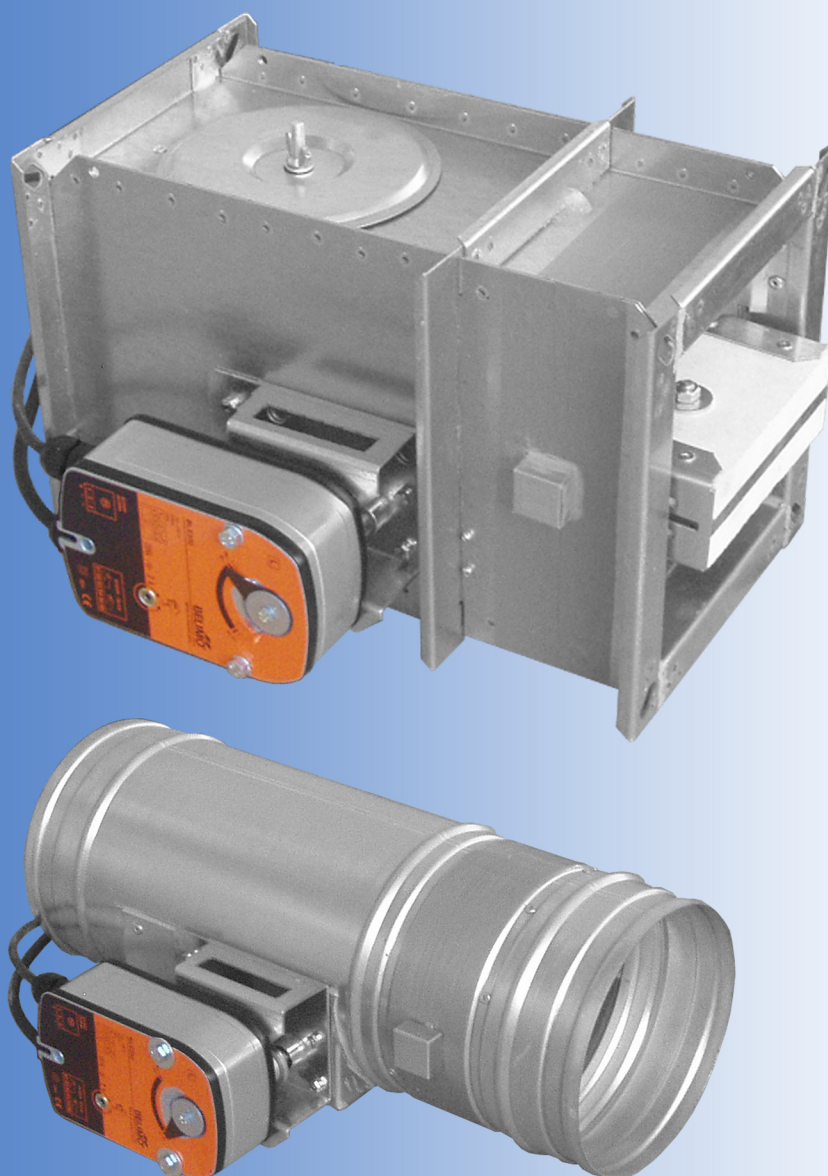




EN 12101-8



**MULTI SMOKE DAMPER
MSD**

ALNOR Systemy Wentylacji Sp. z o.o.
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These technical specifications state a row of manufactured sizes and models of multi smoke dampers (further only dampers) MSD. It is valid for production, designing, ordering, delivery, maintenance and operation.

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II. GENERAL INFORMATION

1. Description

Fig. 1 Damper MSD - square



Fig. 2 Damper MSD - round



- 1.1. Multi smoke dampers are shutters in the smoke exhaust duct systems. The dampers are designed to remove heat and combustible products (e.g. smoke) from effected fire compartments. In the event of fire the Smoke and Fire ventilation system opens the damper in the affected section and removes combustion products and heat from this section. The damper blade is controlled by electrical actuating mechanism. Dampers are fire resistant and are intended for systems with automatic activation. Dampers can be installed in construction of the fire compartment.

1.2. Damper characteristics

- CE certified acc. to EN 12101-8
- Tested in accordance with EN 1366-10
- Classified acc. to EN 13501-4+A1
- Fire resistance according Tab. 1.2.1
- External casing leakage class min. C acc. to EN 1751
- Internal leakage: round dampers - class min. 2, diameters from 560 mm to 630 mm min. class 3 acc. to EN 1751
square dampers - class min. 2, for max. dimension 1500 x 800 mm min. class 3 acc. to EN 1751
- Cycling test in class C 10000 acc. to EN 15650 (design MSD-W is tested without load)
- ES Certificate of conformity No. 1391-CPD-2015/0057 for MSD
- ES Certificate of conformity No. 1391-CPD-2015/0058 for MSD-W
- Declaration of Performance No. CDM/MSD/001/15

Tab. 1.2.1. Classification of Dampers

Supporting Construction	Classification
Porous concrete ceiling construction, thickness 150 mm	EI 120 (h_{ow} - $i \leftrightarrow o$) S1500C ₁₀₀₀₀ AAmulti
Porous concrete wall construction, thickness 100 mm	EI 120 (v_{ew} - $i \leftrightarrow o$) S1500C ₁₀₀₀₀ AAmulti
Gypsum wall, thickness 125 mm	EI 120 (v_{ew} - $i \leftrightarrow o$) S1500C ₁₀₀₀₀ AAmulti

1.3. Working conditions

Exact damper function is provided under the following conditions:

- a) maximum air velocity 15 m.s⁻¹
- b) underpressure max. -1500 Pa or overpressure max. 500 Pa.

Dampers can be installed in arbitrary position (horizontal or vertical blade axis).

Dampers are designed for macroclimatic areas with mild climate according to EN 60 721-3-3. Temperature in the place of installation is permitted to range from - 20°C to + 50°C.

2. Design

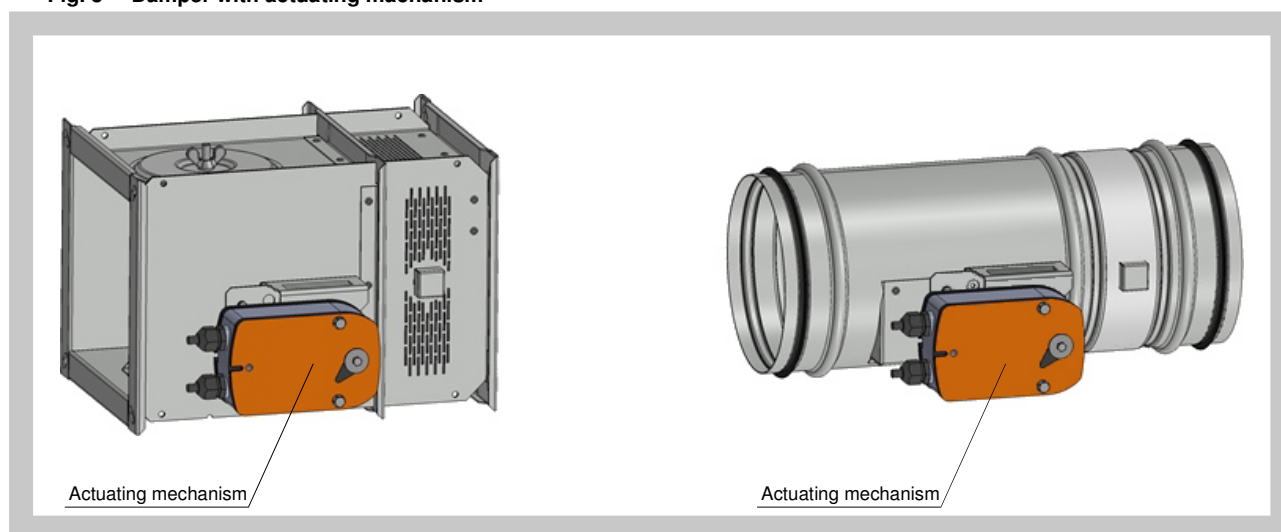
2.1. Design with actuating mechanism

Design .44 and .54

MSD (MSD-W) is equipped by actuating mechanism Belimo BLE24(BE24-12) for 24V supply or BLE230(BE230-12) for 230V supply. MSD with big dimensions is equipped by actuating mechanism Schischek InMax 50.75-S (dual supply 24V or 230V).

After being connected to power supply the actuating mechanism displaces the damper blade into operation position "OPEN" or „CLOSED“ (according to method of connection, see connection diagram). Running time is max. 60s. If is power supply cut off, actuating mechanism is stopped in actual position. The crank handle supplied with the actuator allows it to be operated manually. Signaling of the damper blade positions "OPEN" and "CLOSED" is provided by means of two integrated, invariably set terminal switches.

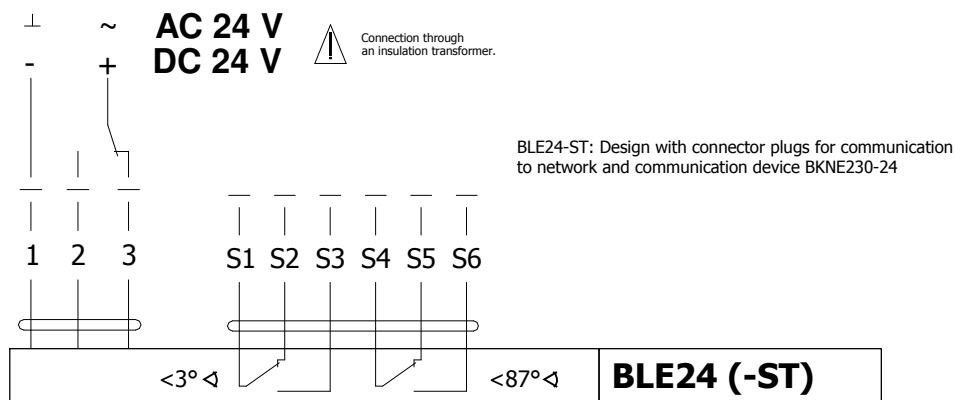
Fig. 3 Damper with actuating mechanism



Tab. 2.1.1. Actuating mechanism BELIMO BLE 24(-ST), BLE 230

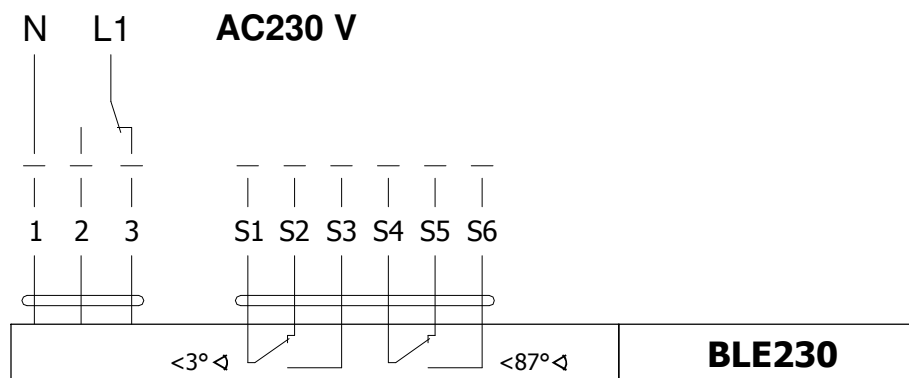
Actuating mechanism BELIMO	BLE 24(-ST)	BLE230
Nominal voltage	AC 24V 50/60Hz DC 24 V	AC 230 V 50/60Hz
Power consumption - motoring - holding	7,5 W < 0,5 W	5W < 1 W
Dimensioning	9 VA (Imax 2,7 A @ 5 ms)	12 VA (Imax 6 A @ 5 ms)
Protection class	III	II
Degree of protection	IP 54	
Running time for 95°	< 30 s	
Ambient temperature range	- 30 °C ... + 50 °C	
Non-operating temperature	- 40 °C ... + 80 °C	
Connecting - motor - auxiliary switch	cable 1 m, 3 x 0,75 mm ² cable 1 m, 6 x 0,75 mm ² (BLE 24-ST) with plug-in connectors	

Fig. 4 Actuating mechanism BELIMO BLE 24(-ST)



Parallel connection of other driver is possible.
Pay attention to the power input data.

Fig. 5 Actuating mechanism BELIMO BLE 230



Parallel connection of other driver is possible.
Pay attention to the power input data.

Tab. 2.1.2. Actuating mechanism BELIMO BE 24-12(-ST), BE 230-12

Actuating mechanism BELIMO	BE 24-12 (-ST)	BE230-12
Nominal voltage	AC 24V 50/60Hz DC 24 V	AC 230 V 50/60Hz
Power consumption - motoring - holding	12 W 0,5 W	8W 0,5 W
Dimensioning	18 VA (I _{max} 8.2 A @ 5 ms)	15 VA (I _{max} 7.9 A @ 5 ms)
Protection class	III	II
Degree of protection	IP 54	
Running time for 95°	< 60 s	
Ambient temperature range Non-operating temperature	- 30 °C ... + 50 °C - 40 °C ... + 80 °C	
Connecting - motor - auxiliary switch	cable 1 m, 3 x 0,75 mm ² cable 1 m, 6 x 0,75 mm ² (BE 24-ST) with plug-in connectors	

Fig. 6 Actuating mechanism BELIMO BE 24-12(-ST)

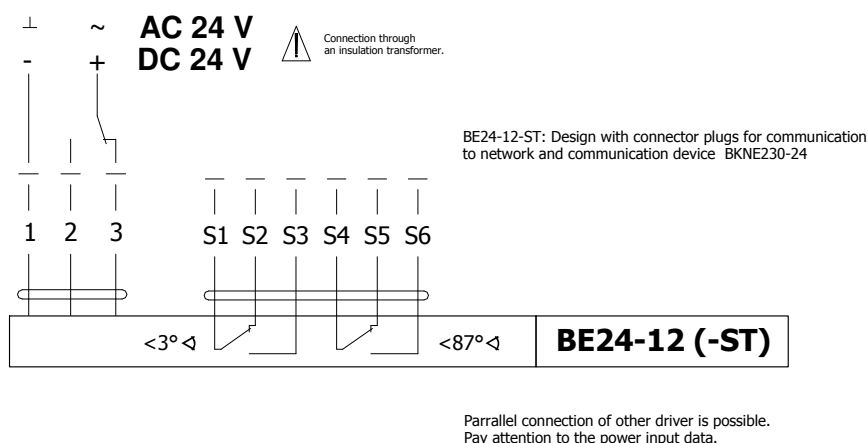
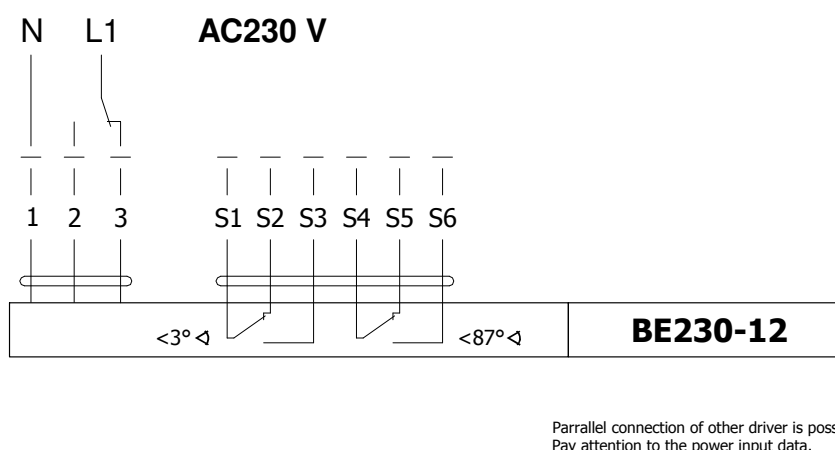


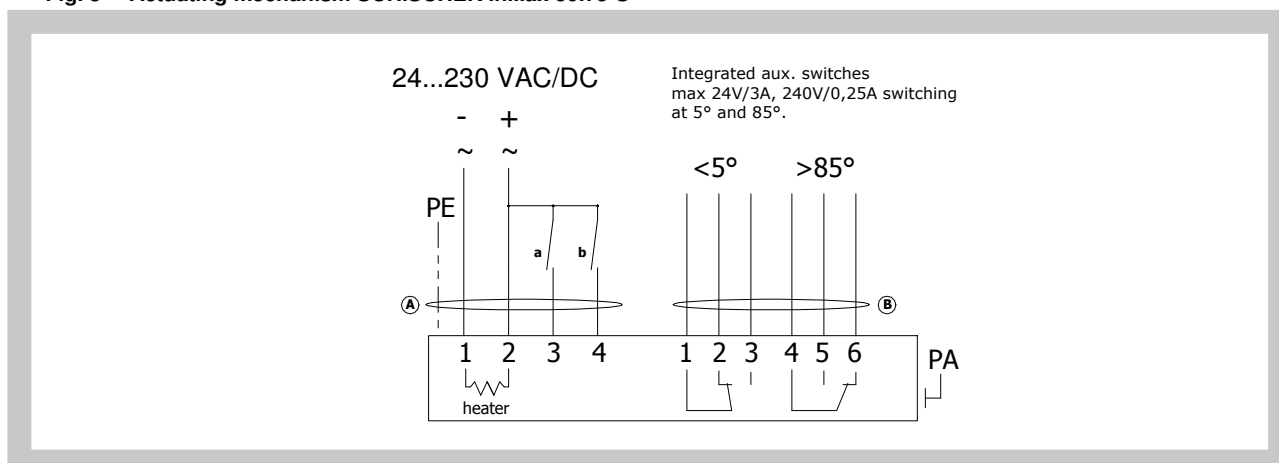
Fig. 7 Actuating mechanism BELIMO BE 230-12



Tab. 2.1.3. Actuating mechanism SCHISCHEK InMax 50.75-S

Actuating mechanism SCHISCHEK	InMax 50.75-S
Nominal voltage	24-240 VAC/DC 50/60Hz
Power consumption - motoring - heating	10 W 16 W (start at -20°C)
Protection class	I
Degree of protection	IP 66
Running time for 95°	< 60 s
Ambient temperature range Non-operating temperature	- 40 °C ... + 50 °C - 40 °C ... + 70 °C
Connecting	cable 1 m, 0,5 mm ²

Fig. 8 Actuating mechanism SCHISCHEK InMax 50.75-S



2.2. Design with the communication and supply device

Design .66

Design with the communication and supply device BKNE230-24 and the actuating mechanism BLE24(BE24-12)-ST.

BKNE230-24 functions as a decentralized network device for supplying the actuating mechanism BLE24(BE24-12)-ST on one hand and on the other hand it transmits signals from communication and control device BKSE24-6.

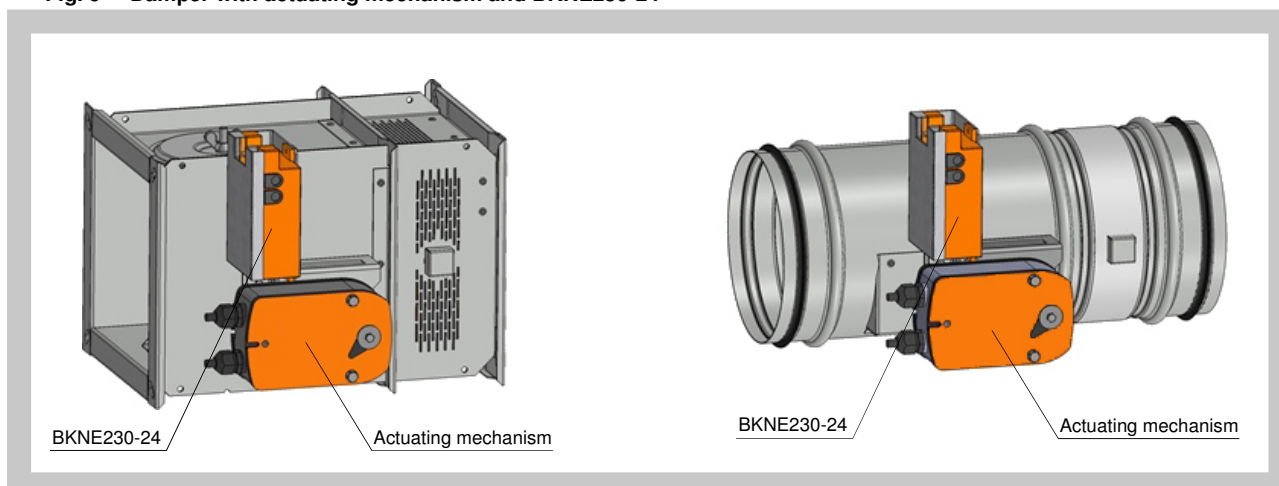
It simplifies electrical wiring and interconnection of dampers. It facilitates on site check and enables central control and checks of fire damper by means of a simple 2-conductor wiring. BKNE230-24 signals the damper position „OPEN“/„CLOSED“ (from switches on the actuator) and any fault alarms to the BKSE24-6 unit. It also receives positioning commands from the control unit and triggers the actuator to the required position. The last control command is retained throughout temporary power failures.

The BKNE230-24 unit monitors the positions of the switches on the actuator, its running time and the exchange of data with the control and monitoring unit BKSE24-6. It also monitors the actuator current and the power supply. In order to make installation as simple as possible the smoke extraction damper actuators ...-ST are fitted with plug connectors that can be inserted directly into the BKNE230-24 unit.

The 2-wire conductor must be connected to screw terminals 6 and 7. It is recommended that a fire alarm signal cable suitable for the application be used for the 2-wire conductor. It is essential to ensure the correct polarity. More information in catalogue Belimo.

Design .66 is not available by using actuating mechanism InMax 50.75-S

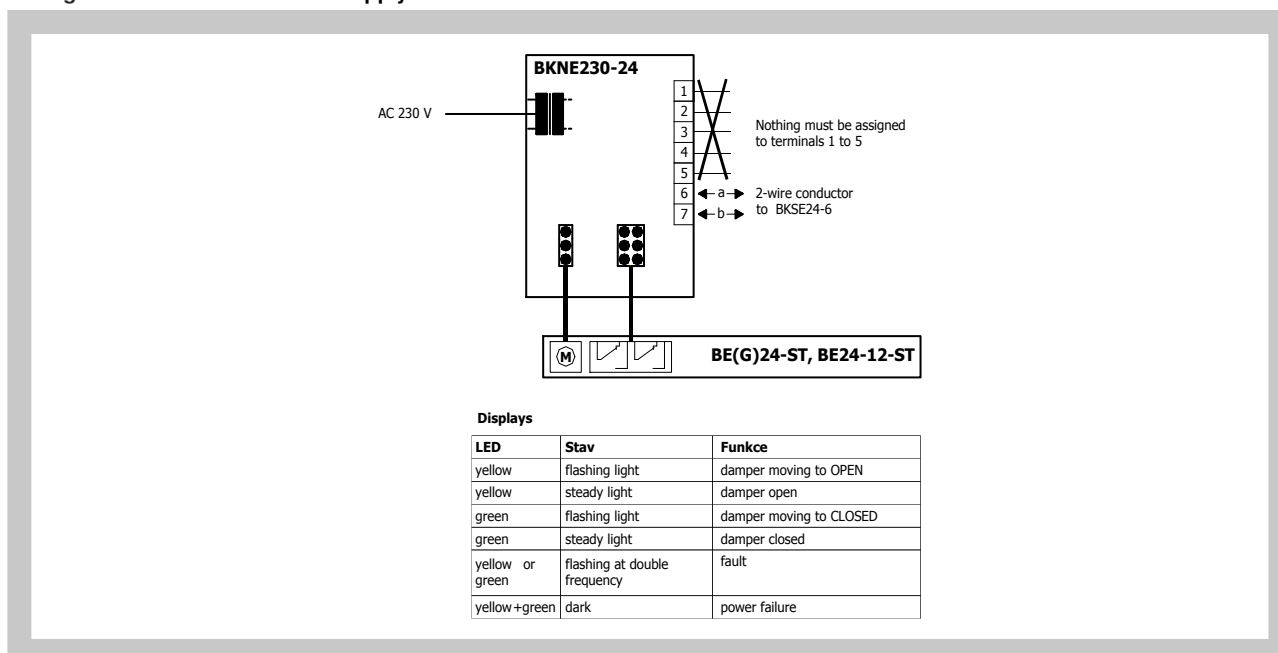
Fig. 9 Damper with actuating mechanism and BKNE230-24



Tab. 2.2.1. Communication and supply device BKNE 230-24

Communication and supply device	BKNE 230-24
Nominal voltage	AC 230V 50/60Hz
Power consumption	10 W (including actuating mechanism)
Dimensioning	19 VA (including actuating mechanism)
Degree of protection	II
Ambient temperature range	- 30 °C ... + 50 °C
Non-operating temperature	- 40 °C ... + 80 °C
Connecting - net - actuator - terminal board	cable 1 m without plug 6-pole connector, 3-pole connector screw terminals for cable 2x1,5 mm ²

Fig. 10 Communication and supply device BKNE 230-24



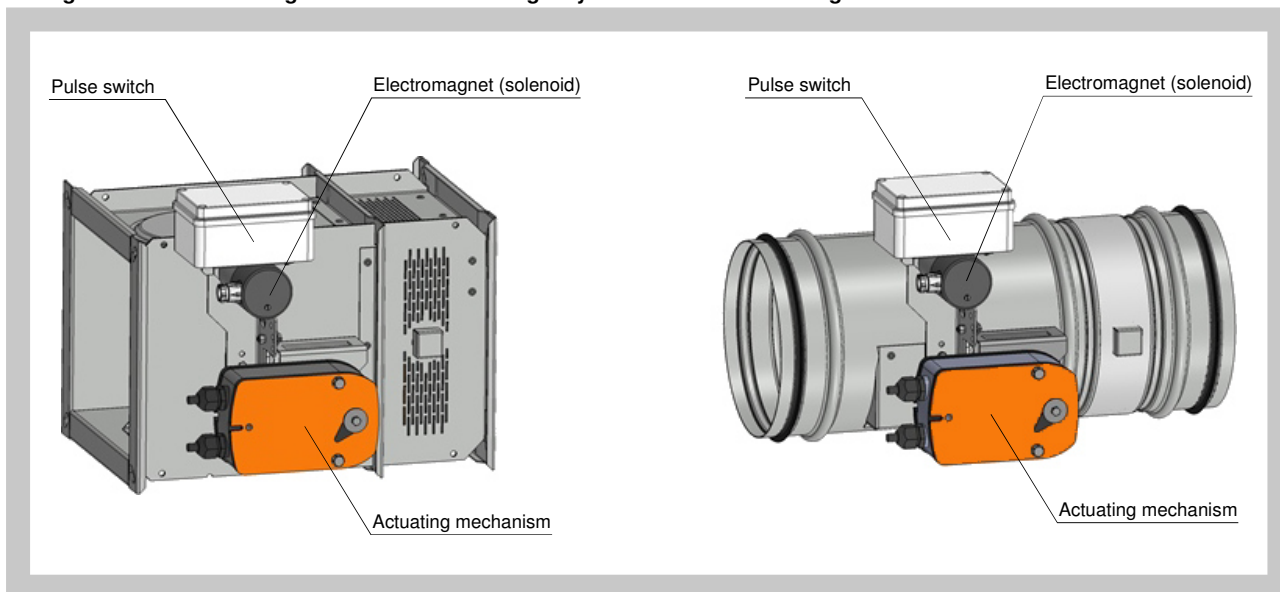
2.3. Design with electric actuating mechanism with emergency function and electromagnet

Design .4M0, .4M1, .5M0 and .5M1

MSD-W is always equipped by electric actuating mechanism BLF 230-T, BLF 24-T, DAF2.20S or DAF1.20S (further only "actuating mechanism") and is complemented with initiation by means of an electromagnet (solenoid). After being connected to power supply AC/DC 24V or 230V, the actuating mechanism displaces the damper blade into operation position "CLOSED" and at the same time it pre-stretches its back spring. When the actuating mechanism is under voltage, the damper blade is in the position "CLOSED" and the back spring is pre-stretched. Time needed for full closing of the flap blade from the position "OPEN" to the position "CLOSED" is maximum 60 sec. This position is secured by initional lever. If the actuating power supply is cut off damper is still in the position "CLOSED". After activation of electromagnet is released initiation lever and the back spring displaces the damper blade into the breakdown position "OPEN". The time of displacing the blade from the position "OPEN" to the position "CLOSED" takes maximum 16 sec. In case that the power supply is restored again (the blade can be in any position), the actuating mechanism starts to re-displace the damper blade into the position "CLOSED".

By voltage AC 230 V is damper equipped by electromagnet EM230. By voltage AC/DC 24 V is damper equipped by electromagnet EM230 with pre-pulse switch SIEM24. SEIM24 activates the electromagnet after capacitor charge witch is placed inside of SIEM24. It takes about 10 sec. Charging time depends on the current supply. For reliable operation is necessary connect to electromagnet or pre-pulse switch appropriate supply for 2 sec (230 V) or 20 to 30 sec (24 V).

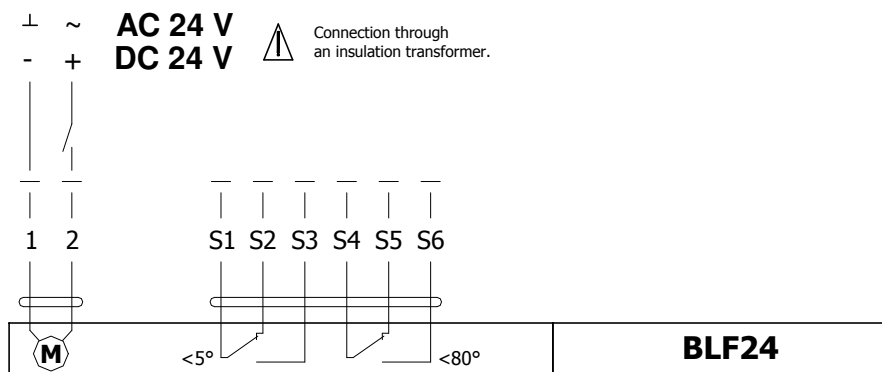
Fig. 11 Electric actuating mechanism with emergency function and electromagnet



Tab. 2.3.1. Actuating mechanism BELIMO BLF 24, BLF 230

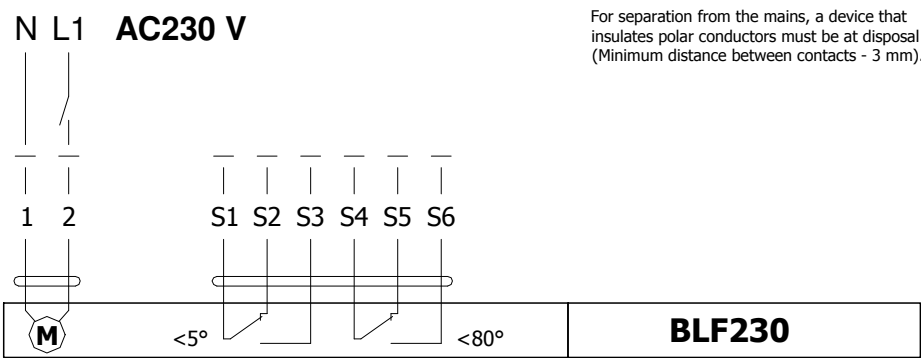
Actuating mechanism BELIMO	BLF 24	BLF230
Nominal voltage	AC 24V 50/60Hz DC 24 V	AC 230 V 50/60Hz
Power consumption - motoring - holding	5 W 2,5 W	5W 3W
Dimensioning	7 VA (Imax 5,8 A @ 5 ms)	7 VA (Imax 150 mA @ 10 ms)
Protection class	III	II
Degree of protection	IP 54	
Running time - motor - spring return	< 120 s ~ 16 s	
Ambient temperature - normal duty - safety duty - non-operating temperature	- 30 °C ... + 50 °C The safe position will be attained up to max. 75°C - 40 °C ... + 50 °C	
Connecting - motor - auxiliary switch	cable 1 m, 2 x 0,75 mm ² cable 1 m, 6 x 0,75 mm ²	

Obr. 12 Actuating mechanism BELIMO BLF 24



Parallel connection of other driver is possible.
Pay attention to the power input data.

Obr. 13 Actuting mechanism BLF 230

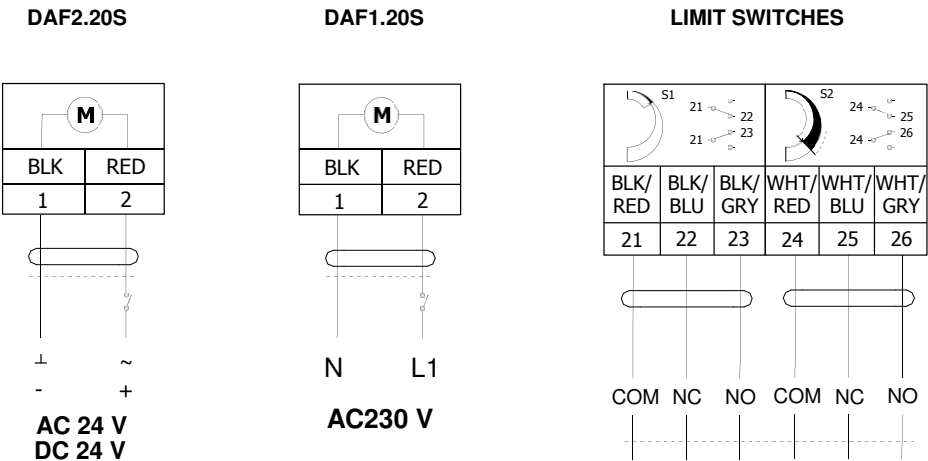


Parrallel connection of other driver is possible.
Pay attention to the power input data.

Tab. 2.3.1. Actuting mechanism Joventa DAF2.20S a DAF1.20S

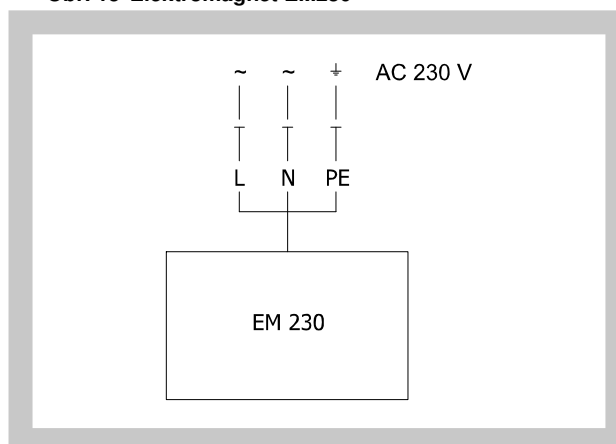
Actuting mechanism Joventa	DAF2.20S	DAF1.20S
Nominal voltage	AC 24V 50/60Hz DC 24 V	AC 230 V 50/60Hz
Power consumption - motoring - holding	26 VA (AC); 15,6 W (DC) 9,3 VA (AC); 2,6 W (DC)	0,15 A 0,09 A
Dimensioning	14 VA	14 VA
Protection class	II	II
Degree of protection	IP 54	
Running time - motor - spring return	24...57 s 11...15 s	
Ambient temperature - normal duty - non-operating temperature	- 40 °C ... + 55 °C - 65 °C ... + 85 °C	
Connecting - motor - auxiliary switch	cable 1,2 m halogen-free; 2-wires cable 1,2 m halogen-free; 6-wires	

Obr. 14 Actuting mechanism Joventa DAF2.20S a DAF1.20S



Tab. 2.1.2. Elektromagnet EM230

Elektromagnet EM230	
Jmenovité napětí	AC 230 V / 50 Hz
Zátahový proud	1,2 A
Krytí	IP 40
Teplota okolí provozní	-10 °C ... +40 °C
Připojení	kabel 1m, 3x0,75mm ²

Obr. 15 Elektromagnet EM230


3. Communication and control devises

- 3.1.** BKSE24-6 indicates operating status and fault signals for the smoke extraction dampers. The auxiliary contacts that are incorporated also allow functions to be signaled or passed on to higherlevel control systems. The signals from the BKNE230-24 unit are received by the BKSE24-6 unit and evaluated individually. All BKNE230-24 units are triggered simultaneously. To BKSE24-6 can be connected max. 6 BKNE230-24.

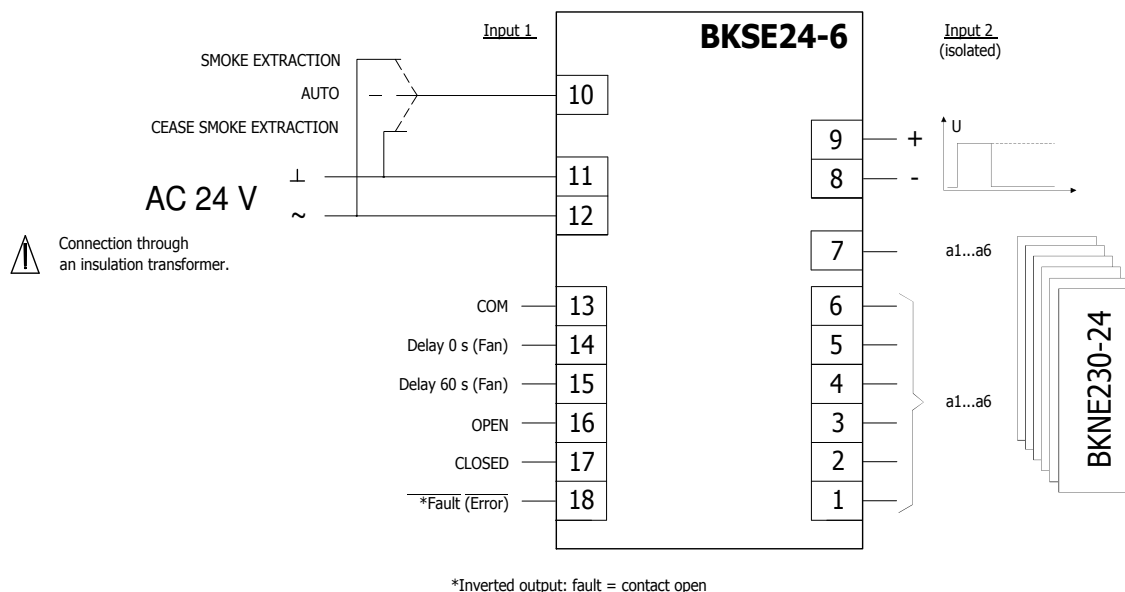
Communication is via the 2-wire conductor. Correct operation of the dampers is indicated by means of two LEDs. The operating status of the SBSE-Control system and any faults are also indicated by this LED and the corresponding fault LED.

The BKSE24-6 unit can be clipped directly to a 35 mm DIN mounting rail and connected by means of two 9-pole plug-in terminals.

Tab. 3.1.1. Communication and control devices BKSE 24-6

Communication and control devices	BKSE 24-6
Nominal voltage	AC 24 V 50/60Hz
Power consumption	3,5 W (operating position)
Dimensioning	5,5 VA 18 VA (I _{max} 6.4 A @ 2.5 ms)
Protection class	III
Degree of protection	IP 20
Ambient temperature range	0 ... + 50 °C
Connecting	screw terminals for cable 2x1,5 mm ²

Fig. 16 Communication and control devices BKSE 24-6



4. Dimensions, weights

4.1. Dimensions

Fig. 17 Square MSD (MSD-W) - design with actuating mechanism

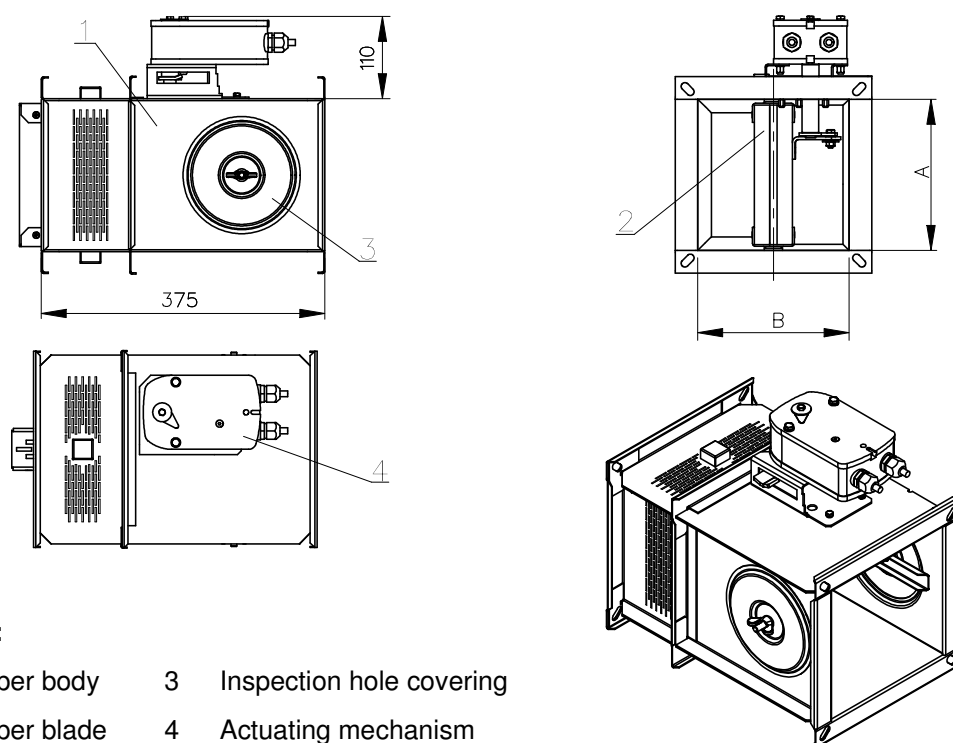
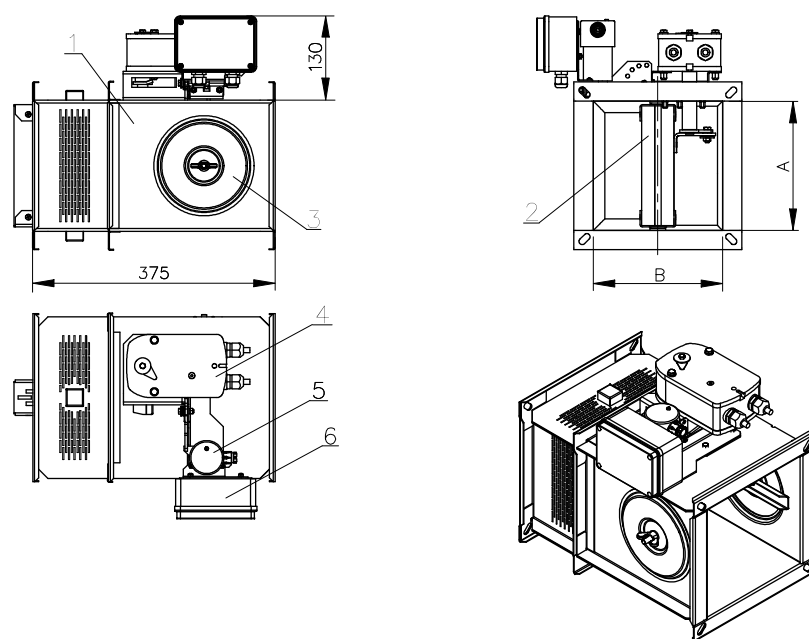
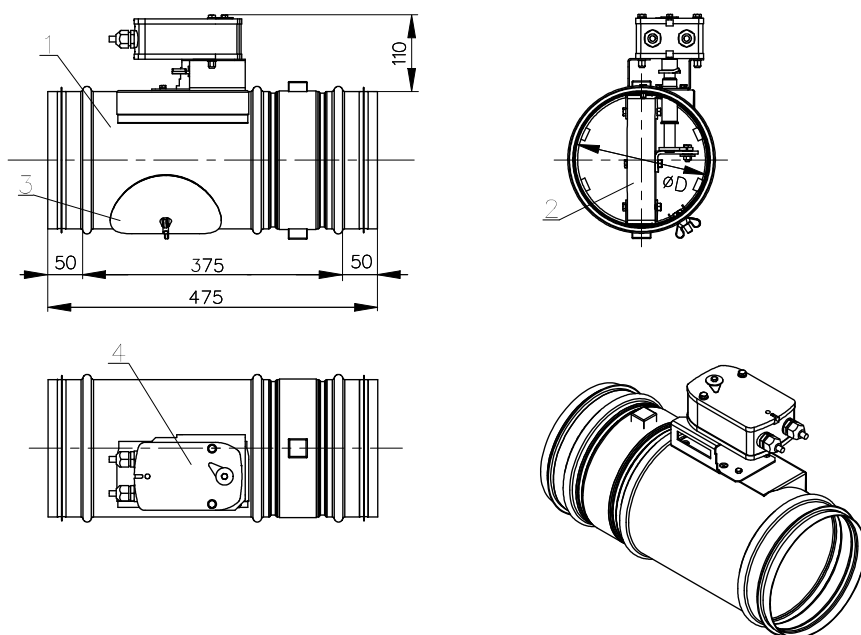


Fig. 18 Square MSD - design with electric actuating mechanism with emergency function and electromagnet

**Position:**

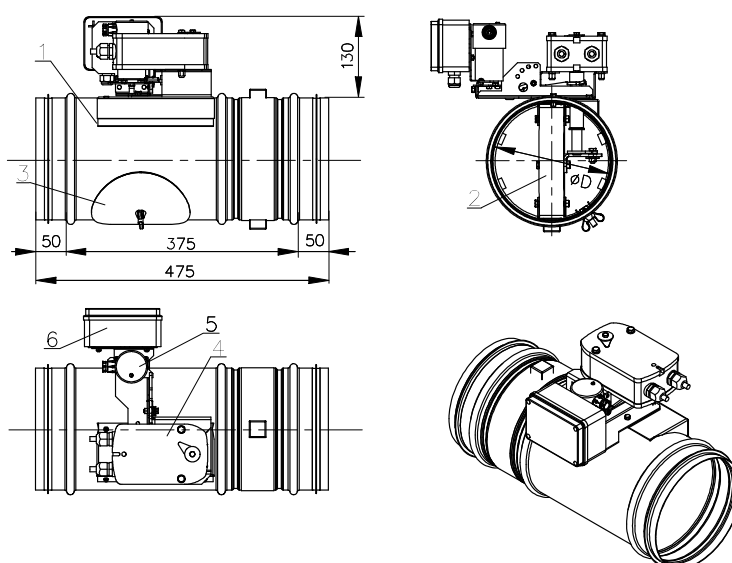
- | | | | |
|---|--------------------------|---|--------------------------|
| 1 | Damper body | 4 | Actuating mechanism |
| 2 | Damper blade | 5 | Electromagnet (solenoid) |
| 3 | Inspection hole covering | 6 | Pulse switch SIEM24 |

Fig. 19 Round MSD (MD-W) - design with actuating mechanism

**Position:**

- | | | | |
|---|--------------|---|--------------------------|
| 1 | Damper body | 3 | Inspection hole covering |
| 2 | Damper blade | 4 | Actuating mechanism |

Fig. 20 Round MSD (MSD-W) - design with electric actuating mechanism with emergency function and electromagnet



Position:

- | | | | |
|---|--------------------------|---|--------------------------|
| 1 | Damper body | 4 | Actuating mechanism |
| 2 | Damper blade | 5 | Electromagnet (solenoid) |
| 3 | Inspection hole covering | 6 | Pulse switch SIEM24 |

4.2. Weight and effective area

Tab. 4.2.1. Weight and effective area - square dampers

Size AxB	Overlaps		Effective area $S_{ef} [m^2]$	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
160 x 180	-	19	0,0162	11,2	BELIMO BLE	11,7	BELIMO BLF	12,2	BELIMO BLE
160 x 200	-	29,0	0,0191	11,6	BELIMO BLE	12,1	BELIMO BLF	12,6	BELIMO BLE
160 x 225	-	41,5	0,0228	12,1	BELIMO BLE	12,6	BELIMO BLF	13,1	BELIMO BLE
160 x 250	-	54	0,0264	12,6	BELIMO BLE	13,1	BELIMO BLF	13,6	BELIMO BLE
160 x 280	-	69	0,0307	13,3	BELIMO BLE	13,8	BELIMO BLF	14,3	BELIMO BLE
160 x 300	-	79,0	0,0336	13,7	BELIMO BLE	14,2	BELIMO BLF	14,7	BELIMO BLE
160 x 315	-	86,5	0,0358	14,0	BELIMO BLE	14,5	BELIMO BLF	15,0	BELIMO BLE
160 x 355	-	106,5	0,0416	14,8	BELIMO BLE	15,3	BELIMO BLF	15,8	BELIMO BLE
160 x 400	-	129	0,0481	15,8	BELIMO BLE	16,3	BELIMO BLF	16,8	BELIMO BLE
160 x 450	-	154	0,0554	16,8	BELIMO BLE	17,3	BELIMO BLF	17,8	BELIMO BLE
160 x 500	-	179	0,0626	17,8	BELIMO BLE	18,3	BELIMO BLF	18,8	BELIMO BLE
160 x 550	-	204	0,0699	18,9	BELIMO BLE	19,4	BELIMO BLF	19,9	BELIMO BLE
160 x 560	-	209	0,0713	19,1	BELIMO BLE	19,6	BELIMO BLF	20,1	BELIMO BLE
160 x 600	-	229	0,0771	19,9	BELIMO BLE	20,4	BELIMO BLF	20,9	BELIMO BLE
160 x 630	-	244	0,0815	20,5	BELIMO BLE	21,0	BELIMO BLF	21,5	BELIMO BLE
160 x 650	9	254	0,0844	20,9	BELIMO BLE	21,4	BELIMO BLF	21,9	BELIMO BLE
160 x 700	34	279	0,0916	22,0	BELIMO BLE	24,3	JOVENTA DAFx.20S	23,0	BELIMO BLE
160 x 710	39	284	0,0931	22,2	BELIMO BLE	24,5	JOVENTA DAFx.20S	23,2	BELIMO BLE
160 x 750	59	304	0,0989	23,0	BELIMO BLE	25,3	JOVENTA DAFx.20S	24,0	BELIMO BLE
160 x 800	84	329	0,1061	24,0	BELIMO BLE	26,4	JOVENTA DAFx.20S	25,0	BELIMO BLE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
180 x 180	-	19	0,0185	11,6	BELIMO BLE	12,1	BELIMO BLF	12,6	BELIMO BLE
180 x 200	-	29	0,0218	12,0	BELIMO BLE	12,5	BELIMO BLF	13,0	BELIMO BLE
180 x 225	-	42	0,0259	12,5	BELIMO BLE	13,0	BELIMO BLF	13,5	BELIMO BLE
180 x 250	-	54	0,0300	13,1	BELIMO BLE	13,6	BELIMO BLF	14,1	BELIMO BLE
180 x 280	-	69	0,0350	13,7	BELIMO BLE	14,2	BELIMO BLF	14,7	BELIMO BLE
180 x 300	-	79	0,0383	14,2	BELIMO BLE	14,7	BELIMO BLF	15,2	BELIMO BLE
180 x 315	-	87	0,0408	14,5	BELIMO BLE	15,0	BELIMO BLF	15,5	BELIMO BLE
180 x 355	-	107	0,0474	15,3	BELIMO BLE	15,8	BELIMO BLF	16,3	BELIMO BLE
180 x 400	-	129	0,0548	16,3	BELIMO BLE	16,8	BELIMO BLF	17,3	BELIMO BLE
180 x 450	-	154	0,0630	17,4	BELIMO BLE	17,9	BELIMO BLF	18,4	BELIMO BLE
180 x 500	-	179	0,0713	18,5	BELIMO BLE	19,0	BELIMO BLF	19,5	BELIMO BLE
180 x 550	-	204	0,0795	19,6	BELIMO BLE	20,1	BELIMO BLF	20,6	BELIMO BLE
180 x 560	-	209	0,0812	19,8	BELIMO BLE	20,3	BELIMO BLF	20,8	BELIMO BLE
180 x 600	-	229	0,0878	20,6	BELIMO BLE	21,1	BELIMO BLF	21,6	BELIMO BLE
180 x 630	-	244	0,0927	21,3	BELIMO BLE	21,8	BELIMO BLF	22,3	BELIMO BLE
180 x 650	9	254	0,0960	21,7	BELIMO BLE	22,2	BELIMO BLF	22,7	BELIMO BLE
180 x 700	34	279	0,1043	22,8	BELIMO BLE	25,1	JOVENTA DAFx.20S	23,8	BELIMO BLE
180 x 710	39	284	0,1059	23,0	BELIMO BLE	25,3	JOVENTA DAFx.20S	24,0	BELIMO BLE
180 x 750	59	304	0,1125	23,9	BELIMO BLE	26,2	JOVENTA DAFx.20S	24,9	BELIMO BLE
180 x 800	84	329	0,1208	25,0	BELIMO BLE	27,3	JOVENTA DAFx.20S	26,0	BELIMO BLE
200 x 180	-	19	0,0207	11,9	BELIMO BLE	12,4	BELIMO BLF	12,9	BELIMO BLE
200 x 200	-	29	0,0244	12,4	BELIMO BLE	12,9	BELIMO BLF	13,4	BELIMO BLE
200 x 225	-	42	0,0290	12,9	BELIMO BLE	13,4	BELIMO BLF	13,9	BELIMO BLE
200 x 250	-	54	0,0337	13,5	BELIMO BLE	14,0	BELIMO BLF	14,5	BELIMO BLE
200 x 280	-	69	0,0392	14,2	BELIMO BLE	14,7	BELIMO BLF	15,2	BELIMO BLE
200 x 300	-	79	0,0429	14,6	BELIMO BLE	15,1	BELIMO BLF	15,6	BELIMO BLE
200 x 315	-	87	0,0457	15,0	BELIMO BLE	15,5	BELIMO BLF	16,0	BELIMO BLE
200 x 355	-	107	0,0531	15,9	BELIMO BLE	16,4	BELIMO BLF	16,9	BELIMO BLE
200 x 400	-	129	0,0614	16,9	BELIMO BLE	17,4	BELIMO BLF	17,9	BELIMO BLE
200 x 450	-	154	0,0707	18,0	BELIMO BLE	18,5	BELIMO BLF	19,0	BELIMO BLE
200 x 500	-	179	0,0799	19,1	BELIMO BLE	19,6	BELIMO BLF	20,1	BELIMO BLE
200 x 550	-	204	0,0892	20,3	BELIMO BLE	20,8	BELIMO BLF	21,3	BELIMO BLE
200 x 560	-	209	0,0910	20,5	BELIMO BLE	21,0	BELIMO BLF	21,5	BELIMO BLE
200 x 600	-	229	0,0984	21,4	BELIMO BLE	21,9	BELIMO BLF	22,4	BELIMO BLE
200 x 630	-	244	0,1040	22,1	BELIMO BLE	22,6	BELIMO BLF	23,1	BELIMO BLE
200 x 650	9	254	0,1077	22,5	BELIMO BLE	23,0	BELIMO BLF	23,5	BELIMO BLE
200 x 700	34	279	0,1169	23,6	BELIMO BLE	26,0	JOVENTA DAFx.20S	24,6	BELIMO BLE
200 x 710	39	284	0,1188	23,9	BELIMO BLE	26,2	JOVENTA DAFx.20S	24,9	BELIMO BLE
200 x 750	59	304	0,1262	24,8	BELIMO BLE	27,1	JOVENTA DAFx.20S	25,8	BELIMO BLE
200 x 800	84	329	0,1354	25,9	BELIMO BLE	28,2	JOVENTA DAFx.20S	26,9	BELIMO BLE
225 x 180	-	19	0,0235	12,4	BELIMO BLE	12,9	BELIMO BLF	13,4	BELIMO BLE
225 x 200	-	29	0,0277	12,8	BELIMO BLE	13,3	BELIMO BLF	13,8	BELIMO BLE
225 x 225	-	42	0,0330	13,4	BELIMO BLE	13,9	BELIMO BLF	14,4	BELIMO BLE
225 x 250	-	54	0,0382	14,0	BELIMO BLE	14,5	BELIMO BLF	15,0	BELIMO BLE
225 x 280	-	69	0,0445	14,7	BELIMO BLE	15,2	BELIMO BLF	15,7	BELIMO BLE
225 x 300	-	79	0,0487	15,2	BELIMO BLE	15,7	BELIMO BLF	16,2	BELIMO BLE
225 x 315	-	87	0,0519	15,6	BELIMO BLE	16,1	BELIMO BLF	16,6	BELIMO BLE
225 x 355	-	107	0,0603	16,5	BELIMO BLE	17,0	BELIMO BLF	17,5	BELIMO BLE
225 x 400	-	129	0,0697	17,6	BELIMO BLE	18,1	BELIMO BLF	18,6	BELIMO BLE
225 x 450	-	154	0,0802	18,7	BELIMO BLE	19,2	BELIMO BLF	19,7	BELIMO BLE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
225 x 500	-	179	0,0907	19,9	BELIMO BLE	20,4	BELIMO BLF	20,9	BELIMO BLE
225 x 550	-	204	0,1012	21,1	BELIMO BLE	21,6	BELIMO BLF	22,1	BELIMO BLE
225 x 560	-	209	0,1033	21,3	BELIMO BLE	21,8	BELIMO BLF	22,3	BELIMO BLE
225 x 600	-	229	0,1117	22,3	BELIMO BLE	22,8	BELIMO BLF	23,3	BELIMO BLE
225 x 630	-	244	0,1180	23,0	BELIMO BLE	25,3	JOVENTA DAFx.20S	24,0	BELIMO BLE
225 x 650	9	254	0,1222	23,4	BELIMO BLE	25,8	JOVENTA DAFx.20S	24,4	BELIMO BLE
225 x 700	34	279	0,1327	24,6	BELIMO BLE	26,9	JOVENTA DAFx.20S	25,6	BELIMO BLE
225 x 710	39	284	0,1348	24,9	BELIMO BLE	27,2	JOVENTA DAFx.20S	25,9	BELIMO BLE
225 x 750	59	304	0,1432	25,8	BELIMO BLE	28,1	JOVENTA DAFx.20S	26,8	BELIMO BLE
225 x 800	84	329	0,1537	27,0	BELIMO BLE	29,3	JOVENTA DAFx.20S	28,0	BELIMO BLE
250 x 180	-	19	0,0263	12,8	BELIMO BLE	13,3	BELIMO BLF	13,8	BELIMO BLE
250 x 200	-	29	0,0310	13,3	BELIMO BLE	13,8	BELIMO BLF	14,3	BELIMO BLE
250 x 225	-	42	0,0369	13,9	BELIMO BLE	14,4	BELIMO BLF	14,9	BELIMO BLE
250 x 250	-	54	0,0428	14,6	BELIMO BLE	15,1	BELIMO BLF	15,6	BELIMO BLE
250 x 280	-	69	0,0498	15,3	BELIMO BLE	15,8	BELIMO BLF	16,3	BELIMO BLE
250 x 300	-	79	0,0545	15,8	BELIMO BLE	16,3	BELIMO BLF	16,8	BELIMO BLE
250 x 315	-	87	0,0580	16,1	BELIMO BLE	16,6	BELIMO BLF	17,1	BELIMO BLE
250 x 355	-	107	0,0674	17,1	BELIMO BLE	17,6	BELIMO BLF	18,1	BELIMO BLE
250 x 400	-	129	0,0780	18,2	BELIMO BLE	18,7	BELIMO BLF	19,2	BELIMO BLE
250 x 450	-	154	0,0898	19,4	BELIMO BLE	19,9	BELIMO BLF	20,4	BELIMO BLE
250 x 500	-	179	0,1015	20,7	BELIMO BLE	21,2	BELIMO BLF	21,7	BELIMO BLE
250 x 550	-	204	0,1133	21,9	BELIMO BLE	22,4	BELIMO BLF	22,9	BELIMO BLE
250 x 560	-	209	0,1156	22,1	BELIMO BLE	22,6	BELIMO BLF	23,1	BELIMO BLE
250 x 600	-	229	0,1250	23,1	BELIMO BLE	25,4	JOVENTA DAFx.20S	24,1	BELIMO BLE
250 x 630	-	244	0,1321	23,8	BELIMO BLE	26,2	JOVENTA DAFx.20S	24,8	BELIMO BLE
250 x 650	9	254	0,1368	24,3	BELIMO BLE	26,7	JOVENTA DAFx.20S	25,3	BELIMO BLE
250 x 700	34	279	0,1485	25,6	BELIMO BLE	27,9	JOVENTA DAFx.20S	26,6	BELIMO BLE
250 x 710	39	284	0,1509	25,8	BELIMO BLE	28,1	JOVENTA DAFx.20S	26,8	BELIMO BLE
250 x 750	59	304	0,1603	26,8	BELIMO BLE	29,1	JOVENTA DAFx.20S	27,8	BELIMO BLE
250 x 800	84	329	0,1720	28,0	BELIMO BLE	30,3	JOVENTA DAFx.20S	29,0	BELIMO BLE
280 x 180	-	19	0,0297	13,4	BELIMO BLE	13,9	BELIMO BLF	14,4	BELIMO BLE
280 x 200	-	29	0,0350	13,9	BELIMO BLE	14,4	BELIMO BLF	14,9	BELIMO BLE
280 x 225	-	42	0,0416	14,5	BELIMO BLE	15,0	BELIMO BLF	15,5	BELIMO BLE
280 x 250	-	54	0,0482	15,2	BELIMO BLE	15,7	BELIMO BLF	16,2	BELIMO BLE
280 x 280	-	69	0,0562	15,9	BELIMO BLE	16,4	BELIMO BLF	16,9	BELIMO BLE
280 x 300	-	79	0,0615	16,5	BELIMO BLE	17,0	BELIMO BLF	17,5	BELIMO BLE
280 x 315	-	87	0,0655	16,8	BELIMO BLE	17,3	BELIMO BLF	17,8	BELIMO BLE
280 x 355	-	107	0,0761	17,9	BELIMO BLE	18,4	BELIMO BLF	18,9	BELIMO BLE
280 x 400	-	129	0,0880	19,0	BELIMO BLE	19,5	BELIMO BLF	20,0	BELIMO BLE
280 x 450	-	154	0,1012	20,3	BELIMO BLE	20,8	BELIMO BLF	21,3	BELIMO BLE
280 x 500	-	179	0,1145	21,6	BELIMO BLE	22,1	BELIMO BLF	22,6	BELIMO BLE
280 x 550	-	204	0,1277	22,8	BELIMO BLE	23,3	BELIMO BLF	23,8	BELIMO BLE
280 x 560	-	209	0,1304	23,1	BELIMO BLE	25,4	JOVENTA DAFx.20S	24,1	BELIMO BLE
280 x 600	-	229	0,1410	24,1	BELIMO BLE	26,4	JOVENTA DAFx.20S	25,1	BELIMO BLE
280 x 630	-	244	0,1489	24,9	BELIMO BLE	27,2	JOVENTA DAFx.20S	25,9	BELIMO BLE
280 x 650	9	254	0,1542	25,4	BELIMO BLE	27,7	JOVENTA DAFx.20S	26,4	BELIMO BLE
280 x 700	34	279	0,1675	26,7	BELIMO BLE	29,0	JOVENTA DAFx.20S	27,7	BELIMO BLE
280 x 710	39	284	0,1701	26,9	BELIMO BLE	29,2	JOVENTA DAFx.20S	27,9	BELIMO BLE
280 x 750	59	304	0,1807	27,9	BELIMO BLE	30,3	JOVENTA DAFx.20S	28,9	BELIMO BLE
280 x 800	84	329	0,1940	29,2	BELIMO BLE	31,5	JOVENTA DAFx.20S	30,2	BELIMO BLE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
300 x 180	-	19	0,0319	13,7	BELIMO BLE	14,2	BELIMO BLF	14,7	BELIMO BLE
300 x 200	-	29	0,0376	14,3	BELIMO BLE	14,8	BELIMO BLF	15,3	BELIMO BLE
300 x 225	-	42	0,0447	14,9	BELIMO BLE	15,4	BELIMO BLF	15,9	BELIMO BLE
300 x 250	-	54	0,0519	15,6	BELIMO BLE	16,1	BELIMO BLF	16,6	BELIMO BLE
300 x 280	-	69	0,0604	16,4	BELIMO BLE	16,9	BELIMO BLF	17,4	BELIMO BLE
300 x 300	-	79	0,0661	16,9	BELIMO BLE	17,4	BELIMO BLF	17,9	BELIMO BLE
300 x 315	-	87	0,0704	17,3	BELIMO BLE	17,8	BELIMO BLF	18,3	BELIMO BLE
300 x 355	-	107	0,0818	18,4	BELIMO BLE	18,9	BELIMO BLF	19,4	BELIMO BLE
300 x 400	-	129	0,0946	19,5	BELIMO BLE	20,0	BELIMO BLF	20,5	BELIMO BLE
300 x 450	-	154	0,1089	20,8	BELIMO BLE	21,3	BELIMO BLF	21,8	BELIMO BLE
300 x 500	-	179	0,1231	22,2	BELIMO BLE	22,7	BELIMO BLF	23,2	BELIMO BLE
300 x 550	-	204	0,1374	23,5	BELIMO BLE	25,8	JOVENTA DAFx.20S	24,5	BELIMO BLE
300 x 560	-	209	0,1402	23,7	BELIMO BLE	26,1	JOVENTA DAFx.20S	24,7	BELIMO BLE
300 x 600	-	229	0,1516	24,8	BELIMO BLE	27,1	JOVENTA DAFx.20S	25,8	BELIMO BLE
300 x 630	-	244	0,1602	25,6	BELIMO BLE	27,9	JOVENTA DAFx.20S	26,6	BELIMO BLE
300 x 650	9	254	0,1659	26,1	BELIMO BLE	28,4	JOVENTA DAFx.20S	27,1	BELIMO BLE
300 x 700	34	279	0,1801	27,4	BELIMO BLE	29,7	JOVENTA DAFx.20S	28,4	BELIMO BLE
300 x 710	39	284	0,1830	27,7	BELIMO BLE	30,0	JOVENTA DAFx.20S	28,7	BELIMO BLE
300 x 750	59	304	0,1944	28,7	BELIMO BLE	31,0	JOVENTA DAFx.20S	29,7	BELIMO BLE
300 x 800	84	329	0,2086	30,0	BELIMO BLE	32,4	JOVENTA DAFx.20S	31,0	BELIMO BLE
315 x 180	-	19	0,0336	14,0	BELIMO BLE	14,5	BELIMO BLF	15,0	BELIMO BLE
315 x 200	-	29	0,0396	14,6	BELIMO BLE	15,1	BELIMO BLF	15,6	BELIMO BLE
315 x 225	-	42	0,0471	15,2	BELIMO BLE	15,7	BELIMO BLF	16,2	BELIMO BLE
315 x 250	-	54	0,0546	15,9	BELIMO BLE	16,4	BELIMO BLF	16,9	BELIMO BLE
315 x 280	-	69	0,0636	16,7	BELIMO BLE	17,2	BELIMO BLF	17,7	BELIMO BLE
315 x 300	-	79	0,0696	17,3	BELIMO BLE	17,8	BELIMO BLF	18,3	BELIMO BLE
315 x 315	-	87	0,0741	17,7	BELIMO BLE	18,2	BELIMO BLF	18,7	BELIMO BLE
315 x 355	-	107	0,0861	18,7	BELIMO BLE	19,2	BELIMO BLF	19,7	BELIMO BLE
315 x 400	-	129	0,0996	19,9	BELIMO BLE	20,4	BELIMO BLF	20,9	BELIMO BLE
315 x 450	-	154	0,1146	21,3	BELIMO BLE	21,8	BELIMO BLF	22,3	BELIMO BLE
315 x 500	-	179	0,1296	22,6	BELIMO BLE	23,1	BELIMO BLF	23,6	BELIMO BLE
315 x 550	-	204	0,1446	23,9	BELIMO BLE	26,3	JOVENTA DAFx.20S	24,9	BELIMO BLE
315 x 560	-	209	0,1476	24,2	BELIMO BLE	26,5	JOVENTA DAFx.20S	25,2	BELIMO BLE
315 x 600	-	229	0,1596	25,3	BELIMO BLE	27,6	JOVENTA DAFx.20S	26,3	BELIMO BLE
315 x 630	-	244	0,1686	26,1	BELIMO BLE	28,4	JOVENTA DAFx.20S	27,1	BELIMO BLE
315 x 650	9	254	0,1746	26,6	BELIMO BLE	28,9	JOVENTA DAFx.20S	27,6	BELIMO BLE
315 x 700	34	279	0,1896	28,0	BELIMO BLE	30,3	JOVENTA DAFx.20S	29,0	BELIMO BLE
315 x 710	39	284	0,1926	28,2	BELIMO BLE	30,6	JOVENTA DAFx.20S	29,2	BELIMO BLE
315 x 750	59	304	0,2046	29,3	BELIMO BLE	31,6	JOVENTA DAFx.20S	30,3	BELIMO BLE
315 x 800	84	329	0,2196	30,6	BELIMO BLE	33,0	JOVENTA DAFx.20S	31,6	BELIMO BLE
355 x 180	-	19	0,0381	14,7	BELIMO BLE	15,2	BELIMO BLF	15,7	BELIMO BLE
355 x 200	-	29	0,0449	15,3	BELIMO BLE	15,8	BELIMO BLF	16,3	BELIMO BLE
355 x 225	-	42	0,0534	16,0	BELIMO BLE	16,5	BELIMO BLF	17,0	BELIMO BLE
355 x 250	-	54	0,0619	16,7	BELIMO BLE	17,2	BELIMO BLF	17,7	BELIMO BLE
355 x 280	-	69	0,0721	17,6	BELIMO BLE	18,1	BELIMO BLF	18,6	BELIMO BLE
355 x 300	-	79	0,0789	18,2	BELIMO BLE	18,7	BELIMO BLF	19,2	BELIMO BLE
355 x 315	-	87	0,0840	18,6	BELIMO BLE	19,1	BELIMO BLF	19,6	BELIMO BLE
355 x 355	-	107	0,0976	19,7	BELIMO BLE	20,2	BELIMO BLF	20,7	BELIMO BLE
355 x 400	-	129	0,1129	21,0	BELIMO BLE	21,5	BELIMO BLF	22,0	BELIMO BLE
355 x 450	-	154	0,1299	22,4	BELIMO BLE	22,9	BELIMO BLF	23,4	BELIMO BLE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
355 x 500	-	179	0,1469	23,8	BELIMO BLE	26,1	JOVENTA DAFx.20S	24,8	BELIMO BLE
355 x 550	-	204	0,1639	25,2	BELIMO BLE	27,5	JOVENTA DAFx.20S	26,2	BELIMO BLE
355 x 560	-	209	0,1673	25,5	BELIMO BLE	27,8	JOVENTA DAFx.20S	26,5	BELIMO BLE
355 x 600	-	229	0,1809	26,6	BELIMO BLE	28,9	JOVENTA DAFx.20S	27,6	BELIMO BLE
355 x 630	-	244	0,1911	27,5	BELIMO BLE	29,8	JOVENTA DAFx.20S	28,5	BELIMO BLE
355 x 650	9	254	0,1979	28,0	BELIMO BLE	30,4	JOVENTA DAFx.20S	29,0	BELIMO BLE
355 x 700	34	279	0,2149	29,5	BELIMO BLE	31,8	JOVENTA DAFx.20S	30,5	BELIMO BLE
355 x 710	39	284	0,2183	29,7	BELIMO BLE	32,1	JOVENTA DAFx.20S	30,7	BELIMO BLE
355 x 750	59	304	0,2319	30,9	BELIMO BLE	33,2	JOVENTA DAFx.20S	31,9	BELIMO BLE
355 x 800	84	329	0,2489	33,3	BELIMO BE	34,6	JOVENTA DAFx.20S	34,3	BELIMO BE
400 x 180	-	19	0,0431	15,5	BELIMO BLE	16,0	BELIMO BLF	16,5	BELIMO BLE
400 x 200	-	29	0,0508	16,2	BELIMO BLE	16,7	BELIMO BLF	17,2	BELIMO BLE
400 x 225	-	42	0,0604	16,9	BELIMO BLE	17,4	BELIMO BLF	17,9	BELIMO BLE
400 x 250	-	54	0,0701	17,7	BELIMO BLE	18,2	BELIMO BLF	18,7	BELIMO BLE
400 x 280	-	69	0,0816	18,6	BELIMO BLE	19,1	BELIMO BLF	19,6	BELIMO BLE
400 x 300	-	79	0,0893	19,2	BELIMO BLE	19,7	BELIMO BLF	20,2	BELIMO BLE
400 x 315	-	87	0,0951	19,6	BELIMO BLE	20,1	BELIMO BLF	20,6	BELIMO BLE
400 x 355	-	107	0,1105	20,8	BELIMO BLE	21,3	BELIMO BLF	21,8	BELIMO BLE
400 x 400	-	129	0,1278	22,2	BELIMO BLE	22,7	BELIMO BLF	23,2	BELIMO BLE
400 x 450	-	154	0,1471	23,7	BELIMO BLE	24,2	BELIMO BLF	24,7	BELIMO BLE
400 x 500	-	179	0,1663	25,2	BELIMO BLE	27,5	JOVENTA DAFx.20S	26,2	BELIMO BLE
400 x 550	-	204	0,1856	26,6	BELIMO BLE	29,0	JOVENTA DAFx.20S	27,6	BELIMO BLE
400 x 560	-	209	0,1894	26,9	BELIMO BLE	29,3	JOVENTA DAFx.20S	27,9	BELIMO BLE
400 x 600	-	229	0,2048	28,1	BELIMO BLE	30,5	JOVENTA DAFx.20S	29,1	BELIMO BLE
400 x 630	-	244	0,2164	29,0	BELIMO BLE	31,4	JOVENTA DAFx.20S	30,0	BELIMO BLE
400 x 650	9	254	0,2241	29,6	BELIMO BLE	31,9	JOVENTA DAFx.20S	30,6	BELIMO BLE
400 x 700	34	279	0,2433	31,1	BELIMO BLE	33,4	JOVENTA DAFx.20S	32,1	BELIMO BLE
400 x 710	39	284	0,2472	31,4	BELIMO BLE	33,7	JOVENTA DAFx.20S	32,4	BELIMO BLE
400 x 750	59	304	0,2626	32,6	BELIMO BLE	34,9	JOVENTA DAFx.20S	33,6	BELIMO BLE
400 x 800	84	329	0,2818	35,1	BELIMO BE	36,4	JOVENTA DAFx.20S	36,1	BELIMO BE
450 x 180	-	19	0,0487	16,5	BELIMO BLE	17,0	BELIMO BLF	17,5	BELIMO BLE
450 x 200	-	29	0,0574	17,1	BELIMO BLE	17,6	BELIMO BLF	18,1	BELIMO BLE
450 x 225	-	42	0,0683	17,9	BELIMO BLE	18,4	BELIMO BLF	18,9	BELIMO BLE
450 x 250	-	54	0,0792	18,7	BELIMO BLE	19,2	BELIMO BLF	19,7	BELIMO BLE
450 x 280	-	69	0,0922	19,7	BELIMO BLE	20,2	BELIMO BLF	20,7	BELIMO BLE
450 x 300	-	79	0,1009	20,3	BELIMO BLE	20,8	BELIMO BLF	21,3	BELIMO BLE
450 x 315	-	87	0,1074	20,8	BELIMO BLE	21,3	BELIMO BLF	21,8	BELIMO BLE
450 x 355	-	107	0,1248	22,1	BELIMO BLE	22,6	BELIMO BLF	23,1	BELIMO BLE
450 x 400	-	129	0,1444	23,5	BELIMO BLE	24,0	BELIMO BLF	24,5	BELIMO BLE
450 x 450	-	154	0,1662	25,1	BELIMO BLE	27,4	JOVENTA DAFx.20S	26,1	BELIMO BLE
450 x 500	-	179	0,1879	26,6	BELIMO BLE	29,0	JOVENTA DAFx.20S	27,6	BELIMO BLE
450 x 550	-	204	0,2097	28,2	BELIMO BLE	30,6	JOVENTA DAFx.20S	29,2	BELIMO BLE
450 x 560	-	209	0,2140	28,5	BELIMO BLE	30,9	JOVENTA DAFx.20S	29,5	BELIMO BLE
450 x 600	-	229	0,2314	29,8	BELIMO BLE	32,1	JOVENTA DAFx.20S	30,8	BELIMO BLE
450 x 630	-	244	0,2445	30,8	BELIMO BLE	33,1	JOVENTA DAFx.20S	31,8	BELIMO BLE
450 x 650	9	254	0,2532	31,4	BELIMO BLE	33,7	JOVENTA DAFx.20S	32,4	BELIMO BLE
450 x 700	34	279	0,2749	33,0	BELIMO BLE	35,3	JOVENTA DAFx.20S	34,0	BELIMO BLE
450 x 710	39	284	0,2793	33,3	BELIMO BLE	35,6	JOVENTA DAFx.20S	34,3	BELIMO BLE
450 x 750	59	304	0,2967	34,6	BELIMO BLE	36,9	JOVENTA DAFx.20S	35,6	BELIMO BLE
450 x 800	84	329	0,3184	37,2	BELIMO BE	38,5	JOVENTA DAFx.20S	38,2	BELIMO BE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
500 x 180	-	19	0,0543	17,4	BELIMO BLE	17,9	BELIMO BLF	18,4	BELIMO BLE
500 x 200	-	29	0,0640	18,1	BELIMO BLE	18,6	BELIMO BLF	19,1	BELIMO BLE
500 x 225	-	42	0,0761	18,9	BELIMO BLE	19,4	BELIMO BLF	19,9	BELIMO BLE
500 x 250	-	54	0,0883	19,8	BELIMO BLE	20,3	BELIMO BLF	20,8	BELIMO BLE
500 x 280	-	69	0,1028	20,8	BELIMO BLE	21,3	BELIMO BLF	21,8	BELIMO BLE
500 x 300	-	79	0,1125	21,5	BELIMO BLE	22,0	BELIMO BLF	22,5	BELIMO BLE
500 x 315	-	87	0,1198	22,0	BELIMO BLE	22,5	BELIMO BLF	23,0	BELIMO BLE
500 x 355	-	107	0,1392	23,3	BELIMO BLE	23,8	BELIMO BLF	24,3	BELIMO BLE
500 x 400	-	129	0,1610	24,8	BELIMO BLE	25,3	BELIMO BLF	25,8	BELIMO BLE
500 x 450	-	154	0,1853	26,5	BELIMO BLE	28,8	JOVENTA DAFx.20S	27,5	BELIMO BLE
500 x 500	-	179	0,2095	28,1	BELIMO BLE	30,5	JOVENTA DAFx.20S	29,1	BELIMO BLE
500 x 550	-	204	0,2338	29,8	BELIMO BLE	32,1	JOVENTA DAFx.20S	30,8	BELIMO BLE
500 x 560	-	209	0,2386	30,2	BELIMO BLE	32,5	JOVENTA DAFx.20S	31,2	BELIMO BLE
500 x 600	-	229	0,2580	31,5	BELIMO BLE	33,8	JOVENTA DAFx.20S	32,5	BELIMO BLE
500 x 630	-	244	0,2726	32,5	BELIMO BLE	34,8	JOVENTA DAFx.20S	33,5	BELIMO BLE
500 x 650	9	254	0,2823	33,2	BELIMO BLE	35,5	JOVENTA DAFx.20S	34,2	BELIMO BLE
500 x 700	34	279	0,3065	34,8	BELIMO BLE	37,2	JOVENTA DAFx.20S	35,8	BELIMO BLE
500 x 710	39	284	0,3114	35,2	BELIMO BLE	37,5	JOVENTA DAFx.20S	36,2	BELIMO BLE
500 x 750	59	304	0,3308	37,5	BELIMO BE	38,8	JOVENTA DAFx.20S	37,5	BELIMO BLE
500 x 800	84	329	0,3550	39,2	BELIMO BE	40,5	JOVENTA DAFx.20S	40,2	BELIMO BE
550 x 180	-	19	0,0599	18,3	BELIMO BLE	18,8	BELIMO BLF	19,3	BELIMO BLE
550 x 200	-	29	0,0706	19,0	BELIMO BLE	19,5	BELIMO BLF	20,0	BELIMO BLE
550 x 225	-	42	0,0840	19,9	BELIMO BLE	20,4	BELIMO BLF	20,9	BELIMO BLE
550 x 250	-	54	0,0974	20,8	BELIMO BLE	21,3	BELIMO BLF	21,8	BELIMO BLE
550 x 280	-	69	0,1134	21,9	BELIMO BLE	22,4	BELIMO BLF	22,9	BELIMO BLE
550 x 300	-	79	0,1241	22,6	BELIMO BLE	23,1	BELIMO BLF	23,6	BELIMO BLE
550 x 315	-	87	0,1321	23,1	BELIMO BLE	23,6	BELIMO BLF	24,1	BELIMO BLE
550 x 355	-	107	0,1535	24,5	BELIMO BLE	25,0	BELIMO BLF	25,5	BELIMO BLE
550 x 400	-	129	0,1776	26,1	BELIMO BLE	28,4	JOVENTA DAFx.20S	27,1	BELIMO BLE
550 x 450	-	154	0,2044	27,9	BELIMO BLE	30,2	JOVENTA DAFx.20S	28,9	BELIMO BLE
550 x 500	-	179	0,2311	29,6	BELIMO BLE	32,0	JOVENTA DAFx.20S	30,6	BELIMO BLE
550 x 550	-	204	0,2579	31,4	BELIMO BLE	33,7	JOVENTA DAFx.20S	32,4	BELIMO BLE
550 x 560	-	209	0,2632	31,8	BELIMO BLE	34,1	JOVENTA DAFx.20S	32,8	BELIMO BLE
550 x 600	-	229	0,2846	33,2	BELIMO BLE	35,5	JOVENTA DAFx.20S	34,2	BELIMO BLE
550 x 630	-	244	0,3007	34,2	BELIMO BLE	36,5	JOVENTA DAFx.20S	35,2	BELIMO BLE
550 x 650	9	254	0,3114	34,9	BELIMO BLE	37,2	JOVENTA DAFx.20S	35,9	BELIMO BLE
550 x 700	34	279	0,3381	36,7	BELIMO BLE	39,0	JOVENTA DAFx.20S	37,7	BELIMO BLE
550 x 710	39	284	0,3435	37,0	BELIMO BLE	39,4	JOVENTA DAFx.20S	38,0	BELIMO BLE
550 x 750	59	304	0,3649	39,5	BELIMO BE	40,8	JOVENTA DAFx.20S	40,5	BELIMO BE
550 x 800	84	329	0,3916	41,2	BELIMO BE	42,5	JOVENTA DAFx.20S	42,2	BELIMO BE
560 x 180	-	19	0,0610	18,4	BELIMO BLE	18,9	BELIMO BLF	19,4	BELIMO BLE
560 x 200	-	29	0,0719	19,2	BELIMO BLE	19,7	BELIMO BLF	20,2	BELIMO BLE
560 x 225	-	42	0,0856	20,1	BELIMO BLE	20,6	BELIMO BLF	21,1	BELIMO BLE
560 x 250	-	54	0,0992	21,0	BELIMO BLE	21,5	BELIMO BLF	22,0	BELIMO BLE
560 x 280	-	69	0,1155	22,1	BELIMO BLE	22,6	BELIMO BLF	23,1	BELIMO BLE
560 x 300	-	79	0,1264	22,8	BELIMO BLE	23,3	BELIMO BLF	23,8	BELIMO BLE
560 x 315	-	87	0,1346	23,4	BELIMO BLE	23,9	BELIMO BLF	24,4	BELIMO BLE
560 x 355	-	107	0,1564	24,8	BELIMO BLE	25,3	BELIMO BLF	25,8	BELIMO BLE
560 x 400	-	129	0,1809	26,4	BELIMO BLE	28,7	JOVENTA DAFx.20S	27,4	BELIMO BLE
560 x 450	-	154	0,2082	28,2	BELIMO BLE	30,5	JOVENTA DAFx.20S	29,2	BELIMO BLE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
560 x 500	-	179	0,2354	29,9	BELIMO BLE	32,3	JOVENTA DAFx.20S	30,9	BELIMO BLE
560 x 550	-	204	0,2627	31,7	BELIMO BLE	34,0	JOVENTA DAFx.20S	32,7	BELIMO BLE
560 x 560	-	209	0,2681	32,1	BELIMO BLE	34,4	JOVENTA DAFx.20S	33,1	BELIMO BLE
560 x 600	-	229	0,2899	33,5	BELIMO BLE	35,8	JOVENTA DAFx.20S	34,5	BELIMO BLE
560 x 630	-	244	0,3063	34,6	BELIMO BLE	36,9	JOVENTA DAFx.20S	35,6	BELIMO BLE
560 x 650	9	254	0,3172	35,3	BELIMO BLE	37,6	JOVENTA DAFx.20S	36,3	BELIMO BLE
560 x 700	34	279	0,3444	37,1	BELIMO BLE	39,4	JOVENTA DAFx.20S	38,1	BELIMO BLE
560 x 710	39	284	0,3499	38,4	BELIMO BE	39,7	JOVENTA DAFx.20S	38,4	BELIMO BLE
560 x 750	59	304	0,3717	39,9	BELIMO BE	41,2	JOVENTA DAFx.20S	40,9	BELIMO BE
560 x 800	84	329	0,3989	41,6	BELIMO BE	42,9	JOVENTA DAFx.20S	42,6	BELIMO BE
600 x 180	-	19	0,0655	19,2	BELIMO BLE	19,7	BELIMO BLF	20,2	BELIMO BLE
600 x 200	-	29	0,0772	20,0	BELIMO BLE	20,5	BELIMO BLF	21,0	BELIMO BLE
600 x 225	-	42	0,0918	20,9	BELIMO BLE	21,4	BELIMO BLF	21,9	BELIMO BLE
600 x 250	-	54	0,1065	21,9	BELIMO BLE	22,4	BELIMO BLF	22,9	BELIMO BLE
600 x 280	-	69	0,1240	23,0	BELIMO BLE	23,5	BELIMO BLF	24,0	BELIMO BLE
600 x 300	-	79	0,1357	23,7	BELIMO BLE	24,2	BELIMO BLF	24,7	BELIMO BLE
600 x 315	-	87	0,1445	24,3	BELIMO BLE	24,8	BELIMO BLF	25,3	BELIMO BLE
600 x 355	-	107	0,1679	25,8	BELIMO BLE	26,3	BELIMO BLF	26,8	BELIMO BLE
600 x 400	-	129	0,1942	27,4	BELIMO BLE	29,8	JOVENTA DAFx.20S	28,4	BELIMO BLE
600 x 450	-	154	0,2235	29,3	BELIMO BLE	31,6	JOVENTA DAFx.20S	30,3	BELIMO BLE
600 x 500	-	179	0,2527	31,1	BELIMO BLE	33,5	JOVENTA DAFx.20S	32,1	BELIMO BLE
600 x 550	-	204	0,2820	33,0	BELIMO BLE	35,3	JOVENTA DAFx.20S	34,0	BELIMO BLE
600 x 560	-	209	0,2878	33,4	BELIMO BLE	35,7	JOVENTA DAFx.20S	34,4	BELIMO BLE
600 x 600	-	229	0,3112	34,8	BELIMO BLE	37,2	JOVENTA DAFx.20S	35,8	BELIMO BLE
600 x 630	-	244	0,3288	36,0	BELIMO BLE	38,3	JOVENTA DAFx.20S	37,0	BELIMO BLE
600 x 650	9	254	0,3405	36,7	BELIMO BLE	39,0	JOVENTA DAFx.20S	37,7	BELIMO BLE
600 x 700	34	279	0,3697	39,6	BELIMO BE	40,9	JOVENTA DAFx.20S	39,5	BELIMO BLE
600 x 710	39	284	0,3756	39,9	BELIMO BE	41,2	JOVENTA DAFx.20S	40,9	BELIMO BE
600 x 750	59	304	0,3990	41,4	BELIMO BE	42,7	JOVENTA DAFx.20S	42,4	BELIMO BE
600 x 800	84	329	0,4282	43,3	BELIMO BE	44,6	JOVENTA DAFx.20S	44,3	BELIMO BE
630 x 180	-	19	0,0689	19,7	BELIMO BLE	20,2	BELIMO BLF	20,7	BELIMO BLE
630 x 200	-	29	0,0812	20,6	BELIMO BLE	21,1	BELIMO BLF	21,6	BELIMO BLE
630 x 225	-	42	0,0966	21,5	BELIMO BLE	22,0	BELIMO BLF	22,5	BELIMO BLE
630 x 250	-	54	0,1119	22,5	BELIMO BLE	23,0	BELIMO BLF	23,5	BELIMO BLE
630 x 280	-	69	0,1304	23,6	BELIMO BLE	24,1	BELIMO BLF	24,6	BELIMO BLE
630 x 300	-	79	0,1427	24,4	BELIMO BLE	24,9	BELIMO BLF	25,4	BELIMO BLE
630 x 315	-	87	0,1519	25,0	BELIMO BLE	25,5	BELIMO BLF	26,0	BELIMO BLE
630 x 355	-	107	0,1765	26,5	BELIMO BLE	27,0	BELIMO BLF	27,5	BELIMO BLE
630 x 400	-	129	0,2042	28,2	BELIMO BLE	30,5	JOVENTA DAFx.20S	29,2	BELIMO BLE
630 x 450	-	154	0,2349	30,1	BELIMO BLE	32,4	JOVENTA DAFx.20S	31,1	BELIMO BLE
630 x 500	-	179	0,2657	32,0	BELIMO BLE	34,4	JOVENTA DAFx.20S	33,0	BELIMO BLE
630 x 550	-	204	0,2964	33,9	BELIMO BLE	36,3	JOVENTA DAFx.20S	34,9	BELIMO BLE
630 x 560	-	209	0,3026	34,3	BELIMO BLE	36,6	JOVENTA DAFx.20S	35,3	BELIMO BLE
630 x 600	-	229	0,3272	35,8	BELIMO BLE	38,2	JOVENTA DAFx.20S	36,8	BELIMO BLE
630 x 630	-	244	0,3456	37,0	BELIMO BLE	39,3	JOVENTA DAFx.20S	38,0	BELIMO BLE
630 x 650	9	254	0,3579	37,8	BELIMO BLE	40,1	JOVENTA DAFx.20S	38,8	BELIMO BLE
630 x 700	34	279	0,3887	40,7	BELIMO BE	42,0	JOVENTA DAFx.20S	40,7	BELIMO BLE
630 x 710	39	284	0,3948	41,1	BELIMO BE	42,4	JOVENTA DAFx.20S	42,1	BELIMO BE
630 x 750	59	304	0,4194	42,6	BELIMO BE	43,9	JOVENTA DAFx.20S	43,6	BELIMO BE
630 x 800	84	329	0,4502	44,5	BELIMO BE	45,8	JOVENTA DAFx.20S	45,5	BELIMO BE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
650 x 180	-	19	0,0711	20,1	BELIMO BLE	20,6	BELIMO BLF	21,1	BELIMO BLE
650 x 200	-	29	0,0838	20,9	BELIMO BLE	21,4	BELIMO BLF	21,9	BELIMO BLE
650 x 225	-	42	0,0997	22,0	BELIMO BLE	22,5	BELIMO BLF	23,0	BELIMO BLE
650 x 250	-	54	0,1156	22,9	BELIMO BLE	23,4	BELIMO BLF	23,9	BELIMO BLE
650 x 280	-	69	0,1346	24,1	BELIMO BLE	24,6	BELIMO BLF	25,1	BELIMO BLE
650 x 300	-	79	0,1473	24,9	BELIMO BLE	25,4	BELIMO BLF	25,9	BELIMO BLE
650 x 315	-	87	0,1568	25,4	BELIMO BLE	25,9	BELIMO BLF	26,4	BELIMO BLE
650 x 355	-	107	0,1822	27,0	BELIMO BLE	27,5	BELIMO BLF	28,0	BELIMO BLE
650 x 400	-	129	0,2108	28,7	BELIMO BLE	31,1	JOVENTA DAFx.20S	29,7	BELIMO BLE
650 x 450	-	154	0,2426	30,7	BELIMO BLE	33,0	JOVENTA DAFx.20S	31,7	BELIMO BLE
650 x 500	-	179	0,2743	32,6	BELIMO BLE	35,0	JOVENTA DAFx.20S	33,6	BELIMO BLE
650 x 550	-	204	0,3061	34,6	BELIMO BLE	36,9	JOVENTA DAFx.20S	35,6	BELIMO BLE
650 x 560	-	209	0,3124	35,0	BELIMO BLE	37,3	JOVENTA DAFx.20S	36,0	BELIMO BLE
650 x 600	-	229	0,3378	36,5	BELIMO BLE	38,8	JOVENTA DAFx.20S	37,5	BELIMO BLE
650 x 630	-	244	0,3569	37,7	BELIMO BLE	40,0	JOVENTA DAFx.20S	38,7	BELIMO BLE
650 x 650	9	254	0,3696	38,5	BELIMO BLE	40,8	JOVENTA DAFx.20S	39,5	BELIMO BLE
650 x 700	34	279	0,4013	41,4	BELIMO BE	42,7	JOVENTA DAFx.20S	42,4	BELIMO BE
650 x 710	39	284	0,4077	41,8	BELIMO BE	43,1	JOVENTA DAFx.20S	42,8	BELIMO BE
650 x 750	59	304	0,4331	43,4	BELIMO BE	44,7	JOVENTA DAFx.20S	44,4	BELIMO BE
650 x 800	84	329	0,4648	45,3	BELIMO BE	46,6	JOVENTA DAFx.20S	46,3	BELIMO BE
700 x 180	-	19	0,0767	21,0	BELIMO BLE	21,5	BELIMO BLF	22,0	BELIMO BLE
700 x 200	-	29	0,0904	21,9	BELIMO BLE	22,4	BELIMO BLF	22,9	BELIMO BLE
700 x 225	-	42	0,1075	23,0	BELIMO BLE	23,5	BELIMO BLF	24,0	BELIMO BLE
700 x 250	-	54	0,1247	24,0	BELIMO BLE	24,5	BELIMO BLF	25,0	BELIMO BLE
700 x 280	-	69	0,1452	25,2	BELIMO BLE	25,7	BELIMO BLF	26,2	BELIMO BLE
700 x 300	-	79	0,1589	26,0	BELIMO BLE	26,5	BELIMO BLF	27,0	BELIMO BLE
700 x 315	-	87	0,1692	26,6	BELIMO BLE	27,1	BELIMO BLF	27,6	BELIMO BLE
700 x 355	-	107	0,1966	28,2	BELIMO BLE	30,6	JOVENTA DAFx.20S	29,2	BELIMO BLE
700 x 400	-	129	0,2274	30,1	BELIMO BLE	32,4	JOVENTA DAFx.20S	31,1	BELIMO BLE
700 x 450	-	154	0,2617	32,1	BELIMO BLE	34,4	JOVENTA DAFx.20S	33,1	BELIMO BLE
700 x 500	-	179	0,2959	34,1	BELIMO BLE	36,4	JOVENTA DAFx.20S	35,1	BELIMO BLE
700 x 550	-	204	0,3302	36,2	BELIMO BLE	38,5	JOVENTA DAFx.20S	37,2	BELIMO BLE
700 x 560	-	209	0,3370	36,6	BELIMO BLE	38,9	JOVENTA DAFx.20S	37,6	BELIMO BLE
700 x 600	-	229	0,3644	38,2	BELIMO BLE	40,5	JOVENTA DAFx.20S	39,2	BELIMO BLE
700 x 630	-	244	0,3850	39,4	BELIMO BLE	41,7	JOVENTA DAFx.20S	40,4	BELIMO BLE
700 x 650	9	254	0,3987	41,2	BELIMO BE	42,5	JOVENTA DAFx.20S	42,2	BELIMO BE
700 x 700	34	279	0,4329	43,3	BELIMO BE	44,6	JOVENTA DAFx.20S	44,3	BELIMO BE
700 x 710	39	284	0,4398	43,7	BELIMO BE	45,0	JOVENTA DAFx.20S	44,7	BELIMO BE
700 x 750	59	304	0,4672	45,3	BELIMO BE	46,6	JOVENTA DAFx.20S	46,3	BELIMO BE
700 x 800	84	329	0,5014	47,3	BELIMO BE	48,6	JOVENTA DAFx.20S	48,3	BELIMO BE
710 x 180	-	19	0,0778	21,2	BELIMO BLE	21,7	BELIMO BLF	22,2	BELIMO BLE
710 x 200	-	29	0,0917	22,1	BELIMO BLE	22,6	BELIMO BLF	23,1	BELIMO BLE
710 x 225	-	42	0,1091	23,2	BELIMO BLE	23,7	BELIMO BLF	24,2	BELIMO BLE
710 x 250	-	54	0,1265	24,2	BELIMO BLE	24,7	BELIMO BLF	25,2	BELIMO BLE
710 x 280	-	69	0,1473	25,4	BELIMO BLE	25,9	BELIMO BLF	26,4	BELIMO BLE
710 x 300	-	79	0,1612	26,2	BELIMO BLE	26,7	BELIMO BLF	27,2	BELIMO BLE
710 x 315	-	87	0,1717	26,8	BELIMO BLE	27,3	BELIMO BLF	27,8	BELIMO BLE
710 x 355	-	107	0,1995	28,5	BELIMO BLE	30,8	JOVENTA DAFx.20S	29,5	BELIMO BLE
710 x 400	-	129	0,2307	30,3	BELIMO BLE	32,6	JOVENTA DAFx.20S	31,3	BELIMO BLE
710 x 450	-	154	0,2655	32,4	BELIMO BLE	34,7	JOVENTA DAFx.20S	33,4	BELIMO BLE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
710 x 500	-	179	0,3002	34,4	BELIMO BLE	36,7	JOVENTA DAFx.20S	35,4	BELIMO BLE
710 x 550	-	204	0,3350	36,5	BELIMO BLE	38,8	JOVENTA DAFx.20S	37,5	BELIMO BLE
710 x 560	-	209	0,3419	36,9	BELIMO BLE	39,2	JOVENTA DAFx.20S	37,9	BELIMO BLE
710 x 600	-	229	0,3697	38,5	BELIMO BLE	40,8	JOVENTA DAFx.20S	39,5	BELIMO BLE
710 x 630	-	244	0,3906	40,8	BELIMO BE	42,1	JOVENTA DAFx.20S	40,8	BELIMO BLE
710 x 650	9	254	0,4045	41,6	BELIMO BE	42,9	JOVENTA DAFx.20S	42,6	BELIMO BE
710 x 700	34	279	0,4392	43,7	BELIMO BE	45,0	JOVENTA DAFx.20S	44,7	BELIMO BE
710 x 710	39	284	0,4462	44,1	BELIMO BE	45,4	JOVENTA DAFx.20S	45,1	BELIMO BE
710 x 750	59	304	0,4740	45,7	BELIMO BE	47,0	JOVENTA DAFx.20S	46,7	BELIMO BE
710 x 800	84	329	0,5087	47,8	BELIMO BE	49,1	JOVENTA DAFx.20S	48,8	BELIMO BE
750 x 180	-	19	0,0823	21,9	BELIMO BLE	22,4	BELIMO BLF	22,9	BELIMO BLE
750 x 200	-	29	0,0970	22,8	BELIMO BLE	23,3	BELIMO BLF	23,8	BELIMO BLE
750 x 225	-	42	0,1154	24,0	BELIMO BLE	24,5	BELIMO BLF	25,0	BELIMO BLE
750 x 250	-	54	0,1338	25,0	BELIMO BLE	25,5	BELIMO BLF	26,0	BELIMO BLE
750 x 280	-	69	0,1558	26,3	BELIMO BLE	26,8	BELIMO BLF	27,3	BELIMO BLE
750 x 300	-	79	0,1705	27,1	BELIMO BLE	27,6	BELIMO BLF	28,1	BELIMO BLE
750 x 315	-	87	0,1815	27,8	BELIMO BLE	28,3	BELIMO BLF	28,8	BELIMO BLE
750 x 355	-	107	0,2109	29,5	BELIMO BLE	31,8	JOVENTA DAFx.20S	30,5	BELIMO BLE
750 x 400	-	129	0,2440	31,4	BELIMO BLE	33,7	JOVENTA DAFx.20S	32,4	BELIMO BLE
750 x 450	-	154	0,2808	33,5	BELIMO BLE	35,8	JOVENTA DAFx.20S	34,5	BELIMO BLE
750 x 500	-	179	0,3175	35,6	BELIMO BLE	37,9	JOVENTA DAFx.20S	36,6	BELIMO BLE
750 x 550	-	204	0,3543	37,7	BELIMO BLE	40,1	JOVENTA DAFx.20S	38,7	BELIMO BLE
750 x 560	-	209	0,3616	38,2	BELIMO BLE	40,5	JOVENTA DAFx.20S	39,2	BELIMO BLE
750 x 600	-	229	0,3910	39,9	BELIMO BLE	42,2	JOVENTA DAFx.20S	40,9	BELIMO BLE
750 x 630	-	244	0,4131	42,2	BELIMO BE	43,5	JOVENTA DAFx.20S	42,1	BELIMO BLE
750 x 650	9	254	0,4278	43,0	BELIMO BE	44,3	JOVENTA DAFx.20S	44,0	BELIMO BE
750 x 700	34	279	0,4645	45,1	BELIMO BE	46,4	JOVENTA DAFx.20S	46,1	BELIMO BE
750 x 710	39	284	0,4719	45,6	BELIMO BE	46,9	JOVENTA DAFx.20S	46,6	BELIMO BE
750 x 750	59	304	0,5013	47,3	BELIMO BE	48,6	JOVENTA DAFx.20S	48,3	BELIMO BE
750 x 800	84	329	0,5380	49,4	BELIMO BE	50,7	JOVENTA DAFx.20S	50,4	BELIMO BE
800 x 180	-	19	0,0879	22,8	BELIMO BLE	23,3	BELIMO BLF	23,8	BELIMO BLE
800 x 200	-	29	0,1036	23,8	BELIMO BLE	24,3	BELIMO BLF	24,8	BELIMO BLE
800 x 225	-	42	0,1232	25,0	BELIMO BLE	25,5	BELIMO BLF	26,0	BELIMO BLE
800 x 250	-	54	0,1429	26,1	BELIMO BLE	26,6	BELIMO BLF	27,1	BELIMO BLE
800 x 280	-	69	0,1664	27,4	BELIMO BLE	27,9	BELIMO BLF	28,4	BELIMO BLE
800 x 300	-	79	0,1821	28,3	BELIMO BLE	28,8	BELIMO BLF	29,3	BELIMO BLE
800 x 315	-	87	0,1939	28,9	BELIMO BLE	29,4	BELIMO BLF	29,9	BELIMO BLE
800 x 355	-	107	0,2253	30,7	BELIMO BLE	33,0	JOVENTA DAFx.20S	31,7	BELIMO BLE
800 x 400	-	129	0,2606	32,7	BELIMO BLE	35,0	JOVENTA DAFx.20S	33,7	BELIMO BLE
800 x 450	-	154	0,2999	34,9	BELIMO BLE	37,2	JOVENTA DAFx.20S	35,9	BELIMO BLE
800 x 500	-	179	0,3391	37,1	BELIMO BLE	39,4	JOVENTA DAFx.20S	38,1	BELIMO BLE
800 x 550	-	204	0,3784	39,3	BELIMO BLE	41,7	JOVENTA DAFx.20S	40,3	BELIMO BLE
800 x 560	-	209	0,3862	39,8	BELIMO BLE	42,1	JOVENTA DAFx.20S	40,8	BELIMO BLE
800 x 600	-	229	0,4176	42,6	BELIMO BE	43,9	JOVENTA DAFx.20S	42,5	BELIMO BLE
800 x 630	-	244	0,4412	43,9	BELIMO BE	45,2	JOVENTA DAFx.20S	44,9	BELIMO BE
800 x 650	9	254	0,4569	44,8	BELIMO BE	46,1	JOVENTA DAFx.20S	45,8	BELIMO BE
800 x 700	34	279	0,4961	47,0	BELIMO BE	48,3	JOVENTA DAFx.20S	48,0	BELIMO BE
800 x 710	39	284	0,5040	47,4	BELIMO BE	48,7	JOVENTA DAFx.20S	48,4	BELIMO BE
800 x 750	59	304	0,5354	49,2	BELIMO BE	50,5	JOVENTA DAFx.20S	50,2	BELIMO BE
800 x 800	84	329	0,5746	51,4	BELIMO BE	52,7	JOVENTA DAFx.20S	52,4	BELIMO BE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
900 x 180	-	19	0,0991	24,6	BELIMO BLE	25,1	BELIMO BLF	25,6	BELIMO BLE
900 x 200	-	29	0,1168	25,7	BELIMO BLE	26,2	BELIMO BLF	26,7	BELIMO BLE
900 x 225	-	42	0,1389	27,0	BELIMO BLE	27,5	BELIMO BLF	28,0	BELIMO BLE
900 x 250	-	54	0,1611	28,2	BELIMO BLE	28,7	BELIMO BLF	29,2	BELIMO BLE
900 x 280	-	69	0,1876	29,6	BELIMO BLE	30,1	BELIMO BLF	30,6	BELIMO BLE
900 x 300	-	79	0,2053	30,5	BELIMO BLE	31,0	BELIMO BLF	31,5	BELIMO BLE
900 x 315	-	87	0,2186	31,3	BELIMO BLE	33,6	JOVENTA DAFx.20S	32,3	BELIMO BLE
900 x 355	-	107	0,2540	33,2	BELIMO BLE	35,5	JOVENTA DAFx.20S	34,2	BELIMO BLE
900 x 400	-	129	0,2938	35,3	BELIMO BLE	37,7	JOVENTA DAFx.20S	36,3	BELIMO BLE
900 x 450	-	154	0,3381	37,7	BELIMO BLE	40,0	JOVENTA DAFx.20S	38,7	BELIMO BLE
900 x 500	-	179	0,3823	40,1	BELIMO BLE	42,4	JOVENTA DAFx.20S	41,1	BELIMO BLE
900 x 550	-	204	0,4266	42,5	BELIMO BLE	44,8	JOVENTA DAFx.20S	43,5	BELIMO BLE
900 x 560	-	209	0,4354	44,0	BELIMO BE	45,3	JOVENTA DAFx.20S	45,0	BELIMO BE
900 x 600	-	229	0,4708	45,9	BELIMO BE	47,2	JOVENTA DAFx.20S	46,9	BELIMO BE
900 x 630	-	244	0,4974	47,4	BELIMO BE	48,7	JOVENTA DAFx.20S	48,4	BELIMO BE
900 x 650	9	254	0,5151	48,3	BELIMO BE	49,6	JOVENTA DAFx.20S	49,3	BELIMO BE
900 x 700	34	279	0,5593	50,7	BELIMO BE	52,0	JOVENTA DAFx.20S	51,7	BELIMO BE
900 x 710	39	284	0,5682	51,2	BELIMO BE	52,5	JOVENTA DAFx.20S	52,2	BELIMO BE
900 x 750	59	304	0,6036	53,1	BELIMO BE	54,4	JOVENTA DAFx.20S	54,1	BELIMO BE
900 x 800	84	329	0,6478	55,5	BELIMO BE	56,8	JOVENTA DAFx.20S	56,5	BELIMO BE
1000 x 180	-	19	0,1103	26,4	BELIMO BLE	26,9	BELIMO BLF	27,4	BELIMO BLE
1000 x 200	-	29	0,1300	27,6	BELIMO BLE	28,1	BELIMO BLF	28,6	BELIMO BLE
1000 x 225	-	42	0,1546	29,0	BELIMO BLE	29,5	BELIMO BLF	30,0	BELIMO BLE
1000 x 250	-	54	0,1793	30,3	BELIMO BLE	30,8	BELIMO BLF	31,3	BELIMO BLE
1000 x 280	-	69	0,2088	31,9	BELIMO BLE	32,4	BELIMO BLF	32,9	BELIMO BLE
1000 x 300	-	79	0,2285	32,9	BELIMO BLE	35,2	JOVENTA DAFx.20S	33,9	BELIMO BLE
1000 x 315	-	87	0,2433	33,7	BELIMO BLE	36,0	JOVENTA DAFx.20S	34,7	BELIMO BLE
1000 x 355	-	107	0,2827	35,8	BELIMO BLE	38,1	JOVENTA DAFx.20S	36,8	BELIMO BLE
1000 x 400	-	129	0,3270	38,1	BELIMO BLE	40,5	JOVENTA DAFx.20S	39,1	BELIMO BLE
1000 x 450	-	154	0,3763	40,7	BELIMO BLE	43,1	JOVENTA DAFx.20S	41,7	BELIMO BLE
1000 x 500	-	179	0,4255	43,4	BELIMO BLE	45,7	JOVENTA DAFx.20S	44,4	BELIMO BLE
1000 x 550	-	204	0,4748	47,0	BELIMO BE	48,3	JOVENTA DAFx.20S	47,0	BELIMO BLE
1000 x 560	-	209	0,4846	47,5	BELIMO BE	48,8	JOVENTA DAFx.20S	48,5	BELIMO BE
1000 x 600	-	229	0,5240	49,6	BELIMO BE	50,9	JOVENTA DAFx.20S	50,6	BELIMO BE
1000 x 630	-	244	0,5536	51,2	BELIMO BE	52,5	JOVENTA DAFx.20S	52,2	BELIMO BE
1000 x 650	9	254	0,5733	52,2	BELIMO BE	53,5	JOVENTA DAFx.20S	53,2	BELIMO BE
1000 x 700	34	279	0,6225	54,9	BELIMO BE	56,2	JOVENTA DAFx.20S	55,9	BELIMO BE
1000 x 710	39	284	0,6324	55,4	BELIMO BE	56,7	JOVENTA DAFx.20S	56,4	BELIMO BE
1000 x 750	59	304	0,6718	57,5	BELIMO BE	58,8	JOVENTA DAFx.20S	58,5	BELIMO BE
1000 x 800	84	329	0,7210	60,1	BELIMO BE	61,4	JOVENTA DAFx.20S	61,1	BELIMO BE
1100 x 180	-	19	0,1215	28,2	BELIMO BLE	28,7	BELIMO BLF	29,2	BELIMO BLE
1100 x 200	-	29	0,1432	29,5	BELIMO BLE	30,0	BELIMO BLF	30,5	BELIMO BLE
1100 x 225	-	42	0,1703	31,0	BELIMO BLE	31,5	BELIMO BLF	32,0	BELIMO BLE
1100 x 250	-	54	0,1975	32,4	BELIMO BLE	32,9	BELIMO BLF	33,4	BELIMO BLE
1100 x 280	-	69	0,2300	34,1	BELIMO BLE	34,6	BELIMO BLF	35,1	BELIMO BLE
1100 x 300	-	79	0,2517	35,2	BELIMO BLE	37,5	JOVENTA DAFx.20S	36,2	BELIMO BLE
1100 x 315	-	87	0,2680	36,0	BELIMO BLE	38,3	JOVENTA DAFx.20S	37,0	BELIMO BLE
1100 x 355	-	107	0,3114	38,2	BELIMO BLE	40,6	JOVENTA DAFx.20S	39,2	BELIMO BLE
1100 x 400	-	129	0,3602	40,8	BELIMO BLE	43,1	JOVENTA DAFx.20S	41,8	BELIMO BLE
1100 x 450	-	154	0,4145	43,6	BELIMO BLE	45,9	JOVENTA DAFx.20S	44,6	BELIMO BLE

Size AxB	Overlaps		Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
1100 x 500	-	179	0,4687	46,4	BELIMO BLE	48,7	JOVENTA DAFx.20S	48,4	BELIMO BE
1100 x 550	-	204	0,5230	50,2	BELIMO BE	51,5	JOVENTA DAFx.20S	51,2	BELIMO BE
1100 x 560	-	209	0,5338	50,7	BELIMO BE	52,0	JOVENTA DAFx.20S	51,7	BELIMO BE
1100 x 600	-	229	0,5772	53,0	BELIMO BE	54,3	JOVENTA DAFx.20S	54,0	BELIMO BE
1100 x 630	-	244	0,6098	54,7	BELIMO BE	56,0	JOVENTA DAFx.20S	55,7	BELIMO BE
1100 x 650	9	254	0,6315	55,8	BELIMO BE	57,1	JOVENTA DAFx.20S	56,8	BELIMO BE
1100 x 700	34	279	0,6857	58,6	BELIMO BE	59,9	JOVENTA DAFx.20S	59,6	BELIMO BE
1100 x 710	39	284	0,6966	59,1	BELIMO BE	60,4	JOVENTA DAFx.20S	60,1	BELIMO BE
1100 x 750	59	304	0,7400	61,4	BELIMO BE	62,7	JOVENTA DAFx.20S	62,4	BELIMO BE
1100 x 800	84	329	0,7942	64,2	BELIMO BE	65,5	JOVENTA DAFx.20S	65,2	BELIMO BE
1250 x 180	-	19	0,1383	30,9	BELIMO BLE	31,4	BELIMO BLF	31,9	BELIMO BLE
1250 x 200	-	29	0,1630	32,3	BELIMO BLE	32,8	BELIMO BLF	33,3	BELIMO BLE
1250 x 225	-	42	0,1939	34,0	BELIMO BLE	34,5	BELIMO BLF	35,0	BELIMO BLE
1250 x 250	-	54	0,2248	35,5	BELIMO BLE	36,0	BELIMO BLF	36,5	BELIMO BLE
1250 x 280	-	69	0,2618	37,4	BELIMO BLE	39,7	JOVENTA DAFx.20S	38,4	BELIMO BLE
1250 x 300	-	79	0,2865	38,6	BELIMO BLE	40,9	JOVENTA DAFx.20S	39,6	BELIMO BLE
1250 x 315	-	87	0,3050	39,5	BELIMO BLE	41,8	JOVENTA DAFx.20S	40,5	BELIMO BLE
1250 x 355	-	107	0,3544	42,0	BELIMO BLE	44,3	JOVENTA DAFx.20S	43,0	BELIMO BLE
1250 x 400	-	129	0,4100	44,7	BELIMO BLE	47,0	JOVENTA DAFx.20S	45,7	BELIMO BLE
1250 x 450	-	154	0,4718	47,8	BELIMO BLE	50,1	JOVENTA DAFx.20S	48,8	BELIMO BLE
1250 x 500	-	179	0,5335	51,9	BELIMO BE	53,2	JOVENTA DAFx.20S	52,9	BELIMO BE
1250 x 550	-	204	0,5953	54,9	BELIMO BE	56,2	JOVENTA DAFx.20S	55,9	BELIMO BE
1250 x 560	-	209	0,6076	55,5	BELIMO BE	56,8	JOVENTA DAFx.20S	56,5	BELIMO BE
1250 x 600	-	229	0,6570	58,0	BELIMO BE	59,3	JOVENTA DAFx.20S	59,0	BELIMO BE
1250 x 630	-	244	0,6941	59,8	BELIMO BE	61,1	JOVENTA DAFx.20S	60,8	BELIMO BE
1250 x 650	9	254	0,7188	61,1	BELIMO BE	62,4	JOVENTA DAFx.20S	62,1	BELIMO BE
1250 x 700	34	279	0,7805	64,1	BELIMO BE	65,4	JOVENTA DAFx.20S	65,1	BELIMO BE
1250 x 710	39	284	0,7929	64,8	BELIMO BE	66,1	JOVENTA DAFx.20S	65,8	BELIMO BE
1250 x 750	59	304	0,8423	67,2	BELIMO BE	68,5	JOVENTA DAFx.20S	68,2	BELIMO BE
1250 x 800	84	329	0,9040	70,3	BELIMO BE	71,6	JOVENTA DAFx.20S	71,3	BELIMO BE
1400 x 180	-	19	0,1551	33,7	BELIMO BLE	34,2	BELIMO BLF	34,7	BELIMO BLE
1400 x 200	-	29	0,1828	35,2	BELIMO BLE	35,7	BELIMO BLF	36,2	BELIMO BLE
1400 x 225	-	42	0,2174	37,0	BELIMO BLE	37,5	BELIMO BLF	38,0	BELIMO BLE
1400 x 250	-	54	0,2521	38,7	BELIMO BLE	41,0	JOVENTA DAF2.20S	39,7	BELIMO BLE
1400 x 280	-	69	0,2936	40,7	BELIMO BLE	43,0	JOVENTA DAF2.20S	41,7	BELIMO BLE
1400 x 300	-	79	0,3213	42,0	BELIMO BLE	44,3	JOVENTA DAF2.20S	43,0	BELIMO BLE
1400 x 315	-	87	0,3421	43,0	BELIMO BLE	45,3	JOVENTA DAF2.20S	44,0	BELIMO BLE
1400 x 355	-	107	0,3975	45,7	BELIMO BLE	48,0	JOVENTA DAF2.20S	46,7	BELIMO BLE
1400 x 400	-	129	0,4598	48,7	BELIMO BLE	51,0	JOVENTA DAF2.20S	49,7	BELIMO BLE
1400 x 450	-	154	0,5291	53,0	BELIMO BE	54,3	JOVENTA DAF2.20S	54,0	BELIMO BE
1400 x 500	-	179	0,5983	56,4	BELIMO BE	57,7	JOVENTA DAF2.20S	57,4	BELIMO BE
1400 x 550	-	204	0,6676	59,7	BELIMO BE	61,0	JOVENTA DAF2.20S	60,7	BELIMO BE
1400 x 560	-	209	0,6814	60,4	BELIMO BE	61,7	JOVENTA DAF2.20S	61,4	BELIMO BE
1400 x 600	-	229	0,7368	63,0	BELIMO BE	64,3	JOVENTA DAF2.20S	64,0	BELIMO BE
1400 x 630	-	244	0,7784	65,0	BELIMO BE	66,3	JOVENTA DAF2.20S	66,0	BELIMO BE
1400 x 650	9	254	0,8061	66,4	BELIMO BE	67,7	JOVENTA DAF2.20S	67,4	BELIMO BE
1400 x 700	34	279	0,8753	69,7	BELIMO BE	71,0	JOVENTA DAF2.20S	70,7	BELIMO BE
1400 x 710	39	284	0,8892	70,4	BELIMO BE	71,7	JOVENTA DAF2.20S	71,4	BELIMO BE
1400 x 750	59	304	0,9446	73,0	BELIMO BE	74,3	JOVENTA DAF2.20S	74,0	BELIMO BE
1400 x 800	84	329	1,0138	76,4	BELIMO BE	77,7	JOVENTA DAF2.20S	84,2	SCHISCHEK InMax 50.75

Size AxB	Overlaps		Effective area ₂ S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a	c		weight	actuator	weight	actuator	weight	actuator
1500 x 180	-	19	0,1663	35,5	BELIMO BLE	36,0	BELIMO BLF	36,5	BELIMO BLE
1500 x 200	-	29	0,1960	37,1	BELIMO BLE	37,6	BELIMO BLF	38,1	BELIMO BLE
1500 x 225	-	42	0,2331	39,0	BELIMO BLE	39,5	BELIMO BLF	40,0	BELIMO BLE
1500 x 250	-	54	0,2703	40,7	BELIMO BLE	43,1	JOVENTA DAFx.20S	41,7	BELIMO BLE
1500 x 280	-	69	0,3148	42,9	BELIMO BLE	45,2	JOVENTA DAFx.20S	43,9	BELIMO BLE
1500 x 300	-	79	0,3445	44,3	BELIMO BLE	46,6	JOVENTA DAFx.20S	45,3	BELIMO BLE
1500 x 315	-	87	0,3668	45,3	BELIMO BLE	47,6	JOVENTA DAFx.20S	46,3	BELIMO BLE
1500 x 355	-	107	0,4262	48,1	BELIMO BLE	50,4	JOVENTA DAFx.20S	49,1	BELIMO BLE
1500 x 400	-	129	0,4930	51,3	BELIMO BLE	53,6	JOVENTA DAFx.20S	52,3	BELIMO BLE
1500 x 450	-	154	0,5673	55,8	BELIMO BE	57,1	JOVENTA DAFx.20S	56,8	BELIMO BE
1500 x 500	-	179	0,6415	59,3	BELIMO BE	60,6	JOVENTA DAFx.20S	60,3	BELIMO BE
1500 x 550	-	204	0,7158	62,9	BELIMO BE	64,2	JOVENTA DAFx.20S	63,9	BELIMO BE
1500 x 560	-	209	0,7306	63,6	BELIMO BE	64,9	JOVENTA DAFx.20S	64,6	BELIMO BE
1500 x 600	-	229	0,7900	66,4	BELIMO BE	67,7	JOVENTA DAFx.20S	67,4	BELIMO BE
1500 x 630	-	244	0,8346	68,5	BELIMO BE	69,8	JOVENTA DAFx.20S	69,5	BELIMO BE
1500 x 650	9	254	0,8643	69,9	BELIMO BE	71,2	JOVENTA DAFx.20S	70,9	BELIMO BE
1500 x 700	34	279	0,9385	73,4	BELIMO BE	74,7	JOVENTA DAFx.20S	74,4	BELIMO BE
1500 x 710	39	284	0,9534	74,1	BELIMO BE	75,4	JOVENTA DAFx.20S	75,1	BELIMO BE
1500 x 750	59	304	1,0128	76,9	BELIMO BE	78,2	JOVENTA DAFx.20S	77,9	BELIMO BE
1500 x 800	84	329	1,0870	80,5	BELIMO BE	81,8	JOVENTA DAFx.20S	88,3	SCHISCHEK InMax 50.75

4.3. Weight and effective area

Tab. 4.3.1. Weight and effective area - round dampers

Size D	Overlaps	Effective area S _{ef} [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	f		weight	actuator	weight	actuator	weight	actuator
180	-	0,0160	9,1	BELIMO BLE	11,3	BELIMO BLF	9,1	BELIMO BLE
200	-	0,0208	9,5	BELIMO BLE	11,7	BELIMO BLF	9,5	BELIMO BLE
225	-	0,0277	10,1	BELIMO BLE	12,2	BELIMO BLF	10,1	BELIMO BLE
250	2,5	0,0356	10,7	BELIMO BLE	12,9	BELIMO BLF	10,7	BELIMO BLE
280	17,5	0,0463	11,4	BELIMO BLE	13,6	BELIMO BLF	11,4	BELIMO BLE
315	35	0,0607	12,5	BELIMO BLE	14,6	BELIMO BLF	12,5	BELIMO BLE
355	55	0,0794	13,6	BELIMO BLE	15,8	BELIMO BLF	13,6	BELIMO BLE
400	77,5	0,1035	15,1	BELIMO BLE	15,6	JOVENTA DAFx.20S	15,1	BELIMO BLE
450	102,5	0,1339	16,8	BELIMO BLE	17,3	JOVENTA DAFx.20S	16,8	BELIMO BLE
500	127,5	0,1683	18,7	BELIMO BLE	19,2	JOVENTA DAFx.20S	18,7	BELIMO BLE
560	157,5	0,2148	21,2	BELIMO BLE	21,7	JOVENTA DAFx.20S	21,2	BELIMO BLE
630	192,5	0,2762	24,3	BELIMO BLE	24,8	JOVENTA DAFx.20S	24,3	BELIMO BLE

- 4.3. For square damper (Fig. 21) the open damper blade overlaps the damper body by the value "c" or "a" and "c". These values are specified in the Tab. 4.2.1.

For round damper (Fig. 22) the open damper blade overlaps the damper body by the value "f". These values are specified in the Tab. 4.2.2.

Values "a", "c" and "f", has to be respected when projecting related smoke exhaust ducts.

Fig. 21 Value "a" a "c"

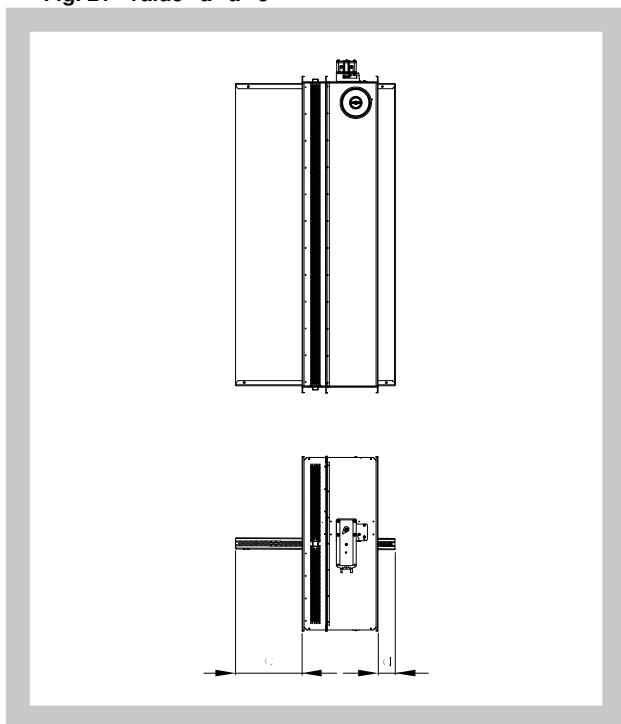
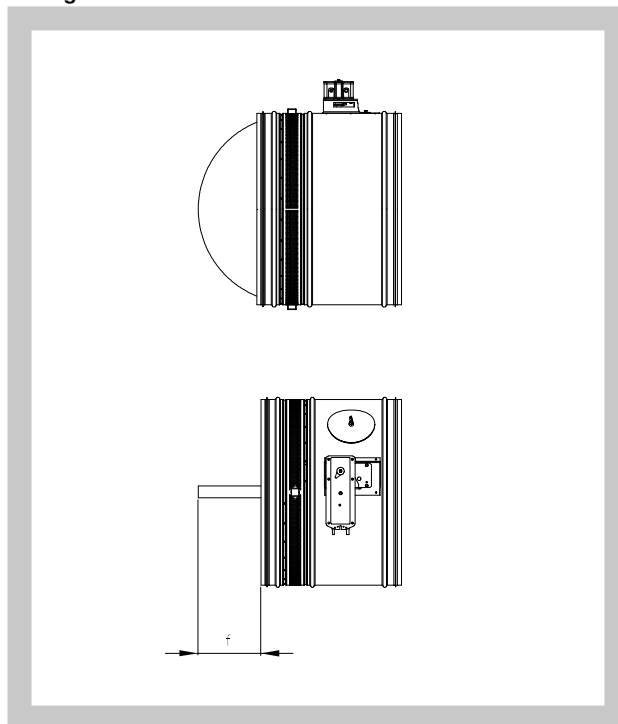


Fig. 22 Value "f"



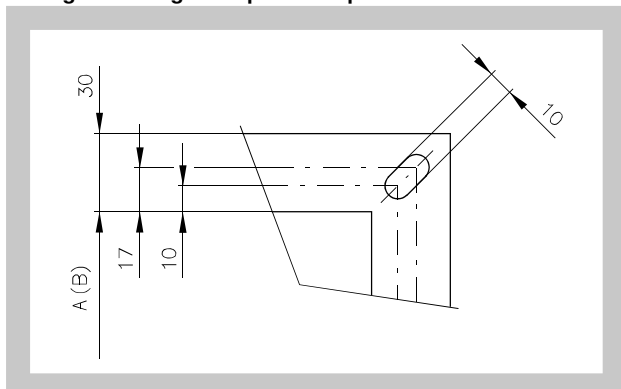
- 4.4. For the design .66 (with BKNE supply and communication device) add to weight of the damper with an actuating mechanism (from the Tab. 4.2.1. and 4.2.2.) the weight of BKNE (0.7 kg).

For the design .4M0, .4M1, .5M0 and .5M1 (with electric actuating mechanism with emergency function and electromagnet add to weight of the damper with an actuating mechanism (from the Tab. 4.2.1. and 4.2.2.) the weight of electromagnet (1 kg).

- 4.5. Square dampers can be supplied on the customer's demands in all subdimension of the above mentioned range.

- 4.6. Flanges of square fire dampers are 30 mm wide with oval hole (Fig. 23).
In case of damper installation into SPIRO duct, round dampers are supplied without the flanges so as it is possible to connect them with external joints.

Fig. 23 Flange of square damper



5. Placement and Assembly

- 5.1.** Multi smoke extraction dampers are designed to remove heat and combustion products (e.g. smoke) from fire compartments according EN1366-8. Multi smoke extraction dampers are designed to horizontal or vertical installation with arbitrary blade axis position. To provide needed access space to the control device, all other objects must be situated at least 350 mm from the control parts of the damper.
- 5.2.** The distance between the fire damper:
- distance 200 mm between dampers installed in the duct;
 - distance 75 mm between damper and construction (wall/ceiling).

Fig. 24 The distance between the smoke damper and the construction

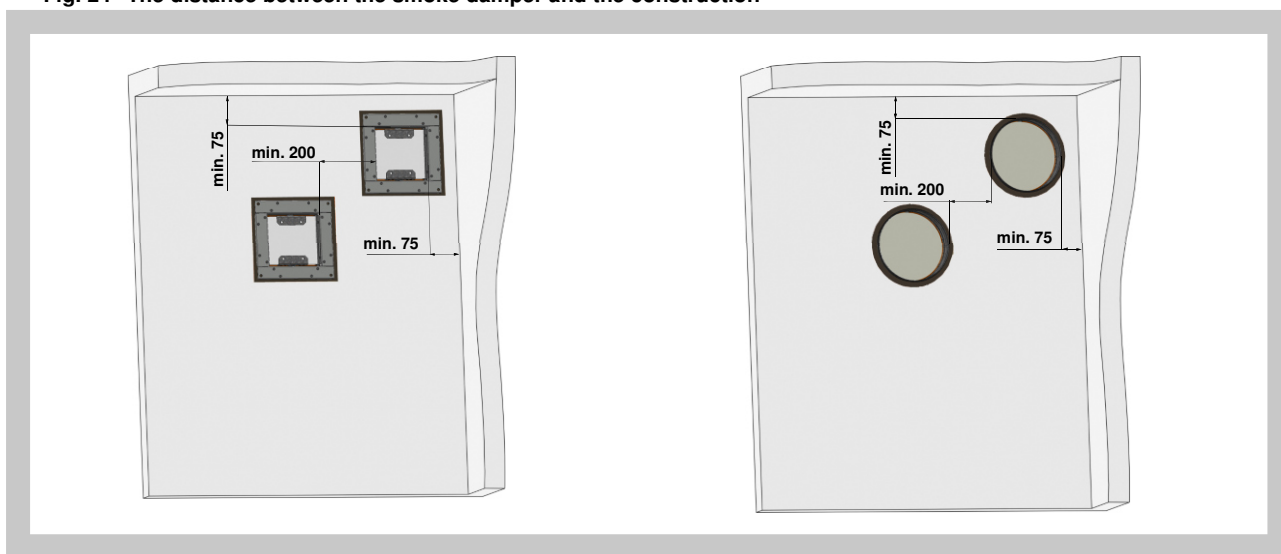
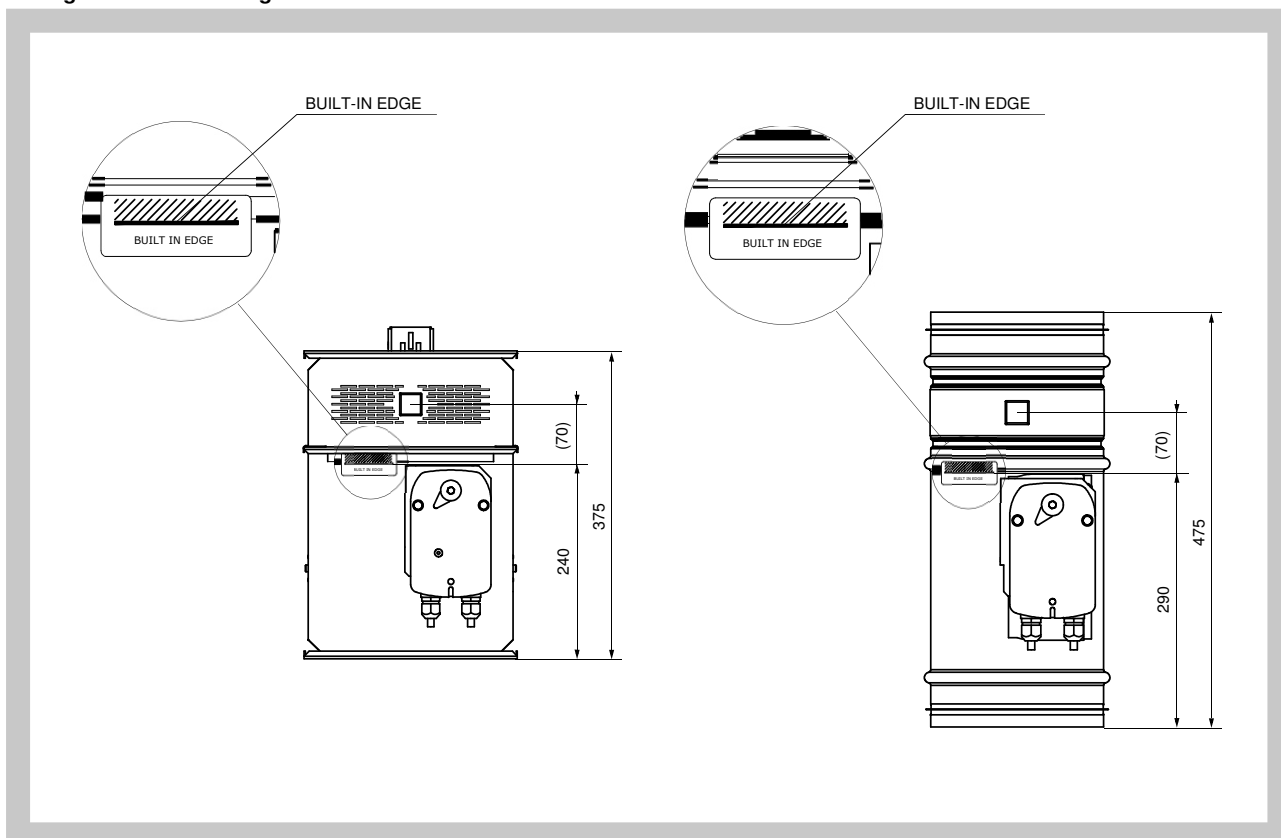


Fig. 25 Built in edge



- 5.3. The control mechanism has to be protected (covered) against damage and pollution during installation process.

During installation the damper blade must be in position "CLOSED". The damper body should not be deformed in the course of installation. Once the damper built in, its blade should not grind on the damper casing during opening or closing.

- 5.4. Installation opening dimensions

Fig. 26 Installation opening - square damper

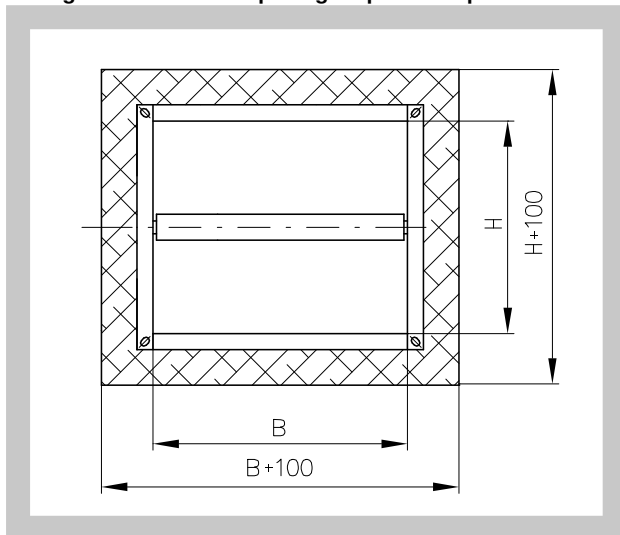


Fig. 27 Installation opening - round damper

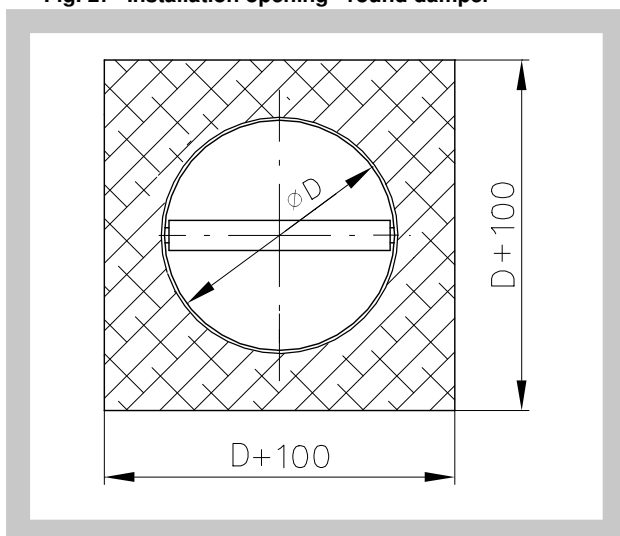
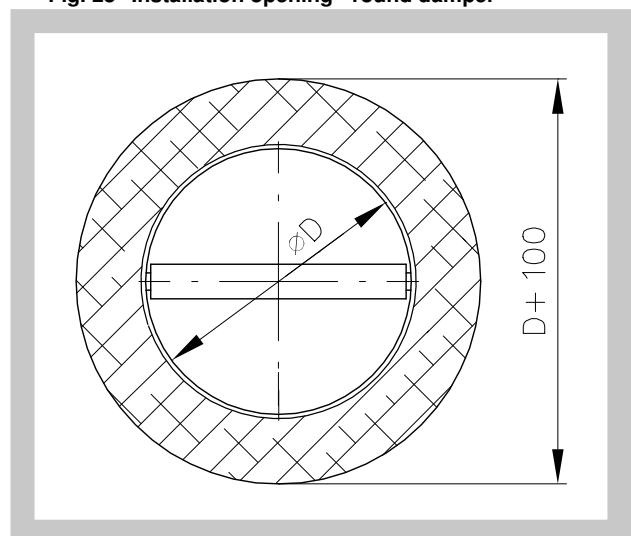


Fig. 28 Installation opening - round damper

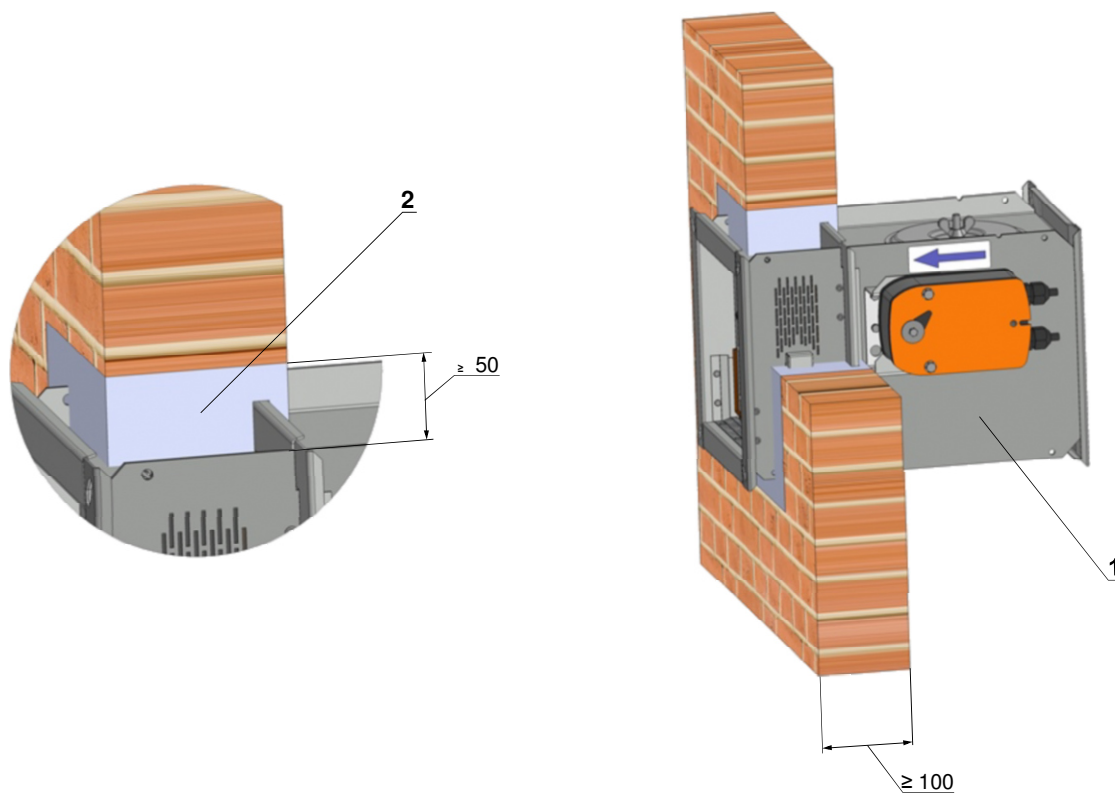


5.5. Installation examples

Tab. 5.5.1. Statement of installations

	Placement	Filling of space between damper and wall	Figure
Square	In solid wall construction	mortar or gypsum	29
	In solid ceiling construction	mortar or gypsum	30
	In gypsum wall construction	mortar or gypsum	31
Round	In solid wall construction	mortar or gypsum	32
	In solid ceiling construction	mortar or gypsum	33
	In gypsum wall construction	mortar or gypsum	34

Fig. 29 Installation in a solid wall construction - MSD-S (MSD-W-S)



POSITION:

- 1 Damper MSD (MSD-W)
- 2 Mortar or gypsum with min. density 800 kg/m³

Fig. 30 Installation in a solid wall construction - MSD-R (MSD-W-R)

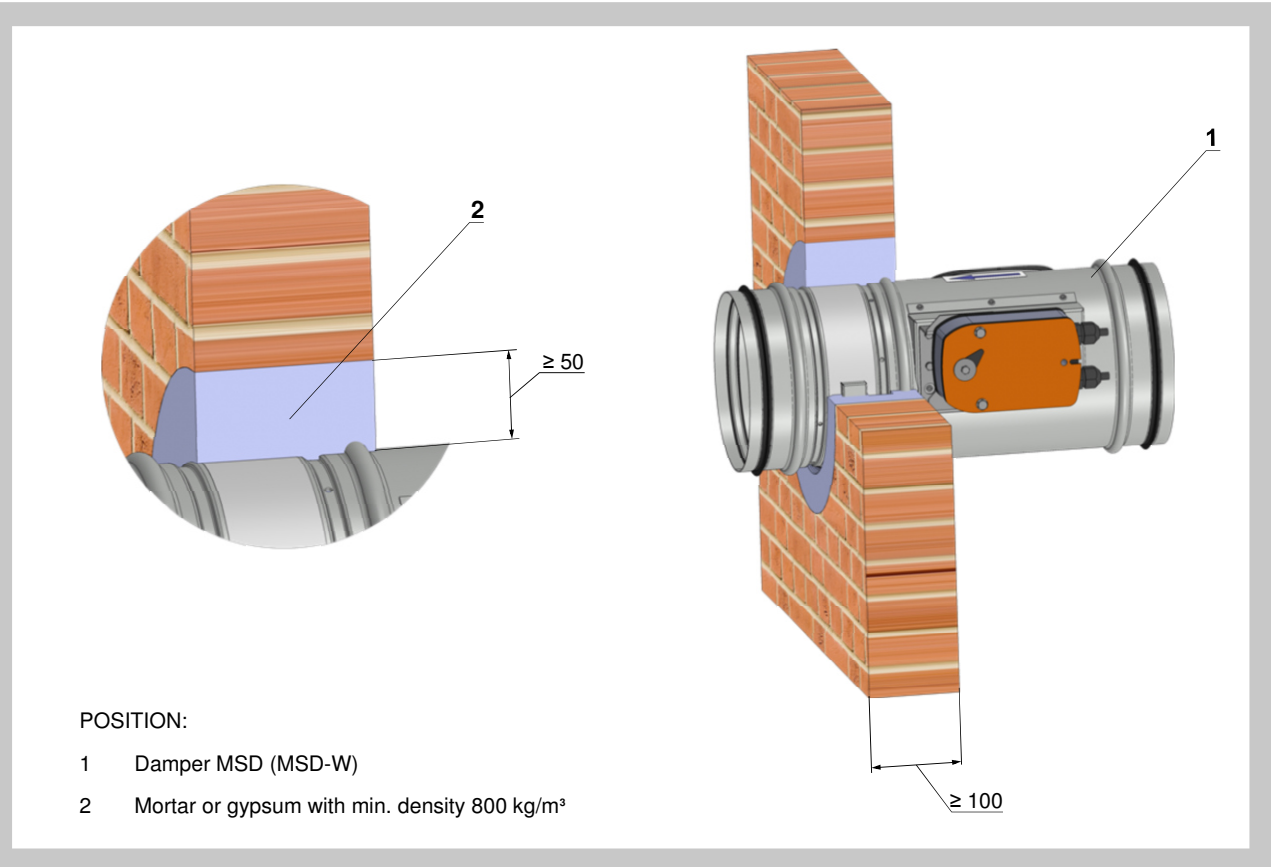


Fig. 31 Installation in a solid ceiling construction - MSD-S (MSD-W-S)

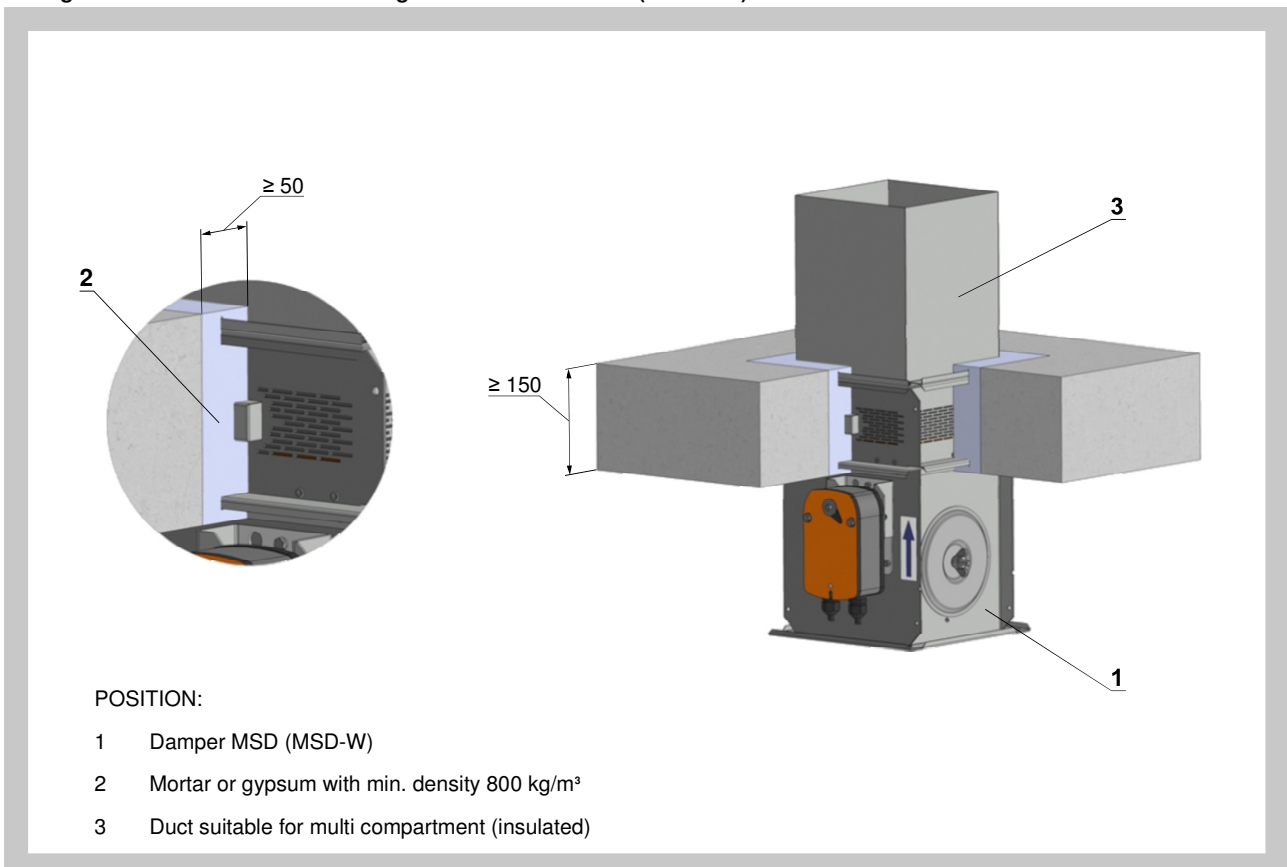
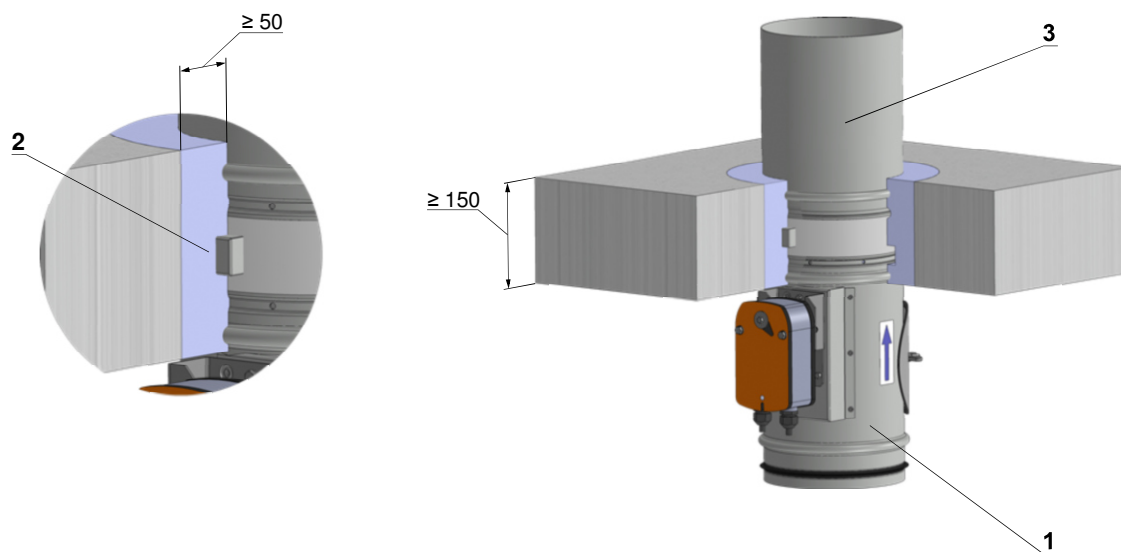


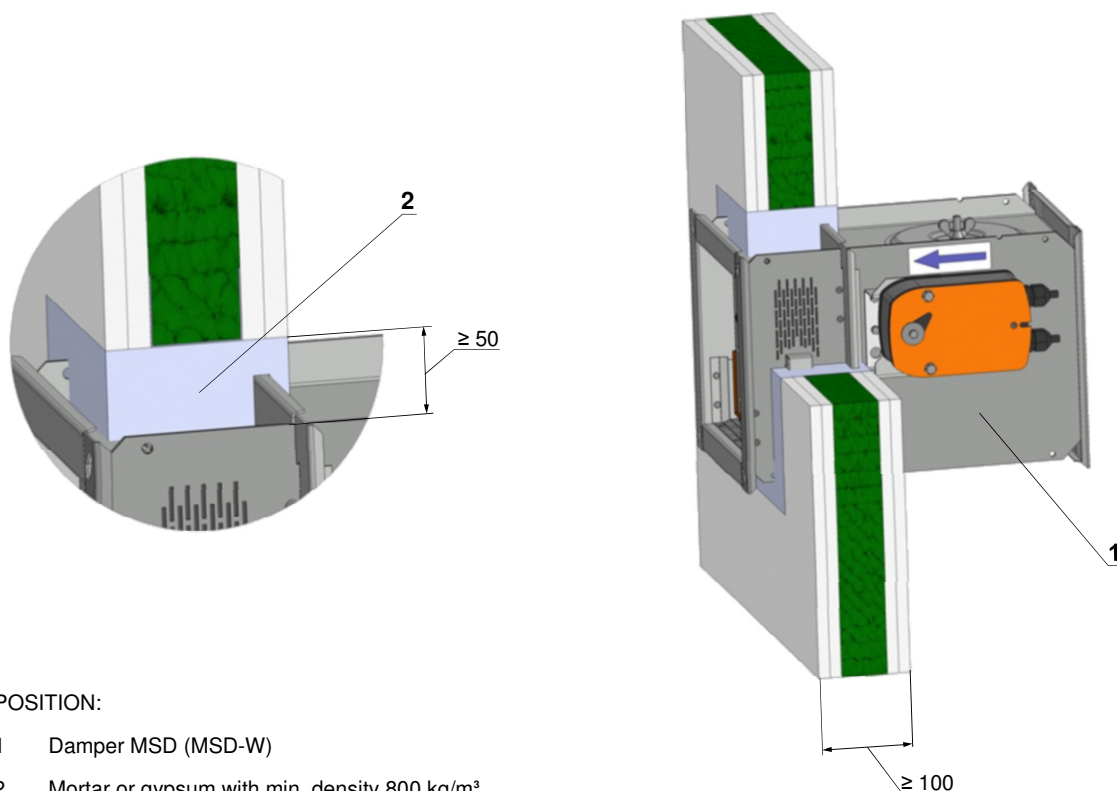
Fig. 32 Installation in a solid ceiling construction - MSD-R (MSD-W-R)



POSITION:

- 1 Damper MSD (MSD-W)
- 2 Mortar or gypsum with min. density 800 kg/m³
- 3 Duct suitable for multi compartment (insulated)

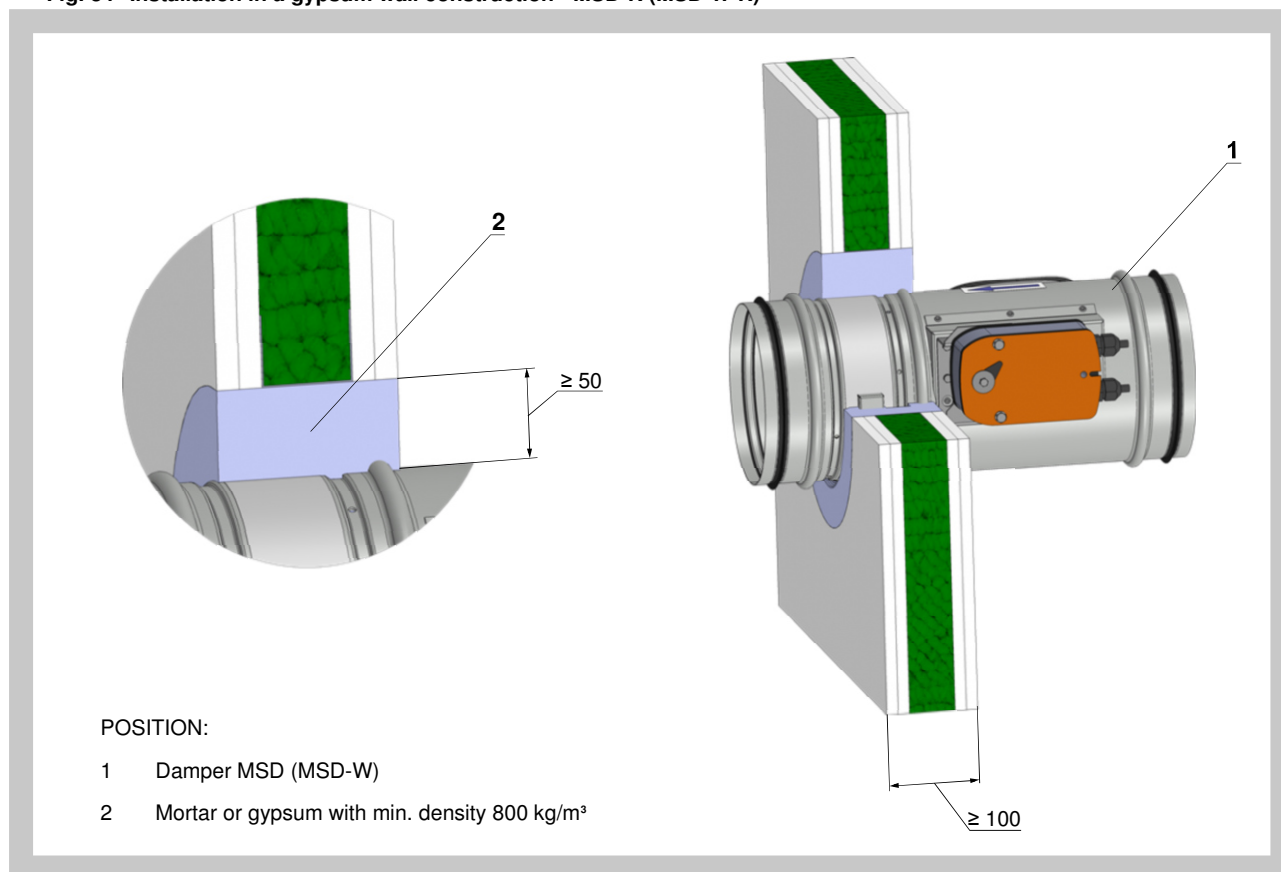
Fig. 33 Installation in a gypsum wall construction - MSD-S (MSD-W-S)



POSITION:

- 1 Damper MSD (MSD-W)
- 2 Mortar or gypsum with min. density 800 kg/m³

Fig. 34 Installation in a gypsum wall construction - MSD-R (MSD-W-R)



III. TECHNICAL DATA

6. Pressure loss

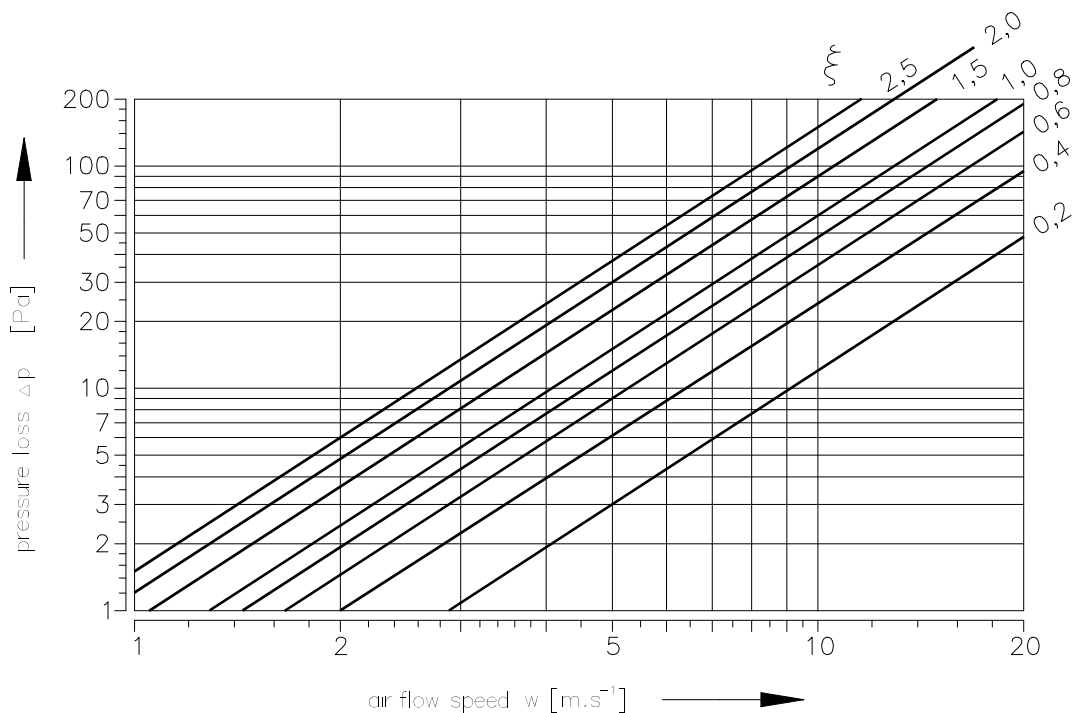
6.1. Pressure loss calculation

$$\Delta p = \xi \cdot \rho \cdot \frac{w^2}{2}$$

Δp	[Pa]	pressure loss
w	[m.s ⁻¹]	air flow speed in nominal damper section
ρ	[kg.m ⁻³]	air density
ξ	[-]	coefficient of local pressure loss for the nominal damper section (see Tab. 7.1.1a, 7.1.1b and 7.1.1.)

6.2. Determination of pressure loss by using diagram $\rho = 1,2 \text{ kg.m}^{-3}$

Diagram 6.2.1. Pressure losses for air density $\rho = 1,2 \text{ kg.m}^{-3}$



7. Coefficient of local pressure loss

Tab. 7.1.1a. Coefficient of local pressure loss ξ (-) - square dampers

A	B									
	180	200	225	250	280	300	315	355	400	450
180	2,1314	1,6906	1,3782	1,1149	1,0037	0,9288	0,7918	0,6827	0,6003	0,5350
200	1,9945	1,5804	1,2423	1,0368	0,9748	0,8785	0,7383	0,6367	0,5585	0,4976
225	1,9207	1,5162	1,1256	0,9994	0,9341	0,8442	0,7137	0,6078	0,5329	0,4772
250	1,8415	1,4584	1,1032	0,9651	0,9009	0,8068	0,6837	0,5832	0,5125	0,4590
280	1,7505	1,3782	1,0732	0,9116	0,8571	0,7597	0,6484	0,5543	0,4847	0,4366
300	1,6853	1,3311	1,0400	0,8635	0,8046	0,7148	0,6099	0,5264	0,4665	0,4109
315	1,6071	1,2690	1,0037	0,8303	0,7597	0,6645	0,5864	0,5050	0,4419	0,3927
355	1,5408	1,2155	0,9544	0,7929	0,7083	0,6356	0,5607	0,4815	0,4227	0,3756
400	1,4841	1,1706	0,9063	0,7651	0,6859	0,6227	0,5382	0,4633	0,4045	0,3606
450	1,4359	1,1331	0,8913	0,7394	0,6666	0,5896	0,5200	0,4473	0,3916	0,3478
500	1,3996	1,1021	0,8624	0,7201	0,6548	0,5810	0,5061	0,4344	0,3799	0,3371
550	1,3803	1,0882	0,8378	0,7073	0,6474	0,5757	0,4965	0,4269	0,3734	0,3349
560	1,3643	1,0754	0,8282	0,7009	0,6324	0,5725	0,4922	0,4227	0,3692	0,3285
600	1,3493	1,0582	0,8218	0,6944	0,6270	0,5585	0,4858	0,4184	0,3659	0,3242
630	1,3332	1,0497	0,8100	0,6837	0,6238	0,5436	0,4804	0,4130	0,3606	0,3199
650	1,3204	1,0379	0,7907	0,6752	0,6003	0,5393	0,4740	0,4066	0,3542	0,3157
700	1,3108	1,0304	0,7832	0,6741	0,5949	0,5382	0,4719	0,4045	0,3531	0,3146
710	1,3043	1,0272	0,7747	0,6688	0,5896	0,5371	0,4697	0,4034	0,3520	0,3135
750	1,2926	1,0176	0,7683	0,6634	0,5842	0,5307	0,4633	0,3980	0,3478	0,3103
800	1,2808	1,0079	0,7618	0,6559	0,5767	0,5222	0,4601	0,3959	0,3456	0,3060
900	1,2594	0,9908	0,7479	0,6441	0,5692	0,5136	0,4526	0,3884	0,3381	0,3007
1000	1,2433	0,9780	0,7383	0,6367	0,5607	0,4976	0,4462	0,3831	0,3338	0,2975
1100	1,2284	0,9662	0,7287	0,6281	0,5478	0,4869	0,4408	0,3777	0,3296	0,2932
1250	1,2155	0,9544	0,7126	0,6206	0,5339	0,4804	0,4355	0,3734	0,3264	0,2900
1400	1,2027	0,9459	0,6998	0,6142	0,5254	0,4783	0,4301	0,3692	0,3231	0,2857
1500	1,1952	0,9395	0,6955	0,6110	0,5157	0,4708	0,4280	0,3670	0,3199	0,2846

Tab. 7.1.1b. Coefficient of local pressure loss ξ (-) - square dampers

	B									
A	500	550	560	600	630	650	700	710	750	800
180	0,4879	0,4665	0,4462	0,4216	0,4109	0,3916	0,3884	0,3820	0,3681	0,3585
200	0,4526	0,4323	0,4152	0,3959	0,3820	0,3681	0,3606	0,3552	0,3424	0,3328
225	0,4355	0,4152	0,4002	0,3788	0,3681	0,3531	0,3456	0,3413	0,3338	0,3221
250	0,4216	0,4002	0,3809	0,3659	0,3542	0,3403	0,3328	0,3274	0,3210	0,3092
280	0,3948	0,3766	0,3585	0,3435	0,3328	0,3199	0,3167	0,3114	0,2975	0,2932
300	0,3766	0,3531	0,3435	0,3253	0,3157	0,3071	0,2996	0,2953	0,2814	0,2750
315	0,3574	0,3349	0,3264	0,3103	0,3007	0,2932	0,2846	0,2782	0,2696	0,2611
355	0,3413	0,3253	0,3114	0,2975	0,2868	0,2750	0,2718	0,2664	0,2557	0,2493
400	0,3274	0,3082	0,2985	0,2900	0,2761	0,2654	0,2589	0,2557	0,2472	0,2386
450	0,3167	0,2964	0,2889	0,2782	0,2654	0,2589	0,2525	0,2461	0,2386	0,2301
500	0,3071	0,2943	0,2803	0,2664	0,2579	0,2482	0,2429	0,2386	0,2311	0,2236
550	0,3039	0,2857	0,2771	0,2611	0,2450	0,2365	0,2301	0,2268	0,2279	0,2194
560	0,2996	0,2825	0,2729	0,2515	0,2504	0,2408	0,2290	0,2268	0,2236	0,2172
600	0,2943	0,2793	0,2707	0,2493	0,2482	0,2375	0,2268	0,2247	0,2194	0,2140
630	0,2910	0,2761	0,2664	0,2482	0,2450	0,2343	0,2268	0,2247	0,2161	0,2119
650	0,2900	0,2707	0,2632	0,2461	0,2418	0,2322	0,2258	0,2236	0,2140	0,2097
700	0,2868	0,2654	0,2622	0,2450	0,2408	0,2301	0,2247	0,2226	0,2129	0,2087
710	0,2846	0,2632	0,2600	0,2440	0,2397	0,2290	0,2226	0,2215	0,2119	0,2076
750	0,2814	0,2611	0,2568	0,2397	0,2365	0,2268	0,2204	0,2194	0,2108	0,2054
800	0,2793	0,2600	0,2547	0,2354	0,2333	0,2236	0,2183	0,2172	0,2087	0,2022
900	0,2739	0,2547	0,2504	0,2333	0,2301	0,2172	0,2151	0,2129	0,2044	0,1990
1000	0,2696	0,2515	0,2461	0,2290	0,2268	0,2151	0,2119	0,2087	0,2001	0,1958
1100	0,2664	0,2482	0,2429	0,2258	0,2236	0,2129	0,2097	0,2065	0,1969	0,1937
1250	0,2632	0,2429	0,2397	0,2226	0,2204	0,2076	0,2065	0,2044	0,1947	0,1905
1400	0,2611	0,2397	0,2375	0,2204	0,2183	0,2044	0,2033	0,2022	0,1926	0,1894
1500	0,2589	0,2386	0,2365	0,2183	0,2161	0,2022	0,2012	0,2001	0,1905	0,1883

7.2. Coefficient of local pressure loss ξ (-) - round dampers

Tab. 7.2.1. Coefficient of local pressure loss - round dampers

D	180	200	225	250	280	315	355	400	450	500	560	630
ξ	3,546	2,124	1,291	0,877	0,609	0,438	0,328	0,255	0,205	0,173	0,147	0,127

8. Noise data

8.1. Level of acoustic output corrected with filter A.

$$L_{WA} = L_{W1} + 10 \log(S) + K_A$$

L_{WA} [dB(A)] level of acoustic output corrected with filter A

L_{W1} [dB] level of acoustic output L_{W1} related to the 1 m² section (see Tab. 10.3.1. a 10.3.2)

S [m²] duct cross section

K_A [dB] correction to the weight filter A (see Tab. 10.3.3.)

8.2. Level of acoustic output in octave ranges.

$$L_{Woct} = L_{W1} + 10 \log(S) + L_{rel}$$

L_{Woct} [dB] spectrum of acoustic output in octave range

L_{W1} [dB] level of acoustic output L_{W1} related to the 1 m² section (see Tab. 10.3.1. a 10.3.2)

S [m²] duct cross section

L_{rel} [dB] relative level expressing the shape of the spectrum (see Tab. 10.3.3.)

8.3. Table of acoustics values

Tab. 8.3.1. Level of acoustic output L_{W1} [dB] related to the 1 m² section - square dampers

	ξ [-]											
w [m.s ⁻¹]	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1	1,5	2	2,5
2	15,5	18,7	20,9	22,6	24,0	25,2	26,3	27,2	28,0	31,2	33,4	35,1
3	26,1	29,2	31,5	33,2	34,6	35,8	36,9	37,8	38,6	41,7	44,0	45,7
4	33,6	36,7	39,0	40,7	42,1	43,3	44,3	45,3	46,1	49,2	51,5	53,2
5	39,4	42,5	44,8	46,5	47,9	49,1	50,2	51,1	51,9	55,0	57,3	59,0
6	44,1	47,3	49,5	51,3	52,7	53,9	54,9	55,8	56,6	59,8	62,0	63,8
7	48,2	51,3	53,5	55,3	56,7	57,9	58,9	59,8	60,7	63,8	66,1	67,8
8	51,6	54,8	57,0	58,8	60,2	61,4	62,4	63,3	64,1	67,3	69,5	71,3
9	54,7	57,9	60,1	61,8	63,2	64,4	65,5	66,4	67,2	70,4	72,6	74,3
10	57,4	60,6	62,8	64,6	66,0	67,2	68,2	69,1	70,0	73,1	75,3	77,1
11	59,9	63,1	65,3	67,1	68,5	69,7	70,7	71,6	72,4	75,6	77,8	79,6
12	62,2	65,4	67,6	69,3	70,7	71,9	73,0	73,9	74,7	77,9	80,1	81,8

Tab. 8.3.2. Level of acoustic output L_{W1} [dB] related to the 1 m² section - round dampers

	ξ [-]											
w [m.s ⁻¹]	0,1	0,2	0,3	0,4	0,6	0,8	1	1,5	2	2,5	3	3,5
2	9,0	11,5	14,7	16,9	20,1	22,3	24,1	27,2	29,4	31,2	32,6	33,8
3	16,7	22,1	25,3	27,5	30,7	32,9	34,6	37,8	40,0	41,7	43,2	44,4
4	24,2	29,6	32,8	35,0	38,1	40,4	42,1	45,3	47,5	49,2	50,7	51,9
5	30,0	35,4	38,6	40,8	44,0	46,2	47,9	51,1	53,3	55,1	56,5	57,7
6	34,8	40,2	43,3	45,6	48,7	51,0	52,7	55,8	58,1	59,8	61,2	62,4
7	38,8	44,2	47,3	49,6	52,7	55,0	56,7	59,9	62,1	63,8	65,2	66,4
8	42,3	47,7	50,8	53,1	56,2	58,4	60,2	63,3	65,6	67,3	68,7	69,9
9	45,4	50,7	53,9	56,1	59,3	61,5	63,3	66,4	68,6	70,4	71,8	73,0
10	48,1	53,5	56,6	58,9	62,0	64,3	66,0	69,1	71,4	73,1	74,5	75,7
11	50,6	56,0	59,1	61,4	64,5	66,7	68,5	71,6	73,9	75,6	77,0	78,2
12	52,8	58,2	61,4	63,6	66,8	69,0	70,7	73,9	76,1	77,9	79,3	80,5

Tab. 8.3.3. Correction to the weight filter A - square and round dampers

w [m.s ⁻¹]	2	3	4	5	6	7	8	9	10	11	12
K _A [dB]	-15,0	-11,8	-9,8	-8,4	(7,30 Kč)	-6,4	-5,7	-5,0	-4,5	-4,0	-3,6

Tab. 8.3.4. Relative level expressing the shape of the spectrum L_{rel} - square and round dampers

	f [Hz]							
w [m.s ⁻¹]	63	125	250	500	1000	2000	4000	8000
2	-4,5	-6,9	-10,9	-16,7	-24,1	-33,2	-43,9	-56,4
3	-3,9	-5,3	-8,4	-13,1	-19,5	-27,6	-37,4	-48,9
4	-3,9	-4,5	-6,9	-10,9	-16,7	-24,1	-33,2	-43,9
5	-4,0	-4,1	-5,9	-9,4	-14,6	-21,5	-30,0	-40,3
6	-4,2	-3,9	-5,3	-8,4	-13,1	-19,5	-27,6	-37,4
7	-4,5	-3,9	-4,9	-7,5	-11,9	-17,9	-25,7	-35,1
8	-4,9	-3,9	-4,5	-6,9	-10,9	-16,7	-24,1	-33,2
9	-5,2	-3,9	-4,3	-6,4	-10,1	-15,6	-22,7	-31,5
10	-5,5	-4,0	-4,1	-5,9	-9,4	-14,6	-21,5	-30,0
11	-5,9	-4,1	-4,0	-5,6	-8,9	-13,8	-20,4	-28,8
12	-6,2	-4,3	-3,9	-5,3	-8,4	-13,1	-19,5	-27,6

IV. MATERIAL, FINISHING

9. Material

- 9.1. Damper bodies are supplied in the standard design made of galvanized plate without any other surface finish.

Damper blades are made of fire resistant asbestos free boards made of mineral fibres.

Fasteners is galvanized.

- 9.2. According to the customer's requirements, damper body, control, springs and jointing material can be made of stainless material.

V. INSPECTION, TESTING

10. Inspection, testing

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

VI. TRANSPORTATION AND STORAGE

11. Logistic terms

- 11.1.** Dampers 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. Dampers must be protected against mechanic damages when transported and manipulated. During transportation, the damper 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. ASSEMBLY, ATTENDANCE, MAINTENANCE AND REVISIONS

12. Assembly

- 12.1.** Assembly, maintenance and damper check can be done only by qualified persons, i.e. "AUTHORIZED PERSONS" that have been trained by the manufacturer.

Trainings are done by the firm MANDÍK that makes out a proficiency "CERTIFICATE" which is valid for 5 years. It can be renewed by the "AUTHORIZED PERSONS" themselves, directly at the manufacturer.

When the "CERTIFICATE" expires, it becomes invalid and is eliminated from the trainer's registration.

Only professional personnel that undertake guarantee for the completed work can be trained.

- 12.2.** All effective safety standards and directives must be observed during fire damper assembly.
- 12.3.** Flange and screw joints must be conductively connected to protect against dangerous contact. 2 galvanized fan shape pads that are placed under the head of one screw and a fastened nut are used for conductive connection.
- 12.4.** To ensure reliable fire damper function it is necessary to avoid blocking the closing mechanism and contact surfaces with collected dust, fibre and sticky materials and solvents.
- 12.5.** Manual operation

Without power supply, the damper can be operated manually and fixed in any required position. Release of the locking mechanism can be achieved manually or automatically by applying the supply voltage (design 4Mx or 5Mx).

13. Entry into service and revisions

- 13.1.** Before entering the dampers into operation after assembly and after sequential revisions, checks and functionality tests of all designs including operation of the electrical components must be done. After entering into operation, these revisions must be done according to requirement set by national regulations.

In case that dampers are found unable to serve for their function for any cause, it must be clearly marked. The operator is obliged to ensure so that the damper is put into condition in which it is able to function and meanwhile he is obliged to provide the fire protection another appropriate way.

Results of regular checks, imperfections found and all-important facts connected with the damper function must be recorded in the "FIRE BOOK" and immediately reported to the operator.

- 13.2.** Before entering the dampers into operation after their assembly and by sequential checks, the following checks must be carried out for all designs.

Visual inspection of proper damper integration, inside damper area, damper blade, contact surfaces and silicon sealing.

Inspection hole disassembly: release the covering lid by turning the wing nut and while turning the lid right or left release it from the security belt. Then tilt the lid and remove it from its original position.

- 13.3.** For designs .44, .54 and .66 check of damper blade displacement can be realized after actuating mechanism supply connection or signal connection from higher level control systems. Blade displacement from position "OPEN" to position "CLOSED" and return displacement is checked.
- 13.4.** For designs 4Mx or 5Mx check of blade displacement into the position "CLOSED" can be done after connecting the electromagnet impuls. Check of blade displacement back into the "OPEN" position can be done after connection of actuating mechanism power supply. After check actuating mechanism power supply has to be cutting off.

14. Spare parts

- 14.1.** Spare parts are supplied only on basis of an order.

VIII. PRODUCT DATA

15. Data label

- 15.1.** Data label is placed on the damper body.

Fig. 35 Data label

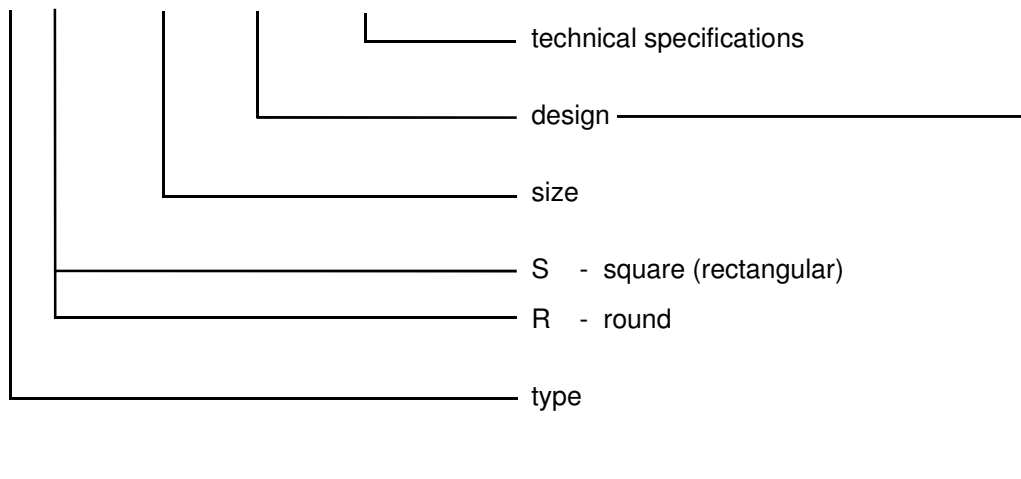
MANDÍK		MANDÍK, a.s. 267 24 Hostomice		Dobříšská 550 Czech Republic	
SMOKE CONTROL DAMPER - MSD					
CLASSIFICATION: EI120 (vew-how-i↔o) S1500C10000AAmulti					
DIMENSION:			DESIGN:		
SERIAL NUMBER:			WEIGHT (kg):		
TPM109/15	Certificate: 1391-CPR-2015/0057		15	EN 12101-8:2011	CE 1391

MANDÍK		MANDÍK, a.s. 267 24 Hostomice		Dobříšská 550 Czech Republic	
SMOKE CONTROL DAMPER - MSD-W					
CLASSIFICATION: EI120 (vew-how-i↔o) S1500C10000AAmulti					
DIMENSION:			DESIGN:		
SERIAL NUMBER:			WEIGHT (kg):		
TPM109/15	Certificate: 1391-CPR-2015/0058		15	EN 12101-8:2011	CE 1391

IX. ORDERING INFORMATION

16. Ordering key

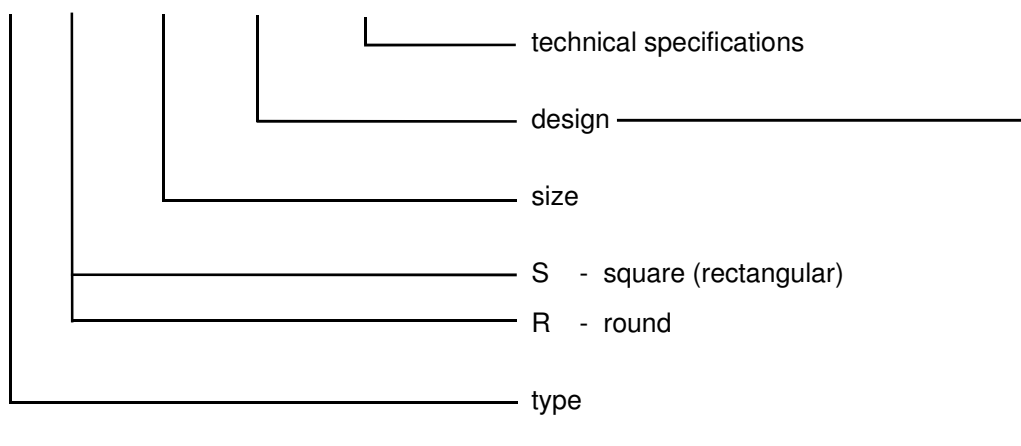
16.1. Smoke damper MSD

MSD-S 800x400 -.44 TPM 109/15

Dampers design	Additional digit
with actuating mechanism BLE230(BE230-12), InMax 50.75-S	.44
with actuating mechanism BLE24(BE24-12), InMax 50.75-S	.54
with the communication and supply device BKNE 230-24 and actuating mechanism BLE24(BE24-12)-ST	.66

* Design .66 is not available by using actuating mechanism InMax 50.75-S

16.2. Smoke damper MSD-W

MSD-W-S 800x400 -.44 TPM 109/15

Dampers design	Additional digit
with actuating mechanism BLE230(BE230-12)	.44
with actuating mechanism BLE24(BE24-12)	.54
with the communication and supply device BKNE 230-24 and actuating mechanism BLE24(BE24-12)-ST	.66
with actuating mechanism BLF230, JOVENTA DAF2.20S with an electromagnet AC 230 V	.4M0
with actuating mechanism BLF230, JOVENTA DAF2.20S with an electromagnet AC/DC 24V	.4M1
with actuating mechanism BLF24, JOVENTA DAF1.20S with an electromagnet AC 230 V	.5M0
with actuating mechanism BLF24, JOVENTA DAF1.20S with an electromagnet AC/DC 24V	.5M1

Producent

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