RVP-R
VAV ROUND VARIABLE FLOW REGULATOR

Specification:
VAV variable flow regulator with a round section, operating from the flow rate of 1 m/s. Equipped with an actuator and a measuring strip.

Table 1. Key parameters.

Key parameters	
VAV Function	**VAV**
Operating range	**1-8 m/s or 2-12 m/s (see details Table 3 and Table 4**
Material	**Zinc-plated steel (DX51D+Z275) or stainless steel 1.4301**
Operating pressure range	**50-1000Pa**
Air leakage class	**B3 / C3**
Control accuracy	**10%**
Operating temperature range	**0...50°C**

Intended use

VAV regulators are used for the automatic control of air stream flow in the mechanical ventilation and air-conditioning systems. RVP-R regulators may be manufactured in two versions in terms of the speed of operation. In the standard version, the time of clipping the regulator damper shutter is 150 seconds or in the fast version, it is 3 seconds.

Performance

The housing and the shutter of the regulator is made of the zinc-plated steel sheet or on special request it is made of stainless steel 1.4301. The damper partition is equipped with sealing guaranteeing tightness with the complete partition closure. This regulator, according to PN-EN1751, has the air leakage class B3 (for Dn100-125 mm) or C3 (for Dn160-500 mm). Optionally, RVP-R is made with the thermal-acoustic insulation – RVP-Rt.

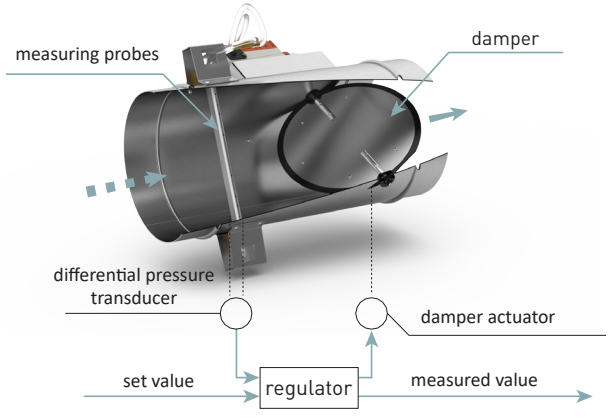

Figure 1. Diagram of VAV regulator operation.

Dimensions

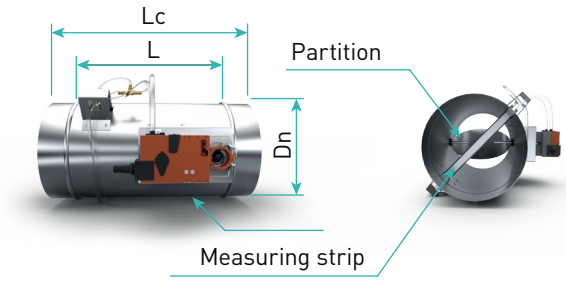

Figure 2. VAV flow regulator type: RVP-R.

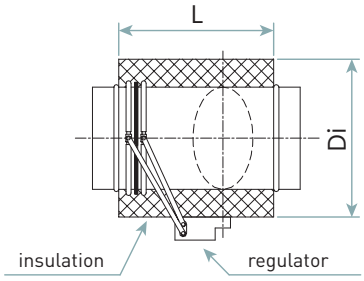

Figure 3. VAV flow regulator type: RVP-Rt (with insulation).

Table 2. The characteristic data of RVP-R regulator.

Characteristic dimensions of RVP-R						
Dn [mm]	**Di [mm]**	**L [mm]**	**Lc [mm]**	**Wi [mm]**	**W [mm]**	**Weight [kg]**
100	200	265	365	270	220	1,97
125	225	265	365	295	245	2,23
160	260	280	380	330	280	2,61
200	300	300	400	370	320	3,06
250	350	350	450	420	370	3,65
315	415	415	515	485	435	4,47
400	500	500	600	570	520	5,58
500	600	600	700	670	620	

The flow parameters are set by the manufacturer at the manufacturing site and must not be modified by unauthorised personnel.

Table 3. The application scope of RVP-RL scope 1 (standard performance only)

DN	Vmin (for 1 m/s)		Vmax (for 8 m/s)	
	m³/h	l/s	m³/h	l/s
100	28	8	226	63
125	44	12	353	98
160	72	20	579	161
200	113	31	905	251
250	177	49	1414	393
315	281	78	2244	623
400	452	126	3619	1005
500	707	196	5655	1571

Table 4. The application scope of RVP-RL scope 2 (standard performance and fast performance)

DN	Vmin (for 2 m/s)		Vmax (for 12 m/s)	
	m³/h	l/s	m³/h	l/s
100	55	15	339	94
125	90	25	530	147
160	145	40	869	241
200	225	63	1357	377
250	350	97	2121	589
315	560	156	3367	935
400	900	250	5420	1506
500	1400	389	8482	2356

Legand:

5Nm	10Nm

Mounting recommendations

In order to ensure the correct device operation, it is recommended to abide by the following rules when mounting the regulators:

- The length of the straight section in front of 2D regulator,
- The length of the straight section behind 1D regulator.
- If a static sensor of differential pressure is used, the only installation is allowed in which the plain to which the sensor is fastened is located vertically.

The electric connection of the measurement-control-execution unit should be carried out in accordance with the pattern provided in the documentation attached to the device by a qualified person.

Pressure drop

RVP-R regulators underwent the analytical tests of the measuring elements distribution, aimed at reducing the calibration error limit of the adjustable air stream what was presented in the MA diploma defended in 2005 at AGH Kraków.

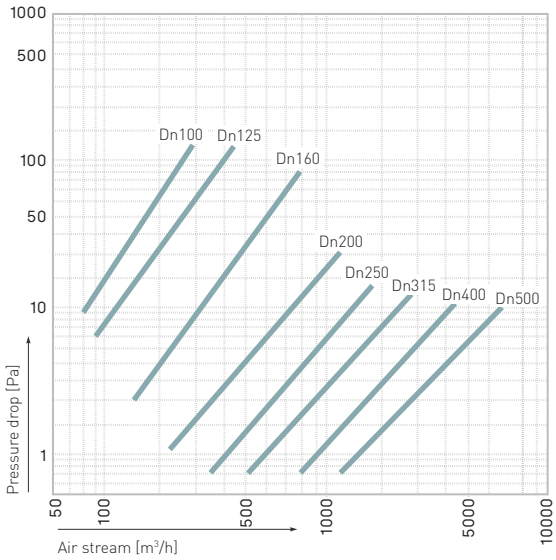

Chart 1. Pressure drop in RVP-R regulator (full damper opening).

Technical data

Table 5. Sound power level L_W [dB] and sound pressure level L_{pA} [dB(A)] emitted by RVP-R regulator.

RVP-R			dP=100Pa											dP=300Pa											dP=500Pa										
			Noise of the air flowing to the duct									through the housing		Noise of the air flowing to the duct								through the housing		Noise of the air flowing to the duct								through the housing		
DN [mm]	Flow	Rate	in frequency bands, L_W [dB]								total	without insul.	with insul.	in frequency bands, L_W [dB]							total	without insul.	with insul.	in frequency bands, L_W [dB]							total	without insul.	with insul.	
	v [m/s]	V [m³/h]	V [l/s]	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	L_{pA} [dB(A)]	L_{pA} [dB(A)]	L_{pA} [dB(A)]	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	L_{pA} [dB(A)]	L_{pA} [dB(A)]	L_{pA} [dB(A)]	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	L_{pA} [dB(A)]	L_{pA} [dB(A)]	L_{pA} [dB(A)]
100	2	57	16	43	39	41	38	32	31	26	22	32	26	<20	51	49	50	47	38	48	45	39	44	40	23	56	53	54	51	41	55	54	47	52	47	30
	4	113	31	50	50	50	47	41	41	35	30	41	32	<20	59	57	58	54	49	51	50	44	50	43	26	63	61	61	58	53	56	56	51	55	49	31
	6	170	47	55	56	55	53	43	46	41	35	46	35	21	63	62	62	59	51	54	52	47	53	45	31	67	65	65	62	55	57	57	53	57	50	35
	8	226	63	58	60	59	56	51	50	45	38	50	38	22	66	66	65	61	56	55	54	49	56	47	31	69	68	68	64	59	57	58	55	59	51	36
	10	283	79	61	64	61	59	53	53	48	41	53	40	23	68	69	68	64	58	56	55	51	58	48	32	71	71	71	67	60	58	59	56	61	52	37
	12	339	94	63	67	64	62	55	55	50	43	55	41	24	70	71	70	67	59	58	56	52	60	49	33	73	73	73	69	61	59	59	57	62	53	38
125	2	88	25	43	41	42	39	33	32	27	23	32	26	<20	52	50	51	47	39	48	46	41	45	40	24	55	55	55	51	42	55	55	49	52	47	30
	4	177	49	52	51	51	48	41	42	36	31	41	32	<20	60	59	58	55	49	52	50	46	50	44	27	63	62	62	58	53	57	57	52	55	49	32
	6	265	74	57	57	56	53	44	47	42	36	46	36	22	65	64	63	59	51	54	53	48	54	46	31	68	67	66	62	55	57	58	54	57	51	35
	8	353	98	60	61	60	57	51	51	46	39	51	38	23	68	67	66	62	56	55	54	50	56	47	32	72	70	69	64	59	58	58	55	59	52	36
	10	442	123	63	64	62	60	53	54	49	42	54	40	24	71	70	68	65	58	57	56	52	58	48	33	75	72	71	67	60	58	59	56	61	53	37
	12	530	147	65	67	65	63	55	56	51	44	56	42	25	73	72	70	68	60	58	57	53	61	49	34	77	74	73	70	62	59	59	57	63	53	39
160	2	145	40	44	43	43	39	34	34	28	24	33	27	<20	52	53	52	47	40	49	47	43	46	41	24	56	57	56	51	43	56	55	51	53	48	31
	4	289	80	53	52	52	48	41	43	38	33	42	33	<20	60	60	59	55	50	52	51	47	51	44	28	64	64	63	58	53	57	57	54	56	50	32
	6	434	121	59	58	57	54	51	48	43	38	48	36	22	67	65	64	60	52	54	53	50	54	46	31	70	68	67	62	55	57	58	55	58	51	36
	8	579	161	63	62	61	58	51	52	47	41	52	39	24	71	68	67	62	56	56	55	51	57	48	33	74	71	70	64	58	58	58	56	59	52	37
	10	723	201	66	65	63	62	54	55	50	44	55	40	25	74	71	69	65	58	57	56	53	59	49	34	78	73	72	67	61	58	59	57	61	53	38
	12	868	241	68	68	66	64	56	58	54	46	57	42	26	77	73	71	68	60	59	58	54	61	50	35	81	75	74	70	62	60	60	57	63	54	40
200	2	226	63	45	44	44	40	34	35	30	25	34	28	<20	53	54	53	48	41	49	47	44	46	41	25	56	59	57	52	43	56	56	53	53	48	31
	4	452	126	55	53	52	49	42	44	39	34	43	33	<20	61	62	60	55	51	53	51	48	52	44	28	64	66	63	58	55	57	57	55	56	50	33
	6	678	188	61	59	58	55	44	49	44	39	48	37	22	68	66	64	60	52	55	54	51	55	46	32	72	70	67	62	56	57	58	56	58	51	36
	8	904	251	65	63	61	59	52	53	48	43	52	39	24	73	69	67	63	57	56	55	52	57	48	33	77	72	70	64	59	58	58	57	60	52	37
	10	1130	314	68	66	64	63	55	56	51	45	56	41	26	77	72	70	65	59	57	56	53	60	49	35	81	74	72	67	61	58	59	57	62	53	39
	12	1356	377	71	68	67	66	57	59	53	48	58	42	27	80	74	72	69	60	60	58	54	62	50	36	84	76	74	70	62	60	60	58	64	54	40
250	2	353	98	46	46	44	40	35	36	31	27	35	29	<20	53	56	53	48	41	50	48	46	47	42	25	56	61	58	52	44	56	56	55	54	48	31
	4	707	196	57	55	53	49	43	45	40	35	44	34	<20	62	63	61	55	51	53	52	50	52	45	28	64	67	64	58	55	57	57	56	56	50	33
	6	1060	294	63	60	59	56	45	50	45	40	49	37	23	70	67	65	60	52	55	54	52	55	47	33	73	71	68	62	56	58	58	57	58	52	37
	8	1413	393	67	63	62	60	52	54	49	44	53	39	25	75	70	68	63	56	57	56	53	58	48	34	79	74	71	64	58	58	58	57	60	53	38
	10	1766	491	71	66	65	64	56	57	52	47	57	41	27	80	73	70	66	59	58	57	54	60	49	36	84	76	73	67	61	58	59	58	62	54	40
	12	2120	589	74	68	68	67	58	60	55	49	59	43	29	83	74	72	69	61	61	58	55	63	50	37	88	77	75	70	62	61	60	58	64	54	42
315	2	561	156	47	48	45	41	36	37	32	28	36	30	<20	54	58	54	48	42	50	49	48	48	43	26	57	63	58	52	45	56	57	57	55	49	32
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	6	1682	467	65	61	59	57	46	51	47	42	50	38	24	72	69	66	61	53	56	54	53	56	47	34	75	73	69	63	56	58	58	58	59	52	39
	8	2243	623	70	64	63	61	52	55	50	46	54	40	26	78	71	69	64	57	57	56	54	58	49	36	82	75	71	65	59	58	58	58	61	53	40
	10	2804	779	73	67	66	65	57	58	53	48	58	42	28	83	74	71	66	60	58	57	55	61	50	38	87	77	74	68	61	58	59	58	63	54	42
	12	3365	935	76	69	69	68	58	61	56	51	61	43	30	87	75	73	70	61	61	59	56	63	51	39	92	78	75	70	63	62	60	58	65	55	44
400	2	904	251	48	50	46	42	38	38	34	29	37	31	<20	54	60	55	49	44	51	50	50	49	43	27	57	65	59	53	47	57	57	59	55	49	33
	4	1809	502	60	57	55	50	47	47	43	38	46	35	21	63	67	62	56	53	54	53	52	54	46	30	65	71	66	58	55	57	58	59	58	51	35
	6	2713	754	67	62	60	57	47	52	48	43	51	38	24	73	70	67	61	54	56	55	54	57	48	36	76	74	69	63	57	58	58	59	59	53	41
	8	3617	1005	72	65	64	62	56	56	51	47	56	40	28	80	73	70	64	58	57	56	55	59	49	38	84	76	72	65	59	58	59	59	61	54	42
	10	4522	1256	76	67	67	66	58	59	54	50	59	42	30	86	75	72	67	60	59	57	56	62	51	40	91	78	74	68	62	59	59	58	64	55	44
	12	5426	1507	79	69	70	69	60	62	57	53	62	44	32	90	76	74	71	62	63	59	56	64	52	42	96	79	76	71	63	63	60	58	67	56	46
500	2	1413	393	49	51	46	42	38	39	35	30	38	32	<20	55	62	56	49	45	51	51	51	50	44	28	58	67	60	53	48	57	58	61	56	49	33
	4	2826	785	61	58	56	51	47	48	44	39	46	36	21	64	68	63	56	53	54	54	54	54	46	31	65	72	66	59	56	58	58	60	58	51	36
	6	4239	1178	69	62	61	58	48	53	49	45	52	39	25	75	71	67	61	54	56	55	55	57	49	37	78	75	70	63	57	58	58	59	60	53	43
	8	5652	1570	74	65	65	63	56	57	53	49	57	41	29	83	74	70	65	59	58	57	56	60	50	39	87	78	73	65	60	58	59	59	62	55	45
	10	7065	1963	78	68	68	66	59	59	55	52	59	43	32	89	76	73	67	61	59	58	57	62	52	42	94	79	75	68	62	59	59	59	65	56	47
	12	8478	2355	82	70	70	69	61	63	58	54	62	45	34	94	77	74	71	63	63	59	57	66	53	44	99	81	76	72	63	63	60	59	68	58	49

Sound pressure level provides for the attenuation of the room and ceiling for a model room accepted at the level of 8 dB. The actual parameters may differ depending on the conditions.

Acoustic data for other pressure and consumption values, including sound power level in respective frequency bands, are available in the design department of SMAY.

Control-drive system

The devices have the possibility of infinitely variable and stroke controlling - enforced.

Infinitely variable controlling - 2-10V (default) or 0-10V (K=K1). Changing the set flow value takes places in the infinitely variable and proportional manner between Vmin (2V or 0V) and Vmax (10V).

Stroke controlling

- **„Close"** – the damper shutter is in the completely closed position (only for communication 2-10V).
- **„Open"** - the damper shutter is in the completely opened position (Belimo – required 1N4007 diode).
- **Vmid** – medium value of volumetric flow between Vmin and Vmax (applies only to Belimo devices).
- **Vmax** – maximum volumetric flow.
- **Vnom** – flow stream in the calibration process (most frequently 1,3 Vmax).

Regulators are manufactured in two performance variants:

A) Standard version – RVP-R standard version (with the time of full damper clipping equalling 150 seconds) for clean air control:

VAV – Compact

Available actuators:

- LMV-D3-... ,NMV-D3-... -made by Belimo
- GDB 181.1... ,GLB 181.1... -made by Siemens,

Controlling by means of communication protocols:

- MOD-BUS,
- EIB Konnex (KNX),
- BACnet,
- MP-BUS*,

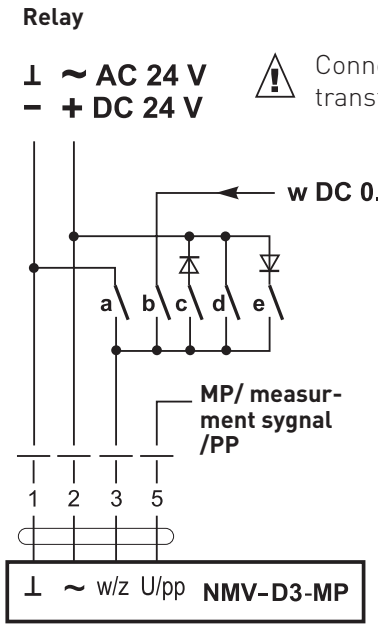
B) Special performance - fast RVP-R version (with the full clipping time of the shutter equalling 3 or 150 seconds) for the control of clean air or polluted air, also for slightly aggressive environment (according to the Corrosive Environments Classification ISO 12944 max. class C3):

The control-drive system of BELIMO pressure regulator consisting of a digital PID VAV regulator (VRU- M1-BAC) with the integrated static sensor of differential pressure.

Controlling by means of communication protocols:

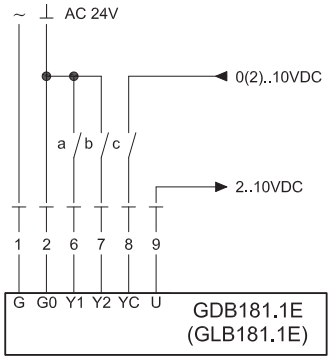
- BACnet
- Modbus
- MP-Bus
- KNX, by means of UK24EIB gate.

* Belimo only



Operating range / Function 2 ... 10 V≅	0 ... 10 V≅	a	b	c *	d	e *
ZAM	$\dot{V}_{MIN}$					
$\dot{V}_{MIN}$						
$\dot{V}_{MIN}$ ... $\dot{V}_{MAX}$						
V_{MID}						
$\dot{V}_{MAX}$						
OTW						

Diagram 1. The diagram of connecting NMV-D3- MP or LMV-D3-MP regulator with the compact actuator.



Controlling function	a (Y1)	b (Y2)	c (YC)
Closed			
V_{min}			
Infinitely veriable V_{min} ... V_{max}			
V_{max}			
Open			

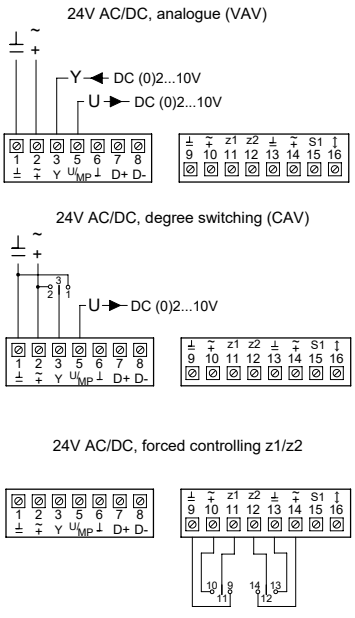
Diagram 2. The diagram of connecting GDB 181.1 or GLB181.1 compact actuator with the regulator.

Releasing the transmission is possible through pressing the press button on the actuator housing. As long as the press button is pressed, it is possible to re-set the damper manually.

The drive-control system is connected through wires by the manufacturer; the purchaser is obliged to supply power to the regulator and possibly controls.
The electric connection of VRU-M1-BAC unit should be carried out in accordance with the pattern provided in the documentation attached to the device by a qualified person.

Table 6. The technical data of actuators.

Technical data of actuators				
Technical data		**Standard**	**MP-Bus**	**BACnet/Modbus**
		LMV-D3-MF.1 SMY, NMV-D3-MF.1 SMY	**LMV-D3-MP, NMV-D3-MP**	**LMV-D3-MOD, NMV-D3-MOD**
Nominal voltage		AC/DC 24 V, 50/60 Hz	AC/DC 24 V, 50/60 Hz	AC/DC 24 V, 50/60 Hz
Power consumption	**Operation**	2 [W], 3 [W]	2 [W], 3[W]	2 [W], 3[W]
	At standby	1 [W], 1.5 [W]	1 [W], 1.5 [W]	1 [W], 1.5 [W]
	Nominal power	3,5 [VA], 5 [VA]	4 [VA], 5 [VA]	4 [VA], 5 [VA]
Torque		5 [Nm], 10 [Nm]	5 [Nm], 10 [Nm]	5 [Nm], 10 [Nm]
Running time from 0 do 100%		150s.	150s.	150s.
Connection diagram		Diagram 1	Diagram 1	Diagram 1



Priority rule - Analogue controlling VAV (a)
1. z1
2. z2
3. a) adaptation
   b) synchronisation
4. Y-analogue: Min....Max.

Priority rule - Analogue controlling of degree switching CAV (b)
1. z1
2. z2
3. a) adaptation
   b) synchronisation
4. Y-degrees: Closed-Min. - Max.

Contact 2-3 = MAX
3 unshielded = MIN.
Contact 1-3 = CLOSED (Mode 2...10 V)
MIN. (Mode 0...10 V)

Forced controlling z1

Contact 11-9 = Engine
STOP Contact 11-10 = OPENED

Forced controlling z2

Contact 12-13 = CLOSED
Contact 12-14 = MAX

Diagram 3. The diagram of connecting with fast automatics (VRU).

Power supply must be connected through the safety transformer!
- In order to enable the performance of diagnostic and service works by means of PC-Tool software, wires 1, 2 (24V AC/DC) and 5 (signal U5) must be supplied to accessible terminal blocks (switching station, control cabinet, etc.)

RVP-R - VAV round variable air flow regulator

When placing an order, provide information according to the below pattern:

RVP-R <X> - <I> - <D> - <V_{MAX}> / <Za> <V_{MIN}> <Ta> - <Ts> - <Tp> - <K> - <N> - <S> - <P> - <Kd>

Where:

X	measuring element*	
	L	**- strip**
I	insulation*	
	none	**- non-insulated**
	t	- insulated
D	diameter [mm]	
V_{MAX}	maximum flow stream [m³/h]	
Za	The complete closing function of the regulator?*	
	-none	**- no**
	(0)	- Yes (available closing option)
V_{MIN}	Minimum flow stream [m³/h]	
Ta	Automatics type*	
	S	**- Siemens (recommended by the manufacturer)**
	B	- Belimo
Ts	Drive type*	
	none	**- standard**
	Q	- fast (Belimo only)
Tp	Connection type*	
	none	**- classic**
	MST	- communication Master/Slave function Master
	SLV	- communication Master/Slave function Slave
K	communication*	
	none	**- 2...10V (with an option of forcing the CLOSE position)**
	K1	- 0...10V
	MP BUS	- general value MP BUS (Belimo only).
	MOD	- Modbus
	KNX	- KNX
	BAC	- - BACnet revision 12
N	system regulator number (only for communication MP BUS or Modbus)	
	from 1 to 8	- the range of numbers for MP BUS communication
	from 1 to 32	- the range of numbers for Modbus communication
	from 1 to 30**	- the range of numbers for Modbus communication in the iFlow system (** number without multiples of 3 e.g.: 1, 2, 4, 5, 7, 8, 10... etc.)
S	environment*	
	none	**- clean air**
	C3	- environment with max. C3 class
P	material*	
	S0	**- zinc plated steel**
	SN	- stainless steel
Kd	additional communication (only Belimo [none, K1, MP])	
	none	**- standard**
	NFC	-communication via NFC

*Optional values - if they are missing, default values are applied

Exemplary marking of the product: **RVP-Rt-315-1100/700-Q-MP BUS-7**