

# **CLASSIFICATION REPORT OF FIRE DAMPER TYPE CR2 No. 16128J**

## **Owner of the classification report:**

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## **1 Introduction**

This classification report defines the classification assigned to a fire damper, CR2, in accordance with the procedures given in EN 13501-3:2005+A1:2009: Fire classification of products and building elements – Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: Fire resistant ducts and fire dampers.

This classification report consists of 28 pages and 5 annexes and may only be used or reproduced in its entirety.

## 2 Details of classified product

### 2.1 Type of function

The product is defined as a fire damper. Its function is to resist fire in respect of integrity, insulation and resistance to smoke leakage.

### 2.2 Description

The classified product is described below, together with the relevant technical specifications. The description below is a short reproduction of the technical files and/or test reports, including the nominal dimensions, provided by the customer. Technical drawings of the dampers are enclosed in annexes 1 till 5.

The exact composition and exposure conditions of the classified product as tested are fully described in the test reports in support of this classification listed in Clause 3.

#### 2.2.1 Short description of the damper

The fire damper is composed of a circular steel housing, a damper blade and an actuating mechanism.

##### Housing:

The housing is composed of a galvanised sheet steel housing with a thickness of 2 mm and a length of 375 mm. The inner diameter amounts to 624 mm.

An intumescent strip protected by PVC tape covers the perforations evenly distributed over the whole circumference of the housing on the inside and the outside of the housing.

The axis of the damper is lead through two holes ( $\varnothing$  20.5 mm) at mid-height of the housing.

On the inside of the housing there are two steel retaining profiles fixed to the housing by means of steel rivets and each is located on one side of the damper blade, sealing of a half-circumference of the opening between the damper blade and the housing. A foam strip, with a section of 25 mm x 15 mm, is glued under both retaining profiles using a silicone mastic.

Damper blade:

The outer diameter of the blade is 610 mm.

The damper blade is composed of two fibre-silicate boards each with a thickness of 25 mm, which are stapled to each other and then glued together with a silicate-based adhesive.

A galvanised steel, transmission bracket is fixed to the damper blade. A counter-plate is fixed to the exposed side of the fire damper blade at the same height as the transmission bracket.

The damper blade rotates around a steel axis. This axis revolves in two bearings which are fixed in the housing and then sealed with a length of PVC taper. There is also a foam washer over the axis.

Actuating mechanism:

Type: - Belimo BF 24T + Belimo BAE 72B-S;  
- Belimo BF 230T + Belimo BAE 72B-S.

The actuator is fixed to the housing by means of a fixing profile and M6 bolts. The motor and the transmission bracket on the blade are connected to each other by means of a transmission arm.

After activating the power switch, the motor moves the damper to the holding point (= in the opened position). Simultaneously, an internal torsion spring is put under tension. In the event of a voltage drop or if the fusible link opens due to high temperature, the internal spring brings the damper in closed position.

## **2.2.2 Relevant technical specifications for the damper**

The damper shall be installed together with a penetration seal.

Fire damper:

- Outer diameter: 630 mm.
- The axis of the damper blade is tested horizontally and vertically.
- For the wall construction the damper is tested with the mechanism at the exposed side and unexposed side.
- For the floor construction the damper is tested with the mechanism at the unexposed side.

Flexible wall construction with type F gypsum plasterboards:

The damper is tested in a flexible wall construction with a thickness of 100 mm, made of type F gypsum plasterboards (GKF).

- The wall construction is composed of a steel frame covered on both sides with two layers of type F gypsum plasterboards (thickness: 2 x 2 x 12.5 mm).
- The wall is insulated by means of rock wool (density: 40 kg/m<sup>3</sup>; thickness: 40 mm).
- All set-ups require a metal stud aperture frame in the opening of the wall (1230 mm x 1230 mm) except for the Promat penetration seal which can be installed with or without an aperture frame.

Flexible wall construction with type A gypsum plasterboards:

The damper is additionally tested in a flexible wall construction with a thickness of 100 mm, made of type A gypsum plasterboards (GKB). It's allowed to exchange the composition of the supporting construction, as long as the lowest classification time is not exceeded.

- The wall construction is composed of a steel frame covered on both sides with two layers of type A gypsum plasterboards (thickness: 2 x 2 x 12.5 mm; density: 708 kg/m<sup>3</sup>).
- The wall is insulated by means of rock wool (density: 50 kg/m<sup>3</sup>; thickness: 40 mm).
- All set-ups require a metal stud aperture frame in the opening of the wall (1230 mm x 1230 mm) except for the Promat penetration seal which can be installed with or without an aperture frame.

Rigid floor construction with aerated concrete:

The damper is additionally tested in a rigid floor construction with a thickness of 150 mm, made of aerated concrete (density: (650 ± 200) kg/m<sup>3</sup>).

- Opening in the floor: 1230 mm (width) x 1230 mm (height).

Penetration seal:

Promat seal:

- Fire-resistant paint coat (Promastop E) is applied:
  - on the connection between the inlet-opening of the rigid floor construction and the penetration seal;
  - on the connection between the aperture framing of the flexible wall construction and the penetration seal.
- The gap between the fire damper and the supporting construction (flexible or rigid) is filled with two layers of paint coated insulation boards (140 kg/m<sup>3</sup>), type: mineral wool + coating (Promastop CB 50 or CC). The layers are mounted with the uncoated sides faced to each other.
- Fire-resistant paint coat (Promastop E or CC) is applied, in a radius of 100 mm around the damper, between the overlap of different panels.
- Fire-resistant paint coat (Promastop E or CC) is applied between the junction of the penetration seal and the fire damper.
- Aperture frame:
  - If installed in a flexible wall, no aperture frame is required in case of:  
EI 60 ( $v_e i \leftrightarrow o$ ) S in a type A or type F wall;  
EI 90 ( $v_e i \leftrightarrow o$ ) S in a type F wall;  
as given in paragraph 4.2.

Hilti seal:

- The gap between the fire damper and the supporting construction (flexible or rigid) is filled with two layers of paint coated insulation boards (150 kg/m<sup>3</sup>), type: Mineral wool + coating (Hilti CFS CT B 1S).
- All joints and connections have been sealed with fire-resistant acrylic sealant, type: Hilti CFS-S ACR.

Mulcol seal:

- The gap between the fire damper and the supporting construction (flexible or rigid) is filled with two layers of 50 mm Mulcol® Multimastic FB1 boards (168 kg/m<sup>3</sup>). Between the perimeter edge of the boards and the fire damper/supporting construction a 15 mm Mulcol® Multimastic SP coating is applied. On the unexposed side and exposed side a Mulcol® Multimastic C coating is applied over the entire surface of the Mulcol® Multimastic FB1 boards with an overlap of 25 mm on the supporting construction.

Pyro-Safe seal (installed in a wall):

- The gap between the fire damper and the supporting construction (flexible or rigid) is filled with two layers of 50 mm mineral wool (Rockwool Hardrock 040, 150 kg/m<sup>3</sup>). The mineral wool is glued into place with Pyro-Safe Flammotect-A.
- On the unexposed and exposed side an ablative coating "Pyro-Safe Flammotect-A" is applied over the entire surface of the mineral wool with a dry film thickness of 1.0 mm.

Pyro-Safe seal (installed in a floor):

- The gap between the fire damper and the supporting construction (rigid) is filled with two layers of 50 mm mineral wool (Rockwool Hardrock 040, 150 kg/m<sup>3</sup>). The mineral wool is glued into place with Pyro-Safe Flammotect-A.
- On the unexposed and exposed side an ablative coating "Pyro-Safe Flammotect-A" is applied over the entire surface of the mineral wool with a dry film thickness of 1.0 mm.

Clustered dampers:

- The gap between fire dampers or between the fire damper and the parallel building element is filled with a mineral wool (thickness: min. 50 mm; density: min. 150 kg/m<sup>3</sup>).
- Over a total length of 400 mm distributed evenly on both sides (150 mm on each side for a 100 mm wall), mineral wool (thickness: min. 50 mm; density: min. 150 kg/m<sup>3</sup>) is applied.
- The remaining gap between the fire damper and the vertical supporting construction is filled with the standard Promastop or Hilti penetration seal.
- if installation of 1 damper at a minimal distance from the supporting construction above, it is allowed to install without a metal stud aperture frame (30 mm from horizontal supporting construction) when the Promat penetration seal type is used.

### 3 Reports and results in support of this classification

#### 3.1 Test reports

NAME OF LABORATORY	NAME OF SPONSOR	REF. No.	E	I	S	Direction (i – o)	Orientation (v <sub>e</sub> , h <sub>o</sub> )
WFRGent nv	Rf-Technologies nv	15282A (CR2 Ø 630 mm)	See § 3.3			i ↔ o	V <sub>e</sub>
WFRGent nv	Rf-Technologies nv	12195 (CR2 Ø 200 mm)	See § 3.4			i ↔ o	Not applicable, only cold leakage test
WFRGent nv	Rf-Technologies nv.	11789 (CR2 Ø 630 mm)	See § 3.5			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	12112603 (CR2 Ø 630 mm)	See § 3.6			o → i	h <sub>o</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	315020220-1 (CR2 Ø 630 mm)	See § 3.7			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	316012106-1 (CR2 Ø 630 mm)	See § 3.8			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	316012505-1 (CR2 Ø 630 mm)	See § 3.9			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	316101111-1, Rev.1 (CU2 1200 mm x 800 mm)	See § 3.10			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	316101109-1, Rev.1 (CU2 500 mm x 800 mm- 500 mm x 560 mm 1200 mm x 800 mm 1080 mm x 560 mm)	See § 3.11			o → i	V <sub>e</sub>
Efectis Nederland BV	Rf-Technologies nv	2020-Efectis-R001435	See § 3.12			o → i	V <sub>e</sub>

Efectis Nederland BV	Rf-Technologies nv	2022-Efectis-R000060 [Rev.1] (CR2 Ø 630 mm)	See § 3.13	$o \rightarrow i$	$V_e$
Efectis France	Rf-Technologies nv	EFR-23-002918 - Rev. 1	See § 3.14	$o \rightarrow i$	$V_e$
Efectis Nederland BV	Rf-Technologies nv	2023-Efectis-R000351 [Rev1]	See § 3.15	$o \rightarrow i$	$h_o$

Exposure conditions during the fire resistance test (ref. No. 15282A):

Test standard: EN 1366-2:1999\*.  
Temperature/time curve: standard as in EN 1363-1:1999\*.  
Working pressure: -300 Pa.  
Supporting construction: mounted in a flexible wall construction with type F boards.

Exposure conditions during the cold leakage test (ref. No. 12195):

Test standard: §10.3 of EN 1366-2:1999\*.  
Working pressure: -500 Pa.

Exposure conditions during the fire resistance test (ref No. 11789):

Test standard: EN 1366-2:1999\*.  
Temperature/time curve: standard as in EN 1363-1:1999\*.  
Working pressure: -500 Pa.  
Supporting construction: mounted in a flexible wall construction with type A boards.

Exposure conditions during the fire resistance test (ref. No. 315020220-1):

Test standard: EN 1366-2:1999\*.  
Temperature/time curve: standard as in EN 1363-1:2012\*.  
Working pressure: -300 Pa.  
Supporting construction: mounted in a flexible wall construction with type F boards.



Exposure conditions during the fire resistance test (ref No. 12112603):

Test standard: EN 1366-2:1999\*.  
Temperature/time curve: standard as in EN 1363-1:1999\*.  
Working pressure: -300 Pa.  
Supporting construction: mounted in an aerated concrete floor.

Exposure conditions during the fire resistance test (ref. No. 316012106-1):

Test standard: EN 1366-2:2015.  
Temperature/time curve: standard as in EN 1363-1:2012\*.  
Working pressure: -500 Pa.  
Supporting construction: mounted in a flexible wall construction with type F boards.

Exposure conditions during the fire resistance test (ref. No. 316012505-1, 316101111-1,Rev1 / 316101109-1,Rev1)):

Test standard: EN 1366-2:2015.  
Temperature/time curve: standard as in EN 1363-1:2012\*.  
Working pressure: -300 Pa.  
Supporting construction: mounted in a flexible wall construction with type F boards.

Exposure conditions during the fire resistance test (ref. No. 2020-Efectis-R001435):

Test standard: EN 1366-2:2015.  
Temperature/time curve: standard as in EN 1363-1:2020.  
Working pressure: -300 Pa.  
Supporting construction: mounted in a flexible wall construction with type F boards.

Exposure conditions during the fire resistance test (ref. No. 2022-Efectis-R000060[Rev.1]):

Test standard: EN 1366-2:2015.  
Temperature/time curve: standard as in EN 1363-1:2020.  
Working pressure: -300 Pa.  
Supporting construction: mounted in a flexible wall construction with type F boards.

Exposure conditions during the fire resistance test (ref. No. EFR-23-002918 - Rev. 1):

Test standard: EN 1366-2:2015.  
Temperature/time curve: standard as in EN 1363-1:2020.  
Working pressure: -300 Pa.  
Supporting construction: mounted in a flexible wall construction with type F boards without an aperture frame around the opening.

Exposure conditions during the fire resistance test (ref. No2023-Efectis-R000351 [Rev1]):

Test standard: EN 1366-2:2015.  
Temperature/time curve: standard as in EN 1363-1:2020.  
Working pressure: -300 Pa.  
Supporting construction: mounted in an aerated concrete floor.

\*At present, these reports were technically examined with the conclusion that there have been no significant revisions to the relevant test standard which would render the test evidence irrelevant.

### **3.2 General rules for reducing the number of fire resistance tests**

The rules and proof for the reduction of the number of fire resistance tests can be found in report 16128I written and published by WFRGent nv.

### 3.3 Test results of the fire damper CR2 (Ø 630 mm) – test No. 15282A

Parameter	Limits	Results in minutes	
		o → i Mechanism at unexposed side	i → o Mechanism at exposed side
<b><u>Integrity (E criterion) *:</u></b>			
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 132 minutes (15 Nm <sup>3</sup> /h.m <sup>2</sup> )	≥ 132 minutes (15 Nm <sup>3</sup> /h.m <sup>2</sup> )
Ignition of the cotton pad		≥ 132 minutes	≥ 132 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 132 minutes	≥ 132 minutes
Spontaneous, continuous flames		≥ 132 minutes	≥ 132 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>			
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	114 minutes	129 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 132 minutes (ΔT <sub>max</sub> : 36°C)	≥ 132 minutes (ΔT <sub>max</sub> : 46°C)
<b><u>Smoke leakage (S criterion):</u></b>			
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	59 Nm <sup>3</sup> /h.m <sup>2</sup>	27 Nm <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 132 minutes (15 Nm <sup>3</sup> /h.m <sup>2</sup> )	≥ 132 minutes (15 Nm <sup>3</sup> /h.m <sup>2</sup> )
<b><u>Actuating mechanism:</u></b>			
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage	No damage
Time at which the fully-open fire damper closes	2 minutes	25 seconds	30 seconds
<b><u>Test duration:</u></b>		132 minutes	

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.4 Test results of the fire damper CR2 (Ø 200 mm) – test No. 12195

Parameter	Limits	Results	
		i → o Mechanism at exposed side	o → i Mechanism at unexposed side
<b><u>Smoke leakage (S criterion):</u></b>			
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	96 Nm <sup>3</sup> /h.m <sup>2</sup>	103 Nm <sup>3</sup> /h.m <sup>2</sup>

### 3.5 Test results of the fire damper CR2 (Ø 630 mm) – test No. 11789

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 75 minutes (37 Nm <sup>3</sup> /h.m <sup>2</sup> )
Ignition of the cotton pad		74 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 75 minutes
Spontaneous, continuous flames		74 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	≥ 75 minutes (ΔT <sub>max</sub> : 114°C)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 75 minutes (ΔT <sub>max</sub> : 73°C)
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	35 Nm <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 75 minutes (37 Nm <sup>3</sup> /h.m <sup>2</sup> )
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycles		No damage
Time at which the fully-open fire damper closes	2 minutes	43 seconds
<b><u>Test duration:</u></b>		75 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.6 Test results of the fire damper CR2 (Ø 630 mm) – test No. 12112603

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 124 minutes (Not measurable)
Ignition of the cotton pad		≥ 124 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 124 minutes
Spontaneous, continuous flames		≥ 124 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	123 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 124 minutes (ΔT <sub>max</sub> : 41.0°C)
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	9.6 Nm <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 124 minutes (Not measurable)
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycles		No damage
Time at which the fully-open fire damper closes	2 minutes	29 seconds
<b><u>Test duration:</u></b>		124 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.7 Test results of the fire damper CR2 (Ø 630 mm) – test No. 315020220-1

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 133 minutes (not measurable)
Ignition of the cotton pad		≥ 133 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 133 minutes
Spontaneous, continuous flames		≥ 133 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	93 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 133 minutes (ΔT <sub>max</sub> : 32,8°C)
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Not measurable
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 133 minutes (not measurable)
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycles		No damage
Time at which the fully-open fire damper closes	2 minutes	68 seconds
<b><u>Test duration:</u></b>		133 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.8 Test results of the fire damper CR2 (Ø 630 mm) – test No. 316012106-1

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	100 minutes (PK1) ≥ 133 minutes (PK2, PK3 and PK4)
Ignition of the cotton pad		≥ 133 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 133 minutes
Spontaneous, continuous flames		≥ 133 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	81 minutes (PK1) 127 minutes (PK2) ≥ 133 minutes (PK3 and PK4)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	92 minutes (PK1) ≥ 133 minutes (PK2, PK3 and PK4)
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 59 Nm <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	100 minutes (PK1) ≥ 133 minutes (PK2, PK3 and PK4)
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycles		No damage
Time at which the fully-open fire damper closes	2 minutes	Max. 43 seconds
<b><u>Test duration:</u></b>		133 minutes

\* These performance criteria apply after 5 minutes from the start of the test.



### 3.9 Test results of the fire damper CR2 (Ø 630 mm) – test No. 316012505-1

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 121 minutes
Ignition of the cotton pad		≥ 121 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 121 minutes
Spontaneous, continuous flames		≥ 121 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	82 minutes (PK3) 93 minutes (PK1) 101 minutes (PK2) 113 minutes (PK4)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 121 minutes
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 10.4 Nm <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 121 minutes
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycles		No damage
Time at which the fully-open fire damper closes	2 minutes	271 seconds (PK3) Max. 71 seconds (PK1, PK2 and PK4)
<b><u>Test duration:</u></b>		121 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.10 Test results of the fire damper CU2 – test No. 316101111-1,Rev1

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	90 minutes (PK3) ≥ 132 minutes (PK1 and PK2)
Ignition of the cotton pad		≥ 132 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 132 minutes
Spontaneous, continuous flames		≥ 132 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	88 minutes (PK3) 99 minutes (PK2) 112 minutes (PK1)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	95 minutes (PK2) 114 minutes (PK1) 131 minutes (PK3)
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 74 Nm <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	90 minutes (PK3) ≥ 132 minutes (PK1 and PK2)
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycles		No damage
Time at which the fully-open fire damper closes	2 minutes	Max. 69 seconds
<b><u>Test duration:</u></b>		132 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.11 Test results of the fire damper CU2 – test No. 316101109-1, Rev1

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	111 minutes (PK2) 128 minutes (PK1) ≥ 133 minutes (PK3 and PK4)
Ignition of the cotton pad		≥ 133 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 133 minutes
Spontaneous, continuous flames		≥ 133 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	108 minutes (PK2) 116 minutes (PK3) 121 minutes (PK1) 132 minutes (PK4)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	108 minutes (PK2) 112 minutes (PK3) 123 minutes (PK1) 131 minutes (PK4)
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 67 Nm <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	111 minutes (PK2) 128 minutes (PK1) ≥ 133 minutes (PK3 and PK4)
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycles		No damage
Time at which the fully-open fire damper closes	2 minutes	Max. 99 seconds
<b><u>Test duration:</u></b>		133 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.12 Test results of the fire damper CR2 (Ø 630 mm) – test No. 2020-Efectis-R001435

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	97 minutes (max: 107.8 m <sup>3</sup> /h.m <sup>2</sup> )
Ignition of the cotton pad		102 minutes
Fail test with the 6 mm and 25 mm gauges		102 minutes
Spontaneous, continuous flames		97 minutes
<b><u>Thermal insulation (I criterion) *:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	77 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	102 minutes
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 16.0 m <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	97 minutes (max: 107.8 m <sup>3</sup> /h.m <sup>2</sup> )
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	47 seconds
<b><u>Test duration:</u></b>		102 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.13 Test results of the fire damper CR2 (Ø 630 mm) – test No. 2022-Efectis-R000060[Rev.1]

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion)*:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	132 minutes (max: 67.3 m <sup>3</sup> /h.m <sup>2</sup> )
Ignition of the cotton pad		132 minutes
Fail test with the 6 mm and 25 mm gauges		132 minutes
Spontaneous, continuous flames		132 minutes
<b><u>Thermal insulation (I criterion)*:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	132 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	132 minutes
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 0.1 m <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	132 minutes (max: 67.3 m <sup>3</sup> /h.m <sup>2</sup> )
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	15 seconds
<b><u>Test duration:</u></b>		132 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

**3.14 Test results of the fire damper CR2 (Ø 630 mm) – test No. EFR-23-002918 -  
Rev. 1**

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion)*:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	132 minutes (max: 67.4 m <sup>3</sup> /h.m <sup>2</sup> )
Ignition of the cotton pad		132 minutes
Fail test with the 6 mm and 25 mm gauges		132 minutes
Spontaneous, continuous flames		132 minutes
<b><u>Thermal insulation (I criterion)*:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	108 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	132 minutes
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 70.3 m <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	132 minutes (max: 67.4 m <sup>3</sup> /h.m <sup>2</sup> )
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	1 minute
<b><u>Test duration:</u></b>		132 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

### 3.15 Test results of the fire damper CR2 (Ø 630 mm) – test No. 2023-Efectis-R000351 [Rev1]

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side
<b><u>Integrity (E criterion)*:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	124 minutes (max: 275.9 m <sup>3</sup> /h.m <sup>2</sup> )
Ignition of the cotton pad		124 minutes
Fail test with the 6 mm and 25 mm gauges		124 minutes
Spontaneous, continuous flames		124 minutes
<b><u>Thermal insulation (I criterion)*:</u></b>		
A maximum temperature rise at the unexposed side (T <sub>1</sub> , T <sub>2</sub> , T <sub>s</sub> )	180°C	80 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	124 minutes
<b><u>Smoke leakage (S criterion):</u></b>		
Leakage through the fire damper at an ambient temperature	200 Nm <sup>3</sup> /h.m <sup>2</sup>	Max. 63.5 m <sup>3</sup> /h.m <sup>2</sup>
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	102 minutes
<b><u>Actuating mechanism:</u></b>		
Any sign of mechanical damage after the opening and closing test of 50 cycli		No damage
Time at which the fully-open fire damper closes	2 minutes	25 seconds
<b><u>Test duration:</u></b>		124 minutes

\* These performance criteria apply after 5 minutes from the start of the test.

## 4 Classification and field of application

### 4.1 Reference of classification

This classification has been carried out in accordance with clause 7.2.3 of EN 13501-3:2005+A1:2009.

### 4.2 Classification

The fire dampers are classified according to the following combinations of performance parameters and classes as appropriate.

For dampers placed in a flexible wall construction, type F gypsum plasterboards (GKF), of 100 mm thick and a penetration seal, type Mineral wool + coating (Pyro-Safe seal). The working pressure of the dampers is -300 Pa.

**EI 120 ( $v_e$  i ↔ o) S**

For dampers placed in a flexible wall construction, type F gypsum plasterboards (GKF), of 100 mm thick and a penetration seal, type Mineral wool + coating (Promat or Hilti seal) or clustered seal. The working pressure of the dampers is -300 Pa.

**EI 90 ( $v_e$  i ↔ o) S**

For dampers, placed in a flexible wall construction, type F gypsum plasterboards (GKF), of 100 mm thick and a penetration seal, type Mineral wool + coating (Mulcol seal). The working pressure of the dampers is -300 Pa.

**EI 60 ( $v_e$  i ↔ o) S**



For dampers placed in a flexible wall construction, type A gypsum plasterboards (GKB), of 100 mm thick and a penetration seal, type Mineral wool + coating (Promat, Hilti, Mulcol or Pyro-Safe seal) or clustered seal. The working pressure of the dampers is -300 Pa.

**EI 60 ( $v_e i \leftrightarrow o$ ) S**

For dampers placed in a rigid floor construction, aerated concrete, of 150 mm thick and a penetration seal, type Mineral wool + coating (Promat or Hilti seal) or clustered seal. The working pressure of the dampers is -300 Pa.

**EI 120 ( $h_o i \leftrightarrow o$ ) S**

For dampers placed in a rigid floor construction, aerated concrete, of 150 mm thick and a penetration seal, type Mineral wool + coating (Pyro-Safe seal). The working pressure of the dampers is -300 Pa.

**EI 60 ( $h_o i \leftrightarrow o$ ) S**

#### 4.3 Field of direct application

a) Size of fire damper (when smoke leakage is not required):

The classification is applicable to all dampers of the same type provided that the maximum diameter does not exceed 630 mm and that the components remain in the same orientation as those tested.

b) Size of fire damper (when smoke leakage is required):

The classification is only applicable to the same type of damper provided that the minimum diameter is not less than 200 mm and that the maximum diameter does not exceed 630 mm. The components have to remain in the same orientation as those tested.

c) Fire dampers installed within structural openings:

The classification for a fire damper installed within a structural opening is only applicable to other fire dampers of the same type installed in the same orientation and position in relation to the supporting construction as that tested.

d) Fire from above:

Fire dampers tested horizontally in floors with fire from below are acceptable in installations where fire might come from above.

e) Separation between fire dampers and between fire dampers and construction elements:

The classification is applicable to a minimum separation in practice of 200 mm between fire dampers in separate ducts and of 75 mm between a fire damper and a constructional element.

f) Clustered dampers:

In case of clustered dampers, the classification is applicable to a minimum separation in practice of 30 mm and a maximum of 200 mm between fire dampers and between a fire damper and a constructional element.

A maximum of 3 dampers next to each other horizontally or vertically or a maximum of 4 dampers clusters are allowed.

g) Supporting constructions:

The following supporting constructions are tested:

- Flexible wall constructions with type F boards;
- Flexible wall constructions with type A boards;
- Rigid floor construction with aerated concrete.

The following rules apply in regards to the allowed supporting constructions:

Test results obtained with dampers installed in flexible vertical supporting constructions may be applied to rigid supporting constructions of a thickness equal to or greater than that of the element used in the tests, provided that the classified fire resistance of the rigid supporting construction is greater than or equal to the one used for the test. The sealants used shall be the same as those tested. Any fasteners used shall be fire rated to suit the supporting construction that is used.

Test results obtained with dampers installed in insulated flexible vertical supporting constructions may be applied to applications where the same flexible vertical supporting construction is uninsulated. The aperture framing shall be constructed using the same materials as used in the test partition construction, using the same number of boards as was tested.

Test results obtained with dampers installed in aerated concrete are applicable to rigid constructions made from hollow blocks, provided that the holes are filled/closed before the addition of the final penetration seal.

h) Blade pivot axis:

Tests with the actuator mounted at the bottom of the fire damper for a test with the blades with a vertical pivot axis shall allow the damper to be installed with the actuator at the top of the unit.

The damper may be installed with the blade axis at any angle.

In case of clustered dampers, the angle of the blade axis is limited to 45°.

#### **4.4 Field of extended application**

Not applicable.

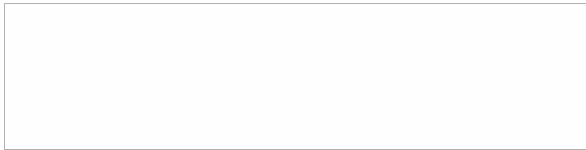
## 5 Duration of the validity of the classification report

At the time the standard EN 13501-3:2005+A1:2009 was published, no decision was made concerning the duration of validity of the classification document.

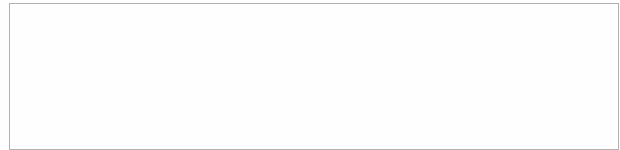
## 6 Limitations

This classification document does not represent type approval nor certification of the product.

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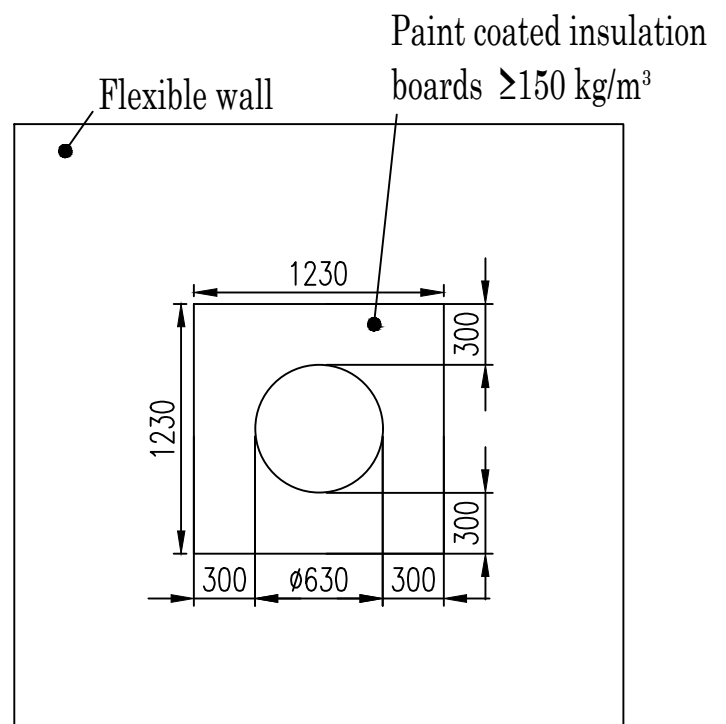
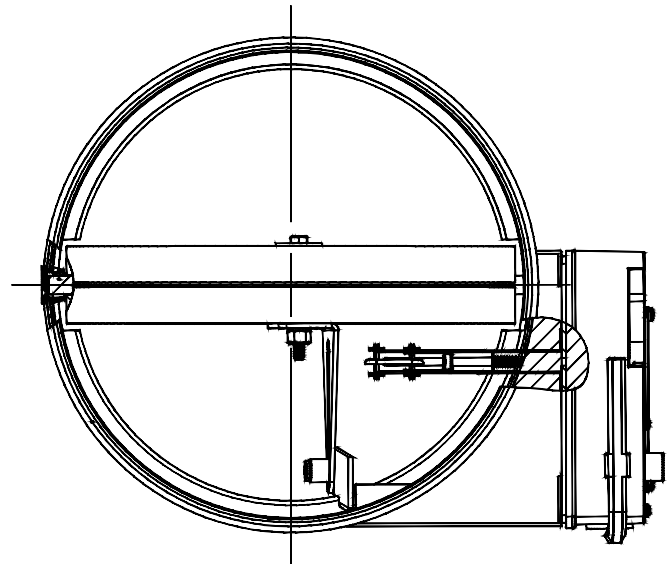
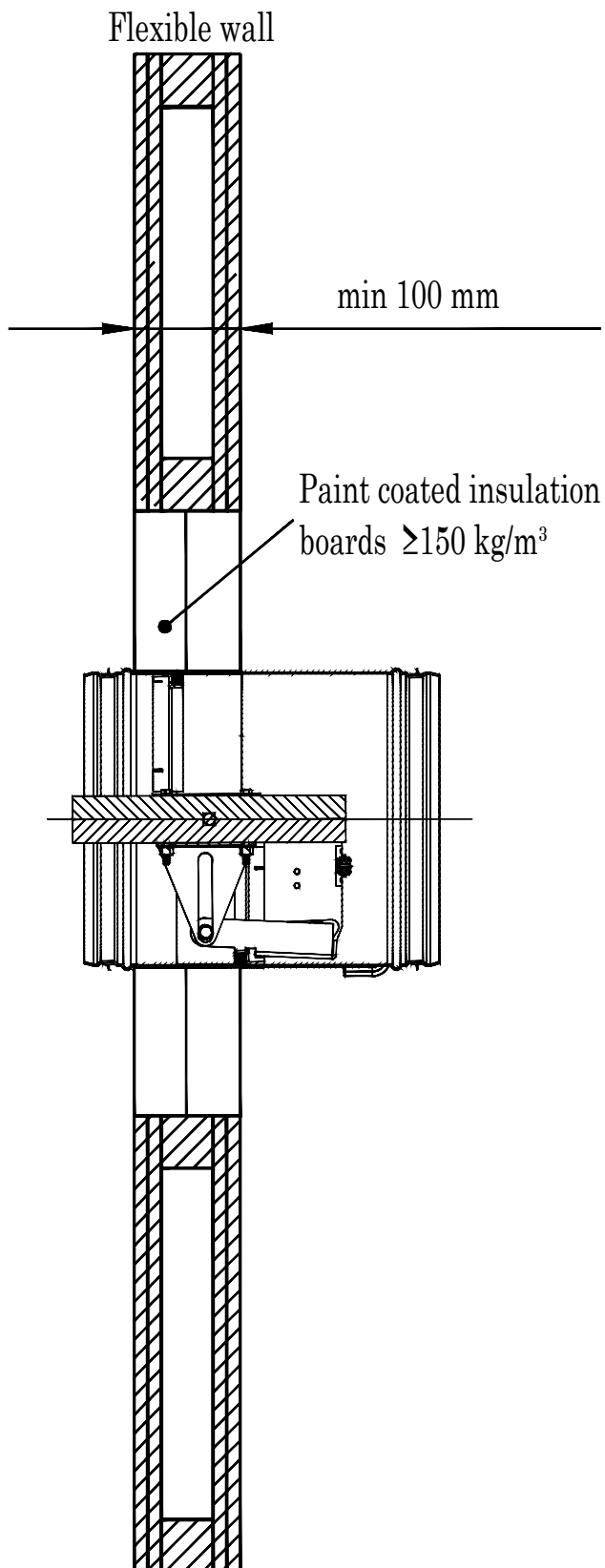


This document is the original version of this classification report and is written in English.

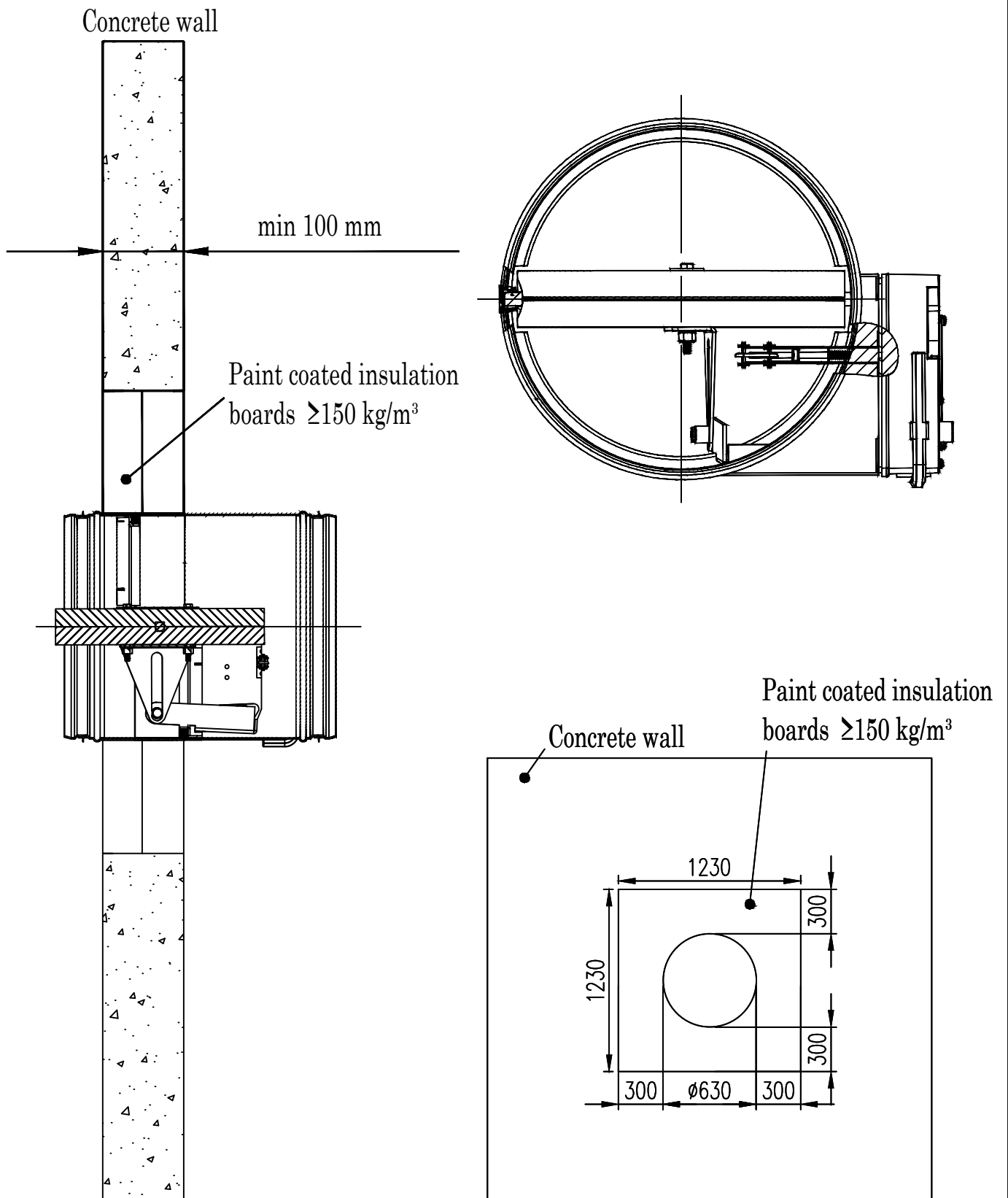
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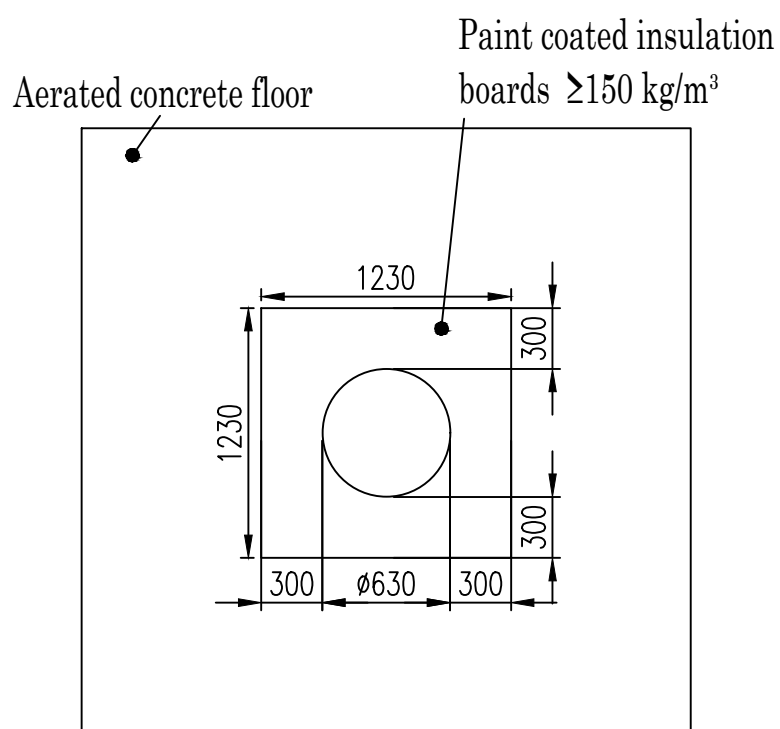
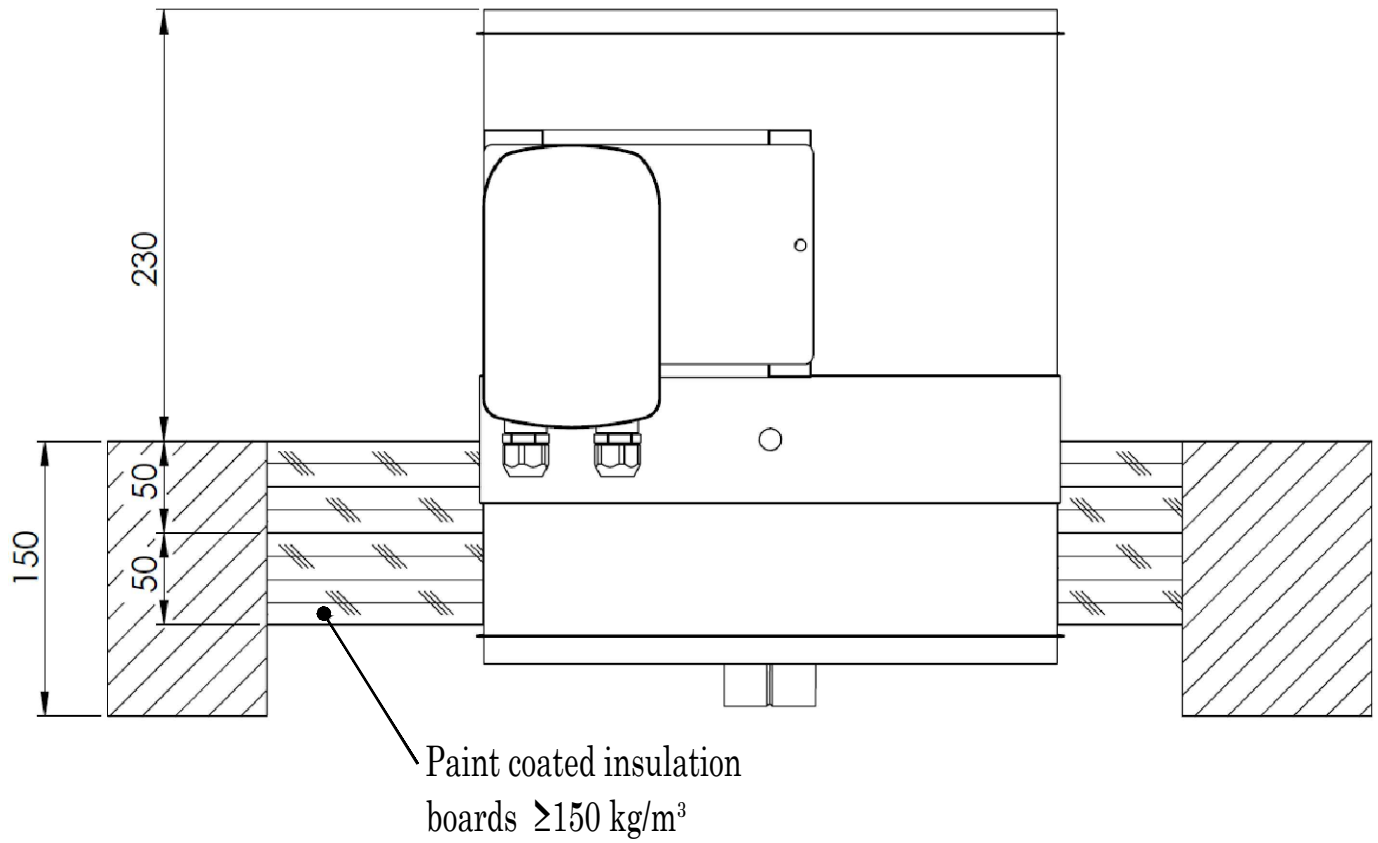
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## Fire damper CR2 in a flexible wall

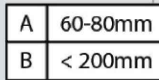


# Fire damper CR2 in a concrete wall



Fire damper CR2 in a aerated concrete floor

### Mounting in a flexible wall at 0 distance



Technical drawing of a reinforced concrete slab with three circular columns. The slab is shown in cross-section with a hatched top surface. The columns are represented by circles with dashed lines indicating their centers. The distance between the centers of the columns is marked as  $\geq 30$ . The distance from the center of the bottom column to the edge of the slab is marked as 40. The width of the slab is marked as  $B$ . A table on the right specifies  $B < 200\text{mm}$ .



## Installation without a metal stud aperture frame

