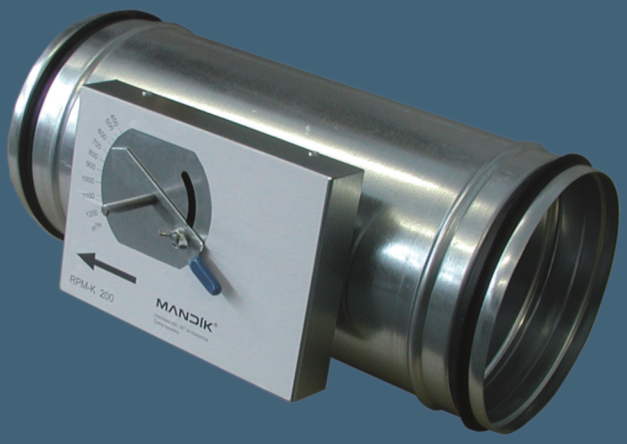
TPM 094/13
Revision 6
Valid from 14.9.2018

MANDÍK®

CONSTANT AIR VOLUME CONTROLLER

RPM-K



These technical specifications state a row of manufactured sizes and models of constant air volume controller (further only controller) RPM-K. It is valid for production, designing, ordering, delivery, assembly and operation.

I. CONTENT

II. GENERAL INFORMATION

1. Description

Fig. 1 Controller RPM-K

1.1. Constant mechanical air volume regulators are meant for input or output air systems. Regulators can be installed in horizontal or vertical position with horizontal or vertical blade axis. The aerodynamic forces acting the list due to the flow are compensated by the control device adjusted according required flow.

Adjustment of required flow is simply performed by lever with a pointer and scale.

Mechanical controllers need not be connected to any external power source.

The controller consists of the casing of the controller with a control blade and control device. Control device is placed inside of box with scale for adjustment of required flow. Accuracy of the scale is ± 5 %.

1.2. Controller characteristics

● Nominal size	DN 80 ÷ DN 400
● Length	L = 450
● Thickness acc. to EN 1751	External casing leakage class C
● Air flow volume	50 ÷ 4 500 m^3/h
● Accuracy	±15-20% for air velocities less than 4m/s ±10% for air velocities more than 4m/s Pollution, deformation of the damper body or non-steady air circulation in the all cross section of the damper can bring bigger inaccuracy.

1.3. Working conditions

The faultless functioning of the controllers is ensured under the following conditions::
a) maximum speed of air flow 10 m/s
b) maximum pressure in the duct 1000 Pa
c) the air circulation in the whole controller section must be secured as steady on whole surface

Controllers are designed for macroclimatic areas with mild climate according to EN 60 721-3-3.

Controllers are suitable for systems without abrasive, chemical and adhesive particles.

Temperature in the place of installation is permitted to range from 0°C to + 50°C.

2. Design

2.1. The controller consists of the casing of the controller with a control blade and control device. Sliding bearings of blade axis are stainless or bronze. Control device consist of spring and shock absorber. On the top of control device box is lever with a pointer and scale for adjustment of required flow.

2.2. Controllers can be alternatively equipped by actuating mechanism. It enable remote adjustment of required flow. In this case actuating mechanism don't control regulator damper. Actuating mechanism control setting of lever for adjustment of required flow. If is used actuating mechanism temperature range is from 0°C to + 50°C.

Tab. 2.1.1. Design

Design - type of control	Additional digits
Manually controlled	.01
Actuating mechanism 230V, open-close control	.45
Actuating mechanism 230V, open-close control, with limit switch	.46
Actuating mechanism 24V, open-close control	.55
Actuating mechanism 24V, open-close control, with limit switch	.56
Actuating mechanism 24V SR modulating control	.57

3. Dimensions, weights

3.1. Dimensions, weights

Tab. 3.1.1. Dimensions, weights

Size	⌀ D	Weigth [kg]								Actuating mechanism
		Design								
		spiro		spiro with actuating mechanism		with flange		with flange and actuating mechanism		
		without insulation	with insulation	without insulation	with insulation	without insulation	with insulation	without insulation	with insulation	
80	80	2,3	3,7	2,8	4,3	2,7	4,1	3,3	4,7	LM
100	100	2,5	3,9	3,1	4,5	2,9	4,3	3,5	4,9	LM
125	125	2,8	4,4	3,4	5,0	3,2	4,8	3,8	5,4	LM
160	160	3,2	5,1	3,8	5,7	4,0	5,8	4,6	6,5	LM
200	200	3,8	5,9	4,4	6,5	4,4	6,5	5,0	7,2	LM
250	250	4,5	7,0	5,4	7,6	5,1	7,7	5,8	8,3	LM
315	315	5,4	8,4	6,3	9,0	6,0	9,3	6,9	9,9	LM
400	400	6,7	10,3	8,9	11,2	7,6	12,5	9,8	13,4	NM

Fig. 2 Constant air volume regulator - spiro with rubber sealing

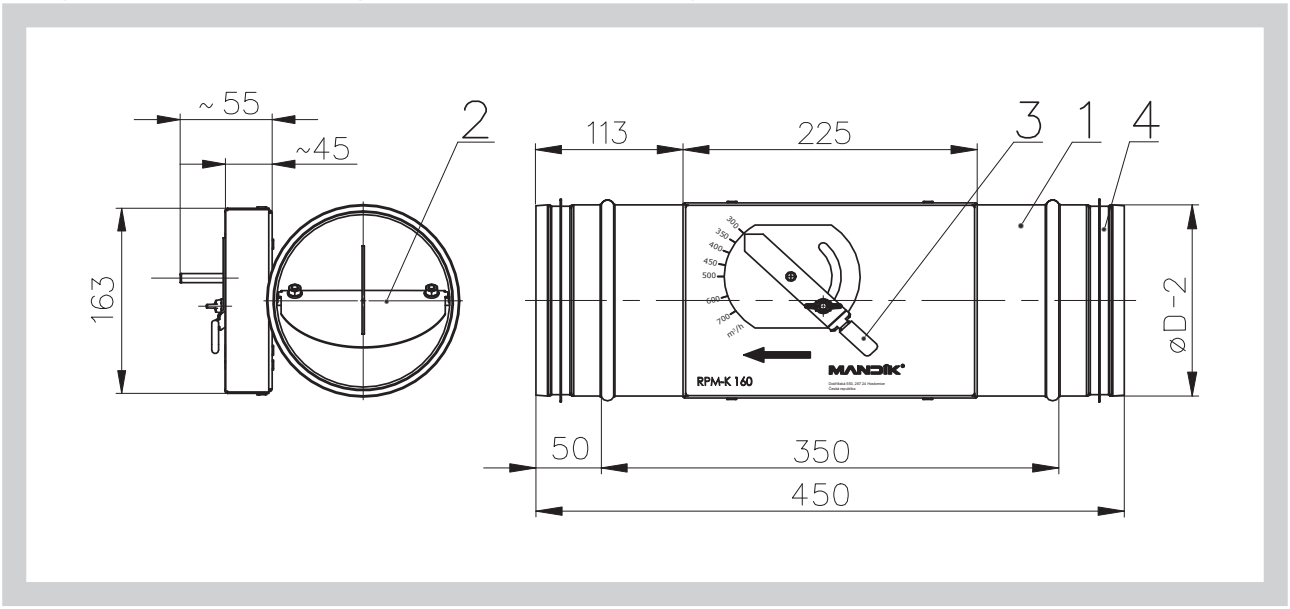


Fig. 3 Constant air volume regulator - with flanges

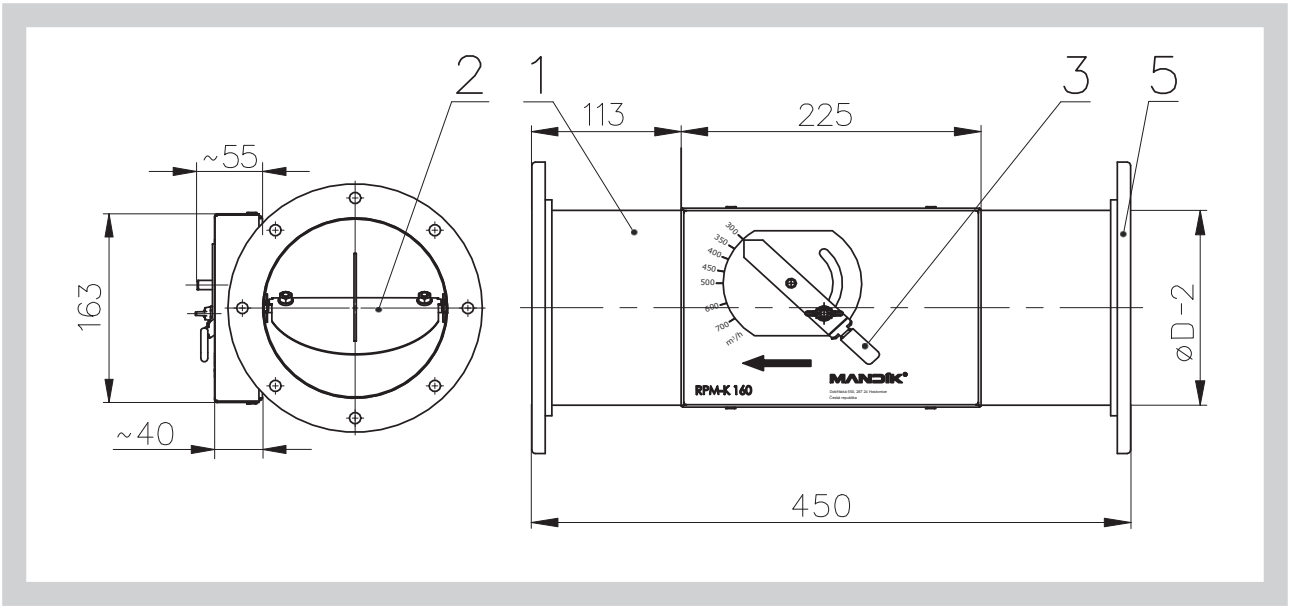


Fig. 4 Constant air volume regulator - with actuating mechanism

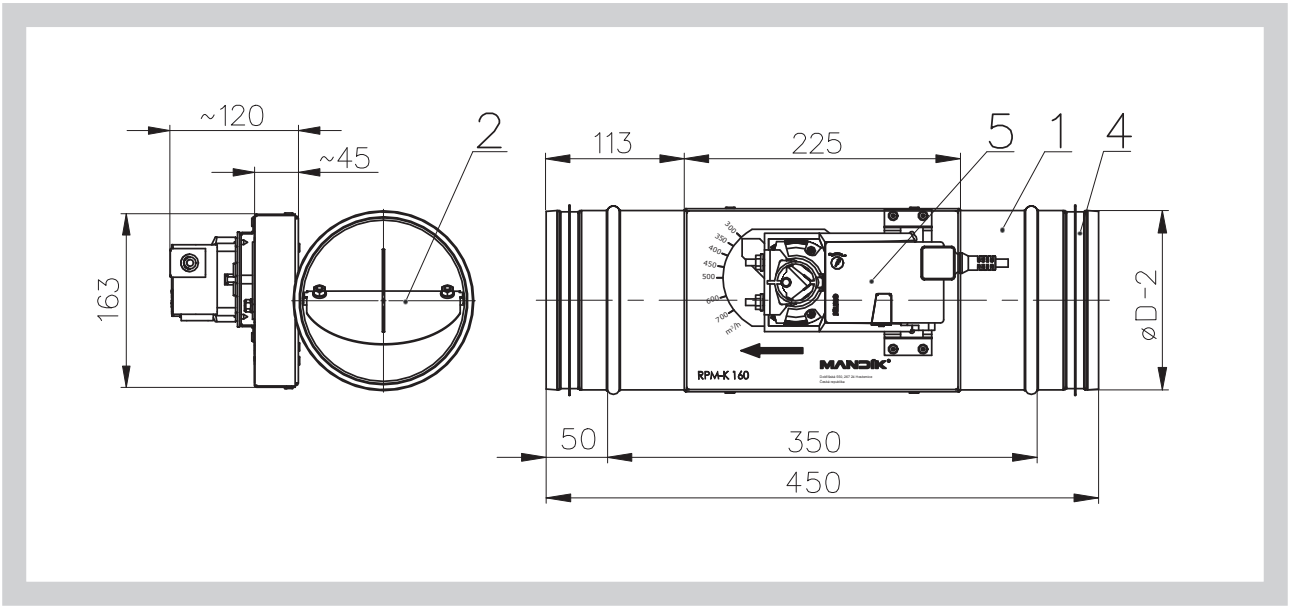
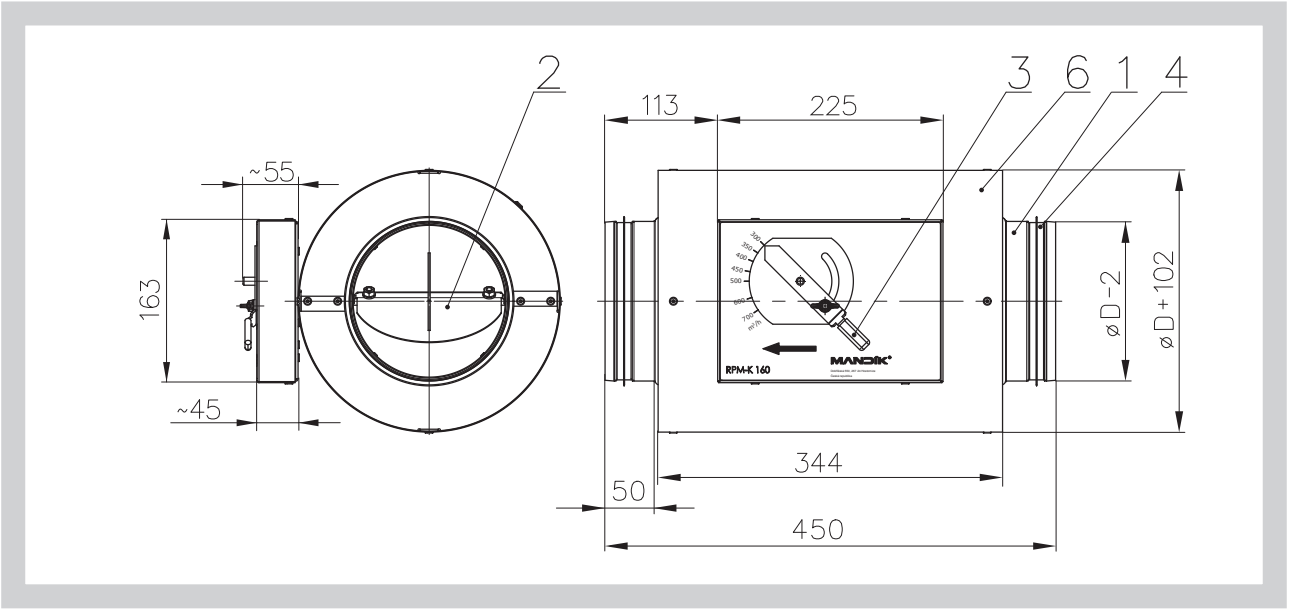


Fig. 5 Constant air volume regulator - spiro with rubber sealing and insulation



Position:

1	Controller casing	5	Flange
2	Controller blade	6	Actuating mechanism
3	Lever	7	Insulation cover
4	Rubber sealing		

4. Placement and Assembly

4.1. Controllers are intended for installation in ventilation ducts. Operating position is horizontal or vertical with horizontal or vertical blade axis.

Controller has to be install depending of flow direction (it is labeled by arrow on the top of control device box).

For faultless functioning has to be the air circulation in the whole controller section must be secured as steady on whole surface. Distance between controller and duct elements (bends, double branch joints etc.) has to be minimal 2x⌀D.

4.2. The controller body should not be deformed in the course of installation.

Fig. 6 Recommended distance from double branch joint

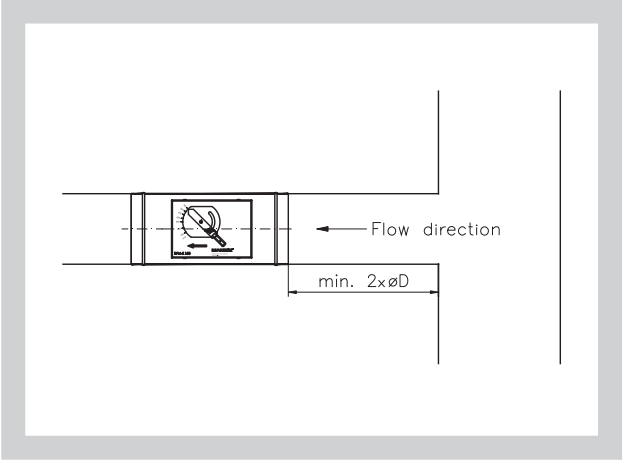
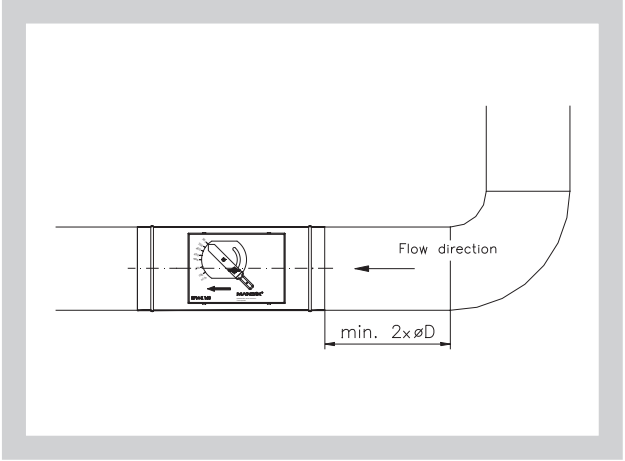


Fig. 7 Recommended distance from bend



III. TECHNICAL DATA

5. Basic parameters

5.1. Air volume

Tab. 5.1.1. Air volume

Size	Air volume [m³.h⁻¹]	
	Minimum	Maximum
80	50	200
100	80	300
125	125	500
160	200	900
200	300	1300
250	500	2000
315	850	2800
400	1200	4500

5.2. Controller parameters

Tab. 5.2.1. Controller parameters

size	Air volume (m³/h)	Max. accuracy (%)	Min. press. difference (Pa)	size	Air volume (m³/h)	Max. accuracy (%)	Min. press. difference (Pa)
80	50	20	100	**200**	300	18	50
	100	15	100		500	15	60
	150	10	100		900	10	70
	200	10	120		1300	10	80
100	80	18	50	**250**	500	15	50
	150	15	60		800	12	70
	250	10	80		1200	10	80
	300	10	90		2000	10	90
125	125	18	50	**315**	800	15	50
	200	15	60		1200	10	70
	350	10	70		2000	10	80
	500	10	90		2800	10	90
160	200	18	50	**400**	1200	15	50
	400	15	70		2000	10	70
	700	10	80		3000	10	80
	900	10	90		4500	10	90

6. Electrical components, wiring diagrams

6.1. Parameters of actuating mechanisms

Tab. 6.1.1. Parameters of actuating mechanisms

Actuating mechanism	Position indication	Torque	Weight [kg]	Nominal voltage	Power consumption		
					In operation	At rest	Dimensioning
Belimo LM 230A	NO	5 Nm	0,5	AC 100 ... 240 V, 50/60 Hz	1,5 W	0,4 W	4 VA
Belimo LM 230A-S	YES	5 Nm	0,6	AC 100 ... 240 V, 50/60 Hz	1,5 W	0,4 W	4 VA
Belimo NM 230A	NO	10 Nm	0,75	AC 100 ... 240 V, 50/60 Hz	2,5 W	0,6 W	5,5 VA
Belimo NM 230A-S	YES	10 Nm	0,85	AC 100 ... 240 V, 50/60 Hz	2,5 W	0,6 W	6 VA
Belimo LM 24A	NO	5 Nm	0,5	AC 24 V, 50/60 Hz; DC 24 V	1 W	0,2 W	2 VA
Belimo LM 24A-S	YES	5 Nm	0,6	AC 24 V, 50/60 Hz; DC 24 V	1 W	0,2 W	2 VA
Belimo NM 24A	NO	10 Nm	0,75	AC 24 V, 50/60 Hz; DC 24 V	1,5 W	0,2 W	3,5 VA
Belimo NM 24A-S	YES	10 Nm	0,85	AC 24 V, 50/60 Hz; DC 24 V	1,5 W	0,2 W	4 VA
Belimo LM 24A-SR	YES	5 Nm	0,85	AC 24 V, 50/60 Hz; DC 24 V	1,0 W	0,4 W	2 VA
Belimo NM 24A-SR	YES	10 Nm	0,80	AC 24 V, 50/60 Hz; DC 24 V	2,0 W	0,4 W	4 VA

6.2. Wiring diagrams

Fig. 8 Wiring diagram - actuating mechanism Belimo LM(NM) 230A

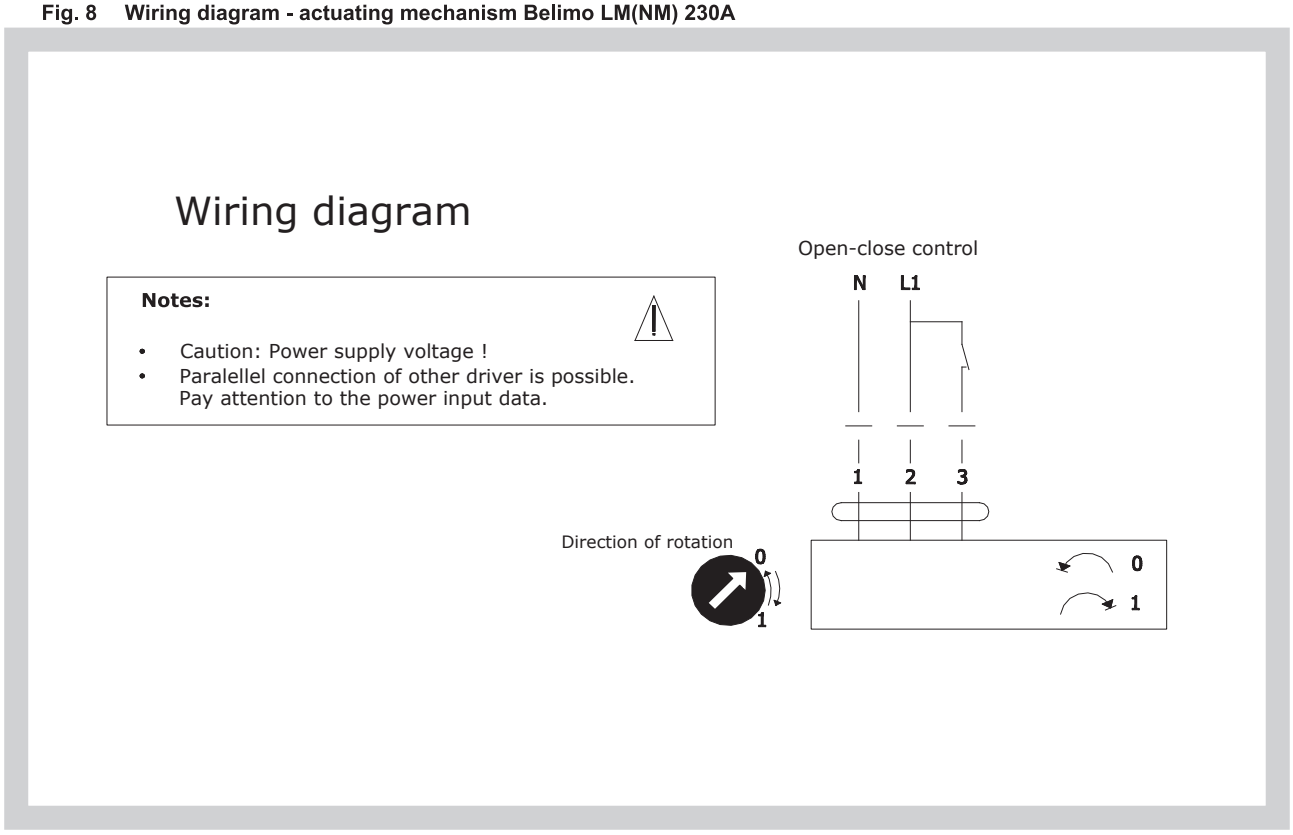


Fig. 9 Wiring diagram - actuating mechanism Belimo LM(NM) 24A

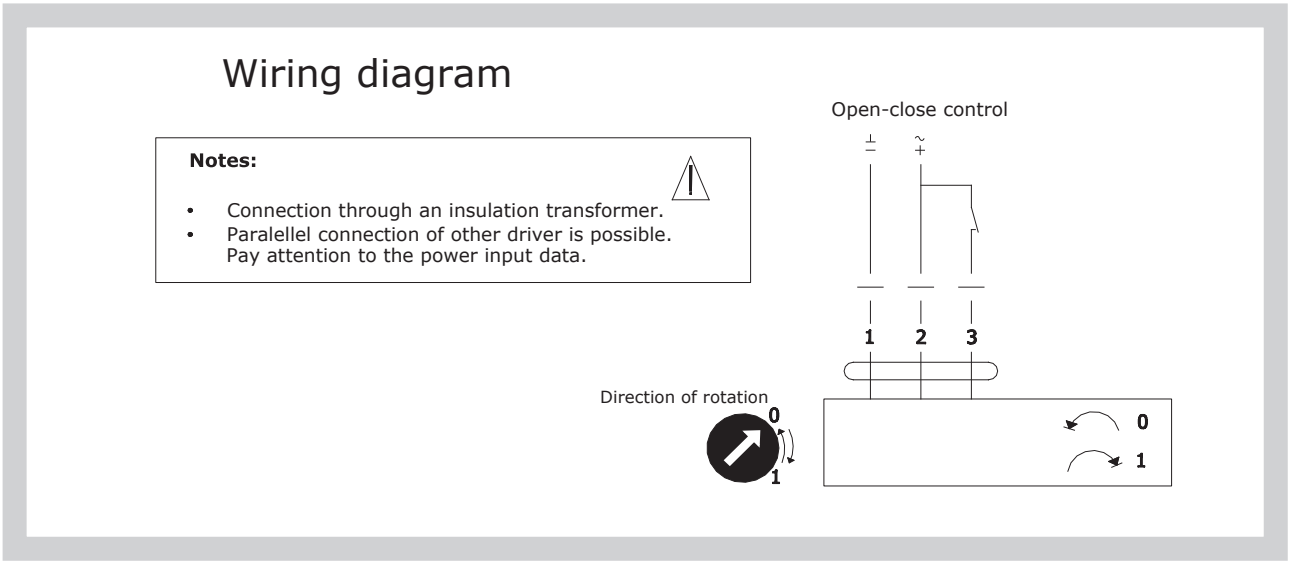


Fig. 10 Wiring diagram - actuating mechanism Belimo LM(NM) 24A-SR

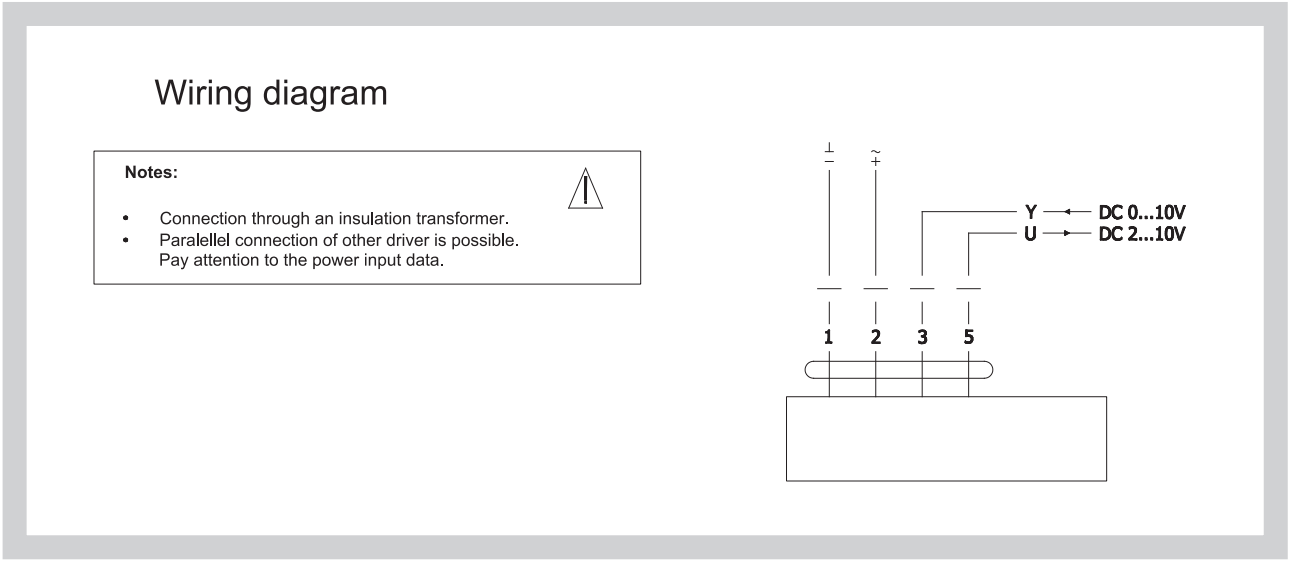


Fig. 11 Wiring diagram - actuating mechanism Belimo LM(NM) 230A-S

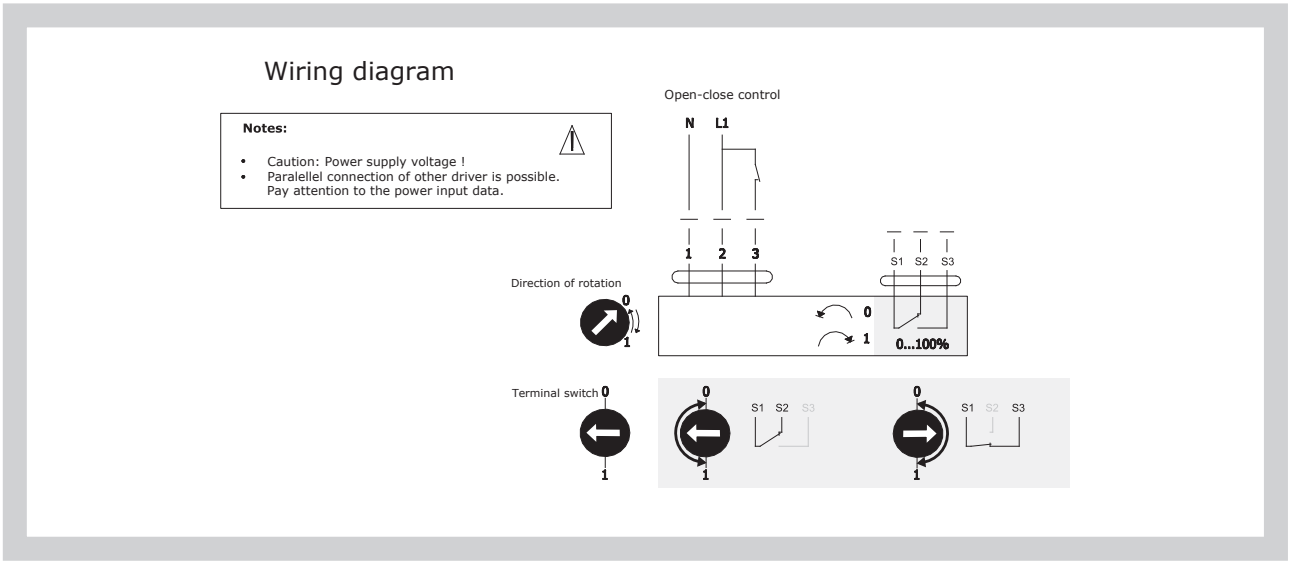
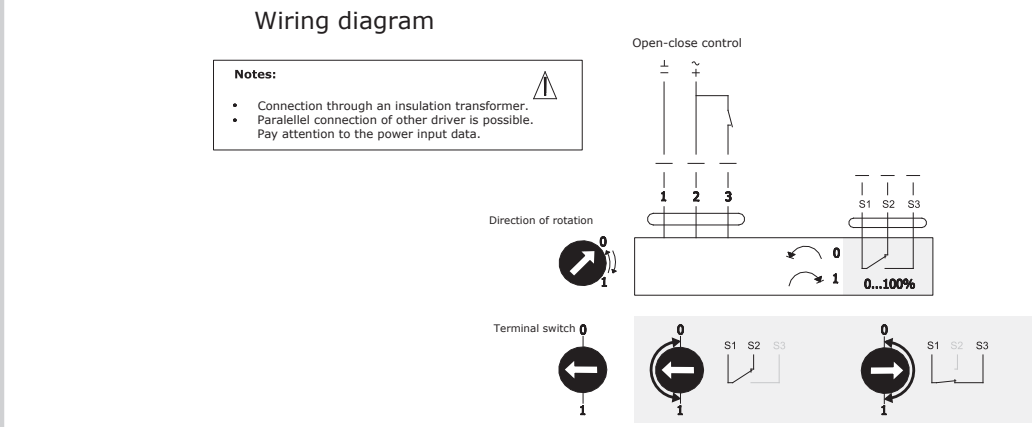


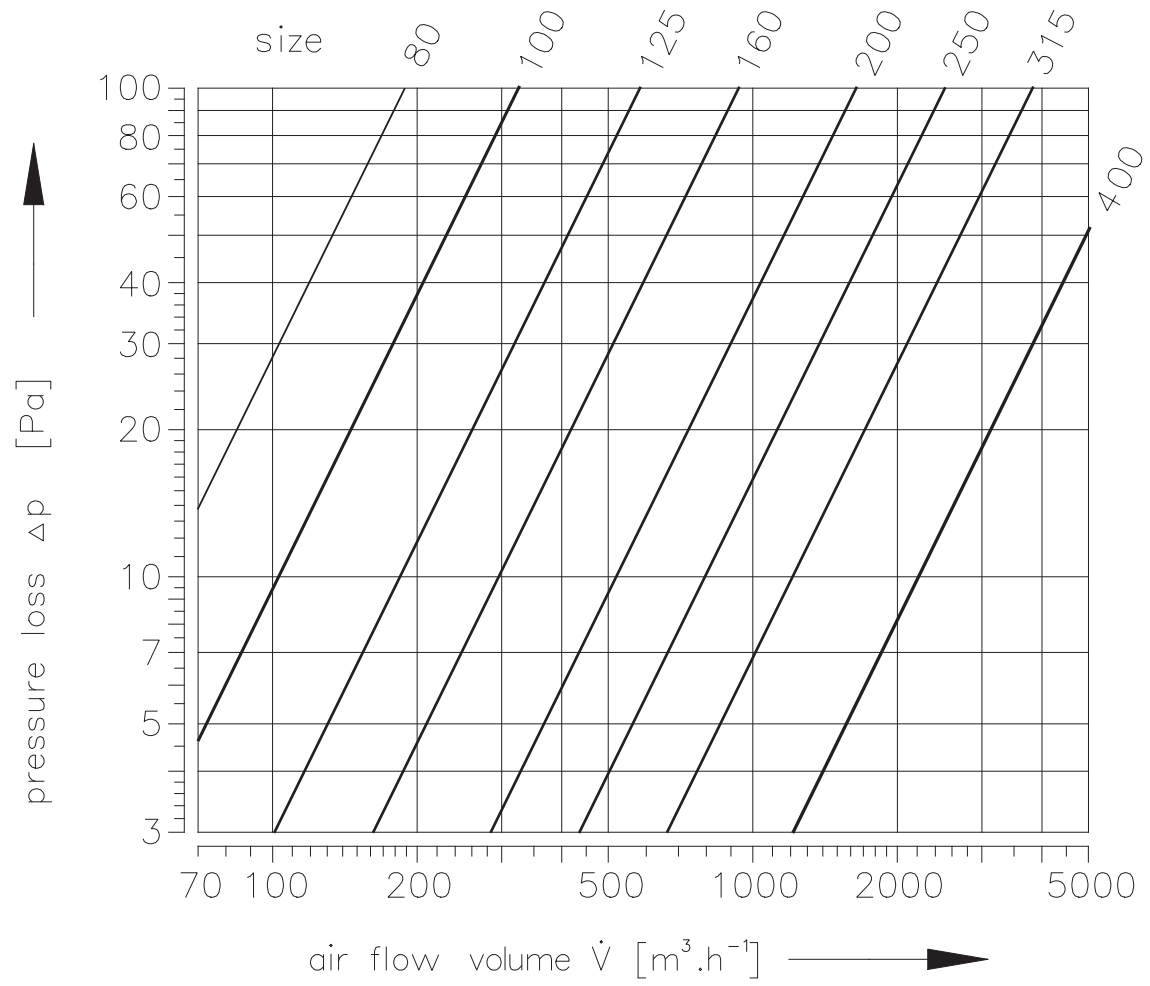
Fig. 12 Wiring diagram - actuating mechanism Belimo LM(NM) 24A-S



7. Pressure loss

7.1. Pressure losses

Diagram 7.1.1. Pressure losses (the values are valid when the damper of the controller is completely open)



8. Noise data

8.1. Air-regenerated Noise

The noise arising due to the flow of air volume controller is listed in the following tables Tab. 8.1.1.

$\dot{V}$ [m³.h⁻¹] - air flow volume

Δp_{st} [Pa] - pressure differential

L_W [dB/Okt.] - level of acoustic power in the octave band

L_{WA} [dB(A)] - total level of acoustic power corrected by filter A

f_m [Hz] - mean frequencies in the octave bands

Tab. 8.1.1.

Δp_{st} = 50 Pa										
Size	$\dot{V}$ [m³/h]	L_W [dB/Okt]								L_{WA} [dB(A)]
		f_m [Hz]								
		63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
80	50	48	38	32	32	35	31	23	<15	38
	100	54	45	41	38	39	34	28	18	43
	150	60	52	48	44	43	39	35	23	48
	200	66	58	54	49	46	42	39	28	52
100	80	49	39	33	33	36	32	24	<15	39
	155	56	47	43	40	41	37	30	20	45
	225	62	54	50	46	45	41	37	26	50
	300	67	59	56	51	48	44	41	30	54
125	125	50	40	34	34	37	33	26	<15	40
	250	58	49	46	43	44	40	33	22	47
	380	64	56	52	48	47	44	40	28	52
	500	70	62	58	53	50	46	43	32	56
160	200	54	44	38	38	41	37	29	18	44
	430	59	50	46	45	44	40	34	23	48
	650	65	57	53	49	48	44	40	28	53
	900	68	61	57	52	49	45	42	31	55
200	300	53	43	37	37	40	36	29	17	43
	630	60	51	47	44	45	41	35	24	49
	960	66	58	54	50	49	45	41	29	54
	1300	72	64	60	55	52	48	45	34	58
250	500	54	44	38	38	41	37	29	18	44
	1000	60	51	47	44	45	41	34	24	49
	1500	66	58	54	50	49	46	42	30	54
	2000	72	64	60	55	52	48	45	34	58
315	800	55	45	39	39	42	38	30	19	45
	1500	62	53	49	46	47	43	36	25	51
	2150	66	58	54	50	49	45	41	30	54
	2800	74	66	62	57	54	50	47	36	60
400	1200	38	28	22	22	25	21	<15	<15	28
	2300	41	32	28	25	26	22	15	<15	30
	3400	44	36	32	28	27	23	19	<15	32
	4500	47	39	35	30	27	23	20	<15	33

Δp_{st} = 100 Pa										
Size	$\dot{V}$ [m³/h]	L_W [dB/Okt]								L_{WA} [dB(A)]
		f_m [Hz]								
		63	125	250	500	1000	2000	4000	8000	
80	50	52	42	36	36	39	35	27	15	42
	100	58	49	45	42	43	39	32	21	47
	150	64	56	52	48	47	43	39	27	52
	200	70	62	58	53	50	46	43	32	56
100	80	53	43	37	37	40	36	28	16	43
	155	60	51	47	44	45	41	34	23	49
	225	66	58	54	50	49	45	41	29	54
	300	72	64	60	55	52	48	45	34	58
125	125	55	45	39	39	42	38	30	18	45
	250	63	54	50	47	48	44	37	26	52
	380	69	61	57	53	52	48	44	32	57
	500	74	66	62	57	54	50	47	36	60
160	200	58	48	42	42	45	41	33	21	48
	430	64	55	51	48	49	45	38	27	53
	650	69	61	57	53	52	48	44	32	57
	900	74	66	62	57	54	50	47	36	60
200	300	58	48	42	42	45	41	33	21	48
	630	65	56	52	49	50	46	39	28	54
	960	70	62	58	54	53	49	45	33	58
	1300	76	68	64	59	56	52	49	38	62
250	500	59	49	43	43	46	42	34	22	49
	1000	65	56	52	49	50	46	39	28	54
	1500	71	63	59	55	54	50	46	34	59
	2000	76	68	64	59	56	52	49	38	62
315	800	60	50	44	44	47	43	35	23	50
	1500	66	57	53	50	51	47	40	29	55
	2150	71	63	59	55	54	50	46	34	59
	2800	78	70	66	61	58	54	51	40	64
400	1200	40	30	24	24	27	23	15	<15	30
	2300	43	34	30	27	28	24	17	<15	32
	3400	46	38	34	30	29	25	21	<15	34
	4500	49	41	37	32	29	25	22	<15	35

Δp_{st} = 200 Pa										
Size	$\dot{V}$ [m³/h]	L_W [dB/Okt]								L_{WA} [dB(A)]
		f_m [Hz]								
		63	125	250	500	1000	2000	4000	8000	
80	50	58	48	42	42	45	41	33	21	48
	100	64	55	51	48	49	45	38	27	53
	150	70	62	58	54	53	49	45	33	58
	200	76	68	64	59	56	52	49	38	62
100	80	59	49	43	43	46	42	34	22	49
	155	65	56	52	49	50	46	39	28	54
	225	73	65	61	57	56	52	48	36	61
	300	77	69	65	60	57	53	50	39	63
125	125	64	54	48	48	51	47	39	27	54
	250	69	60	56	53	54	50	43	32	58
	380	75	67	63	59	58	54	50	38	63
	500	82	74	70	65	62	58	55	44	68
160	200	66	56	50	50	53	49	41	29	56
	430	72	63	59	56	57	53	46	35	61
	650	77	69	65	61	60	56	52	40	65
	900	79	71	67	62	59	55	52	41	65
200	300	67	57	51	51	54	50	42	30	57
	630	72	63	59	56	57	53	46	35	61
	960	77	69	65	61	60	56	52	40	65
	1300	81	73	69	64	61	57	54	43	67
250	500	68	58	52	52	55	51	43	31	58
	1000	72	63	59	56	57	53	46	35	61
	1500	77	69	65	61	60	56	52	40	65
	2000	82	74	70	65	62	58	55	44	68
315	800	68	58	52	52	55	51	43	31	58
	1500	74	65	61	58	59	55	48	37	63
	2150	78	70	66	62	61	57	53	41	66
	2800	82	74	70	65	62	58	55	44	68
400	1200	44	34	28	28	31	27	19	<15	34
	2300	46	37	33	30	31	27	20	<15	35
	3400	49	41	37	33	32	28	24	<15	37
	4500	53	45	41	36	33	29	26	15	39

Δp_{st} = 500 Pa										
Size	$\dot{V}$ [m³/h]	L_W [dB/Okt]								L_{WA} [dB(A)]
		f_m [Hz]								
		63	125	250	500	1000	2000	4000	8000	
80	50	64	54	48	48	51	47	39	27	54
	100	70	61	57	54	55	51	44	33	59
	150	76	68	64	60	59	55	51	39	64
	200	82	74	70	65	62	58	55	44	68
100	80	65	55	49	49	52	48	40	28	55
	155	71	62	58	55	56	52	45	34	60
	225	78	70	66	62	61	57	53	41	66
	300	84	76	72	67	64	60	57	46	70
125	125	71	61	55	55	58	54	46	34	61
	250	76	67	63	60	61	57	50	39	65
	380	82	74	70	66	65	61	57	45	70
	500	87	79	75	70	67	63	60	49	73
160	200	72	62	56	56	59	55	47	35	62
	430	79	70	66	63	64	60	53	42	68
	650	83	75	71	67	66	62	58	46	71
	900	88	80	76	71	68	64	61	50	74
200	300	74	64	58	58	61	57	49	37	64
	630	79	70	66	63	64	60	53	42	68
	960	83	75	71	67	66	62	58	46	71
	1300	87	79	75	70	67	63	60	49	73
250	500	76	66	60	60	63	59	51	39	66
	1000	80	71	67	64	65	61	54	43	69
	1500	84	76	72	68	67	63	59	47	72
	2000	88	80	76	71	68	64	61	50	74
315	800	76	66	60	60	63	59	51	39	66
	1500	80	71	67	64	65	61	54	43	69
	2150	85	77	73	69	68	64	60	48	73
	2800	88	80	76	71	68	64	61	50	74
400	1200	47	37	31	31	34	30	22	10	37
	2300	49	40	36	33	34	30	23	12	38
	3400	52	44	40	36	35	31	27	15	40
	4500	55	47	43	38	35	31	28	17	41

8.2. Radiated noise

The radiated noise of air volume controller is listed in Tab. 8.2.1.

$\dot{V}$ [$m^3.h^{-1}$] - air flow volume

Δp_{st} [Pa] - pressure differential

L_{WA} [dB(A)] - total level of acoustic power corrected by filter A

Tab. 8.2.1.

Size	$\dot{V}$ [m^3/h]	L_{WA} [dB(A)]	L_{WA} [dB(A)]	L_{WA} [dB(A)]	L_{WA} [dB(A)]
		∆pst = 50 Pa	∆pst = 100 Pa	∆pst = 250 Pa	∆pst = 500 Pa
80	50	13	18	29	37
	100	23	27	38	43
	150	30	34	44	48
	200	39	42	47	51
100	80	16	21	32	39
	155	26	30	38	44
	225	33	37	45	50
	300	42	45	48	53
125	125	19	24	34	42
	250	27	32	40	46
	380	33	38	45	51
	500	37	41	47	53
160	200	32	36	43	49
	430	35	40	48	55
	650	40	45	52	59
	900	43	48	53	60
200	300	32	36	46	50
	630	36	41	48	54
	960	42	46	53	57
	1300	46	49	55	58
250	500	31	36	46	53
	1000	36	41	50	56
	1500	43	47	54	59
	2000	45	49	57	61
315	800	32	37	47	53
	1500	40	44	52	57
	2150	43	48	56	62
	2800	50	52	58	58
400	1200	47	52	60	67
	2300	52	57	63	69
	3400	58	62	67	72
	4500	60	64	70	74

8.3. Radiated noise - insulated controller

The radiated noise of air volume controller is listed in Tab. 8.3.1.

$\dot{V}$ [$m^3.h^{-1}$] - air flow volume
Δp_{st} [Pa] - pressure differential
L_{WA} [dB(A)] - total level of acoustic power corrected by filter A

Tab. 8.3.1.

Size	$\dot{V}$ [m^3/h]	L_{WA} [dB(A)]	L_{WA} [dB(A)]	L_{WA} [dB(A)]	L_{WA} [dB(A)]
		Δpst = 50 Pa	Δpst = 100 Pa	Δpst = 250 Pa	Δpst = 500 Pa
80	50	<15	<15	<15	<15
	100	<15	<15	<15	<15
	150	<15	<15	15	20
	200	<15	<15	17	22
100	80	<15	<15	<15	<15
	155	<15	<15	<15	15
	225	<15	<15	19	22
	300	<15	<15	20	25
125	125	<15	<15	<15	15
	250	<15	<15	15	20
	380	<15	17	24	28
	500	18	21	28	30
160	200	<15	<15	19	22
	430	<15	18	26	30
	650	20	23	32	35
	900	21	25	31	37
200	300	<15	15	20	22
	630	16	19	25	30
	960	22	26	34	38
	1300	25	29	36	40
250	500	<15	15	23	27
	1000	16	20	28	33
	1500	24	28	36	42
	2000	27	31	39	44
315	800	<15	16	22	27
	1500	18	22	28	34
	2150	25	29	35	41
	2800	29	33	38	45
400	1200	19	22	28	32
	2300	24	27	33	37
	3400	30	33	39	43
	4500	33	36	42	46

IV. MATERIAL, FINISHING

9. Material

9.1. Controller casings and control device parts are made of galvanized plate. Regulator blade is made of aluminium plate. Damper axis, bearings and spring are made of stainless steel.

9.2. The controller is delivered without further surface treatment.

V. INSPECTION, TESTING

10. Inspection, testing

10.1. The appliance is constructed and preset by the manufacturer, its operation is dependent on proper installation and adjustment.

10.2. All devices are tested terms of safety and operability after production.

VI. TRANSPORTATION AND STORAGE

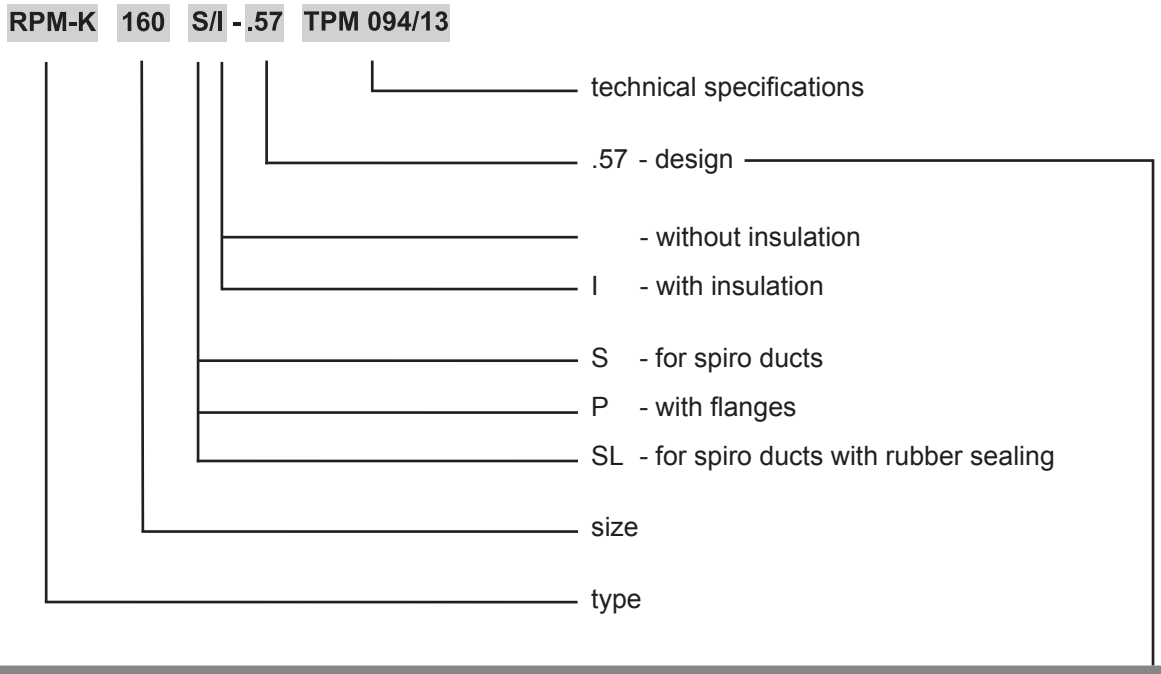
11. Logistic terms

11.1. Controllers are transported by box freight vehicles without direct weather impact, there must not occur any sharp shocks and ambient temperature must not exceed + 40 °C. Controllerss must be protected against mechanic damages when transported and manipulated. During transportation, the controller blade must be in the "CLOSED" position.

11.2. Dampers are stored indoor in environment without any aggressive vapours, gases or dust. Indoor temperature must be in the range from -5 °C to +40 °C and maximum relative humidity 80 %. Dampers must be protected against mechanic damages when transported and manipulated.

VII. ORDERING INFORMATION

12. Odering key



Design - type of control	Additional digits
Manually controlled	.01
Actuating mechanism 230V, open-close control	.45
Actuating mechanism 230V, open-close control, with limit switch	.46
Actuating mechanism 24V, open-close control	.55
Actuating mechanism 24V, open-close control, with limit switch	.56
Actuating mechanism 24V SR modulating control	.57

MANDÍK, a.s.
Dobříšská 550
26724 Hostomice
Czech Republic
Tel.: +420 311 706 706
E-Mail: mandik@mandik.cz
www.mandik.com