CE

TPM 075/09

Revision 9
Valid from 21/2/20

*EN 15650:2010-09*

MANDÍK®

# FIRE DAMPER

# FDMB

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

## I. CONTENT

## 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. 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 FDMB with actuating mechanism - rectangular**

**Fig. 2 FDMB with actuating mechanism - round**

**Fig. 3 FDMB with mechanical control - rectangular**

**Fig. 4 FDMB - with mechanical control - round**

**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-0011/2014
- Declaration of Performance No. PM/FDMB/01/20/1
- Hygienic assessment of fire dampers - Report No. 1.6/pos/19/19b

**1.3.** Working conditions

Right damper function is secured under the following conditions:

a) Maximum air circulation speed: 12 m/s
   Maximum pressure difference: 1200 Pa
b) The air circulation in the whole damper section must be secured as steady on whole surface.

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

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

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

Temperature in the place of installation is permitted to range from -30°C to +50°C.

## 2. Design

### 2.1. Design with mechanical control

**Design .01**

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

**Fig. 5 Design .01**

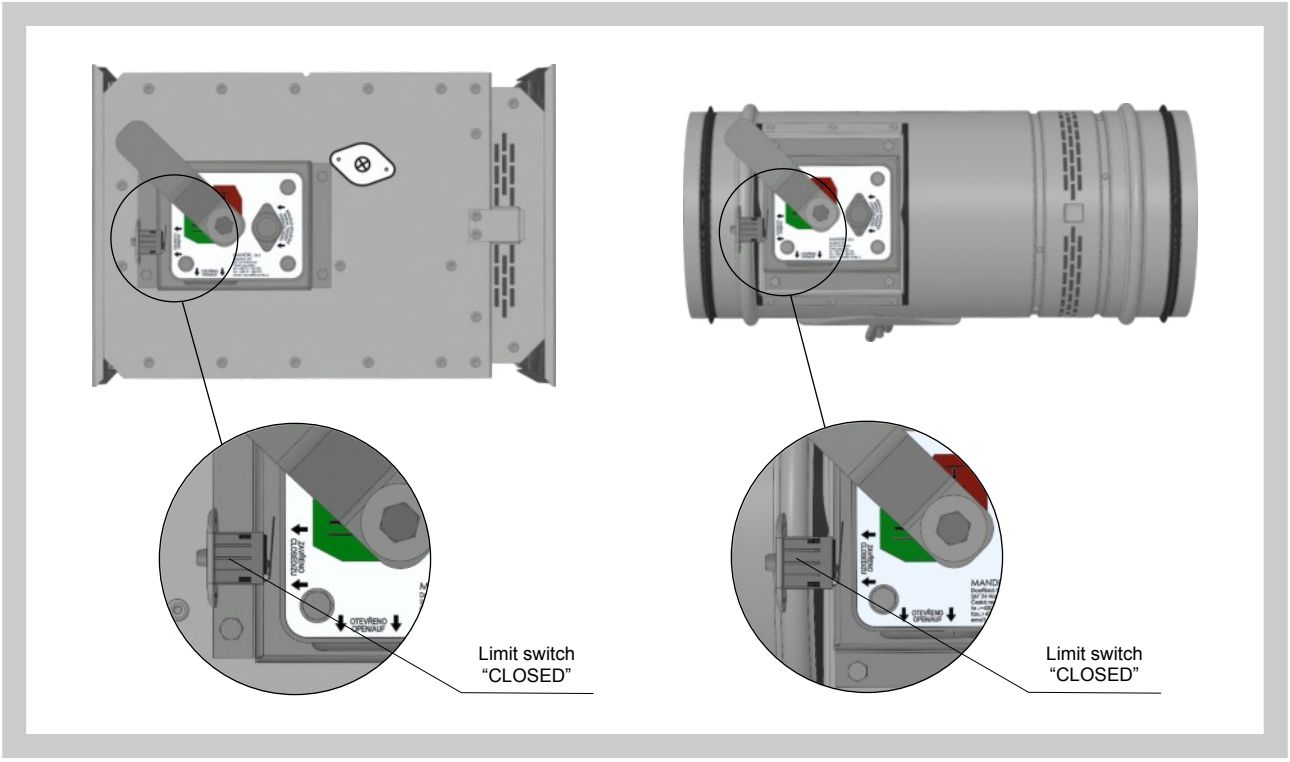
**ATTENTION:**

Mechanisms are produced in four designs **M1** to **M4**, difference is only in size of inner spring, which closes the fire damper. For the size of fire dampers is always assigned the size of mechanism - **Tab 4.3.1., Tab 4.4.1.** It is not recommended to use different size of mechanism, than given by the manufacturer, otherwise, there is a risk of fire damper destruction.

### Design .11

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

**Fig. 6 Design .11**




### Design .80

Design .01 with mechanical control can be complemented with a terminal switches signaling of the damper blade position "CLOSED" and "OPEN". Limit switches are connected via damper casing, cables are connected directly to limit switches.

**Fig. 7 Design .80**

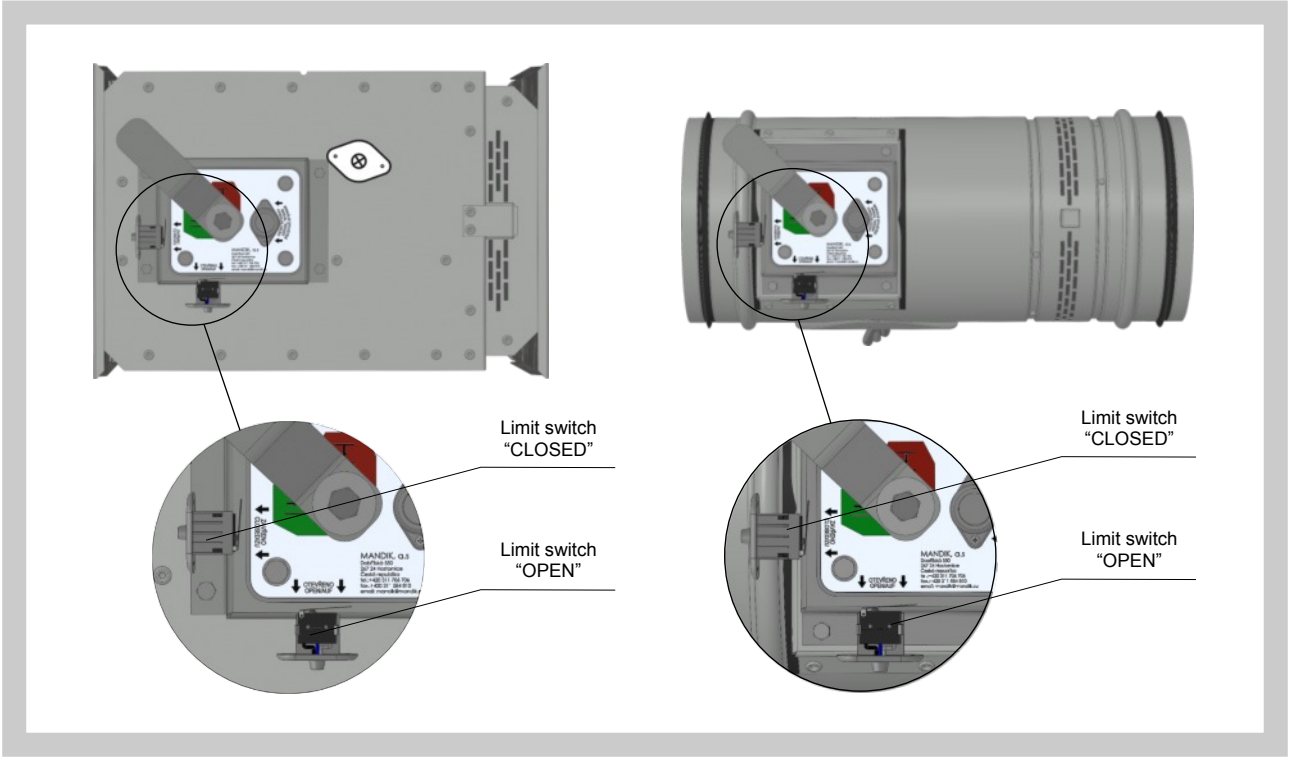
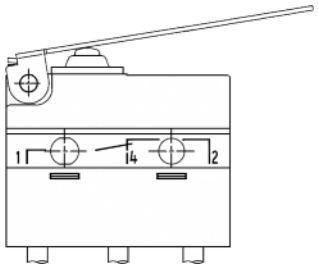
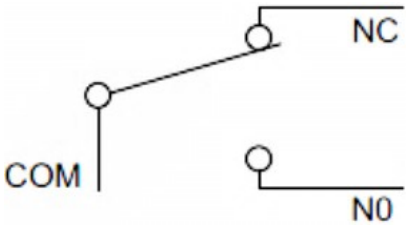


**Fig. 8 Limit switch G905-300E03W1**



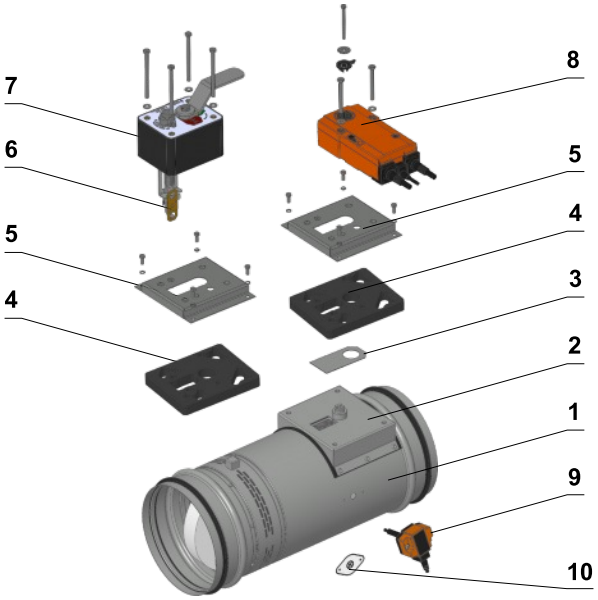




1(COM) - black wire
2(NC) - gray wire
4(NO) - blue wire

| | |
|---|---|
| **Nominal voltage and maximal current** | AC 230V / 5A |
| **Class of protection** | IP 67 |
| **Working temperature** | -25°C … +120°C |

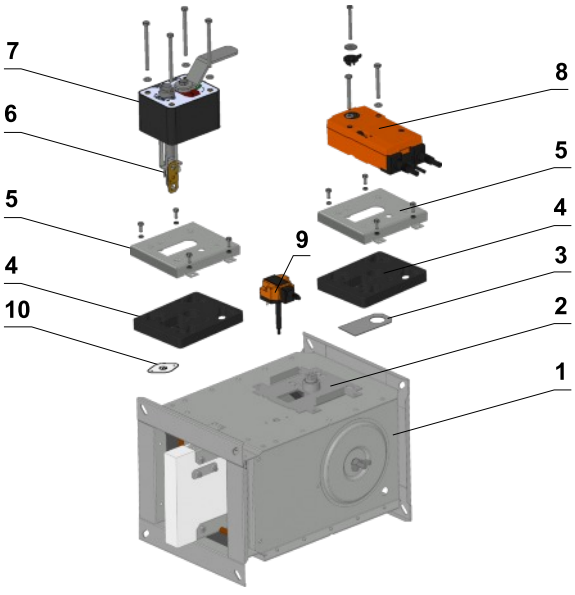
This limit switch is possible to connect in following two versions:
a) **CUT-OFF** if the arm is moving … connect wire 1+2
b) **SWITCH-ON** if the arm is moving … connect wire 1+4

**Fig. 9 Change of mechanical design for the motorised one or vice versa - ROUND**




**Position:**
1 Damper
2 Mounting plate
3 Sealing cover
4 Seal plates
5 Mounting plate cover
6 Thermal fuse
7 Mechanics
8 Actuator
9 Temperature sensor
10 Sensor sticker

**Fig. 10 Change of mechanical design for the motorised one or vice versa - RECTANGULAR**




**Position:**
1 Damper
2 Mounting plate
3 Sealing cover
4 Seal plates
5 Mounting plate cover
6 Thermal fuse
7 Mechanics
8 Actuator
9 Temperature sensor
10 Sensor sticker

## 2.2. Design with actuating mechanism

### Design .40, .50

FDMB is always equipped by electric actuating mechanism BFL, BFN, BF 230-TN or BFL, BFN, BF 230-TN (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 120 sec. If the actuating power supply is cut off (due to loss of supply voltage, or pushing the reset button on the thermoelectrical starting mechanism BAT), the back spring displaces the damper blade into the breakdown position "CLOSED". The time of displacing the blade from the position "OPEN" to the position "CLOSED" takes maximum 20 sec. In case that the power supply is restored again (the blade can be in any position), the actuating mechanism starts to re-displace the damper blade into the position "OPEN".
A thermoelectrical starting mechanism BAT, which contains two thermal fuses Tf1 and Tf2, is a part of the actuating mechanism. These fuses are activated when temperature +72°C has been exceeded (the fuse Tf1 when the temperature around the damper and the fuses Tf2 when the temperature inside the air-conditioning piping has been exceeded). After the thermal fuse Tf1 or Tf2 has been activated, the power supply is permanently and irreversibly cut off and the actuating mechanism, by means of the pre-stretched spring, displaces the damper blade into the breakdown position "CLOSED".

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

**Fig. 11 Design .40, .50**

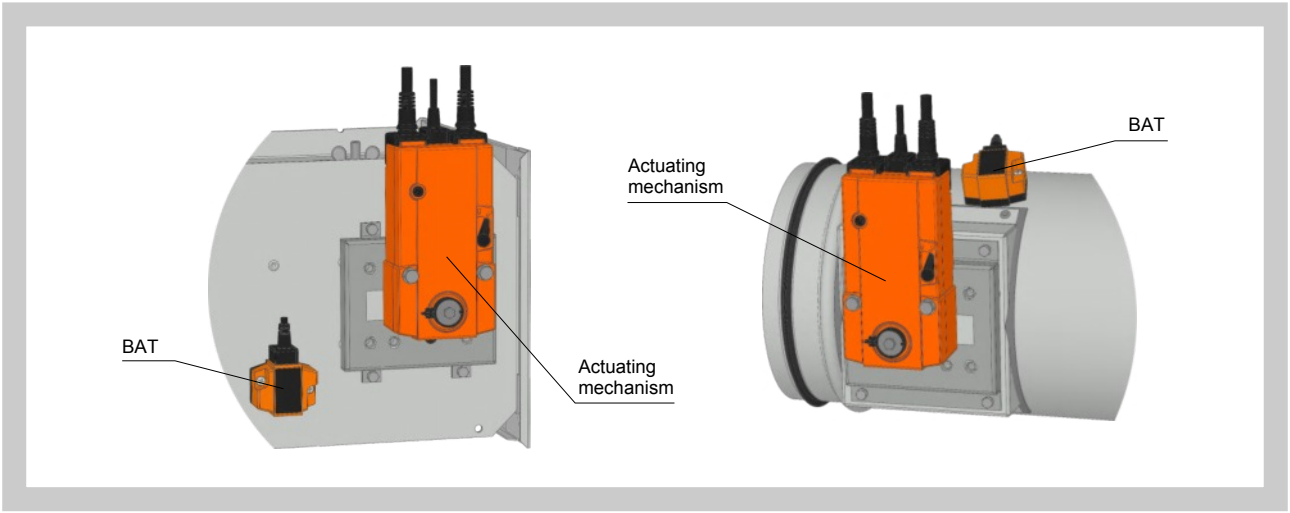



**Fig. 12 Actuating mechanism BELIMO BFL (BFN) 230-T**

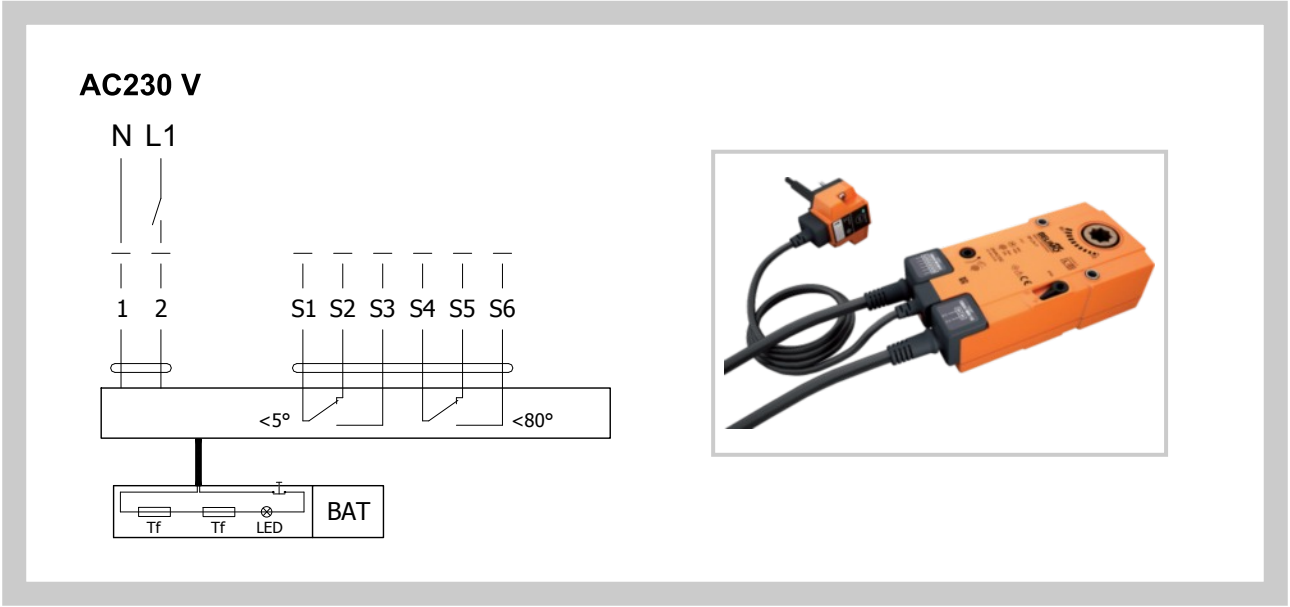
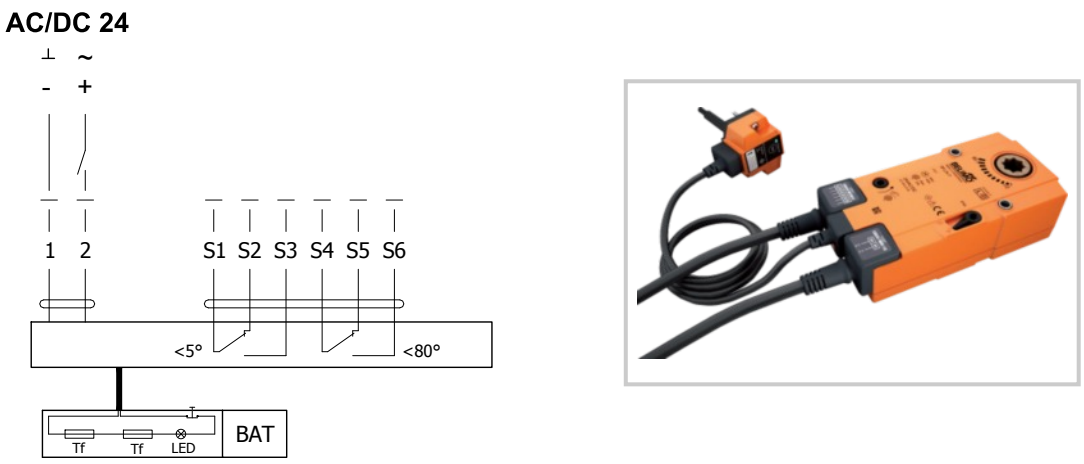


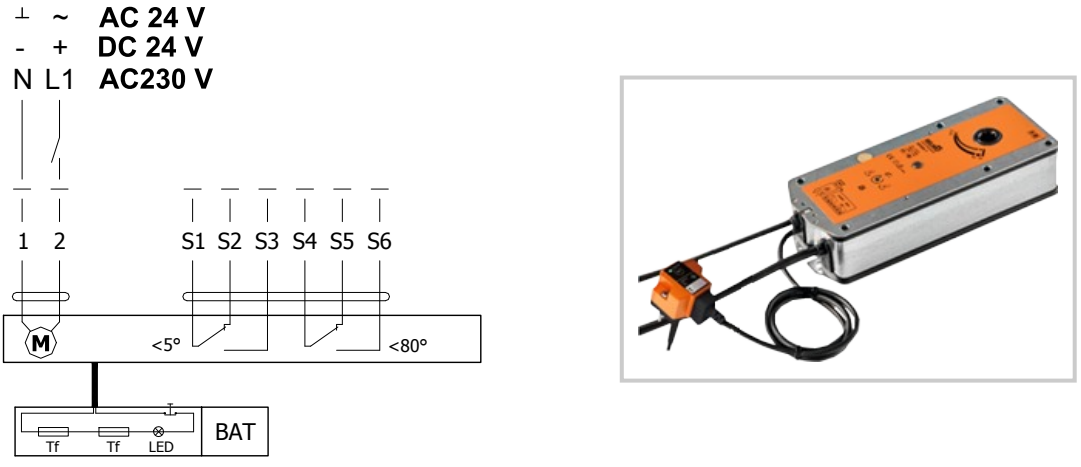
**Fig. 13 Actuating mechanism BELIMO BFL, BFN 24-T(-ST)**




**Tab. 2.2.1. Actuating mechanism 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<br>DC 24 V |
| Power consumption - motoring<br>- holding | 3,5/5 W<br>1,1/2,1 W | 2,5/4 W<br>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<br>- spring return | <60 s<br>~ 20 s | |
| Ambient temperature<br>- normal duty<br>- safety duty<br>- non-operating temperature | - 30°C … +55°C<br>The safe position will be attained up to max. +75°C<br>- 40°C … +55°C | |
| Connecting - motor<br>- auxiliary switch | cable 1 m, 2 x 0,75 mm² (BFL/BFN 24-T-ST) with 3-pin plug-in connectors<br>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<br>duct inside temperature +72°C | |

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



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

| Actuating mechanism BELIMO | BF 24-TN(-ST) | BF 230-TN |
|---|---|---|
| Nominal voltage | AC 24 V 50/60 Hz<br>DC 24 V | AC 230 V 50/60 Hz |
| Power consumption - motoring<br>- holding | 7 W<br>2 W | 8 W<br>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<br>- spring return | 120 sec<br>~ 16 sec | |
| Ambient Temperature<br>- normal duty<br>- safety duty<br>- non-operating temperature | -30°C … +50°C<br>The safe position will be attained up to max. 75°C<br>-40°C … +50°C | |
| Connecting - motor<br>- auxiliary switch | cable 1 m, 2 x 0,75 mm²<br>cable 1 m, 6 x 0,75 mm²<br>(BF 24-T-ST) with plug-in connectors | |
| Thermal trips | Tf1: duct outside temperature Duct +72°C<br>Tf2/Tf3: duct intside temperature Duct +72°C | |

**Design .41, .51**

Design .41 or .51 with actuating mechanism can be complemented with smoke detector ORS 142 K. The voltage can be AC 230 V or 24 V DC. Design with voltage AC 230 V is equpped with Communication and supply device BKN 230-24-MOD and with actuating mechanism BF 24-TN (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 ORS 142 K with the socket 143A**

| Optical smoke detector | ORS 142 K with socket 143A |
|---|---|
| Operating voltage | 18 … 28 V DC |
| Residual ripple | ≤ 200 mV |
| Power Consumption Socket<br>(without actuating mechanism) | max. 22 mA |
| Degree of protection | IP 42 |
| Ambient temperature | -20°C … +75°C |
| Aditional temperature senzor | +70°C |
| Connection - net<br>- motor<br>- communication and supply device BKN | Cabel 1m, connected to terminals 1, 2 and 4<br>Actuator connected on the terminals 2 and 5<br>Cabel 1m, connected to terminals 1, 2, 4 and 5 |

**Fig. 15 Smoke detector ORS 142 K and socket 143A**

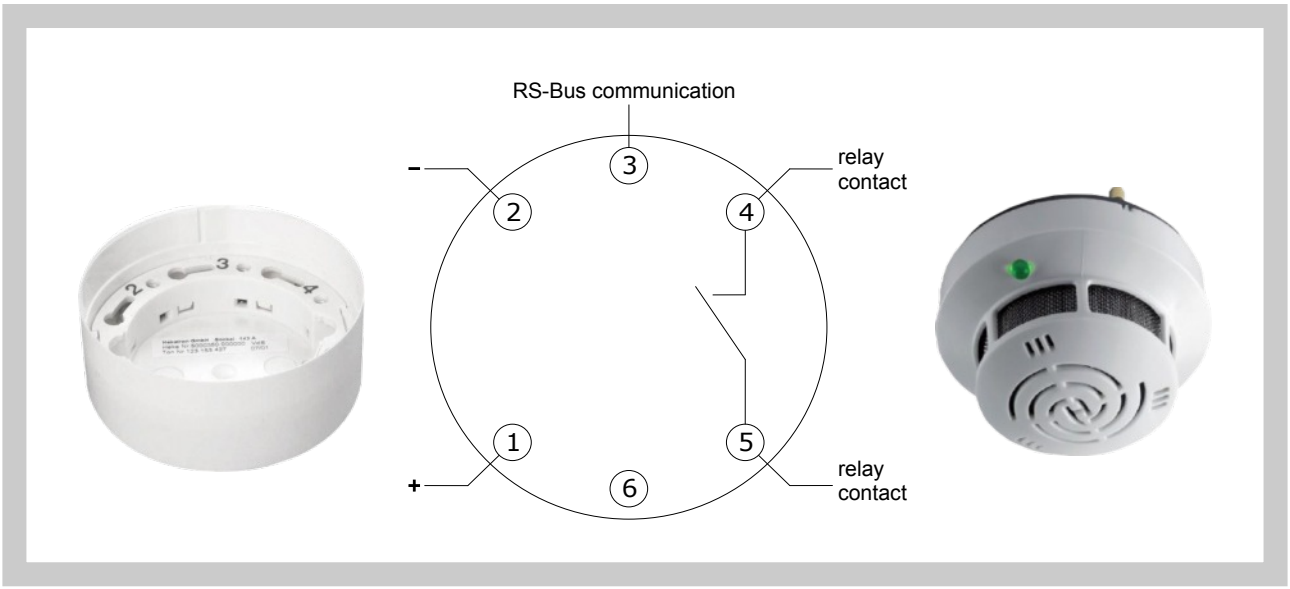



**Fig. 16 Design with actuating mechanism BF 24-TN (BFL, BFN 24-T) , with smoke detector ORS 142 K and with communication and supply device BKN 230-24-MOD (voltage AC 230 V)**

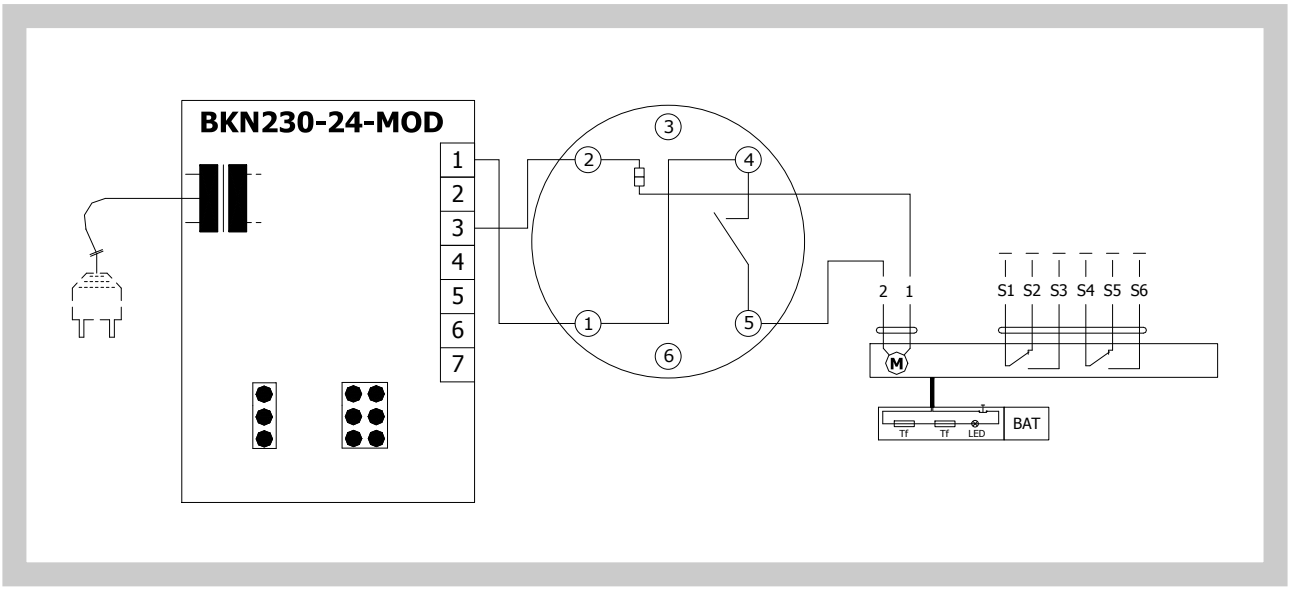
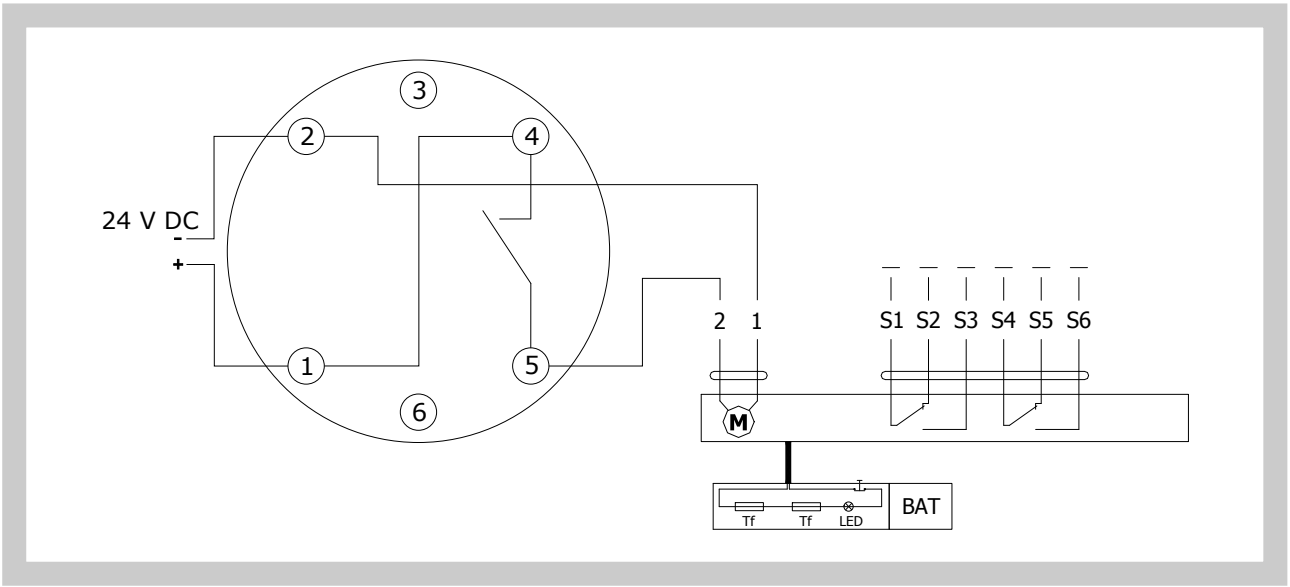



**Fig. 17 Design with actuating mechanism BF 24-TN (BFL, BFN 24-T) , with smoke detector ORS 142 K (voltage 24 V DC)**



## 2.3. Design with the communication and supply device

### Design .60

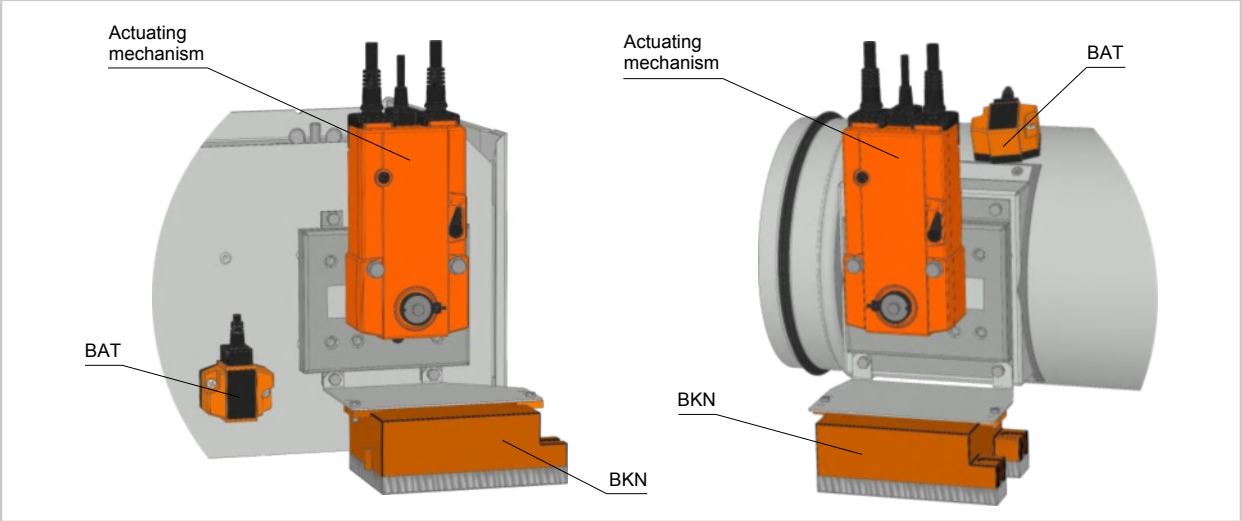
Design with the communication and supply device BKN 230-24 and the actuating mechanism BF 24-TN-ST (BFL 24-T, BFN 24-T). It simplifies electrical wiring and interconnection of fire flap valves. It facilitates on site check and enables central control and checks of fire damper by means of a simple 2-conductor wiring.

BKN 230-24 functions as a decentralized network device for supplying the actuating mechanism BF 24-TN-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-TN-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 BAT is switched on or if the power supply (e.g. by a signal from ELECTRICAL FIRE SIGNALISATION ) is disconnected, the damper position will be "FAILURE".

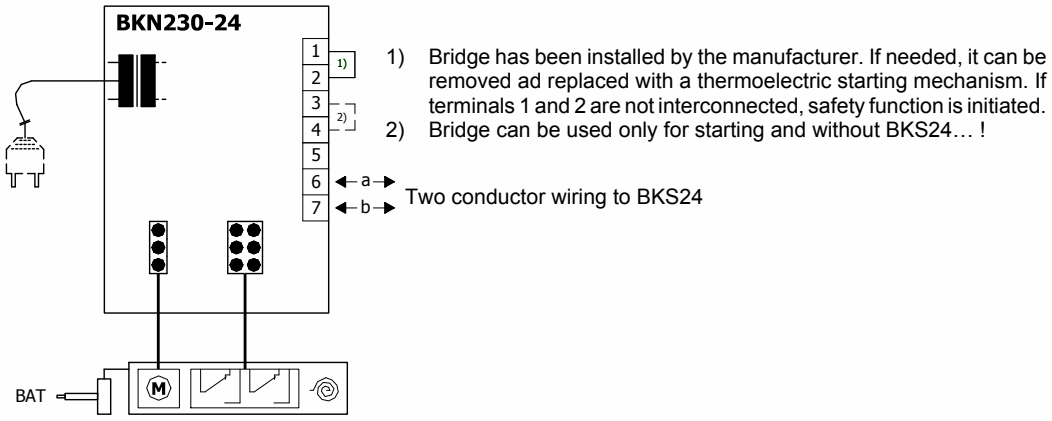
**Fig. 18 Design with the communication and supply device BKN 230-24, BKN230-24-C-MP or BKN 230-24-MOD**




**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 40 |
| Ambient temperature<br>Non-operating temperature | -20°C … +50°C<br>-40°C … +80°C |
| Connection - net<br>- motor<br>- terminal board | cable 0,9 m with EURO plug type 26<br>6-pole connector, 3-pole connector<br>screw terminals for cable 2x1,5 mm² |

**Fig. 19 Communication and supply device BKN 230-24, with act. mechanism BF 24-TN-ST (BFL 24-T-ST, BFN 24-T-ST)**




## Design .61

Design .61 with communication and supply device can be complemented with smoke detector ORS 142 K. For supply and comunnication is used BKN 230-24-C-MP, which together with the BF 24TN-ST (BFL 24T-ST, BFN 24T-ST ) enables central control and checks of fire damper by means of a simple 2-conductor wiring and it also allows connection to the system via MP-BUS communication. More information in the Belimo catalog.

**Tab. 2.3.2. Communication and supply device BKN 230-24-C-MP**

| Communication and supply device | BKN 230-24-C-MP |
|---|---|
| Nominal voltage | AC 230 V 50/60Hz |
| Power consumption | 3,5 W (operating position) |
| Dimensioning | 10 VA (including actuating mechanism with spring return) |
| Protection Class | II |
| Degree of protection | IP 40 |
| Ambient temperature<br>Non-operating temperature | -20°C … +50°C<br>-40°C … +80°C |
| Connection - net<br>- motor<br>- terminal board | cable 0,9 m with EURO plug type 26<br>6-pole connector, 3-pole connector<br>screw terminals for cable 2x1,5 mm² |

**Fig. 20 Communication and supply device BKN 230-24-C-MP**

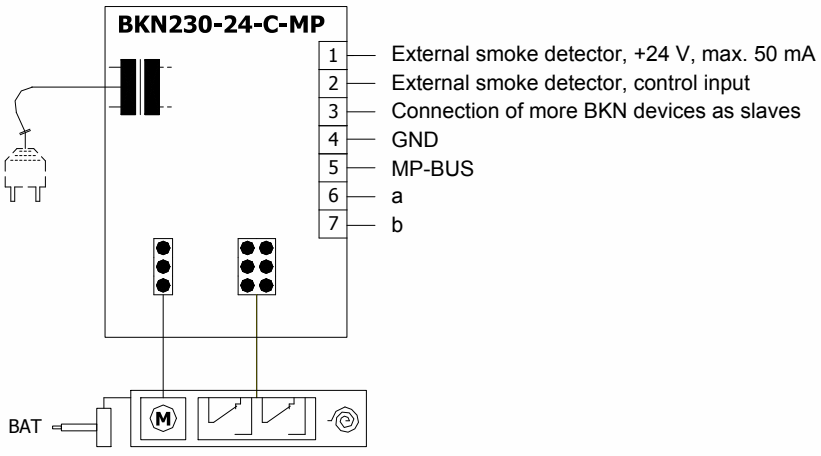
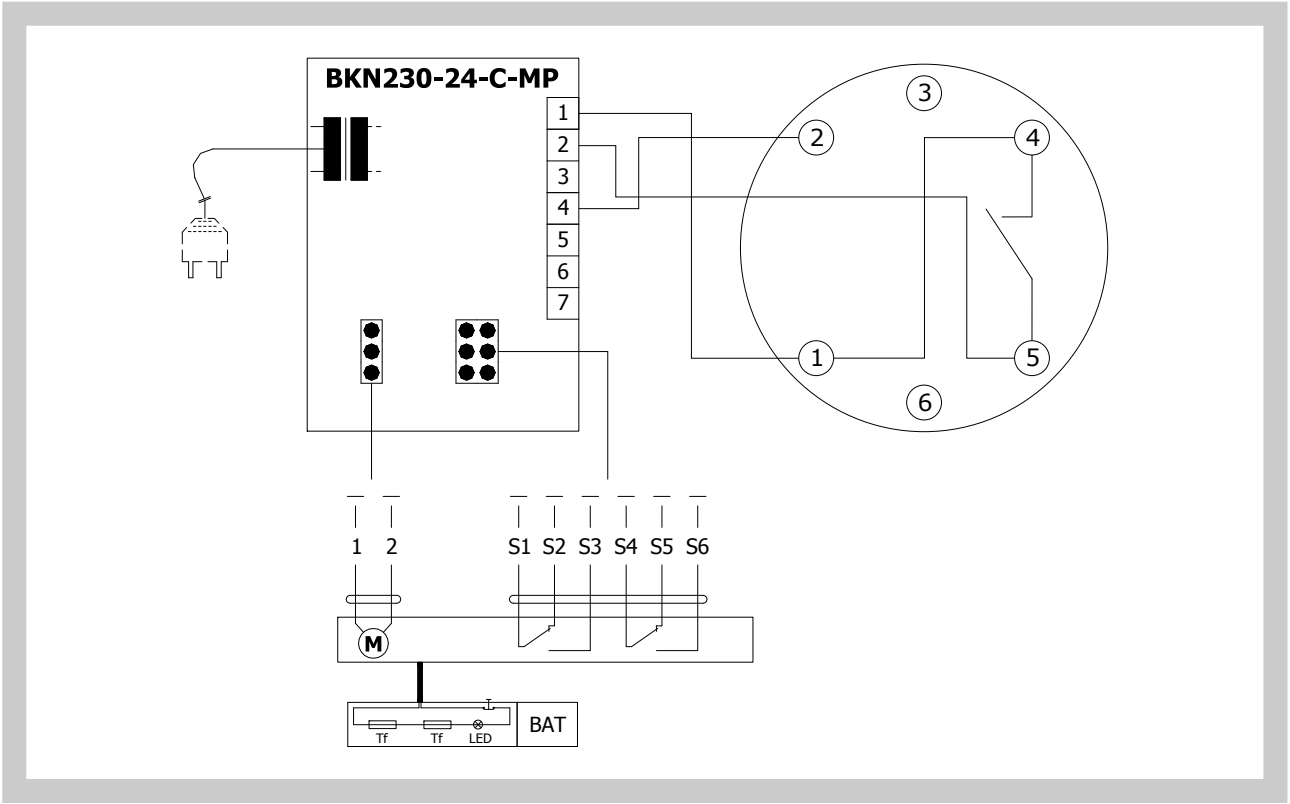


**Fig. 21 Design with communication and supply device BKN 230-24-C-MP, with actuating mechanism BF 24-TN-ST (BFL 24-T-ST, BFN 24-T-ST) with actuating mechanism ORS 142 K**




### Design .63

Design .60 with communication and supply device can be complemented with smoke detector ORS 142 K. For supply and comunnication is used BKN 230-24-MOD, which is used together with the BF 24TN-ST (BFL 24T-ST, BFN 24T-ST) for communication with control systems using the Modbus RTU or BACnet MS / TP protocol. The wiring of the line is to be carried out in accordance with applicable RS485 regulations. Parameterization of the communication is done using DIL switches. The BKN 230-24-MOD can be installed separately, without a connection to a master control system, in which case the connection bridge between the terminals 1 and 4 must be installed. For more information, see the Belimo catalog.

**Tab. 2.3.3. Communication and supply device BKN 230-24-MOD**

| **Communication and supply device** | **BKN 230-24-MOD** |
|---|---|
| Nominal voltage | AC 230 V 50/60Hz |
| Power consumption | 3 W (operating position) |
| Dimensioning | 14 VA (including actuating mechanism with spring return) |
| Protection Class | II |
| Degree of protection | IP 40 |
| Ambient temperature<br>Non-operating temperature | -20°C … +50°C<br>-40°C … +80°C |
| Connection - net<br>- motor<br>- terminal board | cable 0,9 m with EURO plug type 26<br>6-pole connector, 3-pole connector<br>screw terminals for cable 2x1,5 mm² |

**Fig. 22 Communication and supply device BKN 230-24-MOD, with act. mechanism BF 24-TN-ST (BFL 24-T-ST, BFN 24-T-ST)**

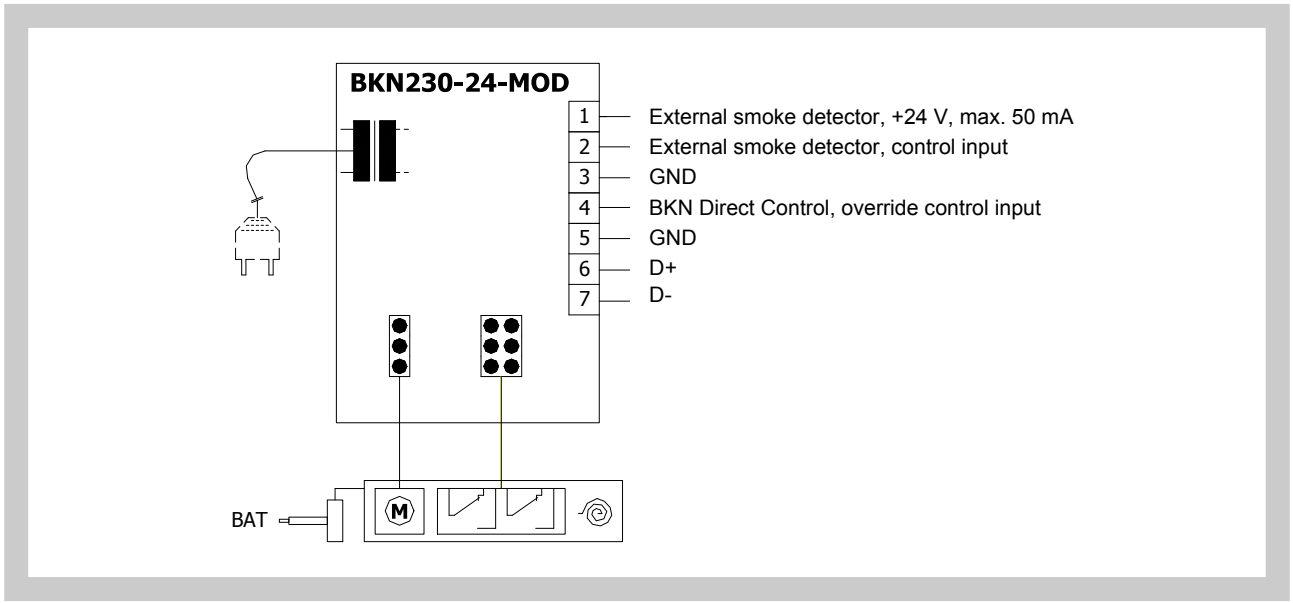
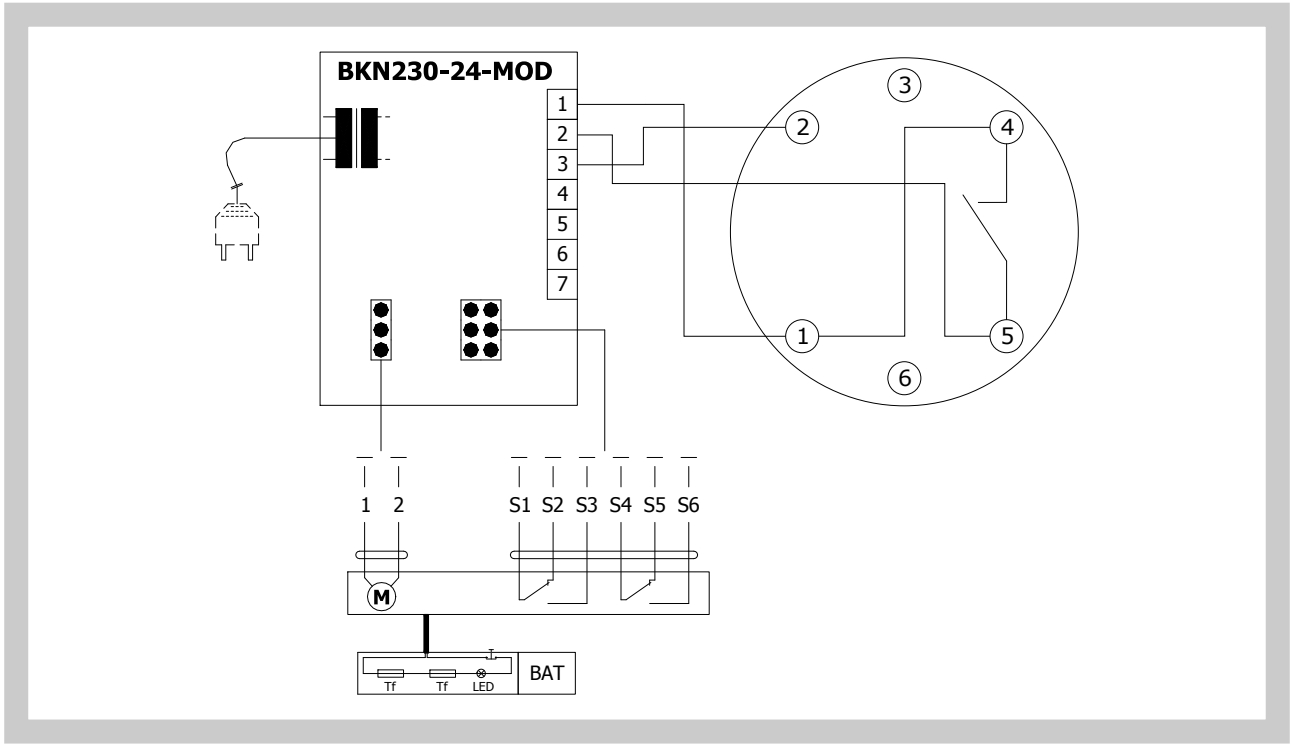



**Fig. 23 Design with communication and supply device BKN 230-24-MOD, with actuating mechanism BF 24-TN-ST (BFL 24-T-ST, BFN 24-T-ST) and smoke detector ORS 142 K**



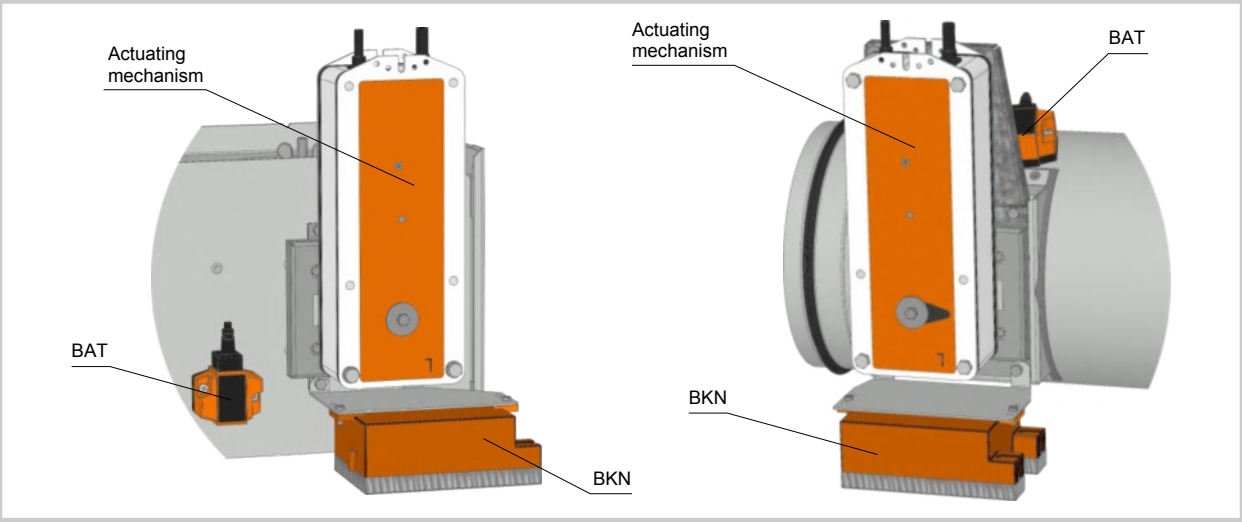

### Design .62

Design with the communication and supply device BKN 230-24MP and actuating mechanism BF 24TL-TN-ST for connection to MP-Bus. BKN 230-24MP supplies to intelligent actuating mechanisms of fire dampers BF 24TL-TN-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-TN-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. 24 Design with communication and supply device BKN 230-24MP or BKN 230-24LON and actuationg mechanism BF 24TL-TN-ST**



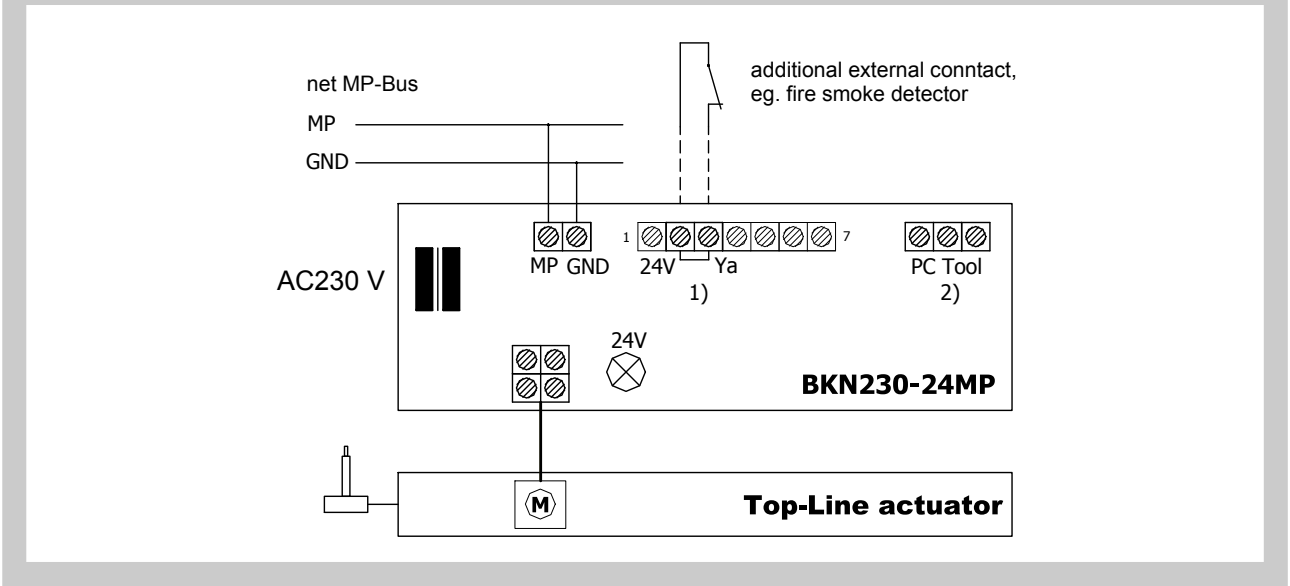

**Tab. 2.3.4. Actuating mechanism BELIMO BF 24TL-TN-ST**

| Actuating mechanism BELIMO | BF 24TL-TN-ST |
|---|---|
| Nominal voltage | AC 24 V 50/60Hz<br>DC 24 V |
| Power consumption - motoring<br>- holding | 7 W<br>2 W |
| Dimensioning | 10 VA (Imax 8,3 A @ 5 ms) |
| Protection class | III |
| Degree of protection | IP 54 |
| Running time - motor<br>- spring return | 120 sec<br>~ 16 sec |
| Ambient temperature<br>Non-operating temperature | -30°C … +50°C<br>-40°C … +50°C |
| Connection | Connector for BKN 230-24LON and BKN 230-24MP<br>cable 1 m, 4 x 0,75 mm² halogen-free |

**Tab. 2.3.5. Communication and supply device BKN 230-24MP**

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

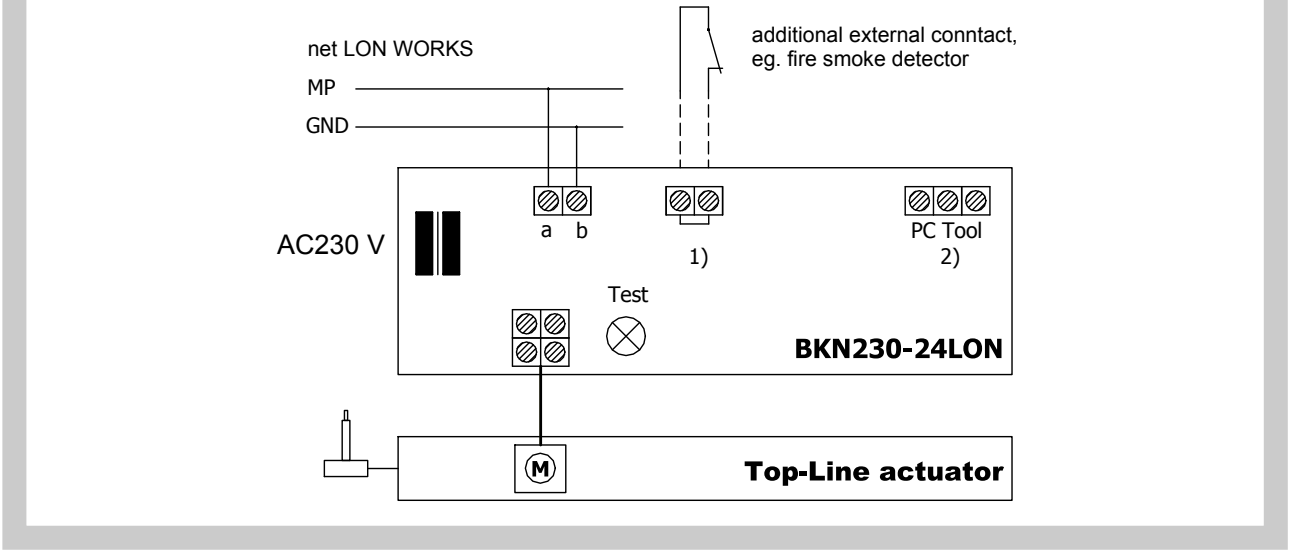
**Fig. 25 Communication and supply device BKN 230-24MP**




**Tab. 2.3.6. 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<br>Non-operating temperature | -30°C … +50°C<br>-40°C … +80°C |
| Connection - net<br>- actuator (BF…-Top)<br>- net LonWorks<br>- starting mechanism (optional)<br>- Top-Line PC-Tool (via ZIP-RS232) | cable 1m, with Euro plug<br>4-pole connector<br>screw terminal 2-pole<br>screw terminal 2-pole<br>3-pole connector |

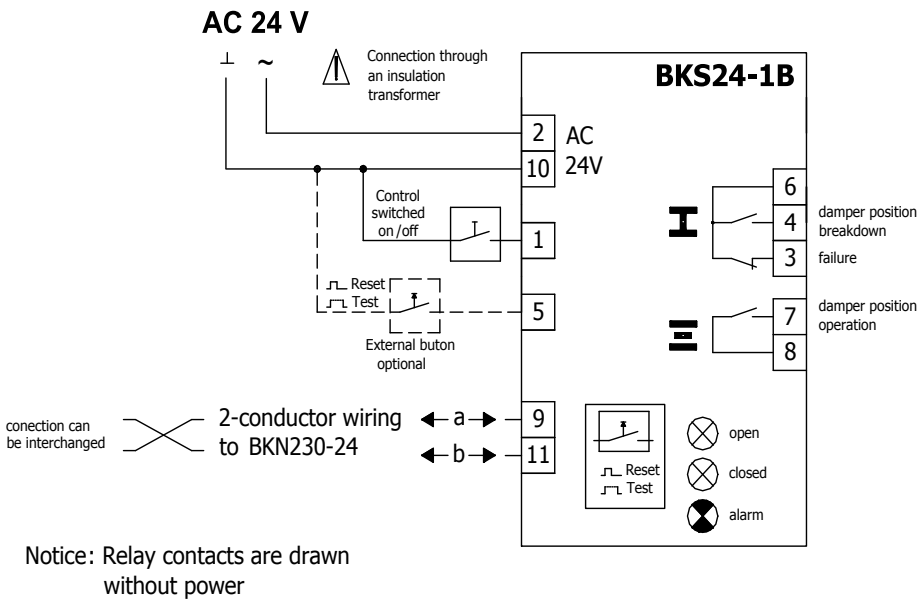
**Fig. 26 Communication and supply device BKN 230-24LON**



## 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-TN-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 (signaling of the damper position, failure reports, release of the ventilators etc.).
While a flashing green LED pilot light signalises damper blade motion towards the given position, the same pilot light reports reaching the required position when shining constantly. If the flap blade, with respect to the given time, does not reach the required position, then a red LED pilot light starts to flash and at the same time, the failure contact is active. Once the damper blade reaches the given position, this contact is deactivated. The LED pilot light keeps flashing unless the failure is unblocked by means of the RESET button. Except for reporting failures, other three auxiliary contacts are available. Contacts showing operating and failure position of the damper are active when the damper is in the given position. Function check can be done by pressing and holding the button "RESET/TEST" for longer time. While holding the button, the damper blade moves in the direction of the failure position. Fault function is indicated by the LED pilot light. BKS 24-1B can be connected by means of ZSO-11 11 pole connector for DIN 35 mm panel.

**Fig. 27 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-TN-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

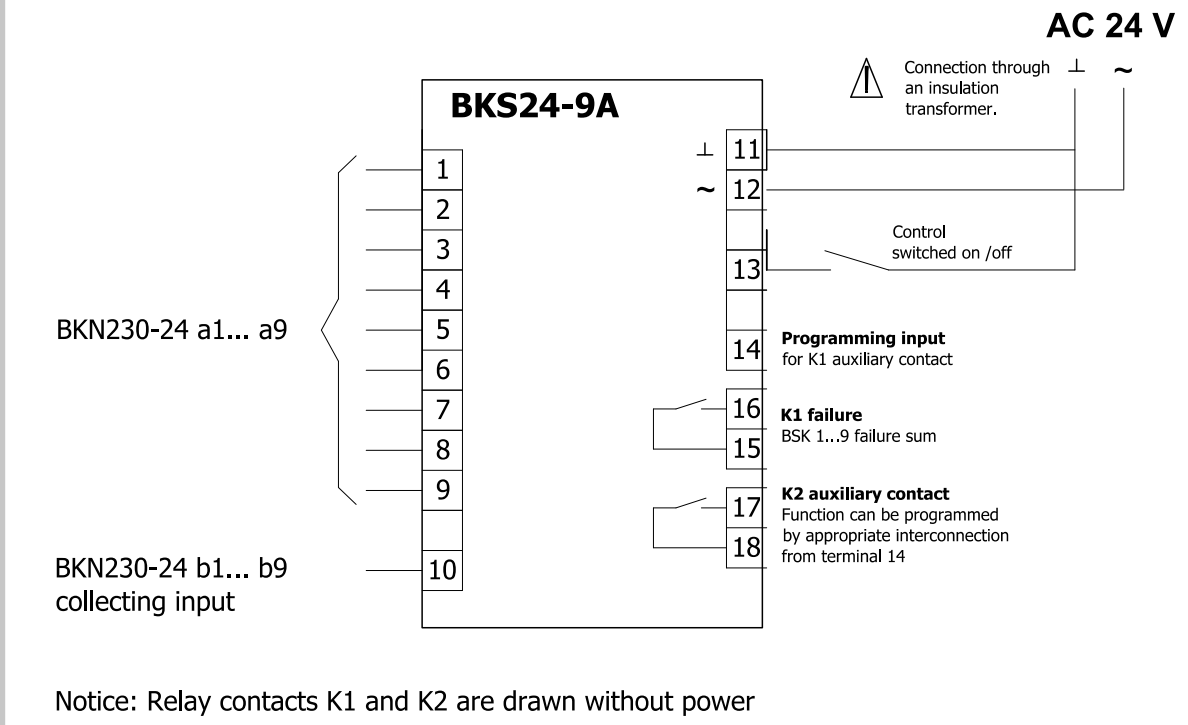
If the fire damper do not reach the given position in time tolerable for displacing, the appropriate light diode FAILURE starts to flash and K1 contact is opened (current failure). In case that the faulty damper finally reaches its given position, K1 is closed and the failure report light shines (the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

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

| Function contact K1 | | Programming K2 Auxiliary Contact | | |
|---|---|---|---|---|
| **situation** | **state** | **function** | **interconnection** | **state** |
| current failure | 15 — 16 | K2 contact is on if all the flaps are open | 14 — 11 | 17 — 18 |
| no failure | 15 — 16 | K2 contact is on if the flap No. 1 is open | 14 — 12 | |
| | | 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. 28 Communication and control device BKS 24-9A**



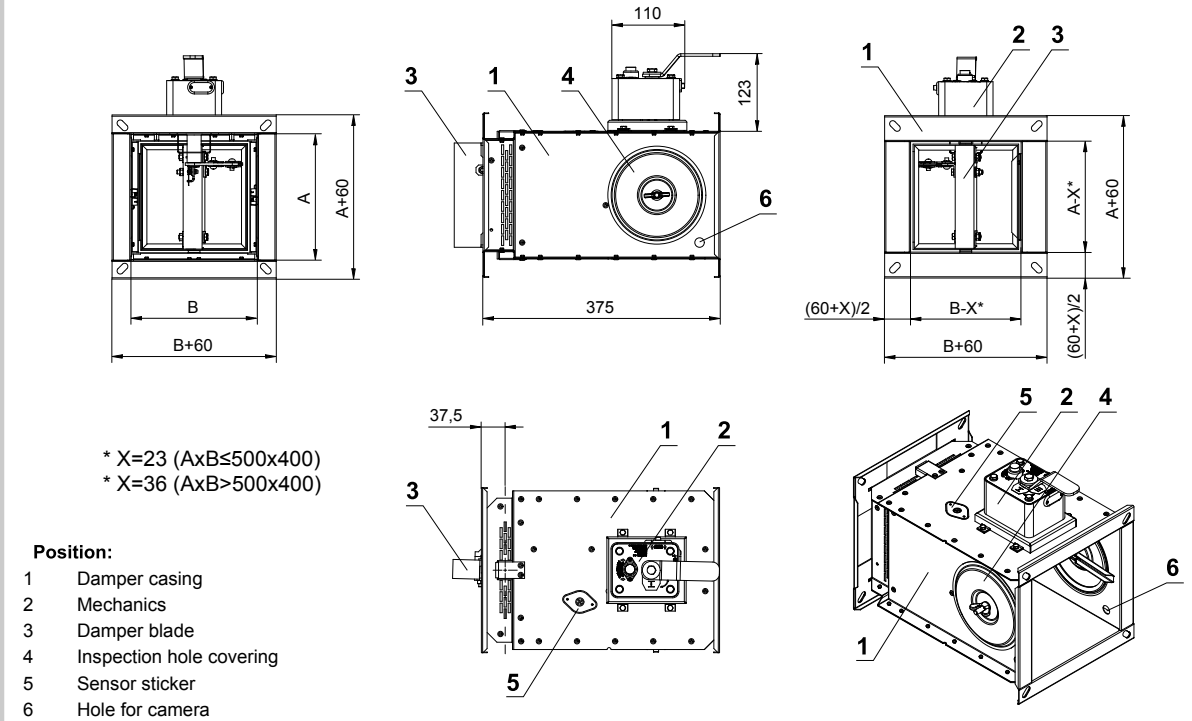

**Tab. 3.2.2. Communication and control device BKS 24-9A**

| **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 and effective area

### 4.1. Rectangular dampers

**Fig. 29 FDMB with mechanical control - rectangular**

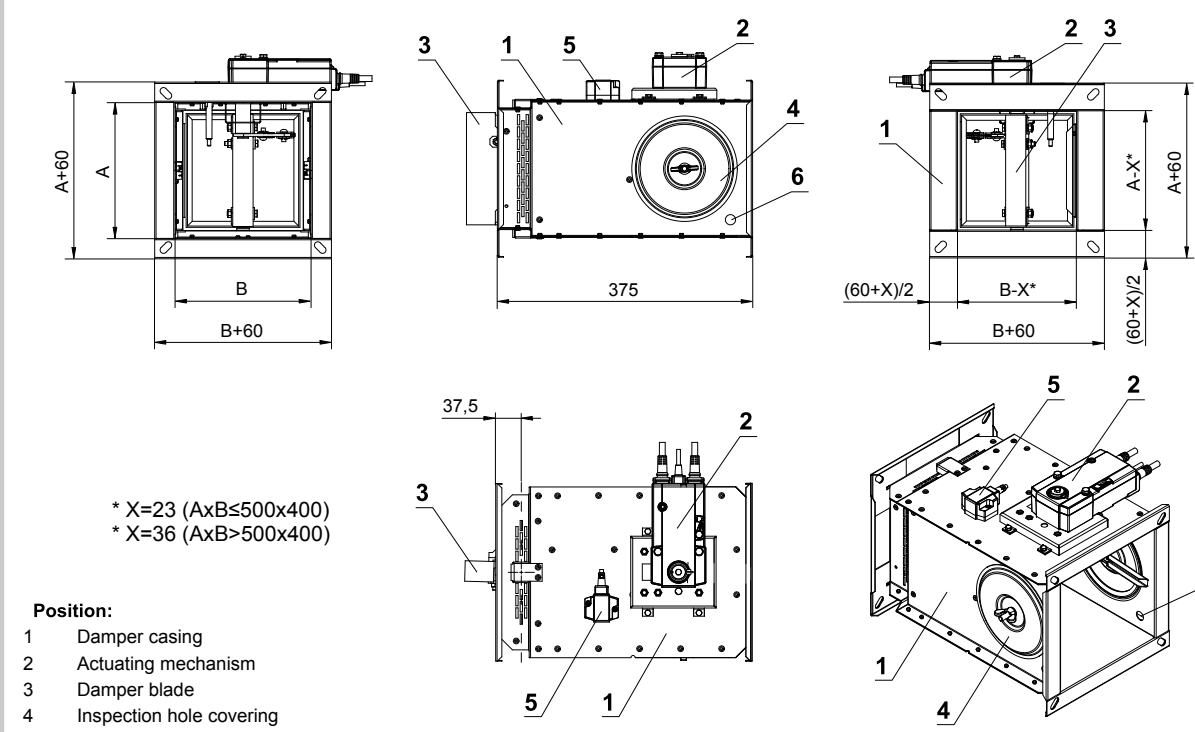



* X=23 (AxB≤500x400)
* X=36 (AxB>500x400)

**Position:**

1 Damper casing
2 Mechanics
3 Damper blade
4 Inspection hole covering
5 Sensor sticker
6 Hole for camera

**Fig. 30 FDMB with actuating mechanism - rectangular**



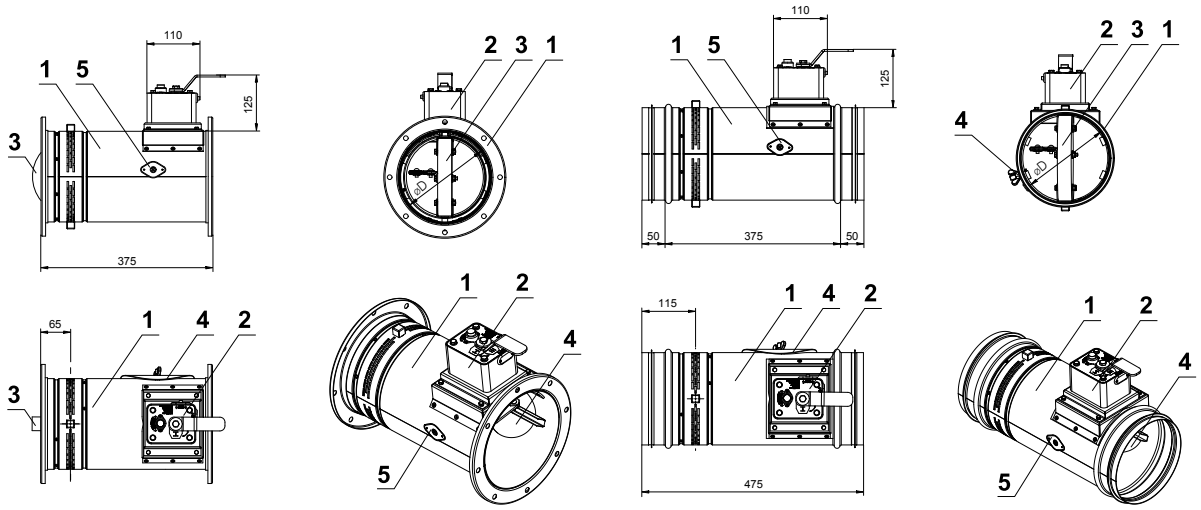

* X=23 (AxB≤500x400)
* X=36 (AxB>500x400)

**Position:**

1 Damper casing
2 Actuating mechanism
3 Damper blade
4 Inspection hole covering
5 BAT thermoelectrical starting mechanism
6 Hole for camera

## 4.2. Round dampers

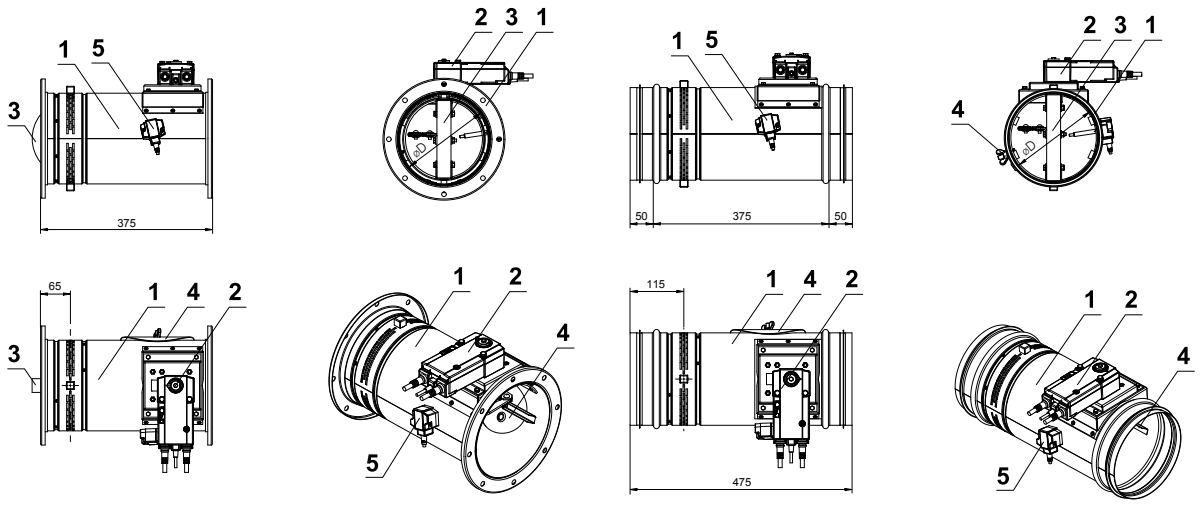
**Fig. 31 FDMB with mechanical control - round**



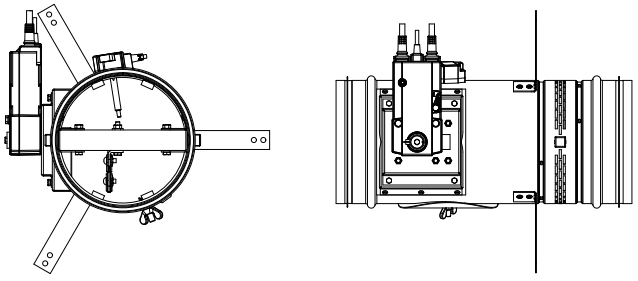

**Position:**

1 Damper casing
2 Mechanics
3 Damper blade
4 Inspection hole covering
5 Sensor sticker

**Fig. 32 FDMB with actuating mechanism - round**




**Fire damper with installation holders**



**Position:**

1 Damper casing
2 Actuating mechanism
3 Damper blade
4 Inspection hole covering
5 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 [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. | A x B [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **160 x 160** | - | 20 | 5,5 | 7,0 | 0,0113 | BFL | M1 | **200 x 315** | - | 97,5 | 8,0 | 9,5 | 0,0398 | BFL | M1 |
| **160 x 180** | - | 30 | 6,0 | 7,5 | 0,0137 | BFL | M1 | **200 x 355** | - | 117,5 | 9,0 | 10,5 | 0,0463 | BFL | M1 |
| **160 x 200** | - | 40 | 6,0 | 7,5 | 0,0161 | BFL | M1 | **200 x 400** | - | 140 | 9,5 | 11,0 | 0,0535 | BFL | M1 |
| **160 x 225** | - | 52,5 | 6,5 | 8,0 | 0,0191 | BFL | M1 | **200 x 450** | - | 165 | 10,0 | 13,0 | 0,0537 | BFL | M1 |
| **160 x 250** | - | 65 | 7,0 | 8,5 | 0,0222 | BFL | M1 | **200 x 500** | - | 190 | 10,5 | 13,5 | 0,0611 | BFL | M2 |
| **160 x 280** | - | 80 | 7,0 | 8,5 | 0,0258 | BFL | M1 | **200 x 550** | - | 215 | 11,5 | 14,5 | 0,0685 | BFL | M2 |
| **160 x 300** | - | 90,0 | 7,5 | 9,0 | 0,0282 | BFL | M1 | **200 x 560** | - | 220 | 11,5 | 14,5 | 0,0700 | BFL | M2 |
| **160 x 315** | - | 97,5 | 7,5 | 9,0 | 0,0300 | BFL | M1 | **200 x 600** | - | 240 | 12,0 | 15,0 | 0,0759 | BFL | M2 |
| **160 x 355** | - | 117,5 | 8,5 | 10,0 | 0,0349 | BFL | M1 | **200 x 630** | - | 255 | 12,5 | 15,5 | 0,0804 | BFL | M2 |
| **160 x 400** | - | 140 | 9,0 | 10,5 | 0,0403 | BFL | M1 | **200 x 650** | - | 265 | 12,5 | 15,5 | 0,0833 | BFL | M2 |
| **160 x 450** | - | 165 | 9,5 | 11,5 | 0,0392 | BFL | M1 | **200 x 700** | - | 290 | 13,0 | 16,0 | 0,0907 | BFN | M2 |
| **160 x 500** | - | 190 | 10,0 | 13,0 | 0,0446 | BFL | M2 | **200 x 710** | - | 295 | 13,5 | 16,5 | 0,0922 | BFN | M2 |
| **160 x 550** | - | 215 | 10,5 | 13,5 | 0,0500 | BFL | M2 | **200 x 750** | 15 | 315 | 14,0 | 17,0 | 0,0981 | BFN | M2 |
| **160 x 560** | - | 220 | 10,5 | 13,5 | 0,0511 | BFL | M2 | **200 x 800** | 40 | 340 | 14,5 | 17,5 | 0,1055 | BFN | M2 |
| **160 x 600** | - | 240 | 11,0 | 14,0 | 0,0554 | BFL | M2 | **200 x 900** | 90 | 390 | 15,5 | 18,5 | 0,1203 | BFN | M2 |
| **160 x 630** | - | 255 | 11,5 | 14,5 | 0,0586 | BFL | M2 | **200 x 1000** | 140 | 440 | 17,0 | 20,0 | 0,1351 | BFN | M2 |
| **160 x 650** | - | 265 | 11,5 | 14,5 | 0,0608 | BFL | M2 | **225 x 160** | - | 20 | 6,5 | 8,0 | 0,0171 | BFL | M1 |
| **160 x 700** | - | 290 | 12,5 | 15,5 | 0,0662 | BFL | M2 | **225 x 180** | - | 30 | 7,0 | 8,5 | 0,0209 | BFL | M1 |
| **160 x 710** | - | 295 | 12,5 | 15,5 | 0,0673 | BFL | M2 | **225 x 200** | - | 40 | 7,5 | 9,0 | 0,0246 | BFL | M1 |
| **160 x 750** | 15 | 315 | 13,0 | 16,0 | 0,0716 | BFN | M2 | **225 x 225** | - | 52,5 | 8,0 | 9,5 | 0,0292 | BFL | M1 |
| **160 x 800** | 40 | 340 | 13,5 | 16,5 | 0,0770 | BFN | M2 | **225 x 250** | - | 65 | 8,5 | 10,0 | 0,0339 | BFL | M1 |
| **160 x 900** | 90 | 390 | 14,5 | 17,5 | 0,0878 | BFN | M2 | **225 x 280** | - | 80 | 9,0 | 10,5 | 0,0395 | BFL | M1 |
| **160 x 1000** | 140 | 440 | 20,0 | 23,0 | 0,0986 | BFN | M2 | **225 x 300** | - | 90 | 9,5 | 11,0 | 0,0432 | BFL | M1 |
| **180 x 160** | - | 20 | 6,0 | 7,5 | 0,0131 | BFL | M1 | **225 x 315** | - | 97,5 | 9,5 | 11,0 | 0,0460 | BFL | M1 |
| **180 x 180** | - | 30 | 6,0 | 7,5 | 0,0159 | BFL | M1 | **225 x 355** | - | 117,5 | 10,0 | 11,5 | 0,0534 | BFL | M1 |
| **180 x 200** | - | 40 | 6,5 | 8,0 | 0,0187 | BFL | M1 | **225 x 400** | - | 140 | 10,5 | 12,0 | 0,0618 | BFL | M1 |
| **180 x 225** | - | 52,5 | 6,5 | 8,0 | 0,0222 | BFL | M1 | **225 x 450** | - | 165 | 11,5 | 13,0 | 0,0628 | BFL | M1 |
| **180 x 250** | - | 65,0 | 7,0 | 8,5 | 0,0258 | BFL | M1 | **225 x 500** | - | 190 | 12,5 | 14,0 | 0,0714 | BFL | M2 |
| **180 x 280** | - | 80 | 7,5 | 9,0 | 0,0300 | BFL | M1 | **225 x 550** | - | 215 | 13,5 | 15,0 | 0,0801 | BFL | M2 |
| **180 x 300** | - | 90 | 7,5 | 9,0 | 0,0328 | BFL | M1 | **225 x 560** | - | 220 | 13,5 | 15,0 | 0,0818 | BFL | M2 |
| **180 x 315** | - | 97,5 | 8,0 | 9,5 | 0,0349 | BFL | M1 | **225 x 600** | - | 240 | 14,0 | 15,5 | 0,0887 | BFL | M2 |
| **180 x 355** | - | 117,5 | 8,5 | 10,5 | 0,0406 | BFL | M1 | **225 x 630** | - | 255 | 14,5 | 16,0 | 0,0939 | BFN | M2 |
| **180 x 400** | - | 140 | 9,0 | 11,0 | 0,0469 | BFL | M1 | **225 x 650** | - | 265 | 15,0 | 16,5 | 0,0974 | BFN | M2 |
| **180 x 450** | - | 165 | 10,0 | 13,0 | 0,0465 | BFL | M1 | **225 x 700** | - | 290 | 16,0 | 17,5 | 0,1060 | BFN | M2 |
| **180 x 500** | - | 190 | 10,5 | 13,5 | 0,0529 | BFL | M2 | **225 x 710** | - | 295 | 16,0 | 17,5 | 0,1078 | BFN | M2 |
| **180 x 550** | - | 215 | 11,0 | 14,0 | 0,0593 | BFL | M2 | **225 x 750** | 15 | 315 | 16,5 | 18,0 | 0,1147 | BFN | M2 |
| **180 x 560** | - | 220 | 11,0 | 14,0 | 0,0605 | BFL | M2 | **225 x 800** | 40 | 340 | 17,5 | 19,0 | 0,1233 | BFN | M2 |
| **180 x 600** | - | 240 | 11,5 | 14,5 | 0,0657 | BFL | M2 | **225 x 900** | 90 | 390 | 19,0 | 22,0 | 0,1406 | BFN | M3 |
| **180 x 630** | - | 255 | 12,0 | 15,0 | 0,0695 | BFL | M2 | **225 x 1000** | 140 | 440 | 20,5 | 23,5 | 0,1579 | BF | M3 |
| **180 x 650** | - | 265 | 12,0 | 15,0 | 0,0721 | BFL | M2 | **250 x 160** | - | 20 | 6,5 | 8,0 | 0,0194 | BFL | M1 |
| **180 x 700** | - | 290 | 13,0 | 16,0 | 0,0785 | BFN | M2 | **250 x 180** | - | 30 | 7,0 | 8,5 | 0,0236 | BFL | M1 |
| **180 x 710** | - | 295 | 13,0 | 16,0 | 0,0797 | BFN | M2 | **250 x 200** | - | 40 | 7,0 | 8,5 | 0,0278 | BFL | M1 |
| **180 x 750** | 15 | 315 | 13,5 | 16,5 | 0,0849 | BFN | M2 | **250 x 225** | - | 52,5 | 7,5 | 9,0 | 0,0331 | BFL | M1 |
| **180 x 800** | 40 | 340 | 14,0 | 17,0 | 0,0913 | BFN | M2 | **250 x 250** | - | 65 | 8,0 | 9,5 | 0,0384 | BFL | M1 |
| **180 x 900** | 90 | 390 | 15,0 | 18,0 | 0,1041 | BFN | M2 | **250 x 280** | - | 80 | 8,5 | 10,0 | 0,0447 | BFL | M1 |
| **180 x 1000** | 140 | 440 | 20,5 | 23,5 | 0,1169 | BFN | M2 | **250 x 300** | - | 90 | 8,5 | 10,0 | 0,0489 | BFL | M1 |
| **200 x 160** | - | 20,0 | 6,0 | 7,5 | 0,0149 | BFL | M1 | **250 x 315** | - | 97,5 | 9,0 | 10,5 | 0,0521 | BFL | M1 |
| **200 x 180** | - | 30,0 | 6,5 | 8,0 | 0,0181 | BFL | M1 | **250 x 355** | - | 117,5 | 9,5 | 11,5 | 0,0605 | BFL | M1 |
| **200 x 200** | - | 40 | 6,5 | 8,0 | 0,0213 | BFL | M1 | **250 x 400** | - | 140 | 10,5 | 12,0 | 0,0700 | BFL | M1 |
| **200 x 225** | - | 52,5 | 7,0 | 8,5 | 0,0253 | BFL | M1 | **250 x 450** | - | 165 | 11,0 | 14,0 | 0,0719 | BFL | M1 |
| **200 x 250** | - | 65 | 7,5 | 9,0 | 0,0294 | BFL | M1 | **250 x 500** | - | 190 | 11,5 | 14,5 | 0,0818 | BFL | M2 |
| **200 x 280** | - | 80 | 7,5 | 9,0 | 0,0342 | BFL | M1 | **250 x 550** | - | 215 | 12,5 | 15,5 | 0,0917 | BFL | M2 |
| **200 x 300** | - | 90 | 8,0 | 9,5 | 0,0374 | BFL | M1 | **250 x 560** | - | 220 | 12,5 | 15,5 | 0,0937 | BFL | M2 |

| A x B [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. | A x B [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **250 x 600** | - | 240 | 13,0 | 16,0 | 0,1016 | BFN | M2 | **315 x 180** | - | 30 | 9,0 | 10,5 | 0,0308 | BFL | M1 |
| **250 x 630** | - | 255 | 13,5 | 16,5 | 0,1075 | BFN | M2 | **315 x 200** | - | 40 | 9,5 | 11,0 | 0,0363 | BFL | M1 |
| **250 x 650** | - | 265 | 13,5 | 16,5 | 0,1115 | BFN | M2 | **315 x 225** | - | 52,5 | 9,5 | 11,5 | 0,0432 | BFL | M1 |
| **250 x 700** | - | 290 | 14,5 | 17,5 | 0,1214 | BFN | M2 | **315 x 250** | - | 65 | 10,0 | 12,0 | 0,0501 | BFL | M1 |
| **250 x 710** | - | 295 | 14,5 | 17,5 | 0,1234 | BFN | M2 | **315 x 280** | - | 80 | 10,5 | 12,0 | 0,0584 | BFL | M1 |
| **250 x 750** | 15 | 315 | 15,0 | 18,0 | 0,1313 | BFN | M3 | **315 x 300** | - | 90 | 11,0 | 12,5 | 0,0639 | BFL | M1 |
| **250 x 800** | 40 | 340 | 15,5 | 18,5 | 0,1412 | BFN | M3 | **315 x 315** | - | 97,5 | 11,5 | 13,0 | 0,0680 | BFL | M1 |
| **250 x 900** | 90 | 390 | 17,0 | 20,0 | 0,1610 | BFN | M3 | **315 x 355** | - | 117,5 | 12,0 | 13,5 | 0,0791 | BFL | M1 |
| **250 x 1000** | 140 | 440 | 18,5 | 21,5 | 0,1808 | BF | M3 | **315 x 400** | - | 140 | 13,0 | 14,5 | 0,0915 | BFL | M1 |
| **280 x 160** | - | 20 | 7,0 | 8,5 | 0,0221 | BFL | M1 | **315 x 450** | - | 165 | 13,5 | 16,5 | 0,0955 | BFL | M1 |
| **280 x 180** | - | 30 | 7,0 | 9,0 | 0,0269 | BFL | M1 | **315 x 500** | - | 190 | 14,5 | 17,5 | 0,1086 | BFL | M2 |
| **280 x 200** | - | 40 | 7,5 | 9,0 | 0,0317 | BFL | M1 | **315 x 550** | - | 215 | 15,0 | 18,0 | 0,1218 | BFN | M2 |
| **280 x 225** | - | 52,5 | 8,0 | 9,5 | 0,0377 | BFL | M1 | **315 x 560** | - | 220 | 15,0 | 18,0 | 0,1244 | BFN | M2 |
| **280 x 250** | - | 65 | 8,5 | 10,0 | 0,0438 | BFL | M1 | **315 x 600** | - | 240 | 15,5 | 18,5 | 0,1349 | BFN | M2 |
| **280 x 280** | - | 80 | 8,5 | 10,5 | 0,0510 | BFL | M1 | **315 x 630** | - | 255 | 16,0 | 19,0 | 0,1428 | BFN | M2 |
| **280 x 300** | - | 90 | 9,0 | 10,5 | 0,0558 | BFL | M1 | **315 x 650** | - | 265 | 16,5 | 19,5 | 0,1481 | BFN | M2 |
| **280 x 315** | - | 97,5 | 9,0 | 11,0 | 0,0594 | BFL | M1 | **315 x 700** | - | 290 | 17,5 | 20,5 | 0,1612 | BFN | M2 |
| **280 x 355** | - | 117,5 | 10,0 | 12,0 | 0,0691 | BFL | M1 | **315 x 710** | - | 295 | 17,5 | 20,5 | 0,1638 | BFN | M2 |
| **280 x 400** | - | 140 | 11,0 | 12,5 | 0,0799 | BFL | M1 | **315 x 750** | 15 | 315 | 18,0 | 21,0 | 0,1744 | BFN | M3 |
| **280 x 450** | - | 165 | 11,5 | 14,5 | 0,0828 | BFL | M1 | **315 x 800** | 40 | 340 | 18,5 | 21,5 | 0,1875 | BFN | M3 |
| **280 x 500** | - | 190 | 12,0 | 15,0 | 0,0942 | BFL | M2 | **315 x 900** | 90 | 390 | 20,0 | 23,0 | 0,2138 | BF | M3 |
| **280 x 550** | - | 215 | 13,0 | 16,0 | 0,1056 | BFL | M2 | **315 x 1000** | 140 | 440 | 21,5 | 24,5 | 0,2401 | BF | M3 |
| **280 x 560** | - | 220 | 13,0 | 16,0 | 0,1078 | BFN | M2 | **355 x 160** | - | 20 | 7,5 | 9,5 | 0,0288 | BFL | M1 |
| **280 x 600** | - | 240 | 13,5 | 16,5 | 0,1170 | BFN | M2 | **355 x 180** | - | 30 | 8,0 | 9,5 | 0,0352 | BFL | M1 |
| **280 x 630** | - | 255 | 14,0 | 17,0 | 0,1238 | BFN | M2 | **355 x 200** | - | 40 | 8,5 | 10,0 | 0,0415 | BFL | M1 |
| **280 x 650** | - | 265 | 14,5 | 17,5 | 0,1284 | BFN | M2 | **355 x 225** | - | 52,5 | 9,0 | 10,5 | 0,0494 | BFL | M1 |
| **280 x 700** | - | 290 | 15,0 | 18,0 | 0,1398 | BFN | M2 | **355 x 250** | - | 65 | 9,5 | 11,0 | 0,0573 | BFL | M1 |
| **280 x 710** | - | 295 | 15,0 | 18,0 | 0,1420 | BFN | M2 | **355 x 280** | - | 80 | 10,0 | 11,5 | 0,0668 | BFL | M1 |
| **280 x 750** | 15 | 315 | 15,5 | 18,5 | 0,1512 | BFN | M3 | **355 x 300** | - | 90 | 10,0 | 11,5 | 0,0731 | BFL | M1 |
| **280 x 800** | 40 | 340 | 16,5 | 19,5 | 0,1626 | BFN | M3 | **355 x 315** | - | 97,5 | 11,0 | 12,0 | 0,0778 | BFL | M1 |
| **280 x 900** | 90 | 390 | 18,0 | 21,0 | 0,1854 | BF | M3 | **355 x 355** | - | 117,5 | 11,5 | 13,0 | 0,0905 | BFL | M1 |
| **280 x 1000** | 140 | 440 | 23,5 | 26,5 | 0,2082 | BF | M3 | **355 x 400** | - | 140 | 12,0 | 13,5 | 0,1047 | BFL | M1 |
| **300 x 160** | - | 20 | 7,0 | 8,5 | 0,0239 | BFL | M1 | **355 x 450** | - | 165 | 13,0 | 16,0 | 0,1100 | BFL | M1 |
| **300 x 180** | - | 30 | 7,5 | 9,0 | 0,0291 | BFL | M1 | **355 x 500** | - | 190 | 13,5 | 16,5 | 0,1251 | BFN | M2 |
| **300 x 200** | - | 40 | 7,5 | 9,5 | 0,0343 | BFL | M1 | **355 x 550** | - | 215 | 14,5 | 17,5 | 0,1403 | BFN | M2 |
| **300 x 225** | - | 52,5 | 8,0 | 9,5 | 0,0408 | BFL | M1 | **355 x 560** | - | 220 | 14,5 | 17,5 | 0,1433 | BFN | M2 |
| **300 x 250** | - | 65 | 8,5 | 10,0 | 0,0474 | BFL | M1 | **355 x 600** | - | 240 | 15,0 | 18,0 | 0,1554 | BFN | M2 |
| **300 x 280** | - | 80 | 9,0 | 10,5 | 0,0552 | BFL | M1 | **355 x 630** | - | 255 | 15,5 | 18,5 | 0,1645 | BFN | M2 |
| **300 x 300** | - | 90 | 9,5 | 11,0 | 0,0604 | BFL | M1 | **355 x 650** | - | 265 | 16,0 | 19,0 | 0,1706 | BFN | M2 |
| **300 x 315** | - | 97,5 | 9,5 | 11,0 | 0,0643 | BFL | M1 | **355 x 700** | - | 290 | 17,0 | 20,0 | 0,1857 | BFN | M2 |
| **300 x 355** | - | 117,5 | 10,5 | 12,0 | 0,0748 | BFL | M1 | **355 x 710** | - | 295 | 17,0 | 20,0 | 0,1888 | BFN | M2 |
| **300 x 400** | - | 140 | 11,0 | 12,5 | 0,0865 | BFL | M1 | **355 x 750** | 15 | 315 | 17,5 | 20,5 | 0,2009 | BFN | M3 |
| **300 x 450** | - | 165 | 12,0 | 15,0 | 0,0900 | BFL | M1 | **355 x 800** | 40 | 340 | 18,5 | 21,5 | 0,2160 | BF | M3 |
| **300 x 500** | - | 190 | 12,5 | 15,5 | 0,1024 | BFL | M2 | **355 x 900** | 90 | 390 | 20,0 | 23,0 | 0,2463 | BF | M3 |
| **300 x 550** | - | 215 | 13,5 | 16,5 | 0,1148 | BFN | M2 | **355 x 1000** | 140 | 440 | 21,5 | 24,5 | 0,2766 | BF | M4 |
| **300 x 560** | - | 220 | 13,5 | 16,5 | 0,1173 | BFN | M2 | **400 x 160** | - | 20 | 8,0 | 10,0 | 0,0329 | BFL | M1 |
| **300 x 600** | - | 240 | 14,0 | 17,0 | 0,1272 | BFN | M2 | **400 x 180** | - | 30 | 8,5 | 10,0 | 0,0401 | BFL | M1 |
| **300 x 630** | - | 255 | 14,5 | 17,5 | 0,1347 | BFN | M2 | **400 x 200** | - | 40 | 9,0 | 10,5 | 0,0473 | BFL | M1 |
| **300 x 650** | - | 265 | 14,5 | 17,5 | 0,1396 | BFN | M2 | **400 x 225** | - | 52,5 | 9,5 | 11,0 | 0,0563 | BFL | M1 |
| **300 x 700** | - | 290 | 15,5 | 18,5 | 0,1520 | BFN | M2 | **400 x 250** | - | 65 | 10,0 | 11,5 | 0,0654 | BFL | M1 |
| **300 x 710** | - | 295 | 15,5 | 18,5 | 0,1545 | BFN | M2 | **400 x 280** | - | 80 | 10,5 | 12,0 | 0,0762 | BFL | M1 |
| **300 x 750** | 15 | 315 | 16,0 | 19,0 | 0,1644 | BFN | M3 | **400 x 300** | - | 90 | 10,5 | 12,5 | 0,0834 | BFL | M1 |
| **300 x 800** | 40 | 340 | 17,0 | 20,0 | 0,1768 | BFN | M3 | **400 x 315** | - | 97,5 | 11,0 | 12,5 | 0,0888 | BFL | M1 |
| **300 x 900** | 90 | 390 | 18,5 | 21,5 | 0,2016 | BF | M3 | **400 x 355** | - | 117,5 | 12,0 | 13,5 | 0,1033 | BFL | M1 |
| **300 x 1000** | 140 | 440 | 20,0 | 23,0 | 0,2264 | BF | M3 | **400 x 400** | - | 140 | 13,0 | 14,5 | 0,1195 | BFL | M1 |
| **315 x 160** | - | 20 | 8,5 | 10,5 | 0,0252 | BFL | M1 | **400 x 450** | - | 165 | 13,5 | 16,5 | 0,1263 | BFL | M1 |

| A x B [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. | A x B [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **400 x 500** | - | 190 | 14,5 | 17,5 | 0,1437 | BFN | M2 | **500 x 750** | 15 | 315 | 21,0 | 24,0 | 0,2970 | BF | M3 |
| **400 x 550** | - | 215 | 15,5 | 18,5 | 0,1611 | BFN | M2 | **500 x 800** | 40 | 340 | 22,0 | 25,0 | 0,3194 | BF | M3 |
| **400 x 560** | - | 220 | 15,5 | 18,5 | 0,1646 | BFN | M2 | **500 x 900** | 90 | 390 | 24,0 | 27,0 | 0,3642 | BF | M3 |
| **400 x 600** | - | 240 | 16,0 | 19,0 | 0,1785 | BFN | M2 | **500 x 1000** | 140 | 440 | 25,5 | 28,5 | 0,4090 | BF | M4 |
| **400 x 630** | - | 255 | 16,5 | 19,5 | 0,1890 | BFN | M2 | **550 x 160** | - | 20 | 10,0 | 13,0 | 0,0364 | BFL | M1 |
| **400 x 650** | - | 265 | 17,0 | 20,0 | 0,1959 | BFN | M2 | **550 x 180** | - | 30 | 10,5 | 13,5 | 0,0463 | BFL | M1 |
| **400 x 700** | - | 290 | 18,0 | 21,0 | 0,2133 | BFN | M2 | **550 x 200** | - | 40 | 10,5 | 13,5 | 0,0563 | BFL | M1 |
| **400 x 710** | - | 295 | 18,0 | 21,0 | 0,2168 | BFN | M2 | **550 x 225** | - | 52,5 | 11,0 | 14,0 | 0,0687 | BFL | M1 |
| **400 x 750** | 15 | 315 | 18,5 | 21,5 | 0,2307 | BF | M3 | **550 x 250** | - | 65 | 12,0 | 15,0 | 0,0812 | BFL | M1 |
| **400 x 800** | 40 | 340 | 19,5 | 22,5 | 0,2481 | BF | M3 | **550 x 280** | - | 80 | 12,5 | 15,5 | 0,0961 | BFL | M1 |
| **400 x 900** | 90 | 390 | 21,0 | 24,0 | 0,2829 | BF | M3 | **550 x 300** | - | 90 | 13,0 | 16,0 | 0,1061 | BFL | M1 |
| **400 x 1000** | 140 | 440 | 23,0 | 26,0 | 0,3177 | BF | M4 | **550 x 315** | - | 97,5 | 13,0 | 16,0 | 0,1135 | BFL | M1 |
| **450 x 160** | - | 20 | 9,0 | 10,5 | 0,0374 | BFL | M1 | **550 x 355** | - | 117,5 | 14,5 | 17,5 | 0,1335 | BFL | M1 |
| **450 x 180** | - | 30 | 9,0 | 10,5 | 0,0456 | BFL | M1 | **550 x 400** | - | 140 | 15,0 | 18,0 | 0,1559 | BFN | M2 |
| **450 x 200** | - | 40 | 9,5 | 11,0 | 0,0538 | BFL | M1 | **550 x 450** | - | 165 | 16,0 | 19,0 | 0,1808 | BFN | M2 |
| **450 x 225** | - | 52,5 | 10,0 | 11,5 | 0,0641 | BFL | M1 | **550 x 500** | - | 190 | 17,0 | 20,0 | 0,2057 | BFN | M2 |
| **450 x 250** | - | 65 | 10,5 | 12,0 | 0,0744 | BFL | M1 | **550 x 550** | - | 215 | 18,0 | 21,0 | 0,2306 | BFN | M2 |
| **450 x 280** | - | 80 | 11,0 | 12,5 | 0,0867 | BFL | M1 | **550 x 560** | - | 220 | 18,5 | 21,5 | 0,2356 | BFN | M2 |
| **450 x 300** | - | 90 | 11,5 | 13,0 | 0,0949 | BFL | M1 | **550 x 600** | - | 240 | 19,0 | 22,0 | 0,2555 | BFN | M2 |
| **450 x 315** | - | 97,5 | 11,5 | 13,5 | 0,1011 | BFL | M1 | **550 x 630** | - | 255 | 20,0 | 23,0 | 0,2704 | BF | M2 |
| **450 x 355** | - | 117,5 | 13,0 | 14,5 | 0,1175 | BFL | M1 | **550 x 650** | - | 265 | 20,0 | 23,0 | 0,2804 | BF | M2 |
| **450 x 400** | - | 140 | 13,5 | 15,0 | 0,1360 | BFL | M1 | **550 x 700** | - | 290 | 21,5 | 24,5 | 0,3053 | BF | M2 |
| **450 x 450** | - | 165 | 14,5 | 17,5 | 0,1445 | BFN | M2 | **550 x 710** | - | 295 | 21,5 | 24,5 | 0,3103 | BF | M2 |
| **450 x 500** | - | 190 | 15,5 | 18,5 | 0,1644 | BFN | M2 | **550 x 750** | 15 | 315 | 22,0 | 25,0 | 0,3302 | BF | M3 |
| **450 x 550** | - | 215 | 16,5 | 19,5 | 0,1843 | BFN | M2 | **550 x 800** | 40 | 340 | 23,0 | 26,0 | 0,3551 | BF | M3 |
| **450 x 560** | - | 220 | 16,5 | 19,5 | 0,1883 | BFN | M2 | **550 x 900** | 90 | 390 | 25,0 | 28,0 | 0,4049 | BF | M3 |
| **450 x 600** | - | 240 | 17,0 | 20,0 | 0,2042 | BFN | M2 | **560 x 160** | - | 20 | 10,0 | 13,0 | 0,0371 | BFL | M1 |
| **450 x 630** | - | 255 | 17,5 | 20,5 | 0,2161 | BFN | M2 | **560 x 180** | - | 30 | 10,5 | 13,5 | 0,0472 | BFL | M1 |
| **450 x 650** | - | 265 | 18,0 | 21,0 | 0,2241 | BFN | M2 | **560 x 200** | - | 40 | 11,0 | 14,0 | 0,0574 | BFL | M1 |
| **450 x 700** | - | 290 | 19,0 | 22,0 | 0,2440 | BF | M2 | **560 x 225** | - | 52,5 | 11,5 | 14,5 | 0,0701 | BFL | M1 |
| **450 x 710** | - | 295 | 19,0 | 22,0 | 0,2480 | BF | M2 | **560 x 250** | - | 65 | 12,0 | 15,0 | 0,0828 | BFL | M1 |
| **450 x 750** | 15 | 315 | 20,0 | 23,0 | 0,2639 | BF | M3 | **560 x 280** | - | 80 | 12,5 | 15,5 | 0,0980 | BFL | M1 |
| **450 x 800** | 40 | 340 | 20,5 | 23,5 | 0,2838 | BF | M3 | **560 x 300** | - | 90 | 13,0 | 16,0 | 0,1082 | BFL | M1 |
| **450 x 900** | 90 | 390 | 22,5 | 25,5 | 0,3236 | BF | M3 | **560 x 315** | - | 97,5 | 13,0 | 16,0 | 0,1158 | BFL | M1 |
| **450 x 1000** | 140 | 440 | 24,0 | 27,0 | 0,3634 | BF | M4 | **560 x 355** | - | 117,5 | 14,5 | 17,5 | 0,1361 | BFL | M1 |
| **500 x 160** | - | 20 | 9,5 | 11,0 | 0,0419 | BFL | M1 | **560 x 400** | - | 140 | 15,5 | 18,5 | 0,1590 | BFN | M2 |
| **500 x 180** | - | 30 | 9,5 | 11,5 | 0,0511 | BFL | M1 | **560 x 450** | - | 165 | 16,5 | 19,5 | 0,1844 | BFN | M2 |
| **500 x 200** | - | 40 | 10,0 | 11,5 | 0,0603 | BFL | M1 | **560 x 500** | - | 190 | 17,5 | 20,5 | 0,2098 | BFN | M2 |
| **500 x 225** | - | 52,5 | 10,5 | 12,5 | 0,0718 | BFL | M1 | **560 x 550** | - | 215 | 18,5 | 21,5 | 0,2352 | BFN | M2 |
| **500 x 250** | - | 65 | 11,0 | 13,0 | 0,0834 | BFL | M1 | **560 x 560** | - | 220 | 18,5 | 21,5 | 0,2403 | BFN | M2 |
| **500 x 280** | - | 80 | 11,5 | 13,5 | 0,0972 | BFL | M1 | **560 x 600** | - | 240 | 19,5 | 22,5 | 0,2606 | BFN | M2 |
| **500 x 300** | - | 90 | 12,0 | 13,5 | 0,1064 | BFL | M1 | **560 x 630** | - | 255 | 20,0 | 23,0 | 0,2758 | BF | M2 |
| **500 x 315** | - | 97,5 | 12,5 | 14,0 | 0,1133 | BFL | M1 | **560 x 650** | - | 265 | 20,5 | 23,5 | 0,2860 | BF | M2 |
| **500 x 355** | - | 117,5 | 13,5 | 15,0 | 0,1318 | BFL | M1 | **560 x 700** | - | 290 | 21,5 | 24,5 | 0,3114 | BF | M2 |
| **500 x 400** | - | 140 | 14,5 | 16,0 | 0,1525 | BFL | M2 | **560 x 710** | - | 295 | 21,5 | 24,5 | 0,3165 | BF | M2 |
| **500 x 450** | - | 165 | 15,5 | 18,5 | 0,1626 | BFN | M2 | **560 x 750** | 15 | 315 | 22,5 | 25,5 | 0,3368 | BF | M3 |
| **500 x 500** | - | 190 | 16,5 | 19,5 | 0,1850 | BFN | M2 | **560 x 800** | 40 | 340 | 23,5 | 26,5 | 0,3622 | BF | M3 |
| **500 x 550** | - | 215 | 17,0 | 20,0 | 0,2074 | BFN | M2 | **600 x 160** | - | 20 | 10,5 | 13,5 | 0,0400 | BFL | M1 |
| **500 x 560** | - | 220 | 17,5 | 20,5 | 0,2119 | BFN | M2 | **600 x 180** | - | 30 | 11,0 | 14,0 | 0,0510 | BFL | M1 |
| **500 x 600** | - | 240 | 18,0 | 21,0 | 0,2298 | BFN | M2 | **600 x 200** | - | 40 | 11,0 | 14,0 | 0,0619 | BFL | M1 |
| **500 x 630** | - | 255 | 19,0 | 22,0 | 0,2433 | BFN | M2 | **600 x 225** | - | 52,5 | 12,0 | 15,0 | 0,0756 | BFL | M1 |
| **500 x 650** | - | 265 | 19,0 | 22,0 | 0,2522 | BF | M2 | **600 x 250** | - | 65 | 12,5 | 15,5 | 0,0893 | BFL | M1 |
| **500 x 700** | - | 290 | 20,0 | 23,0 | 0,2746 | BF | M2 | **600 x 280** | - | 80 | 13,0 | 16,0 | 0,1058 | BFL | M1 |
| **500 x 710** | - | 295 | 20,5 | 23,5 | 0,2791 | BF | M2 | **600 x 300** | - | 90 | 13,5 | 16,5 | 0,1167 | BFL | M1 |

| A x B [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. | A x B [mm] | a [mm] | c [mm] | Weight Design mech [kg] | Weight Design servo [kg] | Effect. area Sef [m²] | Actu. mech. | Mech. contr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **600 x 315** | - | 97,5 | 14,0 | 17,0 | 0,1249 | BFL | M1 | **650 x 750** | 15 | 315 | 24,5 | 27,5 | 0,3965 | BF | M3 |
| **600 x 355** | - | 117,5 | 15,0 | 18,0 | 0,1469 | BFL | M2 | **700 x 160** | - | 20 | 11,5 | 14,5 | 0,0473 | BFL | M1 |
| **600 x 400** | - | 140 | 16,0 | 19,0 | 0,1715 | BFN | M2 | **700 x 180** | - | 30 | 12,0 | 15,0 | 0,0603 | BFL | M1 |
| **600 x 450** | - | 165 | 17,0 | 20,0 | 0,1989 | BFN | M2 | **700 x 200** | - | 40 | 12,5 | 15,5 | 0,0732 | BFL | M1 |
| **600 x 500** | - | 190 | 18,0 | 21,0 | 0,2263 | BFN | M2 | **700 x 225** | - | 52,5 | 13,0 | 16,0 | 0,0894 | BFL | M1 |
| **600 x 550** | - | 215 | 19,0 | 22,0 | 0,2537 | BFN | M2 | **700 x 250** | - | 65 | 13,5 | 16,5 | 0,1056 | BFL | M1 |
| **600 x 560** | - | 220 | 19,5 | 22,5 | 0,2592 | BFN | M2 | **700 x 280** | - | 80 | 14,5 | 17,5 | 0,1251 | BFL | M1 |
| **600 x 600** | - | 240 | 20,5 | 23,5 | 0,2811 | BF | M2 | **700 x 300** | - | 90 | 15,0 | 18,0 | 0,1380 | BFL | M2 |
| **600 x 630** | - | 255 | 21,0 | 24,0 | 0,2976 | BF | M2 | **700 x 315** | - | 97,5 | 15,5 | 18,5 | 0,1477 | BFL | M2 |
| **600 x 650** | - | 265 | 21,5 | 24,5 | 0,3085 | BF | M2 | **700 x 355** | - | 117,5 | 16,5 | 19,5 | 0,1737 | BFN | M2 |
| **600 x 700** | - | 290 | 22,5 | 25,5 | 0,3359 | BF | M2 | **700 x 400** | - | 140 | 17,5 | 20,5 | 0,2028 | BFN | M2 |
| **600 x 710** | - | 295 | 22,5 | 25,5 | 0,3414 | BF | M2 | **700 x 450** | - | 165 | 19,0 | 22,0 | 0,2352 | BFN | M2 |
| **600 x 750** | 15 | 315 | 23,5 | 26,5 | 0,3633 | BF | M3 | **700 x 500** | - | 190 | 20,5 | 23,5 | 0,2676 | BFN | M2 |
| **600 x 800** | 40 | 340 | 24,5 | 27,5 | 0,3907 | BF | M3 | **700 x 550** | - | 215 | 22,0 | 26,5 | 0,3000 | BF | M2 |
| **630 x 160** | - | 20 | 10,5 | 13,5 | 0,0422 | BFL | M1 | **700 x 560** | - | 220 | 22,5 | 27,0 | 0,3065 | BF | M2 |
| **630 x 180** | - | 30 | 11,0 | 14,0 | 0,0538 | BFL | M1 | **700 x 600** | - | 240 | 23,5 | 28,0 | 0,3324 | BF | M2 |
| **630 x 200** | - | 40 | 11,5 | 14,5 | 0,0653 | BFL | M1 | **700 x 630** | - | 255 | 24,5 | 29,0 | 0,3519 | BF | M2 |
| **630 x 225** | - | 52,5 | 12,0 | 15,0 | 0,0798 | BFL | M1 | **700 x 650** | - | 265 | 25,0 | 29,5 | 0,3648 | BF | M2 |
| **630 x 250** | - | 65 | 13,0 | 16,0 | 0,0942 | BFL | M1 | **700 x 700** | - | 290 | 26,5 | 31,0 | 0,3972 | BF | M2 |
| **630 x 280** | - | 80 | 13,5 | 16,5 | 0,1116 | BFL | M1 | **700 x 710** | - | 295 | 27,0 | 31,5 | 0,4037 | BF | M2 |
| **630 x 300** | - | 90 | 14,0 | 17,0 | 0,1231 | BFL | M1 | **710 x 160** | - | 20 | 11,5 | 15,5 | 0,0480 | BFL | M1 |
| **630 x 315** | - | 97,5 | 14,0 | 17,0 | 0,1318 | BFL | M1 | **710 x 180** | - | 30 | 12,0 | 16,0 | 0,0612 | BFL | M1 |
| **630 x 355** | - | 117,5 | 15,5 | 18,5 | 0,1549 | BFL | M2 | **710 x 200** | - | 40 | 12,5 | 15,5 | 0,0744 | BFL | M1 |
| **630 x 400** | - | 140 | 16,5 | 19,5 | 0,1809 | BFN | M2 | **710 x 225** | - | 52,5 | 13,0 | 16,0 | 0,0908 | BFL | M1 |
| **630 x 450** | - | 165 | 17,5 | 20,5 | 0,2098 | BFN | M2 | **710 x 250** | - | 65 | 14,0 | 17,0 | 0,1073 | BFL | M1 |
| **630 x 500** | - | 190 | 18,5 | 21,5 | 0,2387 | BFN | M2 | **710 x 280** | - | 80 | 14,5 | 17,5 | 0,1270 | BFL | M1 |
| **630 x 550** | - | 215 | 20,0 | 23,0 | 0,2676 | BFN | M2 | **710 x 300** | - | 90 | 15,0 | 18,0 | 0,1402 | BFL | M2 |
| **630 x 560** | - | 220 | 20,0 | 23,0 | 0,2734 | BFN | M2 | **710 x 315** | - | 97,5 | 15,5 | 18,5 | 0,1500 | BFL | M2 |
| **630 x 600** | - | 240 | 21,0 | 24,0 | 0,2965 | BF | M2 | **710 x 355** | - | 117,5 | 17,0 | 20,0 | 0,1763 | BFN | M2 |
| **630 x 630** | - | 255 | 21,5 | 24,5 | 0,3139 | BF | M2 | **710 x 400** | - | 140 | 18,0 | 21,0 | 0,2060 | BFN | M2 |
| **630 x 650** | - | 265 | 22,0 | 25,0 | 0,3254 | BF | M2 | **710 x 450** | - | 165 | 19,0 | 22,0 | 0,2389 | BFN | M2 |
| **630 x 700** | - | 290 | 23,5 | 26,5 | 0,3543 | BF | M2 | **710 x 500** | - | 190 | 20,0 | 23,0 | 0,2718 | BFN | M2 |
| **630 x 710** | - | 295 | 23,5 | 26,5 | 0,3601 | BF | M2 | **710 x 550** | - | 215 | 21,5 | 24,5 | 0,3047 | BF | M2 |
| **630 x 750** | 15 | 315 | 24,0 | 27,0 | 0,3832 | BF | M3 | **710 x 560** | - | 220 | 21,5 | 24,5 | 0,3112 | BF | M2 |
| **650 x 160** | - | 20 | 11,0 | 14,0 | 0,0437 | BFL | M1 | **710 x 600** | - | 240 | 22,5 | 25,5 | 0,3376 | BF | M2 |
| **650 x 180** | - | 30 | 11,5 | 14,5 | 0,0556 | BFL | M1 | **710 x 630** | - | 255 | 23,5 | 26,5 | 0,3573 | BF | M2 |
| **650 x 200** | - | 40 | 12,0 | 15,0 | 0,0676 | BFL | M1 | **710 x 650** | - | 265 | 23,5 | 26,5 | 0,3705 | BF | M2 |
| **650 x 225** | - | 52,5 | 12,5 | 15,5 | 0,0825 | BFL | M1 | **710 x 700** | - | 290 | 25,0 | 28,0 | 0,4034 | BF | M2 |
| **650 x 250** | - | 65 | 13,0 | 16,0 | 0,0975 | BFL | M1 | **750 x 160** | - | 20 | 12,0 | 15,0 | 0,0510 | BFL | M1 |
| **650 x 280** | - | 80 | 14,0 | 17,0 | 0,1154 | BFL | M1 | **750 x 180** | - | 30 | 12,5 | 15,5 | 0,0649 | BFL | M1 |
| **650 x 300** | - | 90 | 14,0 | 17,0 | 0,1274 | BFL | M1 | **750 x 200** | - | 40 | 13,0 | 16,0 | 0,0789 | BFL | M1 |
| **650 x 315** | - | 97,5 | 14,5 | 17,5 | 0,1363 | BFL | M2 | **750 x 225** | - | 52,5 | 13,5 | 16,5 | 0,0963 | BFL | M1 |
| **650 x 355** | - | 117,5 | 16,0 | 19,0 | 0,1603 | BFL | M2 | **750 x 250** | - | 65 | 14,5 | 17,5 | 0,1138 | BFL | M1 |
| **650 x 400** | - | 140 | 17,0 | 20,0 | 0,1872 | BFN | M2 | **750 x 280** | - | 80 | 15,0 | 18,0 | 0,1347 | BFL | M2 |
| **650 x 450** | - | 165 | 18,0 | 21,0 | 0,2171 | BFN | M2 | **750 x 300** | - | 90 | 15,5 | 18,5 | 0,1487 | BFL | M2 |
| **650 x 500** | - | 190 | 19,0 | 22,0 | 0,2470 | BFN | M2 | **750 x 315** | - | 97,5 | 16,0 | 19,0 | 0,1591 | BFL | M2 |
| **650 x 550** | - | 215 | 20,0 | 23,0 | 0,2769 | BFN | M2 | **750 x 355** | - | 117,5 | 17,5 | 20,5 | 0,1871 | BFN | M2 |
| **650 x 560** | - | 220 | 20,5 | 23,5 | 0,2829 | BF | M2 | **750 x 400** | - | 140 | 18,5 | 21,5 | 0,2185 | BFN | M2 |
| **650 x 600** | - | 240 | 21,5 | 24,5 | 0,3068 | BF | M2 | **750 x 450** | - | 165 | 19,5 | 22,5 | 0,2534 | BFN | M2 |
| **650 x 630** | - | 255 | 22,0 | 25,0 | 0,3247 | BF | M2 | **750 x 500** | - | 190 | 21,0 | 24,0 | 0,2883 | BFN | M2 |
| **650 x 650** | - | 265 | 22,5 | 25,5 | 0,3367 | BF | M2 | **750 x 550** | - | 215 | 22,0 | 25,0 | 0,3232 | BF | M2 |
| **650 x 700** | - | 290 | 23,5 | 26,5 | 0,3666 | BF | M2 | **750 x 560** | - | 220 | 22,5 | 25,5 | 0,3302 | BF | M2 |
| **650 x 710** | - | 295 | 24,0 | 27,0 | 0,3726 | BF | M2 | **750 x 600** | - | 240 | 23,5 | 26,5 | 0,3581 | BF | M2 |

| A x B [mm] | a [mm] | c [mm] | Weight | | Effect. area | Actu. mech. | Mech. contr. | A x B [mm] | a [mm] | c [mm] | Weight | | Effect. area | Actu. mech. | Mech. contr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Design | | | | | | | | Design | | | | |
| | | | mech [kg] | servo [kg] | Sef [m²] | | | | | | mech [kg] | servo [kg] | Sef [m²] | | |
| **750 x 630** | - | 255 | 24,0 | 27,0 | 0,3790 | BF | M2 | **900 x 250** | - | 65 | 16,5 | 19,5 | 0,1382 | BFL | M2 |
| **750 x 650** | - | 265 | 24,5 | 27,5 | 0,3930 | BF | M2 | **900 x 280** | - | 80 | 17,0 | 20,0 | 0,1637 | BFL | M2 |
| **800 x 160** | - | 20 | 12,5 | 15,5 | 0,0546 | BFL | M1 | **900 x 300** | - | 90 | 17,5 | 20,5 | 0,1806 | BFL | M2 |
| **800 x 180** | - | 30 | 13,0 | 16,0 | 0,0696 | BFL | M1 | **900 x 315** | - | 97,5 | 18,0 | 21,0 | 0,1933 | BFN | M2 |
| **800 x 200** | - | 40 | 13,5 | 16,5 | 0,0845 | BFL | M1 | **900 x 355** | - | 117,5 | 19,5 | 22,5 | 0,2273 | BFN | M2 |
| **800 x 225** | - | 52,5 | 14,5 | 17,5 | 0,1032 | BFL | M1 | **900 x 400** | - | 140 | 21,0 | 24,0 | 0,2654 | BFN | M2 |
| **800 x 250** | - | 65 | 15,0 | 18,0 | 0,1219 | BFL | M2 | **900 x 450** | - | 165 | 22,5 | 25,5 | 0,3078 | BFN | M2 |
| **800 x 280** | - | 80 | 16,0 | 19,0 | 0,1444 | BFL | M2 | **900 x 500** | - | 190 | 23,5 | 26,5 | 0,3502 | BF | M2 |
| **800 x 300** | - | 90 | 16,5 | 19,5 | 0,1593 | BFL | M2 | **900 x 550** | - | 215 | 25,0 | 28,0 | 0,3926 | BF | M2 |
| **800 x 315** | - | 97,5 | 16,5 | 19,5 | 0,1705 | BFL | M2 | **1000 x 160** | - | 20 | 15,0 | 18,0 | 0,0692 | BFL | M1 |
| **800 x 355** | - | 117,5 | 18,0 | 21,0 | 0,2005 | BFN | M2 | **1000 x 180** | - | 30 | 15,5 | 18,5 | 0,0882 | BFL | M1 |
| **800 x 400** | - | 140 | 19,5 | 22,5 | 0,2341 | BFN | M2 | **1000 x 200** | - | 40 | 16,0 | 19,0 | 0,1071 | BFL | M2 |
| **800 x 450** | - | 165 | 20,5 | 23,5 | 0,2715 | BFN | M2 | **1000 x 225** | - | 52,5 | 17,0 | 20,0 | 0,1308 | BFL | M2 |
| **800 x 500** | - | 190 | 22,0 | 25,0 | 0,3089 | BFN | M2 | **1000 x 250** | - | 65 | 17,5 | 20,5 | 0,1545 | BFL | M2 |
| **800 x 550** | - | 215 | 23,0 | 26,0 | 0,3463 | BF | M2 | **1000 x 280** | - | 80 | 18,5 | 21,5 | 0,1830 | BFL | M2 |
| **800 x 560** | - | 220 | 23,5 | 26,5 | 0,3538 | BF | M2 | **1000 x 300** | - | 90 | 19,0 | 22,0 | 0,2019 | BFN | M2 |
| **800 x 600** | - | 240 | 24,5 | 27,5 | 0,3837 | BF | M2 | **1000 x 315** | - | 97,5 | 19,5 | 22,5 | 0,2161 | BFN | M2 |
| **900 x 160** | - | 20 | 13,5 | 16,5 | 0,0619 | BFL | M1 | **1000 x 355** | - | 117,5 | 21,0 | 24,0 | 0,2541 | BFN | M2 |
| **900 x 180** | - | 30 | 14,0 | 17,0 | 0,0789 | BFL | M1 | **1000 x 400** | - | 140 | 22,5 | 25,5 | 0,2967 | BFN | M2 |
| **900 x 200** | - | 40 | 15,0 | 18,0 | 0,0958 | BFL | M1 | **1000 x 450** | - | 165 | 24,0 | 27,0 | 0,3441 | BFN | M2 |
| **900 x 225** | - | 52,5 | 15,5 | 18,5 | 0,1170 | BFL | M2 | **1000 x 500** | - | 190 | 25,5 | 28,5 | 0,3915 | BF | M2 |

## 4.4. Round dampers - dimensions, weights and effective area

**Tab. 4.4.1. Round dampers - dimensions, weights and effective area**

| Nominal size øD [mm] | a [mm] | c [mm] | f [mm] | Weight | | Effective area $S_{ef}$ [m²] | Actuating mechanism | Mechanical control |
|---|---|---|---|---|---|---|---|---|
| | | | | design | | | | |
| | | | | manual [kg] | act. mech. [kg] | | | |
| **160** | - | - | - | 5,6 | 7,2 | 0,0132 | BFL | M1 |
| **180** | - | - | - | 6,7 | 8,3 | 0,0176 | BFL | M1 |
| **200** | - | - | - | 7,7 | 9,3 | 0,0227 | BFL | M1 |
| **225** | - | 12,5 | - | 8,2 | 9,8 | 0,0299 | BFL | M1 |
| **250** | - | 25 | - | 8,7 | 10,3 | 0,0380 | BFL | M2 |
| **280** | - | 40 | - | 9,6 | 11,2 | 0,0492 | BFL | M2 |
| **315** | - | 57,5 | 7,5 | 10,6 | 12,2 | 0,0639 | BFL | M2 |
| **355** | - | 77,5 | 27,5 | 12,6 | 14,2 | 0,0831 | BFL | M2 |
| **400** | - | 100 | 50 | 14,5 | 17,5 | 0,1078 | BFL | M2 |
| **450** | - | 125 | 75 | 16,4 | 19,4 | 0,1389 | BFN | M3 |
| **500** | - | 150 | 100 | 19,4 | 22,4 | 0,1739 | BFN | M3 |
| **560** | - | 180 | 130 | 22,3 | 25,3 | 0,2211 | BFN | M3 |
| **630** | 24 | 215 | 165 | 26,2 | 29,2 | 0,2833 | BF | M4 |

## 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 | "a" | Tab. 4.4.1 |
| | Side without act. mechanism | "c" | Tab. 4.4.1 |
| ROUND DAMPERS SPIRO Fig. 33c | Side without act. mechanism | "f" | Tab. 4.4.1 |

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

**Fig. 33a Blade overlaps - rectangular damper**

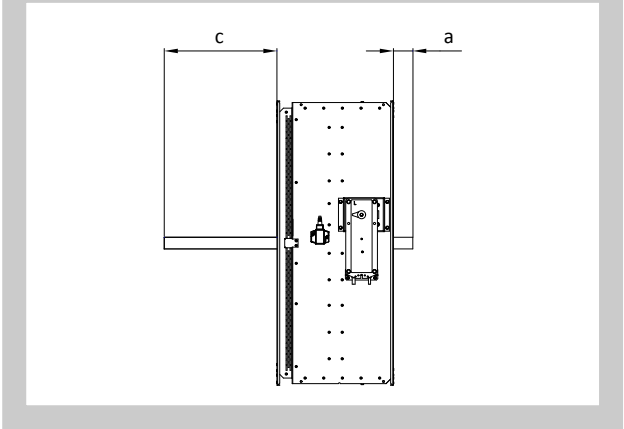



**Fig. 33b Blade overlaps - round damper**

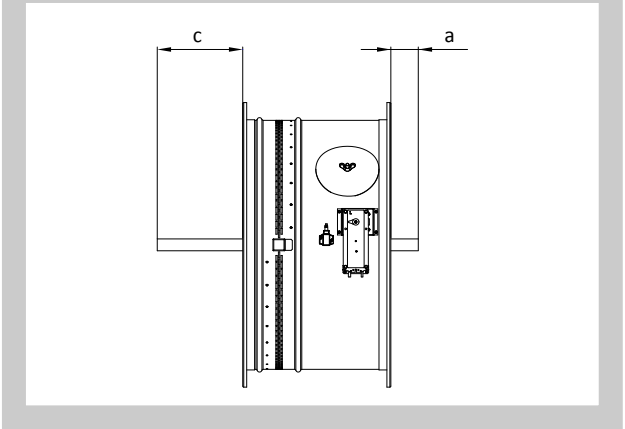



**Fig. 33c Blade overlaps - round damper SPIRO**

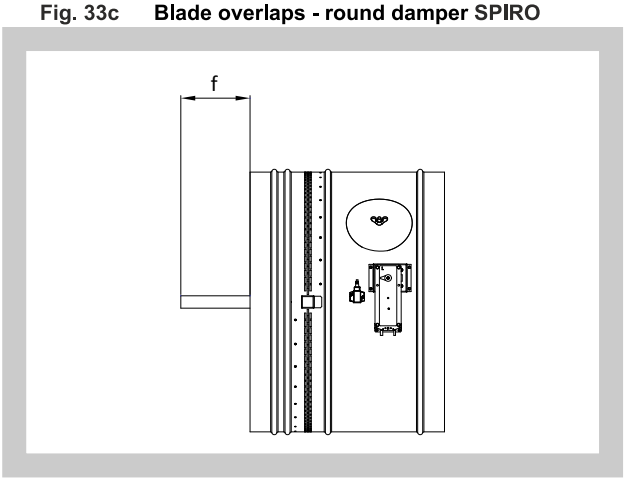
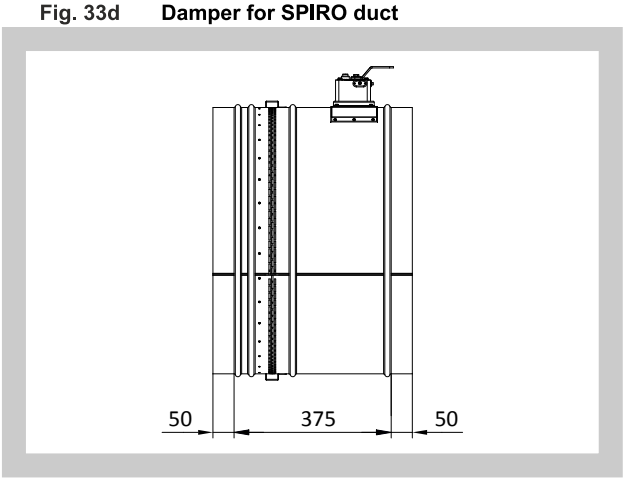



**Fig. 33d Damper for SPIRO duct**




**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 Tab 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, 35).
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. 33d).

**Fig. 34 Flage of rectangular damper - OPERATORS SIDE**

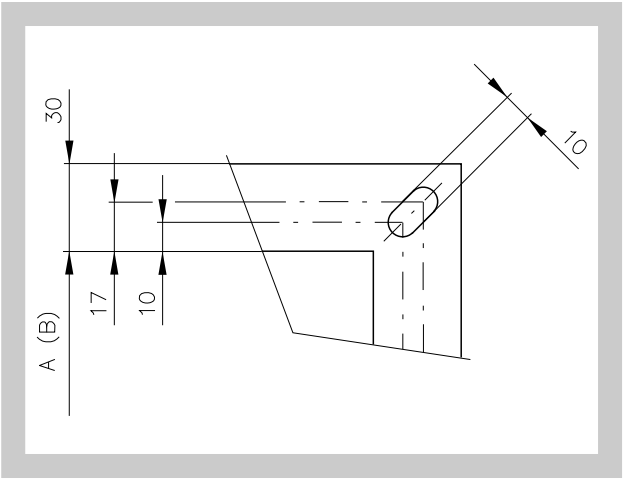
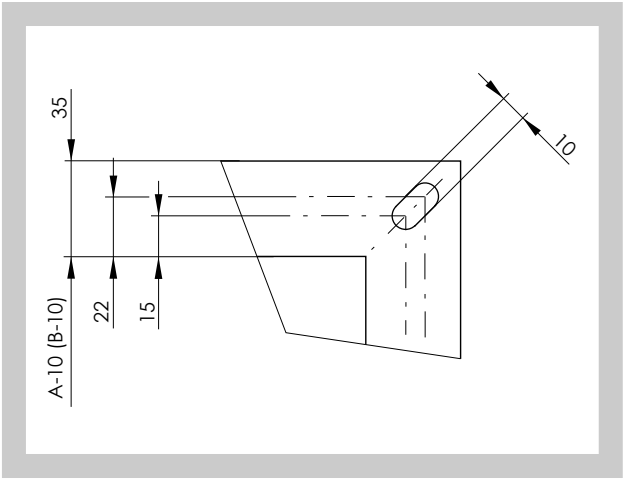



**Fig. 35 Flage of rectangular damper - INSTALLATIONS SIDE**




## 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**

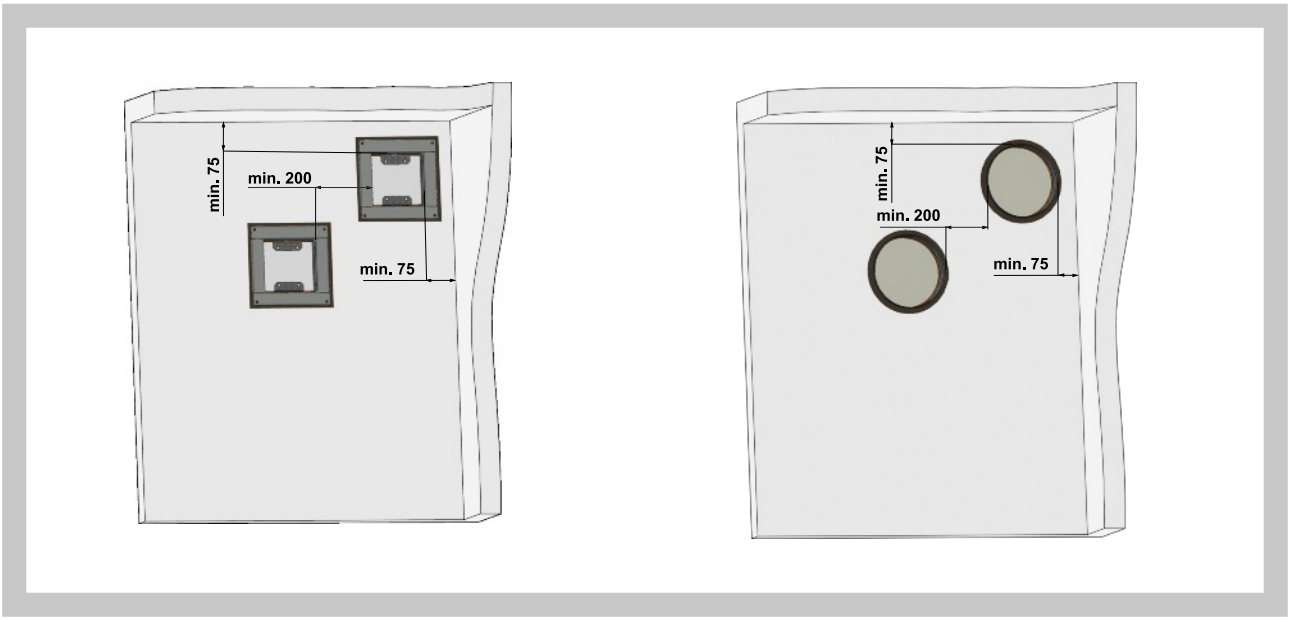


**Fig. 37 Built in edge - rectangular dampers**

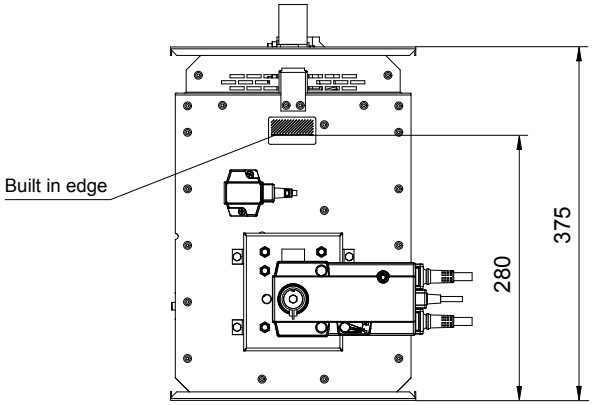
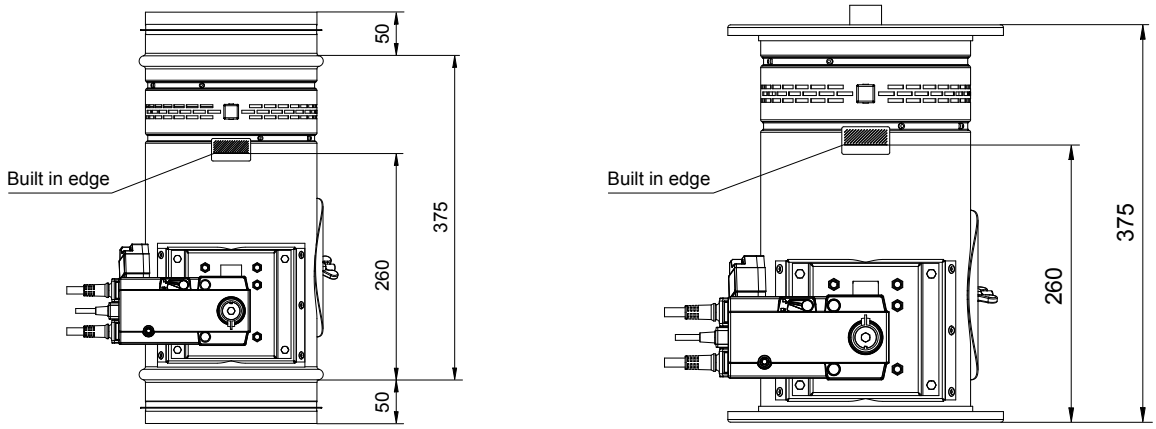



**Fig. 38 Built in edge - round dampers**

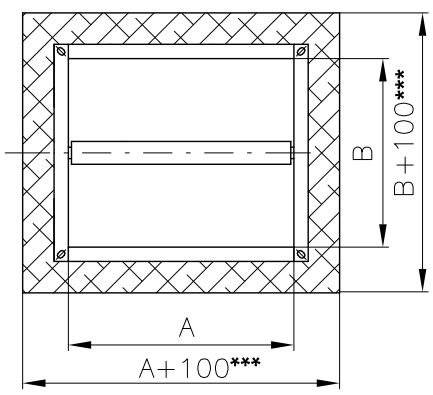



"Wall edge sticker" indicates the recommended edge of installation of fire damper into the fire partition structure (wall). The damper must be installed so that the entire damper blade - in the closed position - is located inside the fire separating structure (wall) and at the same time the control mechanism and inspection openings are freely accessible.

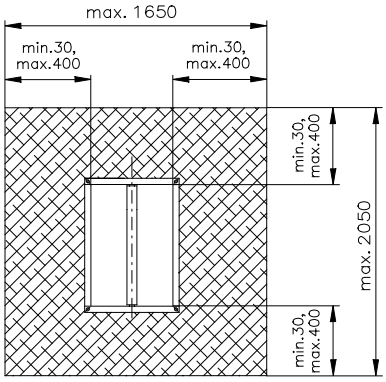
**5.2.** The control mechanism has to be protected (covered) against damage and pollution during installation process. All fire dampers has to be closed during installation process. The damper body should not be deformed in the course of bricking in. Once the damper is built in, its blade should not grind on the damper body during opening or closing.

**Fig. 39 Installation opening - rectangular damper**

**Installation opening - rectangular damper**



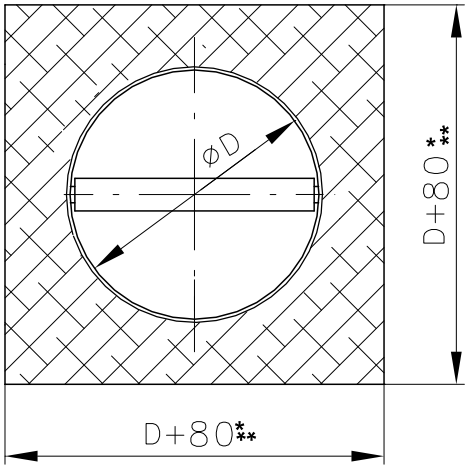

**Installation opening - rectangular damper Weichschott system**



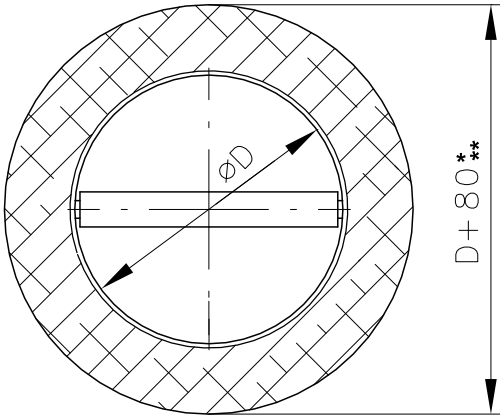

*** The recommended dimension of the installation opening is from 25 mm to 50 mm on the both sides (it means from A+50 to A+100 or B+50 to B+100)

**Fig. 40 Installation opening - round damper**

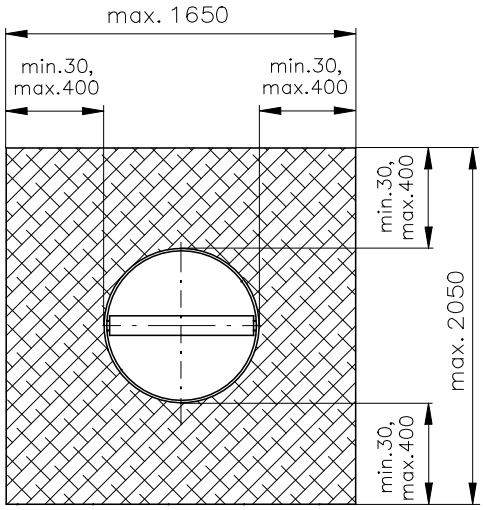
**Installation opening - round damper**




**Installation opening - round damper**




**Installation opening - round damper Weichschott system**




* For dampers with flanges is valid D + 160 mm

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

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

## 5.3. Examples of fire damper installing

The fire damper can be integrated into a solid wall construction made e.g. of normal concrete/ masonry, porous concrete with minimum thickness 100 mm or into solid ceiling construction made e.g. of normal concrete 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 EI 120 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 square damper installed outside a construction it is necessary to use reinforcement VRM-III.

# 6 Statement of installations

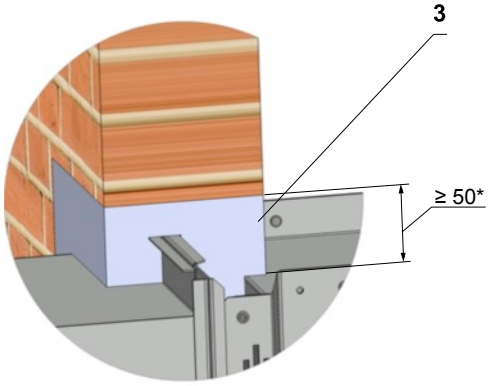
## 6.1. Statement of installations the fire dampers FDMB

**Tab. 6.1.1. Statement of installations**

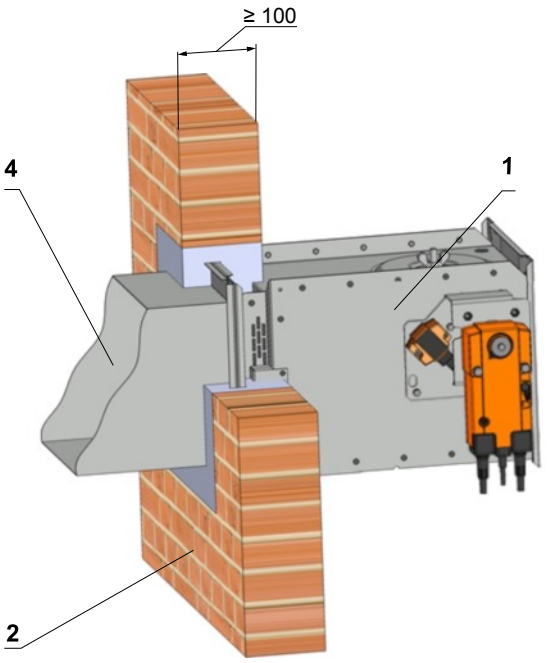
| Fire separating construction | Wall/Ceiling Min. thickness [mm] | Installation | Fire resistance | Page |
|---|---|---|---|---|
| **Solid wall construction** | 100 | Mortar or gypsum | EIS 120 | 32 |
| | 100 | Stuffing box + mastic and cement lime plate | EIS 90 | 37 |
| | 100 | Battery - Mortar or gypsum | EIS 90 | 33 |
| | 100 | Installation frame E1, E2, E4, R1, R2, R3, R4, R5 | EIS 90 | 38 |
| | 100 | Weichschott | EIS 90 | 39 |
| | 100 | Installation next to wall - mortar or gypsum and mineral wool | EIS 90 | 34, 35 |
| | 100 | Installation next to wall - Installation frame R1, R2, R3, R4, R5 and mineral wool | EIS 90 | 35, 36 |
| | 100 | Battery - Installation frame E1, R1 | EIS 90 | 40 |
| | 100 | Stuffing box with fire protection mastic | EIS 60 | 43 |
| | 100 | Fire resistant foam covered by stucco plaster | EIS 60<br>EIS 45<br>EIS 30 | 86 |
| **Solid ceiling construction** | 110 | Mortar or gypsum | EIS 120 | 44 |
| | 110 | Stuffing box + mastic and cement lime plate | EIS 90 | 46 |
| | 110 | Battery - Mortar or gypsum | EIS 90 | 45 |
| | 110 | Installation frame E1, E2, E4, R1, R2, R3, R4, R5 | EIS 90 | 47 |
| | 110 | Weichschott | EIS 90 | 48 |
| | 110 | Battery - Installation frame E1, R2 | EIS 90 | 49 |
| | 110 | Stuffing box with fire protection mastic | EIS 60 | 53 |
| **Gypsum wall construction** | 100 | Mortar or gypsum | EIS 120 | 54 |
| | 100 | Stuffing box + mastic and cement lime plate | EIS 90 | 59 |
| | 100 | Battery - Mortar or gypsum | EIS 90 | 55 |
| | 100 | Installation frame E1, E3, E4, R1, R2, R3, R4, R5 | EIS 90 | 60 |
| | 100 | Weichschott | EIS 90 | 61 |
| | 100 | Installation next to wall - mortar or gypsum and mineral wool | EIS 90 | 56 |
| | 100 | Installation next to wall - Installation frame R1, R2, R5 and mineral wool | EIS 90 | 57, 58 |
| | 100 | Flexible ceiling - Installation frame E5, R7 | EIS 90 | 65 |
| | 100 | Battery - Installation frame E1, R1 | EIS 90 | 62 |
| | 100 | Stuffing box with fire protection mastic | EIS 60 | 64 |
| | 100 | Fire resistant foam covered by stucco plaster | EIS 60<br>EIS 45<br>EIS 30 | 87 |
| **Thin shaft wall** | 100 | Mortar or gypsum - rectangular damper | EIS 90 | 82 |
| | 100 | Mortar or gypsum - round damper | EIS 90 | 84 |
| | 100 | Installation frame E1 - rectangular damper | EIS 90 | 83 |
| | 100 | Installation frame R1 - round damper | EIS 90 | 85 |
| **Outside solid wall construction** | 100 | Insulating with cement lime plates Installation frame E6, R6 | EIS 90 | 42 |
| | 100 | Insulating mineral wool | EIS 90 | 41 |
| | 100 | Insulating mineral wool - Mortar or gypsum | EIS 60 | 88 |
| | 100 | Insulating mineral wool - stone wool + mastic | EIS 60 | 89 |
| **Outside gypsum wall construction** | 100 | Insulating mineral wool | EIS 90 | 63 |
| | 100 | Insulating mineral wool - Mortar or gypsum | EIS 60 | 90 |
| | 100 | Insulating mineral wool - stone wool + mastic | EIS 60 | 91 |
| **Outside solid ceiling construction** | 110 | Insulating mineral wool | EIS 90 | 50 |
| | 110 | Concrete | EIS 90 | 51 |
| | 110 | Concrete with installation frame E4, R5 | EIS 90 | 51 |
| | 110 | Insulating with cement lime plates Installation frame E6, R6 | EIS 90 | 52 |
| **On solid wall construction** | 100 | Installation frame R5 | EIS 90 | 78 |
| **On solid ceiling construction** | 110 | Installation frame R5 | EIS 90 | 78 |
| **On gypsum wall construction** | 100 | Installation frame R5 | EIS 90 | 78 |

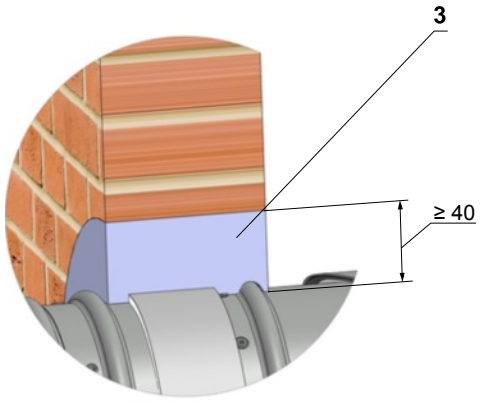
**Fig. 41 Solid wall construction - mortar or gypsum**

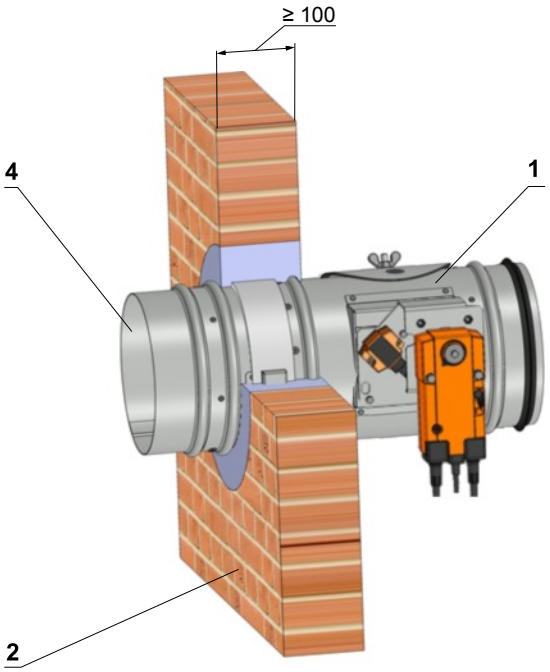
**EIS 120**




* Around the perimeter




POSITION:

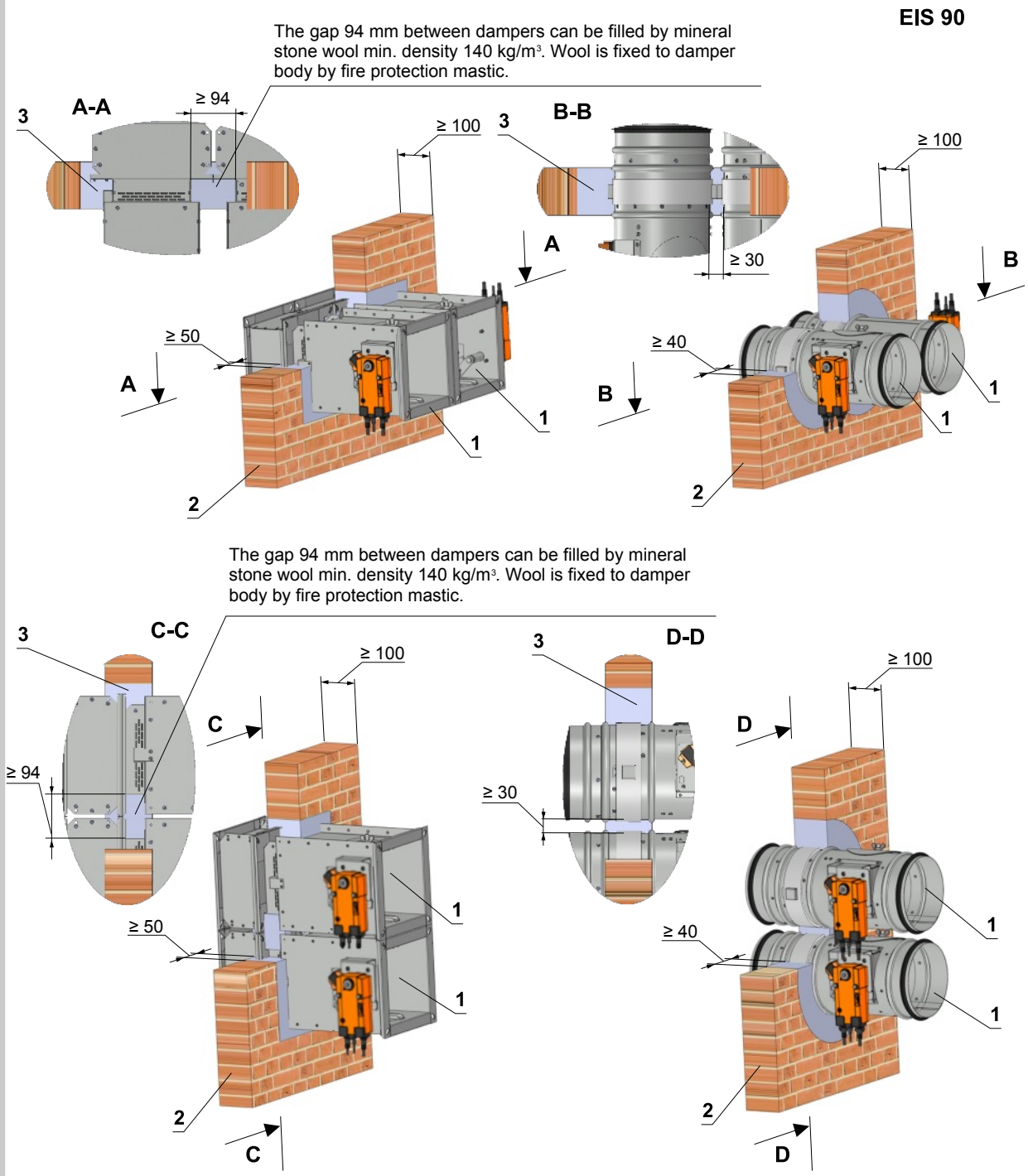
1 Fire damper FDMB

2 Solid wall construction

3 Mortar or gypsum

4 Duct

**Fig. 42 Solid wall construction - flange to flange - mortar or gypsum**




POSITION:

1 Fire damper FDMB

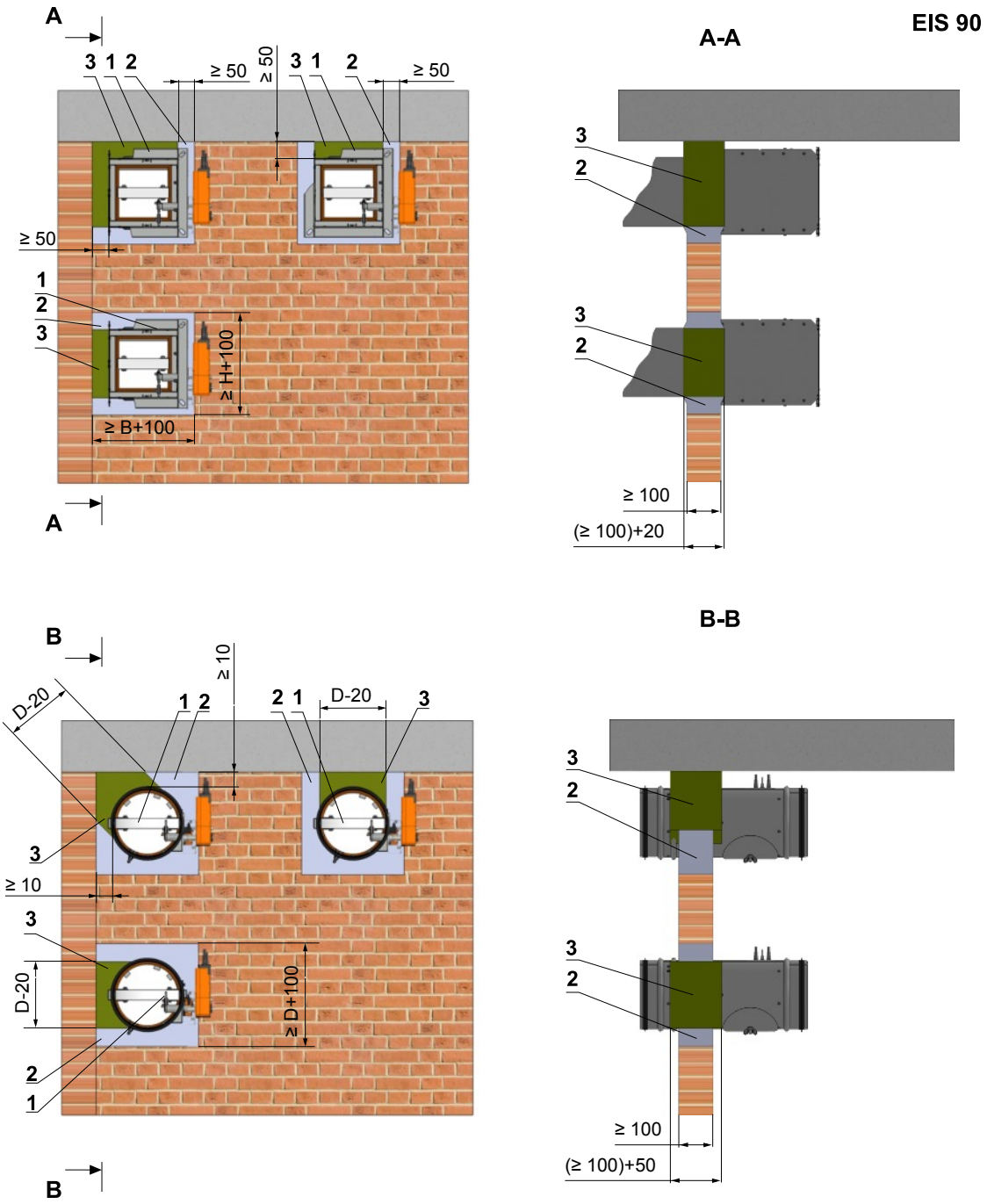
2 Solid wall construction

3 Mortar or gypsum

**Notice:**

- Fire damper FDMB-C - installation opening for each damper has minimal dimensions a x b = (A+100) x (2xB +100) mm or (2xA+100) x (B +100) mm
- Fire damper FDMB-K - installation opening for each damper has minimal dimensions D+80 mm (D+160 mm for dampers with flanges)
- Gap between damper and construction is filled by mortar or gypsum
- Fire damper FDMB-C - distance between dampers 60 mm
- Fire damper FDMB-K - distance between dampers 70 mm
- Flange to flange connection - Up to four dampers can be installed

**Fig. 43 Solid wall construction - installation next to wall, ceiling - mortar or gypsum and mineral wool**



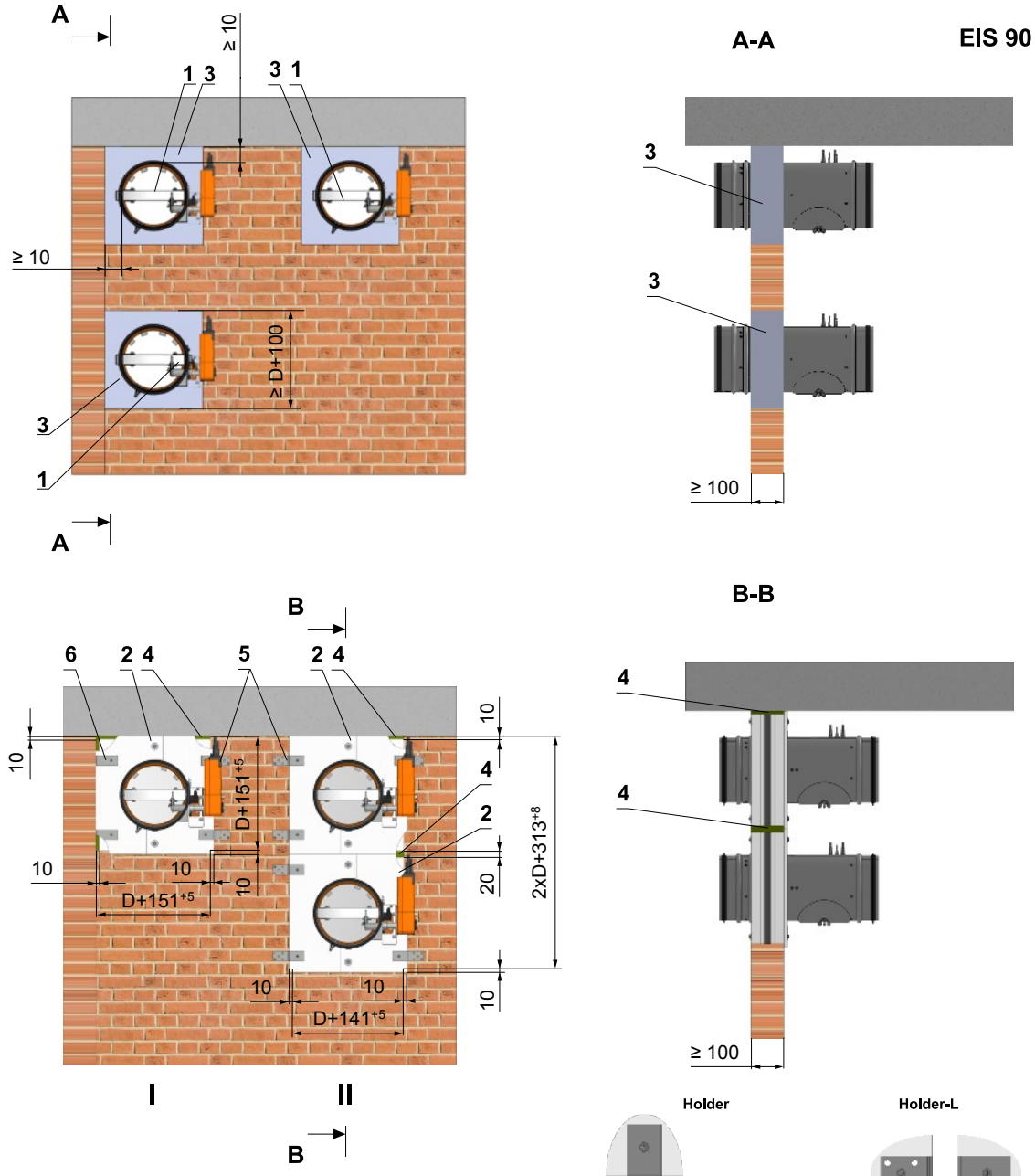

POSITION:

1 Fire damper FDMB
2 Mortar or gypsum
3 Mineral stone wool min. density 140 kg/m³

**Notice**:

- Gap between damper and construction is filled by mortar or gypsum and mineral wool
- Wool is fixed to damper body and construction by fire protection mastic.
- Mineral wool thickness = construction thickness + 20 mm or 50 mm
- Installation is valid for ceiling construction

**Fig. 44** **Solid wall construction - installation next to wall, ceiling - mortar or gypsum**
**Solid wall construction - installation next to wall, ceiling - installation frame R1, R2 and mineral wool**




**I**
**Holders No. X = X1/2**
**Holders-L No Z = X1/2**
**Screws No. Y**

**II**
**Holders No. X = X1 - Z1**
**Holders-L No Z = Z1/2**
**Screws No. Y**

| Dimensions | Number X1 | Number Y | Number Z1 |
|---|---|---|---|
| D ≤ 400 | 4 | 8 | 2 |
| 400 < D ≤ 800 | 8 | 16 | 4 |
| 800 < D ≤ 1000 | 12 | 24 | 6 |

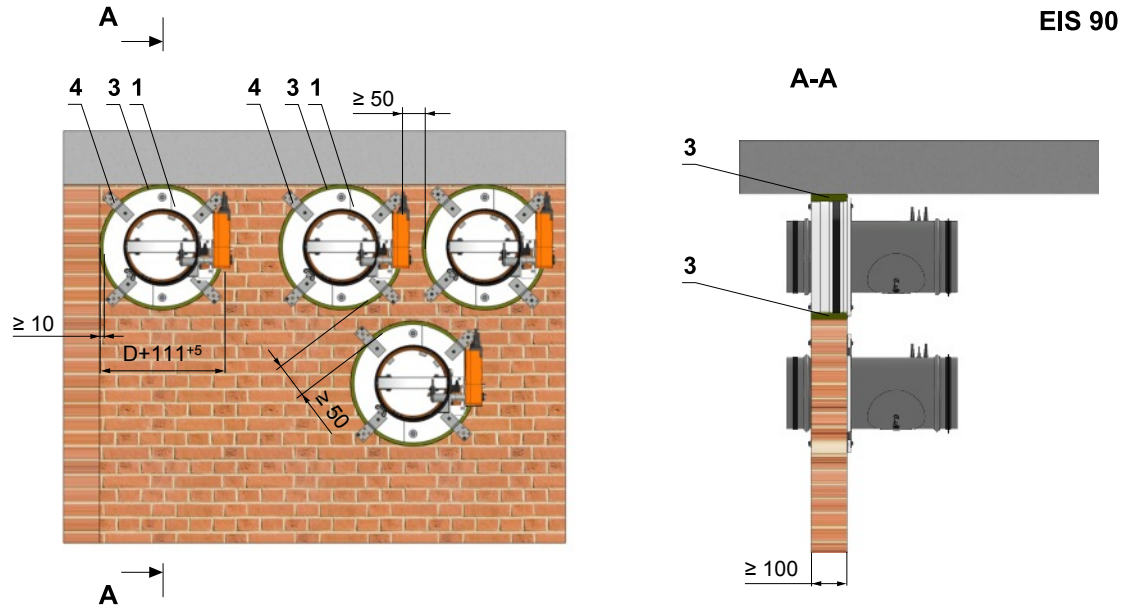
POSITION:

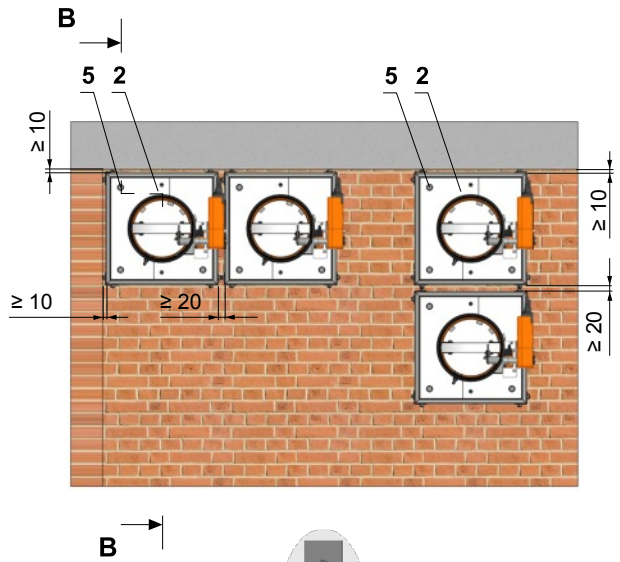
1 Fire damper FDMB
2 Fire damper FDMB with installation frame R1, R2
3 Mortar or gypsum
4 Mineral stone wool min. density 140 kg/m$^3$
5 Holder
6 Holder L

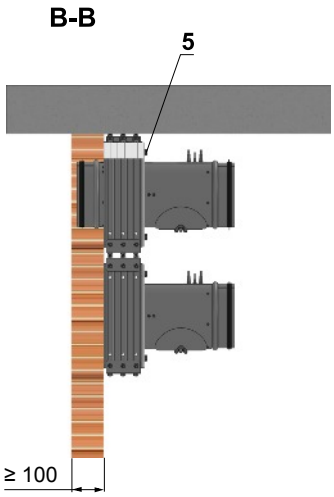
**Notice**:

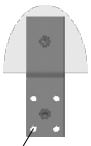
- Gap between frame and damper body and frame and construction must be filled by glue (PROMAT K84).
- Wool is fixed to installation frame and construction by fire protection mastic.
- Installation is valid for ceiling construction

**Fig. 45 Solid wall construction - installation next to wall, ceiling - installation frame R3, R4, R5 and mineral wool**



It is possible to use corresponding number of holes and screws

Fitting with steel bracket

Fitting with threaded rods

**Holders No. X**
**Screws No. Y**

| Dimensions | Number X | Number Y |
|---|---|---|
| D ≤ 400 | 4 | 8 |
| 400 < D ≤ 800 | 8 | 16 |
| 800 < D ≤ 1000 | 12 | 24 |

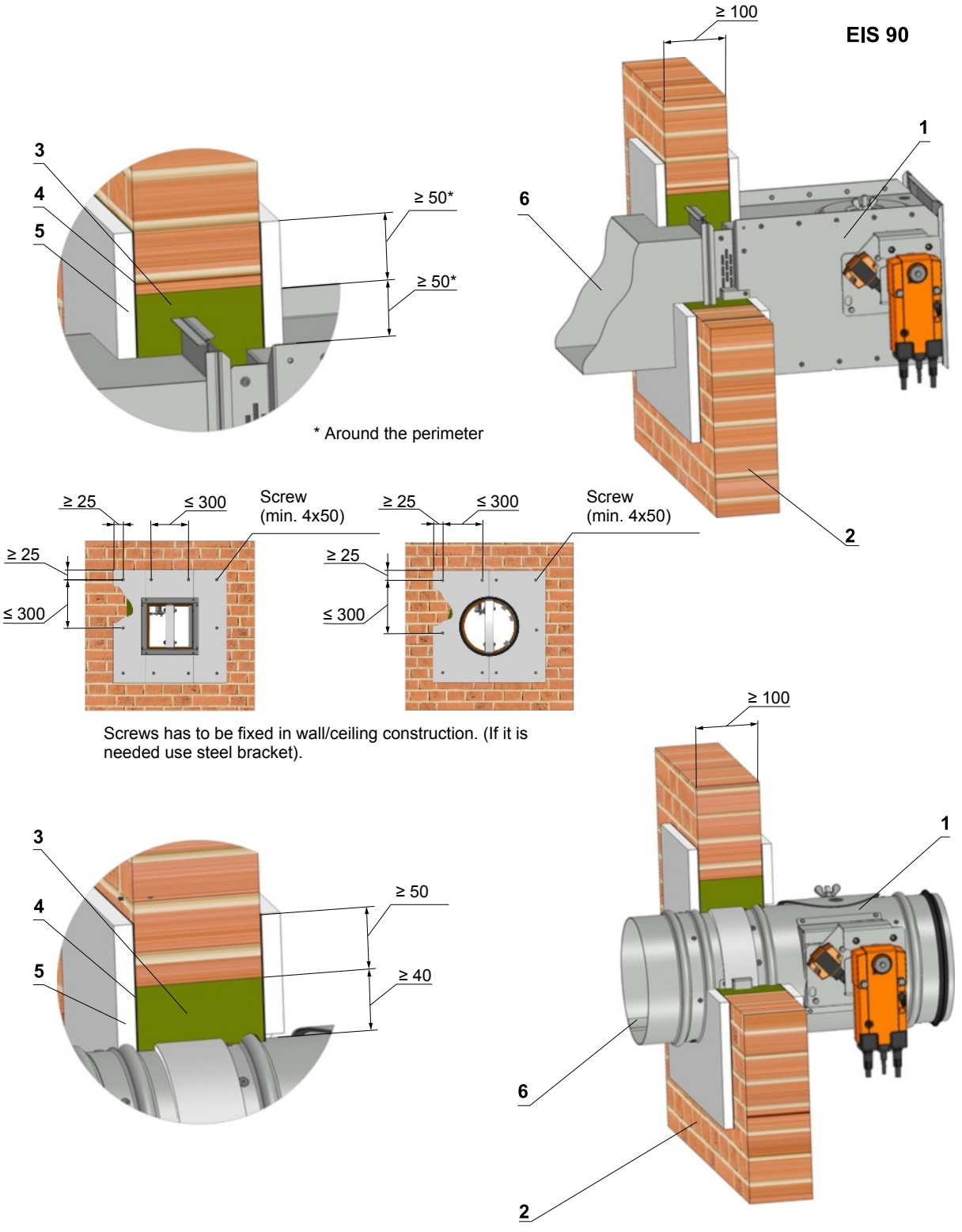
POSITION:

1 Fire damper FDMB with installation frame R3, R4
2 Fire damper FDMB with installation frame R5
3 mineral stone wool min. density 140 kg/m$^3$
4 Holder
5 Fitting with threaded rods or steel bracket

**Notice**:

- Wool is fixed to installation frame and construction by fire protection mastic.
- Installation is valid for ceiling construction

**Fig. 46 Solid wall construction - stuffing box, fire protection mastic and cement lime plate**




POSITION:

1 Fire damper FDMB
2 Solid wall construction
3 Stuffing box (mineral stone wool min. density 140 kg/m$^3$ )
4 Fire protection mastic min. thickness 1 mm
5 Cement lime plate min. thickness 15 mm (min. density 870 kg/m$^3$ )
6 Duct

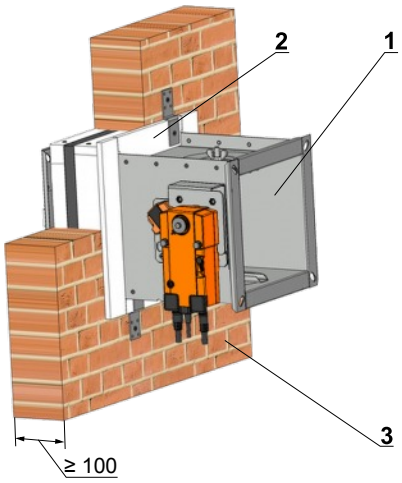
Used materials - example**:

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.

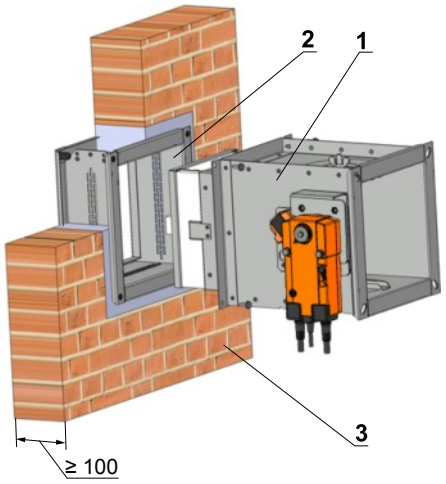
Fig. 47 Solid wall construction - installation frames E1, E2, E4, R1, R2, R3, R4, R5

**Installation frame E1**

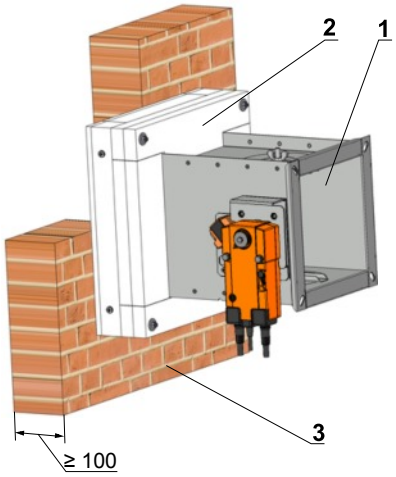



**Installation frame E2**

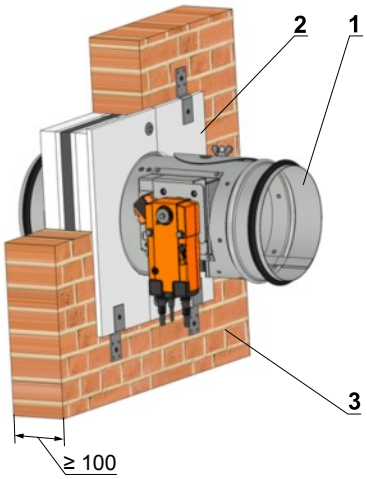
**EIS 90**



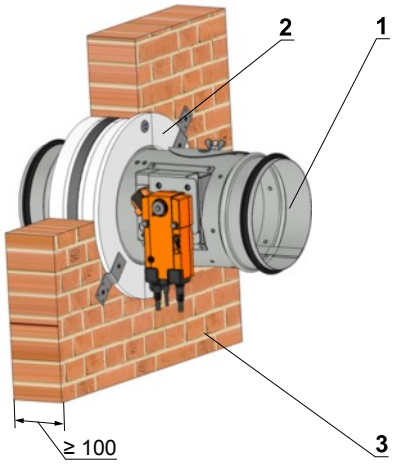

**Installation frame E4**



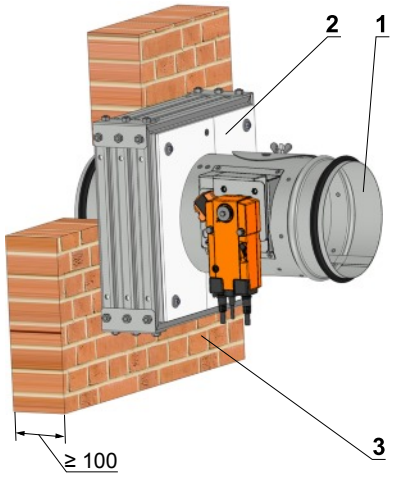

**Installation frame R1, R2**




**Installation frame R3, R4**




**Installation frame R5**

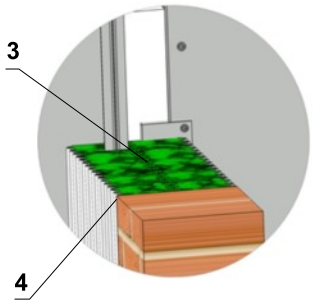


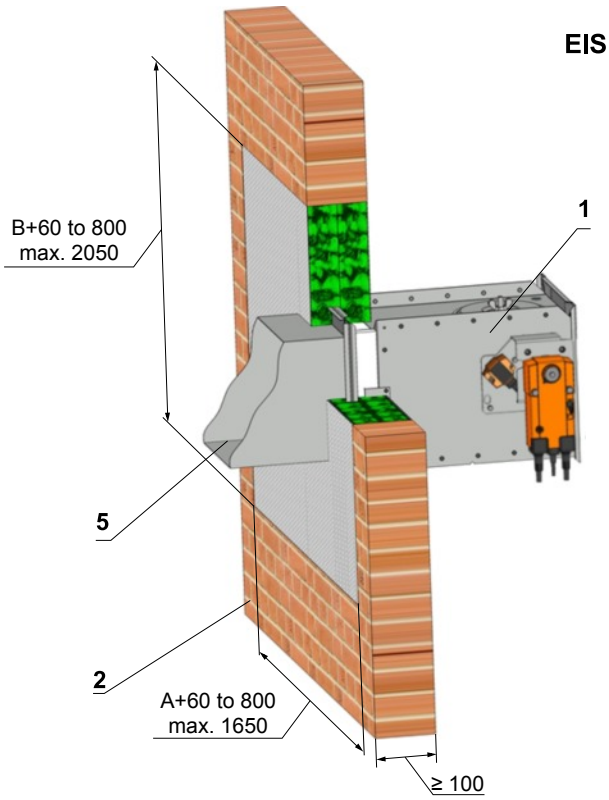

POSITION:

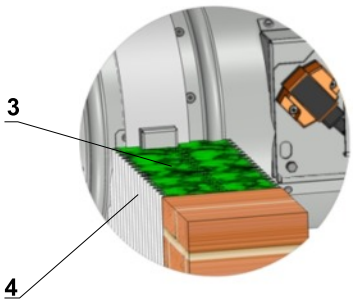
1 Fire damper FDMB
2 Installation frame
3 Solid wall construction

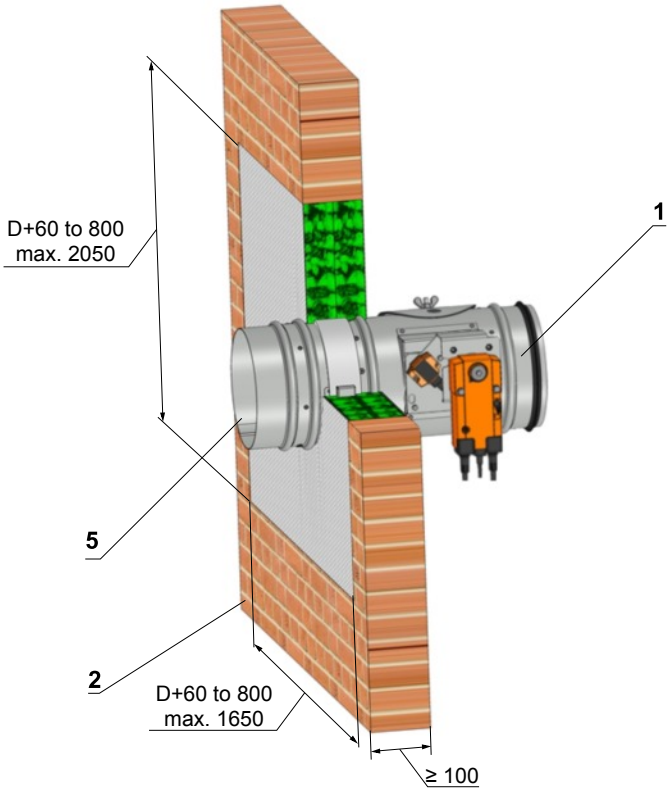
Installation details see chapter 7

**Fig. 48 Solid wall construction - Weichschott**




POSITION:

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

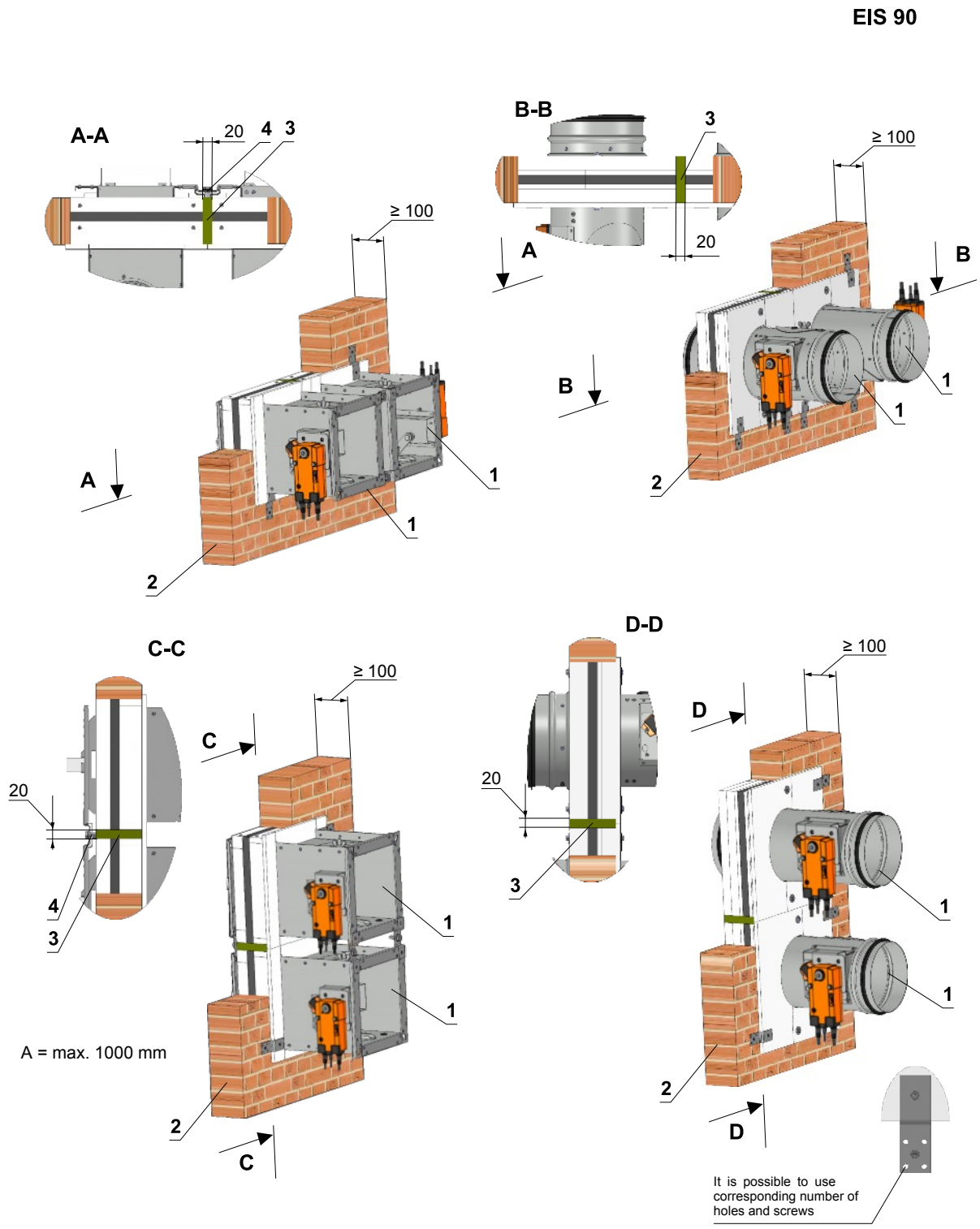
Used materials - example*:

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

**Notice:**

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

**Fig. 49 Solid wall construction - flange to flange - installation frame E1, R1**




POSITION:

1 Fire damper FDMB with installation frame E1, R1
2 Solid wall construction
3 Mineral stone wool min. density 140 kg/m³
4 Flange connection

**Notice:**

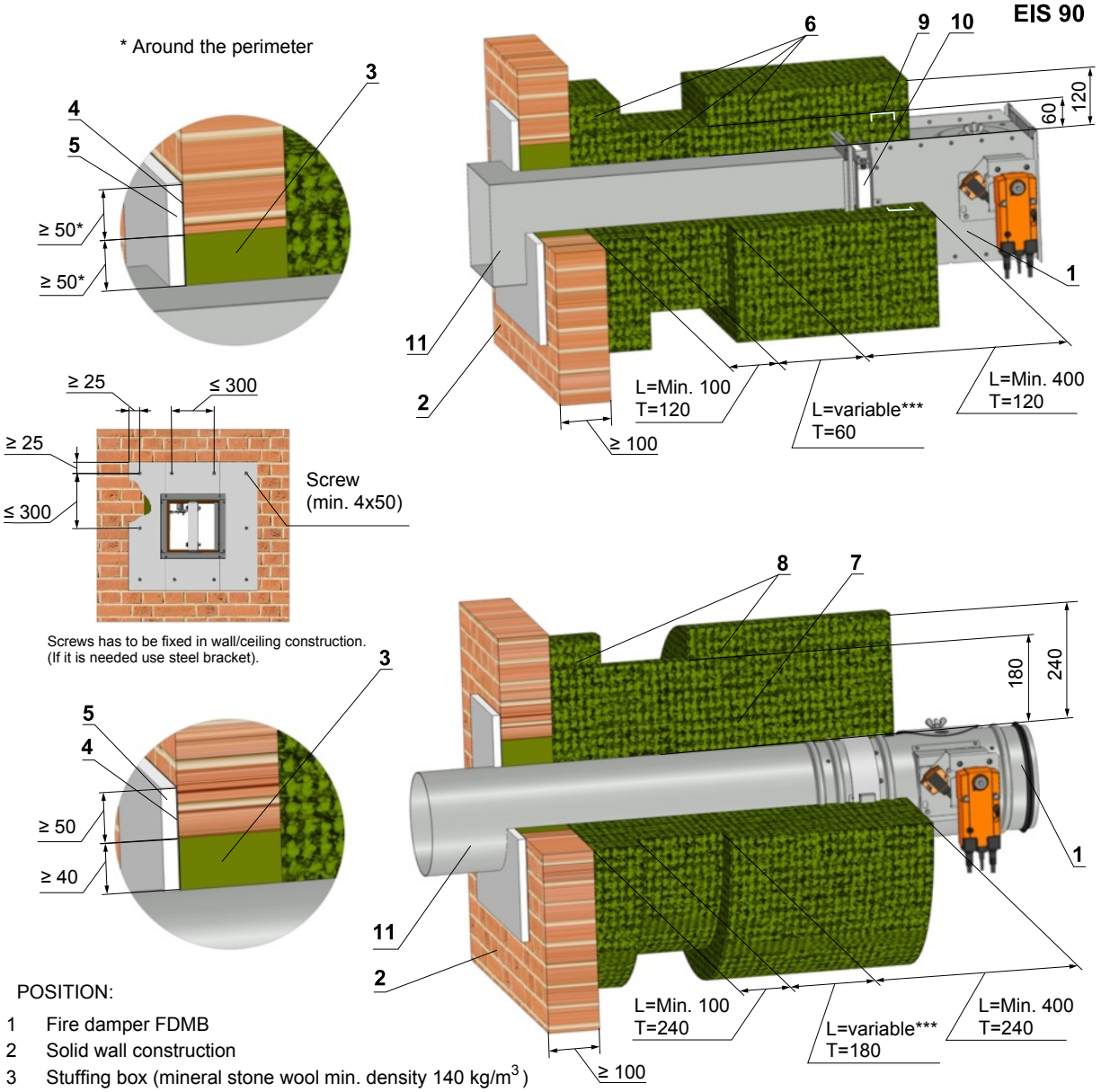
- Fire damper FDMB-C - installation opening dimensions a x b = (2x(A + 85⁺³mm) + 20 mm) x (B + 85⁺³mm) or a x b = (A + 85⁺³mm) x (2x(B + 85⁺³mm) + 20 mm)
- Fire damper FDMB-C - installation opening dimensions a x b = (2x(D + 141⁺³mm) + 20 mm) x (D + 141⁺³mm) or. a x b = (D + 141⁺³mm) x (2x(D + 141⁺³mm) + 20 mm)
- Gap between frame and damper body and frame and construction must be filled by glue (PROMAT K84)
- Fire damper FDMB-C - distance between dampers 104 mm
- Fire damper FDMB-K - distance between dampers 160 mm
- Flange to flange connection - Up to four dampers can be installed

**Holders No. X = (2xZB1) + (2xZH1)**
**Screws No. Y = 2xX**

| Dimensions | Number ZB1 | Number ZH1 |
|---|---|---|
| A1,B1,D1 ≤ 400 | 1 | 1 |
| 400 < A1,B1,D1 ≤ 800 | 2 | 2 |
| 800 < A1,D1 ≤ 1260 | 3 | 3 |
| 1260 < A1,D1 ≤ 1600 | 4 | 4 |
| 1600 < A1 ≤ 2000 | 5 | 5 |

**A1 = A or A1 = 2xA**
**B1 = B or B1 = 2xB**
**D1 = D or D1 = 2xD**

**Fig. 50 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/m$^3$)
4 Fire protection mastic min. thickness 1 mm
5 Cement lime plate min. thickness 15 mm (min. density 870 kg/m$^3$)
6 Stone wool bound with use of an organic resin with crushed stone as a refrigerant, min. density 300 kg/m$^3$, and min. thickness 60 mm
7 Stone wool with one side stitched wire fencing (min. density 105 kg/m$^3$), thickness 180 mm (e.g. 3x60 mm)
8 Stone wool with one side stitched wire fencing (min. density 105 kg/m$^3$), thickness 60 mm
9 Profil U25x40x25
10 VRM-III****
11 Duct

Used materials - example**:

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

**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.

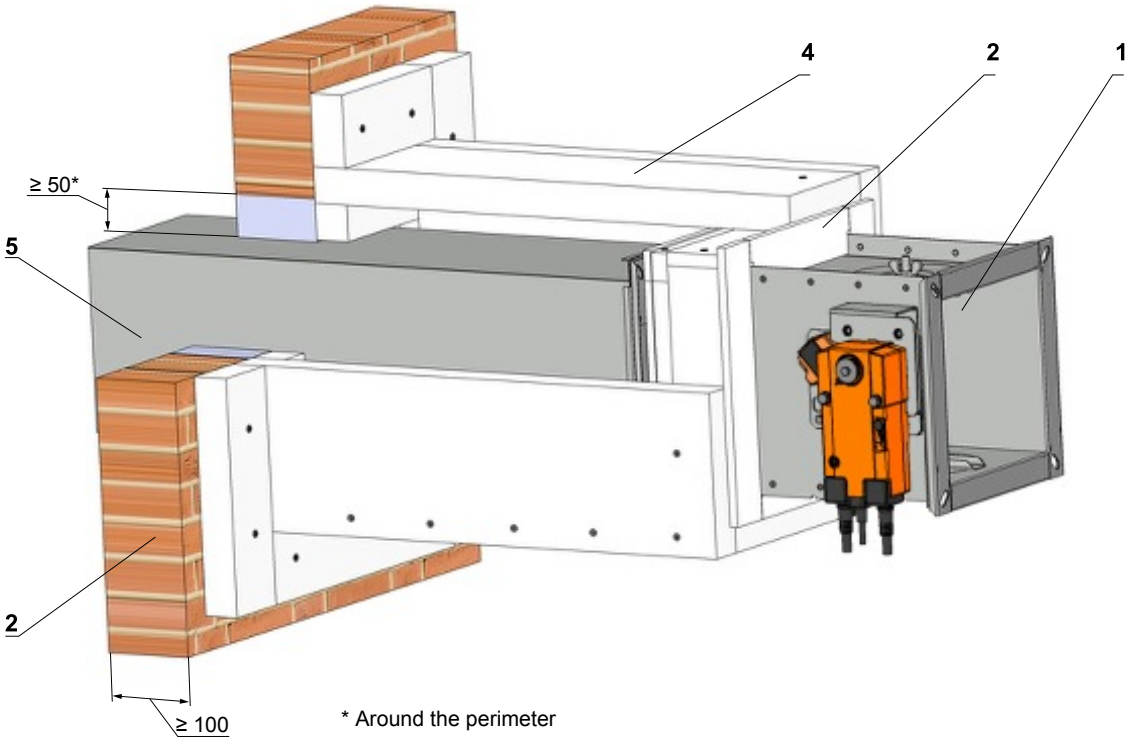
*** Depends on the distance of the flap from the construction, when the maximum distance from the construct is not limited and according to EN 15882-2 must use the required number of hinges according to EN 13366-1:2014.

**** Reinforcement fixing VRM-III see Fig.76
Installation of profile U25x40x25 see Fig.77

T - thickness of the insulation (mm)

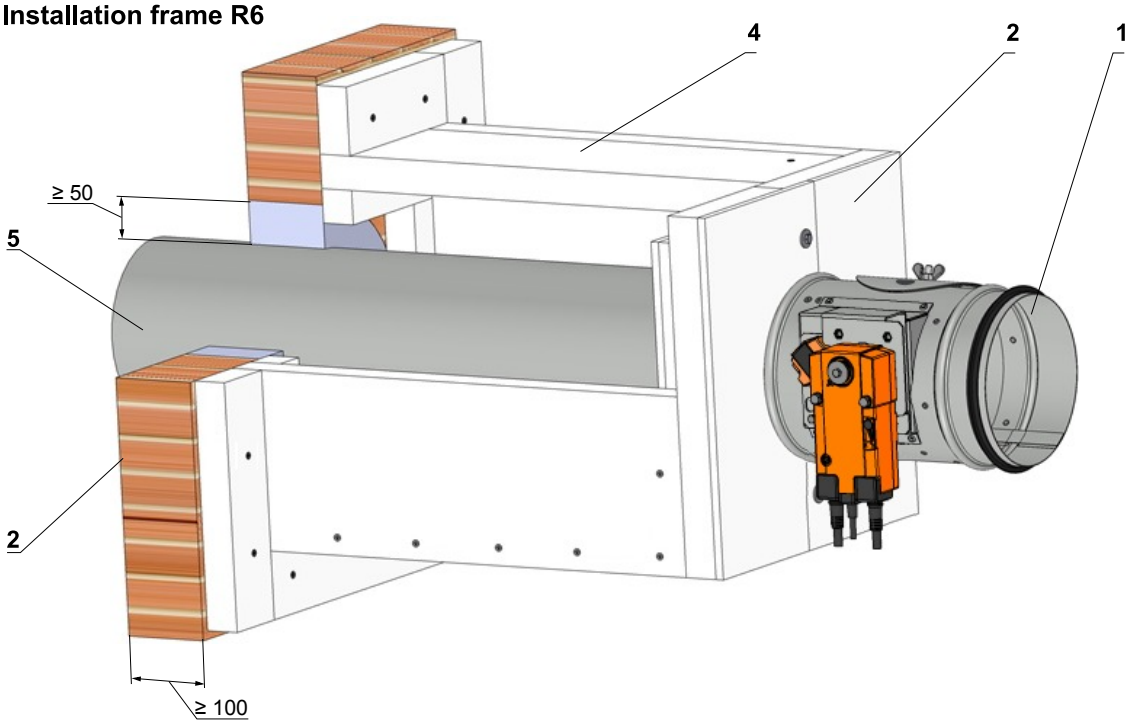
**Fig. 51 Installation outside of solid wall construction - installation frame E6, R6 with cement lime plates**

**Installation frame E6** **EIS 90**




* Around the perimeter

**Installation frame R6**

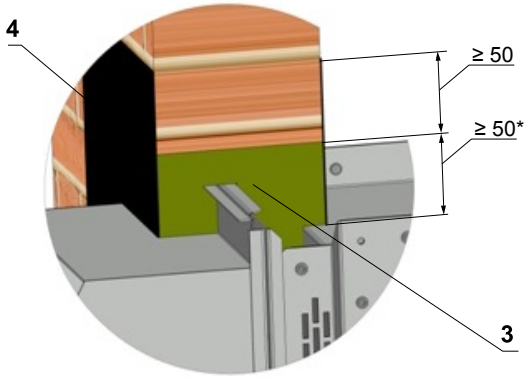



POSITION:

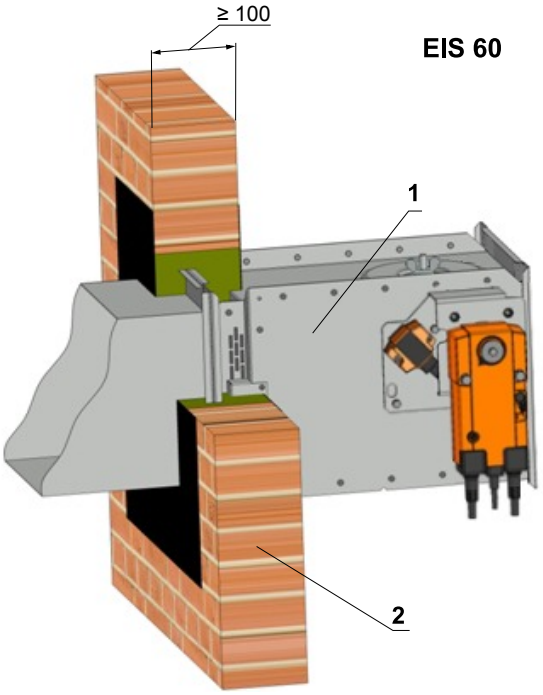
1 Fire damper FDMB
2 Installation frame
3 Solid wall construction
4 Cement lime plate
5 Duct

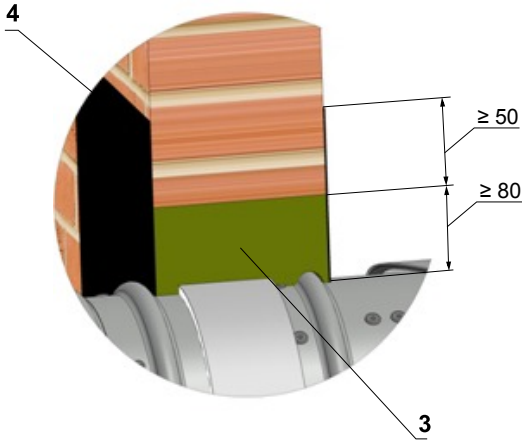
Installation details see chapter 7

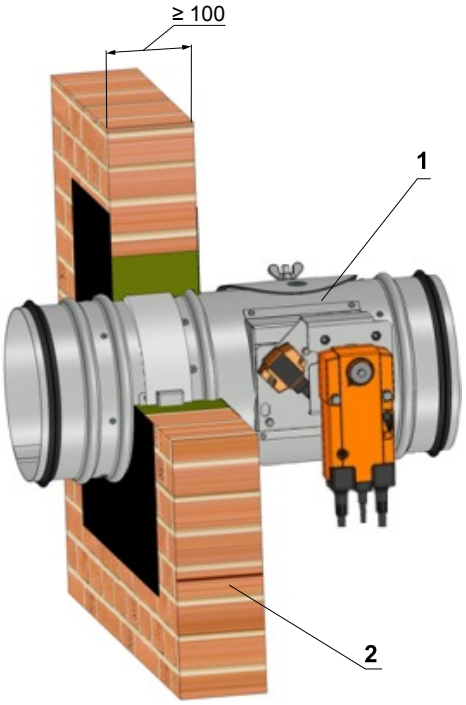
**Fig. 52 Solid wall construction - stuffing box and fire protection mastic**




* Around the perimeter




LEGENDA:

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

Used materials - example**:

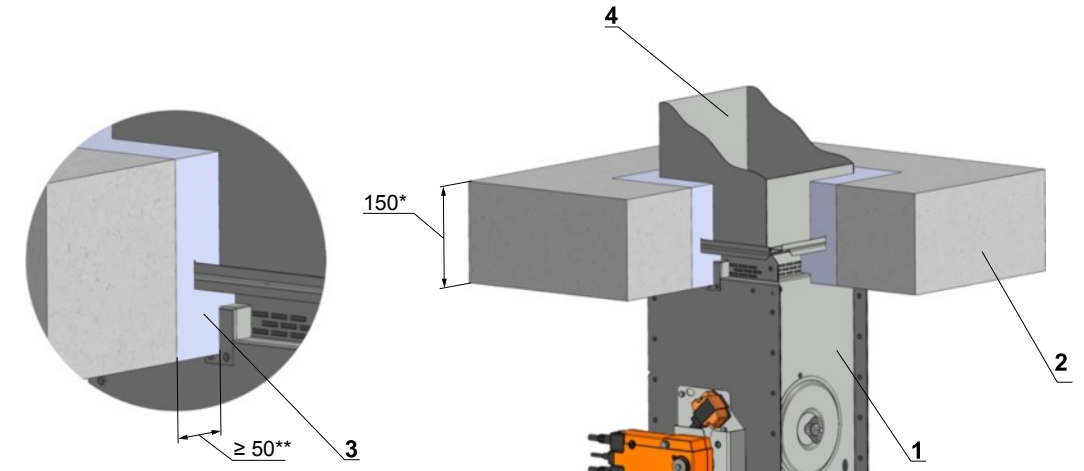
3 - Promapyr, Rockwool Steprock HD
4 - Promastop - P, K

**Notice:**

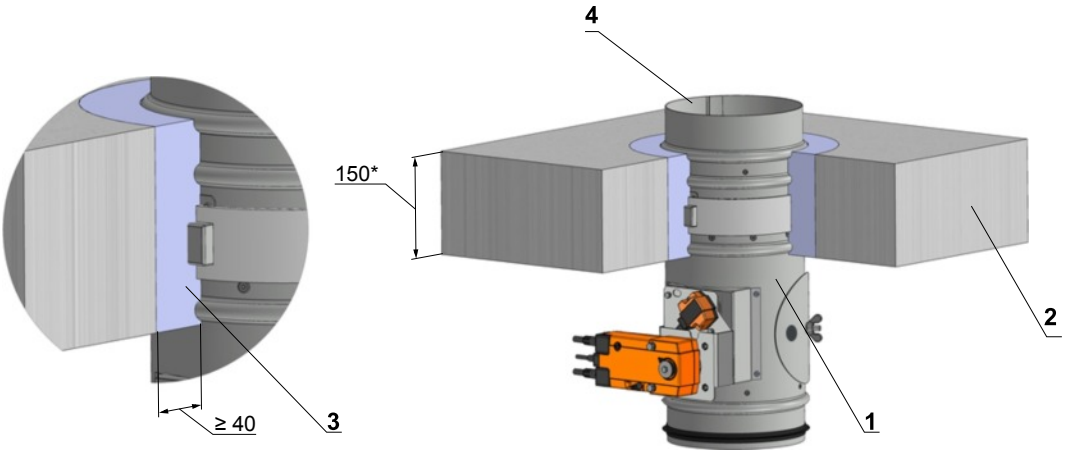
** Fire resistant insulation and fire resistant board can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

**Fig. 53 Solid ceiling construction - mortar or gypsum**

**EIS 120**




** Around the perimeter




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

POSITION:

1 Fire damper FDMB

2 Solid ceiling construction

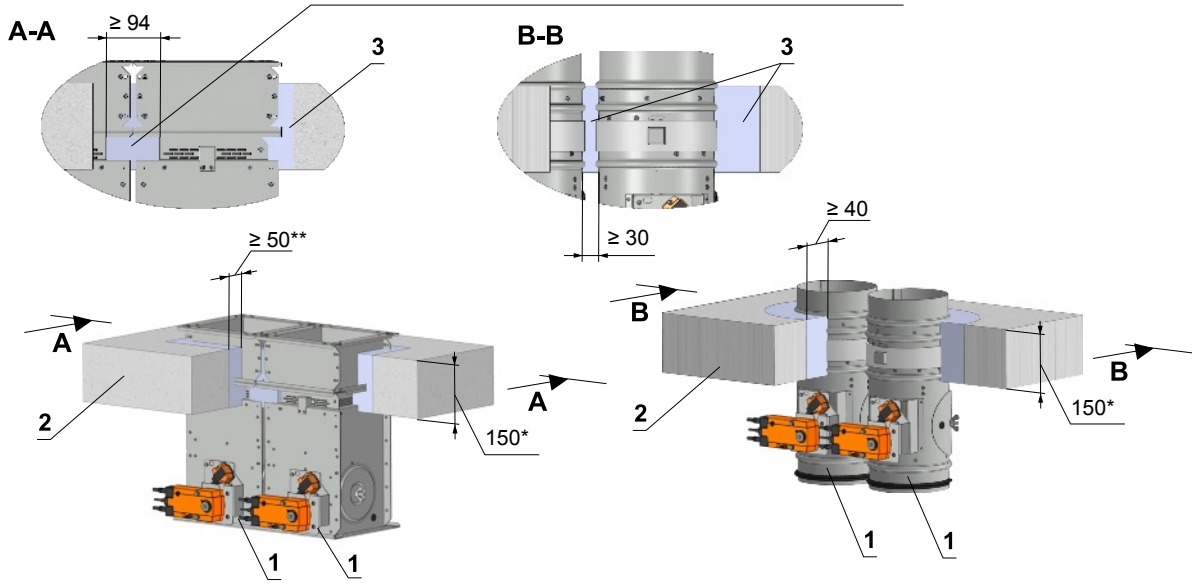
3 Mortar or gypsum

4 Duct

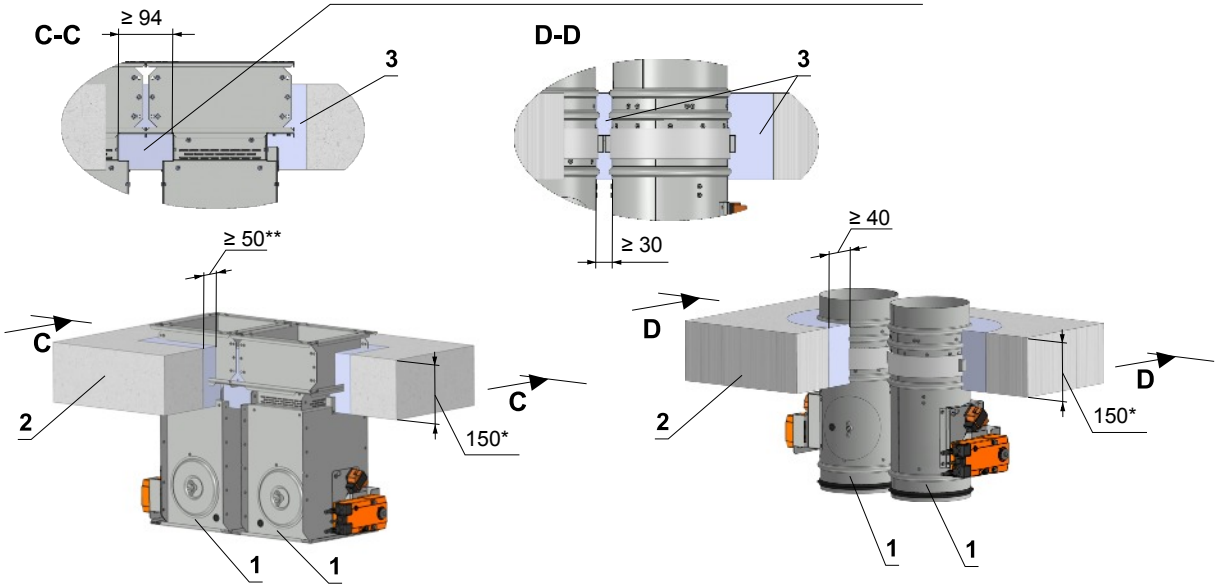
**Fig. 54 Solid ceiling construction - flange to flange - mortar or gypsum**

**EIS 90**

The gap 94 mm between dampers can be filled by mineral stone wool min. density 140 kg/m³. Wool is fixed to damper body by fire protection mastic.




The gap 94 mm between dampers can be filled by mineral stone wool min. density 140 kg/m³. Wool is fixed to damper body by fire protection mastic.




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

** Around the perimeter

POSITION:

1 Fire damper FDMB

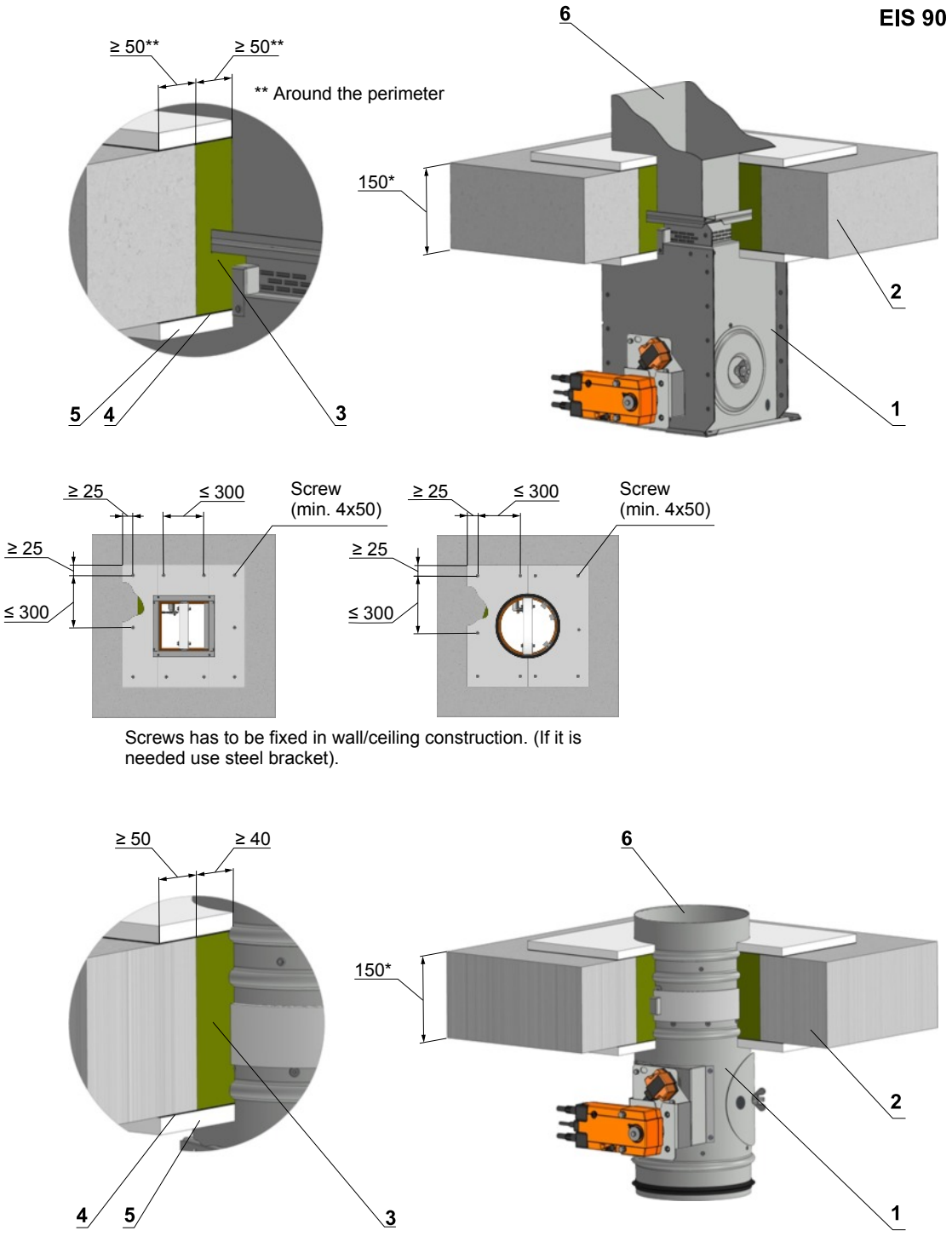
2 Solid ceiling construction

3 Mortar or gypsum

**Notice:**

- Fire damper FDMB-C - installation opening for each damper has minimal dimensions a x b = (A+100) x (2xB +100) mm or (2xA+100) x (B +100) mm
- Fire damper FDMB-K - installation opening for each damper has minimal dimensions D+80 mm (D+160 mm for dampers with flanges)
- Gap between damper and construction is filled by mortar or gypsum
- Fire damper FDMB-C - distance between dampers 60 mm
- Fire damper FDMB-K - distance between dampers 70 mm
- Flange to flange connection - Up to four dampers can be installed

**Fig. 55 Solid ceiling construction - stuffing box, fire protection mastic and cement lime plate**




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

POSITION:

1 Fire damper FDMB
2 Solid ceiling 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 Duct

Used materials - example**:

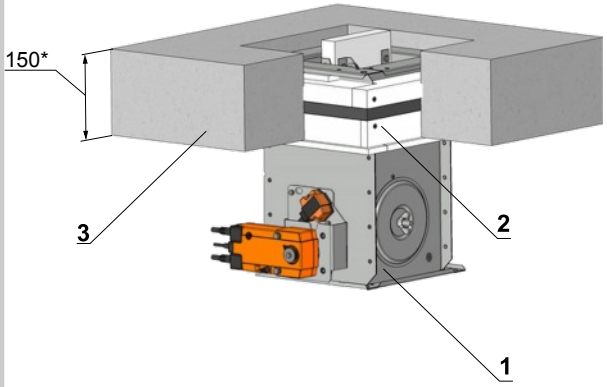
3 - Promapyr, Rockwool Steprock HD
4 - Promastop - P, K
5 - Promatect - H

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

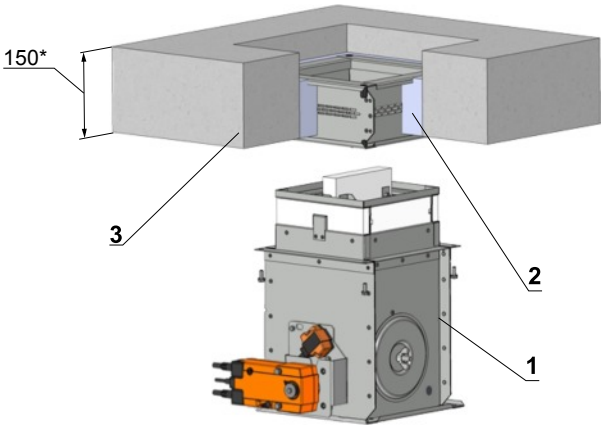
**Fig. 56 Solid ceiling construction - installation frame E1, E2, E4, R1, R2, R3, R4, R5**

EIS 90

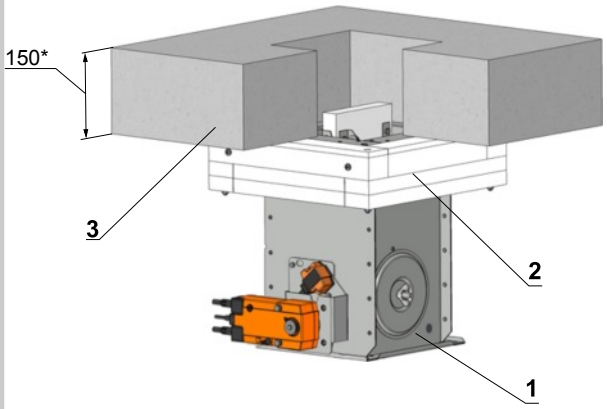
### Installation frame E1



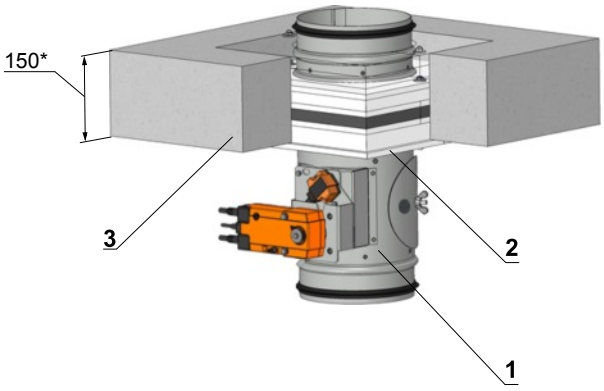

### Installation frame E2



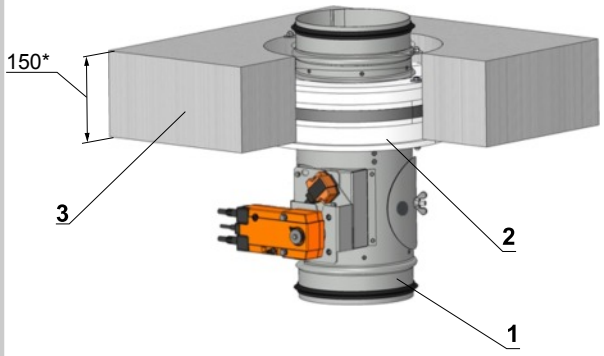

### Installation frame E4



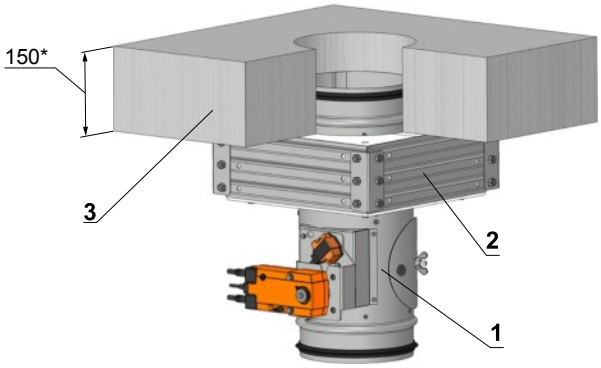

### Installation frame R1, R2




### Installation frame R3, R4




### Installation frame R5




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

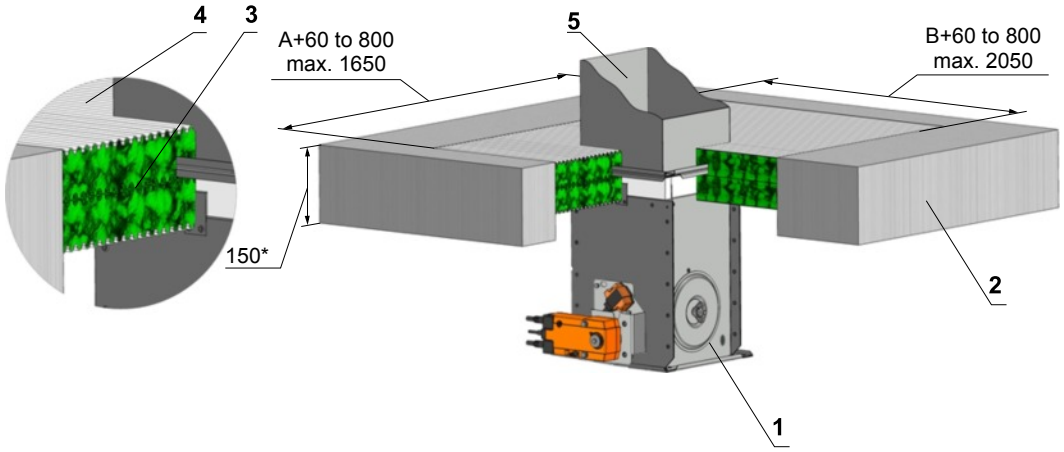
POSITION:

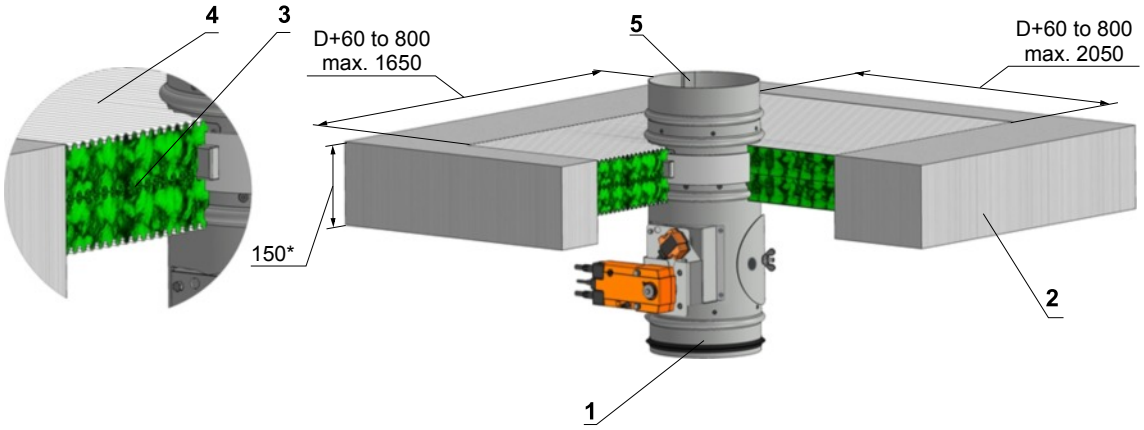
1 Fire damper FDMB
2 Installation frame
3 Solid ceiling construction

Installation details see chapter 7

**Fig. 57 Solid ceiling construction - Weichschott**

**EIS 90**




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

POSITION:

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

Used materials - example**:

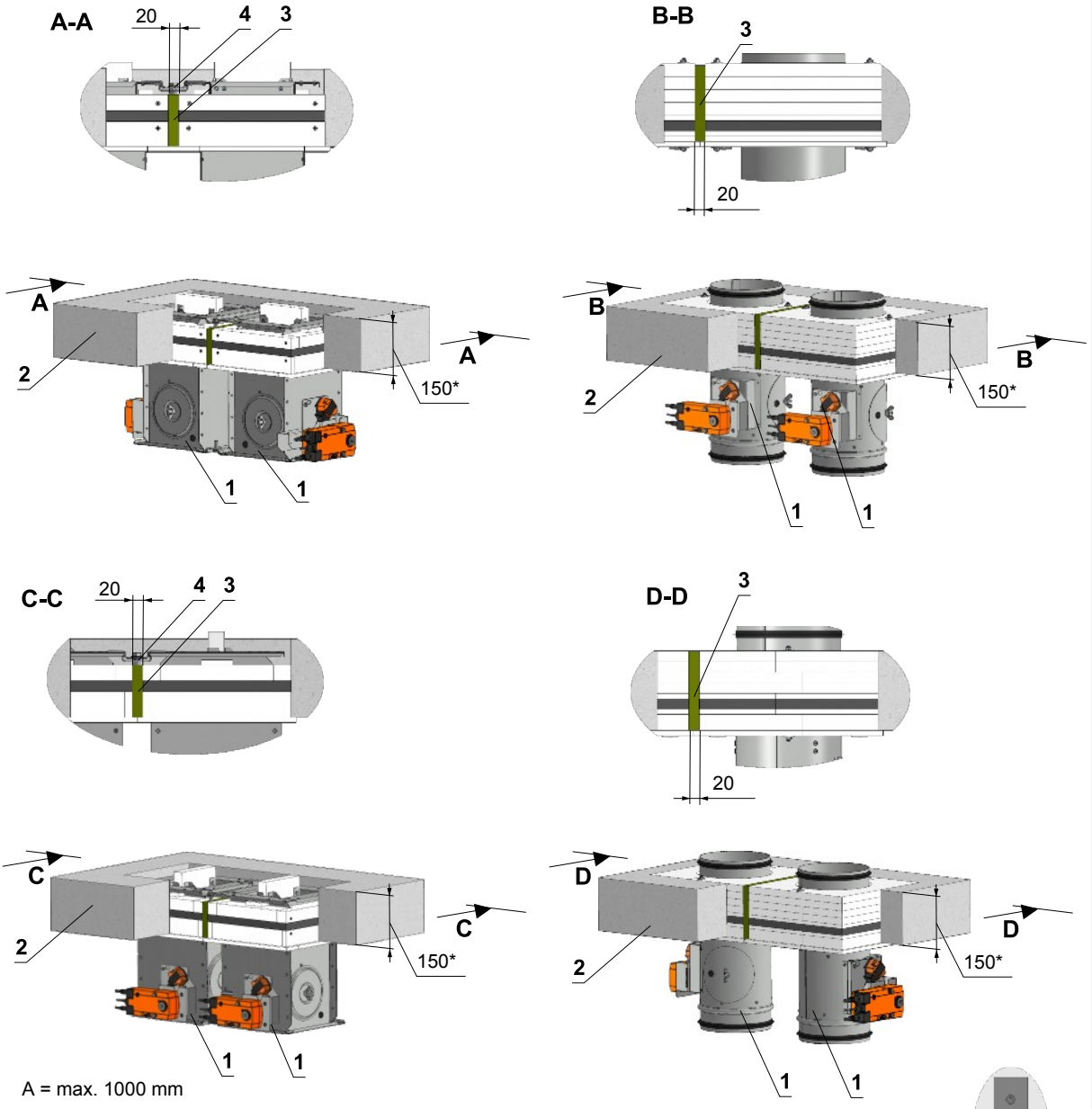
3 - Hilti CFS-CT B 1S 140/50
4 - Hilti CFS-CT

**Notice:**

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

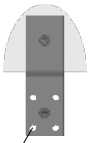
**Fig. 58 Solid ceiling construction - flange to flange - installation frame E1, R2**

**EIS 90**




A = max. 1000 mm

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



It is possible to use corresponding number of holes and screws

POSITION:

1 Fire damper FDMB with installation frame E1, R2
2 Solid ceiling construction
3 Mineral stone wool min. density 140 kg/m$^3$
4 Flange connection

**Notice**:

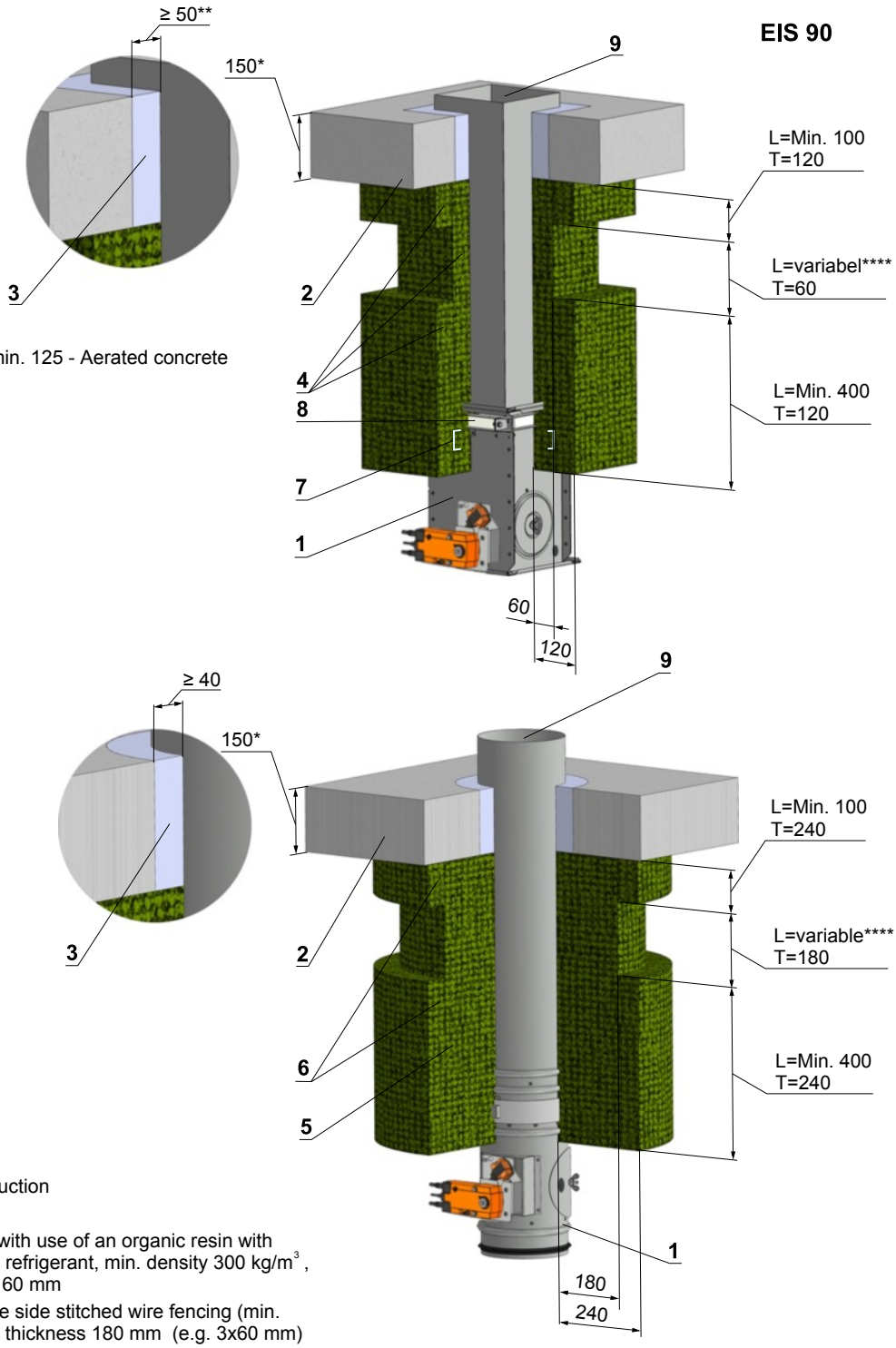
- Fire damper FDMB-C - installation opening dimensions a x b = (2x(A + 85$^{+3}$mm) + 20 mm) x (B + 85$^{+3}$mm) or a x b = (A + 85$^{+3}$mm) x (2x(B + 85$^{+3}$mm) + 20 mm)
- Fire damper FDMB-C - installation opening dimensions a x b = (2x(D + 141$^{+3}$mm) + 20 mm) x (D + 141$^{+3}$mm) or a x b = (D + 141$^{+3}$mm) x (2x(D + 141$^{+3}$mm) + 20 mm)
- Gap between frame and damper body and frame and construction must be filled by glue (PROMAT K84)
- Fire damper FDMB-C - distance between dampers 104 mm
- Fire damper FDMB-K - distance between dampers 160 mm
- Flange to flange connection - Up to four dampers can be installed

**Holders No. X = (2xZB1) + (2xZH1)**
**Screws No. Y = 2xX**

| Dimensions | Number ZB1 | Number ZH1 |
|---|---|---|
| A1,B1,D1 ≤ 400 | 1 | 1 |
| 400 < A1,B1,D1 ≤ 800 | 2 | 2 |
| 800 < A1,D1 ≤ 1260 | 3 | 3 |
| 1260 < A1,D1 ≤ 1600 | 4 | 4 |
| 1600 < A1 ≤ 2000 | 5 | 5 |

**A1 = A or A1 = 2xA**
**B1 = B or B1 = 2xB**
**D1 = D or D1 = 2xD**

**Fig. 59 Installation outside of solid ceiling construction - mineral wool**




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

POSITION:

1 Fire damper FDMB
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/m$^3$ , and min. thickness 60 mm
5 Stone wool with one side stitched wire fencing (min. density 105 kg/m$^3$), thickness 180 mm (e.g. 3x60 mm)
6 Stone wool with one side stitched wire fencing (min. density 105 kg/m$^3$), thickness 60 mm
7 Profil U25x40x25
8 VRM-III*****
9 Duct

Used materials - example***:

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

**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.

**** Depends on the distance of the flap from the construction, when the maximum distance from the construct is not limited and according to EN 15882-2 must use the required number of hinges according to EN 13366-1:2014.

***** Reinforcement fixing VRM-III see Fig.76
Installation of profile U25x40x25 see Fig.77

T - thickness of the insulation (mm)

**Fig. 60 Installation outside of solid ceiling construction - concrete**

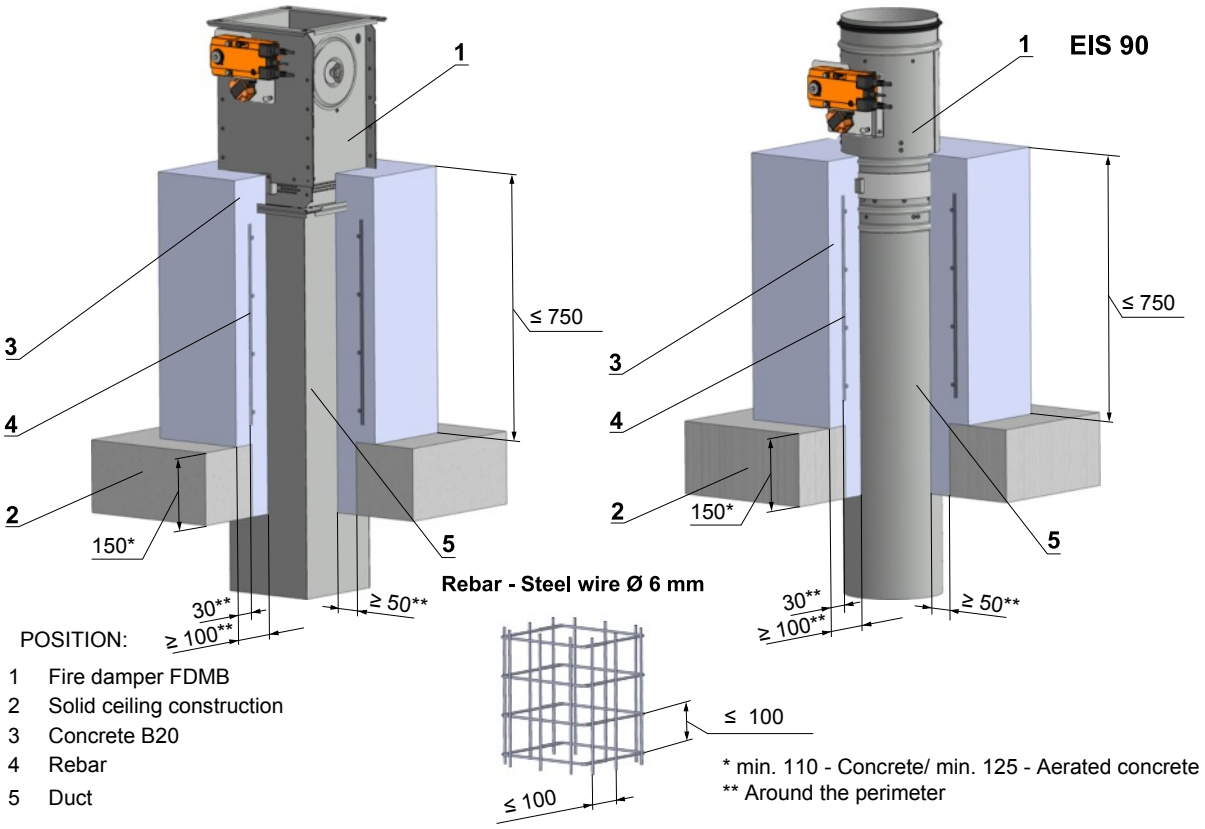



**Fig. 61 Installation outside of solid ceiling construction - concrete and installation frame E4, R5**

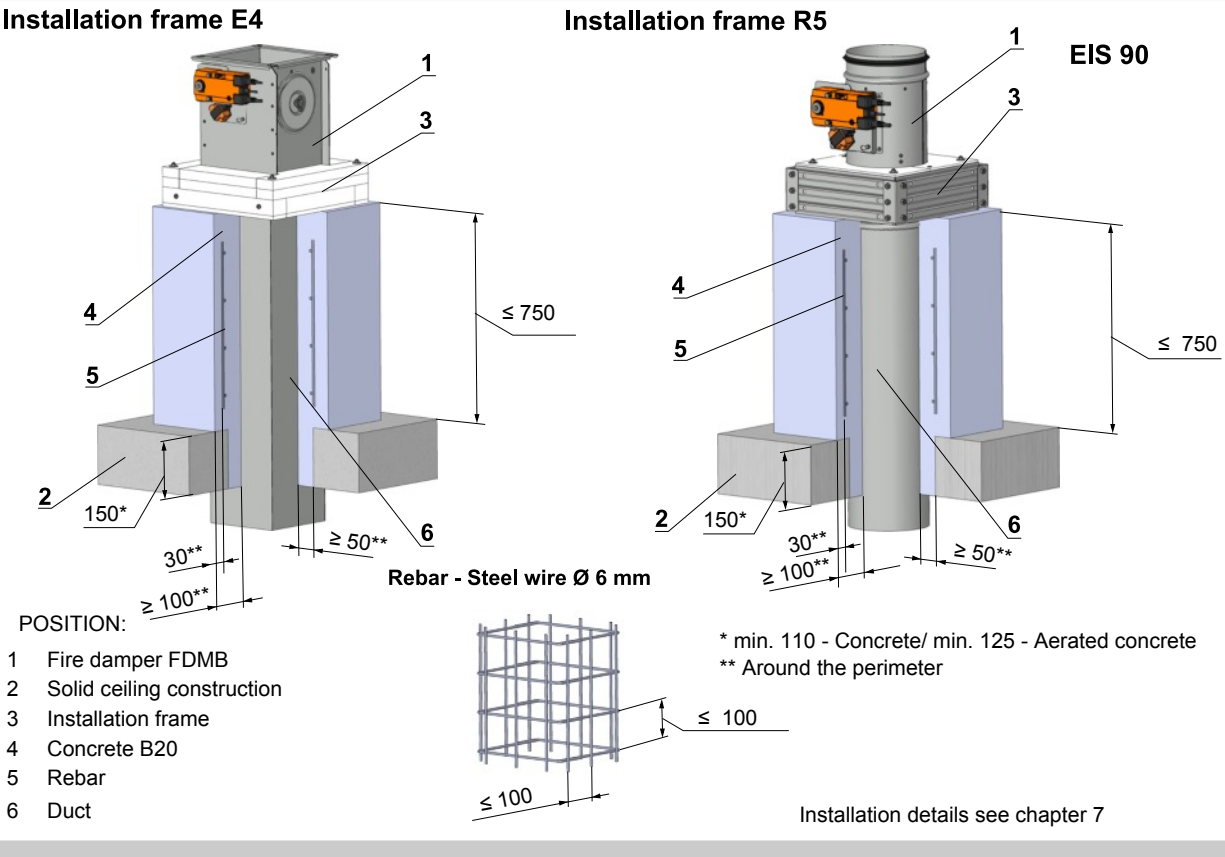
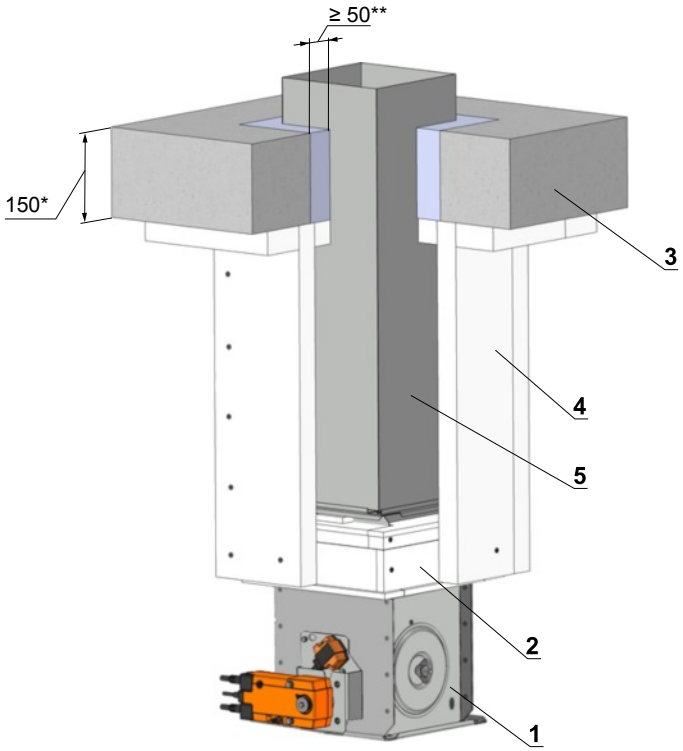


**Fig. 62 Installation outside of solid ceiling construction - installation frame E6, R6 with cement lime plates**

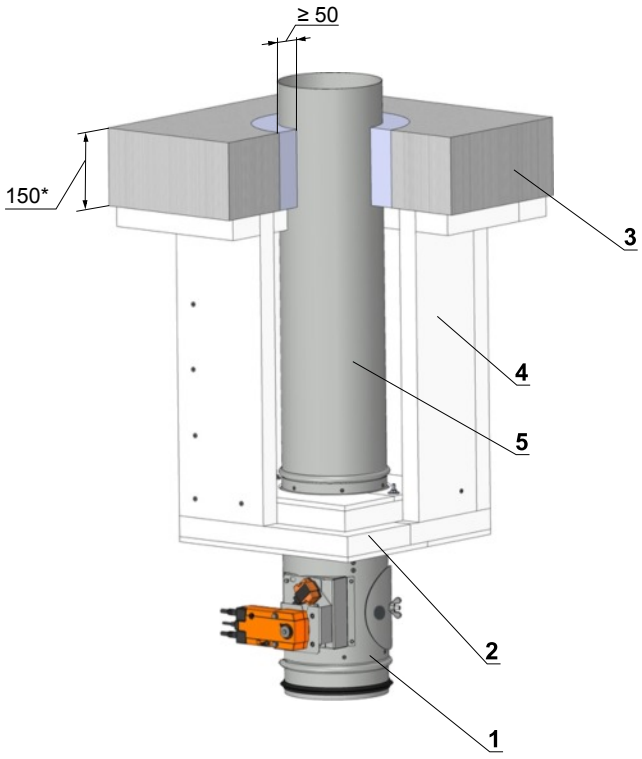
## Installation frame E6

**EIS 90**




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

## Installation frame R6



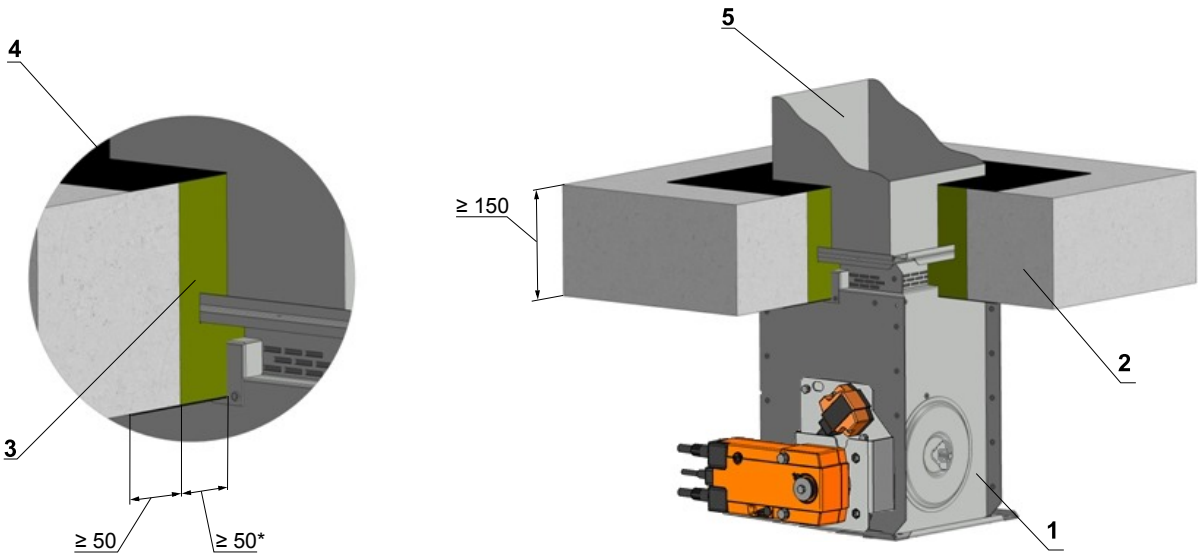

POSITION:

1 Fire damper FDMB
2 Installation frame
3 Solid ceiling construction
4 Cement lime plate
5 Duct

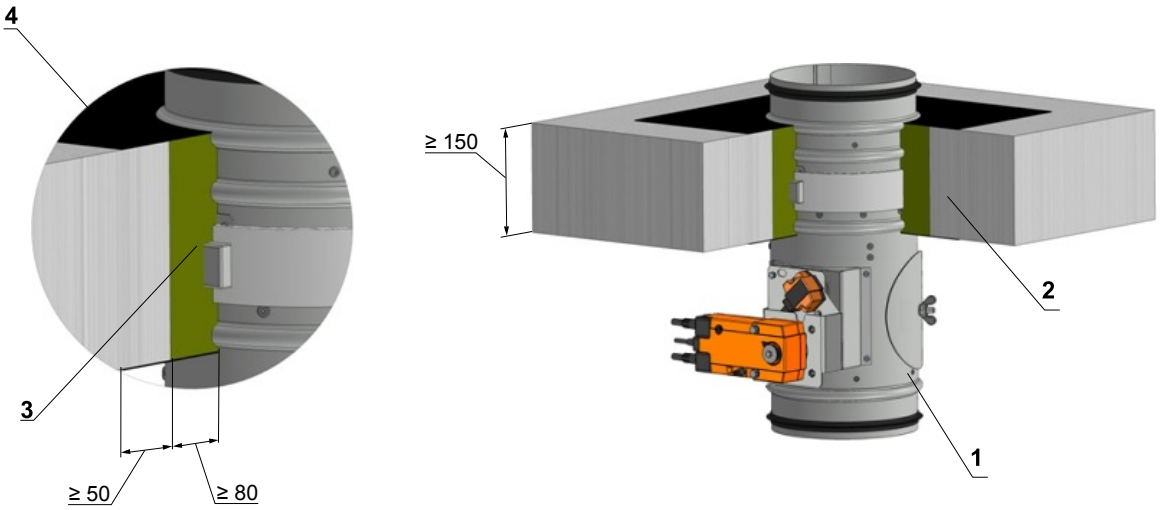
Installation details see chapter 7

**Fig. 63 Solid ceiling construction - stuffing box, fire protection mastic**

**EIS 60**




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




LEGENDA:

1 Fire damper FDMB
2 Solid ceiling construction
3 Stuffing box (mineral stone wool min. density 140 kg/m$^3$)
4 Fire protection mastic min. thickness 1 mm
5 Duct

Used materials - example***:

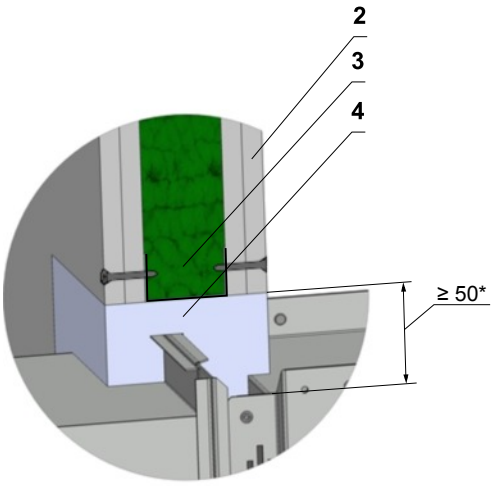
3 - Promapyr, Rockwool Steprock HD
4 - Promastop - P, K

**Notice:**

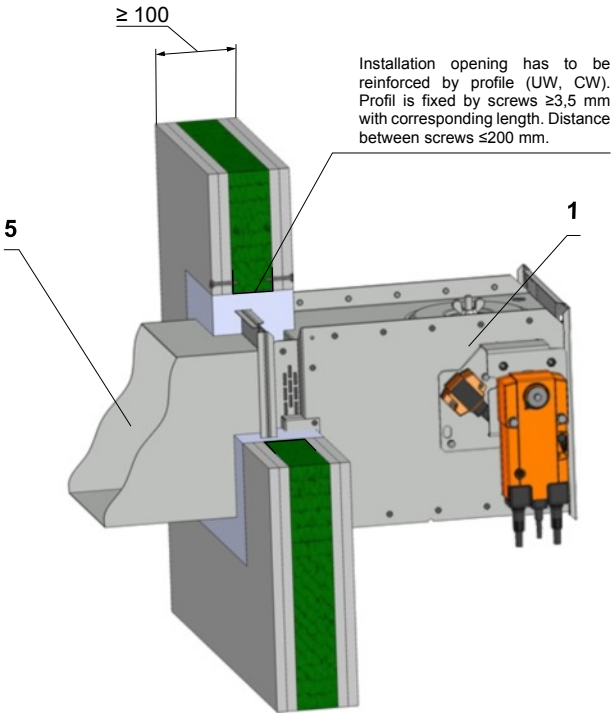
*** Fire resistant insulation and fire resistant board can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

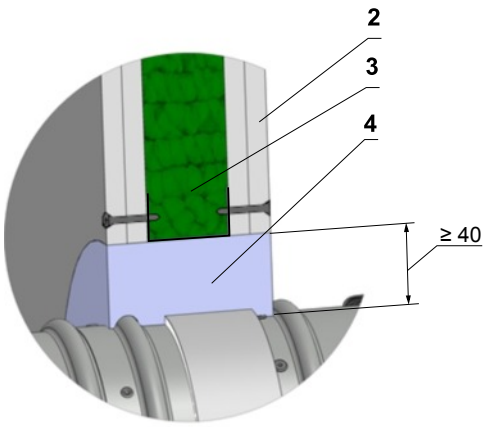
**Fig. 64 Gypsum wall construction - mortar or gypsum**

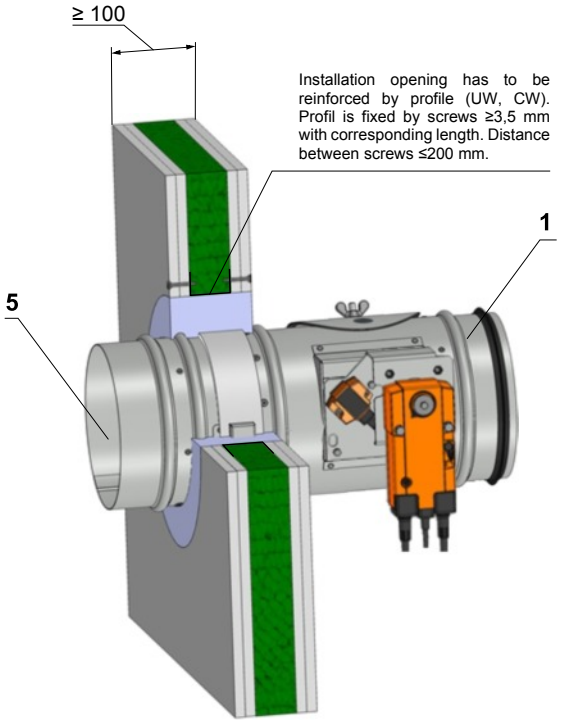
**EIS 120**




* Around the perimeter




POSITION:

1 Fire damper FDMB

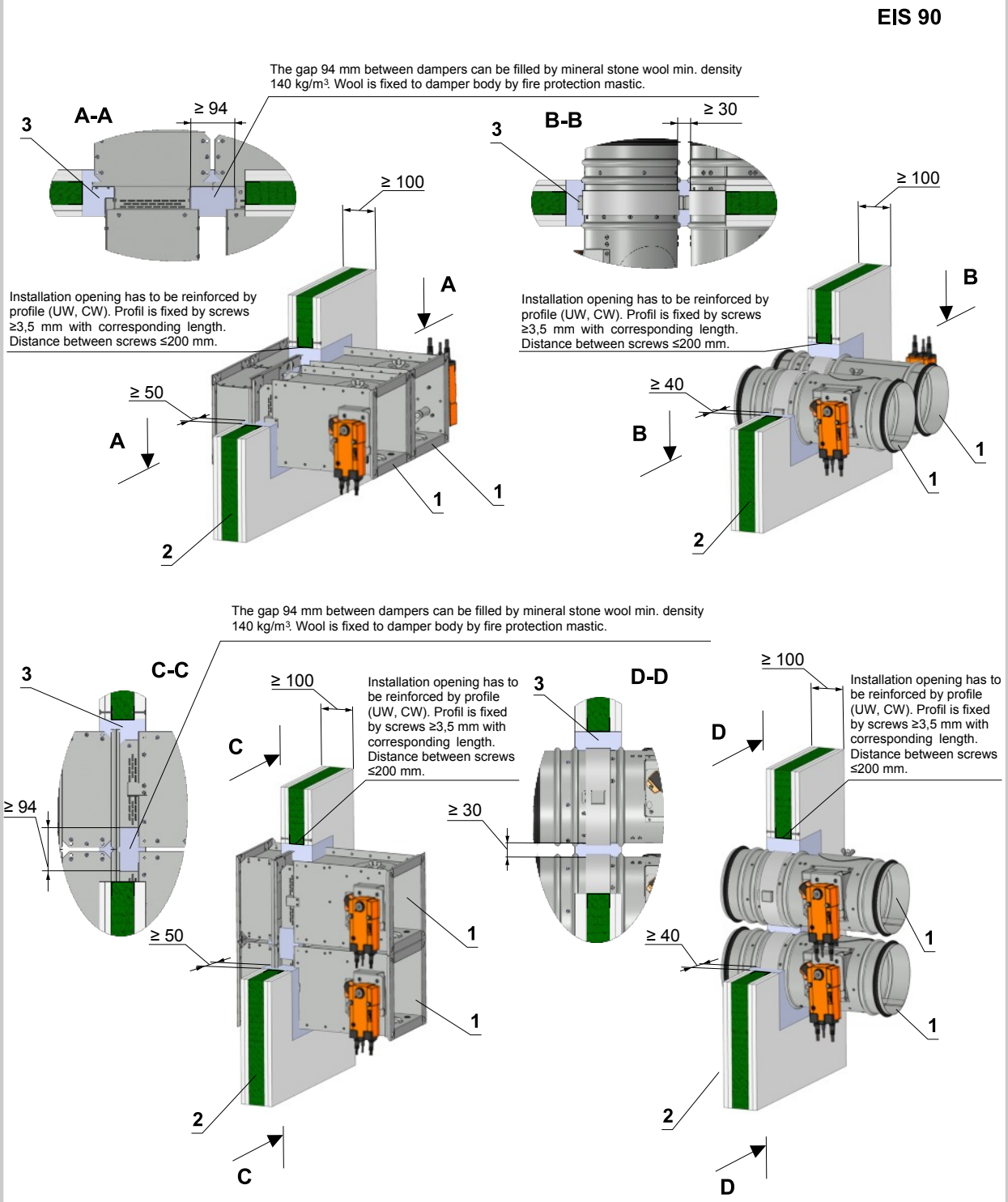
2 Gypsum plate

3 Mineral wool (type depending on the type of construction)

4 Mortar or gypsum

5 Duct

**Fig. 65 Gypsum wall construction - flange to flange - mortar or gypsum**



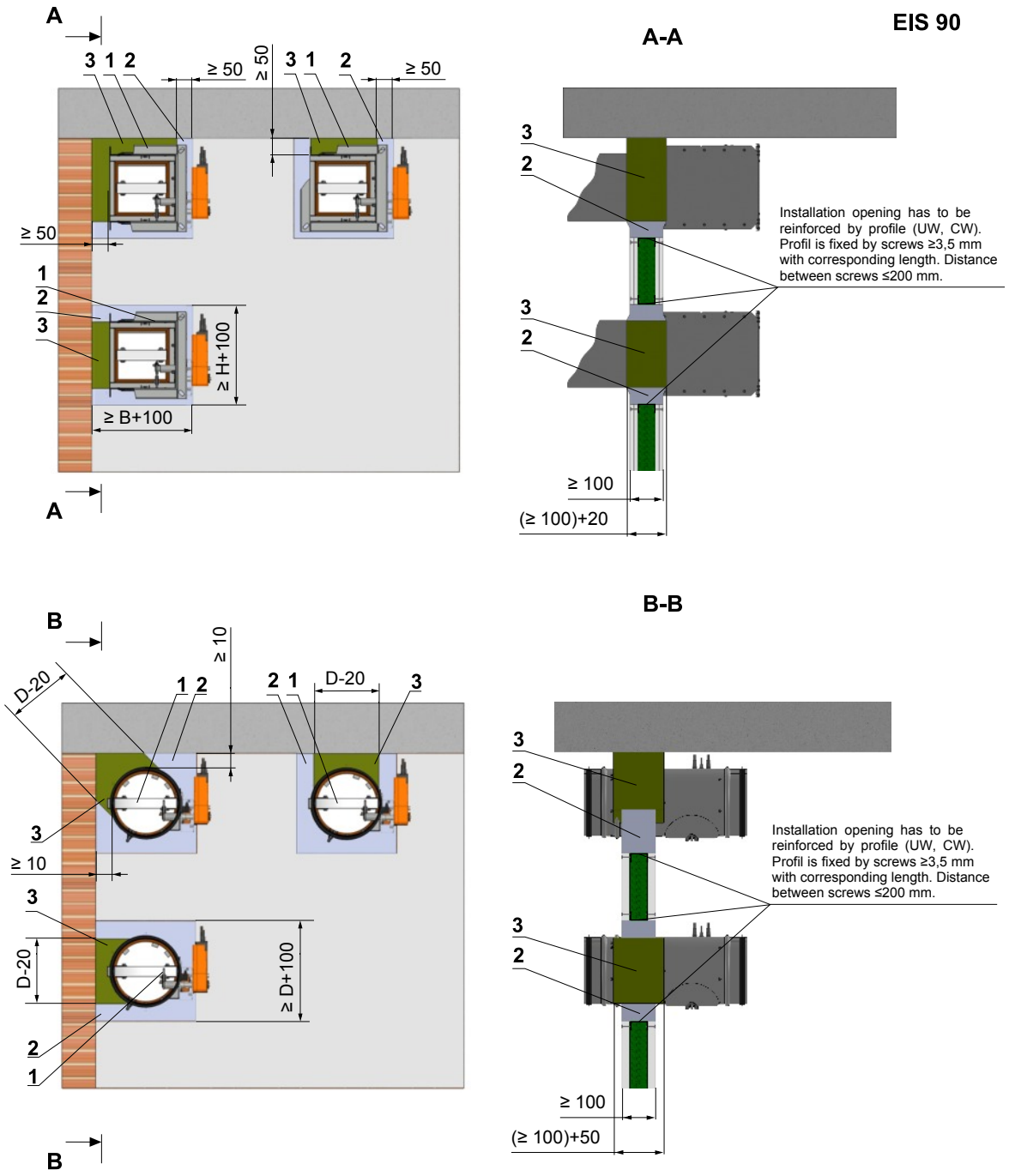

POSITION:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Mortar or gypsum

**Notice:**

- Fire damper FDMB-C - installation opening for each damper has minimal dimensions
  a x b = (A+100) x (2xB +100) mm or (2xA+100) x (B +100) mm
- Fire damper FDMB-K - installation opening for each damper has minimal dimensions
  D+80 mm (D+160 mm for dampers with flanges)
- Gap between damper and construction is filled by mortar or gypsum
- Fire damper FDMB-C - distance between dampers 60 mm
- Fire damper FDMB-K - distance between dampers 70 mm
- Flange to flange connection - Up to four dampers can be installed

**Fig. 66 Gypsum wall construction - installation next to wall, ceiling - mortar or gypsum and mineral wool**



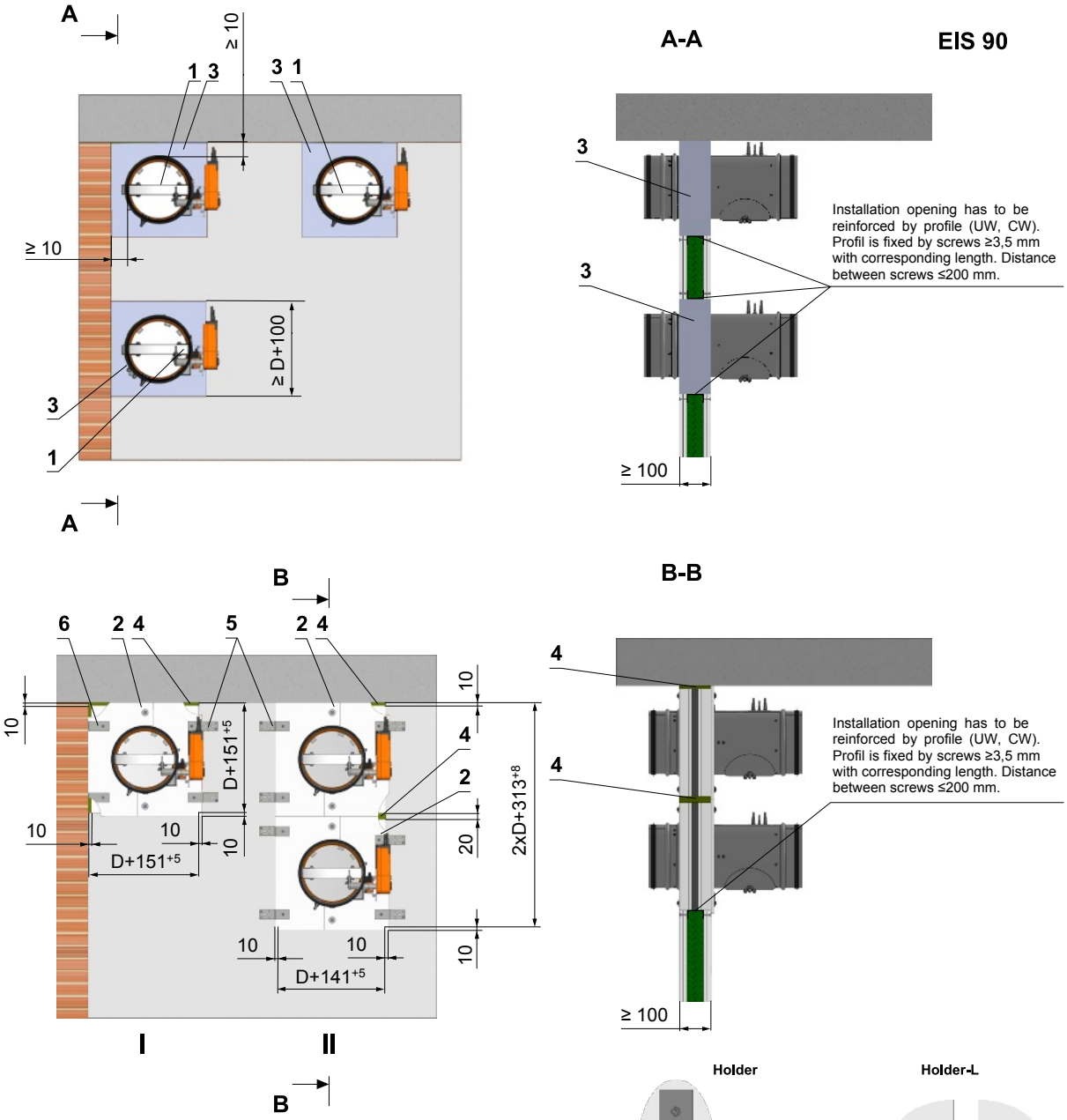

POSITION:

1 Fire damper FDMB
2 Mortar or gypsum
3 Mineral stone wool min. density 140 kg/m³

**Notice:**

- Gap between damper and construction is filled by mortar or gypsum and mineral wool
- Wool is fixed to damper body and construction by fire protection mastic
- Mineral wool thickness = construction thickness + 20 mm or 50 mm
- Installation is valid for ceiling construction

**Fig. 67** **Gypsum wall construction - installation next to wall, ceiling - mortar or gypsum and mineral wool**
**Gypsum wall construction - installation next to wall, ceiling - installation frame R1, R2 and mineral wool**




**I**
**Holders No. X = X1/2**
**Holders-L No Z = X1/2**
**Screws No. Y**

**II**
**Holders No. X = X1 - Z1**
**Holders-L No Z = Z1/2**
**Screws No. Y**

| Dimensions | Number X1 | Number Y | Number Z1 |
|---|---|---|---|
| D ≤ 400 | 4 | 8 | 2 |
| 400 < D ≤ 800 | 8 | 16 | 4 |
| 800 < D ≤ 1000 | 12 | 24 | 6 |

POSITION:

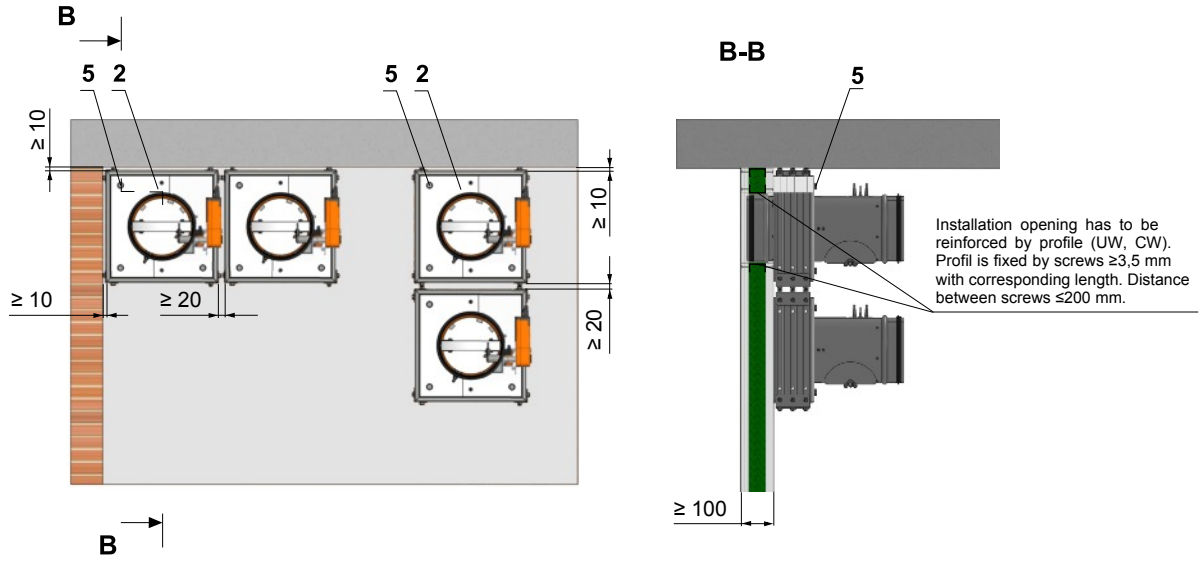
1 Fire damper FDMB
2 Fire damper FDMB with installation frame R1, R2
3 Mortar or gypsum
4 Mineral stone wool min. density 140 kg/m$^3$
5 Holder
6 Holder L

**Notice:**

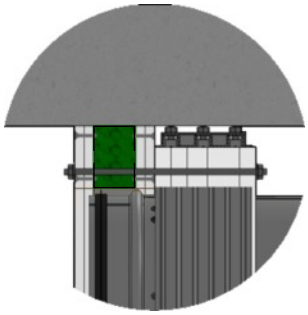
- Gap between frame and damper body and frame and construction must be filled by glue (PROMAT K84).
- Wool is fixed to installation frame and construction by fire protection mastic.

**Fig. 68 Gypsum wall construction - installation next to wall, ceiling - installation frame R5**

**EIS 90**



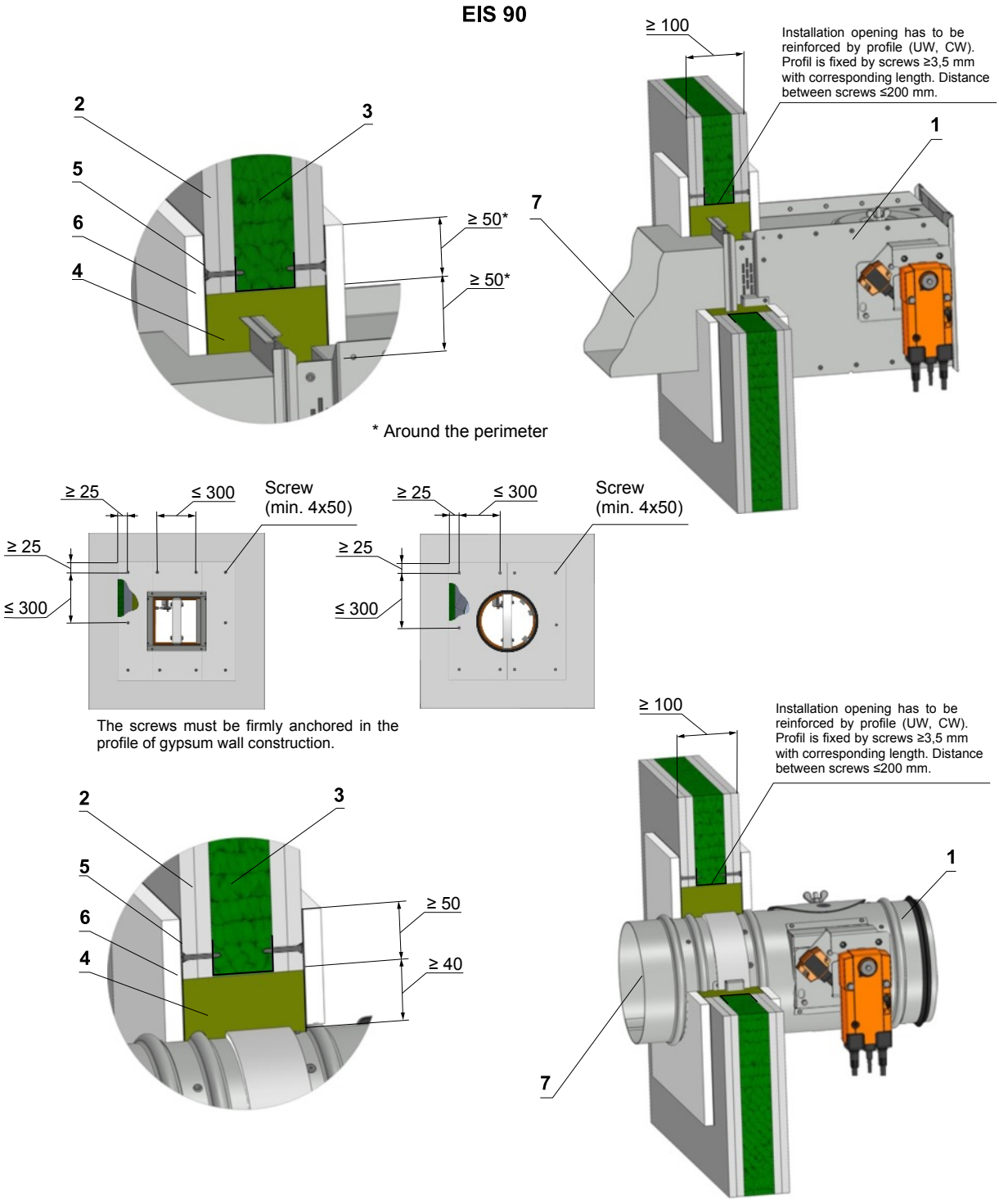

Fitting with threaded rods



POSITION:

1 Fire damper FDMB with installation frame R5
2 Fitting with threaded rods

**Fig. 69 Gypsum wall construction - stuffing box, fire protection mastic and cement lime plate**




POSITION:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Stuffing box (mineral stone wool min. density 140 kg/m³)
5 Fire protection mastic min. thickness 1 mm
6 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
7 Duct

Used materials - example**:

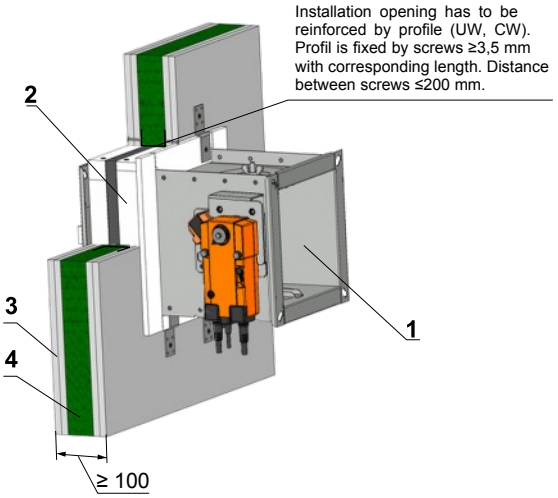
3 - Promapyr, Rockwool Steprock HD
4 - Promastop - P, K
5 - Promatect - H

**Notice:**

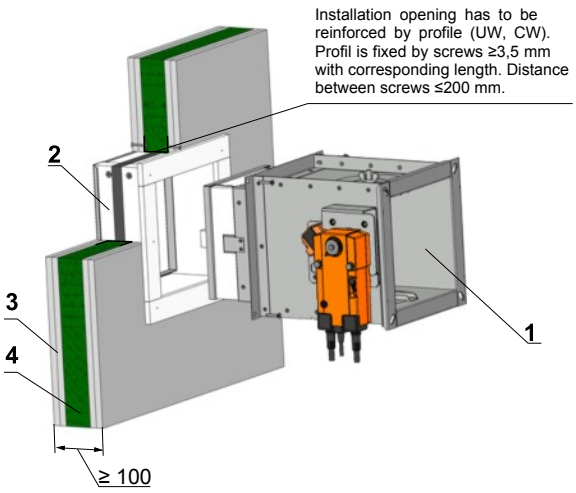
** Fire resistant insulation and fire resistant board can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

**Fig. 70 Gypsum wall construction - installation frame E1, E3, E4, R1, R2, R3, R4, R5**

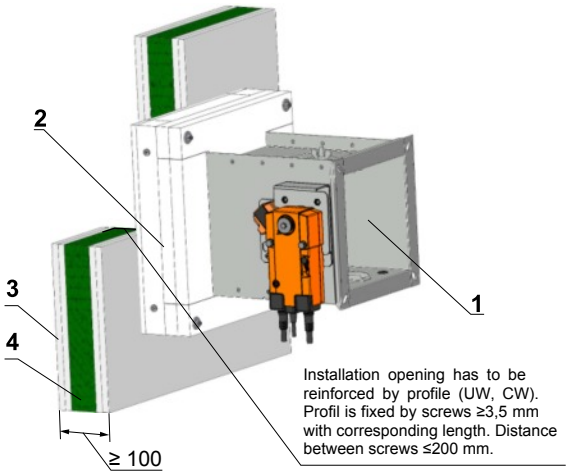
## Installation frame E1



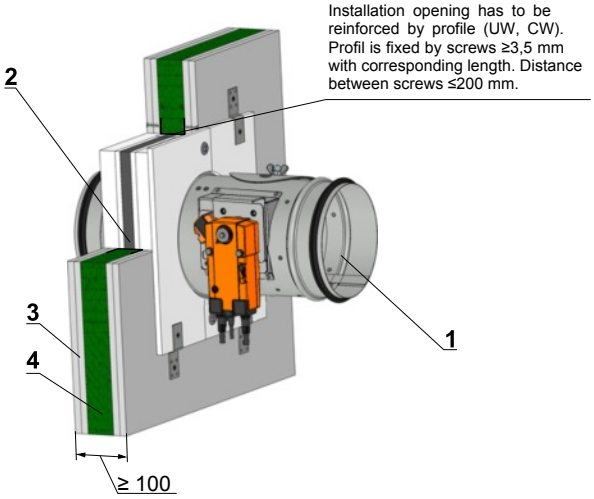

## EIS 90 Installation frame E3



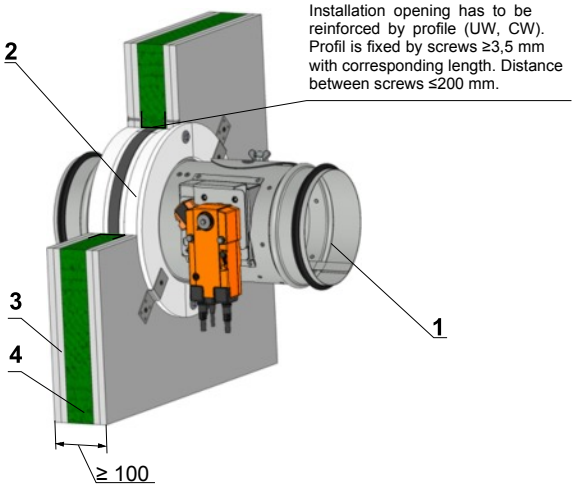

## Installation frame E4



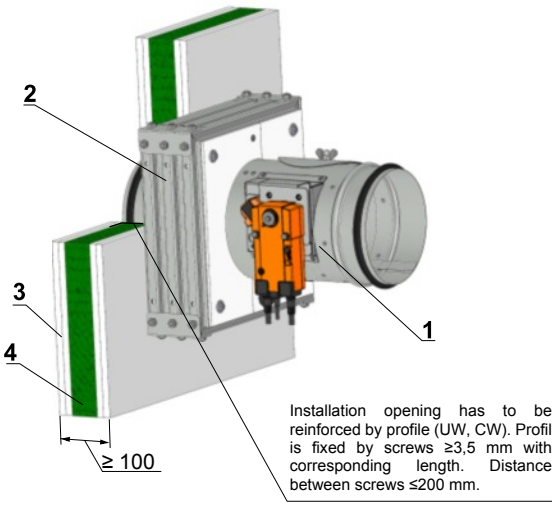

## Installation frame R1, R2




## Installation frame R3, R4




## Installation frame R5



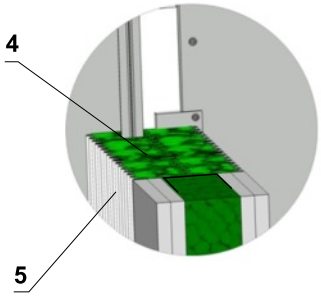

POSITION:

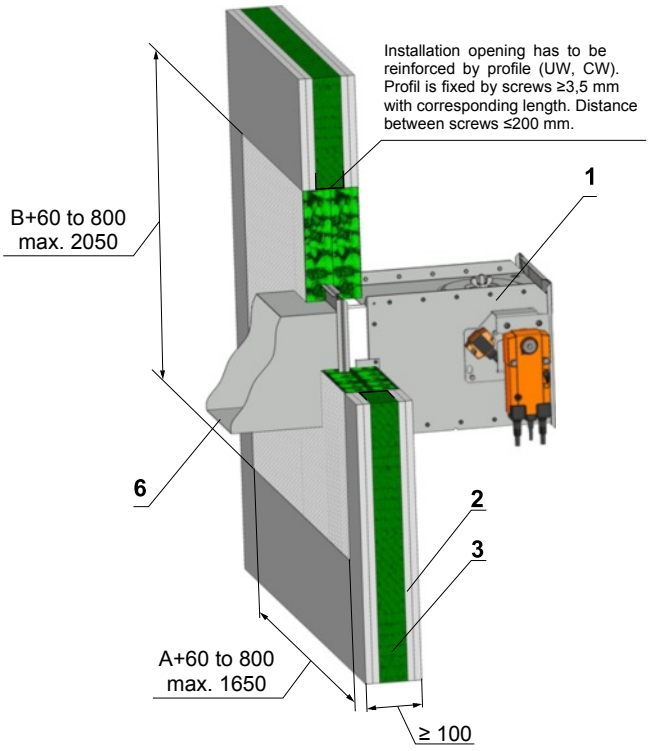
1 Fire damper FDMB
2 Installation frame
3 Gypsum plate
4 Mineral wool (type depending on the type of construction)

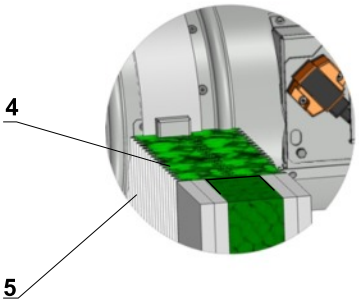
Installation details see chapter 7

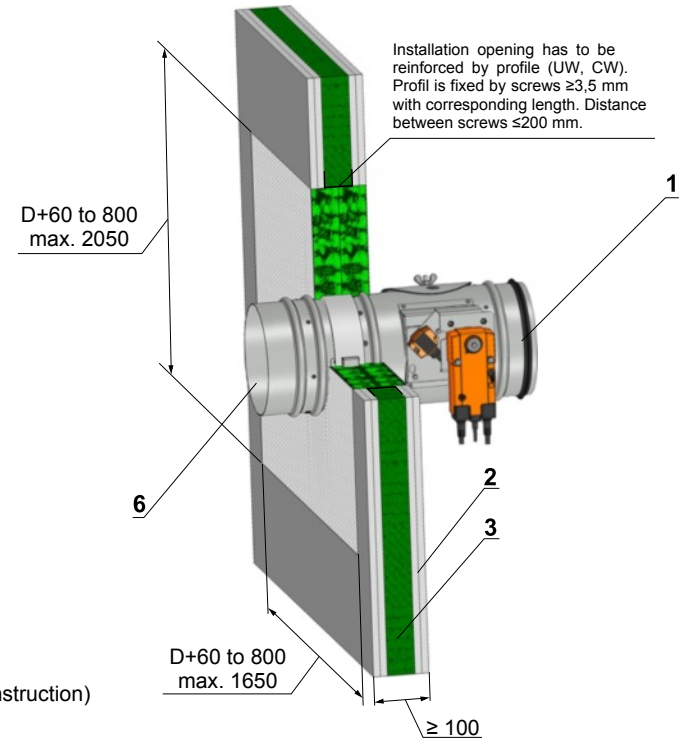
**Fig. 71 Gypsum wall construction - Weichschott**

**EIS 90**




POSITION:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Fire resistant board
5 Fire stop coating thickness 1 mm
6 Duct

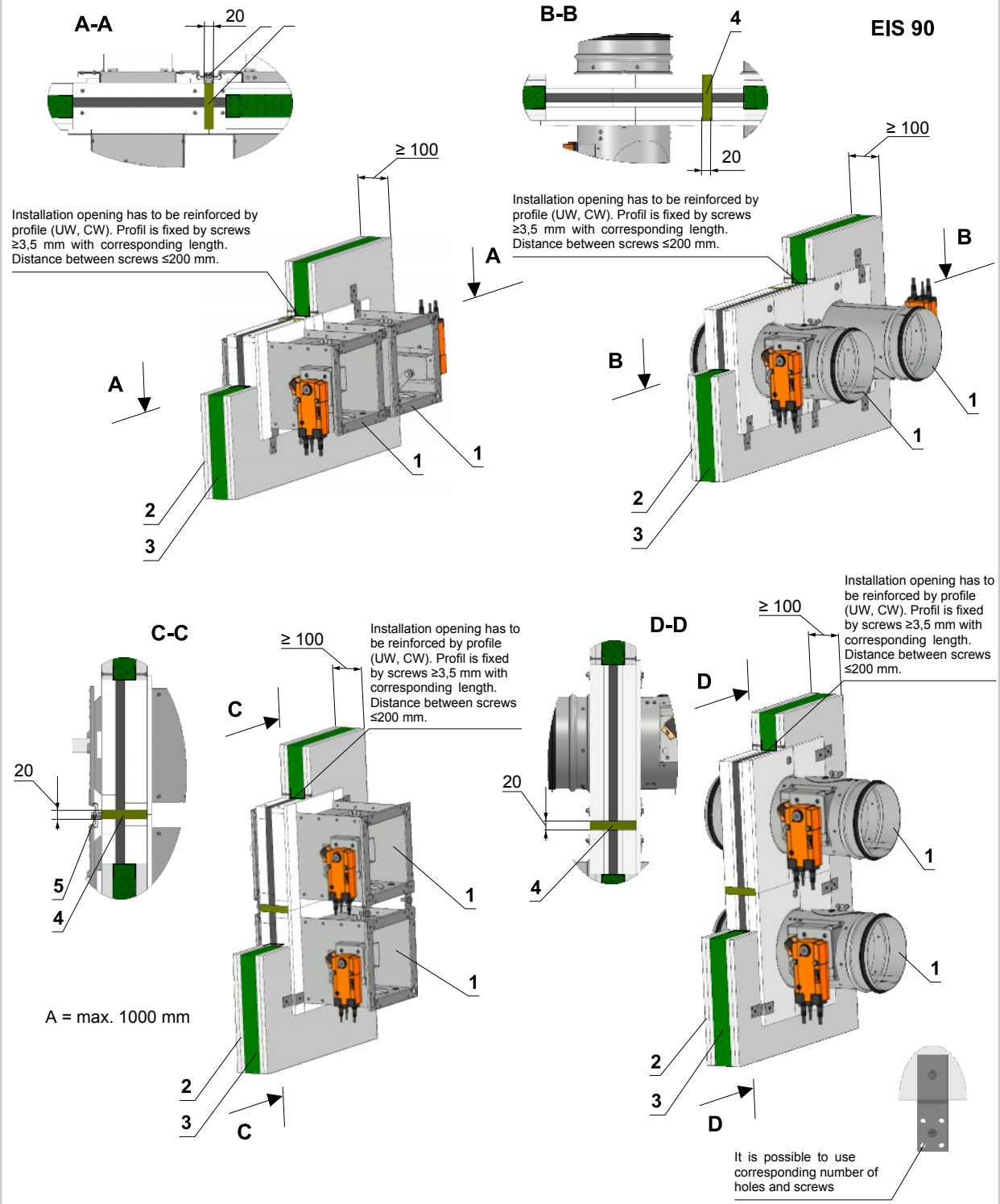
Used materials - example*:

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

**Notice:**

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

**Fig. 72 Gypsum wall construction - flange to flange - installation frame E1, R1**




POSITION:

1 Fire damper FDMB with Installation frame E1, R1

2 Gypsum plate

3 Mineral wool (type depending on the type of construction)

4 Mineral stone wool min. density 140 kg/m³

5 Flange connection

**Notice:**

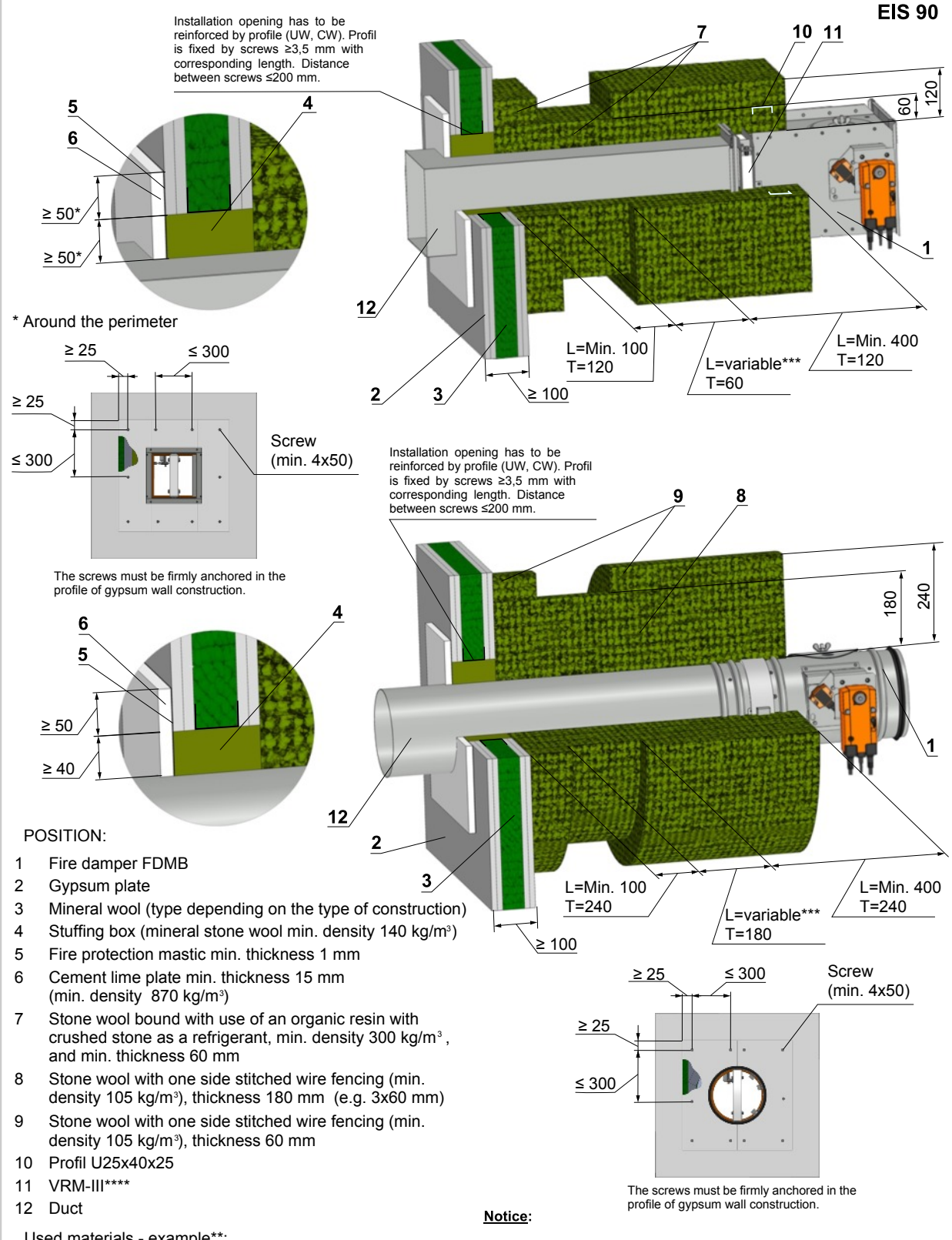
- Fire damper FDMB-C - installation opening dimensions a x b = (2x(A + 85⁺³mm) + 20 mm) x (B + 85⁺³mm) or a x b = (A + 85⁺³mm) x (2x(B + 85⁺³mm) + 20 mm)
- Fire damper FDMB-C - installation opening dimensions a x b = (2x(D + 141⁺³mm) + 20 mm) x (D + 141⁺³mm) or a x b = (D + 141⁺³ mm) x (2x(D + 141⁺³mm) + 20 mm)
- Gap between frame and damper body and frame and construction must be filled by glue (PROMAT K84)
- Fire damper FDMB-C - distance between dampers 104 mm
- Fire damper FDMB-K - distance between dampers 160 mm
- Flange to flange connection - Up to four dampers can be installed

**Holders No. X = (2xZB1) + (2xZH1)**
**Screws No. Y = 2xX**

| Dimensions | Number ZB1 | Number ZH1 |
|---|---|---|
| A1,B1,D1 ≤ 400 | 1 | 1 |
| 400 < B1,H1,D1 ≤ 800 | 2 | 2 |
| 800 < B1,D1 ≤ 1260 | 3 | 3 |
| 1260 < B1,D1 ≤ 1600 | 4 | 4 |
| 1600 < B1 ≤ 2000 | 5 | 5 |

**A1 = A or A1 = 2xA**
**B1 = B or B1 = 2xB**
**D1 = D or D1 = 2xD**

**Fig. 73 Installation outside of gypsum wall construction - mineral wool**




POSITION:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Stuffing box (mineral stone wool min. density 140 kg/m³)
5 Fire protection mastic min. thickness 1 mm
6 Cement lime plate min. thickness 15 mm (min. density 870 kg/m³)
7 Stone wool bound with use of an organic resin with crushed stone as a refrigerant, min. density 300 kg/m³, and min. thickness 60 mm
8 Stone wool with one side stitched wire fencing (min. density 105 kg/m³), thickness 180 mm (e.g. 3x60 mm)
9 Stone wool with one side stitched wire fencing (min. density 105 kg/m³), thickness 60 mm
10 Profil U25x40x25
11 VRM-III****
12 Duct

Used materials - example**:

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

**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.

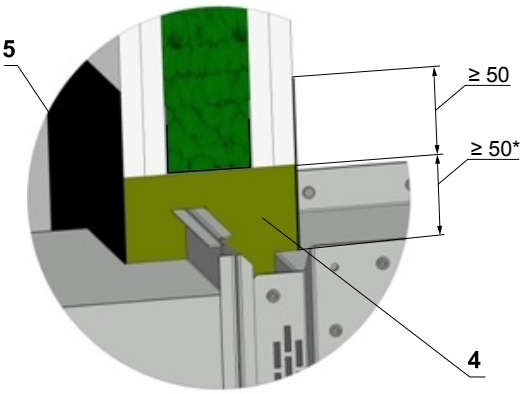
*** Depends on the distance of the flap from the construction, when the maximum distance from the construct is not limited and according to EN 15882-2 must use the required number of hinges according to EN 13366-1:2014.

**** Reinforcement fixing VRM-III see Fig.76
Installation of profile U25x40x25 see Fig.77

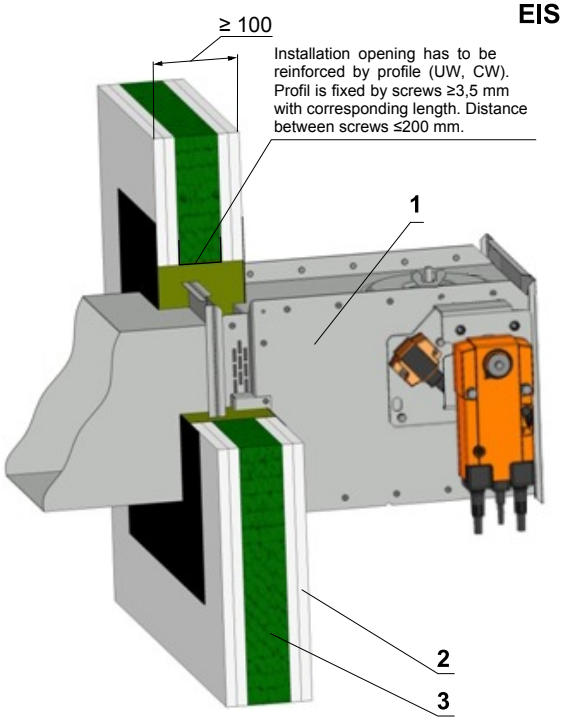
T - thickness of the insulation (mm)

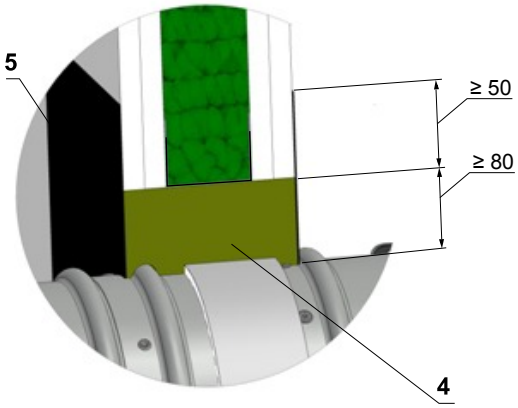
**Fig. 74 Gypsum wall construction - stuffing box and fire protection mastic**

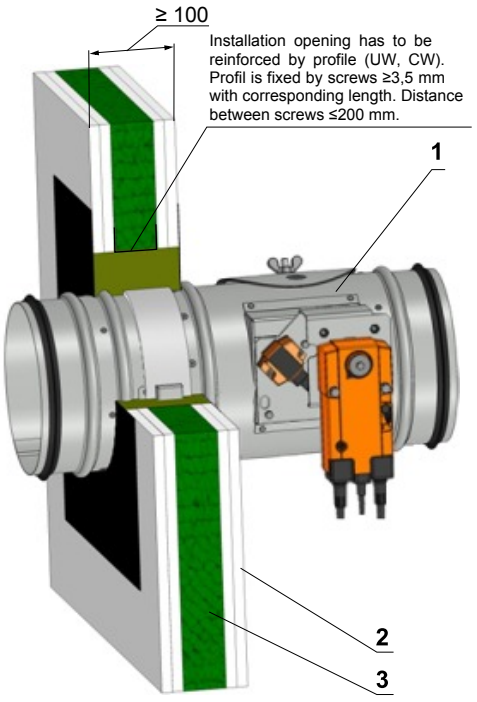
**EIS 60**




* Around the perimeter




LEGENDA:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Stuffing box (mineral stone wool min. density 140 kg/m³)
5 Fire protection mastic min. thickness 1 mm

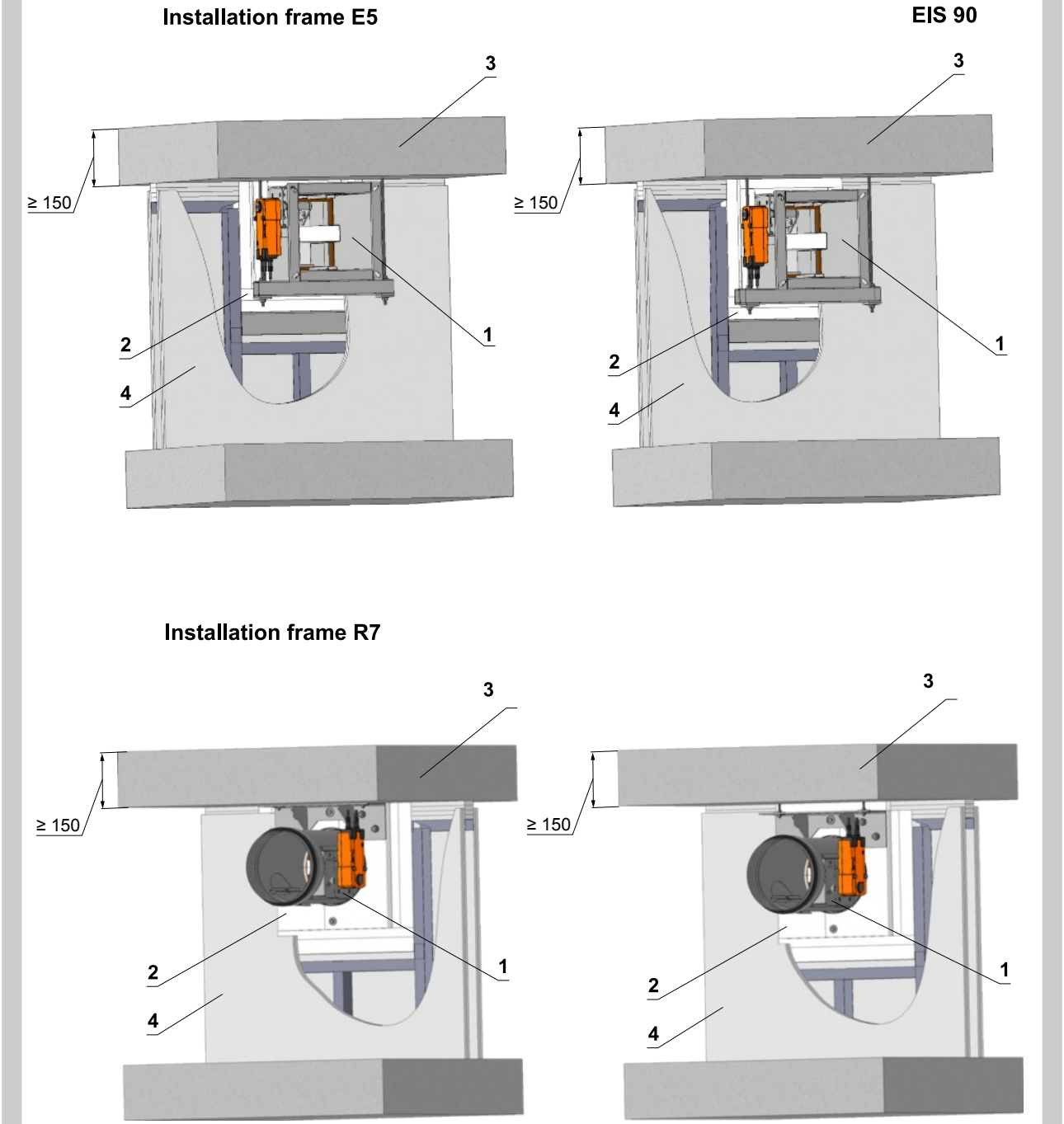
Used materials - example**:

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

**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. 75 Gypsum wall construction - flexible ceiling (with possibility to move/to sag) - installation frame E5, R7**



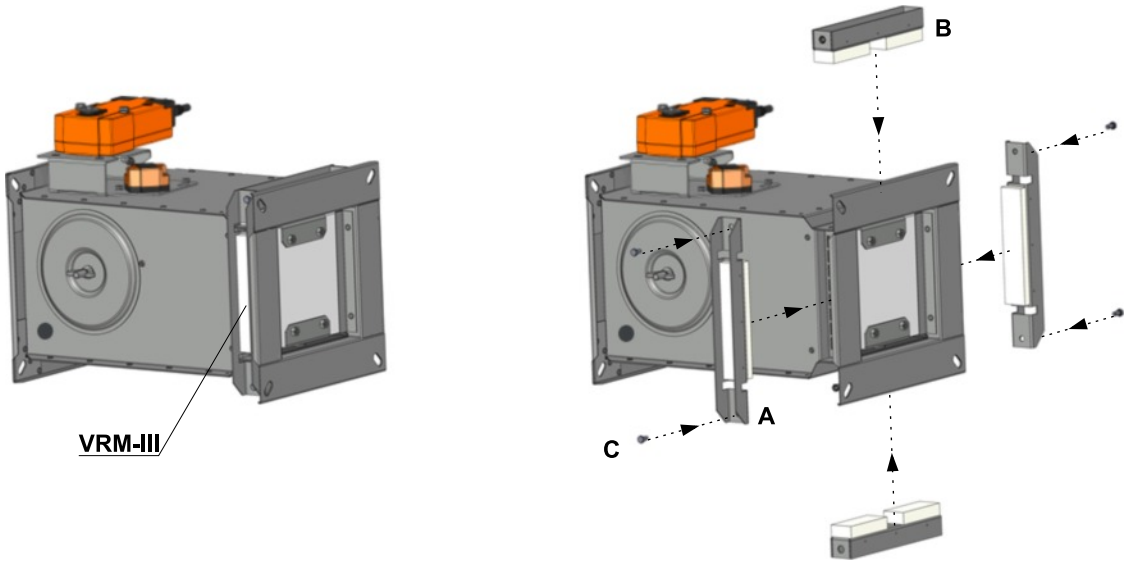

POSITION:

1 Fire damper FDMB
2 Installation frame
3 Solid ceiling construction
4 Wall with possibility of ceiling movement

Installation details see chapter 7

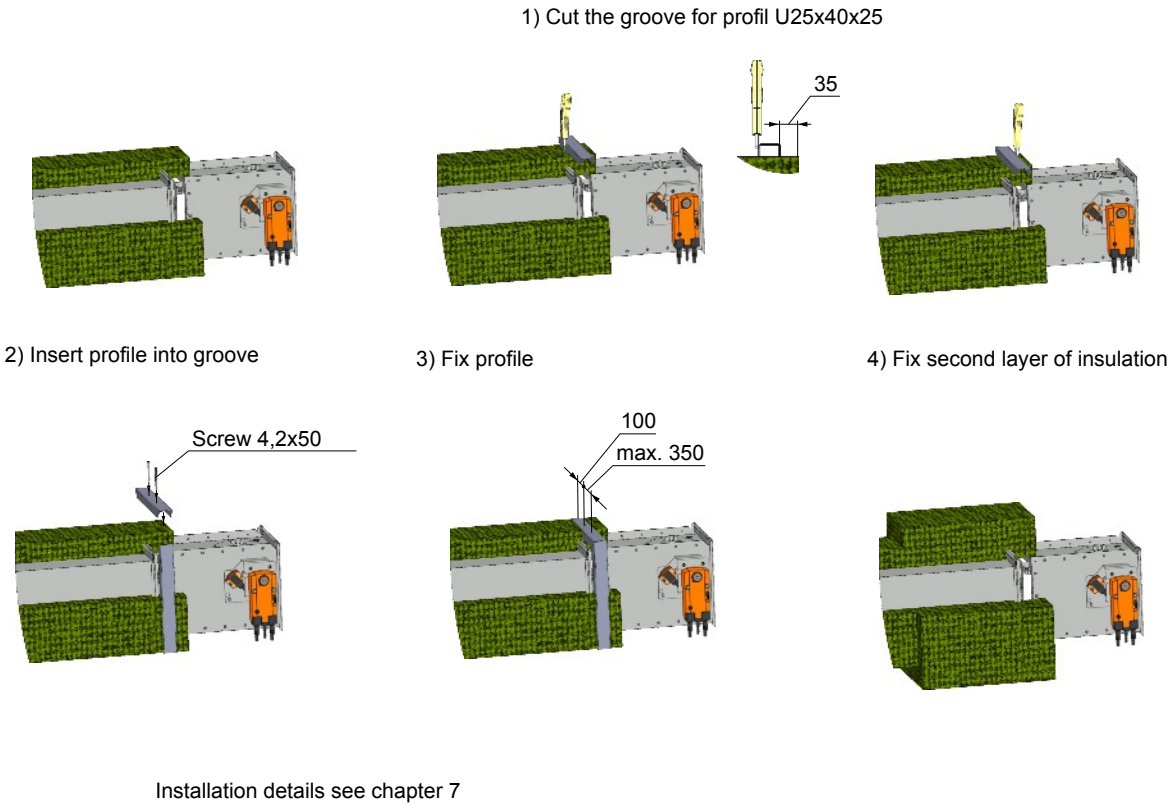
**Fig. 76 Fixing of reinforcement to damper body VRM**

**Important: For lower fire resistance than EI90 the reinforcement VRM is not necessary !!!**




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

**Fig. 77**




Installation details see chapter 7

## 7. Installation frames

### 7.1. Rectangular dampers

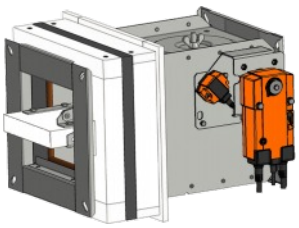
**Tab. 7.1.1.**

| Installation frame | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Material | Installation type | | | | | | | | | |
| | | Solid wall constr. | Th. [mm] | Solid ceiling const. | Th. [mm] | Gypsum wall constr. | Th. [mm] | Outside solid wall con./solid ceiling con. | Th. [mm] | On solid wall constr./Solid ceiling constr. | Th. [mm] |
| E1 | Cement lime | √ | ≥100 | √ | ≥150 | √ | ≥100 | - | - | - | - |
| E2 | Galvanized plate | √ | ≥100 | √ | ≥150 | - | - | - | - | - | - |
| E3 | Cement lime | - | - | - | - | √ | ≥100 | - | - | - | - |
| E4 | Cement lime | √ | ≥100 | √ *) | ≥150 | - | - | Solid ceiling construction *) | ≥150 | √ | ≥100/ ≥150 |
| E5 | Cement lime | - | - | - | - | √ **) | ≥100 | - | - | - | - |
| E6 | Cement lime | - | - | - | - | - | - | √ | ≥100/ ≥150 | - | - |

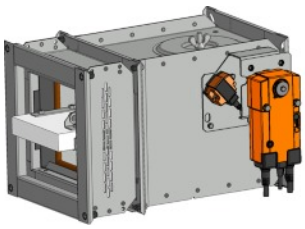
* **With concrete**
** **Ceiling with movement possibility**

**Fig. 78**

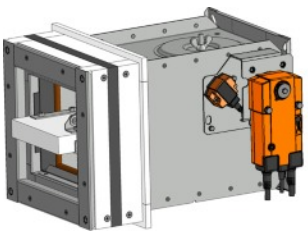
**Installation frame E1**



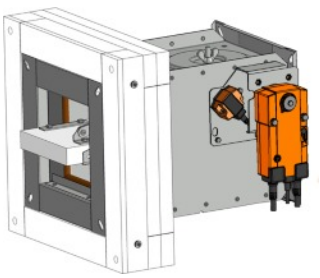
**Installation frame E2**



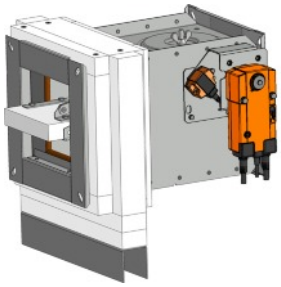
**Installation frame E3**



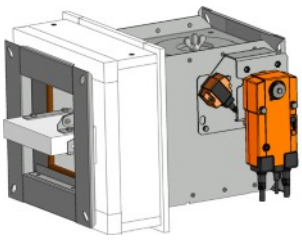
**Installation frame E4**



**Installation frame E5**



**Installation frame E6**



## 7.2. Round dampers

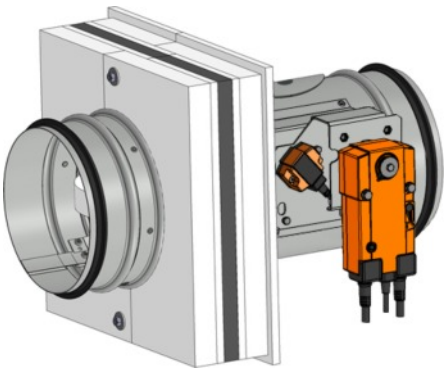
**Tab. 7.2.1.**

| Installation frame | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | Material | Installation type | | | | | | | | | |
| | | Solid wall constr. | Th. [mm] | Solid ceiling const. | Th. [mm] | Gypsum wall constr. | Th. [mm] | Outside solid wall con./solid ceiling con. | Th. [mm] | On solid wall constr./Solid ceiling constr. | Th. [mm] |
| R1 | Cement lime | √ | ≥100 | √ | ≥150 | √ | ≥100 | - | - | - | - |
| R2 | Cement lime | √ | ≥150 | √ | ≥150 | √ | ≥100 | - | - | - | - |
| R3 | Cement lime | √ | ≥100 | √ | ≥150 | √ | ≥100 | - | - | - | - |
| R4 | Cement lime | √ | ≥150 | √ | ≥150 | √ | ≥100 | - | - | - | - |
| R5 | Cement lime | - | - | - | - | - | - | Solid ceiling construction *) | ≥150 | √ | ≥100 |
| R6 | Cement lime | - | - | - | - | - | - | √ | ≥100/ ≥150 | - | - |
| R7 | Cement lime | - | - | - | - | √ **) | ≥100 | - | - | - | - |

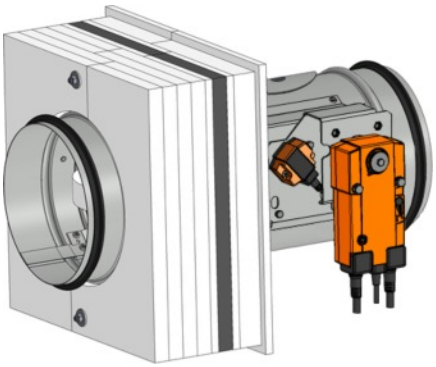
* **With concrete**
** **Ceiling with movement possibility**

**Fig. 79**

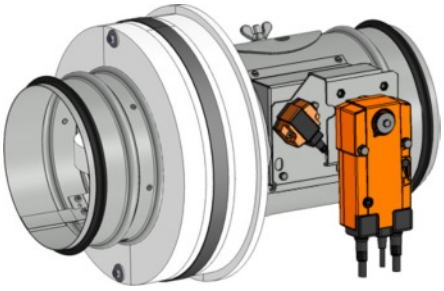
**Installation frame R1**



**Installation frame R2**



**Installation frame R3**



**Installation frame R4**

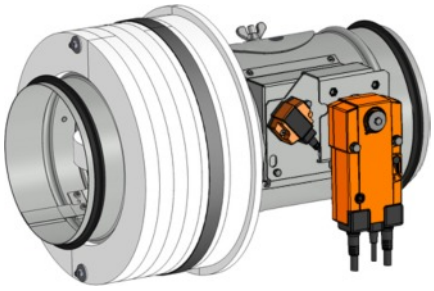
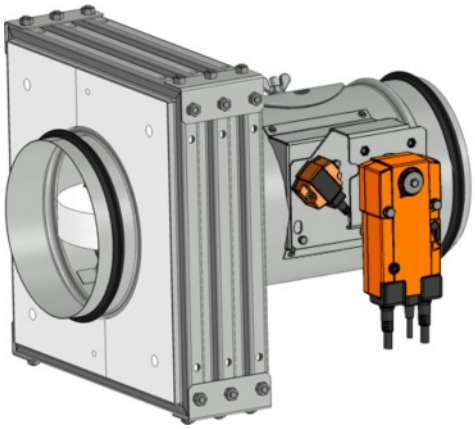
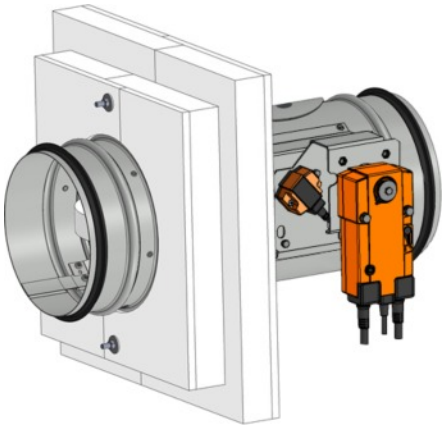


Fig. 80

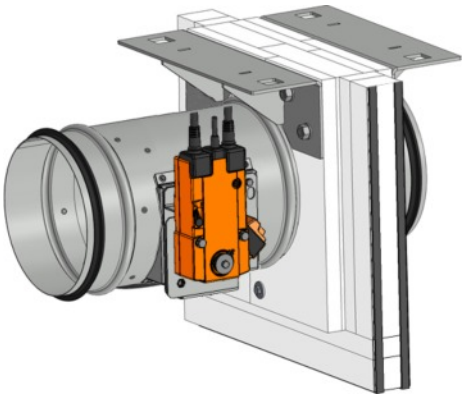
**Installation frame R5**



**Installation frame R6**



**Installation frame R7**



**Installation frame can be delivered mounted on the damper body or separately.**

## Installation frame E1

Installation frame E1 is suitable for:

- Solid wall construction
- Gypsum wall construction
- Solid ceiling construction

On the inside and outside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between damper body and installation frame and between installation frame and wall construction.

**Installation:**

- Gypsum wall construction has to be installed according manufacture requirements.

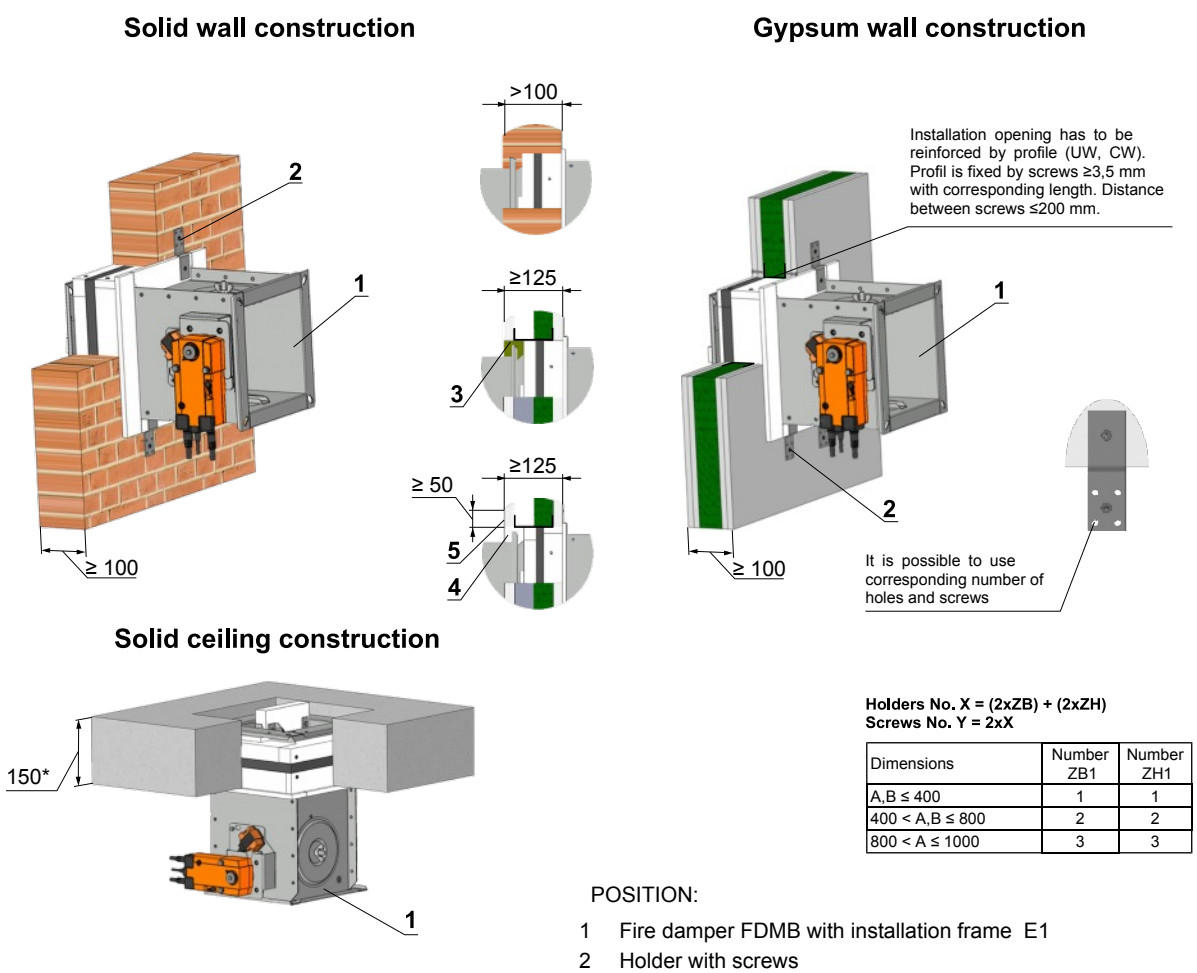
**Material:**

- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Installation opening:**

- a x b = (A + $105^{+3}$mm) x (B + $105^{+3}$mm)

**Fig. 81 Installation frame E1**




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

**Holders No. X = (2xZB) + (2xZH)**
**Screws No. Y = 2xX**

| Dimensions | Number ZB1 | Number ZH1 |
|---|---|---|
| A,B ≤ 400 | 1 | 1 |
| 400 < A,B ≤ 800 | 2 | 2 |
| 800 < A ≤ 1000 | 3 | 3 |

POSITION:

1 Fire damper FDMB with installation frame E1
2 Holder with screws
3 Gypsum plate
4 Mineral stone wool min. density 140 kg/m³
5 Fire protection mastic min. thickness 1 mm

**Notice: Gap between frame end damper body and frame and solid (gypsum) wall construction must be filled by glue (PROMAT K84).**
**Dampers has to be suspended in an appropriate manner see chapter 11**

### Installation frame E2

Installation frame E2 is suitable for:

- Solid wall construction
- Solid ceiling construction

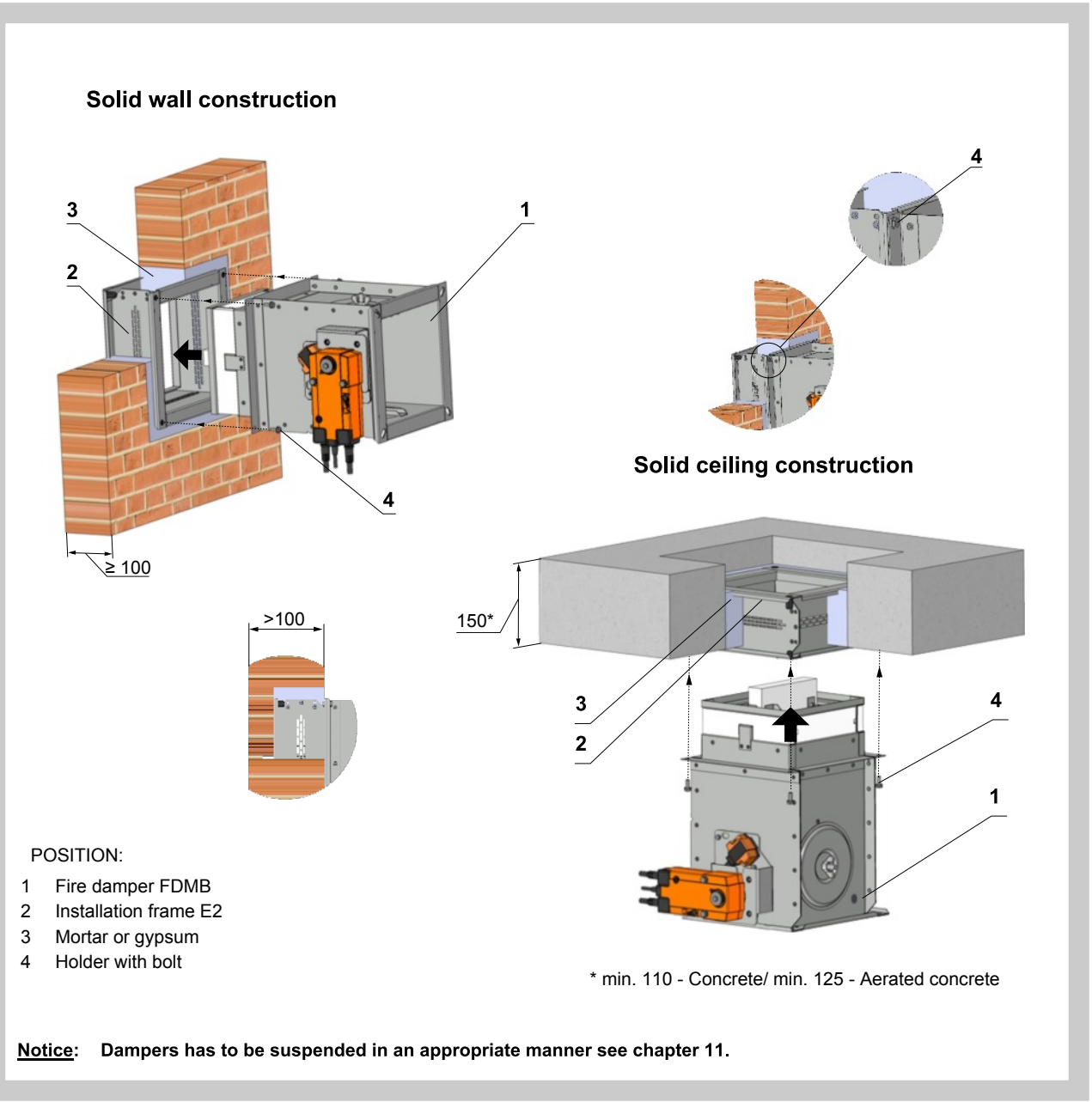
Damper is on the body equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between damper body and steel cartridge.

**Installation:**
- Gypsum wall construction has to be installed according manufacture requirements.

**Material:**
- Installation frame: cement lime plates and galvanized plate
- Fasteners: galvanized plate

**Installation opening:**
- a x b = (A + $100^{+3}$mm) x (B + $100^{+3}$mm)

**Fig. 82 Installation frame E2**




POSITION:
1 Fire damper FDMB
2 Installation frame E2
3 Mortar or gypsum
4 Holder with bolt

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

**Notice: Dampers has to be suspended in an appropriate manner see chapter 11.**

### Installation frame E3

Installation frame E3 is suitable for:

- Gypsum wall construction

Damper is on the body equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between damper body and cement lime cartridge.
On the outside is cement lime cartridge equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between cement lime cartridge and construction.

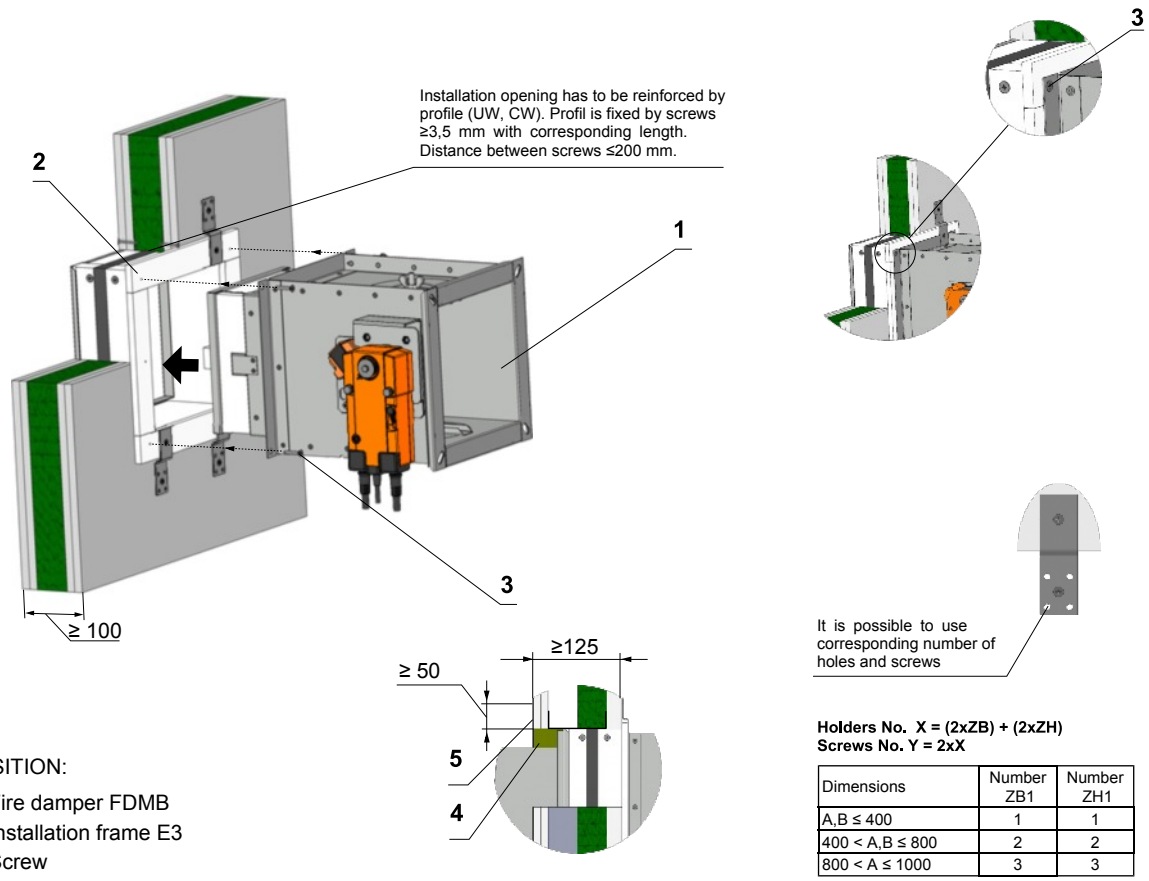
**Installation:**
- Gypsum wall construction has to be installed according manufacture requirements.

**Material:**
- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Installation opening:**
- a x b = (A + $67^{+3}$mm) x (B + $67^{+3}$mm)

**Fig. 83 Installation frame E3**

**Gypsum wall construction**




POSITION:
1 Fire damper FDMB
2 Installation frame E3
3 Screw
4 Mineral stone wool min. density 140 kg/m³
5 Fire protection mastic min. thickness 1 mm

**Holders No. X = (2xZB) + (2xZH)**
**Screws No. Y = 2xX**

| Dimensions | Number ZB1 | Number ZH1 |
|---|---|---|
| A,B ≤ 400 | 1 | 1 |
| 400 < A,B ≤ 800 | 2 | 2 |
| 800 < A ≤ 1000 | 3 | 3 |

**Notice: Gap between frame and solid (gypsum) wall construction must be filled by glue (PROMAT K84). Dampers has to be suspended in an appropriate manner see chapter 11.**

### Installation frame E4

Installation frame E4 is suitable for:
- Installation on solid wall/ceiling construction
- Installation on gypsum wall construction
- Installation outside solid ceiling constructions with concrete

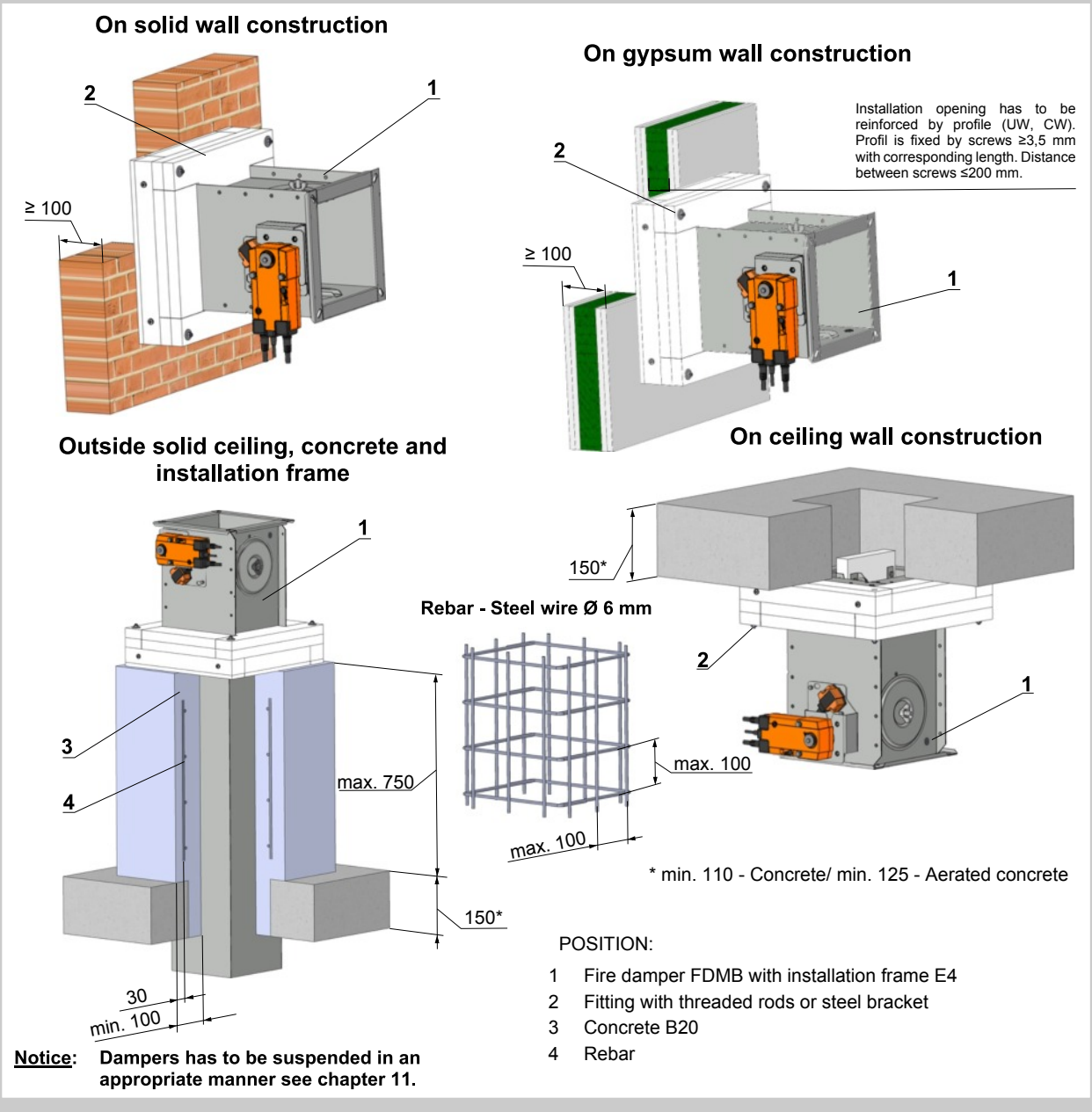
On the inside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between installation frame and damper body.

**Installation:**
- Gypsum wall construction has to be installed according manufacture requirements.

**Material:**
- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Installation opening:**
- a x b = (A + $5^{+3}$mm) x (B + $5^{+3}$mm)
- a x b = (A + $100^{+3}$mm) x (B + $100^{+3}$mm) installation with concrete

**Fig. 84 Installation frame E4**




**Notice: Dampers has to be suspended in an appropriate manner see chapter 11.**

## Installation frame E5

Installation frame E5 is suitable for gypsum wall construction with ceiling movement possibility. Distance of movement “x”.
On the inside and outside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between damper body and installation frame and between installation frame and wall construction.

**Installation:**

Damper position:

- Directly on the ceiling
- In distance from ceiling max. 80 mm

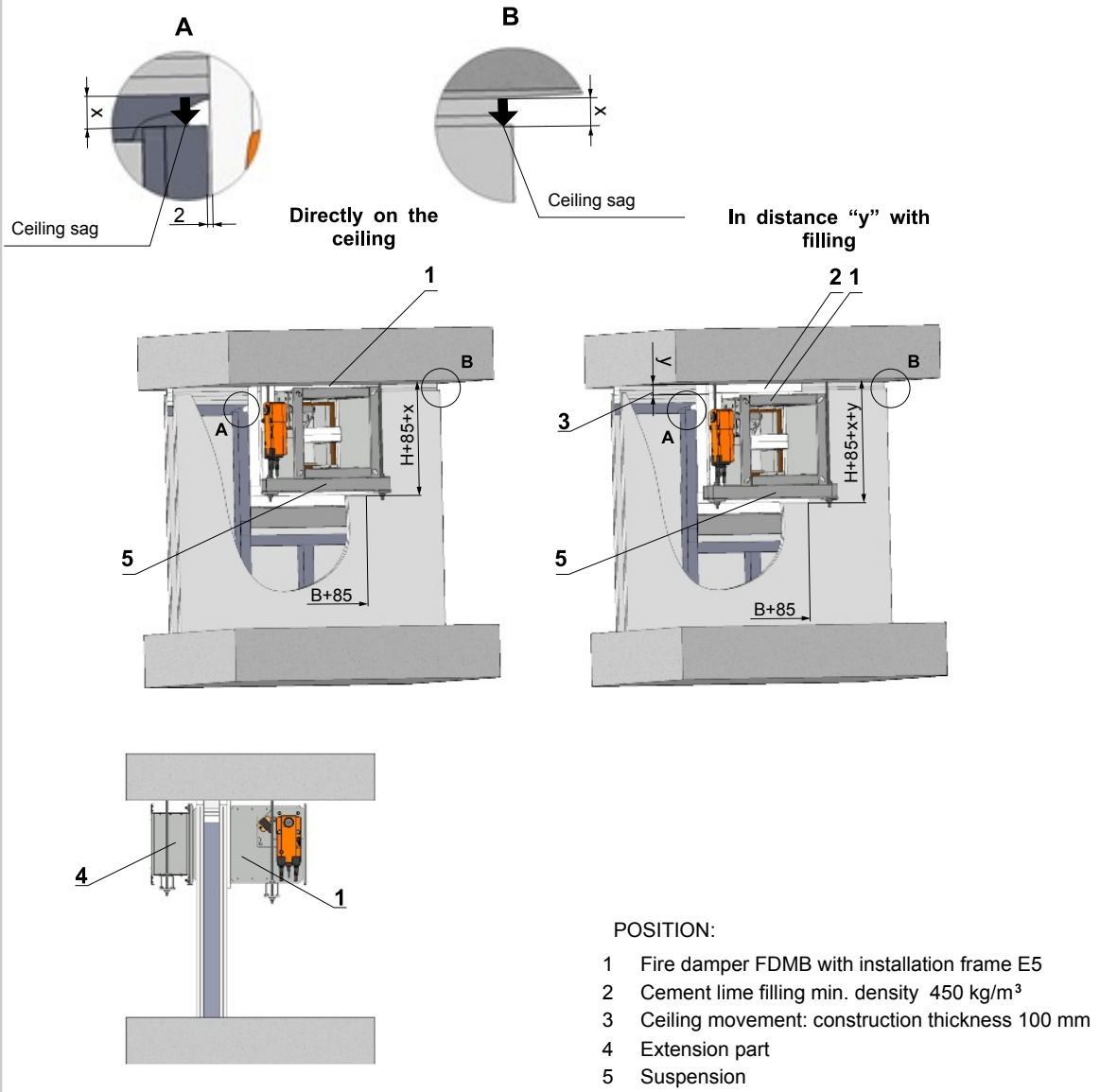
**Material:**

- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Notice:**

- For ceiling movement ≥10 mm

**Fig. 85 Installation frame E5**



## Installation frame E6

Installation frame E6 is suitable for:

- Installation outside solid wall/ceiling construction with cement lime plates

On the inside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between installation frame and damper body.

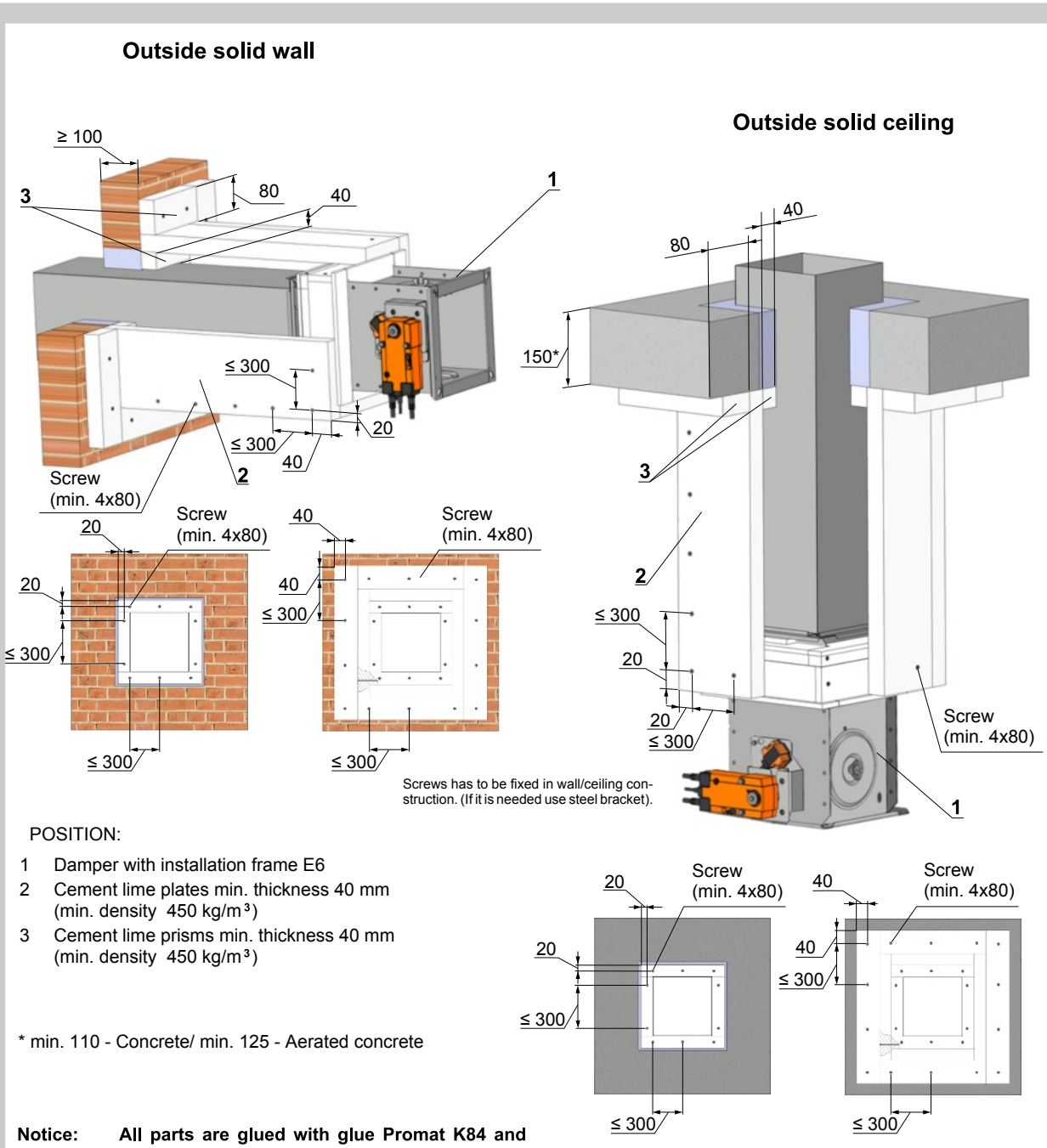
**Material:**

- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Installation opening:**

- a x b = (A + $105^{+3}$mm) x (B + $105^{+3}$mm)

**Fig. 86 Installation frame E6**




POSITION:

1 Damper with installation frame E6
2 Cement lime plates min. thickness 40 mm (min. density 450 kg/m³)
3 Cement lime prisms min. thickness 40 mm (min. density 450 kg/m³)




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

**Notice:** **All parts are glued with glue Promat K84 and secured by screws.**
**Dampers has to be suspended in an appropriate manner see chapter 11.**

### Installation frame R1, R2

Installation frames R1, R2 are suitable for:
- Solid wall construction
- Gypsum wall construction
- Solid ceiling construction

On the inside and outside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between damper body and installation frame and between installation frame and wall construction.

**Installation frame R1 - solid wall/gypsum wall th. 100mm or solid ceiling th. 150 mm**
**Installation frame R2 - solid wall/gypsum wall th. 150mm or solid ceiling th. 150 mm**

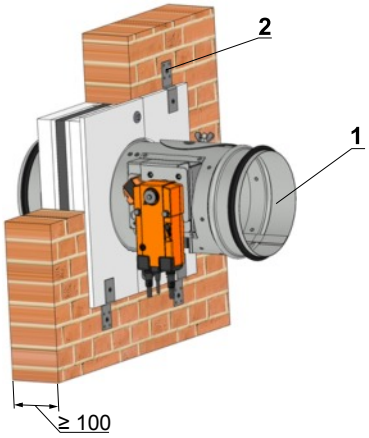
**Installation:**
- Gypsum wall construction has to be installed according manufacture requirements.

**Material:**
- Installation frame: cement lime plates
- Fasteners: galvanized plate

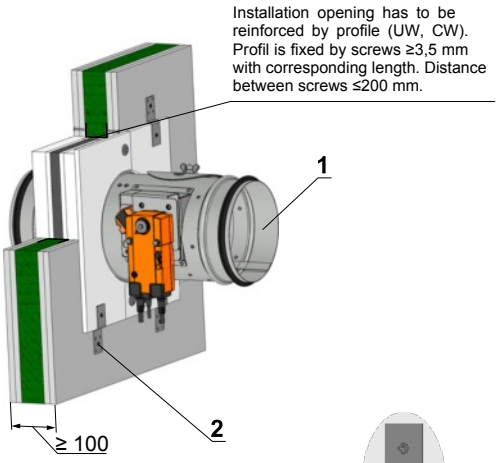
**Installation opening:**
- a x b = (D + $141^{+3}$mm) x (D + $141^{+3}$mm)

**Fig. 87 Installation frame R1, R2**

**Solid wall construction**



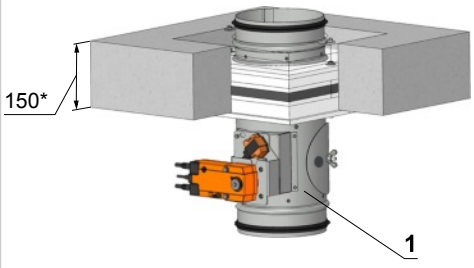

**Gypsum wall construction**




**Holders No. X**
**Screws No. Y**

| Dimensions | Number X | Number Y |
|---|---|---|
| D ≤ 400 | 4 | 8 |
| 400 < D ≤ 630 | 8 | 16 |

**Solid ceiling construction**




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

POSITION:
1 Fire damper FDMB with installation frame R1 or R2
2 Holder

**Notice: Gap between frame end damper body and frame and solid (gypsum) wall construction must be filled by glue (PROMAT K84).**
**Dampers has to be suspended in an appropriate manner see chapter 11.**

### Installation frame R3, R4

Installation frame R3, R4 are suitable for:
- Solid wall construction
- Gypsum wall construction
- Solid ceiling construction

On the inside and outside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between damper body and installation frame and between installation frame and wall construction.

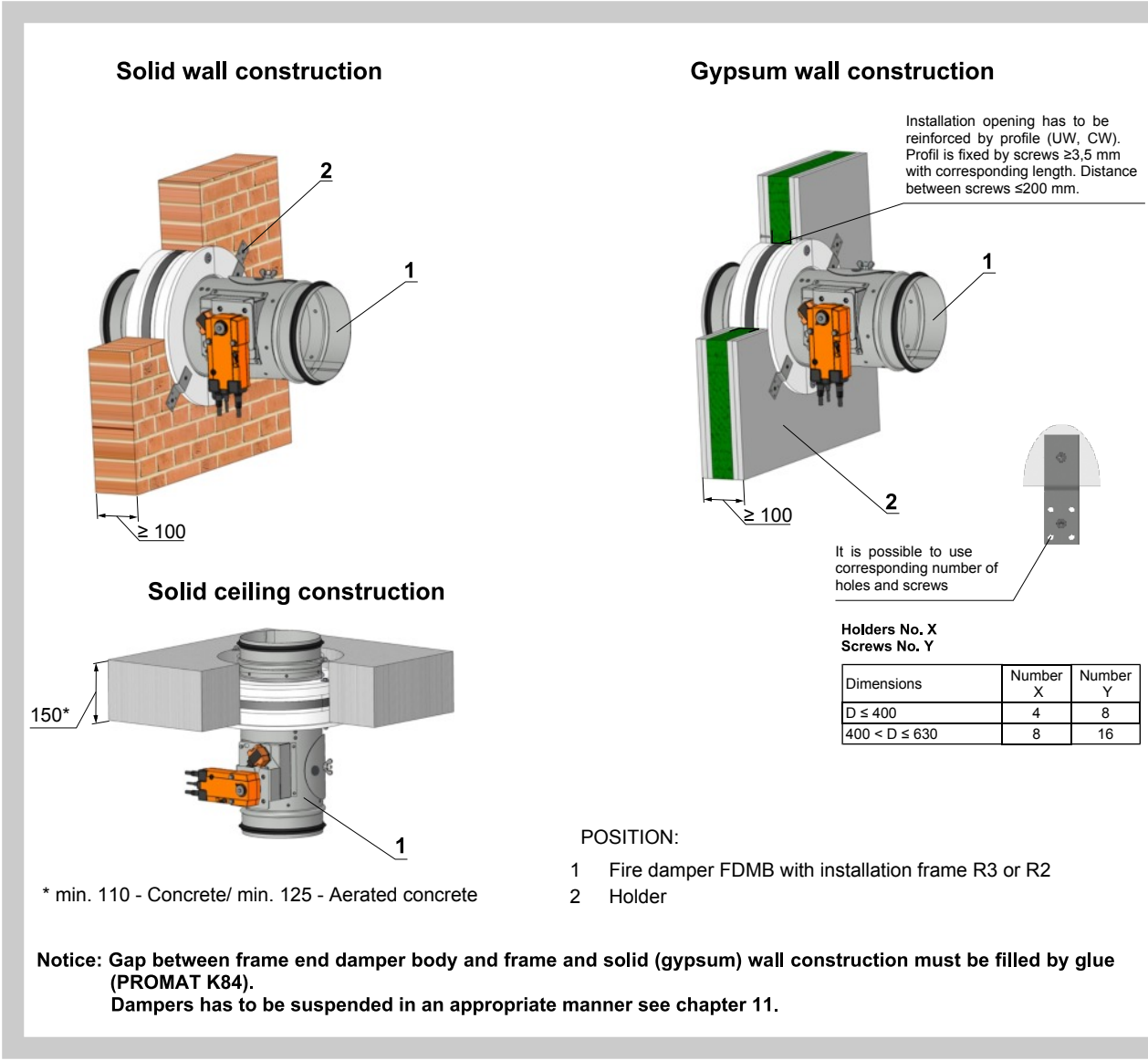
**Installation frame R3 - solid wall/gypsum wall th. 100mm or solid ceiling th. 150 mm**
**Installation frame R4 - solid wall/gypsum wall th. 150mm or solid ceiling th. 150 mm**

**Installation:**
- Gypsum wall construction has to be installed according manufacture requirements.

**Material:**
- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Installation opening:**
- d = (D + $111^{+3}$mm)

**Fig. 88 Installation frame R3, R4**




**Notice: Gap between frame end damper body and frame and solid (gypsum) wall construction must be filled by glue (PROMAT K84).**
**Dampers has to be suspended in an appropriate manner see chapter 11.**

## Installation frame R5

Installation frame R5 is suitable for:

- Installation on solid wall/ceiling construction
- Installation on gypsum wall construction
- Installation outside solid ceiling constructions with concrete

On the inside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between installation frame and damper body.

**Installation:**

- Gypsum wall construction has to be installed according manufacture requirements.

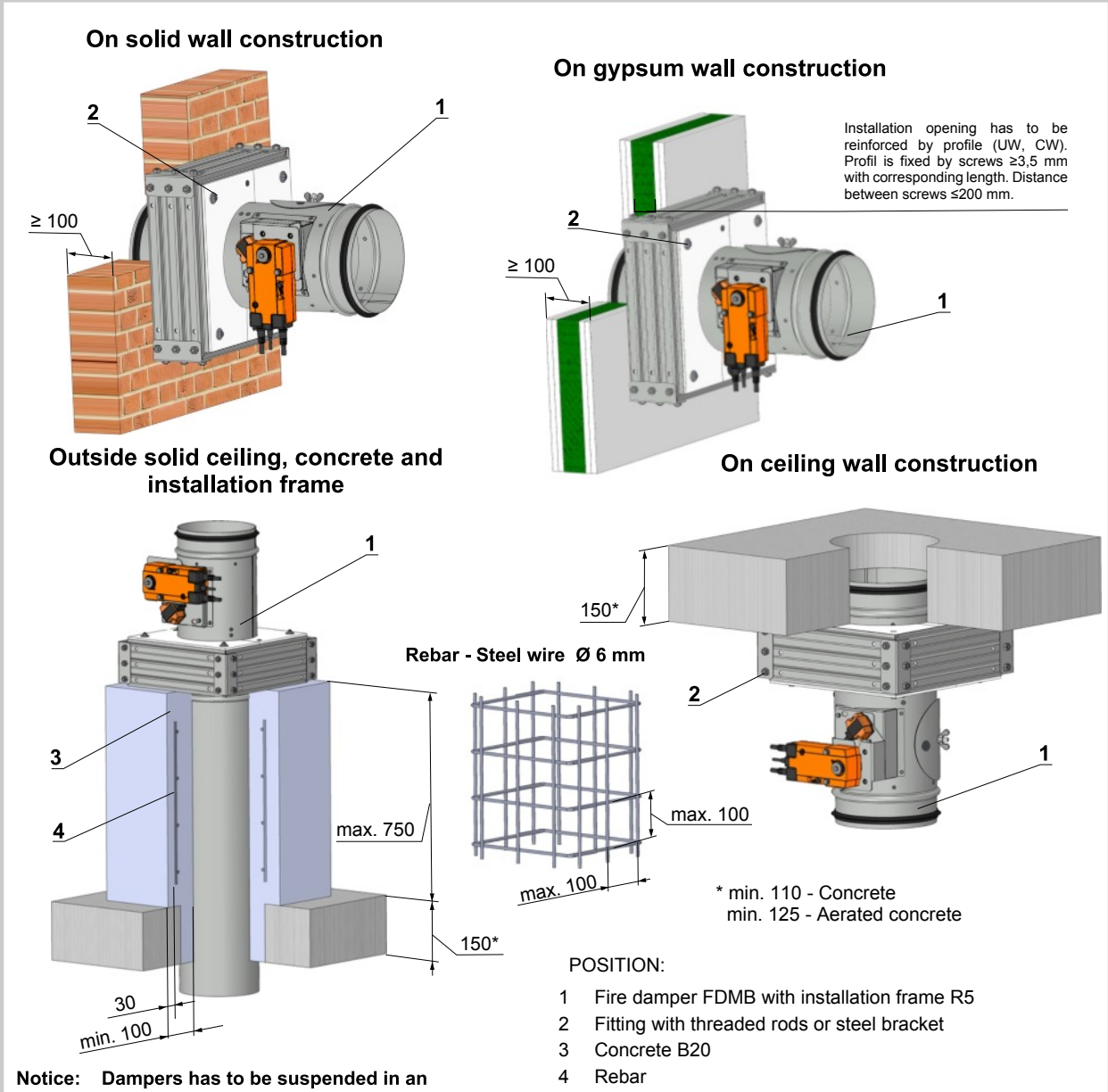
**Material:**

- Installation frame: cement lime plates and galvanized plate
- Fasteners: galvanized plate

**Installation opening:**

- d = (D + $10^{+3}$mm)
- d = (D + $100^{+3}$mm) installation with concrete

**Fig. 89 Installation frame R5**




**Notice: Dampers has to be suspended in an appropriate manner see chapter 11.**

## Installation frame R6

Installation frame R6 is suitable for:

- Installation outside solid wall/ceiling construction with cement lime plates

On the inside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between installation frame and damper body.

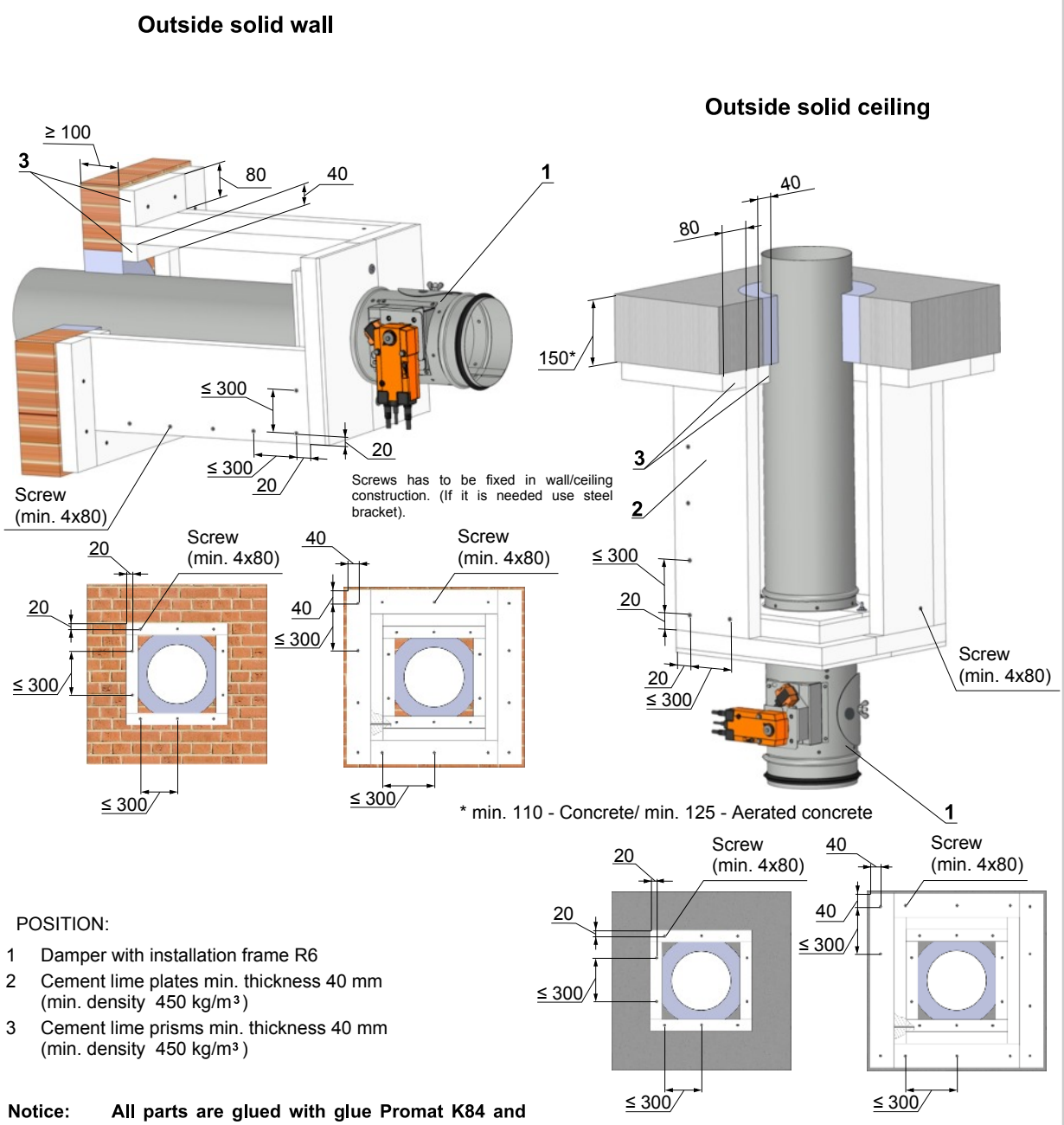
**Material:**

- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Installation opening:**

- d = (D +100$^{+3}$mm)

**Fig. 90 Installation frame R6**




POSITION:

1 Damper with installation frame R6
2 Cement lime plates min. thickness 40 mm (min. density 450 kg/m³)
3 Cement lime prisms min. thickness 40 mm (min. density 450 kg/m³)

**Notice:** **All parts are glued with glue Promat K84 and secured by screws. Dampers has to be suspended in an appropriate manner see chapter 11.**

## Installation frame R7

Installation frame R7 is suitable for gypsum wall construction with ceiling movement possibility. Distance of movement “x”.
On the inside and outside is installation frame equipped by intumescent sealing. It enlarges its capacity and air proofs the gap between damper body and installation frame and between installation frame and wall construction.

**Installation:**

Damper position:

- Directly on the ceiling
- In distance from ceiling max. 80 mm

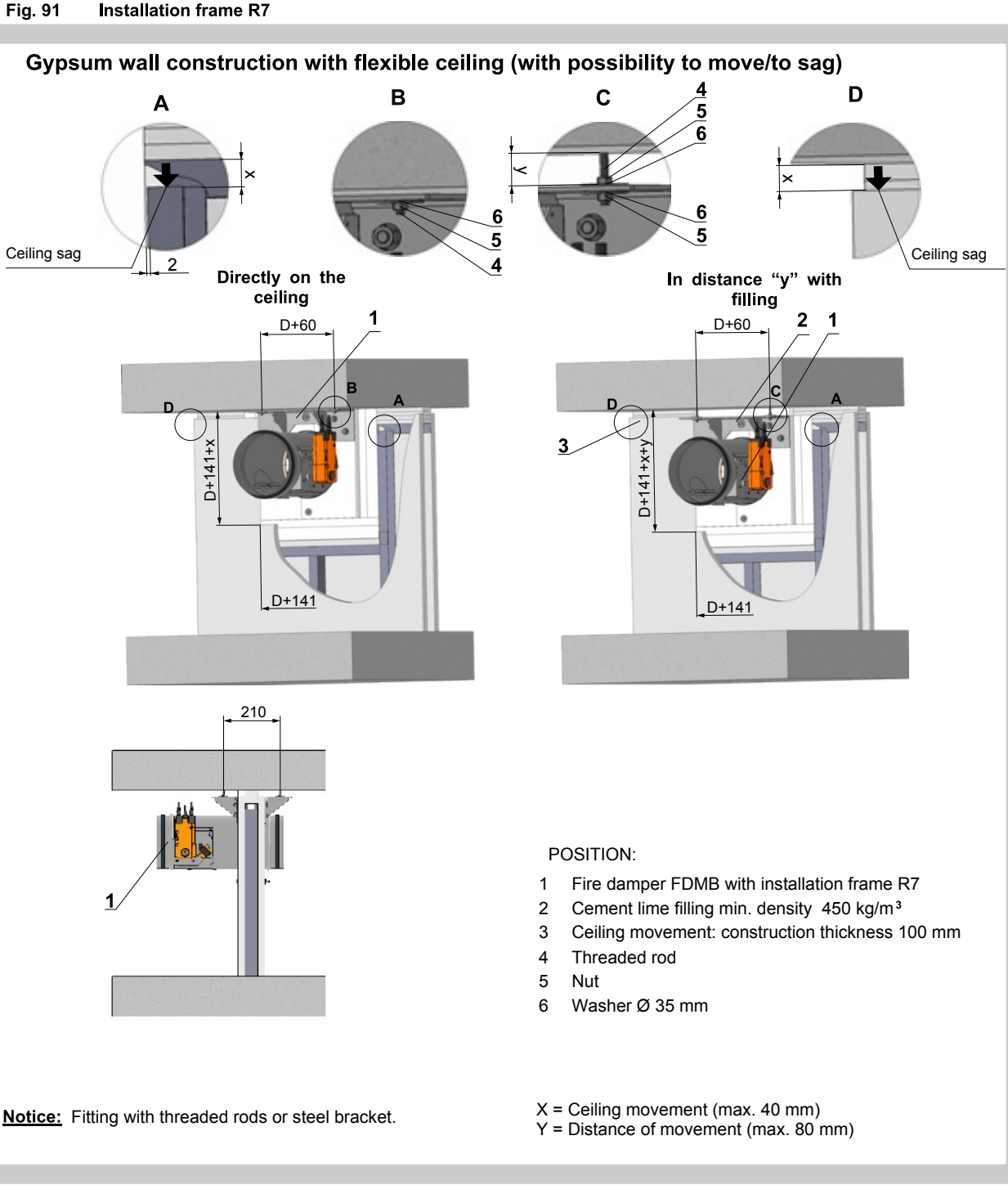
**Material:**

- Installation frame: cement lime plates
- Fasteners: galvanized plate

**Notice:**

- For ceiling movement ≥10 mm

**Fig. 91 Installation frame R7**



## 8. Thin shaft walls

### Thin shaft wall description

Shaft wall is a vertical, non-bearing partition construction meeting the double-sided fire requirements. The shaft wall can be mounted only from one side. No mineral insulation is used in the construction.

First of all, the shaft wall structure must be laid out. Apart from other vertical constructions, the perimeter sections must be fitted with connection sealing made from A1 or A2 fire reaction materials (for instance floor strips Orsil N/PP). The perimeter sections must be anchored using steel plugs Ø 6 mm (for example DN6 or ZHOP) with 500 mm span.

Sheathing is carried out using two layers of Glasroc F boards Ridurit with 20 mm thickness, the boards are oriented horizontally. First sheathing layer is fixed with TN 212 screws in spacing 200mm to the support structure. The boards are mounted to tight butt joints without need of cementing. The second sheathing layer is screwed to the first sheathing layer using screws Rodurit in square net 250 mm. Reset of joints of the first and second layer of Ridurit sheathing is set to 600 mm vertically and 300 mm horizontally.

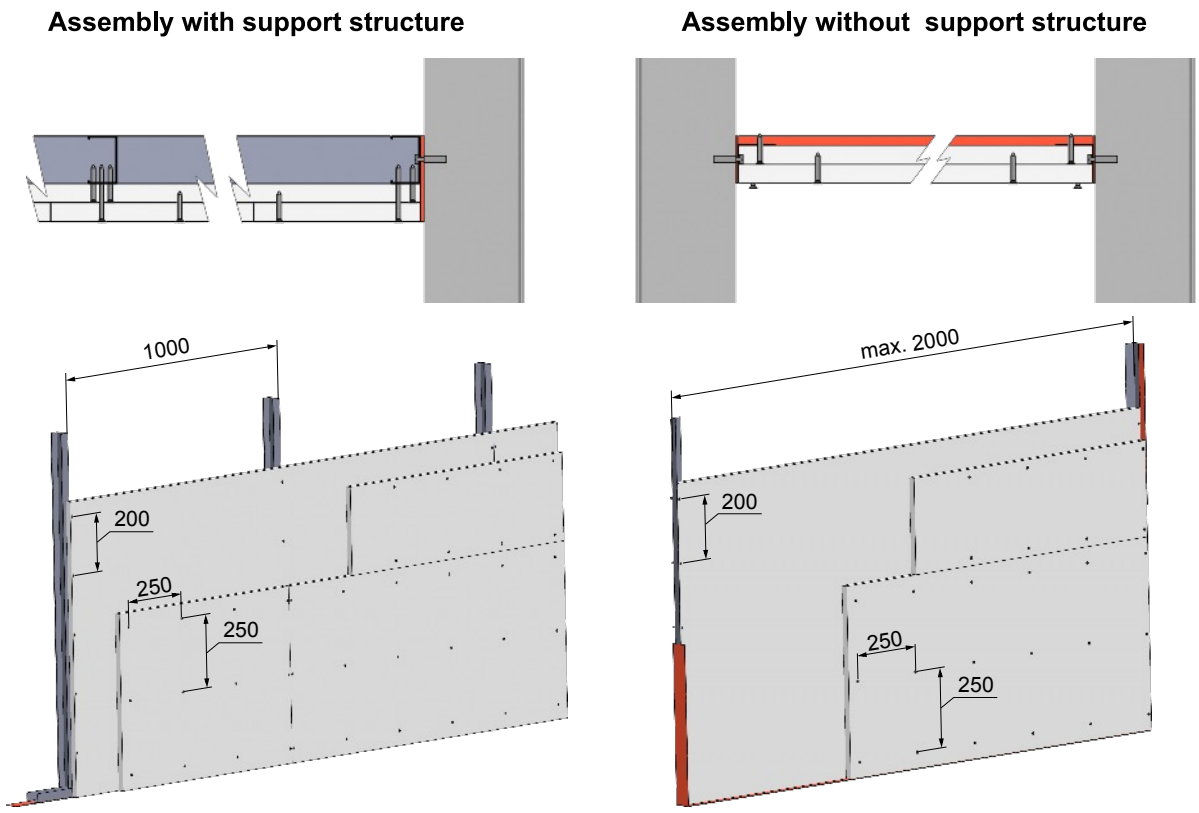
### Assembly with support structure

Vertical intermediate R-CW sections are fixed in 1000 mm layout spacing between R-UW sections and vertical perimeter R-CW sections.

### Assembly without support structure

Maximum width of the shaft wall is 2 metres in this case (board length). Steel squares made from steel galvanized plate metal 40/20/1 mm are used as perimeter sections, they are anchored to bearing wall using Ø 6 mm steel plugs (for example DN6 or ZHOP) with 500 mm spacing.

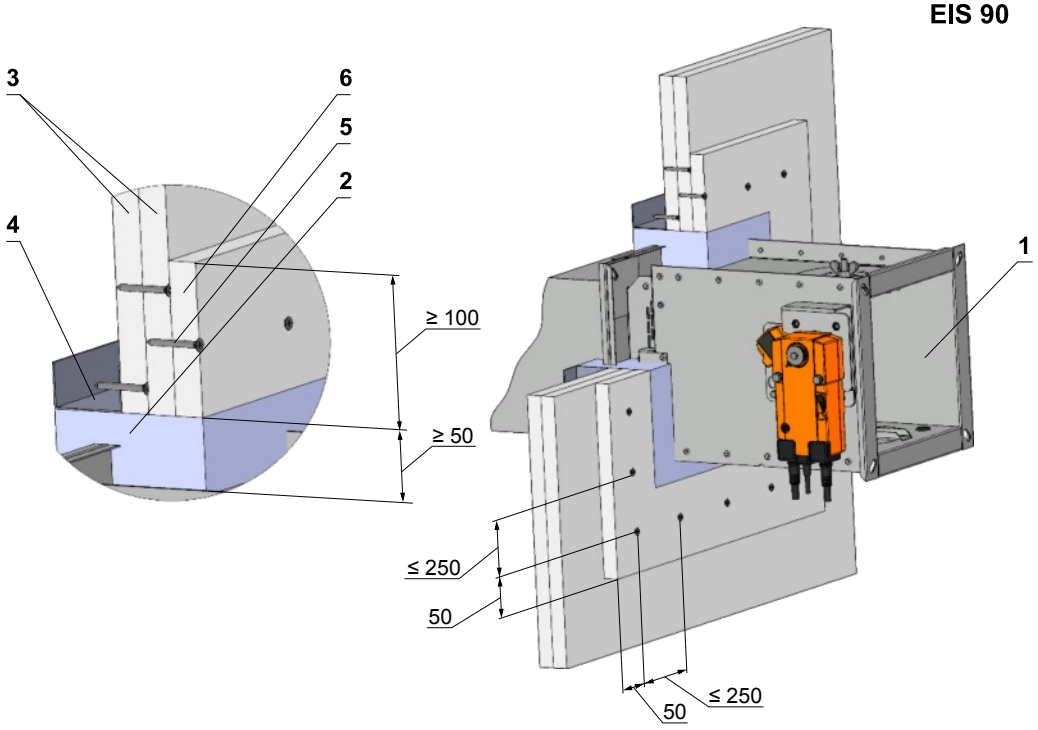
**Fig. 92**

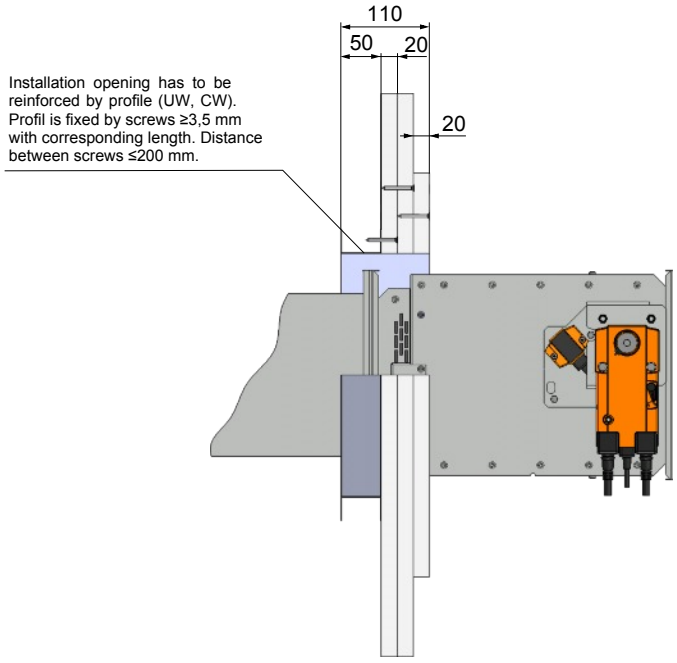



**Notice:** Rigips solution is shown here as an example. Alternatively it is possible to apply the solution from Knauf or Promat. In such a case follow the instructions of the producer.

**Fig. 93 Thin shaft wall - mortar or gypsum - RECTANGULAR DAMPER**

**EIS 90**

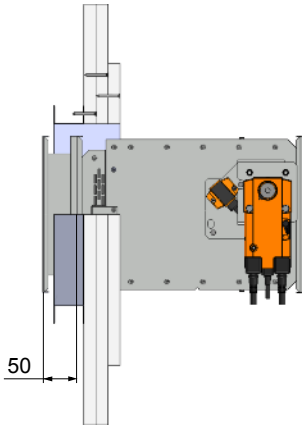



**Installation opening:**

**a x b = (A + 100 mm) x (B + 100 mm)**

**If there isn't connected duct to the damper, it is necessary use extension piece 50 mm**




POSITION:

1 Fire damper FDMB-S
2 Mortar or gypsum
3 Fire resistant board
4 Profile 50 UW or 50 CW
5 Screw
6 Additional fire resistant board

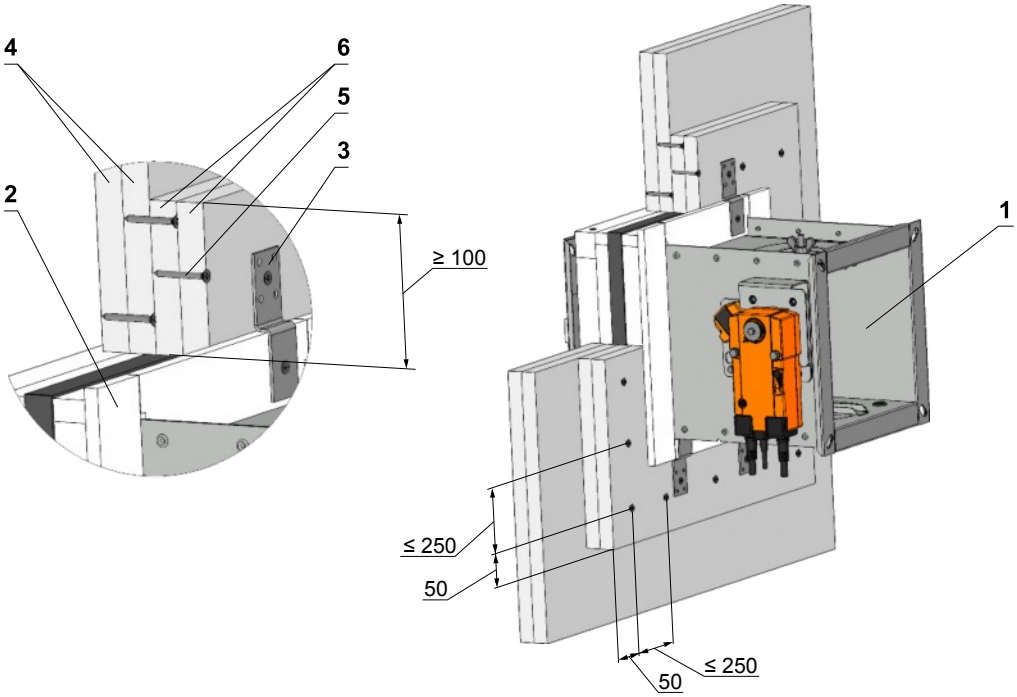
Used materials - example*:

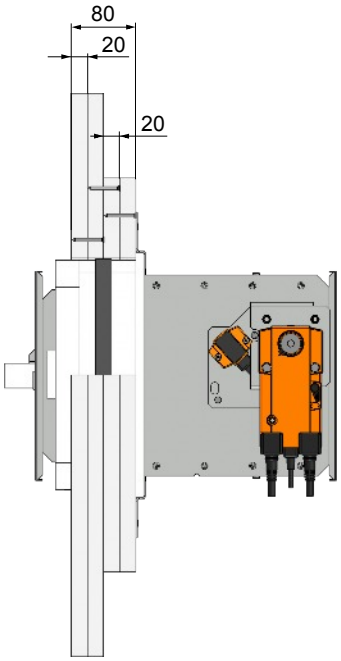
3 - Glasroc F Ridurit tl. 20 mm
4 - R-CW
5 - Screw Ridurit
6 - Glasroc F Ridurit tl. 20 mm

* It is alternatively possible to use Knauf or Promat solution.

**Fig. 94 Thin shaft wall - Installation frame E1 - RECTANGULAR DAMPER**

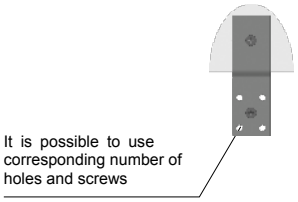
**EIS 90**




**Installation opening:**

**a x b = (A + 85$^{+3}$mm) x (B + 85$^{+3}$mm)**




**Holders No. X = (2xZB) + (2xZH)**
**Screws No. Y = 2xX**

| Dimensions | Number ZB1 | Number ZH1 |
|---|---|---|
| A,B ≤ 400 | 1 | 1 |
| 400 < A,B ≤ 800 | 2 | 2 |
| 800 < A ≤ 1000 | 3 | 3 |

POSITION:

1 Fire damper FDMB-S
2 Installation frame E1
3 Holder (including in installation frame E1 packing)
4 Fire resistant board
5 Screw
6 Additional fire resistant board

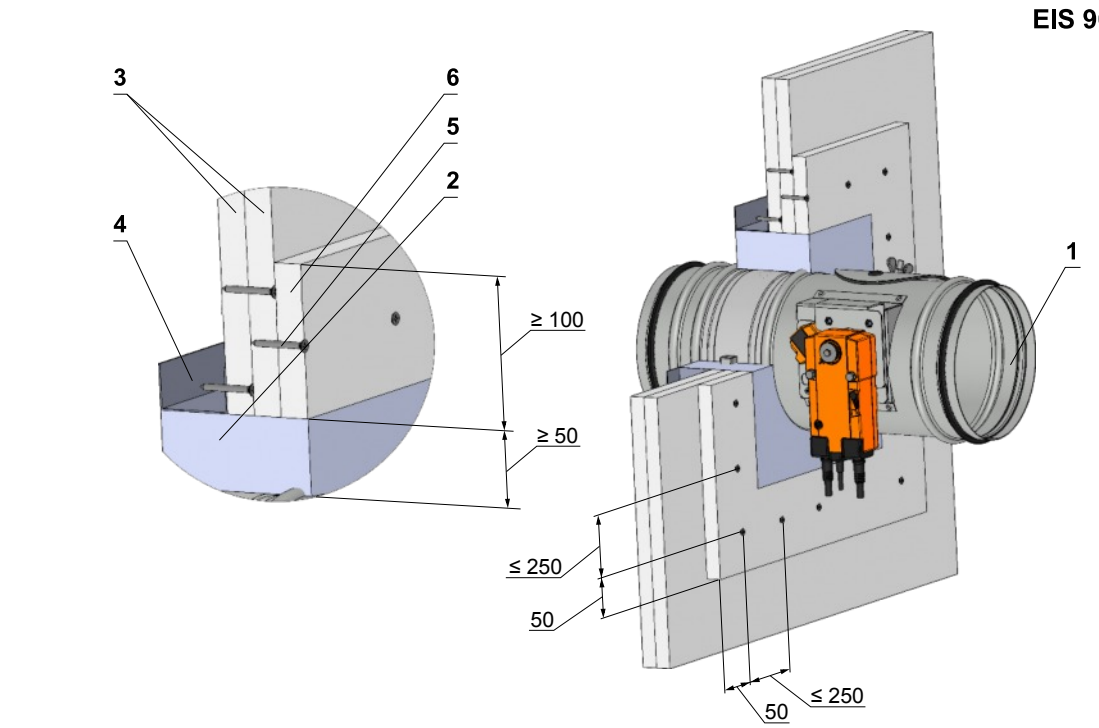
Used materials - example*:

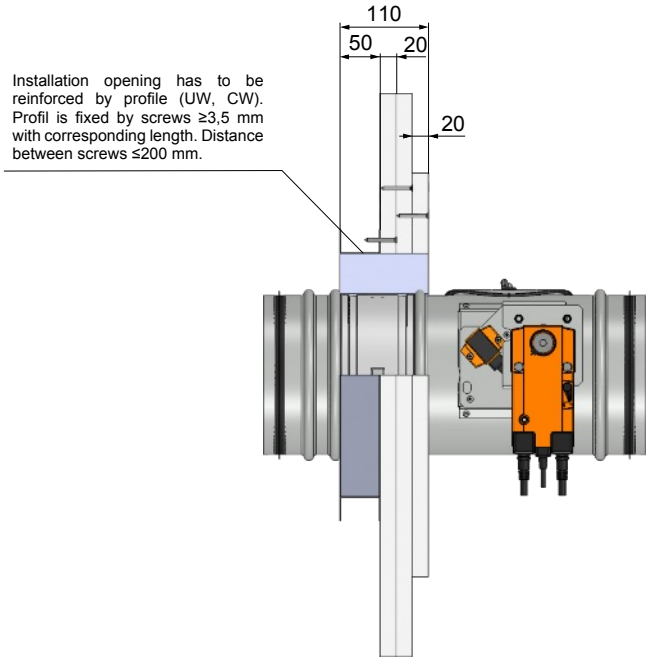
4 - Glasroc F Ridurit tl. 20 mm
5 - Screw Ridurit
6 - Glasroc F Ridurit tl. 20 mm

* It is alternatively possible to use Knauf or Promat solution.

**Notice: Gap between frame and thin shaft wall construction must be filled by glue (PROMAT K84).**
**Dampers has to be suspended in an appropriate manner see chapter 11.**

**Fig. 95 Thin shaft wall - mortar or gypsum - ROUND DAMPER**

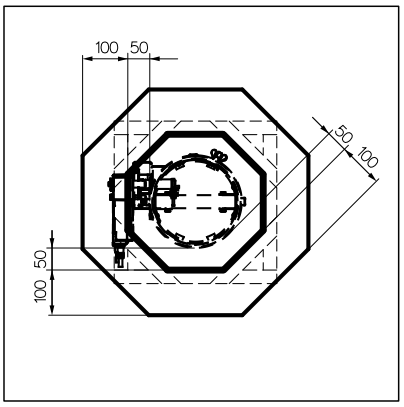



**Installation opening:**

**a x b = (D + 100 mm) x (D + 100 mm)**

**Alternatively solution of installation opening**




POSITION:

1 Fire damper FDMA-R
2 Mortar or gypsum
3 Fire resistant board
4 Profile 50 UW or 50 CW
5 Screw
6 Additional fire resistant board

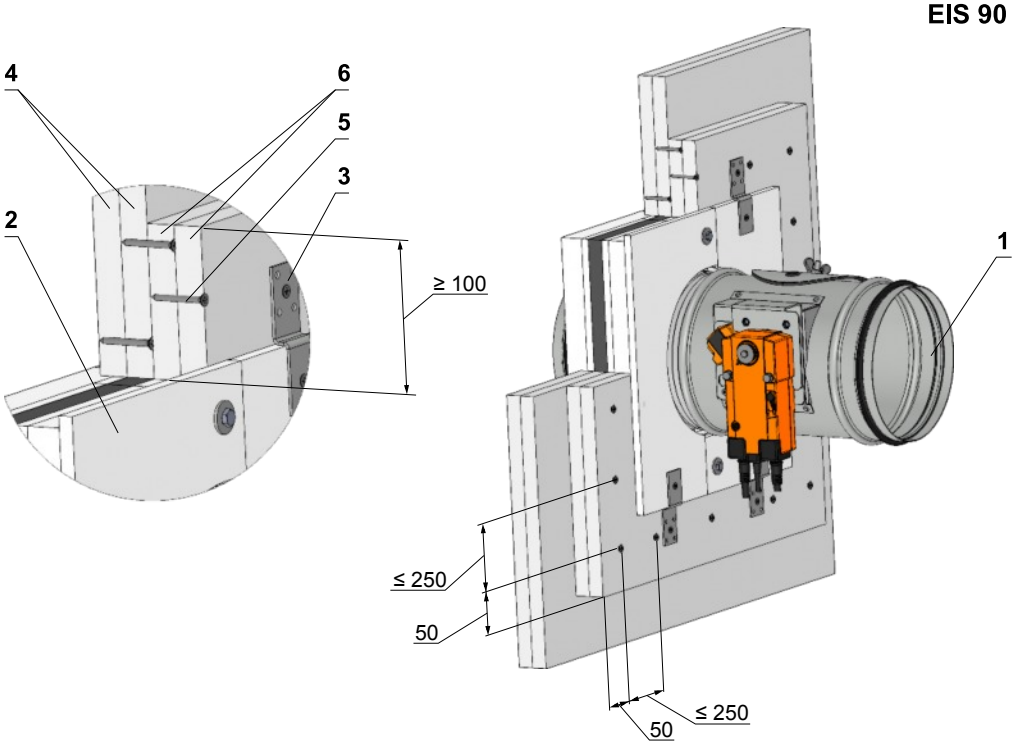
Used materials - example*:

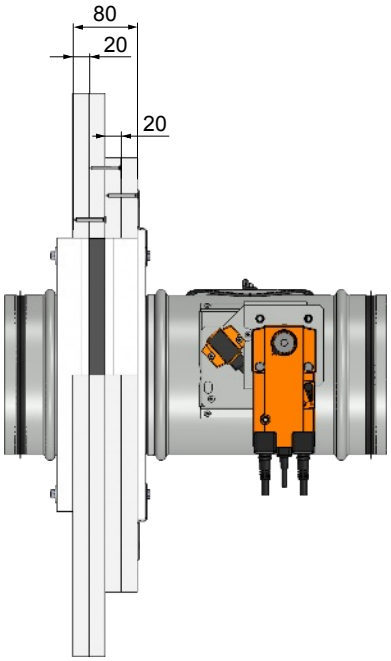
3 - Glasroc F Ridurit tl. 20 mm
4 - R-CW
5 - Screw Ridurit
6 - Glasroc F Ridurit tl. 20 mm

* It is alternatively possible to use Knauf or Promat solution.

**Fig. 96 Thin shaft wall - Installation frame R1 - ROUND DAMPER**

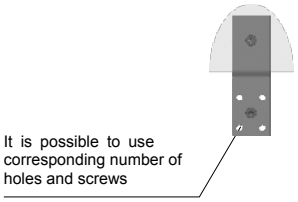
**EIS 90**




**Installation opening:**

**a x b = (D + 141$^{+3}$mm) x (D + 141$^{+3}$mm)**




**Holders No. X**
**Screws No. Y**

| Dimensions | Number X | Number Y |
|---|---|---|
| D ≤ 400 | 4 | 8 |
| 400 < D ≤ 630 | 8 | 16 |

POSITION:

1 Fire damper FDMB-S
2 Installation frame R1
3 Holder (including in installation frame R1 packing)
4 Fire resistant board
5 Screw
6 Additional fire resistant board

Used materials - example*:

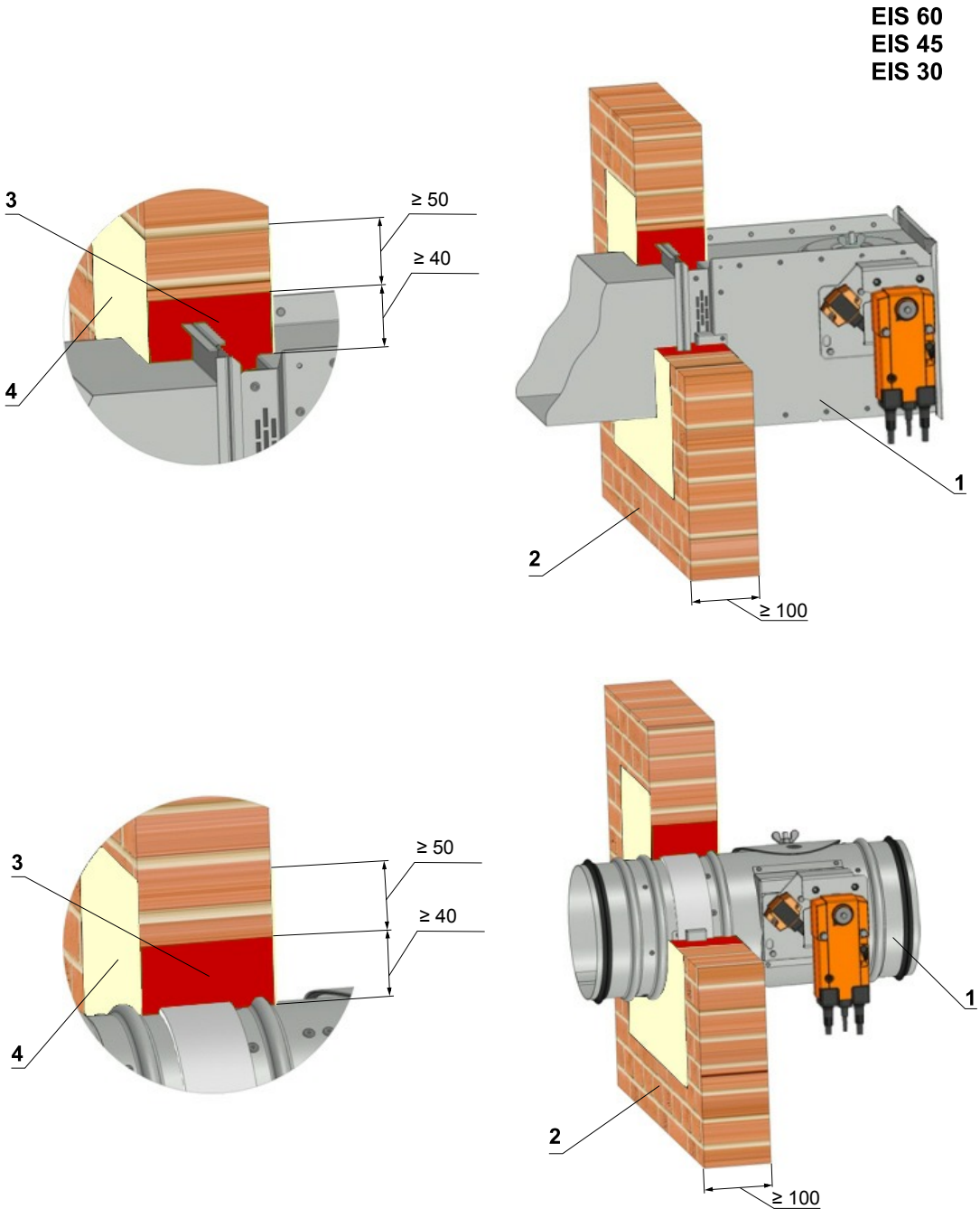
4 - Glasroc F Ridurit tl. 20 mm
5 - Screw Ridurit
6 - Glasroc F Ridurit tl. 20 mm

* It is alternatively possible to use Knauf or Promat solution.

**Notice: Gap between frame and thin shaft wall construction must be filled by glue (PROMAT K84).**
**Dampers has to be suspended in an appropriate manner see chapter 11.**

## 9. Installation in Fire resistant foam

**Fig. 97 Solid wall construction - Fire resistant foam covered by stucco plaster**




POSITION:

1 Fire damper FDMB
2 Solid wall
3 Fire resistant foam
4 Stucco plaster
5 Duct

Used materials - example*:

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

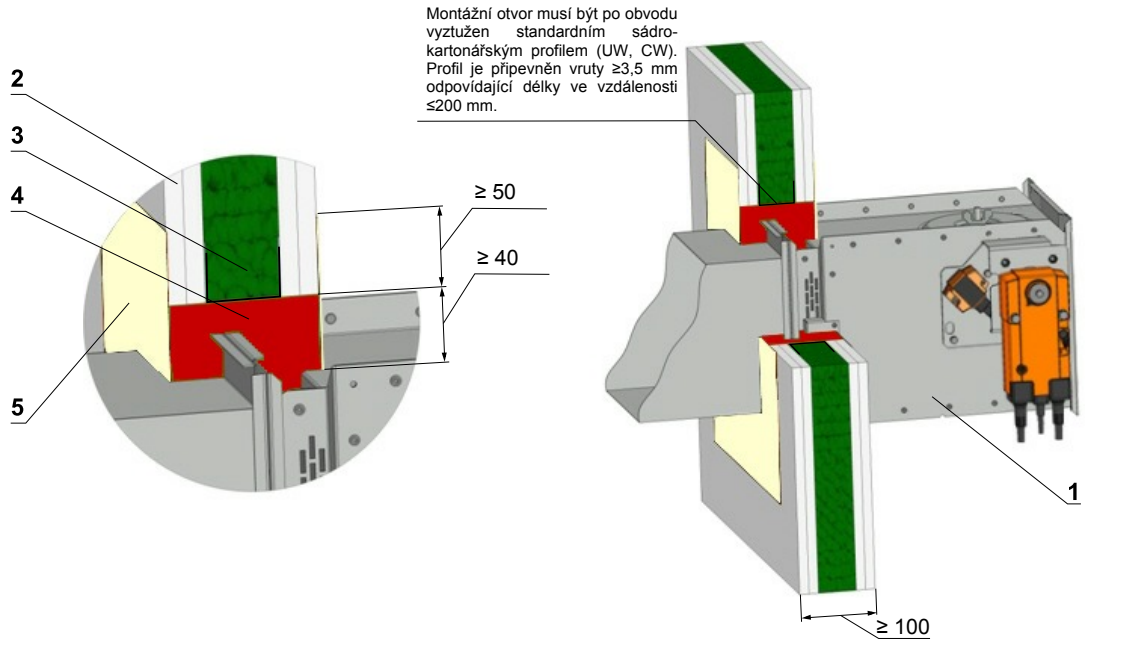
**Maximal damper dimensions:**

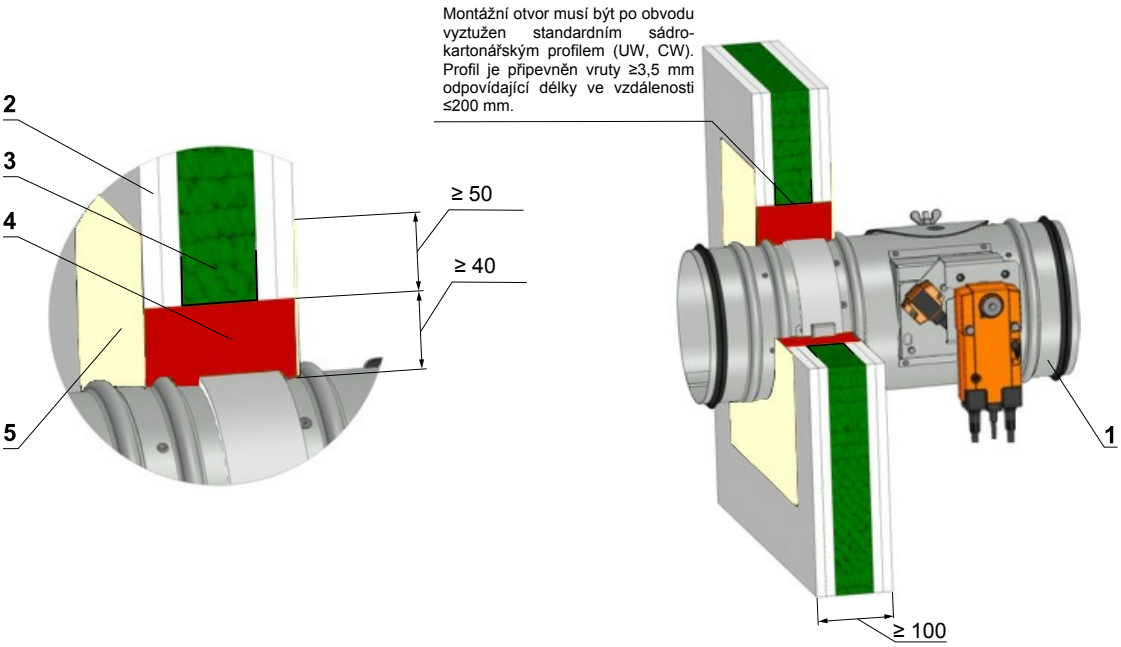
**Square 400 x 400 mm**

**Round 200 mm**

**Fig. 98 Gypsum wall construction - Fire resistant foam covered by stucco plaster**

**EIS 60**
**EIS 45**
**EIS 30**




POSITION:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Fire resistant foam
5 Stucco plaster

Used materials - example*:

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

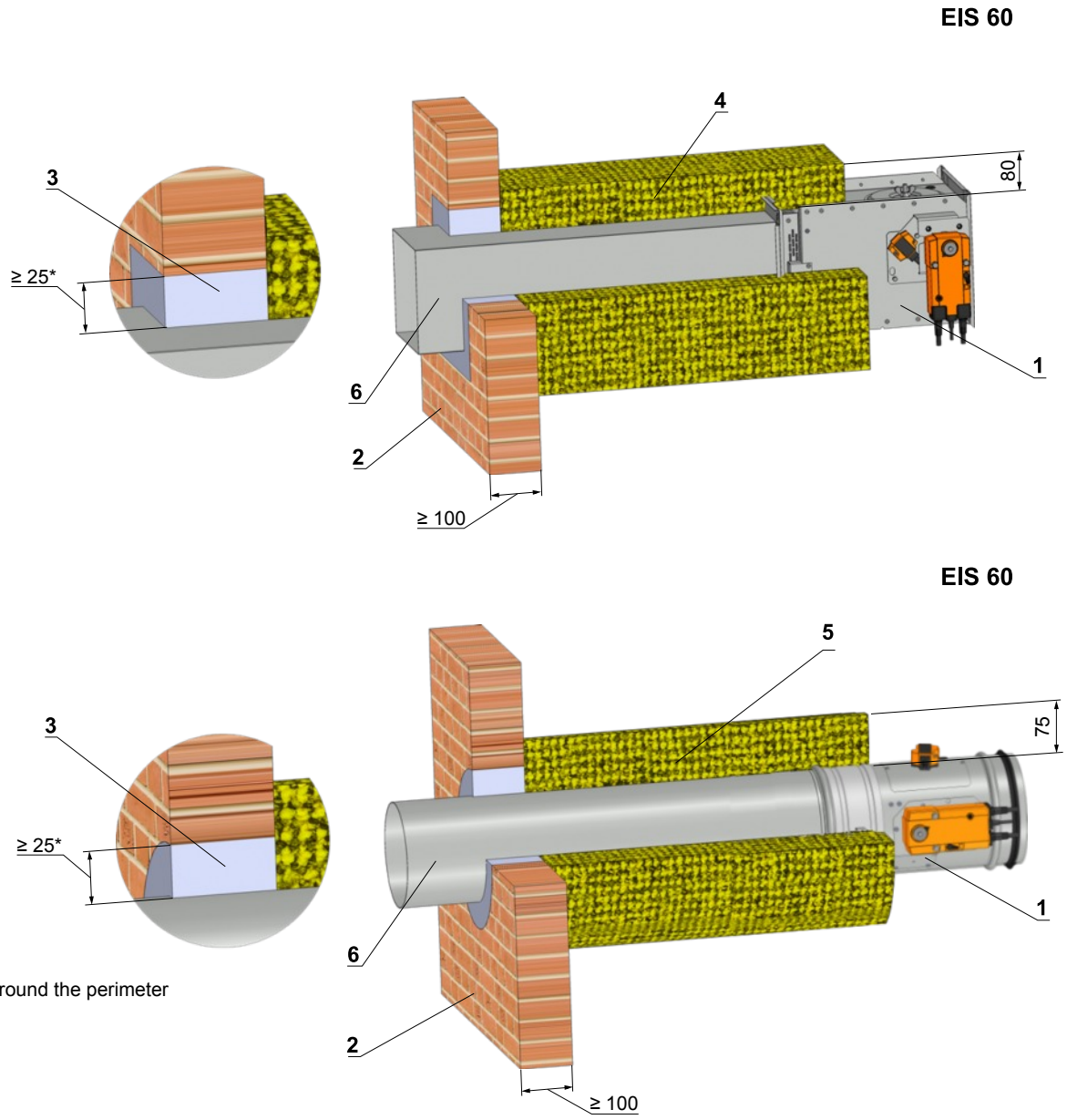
**Maximal damper dimensions:**

**Square 400 x 400 mm**

**Round 200 mm**

## 10. Installation outside of wall construction EIS60

**Fig. 99 Installation outside of solid wall construction - mineral wool**




* Around the perimeter

POSITION:

1 Fire damper FDMB
2 Solid wall
3 Mortar or gypsum
4 Stone wool with min. density 66 kg/m³ and min. thickness 80 mm
5 Stone wool with min. density 66 kg/m³ and min. thickness 75 mm
6 Duct

Used materials - example**:

4 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
5 - Isover Ultimate Protect Wired MAT 4.0, th. 75 mm ALU1

Installation details of wool layers see chapter 11

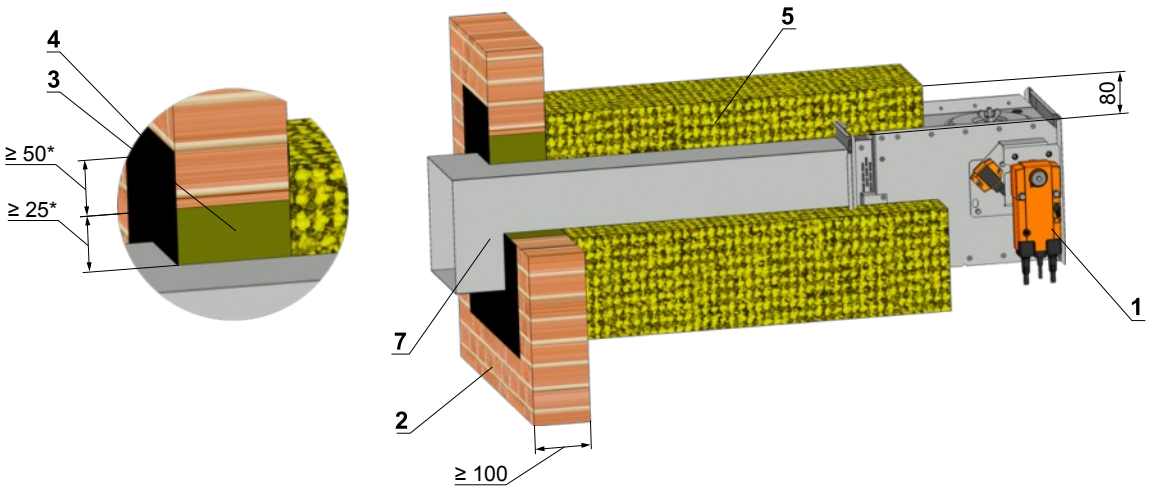
**Notice:**

*** 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.

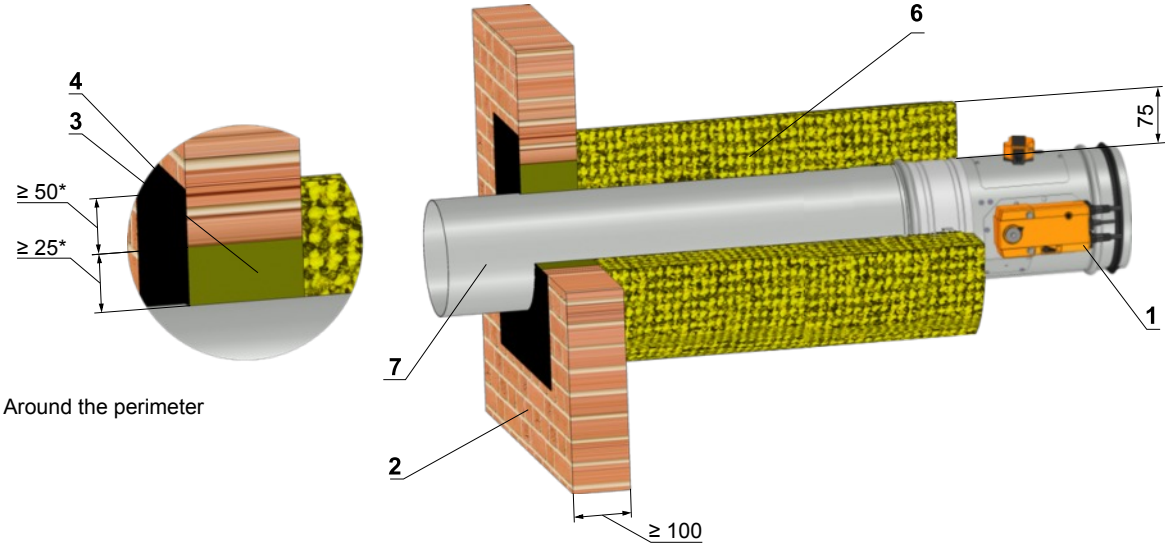
The maximum distance from the construction of fire dampers is not limited and according to EN 15882-2 must use the required number of hinges according to EN 13366-1:2014.

**Fig. 100 Installation outside of solid wall construction - mineral wool - fire protection mastic**

**EIS 60**




**EIS 60**




* Around the perimeter

POSITION:

1 Fire damper FDMB
2 Solid wall
3 Stuffing box (mineral stone wool min. density 140 kg/m$^3$ )
4 Fire protection mastic min. thickness 1 mm
5 Stone wool with min. density 66 kg/m$^3$ and min. thickness 80 mm
6 Stone wool with min. density 66 kg/m$^3$ and min. thickness 75 mm
7 Duct

Used materials - example**:

3 - Promapyr, Rockwool Steprock HD
4 - Promastop - P, K
5 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
6 - Isover Ultimate Protect Wired MAT 4.0, th. 75 mm ALU1

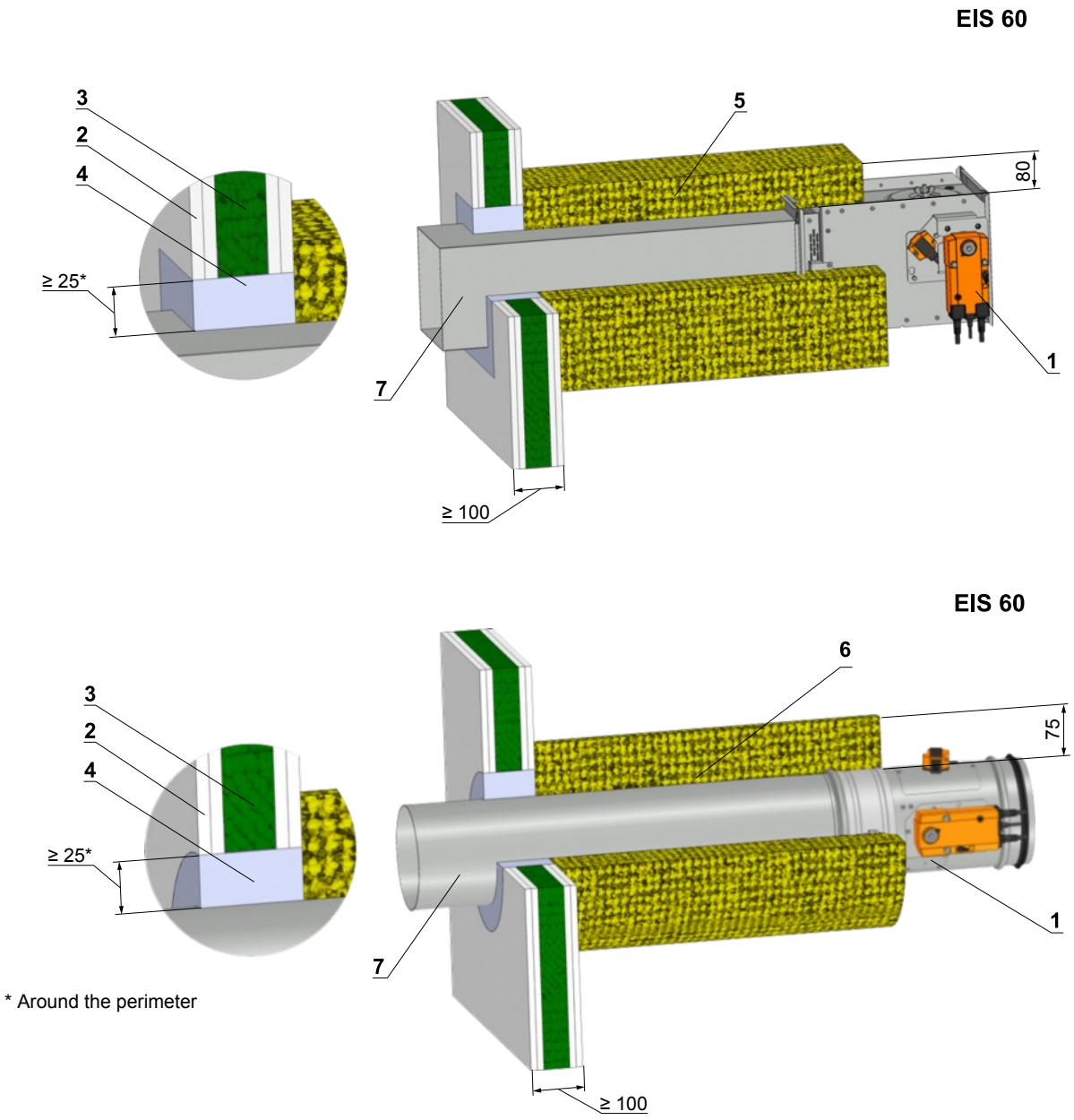
Installation details of wool layers see chapter 11

**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.

The maximum distance from the construction of fire dampers is not limited and according to EN 15882-2 must use the required number of hinges according to EN 13366-1:2014.

**Fig. 101 Installation outside of gypsum wall construction - mineral wool - mortar or gypsum**




* Around the perimeter

POSITION:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Mortar or gypsum
5 Stone wool with min. density 66 kg/m³ and min. thickness 80 mm
6 Stone wool with min. density 66 kg/m³ and min. thickness 75 mm
7 Duct

Used materials - example**:

5 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
6 - Isover Ultimate Protect Wired MAT 4.0, th. 75 mm ALU1

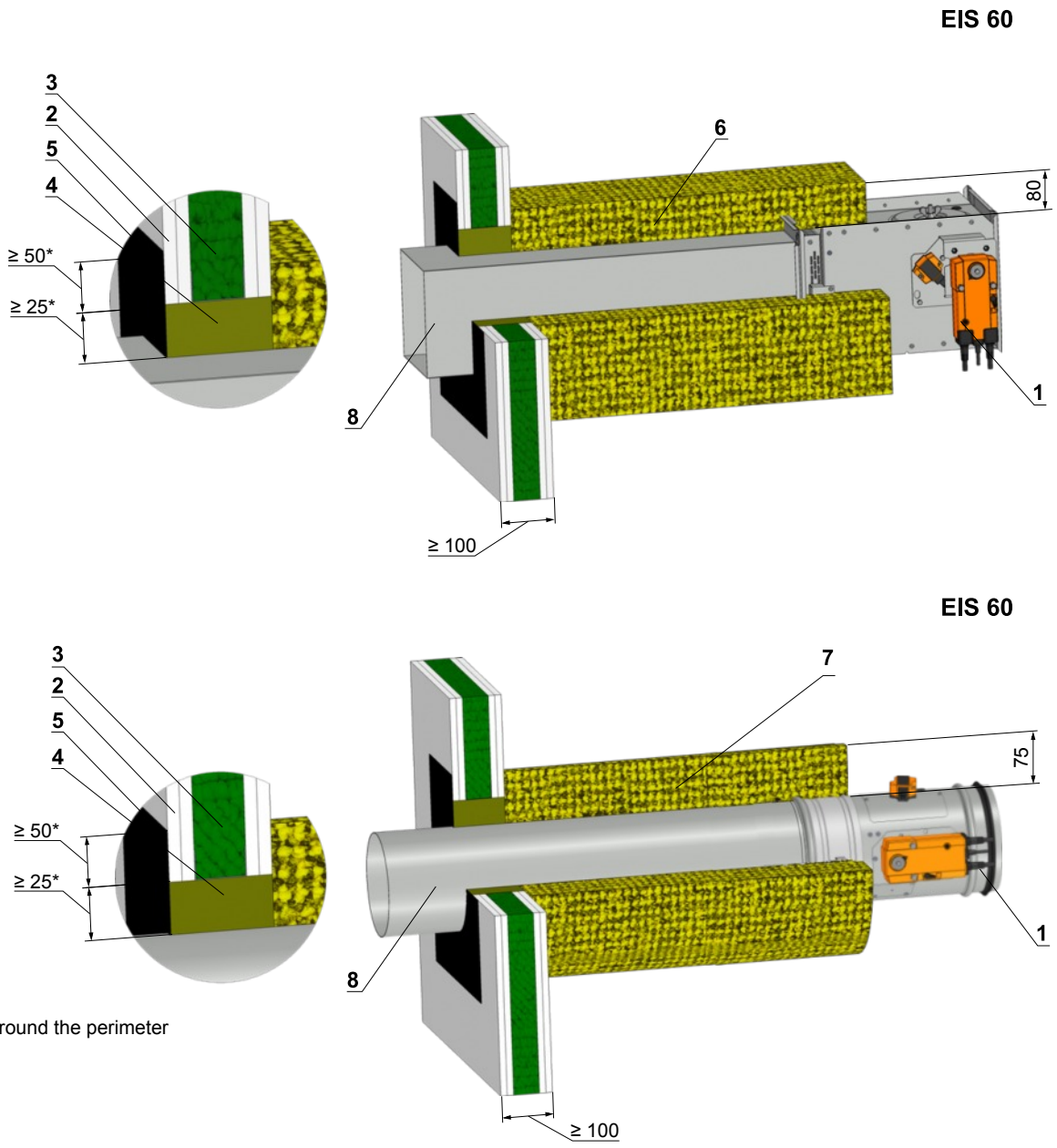
Installation details of wool layers see chapter 11

**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.

The maximum distance from the construction of fire dampers is not limited and according to EN 15882-2 must use the required number of hinges according to EN 13366-1:2014.

**Fig. 102 Installation outside of gypsum wall construction - mineral wool - fire protection mastic**




* Around the perimeter

POSITION:

1 Fire damper FDMB
2 Gypsum plate
3 Mineral wool (type depending on the type of construction)
4 Stuffing box (mineral stone wool min. density 140 kg/m$^3$ )
5 Fire protection mastic min. thickness 1 mm
6 Stone wool with min. density 66 kg/m$^3$ and min. thickness 80 mm
7 Stone wool with min. density 66 kg/m$^3$ and min. thickness 75 mm
8 Duct

Used materials - example**:

4 - Promapyr, Rockwool Steprock HD
5 - Promastop - P, K
6 - Isover Ultimate Protect SLAB 4.0, th. 80 mm ALU1
7 - Isover Ultimate Protect Wired MAT 4.0, th. 75 mm ALU1

Installation details of wool layers see chapter 11

**Notice:**

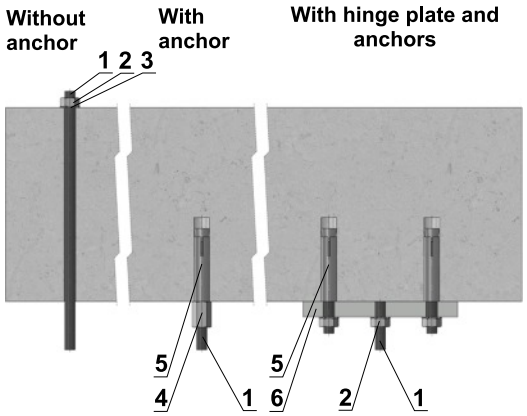
*** Stuffing box, fire protection mastic, cement lime plate and insulation materials can be replaced by another approved fire sealing system for damper installation with equivalent material properties.

The maximum distance from the construction of fire dampers is not limited and according to EN 15882-2 must use the required number of hinges according to EN 13366-1:2014.

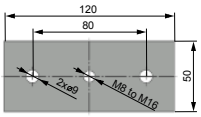
## 11. Suspension systems

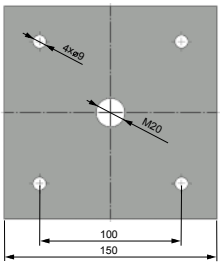
### 11.1. Mounting to the ceiling wall

**Fig. 103 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 | 843 | 52 | 104 |
| M14 | 115 | 70 | 140 |
| M16 | 157 | 96 | 192 |
| M18 | 192 | 117 | 234 |
| M20 | 245 | 150 | 300 |

### 11.2. Horizontal installation

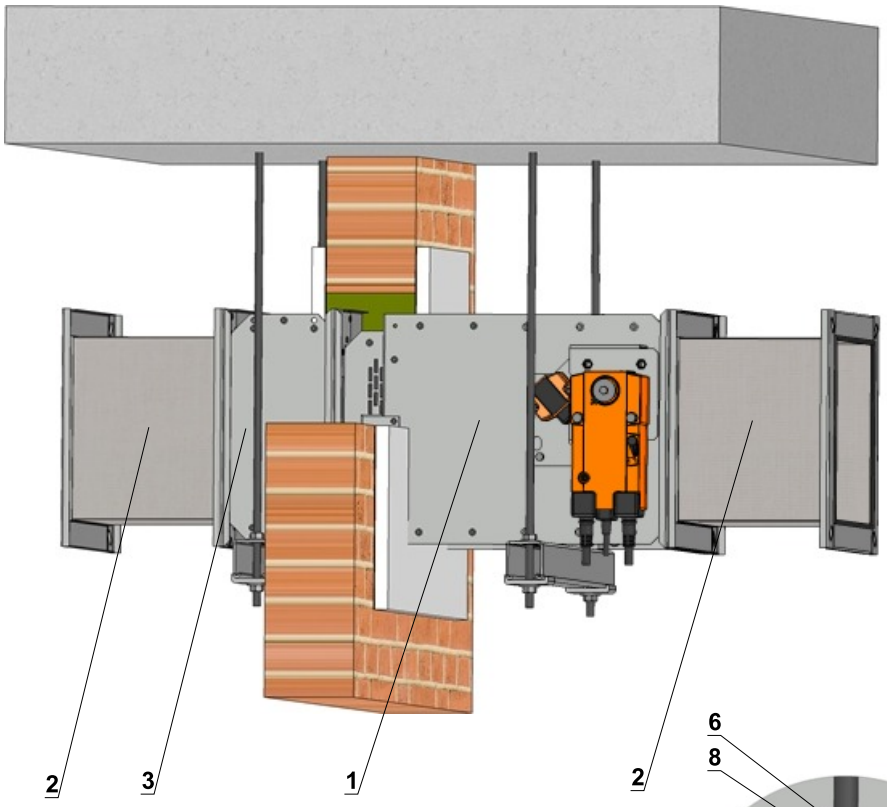
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

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. 103

Fig. 104 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.**

## 11.3. Vertical installation

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

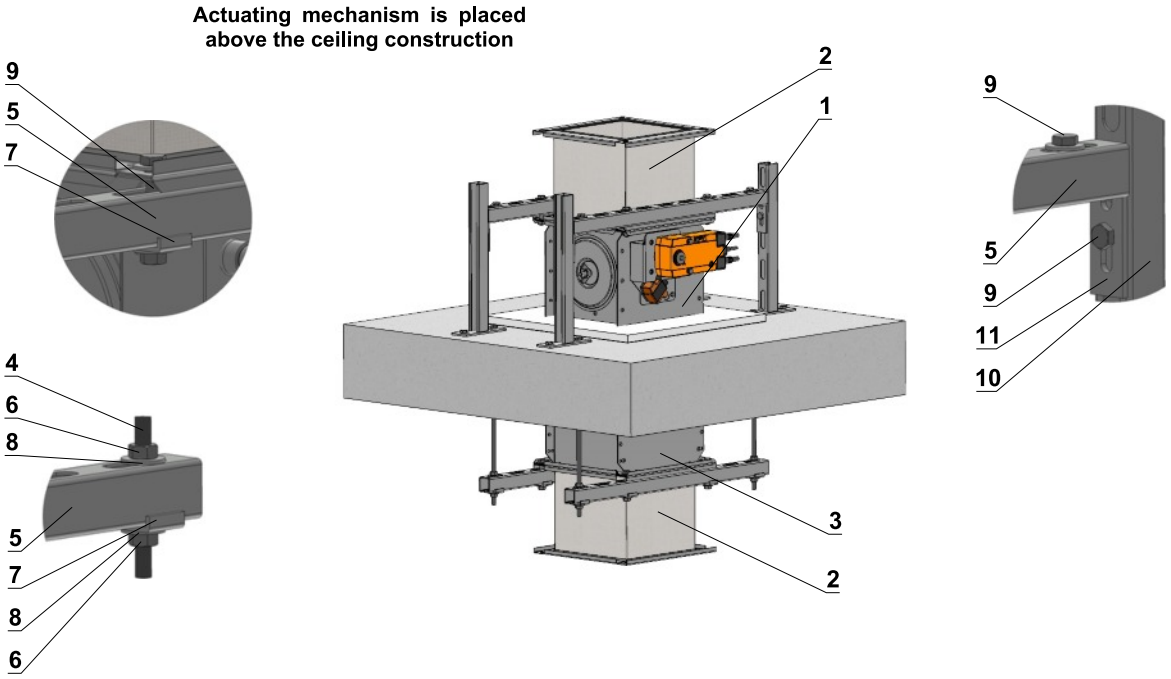
Damper can be suspended from the ceiling construction or supported above the ceiling construction.

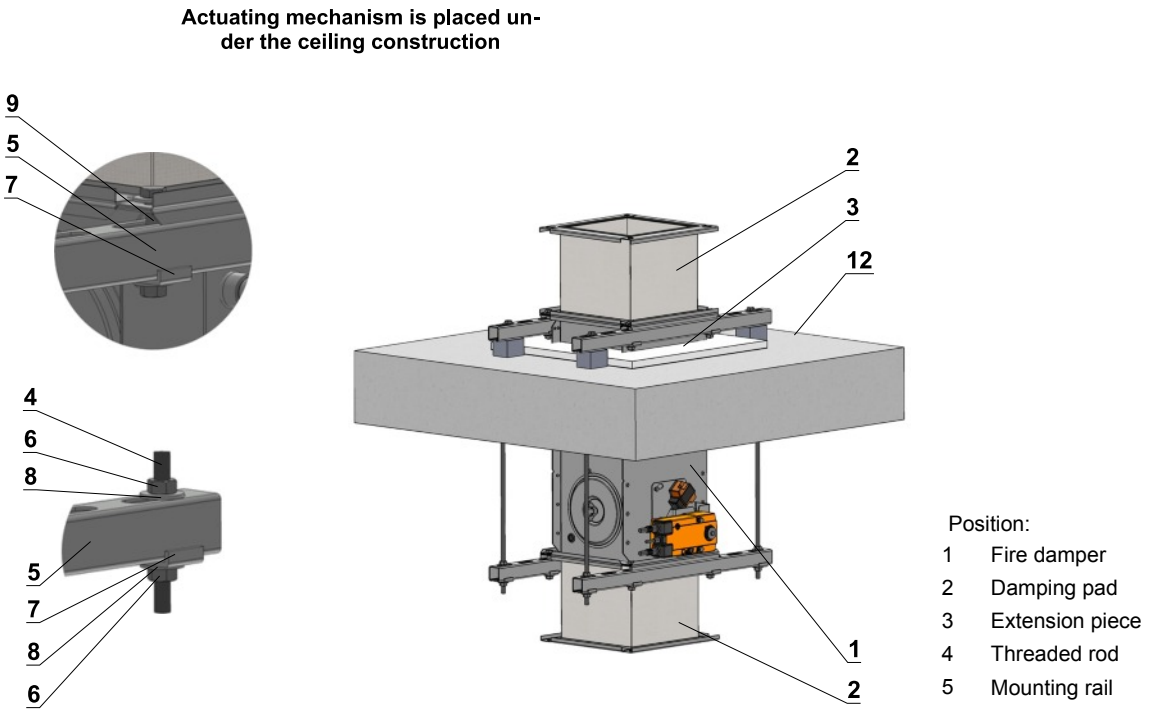
Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

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

Threaded rod fixing to the ceiling construction - see fig. 103

**Fig. 105 Suspension - vertical duct**




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.**

## 11.4. 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.

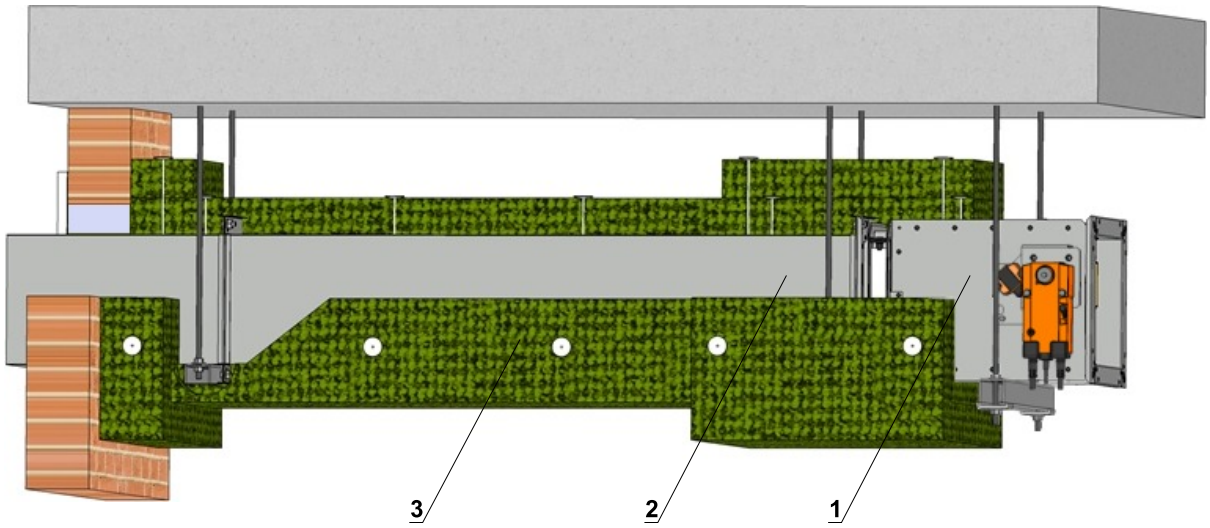
Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported so as all load transfer from the back-to-back piping to the damper is absolutely excluded.

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.

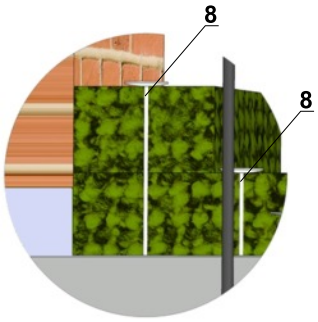
Threaded rod fixing to the ceiling construction - see fig. 103

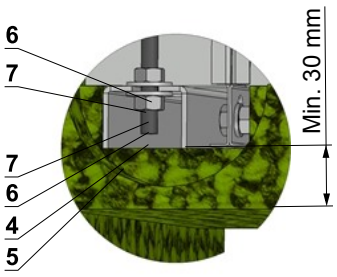
The insulation boards are fastened to the duct by weld pins. Distance between weld pins, distance between weld pins and flanges is dependent on the materials. For more information see documentation of insulation manufacturer.

**Fig. 106 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 |

## 11.5. Horizontal installation

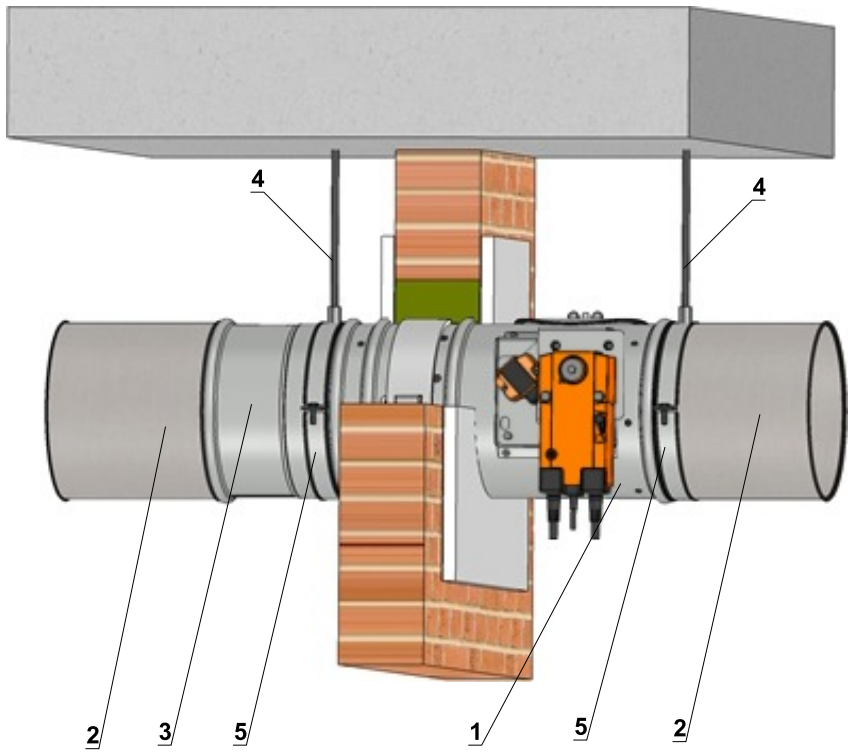
Fire dampers can be suspended by using threaded rods and a mounting profiles. Load the suspension system depend on weight of the fire damper.

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. 103

**Fig. 107 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.**

## 11.6. Vertical installation

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

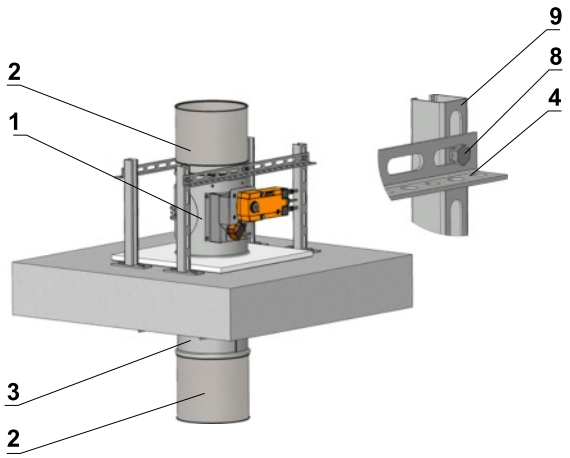
Damper can be suspended from the ceiling construction or supported above the ceiling construction. Damper assembly procedures must be done so as all load transfer from the fire separating constructions to the damper body is absolutely excluded. Back-to-back air-conditioning piping must be hung or supported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

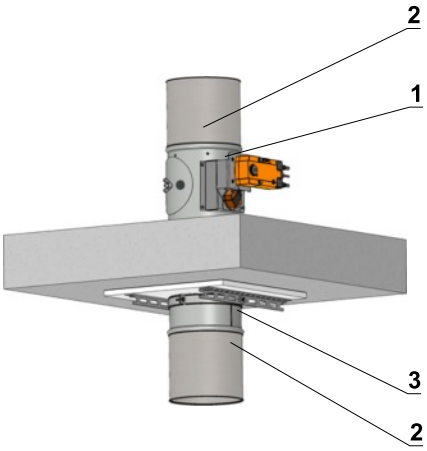
Threaded rods longer than 1,5 m require fire-resistant insulation.

Threaded rod fixing to the ceiling construction - see fig. 103

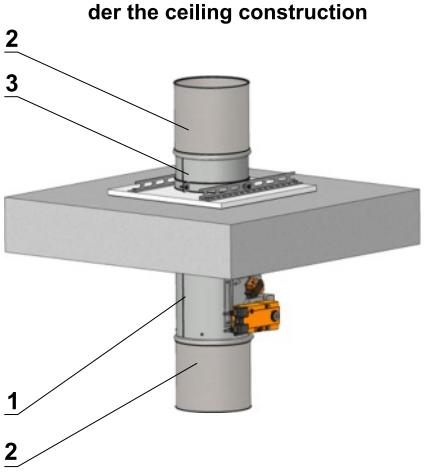
**Fig. 108 Suspension - vertical duct**

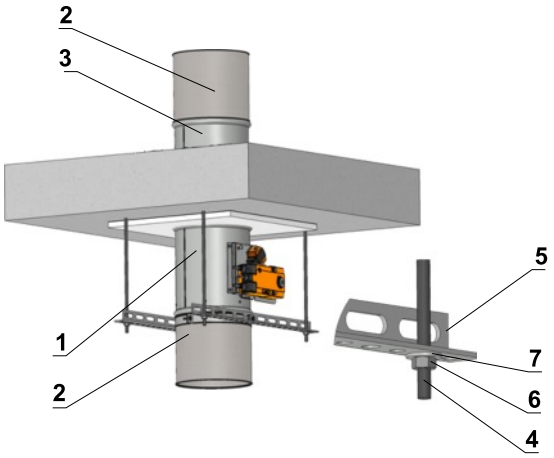
**Actuating mechanism is placed above the ceiling construction**



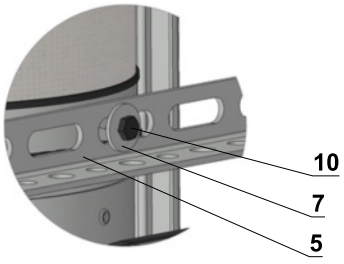

**Actuating mechanism is placed under the ceiling construction**



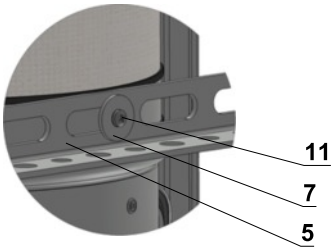




**Notice:** Damper must be firmly connected with extension piece by screws or rivets.

**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.**

## 11.7. Round fire damper suspension on the wall - horizontal installation

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

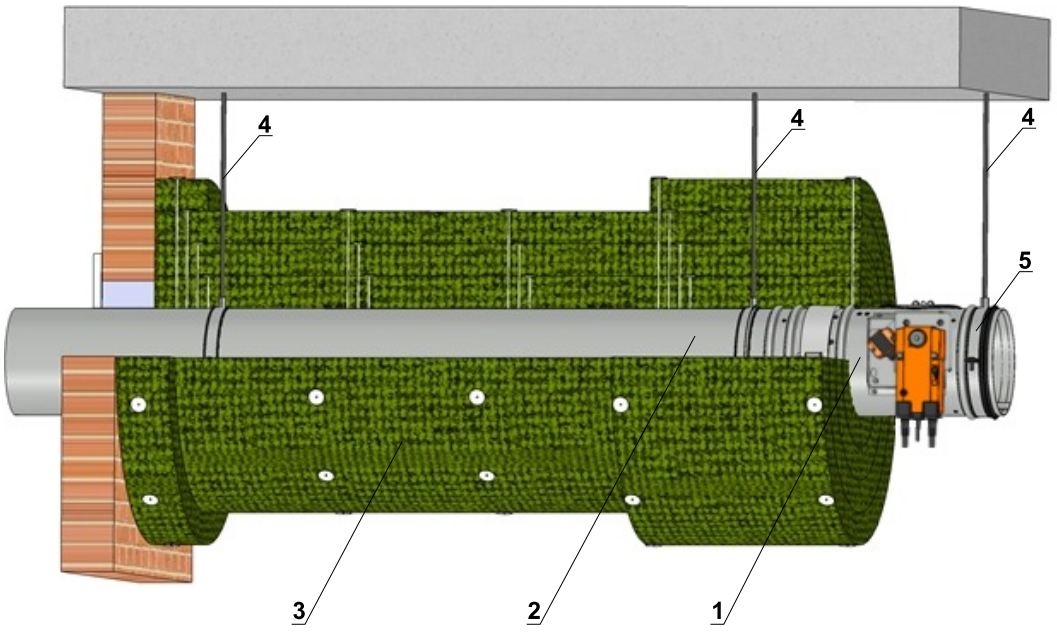
Max. length between two suspension systems is 1500 mm.

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

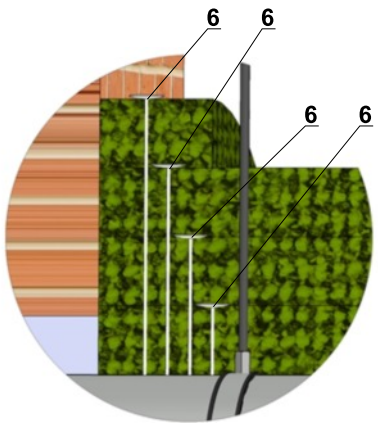
Threaded rod fixing to the ceiling construction - see fig. 103

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. 109 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

### 12. Pressure loss

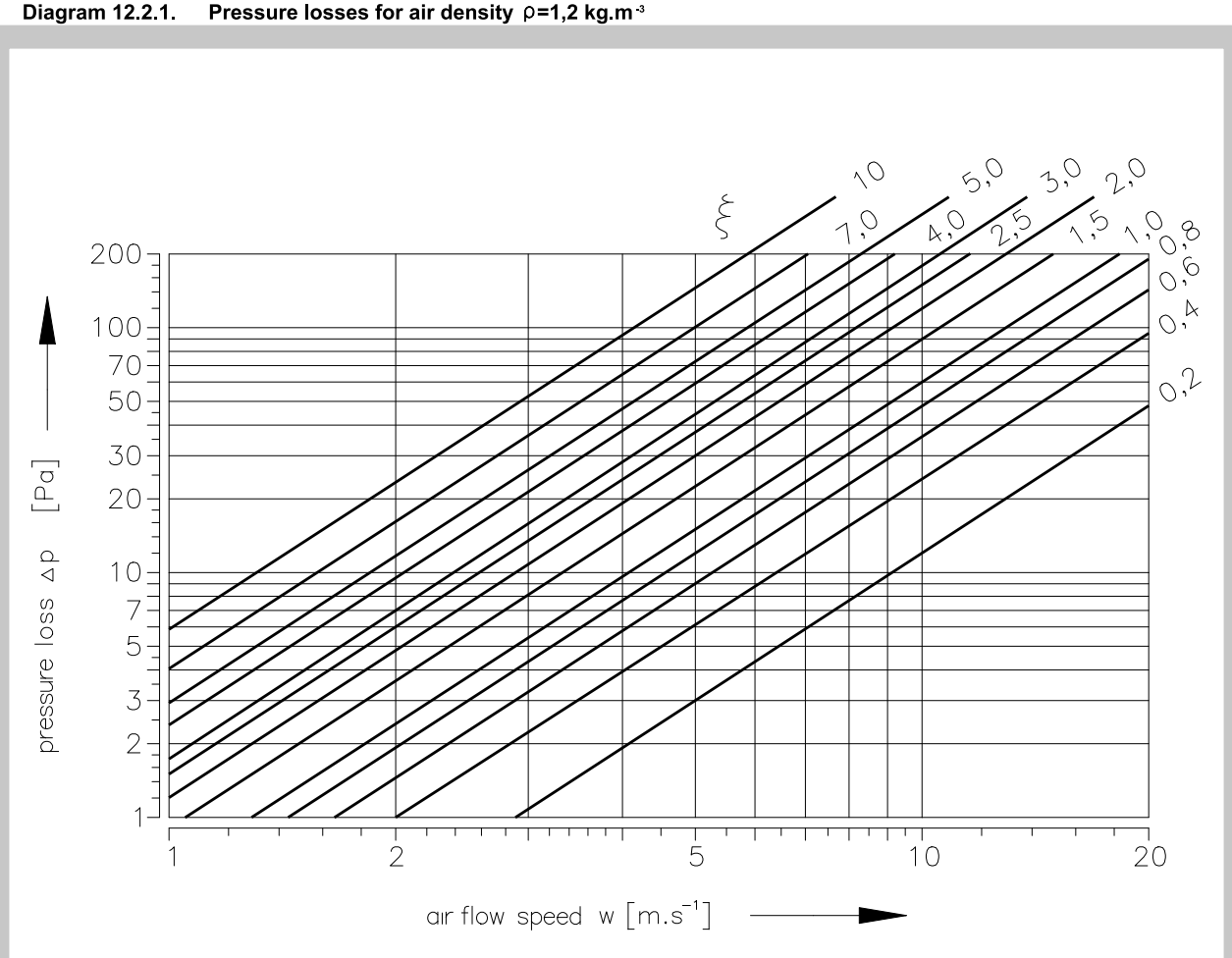
**12.1.** Pressure loss calculation

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

| | | |
|---|---|---|
| $\Delta p$ | [Pa] | presure loss |
| w | [m.s$^{-1}$] | air flow speed in nominal damper section |
| $\rho$ | [kg.m$^{-3}$] | air density |
| $\xi$ | [-] | coefficient of local pressure loss for the nominal damper section (see Tab. 13.1.1.) |

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

**Diagram 12.2.1. Pressure losses for air density $\rho$=1,2 kg.m$^{-3}$**



## 13. Coefficient of local pressure loss

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

**Tab. 13.1.1. Coefficient of local pressure loss - square dampers**

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

| | B | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | **550** | **560** | **600** | **630** | **650** | **700** | **710** | **750** | **800** | **900** | **1000** |
| **160** | 1,761 | 1,741 | 1,672 | 1,627 | 1,601 | 1,598 | 1,532 | 1,493 | 1,452 | 1,386 | 1,336 |
| **180** | 1,451 | 1,434 | 1,375 | 1,337 | 1,315 | 1,289 | 1,256 | 1,224 | 1,180 | 1,133 | 1,090 |
| **200** | 1,246 | 1,232 | 1,179 | 1,146 | 1,126 | 1,106 | 1,074 | 1,046 | 1,015 | 0,965 | 0,928 |
| **225** | 1,075 | 1,035 | 0,998 | 0,965 | 0,938 | 0,926 | 0,905 | 0,873 | 0,856 | 0,822 | 0,803 |
| **250** | 0,952 | 0,940 | 0,898 | 0,871 | 0,855 | 0,831 | 0,813 | 0,790 | 0,765 | 0,725 | 0,695 |
| **280** | 0,849 | 0,880 | 0,800 | 0,775 | 0,760 | 0,742 | 0,722 | 0,701 | 0,678 | 0,641 | 0,613 |
| **300** | 0,797 | 0,786 | 0,750 | 0,726 | 0,712 | 0,689 | 0,675 | 0,655 | 0,633 | 0,599 | 0,572 |
| **315** | 0,764 | 0,754 | 0,718 | 0,695 | 0,681 | 0,662 | 0,646 | 0,626 | 0,605 | 0,572 | 0,546 |
| **355** | 0,694 | 0,685 | 0,651 | 0,630 | 0,617 | 0,603 | 0,584 | 0,566 | 0,546 | 0,514 | 0,490 |
| **400** | 0,637 | 0,628 | 0,597 | 0,577 | 0,565 | 0,543 | 0,534 | 0,516 | 0,498 | 0,468 | 0,445 |
| **450** | 0,591 | 0,583 | 0,553 | 0,534 | 0,522 | 0,503 | 0,493 | 0,476 | 0,458 | 0,430 | 0,408 |
| **500** | 0,556 | 0,548 | 0,520 | 0,501 | 0,490 | 0,482 | 0,462 | 0,446 | 0,429 | 0,401 | 0,380 |
| **550** | 0,529 | 0,521 | 0,494 | 0,476 | 0,465 | 0,441 | 0,437 | 0,422 | 0,405 | 0,379 | – |
| **560** | 0,524 | 0,517 | 0,489 | 0,471 | 0,461 | 0,448 | 0,433 | 0,418 | 0,401 | – | – |
| **600** | 0,507 | 0,500 | 0,473 | 0,455 | 0,445 | 0,426 | 0,418 | 0,403 | 0,387 | – | – |
| **630** | 0,496 | 0,489 | 0,462 | 0,445 | 0,435 | 0,418 | 0,408 | 0,393 | – | – | – |
| **650** | 0,490 | 0,482 | 0,456 | 0,439 | 0,428 | 0,414 | 0,402 | 0,387 | – | – | – |
| **700** | 0,483 | 0,476 | 0,444 | 0,431 | 0,421 | 0,409 | 0,398 | 0,379 | – | – | – |
| **710** | 0,472 | 0,465 | 0,439 | 0,422 | 0,412 | 0,399 | – | – | – | – | – |
| **750** | 0,462 | 0,455 | 0,429 | 0,413 | 0,403 | – | – | – | – | – | – |
| **800** | 0,451 | 0,444 | 0,419 | – | – | – | – | – | – | – | – |
| **900** | 0,434 | – | – | – | – | – | – | – | – | – | – |

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

**Tab. 13.2.1. Coefficient of local pressure loss - round dampers**

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

## 14. Noise data

**14.1.** Level of acoustic output corrected with filter A.

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

| | | |
|---|---|---|
| $L_{WA}$ | [dB(A)] | level of acoustic output corrected with filter A |
| $L_{W1}$ | [dB] | level of acoustic output $L_{W1}$ related to the 1 m² section (see Tab. 14.3.1. and 14.3.2) |
| S | [m²] | duct cross section |
| $K_A$ | [dB] | correction to the weight filter A (viz Tab. 14.3.3.) |

**14.2.** Level of acoustic output in octave ranges.

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

| | | |
|---|---|---|
| $L_{Woct}$ | [dB] | spectrum of acoustic output in octave range |
| $L_{W1}$ | [dB] | level of acoustic output $L_{W1}$ related to the 1 m² section (see Tab. 14.3.1. and 14.3.2) |
| S | [m²] | duct cross section |
| $L_{rel}$ | [dB] | relative level expressing the shape of the spectrum (see Tab. 14.3.4.) |

**14.3.** Table of acoustics values

**Tab. 14.3.1. Level of acoustic output $L_{W1}$[dB] related to the 1 m² section - square dampers**

| | [-] ξ | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v [m/s] | 0,2 | 0,3 | 0,4 | 0,5 | 0,6 | 0,7 | 0,8 | 0,9 | 1,0 | 1,5 | 2,0 | 2,5 | 3,0 | 4,0 | 5,0 |
| 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 | 36,5 | 38,8 | 40,5 |
| 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 | 47,1 | 49,4 | 51,1 |
| 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 | 54,6 | 56,9 | 58,6 |
| 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 | 60,4 | 62,7 | 64,4 |
| 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 | 65,2 | 67,4 | 69,2 |
| 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 | 69,2 | 71,4 | 73,2 |
| 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 | 72,7 | 74,9 | 76,7 |
| 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 | 75,7 | 78,0 | 79,7 |
| 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 | 78,5 | 80,7 | 82,5 |
| 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 | 81,0 | 83,2 | 85,0 |
| 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 | 83,2 | 85,5 | 87,2 |

Tab. 14.3.2. Level of acoustic output $L_{W1}$[dB] related to the 1 m² section - round dampers

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

Tab. 14.3.3. 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. 14.3.4. 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

### 15. Material

**15.1.** Damper bodies are supplied in the design made of galvanized plate without any other surface finishing.

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

Control devices of dampers has cover from mechanically resistant and standing plastic and rest of the parts is galvanised without further surface treatment.

Springs are galvanized.

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

Fasteners is galvanized. Fasteners is galvanized.

**15.2.** According to the customer's requirements, damper can be made of stainless material.

Specifications for stainless-steel models – classification of stainless steel:

- Class A2 – Food-grade stainless steel (AISI 304 – ČSN 17240)
- Class A4 – Chemistry-grade stainless steel (AISI 316, 316L – ČSN 17346, 17349)

The respective stainless steel is the material for all components present or accessing the damper interior; components outside the damper body are typically from galvanised sheet metal (fasteners for mounting the servo drive or mechanics, mechanics components except Item 4), frame components.

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

1) Damper body and all components permanently attached
2) Leaf holders, including pins, metal parts of leaf
3) Control components inside the damper (leaf angle selector, pin with lever)
4) Mechanical components entering the interior of damper body (lower sheet of mechanics, lock holder “1”, lock lever “2”, lock spring, 8 dia. stopper pin, mechanics pin)
5) Inspection hole cover including the clip and fasteners (if they are parts of the cover)
6) Bearing for torque transfer from the lever with pin on the angle selector at the leaf (made from AISI 440C)

The leaf of the damper is made from a single piece of homogeneous material Promatect-MST, thickness 30 mm.

Plastic, rubber and silicon components, sealants, foaming bands, glass-ceramic seals, housings, brass bearings of the leaf, servo drives, and end switches are identical for all material variants of the dampers.

The thermal link is identical for all material variants of the dampers. Upon specification by customer, the thermal link may be made from A4 stainless steel. The solder is standard, corresponding to the initialisation temperature.

The temperature-dependent initiator of the servo drive (sensor) is modified for stainless-steel variants of the dampers; the standard galvanised screws are replaced with stainless-steel M4 screws of corresponding class the counterpart has stainless-steel riveting M4 nuts.

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

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

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

## V. INSPECTION, TESTING

### 16. Inspection, testing

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

## VI. TRANSPORTATION AND STORAGE

### 17. Logistic terms

**17.1.** 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.

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

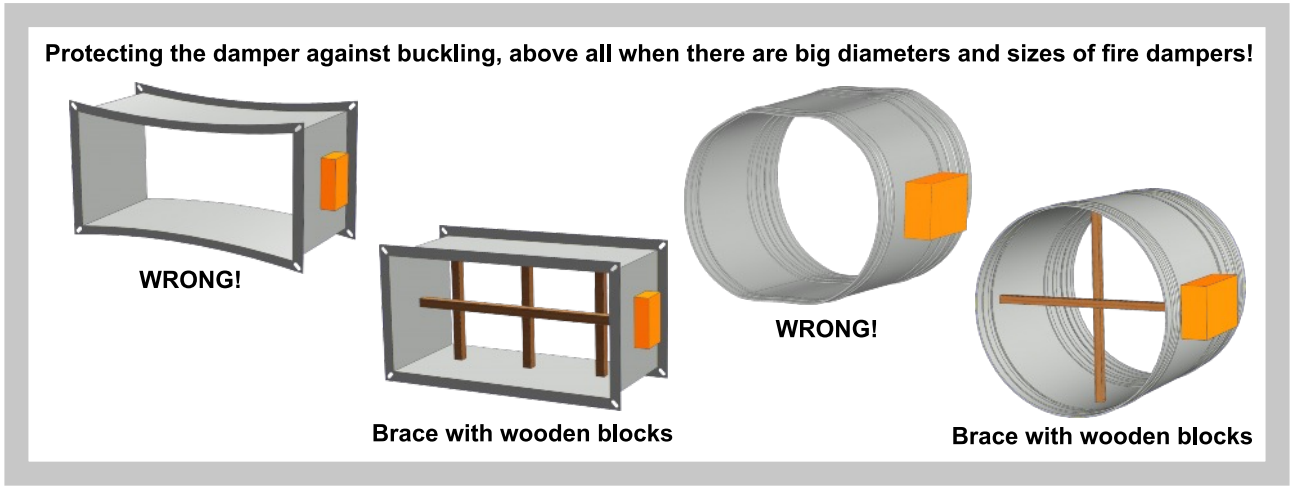
## VII. ASSEMBLY, ATTENDANCE, MAINTENANCE AND REVISIONS

### 18. Assembly

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

**18.2.** 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.

**Fig. 110 Embedding / fixing the damper**




**18.3.** 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.

## 19. Entry into service and revisions

**19.1.** Before entering the dampers into operation after their assembly and by sequential checks, the following checks must be carried out. Visual inspection of proper damper integration , inside damper area, damper blade, contact surfaces and silicon sealing. Check of thermal protective fuse and closing mechanism. Check the closing function of the damper blade. This can be done by removing of thermal fuse from damper body.

Before entering the dampers with actuating mechanism into operation after their assembly and by sequential checks. 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 BAT 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). 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. It is recommended to provide periodical checks, maintenance and service actions on Fire Equipment by Authorized persons. The authorized persons can be trained by Producer, or by authorized Distributor. All effective safety standards and directives must be observed during fire damper assembly.

For regular or exceptional inspection of interior of fire damper, micro-camera device can be used. On each fire damper is ispection hole. In the case of inspection by camera, take out the black rubber cap, insert the camera inside the damper, check interior and at the end of inspection, put the rubber cap back tightly to cover the empty hole.

**19.2.** Before entering the dampers with manual control (design .01, .11, .80) into operation after their assembly and by sequential checks and following checks must be carried out.

### Verification of closing device and thermal fuse:

**When you verify functionality of mechanism, follow these steps:**

Adjustment of damper blade in position "CLOSED" shall be made following:

- Damper is in „OPEN“ position.
- By pressing control button mechanism, you close damper in "CLOSED" position.
- Check damper blade adjustment in "CLOSED" position.
- Closing must be strong and control lever must be in "CLOSED" position.
- If closing is not sufficiently strong and damper control lever is not in "CLOSED" position, you must contact manufacturer and order new mechanism.
- Mechanism dimension is marked M1 to M4, according to internal forces of spring.

Adjustment of damper blade in position "OPEN" shall be made following:

- Rotate control lever by 90°.
- Lever get fasten automatically in “OPEN” position.
- Check damper blade adjustment in "OPEN" position.

**Checking function and the status of the thermal fuse shall be made following:**

- To check the function and the status of the fuse is possible to remove whole mechanism from the body of fire damper - mechanism is attached to the dampers body with four screws M6.
- Removing the thermal fuse from the fuse holder of initiation device, check its correct functionality.
- There must be a release lever, which releases initiation lever of control and mechanism will displace to "CLOSED" position.
- If not, you need to contact the manufacturer and order new mechanism.
- Mechanism dimension is marked M1 to M4, according to internal forces of spring.

**19.3.** Before entering the dampers with actuating mechanism into operation after their assembly and by sequential checks 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 BAT 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).

**19.4.** 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.

**19.5.** It is recommended to provide periodical checks, maintenance and service actions on Fire Equipment by Authorized persons schooled by Producer.

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

**19.7.** 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.

## 20. Spare parts

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

**20.2.** Control for square damper and round damper is identical.

## 21. Restore function of actuating mechanism after fuses initiation

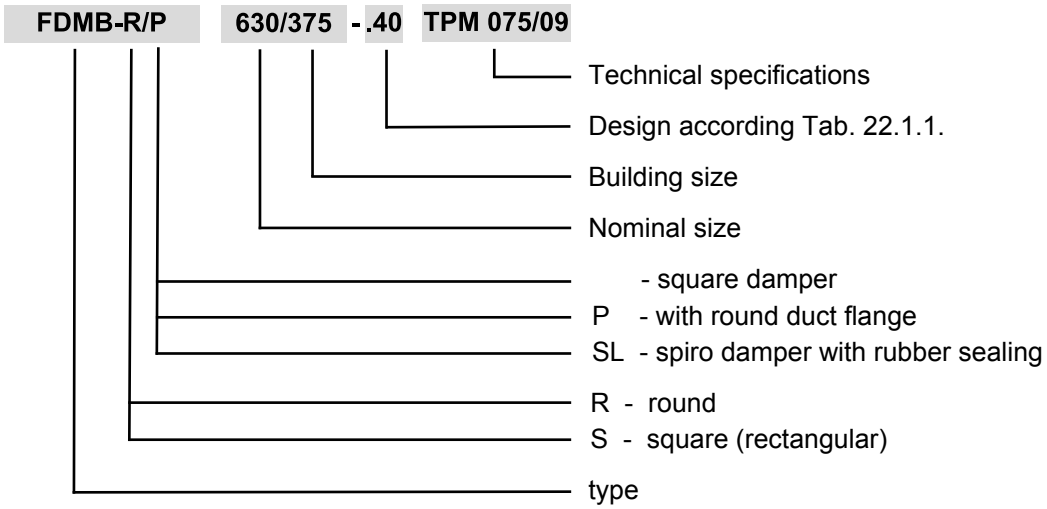
**21.1.** If fuse Tf1 is initiated (duct outside temperature) than is necessary to change thermoelectrical starting mechanism BAT72B-S. Whereas is initiation temperature higher than actuator mechanism operating temperature +50°C, recommended actuating mechanism manufacturer make complete revision or change actuating mechanism and thermoelectrical starting mechanism.

**21.2.** If fuses Tf2/Tf3 are initiated (duct inside temperature) than is possible change only part ZBAT72 or ZBAT95 (according initiating temperature).

# VIII. ORDERING INFORMATION

## 22. Ordering key

### 22.1. Fire damper



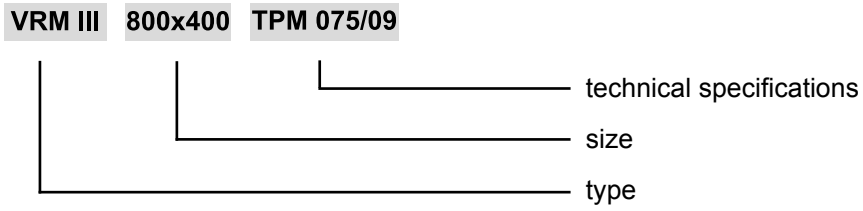

**If installation holders, installation frame or design for installation in Weichschott system are requested, it has to be mentioned separately in the order. Installation frame could be fixed to the damper body or supplied separately.**

**Tab. 22.1.1. Dampers design**

| Dampers design | Additional digit |
|---|---|
| Manual and thermal | .01 |
| Manual and thermal (Zone 1,2) | .02 |
| Manual and thermal with a terminal switch („CLOSED“) | .11 |
| Manual and thermal with a terminal switch („CLOSED“) (Zone 1,2) | .12 |
| With actuating mechanism BF 230-TN (BFL, BFN 230-T) - voltage AC 230 V | .40 |
| With actuating mechanism BF 24-TN (BFL, BFN 24-T), with smoke detector ORS 142 K and with supply device BKN 230-24-MOD (voltage AC 230 V) | .41 |
| With actuating mechanism ExMax-15-BF (AC 230 V, AC/DC 24 V) with thermoelectric activation mechanism (Zone 1,2) | .42 |
| With actuating mechanism BF 24-TN (BFL, BFN 24-T) - voltage AC/DC 24 V | .50 |
| With actuating mechanism BF 24-TN (BFL, BFN 24-T), with smoke detector ORS 142 K (voltage AC/DC 24 V) | .51 |
| With communication and supply device BKN 230-24 and actuating mechanism BF 24-TN-ST (BFL, BFN 24-T-ST) | .60 |
| With communication and supply device BKN 230-24-C-MP, with actuating mechanism BF 24-TN-ST (BFL, BFN 24-T-ST) and with smoke detector ORS 142 K | .61 |
| With communication and supply device BKN 230-24MP and with actuating mechanism BF 24TL-TN-ST (Top-Line) for connection to MP-Bus | .62 |
| With communication and supply device BKN 230-24-MOD, with actuating mechanism BF 24-TN-ST (BFL, BFN 24-T-ST) and with smoke detector ORS 142 K | .63 |
| With communication and supply device BKN 230-24LON and with actuating mechanism BF 24TL-TN-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 |

**Some designs are possible to supply with optical smoke detector ORS 142 K. For more information contact manufacturer.**

**22.2.** Reinforcement - damper placement outside wall or ceiling construction

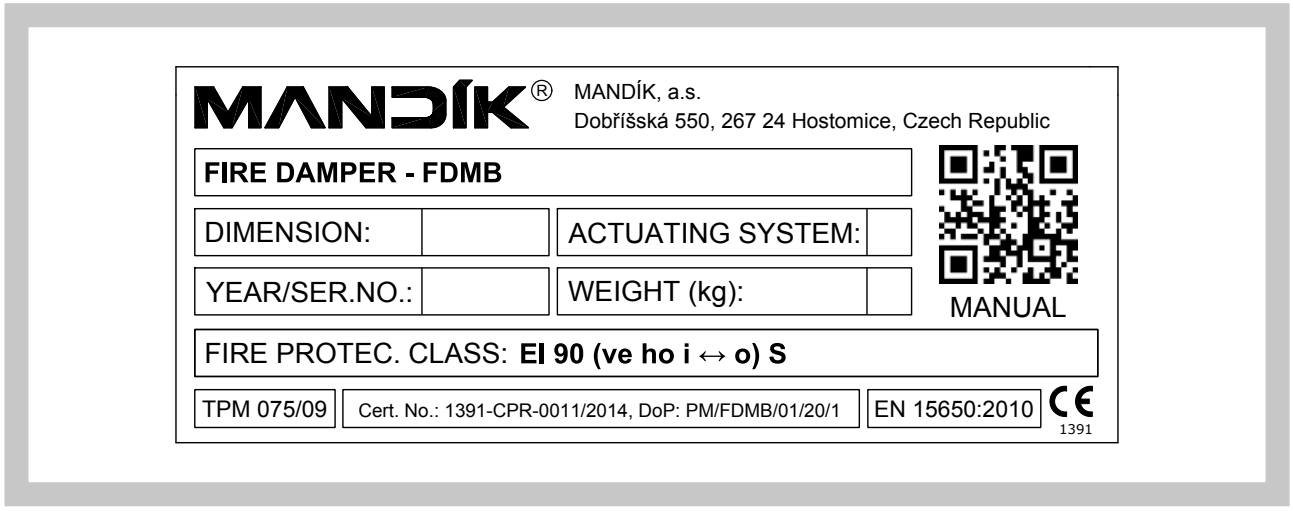



## IX. PRODUCT DATA

### 23. Data label

**23.1.** Data label is placed on the damper body.

**Fig. 111 Data label**



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