

## FDML

### Multi blade fire damper

Technical Documentation

Installation, Commissioning, Operation, Maintenance and Service Manual



These technical specifications state a row of manufactured sizes and models of fire dampers FDML  
It is valid for production, designing, ordering, delivery, maintenance and operation.

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# I. GENERAL

## Description

Fire dampers are shutters in ducts of air-conditioning devices that prevent the spread of fire and combustion products from one fire segment to the other one. FDML multi blade fire dampers are in motorised design only with actuator and they have the following two main applications:

For use as a fire shutter without following air duct with cover grilles for closing ventilation openings in fire separating walls, constructions, elevator and other shafts, cable and other ducts, preventing the spread of heat and combustion products.

For use as a multi blade fire damper with following air duct on both sides (without cover grilles) or with duct on one side (with one cover grille), preventing the spread of heat and combustion products through this duct system.

Damper blades automatically closes air duct using a spring return actuator. The return spring of the actuator is actuated when a thermoelectric activation device BAT is activated, when a test button on BAT is pressed or when power supply of the actuator is interrupted.

After closing blades, the damper is sealed with silicon against smoke penetration. On request by customer, the damper can be supplied silicon-free. In the closed position, the damper is also sealed with material which increases its volume due to increasing temperature and air proofs the air duct.

### Damper characteristics

- CE certified acc. to EN 15650
- Tested in accordance with EN 1366-2
- Classified acc. to EN 13501-3+A1
- Fire resistance EI 90 S
- Leakage acc. to EN 1751, through the casing class ATC 4 (old marking "B") and through the damper blades class 3
- Cycling tests in class C<sub>10000</sub> acc. to EN 15650
- Corrosion resistant acc. to EN 15650
- Certificate of constancy of performance No. 1391-CPR-XXXX/XXXX
- Declaration of Performance No. PM/FDML/01/XX/X
- Hygienic assessment of fire dampers - Report No. 1.6/pos/19/19b

### Working conditions

- Exact damper function is provided under the following conditions:
  - maximum air velocity 12 m/s
  - maximum pressure difference 1500 Pa
  - Even distribution of air flow in complete damper cross section area
- Damper operating characteristics are independent on airflow direction through the damper. The damper can be installed with blade axis vertically or horizontally, temperature sensor (BAT) must always be in damper upper part.
- Dampers are suitable for systems without abrasive, chemical and adhesive particles.
- Dampers are designed for macroclimatic areas with mild climate according to EN IEC 60 721-3-3 ed.2., class 3K22. (Environment 3K22 is typically protected place with regulated temperature).
- Temperature in the place of installation is permitted to range from -30°C to +50°C.
- Optical smoke detector ORS 142K with socket 143A is intended for environments protected from weathering of categories 3K5/3Z1/3Z8/3B1/3C2/3S1/3M2 within temperature scope -25°C to +70°C, max. relative humidity 95% at 40°C, without condensing, icing and ice formation according to EN 60 721-3-3 amend.A2.
- If the damper is used for self-ventilation it must be equipped with cover grilles from both sides.

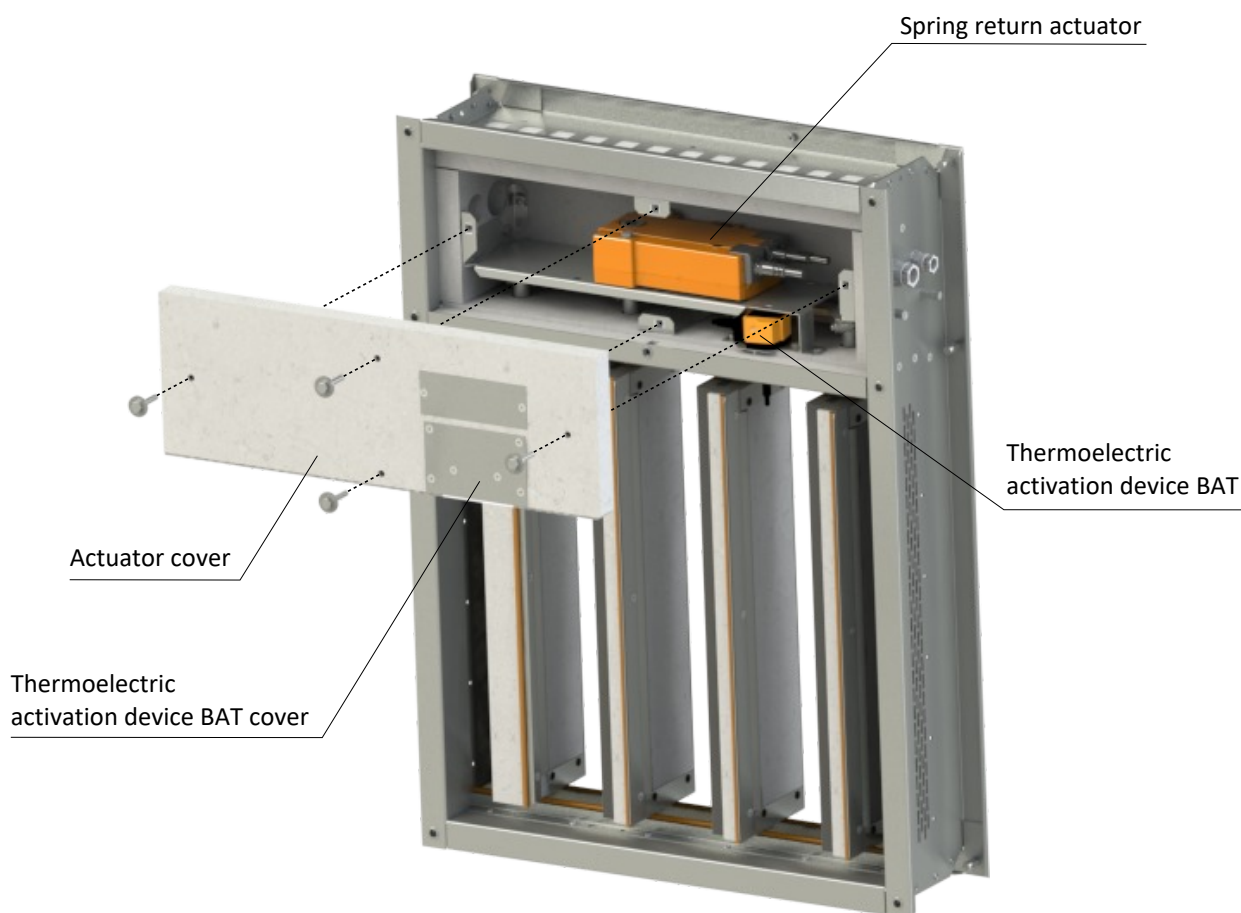


## II. DESIGN

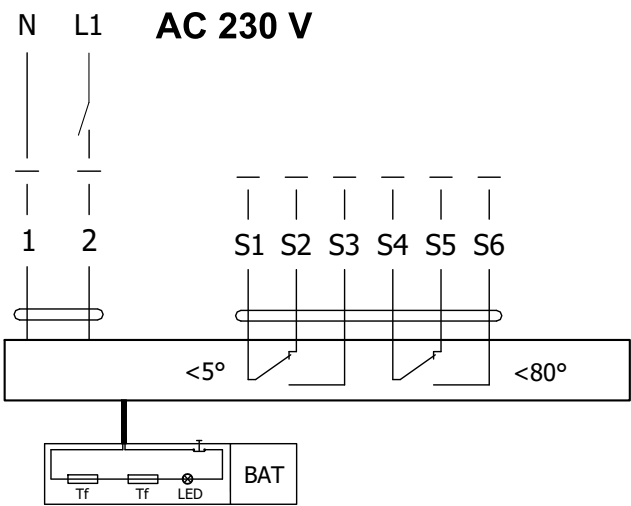
### Design with spring return actuator

#### Design .40 and .50

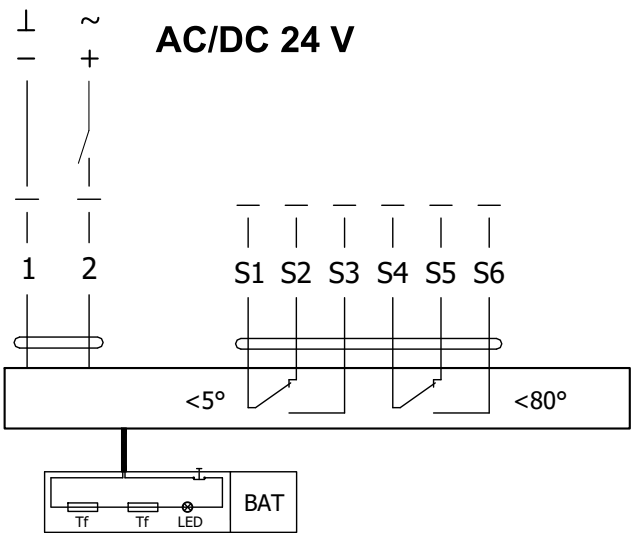
- Fire dampers are equipped with Belimo spring return actuators with thermoelectric activation device BAT. The spring return actuator types are BFL, BFN or BF depending on the damper size. (Further mentioned as „actuator“).
- After being connected to power supply 230V or AC/DC 24V, the actuator rotates the damper blades to the operating position "OPEN" and at the same time prestretches its return spring. When the actuator is power supplied, the damper blades are in the position "OPEN" and the return spring is prestretched. Time needed for full opening of the damper blades from the position "CLOSED" to the position "OPEN" is maximum 120 sec.
- If the actuator power supply is interrupted (due to loss of supply voltage, or pressing a test button on the thermoelectric activation device BAT), the actuator rotates the damper blades to the breakdown position "CLOSED". The time of closing the damper blades from the position "OPEN" to the position "CLOSED" takes maximum 20 sec.
- In case that the power supply is restored again (the blades can be in any position), the actuator starts to rotate the damper blades back to the position "OPEN".
- A thermoelectric activation device BAT, which contains two thermal fuses Tf1 and Tf2, is an integral part of the actuator.
- These fuses are activated when temperature +72°C has been reached (the fuse Tf1 due to temperature outside the duct and the fuse Tf2 due to temperature inside the duct). The thermoelectric activation device can also be equipped with a Tf2 thermal fuse type ZBAT 95/120/140 (must be specified in the order). In this case, the activation temperature inside the duct is +95°C, +120°C or +140°C (depending on the type).
- After the thermal fuse Tf1 or Tf2 has been activated, the power supply is permanently and irreversibly interrupted and the actuator, by means of the pre-stretched spring, rotate the damper blades into the breakdown position "CLOSED".
- Signalisation of damper blades position "OPEN" and "CLOSE" is provided by two microswitches.



Actuator BELIMO BFL 230-T(-ST)



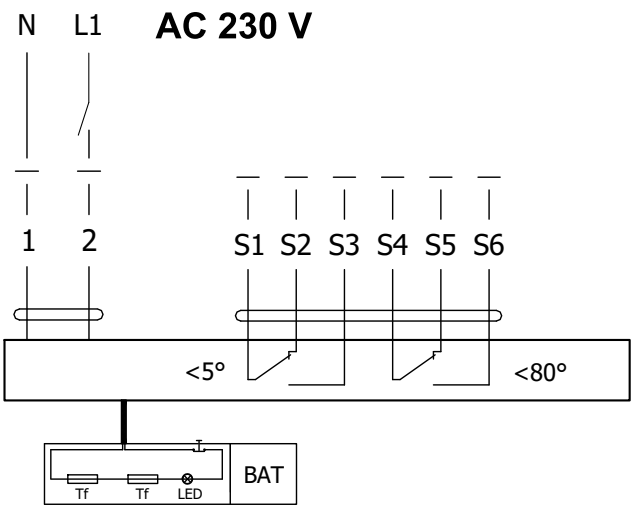
Actuator BELIMO BFL 24-T(-ST)



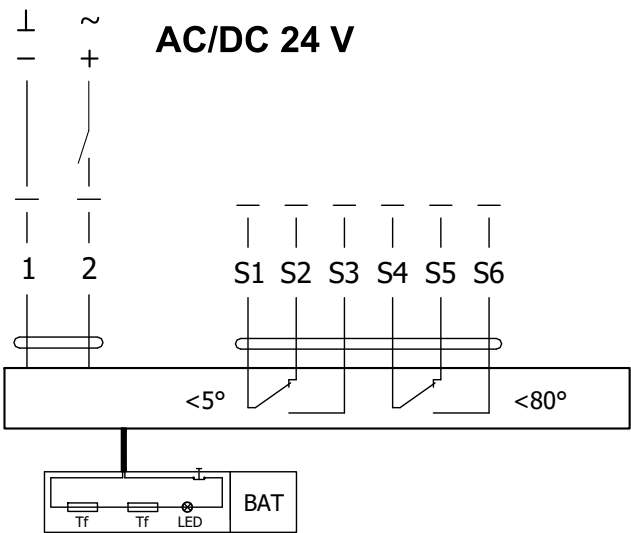
Actuator BELIMO BFL 230-T(-ST), BFL 24-T(-ST)

| Actuator BELIMO - 4 Nm/ 3 Nm Spring                                                  | BFL 230-T(-ST)                                                                                                                                                       | BFL 24-T(-ST)            |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Power voltage                                                                        | AC 230 V<br>50/60Hz                                                                                                                                                  | AC/DC 24 V<br>50/60Hz    |
| Power consumption - in operation<br>- in rest position                               | 3,5 W<br>1,1 W                                                                                                                                                       | 2,5 W<br>0,8 W           |
| Dimensioning                                                                         | 6,5 VA (Imax 4 A @ 5 ms)                                                                                                                                             | 4 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                                                                            |                          |
| Connection - supply/control<br>- auxiliary switch                                    | cable 1 m, 2 x 0,75 mm <sup>2</sup> (BFL 2xx-T-ST) with 3-pin plug-in connectors<br>cable 1 m, 6 x 0,75 mm <sup>2</sup> (BFL 2xx-T-ST) with 6-pin plug-in connectors |                          |
| Response temperature thermal fuse                                                    | duct outside temperature +72°C<br>duct inside temperature +72°C                                                                                                      |                          |

Actuator BELIMO BFN 230-T(-ST)

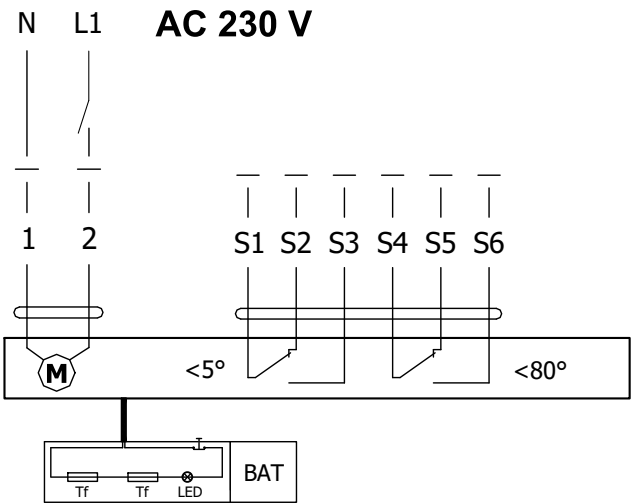


Actuator BELIMO BFN 24-T(-ST)

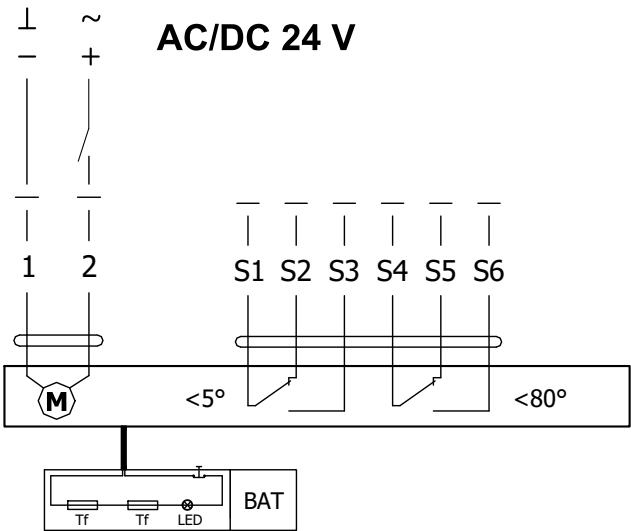


| Actuator BELIMO BFN 230-T(-ST), BFN 24-T(-ST)                                        |                                                                                                                                              |                          |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Actuator BELIMO - 9 Nm/ 7 Nm Spring                                                  | BFN 230-T(-ST)                                                                                                                               | BFN 24-T(-ST)            |
| Power voltage                                                                        | AC 230 V<br>50/60Hz                                                                                                                          | AC/DC 24 V<br>50/60Hz    |
| Power consumption - in operation<br>- in rest position                               | 5 W<br>2,1 W                                                                                                                                 | 4 W<br>1,4 W             |
| Dimensioning                                                                         | 10 VA (Imax 4 A @ 5 ms)                                                                                                                      | 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                                                    |                          |
| Connection - supply/control<br>- auxiliary switch                                    | cable 1 m, 2 x 0,75 mm² (BFN 2xx-T-ST) with 3-pin plug-in connectors<br>cable 1 m, 6 x 0,75 mm² (BFN 2xx-T-ST) with 6-pin plug-in connectors |                          |
| Response temperature thermal fuse                                                    | duct outside temperature +72°C<br>duct inside temperature +72°C                                                                              |                          |

Actuator BELIMO BF 230-TN(-ST)



Actuator BELIMO BF 24-TN (-ST)



Actuator BELIMO BF 230-TN(-ST), BF 24-TN(-ST)

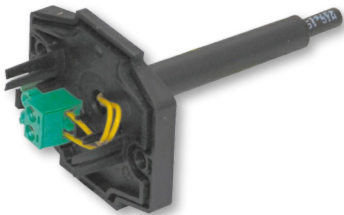
| Actuator BELIMO - 18 Nm/ 12 Nm Spring                                                | BF 230-TN(-ST)                                                                                                                                                       | BF 24-TN(-ST)             |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Power voltage                                                                        | AC 230 V<br>50/60Hz                                                                                                                                                  | AC/DC 24 V<br>50/60Hz     |
| Power consumption - in operation<br>- in rest position                               | 8,5 W<br>3 W                                                                                                                                                         | 7 W<br>2 W                |
| Dimensioning                                                                         | 11 VA (Imax 8,3 A @ 5 ms)                                                                                                                                            | 10 VA (Imax 8,3 A @ 5 ms) |
| Protection class                                                                     | II                                                                                                                                                                   | III                       |
| Degree of protection                                                                 | IP 54                                                                                                                                                                |                           |
| Running time - motor<br>- spring return                                              | 120 s<br>~ 16 s                                                                                                                                                      |                           |
| 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                                                                            |                           |
| Connection - supply/control<br>- auxiliary switch                                    | cable 1 m, 2 x 0,75 mm <sup>2</sup> (BF 2xx-TN-ST) with 3-pin plug-in connectors<br>cable 1 m, 6 x 0,75 mm <sup>2</sup> (BF 2xx-TN-ST) with 6-pin plug-in connectors |                           |
| Response temperature thermal fuse                                                    | duct outside temperature +72°C<br>duct inside temperature +72°C                                                                                                      |                           |

Thermoelectric activation device BAT

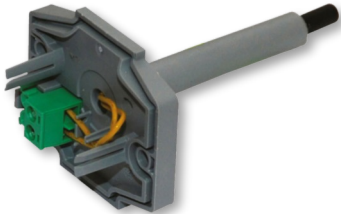
- If the thermal fuse Tf1 is interrupted (due to temperature outside the duct), it is necessary to replace the spring return actuator. Thermoelectric activation device BAT is integral part of the actuator.
  - If the thermal fuse Tf2 is interrupted (due to temperature inside the duct), only the spare part ZBAT 72 (95/120/140) needs to be replaced (acc.to the activation temperature).
- When one of the thermal fuses responds, the supply voltage is interrupted permanently and irreversibly.
  - The function (interruption of the supply voltage) can be checked by pressing the test button.
  - Installation is carried out with the pre-assembled, self-tapping screws.



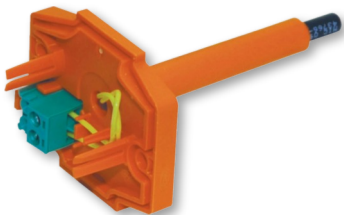
**BELIMO ZBAT 72**  
Black (BK) = 72°C (standard)



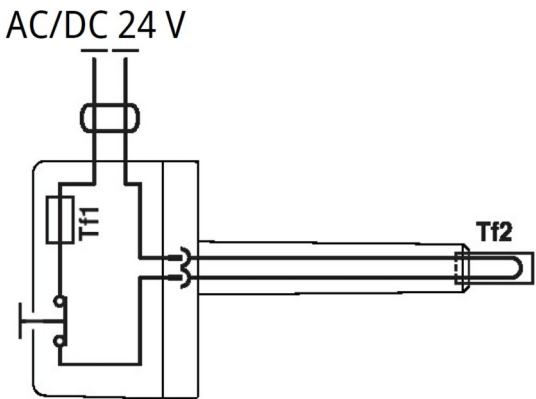
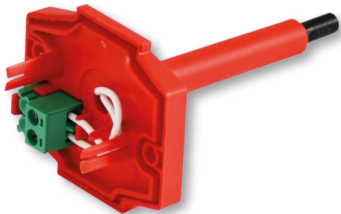
**BELIMO ZBAT 95**  
Grey (GY) = 95°C



**BELIMO ZBAT 120**  
Orange (OG) = 120°C



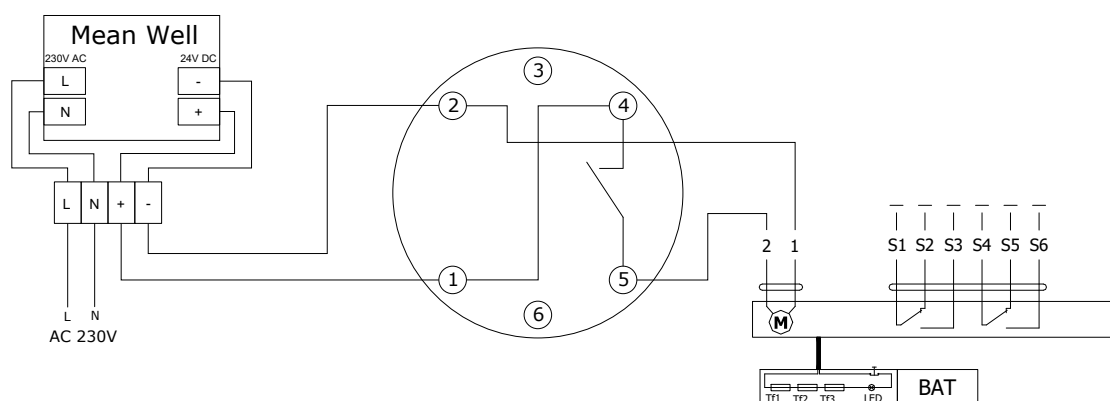
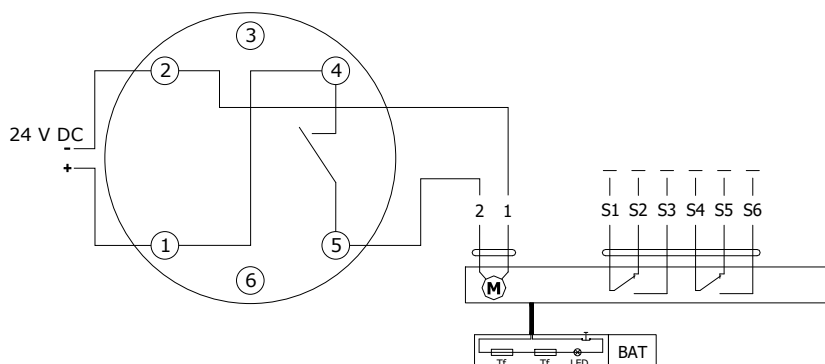
**BELIMO ZBAT 140**  
Red (RD) = 140°C



| Thermoelectric activation device BAT 72 (95/120/140) |                                                                                           |
|------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Power voltage                                        | AC/DC 24 V<br>50/60Hz                                                                     |
| Rated current                                        | 1 A                                                                                       |
| AC/DC throughput resistance                          | <1 Ω                                                                                      |
| Protection class                                     | III                                                                                       |
| Degree of protection                                 | IP 54                                                                                     |
| Probe length                                         | 65 mm                                                                                     |
| Ambient temperature                                  | -30°C ... +50°C                                                                           |
| Storage temperature                                  | -40°C ... +50°C                                                                           |
| Ambient humidity                                     | Max. 95% RH, non-condensing                                                               |
| Connection supply                                    | Cable 1 m, 2 x 0.5 mm², Betaflam cable heatresistant up to 145°C                          |
| Response temperature thermal fuse                    | Duct inside temperature +72 (95/120/140)°C<br>Duct outside temperature +72 (95/120/140)°C |

**Design .41 and .51**

- Design .41 or .51 with actuator and smoke detector ORS 142 K. The voltage can be AC 230 V or 24 V DC. Design .41 with voltage AC 230 V is equipped with power supply device MEAN WELL HDR-15-24 and with actuator BF 24-TN (BFL 24-T, BFN 24-T).
- The smoke detector is activated when smoke spreads in air duct system. Deactivation of the smoke detector alarm status is provided by interruption of supply voltage for min. 2s.
- Signalisation of damper blades position "OPEN" and "CLOSE" is provided by two microswitches.
- Optical smoke detectors ORS 142K and power supply unit MEAN WELL HDR-15-24 are delivered in bulk

**Design .41 with actuator BF 24-TN (BFL, BFN 24-T), with smoke detector ORS 142 K and with power supply device MEAN WELL HDR-15-24 (voltage AC 230 V)****Design .51 with actuator BF 24-TN (BFL, BFN 24-T), with smoke detector ORS 142 K (voltage 24 V DC)****Power supply device MEAN WELL HDR-15-24**

|                             |                                |
|-----------------------------|--------------------------------|
| Supply voltage              | AC 230 V (50-60Hz)             |
| No load power consumption   | < 0,3 W                        |
| Rated power                 | 15,2 W                         |
| Output voltage              | DC 24 V volatile<br>AC 24 V    |
| Voltage - no-load AC (max.) | 21.6 V                         |
| Voltage - no-load DC (max.) | 29 V                           |
| Degree of protection        | IP40 front panel / IP20 clamps |
| Ambient temperature         | -30°C ... +70°C                |
| Storage temperature         | -40°C ... +85°C                |
| Dimensions                  | 17.5 × 90 × 54.5 mm            |
| Weight                      | 78 g                           |

Optical smoke detector ORS 142 K with the socket 143A

- The smoke detector ORS 142 K is used for early smoke detection in rooms or inside the ventilation system.
  - The sensor operates on the light scatter principle. Inside the scanning chamber is a light source and a light sensor, in the normal state the light from the source does not fall on the sensor. Only when smoke enters the scanning chamber the light is scattered and falls on the sensor.
  - The smoke detector can be connected directly to the actuator (design .51) or to the MEAN WELL HDR-15-24 power supply unit (design .41)
  - By early detection of smoke, it can be effectively prevented from spreading of smoke through the
- ventilation system. In addition to smoke detection, the sensor can distinguish and signal slight and heavy contamination, e.g. the presence of large amounts of dust.

  - The ORS 142 K smoke detector has an alarm memory, i.e. if the alarm is triggered, the safety relay opens and stays in this state even if the smoke disappears from the scanning chamber. The sensor remains in the alarm state until the power supply is briefly reset.
  - On the pin 3, an external device can be connected via RS-Bus communication to report the status of the sensor.
  - Pin 6 has no connection to the detector and is designed as a load-bearing structure in the base.

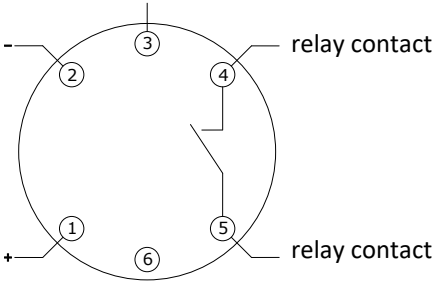
ORS 142 K

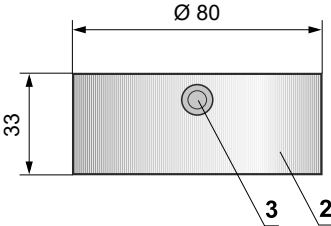


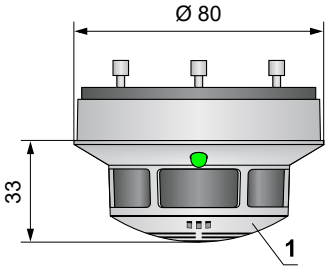
Socket 143A



RS-Bus communication







| Relay contact        |                                                                                     | LED            |         |
|----------------------|-------------------------------------------------------------------------------------|----------------|---------|
| In operation         |  | Green          | Shines  |
| Slight contamination |  | Green / Yellow | Flashes |
| Heavy contamination  |  | Green / Yellow | Flashes |
| Fault                |  | Yellow         | Shines  |
| Alarm                |  | Red            | Shines  |
| Power Off            |  | Off            | –       |

1 ORS 142 K

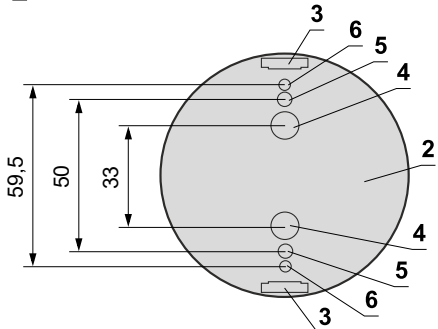
2 Socket 143A

3 Side cable entries Ø 9mm

4 Rear cable entries Ø 9mm

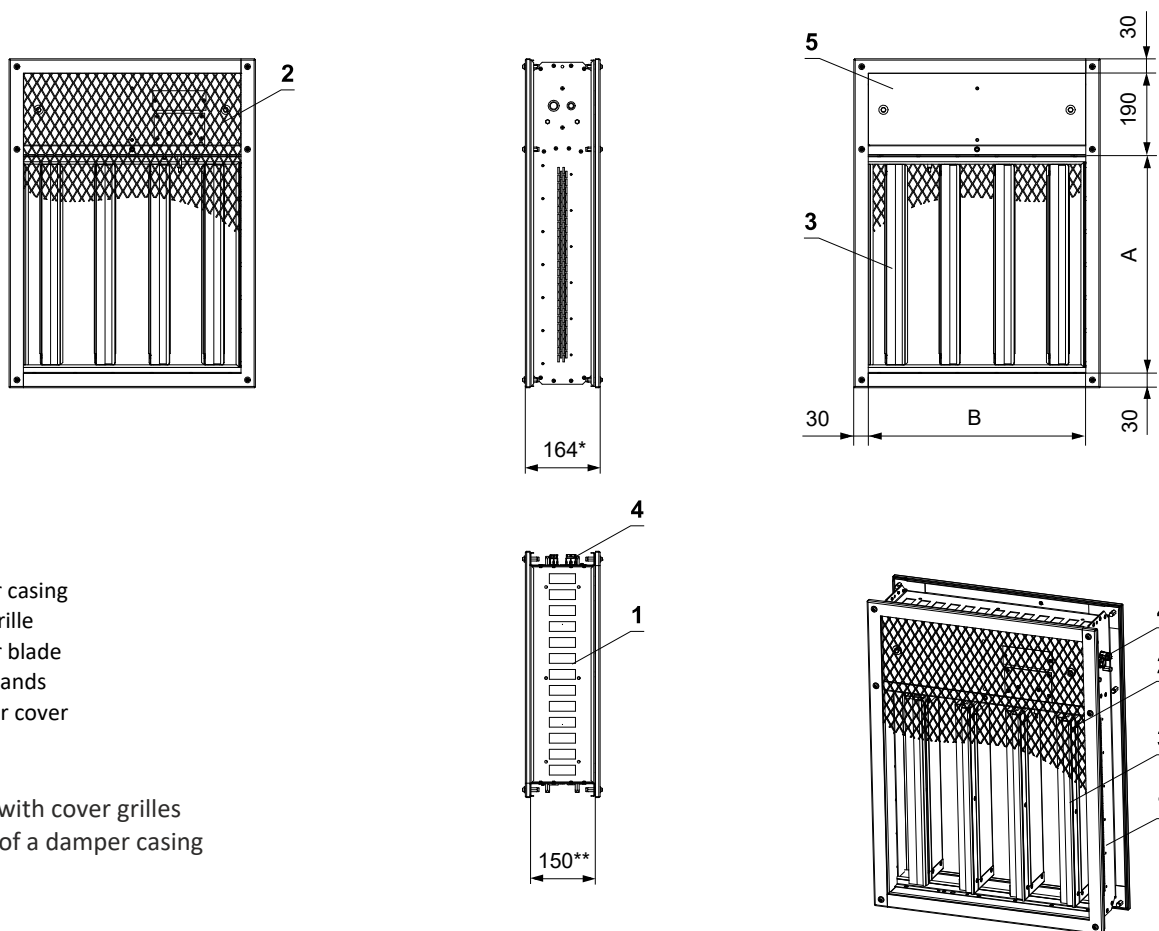
5 Fixing hole Ø 4,5 mm

6 Fixing hole Ø 3,7 mm



| Optical smoke detector ORS 142 K with the socket 143A |                                                |
|-------------------------------------------------------|------------------------------------------------|
| Operating voltage                                     | 18 ... 28 V DC                                 |
| Residual ripple                                       | ≤ 200 mV                                       |
| Power Consumption Socket (without actuator)           | max. 22 mA                                     |
| Degree of protection                                  | IP 42                                          |
| Ambient temperature                                   | -20°C ... +75°C                                |
| Additional temperature sensor                         | +70°C                                          |
| Connection - net                                      | Cabel 1m, connected to terminals 1, 2 and 4    |
| - motor                                               | Actuator connected on the terminals 2 and 5    |
| - power supply device MEAN WELL HDR-15-24             | Cabel 1m, connected to terminals 1, 2, 4 and 5 |

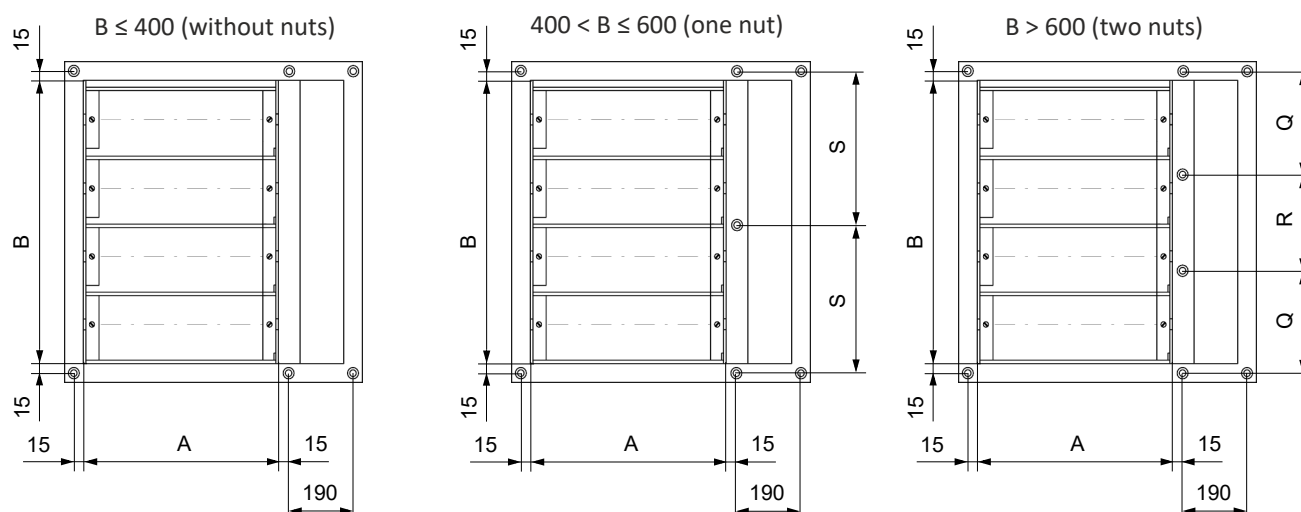
### III. DIMENSIONS



- 1 Damper casing
- 2 Cover grille
- 3 Damper blade
- 4 Cable glands
- 5 Actuator cover

\* Depth with cover grilles  
 \*\* Depth of a damper casing

#### Connecting dimensions of nuts M6



| B [mm] | R [mm] | Q [mm] | S [mm] | B [mm] | R [mm] | Q [mm] | S [mm] |
|--------|--------|--------|--------|--------|--------|--------|--------|
| 300    | /      | /      | /      | 650    | 220    | 230    | /      |
| 315    | /      | /      | /      | 700    | 240    | 245    | /      |
| 355    | /      | /      | /      | 710    | 240    | 250    | /      |
| 400    | /      | /      | /      | 750    | 250    | 265    | /      |
| 450    | /      | /      | 240    | 800    | 270    | 280    | /      |
| 500    | /      | /      | 265    | 850    | 290    | 295    | /      |
| 560    | /      | /      | 295    | 900    | 300    | 315    | /      |
| 600    | /      | /      | 315    | 950    | 320    | 330    | /      |
| 630    | 210    | 225    | /      | 1000   | 340    | 345    | /      |

## Technical parameters

| A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>f</sub> [m <sup>2</sup> ] | Actua. | A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>f</sub> [m <sup>2</sup> ] | Actua. |
|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|
|               |                        | FDML*          | 1<br>KMM |                                                  |        |               |                        | FDML*          | 1<br>KMM |                                                  |        |
| 200 x         | 300                    | 2              | 15,3     | 1,0                                              | 0,0276 | 300 x         | 300                    | 2              | 17,2     | 1,2                                              | 0,0444 |
|               | 315                    | 2              | 15,9     | 1,1                                              | 0,0284 |               | 315                    | 2              | 17,9     | 1,2                                              | 0,0457 |
|               | 355                    | 3              | 17,1     | 1,1                                              | 0,0349 |               | 355                    | 3              | 19,2     | 1,3                                              | 0,0562 |
|               | 400                    | 3              | 18,8     | 1,2                                              | 0,0423 |               | 400                    | 3              | 21,1     | 1,4                                              | 0,0681 |
|               | 450                    | 4              | 20,8     | 1,3                                              | 0,0440 |               | 450                    | 4              | 23,3     | 1,5                                              | 0,0708 |
|               | 500                    | 4              | 22,8     | 1,4                                              | 0,0522 |               | 500                    | 4              | 25,5     | 1,6                                              | 0,0840 |
|               | 560                    | 4              | 25,0     | 1,5                                              | 0,0554 |               | 560                    | 4              | 28,1     | 1,8                                              | 0,0892 |
|               | 600                    | 5              | 26,1     | 1,6                                              | 0,0620 |               | 600                    | 5              | 29,3     | 1,9                                              | 0,0998 |
|               | 630                    | 5              | 27,4     | 1,7                                              | 0,0669 |               | 630                    | 5              | 30,6     | 2,3                                              | 0,1077 |
|               | 650                    | 5              | 28,0     | 1,7                                              | 0,0702 |               | 650                    | 5              | 31,3     | 2,4                                              | 0,1130 |
|               | 700                    | 6              | 29,7     | 1,8                                              | 0,0718 |               | 700                    | 6              | 33,6     | 2,5                                              | 0,1156 |
|               | 710                    | 6              | 30,3     | 1,8                                              | 0,0735 |               | 710                    | 6              | 34,2     | 2,5                                              | 0,1183 |
|               | 750                    | 6              | 31,9     | 1,9                                              | 0,0800 |               | 750                    | 6              | 35,9     | 2,6                                              | 0,1288 |
|               | 800                    | 6              | 33,6     | 2,4                                              | 0,0833 |               | 800                    | 6              | 38,0     | 2,7                                              | 0,1341 |
|               | 850                    | 7              | 35,2     | 2,5                                              | 0,0899 |               | 850                    | 7              | 39,7     | 2,8                                              | 0,1447 |
|               | 900                    | 7              | 37,4     | 2,6                                              | 0,0981 |               | 900                    | 7              | 41,8     | 3,0                                              | 0,1579 |
|               | 950                    | 8              | 38,8     | 2,7                                              | 0,0997 |               | 950                    | 8              | 43,7     | 3,1                                              | 0,1605 |
|               | 1000                   | 8              | 41,0     | 2,9                                              | 0,1079 |               | 1000                   | 8              | 45,9     | 3,2                                              | 0,1737 |
| 250 x         | 300                    | 2              | 16,3     | 1,1                                              | 0,0360 | 315 x         | 300                    | 2              | 17,5     | 1,2                                              | 0,0469 |
|               | 315                    | 2              | 16,9     | 1,2                                              | 0,0370 |               | 315                    | 2              | 18,2     | 1,3                                              | 0,0483 |
|               | 355                    | 3              | 18,1     | 1,2                                              | 0,0456 |               | 355                    | 3              | 19,5     | 1,4                                              | 0,0594 |
|               | 400                    | 3              | 19,9     | 1,3                                              | 0,0552 |               | 400                    | 3              | 21,4     | 1,5                                              | 0,0720 |
|               | 450                    | 4              | 22,0     | 1,4                                              | 0,0574 |               | 450                    | 4              | 23,7     | 1,6                                              | 0,0748 |
|               | 500                    | 4              | 24,2     | 1,5                                              | 0,0681 |               | 500                    | 4              | 25,9     | 1,7                                              | 0,0887 |
|               | 560                    | 4              | 26,5     | 1,7                                              | 0,0723 |               | 560                    | 4              | 28,5     | 1,8                                              | 0,0943 |
|               | 600                    | 5              | 27,7     | 1,7                                              | 0,0809 |               | 600                    | 5              | 29,7     | 2,3                                              | 0,1055 |
|               | 630                    | 5              | 29,0     | 1,8                                              | 0,0873 |               | 630                    | 5              | 31,1     | 2,3                                              | 0,1138 |
|               | 650                    | 5              | 29,7     | 1,8                                              | 0,0916 |               | 650                    | 5              | 31,8     | 2,4                                              | 0,1194 |
|               | 700                    | 6              | 31,8     | 2,3                                              | 0,0937 |               | 700                    | 6              | 34,1     | 2,5                                              | 0,1222 |
|               | 710                    | 6              | 32,3     | 2,4                                              | 0,0959 |               | 710                    | 6              | 34,7     | 2,5                                              | 0,1250 |
|               | 750                    | 6              | 34,0     | 2,4                                              | 0,1044 |               | 750                    | 6              | 36,5     | 2,6                                              | 0,1362 |
|               | 800                    | 6              | 36,0     | 2,6                                              | 0,1087 |               | 800                    | 6              | 38,6     | 2,8                                              | 0,1417 |
|               | 850                    | 7              | 37,6     | 2,7                                              | 0,1173 |               | 850                    | 7              | 40,3     | 2,9                                              | 0,1529 |
|               | 900                    | 7              | 39,6     | 2,8                                              | 0,1280 |               | 900                    | 7              | 42,4     | 3,0                                              | 0,1668 |
|               | 950                    | 8              | 41,4     | 2,9                                              | 0,1301 |               | 950                    | 8              | 44,4     | 3,2                                              | 0,1696 |
|               | 1000                   | 8              | 43,4     | 3,0                                              | 0,1408 |               | 1000                   | 8              | 46,6     | 3,3                                              | 0,1836 |
| 280 x         | 300                    | 2              | 16,8     | 1,2                                              | 0,0410 | 355 x         | 300                    | 2              | 18,3     | 1,3                                              | 0,0536 |
|               | 315                    | 2              | 17,5     | 1,2                                              | 0,0422 |               | 315                    | 2              | 19,0     | 1,3                                              | 0,0552 |
|               | 355                    | 3              | 18,7     | 1,3                                              | 0,0520 |               | 355                    | 3              | 20,3     | 1,4                                              | 0,0679 |
|               | 400                    | 3              | 20,6     | 1,4                                              | 0,0630 |               | 400                    | 3              | 22,3     | 1,5                                              | 0,0823 |
|               | 450                    | 4              | 22,8     | 1,5                                              | 0,0654 |               | 450                    | 4              | 24,7     | 1,6                                              | 0,0855 |
|               | 500                    | 4              | 25,0     | 1,6                                              | 0,0776 |               | 500                    | 4              | 27,0     | 1,8                                              | 0,1014 |
|               | 560                    | 4              | 27,5     | 1,7                                              | 0,0825 |               | 560                    | 4              | 29,8     | 2,3                                              | 0,1078 |
|               | 600                    | 5              | 28,6     | 1,8                                              | 0,0922 |               | 600                    | 5              | 31,3     | 2,4                                              | 0,1206 |
|               | 630                    | 5              | 30,0     | 1,9                                              | 0,0996 |               | 630                    | 5              | 32,7     | 2,5                                              | 0,1302 |
|               | 650                    | 5              | 30,7     | 2,3                                              | 0,1044 |               | 650                    | 5              | 33,5     | 2,5                                              | 0,1365 |
|               | 700                    | 6              | 32,9     | 2,4                                              | 0,1069 |               | 700                    | 6              | 35,6     | 2,6                                              | 0,1397 |
|               | 710                    | 6              | 33,4     | 2,4                                              | 0,1093 |               | 710                    | 6              | 36,1     | 2,7                                              | 0,1429 |
|               | 750                    | 6              | 35,2     | 2,5                                              | 0,1191 |               | 750                    | 6              | 38,0     | 2,8                                              | 0,1557 |
|               | 800                    | 6              | 37,2     | 2,7                                              | 0,1240 |               | 800                    | 6              | 40,2     | 2,9                                              | 0,1621 |
|               | 850                    | 7              | 38,8     | 2,8                                              | 0,1337 |               | 850                    | 7              | 42,0     | 3,0                                              | 0,1748 |
|               | 900                    | 7              | 40,9     | 2,9                                              | 0,1459 |               | 900                    | 7              | 44,2     | 3,2                                              | 0,1908 |
|               | 950                    | 8              | 42,8     | 3,0                                              | 0,1484 |               | 950                    | 8              | 46,3     | 3,3                                              | 0,1940 |
|               | 1000                   | 8              | 44,9     | 3,1                                              | 0,1606 |               | 1000                   | 8              | 48,5     | 3,4                                              | 0,2099 |

\* For design with MEAN WELL HDR-15-24 power supply, a weight of 0,4 kg must be added.

| A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>r</sub> [m <sup>2</sup> ] | Actua. | A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>r</sub> [m <sup>2</sup> ] | Actua. |
|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|
|               |                        | FDML*          | 1<br>KMM |                                                  |        |               |                        | FDML*          | 1<br>KMM |                                                  |        |
| 400 x         | 300                    | 2              | 19,1     | 1,4                                              | 0,0612 | 560 x         | 300                    | 2              | 22,2     | 1,7                                              | 0,0880 |
|               | 315                    | 2              | 19,9     | 1,4                                              | 0,0630 |               | 315                    | 2              | 23,1     | 1,7                                              | 0,0907 |
|               | 355                    | 3              | 21,2     | 1,5                                              | 0,0775 |               | 355                    | 3              | 24,8     | 1,8                                              | 0,1116 |
|               | 400                    | 3              | 23,3     | 1,6                                              | 0,0939 |               | 400                    | 3              | 27,2     | 2,3                                              | 0,1352 |
|               | 450                    | 4              | 25,8     | 1,7                                              | 0,0976 |               | 450                    | 4              | 30,0     | 2,5                                              | 0,1404 |
|               | 500                    | 4              | 28,2     | 1,9                                              | 0,1158 |               | 500                    | 4              | 32,8     | 2,6                                              | 0,1666 |
|               | 560                    | 4              | 31,1     | 2,4                                              | 0,1230 |               | 560                    | 4              | 36,3     | 2,8                                              | 0,1771 |
|               | 600                    | 5              | 32,7     | 2,5                                              | 0,1376 |               | 600                    | 5              | 37,7     | 2,9                                              | 0,1981 |
|               | 630                    | 5              | 34,2     | 2,6                                              | 0,1485 |               | 630                    | 5              | 39,4     | 3,0                                              | 0,2138 |
|               | 650                    | 5              | 35,0     | 2,6                                              | 0,1558 |               | 650                    | 5              | 40,3     | 3,1                                              | 0,2243 |
|               | 700                    | 6              | 37,2     | 2,8                                              | 0,1594 |               | 700                    | 6              | 42,9     | 3,3                                              | 0,2295 |
|               | 710                    | 6              | 37,8     | 2,8                                              | 0,1631 |               | 710                    | 6              | 43,5     | 3,3                                              | 0,2348 |
|               | 750                    | 6              | 39,7     | 2,9                                              | 0,1776 |               | 750                    | 6              | 45,7     | 3,4                                              | 0,2557 |
|               | 800                    | 6              | 42,1     | 3,0                                              | 0,1849 |               | 800                    | 6              | 48,6     | 3,6                                              | 0,2662 |
|               | 850                    | 7              | 43,9     | 3,2                                              | 0,1995 |               | 850                    | 7              | 52,3     | 3,7                                              | 0,2872 |
|               | 900                    | 7              | 46,2     | 3,3                                              | 0,2177 |               | 900                    | 7              | 54,9     | 3,9                                              | 0,3134 |
|               | 950                    | 8              | 48,4     | 3,5                                              | 0,2213 |               | 950                    | 8              | 57,5     | 4,0                                              | 0,3186 |
|               | 1000                   | 8              | 50,7     | 3,6                                              | 0,2395 |               | 1000                   | 8              | 60,1     | 4,2                                              | 0,3448 |
| 450 x         | 300                    | 2              | 20,1     | 1,5                                              | 0,0696 | 600 x         | 300                    | 2              | 22,9     | 1,7                                              | 0,0948 |
|               | 315                    | 2              | 20,9     | 1,5                                              | 0,0716 |               | 315                    | 2              | 23,9     | 1,8                                              | 0,0976 |
|               | 355                    | 3              | 22,2     | 1,6                                              | 0,0882 |               | 355                    | 3              | 25,6     | 1,9                                              | 0,1201 |
|               | 400                    | 3              | 24,7     | 1,7                                              | 0,1068 |               | 400                    | 3              | 28,1     | 2,4                                              | 0,1455 |
|               | 450                    | 4              | 27,3     | 1,8                                              | 0,1110 |               | 450                    | 4              | 31,0     | 2,6                                              | 0,1512 |
|               | 500                    | 4              | 29,8     | 2,4                                              | 0,1317 |               | 500                    | 4              | 33,8     | 2,7                                              | 0,1794 |
|               | 560                    | 4              | 33,0     | 2,5                                              | 0,1399 |               | 560                    | 4              | 37,6     | 2,9                                              | 0,1906 |
|               | 600                    | 5              | 34,2     | 2,6                                              | 0,1565 |               | 600                    | 5              | 38,9     | 3,1                                              | 0,2132 |
|               | 630                    | 5              | 35,8     | 2,7                                              | 0,1689 |               | 630                    | 5              | 40,7     | 3,1                                              | 0,2301 |
|               | 650                    | 5              | 36,6     | 2,8                                              | 0,1772 |               | 650                    | 5              | 41,6     | 3,2                                              | 0,2414 |
|               | 700                    | 6              | 39,0     | 2,9                                              | 0,1813 |               | 700                    | 6              | 44,3     | 3,4                                              | 0,2470 |
|               | 710                    | 6              | 39,6     | 3,0                                              | 0,1855 |               | 710                    | 6              | 45,0     | 3,4                                              | 0,2527 |
|               | 750                    | 6              | 41,6     | 3,1                                              | 0,2020 |               | 750                    | 6              | 47,2     | 3,5                                              | 0,2752 |
|               | 800                    | 6              | 44,1     | 3,2                                              | 0,2103 |               | 800                    | 6              | 50,2     | 3,7                                              | 0,2865 |
|               | 850                    | 7              | 46,0     | 3,3                                              | 0,2269 |               | 850                    | 7              | 53,9     | 3,8                                              | 0,3091 |
|               | 900                    | 7              | 48,4     | 3,5                                              | 0,2476 |               | 900                    | 7              | 56,6     | 4,0                                              | 0,3373 |
|               | 950                    | 8              | 50,7     | 3,6                                              | 0,2517 |               | 950                    | 8              | 59,3     | 4,2                                              | 0,3429 |
|               | 1000                   | 8              | 53,2     | 3,8                                              | 0,2724 |               | 1000                   | 8              | 62,1     | 4,3                                              | 0,3711 |
| 500 x         | 300                    | 2              | 21,0     | 1,6                                              | 0,0780 | 630 x         | 300                    | 2              | 23,5     | 1,8                                              | 0,0998 |
|               | 315                    | 2              | 21,9     | 1,6                                              | 0,0803 |               | 315                    | 2              | 24,5     | 1,8                                              | 0,1028 |
|               | 355                    | 3              | 23,3     | 1,7                                              | 0,0988 |               | 355                    | 3              | 26,2     | 1,9                                              | 0,1265 |
|               | 400                    | 3              | 25,9     | 1,8                                              | 0,1197 |               | 400                    | 3              | 28,7     | 2,5                                              | 0,1533 |
|               | 450                    | 4              | 28,5     | 2,3                                              | 0,1244 |               | 450                    | 4              | 31,8     | 2,6                                              | 0,1592 |
|               | 500                    | 4              | 31,2     | 2,5                                              | 0,1476 |               | 500                    | 4              | 34,6     | 2,8                                              | 0,1889 |
|               | 560                    | 4              | 34,5     | 2,7                                              | 0,1568 |               | 560                    | 4              | 38,5     | 3,0                                              | 0,2008 |
|               | 600                    | 5              | 35,8     | 2,8                                              | 0,1754 |               | 600                    | 5              | 39,9     | 3,1                                              | 0,2245 |
|               | 630                    | 5              | 37,4     | 2,9                                              | 0,1893 |               | 630                    | 5              | 41,6     | 3,2                                              | 0,2424 |
|               | 650                    | 5              | 38,3     | 2,9                                              | 0,1986 |               | 650                    | 5              | 42,6     | 3,3                                              | 0,2542 |
|               | 700                    | 6              | 40,7     | 3,1                                              | 0,2032 |               | 700                    | 6              | 45,4     | 3,5                                              | 0,2602 |
|               | 710                    | 6              | 41,4     | 3,1                                              | 0,2079 |               | 710                    | 6              | 46,1     | 3,5                                              | 0,2661 |
|               | 750                    | 6              | 43,5     | 3,2                                              | 0,2264 |               | 750                    | 6              | 48,4     | 3,6                                              | 0,2899 |
|               | 800                    | 6              | 46,2     | 3,4                                              | 0,2357 |               | 800                    | 6              | 51,5     | 3,8                                              | 0,3018 |
|               | 850                    | 7              | 48,1     | 3,5                                              | 0,2543 |               | 850                    | 7              | 55,2     | 3,9                                              | 0,3255 |
|               | 900                    | 7              | 50,6     | 3,7                                              | 0,2775 |               | 900                    | 7              | 58,0     | 4,1                                              | 0,3552 |
|               | 950                    | 8              | 54,7     | 3,8                                              | 0,2821 |               | 950                    | 8              | 60,7     | 4,3                                              | 0,3612 |
|               | 1000                   | 8              | 57,2     | 4,0                                              | 0,3053 |               | 1000                   | 8              | 63,5     | 4,4                                              | 0,3909 |

\* For design with MEAN WELL HDR-15-24 power supply, a weight of 0,4 kg must be added.

| A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>r</sub> [m <sup>2</sup> ] | Actua. | A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>r</sub> [m <sup>2</sup> ] | Actua. |
|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|
|               |                        | FDML*          | 1<br>KMM |                                                  |        |               |                        | FDML*          | 1<br>KMM |                                                  |        |
| 650 x         | 300                    | 2              | 23,9     | 1,8                                              | 0,1032 | 300           | 2                      | 25,8           | 2,0      | 0,1200                                           | BFL    |
|               | 315                    | 2              | 24,9     | 1,9                                              | 0,1062 |               | 2                      | 26,9           | 2,0      | 0,1235                                           |        |
|               | 355                    | 3              | 26,6     | 2,0                                              | 0,1308 |               | 3                      | 28,7           | 2,6      | 0,1521                                           |        |
|               | 400                    | 3              | 29,2     | 2,5                                              | 0,1584 | 400           | 3                      | 31,4           | 2,8      | 0,1842                                           | BFN    |
|               | 450                    | 4              | 32,3     | 2,7                                              | 0,1646 |               | 4                      | 34,8           | 2,9      | 0,1914                                           |        |
|               | 500                    | 4              | 35,2     | 2,9                                              | 0,1953 |               | 4                      | 37,9           | 3,1      | 0,2271                                           |        |
|               | 560                    | 4              | 39,1     | 3,1                                              | 0,2075 |               | 4                      | 42,2           | 3,3      | 0,2413                                           |        |
|               | 600                    | 5              | 40,5     | 3,2                                              | 0,2321 |               | 5                      | 43,6           | 3,5      | 0,2699                                           |        |
|               | 630                    | 5              | 42,3     | 3,3                                              | 0,2505 |               | 5                      | 45,5           | 3,6      | 0,2913                                           |        |
|               | 650                    | 5              | 43,3     | 3,4                                              | 0,2628 | 650           | 5                      | 46,6           | 3,6      | 0,3056                                           | BF     |
|               | 700                    | 6              | 47,7     | 3,5                                              | 0,2689 |               | 6                      | 51,3           | 3,8      | 0,3127                                           |        |
|               | 710                    | 6              | 48,4     | 3,6                                              | 0,2751 |               | 6                      | 52,0           | 3,9      | 0,3199                                           |        |
|               | 750                    | 6              | 50,7     | 3,7                                              | 0,2996 |               | 6                      | 54,5           | 4,0      | 0,3484                                           |        |
|               | 800                    | 6              | 53,9     | 3,8                                              | 0,3119 |               | 6                      | 58,0           | 4,2      | 0,3627                                           |        |
|               | 850                    | 7              | 56,1     | 4,0                                              | 0,3365 |               | 7                      | 60,3           | 4,3      | 0,3913                                           |        |
|               | 900                    | 7              | 58,9     | 4,2                                              | 0,3672 | 900           | 7                      | 63,3           | 4,5      | 0,4270                                           | BF     |
|               | 950                    | 8              | 61,7     | 4,3                                              | 0,3733 |               | 8                      | 66,3           | 4,7      | 0,4341                                           |        |
|               | 1000                   | 8              | 64,5     | 4,5                                              | 0,4040 |               | 8                      | 69,3           | 4,9      | 0,4698                                           |        |
| 700 x         | 300                    | 2              | 24,8     | 1,9                                              | 0,1116 | 300           | 2                      | 26,8           | 2,1      | 0,1284                                           | BFL    |
|               | 315                    | 2              | 25,9     | 1,9                                              | 0,1149 |               | 2                      | 27,9           | 2,6      | 0,1322                                           |        |
|               | 355                    | 3              | 27,7     | 2,5                                              | 0,1414 |               | 3                      | 29,7           | 2,7      | 0,1627                                           |        |
|               | 400                    | 3              | 30,3     | 2,6                                              | 0,1713 | 400           | 3                      | 32,6           | 2,8      | 0,1971                                           | BFN    |
|               | 450                    | 4              | 33,5     | 2,8                                              | 0,1780 |               | 4                      | 36,0           | 3,0      | 0,2048                                           |        |
|               | 500                    | 4              | 36,5     | 3,0                                              | 0,2112 |               | 4                      | 39,2           | 3,2      | 0,2430                                           |        |
|               | 560                    | 4              | 40,6     | 3,2                                              | 0,2244 |               | 4                      | 43,7           | 3,5      | 0,2582                                           |        |
|               | 600                    | 5              | 42,0     | 3,3                                              | 0,2510 |               | 5                      | 46,8           | 3,6      | 0,2888                                           |        |
|               | 630                    | 5              | 43,9     | 3,4                                              | 0,2709 |               | 5                      | 48,8           | 3,7      | 0,3117                                           |        |
|               | 650                    | 5              | 44,9     | 3,5                                              | 0,2842 | 650           | 5                      | 49,9           | 3,8      | 0,3270                                           | BF     |
|               | 700                    | 6              | 49,5     | 3,7                                              | 0,2908 |               | 6                      | 53,1           | 4,0      | 0,3346                                           |        |
|               | 710                    | 6              | 50,2     | 3,7                                              | 0,2975 |               | 6                      | 53,8           | 4,0      | 0,3423                                           |        |
|               | 750                    | 6              | 52,6     | 3,8                                              | 0,3240 |               | 6                      | 56,4           | 4,1      | 0,3728                                           |        |
|               | 800                    | 6              | 56,0     | 4,0                                              | 0,3373 |               | 6                      | 60,0           | 4,3      | 0,3881                                           |        |
|               | 850                    | 7              | 58,2     | 4,2                                              | 0,3639 |               | 7                      | 62,4           | 4,5      | 0,4187                                           |        |
|               | 900                    | 7              | 61,1     | 4,4                                              | 0,3971 | 900           | 7                      | 65,5           | 4,7      | 0,4569                                           | BF     |
|               | 950                    | 8              | 64,0     | 4,5                                              | 0,4037 |               | 8                      | 68,6           | 4,9      | 0,4645                                           |        |
|               | 1000                   | 8              | 66,9     | 4,7                                              | 0,4369 |               | 8                      | 71,8           | 5,1      | 0,5027                                           |        |
| 710 x         | 300                    | 2              | 25,0     | 1,9                                              | 0,1132 | 300           | 2                      | 28,0           | 2,6      | 0,1368                                           | BFL    |
|               | 315                    | 2              | 26,1     | 2,0                                              | 0,1166 |               | 2                      | 29,2           | 2,7      | 0,1408                                           |        |
|               | 355                    | 3              | 27,9     | 2,5                                              | 0,1436 |               | 3                      | 30,8           | 2,8      | 0,1734                                           |        |
|               | 400                    | 3              | 30,5     | 2,7                                              | 0,1739 | 400           | 3                      | 33,7           | 3,0      | 0,2100                                           | BFN    |
|               | 450                    | 4              | 33,8     | 2,8                                              | 0,1806 |               | 4                      | 37,2           | 3,2      | 0,2182                                           |        |
|               | 500                    | 4              | 36,8     | 3,0                                              | 0,2143 |               | 4                      | 40,6           | 3,4      | 0,2589                                           |        |
|               | 560                    | 4              | 40,9     | 3,2                                              | 0,2278 |               | 4                      | 45,2           | 3,6      | 0,2751                                           |        |
|               | 600                    | 5              | 42,4     | 3,4                                              | 0,2548 |               | 5                      | 48,4           | 3,7      | 0,3077                                           |        |
|               | 630                    | 5              | 44,2     | 3,5                                              | 0,2750 |               | 5                      | 50,4           | 3,8      | 0,3321                                           |        |
|               | 650                    | 5              | 45,3     | 3,5                                              | 0,2885 | 650           | 5                      | 51,6           | 3,9      | 0,3484                                           | BF     |
|               | 700                    | 6              | 49,9     | 3,7                                              | 0,2952 |               | 6                      | 54,9           | 4,1      | 0,3565                                           |        |
|               | 710                    | 6              | 50,6     | 3,7                                              | 0,3020 |               | 6                      | 55,6           | 4,1      | 0,3647                                           |        |
|               | 750                    | 6              | 53,0     | 3,9                                              | 0,3289 |               | 6                      | 58,3           | 4,3      | 0,3972                                           |        |
|               | 800                    | 6              | 56,4     | 4,0                                              | 0,3424 |               | 6                      | 62,1           | 4,5      | 0,4135                                           |        |
|               | 850                    | 7              | 58,6     | 4,2                                              | 0,3694 |               | 7                      | 64,5           | 4,7      | 0,4461                                           |        |
|               | 900                    | 7              | 61,5     | 4,4                                              | 0,4031 | 900           | 7                      | 67,7           | 4,9      | 0,4868                                           | BF     |
|               | 950                    | 8              | 64,5     | 4,6                                              | 0,4098 |               | 8                      | 71,0           | 5,1      | 0,4949                                           |        |
|               | 1000                   | 8              | 67,4     | 4,7                                              | 0,4435 |               | 8                      | 74,2           | 5,2      | 0,5356                                           |        |

\* For design with MEAN WELL HDR-15-24 power supply, a weight of 0,4 kg must be added.

| A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>f</sub> [m <sup>2</sup> ] | Actua. | A x B<br>[mm] | Number<br>of<br>blades | Weight<br>[kg] |          | Free<br>area<br>S <sub>f</sub> [m <sup>2</sup> ] | Actua. |
|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|---------------|------------------------|----------------|----------|--------------------------------------------------|--------|
|               |                        | FDML*          | 1<br>KMM |                                                  |        |               |                        | FDML*          | 1<br>KMM |                                                  |        |
| 900 x         | 300                    | 2              | 28,9     | 2,7                                              | 0,1452 | 950 x         | 650                    | 5              | 54,9     | 4,2                                              | 0,3912 |
|               | 315                    | 2              | 30,2     | 2,8                                              | 0,1495 |               | 700                    | 6              | 58,4     | 4,4                                              | 0,4003 |
|               | 355                    | 3              | 31,8     | 2,9                                              | 0,1840 |               | 710                    | 6              | 59,3     | 4,4                                              | 0,4095 |
|               | 400                    | 3              | 34,8     | 3,1                                              | 0,2229 |               | 750                    | 6              | 62,0     | 4,6                                              | 0,4460 |
|               | 450                    | 4              | 38,5     | 3,3                                              | 0,2316 |               | 800                    | 6              | 66,2     | 4,8                                              | 0,4643 |
|               | 500                    | 4              | 41,9     | 3,5                                              | 0,2748 |               | 850                    | 7              | 68,7     | 5,0                                              | 0,5009 |
|               | 560                    | 4              | 46,8     | 3,7                                              | 0,2920 |               | 900                    | 7              | 72,1     | 5,2                                              | 0,5466 |
|               | 600                    | 5              | 49,9     | 3,9                                              | 0,3266 |               | 950                    | 8              | 75,6     | 5,4                                              | 0,5557 |
|               | 630                    | 5              | 52,0     | 4,0                                              | 0,3525 |               | 1000                   | 8              | 79,1     | 5,6                                              | 0,6014 |
|               | 650                    | 5              | 53,2     | 4,1                                              | 0,3698 |               | 300                    | 2              | 30,8     | 2,9                                              | 0,1620 |
|               | 700                    | 6              | 56,7     | 4,3                                              | 0,3784 |               | 315                    | 2              | 32,2     | 3,0                                              | 0,1668 |
|               | 710                    | 6              | 57,4     | 4,3                                              | 0,3871 |               | 355                    | 3              | 33,8     | 3,1                                              | 0,2053 |
|               | 750                    | 6              | 60,2     | 4,5                                              | 0,4216 |               | 400                    | 3              | 37,1     | 3,3                                              | 0,2487 |
|               | 800                    | 6              | 64,1     | 4,6                                              | 0,4389 |               | 450                    | 4              | 42,6     | 3,5                                              | 0,2584 |
|               | 850                    | 7              | 66,6     | 4,8                                              | 0,4735 |               | 500                    | 4              | 46,2     | 3,7                                              | 0,3066 |
|               | 900                    | 7              | 69,9     | 5,0                                              | 0,5167 |               | 560                    | 4              | 51,5     | 4,0                                              | 0,3258 |
|               | 950                    | 8              | 73,3     | 5,2                                              | 0,5253 |               | 600                    | 5              | 53,1     | 4,1                                              | 0,3644 |
|               | 1000                   | 8              | 76,6     | 5,4                                              | 0,5685 |               | 630                    | 5              | 55,3     | 4,3                                              | 0,3933 |
| 950 x         | 300                    | 2              | 29,9     | 2,8                                              | 0,1536 | 1000 x        | 650                    | 5              | 56,6     | 4,4                                              | 0,4126 |
|               | 315                    | 2              | 31,2     | 2,9                                              | 0,1581 |               | 700                    | 6              | 60,2     | 4,6                                              | 0,4222 |
|               | 355                    | 3              | 32,8     | 3,0                                              | 0,1947 |               | 710                    | 6              | 61,1     | 4,6                                              | 0,4319 |
|               | 400                    | 3              | 35,9     | 3,2                                              | 0,2358 |               | 750                    | 6              | 63,9     | 4,8                                              | 0,4704 |
|               | 450                    | 4              | 39,7     | 3,4                                              | 0,2450 |               | 800                    | 6              | 68,2     | 5,0                                              | 0,4897 |
|               | 500                    | 4              | 43,2     | 3,6                                              | 0,2907 |               | 850                    | 7              | 70,8     | 5,2                                              | 0,5283 |
|               | 560                    | 4              | 48,3     | 3,8                                              | 0,3089 |               | 900                    | 7              | 74,3     | 5,4                                              | 0,5765 |
|               | 600                    | 5              | 51,5     | 4,0                                              | 0,3455 |               | 950                    | 8              | 78,0     | 5,6                                              | 0,5861 |
|               | 630                    | 5              | 53,6     | 4,1                                              | 0,3729 |               | 1000                   | 8              | 81,5     | 5,8                                              | 0,6343 |
|               |                        |                |          |                                                  |        |               |                        |                |          |                                                  |        |

\* For design with MEAN WELL HDR-15-24 power supply, a weight of 0,4 kg must be added.

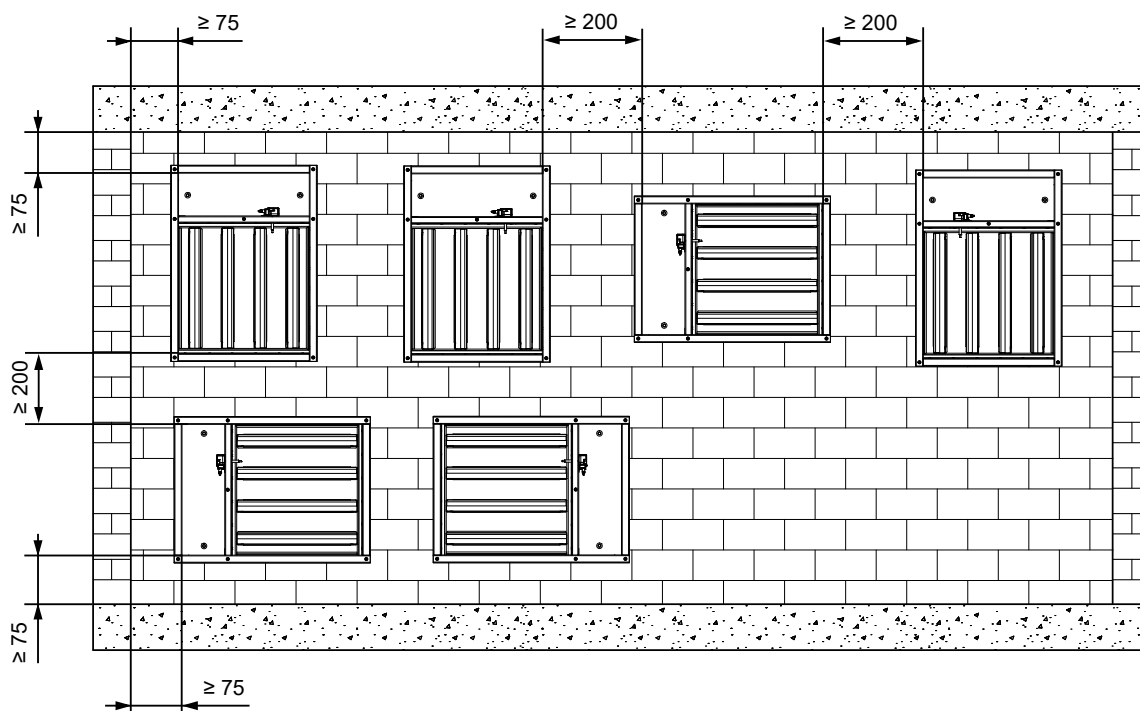
## IV. INSTALLATION

### Placement and installation

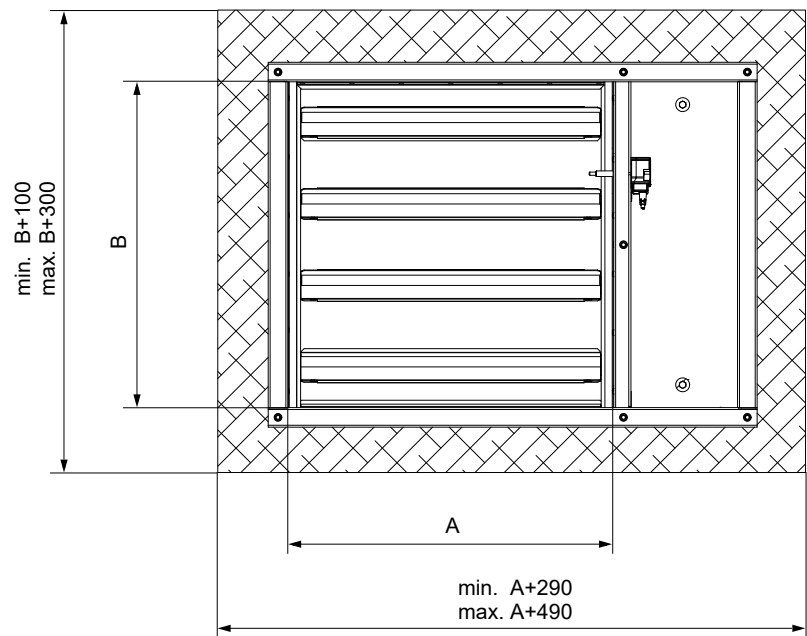
- The damper can be installed with blade axis vertically or horizontally, temperature sensor (BAT) must always be in damper upper part. The damper installation procedures must be done so that all load transfer from the fire separating constructions to the damper is absolutely excluded. Following air-conditioning duct must be suspended or supported so that all load transfer from the following duct to the fire damper is absolutely excluded. The gap between the installed damper and the fire separating construction must be perfectly filled with approved material.
- During the installation and plastering process, the actuating mechanism must be protected (covered) against damage and pollution. The damper casing should not be deformed during bricking in. Once the damper is built in, the damper blades should not grind against the damper casing during opening or closing.
- The distance between the fire damper and the construction (wall, ceiling) must be 75 mm at the minimum, according to EN 1366-2. If two or more dampers are to be installed in one fire separating construction, the distance between adjacent dampers must be 200 mm at the minimum, according to EN 1366-2.
- Fire dampers can be installed without following duct on one or both sides. In the case of this installation, the fire dampers must be equipped with cover grilles.
- For designs with an optical smoke detector, the best conditions for detecting smoke and combustion products must be ensured, i.e. the smoke detector must be located at the upper part of the room.
- It is recommended to install the dampers according to the local disposition in such a way that the side of the damper with the thermoelectric activation device is in line with the wall and the opening on the other side of the wall is permanently covered by a second cover grille fixed e.g. in the frame. The minimum thickness of the standard wall construction is 100 mm. In the case of an installation where one side of the damper is in line with the surface of the construction and the other side extends more than 25 mm from the construction, the extending part must be covered with fire-resistant boards. In the case of installation in a gypsum wall, the opening must be lined with reinforcement profiles.
- Dampers are not equipped with inspection openings. If these dampers are used as dampers for simple maintenance and revision they must be completed with connecting inspection part installed just behind the damper.
- The dampers must be installed so that the actuator cover can be easily removed from at least one side. It is recommended that the cover be accessible from the side where the thermoelectric activation device cover is located for easy access.

#### Minimum distance between the fire dampers and the construction

- minimum distance 200 mm between dampers, according to EN 1366-2
- minimum distance 75 mm between damper and construction (wall/ceiling), according to EN 1366-2

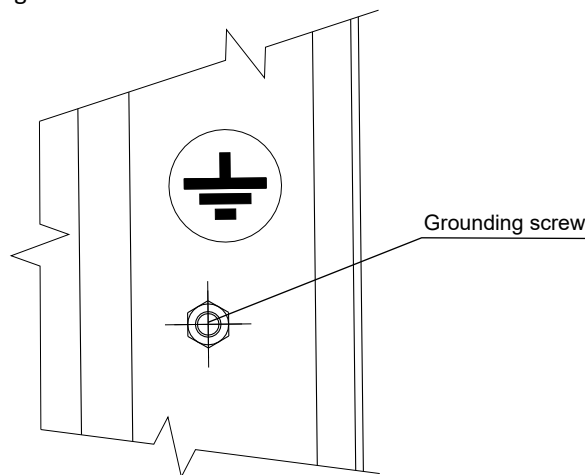


Dimensions of an installation opening



Grounding of the damper

- It is necessary to ground the damper casing before installation.



Statement of installations

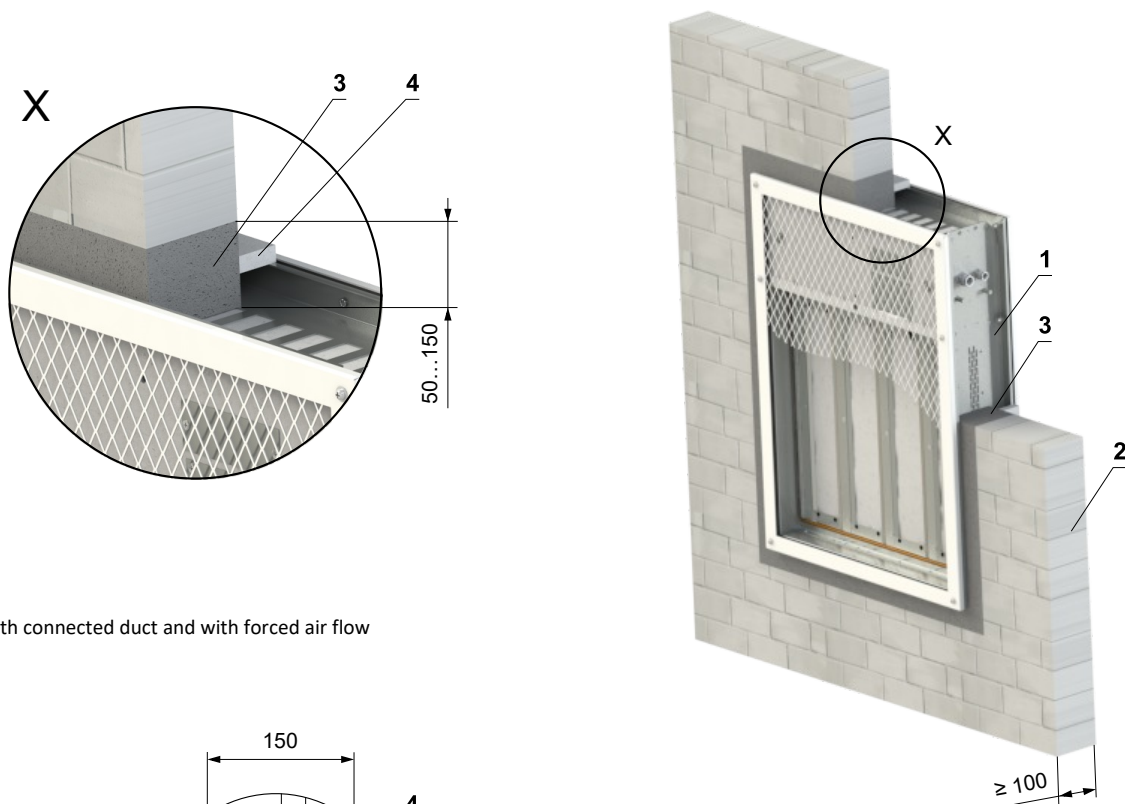
| Placement                     | wall/ceiling min.<br>thickness<br>[mm] | Method of installation | Fire resistance                 | Page |
|-------------------------------|----------------------------------------|------------------------|---------------------------------|------|
| In solid wall construction    | 100                                    | Mortar or gypsum       | EI 90 (v <sub>e</sub> ) S [V/H] | 18   |
|                               |                                        | Ablative Coated Batt   |                                 | 19   |
| In gypsum wall construction   |                                        | Mortar or gypsum       |                                 | 20   |
|                               |                                        | Ablative Coated Batt   |                                 | 21   |
| In solid ceiling construction | 150                                    | Mortar or gypsum       | EI 90 (h <sub>o</sub> ) S [H]   | 22   |

# In solid wall construction

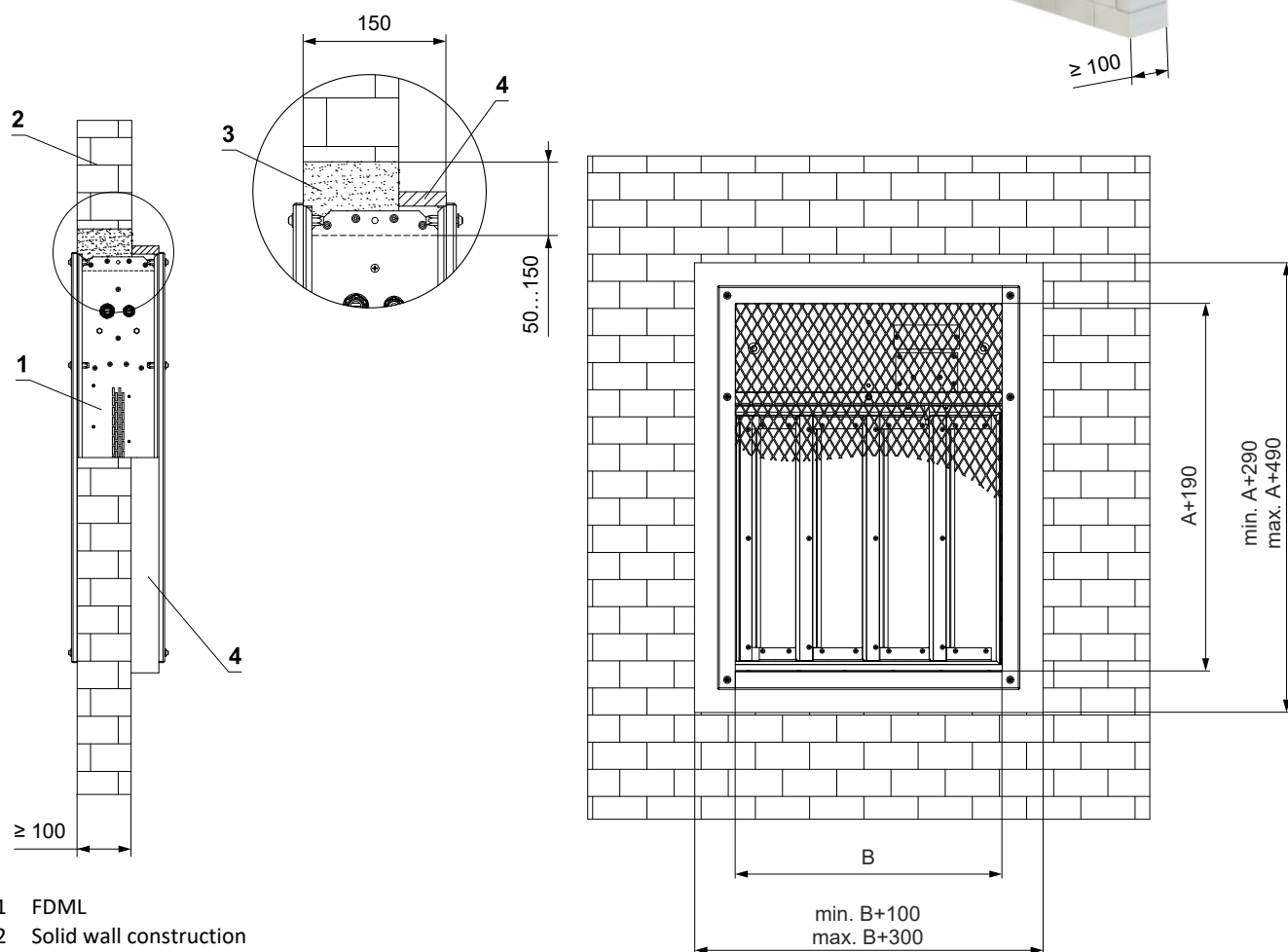
## In solid wall construction - mortar or gypsum

\*EI 90 (v<sub>e</sub>) S [V/H]

- For connection of following duct → see page 27



\* In case with connected duct and with forced air flow

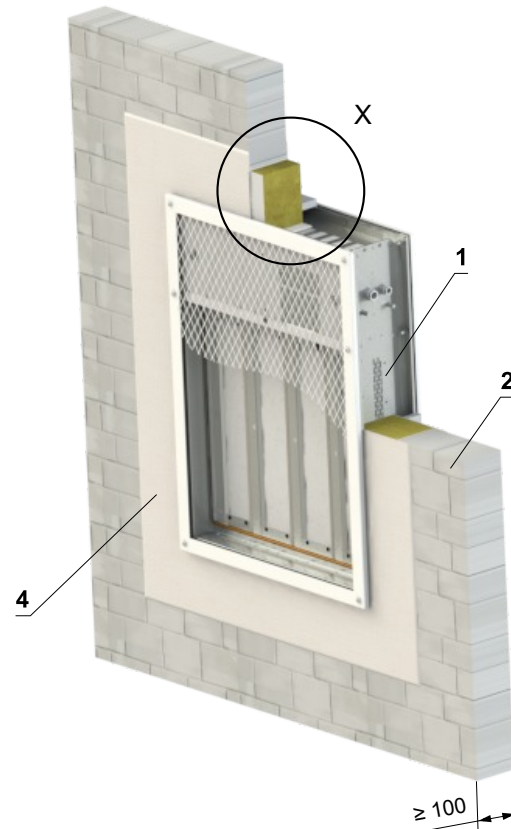
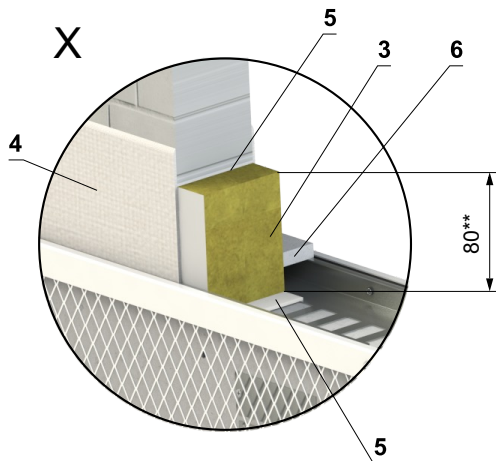


- 1 FDML
- 2 Solid wall construction
- 3 Mortar or gypsum
- 4 Fire-resistant cover boards - only if one side of the damper is in line with the surface of the construction and the other side extends more than 25 mm from the construction - (Promatect-H...) min. thickness 15 mm - connect the boards together with screws

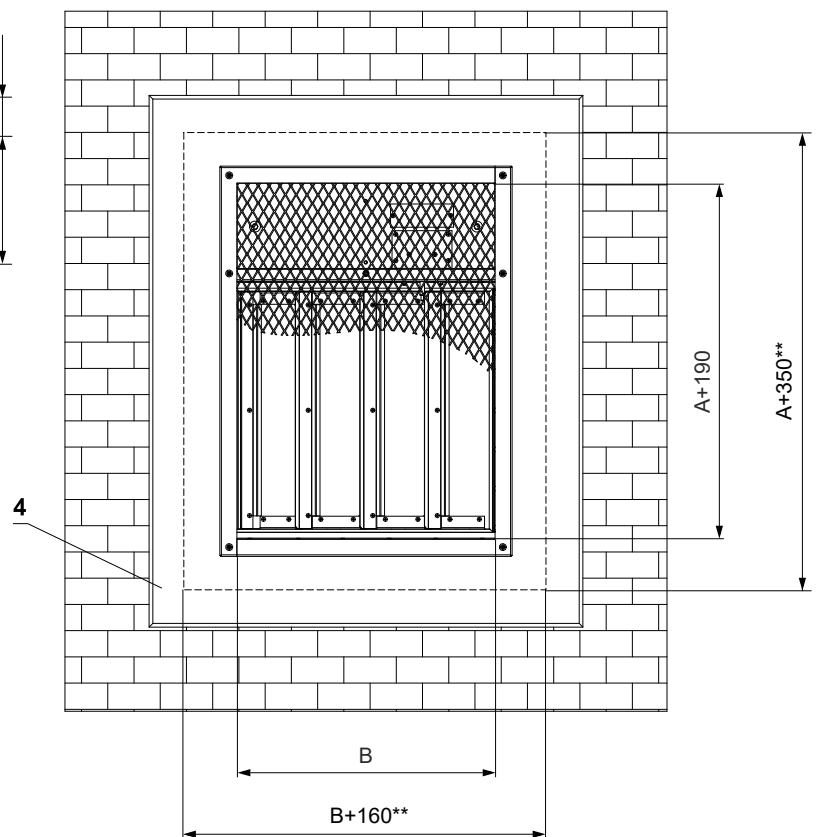
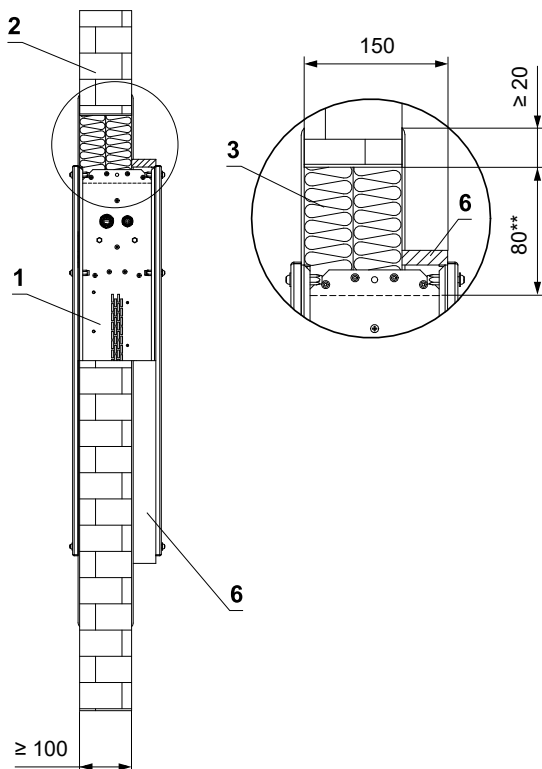
## In solid wall construction - Ablative Coated Batt

\*EI 90 (v<sub>e</sub>) S [V/H]

- For connection of following duct → see page 27



- \* In case with connected duct and with forced air flow  
 \*\* For fire resistance EI 60 S is approved opening between the construction and the damper in the range of 50...120 mm.  
 \*\*\* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.



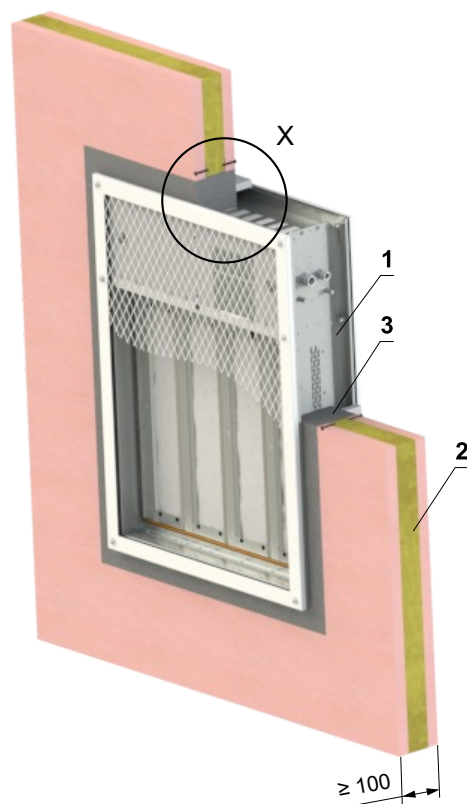
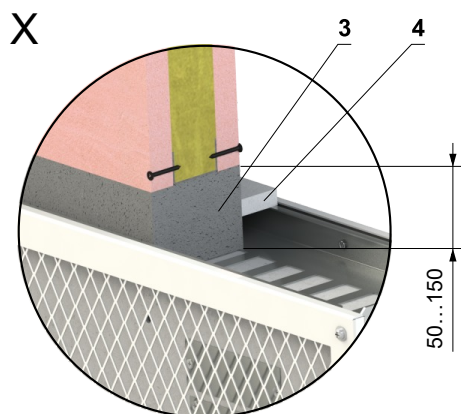
- 1 FDML
- 2 Solid wall construction  
Ablative Coated Batt System HILTI\*\*\*
- 3 Mineral wool board - min. density 140 kg/m<sup>3</sup> (HILTI CFS-CT B 1S 140/50...)
- 4 Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
- 5 Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing
- 6 Fire-resistant cover boards - only if one side of the damper is in line with the surface of the construction and the other side extends more than 25 mm from the construction - (Promatect-H...) min. thickness 15 mm - connect the boards together with screws

## In gypsum wall construction

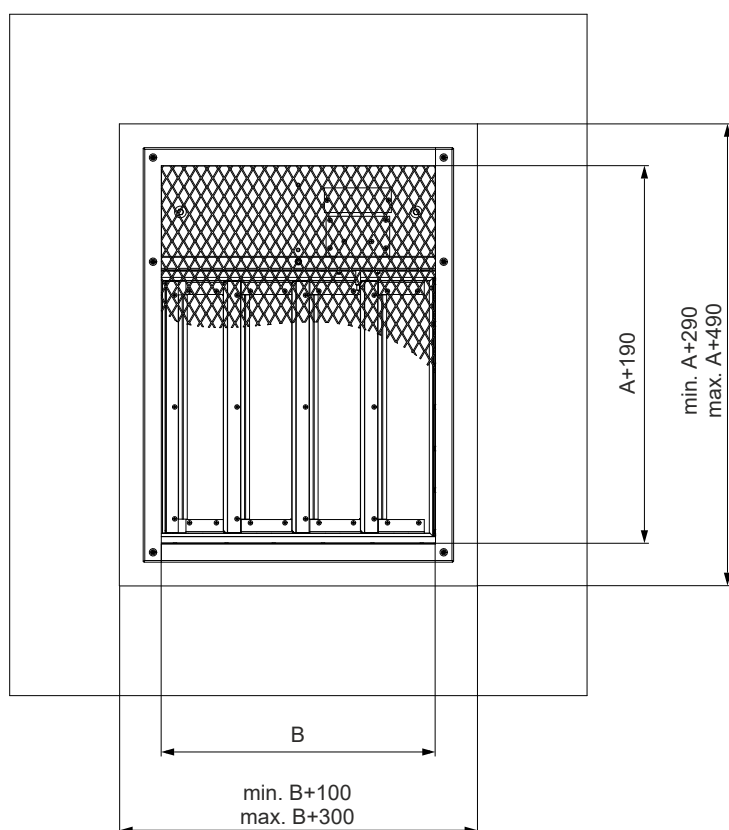
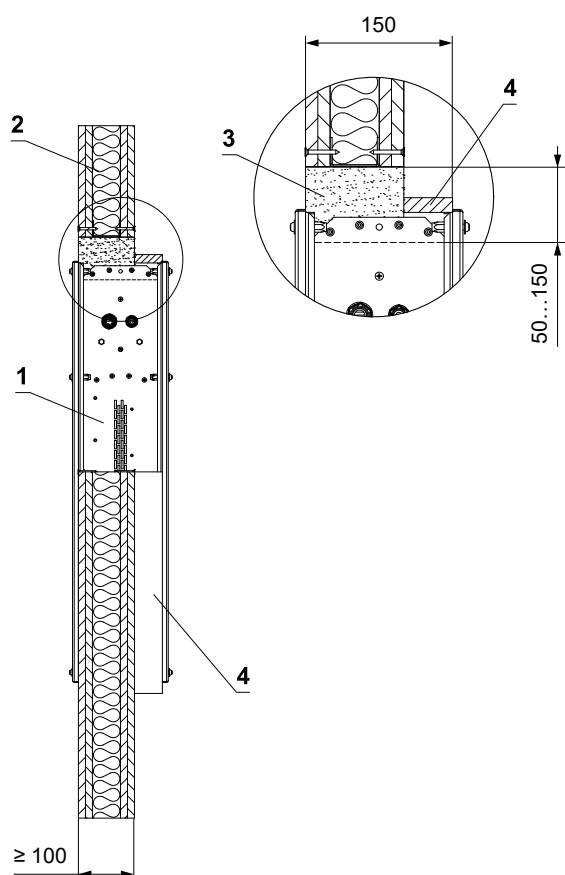
### In gypsum wall construction - mortar or gypsum

\*EI 90 (v<sub>e</sub>) S [V/H]

- For connection of following duct → see page 27
- The installation opening is lined with a UW/CW profile.



\* In case with connected duct and with forced air flow

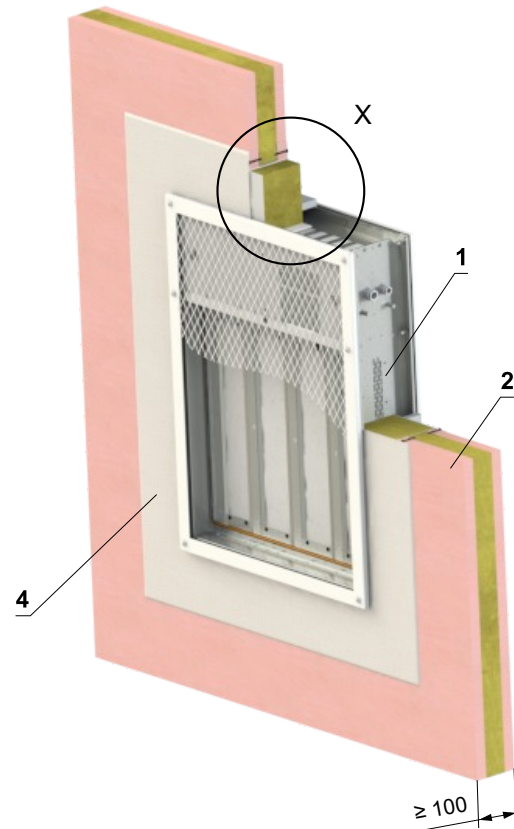
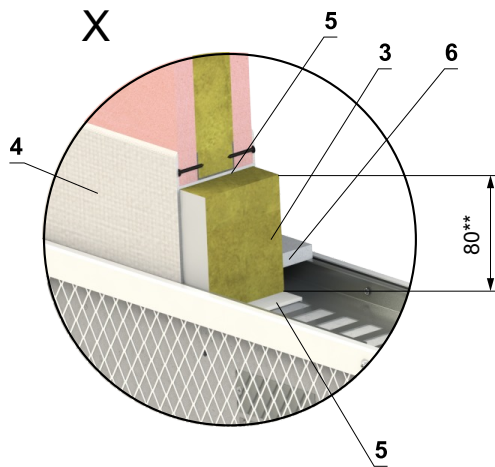


- 1 FDML
- 2 Gypsum wall construction
- 3 Mortar or gypsum
- 4 Fire-resistant cover boards - only if one side of the damper is in line with the surface of the construction and the other side extends more than 25 mm from the construction - (Promatect-H...) min. thickness 15 mm - connect the boards together with screws

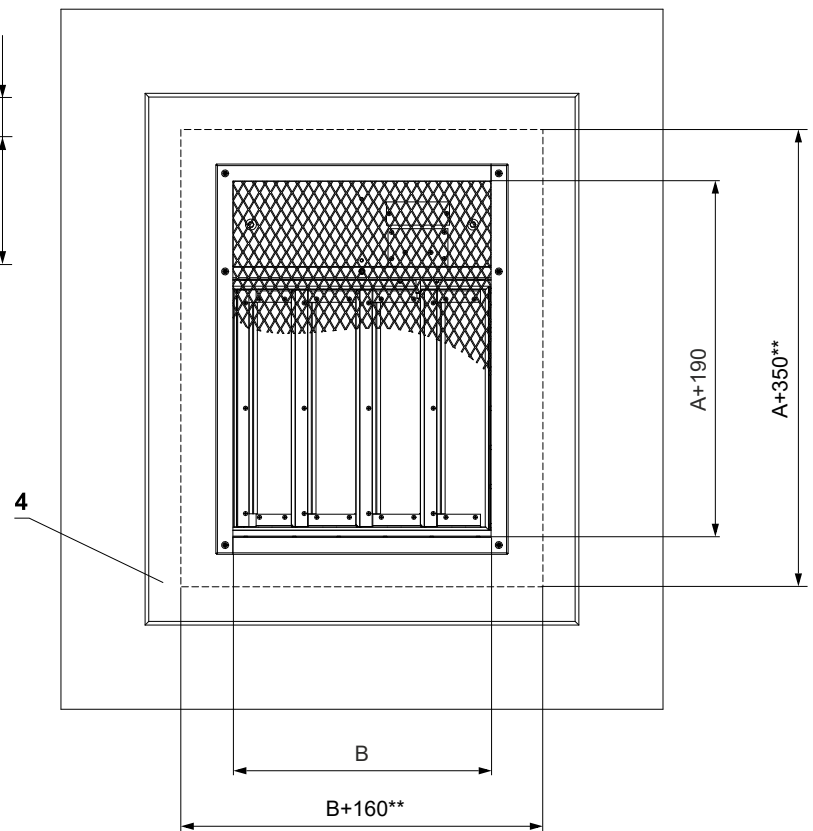
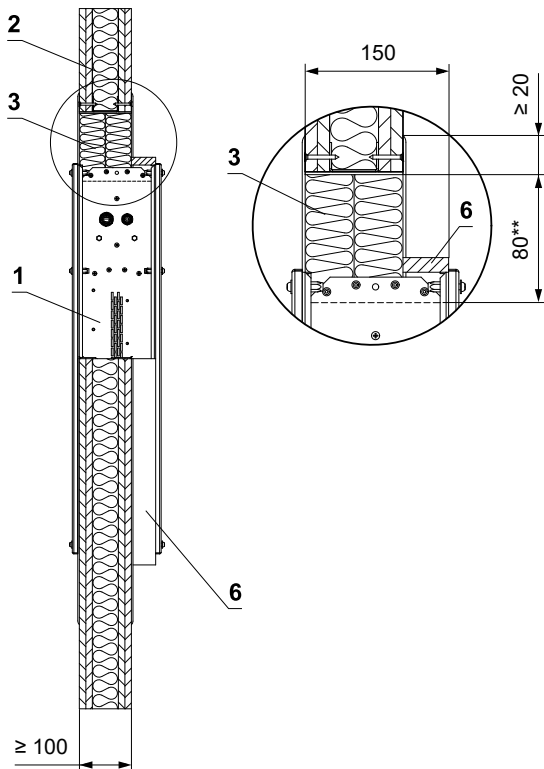
## In gypsum wall construction - Ablative Coated Batt

\*EI 90 (v<sub>e</sub>) S [V/H]

- For connection of following duct → see page 27
- The installation opening is lined with a UW/CW profile.



- \* In case with connected duct and with forced air flow
- \*\* For fire resistance EI 60 S is approved opening between the construction and the damper in the range of 50...120 mm.
- \*\*\* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.



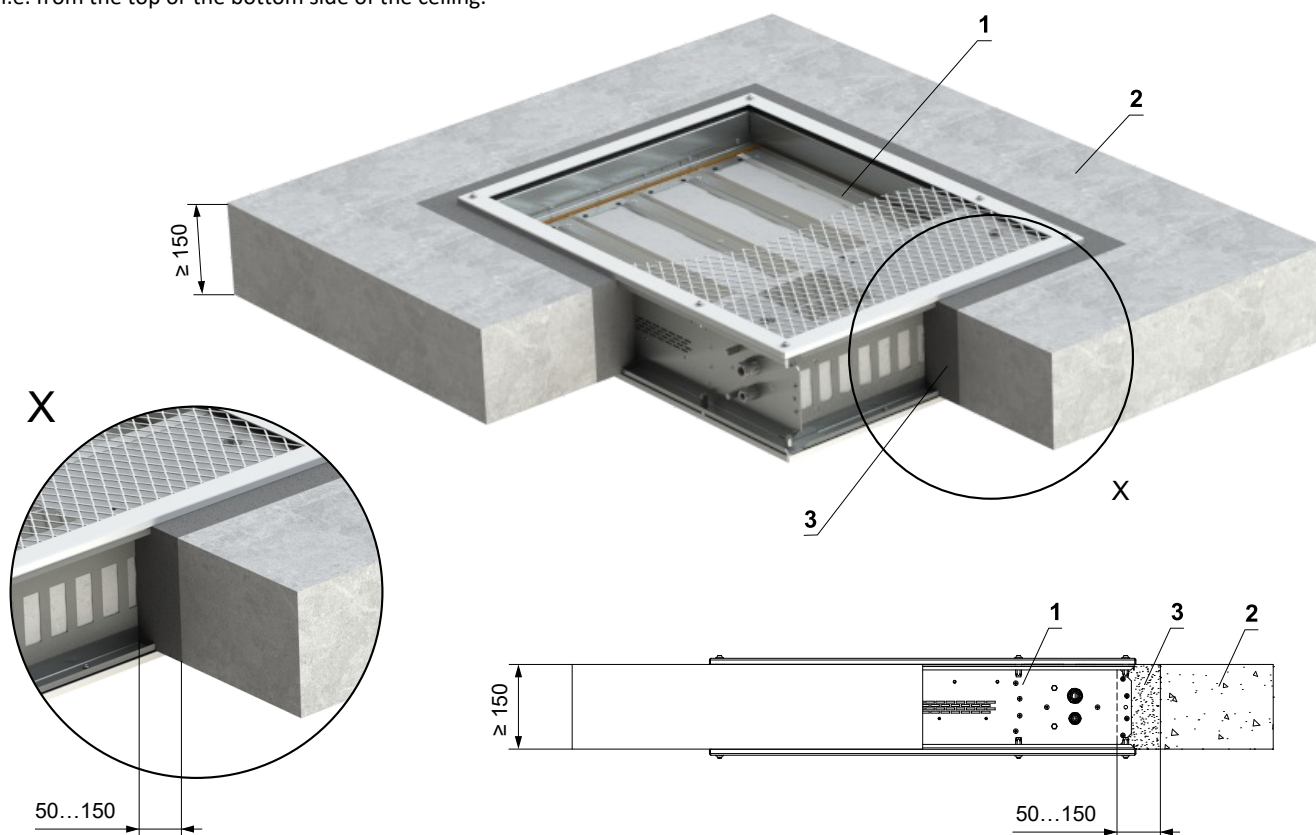
- 1 FDML
- 2 Gypsum wall construction  
Ablative Coated Batt System HILTI\*\*\*
- 3 Mineral wool board - min. density 140 kg/m<sup>3</sup> (HILTI CFS-CT B 1S 140/50...)
- 4 Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
- 5 Fire-resistant mastic - (HILTI CFS-S ACR...) fill the gap from both sides of the fire separation construction and around the perimeter of penetration and damper casing
- 6 Fire-resistant cover boards - only if one side of the damper is in line with the surface of the construction and the other side extends more than 25 mm from the construction - (Promatect-H...) min. thickness 15 mm - connect the boards together with screws

## In solid ceiling construction

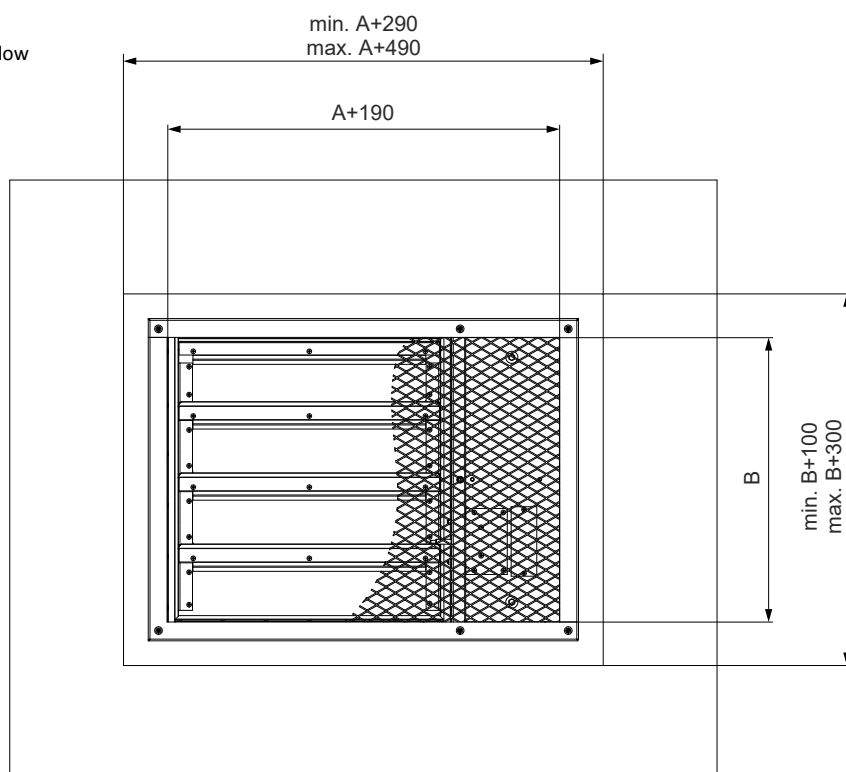
### In solid ceiling construction - mortar or gypsum

\*EI 90 (h<sub>o</sub>) S [H]

- For connection of following duct → see page 27
- The damper can be installed from both sides of the construction, i.e. from the top or the bottom side of the ceiling.



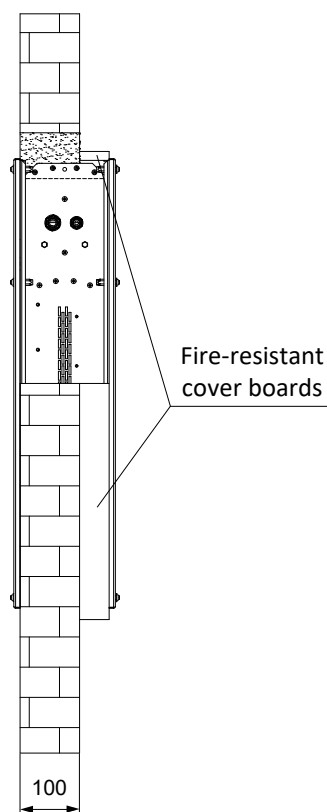
\* In case with connected duct and with forced air flow



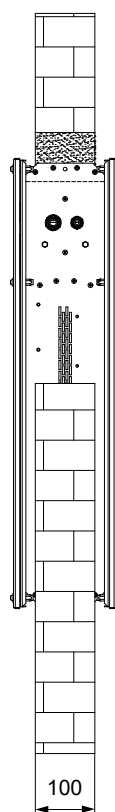
- 1 FDML
- 2 Solid ceiling construction
- 3 Mortar or gypsum

## Examples of installation situations

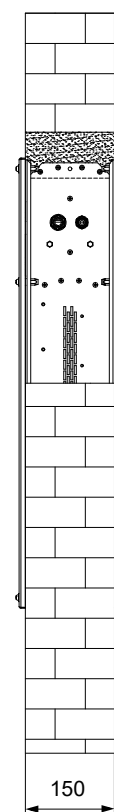
**Damper in line with the wall  
(fire-resistant cover boards  
required)**



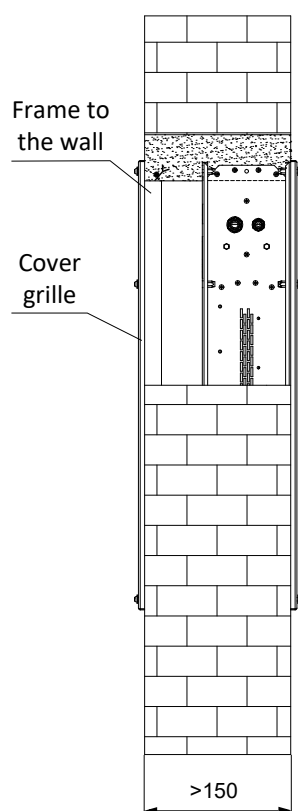
**Damper in the centre of the  
wall (fire-resistant cover  
boards not required)**



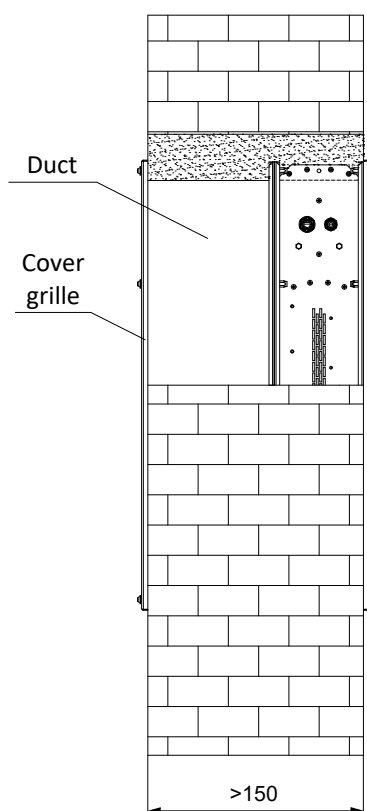
**Damper in the wall 150 mm**



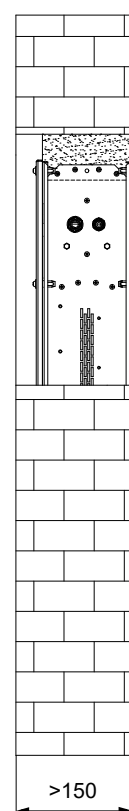
**Damper with  
grille on the wall**



**Damper with duct  
and grille on the wall**

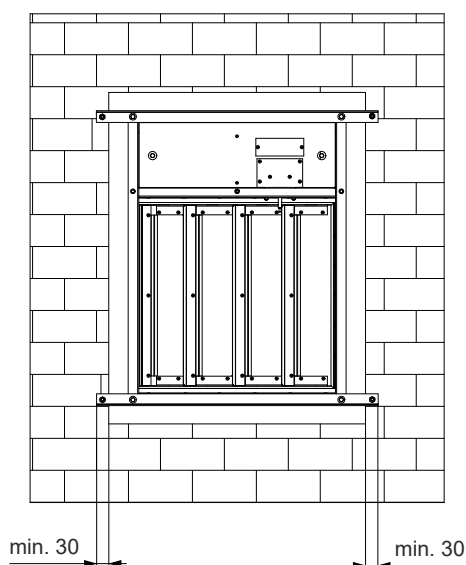
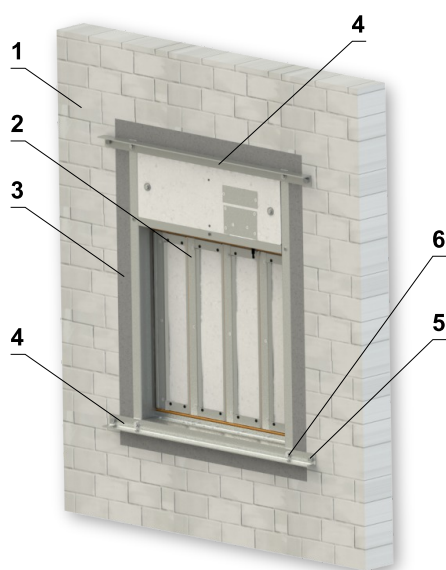


**Damper with grille  
inside the wall**

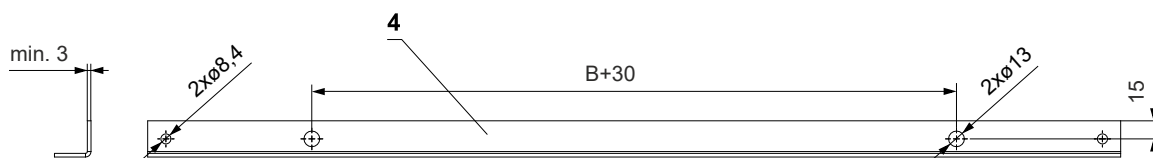
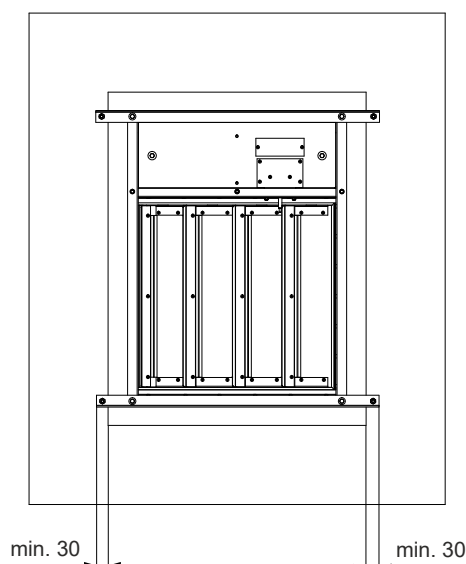
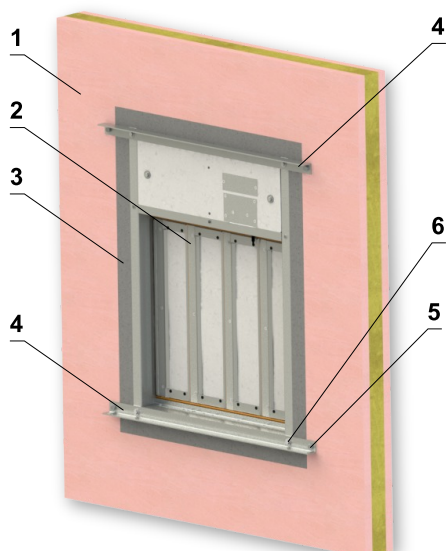


## Examples of fixing FDML

### In solid wall construction - mortar or gypsum/Ablative Coated Batt



### In gypsum wall construction - mortar or gypsum/Ablative Coated Batt

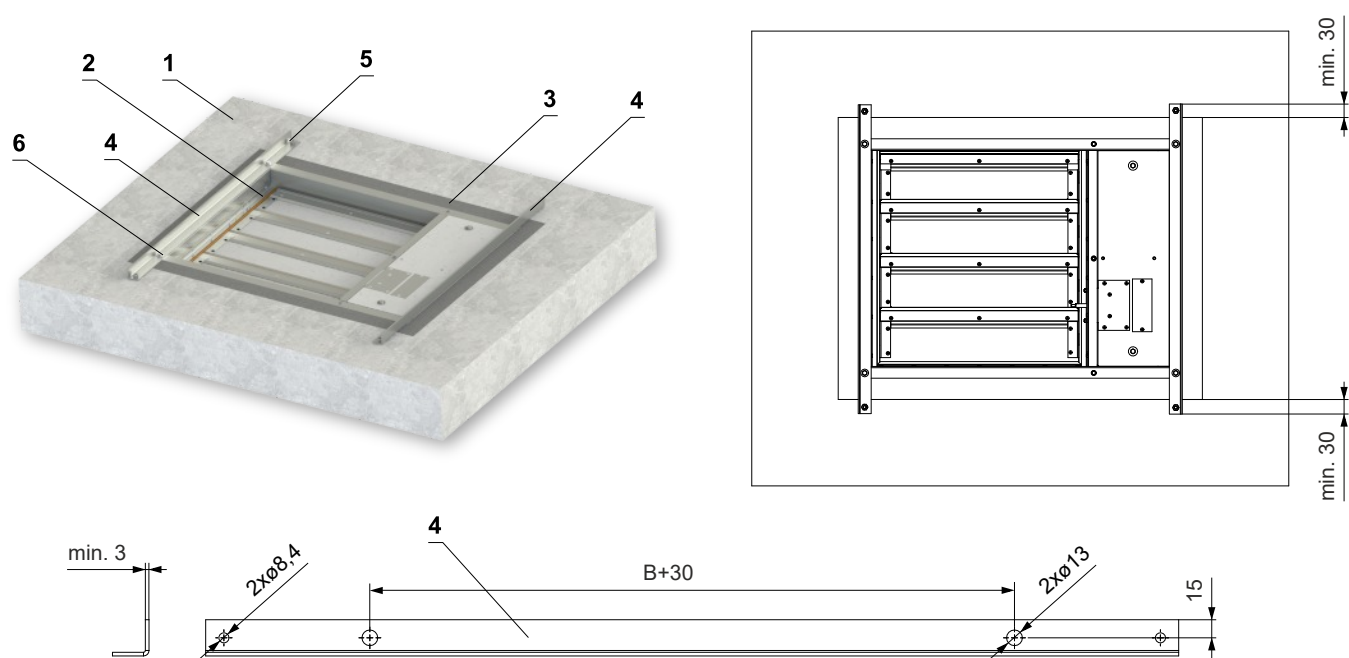


- Screw two L-profiles to the damper using M6x20 screws + washers and fix the L-profiles to the wall using M8 anchors and nuts (solid wall construction) or screws (gypsum wall construction - screws must go through a gypsum profile). Fill the gap between the damper and the wall with approved material. L-profiles must be removed before installing grilles or duct and are not part of the installation, they are only used to help install the damper.

- 1 Solid wall construction/Gypsum wall construction
- 2 FDML
- 3 Mortar or gypsum/Ablative Coated Batt
- 4 L-profile - min. 30x30x3, length according to size of the installation opening (min. profile overlap 30 mm on each side) - L-profile is not part of the delivery
- 5 Nut M8 with anchor - Solid wall construction or Screw with hexagon head - Gypsum wall construction
- 6 Bolt M6x20 + large-area washer

**In solid ceiling construction - mortar or gypsum**

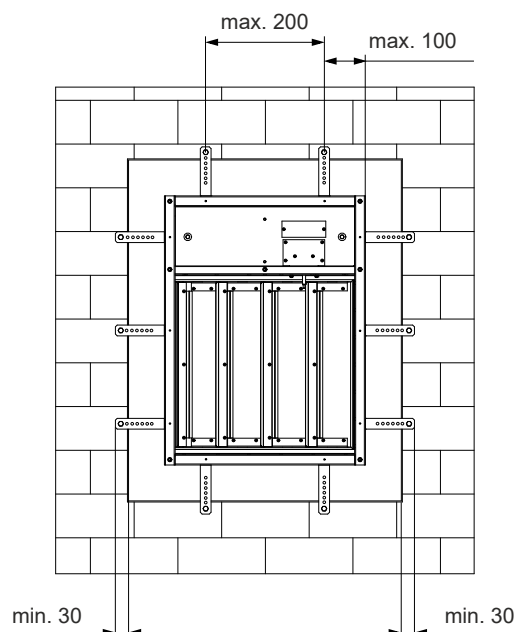
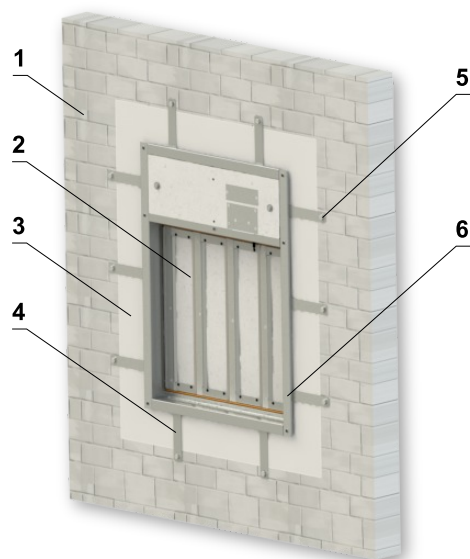
- The damper can be installed from both sides of the construction, i.e. from the top or the bottom side of the ceiling.



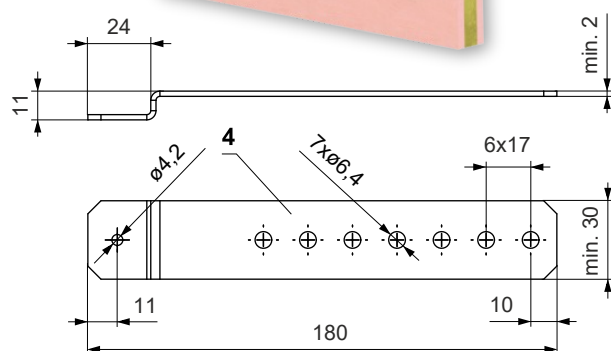
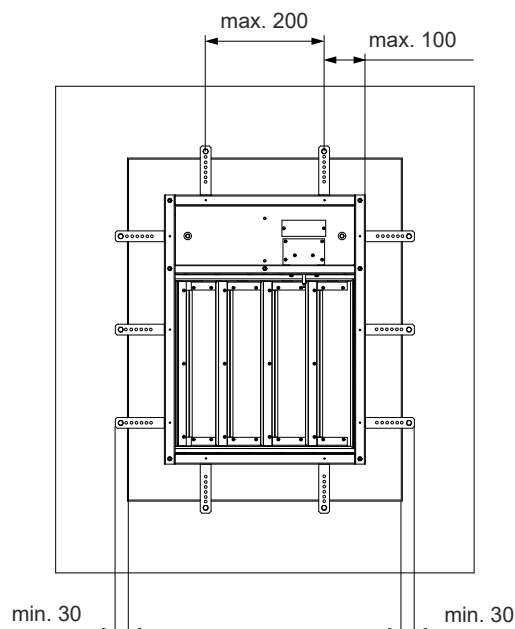
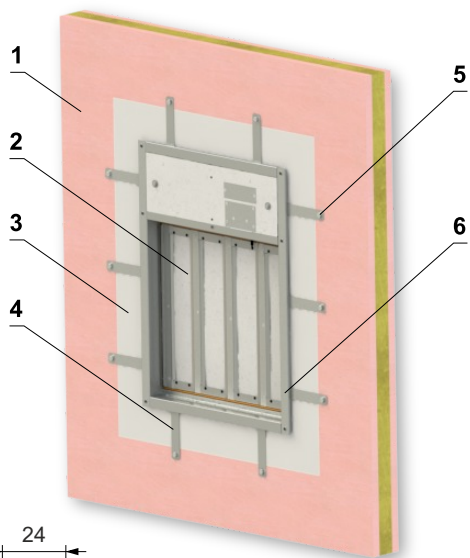
- Screw two L-profiles to the damper using M6x20 screws + washers and fix the L-profiles to the ceiling using M8 anchors and nuts. Fill the gap between the damper and the ceiling with mortar or gypsum. L-profiles must be removed before installing grilles or duct and are not part of the installation, they are only used to help install the damper.

- 1 Solid ceiling construction
- 2 FDML
- 3 Mortar or gypsum
- 4 L-profile - min. 30x30x3, length according to size of the installation opening (min. profile overlap 30 mm on each side) - L-profile is not part of the delivery
- 5 Nut M8 with anchor
- 6 Bolt M6x20 + large-area washer

### In solid wall construction - mortar or gypsum/Ablative Coated Batt



### In gypsum wall construction - mortar or gypsum/Ablative Coated Batt

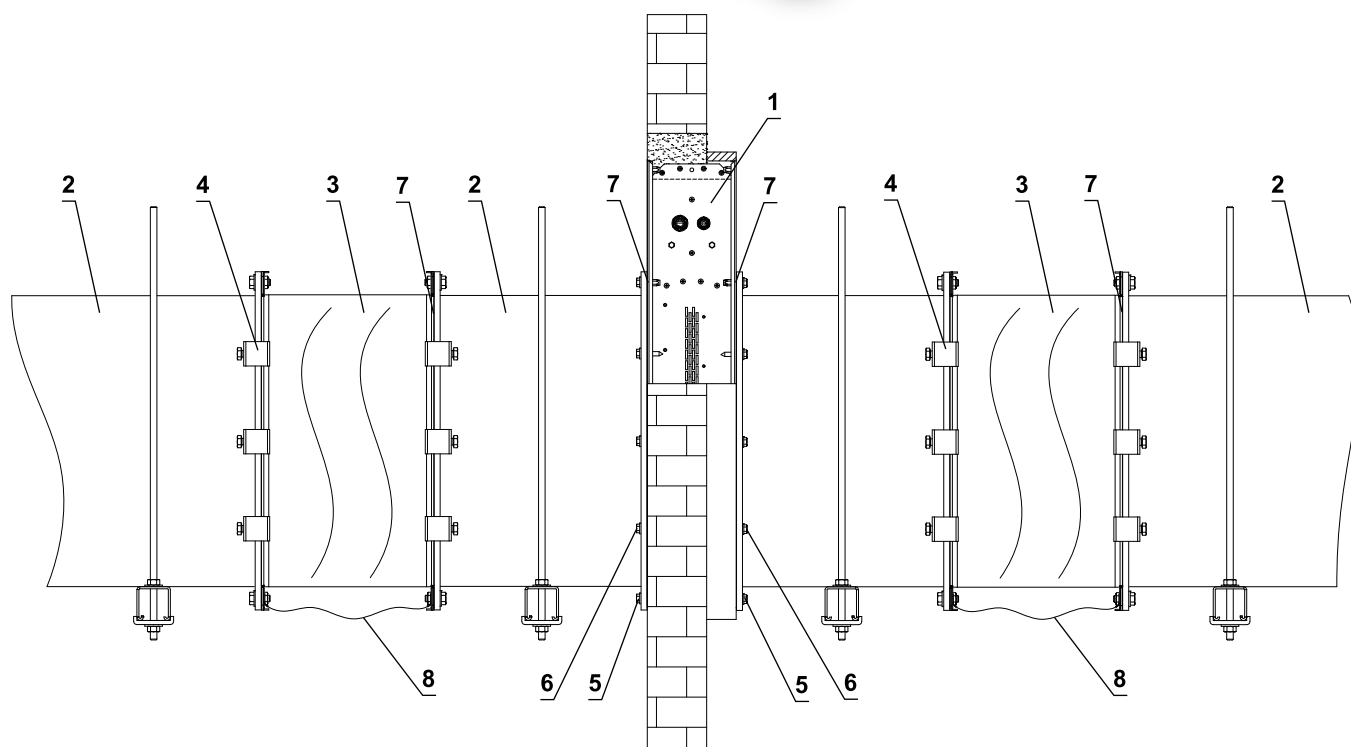
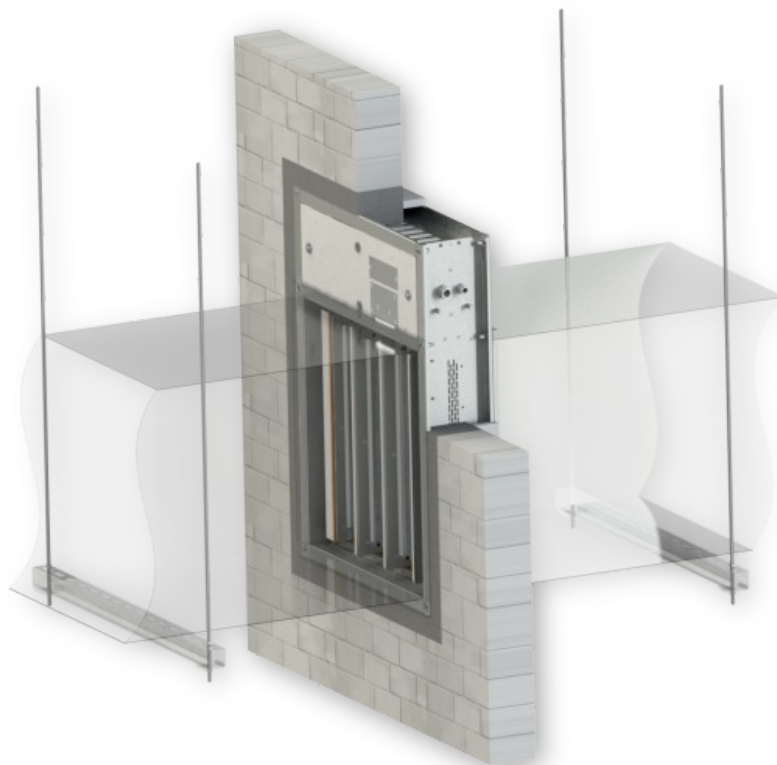


- Drill holes for rivets in the damper flange and rivet the damper holders. There must be at least 2 holders on each side of the damper with a maximum spacing of 200 mm and a maximum distance from the edge of the damper of 100 mm. Fix the holders to the wall using M6 anchors and nuts (solid wall construction) or screws (gypsum wall construction - screws must go through a gypsum profile). Fill the gap between the damper and the wall with approved material. The holders cannot be removed afterwards and will remain as a part of the installation. Install grilles or duct on the damper.

- 1 Solid wall construction/Gypsum wall construction
- 2 FDML
- 3 Mortar or gypsum/Ablative Coated Batt
- 4 Damper holder - holders can be ordered from Mandík a.s. or custom-made according to the required dimensions of the installation opening (min. width 30 mm, min. thickness 2 mm and min. overlap of holders 30 mm)
- 5 Nut M6 with anchor - Solid wall construction or Screw with hexagon head - Gypsum wall construction
- 6 Rivet 4x6

## Example of duct connection

- The air duct is not connected to the damper in the entire cross-section of the damper, but only through the area of the damper with blades. The actuator cover must be accessible from at least one side. It is recommended that the cover be accessible from the side where the thermoelectric activation device cover is located for easy access.



- 1 FDML
- 2 Duct
- 3 Damping pad
- 4 Steel clamp min. screw M8
- 5 Screws M6 in corners (more about connecting dimensions → see page 11)
- 6 Self-drilling screw - connection of the flanges of the damper and the duct
- 7 Sealing
- 8 Protective bonding conductor

V. TECHNICAL DATA

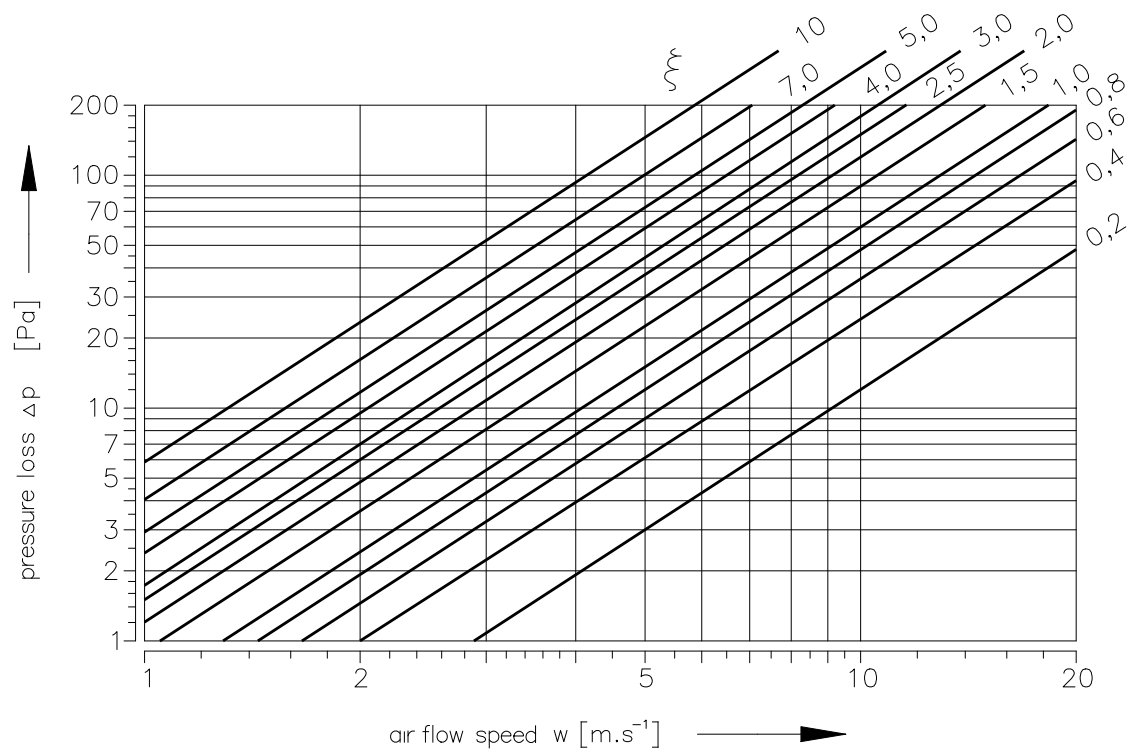
Pressure loss

Pressure loss calculation

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

|            |         |                                                                                 |
|------------|---------|---------------------------------------------------------------------------------|
| $\Delta p$ | [Pa]    | pressure loss                                                                   |
| $w$        | [m/s]   | air flow speed in nominal damper section                                        |
| $\rho$     | [kg/m³] | air density                                                                     |
| $\xi$      | [-]     | coefficient of local pressure loss for the nominal damper section → see page 29 |

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



## Coefficient of local pressure loss

|      | A     |       |       |       |       |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| B    | 200   | 250   | 280   | 300   | 315   | 355   | 400   | 450   | 500   | 560   |
| 300  | 4,185 | 4,069 | 4,000 | 3,954 | 3,919 | 3,827 | 3,723 | 3,608 | 3,492 | 3,354 |
| 315  | 4,347 | 4,226 | 4,154 | 4,106 | 4,070 | 3,974 | 3,865 | 3,745 | 3,625 | 3,480 |
| 355  | 3,660 | 3,543 | 3,472 | 3,426 | 3,390 | 3,297 | 3,191 | 3,074 | 2,957 | 2,816 |
| 400  | 2,828 | 2,742 | 2,690 | 2,656 | 2,630 | 2,561 | 2,484 | 2,397 | 2,311 | 2,208 |
| 450  | 3,803 | 3,689 | 3,622 | 3,576 | 3,542 | 3,452 | 3,350 | 3,236 | 3,123 | 2,987 |
| 500  | 2,866 | 2,791 | 2,747 | 2,717 | 2,694 | 2,635 | 2,567 | 2,493 | 2,418 | 2,329 |
| 560  | 3,391 | 3,286 | 3,223 | 3,181 | 3,149 | 3,065 | 2,971 | 2,866 | 2,761 | 2,634 |
| 600  | 3,169 | 3,073 | 3,015 | 2,976 | 2,947 | 2,869 | 2,782 | 2,685 | 2,589 | 2,472 |
| 630  | 2,721 | 2,644 | 2,597 | 2,566 | 2,543 | 2,481 | 2,412 | 2,335 | 2,258 | 2,165 |
| 650  | 2,661 | 2,578 | 2,527 | 2,494 | 2,469 | 2,402 | 2,326 | 2,243 | 2,159 | 2,059 |
| 700  | 3,195 | 3,099 | 3,042 | 3,004 | 2,975 | 2,898 | 2,812 | 2,716 | 2,620 | 2,505 |
| 710  | 3,012 | 2,924 | 2,871 | 2,836 | 2,809 | 2,739 | 2,659 | 2,571 | 2,483 | 2,377 |
| 750  | 2,652 | 2,574 | 2,527 | 2,495 | 2,472 | 2,409 | 2,339 | 2,260 | 2,182 | 2,088 |
| 800  | 2,741 | 2,664 | 2,617 | 2,586 | 2,563 | 2,501 | 2,431 | 2,354 | 2,276 | 2,183 |
| 850  | 2,647 | 2,573 | 2,528 | 2,498 | 2,476 | 2,417 | 2,350 | 2,275 | 2,201 | 2,112 |
| 900  | 2,344 | 2,276 | 2,236 | 2,209 | 2,188 | 2,134 | 2,073 | 2,006 | 1,938 | 1,857 |
| 950  | 2,777 | 2,699 | 2,652 | 2,621 | 2,597 | 2,535 | 2,465 | 2,387 | 2,309 | 2,215 |
| 1000 | 2,616 | 2,538 | 2,491 | 2,459 | 2,436 | 2,373 | 2,302 | 2,223 | 2,145 | 2,050 |

|      | A     |       |       |       |       |       |       |       |       |       |       |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| B    | 600   | 630   | 650   | 700   | 710   | 750   | 800   | 850   | 900   | 950   | 1000  |
| 300  | 3,261 | 3,192 | 3,146 | 3,031 | 3,007 | 2,915 | 2,800 | 2,684 | 2,569 | 2,453 | 2,338 |
| 315  | 3,384 | 3,312 | 3,264 | 3,144 | 3,119 | 3,023 | 2,903 | 2,783 | 2,662 | 2,542 | 2,422 |
| 355  | 2,722 | 2,652 | 2,605 | 2,488 | 2,464 | 2,370 | 2,253 | 2,136 | 2,019 | 1,901 | 1,784 |
| 400  | 2,139 | 2,087 | 2,053 | 1,967 | 1,949 | 1,880 | 1,794 | 1,708 | 1,622 | 1,536 | 1,450 |
| 450  | 2,897 | 2,829 | 2,783 | 2,670 | 2,648 | 2,557 | 2,444 | 2,330 | 2,217 | 2,104 | 1,991 |
| 500  | 2,269 | 2,224 | 2,194 | 2,119 | 2,105 | 2,045 | 1,970 | 1,896 | 1,821 | 1,746 | 1,672 |
| 560  | 2,550 | 2,487 | 2,445 | 2,340 | 2,319 | 2,235 | 2,130 | 2,025 | 1,920 | 1,815 | 1,710 |
| 600  | 2,395 | 2,337 | 2,298 | 2,201 | 2,182 | 2,105 | 2,008 | 1,911 | 1,814 | 1,717 | 1,621 |
| 630  | 2,103 | 2,057 | 2,026 | 1,949 | 1,933 | 1,871 | 1,794 | 1,717 | 1,640 | 1,563 | 1,485 |
| 650  | 1,992 | 1,941 | 1,908 | 1,824 | 1,808 | 1,741 | 1,657 | 1,573 | 1,489 | 1,406 | 1,322 |
| 700  | 2,429 | 2,371 | 2,333 | 2,237 | 2,218 | 2,141 | 2,045 | 1,949 | 1,853 | 1,758 | 1,662 |
| 710  | 2,306 | 2,254 | 2,218 | 2,130 | 2,112 | 2,042 | 1,954 | 1,865 | 1,777 | 1,689 | 1,601 |
| 750  | 2,025 | 1,978 | 1,947 | 1,869 | 1,853 | 1,790 | 1,712 | 1,634 | 1,555 | 1,477 | 1,399 |
| 800  | 2,121 | 2,075 | 2,044 | 1,967 | 1,951 | 1,889 | 1,812 | 1,734 | 1,657 | 1,579 | 1,502 |
| 850  | 2,052 | 2,008 | 1,978 | 1,904 | 1,889 | 1,830 | 1,755 | 1,681 | 1,607 | 1,532 | 1,458 |
| 900  | 1,803 | 1,762 | 1,735 | 1,668 | 1,654 | 1,600 | 1,532 | 1,465 | 1,397 | 1,330 | 1,262 |
| 950  | 2,153 | 2,106 | 2,074 | 1,996 | 1,981 | 1,918 | 1,840 | 1,762 | 1,684 | 1,606 | 1,528 |
| 1000 | 1,987 | 1,940 | 1,909 | 1,830 | 1,814 | 1,751 | 1,673 | 1,594 | 1,516 | 1,437 | 1,358 |

## VI. MATERIAL, FINISHING

- Damper casings are made from galvanized sheet metal without further surface treatment.
- Cover grilles are made of sheet metal and coated with RAL 9010 burning varnish. Requests for other colours must be discussed in advance with the manufacturer.
- Damper blades are made from fire resistant asbestos free boards made of mineral fibres.
- The cover housing for the actuator is covered with fire resistant asbestos free boards made of mineral fibres.
- Closing mechanism and fasteners are galvanized.
- Damper blades are made from boards of homogeneous material Promatect-H.
- Plastic, rubber and silicon components, sealants, foaming tapes, glass-ceramic seals, housings, brass bearings of the blades, actuators, and end switches are identical for all material variants of the dampers.
- Cover grilles are always made of common steel sheet metal with a burning varnish.
- The damper blades in the variant for chemical environments (Class A4) are always treated with a coating of chemically resistant Promat SR.
- Any other requirements for the design will be considered atypical and will be addressed on an individual basis.

## VII. TRANSPORTATION, STORAGE AND WARRANTY

### Logistic terms

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

### Warranty

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

## VIII. ASSEMBLY, ATTENDANCE AND MAINTENANCE

- Assembly, maintenance and damper function check can be done only by qualified and trained person, i.e. "AUTHORIZED PERSON" according to the manufacturer documentation. All works done on the fire dampers must be done according international and local norms and laws.
- All effective safety standards and directives must be observed during damper assembly.
- To ensure reliable damper function it is necessary to avoid blocking the actuating mechanism and contact surfaces with collected dust, fibre and sticky materials and solvents.

### Manual operation - actuator control without electric voltage

- A special wrench (part of the actuator) can be used to manually turn the damper blades to any position. When the wrench is turned in the direction of the arrow, the damper blades rotate to open position. As the blades rotation is stopped, in every position, the actuator will be locked. Unlocking is possible even manually as per instructions on the actuator, or by the activation of the supply voltage.
- If the actuator is manually locked, the damper blades will not close in the event of a fire after the activation of the thermoelectric activation device BAT. To restore correct damper operation, the actuator must be unlocked (manually or by applying power supply).

### Installation / fixing the damper

- It is necessary to ground the damper casing before installation.
- The damper casing shall not be deformed in the course of bricking in.
- Once the damper is built in, the damper blades shall not grind on the damper casing during opening or closing.
- Dampers are not equipped with inspection openings. If these dampers are used as dampers for simple maintenance and revision they must be completed with connecting inspection part installed just behind the damper.

## Commissioning and revisions

- Before putting the damper into operation, serviceability checks and functional tests must be carried out including testing of functionality of all electrical elements. After putting into operation these serviceability checks must be carried at least twice a year. If no defect is found during two subsequent serviceability checks, these checks can be carried out once a year.
- In case that dampers are found unable to serve for their function for any cause, it must be clearly marked. The operator is obliged to ensure that the damper is put into condition in which it is ready for function and meanwhile he is obliged to provide the fire protection by another appropriate way.
- Results of regular checks, imperfections found and all important facts connected with the damper function must be recorded in the "FIRE BOOK" and immediately reported to the operator.
- Before entering the dampers with actuator into operation after their assembly and by sequential checks. Check of blades rotation into the breakdown position "CLOSED" can be done after disconnecting the actuator supply (e.g. by pressing the test button at the thermoelectric activation device BAT or disconnecting the supply from ELECTRICAL FIRE SIGNALISATION). Check of blades rotation back into the "OPEN" position can be done after restoration of power supply (e.g. by releasing the test 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.
- Visual inspection of proper damper installation, inner area of a damper, damper blades, contact surfaces and silicon seal.

### Following checks must be carried out for all dampers

- Check the rotation of the blades to "CLOSED" failure position after disconnection the power supply of the actuator (e.g. by pressing the test button on the thermoelectric activation device BAT or by disconnection the power supply from electrical fire signalization). Check the rotation of the blades back to "OPEN" position by restoring the power supply to the actuator (e.g. by releasing the test button or by restoring the power supply from electrical fire signalization).

### Following checks must be carried out for dampers with optical smoke detector

- The function checks of the optical smoke detector are to be carried out by employees of an authorized organization who have corresponding electrotechnical qualification and have been properly trained by the manufacturer. The function checks are to be carried out as a part of function checks of the fire dampers, at least 1x a year.
- For the function checks, the damper blades should be in "CLOSED" position with the fan off or with closed air regulation situated between the fan and the fire damper.

### How to proceed after Tf1 or Tf2 fuses have been activated

- If the thermal fuse **Tf1** is interrupted (due to temperature outside the duct), it is necessary to replace the spring return actuator. → see page 8.
- If the thermal fuse **Tf2** is interrupted (due to temperature inside the duct), only the spare part ZBAT 72 (95/120/140) needs to be replaced (acc.to the activation temperature). → see page 8

## IX. ORDERING INFORMATION

### Ordering key

|      |    |          |     |     |   |     |      |    |    |
|------|----|----------|-----|-----|---|-----|------|----|----|
| 1    | 2  | 3        | 4   | 5   | 6 | 7   | 8    | 9  | 10 |
| FDML | EN | 1000x300 | .40 | 120 | B | Q30 | - ZN | IW | G  |

#### EXAMPLE:

#### FDML EN 1000x300 .40 120 B Q30-ZN IW G

Fire damper FDML, dimension 1000x300 mm, control design with spring return actuator AC 230 V, activation temperature 120 °C, cover grille KMM on one side, flange dimension 30 mm, galvanized material variant, impregnation against humidity, silicone-free rubber.

#### 1| Fire damper type - FDML

#### 2| Country of destination

#### 3| Damper dimensions A x B → see pages 12 to 15

„A“ is the width of the damper

„B“ is the height of the damper

#### 4| Damper design

|       |                                                                                                                                     |
|-------|-------------------------------------------------------------------------------------------------------------------------------------|
| .40   | With actuator BF 230-TN (BFL, BFN 230-T) - voltage AC 230 V                                                                         |
| .41 * | With actuator BF 24-TN (BFL, BFN 24-T), with smoke detector ORS 142 K and with supply device MEAN WELL HDR-15-24 (voltage 230 V AC) |
| .50   | With actuator BF 24-TN (BFL, BFN 24-T) - voltage AC/DC 24 V                                                                         |
| .51 * | With actuator BF 24-TN (BFL, BFN 24-T), with smoke detector ORS 142 K (voltage 24V DC)                                              |

\* Optical smoke detectors ORS 142 K and power supply unit MEAN WELL HDR-15-24 are delivered in bulk

#### 5| Activation temperature

|                                |         |
|--------------------------------|---------|
| Spring return actuator control |         |
|                                | 72 °C * |
| 95                             | 95 °C   |
| 120                            | 120 °C  |
| 140                            | 140 °C  |

\* Standard activation temperature

#### 6| Accessories \*

|   |                                                                          |
|---|--------------------------------------------------------------------------|
|   | Cover grille KMM on both sides (installation as an overflow damper)      |
| A | Without cover grilles KMM (installation as a part of ventilation system) |
| B | With cover grille KMM on one side (ducting on one side)                  |

\* The surface of the cover grille KMM is provided with powder coating, standard colour is the RAL 9010. Requirements for other colour of the cover grille KMM, must be discussed in advance with the manufacturer.

#### 7| Flange dimension

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

#### 8| Material

|    |            |
|----|------------|
| ZN | Galvanized |
|----|------------|

#### 9| Surface treatment

|    |                                                                                           |
|----|-------------------------------------------------------------------------------------------|
|    | Without surface treatment                                                                 |
| IW | Damper blade impregnation, impregnating agent PROMAT 2000 - impregnation against humidity |
| IA | Damper blade impregnation, impregnating agent PROMAT SR - impregnation against chemical   |

#### 10| Cold seal variant

|   |                      |
|---|----------------------|
|   | Silicone rubber *    |
| G | Silicone-free rubber |

\* Standard cold seal

Accessories

Cover grille KMM \*



- 1| Accessory type - cover grille KMM
- 2| Fire damper type - FDML
- 3| Damper dimensions A x B → see pages 12 to 15

\* The surface of the cover grille KMM is provided with powder coating, standard colour is the RAL 9010. Requirements for other colour of the cover grille KMM, must be discussed in advance with the manufacturer.

Data label

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

|                    |                                                     |                                                                 |                  |
|--------------------|-----------------------------------------------------|-----------------------------------------------------------------|------------------|
| <b>MANDÍK®</b>     |                                                     | MANDÍK, a.s.<br>Dobříšská 550, 267 24 Hostomice, Czech Republic |                  |
| FIRE DAMPER - XXXX |                                                     |                                                                 |                  |
| DIMENSION:         |                                                     | DESIGN:                                                         |                  |
| SERIAL.NO.:        |                                                     | WEIGHT (kg):                                                    |                  |
| CLASSIFICATION:    |                                                     |                                                                 |                  |
| TPM XXX/XX         | Cert. No.: 1391-CPR-XXXX/XXXX, DoP: PM/XXXX/XX/XX/X |                                                                 | XX EN 15650:2010 |

  
MANUAL

  
1391

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