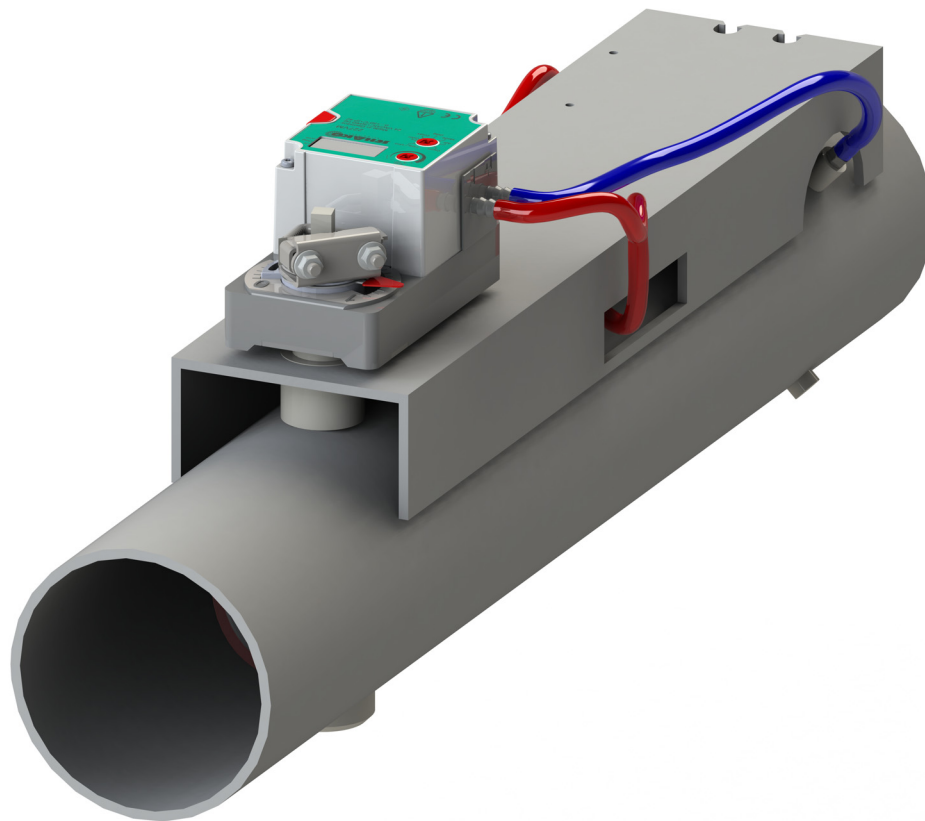




Volumetric flow controller VRAPPs



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Volumetric flow controller VRAPPs

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Volumetric flow controller VRAPPs

Description

The volumetric flow controller allows the volumetric flow in ducts to be kept constant or to be regulated using positive control V_{\min} , V_{\max} or "CLOSED". The volumetric flow controller can also be used as a room or duct pressure regulator. In VAV systems the volumetric flow controller can regulate variable volumetric flows between V_{\min} and V_{\max} as a function of the supply air (room temperature controller).

The round volumetric flow controller type VRAPPs made of plastic PPs is suitable for use with air contaminated with aggressive components. The volumetric flow setpoints V_{\min} and V_{\max} can also be altered at the controller at a later stage, even after installation. If the changes in air volume are so large that the calibration curve must be changed, the controllers must either be recalibrated in-factory or the calibration curve must be changed on-site by the customer service of Schako.

Setpoints are initially set in-factory according to the customer's requirements. During this in-factory setting, the functions of all volumetric flow controllers are also checked. The V_{\min} and V_{\max} values can range from 20 to 100 %. The maximum deviation of the volumetric flows is +/- 5%, relative to the nominal volumetric flow V_{neff} , based on a calibration curve of 12 m/sec. At lower flow rates, the deviation in percent may increase.

For the calibration of the controllers, a curve with a flow rate of 12 m/ sec is available. For constant-volume volumetric flow controllers, the V_{\min} value will be set to the desired constant-volume value.

If the calibration curve must be changed on site, the controllers must either be recalibrated ex factory or the calibration curve must be changed on site by the customer service of Schako.

Volumetric flow controllers are in general insensitive to the in-flow. 12 measuring points are distributed on the measuring cross based on the median line method. In comparison with measuring rods having only four measuring points or measuring orifices, this gives optimum measurement results.

When using the controllers in systems with heavy dust contamination, suitable filters must be connected upstream. For polluted air or air containing aggressive components, the volumetric flow controllers must be used with an integrated controller with a static membrane pressure sensor. In this case, the notice sign about installation must be observed.

The volumetric flow controllers are not suitable for air containing sticky and greasy components.

For maintenance, service, retrofitting, etc., inspection openings in sufficient number and size must be provided on site.

Field of application

- for supply and return air systems
- for constant or variable volumetric flows
- Positive control V_{\min} , V_{\max} , or "CLOSED"
- suitable for constant and variable volumetric flow or room pressure or duct pressure control
- Differential pressure range from 50 to 1000 Pa
- for duct velocities of 1 - 12 m/s
- for ambient temperatures from 0 to 55°C
- Digesters and contaminated media

Construction

The user must check whether the materials used are suitable for the particular application.

Model

Round design, for duct connection, with silicone-free damper leaf seal made of PUR (NW 110 sealing airtight to DIN EN 1751, Class 2), (NW 125-400 sealing airtight to DIN EN 1751, Class 3), Housing tightness class C to DIN EN 1751.

Volumetric flow controller VRAPPs

Installation

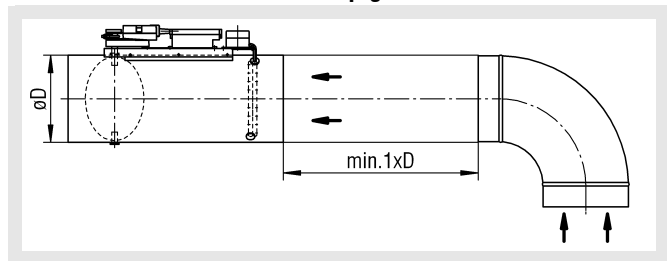
Installation information

To avoid unnecessary controller errors, the min. distances according to the following table / drawings must be observed. For combinations of several connection pieces or pieces with fire dampers or silencers, the larger minimum distances must be observed.

Distance to:

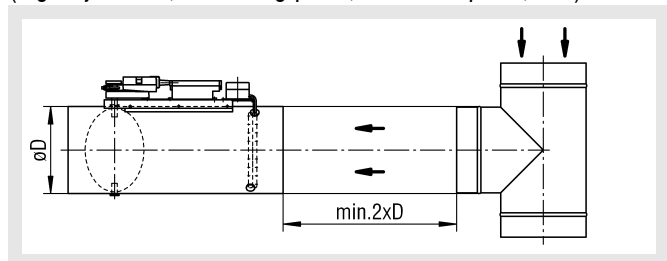
- Bent connection piece	1xD
- other connection pieces: (e.g. T-junction, branching piece, reduction piece, etc.)	2xD
- Fire damper	2xD
- Silencer	2xD

Distance to a bent connection spigot

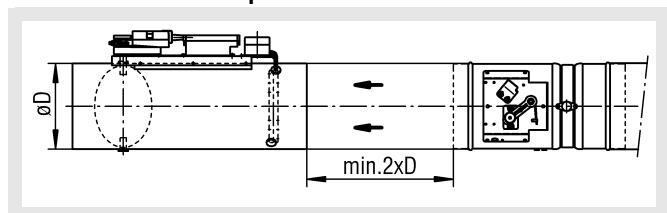


Distance to other connection pieces

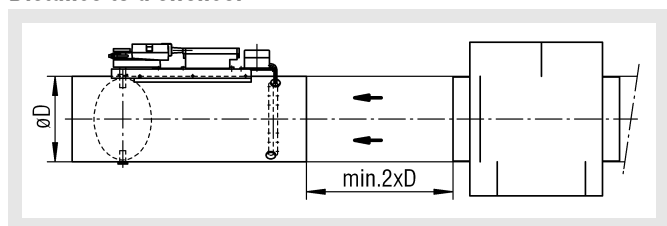
(e.g. T-junction, branching piece, reduction piece, etc.)



Distance to a fire damper



Distance to a silencer



Construction

Housing

- Plastic PPs

Damper axle

- Plastic PP

Damper blade

- Plastic PP

Damper leaf seal

- Silicone-free made of PUR (NW 110 sealing airtight to DIN EN 1751 Class 2, NW125 - 400 sealing airtight to DIN EN 1751 Class 3)

Measuring cross

- Plastic PP

Control and driving console

- Plastic PP

Model

VRAPPs - round design, with plastic damper blade with silicone-free damper blade seal (NW 110 sealing airtight to DIN EN 1751 Class 2, NW 125-400 sealing airtight to DIN EN 1751 Class 3)

- Housing tightness class C to DIN EN 1751.

...-A-...

- with electric controller
 - Control voltage 24 V AC 50/60 Hz
 - alternatively with spring return actuator zero-current "CLOSED" or zero-current "OPEN" (at an extra charge).
 - alternatively with high-speed actuator running time 3-5 sec. for 90° angle of rotation (at an extra charge).
- with pneumatic controller
 - in the design depressurised "CLOSED" (standard) or depressurised "OPEN"
 - Feed pressure 1.2 ± 0.1 bar

Accessories

Flange (-KA0/-FF3) (duct connection)

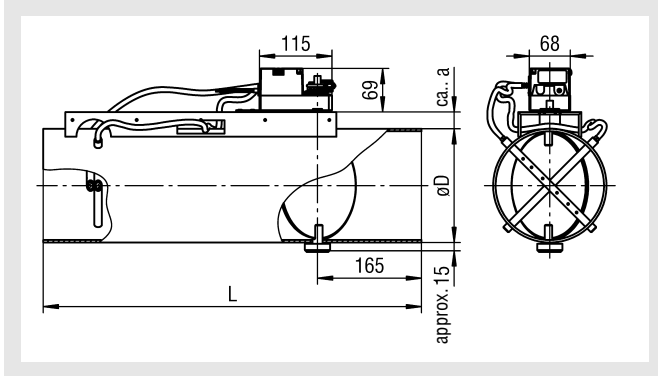
- without flange, butted (-KA0) (standard)
- with flat flange (-FF3), pair, on both sides, made of plastic material PPs.

Volumetric flow controller VRAPPs

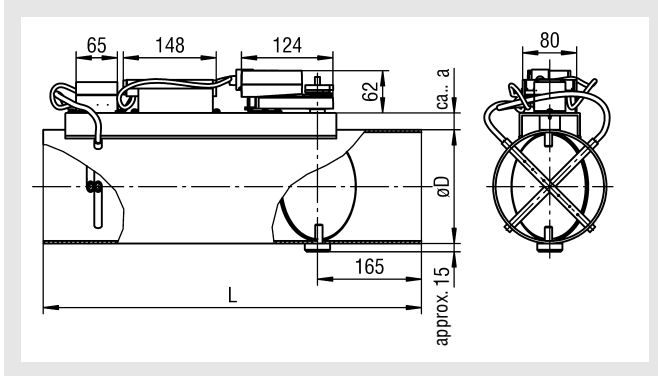
Models and dimensions

Dimensions

with electric controller, make Gruner (standard)



with electric controller, make Belimo (at an extra charge)



Available sizes

NW	$\varnothing D$	L	ca. a
110	110	600	23
125	125	600	24
160	160	600	26
200	200	600	26
250	250	600	27
315	315	600	29
400	400	640	31

NW 110 sealing airtight to DIN EN 1751 class 2

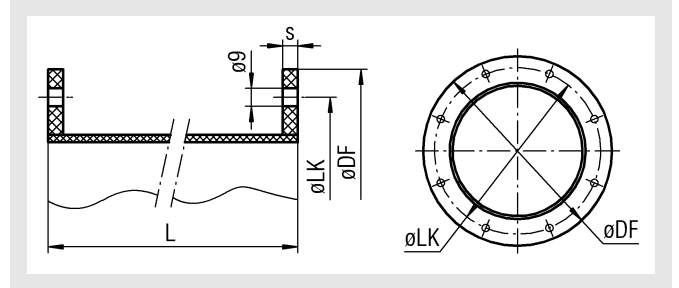
NW 125-400 sealing airtight to DIN EN 1751 class 3

Dimensions of accessories

Flange (-KA0/-FF3) (duct connection)

- without flange, butted (-KA0) (standard)
- with flat flange (-FF3), pair, on both sides, made of plastic material PPs.

Flat flange (-FF3, pair), on both sides



Available sizes

NW	$\varnothing D$	$\varnothing DF$	$\varnothing LK$	s	Number of holes
110	110	170	150	10	4
125	125	185	165	10	8
160	160	230	200	10	8
200	200	270	240	10	8
250	250	320	290	10	12
315	315	395	350	10	12
400	400	480	445	10	16

NW 110 sealing airtight to DIN EN 1751 class 2

NW 125-400 sealing airtight to DIN EN 1751 class 3

Volumetric flow controller VRAPPs

Technical data

Volumetric flow range

NW (mm)	V	Belimo/Gruner		
		Compact controller V_{\min} (1 m/s)	V_{\min} (2 m/s)	V_{\max} (12 m/s)
110	m ³ /h	31	61	367
	l/s	9	17	102
125	m ³ /h	40	80	480
	l/s	11	22	133
160	m ³ /h	67	134	804
	l/s	19	37	223
200	m ³ /h	107	213	1280
	l/s	30	59	356
250	m ³ /h	167	334	2004
	l/s	46	93	557
315	m ³ /h	263	526	3156
	l/s	73	146	877
400	m ³ /h	426	851	5108
	l/s	118	236	1419

For the parameter setting of the control components, an air density of 1.2 kg/m³ has been taken into account.

Attention, the following specifications are important for programming the volumetric flow controllers:

- this table merely specifies the complete measuring range of the controller (volumetric flow range)
- If the customer absolutely wants a calibration curve different from 12 m/s, it must be specified! Once it is approved by the competent department, it can be adjusted correspondingly.
- When the air volume drops below the V_{\min} shown in the chart, the correct functioning of the volumetric flow controller is no longer guaranteed!
- If only one air volume is specified in the order (as V_{\max} value), the volumetric flow controller will be delivered as variable volumetric flow controller. The V_{\min} value will be set to the value specified in the catalogue.
- If only one air volume is specified in the order (as V_{\min} or V_{konstant} value or without value specification), then the volumetric flow controller will be delivered as a constant volumetric flow controller. The volume specified in the order is set to the V_{\min} value, and the V_{\max} value is set to 100%.
- The air volumes can be changed using setting devices specific for the controller make, depending on the calibration curve set ex works.
- The controller make Gruner, type 327VM compact, can be used with a sensor linearised to an air velocity of 1 m/s.
- For the parameter setting of the control components (all controllers), an air density of 1.2 kg/m³ has been taken into account.
- Belimo compact controllers are height-compensated. They are calibrated ex works to the system height in question of the specified installation site.
- If no system height is given in the order, the controllers will be set to the elevation of the delivery address.
- If the customer does not specify whether the "Parallel" or "Master/Slave" operating mode is desired, the controller is set for the parallel operation (Master/Slave mode only upon customer request).

Volumetric flow controller VRAPPs

Flow generated noise

Pressure loss 100-200 Pa

NW	v _K (m/s)	V (m ³ /h) [l/s]			Δp _t = 100 Pa								Δp _t = 150 Pa								Δp _t = 200 Pa										
					L _w [dB/oct]								L _{WA} [dB(A)]	L _w [dB/oct]								L _{WA} [dB(A)]	L _w [dB/oct]								L _{WA} [dB(A)]
					f _m (Hz)									f _m (Hz)									f _m (Hz)								
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000	
110	3	91	25	50	51	47	42	43	40	29	26	47	50	56	54	50	49	46	39	37	53	49	55	56	53	50	48	42	41	56	
	6	182	51	50	51	47	42	43	40	29	26	47	51	57	55	51	50	47	40	38	54	50	55	57	56	52	50	46	46	58	
	9	273	76	51	53	49	44	45	42	31	28	49	52	58	56	52	51	48	41	39	55	51	56	58	57	53	51	45	45	59	
	12	367	102	52	53	50	45	47	43	33	29	50	53	59	57	53	52	49	42	40	56	52	57	59	58	54	52	46	46	60	
125	3	120	33	51	52	48	43	42	41	30	27	48	50	56	54	50	49	46	39	37	54	49	55	56	53	50	48	42	41	56	
	6	240	67	52	55	50	44	44	39	34	31	49	53	59	57	53	52	49	42	40	56	55	61	59	55	54	51	44	42	58	
	9	360	100	60	56	51	45	45	40	35	32	50	53	59	57	53	52	49	42	40	57	52	57	59	58	54	52	46	46	60	
	12	480	133	54	55	51	46	47	44	33	30	51	51	57	58	55	52	50	44	43	58	54	59	61	60	56	54	48	48	62	
160	3	201	56	56	57	49	44	42	42	30	30	48	51	61	55	49	46	44	40	39	53	50	57	58	53	49	47	43	42	56	
	6	402	112	62	58	51	45	45	40	35	32	50	64	64	57	50	48	46	41	40	55	63	70	61	55	51	49	46	44	59	
	9	603	168	57	54	50	49	48	41	35	30	52	63	63	57	52	52	45	40	38	56	66	68	61	55	54	49	44	43	59	
	12	804	223	53	51	49	52	50	42	35	29	53	60	59	55	54	56	48	43	39	59	66	66	61	58	59	51	47	45	62	
200	3	320	89	52	51	47	44	43	41	33	30	48	49	54	52	48	46	45	41	40	52	49	61	56	53	49	49	46	45	56	
	6	640	178	60	55	51	47	46	42	35	30	51	61	59	55	50	48	46	41	39	54	60	63	59	54	51	50	47	45	58	
	9	960	267	57	54	52	50	51	42	36	30	53	63	60	57	53	53	47	42	37	57	66	64	61	56	54	51	46	43	59	
	12	1280	356	55	53	53	52	55	42	37	30	54	59	56	55	55	58	49	44	40	60	67	65	62	59	60	53	49	45	63	
250	3	501	139	51	50	47	45	43	45	36	28	50	51	53	52	48	46	48	43	36	53	51	55	56	51	48	50	48	42	56	
	6	1002	278	62	56	52	51	45	43	34	27	52	62	60	55	53	50	49	41	36	56	63	62	57	54	52	52	47	41	58	
	9	1503	418	58	55	53	53	46	43	36	32	53	65	61	58	57	50	48	41	37	58	66	65	61	59	53	51	45	41	60	
	12	2004	557	55	54	54	54	47	43	37	36	54	62	61	59	59	55	51	45	42	60	68	67	63	62	57	54	48	45	63	
315	3	738	205	60	61	53	48	45	45	33	33	51	61	58	56	56	49	46	39	35	56	63	62	57	54	52	52	47	41	58	
	6	1476	410	56	53	51	51	44	41	34	30	51	62	60	55	53	50	49	41	36	56	64	63	58	55	53	53	48	42	59	
	9	2214	615	58	55	53	53	46	43	36	32	53	63	61	56	54	51	50	42	38	57	65	63	58	56	53	52	44	40	59	
	12	3156	877	59	56	54	54	47	44	37	33	54	64	64	60	57	55	55	50	44	61	67	66	61	58	56	56	51	45	62	
400	3	1277	355	55	53	56	49	45	42	35	35	52	63	62	59	54	52	52	47	41	59	62	64	64	60	51	51	50	44	61	
	6	2554	709	53	54	57	48	46	43	35	35	53	60	64	60	55	52	52	47	41	59	60	65	63	61	51	51	50	46	61	
	9	3831	1064	56	57	55	51	48	43	36	32	53	60	63	59	54	51	51	45	41	58	65	64	60	58	56	56	52	46	62	
	12	5108	1419	56	57	55	51	48	44	36	33	53	60	62	60	55	51	51	45	41	58	65	65	59	60	55	56	52	46	62	

Volumetric flow controller VRAPPs

Flow generated noise

Pressure loss 250-500 Pa

NW	v _K (m/s)	V (m ³ /h) [l/s]			Δp _t = 250 Pa									Δp _t = 500 Pa										
					L _W [dB/oct]									L _{WA} [dB(A)]	L _W [dB/oct]									L _{WA} [dB(A)]
					f _m (Hz)										f _m (Hz)									
					63	125	250	500	1000	2000	4000	8000	L _{WA} [dB(A)]		63	125	250	500	1000	2000	4000	8000	L _{WA} [dB(A)]	
110	3	91	25	50	55	57	56	52	50	44	44	58	50	55	55	59	58	52	44	44	61			
	6	182	51	52	57	59	58	54	52	46	46	60	55	60	61	63	56	52	48	46	63			
	9	273	76	54	59	60	59	55	53	47	47	62	55	62	66	64	56	56	50	46	65			
	12	367	102	53	58	59	58	54	52	46	46	61	53	66	64	67	56	56	50	46	66			
125	3	120	33	50	55	57	56	52	50	44	44	58	52	57	59	58	54	52	46	46	60			
	6	240	67	55	60	60	59	55	53	47	47	62	55	62	66	64	56	56	50	46	65			
	9	360	100	54	59	60	59	55	53	47	47	62	54	61	65	65	56	56	50	46	65			
	12	480	133	51	59	61	60	56	54	48	48	62	55	62	66	66	57	57	51	47	66			
160	3	201	56	49	58	62	58	52	51	46	46	60	50	58	61	62	56	56	49	49	63			
	6	402	112	62	69	64	58	54	51	50	48	61	52	60	63	65	56	56	49	49	65			
	9	603	168	66	72	64	58	55	52	47	46	62	56	67	66	67	58	58	45	46	67			
	12	804	223	68	69	65	60	59	53	49	48	64	60	70	71	69	62	60	54	46	70			
200	3	320	89	50	60	59	56	52	51	49	48	59	67	67	62	59	60	52	48	46	63			
	6	640	178	62	68	63	59	55	52	50	49	62	65	68	65	62	61	52	48	46	65			
	9	960	267	66	68	63	58	55	53	49	47	62	66	69	66	63	62	53	49	47	66			
	12	1280	356	66	64	64	60	59	55	51	48	64	69	72	69	66	65	56	50	49	69			
250	3	501	139	50	57	60	56	51	51	51	46	59	65	64	63	60	56	52	48	44	62			
	6	1002	278	61	64	60	56	53	54	51	46	61	68	69	65	61	57	55	51	47	64			
	9	1503	418	67	68	64	60	56	55	50	46	63	68	69	69	65	59	57	54	47	67			
	12	2004	557	69	69	65	62	57	55	50	47	64	68	71	72	69	65	57	54	49	70			
315	3	738	205	66	65	60	57	55	55	50	44	61	58	68	64	59	56	57	54	49	64			
	6	1476	410	65	62	60	62	56	57	48	45	63	58	69	67	63	57	58	55	49	66			
	9	2214	615	63	67	62	58	55	56	53	48	63	67	71	70	65	64	59	54	48	69			
	12	3156	877	69	68	63	60	58	58	53	47	64	67	74	73	68	67	63	57	51	72			
400	3	1277	355	66	65	62	59	57	55	51	45	63	69	68	65	62	60	58	54	48	66			
	6	2554	709	67	66	63	60	58	56	52	46	64	68	70	67	64	62	60	56	49	68			
	9	3831	1064	68	67	64	61	59	57	53	47	65	67	72	69	68	64	62	58	52	70			
	12	5108	1419	66	68	65	61	59	59	50	47	65	67	72	73	72	68	62	56	50	73			

Volumetric flow controller VRAPPs

Radiated noise

Pressure loss 100-200 Pa

NW	v _K (m/s)	V (m ³ /h) [l/s]			Δp _t = 100 Pa								Δp _t = 150 Pa								Δp _t = 200 Pa										
					L _W [dB/oct]								L _{WA} [dB(A)]	L _W [dB/oct]								L _{WA} [dB(A)]	L _W [dB/oct]								L _{WA} [dB(A)]
					f _m (Hz)									f _m (Hz)									f _m (Hz)								
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000	
110	3	91	25	25	18	17	22	17	22	17	20	27	26	19	18	23	28	23	18	21	31	24	25	21	19	23	30	27	23	34	
	6	182	51	24	20	19	22	18	22	18	20	27	26	22	22	25	29	25	18	21	32	30	26	26	29	33	29	22	25	36	
	9	273	76	25	21	21	24	28	24	17	20	31	31	28	27	30	34	30	23	26	37	32	30	33	32	35	32	25	30	39	
	12	367	102	24	25	21	19	23	30	27	23	34	34	32	35	34	37	34	27	32	41	36	36	39	38	41	38	34	32	45	
125	3	120	33	26	19	18	23	18	23	18	21	28	27	20	19	24	29	24	19	22	32	25	26	22	20	24	30	27	23	34	
	6	240	67	41	27	25	21	23	24	21	16	29	40	30	27	23	26	30	27	21	34	42	33	28	24	27	32	30	25	36	
	9	360	100	37	27	27	26	27	26	22	17	32	45	35	34	31	32	34	30	23	39	47	37	36	31	33	36	33	27	40	
	12	480	133	32	24	30	32	31	29	19	16	35	37	29	37	39	37	38	28	24	43	50	37	42	40	41	42	35	30	47	
160	3	201	56	24	20	19	22	18	24	19	22	28	27	23	22	25	21	27	22	25	31	30	23	25	28	24	30	25	28	34	
	6	402	112	26	22	21	24	20	26	21	24	30	29	22	24	27	26	29	24	27	33	33	26	28	31	30	33	27	31	37	
	9	603	168	32	26	25	30	24	29	24	27	34	36	30	29	34	28	33	28	31	38	37	31	30	35	29	34	29	32	39	
	12	804	223	36	29	28	34	27	31	26	29	37	46	35	39	45	38	35	28	20	44	47	36	40	46	39	36	29	21	46	
200	3	320	89	28	24	16	22	21	22	19	22	28	30	26	18	24	23	24	21	24	30	34	30	32	28	27	28	25	28	34	
	6	640	178	32	28	20	26	25	24	21	24	31	33	29	21	27	26	25	22	25	32	37	33	25	31	30	29	26	28	36	
	9	960	267	35	34	25	28	29	28	26	28	35	39	38	29	32	33	32	30	32	39	39	39	31	32	33	32	30	32	39	
	12	1280	356	37	38	29	29	32	31	30	31	38	43	45	38	38	41	38	35	38	45	46	48	41	41	44	41	38	41	48	
250	3	501	139	30	28	19	23	24	24	22	24	30	30	30	21	23	22	26	23	23	31	33	33	24	26	25	29	26	26	34	
	6	1002	278	31	31	22	24	23	27	24	23	32	32	30	25	24	25	28	28	28	34	36	34	24	29	30	29	27	30	36	
	9	1503	418	33	31	25	29	28	27	28	30	35	38	36	30	34	33	32	33	32	40	39	35	30	36	33	32	33	32	40	
	12	2004	557	34	31	27	33	32	27	31	35	37	40	41	40	39	41	38	32	32	45	43	44	43	42	44	41	35	35	48	
315	3	738	205	33	30	27	25	26	25	28	26	33	34	28	27	32	26	31	26	29	36	36	30	29	34	28	33	28	31	38	
	6	1476	410	31	25	24	29	23	28	23	26	33	31	28	25	29	24	28	23	26	33	36	33	31	35	32	33	29	31	39	
	9	2214	615	33	27	25	30	25	31	25	28	35	33	30	30	34	30	33	30	32	39	35	32	32	36	32	35	32	34	41	
	12	3156	877	34	28	26	31	26	33	26	29	36	47	40	38	43	39	41	38	38	47	48	41	39	44	40	42	39	38	48	
400	3	1277	355	35	30	29	27	26	29	25	26	34	35	35	34	32	31	34	30	31	39	37	38	36	34	34	35	32	32	41	
	6	2554	709	32	31	30	29	28	28	26	27	35	36	35	34	33	32	32	30	31	39	39	38	37	36	36	35	27	29	41	
	9	3831	1064	30	28	29	30	29	27	26	27	35	39	37	35	36	33	33	29	31	40	32	32	33	34	32	32	41	34	44	
	12	5108	1419	35	34	33	32	31	31	29	29	38	32	32	33	34	32	32	41	34	44	36	36	37	38	36	36	45	38	48	

Volumetric flow controller VRAPPs

Radiated noise

Pressure loss 250-500 Pa

NW	v _K (m/s)	V (m ³ /h) [l/s]			Δp _t = 250 Pa								Δp _t = 500 Pa									
					L _W [dB/oct]								L _{WA} [dB(A)]	L _W [dB/oct]								L _{WA} [dB(A)]
					f _m (Hz)									f _m (Hz)								
					63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000	
110	3	91	25	26	27	26	26	28	32	32	29	36	35	36	35	35	36	40	40	28	45	
	6	182	51	35	28	28	31	35	31	24	27	38	37	38	37	37	38	42	42	30	47	
	9	273	76	35	33	36	35	38	35	28	33	42	41	42	43	42	42	46	44	34	51	
	12	367	102	37	37	40	39	42	39	35	33	46	47	47	50	49	52	49	45	40	56	
125	3	120	33	35	25	24	24	26	30	30	27	36	35	36	32	30	34	40	37	33	44	
	6	240	67	47	35	31	28	30	36	34	30	40	56	46	42	39	41	47	45	41	51	
	9	360	100	49	38	36	31	33	37	35	30	42	58	47	45	40	42	46	44	39	51	
	12	480	133	51	40	43	40	42	41	36	31	47	60	49	52	49	51	50	45	40	56	
160	3	201	56	34	37	29	32	28	34	29	32	38	45	40	40	42	40	41	38	35	47	
	6	402	112	35	38	30	33	29	35	30	33	39	48	42	45	42	43	44	38	35	49	
	9	603	168	40	34	33	38	32	37	32	35	42	50	47	45	48	42	49	43	38	53	
	12	804	223	51	40	44	50	43	40	33	25	49	58	52	53	59	56	49	42	33	60	
200	3	320	89	35	30	30	32	31	31	28	31	37	46	39	41	43	42	39	38	34	47	
	6	640	178	40	38	31	38	32	32	32	30	40	49	47	40	47	41	41	40	38	49	
	9	960	267	40	42	35	35	38	35	33	35	42	52	51	44	45	48	45	43	45	52	
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250	3	501	139	37	34	27	29	28	32	29	29	37	45	42	39	38	39	40	40	39	46	
	6	1002	278	39	37	27	32	33	31	29	32	39	47	47	42	41	44	39	40	39	48	
	9	1503	418	39	39	38	36	39	38	32	32	44	50	52	47	46	49	44	44	45	53	
	12	2004	557	44	45	44	43	45	42	36	36	49	50	45	53	55	53	55	49	49	60	
315	3	738	205	41	35	34	39	33	38	33	36	43	44	44	42	41	42	45	42	37	50	
	6	1476	410	44	37	36	42	36	40	35	36	45	46	46	44	43	44	47	44	40	52	
	9	2214	615	46	39	38	44	38	42	37	38	47	49	49	47	46	47	50	47	43	55	
	12	3156	877	50	53	42	46	42	44	41	40	50	52	49	55	58	59	54	56	51	63	
400	3	1277	355	43	38	38	42	37	40	34	35	45	49	45	43	48	45	47	42	43	52	
	6	2554	709	44	44	43	44	42	38	30	32	46	52	55	50	49	48	46	46	42	54	
	9	3831	1064	46	42	40	45	42	44	39	40	49	54	57	52	51	50	48	48	44	56	
	12	5108	1419	39	39	40	41	39	39	48	42	51	60	52	55	59	59	55	56	51	64	

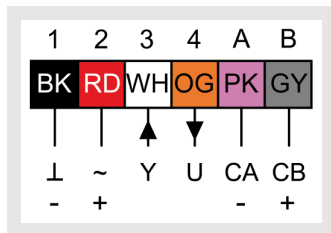
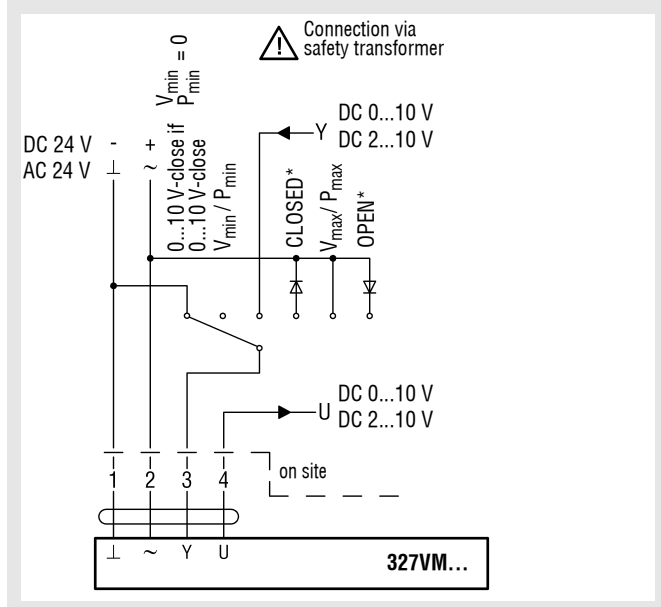
Volumetric flow controller VRAPPs

Circuit diagrams

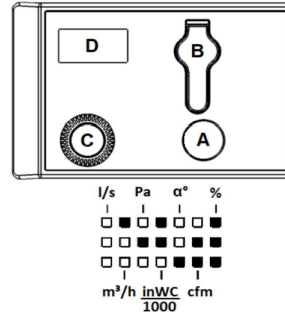
Circuit diagram electric controller (standard)

Controller Gruner make 327VM Compact

Connection diagram



No.	Designation	Wire colour	Function
1	—	- black	Power supply 24 V AC/DC
2	—	+ red	
3	←	Y white	Input signal 0-10 V DC
4	→	U orange	Feedback signal 0-10 V DC
A	CA -	pink	Modbus RTU connection (RS485)
B	CB +	grey	

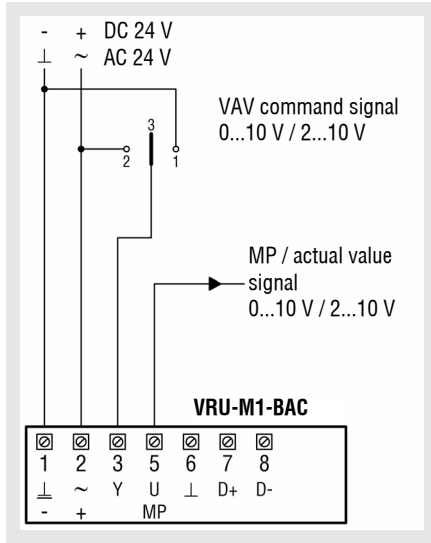


- I/s (volume) = No square is shown in the display
- m³/h (volume) = Only the upper square is shown in the display
- Pa (pressure) = Only the middle square is shown in the display
- inWC/1000 = The upper & the middle square are shown in the display
- α° (angle) = Only the lower square is shown in the display
- Cfm = The middle & the lower square are shown in the display

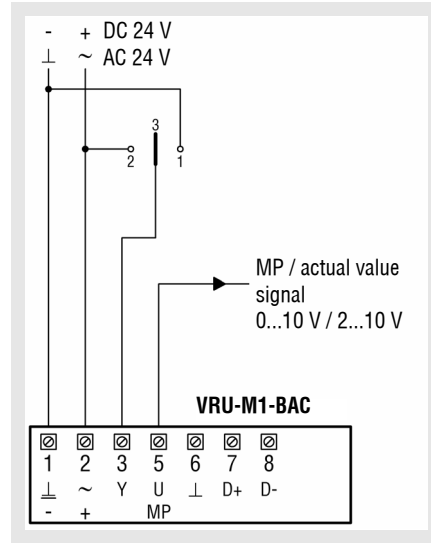
Act / Set:	Display of current value / setpoint value or positive control.
Min:	To set the required min. value (setpoint value Y = 0 / 2 VDC).
Max:	To set the required max. value (setpoint value Y = 10 VDC).
Diag:	Diagnostics menu: y/u - Display of setpoint value / feedback signal oP - opens the damper leaf cL - closes the damper leaf Hi - activates max. value Lo - activates min. value bE - activates intermediate value St - diagnostic mode is on, motor is off Adp - adaptation travel (only 15 Nm or Modbus version) 123 - software version
Mode:	0An (0-10 V DC standard direction of rotation) 2An (2-10 V DC standard direction of rotation)
Adr:	Setting the Modbus address (1...247) and Modbus parameters (if actuator is Modbus-capable).
Nom:	Display & setting of the nominal value, depending on the VAV box (setting is only possible with volumetric flow rate control).
Settings:	327 VAV controllers can be set directly on the display. All 327 VAV controllers can communicate with the setting device GUIV3-M or with the setting software Win-VAV2 via the service connection. When using the setting software WIN-VAV2, the GUIV3-S serves as an interface converter.
Accessories:	GUIV3-M – service plug + setting device GUIV3-M WIN-VAV2 bundle – service plug + interface converter GUIV3-S + setting software WIN-VAV2

Volumetric flow controller VRAPPs

Circuit diagram of electric controller (alternative)
 Universal controller make Belimo VRU-M1-BAC
 VAV with analogue command signal



CAV operation



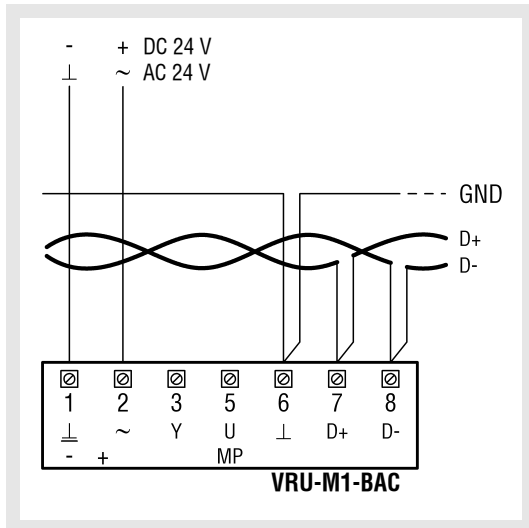
Command signal Y	Volumetric flow	Function
$< 0,1 \text{ V}^{**}$	0	Damper CLOSED, VAV control inactive
0.2...2 V	V_{\min}	V_{\min} operating stage active
2...10 V	$V_{\min} \dots V_{\max}$	Continuous operation $V_{\min} \dots V_{\max}$

**Attention: Controller/DDC must be able to pull the command signal to 0 V.

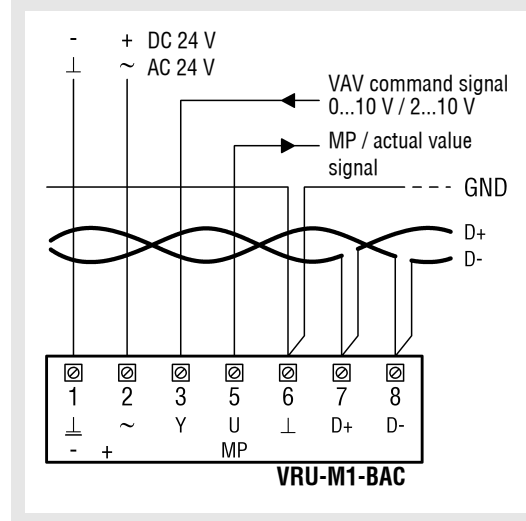
Function - Analogue CAV step control

1. Damper CLOSED
2. V_{\max}
3. V_{\min}

BACnet MS/TP / Modbus RTU operation



BACnet MS/TP / Modbus RTU hybrid operation



Priority rule - BACnet/Modbus control

1. z1
2. z2
3. Bus watchdog
4. a) Adaptation
b) Synchronisation
5. Bus positive control
6. Bus setpoint value: Min...Max

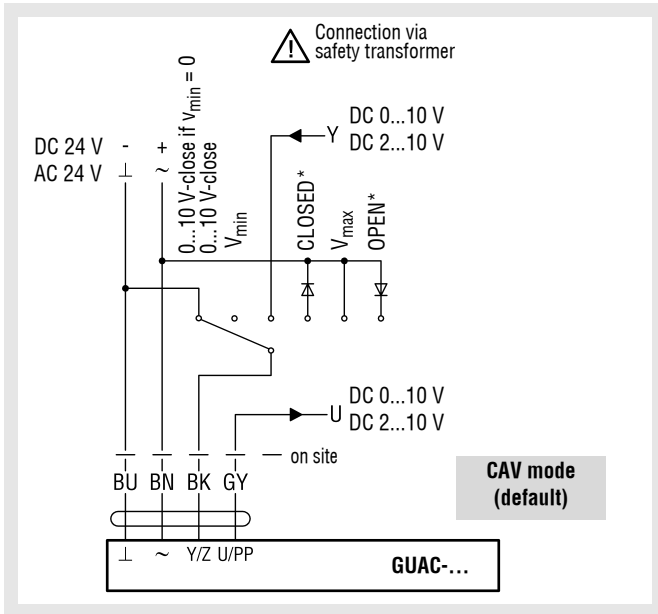
Priority rule - BACnet/Modbus hybrid operation

1. z1
2. z2
3. Bus watchdog
4. a) Adaptation
b) Synchronisation
5. Bus positive control
6. Y stage: actuator CLOSED / MIN / MAX
7. Bus setpoint value: Min...Max

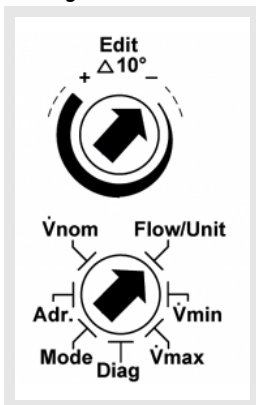
Volumetric flow controller VRAPPs

Circuit diagram of electric controller (alternative)

Controller Gruner make:
GUAC-SM3/SCH Universal
 Connection diagram



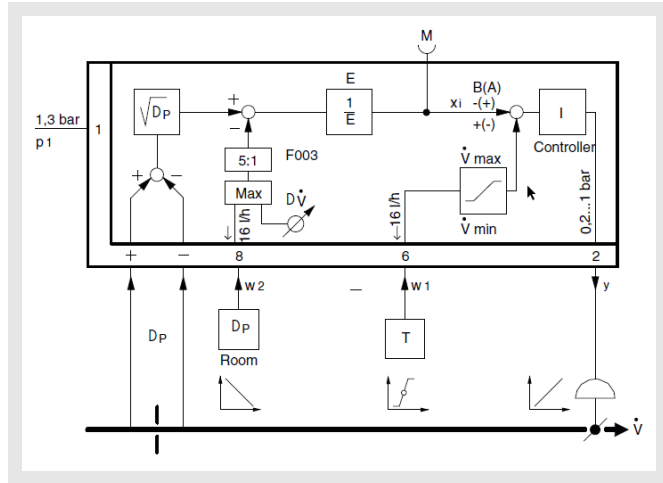
Setting



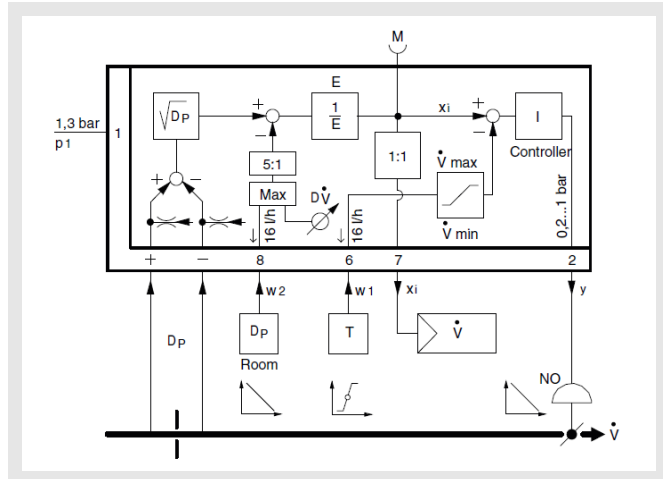
Edit:	The selector value allows values to be changed. The position of the arrow shows the set value. The changes are displayed as soon as the selector is moved $\pm 10^\circ$ out of its position.
Flow / Unit:	To set the desired current volumetric flow unit in m^3/h and l/s .
V_{min} :	To set the required min. volumetric flow (setpoint value $Y = 0 V / 2 V$)
V_{max} :	To set the required max. volumetric flow (setpoint value $Y = 10 V$)
Mode:	(To set the direction of rotation) 0-n...0-10 V normal (clockwise) 2-n...2-10 V normal (clockwise) 0-i ...0-10 V inverse (counterclockwise) 2-i ...2-10 V inverse (counterclockwise)
Diag:	Diagnosics menu: oP = opens the damper leaf cL = closes the damper leaf Hi = activates V_{max} Lo = activates V_{min} on = Diagnostic mode is on, motor is off off = Diagnostic mode is off, display Y setpoint
V_{nom} :	To display and set the nominal volumetric flow (by the box manufacturer only).
(for more information, please refer to the technical data sheet GUAC-SM3/SCH universal 361C-024-10-V / 328CS-024-10B-V/ST06 from Gruner)	

Volumetric flow controller VRAPPs

Circuit diagram of pneumatic controller (standard)
Compact controller Sauter make RLP100 F003



Circuit diagram of pneumatic controller (alternative)
Compact controller Sauter make RLP100 F914



- w = Command variable
- Δp = Pressure difference
- v = Output pressure
- y (2) = Output to the actuator

Calculation formulae

Calculation of the U_5 voltage value

Operating mode: 2 - 10 V DC:

$$U_5 = \frac{V_{\max}}{V_{\text{nenn}}} \times 8V + 2V \quad V_{\max} \text{ values}$$

$$U_5 = \frac{V_{\min}}{V_{\text{nenn}}} \times 8V + 2V \quad V_{\min} \text{ values}$$

Operating mode: 0 - 10 V DC:

$$U_5 = \frac{V_{\max}}{V_{\text{nenn}}} \times 10V \quad V_{\max} \text{ values}$$

$$U_5 = \frac{V_{\min}}{V_{\text{nenn}}} \times 10V \quad V_{\min} \text{ values}$$

Calculation of the V_{nenn} volumetric flow

$$V_{\text{nenn}} = EK \times F \times 3600$$

Attention:

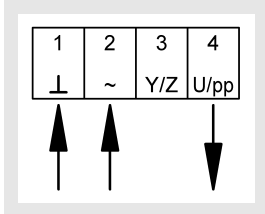
The V_{nenn} value changes as a function of the set calibration curve.

- EW (%) = Set value
- EK (m/s) = Calibration curve
- U_5 (V DC) = U_5 signal
- F (m²) = Surface

Volumetric flow controller VRAPPs

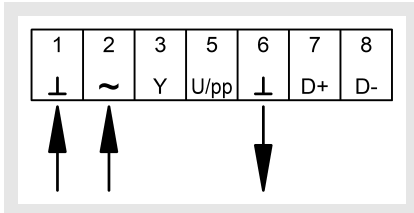
Actual value measurement via feedback signal U_5 using a voltmeter or PC tool

Terminal assignment 327VM/GUAC-...



Supply voltage 24 V AC/DC (terminals 1+2)
Measurement output 2 - 10 V DC (terminals 1+4)
Measurement output 0-10 V DC (terminals 1+4)

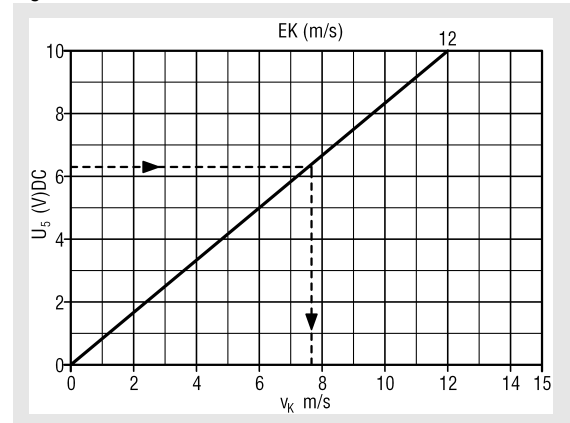
VRU-...



Supply voltage: 24 V AC/DC (terminals 1+2)
Measurement output 2 - 10 V DC (terminals 1+5)
Measurement output 0 - 10 V DC (terminals 1+5)

The actual value signal U_5 is a real feedback of the volumetric flow actual value for monitoring and controlling the air throughput volume.

U_5 signal 0-10 V DC



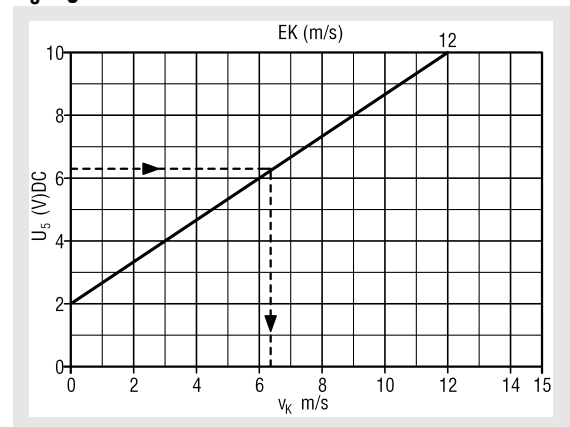
Example

Assume: Measurement output signal $U_5 = 6.3$ V DC
Calibration value VRAPPs = 12 m/sec

Measured value: Duct velocity = 7.6 m/s

Air volume: Duct velocity x area m^2 x 3600 = m^3/h

U_5 signal 2-10 V DC



Example

Assume: Measurement output signal $U_5 = 6.3$ V DC
Calibration value VRAPPs = 12 m/sec

Measured value: Duct velocity = 6.3 m/s

Air volume: Duct velocity x area m^2 x 3600 = m^3/h

Volumetric flow controller VRAPPs

Technical data of controllers and motors

Standard electric controller

327VM-024-10-DS4-MB (Gruner product)

Static pressure sensor, digital VAV and pressure controller as a communication-capable VAV-Compact solution.

Measuring principle:	static pressure measurement (position-independent)
Measuring range sensor:	0...~300 Pa (bursting pressure 1 bar)
Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V
Functional range:	AC 19...29 V / DC 19...29 V
Power consumption:	2.5 W (5 Nm)
Dimensioning:	4.0 VA (5 Nm)
Torque:	min. 5 Nm at the rated voltage (10 Nm, 15 Nm, optional)
Control function:	VAV/CAV/Open-Loop; pressure control, supply/return air or stand-alone operation; master/slave parallel circuit; mixing box control
Setting range V_{\min} to V_{\max} :	$V_{\min} = 0...100\%$ of V_{nom} $V_{\max} = 0...100\%$ of V_{nom} $V_{\text{konst.}} = 0...100\%$ of V_{nom}
Command variable Y/Z: (inherent resistance min. 100 k Ω)	DC 0-10 V (0-20 mA at least 500 Ω input resistance) DC 2-10 V (4-20 mA at least 500 Ω input resistance)
Setting range: (actual value signal U/PP)	DC 0-10 V DC 2-10 V
Bus function:	Modbus RTU, hybrid mode
DCC controller:	DCC controller or PLC
Sensor integration:	passive or active sensors (0-10V) for example, humidity, temperature 2-point signal (switching power 16 mA @ 24 V), for example switch, motion detector
Protection class:	III (Safety extra low voltage)
Degree of protection:	IP54 (measuring hoses connected)
Measuring air and ambient temp.:	0 °C to +70 °C (medium) 0 °C to +50 °C (environment) 5-95% relative humidity, non-condensing
Storage temperature:	-20 °C to +80 °C
Sound power level:	max. 35 dB(A)
Operation and service:	Using the display by means of a screwdriver directly at the device or via the feedback signal.
Communication:	Modbus RTU
Connection:	cable 1000 mm, 4 x 0.75 mm ² (halogen-free), terminals
Dimensions:	115 x 65 x 61 mm
Weight:	approx. 550 g
Maintenance:	maintenance-free

Volumetric flow controller VRAPPs

Alternative electric controller

VRU-M1-BAC (make Belimo)

Self-adapting digital volumetric flow/pressure controller, with integrated static pressure sensor. Position-independent as a communication-capable universal solution with external actuators.

Measuring principle:	static differential pressure measurement
Measuring range sensor:	0... ~600 Pa (bursting pressure +/- 10 kPa)
Sensor functional range:	0... ~600 Pa
Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V
Functional range:	AC 19...29 V / DC 19...29 V
Power consumption:	1.5 W (without actuator)
Dimensioning:	2 VA (with VST actuator)
Control function:	VAV/CAV, STP (pressure), open loop Supply/return air or stand-alone operation; positive control; master/slave or parallel circuit
Setting range: V_{\min}/V_{\max} (volumetric flow)	$V_{\min} = 0...100\%$ of V_{nom} $V_{\max} = 20...100\%$ of V_{nom} $V_{\text{kon.}} = 0...100\%$ of V_{nom}
Setting range: P_{\min} to P_{\max} (pressure)	$P_{\min} = 0...100\%$ of P_{nom} $P_{\max} = 20...100\%$ of P_{nom} $P_{\text{kon.}} = 0...100\%$ of P_{nom}
Bus function:	BACnet MS/TP, Modbus RTU, MP bus
Command variable Y/Z: (inherent resistance min. 100 k Ω)	DC 0-10 V DC 2-10 V variable
Setting range: (actual value signal U)	DC 0-10 V DC 2-10 V variable
Sensor integration:	passive or active sensors (0-10V) for example, humidity, temperature 2-point signal (switching power 16 mA @ 24 V), for example switch, motion detector
Protection class:	III Safety extra-low voltage (SELV)
Degree of protection:	IP42 (measuring hoses and actuator connected)
Ambient temperature:	0 °C to +50 °C (environment), 5-95% relative humidity, non-condensing
Storage temperature:	-20 °C to +80 °C, 5-95% relative humidity, non-condensing
Operation and service:	via the ZTH EU setting device, Belimo Assistant app (NFC, Bluetooth) or via feedback signal/service plug with Belimo PC-Tool
Connection:	Terminals 2.5 mm ²
Dimensions:	170 x 98 x 58 mm
Weight:	approx. 340 g
Maintenance:	maintenance-free

VRU-M1R-BAC (make Belimo)

Self-adapting digital room pressure controller, with integrated static pressure sensor. Position-independent as a communication-capable universal solution with external actuators.

Measuring principle:	static differential pressure measurement
Measuring range sensor:	-75... ~75 Pa (bursting pressure +/- 10 kPa)
Sensor functional range:	-75... ~75 Pa
Supply voltage:	AC 24 V, 50/60 Hz; DC 24 V
Functional range:	AC 19...29 V / DC 19...29 V
Power consumption:	1.5 W (without actuator)
Dimensioning:	2 VA (with VST actuator)
Control function:	room pressure, stand-alone operation; positive control; parallel circuit
Setting range: P_{\min} to P_{\max} (pressure)	$P_{\min} = 0...100\%$ of P_{nom} $P_{\max} = 20...100\%$ of P_{nom} $P_{\text{kon.}} = 0...100\%$ of P_{nom}
Bus function:	BACnet MS/TP, Modbus RTU, MP bus
Command variable Y/Z: (inherent resistance min. 100 k Ω)	DC 0-10 V DC 2-10 V variable
Setting range: (actual value signal U)	DC 0-10 V DC 2-10 V variable
Sensor integration:	passive or active sensors (0-10V) for example, humidity, temperature 2-point signal (switching power 16 mA @ 24 V), for example switch, motion detector
Protection class:	III Safety extra-low voltage (SELV)
Degree of protection:	IP42 (measuring hoses and actuator connected)
Ambient temperature:	0 °C to +50 °C (environment), 5-95% relative humidity, non-condensing
Storage temperature:	-20 °C to +80 °C, 5-95% relative humidity, non-condensing
Operation and service:	via the ZTH EU setting device, Belimo Assistant app (NFC, Bluetooth) or via feedback signal/service plug with Belimo PC-Tool
Connection:	Terminals 2.5 mm ²
Dimensions:	170 x 98 x 58 mm
Weight:	approx. 340 g
Maintenance:	maintenance-free

Volumetric flow controller VRAPPs

Alternative electric controller

GUAC-SM3/SCH (make Gruner)

Digital VAV controller, with static pressure sensor, position-independent als communication-capable universal solution.

Measuring principle:	static differential pressure measurement
Measuring range sensor:	0...~300 Pa (bursting pressure 1 bar)
Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V
Functional range:	AC 19...29 V / DC 19...29 V
Power consumption:	0.5 W (without actuator)
Dimensioning:	1.5 VA (without actuator)
Control function:	VAV/CAV; Supply/return air or stand-alone operation; master/slave or parallel circuit
Setting range V_{\min} to V_{\max} :	$V_{\min} = 0...100\%$ of V_{nom} $V_{\max} = 0...100\%$ of V_{nom} $V_{\text{konst.}} = 0...100\%$ of V_{nom}
Command variable Y/Z: (inherent resistance min. 100 k Ω)	DC 0-10 V (0-20 mA at least 500 Ω input resistance) DC 2-10 V (4-20 mA at least 500 Ω input resistance)
Setting range (actual value signal U/ PP):	DC 0-10 V DC 2-10 V
DCC controller:	DCC controller or PLC
Sensor integration:	passive or active sensors (0-10V) for example, humidity, temperature 2-point signal (switching power 16 mA @ 24 V), for example switch, motion de- tector
Protection class:	III (Safety extra low voltage)
Degree of protection:	IP54 (measuring hoses connected)
Measuring air and ambi- ent temp.:	0 °C to +70 °C (medium) 0 °C to +50 °C (environment), 5-95% relative humidity, non-condensing
Storage temperature:	-20 °C to +80 °C
Sound power level:	<35 dB(A)
Operation and service:	on the display, using a screwdriver directly at the device or via feedback signal/service plug using PC software
Connection:	cable 1000 mm, 4 x 0.75 mm ² (halogen-free), terminals
Dimensions:	124 x 71.5 x 66.5 mm
Weight:	approx. 175 g
Maintenance:	maintenance-free

Standard pneumatic controller

RLP100 F003 (make Sauter)

Pneumatic integral volumetric flow controller in connection with a damper drive with control flap and a measuring sensor for use with fixed, switchover and variable control

Measuring principle:	High-precision, static differential pressure sensor
Measuring range sensor:	1...160 Pa
Feed pressure:	1.3 bar +/- 0.1 bar
Air consumption:	44 l/h
Air flow pressure:	0.2...1.0 bar
Response sensitivity:	0.1 Pa
Allowed ambient tempera- ture:	0 °C to +55 °C
Degree of protection:	IP 30
Control direction:	Depressurised CLOSED/OPEN (B/A)
Conforms to EN 13463-1 and EN 1127-1 (Ex II 2 G T6) and for use in potentially explosive atmospheres of Zone 1.	

For supply and return air (integral room air control system)

Alternative pneumatic controller

RLP100 F914 (make Sauter)

Pneumatic integral volumetric flow controller in connection with a damper drive with control flap and a measuring sensor for use with fixed, switchover and variable control. Can be used if air contains aggressive media.

Measuring principle:	High-precision, static differential pressure sensor
Measuring range sensor:	1...160 Pa
Feed pressure:	1.3 bar +/- 0.1 bar
Air consumption:	44 l/h
Air flow pressure:	0.2...1.0 bar
Response sensitivity:	0.1 Pa
Allowed ambient tempera- ture:	0 °C to +55 °C
Degree of protection:	IP 30
Control direction:	Depressurised OPEN (A)
Conforms to EN 13463-1 and EN 1127-1 (Ex II 2 G T6) and for use in potentially explosive atmospheres of Zone 1.	

For return air with aggressive gases (integral room air control system)

Volumetric flow controller VRAPPs

**Damper actuators ...24A-VST (make BELIMO)
for VRU-...-BAC**

NM24A-VST

Actuator, communicative, with position feedback

Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V, ready to plug in
Functional range:	AC 19.2-28.8 V / DC 21.6-28.8 V
Power consumption:	2 W (during operation)
Dimensioning:	4 VA
Torque:	10 Nm (at the rated voltage)
Running time for 90° (or 95°):	120 sec.
Activation:	communicative PP
Protection class:	III Safety extra-low voltage (SELV)
Degree of protection:	IP 54
Ambient temperature:	-30 °C to +50 °C, 5-95% relative humidity, non-condensing
Storage temperature:	-40 °C to +80 °C
Sound power level:	max. 35 dB(A)
Manual adjustment:	Gears are disengaged by pushbutton, self-restoring
Connection:	cable 500 mm with VST plug
Dimensions:	124 x 80 x 62 mm
Weight:	approx. 780 g
Maintenance:	maintenance-free

NF24A-VST

Spring return actuator with emergency control function, communicative, with position feedback.

Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V, ready to plug in
Functional range:	AC 19.2-28.8 V / DC 21.6-28.8 V
Power consumption:	5 W (in motion)
Dimensioning:	8 VA
Torque:	10 Nm (at the rated voltage)
Spring torque:	10 Nm
Running time for 90°:	120 sec. (motor) < 20 sec. (spring)
Activation:	communicative PP
Protection class:	III Safety extra-low voltage (SELV)
Degree of protection:	IP54
Ambient temperature:	-30 °C to +50 °C, 5-95% relative humidity, non-condensing
Storage temperature:	-40 °C to +80 °C
Sound power level:	max. 40 dB(A) (motor)
Manual adjustment:	Manual winding with lock
Connection:	cable 500 mm with VST plug
Dimensions:	214 x 98 x 93 mm
Weight:	approx. 2300 g
Maintenance:	maintenance-free

NMQ24A-VST

High-speed actuator, communicative, with position feedback

Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V, ready to plug in
Functional range:	AC 19.2-28.8 V / DC 21.6-28.8 V
Power consumption:	13 W (during operation)
Dimensioning:	23 VA
Torque:	8 Nm (at the rated voltage)
Running time for 90°:	4 sec.
Activation:	communicative PP
Protection class:	III Safety extra-low voltage (SELV)
Degree of protection:	IP 54
Ambient temperature:	-30 °C to +50 °C, 5-95% relative humidity, non-condensing
Storage temperature:	-40 °C to +80 °C
Sound power level:	max. 56 dB(A)
Manual adjustment:	Gears are disengaged by pushbutton, self-restoring
Connection:	cable 500 mm with VST plug
Dimensions:	139 x 88 x 77 mm
Weight:	approx. 780 g
Maintenance:	maintenance-free

NKQ24A-VST

High-speed actuator with emergency control function, communicative, with position feedback

Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V, ready to plug in
Functional range:	AC 19.2-28.8 V / DC 21.6-28.8 V
Power consumption:	11 W (during operation)
Dimensioning:	22 VA
Torque:	6 Nm (at the rated voltage)
Running time for 90°:	4 sec. (motor) 4 sec. (emergency control)
Emergency position setting	0...100% in 10% steps
Precharge time:	approx. 15 sec.
Activation:	communicative PP
Protection class:	III Safety extra-low voltage (SELV)
Degree of protection:	IP 54
Ambient temperature:	-30 °C to +50 °C, 5-95% relative humidity, non-condensing
Storage temperature:	-40 °C to +80 °C
Sound power level:	max. 60 dB(A)
Manual adjustment:	Gears are disengaged by pushbutton, self-restoring
Connection:	cable 500 mm with VST plug
Dimensions:	139 x 88 x 80 mm
Weight:	approx. 1400 g
Maintenance:	maintenance-free

Volumetric flow controller VRAPPs

Damper drives...24- (make Gruner)
for **GUAC-SM3/SCH**

361C-024-10-V

Spring return actuator, ready to be plugged in for GUAC-...

Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V
Functional range:	AC 19...29 V / DC 19...29 V
Power consumption:	5 W (in motion)
Dimensioning:	8 VA
Torque:	> 10 Nm (at the rated voltage)
Spring torque:	> 10 Nm
Running time for 90°:	< 150 sec. (motor) < 20 sec. (spring)
Activation:	6 ± 4 V DC (from GUAC)
Protection class:	III (safety extra low voltage)
Degree of protection:	IP 54
Ambient temperature:	-30 °C to +50 °C, 5-95% relative humidity, non-condensing
Storage temperature:	-30 °C to +80 °C
Sound power level:	< 35 dB(A) (Motor) < 65 dB(A) (Feder)
Manual adjustment:	Manual winding with lock
Connection:	Cable 1000mm with Phönix plug
Dimensions:	193 x 96 x 60 mm
Weight:	approx. 1,800 g
Maintenance:	maintenance-free

328CS-024-10B-V

High-speed drive, ready to be plugged in for GUAC-... with position feedback

Supply voltage:	AC 24 V, 50/60 Hz, DC 24 V
Functional range:	AC 19...29 V / DC 19...29 V
Power consumption:	18 W (in motion)
Dimensioning:	22 VA
Torque:	> 10 Nm (at the rated voltage)
Running time for 90°:	3 sec.
Activation:	6 ± 4 V DC (from GUAC)
Protection class:	III (safety extra low voltage)
Degree of protection:	IP 54
Ambient temperature:	-30 °C to +50 °C, 5-95% relative humidity, non-condensing
Storage temperature:	-30 °C to +80 °C
Sound power level:	< 55 dB(A)
Manual adjustment:	Gears are disengaged by pushbutton, self-restoring
Connection:	Cable 1000mm with Phönix plug
Dimensions:	172.5 x 65 x 90 mm
Weight:	approx. 790 g
Maintenance:	maintenance-free

Volumetric flow controller VRAPPs

Controller selection

The selection of each actuator (torque) depends on the housing dimensions. The actuator is already selected and mounted at the factory.

Electric controller - standard				
Controller	Actuator	DM	AN	AG
- Gruner :				
- 327VM-24-10-DS4-MB	Compact	10 Nm	-	-A164

Electric controller - alternative				
Controller	Actuator	DM	AN	AG
- Belimo :				
- VRU-M1-BAC	NM24A-VST	10 Nm	-	-A151
	NMQ24A-VST	8 Nm	SL	-A154
	NKQ24A-VST	8 Nm	SR	-A155
	NF24A-VST	10 Nm	FR	-A156
- VRU-M1R-BAC	NMQ24A-VST	8 Nm	SL	-A159
- Sauter :				
- ASV215BF132E	Compact	10 Nm	-	-A138
- ASV215BF152E	Compact	10 Nm	SL	-A139
- Gruner :				
- GUAC-SM3/SCH	361C-024-10-V	10 Nm	FR	-A069
	328CS-024-10B-V/ST06	10 Nm	SL	-A071
- GUAC-PM3/SCH	341C-024-10-V	10 Nm	FR	-A073
	328CS-024-10B-V/ST06	10 Nm	SL	-A075
- 327VM-024-10-DS6-MB	Compact	10 Nm	-	-A167

Pneumatic controller - standard				
Controller	servo cylinder	DM	AN	AG
- Sauter :				
- RLP100 F003	AK42P F003	200 N	LA	-A107

Pneumatic controller - alternative				
Controller	servo cylinder	DM	AN	AG
- Sauter :				
- RLP100 F914	AK42P F003	200 N	LA	-A109
- RLP100 F123	AK42P F003	200 N	LA	-A111

Accessories:

S1A/S2A, limit switch make Belimo, to fit all new compact controllers and actuators of make Belimo.

ZTH EU, PC tool and ZTH EU for Belimo LMV-D3-MP / AST20 for Siemens GLB 181.1 E/3 / WIN-VAV-2 for Gruner 327VM.

DM = Torque

AN = Actuator type

SL (High-speed damper drive)

FR (Spring return)

LA (Linear drive)

- (standard)

AG = Attachment assembly

Attention

The volumetric flow controllers VRAPPs are used for air contaminated with aggressive components. For this reason, the Gruner controller 327VM-24-10-DS3 or the Belimo controllers VRU are mounted to the electric volumetric flow controller. In these controllers, the air volume throughput is measured using a static differential pressure measurement. A membrane integrated in the controller measures the pressure and prevents air flow to the measuring unit. This considerably reduces the risk of damage.

Due to the integrated membrane, the Belimo aneroid diaphragm must be installed in the correct position (non-horizontal mounting position)!

The Gruner controllers have a static differential pressure sensor which can be used irrespective of the position!

Legend

v_K (m/s) = Duct velocity

Δp_t (Pa) = Pressure loss

V (m³/h) = Volumetric flow

V [l/s] = Volumetric flow

f_m (Hz) = Octave centre frequency

L_W [dB/Okt] = Sound power level / octave

L_{WA} [dB(A)] = A-weighted sound power level

L (mm) = Length

NW (mm) = Nominal width

Volumetric flow controller VRAPPs

Order code

01	02	03	04	05	06	07	08
Type	Nominal width	Attachment assembly	Mode	Volumetric flow $V_{\min} / V_{\text{kon}}$	Volumetric flow V_{\max}	Duct connection	Damper position
Example							
VRAPPs	-110	-A164	-0	-0100	-0350	-KA0	-NA

Sample

VRAPPs-110-A164-2-0100-0350-KA0-NA

Volumetric flow controller VRAPPs, round design (made of PPs) | NW 110 | 327VM-024-10-DS3-MB, compact | 0-10 V | $V_{\min}= 100 \text{ m}^3/\text{h}$ | $V_{\max}= 350 \text{ m}^3/\text{h}$ | without flange, butted | no spring return actuator

Order details

01 - Type

VRAPPs = Volumetric flow controller VRAPPs, round design (made of PPs)

02 - Nominal width

110 = NW 110
 125 = NW 125
 160 = NW 160
 200 = NW 200
 250 = NW 250
 315 = NW 315
 400 = NW 400

03 - Attachment assembly

- with electric controller – standard:

A164 = 327VM-024-10-DS4-MB, compact

- with electric controller – alternative:

A151 = VRU-M1-BAC, NM24A-VST

other modules available upon request (see Controller selection table on page 21).

- with pneumatic controller – standard:

A107 = RLP100 F003, AK42P F003 (linear drive)

- with pneumatic controller – alternative:

A109 = RLP100 F914, AK42P F003 (linear drive)

A111 = RLP100 F123, AK42P F003 (linear drive)

04 - Mode

0 = 0-10 V

2 = 2-10 V (pneumatic controllers can only be delivered in mode 2!)

05 - Volumetric flow set value V_{\min}/V_{kon}

0000 = ex-works, according to table

xxxx = Value in m^3/h (always with 4 digits)

06 - Volumetric flow set value V_{\max}

0000 = ex-works, according to table

xxxx = Value in m^3/h (always with 4 digits)

07 - Duct connection

KA0 = without flange, butted (standard).

FF3 = with flat flange (pair), on both sides, PPs.

08 - Damper position

NA = no spring return actuator (standard)

NO = currentless OPEN

NC = currentless CLOSED

Please note!

Counter flanges and duct silencers must be ordered separately!

Volumetric flow controller VRAPPs

Specification texts

Volumetric flow rate controllers for use in supply/return air systems for constant or variable volume flow, room or duct pressure control. Also suitable for use in digesters or with air containing aggressive media. With positive control V_{\min} , V_{\max} or "CLOSED". Permitted pressure difference range: 20-1000 Pa, permitted surrounding temperatures 0-55° C. For use with duct velocities of 1-12 m/s (only Gruner 327 VM). It is possible to subsequently adjust the ex-factory set operational volumetric flows (type Gruner, setting directly at the controller via the potentiometer without service tool). The output signal can be used for master/slave or parallel operation of several controllers or for actual value display 2-10 V DC which corresponds to 0-100 % of the set V_{\max} or 0(2)-10 V which corresponds to 0-100% of V_{nein} in DDC / ZLT systems.

Housing made of plastic PPs. Damper blade, damper axle and measuring cross made of plastic material PP. Controller and drive console made of plastic PP. Damper blade seal silicone-free made of PUR (NW 110 sealing airtight to DIN EN 1751 Class 2, NW 125 - 400 sealing airtight to DIN EN 1751 Class 3).

Housing tightness class C to DIN EN 1751.

Product: SCHAKO type **VRAPPs**

Nominal width:

- NW 110 (-110)
- NW 125 (-125)
- NW 160 (-160)
- NW 200 (-200)
- NW 250 (-250)
- NW 315 (-315)
- NW 400 (-400)

Attachment assembly:

- **with electric controller – standard**
 - Gruner:
 - 327VM-24-10-DS4-MB, compact (-A164), 10 Nm
- **with electric controller - alternative**
 - Belimo:
 - VRU-M1-BAC, NM24A-VST (-A151), 10 Nm
 - VRU-M1-BAC, NMQ24A-VST (-A154), 8 Nm
 - VRU-M1-BAC, NKQ24A-VST (-A155), 8 Nm
 - VRU-M1-BAC, NF24A-VST (-A156), 10 Nm
 - VRU-M1R-BAC, NMQ24A-VST (-A159) 8 Nm
 - Sauter:
 - ASV215BF132E, compact (-A138), 10 Nm
 - ASV215BF152E, compact (-A139), 10 Nm
 - Gruner:
 - GUAC-SM3/SCH, 361C-024-10-V (-A069), 10 Nm
 - GUAC-SM3/SCH, 328CS-024-10B-V/ST06 (-A071), 10 Nm
 - GUAC-PM3/SCH, 341C-024-10-V (-A073), 10 Nm
 - GUAC-PM3/SCH, 328CS-024-10B-V/ST06 (-A075), 10 Nm
 - 327VM-024-10-DS6-MB, compact (-A167), 10 Nm

- with pneumatic controller – standard

- Sauter:
 - RLP100 F003, AK42P F003 (linear drive) (-A107), 200 N

- with pneumatic controller - alternative

- Sauter:
 - RLP100 F914, AK42P F003 (linear drive) (-A109), 200 N
 - RLP100 F123, AK42P F003 (linear drive) (-A111), 200 N

Mode:

- 0-10 V (-0)
- 2-10 V (-2) (pneumatic controllers can only be delivered in mode 2!)

Volumetric flow set value V_{\min}/V_{kon} :

- ex-works, according to table (-0000)
- Value in m³/h (-xxxx) (always with 4 digits)

Volumetric flow set value V_{\max} :

- ex-works, according to table (-0000)
- Value in m³/h (-xxxx) (always with 4 digits)

Damper position:

- no spring return actuator (standard) (-NA)
- currentless OPEN (-NO), only for actuators with spring return
- currentless CLOSED (-NC), only for actuators with spring return

Please note!

Counter flanges and duct silencers must be ordered separately!

Accessories (at an extra charge):

- Flange (-KA0/-FF3) (duct connection)
 - without flange, butted (-KA0) (standard)
 - with flat flange (pair), on both sides, made of plastic material PPs (-FF3)