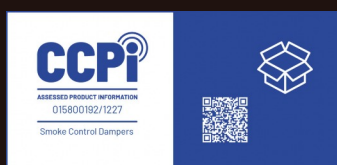
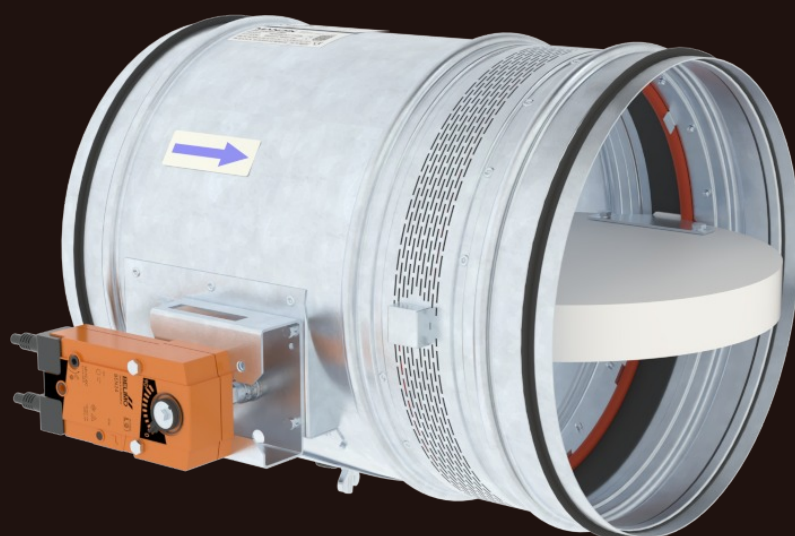


MSD (MSD-W)

Multi compartment smoke control damper

Technical Documentation

Installation, Commissioning, Operation, Maintenance and Service Manual



MANDÍK®

www.mandik.com

These technical specifications state a row of manufactured sizes, main dimensions, design and range of use of multi compartment smoke control dampers MSD. It is valid for production, design, ordering, delivery, storage, assembly, operation, maintenance and serviceability checks.

CONTENT

I. GENERAL.....	3
Description.....	3
II. DESIGN.....	5
Design with actuating mechanism.....	5
Design with electric actuating mechanism with emergency function and electromagnet.....	10
III. DIMENSIONS.....	14
Technical parameters.....	18
For square dampers.....	18
For round dampers.....	28
IV. INSTALLATION.....	29
Placement and installation.....	29
Statement of installations.....	32
In solid wall construction.....	33
In gypsum wall construction.....	38
In solid ceiling construction.....	43
Installation damper into/onto smoke extraction ducts.....	48
V. SUSPENSION SYSTEMS.....	50
Example of duct connection.....	52
VI. TECHNICAL DATA.....	53
Pressure loss.....	53
Noise data.....	55
VII. MATERIAL, FINISHING.....	56
VIII. TRANSPORTATION, STORAGE AND WARRANTY.....	57
Logistic terms.....	57
Warranty.....	57
IX. ASSEMBLY, ATTENDANCE AND MAINTENANCE.....	58
Electrical connection of the actuator in protection box.....	60
Entry into service and revisions.....	61
X. ORDERING INFORMATION.....	62
Ordering key MSD.....	62
Square damper MSD.....	62
Round damper MSD.....	62
Ordering key MSD-W.....	63
Square damper MSD-W.....	63
Round damper MSD-W.....	63
Data label.....	64

I. GENERAL

Description

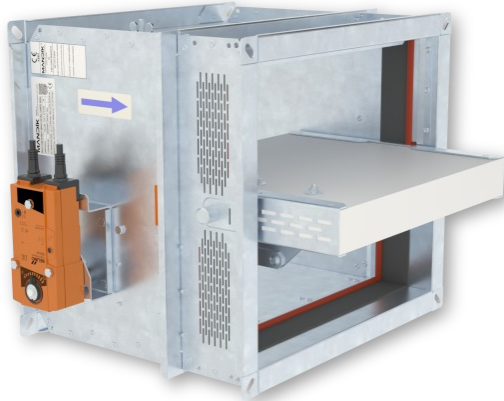
Smoke control dampers – MULTI are closures installed in ductwork of smoke extraction systems. In the event of fire, the Smoke and Heat Exhaust Ventilation Systems system opens the dampers in the affected section, thereby allowing the exhaust fans to remove combustion products and heat from the endangered areas.

The damper blade is controlled by electrical actuating mechanism.

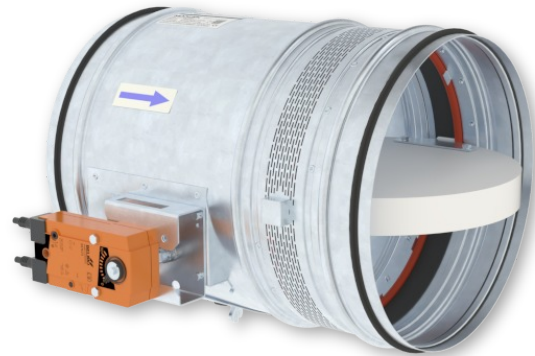
Dampers are fire resistant and are intended for systems with automatic activation.

Dampers can be installed in the structure of the fire compartment.

Dampers are designed for use in fire compartments that can be connected to smoke exhaust ducts (tested according to EN 1366-10), or they can be installed in or on the structure of the fire compartment.



MSD - square



MSD - round

Basic types of square dampers

- MSD - Cycling test with load (possible design .44, .54, .65)
- MSD-W - Cycling test without load (possible design .44, .54, .4M0, .4M1, .5M0, .5M1)

Basic types of round dampers

- MSD - Cycling test with load (possible design .44, .54)
- MSD-W - Cycling test without load (possible design .4M0, .4M1, .5M0, .5M1)

MSD dampers can be open against flow and pressure.

MSD-W dampers has to be open with the help of flow or without flow present.

Damper characteristics

- CE certified acc. to EN 12101-8
- Tested in accordance with EN 1366-10
- Classified acc. to EN 13501-4
- External Casing leakage class ATC 3 (old marking "C"), Internal leakage min. class 2 acc. to EN 1751
- Leakage across the blade: round dampers - min. class 2, diameters from 560 mm to 630 mm
min. class 3 according to EN 1751
square dampers - min. class 2, for max. size 1500 × 800 mm
min. class 3 according to EN 1751
- Cycling: MSD square dampers C_{mod} according to EN 12101-8
MSD, MSD-W round dampers C_{10000} according to EN 12101-8
MSD-W square dampers C_{10000} according to EN 12101-8 (tested without load according to EN 1366-10)
- EC Certificate of Conformity No. 1391-CPR-XXXX/XXXX for MSD
- EC Certificate of Conformity No. 1391-CPR-XXXX/XXXX for MSD-W
- Declaration of Performance No. PM/MSD/01/XX/X, PM/MSD-W/01/XX/X
- Hygienic assessment – Report No. 1.6/pos/19/19c

Classification of square dampers

Supporting construction	Installation type	Classification
Horizontal or vertical smoke extraction ducts tested according to EN 1366-8 or EN 1366-9 • Into or onto the duct	Damper installed Into or onto a duct	EI 120 (h _{od}) S1500[H]C _{mod} HOT400/30AAmulti EI 120 (v _{ed}) S1500[H]C _{mod} HOT400/30AAmulti
Standard low- and high-density rigid wall construction according to EN 1363-1 • damper in the wall • 100 mm min. wall thickness	Mortar or gypsum	EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti
	Ablative Coated Batt	
Standard flexible wall construction min. EI 90 according to EN 1363-1 • damper in the wall • 100 mm min. wall thickness	Mortar or gypsum	
	Ablative Coated Batt	
Standard low- and high-density rigid floor construction according to EN 1366-2 • damper in the ceiling • 150 mm min. ceiling thickness	Mortar or gypsum	EI 120 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (h _{ow}) S1500[H]C ₁₀₀₀₀ AAmulti
	Ablative Coated Batt	EI 90 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti EI 120 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (h _{ow}) S1500[H]C ₁₀₀₀₀ AAmulti

* Applies to MSD-W damper

Classification of round dampers

Supporting construction	Installation type	Classification
Standard low- and high-density rigid wall construction according to EN 1363-1 • damper in the wall • 125 mm min. wall thickness	Mortar or gypsum	EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti
Standard flexible wall construction min. EI 90 according to EN 1363-1 • damper in the wall • 125 mm min. wall thickness	Mortar or gypsum	EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti
Standard low- and high-density rigid floor construction according to EN 1366-2 • damper in the ceiling • 150 mm min. ceiling thickness	Mortar or gypsum	EI 120 (h _{ow}) S1500[H]C ₁₀₀₀₀ AAmulti

Working conditions

- Exact damper function is provided under the following conditions
 - maximum air velocity 15 m/s
 - underpressure max. -1500 Pa or overpressure max. 500 Pa
- Dampers can be installed with a horizontal blade axis.
- Dampers are designed for macroclimatic areas with mild climate according to EN IEC 60 721-3-3 ed.2., class 3K22. (Environment 3K22 is typically protected place with regulated temperature)
- Temperature in the place of installation is permitted to range from -30 °C to +50 °C.

II. DESIGN

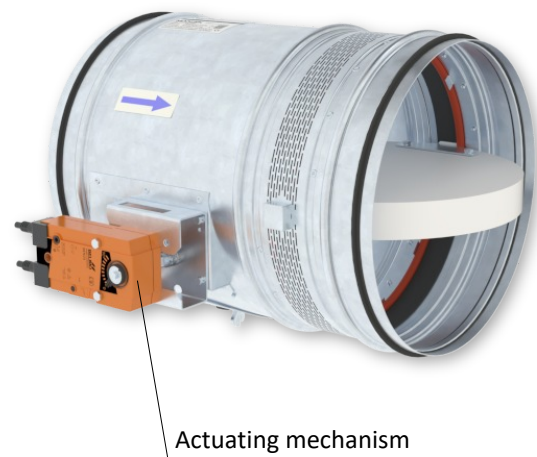
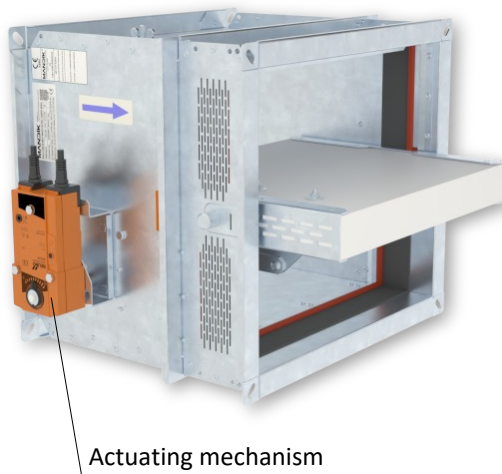
Design with actuating mechanism

Design .44 and .54

- Belimo actuators are used for dampers, series BEN, BEE, BE for 230V AC resp. 24 V AC/DC, Schischek InMax 50.75-S actuators (universal 24V or 230V supply) are used for large size of dampers.
- After connection to the power supply voltage, the actuator moves the damper blade to the "OPEN" position or "CLOSED" (according to the corresponding connection, see wiring diagram). If the power supply is interrupted, the actuator stops at the current position. The signalling of the "OPEN" and "CLOSED" damper blade positions is ensured by two built-in fixed "potential-free" end- limit switches.
- The actuator for operating the damper blade is mounted in an insulated cover/box. It is accessible after removing the cover lid. The electrical connection of the actuator is made with a non-flammable cable (or a cable located in the adjoining cable duct), which passes through an opening made in the wall of the insulated cover/box when installing the damper or when connecting the actuator power cable. Cable penetrations must meet a minimum fire resistance of 30 minutes.

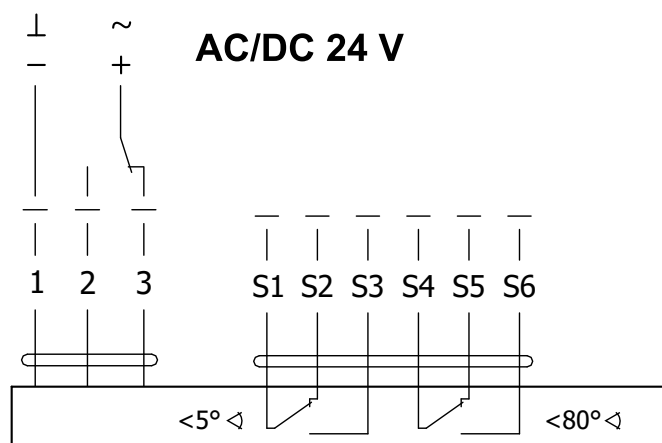
Design .65 - only for square dampers MSD

- Belimo modulating actuators, BEN (BEE)-SR series for 24V AC/DC are specially designed for remote control of smoke control dampers. The position of the damper blade is adjustable by means of control voltage 0 (2)...10V DC.
- The signalling of the "OPEN" and "CLOSED" damper blade positions is ensured by two built-in fixed "potential-free" limit switches.
- The actuator for operating the damper blade is mounted in an insulated cover/box. It is accessible after removing the cover lid. The electrical connection of the actuator is made with non-flammable cables (or cables located in the adjoining cable duct), which pass through an opening made in the wall of the insulated cover when installing the damper or when connecting the power cables of the actuator. Cable penetrations must meet a minimum fire resistance of 30 minutes.

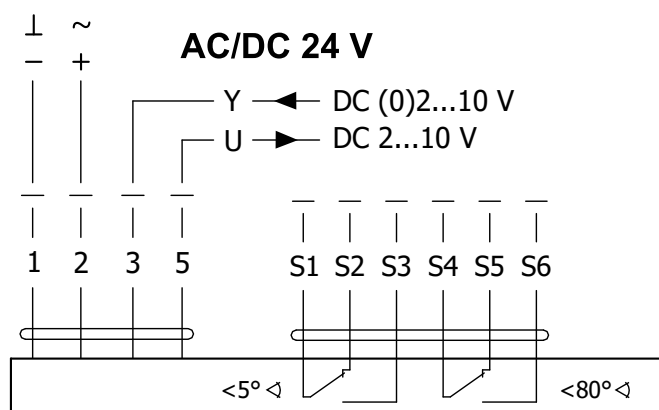


Design .44, .54 and .65

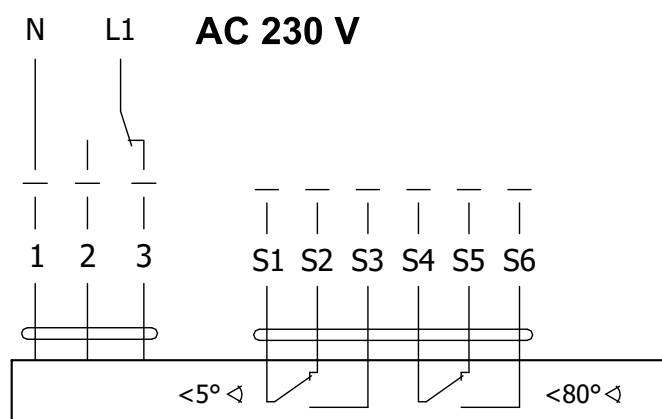
Actuator BELIMO BEN 24(-ST)



Actuator BELIMO BEN 24-SR



Actuator BELIMO BEN 230

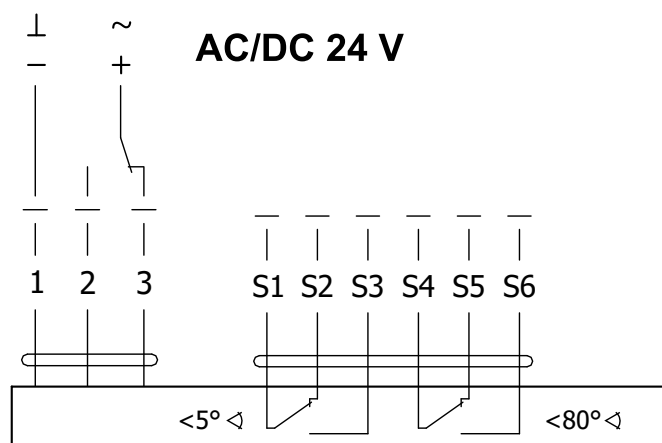


Actuator BELIMO BEN 24(-ST), BEN 24-SR, BEN 230

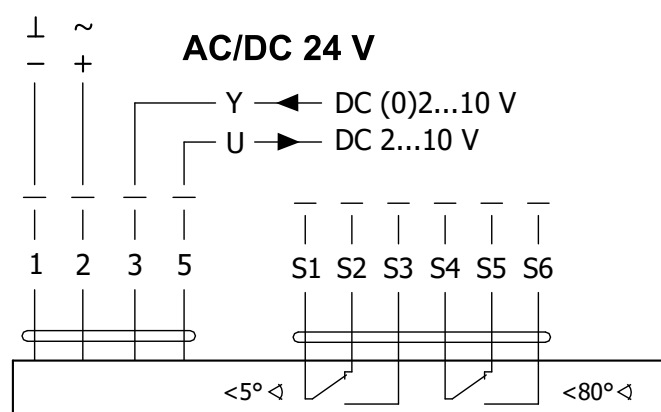
Actuator BELIMO - 15 Nm	BEN 24(-ST)	BEN 24-SR*	BEN 230
Power voltage	AC/DC 24 V 50/60Hz	AC/DC 24 V 50/60Hz	AC 230 V 50/60Hz
Power consumption - in operation - in the end position	3 W 0,1 W	3 W 0,3 W	4 W 0,4 W
Dimensioning	6 VA (I _{max} 8,2 A @ 5 ms)	6,5 VA (I _{max} 8.2 A @ 5 ms)	7 VA (I _{max} 4 A @ 5 ms)
Protection class	III	III	II
Degree of protection		IP 54	
Adjustment time for 95°		< 30 s	
Ambient temperature Storage temperature		-30°C ... +55°C -40°C ... +80°C	
Connection - drive - auxiliary switch	Cable 1 m, 3 x 0,75 mm ² Cable 1 m, 6 x 0,75 mm ² (BEN 24-ST) with plug connectors	Cable 1 m, 4 x 0,75 mm ² Cable 1 m, 6 x 0,75 mm ²	Cable 1 m, 3 x 0,75 mm ² Cable 1 m, 6 x 0,75 mm ²

* Only available for 24V and selected damper sizes

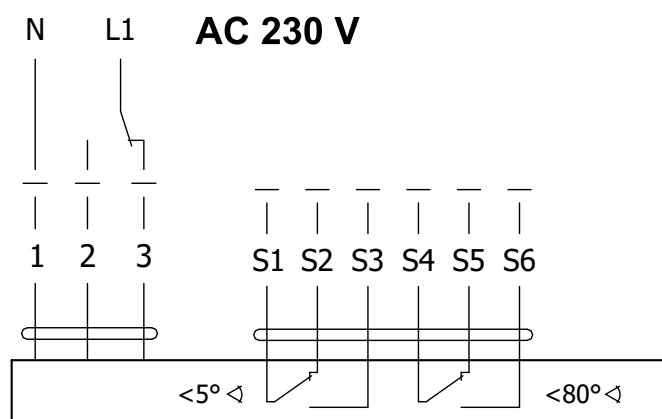
Actuator BELIMO BEE 24(-ST)



Actuator BELIMO BEE 24-SR



Actuator BELIMO BEE 230

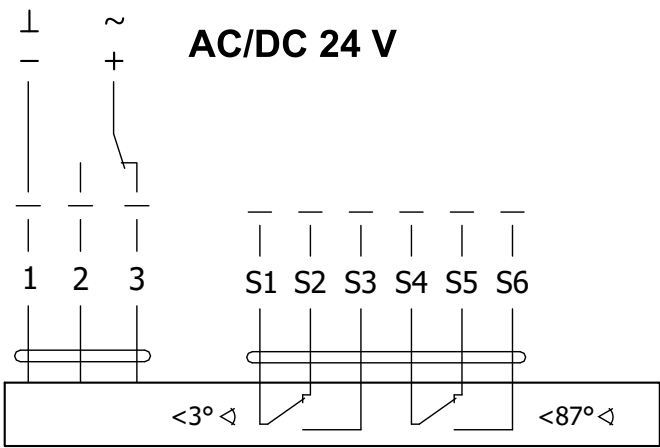


Actuator BELIMO BEE 24(-ST), BEE 24-SR, BEE 230

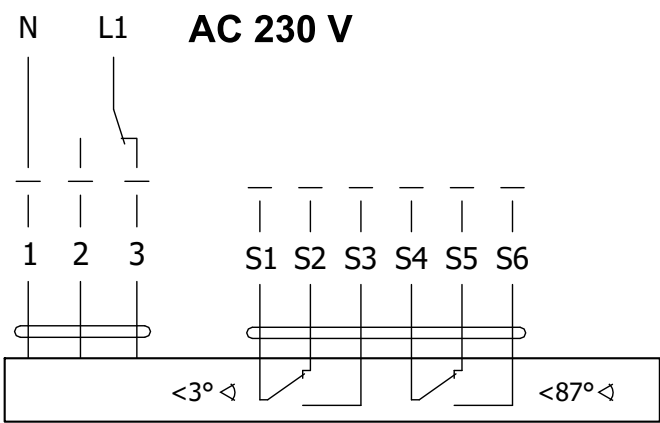
Actuator BELIMO - 25 Nm	BEE 24(-ST)	BEE 24-SR*	BEE 230
Power voltage	AC/DC 24 V 50/60Hz	AC/DC 24 V 50/60Hz	AC 230 V 50/60Hz
Power consumption - in operation - in the end position	2,5 W 0,1 W	3 W 0,3 W	3,5 W 0,4 W
Dimensioning	5 VA (Imax 8,2 A @ 5 ms)	5,5 VA (Imax 8.2 A @ 5 ms)	6 VA (Imax 4 A @ 5 ms)
Protection class	III	III	II
Degree of protection		IP 54	
Adjustment time for 95°		< 60 s	
Ambient temperature Storage temperature		-30°C ... +55°C -40°C ... +80°C	
Connection - drive - auxiliary switch	Cable 1 m, 3 x 0,75 mm ² Cable 1 m, 6 x 0,75 mm ² (BEE 24-ST) with plug connectors	Cable 1 m, 4 x 0,75 mm ² Cable 1 m, 6 x 0,75 mm ²	Cable 1 m, 3 x 0,75 mm ² Cable 1 m, 6 x 0,75 mm ²

* Only available for 24V and selected damper sizes

Actuator BELIMO BE 24-12(-ST)

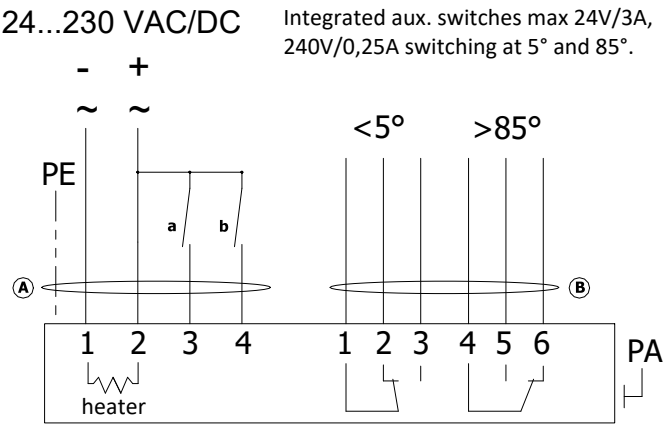


Actuator BELIMO BE 230-12



Actuator BELIMO BE 24-12(-ST), BE 230-12		
Actuator BELIMO - 40 Nm	BE 24-12(-ST)	BE 230-12
Power voltage	AC/DC 24 V 50/60Hz	AC 230 V 50/60Hz
Power consumption - in operation - in the end position	12 W 0,5 W	8 W 0,5 W
Dimensioning	18 VA (Imax 8,2 A @ 5 ms)	15 VA (Imax 7.9 A @ 5 ms)
Protection class	III	II
Degree of protection	IP 54	
Adjustment time for 95°	< 60 s	
Ambient temperature Storage temperature	-30°C ... +55°C -40°C ... +80°C	
Connection - drive - 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 connectors	

Actuator SCHISCHEK InMax 50.75-S

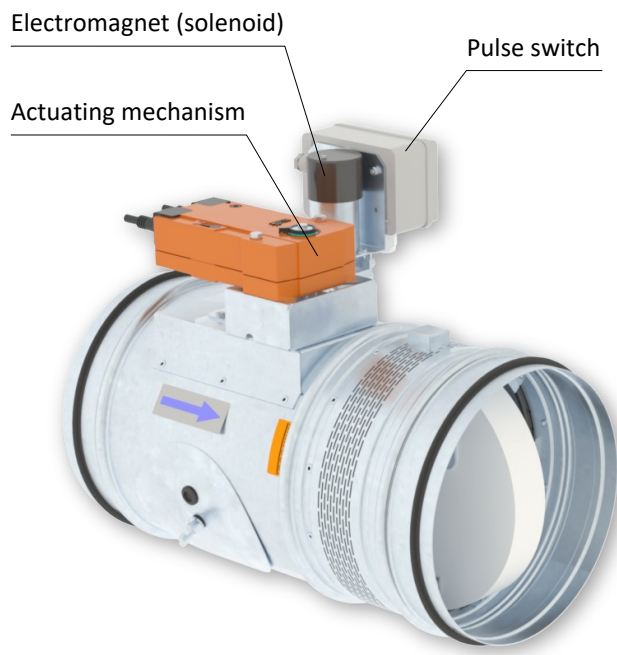
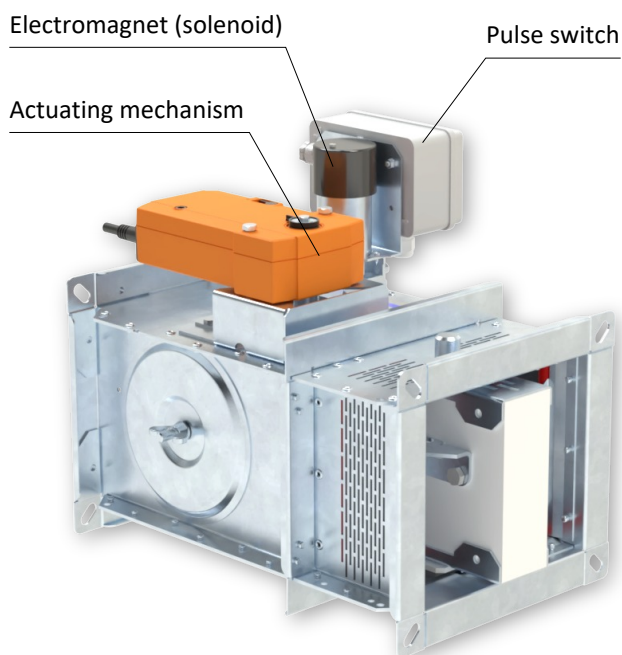


Actuator SCHISCHEK InMax 50.75-S	
Actuator SCHISCHEK	InMax 50.75-S
Power voltage	24-240 VAC/DC 50/60Hz
Power consumption - in operation - heating	10 W 16 W (start at -20°C)
Protection class	I
Degree of protection	IP 66
Adjustment time for 95°	< 60 s
Ambient temperature	-40°C ... +50°C
Storage temperature	-40°C ... +70°C
Connection	cable 1 m, 0,5 mm ²

Design with electric actuating mechanism with emergency function and electromagnet

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

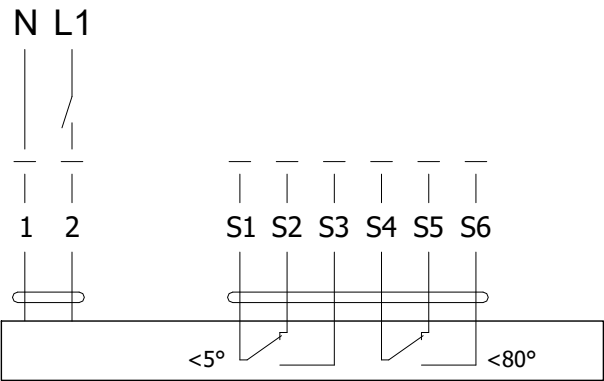
- MSD-W is always equipped by electric actuating mechanism BFN 230-T, BFN 24-T, DAF2.20S or DAF1.20S (further only "actuating mechanism") and is complemented with initiation by means of an electromagnet (solenoid).
- After being connected to power supply AC/DC 24V or 230V, the actuating mechanism displaces 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 initial 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).



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

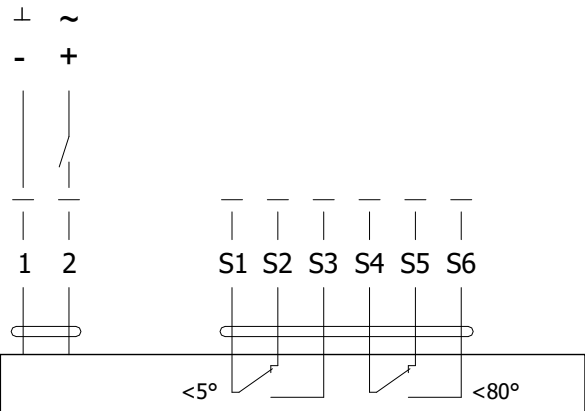
Actuator BELIMO BFN 230

AC230 V



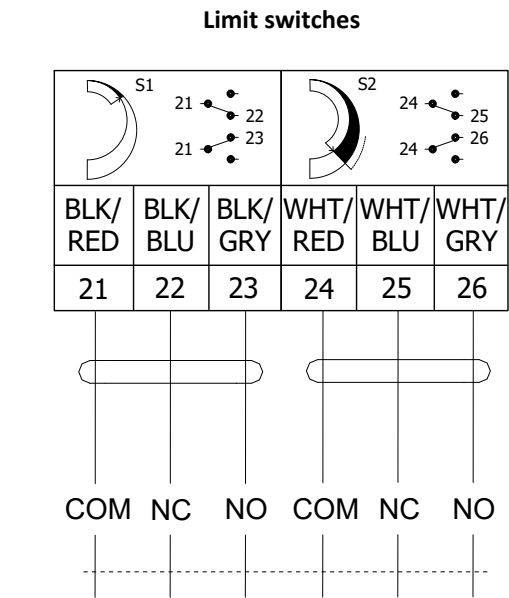
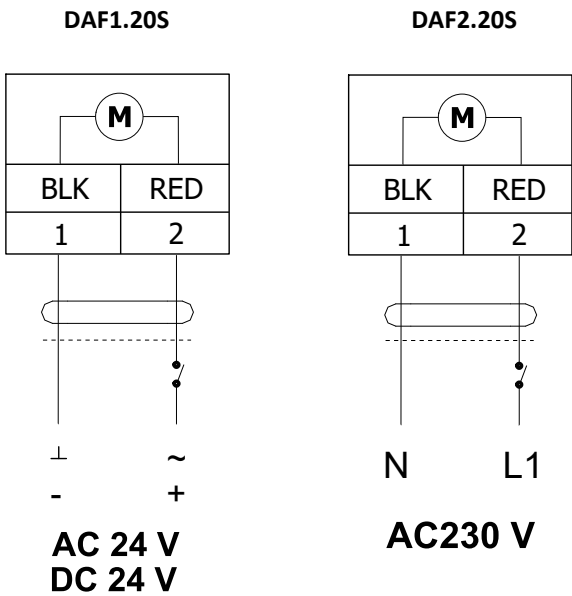
Actuator BELIMO BFN 24

AC/DC 24



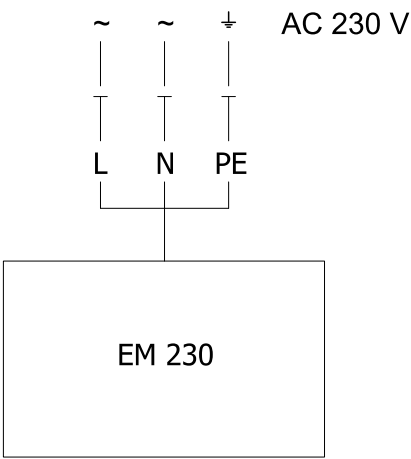
Actuator BELIMO BFN 230, BFN 24		
Actuator BELIMO - 9 Nm/ 7 Nm Spring	BFN 230	BFN 24
Power voltage	AC 230 V 50/60Hz	AC/DC 24 V 50/60Hz
Power consumption - in operation - in rest position	3,5 W 1,3 W	3,2 W 1,2 W
Dimensioning	6,5 VA (Imax 4 A @ 5 ms)	4,3 VA (Imax 2,9 A @ 5 ms)
Protection class	II	III
Degree of protection	IP 54	
Running time - motor - spring return	< 60 s ~ 20 s	
Ambient temperature - normal duty - safety duty - non-operating temperature	-30°C ... +55°C The safe position will be attained up to max. 75°C -40°C ... +55°C	
Connection - supply/control - auxiliary switch	cable 1 m, 2 x 0,75 mm² (BFN 2xx-T-ST) with 3-pin plug-in connectors cable 1 m, 6 x 0,75 mm² (BFN 2xx-T-ST) with 6-pin plug-in connectors	
Response temperature thermal fuse	duct outside temperature +72°C duct inside temperature +72°C	

Actuator Joventa DAF1.20S and DAF2.20S



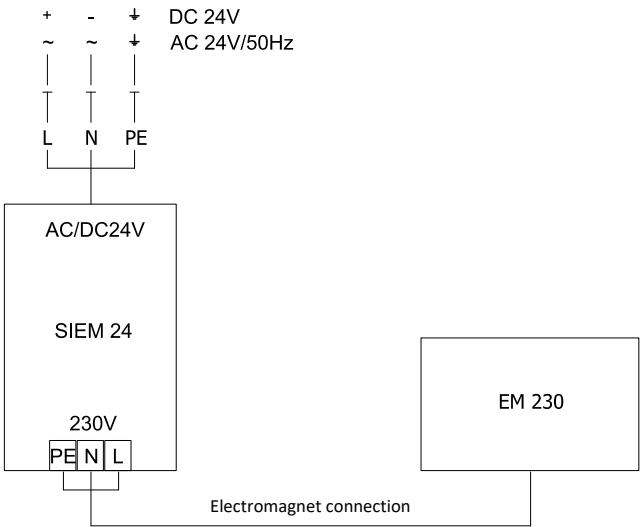
Actuator Joventa DAF1.20S and DAF2.20S		
Actuator Joventa	DAF1.20S	DAF2.20S
Power voltage	AC/DC 24 V 50/60Hz	AC 230 V 50/60Hz
Power consumption - in operation	26 VA (AC); 15,6 W (DC)	0,15 A
- in rest position	9,3 VA (AC); 2,6 W (DC)	0,09 A
Dimensioning	14 VA	14 VA
Protection class	II	II
Degree of protection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

Electromagnet EM230



Electromagnet EM230	
Nominal voltage	AC 230 V
	50 Hz
Dimensioning	1,2 A
Degree of protection	IP 40
Ambient temperature range	-10°C ... +40°C
Connecting	cable 1m, 3x0,75mm ²

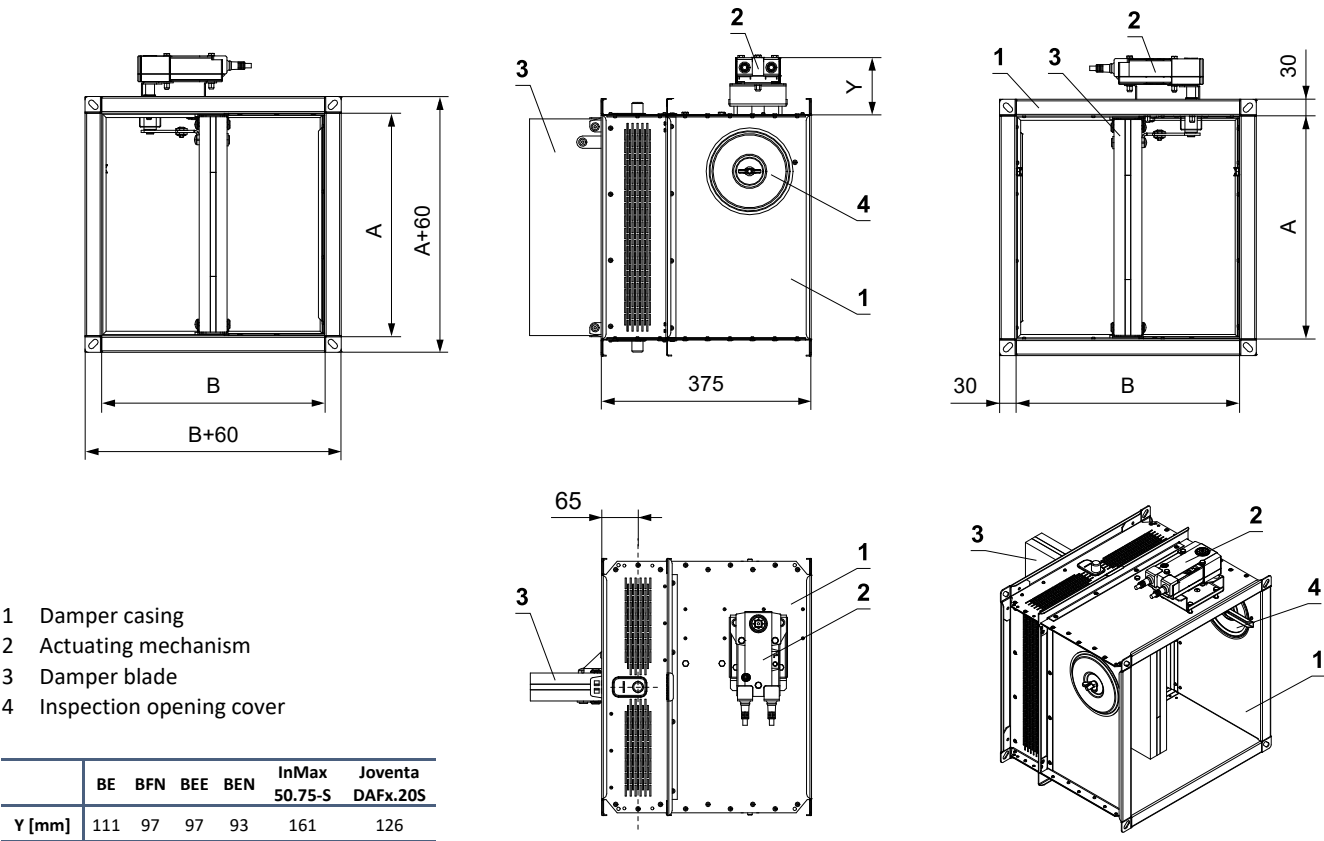
Electromagnet EM230 with impulse switch SIEM24



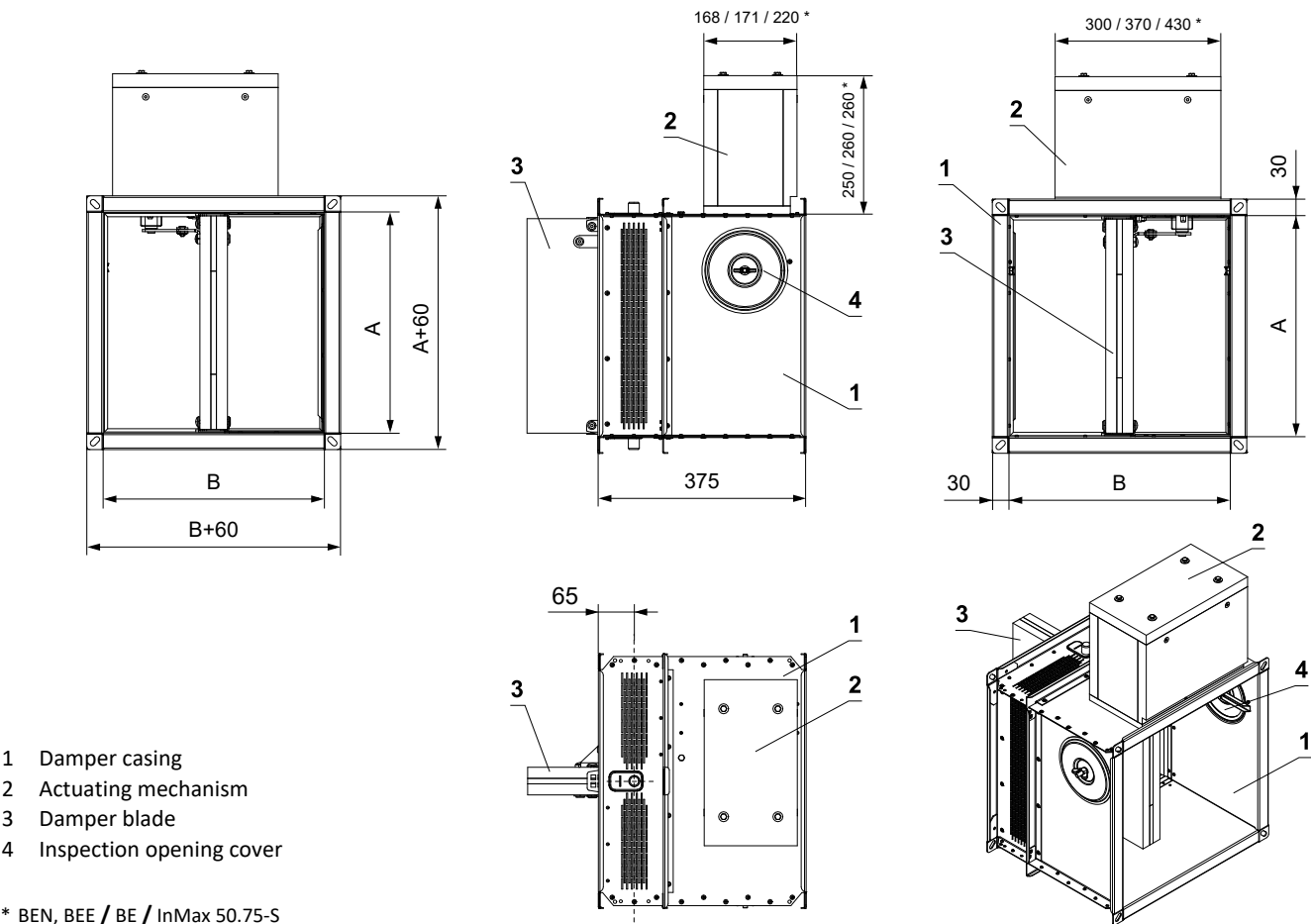
Electromagnet EM230 with impulse switch SIEM24	
Nominal voltage	AC/DC 24 V
	50 Hz
Dimensioning	1 A
Degree of protection	IP 40
Ambient temperature range	-10°C ... +40°C
Switching frequency	max. 1x per minute
Connecting	cable 1m, 3x0,75mm ²

III. DIMENSIONS

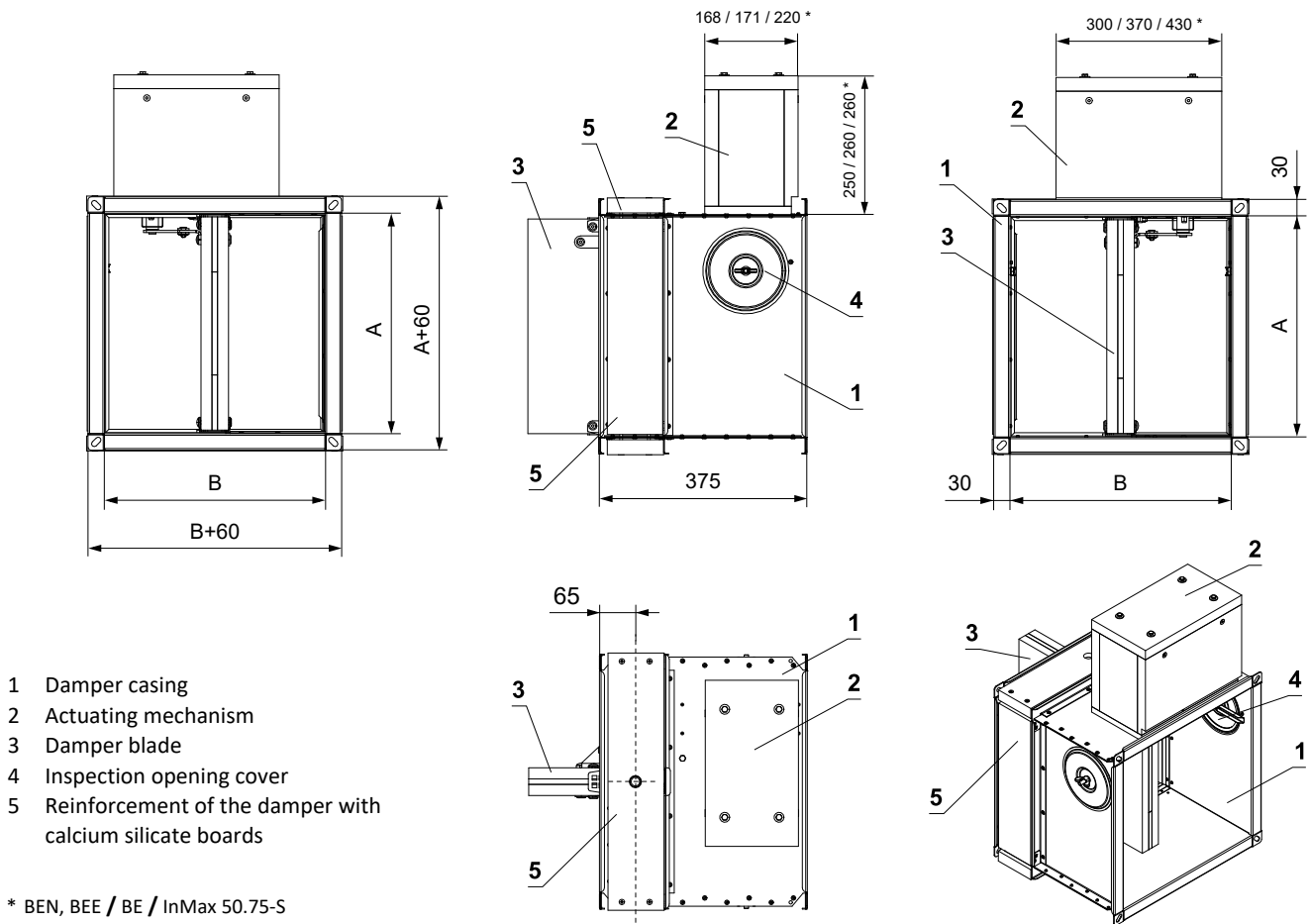
Square MSD (MSD-W) - design with actuating mechanism



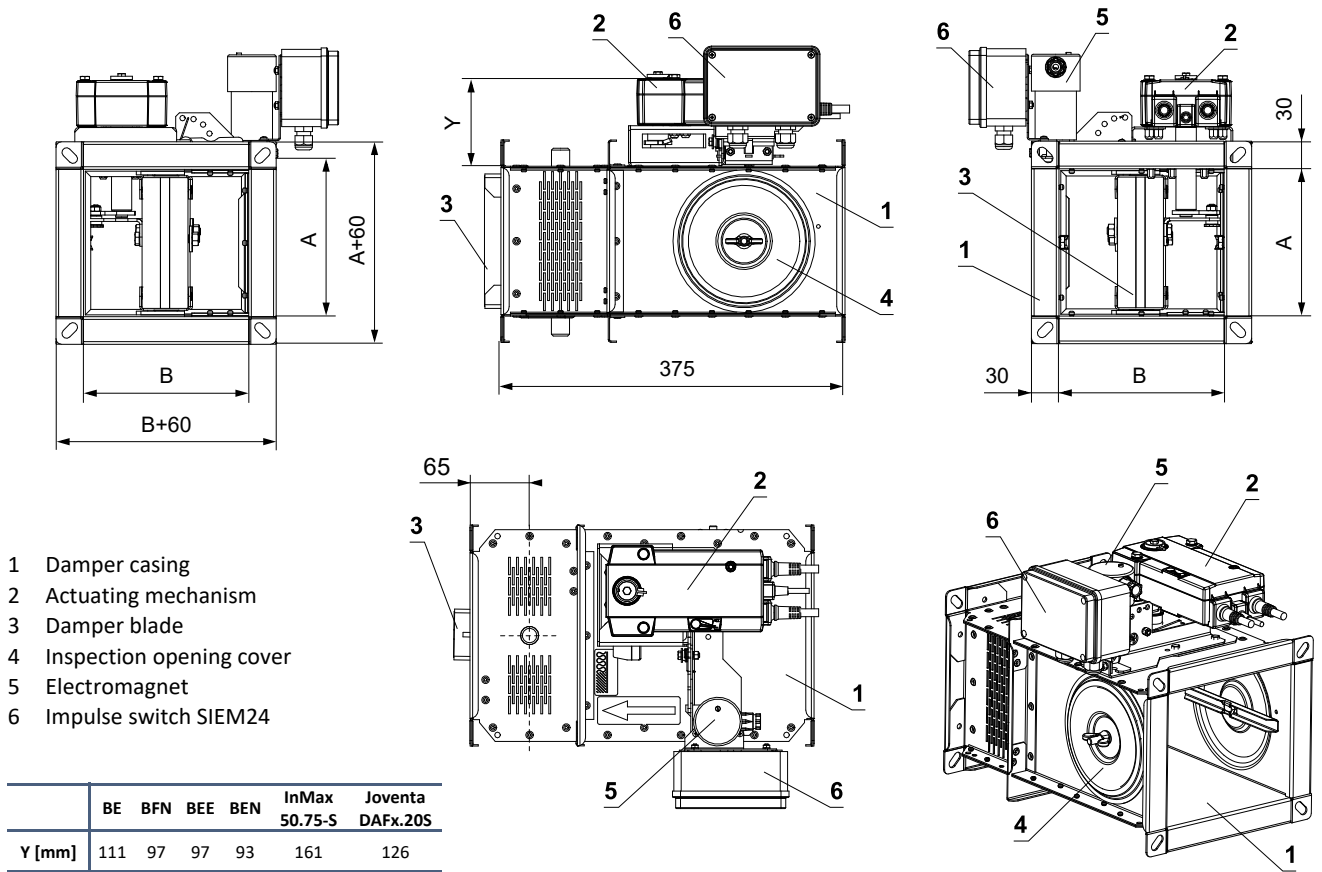
Square MSD - design with actuating mechanism and insulation box



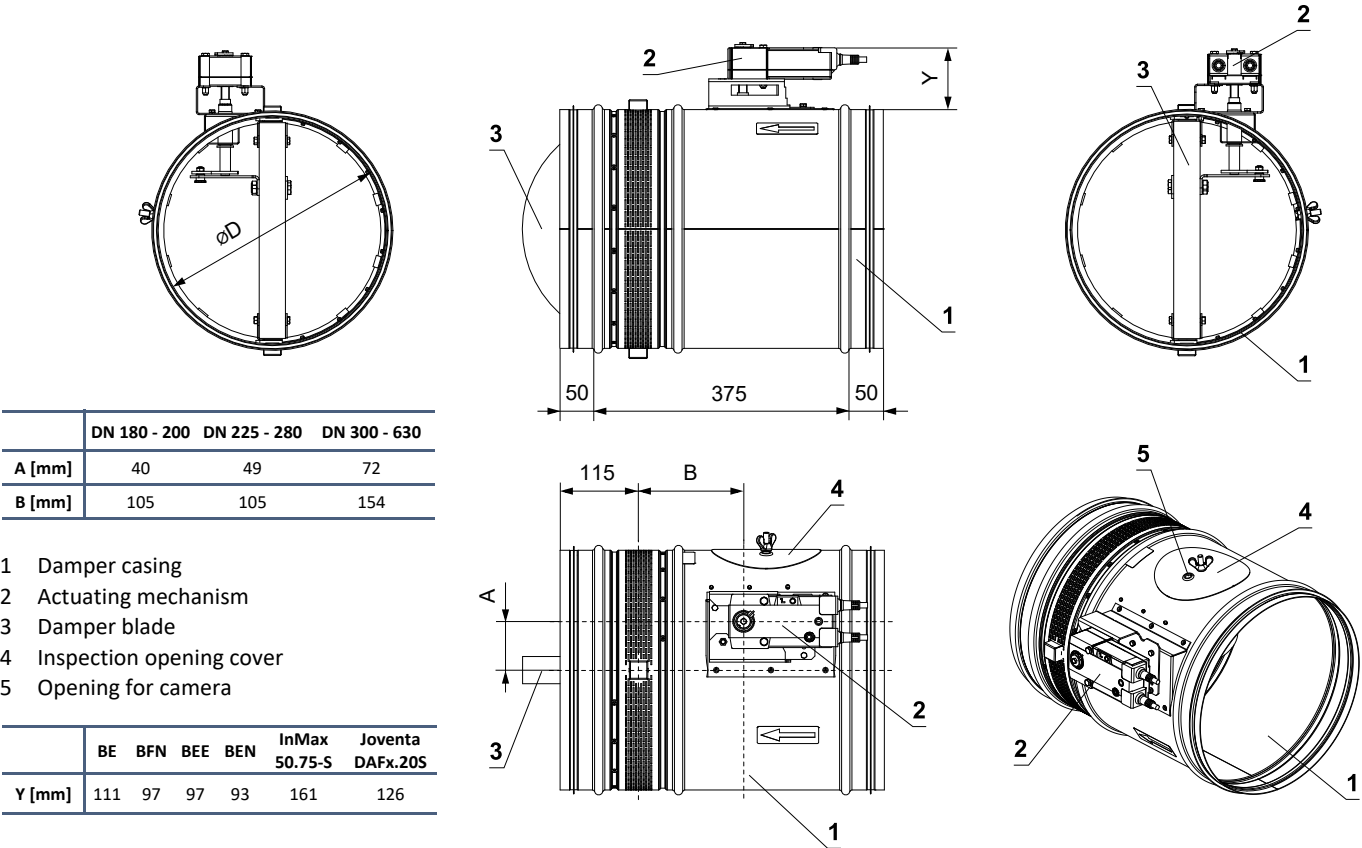
Square MSD (MSD-W) - design with actuating mechanism, insulation box and lining panels



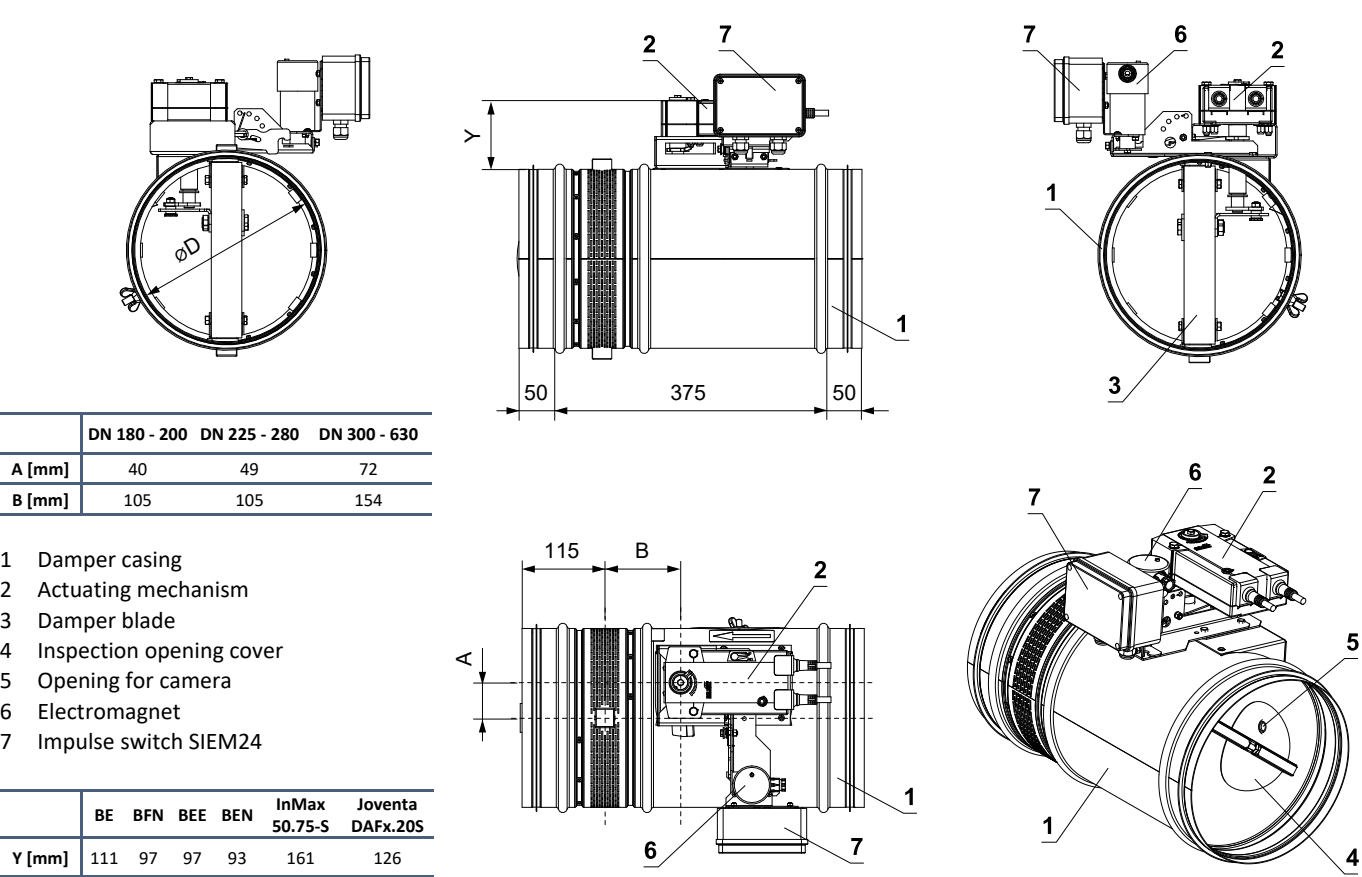
Square MSD-W - design with actuating mechanism with emergency function and electromagnet



Round MSD (MSD-W) - design with actuating mechanism

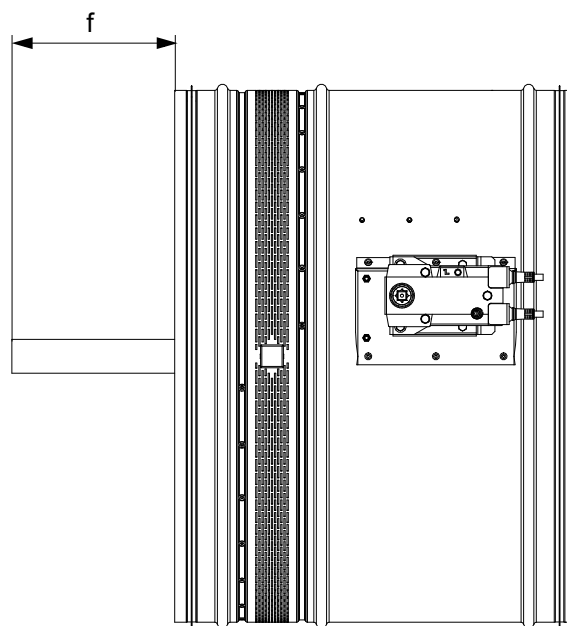
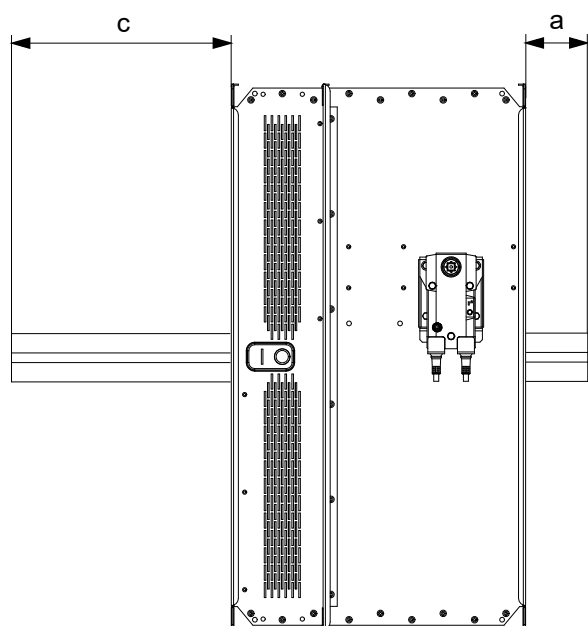


Round MSD-W - design with actuating mechanism with emergency function and electromagnet



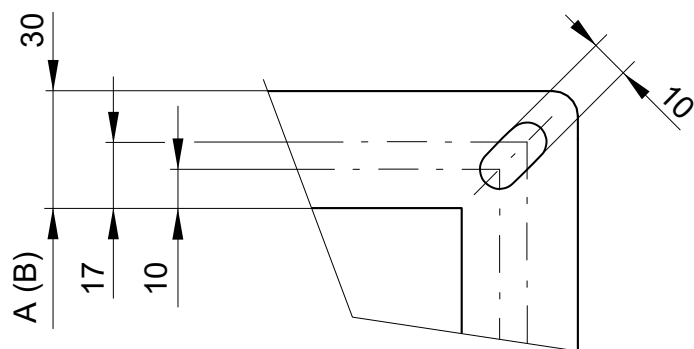
Damper blade overlaps

- Open damper blade overlaps the square damper casing by the value "a" or "c". These values are specified in chapter Technical parameters → see pages 18 to 27
- Open damper blade overlaps the round damper casing by the value "f". These values are specified in chapter Technical parameters → see page 28



Values "a" , "c" and "f" has to be respected when projecting following air-conditioning duct.

Flange of a damper



30 mm wide flanges are fitted with oval holes in the corners

Technical parameters

For square dampers

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
160 x	180	–	19	0,0162	BELIMO BEN	11,7	BELIMO BFN	17,4	BELIMO BEN
	200	–	29	0,0191		12,1		17,7	
	225	–	41,5	0,0228		12,6		18,1	
	250	–	54	0,0264		13,1		18,5	
	280	–	69	0,0307		13,8		19	
	300	–	79	0,0336		14,2		19,3	
	315	–	86,5	0,0358		14,5		19,5	
	355	–	106,5	0,0416		15,3		20,1	
	400	–	129	0,0481		16,3		20,8	
	450	–	154	0,0554		17,3		21,6	
	500	–	179	0,0626		18,3	JOVENTA DAFx.20S	22,3	
	550	–	204	0,0699		19,4		23,1	
	560	–	209	0,0713		19,6		23,3	
	600	–	229	0,0771		20,4		23,9	
	630	–	244	0,0815		21		24,3	
	650	9	254	0,0844		21,4		24,6	
	700	34	279	0,0916		24,3		25,4	
	710	39	284	0,0931		24,5		25,5	
	750	59	304	0,0989		25,3		26,1	
	800	84	329	0,1061		26,4		26,9	
180 x	180	–	19	0,0185	BELIMO BEN	12,1	BELIMO BFN	17,8	BELIMO BEN
	200	–	29	0,0218		12,5		18,1	
	225	–	41,5	0,0259		13		18,5	
	250	–	54	0,0300		13,6		19	
	280	–	69	0,0350		14,2		19,5	
	300	–	79	0,0383		14,7		19,8	
	315	–	86,5	0,0408		15		20,1	
	355	–	106,5	0,0474		15,8		20,8	
	400	–	129	0,0548		16,8		21,6	
	450	–	154	0,0630		17,9		22,4	
	500	–	179	0,0713		19	JOVENTA DAFx.20S	23,3	
	550	–	204	0,0795		20,1		24,1	
	560	–	209	0,0812		20,3		24,3	
	600	–	229	0,0878		21,1		25	
	630	–	244	0,0927		21,8		25,5	
	650	9	254	0,0960		22,2		25,9	
	700	34	279	0,1043		25,1		26,7	
	710	39	284	0,1059		25,3		26,9	
	750	59	304	0,1125		26,2		27,5	
	800	84	329	0,1208		27,3		28,4	
200 x	180	–	19	0,0207	BELIMO BEN	12,4	BELIMO BFN	18,1	BELIMO BEN
	200	–	29	0,0244		12,9		18,5	
	225	–	41,5	0,0290		13,4		19	
	250	–	54	0,0337		14		19,5	
	280	–	69	0,0392		14,7		20	
	300	–	79	0,0429		15,1		20,4	
	315	–	86,5	0,0457		15,5		20,7	
	355	–	106,5	0,0531		16,4		21,5	
	400	–	129	0,0614		17,4		22,3	
	450	–	154	0,0707		18,5		23,3	
	500	–	179	0,0799		19,6		24,2	
	550	–	204	0,0892		20,8		25,2	

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
200 x	560	–	209	0,0910	BELIMO BEN	21	BELIMO BFN	25,4	BELIMO BEN
	600	–	229	0,0984		21,9		26,1	
	630	–	244	0,1040		22,6		26,7	
	650	9	254	0,1077		23		27,1	
	700	34	279	0,1169		26	JOVENTA DAFx.20S	28	
	710	39	284	0,1188		26,2		28,2	
	750	59	304	0,1262		27,1		29	
	800	84	329	0,1354		28,2		29,9	
225 x	180	–	19	0,0235	BELIMO BEN	12,9	BELIMO BFN	18,5	BELIMO BEN
	200	–	29	0,0277		13,3		19	
	225	–	41,5	0,0330		13,9		19,5	
	250	–	54	0,0382		14,5		20,1	
	280	–	69	0,0445		15,2		20,7	
	300	–	79	0,0487		15,7		21,1	
	315	–	86,5	0,0519		16,1		21,5	
	355	–	106,5	0,0603		17		22,3	
	400	–	129	0,0697		18,1	JOVENTA DAFx.20S	23,3	
	450	–	154	0,0802		19,2		24,4	
	500	–	179	0,0907		20,4		25,4	
	550	–	204	0,1012		21,6		26,5	
	560	–	209	0,1033		21,8		26,7	
	600	–	229	0,1117		22,8		27,5	
	630	–	244	0,1180		25,3		28,2	
	650	9	254	0,1222		25,8		28,6	
	700	34	279	0,1327		26,9		29,6	
	710	39	284	0,1348		27,2		29,9	
	750	59	304	0,1432		28,1		30,7	
	800	84	329	0,1537		29,3		31,7	
250 x	180	–	19	0,0263	BELIMO BEN	13,3	BELIMO BFN	19	BELIMO BEN
	200	–	29	0,0310		13,8		19,5	
	225	–	41,5	0,0369		14,4		20,1	
	250	–	54	0,0428		15,1		20,7	
	280	–	69	0,0498		15,8		21,4	
	300	–	79	0,0545		16,3		21,9	
	315	–	86,5	0,0580		16,6		22,2	
	355	–	106,5	0,0674		17,6		23,2	
	400	–	129	0,0780		18,7	JOVENTA DAFx.20S	24,2	
	450	–	154	0,0898		19,9		25,4	
	500	–	179	0,1015		21,2		26,6	
	550	–	204	0,1133		22,4		27,8	
	560	–	209	0,1156		22,6		28	
	600	–	229	0,1250		25,4		29	
	630	–	244	0,1321		26,2		29,6	
	650	9	254	0,1368		26,7		30,1	
	700	34	279	0,1485		27,9		31,3	
	710	39	284	0,1509		28,1		31,5	
	750	59	304	0,1603		29,1		32,4	
	800	84	329	0,1720		30,3		33,6	
280 x	180	–	19	0,0297	BELIMO BEN	13,9	BELIMO BFN	19,5	BELIMO BEN
	200	–	29	0,0350		14,4		20	
	225	–	42	0,0416		15		20,7	
	250	–	54	0,0482		15,7		21,4	
	280	–	69	0,0562		16,4		22,2	
	300	–	79	0,0615		17		22,7	
	315	–	86,5	0,0655		17,3		23,1	

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
280 x	355	–	106,5	0,0761	15,1	18,4	BELIMO BFN	24,2	BELIMO BEN
	400	–	129	0,0880	16,1	19,5		25,4	
	450	–	154	0,1012	17,2	20,8		26,7	
	500	–	179	0,1145	18,4	22,1		28	
	550	–	204	0,1277	19,5	23,3		29,3	
	560	–	209	0,1304	19,7	25,4	JOVENTA DAFx.20S	29,6	
	600	–	229	0,1410	20,6	26,4		30,6	
	630	–	244	0,1489	21,3	27,2		31,4	
	650	9	254	0,1542	21,7	27,7		31,9	
	700	34	279	0,1675	22,8	29		33,2	
	710	39	284	0,1701	23	29,2		33,5	
	750	59	304	0,1807	23,9	30,3		34,5	
	800	84	329	0,1940	25	31,5		35,8	
300 x	180	–	19	0,0319	11,4	14,2	BELIMO BFN	19,8	BELIMO BEN
	200	–	29	0,0376	11,9	14,8		20,4	
	225	–	41,5	0,0447	12,5	15,4		21,1	
	250	–	54	0,0519	13,1	16,1		21,9	
	280	–	69	0,0604	13,8	16,9		22,7	
	300	–	79	0,0661	14,3	17,4		23,3	
	315	–	86,5	0,0704	14,7	17,8		23,7	
	355	–	106,5	0,0818	15,7	18,9		24,9	
	400	–	129	0,0946	16,8	20	JOVENTA DAFx.20S	26,1	
	450	–	154	0,1089	18	21,3		27,5	
	500	–	179	0,1231	19,2	22,7		29	
	550	–	204	0,1374	20,4	25,8		30,3	
	560	–	209	0,1402	20,6	26,1		30,6	
	600	–	229	0,1516	21,5	27,1		31,7	
	630	–	244	0,1602	22,3	27,9		32,6	
	650	9	254	0,1659	22,7	28,4		33,1	
	700	34	279	0,1801	23,9	29,7		34,5	
	710	39	284	0,1830	24,1	30		34,8	
	750	59	304	0,1944	25,1	31		35,9	
	800	84	329	0,2086	26,2	32,4		37,2	
315 x	180	–	19	0,0336	11,6	14,5	BELIMO BFN	20,1	BELIMO BEN
	200	–	29	0,0396	12,1	15,1		20,7	
	225	–	41,5	0,0471	12,8	15,7		21,5	
	250	–	54	0,0546	13,4	16,4		22,2	
	280	–	69	0,0636	14,2	17,2		23,1	
	300	–	79	0,0696	14,7	17,8		23,7	
	315	–	86,5	0,0741	15,1	18,2		24,2	
	355	–	106,5	0,0861	16,1	19,2	JOVENTA DAFx.20S	25,4	
	400	–	129	0,0996	17,2	20,4		26,7	
	450	–	154	0,1146	18,5	21,8		28,2	
	500	–	179	0,1296	19,8	23,1		29,6	
	550	–	204	0,1446	21	26,3		31,1	
	560	–	209	0,1476	21,3	26,5		31,4	
	600	–	229	0,1596	22,3	27,6		32,6	
	630	–	244	0,1686	23	28,4		33,4	
	650	9	254	0,1746	23,5	28,9		34	
	700	34	279	0,1896	24,7	30,3		35,5	
	710	39	284	0,1926	25	30,6		35,7	
	750	59	304	0,2046	26	31,6		36,9	
	800	84	329	0,2196	27,2	33		38,3	
355 x	180	–	19	0,0381	12,2	15,2	BELIMO BFN	20,8	BELIMO BEN
	200	–	29	0,0449	12,8	15,8		21,5	

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
355 x	225	–	41,5	0,0534	13,5	16,5		22,3	
	250	–	54	0,0619	14,2	17,2		23,2	
	280	–	69	0,0721	15,1	18,1		24,2	
	300	–	79	0,0789	15,7	18,7	BELIMO BFN	24,9	
	315	–	86,5	0,0840	16,1	19,1		25,4	
	355	–	106,5	0,0976	17,2	20,2		26,7	
	400	–	129	0,1129	18,5	21,5		28,2	
	450	–	154	0,1299	19,9	22,9		29,9	
	500	–	179	0,1469	21,3	26,1	JOVENTA DAFx.20S	31,5	BELIMO BEN
	550	–	204	0,1639	22,7	27,5		33,1	
	560	–	209	0,1673	23	27,8		33,5	
	600	–	229	0,1809	24,1	28,9		34,8	
	630	–	244	0,1911	25	29,8		35,7	
	650	9	254	0,1979	25,5	30,4		36,4	
	700	34	279	0,2149	26,9	31,8		38	
	710	39	284	0,2183	27,2	32,1		38,3	
	750	59	304	0,2319	28,3	33,2		39,6	
	800	84	329	0,2489	29,7	34,6		41,2	BELIMO BEE
400 x	180	–	19	0,0431	12,9	16		21,6	
	200	–	29	0,0508	13,5	16,7		22,3	
	225	–	41,5	0,0604	14,3	17,4		23,3	
	250	–	54	0,0701	15,1	18,2		24,2	
	280	–	69	0,0816	16,1	19,1	BELIMO BFN	25,4	
	300	–	79	0,0893	16,8	19,7		26,1	
	315	–	86,5	0,0951	17,2	20,1		26,7	
	355	–	106,5	0,1105	18,5	21,3		28,2	
	400	–	129	0,1278	20	22,7		29,9	
	450	–	154	0,1471	21,5	24,2	JOVENTA DAFx.20S	31,7	BELIMO BEN
	500	–	179	0,1663	23,1	27,5		33,6	
	550	–	204	0,1856	24,7	29		35,4	
	560	–	209	0,1894	25	29,3		35,8	
	600	–	229	0,2048	26,2	30,5		37,2	
	630	–	244	0,2164	27,2	31,4		38,3	
	650	9	254	0,2241	27,8	31,9		39	
	700	34	279	0,2433	29,3	33,4		40,8	
	710	39	284	0,2472	29,7	33,7		41,2	
	750	59	304	0,2626	30,9	34,9		42,6	
	800	84	329	0,2818	32,4	36,4		44,4	BELIMO BEE
450 x	180	–	19	0,0487	13,6	17		22,4	
	200	–	29	0,0574	14,3	17,6		23,3	
	225	–	41,5	0,0683	15,2	18,4		24,4	
	250	–	54	0,0792	16,2	19,2		25,4	
	280	–	69	0,0922	17,2	20,2	BELIMO BFN	26,7	
	300	–	79	0,1009	18	20,8		27,5	
	315	–	86,5	0,1074	18,5	21,3		28,2	
	355	–	106,5	0,1248	19,9	22,6		29,9	
	400	–	129	0,1444	21,5	24	JOVENTA DAFx.20S	31,7	BELIMO BEN
	450	–	154	0,1662	23,3	27,4		33,8	
	500	–	179	0,1879	25,1	29		35,9	
	550	–	204	0,2097	26,8	30,6		37,9	
	560	–	209	0,2140	27,2	30,9		38,3	
	600	–	229	0,2314	28,6	32,1		39,9	
	630	–	244	0,2445	29,6	33,1		41,1	
	650	9	254	0,2532	30,3	33,7		41,9	
	700	34	279	0,2749	32	35,3		43,9	

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
450 x	710	39	284	0,2793	BELIMO BEN	32,4	JOVENTA DAFx.20S	35,6	44,3
	750	59	304	0,2967		33,7		17,2	23,2
	800	84	329	0,3184		35,4		18,1	24,2
500 x	180	–	19	0,0543	BELIMO BEN	14,3	BELIMO BFN	18,7	24,9
	200	–	29	0,0640		15,1		19,1	25,4
	225	–	41,5	0,0761		16,2		20,2	26,7
	250	–	54	0,0883		17,2		21,5	28,2
	280	–	69	0,1028		18,4		22,9	29,9
	300	–	79	0,1125		19,2		26,1	31,5
	315	–	86,5	0,1198		19,8		27,5	33,1
	355	–	106,5	0,1392		21,3		27,8	33,5
	400	–	129	0,1610		23,1		28,9	34,8
	450	–	154	0,1853		25,1		29,8	35,7
	500	–	179	0,2095		27	JOVENTA DAFx.20S	30,4	36,4
	550	–	204	0,2338		29		31,8	38
	560	–	209	0,2386		29,3		32,1	38,3
	600	–	229	0,2580		30,9		33,2	39,6
	630	–	244	0,2726		32		34,6	41,2
	650	9	254	0,2823		32,8		16	21,6
	700	34	279	0,3065		34,7		16,7	22,3
	710	39	284	0,3114		35,1		17,4	23,3
	750	59	304	0,3308		36,6		18,2	24,2
	800	84	329	0,3550		38,4		19,1	25,4
550 x	180	–	19	0,0599	BELIMO BEN	15,1	BELIMO BFN	19,7	26,1
	200	–	29	0,0706		16		20,1	26,7
	225	–	41,5	0,0840		17,1		21,3	28,2
	250	–	54	0,0974		18,2		22,7	29,9
	280	–	69	0,1134		19,5		24,2	31,7
	300	–	79	0,1241		20,4		27,5	33,6
	315	–	86,5	0,1321		21		29	35,4
	355	–	106,5	0,1535		22,7		29,3	35,8
	400	–	129	0,1776		24,7		30,5	37,2
	450	–	154	0,2044		26,8		31,4	38,3
	500	–	179	0,2311		29	JOVENTA DAFx.20S	31,9	39
	550	–	204	0,2579		31,1		33,4	40,8
	560	–	209	0,2632		31,5		33,7	41,2
	600	–	229	0,2846		33,2		34,9	42,6
	630	–	244	0,3007		34,4		36,4	44,4
	650	9	254	0,3114		35,2		17	22,4
	700	34	279	0,3381		37,3		17,6	23,3
	710	39	284	0,3435		37,7		18,4	24,4
	750	59	304	0,3649		39,4		19,2	25,4
	800	84	329	0,3916		41,4		20,2	26,7
560 x	180	–	19	0,0610	BELIMO BEN	15,2	BELIMO BFN	20,8	27,5
	200	–	29	0,0719		16,1		21,3	28,2
	225	–	42	0,0856		17,2		22,6	29,9
	250	–	54	0,0992		18,4		24	31,7
	280	–	69	0,1155		19,7		27,4	33,8
	300	–	79	0,1264		20,6		29	35,9
	315	–	87	0,1346		21,3		30,6	37,9
	355	–	106,5	0,1564		23		30,9	38,3
	400	–	129	0,1809		25		32,1	39,9
	450	–	154	0,2082		27,2	JOVENTA DAFx.20S	33,1	41,1
	500	–	179	0,2354		29,3		33,7	41,9
	550	–	204	0,2627		31,5		35,3	43,9

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
560 x	560	–	209	0,2681	BELIMO BEN	34,4	JOVENTA DAFx.20S	43,8	BELIMO BEN
	600	–	229	0,2899		35,8		45,8	
	630	–	244	0,3063		36,9		47,2	
	650	9	254	0,3172		37,6		48,2	
	700	34	279	0,3444		39,4		50,6	
	710	39	284	0,3499		39,7		51,1	
	750	59	304	0,3717		41,2		53	
	800	84	329	0,3989		42,9		55,4	
600 x	180	–	19	0,0655	BELIMO BEN	19,7	BELIMO BFN JOVENTA DAFx.20S	25	BELIMO BEN
	200	–	29	0,0772		20,5		26,1	
	225	–	41,5	0,0918		21,4		27,5	
	250	–	54	0,1065		22,4		29	
	280	–	69	0,1240		23,5		30,6	
	300	–	79	0,1357		24,2		31,7	
	315	–	86,5	0,1445		24,8		32,6	
	355	–	106,5	0,1679		26,3		34,8	
	400	–	129	0,1942		29,8		37,2	
	450	–	154	0,2235		31,6		39,9	
	500	–	179	0,2527		33,5		42,6	
	550	–	204	0,2820		35,3		45,3	
	560	–	209	0,2878		35,7		45,8	
	600	–	229	0,3112		37,2		47,9	
	630	–	244	0,3288		38,3		49,4	
	650	9	254	0,3405		39		50,5	
	700	34	279	0,3697		40,9		53	
	710	39	284	0,3756		41,2		53,5	
	750	59	304	0,3990		42,7		55,6	
	800	84	329	0,4282		44,6		58,1	
630 x	180	–	19	0,0689	BELIMO BEN	20,2	BELIMO BFN JOVENTA DAFx.20S	25,5	BELIMO BEN
	200	–	29	0,0812		21,1		26,7	
	225	–	41,5	0,0966		22		28,2	
	250	–	54	0,1119		23		29,6	
	280	–	69	0,1304		24,1		31,4	
	300	–	79	0,1427		24,9		32,6	
	315	–	86,5	0,1519		25,5		33,4	
	355	–	106,5	0,1765		27		35,7	
	400	–	129	0,2042		30,5		38,3	
	450	–	154	0,2349		32,4		41,1	
	500	–	179	0,2657		34,4		43,9	
	550	–	204	0,2964		36,3		46,7	
	560	–	209	0,3026		36,6		47,2	
	600	–	229	0,3272		38,2		49,4	
	630	–	244	0,3456		39,3		51,1	
	650	9	254	0,3579		40,1		52,1	
	700	34	279	0,3887		42		54,8	
	710	39	284	0,3948		42,4		55,3	
	750	59	304	0,4194		43,9		57,4	
	800	84	329	0,4502		45,8		60,1	
650 x	180	–	19	0,0711	BELIMO BEN	20,6	BELIMO BFN	25,9	BELIMO BEN
	200	–	29	0,0838		21,4		27,1	
	225	–	41,5	0,0997		22,5		28,6	
	250	–	54	0,1156		23,4		30,1	
	280	–	69	0,1346		24,6		31,9	
	300	–	79	0,1473		25,4		33,1	
	315	–	86,5	0,1568		25,9		34	

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
650 x	355	–	106,5	0,1822	25,5	34,4	BELIMO BFN	39	
	400	–	129	0,2108	27,8	31,1		41,9	
	450	–	154	0,2426	30,3	33		44,8	
	500	–	179	0,2743	32,8	35		47,7	
	550	–	204	0,3061	35,2	36,9		48,2	BELIMO BEN
	560	–	209	0,3124	35,7	37,3		50,5	
	600	–	229	0,3378	37,7	38,8	JOVENTA	52,1	
	630	–	244	0,3569	39,1	40	DAFx.20S	53,2	
	650	9	254	0,3696	40,1	40,8		56	
	700	34	279	0,4013	42,5	42,7		56,5	
	710	39	284	0,4077	43	43,1		58,7	BELIMO BEE
	750	59	304	0,4331	44,9	44,7		61,4	
	800	84	329	0,4648	47,2	46,6		26,7	BELIMO BE
700 x	180	–	19	0,0767	17,2	21,5		28	
	200	–	29	0,0904	18,4	22,4		29,6	
	225	–	41,5	0,1075	19,8	23,5		31,3	
	250	–	54	0,1247	21,1	24,5	BELIMO BFN	33,2	
	280	–	69	0,1452	22,8	25,7		34,5	
	300	–	79	0,1589	23,9	26,5		35,5	
	315	–	86,5	0,1692	24,7	27,1		38	
	355	–	106,5	0,1966	26,9	30,6		40,8	BELIMO BEN
	400	–	129	0,2274	29,3	32,4		43,9	
	450	–	154	0,2617	32	34,4		47	
	500	–	179	0,2959	34,7	36,4		50	
	550	–	204	0,3302	37,3	38,5		50,6	
	560	–	209	0,3370	37,8	38,9		53	
	600	–	229	0,3644	39,9	40,5	JOVENTA	54,8	
	630	–	244	0,3850	41,5	41,7	DAFx.20S	56	
	650	9	254	0,3987	42,5	42,5		58,9	
	700	34	279	0,4329	45,1	44,6		59,5	
	710	39	284	0,4398	45,6	45		61,8	BELIMO BEE
	750	59	304	0,4672	47,6	46,6		64,6	
	800	84	329	0,5014	50,1	48,6		26,9	BELIMO BE
710 x	180	–	19	0,0778	17,4	21,7		28,2	
	200	–	29	0,0917	18,5	22,6		29,9	
	225	–	41,5	0,1091	19,9	23,7		31,5	
	250	–	54	0,1265	21,3	24,7	BELIMO BFN	33,5	
	280	–	69	0,1473	23	25,9		34,8	
	300	–	79	0,1612	24,1	26,7		35,7	
	315	–	86,5	0,1717	25	27,3		38,3	
	355	–	106,5	0,1995	27,2	30,8		41,2	BELIMO BEN
	400	–	129	0,2307	29,7	32,6		44,3	
	450	–	154	0,2655	32,4	34,7		47,4	
	500	–	179	0,3002	35,1	36,7		50,5	
	550	–	204	0,3350	37,7	38,8		51,1	
	560	–	209	0,3419	38,3	39,2		53,5	
	600	–	229	0,3697	40,4	40,8	JOVENTA	55,3	
	630	–	244	0,3906	41,9	42,1	DAFx.20S	56,5	
	650	9	254	0,4045	43	42,9		59,5	
	700	34	279	0,4392	45,6	45		60,1	BELIMO BEE
	710	39	284	0,4462	46,1	45,4		62,4	
	750	59	304	0,4740	48,1	47		65,3	
	800	84	329	0,5087	50,6	49,1		27,5	BELIMO BE
	180	–	19	0,0823	18	22,4		29	
	200	–	29	0,0970	19,2	23,3	BELIMO BFN	34	BELIMO BEN

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
750 x	225	–	41,5	0,1154	20,6	24,5	BELIMO BFN	30,7	BELIMO BEN
	250	–	54	0,1338	22,1	25,5		32,4	
	280	–	69	0,1558	23,9	26,8		34,5	
	300	–	79	0,1705	25,1	27,6		35,9	
	315	–	86,5	0,1815	26	28,3		36,9	
	355	–	106,5	0,2109	28,3	31,8		39,6	
	400	–	129	0,2440	30,9	33,7	JOVENTA DAFx.20S	42,6	BELIMO BEN
	450	–	154	0,2808	33,7	35,8		45,9	
	500	–	179	0,3175	36,6	37,9		49,2	
	550	–	204	0,3543	39,4	40,1		52,4	
	560	–	209	0,3616	39,9	40,5		53	
	600	–	229	0,3910	42,1	42,2		55,6	
	630	–	244	0,4131	43,8	43,5		57,4	
	650	9	254	0,4278	44,9	44,3	BELIMO BEE	58,7	BELIMO BEE
	700	34	279	0,4645	47,6	46,4		61,8	
	710	39	284	0,4719	48,1	46,9		62,4	
	750	59	304	0,5013	50,3	48,6	BELIMO BE	64,8	BELIMO BE
	800	84	329	0,5380	52,9	50,7		67,8	
800 x	180	–	19	0,0879	18,7	23,3	BELIMO BFN	28,4	BELIMO BEN
	200	–	29	0,1036	20	24,3		29,9	
	225	–	41,5	0,1232	21,5	25,5		31,7	
	250	–	54	0,1429	23,1	26,6		33,6	
	280	–	69	0,1664	25	27,9		35,8	
	300	–	79	0,1821	26,2	28,8		37,2	
	315	–	86,5	0,1939	27,2	29,4	JOVENTA DAFx.20S	38,3	BELIMO BEN
	355	–	106,5	0,2253	29,7	33		41,2	
	400	–	129	0,2606	32,4	35		44,4	
	450	–	154	0,2999	35,4	37,2		47,9	
	500	–	179	0,3391	38,4	39,4		51,3	
	550	–	204	0,3784	41,4	41,7		54,7	
	560	–	209	0,3862	42	42,1	BELIMO BEE	55,4	BELIMO BEE
	600	–	229	0,4176	44,3	43,9		58,1	
	630	–	244	0,4412	46,1	45,2		60,1	
	650	9	254	0,4569	47,2	46,1	BELIMO BE	61,4	BELIMO BE
	700	34	279	0,4961	50,1	48,3		64,6	
	710	39	284	0,5040	50,6	48,7		65,3	
	750	59	304	0,5354	52,9	50,5	BELIMO BE	67,8	BELIMO BE
	800	84	329	0,5746	55,7	52,7		71	
900 x	180	–	19	0,0991	20,1	25,1	BELIMO BFN	30,1	BELIMO BEN
	200	–	29	0,1168	21,5	26,2		31,7	
	225	–	42	0,1389	23,3	27,5		33,8	
	250	–	54	0,1611	25,1	28,7		35,9	
	280	–	69	0,1876	27,2	30,1		38,3	
	300	–	79	0,2053	28,6	31		39,9	
	315	–	86,5	0,2186	29,6	33,6	JOVENTA DAFx.20S	41,1	BELIMO BEN
	355	–	106,5	0,2540	32,4	35,5		44,3	
	400	–	129	0,2938	35,4	37,7		47,9	
	450	–	154	0,3381	38,8	40		51,7	
	500	–	179	0,3823	42,1	42,4		55,6	
	550	–	204	0,4266	45,4	44,8		59,3	
	560	–	209	0,4354	46,1	45,3	BELIMO BEE	60,1	BELIMO BEE
	600	–	229	0,4708	48,7	47,2		63	
	630	–	244	0,4974	50,6	48,7		65,2	
	650	9	254	0,5151	51,9	49,6	BELIMO BE	66,6	BELIMO BE
	700	34	279	0,5593	55	52		70,2	

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
900 x	710	39	284	0,5682	55,6	52,5	JOVENTA DAFx.20S	70,9	BELIMO BE
	750	59	304	0,6036				73,7	
	800	84	329	0,6478				77,1	
1000 x	180	–	19	0,1103	21,5	26,9	BELIMO BFN	31,7	BELIMO BEN
	200	–	29	0,1300				33,6	
	225	–	42	0,1546				35,9	
	250	–	54	0,1793				38,1	
	280	–	69	0,2088				40,8	
	300	–	79	0,2285				42,6	
	315	–	86,5	0,2433				43,9	
	355	–	106,5	0,2827				47,4	
	400	–	129	0,3270				51,3	
	450	–	154	0,3763				55,6	
	500	–	179	0,4255				59,7	
	550	–	204	0,4748			JOVENTA DAFx.20S	63,8	
	560	–	209	0,4846				64,6	BELIMO BEE
	600	–	229	0,5240				67,8	
	630	–	244	0,5536				70,2	BELIMO BE
	650	9	254	0,5733				71,7	
	700	34	279	0,6225				75,6	
	710	39	284	0,6324				76,4	
	750	59	304	0,6718				79,4	
	800	84	329	0,7210				83,1	
1100 x	180	–	19	0,1215	23	28,7	BELIMO BFN	33,4	BELIMO BEN
	200	–	29	0,1432				35,4	
	225	–	41,5	0,1703				37,9	
	250	–	54	0,1975				40,4	
	280	–	69	0,2300				43,3	
	300	–	79	0,2517				45,3	
	315	–	86,5	0,2680				46,7	
	355	–	106,5	0,3114				50,5	
	400	–	129	0,3602				54,7	
	450	–	154	0,4145				59,3	
	500	–	179	0,4687			JOVENTA DAFx.20S	63,8	
	550	–	204	0,5230				68,2	BELIMO BEE
	560	–	209	0,5338				69,1	
	600	–	229	0,5772				72,5	BELIMO BE
	630	–	244	0,6098				75,1	
	650	9	254	0,6315				76,7	
	700	34	279	0,6857				80,9	
	710	39	284	0,6966				81,7	
	750	59	304	0,7400				84,9	
	800	84	329	0,7942				88,8	
1250 x	180	–	19	0,1383	25,1	31,4	BELIMO BFN	35,9	BELIMO BEN
	200	–	29	0,1630				38,1	
	225	–	41,5	0,1939				40,9	
	250	–	54	0,2248				43,7	
	280	–	69	0,2618				47	
	300	–	79	0,2865				49,2	
	315	–	87	0,3050			JOVENTA DAFx.20S	50,8	
	355	–	106,5	0,3544				55	
	400	–	129	0,4100				59,7	
	450	–	154	0,4718				64,8	
	500	–	179	0,5335				69,8	BELIMO BEE
	550	–	204	0,5953				74,6	

A x B [mm]	Damper blade overlaps		Free area S _f [m ²]	MSD-W		MSD-W with electromagnet		MSD	
	a [mm]	c [mm]		Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
1250 x	560	–	209	0,6076	BELIMO BEN	56,8	JOVENTA DAFx.20S	75,6	BELIMO BE
	600	–	229	0,6570		59,3		79,4	
	630	–	244	0,6941		61,1		82,1	
	650	9	254	0,7188		62,4		84	
	700	34	279	0,7805		65,4		88,5	
	710	39	284	0,7929		66,1		89,3	
	750	59	304	0,8423		68,5		92,8	
	800	84	329	0,9040		71,6		97,1	
1400 x	180	–	19	0,1551	BELIMO BEN	34,2	BELIMO BFN	38,3	BELIMO BEN
	200	–	29	0,1828		35,7		40,8	
	225	–	41,5	0,2174		37,5		43,9	
	250	–	54	0,2521		41		47	
	280	–	69	0,2936		43	JOVENTA DAF2.20S	50,6	
	300	–	79	0,3213		44,3		53	
	315	–	86,5	0,3421		45,3		54,8	
	355	–	106,5	0,3975		48		59,5	
	400	–	129	0,4598		51		64,6	
	450	–	154	0,5291		54,3		70,2	
	500	–	179	0,5983		57,7		75,6	
	550	–	204	0,6676		61		80,9	
	560	–	209	0,6814		61,7		81,9	
	600	–	229	0,7368		64,3		86	
	630	–	244	0,7784		66,3		88,9	
	650	9	254	0,8061		67,7		90,9	
	700	34	279	0,8753		71		95,7	
	710	39	284	0,8892		71,7		96,7	
	750	59	304	0,9446		74,3		100,4	
	800	84	329	1,0138		77,7		104,9	SCHISCHEK InMax 50.75
1500 x	180	–	19	0,1663	BELIMO BEN	36	BELIMO BFN	39,9	BELIMO BEN
	200	–	29	0,1960		37,6		42,6	
	225	–	42	0,2331		39,5		45,9	
	250	–	54	0,2703		43,1		49,2	
	280	–	69	0,3148		45,2	JOVENTA DAFx.20S	53	
	300	–	79	0,3445		46,6		55,6	
	315	–	86,5	0,3668		47,6		57,4	
	355	–	106,5	0,4262		50,4		62,4	
	400	–	129	0,4930		53,6		67,8	
	450	–	154	0,5673		57,1		73,7	
	500	–	179	0,6415		60,6		79,4	
	550	–	204	0,7158		64,2		84,9	
	560	–	209	0,7306		64,9		86	
	600	–	229	0,7900		67,7		90,2	
	630	–	244	0,8346		69,8		93,3	
	650	9	254	0,8643		71,2		95,4	
	700	34	279	0,9385		74,7		100,4	
	710	39	284	0,9534		75,4		101,3	
	750	59	304	1,0128		78,2		105,2	
	800	84	329	1,0870		81,6	JOVENTA DAF2.20S	109,8	SCHISCHEK InMax 50.75

For round dampers

Nominal size ØD [mm]	Damper blade overlaps f [mm]	Free area Sf [m²]	MSD-W with electromagnet		MSD	
			Weight [kg]	Actuating mechanism	Weight [kg]	Actuating mechanism
180	–	0,0160	11,3	BELIMO BFN	5,9	BELIMO BEN
200	–	0,0208	11,7		6,4	
225	–	0,0277	12,2		7	
250	2,5	0,0356	12,9		7,7	
280	17,5	0,0463	13,6		8,6	
315	35	0,0607	14,6		9,7	
355	55	0,0794	15,8		10,9	
400	77,5	0,1035	15,6	JOVENTA DAFx.20S	12,4	
450	102,5	0,1339	17,3		14,2	
500	127,5	0,1683	19,2		16	
560	157,5	0,2148	21,7		18,3	
630	192,5	0,2762	24,8		21,2	

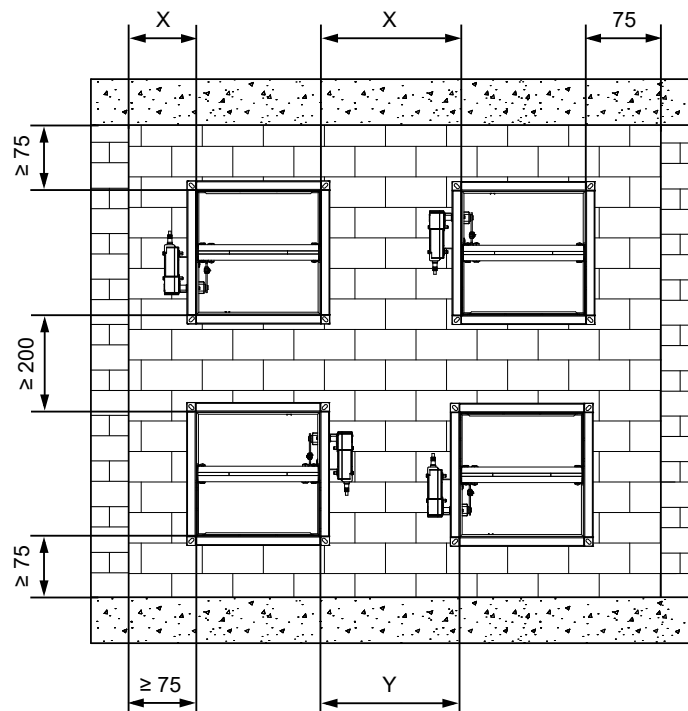
IV. INSTALLATION

Placement and installation

- Dampers are designed to remove heat and combustion products (e.g. smoke) from fire compartments.
- Dampers are suitable for installation in vertical and horizontal position passages of fire separating constructions. The damper installation procedures must be done so that all load transfer from the fire separating constructions to the damper is absolutely excluded.
- Following air-conditioning duct must be suspended or supported so that all load transfer from the following duct to the damper flange is absolutely excluded.
- The gap between the installed damper and the fire separating construction must be perfectly filled with approved material.
- After installing the damper, the damper blades must only be opened, or closed by operation of the actuator only.
- The distance between the damper and the construction (wall, ceiling) must be 75 mm at the minimum, according to EN 1366-2. If two or more dampers are to be installed in one fire separating construction, the distance between adjacent dampers must be 200 mm at the minimum, according to EN 1366-10.
- To provide the necessary space for access to the control device, it is recommended that other objects be at least 350 mm away from the control parts of the damper device, it is recommended that other objects be at least 350 mm away from the control parts of the damper.

Minimum distance between the dampers and the construction (applies to both round and square dampers)

- minimum distance 200 mm between dampers, according to EN 1366-10
- minimum distance 75 mm between damper and construction (wall/ceiling), according to EN 1366-10



X = recommended minimum distance for a square damper with actuator ≥ 200 mm

X = recommended minimum distance for a square damper with actuator and box ≥ 400 mm

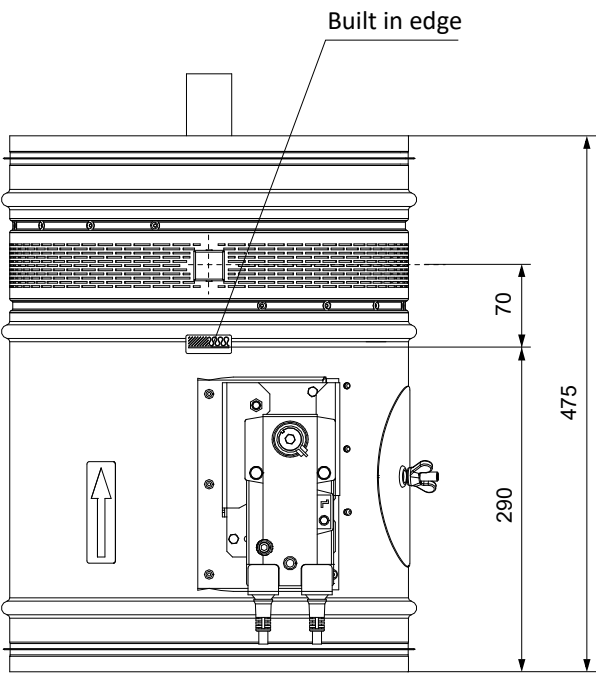
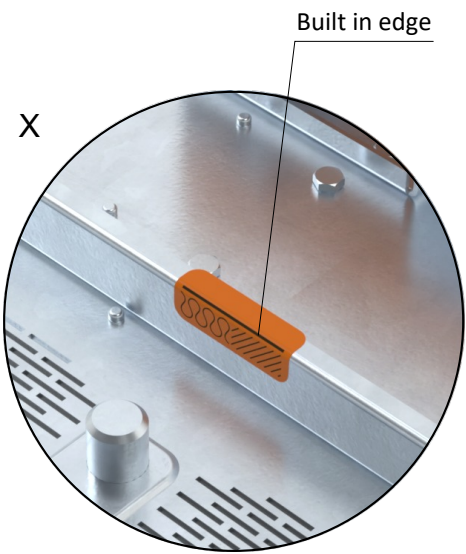
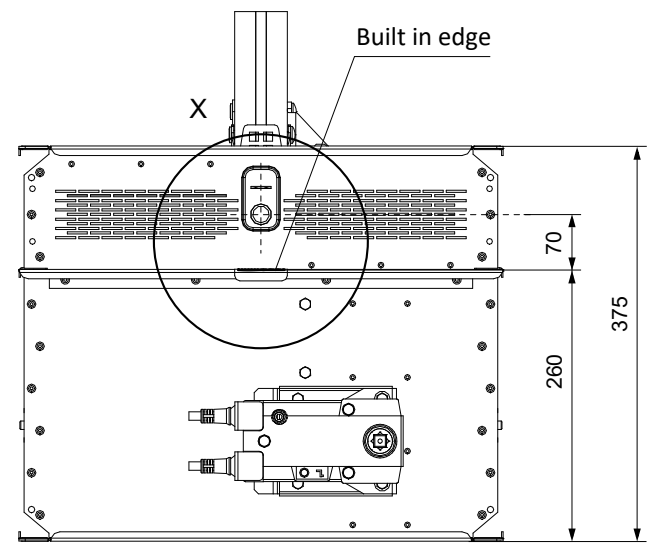
X = recommended minimum distance for a round damper with actuator ≥ 200 mm

Y = recommended minimum distance for a square damper with actuator ≥ 380 mm

Y = recommended minimum distance for a square damper with actuator and box ≥ 700 mm

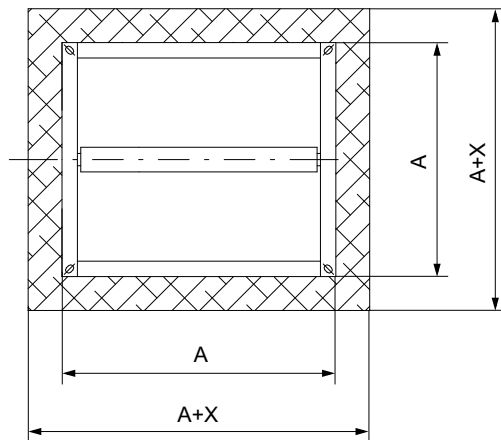
Y = recommended minimum distance for a round damper with actuator ≥ 350 mm

Built in edge



Dimensions of an installation opening

Dimensions of an installation opening - square dampers



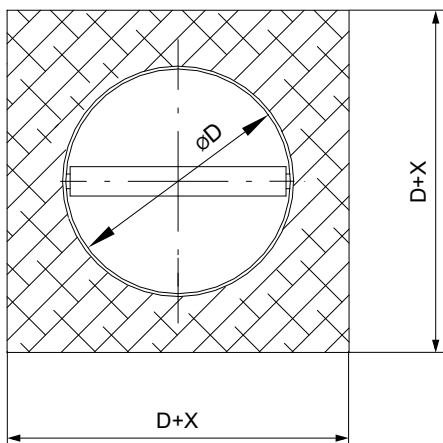
Mortar or gypsum

- X = min. 50 mm
- X = max. 150 mm

Ablative Coated Batt

- X = min. 50 mm
- X = max. 200 mm

Dimensions of an installation opening - round dampers



Mortar or gypsum

- X = min. 50 mm
- X = max. 150 mm

Statement of installations

Fire separating construction, location of the damper	Shape of the damper	Damper in section	Installation type, installation system	Gap width [mm]	Classification	Page
Standard low- and high-density rigid wall construction according to EN 1363-1 - damper in the wall 125 mm min. wall thickness	Round	SINGLE	Mortar or gypsum	50-150	EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti	33
Standard low- and high-density rigid wall construction according to EN 1363-1 - damper in the wall 100 mm min. wall thickness	Square	SINGLE	Mortar or gypsum	50-150	EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti	34
		MULTI			EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti	35
		SINGLE	Ablative Coated Batt	50-200	EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti	36
		MULTI			EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti	37
Standard flexible wall construction min. EI 90 according to EN 1363-1 - damper in the wall 125 mm min. wall thickness	Round	SINGLE	Mortar or gypsum	50-150	EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti	38
Standard flexible wall construction min. EI 90 according to EN 1363-1 - damper in the wall 100 mm min. wall thickness	Square	SINGLE	Mortar or gypsum	50-150	EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti	39
		MULTI			EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti	40
		SINGLE	Ablative Coated Batt	50-200	EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (v _{ew}) S1500[H]C ₁₀₀₀₀ AAmulti	41
		MULTI			EI 120 (v _{ew}) S1500[H]C _{mod} HOT400/30AAmulti	42
Standard low- and high-density rigid floor construction according to EN 1366-2 - damper in the ceiling 150 mm min. ceiling thickness	Round	SINGLE	Mortar or gypsum	50-150	EI 120 (h _{ow}) S1500[H]C ₁₀₀₀₀ AAmulti	43
	Square	SINGLE			EI 120 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (h _{ow}) S1500[H]C ₁₀₀₀₀ AAmulti	44
		MULTI			EI 120 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti	45
		SINGLE	Ablative Coated Batt	50-200	EI 90 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti E 120 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti * EI 120 (h _{ow}) S1500[H]C ₁₀₀₀₀ AAmulti	46
		MULTI			EI 90 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti E 120 (h _{ow}) S1500[H]C _{mod} HOT400/30AAmulti	47
Horizontal or vertical smoke extraction ducts tested according to EN 1366-8 or EN 1366-9 Into or onto the duct	Square	MULTI	Damper installed Into or onto a duct	N/A	EI 120 (v _{ed}) S1500[H]C _{mod} HOT400/30AAmulti EI 120 (h _{od}) S1500[H]C _{mod} HOT400/30AAmulti	48-49

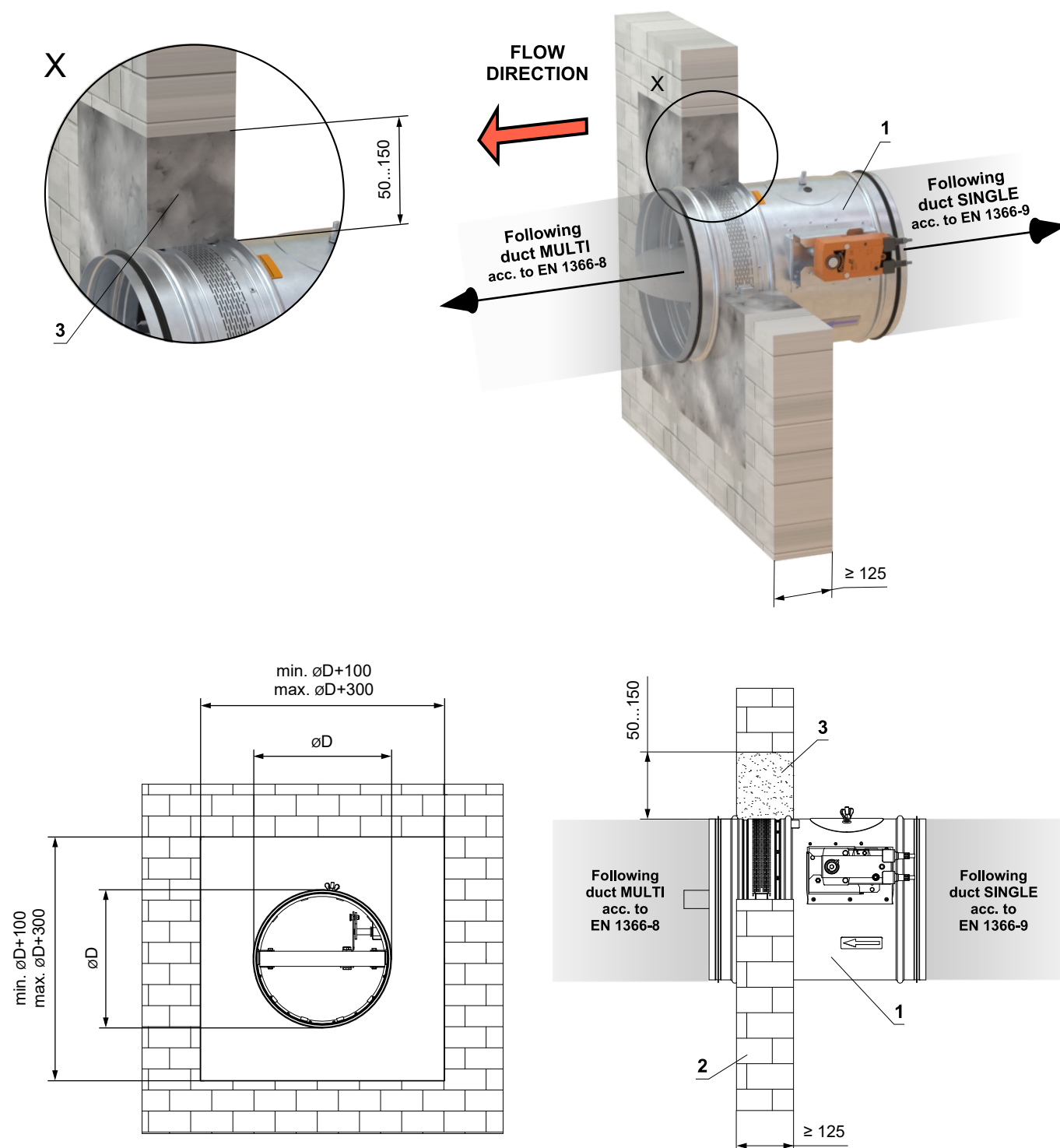
* Applies to MSD-W damper

In solid wall construction

In solid wall construction - mortar or gypsum
- damper placement in a single section

EI 120 (v_{ew}) S1500[H]C₁₀₀₀₀AAmulti

- Standard low- and high-density rigid wall construction according to EN 1363-1
- For connection of following duct → see page 52



- 1 MSD-W / MSD - design „A“
- 2 Solid wall construction
- 3 Mortar or gypsum

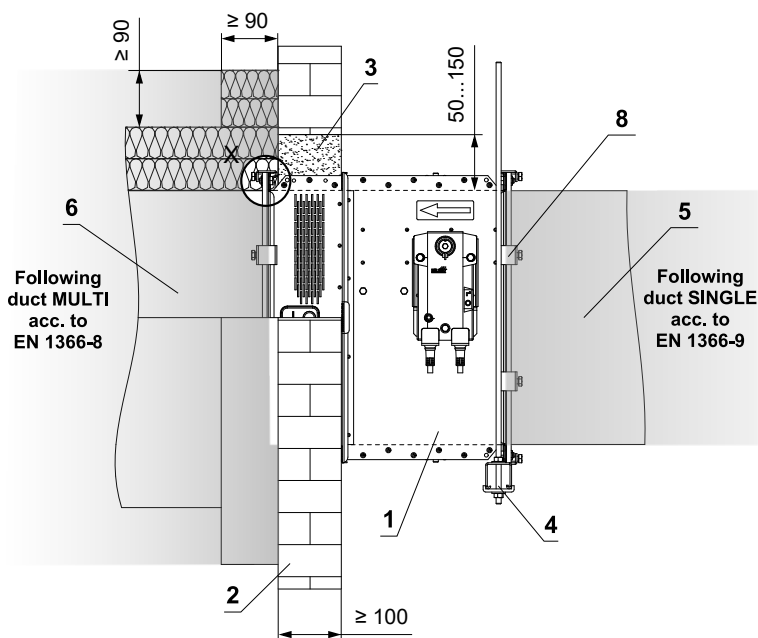
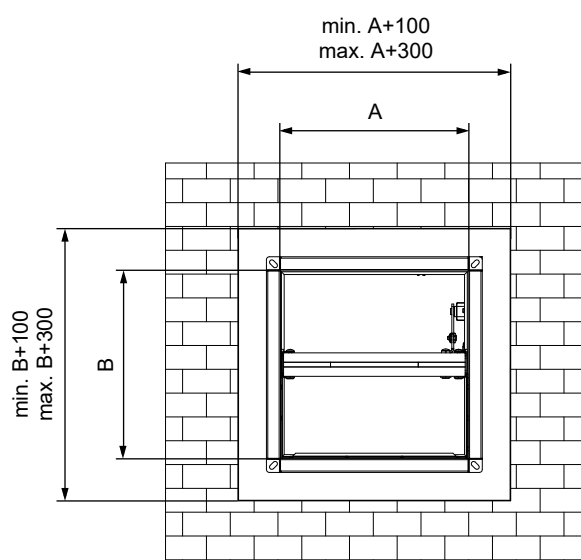
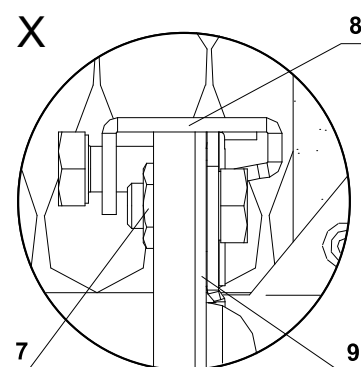
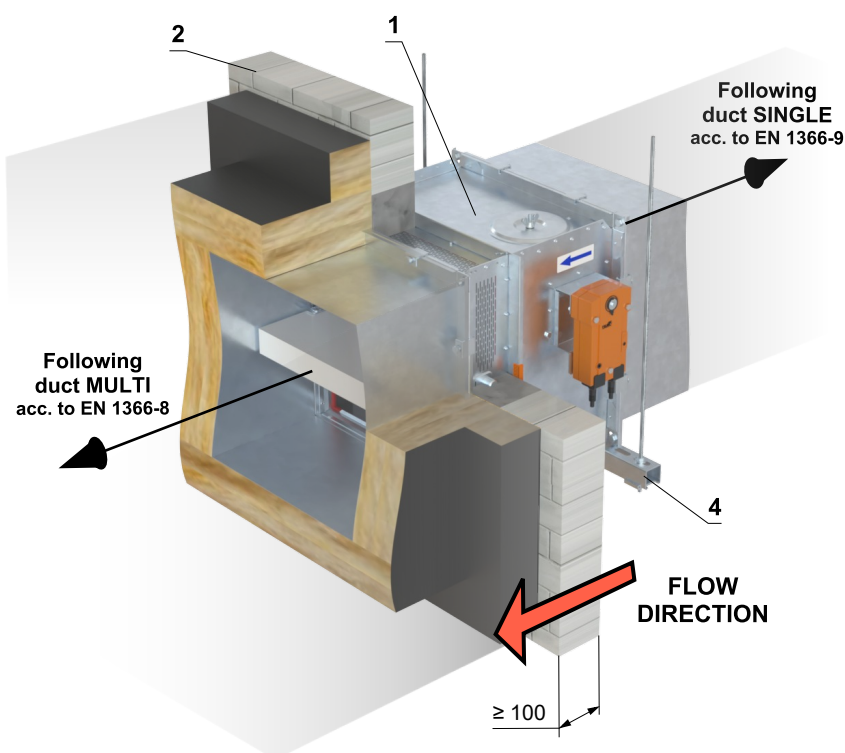
**In solid wall construction - mortar or gypsum
- damper placement in a single section**

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

*** EI 120 (v_{ew}) S1500[H]C₁₀₀₀₀AAmulti**

- Standard low- and high-density rigid wall construction according to EN 1363-1
- For connection of following duct → see page 52

** Applies to MSD-W damper*

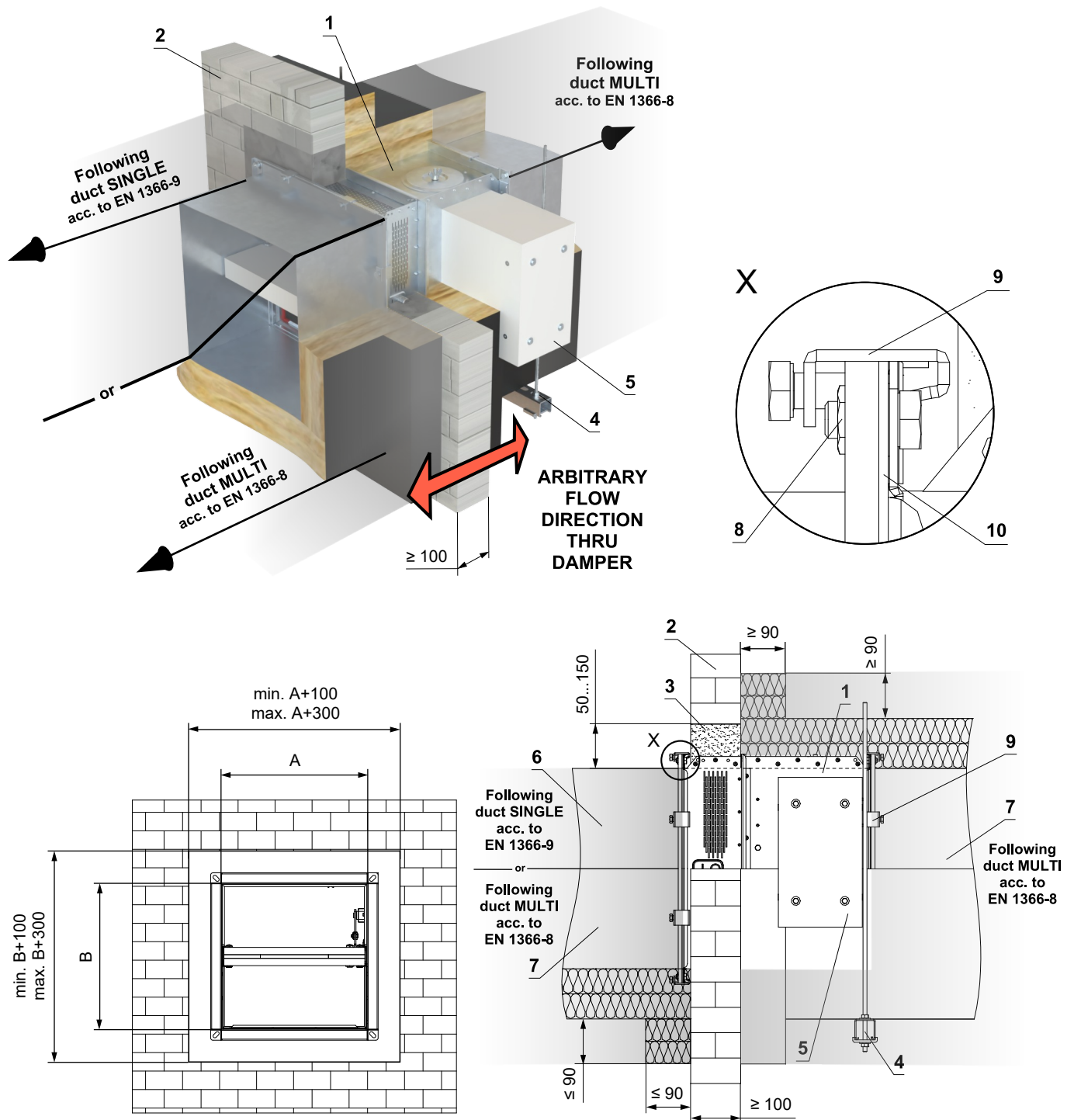


- 1 MSD-W / MSD - design „A“
- 2 Solid wall construction
- 3 Mortar or gypsum
- 4 Suspension system (type according to duct manufacturer instructions) → see page 51
- 5 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 6 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 7 Flange connection at corners - M10 bolt, washers and nut
- 8 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 9 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)

**In solid wall construction - mortar or gypsum
- damper placement in a multi section**

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

- Standard low- and high-density rigid wall construction according to EN 1363-1
- For connection of following duct → see page 52



- 1 MSD - design „IB“
- 2 Solid wall construction
- 3 Mortar or gypsum
- 4 Suspension system (type according to duct manufacturer instructions) → see page 51
- 5 Actuator cover - must be removable after installation of the damper
- 6 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 7 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 8 Flange connection at corners - M10 bolt, washers and nut
- 9 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 10 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)

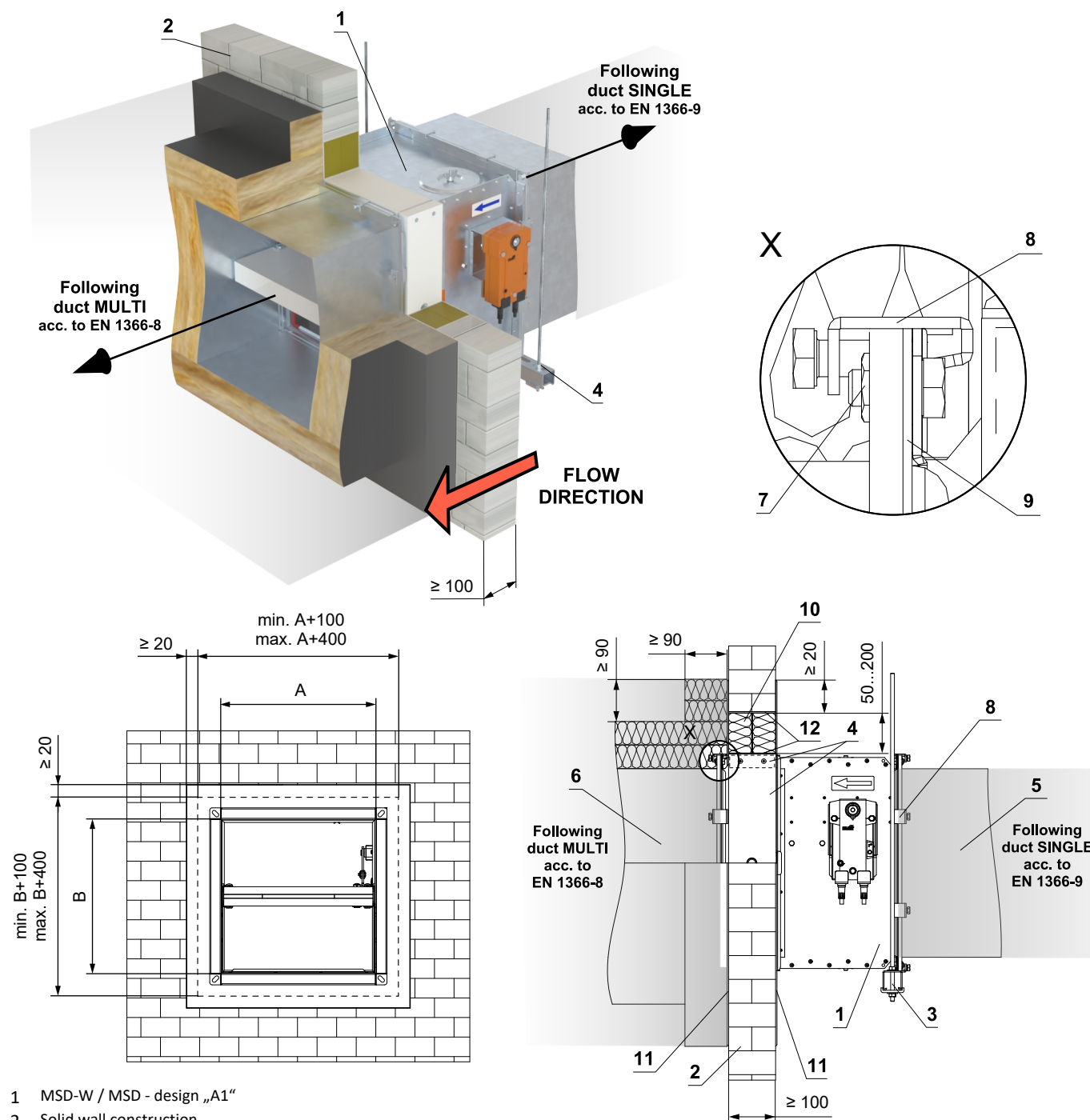
**In solid wall construction - Ablative Coated Batt
- damper placement in a single section**

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

*** EI 120 (v_{ew}) S1500[H]C₁₀₀₀₀AAmulti**

- Standard low- and high-density rigid wall construction according to EN 1363-1
- For connection of following duct → see page 52

** Applies to MSD-W damper*



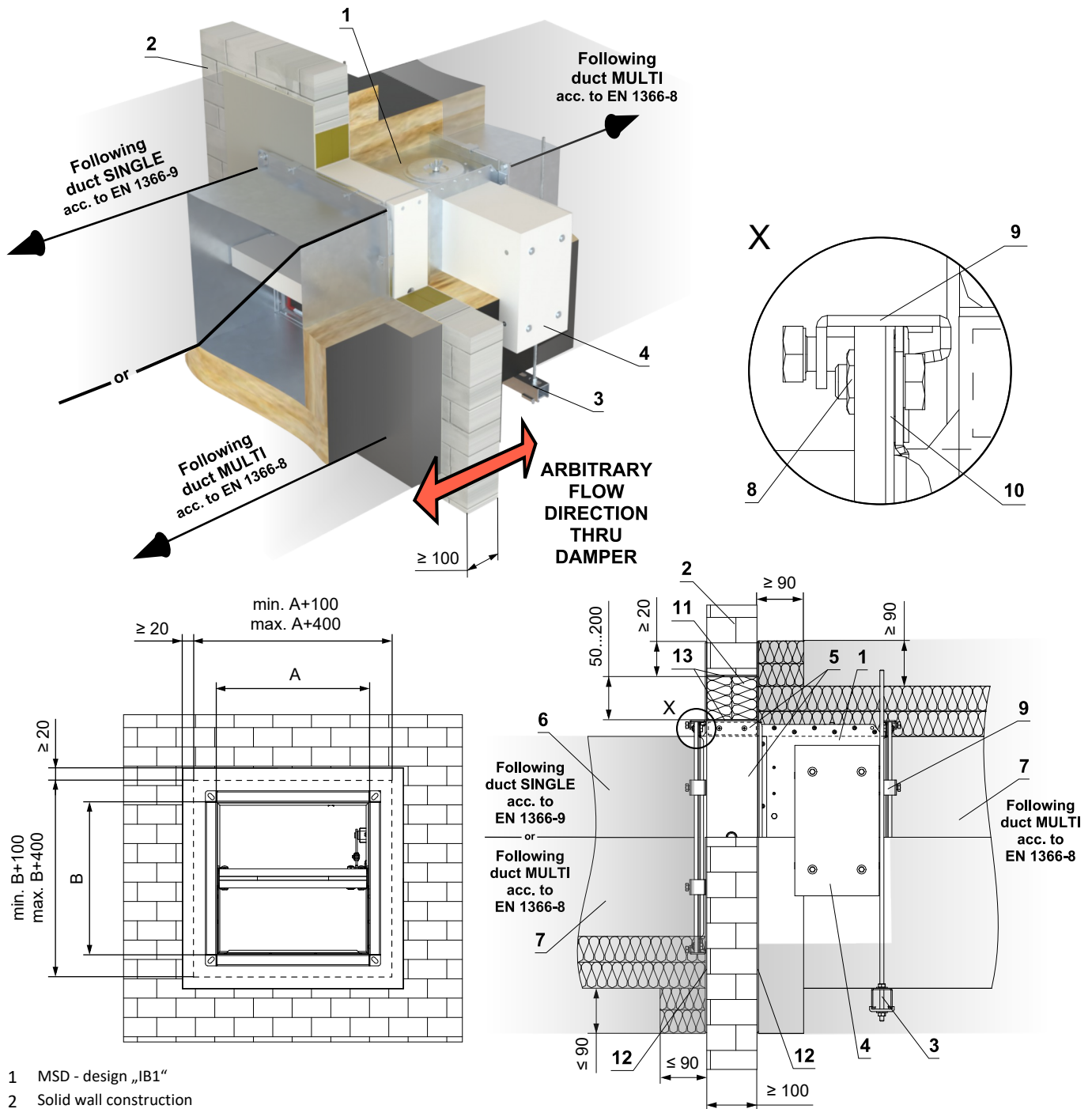
- 1 MSD-W / MSD - design „A1“
- 2 Solid wall construction
- 3 Suspension system (type according to duct manufacturer instructions) → see page 51
- 4 Protective cladding board - min. th. 30 mm, min. density 750 kg/m³ (e.g. PROMATECT-MST) → see page 59
- 5 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 6 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 7 Flange connection at corners - M10 bolt, washers and nut
- 8 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 9 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)
- Ablative Coated Batt System HILTI*
- 10 Mineral wool board - min. density 140 kg/m³ (HILTI CFS-CT B 1S 140/50...)
- 11 Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct.
- 12 Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing.

* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

In solid wall construction - Ablative Coated Batt - damper placement in a multi section

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

- Standard low- and high-density rigid wall construction according to EN 1363-1
- For connection of following duct → see page 52



- 1 MSD - design „IB1“
- 2 Solid wall construction
- 3 Suspension system (type according to duct manufacturer instructions) → see page 51
- 4 Actuator cover - must be removable after installation of the damper
- 5 Protective cladding board - min. th. 30 mm, min. density 750 kg/m³ (e.g. PROMATECT-MST) → see page 59
- 6 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 7 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 8 Flange connection at corners - M10 bolt, washers and nut
- 9 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 10 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)
- 11 Mineral wool board - min. density 140 kg/m³ (HILTI CFS-CT B 1S 140/50...)
- 12 Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct.
- 13 Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing.

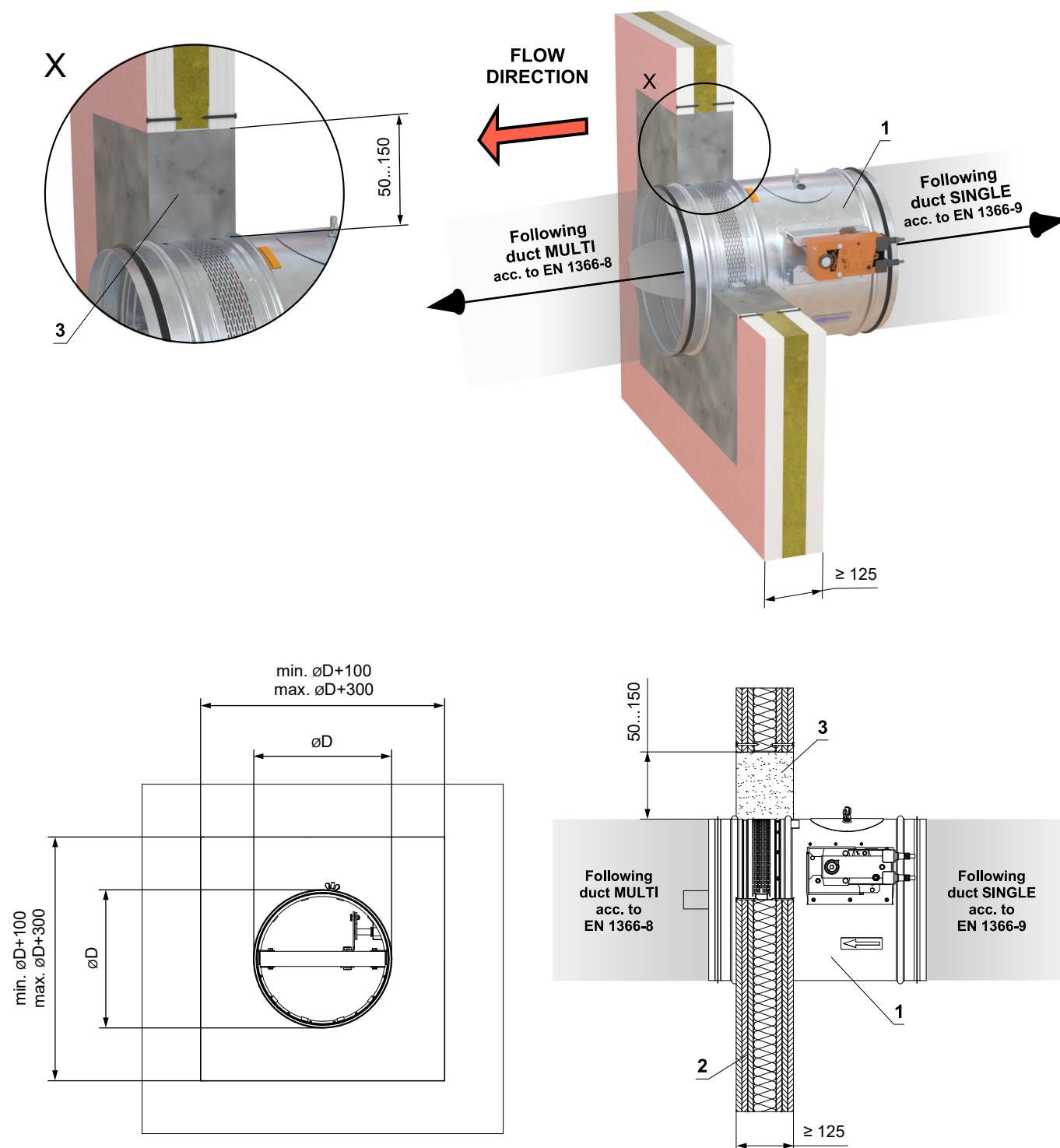
* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

In gypsum wall construction

In gypsum wall construction min. EI 90 - mortar or gypsum
- damper placement in a single section

EI 120 (v_{ew}) S1500[H]C₁₀₀₀₀AAmulti

- Standard flexible wall construction min. EI 90 according to EN 1363-1.
- For connection of following duct → see page 52
- The installation opening is lined with a UW/CW profile.



- 1 MSD-W / MSD - design „A“
- 2 Gypsum wall construction
- 3 Mortar or gypsum

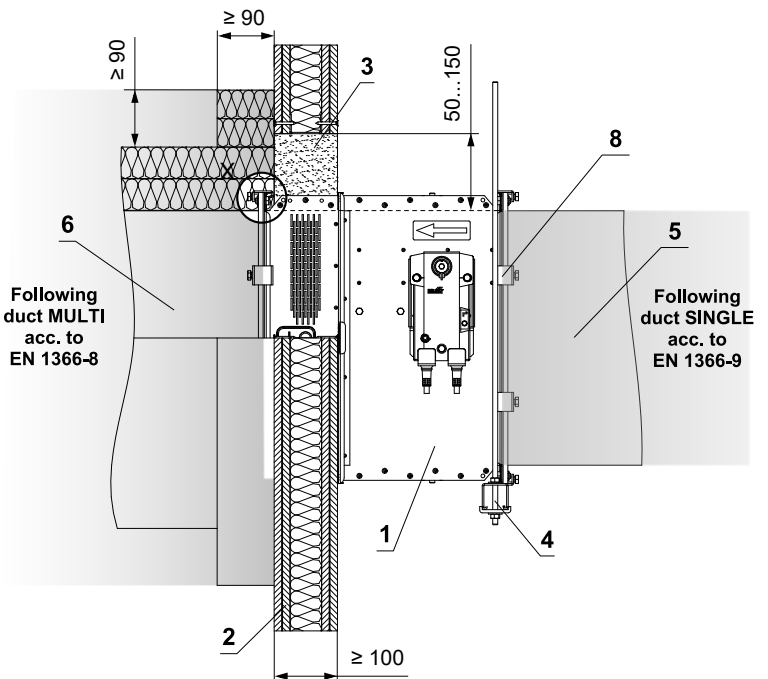
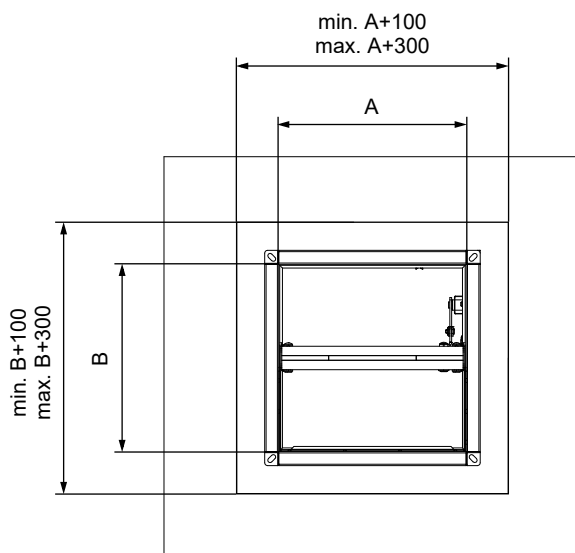
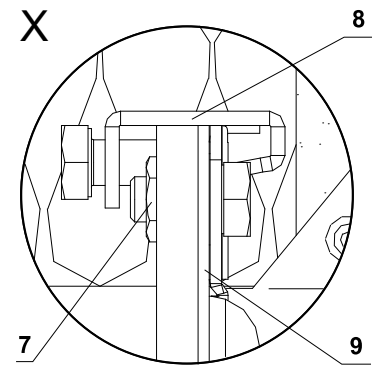
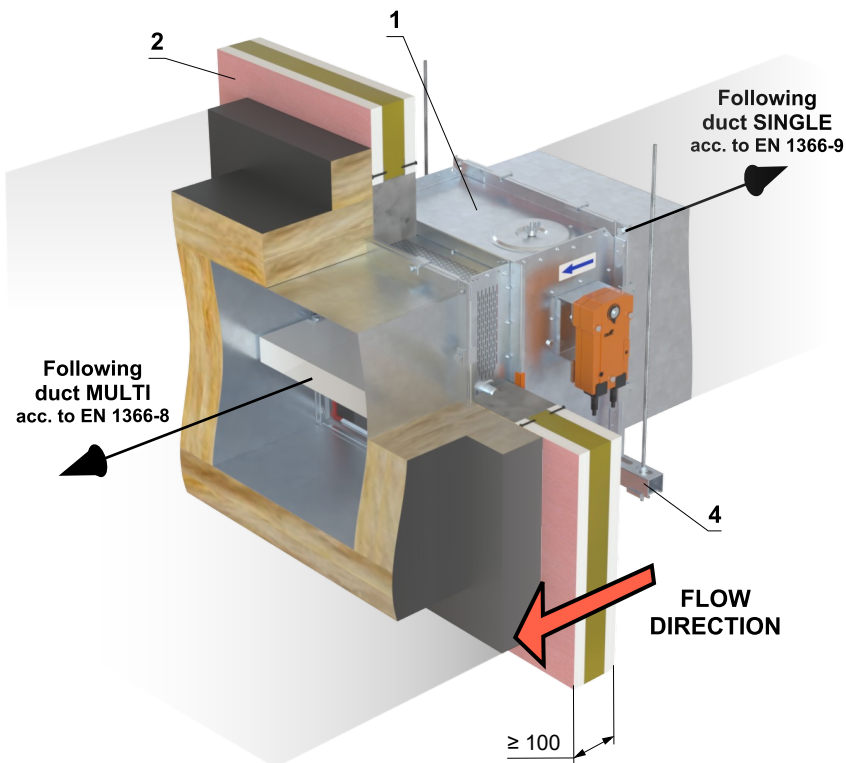
**In gypsum wall construction min. EI 90 - mortar or gypsum
- damper placement in a single section**

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

*** EI 120 (v_{ew}) S1500[H]C₁₀₀₀₀AAmulti**

- Standard flexible wall construction min. EI 90 according to EN 1363-1.
- For connection of following duct → see page 52
- The installation opening is lined with a UW/CW profile.

* Applies to MSD-W damper

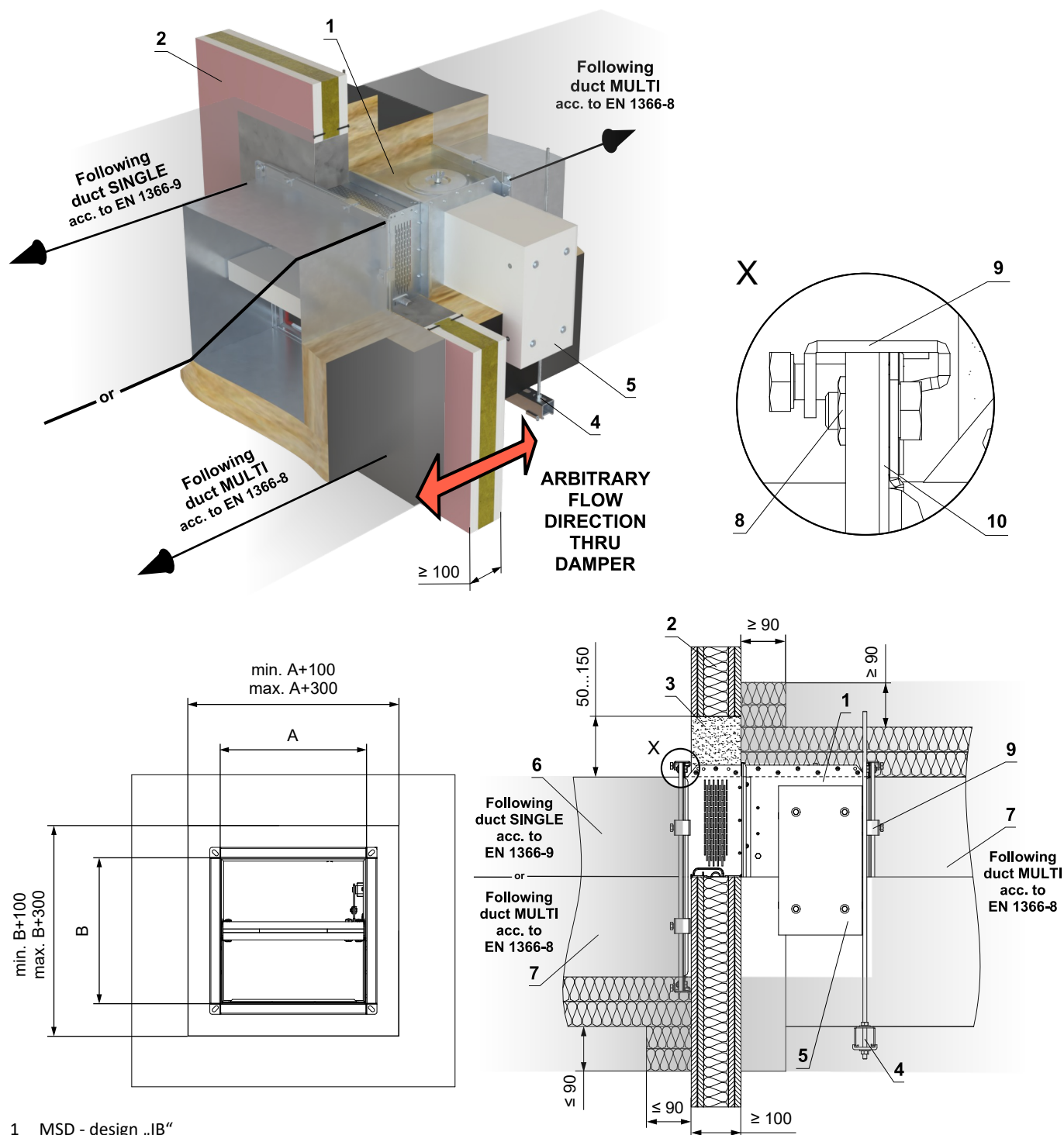


- 1 MSD-W / MSD - design „A“
- 2 Gypsum wall construction
- 3 Mortar or gypsum
- 4 Suspension system (type according to duct manufacturer instructions) → see page 51
- 5 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 6 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 7 Flange connection at corners - M10 bolt, washers and nut
- 8 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 9 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)

**In gypsum wall construction min. EI 90 - mortar or gypsum
- damper placement in a multi section**

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

- Standard flexible wall construction min. EI 90 according to EN 1363-1.
- For connection of following duct → see page 52
- The installation opening is lined with a UW/CW profile.



- 1 MSD - design „IB“
- 2 Gypsum wall construction
- 3 Mortar or gypsum
- 4 Suspension system (type according to duct manufacturer instructions) → see page 51
- 5 Actuator cover - must be removable after installation of the damper
- 6 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 7 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 8 Flange connection at corners - M10 bolt, washers and nut
- 9 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 10 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)

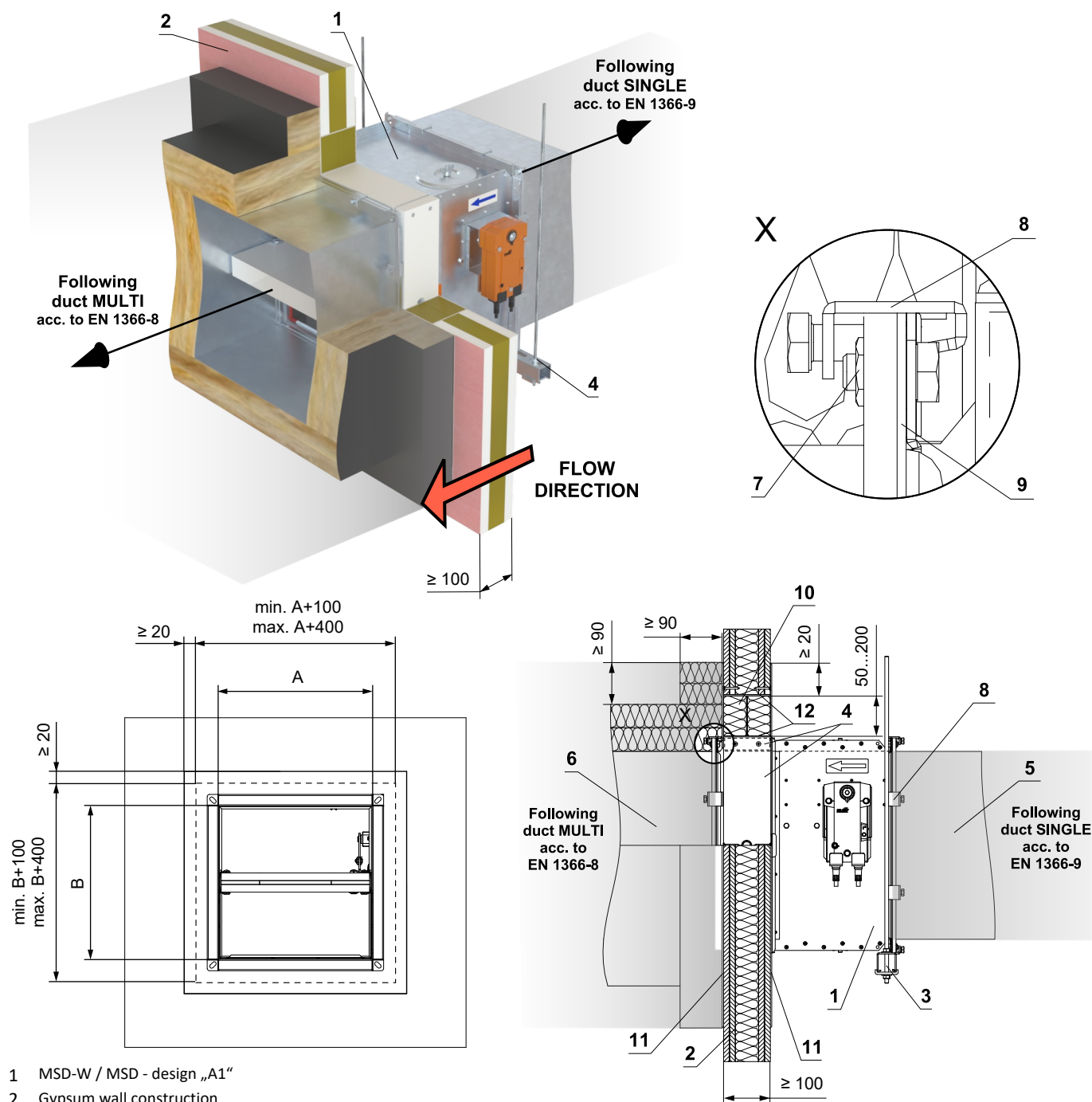
In gypsum wall construction min. EI 90 - Ablative Coated Batt - damper placement in a single section

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

* EI 120 (v_{ew}) S1500[H]C₁₀₀₀₀AAmulti

- Standard flexible wall construction min. EI 90 according to EN 1363-1.
- For connection of following duct → see page 52
- The installation opening is lined with a UW/CW profile.

* Applies to MSD-W damper



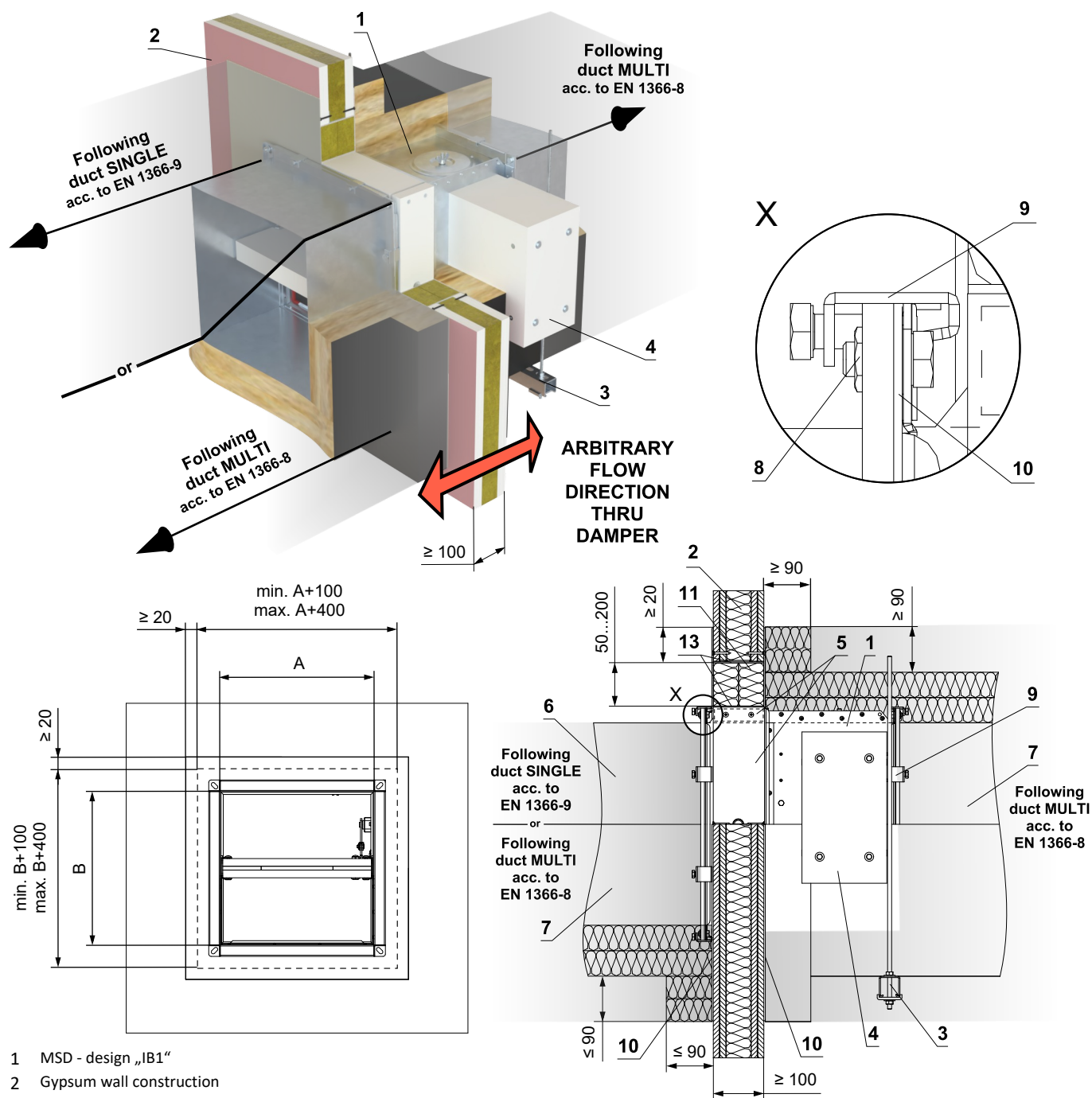
- MSD-W / MSD - design „A1“
- Gypsum wall construction
- Suspension system (type according to duct manufacturer instructions) → see page 51
- Protective cladding board - min. th. 30 mm, min. density 750 kg/m³ (e.g. PROMATECT-MST) → see page 59
- SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- Flange connection at corners - M10 bolt, washers and nut
- M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)
- Ablative Coated Batt System HILTI*
- Mineral wool board - min. density 140 kg/m³ (HILTI CFS-CT B 1S 140/50...)
- Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct.
- Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing.

* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

In gypsum wall construction min. EI 90 - Ablative Coated Batt - damper placement in a multi section

EI 120 (v_{ew}) S1500[H]C_{mod}HOT400/30AAmulti

- Standard flexible wall construction min. EI 90 according to EN 1363-1.
- For connection of following duct → see page 52
- The installation opening is lined with a UW/CW profile.



- 1 MSD - design „IB1“
- 2 Gypsum wall construction
- 3 Suspension system (type according to duct manufacturer instructions) → see page 51
- 4 Actuator cover - must be removable after installation of the damper
- 5 Protective cladding board - min. th. 30 mm, min. density 750 kg/m³ (e.g. PROMATECT-MST) → see page 59
- 6 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 7 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 8 Flange connection at corners - M10 bolt, washers and nut
- 9 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 10 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions) Ablative Coated Batt System HILTI*
- 11 Mineral wool board - min. density 140 kg/m³ (HILTI CFS-CT B 1S 140/50...)
- 12 Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct.
- 13 Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing.

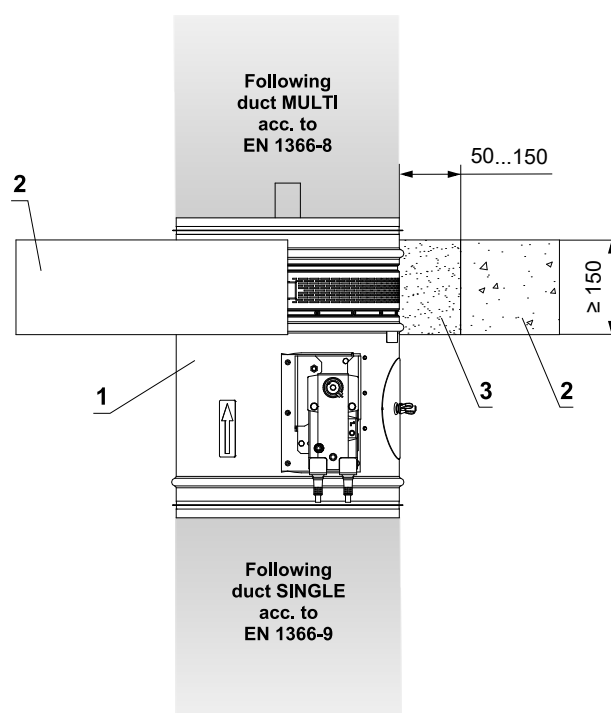
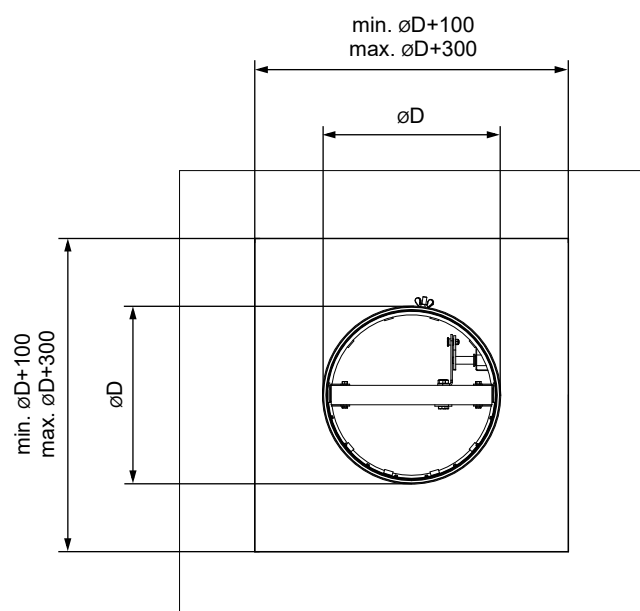
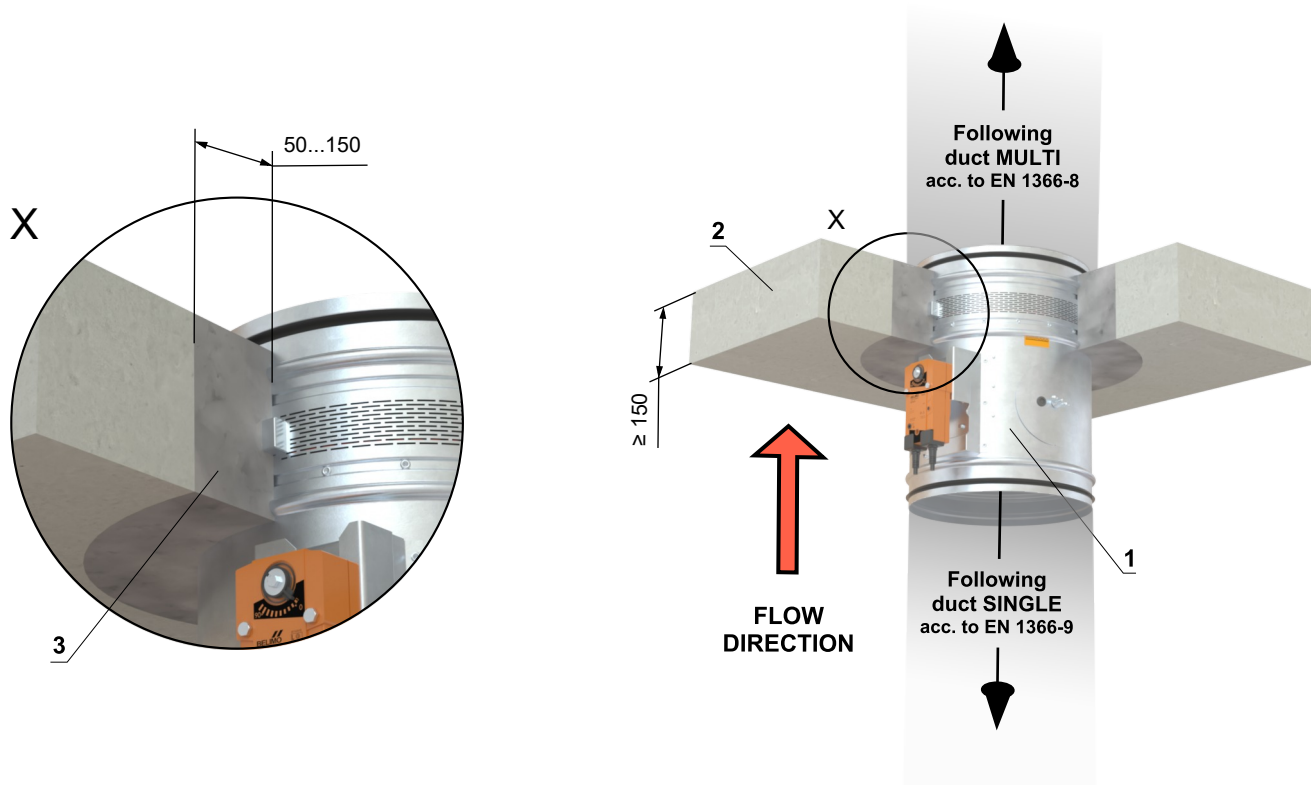
* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

In solid ceiling construction

In solid ceiling construction - mortar or gypsum - damper placement in a single section

EI 120 (h_{ow}) S1500[H]C₁₀₀₀₀AAmulti

- Standard low- and high-density rigid floor construction according to EN 1366-2
- For connection of following duct → see page 52
- The damper can be installed from both sides of the construction, i.e. from the top or the bottom side of the ceiling



- 1 MSD-W / MSD - design „A“
- 2 Solid ceiling construction
- 3 Mortar or gypsum

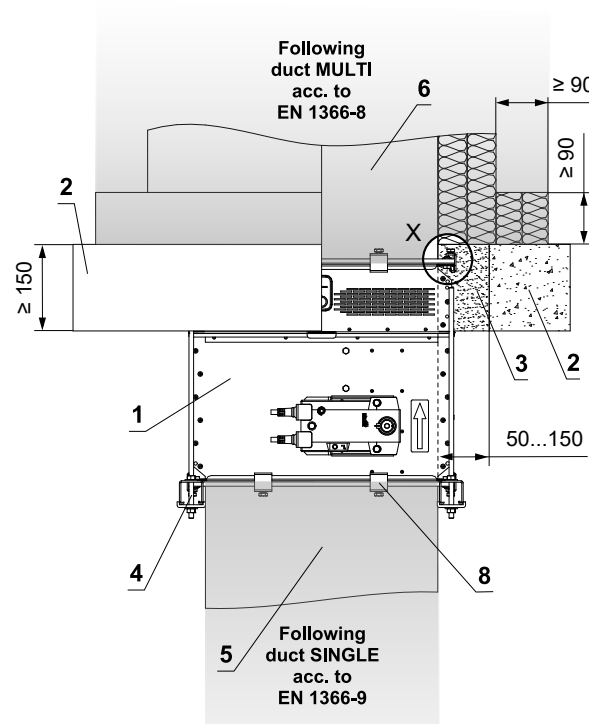
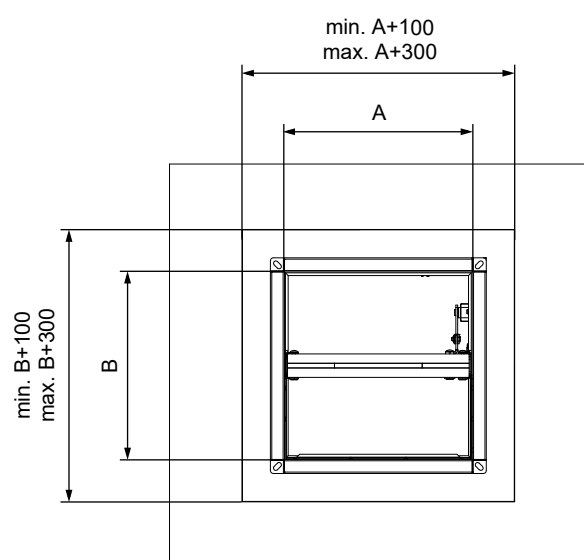
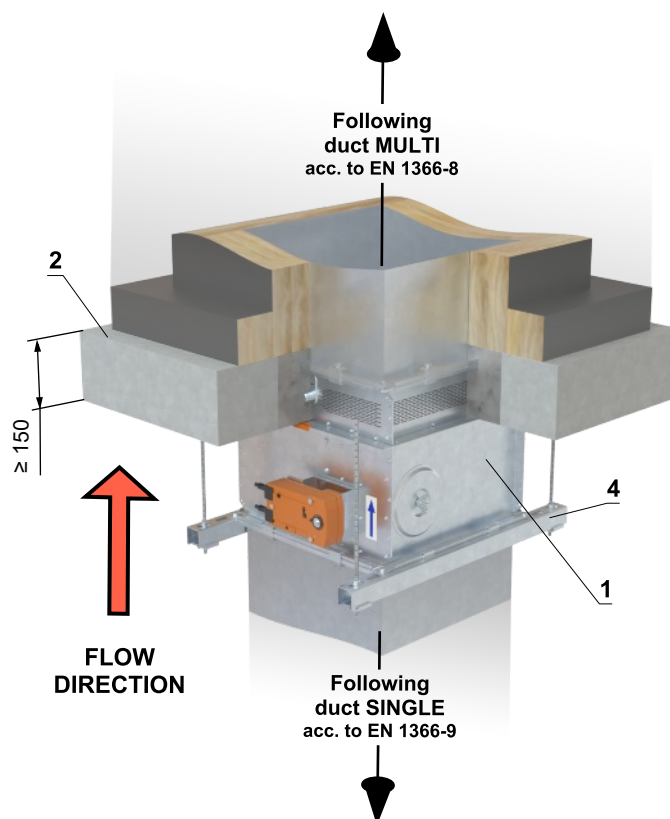
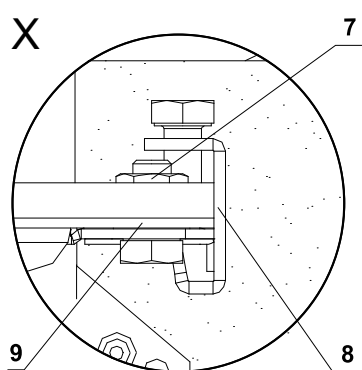
**In solid ceiling construction - mortar or gypsum
- damper placement in a single section**

- Standard low- and high-density rigid floor construction according to EN 1366-2
- For connection of following duct → see page 52
- The damper can be installed from both sides of the construction, i.e. from the top or the bottom side of the ceiling

EI 120 (h_{ow}) S1500[H]C_{mod}HOT400/30AAmulti

* EI 120 (h_{ow}) S1500[H]C₁₀₀₀₀AAmulti

* Applies to MSD-W damper

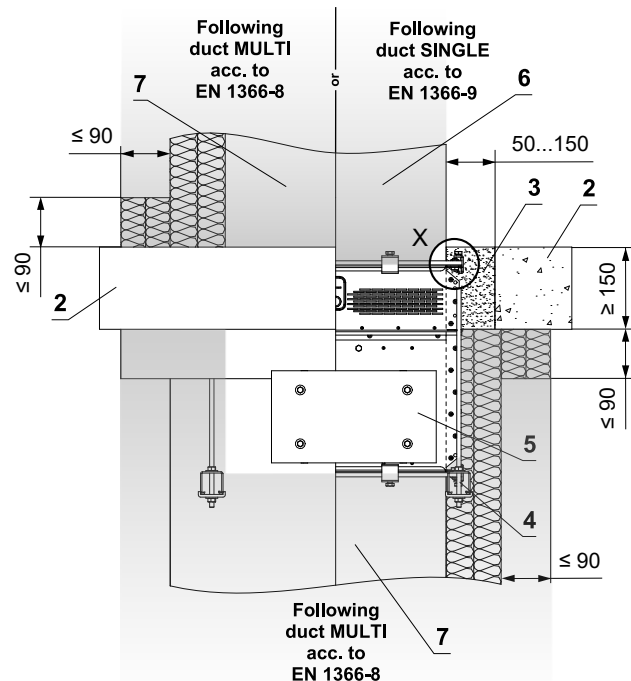
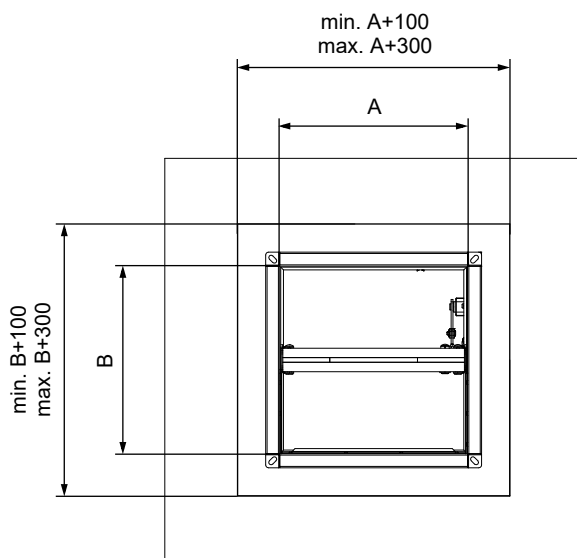
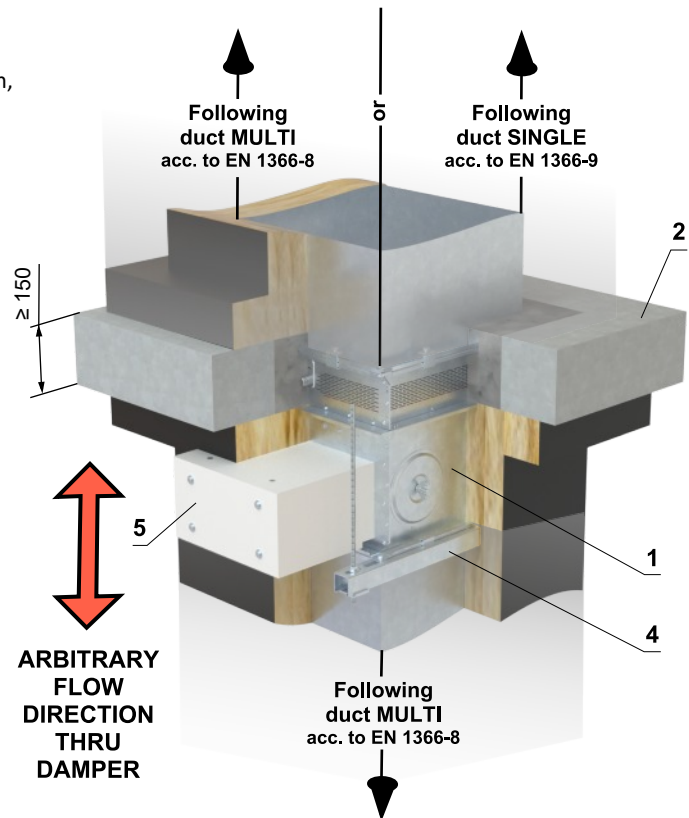
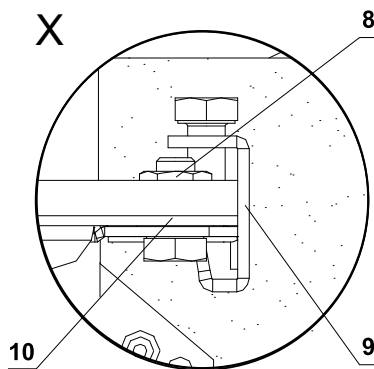


- 1 MSD-W / MSD - design „A“
- 2 Solid ceiling construction
- 3 Mortar or gypsum
- 4 Suspension system (type according to duct manufacturer instructions) → see page 51
- 5 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 6 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 7 Flange connection at corners - M10 bolt, washers and nut
- 8 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 9 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)

**In solid ceiling construction - mortar or gypsum
- damper placement in a multi section**

EI 120 (h_{ow}) S1500[H]C_{mod}HOT400/30AAmulti

- Standard low- and high-density rigid floor construction according to EN 1366-2
- For connection of following duct → see page 52
- The damper can be installed from both sides of the construction, i.e. from the top or the bottom side of the ceiling



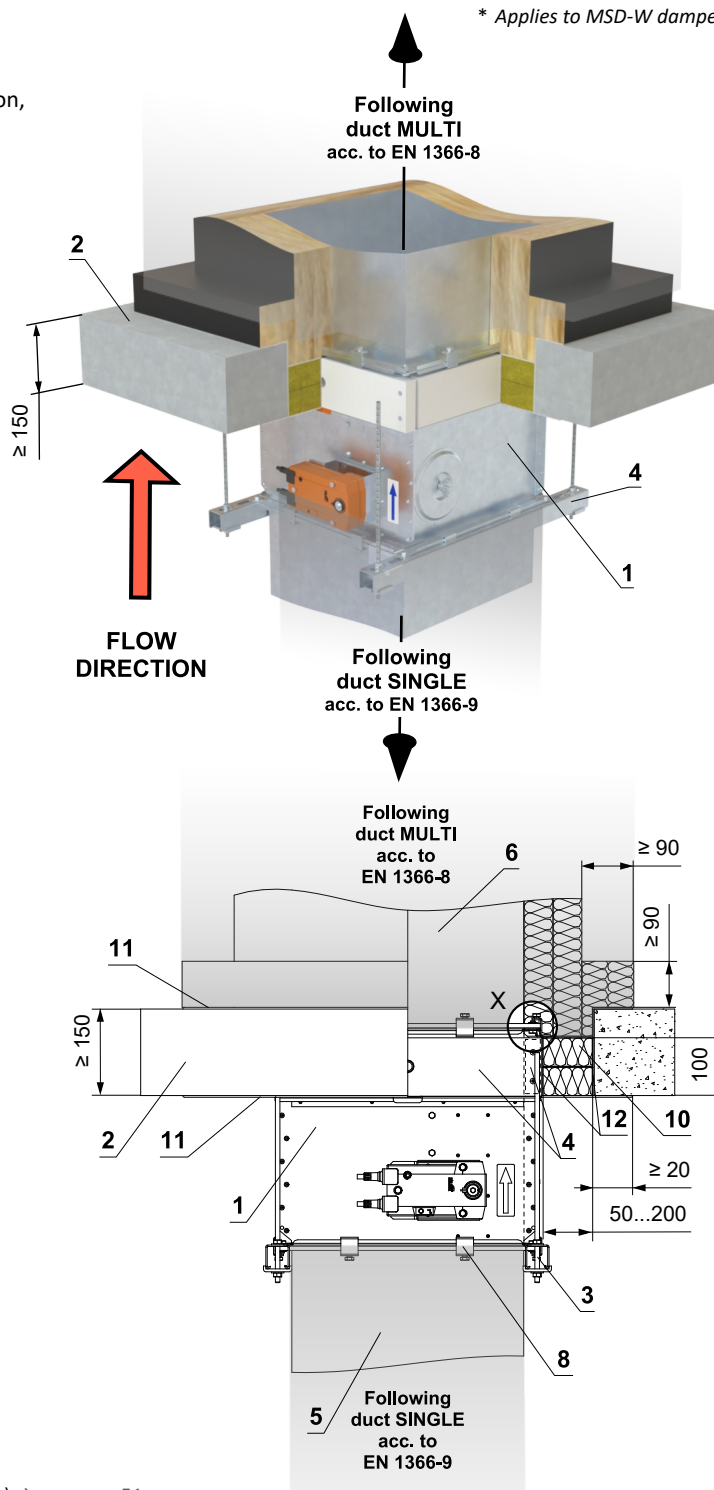
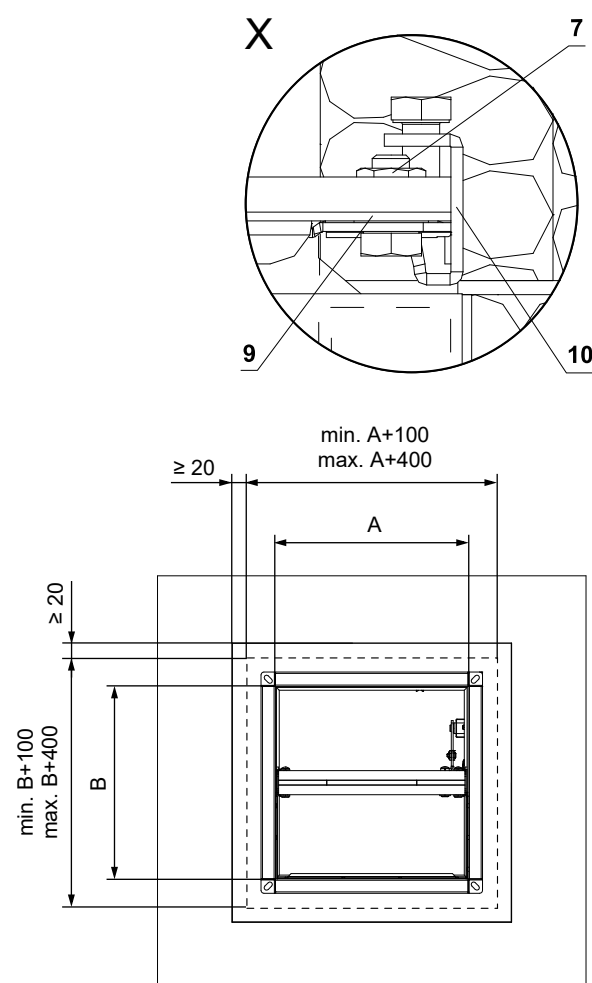
- 1 MSD - design „IB“
- 2 Solid ceiling construction
- 3 Mortar or gypsum
- 4 Suspension system (type according to duct manufacturer instructions) → see page 51
- 5 Actuator cover - must be removable after installation of the damper
- 6 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 7 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 8 Flange connection at corners - M10 bolt, washers and nut
- 9 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 10 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)

In solid ceiling construction - Ablative Coated Batt - damper placement in a single section

- Standard low- and high-density rigid floor construction according to EN 1366-2
- For connection of following duct → see page 52
- The damper can be installed from both sides of the construction, i.e. from the top or the bottom side of the ceiling

EI 90 (h_{ow}) S1500[H]C_{mod}HOT400/30AAmulti
E 120 (h_{ow}) S1500[H]C_{mod}HOT400/30AAmulti
* EI 120 (h_{ow}) S1500[H]C₁₀₀₀₀AAmulti

* Applies to MSD-W damper



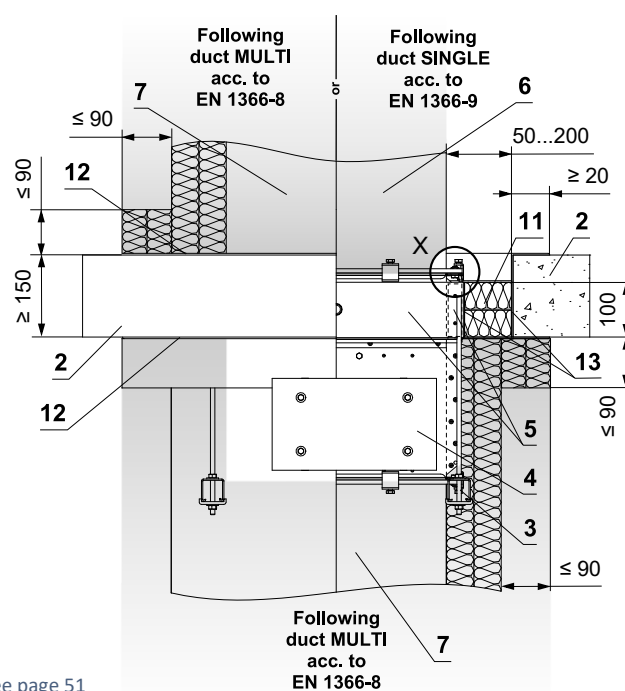
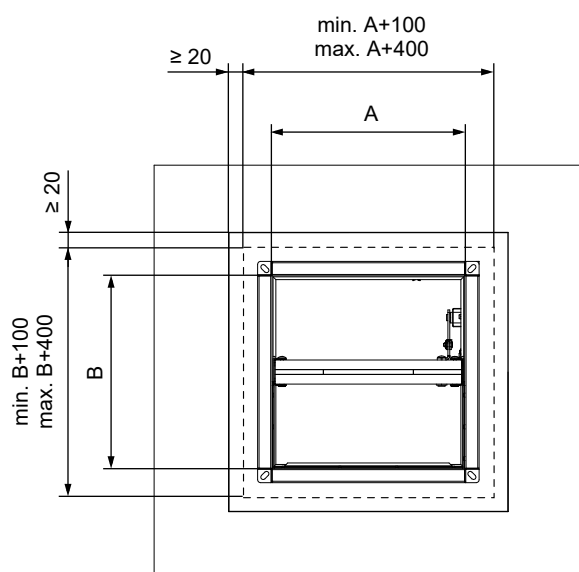
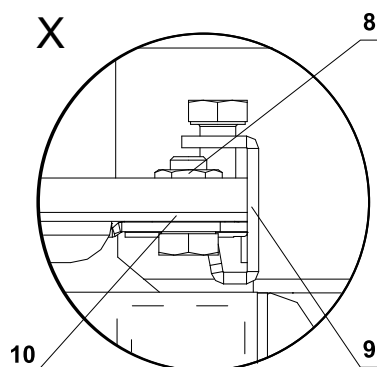
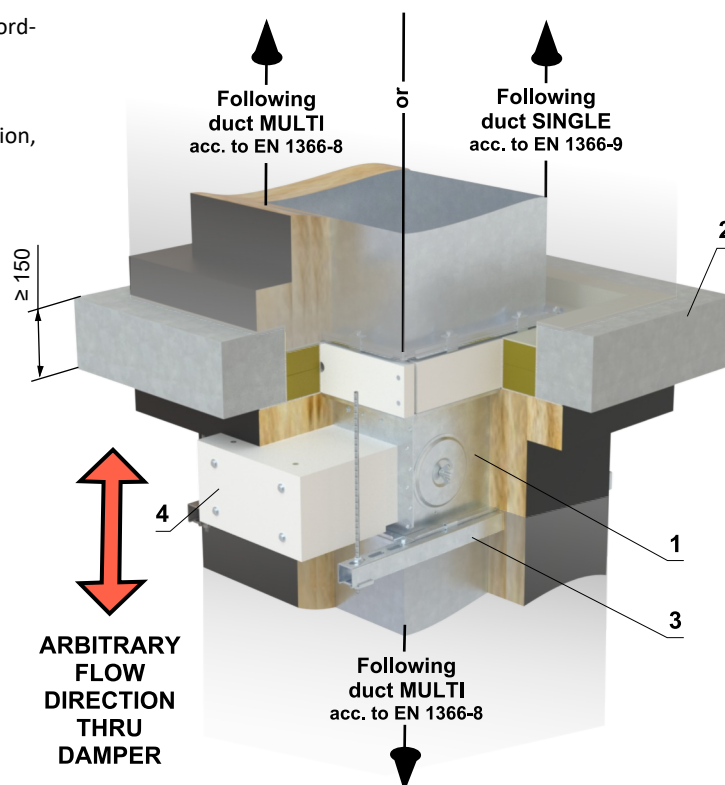
- MSD-W / MSD - design „A1“
- Solid ceiling construction
- Suspension system (type according to duct manufacturer instructions) → see page 51
- Protective cladding board - min. th. 30 mm, min. density 750 kg/m³ (e.g. PROMATECT-MST) → see page 59
- SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- Flange connection at corners - M10 bolt, washers and nut
- M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)
- Ablative Coated Batt System HILTI*
- Mineral wool board - min. density 140 kg/m³ (HILTI CFS-CT B 1S 140/50...)
- Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct.
- Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing.

* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

In solid ceiling construction - Ablative Coated Batt - damper placement in a multi section

- Standard low- and high-density rigid floor construction according to EN 1366-2
- For connection of following duct → see page 52
- The damper can be installed from both sides of the construction, i.e. from the top or the bottom side of the ceiling

EI 90 (h_{ow}) S1500[H]C_{mod}HOT400/30AAmulti
E 120 (h_{ow}) S1500[H]C_{mod}HOT400/30AAmulti



- 1 MSD - design „IB1“
- 2 Solid ceiling construction
- 3 Suspension system (type according to duct manufacturer instructions) → see page 51
- 4 Actuator cover - must be removable after installation of the damper
- 5 Protective cladding board - min. th. 30 mm, min. density 750 kg/m³ (e.g. PROMATECT-MST) → see page 59
- 6 SINGLE duct made of sheet metal, thickness min. 1 mm, acc. to EN 1366-9
- 7 MULTI duct made of sheet metal acc. to EN 1366-8 → see page 48
- 8 Flange connection at corners - M10 bolt, washers and nut
- 9 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)
- 10 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)
Ablative Coated Batt System HILTI*
- 11 Mineral wool board - min. density 140 kg/m³ (HILTI CFS-CT B 1S 140/50...)
- 12 Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct.
- 13 Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing.

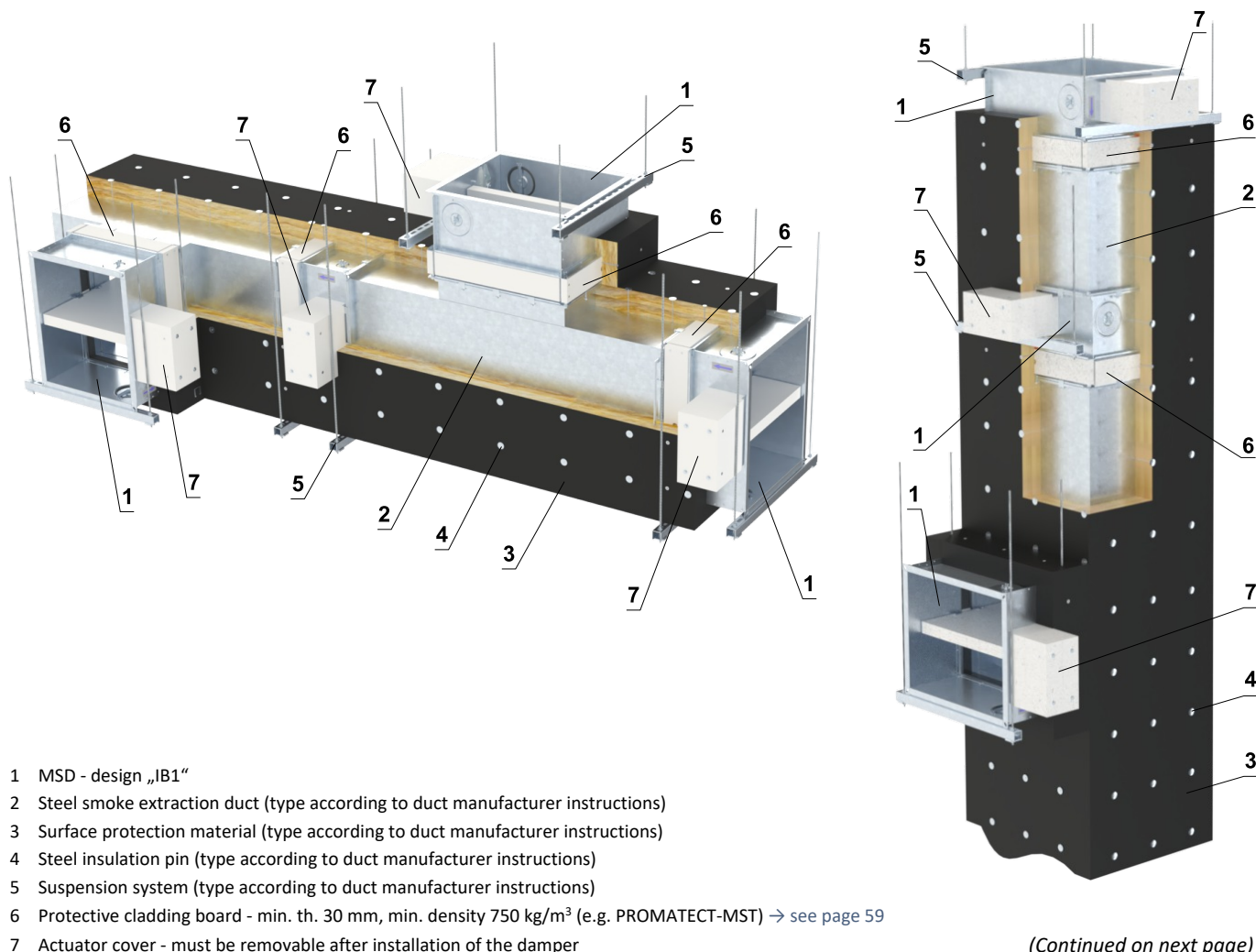
* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

Installation damper into/onto smoke extraction ducts

Installation of the damper into/onto horizontal or vertical steel smoke extraction duct insulated with mineral wool
- damper placement in a multi section

EI 120 (h_{od}) S1500[H]C_{mod}HOT400/30AAmulti
EI 120 (v_{ed}) S1500[H]C_{mod}HOT400/30AAmulti

- The dampers may be installed onto or into smoke extraction ducts listed below:
 - **FlameshieldEN (manufacturer Kent Ductwork Ltd.)**
The duct is made of 1.2 mm thick galvanized steel sheet and insulated with 1 layer of 90 mm thick stone wool Rockwool FirePro DuctRock Slab (manufacturer ROCKWOOL Ltd.). The stone wool is finished with a black aluminium foil on the outer side.
 - **FPL BW18 (manufacturer Fire Protection Ltd.)**
The duct is made of galvanized steel sheet. The thickness of the duct depends of its dimensions. The surface of the duct is fire sprayed with Flamebar BW18 (manufacturer Firespray International Ltd). The duct is insulated with two layers of stone wool. The first layer is made of 50 mm thick ROCKWOOL FPL 110 SLAB and the second layer with aluminium foil is made of 50 mm thick ROCKWOOL FPL 110 FOIL FACED SLAB (manufacturer ROCKWOOL Ltd.)
 - **IFS-DS (manufacturer Imperial Ductwork Services Ltd.)**
The duct is made of 1 mm thick galvanized steel sheet and insulated with two layers of 60 mm thick stone wool ULTIMATE U Protect Slab 4.0 Alu1 (manufacturer ISOVER). The stone wool is finished with a black aluminium foil on the outer side.
- The dampers may be installed onto or into other smoke extraction ducts than that specified above with the following limitations:
 - The duct shall be tested according to EN 1366-9 or EN 1366-8 depending on the intended use.
 - The duct shall be made of material of the same or greater density and of the same or greater thickness as the ducts listed above.
 - Changing surface protection materials is not permitted.
 - Changing the paint surface finish is not permitted.
- Support, drop rods, anchors etc. must be used in accordance with a duct manufacturer instructions.
- The connected duct shall be suspended in such a way that the transfer of all loads from the duct to the damper is completely excluded.
- The damper may be installed in position according picture below.



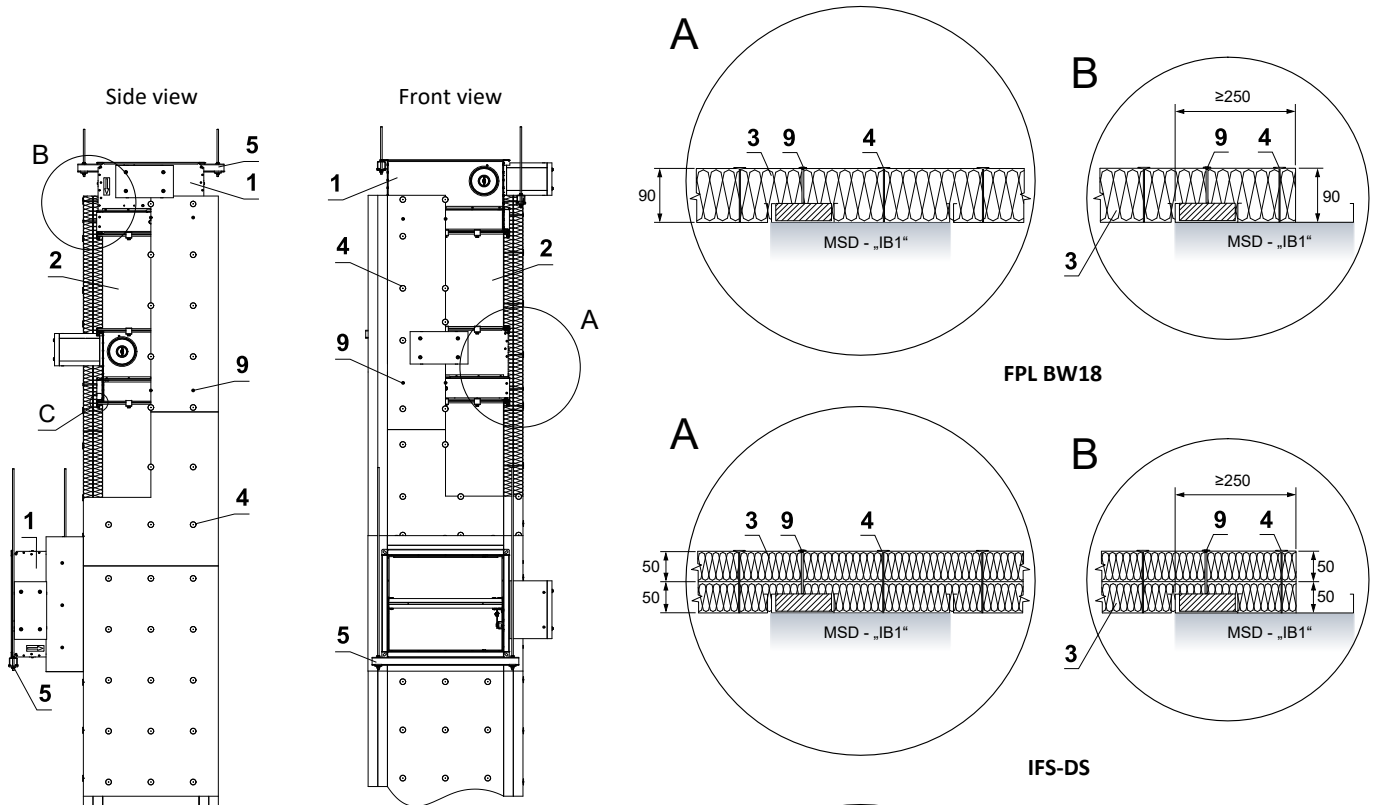
(Continued on next page)

continuation of installation damper into/onto horizontal or vertical steel smoke extraction duct insulated with mineral wool

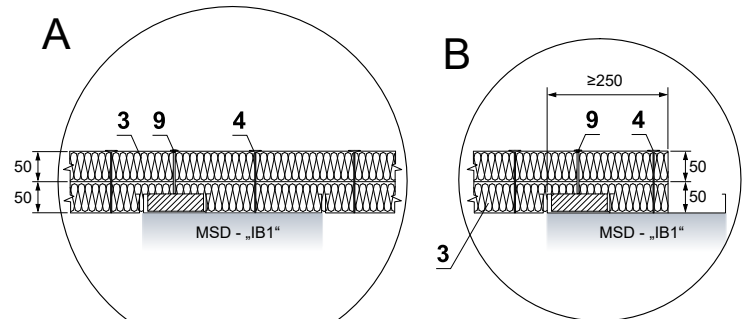
■ The damper is connected to the smoke extraction duct by the damper flange as follow:

- M10 bolts, washers and nuts are used at the corners of the flange
- C-clamps with M8 bolts with a maximum spacing of 200 mm are used around the circumference
- Ceramic selfadhesive sealing tape is inserted between flanges

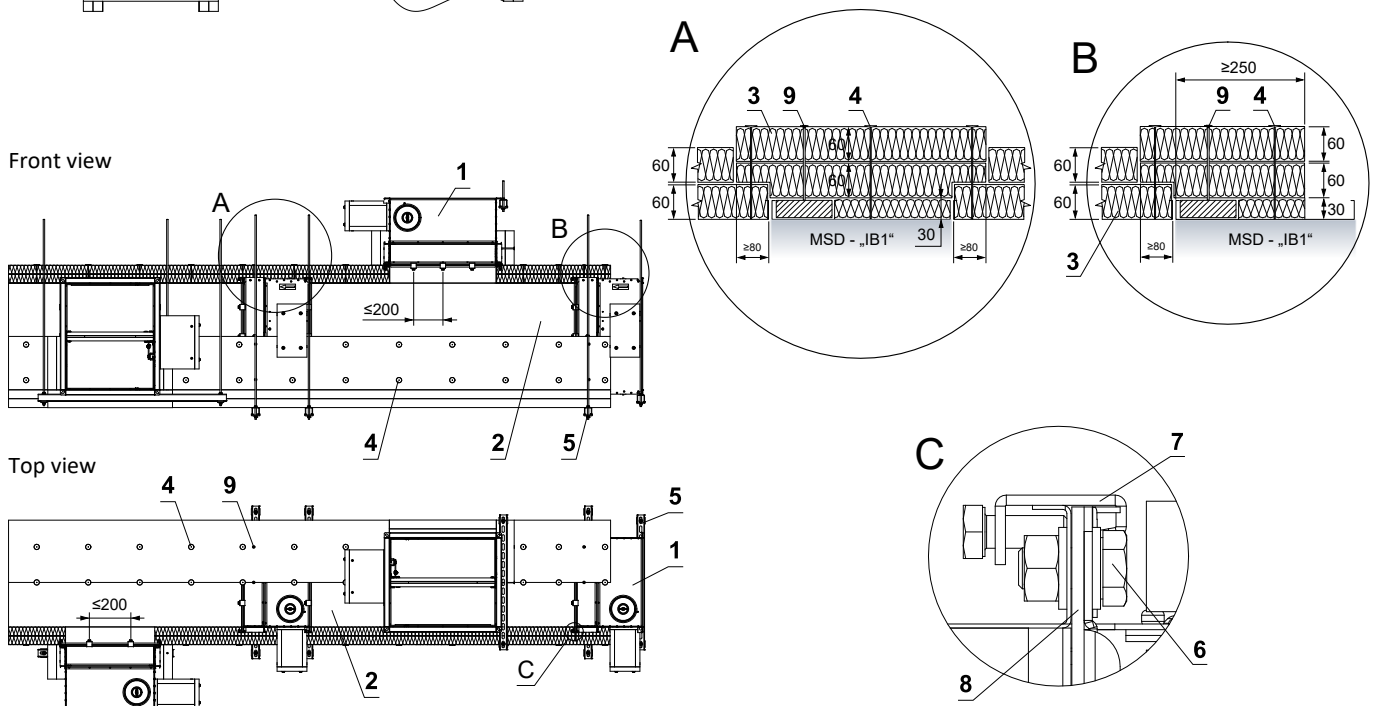
FlameshieldEN



FPL BW18



IFS-DS



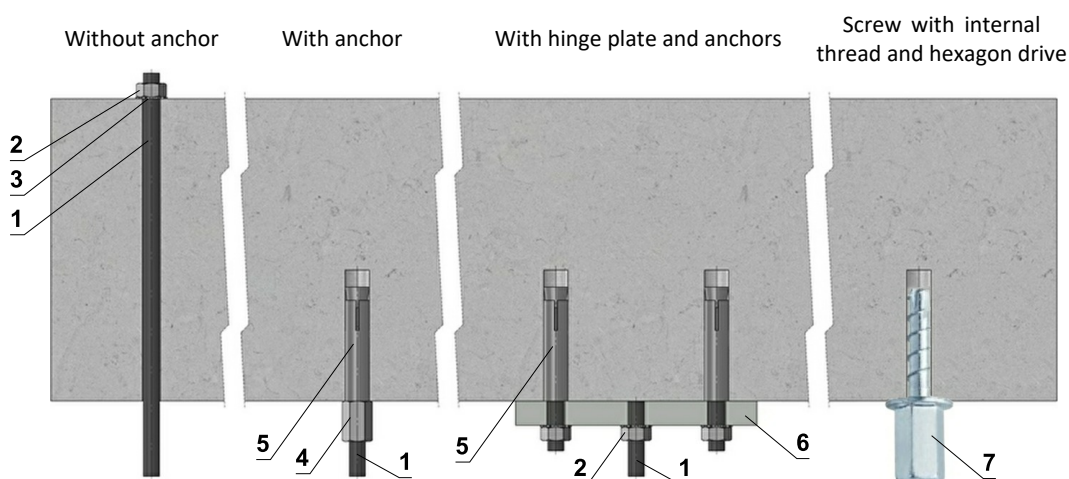
- | | |
|--|---|
| 1 MSD - design „IB1“ | 7 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions) |
| 2 Steel smoke extraction duct (type according to duct manufacturer instructions) | 8 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions) |
| 3 Surface protection material (type according to duct manufacturer instructions) | 9 Insulation connection to the damper body – washer M5 (DIN 9021), screw 5xL mm (screw length = insulation thickness + 20 mm), with a maximum spacing of 200 mm and a distance of 50–150 mm from the damper edges |
| 4 Steel insulation pin (type according to duct manufacturer instructions) | |
| 5 Suspension system (type according to duct manufacturer instructions) | |
| 6 Flange connection at corners - M10 bolt, washers and nut | |

V. SUSPENSION SYSTEMS

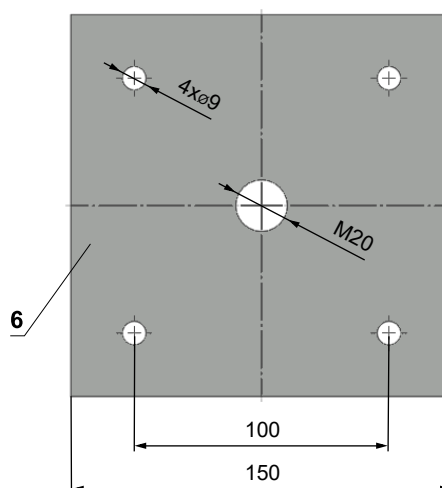
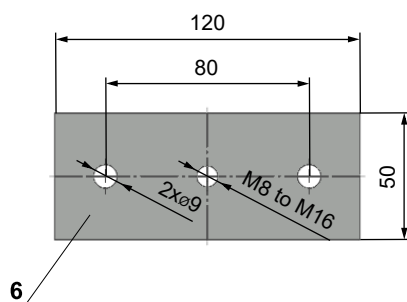
Mounting to the ceiling wall

- The dampers must be suspended using threaded rods and mounting profiles. Their dimensioning depend on the weight of the damper.
- The dampers and the duct must be suspended separately.
- Following air-conditioning duct must be suspended or supported so that all load transfer from the following duct to the damper flanges is absolutely excluded. Adjacent duct must be suspended or supported, as required by the duct suppliers.

Examples of anchoring to the ceiling construction Follow the instructions of fixing specialist or installation company



Hinge plates



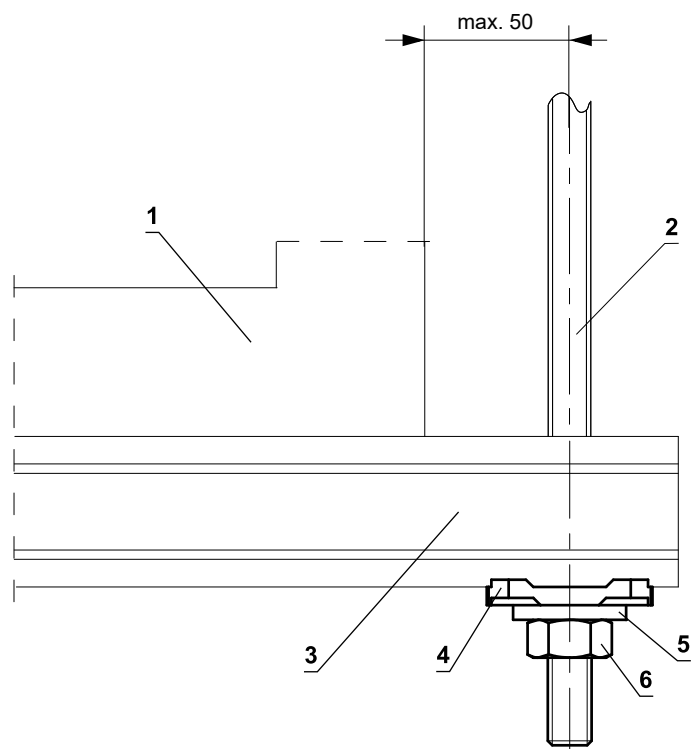
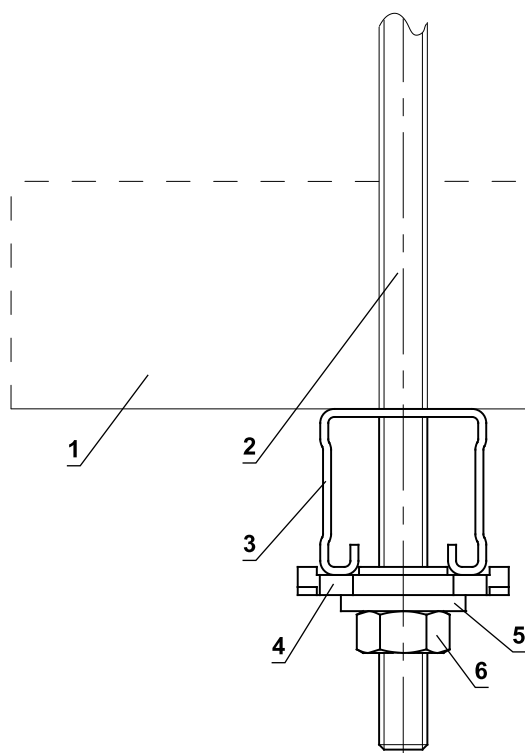
- If in doubt, always consult an anchor specialist engineer such as Halfen or Hilti.

Load capacities of threaded rods at the required fire resistance 60 min. < t ≤ 120 min.

Size	As [mm²]	Weight [kg]	
		for 1 rod	for 2 rods
M8	36,6	22	44
M10	58	35	70
M12	84,3	52	104
M16	157	96	192
M18	192	117	234
M20	245	150	300

- 1 Threaded rod M8 - M20
- 2 Nut M8 - M20
- 3 Washer for M8 - M20
- 4 Coupling Nut M8 - M20
- 5 Anchor
- 6 Hinge plate - min. thickness 10 mm
- 7 Concrete screw tested for fire resistance R30-R90, max. Tension up to 0.75 KN (length 35 mm)

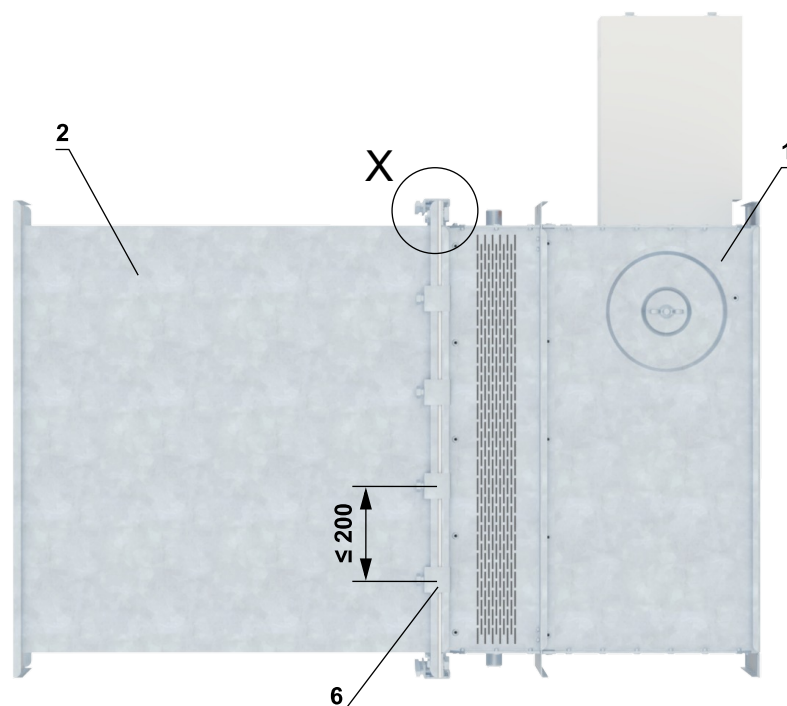
Example of placing of mounting profiles HILTI



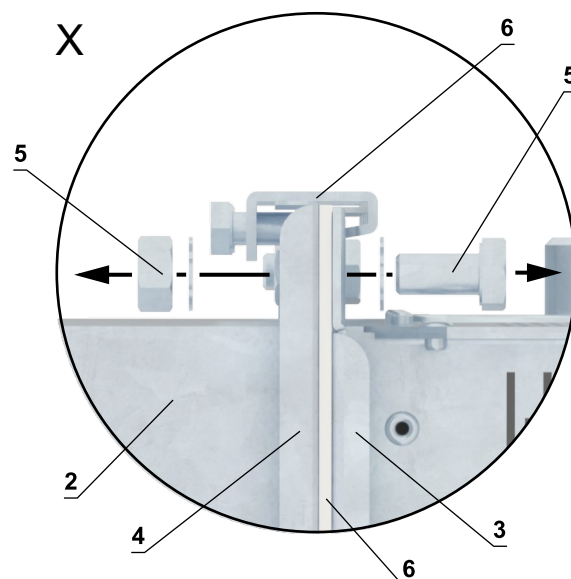
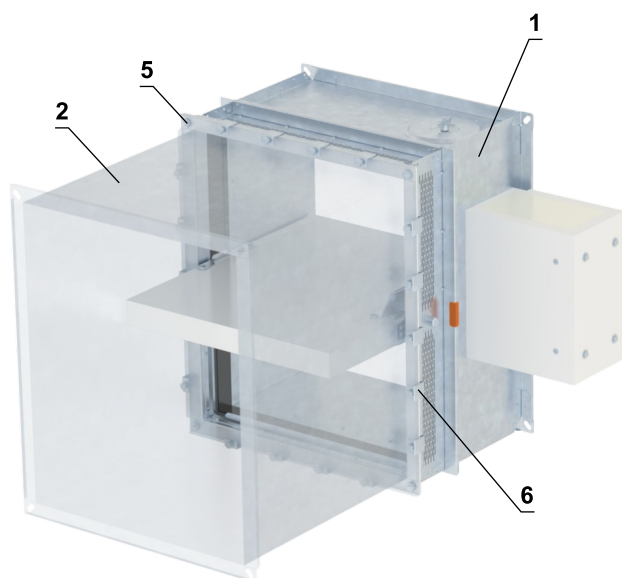
- 1 MSD
- 2 Threaded rod M8 - M12
- 3 Support HILTI MQ-41 or MQ-41/3
- 4 Bored plate HILTI MQZ-L
- 5 Washer for M8 - M12
- 6 Nut M8 - M12

Example of duct connection

Connection to smoke extract duct acc. to EN 1366-8 (MULTI) / to EN 1366-9 (SINGLE)



Electrically conductive connection



- 1 MSD
- 2 Duct
- 3 Flange of MSD
- 4 Flange of duct
- 5 M8 bolt assembly (bolt M8x20 mm, 2 pcs lock washer M8, nut M8) *
- 6 Ceramic selfadhesive sealing tape - around the duct circumference (type according to duct manufacturer instructions)
- 7 M8 C-clamps - maximum spacing of C-clamps 200 mm (type according to duct manufacturer instructions)

* min. one connection must be electrically conductive

VI. TECHNICAL DATA

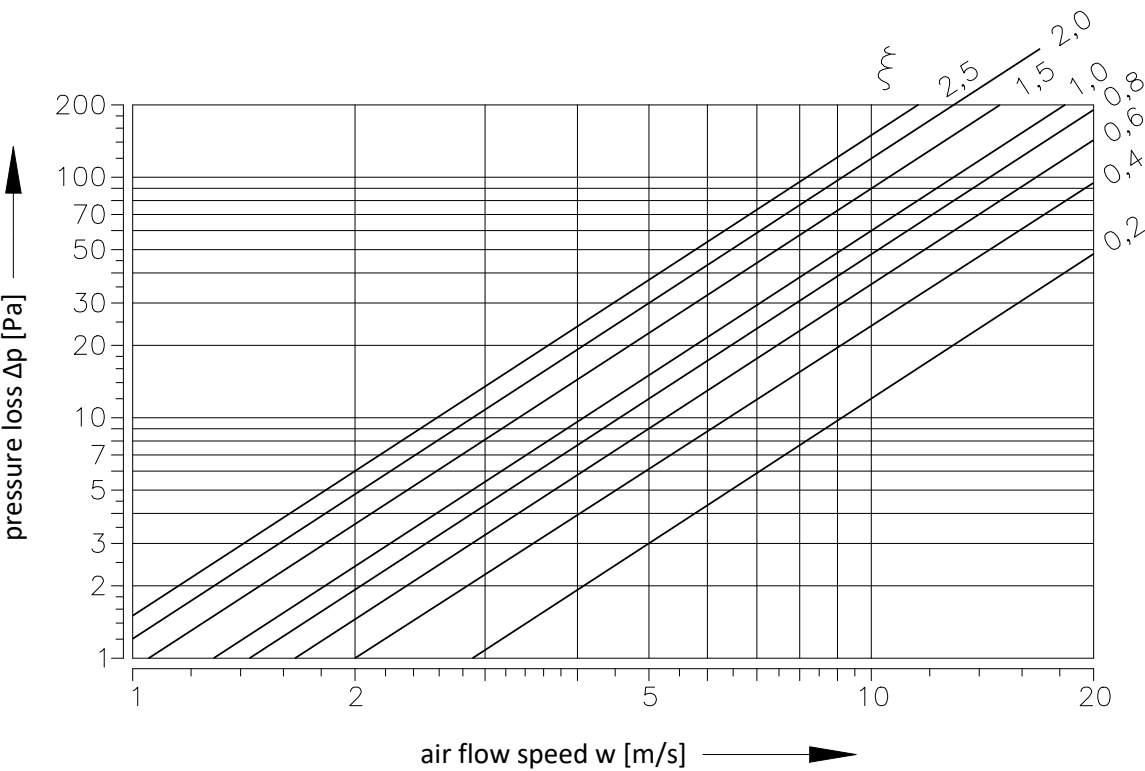
Pressure loss

Pressure loss calculation

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

Δp	[Pa]	pressure loss
w	[m/s]	air flow speed in nominal damper section
ρ	[kg/m³]	air density
ξ	[-]	coefficient of local pressure loss for the nominal damper section → see page 54

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



Coefficient of local pressure loss of 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

A	B									
	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

Coefficient of local pressure loss of round dampers

ØD	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

Noise data

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 m ² section
S	[m ²]	duct cross section
K_A	[dB]	correction to the weight filter A

Level of acoustic output L_{W1} [dB] related to the 1 m ² section - square dampers												
	ξ [-]											
w [m/s]	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	25,2	26,3	27,2	28	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	45,7
4	33,6	36,7	39	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	57,3	59
6	44,1	47,3	49,5	51,3	52,7	53,9	54,9	55,8	56,6	59,8	62	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	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	67,2	68,2	69,1	70	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	73,9	74,7	77,9	80,1	81,8

Level of acoustic output L_{W1} [dB] related to the 1 m ² section - round dampers												
	ξ [-]											
w [m/s]	0,1	0,2	0,3	0,4	0,6	0,8	1,0	1,5	2	2,5	3	3,5
2	9	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	41,7	43,2	44,4
4	24,2	29,6	32,8	35	38,1	40,4	42,1	45,3	47,5	49,2	50,7	51,9
5	30	35,4	38,6	40,8	44	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	52,7	55,8	58,1	59,8	61,2	62,4
7	38,8	44,2	47,3	49,6	52,7	55	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
10	48,1	53,5	56,6	58,9	62	64,3	66	69,1	71,4	73,1	74,5	75,7
11	50,6	56	59,1	61,4	64,5	66,7	68,5	71,6	73,9	75,6	77	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

Correction to the weight filter A - square and round dampers											
w [m/s]	2	3	4	5	6	7	8	9	10	11	12
K_A [dB]	-15	-11,8	-9,8	-8,4	-7,3	-6,4	-5,7	-5	-4,5	-4	-3,6

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 m ² section
S	[m ²]	duct cross section
L_{rel}	[dB]	relative level expressing the shape of the spectrum

Relative level expressing the shape of the spectrum L_{rel} - square and round dampers								
	f [Hz]							
w [m/s]	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	-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	-4,1	-5,9	-9,4	-14,6	-21,5	-30
11	-5,9	-4,1	-4	-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

VII. MATERIAL, FINISHING

- Damper casings are made from galvanized sheet metal without further surface treatment.
- Damper blades and actuator cover are made from fire resistant asbestos free boards made of mineral fibres.
- Fasteners are galvanized.
- According to the customer's requirements, dampers can be made of stainless steel material.
- Specifications for stainless-steel design:
 - Class A2 – Food-grade stainless steel (AISI 304 – EN 1.4301)
 - Class A4 – Chemistry-grade stainless steel (AISI 316, 316L – EN 1.4401, EN 1.4404)

The respective stainless steel is the material for all components that are located or entering the damper inner space; components outside the damper casing are typically from galvanised sheet metal (fasteners for mounting the actuator).

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

- 1) Damper casing and all components permanently attached
- 2) Blade holders including pins, metal parts of blades
- 3) Control components inside the damper (L-profile, pin with lever, rod, fasteners)
- 4) Inspection opening cover including the stirrup and fasteners (if they are parts of the cover)
- 5) Bearing for torque transfer from the lever with pin on the blade L-profile (made from AISI 440C)

The damper blade is made from boards of homogeneous material Promatect-H, connected with "U" clips on the outside, sealed with Promat K84 glue.

Plastic, rubber and silicon components, sealants, foaming tapes, glass-ceramic seals, housings, brass bearings of the blade, actuators are identical for all material variants of the dampers.

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

The damper blade in the variant for chemical environments (Class A4) is always treated with a coating of chemically resistant Promat SR.

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

VIII. TRANSPORTATION, STORAGE AND WARRANTY

Logistic terms

- Dampers are delivered on pallets. As standard, the dampers are wrapped in plastic foil for protection during transport and must not be used for long-term storage. Temperature changes during transport can cause condensation of water inside the packaging and thereby cause corrosion of materials used in the dampers (e.g. white corrosion on zinc-coated items or mould on calcium silicate). Therefore, it is necessary to remove the transport packaging immediately after unloading to allow air to circulate around the product.
- The dampers must be stored in clean, dry, well ventilated and dust-free environment out of direct sunlight. Ensure protection against moisture and extreme temperatures (minimum temperature +5°C). The dampers must be protected against mechanical and accidental damage prior to installation.
- Another required packaging system should be approved and agreed by manufacturer. Packaging material is not returnable in case that another packaging system (material) is required and used and it is not included into final price of damper.
- Dampers are transported by box freight vehicles without direct weather impact, there must not occur any shocks and ambient temperature must not exceed +50°C. Dampers must be protected against impact when transported and manipulated. During transportation, the damper blade must be in the "CLOSED" position.
- Dampers must be stored indoor in environment without any aggressive vapours, gases or dust. Indoor temperature must be in the range from -30°C to +50°C and maximum relative humidity 95%.

Warranty

- The manufacturer provides a warranty of 24 months from the date of dispatch for the dampers.
- In case of using a Schischek actuator, the manufacturer provides a 12-month warranty for the actuator from the date of shipment.
- The warranty for dampers MSD, provided by the manufacturer, is completely void if actuating, closing and control devices are unprofessionally handled by untrained workers or if electric components, i.e. limit switches, actuators, communication and supply devices and thermoelectric activation devices are dismantled.
- The warranty is void if dampers are used for other purposes, devices and working conditions than those allowed by these technical conditions or if the dampers are mechanically damaged during handling.
- If the dampers are damaged by transport, a record must be written down with the forwarder at reception for later complaint.

IX. ASSEMBLY, ATTENDANCE AND MAINTENANCE

- Assembly, maintenance and damper function check can be done only by qualified and trained person, i.e. "AUTHORIZED PERSON" according to the manufacturer documentation. All works done on the fire dampers must be done according international and local norms and laws.
- All effective safety standards and directives must be observed during damper assembly.
- To ensure reliable damper function it is necessary to avoid blocking the actuating mechanism and contact surfaces with collected dust, fibre and sticky materials and solvents.
- Flange and screw joints must be conductively connected to protect against dangerous contact. 2 galvanized lock washers that are placed under the head of one screw and a fastened nut are used for conductive connection.

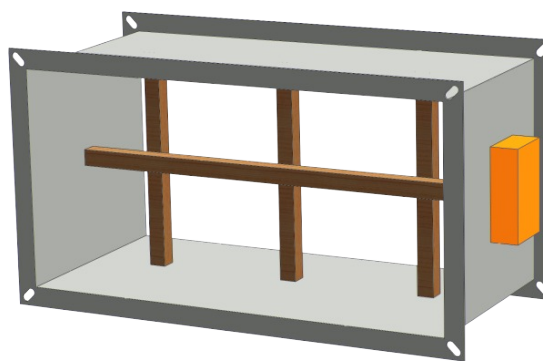
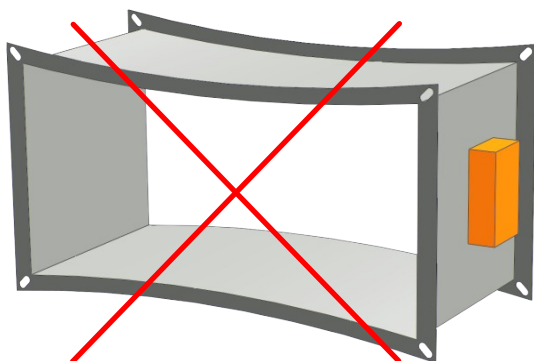
Manual operation - actuator control without electric voltage

- A special wrench (part of the actuator) can be used to manually turn the damper blade to any position. When the wrench is turned in the direction of the arrow, the damper blade rotates to its open position. As the blade rotation is stopped, in every position, the actuator will be locked. Unlocking is possible even manually as per instructions on the actuator, or by the activation of the supply voltage.

Installation / fixing the damper

- The damper casing shall not be deformed in the course of bricking in.
- Once the damper is built in, the damper blade shall not grind on the damper casing during opening or closing.

Protection of the damper casing against buckling during installation, especially for large sizes!

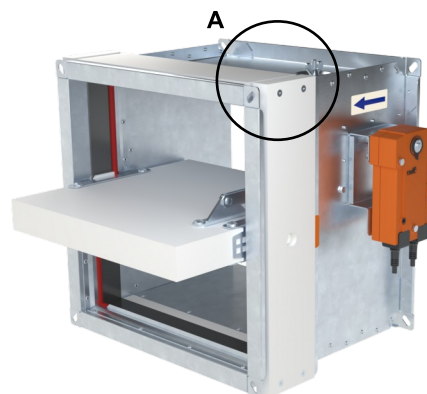
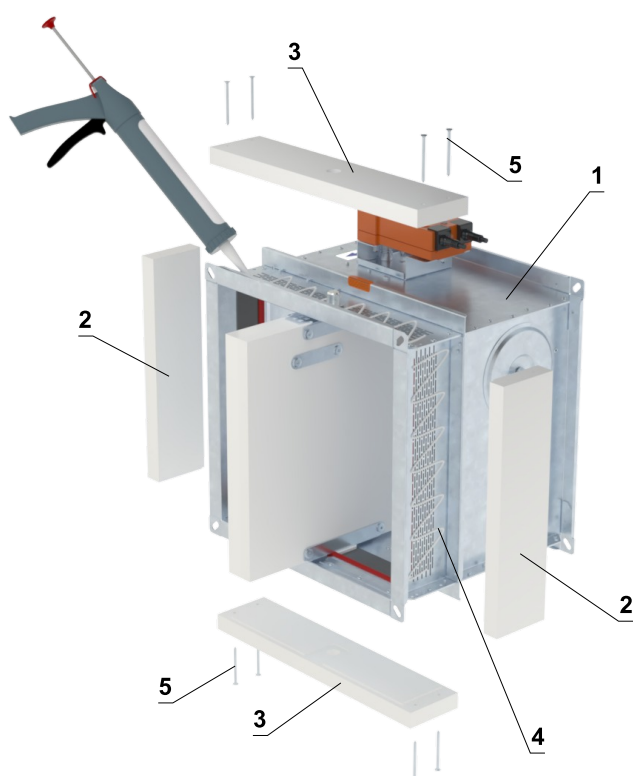


Protective cladding boards

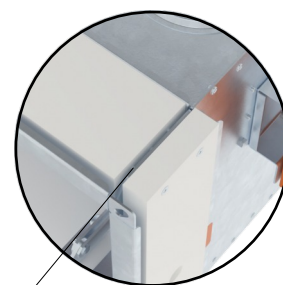
- Protective cladding boards must be used as part of the penetration filling of installation with Ablative Coated Batt.
- Can be ordered from MANDIK (installed on the damper or as an accessory) or can be sourced from local supplier
- If protective cladding boards are required, this must be specified in the ordering key
- Protective cladding boards are made of PROMATECT-MST, thickness 30 mm.
- Glue K84 is not included in the package

Installation procedure

- 1) Apply K84 glue over the entire surface
- 2) Attach protective cladding boards on all sides of a fire damper and glue them on the damper casing
- 3) Screw parts A and B using four screws 5x70 mm
- 4) Completely fill the gaps with glue



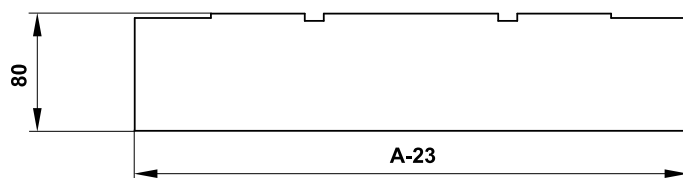
DETAIL A



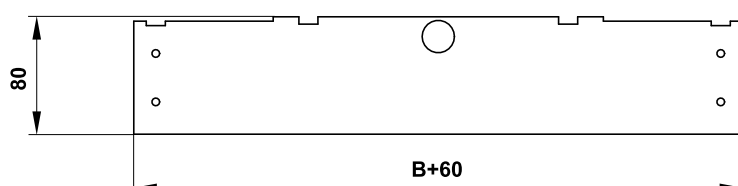
Completely fill the gaps between boards!

- 1 MSD
- 2 Part A
- 3 Part B
- 4 Glue PROMAT K-84
- 5 Screw 5x70 mm

Part A



Part B



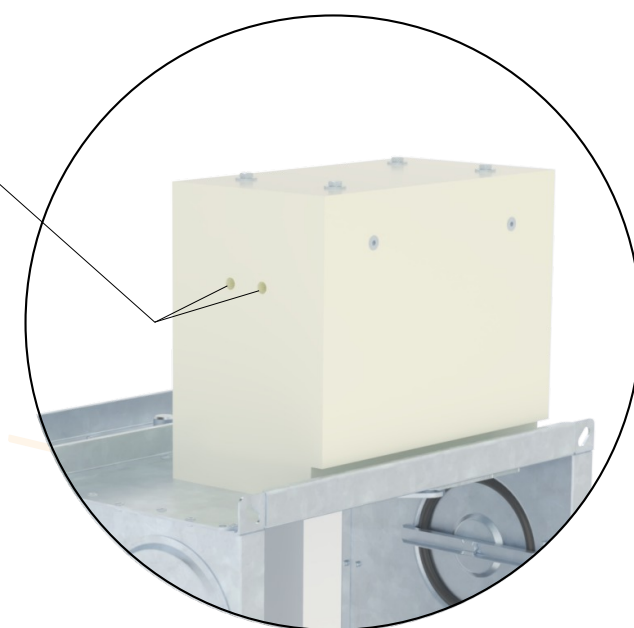
- Detailed dimensions of protective cladding boards on request.

Electrical connection of the actuator in protection box

protection box without slot or predrilled holes

- Drill two holes into the protection box (from outside to inside) and pull through field wiring cables (CAT 3 fire resistant cables as BS 8519) to connect to the actuator trailing lead inside the housing, using a standard screwed cable connector block, the protection box is made of calcium silicate plates.
- Procedure
 - Use drill (drill size acc. To suit connecting cable $\varnothing + 2$ mm for seal up by mastic) and make two holes. It is possible to drill holes in any side of the housing.
 - Pull the heat resistant cable through the calcium silicate plate (wall) and connect with cables from actuator acc. To electrical diagram → [see pages 6 to 9](#)
 - Seal up the space around cable with fire resistant mastic (HILTI CFS-S ACR, PROMASTOP) or equivalent.
 - Let the mastic harden

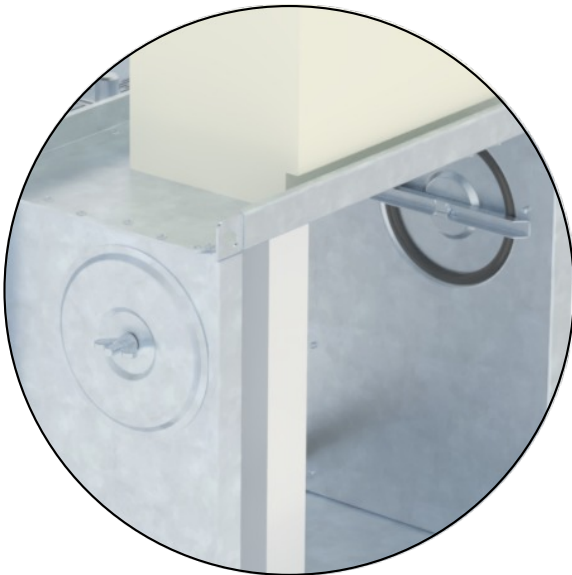
Example of drilled holes



Example of position of holes in the wall of the box, without pre-manufactured slot

Entry into service and revisions

- 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 successfully provided and finished. 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 that the damper is put into condition in which it is ready for function and meanwhile he is obliged to provide the fire protection by another appropriate way.
- Removing the inspection hole cover
 - Unscrew four of the edge screws to release the cover and then remove it from its original position.
- 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.
- 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.



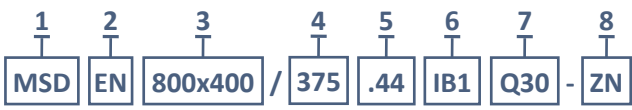
Inspection hole detail

- Ensure each damper is fully checked for operational capability, control should be initiated from the control system. Dampers blades should open and close correctly and operation should be visually inspected and documented prior to handover.

X. ORDERING INFORMATIONS

Ordering key MSD

Square damper MSD



EXAMPLE:

MSD EN 800x400/375 .44 IB1 Q30-ZN

Square smoke control damper MSD, dimension 800x400 mm, built length 375 mm, control design with actuating mechanism 230 V, design includes protection box of the actuator and include the protective cladding boards in line with the blade, flange dimension 30 mm, galvanized material variant.

1 | Type of smoke control damper - MSD

2 | Country of destination

3 | Damper dimensions A x B → see pages 18 to 27

4 | Built length - 375 mm

"A" is the width of the damper

"B" is the height of the damper

5 | Damper design

.44	With actuating mechanism BEN, BEE, BE, InMax 50.75-S for 230V
.54	With actuating mechanism BEN, BEE, BE, InMax 50.75-S for 24V
.65*	With actuating mechanism BEN (BEE)-SR for 24V

* Design .65 is not available by using actuating mechanism BE, InMax 50.75-S

6 | Accessories

	Without accessories
A	Design does not include protection box of the actuator and does not include protective cladding boards in line with the blade
A1	Design does not include protection box of the actuator and includes protective cladding boards in line with the blade
IB	Design includes protection box of the actuator and does not include the protective cladding boards in line with the blade
IB1	Design includes protection box of the actuator and include the protective cladding boards in line with the blade

7 | Flange dimension

Q30	Flange width 30 mm
-----	--------------------

8 | Material and other design options

ZN	Galvanized
A2	Stainless steel 1.4301 (AISI 304)
A4	Stainless steel 1.4404 (AISI 316L)

Round damper MSD



EXAMPLE:

MSD EN DN 500 .44 RS-ZN

Round smoke control damper MSD, dimension DN 500 mm, control design with actuating mechanism 230 V, straight connection to circular duct, galvanized material variant.

1 | Type of smoke control damper - MSD

2 | Country of destination

3 | Damper dimensions ØD → see page 28

4 | Damper design

.44	With actuating mechanism BEN 230V
.54	With actuating mechanism BEN 24V

5 | Duct connection

RS	Straight connection to circular duct
----	--------------------------------------

6 | Material and other design options

ZN	Galvanized
A2	Stainless steel 1.4301 (AISI 304)
A4	Stainless steel 1.4404 (AISI 316L)

Ordering key MSD-W

Square damper MSD-W



EXAMPLE:

MSD-W EN 800x400/375 .44 Q30-ZN

Square smoke control damper MSD-W, dimension 800x400 mm, built length 375 mm, control design with actuating mechanism 230 V, flange dimension 30 mm, galvanized material variant.

1| Type of smoke control damper - MSD-W

2| Country of destination

3| Damper dimensions A x B → see pages 18 to 27

"A" is the width of the damper

"B" is the height of the damper

4| Built length - 375 mm

5| Damper design

.44	With actuating mechanism BEN 230V
.54	With actuating mechanism BEN 24V
.4M0	With actuating mechanism BFN 230, JOVENTA DAF2.20S with an electromagnet for 230V
.4M1	With actuating mechanism BFN 230, JOVENTA DAF2.20S with an electromagnet for 24V
.5M0	With actuating mechanism BFN 24, JOVENTA DAF1.20S with an electromagnet for 230V
.5M1	With actuating mechanism BFN 24, JOVENTA DAF1.20S with an electromagnet for 24V

6| Flange dimension

Q30	Flange width 30 mm
-----	--------------------

7| Material and other design options

ZN	Galvanized
A2	Stainless steel 1.4301 (AISI 304)
A4	Stainless steel 1.4404 (AISI 316L)

Round damper MSD-W



EXAMPLE:

MSD-W EN DN 400 .4M0 RS-ZN

Round smoke control damper MSD-W, dimension DN 400 mm, control design with actuating mechanism 230 V, straight connection to circular duct, galvanized material variant.

1| Type of smoke control damper - MSD-W

2| Country of destination

3| Damper dimensions ØD → see page 28

4| Damper design

.4M0	With actuating mechanism BFN 230, JOVENTA DAF2.20S with an electromagnet for 230V
.4M1	With actuating mechanism BFN 230, JOVENTA DAF2.20S with an electromagnet for 24V
.5M0	With actuating mechanism BFN 24, JOVENTA DAF1.20S with an electromagnet for 230V
.5M1	With actuating mechanism BFN 24, JOVENTA DAF1.20S with an electromagnet for 24V

5| Duct connection

RS	Straight connection to circular duct
----	--------------------------------------

6| Material and other design options

ZN	Galvanized
A2	Stainless steel 1.4301 (AISI 304)
A4	Stainless steel 1.4404 (AISI 316L)

Data label

- Data label is placed on the damper casing (example)

MANDÍK®		MANDÍK, a.s. Dobříšská 550, 267 24 Hostomice, Czech Republic	
MULTI COMPARTMENT SMOKE CONTROL DAMPER - XXXX			
DIMENSION:		DESIGN:	
SERIAL.NO.:		WEIGHT (kg):	
CLASSIFICATION:		MANUAL	
TPM XXX/XX	Cert. No.: 1391-CPR-XXXX/XXXX, DoP: PM/XXXX/XX/XX/X	XX	EN 12101:2011
			 1391

The producer reserves the right for innovations of the product.
For actual product information see www.mandik.com

MANDÍK[®]
www.mandik.com

