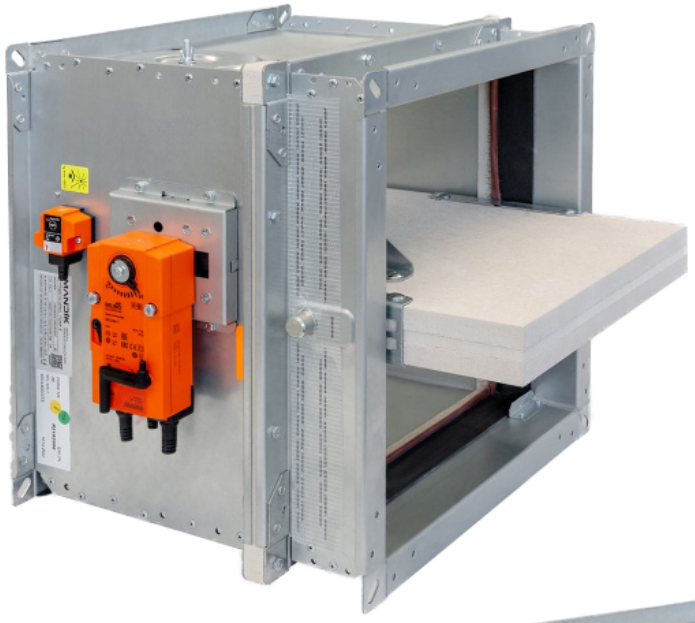
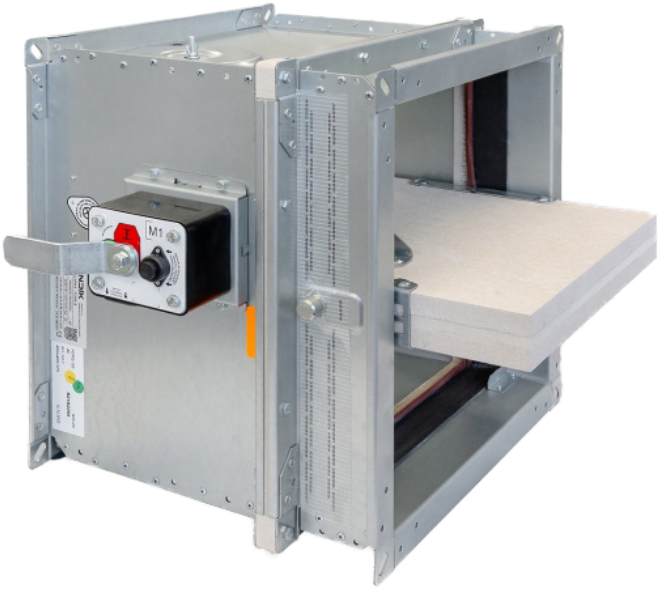




NORDfire

FDMQ 120 Fire Damper

- Square dampers from 150×150 mm to 1500×800 mm
- CE certified acc. to EN 15650
- Fire resistance EIS 120
- External casing leakage class C, Internal leakage class 2 acc. to EN 1751
- Manual or electrical

ETS NORD

Contents

1. General

1.1 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 by means of closing the duct in the points of fire separating constructions.

Damper blade automatically closes air duct using a closing spring or a spring return actuator. The closing spring is actuated by pressing a button on the manual control or by melting a thermal fuse.

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 the blade, 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.

Fig. 1. FDMQ 120 with spring return actuator

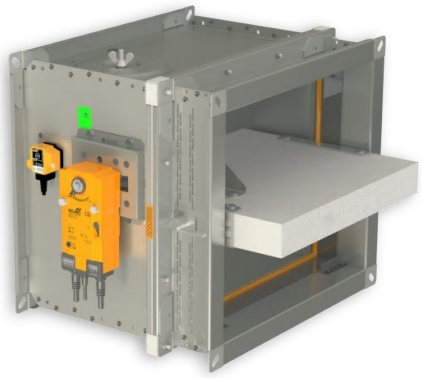
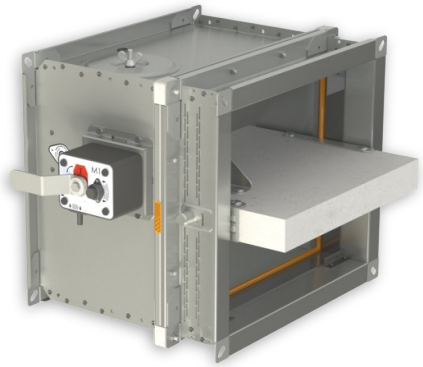


Fig. 2. FDMQ 120 with manual control



1.2 Damper characteristics

- CE certified acc. to EN 15650
- Tested in accordance with EN 1366-2
- Classified acc. to EN 13501-3+A1
- External Casing leakage class min. C acc. to EN 1751, Internal leakage min. class 2 acc. to EN 1751
- Cycling test in class C_{10000} acc. to EN 15650
- Corrosion resistant acc. to EN 15650
- Certificate of constancy of performance No. 1391-CPR-2023/0087
- Declaration of Perfomance No. PM/FDMQ120/01/24/1
- Hygienic assessment of fire dampers - Report No. 1.6/pos/19/19b

1.3 Working conditions

Exact damper function is provided under the following conditions:

- maximum air circulation speed: 12 m/s
- maximum pressure difference: 1200 Pa
- the air circulation in the whole damper section must be secured steady over the entire surface.

Dampers can be installed in arbitrary position.

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

Dampers are designed for macroclimatic areas with mild climate according to EN 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.

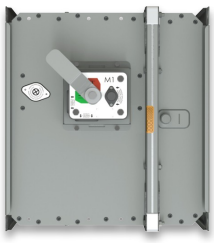
2. Design

2.1 Design with manual control

Design .01

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

Fig. 3. Design .01



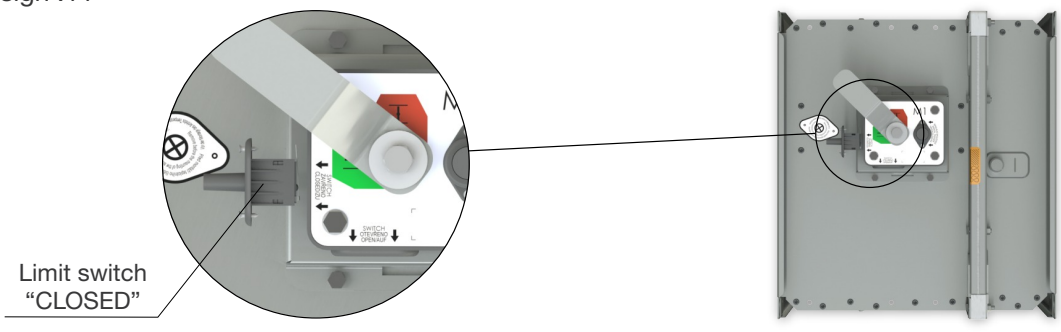
ATTENTION:

Manual controls are produced in five sizes M1 to M5, difference is only in size of a closing spring, which closes the fire damper. For the size of fire dampers is always assigned the size of the manual control, see Tab. 5. It is not recommended to use different size of the manual control than given by the manufacturer, otherwise there is a risk of damaging the fire damper.

Design .11

Design .01 with manual control can be complemented with a limit switch signaling of the damper blade position “CLOSED”. Cable is connected directly to limit switch. Limit switch details, see page 5.

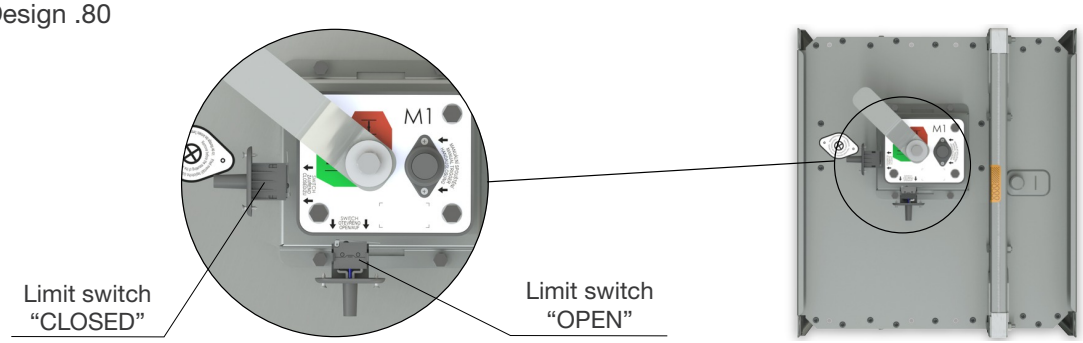
Fig. 4. Design .11



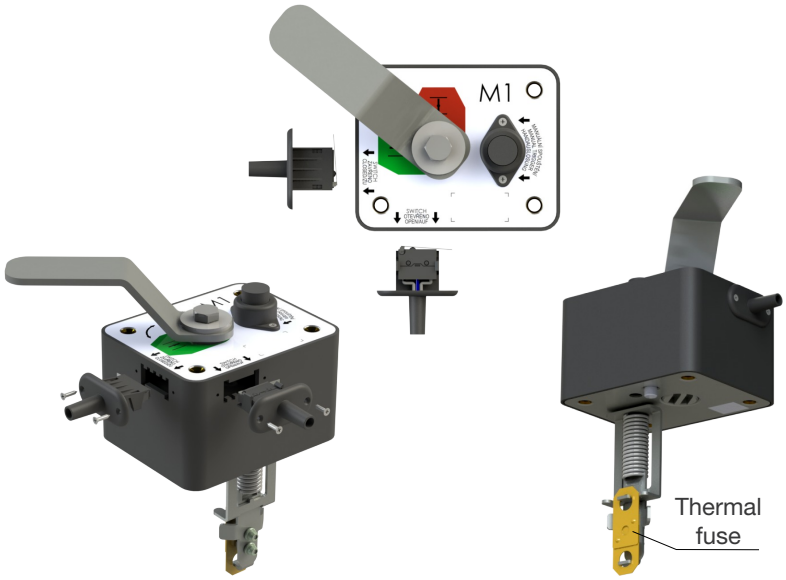
Design .80

Design .01 with manual control can be complemented with two limit switches signaling of the damper blade position “CLOSED” and “OPEN”. Cables are connected directly to limit switches.

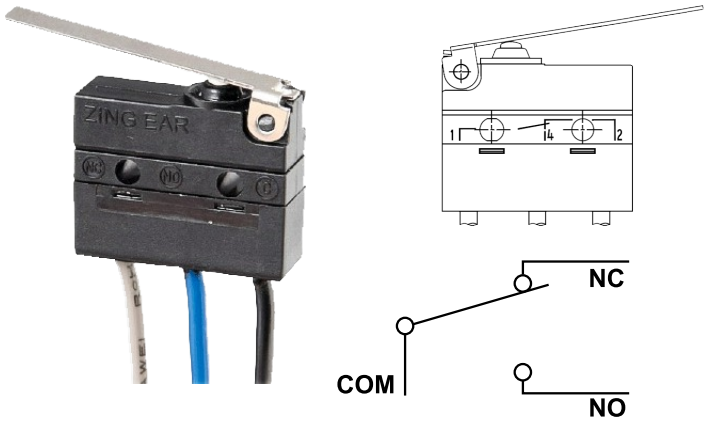
Fig. 5. Design .80



Manual control



Limit switch G905-300E03W1



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

Nominal voltage and maximal current	AC 230 V / 5A
Class of protection	IP 67
Working temperature	–25 °C ... +120 °C

This limit switch is possible to connect in two following ways

a) CUT-OFF if the arm is moving ... connect wire 1+2
b) SWITCH-ON if the arm is moving ... connect wire 1+4

2.2 Design with spring return actuator

Design .40 and .50

The 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 blade to the operating position “OPEN” and at the same time prestretches its return spring.

When the actuator is power supplied, the damper blade is in the position “OPEN” and the return spring is prestretched.

Time needed for full opening of the damper blade 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 blade to the breakdown position “CLOSED”.

The time of closing the damper blade from the position “OPEN” to the position “CLOSED” takes maximum 20 sec.

In case that the power supply is restored again (the blade can be in any position), the actuator starts to rotate the damper blade back to the position “OPEN”.

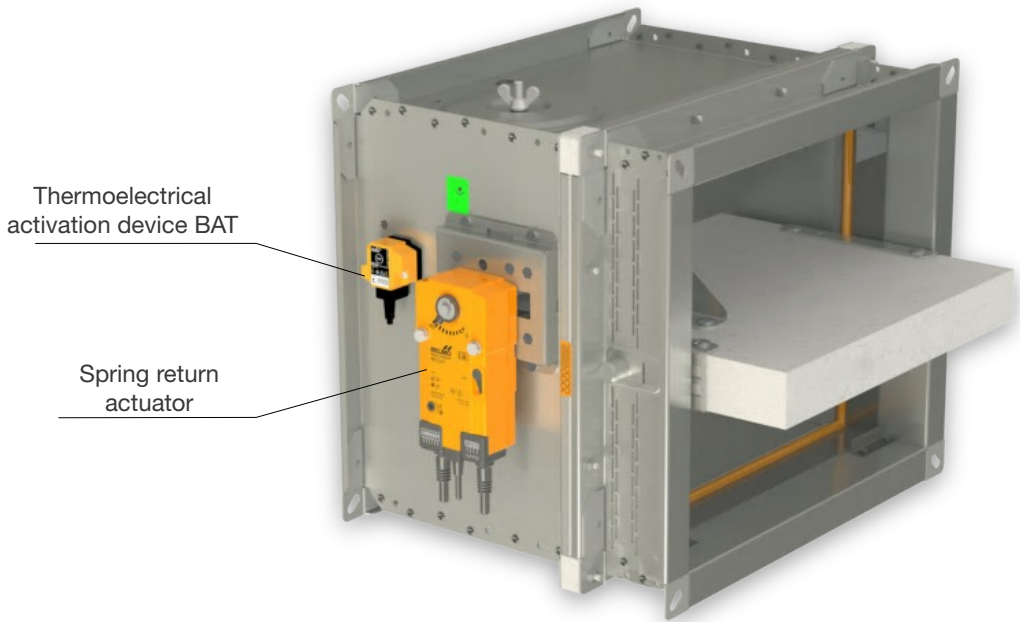
A thermoelectric activation device BAT, which contains two thermal fuses Tf1 and Tf2, is an integral part of the actuator.

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).

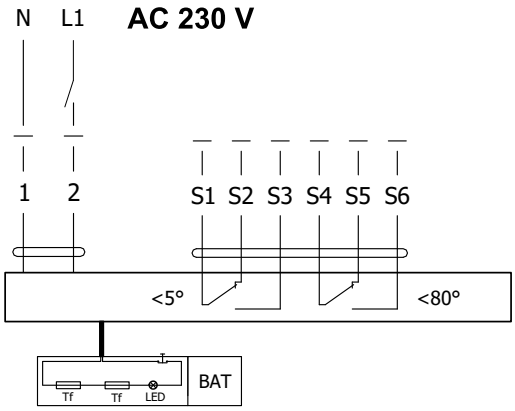
After the thermal fuse Tf1 or Tf2 has been activated, the power supply is permanently and irreversibly interrupted and the actuator, by means of the pre-stretched spring, rotates the damper blade into the breakdown position “CLOSED”.

Signalisation of damper blade position “OPEN” and “CLOSE” is provided by two microswitches.

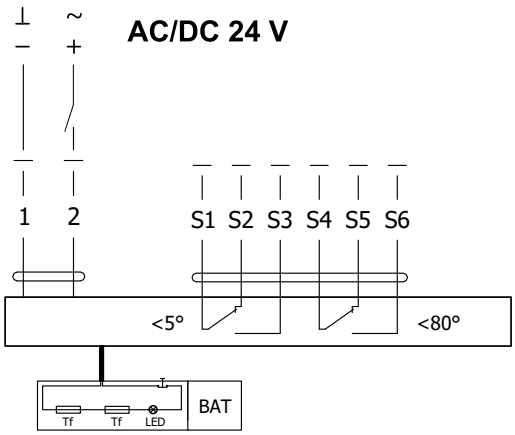
Fig. 6. Design .40 and .50



Actuator Belimo BFL 230-T



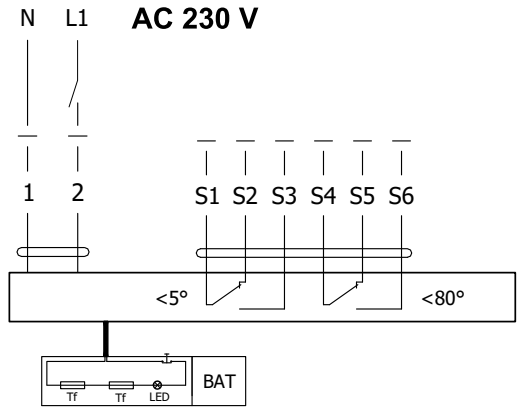
Actuator Belimo BFL 24-T(-ST)



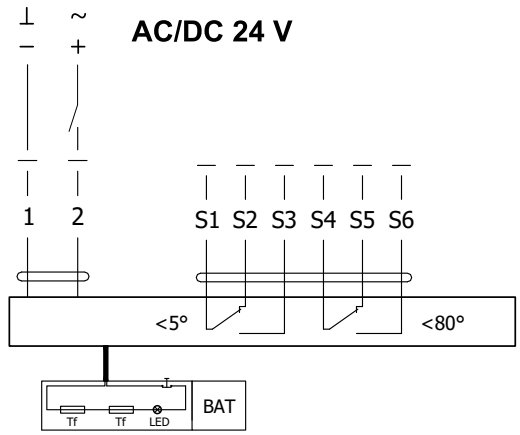
Tab. 1. Actuator BELIMO BFL 230-T(-ST), BFL 24-T(-ST)

Actuator BELIMO - 4 Nm / 3 Nm Spring	BFL 230-T(-ST)	BFL 24-T(-ST)
Power voltage	AC 230 V 50/60 Hz	AC/DC 24 V 50/60 Hz
Power consumption - in operation - in rest position	 3,5 W 1,1 W	 2,5 W 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 - spring return	 <60 s ~ 20 s	
Ambient temperature - normal duty - safety duty - non-operating temperature	 -30 °C … +55 °C The safe position will be attained up to max. +75 °C -40 °C … +55 °C	
Connecting - supply/control - auxiliary switch	 cable 1 m, 2 x 0,75 mm² (BFL 2xx-T-ST) with 3-pin plug-in connectors cable 1 m, 6 x 0,75 mm² (BFL 2xx-T-ST) with 6-pin plug-in connectors	
Response temperature thermal fuse	duct outside temperature +72 °C duct inside temperature +72 °C	

Actuator Belimo BFN 230-T



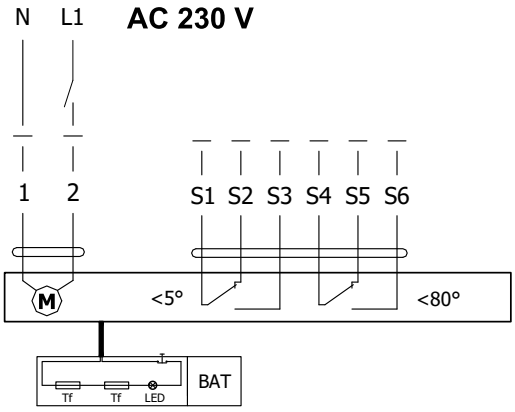
Actuator Belimo BFN 24-T(-ST)



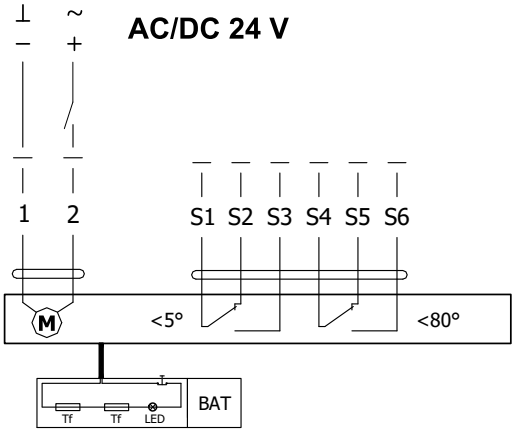
Tab. 2. Actuator BELIMO BFN 230-T(-ST), BFN 24-T(-ST)

Actuator BELIMO - 9 Nm / 7 Nm Spring	BFN 230-T(-ST)	BFN 24-T(-ST)
Power voltage	AC 24 V 50/60 Hz	AC/DC 24 V 50/60 Hz
Power consumption - in operation - in rest position	 5 W 2,1 W	 4 W 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 - spring return	 < 60 s ~ 20 s	
Ambient Temperature - normal duty - safety duty - non-operating temperature	 -30 °C … +55 °C The safe position will be attained up to max. +75 °C -40 °C … +55 °C	
Connecting - supply/control - auxiliary switch	 cable 1 m, 2 x 0,75 mm² (BFN 2xx-T-ST) with 3-pin plug-in connectors 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 Duct inside temperature +72 °C	

Actuator Belimo BF 230-TN



Actuator Belimo BF 24-TN(-ST)



Tab. 3. 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 50/60Hz	AC/DC 24 V 50/60Hz
Power consumption - in operation - in rest position	 8,5 W 3 W	 7 W 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 - spring return	 120 s ~ 16 s	
Ambient Temperature - normal duty - safety duty - non-operating temperature	 -30 °C … +50 °C The safe position will be attained up to max. +75 °C -40 °C … +50 °C	
Connecting - supply/control - auxiliary switch	 cable 1 m, 2 x 0,75 mm² (BF 2xx-TN-ST) with 3-pin plug-in connectors cable 1 m, 6 x 0,75 mm² (BF 2xx-TN-ST) with 6-pin plug-in connectors	
Response temperature thermal fuse	Duct outside temperature +72 °C Duct inside temperature +72 °C	

Thermoelectric activation device BAT

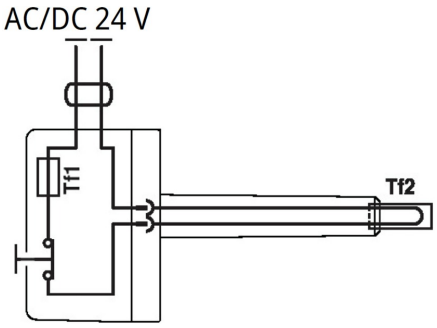
If the thermal fuse Tf1 is interrupted (due to temperature outside the duct), it is necessary to replace the spring return actuator. Thermoelectric activation device BAT is integral part of the actuator.

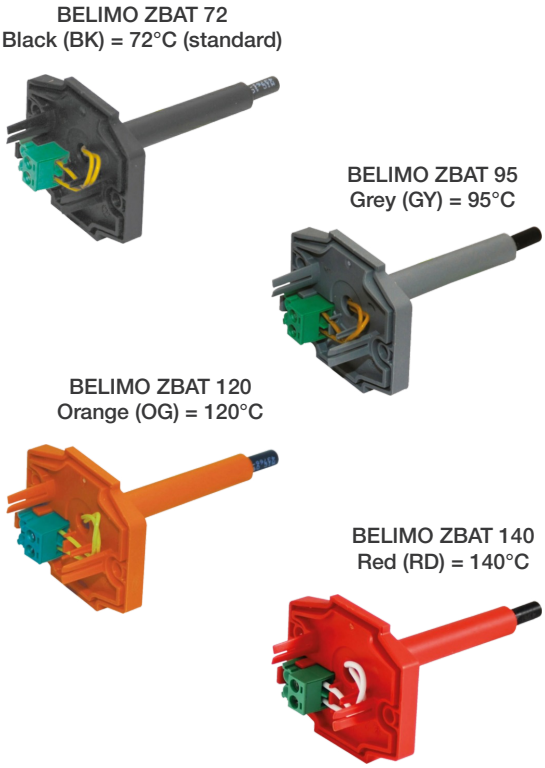
If the thermal fuse Tf2 is interrupted (due to temperature inside the duct), only the spare part ZBAT 72 (95/120/140) needs to be replaced (acc.to the activation temperature).

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, selftapping screws.





Tab. 4. Thermoelectric activation device

BAT 72 (95/120/140)	
Power voltage	AC/DC 24 V 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 Storage temperature Ambient humidity	-30°C … +50°C -40°C … +50°C 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 Duct outside temperature +72 (95/120/140)°C

3. Material, dimensions, weights and effective area

3.1 Material

Damper casings are made from galvanized sheet metal without further surface treatment.

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

Manual control have cover made of mechanically resistant and durable plastic and the other parts are galvanized without further surface treatment.

Thermal fuses are made of sheet brass, thickness 0,5 mm.

Fasteners and springs are galvanized.

According to the customer's requirements, dampers can be made of stainless steel material.

Specifications for stainless-steel design:

- Class A2 – Food-grade stainless steel (AISI 304 – EN 1.4301)
- Class A4 – Chemistry-grade stainless steel (AISI 316, 316L – EN 1.4401, EN 1.4404)

The respective stainless steel is the material for all components that are located or entering the damper inner space; components outside the damper casing are typically from galvanised sheet metal (fasteners for mounting the actuator or manual control, mechanical components except Item 4), frame components.

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

1) Damper casing and all components permanently attached.
2) Blade holders including pins, metal parts of blades.
3) Control components inside the damper (L-profile, pin with lever, rod, fasteners).
4) Parts of a manual contol entering the inner space of a damper casing (lower sheet of a manual control, lock holder "1", lock lever "2", closing spring, 8 dia. stopper pin, manual control pin).
5) Inspection opening cover including the stirrup and fasteners (if they are parts of the cover).
6) Bearing for torque transfer from the lever with pin on the blade L-profile (made from AISI 440C).

The damper blade is made from a board of homogeneous material Promatect- MST, thickness 40 mm or it is composed of two Promatect-H boards, thickness 20 mm, connected by galvanized "U" clips on the outside, sealed with Promat K84 glue.

Thermal fuse is identical for all material variants of the dampers. Upon specification by customer, the thermal fuse can be made from A4 from stainless steel sheet metal.

Thermoelectric activation device BAT is modified for stainless-steel variant of the dampers; standard galvanised screws are replaced with stainless-steel M4 screws of corresponding class. Damper casing has stainless-steel riveting M4 nuts.

Plastic, rubber and silicon components, sealants, foaming tapes, glass-ceramic seals, housings, brass bearings of the blade, actuators, and end switches are identical for all material variants of the dampers.

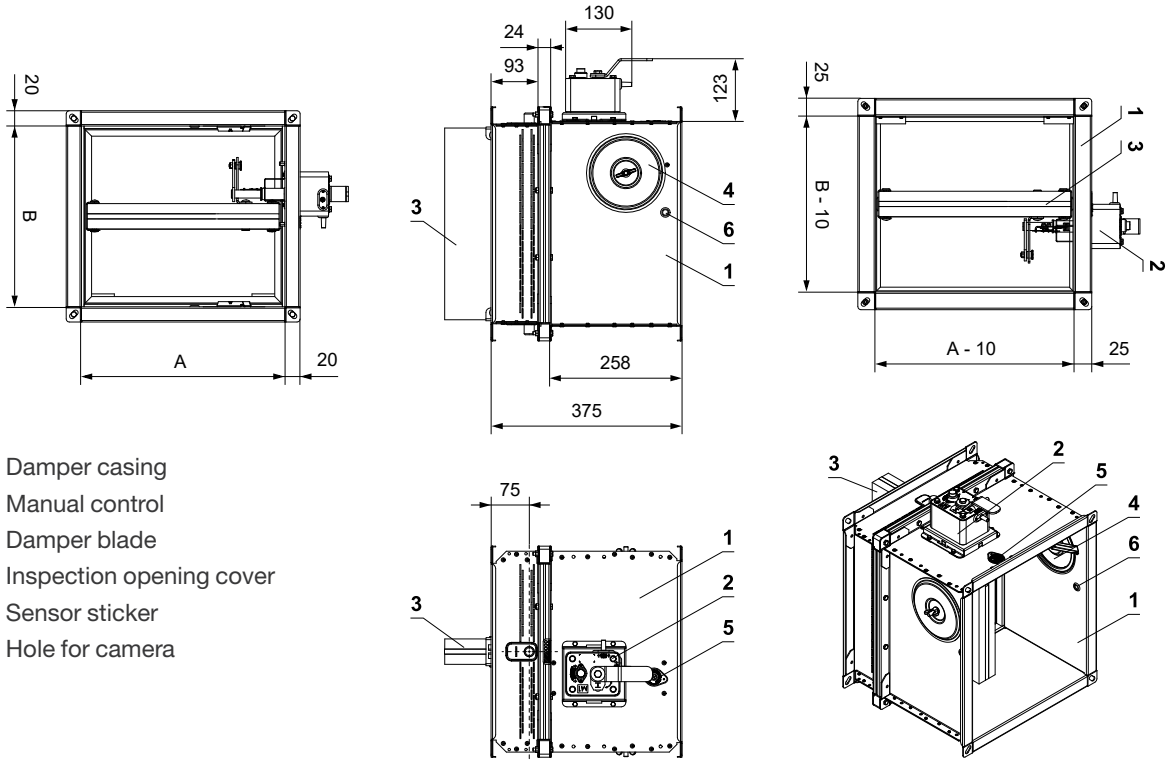
Some fasteners and components are only available in one class of stainless steel; the type will be used in all stainless-steel variants.

The damper blade in the variant for chemical environments (Class A4) is 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.

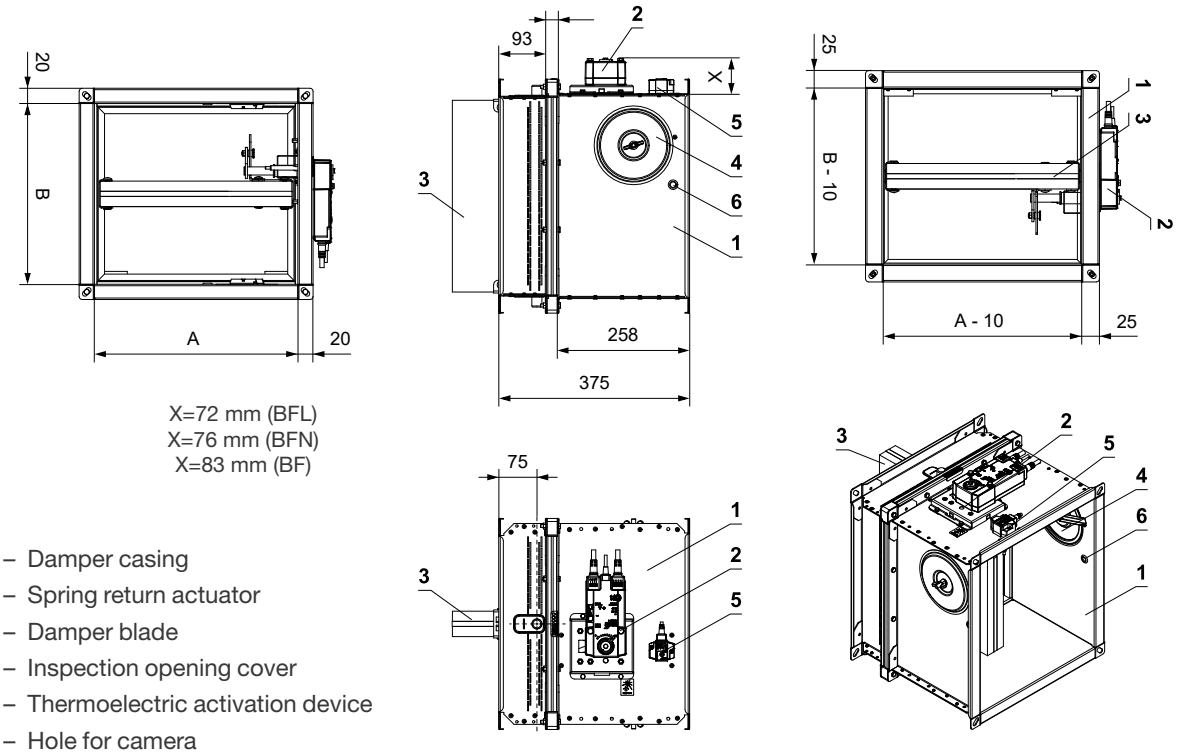
3.2 Dimensions

Fig. 7. FDMQ 120 with manual control



1 – Damper casing
2 – Manual control
3 – Damper blade
4 – Inspection opening cover
5 – Sensor sticker
6 – Hole for camera

Fig. 8. FDMQ 120 with spring return actuator



X=72 mm (BFL)
X=76 mm (BFN)
X=83 mm (BF)

1 – Damper casing
2 – Spring return actuator
3 – Damper blade
4 – Inspection opening cover
5 – Thermoelectric activation device
6 – Hole for camera

3.3 Damper blade overlaps

Open damper blade overlaps the damper casing by the value “a” or “c”. These values are specified in Tab. 5. Values “a” and “c” has to be respected when projecting following air-conditioning duct.

Fig. 9. Damper overlaps

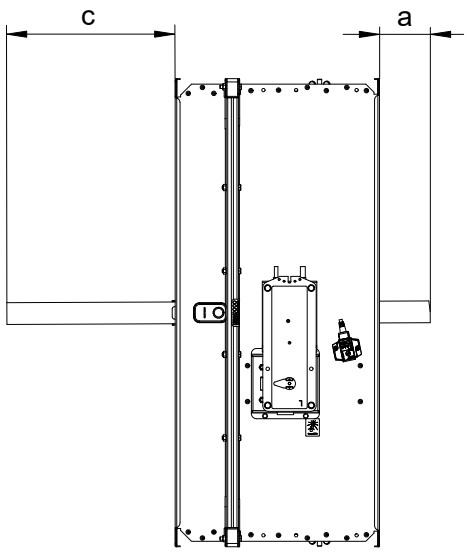


Fig. 10. Flange of damper - CONTROL SIDE

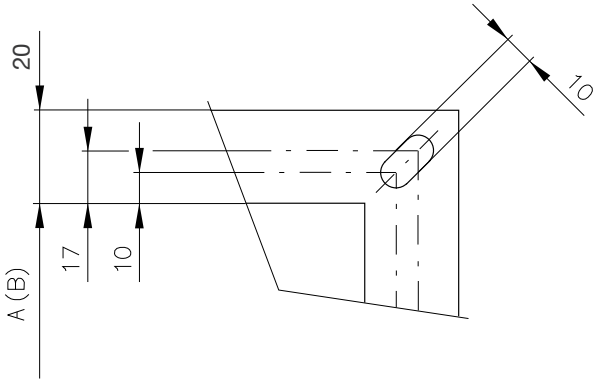
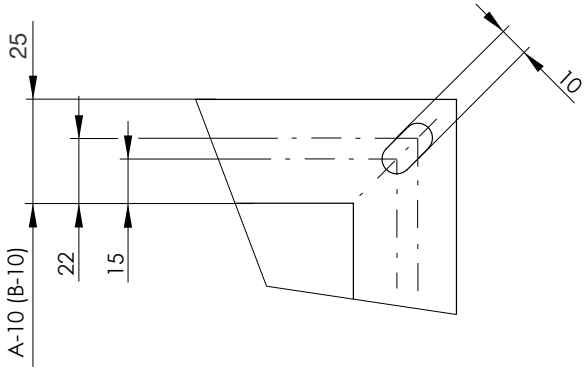


Fig. 11. Flange of Damper - INSTALLATION SIDE



20 mm wide flanges are fitted with oval holes in the corners.

Tab. 5. Technical parameters

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
150×150	-	-	8,3	8,4	0,0094	BFL	M1
×180	-	13	8,8	8,9	0,0131	BFL	M1
×200	-	23	9,1	9,2	0,0156	BFL	M1
×225	-	35,5	9,7	9,8	0,0188	BFL	M1
×250	-	48	10,2	10,3	0,0219	BFL	M1
×280	-	63	10,7	10,8	0,0256	BFL	M1
×300	-	73	11,3	11,4	0,0281	BFL	M1
×315	-	80,5	11,5	11,6	0,0300	BFL	M1
×355	-	100,5	12,5	12,6	0,0350	BFL	M1
×400	-	123	13,4	13,5	0,0406	BFL	M1
×450	-	148	14,3	14,4	0,0469	BFL	M1
×500	-	173	15,2	15,3	0,0531	BFL	M1
×550	-	198	15,8	15,9	0,0594	BFL	M1
×560	-	203	16,0	16,1	0,0606	BFL	M2
×600	-	223	16,7	16,8	0,0656	BFL	M2
×630	-	238	17,3	17,4	0,0694	BFL	M2
180×150	-	-	9,1	9,2	0,0116	BFL	M1
×180	-	13	9,7	9,8	0,0163	BFL	M1
×200	-	23	10,1	10,2	0,0194	BFL	M1
×225	-	36	10,7	10,8	0,0233	BFL	M1
×250	-	48	11,2	11,3	0,0271	BFL	M1
×280	-	63	11,8	11,9	0,0318	BFL	M1
×300	-	73	12,4	12,5	0,0349	BFL	M1
×315	-	80,5	12,7	12,8	0,0372	BFL	M1
×355	-	100,5	13,7	13,8	0,0434	BFL	M1
×400	-	123	14,6	14,7	0,0504	BFL	M1
×450	-	148	15,6	15,7	0,0581	BFL	M1
×500	-	173	16,6	16,7	0,0659	BFL	M2
×550	-	198	14,4	14,5	0,0736	BFL	M2
×560	-	203	17,5	17,6	0,0752	BFL	M2
×600	-	223	18,3	18,4	0,0814	BFL	M2
×630	-	238	18,9	19,0	0,0860	BFL	M2
×650	3	248	19,3	19,4	0,0891	BFL	M2
×700	28	273	20,3	20,7	0,0969	BFN	M2
×710	33	278	20,5	20,9	0,0984	BFN	M2
×750	53	298	21,3	21,7	0,1046	BFN	M2
×800	78	323	22,2	22,6	0,1124	BFN	M2
200×150	-	-	9,5	9,6	0,0131	BFL	M1
×180	-	13	10,1	10,2	0,0184	BFL	M1
×200	-	23	10,5	10,6	0,0219	BFL	M1
×225	-	36	11,2	11,3	0,0263	BFL	M1
×250	-	48	11,7	11,8	0,0306	BFL	M1
×280	-	63	12,3	12,4	0,0359	BFL	M1
×300	-	73	12,9	13,0	0,0394	BFL	M1
×315	-	80,5	13,2	13,3	0,0420	BFL	M1
×355	-	100,5	14,3	14,4	0,0490	BFL	M1
×400	-	123	15,2	15,3	0,0569	BFL	M1
×450	-	148	16,2	16,3	0,0656	BFL	M1
×500	-	173	17,3	17,4	0,0744	BFL	M2
×550	-	198	18,0	18,1	0,0831	BFL	M2
×560	-	203	18,2	18,3	0,0849	BFL	M2
×600	-	223	19,1	19,2	0,0919	BFL	M2

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×630	-	238	19,7	19,8	0,0971	BFL	M2
×650	3	248	20,1	20,2	0,1006	BFL	M2
×700	28	273	21,2	21,6	0,1094	BFN	M2
×710	33	278	21,4	21,8	0,1111	BFN	M2
×750	53	298	22,2	22,6	0,1181	BFN	M2
×800	78	323	23,2	23,6	0,1269	BFN	M2
225×150	-	-	10,0	10,1	0,0150	BFL	M1
×180	-	13	10,6	10,7	0,0210	BFL	M1
×200	-	23	11,0	11,1	0,0250	BFL	M1
×225	-	36	11,7	11,8	0,0300	BFL	M1
×250	-	48	12,3	12,4	0,0350	BFL	M1
×280	-	63	12,9	13,0	0,0410	BFL	M1
×300	-	73	13,5	13,6	0,0450	BFL	M1
×315	-	80,5	13,9	14,0	0,0480	BFL	M1
×355	-	100,5	15,0	15,1	0,0560	BFL	M1
×400	-	123	16,0	16,1	0,0650	BFL	M1
×450	-	148	17,1	17,2	0,0750	BFL	M1
×500	-	173	18,2	18,3	0,0850	BFL	M2
×550	-	198	19,0	19,1	0,0950	BFL	M2
×560	-	203	19,2	19,3	0,0970	BFL	M2
×600	-	223	20,1	20,5	0,1050	BFL	M2
×630	-	238	20,8	21,2	0,1110	BFN	M2
×650	3	248	21,2	21,6	0,1150	BFN	M2
×700	28	273	22,3	22,7	0,1250	BFN	M2
×710	33	278	22,5	22,9	0,1270	BFN	M2
×750	53	298	23,4	23,8	0,1350	BFN	M2
×800	78	323	24,5	24,9	0,1450	BFN	M2
250×150	-	-	10,4	10,5	0,0169	BFL	M1
×180	-	13	12,1	12,2	0,0236	BFL	M1
×200	-	23	11,5	11,6	0,0281	BFL	M1
×225	-	36	12,3	12,4	0,0338	BFL	M1
×250	-	48	12,8	12,9	0,0394	BFL	M1
×280	-	63	13,5	13,6	0,0461	BFL	M1
×300	-	73	14,2	14,3	0,0506	BFL	M1
×315	-	80,5	14,5	14,6	0,0540	BFL	M1
×355	-	100,5	15,7	15,8	0,0630	BFL	M1
×400	-	123	16,7	16,8	0,0731	BFL	M1
×450	-	148	17,9	18,0	0,0844	BFL	M1
×500	-	173	19,0	19,1	0,0956	BFL	M2
×550	-	198	19,9	20,0	0,1069	BFL	M2
×560	-	203	20,1	20,2	0,1091	BFL	M2
×600	-	223	21,1	21,5	0,1181	BFN	M2
×630	-	238	21,8	22,2	0,1249	BFN	M2
×650	3	248	22,3	22,7	0,1294	BFN	M2
×700	28	273	23,4	23,8	0,1406	BFN	M2
×710	33	278	23,6	24,0	0,1429	BFN	M2
×750	53	298	24,6	25,0	0,1519	BFN	M3
×800	78	323	25,7	26,1	0,1631	BFN	M3
280×150	-	-	11,0	11,1	0,0191	BFL	M1
×180	-	13	11,7	11,8	0,0268	BFL	M1
×200	-	23	12,2	12,3	0,0319	BFL	M1
×225	-	36	12,9	13,0	0,0383	BFL	M1

A×B (mm)	a	c	Weight man. (kg)	Weight actu. (kg)	Effect. area Sef (m²)	Spring return actu.	Manual contr.
×250	-	48	13,5	13,6	0,0446	BFL	M1
×280	-	63	14,3	14,4	0,0523	BFL	M1
×300	-	73	14,9	15,0	0,0574	BFL	M1
×315	-	80,5	15,3	15,4	0,0612	BFL	M1
×355	-	100,5	16,5	16,6	0,0714	BFL	M1
×400	-	123	17,6	17,7	0,0829	BFL	M1
×450	-	148	18,9	19,0	0,0956	BFL	M1
×500	-	173	20,1	20,2	0,1084	BFL	M2
×550	-	198	21,0	21,1	0,1211	BFL	M2
×560	-	203	21,3	21,7	0,1237	BFN	M2
×600	-	223	22,3	22,7	0,1339	BFN	M2
×630	-	238	23,0	23,4	0,1415	BFN	M2
×650	3	248	23,5	23,9	0,1466	BFN	M2
×700	28	273	24,7	25,1	0,1594	BFN	M2
×710	33	278	25,0	25,4	0,1619	BFN	M2
×750	53	298	26,0	26,4	0,1721	BFN	M3
×800	78	323	27,2	27,6	0,1849	BFN	M3
300×150	-	-	11,3	11,4	0,0206	BFL	M1
×180	-	13	12,1	12,2	0,0289	BFL	M1
×200	-	23	12,6	12,7	0,0344	BFL	M1
×225	-	36	13,4	13,5	0,0413	BFL	M1
×250	-	48	14,0	14,1	0,0481	BFL	M1
×280	-	63	14,8	14,9	0,0564	BFL	M1
×300	-	73	15,7	15,8	0,0619	BFL	M1
×315	-	80,5	16,1	16,2	0,0660	BFL	M1
×355	-	100,5	17,3	17,4	0,0770	BFL	M1
×400	-	123	18,5	18,6	0,0894	BFL	M1
×450	-	148	19,7	19,8	0,1031	BFL	M1
×500	-	173	21,0	21,1	0,1169	BFL	M2
×550	-	198	21,8	22,2	0,1306	BFN	M2
×560	-	203	22,0	22,4	0,1334	BFN	M2
×600	-	223	23,0	23,4	0,1444	BFN	M2
×630	-	238	23,8	24,2	0,1526	BFN	M2
×650	3	248	24,3	24,7	0,1581	BFN	M2
×700	28	273	25,5	25,9	0,1719	BFN	M2
×710	33	278	25,8	26,2	0,1746	BFN	M2
×750	53	298	26,8	27,2	0,1856	BFN	M3
×800	78	323	28,0	28,4	0,1994	BFN	M3
315×150	-	-	11,6	11,7	0,0218	BFL	M1
×180	-	13	12,4	12,5	0,0305	BFL	M1
×200	-	23	12,9	13,0	0,0363	BFL	M1
×225	-	36	13,7	13,8	0,0435	BFL	M1
×250	-	48	14,3	14,4	0,0508	BFL	M1
×280	-	63	15,1	15,2	0,0595	BFL	M1
×300	-	73	16,1	16,2	0,0653	BFL	M1
×315	-	80,5	16,5	16,6	0,0696	BFL	M1
×355	-	100,5	17,7	17,8	0,0812	BFL	M1
×400	-	123	18,9	19,0	0,0943	BFL	M1
×450	-	148	20,2	20,3	0,1088	BFL	M1
×500	-	173	21,5	21,6	0,1233	BFL	M2
×550	-	198	22,3	22,7	0,1378	BFN	M2
×560	-	203	22,6	23,0	0,1407	BFN	M2
×600	-	223	23,6	24,0	0,1680	BFN	M2
×630	-	238	24,3	24,7	0,1610	BFN	M2

A×B (mm)	a	c	Weight man. (kg)	Weight actu. (kg)	Effect. area Sef (m²)	Spring return actu.	Manual contr.
×650	3	248	24,8	25,2	0,1668	BFN	M2
×700	28	273	26,1	26,5	0,1813	BFN	M2
×710	33	278	26,4	26,8	0,1842	BFN	M2
×750	53	298	27,4	27,8	0,1958	BFN	M3
×800	78	323	28,7	29,1	0,2103	BFN	M3
355×150	-	-	12,4	12,5	0,0248	BFL	M1
×180	-	13	13,1	13,2	0,0347	BFL	M1
×200	-	23	13,7	13,8	0,0413	BFL	M1
×225	-	36	14,6	14,7	0,0495	BFL	M1
×250	-	48	15,3	15,4	0,0578	BFL	M1
×280	-	63	16,1	16,2	0,0677	BFL	M1
×300	-	73	17,1	17,2	0,0743	BFL	M1
×315	-	80,5	17,5	17,6	0,0792	BFL	M1
×355	-	100,5	18,8	18,9	0,0924	BFL	M1
×400	-	123	20,0	20,1	0,1073	BFL	M1
×450	-	148	21,4	21,5	0,1238	BFL	M1
×500	-	173	22,8	23,2	0,1403	BFN	M2
×550	-	198	23,7	24,1	0,1568	BFN	M2
×560	-	203	24,0	24,4	0,1601	BFN	M2
×600	-	223	25,0	25,4	0,1733	BFN	M2
×630	-	238	25,8	26,2	0,1832	BFN	M2
×650	3	248	26,4	26,8	0,1898	BFN	M2
×700	28	273	27,7	28,1	0,2063	BFN	M2
×710	33	278	28,0	28,4	0,2096	BFN	M2
×750	53	298	29,1	29,5	0,2228	BFN	M3
×800	78	323	30,4	32,5	0,2393	BF	M3
400×150	-	-	13,2	13,3	0,0281	BFL	M1
×180	-	13	14,0	14,1	0,0394	BFL	M1
×200	-	23	14,6	14,7	0,0469	BFL	M1
×225	-	36	15,6	15,7	0,0563	BFL	M1
×250	-	48	16,3	16,4	0,0656	BFL	M1
×280	-	63	17,2	17,3	0,0769	BFL	M1
×300	-	73	18,2	18,3	0,0844	BFL	M1
×315	-	80,5	18,6	18,7	0,0900	BFL	M1
×355	-	100,5	20,0	20,1	0,1050	BFL	M1
×400	-	123	21,3	21,4	0,1219	BFL	M1
×450	-	148	22,8	22,9	0,1406	BFL	M1
×500	-	173	24,3	24,7	0,1594	BFN	M2
×550	-	198	25,2	25,6	0,1781	BFN	M2
×560	-	203	25,5	25,9	0,1819	BFN	M2
×600	-	223	26,7	27,1	0,1969	BFN	M2
×630	-	238	27,5	27,9	0,2081	BFN	M2
×650	3	248	28,1	28,5	0,2156	BFN	M2
×700	28	273	29,5	29,9	0,2344	BFN	M2
×710	33	278	29,8	30,2	0,2381	BFN	M2
×750	53	298	31,0	33,1	0,2531	BF	M3
×800	78	323	32,4	34,5	0,2719	BF	M3
450×150	-	-	14,1	14,2	0,0319	BFL	M1
×180	-	13	15,0	15,1	0,0446	BFL	M1
×200	-	23	15,7	15,8	0,0531	BFL	M1
×225	-	36	16,7	16,8	0,0638	BFL	M1
×250	-	48	17,5	17,6	0,0744	BFL	M1
×280	-	63	18,4	18,5	0,0871	BFL	M1
×300	-	73	19,4	19,5	0,0956	BFL	M1

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×315	-	80,5	19,9	20,0	0,1020	BFL	M1
×355	-	100,5	21,4	21,5	0,1190	BFL	M1
×400	-	123	22,8	22,9	0,1381	BFL	M1
×450	-	148	24,3	24,7	0,1594	BFN	M2
×500	-	173	25,9	26,3	0,1806	BFN	M2
×550	-	198	27,0	27,4	0,2019	BFN	M2
×560	-	203	27,3	27,7	0,2061	BFN	M2
×600	-	223	28,5	28,9	0,2231	BFN	M2
×630	-	238	29,4	29,8	0,2359	BFN	M2
×650	3	248	30,0	30,4	0,2444	BFN	M2
×700	28	273	31,6	33,7	0,2656	BF	M2
×710	33	278	31,9	34,0	0,2699	BF	M2
×750	53	298	33,1	35,2	0,2869	BF	M3
×800	78	323	34,6	36,7	0,3081	BF	M3
500×150	-	-	15,0	15,1	0,0356	BFL	M1
×180	-	13	16,0	16,1	0,0499	BFL	M1
×200	-	23	16,7	16,8	0,0594	BFL	M1
×225	-	36	17,8	17,9	0,0713	BFL	M1
×250	-	48	18,6	18,7	0,0831	BFL	M1
×280	-	63	19,7	19,8	0,0974	BFL	M1
×300	-	73	20,7	20,8	0,1069	BFL	M1
×315	-	80,5	21,2	21,3	0,1140	BFL	M1
×355	-	100,5	22,7	22,8	0,1330	BFL	M1
×400	-	123	24,2	24,3	0,1544	BFL	M2
×450	-	148	25,9	26,3	0,1781	BFN	M2
×500	-	173	27,5	27,9	0,2019	BFN	M2
×550	-	198	29,0	29,4	0,2256	BFN	M2
×560	-	203	29,3	29,7	0,2304	BFN	M2
×600	-	223	30,7	31,1	0,2494	BFN	M2
×630	-	238	31,7	32,1	0,2636	BFN	M2
×650	3	248	32,4	34,5	0,2731	BF	M2
×700	28	273	34,0	36,1	0,2969	BF	M2
×710	33	278	34,4	36,5	0,3016	BF	M2
×750	53	298	35,7	37,8	0,3206	BF	M3
×800	78	323	37,4	39,5	0,3444	BF	M3
550×150	-	-	16,0	16,1	0,0394	BFL	M1
×180	-	13	17,0	17,1	0,0551	BFL	M1
×200	-	23	17,8	17,9	0,0656	BFL	M1
×225	-	36	18,9	19,0	0,0788	BFL	M1
×250	-	48	19,8	19,9	0,0919	BFL	M1
×280	-	63	20,9	21,0	0,1076	BFL	M1
×300	-	73	21,9	22,0	0,1181	BFL	M1
×315	-	80,5	22,5	22,6	0,1260	BFL	M1
×355	-	100,5	24,1	24,2	0,1470	BFL	M1
×400	-	123	25,7	26,1	0,1706	BFN	M2
×450	-	148	27,4	27,8	0,1969	BFN	M2
×500	-	173	29,4	29,8	0,2231	BFN	M2
×550	-	198	30,7	31,1	0,2494	BFN	M2
×560	-	203	31,1	31,5	0,2546	BFN	M2
×600	-	223	32,5	32,9	0,2756	BFN	M2
×630	-	238	33,6	35,7	0,2914	BF	M2
×650	3	248	34,3	36,4	0,3019	BF	M2
×700	28	273	36,1	38,2	0,3281	BF	M2
×710	33	278	36,4	38,5	0,3334	BF	M2

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×750	53	298	37,8	39,9	0,3544	BF	M3
×800	78	323	39,6	41,7	0,3806	BF	M3
560×150	-	-	16,1	16,2	0,0401	BFL	M1
×180	-	13	17,2	17,3	0,0562	BFL	M1
×200	-	23	18,0	18,1	0,0669	BFL	M1
×225	-	36	19,1	19,2	0,0803	BFL	M1
×250	-	48	20,0	20,1	0,0936	BFL	M1
×280	-	63	21,2	21,3	0,1097	BFL	M1
×300	-	73	22,2	22,3	0,1204	BFL	M1
×315	-	80,5	22,7	22,8	0,1284	BFL	M1
×355	-	100,5	24,4	24,5	0,1498	BFL	M1
×400	-	123	26,0	26,4	0,1739	BFN	M2
×450	-	148	27,7	28,1	0,2006	BFN	M2
×500	-	173	29,8	30,2	0,2274	BFN	M2
×550	-	198	31,1	31,5	0,2541	BFN	M2
×560	-	203	31,4	31,8	0,2595	BFN	M2
×600	-	223	32,9	33,3	0,2809	BFN	M2
×630	-	238	34,0	36,1	0,2969	BF	M2
×650	3	248	34,7	36,8	0,3076	BF	M2
×700	28	273	36,5	38,6	0,3344	BF	M2
×710	33	278	36,8	38,9	0,3397	BF	M2
×750	53	298	38,3	40,4	0,3611	BF	M3
×800	78	323	40,0	42,1	0,3879	BF	M3
600×150	-	-	16,9	17,0	0,0431	BFL	M1
×180	-	13	18,0	18,1	0,0604	BFL	M1
×200	-	23	18,8	18,9	0,0719	BFL	M1
×225	-	36	20,0	20,1	0,0863	BFL	M1
×250	-	48	21,0	21,1	0,1006	BFL	M1
×280	-	63	22,2	22,3	0,1179	BFL	M1
×300	-	73	23,2	23,3	0,1294	BFL	M1
×315	-	80,5	23,7	23,8	0,1380	BFL	M1
×355	-	100,5	25,4	25,5	0,1610	BFL	M2
×400	-	123	27,1	27,5	0,1869	BFN	M2
×450	-	148	29,0	29,4	0,2156	BFN	M2
×500	-	173	31,1	31,5	0,2444	BFN	M2
×550	-	198	32,5	32,9	0,2731	BFN	M2
×560	-	203	32,8	33,2	0,2789	BFN	M2
×600	-	223	34,4	36,5	0,3019	BF	M2
×630	-	238	35,5	37,6	0,3191	BF	M2
×650	3	248	36,2	38,3	0,3306	BF	M2
×700	28	273	38,1	40,2	0,3594	BF	M2
×710	33	278	38,5	40,6	0,3651	BF	M2
×750	53	298	39,9	42,0	0,3881	BF	M3
×800	78	323	41,8	43,9	0,4169	BF	M3
630×150	-	-	17,4	17,5	0,0454	BFL	M1
×180	-	13	18,6	18,7	0,0635	BFL	M1
×200	-	23	19,4	19,5	0,0756	BFL	M1
×225	-	36	20,6	20,7	0,0908	BFL	M1
×250	-	48	21,7	21,8	0,1059	BFL	M1
×280	-	63	22,9	23,0	0,1240	BFL	M1
×300	-	73	23,9	24,0	0,1361	BFL	M1
×315	-	80,5	24,5	24,6	0,1452	BFL	M1
×355	-	100,5	26,3	26,4	0,1694	BFL	M2
×400	-	123	28,0	28,4	0,1966	BFN	M2

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×450	-	148	29,9	30,3	0,2269	BFN	M2
×500	-	173	32,0	32,4	0,2571	BFN	M2
×550	-	198	33,5	33,9	0,2874	BFN	M2
×560	-	203	33,9	34,3	0,2934	BFN	M2
×600	-	223	35,4	37,5	0,3176	BF	M2
×630	-	238	36,6	38,7	0,3358	BF	M2
×650	3	248	37,4	39,5	0,3479	BF	M2
×700	28	273	39,3	41,4	0,3781	BF	M2
×710	33	278	39,7	41,8	0,3842	BF	M2
×750	53	298	41,2	43,3	0,4084	BF	M3
×800	78	323	43,1	45,2	0,4386	BF	M4
650×150	-	-	17,8	17,9	0,0469	BFL	M1
×180	-	13	19,0	19,1	0,0656	BFL	M1
×200	-	23	19,9	20,0	0,0781	BFL	M1
×225	-	36	21,1	21,2	0,0938	BFL	M1
×250	-	48	22,1	22,2	0,1094	BFL	M1
×280	-	63	23,4	23,5	0,1281	BFL	M1
×300	-	73	24,4	24,5	0,1406	BFL	M1
×315	-	80,5	25,0	25,1	0,1500	BFL	M2
×355	-	100,5	26,8	26,9	0,1750	BFL	M2
×400	-	123	28,6	29,0	0,2031	BFN	M2
×450	-	148	30,5	30,9	0,2344	BFN	M2
×500	-	173	32,7	33,1	0,2656	BFN	M2
×550	-	198	34,2	34,6	0,2969	BFN	M2
×560	-	203	34,6	36,7	0,3031	BF	M2
×600	-	223	36,2	38,3	0,3281	BF	M2
×630	-	238	37,3	39,4	0,3469	BF	M2
×650	3	248	38,1	40,2	0,3594	BF	M2
×700	28	273	40,1	42,2	0,3906	BF	M2
×710	33	278	40,5	42,6	0,3969	BF	M2
×750	53	298	42,1	44,2	0,4219	BF	M3
×800	78	323	44,0	46,1	0,4531	BF	M4
700×150	-	-	18,7	18,8	0,0506	BFL	M1
×180	-	13	20,0	20,1	0,0709	BFL	M1
×200	-	23	20,9	21,0	0,0844	BFL	M1
×225	-	36	22,2	22,3	0,1013	BFL	M1
×250	-	48	23,3	23,4	0,1181	BFL	M1
×280	-	63	24,6	24,7	0,1384	BFL	M1
×300	-	73	25,7	25,8	0,1519	BFL	M2
×315	-	80,5	26,3	26,4	0,1620	BFL	M2
×355	-	100,5	28,2	28,6	0,1890	BFN	M2
×400	-	123	30,0	30,4	0,2194	BFN	M2
×450	-	148	32,0	32,4	0,2531	BFN	M2
×500	-	173	34,3	34,7	0,2869	BFN	M2
×550	-	198	35,9	38,0	0,3206	BF	M2
×560	-	203	36,3	38,4	0,3274	BF	M2
×600	-	223	38,0	40,1	0,3544	BF	M2
×630	-	238	39,2	41,3	0,3746	BF	M2
×650	3	248	40,0	42,1	0,3881	BF	M2
×700	28	273	42,1	44,2	0,4219	BF	M2
×710	33	278	42,5	44,6	0,4286	BF	M2
×750	53	298	44,2	46,3	0,4556	BF	M3
×800	78	323	46,2	48,3	0,4894	BF	M4
710×150	-	-	18,9	19,0	0,0514	BFL	M1

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×180	-	13	20,2	20,3	0,0719	BFL	M1
×200	-	23	21,1	21,2	0,0856	BFL	M1
×225	-	36	22,4	22,5	0,1028	BFL	M1
×250	-	48	23,5	23,6	0,1199	BFL	M1
×280	-	63	24,9	25,0	0,1404	BFL	M1
×300	-	73	25,9	26,0	0,1541	BFL	M2
×315	-	80,5	26,5	26,6	0,1644	BFL	M2
×355	-	100,5	28,4	28,8	0,1918	BFN	M2
×400	-	123	30,3	30,7	0,2226	BFN	M2
×450	-	148	32,3	32,7	0,2569	BFN	M2
×500	-	173	34,6	35,0	0,2911	BFN	M2
×550	-	198	36,3	38,4	0,3254	BF	M2
×560	-	203	36,7	38,8	0,3322	BF	M2
×600	-	223	38,4	40,5	0,3596	BF	M2
×630	-	238	39,6	41,7	0,3802	BF	M2
×650	3	248	40,4	42,5	0,3939	BF	M2
×700	28	273	42,5	44,6	0,4281	BF	M2
×710	33	278	42,9	45,0	0,4350	BF	M3
×750	53	298	44,6	46,7	0,4624	BF	M3
×800	78	323	46,7	48,8	0,4966	BF	M4
750×150	-	-	19,6	19,7	0,0544	BFL	M1
×180	-	13	21,0	21,1	0,0761	BFL	M1
×200	-	23	21,9	22,0	0,0906	BFL	M1
×225	-	36	23,3	23,4	0,1088	BFL	M1
×250	-	48	24,4	24,5	0,1269	BFL	M1
×280	-	63	25,9	26,0	0,1486	BFL	M2
×300	-	73	26,9	27,0	0,1631	BFL	M2
×315	-	80,5	27,5	27,6	0,1740	BFL	M2
×355	-	100,5	29,5	29,9	0,2030	BFN	M2
×400	-	123	31,4	31,8	0,2356	BFN	M2
×450	-	148	33,6	34,0	0,2719	BFN	M2
×500	-	173	35,9	36,3	0,3081	BFN	M2
×550	-	198	37,7	39,8	0,3444	BF	M2
×560	-	203	38,1	40,2	0,3516	BF	M2
×600	-	223	39,8	41,9	0,3806	BF	M2
×630	-	238	41,1	43,2	0,4024	BF	M2
×650	3	248	42,0	44,1	0,4169	BF	M2
×700	28	273	44,1	46,2	0,4531	BF	M3
×710	33	278	44,5	46,6	0,4604	BF	M3
×750	53	298	46,3	48,4	0,4894	BF	M3
×800	78	323	48,4	50,5	0,5256	BF	M4
800×150	-	-	20,6	20,7	0,0581	BFL	M1
×180	-	13	22,0	22,1	0,0814	BFL	M1
×200	-	23	23,0	23,1	0,0969	BFL	M1
×225	-	36	24,4	24,5	0,1163	BFL	M1
×250	-	48	25,6	25,7	0,1356	BFL	M2
×280	-	63	27,1	27,2	0,1589	BFL	M2
×300	-	73	28,2	28,3	0,1744	BFL	M2
×315	-	80,5	28,8	28,9	0,1860	BFL	M2
×355	-	100,5	30,9	31,3	0,2170	BFN	M2
×400	-	123	32,9	33,3	0,2519	BFN	M2
×450	-	148	35,1	35,5	0,2906	BFN	M2
×500	-	173	37,6	38,0	0,3294	BFN	M2
×550	-	198	39,4	41,5	0,3681	BF	M2

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×560	-	203	39,8	41,9	0,3759	BF	M2
×600	-	223	41,6	43,7	0,4069	BF	M2
×630	-	238	43,0	45,1	0,4301	BF	M3
×650	3	248	43,9	46,0	0,4456	BF	M3
×700	28	273	46,1	48,2	0,4844	BF	M3
×710	33	278	46,6	48,7	0,4921	BF	M3
×750	53	298	48,4	50,5	0,5231	BF	M3
×800	78	323	50,6	52,7	0,5619	BF	M4
900×150	-	-	22,4	22,5	0,0656	BFL	M1
×180	-	13	24,0	24,1	0,0919	BFL	M1
×200	-	23	25,1	25,2	0,1094	BFL	M1
×225	-	36	26,6	26,7	0,1313	BFL	M2
×250	-	48	27,9	28,0	0,1531	BFL	M2
×280	-	63	29,5	29,6	0,1794	BFL	M2
×300	-	73	30,6	30,7	0,1969	BFL	M2
×315	-	80,5	31,4	31,8	0,2100	BFN	M2
×355	-	100,5	33,6	34,0	0,2450	BFN	M2
×400	-	123	35,7	36,1	0,2844	BFN	M2
×450	-	148	38,2	38,6	0,3281	BFN	M2
×500	-	173	40,9	43,0	0,3719	BF	M2
×550	-	198	42,8	44,9	0,4156	BF	M2
×560	-	203	43,3	45,4	0,4244	BF	M3
×600	-	223	45,3	47,4	0,4594	BF	M3
×630	-	238	46,7	48,8	0,4856	BF	M3
×650	3	248	47,7	49,8	0,5031	BF	M3
×700	28	273	50,2	52,3	0,5469	BF	M3
×710	33	278	50,6	52,7	0,5556	BF	M3
×750	53	298	52,6	54,7	0,5906	BF	M3
×800	78	323	55,0	57,1	0,6344	BF	M4
1000×150	-	-	24,2	24,3	0,0731	BFL	M1
×180	-	13	26,0	26,1	0,1024	BFL	M1
×200	-	23	27,1	27,2	0,1219	BFL	M2
×225	-	36	28,8	28,9	0,1463	BFL	M2
×250	-	48	30,2	30,3	0,1706	BFL	M2
×280	-	63	32,0	32,1	0,1999	BFL	M2
×300	-	73	33,2	33,6	0,2194	BFN	M2
×315	-	80,5	33,9	34,3	0,2340	BFN	M2
×355	-	100,5	36,3	36,7	0,2730	BFN	M2
×400	-	123	38,6	39,0	0,3169	BFN	M2
×450	-	148	41,2	41,6	0,3656	BFN	M2
×500	-	173	44,1	46,2	0,4144	BF	M2
×550	-	198	46,3	48,4	0,4631	BF	M3
×560	-	203	46,8	48,9	0,4729	BF	M3
×600	-	223	48,9	51,0	0,5119	BF	M3
×630	-	238	50,5	52,6	0,5411	BF	M3
×650	3	248	51,5	53,6	0,5606	BF	M3
×700	28	273	54,2	56,3	0,6094	BF	M3
×710	33	278	54,7	56,8	0,6191	BF	M3
×750	53	298	56,8	58,9	0,6581	BF	M3
×800	78	323	59,4	61,5	0,7069	BF	M4
1100×180	-	13	28,0	28,1	0,1129	BFL	M1
×200	-	23	29,2	29,3	0,1344	BFL	M2
×225	-	36	31,0	31,1	0,1613	BFL	M2
×250	-	48	32,6	32,7	0,1881	BFL	M2

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×280	-	63	34,5	34,6	0,2204	BFL	M2
×300	-	73	35,7	36,1	0,2419	BFN	M2
×315	-	80,5	36,5	36,9	0,2580	BFN	M2
×355	-	100,5	39,0	39,4	0,3010	BFN	M2
×400	-	123	41,5	41,9	0,3494	BFN	M2
×450	-	148	44,3	46,4	0,4031	BF	M2
×500	-	173	47,4	49,5	0,4569	BF	M3
×550	-	198	49,7	51,8	0,5106	BF	M3
×560	-	203	50,3	52,4	0,5214	BF	M3
×600	-	223	52,6	54,7	0,5644	BF	M3
×630	-	238	54,3	56,4	0,5966	BF	M3
×650	3	248	55,4	57,5	0,6181	BF	M3
×700	28	273	58,2	60,3	0,6719	BF	M3
×710	33	278	58,8	60,9	0,6826	BF	M3
×750	53	298	61,0	63,1	0,7256	BF	M3
×800	78	323	63,9	66,0	0,7794	BF	M4
1250×180	-	13	30,9	31,0	0,1286	BFL	M2
×200	-	23	32,4	32,5	0,1531	BFL	M2
×225	-	36	34,3	34,4	0,1838	BFL	M2
×250	-	48	36,1	36,5	0,2144	BFL	M2
×280	-	63	38,2	38,6	0,2511	BFN	M2
×300	-	73	39,4	39,8	0,2756	BFN	M2
×315	-	80,5	40,3	40,7	0,2940	BFN	M2
×355	-	100,5	43,0	43,4	0,3430	BFN	M2
×400	-	123	45,8	46,2	0,3981	BFN	M2
×450	-	148	48,9	51,0	0,4594	BF	M3
×500	-	173	52,3	54,4	0,5206	BF	M3
×550	-	198	54,9	57,0	0,5819	BF	M3
×560	-	203	55,5	57,6	0,5941	BF	M3
×600	-	223	58,0	60,1	0,6431	BF	M3
×630	-	238	59,9	62,0	0,6799	BF	M3
×650	3	248	61,1	63,2	0,7044	BF	M3
×700	28	273	64,3	66,4	0,7656	BF	M4
×710	33	278	64,9	67,0	0,7779	BF	M4
×750	53	298	67,4	69,5	0,8269	BF	M5
×800	78	323	70,5	72,6	0,8881	BF	M5
1400×180	-	13	33,9	34,0	0,1444	BFL	M2
×200	-	23	35,5	35,6	0,1719	BFL	M2
×225	-	36	37,6	37,7	0,2063	BFL	M2
×250	-	48	39,6	40,0	0,2406	BFN	M2
×280	-	63	41,9	42,3	0,2819	BFN	M2
×300	-	73	43,1	43,5	0,3094	BFN	M2
×315	-	80,5	44,1	44,5	0,3300	BFN	M2
×355	-	100,5	47,1	47,5	0,3850	BFN	M2
×400	-	123	50,1	52,2	0,4469	BF	M3
×450	-	148	53,5	55,6	0,5156	BF	M3
×500	-	173	57,1	59,2	0,5844	BF	M3
×550	-	198	60,1	62,2	0,6531	BF	M3
×560	-	203	60,8	62,9	0,6669	BF	M3
×600	-	223	63,5	65,6	0,7219	BF	M3
×630	-	238	65,5	67,6	0,7631	BF	M4
×650	3	248	66,9	69,0	0,7906	BF	M5
×700	28	273	70,3	72,4	0,8594	BF	M5
×710	33	278	71,0	73,1	0,8731	BF	M5

A×B (mm)	a	c	Weight		Effect. area Sef (m²)	Spring return actu.	Manual contr.
			man. (kg)	actu. (kg)			
×750	53	298	73,7	75,8	0,9281	BF	M5
×800	78	323	77,1	79,2	0,9969	BF	M5
1500×180	-	13	35,9	36,0	0,1549	BFL	M2
×200	-	23	37,5	37,6	0,1844	BFL	M2
×225	-	36	39,8	39,9	0,2213	BFL	M2
×250	-	48	41,9	42,3	0,2581	BFN	M2
×280	-	63	44,4	44,8	0,3024	BFN	M2
×300	-	73	45,6	46,0	0,3319	BFN	M2
×315	-	80,5	46,7	47,1	0,3540	BFN	M2
×355	-	100,5	49,8	50,2	0,4130	BFN	M3
×400	-	123	53,0	55,1	0,4794	BF	M3
×450	-	148	56,6	58,7	0,5531	BF	M3
×500	-	173	60,4	62,5	0,6269	BF	M3
×550	-	198	63,5	65,6	0,7006	BF	M3
×560	-	203	64,3	66,4	0,7154	BF	M3
×600	-	223	67,1	69,2	0,7744	BF	M4
×630	-	238	69,3	71,4	0,8186	BF	M5
×650	3	248	70,7	72,8	0,8481	BF	M5
×700	28	273	74,3	76,4	0,9219	BF	M5
×710	33	278	75,0	77,1	0,9366	BF	M5
×750	53	298	77,9	80,0	0,9956	BF	M5
×800	78	323	81,5	83,6	1,0694	BF	M5

Sizes in increments of 5 mm can be manufactured on request.

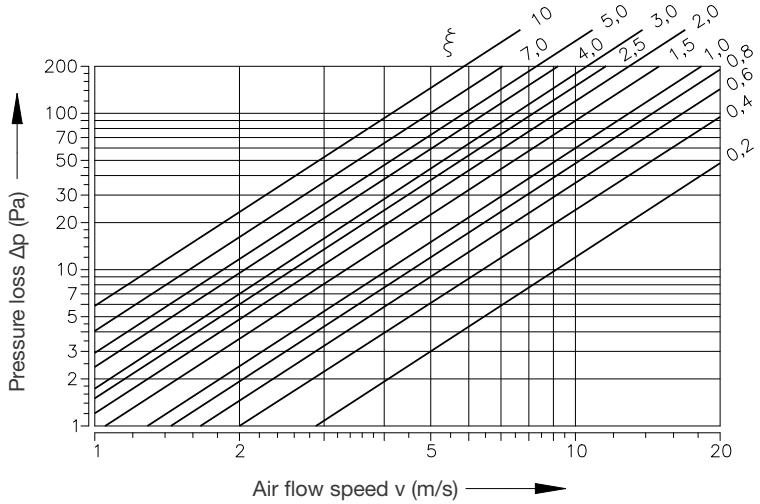
4. Technical data

4.1 Pressure loss

Pressure loss calculation

$$\Delta p = \xi * \rho * (v^2 / 2)$$

Δp - presure loss (Pa)
ξ - coefficient of local pressure loss
ρ - air density (kg/m³)
v - air flow speed (m/s)



Pressure losses for air density ρ=1,2 kg/m³

Tab. 6. Coefficient of local pressure loss ξ (-)

B	A													
	150	180	200	225	250	280	300	315	355	400	450	500	550	560
150	3,522	3,307	3,081	2,980	2,850	2,704	2,629	2,510	2,421	2,326	2,252	2,187	2,166	2,139
180	2,557	2,389	2,236	2,153	2,064	1,962	1,889	1,802	1,727	1,664	1,610	1,569	1,547	1,529
200	1,972	1,843	1,723	1,653	1,590	1,502	1,451	1,383	1,325	1,276	1,235	1,201	1,186	1,172
225	1,522	1,465	1,321	1,197	1,173	1,141	1,106	1,067	1,015	0,964	0,948	0,917	0,891	0,881
250	1,249	1,164	1,083	1,044	1,008	0,952	0,902	0,867	0,828	0,799	0,772	0,752	0,739	0,732
280	1,133	1,032	1,002	0,960	0,926	0,881	0,827	0,781	0,728	0,705	0,685	0,673	0,665	0,650
300	1,041	0,947	0,896	0,861	0,823	0,775	0,729	0,677	0,648	0,635	0,601	0,592	0,587	0,584
315	0,865	0,803	0,749	0,724	0,693	0,658	0,618	0,595	0,569	0,546	0,527	0,513	0,503	0,499
355	0,735	0,684	0,638	0,609	0,585	0,556	0,528	0,506	0,483	0,464	0,448	0,436	0,428	0,424
400	0,640	0,596	0,555	0,529	0,509	0,481	0,463	0,439	0,420	0,402	0,389	0,377	0,371	0,367
450	0,567	0,527	0,490	0,470	0,452	0,430	0,405	0,387	0,370	0,355	0,343	0,332	0,330	0,324
500	0,514	0,478	0,443	0,426	0,413	0,387	0,369	0,350	0,334	0,321	0,310	0,301	0,298	0,293
550	0,490	0,455	0,421	0,405	0,390	0,367	0,344	0,326	0,317	0,300	0,289	0,287	0,278	0,275
560	0,469	0,434	0,404	0,390	0,371	0,349	0,334	0,318	0,303	0,291	0,281	0,273	0,270	0,266
600	0,439	0,409	0,384	0,368	0,355	0,333	0,316	0,301	0,289	0,281	0,270	0,259	0,253	0,244
630	0,429	0,398	0,370	0,357	0,343	0,322	0,306	0,291	0,278	0,267	0,257	0,250	0,237	0,243
650	–	0,379	0,356	0,342	0,329	0,309	0,297	0,284	0,266	0,257	0,250	0,240	0,229	0,233
700	–	0,375	0,348	0,333	0,321	0,306	0,289	0,275	0,262	0,250	0,244	0,234	0,222	0,221
710	–	0,368	0,343	0,329	0,316	0,300	0,285	0,268	0,257	0,247	0,237	0,230	0,219	0,219
750	–	0,354	0,330	0,321	0,309	0,286	0,271	0,260	0,246	0,238	0,230	0,222	0,219	0,215
800	–	0,344	0,320	0,309	0,297	0,282	0,264	0,251	0,239	0,229	0,221	0,215	0,211	0,209

B	A												
	600	630	650	700	710	750	800	900	1000	1100	1250	1400	1500
150	2,112	2,091	2,083	2,067	2,062	2,044	2,029	1,992	1,972	–	–	–	–
180	1,513	1,495	1,480	1,469	1,462	1,449	1,436	1,412	1,394	1,377	1,363	1,348	1,340
200	1,154	1,144	1,131	1,123	1,120	1,109	1,099	1,080	1,066	1,053	1,040	1,031	1,024
225	0,874	0,861	0,841	0,833	0,824	0,817	0,810	0,795	0,785	0,775	0,758	0,744	0,740
250	0,725	0,714	0,705	0,704	0,698	0,693	0,685	0,673	0,665	0,656	0,648	0,641	0,638
280	0,645	0,641	0,617	0,612	0,606	0,601	0,593	0,585	0,576	0,563	0,549	0,540	0,530
300	0,569	0,554	0,550	0,549	0,548	0,541	0,532	0,524	0,507	0,496	0,490	0,488	0,480
315	0,493	0,487	0,481	0,479	0,476	0,470	0,467	0,459	0,452	0,447	0,442	0,436	0,434
355	0,419	0,414	0,408	0,405	0,404	0,399	0,397	0,389	0,384	0,379	0,374	0,370	0,368
400	0,363	0,358	0,352	0,351	0,350	0,345	0,343	0,336	0,331	0,327	0,324	0,321	0,318
450	0,319	0,315	0,311	0,310	0,309	0,306	0,301	0,296	0,293	0,289	0,286	0,281	0,280
500	0,288	0,285	0,284	0,281	0,279	0,276	0,273	0,268	0,264	0,261	0,258	0,256	0,254
550	0,272	0,269	0,264	0,259	0,256	0,254	0,253	0,248	0,245	0,242	0,237	0,234	0,232
560	0,264	0,259	0,256	0,255	0,253	0,250	0,248	0,244	0,240	0,236	0,233	0,231	0,230
600	0,242	0,241	0,239	0,238	0,237	0,233	0,228	0,226	0,222	0,219	0,216	0,214	0,212
630	0,240	0,237	0,234	0,233	0,232	0,229	0,226	0,223	0,220	0,217	0,213	0,211	0,209
650	0,230	0,227	0,225	0,223	0,222	0,219	0,216	0,210	0,208	0,206	0,201	0,198	0,196
700	0,219	0,219	0,218	0,217	0,215	0,213	0,211	0,207	0,204	0,202	0,199	0,196	0,194
710	0,217	0,217	0,216	0,215	0,214	0,212	0,209	0,205	0,201	0,199	0,197	0,195	0,193
750	0,211	0,208	0,206	0,205	0,204	0,203	0,201	0,197	0,193	0,189	0,187	0,185	0,183
800	0,206	0,203	0,201	0,200	0,199	0,197	0,194	0,191	0,188	0,186	0,183	0,182	0,181

5. Noise data

Level of acoustic output corrected with filter A

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

L_{WA}	(dB(A))	level of acoustic output corrected with filter A
L_{W1}	(dB)	level of acoustic output L_{W1} related to the 1 m^2 section
S	(m^2)	duct cross section
K_A	(dB)	correction to the weight filter A

Level of acoustic output in octave ranges

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

L_{Woct}	(dB)	spectrum of acoustic output in octave range
L_{W1}	(dB)	level of acoustic output L_{W1} related to the 1 m^2 section
S	(m^2)	duct cross section
L_{rel}	(dB)	relative level expressing the shape of the spectrum

Tables of acoustic values

Tab. 7. Level of accoustic output L_{W1} (dB) related to the 1 m^2 section

v	ξ (-)																
(m/s)	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0	1,5	2,0	2,5	3,0	4,0	5,0	8,0	10,0
2	15,5	18,7	20,9	22,6	24	25,2	26,3	27,2	28	31,2	33,4	35,1	36,5	38,8	40,5	44,2	45,9
3	26,1	29,2	31,5	33,2	34,6	35,8	36,9	37,8	38,6	41,7	44,0	45,7	47,1	49,4	51,1	54,7	56,5
4	33,6	36,7	39	40,7	42,1	43,3	44,3	45,3	46,1	49,2	51,5	53,2	54,6	56,9	58,6	62,2	64
5	39,4	42,5	44,8	46,5	47,9	49,1	50,2	51,1	51,9	55	57,3	59	60,4	62,7	64,4	68	69,8
6	44,1	47,3	49,5	51,3	52,7	53,9	54,9	55,8	56,6	59,8	62	63,8	65,2	67,4	69,2	72,8	74,5
7	48,2	51,3	53,5	55,3	56,7	57,9	58,9	59,8	60,7	63,8	66,1	67,8	69,2	71,4	73,2	76,8	78,6
8	51,6	54,8	57	58,8	60,2	61,4	62,4	63,3	64,1	67,3	69,5	71,3	72,7	74,9	76,7	80,3	82
9	54,7	57,9	60,1	61,8	63,2	64,4	65,5	66,4	67,2	70,4	72,6	74,3	75,7	78	79,7	83,4	85,1
10	57,4	60,6	62,8	64,6	66	67,2	68,2	69,1	70	73,1	75,3	77,1	78,5	80,7	82,5	86,1	87,9
11	59,9	63,1	65,3	67,1	68,5	69,7	70,7	71,6	72,4	75,6	77,8	79,6	81	83,2	85	88,6	90,3
12	62,2	65,4	67,6	69,3	70,7	71,9	73	73,9	74,7	77,9	80,1	81,8	83,2	85,5	87,2	90,9	92,6

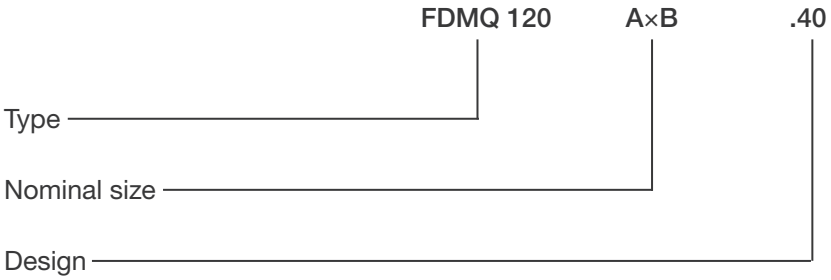
Tab. 8. Correction to the weight filter A

v (m/s)	2	3	4	5	6	7	8	9	10	11	12
(dB)	-15	-11,8	-9,8	-8,4	-7,3	-6,4	-5,7	-5	-4,5	-4	-3,6

Tab. 9. Relative level expressing the shape of the spectrum L_{rel}

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

6. Product marking



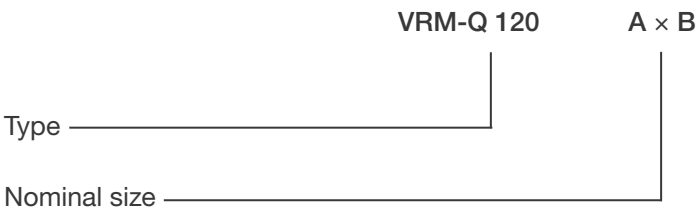
- .01 - Manual control and thermal
- .02 - Manual control and thermal (Zone 1,2)
- .11 - Manual control and thermal with a terminal switch („CLOSED“)
- .12 - Manual control and thermal with a terminal switch („CLOSED“) (ATEX zone 1,2)
- .40 - With actuator BF 230-TN (BFL, BFN 230-T) - voltage AC 230 V
- .50 - With actuator BF 24-TN (BFL, BFN 24-T) - voltage AC/DC 24 V
- .80 - Manual control and thermal with two terminal switches („OPEN“, „CLOSED“)
- .81 - Manual control and thermal with two terminal switches („OPEN“, „CLOSED“) (ATEX zone 1,2)

Example: FDMQ 120 800×400 .40

If dampers with installation frame are required, that must be specified separately in the order. The installation frame can be installed on the damper or delivered separately.

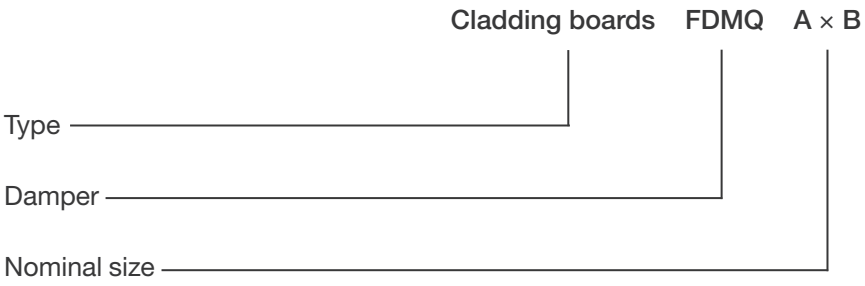
6.1 Accessories

Reinforcing frame VRM-Q 120



Example: VRM 120 800×400

Protective cladding boards



Example: Cladding boards FDMQ 800×400

6.2 Data label

Data label is placed on the damper body.

7. Installation

7.1 Placement and installation

The fire dampers are suitable for installation in arbitrary position in vertical and horizontal passages of fire separating constructions. 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.

The damper must be installed so that the damper blade (in closed position) is situated in the fire separating construction - marked by the label BUILT-IN EDGE on the damper casing. If such solution is not possible, the duct between the fire separating construction and the damper blade must be protected according to the certified installation method, see pages 27 to 41.

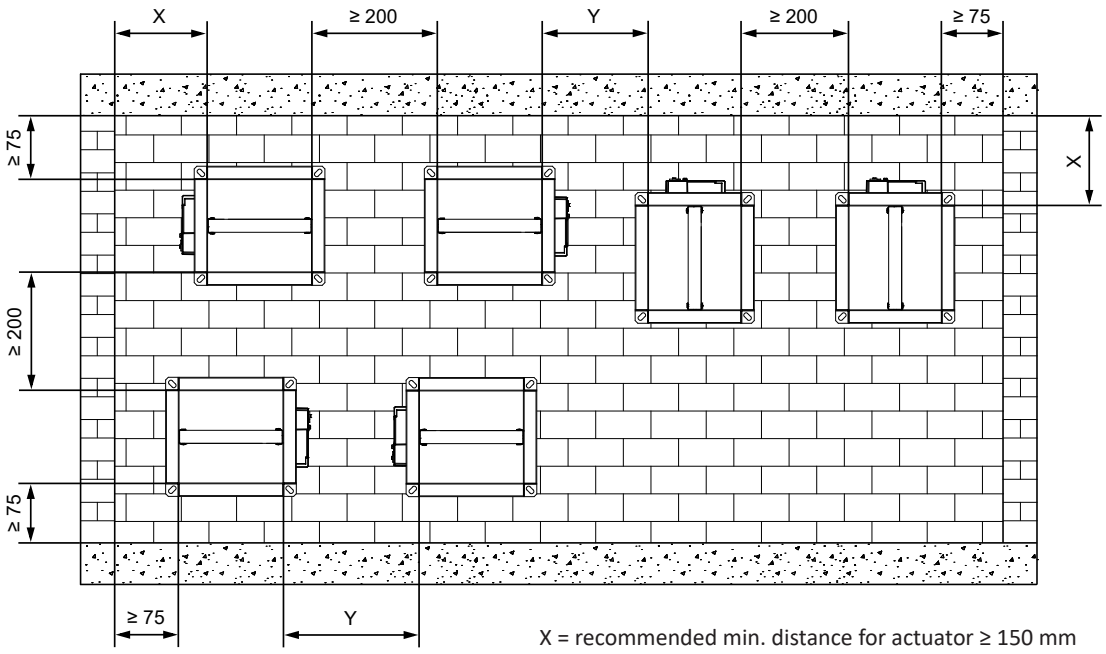
During the installation and plastering process, the actuating mechanism must be protected (covered) against damage and pollution. The damper casing should not be deformed during bricking in. Once the damper is built in, the damper blade should not grind against the damper casing during opening or closing.

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. Installation without following duct is only possible in vertical constructions. In this case, the fire dampers must be installed with cover grilles (additional extension parts may be required due to overlapping of the damper blade, see Tab. 5). The damper must be installed so that the activation device (thermal fuse/thermoelectric activation device/smoke detector) is located at the highest possible point of the damper (top of the casing).

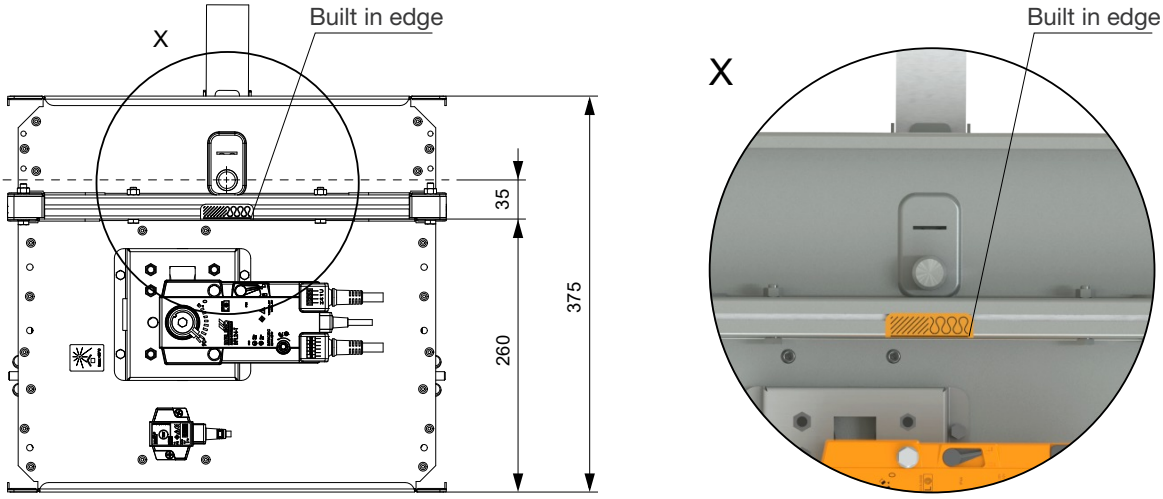
Minimum distance between the fire dampers and the construction

- 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
- recommended minimum distance 150 mm necessary for access to the actuator
- recommended minimum distance 250 mm necessary for access to the manual control



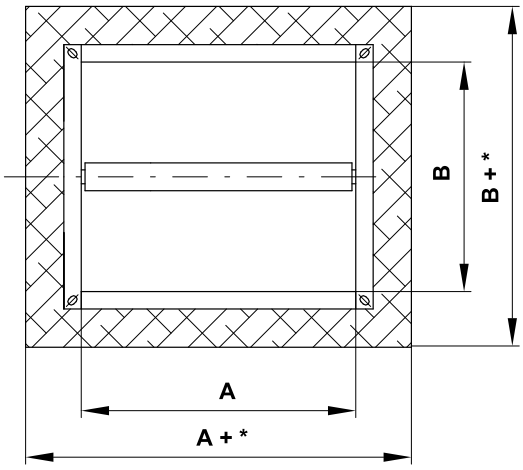
X = recommended min. distance for actuator ≥ 150 mm
X = recommended min. distance for manual control ≥ 250 mm
Y = min. distance for actuator ≥ 200 mm acc. to EN 1366-2
Y = recommended min. distance for manual control ≥ 250 mm

Built in edge



“BUILT IN EDGE label” indicates the recommended edge of installation of a fire damper in the fire separating construction (wall/ceiling). The damper must be installed so that the entire damper blade (in the closed position) is located in the fire separating construction (wall/ceiling) and at the same time the actuating mechanism and inspection openings are freely accessible.

Fig. 12. Dimensions of an installation opening



Mortar or gypsum

- min. A(B)+100 - 140, by the type of installation
- max. A(B)+300

Weichschott

- min. A(B)+80
- max. A(B)+800

Examples of constructions for fire damper installation

The fire damper can be installed into:

- Solid wall construction made e.g. of normal concrete/masonry or porous concrete with min. thickness 100 mm.
- Gypsum wall construction with min. thickness 100 mm.
- Solid ceiling construction made e.g. of normal concrete or pourous concrete, with minimum thickness according to EN 1366-2.
- Outside the wall/ceiling contruction. The duct and damper must be protected by fire insulation. If damper is installed outside a construction it is necessary to use reinforcing frame VRM-Q 120, see page 49.

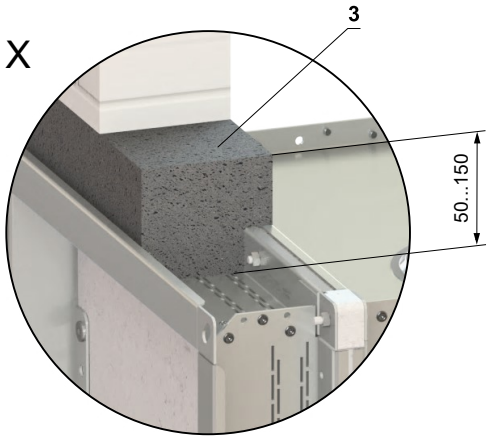
7.2 Statement of Installations

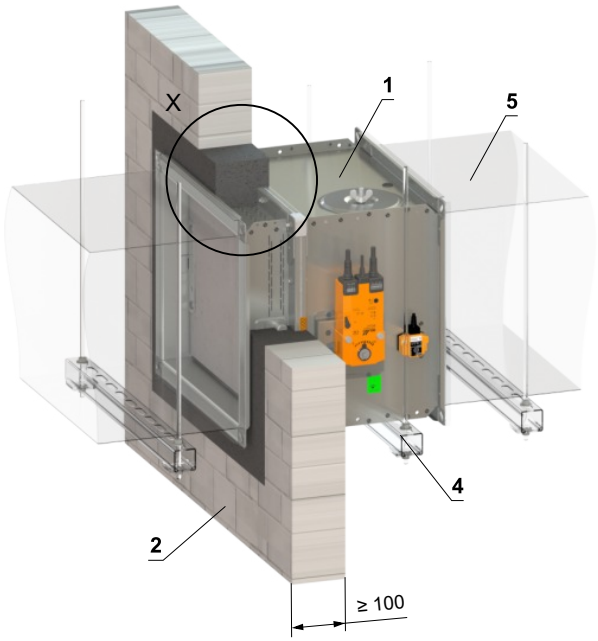
Placement	Wall/Ceiling min. thickness (mm)	Method of installation	Fire resist.	Page
In solid wall construction	100	Mortar or gypsum	EI 120 (v_e i↔o) S	27
		2 dampers in battery - mortar or gypsum		28
		4 dampers in battery - mortar or gypsum		29
		Weichschott system		30
Outside solid wall construction	100	ISOVER Ultimate Protect - Weichschott system	EI 120 (v_e i↔o) S	31
In gypsum wall construction	100	Mortar or gypsum	EI 120 (v_e i↔o) S	33
		2 dampers in battery - mortar or gypsum		34
		4 dampers in battery - mortar or gypsum		35
		Weichschott system		36
Outside gypsum wall construction	100	ISOVER Ultimate Protect - Weichschott system	EI 120 (v_e i↔o) S	37
In solid ceiling construction	150	Mortar or gypsum	EI 120 (h_o i↔o) S	39
		2 dampers in battery - mortar or gypsum		40
		4 dampers in battery - mortar or gypsum		41

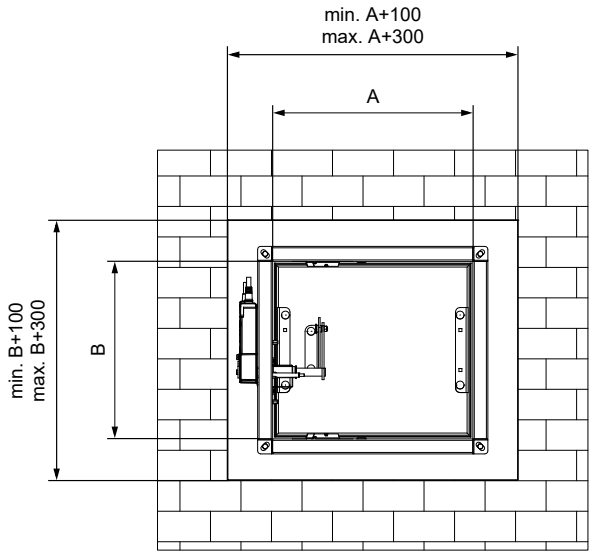
7.3 Installation in solid wall construction

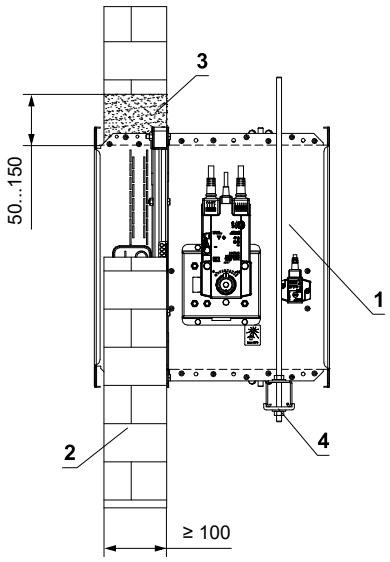
Fig. 13. In solid wall construction - mortar or gypsum

EIS 120





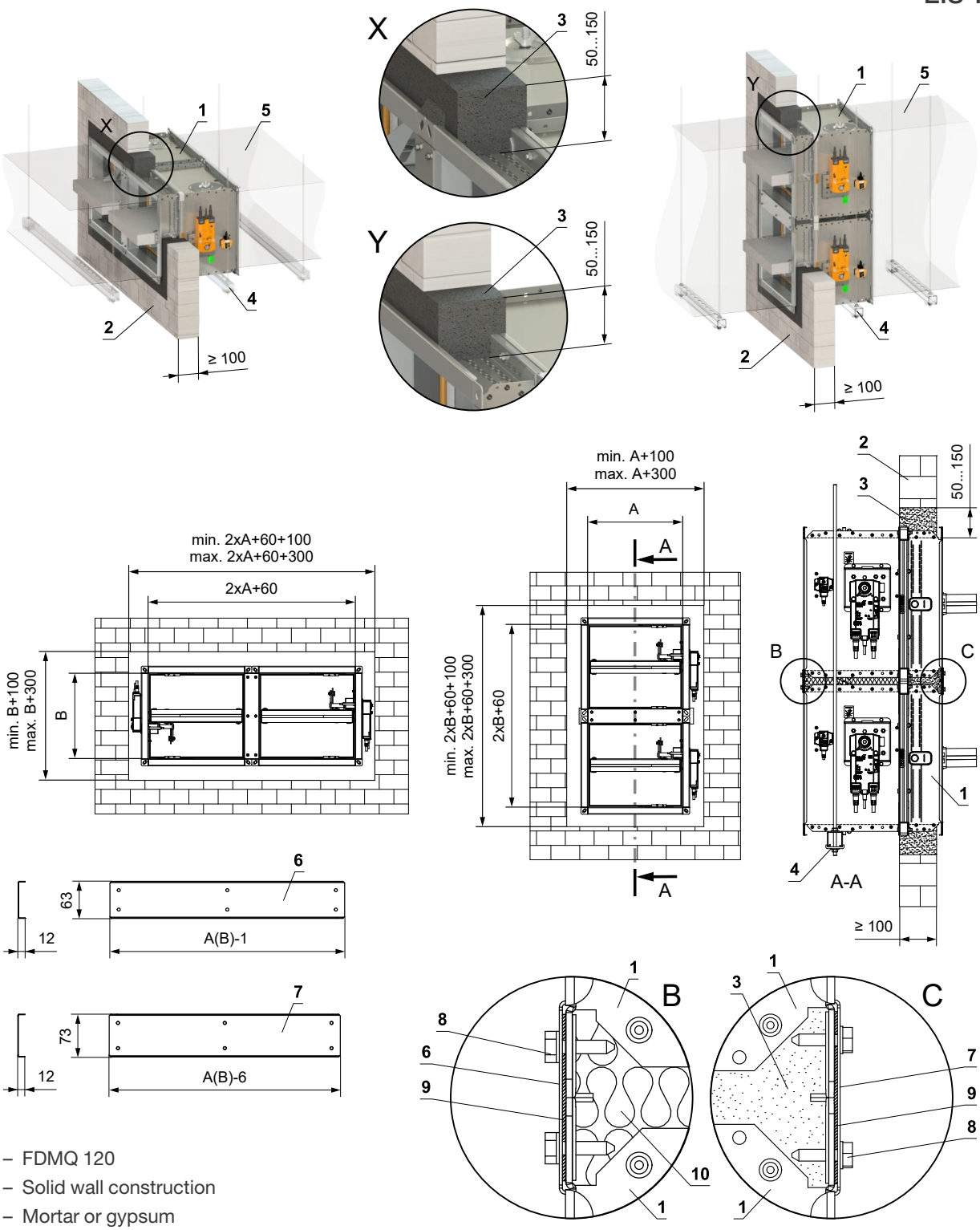




1 – FDMQ 120
2 – Solid wall construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct

Fig. 14. In solid wall construction - 2 dampers in battery - mortar or gypsum

EIS 120



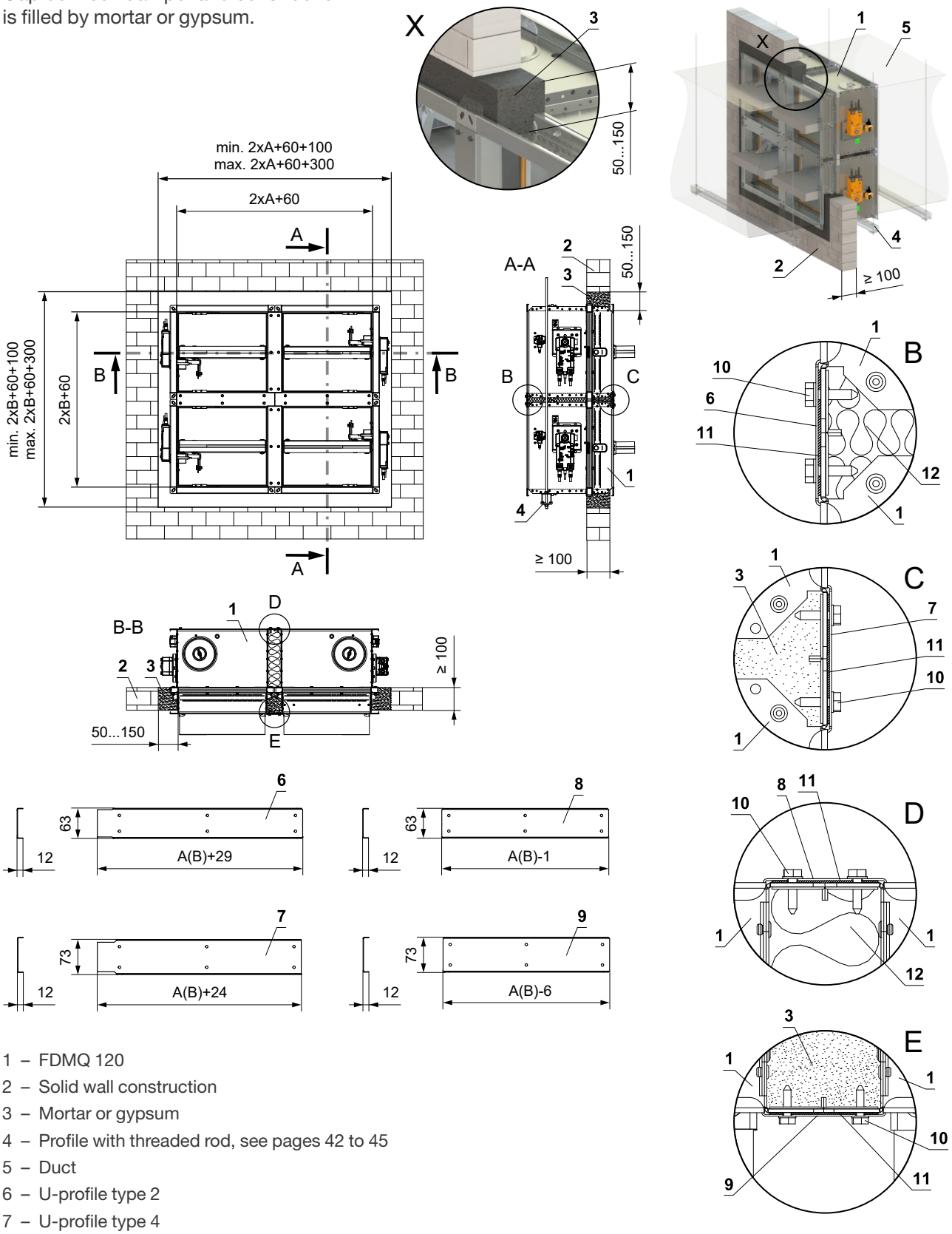
1 – FDMQ 120
2 – Solid wall construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct
6 – U-profile type 3
7 – U-profile type 1
8 – Screw TEX 4,8×18 mm (pitch ≤ 200 mm)
9 – Sealing
10 – Insulation board made of mineral wool - recommended for easy filling of gap with mortar/gypsum

Gap between the damper and construction is filled with mortar or gypsum.

Fig. 15. In solid wall construction - 4 dampers in battery - mortar or gypsum

EIS 120

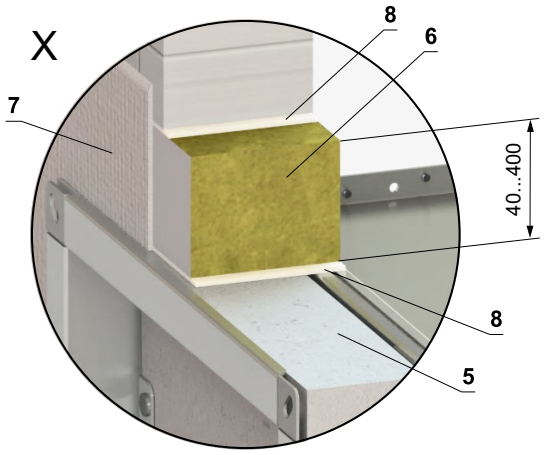
Gap between damper and construction is filled by mortar or gypsum.

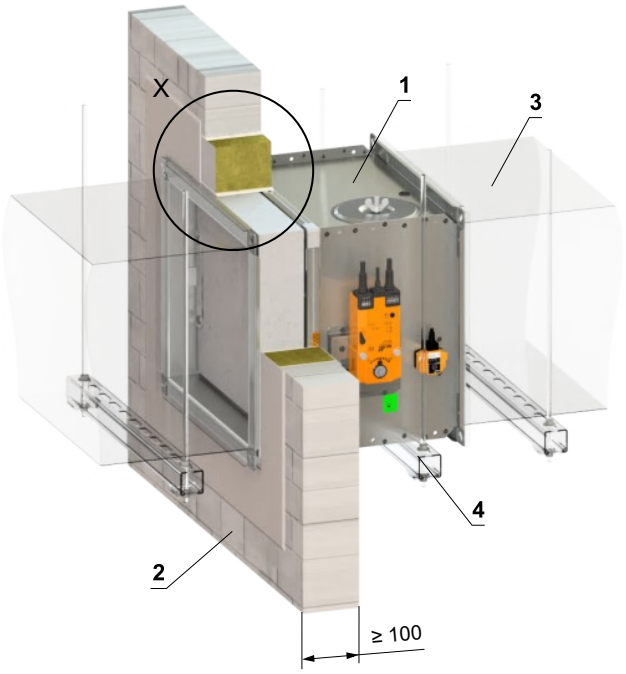


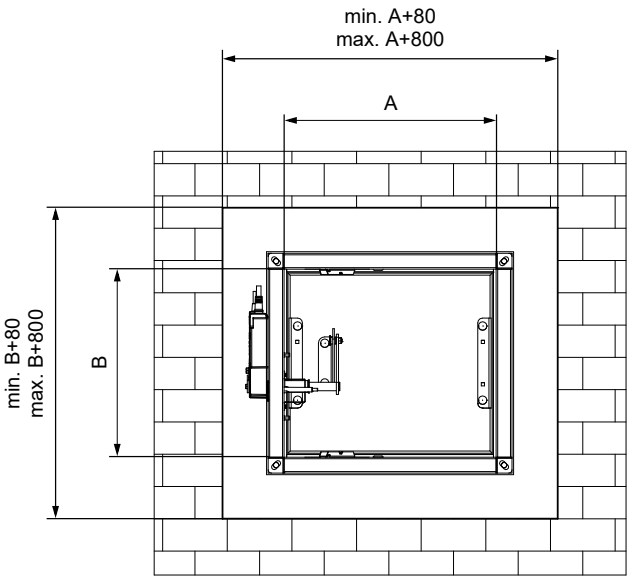
1 – FDMQ 120
2 – Solid wall construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct
6 – U-profile type 2
7 – U-profile type 4
8 – U-profile type 1
9 – U-profile type 3
10 – Screw TEK 4,8x18 mm (pitch ≤ 200 mm)
11 – Sealing
12 – Insulation board made of mineral wool - recommended for easy filling of gap with mortar/gypsum

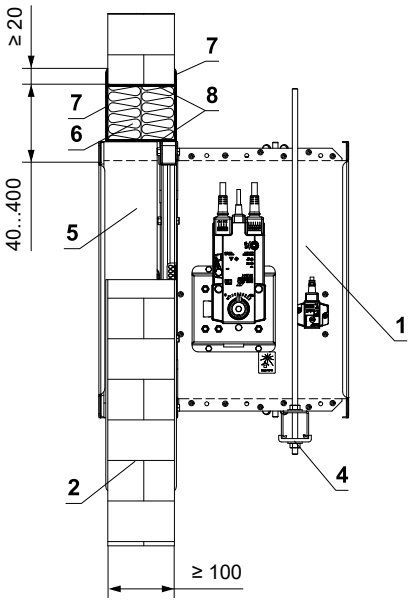
Fig. 16. In solid wall construction - Weichschott system

EIS 120









* 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 – FDMQ
2 – Solid wall construction
3 – Duct
4 – Profile with threaded rod, see pages 42 to 45
5 – Protective cladding board - min. th. 30 mm, min. density 750 kg/m3 (e.g. PROMATECT-MST), see page 50, Weichschott system HILTI*
6 – Mineral wool board - min. density 140 kg/m^3 (HILTI CFS-CT B 1S 140/50...)
7 – Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
8 – 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

7.4 Installation outside solid wall constrution

Fig. 17. Outside solid wall construction - ISOVER Ultimate Protect - Weichschott system

EIS 120

Minimum and maximum distance between the wall and fire damper is unlimited.

When installing the insulation, follow the ISOVER manufacturer's instructions.

The damper and the duct must be suspended separately.

The duct must be suspended on both sides of damper acc. to national rules.

Duct between fire damper and fire separating construction must be suspended by using threaded rods and mounting profiles, or another mounting system acc. to national standards.

The damper inspection openings are covered by insulation and therefore it's necessary to make inspection openings on the connecting duct.

Load of the suspension system depends on weight of the fire damper and duct system, see page 42.

Max. distance between two suspension systems is 1500 mm.

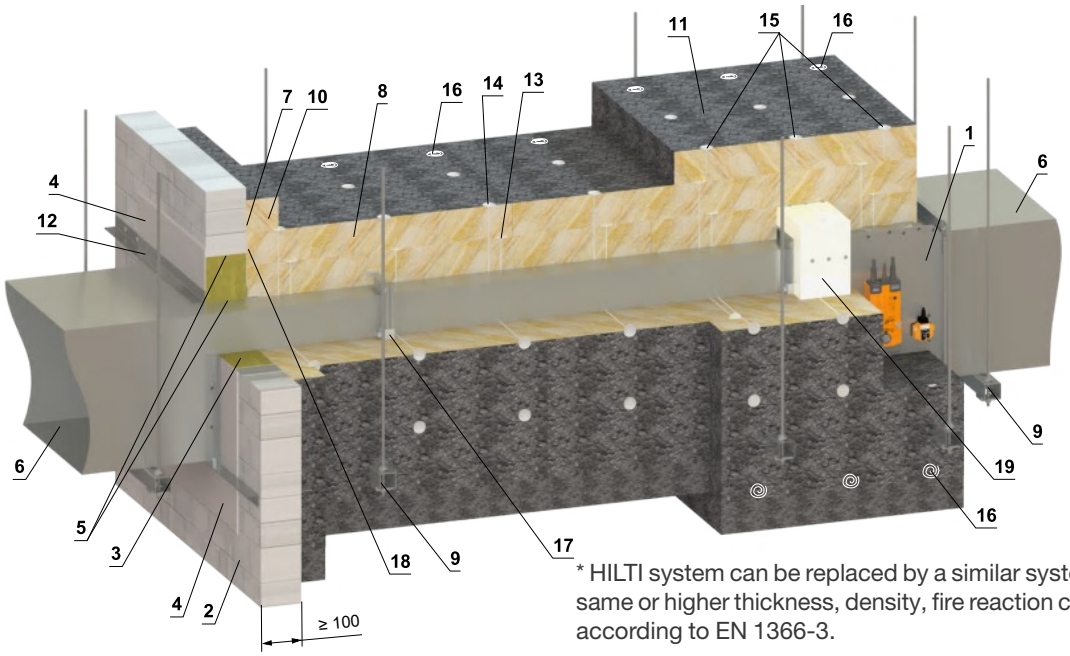
Duct at the point of penetration must be fixed to the fire separation structure.

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. Adjacent duct must be suspended or supported, as required by the duct suppliers.

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

If the threaded rod is located outside the duct isolation, distance between threaded rod and isolation is max. 40 mm.

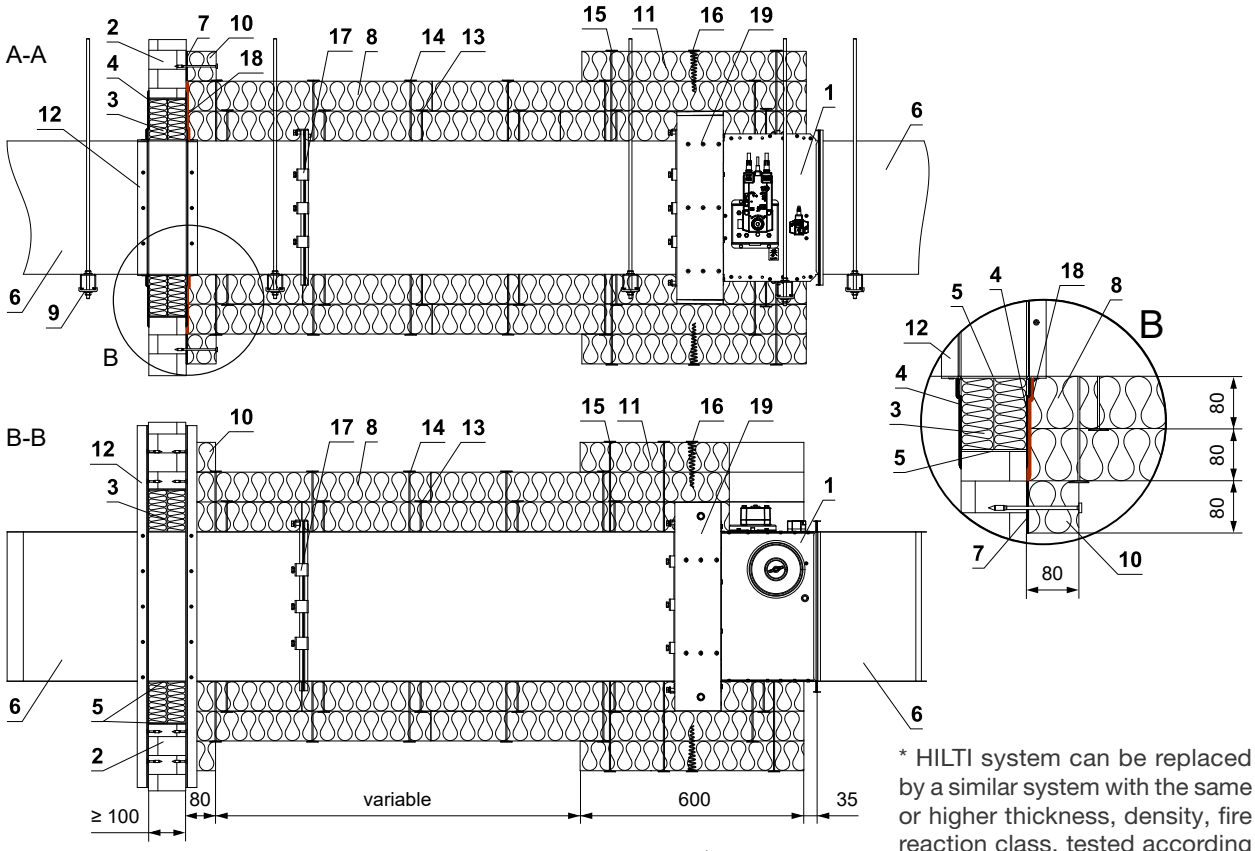
Reinforcing frame VRM-Q 120 must always be used for this type of installation. VRM-Q 120 is not a part of the fire damper and must be ordered separately for each installation case (see page 49)!



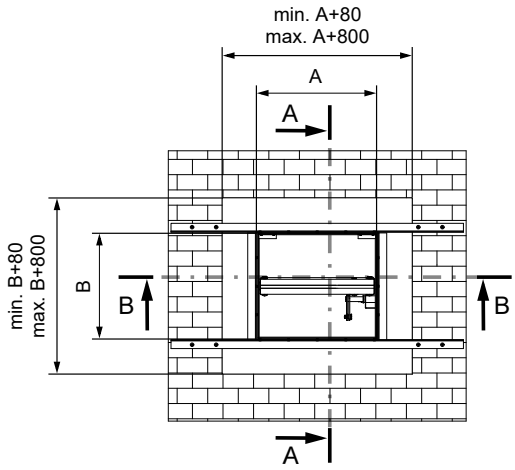
* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

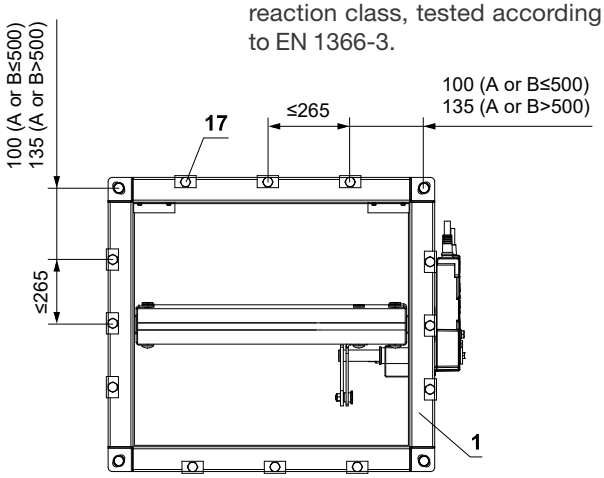
1 – FDMQ 120
2 – Solid wall construction, Weichschott system HILTI*
3 – Mineral wool board - min. density 140 kg/m^3 (HILTI CFS-CT B 1S 140/50...)
4 – Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
5 – Fire-resistant mastic - (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 – Standard air duct, made of galvanized sheet metal min. thickness 0,8 mm, flanges 30 mm, acc. to EN 1507 and DIN 24190
7 – ISOVER Protect BSK glue - apply on the insulation and fix it to the fire separation construction
8 – Insulation board made of mineral wool, with a surface treatment of aluminum foil, min. thickness 80 mm, min. density 66 kg/m^3 (System ISOVER Ultimate Protect SLAB 4.0 Alu1)
9 – Profile with threaded rod, see pages 42 to 45
10 – Duct penetration insulation collar - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm - glued (pos. 7) and fixed with screws to the wall construction
11 – Insulating collar of the damper and duct connection - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm
12 – L-profile 30x30x3 mm - dimensions and installation acc. to ISOVER manuf.
13 – Stud-welded pins 80 mm - quantity and placing acc. to ISOVER manufa.
14 – Stud-welded pins 160 mm - quantity and placing acc. to ISOVER manufa.
15 – Stud-welded pins 240 mm - quantity and placing acc. to ISOVER manufa.
16 – Fire spiral shaped screws - quantity and placing acc. to ISOVER manufa.
17 – Steel clamp min. screw M8
18 – ISOVER Protect BSF
19 – VRM-Q 120, see page 49

(continuation of installation Outside solid wall construction - ISOVER Ultimate Protect - Weichschott system)



* 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.



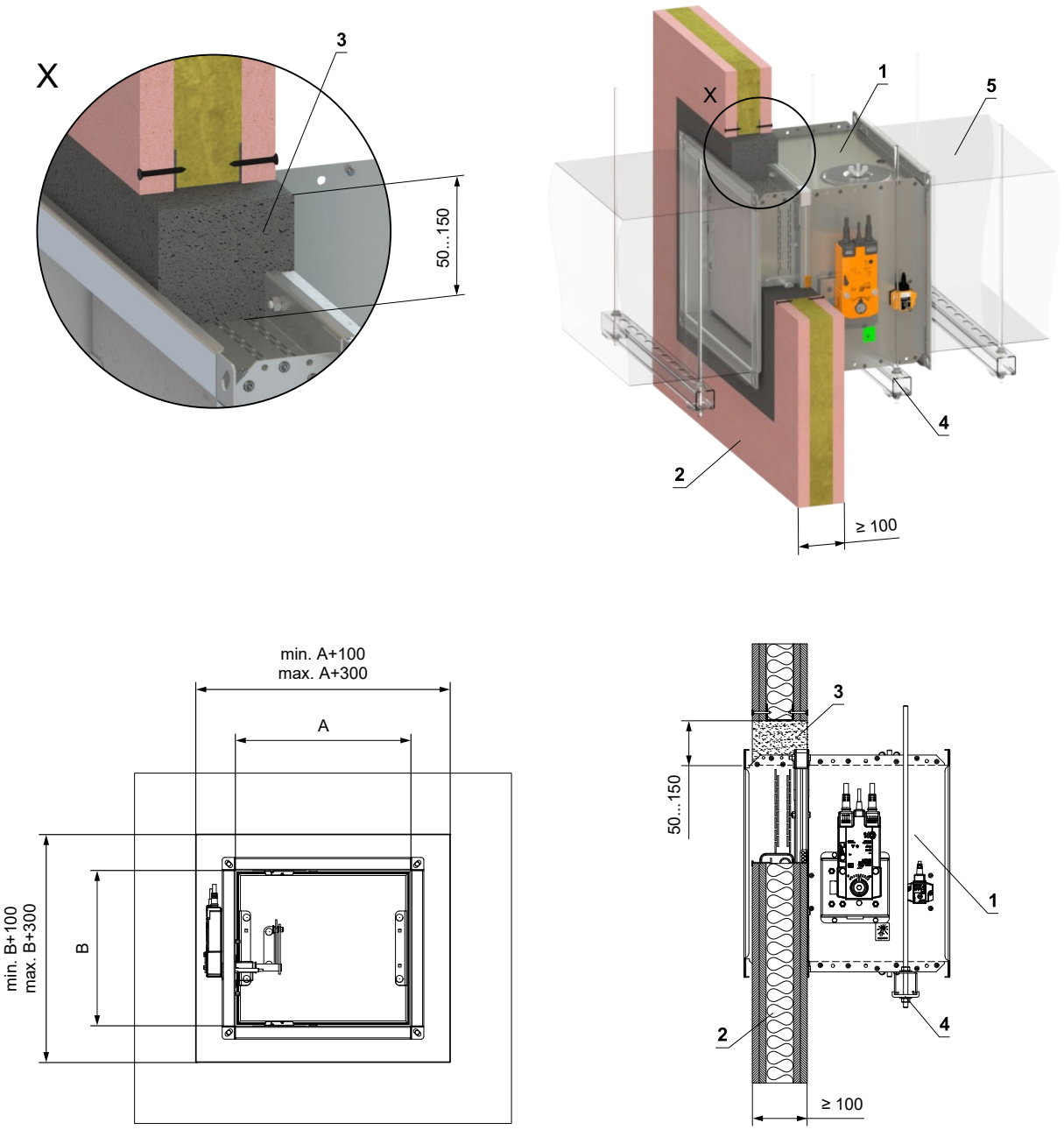


1 – FDMQ 120
2 – Solid wall construction, Weichschott system HILTI*
3 – Mineral wool board - min. density 140 kg/m^3 (HILTI CFS-CT B 1S 140/50...)
4 – Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
5 – Fire-resistant mastic - (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 – Standard air duct, made of galvanized sheet metal min. thickness 0,8 mm, flanges 30 mm, acc. to EN 1507 and DIN 24190
7 – ISOVER Protect BSK glue - apply on the insulation and fix it to the fire separation construction
8 – Insulation board made of mineral wool, with a surface treatment of aluminum foil, min. thickness 80 mm, min. density 66 kg/m^3 (System ISOVER Ultimate Protect SLAB 4.0 Alu1)
9 – Profile with threaded rod, see pages 42 to 45
10 – Duct penetration insulation collar - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm - glued (pos. 7) and fixed with screws to the wall construction
11 – Insulating collar of the damper and duct connection - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm
12 – L-profile 30x30x3 mm - dimensions and installation acc. to ISOVER manuf.
13 – Stud-welded pins 80 mm - quantity and placing acc. to ISOVER manufa.
14 – Stud-welded pins 160 mm - quantity and placing acc. to ISOVER manufa.
15 – Stud-welded pins 240 mm - quantity and placing acc. to ISOVER manufa.
16 – Fire spiral shaped screws - quantity and placing acc. to ISOVER manufa.
17 – Steel clamp min. screw M8
18 – ISOVER Protect BSF
19 – VRM-Q 120, see page 49

7.5 Installation in gypsum wall construction

Fig. 18. In gypsum wall construction - mortar or gypsum

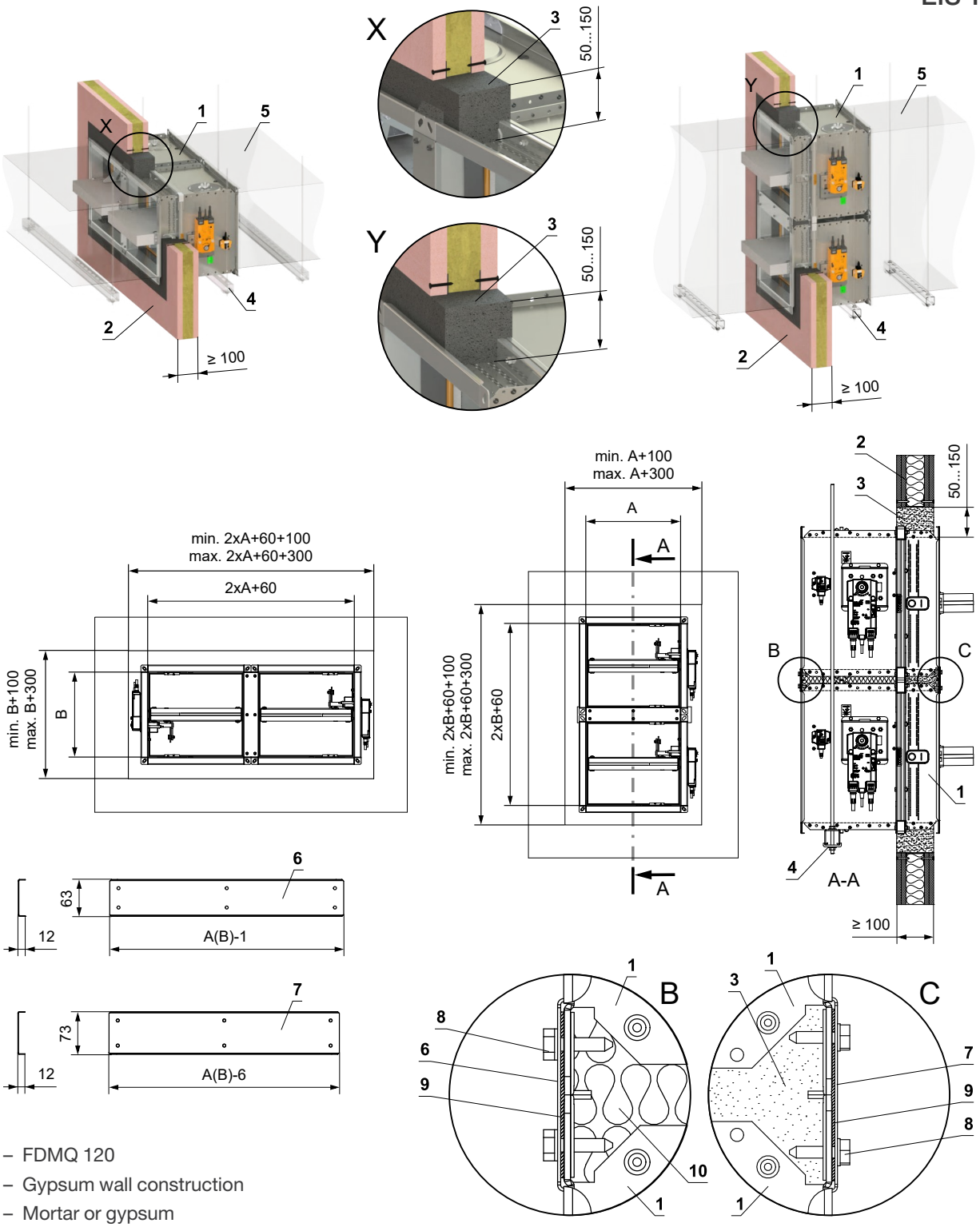
EIS 120



1 – FDMQ 120
2 – Gypsum wall construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct

Fig. 19. In gypsum wall construction - 2 dampers in battery - mortar or gypsum

EIS 120

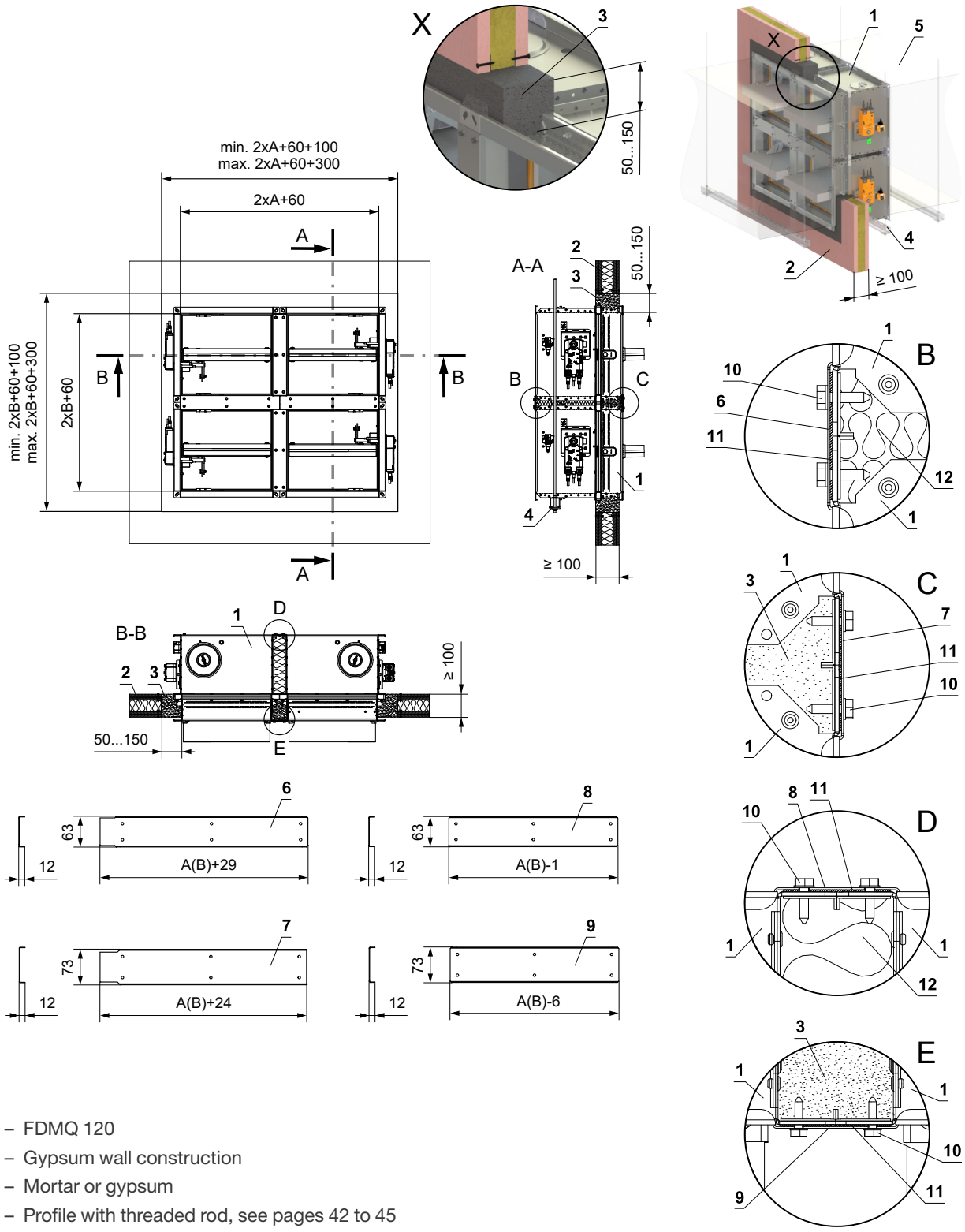


1 – FDMQ 120
2 – Gypsum wall construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct
6 – U-profile type 3
7 – U-profile type 1
8 – Screw TEX 4,8×18 mm (pitch ≤ 200 mm)
9 – Sealing
10 – Insulation board made of mineral wool - recommended for easy filling of gap with mortar/gypsum

Gap between the damper and construction is filled with mortar or gypsum.

Fig. 20. In gypsum wall construction - 4 dampers in battery - mortar or gypsum

EIS 120

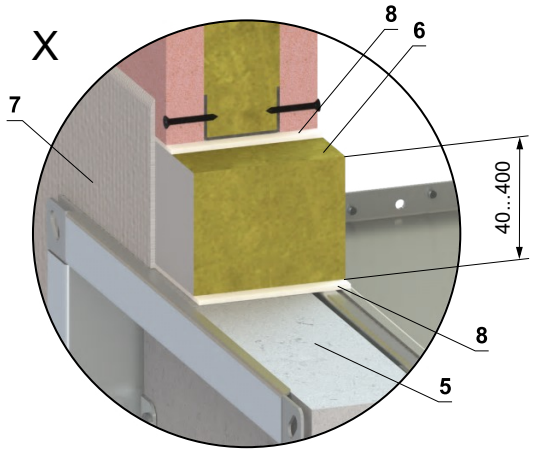


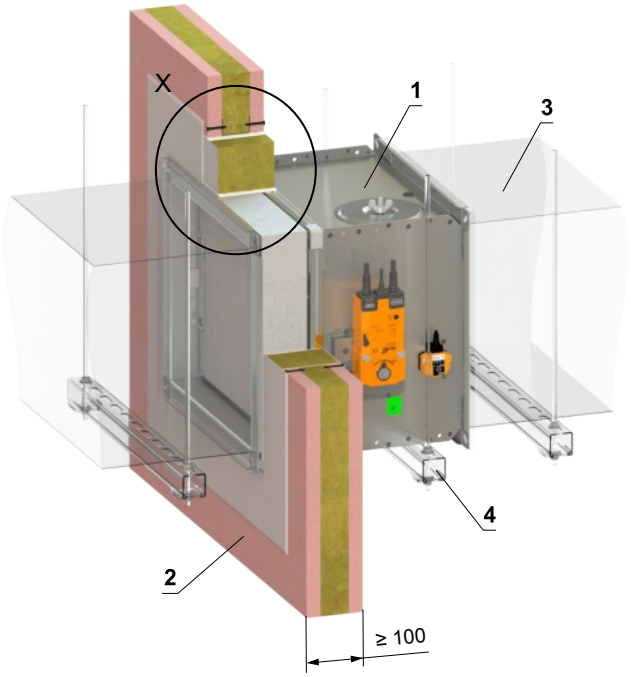
1 – FDMQ 120
2 – Gypsum wall construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct
6 – U-profile type 2
7 – U-profile type 4
8 – U-profile type 1
9 – U-profile type 3
10 – Screw TEX 4,8×18 mm (pitch ≤ 200 mm)
11 – Sealing
12 – Insulation board made of mineral wool - recommended for easy filling of gap with mortar/gypsum

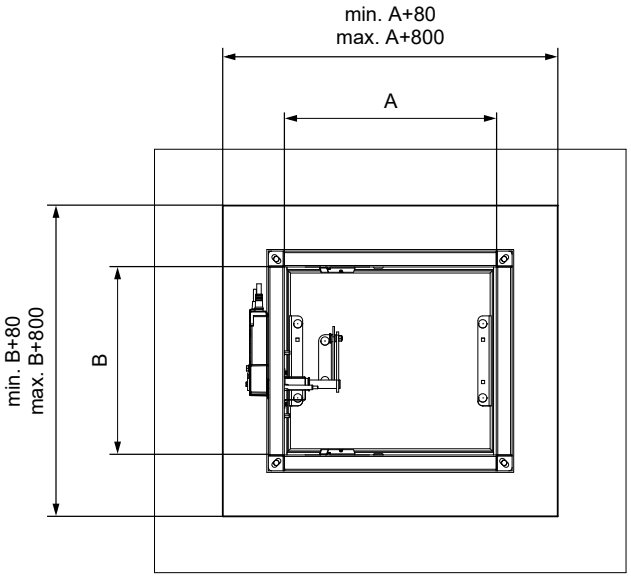
Gap between the damper and construction is filled with mortar or gypsum.

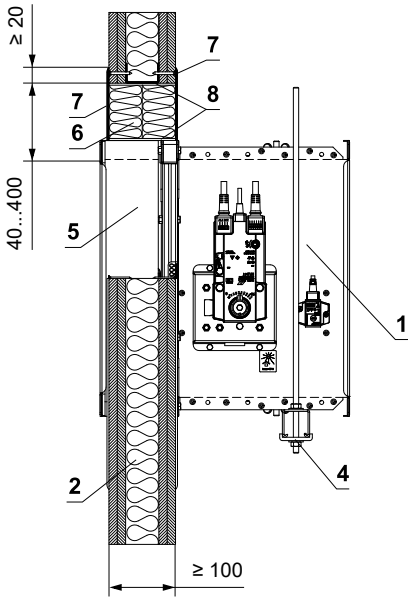
Fig. 21. In gypsum wall construction - Weichschott system

EIS 120









1 – FDMQ 120
2 – Gypsum wall construction
3 – Duct
4 – Profile with threaded rod, see pages 42 to 45
5 – Protective cladding board - min. th. 30 mm, min. density 750 kg/m3 (e.g. PROMATECT-MST), see page 50 Weichschott system HILTI*
6 – Mineral wool board - min. density 140 kg/m^3 (HILTI CFS-CT B 1S 140/50...)
7 – Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
8 – 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

* 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.

7.6 Installation outside gypsum wall constrution

Fig. 22. Outside gypsum wall construction - ISOVER Ultimate Protect - Weichschott system

EIS 120

Minimum and maximum distance between the wall and fire damper is unlimited.

When installing the insulation, follow the ISOVER manufacturer's instructions.

The damper and the duct must be suspended separately.

The duct must be suspended on both sides of damper acc. to national rules.

Duct between fire damper and fire separating construction must be suspended by using threaded rods and mounting profiles, or another mounting system acc. to national standards.

The damper inspection openings are covered by insulation and therefore it's necessary to make inspection openings on the connecting duct.

Load of the suspension system depends on weight of the fire damper and duct system, see page 42.

Max. distance between two suspension systems is 1500 mm.

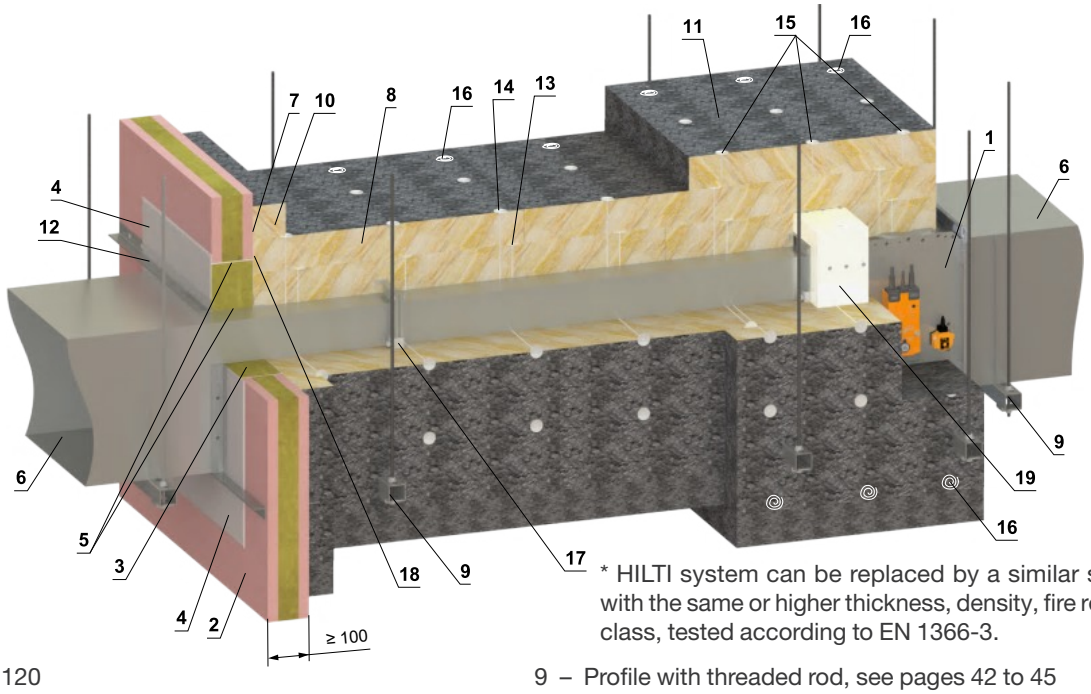
Duct at the point of penetration must be fixed to the fire separation structure.

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. Adjacent duct must be suspended or supported, as required by the duct suppliers.

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

If the threaded rod is located outside the duct isolation, distance between threaded rod and isolation is max. 40 mm.

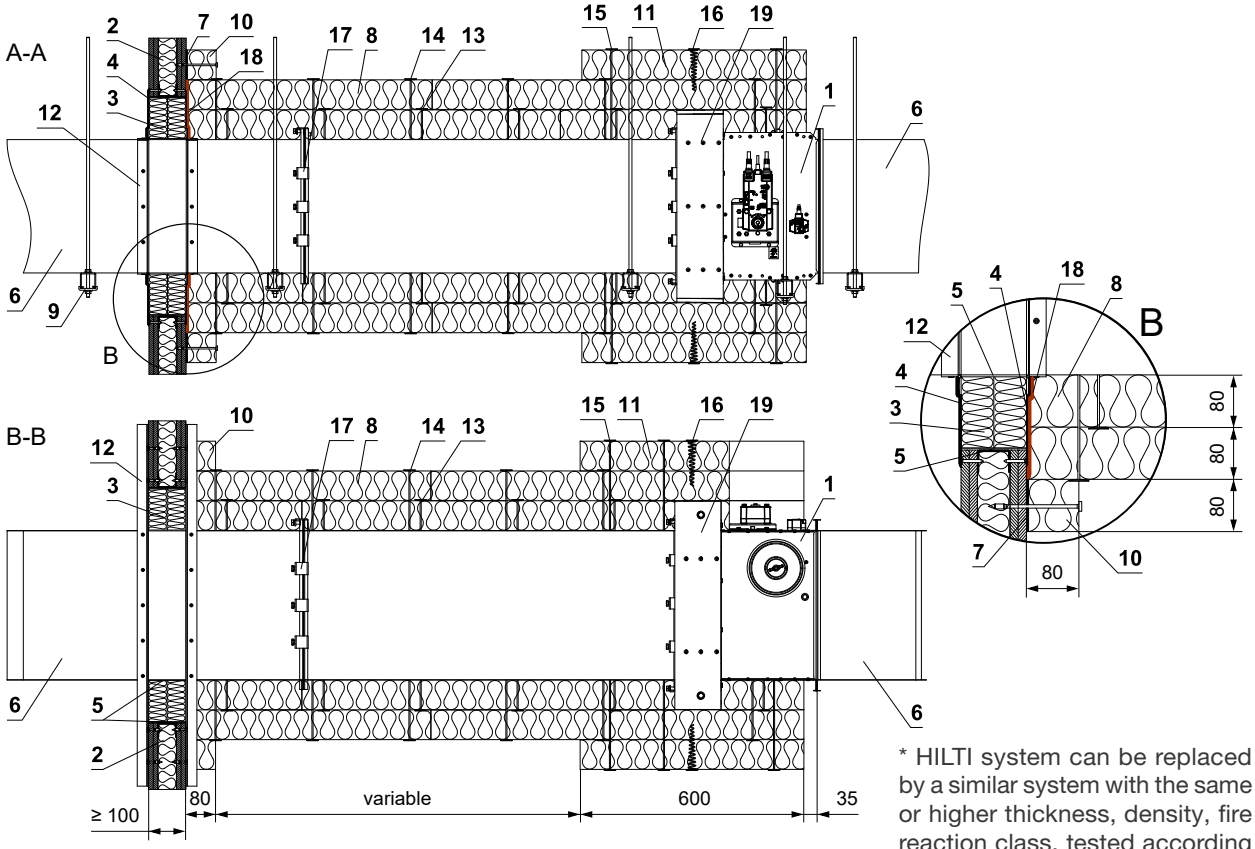
Reinforcing frame VRM-Q 120 must always be used for this type of installation. VRM-Q 120 is not a part of the fire damper and must be ordered separately for each installation case (see page 49)!



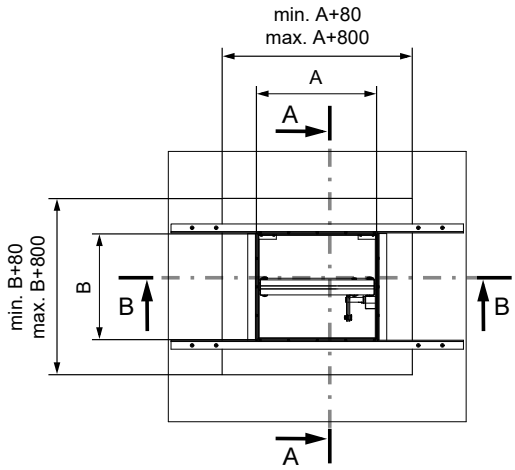
* HILTI system can be replaced by a similar system with the same or higher thickness, density, fire reaction class, tested according to EN 1366-3.

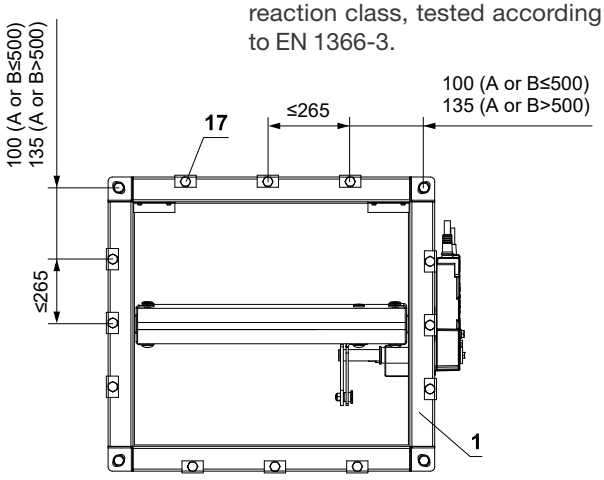
1 – FDMQ 120
2 – Gypsum wall construction, Weichschott system HILTI*
3 – Mineral wool board - min. density 140 kg/m^3 (HILTI CFS-CT B 1S 140/50...)
4 – Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
5 – Fire-resistant mastic - (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 – Standard air duct, made of galvanized sheet metal min. thickness 0,8 mm, flanges 30 mm, acc. to EN 1507 and DIN 24190
7 – ISOVER Protect BSK glue - apply on the insulation and fix it to the fire separation construction
8 – Insulation board made of mineral wool, with a surface treatment of aluminum foil, min. thickness 80 mm, min. density 66 kg/m^3 (System ISOVER Ultimate Protect SLAB 4.0 Alu1)
9 – Profile with threaded rod, see pages 42 to 45
10 – Duct penetration insulation collar - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm - glued (pos. 7) and fixed with screws to the wall construction
11 – Insulating collar of the damper and duct connection - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm
12 – L-profile 30x30x3 mm - dimensions and installation acc. to ISOVER manuf.
13 – Stud-welded pins 80 mm - quantity and placing acc. to ISOVER manufa.
14 – Stud-welded pins 160 mm - quantity and placing acc. to ISOVER manufa.
15 – Stud-welded pins 240 mm - quantity and placing acc. to ISOVER manufa.
16 – Fire spiral shaped screws - quantity and placing acc. to ISOVER manufa.
17 – Steel clamp min. screw M8
18 – ISOVER Protect BSF
19 – VRM-Q 120, see page 49

(continuation of installation Outside gypsum wall construction - ISOVER Ultimate Protect - Weichschott system)



* 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.



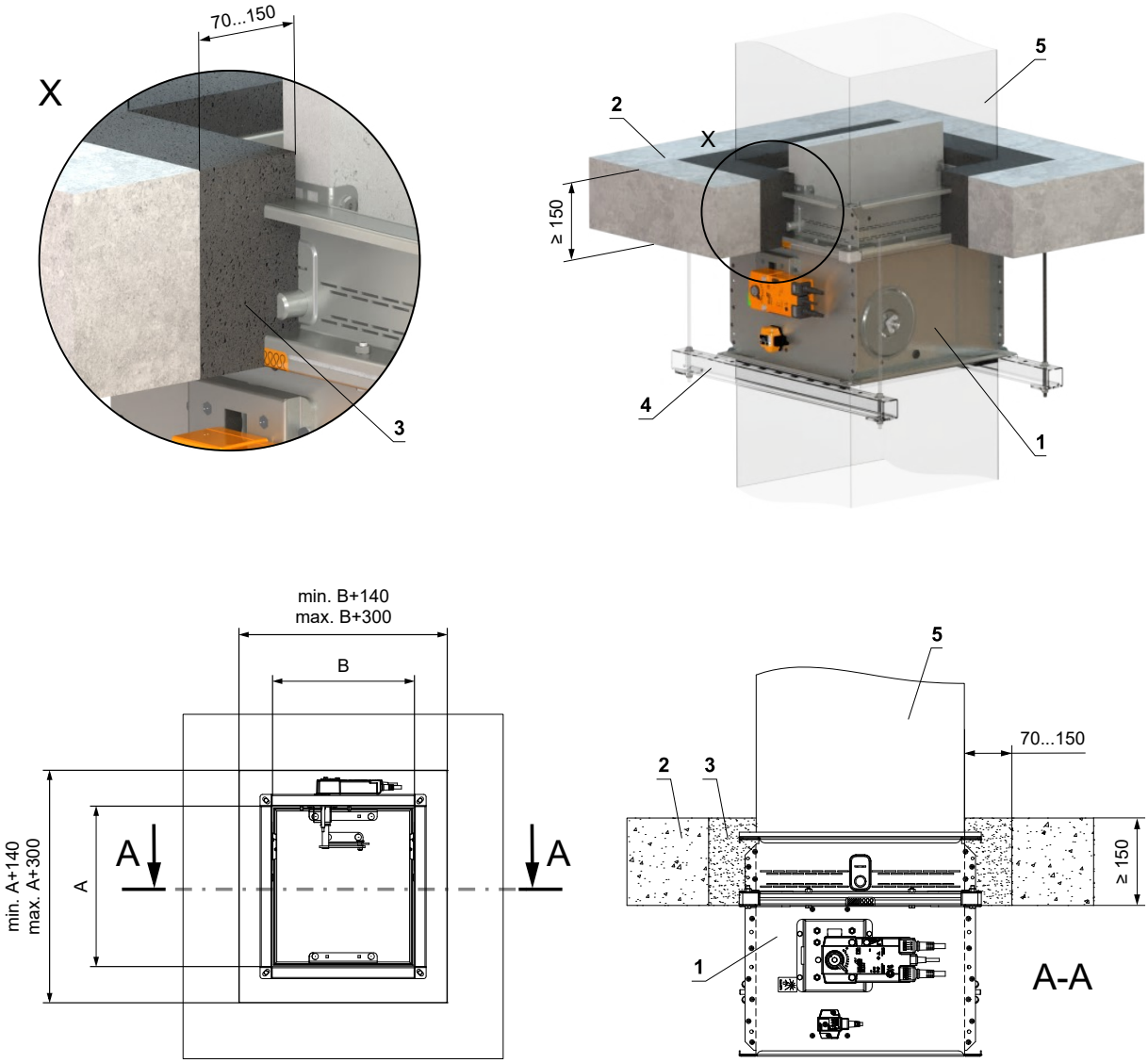


1 – FDMQ 120
2 – Gypsum wall construction, Weichschott system HILTI*
3 – Mineral wool board - min. density 140 kg/m^3 (HILTI CFS-CT B 1S 140/50...)
4 – Fire stop coating - th. 1 mm (HILTI CFS-CT...) - coating is overcoated on the support construction and on the damper casing/duct
5 – Fire-resistant mastic - (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 – Standard air duct, made of galvanized sheet metal min. thickness 0,8 mm, flanges 30 mm, acc. to EN 1507 and DIN 24190
7 – ISOVER Protect BSK glue - apply on the insulation and fix it to the fire separation construction
8 – Insulation board made of mineral wool, with a surface treatment of aluminum foil, min. thickness 80 mm, min. density 66 kg/m^3 (System ISOVER Ultimate Protect SLAB 4.0 Alu1)
9 – Profile with threaded rod, see pages 42 to 45
10 – Duct penetration insulation collar - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm - glued (pos. 7) and fixed with screws to the wall construction
11 – Insulating collar of the damper and duct connection - ISOVER Ultimate Protect SLAB 4.0 Alu1, th. 80 mm
12 – L-profile 30x30x3 mm - dimensions and installation acc. to ISOVER manuf.
13 – Stud-welded pins 80 mm - quantity and placing acc. to ISOVER manufa.
14 – Stud-welded pins 160 mm - quantity and placing acc. to ISOVER manufa.
15 – Stud-welded pins 240 mm - quantity and placing acc. to ISOVER manufa.
16 – Fire spiral shaped screws - quantity and placing acc. to ISOVER manufa.
17 – Steel clamp min. screw M8
18 – ISOVER Protect BSF
19 – VRM-Q 120, see page 49

7.7 Installation in solid ceiling construction

Fig. 23. In solid ceiling construction - mortar or gypsum

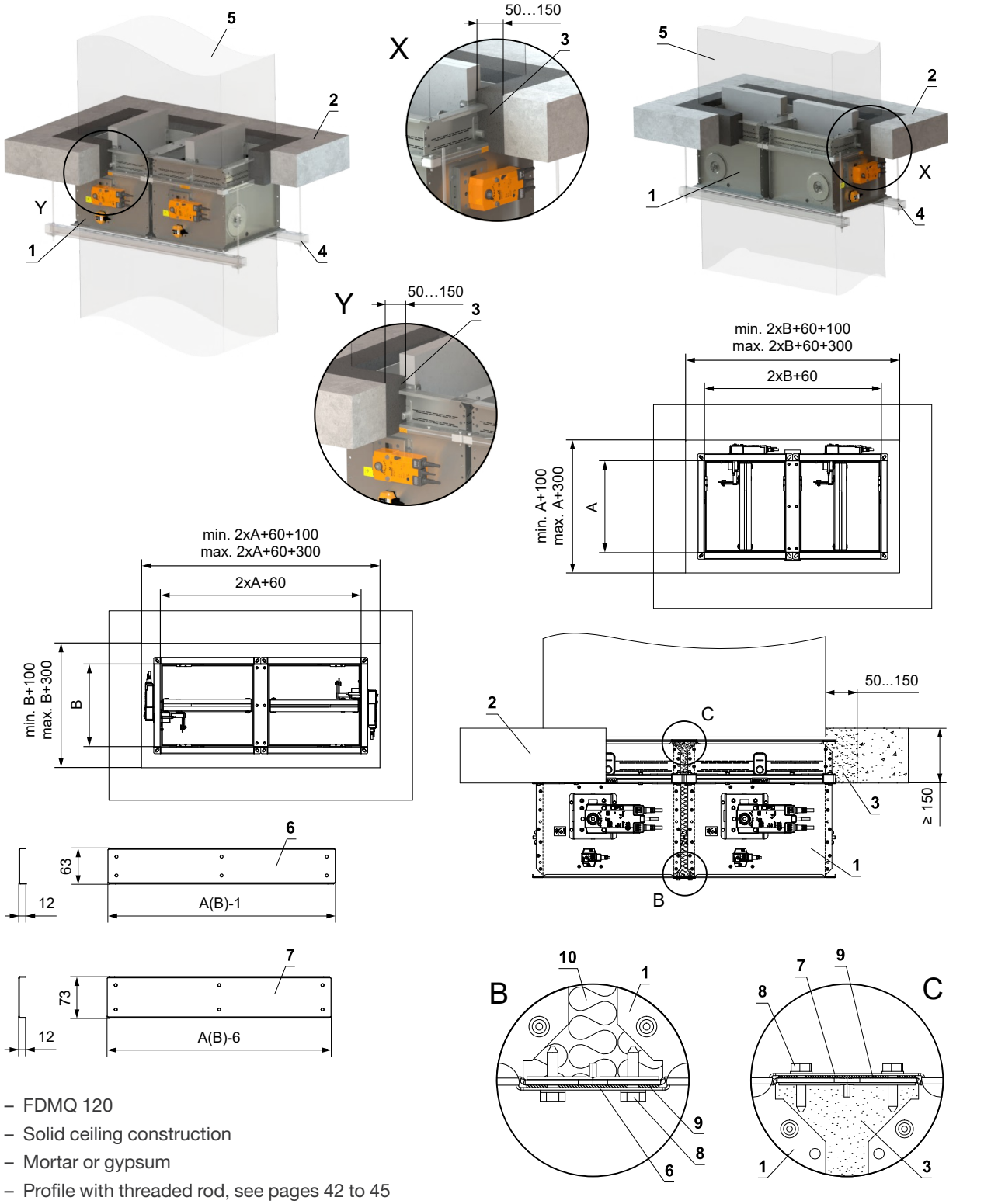
EIS 120



1 – FDMQ 120
2 – Solid ceiling construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct

Fig. 24. In solid ceiling construction - 2 dampers in battery - mortar or gypsum

EIS 120

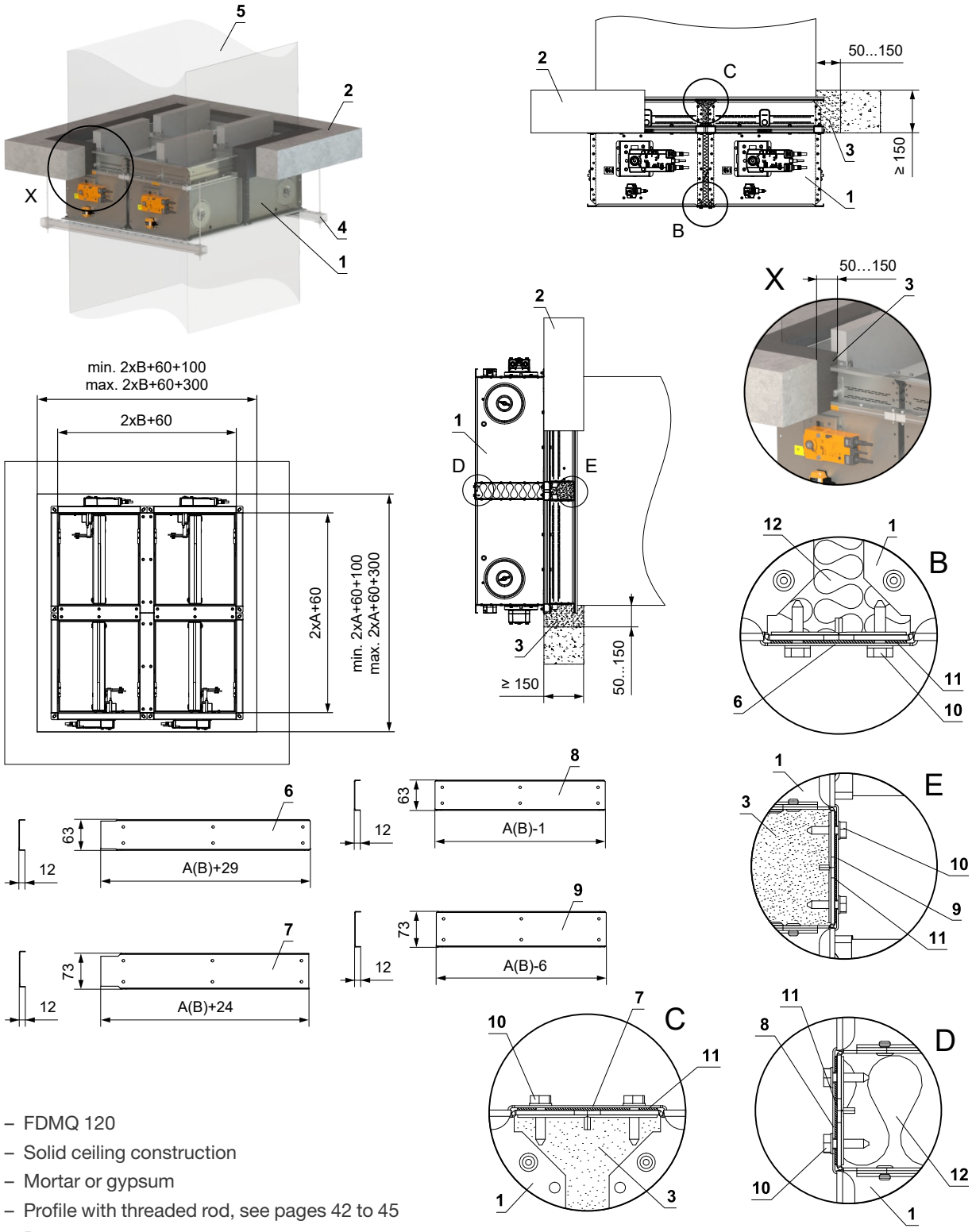


1 – FDMQ 120
2 – Solid ceiling construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct
6 – U-profile type 3
7 – U-profile type 1
8 – Screw TEX 4,8×18 mm (pitch ≤ 200 mm)
9 – Sealing
10 – Insulation board made of mineral wool - recommended for easy filling of gap with mortar/gypsum

Gap between the damper and construction is filled with mortar or gypsum.

Fig. 25. In solid ceiling construction - 4 dampers in battery - mortar or gypsum

EIS 120



1 – FDMQ 120
2 – Solid ceiling construction
3 – Mortar or gypsum
4 – Profile with threaded rod, see pages 42 to 45
5 – Duct
6 – U-profile type 2
7 – U-profile type 4
8 – U-profile type 1
9 – U-profile type 3
10 – Screw TEX 4,8×18 mm (pitch ≤ 200 mm)
11 – Sealing
12 – Insulation board made of mineral wool - recommended for easy filling of gap with mortar/gypsum

Gap between the damper and construction is filled with mortar or gypsum.

8. Suspension Systems

Mounting to the ceiling wall

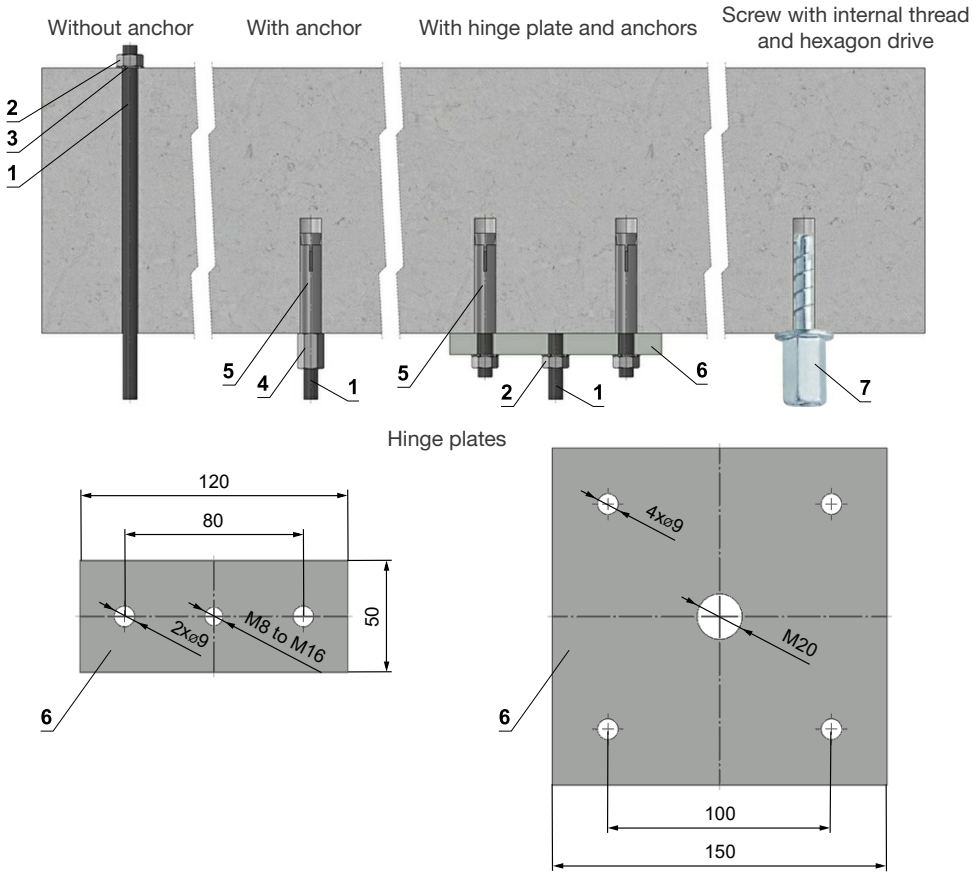
The dampers must be suspended using threaded rods and mounting profiles. Their dimensioning depend on the weight of the damper.

The dampers and the duct must be suspended separately.

Following air-conditioning duct must be suspended or supported so that all load transfer from the following duct to the damper flanges is absolutely excluded. Adjacent duct must be suspended or supported, as required by the duct suppliers.

Threaded rods longer than 1,5 m must be protected by fire insulation.

Examples of anchoring to the ceiling construction
Follow the instructions of fixing specialist or installation company



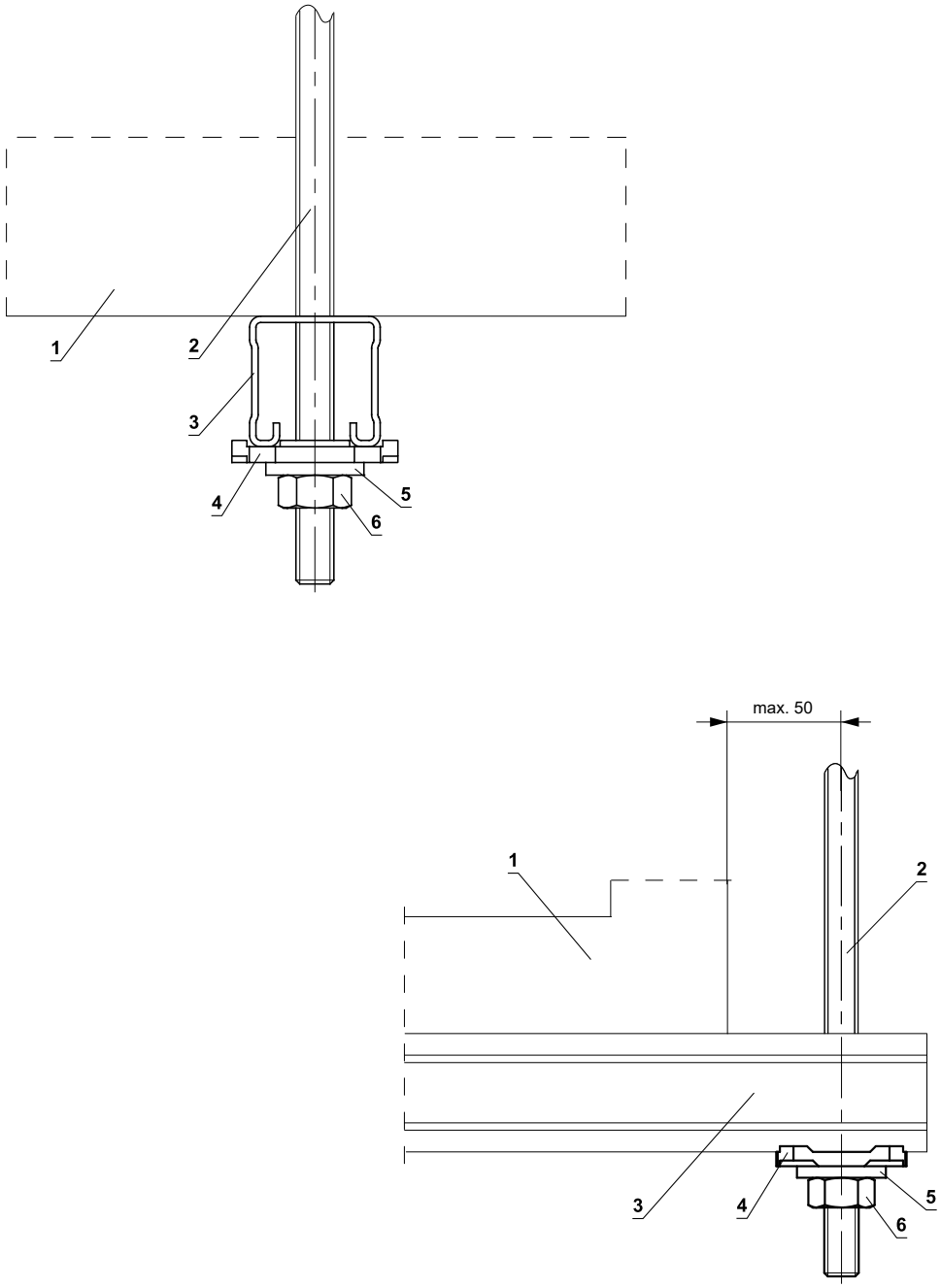
If in doubt, always consult an anchor specialist engineer such as Halfen or Hilti.

1 – Threaded rod M8 – M20
2 – Nut M8 - M20
3 – Washer for M8 - M20
4 – Coupling Nut M8 - M20
5 – Anchor
6 – Hinge plate - min. thickness 10 mm
7 – Concrete screw tested for fire resistance
R30-R90, max. Tension up to 0.75 KN (length 35 mm)

Load capacities of threaded rods at the required fire resistance 60 min. < t 120 min.

Size	As (mm²)	Weight (kg)	
		for 1 rod	for 2 rods
M8	36,6	22	44
M10	58	35	70
M12	84,3	52	104
M14	115	70	140
M16	157	96	192
M18	192	117	234
M20	245	150	300

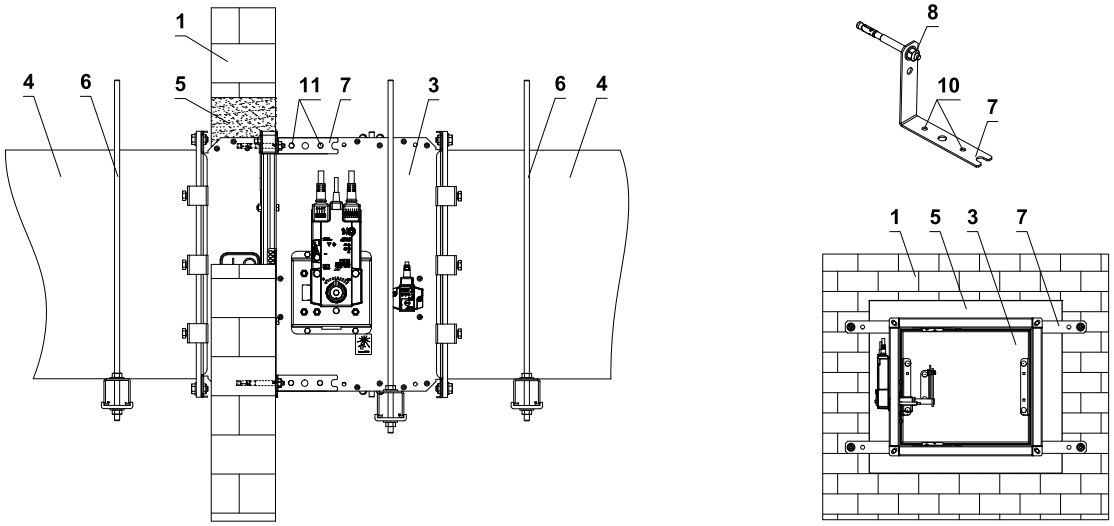
Fig. 26. Example of placing of mounting profiles HILTI



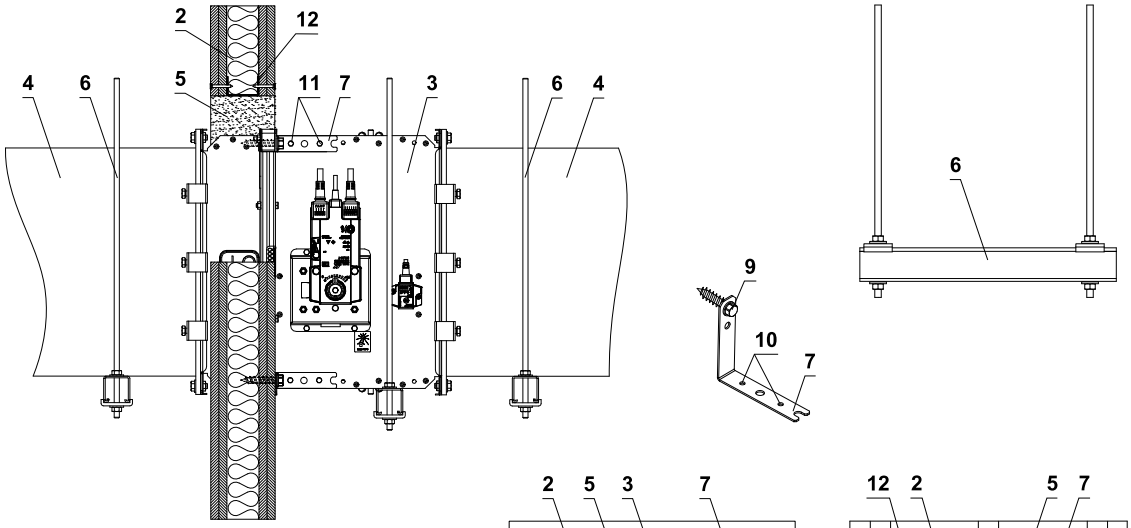
1 – FDMQ 120
2 – Threaded rod M8 - M12
3 – Support HILTI MQ-41 or MQ-41/3
4 – Bored plate HILTI MQZ-L
5 – Washer for M8 - M12
6 – Nut M8 - M12

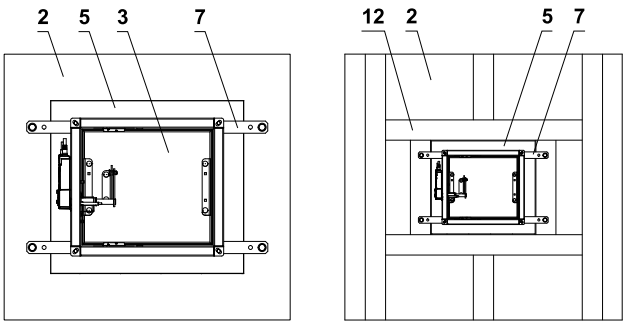
Fig. 27. Example of fixing FDMQ 120 to the wall ceiling

In solid wall construction



In gypsum wall construction





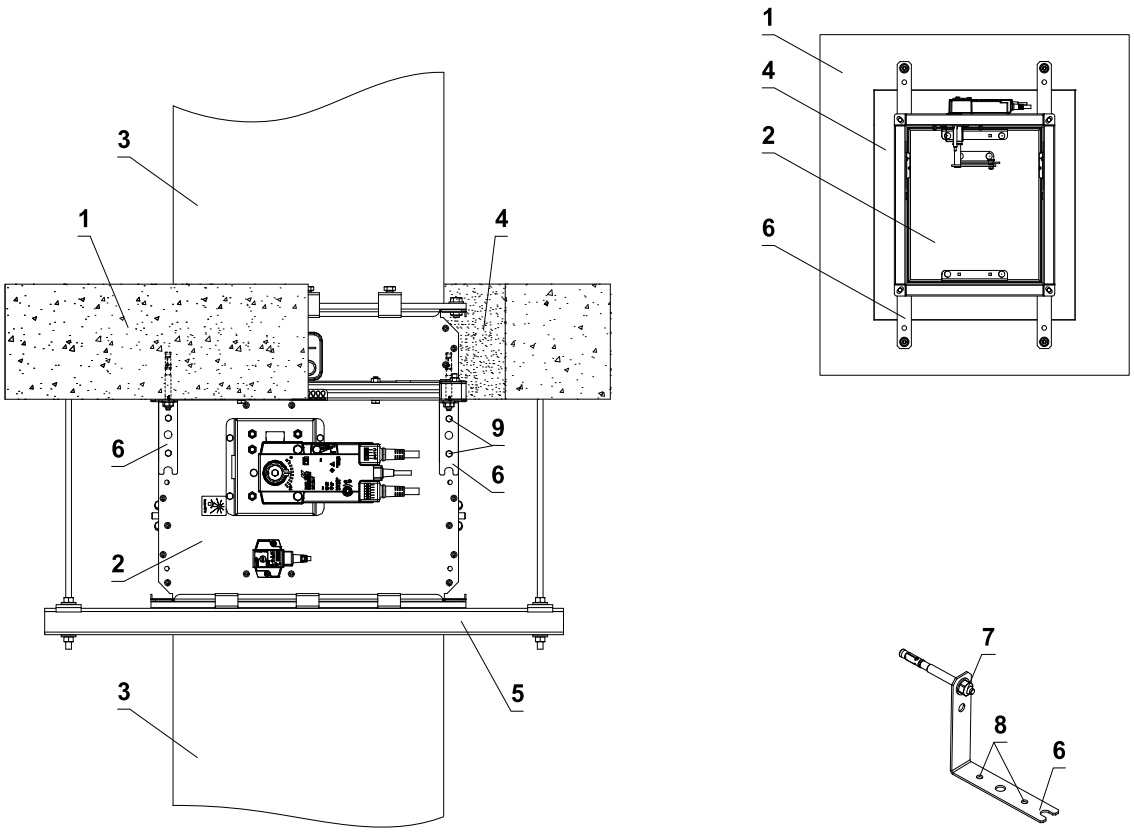
Grid from "U" profile

1 – Solid wall construction
2 – Gypsum wall construction
3 – FDMQ 120
4 – Duct
5 – Penetration
6 – Profile with threaded rod, see page 42
7 – Fixing element/steel bracket for fixing the damper to the wall (optional accessories)
8 – Nut M8 with anchor
9 – Hexagon head screw
10 – Installation holes
11 – Screw assembly M6 (screw M6x10, nut M6)
12 – Gypsum grid from "U" profile

The method of attachment must follow the minimum requirements for attachment and connection of ductwork in accordance with national regulations. Also, the elements can be suspended from the top, or supported from bottom, or fastened from the side.

Fig. 28. Example of fixing FDMQ 120 to the ceiling

In solid ceiling construction



1 – Solid ceiling construction
2 – FDMQ 120
3 – Duct
4 – Penetration
5 – Profile with threaded rod, see page 42
6 – Fixing element/steel bracket for fixing the damper to the wall (optional accessories)
7 – Nut M8 with anchor
8 – Installation holes
9 – Screw assembly M6 (screw M6x10, nut M6)

The method of attachment must follow the minimum requirements for attachment and connection of ductwork in accordance with national regulations. Also, the elements can be suspended from the top, or supported from bottom, or fastened from the side.

9. Transportation, storage and warranty

9.1 Logistic terms

Dampers are delivered on pallets. 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 (minumum 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 blade 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%.

9.2 Warranty

The manufacturer provides a warranty of 24 months from the date of dispatch for the dampers.

In case of using a Schischek actuator, the manufacturer provides a 12-month warranty for the actuator from the date of shipment.

The warranty for fire dampers FDMQ, 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. limit switches, actuators, communication and supply devices and thermoelectric activation devices are dismounted.

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.

10. 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.

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

Manual operation - actuator control without electric voltage

A special wrench (part of the actuator) can be used to manually turn the damper blade to any position. When the wrench is turned in the direction of the arrow, the damper blade rotates to its open position. As the blade 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 blade 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).

Limit switches

If the damper is equipped with limit switches and these switches are not used during operation (e.g. because of a project change), they can be left on the damper and not connected (they need not be dismounted).

On the other hand, if the limit switch is to be added to the damper design, the change can be implemented by change kit.

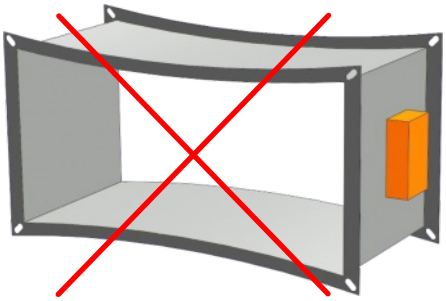
These facts must be recorded in the respective operation documentation of the damper (record books of the damper, fire logs, etc.) and subsequently, adequate function checks must be carried out.

Installation / fixing the damper

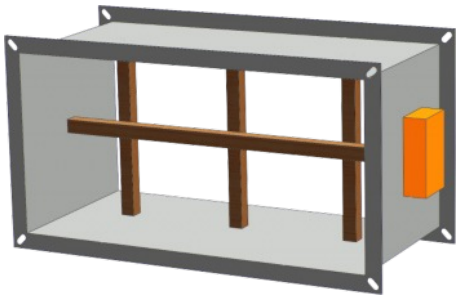
The damper casing shall not be deformed in the course of bricking in.

Once the damper is built in, the damper blade shall not grind on the damper casing during opening or closing.

Protection of the damper casing against buckling during installation, especially for large sizes!

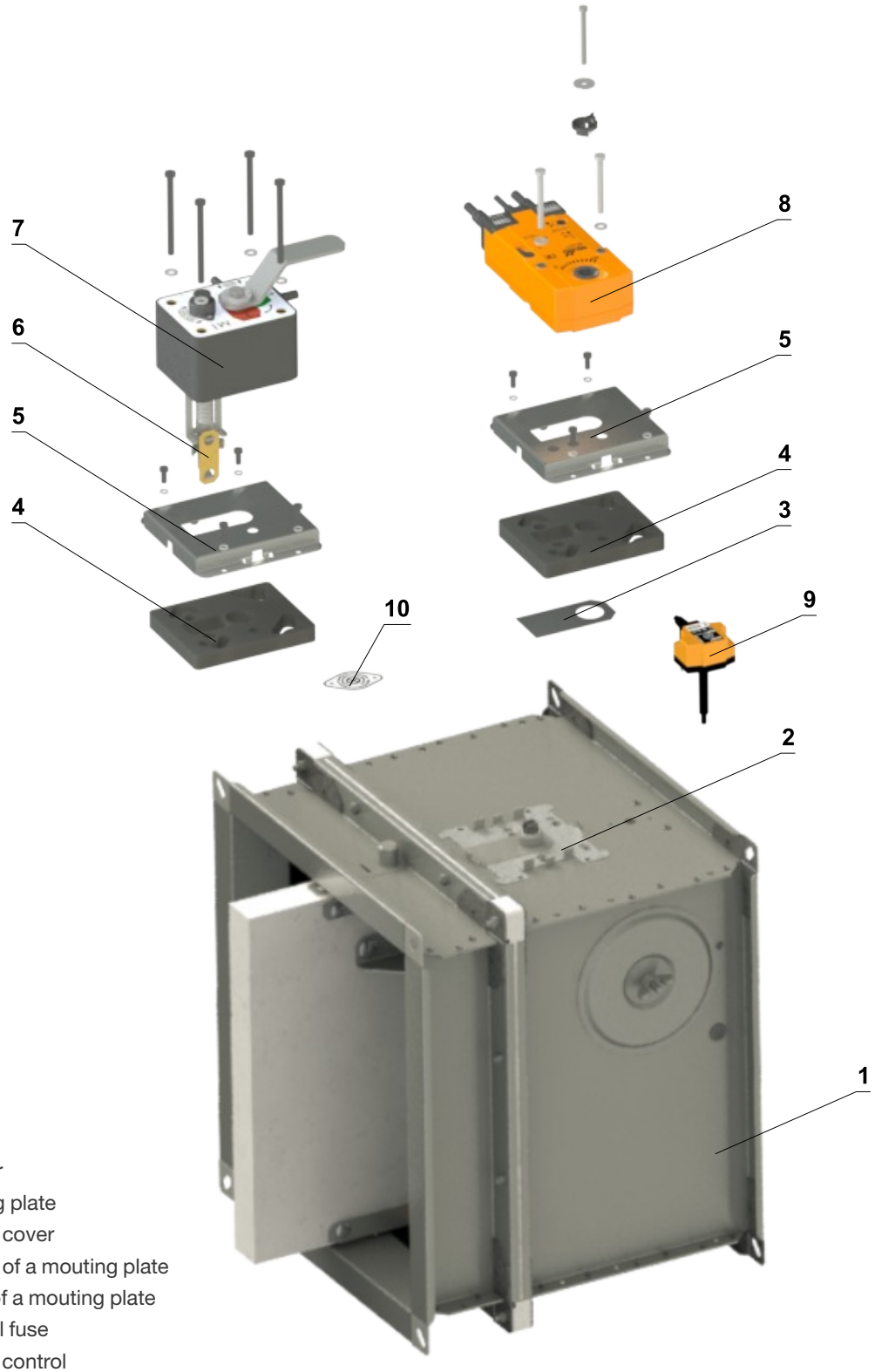


WRONG!



Reinforcement of the casing with wooden beams

Fig. 29. Change of manual control for the actuator or vice versa

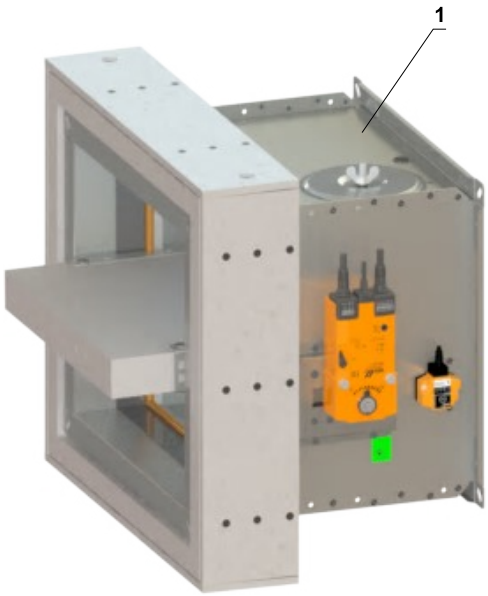


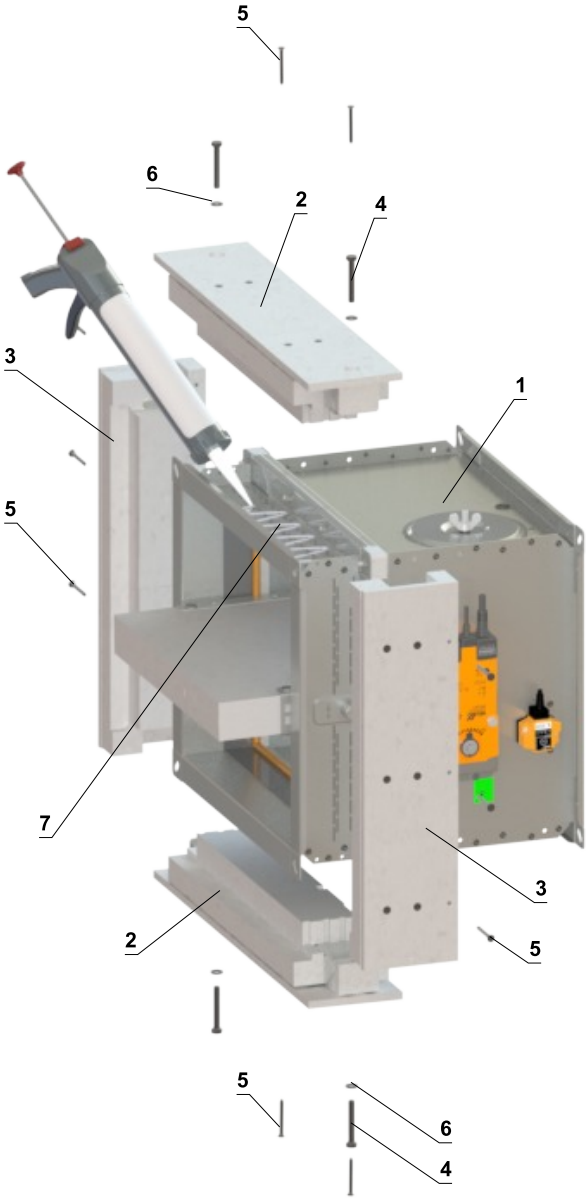
1 – Damper
2 – Mouting plate
3 – Sealing cover
4 – Sealing of a mouting plate
5 – Cover of a mouting plate
6 – Thermal fuse
7 – Manual control
8 – Spring return actuator
9 – Thermoelectric activation device BAT
10 – Sensor sticker

Reinforcement frame VRM-Q

For damper installation outside wall construction is necessary to use reinforcing frame VRM-Q 120.
Install reinforcing frame only after connecting duct.
Fastening material is included in the package except glue K84.

Fixing of reinforcing frame VRM-Q 120 to the damper casing





Installation procedure

1. Apply K84 glue over the entire surface.
2. Attach the frame parts to the damper and screw it in the corners using M8x60 mm hexagon head screws DIN 931 with M8/8.4 washers DIN 7349.
3. Screw 5x60 mm screws into the predrilled holes.

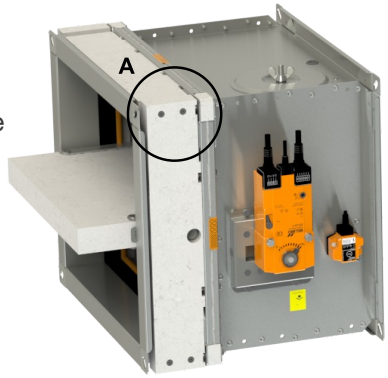
1 – FDMQ 120
2 – Part A of VRM-Q 120
3 – Part B of VRM-Q 120
4 – Hexagon head screw M8x60 mm DIN 931
5 – Screw 5x60 mm
6 – Washer M8/8,4 DIN 7349
7 – Glue K-84 PROMAT

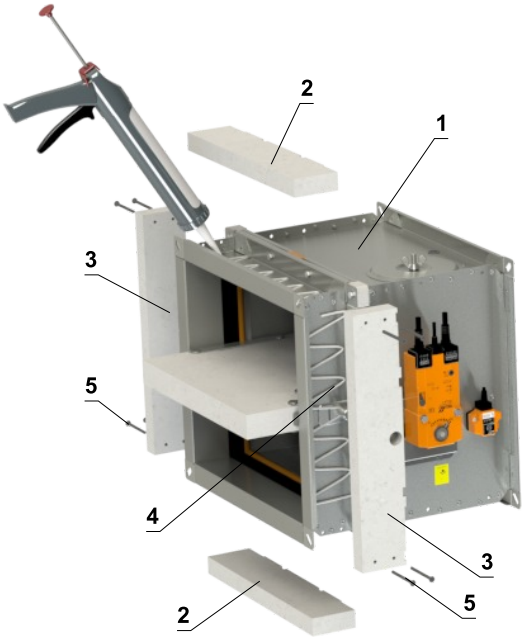
Protective cladding boards

Protective cladding boards must be used as a part of installation with weichschott system.
Can be ordered from MANDIK (installed on the damper or as an accessory) or can be sourced from local supplier.
If protective cladding boards are required, this must be specified in the ordering key.
Protective cladding boards are made of PROMATECTMST, thickness 30 mm.
Glue K84 is not included in the package.

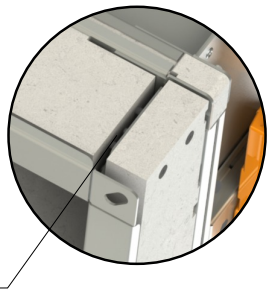
Installation procedure

1. Apply K84 glue over the entire surface.
2. Attach protective cladding boards on all sides of a fire damper and glue them on the damper casing.
3. Screw parts A and B using four screws 5x70 mm.
4. Completely fill the gaps with glue.





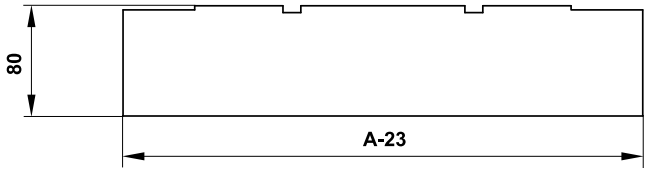
DETAIL A



Complitly fill the gaps between boards!

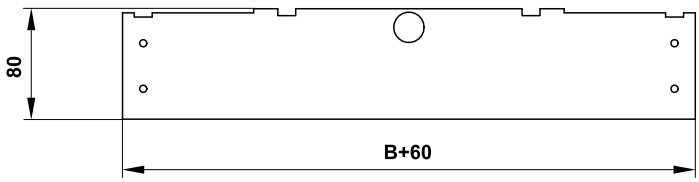
1 – FDMQ 120
2 – Part A of protective cladding boards
3 – Part B of protective cladding boards
4 – Glue PROMAT K-84
5 – Screw 5x70 mm

Part A



Detailed dimensions of protective cladding boards on request.

Part B



11. Entry into service 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 allimportant 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 blade 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 blade 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 blade, contact surfaces and silicon seal.

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

For dampers with manual control, following checks must be carried out:

Check of a manual control and thermal fuse

To check the funcktion of the mechanism proceed as follows:

- Turn the damper blade to "CLOSED" position as follows:
  - The damper blade is in "OPEN" position.
  - Press the control button of the manual control to turn the damper blade to "CLOSED" position.
  - Check the damper blade rotation to "CLOSED" position.
  - Damper blade closing shall be smooth and fast, the control lever shall be in „CLOSED“ position.

- Turn the damper blade to "OPEN" position as follows:
  - Turn the control lever by 90°.
  - Check the damper blade rotation to "OPEN" position.
  - The lever will automatically lock in "OPEN" position.

- Check of function and condition of the thermal fuse:
  - To check the function and the status of the fuse it's possible to remove the manual control from the casing of the fire damper which is attached to the damper casing with four screws M6.
  - Removing the thermal fuse from the fuse holder of a manual control, checks its correct functionality.
  - The manual control is identified as M1 to M5, depending on the closing spring strength.

For dampers with actuators, following checks must be carried out

Check the rotation of the blade 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 blade 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).

The check of function of the damper with actuator can be carried out as follows

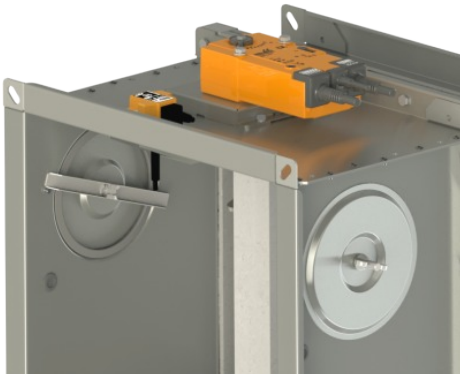
- By disconnecting and restoring the power supply, e.g. by a signal from electrical fire signalization.
- By pressing the test button on the thermoelectric activation device BAT (simulating fuse tripping).

Before putting the dampers into operation and during subsequent function checks, the 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 blade should be in "CLOSED" position with the fan off or with closed air regulation situated between the fan and the fire damper.

Inspection opening disassembly

- Release the covering lid by turning the wing nut and while turning the lid right or left release it from the security belt. Then tilt the lid and remove it from its original position.
- Ensure each damper is fully checked for operational capability, control should be initiated from the control system or by manual control. Damper blades should open and close correctly and operation should be visually inspected and documented prior to handover.



Inspection opening detail

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 10.
- 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 10.

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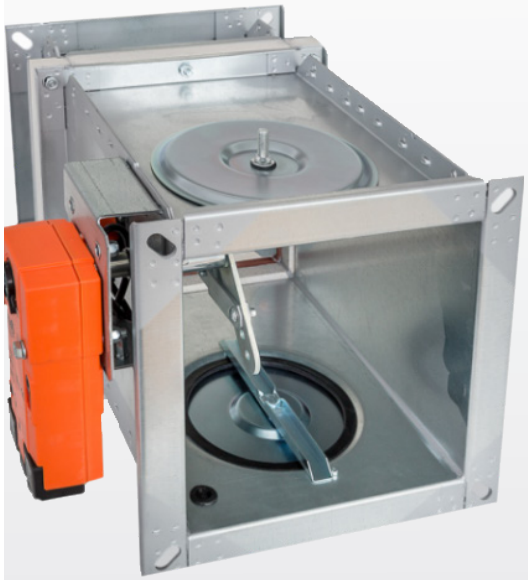

Let's move the air ***together!***