

MANDÍK[®]

REGULATION DAMPER

RKM



These technical conditions define the range of produced dimensions and versions of "REGULATION DAMPER RKM" ("damper"). These technical conditions apply to the manufacture, design, ordering, assembly, operation and maintenance.

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II. GENERAL

1. Description

- 1.1. The dampers consist of a frame, blades and a control actuator. They are used to control the air flow by choking the flow.
- 1.2. Dampers are not tight across blade. Tightness across the body in accordance with EN 1751, class C.
- 1.3. The dampers are destined for maximal velocity of air flow 12 m.s⁻¹.
- 1.4. The dampers are intended for environment protected against weather impacts with the classification of climatic conditions class 3K5, without condensation, frost, ice formation, and without water even from other sources than rain according to EN 60 72133, change A2, with temperature range from -20°C to +80°C.
- If the electrical elements are mounted on the damper, temperature range is narrowed by the electrical elements.
- 1.5. If is not noticed other way, all dimensions and weight are in millimeters and kilograms.

2. Design

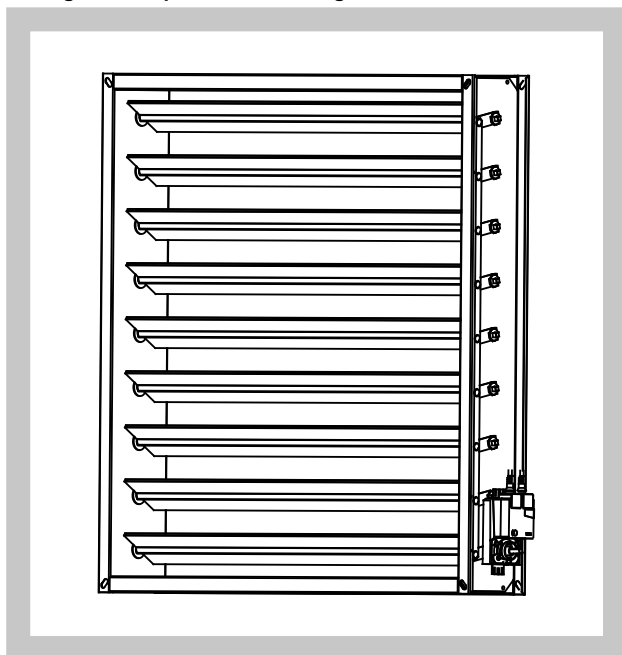
- 2.1. Versions of dampers are shown in the table Tab. 2.1.1. The version is designated by two digits following the TP mark.

Tab. 2.1.1. Version of damper

Version of damper – type of control	Two digits following the TP mark
Manually controlled	.01
To fit actuator drive	.09
To fit actuator drive with emergency function	.09F
Actuator with emergency function 230V	.43*
Actuator controlled 230V, two point regulation - without position signal	.45
Actuator controlled 230V, two point regulation - with position signal	.46
Actuator with emergency function 230V - with position signal	.48*
Actuator with emergency function 24V	.53*
Actuator controlled 24V, two point regulation - without position signal	.55
Actuator controlled 24V, two point regulation - with position signal	.56
Actuator controlled 24V SR with smooth regulation	.57
Actuator with emergency function 24V - with position signal	.58*

* design is available on request, is necessary to specify the position of the damper blade (open or closed) without voltage.

Fig. 1 damper with actuating mechanism



3. Dimensions and weights

3.1. Dimensions, range of dimensions, airflow (effective) area

Tab. 3.1.1. Dimensions, range of dimensions, weight, airflow (effective) area

A x B	Number of blades	Sef [m ²]	Weight [kg]	A x B	Number of blades	Sef [m ²]	Weight [kg]
200 x 200	2	0,036	2,9	500 x 400	4	0,180	7,4
250	2	0,036	3,4	500	5	0,225	8,5
315	3	0,054	3,9	630	6	0,270	10,3
400	4	0,072	4,5	800	8	0,360	12,3
500	5	0,090	5,3	1000	10	0,450	14,7
250 x 200	2	0,045	3,3	1250	12	0,540	18,0
250	2	0,045	3,9	630 x 200	2	0,113	6,2
315	3	0,068	4,3	250	2	0,113	7,1
400	4	0,090	5,0	315	3	0,170	7,8
500	5	0,113	5,8	400	4	0,227	8,6
630	6	0,135	7,0	500	5	0,284	10,0
315 x 200	2	0,057	3,7	630	6	0,340	12,0
250	2	0,057	4,4	800	8	0,454	14,3
315	3	0,085	4,9	1000	10	0,567	17,0
400	4	0,113	5,6	1250	12	0,680	21,0
500	5	0,142	6,5	1400	14	0,794	23,0
630	6	0,170	7,9	800 x 200	2	0,144	8,2
800	8	0,227	9,6	250	2	0,144	9,0
400 x 200	2	0,072	4,3	315	3	0,216	9,6
250	2	0,072	5,1	400	4	0,288	10,6
315	3	0,108	5,7	500	5	0,360	12,2
400	4	0,144	6,4	630	6	0,432	14,6
500	5	0,180	7,4	800	8	0,576	17,0
630	6	0,216	9,0	1000	10	0,720	20,0
800	8	0,288	10,8	1250	12	0,864	24,5
1000	10	0,360	13,0	1400	14	1,008	27,0
500 x 200	2	0,090	5,0	1600	16	1,152	30,0
250	2	0,090	6,0	1800	18	1,296	33,0
315	3	0,135	6,6	2000	20	1,440	36,0

A x B	Number of blades	S _{ef} [m ²]	Weight [kg]	A x B	Number of blades	S _{ef} [m ²]	Weight [kg]
1000 x 200	2	0,180	9,8	1400 x 1400	14	1,714	46,0
250	2	0,180	11,0	1600	16	1,958	51,5
315	3	0,270	11,7	1800	18	2,203	57,0
400	4	0,360	12,5	2000	20	2,448	62,5
500	5	0,450	14,3	1600 x 630	6	0,842	28,5
630	6	0,540	17,5	800	8	1,123	33,0
800	8	0,720	20,0	1000	10	1,404	39,0
1000	10	0,900	23,5	1250	12	1,685	47,5
1250	12	1,080	29,0	1400	14	1,966	51,0
1400	14	1,260	31,5	1600	16	2,246	57,0
1600	16	1,440	35,0	1800	18	2,527	63,0
1800	18	1,620	38,5	2000	20	2,808	69,0
2000	20	1,800	42,0	1800 x 630	6	0,950	31,0
1250 x 400	4	0,450	15,0	800	8	1,267	35,5
500	5	0,563	17,0	1000	10	1,584	42,0
630	6	0,675	20,5	1250	12	1,901	51,5
800	8	0,900	23,5	1400	14	2,218	55,0
1000	10	1,125	27,5	1600	16	2,534	61,5
1250	12	1,350	34,0	1800	18	2,851	68,0
1400	14	1,575	37,0	2000	20	3,168	74,5
1600	16	1,800	41,0	2000 x 800	8	1,411	39,0
1800	18	2,025	45,0	1000	10	1,764	46,0
2000	20	2,250	49,0	1250	12	2,117	55,0
1400 x 500	5	0,612	21,5	1400	14	2,470	60,0
630	6	0,734	26,0	1600	16	2,822	67,0
800	8	0,965	29,5	1800	18	3,175	74,0
1000	10	1,224	35,0	2000	20	3,528	81,0
1250	12	1,469	43,0				

S_{ef} - effective area for fully opened damper.

The weights listed in the table are valid for the basic version (manually controlled). The weight of the servo actuator must be added to all other versions – see table 6.1.1.

Atypical dimensions of the damper must be discussed with the manufacturer in advance.

Fig. 2 Manually controlled damper without divider (for A < 1300) without reinforcing bolt (for B < 1200)

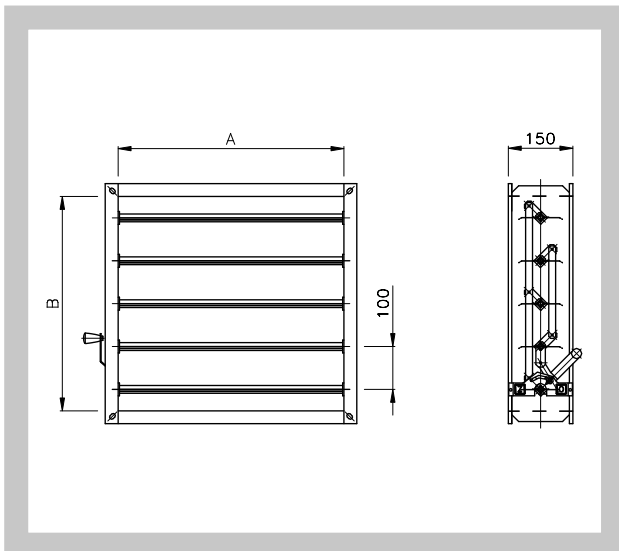


Fig. 3 Actuator controlled damper without divider (for A < 1300) without reinforcing bolt (for B < 1200)

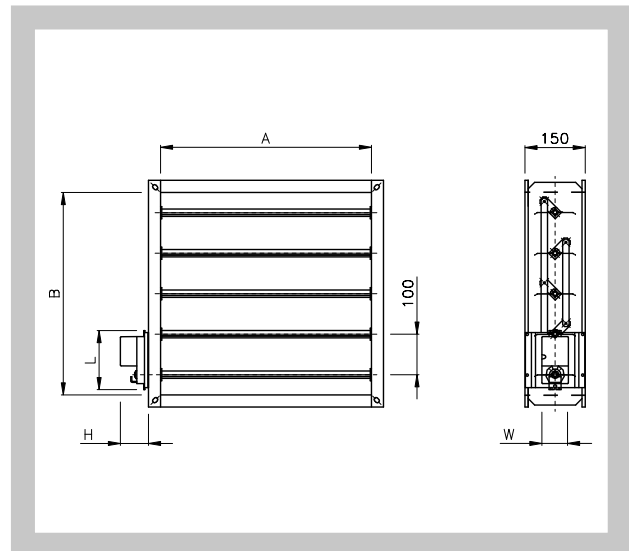


Fig. 4 Manually controlled damper with divider (for $A \geq 1300$) with reinforcing bolt (for $B \geq 1200$)

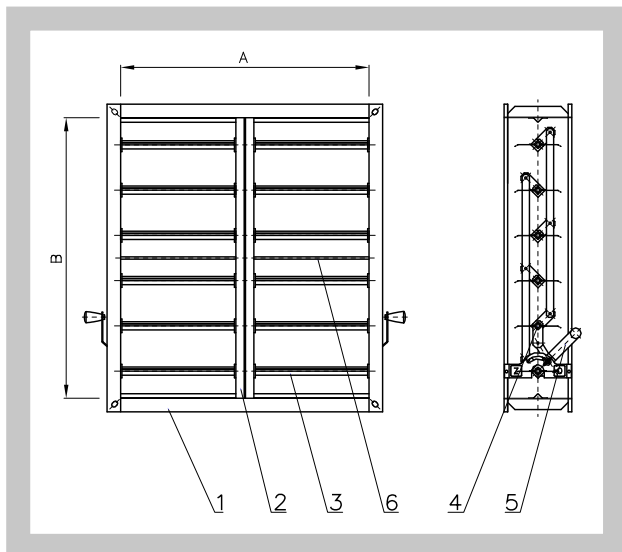
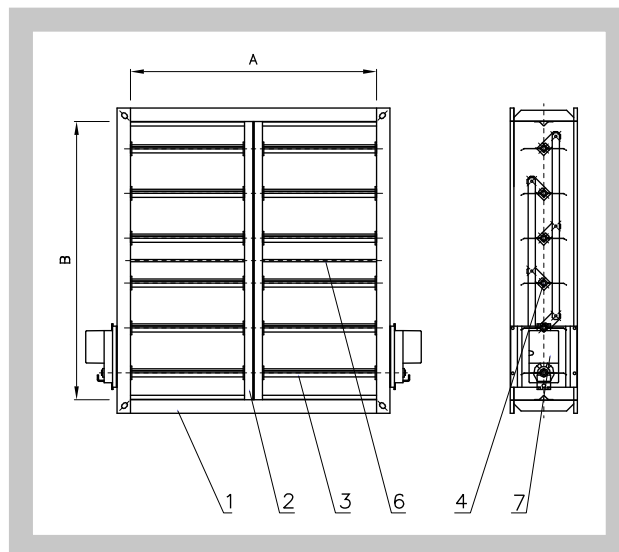


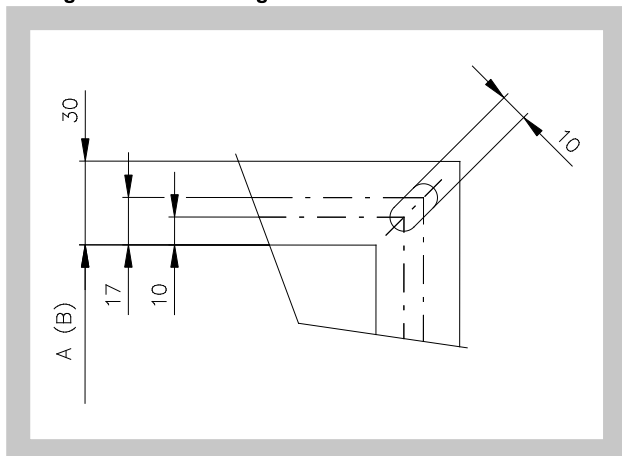
Fig. 5 Actuator controlled damper with divider (for $A \geq 1300$) with reinforcing bolt (for $B \geq 1200$)



Item:

- | | | |
|--|--|------------------------|
| 1. body of damper | 4. control actuator | 7. actuating mechanism |
| 2. divider (only for dampers where $A \geq 1300$ mm) | 5. control rod | |
| 3. blade | 6. reinforcing bolt (only for damper where $B \geq 1200$ mm) | |

Fig. 6 Detail of flange



3.2. Atypical dimensions regulating valve must first be discussed with the manufacturer.

3.3. Dampers to install servo drive unit are provided square-shaped pin of cross-section 8x8 mm, which the servo drive unit is fitted on directly or using a reducer. The pin is overlapping the damper flange by 60 mm.

4. Placement and installation

4.1. The dampers are designed to be installed into the air duct. The flaps can be used in any orientation.

4.2. The actuator requires a 250 mm clearance (minimum).

III. TECHNICAL DATA

5. Basic parameters

5.1. Maximum pressure difference on control dampers

Tab. 5.1.1. Maximum pressure difference

Maximum pressure difference Δp [Pa]													
A/B	200	250	315	400	500	630	800	1000	1250	1400	1600	1800	2000
200	1500	1500	1500	1500	1500	x	x	x	x	x	x	x	x
250	1500	1500	1500	1500	1500	1500	x	x	x	x	x	x	x
315	1500	1500	1500	1500	1500	1500	1500	x	x	x	x	x	x
400	1500	1500	1500	1500	1500	1500	1500	1500	x	x	x	x	x
500	1500	1500	1500	1500	1500	1500	1500	1500	1500	x	x	x	x
630	1500	1500	1500	1500	1500	1500	1500	1500	1500	1200	x	x	x
800	1500	1500	1500	1500	1500	1500	1500	1500	1500	1200	1200	1200	1200
1000	1500	1500	1500	1500	1500	1500	1500	1500	1500	1200	1200	1200	1200
1250	x	x	x	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200
1400	x	x	x	x	1200	1200	1200	1200	1200	1200	1200	1200	1200
1600	x	x	x	x	x	1200	1200	1200	1200	1200	1200	1200	1200
1800	x	x	x	x	x	1200	1200	1200	1200	1200	1200	1200	1200
2000	x	x	x	x	x	x	1200	1200	1200	1200	1200	1200	1200

6. Electrical elements, wiring diagram

6.1. Types and weights of servo actuators for control of dampers

Tab. 6.1.1. Type of actuator for individually dampers

Type of servo actuator	Position signal	Emergency functions	Torque	Weight of actuator [kg]	Dimensions L x H x W
Belimo LM 230A-S (.46)	YES	NO	5 Nm	0,6	116 x 61 x 66
Belimo LM 230A (.45)	NO	NO		0,5	
Belimo LM 24A-S (.56)	YES	NO		0,6	
Belimo LM 24A (.55)	NO	NO		0,5	
Belimo LM 24A-SR (.57)	YES	NO		0,5	
Belimo NM 230A-S (.46)	YES	NO	10 Nm	0,85	124 x 62 x 80
Belimo NM 230A (.45)	NO	NO		0,8	
Belimo NM 24A-S (.56)	YES	NO		0,85	
Belimo NM 24A (.55)	NO	NO		0,75	
Belimo NM 24A-SR (.57)	YES	NO		0,8	
Belimo SM 230A-S (.46)	YES	NO	20 Nm	1,1	139 x 64 x 88
Belimo SM 230A (.45)	NO	NO		1,05	
Belimo SM 24A-S (.56)	YES	NO		1,05	
Belimo SM 24A (.55)	NO	NO		1	
Belimo SM 24A-SR (.57)	YES	NO		1,05	
Belimo LF 230A (.43)	NO	YES	4 Nm	1,7	130 x 82 x 98
Belimo LF 230A-S (.48)	YES	YES		1,8	
Belimo LF 24A (.53)	NO	YES		1,5	
Belimo LF 24A-S (.58)	YES	YES		1,6	
Belimo NFA (.43)	NO	YES	10 Nm	1,8	182 x 93 x 98
Belimo NFA-S2 (.48)	YES	YES		1,9	
Belimo NF 24A (.53)	NO	YES		2,1	
Belimo NF 24A-S2 (.58)	YES	YES		2,3	
Belimo SFA (.43)	NO	YES	20 Nm	1,7	182 x 93 x 98
Belimo SFA-S2 (.48)	YES	YES		2	
Belimo SF 24A (.53)	NO	YES		2,3	
Belimo SF 24A-S2 (.58)	YES	YES		2,4	

Tab. 6.1.2. The type and number of actuators for damper size - standard servo / actuator with emergency function

RKM		A													
		200	250	315	400	500	630	800	1000	1250	1400	1600	1800	2000	
B	200	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	x	x	x	x	x
	250	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	x	x	x	x	x
	315	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/NF	LM/NF	LM/NF	x	x	x	x	x
	400	LM/LF	LM/LF	LM/LF	LM/LF	LM/LF	LM/NF	LM/NF	LM/NF	LM/NF	NM/NF	x	x	x	x
	500	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	2xNM/ 2xNF	x	x	x
	630	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	2xNM/ 2xNF	2xNM/ 2xNF	2xNM/ 2xNF	x
	800	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	NM/NF	SM/SF	2xNM/ 2xSF	2xNM/ 2xSF	2xNM/ 2xSF	2xNM/ 2xSF
	1000	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF
	1250	x	x	x	x	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF
	1400	x	x	x	x	x	SM/SF	SM/SF	SM/SF	SM/SF	SM/SF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF
	1600	x	x	x	x	x	x	SM/SF	SM/SF	SM/SF	SM/SF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF
	1800	x	x	x	x	x	x	SM/SF	SM/SF	SM/SF	SM/SF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF
2000	x	x	x	x	x	x	SM/SF	SM/SF	SM/SF	SM/SF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF	2xSM/ 2xSF	

6.2. Supply voltage and power inputs

Tab. 6.2.1. Supply voltage and power input

Type of actuator	Supply voltage	Power input		
		In operation	Resting position	Dimensioning
LM 230A, LM 230A-S	AC 100 ... 240 V, 50/60 Hz	1,5 W	0,4 W	4 VA
LM 24A, LM 24A-S	AC 24 V, 50/60 Hz; DC 24 V	1 W	0,2 W	2 VA
LM 24A-SR	AC 24 V, 50/60 Hz; DC 24 V	1 W	0,4 W	2 VA
NM 230A, NM 230A-S	AC 100 ... 240 V, 50/60 Hz	2,5 W	0,6 W	6 VA
NM 24A, NM 24A-S	AC 24 V, 50/60 Hz; DC 24 V	1,5 W	0,2 W	3,5 VA
NM 24A-SR	AC 24 V, 50/60 Hz; DC 24 V	2 W	0,4 W	4 VA
SM 230A, SM 230A-S	AC 100 ... 240 V, 50/60 Hz	2,5 W	0,6 W	6 VA
SM 24A, SM 24A-S	AC 24 V, 50/60 Hz; DC 24 V	2 W	0,2 W	4 VA
SM 24A-SR	AC 24 V, 50/60 Hz; DC 24 V	2 W	0,4 W	4 VA
LF 230, LF 230-S	AC 198 ... 264 V, 50/60 Hz	5 W	3 W	7 VA
LF 24, LF 24-S	AC 24 V, 50/60 Hz/DC 24 V	5 W	2,5 W	7 VA
NFA, NFA-S2	AC 24 ... 240 V, 50/60 Hz / DC 24 ... 125 V	6 W	2,5 W	9,5 VA
NF 24A, NF 24A-S2	AC 24 V, 50/60 Hz/DC 24 V	6 W	2,5 W	8,5 VA
SFA, SFA-S2	AC 24 ... 240 V, 50/60 Hz / DC 24 ... 125 V	7 W	3,5 W	18 VA
SF 24A, SF 24A-S2	AC 24 V, 50/60 Hz/DC 24 V	5 W	2,5 W	7,5 VA

6.3. Wiring diagram of servo actuators Belimo

Fig. 7 Wiring diagram of servo actuators Belimo LM 230A, NM 230A a SM 230A

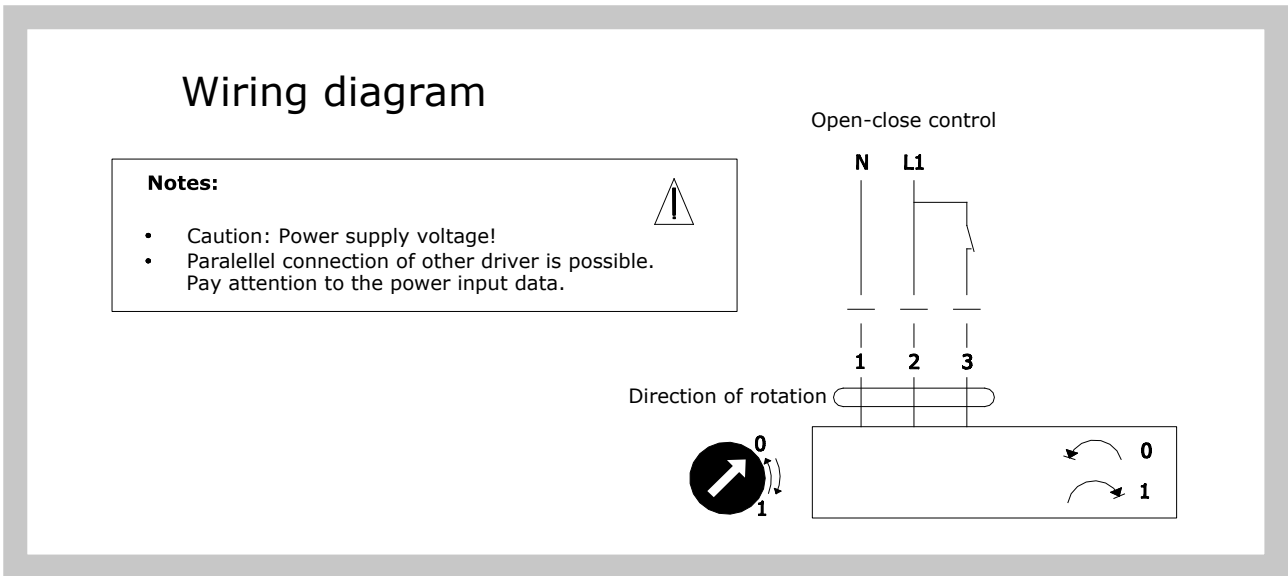


Fig. 8 Wiring diagram of servo actuators Belimo LM 230A-S, NM 230A-S a SM 230A-S

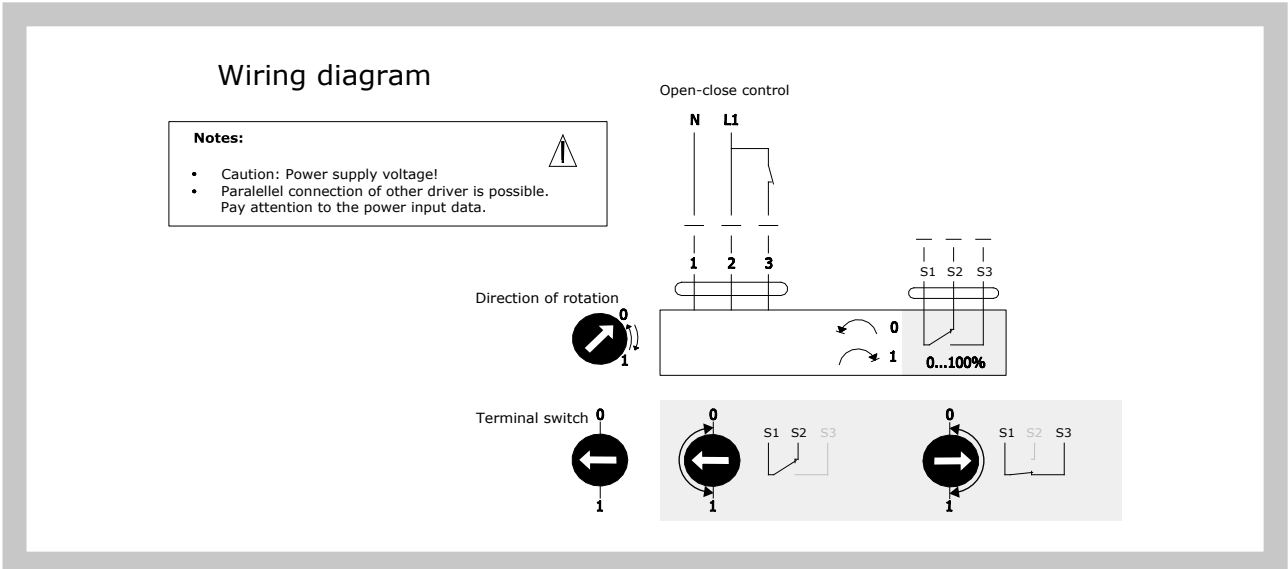


Fig. 9 Wiring diagram of servo actuators Belimo LM 24A, NM 24A a SM 24A

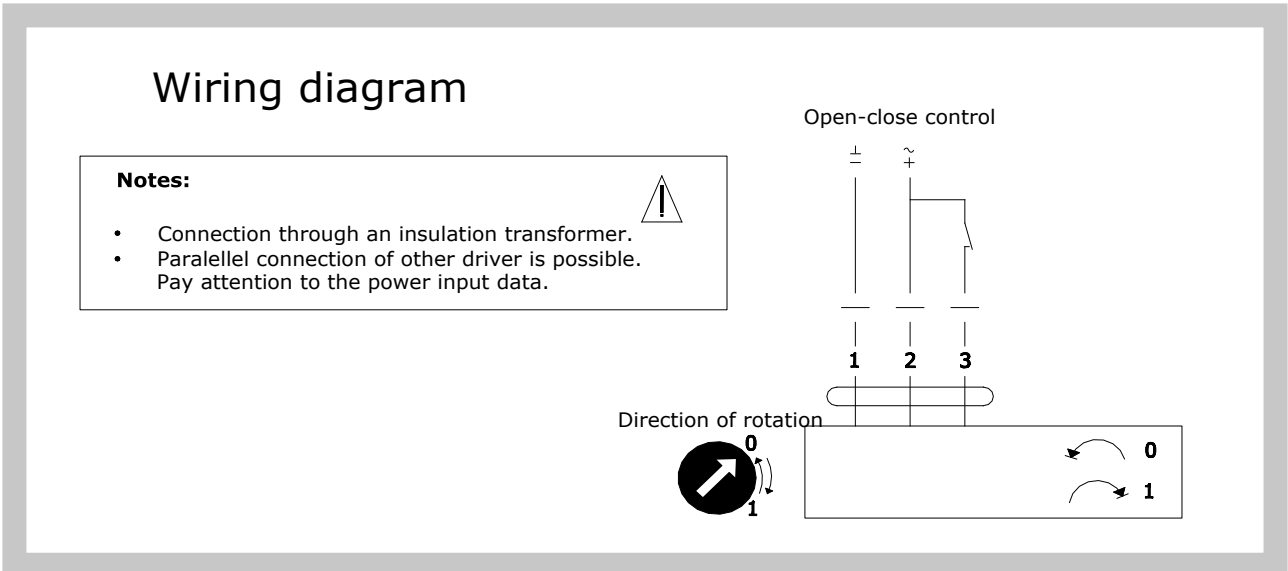


Fig. 10 Wiring diagram of servo actuators BelimoLM 24A-S, NM 24A-S a SM 24A-S

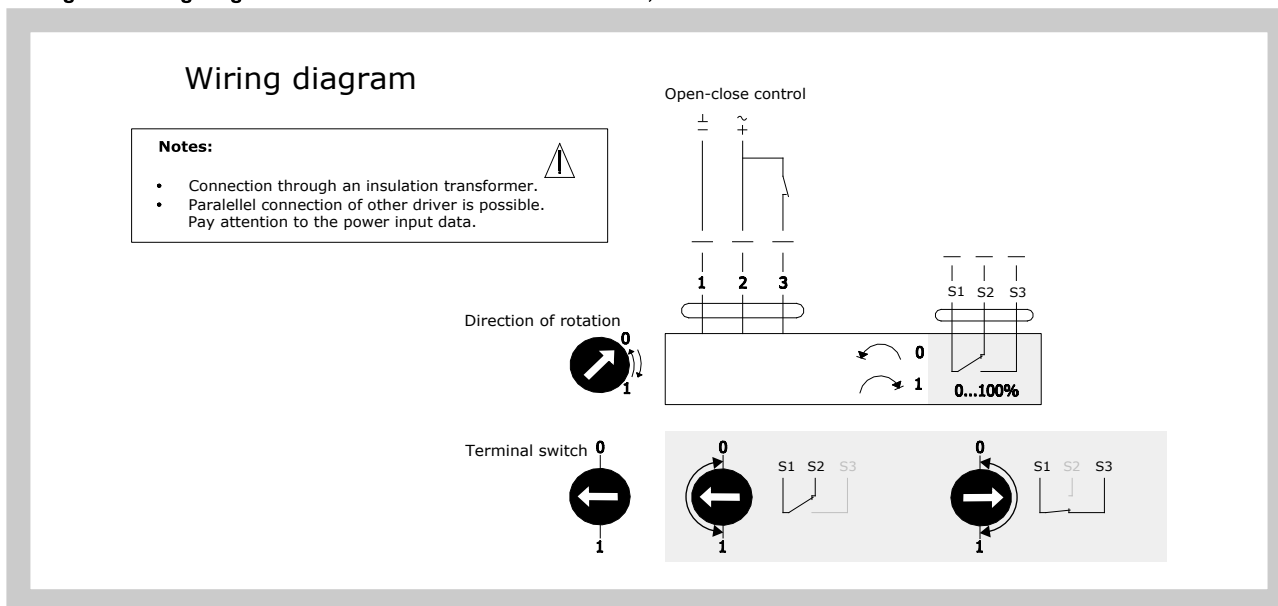


Fig. 11 Wiring diagram of servo actuators Belimo LM 24A-SR, NM 24A-SR a SM 24A-SR

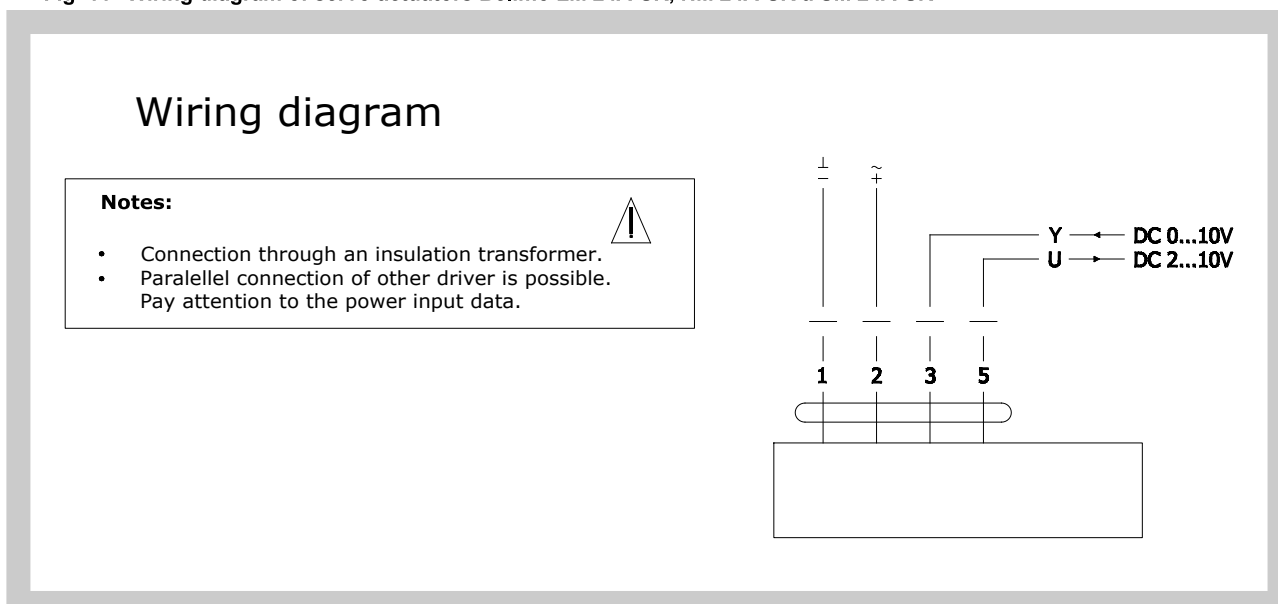


Fig. 12 Wiring diagram of servo actuators Belimo LF 24, NF 24A, SF 24A

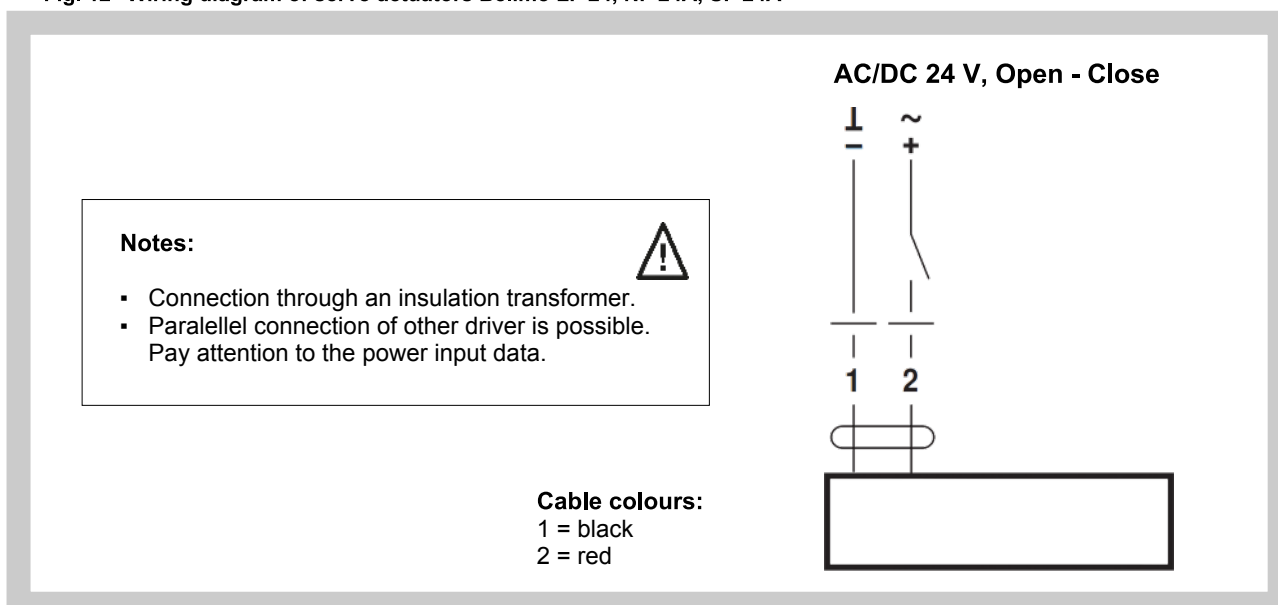


Fig. 13 Wiring diagram of servo actuators Belimo LF 230

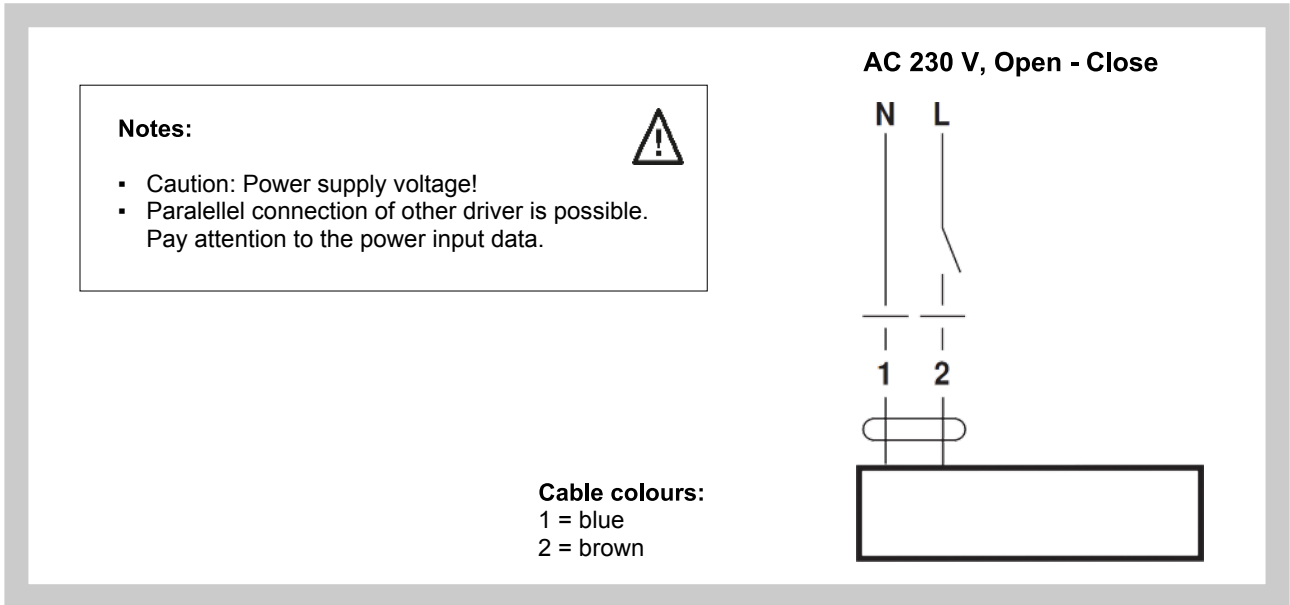


Fig. 14 Wiring diagram of servo actuators Belimo LF 24-S

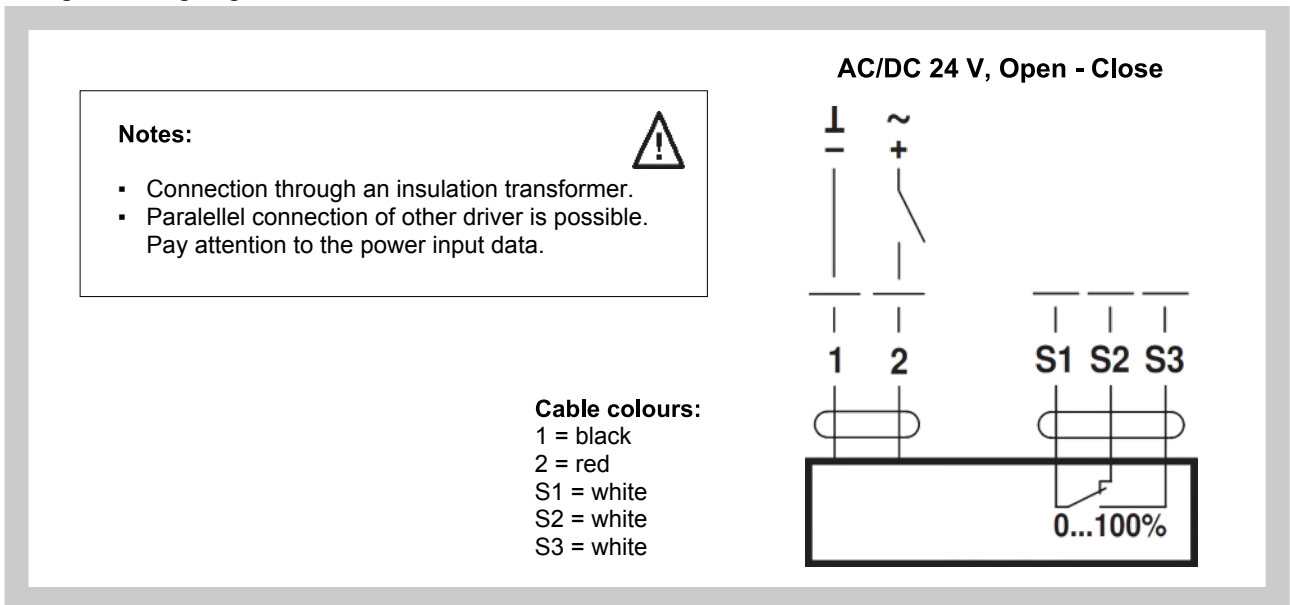


Fig. 15 Wiring diagram of servo actuators Belimo LF 230-S

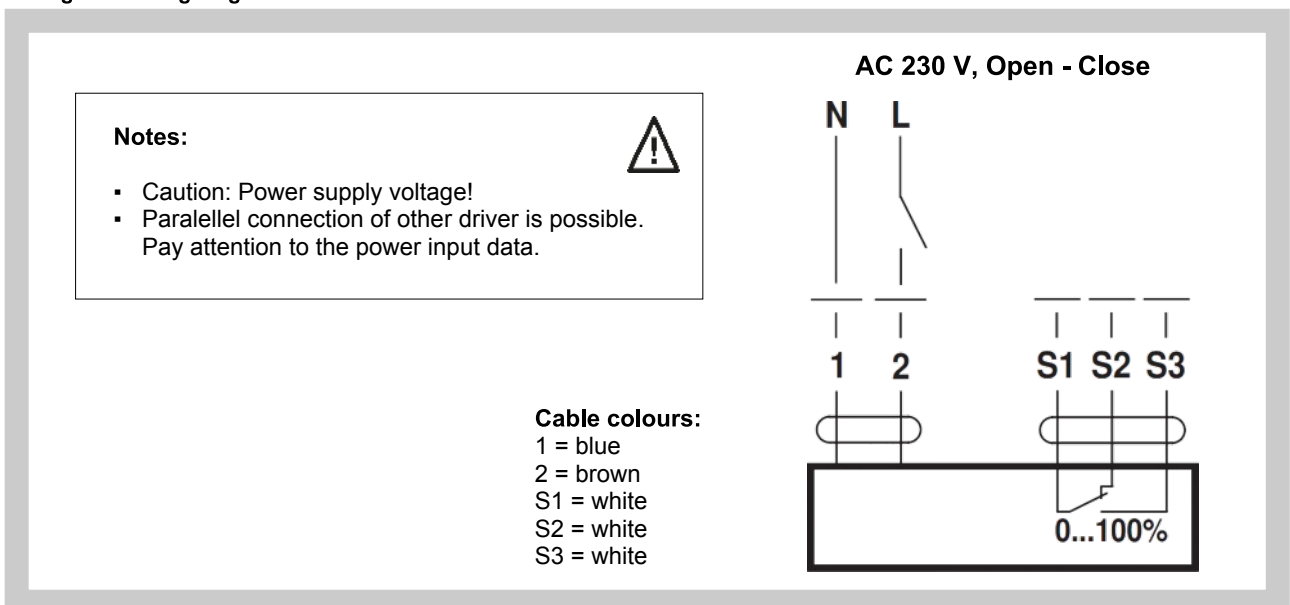


Fig. 16 Wiring diagram of servo actuators Belimo NFA, SFA

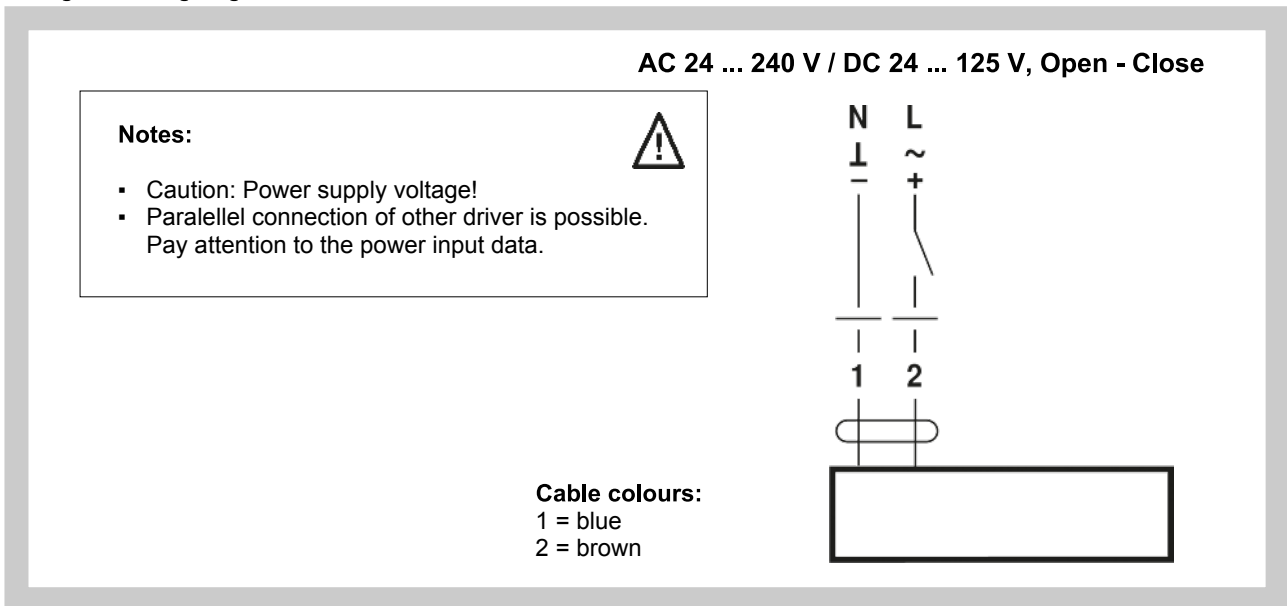


Fig. 17 Wiring diagram of servo actuators Belimo NF 24A-S2, SF 24A-S2

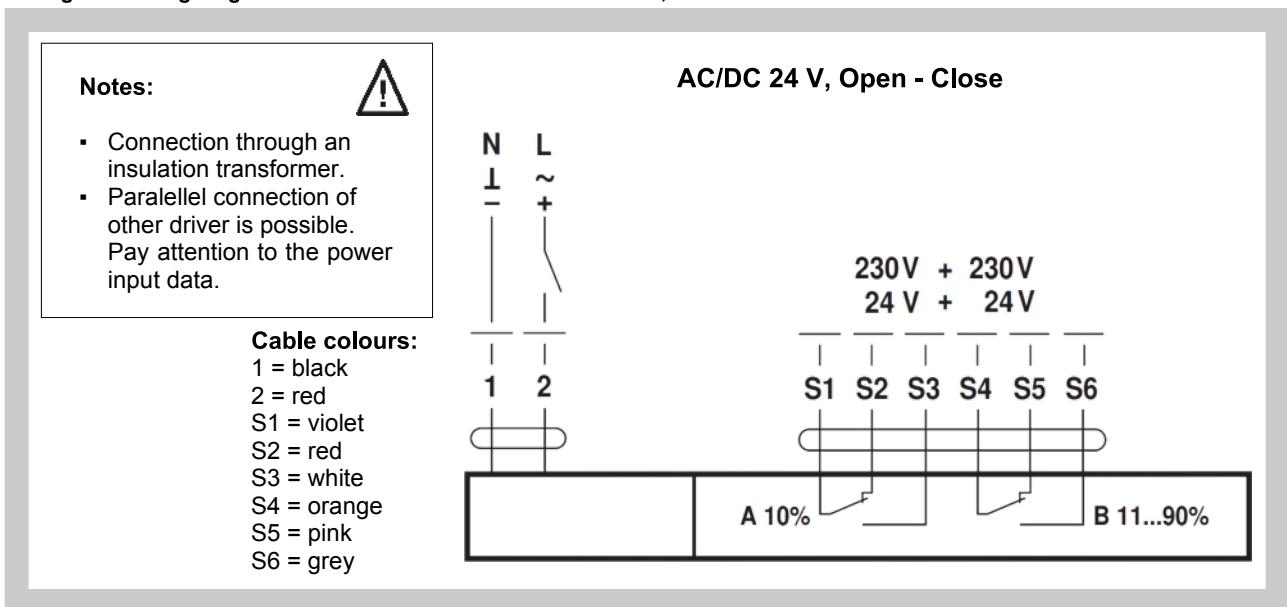
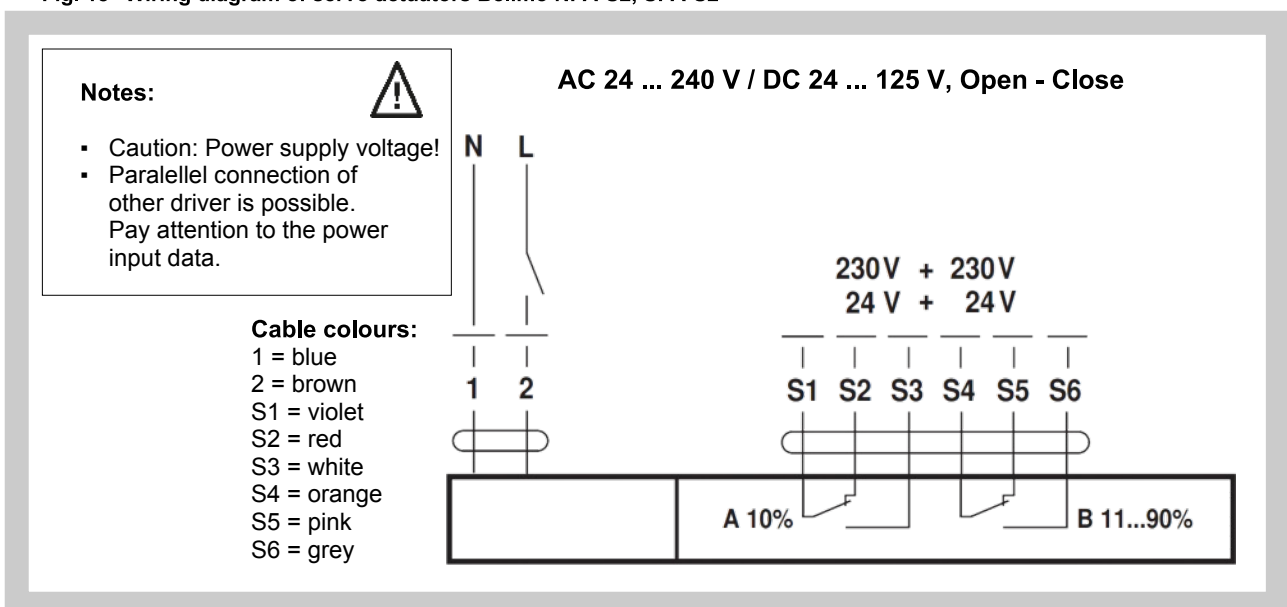


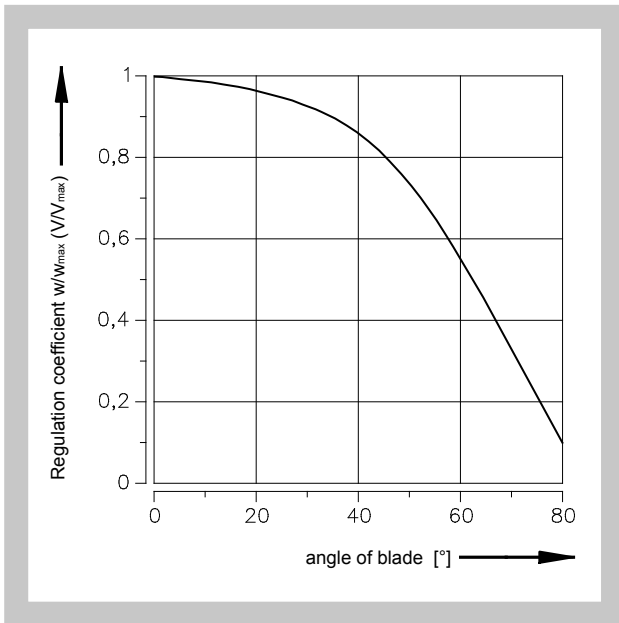
Fig. 18 Wiring diagram of servo actuators Belimo NFA-S2, SFA-S2



7. Pressure lost, air flow characteristic

7.1. Air flow characteristic

Chart 7.1.1. Flow characteristic for constant pressure difference at the damper $p = \text{konst.} = 40\text{Pa}$



7.2. Pressure lost depending on the angle of damper blade

Chart 7.2.1. Regulation damper inserted into the duct

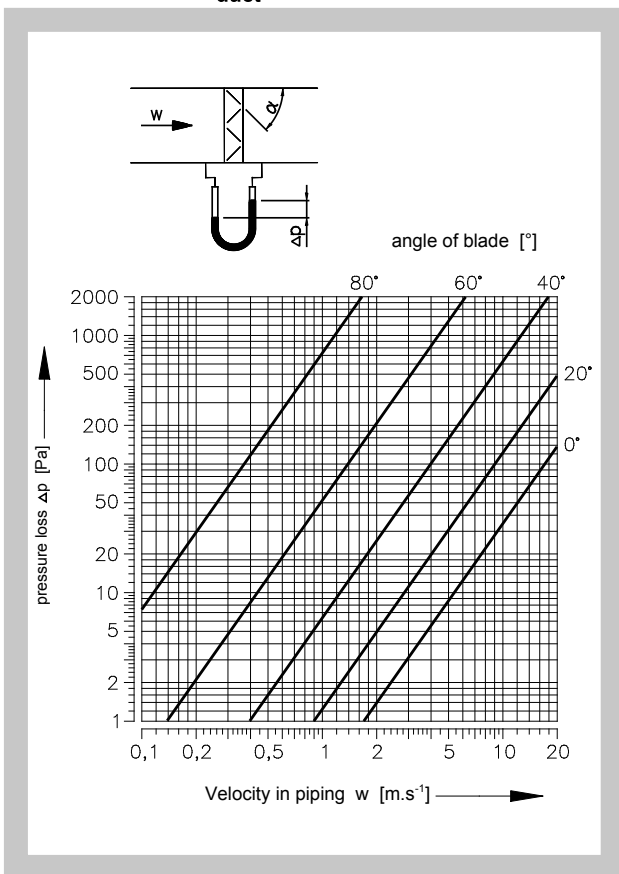
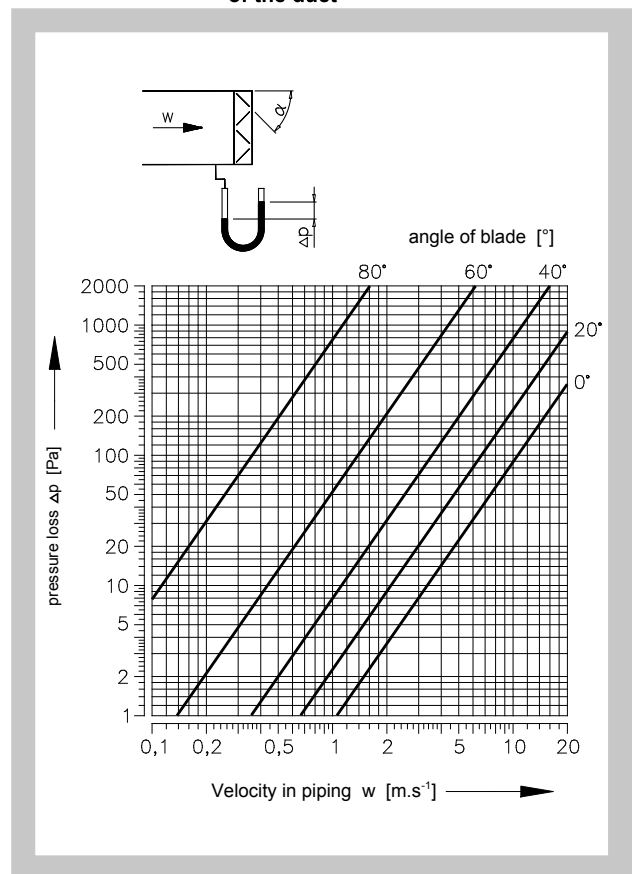


Chart 7.2.2. Regulation damper attached to the end of the duct



\dot{V} [m³.h⁻¹] volumetric airflow
 w [m.s⁻¹] velocity of air flow

Δp [Pa] pressure lost at $\rho = 1,2 \text{ kg.m}^{-3}$
 α [°] angle of blade

8. Noise data

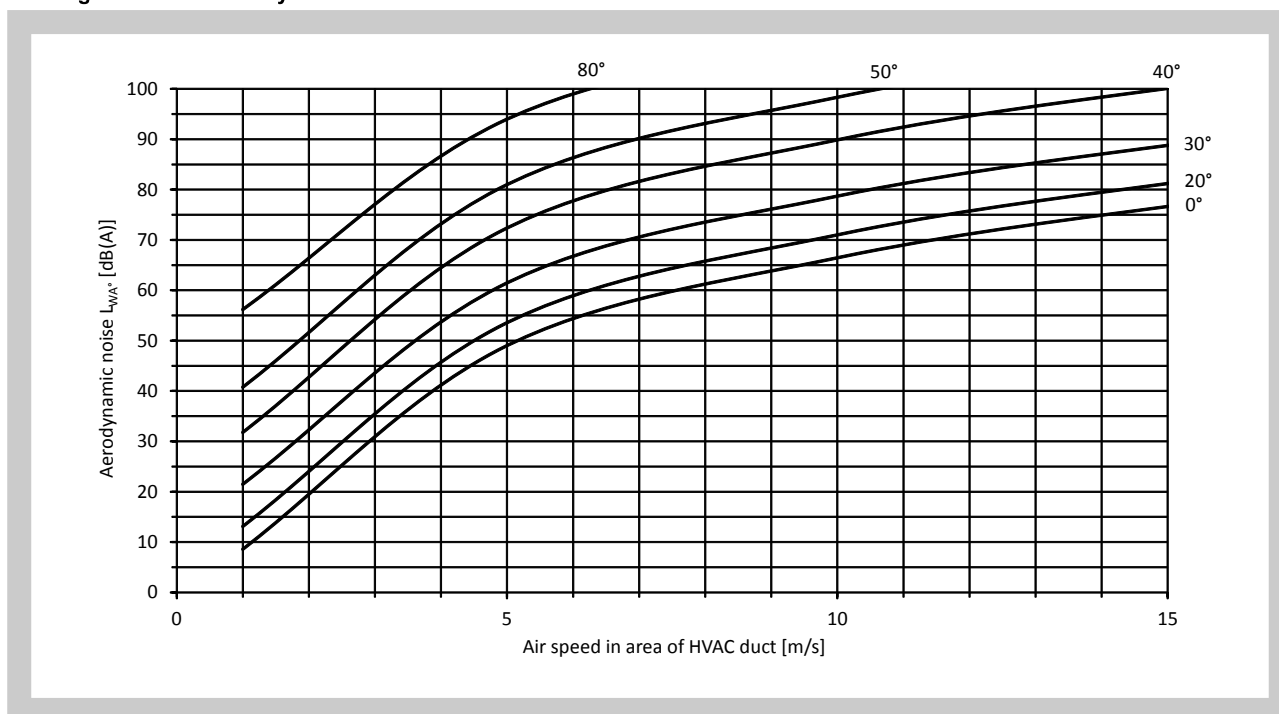
8.1. Aerodynamic noise from airflow controller is mentioned in Table. 8.1.1.

$$L_{WA} = L_{WA^\circ} + K_A$$

Tab. 8.1.1. Correction

Area of damper A x B [m²]	0,04	0,06	0,1	0,2	0,4	0,6	1	2	4	8
Factor K [dB]	-13	-12	-10	-8	-4	-2	1	3	6	9

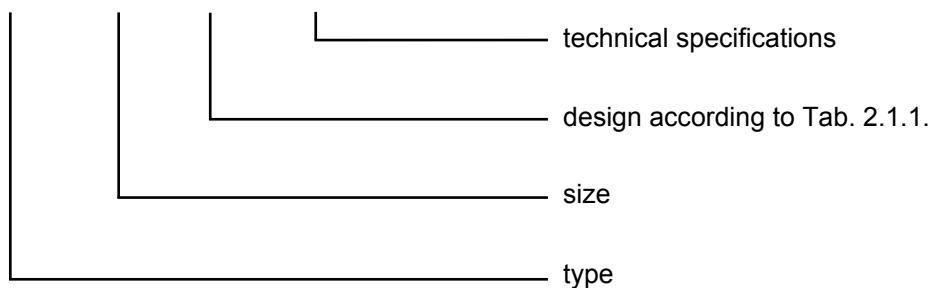
Diagram 8.1.1. Aerodynamic noise



IV. ORDERING INFORMATION

9. Ordering key

RKM 500x400 - .45 TPM 009/00



V. MATERIAL, FINISHING

10. Material

- 10.1. The frame, blades and actuator are made of zinc-plated steel sheet, the pins of the damper are made of plastic. The damper has no other surface treatment.
- 10.2. According to the customer's requirements, damper can be made of stainless material.

Specifications for stainless-steel models – classification of stainless steel:

- Class A2 – Food-grade stainless steel (AISI 304 – ČSN 17240)
- Class A4 – Chemistry-grade stainless steel (AISI 316, 316L – ČSN 17346, 17349)

The indicated metal is used for all metal components of the damper except the servo drive and its adapters.

The following components, including the fasteners, are made from stainless steel at all times:

- 1) Damper body and all components permanently attached
- 2) Leaf pins, metal components of the leaf
- 3) Controlling components outside the damper (levers, control levers, metal part of the pin or the entire pin)
- 4) Servo drive mount

Plastic, rubber and silicon components, sealants, servo drives, and end switches are identical for all material variants of the dampers.

Some fasteners and components are available in one class of stainless steel; the type will be used in all stainless-steel variants.

Any other requirements for the design shall be considered atypical and shall be addressed on an individual basis.

VI. INSPECTION, TESTING

11. Inspection

- 11.1. Dimensions are checked using regular rulers according to the standard applicable to dimensions without defined tolerances used in the air conditioning trade.
- 11.2. Intraoperational inspections of the parts and main dimensions according to the drawing documentation are performed.

12. Testing

- 12.1. After assembly, the operation of the blade and of electrical actuators is performed.

VII. PACKING, TRANSPORT, STORAGE

13. Logistical data

- 13.1. The delivery includes a complete damper including the control mechanism.
- 13.2. The dampers are transported as bulk cargo, using suitable covered means of transport. When agreed upon with the manufacturer, the dampers can be loaded onto pallets or wooden crates. Dampers must be protected from mechanical damage during transport and storage. If packing is used, it is non-returnable and its price is not included in the price of the damper.
- 13.3. If not otherwise agreed, the handover is considered when the goods are forwarded to the carrier.
- 13.4. The dampers must be stored in the indoor 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 mechanical damages when transported and manipulated.

VIII. ASSEMBLY

14. Assembly

- 14.1. The assembly consists of installation of the damper into the air duct, with connection of optional servo actuator to the mains.

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