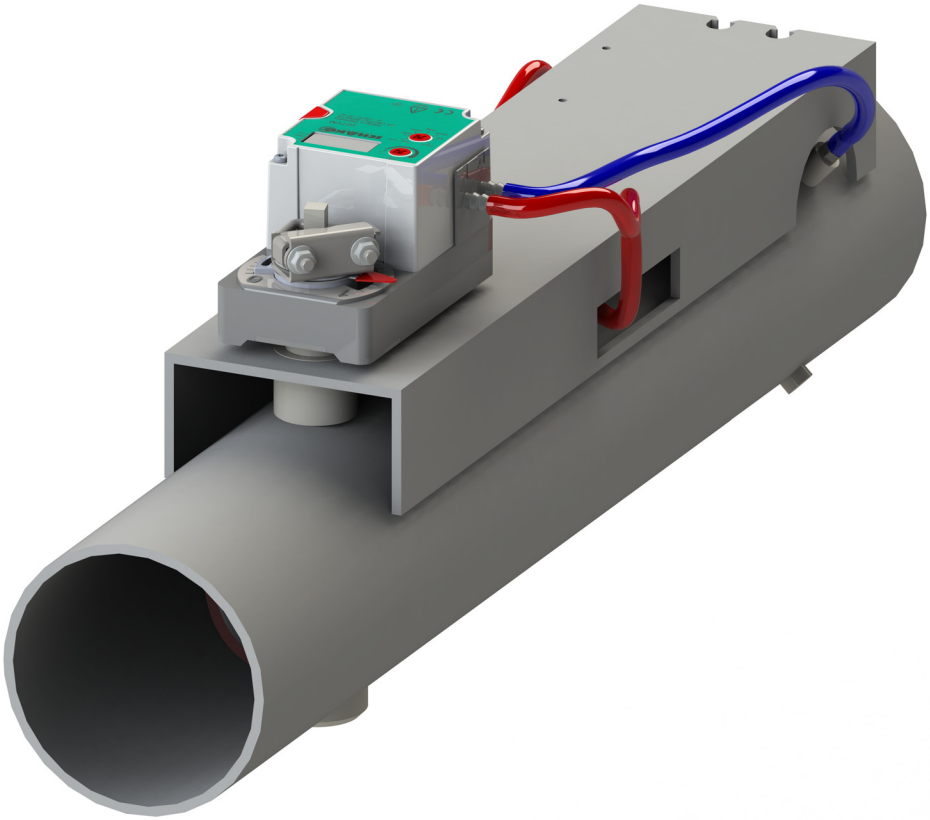
Volumetric flow controller

VRA-R-E-PPs



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Volumetric flow controller VRA-R-E-PPs

Content

Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

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 VRA-R-E-PPs is suitable for use with aggressive components of polluted air.

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 ex factory according to the customer's requirements. If these values are set ex factory, the functions of the volumetric flow controller 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_{nenn}, 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 inflow. 12 measuring points are distributed on the measuring cross according to 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 2 - 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.

Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

Installation

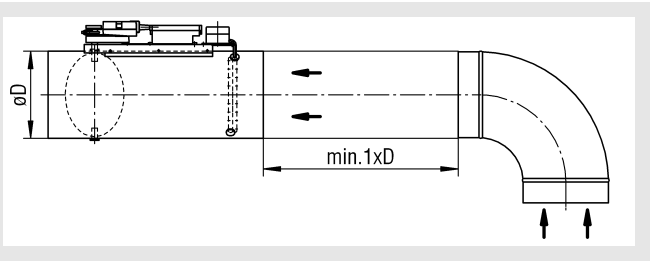
Installation information

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:

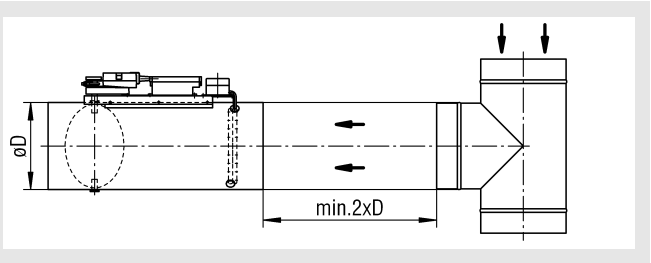
- Bent connection piece	1xD
- other connection pieces: (e.g. T-junction, branching piece, reduction piece, etc.)	2xD
- Fire damper	2xD
- Silencer	2xD

Distance to a connection piece with bend

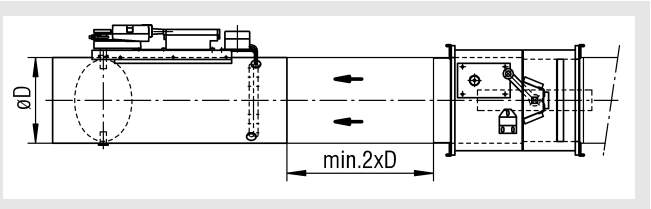


Distance to other connection pieces

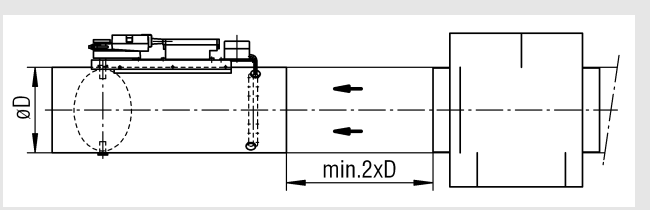
(e.g. T-junction, branching piece, reduction piece, etc.)



Distance to a fire damper



Distance to a silencer



Construction

Housing
- Plastic PPs

Damper axle
- Plastic PP

Damper leaf
- 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

VRA-R-E-PPs
- 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 plastic damper leaf with silicone-free damper leaf 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.

Accessories

Flange-to-flange (-FF) (at an extra charge)
- on both sides, made of plastic PPs

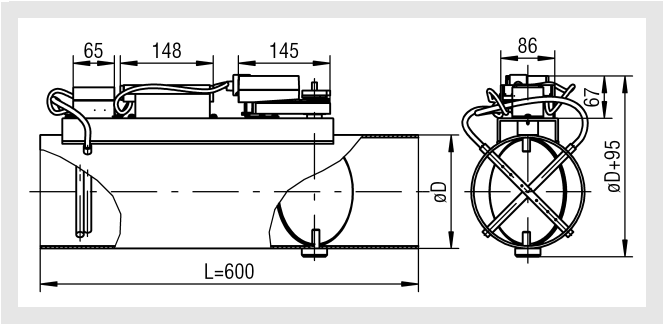
Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

Models and dimensions

Dimensions



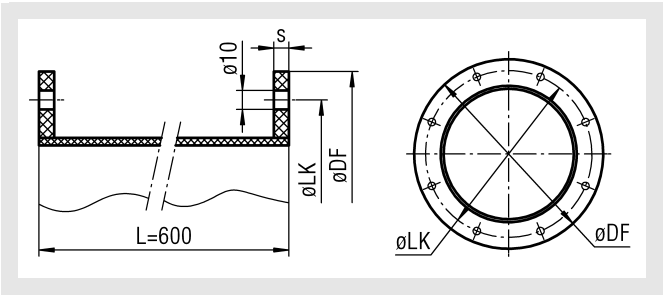
Available sizes

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

NW 110 sealing airtight to DIN EN 1751 Class 2
NW 125-400 sealing airtight to DIN EN 1751 Class 3

Dimensions of accessories

Flat flange (-FF), on both sides



Available sizes

NW	øD	øDF	øLK	s	Number of holes
110	110	170	150	8	8
125	125	185	165	8	8
160	160	230	200	8	8
200	200	270	240	8	8
250	250	320	290	8	12
315	315	395	350	10	12
400	400	475	445	10	16

NW 110 sealing airtight to DIN EN 1751 Class 2
NW 125-400 sealing airtight to DIN EN 1751 Class 3

Technical data

Volumetric flow range

NW (mm)	V	Belimo/Gruner		
		Gruner v_{min} (1 m/s)	v_{min} (2 m/s)	v_{max} (12 m/s)
110	m³/h	31	61	364
	l/s	9	17	101
125	m³/h	40	80	480
	l/s	11	22	133
160	m³/h	67	134	804
	l/s	19	37	223
200	m³/h	107	213	1280
	l/s	30	59	356
250	m³/h	167	334	2004
	l/s	46	93	557
315	m³/h	246	492	2952
	l/s	68	137	820
400	m³/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.

Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

Flow generated noise

100-200 Pa

NW	v_K	V		Δp_t = 100 Pa									Δp_t = 150 Pa									Δp_t = 200 Pa								
				L_W [dB/Oct]									L_W [dB/Oct]									L_W [dB/Oct]								
				f_m (Hz)									f_m (Hz)									f_m (Hz)								
	(m/s)	(m^3/h)	[l/s]	63	125	250	500	1000	2000	4000	8000	L_{WA} [dB(A)]	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	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	364	101	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	-	-	-	-	-	-	-	-	**-**	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	-	-	-	-	-	-	-	-	**-**	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	-	-	-	-	-	-	-	-	**-**	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	2952	820	-	-	-	-	-	-	-	-	**-**	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**

Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

Flow generated noise

250-500 Pa

NW	v_K	V		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)								
	(m/s)	(m^3/h)	[l/s]	63	125	250	500	1000	2000	4000	8000		63	125	250	500	1000	2000	4000	8000	
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	364	101	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	2952	820	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**

Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

Radiated noise

100-200 Pa

NW	v_K	V		Δp_t = 100 Pa									Δp_t = 150 Pa									Δp_t = 200 Pa								
				L_W [dB/Oct]									L_W [dB/Oct]									L_W [dB/Oct]								
				f_m (Hz)									f_m (Hz)									f_m (Hz)								
	(m/s)	(m^3/h)	[l/s]	63	125	250	500	1000	2000	4000	8000	L_{WA} [dB(A)]	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	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	364	101	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	-	27	25	21	23	24	21	-	**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	-	-	-	-	-	-	-	-	**-**	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	-	-	-	-	-	-	-	-	**-**	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	-	-	-	-	-	-	-	-	**-**	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	2952	820	-	-	-	-	-	-	-	-	**-**	47	40	38	43	39	41	38	38	**47**	48	41	39	44	40	42	39	38	**48**
400	3	1277	355	90	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**

Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

Radiated noise

250-500 Pa

NW	v_K	V		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)								
	(m/s)	(m^3/h)	[l/s]	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	364	101	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**
	12	1280	356	47	49	42	42	45	42	39	42	**49**	56	54	52	52	55	52	48	48	**59**
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	2952	820	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**

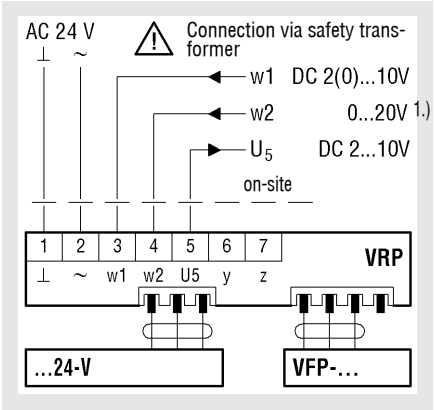
Volumenstromregler VRA-R-E-PPs

Circuit diagrams

Circuit diagram controller

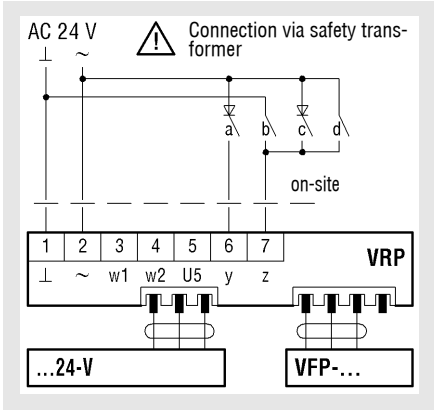
Universal controller Belimo make VRP-VFP300

Connection diagram VRP



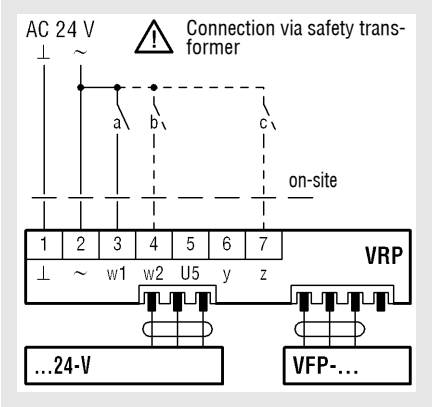
1.) Phase crossover

Positive control VRP



Function	a	b	c	d
CLOSED				
V_{min}				
V_{max}				
OPEN				

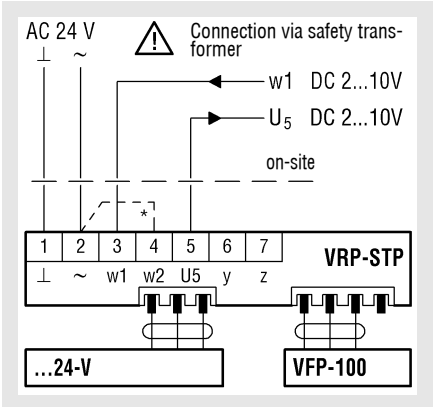
Two-stage volumetric flow rate control VRP



Function	a	b	c
V_{min}			
V_{max}			
V_{max}			
V_{max}			

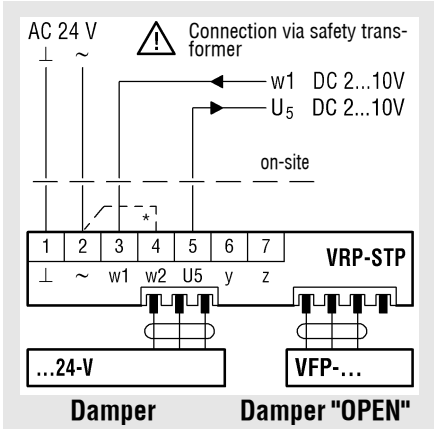
Universal controller Belimo make VRP-STP

Connection diagram



* Wire bridge 2.4 assembled ex factory. Remove if external setpoint has been set!

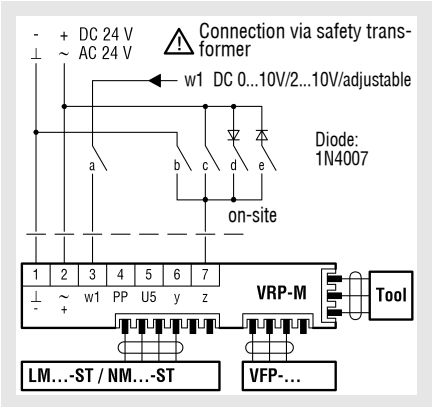
Positive control



* Wire bridge 2.4 assembled ex factory. Remove if external setpoint has been set!

Compact controller Belimo make VRP-M

Connection diagram

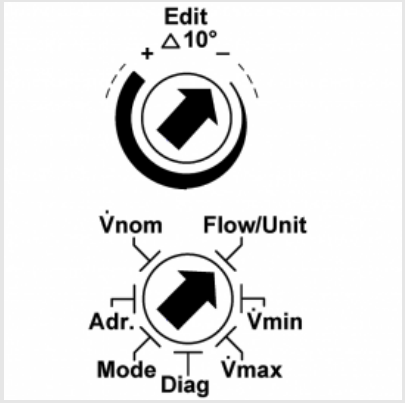


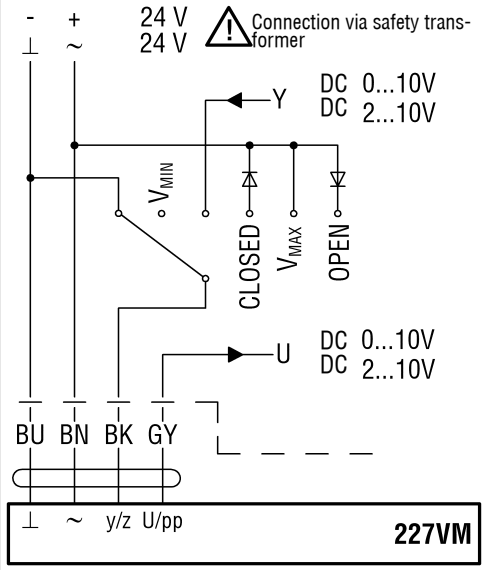
Function	a	b	c	d	e
CLOSED					
V_{min}					
V_{min} ... V_{max}					
V_{mid}					
V_{max}					
OPEN					

Construction subject to change. No return possible!

Volumetric flow controller VRA-R-E-PPs

Controller Gruner make 227V Compact
Connection diagram and positive control





Edit
The value selector allows values to be changed. The position of the arrow shows the set value. The changes are displayed once the selector is moved ±10° from its position.

Flow/Unit
To set the required actual volumetric flow unit in m^3/h and l/s.

Vmin
To set the required min. volumetric flow (setpoint value Y = 0V / 2V)

Vmax
To set the required max. volumetric flow (setpoint value Y = 10V)

Mode
To set the direction of rotation:
0-n...0-10 V normal
2-n...2-10 V normal
0-i...0-10 V inverse
2-i...2-10 V inverse

Diag (diagnostics menu:)
oP - opens the damper leaf
cL - closes the damper leaf
Hi - activates Vmax
Lo - activates Vmin
on - Diagnostic mode is on, motor is off
off - Diagnostic mode is off, display Y setpoint

Vnom
To set the volumetric flow according to VAV box

Construction subject to change.
No return possible!

Volumenstromregler VRA-R-E-PPs

Setting the operating potentiometers / calculation formulae

Set value for V_{max}

$$EW_{V_{max}} = \frac{V_{max}}{V_{nenn}} \times 100\%$$

The required volumetric flow which should flow at the 10 V DC command signal at terminal 3 (w/Y) or with positive control V_{max} is set in % at the V_{max} potentiometer of the controller (VRP), the ZTH device (VRP-M) or PC tool (VRP-M). This value refers to the set $\mathbf{V_{nenn}}$ nominal volumetric flow.

Set value for V_{min}

$$EW_{V_{min}} = \frac{V_{min}}{V_{nenn} \text{ oder } V_{max}} \times 100\%$$

The required volumetric flow which should flow at the 0 V DC command signal (operating mode 0-10 V DC) or at the 2 V DC driving signal (operating mode 2 - 10 V DC) at terminal 3 (w/Y) or with positive control V_{min} is set in % at the V_{min} potentiometer of the controller (VRP, the ZTH device (VRP-M) or PC tool (VRP-M). This value refers to the set V_{nenn} or V_{max} volumetric flow (depending on controller type).

Information regarding the set value V_{min}

In the following controllers, V_{min} refers to V_{max}:

Make	Type
Belimo	VRP-VFP

In the following controllers, V_{min} refers to V_{nenn}:

Make	Type
Belimo	VRP-M
Gruner	227VM-024-10-DS3

Calculation of the U_5 voltage value

Operating mode: 2 - 10 V DC:

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

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

Operating mode: 0 - 10 V DC:

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

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

Calculation of the V_{nenn} volumetric flow

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

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 (m^2) = Surface

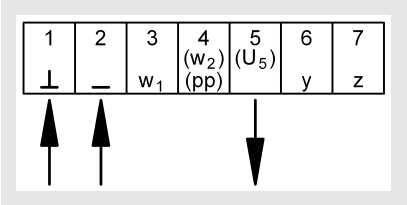
Construction subject to change.

No return possible!

Volumetric flow controller VRA-R-E-PPs

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

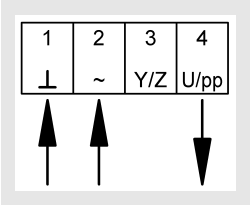
Terminal assignment
VRP-VFP / VRP-M-VFP



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) (only possible with VRP-M)

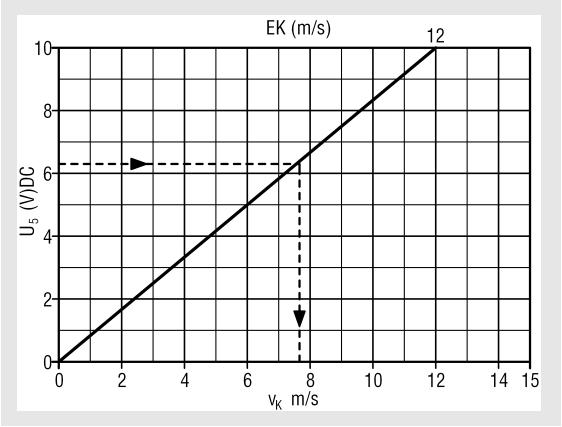
The actual value signal U_5 is a real feedback of the volumetric flow actual value for monitoring and controlling the air throughput volume.

227VM-024-10-DS3



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)

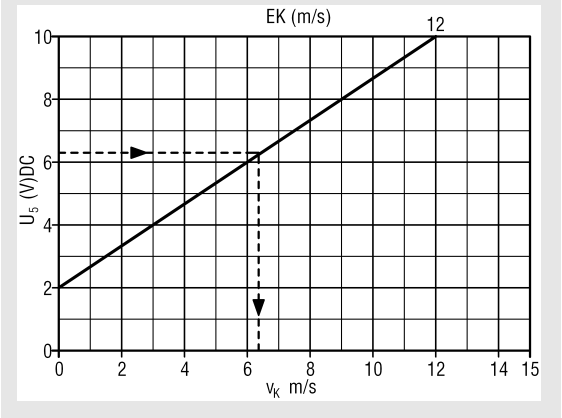
U_5 signal 0-10 V DC



Example

Assume:	Measurement output signal U_5 = 6.3 V DC Calibration value VRA-R-E-PPs = 12 m/sec
Measured value:	Duct velocity = 7.6 m/s
Air volume:	Duct velocity x area m² x 3600 = m³/h

U_5 signal 2-10 V DC



Example

Assume:	Measurement output signal U_5 = 6.3 V DC Calibration value VRA-R-E-PPs = 12 m/sec
Measured value:	Duct velocity = 6.3 m/s
Air volume:	Duct velocity x area m² x 3600 = m³/h

Volumenstromregler VRA-R-E-PPs

Technical data of controllers and motors

Controller standard

VRP-VFP (make Belimo)
For static differential pressure control with separately available sensors VFP-100, 300 or 600

Measuring principle :	Pressure measurement with metal membrane
Measuring range of the sensor:	0...100 Pa, 0...300 Pa or 0...600 Pa
Supply voltage :	AC 24 V 50/60 Hz;
Power consumption :	1.3 W (incl. sensor VFP-..., without actuator)
Dimensioning :	2.6 VA (incl. sensor VFP-..., without actuator)
Command variable w:	-
Command variable w1:	DC 2-10 V (input resistance 100 kΩ)
Command variable w2:	0-20 V phase crossover (input resistance 8 kΩ)
Operating range:	DC 2-10 V
Volumetric flow:	DC 2-10 V
Actual value signal U_5:	-
Torque	-
Sound power level	-

VRP-STP (make Belimo)
For static differential pressure control with separately available sensors VFP-100

Supply voltage :	AC 24 V 50/60 Hz;
Power consumption :	1.3 W (incl. sensor VFP-..., without actuator ...-24 V)
Dimensioning :	2.6 W (incl. sensor VFP-..., without actuator ...-24 V)
Command variable w1:	DC 2...10 V @ input resistance 100 kΩ
Operating range:	DC 2...10 V
Actual value signal U_5:	DC 2...10 V @ max. 0.5 mA (linear signal, corresponds to 0...100%Δp)
Setting ranges	
- Standard value:	25...100% FS sensor (factory setting = 100%. Example VFP-300: FS = 300 Pa = 100%)
- Setpoint value:	30...100 % of the set standard value (Δp)
Protection class :	III (safety extra low voltage)
Protection type :	IP42
Ambient temperature:	0...+50°C
Storage temperature :	-20...+80°C

VFP-100 (make Belimo)

Supply voltage :	DC 15 V (of the controller VRP...)
Measuring range:	7.5...100 Pa (zero points can be set)
Overload protection:	up to 500 Pa
Measuring principle :	Differential pressure measurement by membrane (inductive)
Output signal:	DC 0...10 V (as a linear function of the pressure for controller VRP...)
Linearity:	±1 % of the end value (FS)
Hysteresis:	0.1 % typ.
Temperature dependence:	
- Zero point	± 0.1%/K
- Measuring range:	± 0.1%/K
	t = +10...+40°C (reference temperature T_0 = 25°C)
Mounting position:	Vertical (i.e. hose connecting piece top, lateral or bottom)
Position dependence:	Max. ± 4.5 Pa upon rotation by 90° around the horizontal axis
Pressure connection:	Hose connecting piece for hose internal diameter ø4...6 mm
Electric connection:	Cable 1 m, with 4-pin plug., to fit controller VRP...
Protection class :	III (safety extra low voltage)
Protection type :	IP42
Ambient temperature:	0...+50°C
Storage temperature :	-10...+80°C

Volumetric flow controller VRA-R-E-PPs

227VM-024-10-DS3 (make Gruner)
Static pressure sensor, digital VAV controller and damper drive as a communication-capable VAV compact solution.

Measuring principle :	static pressure measurement
Measuring range:	0...~300Pa; (bursting pressure 1 bar)
Sensor :	Supply voltage AC 24 V 50/60 Hz; DC 24 V
Installation:	position-independent
Functional range :	AC 19...29 V; DC 19...29V
Power consumption :	2.5 W (10 Nm)
Dimensioning :	4.5 VA (10 Nm)
Torque	min. 10 Nm at the rated voltage
Control function	VAV/CAV (Open-Loop); Supply/return air or stand-alone operation master/slave parallel circuit Mixing box control
Setting range:	V_{min}=0...100% of V_{nom} V_{max}=0...100% of V_{nom} $V_{konst.}$=0...100% of V_{nom}
Command variable Y/Z: (inherent resistance min. 100 kΩ)	DC 0-10 V (0-20 mA min. 500 Ω input resistance) DC 2-10 V (4-20 mA min. 500Ω input resistance)
Setting range: (Actual value signal U/ PP)	DC 0-10 V DC 2-10 V
Bus function:	PP bus (open PP protocol) (Modbus RTU optional)
DDC controller :	DDC controller / or PLC
Sensor connection :	Passive and 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)
Protection type :	IP54 (measuring hoses connected)
Measuring air and ambient temp. :	0-70°C (medium), 5-95°C rel. 0-50°C (environment)
Storage temperature :	-20° C to +80° C
Switching capacity level:	<35 dB(A)
Operation and service :	Using the display by means of a screwdriver directly at the device or via the feedback signal
Communication:	PP bus, max. 15 VDC, 1200 Baud
Connection:	Cable 1000 m, 4 x 0.75 mm^2 (halogen-free), terminals
Dimensions:	115 x 65 x 61 mm
Weight:	approx. 460 g
Maintenance:	maintenance-free

VRP-M (make Belimo)
Self-adapting digital VAV controller, with external static pressure sensor and external damper actuator as a communication-capable VAV or CAV solution (e.g. applications including high-speed actuators)

Measuring principle :	Pressure sensor for static effective pressure measurement
Measuring range of the sensor:	VFP-100: 0...100 Pa (room pressure controls) VFP-300: 0...300 Pa (standard volumetric flow controls) VFP-600: 0...600 Pa (duct pressure controls)
Supply voltage :	AC 24 V 50/60 Hz; DC 24 V
Functional range :	AC +/- 20%, DC +/- 10%
Power consumption :	1.1 W
Dimensioning :	2.6 VA
Control function:	VAV / CAV / Open-Loop; Supply/return air or stand-alone operation; master/slave parallel circuit; Mixing box control
Setting range V_{min}/V_{max} :	V_{min} = 0...100% of set V_{max} volumetric flow V_{max} = 30...100 % of set V_{nenn} volumetric flow
Command variable w/Y : (Input resistance min. 100 kΩ)	DC 2-10 V (4...20 mA with 500 Ω input resistance) DC 0-10 V (0...20 mA with 500 Ω input resistance)
Setting range actual value signal U_5 :	DC 2...10 V DC 0...10V
MP bus function	
Address in bus mode :	MP 1 ... 8 (standard operation: PP)
LONWORKS® / Konnex EIB :	with BELIMO interface UK24LON / UK24EIB, 1 ... 8 BELIMO MP devices (VAV / damper drive/ valve)
DDC controller :	DDC controller / PLC from different manufacturers, with integrated MP interface
Fan Optimiser :	BELIMO Optimiser COU24-A-MP
Sensor connection :	Passive (Pt1000, Ni1000, etc.) and active sensors (0...10 V), for example temperature, humidity, 2-point signal (switching power 16 mA @ 24 V), for example switch, presence detector
Protection class :	III (safety extra low voltage)
Protection type :	IP 42
Measuring air and ambient temperatures :	0° C...+50° C, 5...95% rH, non-condensing
Storage temperature :	-20° C...+80° C
Operation and service :	Plug-in via service socket / VRP-M-Tool
Communication :	PP/MP bus, max. DC 15V, 1200 baud

Construction subject to change.

No return possible!

Volumenstromregler VRA-R-E-PPs

Damper drives...24-
for VRP-VFP, VRP-STP, VRP-M
LM24A-V

Supply voltage :	AC 24V 50/60 Hz / DC 24V of VR..., ready to plug in
Power consumption/ Dimensioning :	2 W / 3.5 VA
Actuator signal:	DC 6.0 V± 4V (of VR...)
Torque at the rated voltage:	min. 5 Nm
Running time for 90° (or 95°):	150 s.
Protection type :	IP 54
Protection class :	III (safety extra low voltage)
Sound power level:	max. 35 dB (A)

SF24A-V (-ST for VRP-M only), (spring return actuator)

Supply voltage :	AC 24V 50/60 Hz / DC 24V of VR..., ready to plug in
Power consumption/ Dimensioning :	7.5 W / 10 VA
Actuator signal:	DC 6.0 V± 4V (of VR...)
Torque at the rated voltage:	20 Nm
Running time for 90° (or 95°):	Drive 150 s, spring return =20 s
Protection type :	IP 54
Protection class :	III (safety extra low voltage)
Sound power level:	Drive max. 40 dB(A) / Spring max. 62 dB(A)

NMQ24A-SRV-ST (only for VRP-M), (high-speed damper drive)

Supply voltage :	AC 24V 50/60 Hz / DC 24V of VRP-M..., ready to plug in
Power consumption/ Dimensioning :	12 W / 18 VA
Actuator signal:	DC 6.0 V± 4V (of VR...)
Torque at the rated voltage:	min. 8 Nm
Running time for 90° (or 95°):	4 s.
Protection type :	IP 54
Protection class :	III (safety extra low voltage)
Sound power level:	max. 52 dB (A)

NM24A-V-ST (for VRP-M only)

Supply voltage :	AC 24V 50/60 Hz / DC 24V of VRP-M..., ready to plug in
Power consumption/ Dimensioning :	3.5 W / 6 VA
Actuator signal:	DC 6.0 V± 4V (of VR...)
Torque at the rated voltage:	min. 10 Nm
Running time for 90° (or 95°):	150 s.
Protection type :	IP 54
Protection class :	III (safety extra low voltage)
Sound power level:	max. 35 dB (A)

Controller selection

Electrical controllers:	**Actuator**:
- Belimo VRP-VFP 300	NM24A-V (standard)
- Belimo VRP-VFP 300	SF24A-V (spring return actuator)
- Belimo VRP-M-VFP 300: (MP-bus-capable)	NM24A-V-ST NMQ24A-SRV-ST (high-speed damper drive) SF24A-V-ST (spring return actuator)
- Gruner 227VM-024-10-DS3 (bus-capable)	Compact

Accessories:

- integrated ES Belimo S1
- integrated ES Belimo S2
- integrated potentiometer Belimo P1

Attention

The volumetric flow controllers of type VRA-R-E-PPs are used for air contaminated with aggressive components. For this reason, the Belimo controllers VRP-VFP, VRP-M or the Gruner controller of type 227VM-024-10-DS3 are installed in the electric volumetric flow controllers. 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!

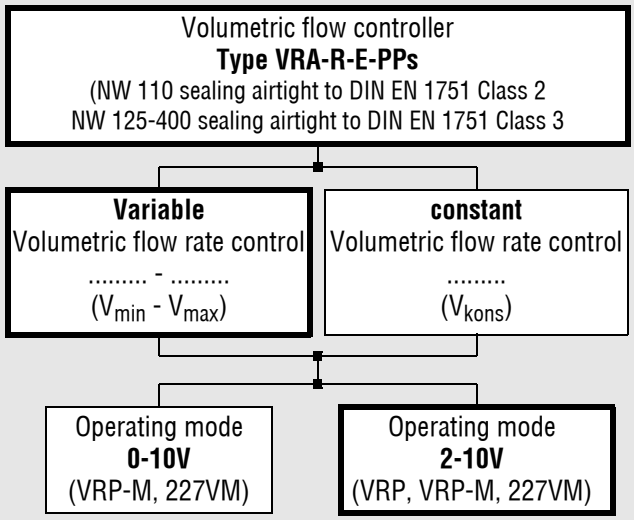
Legend

v_K	(m/s)	=	Duct velocity
Δp_t	(Pa)	=	Pressure loss
V	(m^3/h)	=	Volumetric flow
V	[l/s]	=	Volumetric flow
f_m	(Hz)	=	Octave centre frequency
L_W	[dB/Oct]	=	Sound power level / octave
L_{WA}	[dB(A)]	=	A-weighted sound power level
L	(mm)	=	Length
NW	(mm)	=	Nominal width

Construction subject to change. No return possible!

Volumetric flow controller VRA-R-E-PPs

Order details



Accessories:

Flat flange (-FF), on both sides **-FF**

Order example:
VRA-R-E-PPs-ø250

Unless stated otherwise, the thick-frame model will be delivered!

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 227 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_{nenn} in DDC / ZLT systems.
Housing made of plastic PPs. Damper blade, damper axle and measuring cross made of plastic PP. Controller and drive console made of plastic PP. With electric controller (VRP-VFP 300 / NM 24 A-V or 227VM-024-10-DS3), control voltage 24 V AC, 50/60 Hz, temperature compensation of 10-40 °C wired and adjusted ex factory.
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.
Make: SCHAKO type **VRA-R-E-PPs**
Size .....

- with MP-bus-capable controller
  VRP-M-VFP300 / NM24A-V-ST

- with high-speed actuator drive
  VRP-M-VFP 300 / NMQ24A-SRV-ST

- with spring return actuator
  VRP-VFP 300 / SF24A-V
  VRP-M-VFP 300 / SF24A-V-ST (MP-bus-capable)
  - currentless "CLOSED"
  - currentless "OPEN"

- with Gruner compact controller (bus-capable)
  - 227VM-024-10-DS3

Accessories:
- Flat flange (-FF), on both sides, made of plastic PPs.

Construction subject to change. No return possible!