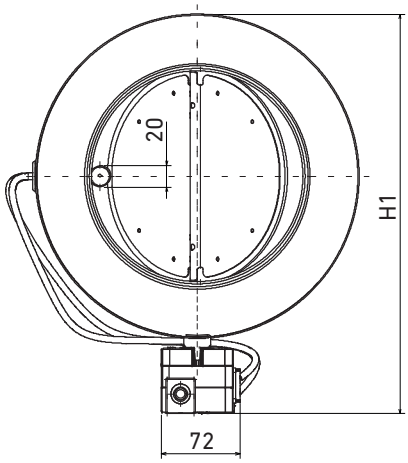


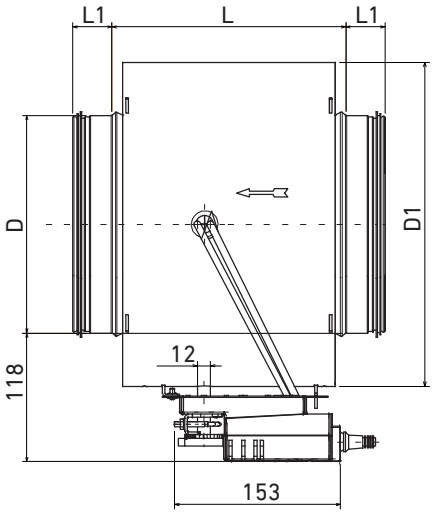




With insulatinge shell
(retrofit)







Version with plug-in ends and lip seal gasket.
Total length of the housing of the version with flange L + 2 x L1.

Nominal size Ø D	L	L1	D	D1	H	H1	Damper angle	Weight without | with insulating shell	
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[°]	[kg]	
100	195	36	99	199	233	267	60	1.5	2.9
125	195	36	124	224	258	292	60	1.8	3.4
160	215	36	159	259	293	327	60	2.1	4.1
200	215	36	199	299	333	367	60	2.6	4.9
250	260	54	249	349	383	417	60	3.3	6.5
315	260	54	314	414	448	482	60	4.4	8.2
400	315	72	399	499	533	567	60	6.1	11.7

Airborne sound transmission without silencer

Nominal size Ø D	Air speed [m/s]	Flow rate [m³/h]	Δp_{tot} = 100 Pa										Δp_{tot} = 200 Pa									
			f_m [Hz]								Sum		f_m [Hz]								Sum	
			63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]	63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]
			L_W [dB/Okt]										L_W [dB/Okt]									
100	1	27	33	32	36	42	43	32	23	26	**45**	**37**	35	35	37	41	47	39	32	28	**48**	**41**
	4	108	39	48	44	42	41	35	31	27	**45**	**37**	42	51	50	48	50	46	47	42	**54**	**46**
	7	189	41	50	45	46	45	42	38	33	**50**	**42**	44	56	53	51	51	48	49	46	**57**	**49**
	10	272	44	51	48	50	49	47	42	43	**54**	**46**	47	58	56	55	54	53	49	52	**60**	**52**
125	1	43	32	29	31	39	41	32	23	16	**42**	**35**	37	29	33	41	49	44	37	29	**51**	**43**
	4	172	46	48	42	44	44	38	32	23	**47**	**39**	48	53	48	49	50	45	53	48	**57**	**49**
	7	299	50	54	48	49	50	42	40	36	**53**	**45**	52	61	54	54	55	49	53	51	**60**	**52**
	10	428	50	55	50	53	54	46	43	37	**57**	**49**	55	63	57	58	58	53	52	49	**62**	**54**
160	1	71	43	37	39	42	42	30	23	26	**44**	**37**	42	42	44	45	52	43	39	40	**53**	**46**
	4	284	49	50	46	46	46	36	29	26	**48**	**41**	52	54	53	52	53	46	39	34	**55**	**48**
	7	494	55	57	53	53	52	44	40	36	**55**	**48**	58	63	59	57	57	51	47	44	**61**	**53**
	10	706	58	60	56	57	57	49	45	40	**60**	**51**	62	66	63	61	61	55	51	49	**65**	**56**
200	1	111	38	33	37	40	39	31	21	15	**42**	**34**	41	37	41	46	49	45	36	28	**51**	**44**
	4	444	50	46	44	43	43	39	31	22	**46**	**39**	55	52	49	47	47	45	40	33	**52**	**44**
	7	776	58	53	50	50	51	46	40	37	**54**	**44**	62	59	57	54	54	51	47	48	**58**	**49**
	10	1108	65	60	58	57	57	53	48	54	**61**	**51**	66	63	61	58	58	56	51	56	**63**	**52**
250	1	174	38	39	42	43	39	33	28	26	**44**	**36**	39	42	45	50	50	46	38	31	**53**	**46**
	4	696	53	50	49	44	41	38	31	28	**47**	**38**	56	55	54	49	47	45	41	35	**53**	**44**
	7	1217	65	59	57	55	52	50	45	39	**58**	**46**	69	65	63	58	55	54	51	49	**62**	**50**
	10	1739	68	64	61	58	56	54	53	51	**62**	**49**	73	70	67	64	61	60	58	57	**68**	**55**
315	1	277	46	45	44	44	41	33	28	31	**45**	**38**	47	49	48	49	50	46	38	33	**53**	**45**
	4	1108	56	52	49	44	42	40	33	31	**48**	**37**	61	58	57	52	50	48	45	37	**56**	**45**
	7	1939	67	60	56	53	52	49	45	37	**57**	**43**	74	67	63	58	55	54	53	46	**62**	**48**
	10	2770	-	-	-	-	-	-	-	-	**-**	**-**	77	70	66	61	60	58	55	52	**66**	**51**
400	1	448	47	46	46	45	43	33	29	36	**47**	**39**	50	53	50	50	51	47	39	35	**54**	**46**
	4	1792	59	54	49	45	43	42	34	36	**50**	**36**	63	60	58	53	50	49	46	39	**57**	**44**
	7	3135	69	61	57	54	52	48	45	39	**57**	**41**	78	70	64	58	56	54	54	44	**63**	**47**
	10	4479	-	-	-	-	-	-	-	-	**-**	**-**	80	71	66	62	59	56	52	48	**65**	**48**

Δp_{ges} - Total pressure difference
f_m - Octave mid-band frequency
L_W - Sound power level
L_{WA} - Sound power level, A-weighted
L_{pA} - Sound pressure level, A-weighted

Airborne sound transmission with silencer type SDE-SO 900 mm long

Nominal size Ø D	Air speed [m/s]	Flow rate [m³/h]	Δp_{tot} = 100 Pa										Δp_{tot} = 200 Pa									
			f_m [Hz]								Sum		f_m [Hz]								Sum	
			63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]	63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]
			L_W [dB/Okt]										L_W [dB/Okt]									
100	1	27	29	22	21	<15	<15	<15	<15	<15	**16**	**<15**	31	25	22	<15	<15	<15	<15	<15	**17**	**<15**
	4	108	33	28	25	17	<15	<15	<15	<15	**20**	**<15**	35	33	28	18	<15	<15	<15	<15	**24**	**<15**
	7	189	36	34	29	19	<15	<15	<15	<15	**24**	**16**	39	40	34	22	<15	<15	<15	17	**30**	**20**
	10	272	40	40	32	23	19	<15	<15	15	**29**	**20**	43	47	40	27	20	<15	<15	24	**35**	**26**
125	1	43	28	20	17	<15	<15	<15	<15	<15	**<15**	**<15**	33	20	19	<15	<15	<15	<15	<15	**16**	**<15**
	4	172	34	29	23	17	<15	<15	<15	<15	**19**	**<15**	39	31	27	20	<15	<15	<15	<15	**24**	**<15**
	7	299	40	37	29	21	<15	<15	<15	<15	**27**	**17**	45	42	35	25	<15	<15	<15	18	**33**	**22**
	10	428	46	45	35	26	21	17	<15	<15	**33**	**24**	51	53	42	31	22	17	17	24	**40**	**30**
160	1	71	40	32	28	19	<15	<15	<15	<15	**23**	**<15**	39	37	33	22	17	<15	<15	28	**30**	**22**
	4	284	45	40	34	24	<15	<15	<15	19	**29**	**20**	46	45	39	27	20	<15	<15	31	**35**	**27**
	7	494	50	47	39	29	18	<15	<15	23	**35**	**26**	52	53	45	33	23	<15	17	34	**41**	**32**
	10	706	55	55	45	34	25	19	17	27	**42**	**31**	59	61	52	38	28	21	21	36	**48**	**37**
200	1	111	37	28	27	21	<15	<15	<15	<15	**22**	**<15**	40	32	31	27	17	<15	20	17	**28**	**21**
	4	444	46	37	34	27	<15	<15	<15	17	**29**	**21**	48	41	38	31	20	18	25	26	**34**	**26**
	7	776	55	46	41	32	20	16	23	30	**37**	**27**	57	49	44	35	23	21	30	35	**40**	**31**
	10	1108	64	55	48	38	28	24	32	43	**46**	**34**	65	58	51	39	28	26	35	45	**48**	**37**
250	1	174	36	36	33	26	<15	<15	15	18	**29**	**21**	37	39	36	33	24	25	25	23	**34**	**27**
	4	696	46	44	39	31	19	19	23	26	**37**	**26**	48	48	43	38	28	30	32	32	**41**	**32**
	7	1217	56	53	46	36	25	26	32	35	**45**	**30**	60	58	51	42	31	34	38	40	**47**	**36**
	10	1739	66	61	52	41	32	33	40	43	**50**	**36**	71	67	58	47	35	39	45	49	**56**	**42**
315	1	277	45	43	38	29	20	18	20	24	**33**	**25**	46	47	42	34	29	31	30	26	**39**	**31**
	4	1108	55	50	44	33	25	26	28	27	**40**	**28**	59	56	49	38	31	35	37	32	**46**	**35**
	7	1939	66	58	50	38	31	34	37	30	**47**	**32**	73	65	57	43	34	39	45	39	**54**	**39**
	10	2770	76	65	56	42	37	42	45	33	**57**	**38**	86	74	64	47	37	43	52	45	**61**	**46**
400	1	448	46	44	41	32	28	25	26	34	**38**	**30**	49	51	45	37	36	39	50	33	**49**	**44**
	4	1792	57	52	47	37	33	33	34	36	**44**	**30**	63	60	52	41	39	43	51	38	**53**	**40**
	7	3135	68	59	52	41	37	40	42	37	**50**	**34**	77	68	59	45	41	46	51	42	**58**	**41**
	10	4479	79	66	57	46	42	47	50	38	**59**	**39**	91	76	66	49	44	49	51	46	**62**	**46**

Δp_{tot} - Total pressure difference
f_m - Octave mid-band frequency
L_W - Sound power level
L_{WA} - Sound power level, A-weighted
L_{pA} - Sound pressure level, A-weighted

Casing sound emission without insulating shell

Nominal size Ø D	Air speed [m/s]	Flow rate [m³/h]	Δp_{tot} = 100 Pa										Δp_{tot} = 200 Pa									
			f_m [Hz]								Sum		f_m [Hz]								Sum	
			63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]	63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]
			L_W [dB/Okt]										L_W [dB/Okt]									
100	1	27	20	<15	18	25	28	23	<15	15	**30**	**21**	22	<15	19	23	31	31	20	17	**35**	**26**
	4	108	26	24	26	25	26	27	19	16	**31**	**22**	30	26	33	31	34	37	36	31	**42**	**33**
	7	189	28	25	28	28	30	34	26	23	**37**	**28**	31	31	36	34	36	40	38	36	**45**	**36**
	10	272	32	27	31	33	34	39	31	33	**42**	**33**	34	33	38	37	39	44	38	42	**48**	**39**
125	1	43	18	<15	<15	21	24	23	<15	<15	**28**	**19**	23	<15	<15	23	33	35	25	17	**38**	**29**
	4	172	33	23	24	26	27	29	19	<15	**33**	**24**	35	28	30	31	34	36	41	37	**44**	**36**
	7	299	37	29	29	31	33	33	27	25	**38**	**29**	39	36	36	36	38	40	41	40	**47**	**38**
	10	428	37	30	32	35	38	37	31	26	**42**	**33**	42	37	39	40	42	43	40	37	**48**	**39**
160	1	71	29	<15	20	23	25	20	<15	16	**27**	**19**	28	16	25	26	35	33	26	30	**38**	**30**
	4	284	35	24	27	27	29	26	16	16	**32**	**23**	38	28	34	33	36	36	26	24	**40**	**32**
	7	494	41	31	34	34	35	34	27	26	**39**	**31**	44	37	40	38	40	41	34	34	**45**	**37**
	10	706	44	34	37	38	40	39	32	30	**44**	**35**	48	40	44	42	44	45	38	39	**49**	**41**
200	1	111	28	<15	22	25	23	17	<15	<15	**26**	**17**	31	17	27	30	33	30	22	19	**36**	**27**
	4	444	40	27	30	28	27	24	16	<15	**31**	**22**	45	32	35	32	31	31	25	24	**37**	**28**
	7	776	48	34	36	35	35	31	26	28	**39**	**30**	52	40	43	39	37	37	33	39	**44**	**35**
	10	1108	55	41	44	42	41	39	34	45	**48**	**39**	56	44	47	43	42	41	36	47	**50**	**41**
250	1	174	27	19	27	27	22	18	<15	16	**28**	**19**	28	22	30	34	33	31	23	21	**37**	**28**
	4	696	42	30	34	28	24	23	16	18	**31**	**22**	45	35	39	33	30	30	26	25	**37**	**28**
	7	1217	54	39	42	39	35	35	30	29	**42**	**33**	58	45	48	42	38	39	36	39	**47**	**38**
	10	1739	57	44	46	42	39	39	38	41	**47**	**38**	62	50	52	48	44	45	43	47	**53**	**44**
315	1	277	34	24	28	30	26	21	16	24	**31**	**22**	35	28	32	35	35	34	26	26	**39**	**31**
	4	1108	44	31	33	30	27	28	21	24	**34**	**25**	49	37	41	38	35	36	33	30	**42**	**33**
	7	1939	55	39	40	39	37	37	33	30	**43**	**34**	62	46	47	44	40	42	41	39	**49**	**40**
	10	2770	-	-	-	-	-	-	-	-	-	-	65	49	50	47	45	46	43	45	**52**	**44**
400	1	448	34	24	29	34	31	24	20	32	**36**	**27**	37	31	33	39	39	38	30	31	**43**	**35**
	4	1792	46	32	32	34	31	33	25	32	**38**	**29**	50	38	41	42	38	40	37	35	**46**	**37**
	7	3135	56	39	40	43	40	39	36	35	**46**	**37**	65	48	47	47	44	45	45	40	**52**	**43**
	10	4479	-	-	-	-	-	-	-	-	**-**	**-**	67	49	49	51	47	47	43	44	**54**	**45**

Casing sound emission data given in the chart refer to the emitting jacket surface of a duct of galvanized sheet steel, total length 6 m, with the flow rate controller installed.
Due to resonance effects given frequency-related sound power level datamay vary by ± 6 dB max.

Δp_{tot} - Total pressure difference
f_m - Octave mid-band frequency
L_W - Sound power level
L_{WA} - Sound power level, A-weighted
L_{pA} - Sound pressure level, A-weighted

Casing sound emission with 50 mm insulating shell

Nominal size Ø D	Air speed [m/s]	Flow rate [m³/h]	Δp_{tot} = 100 Pa										Δp_{tot} = 200 Pa									
			f_m [Hz]								Sum		f_m [Hz]								Sum	
			63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]	63	125	250	500	1 K	2 K	4 K	8 K	L_{WA} [dB(A)]	L_{pA} [dB(A)]
			L_W [dB/Okt]										L_W [dB/Okt]									
100	1	27	19	<15	18	19	19	<15	<15	<15	**21**	**12**	21	<15	19	17	22	<15	<15	<15	**23**	**14**
	4	108	25	24	26	19	17	<15	<15	<15	**22**	**13**	29	26	33	25	25	16	16	<15	**29**	**20**
	7	189	27	25	28	22	21	<15	<15	<15	**25**	**16**	30	31	36	28	27	19	18	16	**32**	**23**
	10	272	31	27	31	27	25	18	<15	<15	**29**	**20**	33	33	38	31	30	23	18	22	**35**	**26**
125	1	43	17	<15	18	17	16	<15	<15	<15	**19**	**9**	22	<15	<15	17	24	<15	<15	<15	**25**	**15**
	4	172	32	23	24	20	18	<15	<15	<15	**22**	**13**	34	28	30	25	25	15	21	17	**29**	**20**
	7	299	36	29	29	25	24	<15	<15	<15	**28**	**18**	38	36	36	30	29	19	21	20	**34**	**25**
	10	428	36	30	32	29	29	16	<15	<15	**32**	**23**	41	37	39	34	33	22	20	17	**37**	**28**
160	1	71	28	<15	20	17	16	<15	<15	<15	**19**	**10**	27	16	25	20	26	<15	<15	<15	**27**	**18**
	4	284	34	24	27	21	20	<15	<15	<15	**24**	**15**	37	28	34	27	27	<15	<15	<15	**30**	**21**
	7	494	40	31	34	28	26	<15	<15	<15	**30**	**21**	43	37	40	32	31	20	<15	<15	**35**	**27**
	10	706	43	34	37	32	31	18	<15	<15	**34**	**26**	47	40	44	36	35	24	18	17	**39**	**31**
200	1	111	25	<15	20	22	20	<15	<15	<15	**23**	**14**	28	15	25	27	30	24	<15	<15	**32**	**23**
	4	444	37	25	28	25	24	18	<15	<15	**28**	**19**	42	30	33	29	28	25	<15	<15	**32**	**23**
	7	776	45	32	34	32	32	25	<15	<15	**35**	**26**	49	38	41	36	34	31	<15	18	**39**	**30**
	10	1108	52	39	42	39	38	33	<15	24	**42**	**33**	53	42	45	40	39	35	<15	26	**43**	**35**
250	1	174	24	17	25	24	19	<15	<15	<15	**24**	**15**	25	20	28	31	30	25	<15	<15	**33**	**24**
	4	696	39	28	32	25	21	17	<15	<15	**28**	**19**	42	33	37	30	27	24	<15	<15	**33**	**24**
	7	1217	51	37	40	36	32	29	<15	<15	**38**	**29**	55	43	46	39	35	33	<15	18	**42**	**33**
	10	1739	54	42	44	39	36	33	16	20	**42**	**33**	59	48	50	45	41	39	21	26	**47**	**38**
315	1	277	31	22	26	24	20	<15	<15	<15	**25**	**16**	32	26	30	29	29	<15	<15	<15	**33**	**22**
	4	1108	41	29	31	24	21	20	<15	<15	**28**	**19**	46	35	39	32	29	<15	<15	<15	**35**	**26**
	7	1939	52	37	38	33	31	29	<15	<15	**36**	**28**	59	44	45	38	34	17	17	17	**42**	**32**
	10	2770	-	-	-	-	-	-	-	-	-	-	62	47	48	41	39	19	19	23	**45**	**35**
400	1	448	31	22	27	24	21	<15	<15	<15	**25**	**16**	34	29	31	29	29	<15	<15	<15	**31**	**22**
	4	1792	43	30	30	24	21	24	<15	<15	**29**	**20**	47	36	39	32	28	<15	<15	<15	**34**	**25**
	7	3135	53	37	38	33	30	30	<15	<15	**37**	**28**	62	46	45	37	34	20	20	<15	**43**	**33**
	10	4479	-	-	-	-	-	-	-	-	**-**	**-**	64	47	47	41	37	18	18	19	**45**	**35**

Casing sound emission data given in the chart refer to the emitting jacket surface of a duct of galvanized sheet steel, total length 6 m, with the flow rate controller installed. Both the flow rate controller and the duct are provided with a 50 mm insulating shell.
Due to resonance effects given frequency-related sound power level data may vary by ± 6 dB max.

Δp_{tot} - Total pressure difference
f_m - Octave mid-band frequency
L_W - Sound power level
L_{WA} - Sound power level, A-weighted
L_{pA} - sound pressure level, A-weighted

Room sound pressure level calculation from controller sound transmission (excluding flow noise from the air diffusers)

System attenuation according to VDI 2081

f_m		[Hz]	63	125	250	500	1000	2000	4000	8000
Deflection	$\Delta L_{W\,Okt}$	[dB/Okt]	0	0	1	2	3	3	3	3
Room attenuation	$\Delta L_{W\,Okt}$	[dB/Okt]	5	5	5	5	5	5	5	5
Outlet reflection	$\Delta L_{W\,Okt}$	[dB/Okt]	10	5	2	0	0	0	0	0

Branching attenuation for distributing the sound power over multiple rooms, V_{room} = 540 m³/h

V	[m³/h]	540	1080	2160	5400	10800	16200	21600	25200	28800	32400	36000
$\Delta L_{W\,Okt} = 10 \times Lg \frac{V}{540\ m^3/h}$	[dB/Okt]	0	3	6	10	13	14	16	17	17	18	19

Sample calculation sound transmission

Given: VRE*active* 200 with silencer type SDE-SO 900 mm long

V_{max} = 444 m³/h, equates to 4 m/s

Δp_{tot} = 200 Pa

L_{WA} = 34 dB(A)

Required: Room sound pressure level L_{pA} room controller sound transmission

Solution:

f_m		[Hz]	63	125	250	500	1000	2000	4000	8000	Source
Sound power level	$L_{W\,Okt}$	[dB/Okt]	48	41	38	31	20	18	25	26	page 9
Deflection	$\Delta L_{W\,Okt}$	[dB/Okt]	0	0	-1	-2	-3	-3	-3	-3	page 12
Room attenuation	$\Delta L_{W\,Okt}$	[dB/Okt]	-5	-5	-5	-5	-5	-5	-5	-5	page 12
Outlet reflection	$L_{W\,Okt}$	[dB/Okt]	-10	-5	-2	0	0	0	0	0	page 12
Branching attenuation $\Delta L_{W\,Okt} = 10 \times Lg \frac{444\ m^3/h}{540\ m^3/h}$		[dB/Okt]	0	0	0	0	0	0	0	0	page 12
A-weighted	$\Delta L_{W\,Okt}$	[dB/Okt]	-26	-16	-9	-3	0	1	1	-1	
A-weighted sound pressure level	$L_{pA\,Okt}$	[dB(A)/Okt]	<15	<15	20	21	<15	<15	17	16	
A-weighted sum sound pressure level L_{pA} = 26 dB(A)											

Room sound pressure level calculation from controller radiation

f_m		[Hz]	63	125	250	500	1000	2000	4000	8000
Ceiling attenuation	$\Delta L_{W\,Okt}$	[dB/Okt]	4	4	4	4	4	4	4	4
Room attenuation	$\Delta L_{W\,Okt}$	[dB/Okt]	5	5	5	5	5	5	5	5

Sample calculation radiation

Given: VRE*active* 200 without insulating shell

V_{max} = 444 m³/h, equates to 4 m/s

Δp_{tot} = 200 Pa

L_{WA} = 37 dB(A)

Required: Room sound pressure level L_{pA} rom controller radiation

Solution:

f_m		[Hz]	63	125	250	500	1000	2000	4000	8000	Source
Sound power level	$L_{W\,Okt}$	[dB/Okt]	45	32	35	32	31	31	25	24	page 10
Ceiling attenuation	$\Delta L_{W\,Okt}$	[dB/Okt]	-4	-4	-4	-4	-4	-4	-4	-4	page 12
Room attenuation	$\Delta L_{W\,Okt}$	[dB/Okt]	-5	-5	-5	-5	-5	-5	-5	-5	page 12
A-weighted	$\Delta L_{W\,Okt}$	[dB/Okt]	-26	-16	-9	-3	0	1	1	-1	
A-weghted sound pressure level	$L_{pA\,Okt}$	[dB(A)/Okt]	<15	<15	17	20	22	23	17	<15	
A-weighted sum sound pressure level L_{pA} = 28 dB(A)											

Nomenclature, ordering code

VRE*active*	100 / S / D / L / A / B 671
(1)	(2) (3) (4) (5) (6) (7) (8) (9)

(1)	**Series**	**VRE*active***	= Flow rate controller, round, short, with map control
(2)	**Measuring priciple**		= dynamic
		-S	= static
(3)	**Size**	**100**	= 100
		125	= 125
		160	= 160
		200	= 200
		250	= 250
		315	= 315
		400	= 400
(4)	**Version**	**S**	= Galvanized steel
		E	= Stainless steel V4A
		K	= Coated
(5)	**Insulating shell**	**D**	= With
		–	= Without
(6)	**Connection**	**–**	= Plug-in end pieces without lip seal gasket
		L	= Plug-in end pieces with lip seal gasket
		F	= Flanges acc. to DIN 24154 R1
		B	= Bord
(7)	**Casing leakness**	**A**	= Class A acc. to DIN EN 1751 (standard)
		C	= Class C acc. to DIN EN 1751
(8)	**Compact controller (make)**	**B**	= Belimo
		G	= Gruner
(9)	**Compact controller (type)**	**671**	= Belimo LMV-D3W-MF-F (standard, analogue / continuous activation)
		670	= Belimo LMV-D3W-MP-F (compatible with MP-Bus, with NFC interface)
		672	= Belimo LMV-D3W-MOD-F (compatible with Modbus and BACnet)
		227-05	= Gruner 227VMZ-024-05-DS6 (static)

Additional ordering specifications

Please specify when ordering

- V_{min} [m^3/h]
- V_{max} [m^3/h]
- Mode: 0...10 V or 2...10 V

Please notice:

- V_{nom} see page 7
- $V_{min} \geq 0$ m^3/h
- $V_{min} \leq V_{max}$
- $V_{max} \leq V_{nom}$
- $V_{max} \geq 0{,}2\ V_{nom}$

In the absence of such specifications the unit will be delivered with the following factory settings:

- V_{min} = 0 m^3/h
- $V_{max} = V_{nom}$
- Mode = 0...10 V

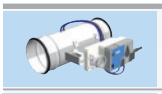
Ordering example

VRE*active* 100/S/D/–/A/B671, V_{min} = 100 m^3/h, V_{max} = 200 m^3/h, Mode 2...10 V

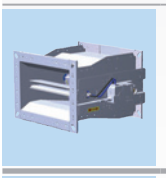
Product Overview • **LTG Air Distribution**

Flow rate controllers

Rund

Variable		VRE*active*	LTG Map Control System *ActiveControl*; highest precision, short installation length
		VRD*active*	
		VRE	To combine with customized drives; VRE also available in PPs
		VRD	
Constant		VRW	Without external power supply, pollution-insentitive
		VRZ	

Eckig

Variable		VRF*active*	LTG Map Control System *ActiveControl*; highest precision, short installation length
		VRF*vent*	LTG control principle-*VenturiControl*; high pecision with low pressure loss, to combine with customized drives
Constant		VRX	Without external power supply, pollution-insentitive

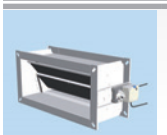
All variable controllers are available with dynamic or static measuring principle

Pressure controllers

Round

	DRE DRE*active*	To balance extreme pressure level differences; optionally with flow rate measuring

Square

	DRF DRF*active*	To balance extreme pressure level differences; optionally with flow rate measuring

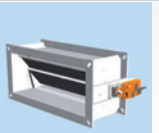
Shut-off units

Round

	KLB	Ultra-tight shut-off damper
	ARE	Air-tight shut-off damper

Luftdichte Absperrung nach DIN EN 1751: Klasse 4

Square

	ARF	Air-tight shut-off damper

Engineering Services

LTG Engineering Services Comfort Air Technology

Portfolio

For our complete portfolio of air distribution products with suitable accessories see
https://www.ltg.de/en/products-services/ltg-comfort-air-technology/air-distribution/

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R&D & Start-up

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