CE

TPM 018/01

Revision 3
Valid from 01/02/2016

EN 15650:2010-09

MANDÍK®

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.

I. OBSAH

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-2015/0175
- Declaration of Performance No. CDM/FDMA/001/14
- 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) Dampers could be displaced into position “CLOSED” only in case that ventilator, or Air Handling Unit is switched off. The goal is the securing of proper closing and safe function of Fire Damper in case of Fire.
c) The air circulation in the whole damper section must be secured as steady on whole surface.

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

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

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

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

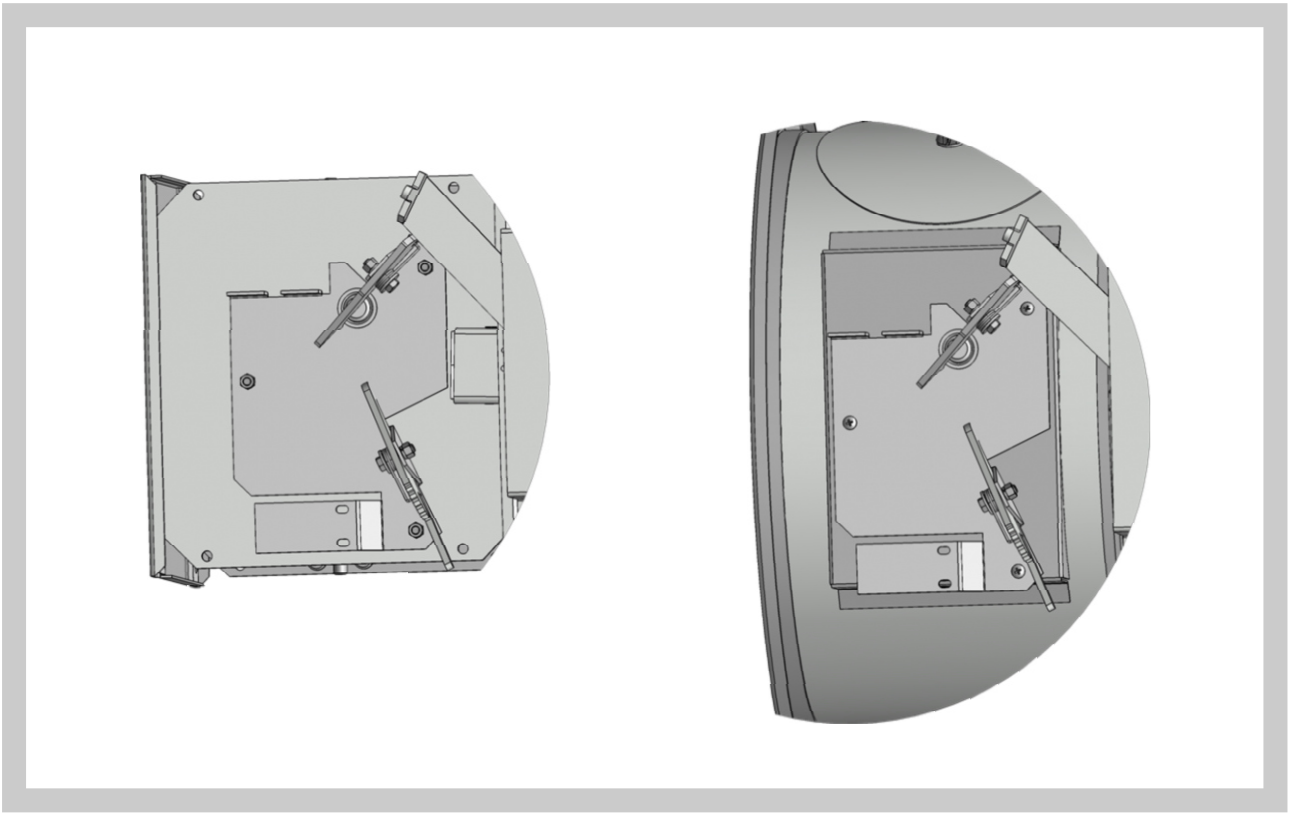
2. Design

2.1. Design with mechanical control

Design .01

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

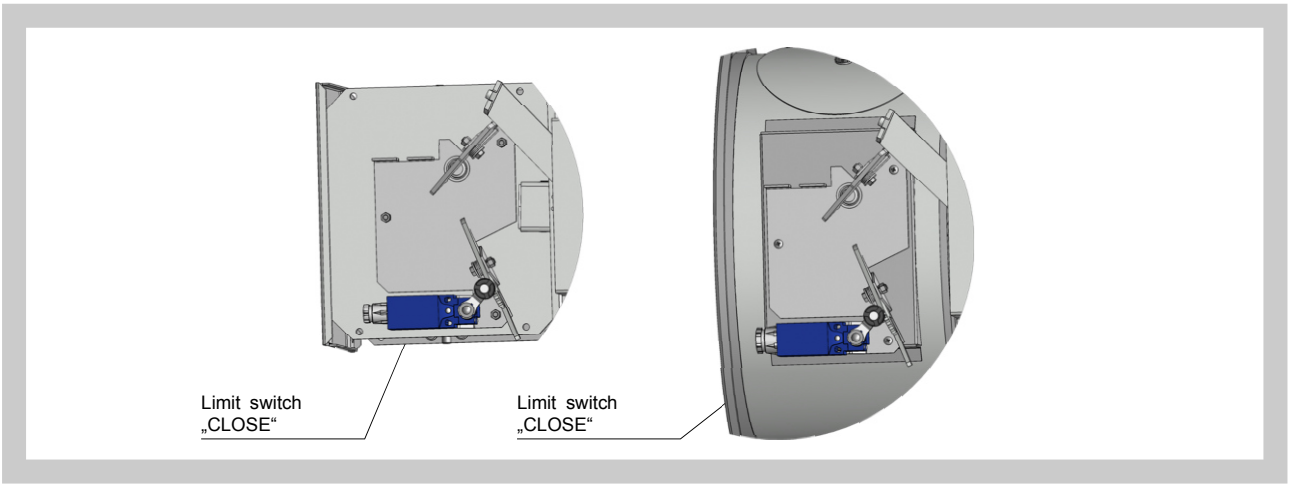
Fig. 3 Design with mechanical control



Design .11

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

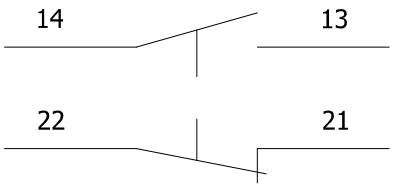
Fig.4 Design with mechanical control and limit switch



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

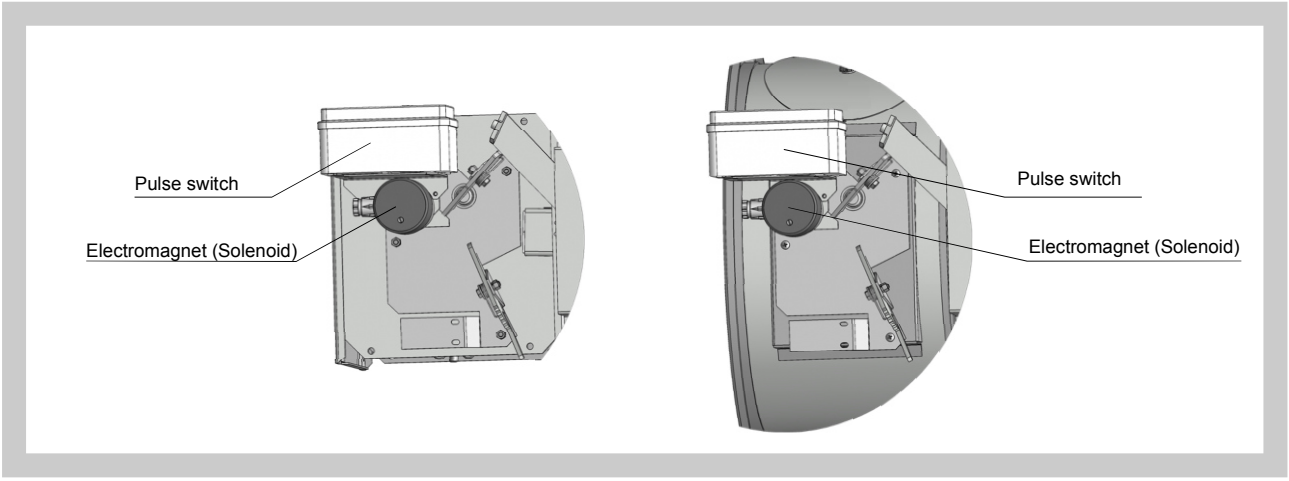
Fig. 5 Limit switch XCKN2118G-11



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 witch is placed inside of SIEM24. It takes about 10 sec. Charging time depends on the current supply. For reliable operation is necessary connect to electromagnet or pre-pulse switch appropriate supply for 20 to 30 sec. After activation of electromagnet is released initiation lever and damper is closed. After activation is initiation lever released. If is damper set up in position "OPEN" is necessary unlock initiation lever by pulling of electromagnet core.

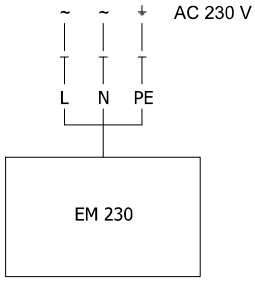
Fig. 6 Design with mechanical control and electromagnet (solenoid)



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, 3x0,75mm²

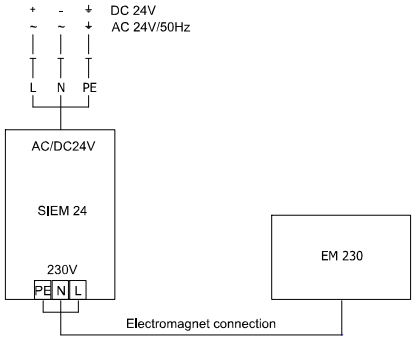
Fig. 7 Elektromagnet EM230



Tab. 2.1.3. Electromagnet EM230 with pulse switch SIEM24

Electromagnet EM230 with pulse switch SIEM24	
Nominal voltage	AC 24 V / 50 Hz DC 24 V
Attraction current	1 A
Degree of protection	IP 40
Ambient temperature	-10 °C … +40 °C
Switching frequency	max. 1x per minute
Connection	cable 1m, 3x0,75mm²

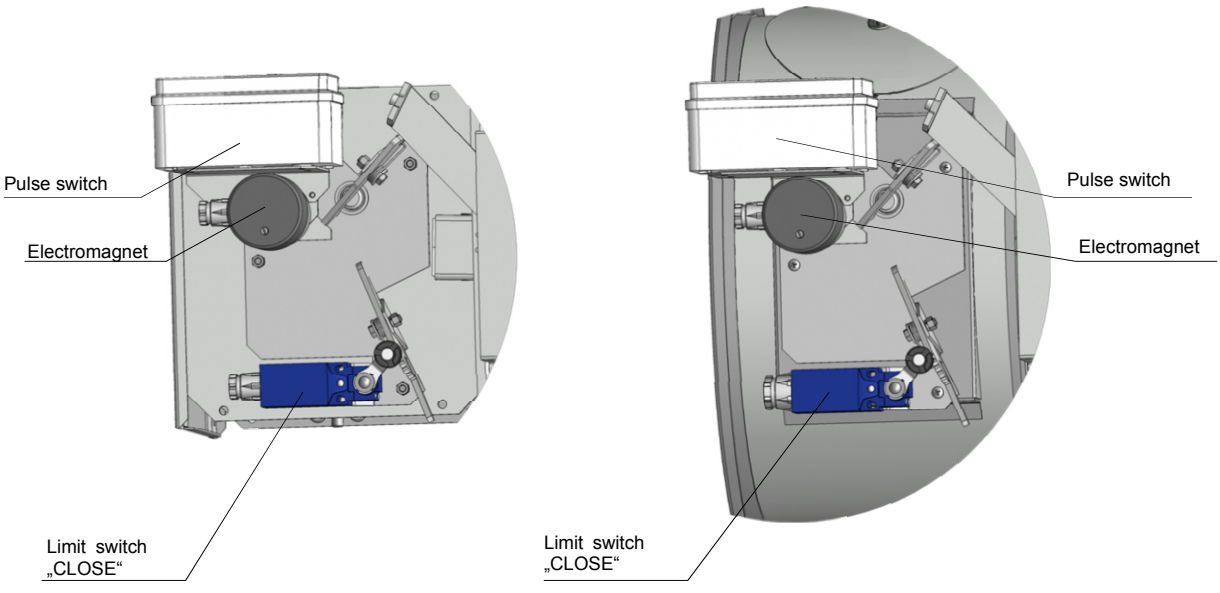
Fig. 8 Electromagnet EM230 with pulse switch SIEM24



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".

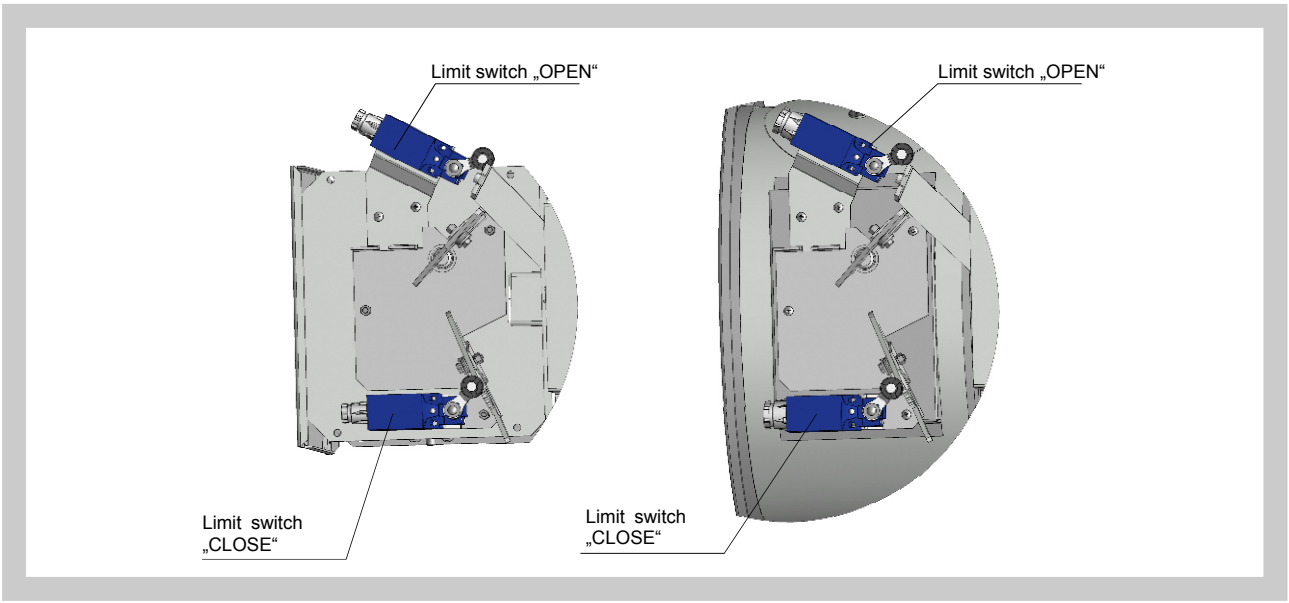
Fig. 9 Design with mechanical control, electromagnet (solenoid) and limit switch



Design .80

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

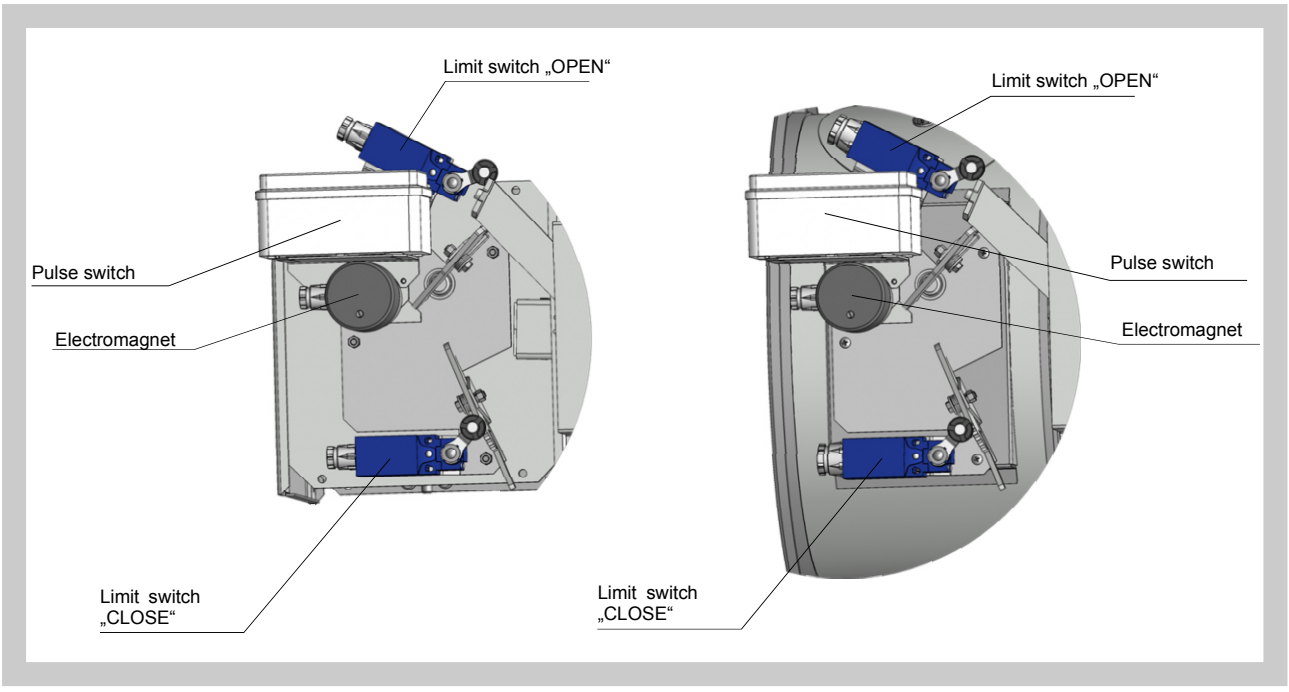
Fig. 10 Design with mechanical control and limit switches



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, activation of thermoelectrical actuating mechanism 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

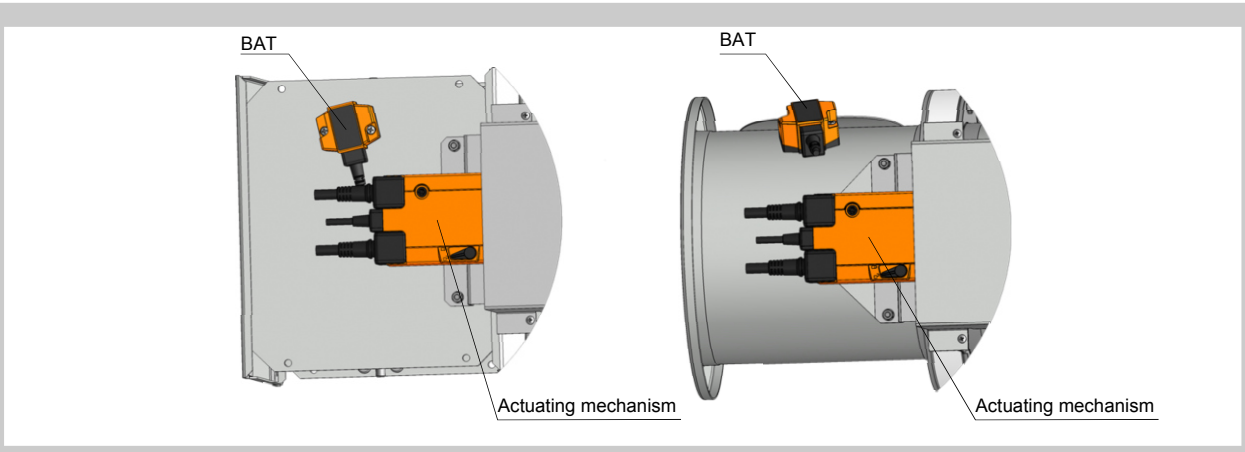


Fig. 13 Actuating mechanism BELIMO BFL, BFN 230-T

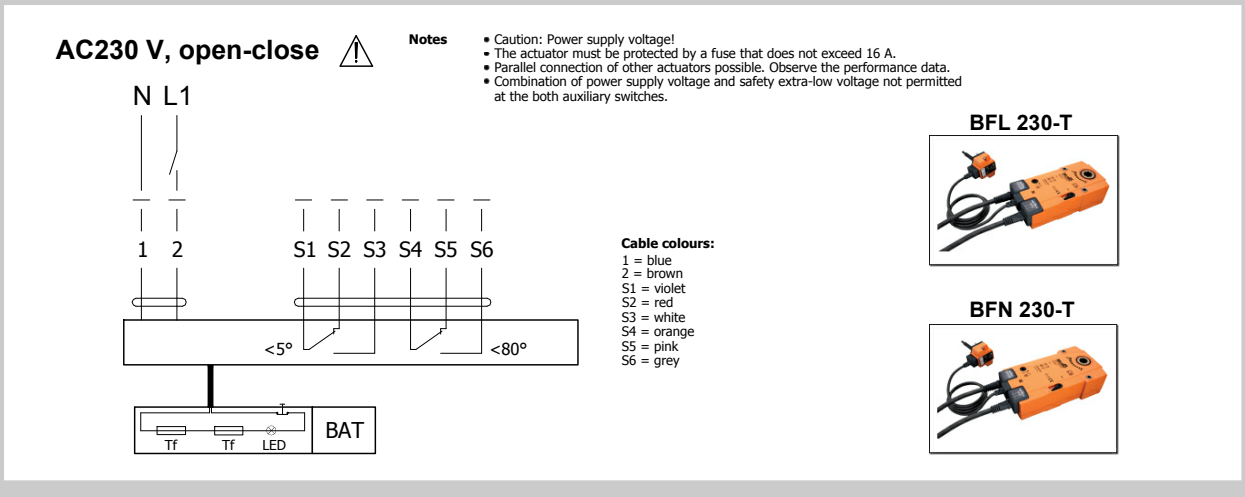
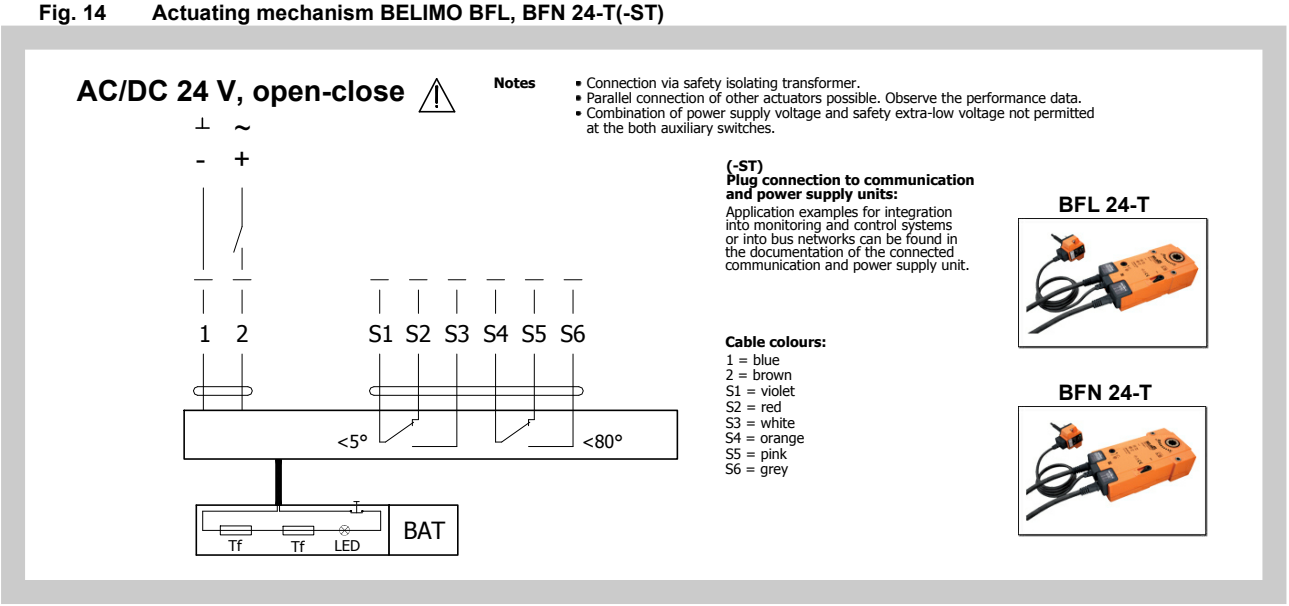


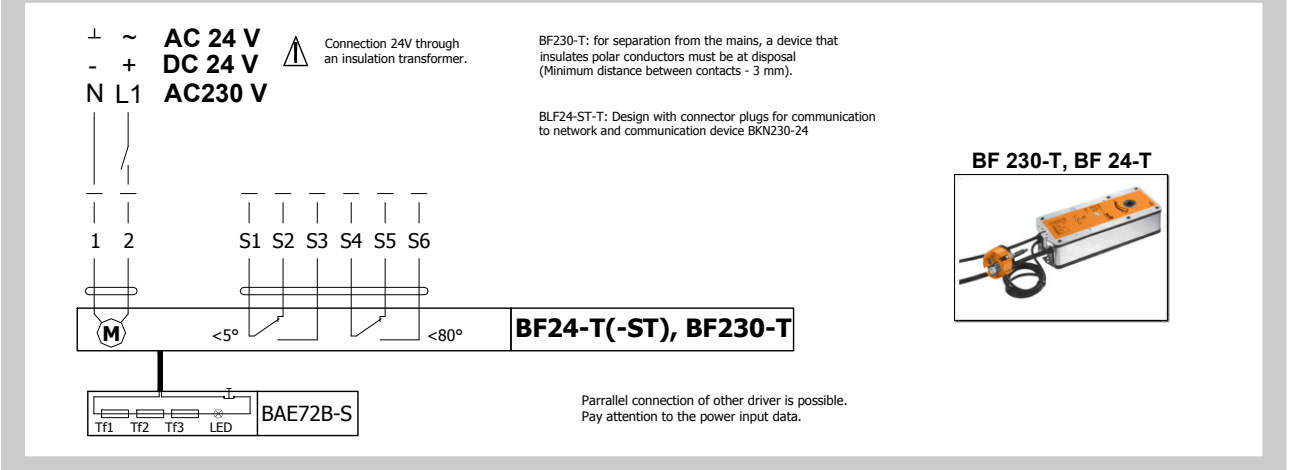
Fig. 14 Actuating mechanism BELIMO BFL, BFN 24-T(-ST)



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



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 mm² cable 1 m, 6 x 0,75 mm² (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 equpped with Communication and supply device BKN 230-24-MA 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-MA	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

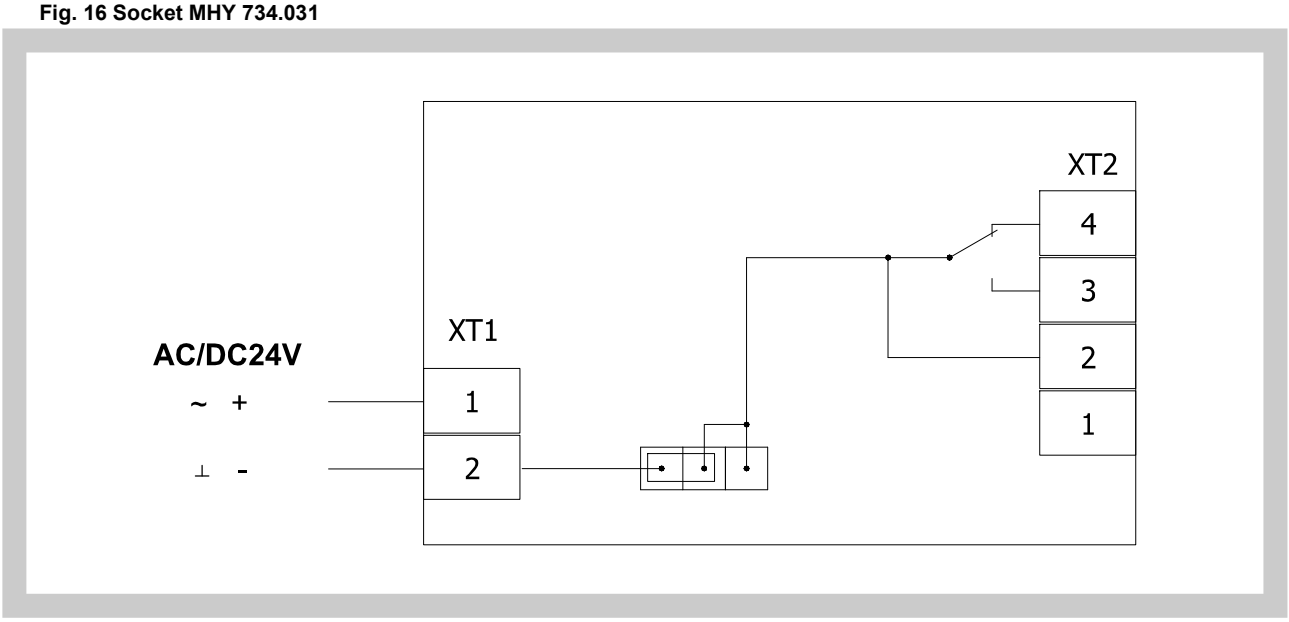


Fig. 17 Design with actuating mechanism BF 24-T (BFL, BFN 24-T) , with smoke detector MHG 231 and with communication and supply device BKN 230-24-MA (voltage AC 230 V)

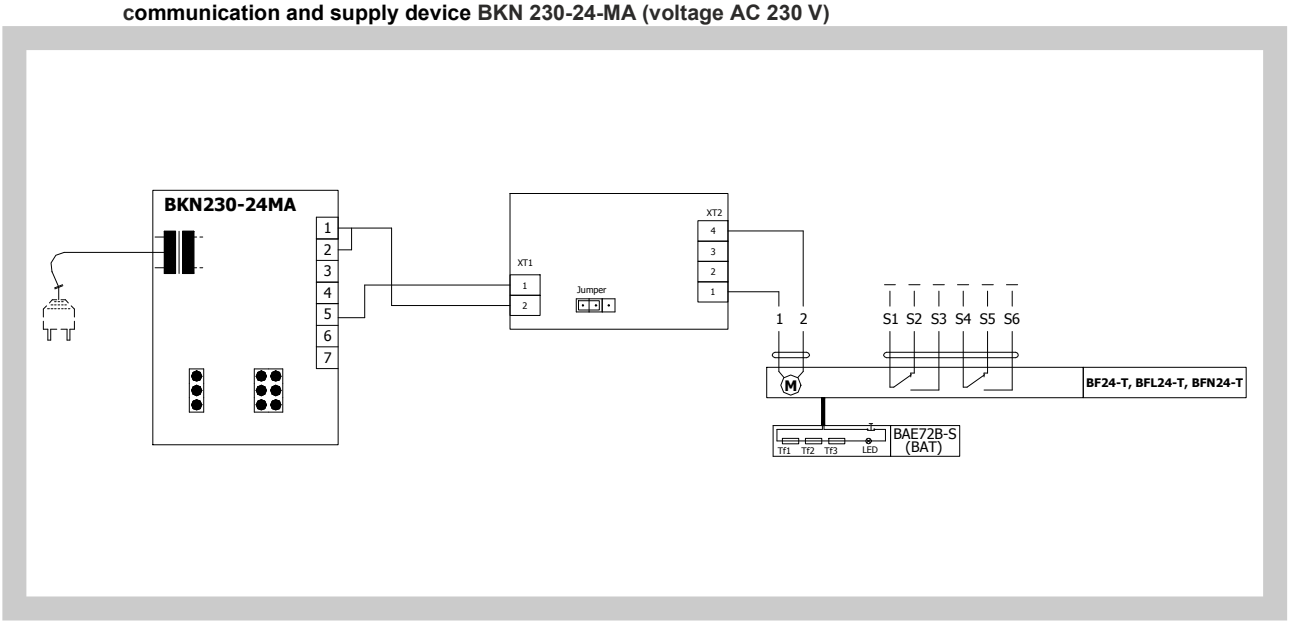
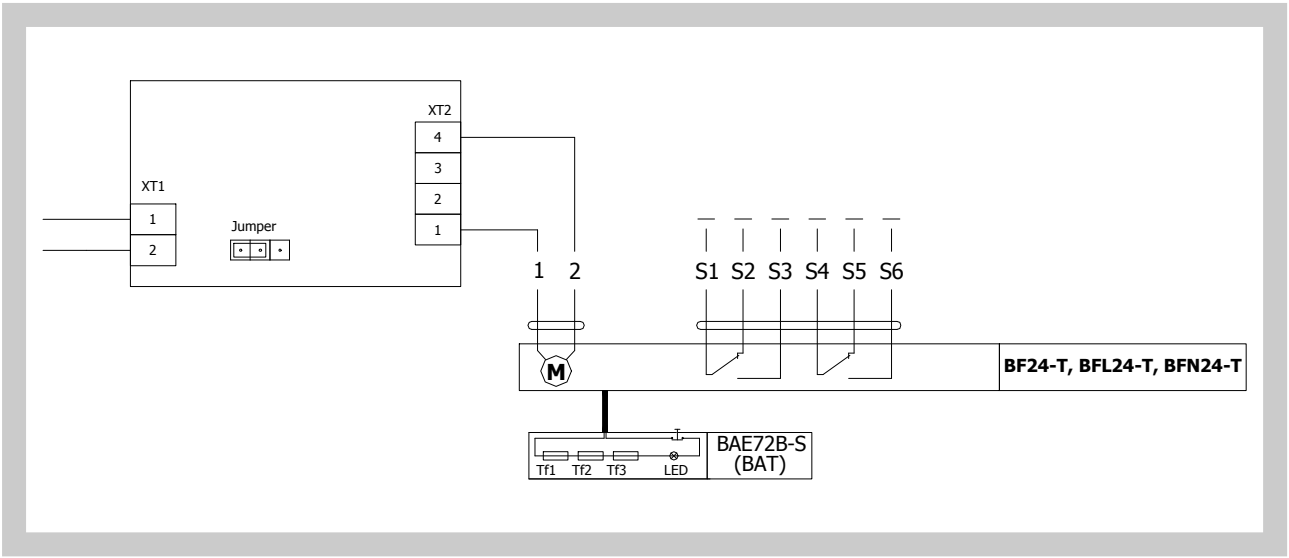


Fig. 18 Design with actuating mechanism BF 24-T (BFL, BFN 24-T) , with smoke detector MHG 231 (voltage AC/DC 24 V)

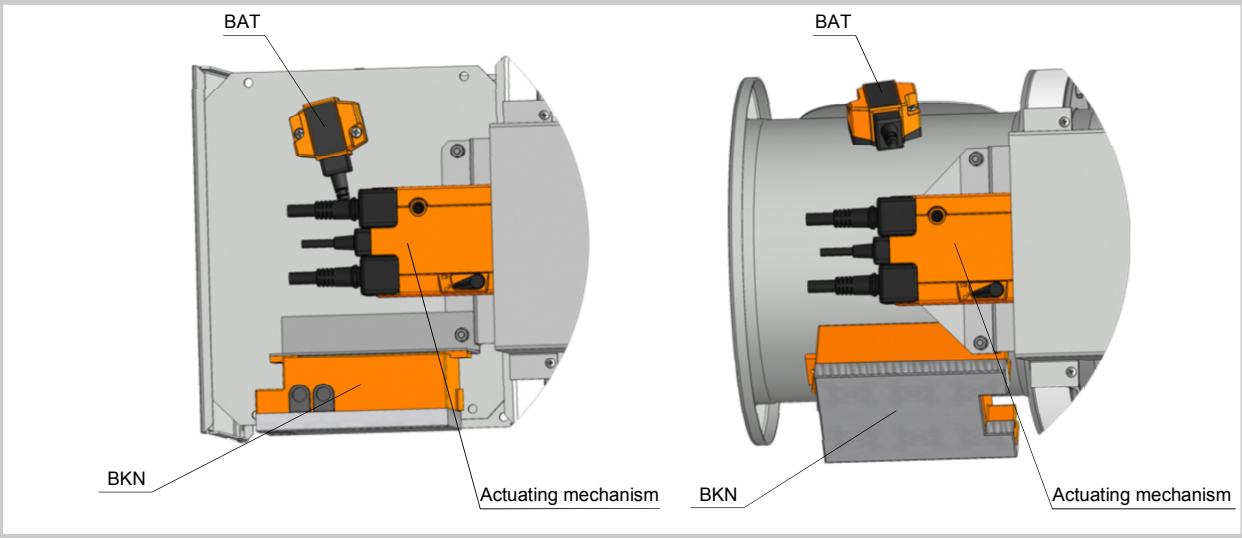


2.3. Design with the communication and supply device

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".

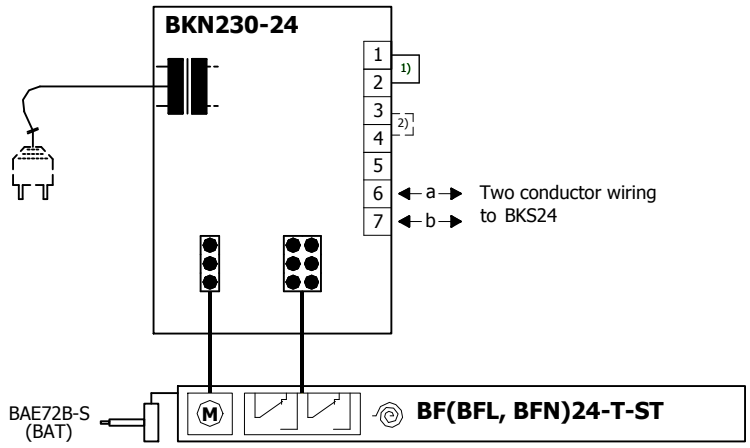
Fig. 19 Design with the communication and supply device



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 mm²

Fig. 20 Communication and supply device BKN 230-24



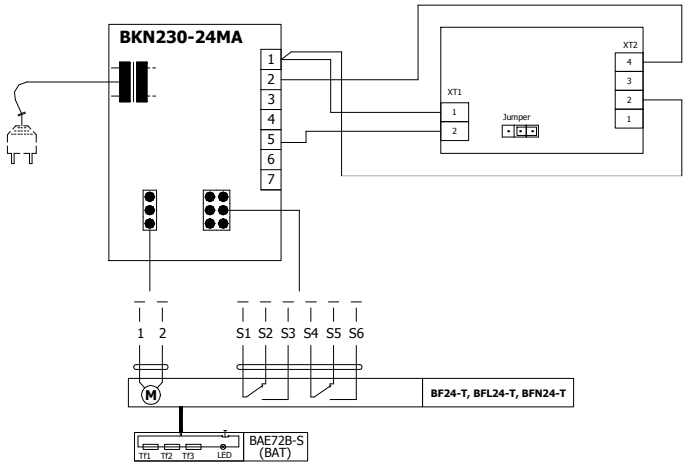
1) Bridge has been installed by the manufacturer. If needed, it can be removed and replaced with a thermoelectrical starting mechanism.
If terminals 1 and 2 are not interconnected, safety function is initiated.

2) Bridge can be used only for starting and without BKS 24!

Design .61

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

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



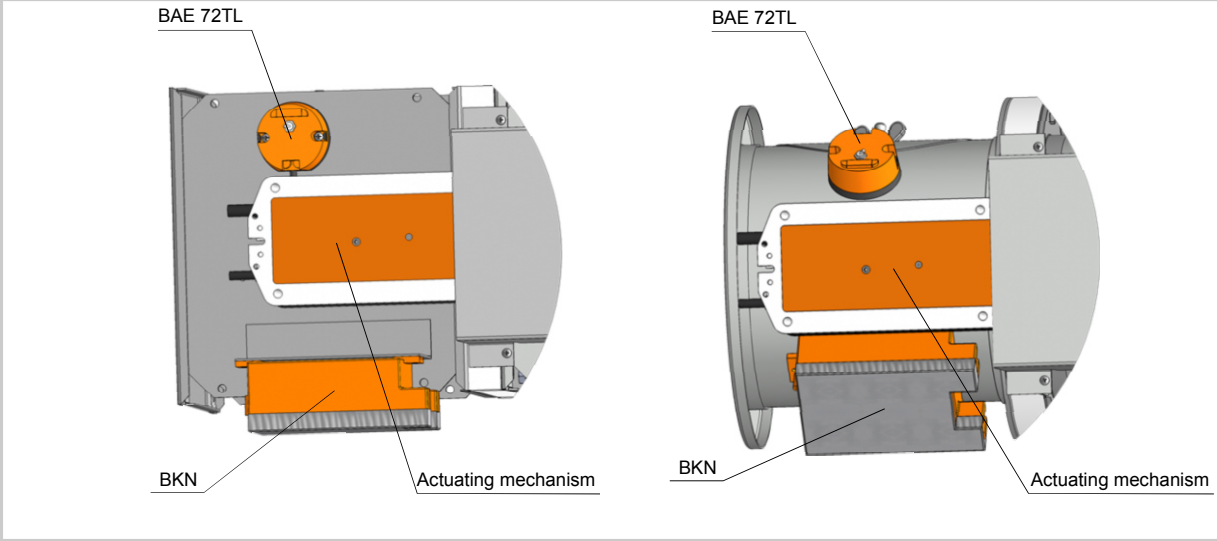
Design .62

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



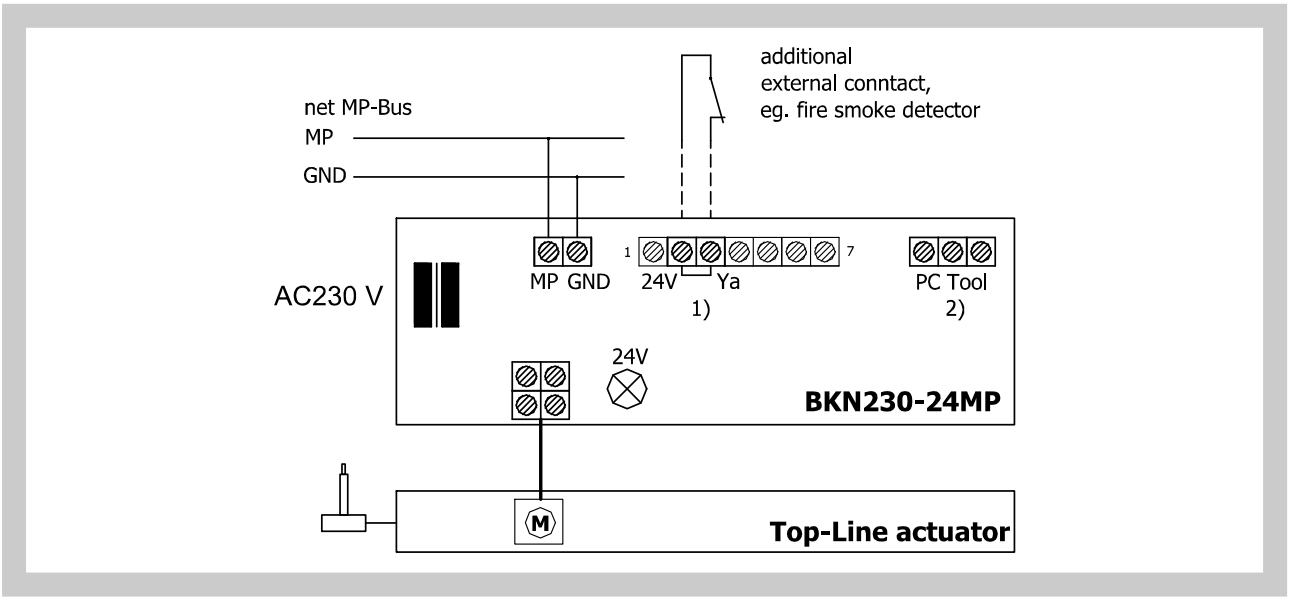
Tab. 2.3.2. Actuating mechanism BELIMO BF 24TL-T-ST

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

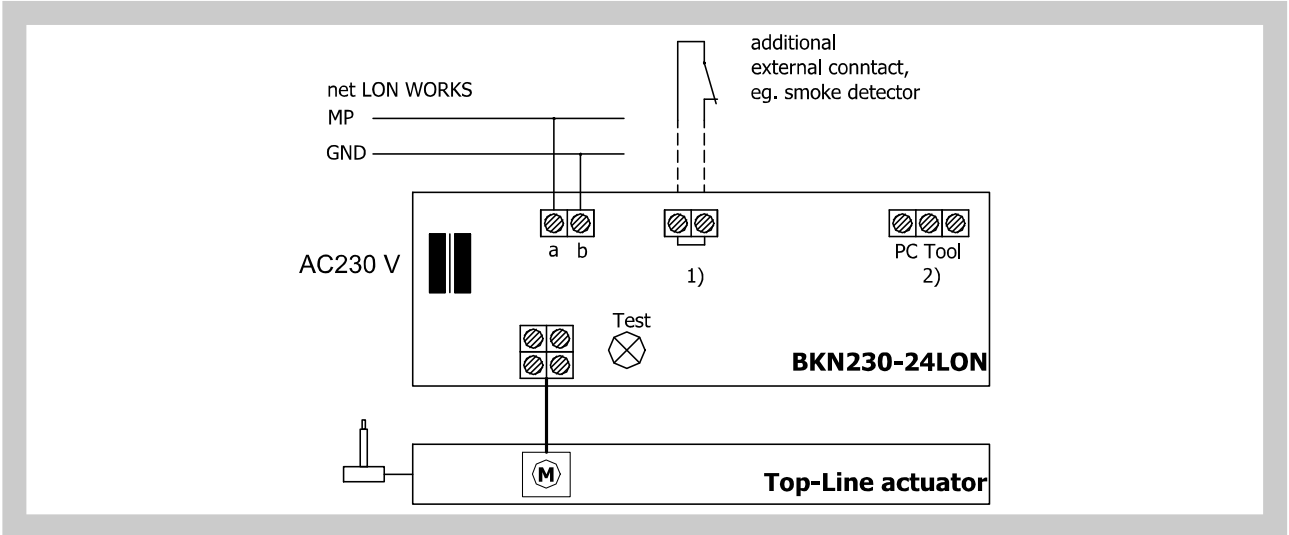
Fig 23 Communication and supply device BKN 230-24MP



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

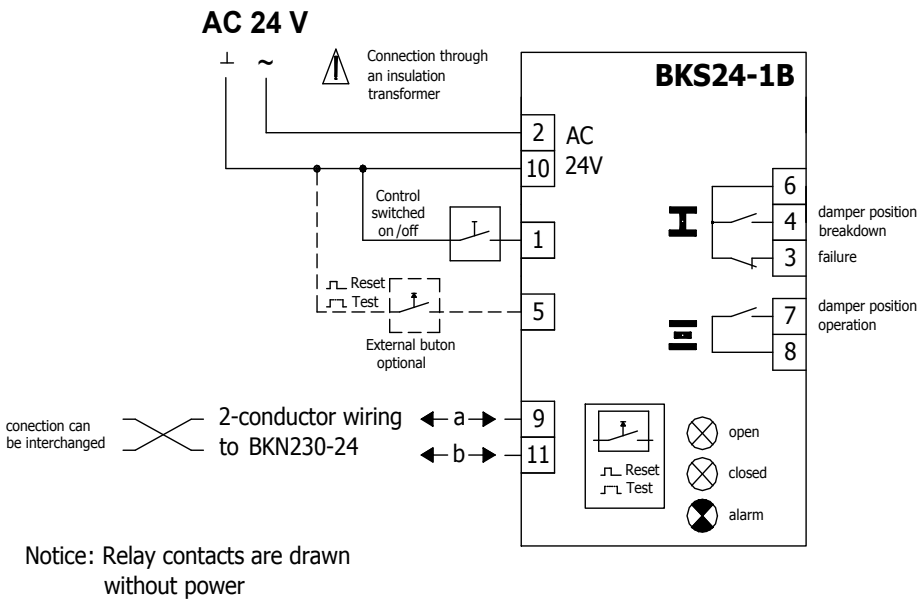
Fig. 24 Communication and supply device BKN 230-24LON



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

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

Communication and control device	BKS 24-1B
Nominal voltage	AC 24 V 50/60Hz
Power consumption	2,5 W (operating position)
Dimensioning	5 VA
Protection Class	III
Degree of protection	IP 30
Ambient temperature	0 … + 50 °C
Connection	11-pole connector ZSO-11, it is not part of BKS24-1B, ZSO-11 is 11-pole screw terminal 11 x 1,5 mm²

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

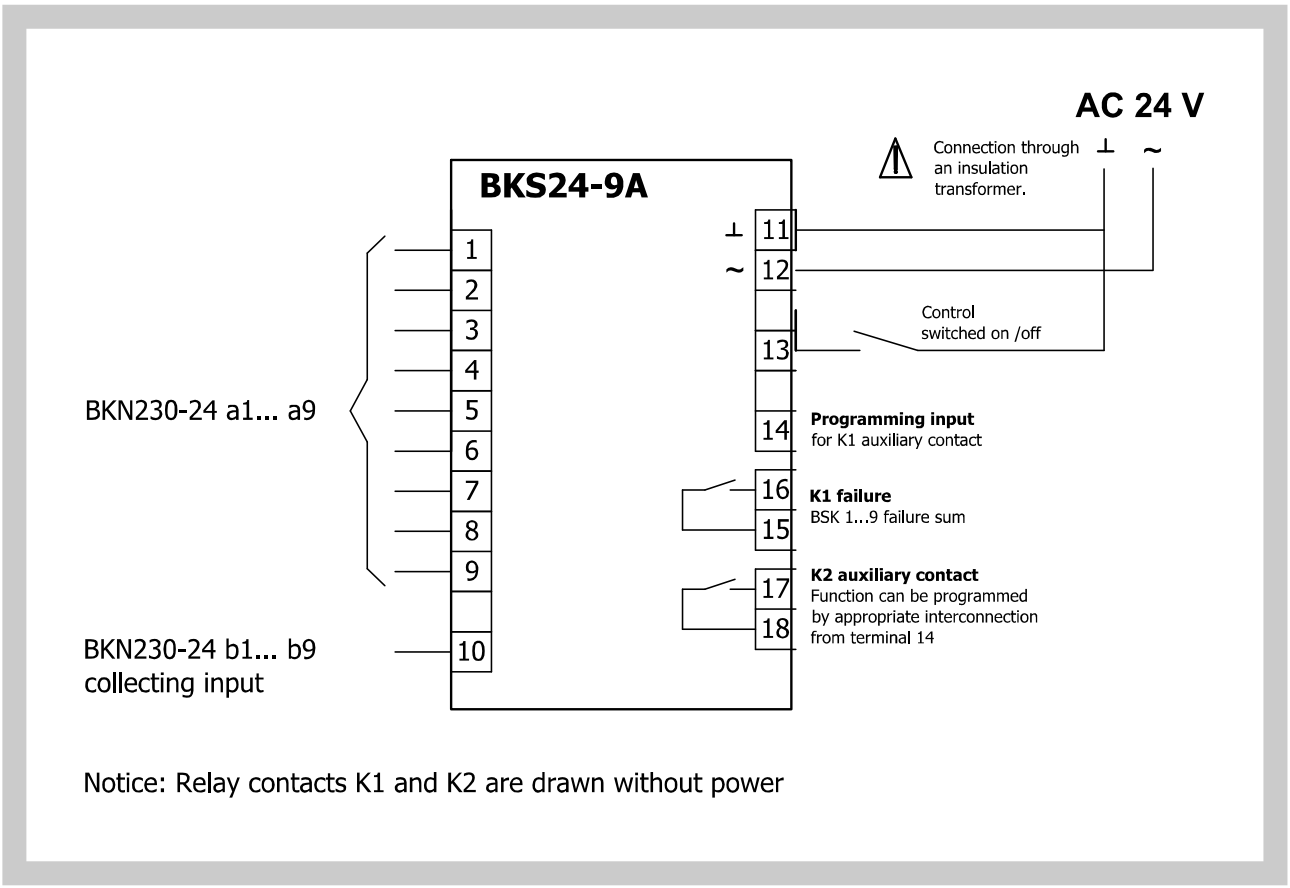
If the fire damper do not reach the given position in time tolerable for displacing, the appropriate light diode FAILURE starts to flash and K1 contact is opened (current failure). In case that the faulty damper finally reaches its given position, K1 is closed and the failure report light shines (the 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



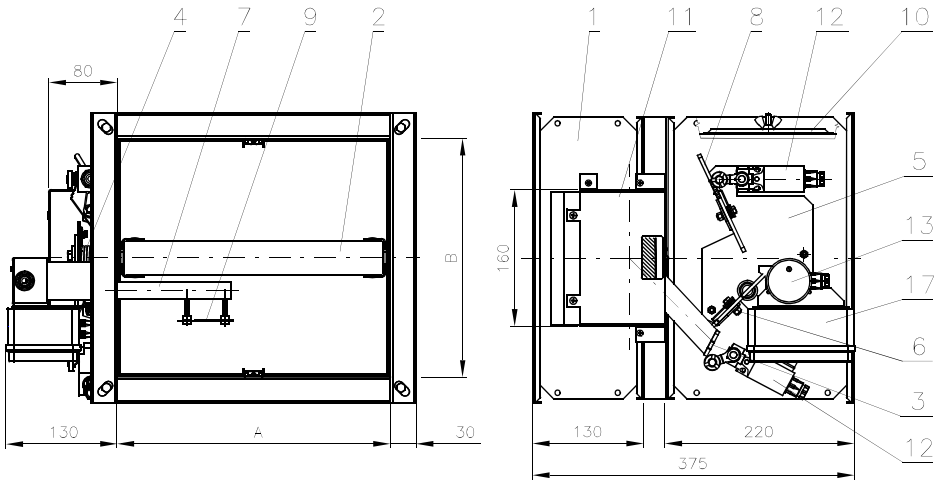
Tab. 3.2.2. Communication and control device BKS 24-9A

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 mm²

4. Dimensions, weights

4.1. Rectangular dampers

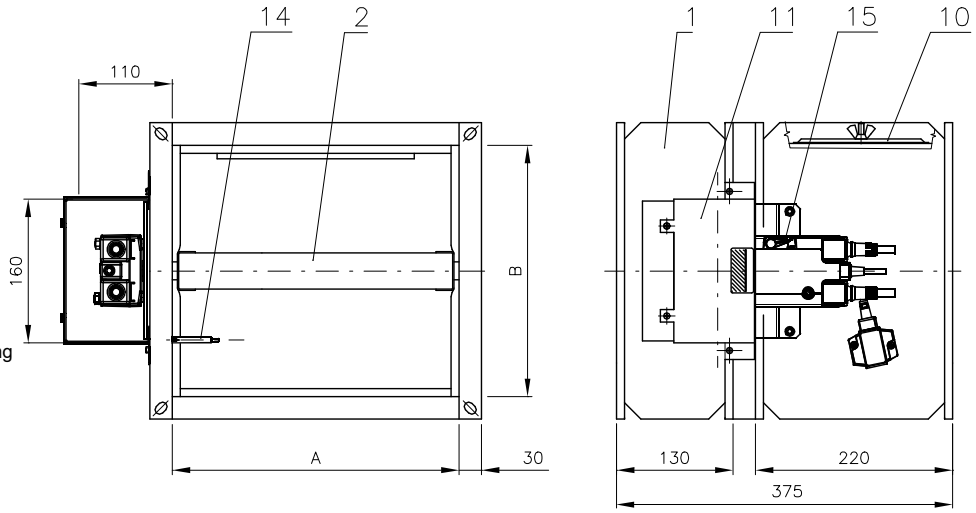
Fig. 27 FDMA - design manual and thermal



Position:

1 Damper body
2 Damper blade
3 Control lever
4 Shutting spring
5 Base plate
6 Initiation lever
7 Starting mechanism
8 Pawl
9 Thermal protective fuse
10 Inspection hole covering
11 Prestressing rosette
12 Terminal switch
13 Electromagnet (Solenoid)
17 Pulse switch SIEM24

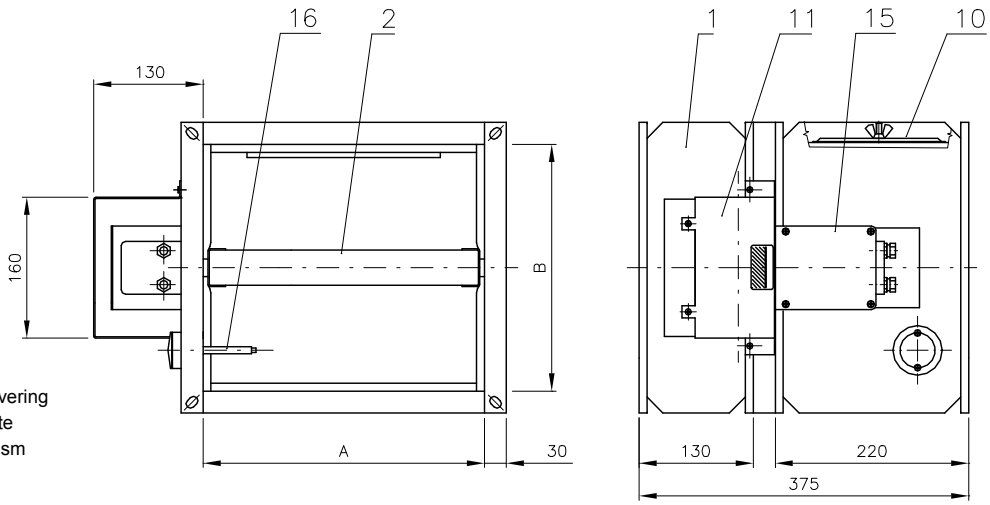
Fig. 28 FDMA - C - with covered control mechanism



Position:

1 Damper body
2 Damper blade
10 Inspection hole covering
11 Rozeta předepínací
14 BAT thermoelectrical starting mechanism
15 Actuating mechanism

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



Position:

1 Damper body
2 Damper blade
10 Inspection hole covering
11 Prestressing rosette
15 Actuating mechanism
17 Pulse switch

4.2. Round dampers

Fig. 30 FDMA - K - design manual and thermal

Position:
1 Damper body
2 Damper blade
3 Control lever
4 Shutting spring
5 Base plate
6 Initiation lever
7 Starting mechanism
8 Pawl
9 Thermal protective fuse
10 Inspection hole covering
11 Prestressing rosette
12 Terminal switch
13 Electromagnet (Solenoid)
17 Pulse switch SIEM24

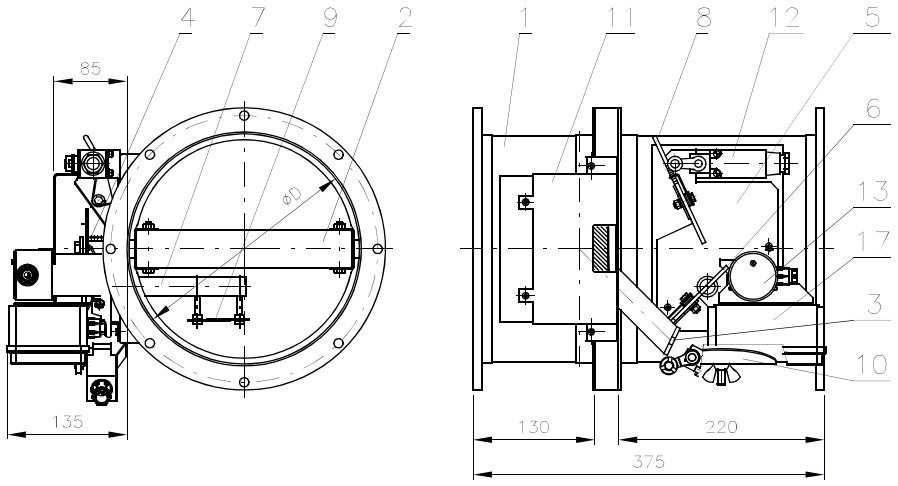


Fig. 31 FDMA - K - design with actuating mechanism

Position:
1 Damper body
2 Damper blade
10 Inspection hole covering
11 BAT thermoelectrical starting mechanism
14 Actuating mechanism
15 Servopohon

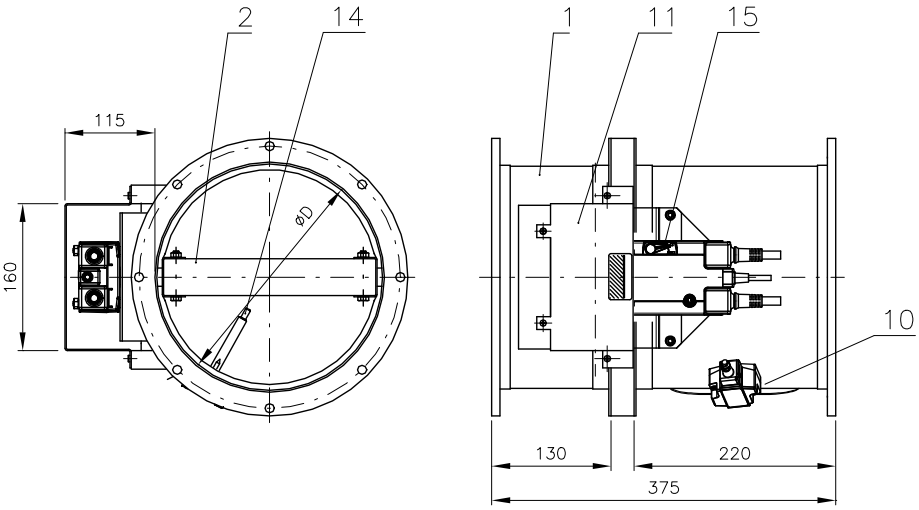
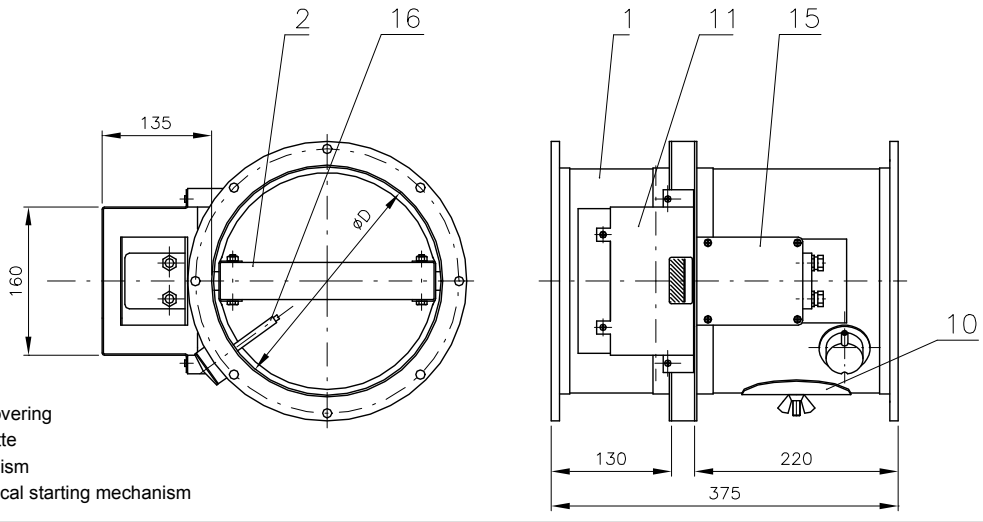


Fig. 32 FDMA - K - design with actuating mechanism into (ZONE 1,2)

Position:
1 Damper body
2 Damper blade
10 Inspection hole covering
11 Prestressing rosette
15 Actuating mechanism
17 BAT thermoelectrical starting mechanism



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

A x B	a	c	Weight		Effective area S_{ef} [m²]	Actuat. mech. type	A x B	a	c	Weight		Effective area S_{ef} [m²]	Actuat. mech. type
			Design							Design			
			Manual	Actuat. mech.						Manual	Actuat. mech.		
300 x 280	-	5	13,7	15,4	0,0616	BFL	**355 x 710**	85	230	26,6	29,6	0,2178	BFN
300 x 300	-	20	14,2	15,9	0,0672	BFL	**355 x 750**	90	235	27,7	30,7	0,2312	BFN
300 x 315	-	30	14,6	16,3	0,0714	BFL	**355 x 800**	110	255	29,1	32,1	0,2479	BF
300 x 355	-	37	15,6	17,3	0,0826	BFL	**355 x 900**	135	280	31,8	34,8	0,2814	BF
300 x 400	-	57	16,8	18,5	0,0952	BFL	**355 x 1000**	235	380	34,5	37,5	0,3149	BF
300 x 450	-	80	18,0	21,0	0,1092	BFL	**400 x 180**	-	-	13,0	14,7	0,0456	BFL
300 x 500	-	105	19,3	22,3	0,1232	BFL	**400 x 200**	-	-	13,6	15,3	0,0532	BFL
300 x 550	-	130	20,5	23,5	0,1372	BFN	**400 x 225**	-	-	14,3	16,0	0,0627	BFL
300 x 560	10	155	20,8	23,8	0,1400	BFN	**400 x 250**	-	-	15,1	16,8	0,0722	BFL
300 x 600	15	160	21,8	24,8	0,1512	BFN	**400 x 280**	-	5	15,9	17,6	0,0836	BFL
300 x 630	35	180	22,6	25,6	0,1596	BFN	**400 x 300**	-	20	16,5	18,2	0,0912	BFL
300 x 650	50	195	23,1	26,1	0,1652	BFN	**400 x 315**	-	30	16,9	18,6	0,0969	BFL
300 x 700	60	205	24,3	27,3	0,1792	BFN	**400 x 355**	-	37	18,1	19,8	0,1121	BFL
300 x 710	85	230	24,6	27,6	0,1820	BFN	**400 x 400**	-	57	19,4	21,1	0,1292	BFL
300 x 750	90	235	25,6	28,6	0,1932	BFN	**400 x 450**	-	80	20,8	23,8	0,1482	BFL
300 x 800	110	255	26,8	29,8	0,2072	BFN	**400 x 500**	-	105	22,3	25,3	0,1672	BFN
300 x 900	135	280	29,4	32,4	0,2352	BF	**400 x 550**	-	130	23,7	26,7	0,1862	BFN
300 x 1000	235	380	31,9	34,9	0,2632	BF	**400 x 560**	10	155	24,0	27,0	0,1900	BFN
315 x 180	-	-	11,5	13,2	0,0354	BFL	**400 x 600**	15	160	25,1	28,1	0,2052	BFN
315 x 200	-	-	12,0	13,7	0,0413	BFL	**400 x 630**	35	180	26,0	29,0	0,2166	BFN
315 x 225	-	-	12,6	14,3	0,0487	BFL	**400 x 650**	50	195	26,6	29,6	0,2242	BFN
315 x 250	-	-	13,3	15,0	0,0561	BFL	**400 x 700**	60	205	28,0	31,0	0,2432	BFN
315 x 280	-	5	14,1	15,8	0,0649	BFL	**400 x 710**	85	230	28,3	31,3	0,2470	BFN
315 x 300	-	20	14,6	16,3	0,0708	BFL	**400 x 750**	90	235	29,5	32,5	0,2622	BF
315 x 315	-	30	15,0	16,7	0,0752	BFL	**400 x 800**	110	255	30,9	33,9	0,2812	BF
315 x 355	-	37	16,0	17,7	0,0870	BFL	**400 x 900**	135	280	33,8	36,8	0,3192	BF
315 x 400	-	57	17,1	18,8	0,1003	BFL	**400 x 1000**	235	380	36,7	39,7	0,3572	BF
315 x 450	-	80	18,4	21,4	0,1151	BFL	**450 x 180**	-	-	14,0	15,7	0,0516	BFL
315 x 500	-	105	19,7	22,7	0,1298	BFL	**450 x 200**	-	-	14,6	16,3	0,0602	BFL
315 x 550	-	130	21,0	24,0	0,1446	BFN	**450 x 225**	-	-	15,3	17,0	0,0710	BFL
315 x 560	10	155	21,3	24,3	0,1475	BFN	**450 x 250**	-	-	16,1	17,8	0,0817	BFL
315 x 600	15	160	22,3	25,3	0,1593	BFN	**450 x 280**	-	5	17,0	18,7	0,0946	BFL
315 x 630	35	180	23,1	26,1	0,1682	BFN	**450 x 300**	-	20	17,6	19,3	0,1032	BFL
315 x 650	50	195	23,6	26,6	0,1741	BFN	**450 x 315**	-	30	18,1	19,8	0,1097	BFL
315 x 700	60	205	24,9	27,9	0,1888	BFN	**450 x 355**	-	37	19,3	21,0	0,1269	BFL
315 x 710	85	230	25,1	28,1	0,1918	BFN	**450 x 400**	-	57	20,7	22,4	0,1462	BFL
315 x 750	90	235	26,2	29,2	0,2036	BFN	**450 x 450**	-	80	22,2	25,2	0,1677	BFN
315 x 800	110	255	27,5	30,5	0,2183	BFN	**450 x 500**	-	105	23,8	26,8	0,1892	BFN
315 x 900	135	280	30,0	33,0	0,2478	BF	**450 x 550**	-	130	25,3	28,3	0,2107	BFN
315 x 1000	235	380	32,6	35,6	0,2773	BF	**450 x 560**	10	155	25,6	28,6	0,2150	BFN
355 x 180	-	-	12,2	13,9	0,0402	BFL	**450 x 600**	15	160	26,8	29,8	0,2322	BFN
355 x 200	-	-	12,8	14,5	0,0469	BFL	**450 x 630**	35	180	27,7	30,7	0,2451	BFN
355 x 225	-	-	13,4	15,1	0,0553	BFL	**450 x 650**	50	195	28,4	31,4	0,2537	BFN
355 x 250	-	-	14,1	15,8	0,0737	BFL	**450 x 700**	60	205	29,9	32,9	0,2752	BF
355 x 280	-	5	14,9	16,6	0,0637	BFL	**450 x 710**	85	230	30,2	33,2	0,2795	BF
355 x 300	-	20	15,5	17,2	0,0804	BFL	**450 x 750**	90	235	31,4	34,4	0,2967	BF
355 x 315	-	30	15,9	17,6	0,0854	BFL	**450 x 800**	110	255	33,0	36,0	0,3182	BF
355 x 355	-	37	17,0	18,7	0,0988	BFL	**450 x 900**	135	280	36,0	39,0	0,3612	BF
355 x 400	-	57	18,2	19,9	0,1139	BFL	**450 x 1000**	235	380	39,1	42,1	0,4042	BF
355 x 450	-	80	19,6	22,6	0,1307	BFL	**500 x 180**	-	-	14,9	16,6	0,0576	BFL
355 x 500	-	105	20,9	23,9	0,1474	BFN	**500 x 200**	-	-	15,5	17,2	0,0672	BFL
355 x 550	-	130	22,3	25,3	0,1642	BFN	**500 x 225**	-	-	16,3	18,0	0,0792	BFL
355 x 560	10	155	22,6	25,6	0,1675	BFN	**500 x 250**	-	-	17,1	18,8	0,0912	BFL
355 x 600	15	160	23,6	26,6	0,1809	BFN	**500 x 280**	-	5	18,1	19,8	0,1056	BFL
355 x 630	35	180	24,5	27,5	0,1910	BFN	**500 x 300**	-	20	18,8	20,5	0,1152	BFL
355 x 650	50	195	25,0	28,0	0,1977	BFN	**500 x 315**	-	30	19,3	21,0	0,1224	BFL
355 x 700	60	205	26,4	29,4	0,2144	BFN	**500 x 355**	-	37	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	-	57	22,0	23,7	0,1632	BFL	**560 x 900**	135	280	40,9	43,9	0,4536	BF
500 x 450	-	80	23,6	26,6	0,1872	BFN	**560 x 1000**	235	380	44,4	47,4	0,5076	BF
500 x 500	-	105	25,3	28,3	0,2112	BFN	**600 x 180**	-	-	16,7	19,7	0,0696	BFL
500 x 550	-	130	26,9	29,9	0,2352	BFN	**600 x 200**	-	-	17,4	20,4	0,0812	BFL
500 x 560	10	155	27,2	30,2	0,2400	BFN	**600 x 225**	-	-	18,3	21,3	0,0957	BFL
500 x 600	15	160	28,5	31,5	0,2592	BFN	**600 x 250**	-	-	19,2	22,2	0,1102	BFL
500 x 630	35	180	29,5	32,5	0,2736	BFN	**600 x 280**	-	5	20,3	23,3	0,1276	BFL
500 x 650	50	195	30,1	33,1	0,2832	BF	**600 x 300**	-	20	21,0	24,0	0,1392	BFL
500 x 700	60	205	31,7	34,7	0,3072	BF	**600 x 315**	-	30	21,6	24,6	0,1479	BFL
500 x 710	85	230	32,1	35,1	0,3120	BF	**600 x 355**	-	37	23,0	26,0	0,1711	BFL
500 x 750	90	235	33,4	36,4	0,3312	BF	**600 x 400**	-	57	24,6	27,6	0,1972	BFN
500 x 800	110	255	35,0	38,0	0,3552	BF	**600 x 450**	-	80	26,4	29,4	0,2262	BFN
500 x 900	135	280	38,2	41,2	0,4032	BF	**600 x 500**	-	105	28,3	31,3	0,2552	BFN
500 x 1000	235	380	41,5	44,5	0,4512	BF	**600 x 550**	-	130	30,1	33,1	0,2842	BFN
550 x 180	-	-	15,8	17,5	0,0636	BFL	**600 x 560**	10	155	30,4	33,4	0,2900	BFN
550 x 200	-	-	16,5	18,2	0,0742	BFL	**600 x 600**	15	160	31,9	34,9	0,3132	BF
550 x 225	-	-	17,3	19,0	0,0875	BFL	**600 x 630**	35	180	32,9	35,9	0,3306	BF
550 x 250	-	-	18,2	19,9	0,1007	BFL	**600 x 650**	50	195	33,7	36,7	0,3422	BF
550 x 280	-	5	19,2	20,9	0,1166	BFL	**600 x 700**	60	205	35,5	38,5	0,3712	BF
550 x 300	-	20	19,9	21,6	0,1272	BFL	**600 x 710**	85	230	35,8	38,8	0,3770	BF
550 x 315	-	30	20,4	22,1	0,1352	BFL	**600 x 750**	90	235	37,3	40,3	0,4002	BF
550 x 355	-	37	21,8	23,5	0,1564	BFL	**600 x 800**	110	255	39,1	42,1	0,4292	BF
550 x 400	-	57	23,3	25,0	0,1802	BFN	**600 x 900**	135	280	42,7	45,7	0,4872	BF
550 x 450	-	80	25,0	28,0	0,2067	BFN	**600 x 1000**	235	380	46,3	49,3	0,5452	BF
550 x 500	-	105	26,8	29,8	0,2332	BFN	**630 x 180**	-	-	17,3	20,3	0,0732	BFL
550 x 550	-	130	28,5	31,5	0,2597	BFN	**630 x 200**	-	-	18,0	21,0	0,0854	BFL
550 x 560	10	155	28,8	31,8	0,2650	BFN	**630 x 225**	-	-	18,9	21,9	0,1007	BFL
550 x 600	15	160	30,2	33,2	0,2862	BFN	**630 x 250**	-	-	19,9	22,9	0,1159	BFL
550 x 630	35	180	31,2	34,2	0,3021	BF	**630 x 280**	-	5	21,0	24,0	0,1342	BFL
550 x 650	50	195	31,9	34,9	0,3127	BF	**630 x 300**	-	20	21,7	24,7	0,1464	BFL
550 x 700	60	205	33,6	36,6	0,3392	BF	**630 x 315**	-	30	22,3	25,3	0,1556	BFL
550 x 710	85	230	33,9	36,9	0,3445	BF	**630 x 355**	-	37	23,8	26,8	0,1800	BFL
550 x 750	90	235	35,3	38,3	0,3657	BF	**630 x 400**	-	57	25,4	28,4	0,2074	BFN
550 x 800	110	255	37,0	40,0	0,3922	BF	**630 x 450**	-	80	27,3	30,3	0,2379	BFN
550 x 900	135	280	40,4	43,4	0,4452	BF	**630 x 500**	-	105	29,1	32,1	0,2684	BFN
550 x 1000	235	380	43,9	46,9	0,4982	BF	**630 x 550**	-	130	31,0	34,0	0,2989	BFN
560 x 180	-	-	16,0	17,7	0,0648	BFL	**630 x 560**	10	155	31,4	34,4	0,3050	BFN
560 x 200	-	-	16,7	18,4	0,0756	BFL	**630 x 600**	15	160	32,9	35,9	0,3294	BF
560 x 225	-	-	17,5	19,2	0,0891	BFL	**630 x 630**	35	180	34,0	37,0	0,3477	BF
560 x 250	-	-	18,4	20,1	0,1026	BFL	**630 x 650**	50	195	34,7	37,7	0,3599	BF
560 x 280	-	5	19,4	21,1	0,1188	BFL	**630 x 700**	60	205	36,6	39,6	0,3904	BF
560 x 300	-	20	20,1	21,8	0,1296	BFL	**630 x 710**	85	230	36,9	39,9	0,3965	BF
560 x 315	-	30	20,7	22,4	0,1377	BFL	**630 x 750**	90	235	38,4	41,4	0,4209	BF
560 x 355	-	37	22,0	23,7	0,1593	BFL	**630 x 800**	110	255	40,3	43,3	0,4514	BF
560 x 400	-	57	23,6	25,3	0,1836	BFN	**630 x 900**	135	280	44,0	47,0	0,5124	BF
560 x 450	-	80	25,3	28,3	0,2106	BFN	**630 x 1000**	235	380	47,7	50,7	0,5734	BF
560 x 500	-	105	27,1	30,1	0,2376	BFN	**650 x 180**	-	-	17,6	20,6	0,0756	BFL
560 x 550	-	130	28,8	31,8	0,2646	BFN	**650 x 200**	-	-	18,4	21,4	0,0882	BFL
560 x 560	10	155	29,1	32,1	0,2700	BFN	**650 x 225**	-	-	19,3	22,3	0,1040	BFL
560 x 600	15	160	30,5	33,5	0,2916	BFN	**650 x 250**	-	-	20,3	23,3	0,1197	BFL
560 x 630	35	180	31,6	34,6	0,3078	BF	**650 x 280**	-	5	21,4	24,4	0,1386	BFL
560 x 650	50	195	32,2	35,2	0,3186	BF	**650 x 300**	-	20	22,2	25,2	0,1512	BFL
560 x 700	60	205	34,0	37,0	0,3456	BF	**650 x 315**	-	30	22,7	25,7	0,1607	BFL
560 x 710	85	230	34,3	37,3	0,3510	BF	**650 x 355**	-	37	24,3	27,3	0,1859	BFL
560 x 750	90	235	35,7	38,7	0,3726	BF	**650 x 400**	-	57	26,0	29,0	0,2142	BFN
560 x 800	110	255	37,4	40,4	0,3996	BF	**650 x 450**	-	80	27,9	30,9	0,2457	BFN

A x B	a	c	Weight		Effective area S_{ef} [m²]	Actuat. mech. type	A x B	a	c	Weight		Effective area S_{ef} [m²]	Actuat. mech. type
			Design							Design			
			Manual	Actuat. mech.						Manual	Actuat. mech.		
650 x 450	-	80	27,9	30,9	0,2457	BFN	**710 x 1000**	235	380	51,5	54,5	0,6486	BF
650 x 500	-	105	29,7	32,7	0,2772	BFN	**750 x 180**	-	-	19,5	22,5	0,0876	BFL
650 x 550	-	130	31,6	34,6	0,3087	BFN	**750 x 200**	-	-	20,3	23,3	0,1022	BFL
650 x 560	10	155	32,0	35,0	0,3150	BF	**750 x 225**	-	-	21,3	24,3	0,1205	BFL
650 x 600	15	160	33,5	36,5	0,3402	BF	**750 x 250**	-	-	22,4	25,4	0,1387	BFL
650 x 630	35	180	34,7	37,7	0,3591	BF	**750 x 280**	-	5	23,6	26,6	0,1606	BFL
650 x 650	50	195	35,4	38,4	0,3717	BF	**750 x 300**	-	20	24,5	27,5	0,1752	BFL
650 x 700	60	205	37,3	40,3	0,4032	BF	**750 x 315**	-	30	25,1	28,1	0,1862	BFL
650 x 710	85	230	37,7	40,7	0,4095	BF	**750 x 355**	-	37	26,7	29,7	0,2154	BFN
650 x 750	90	235	39,2	42,2	0,4347	BF	**750 x 400**	-	57	28,6	31,6	0,2482	BFN
650 x 800	110	255	41,1	44,1	0,4662	BF	**750 x 450**	-	80	30,7	33,7	0,2847	BFN
650 x 900	135	280	44,9	47,9	0,5292	BF	**750 x 500**	-	105	32,7	35,7	0,3212	BFN
650 x 1000	235	380	48,7	51,7	0,5922	BF	**750 x 550**	-	130	34,8	37,8	0,3577	BF
700 x 180	-	-	18,6	21,6	0,0816	BFL	**750 x 560**	10	155	35,2	38,2	0,3650	BF
700 x 200	-	-	19,4	22,4	0,0952	BFL	**750 x 600**	15	160	36,9	39,9	0,3942	BF
700 x 225	-	-	20,3	23,3	0,1122	BFL	**750 x 630**	35	180	38,1	41,1	0,4161	BF
700 x 250	-	-	21,3	24,3	0,1292	BFL	**750 x 650**	50	195	39,0	42,0	0,4307	BF
700 x 280	-	5	22,5	25,5	0,1496	BFL	**750 x 700**	60	205	41,0	44,0	0,4672	BF
700 x 300	-	20	23,3	26,3	0,1632	BFL	**750 x 710**	85	230	41,4	44,4	0,4745	BF
700 x 315	-	30	23,9	26,9	0,1734	BFL	**750 x 750**	90	235	43,1	46,1	0,5037	BF
700 x 355	-	37	25,5	28,5	0,2006	BFN	**750 x 800**	110	255	45,2	48,2	0,5402	BF
700 x 400	-	57	27,3	30,3	0,2312	BFN	**750 x 900**	135	280	49,3	52,3	0,6132	BF
700 x 450	-	80	29,3	32,3	0,2652	BFN	**750 x 1000**	235	380	53,5	56,5	0,6862	BF
700 x 500	-	105	31,2	34,2	0,2992	BFN	**800 x 180**	-	-	20,4	23,4	0,0936	BFL
700 x 550	-	130	33,2	36,2	0,3332	BF	**800 x 200**	-	-	21,3	24,3	0,1092	BFL
700 x 560	10	155	33,6	36,6	0,3400	BF	**800 x 225**	-	-	22,3	25,3	0,1287	BFL
700 x 600	15	160	35,2	38,2	0,3672	BF	**800 x 250**	-	-	23,4	26,4	0,1482	BFL
700 x 630	35	180	36,4	39,4	0,3876	BF	**800 x 280**	-	5	24,7	27,7	0,1716	BFL
700 x 650	50	195	37,2	40,2	0,4012	BF	**800 x 300**	-	20	25,6	28,6	0,1872	BFL
700 x 700	60	205	39,2	42,2	0,4352	BF	**800 x 315**	-	30	26,2	29,2	0,1989	BFL
700 x 710	85	230	39,6	42,6	0,4420	BF	**800 x 355**	-	37	28,0	31,0	0,2301	BFN
700 x 750	90	235	41,2	44,2	0,4692	BF	**800 x 400**	-	57	29,9	32,9	0,2652	BFN
700 x 800	110	255	43,1	46,1	0,5032	BF	**800 x 450**	-	80	32,1	35,1	0,3042	BFN
700 x 900	135	280	47,1	50,1	0,5712	BF	**800 x 500**	-	105	34,2	37,2	0,3432	BFN
700 x 1000	235	380	51,1	54,1	0,6392	BF	**800 x 550**	-	130	36,4	39,4	0,3822	BF
710 x 180	-	-	18,7	21,7	0,0828	BFL	**800 x 560**	10	155	36,8	39,8	0,3900	BF
710 x 200	-	-	19,5	22,5	0,0966	BFL	**800 x 600**	15	160	38,6	41,6	0,4212	BF
710 x 225	-	-	20,5	23,5	0,1139	BFL	**800 x 630**	35	180	39,9	42,9	0,4446	BF
710 x 250	-	-	21,5	24,5	0,1311	BFL	**800 x 650**	50	195	40,7	43,7	0,4602	BF
710 x 280	-	5	22,7	25,7	0,1518	BFL	**800 x 700**	60	205	42,9	45,9	0,4992	BF
710 x 300	-	20	23,5	26,5	0,1656	BFL	**800 x 710**	85	230	43,3	46,3	0,5070	BF
710 x 315	-	30	24,1	27,1	0,1760	BFL	**800 x 750**	90	235	45,0	48,0	0,5382	BF
710 x 355	-	37	25,7	28,7	0,2036	BFN	**800 x 800**	110	255	47,2	50,2	0,5772	BF
710 x 400	-	57	27,5	30,5	0,2346	BFN	**800 x 900**	135	280	51,5	54,5	0,6552	BF
710 x 450	-	80	29,5	32,5	0,2691	BFN	**800 x 1000**	235	380	55,9	58,9	0,7332	BF
710 x 500	-	105	31,5	34,5	0,3036	BFN	**900 x 180**	-	-	22,2	25,2	0,1056	BFL
710 x 550	-	130	33,5	36,5	0,3381	BF	**900 x 200**	-	-	23,2	26,2	0,1232	BFL
710 x 560	10	155	33,9	36,9	0,3450	BF	**900 x 225**	-	-	24,3	27,3	0,1452	BFL
710 x 600	15	160	35,5	38,5	0,3726	BF	**900 x 250**	-	-	25,5	28,5	0,1672	BFL
710 x 630	35	180	36,7	39,7	0,3933	BF	**900 x 280**	-	5	26,9	29,9	0,1936	BFL
710 x 650	50	195	37,5	40,5	0,4071	BF	**900 x 300**	-	20	27,9	30,9	0,2112	BFL
710 x 700	60	205	39,5	42,5	0,4416	BF	**900 x 315**	-	30	28,6	31,6	0,2244	BFN
710 x 710	85	230	39,9	42,9	0,4485	BF	**900 x 355**	-	37	30,4	33,4	0,2596	BFN
710 x 750	90	235	41,5	44,5	0,4761	BF	**900 x 400**	-	57	32,5	35,5	0,2992	BFN
710 x 800	110	255	43,5	46,5	0,5106	BF	**900 x 450**	-	80	34,9	37,9	0,3432	BFN
710 x 900	135	280	47,5	50,5	0,5796	BF	**900 x 500**	-	105	37,2	40,2	0,3872	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 550	-	130	39,6	42,6	0,4312	BF	**1250 x 200**	-	-	29,9	32,9	0,1722	BFL
900 x 560	10	155	40,0	43,0	0,4400	BF	**1250 x 225**	-	-	31,4	34,4	0,2030	BFL
900 x 600	15	160	41,9	44,9	0,4752	BF	**1250 x 250**	-	-	32,8	35,8	0,2337	BFL
900 x 630	35	180	43,3	46,3	0,5016	BF	**1250 x 280**	-	5	34,6	37,6	0,2706	BFN
900 x 650	50	195	44,3	47,3	0,5192	BF	**1250 x 300**	-	20	35,8	38,8	0,2952	BFN
900 x 700	60	205	46,6	49,6	0,5632	BF	**1250 x 315**	-	30	36,7	39,7	0,3137	BFN
900 x 710	85	230	47,1	50,1	0,5720	BF	**1250 x 355**	-	37	39,1	42,1	0,3629	BFN
900 x 750	90	235	48,9	51,9	0,6072	BF	**1250 x 400**	-	57	41,8	44,8	0,4182	BFN
900 x 800	110	255	51,3	54,3	0,6512	BF	**1250 x 450**	-	80	44,7	47,7	0,4797	BF
900 x 900	135	280	56,0	59,0	0,7392	BF	**1250 x 500**	-	105	47,7	50,7	0,5412	BF
900 x 1000	235	380	60,6	63,6	0,8272	BF	**1250 x 550**	-	130	50,7	53,7	0,6027	BF
1000 x 180	-	-	24,1	27,1	0,1176	BFL	**1250 x 560**	10	155	51,3	54,3	0,6150	BF
1000 x 200	-	-	25,1	28,1	0,1372	BFL	**1250 x 600**	15	160	53,6	56,6	0,6642	BF
1000 x 225	-	-	26,4	29,4	0,1617	BFL	**1250 x 630**	35	180	55,4	58,4	0,7011	BF
1000 x 250	-	-	27,6	30,6	0,1862	BFL	**1250 x 650**	50	195	56,6	59,6	0,7257	BF
1000 x 280	-	5	29,1	32,1	0,2156	BFL	**1250 x 700**	60	205	59,6	62,6	0,7872	BF
1000 x 300	-	20	30,1	33,1	0,2352	BFN	**1250 x 710**	85	230	60,2	63,2	0,7995	BF
1000 x 315	-	30	30,9	33,9	0,2499	BFN	**1250 x 750**	90	235	62,6	65,6	0,8487	BF
1000 x 355	-	37	32,9	35,9	0,2891	BFN	**1250 x 800**	110	255	65,5	68,5	0,9102	BF
1000 x 400	-	57	35,2	38,2	0,3332	BFN	**1250* x 900**	135	280	71,5	74,5	1,0332	BF
1000 x 450	-	80	37,7	40,7	0,3822	BFN	**1250* x 1000**	235	380	77,4	80,4	1,1562	BF
1000 x 500	-	105	40,2	43,2	0,4312	BF	**1400 x 180**	-	-	31,4	34,4	0,1656	BFL
1000 x 550	-	130	42,7	45,7	0,4802	BF	**1400 x 200**	-	-	32,7	35,7	0,1932	BFL
1000 x 560	10	155	43,2	46,2	0,4900	BF	**1400 x 225**	-	-	34,4	37,4	0,2277	BFL
1000 x 600	15	160	45,3	48,3	0,5292	BF	**1400 x 250**	-	-	36,0	39,0	0,2622	BFN
1000 x 630	35	180	46,8	49,8	0,5586	BF	**1400 x 280**	-	5	37,9	40,9	0,3036	BFN
1000 x 650	50	195	47,8	50,8	0,5782	BF	**1400 x 300**	-	20	39,2	42,2	0,3312	BFN
1000 x 700	60	205	50,3	53,3	0,6272	BF	**1400 x 315**	-	30	40,2	43,2	0,3519	BFN
1000 x 710	85	230	50,8	53,8	0,6370	BF	**1400 x 355**	-	37	42,8	45,8	0,4071	BFN
1000 x 750	90	235	52,8	55,8	0,6762	BF	**1400 x 400**	-	57	45,7	48,7	0,4692	BF
1000 x 800	110	255	55,3	58,3	0,7252	BF	**1400 x 450**	-	80	48,9	51,9	0,5382	BF
1000 x 900	135	280	60,4	63,4	0,8232	BF	**1400 x 500**	-	105	52,2	55,2	0,6072	BF
1000 x 1000	235	380	65,4	68,4	0,9212	BF	**1400 x 550**	-	130	55,4	58,4	0,6762	BF
1100 x 180	-	-	25,9	28,9	0,1296	BFL	**1400 x 560**	10	155	56,1	59,1	0,6900	BF
1100 x 200	-	-	27,0	30,0	0,1512	BFL	**1400 x 600**	15	160	58,7	61,7	0,7452	BF
1100 x 225	-	-	28,4	31,4	0,1782	BFL	**1400* x 630**	35	180	60,6	63,6	0,7866	BF
1100 x 250	-	-	29,7	32,7	0,2052	BFL	**1400* x 650**	50	195	61,9	64,9	0,8142	BF
1100 x 280	-	5	31,3	34,3	0,2376	BFL	**1400* x 700**	60	205	65,2	68,2	0,8832	BF
1100 x 300	-	20	32,4	35,4	0,2592	BFN	**1400* x 710**	85	230	65,8	68,8	0,8970	BF
1100 x 315	-	30	33,2	36,2	0,2754	BFN	**1400* x 750**	90	235	68,4	71,4	0,9522	BF
1100 x 355	-	37	35,4	38,4	0,3186	BFN	**1400* x 800**	110	255	71,6	74,6	1,0212	BF
1100 x 400	-	57	37,8	40,8	0,3672	BFN	**1400* x 900**	135	280	78,1	81,1	1,1592	BF
1100 x 450	-	80	40,5	43,5	0,4212	BF	**1400* x 1000**	235	380	84,6	87,6	1,2972	BF
1100 x 500	-	105	43,2	46,2	0,4752	BF	**1500 x 180**	-	-	33,3	36,3	0,1776	BFL
1100 x 550	-	130	45,9	48,9	0,5292	BF	**1500 x 200**	-	-	34,7	37,7	0,2072	BFL
1100 x 560	10	155	46,5	49,5	0,5400	BF	**1500 x 225**	-	-	36,4	39,4	0,2442	BFL
1100 x 600	15	160	48,6	51,6	0,5832	BF	**1500 x 250**	-	-	38,1	41,1	0,2812	BFN
1100 x 630	35	180	50,2	53,2	0,6156	BF	**1500 x 280**	-	5	40,1	43,1	0,3256	BFN
1100 x 650	50	195	51,3	54,3	0,6372	BF	**1500 x 300**	-	20	41,5	44,5	0,3552	BFN
1100 x 700	60	205	54,0	57,0	0,6912	BF	**1500 x 315**	-	30	42,5	45,5	0,3774	BFN
1100 x 710	85	230	54,6	57,6	0,7020	BF	**1500 x 355**	-	37	45,3	48,3	0,4366	BFN
1100 x 750	90	235	56,7	59,7	0,7452	BF	**1500 x 400**	-	57	48,3	51,3	0,5032	BF
1100 x 800	110	255	59,4	62,4	0,7992	BF	**1500 x 450**	-	80	51,8	54,8	0,5772	BF
1100 x 900	135	280	64,8	67,8	0,9072	BF	**1500 x 500**	-	105	55,2	58,2	0,6512	BF
1100 x 1000	235	380	70,2	73,2	1,0152	BF	**1500 x 550**	-	130	58,6	61,6	0,7252	BF
1250 x 180	-	-	28,7	31,7	0,1476	BFL	**1500 x 560**	10	155	59,3	62,3	0,7400	BF

A x B	a	c	Weight Design Manual	Weight Design Actuat. mech.	Effective area S_{ef} [m^2]	Actuat. mech. type	A x B	a	c	Weight Design Manual	Weight Design Actuat. mech.	Effective area S_{ef} [m^2]	Actuat. mech. type
1500 x 600	15	160	62,0	65,0	0,7992	BF	**1600 x 355**	-	37	47,7	50,7	0,4661	BFN
1500* x 630	35	180	64,1	67,1	0,8436	BF	**1600 x 400**	-	57	51,0	54,0	0,5372	BF
1500* x 650	50	195	65,4	68,4	0,8732	BF	**1600 x 450**	-	80	54,6	57,6	0,6162	BF
1500* x 700	60	205	68,9	71,9	0,9472	BF	**1600 x 500**	-	105	58,2	61,2	0,6952	BF
1500* x 710	85	230	69,6	72,6	0,9620	BF	**1600 x 550**	-	130	61,8	64,8	0,7742	BF
1500* x 750	90	235	72,3	75,3	1,0212	BF	**1600 x 560**	10	155	62,5	65,5	0,7900	BF
1500* x 800	110	255	75,7	78,7	1,0952	BF	**1600 x 600**	15	160	65,4	68,4	0,8532	BF
1500* x 900	135	280	82,6	85,6	1,2432	BF	**1600* x 630**	35	180	67,5	70,5	0,9006	BF
1500* x 1000	235	380	89,4	92,4	1,3912	BF	**1600* x 650**	50	195	69,0	72,0	0,9322	BF
1600 x 180	-	-	35,1	38,1	0,1896	BFL	**1600* x 700**	60	205	72,6	75,6	1,0112	BF
1600 x 200	-	-	36,6	39,6	0,2212	BFL	**1600* x 710**	85	230	73,3	76,3	1,0270	BF
1600 x 225	-	-	38,4	41,4	0,2607	BFL	**1600* x 750**	90	235	76,2	79,2	1,0902	BF
1600 x 250	-	-	40,2	43,2	0,3002	BFN	**1600* x 800**	110	255	79,8	82,8	1,1692	BF
1600 x 280	-	5	42,3	45,3	0,3476	BFN	**1600* x 900**	135	280	87,0	90,0	1,3272	BF
1600 x 300	-	20	43,8	46,8	0,3792	BFN	**1600* x 1000**	235	380	94,2	97,2	1,4852	BF
1600 x 315	-	30	44,8	47,8	0,4029	BFN							

*** 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 ⌀D	g	h	e	f	Weight design manual	Weight design act. mechan.	Effective area S_{ef} [m^2]	Actuating mechanism type
180	-	-	-	-	7	8,5	0,0137	BFL
200	-	-	-	-	8	9,5	0,0182	BFL
225	-	-	-	-	8,5	10	0,0248	BFL
250	-	5	-	-	9	10,5	0,0323	BFL
280	-	20	-	-	10	11,5	0,0427	BFL
315	-	37	-	-	11	12,5	0,0565	BFL
355	-	57	-	7	13	14,5	0,0747	BFL
400	-	80	-	30	15	18	0,0982	BFL
450	-	105	-	55	17	20	0,1279	BFN
500	-	130	-	80	20	23	0,1617	BFN
560	15	160	-	110	23	26	0,2073	BFN
630	50	195	-	145	27	30	0,2677	BF
710	90	235	40	185	32	35	0,3461	BF
800	135	280	85	230	38	41	0,4464	BF
900	185	330	135	280	56	59	0,5727	BF
1000	235	380	185	330	74	77	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. 4.4.2
	Side without act. mechanism	"h"	Tab. 4.4.2

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

Fig. 33a Blade overlaps - rectangular damper

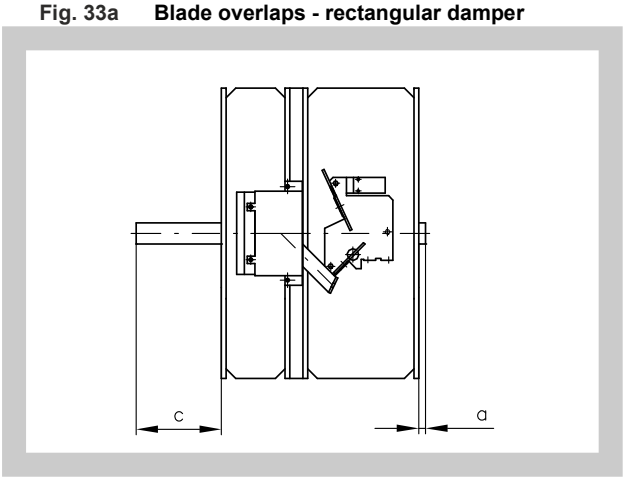


Fig. 33b Blade overlaps - round damper

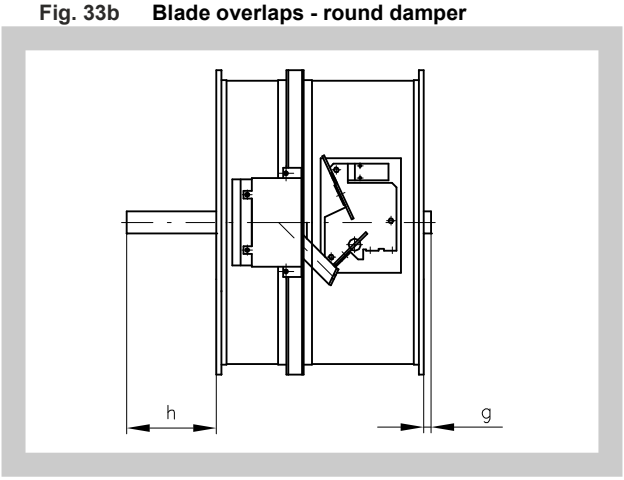
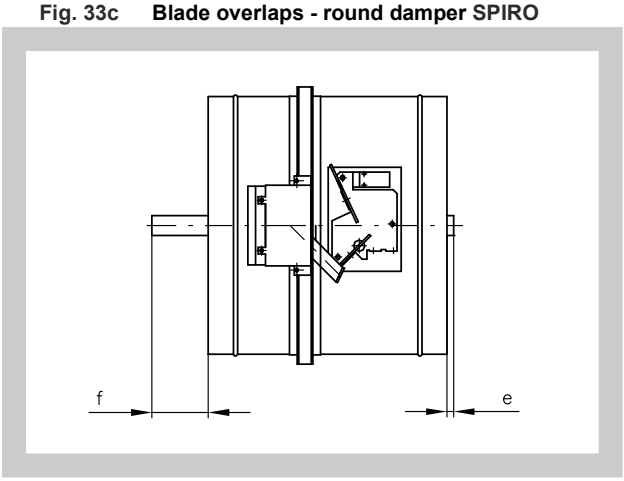


Fig. 33c Blade overlaps - round damper SPIRO



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

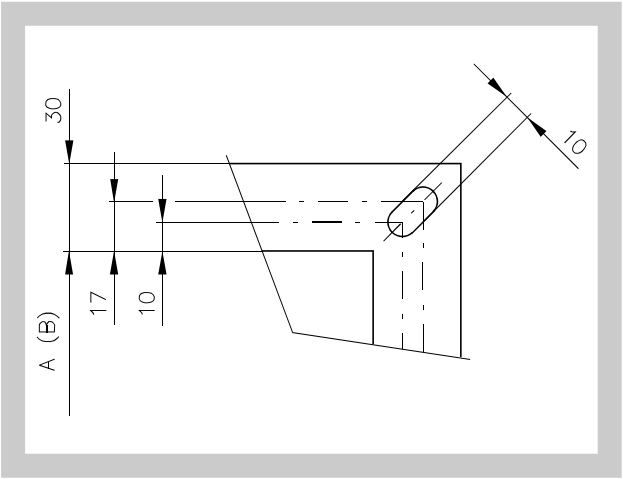
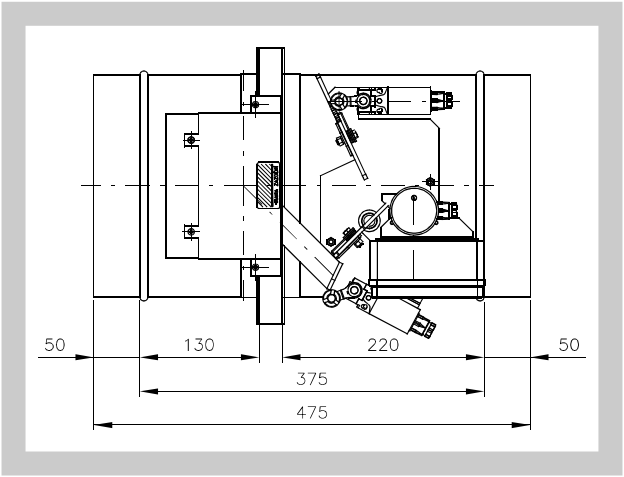


Fig. 35 Damper for SPIRO duct



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 minimum 75 mm. In case that two or more dampers are supposed to be installed in one fire separating construction, the distance between the adjacent dampers must be at least 200 mm according to EN 1366-2 paragraph 13.5.
Exceptions are given in chapter 6.

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

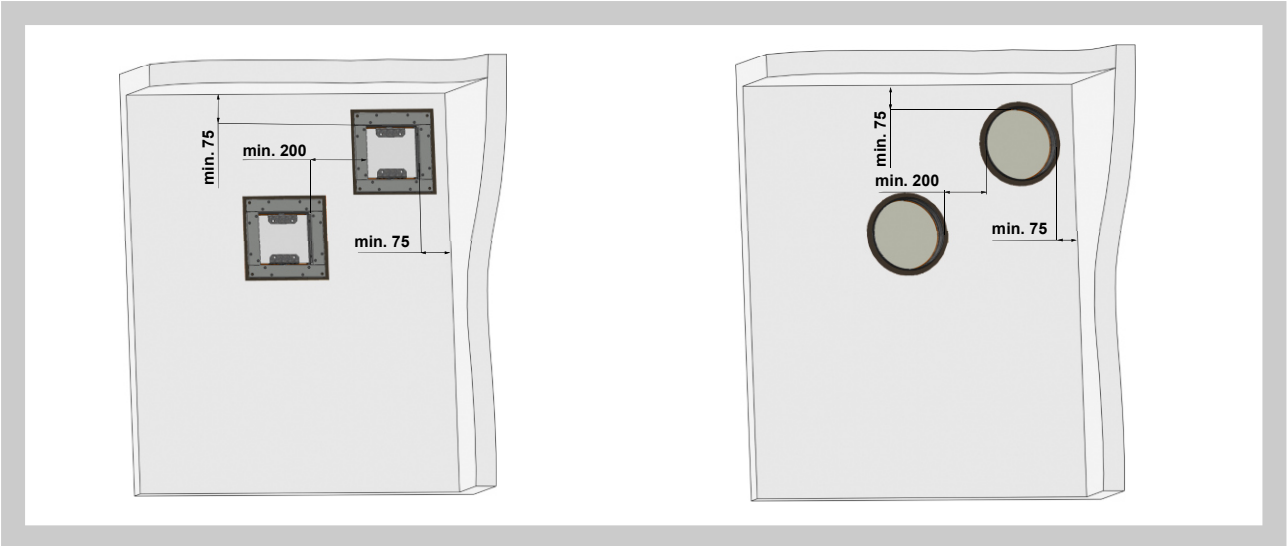
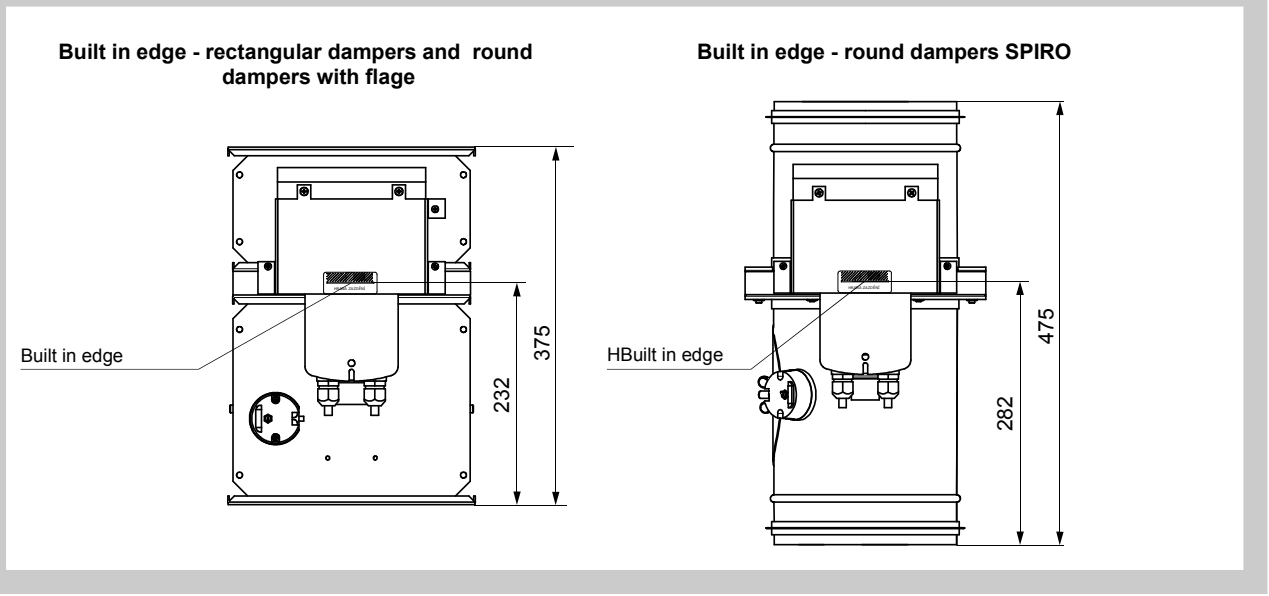


Fig. 37 Built in edge



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

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

5.3. Installation opening dimensions

Fig 38 Installation opening

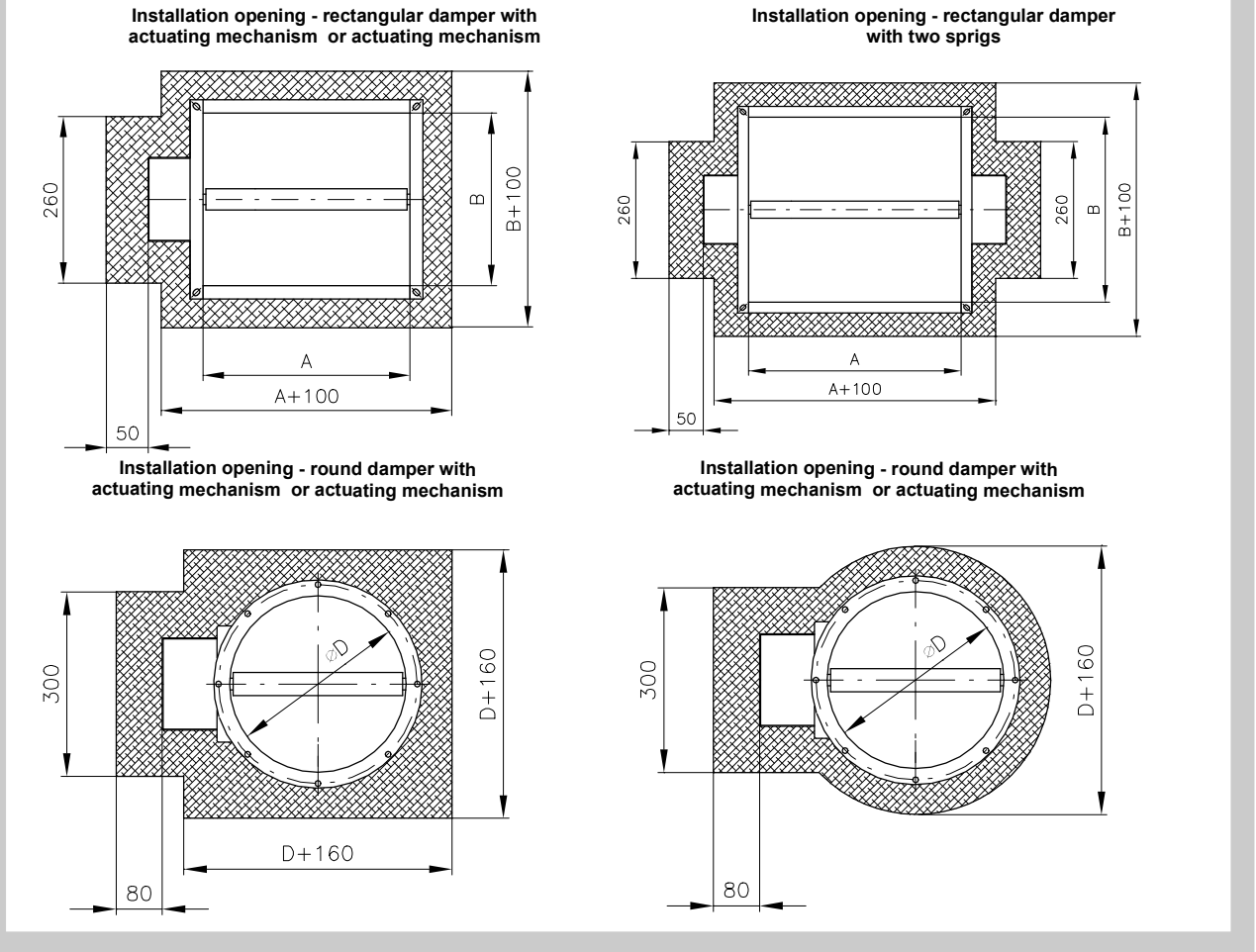
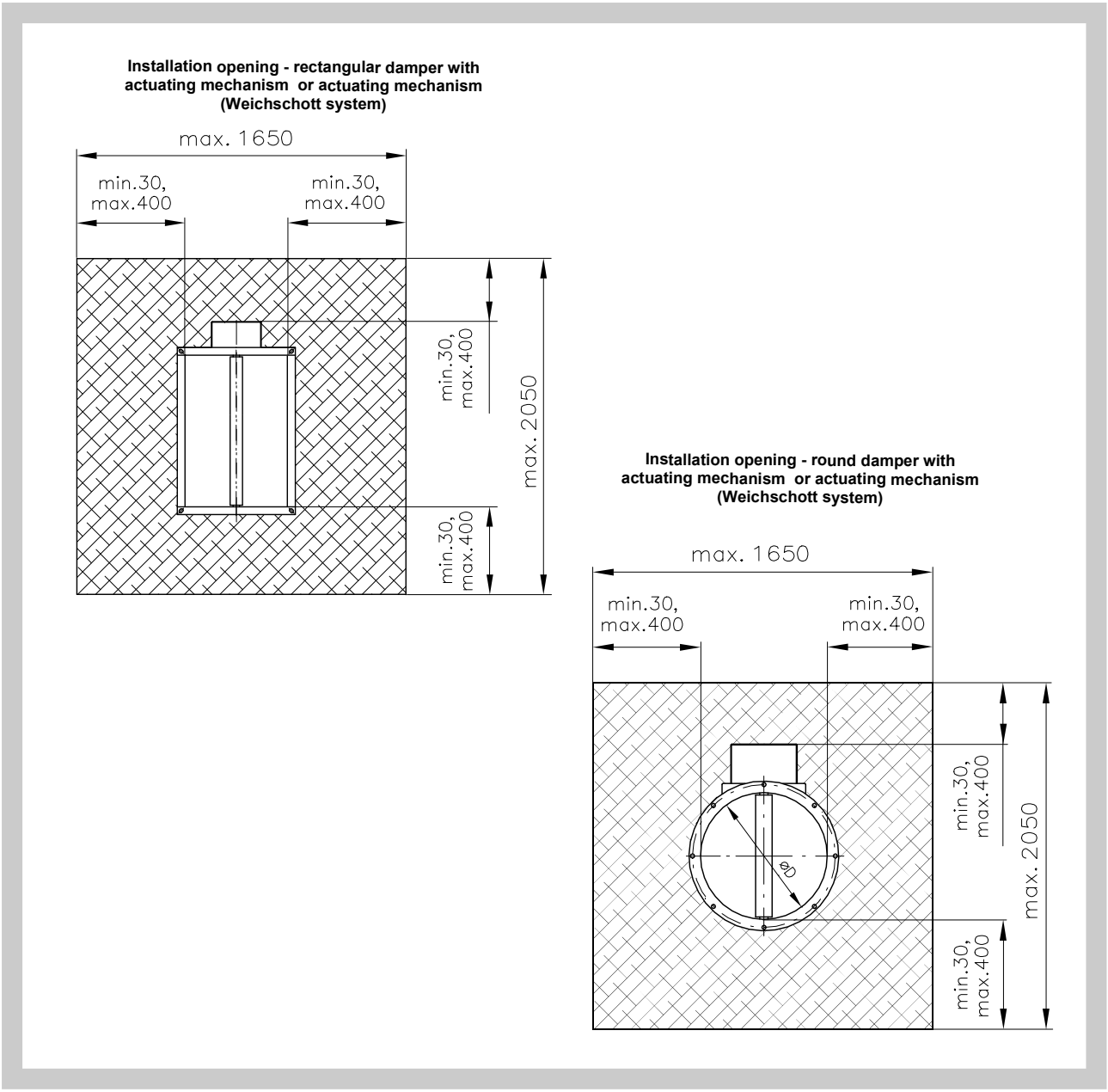


Fig. 39 Installation opening - rectangular damper Weichschott system



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 ≥ 800 mm.

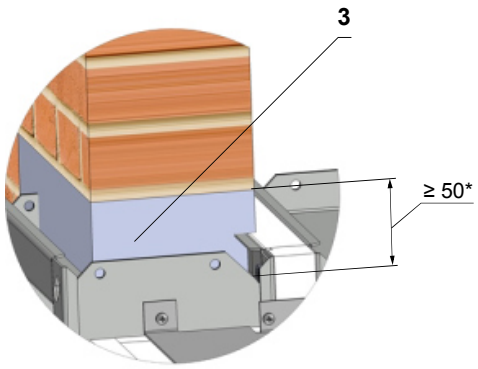
6 Statement of installations

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

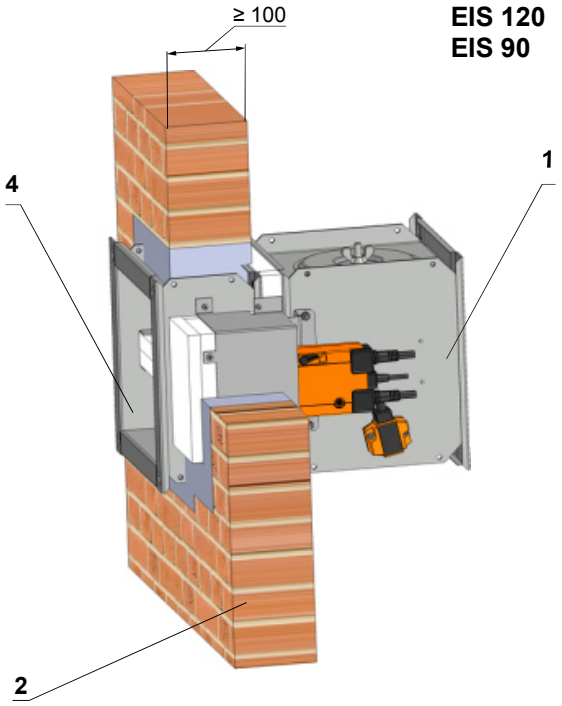
Tab. 6.1.1. Statement of installations

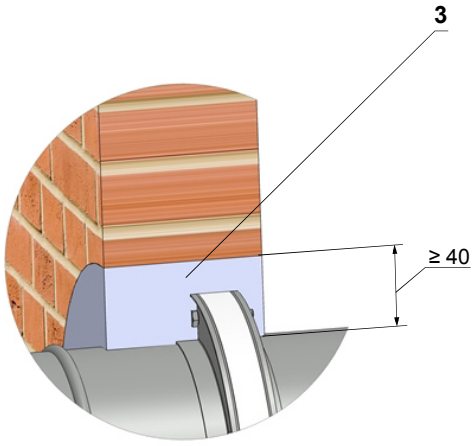
Construction	Installation	Material of stuffing box	Figure
Solid wall construction	Wet	mortar or gypsum	40
	Dry	stuffing box, fire protection mastic and cement lime plate	41
		Weichschott	42
Outside solid wall construction		mineral wool	43
Solid ceiling construction	Wet	mortar or gypsum	44
	Dry	stuffing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

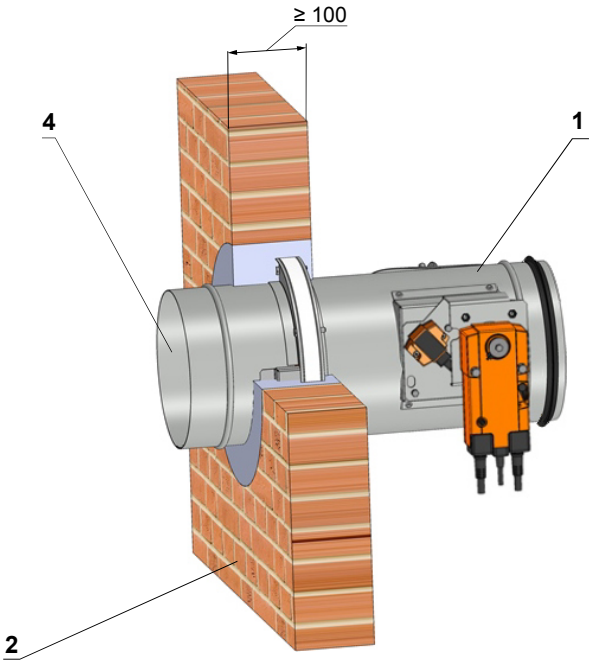
Fig. 40 Solid wall construction - mortar or gypsum



* Around the perimeter







POSITION:

1 Fire damper FDMA

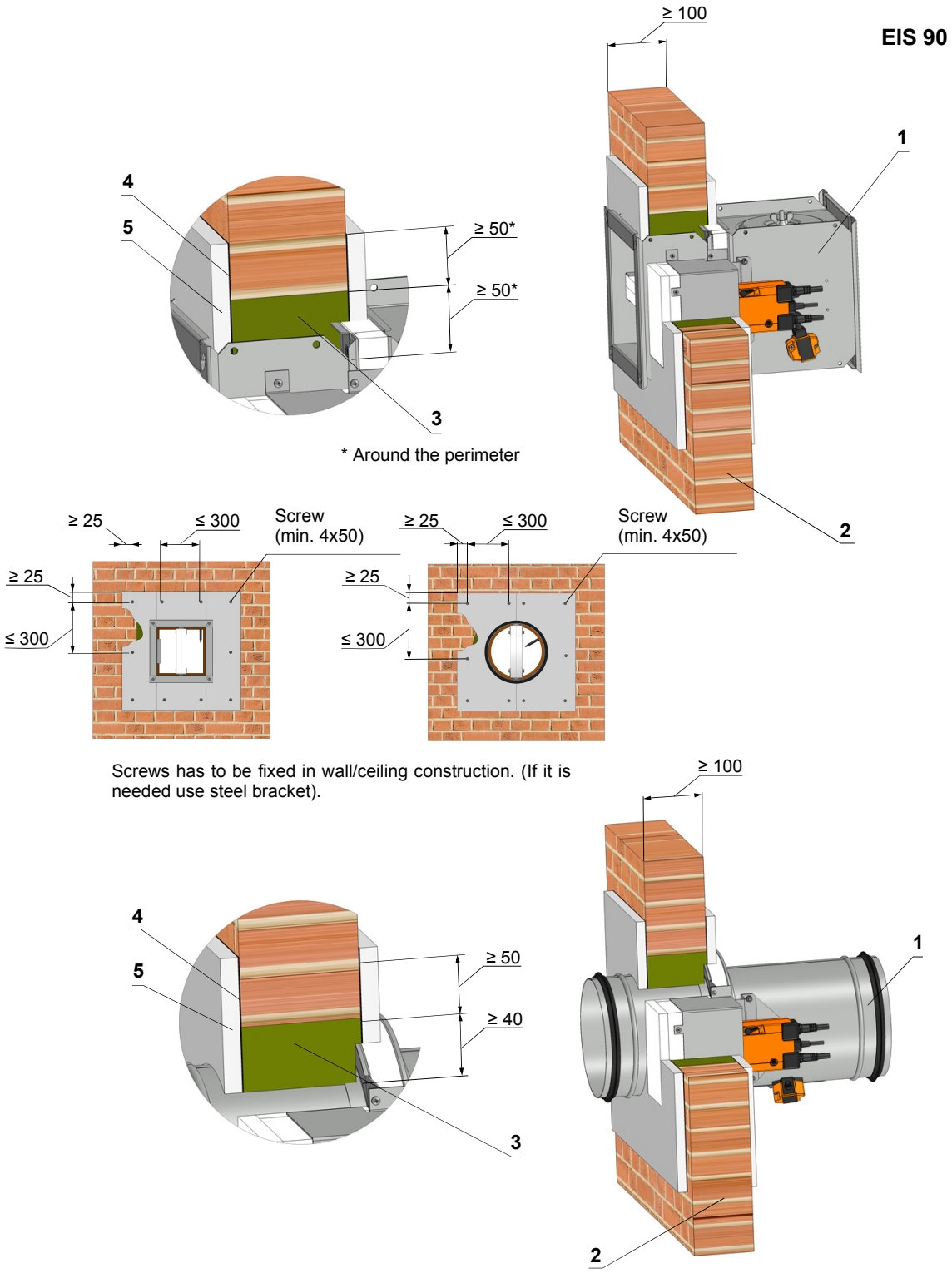
2 Solid wall construction

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



POSITION:

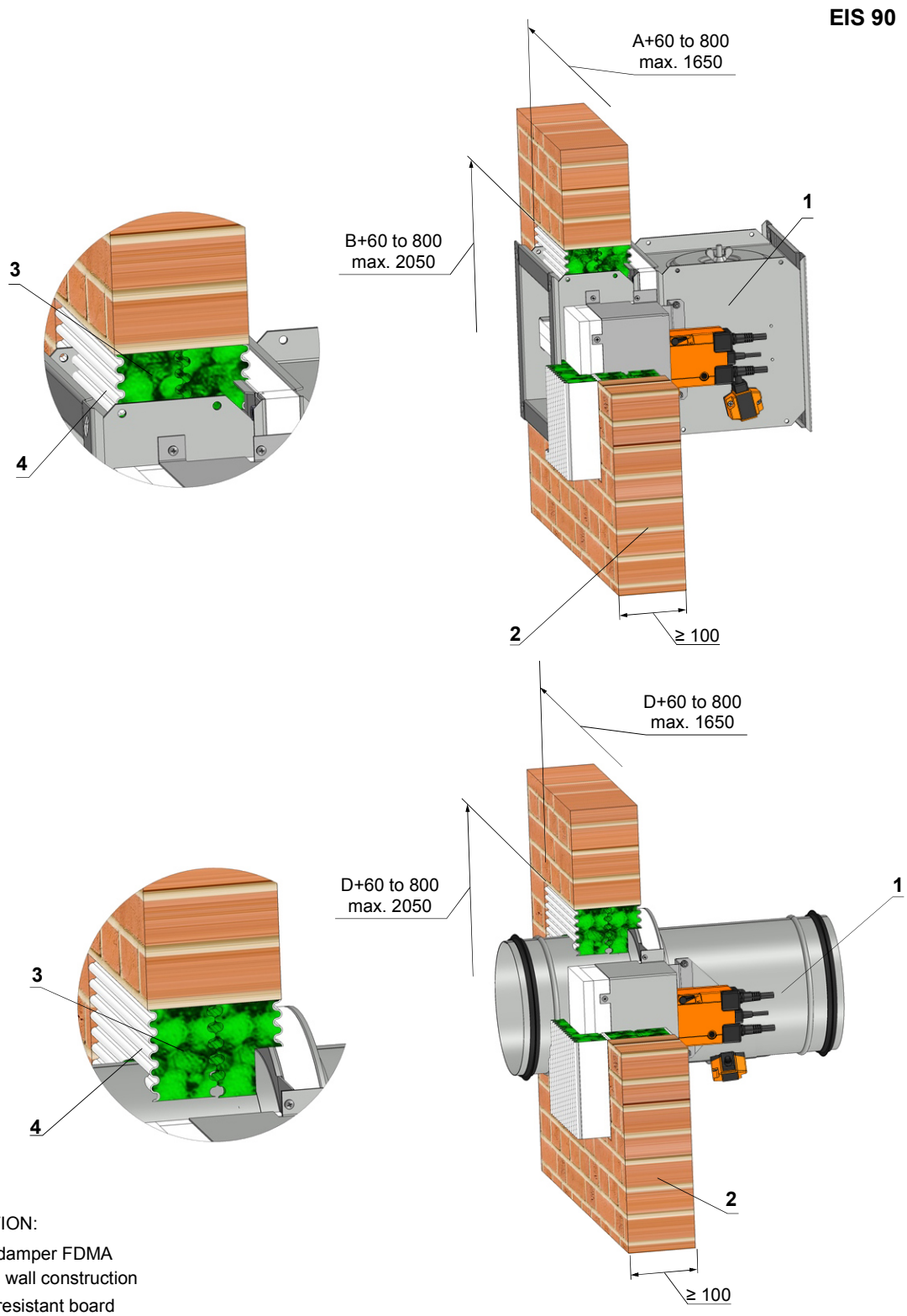
1 Fire damper FDMA
2 Solid wall construction
3 Mineral stone wool min. density 140 kg/m³
4 Fire protection mastic min. thickness 1 mm
5 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)

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. 42 Solid wall construction - Weichschott



POSITION:

1 Fire damper FDMA
2 Solid wall construction
3 Fire resistant board
4 Fire stop coating thickness 1 mm

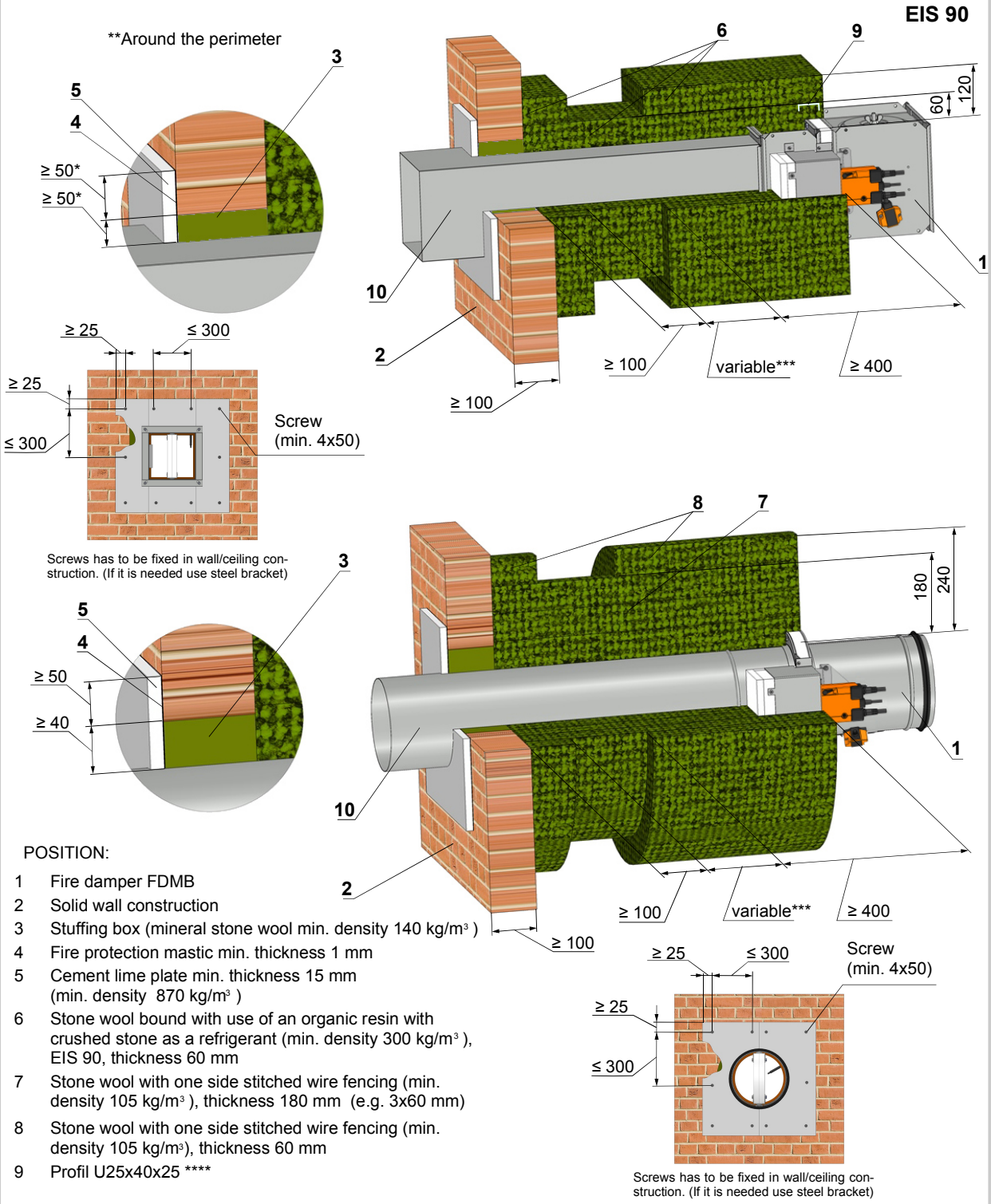
Used materials - example*:

3 - Hilti CP673 PF
4 - Hilti CP673

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



POSITION:

1 Fire damper FDMB
2 Solid wall construction
3 Stuffing box (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 Stone wool bound with use of an organic resin with crushed stone as a refrigerant (min. density 300 kg/m³), EIS 90, thickness 60 mm
7 Stone wool with one side stitched wire fencing (min. density 105 kg/m³), thickness 180 mm (e.g. 3x60 mm)
8 Stone wool with one side stitched wire fencing (min. density 105 kg/m³), thickness 60 mm
9 Profil U25x40x25 ****
10 Duck

Used materials - example**:

3 - Promapyr, Rockwool Steprock HD
4 - Promastop - P, K
5 - Promatect - H
6 - Rockwool Conlit Ductrock EIS 90, Dicke 60 mm
7 - Rockwool Wired Mat 105 Dicke 3x60 mm
8 - Rockwool Wired Mat 105 Dicke 60 mm

Installation details of wool layers see chapter 7

Notice:

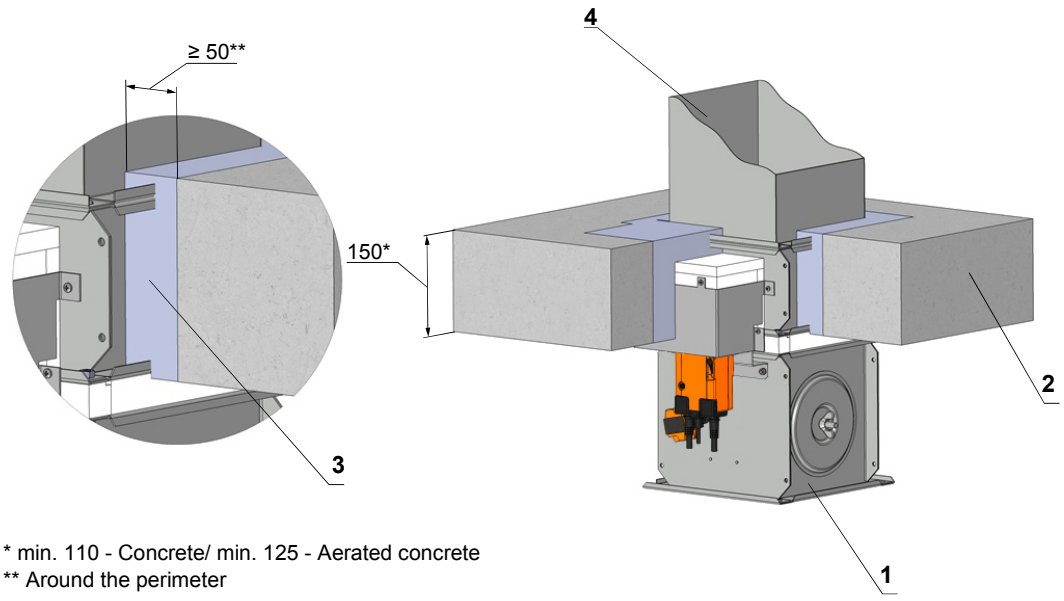
** Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

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

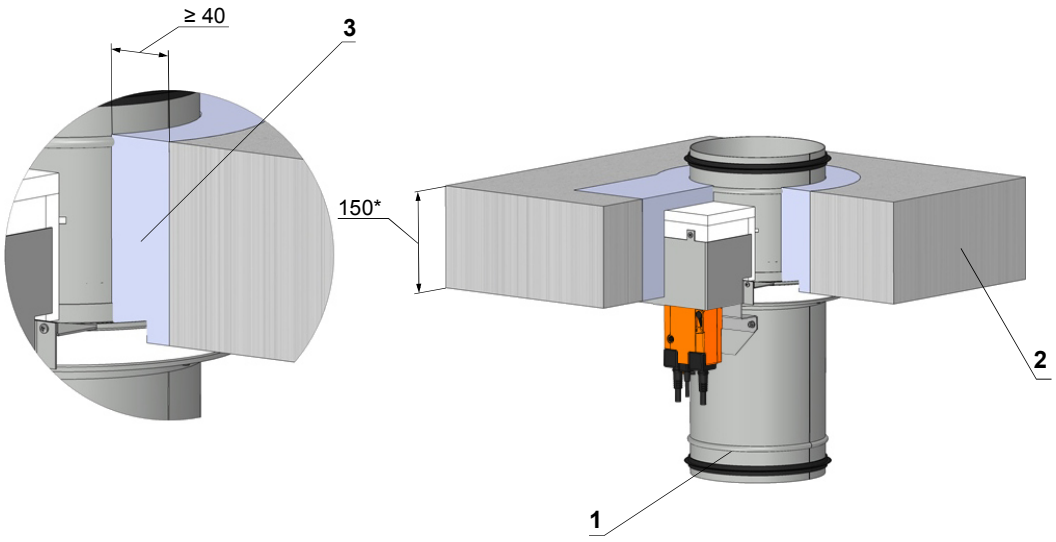
**** Installation of profile U25x40x25 see Fig.53

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

EIS 90
EIS 120



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



POSITION:

1 Fire damper FDMA

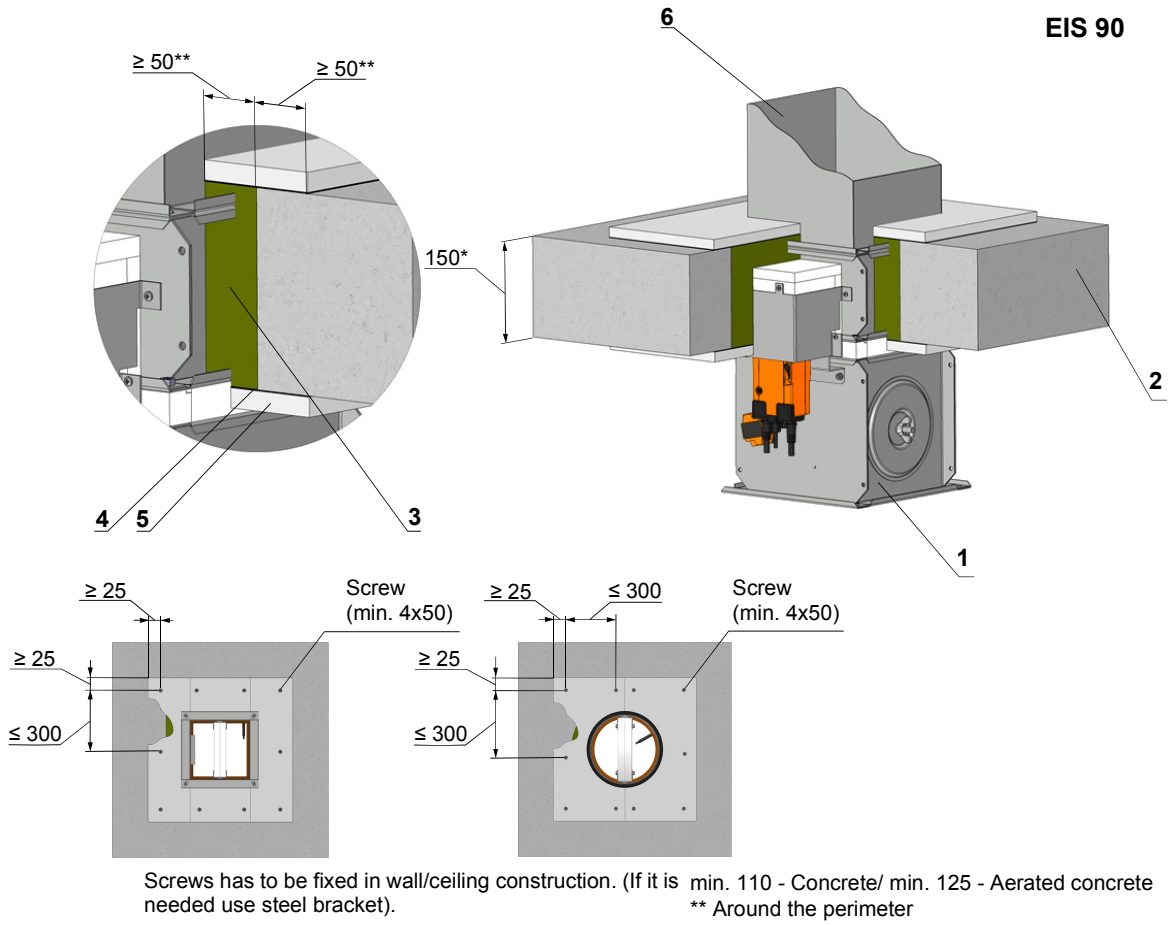
2 Solid ceiling construction

3 Mortar or gypsum

4 Duct

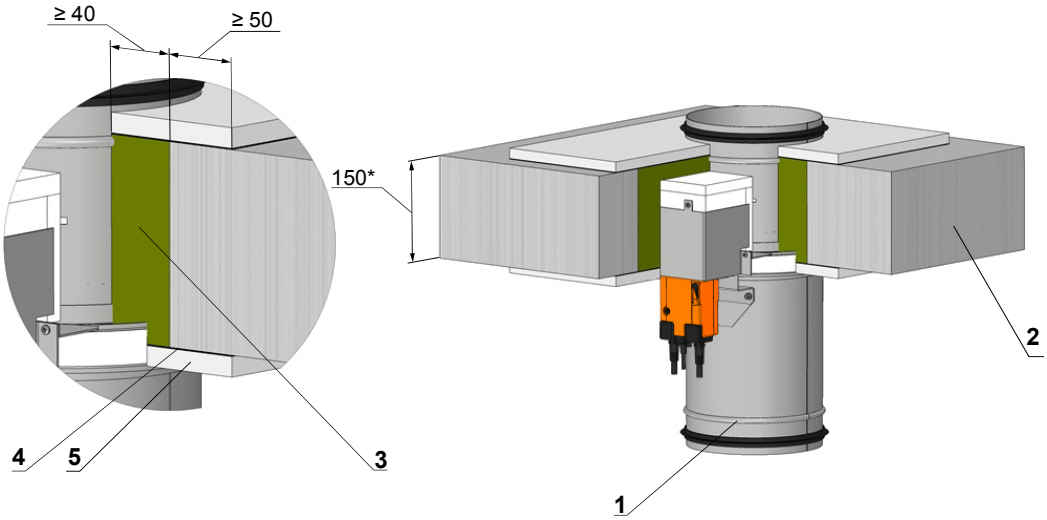
Notice: **The requirement to EIS 120 must be specified in the order alone. Without specification is supplied the standard flap EIS90.**

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 needed use steel bracket).

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

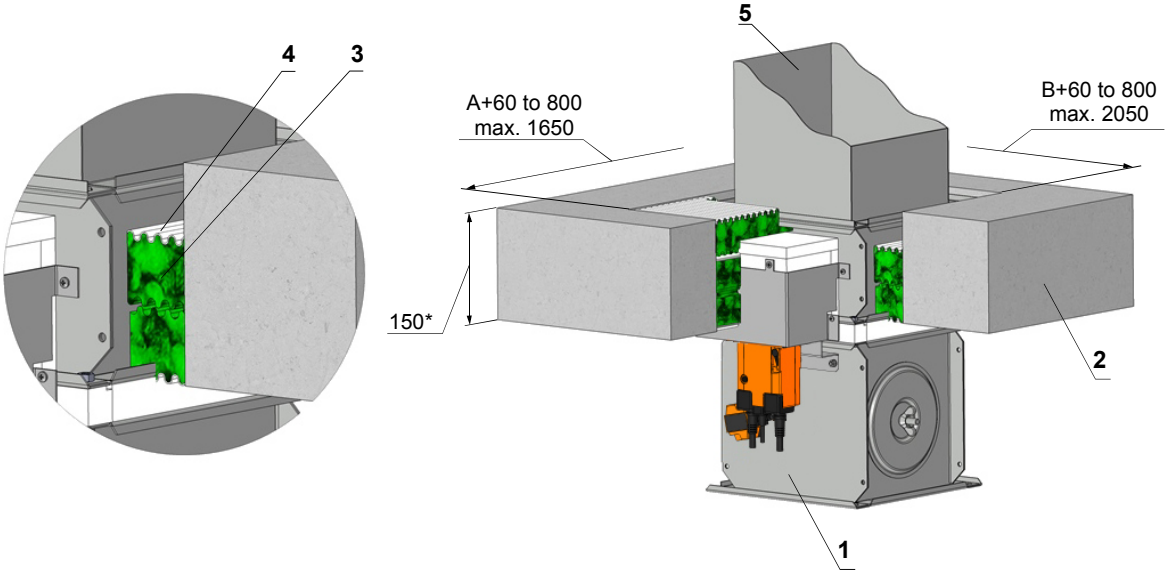
Used materials - example**:

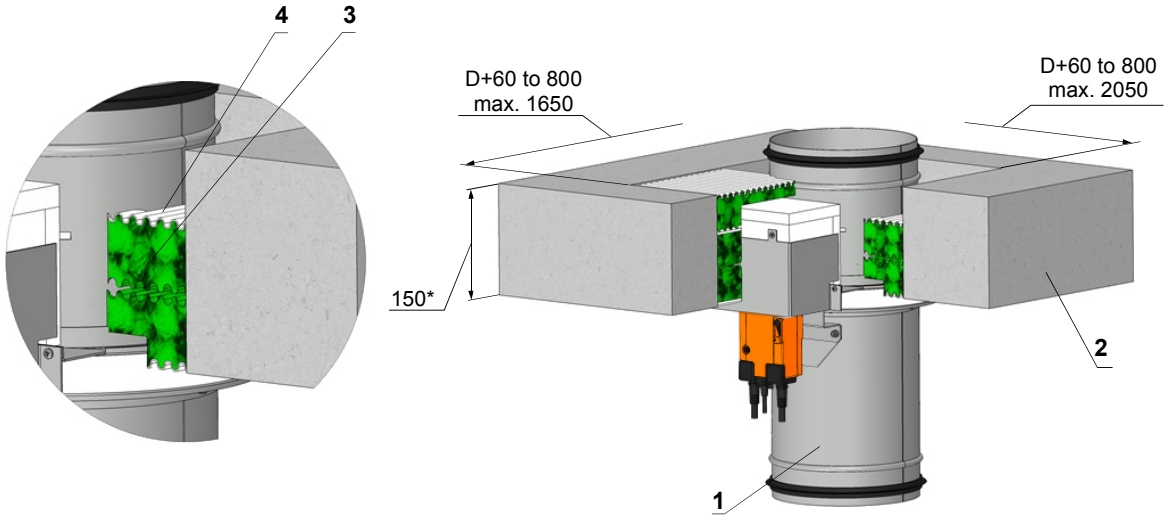
3 - Promapyr, Rockwool Steprock HD
4 - Promastop - P, K
5 - Promatect - H

** 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

EIS 90





POSITION:

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

Used materials - example**:

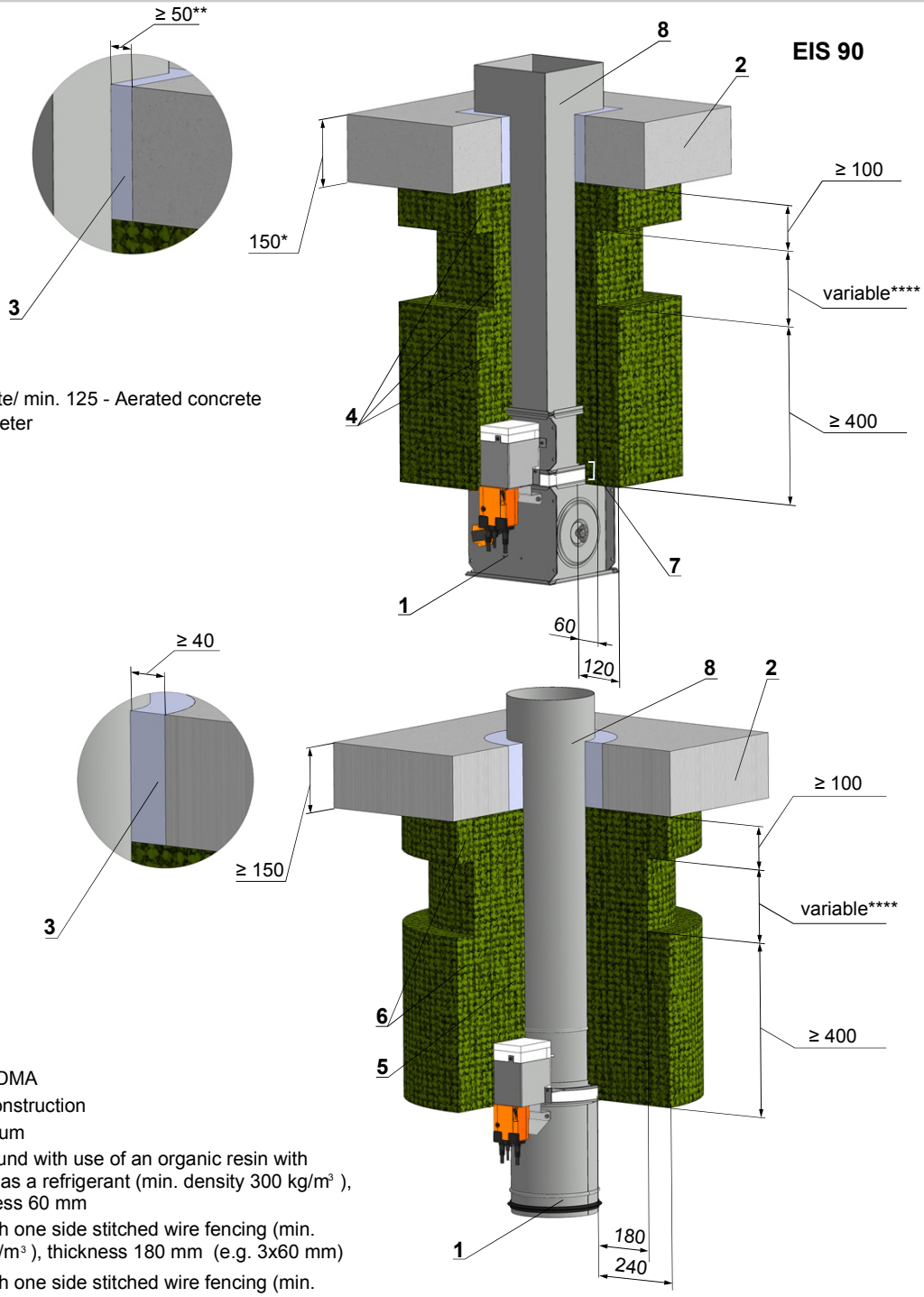
3 - Hilti CP673 PF
4 - Hilti CP673

* 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.

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



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

POSITION:

1 Fire damper FDMA
2 Solid ceiling construction
3 Mortar or gypsum
4 Stone wool bound with use of an organic resin with crushed stone as a refrigerant (min. density 300 kg/m³), EIS 90, thickness 60 mm
5 Stone wool with one side stitched wire fencing (min. density 105 kg/m³), thickness 180 mm (e.g. 3x60 mm)
6 Stone wool with one side stitched wire fencing (min. density 105 kg/m³), thickness 60 mm
7 Profil U25x40x25
8 Duct

Used materials - example***:

4 - Rockwool Conlit Ductrock EIS 90, Dicke 60 mm
5 - Rockwool Wired Mat 105 Dicke 3x60 mm
6 - Rockwool Wired Mat 105 Dicke 60 mm

Installation details of wool layers see chapter 7

Notice:

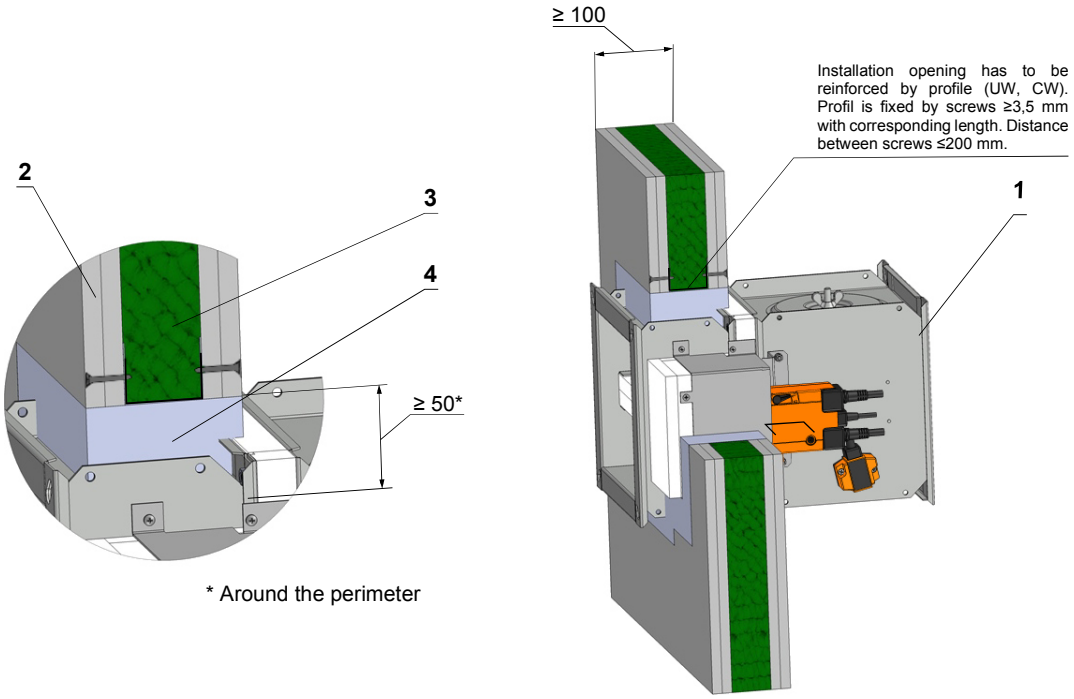
*** Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

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

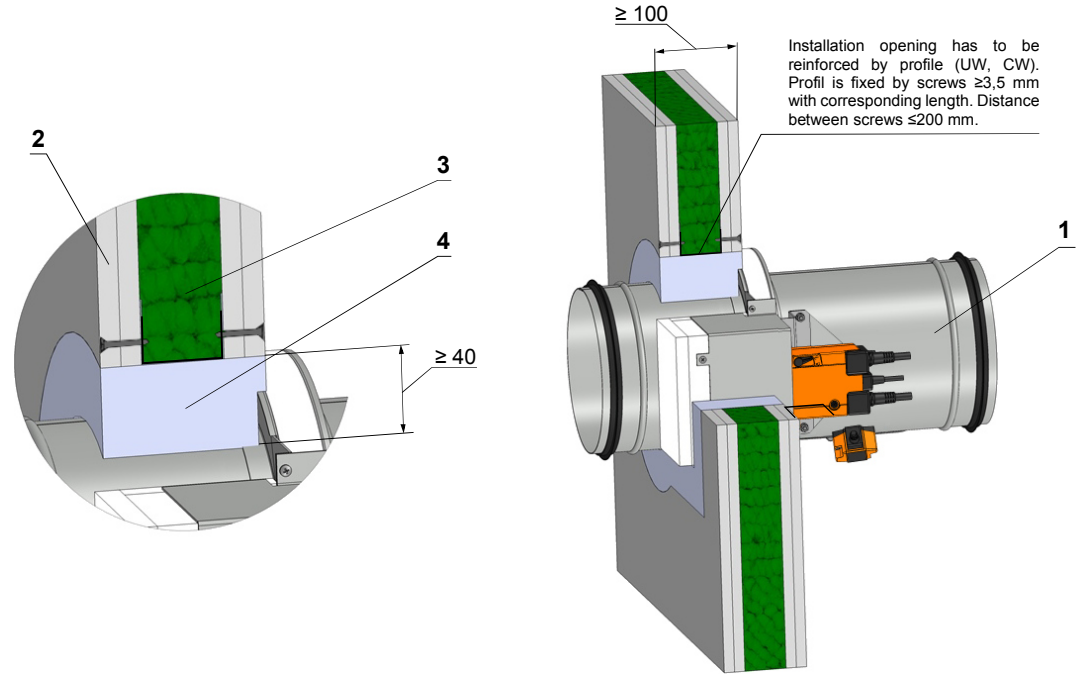
Installation of profile U25x40x25 see Fig.53

Fig. 48 Gypsum wall construction - mortar or gypsum

EIS 90
EIS 120



* Around the perimeter



POSITION:

1 Fire damper FDMA

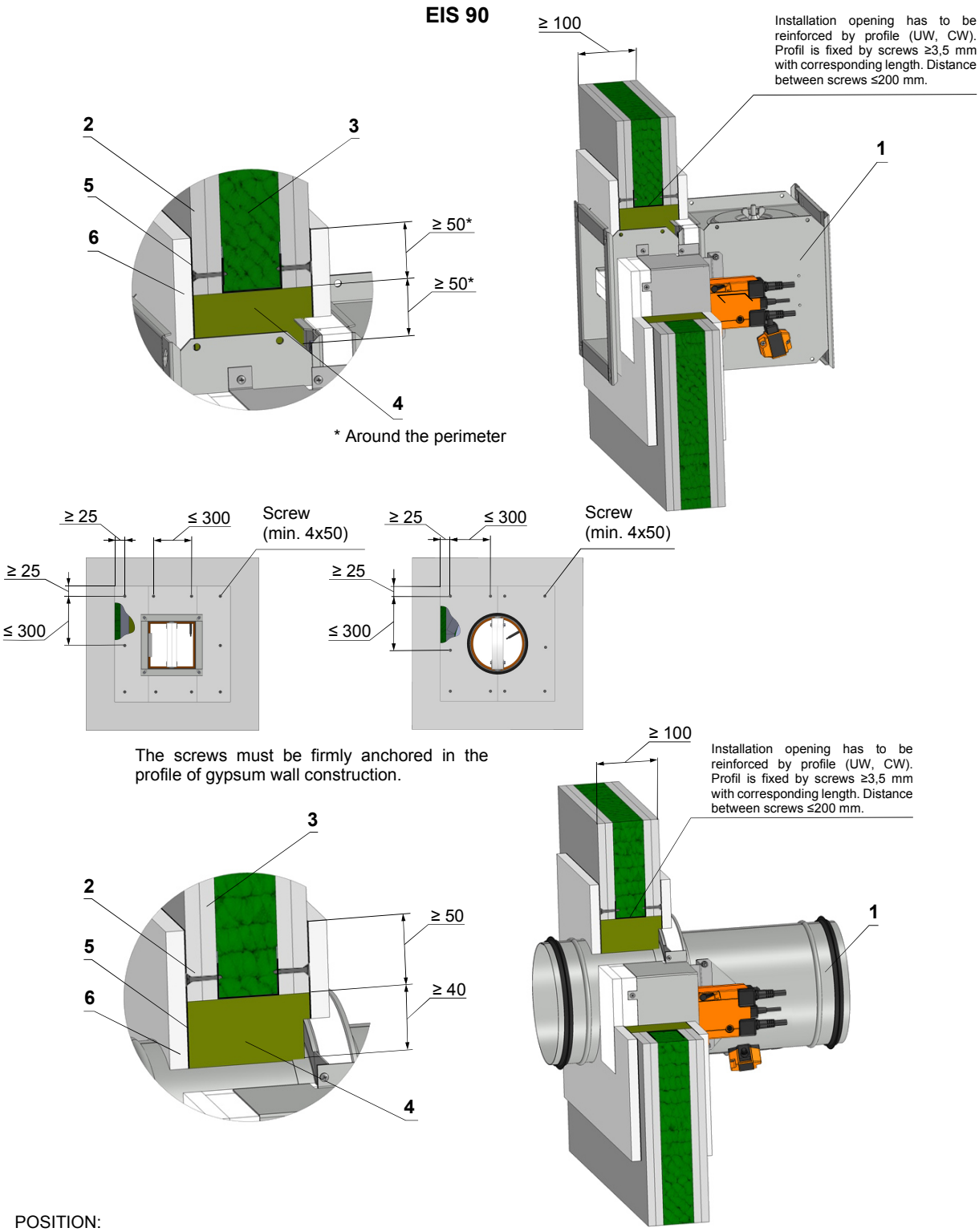
2 Gypsum plate

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



POSITION:

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

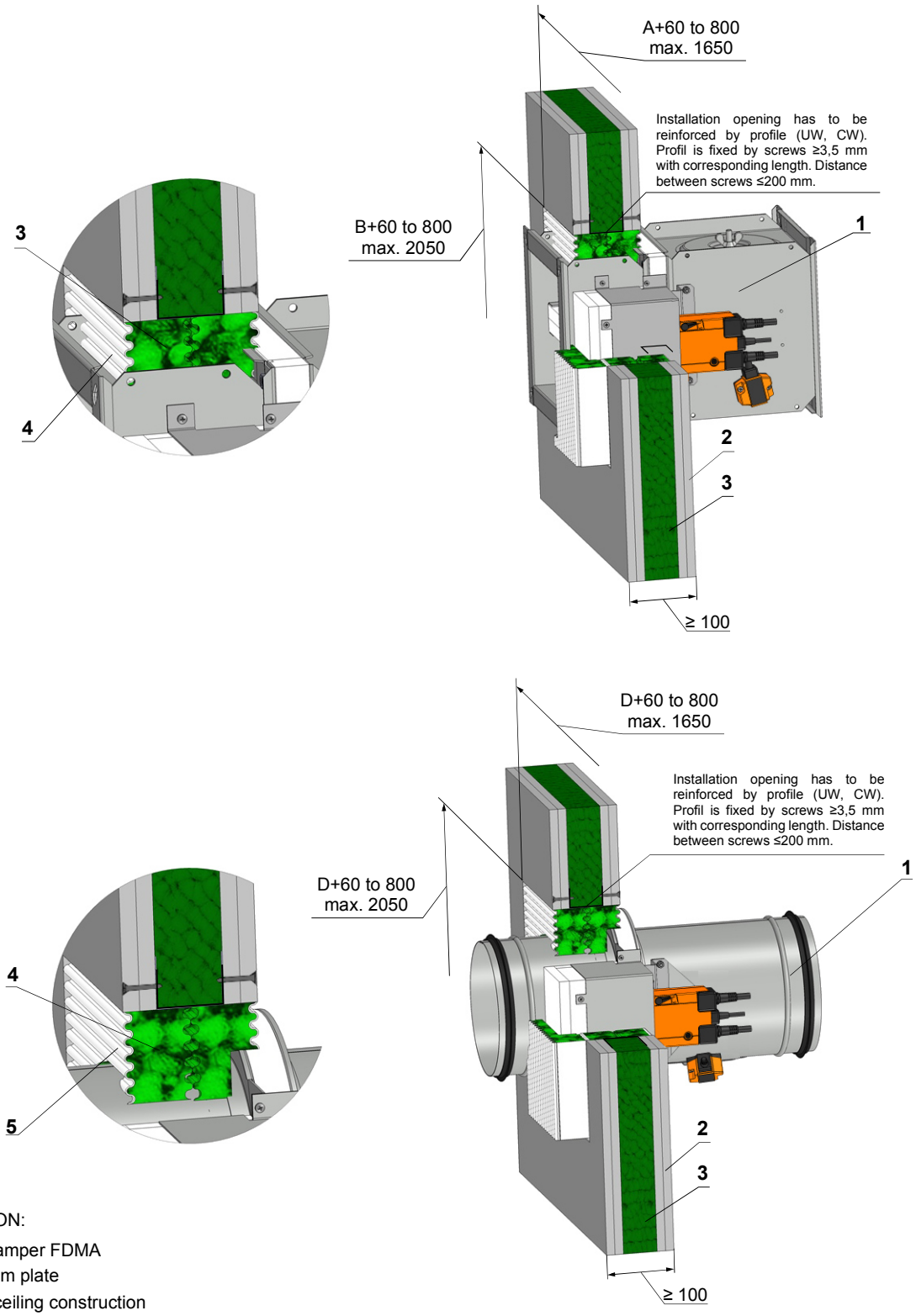
Used materials - example*:

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. 50 Gypsum wall construction - Weichschott

EIS 90



POSITION:

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

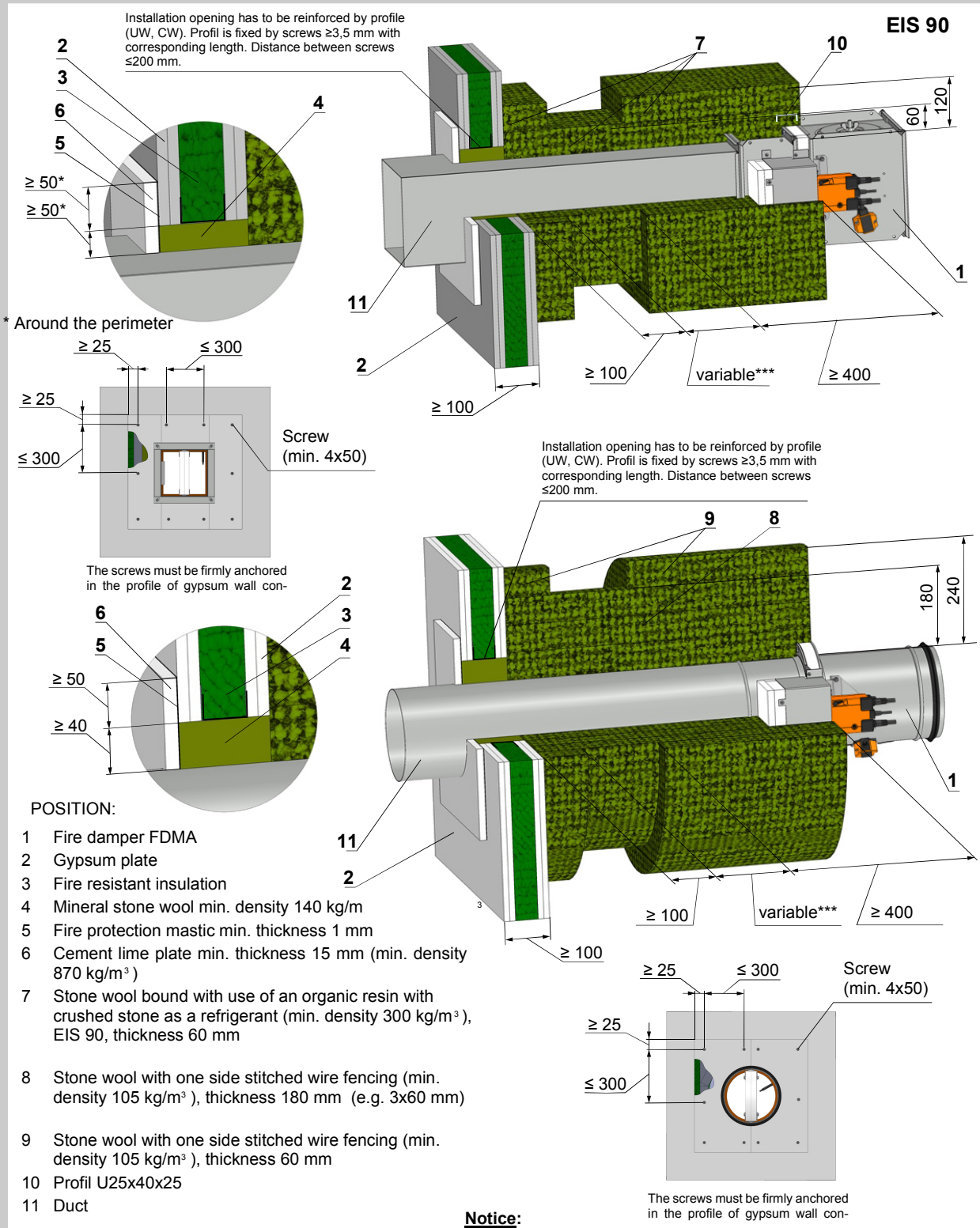
Used materials - example*:

4 - Hilti CP673 PF
5 - Hilti CP673

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. 51 Installation outside of solid wall construction - mineral wool



POSITION:

1 Fire damper FDMA
2 Gypsum plate
3 Fire resistant insulation
4 Mineral stone wool min. density 140 kg/m
5 Fire protection mastic min. thickness 1 mm
6 Cement lime plate min. thickness 15 mm (min. density 870 kg/m^3)
7 Stone wool bound with use of an organic resin with crushed stone as a refrigerant (min. density 300 kg/m^3), EIS 90, thickness 60 mm
8 Stone wool with one side stitched wire fencing (min. density 105 kg/m^3), thickness 180 mm (e.g. 3x60 mm)
9 Stone wool with one side stitched wire fencing (min. density 105 kg/m^3), thickness 60 mm
10 Profil U25x40x25
11 Duct

Used materials - example**:

4 - Promapyr, Rockwool Steprock HD
5 - Promastop - P, K
6 - Promatect - H
7 - Rockwool Conlit Ductrock EIS 90, Dicke 60 mm
8 - Rockwool Wired Mat 105 Dicke 3x60 mm
9 - Rockwool Wired Mat 105 Dicke 60 mm

Installation details of wool layers see chapter 7

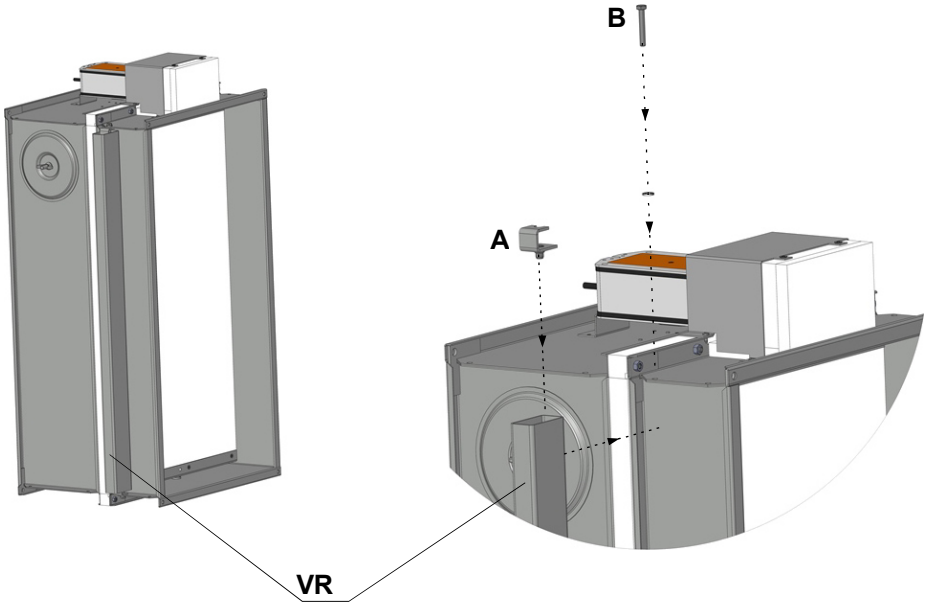
Notice:

** 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.

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

**** Reinforcement fixing VRM-III see Fig.52
Installation of profile U25x40x25 see Fig.53

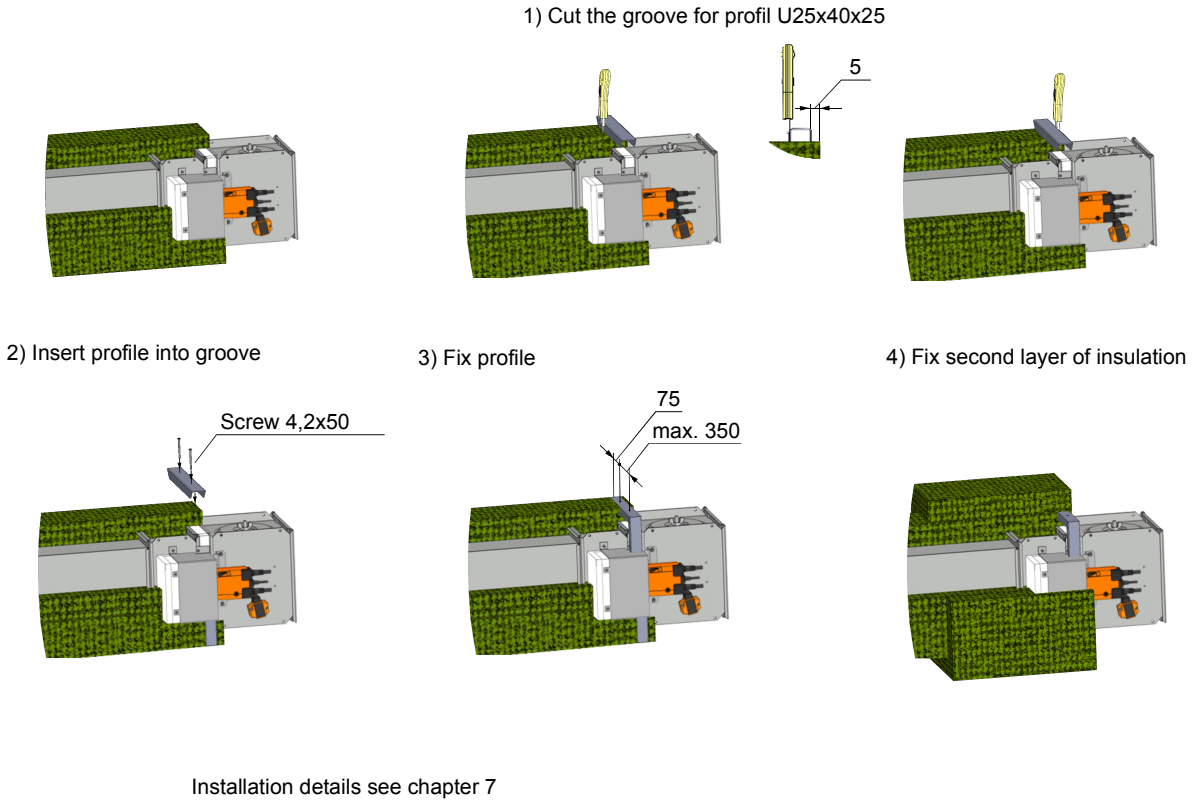
Fig 52 Fixing of reinforcement to damper body



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 ≥ 800 and damper placement outside wall construction is necessary to use reinforcement VRM-PM.

Obr. 53

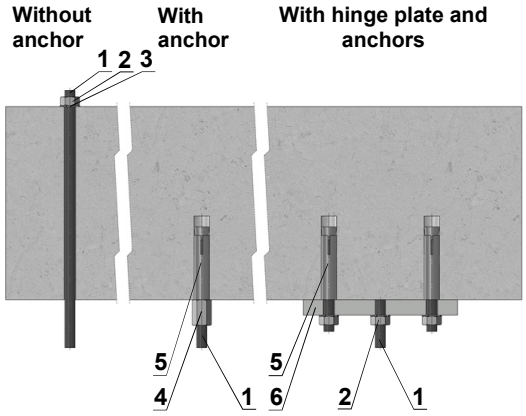


Installation details see chapter 7

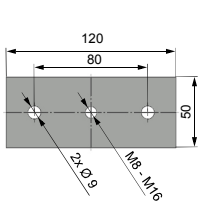
7 Suspension systems

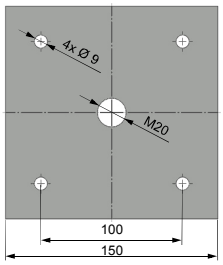
7.1. Mounting to the ceiling wall

Fig. 54 Mounting to the ceiling wall



Hinge plates





Position:

1 Threaded rod M8 – M20
2 Nut
3 Washer
4 Coupling Nut
5 Anchor
6 Hinge plate - min. thickness 10 mm

Load capacities of threaded hanger rods F [N] at the required fire resistance 90 minutes

Size	A_s [mm^2]	Weight G [kg]	
		for 1 piece	for 1 pair
M8	36,6	22	44
M10	58,0	35	70
M12	84,3	52	104
M14	115	70	140
M16	157	96	192
M18	192	117	234
M20	245	150	300

7.2. Horizontal installation

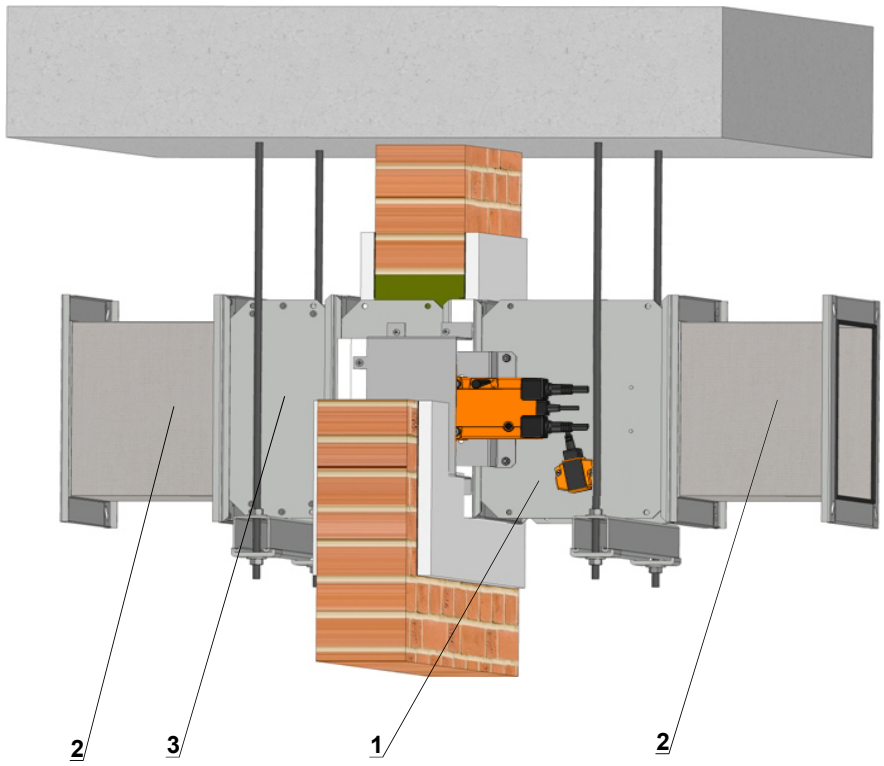
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

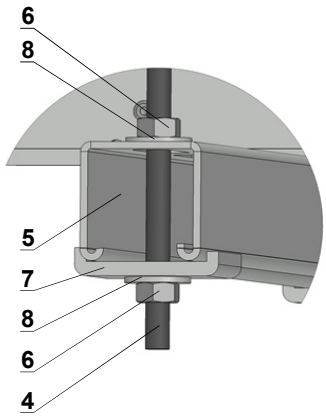
Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

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

Threaded rod fixing to the ceiling construction - see fig. 54

Fig. 55 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.**

7.3. Vertical installation

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

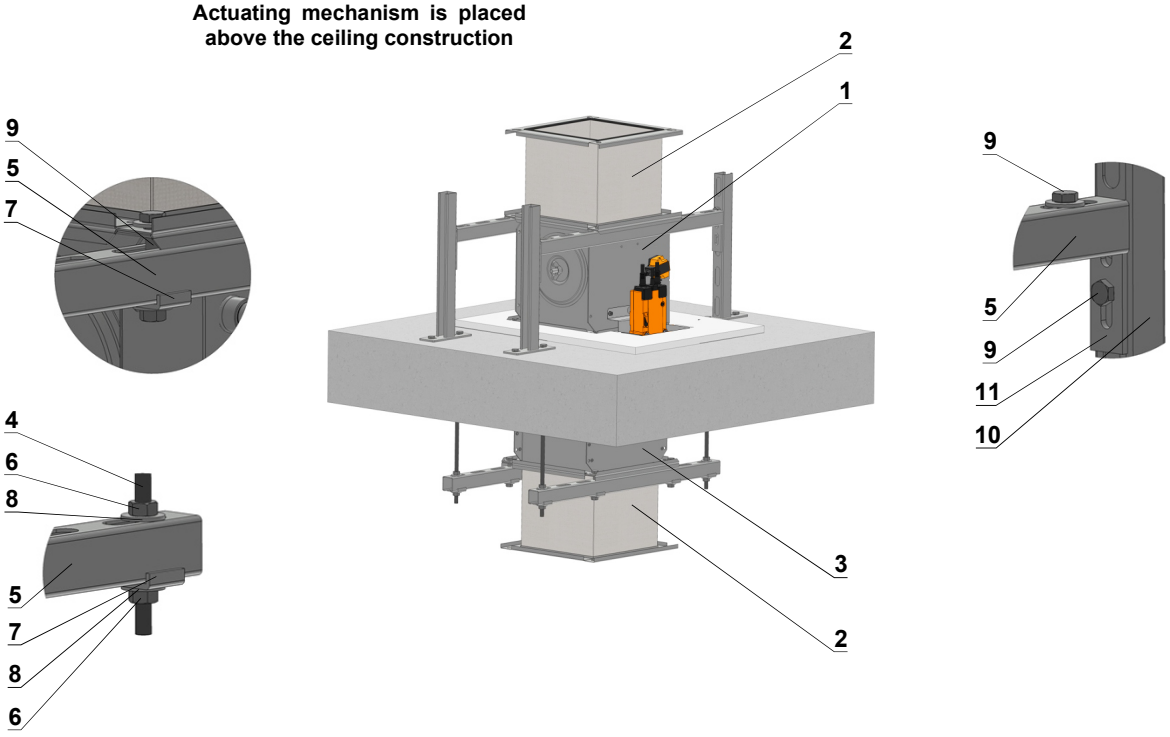
Damper can be suspended from the ceiling construction or supported above the ceiling construction.

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

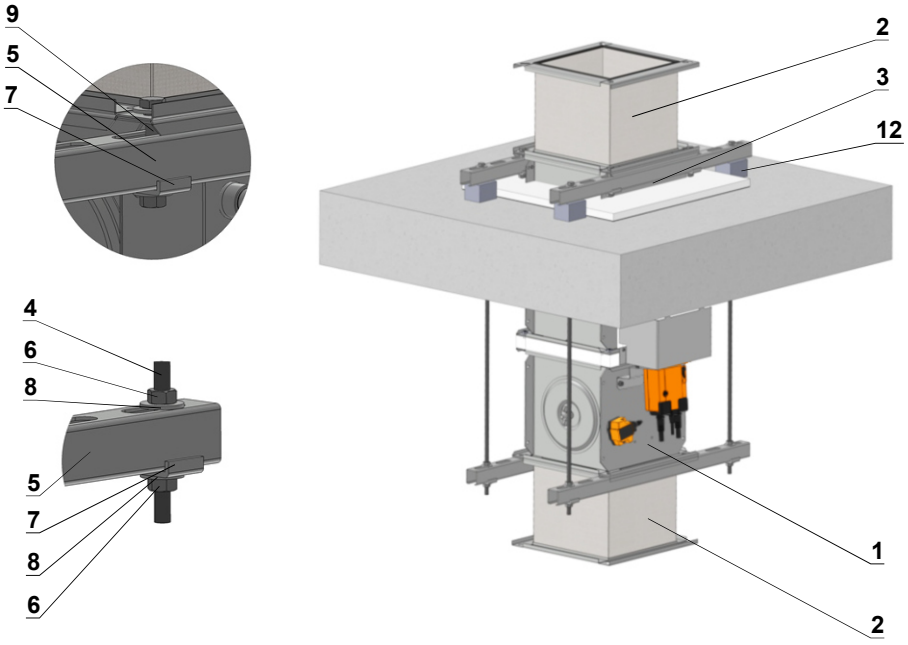
Threaded rods longer than 1,5 m require fire-resistant insulation.

Fig. 56 Suspension - vertical duct

Actuating mechanism is placed above the ceiling construction



Actuating mechanism is placed under the ceiling construction



Position:

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

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

7.4 Rectangular fire damper suspension on the wall - horizontal installation

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

Max. length between two suspension systems is 1500 mm.

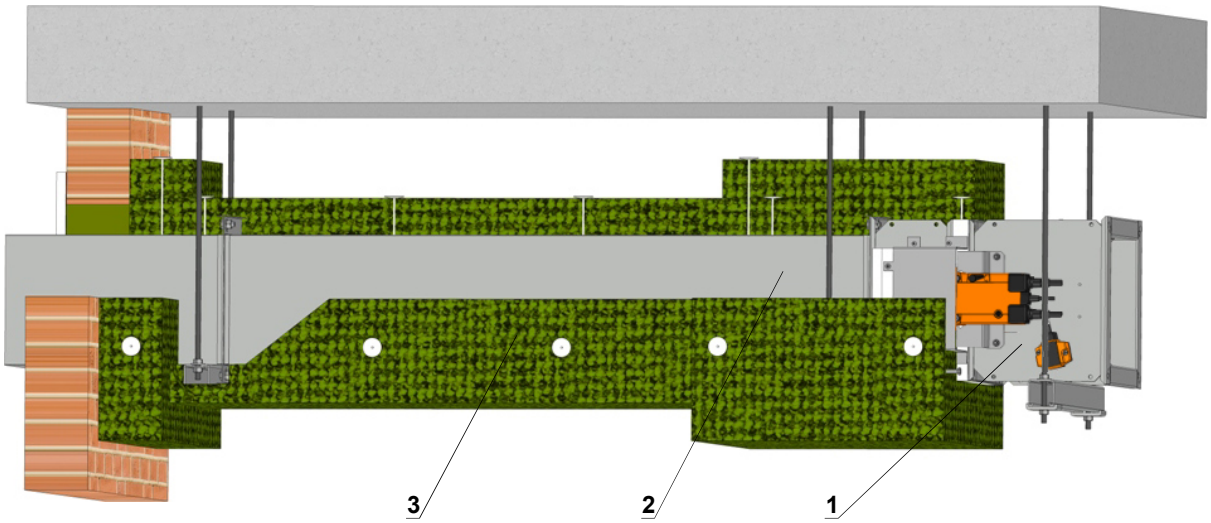
Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

Threaded rods longer than 1,5 m require fire-resistant insulation.
If the threaded rod is located inside the duct insulation, distance between threaded rod and duct is max 30 mm. If the 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.

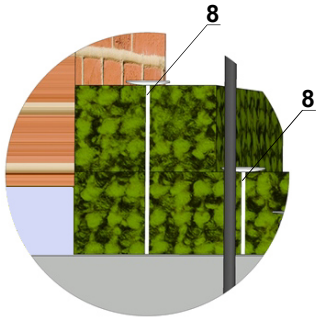
Threaded rod fixing to the ceiling construction - see fig. 54

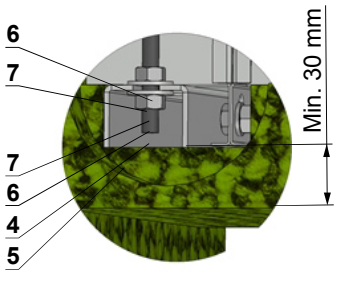
The insulation boards are fastened to the duct by weld pins. Distance between weld pins, distance between weld pins and flanges is dependent on the materials. For more information see documentation of insulation manufacturer.

Fig. 57 Rectangular 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	Mounting rail
6	Nut
7	Washer
8	Weld pin

7.5 Horizontal installation

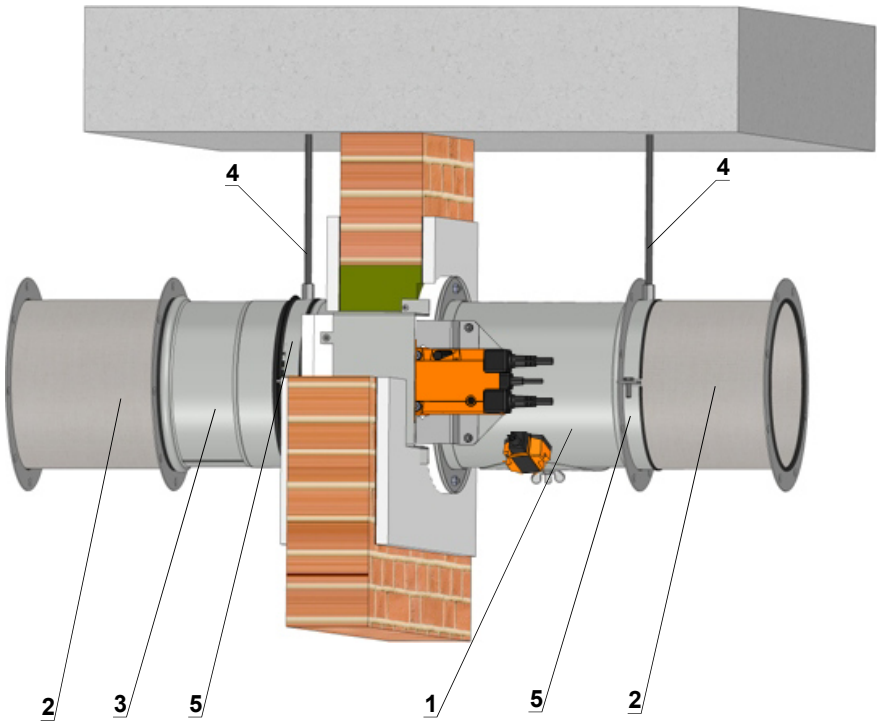
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

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

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

Threaded rod fixing to the ceiling construction - see fig. 54

Fig. 58 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.**

7.6. Vertical installation

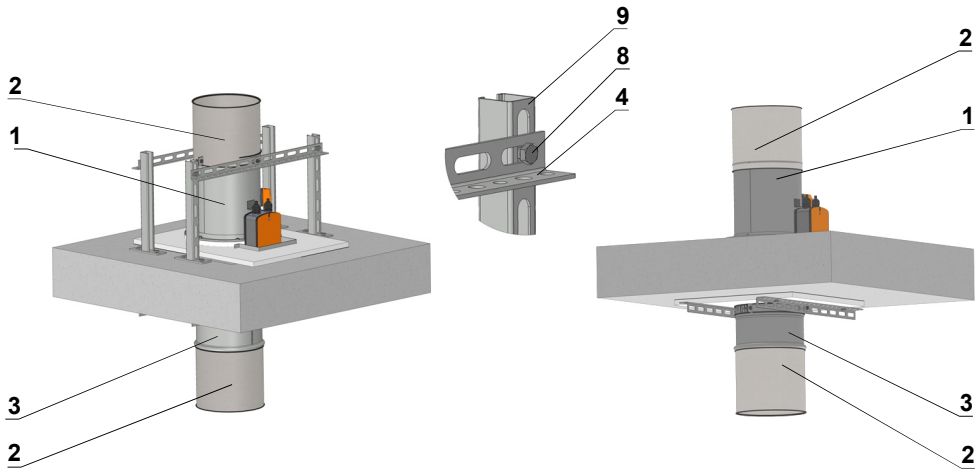
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

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

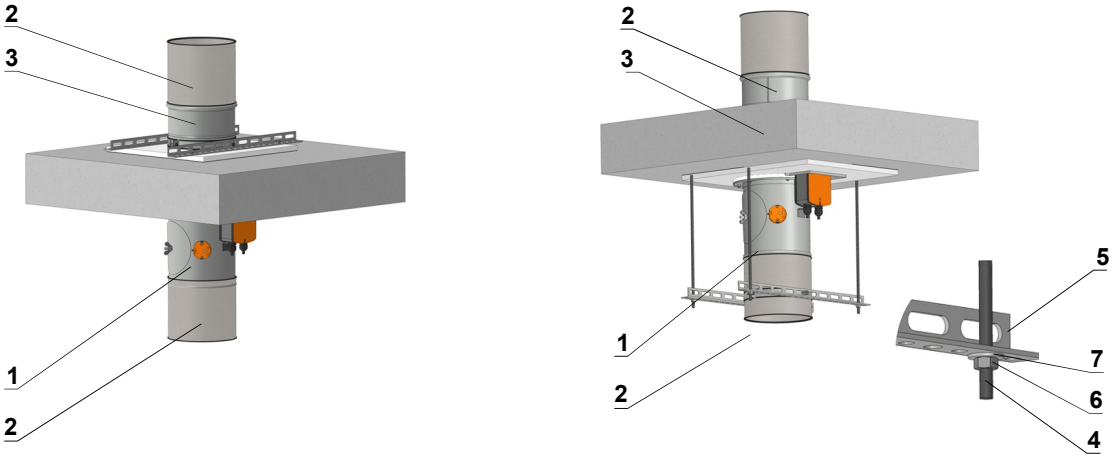
Threaded rods longer than 1,5 m require fire-resistant insulation.

Fig. 59 Suspension - vertical duct

Actuating mechanism is placed above the ceiling construction

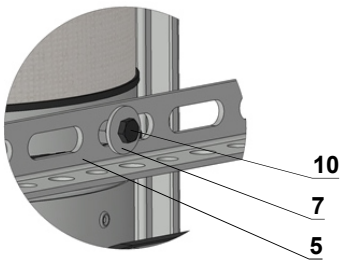


Actuating mechanism is placed under the ceiling construction

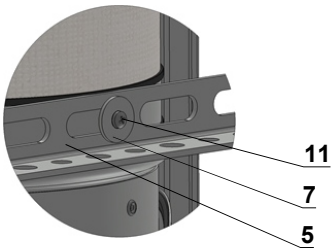


Notice: Damper must be firmly connected with extension piece by screws or rivets.

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

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

7.7 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.

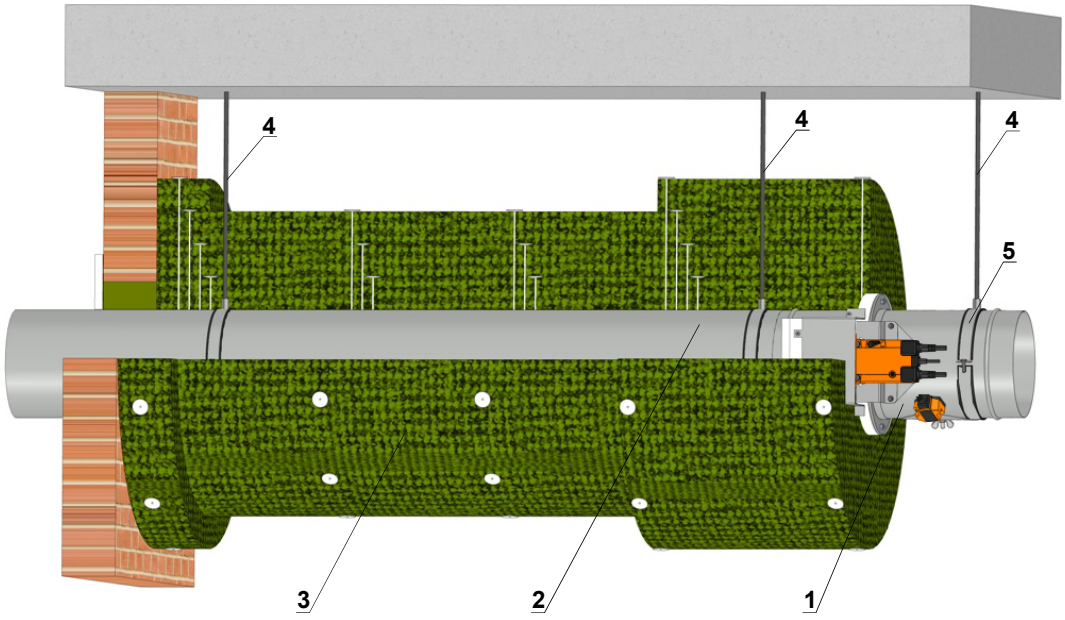
Max. length between two suspension systems is 1500 mm.

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.

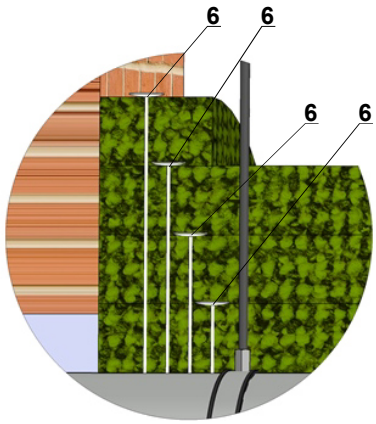
Threaded rod fixing to the ceiling construction - see fig. 54

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. 60 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

8. Pressure loss

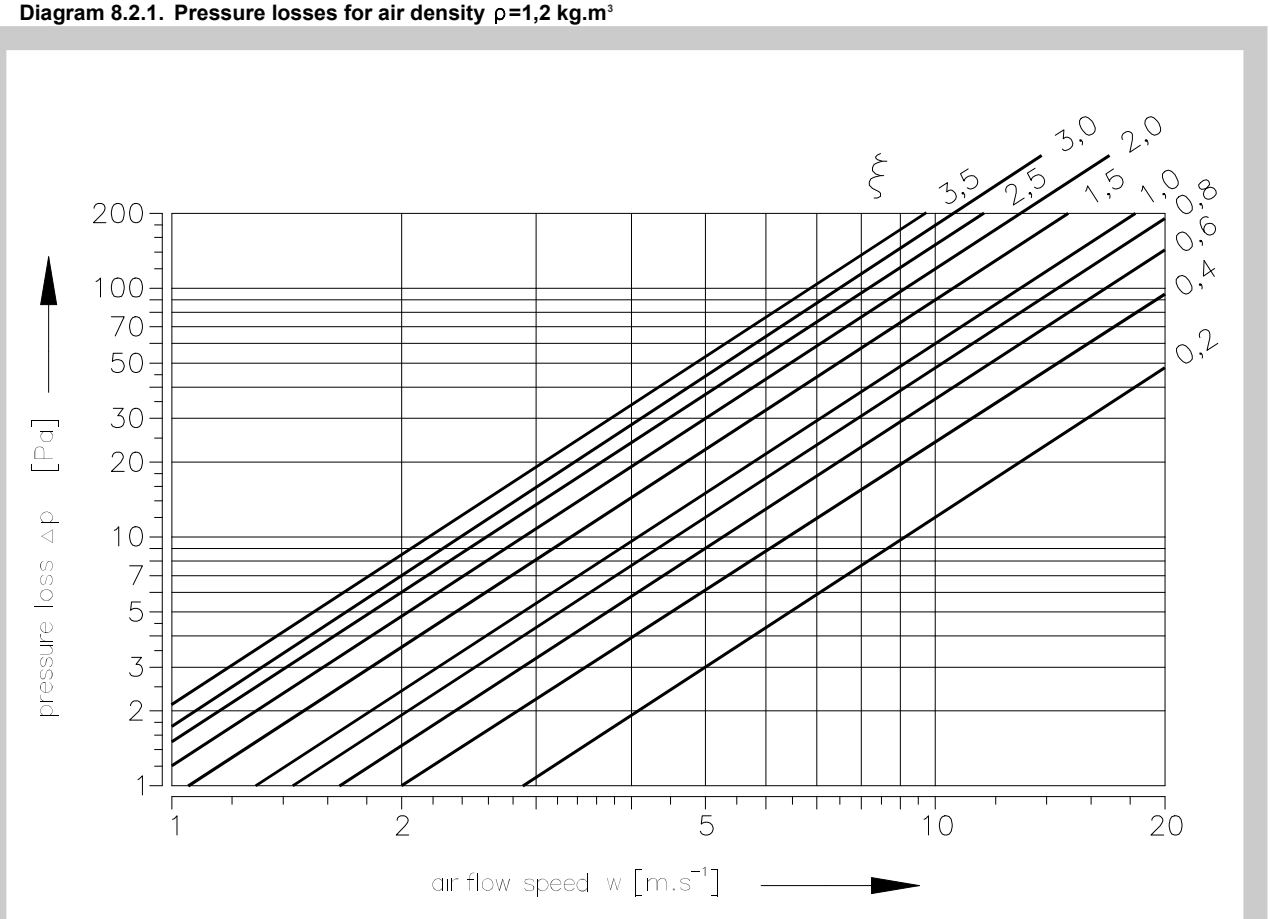
8.1. Pressure loss calculation

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

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

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

Diagram 8.2.1. Pressure losses for air density ρ=1,2 kg.m^{3}



9. Coefficient of local pressure loss

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

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

	B										
A	**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	1,062	0,840
1600	0,220	0,216	0,200	0,199	0,187	0,186	0,185	0,175	0,173	0,163	0,155

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

Tab. 9.2.1. 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

10. Noise data

10.1. Level of acoustic output corrected with filter A.

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

L_{WA}	[dB(A)]	level of acoustic output corrected with filter A
L_{W1}	[dB]	level of acoustic output LW1 related to the 1 m² section (see Tab. 10.3.1. and 10.3.2)
S	[m²]	duct cross section
K_A	[dB]	correction to the weight filter A (see 10.3.3.)

10.2. Level of acoustic output in octave ranges.

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

L_{Woct}	[dB]	spectrum of acoustic output in octave range
L_{W1}	[dB]	level of acoustic output LW1 related to the 1 m² section (see Tab. 10.3.1. and 10.3.2)
S	[m²]	duct cross section
L_{rel}	[dB]	relative level expressing the shape of the spectrum (see Tab. 10.3.4.)

10.3. Table of acoustics values

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

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

Tab. 10.3.2. Level of acoustic output L_{W1}[dB] related to the 1 m^2 section - round dampers

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

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

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

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

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

IV. MATERIAL, FINISHING

11. Material

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

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

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

Springs are galvanized.

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

Fasteners is galvanized.

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

V. INSPECTION, TESTING

12. Inspection, testing

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

VI. TRANSPORTATION AND STORAGE

13. Logistic terms

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

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

VII. ASSEMBLY, ATTENDANCE, MAINTENANCE AND REVISIONS

14. Assembly

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

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

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

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

14.3. Flange and screw joints must be conductively connected to protect against dangerous contact. 2 galvanized fan shape pads that are placed under the head of one screw and a fastened nut are used for conductive connection.

14.4. To ensure reliable fire damper function it is necessary to avoid blocking the closing mechanism and contact surfaces with collected dust, fibre and sticky materials and solvents.

14.5. Manual operation

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

15. Entry into service and revisions

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

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

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

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

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

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

15.3. Before entering the dampers with manual control into operation after their assembly and by sequential checks, checks according 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.

15.4. 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 BAE 72B-S or cutting off the supply from ELECTRICAL FIRE SIGNALISATION). Check of blade displacement back into the "OPEN" position can be done after restoration of power supply (e.g. By releasing the RESET button or restoration of supply from ELECTRICAL FIRE SIGNALISATION).

16. Spare parts

16.1. Spare parts are supplied only on basis of an order.

16.2. Control for square damper and round damper is identical.

17. Restore function of actuating mechanism after fuses initiation

17.1. If fuse Tf1 is initiated (duct outside temperature) than is necessary to change thermoelectrical starting mechanism BAE72B-S. Whereas is initiation temperature higher than actuator mechanism operating temperature +50°C, recommended actuating mechanism manufacturer make complete revision or change actuating mechanism and thermoelectrical starting mechanism.

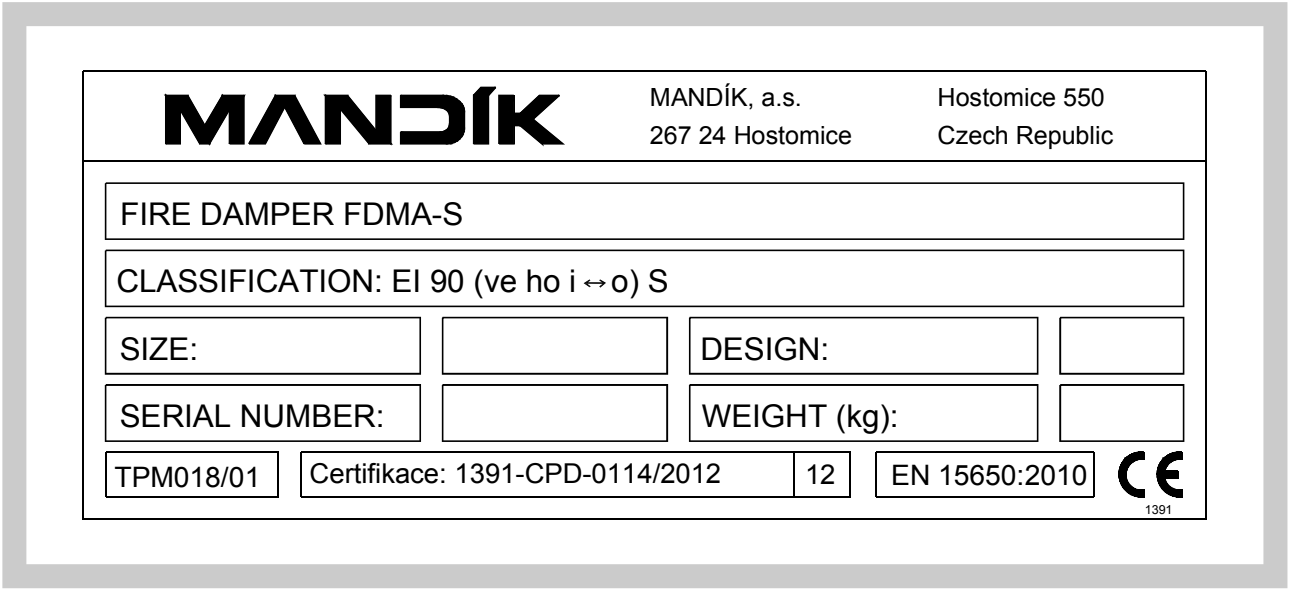
17.2. If fuses Tf2/Tf3 are initiated (duct inside temperature) than is possible change only part ZBAE72, or ZBAE95 (according initiating temperature).

VIII. PRODUCT DATA

18. Data label

18.1. Data label is placed on the damper body.

Fig. 61 Data label



19. Quick review

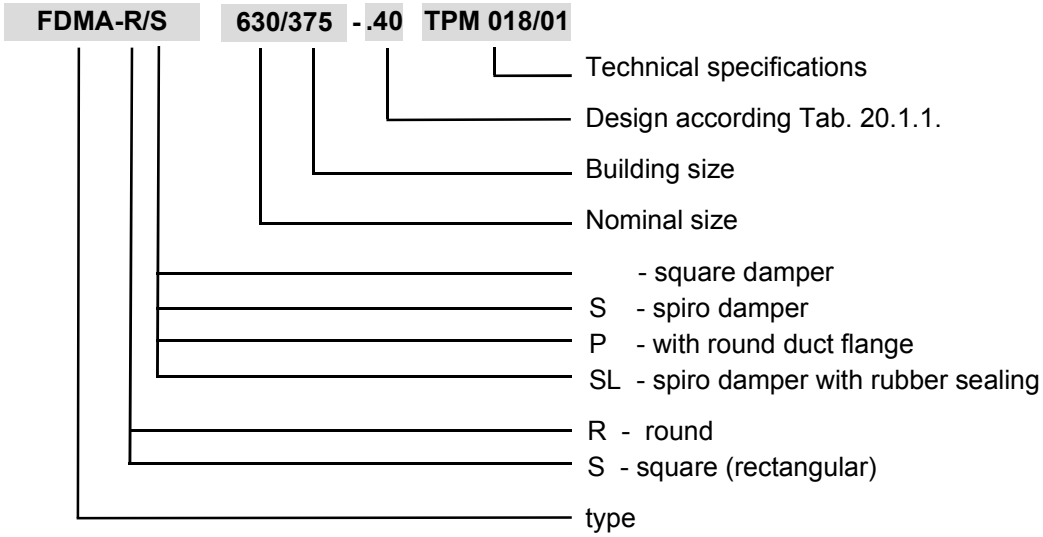
Tab. 19.1.1. Quick Overview

Damper	FDMA			
Fire separating construction	wall/ceiling Min. thichness [mm]	Installation	Fire resistant	Fig.
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	43
Outside of solid gypsum wall construction	100	Mineral stone wool with mastic and cement lime plate	EIS 90	47
Outside of solid ceiling construction	150	Mineral stone wool with mastic and cement lime plate	EIS 90	51

IX. ORDERING INFORMATION

20. Ordering key

20.1. Fire damper

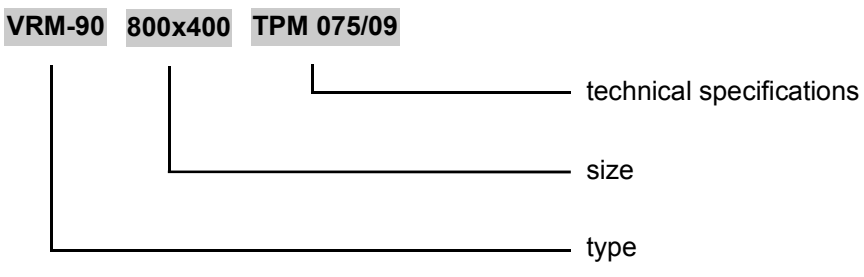


If you are required dampers with installation anchors it is necessary be specified in the order.

Tab. 20.1.1. 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-MA (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-MA, 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

20.2. Reinforcement - damper placement outside wall or ceiling construction



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