

# CLASSIFICATION REPORT OF FIRE DAMPER TYPE CR60 No. 16126F

## Owner of the classification report:

RF-TECHNOLOGIES NV  
Lange Ambachtstraat 40  
9860 Oosterzele  
Belgium

## 1 Introduction

This classification report defines the classification assigned to a fire damper, CR60, in accordance with the procedures given in EN 13501-3:2005+A1: 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 29 pages and 4 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 4.

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 consists of a galvanised sheet steel housing with a thickness of 0.8 mm and a length of 345 mm. The nominal diameter amounts to 315 mm.

At the place where the damper blade is mounted, rectangular perforations are distributed evenly over the whole circumference of the housing. On the inside of the housing, the perforations are fully covered by a self-adhesive intumescent graphite strip (35 mm x 1.5 mm). A self-adhesive PVC strip of 50 mm wide has been applied on the outside.

Two holes with a diameter of 9 mm and 16 mm (on the side of the actuating mechanism) are realized in the housing for the passage of the damper blade axis. Furthermore there are 3 holes with a diameter of 5.3 mm to fasten the transmission case by means of aluminum blind rivets.

### Damper blade:

The outer diameter of the blade is 301 mm.

The damper blade is composed of a fibre-silicate board with a thickness of 20 mm. In the outside perimeter of the damper blade there is a groove with a rubber washer in it.

Two axis supports are mounted to the damper blade by means of two aluminium blind rivets. The damper blade rotates around a square steel axis. The axis revolves in two bearings, which are secured to the housing wall.

### Actuating mechanism:

Type: MFUS (MTAL) + FUS 72.

The actuator is fixed to the housing by means of a steel fixing profile.

The actuator shall be manually put in hold position (=open). An internal torsion spring is tightened simultaneously. When the fusible alloy opens, the internal spring puts the damper in closed position.

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

The actuator is fixed to the housing by means of a steel fixing profile.

When voltage is supplied, the servomotor puts the damper in hold position (=open). An internal torsion spring is tightened simultaneously. In the event of a voltage drop or if the fusible alloy opens, the internal spring puts 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:

- Nominal diameter: 315 mm.
- Fire resistant paint coat on the outside of the housing (only needs to be applied to the Promat seal):
  - If a gap of 10 mm, filled with fire resistant paint (type: Promastop E) is realized between the damper and the penetration seal, a fire resistant paint coat (type: Promastop E) may be applied with maximum thickness 2.5 mm. The application of the paint coat is however not obligatory.
  - If no gap of 10 mm is realized between the damper and the penetration seal, a fire resistant paint coat (type: Promastop E) must be applied for the Promat seal, with a thickness of 1 mm tot 2.5 mm. The application of the paint coat is obligatory.

- 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 (GKF) gypsum plasterboards.

- 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).
- Opening in the wall by aperture framing: 915 mm x 915 mm.

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 (GKB) gypsum plasterboards. 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: 742 kg/m<sup>3</sup>).
- The wall is insulated by means of rock wool (density: 33 kg/m<sup>3</sup>; thickness: 40 mm).
- Opening in the wall by aperture framing: 915 mm x 915 mm.

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: 915 mm x 915 mm.

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 (150 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.

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<sup>®</sup> 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<sup>®</sup> Multimastic SP coating is applied. On the unexposed side and exposed side a Mulcol<sup>®</sup> Multimastic C coating is applied over the entire surface of the Mulcol<sup>®</sup> Multimastic FB1 boards with an overlap of 25 mm on the supporting construction.

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.

### 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> )
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	12071607 (CR60 Ø 315 mm)	See § 3.3			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	12051011 (CR60 Ø 315 mm)	See § 3.4			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	11080312 (CR60 Ø 315 mm)	See § 3.5			i → o	V <sub>e</sub>
WFRGent nv.	Rf-Technologies nv.	12558 (CR60 Ø 100 mm)	See § 3.6			i ↔ o	not applicable - cold leakage test
WFRGent nv.	Rf-Technologies nv.	12374A (CR60 Ø 250 mm)	See § 3.7			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	13082108 (CR60 Ø 315 mm)	See § 3.8			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	12112602 (CR60 Ø 315 mm)	See § 3.9			o → i	h <sub>o</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	12112603 (CR2 Ø 630 mm)	See § 3.10			o → i	h <sub>o</sub>
WFRGent nv	Rf-Technologies nv.	15282A (CR2 Ø 630 mm)	See § 3.11			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	315020220-1 (CR2 Ø 630 mm)	See § 3.12			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	316012106-1 (CR2 Ø 630 mm)	See § 3.13			o → i	V <sub>e</sub>
IBS GmbH (A-4017 Linz)	Rf-Technologies nv	316012505-1 (CR2 Ø 630 mm)	See § 3.14			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 § 3.15	o → i	Ve
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 § 3.16	o → i	Ve
Efectis Nederland BV	Rf-Technologies nv	2020-Efectis- R001435	See § 3.17	o → i	Ve

Exposure conditions during the fire resistance test (ref. Nos. 12051011 / 11080312 / 12071607 / 13082108 / 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. 12558):

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

Exposure conditions during the fire resistance test (ref. No. 12374A):

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. Nos. 12112602 / 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 a rigid floor construction.

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.

\*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 16126E written and published by WFRGent nv.

### 3.3 Test results of the fire damper CR60 (Ø 315 mm) – test No. 12071607

Parameter	Limits	Results in minutes	
		o → i Mechanism at unexposed side Paint coat: 1.5-2.5 mm	o → i Mechanism at unexposed side Paint coat: 1.0 -2.0 mm
<b><u>Integrity (E criterion) *:</u></b>			
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 90 minutes (not measurable)	≥ 90 minutes (not measurable)
Ignition of the cotton pad		≥ 90 minutes	≥ 90 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 90 minutes	≥ 90 minutes
Spontaneous, continuous flames		≥ 90 minutes	≥ 90 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	≥ 90 minutes (ΔT <sub>max</sub> : 140.1 °C)	≥ 90 minutes (ΔT <sub>max</sub> : 155.7 °C)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 90 minutes (ΔT <sub>max</sub> : 48.0 °C)	≥ 90 minutes (ΔT <sub>max</sub> : 57.0 °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>	not measurable	not measurable
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 90 minutes (not measurable)	≥ 90 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	No damage
Time at which the fully-open fire damper closes	2 minutes	41 seconds	66 seconds
<b><u>Test duration:</u></b>		≥ 90 minutes	

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

### 3.4 Test results of the fire damper CR60 (Ø 315 mm) – test No. 12051011

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side Paint coat: 0.2-1.0 mm
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	105 minutes
Ignition of the cotton pad		≥ 123 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 123 minutes
Spontaneous, continuous flames		≥ 123 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
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	105 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>	29.8 Nm <sup>3</sup> /h.m
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	103 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	55 seconds
<b><u>Test duration:</u></b>		123 minutes

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

### 3.5 Test results of the fire damper CR60 (Ø 315 mm) – test No. 11080312

Parameter	Limits	Results in minutes
		i → o Mechanism at exposed side Paint coat: 0.2-1.0 mm
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 90 minutes (not measurable)
Ignition of the cotton pad		≥ 90 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 90 minutes
Spontaneous, continuous flames		≥ 90 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	≥ 90 minutes (ΔT <sub>max</sub> : 156.6 °C)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 90 minutes (ΔT <sub>max</sub> : 66.9 °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>	15.7 Nm <sup>3</sup> /h.m
Leakage through the fire damper during the test *	200 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 90 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	51 seconds
<b><u>Test duration:</u></b>		
		≥ 90 minutes

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

**3.6 Test results of the fire damper CR60 (Ø 100 mm) – test No. 12558**

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>	5.1 Nm <sup>3</sup> /h.m <sup>2</sup>	3.3 Nm <sup>3</sup> /h.m <sup>2</sup>

### 3.7 Test results of the fire damper CR60 (Ø 250 mm) – test No. 12374A

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>	≥ 77 minutes (19.6 Nm <sup>3</sup> /h.m <sup>2</sup> )
Ignition of the cotton pad		77 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 77 minutes
Spontaneous, continuous flames		≥ 77 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 (ΔT <sub>max</sub> : 163°C)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 77 minutes (ΔT <sub>max</sub> : 48.7°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>	16.2 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>	≥ 77 minutes (19.6 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	55 seconds
<b><u>Test duration:</u></b>		
		77 minutes

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

### 3.8 Test results of the fire damper CR60 (Ø 315 mm) – test No. 13082108

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side No paint coat was applied
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 90 minutes (Not measurable)
Ignition of the cotton pad		≥ 90 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 90 minutes
Spontaneous, continuous flames		≥ 90 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	≥ 90 minutes (ΔT <sub>max</sub> : 161.6°C)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 90 minutes (ΔT <sub>max</sub> : 52.5°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>	≥ 90 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	43 seconds
<b><u>Test duration:</u></b>		≥ 90 minutes

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

3.9 Test results of the fire damper CR60 (Ø 315 mm) – test No. 12112602

Parameter	Limits	Results in minutes
		o → i Mechanism at unexposed side Paint coat: 1.0-1.5 mm
<b><u>Integrity (E criterion) *:</u></b>		
Leakage through the fire damper	360 Nm <sup>3</sup> /h.m <sup>2</sup>	≥ 90 minutes (Not measurable)
Ignition of the cotton pad		≥ 90 minutes
Fail test with the 6 mm and 25 mm gauges		≥ 90 minutes
Spontaneous, continuous flames		≥ 90 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	≥ 90 minutes (ΔT <sub>max</sub> : 130.3°C)
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 90 minutes (ΔT <sub>max</sub> : 48.4°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>	≥ 90 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	38 seconds
<b><u>Test duration:</u></b>		
		≥ 90 minutes

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



### 3.10 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.

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

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 (15 Nm <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	114 minutes
An average temperature rise at the unexposed side (T <sub>2</sub> )	140°C	≥ 132 minutes (ΔT <sub>max</sub> : 36°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>
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> )
<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	25 seconds
<b><u>Test duration:</u></b>		132 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. 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 cycli		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.

### 3.13 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.

### 3.14 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
<p><b><u>Integrity (E criterion) *:</u></b></p> <p>Leakage through the fire damper</p> <p>Ignition of the cotton pad</p> <p>Fail test with the 6 mm and 25 mm gauges</p> <p>Spontaneous, continuous flames</p>	360 Nm <sup>3</sup> /h.m <sup>2</sup>	<p>≥ 121 minutes</p> <p>≥ 121 minutes</p> <p>≥ 121 minutes</p> <p>≥ 121 minutes</p>
<p><b><u>Thermal insulation (I criterion) *:</u></b></p> <p>A maximum temperature rise at the unexposed side (T<sub>1</sub>, T<sub>2</sub>, T<sub>s</sub>)</p> <p>An average temperature rise at the unexposed side (T<sub>2</sub>)</p>	<p>180°C</p> <p>140°C</p>	<p>82 minutes (PK3)</p> <p>93 minutes (PK1)</p> <p>101 minutes (PK2)</p> <p>113 minutes (PK4)</p> <p>≥ 121 minutes</p>
<p><b><u>Smoke leakage (S criterion):</u></b></p> <p>Leakage through the fire damper at an ambient temperature</p> <p>Leakage through the fire damper during the test *</p>	<p>200 Nm<sup>3</sup>/h.m<sup>2</sup></p> <p>200 Nm<sup>3</sup>/h.m<sup>2</sup></p>	<p>Max. 10.4 Nm<sup>3</sup>/h.m<sup>2</sup></p> <p>≥ 121 minutes</p>
<p><b><u>Actuating mechanism:</u></b></p> <p>Any sign of mechanical damage after the opening and closing test of 50 cycles</p> <p>Time at which the fully-open fire damper closes</p>	2 minutes	<p>No damage</p> <p>271 seconds (PK3)</p> <p>Max. 71 seconds (PK1, PK2 and PK4)</p>
<p><b><u>Test duration:</u></b></p>		121 minutes

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

3.15 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 cycli		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.

3.16 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.

**3.17 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.



## 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 (Promat seal). The working pressure of the dampers is -300 Pa.

With a gap of 10 mm between the damper and the penetration seal, filled with fire resistant paint: with or without a fire-resistant paint coat on the outside of the housing.

Alternatively with a gap of 10 mm between the damper and the penetration seal, filled with fire resistant paint: with a fire-resistant paint coat (allowed thickness: 1 mm until 2.5 mm) on the outside of the housing.

Or

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 (Hilti seal) or clustered seal. The working pressure of the dampers is -300 Pa.

**EI 90 (v<sub>e</sub> 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<sub>e</sub> 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 or Mulcol seal) or clustered seal. The working pressure of the dampers is -300 Pa.

**EI 60 (v<sub>e</sub> i ↔ 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 seal). The working pressure of the dampers is -300 Pa.

With a gap of 10 mm between the damper and the penetration seal, filled with fire resistant paint: with or without a fire-resistant paint coat on the outside of the housing.

Alternatively with a gap of 10 mm between the damper and the penetration seal, filled with fire resistant paint: with a fire-resistant paint coat (allowed thickness: 1 mm until 2.5 mm) on the outside of the housing.

Or

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

**EI 90 (h<sub>o</sub> i ↔ 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 nominal diameter does not exceed 315 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 nominal diameter is not less than 100 mm and that the maximum nominal diameter does not exceed 315 mm.

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 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.

SIGNED

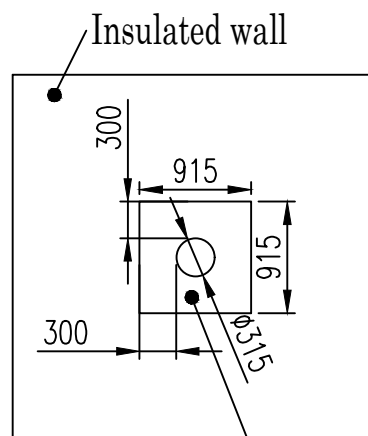
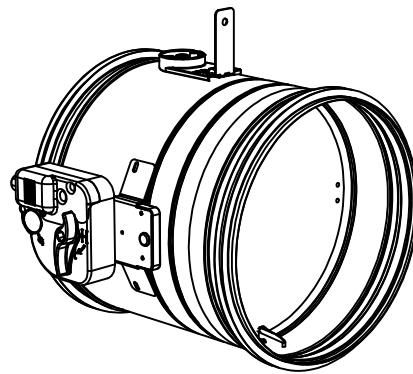
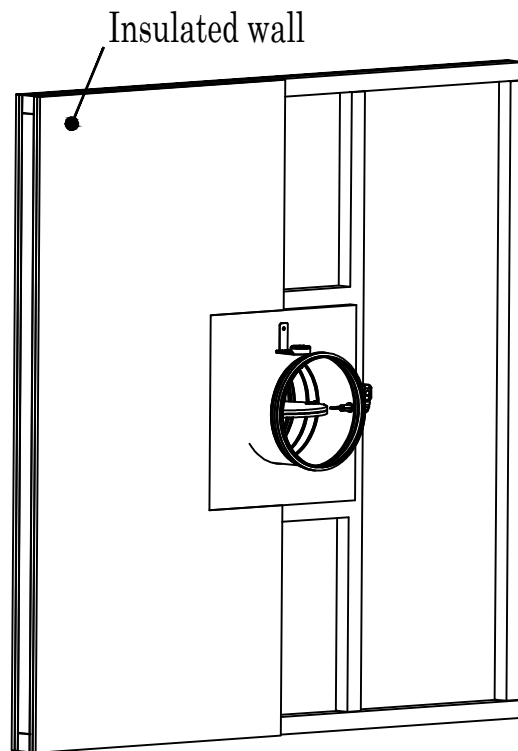
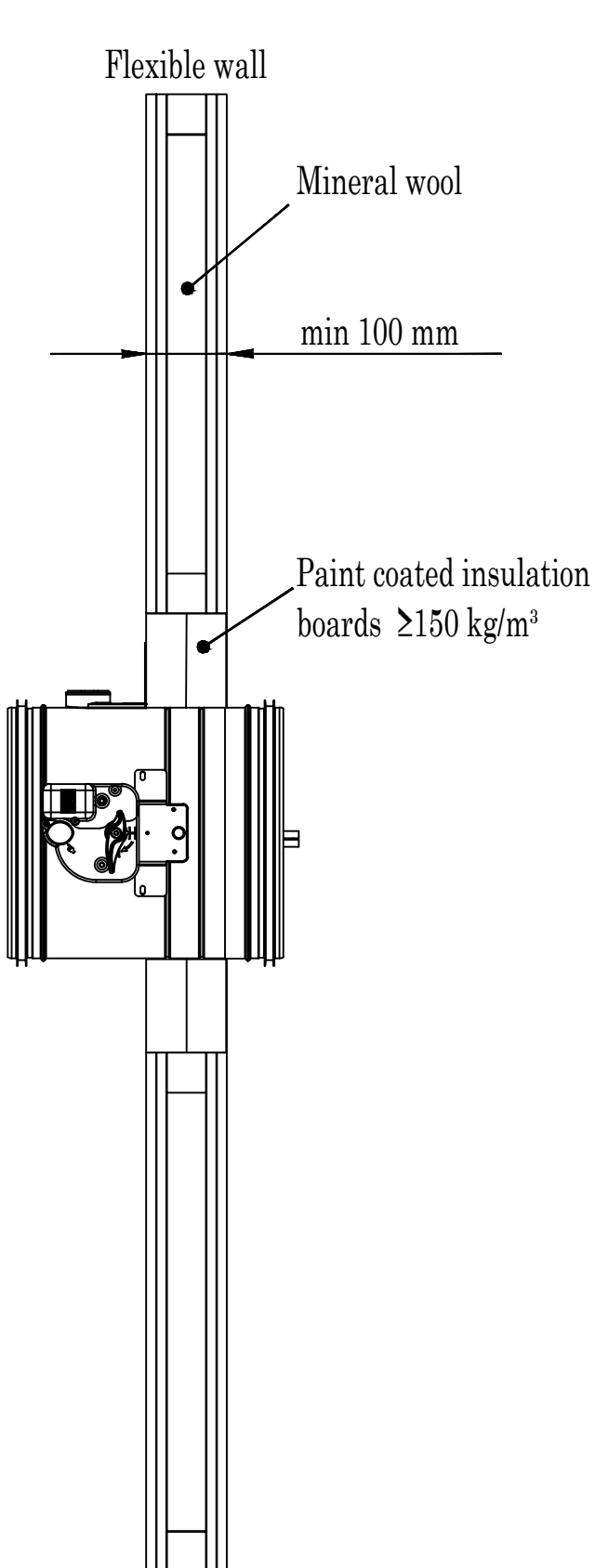
APPROVED

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

This report may be used only literally and completely for publications. - For publications of certain texts, in which this report is mentioned, our permission must be obtained in advance.

The authenticity of the electronic signatures is assured by Belgium Root CA.

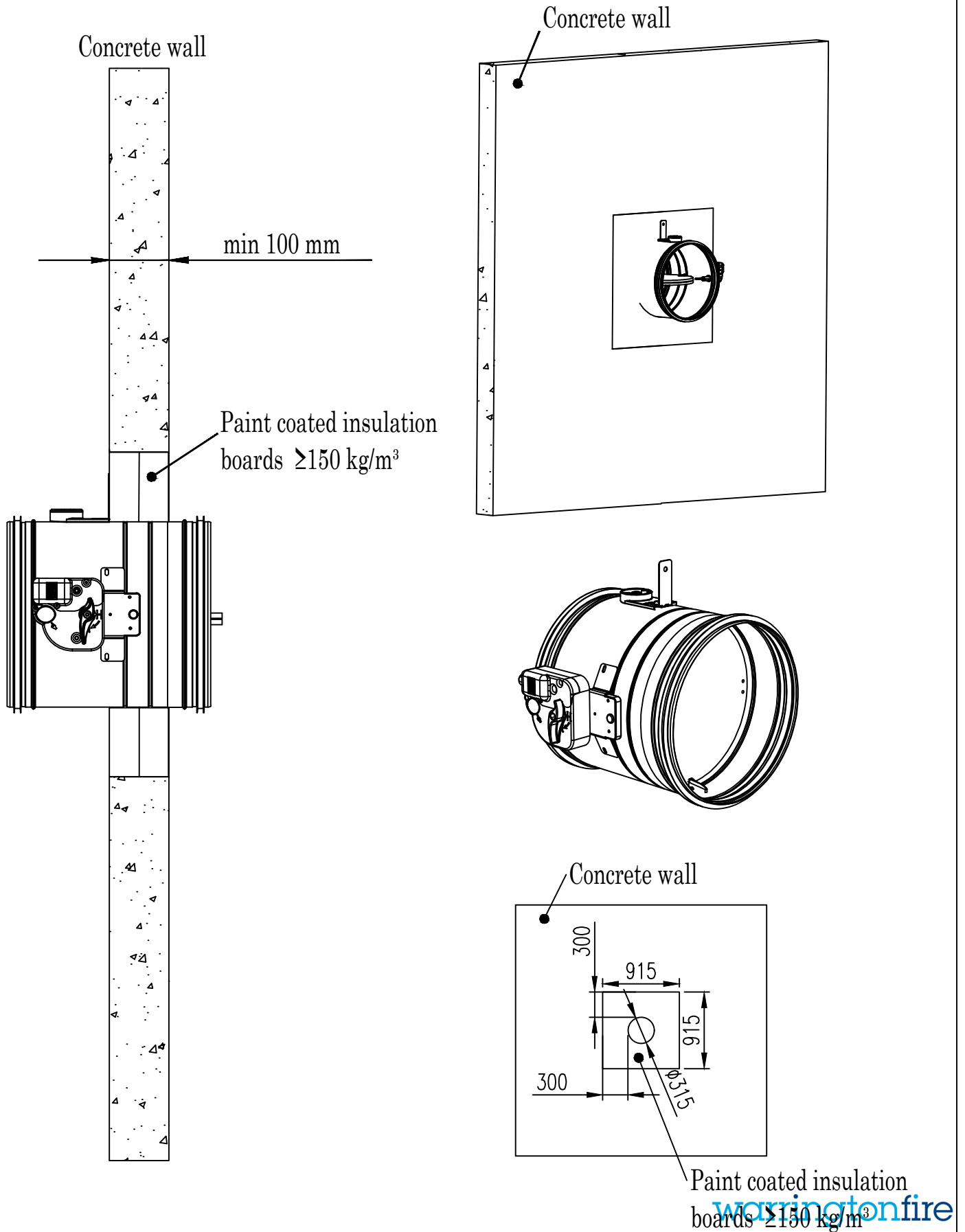
Fire damper CR60 in a flexible wall



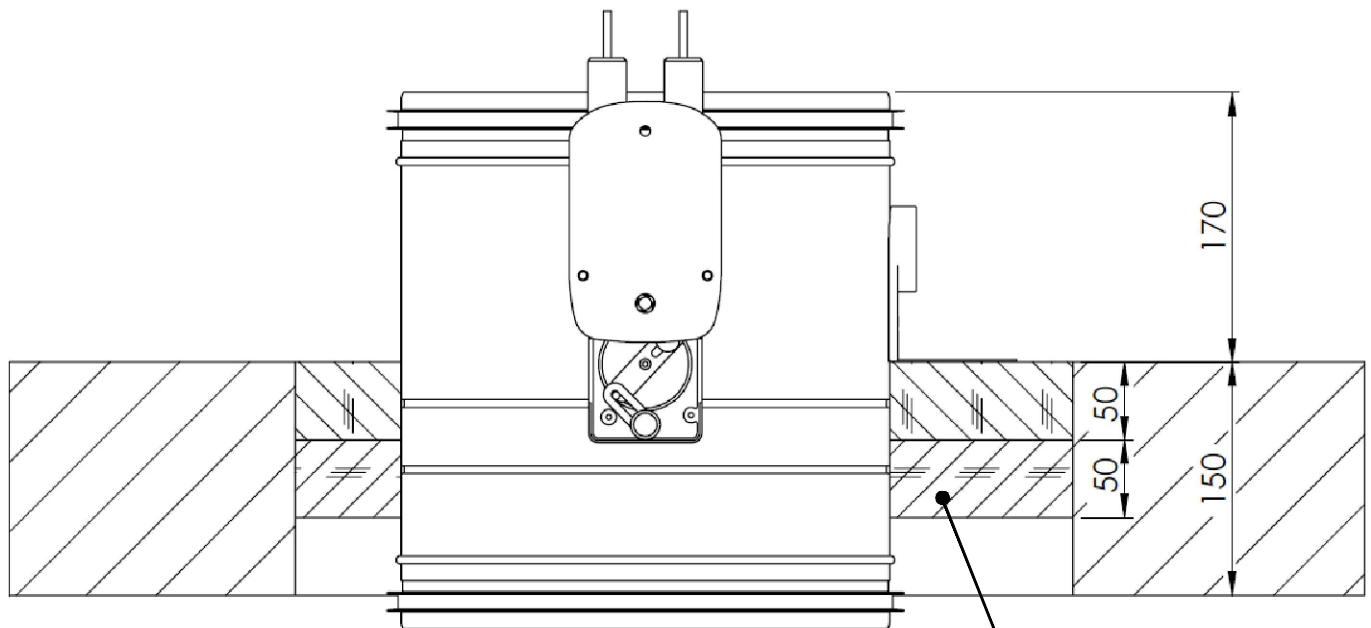
Paint coated insulation boards  $\geq 150 \text{ kg/m}^3$

warringtonfire

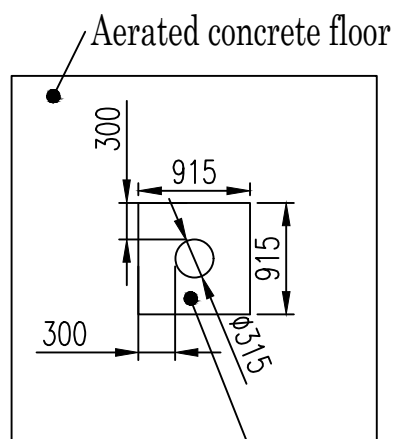
# Fire damper CR60 in a concrete wall



Fire damper CR60 in an aerated concrete floor



Paint coated insulation boards  $\geq 150 \text{ kg/m}^3$



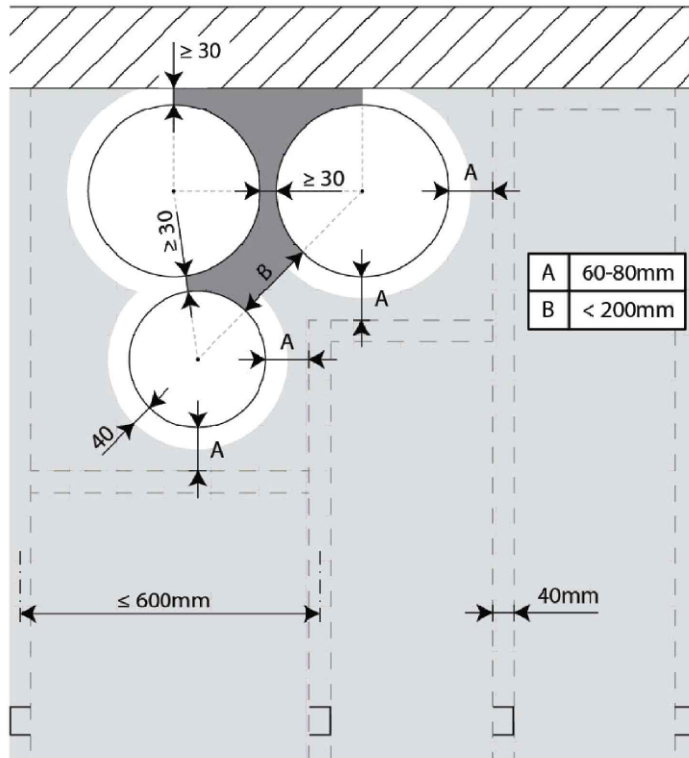
Aerated concrete floor

Paint coated insulation boards  $\geq 150 \text{ kg/m}^3$



## Clustered dampers

Mounting in a flexible wall at 0 distance



Mounting in a rigid wall at 0 distance

