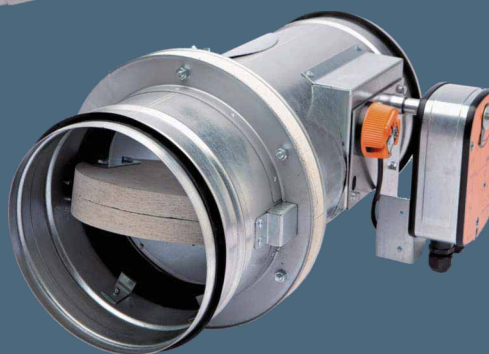


MANDÍK®

FIRE DAMPER FDMB



These technical specifications state a row of manufactured sizes and models of fire dampers (further only dampers) FDMB. It is valid for production, designing, ordering, delivery, assembly and operation.

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II. GENERAL INFORMATION

Fig. 1 Rectangular FDMB - design manual and thermal

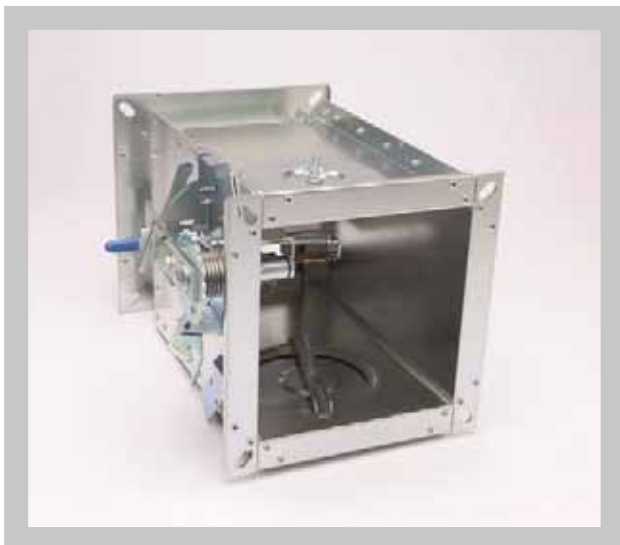


Fig. 2 Rectangular FDMB - design with actuating mechanism



Fig. 3 Round FDMB - design manual and thermal



Fig. 4 Round FDMB - design with actuating mechanism



Fig. 5 FDMB with covered control mechanism .01v2



Fig. 6 FDMB with covered control mechanism .01v2



1. Description

1.1. Fire dampers are shutters in ducts of air-conditioning devices that prevent spreading the fire and combustion products from one fire segment to the other one by means of closing the duct in the points of fire separating constructions.

Dampers blade automatically closes air duct using a shutting spring or an actuating mechanism back spring. The shutting spring is started by releasing an initiation lever. The impulse for releasing the lever can be either a manual one, a thermal one or an electromagnetic one. The back spring of the actuating mechanism is started when the thermoelectrical starting mechanism BAE 72B-S is activated, when a reset button on BAE 72B-S is pushed or when a power supply of the actuating mechanism is stopped.

The damper is sealed with a silicon packing against smoke penetration after closing the blade. At the same time, the damper blade is bedded in a material which enlarges its capacity and air proofs the air duct.

Square dampers have two inspection holes. Round dampers have one inspection hole, since the shutting device and the inspection hole can be set into the most advantageous position (with respect to the operation and manipulation with the control device).

1.2. Damper characteristics

- CE certified acc. to EN 15650
- Tested in accordance with EN 1366-2
- Classified acc. to EN 13501-3+A1
- Fire resistance EIS 90
- External Casing leakage class C, Internal leakage class 2 acc. to EN 1751
- Cycling test in class C 10000 acc. to EN 15650
- Corrosion resistant acc. to EN 15650
- ES Certificate of conformity No. 1391-CPD-0113/2012
- Declaration of Performance No. CDM/FDMB/001/13
- Hygienic assessment of fire dampers - Report No. 1.6/13/16/1

1.3. Working conditions

Right damper function is secured under the following conditions:

- a) Maximum air circulation speed: 12 m.s
Maximum pressure difference: 1200 Pa
- b) Dampers could be displaced into position "CLOSED" only in case that ventilator, or Air Handling Unit is switched off. The goal is the securing of proper closing and safe function of Fire Damper in case of Fire.
- c) The air circulation in the whole damper section must be secured as steady on whole surface.

Operation of the dampers does not depend on the direction of air circulation. The dampers can be located in an arbitrary position.

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

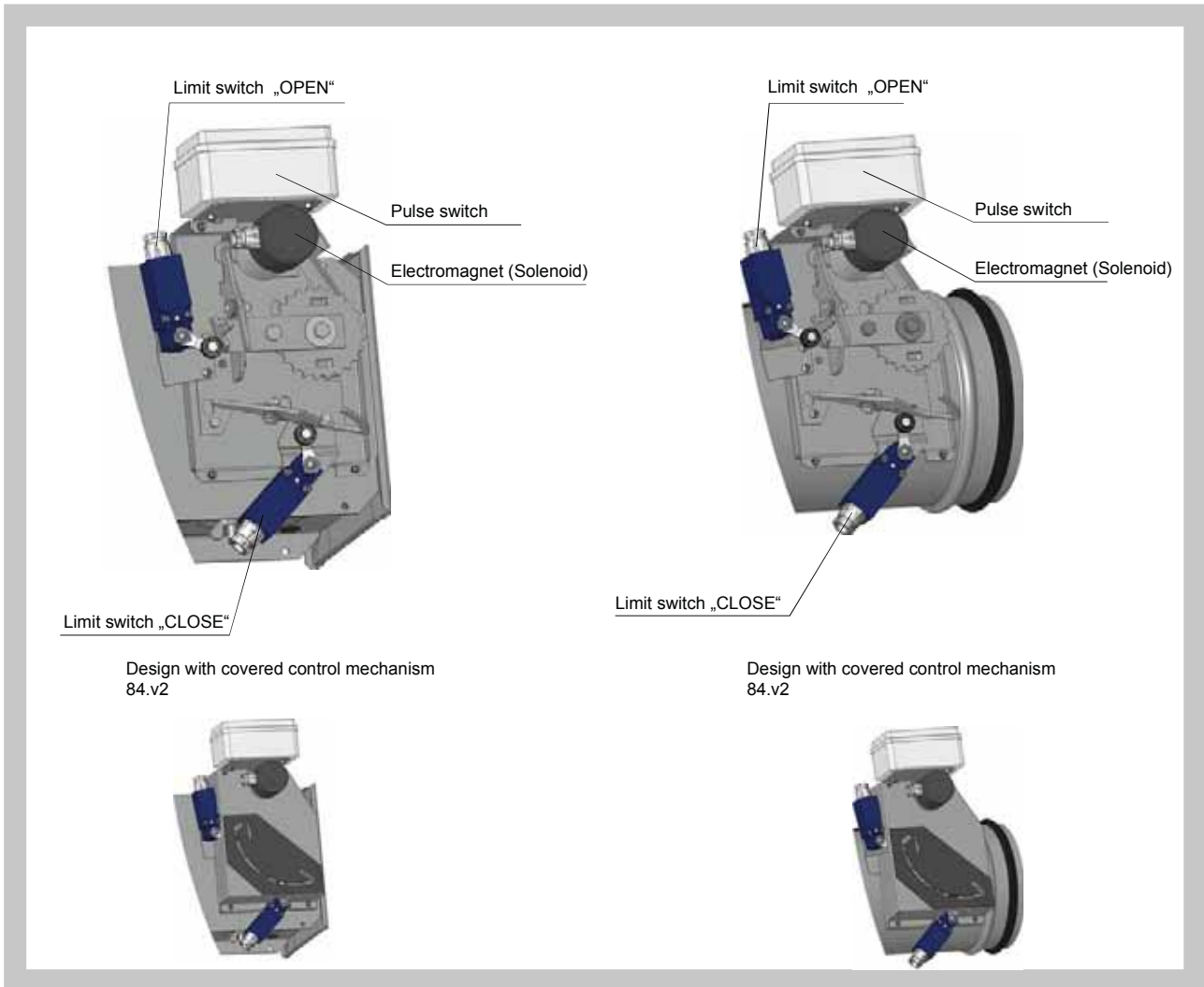
Dampers are designed for macroclimatic areas with mild climate according to EN 60 721-3-3.

Temperature in the place of installation is permitted to range from - 20°C to + 50°C.

2. Design

2.1. Design with mechanical control

Fig. 7 Design with mechanical control



Design .01 and .01v2

Design with mechanical control with a thermal protective fuse which actuates the shutting device within 120 seconds at latest after the nominal start temperature 72 °C has been reached. Automatic initiation of the shutting device is not activated if the temperature does not exceed 70 °C. In case that other start temperatures are required, thermal fuses with nominal start temperature + 104 °C or +147 °C can be supplied (this requirement must be specified in the order).

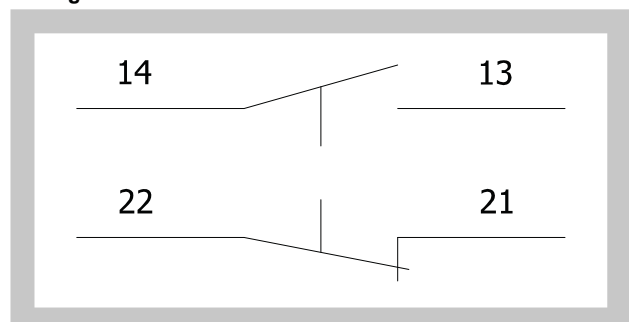
Design .11 and .11v2

Design .01 with mechanical control can be complemented with a terminal switch signaling of the damper blade position "CLOSED".

Tab. 2.1.1. Limit switch XCKN2118G-11

Limit switch XCKN2118G-11	
Nominal voltage, current	AC 240 V; 3 A DC 250 V; 0,1 A
Degree of protection	IP 65
Ambient temperature	-15 °C ... +70 °C

Fig. 8 Limit switch XCKN2118G-11



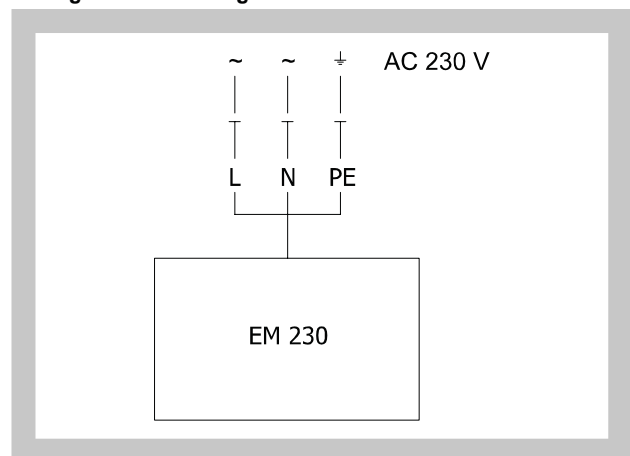
Design .20, .20v2, .21 and .21v2

Design .01 or .11 with mechanical control can be complemented with initiation by means of an electromagnet (solenoid). The voltage of the electromagnet (solenoid) can be AC 230V, AC/DC 24V. 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 20 to 30 sec. After activation of electromagnet is released initiation lever and damper is closed. After activation is initiation lever released. If is damper set up in position "OPEN" is necessary unlock initiation lever by pulling of electromagnet core.

Tab. 2.1.2. Electromagnet EM230

Elektromagnet EM230	
Nominal voltage	AC 230 V / 50 Hz
Attraction current	1,2 A
Degree of protection	IP 40
Ambient temperature	-10 °C ... +40 °C
Connection	cable 1m, 3x0,75mm ²

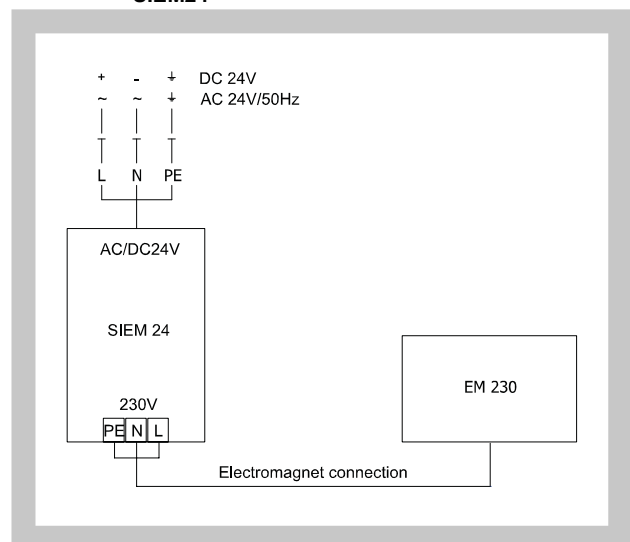
Fig. 9 Electromagnet EM230



Tab. 2.1.3. Electromagnet EM230 with pulse switch SIEM24

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

Fig. 10 Electromagnet EM230 with pulse switch SIEM24



Design .23, .23v2, .24 and .24v2

Design .20 or .21 with mechanical control and electromagnet can be complemented with limit switch signaling of the damper blade position "CLOSE".

Design .80, .80v2, .82, .82v2, .83, .83v2

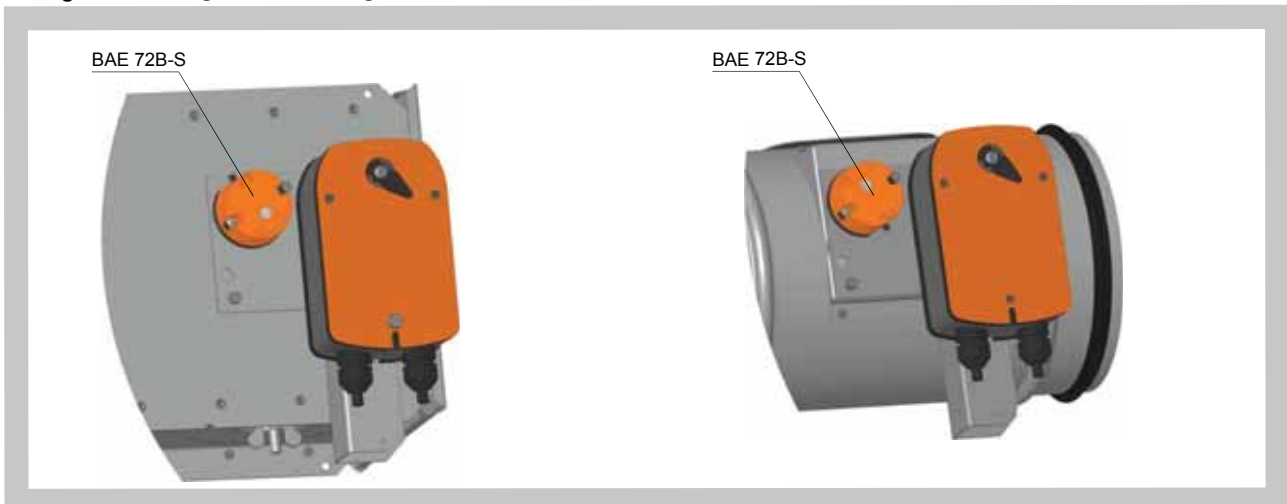
Design .11, .23, or .24 can be complemented with a terminal switch signaling of the damper blade position "OPEN".

2.2. Design with electric actuating mechanism

Design .40, .50

FDMB is always equipped by electric actuating mechanism BLF(BF) 230-T or BLF(BF) 24-T (further only "actuating mechanism"). After being connected to power supply AC/DC 24V or 230V, the actuating mechanism displaces the damper blade into operation position "OPEN" 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 "OPEN" and the back spring is pre-stretched. Time needed for full opening of the flap blade from the position "CLOSED" to the position "OPEN" is maximum 140 sec. If the actuating power supply is cut off (due to loss of supply voltage, activation of thermoelectrical actuating mechanism or pushing the reset button on the thermoelectrical starting mechanism BAE 72B-S), the back spring displaces the damper blade into the breakdown position "CLOSED". 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 "OPEN". A thermoelectrical starting mechanism BAE 72B-S, which contains two thermal fuses Tf1 and Tf2/Tf3, is a part of the actuating mechanism. These fuses are activated when temperature +72 °C has been exceeded (the fuse Tf1 when the temperature around the damper and the fuses Tf2/Tf3 when the temperature inside the air-conditioning piping has been exceeded). After the thermal fuse Tf1 or Tf2/Tf3 has been activated, the power supply is permanently and irreversibly cut off and the actuating mechanism, by means of the pre-stretched spring, displaces the damper blade into the breakdown position "CLOSED".

Fig. 11 Design with actuating mechanism



Tab. 2.2.1. Actuating mechanism BELIMO BLF 24-T(-ST), BLF 230-T

Actuating mechanism BELIMO	BLF 24-T(-ST)	BLF 230-T
Nominal voltage	AC 24 V 50/60 Hz DC 24 V	AC 230 V 50/60 Hz
Power consumption - motoring - holding	5 W 2,5 W	5 W 3 W
Dimensioning	7 VA (Imax 5,8 A @ 5 ms)	7 VA (Imax 150 mA @ 10 ms)
Protection class	III	II
Degree of protection	IP 54	
Running time - motor - spring return	40..75 sec ~ 20 sec	
Ambient temperature - normal duty - safety duty - non-operating temperature	- 30 °C ... + 50 °C The safe position will be attained up to max. 75°C - 40 °C ... + 50 °C	
Connecting - motor - auxiliary switch	cable 1 m, 2 x 0,75 mm ² cable 1 m, 6 x 0,75 mm ² (BLF 24-T(-ST) with plug-in connectors)	
Thermal trips	Tf1: duct outside temperature 72 °C Tf2/Tf3: duct inside temperature 72 °C	

Fig. 12 Actuating mechanism BELIMO BLF 24-T(-ST)

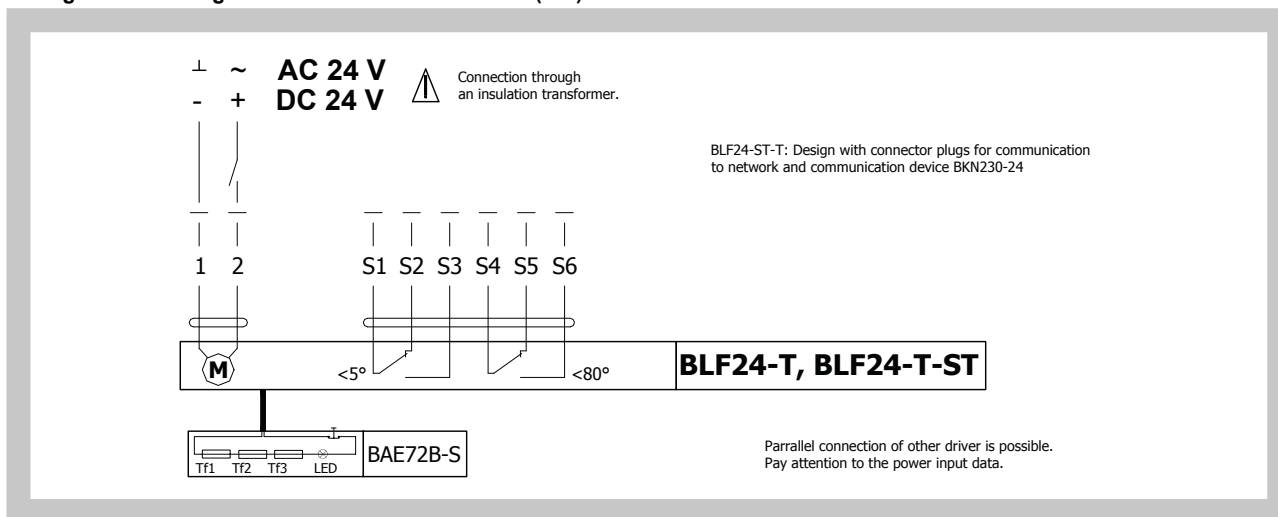
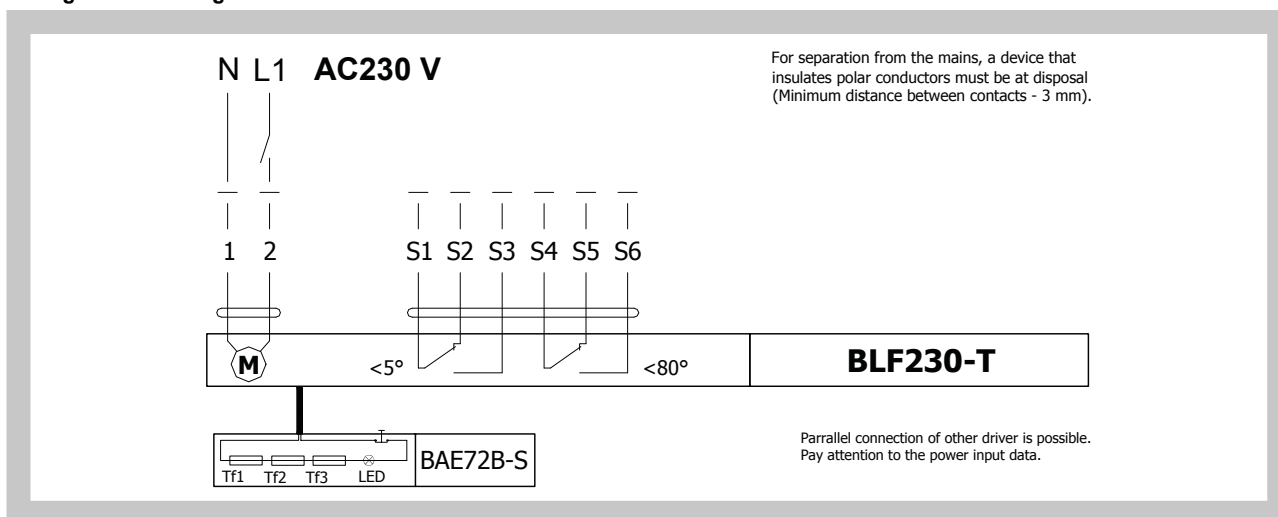


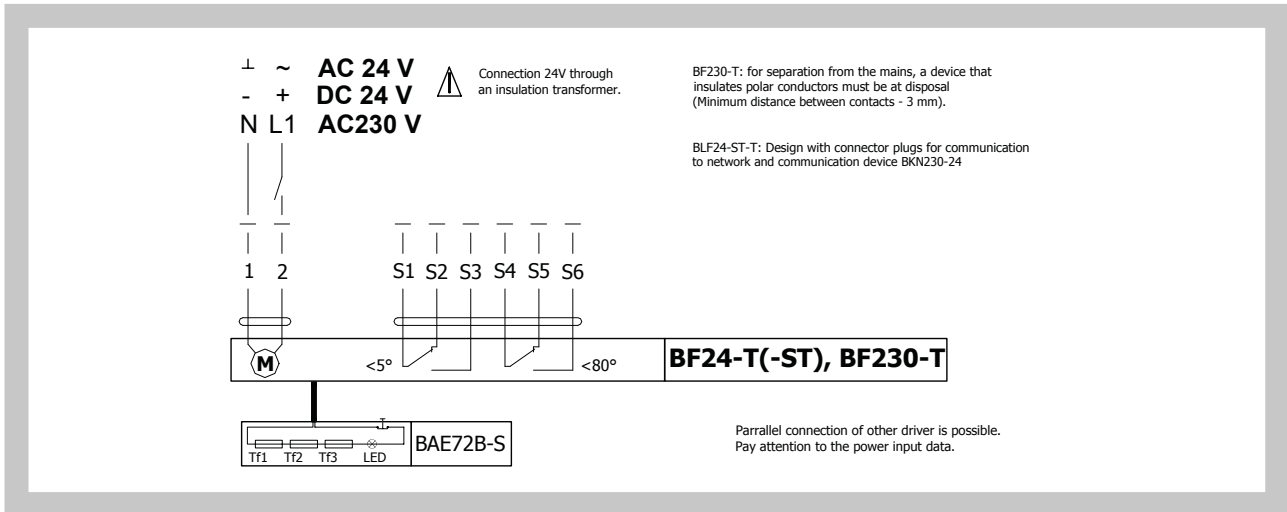
Fig. 13 Actuating mechanism BELIMO BLF 230-T



Tab. 2.2.2. Actuating mechanism BELIMO BF 24-T(-ST), BF 230-T

Actuating mechanism BELIMO	BF 24-T(-ST)	BF 230-T
Nominal voltage	AC 24 V 50/60 Hz DC 24 V	AC 230 V 50/60 Hz
Power consumption - motoring - holding	7 W 2 W	8 W 3 W
Dimensioning	10 VA (I _{max} 8,3 A @ 5 ms)	12,5 VA (I _{max} 500 mA @ 5 ms)
Protection class	III	II
Degree of protection	IP 54	
Running time - motor - spring return	140 sec ~ 16 sec	
Ambient Temperature - normal duty - safety duty - non-operating temperature	- 20 °C ... + 50 °C The safe position will be attained up to max. 75°C - 40 °C ... + 50 °C	
Connecting - motor - auxiliary switch	cable 1 m, 2 x 0,75 mm ² cable 1 m, 6 x 0,75 mm ² (BF 24-T-ST) with plug-in connectors	
Thermal trips	Tf1: duct outside temperature Duct 72 °C Tf2/Tf3: duct inside temperature Duct 72 °C	

Fig. 14 Actuating mechanism BELIMO BF 24-T(-ST), BF 230-T



Design .41, .51

Design .41 or .51 with actuating mechanism can be complemented with smoke detector MHG 231. The voltage can be AC 230 V or AC/DC 24 V. Design with voltage AC 230 V is equipped with Communication and supply device BKN 230-24-MA and with actuating mechanism BF 24-T (BLF 24-T).

The smoke detector is activated when smoke spreads in air duct system. Deactivation of smoke detector is provided by interruption of supply voltage for min. 2s.

Tab. 2.2.3. Optical smoke detector MHG 231 with the socket MHY 734.031

Optical smoke detector	MHG 231 with socket MHY 734.031
Nominal voltage	AC/DC 24 V
Voltage range	AC 18 ... 28 V DC 24 ... 30 V
Power Consumption Socket (without actuating mechanism)	max. 50mA
Degree of protection	IP 40
Ambient temperature Non-operating temperature	- 25 °C ... + 70 °C - 5 °C ... + 40 °C
Connection - net - motor - communication and supply device BKN 230-24-MA	Cabel 1m, connected to terminal XT1 Screw terminals on the terminal block XT2 Screw terminals on the terminal block XT1 a XT2

Fig. 15 Socket MHY 734.031

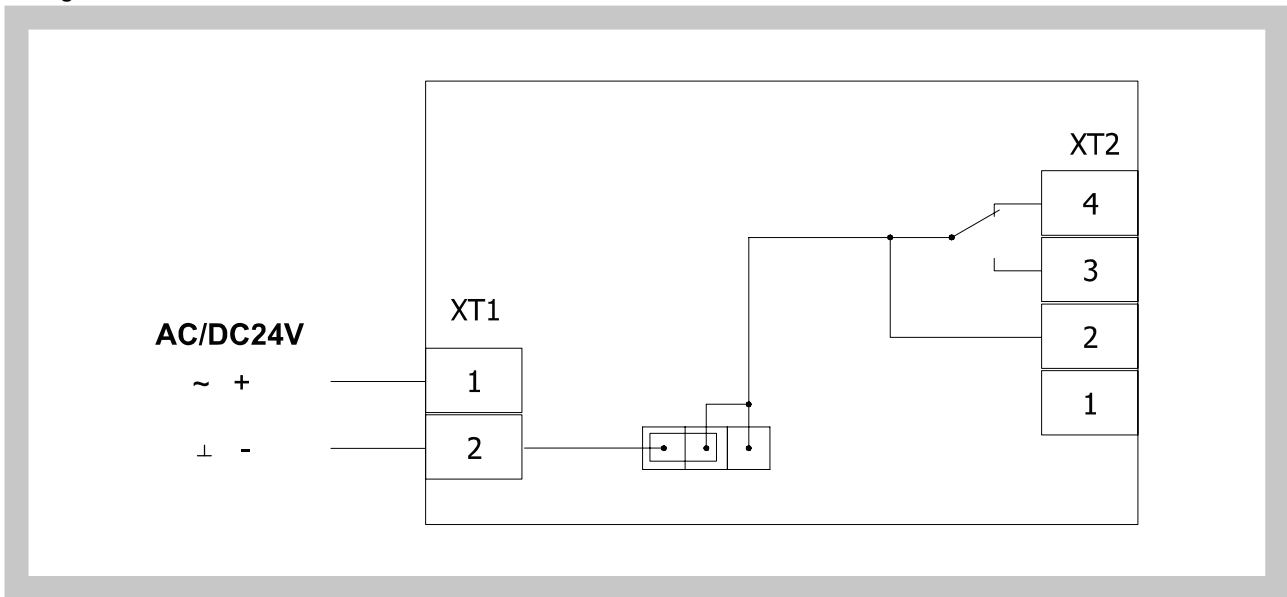


Fig. 16 Design with actuating mechanism BF 24-T (BLF 24-T) , with smoke detector MHG 231 and with Communication and supply device BKN 230-24-MA (voltage AC 230 V)

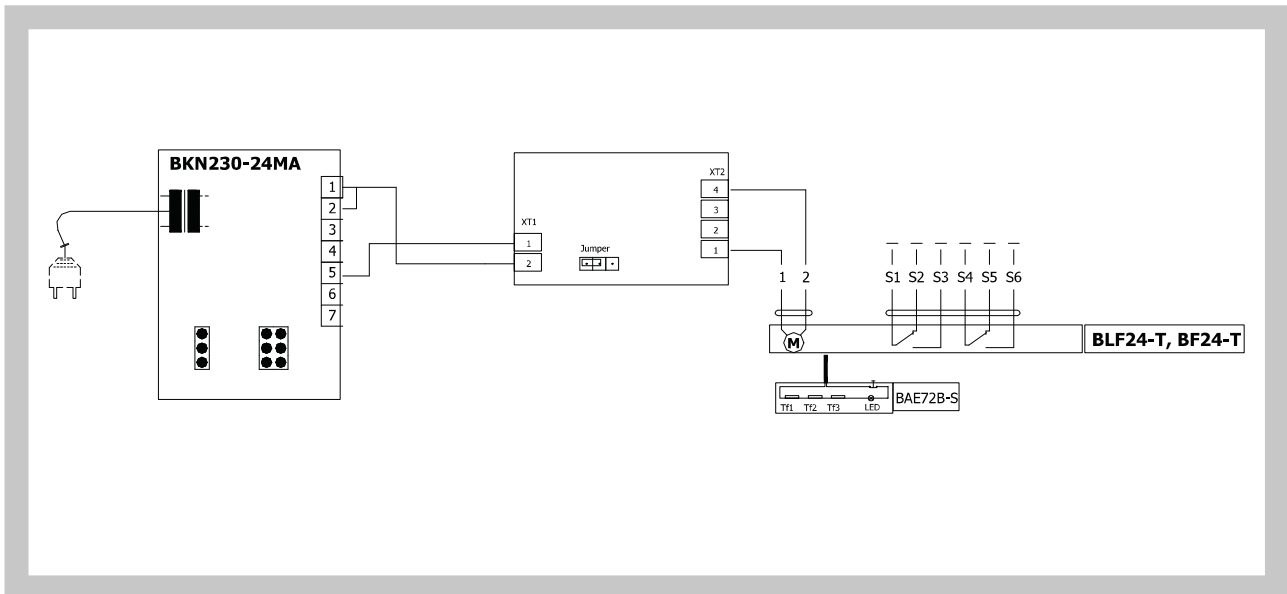
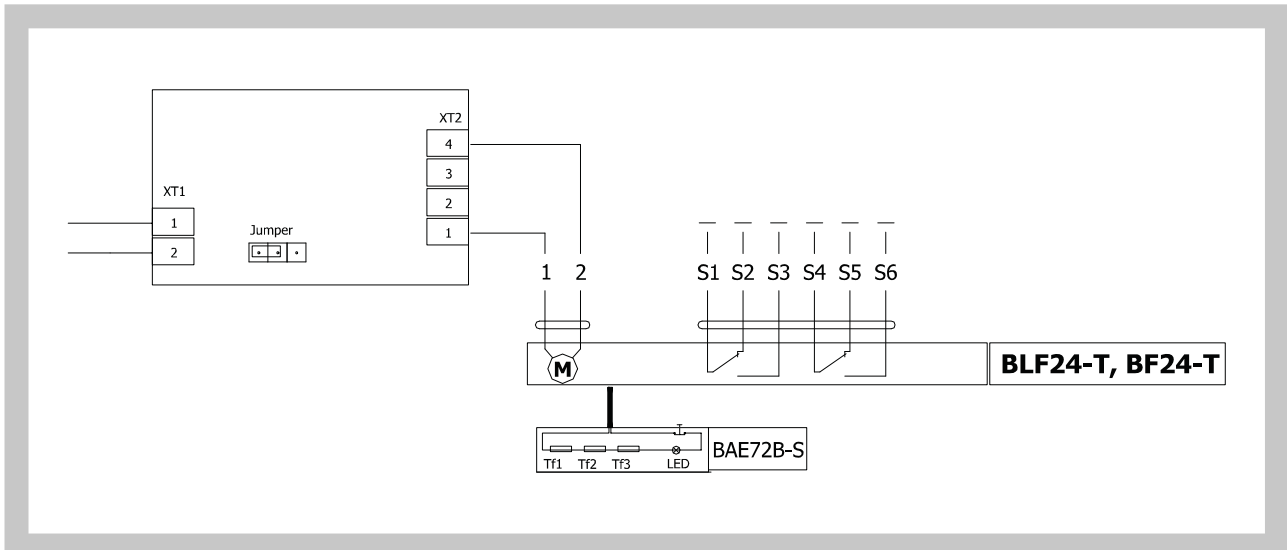


Fig. 17 Design with actuating mechanism BF 24-T (BLF 24-T) , with smoke detector MHG 231 (voltage AC/DC 24 V)



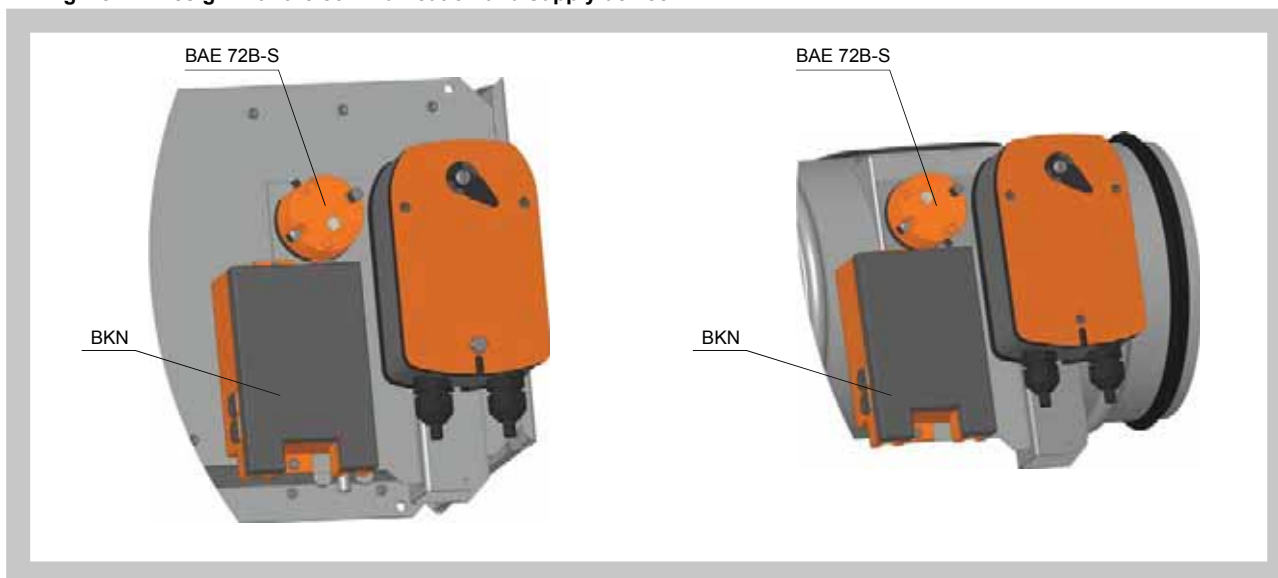
2.3. Design with the communication and supply device

Design .60

Design with the communication and supply device BKN 230-24 and the actuating mechanism BF 24-T-ST (BLF 24-T-ST). It simplifies electrical wiring and interconnection of fire flap valves. It facilitates on site check and enables central control and checks of fire damper by means of a simple 2-conductor wiring. BKN 230-24 functions as a decentralized network device for supplying the actuating mechanism BF 24-T-ST (BLF 24-T-ST) with a spring back drive on one hand and on the other hand it transmits the signal informing about the flap valve position OPERATION and FAILURE through 2-conductor wiring to the central. Control command SWITCHED ON - SWITCHED OFF from the central through BKN 230-24 goes through the same wiring to the actuating mechanism.

To simplify the connection, the actuating mechanism BF 24-T-ST (BLF 24-T-ST) is equipped with connecting plugs that are inserted directly to BKN 230-24. BKN 230-24 is supplied with a conductor and an EURO plug to be connected to the 230V mains. 2- conductor wiring is connected to BKN 230-24 by means of terminals 6 and 7. If the drive is supposed to be controlled without any signal from the central, it can be switched on by means of a bridge between the terminals 3 and 4. A green LED pilot light on BKN 230-24 is on when voltage is present in the drive (AC 24V). If the button on BAE 72-S is switched on or if the power supply (e.g. by a signal from ELECTRICAL FIRE SIGNALISATION) is disconnected, the damper position will be "FAILURE".

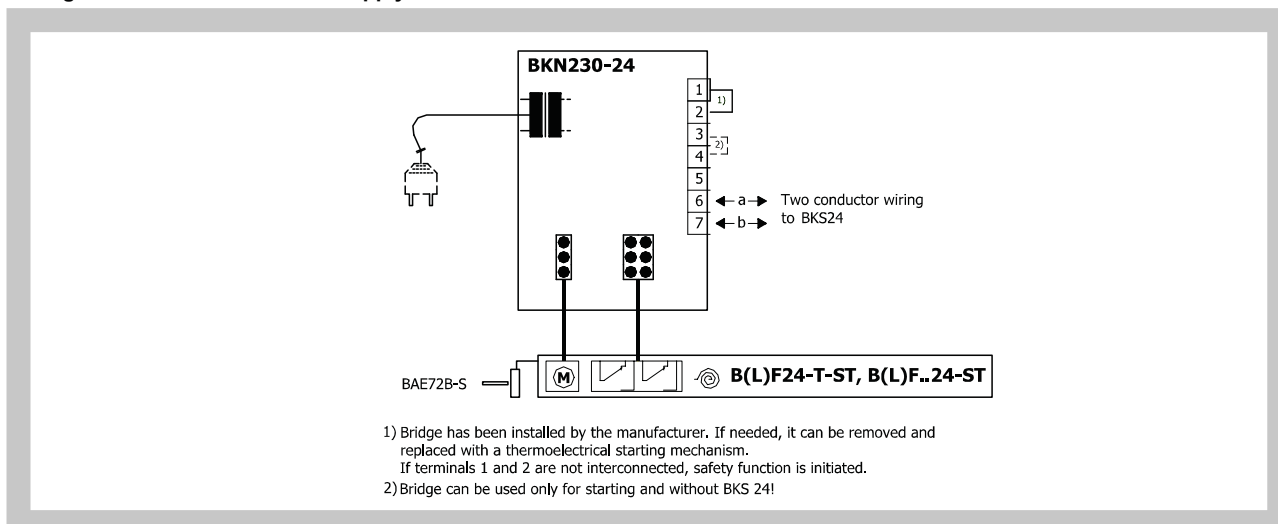
Fig. 18 Design with the communication and supply device



Tab. 2.3.1. Communication and supply device BKN 230-24

Communication and supply device	BKN 230-24
Nominal voltage	AC 230 V 50/60Hz
Power consumption	3,5 W (operating position)
Dimensioning	11 VA (including actuating mechanism with spring return)
Protection Class	II
Degree of protection	IP 42
Ambient temperature	- 20 °C ... + 50 °C
Non-operating temperature	- 40 °C ... + 80 °C
Connection - net - motor - terminal board	cable 0,9 m with EURO plug type 26 6-pole connector, 3-pole connector screw terminals for cable 2x1,5 mm ²

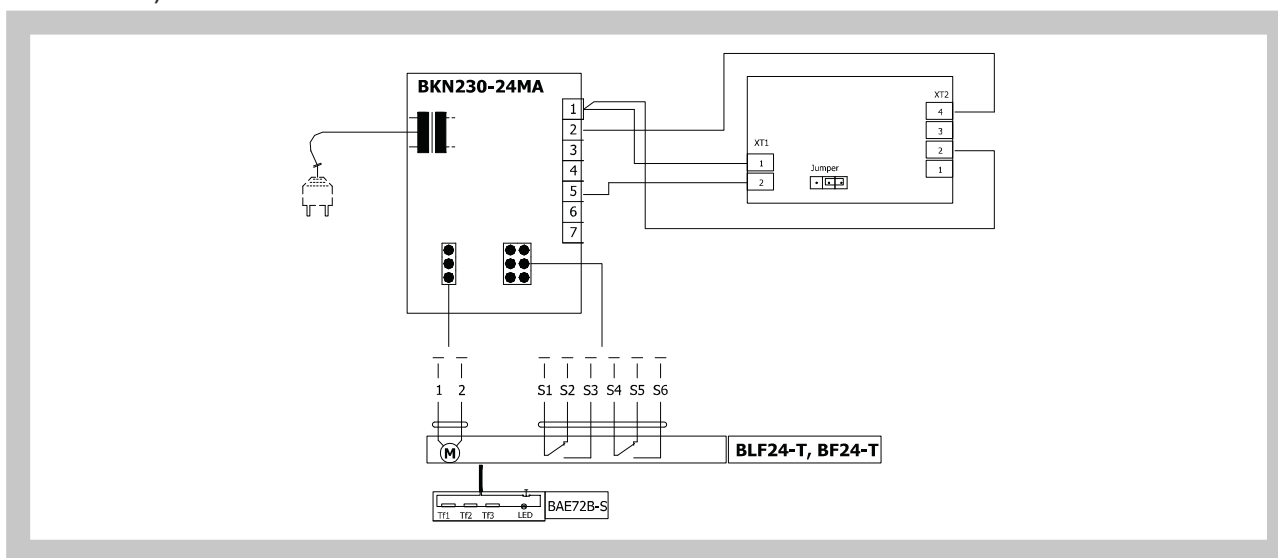
Fig. 19 Communication and supply device BKN 230-24



Design .61

Design .61 with communication and supply device can be complemented with smoke detector MHG 231. For supply and communication is used BKN 230-24-MA.

Fig. 20 Design with communication and supply device BKN 230-24-MA, with actuating mechanism BF 24-T-ST (BLF 24-T-ST) and smoke detector MHG 231



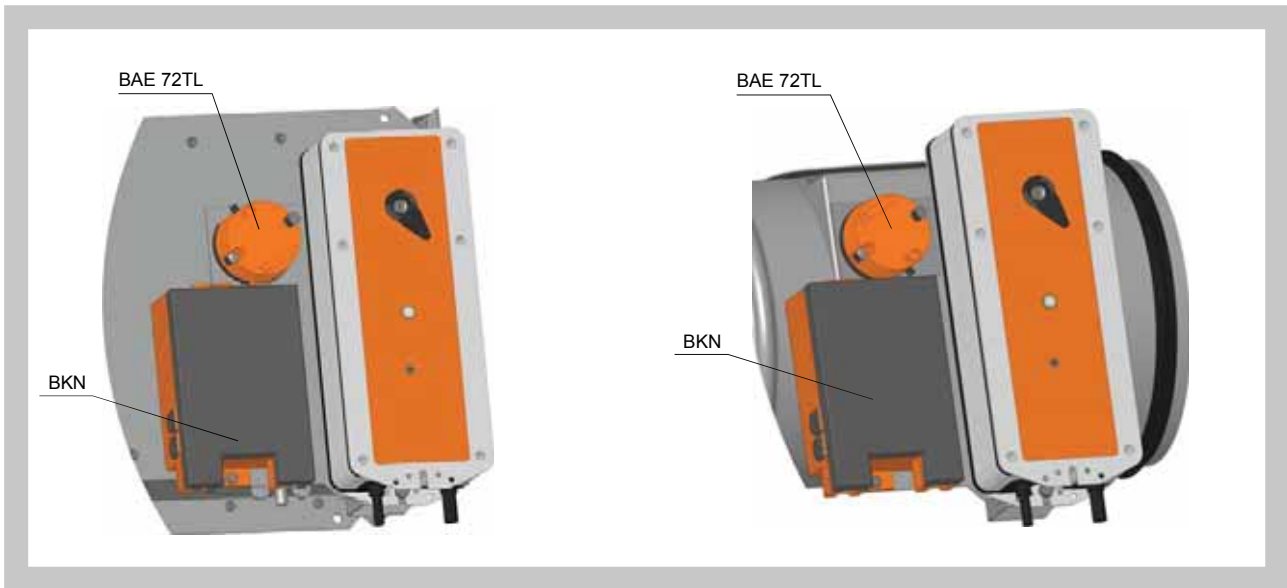
Design .62

Design with the communication and supply device BKN 230-24MP and actuating mechanism BF24TL-T-ST for connection to MP-Bus. BKN 230-24MP supplies to intelligent actuating mechanisms of fire dampers BF 24TL-T-ST decentrally needed power supply. In this way can be realize long MP-Bus communications (up to 800 m). Up to 8 Bus nodes can be parallel connected and controlled by Master device (DDC with interface). More information in Belimo catalogue.

Design .63

Design with the communication and supply device BKN 230-24LON and actuating mechanisms of fire dampers BF 24TL-T-ST for cooperation with control units based on technology LonWorks. BKN 230-24LON complements actuating mechanism for integrated safety function and converts digital protocol MP from actuating mechanism to LonTalk and back. More information in Belimo catalogue.

Fig. 21 Design with communication and supply device BKN 230-24MP or BKN 230-24LON and actuating mechanism BF 24TL-T-ST



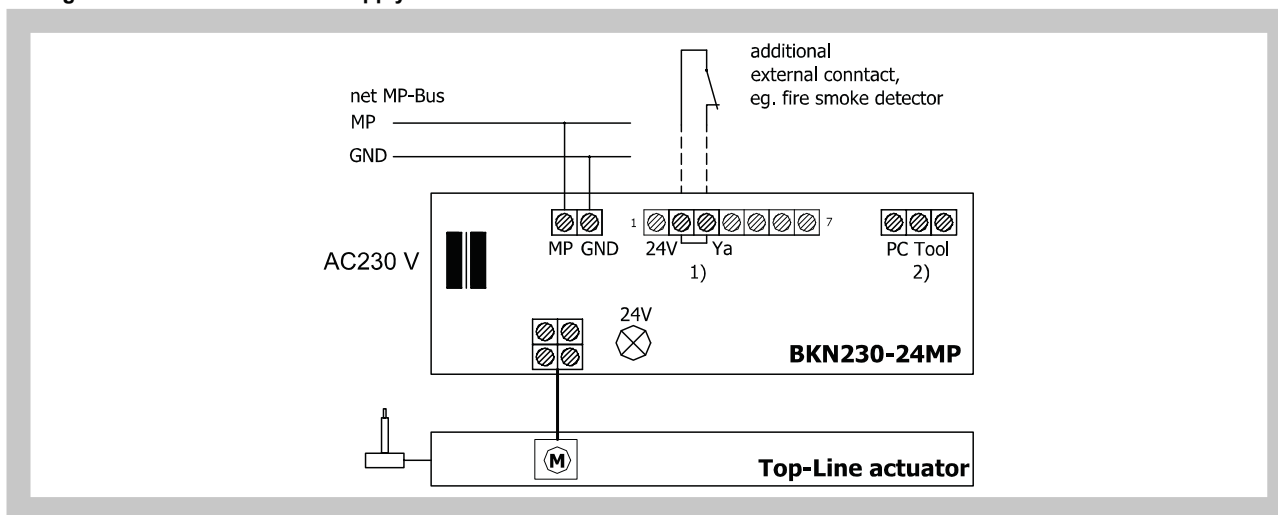
Tab. 2.3.2. Actuating mechanism BELIMO BF 24TL-T-ST

Actuating mechanism BELIMO	BF 24TL-T-ST
Nominal voltage	AC 24 V 50/60Hz DC 24 V
Power consumption - motoring - holding	7 W 2 W
Dimensioning	10 VA (I _{max} 8,3 A @ 5 ms)
Protection class	III
Degree of protection	IP 54
Running time - motor - spring return	140 sec ~ 16 sec
Ambient temperature Non-operating temperature	- 20 °C ... + 50 °C - 40 °C ... + 50 °C
Connection	Connector for BKN 230-24LON and BKN 230-24MP cable 1 m, 4 x 0,75 mm ² halogen-free

Tab. 2.3.3. Communication and supply device BKN 230-24MP

Communication and supply device	BKN 230-24MP
Nominal voltage	AC 230 V 50/60Hz
Power consumption	11 W (including actuator mechanism)
Dimensioning	13 VA (including actuator mechanism)
Protection Class	II
Degree of protection	IP 40
Ambient temperature Non-operating temperature	- 30 °C ... + 50 °C - 40 °C ... + 80 °C
Connection - net - motor (BF...-Top) - net MP - starting mechanism (variable) - Top-Line PC-Tool (via ZIP-RS232)	cable 1m, with EURO plug 4-pole connector screw terminal 2-pole screw terminal 2-pole 3-pole connector

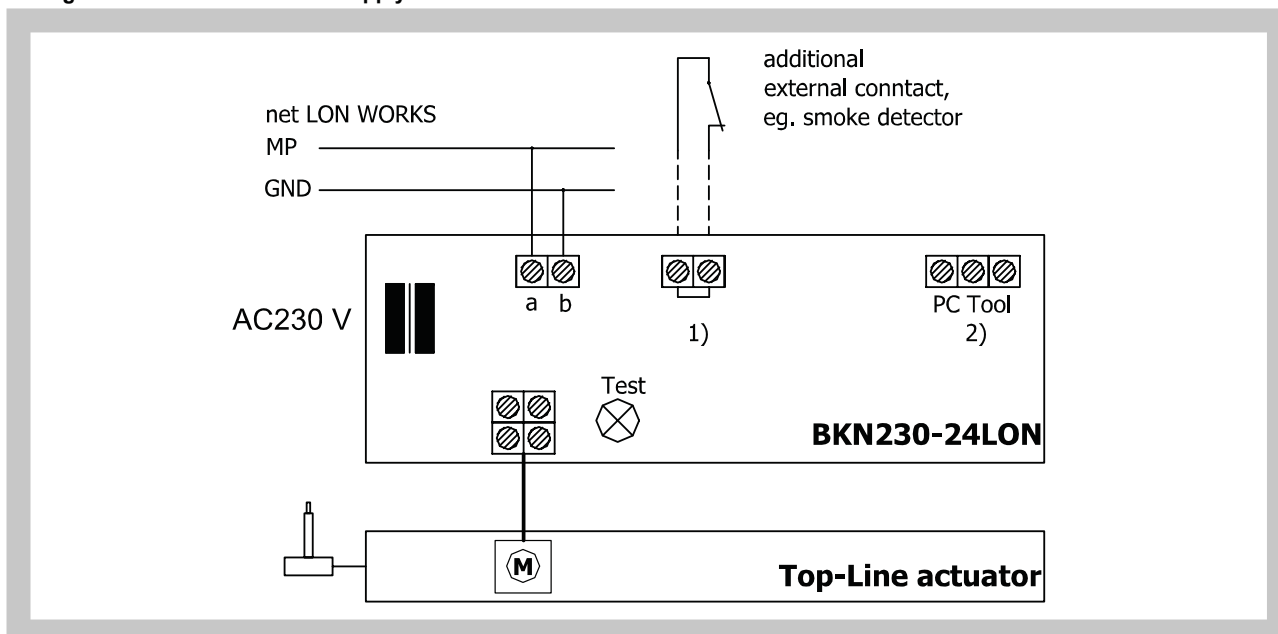
Fig. 22 Communication and supply device BKN 230-24MP



Tab. 2.3.4. Communication and supply device BKN 230-24LON

Communication and supply device	BKN 230-24LON
Nominal voltage	AC 230 V 50/60Hz
Power consumption	14 W (including actuating mechanism)
Dimensioning	16 VA (including actuating mechanism)
Protection Class	II
Degree of protection	IP 40
Ambient temperature Non-operating temperature	- 30 °C ... + 50 °C - 40 °C ... + 80 °C
Connection - net - actuator (BF...-Top) - net LonWorks® - starting mechanism (optional) - Top-Line PC-Tool (via ZIP-RS232)	cable 1m, with Euro plug 4-pole connector screw terminal 2-pole screw terminal 2-pole 3-pole connector

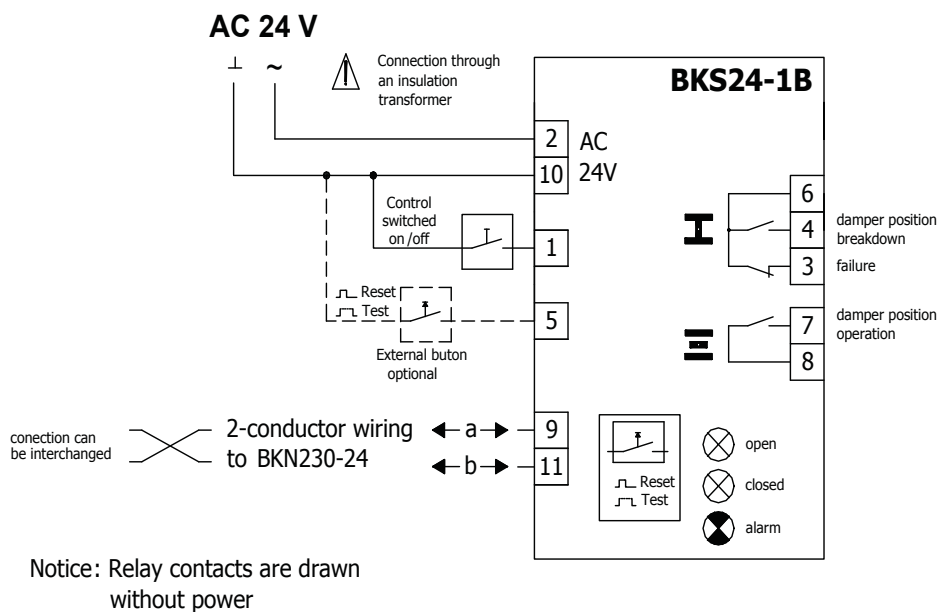
Fig. 23 Communication and supply device BKN 230-24LON



3. Communication and control devices

3.1. BKS 24-1B communication and control device is used for control and checks of fire dampers with the BF 24-T-ST (BLF 24-T-ST) actuating mechanism in conjunction with the BKN 230-24 supply and communication device. BKS 24-1B receives information about the situation of the fire damper through the BKN 230-24 supply and communication device and issues controlling commands. The device is intended for building in into the distribution board. Light diodes on the front side of the device signalise the operating situations of the damper and breakdowns of the whole system. Potentialless auxiliary contacts enable connection to the master control system (signaling of the damper position, failure reports, release of the ventilators etc.). While a flashing green LED pilot light signalises damper blade motion towards the given position, the same pilot light reports reaching the required position when shining constantly. If the flap blade, with respect to the given time, does not reach the required position, then a red LED pilot light starts to flash and at the same time, the failure contact is active. Once the damper blade reaches the given position, this contact is deactivated. The LED pilot light keeps flashing unless the failure is unblocked by means of the RESET button. Except for reporting failures, other three auxiliary contacts are available. Contacts showing operating and failure position of the damper are active when the damper is in the given position. Function check can be done by pressing and holding the button "RESET/TEST" for longer time. While holding the button, the damper blade moves in the direction of the failure position. Fault function is indicated by the LED pilot light. BKS 24-1B can be connected by means of ZSO-11 11 pole connector for DIN 35 mm panel.

Fig. 24 Communication and control device BKS 24-1B



light diodes			contacts	Description
open	closed	alarm	state	Cause/Course
⊗	⊗	⊙	[6] — [3]	Power supply AC 24V not available
⊗	⊗	⊙	[6] — [3]	Check test cca 35sec , starting with switching AC 24 on or pressing «Reset/Test» button
⊗	⊗	⊙	[6] — [3]	Current failure , possible cause: • short circuit or interruption of 2-conductor wiring or damper failure (at BKN..) • Power supply AC 230V missing • defective thermoelectrical starting • smoke detector activated • exceeded operation time • damper blocked
⊗	⊗	⊙	[6] — [3]	Failure saved in memory • Fault in system signalled, system check should be done
⊗	⊗	⊙	[6] — [4]	Damper (drive) turning into the direction of breakdown position
⊗	⊗	⊙	[6] — [4]	Damper (drive) in breakdown position I
⊗	⊗	⊙	[6] — [7]	Damper (drive) turning into the direction of operating position
⊗	⊗	⊙	[6] — [7]	Damper (drive) in operating position II

Tab. 3.1.1. Communication and control device BKS 24-1B


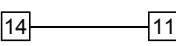

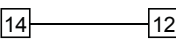


Communication and control device	BKS 24-1B
Nominal voltage	AC 24 V 50/60Hz
Power consumption	2,5 W (operating position)
Dimensioning	5 VA
Protection Class	III
Degree of protection	IP 30
Ambient temperature	0 ... + 50 °C
Connection	11-pole connector ZSO-11, it is not part of BKS24-1B, ZSO-11 is 11-pole screw terminal 11 x 1,5 mm ²

3.2. BKS 24-9A communication and control device is used for group control and checks of 1 to 9 fire dampers with the actuating mechanism BF 24-T-ST (BLF 24-T-ST) in connection with the supply and communication device BKN 230-24. Signalisation of the damper position is individual; the damper can be controlled and tested only as a group. BKS 24-9A is intended for use in the distribution board and displays the operation situations and failure reports of the connected fire dampers. It is possible to signalise functions such as the damper position and failure reports or to transmit them further to the system by means of integrated auxiliary switches. BKS 24-9A receives signals from BKN 230-24 through the two-conductor wiring and issues control commands. Proper damper operation is indicated by two light LED diodes:

Control ON = position OPERATION
 Control OFF = position FAILURE

If the fire damper do not reach the given position in time tolerable for displacing, the appropriate light diode FAILURE starts to flash and K1 contact is opened (current failure). In case that the faulty damper finally reaches its given position, K1 is closed and the failure report light shines (the failure is saved in memory). K2 - the auxiliary contact - is used for signaling of the flap position to the master device. Function of this auxiliary contact can be programmed through the terminal 14 according to the Tab. 3.2.1.

Tab. 3.2.1. BKS 24 -9A contacts K1 and K2

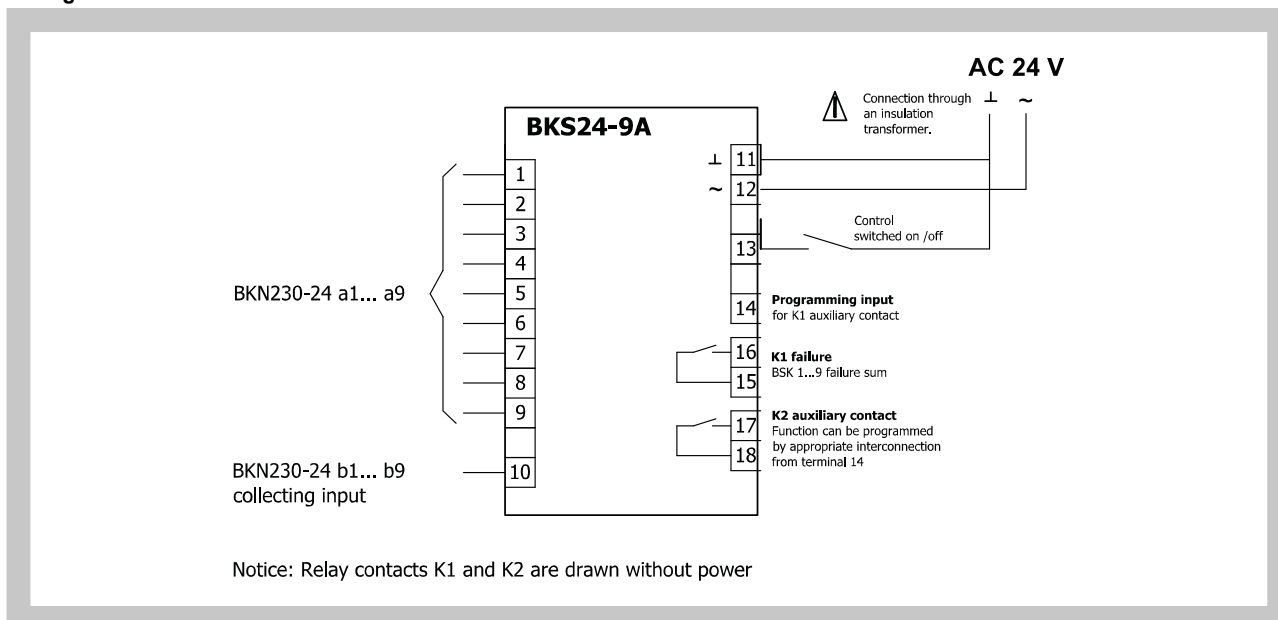
Function contact K1		Programming K2 Auxiliary Contact		
situation	state	function	interconnection	state
current failure		K2 contact is on if all the flaps are open		
		K2 contact is on if the flap No. 1 is open		
no failure		K2 contact is on if all the flaps are closed		

Function check can be done in the position OPERATION by means of pushing the TEST button. While the button is pushed, the flap blade is turning into the position FAILURE. Fault function is indicated by a report "FAILURE". Assembly and connection BKS 24 - 9A can be made by DIN 35 mm panel. It is connected by two 9-pole plug-in connectors.

Tab. 3.2.2. Communication and control device BKS 24-9A

Communication and control device	BKS 24-9A
Nominal voltage	AC 24 V 50/60Hz
Power consumption	3,5 W
Dimensioning	5,5 VA
Protection Class	III
Degree of protection	IP 30
Ambient temperature	0 ... + 50 °C
Connection	terminal 2 x 1,5 mm ²

Fig. 25 Communication and control device BKS 24-9A



4. Dimensions, weights

4.1. Rectangular dampers

Fig. 26 FDMB - design manual and thermal

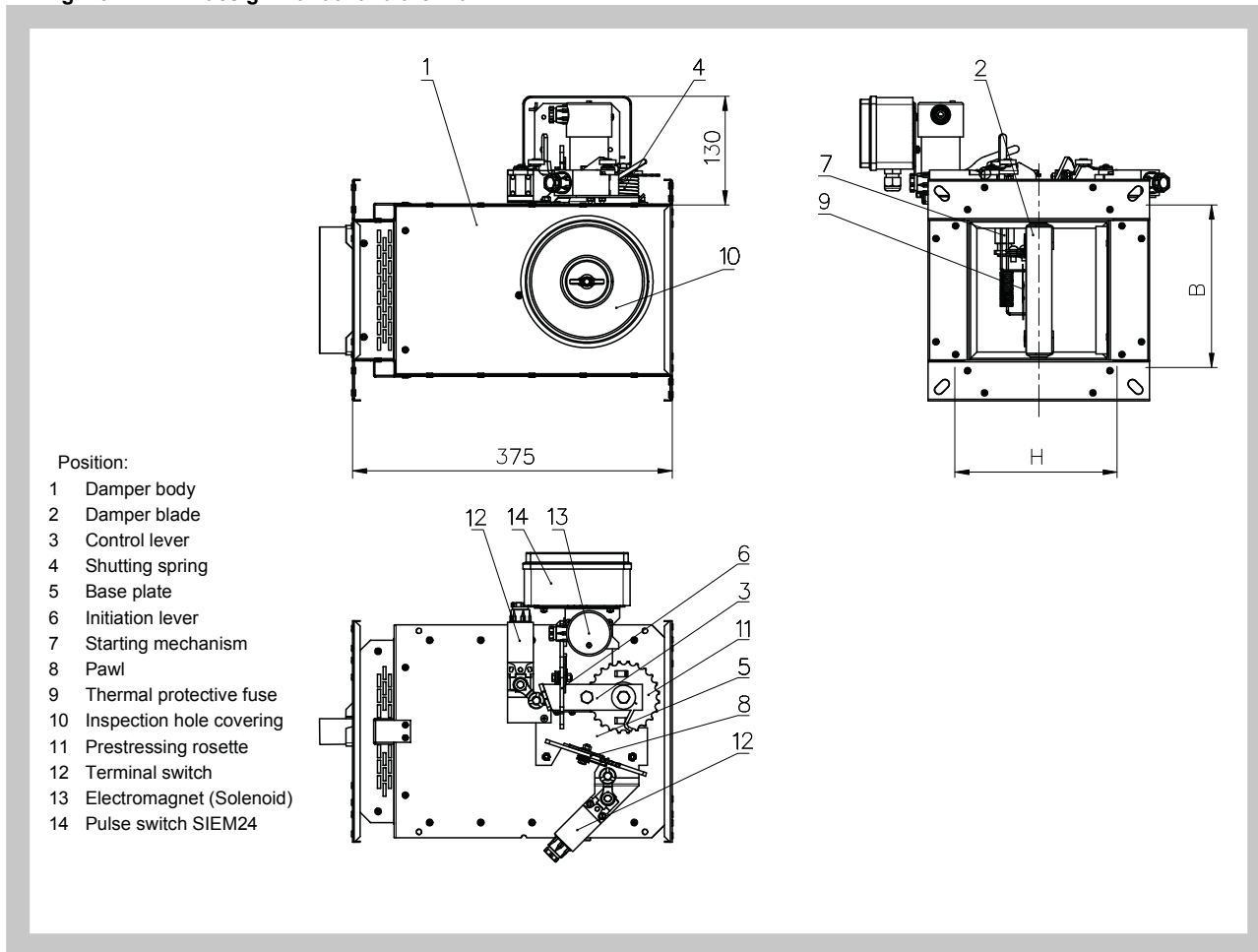


Fig. 27 FDMB with covered control mechanism

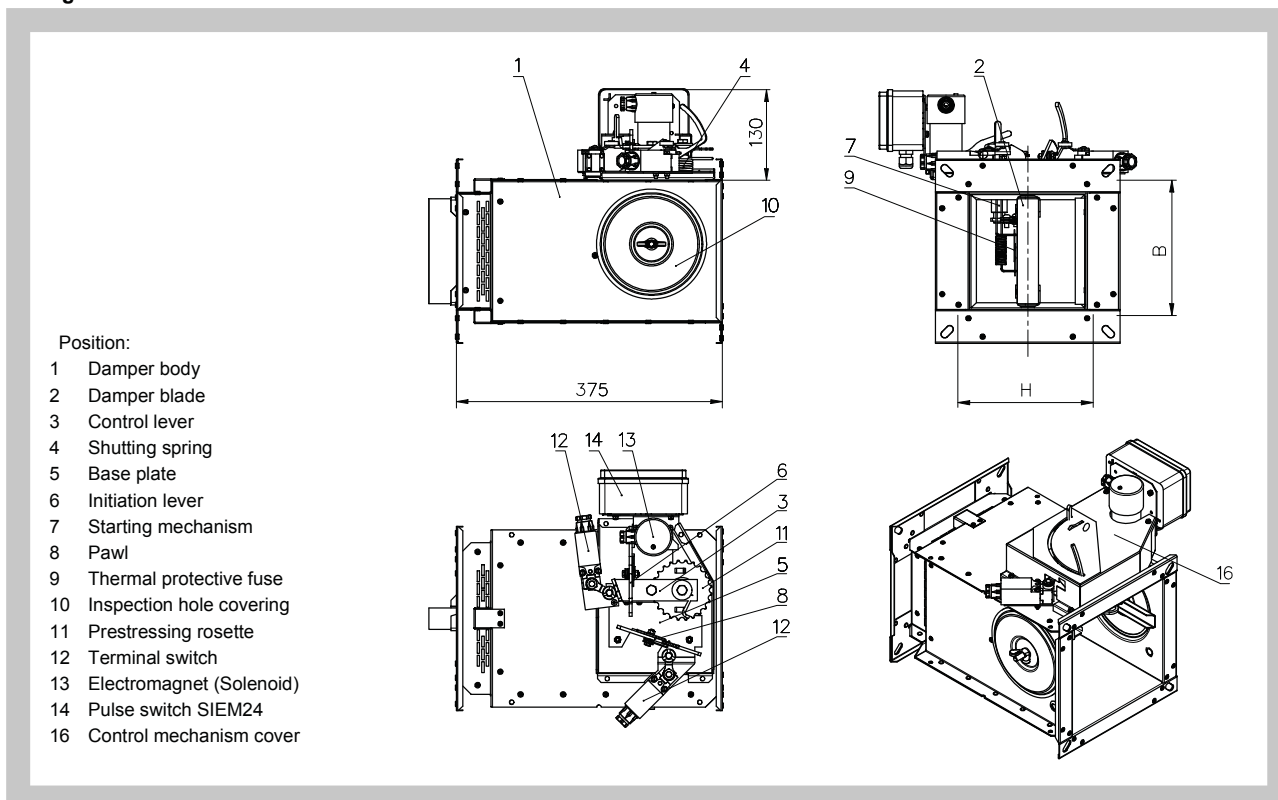
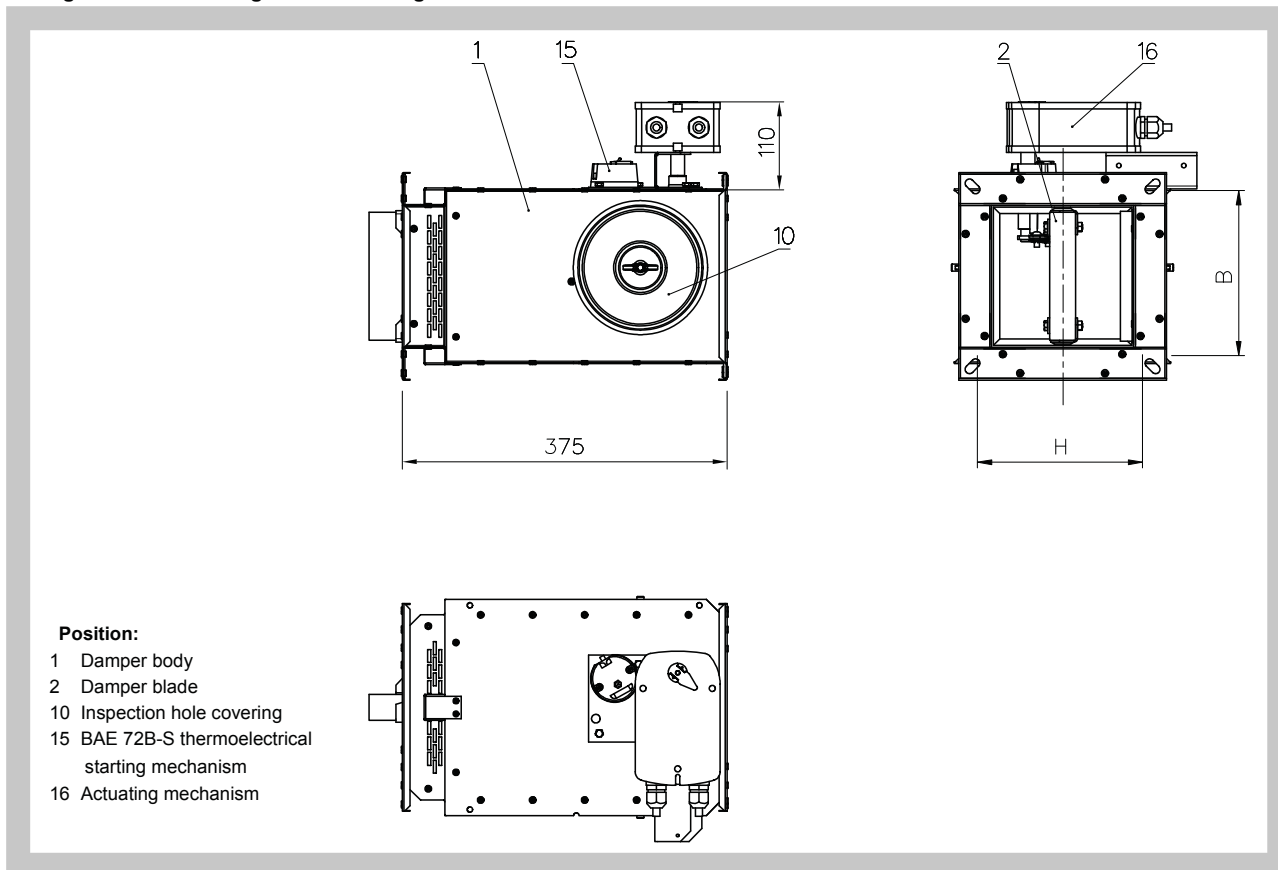


Fig. 28 FDMB - design with actuating mechanism



4.2. Round dampers

Fig. 29 FDMB - design manual and thermal

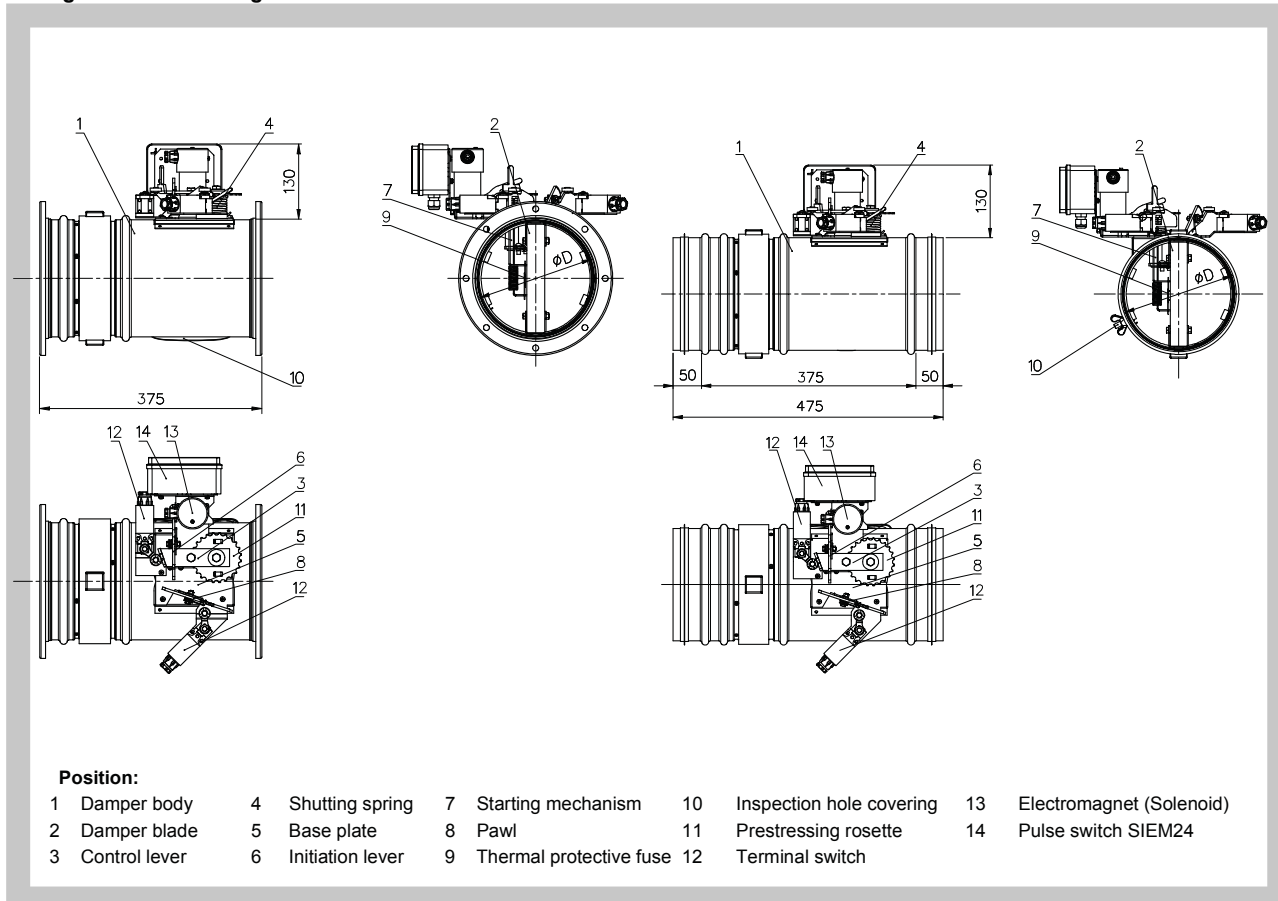
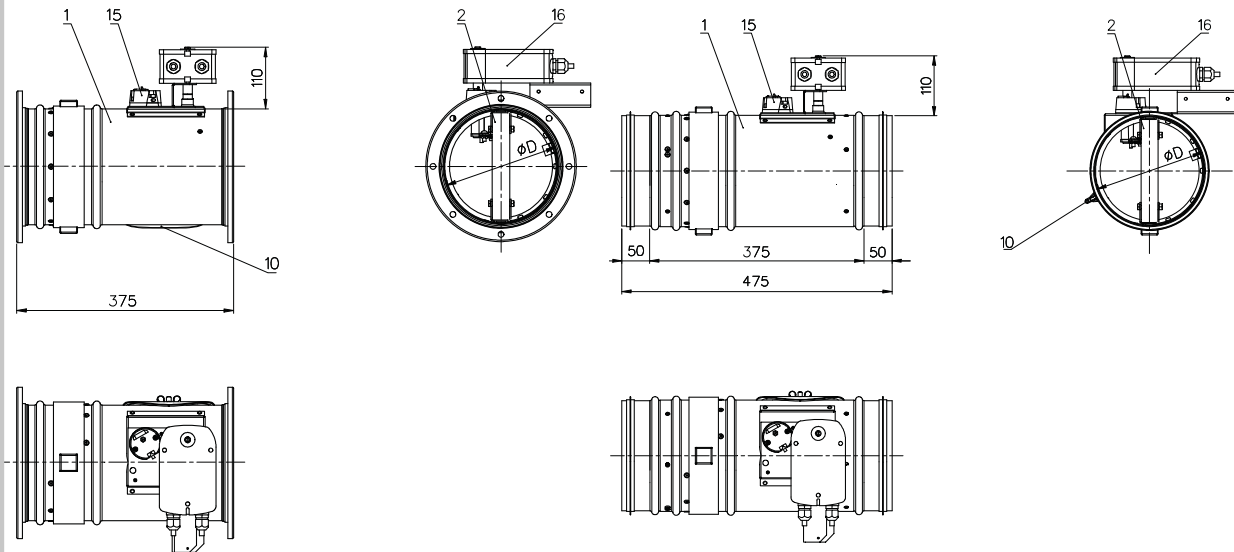


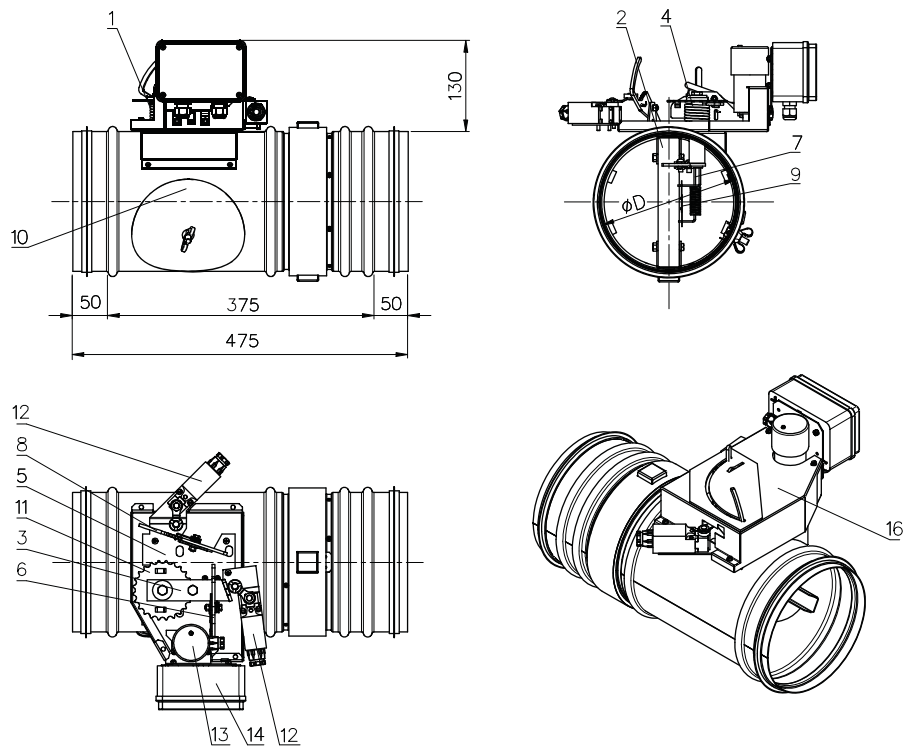
Fig. 30 FDMB - design with actuating mechanism



Position:

- 1 Damper body
- 2 Damper blade
- 10 Inspection hole covering
- 15 BAE 72B-S thermoelectrical starting mechanism
- 16 Actuating mechanism

Fig. 31 FDMB with covered control mechanism

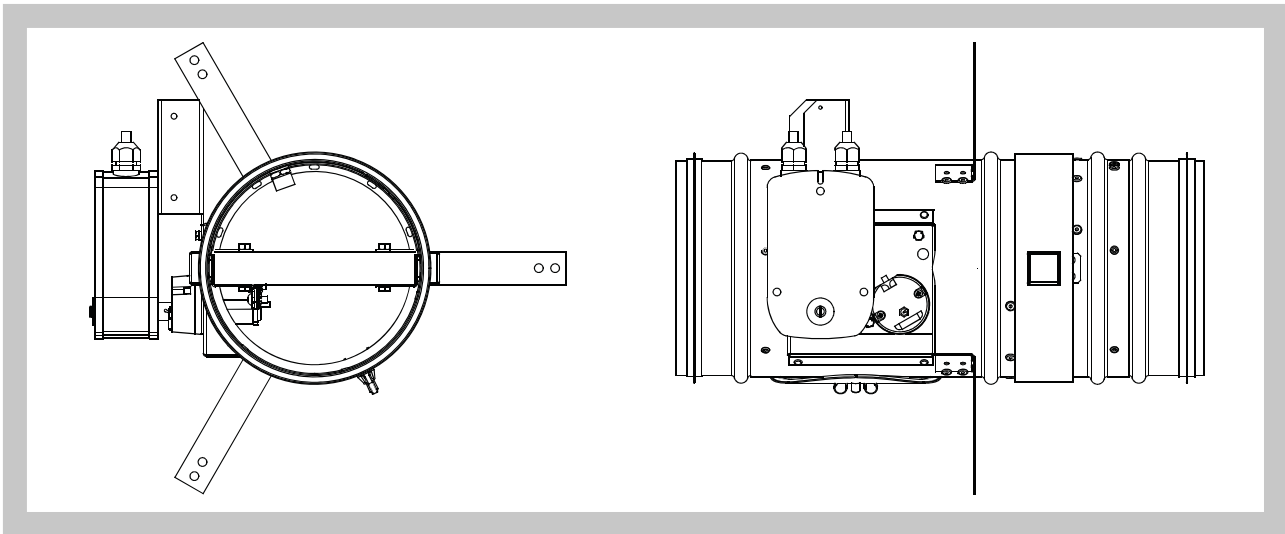


Position:

- 1 Damper body
- 2 Damper blade
- 3 Control lever
- 4 Shutting spring
- 5 Base plate
- 6 Initiation lever
- 7 Starting mechanism
- 8 Pawl
- 9 Thermal protective fuse
- 10 Inspection hole covering
- 11 Rosette
- 12 Limit switch
- 13 Elektromagnet (solenoid)
- 14 Pulse swith SIEM24
- 16 Control mechanism cover

4.3. Optional is possible use installation holders

Fig. 32 Fire damper FDMB - with installation holders



4.4. Square dampers - dimensions, weights and effective area

Tab. 4.4.1. Square dampers - dimensions, weights and effective area

A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type	A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type
			Design							Design			
			Manual	Actuat. mech.						Manual	Actuat. mech.		
160 x 160	-	20	5,5	7	0,0113	BLF	180 x 450	-	165	10	13	0,0465	BLF
160 x 180	-	30,0	9	10,5	0,0137	BLF	180 x 500	-	190	10,5	13,5	0,0529	BLF
160 x 200	-	40	6	7,5	0,0161	BLF	180 x 550	-	215	11	14	0,0593	BLF
160 x 225	-	52,5	6,5	8	0,0191	BLF	180 x 560	-	220	11	14	0,0605	BLF
160 x 250	-	65	7	8,5	0,0222	BLF	180 x 600	-	240	11,5	14,5	0,0657	BLF
160 x 280	-	80,0	7	8,5	0,0258	BLF	180 x 630	-	255	12	15	0,0695	BLF
160 x 300	-	90	7,5	9	0,0282	BLF	180 x 650	-	265	12	15	0,0721	BLF
160 x 315	-	97,5	7,5	9	0,0300	BLF	180 x 700	-	290	13	16	0,0785	BLF
160 x 355	-	117,5	8,5	10	0,0349	BLF	180 x 710	-	295	13	16	0,0797	BLF
160 x 400	-	140	9	10,5	0,0403	BLF	180 x 750	15	315	13,5	16,5	0,0849	BLF
160 x 450	-	165	3,0	6	0,0392	BLF	180 x 800	40	340	14	17	0,0913	BLF
160 x 500	-	190	10	13	0,0446	BLF	180 x 900	90	390	15	18	0,1041	BLF
160 x 550	-	215	10,5	13,5	0,0500	BLF	180 x 1000	140	440	20,5	23,5	0,1169	BF
160 x 560	-	220	10,5	13,5	0,0511	BLF	200 x 160	-	20	6	7,5	0,0149	BLF
160 x 600	-	240	11	14	0,0554	BLF	200 x 180	-	30	6,5	8	0,0181	BLF
160 x 630	-	255	11,5	14,5	0,0586	BLF	200 x 200	-	40	6,5	8	0,0213	BLF
160 x 650	-	265	11,5	14,5	0,0608	BLF	200 x 225	-	52,5	7	8,5	0,0253	BLF
160 x 700	-	290	12,5	15,5	0,0662	BLF	200 x 250	-	65	7,5	9	0,0294	BLF
160 x 710	-	295	12,5	15,5	0,0673	BLF	200 x 280	-	80	7,5	9	0,0342	BLF
160 x 750	15	315	13	16	0,0716	BLF	200 x 300	-	90	8	9,5	0,0374	BLF
160 x 800	40	340	13,5	16,5	0,0770	BLF	200 x 315	-	97,5	8	9,5	0,0398	BLF
160 x 900	90	390	14,5	17,5	0,0878	BLF	200 x 355	-	117,5	9	10,5	0,0463	BLF
160 x 1000	140	440	20	23	0,0986	BLF	200 x 400	-	140	9,5	11	0,0535	BLF
180 x 160	-	20	6	7,5	0,0131	BLF	200 x 450	-	165	10	13	0,0537	BLF
180 x 180	-	30	6	7,5	0,0159	BLF	200 x 500	-	190	10,5	13,5	0,0611	BLF
180 x 200	-	40	6,5	8	0,0187	BLF	200 x 550	-	215	11,5	14,5	0,0685	BLF
180 x 225	-	52,5	6,5	8	0,0222	BLF	200 x 560	-	220	11,5	14,5	0,0700	BLF
180 x 250	-	65	7	8,5	0,0258	BLF	200 x 600	-	240	12	15	0,0759	BLF
180 x 280	-	80	7,5	9	0,0300	BLF	200 x 630	-	255	12,5	15,5	0,0804	BLF
180 x 300	-	90	7,5	9	0,0328	BLF	200 x 650	-	265	12,5	15,5	0,0833	BLF
180 x 315	-	97,5	8	9,5	0,0349	BLF	200 x 700	-	290	13	16	0,0907	BLF
180 x 355	-	117,5	8,5	10,5	0,0406	BLF	200 x 710	-	295	13,5	16,5	0,0922	BLF
180 x 400	-	140	9	11	0,0469	BLF	200 x 750	15	315	14	17	0,0981	BLF

A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type	A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type
			Design							Design			
			Manual	Actuat. mech.						Manual	Actuat. mech.		
200 x 800	40	340	14,5	17,5	0,1055	BLF	280 x 315	-	97,5	9	11	0,0594	BLF
200 x 900	90	390	15,5	18,5	0,1203	BLF	280 x 355	-	117,5	10	12	0,0691	BLF
200 x 1000	140	440	17	20	0,1351	BF	280 x 400	-	140	11	12,5	0,0799	BLF
225 x 160	-	20	6,5	8	0,0171	BLF	280 x 450	-	165	11,5	14,5	0,0828	BLF
225 x 180	-	30	7	8,5	0,0209	BLF	280 x 500	-	190	12	15	0,0942	BLF
225 x 200	-	40	7,5	9	0,0246	BLF	280 x 550	-	215	13	16	0,1056	BLF
225 x 225	-	52,5	8	9,5	0,0292	BLF	280 x 560	-	220	13	16	0,1078	BLF
225 x 250	-	65	8,5	10	0,0339	BLF	280 x 600	-	240	13,5	16,5	0,1170	BLF
225 x 280	-	80	9	10,5	0,0395	BLF	280 x 630	-	255	14	17	0,1238	BLF
225 x 300	-	90	9,5	11	0,0432	BLF	280 x 650	-	265	14,5	17,5	0,1284	BLF
225 x 315	-	97,5	9,5	11	0,0460	BLF	280 x 700	-	290	15	18	0,1398	BLF
225 x 355	-	117,5	10	11,5	0,0534	BLF	280 x 710	-	295	15	18	0,1420	BLF
225 x 400	-	140	10,5	12	0,0618	BLF	280 x 750	15	315	15,5	18,5	0,1512	BLF
225 x 450	-	165	11,5	13	0,0628	BLF	280 x 800	40	340	16,5	19,5	0,1626	BF
225 x 500	-	190	12,5	14	0,0714	BLF	280 x 900	90	390	18	21	0,1854	BF
225 x 550	-	215	13,5	15	0,0801	BLF	280 x 1000	140	440	23,5	26,5	0,2082	BF
225 x 560	-	220	13,5	15	0,0818	BLF	300 x 160	-	20	7	8,5	0,0239	BLF
225 x 600	-	240	14	15,5	0,0887	BLF	300 x 180	-	30	7,5	9	0,0291	BLF
225 x 630	-	255	14,5	16	0,0939	BLF	300 x 200	-	40	7,5	9,5	0,0343	BLF
225 x 650	-	265	15	16,5	0,0974	BLF	300 x 225	-	52,5	8	9,5	0,0408	BLF
225 x 700	-	290	16	17,5	0,1060	BLF	300 x 250	-	65	8,5	10	0,0474	BLF
225 x 710	-	295	16	17,5	0,1078	BLF	300 x 280	-	80	9	10,5	0,0552	BLF
225 x 750	15	315	16,5	18	0,1147	BLF	300 x 300	-	90	9,5	11	0,0604	BLF
225 x 800	40	340	17,5	19	0,1233	BLF	300 x 315	-	97,5	9,5	11	0,0643	BLF
225 x 900	90	390	19	22	0,1406	BF	300 x 355	-	117,5	10,5	12	0,0748	BLF
225 x 1000	140	440	20,5	23,5	0,1579	BF	300 x 400	-	140	11	12,5	0,0865	BLF
250 x 160	-	20	6,5	8	0,0194	BLF	300 x 450	-	165	12	15	0,0900	BLF
250 x 180	-	30	7	8,5	0,0236	BLF	300 x 500	-	190	12,5	15,5	0,1024	BLF
250 x 200	-	40	7	8,5	0,0278	BLF	300 x 550	-	215	13,5	16,5	0,1148	BLF
250 x 225	-	52,5	7,5	9	0,0331	BLF	300 x 560	-	220	13,5	16,5	0,1173	BLF
250 x 250	-	65	8	9,5	0,0384	BLF	300 x 600	-	240	14	17	0,1272	BLF
250 x 280	-	80	8,5	10	0,0447	BLF	300 x 630	-	255	14,5	17,5	0,1347	BLF
250 x 300	-	90	8,5	10	0,0489	BLF	300 x 650	-	265	14,5	17,5	0,1396	BLF
250 x 315	-	97,5	9	10,5	0,0521	BLF	300 x 700	-	290	15,5	18,5	0,1520	BLF
250 x 355	-	117,5	9,5	11,5	0,0605	BLF	300 x 710	-	295	15,5	18,5	0,1545	BLF
250 x 400	-	140	10,5	12	0,0700	BLF	300 x 750	15	315	16	19	0,1644	BLF
250 x 450	-	165	11	14	0,0719	BLF	300 x 800	40	340	17	20	0,1768	BF
250 x 500	-	190	11,5	14,5	0,0818	BLF	300 x 900	90	390	18,5	21,5	0,2016	BF
250 x 550	-	215	12,5	15,5	0,0917	BLF	300 x 1000	140	440	20	23	0,2264	BF
250 x 560	-	220	12,5	15,5	0,0937	BLF	315 x 160	-	20	8,5	10,5	0,0252	BLF
250 x 600	-	240	13	16	0,1016	BLF	315 x 180	-	30	9	10,5	0,0308	BLF
250 x 630	-	255	13,5	16,5	0,1075	BLF	315 x 200	-	40	9,5	11	0,0363	BLF
250 x 650	-	265	13,5	16,5	0,1115	BLF	315 x 225	-	52,5	9,5	11,5	0,0432	BLF
250 x 700	-	290	14,5	17,5	0,1214	BLF	315 x 250	-	65	10	12	0,0501	BLF
250 x 710	-	295	14,5	17,5	0,1234	BLF	315 x 280	-	80	10,5	12	0,0584	BLF
250 x 750	15	315	15	18	0,1313	BLF	315 x 300	-	90	11,5	13	0,0639	BLF
250 x 800	40	340	15,5	18,5	0,1412	BLF	315 x 315	-	97,5	11	12,5	0,0680	BLF
250 x 900	90	390	17	20	0,1610	BF	315 x 355	-	117,5	12	13,5	0,0791	BLF
250 x 1000	140	440	18,5	21,5	0,1808	BF	315 x 400	-	140	13	14,5	0,0915	BLF
280 x 160	-	20	7	8,5	0,0221	BLF	315 x 450	-	165	13,5	16,5	0,0955	BLF
280 x 180	-	30	7	9	0,0269	BLF	315 x 500	-	190	14,5	17,5	0,1086	BLF
280 x 200	-	40	7,5	9	0,0317	BLF	315 x 550	-	215	15	18	0,1218	BLF
280 x 225	-	52,5	8	9,5	0,0377	BLF	315 x 560	-	220	15	18	0,1244	BLF
280 x 250	-	65	8,5	10	0,0438	BLF	315 x 600	-	240	15,5	18,5	0,1349	BLF
280 x 280	-	80	8,5	10,5	0,0510	BLF	315 x 630	-	255	16	19	0,1428	BLF
280 x 300	-	90	9	10,5	0,0558	BLF	315 x 650	-	265	16,5	19,5	0,1481	BLF

A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type	A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type
			Design							Design			
			Manual	Actuat. mech.						Manual	Actuat. mech.		
315 x 700	-	290	17,5	20,5	0,1612	BLF	450 x 250	-	65	10,5	12	0,0744	BLF
315 x 710	-	295	17,5	20,5	0,1638	BLF	450 x 280	-	80	11	12,5	0,0867	BLF
315 x 750	15	315	18	21	0,1744	BF	450 x 300	-	90	11,5	13	0,0949	BLF
315 x 800	40	340	18,5	21,5	0,1875	BF	450 x 315	-	97,5	11,5	13,5	0,1011	BLF
315 x 900	90	390	20	23	0,2138	BF	450 x 355	-	117,5	13	14,5	0,1175	BLF
315 x 1000	140	440	21,5	24,5	0,2401	BF	450 x 400	-	140	13,5	15	0,1360	BLF
355 x 160	-	20	7,5	9,5	0,0288	BLF	450 x 450	-	165	14,5	17,5	0,1445	BLF
355 x 180	-	30	8	9,5	0,0352	BLF	450 x 500	-	190	15,5	18,5	0,1644	BLF
355 x 200	-	40	8,5	10	0,0415	BLF	450 x 550	-	215	16,5	19,5	0,1843	BLF
355 x 225	-	52,5	9	10,5	0,0494	BLF	450 x 560	-	220	16,5	19,5	0,1883	BLF
355 x 250	-	65	9,5	11	0,0573	BLF	450 x 600	-	240	17	20	0,2042	BLF
355 x 280	-	80	10	11,5	0,0668	BLF	450 x 630	-	255	17,5	20,5	0,2161	BLF
355 x 300	-	90	10	11,5	0,0731	BLF	450 x 650	-	265	18	21	0,2241	BLF
355 x 315	-	97,5	9	10,5	0,0778	BLF	450 x 700	-	290	19	22	0,2440	BF
355 x 355	-	117,5	11,5	13	0,0905	BLF	450 x 710	-	295	19	22	0,2480	BF
355 x 400	-	140	12	13,5	0,1047	BLF	450 x 750	15	315	20	23	0,2639	BF
355 x 450	-	165	13	16	0,1100	BLF	450 x 800	40	340	20,5	23,5	0,2838	BF
355 x 500	-	190	13,5	16,5	0,1251	BLF	450 x 900	90	390	22,5	25,5	0,3236	BF
355 x 550	-	215	14,5	17,5	0,1403	BLF	450 x 1000	140	440	24	27	0,3634	BF
355 x 560	-	220	14,5	17,5	0,1433	BLF	500 x 160	-	20	9,5	11	0,0419	BLF
355 x 600	-	240	15	18	0,1554	BLF	500 x 180	-	30	9,5	11,5	0,0511	BLF
355 x 630	-	255	15,5	18,5	0,1645	BLF	500 x 200	-	40	10	11,5	0,0603	BLF
355 x 650	-	265	16	19	0,1706	BLF	500 x 225	-	52,5	10,5	12,5	0,0718	BLF
355 x 700	-	290	17	20	0,1857	BLF	500 x 250	-	65	11	13	0,0834	BLF
355 x 710	-	295	17	20	0,1888	BF	500 x 280	-	80	11,5	13,5	0,0972	BLF
355 x 750	15	315	17,5	20,5	0,2009	BF	500 x 300	-	90	12	13,5	0,1064	BLF
355 x 800	40	340	18,5	21,5	0,2160	BF	500 x 315	-	97,5	12,5	14	0,1133	BLF
355 x 900	90	390	20	23	0,2463	BF	500 x 355	-	117,5	13,5	15	0,1318	BLF
355 x 1000	140	440	21,5	24,5	0,2766	BF	500 x 400	-	140	14,5	16	0,1525	BLF
400 x 160	-	20	8	10	0,0329	BLF	500 x 450	-	165	15,5	18,5	0,1626	BLF
400 x 180	-	30	8,5	10	0,0401	BLF	500 x 500	-	190	16,5	19,5	0,1850	BLF
400 x 200	-	40	9	10,5	0,0473	BLF	500 x 550	-	215	17	20	0,2074	BLF
400 x 225	-	52,5	9,5	11	0,0563	BLF	500 x 560	-	220	17,5	20,5	0,2119	BLF
400 x 250	-	65	10	11,5	0,0654	BLF	500 x 600	-	240	18	21	0,2298	BLF
400 x 280	-	80	10,5	12	0,0762	BLF	500 x 630	-	255	19	22	0,2433	BF
400 x 300	-	90	10,5	12,5	0,0834	BLF	500 x 650	-	265	19	22	0,2522	BF
400 x 315	-	97,5	11	12,5	0,0888	BLF	500 x 700	-	290	20	23	0,2746	BF
400 x 355	-	117,5	12	13,5	0,1033	BLF	500 x 710	-	295	20,5	23,5	0,2791	BF
400 x 400	-	140	13	14,5	0,1195	BLF	500 x 750	15	315	21	24	0,2970	BF
400 x 450	-	165	13,5	16,5	0,1263	BLF	500 x 800	40	340	22	25	0,3194	BF
400 x 500	-	190	14,5	17,5	0,1437	BLF	500 x 900	90	390,0	24	27	0,3642	BF
400 x 550	-	215	15,5	18,5	0,1611	BLF	500 x 1000	140	440	25,5	28,5	0,4090	BF
400 x 560	-	220	15,5	18,5	0,1646	BLF	550 x 160	-	20	10	13	0,0364	BLF
400 x 600	-	240	16	19	0,1785	BLF	550 x 180	-	30	10,5	13,5	0,0463	BLF
400 x 630	-	255	16,5	19,5	0,1890	BLF	550 x 200	-	40	10,5	13,5	0,0563	BLF
400 x 650	-	265	17	20	0,1959	BLF	550 x 225	-	52,5	11	14	0,0687	BLF
400 x 700	-	290	18	21	0,2133	BF	550 x 250	-	65	12	15	0,0812	BLF
400 x 710	-	295	18	21	0,2168	BF	550 x 280	-	80	12,5	15,5	0,0961	BLF
400 x 750	15	315	18,5	21,5	0,2307	BF	550 x 300	-	90	13	16	0,1061	BLF
400 x 800	40	340	19,5	22,5	0,2481	BF	550 x 315	-	97,5	13	16	0,1135	BLF
400 x 900	90	390	21	24	0,2829	BF	550 x 355	-	117,5	14,5	17,5	0,1335	BLF
400 x 1000	140	440	23	26	0,3177	BF	550 x 400	-	140	15	18	0,1559	BLF
450 x 160	-	20	9	10,5	0,0374	BLF	550 x 450	-	165	16	19	0,1808	BLF
450 x 180	-	30	9	10,5	0,0456	BLF	550 x 500	-	190	17	20	0,2057	BLF
450 x 200	-	40	9,5	11	0,0538	BLF	550 x 550	-	215	18	21	0,2306	BLF
450 x 225	-	52,5	10	11,5	0,0641	BLF	550 x 560	-	220	18,5	21,5	0,2356	BLF

A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type	A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type
			Design							Design			
			Manual	Actuat. mech.						Manual	Actuat. mech.		
550 x 600	-	240	19	22	0,2555	BF	630 x 300	-	90	14	17	0,1231	BLF
550 x 630	-	255	20,0	23	0,2704	BF	630 x 315	-	97,5	14	17	0,1318	BLF
550 x 650	-	265	20	23	0,2804	BF	630 x 355	-	117,5	15,5	18,5	0,1549	BLF
550 x 700	-	290	21,5	24,5	0,3053	BF	630 x 400	-	140	16,5	19,5	0,1809	BLF
550 x 710	-	295	21,5	24,5	0,3103	BF	630 x 450	-	165	17,5	20,5	0,2098	BLF
550 x 750	15	315	22	25	0,3302	BF	630 x 500	-	190	18,5	21,5	0,2387	BLF
550 x 800	40	340	23	26	0,3551	BF	630 x 550	-	215	20	23	0,2676	BLF
550 x 900	90	390	25	28	0,4049	BF	630 x 560	-	220	20	23	0,2734	BF
560 x 160	-	20	10	13	0,0371	BLF	630 x 600	-	240	21	24	0,2965	BF
560 x 180	-	30	10,5	13,5	0,0472	BLF	630 x 630	-	255	21,5	24,5	0,3139	BF
560 x 200	-	40	11	14	0,0574	BLF	630 x 650	-	265	22	25	0,3254	BF
560 x 225	-	52,5	11,5	14,5	0,0701	BLF	630 x 700	-	290	23,5	26,5	0,3543	BF
560 x 250	-	65	12	15	0,0828	BLF	630 x 710	-	295	23,5	26,5	0,3601	BF
560 x 280	-	80	12,5	15,5	0,0980	BLF	630 x 750	15	315	24	27	0,3832	BF
560 x 300	-	90	13	16,0	0,1082	BLF	650 x 160	-	20	11	14	0,0437	BLF
560 x 315	-	97,5	13	16	0,1158	BLF	650 x 180	-	30	11,5	14,5	0,0556	BLF
560 x 355	-	117,5	14,5	17,5	0,1361	BLF	650 x 200	-	40	12	15	0,0676	BLF
560 x 400	-	140	15,5	18,5	0,1590	BLF	650 x 225	-	52,5	12,5	15,5	0,0825	BLF
560 x 450	-	165	16,5	19,5	0,1844	BLF	650 x 250	-	65	13	16	0,0975	BLF
560 x 500	-	190	17,5	20,5	0,2098	BLF	650 x 280	-	80	14	17	0,1154	BLF
560 x 550	-	215	18,5	21,5	0,2352	BLF	650 x 300	-	90	14	17	0,1274	BLF
560 x 560	-	220	18,5	21,5	0,2403	BLF	650 x 315	-	97,5	14,5	17,5	0,1363	BLF
560 x 600	-	240	19,5	22,5	0,2606	BF	650 x 355	-	117,5	16	19	0,1603	BLF
560 x 630	-	255	20	23	0,2758	BF	650 x 400	-	140	17	20	0,1872	BLF
560 x 650	-	265	20,5	23,5	0,2860	BF	650 x 450	-	165	18	21	0,2171	BLF
560 x 700	-	290	21,5	24,5	0,3114	BF	650 x 500	-	190	19	22	0,2470	BLF
560 x 710	-	295	21,5	24,5	0,3165	BF	650 x 550	-	215	20	23	0,2769	BLF
560 x 750	15	315	22,5	25,5	0,3368	BF	650 x 560	-	220	20,5	23,5	0,2829	BF
560 x 800	40	340	23,5	26,5	0,3622	BF	650 x 600	-	240	21,5	24,5	0,3068	BF
600 x 160	-	20	10,5	13,5	0,0400	BLF	650 x 630	-	255	22	25	0,3247	BF
600 x 180	-	30	11	14	0,0510	BLF	650 x 650	-	265	22,5	25,5	0,3367	BF
600 x 200	-	40	11	14	0,0619	BLF	650 x 700	-	290	23,5	26,5	0,3666	BF
600 x 225	-	52,5	12	15	0,0756	BLF	650 x 710	-	295	24	27	0,3726	BF
600 x 250	-	65	12,5	15,5	0,0893	BLF	650 x 750	15	315	24,5	27,5	0,3965	BF
600 x 280	-	80	13	16	0,1058	BLF	700 x 160	-	20	11,5	14,5	0,0473	BLF
600 x 300	-	90	13,5	16,5	0,1167	BLF	700 x 180	-	30	12	15	0,0603	BLF
600 x 315	-	97,5	14	17	0,1249	BLF	700 x 200	-	40	12,5	15,5	0,0732	BLF
600 x 355	-	117,5	15	18	0,1469	BLF	700 x 225	-	52,5	13	16	0,0894	BLF
600 x 400	-	140	16	19	0,1715	BLF	700 x 250	-	65	13,5	16,5	0,1056	BLF
600 x 450	-	165,0	17	20	0,1989	BLF	700 x 280	-	80	14,5	17,5	0,1251	BLF
600 x 500	-	190	18	21	0,2263	BLF	700 x 300	-	90	15	18	0,1380	BLF
600 x 550	-	215	19	22	0,2537	BLF	700 x 315	-	97,5	15,5	18,5	0,1477	BLF
600 x 560	-	220	19,5	22,5	0,2592	BF	700 x 355	-	117,5	16,5	19,5	0,1737	BLF
600 x 600	-	240	20,5	23,5	0,2811	BF	700 x 400	-	140	17,5	20,5	0,2028	BLF
600 x 630	-	255	21	24	0,2976	BF	700 x 450	-	165	19	22	0,2352	BLF
600 x 650	-	265	21,5	24,5	0,3085	BF	700 x 500	-	190	20,5	23,5	0,2676	BLF
600 x 700	-	290	22,5	25,5	0,3359	BF	700 x 550	-	215	22	26,5	0,3000	BF
600 x 710	-	295	22,5	25,5	0,3414	BF	700 x 560	-	220	22,5	27	0,3065	BF
600 x 750	15	315	23,5	26,5	0,3633	BF	700 x 600	-	240	23,5	28	0,3324	BF
600 x 800	40	340	24,5	27,5	0,3907	BF	700 x 630	-	255	24,5	29	0,3519	BF
630 x 160	-	20	10,5	13,5	0,0422	BLF	700 x 650	-	265	25	29,5	0,3648	BF
630 x 180	-	30	11	14	0,0538	BLF	700 x 700	-	290	26,5	31	0,3972	BF
630 x 200	-	40	11,5	14,5	0,0653	BLF	700 x 710	-	295	27	31,5	0,4037	BF
630 x 225	-	52,5	12	15	0,0798	BLF	710 x 160	-	20	11,5	15,5	0,0480	BLF
630 x 250	-	65	13	16	0,0942	BLF	710 x 180	-	30	12	16	0,0612	BLF
630 x 280	-	80	13,5	16,5	0,1116	BLF	710 x 200	-	40	12,5	15,5	0,0744	BLF

A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type	A x B	a	c	Weight		Effective area S _{ef} [m ²]	Actuat. mech. type
			Design							Design			
			Manual	Actuat. mech.						Manual	Actuat. mech.		
710 x 225	-	52,5	13	16	0,0908	BLF	800 x 250	-	65	15	18	0,1219	BLF
710 x 250	-	65	14	17	0,1073	BLF	800 x 280	-	80	16	19	0,1444	BLF
710 x 280	-	80	14,5	17,5	0,1270	BLF	800 x 300	-	90	16,5	19,5	0,1593	BLF
710 x 300	-	90	15	18	0,1402	BLF	800 x 315	-	97,5	16,5	19,5	0,1705	BLF
710 x 315	-	97,5	15,5	18,5	0,1500	BLF	800 x 355	-	117,5	18	21	0,2005	BLF
710 x 355	-	117,5	17	20	0,1763	BLF	800 x 400	-	140	19,5	22,5	0,2341	BLF
710 x 400	-	140	18	21,0	0,2060	BLF	800 x 450	-	165	20,5	23,5	0,2715	BLF
710 x 450	-	165	19	22	0,2389	BLF	800 x 500	-	190	22	25	0,3089	BLF
710 x 500	-	190	20	23	0,2718	BLF	800 x 550	-	215	23	26	0,3463	BF
710 x 550	-	215	21,5	24,5	0,3047	BF	800 x 560	-	220	23,5	26,5	0,3538	BF
710 x 560	-	220	21,5	24,5	0,3112	BF	800 x 600	-	240	24,5	27,5	0,3837	BF
710 x 600	-	240	22,5	25,5	0,3376	BF	900 x 160	-	20	13,5	16,5	0,0619	BLF
710 x 630	-	255	23,5	26,5	0,3573	BF	900 x 180	-	30	14	17	0,0789	BLF
710 x 650	-	265	23,5	26,5	0,3705	BF	900 x 200	-	40	15	18	0,0958	BLF
710 x 700	-	290	25	28	0,4034	BF	900 x 225	-	52,5	15,5	18,5	0,1170	BLF
750 x 160	-	20	12	15	0,0510	BLF	900 x 250	-	65	16,5	19,5	0,1382	BLF
750 x 180	-	30	12,5	15,5	0,0649	BLF	900 x 280	-	80	17	20	0,1637	BLF
750 x 200	-	40	13	16	0,0789	BLF	900 x 300	-	90	17,5	20,5	0,1806	BLF
750 x 225	-	52,5	13,5	16,5	0,0963	BLF	900 x 315	-	97,5	18	21	0,1933	BLF
750 x 250	-	65	14,5	17,5	0,1138	BLF	900 x 355	-	117,5	19,5	22,5	0,2273	BLF
750 x 280	-	80	15	18	0,1347	BLF	900 x 400	-	140	21	24	0,2654	BLF
750 x 300	-	90	15,5	18,5	0,1487	BLF	900 x 450	-	165	22,5	25,5	0,3078	BLF
750 x 315	-	97,5	16	19	0,1591	BLF	900 x 500	-	190	23,5	26,5	0,3502	BF
750 x 355	-	117,5	17,5	20,5	0,1871	BLF	900 x 550	-	215	25	28	0,3926	BF
750 x 400	-	140	18,5	21,5	0,2185	BLF	1000 x 160	-	20	15	18	0,0692	BLF
750 x 450	-	165	19,5	22,5	0,2534	BLF	1000 x 180	-	30	15,5	18,5	0,0882	BLF
750 x 500	-	190	21	24	0,2883	BLF	1000 x 200	-	40	16	19	0,1071	BLF
750 x 550	-	215	22	25	0,3232	BF	1000 x 225	-	52,5	17	20	0,1308	BLF
750 x 560	-	220	22,5	25,5	0,3302	BF	1000 x 250	-	65	17,5	20,5	0,1545	BLF
750 x 600	-	240	23,5	26,5	0,3581	BF	1000 x 280	-	80	18,5	21,5	0,183	BLF
750 x 630	-	255	24	27	0,3790	BF	1000 x 300	-	90	19	22	0,2019	BLF
750 x 650	-	265	24,5	27,5	0,3930	BF	1000 x 315	-	97,5	19,5	22,5	0,2161	BLF
800 x 160	-	20	12,5	15,5	0,0546	BLF	1000 x 355	-	117,5	21	24	0,2	BLF
800 x 180	-	30	13	16	0,0696	BLF	1000 x 400	-	140	22,5	25,5	0,2967	BLF
800 x 200	-	40	13,5	16,5	0,0845	BLF	1000 x 450	-	165	24	27	0,3441	BF
800 x 225	-	52,5	14,5	17,5	0,1032	BLF	1000 x 500	-	190	25,5	28,5	0,3915	BF

4.5. Round dampers - weight and dimensions

Tab. 4.5.1. Round dampers - weight and dimension

Nominal size $\varnothing D$	a	c	f	Weight		Effective area S _{ef} [m ²]	Actuating mechanism type
				design			
				manual	Act.mechan.		
160	-	-	-	5,6	7,2	0,0132	BLF
180	-	-	-	6,7	8,3	0,0176	BLF
200	-	-	-	7,7	9,3	0,0227	BLF
225	-	12,5	-	8,2	9,8	0,0299	BLF
250	-	25	-	8,7	10,3	0,0380	BLF
280	-	40	-	9,6	11,2	0,0492	BLF
315	-	57,5	7,5	10,6	12,2	0,0639	BLF
355	-	77,5	27,5	12,6	14,2	0,0831	BLF
400	-	100	50	14,5	17,5	0,1078	BLF
450	-	125	75	16,4	19,4	0,1389	BLF
500	-	150	100	19,4	22,4	0,1739	BLF
560	-	180	130	22,3	25,3	0,2211	BF
630	24	215	165	26,2	29,2	0,2833	BF

4.6. Blades overlaps

- a) For square fire damper (Fig. 33a) the open damper blade overlaps the damper body from dimension $B \geq 750$ mm by the value "c" or "a" and "c"
These values are specified in the Tab. 4.4.1.
- b) For round fire damper (Fig. 33b) the open damper blade overlaps the damper body from dimension $\varnothing 225$ mm by the value "c" or "a" and "c"
These values are specified in the Tab. 4.5.1.
- c) For round fire damper (Fig. 33c) for SPIRO ducts the open damper blade overlaps the damper body from dimension $\varnothing 355$ mm by the value "f" or "e" and "f"
These values are specified in the Tab. 4.5.1

Values "a" and "c" or "e" and "f" has to be respected when projecting related air-conditioning ducts.

Fig. 33a Overlaps of square dampers

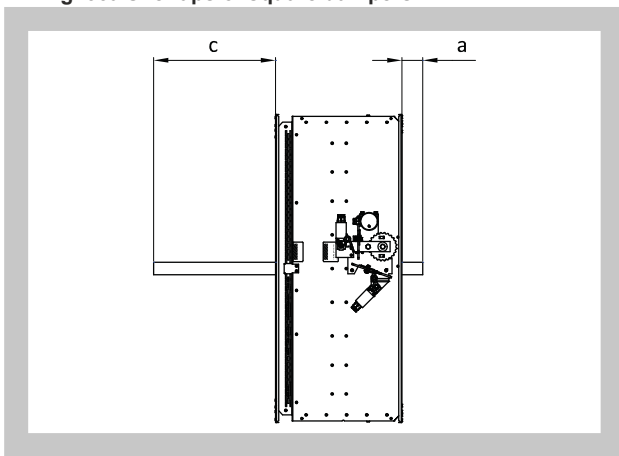


Fig. 33b Overlaps of round dampers

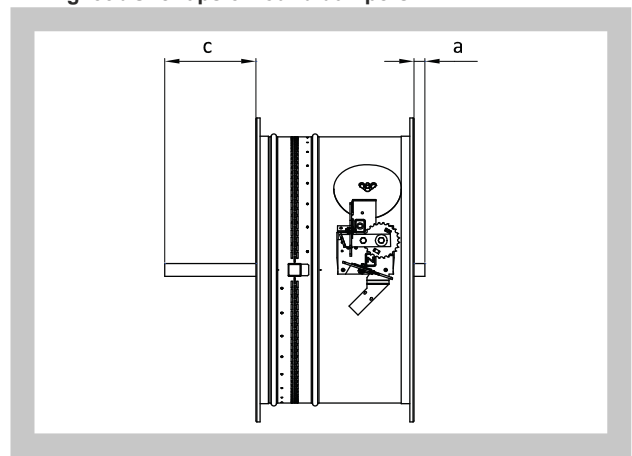
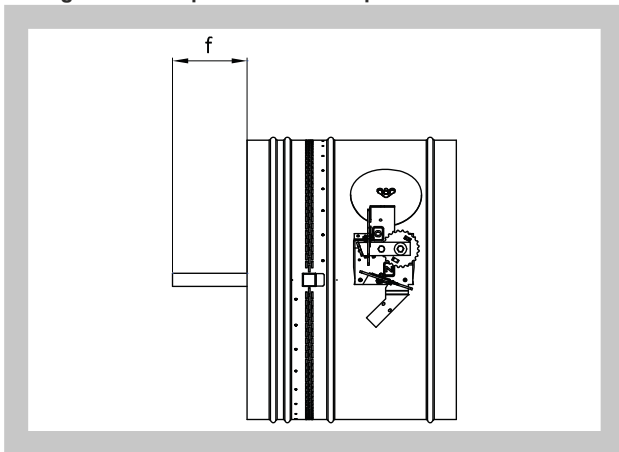


Fig. 33c Overlaps of SPIRO dampers



- 4.7. For the design .60 (with BKN supply and communication device) add to weight of the damper with an actuating mechanism (from the Tab. 4.3.1. and 4.4.1.) the weight of BKN (0.5 kg).
- 4.8. Square dampers can be supplied on the customer's demands in all subdimension of the above mentioned range.
- 4.9. Flanges of square fire dampers are 30 mm wide with oval hole (Fig. 34). Dimensions of damper connecting flanges are in accordance with EN 12 220. In case of damper installation into SPIRO duct, round dampers are supplied without the flanges so as it is possible to connect them with external joints (it is necessary to specify this requirement in the order). Damper length for SPIRO duct is 475 mm (Fig. 35).

Fig. 34 Flange of square damper

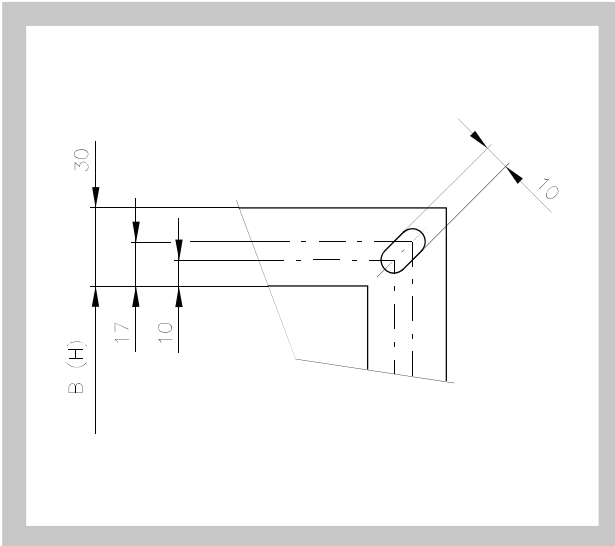
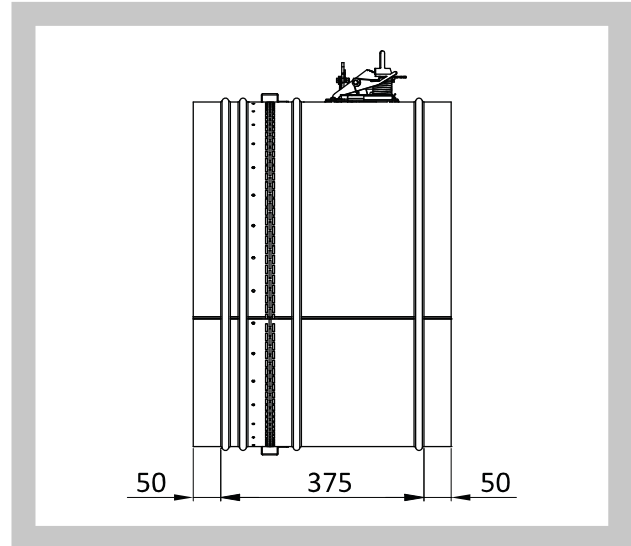


Fig. 35 Damper for SPIRO duct



5. Placement and Assembly

- 5.1. Fire dampers are suitable for installation in arbitrary position in vertical and horizontal passages of fire separating constructions. Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded. Installation gap must be filled by approved material perfectly in all the installation space volume (installation gap).

To provide needed access space to the control device, all other objects must be situated at least 350 mm from the control parts of the damper. Inspection hole must be accessible.

Damper blade has to be inside of construction (labelled with min. or max. BUILD IN EDGE on the damper body) after installation. The fire damper can also be installed outside the wall construction. Duct and the damper part between the wall construction and the damper blade (labelled with min. or max. BUILD IN EDGE on the protective covering) must be protected with firefighting insulation (see fig. 37)

The distance between the fire damper and the construction (wall, ceiling) must be minimum 75 mm. In case that two or more dampers are supposed to be installed in one fire separating construction, the distance between the adjacent dampers must be at least 200 mm according to EN 1366-2 paragraph 13.5.

Fig. 36 The distance between the fire damper and the construction

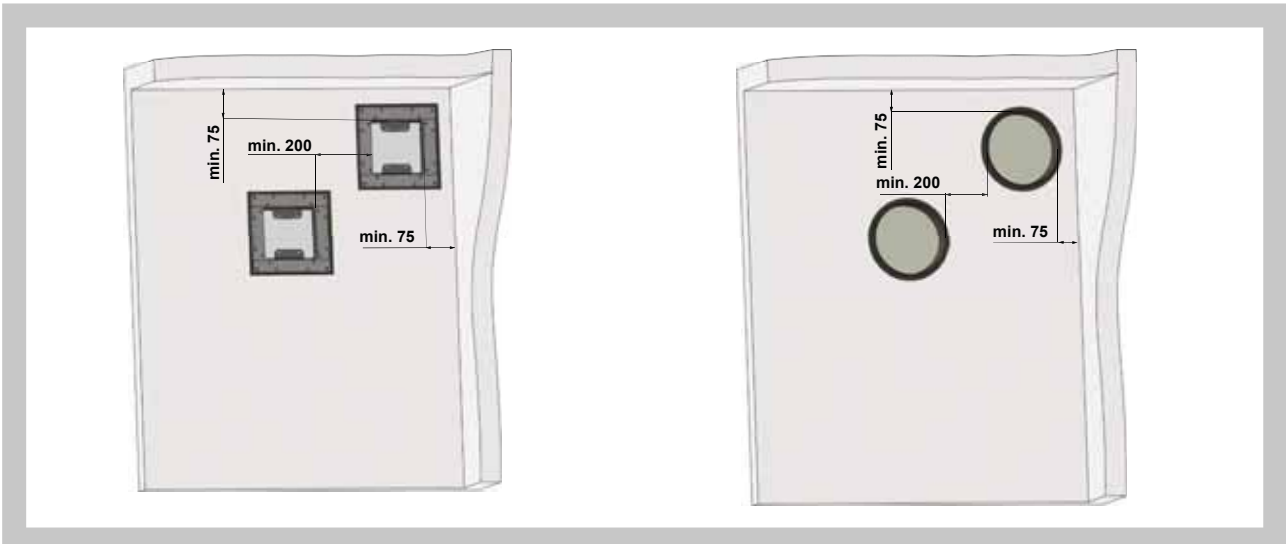
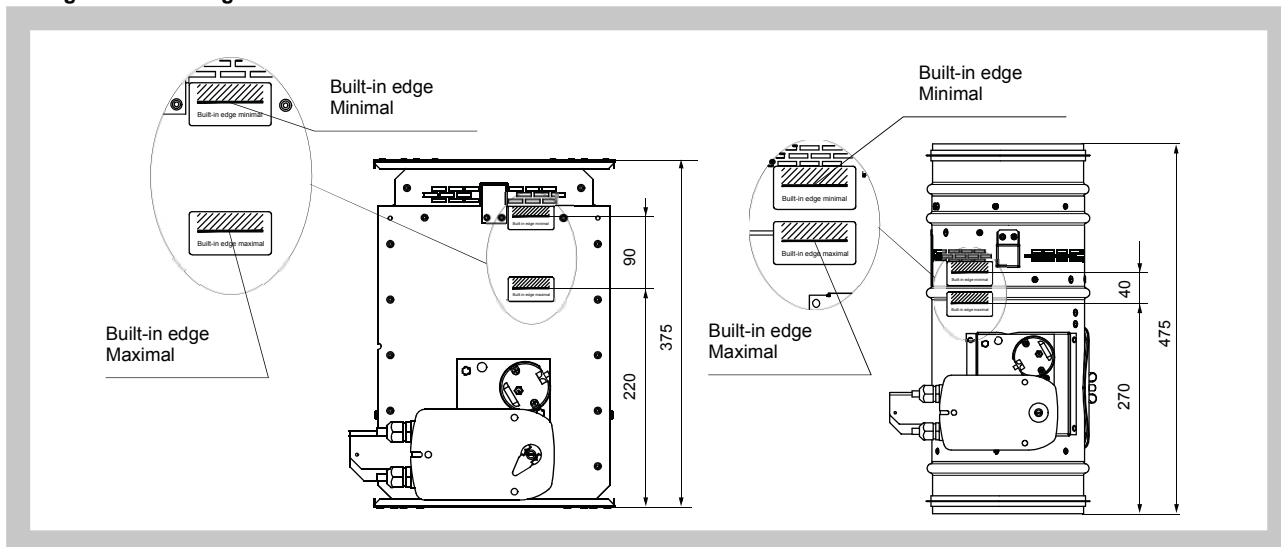


Fig. 37 Built in edge



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

All fire dampers has to be closed during installation process. The damper body should not be deformed in the course of bricking in. Once the damper is built in, its blade should not grind on the damper body during opening or closing.

5.3. Installation opening dimensions

Fig. 38 Installation opening - square damper

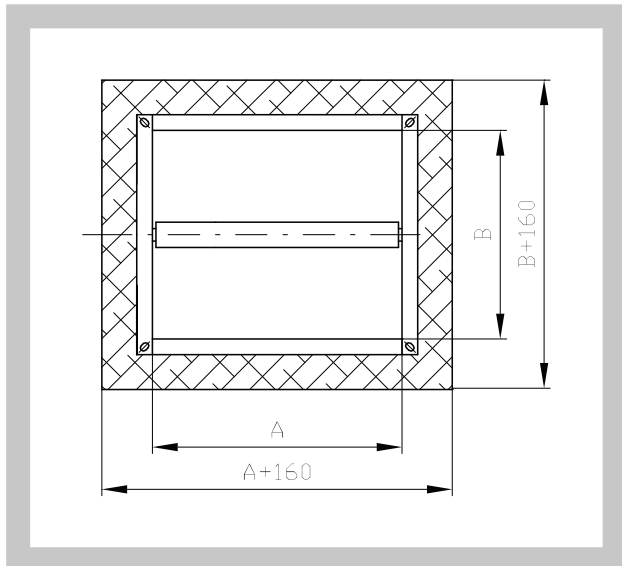


Fig. 39 Installation opening - square damper system Weichschott

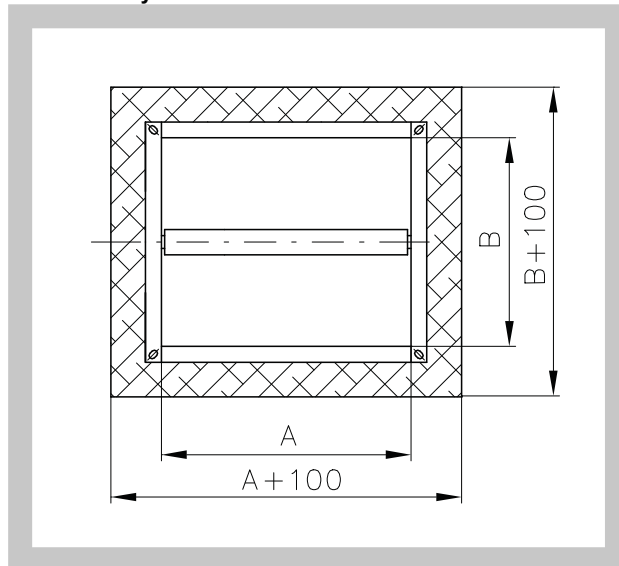


Fig. 40 Installation opening - round damper

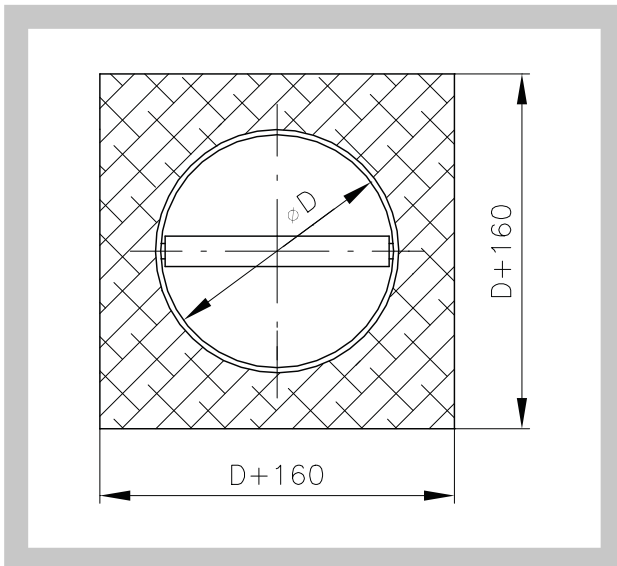


Fig. 41 Installation opening - round damper

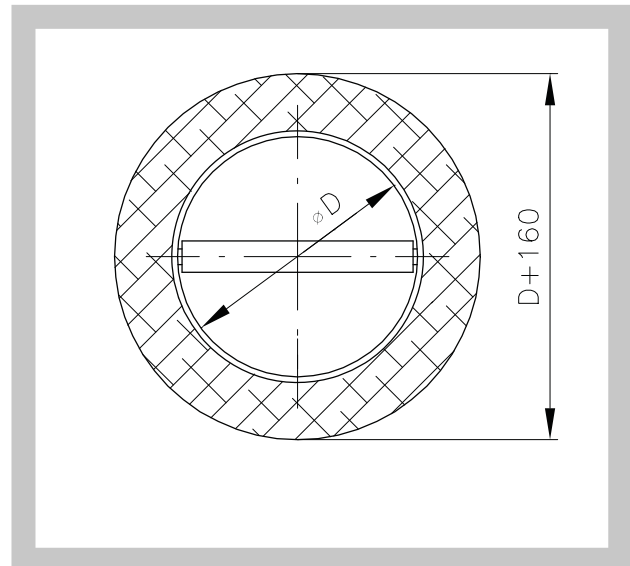
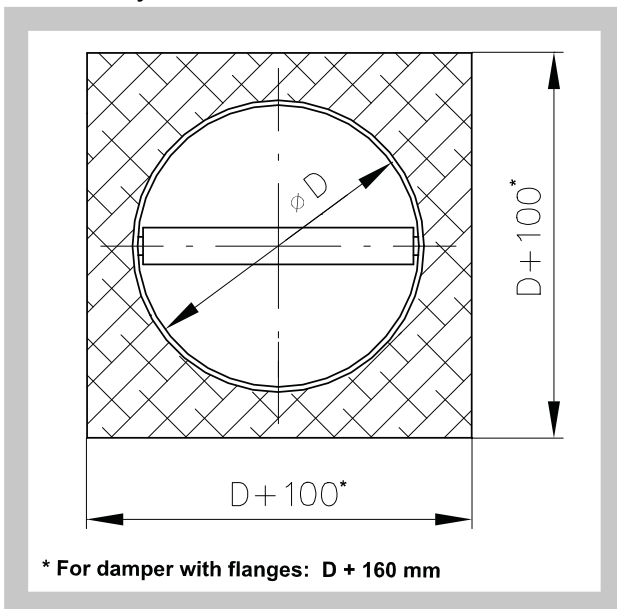


Fig. 42 Installation opening - round damper system Weichschott



5.3. Examples of fire damper installing

The fire damper can be integrated into a solid wall construction made e.g. of normal concrete/masonry, porous concrete with minimum thickness 100 mm or into solid ceiling construction made e.g. of normal concrete/porous concrete with minimum thickness 150 mm. Recommended structural holes are specified in Fig. 13-17.

The fire damper can be integrated into a gypsum wall construction with fire classification EI 90.

The fire damper can also be integrated outside the wall construction. Duct and the damper part between the wall construction and the damper blade (labelled with BUILD IN EDGE on the protective covering) must be protected with fire-fighting insulation.

If is square damper installed outside a construction it is necessary to use reinforcement VRM-III.

6. Statement of installations

6.1. Statement of installations

Tab. 6.1.1. Statement of installations

FDMB installation	Classification	Figure
Damper installed in a solid wall construction, min. thickness 100 mm. Space between damper and wall is filled by mortar, gypsum. (<i>notice 1</i>)	EIS 90 EIS 120	43
Damper installed in a solid wall construction, min. thickness 100 mm. Space between damper and wall is filled by mineral stone wool. Surface is covered by fire protection mastic and cement lime plate (<i>notice 1</i>)	EIS 90	44
Damper installed in a solid wall construction min. thickness 100 mm. Space between damper and wall is filled by system Weichshott (<i>notice 1</i>)	EIS 90	45
Damper installed in a a gypsum wall construction - classification EI 90. Space between damper and wall is filled by mortar, gypsum. (<i>notice 5</i>)	EIS 90 EIS 120	46
Damper installed in a gypsum wall construction - classification EI 90. Space between damper and wall is filled by mineral stone wool. Surface is covered by fire protection mastic and cement lime plate. (<i>notice 5</i>)	EIS 90	47
Damper installed in a gypsum wall construction, classification EI 90. Space between damper and wall is filled by system Weichshott. (<i>notice 5</i>)	EIS 90	48
Damper installed in a solid ceiling construction, min. thickness 150 mm. Space between damper and ceiling is filled by mortar, gypsum (<i>notice 2</i>)	EIS 90 EIS 120	49
Damper installed in a solid ceiling construction, min. thickness 150 mm. Space between damper and wall is filled by mineral stone wool. Surface is covered by fire protection mastic and cement lime plate. (<i>notice 2</i>)	EIS 90	50
Damper installed in a solid ceiling construction. Space between damper and wall is filled by system Weichshott. (<i>notice 2</i>)	EIS 90	51
Damper installed outside of solid wall construction. (<i>notice 3</i>)	EIS 90	52
Damper installed outside of gypsum wall construction, classification EI 90. (<i>notice 3</i>)	EIS 90	53
Damper installed outside of solid wall construction. (<i>notice 3</i>)	EIS 90	54
Damper installed in a solid wall construction, min. thickness 100 mm. Space between damper and wall is filled by mineral stone wool. Surface is covered by fire protection mastic (<i>notice 1</i>)	EIS 60	56
Damper installed in a gypsum wall construction - classification EI 90. Space between damper and wall is filled by mineral stone wool. Surface is covered by fire protection mastic. (<i>notice 5</i>)	EIS 60	57
Damper installed in a solid ceiling construction, min. thickness 150 mm. Space between damper and wall is filled by mineral stone wool. Surface is covered by fire protection mastic. (<i>notice 2</i>)	EIS 60	58

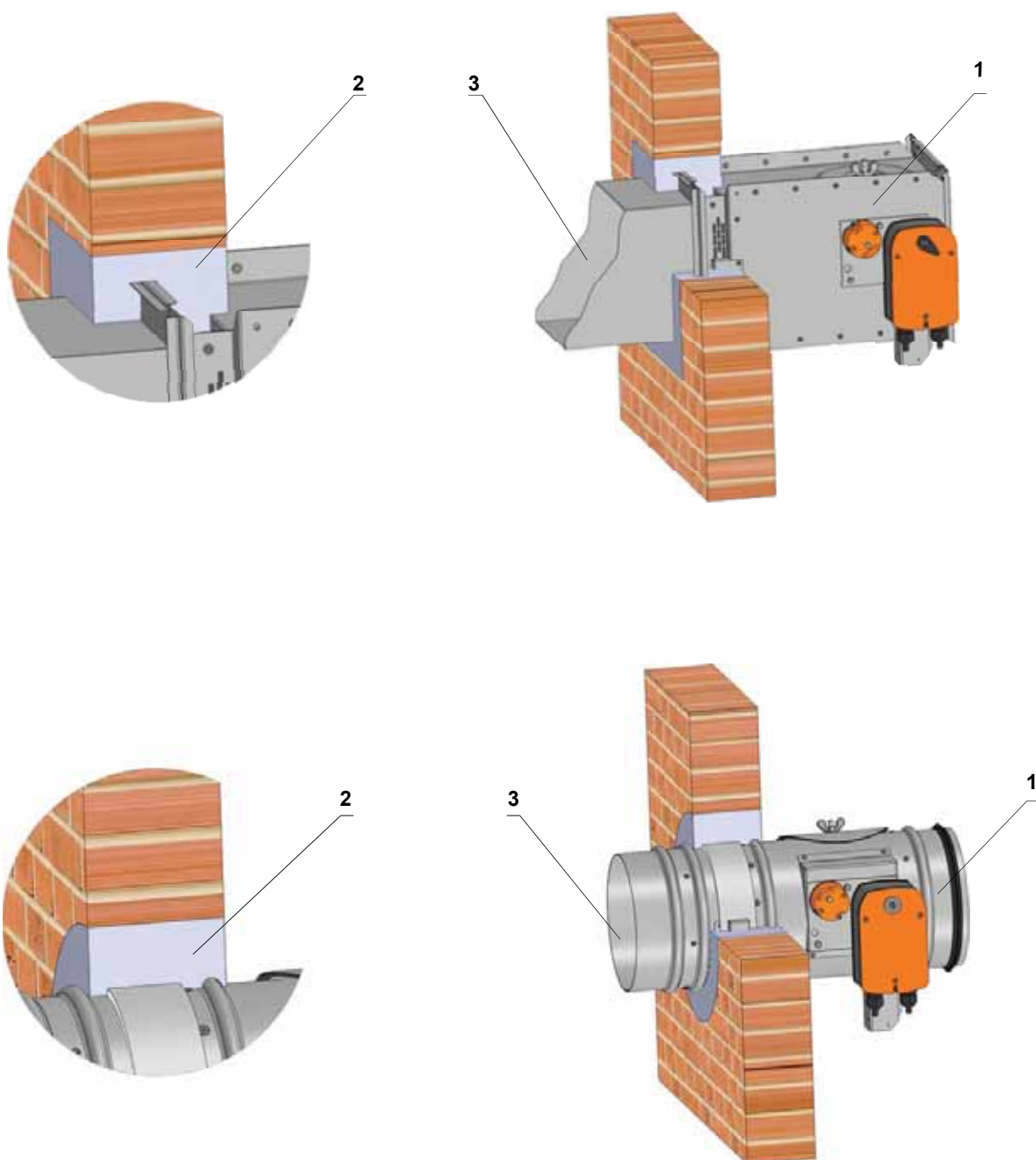
Tab. 6.1.2. Damper installations with using installation frames

Damper type	FDMB installation	Classification	Figure
Square (max. dimension 1000x500 or 500x1000, max. area 0,5m ²)	Damper installed: in a solid wall construction, min. thickness 100 mm in a gypsum wall construction - classification EI 90 in a solid ceiling construction, min. thickness 150 mm Installations with using installation frame E1	EIS 90	59
	Damper installed: in a solid wall construction, min. thickness 100 mm in a solid ceiling construction, min. thickness 150 mm Installations with using installation frame E2	EIS 90	60
	Damper installed: in a gypsum wall construction - classification EI 90 Installations with using installation frame E3	EIS 90	61
	Damper installed: on a solid wall construction, min. thickness 100 mm on a solid ceiling construction, min. thickness 150 mm outside of solid ceiling construction, min. thickness 150 mm - installation in concrete channell Installations with using installation frame E4	EIS 90	62
	Damper installed: outside of solid wall construction, min. thickness 100 mm outside of solid ceiling construction, min. thickness 150 mm Installations with using installation frame E6.	EIS 90	63
Round (size 160-630)	Damper installed: in a solid wall construction, min. thickness 100 mm in a gypsum wall construction - classification EI 90 in a solid ceiling construction, min. thickness 150 mm Installations with using installation frame R1 or R2	EIS 90	64
	Damper installed: in a solid wall construction, min. thickness 100 mm in a gypsum wall construction - classification EI 90 in a solid ceiling construction, min. thickness 150 mm Installations with using installation frame R3 or R4	EIS 90	65
	Damper installed: on a solid wall construction, min. thickness 100 mm on a solid ceiling construction, min. thickness 150 mm outside of solid ceiling construction, min. thickness 150 mm - installation in concrete channell Installations with using installation frame R5	EIS 90	66
	Damper installed: outside of solid wall construction, min. thickness 100 mm outside of solid ceiling construction, min. thickness 150 mm Installations with using installation frame R6	EIS 90	67
Square and round dampers	Installation in a solid wall construction, min. thickness 100 mm, near the ceiling or wall. Gap is filled by gypsum or mortar and mineral stone wool	EIS 90	68
	Installation in a gypsum wall construction, classification EI 90, near the ceiling or wall. Gap is filled by gypsum or mortar and mineral stone wool	EIS 90	69
	Installation in a solid wall construction, min. thickness 100 mm. Installation of 2 fire dampers abreast - gap is filled by gypsum or mortar	EIS 90	70
	Installation in a solid wall construction, min. thickness 100 mm. Installation of 2 fire dampers abreast - gap is filled by gypsum or mortar	EIS 90	71

NOTICES:

- 1) Solid wall construction: normal concrete/masonry or porous concrete with minimum thickness 100 mm
- 2) Solid ceiling construction: normal concrete/masonry or porous concrete with minimum thickness 150 mm
- 3) analogical approved fire insulation system = identical thickness, identical ρ , identical reaction to fire, analogical λ and c_p
- 4) Reinforcement of damper VRM-III

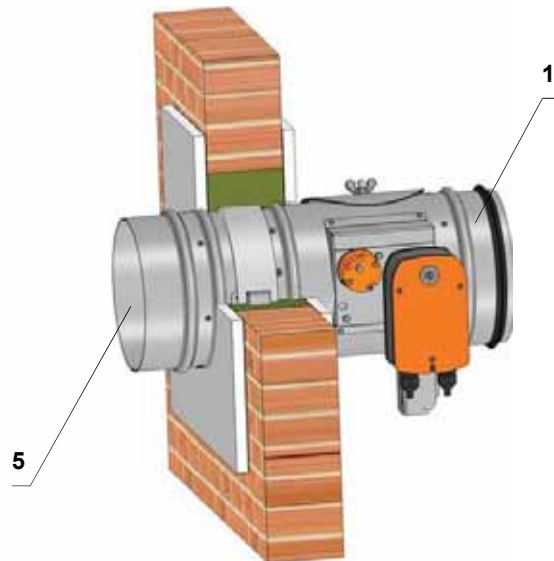
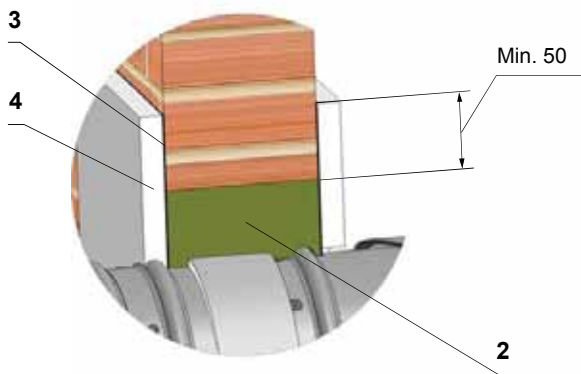
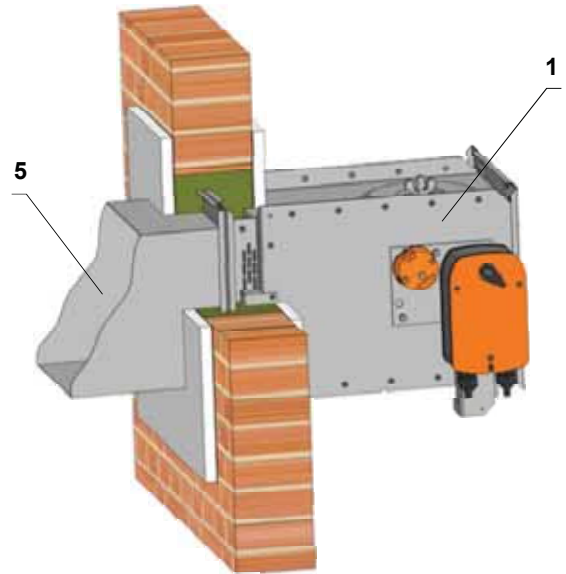
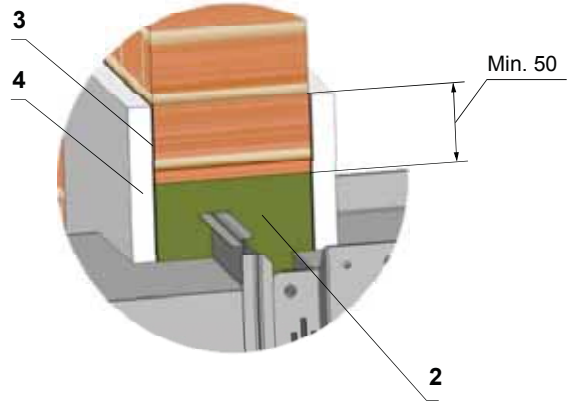
Fig. 43 Installation in a solid wall construction



POSITION:

- 1 Fire damper FDMB
- 2 Mortar or gypsum with min. density 800 kg/m³
- 3 Duct

Fig. 44 Installation in a solid wall construction



POSITION:

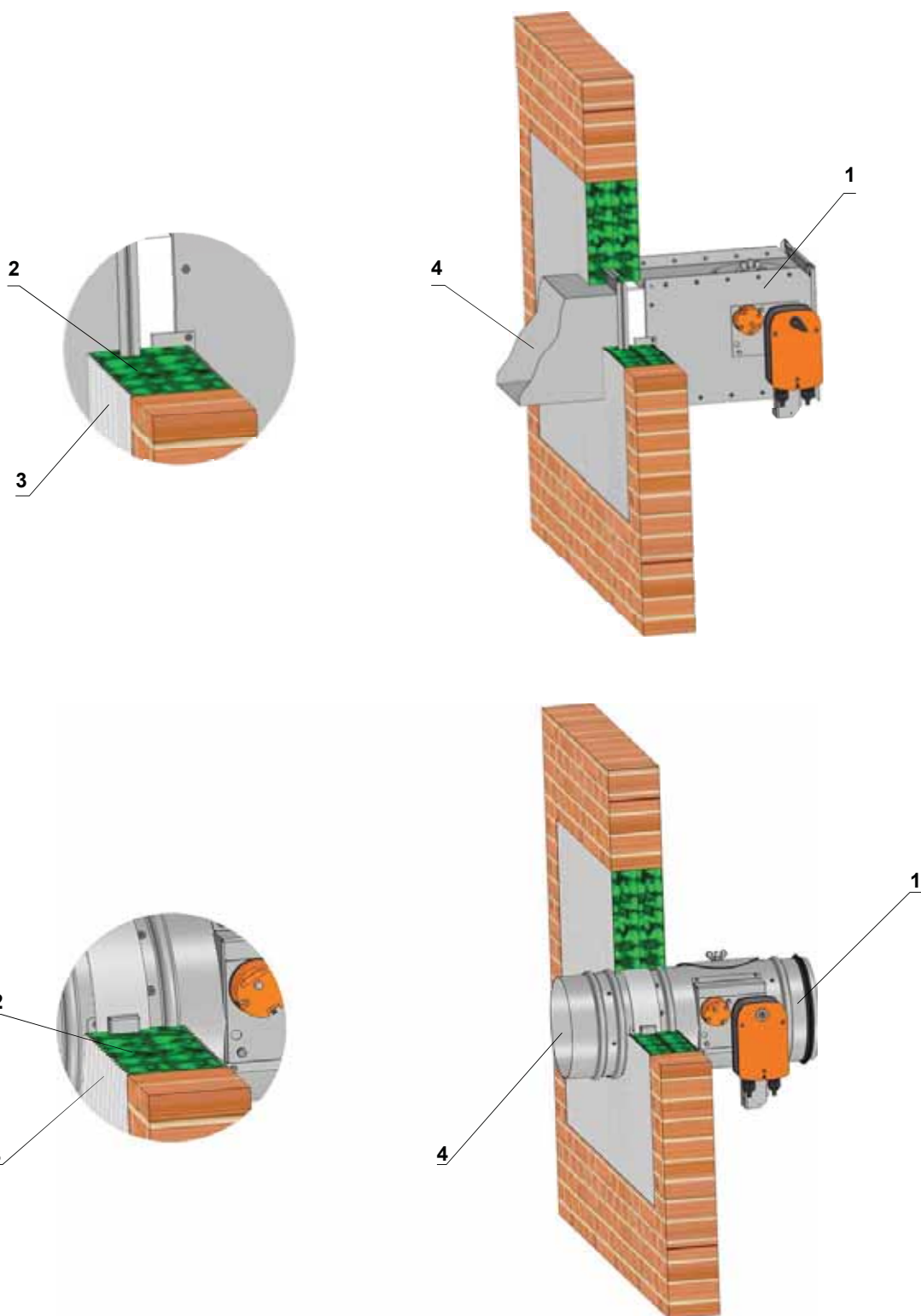
- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm
- 4 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 5 Duct

Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K
- 4 - Promatect - H

* Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

Fig. 45 Installation in a solid wall construction



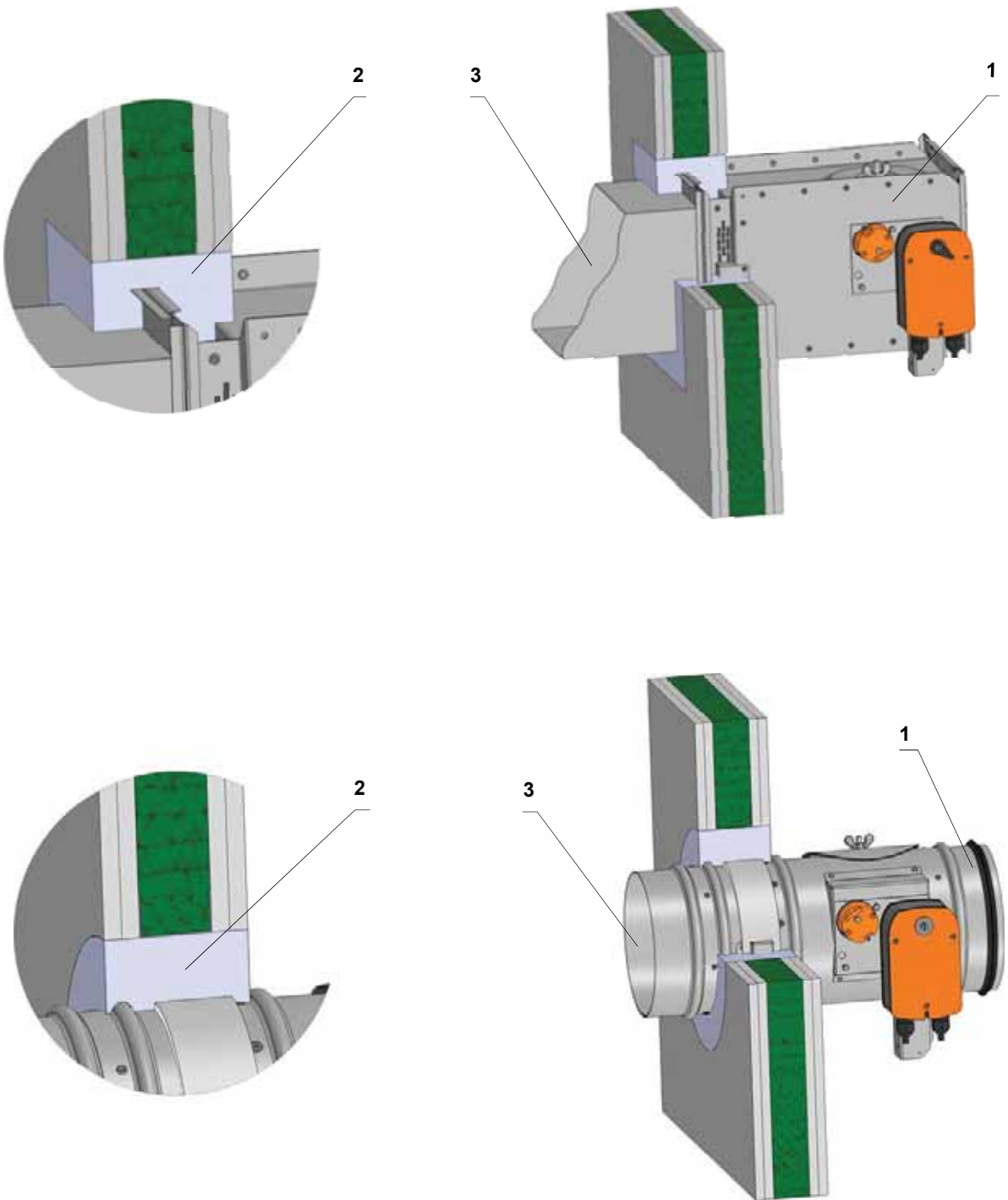
POSITION:

- 1 Fire damper FDMB
- 2 Fire resistant board
- 3 Fire stop coating thickness 1 mm
- 4 Duct

Used materials - example:

- 2 - Hilti CP673 PF
- 3 - Hilti CP673

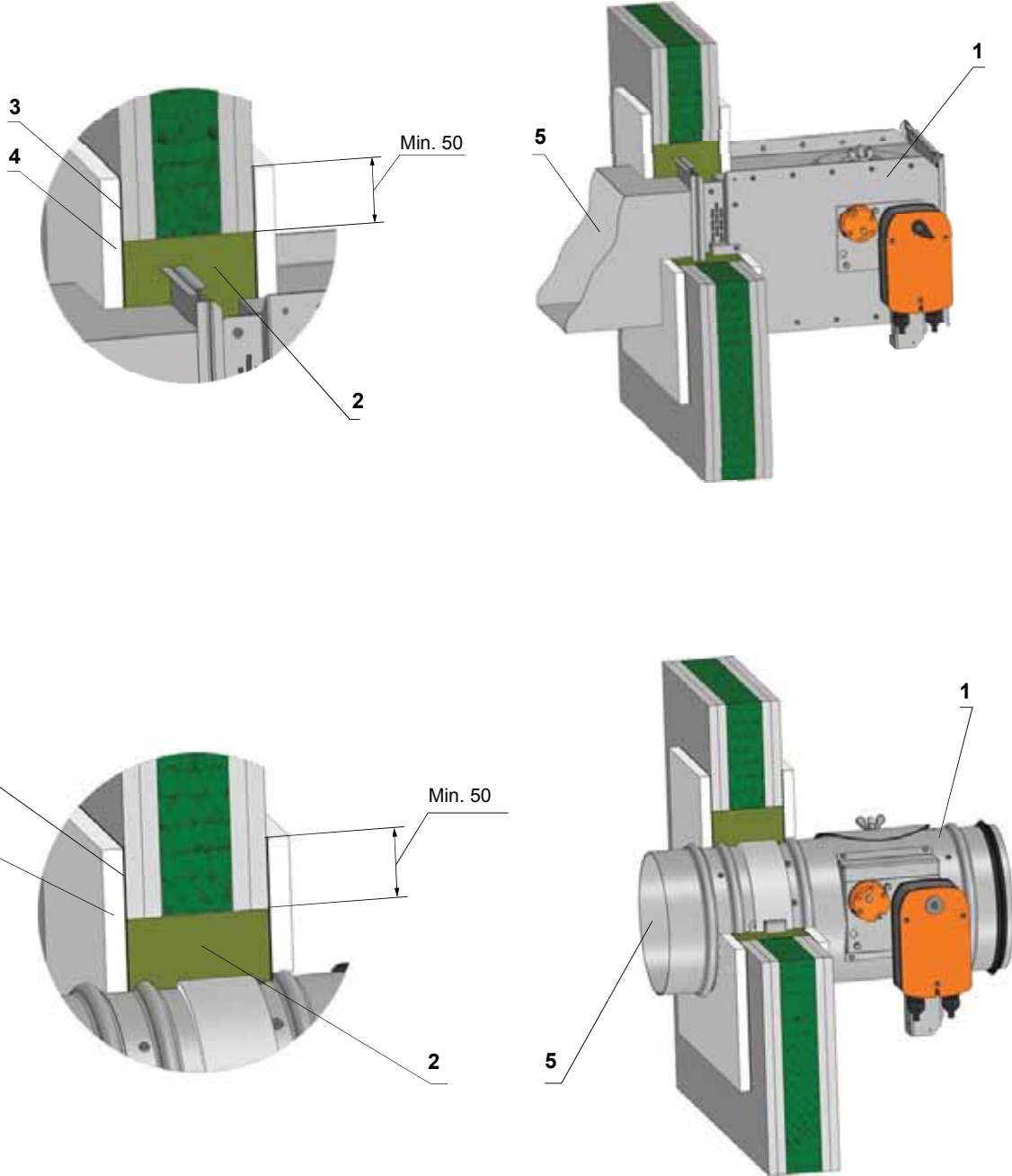
Fig. 46 Installation in gypsum wall construction



POSITION:

- 1 Fire damper FDMB
- 2 Mortar or gypsum with min. density 800 kg/m³
- 3 Duct

Fig. 47 Installation in gypsum wall construction



POSITION:

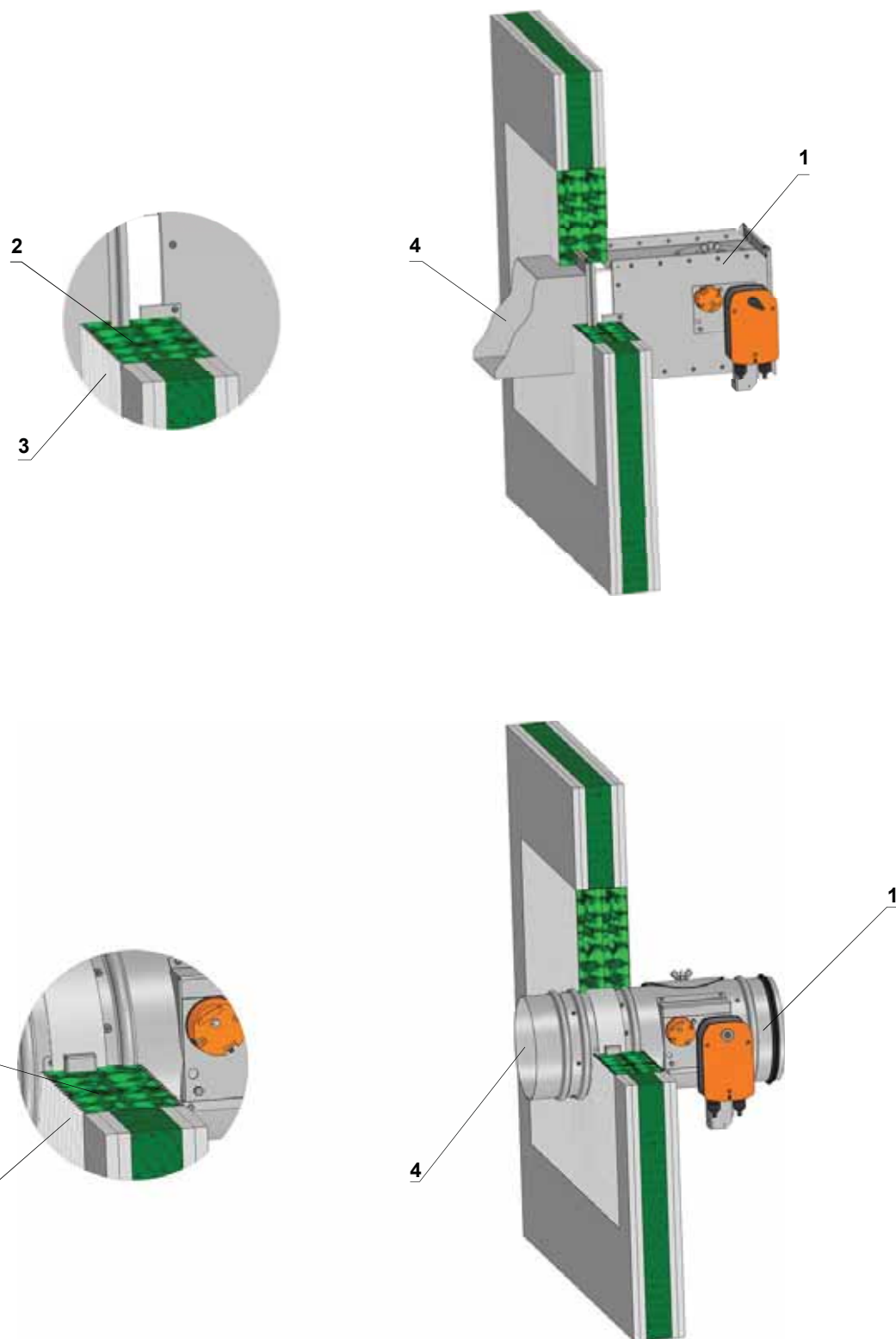
- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm
- 4 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 5 Duct

Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K
- 4 - Promatect - H

* Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

Fig. 48 Installation in gypsum wall construction



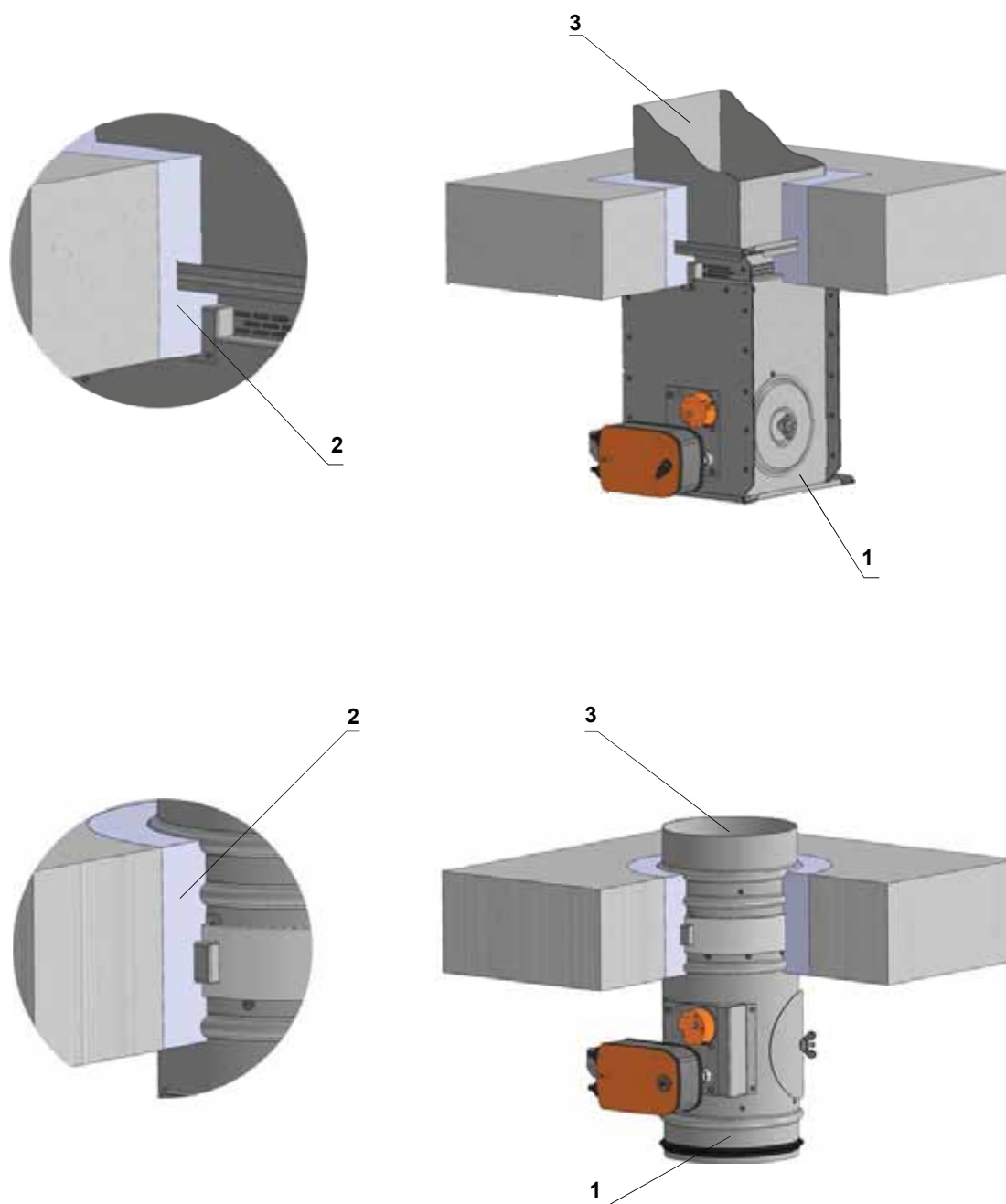
POSITION:

- 1 Fire damper FDMB
- 2 Fire resistant board
- 3 Fire stop coating thickness 1 mm
- 4 Duct

Used materials - example:

- 2 - Hilti CP673 PF
- 3 - Hilti CP673

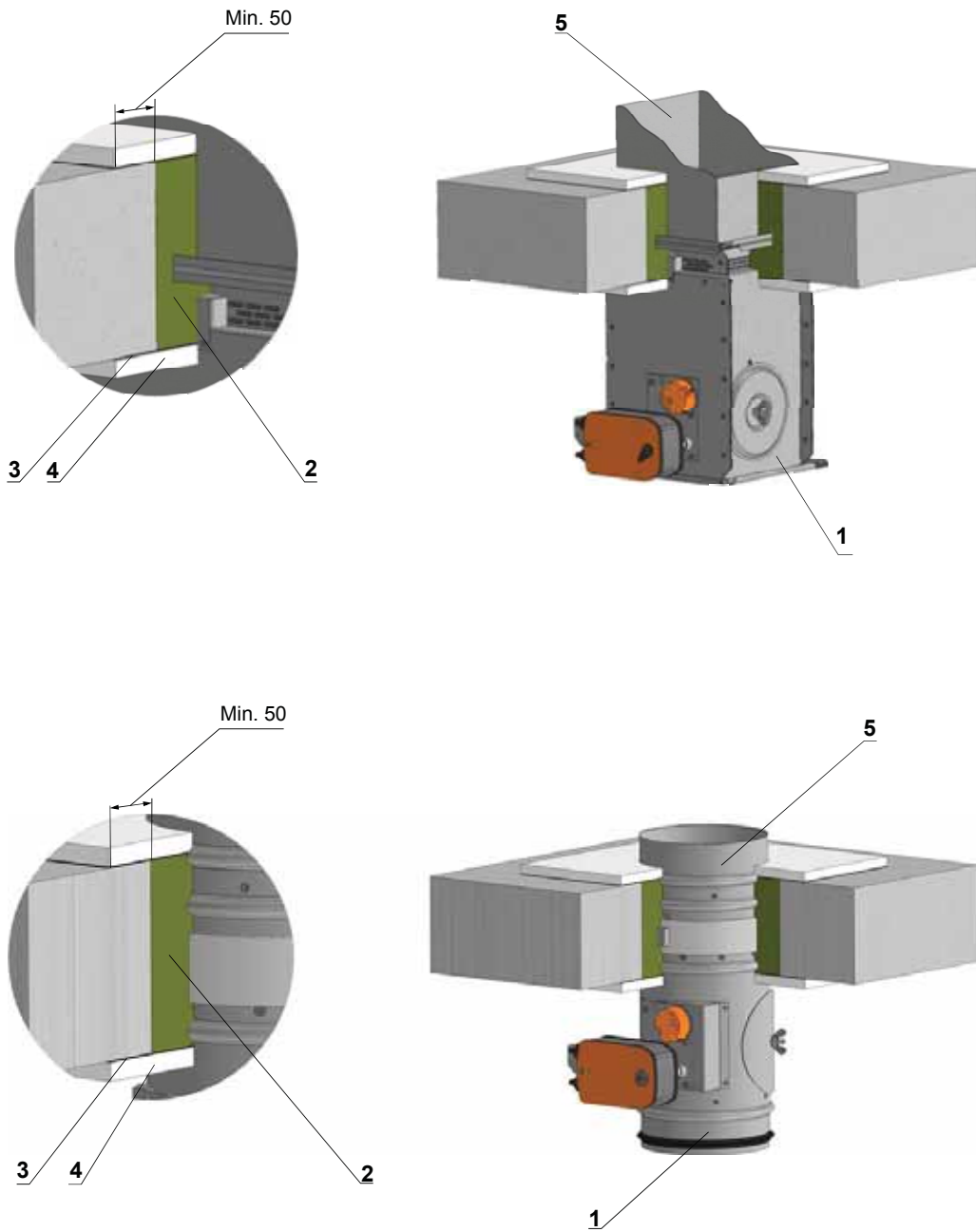
Fig. 49 Installation in solid ceiling construction



POSITION:

- 1 Fire damper FDMB
- 2 Mortar or gypsum with min. density 800 kg/m³
- 3 Duct

Fig. 50 Installation in solid ceiling construction



POSITION:

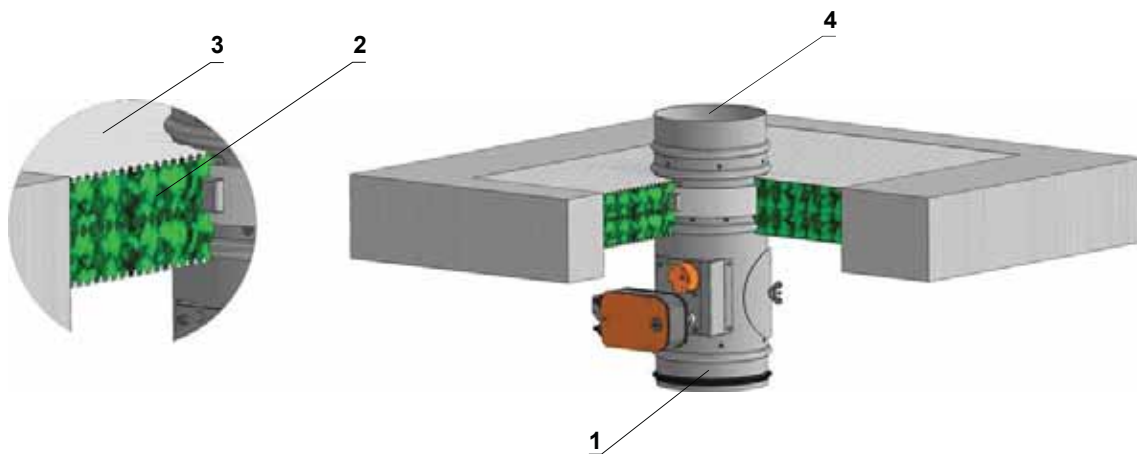
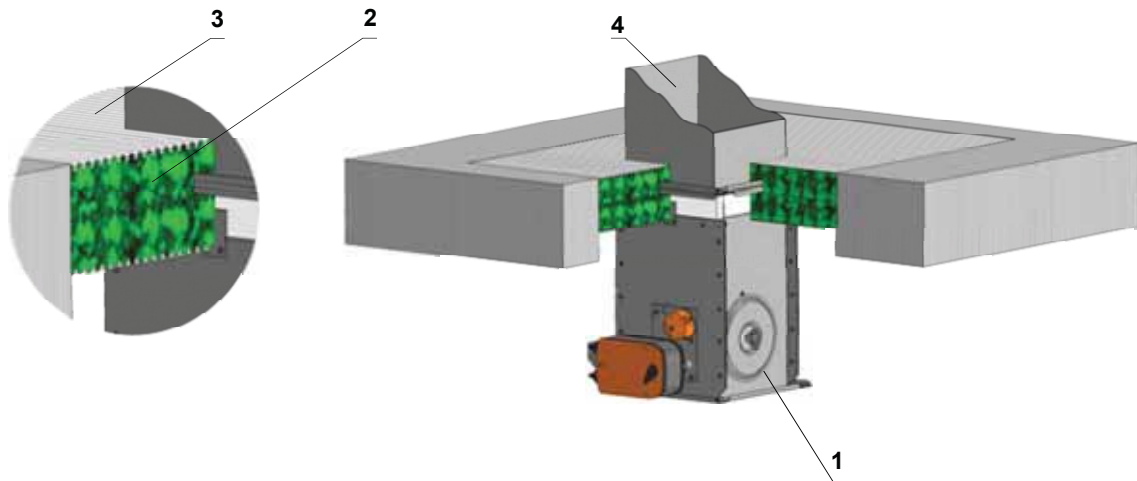
- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm
- 4 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 5 Duct

Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K
- 4 - Promatect - H

* Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

Fig. 51 Installation in solid ceiling construction



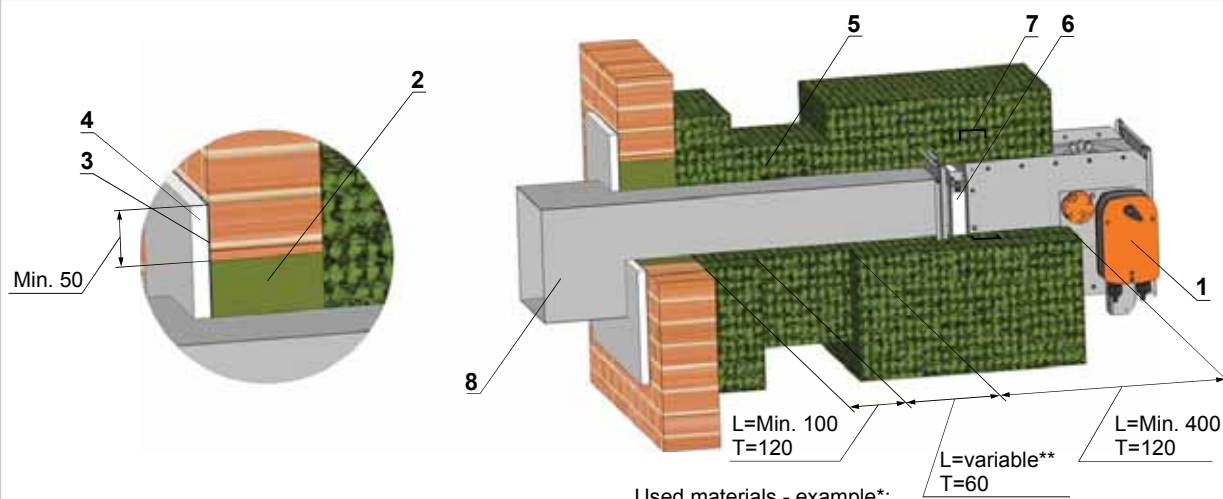
POSITION:

- 1 Fire damper FDMB
- 2 Fire resistant board
- 3 Fire stop coating thickness 1 mm
- 4 Duct

Used materials - example:

- 2 - Hilti CP673 PF
- 3 - Hilti CP673

Fig. 52 Installation outside of solid wall construction

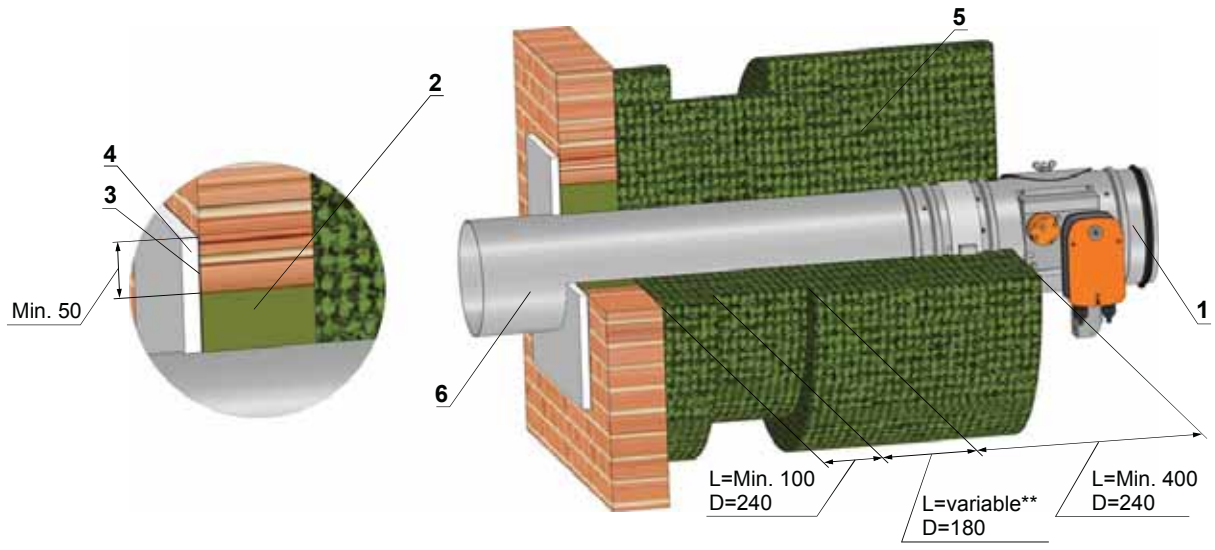


POSITION:

- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm
- 4 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 5 Stone wool bound with use of an organic resin with crushed stone as a refrigerant (min. density 300 kg/m³, EIS 90, thickness 60 mm)
- 6 VRM-III***
- 7 Profil U25x40x25
- 8 Duct

Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K
- 4 - Promatect - H
- 5 - Rockwool Conlit Ductrock EIS 90, thickness 60 mm
- * Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties
- ** Dependent on the distance between damper and fire separating construction
- *** Reinforcement fixing VRM-III see Fig. 44



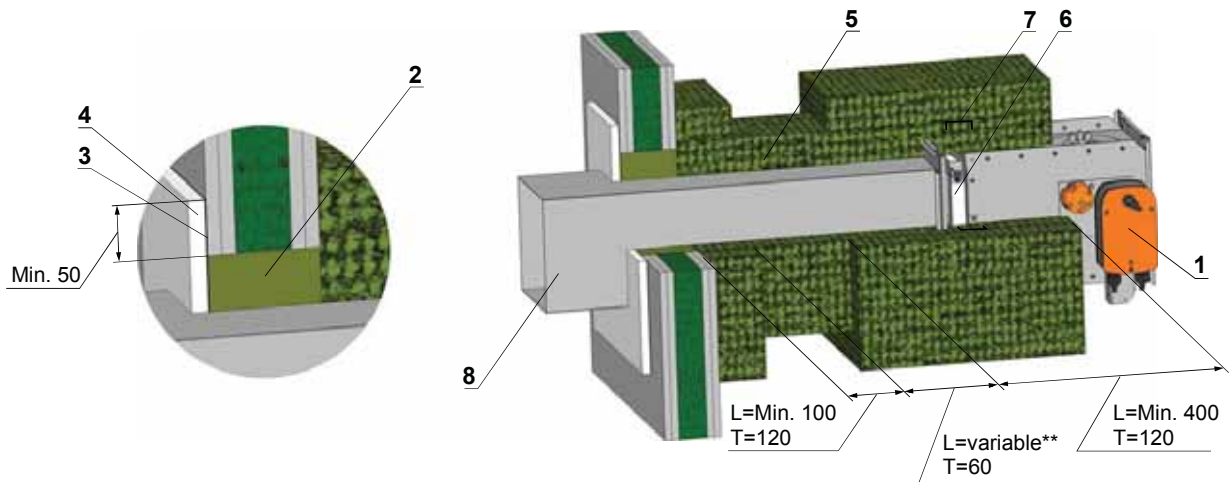
POSITION:

- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm
- 4 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 5 Stone wool with one side stitched wire fencing (min. density 105 kg/m³).
- 6 Duct

Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K
- 4 - Promatect - H
- 5 - Rockwool Wired Mat 105 thickness 3x60 mm
- * Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties
- ** Dependent on the distance between damper and fire separating construction

Fig. 53 Installation outside of gypsum wall construction



POSITION:

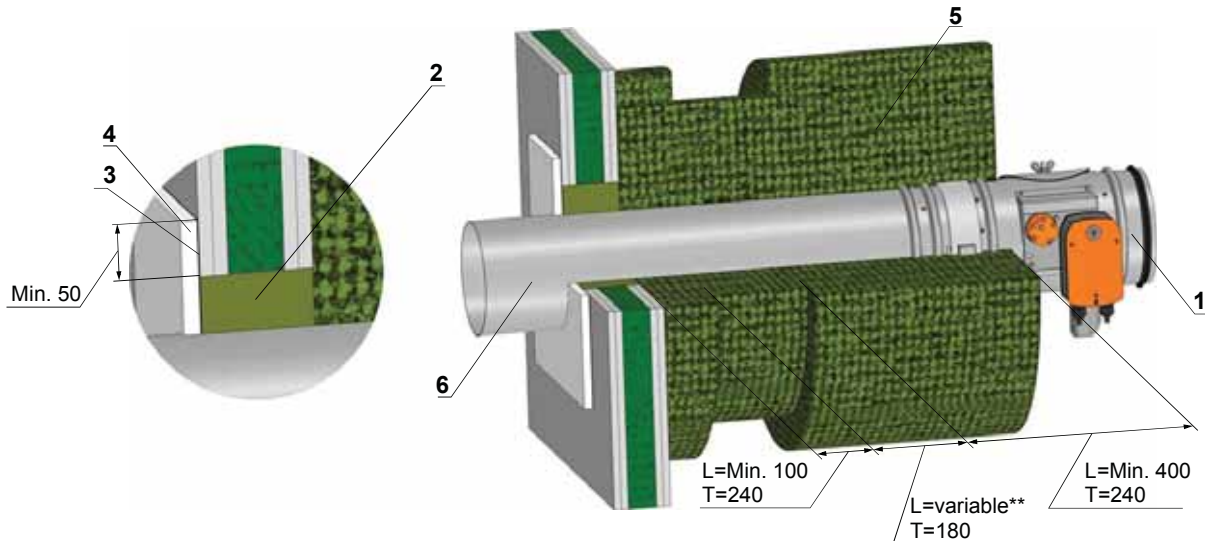
- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm
- 4 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 5 Stone wool bound with use of an organic resin with crushed stone as a refrigerant (min. density 300 kg/m³), EIS 90, thickness 60 mm
- 6 VRM-III***
- 7 Profil U25x40x25
- 8 Duct

Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
 - 3 - Promastop - P, K
 - 4 - Promatect - H
 - 5 - Rockwool Conlit Ductrock EIS 90, thickness 60 mm
- * Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

** Dependent on the distance between damper and fire separating construction

*** Reinforcement fixing VRM-III see Fig. 44



POSITION:

- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm
- 4 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 5 Stone wool with one side stitched wire fencing (min. density 105 kg/m³).
- 6 Duct

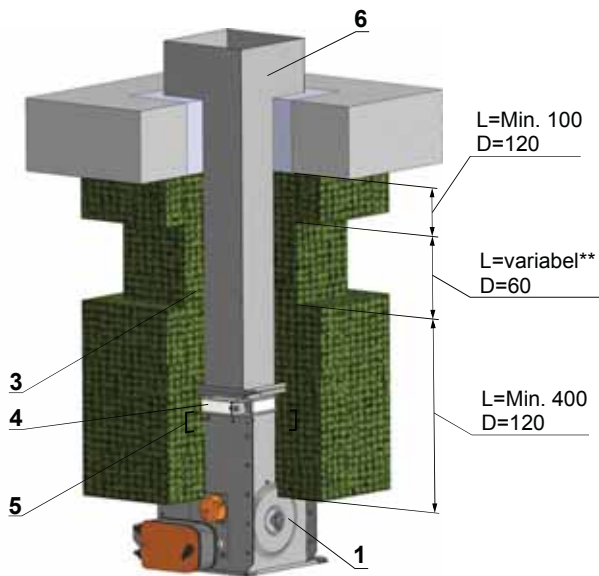
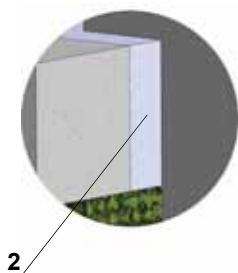
Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K
- 4 - Promatect - H
- 5 - Rockwool Wired Mat 105 thickness 3x60 mm

* Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

** Dependent on the distance between damper and fire separating construction

Fig. 54 Installation outside of solid ceiling construction



POSITION:

- 1 Fire damper FDMB
- 2 Mortar or gypsum with min. density 800 kg/m³
- 3 Stone wool bound with use of an organic resin with crushed stone as a refrigerant (min. density 300 kg/m³), EIS 90, thickness 60 mm
- 4 VRM-III***
- 5 Profil U25x40x25
- 6 Duct

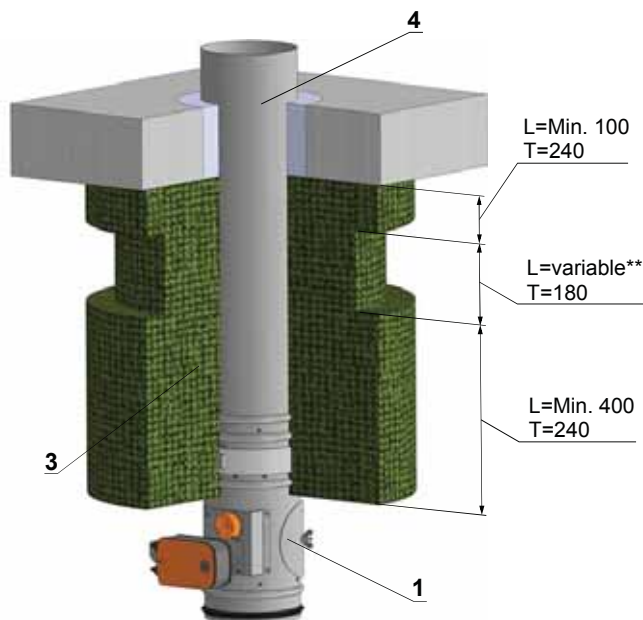
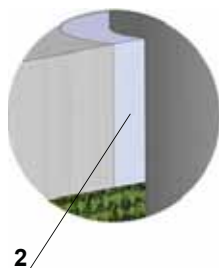
* Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

** Dependent on the distance between damper and fire separating construction

*** Reinforcement fixing VRM-III see Fig. 44

Used materials - example*:

- 3 - Rockwool Conlit Ductrock EIS 90, thickness 60 mm



POSITION:

- 1 Fire damper FDMB
- 2 Mortar or gypsum with min. density 800 kg/m³
- 3 Stone wool with one side stitched wire fencing (min. density 105 kg/m³).
- 4 Duct

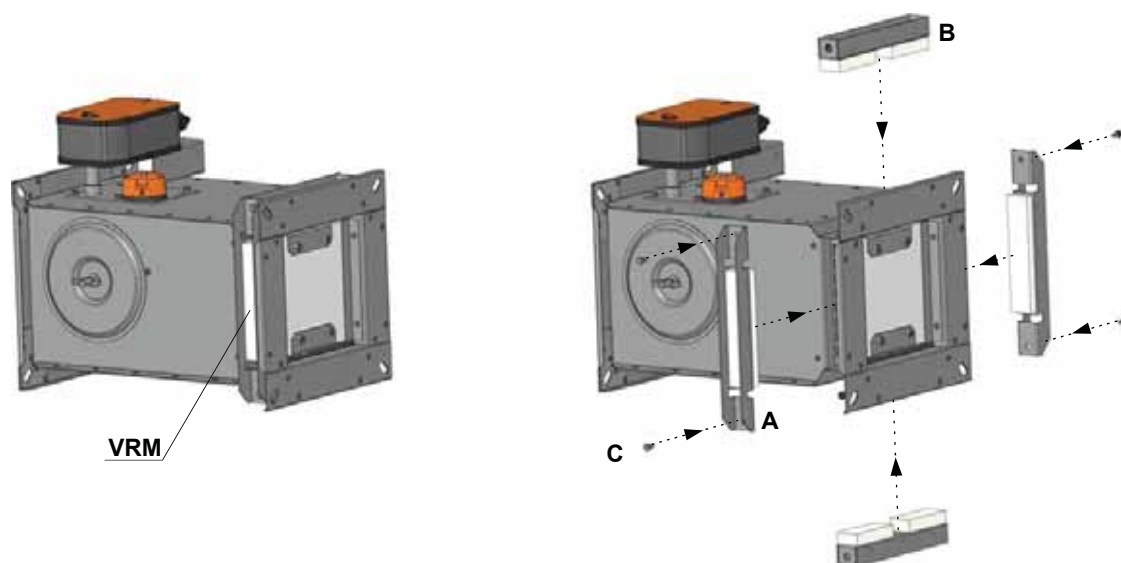
* Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

** Dependent on the distance between damper and fire separating construction

Used materials - example*:

- 3 - Rockwool Wired Mat 105 thickness 3x 60 mm

Fig. 55 Fixing of reinforcement to damper body

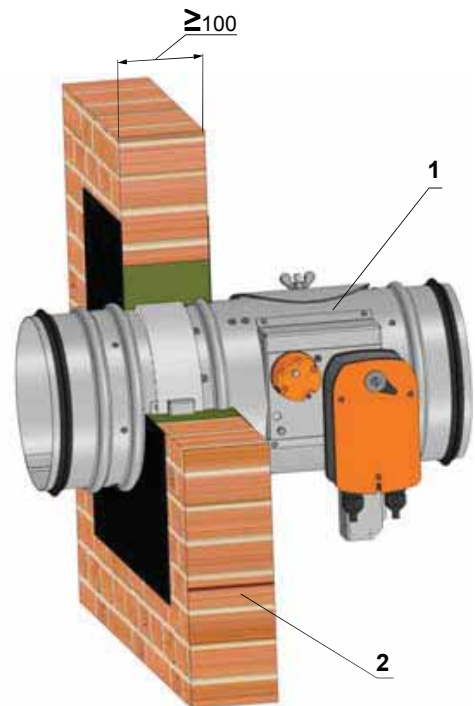
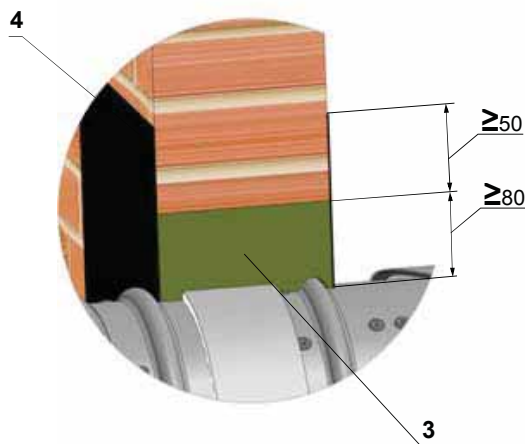
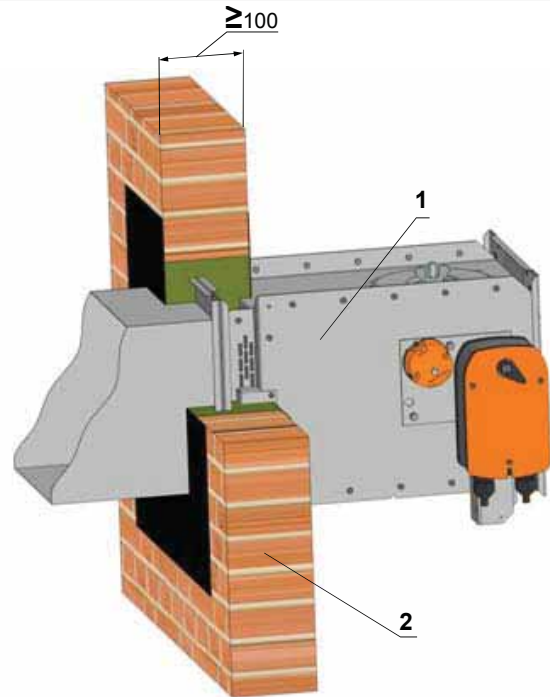
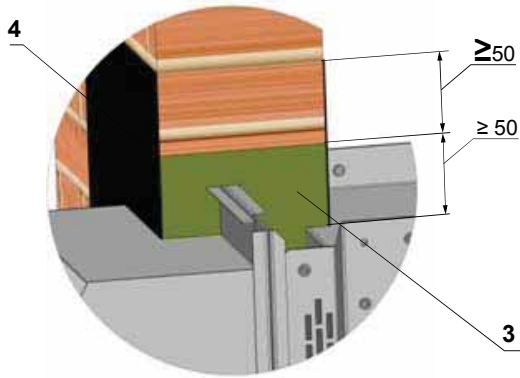


- 1.) Insert part A, B on body of fire damper in correct position
- 2.) Lock screw C
- 3.) It has to be done on each corner of VRM

6.2. Damper installation - fire resistant EIS 60

Fig. 56 Installation in solid wall construction

EIS 60



Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K

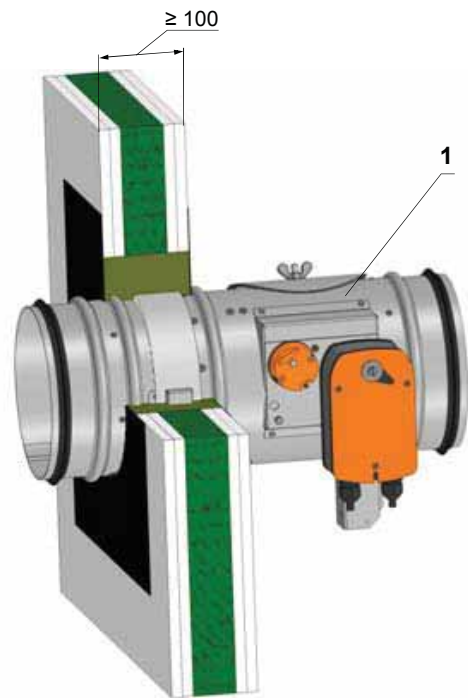
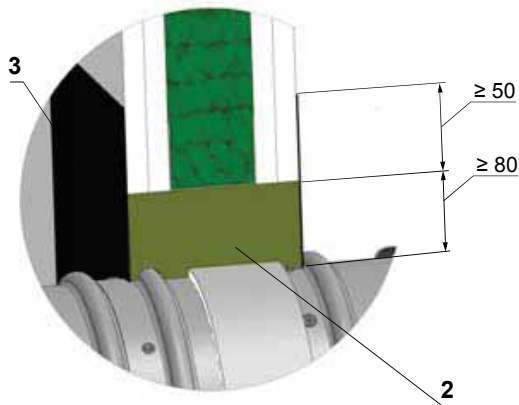
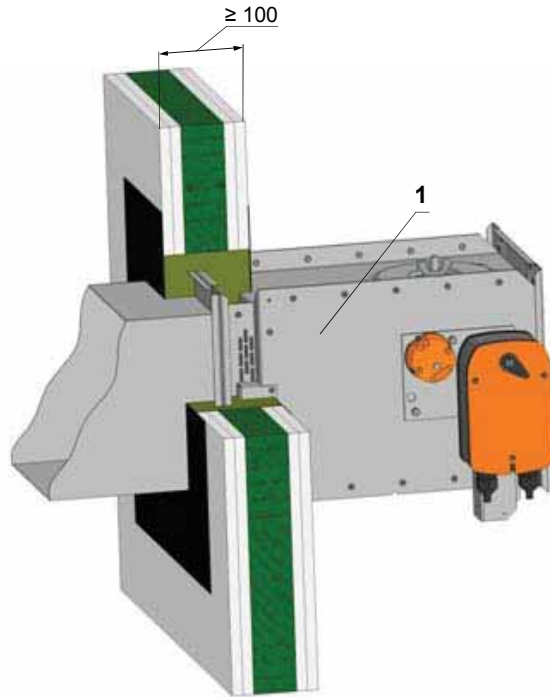
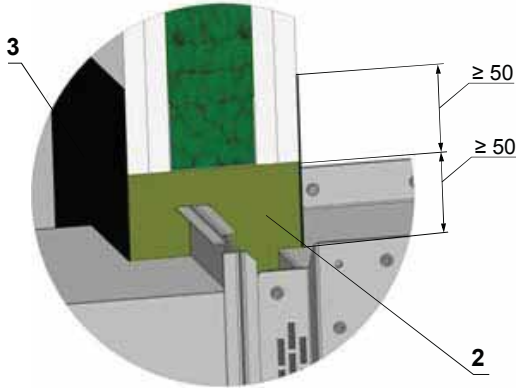
POSITION:

- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m)
- 3 Fire protection mastic min. thickness 1 mm

* Stuffing box, fire protection mastic and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

Fig. 57 Installation in gypsum wall construction

EIS 60



Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K

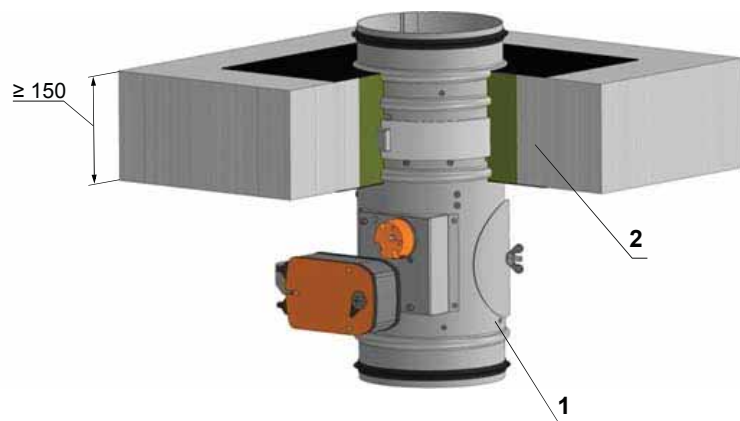
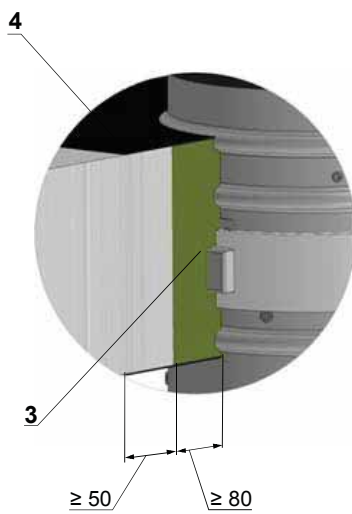
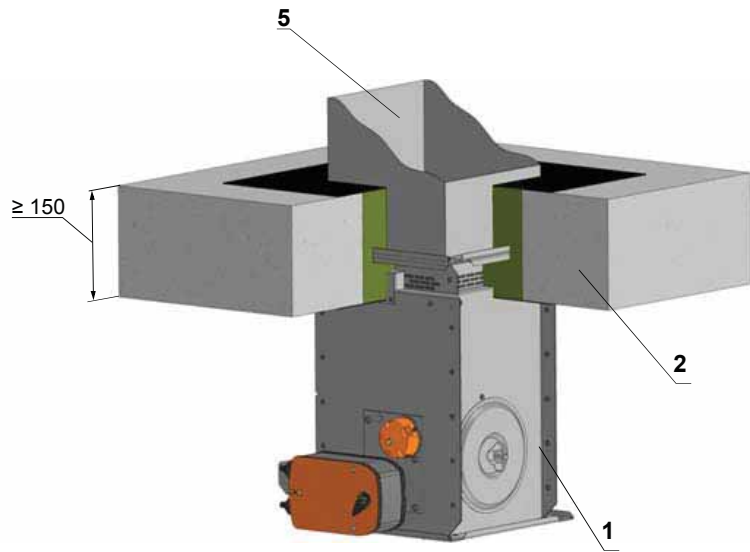
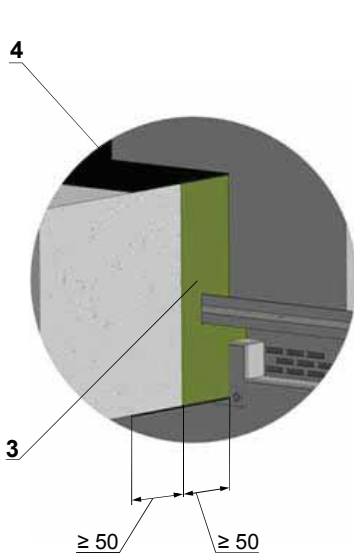
POSITION:

- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 3 Fire protection mastic min. thickness 1 mm

* Stuffing box, fire protection mastic and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

Fig. 58 Installation in solid ceiling construction

EIS 60



Used materials - example*:

- 2 - Promapyr, Rockwool Steprock HD
- 3 - Promastop - P, K

POSITION:

- 1 Fire damper FDMB
- 2 Stuffing box (mineral stone wool min. density 140 kg/m)
- 3 Fire protection mastic min. thickness 1 mm

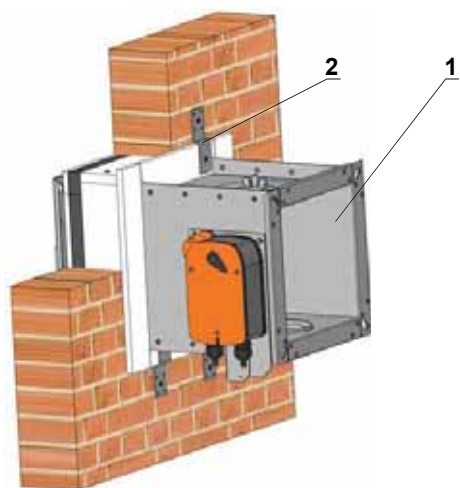
* Stuffing box, fire protection mastic and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties

6.3. Damper installation with using installation frames - square dampers

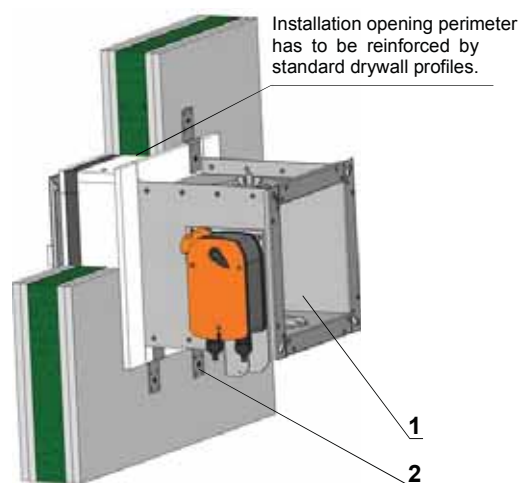
Fig. 59 Installation frame E1

EIS 90

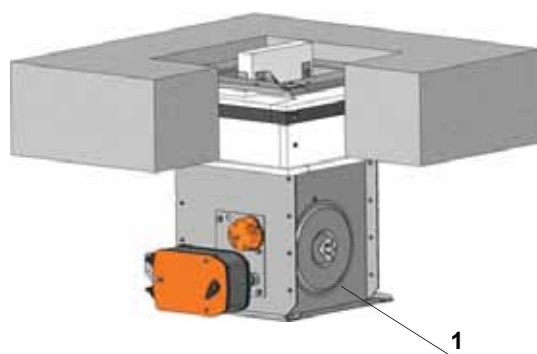
Installation in solid wall construction



Installation in gypsum wall construction



Installation in solid ceiling construction



Position:

- 1 FDMB-S with installation frame E1
- 2 Holder with screws

Installation opening a x b:

- $a \times b = (A + 85^{+3} \text{ mm}) \times (B + 85^{+3} \text{ mm})$;
- $A \times B =$ damper nominal size

Notice: Gap between installation frame and solid (gypsum) wall construction must be filled by glue. (PROMAT K84).
Fire dampers must be suspended accordingly, see chapter 7,

Fig. 60 Installation frame E2

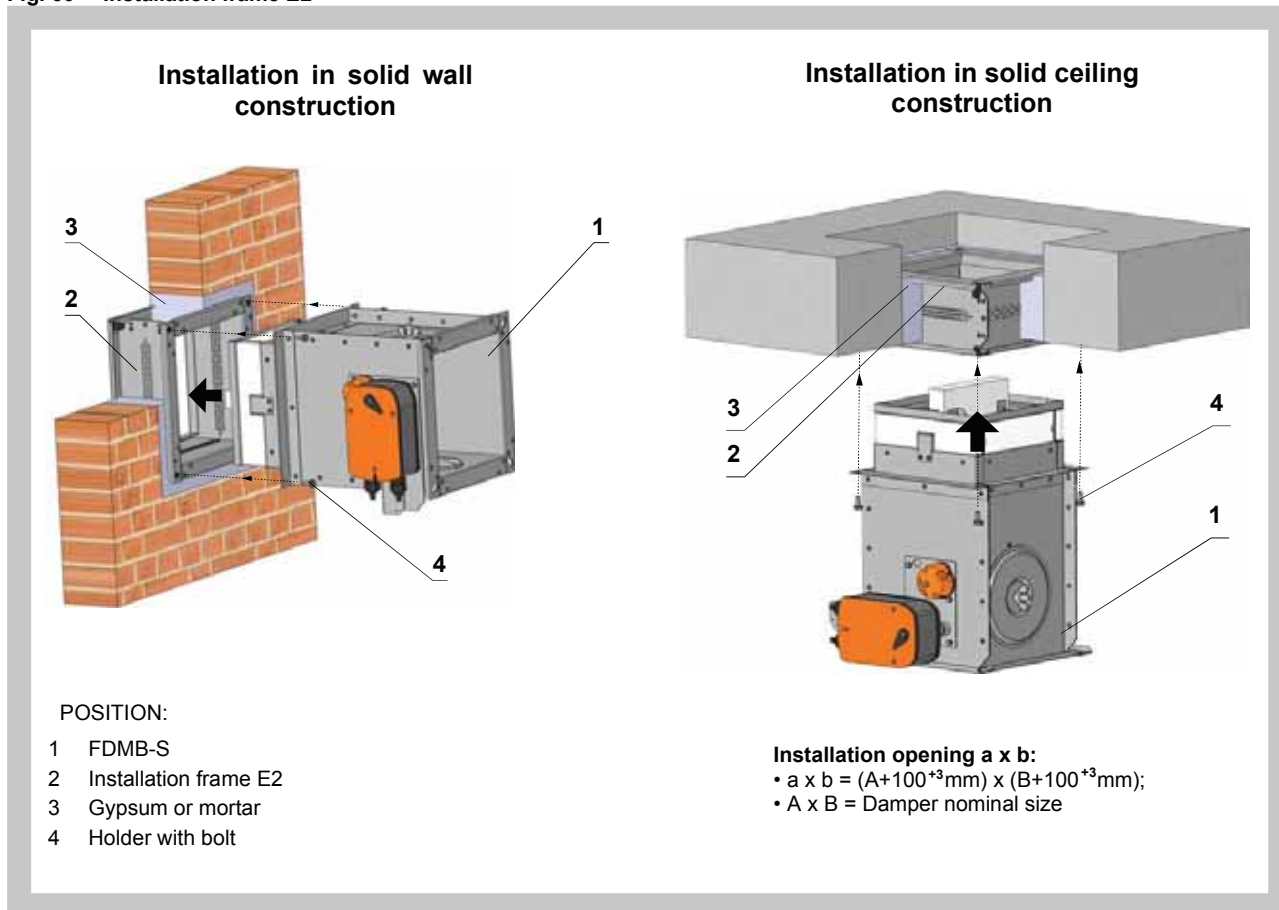


Fig. 61 Installation frame E3

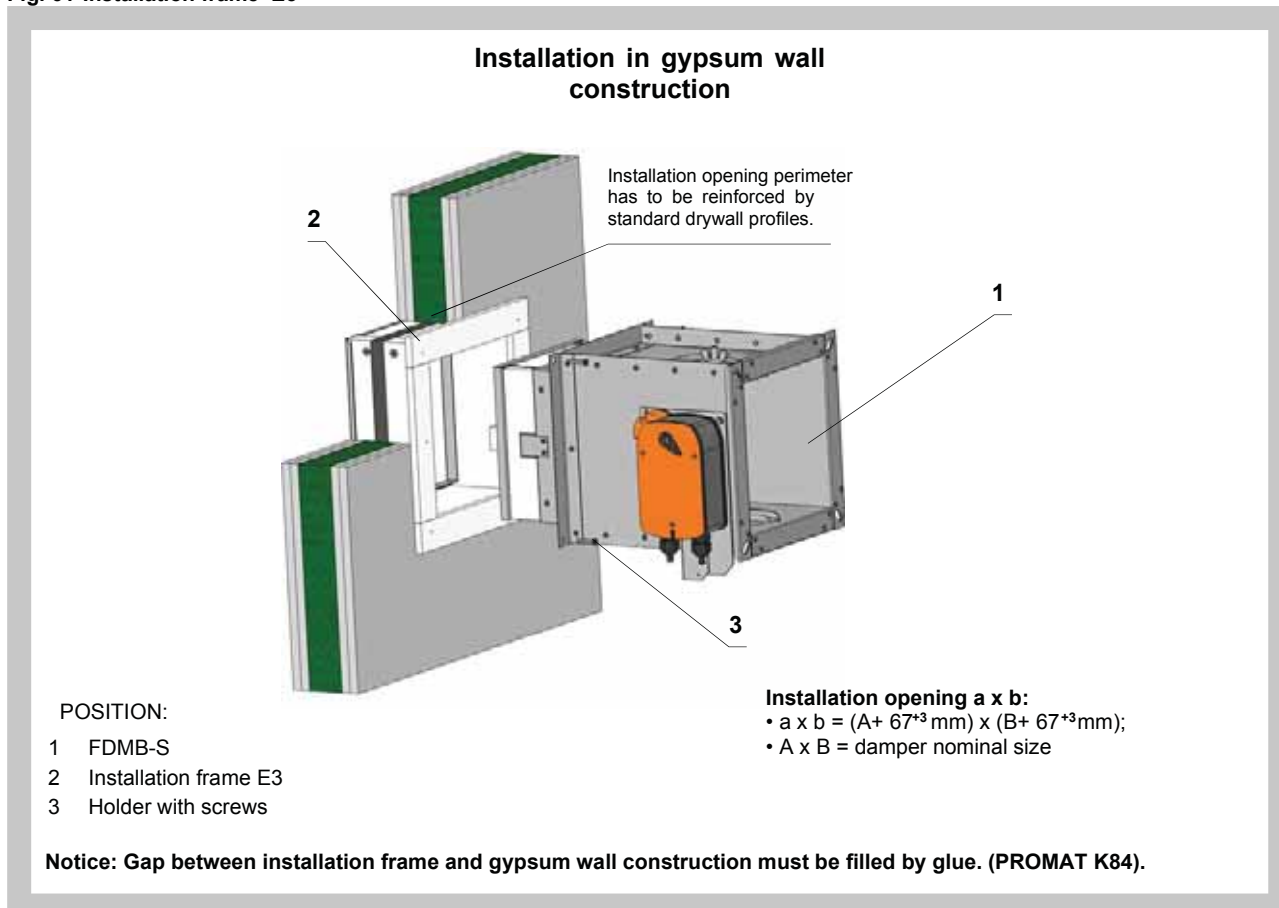
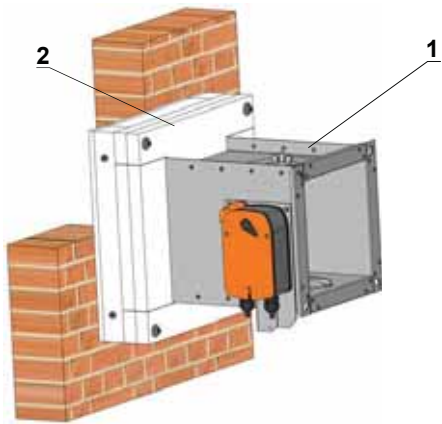
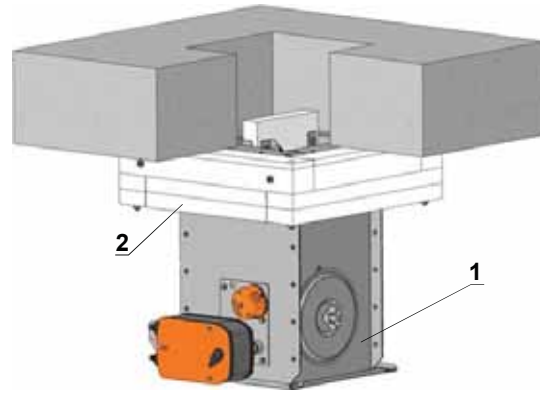


Fig. 62 Installation frame E4

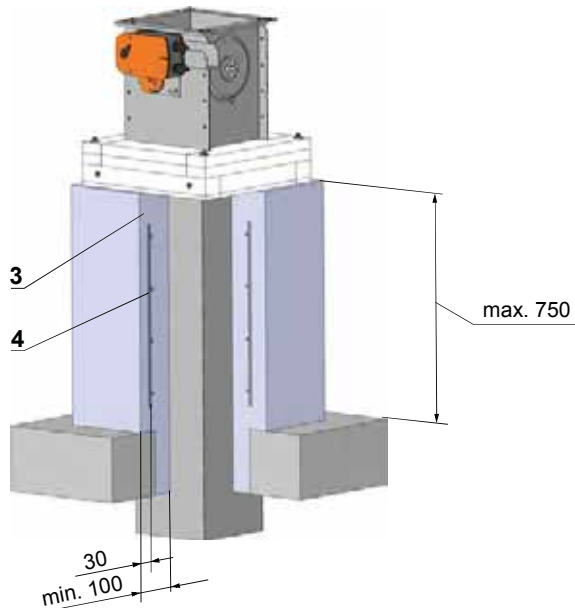
Installation on solid wall construction



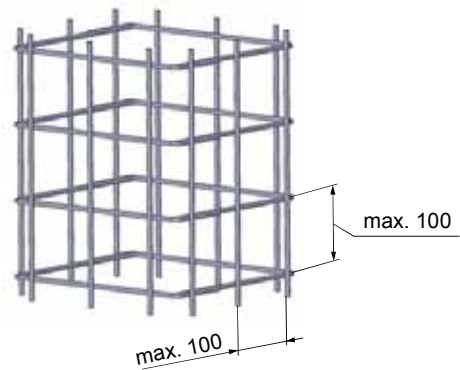
Installation on solid ceiling construction



Installation in concrete channel



Rebar - Steel wire Ø 6 mm



POSITION:

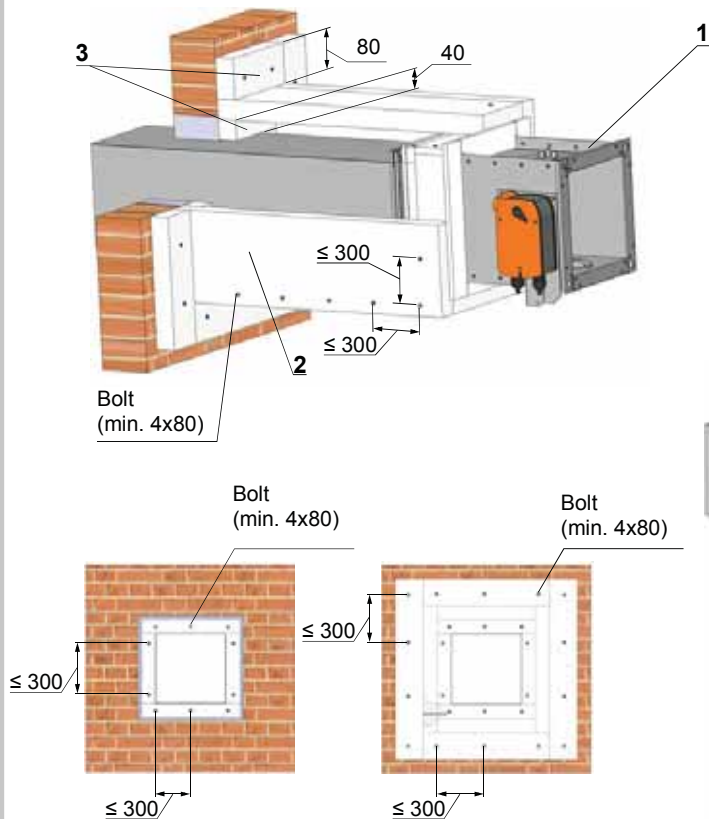
- 1 FDMB-S with installation frame E4
- 2 Fitting with threaded rods or steel bracket
- 3 Concrete B20
- 4 Rebar

Installation opening a x b:

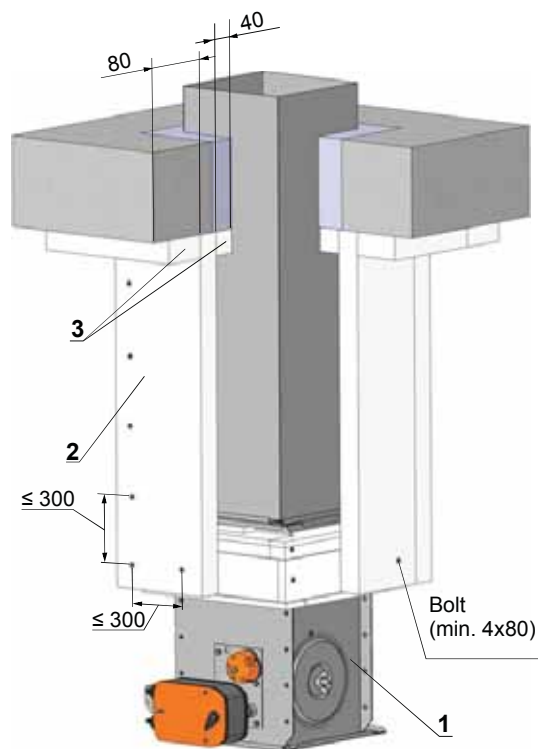
- $a \times b = (A + 5^{+3} \text{ mm}) \times (B + 5^{+3} \text{ mm})$;
- $a \times b = (A + 100^{+3} \text{ mm}) \times (B + 100^{+3} \text{ mm})$; - installation in concrete channel
- A x B = damper nominal size

Fig. 63 Installation frame E6

Installation outside of solid wall construction



Installation outside of solid ceiling construction



Installation opening a x b:

- $a \times b = (A + 100^{+3} \text{mm}) \times (B + 100^{+3} \text{mm})$;
- A x B = damper nominal size

Notice: The bolts must be firmly anchored in the ceiling/wall. (If it is necessary, use the steel bracket.)

POSITION:

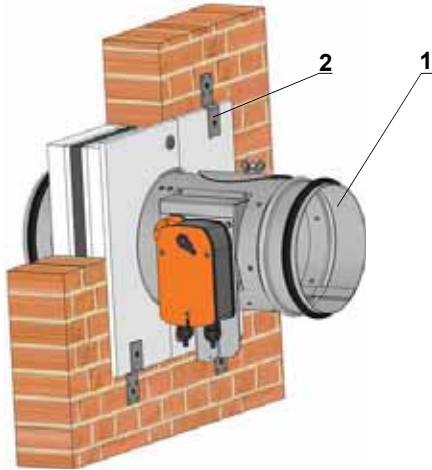
- 1 FDMB-S with installation frame E6
- 2 Isolation - cement lime plate, min. density 450 kg/m³, thickness 40 mm
- 3 Cement lime plate, min. density 450 kg/m³, thickness 40 mm

Notice: All parts are glued with glue Promat K84 and secured by screws.

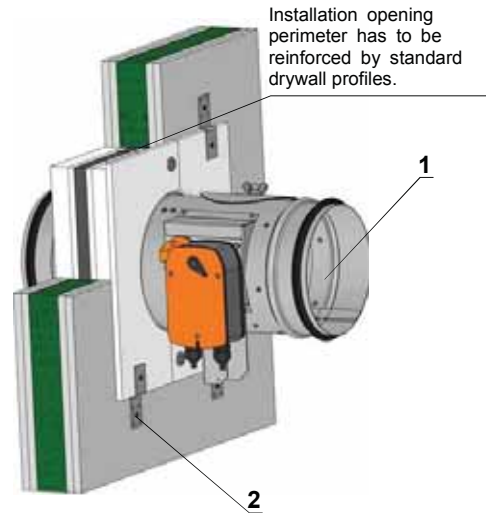
6.3. Damper installation with using installation frames - round dampers

Fig. 64 Installation frames R1, R2

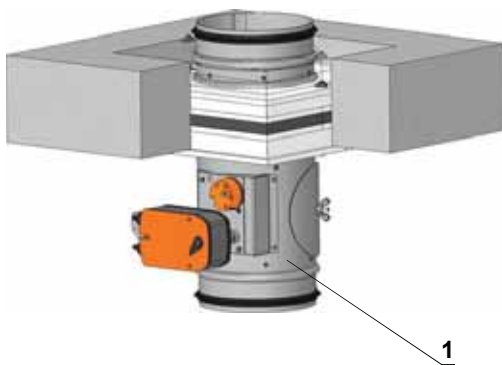
Installation in solid wall construction



Installation in gypsum wall construction



Installation in solid ceiling construction



POSITION:

- 1 FDMB-R with installation frame R1 or R2
- 2 Holder with screws

Installation opening a x b:

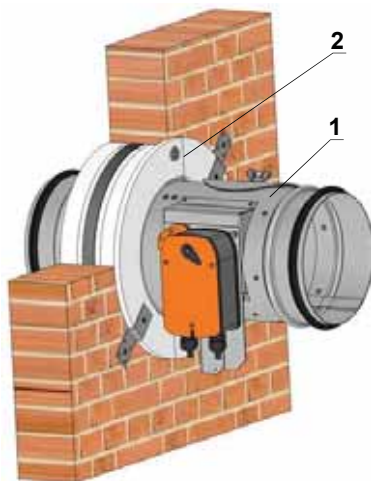
- a x b = (D+145⁺³mm) x (D+145⁺³mm);
- D = Damper nominal size

Notices:

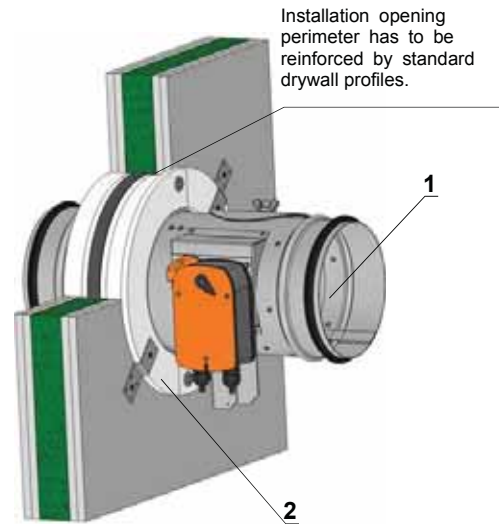
Installation frame R1 - for solid wall construction with thickness 100 mm
 Installation frame R2 - for solid wall construction with thickness 150 mm
 Gap between frame and solid (gypsum) wall construction must be filled by glue (PROMAT K84).

Fig. 65 Installation frame R3, R4

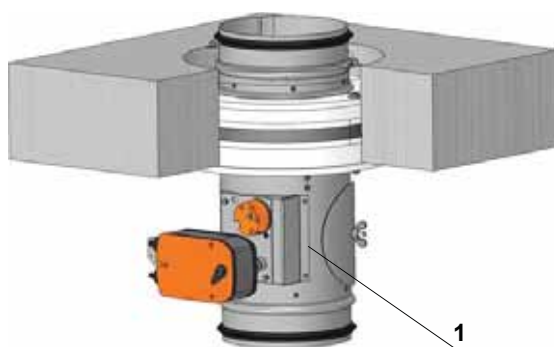
Installation in solid wall construction



Installation in gypsum wall construction



Installation in solid ceiling construction



POSITION:

- 1 FDMB-R with installation frame R3 or R4
- 2 Holder with screws

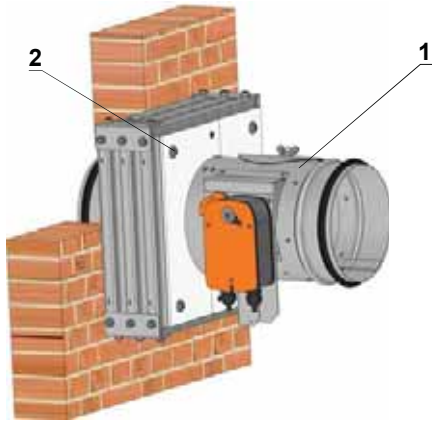
Installation opening:

- $d = (D+111)^{+3} \text{mm}$
- D = damper nominal size

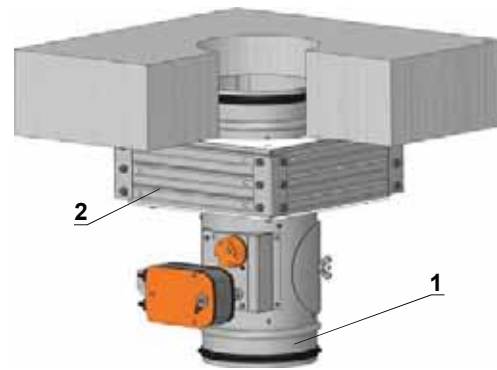
Notices: Installation frame R3 - for solid wall construction with thickness 100 mm
 Installation frame R4 - for solid wall construction with thickness 150 mm
 Gap between frame and solid (gypsum) wall construction must be filled by glue (PROMAT K84).

Fig. 66 Installation frame R5

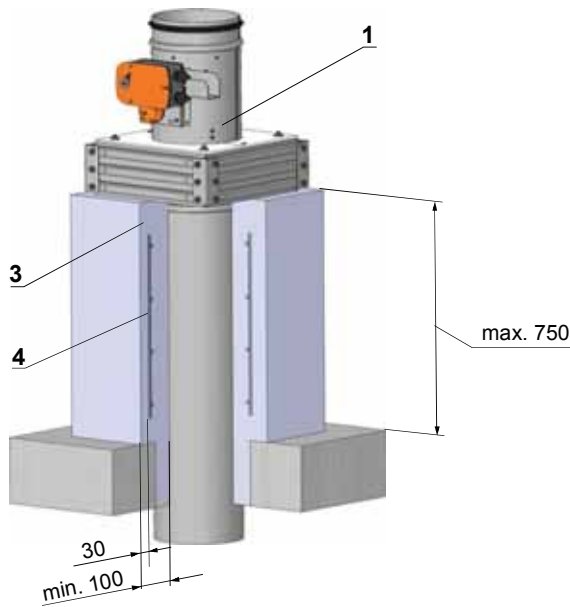
Installation on solid wall construction



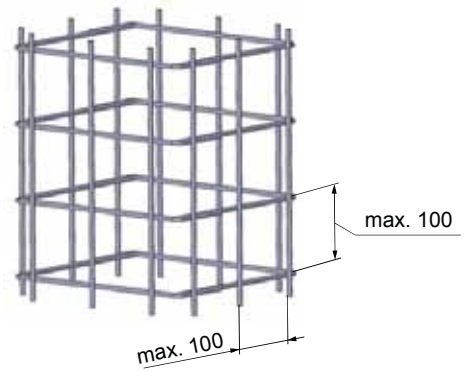
Installation on solid ceiling construction



Installation in concrete channel



Rebar - Steel wire Ø 6 mm



POSITION:

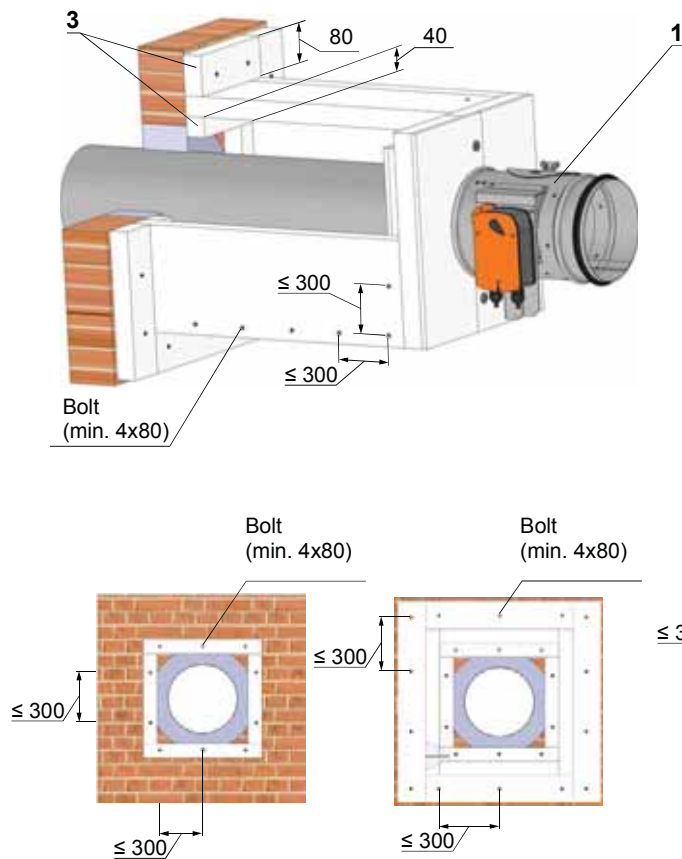
- 1 FDMB-R with installation frame R5
- 2 Fitting with threaded rods or steel bracket
- 3 Concrete B20
- 4 Rebar

Installation opening d:

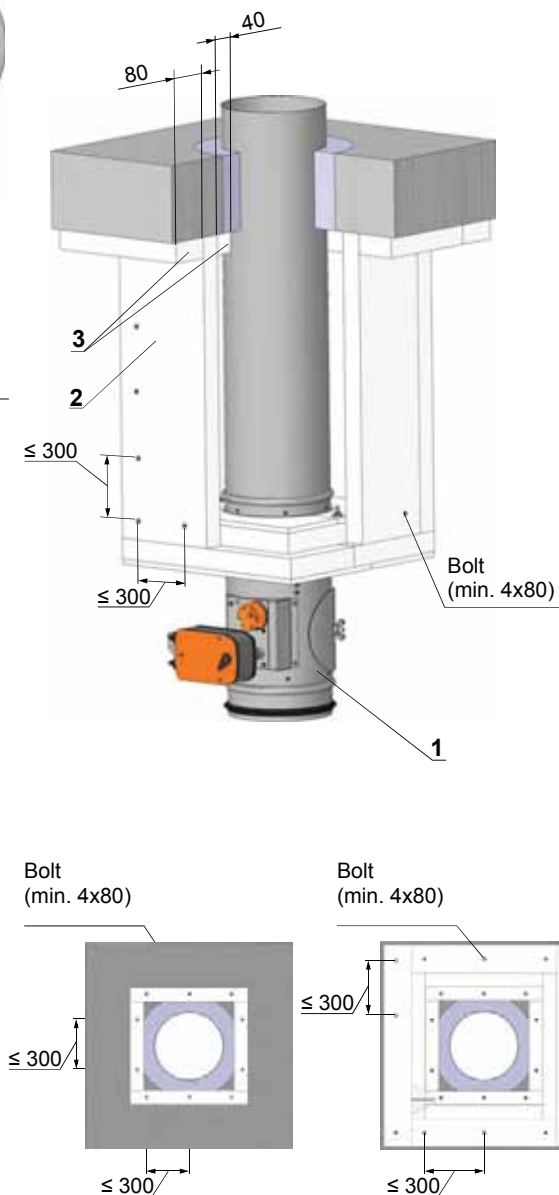
- $d = (D + 10^{+3}mm)$
- $d = (D + 100^{+3}mm)$ - installation in concrete channel
- D = damper nominal size

Fig. 67 Installation frame R6

Installation outside of solid wall construction



Installation outside of solid ceiling construction



Installation opening d:
 • $d = D + 100^{+3} \text{ mm}$
 • $D = \text{Damper nominal size}$

**The bolts must be firmly anchored in the ceiling/wall.
 (If it is necessary, use the steel bracket.)**

POSITION:

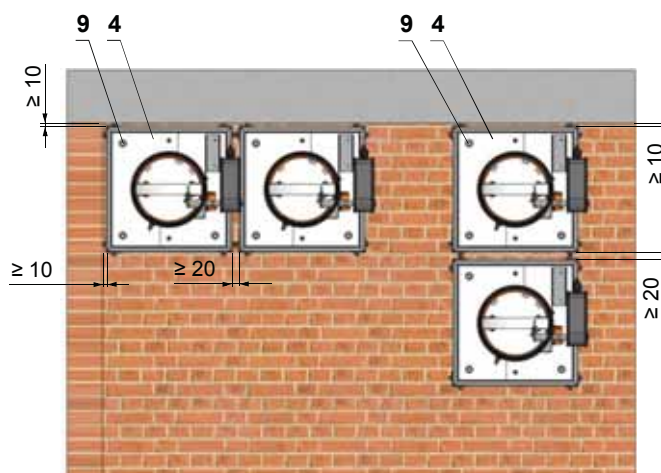
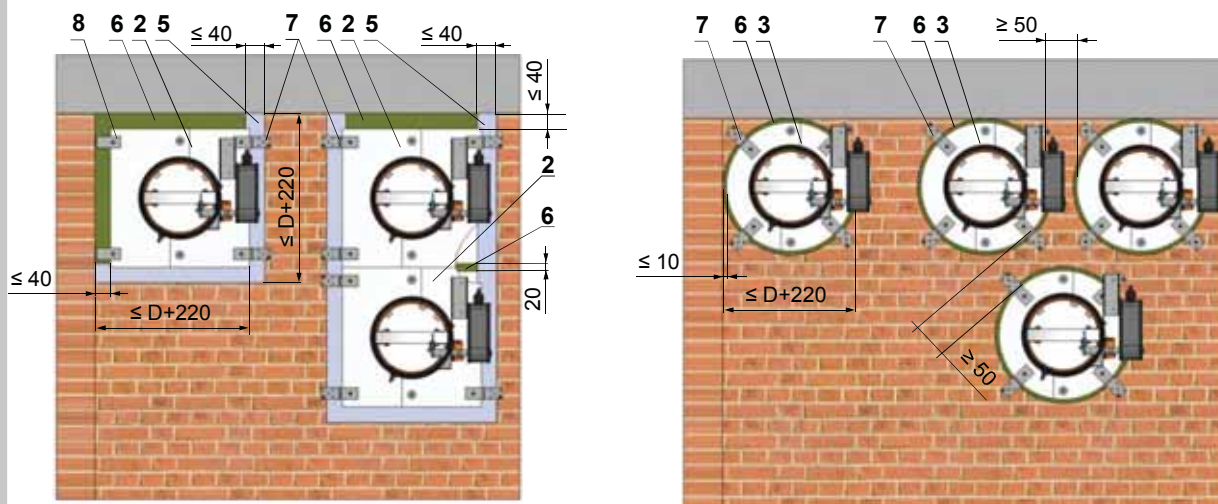
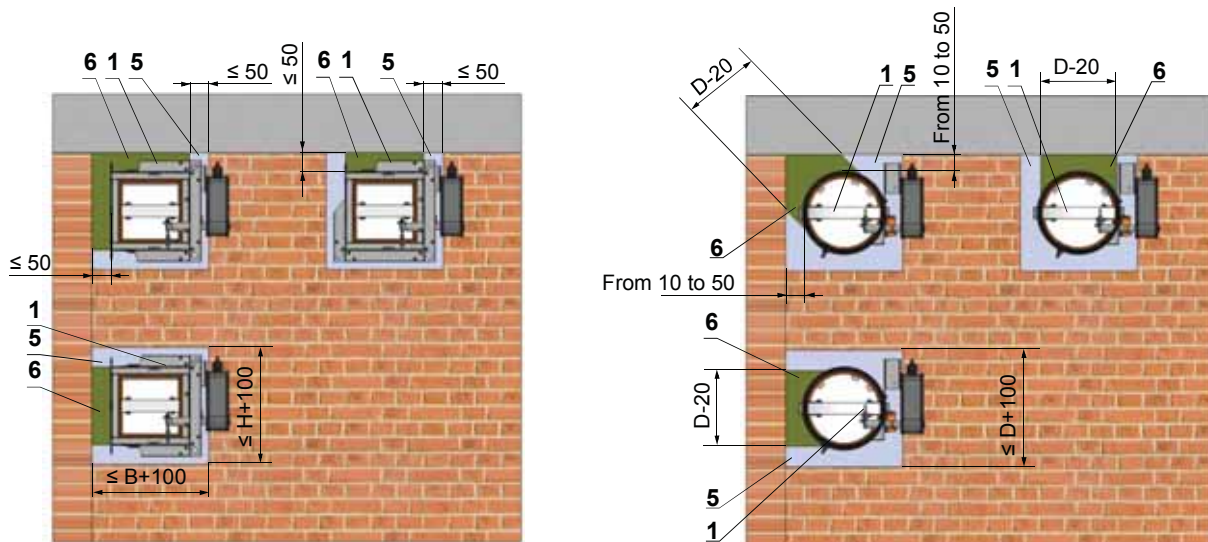
- 1 FDMB-R with installation frame R6
- 2 Isolation - cement lime plate, min. density 450 kg/m³, thickness 40 mm
- 3 Cement lime plate, min. density 450 kg/m³, thickness 40 mm

Notice: All parts are glued with glue Promat K84 and secured by screws.

6.5. Installation in a solid wall construction near the ceiling or wall. Gap is filled by gypsum or mortar and mineral stone wool

Fig. 68 Installation in a solid wall construction

EIS 90



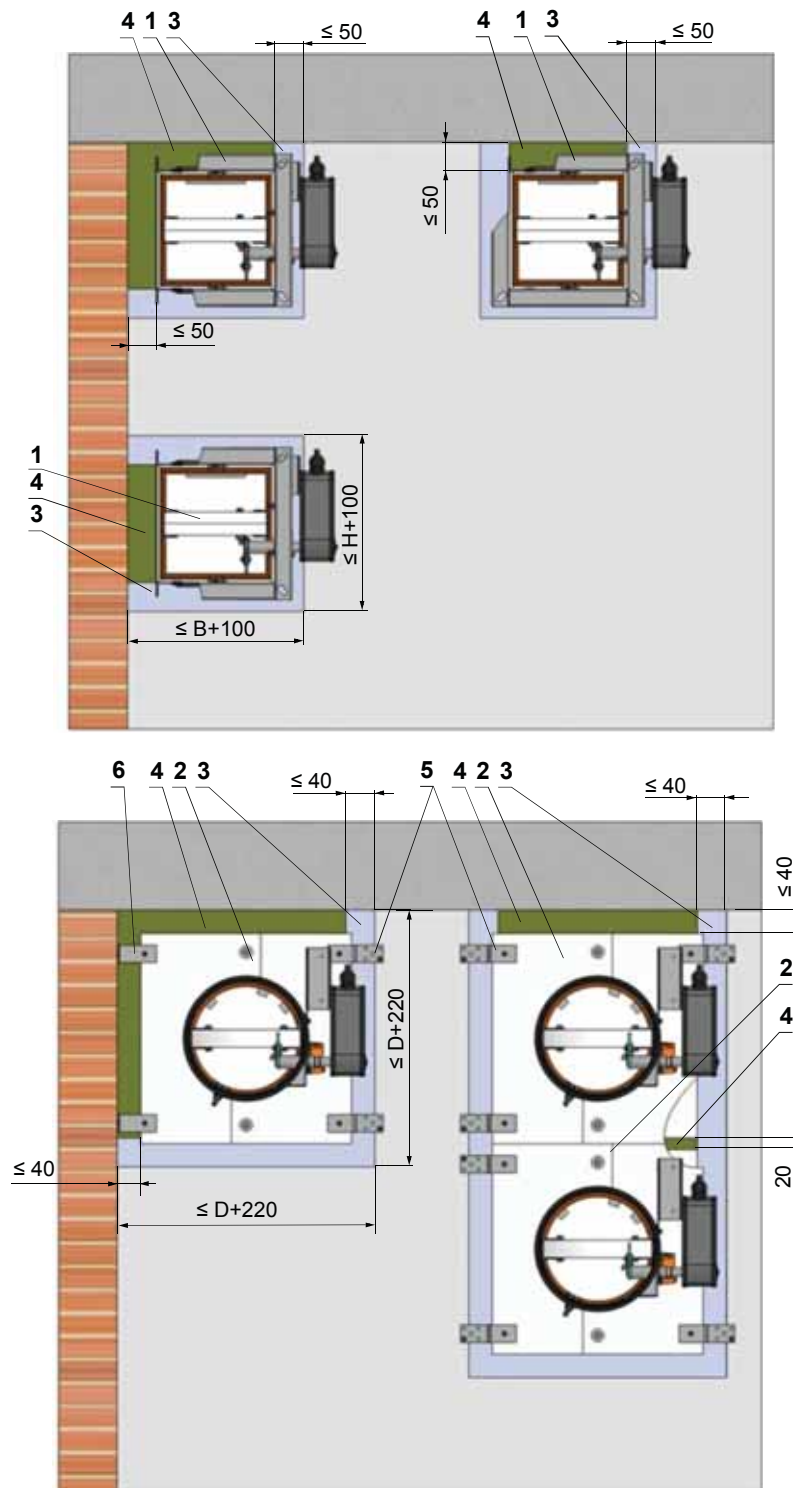
POSITION:

- 1 FDMB
- 2 FDMB with installation frame R1, R2
- 3 FDMB with installation frame R3, R4
- 4 FDMB with installation frame R5
- 5 Gypsum or mortar
- 6 Mineral stone wool, min. density 140 kg/m³
- 7 Holder
- 8 Holder L
- 9 Fitting with threaded rods or steel brackets

4.2. Installation in gypsum wall construction near the ceiling or wall. Gap is filled by gypsum or mortar and mineral stone wool.

Fig. 69 Installation in gypsum wall construction

EIS 90



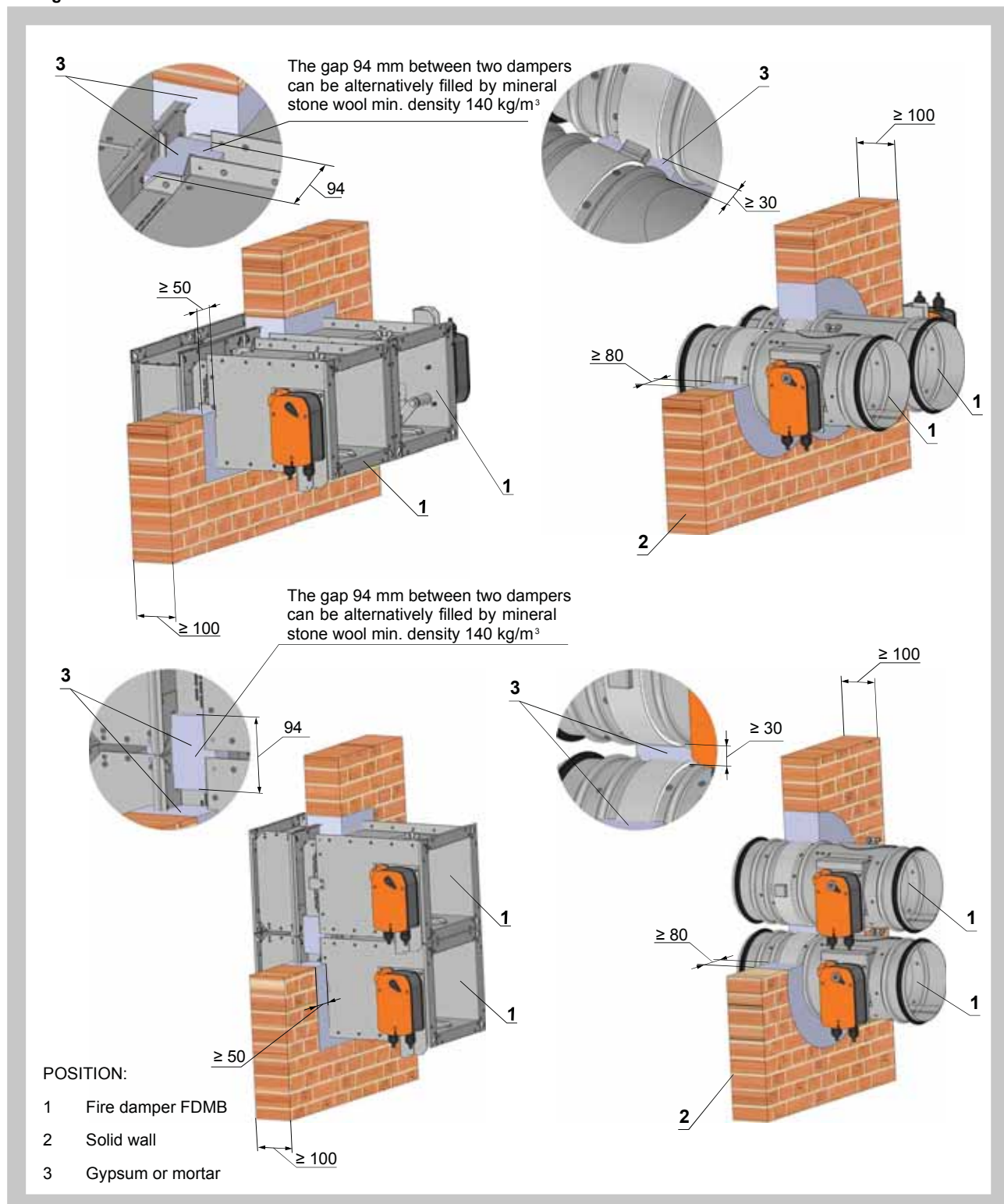
POSITION:

- 1 FDMB
- 2 FDMB with installation frame R1, R2
- 3 Gypsum or mortar
- 4 Mineral stone wool, min. density 140 kg/m³
- 5 Holder
- 6 Holder L

4.3. Installation of 2 fire dampers abreast - solid wall, gap is filled by gypsum or mortar

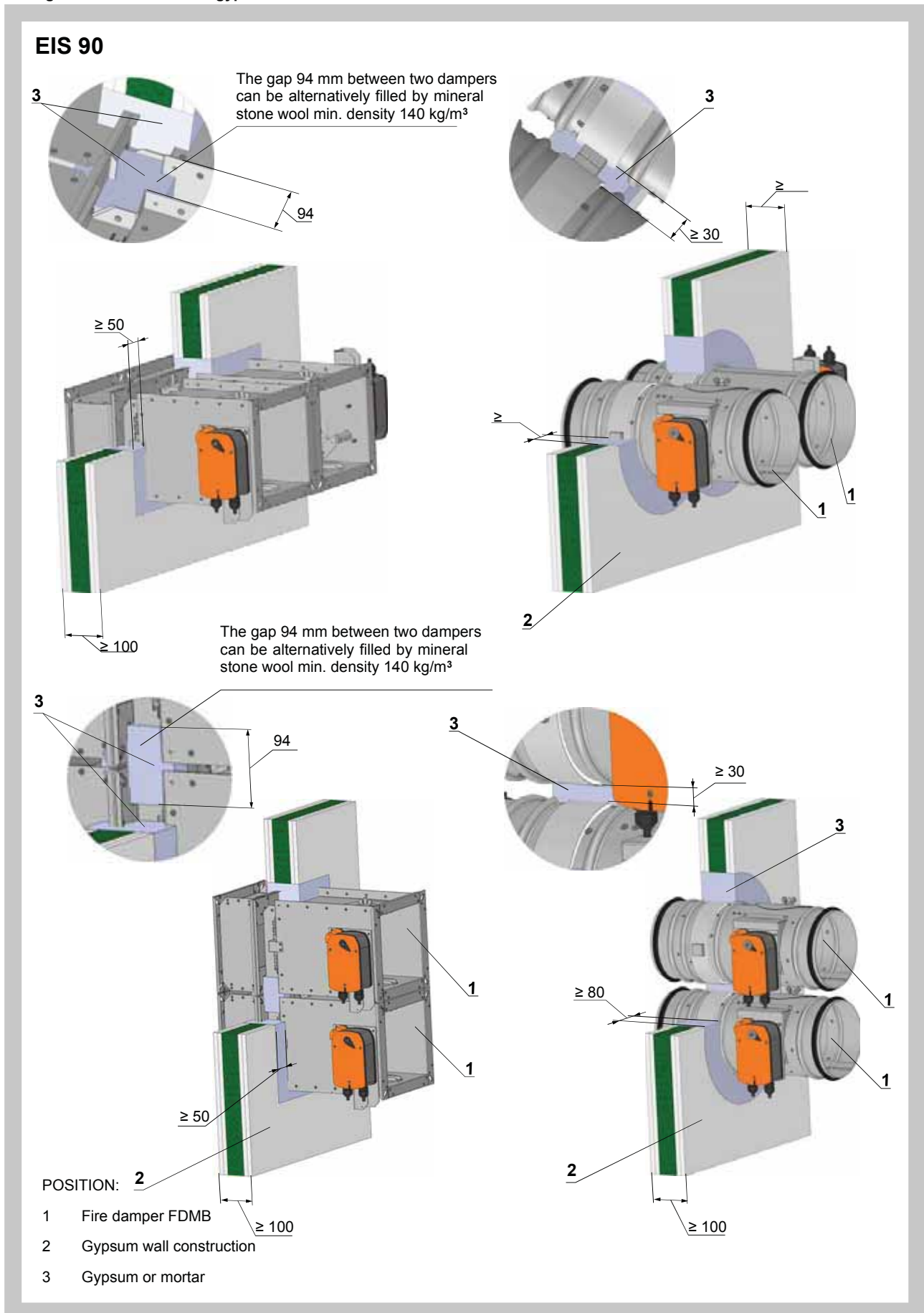
- Installation in solid wall
- Installation opening for one damper $axb = (A+100) \times (B+100)$ or $d = D+160$ mm
- Square dampers - minimum distance between damper and solid construction is 75 mm
- Round dampers - minimum distance between damper and solid construction is 75 mm
- Minimum distance between two square dampers is 60 mm
- Minimum distance between two round dampers is 30 mm
- Maximal size of fire damper is $A \times B - B = 1000$; $A = 1000$ mm but max. area of damper is $0,5 \text{ m}^2$ or $D = 630$ mm
- Fire damper axis has to be installed in horizontal position

Fig. 70 Installation in solid wall



4.4. Installation of 2 fire dampers abreast - solid wall, gap is filled by gypsum or mortar and mineral stone wool

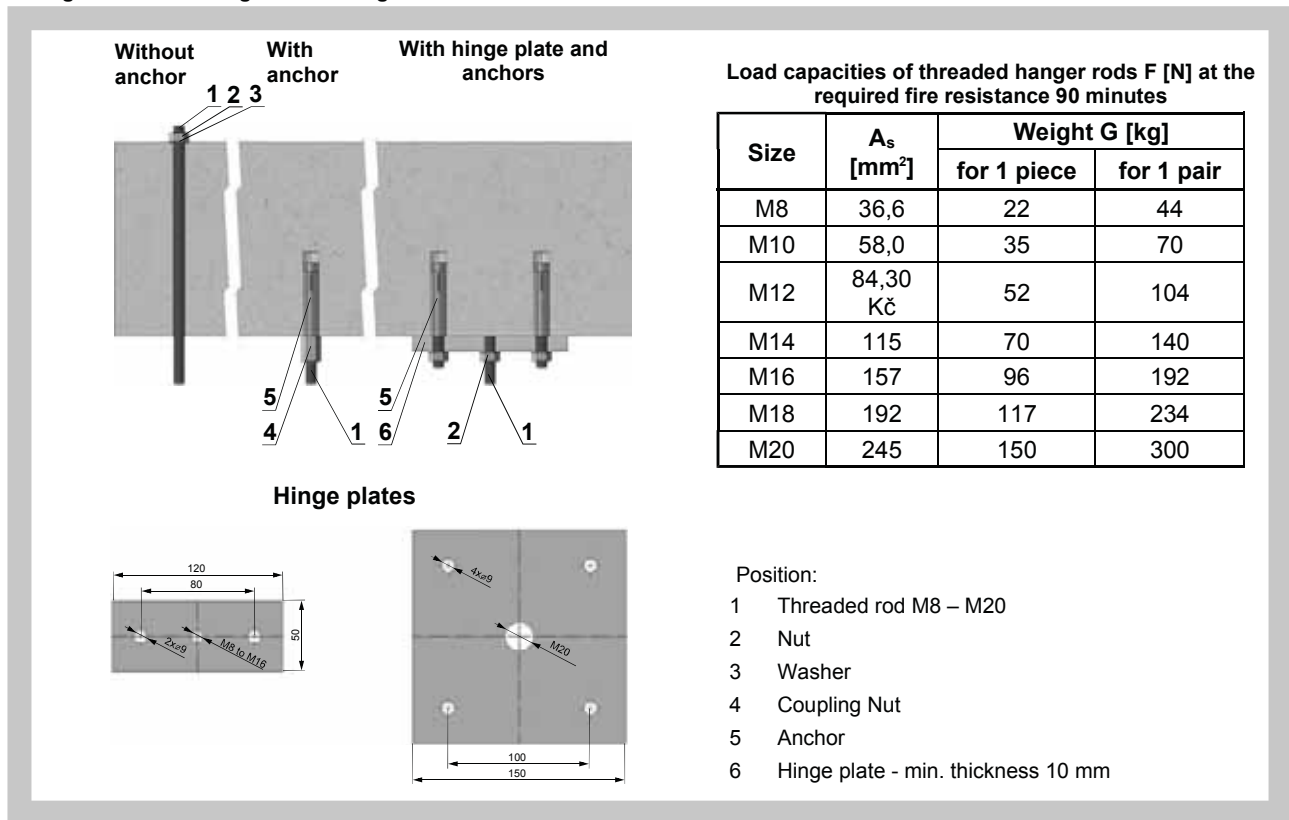
Fig. 71 Installation in gypsum wall



7. Suspension systems

7.1. Mounting to the ceiling wall

Fig. 72 Mounting to the ceiling wall



7.2. Horizontal installation

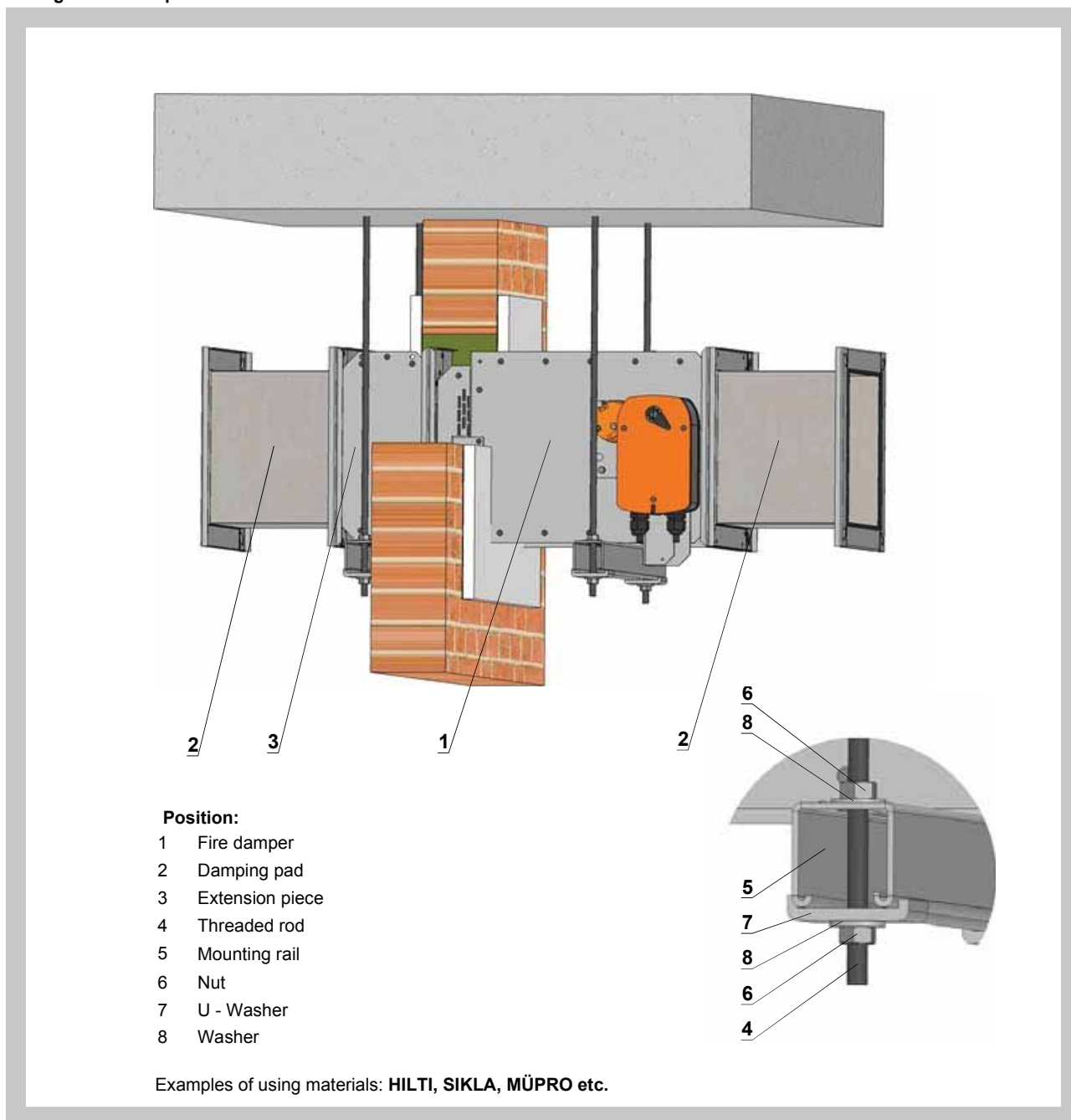
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

Threaded rods longer than 1,5 m require fire-resistant insulation.

Threaded rod fixing to the ceiling construction - see fig. 72

Fig. 73 Suspension - horizontal duct



7.3. Vertical installation

Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

Damper can be suspended from the ceiling construction or supported above the ceiling construction.

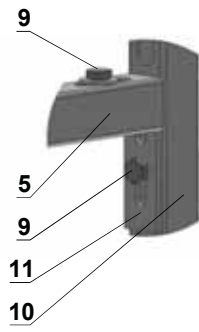
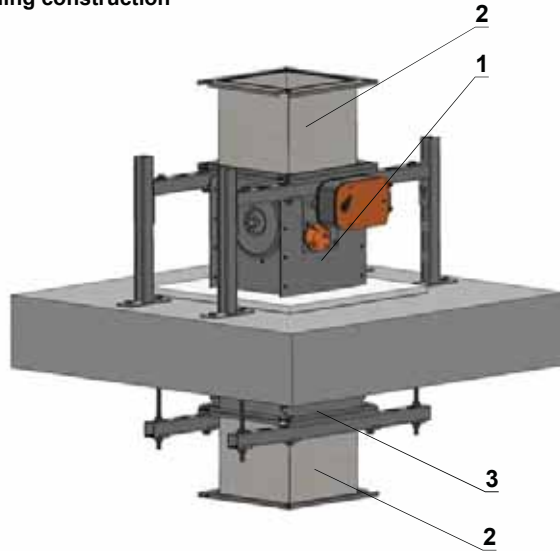
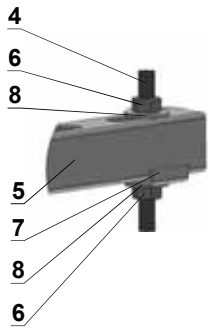
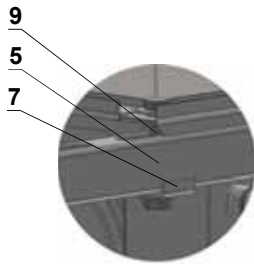
Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

Threaded rods longer than 1,5 m require fire-resistant insulation.

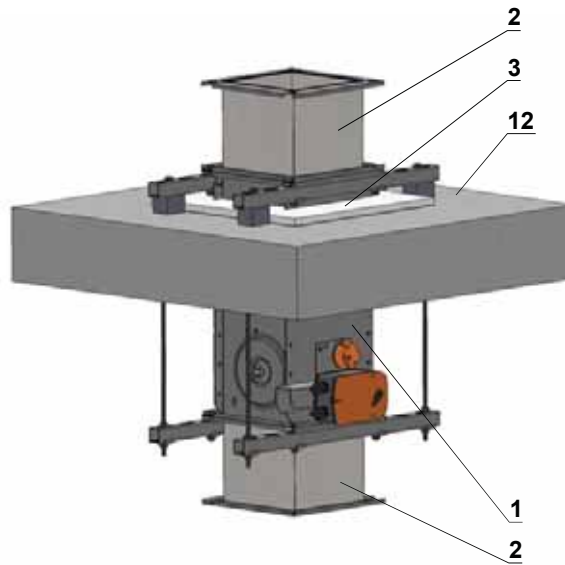
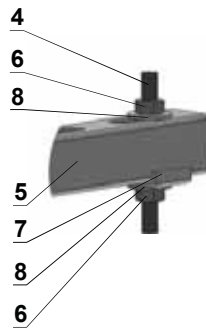
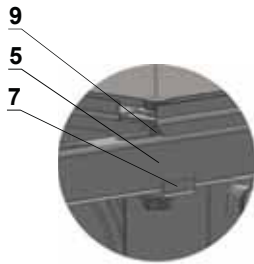
Threaded rod fixing to the ceiling construction - see fig. 72

Fig. 74 Suspension - vertical duct

Actuating mechanism is placed above the ceiling construction



Actuating mechanism is placed under the ceiling construction



Position:

- 1 Fire damper
- 2 Damping pad
- 3 Extension piece
- 4 Threaded rod
- 5 Mounting rail
- 6 Nut
- 7 U - Washer
- 8 Washer
- 9 Screw connection
- 10 Mounting profile
- 11 Mounting bracket
- 12 Fire-resistant board

The examples of using materials: HILTI, SIKLA, MÜPRO etc.

7.4 Rectangular fire damper suspension on the wall - horizontal installation

Duct between fire damper and fire separating construction can be suspended by using threaded rods and mounting profiles. Load the suspension system depend on weight of the fire damper and duct system.

Max. length between two suspension systems is 1500 mm.

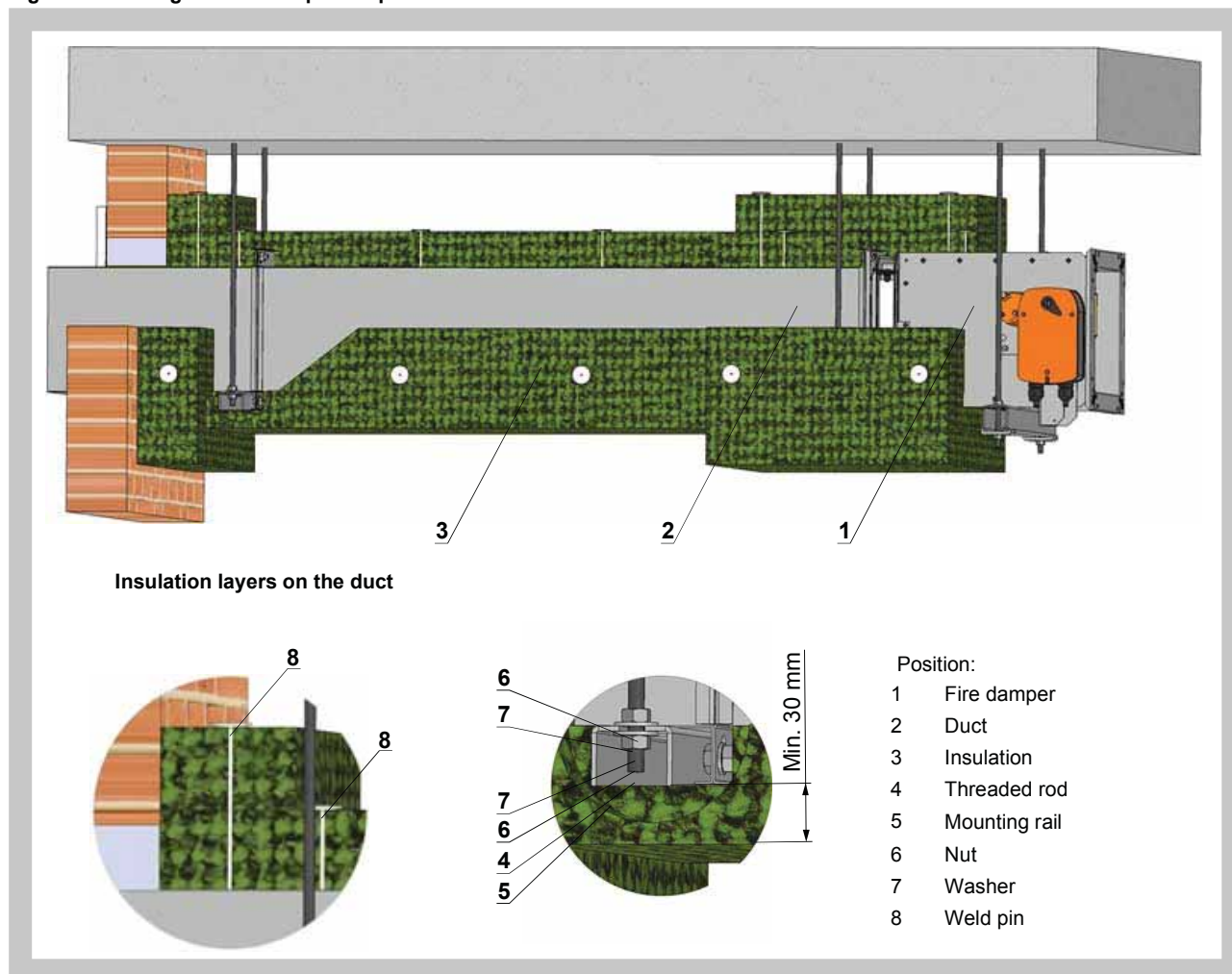
Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

Threaded rods longer than 1,5 m require fire-resistant insulation. If the threaded rod is located inside the duct insulation, distance between threaded rod and duct is max 30 mm. If the threaded rod is located outside the duct isolation, distance between threaded rod and isolation is max. 40 mm. Thickness of the insulation under mounting profile must be min. 30 mm.

Threaded rod fixing to the ceiling construction - see fig. 68

The insulation boards are fastened to the duct by weld pins. Distance between weld pins, distance between weld pins and flanges is dependent on the materials. For more information see documentation of insulation manufacturer.

Fig. 75 Rectangular fire damper suspension on the wall - horizontal installation



7.5 Horizontal installation

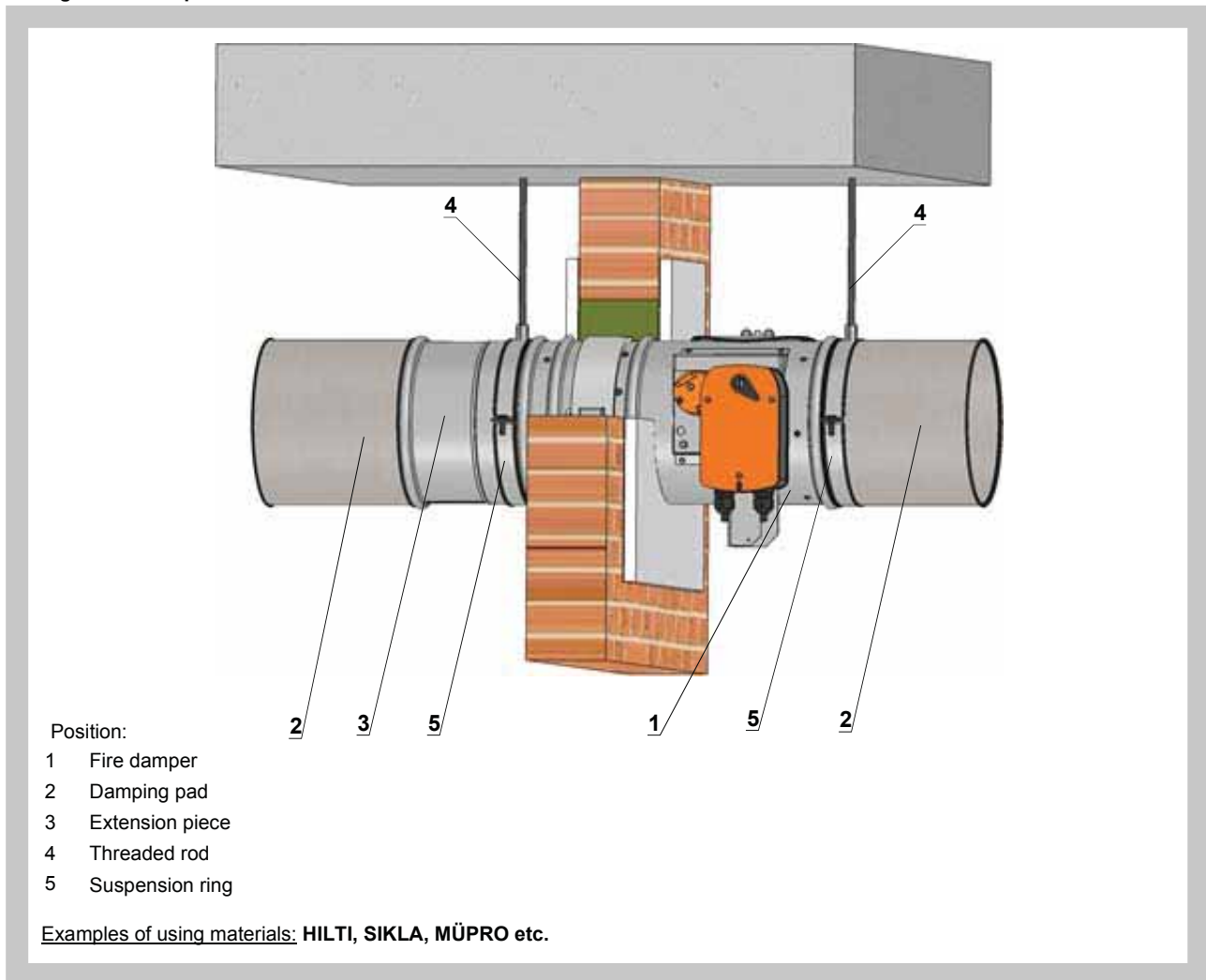
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

Threaded rods longer than 1,5 m require fire-resistant insulation

Threaded rod fixing to the ceiling construction - see fig. 72

Fig. 76 Suspension - horizontal duct



7.6. Vertical installation

Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

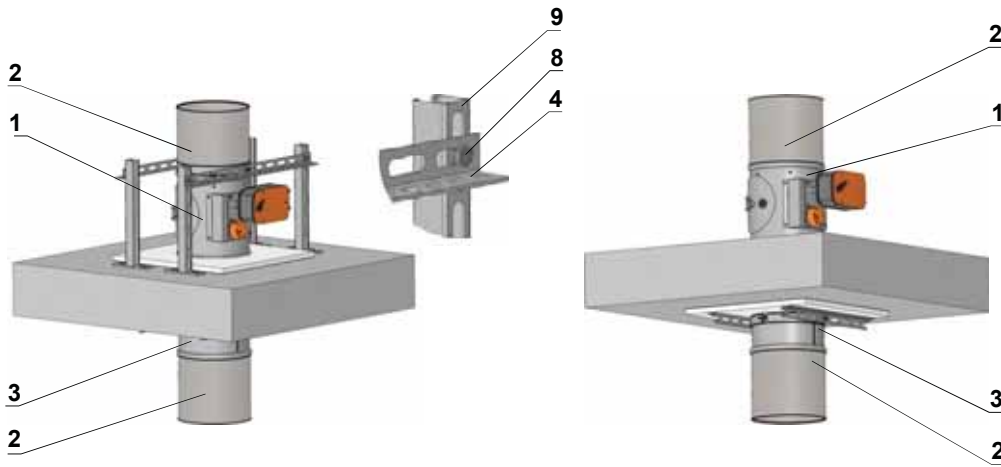
Damper can be suspended from the ceiling construction or supported above the ceiling construction. Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

Threaded rods longer than 1,5 m require fire-resistant insulation.

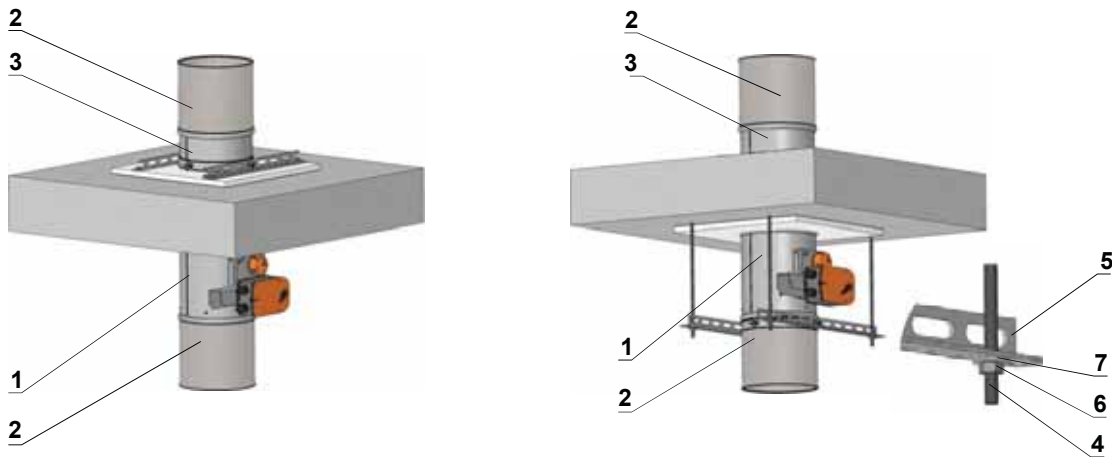
Threaded rod fixing to the ceiling construction - see fig. 72

Fig. 77 Suspension - vertical duct

Actuating mechanism is placed above the ceiling construction

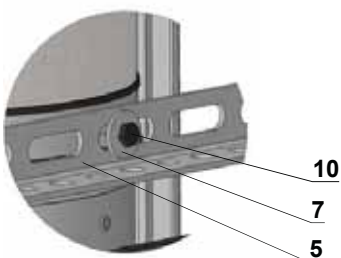


Actuating mechanism is placed under the ceiling construction

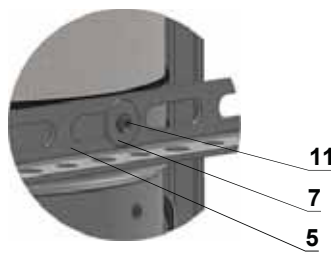


Notice: Damper must be firmly connected with extension piece by screws or rivets.

Suspension ring and mounting rail connected by bolt



Suspension ring and mounting rail connected by screw or rivet



- Position:
- 1 Fire damper
 - 2 Damping pad
 - 3 Extension piece
 - 4 Threaded rod
 - 5 Mounting rail
 - 6 Nut
 - 7 Washer
 - 8 Screw connection
 - 9 Mounting profile
 - 10 Bolt
 - 11 Screw or rivet

Examples of using materials: HILTI, SIKLA, MÜPRO etc.

7.7 Round fire damper suspension on the wall - horizontal installation

Duct between fire damper and fire separating construction can be suspended by using threaded rods and suspension rings. Load the suspension system depend on weight of the fire damper and duct system

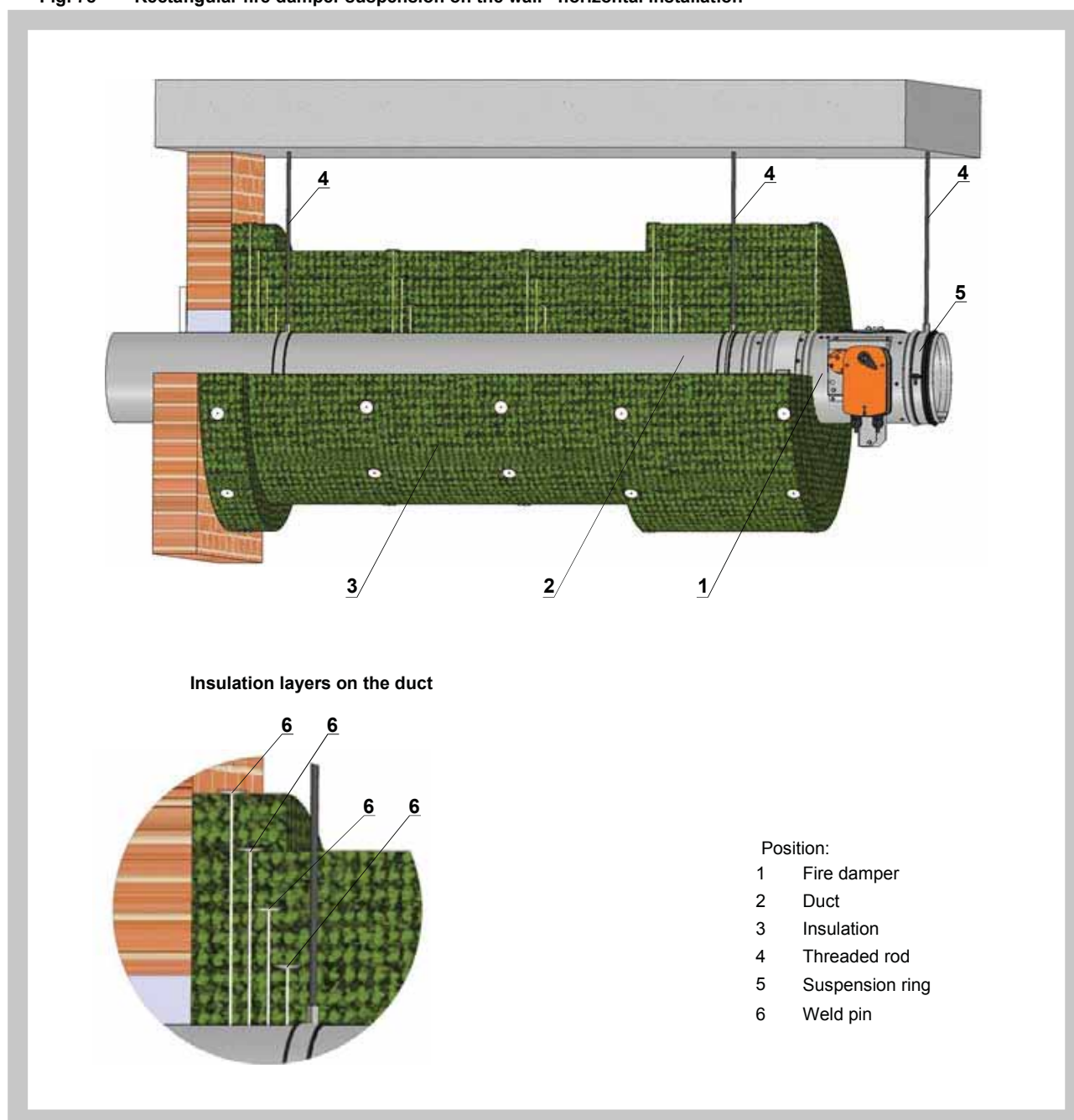
Max. length between two suspension systems is 1500 mm.

Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

Threaded rod fixing to the ceiling construction - see fig. 72

The insulation boards are fastened to the duct by weld pins. Distance between weld pins, distance between weld pins and flanges is dependent on the materials. For more information see documentation of insulation manufacturer.

Fig. 78 Rectangular fire damper suspension on the wall - horizontal installation



III. TECHNICAL DATA

8. Pressure loss

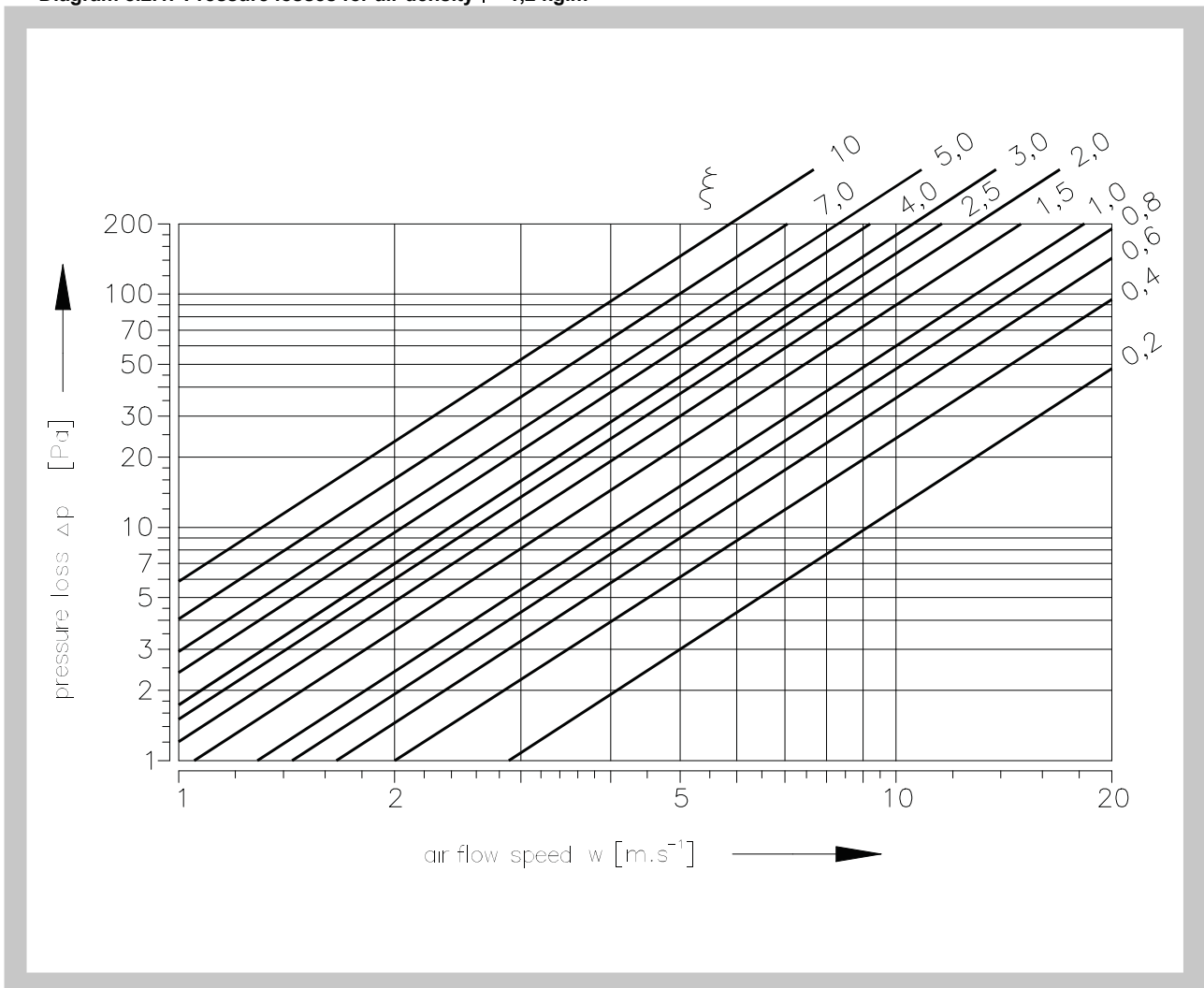
8.1. Pressure loss calculation

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

Δp	[Pa]	pressure loss
w	[m.s ⁻¹]	air flow speed in nominal damper section
ρ	[kg.m ⁻³]	air density
ξ	[-]	coefficient of local pressure loss for the nominal damper section (see Tab. 9.1.1.)

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

Diagram 8.2.1. Pressure losses for air density $\rho=1,2 \text{ kg.m}^{-3}$



9. Coefficient of local pressure loss

9.1. Coefficient of local pressure loss ξ (-) - square dampers

Tab. 9.1.1. Coefficient of local pressure loss - square dampers

A	B											
	160	180	200	225	250	280	300	315	355	400	450	500
160	4,771	3,458	2,717	2,285	1,813	1,538	1,407	1,327	1,165	1,040	2,025	1,874
180	4,102	3,251	2,351	2,016	1,676	1,342	1,221	1,136	0,986	0,922	1,676	1,548
200	3,701	2,951	2,105	1,867	1,554	1,302	1,113	1,052	0,933	0,801	1,445	1,332
225	3,654	2,873	2,056	1,726	1,475	1,226	1,067	1,029	0,917	0,781	1,239	1,172
250	3,588	2,793	2,005	1,675	1,386	1,155	1,033	0,987	0,893	0,736	1,113	1,021
280	3,411	2,692	1,975	1,599	1,341	1,123	0,986	0,916	0,822	0,713	0,996	0,912
300	3,288	2,599	1,903	1,536	1,315	1,101	0,974	0,911	0,787	0,692	0,937	0,857
315	3,102	2,454	1,833	1,489	1,289	0,988	0,933	0,833	0,721	0,634	0,900	0,822
355	2,955	2,302	1,796	1,412	1,199	0,956	0,902	0,799	0,678	0,588	0,821	0,749
400	2,833	2,159	1,703	1,356	1,126	0,931	0,825	0,711	0,635	0,527	0,757	0,689
450	2,732	2,055	1,623	1,302	1,103	0,852	0,777	0,677	0,599	0,507	0,705	0,640
500	2,670	1,988	1,587	1,251	1,025	0,796	0,725	0,618	0,529	0,460	0,666	0,603
550	4,219	2,941	2,237	1,687	1,402	1,156	1,039	0,968	0,827	0,719	0,635	0,575
560	4,194	2,922	2,222	1,623	1,392	1,147	1,031	0,910	0,820	0,713	0,630	0,570
600	4,104	2,857	2,170	1,573	1,357	1,117	1,004	0,935	0,797	0,692	0,611	0,552
630	4,046	2,814	2,137	1,553	1,334	1,098	0,986	0,918	0,782	0,678	0,598	0,540
650	4,010	2,788	2,116	1,526	1,320	1,086	0,975	0,908	0,773	0,670	0,590	0,533
700	3,975	2,759	2,098	1,515	1,297	1,071	0,965	0,892	0,761	0,656	0,581	0,527
710	3,918	2,720	2,062	1,496	1,284	1,055	0,947	0,881	0,749	0,648	0,571	0,515
750	3,865	2,682	2,032	1,475	1,264	1,037	0,931	0,866	0,736	0,636	0,560	0,504
800	3,808	2,640	1,999	1,445	1,241	1,018	0,913	0,849	0,721	0,623	0,547	0,493
900	3,715	2,572	1,946	1,414	1,205	0,988	0,885	0,822	0,697	0,602	0,528	0,474
1000	3,643	2,519	1,904	1,395	1,177	0,964	0,863	0,801	0,679	0,585	0,512	0,460

A	B									
	550	560	600	630	650	710	750	800	900	1000
160	1,761	1,741	1,672	1,627	1,601	1,532	1,493	1,452	1,386	1,336
180	1,451	1,434	1,375	1,337	1,315	1,256	1,224	1,180	1,133	1,090
200	1,246	1,232	1,179	1,146	1,126	1,074	1,046	1,015	0,965	0,928
250	0,952	0,940	0,898	0,871	0,855	0,813	0,790	0,765	0,725	0,695
280	0,849	0,880	0,800	0,775	0,760	0,722	0,701	0,678	0,641	0,613
300	0,797	0,786	0,750	0,726	0,712	0,675	0,655	0,633	0,599	0,572
315	0,764	0,754	0,718	0,695	0,681	0,646	0,626	0,605	0,572	0,546
355	0,694	0,685	0,651	0,630	0,617	0,584	0,566	0,546	0,514	0,490
400	0,637	0,628	0,597	0,577	0,565	0,534	0,516	0,498	0,468	0,445
450	0,591	0,583	0,553	0,534	0,522	0,493	0,476	0,458	0,430	0,408
500	0,556	0,548	0,520	0,501	0,490	0,462	0,446	0,429	0,401	0,380
550	0,529	0,521	0,494	0,476	0,465	0,437	0,422	0,405	0,379	-
560	0,524	0,517	0,489	0,471	0,461	0,433	0,418	0,401	-	-
600	0,507	0,500	0,473	0,455	0,445	0,418	0,403	0,387	-	-
630	0,496	0,489	0,462	0,445	0,435	0,408	0,393	-	-	-
650	0,490	0,482	0,456	0,439	0,428	0,402	0,387	-	-	-
710	0,472	0,465	0,439	0,422	0,412	-	-	-	-	-
750	0,462	0,455	0,429	0,413	0,403	-	-	-	-	-
800	0,451	0,444	0,419	-	-	-	-	-	-	-
900	0,434	-	-	-	-	-	-	-	-	-

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

Tab. 9.2.1. Coefficient of local pressure loss - round dampers

D	160	180	200	225	250	280	315	355	400	450	500	560	630
ξ	1,812	1,380	1,110	0,892	0,747	0,627	0,531	0,455	0,393	0,344	0,307	0,273	0,243

10. Noise data

10.1. Level of acoustic output corrected with filter A.

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

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

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

S [m²] duct cross section

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

10.2. Level of acoustic output in octave ranges.

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

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

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

S [m²] duct cross section

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

10.3. Table of acoustics values

Tab. 10.3.1. Level of acoustic output L_{W1} [dB] related to the 1 m² section - square dampers

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

Tab. 10.3.2. Level of acoustic output L_{w1} [dB] related to the 1 m section - round dampers

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

Tab. 10.3.3. Correction to the weight filter A - square and round dampers

w [m.s ⁻¹]	2	3	4	5	6	7	8	9	10	11	12
K_A [dB]	-15,0	-11,8	-9,8	-8,4	-7,3	-6,4	-5,7	-5,0	-4,5	-4,0	-3,6

Tab. 10.3.4. Relative level expressing the shape of the spectrum L_{rel} - square and round dampers

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

IV. MATERIAL, FINISHING

11. Material

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

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

Damper controls are made of galvanized materials with no other surface finish.

Springs are galvanized.

Thermal protective fuses are made of sheet brass, thickness = 0.5 mm.

Fasteners is galvanized.

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

V. INSPECTION, TESTING

12. Inspection, testing

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

VI. TRANSPORTATION AND STORAGE

13. Logistic terms

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

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

VII. ASSEMBLY, ATTENDANCE, MAINTENANCE AND REVISIONS

14. Assembly

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

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

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

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

- 14.2.** All effective safety standards and directives must be observed during fire damper assembly.

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

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

15. Entry into service and revisions

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

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

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

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

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

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

- 15.3.** Before entering the dampers with manual control into operation after their assembly and by sequential checks, checks according 16.2. and following checks must be carried out.

Check of thermal protective fuse and closing mechanism.

Exert pressure on double arm initiation lever with a spring to release the control lever and check its displacement into the "CLOSED" position. Closing must be smart and the control lever must be firmly locked with a pawl. In case that the closing is not smart enough and the control lever is not locked with the pawl in the "CLOSED" position, higher pre-stretch of the closing spring must be set using a ratchet wheel.

Proper function of the thermal fuse can be checked when the fuse is removed from the starting mechanism pin. The pin must be taken out and the initiation lever must be turned over. If this is not possible, then the pin and the starting mechanism spring must be checked or the base plate must be replaced. The base plate is attached to the damper body with three M5 screws and nuts.

Displacing the damper blade into "OPEN" position is done the following way:

Release the pawl exerting pressure and return the control lever into the second outlaying position where the lever is hold by the initiation lever.

In case of the flap valve with an electromagnet check the control lever displacement into the "CLOSED" position after connecting to power supply.

- 15.4. Before entering the dampers with actuating mechanism into operation after their assembly and by sequential checks, checks according 16.2. and following checks must be carried out.

Check of blade displacement into the breakdown position "CLOSED" can be done after cutting off the actuating mechanism supply (e.g. by pressing the RESET button at the thermoelectrical starting mechanism BAE 72B-S or cutting off the supply from ELECTRICAL FIRE SIGNALISATION). Check of blade displacement back into the "OPEN" position can be done after restoration of power supply (e.g. By releasing the RESET button or restoration of supply from ELECTRICAL FIRE SIGNALISATION).

16. Spare parts

- 16.1. Spare parts are supplied only on basis of an order.
- 16.2. Control for square damper and round damper is identical.

17. Restore function of actuating mechanism after fuses initiation

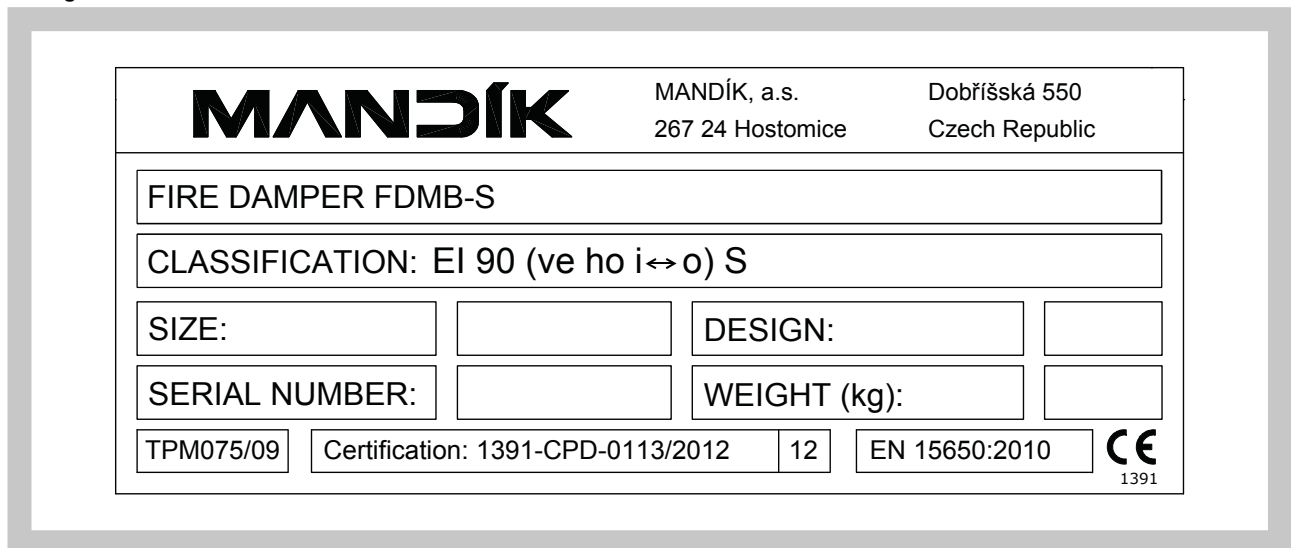
- 17.1. If fuse Tf1 is initiated (duct outside temperature) than is necessary to change thermoelectrical starting mechanism BAE72B-S. Whereas is initiation temperature higher than actuator mechanism operating temperature +50°C, recommended actuating mechanism manufacturer make complete revision or change actuating mechanism and thermoelectrical starting mechanism.
- 17.2. If fuses Tf2/Tf3 are initiated (duct inside temperature) than is possible change only part ZBAE72, or ZBAE95 (according initiating temperature).

VIII. PRODUCT DATA

18. Data label

- 18.1. Data label is placed on the damper body.

Fig. 79 Data label



19. Quick overview

Tab. 19.2.1. Quick Overview

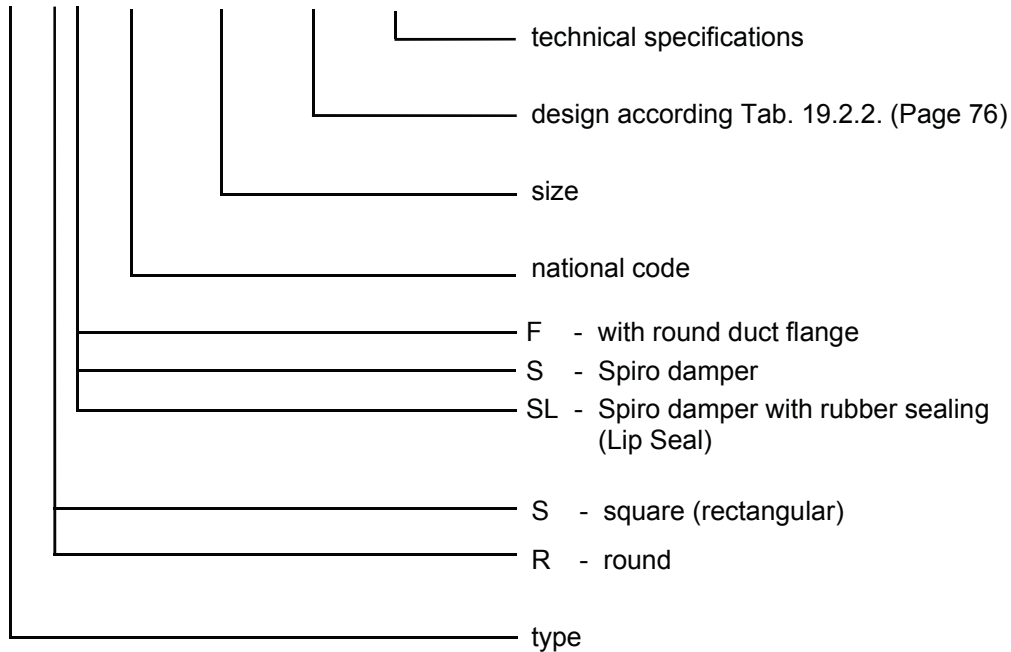
Damper	FDMB			
	Fire separating construction	wall/ceiling Min. thickness [mm]	Installation	Fire resistant
Solid wall construction	100	Mortar or gypsum	EIS 120 EIS 90	43
	100	Mineral stone wool with mastic and cement lime plate	EIS 90	44
	100	Weichschott	EIS 90	45
	100	Mineral stone wool with mastic	EIS 60	56
	100	Installation frame E1 - square damper	EIS 90	59
	150	Installation frame E2 - square damper	EIS 90	60
	100	Installation frame R1 - round damper	EIS 90	64
	150	Installation frame R2 - round damper	EIS 90	64
	100	Installation frame R1 - round damper	EIS 90	65
	150	Installation frame R2 - round damper	EIS 90	65
	100	Installation near the ceiling or wall	EIS 90	68
	100	Installation of 2 fire damper abreast	EIS 90	70
	Gypsum wall construction	100	Mortar or gypsum	EIS 120 EIS 90
100		Mineral stone wool with mastic and cement lime plate	EIS 90	47
100		Weichschott	EIS 90	48
100		Mineral stone wool with mastic	EIS 60	57
100		Installation frame E1 - square damper	EIS 90	59
100		Installation frame E3 - square damper	EIS 90	61
100		Installation frame R1 - round damper	EIS 90	64
150		Installation frame R2 - round damper	EIS 90	64
100		Installation frame R1 - round damper	EIS 90	65
150		Installation frame R2 - round damper	EIS 90	65
100		Installation near the ceiling or wall	EIS 90	69
100		Installation of 2 fire damper abreast	EIS 90	71
Solid ceiling construction		150	Mortar or gypsum	EIS 120 EIS 90
	150	Mineral stone wool with mastic and cement lime plate	EIS 90	50
	150	Weichschott	EIS 90	51
	150	Ucpávka se stěrkou	EIS 60	58
	150	Mineral stone wool with mastic	EIS 90	59
	150	Installation frame E1 - square damper	EIS 90	60
	150	Installation frame E2 - square damper	EIS 90	64
	150	Installation frame R1 - round damper	EIS 90	64
	150	Installation frame R2 - round damper	EIS 90	65
	150	Installation frame R1 - round damper	EIS 90	65
	Outside of solid wall construction	100	Mineral stone wool with mastic and cement lime plate	EIS 90
100		Installation frame R6 - round damper	EIS 90	67
Outside of solid ceiling construction	150	Mineral stone wool with mastic and cement lime plate	EIS 90	54
	150	In concrete channel - installation frame E4 - square damper	EIS 90	62
	150	Installation frame E6 - square damper	EIS 90	63
	150	In concrete channel - installation frame R5 - round damper	EIS 90	66
	150	Installation frame R6	EIS 90	67
On the solid wall construction	100	Installation frame E4 - square damper	EIS 90	62
	100	Installation frame R5 - round damper	EIS 90	66
On the solid ceiling construction	150	Installation frame R5 - round damper	EIS 90	66
	150	Installation frame E4 - square damper	EIS 90	62

IX. ORDERING INFORMATION

19. Ordering key

19.1. Fire damper

FDMB-S/- / XX 800x400 - .40 TPM 075/09



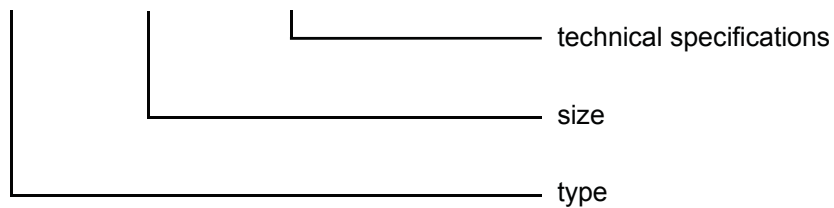
If installation holders, installation frame or design for installation in Weichschott system are requested, it has to be mentioned separately in the order. Installation frame could be fixed to the damper body or supplied separately.

Tab. 19.2.2. Dampers design

Dampers design	Additional digit
Manual and thermal	.01
Manual and thermal with a terminal switch ("CLOSED")	.11
Manual, thermal and with an electromagnet AC 230 V	.20
Manual, thermal and with an electromagnet AC 24 V	.21
Manual, thermal and with an electromagnet DC 24 V	.22
Manual, thermal and with an electromagnet AC 230 V, with a terminal switch ("CLOSED")	.23
Manual, thermal and with an electromagnet AC 24 V, with a terminal switch ("CLOSED")	.24
Manual, thermal and with an electromagnet DC 24 V, with a terminal switch ("CLOSED")	.25
With actuating mechanism BF 230-T (BLF 230-T)	.40
With actuating mechanism BF 24-T (BLF 24-T)	.50
With communication and supply device BKN 230-24 and actuating mechanism BF 24-T-ST (BLF 24-T-ST)	.60
With communication and supply device BKN 230-24MP and actuating mechanism BF 24TL-T-ST (Top-Line) for connection to MP-Bus	.62
With communication and supply device BKN 230-24LON and with actuating mechanism BF 24TL-T-ST (Top-Line) for connection to LonWorks	.64
Manual and thermal with two terminal switches ("OPEN", "CLOSED")	.80
Manual, thermal and with an electromagnet AC 230 V and two terminal switches ("OPEN", "CLOSED")	.82
Manual, thermal and with an electromagnet AC 24 V and two terminal switches ("OPEN", "CLOSED")	.83
Manual, thermal and with an electromagnet DC 24 V and two terminal switches ("OPEN", "CLOSED")	.84

Some designs are possible to supply with optical smoke detector MHG 231. For more information contact manufacturer.

19.2. Reinforcement - damper placement outside wall or ceiling construction

VRM III 800x400 TPM 075/09

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