

CE

TPM 018/01

Revision 4
Valid from 20/6/18

EN 15650:2010-09

MANDIK®

FIRE DAMPER
FDMA



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

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II. GENERAL INFORMATION

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 BAT is activated, when a reset button on BAT 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.

rectangular 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).

Fig. 1 Rectangular FDMA - design with actuating mechanism



Fig. 2 Round FDMA - design with actuating mechanism



- 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 120, 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-CPR-2016/0158
- Declaration of Performance No. PM/PKTM_90/01/16/1
- 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⁻¹
Maximum pressure difference: 1200 Pa
- b) 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 - 30°C to + 50°C.

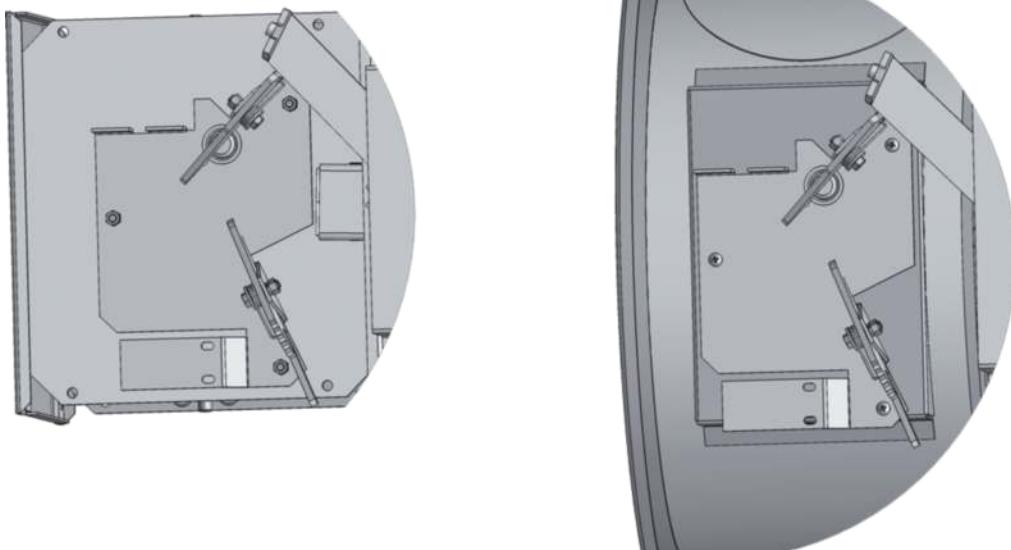
2. Design

2.1. Design with mechanical control

Design .01

Design with mechanical control with a thermal protective fuse which actuates the shutting device 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).

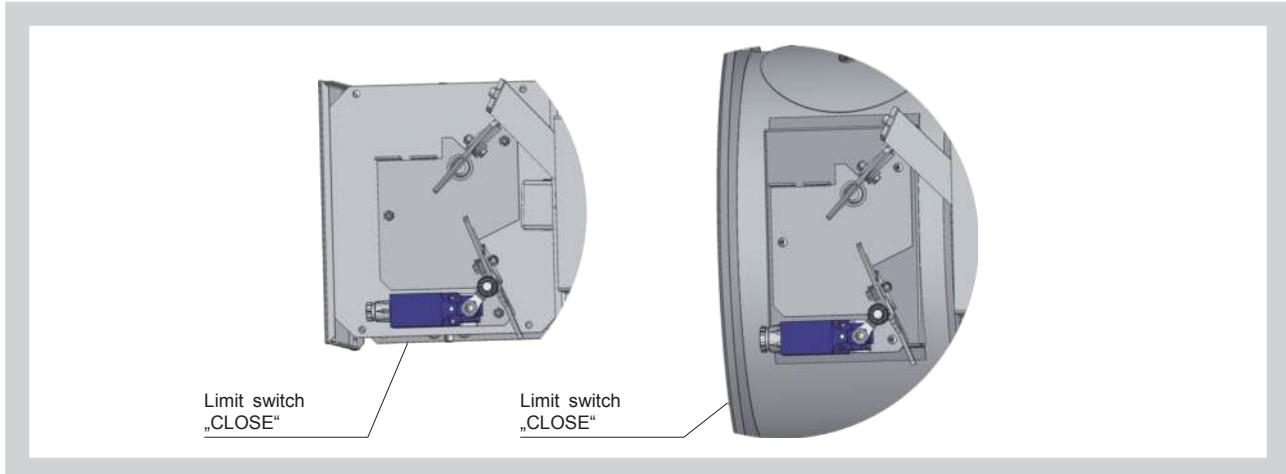
Fig. 3 Design with mechanical control



Design .11

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

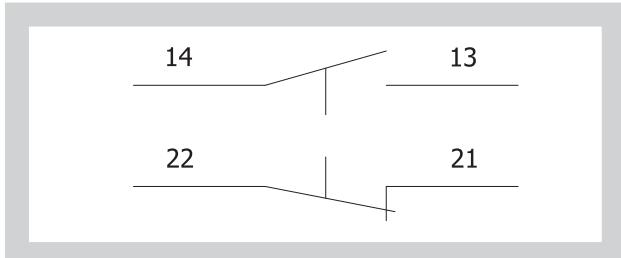
Fig.4 Design with mechanical control and limit switch



Tab. 2.1.1. Limit switch XCKN2118G-11

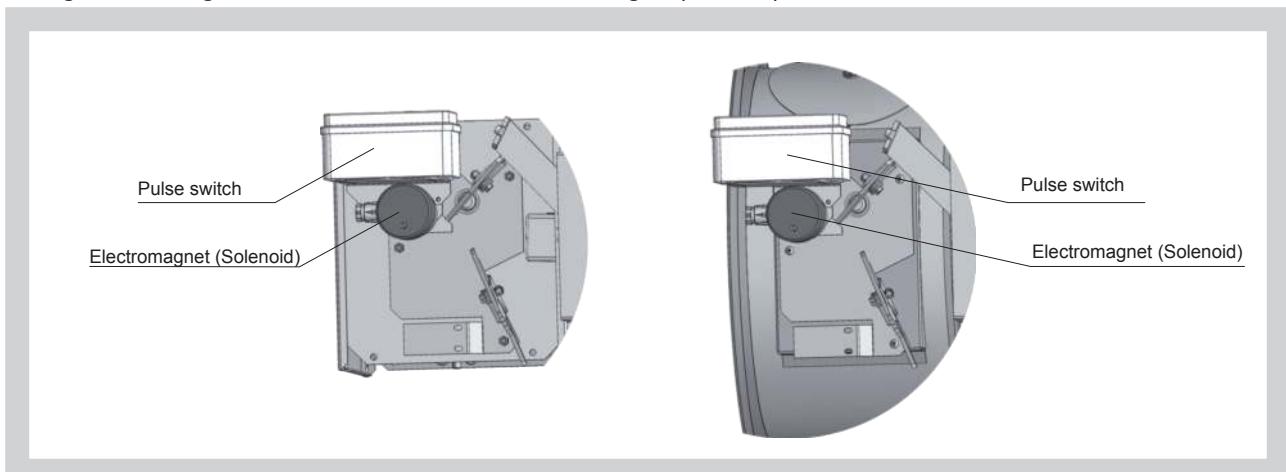
Koncový spínač XCKN2118G-11	
Jmenovité napětí, proud	AC 240 V; 3 A DC 250 V; 0,1 A
Krytí	IP 65
Teplota okolí provozní	-15 °C ... +70 °C

Fig. 5 Limit switch XCKN2118G-11

**Design .20 and .21**

Design .01 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 which 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.

Fig. 6 Design with mechanical control and electromagnet (solenoid)



Tab. 2.1.2. Elektromagnet 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

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. 7 Elektromagnet EM230

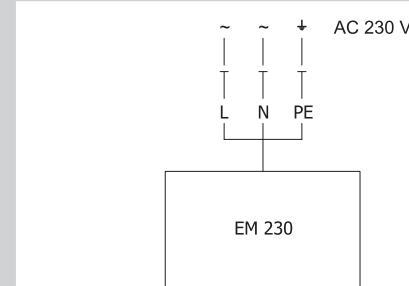
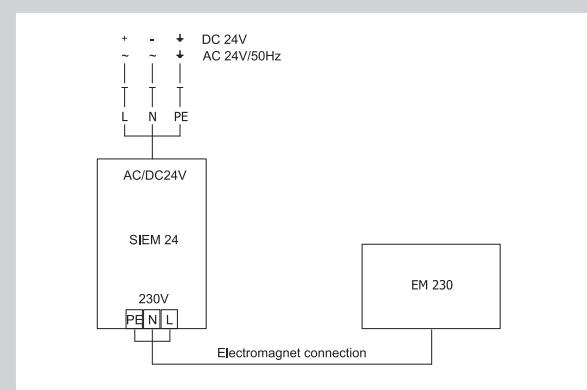


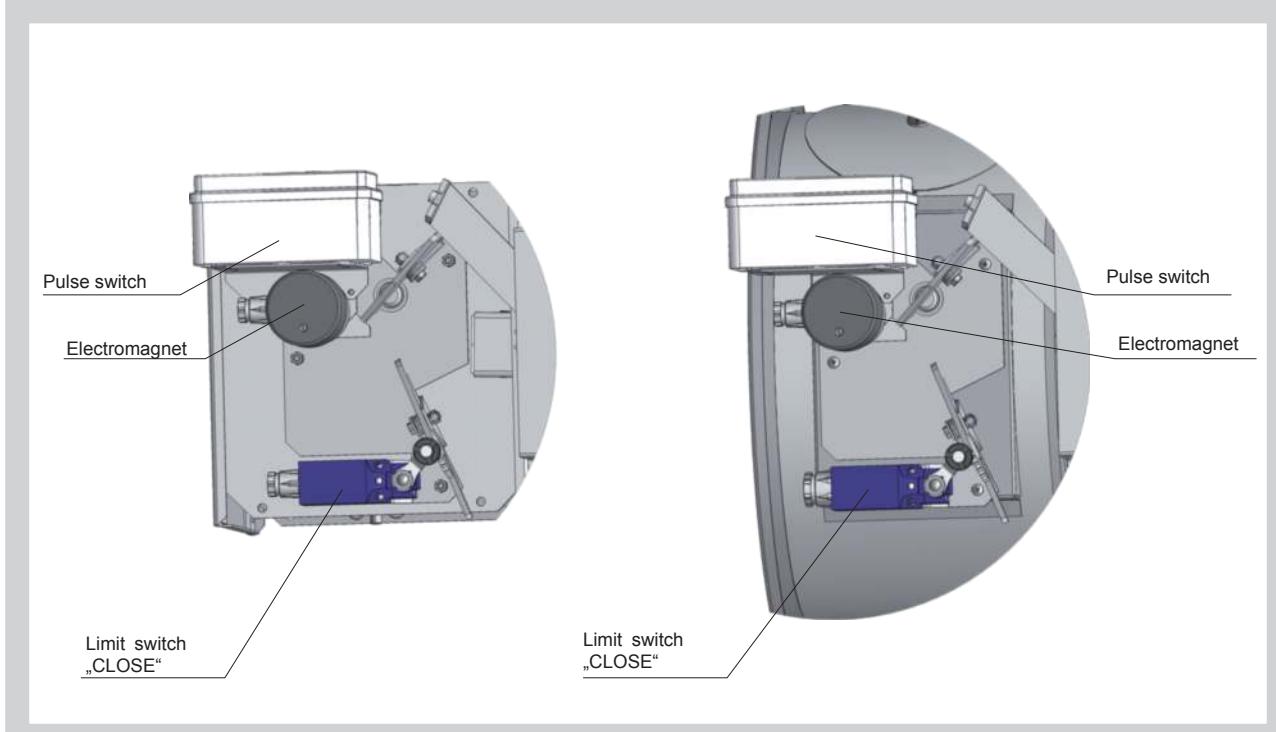
Fig. 8 Electromagnet EM230 with pulse switch SIEM24



Design .23 and .24

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

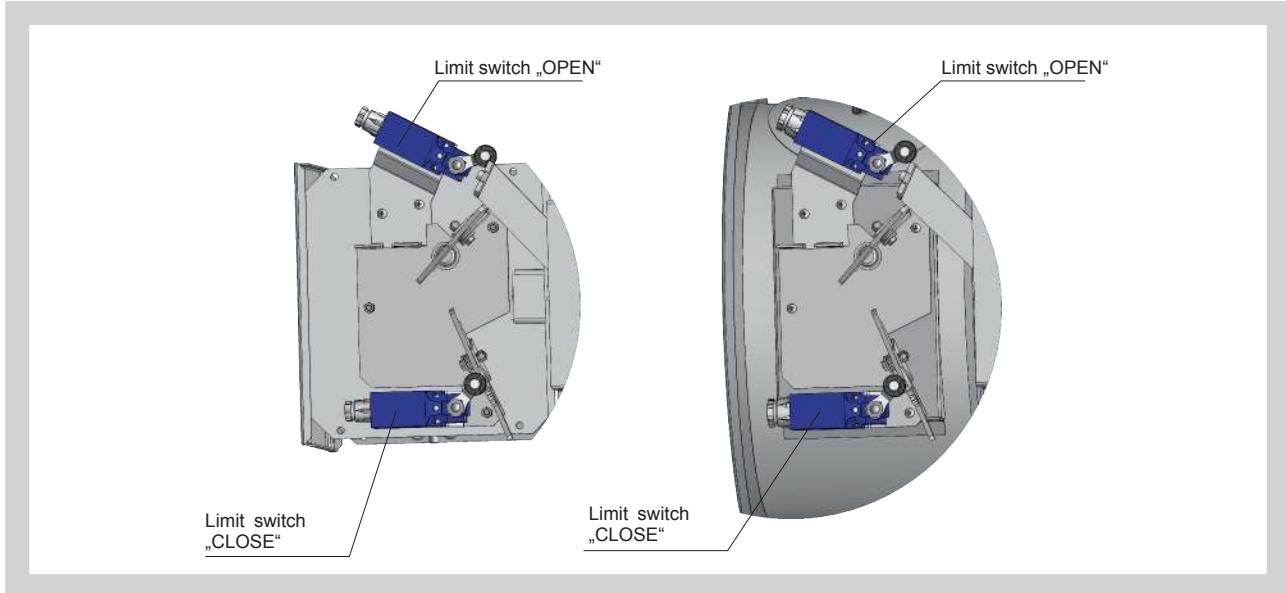
Fig. 9 Design with mechanical control, electromagnet (solenoid) and limit switch



Design .80

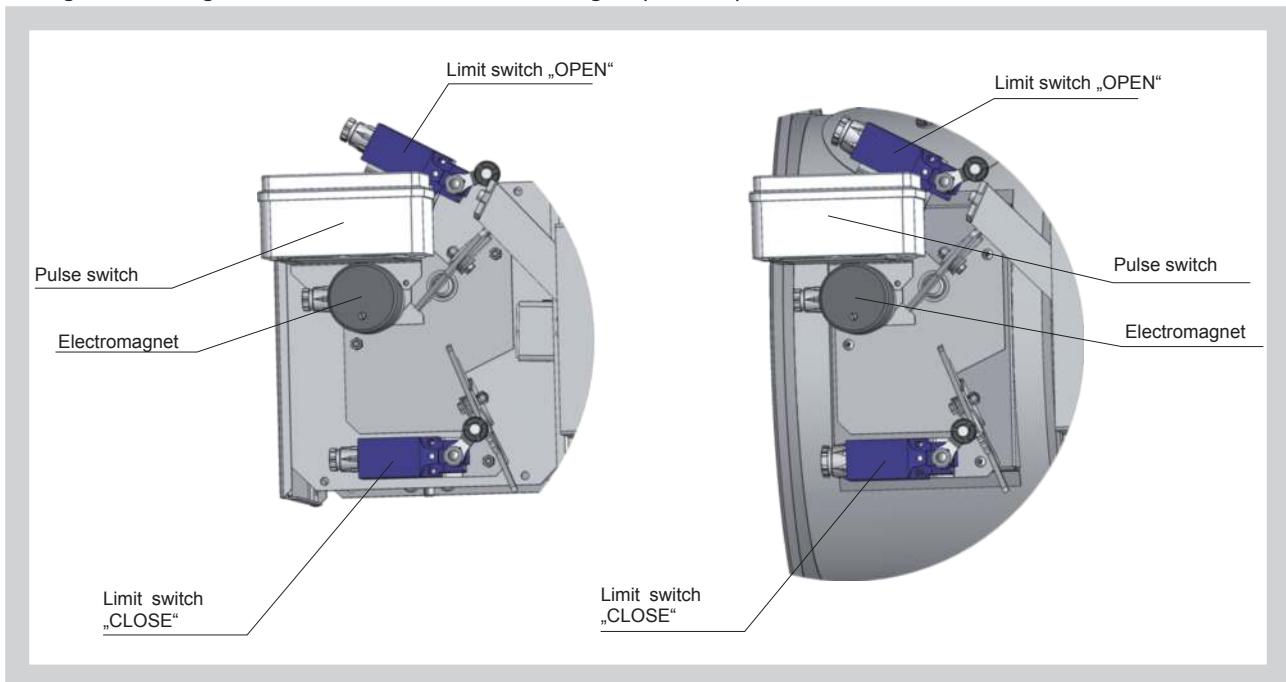
Design .11 can be complemented with a terminal switch signalling of the damper blade position "OPEN".

Fig. 10 Design with mechanical control and limit switches

**Design .82 and .83**

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

Fig. 11 Design with mechanical control, electromagnet (solenoid) and limit switches

**Product designed into the Zone 2 (designs .30, .33, .85)**

Product is designed to the Zone 2 with mechanical actuating mechanism and fusible link, electromagnetic initiator (AC 230V) and auxiliary with end-switches (signalling the position of the blade "Open" or/and "Close"). Such designs are the same as the designs .23, .24 and .83 and they are adapted to fulfill the requirements of the usage in the Non-explosive environment.

2.2. Design with electric actuating mechanism

Design .40, .50

FDMB is always equipped by electric actuating mechanism BFL, BFN, BF 230-T or BFL, BFN, BF 230-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, or pushing the reset button on the thermoelectrical starting mechanism BAT), 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 20 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 BAT, which contains two thermal fuses Tf1 and Tf2, 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 when the temperature inside the air-conditioning piping has been exceeded). After the thermal fuse Tf1 or Tf2 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".

Signalisation of damper blade position "OPEN" a "CLOSE" is provided by two limit switches.

Fig. 12 Design with actuating mechanism

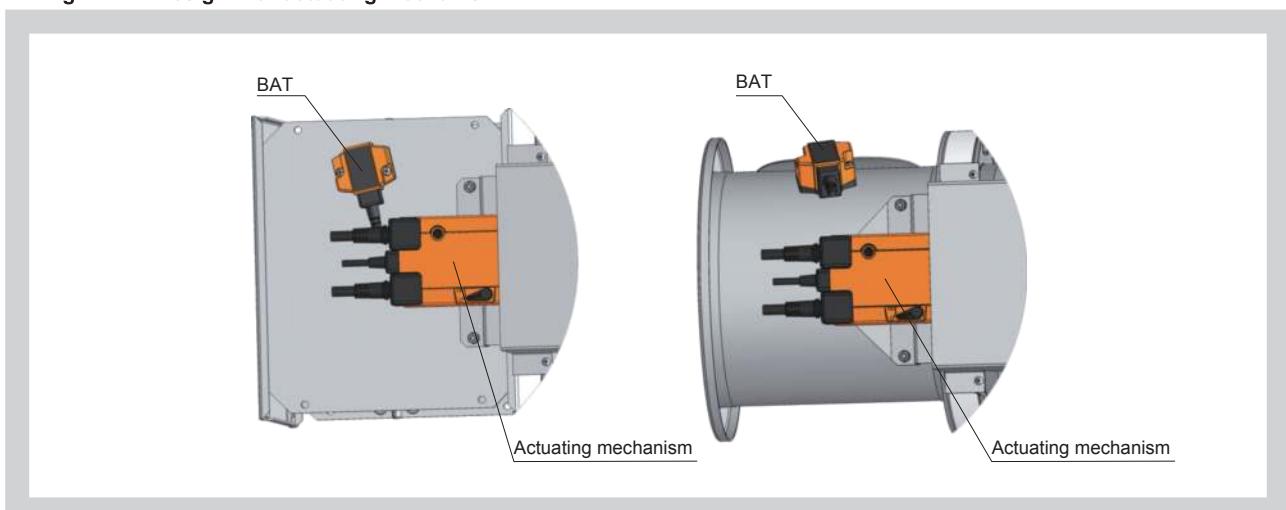
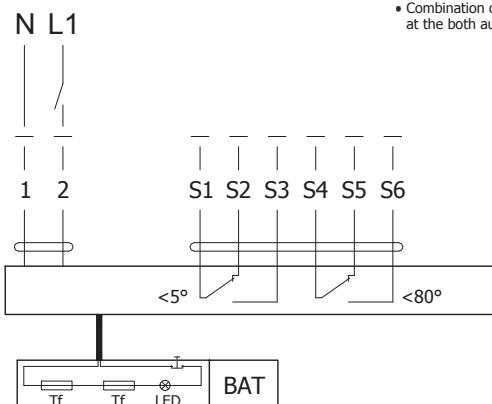


Fig. 13 Actuating mechanism BELIMO BFL, BFN 230-T

AC230 V, open-close

Notes

- Caution: Power supply voltage!
- The actuator must be protected by a fuse that does not exceed 16 A.
- Parallel connection of other actuators possible. Observe the performance data.
- Combination of power supply voltage and safety extra-low voltage not permitted at the both auxiliary switches.



Cable colours:

- | |
|-------------|
| 1 = blue |
| 2 = brown |
| S1 = violet |
| S2 = red |
| S3 = white |
| S4 = orange |
| S5 = pink |
| S6 = grey |

BFL 230-T



BFN 230-T



Fig. 14 Actuating mechanism BELIMO BFL, BFN 24-T(-ST)

AC/DC 24 V, open-close

Notes

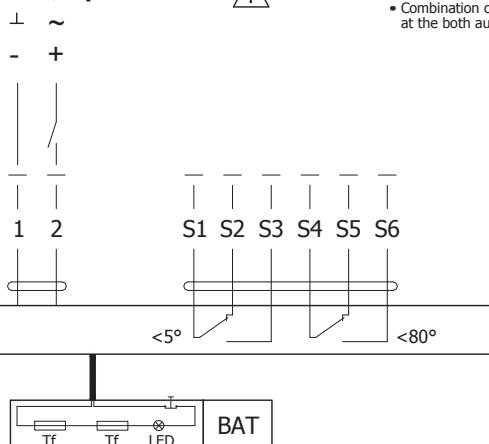
- Connection via safety isolating transformer.
- Parallel connection of other actuators possible. Observe the performance data.
- Combination of power supply voltage and safety extra-low voltage not permitted at the both auxiliary switches.

**(-ST)
Plug connection to communication
and power supply units:**

Application examples for integration into monitoring and control systems or into bus networks can be found in the documentation of the connected communication and power supply unit.

BFL 24-T**BFN 24-T****Cable colours:**

- 1 = blue
2 = brown
S1 = violet
S2 = red
S3 = white
S4 = orange
S5 = pink
S6 = grey



Tab. 2.2.1. Servopohon BELIMO BFL24-T(-ST), BFN 24-T(-ST), BFL 230-T a BFN 230-T

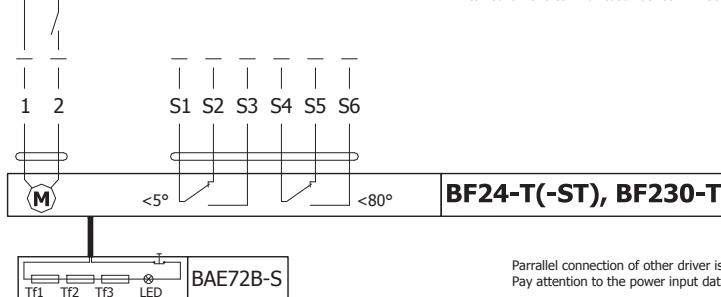
Actuating mechanism BELIMO	BFL, BFN 230-T	BFL, BFN 24-T(-ST)
Nominal voltage	AC 230 V 50/60 Hz	AC 24 V 50/60 Hz DC 24 V
Power consumption - motoring - holding	3,5/5 W 1,1/2,1 W	2,5/4 W 0,8/1,4 W
Dimensioning	6,5/10 VA (Imax 4 A @ 5 ms)	4/6 VA (Imax 8,3 A @ 5 ms)
Protection class	II	III
Degree of protection	IP 54	
Running time - motor - spring return	<60 s ~ 20 s	
Ambient temperature - normal duty - safety duty - non-operating temperature	- 30 °C ... 55 °C The safe position will be attained up to max. 75°C - 40 °C ... 55 °C	
Connecting - motor - auxiliary switch	cable 1 m, 2 x 0,75 mm² (BFL/BFN 24-T-ST) with 3-pin plug-in connectors cable 1 m, 6 x 0,75 mm² (BFL/BFN 24-T-ST) with 6-pin plug-in connectors	
Thermal trips	duct outside temperature 72 °C duct inside temperature 72 °C	

Fig. 15 Actuating mechanism BELIMO BF 230-T, BF 24-T

AC 24 V Connection 24V through an insulation transformer.
DC 24 V
N L1 AC230 V

BF230-T: for separation from the mains, a device that insulates polar conductors must be at disposal (Minimum distance between contacts - 3 mm).

BLF24-ST-T: Design with connector plugs for communication to network and communication device BKN230-24

**BF 230-T, BF 24-T**

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

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 (Imax 8,3 A @ 5 ms)	12,5 VA (Imax 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 intside temperature Duct 72 °C

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-MP and with actuating mechanism BF 24-T (BFL 24-T, BFN 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.

Signalisation of damper blade position "OPEN" a "CLOSE" is provided by two limit switches..

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-MP	Cabel 1m, connected to terminal XT1 Screw terminals on the terminal block XT2 Screw terminals on the terminal block XT1 a XT2

Fig. 16 Socket MHY 734.031

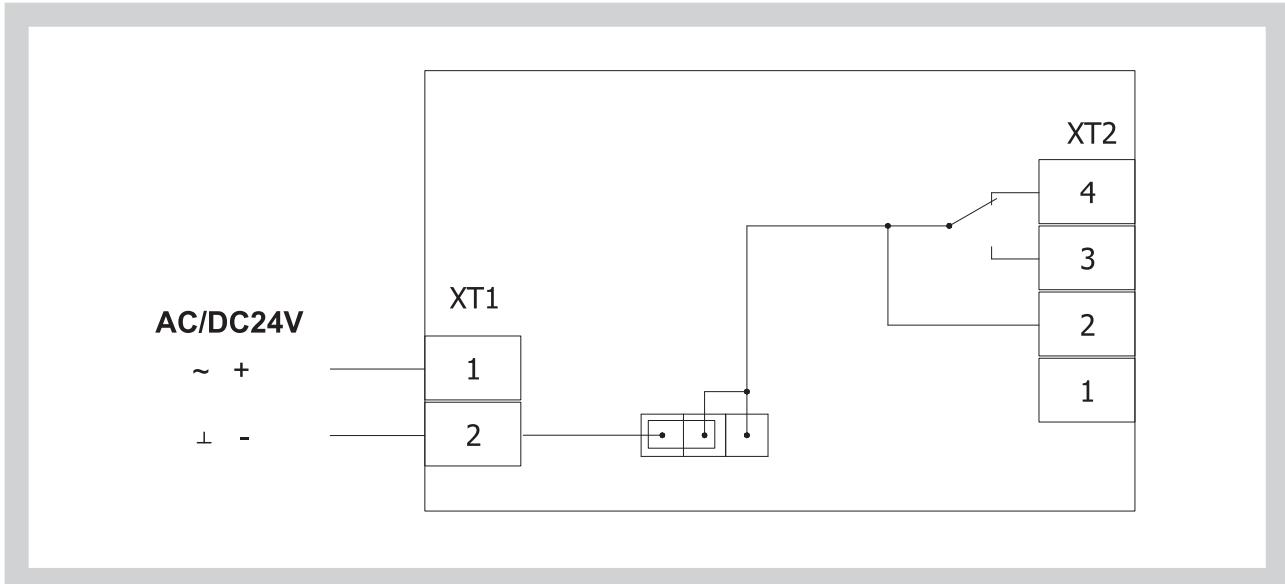


Fig. 17 Design with actuating mechanism BF 24-T (BFL, BFN 24-T), with smoke detector MHG 231 and with communication and supply device BKN 230-24-C-MP (voltage AC 230 V)

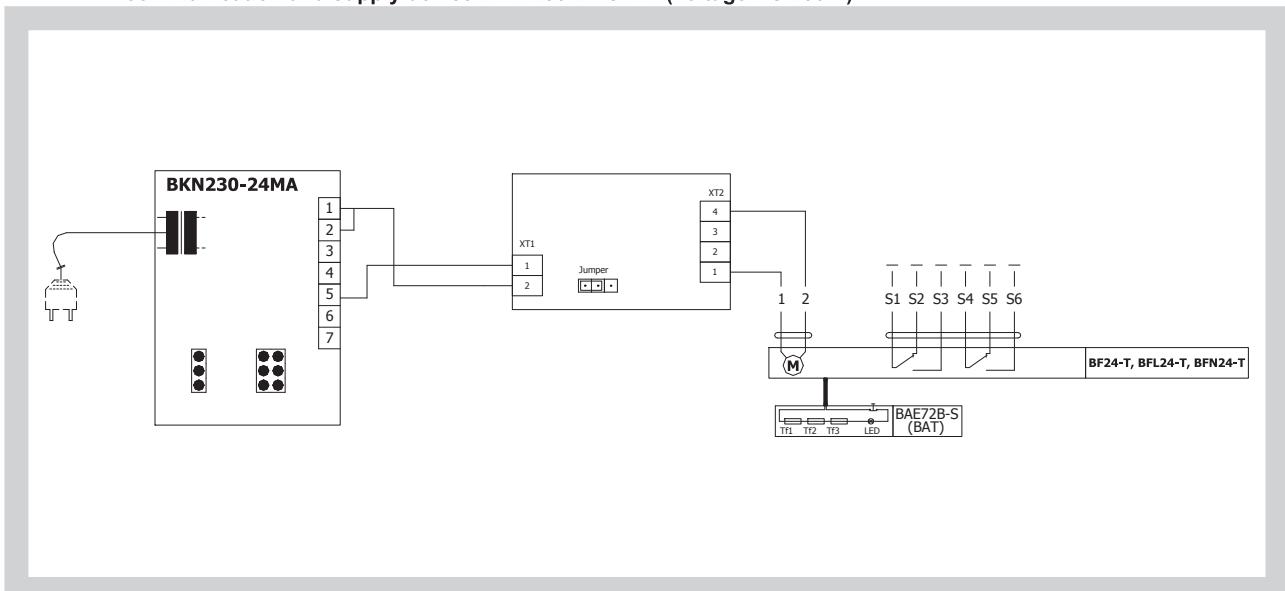
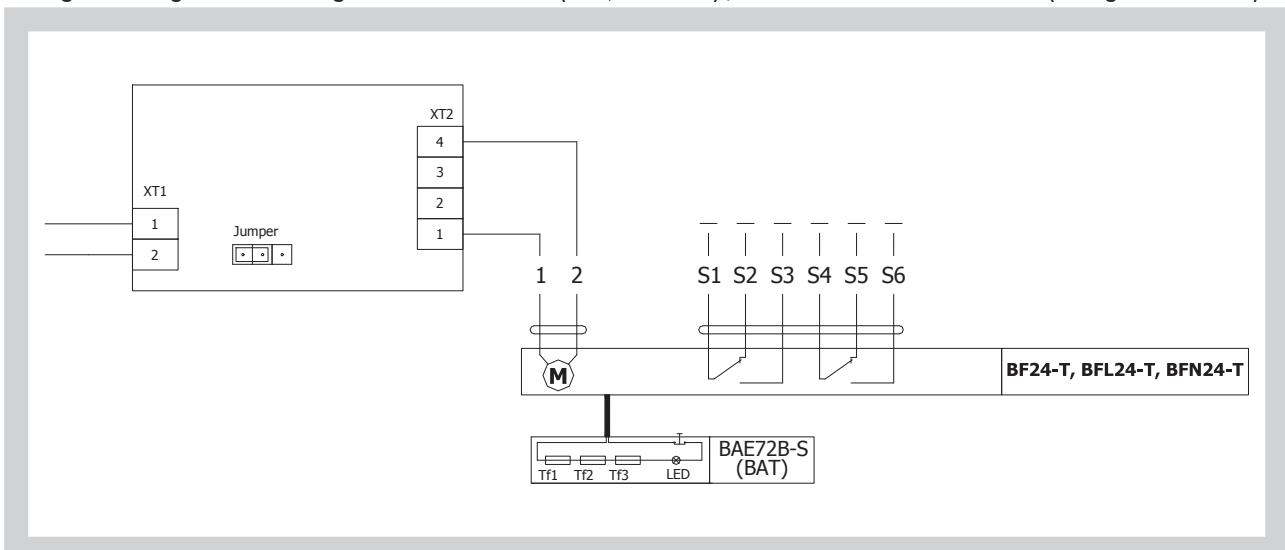


Fig. 18 Design with actuating mechanism BF 24-T (BFL, BFN 24-T), with smoke detector MHG 231 (voltage AC/DC 24 V)



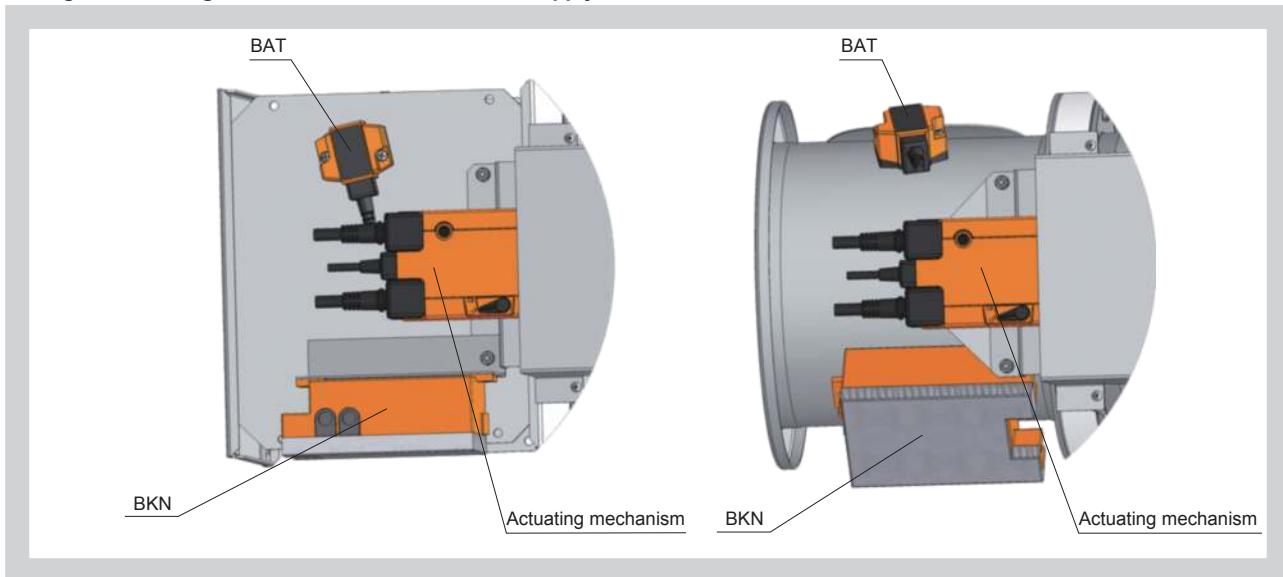
2.3. Design with the communication and supply device

Design .60

Design with the communication and supply device BKN 230-24 and the actuating mechanism BF 24-T-ST (BFL 24-T, BFN 24-T). 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 (BFL 24-T, BFN 24-T) 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 (BFL 24-T, BFN 24-T) 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".

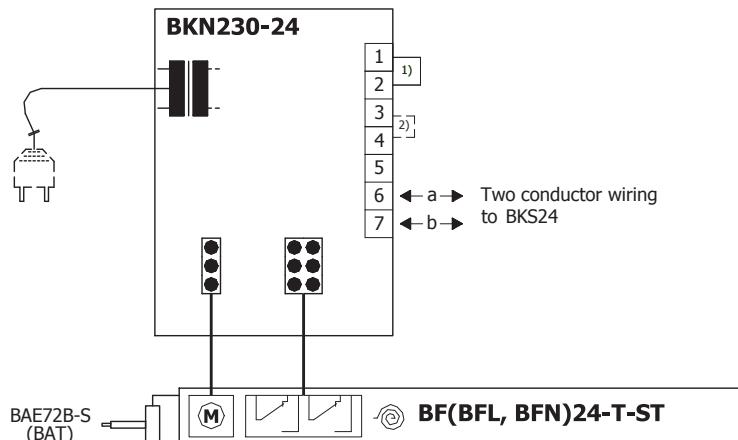
Fig. 19 Design with the communication and supply device



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 Non-operating temperature	- 20 °C ... + 50 °C - 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

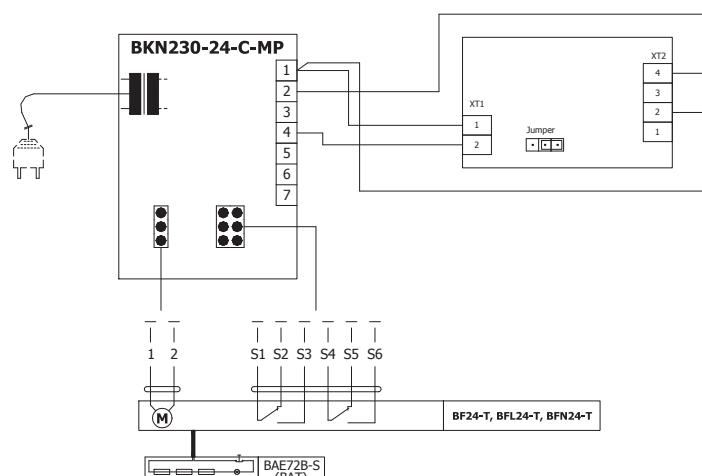
Fig. 20 Communication and supply device BKN 230-24



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-C-MP.

Fig. 21 Design with communication and supply device BKN 230-24-C-MP, with actuating mechanism BF 24-T-ST (BFL 24-T-ST, BFN 24-T-ST) and smoke detector MHG 231



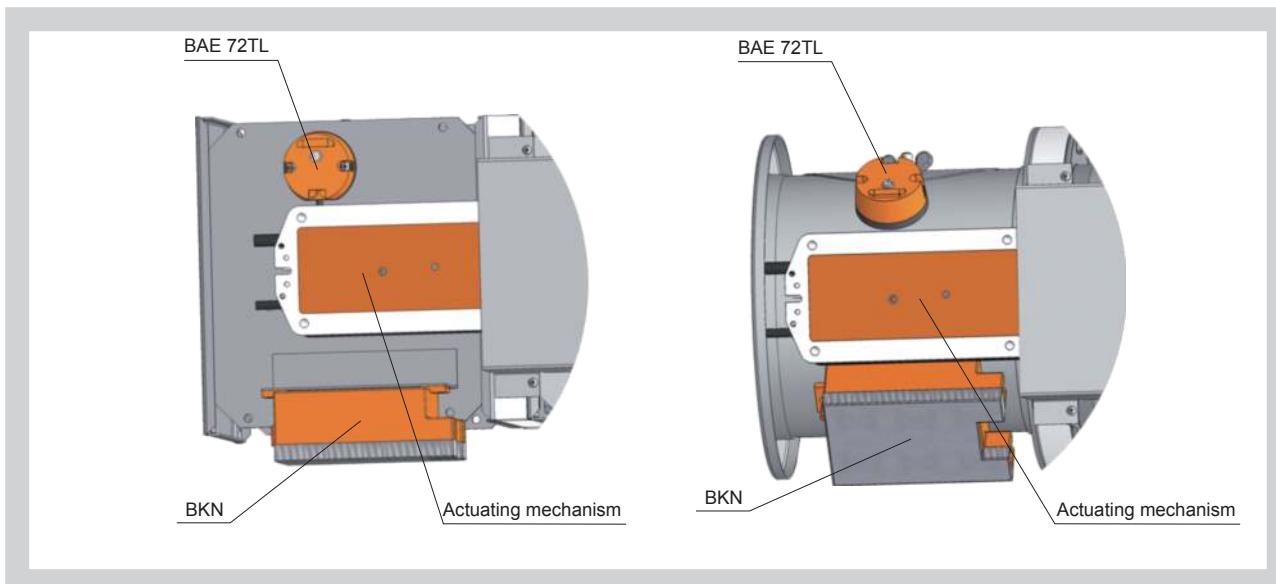
Design .62

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 .64

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. 22 Design with communication and supply device BKN 230-24MP or BKN 230-24LON and actuationg mechanism BF 24TL-T-ST



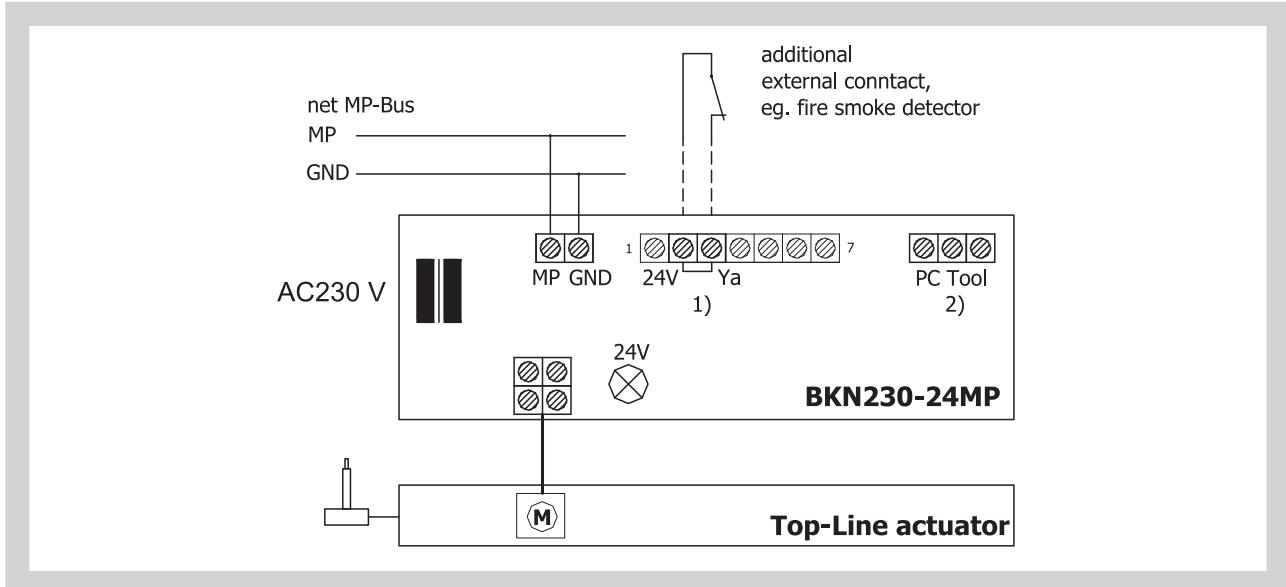
Tab. 2.3.2. Actuating mechanism BELIMO BF 24TL-T-ST

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 (Imax 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 mm² halogen-free

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

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

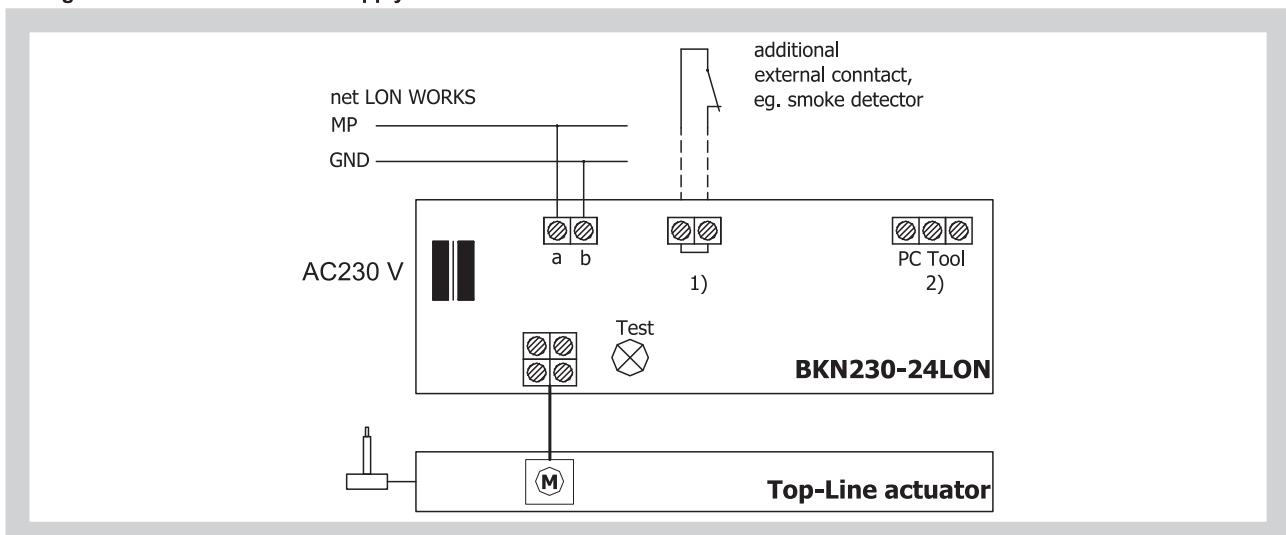
Fig 23 Communication and supply device BKN 230-24MP



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

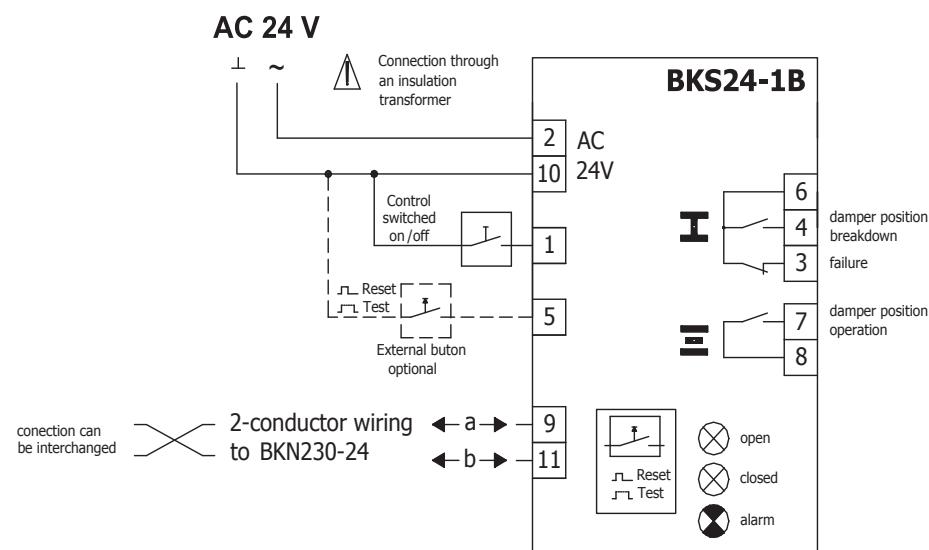
Fig. 24 Communication and supply device BKN 230-24LON



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 (BFL 24-T-ST, BFN 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 (signalling 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. 25 Communication and control device BKS 24-1B



Signals and diagnosis				
light diodes	contacts	Description		
open	closed	alarm	state	
open	closed	closed	Power supply AC 24Vnot available	
open	open	open	Check test cca 35sec , starting with switching AC 24 on or pressing «Reset/Test» button	
closed	closed	flashing	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	
closed	closed	open	Failure saved in memory • Fault in system signalled, system check should be done	
closed	flashing	closed	Damper (drive) turning into the direction of breakdown position	
closed	open	closed	Damper (drive) in breakdown position I	
flashing	closed	closed	Damper (drive) turning into the direction of operating position	
open	closed	closed	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 (BFL 24-T-ST, BFN 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

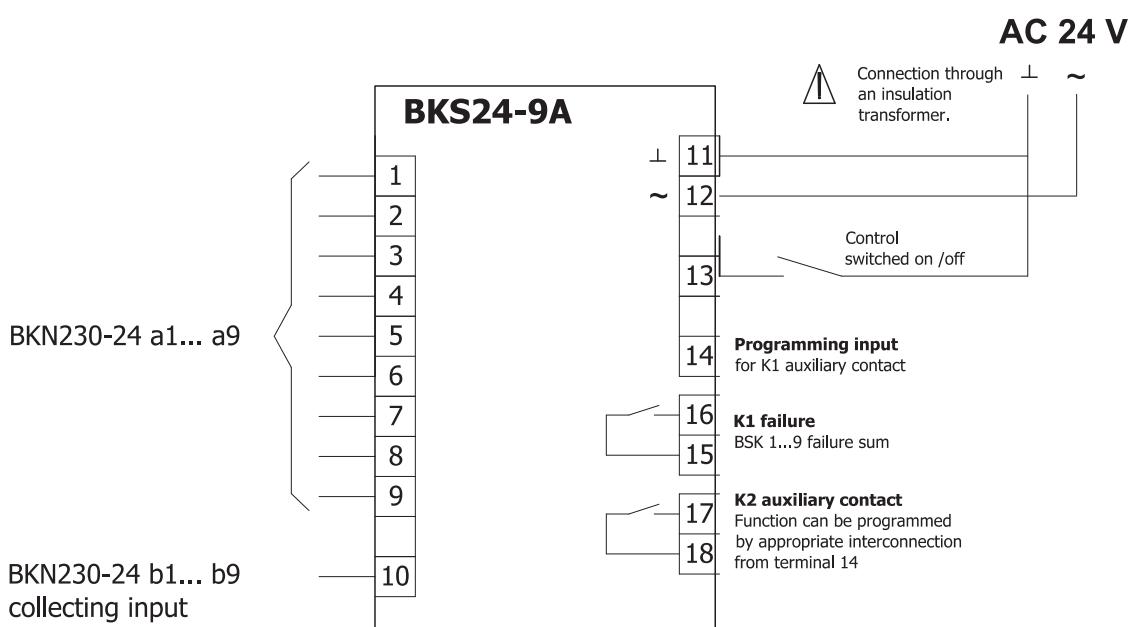
If the fire damper do not reach the given position in time tolerable for displacing, the appropriate light diode FAILURE starts to flash and K1 contact is opened (current failure). In case that the faulty damper finally reaches its given position, K1 is closed and the failure report light shines (the failure is saved in memory). K2 - the auxiliary contact - is used for signalling 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	15 ——— 16	K2 contact is on if all the flaps are open	[14] ——— [11]	17 ——— 18
		K2 contact is on if the flap No. 1 is open	[14] ——— [12]	
no failure	15 ——— [16]	K2 contact is on if all the flaps are closed	[14] open	

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.

Fig. 26 Communication and control device BKS 24-9A



Notice: Relay contacts K1 and K2 are drawn without power

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

4. Dimensions, weights

4.1. Rectangular dampers

Fig. 27 FDMA - design manual and thermal

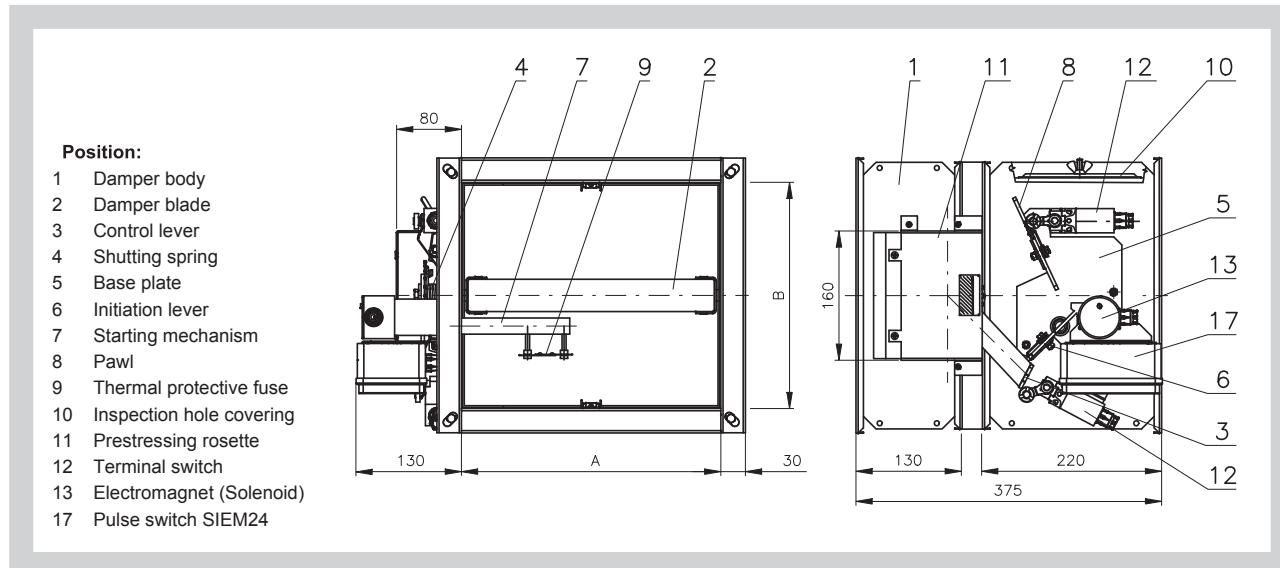


Fig. 28 FDMA - C - with covered control mechanism

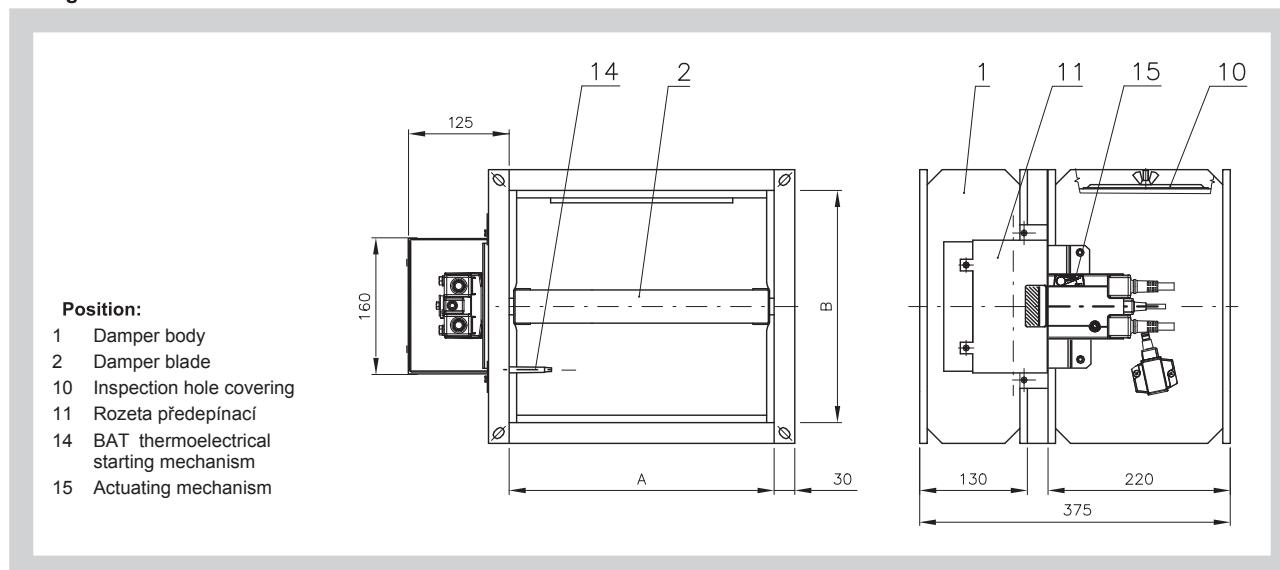
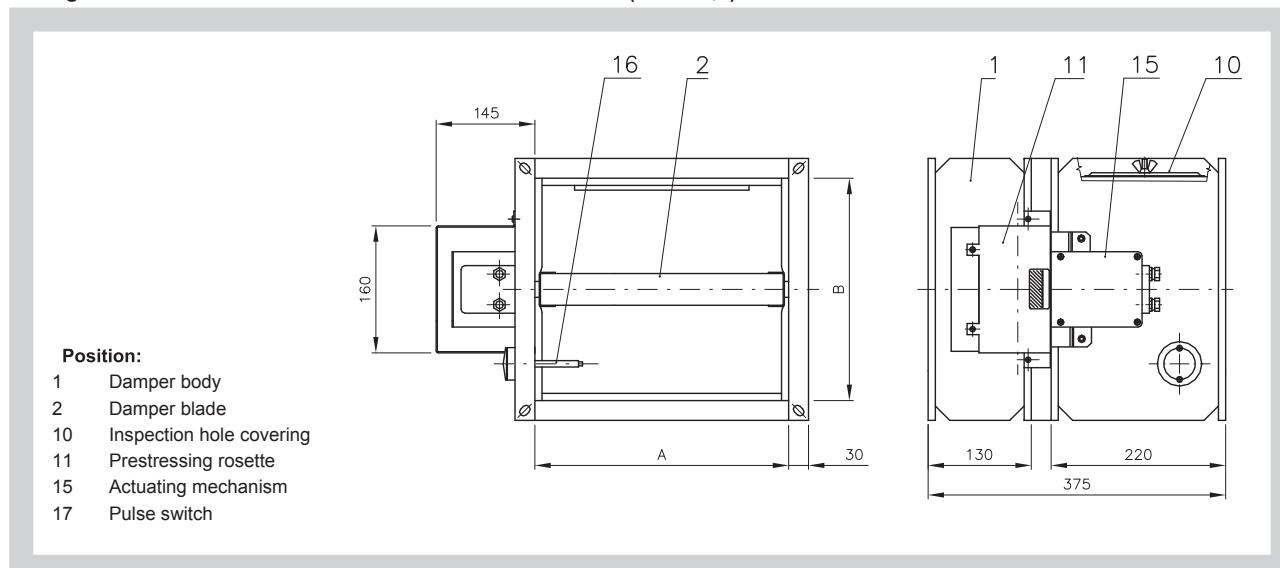


Fig. 29 FDMA - C - with covered control mechanism into (ZONE 1,2)



4.2. Round dampers

Fig. 30 FDMA - K - design manual and thermal

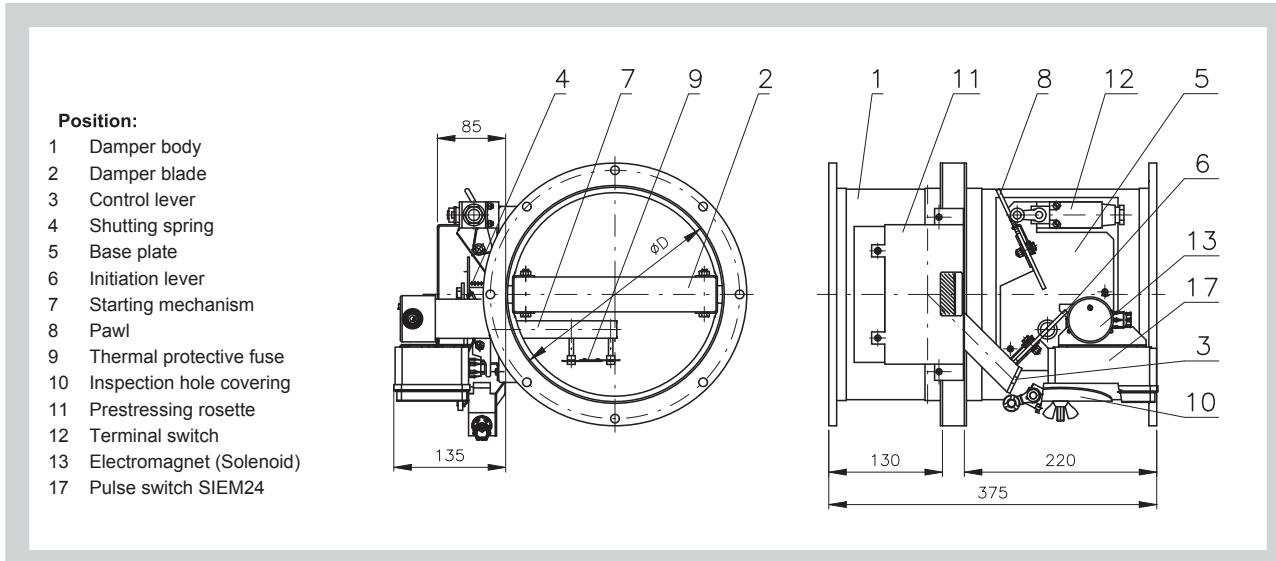


Fig. 31 FDMA - K - design with actuating mechanism

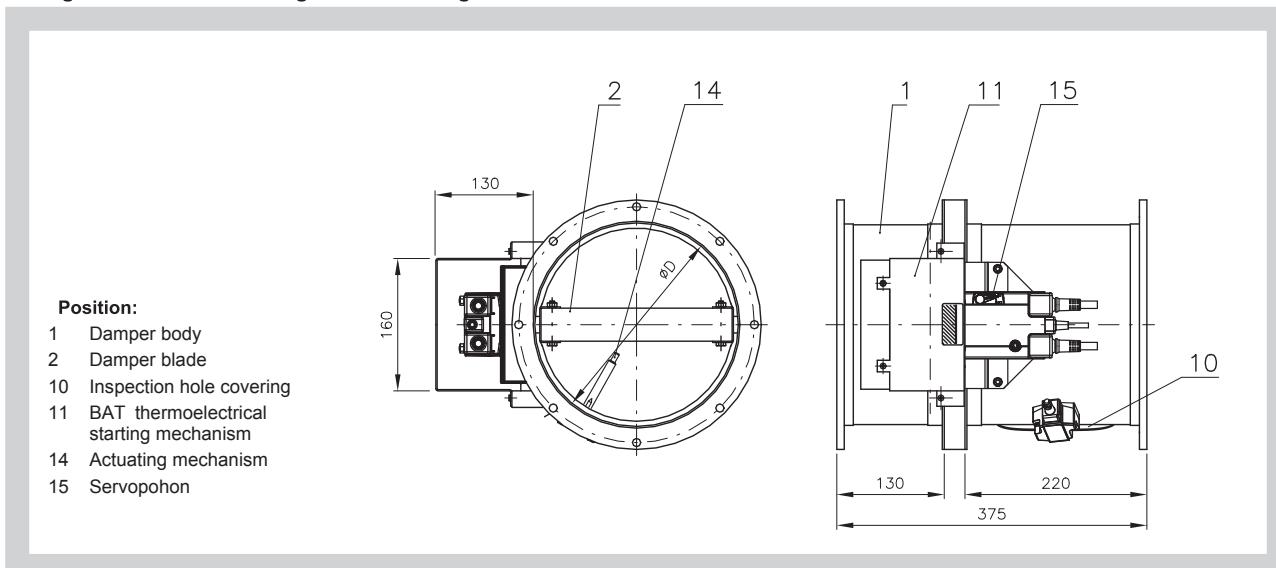
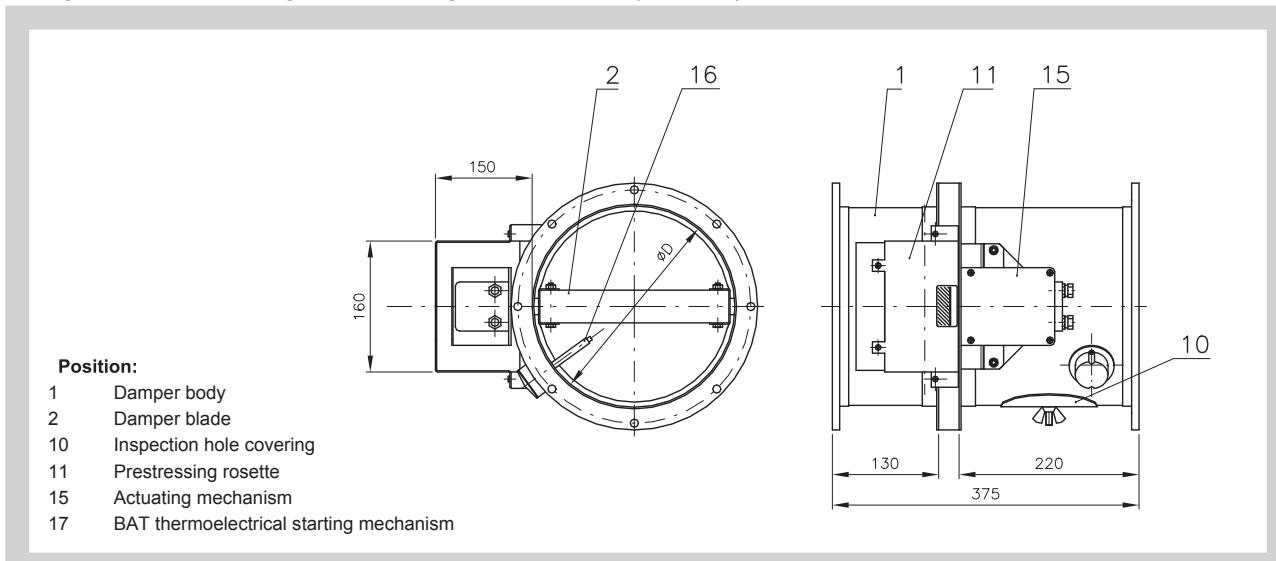


Fig. 32 FDMA - K - design with actuating mechanism into (ZONE 1,2)



4.3. Rectangular dampers - dimensions, weights and effective area

Tab. 4.3.1. rectangular 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.										
180 x 180	-	-	9,0	10,7	0,0192	BFL	225 x 630	50	195	20,0	23,0	0,1169	BFN								
180 x 200	-	-	9,4	11,1	0,0224	BFL	225 x 650	60	205	20,4	23,4	0,1210	BFN								
180 x 225	-	-	9,9	11,6	0,0264	BFL	225 x 700	85	230	21,5	24,5	0,1312	BFN								
180 x 250	-	5	10,5	12,2	0,0304	BFL	225 x 710	90	235	21,8	24,8	0,1333	BFN								
180 x 280	-	20	11,1	12,8	0,0352	BFL	225 x 750	110	255	22,7	25,7	0,1415	BFN								
180 x 300	-	30	11,5	13,2	0,0384	BFL	225 x 800	135	280	23,8	26,8	0,1517	BFN								
180 x 315	-	37	11,8	13,5	0,0408	BFL	225 x 900	185	330	26,0	29,0	0,1722	BFN								
180 x 355	-	57	12,7	14,4	0,0472	BFL	225 x 1000	235	380	28,3	31,3	0,1927	BF								
180 x 400	-	80	13,6	15,3	0,0544	BFL	250 x 180	-	-	10,3	12,0	0,0276	BFL								
180 x 450	-	105	14,6	17,6	0,0624	BFL	250 x 200	-	-	10,7	12,4	0,0322	BFL								
180 x 500	-	130	15,7	18,7	0,0704	BFL	250 x 225	-	-	11,3	13,0	0,0380	BFL								
180 x 550	10	155	16,7	19,7	0,0784	BFL	250 x 250	-	5	11,9	13,6	0,0437	BFL								
180 x 560	15	160	16,9	19,9	0,0800	BFL	250 x 280	-	20	12,6	14,3	0,0506	BFL								
180 x 600	35	180	17,8	20,8	0,0864	BFL	250 x 300	-	30	13,1	14,8	0,0552	BFL								
180 x 630	50	195	18,4	21,4	0,0912	BFL	250 x 315	-	37	13,4	15,1	0,0587	BFL								
180 x 650	60	205	18,8	21,8	0,0944	BFL	250 x 355	-	57	14,4	16,1	0,0679	BFL								
180 x 700	85	230	19,9	22,9	0,1024	BNF	250 x 400	-	80	15,4	17,1	0,0782	BFL								
180 x 710	90	235	20,1	23,1	0,1040	BNF	250 x 450	-	105	16,6	19,6	0,0897	BFL								
180 x 750	110	255	20,9	23,9	0,1104	BNF	250 x 500	-	130	17,8	20,8	0,1012	BFL								
180 x 800	135	280	22,0	25,0	0,1184	BNF	250 x 550	10	155	18,9	21,9	0,1127	BFL								
200 x 180	-	-	9,4	11,1	0,0216	BFL	250 x 560	15	160	19,2	22,2	0,1150	BFL								
200 x 200	-	-	9,8	11,5	0,0252	BFL	250 x 600	35	180	20,1	23,1	0,1242	BNF								
200 x 225	-	-	10,3	12,0	0,0297	BFL	250 x 630	50	195	20,8	23,8	0,1311	BNF								
200 x 250	-	5	10,9	12,6	0,0396	BFL	250 x 650	60	205	21,3	24,3	0,1357	BNF								
200 x 280	-	20	11,5	13,2	0,0342	BFL	250 x 700	85	230	22,5	25,5	0,1472	BNF								
200 x 300	-	30	12,0	13,7	0,0432	BFL	250 x 710	90	235	22,7	25,7	0,1495	BNF								
200 x 315	-	37	12,3	14,0	0,0459	BFL	250 x 750	110	255	23,6	26,6	0,1587	BNF								
200 x 355	-	57	13,1	14,8	0,0531	BFL	250 x 800	135	280	24,8	27,8	0,1702	BNF								
200 x 400	-	80	14,1	15,8	0,0612	BFL	250 x 900	185	330	27,2	30,2	0,1932	BNF								
200 x 450	-	105	15,2	18,2	0,0702	BFL	250 x 1000	235	380	29,5	32,5	0,2162	BF								
200 x 500	-	130	16,3	19,3	0,0792	BFL	280 x 180	-	-	10,8	12,5	0,0312	BFL								
200 x 550	10	155	17,4	20,4	0,0882	BFL	280 x 200	-	-	11,3	13,0	0,0364	BNF								
200 x 560	15	160	17,6	20,6	0,0900	BFL	280 x 225	-	-	11,9	13,6	0,0429	BFL								
200 x 600	35	180	18,4	21,4	0,0972	BFL	280 x 250	-	5	12,5	14,2	0,0494	BFL								
200 x 630	50	195	19,1	22,1	0,1026	BFL	280 x 280	-	20	13,3	15,0	0,0572	BFL								
200 x 650	60	205	19,5	22,5	0,1062	BFL	280 x 300	-	30	13,8	15,5	0,0624	BFL								
200 x 700	85	230	20,6	23,6	0,1152	BNF	280 x 315	-	37	14,1	15,8	0,0663	BFL								
200 x 710	90	235	20,8	23,8	0,1170	BNF	280 x 355	-	57	15,1	16,8	0,0767	BFL								
200 x 750	110	255	21,7	24,7	0,1242	BNF	280 x 400	-	80	16,2	17,9	0,0884	BFL								
200 x 800	135	280	22,8	25,8	0,1332	BNF	280 x 450	-	105	17,4	20,4	0,1014	BFL								
200 x 900	185	330	24,9	27,9	0,1512	BNF	280 x 500	-	130	18,7	21,7	0,1144	BFL								
200 x 1000	235	380	27,1	30,1	0,1692	BNF	280 x 550	10	155	19,9	22,9	0,1274	BFL								
225 x 180	-	-	9,8	11,5	0,0246	BFL	280 x 560	15	160	20,1	23,1	0,1300	BNF								
225 x 200	-	-	10,3	12,0	0,0287	BFL	280 x 600	35	180	21,1	24,1	0,1404	BNF								
225 x 225	-	-	10,8	12,5	0,0338	BFL	280 x 630	50	195	21,9	24,9	0,1482	BNF								
225 x 250	-	5	11,4	13,1	0,0390	BFL	280 x 650	60	205	22,4	25,4	0,1534	BNF								
225 x 280	-	20	12,1	13,8	0,0451	BFL	280 x 700	85	230	23,6	26,6	0,1664	BNF								
225 x 300	-	30	12,5	14,2	0,0492	BFL	280 x 710	90	235	23,8	26,8	0,1690	BNF								
225 x 315	-	37	12,9	14,6	0,0523	BFL	280 x 750	110	255	24,8	27,8	0,1794	BNF								
225 x 355	-	57	13,8	15,5	0,0605	BFL	280 x 800	135	280	26,0	29,0	0,1924	BNF								
225 x 400	-	80	14,8	16,5	0,0697	BFL	280 x 900	185	330	28,5	31,5	0,2184	BF								
225 x 450	-	105	15,9	18,9	0,0800	BFL	280 x 1000	235	380	30,9	33,9	0,2444	BF								
225 x 500	-	130	17,0	20,0	0,0902	BFL	300 x 180	-	-	11,2	12,9	0,0336	BFL								
225 x 550	10	155	18,2	21,2	0,1005	BFL	300 x 200	-	-	11,7	13,4	0,0392	BFL								
225 x 560	15	160	18,4	21,4	0,1025	BFL	300 x 225	-	-	12,3	14,0	0,0462	BFL								
225 x 600	35	180	19,3	22,3	0,1107	BFL	300 x 250	-	5	13,0	14,7	0,0532	BFL								

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.									
300 x 280	-	20	13,7	15,4	0,0616	BFL	355 x 710	90	235	26,6	29,6	0,2178	BFN							
300 x 300	-	30	14,2	15,9	0,0672	BFL	355 x 750	110	255	27,7	30,7	0,2312	BFN							
300 x 315	-	37	14,6	16,3	0,0714	BFL	355 x 800	135	280	29,1	32,1	0,2479	BF							
300 x 355	-	57	15,6	17,3	0,0826	BFL	355 x 900	185	330	31,8	34,8	0,2814	BF							
300 x 400	-	80	16,8	18,5	0,0952	BFL	355 x 1000	235	380	34,5	37,5	0,3149	BF							
300 x 450	-	105	18,0	21,0	0,1092	BFL	400 x 180	-	-	13,0	14,7	0,0456	BFL							
300 x 500	-	130	19,3	22,3	0,1232	BFL	400 x 200	-	-	13,6	15,3	0,0532	BFL							
300 x 550	10	155	20,5	23,5	0,1372	BFN	400 x 225	-	-	14,3	16,0	0,0627	BFL							
300 x 560	15	160	20,8	23,8	0,1400	BFN	400 x 250	-	5	15,1	16,8	0,0722	BFL							
300 x 600	35	180	21,8	24,8	0,1512	BFN	400 x 280	-	20	15,9	17,6	0,0836	BFL							
300 x 630	50	195	22,6	25,6	0,1596	BFN	400 x 300	-	30	16,5	18,2	0,0912	BFL							
300 x 650	60	205	23,1	26,1	0,1652	BFN	400 x 315	-	37	16,9	18,6	0,0969	BFL							
300 x 700	85	230	24,3	27,3	0,1792	BFN	400 x 355	-	57	18,1	19,8	0,1121	BFL							
300 x 710	90	235	24,6	27,6	0,1820	BFN	400 x 400	-	80	19,4	21,1	0,1292	BFL							
300 x 750	110	255	25,6	28,6	0,1932	BFN	400 x 450	-	105	20,8	23,8	0,1482	BFL							
300 x 800	135	280	26,8	29,8	0,2072	BFN	400 x 500	-	130	22,3	25,3	0,1672	BFN							
300 x 900	185	330	29,4	32,4	0,2352	BF	400 x 550	10	155	23,7	26,7	0,1862	BFN							
300 x 1000	235	380	31,9	34,9	0,2632	BF	400 x 560	15	160	24,0	27,0	0,1900	BFN							
315 x 180	-	-	11,5	13,2	0,0354	BFL	400 x 600	35	180	25,1	28,1	0,2052	BFN							
315 x 200	-	-	12,0	13,7	0,0413	BFL	400 x 630	50	195	26,0	29,0	0,2166	BFN							
315 x 225	-	-	12,6	14,3	0,0487	BFL	400 x 650	60	205	26,6	29,6	0,2242	BFN							
315 x 250	-	5	13,3	15,0	0,0561	BFL	400 x 700	85	230	28,0	31,0	0,2432	BFN							
315 x 280	-	20	14,1	15,8	0,0649	BFL	400 x 710	90	235	28,3	31,3	0,2470	BFN							
315 x 300	-	30	14,6	16,3	0,0708	BFL	400 x 750	110	255	29,5	32,5	0,2622	BF							
315 x 315	-	37	15,0	16,7	0,0752	BFL	400 x 800	135	280	30,9	33,9	0,2812	BF							
315 x 355	-	57	16,0	17,7	0,0870	BFL	400 x 900	185	330	33,8	36,8	0,3192	BF							
315 x 400	-	80	17,1	18,8	0,1003	BFL	400 x 1000	235	380	36,7	39,7	0,3572	BF							
315 x 450	-	105	18,4	21,4	0,1151	BFL	450 x 180	-	-	14,0	15,7	0,0516	BFL							
315 x 500	-	130	19,7	22,7	0,1298	BFL	450 x 200	-	-	14,6	16,3	0,0602	BFL							
315 x 550	10	155	21,0	24,0	0,1446	BFN	450 x 225	-	-	15,3	17,0	0,0710	BFL							
315 x 560	15	160	21,3	24,3	0,1475	BFN	450 x 250	-	5	16,1	17,8	0,0817	BFL							
315 x 600	35	180	22,3	25,3	0,1593	BFN	450 x 280	-	20	17,0	18,7	0,0946	BFL							
315 x 630	50	195	23,1	26,1	0,1682	BFN	450 x 300	-	30	17,6	19,3	0,1032	BFL							
315 x 650	60	205	23,6	26,6	0,1741	BFN	450 x 315	-	37	18,1	19,8	0,1097	BFL							
315 x 700	85	230	24,9	27,9	0,1888	BFN	450 x 355	-	57	19,3	21,0	0,1269	BFL							
315 x 710	90	235	25,1	28,1	0,1918	BFN	450 x 400	-	80	20,7	22,4	0,1462	BFL							
315 x 750	110	255	26,2	29,2	0,2036	BFN	450 x 450	-	105	22,2	25,2	0,1677	BFN							
315 x 800	135	280	27,5	30,5	0,2183	BFN	450 x 500	-	130	23,8	26,8	0,1892	BFN							
315 x 900	185	330	30,0	33,0	0,2478	BF	450 x 550	10	155	25,3	28,3	0,2107	BFN							
315 x 1000	235	380	32,6	35,6	0,2773	BF	450 x 560	15	160	25,6	28,6	0,2150	BFN							
355 x 180	-	-	12,2	13,9	0,0402	BFL	450 x 600	35	180	26,8	29,8	0,2322	BFN							
355 x 200	-	-	12,8	14,5	0,0469	BFL	450 x 630	50	195	27,7	30,7	0,2451	BFN							
355 x 225	-	-	13,4	15,1	0,0553	BFL	450 x 650	60	205	28,4	31,4	0,2537	BFN							
355 x 250	-	5	14,1	15,8	0,0737	BFL	450 x 700	85	230	29,9	32,9	0,2752	BF							
355 x 280	-	20	14,9	16,6	0,0637	BFL	450 x 710	90	235	30,2	33,2	0,2795	BF							
355 x 300	-	30	15,5	17,2	0,0804	BFL	450 x 750	110	255	31,4	34,4	0,2967	BF							
355 x 315	-	37	15,9	17,6	0,0854	BFL	450 x 800	135	280	33,0	36,0	0,3182	BF							
355 x 355	-	57	17,0	18,7	0,0988	BFL	450 x 900	185	330	36,0	39,0	0,3612	BF							
355 x 400	-	80	18,2	19,9	0,1139	BFL	450 x 1000	235	380	39,1	42,1	0,4042	BF							
355 x 450	-	105	19,6	22,6	0,1307	BFL	500 x 180	-	-	14,9	16,6	0,0576	BFL							
355 x 500	-	130	20,9	23,9	0,1474	BFN	500 x 200	-	-	15,5	17,2	0,0672	BFL							
355 x 550	10	155	22,3	25,3	0,1642	BFN	500 x 225	-	-	16,3	18,0	0,0792	BFL							
355 x 560	15	160	22,6	25,6	0,1675	BFN	500 x 250	-	5	17,1	18,8	0,0912	BFL							
355 x 600	35	180	23,6	26,6	0,1809	BFN	500 x 280	-	20	18,1	19,8	0,1056	BFL							
355 x 630	50	195	24,5	27,5	0,1910	BFN	500 x 300	-	30	18,8	20,5	0,1152	BFL							
355 x 650	60	205	25,0	28,0	0,1977	BFN	500 x 315	-	37	19,3	21,0	0,1224	BFL							
355 x 700	85	230	26,4	29,4	0,2144	BFN	500 x 355	-	57	20,6	22,3	0,1416	BFL							

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.									
500 x 400	-	80	22,0	23,7	0,1632	BFL	560 x 900	185	330	40,9	43,9	0,4536	BF							
500 x 450	-	105	23,6	26,6	0,1872	BFN	560 x 1000	235	380	44,4	47,4	0,5076	BF							
500 x 500	-	130	25,3	28,3	0,2112	BFN	600 x 180	-	-	16,7	19,7	0,0696	BFL							
500 x 550	10	155	26,9	29,9	0,2352	BFN	600 x 200	-	-	17,4	20,4	0,0812	BFL							
500 x 560	15	160	27,2	30,2	0,2400	BFN	600 x 225	-	-	18,3	21,3	0,0957	BFL							
500 x 600	35	180	28,5	31,5	0,2592	BFN	600 x 250	-	5	19,2	22,2	0,1102	BFL							
500 x 630	50	195	29,5	32,5	0,2736	BFN	600 x 280	-	20	20,3	23,3	0,1276	BFL							
500 x 650	60	205	30,1	33,1	0,2832	BF	600 x 300	-	30	21,0	24,0	0,1392	BFL							
500 x 700	85	230	31,7	34,7	0,3072	BF	600 x 315	-	37	21,6	24,6	0,1479	BFL							
500 x 710	90	235	32,1	35,1	0,3120	BF	600 x 355	-	57	23,0	26,0	0,1711	BFL							
500 x 750	110	255	33,4	36,4	0,3312	BF	600 x 400	-	80	24,6	27,6	0,1972	BFN							
500 x 800	135	280	35,0	38,0	0,3552	BF	600 x 450	-	105	26,4	29,4	0,2262	BFN							
500 x 900	185	330	38,2	41,2	0,4032	BF	600 x 500	-	130	28,3	31,3	0,2552	BFN							
500 x 1000	235	380	41,5	44,5	0,4512	BF	600 x 550	10	155	30,1	33,1	0,2842	BFN							
550 x 180	-	-	15,8	17,5	0,0636	BFL	600 x 560	15	160	30,4	33,4	0,2900	BFN							
550 x 200	-	-	16,5	18,2	0,0742	BFL	600 x 600	35	180	31,9	34,9	0,3132	BF							
550 x 225	-	-	17,3	19,0	0,0875	BFL	600 x 630	50	195	32,9	35,9	0,3306	BF							
550 x 250	-	5	18,2	19,9	0,1007	BFL	600 x 650	60	205	33,7	36,7	0,3422	BF							
550 x 280	-	20	19,2	20,9	0,1166	BFL	600 x 700	85	230	35,5	38,5	0,3712	BF							
550 x 300	-	30	19,9	21,6	0,1272	BFL	600 x 710	90	235	35,8	38,8	0,3770	BF							
550 x 315	-	37	20,4	22,1	0,1352	BFL	600 x 750	110	255	37,3	40,3	0,4002	BF							
550 x 355	-	57	21,8	23,5	0,1564	BFL	600 x 800	135	280	39,1	42,1	0,4292	BF							
550 x 400	-	80	23,3	25,0	0,1802	BFN	600 x 900	185	330	42,7	45,7	0,4872	BF							
550 x 450	-	105	25,0	28,0	0,2067	BFN	600 x 1000	235	380	46,3	49,3	0,5452	BF							
550 x 500	-	130	26,8	29,8	0,2332	BFN	630 x 180	-	-	17,3	20,3	0,0732	BFL							
550 x 550	10	155	28,5	31,5	0,2597	BFN	630 x 200	-	-	18,0	21,0	0,0854	BFL							
550 x 560	15	160	28,8	31,8	0,2650	BFN	630 x 225	-	-	18,9	21,9	0,1007	BFL							
550 x 600	35	180	30,2	33,2	0,2862	BFN	630 x 250	-	5	19,9	22,9	0,1159	BFL							
550 x 630	50	195	31,2	34,2	0,3021	BF	630 x 280	-	20	21,0	24,0	0,1342	BFL							
550 x 650	60	205	31,9	34,9	0,3127	BF	630 x 300	-	30	21,7	24,7	0,1464	BFL							
550 x 700	85	230	33,6	36,6	0,3392	BF	630 x 315	-	37	22,3	25,3	0,1556	BFL							
550 x 710	90	235	33,9	36,9	0,3445	BF	630 x 355	-	57	23,8	26,8	0,1800	BFL							
550 x 750	110	255	35,3	38,3	0,3657	BF	630 x 400	-	80	25,4	28,4	0,2074	BFN							
550 x 800	135	280	37,0	40,0	0,3922	BF	630 x 450	-	105	27,3	30,3	0,2379	BFN							
550 x 900	185	330	40,4	43,4	0,4452	BF	630 x 500	-	130	29,1	32,1	0,2684	BFN							
550 x 1000	235	380	43,9	46,9	0,4982	BF	630 x 550	10	155	31,0	34,0	0,2989	BFN							
560 x 180	-	-	16,0	17,7	0,0648	BFL	630 x 560	15	160	31,4	34,4	0,3050	BFN							
560 x 200	-	-	16,7	18,4	0,0756	BFL	630 x 600	35	180	32,9	35,9	0,3294	BF							
560 x 225	-	-	17,5	19,2	0,0891	BFL	630 x 630	50	195	34,0	37,0	0,3477	BF							
560 x 250	-	5	18,4	20,1	0,1026	BFL	630 x 650	60	205	34,7	37,7	0,3599	BF							
560 x 280	-	20	19,4	21,1	0,1188	BFL	630 x 700	85	230	36,6	39,6	0,3904	BF							
560 x 300	-	30	20,1	21,8	0,1296	BFL	630 x 710	90	235	36,9	39,9	0,3965	BF							
560 x 315	-	37	20,7	22,4	0,1377	BFL	630 x 750	110	255	38,4	41,4	0,4209	BF							
560 x 355	-	57	22,0	23,7	0,1593	BFL	630 x 800	135	280	40,3	43,3	0,4514	BF							
560 x 400	-	80	23,6	25,3	0,1836	BFN	630 x 900	185	330	44,0	47,0	0,5124	BF							
560 x 450	-	105	25,3	28,3	0,2106	BFN	630 x 1000	235	380	47,7	50,7	0,5734	BF							
560 x 500	-	130	27,1	30,1	0,2376	BFN	650 x 180	-	-	17,6	20,6	0,0756	BFL							
560 x 550	10	155	28,8	31,8	0,2646	BFN	650 x 200	-	-	18,4	21,4	0,0882	BFL							
560 x 560	15	160	29,1	32,1	0,2700	BFN	650 x 225	-	-	19,3	22,3	0,1040	BFL							
560 x 600	35	180	30,5	33,5	0,2916	BFN	650 x 250	-	5	20,3	23,3	0,1197	BFL							
560 x 630	50	195	31,6	34,6	0,3078	BF	650 x 280	-	20	21,4	24,4	0,1386	BFL							
560 x 650	60	205	32,2	35,2	0,3186	BF	650 x 300	-	30	22,2	25,2	0,1512	BFL							
560 x 700	85	230	34,0	37,0	0,3456	BF	650 x 315	-	37	22,7	25,7	0,1607	BFL							
560 x 710	90	235	34,3	37,3	0,3510	BF	650 x 355	-	57	24,3	27,3	0,1859	BFL							
560 x 750	110	255	35,7	38,7	0,3726	BF	650 x 400	-	80	26,0	29,0	0,2142	BFN							
560 x 800	135	280	37,4	40,4	0,3996	BF	650 x 450	-	105	27,9	30,9	0,2457	BFN							

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.									
650 x 500	-	130	29,7	32,7	0,2772	BFN	750 x 180	-	-	19,5	22,5	0,0876	BFL							
650 x 550	10	155	31,6	34,6	0,3087	BFN	750 x 200	-	-	20,3	23,3	0,1022	BFL							
650 x 560	15	160	32,0	35,0	0,3150	BF	750 x 225	-	-	21,3	24,3	0,1205	BFL							
650 x 600	35	180	33,5	36,5	0,3402	BF	750 x 250	-	5	22,4	25,4	0,1387	BFL							
650 x 630	50	195	34,7	37,7	0,3591	BF	750 x 280	-	20	23,6	26,6	0,1606	BFL							
650 x 650	60	205	35,4	38,4	0,3717	BF	750 x 300	-	30	24,5	27,5	0,1752	BFL							
650 x 700	85	230	37,3	40,3	0,4032	BF	750 x 315	-	37	25,1	28,1	0,1862	BFL							
650 x 710	90	235	37,7	40,7	0,4095	BF	750 x 355	-	57	26,7	29,7	0,2154	BFN							
650 x 750	110	255	39,2	42,2	0,4347	BF	750 x 400	-	80	28,6	31,6	0,2482	BFN							
650 x 800	135	280	41,1	44,1	0,4662	BF	750 x 450	-	105	30,7	33,7	0,2847	BFN							
650 x 900	185	330	44,9	47,9	0,5292	BF	750 x 500	-	130	32,7	35,7	0,3212	BFN							
650 x 1000	235	380	48,7	51,7	0,5922	BF	750 x 550	10	155	34,8	37,8	0,3577	BF							
700 x 180	-	-	18,6	21,6	0,0816	BFL	750 x 560	15	160	35,2	38,2	0,3650	BF							
700 x 200	-	-	19,4	22,4	0,0952	BFL	750 x 600	35	180	36,9	39,9	0,3942	BF							
700 x 225	-	-	20,3	23,3	0,1122	BFL	750 x 630	50	195	38,1	41,1	0,4161	BF							
700 x 250	-	5	21,3	24,3	0,1292	BFL	750 x 650	60	205	39,0	42,0	0,4307	BF							
700 x 280	-	20	22,5	25,5	0,1496	BFL	750 x 700	85	230	41,0	44,0	0,4672	BF							
700 x 300	-	30	23,3	26,3	0,1632	BFL	750 x 710	90	235	41,4	44,4	0,4745	BF							
700 x 315	-	37	23,9	26,9	0,1734	BFL	750 x 750	110	255	43,1	46,1	0,5037	BF							
700 x 355	-	57	25,5	28,5	0,2006	BFN	750 x 800	135	280	45,2	48,2	0,5402	BF							
700 x 400	-	80	27,3	30,3	0,2312	BFN	750 x 900	185	330	49,3	52,3	0,6132	BF							
700 x 450	-	105	29,3	32,3	0,2652	BFN	750 x 1000	235	380	53,5	56,5	0,6862	BF							
700 x 500	-	130	31,2	34,2	0,2992	BFN	800 x 180	-	-	20,4	23,4	0,0936	BFL							
700 x 550	10	155	33,2	36,2	0,3332	BF	800 x 200	-	-	21,3	24,3	0,1092	BFL							
700 x 560	15	160	33,6	36,6	0,3400	BF	800 x 225	-	-	22,3	25,3	0,1287	BFL							
700 x 600	35	180	35,2	38,2	0,3672	BF	800 x 250	-	5	23,4	26,4	0,1482	BFL							
700 x 630	50	195	36,4	39,4	0,3876	BF	800 x 280	-	20	24,7	27,7	0,1716	BFL							
700 x 650	60	205	37,2	40,2	0,4012	BF	800 x 300	-	30	25,6	28,6	0,1872	BFL							
700 x 700	85	230	39,2	42,2	0,4352	BF	800 x 315	-	37	26,2	29,2	0,1989	BFL							
700 x 710	90	235	39,6	42,6	0,4420	BF	800 x 355	-	57	28,0	31,0	0,2301	BFN							
700 x 750	110	255	41,2	44,2	0,4692	BF	800 x 400	-	80	29,9	32,9	0,2652	BFN							
700 x 800	135	280	43,1	46,1	0,5032	BF	800 x 450	-	105	32,1	35,1	0,3042	BFN							
700 x 900	185	330	47,1	50,1	0,5712	BF	800 x 500	-	130	34,2	37,2	0,3432	BFN							
700 x 1000	235	380	51,1	54,1	0,6392	BF	800 x 550	10	155	36,4	39,4	0,3822	BF							
710 x 180	-	-	18,7	21,7	0,0828	BFL	800 x 560	15	160	36,8	39,8	0,3900	BF							
710 x 200	-	-	19,5	22,5	0,0966	BFL	800 x 600	35	180	38,6	41,6	0,4212	BF							
710 x 225	-	-	20,5	23,5	0,1139	BFL	800 x 630	50	195	39,9	42,9	0,4446	BF							
710 x 250	-	5	21,5	24,5	0,1311	BFL	800 x 650	60	205	40,7	43,7	0,4602	BF							
710 x 280	-	20	22,7	25,7	0,1518	BFL	800 x 700	85	230	42,9	45,9	0,4992	BF							
710 x 300	-	30	23,5	26,5	0,1656	BFL	800 x 710	90	235	43,3	46,3	0,5070	BF							
710 x 315	-	37	24,1	27,1	0,1760	BFL	800 x 750	110	255	45,0	48,0	0,5382	BF							
710 x 355	-	57	25,7	28,7	0,2036	BFN	800 x 800	135	280	47,2	50,2	0,5772	BF							
710 x 400	-	80	27,5	30,5	0,2346	BFN	800 x 900	185	330	51,5	54,5	0,6552	BF							
710 x 450	-	105	29,5	32,5	0,2691	BFN	800 x 1000	235	380	55,9	58,9	0,7332	BF							
710 x 500	-	130	31,5	34,5	0,3036	BFN	900 x 180	-	-	22,2	25,2	0,1056	BFL							
710 x 550	10	155	33,5	36,5	0,3381	BF	900 x 200	-	-	23,2	26,2	0,1232	BFL							
710 x 560	15	160	33,9	36,9	0,3450	BF	900 x 225	-	-	24,3	27,3	0,1452	BFL							
710 x 600	35	180	35,5	38,5	0,3726	BF	900 x 250	-	5	25,5	28,5	0,1672	BFL							
710 x 630	50	195	36,7	39,7	0,3933	BF	900 x 280	-	20	26,9	29,9	0,1936	BFL							
710 x 650	60	205	37,5	40,5	0,4071	BF	900 x 300	-	30	27,9	30,9	0,2112	BFL							
710 x 700	85	230	39,5	42,5	0,4416	BF	900 x 315	-	37	28,6	31,6	0,2244	BFN							
710 x 710	90	235	39,9	42,9	0,4485	BF	900 x 355	-	57	30,4	33,4	0,2596	BFN							
710 x 750	110	255	41,5	44,5	0,4761	BF	900 x 400	-	80	32,5	35,5	0,2992	BFN							
710 x 800	135	280	43,5	46,5	0,5106	BF	900 x 450	-	105	34,9	37,9	0,3432	BFN							
710 x 900	185	330	47,5	50,5	0,5796	BF	900 x 500	-	130	37,2	40,2	0,3872	BF							
710 x 1000	235	380	51,5	54,5	0,6486	BF	900 x 550	10	155	39,6	42,6	0,4312	BF							

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.									
900 x 560	15	160	40,0	43,0	0,4400	BF	1250 x 225	-	-	31,4	34,4	0,2030	BFL							
900 x 600	35	180	41,9	44,9	0,4752	BF	1250 x 250	-	5	32,8	35,8	0,2337	BFL							
900 x 630	50	195	43,3	46,3	0,5016	BF	1250 x 280	-	20	34,6	37,6	0,2706	BNF							
900 x 650	60	205	44,3	47,3	0,5192	BF	1250 x 300	-	30	35,8	38,8	0,2952	BNF							
900 x 700	85	230	46,6	49,6	0,5632	BF	1250 x 315	-	37	36,7	39,7	0,3137	BNF							
900 x 710	90	235	47,1	50,1	0,5720	BF	1250 x 355	-	57	39,1	42,1	0,3629	BNF							
900 x 750	110	255	48,9	51,9	0,6072	BF	1250 x 400	-	80	41,8	44,8	0,4182	BNF							
900 x 800	135	280	51,3	54,3	0,6512	BF	1250 x 450	-	105	44,7	47,7	0,4797	BF							
900 x 900	185	330	56,0	59,0	0,7392	BF	1250 x 500	-	130	47,7	50,7	0,5412	BF							
900 x 1000	235	380	60,6	63,6	0,8272	BF	1250 x 550	10	155	50,7	53,7	0,6027	BF							
1000 x 180	-	-	24,1	27,1	0,1176	BFL	1250 x 560	15	160	51,3	54,3	0,6150	BF							
1000 x 200	-	-	25,1	28,1	0,1372	BFL	1250 x 600	35	180	53,6	56,6	0,6642	BF							
1000 x 225	-	-	26,4	29,4	0,1617	BFL	1250 x 630	50	195	55,4	58,4	0,7011	BF							
1000 x 250	-	5	27,6	30,6	0,1862	BFL	1250 x 650	60	205	56,6	59,6	0,7257	BF							
1000 x 280	-	20	29,1	32,1	0,2156	BFL	1250 x 700	85	230	59,6	62,6	0,7872	BF							
1000 x 300	-	30	30,1	33,1	0,2352	BNF	1250 x 710	90	235	60,2	63,2	0,7995	BF							
1000 x 315	-	37	30,9	33,9	0,2499	BNF	1250 x 750	110	255	62,6	65,6	0,8487	BF							
1000 x 355	-	57	32,9	35,9	0,2891	BNF	1250 x 800	135	280	65,5	68,5	0,9102	BF							
1000 x 400	-	80	35,2	38,2	0,3332	BNF	1250* x 900	185	330	71,5	74,5	1,0332	BF							
1000 x 450	-	105	37,7	40,7	0,3822	BNF	1250* x 1000	235	380	77,4	80,4	1,1562	BF							
1000 x 500	-	130	40,2	43,2	0,4312	BF	1400 x 180	-	-	31,4	34,4	0,1656	BFL							
1000 x 550	10	155	42,7	45,7	0,4802	BF	1400 x 200	-	-	32,7	35,7	0,1932	BFL							
1000 x 560	15	160	43,2	46,2	0,4900	BF	1400 x 225	-	-	34,4	37,4	0,2277	BFL							
1000 x 600	35	180	45,3	48,3	0,5292	BF	1400 x 250	-	5	36,0	39,0	0,2622	BNF							
1000 x 630	50	195	46,8	49,8	0,5586	BF	1400 x 280	-	20	37,9	40,9	0,3036	BNF							
1000 x 650	60	205	47,8	50,8	0,5782	BF	1400 x 300	-	30	39,2	42,2	0,3312	BNF							
1000 x 700	85	230	50,3	53,3	0,6272	BF	1400 x 315	-	37	40,2	43,2	0,3519	BNF							
1000 x 710	90	235	50,8	53,8	0,6370	BF	1400 x 355	-	57	42,8	45,8	0,4071	BNF							
1000 x 750	110	255	52,8	55,8	0,6762	BF	1400 x 400	-	80	45,7	48,7	0,4692	BF							
1000 x 800	135	280	55,3	58,3	0,7252	BF	1400 x 450	-	105	48,9	51,9	0,5382	BF							
1000 x 900	185	330	60,4	63,4	0,8232	BF	1400 x 500	-	130	52,2	55,2	0,6072	BF							
1000 x 1000	235	380	65,4	68,4	0,9212	BF	1400 x 550	10	155	55,4	58,4	0,6762	BF							
1100 x 180	-	-	25,9	28,9	0,1296	BFL	1400 x 560	15	160	56,1	59,1	0,6900	BF							
1100 x 200	-	-	27,0	30,0	0,1512	BFL	1400 x 600	35	180	58,7	61,7	0,7452	BF							
1100 x 225	-	-	28,4	31,4	0,1782	BFL	1400* x 630	50	195	60,6	63,6	0,7866	BF							
1100 x 250	-	5	29,7	32,7	0,2052	BFL	1400* x 650	60	205	61,9	64,9	0,8142	BF							
1100 x 280	-	20	31,3	34,3	0,2376	BFL	1400* x 700	85	230	65,2	68,2	0,8832	BF							
1100 x 300	-	30	32,4	35,4	0,2592	BNF	1400* x 710	90	235	65,8	68,8	0,8970	BF							
1100 x 315	-	37	33,2	36,2	0,2754	BNF	1400* x 750	110	255	68,4	71,4	0,9522	BF							
1100 x 355	-	57	35,4	38,4	0,3186	BNF	1400* x 800	135	280	71,6	74,6	1,0212	BF							
1100 x 400	-	80	37,8	40,8	0,3672	BNF	1400* x 900	185	330	78,1	81,1	1,1592	BF							
1100 x 450	-	105	40,5	43,5	0,4212	BF	1400* x 1000	235	380	84,6	87,6	1,2972	BF							
1100 x 500	-	130	43,2	46,2	0,4752	BF	1500 x 180	-	-	33,3	36,3	0,1776	BFL							
1100 x 550	10	155	45,9	48,9	0,5292	BF	1500 x 200	-	-	34,7	37,7	0,2072	BFL							
1100 x 560	15	160	46,5	49,5	0,5400	BF	1500 x 225	-	-	36,4	39,4	0,2442	BFL							
1100 x 600	35	180	48,6	51,6	0,5832	BF	1500 x 250	-	5	38,1	41,1	0,2812	BNF							
1100 x 630	50	195	50,2	53,2	0,6156	BF	1500 x 280	-	20	40,1	43,1	0,3256	BNF							
1100 x 650	60	205	51,3	54,3	0,6372	BF	1500 x 300	-	30	41,5	44,5	0,3552	BNF							
1100 x 700	85	230	54,0	57,0	0,6912	BF	1500 x 315	-	37	42,5	45,5	0,3774	BNF							
1100 x 710	90	235	54,6	57,6	0,7020	BF	1500 x 355	-	57	45,3	48,3	0,4366	BNF							
1100 x 750	110	255	56,7	59,7	0,7452	BF	1500 x 400	-	80	48,3	51,3	0,5032	BF							
1100 x 800	135	280	59,4	62,4	0,7992	BF	1500 x 450	-	105	51,8	54,8	0,5772	BF							
1100 x 900	185	330	64,8	67,8	0,9072	BF	1500 x 500	-	130	55,2	58,2	0,6512	BF							
1100 x 1000	235	380	70,2	73,2	1,0152	BF	1500 x 550	10	155	58,6	61,6	0,7252	BF							
1250 x 180	-	-	28,7	31,7	0,1476	BFL	1500 x 560	15	160	59,3	62,3	0,7400	BF							
1250 x 200	-	-	29,9	32,9	0,1722	BFL	1500 x 600	35	180	62,0	65,0	0,7992	BF							

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.									
1500*x630	50	195	64,1	67,1	0,8436	BF	1600 x 355	-	57	47,7	50,7	0,4661	BFN							
1500*x650	60	205	65,4	68,4	0,8732	BF	1600 x 400	-	80	51,0	54,0	0,5372	BF							
1500*x700	85	230	68,9	71,9	0,9472	BF	1600 x 450	-	105	54,6	57,6	0,6162	BF							
1500*x710	90	235	69,6	72,6	0,9620	BF	1600 x 500	-	130	58,2	61,2	0,6952	BF							
1500*x750	110	255	72,3	75,3	1,0212	BF	1600 x 550	10	155	61,8	64,8	0,7742	BF							
1500*x800	135	280	75,7	78,7	1,0952	BF	1600 x 560	15	160	62,5	65,5	0,7900	BF							
1500*x900	185	330	82,6	85,6	1,2432	BF	1600 x 600	35	180	65,4	68,4	0,8532	BF							
1500*x1000	235	380	89,4	92,4	1,3912	BF	1600* x 630	50	195	67,5	70,5	0,9006	BF							
1600 x 180	-	-	35,1	38,1	0,1896	BFL	1600* x 650	60	205	69,0	72,0	0,9322	BF							
1600 x 200	-	-	36,6	39,6	0,2212	BFL	1600* x 700	85	230	72,6	75,6	1,0112	BF							
1600 x 225	-	-	38,4	41,4	0,2607	BFL	1600* x 710	90	235	73,3	76,3	1,0270	BF							
1600 x 250	-	5	40,2	43,2	0,3002	BFN	1600* x 750	110	255	76,2	79,2	1,0902	BF							
1600 x 280	-	20	42,3	45,3	0,3476	BFN	1600* x 800	135	280	79,8	82,8	1,1692	BF							
1600 x 300	-	30	43,8	46,8	0,3792	BFN	1600* x 900	185	330	87,0	90,0	1,3272	BF							
1600 x 315	-	37	44,8	47,8	0,4029	BFN	1600* x 1000	235	380	94,2	97,2	1,4852	BF							

* for these dimensions are used two closing springs

4.4. Round dampers - weight and dimensions

Tab. 4.4.1. Round dampers - weight and dimensions

Nominal size $\varnothing D$	e	f	g	h	Weight		Effective area S _{ef} [m ²]	Actuating mechanism type		
					design					
					manual	act. mechan.				
180	-	-	-	-	7,0	8,5	0,0137	BFL		
200	-	-	-	-	8,0	9,5	0,0182	BFL		
225	-	-	-	-	8,5	10,0	0,0248	BFL		
250	-	5	-	-	9,0	10,5	0,0323	BFL		
280	-	20	-	-	10,0	11,5	0,0427	BFL		
315	-	37	-	-	11,0	12,5	0,0565	BFL		
355	-	57	-	7	13,0	14,5	0,0747	BFL		
400	-	80	-	30	15,0	18,0	0,0982	BFL		
450	-	105	-	55	17,0	20,0	0,1279	BFN		
500	-	130	-	80	20,0	23,0	0,1617	BFN		
560	15	160	-	110	23,0	26,0	0,2073	BFN		
630	50	195	-	145	27,0	30,0	0,2677	BF		
710	90	235	40	185	32,0	35,0	0,3461	BF		
800	135	280	85	230	38,0	41,0	0,4464	BF		
900	185	330	135	280	56,0	59,0	0,5727	BF		
1000	235	380	185	330	74,0	77,0	0,7147	BF		

Notice: 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).

4.5. Blades overlaps

Tab. 4.5.1 Blades overlaps

Blades overlaps		Dimension	Overlaps
RECTANGULAR DAMPERS Fig. 33a	Act. mechanism side	"a"	Tab. 4.3.1
	Side without act. mechanism	"c"	Tab. 4.3.1
ROUND DAMPERS Fig. 33b	Act. mechanism side	"e"	Tab. 4.4.1
	Side without act. mechanism	"f"	Tab. 4.4.1
ROUND DAMPERS SPIRO Fig. 33c	Act. mechanism side	"g"	Tab. 4.4.1
	Side without act. mechanism	"h"	Tab. 4.4.1

These values has to be respected when projecting related air-conditioning ducts.

Fig. 33a Blade overlaps - rectangular damper

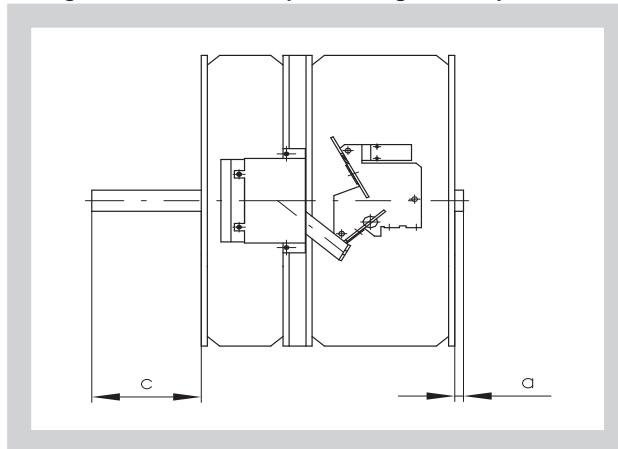


Fig. 33b Blade overlaps - round damper

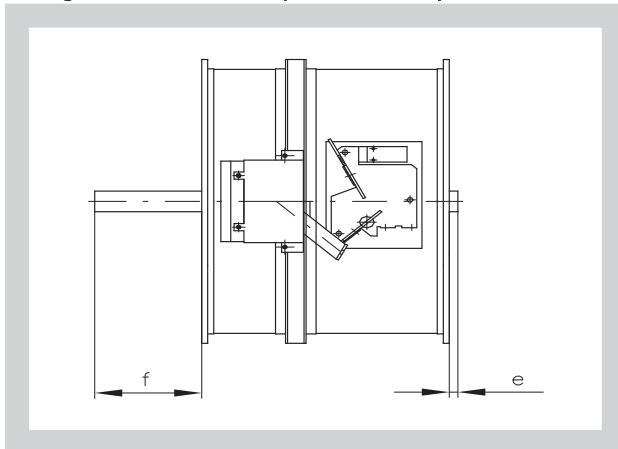
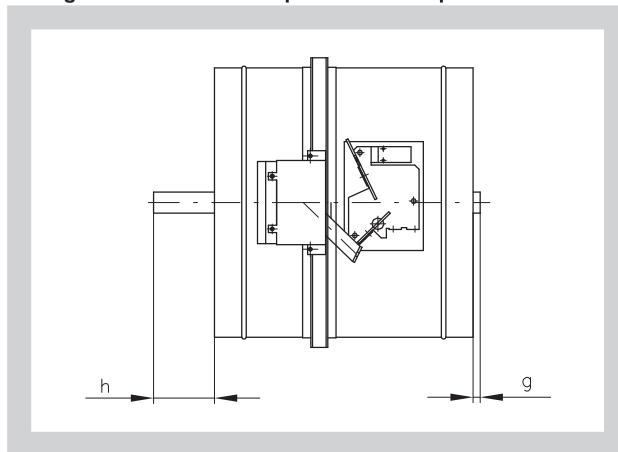


Fig. 33c Blade overlaps - round damper SPIRO



- 4.6. 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).
- 4.7. rectangular dampers can be supplied on the customer's demands in all subdimension of the above mentioned range.
- 4.8. Flanges of rectangular 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 Flage of rectangular damper

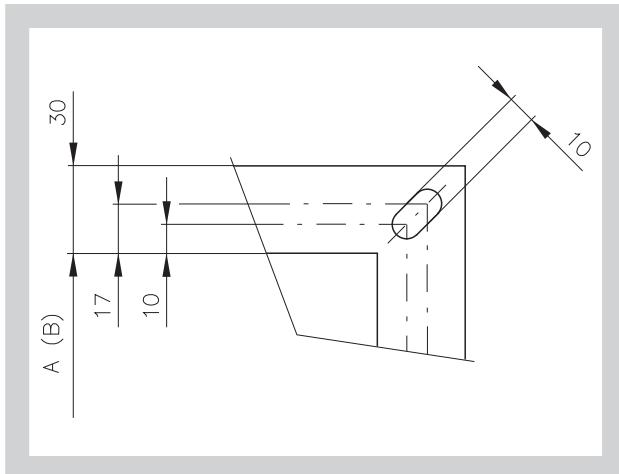
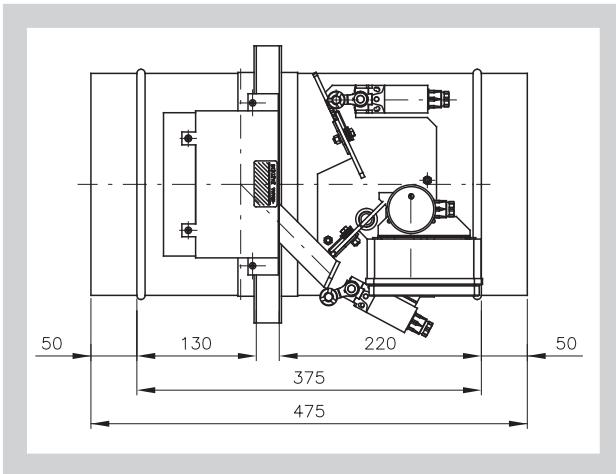


Fig. 35 Damper for SPIRO duct



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 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 BUILD IN EDGE on the protective covering) must be protected with firefighting insulation (see fig. 36).

The distance between the fire damper and the construction (wall, ceiling) must be minimal in range from 10 to 50 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 50 mm.

Exceptions are given in chapter 6.

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

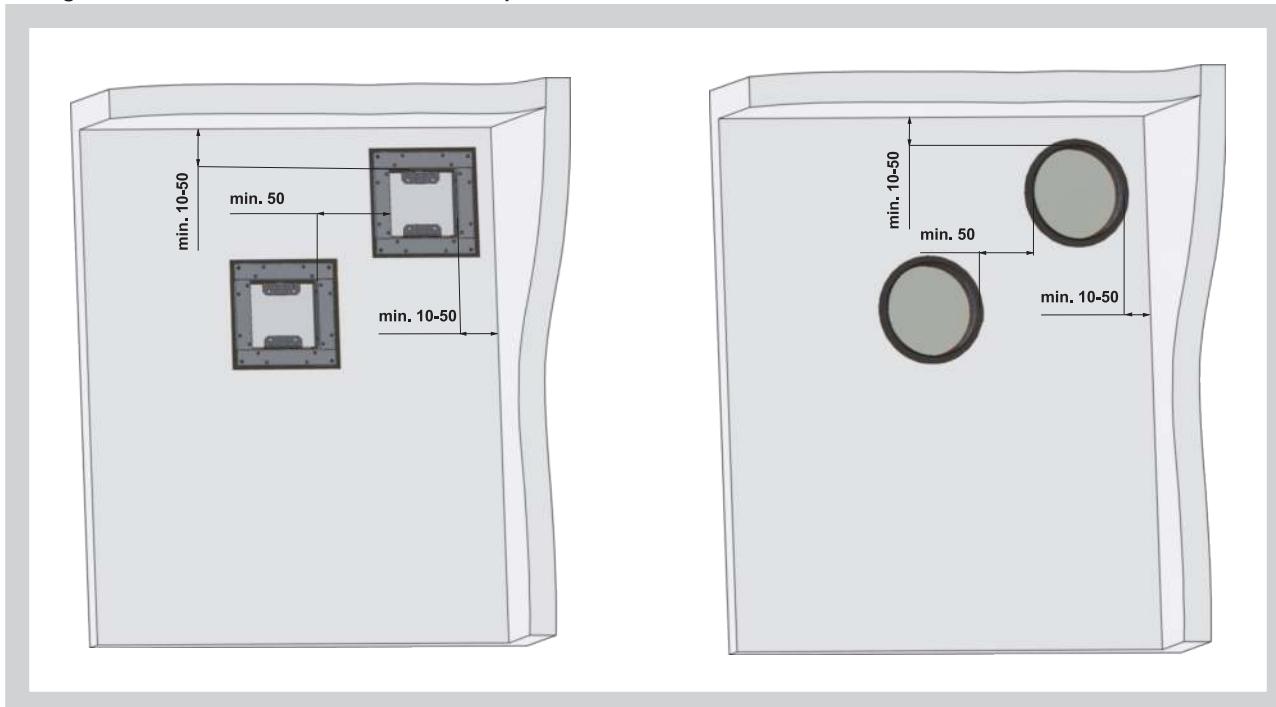
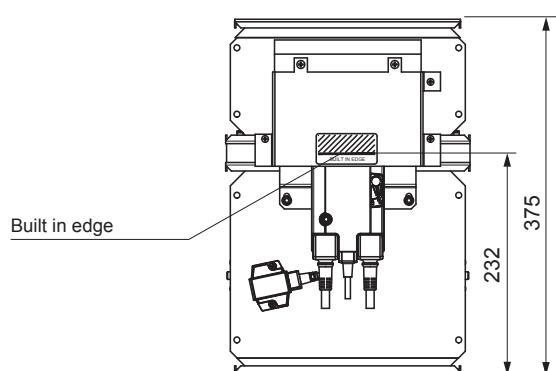
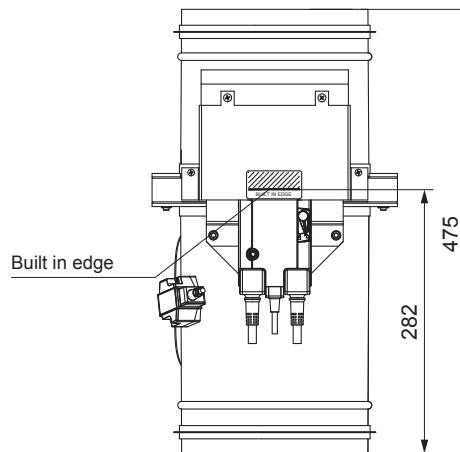


Fig. 37 Built in edge

Built in edge - rectangular dampers and round dampers with flange



Built in edge - round dampers SPIRO



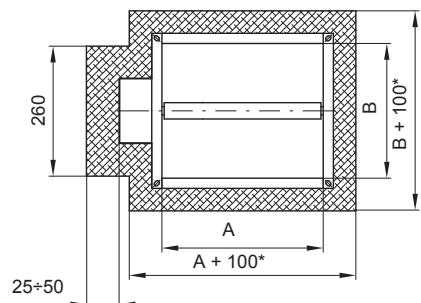
- 5.2.** The control mechanism has to be protected (covered) against damage and pollution during installation process.

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.

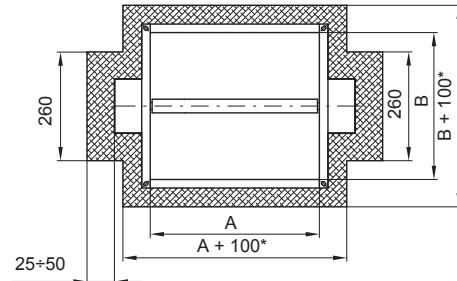
5.3. Installation opening dimensions

Fig 38 Installation opening

Installation opening - rectangular damper with actuating mechanism or actuating mechanism

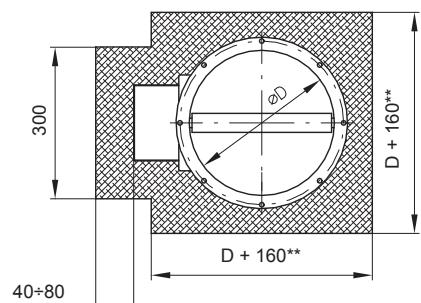


Installation opening - rectangular damper with two sprigs

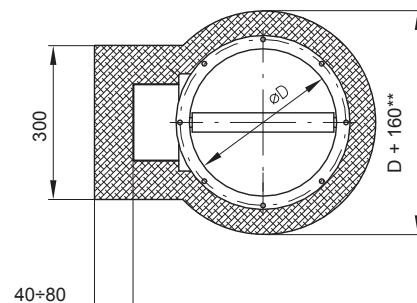


* The recommended dimension of the installation opening is from 25 mm to 50 mm on the both sides (it means from $A+50$ to $A+100$ or $B+50$ to $B+100$)

Installation opening - round damper with actuating mechanism or actuating mechanism

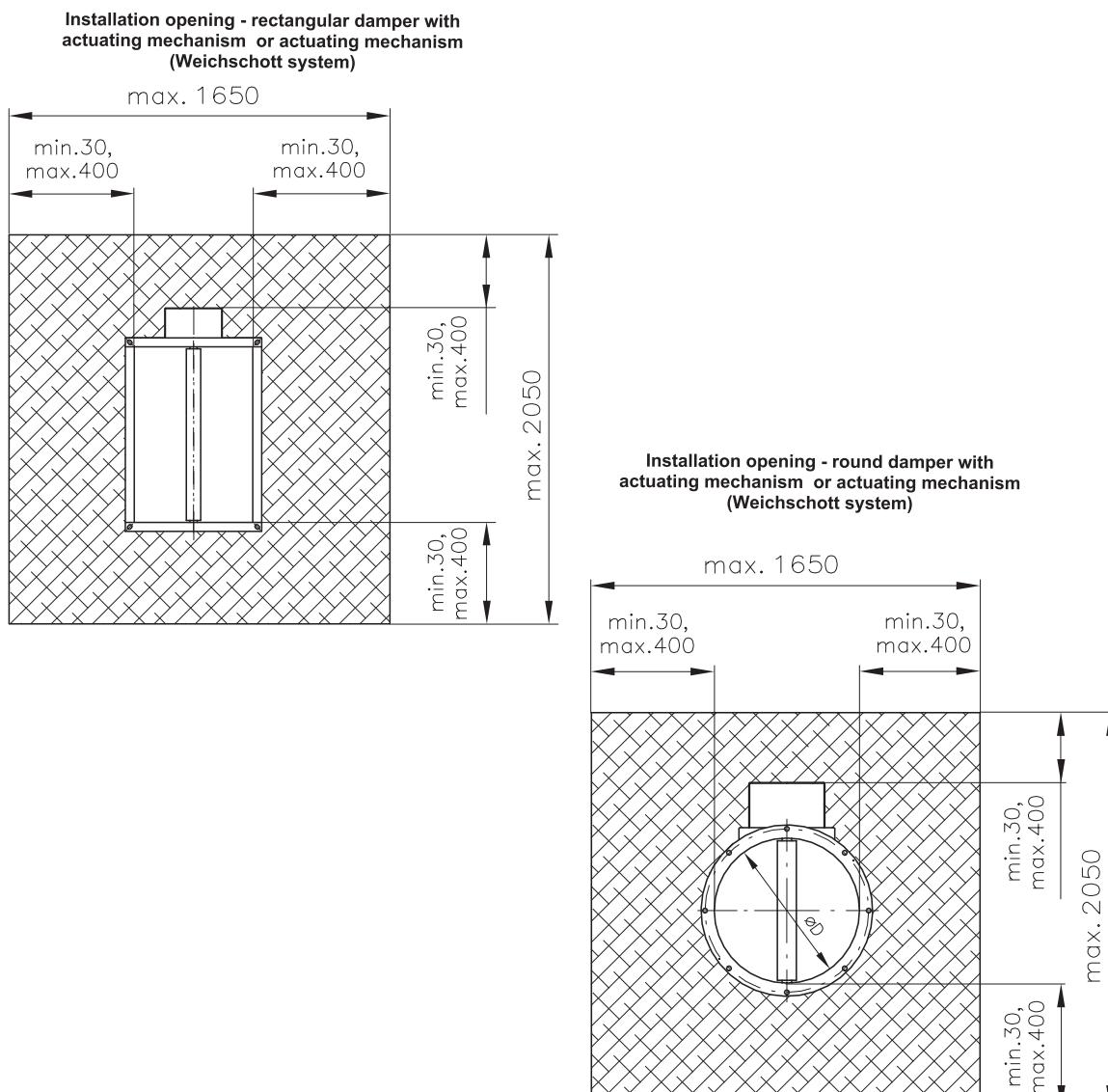


Installation opening - round damper with actuating mechanism or actuating mechanism



** The recommended dimension of the installation opening is from 40 mm to 80 mm on the both sides (it means from $D+80$ to $D+160$)

Fig. 39 Installation opening - rectangular damper Weichschott system



5.4. 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 with minimum thickness 110 mm or porous concrete with minimum thickness 125 mm.

The fire damper can be integrated into a gypsum wall construction with fire classification EI120 or 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 rectangular damper installed outside a construction it is necessary to use reinforcement VRM for dampers with dimension A \geq 800 mm.

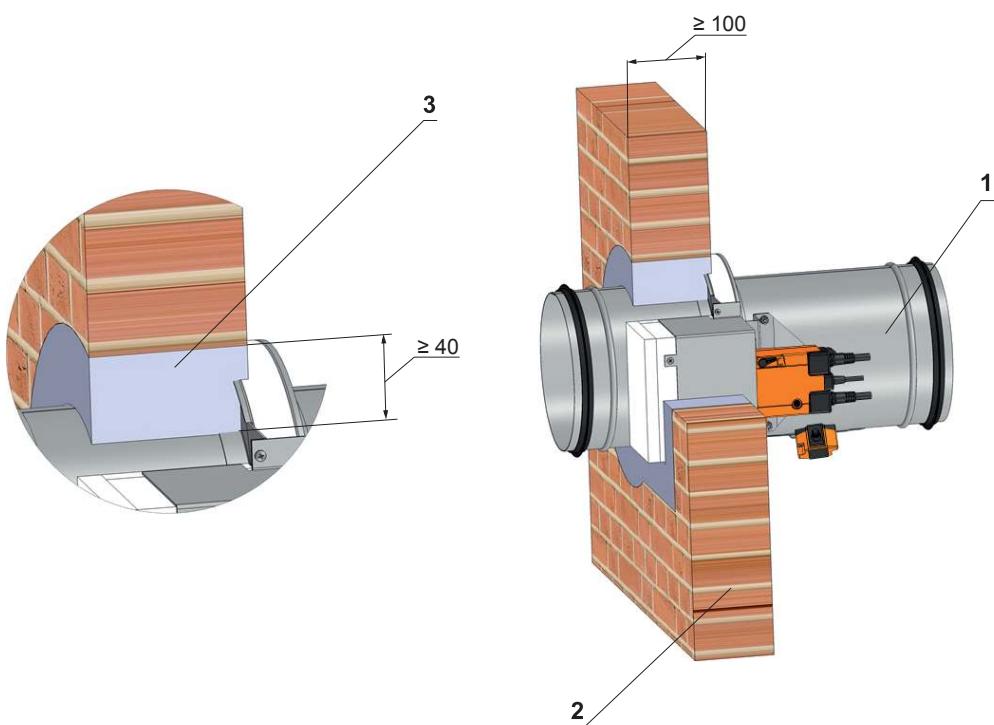
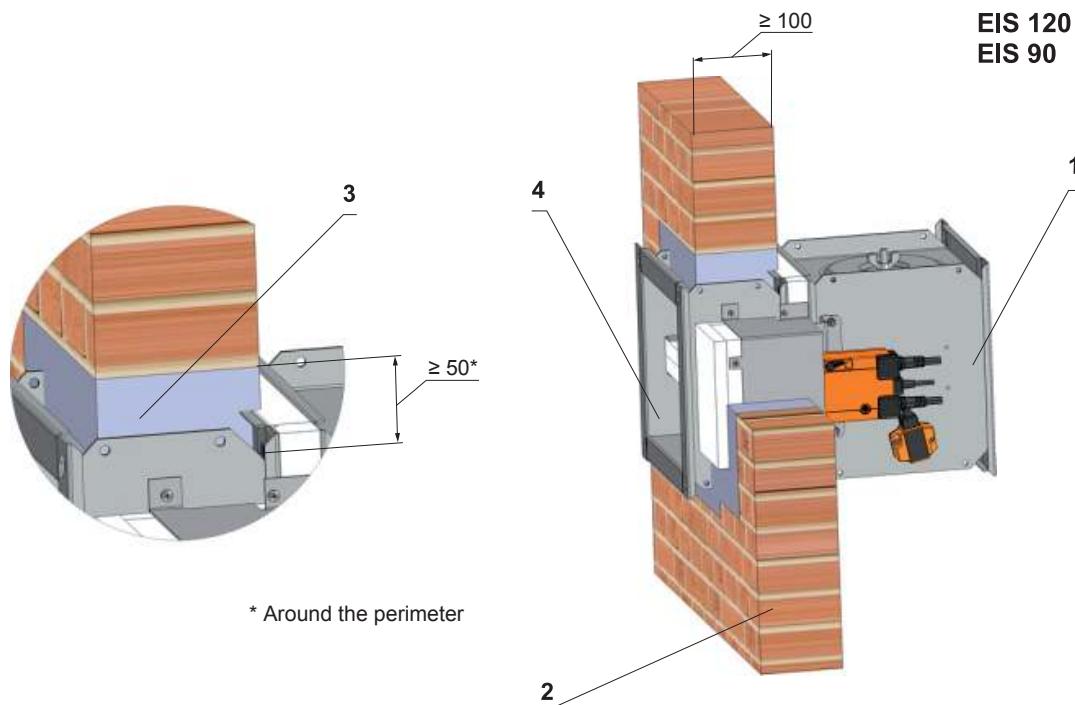
6 Statement of installations

6.1. Statement of installations the fire dampers FDMA 90 and their fire resistance Tab. 6.1.1.

Tab. 6.1.1. Statement of installations

Construction	Installation	Material of stuffing box	Figure
Solid wall construction	Wet	mortar or gypsum	40
	Dry	stuffing box, fire protection mastic and cement lime plate	41
		Weichschott	42
		Fire resistant foam	54
Outside solid wall construction	Wet	mineral wool	56
	Dry	mineral wool	43, 57
Solid ceiling construction	Wet	mortar or gypsum	44
	Dry	stuffing box, fire protection mastic and cement lime plate	45
		Weichschott	46
Outside solid ceiling construction	Wet	mineral wool	47
Gypsum wall construction	Wet	mortar or gypsum	48, 56
	Dry	stuffing box, fire protection mastic and cement lime plate	49
		Weichschott	50
		Fire resistant foam	55
Outside Gypsum wall construction	Wet	mineral wool	58
	Dry	mineral wool	51, 59

Fig. 40 Solid wall construction - mortar or gypsum

**POSITION:**

- 1 Fire damper FDMA
- 2 Solid wall construction
- 3 Mortar or gypsum
- 4 Duct

Notice:

The requirement to EIS 120 must be specified in the order alone. Without specification is supplied the standard flap EIS 90.

Fig. 41 Solid wall construction - stuffing box, fire protection mastic and cement lime plate

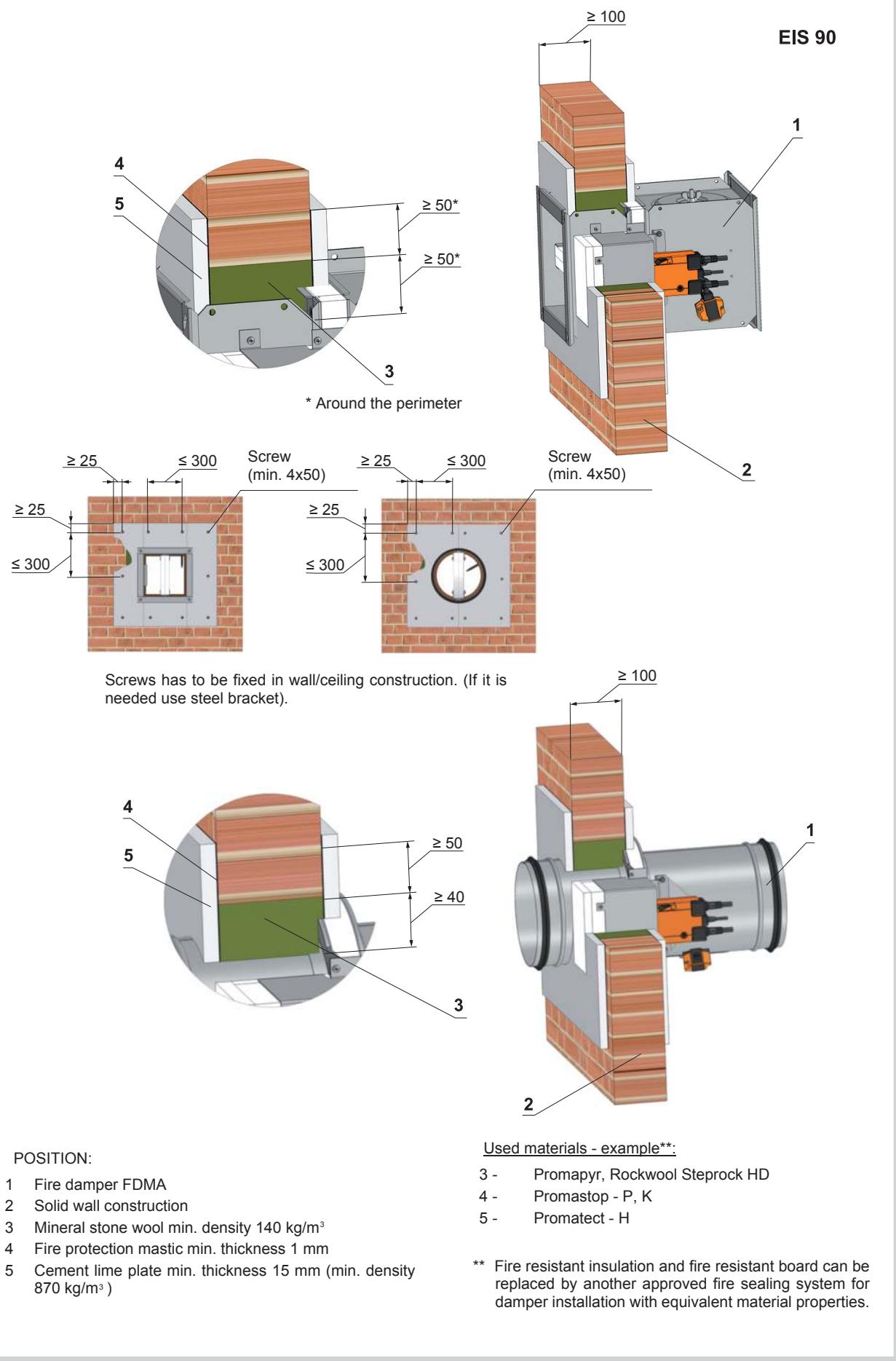
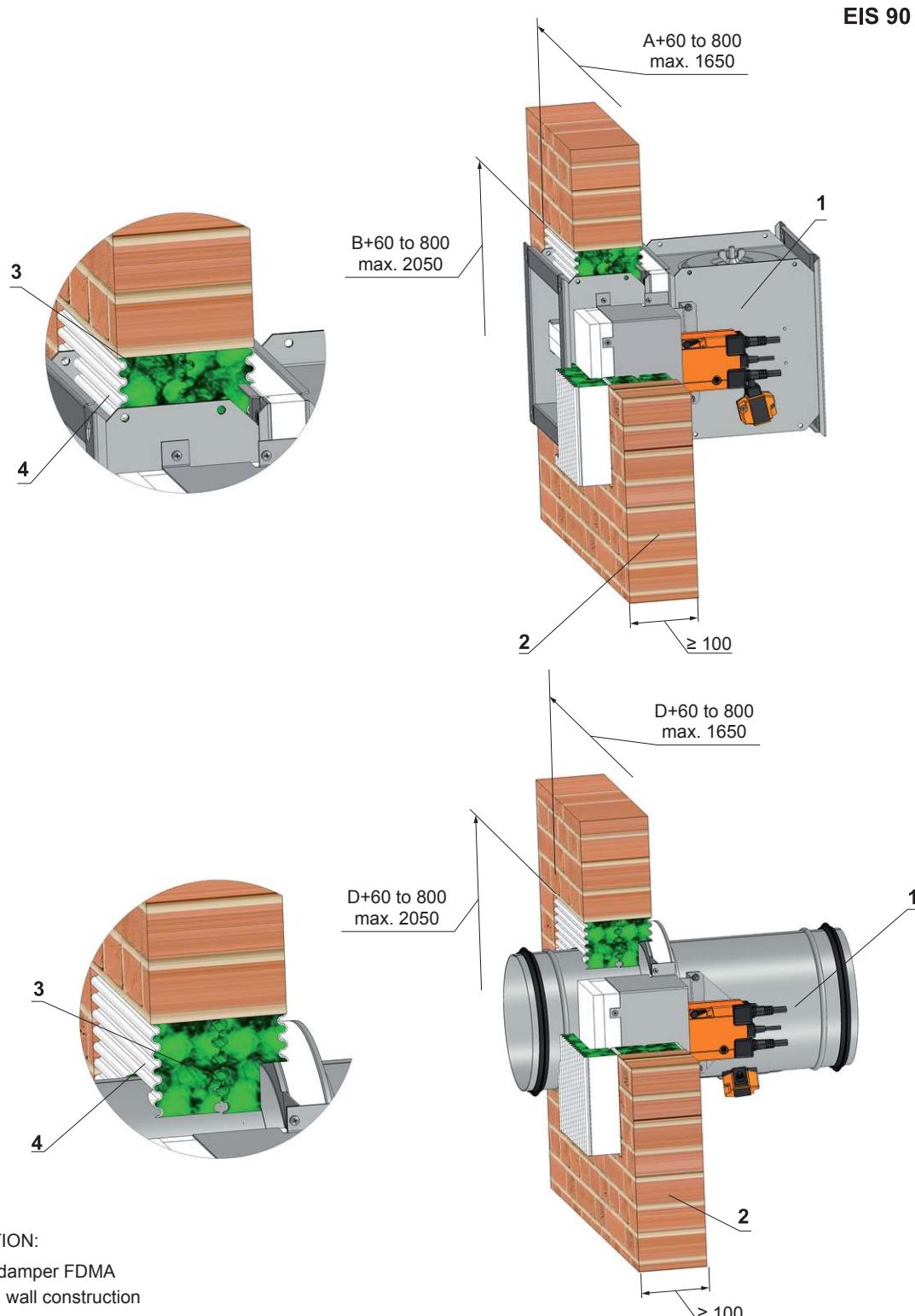


Fig. 42 Solid wall construction - Weichschott

Used materials - example*:

- 3 - Hilti CFS-CT B 1S 140/50
- 4 - Hilti CFS-CT

Notice:

- * Fire resistant insulation and fire resistant board can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

Fig. 43 Installation outside of solid wall construction - mineral wool

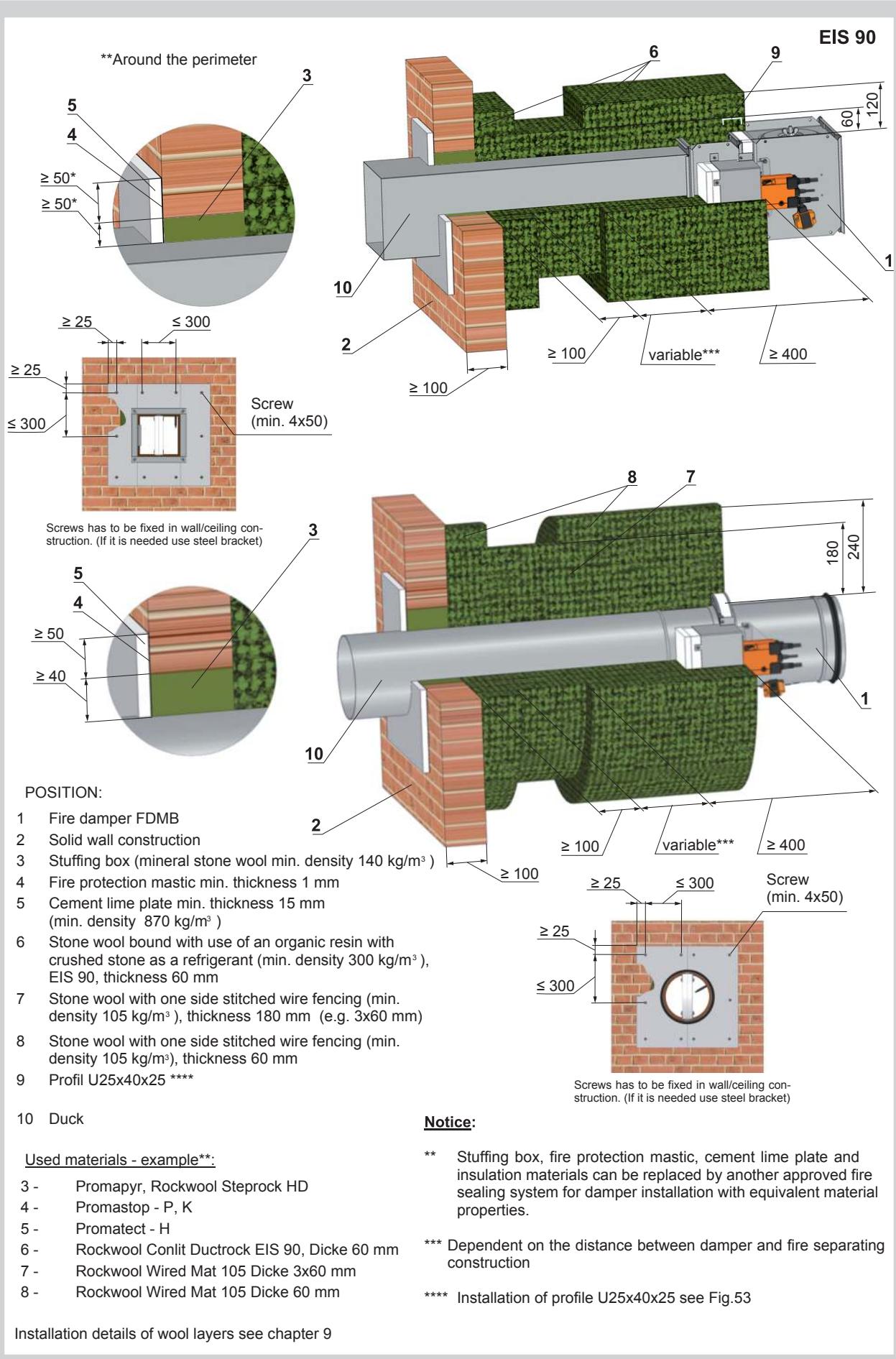
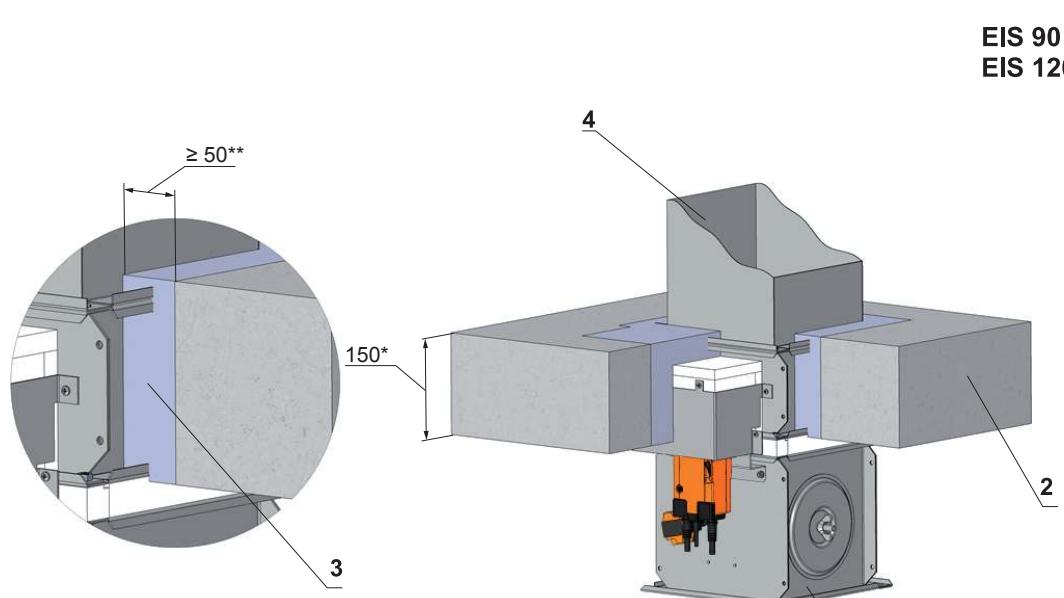
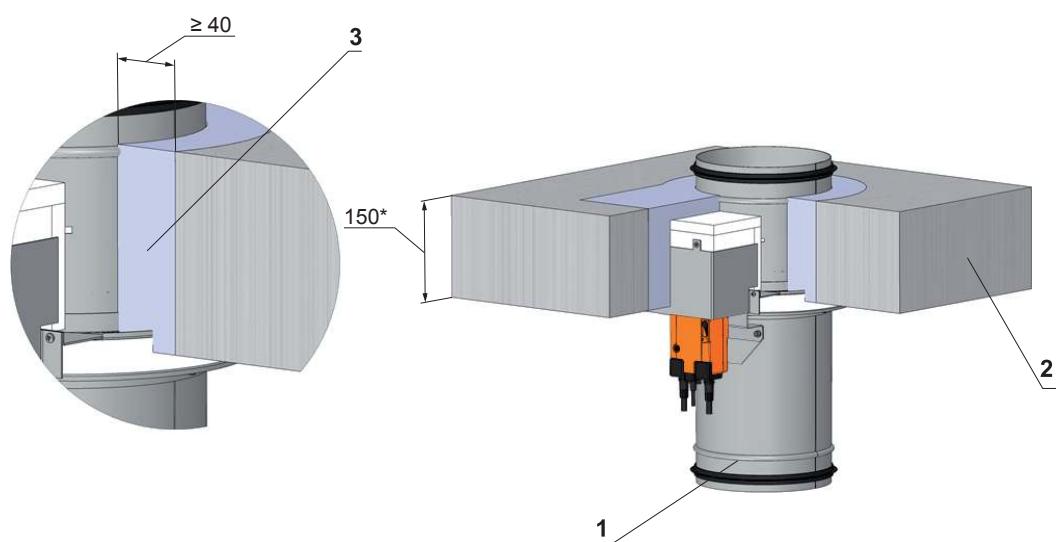


Fig. 44 Solid wall construction - stuffing box and fire protection mastic



* min. 110 - Concrete/ min. 125 - Aerated concrete
** Around the perimeter



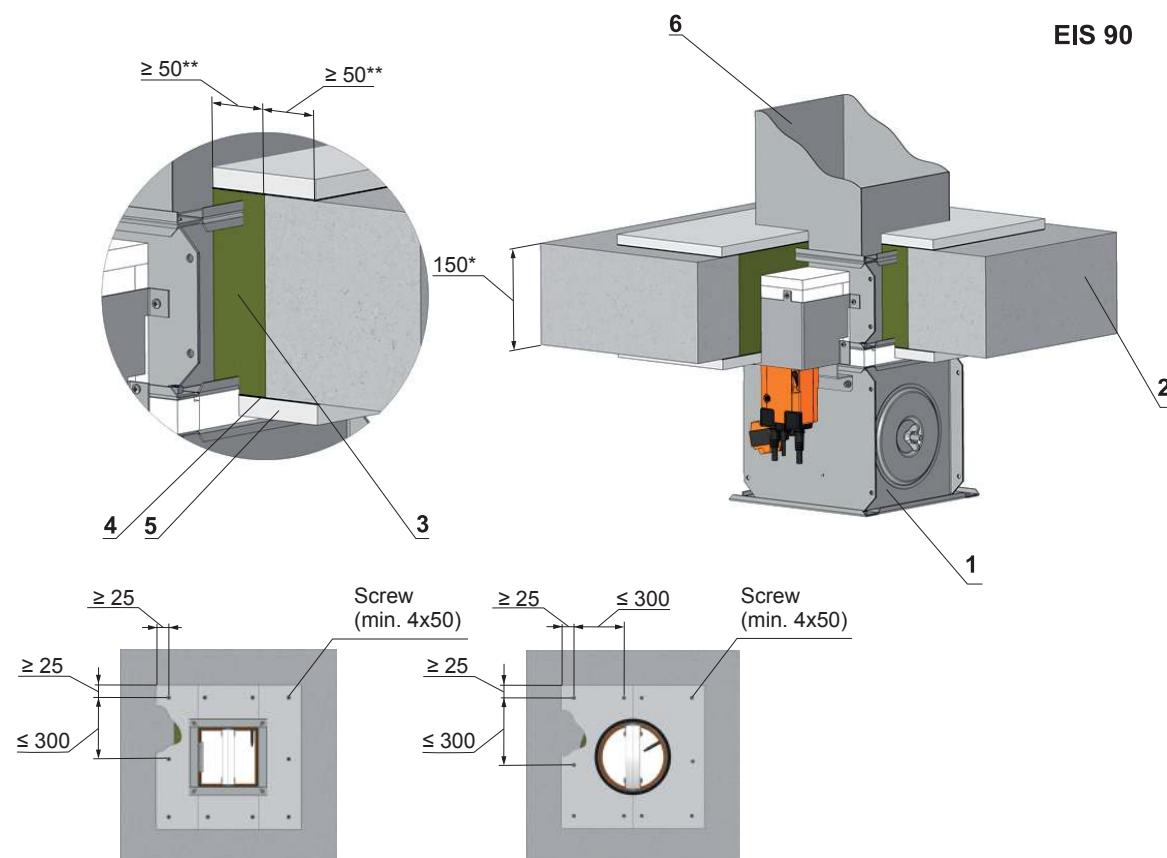
POSITION:

- 1 Fire damper FDMA
- 2 Solid ceiling construction
- 3 Mortar or gypsum
- 4 Duct

Notice:

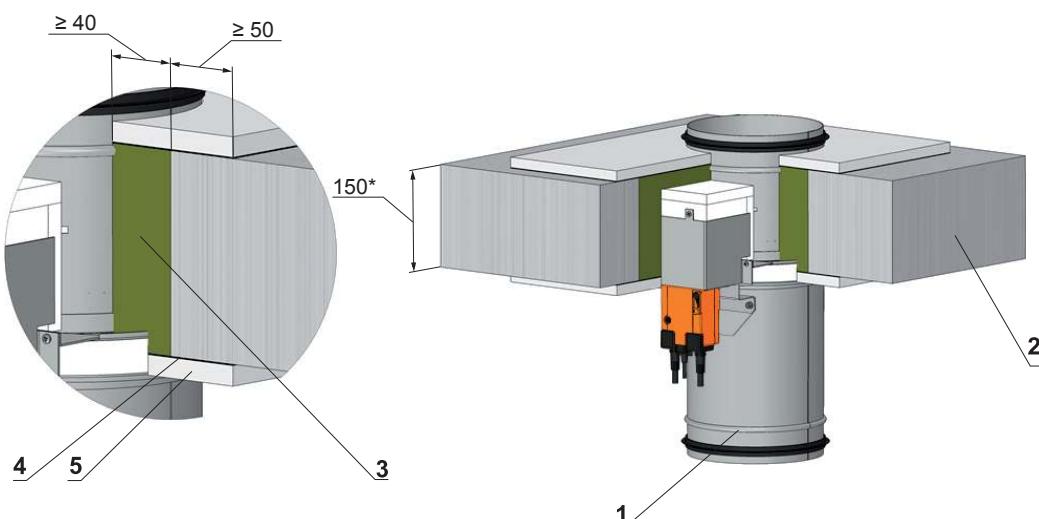
The requirement to EIS 120 must be specified in the order alone. Without specification is supplied the standard flap EIS90.

Fig. 45 Solid ceiling construction - stuffing box, fire protection mastic and cement lime plate



Screws has to be fixed in wall/ceiling construction. (If it is min. 110 - Concrete/ min. 125 - Aerated concrete needed use steel bracket).

** Around the perimeter



POSITION:

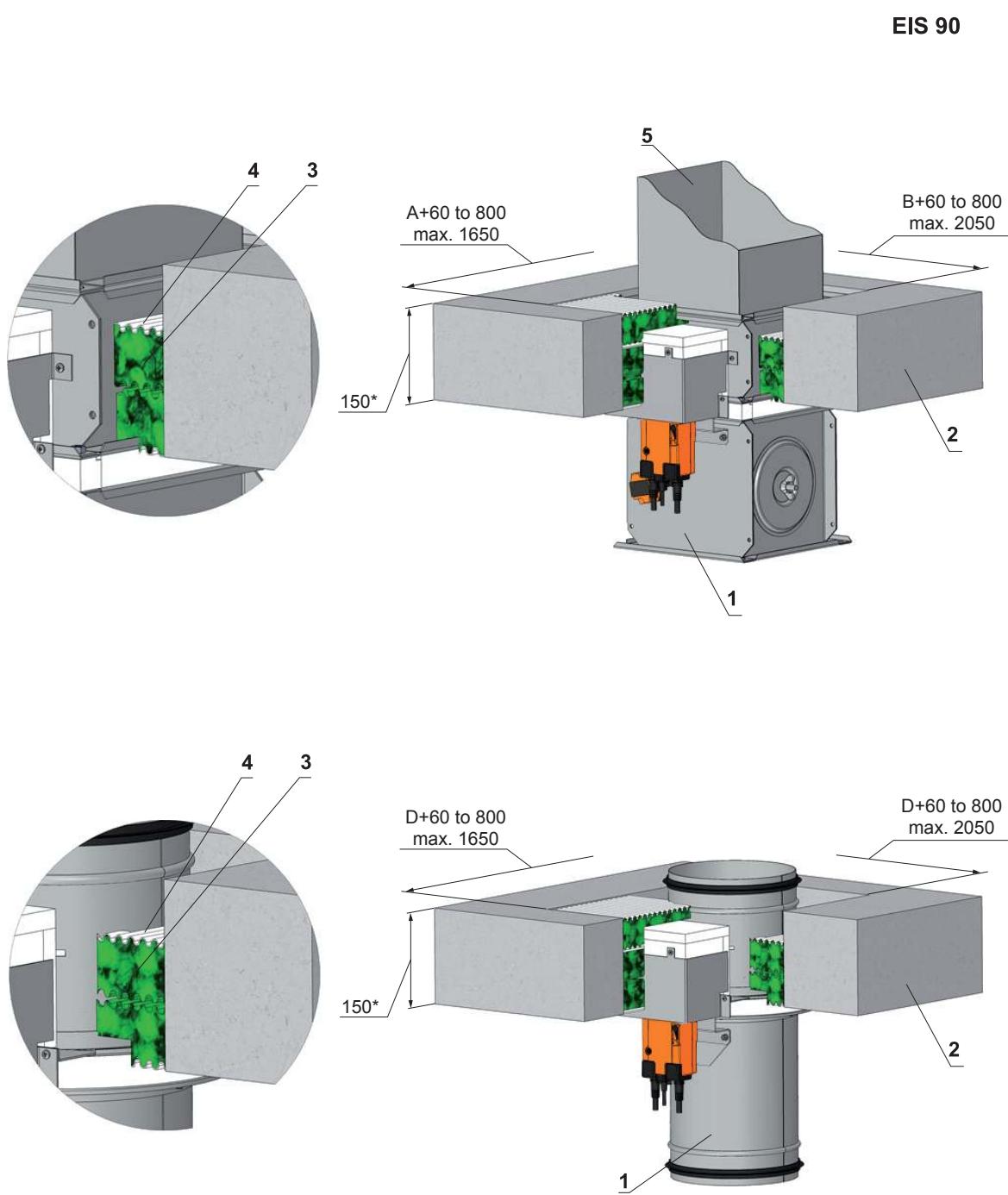
- 1 Fire damper FDMA
- 2 Solid ceiling construction
- 3 Mineral stone wool min. density 140 kg/m³
- 4 Fire protection mastic min. thickness 1 mm
- 5 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
- 6 Duct

Used materials - example**:

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

** Fire resistant insulation and fire resistant board can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

Fig. 46 Solid ceiling construction - Weichschott

**POSITION:**

- 1 Fire damper FDMA
- 2 Solid ceiling construction
- 3 Fire resistant board
- 4 Fire stop coating thickness 1 mm
- 5 Duct

* min. 110 - Concrete/ min. 125 - Aerated concrete

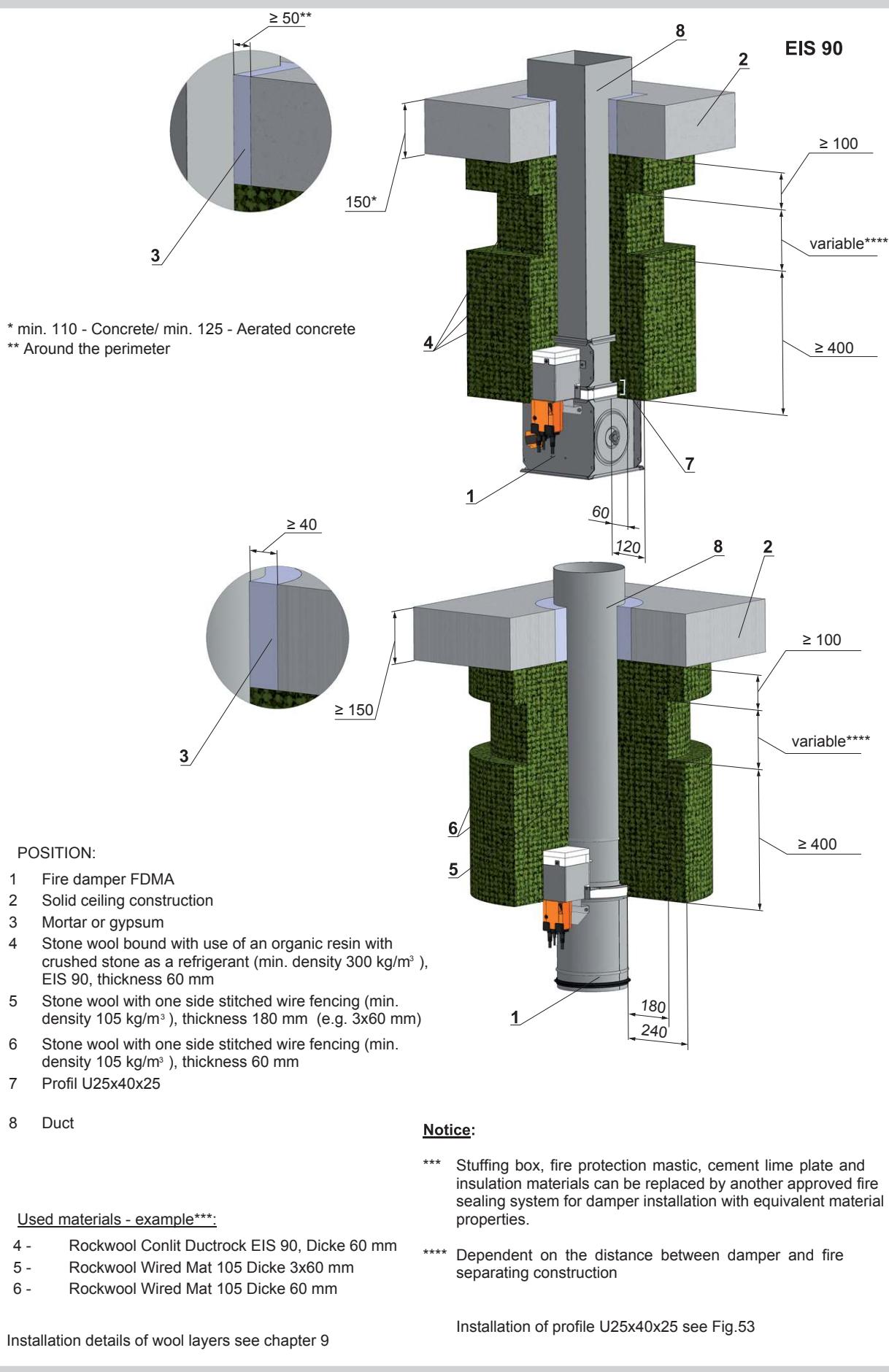
Notice:

** Fire resistant insulation and fire resistant board can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

Used materials - example**:

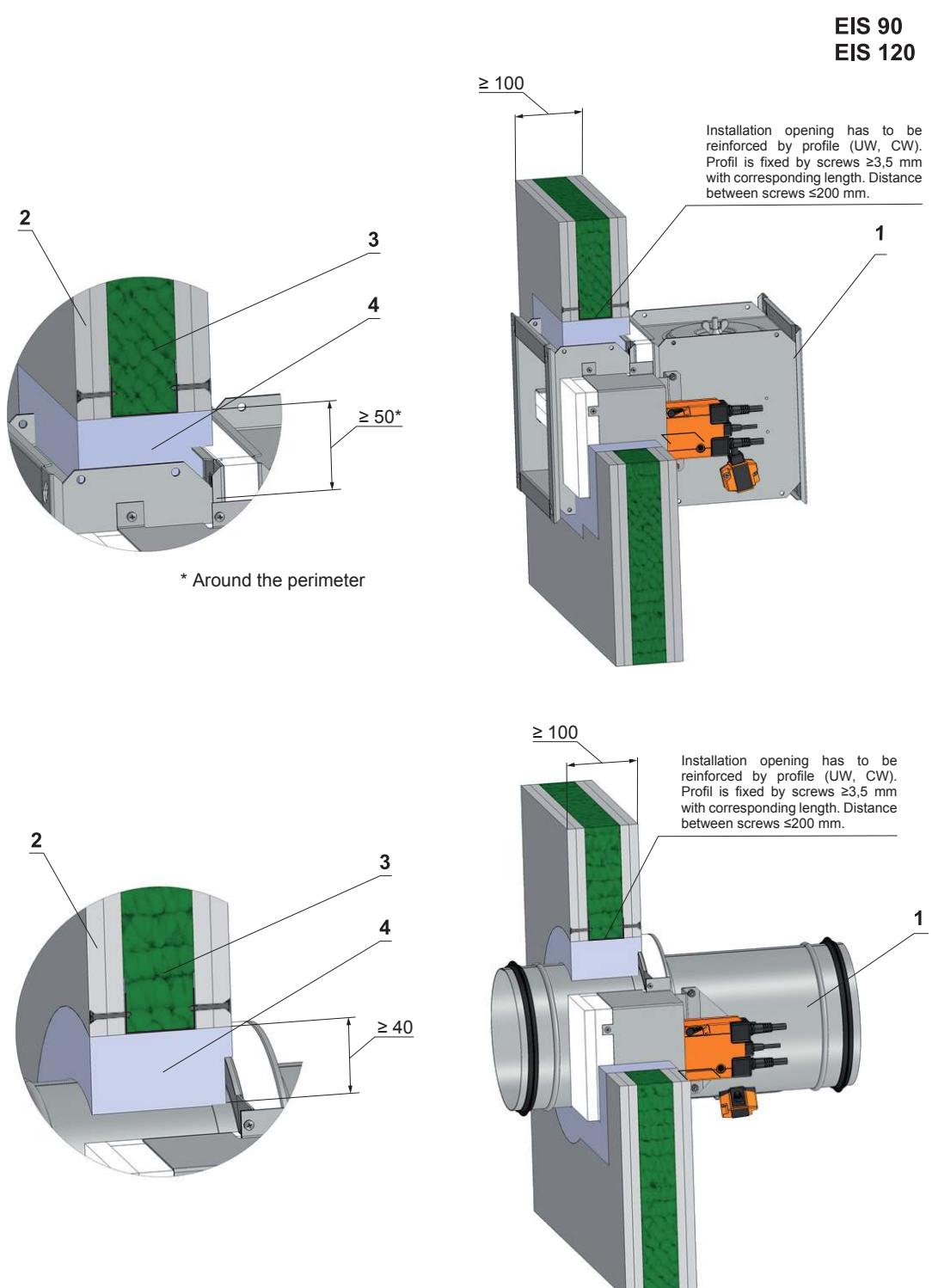
- 3 - Hilti CFS-CT B 1S 140/50
- 4 - Hilti CFS-CT

Fig. 47 Installation outside of solid ceiling construction - mineral wool



Installation details of wool layers see chapter 9

Fig. 48 Gypsum wall construction - mortar or gypsum

**POSITION:**

- 1 Fire damper FDMA
- 2 Gypsum plate
- 3 Fire resistant insulation
- 4 Mortar or gypsum

Notice:

The requirement to EIS 120 must be specified in the order alone. Without specification is supplied the standard flap EIS90.

Fig. 49 Gypsum wall construction - stuffing box, fire protection mastic and cement lime plate

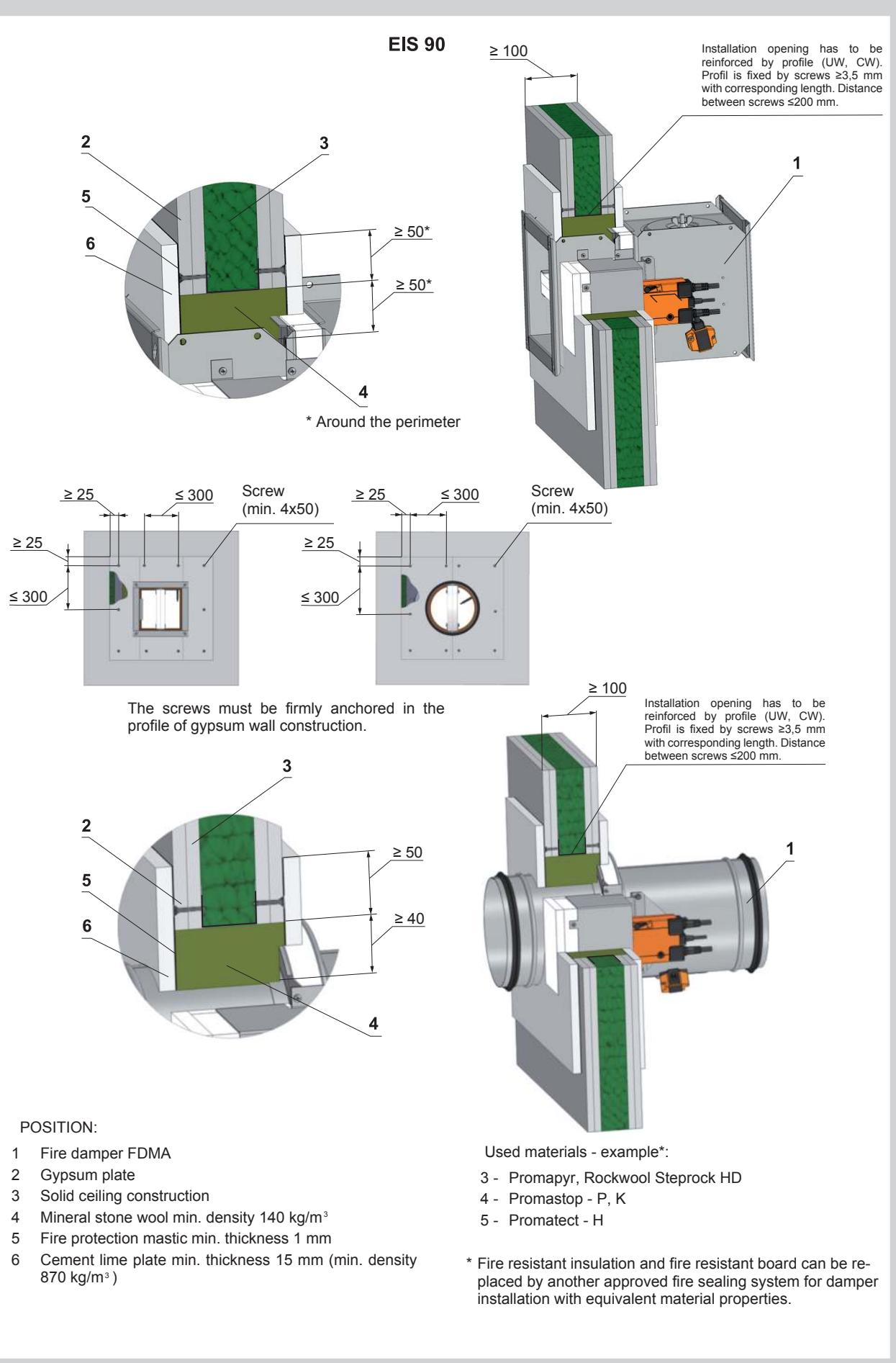
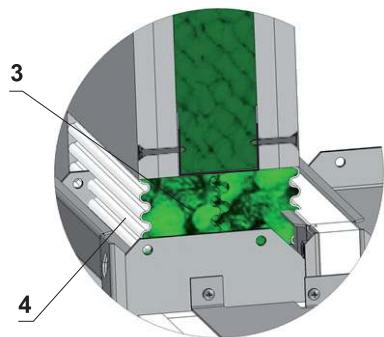
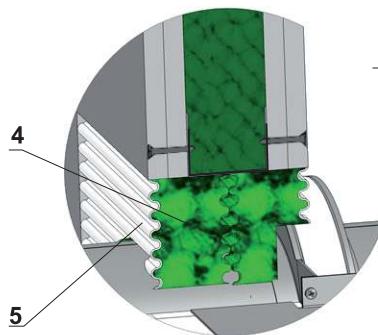
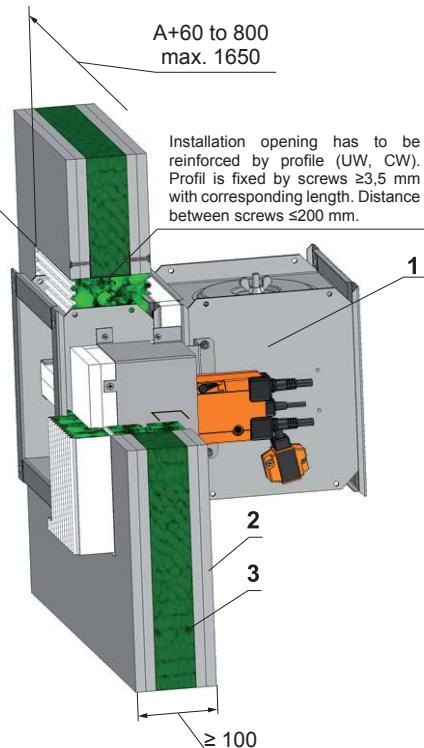


Fig. 50 Gypsum wall construction - Weichschott

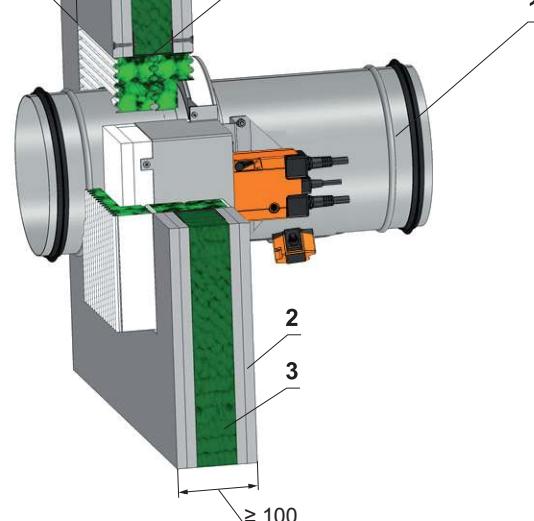
EIS 90

B+60 to 800
max. 2050A+60 to 800
max. 1650

Installation opening has to be reinforced by profile (UW, CW). Profil is fixed by screws $\geq 3,5$ mm with corresponding length. Distance between screws ≤ 200 mm.

D+60 to 800
max. 2050D+60 to 800
max. 1650

Installation opening has to be reinforced by profile (UW, CW). Profil is fixed by screws $\geq 3,5$ mm with corresponding length. Distance between screws ≤ 200 mm.

**POSITION:**

- 1 Fire damper FDMA
- 2 Gypsum plate
- 3 Solid ceiling construction
- 4 Fire resistant board
- 5 Fire stop coating thickness 1 mm

Notice:

- * Fire resistant insulation and fire resistant board can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

Used materials - example*:

- 4 - Hilti CFS-CT B 1S 140/50
- 5 - Hilti CFS-CT

Fig. 51 Installation outside of gypsum wall construction - mineral wool

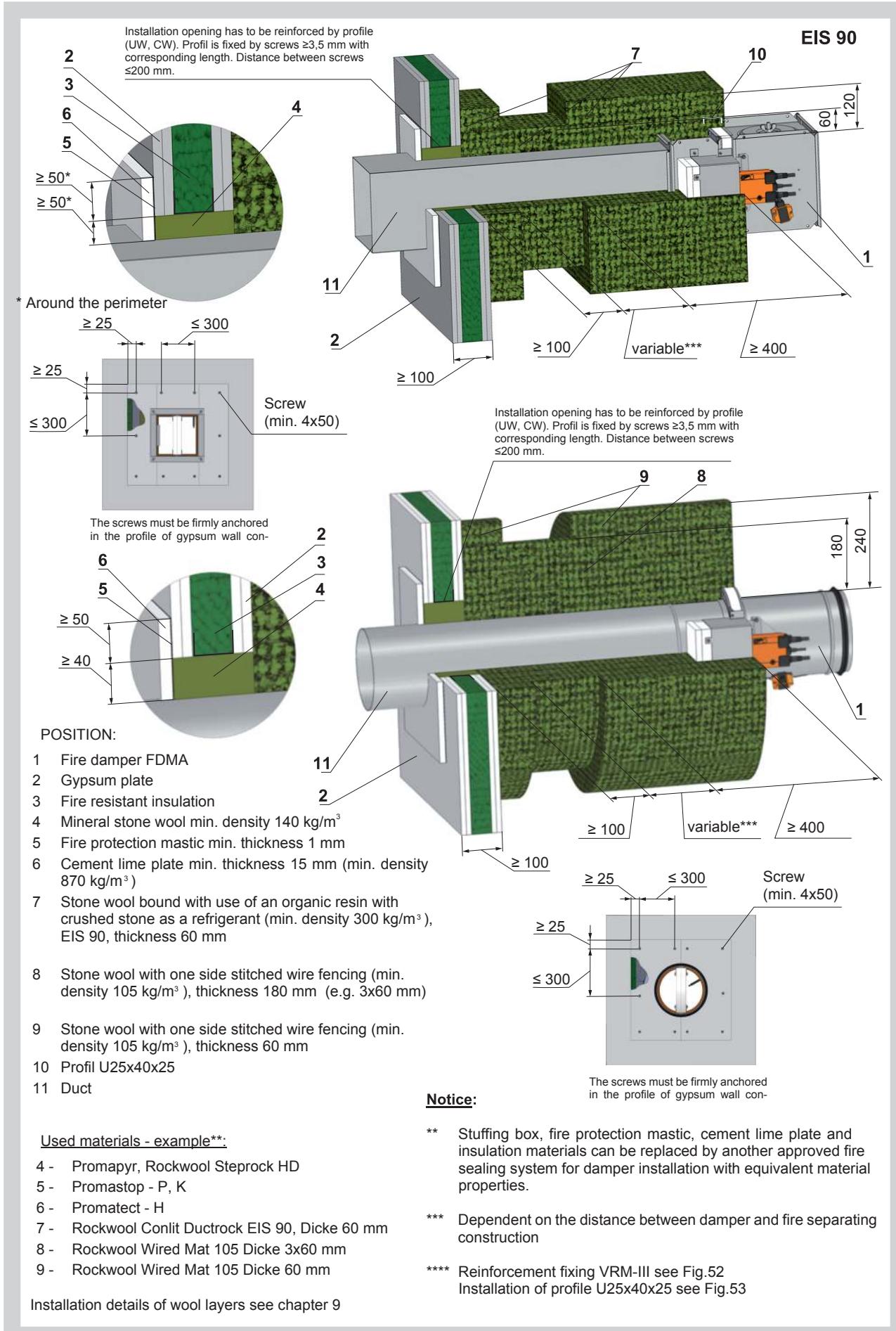
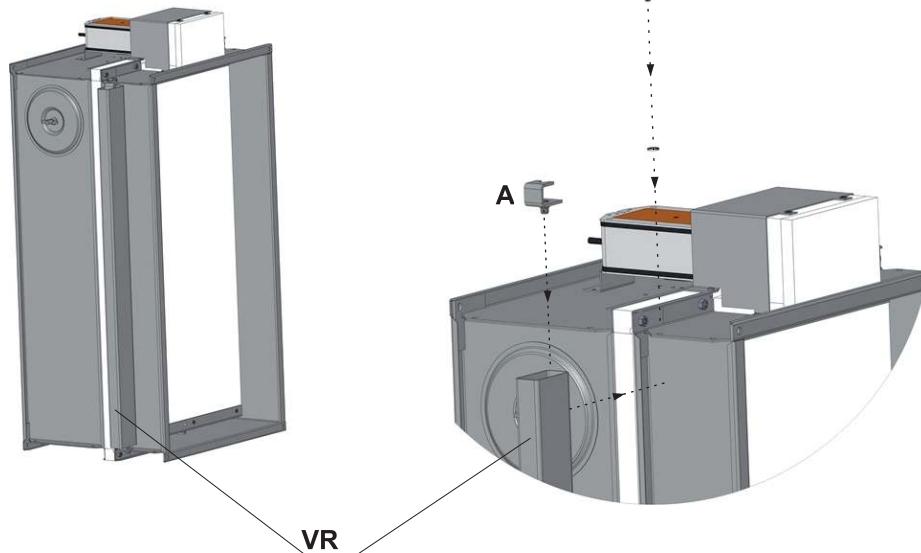


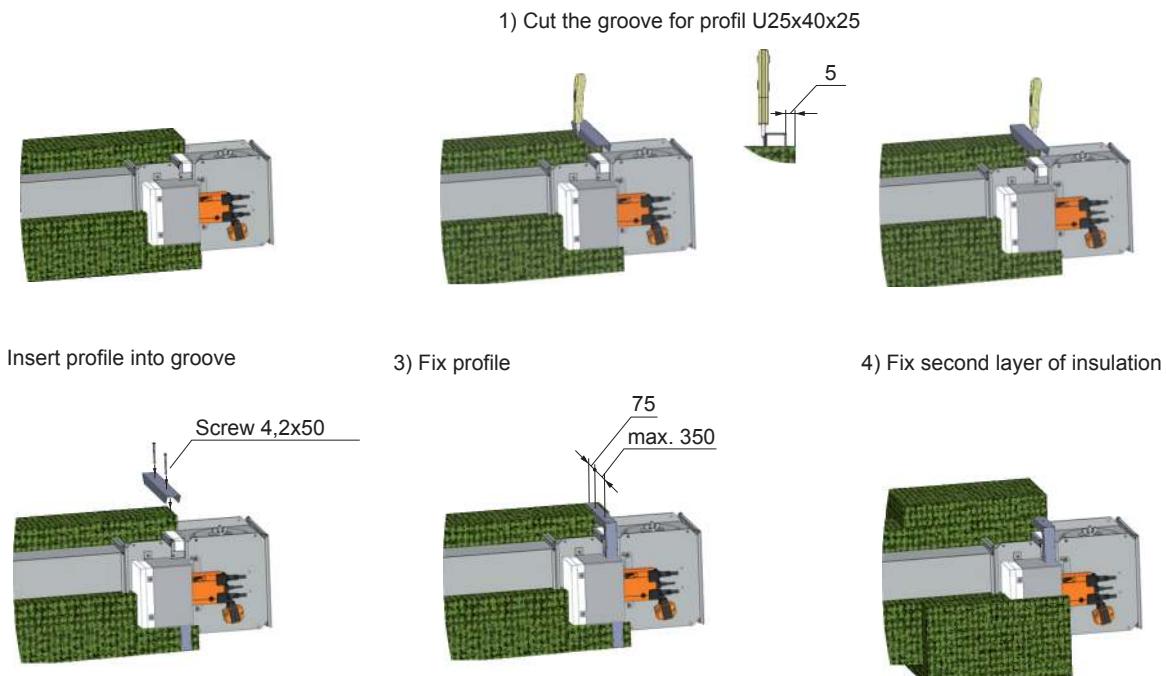
Fig 52 Fixing of reinforcement to damper body



- 1.) Insert part A into reinforcement VRM-PM
- 2.) Set up nut of the part A under correct hole
- 3.) Lock screw B
- 4.) It has to be done on each side of VRM-90

NOTICE: For dampers with $A \geq 800$ and damper placement outside wall construction is necessary to use reinforcement VRM-PM.

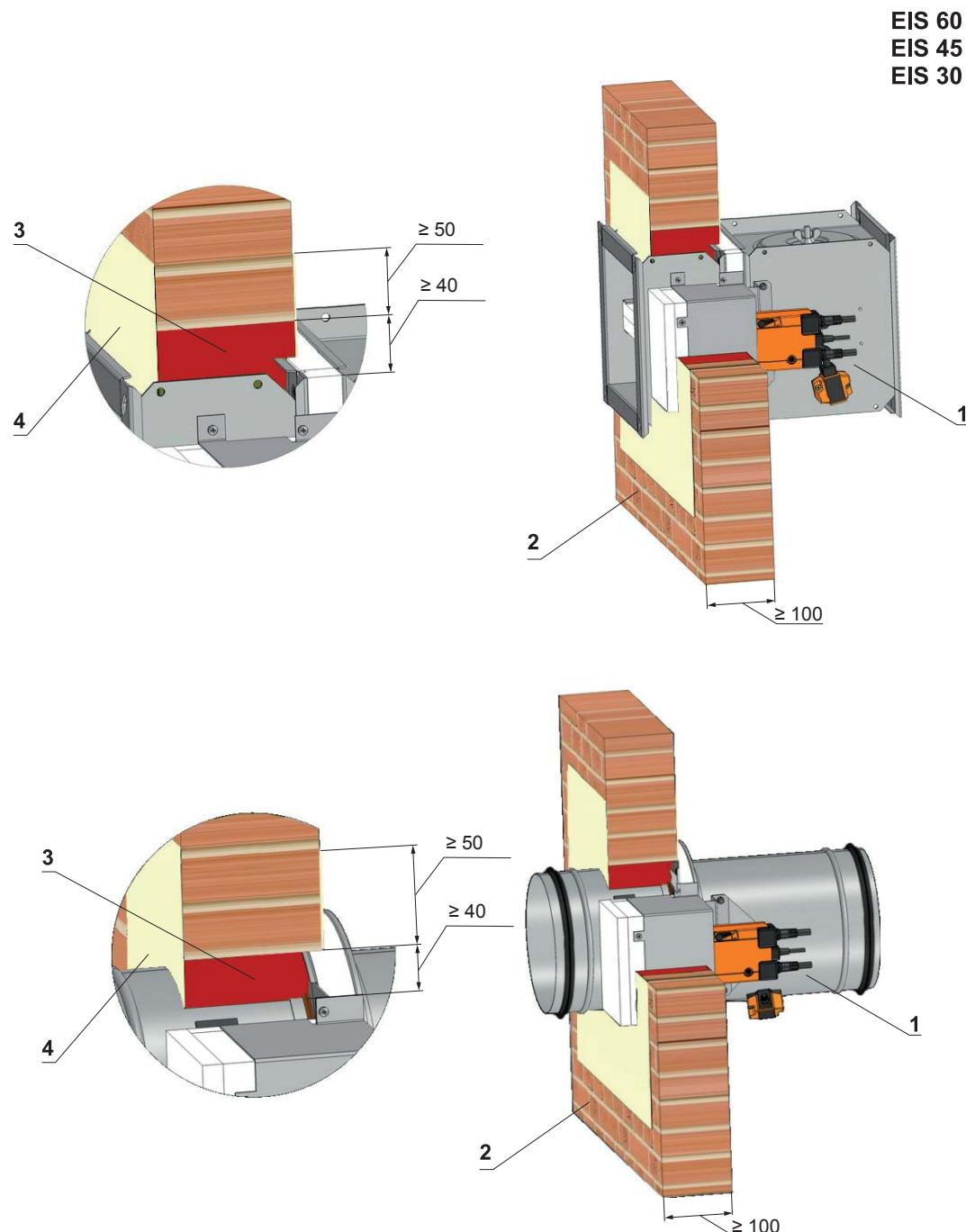
Fig. 53



Installation details see chapter 9

7. Installation in Fire resistant foam

Fig. 54 Solid wall construction - Fire resistant foam covered by stucco plaster



POSITION:

- 1 Fire damper FDMA
- 2 Solid wall
- 3 Fire resistant foam
- 4 Stucco plaster

Used materials - example*:

- 3 - HILTI CFS-F FX - EIS 60
- PROMAFOAM-C - EIS 45
- SOUDAL, Soudafoma FR-B1 - EIS 30
- DenBraven, Fire resistant foam PUR - EIS 30

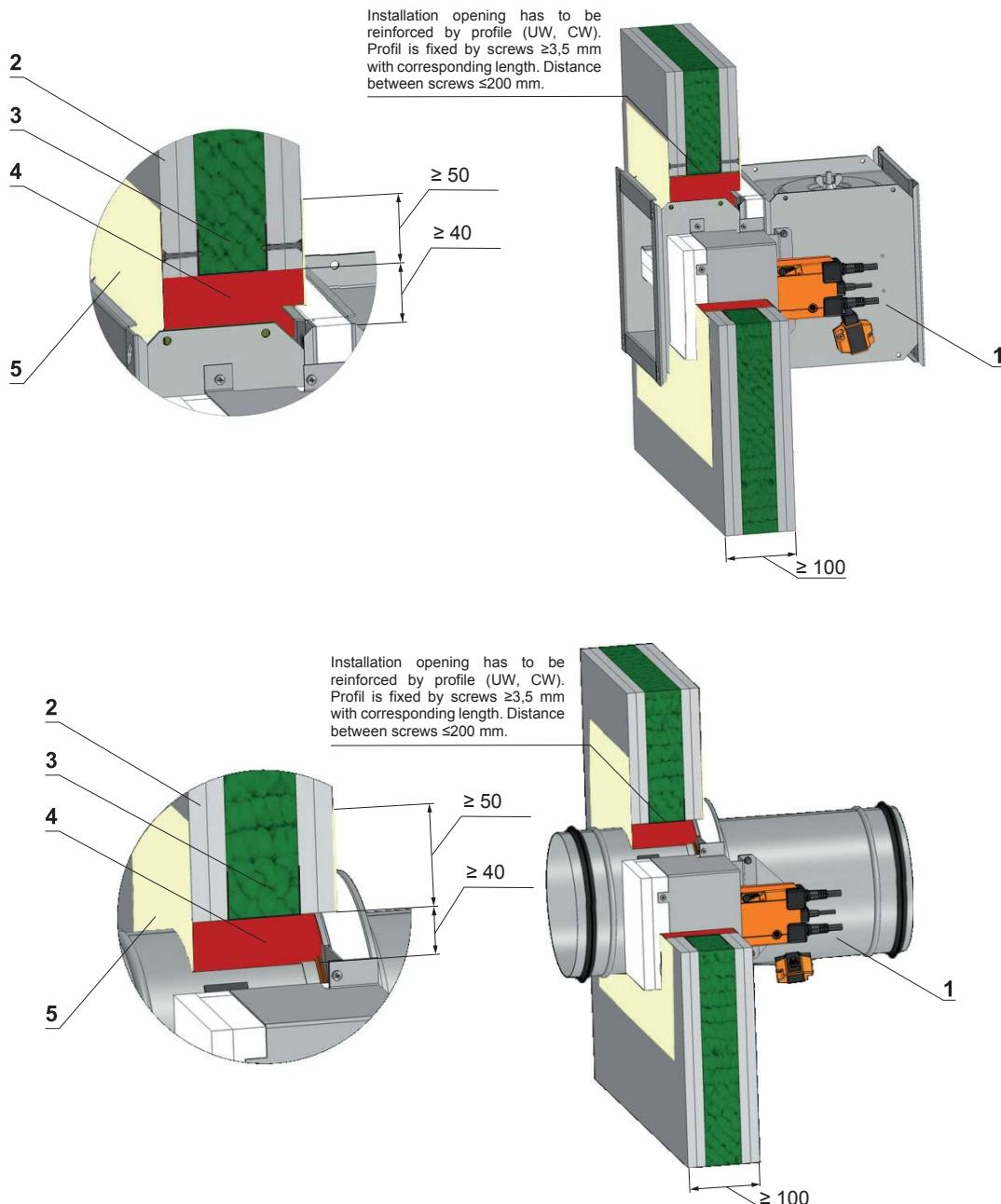
Maximal damper dimensions:

Square 400 x 400 mm

Round 200 mm

Fig. 55 Gypsum wall construction - Fire resistant foam covered by stucco plaster

EIS 60
EIS 45
EIS 30



POSITION:

- 1 Fire damper FDMA
- 2 Gypsum plate
- 3 Fire resistant insulation
- 4 Fire resistant foam
- 5 Stucco plaster

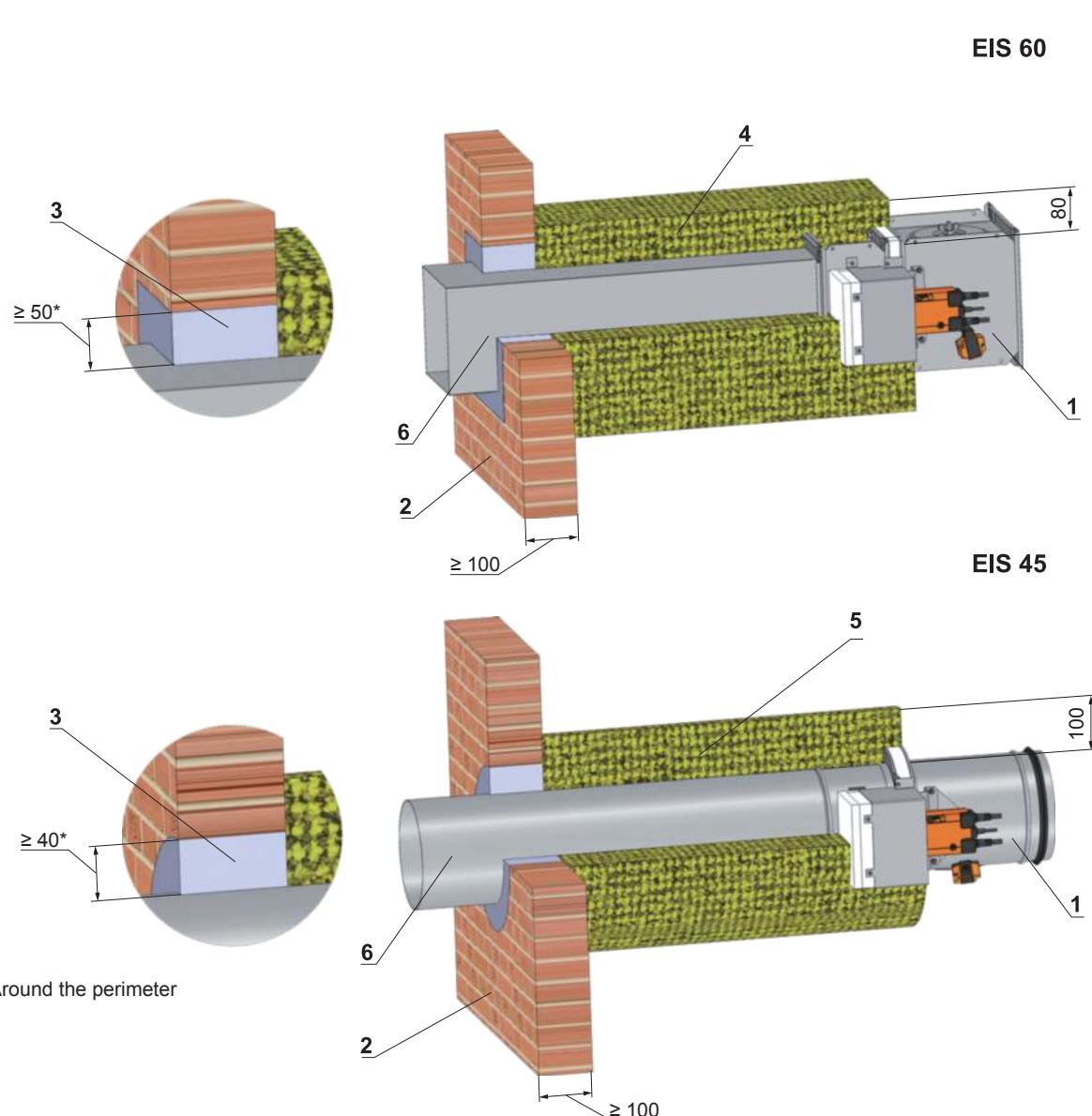
Used materials - example*:

- 3 - HILTI CFS-F FX - EIS 60
- PROMAFOAM-C - EIS 45
- SOUDAL, Soudafoam FR-B1 - EIS 30
- DenBraven, Fire resistant foam PUR - EIS 30

Maximal damper dimensions:**Square 400 x 400 mm****Round 200 mm**

8. Installation outside of wall construction EIS60, EIS45

Fig. 56 Installation outside of solid wall construction - mineral wool



POSITION:

- 1 Fire damper FDMA
- 2 Solid wall
- 3 Mortar or gypsum
- 4 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 80 mm
- 5 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 100 mm
- 6 Duct

Used materials - example**:

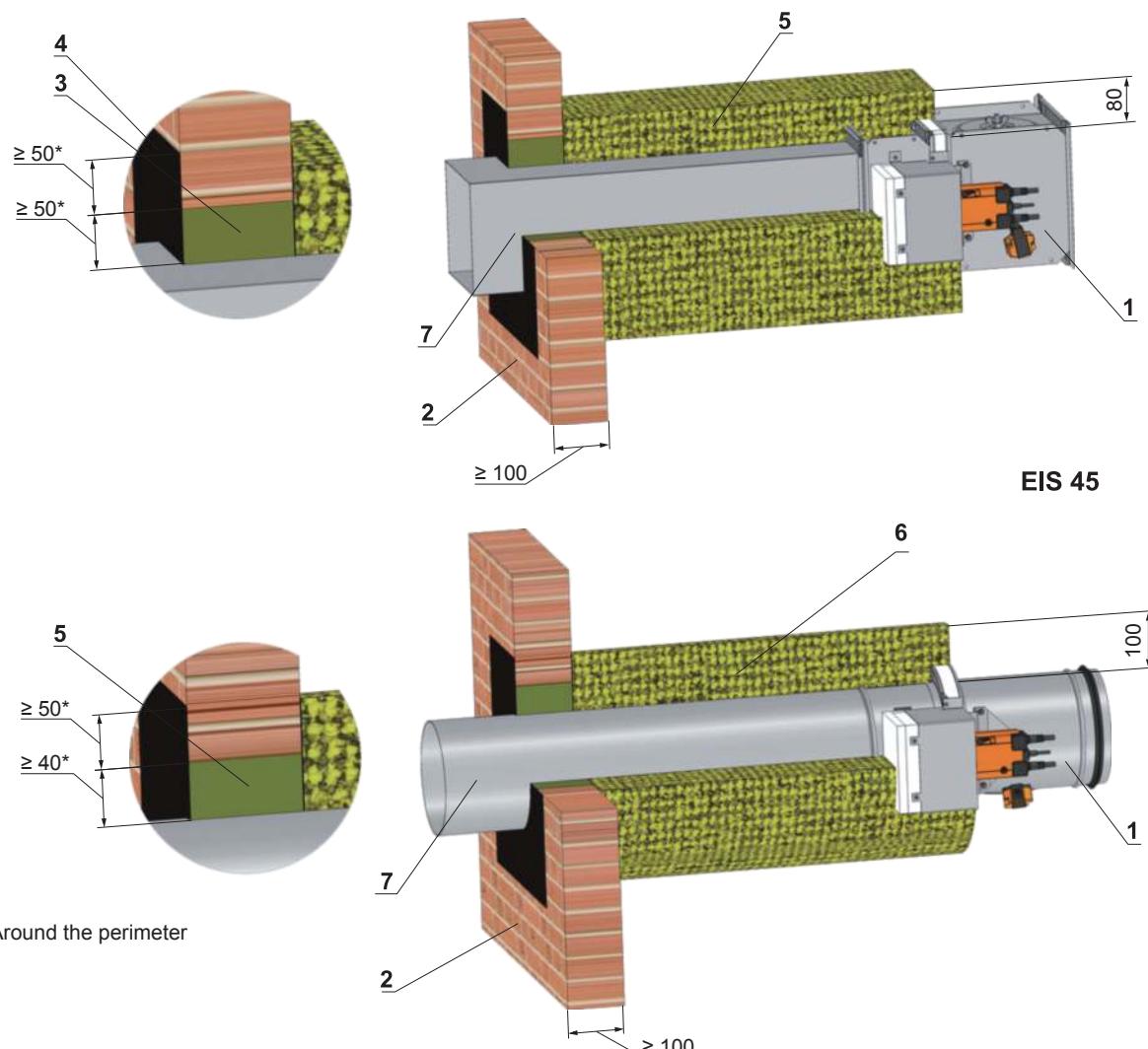
- 4 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
- 5 - Isover Ultimate Protect Wired MAT 4.0, th. 100 mm ALU1

Installation details of wool layers see chapter 9

Notice:

- *** 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. 57 Installation outside of solid wall construction - mineral wool



POSITION:

- 1 Fire damper FDMA
- 2 Solid wall
- 3 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 4 Fire protection mastic min. thickness 1 mm
- 5 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 80 mm
- 6 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 100 mm
- 7 Duct

Used materials - example**:

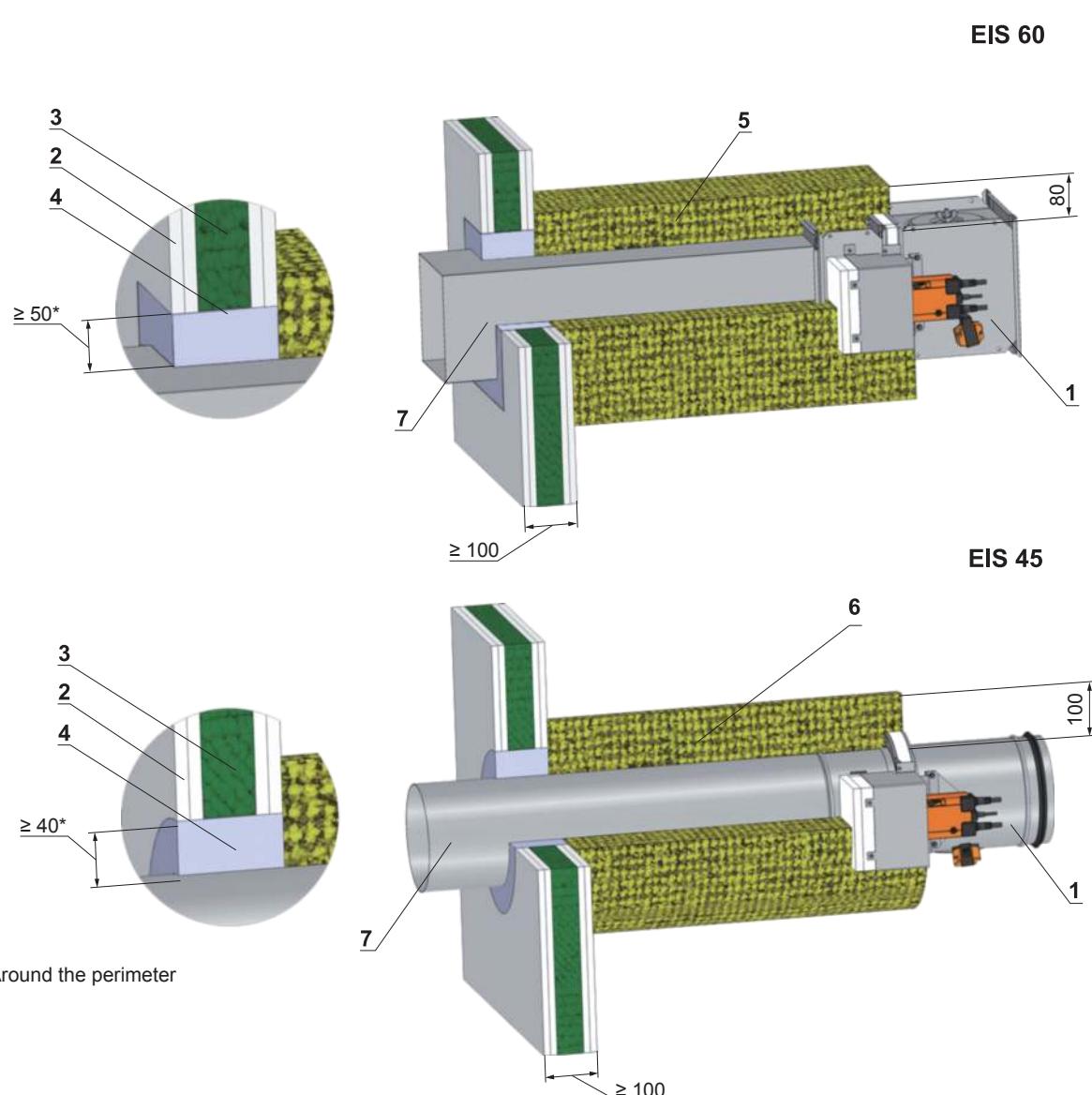
- 3 - Promapyr, Rockwool Steprock HD
- 4 - Promastop - P, K
- 5 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
- 6 - Isover Ultimate Protect Wired MAT 4.0, th. 100 mm ALU1

Installation details of wool layers see chapter 9

Notice:

- *** 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. 58 Installation outside of gypsum wall construction - mineral wool

**POSITION:**

- 1 Fire damper FDMA
- 2 Gypsum plate
- 3 Fire resistant insulation
- 4 Mortar or gypsum
- 5 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 80 mm
- 6 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 100 mm
- 7 Duct

Used materials - example:**

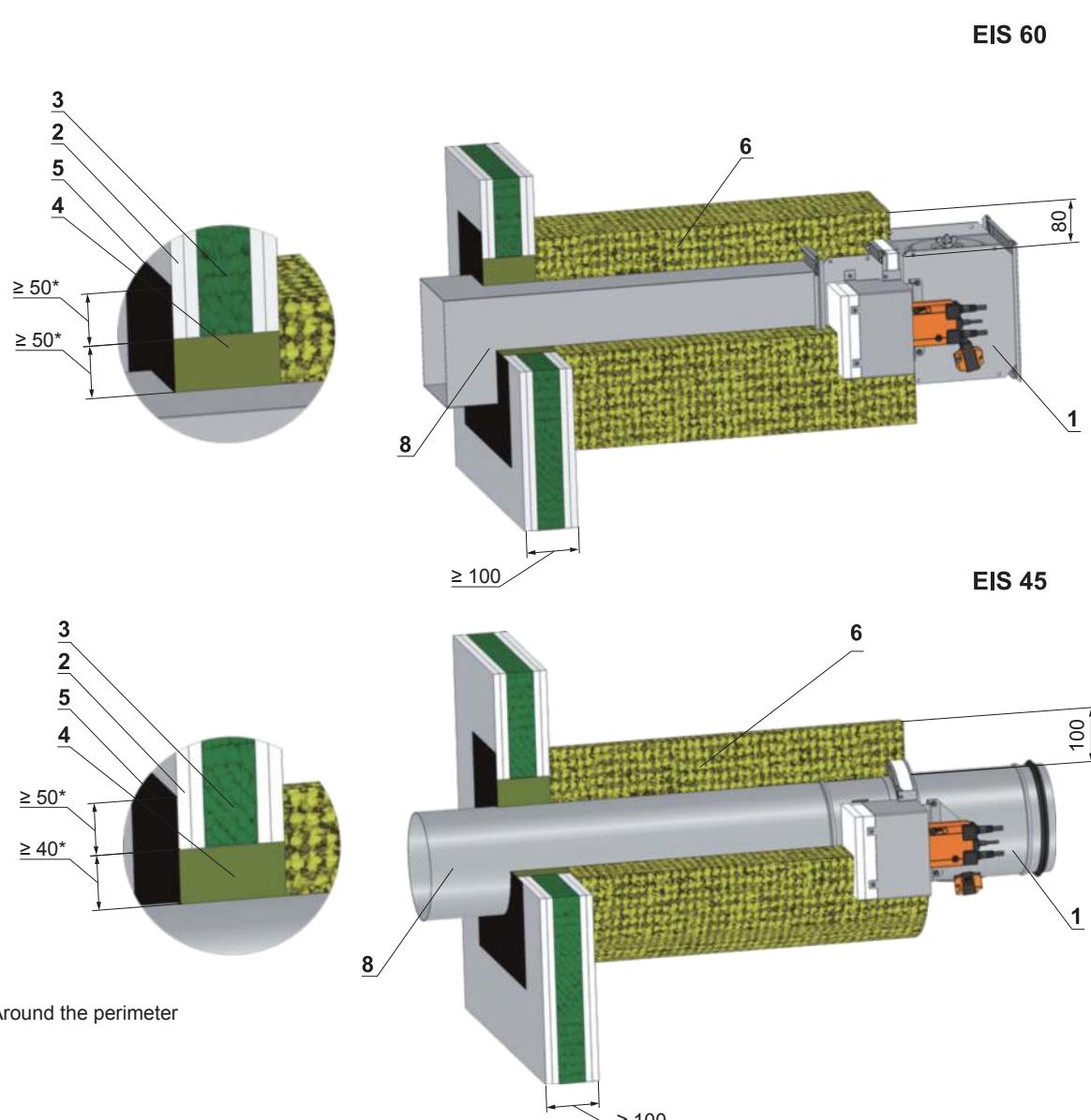
- 5 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
- 6 - Isover Ultimate Protect Wired MAT 4.0, th. 100 mm ALU1

Installation details of wool layers see chapter 9

Notice:

- *** 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. 59 Installation outside of gypsum wall construction - mineral wool



* Around the perimeter

POSITION:

- 1 Fire damper FDMA
- 2 Gypsum plate
- 3 Fire resistant insulation
- 4 Stuffing box (mineral stone wool min. density 140 kg/m³)
- 5 Fire protection mastic min. thickness 1 mm
- 6 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 80 mm
- 7 Stone wool with fire resistance EI 60, (min. density 66 kg/m³), thickness 100 mm
- 8 Duct

Used materials - example**:

- 4 - Promapyr, Rockwool Steprock HD
- 5 - Promastop - P, K
- 6 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
- 7 - Isover Ultimate Protect Wired MAT 4.0, th. 100 mm ALU1

Installation details of wool layers see chapter 9

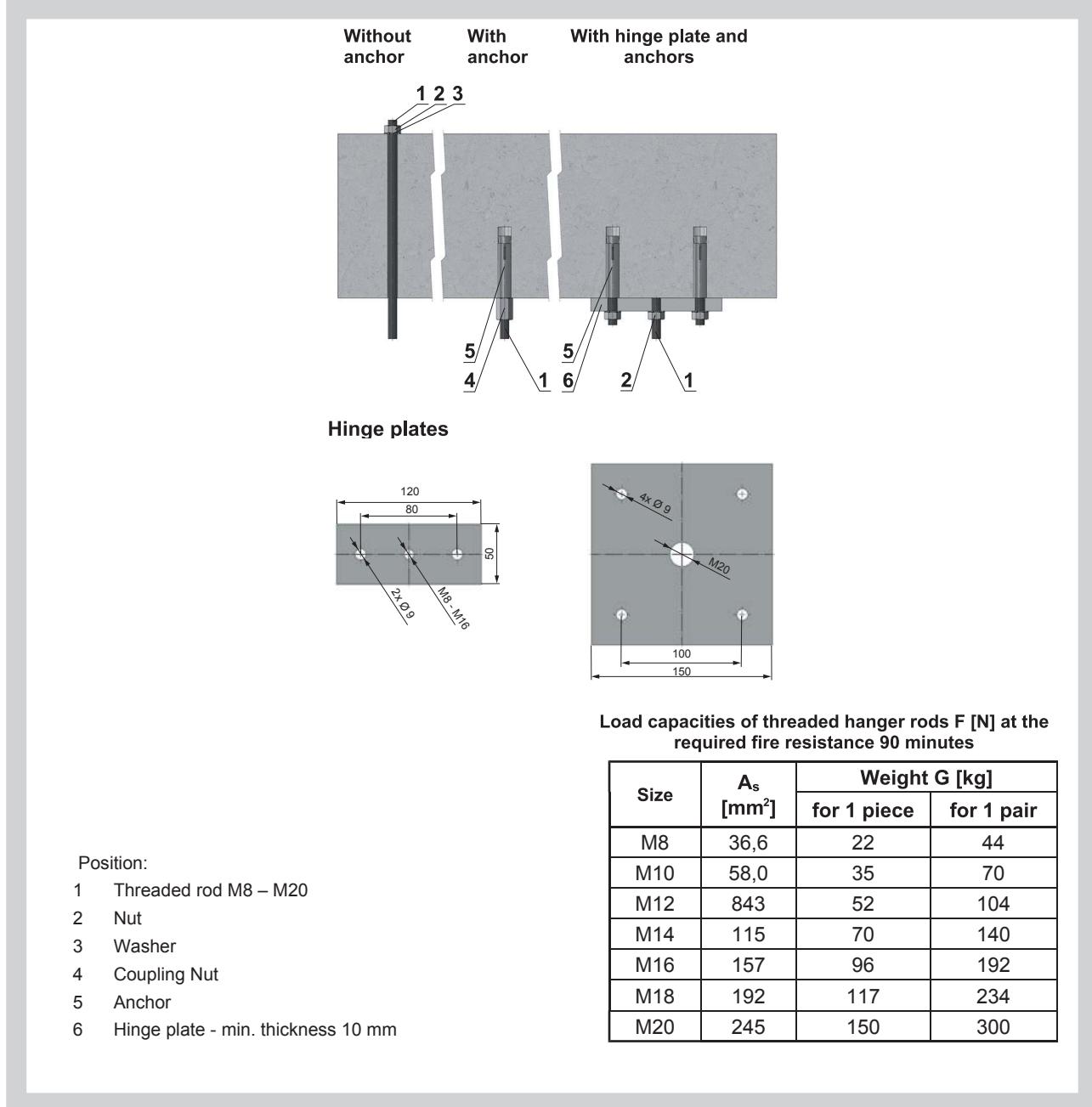
Notice:

- *** 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.

9. Suspension systems

9.1. Mounting to the ceiling wall

Fig. 60 Mounting to the ceiling wall



9.2. Horizontal installation

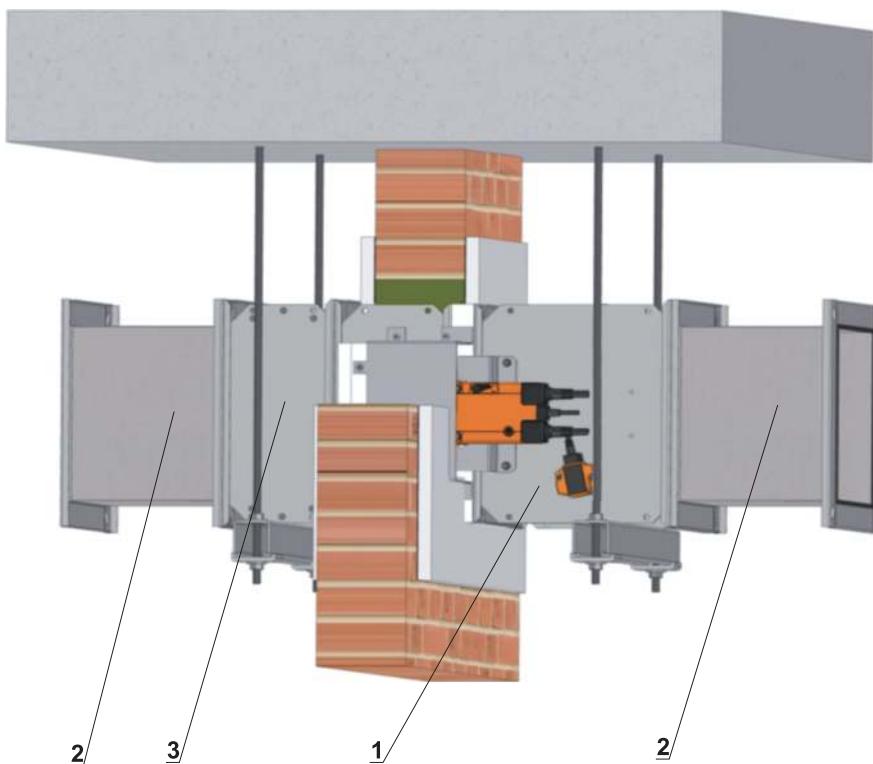
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

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.

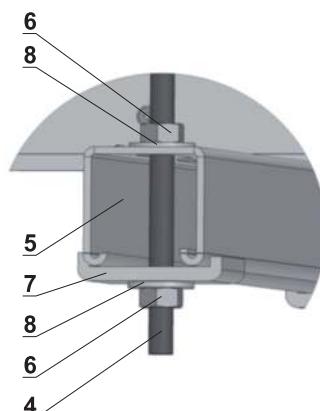
Threaded rods longer than 1,5 m require fire-resistant insulation.

Threaded rod fixing to the ceiling construction - see fig. 60

Fig. 61 Suspension - horizontal duct

**Position:**

- 1 Fire damper
- 2 Damping pad
- 3 Extension piece
- 4 Threaded rod
- 5 Mounting rail
- 6 Nut
- 7 U - Washer
- 8 Washer



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

9.3. 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.

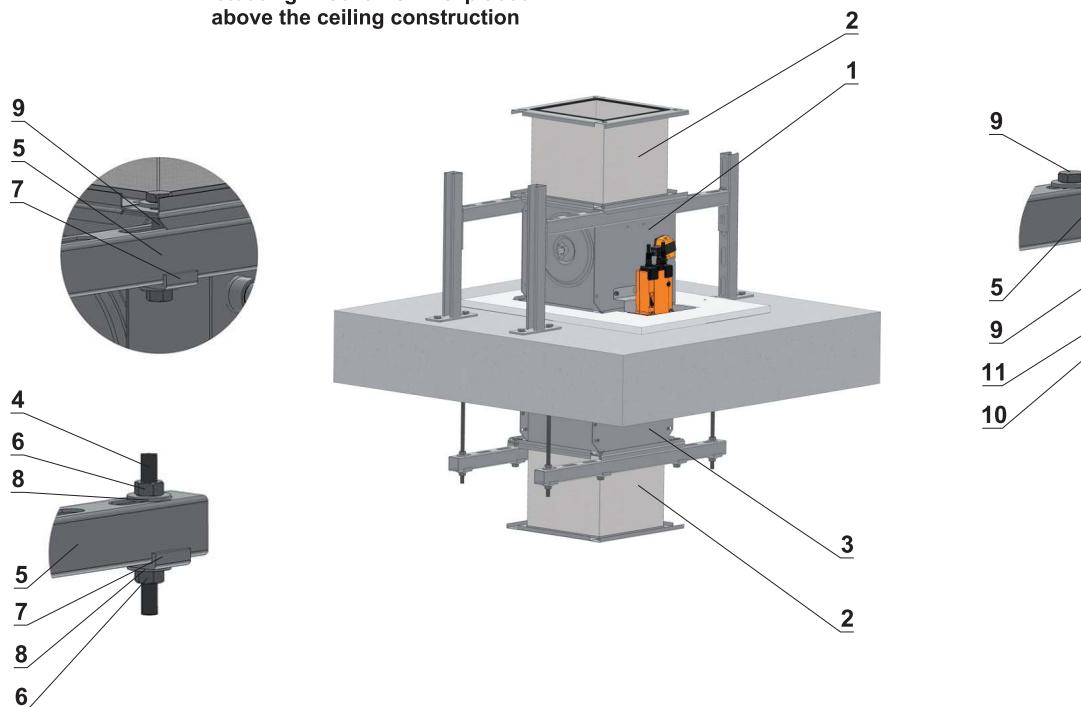
Damper can be suspended from the ceiling construction or supported above the ceiling construction.

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.

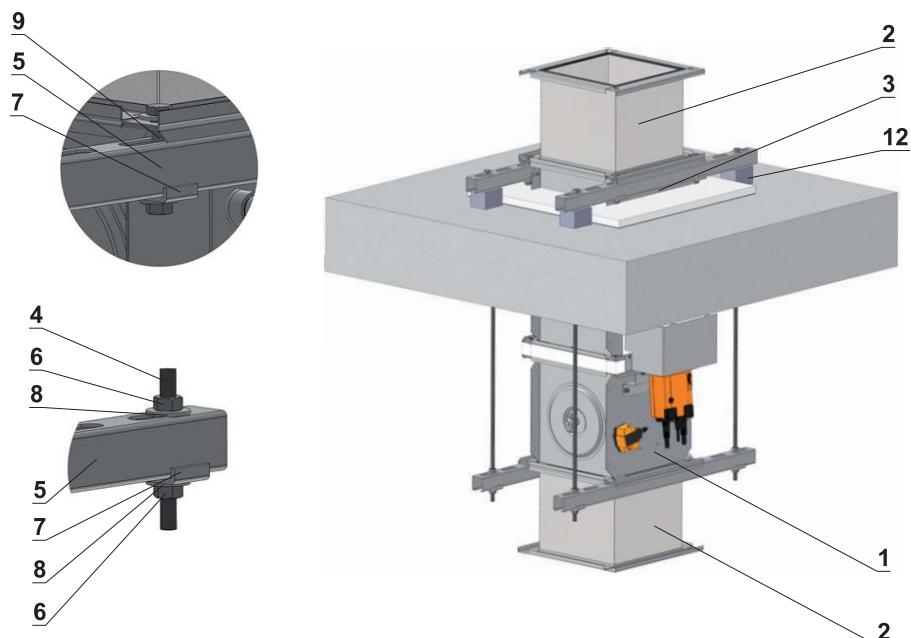
Threaded rods longer than 1,5 m require fire-resistant insulation.

Fig. 62 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.

9.4 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.

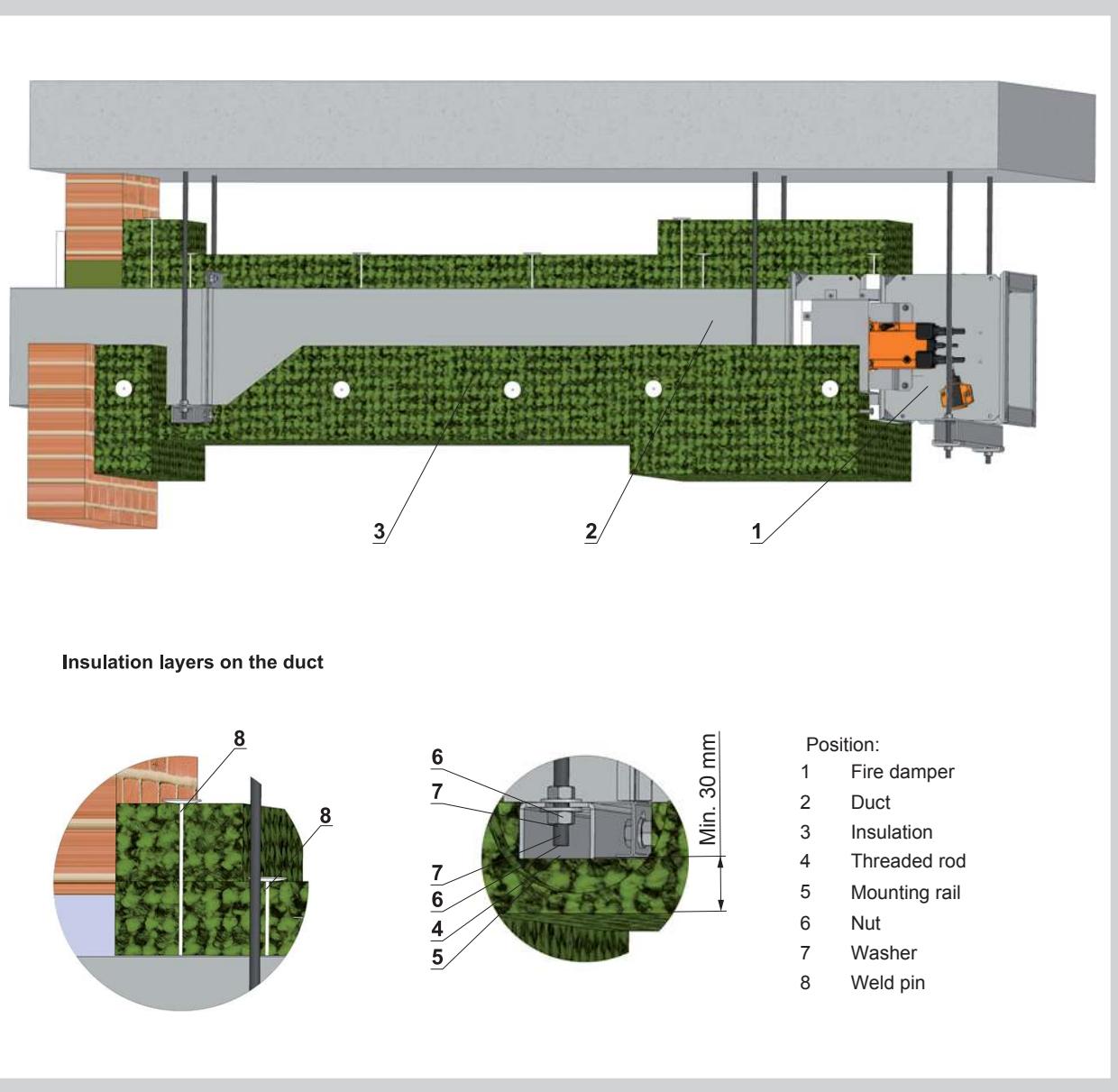
Threaded rods longer than 1,5 m require fire-resistant insulation.

If the threaded rod is located inside the duct insulation, distance between threaded rod and duct is max 30 mm. If the treaded 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. 60

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. 63 Rectangular fire damper suspension on the wall - horizontal installation



9.5 Horizontal installation

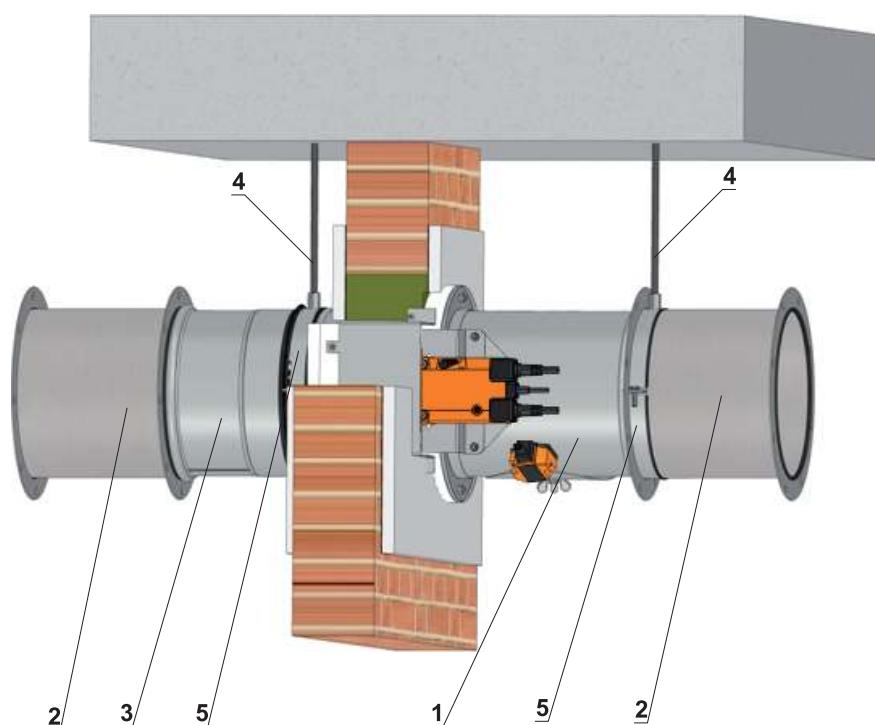
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

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. 60

Fig. 64 Suspension - horizontal duct



Position:

- 1 Fire damper
- 2 Damping pad
- 3 Extension piece
- 4 Threaded rod
- 5 Suspension ring

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

9.6. Vertical installation

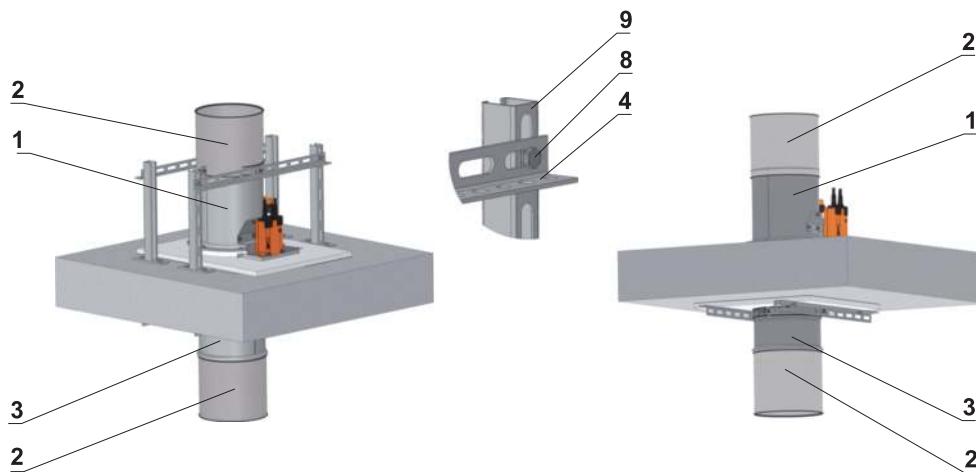
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

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.

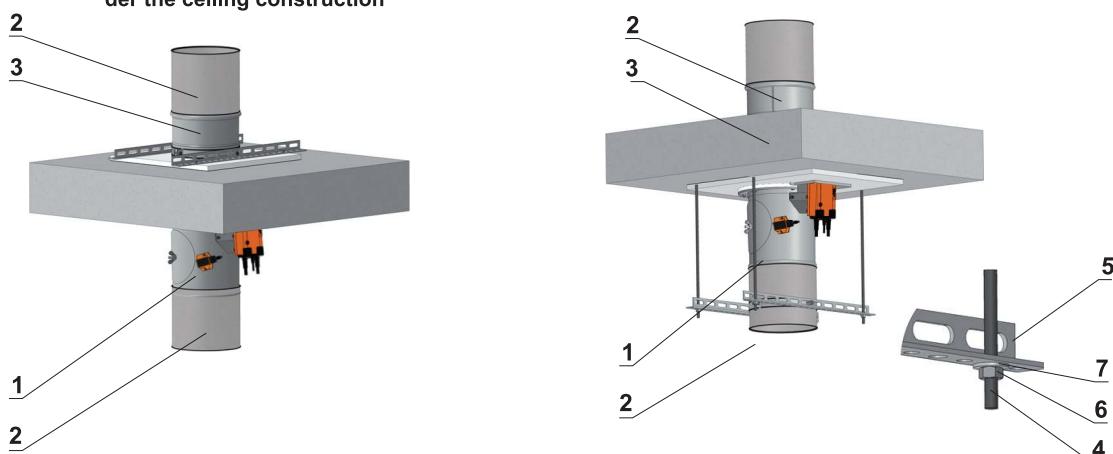
Threaded rods longer than 1,5 m require fire-resistant insulation.

Fig. 65 Suspension - vertical duct

Actuating mechanism is placed above the ceiling construction

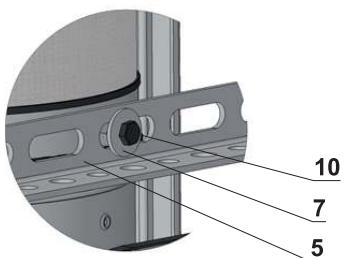


Actuating mechanism is placed under the ceiling construction

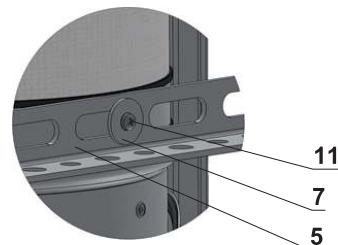


Notice: Damper must be firmly connected with extension piece by screws or rivets.

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.

- 9.7.** 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.

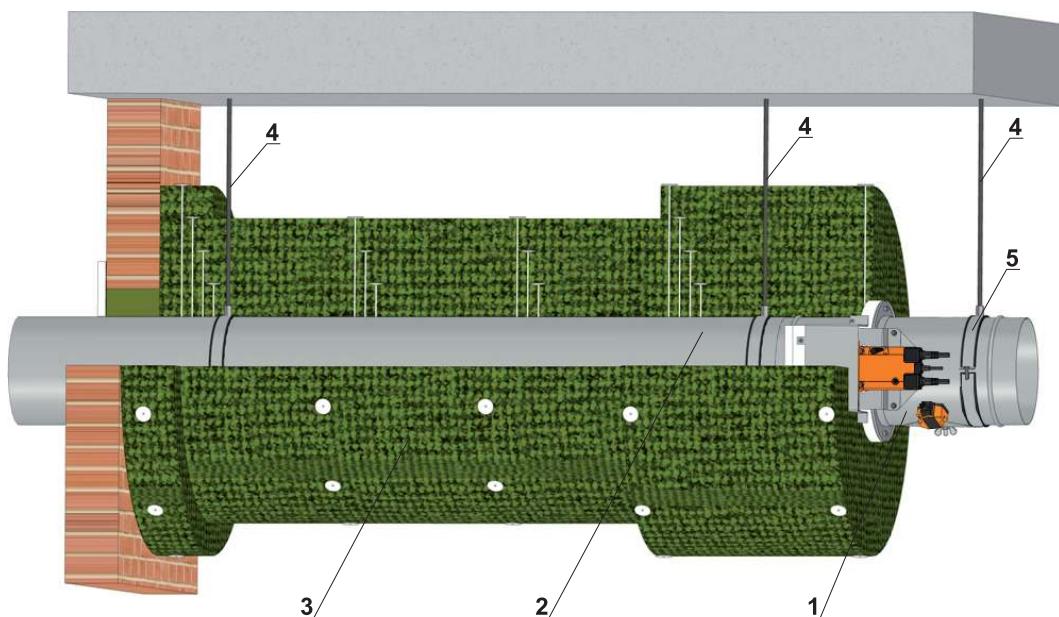
Max. length between two suspension systems is 1500 mm.

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.

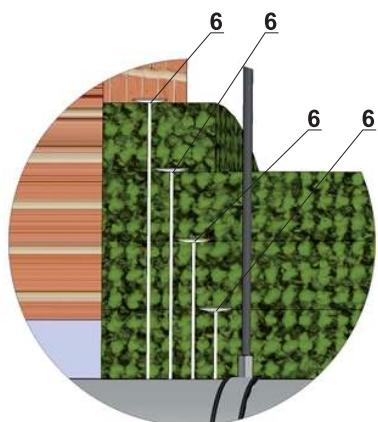
Threaded rod fixing to the ceiling construction - see fig. 60

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. 66 Round fire damper suspension on the wall - horizontal installation



Insulation layers on the duct



Position:	
1	Fire damper
2	Duct
3	Insulation
4	Threaded rod
5	Suspension ring
6	Weld pin

III. TECHNICAL DATA

10. Pressure loss

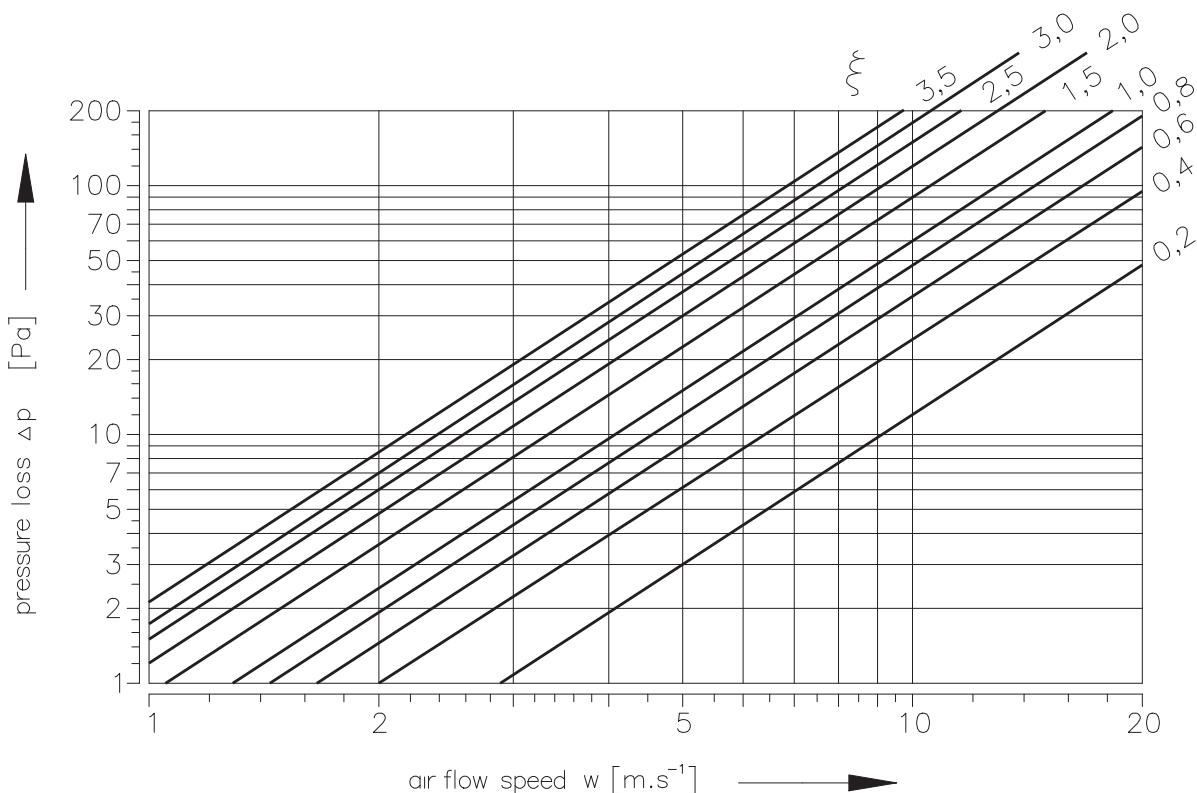
10.1. Pressure loss calculation

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

Δp	[Pa]	Pressure loss
w	[m.s ⁻¹]	air flow speed in nominal damper section
ρ	[kg.m ⁻³]	Air density
ξ	[\cdot]	coefficient of local pressure loss for the nominal damper section (see Tab. 9.1.1. and Tab. 9.2.1.)

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

Diagram 10.2.1. Pressure losses for air density $\rho=1,2 \text{ kg.m}^{-3}$



11. Coefficient of local pressure loss

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

Tab. 11.1.1. Coefficient of local pressure loss - square dampers

A	B										
	180	200	225	250	280	300	315	355	400	450	500
180	1,849	1,476	1,210	0,983	0,888	0,823	0,703	0,608	0,535	0,478	0,437
200	1,737	1,385	1,095	0,921	0,862	0,782	0,658	0,569	0,500	0,446	0,407
225	1,678	1,333	0,995	0,887	0,832	0,754	0,638	0,545	0,479	0,430	0,393
250	1,613	1,286	0,978	0,859	0,805	0,722	0,613	0,524	0,462	0,414	0,381
280	1,538	1,218	0,954	0,814	0,768	0,682	0,583	0,499	0,438	0,395	0,358
300	1,482	1,178	0,926	0,772	0,722	0,642	0,549	0,475	0,422	0,372	0,342
315	1,415	1,124	0,894	0,743	0,682	0,598	0,528	0,456	0,400	0,356	0,325
355	1,359	1,079	0,852	0,713	0,635	0,573	0,506	0,436	0,383	0,341	0,311
400	1,312	1,041	0,811	0,687	0,618	0,562	0,487	0,420	0,368	0,328	0,299
450	1,271	1,009	0,798	0,665	0,602	0,533	0,471	0,406	0,356	0,317	0,289
500	1,240	0,983	0,773	0,648	0,592	0,526	0,459	0,395	0,346	0,308	0,281
550	1,225	0,971	0,752	0,638	0,586	0,522	0,451	0,389	0,341	0,306	0,278
560	1,211	0,960	0,744	0,632	0,572	0,519	0,447	0,385	0,337	0,300	0,274
600	1,198	0,945	0,738	0,626	0,568	0,507	0,441	0,381	0,334	0,297	0,270
630	1,184	0,938	0,728	0,617	0,565	0,493	0,437	0,376	0,329	0,293	0,267
650	1,173	0,928	0,711	0,610	0,544	0,490	0,431	0,371	0,324	0,289	0,266
700	1,165	0,922	0,705	0,609	0,539	0,489	0,429	0,369	0,323	0,288	0,263
710	1,160	0,919	0,697	0,604	0,535	0,488	0,427	0,368	0,322	0,287	0,261
750	1,150	0,911	0,691	0,600	0,530	0,482	0,422	0,363	0,318	0,284	0,258
800	1,140	0,903	0,686	0,593	0,523	0,475	0,419	0,361	0,316	0,281	0,256
900	1,122	0,888	0,674	0,583	0,517	0,467	0,412	0,355	0,310	0,276	0,252
1000	1,108	0,877	0,666	0,576	0,509	0,453	0,407	0,350	0,306	0,273	0,248
1100	1,095	0,867	0,657	0,569	0,498	0,443	0,402	0,345	0,302	0,269	0,245
1250	1,084	0,857	0,643	0,562	0,486	0,438	0,397	0,342	0,299	0,266	0,242
1400	1,073	0,849	0,632	0,557	0,478	0,436	0,393	0,338	0,296	0,263	0,240
1500	1,067	0,844	0,628	0,554	0,469	0,429	0,391	0,336	0,294	0,262	0,238
1600	1,062	0,840	0,610	0,551	0,450	0,420	0,389	0,334	0,293	0,260	0,237

	B										
A	550	560	600	630	650	700	710	750	800	900	1000
180	0,418	0,400	0,378	0,369	0,352	0,349	0,343	0,331	0,322	0,304	0,291
200	0,389	0,373	0,356	0,344	0,332	0,325	0,320	0,309	0,300	0,284	0,271
225	0,375	0,361	0,342	0,333	0,319	0,313	0,309	0,302	0,292	0,272	0,262
250	0,362	0,345	0,331	0,321	0,308	0,302	0,297	0,291	0,281	0,263	0,253
280	0,342	0,325	0,312	0,302	0,291	0,288	0,283	0,271	0,267	0,249	0,241
300	0,321	0,312	0,296	0,287	0,279	0,273	0,269	0,256	0,251	0,236	0,228
315	0,305	0,297	0,282	0,274	0,267	0,259	0,254	0,246	0,238	0,225	0,215
355	0,296	0,284	0,271	0,262	0,251	0,248	0,243	0,234	0,228	0,215	0,205
400	0,281	0,273	0,265	0,252	0,243	0,237	0,234	0,226	0,219	0,207	0,197
450	0,271	0,264	0,255	0,243	0,237	0,231	0,226	0,219	0,211	0,199	0,190
500	0,269	0,257	0,244	0,236	0,228	0,223	0,219	0,212	0,205	0,194	0,185
550	0,262	0,254	0,239	0,225	0,217	0,211	0,208	0,209	0,202	0,191	0,182
560	0,259	0,250	0,231	0,230	0,221	0,210	0,208	0,206	0,200	0,189	0,180
600	0,256	0,248	0,229	0,228	0,218	0,209	0,207	0,202	0,197	0,186	0,178
630	0,253	0,244	0,228	0,225	0,215	0,209	0,207	0,199	0,195	0,184	0,176
650	0,248	0,242	0,226	0,222	0,213	0,208	0,206	0,197	0,193	0,182	0,174
700	0,244	0,241	0,225	0,221	0,212	0,207	0,205	0,196	0,192	0,181	0,173
710	0,242	0,239	0,224	0,220	0,211	0,205	0,204	0,195	0,191	0,180	0,172
750	0,240	0,236	0,220	0,218	0,209	0,203	0,202	0,194	0,189	0,178	0,170
800	0,239	0,234	0,217	0,215	0,206	0,201	0,200	0,192	0,187	0,176	0,168
900	0,234	0,230	0,215	0,212	0,200	0,198	0,196	0,189	0,184	0,173	0,165
1000	0,231	0,227	0,211	0,209	0,198	0,195	0,193	0,185	0,181	0,171	0,163
1100	0,229	0,224	0,208	0,206	0,196	0,194	0,191	0,182	0,179	0,168	0,161
1250	0,224	0,221	0,205	0,203	0,192	0,191	0,189	0,180	0,176	0,166	0,159
1400	0,221	0,219	0,203	0,201	0,189	0,188	0,187	0,178	0,175	0,165	0,157
1500	0,220	0,218	0,201	0,200	0,187	0,186	0,185	0,176	0,174	0,164	0,156
1600	0,220	0,216	0,200	0,199	0,187	0,186	0,185	0,175	0,173	0,163	0,155

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

Tab. 11.2.1. Coefficient of local pressure loss - round dampers

D	180	200	225	250	280	315	355	400	450	500	560	630	710	800	900	1000
ξ	3,546	2,124	1,291	0,877	0,609	0,438	0,328	0,255	0,205	0,173	0,147	0,127	0,111	0,099	0,09	0,083

12. Noise data

12.1. 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^2 section (see Tab. 12.3.1. and 12.3.2)

S [m^2] duct cross section

K_A [DB] correction to the weight filter A (see 12.3.3.)

12.2. 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^2 section (see Tab. 12.3.1. and 12.3.2)

S [m^2] duct cross section

L_{rel} [dB] relative level expressing the shape of the spectrum (see Tab. 12.3.4.)

12.3. Table of acoustics values

Tab. 12.3.1. Level of acoustic output $L_{W1}[\text{dB}]$ related to the 1 m^2 section - square dampers

$w [\text{m.s}^{-1}]$	$\xi [-]$											
	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. 12.3.2. Level of acoustic output L_{w1} [dB] related to the 1 m^2 section - round dampers

	$\xi [-]$											
$w [\text{m.s}^{-1}]$	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. 12.3.3. Correction to the weight filter A - square and round dampers

$w [\text{m.s}^{-1}]$	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. 12.3.4. Relative level expressing the shape of the spectrum L_{rel} - square and round dampers

	$f [\text{Hz}]$							
$w [\text{m.s}^{-1}]$	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**13. Material**

- 13.1.** 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.

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

V. INSPECTION, TESTING**14. Inspection, testing**

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

VI. TRANSPORTATION AND STORAGE**15. Logistic terms**

- 15.1.** 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.

- 15.2.** Dampers are stored indoor in environment without any aggressive vapours, gases or dust. Indoor temperature must be in the range from -30 °C to +40 °C and maximum relative humidity 95 % (avoid condensation on the damper body). Dampers must be protected against mechanic damages when transported and manipulated.

VII. ASSEMBLY, ATTENDANCE, MAINTENANCE AND REVISIONS**16. Assembly**

- 16.1.** Assembly, maintenance and damper function check can be done only by qualified and trained person, i.e. "AUTHORIZED PERSON" according to the manufacturer documentation. All works done on the fire dampers must be done according international and local norms and laws.

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

- 16.3.** 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.

- 16.4.** 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.

16.5. 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.

17. Entry into service and revisions

- 17.1.** 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.

- 17.2.** 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.

- 17.3.** Before entering the dampers with manual control into operation after their assembly and by sequential checks, checks according 15.2. 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.

- 17.4.** Before entering the dampers with actuating mechanism into operation after their assembly and by sequential checks, checks according 15.2. 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 BAT72B-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).

- 17.5.** 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.

18. Spare parts

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

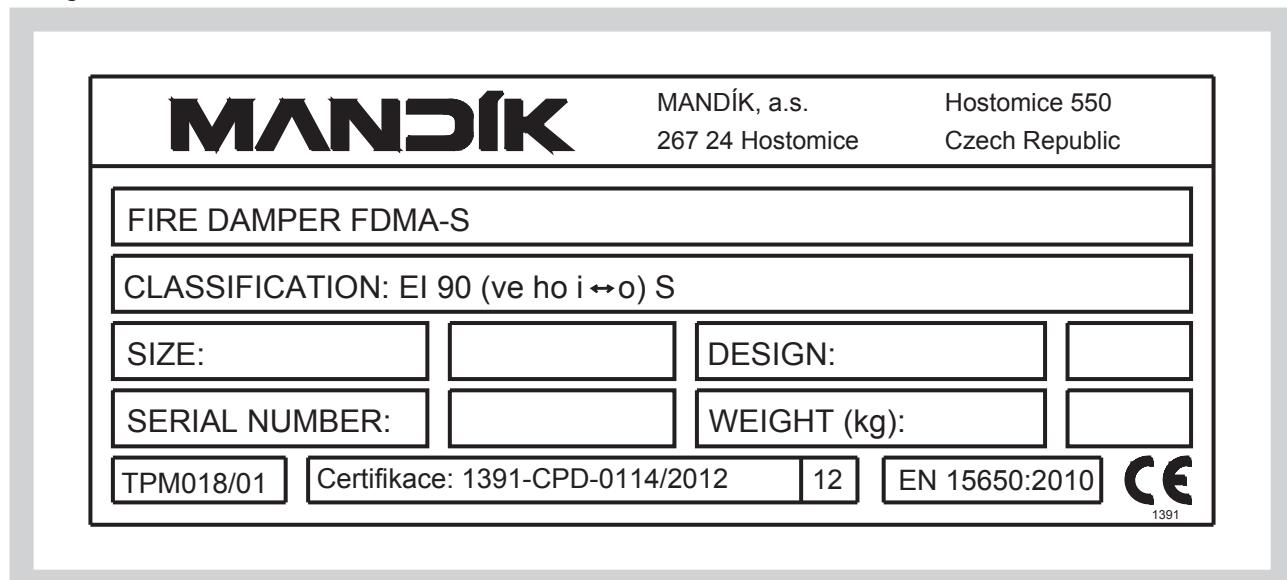
19. Restore function of actuating mechanism after fuses initiation

- 19.1. If fuse Tf1 is initiated (duct outside temperature) than is necessary to change thermoelectrical starting mechanism BAT72B-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.
- 19.2. If fuses Tf2/Tf3 are initiated (duct inside temperature) than is possible change only part ZBAT72 or ZBAT95 (according initiating temperature).

VIII. PRODUCT DATA**20. Data label**

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

Fig. 67 Data label



21. Quick review

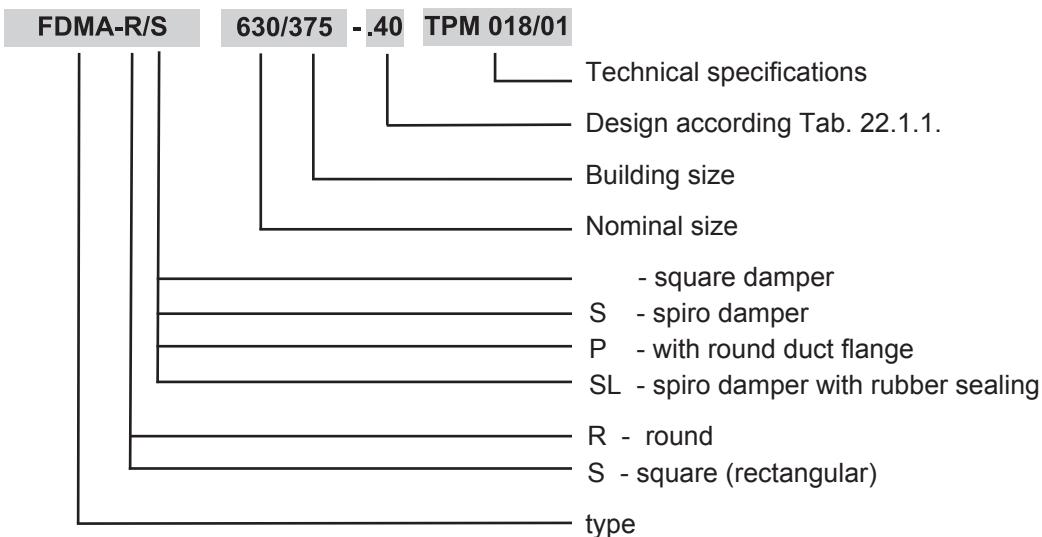
Tab. 21.1.1. Quick Overview

Damper	FDMA			
Fire separating construction	wall/ceiling	Installation	Fire resistant	Fig.
	Min. thickness [mm]			
Solid wall construction	100	Mortar or gypsum	EIS 90	40
	100	Mineral stone wool with mastic and cement lime plate	EIS 90	41
	100	Weichschott	EIS 90	42
Gypsum plate	100	Mortar or gypsum	EIS 90	48
	100	Mineral stone wool with mastic and cement lime plate	EIS 90	49
	100	Weichschott	EIS 90	50
Solid ceiling construction	150	Mortar or gypsum	EIS 90	44
	150	Mineral stone wool with mastic and cement lime plate	EIS 90	45
	150	Weichschott	EIS 90	46
Outside of solid wall construction	100	Mineral stone wool with mastic and cement lime plate	EIS 90 EIS 60 EIS 45	43, 56, 57
Outside of solid gypsum wall construction	100	Mineral stone wool with mastic and cement lime plate	EIS 90 EIS 60 EIS 45	51, 58, 59
Outside of solid ceiling construction	150	Mineral stone wool with mastic and cement lime plate	EIS 90	47

IX. ORDERING INFORMATION

22. Ordering key

22.1. Fire damper



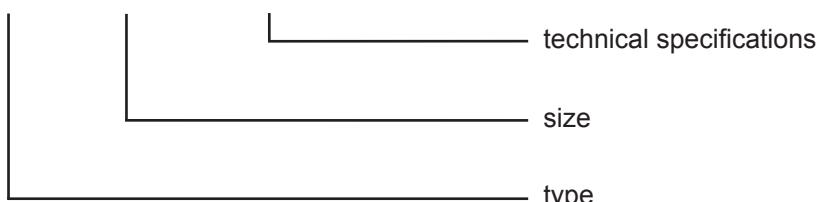
If you are required dampers with installation anchors it is necessary be specified in the order.

Tab. 22.1.1. Dampers design

Dampers design	Additional digit
Manual and thermal	.01
Manual and thermal (ZONE 1, 2)	.02
Manual and thermal with a terminal switch („CLOSED“)	.11
Manual and thermal with a terminal switch („CLOSED“) (ZONE 1, 2)	.12
Manual, thermal and with an electromagnet AC 230 V	.20
Manual, thermal and with an electromagnet AC/DC 24 V	.21
Manual, thermal and with an electromagnet AC 230 V, with a terminal switch („CLOSED“)	.23
Manual, thermal and with an electromagnet AC/DC 24 V, with a terminal switch („CLOSED“)	.24
Manual, thermal and with an electromagnet AC 230 V (ZONE 2)	.30
Manua, thermal and with an electromagnet AC 230 V, with a terminal switch („CLOSED“) (ZONE 2)	.33
With actuating mechanism BF 230-T (BFL, BFN 230-T)	.40
With actuating mechanism BF 24-T (BFL, BFN 24-T) , with smoke detector MHG 231 and with supply device BKN 230-24-MP (voltage AC 230 V)	.41
With actuating mechanism ExMax-15-BF AC 230 V, with thermoelectrical starting mechanism (ZONE 1,2)	.42
With actuating mechanism BF 24-T (BFL, BFN 24-T)	.50
With actuating mechanism BF 24-T (BFL, BFN 24-T) , with smoke detector MHG 231 (voltage AC/DC 24 V)	.51
With actuating mechanism ExMax-15-BF AC/DC 24 V, with thermoelectrical starting mechanism (ZONE 1,2)	.52
With communication and supply device BKN 230-24 and with actuating mechanism BF 24-T-ST (BFL, BFN 24-T-ST)	.60
With communication and supply device BKN 230-24-C-MP, with actuating mechanism BF 24-T-ST (BFL, BFN 24-T-ST) and with smoke detector MHG 231	.61
With communication and supply device BKN 230-24MP and with 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 and thermal with two terminal switches („OPEN“, „CLOSED“) (ZONE 1,2)	.81
Manual, thermal and with an electromagnet AC 230 V, with two terminal switches („OPEN“, „CLOSED“)	.82
Manual, thermal and with an electromagnet AC/DC 24 V., with two terminal switches („OPEN“, „CLOSED“)	.83
Manual, thermal and with an electromagnet AC 230 V, with two terminal switches („OPEN“, „CLOSED“) (ZONE 2)	.85

22.2. Reinforcement - damper placement outside wall or ceiling construction

VRM-90 800x400 TPM 075/09



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