

LTG Aktiengesellschaft

Flow Rate Controller Type VRE-W (short)



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The Program for Room Air Technology

Components

Air diffusers for walls, floors and ceilings · "LTG System clean"® · Coandatrol® and Coandavent® air diffusers · LTG cool wave® chilling fans · Klimavent® induction units · Raumluft® fan coil units · Facade fan coil units · Airflow control units · labair® system

Engineering services

Technical services for investors, architects, engineers and plant builders during design, construction and operation of buildings. Reliable and precise data relating to the ventilation of air conditioning system are given already before realization of the project, determined by measurements, calculations, building simulations and experiments.

The Program for Process Air Technology

Components

Axial-flow, centrifugal and tangential fans · Collector system for: coarse and fine particle filtration, separating and compacting, compressing and humidifying.

Engineering services

Technical services for construction engineers and plant designers during development and operation of assembly groups, machines and plants.

Flow Rate Controller VRE-W (short)

Application

The round flow rate control unit VRE-W 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 is approx. 5 Pa to approx. 150 Pa, based on duct air speeds of 1-10 m/s.

The casing is provided with plug-in end pieces to fit lock-seam spiral wound ducts according to DIN 24145. All components are factory-wired.

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

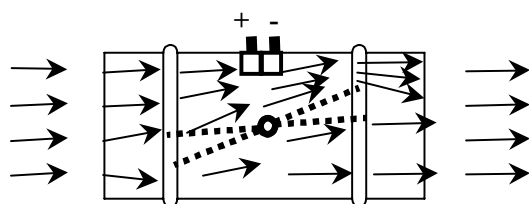
Measuring Principle

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

When the compact controller is powered, it synchronizes the blade at the open stop and throttles the damper to the 20° setting. In this way a "jet effect" is achieved in the damper blade area 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

Accessories and Special Versions

- Insulating case
- Flexible sound absorber SDE-AO made of corrugated aluminum tube
- Rigid sound absorber SDE-SO, as above, with galvanized sheet steel jacket
- Lip seal gasket
- Flanges according to DIN 24154 R3

Advantages

- Excellent control accuracy from $\pm 5\%$ ($\dot{V}_{nom}$) to $\pm 15\%$ ($\dot{V}_{min}$)
- 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 of 1 m/s to 10 m/s).
- Low minimum pressure loss, comparable to LTG special orifice plate B2, resulting in energy savings during operation and lower noise generation.
- Very low air leakage rate with the shut-off damper according to DIN 1946/4.
- Thanks to "jet effect" good control accuracy even in case of unfavourable entry conditions.



Flow Rate Controller Type VRE-W

Design and Characteristics

Through use of differential pressure measurement in the damper blade area, the VRE-W can operate with an extremely short galvanized sheet steel housing.

The damper has an oval blade of galvanized sheet steel with an EPDM sealing meeting DIN 1946/4. For "near gas-tight" sealing of the closed blade.

The damper is positioned on a form-fitting, galvanized precision steel round shaft meeting DIN 1652 requirements.

Form-fitting is achieved through a milled surface in the controller area on the longitudinal side. This surface is in parallel to the damper and, in connection with an angle scale on the housing, simultaneously serves as a position indicator.

The shaft is maintenance-free and low-friction due to the use of copolymer bearing bushings (Hostaform C 9021).

Flow Rate Controller VRE-W (short)

Flow rate range and minimum pressure loss at 5 m/s

DN [mm]	Area [m ²]	V _{nom} [m ³ /h]	w _{nom} [m/s]	Δp _{min} * [Pa]	V _{min} [m ³ /h]	w _{min} [m/s]
100	0.008	270	10	37	27	1
125	0.012	428	10	36	43	1
160	0.020	706	10	35	71	1
200	0.031	1109	10	34	111	1
250	0.048	1739	10	31	174	1
315	0.077	2768	10	26	277	1
400	0.124	4478	10	23	448	1

* at 5 m/s. At 10 m/s, the minimum pressure loss increases to four times the value for 5 m/s.

DN: Nominal diameter
V_{nom}: Nominal flow rate
w_{nom}: Nominal air speed
Δp_{min}: Minimum pressure loss at nominal flow rate
V_{min}: Minimum flow rate
w_{min}: Minimum air speed

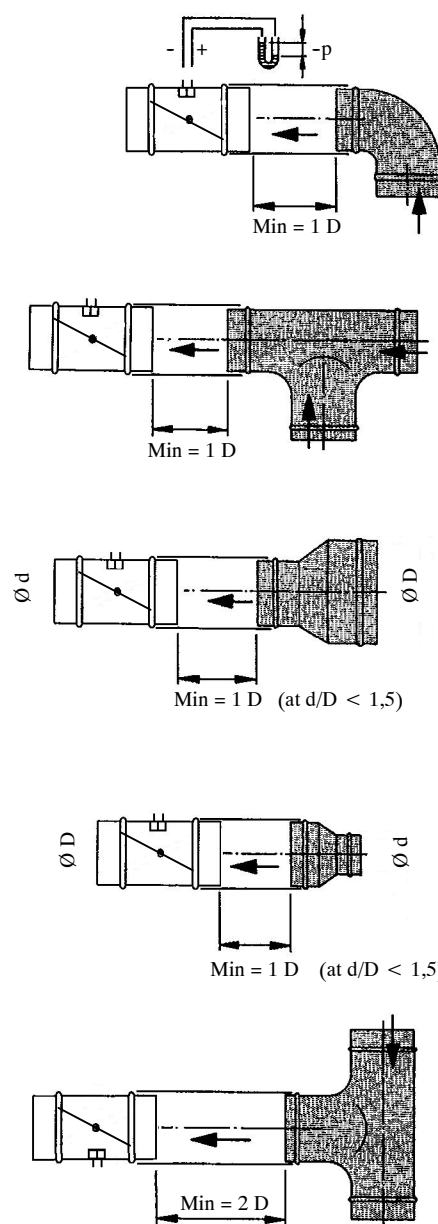


Inside view in direction of air flow

Installation Conditions

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

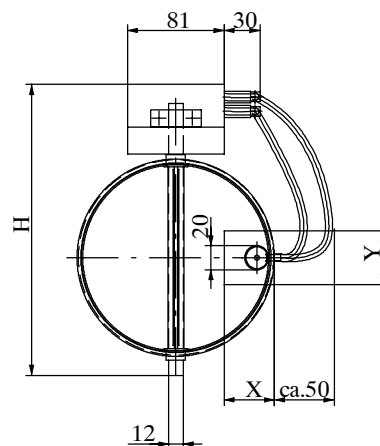
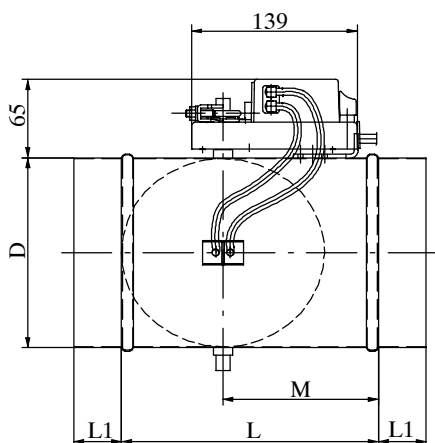
Please ensure a perfect positioning of the measuring nipples with respect to the air flow. Avoid turbulent air flow and short radius bends or T-branches before the damper.



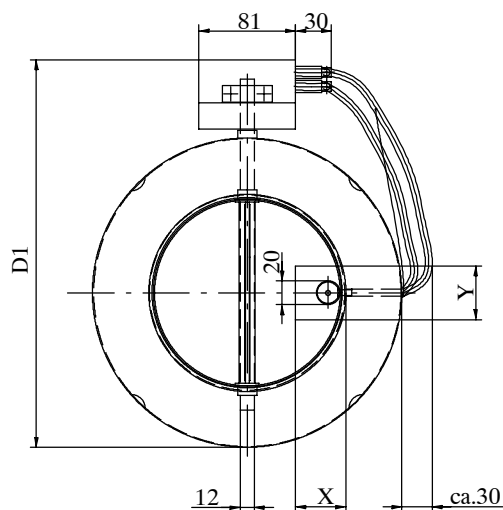
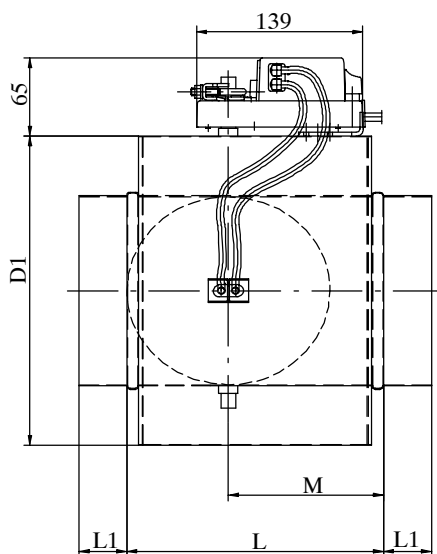
Min. = Minimum distance (measuring accuracy $\pm 5\%$ regarding V_{100%}). If a combination of fittings that is unfavorable with view to the air flow is unavoidable, the minimum distance is several times the given Min.

Flow Rate Controller VRE-W (short)

Dimensions and weights



Version without insulating case



Version with insulating case

Nominal diameter DN	D [mm]	D1 [mm]	L [mm]	L1 [mm]	H [mm]	H1 [mm]	M [mm]	X [mm]	Y [mm]	Damper angle [°]	Weight [kg]	
											without insulating case	with insulating case
100	99	199	195	40	185	265	130	-	-	60	1.5	2.9
125	124	224	195	40	210	290	130	-	-	60	1.8	3.4
160	159	259	215	40	245	325	130	-	-	60	2.1	4.1
200	199	299	215	40	285	365	130	42	45	60	2.6	4.9
250	249	349	260	60	335	415	130	42	45	60	3.3	6.5
315	314	414	260	60	400	480	130	70	70	60	4.4	8.2
400	399	499	315	80	485	565	158	70	70	60	6.1	11.7

Flow Rate Controller VRE- W (short)

Acoustic data, Airborne Sound Transmission

Pressure loss $\Delta p = 100 \text{ Pa}$

Nominal size (dia)	Air speed [m/s]	Flow rate [m³/h]	L _W [dB]									
			f _m [Hz]								Weighted levels	
			63	125	250	500	1 K	2 K	4 K	8 K	L _W [dB]	L _{WA} [dB(A)]
100	1	27	33	32	36	42	43	32	23	26	46.7	45.1
	4	108	39	48	44	42	41	35	31	27	51.1	45
	7	189	41	50	45	46	45	42	38	33	53.7	49.6
	10	270	44	51	48	50	49	47	42	43	56.8	53.7
125	1	43	32	29	31	39	41	32	23	16	43.9	42.4
	4	172	46	48	42	44	44	38	32	23	52.6	46.9
	7	299	50	54	48	49	50	42	40	36	57.9	52.7
	10	428	50	55	50	53	54	46	43	37	59.8	56.3
160	1	71	43	37	39	42	42	30	23	26	48.1	43.9
	4	284	49	50	46	46	46	36	29	26	54.6	48.3
	7	494	55	57	53	53	52	44	40	36	61.4	55.1
	10	706	58	60	56	57	57	49	45	40	64.8	59.6
200	1	111	38	33	37	40	39	31	21	15	45.1	41.7
	4	444	50	46	44	43	43	39	31	22	53.4	46.3
	7	776	58	53	50	50	51	46	40	37	61	53.9
	10	1108	65	60	58	57	57	53	48	54	67.9	61.3
250	1	174	38	39	42	43	39	33	28	26	48.0	43.8
	4	696	53	50	49	44	41	38	31	28	56	46.8
	7	1217	65	59	57	55	52	50	45	39	66.7	57.6
	10	1739	68	64	61	58	56	54	53	51	70.7	62.1
315	1	277	46	45	44	44	41	33	28	31	51,4	44.9
	4	1108	56	52	49	44	42	40	33	31	58,2	47.6
	7	1939	67	60	56	53	52	49	45	37	68,5	56.7
	10	2770	-	-	-	-	-	-	-	-	-	-
400	1	448	47	46	46	45	43	33	29	36	52,7	46.9
	4	1792	59	54	49	45	43	42	34	36	60,8	49.1
	7	3135	69	61	57	54	52	48	45	39	70,1	57.2
	10	4479	-	-	-	-	-	-	-	-	-	-

Chart: Airborne Sound Transmission

Flow Rate Controller VRE- W (short)

Acoustic data, Airborne Sound Transmission

Pressure loss $\Delta p = 200 \text{ Pa}$

Nominal size (dia)	Air speed [m/s]	Flow rate [m³/h]	L _w [dB]									
			f _m [Hz]								Weighted levels	
			63	125	250	500	1 K	2 K	4 K	8 K	L _w [dB]	L _{WA} [dB(A)]
100	1	27	35	35	37	41	47	39	32	28	49	48.4
	4	108	42	51	50	48	50	46	47	42	57	54.4
	7	189	44	56	53	51	51	48	49	46	60.3	56.6
	10	270	47	58	56	55	54	53	49	52	63	59.7
125	1	43	37	29	33	41	49	44	37	29	51.4	51.4
	4	172	48	53	48	49	50	45	53	48	58.9	56.9
	7	299	52	61	54	54	55	49	53	51	64.3	59.9
	10	428	55	63	57	58	58	53	52	49	66.4	62
160	1	71	42	42	44	45	52	43	39	40	54.2	52.8
	4	284	52	54	53	52	53	46	39	34	60	55.4
	7	494	58	63	59	57	57	51	47	44	66.6	60.6
	10	706	62	66	63	61	61	55	51	49	70.3	64.6
200	1	111	41	37	41	46	49	45	36	28	52.5	51.4
	4	444	55	52	49	47	47	45	40	33	58.3	51.6
	7	776	62	59	57	54	54	51	47	48	65.6	58.4
	10	1108	66	63	61	58	58	56	51	56	69.9	63.2
250	1	174	39	42	45	50	50	46	38	31	54.7	53.3
	4	696	56	55	54	49	47	45	41	35	60.7	52.8
	7	1217	69	65	63	58	55	54	51	49	71.4	62
	10	1739	73	70	67	64	61	60	58	57	76	67.8
315	1	277	47	49	48	49	50	46	38	33	56,2	53.1
	4	1108	61	58	57	52	50	48	45	37	64,1	55.7
	7	1939	74	67	63	58	55	54	53	46	74,9	62.1
	10	2770	77	70	66	61	60	58	55	52	78	65.8
400	1	448	50	53	50	50	51	47	39	35	58,4	54.3
	4	1792	63	60	58	53	50	49	46	39	66,1	56.8
	7	3135	78	70	64	58	56	54	54	44	78,9	63.2
	10	4479	80	71	66	62	59	56	52	48	80,8	65.4

Chart: Airborne Sound Transmission

Flow Rate Controller VRE- W (short)

Acoustic data, Airborne Sound Transmission

Pressure loss $\Delta p = 500 \text{ Pa}$

Nominal size (dia)	Air speed [m/s]	Flow rate [m³/h]	L _W [dB]									
			f _m [Hz]								Weighted levels	
			63	125	250	500	1 K	2 K	4 K	8 K	L _W [dB]	L _{WA} [dB(A)]
100	1	27	33	37	43	44	48	47	46	40	53.4	53.2
	4	108	44	53	54	54	58	58	53	48	63.6	62.9
	7	189	47	59	60	59	59	58	55	61	67.5	65.5
	10	270	51	64	64	63	61	60	56	54	69.7	66.5
125	1	43	37	29	33	41	49	44	37	29	51.4	51.4
	4	172	48	53	48	49	50	45	53	48	58.9	56.9
	7	299	52	61	54	54	55	49	53	51	64.3	59.9
	10	428	55	63	57	58	58	53	52	49	66.4	62
160	1	71	42	41	50	51	54	57	50	46	60.5	60.3
	4	284	57	56	60	61	61	58	55	53	67.6	65.3
	7	494	64	67	66	65	64	62	57	54	72.8	68.6
	10	706	67	71	70	68	66	64	59	58	76.4	71.4
200	1	111	43	41	43	49	56	60	55	47	62.9	63.6
	4	444	58	57	57	54	54	56	53	51	64.5	61.1
	7	776	67	66	64	60	59	59	56	60	71.7	65.8
	10	1108	71	70	68	64	62	61	58	57	75.6	68.4
250	1	174	42	48	49	51	57	58	55	50	62.7	62.9
	4	696	60	61	62	58	57	57	55	52	67.6	63.3
	7	1217	75	72	72	66	62	60	59	59	78.7	69.7
	10	1739	80	77	76	70	66	64	62	59	83.3	73.2
315	1	277	50	53	49	52	59	59	56	49	62,2	64.1
	4	1108	66	66	64	61	61	59	57	52	71,4	65.9
	7	1939	77	76	74	68	63	61	60	58	80,9	70.7
	10	2770	84	80	76	71	66	64	63	61	86,1	73.7
400	1	448	52	55	50	53	60	60	56	48	65,1	64.8
	4	1792	65	71	66	64	65	61	59	51	74,4	69
	7	3135	80	79	75	70	64	62	60	58	83,6	72.5
	10	4479	88	84	75	71	67	64	64	63	89,7	74.9

Chart: Airborne Sound Transmission

Flow Rate Controller VRE- W (short)

Flow Rate Controller VAV Compact NMV-DW

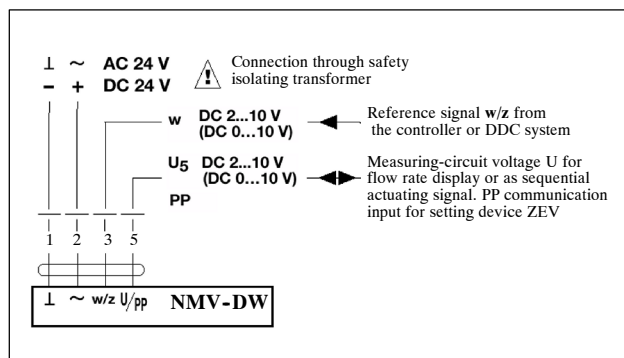


Controller NMV-DW

Pressure sensor, controller and actuator in one compact unit 8 Nm operating torque

Continuous control:
DC 2 ... 10 V, DC 0 ... 10 V

Forced controls:
«SHUT», $\dot{V}_{\text{MIN}}$, $\dot{V}_{\text{ZS}}$, $\dot{V}_{\text{MAX}}$, «OPEN»
communication capability (PP)



Wiring diagram for controller NMV-DW

Application

The VAV Compact NMV-DW is designed for an initial pressure independent control of VAV boxes.

It is activated through continuous signals of position transmitters, master controller or DDC systems. Through simple application of AC signals, various modes of operation may be realized in terms of forced controls.

Design

The NMV-DW includes a dynamic differential pressure sensor and an electronic measuring and control unit with a microprocessor. The unit is based on the proven NM actuator.

Function and Setting

The gearbox may be released by pressing the button on the housing. While the button is pressed the damper may be operated by hand. Apart from the release button, the NMV-DW has no further operating elements such as switches or set point potentiometers.

Programming of the operating range and of the operating parameters $\dot{V}_{\text{MIN}}$, $\dot{V}_{\text{MAX}}$ and $\dot{V}_{\text{NOM}}$ is performed using the PP setting device ZEV.

Advantages of the PP Communication:

- Possibility to check the actual value and remotely adjust parameters.
- Maloperations through unauthorized or unskilled persons are virtually prevented.

Techn. characteristics	NMV-DW
Rated voltage	AC 24 V, 50/60 Hz, DC 24 V
Operating range	AC 19.2 ... 28.8 V, DC 21.6 ... 26.4 V
Power consumption	3 W
Dimensioning	5.5 VA
Reference variable w	DC 0 ... 10 V (control between V_{MIN} and V_{MAX})
Input resistance	min. 50 kΩ
Mode control z	Forced control for «SHUT», V_{MIN} , V_{ZS} , V_{MAX} , «OPEN» specific switching with supply voltage
Working range (mode) acc. to choice	«2 ... 10 V» = DC 2 ... 10 V for $V_{\text{MIN}} ... V_{\text{MAX}}$ «0 ... 10 V» = DC 0 ... 10 V for $V_{\text{MIN}} ... V_{\text{MAX}}$
Flow rate Actual value signal U5	DC 2 ... 10 V @ 0,6 mA (modo 2 ... 10) DC 0 ... 10 V @ 0,6 mA (modo 0 ... 10) Linear signals, corresponding to 0 ... 100 % V_{NOM}
Measuring range of sensor	2 ... ≈ 300 Pa (OEM-dependent)
Connection	1 m, 4 x 0.75 mm ² cable
Direction of rotation	left/right selectable with ZEVO or PC (realized by OEM)
Class of protection	III (safety extra-low voltage)
Degree of protection	IP 42
Angle of rotation	max. 95°, adjustable mechanical stops
Torque	8 Nm min. with rated voltage
Position indication	mechanical with pointer
Ambient temperature	0 ... + 50 °C
Storage temperature	- 20 ... + 80 °C
Humidity testing	according to EN 60335-1
EMC	CE complying with 89/336/EWG and 92/31/EWG
Sound power level	max. 35 dB(A)
Maintenance	maintenance-free
Weight	900 g

Electrical Accessories

ZEV Setting device
SN1, SN2 Auxiliary switches

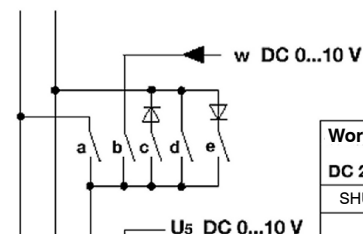
Flow Rate Controller VRE-W (short)

Operating modes

With contact assembly

⊥ ~ AC 24 V
- + DC 24 V

⚠ Connection via safety isolating transformer



Work. range/Function	a	b	c*	d	e*
DC 2 ...10 V					
SHUT	—	—	—	—	—
$\dot{V}_{MIN}$	—	—	—	—	—
variable $\dot{V}_{MIN} \dots \dot{V}_{MAX}$	—	—	—	—	—
** ZS (intermediate stage)	—	—	—	—	—
$\dot{V}_{MAX}$	—	—	—	—	—
OPEN	—	—	—	—	—

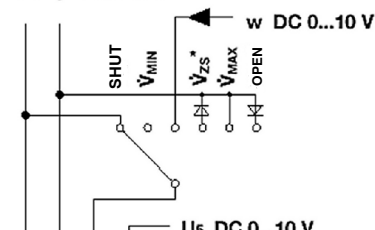
* only with AC 24 V

** $\dot{V}_{ZS} = 0,5 \cdot (\dot{V}_{MAX} - \dot{V}_{MIN}) + \dot{V}_{MIN}$

⊥ ~ w/z U/pp NMV-DW

With rotary switch

⊥ ~ AC 24 V
- + DC 24 V

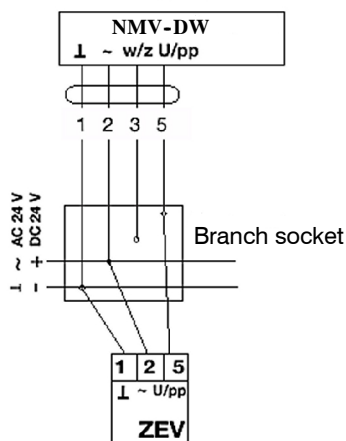


⊥ ~ w/z U/pp NMV-DW

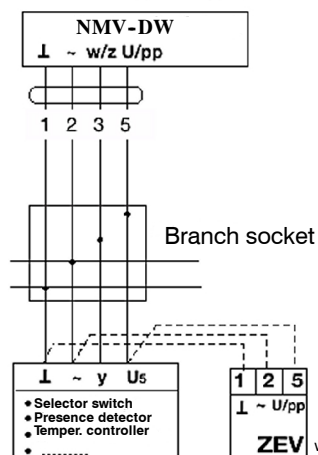
«SHUT», «OPEN» function: Flow rate control is inactive!

Examples for connecting the control and setting device ZEV with the NMV-DW

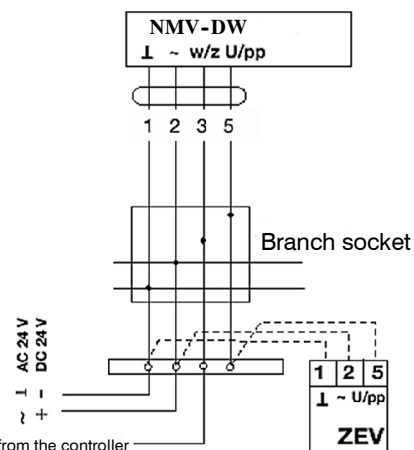
On site, at the controller connection



On site, at the master controller / control device



In the control cabinet



Flow Rate Controller VRE-W (short)

Operating Flow Rate $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$

The flow rate controller's linear characteristic allows an easy setting of the operating flow rates on site through the use of two potentiometers on the setting device ZEV, a job that is performed in the factory (OEM), during installation or first use.

$\dot{V}_{MAX}$ represents the upper limit depending on the nominal flow rate.

$\dot{V}_{MIN}$ may be adjusted as a percentage of the set $\dot{V}_{MAX}$.

The actual value output U_5 is not affected by the $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$ settings.

Using the reference signals w/z, the flow rate setpoint may be adjusted continuously or in steps within the specified limits.

Operating Modes

Multi-stage constant operation via forced controls:

Through simple forced control signals, the controller may be set to various operating stages according to requirement. As required, the controller will maintain constant the operating flow rate for $\dot{V}_{MIN}$, $\dot{V}_{MAX}$, or the average value thereof, will open or shut the damper depending on

the control signal.

For technical reasons, forced control «SHUT» is only possible for the DC 2 ... 10 V working range or, in general, when setting $\dot{V}_{MIN}$ to 0%.

Continuous:

Using the reference signal w (DC 0 ... 10 V), the flow rate may be controlled within the $\dot{V}_{MIN} / \dot{V}_{MAX}$ limits.

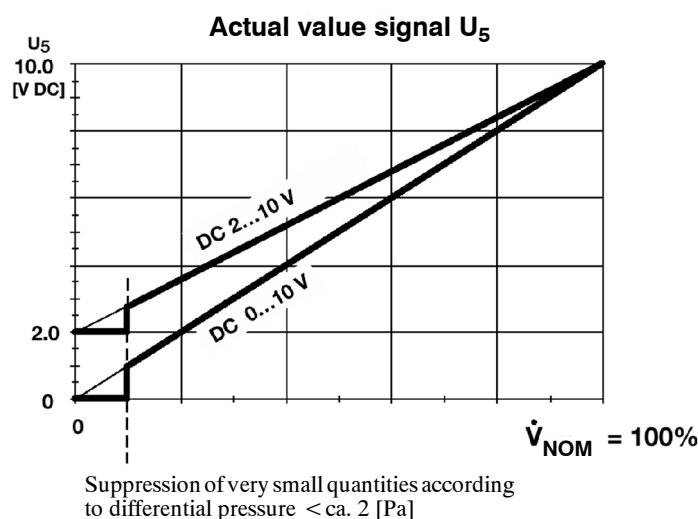
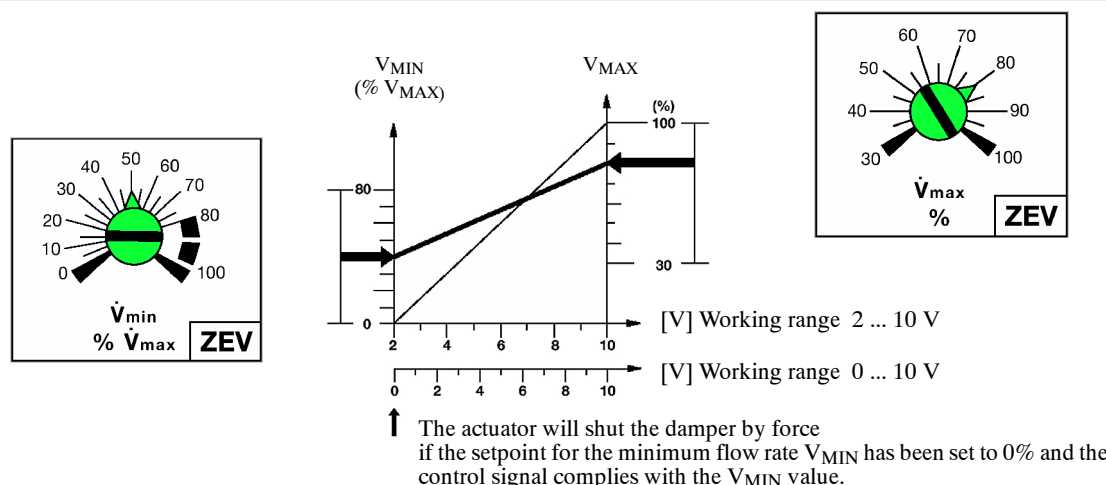
The effective working range DC 2 ... 10 V or DC 0 ... 10 V may be selected.

Forced control functions are active even when in the continuous mode and may be used in virtually any combination.

Operating elements for mode and parameter selection:

Except for the gearbox release button, the NMV-DW has no operating elements.

The installation specific operating parameters $\dot{V}_{MIN}$ and $\dot{V}_{MAX}$ and the working range are set via the PP communication interface U_5 using the setting device ZEV.



Flow Rate Controller VRE- W (short)

Nomenclature

	VRE- W	...	/	.	/	.	/	..	...
Flow rate controller, round (short))									
Size or diameter									
100									
125									
160									
200									
250									
315									
400									
Version									
S: steel, galvanized									
Pre-insulated casing (controls mounted outside case)									
- : without									
D: with									
Control type									
BI 570: Belimo NMV-DW LTG									

Flow Rate Controller VRE- W (short)

Specification and Schedule of Prices

Qty	Description	Unit price €	Total €
	<u>Design:</u> Flow rate controller, round, to control a constant or variable flow rate, initial pressure independent, minimum initial pressure depending on the flow rate approx. 5 Pa to approx. 150 Pa, differential pressure range up to 800 Pa, air speed 1-10 m/s, plug-in installation system to fit lock-seam spiral wound ducts according to DIN 24145. All components are factory-wired and hose-connected. Display of damper setting and angle scale on the housing's outside. <u>Unit consisting of:</u> Short housing of galvanized sheet steel. Oval damper blade of galvanized sheet steel with EPDM sealing, low leakage meeting DIN 1946/4 requirements. Form-fitting damper axle of galvanized precision steel according to DIN 1652. Low-friction, maintenance-free co-polymer damper bearing bushings (Hostaform C9021). Differential pressure measurement in the damper blade area on two cup-shaped elements. <u>Model sizes:</u> - o 100, installation length 195 mm - o 125, installation length 195 mm - o 160, installation length 215 mm - o 200, installation length 215 mm - o 250, installation length 260 mm - o 315, installation length 260 mm - o 400, installation length 315 mm <u>Actuator/Control:</u> - o Belimo NMV-DW-LTG (dynamic measuring principle) <u>Accessories:</u> - o Plug-in end pieces with lip seal ga - o 50 mm insulating case - o Sound absorberr SDE-.. Manufacturer: LTG Aktiengesellschaft Series: Flow Rate Controller Type: VRE-W		