



Chapter 8

Fire-resistant and smoke-resistant components

Chapter 8
Fire-resistant and smoke-resitant
components

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The Solid Air fire dampers have been tested in accordance with the European standard EN 1366-2, they are classified in accordance with EN 13501-3 and CE marked in accordance with EN 15650:2010



FDC25

Fire damper, round, damper blade 25 mm
CE marked in accordance with EN 15650:2010
Tested in accordance with EN 1366-2
Classified in accordance with EN 13501-3
LUKA C/ATC 3

Available types

F D C 25 - - -

- F** fire-resistant
- D** damper
- C** round
- 25** damper blade thickness 25 mm

- Mounting frame

- O** none
- APP** applique
- MF1** mounting frame 1
- MF2** mounting frame 2

- Operation

Manual

- R** without end switches
- RS** with end switches
- EMS-S** with solenoid 24/48 VDC and end switches, magnetic with a supply, (information available on request)

Motor-operated

- M24S** Belimo 24V
- M230S** Belimo 230V
- M24S-ST** Belimo 24V plug-and-play for connection to Belimo supply and/or communication modules
- EX** ATEX classified Schischek 230/24V servomotor explosion-safe (information available on request)

- Accessory

- O** none
- UG** smoke sensor (cannot be used in combination with operating option R, RS, EMS-S or EX)

SA-Select

Check [SA-Select](#) to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The round fire dampers type FDC25 can be used in fire and smoke-separating walls and floors. If they are incorporated in accordance with the instructions, there is a fire resistance of up to 120 minutes depending on how they are built in. The fire dampers have two standard inspection openings. For rapid fitting, the damper is available with a pre-fitted mounting frame. A smoke sensor is available as an optional accessory. For the classification list and the corresponding installation instructions, please see the manual on our website. Certified use requires compliance with the [installation instructions in the manual](#).

Characteristics

- Available in dimensions of \varnothing 100 to 315 mm.
- Fitting can be horizontal or vertical, in any flow direction.
- Two standard round inspection openings of 39 mm.
- Airtightness class C over the housing in accordance with EN1751 (LUKA C)/ATC3.
- Airtightness class 3 over the damper blade in accordance with EN1751.
- Hygiene certificate in accordance with VDI 6022.

Finish

Housing:	galvanised sheet steel
Damper blade:	heat-resistant thickness 25 mm
Fusible link:	72 °C

Optional (information available on request)

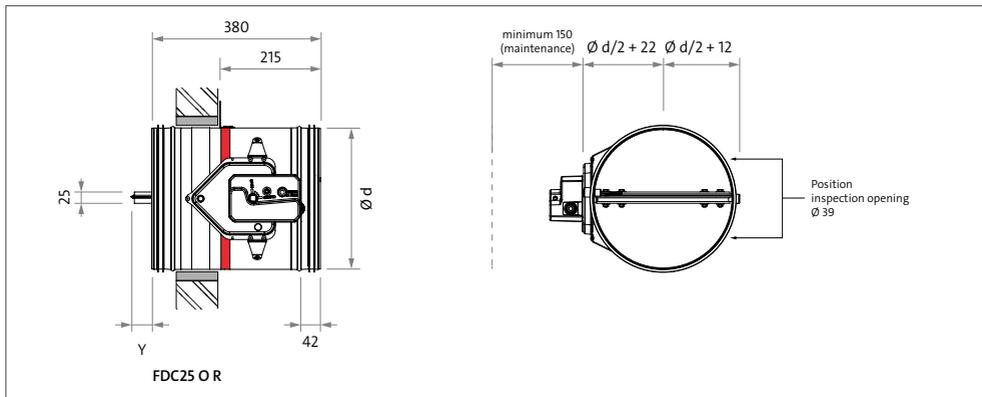
- Galvanised sheet steel with internal and external powder coating.
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L).
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L) with internal and external powder coating.
- Motor-operated version with 95 °C fusible link.
- Belimo supply and/or communication module BKN-230-24-MOD.
- For other versions, please ask our sales department.

Classified in accordance with EN 13501-3

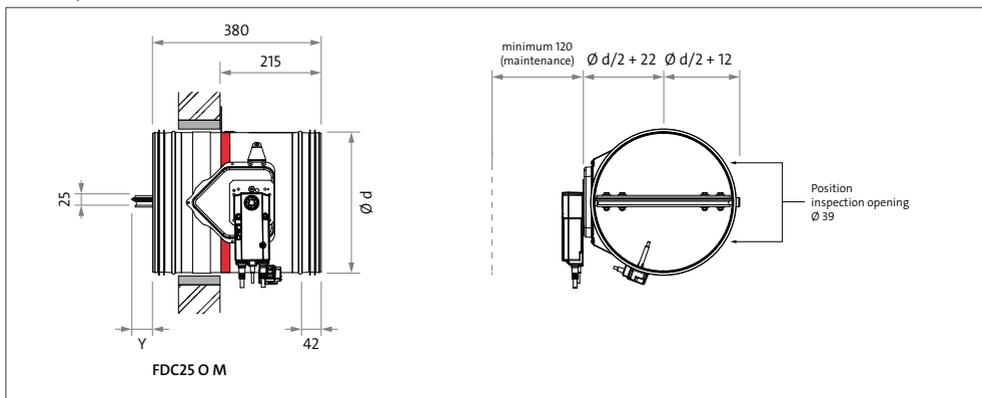
For a full classification overview with the various sealing methods, we refer to the [manual](#).

Dimensions

Manual

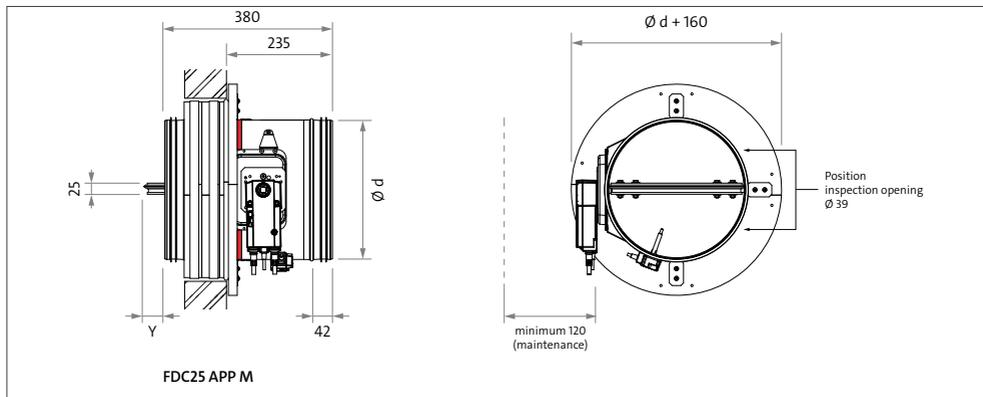


Motor-operated

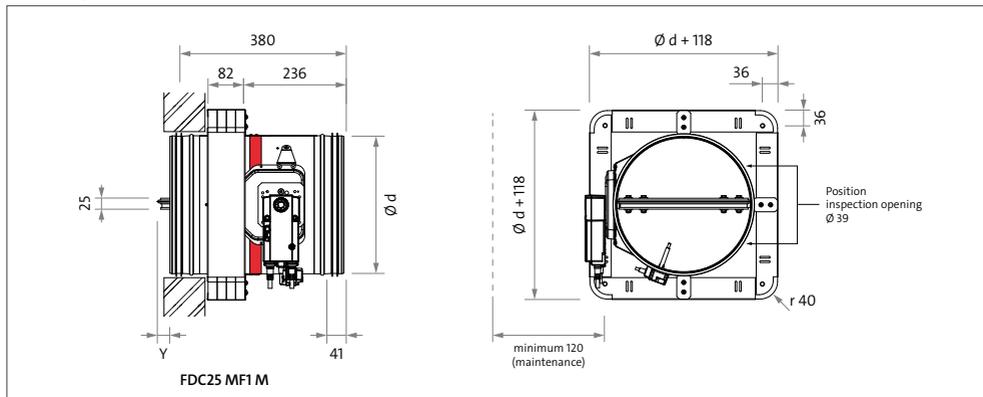


Dimensions

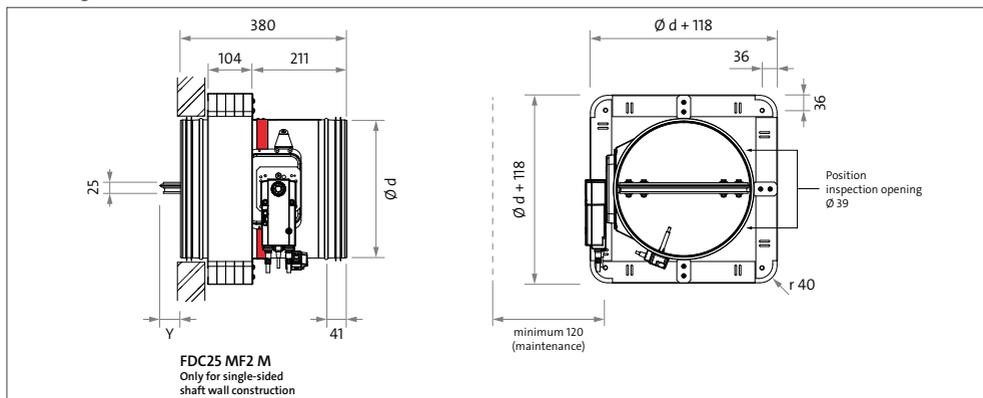
Applique



Mounting frame 1

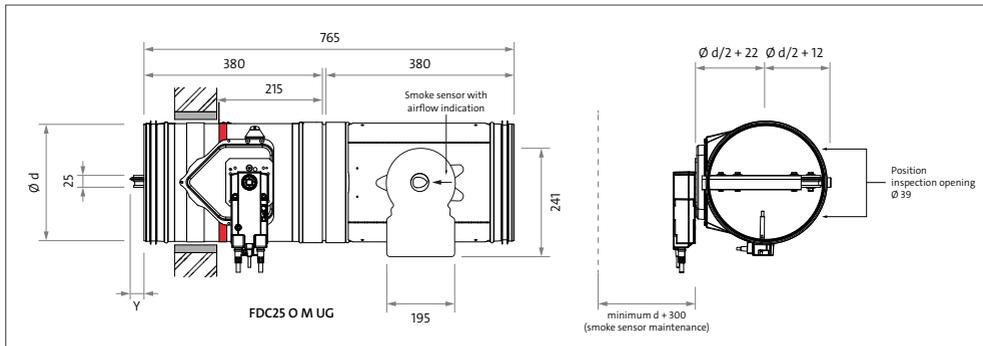


Mounting frame 2



Dimensions

Smoke sensor



Available dimensions

model	d	free passage in m ²	Y	g
100	98	0.005	-	3.8
125	123	0.0087	-	4.2
160	158	0.0155	-	4.7
200	198	0.0256	-	5.4
250	248	0.0418	15	6.3
315	313	0.0687	48	7.7

Y = protruding length of the damper blade.

g = weight in kg (manual version without mounting frame).

For more specific information about the dimensions or weights per model, we refer to the [manual](#).

Comments

- The dimensions are in mm.
- Please visit our website to download the [manual](#), [declaration of performance \(DoP\)](#) and the [verification certificate of the declaration of performance](#).

Fitting

Installation of the fire damper must be carried out according to the [manual](#).

Points of attention for the installation of fire damper/ smoke sensor combination

Check the airflow direction when applying the fire damper/smoke sensor combination and verify the placement of the combination based on the criteria of NEN EN 6075. Install the combination, as supplied in one piece, so that the air flows through the smoke sensor first and then through the fire damper. Take into account a straight intake length of 5 x Dhydraulic for the smoke

sensor, based on the size of the smoke sensor. This duct section for the smoke sensor must be made in the size of the smoke sensor. After installation, check whether the air direction indication on the smoke sensor corresponds with the direction of the air flow.

In situations where it is not possible to pass the air over the smoke sensor before it flows over the fire damper (think of a supply duct that comes out of a shaft), one can detach the smoke detector section from the fire damper and place it in an alternative position.

It is necessary to take into account:

- The regulations from NEN EN 6075.
- The required approach conditions of 5 x Dhydraulic before the sensor and 3 x Dhydraulic after the sensor.
- The channel between the fire damper and smoke sensor must be a closed section without T-pieces or branches/openings that could affect the measurement/ smoke density.

For more detailed information, we refer to the [manual](#).

For good accessibility of the control mechanism/ servomotor, a free space of about 300 mm is recommended.



FDC40

Fire damper, round, damper blade 40 mm
CE marked in accordance with EN 15650:2010
Tested in accordance with EN 1366-2
Classified in accordance with EN 13501-3
LUKA C/ATC 3

Available types

F D C 40 - - -

- F** fire-resistant
- D** damper
- C** round
- 40** damper blade thickness 40 mm

- Mounting frame

- O** none
- MF2** mounting frame 2

- Operation

Manual

- R** without end switches
- RS** with end switches
- EMS-S** with solenoid 24/48 VDC and end switches, magnetic with a supply, (information available on request)

Motor-operated

- M24S** Belimo 24V
- M230S** Belimo 230V
- M24S-ST** Belimo 24V plug-and-play for connection to Belimo supply and/or communication modules

- EX** ATEX classified Schischek 230/24V servomotor explosion-safe (information available on request)

- Accessory

- O** none
- UG** smoke sensor (cannot be used in combination with operating option R, RS, EMS-S or EX)

SA-Select

Check [SA-Select](#) to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The round fire dampers type FDC40 can be used in fire and smoke-separating walls and floors. If they are incorporated in accordance with the instructions, there is a fire resistance of up to 120 minutes depending on how they are built in. The fire dampers have two standard inspection openings. For rapid fitting, the damper is available with a pre-fitted mounting frame. A smoke sensor is available as an optional accessory. For the classification list and the corresponding installation instructions, please see the manual on our website. Certified use requires compliance with the installation instructions in the [manual](#).

Characteristics

- Available in dimensions of \varnothing 355 to 800 mm.
- Fitting can be horizontal or vertical, in any flow direction.
- Two standard round inspection openings of 39 mm.
- Airtightness class C over the housing in accordance with EN1751 (LUKA C) ATC3.
- Airtightness class 3 over the damper blade in accordance with EN1751.
- Hygiene certificate in accordance with VDI 6022.

Finish

- | | |
|---------------|---------------------------------|
| Housing: | galvanised sheet steel |
| Damper blade: | heat-resistant, thickness 40 mm |
| Fusible link: | 72 °C |

Optional (information available on request)

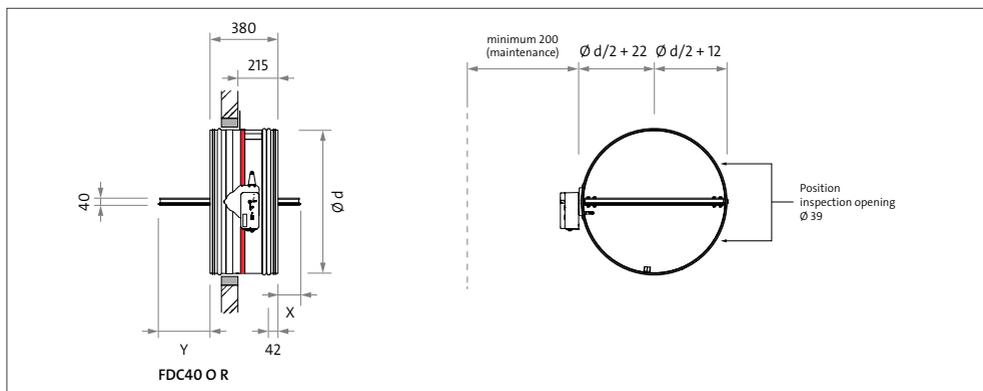
- Galvanised sheet steel with internal and external powder coating.
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L).
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L) with internal and external powder coating.
- Motor-operated version with 95 °C fusible link.
- Belimo supply and/or communication module BKN-230-24-MOD.
- For other versions, please ask our sales department.

Classified in accordance with EN 13501-3

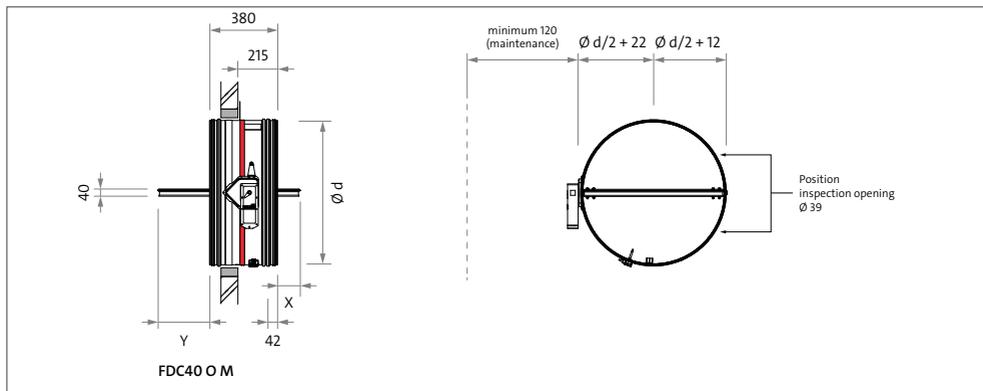
For a full classification overview with the various sealing methods, we refer to the manual.

Dimensions

Manual

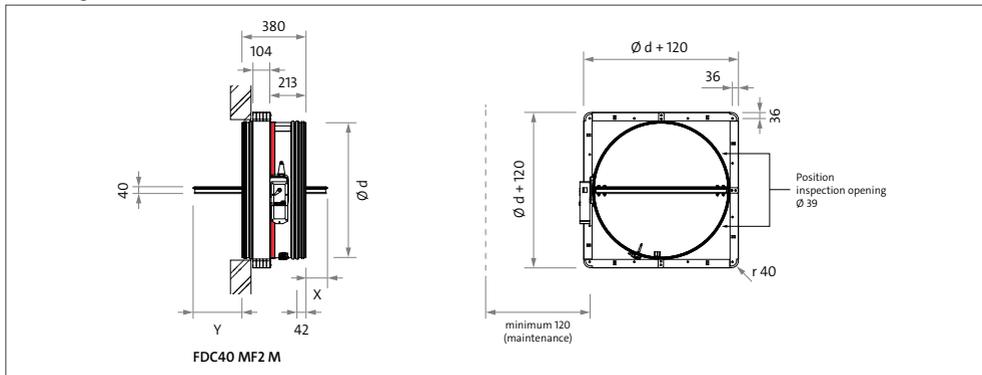


Motor-operated

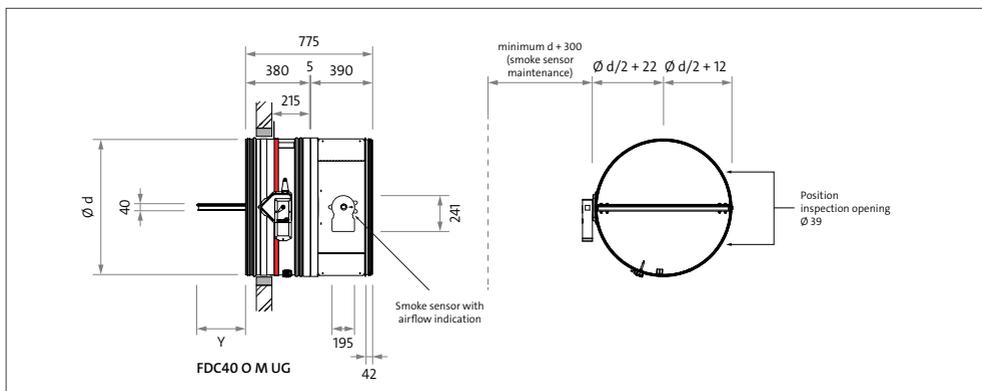


Dimensions

Mounting frame 2



Smoke sensor



Available dimensions

model	d	free passage in m ²	X	Y	g
355	353	0.0833	-	68	11.9
400	398	0.1079	-	90	13.5
450	448	0.1391	-	115	15.4
500	498	0.1741	-	140	17.5
560	558	0.2301	10	170	20.2
630	628	0.2836	45	205	23.6
710	708	0.3642	85	245	27.7
800	798	0.4668	130	290	33.7

X, Y = protruding length of the damper blade.

g = weight in kg (manual version without mounting frame).

For more specific information about the dimensions or weights per model, we refer to the [manual](#).

Comments

- The dimensions are in mm.
- Please visit our website to download the [manual](#), [declaration of performance \(DoP\)](#) and the [verification certificate of the declaration of performance](#).

Fitting

Installation of the fire damper must be carried out according to the manual.

Points of attention for the installation of fire damper/ smoke sensor combination

Check the airflow direction when applying the fire damper/smoke sensor combination and verify the placement of the combination based on the criteria of NEN EN 6075. Install the combination, as supplied in one piece, so that the air flows through the smoke sensor first and then through the fire damper. Take into account a straight intake length of 5 x Dhydraulic for the smoke sensor, based on the size of the smoke sensor.

This duct section for the smoke sensor must be made in the size of the smoke sensor. After installation, check whether the air direction indication on the smoke sensor corresponds with the direction of the air flow.

In situations where it is not possible to pass the air over the smoke sensor before it flows over the fire damper (think of a supply duct that comes out of a shaft), one can detach the smoke detector section from the fire damper and place it in an alternative position.

It is necessary to take into account:

- The regulations from NEN EN 6075.
- The required approach conditions of 5 x Dhydraulic before the sensor and 3 x Dhydraulic after the sensor.
- The channel between the fire damper and smoke sensor must be a closed section without T-pieces or branches/openings that could affect the measurement/smoke density.

For more detailed information, we refer to the [manual](#).

For good accessibility of the control mechanism/servomotor, a free space of about 300 mm is recommended.



FDCDD

Fire damper, round, damper blade 25 mm
CE marked in accordance with EN 15650:2010
Tested in accordance with EN 1366-2
Classified in accordance with EN 13501-3
LUKA C/ATC 3

Available types

FDCDD--

- F** fire-resistant
- D** damper
- C** round
- DD** direct drive

- Mounting frame

- O** standard

- Operation

Motor-operated

- M24S** Belimo 24V
- M230S** Belimo 230V
- M24S-ST** Belimo 24V plug-and-play for connection to Belimo supply and/or communication modules

SA-Select

Check **SA-Select** to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The round fire dampers type FDCDD can be used in fire and smoke-separating solid and flexible walls. If they are incorporated in accordance with the instructions, there is a fire resistance of up to 60 minutes depending on how they are built in. The damper is supplied with a fitted mounting frame and Belimo motor. This has a fitting advantage, as it is easier and quicker to fit. The fusible link has to be fitted in the subsequent duct. For the classification list and the corresponding installation instructions, please see the manual on our website. Certified use requires compliance with the installation instructions in the [manual](#).

Characteristics

- Available in dimensions of Ø 100 to 315 mm.
- Fitted in the wall in any spindle direction or airflow direction.
- Airtightness class C over the housing in accordance with EN1751 (LUKA C)/ATC3.
- Airtightness class 3 over the damper blade in accordance with EN1751.
- Hygiene certificate in accordance with VDI 6022.

Finish

Housing:	galvanised sheet steel
Damper blade:	heat-resistant thickness 25 mm
Fusible link:	72 °C

Optional (information available on request)

- Galvanised sheet steel with internal and external powder coating.
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L).
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L) with internal and external powder coating.
- Motor-operated version with 95 °C fusible link.
- Belimo supply and/or communication module BKN-230-24-MOD.

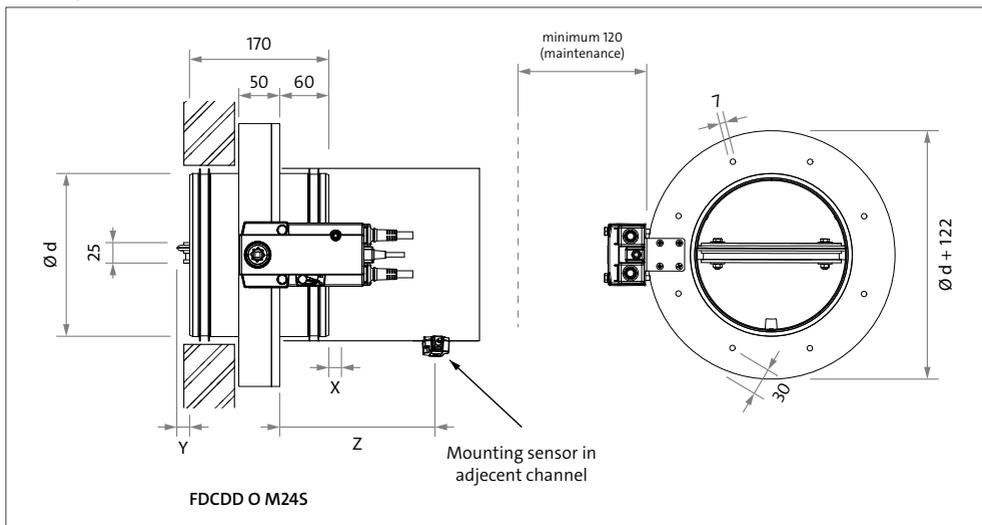
- Promaseal S white silicone sealant: tube 310 ml (expected use: approx. 3 m/tube with 10x10 mm adhesive layer).
- For other versions, please ask our sales department.

Classified in accordance with EN 13501- 3

For a full classification overview with the various sealing methods, we refer to the [manual](#).

Dimensions

Motor-operated



Available dimensions

model/ Dnom	d	free passage in m ²	X	Y	Z	g
100	98	0.005	-	-	90	3.0
125	123	0.0087	-	-	90	3.4
160	158	0.0155	-	-	90	3.9
200	198	0.0256	22	16	100	4.6
250	248	0.0418	38	41	130	5.5
315	313	0.0687	70	74	160	6.9

X, Y = protruding length of the damper blade.

Z = minimum distance from sensor to calcium silicate.

g = weight in kg.

For more specific information about the dimensions, please refer to the [manual](#).

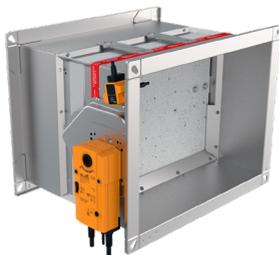
Comments

- The dimensions are in mm.
- Please visit our website to download the [manual](#) and [declaration of performance \(DoP\)](#).

Fitting

The fire damper is fitted, in a closed position, in line with statutory regulations in accordance with the [manual](#).

A clearance of approximately 300 mm is recommended for good access to the servomotor.



FD25

**Fire damper, rectangular, damper blade 25 mm
CE marked in accordance with EN 15650:2010
Tested in accordance with EN 1366-2
Classified in accordance with EN 13501-3
LUKA C/ATC 3**

Available types

FD 25

- F** fire-resistant
- D** damper, square or rectangular
- 25** damper blade thickness 25 mm

- Mounting frame

- O** none
- APP** applique
- MF1** mounting frame 1
- MF2** mounting frame 2

- Operation

Manual

- R** without end switches
- RS** with end switches
- EMS-S** with solenoid 24/48 VDC and end switches, magnetic with a supply, (information available on request)

Motor-operated

- M24S** Belimo 24V
- M230S** Belimo 230V
- M24S-ST** Belimo 24V plug-and-play for connection to Belimo supply and/or communication modules

- EX** ATEX classified Schischek 230/24V servomotor explosion-safe (information available on request)

- Accessory

- O** none
- UG** smoke sensor (cannot be used in combination with operating option R, RS, EMS-S or EX)

SA-Select

Check [SA-Select](#) to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The rectangular fire dampers type FD25 can be used in fire and smoke-separating walls and floors. If they are incorporated in accordance with the instructions, there is a fire resistance of up to 120 minutes depending on how they are built in. The fire dampers have two standard inspection openings. For rapid fitting, the damper is available with a pre-fitted mounting frame. A smoke sensor is available as an optional accessory. For the classification list and the corresponding installation instructions, please see the manual on our website. Certified use requires compliance with the installation instructions in the [manual](#).

Characteristics

- Available in dimensions from (W x H) 100 x 200 mm to (W x H) 800 x 600 mm.
- Fitting can be horizontal or vertical, in any flow direction.
- Two standard round inspection openings of 39 mm.
- Airtightness class C over the housing in accordance with EN1751 (LUKA C)/ATC3.
- Airtightness class 3 over the damper blade in accordance with EN1751.
- Hygiene certificate in accordance with VDI 6022.

Finish

- Housing: galvanised sheet steel
- Damper blade: heat-resistant, thickness 25 mm
- Fusible link: 72°C

Optional (information available on request)

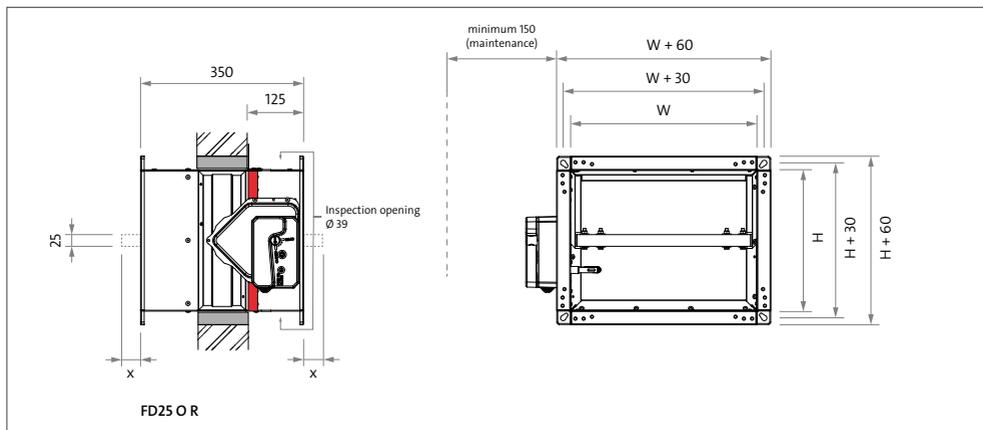
- Galvanised sheet steel with internal and external powder coating.
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L).
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L) with internal and external powder coating.
- Motor-operated version with 95 °C fusible link.
- Belimo supply and/or communication module BKN-230-24-MOD.
- For other versions, please ask our sales department.

Classified in accordance with EN 13501-3

For a full classification overview with the various sealing methods, we refer to the manual.

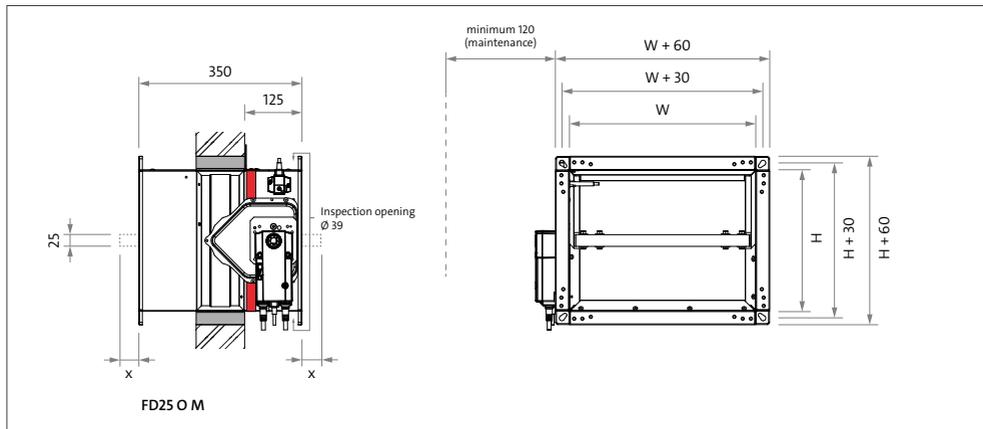
Dimensions

Manual



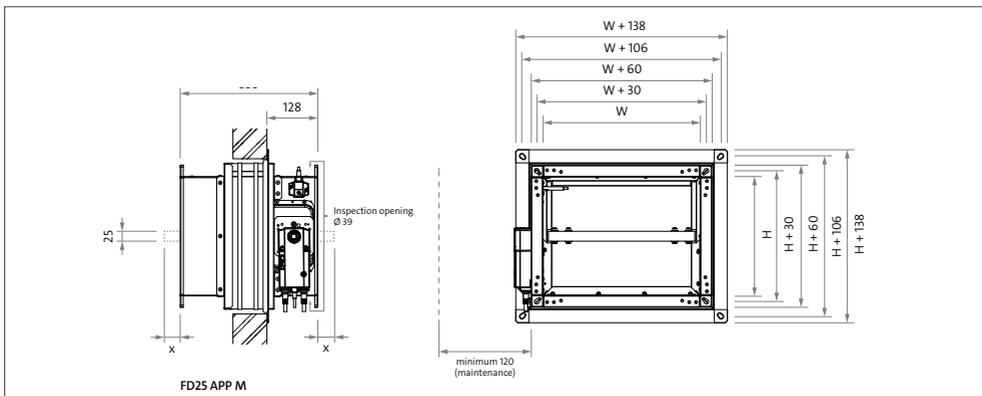
FD25 O R

Motor-operated

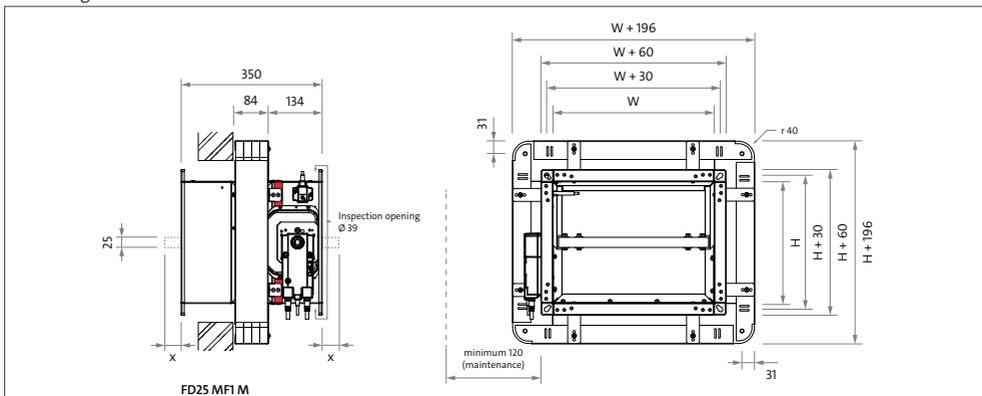


FD25 O M

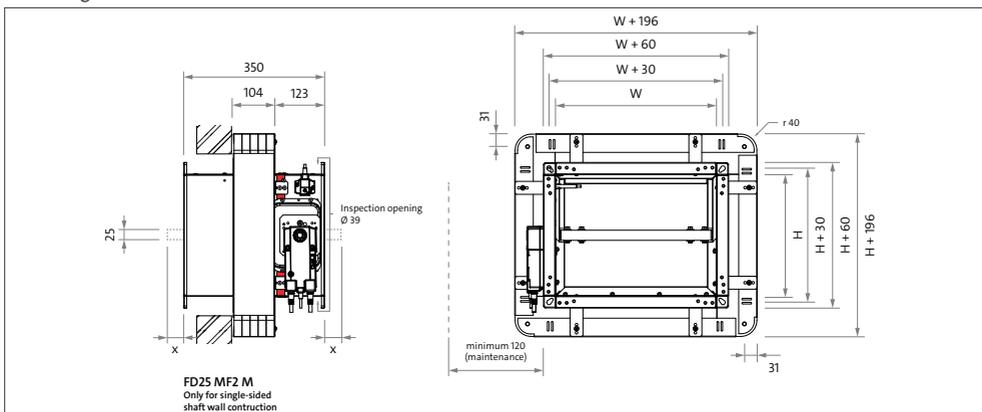
Dimensions Applique



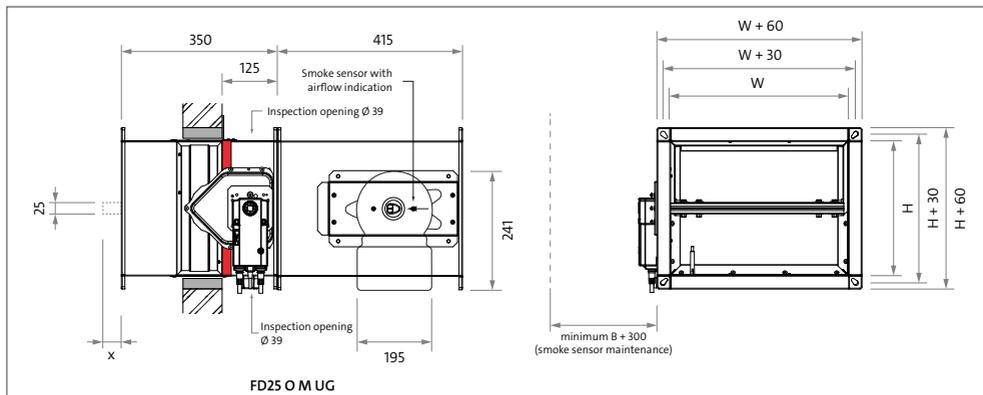
Mounting frame 1



Mounting frame 2



Smoke sensor



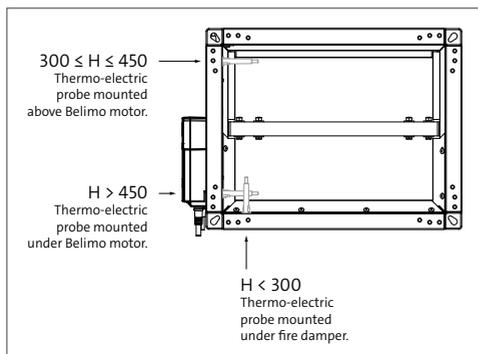
Dimensions damper blade

height	X
400	25
450	50
500	75
550	100
600	125

X = protruding length of the damper blade.

For more specific information about the dimensions or weights per model, we refer to the [manual](#).

Positioning thermo-electric probes



Comments

- The dimensions are in mm.
- Please visit our website to download the [manual](#), [declaration of performance \(DoP\)](#) and [verification certificate of the declaration of performance](#).

Fitting

Installation of the fire damper must be carried out according to the [manual](#).

Points of attention for the installation of fire damper/ smoke sensor combination

Check the airflow direction when applying the fire damper/smoke sensor combination and verify the placement of the combination based on the criteria of NEN EN 6075. Install the combination, as supplied in one piece, so that the air flows through the smoke sensor first and then through the fire damper. Take into account a straight intake length of $5 \times D_{\text{hydraulic}}$ for the smoke sensor, based on the size of the smoke sensor. This duct section for the smoke sensor must be made in the size of the smoke sensor. After installation, check whether the air direction indication on the smoke sensor corresponds with the direction of the air flow.

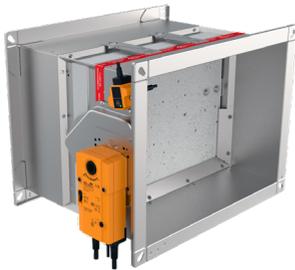
In situations where it is not possible to pass the air over the smoke sensor before it flows over the fire damper (think of a supply duct that comes out of a shaft), one can detach the smoke detector section from the fire damper and place it in an alternative position.

It is necessary to take into account:

- The regulations from NEN EN 6075.
- The required approach conditions of $5 \times D_{\text{hydraulic}}$ before the sensor and $3 \times D_{\text{hydraulic}}$ after the sensor.
- The channel between the fire damper and smoke sensor must be a closed section without T-pieces or branches/openings that could affect the measurement/ smoke density.

For more detailed information, we refer to the [manual](#).

For good accessibility of the control mechanism/ servomotor, a free space of about 300 mm is recommended.



FD40

**Fire damper, rectangular, damper blade 40 mm
CE marked in accordance with EN 15650:2010
Tested in accordance with EN 1366-2
Classified in accordance with EN 13501-3
LUKA C/ATC 3**

Available types

FD 40

- F** fire-resistant
- D** damper, square or rectangular
- 40** damper blade thickness 40 mm

- Mounting frame

- O** none
- MF2** mounting frame 2

- Operation

Manual

- R** without end switches
- RS** with end switches
- EMS-S** with solenoid 24/48 VDC and end switches, magnetic with a supply, (information available on request)

Motor-operated

- M24S** Belimo 24V
- M230S** Belimo 230V
- M24S-ST** Belimo 24V plug-and-play for connection to Belimo supply and/or communication modules
- EX** ATEX classified Schischek 230/24V servomotor explosion-safe (information available on request)

- Accessory

- O** none
- UG** smoke sensor (cannot be used in combination with operating option R, RS, EMS-S or EX)

SA-Select

Check SA-Select to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The rectangular fire dampers type FD40 can be used in fire and smoke-separating walls and floors. If they are incorporated in accordance with the instructions, there is a fire resistance of up to 120 minutes depending on how they are built in. The fire dampers have two standard inspection openings. For rapid fitting, the damper is available with a pre-fitted mounting frame. A smoke sensor is available as an optional accessory. For the classification list and the corresponding installation instructions, please see the manual on our website. Certified use requires compliance with the installation instructions in the [manual](#).

Characteristics

- Available in dimensions from (W x H) 800 x 600 mm to (W x H) 1500 x 800 mm. For battery fitting, smaller dimensions are also available.
- Fitting can be horizontal or vertical, in any flow direction.
- Two standard round inspection openings of 39 mm.
- Airtightness class C over the housing in accordance with EN1751 (LUKA C)/ATC3.
- Airtightness class 3 over the damper blade in accordance with EN1751.
- Hygiene certificate in accordance with VDI 6022.

Finish

- Housing: galvanised sheet steel
- Damper blade: heat-resistant, thickness 40 mm
- Fusible link: 72 °C

Optional (information available on request)

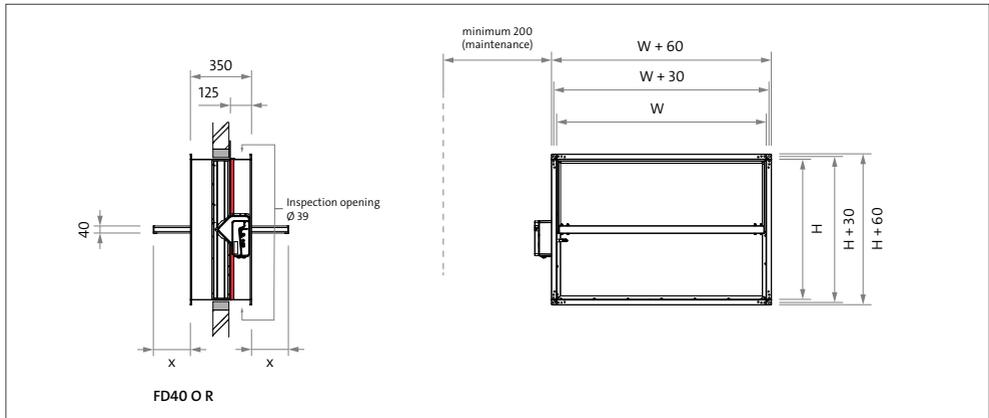
- Can be composed up to greater dimensions, with FDA CF100BATT and FDA CF100BATT 2 x 2 assembly set, see the [manual](#) for battery fitting instructions.
- Galvanised sheet steel with internal and external powder coating.
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L).
- Stainless steel EN1.4301/EN1.4401/EN1.4404 (AISI 304/316/316L) with internal and external powder coating.
- Motor-operated version with 95 °C fusible link.
- Belimo supply and/or communication module BKN-230-24-MOD.
- For other versions, please ask our sales department.

Classified in accordance with EN 13501-3

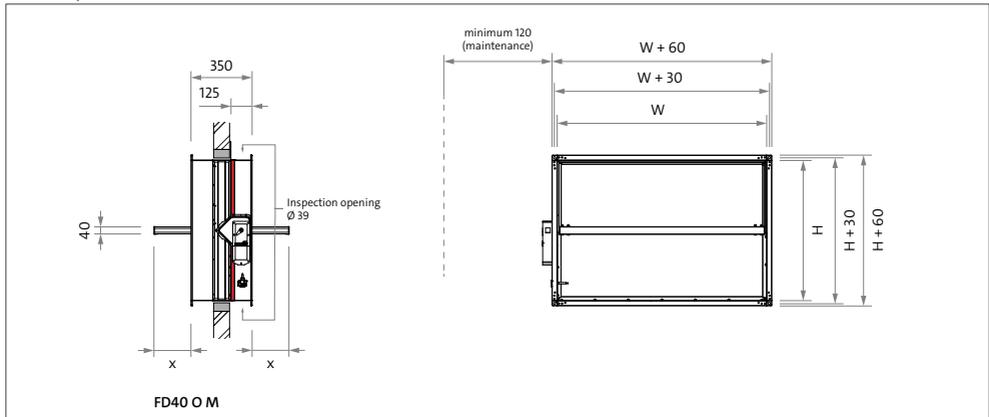
For a full classification overview with the various sealing methods, we refer to the [manual](#).

Dimensions

Manual

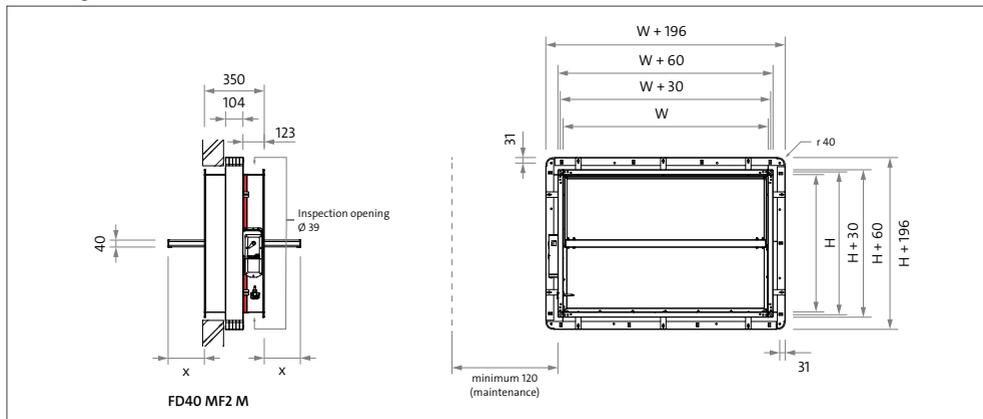


Motor-operated

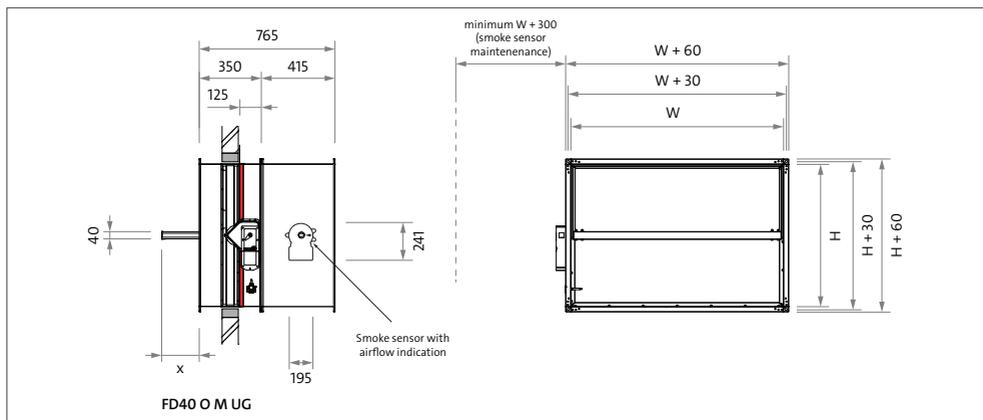


Dimensions

Mounting frame 2



Smoke sensor

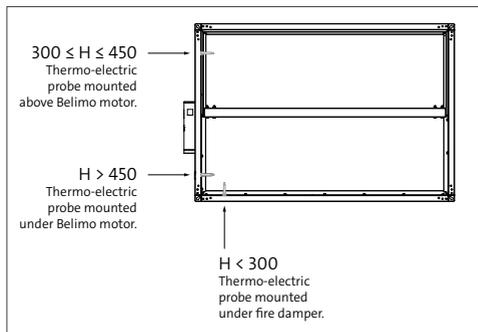


Dimensions damper blade

height	X
600	125
650	150
700	175
750	200
800	225

X = protruding length of the damper blade.

Positioning thermo-electric probes



Comments

- The dimensions are in mm.
- Please visit our website to download the [manual](#), [declaration of performance \(DoP\)](#) and [the verification certificate of the declaration of performance](#).

Fitting

Installation of the fire damper must be carried out according to the [manual](#).

Points of attention for the installation of fire damper/ smoke sensor combination

Check the airflow direction when applying the fire damper/smoke sensor combination and verify the placement of the combination based on the criteria of NEN EN 6075. Install the combination, as supplied in one piece, so that the air flows through the smoke sensor first and then through the fire damper. Take into account a straight intake length of 5 x Dhydraulic for the smoke sensor, based on the size of the smoke sensor. This duct section for the smoke sensor must be made in the size of the smoke sensor. After installation, check whether the air direction indication on the smoke sensor corresponds with the direction of the air flow.

In situations where it is not possible to pass the air over the smoke sensor before it flows over the fire damper (think of a supply duct that comes out of a shaft), one can detach the smoke detector section from the fire damper and place it in an alternative position.

It is necessary to take into account:

- The regulations from NEN EN 6075.
- The required approach conditions of 5 x Dhydraulic before the sensor and 3 x Dhydraulic after the sensor.
- The channel between the fire damper and smoke sensor must be a closed section without T-pieces or branches/openings that could affect the measurement/ smoke density.

For more detailed information, we refer to the [manual](#).

For good accessibility of the control mechanism/ servomotor, a free space of about 300 mm is recommended.



BFDC

Fire-resistant butterfly damper
CE marked in accordance with EN 15650:2010
Tested in accordance with EN 1366-2
Classified in accordance with EN 13501-3
Fire-resistant up to 120 minutes

Available types

BFDC-

- B** butterfly damper
- F** fire-resistant
- D** damper
- C** round, insert for a spiral duct

- Accessories

- V** suitable for an extraction valve. The RRSVKO can be used as an extraction valve.

SA-Select

Check [SA-Select](#) to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The round butterfly fire dampers type BFDC can be built into fire-separating walls and floors. It is easy to push the butterfly damper in the spiral duct and it requires no further fixing. The element can also be supplied with longer housing, suitable for an extraction valve. For the classification list and the corresponding installation instructions, please see the [manual](#) on our website. Certified use requires compliance with the installation instructions in the manual.

Finish

Housing:	steel
Damper blade:	heat-resistant, thickness 6 mm
Fusible link:	72 °C (fusible link)

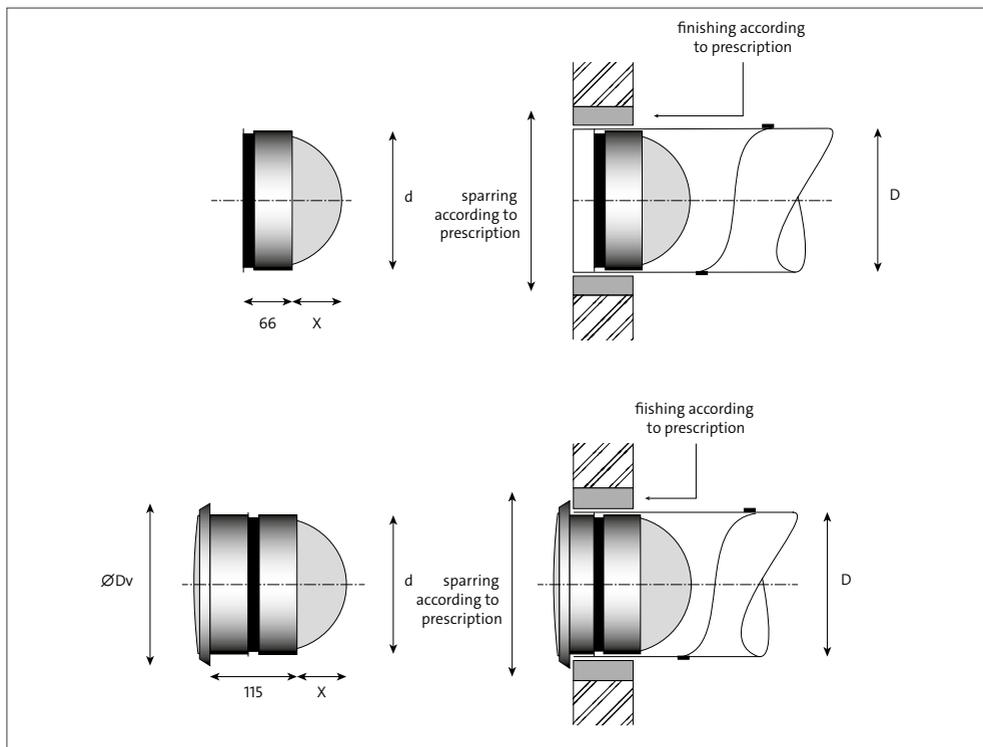
Optional

End switch

Classified in accordance with EN 13501-3

For a full classification overview with the various sealing methods, we refer to the [manual](#).

Dimensions



Available dimensions

model	d	D	X	Dv
100	98.5	100	18	150
125	123.5	125	30,5	185
160	158.5	160	48	220
200	198.5	200	68	260

Fitting

The fire damper is fitted, in a closed position, in line with statutory requirements in accordance with the [manual](#).

If we assume that the jet velocity in the y-direction does not change, that there is no build-up of static pressure in the room, and that the momentum in the jet is maintained, the following applies:

$$v_0^2 \cdot h_0 = v^2 \cdot h$$

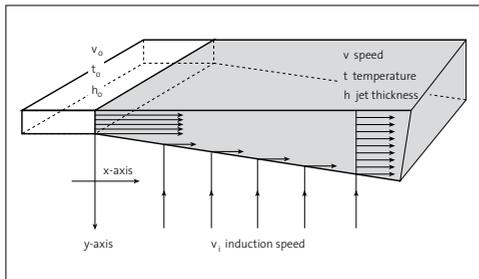


Fig. 2.2 Radial Flow

By using the law of conservation of mass and momentum, it is possible to calculate the jet thickness, velocity and temperature with the applied assumptions (fig. 2.3).

The course of the jet thickness is linear to the distance and increases twice as fast for plane flows as for radial flows.

As the jet induces more, the jet thickness increases faster too. The starting velocity has very little influence on the eventual jet thickness. The calculated course matches observations in practice. The course of the speed for a radial and a plane flow is given in fig. 2.4.

It is clear that the velocity reduces to a lower level with a radial pattern than with a plane pattern. The distance over which the velocity in the jet has a value of 0.25 m/s is called the “throw”. At that distance, you can place a wall without producing uncomfortable air movements. If there is no wall, the jet remains intact until the speed becomes 0.10 to 0.15 m/s and it is not longer possible to detect the difference between jet air and room air. The term throw is not an absolute. It is a practical tool to select an air-outflow device. The course of the jet temperature equals the course of the velocity (fig. 2.5).

Takeaways

- Radial flows reduce velocity and speed quicker than plane flows.
- For plane flows, the jet thickness increases twice as quickly as for radial flows.

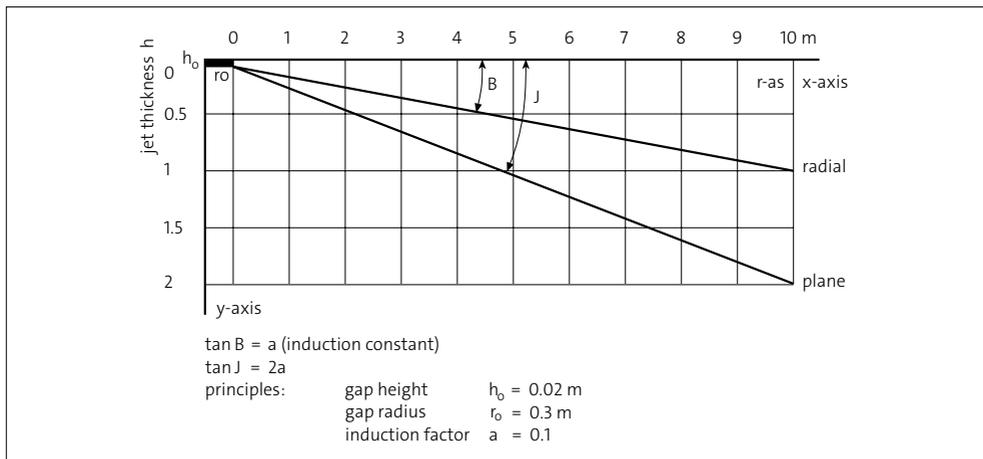


Fig. 2.3 Jet thickness

8

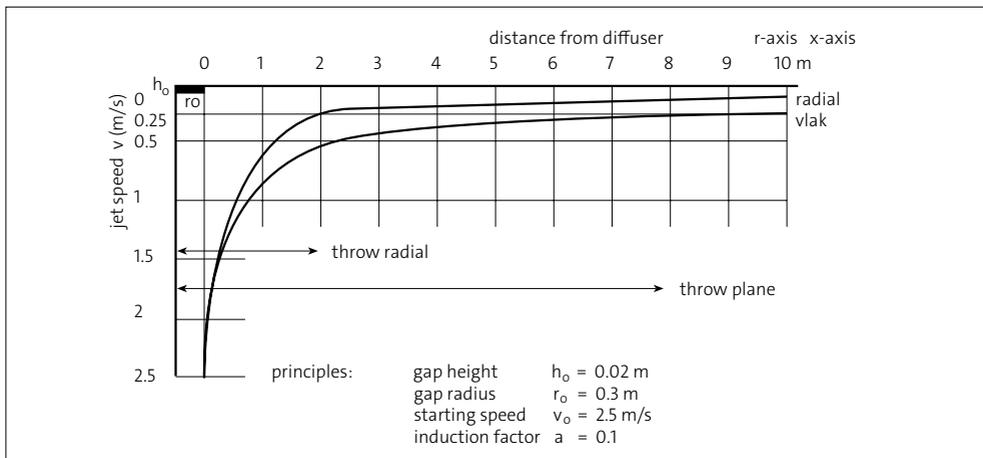


Fig. 2.4 Jet velocity

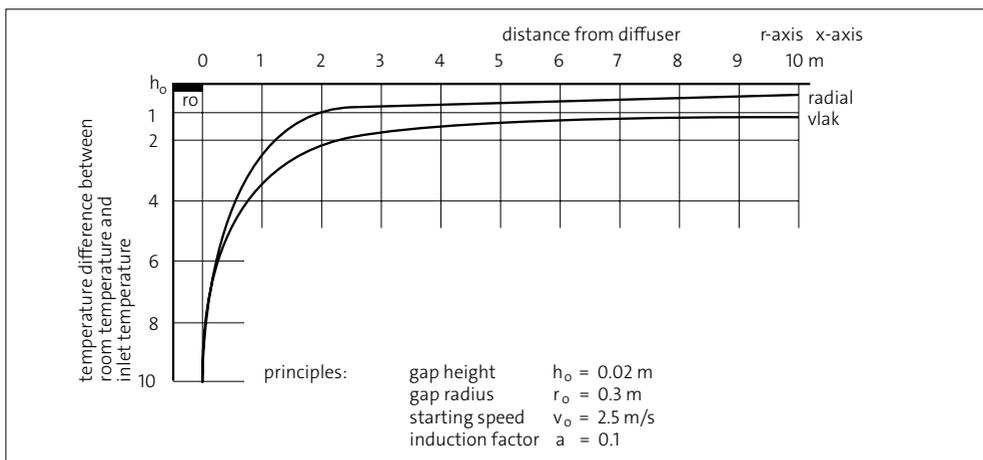


Fig. 2.5 Jet temperature

3. Influence of the floor

If a floor is built under the existing ceiling, the flow from the infinity of induction air to the jet is impeded. However, according to the assumption, the jet will continue to supply air. At this point, an air movement is produced over the floor that goes against the jet direction, which is known as the return vortex. Assuming that the velocity at the jet edge is nil in the x-direction, the velocity will be highest at floor level.

From this assumption, it is possible to calculate the velocity distribution in the return vortex in the x-direction. The sum of the shaded surfaces in fig. 3.1 and 3.4 should be equal to the blocked surface. This velocity course is theoretical.

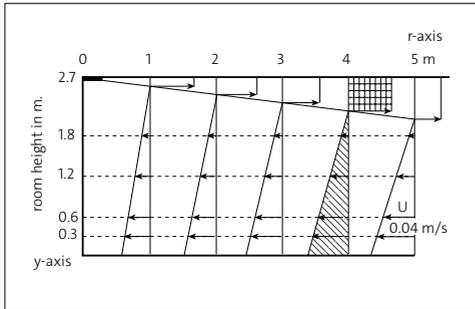


Fig. 3.1 Velocity increase return vortex in the x-direction radial pattern

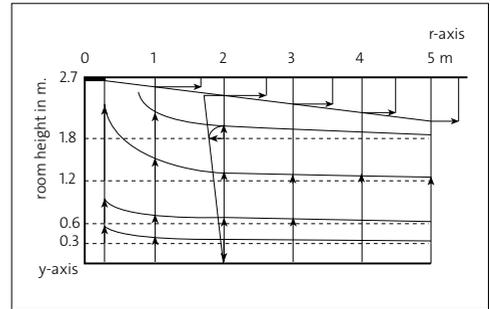


Fig. 3.2 Velocity increase return vortex in the y-direction radial pattern

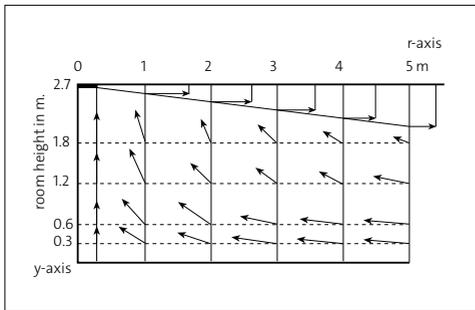


Fig. 3.3 Velocity increase return vortex radial pattern

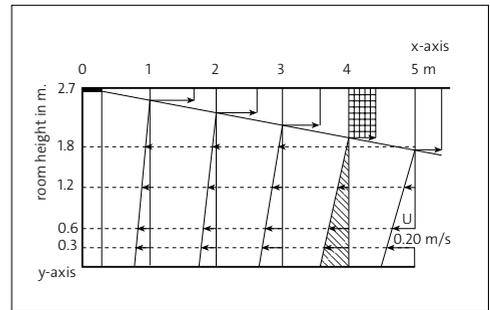


Fig. 3.4 Velocity increase return vortex in the x-direction plane pattern

To give an impression of the actual course, this has been marked with a thin line at $r = 5$. To describe the complete vortex, the velocity in the y-direction must be calculated too. This is a $x \cdot v$ on the jet edge, and will be nil on the floor. Now, it is possible to calculate the y-component (fig. 3.2 and 3.5). A complete picture of the room flow with a radial pattern is given in fig. 3.3. For the plane flow pattern, see fig. 3.6.

Takeaways

For a plane pattern, the velocities in the return vortex are higher and distributed more unevenly.

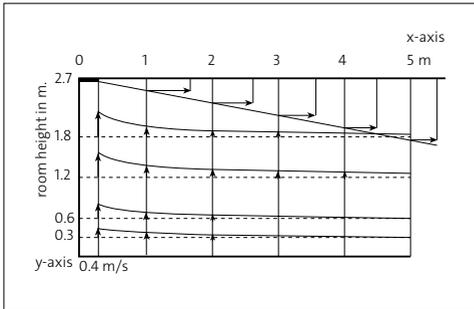


Fig. 3.5 Velocity increase return vortex in the y-direction plane pattern

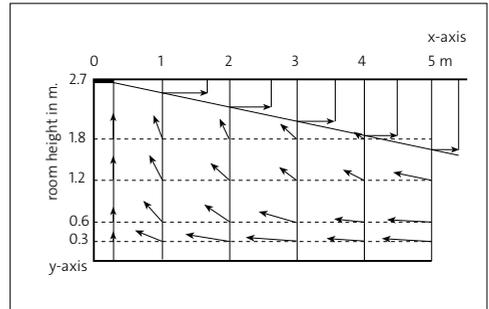


Fig. 3.6 Velocity increase return vortex plane pattern

4. The influence of walls

The back wall prevents the air jet from going straight on and bends it downwards, whereby the jet expands to the return vortex. This happens with the smallest possible curvature radius, and it creates an eye where the air is motionless. The supply of air from the return vortex is interrupted, and the jet itself becomes a return vortex. In the downward area there is no longer any induction. Therefore, the throw along the back wall may not be

made equal to the throw along the ceiling! It is possible to distinguish two separate areas: induction area, downward and expansion area.

The flow patterns for a plane and radial pattern have been given in fig. 4.1 and 4.2. The radial pattern produces an extremely even vortex with a small downward area.

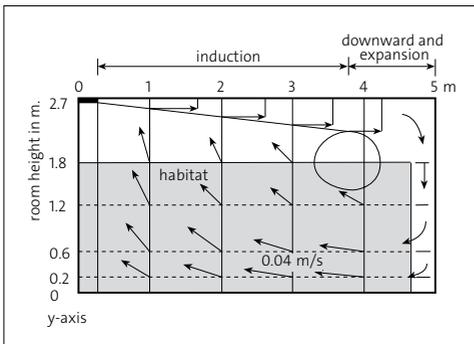


Fig. 4.1 Flow picture radial pattern

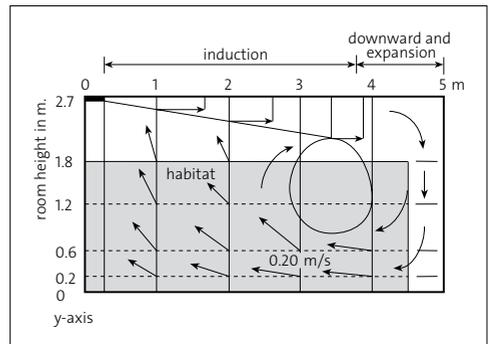


Fig. 4.2 Flow picture plane pattern

5. The influence of heat sources

With heat development in a room, air with a lower temperature than the room temperature is blown into the room to control the temperature. If the heat load is divided evenly over the floor surface area, this is taken up in the downward and expansion area which means the temperature of the supplied air rises. This heated air rises to the induction area, where the rest of the heat load is taken up by the moving air. The air heated by the heat load is taken up in the cold jet. If the heat production is concentrated in the discharge area (fig. 5.2) the convection flow that is produced will be taken up by the jet without any difficulties, but the temperature gradient of the room will go up.

However, if the heat development is concentrated in the downward area, you have a completely different situation. At that point the convection flow of the heat source is directed against the forced air flow.

With relatively low heat loads, the source is unable to build up its own vortex. In that case, the flow picture does not change (fig. 5.3). If there is a strong source, such as a radiator, there is a problem. The warm convection vortex and the cold return vortex will exist alongside each other. There will be a cold zone, often with high air velocities, alongside a warm area (fig. 5.4).

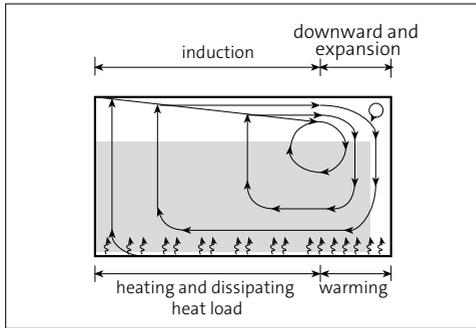


Fig. 5.1 Even heat load

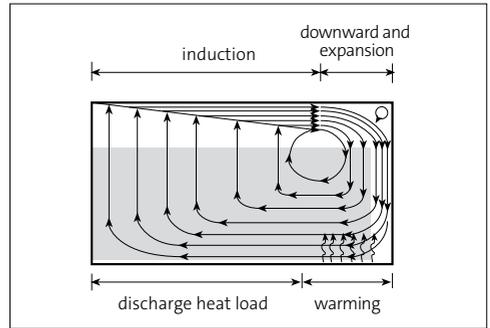


Fig. 5.3 Heat load in the downward area (weak source)

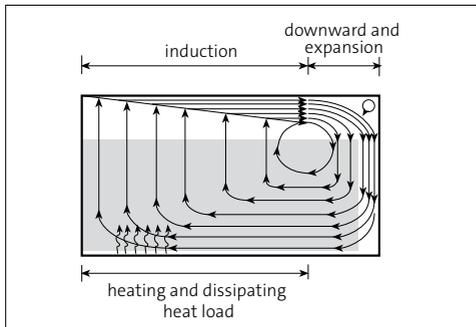


Fig. 5.2 Concentrated heat load

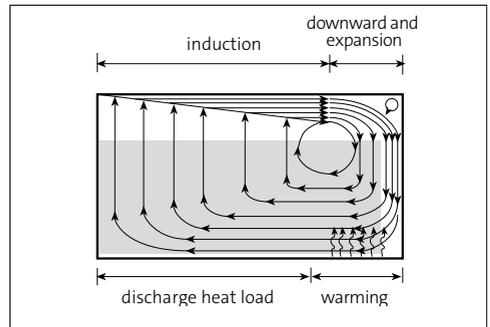


Fig. 5.4 Heat load in the downward area (strong source)

8

6. Obstacles

The rooms considered up to now were completely empty. In reality used rooms have all types of obstacles that impact the flow pattern. The effect and the level of impact are very difficult to predict. For two situations, data is known from measurements and observations in practice:

- Beam on the ceiling.
- Large closed obstacles on the floor.

Beams bend the air flow. The part of the jet that flows against the beam (or the surface-mounted strip-light fitting) is bent down. Part of the jet will flow under the beam. As the velocity is constant in the entire jet, the resulting momentum direction can be composed from the geometry (fig. 6.1).

Deflection angle: $\tan c = \frac{b}{h - b}$

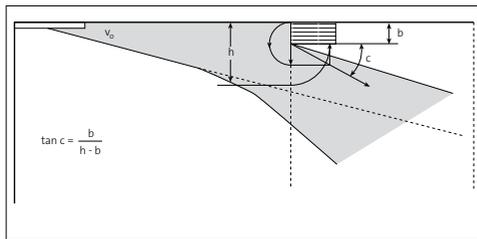


Fig. 6.1 Beam in air flow

The influence of an obstacle has to be related to the jet thickness at the location of the obstacle. If large solid obstacles are in the room perpendicular to the floor, the creation of the return vortex often becomes completely impossible (fig. 6.2).

The top of the obstacles will operate as a type of “pseudo floor”. Between the obstacles, there is low heat discharge, except when the jet is peeled off as it were and there is too much heat discharge.

These types of problems can occur in bedrooms (closed curtains), laboratories, storage areas, et cetera. By blowing parallel to the obstacles, the flow picture could be better but it is important to be cautious.

As air distributors with a radial outflow are less sensitive to disruption by heat sources or obstacles, they are often preferred over plane patterns for comfort reasons.

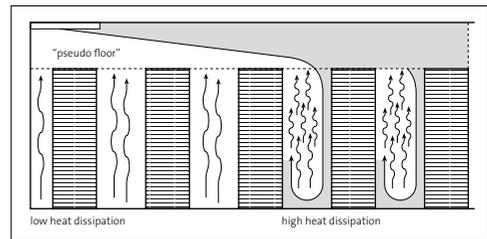


Fig. 6.2 Obstacles perpendicular to the return vortex

Appendix I

Assumptions:

- 1 The momentum of the jet is retained.
- 2 The jet does not build up static pressure in the room.
- 3 The induction velocity is directly proportionate to the jet velocity.
- 4 The jet velocity is an average constant.
- 5 The velocity in the return vortex is nil on the floor and is linear from the floor to the jet edge.

Appendix II

Overview of formulas:

Plane pattern

Momentum: $h_o * v_o^2 = h * v^2$

Mass: $d(h * v) = v_i * d_x$

Induction: $v_i = a * v$

Radial pattern

Momentum: $h_o * r_o * v_o^2 = h * r * v^2$

Mass: $d(h * r * v) = v_i * r * d_x$

Induction: $v_i = a * v$

Appendix III

Definitions:

Symbol	Quantity	Unit
a	Induction constant	-
x, y	Coordinates	m
r	Radius	m
r_o	Baffle radius	m
h_o	Baffle height	m
v_o	Air velocity in the baffle	m/s
v	Air velocity	m/s
v_i	Induction velocity	m/s
t	Air supply temperature	°C (K)
t	Jet temperature	°C (K)



WDBA

**Fire-resistant wall/door diffuser
Transfer
Tested in accordance with BS 476; B20, 1987**

Available types

WDBA O O

- W** wall/door diffuser
- D** transfer
- B** fire-resistant
- A** rectangular, thickness 40 mm, 60 minutes fire-resistant
- O** none
- O** not applicable

Single cover diffuser

WDOOEO

- W** wall/door diffuser
- D** transfer
- O** not applicable
- O** not applicable
- E** cover diffuser
- O** not applicable

SA-Select

Check SA-Select to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The fire-resistant element type WDBA is suitable for use in fire-retardant wall or door constructions. It should be fixed mechanically in the recess or it can be fitted between two cover diffusers (optional). The gap between the recess and the element should be filled with intumescent sealant. The fire-resistant element consists of thermal foam material, enclosed by plastic profiles. In temperatures above 100 °C it expands strongly in volume and consequently closes the opening. As the basic material is hygroscopic, the element should be stored and used in dry conditions only.

Characteristics

Free passage: approx. 56 to 69 %

Finish

Fire-resistant element

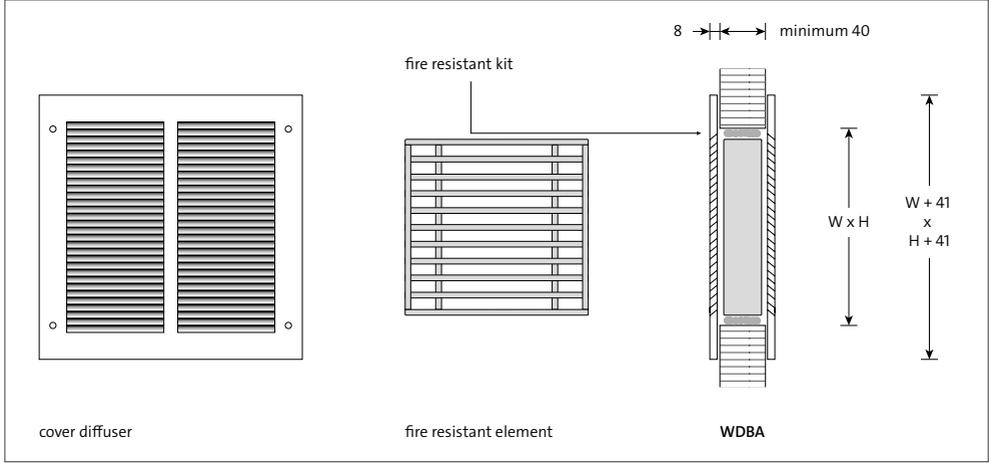
Plastic profiles filled with heat-sensitive foam material.

Post-treatment: none
 Colour: grey
 Fitting: intumescent sealant

Cover diffusers WDOOEO (optional)

Material: pressed steel
 Post-treatment: none
 Colour: white RAL 9010

Dimensions



Available dimensions

H	W									
	100	150	200	250	300	350	400	450	500	600
100	■	■	■	■	■	■	■	■	■	■
150	■	■	■	■	■	■	■	■	■	■
200	■	■	■	■	■	■	■	■	■	■
250	■	■	■	■	■	■	■	■	■	■
300	■	■	■	■	■	■	■	■	■	■
350	■	■	■	■	■	■	■	■	■	■
400	■	■	■	■	■	■	■	■	■	■
450	■	■	■	■	■	■	■	■	■	■
500	■	■	■	■	■	■	■	■	■	■
600	■	■	■	■	■	■	■	■	■	■

Comment

- The listed dimensions are in mm.
- W x H is the recess size.
- The actual width is W - 2 mm.
- The actual height is H - 2 mm.
- Any sizes in between are available on request.
- Fire resistance of 60 minutes in accordance with BS 476 : part 20 : 1987.

Selection details

WDBA

air volume		free passage in cm ²																	
		50		60		80		100		125		150		200		250		300	
m ³ /s	m ³ /h	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p
0.0100	36	5	-																
0.0125	45	8	11	6	7														
0.0150	54	12	15	9	12	5	-												
0.0175	63	17	20	12	16	7	-	4	-										
0.0200	72	22	23	15	19	9	13	5	-	4	-								
0.0250	90	34	29	24	25	13	19	9	14	6	-	4	-						
0.0300	108			34	30	19	23	12	19	8	14	6	10						
0.0400	144					34	31	22	26	14	21	10	17	6	11	4	-		
0.0500	180							34	32	22	27	15	23	9	17	6	12	4	-
0.0600	216									32	32	22	28	13	22	8	17	6	13
0.0800	288											40	35	22	29	15	25	10	21
0.1000	360													35	35	23	30	16	27
0.1250	450															36	36	25	32
0.1500	540																	36	37

air volume		free passage in cm ²																	
		400		500		600		800		1000		1250		1500		2000		2500	
m ³ /s	m ³ /h	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p
0.0800	288	6	15	4	10														
0.1000	360	9	21	6	16	4	12												
0.1250	450	14	26	9	22	7	18	4	12										
0.1500	540	21	31	14	27	10	23	6	17	4	13								
0.1750	630	28	35	18	31	13	27	8	21	5	17	4	-						
0.2000	720			24	34	17	30	10	25	7	20	5	16	3	13				
0.2500	900					27	36	16	30	11	26	7	22	5	19				
0.3000	1080							23	35	15	31	10	27	8	23	5	19	4	15
0.4000	1440									27	38	18	34	14	31	9	26	6	23
0.5000	1800											29	40	21	37	14	32	10	29
0.6000	2160															20	37	14	33
0.8000	2880																	26	41

Preferred range for use in doors: 8 - 10 Pa.

Free passage in cm²

H	W									
	100	150	200	250	300	350	400	450	500	600
100	56	85	114	146	179	208	241	273	302	363
150	89	134	180	232	283	329	380	432	478	575
200	122	184	246	317	387	450	520	591	653	786
250	154	233	312	402	491	570	660	750	829	997
300	187	283	378	487	596	691	800	909	1004	1209
350	220	332	444	572	700	812	940	1067	1180	1420
400	252	381	510	657	804	933	1080	1226	1355	1631
450	285	431	577	742	908	1054	1219	1385	1531	1842
500	318	480	643	827	1012	1175	1359	1544	1706	2054
600	383	579	775	998	1220	1416	1639	1862	2058	2476

Important information

Fire-resistant products based on thermal foam material, such as the WDBA, are tested in accordance with BS 476 : part 20 : 1987; or similar products tested in accordance with NEN-EN 1366-3, or NEN 6069 pertain to “dividing constructions”.

The NEN-EN 1366-2 (or NEN 6077) regarding ‘fire dampers in air ducts’ applies to using fire-resistant elements in air ducts, such as fire dampers, where tests take place under much greater pressure differences. Therefore, the aforementioned products cannot simply be used in air ducts.

General

- Static pressure loss Ps in Pa.
- The assumed space attenuation is 10 dB.
- Sound pressure Lp in dB(A).
- It is permitted to interpolate the interim values.
- The selection details apply to the WDBA00 and in combination with the WDOEO diffuser.



WDBB

Fire-resistant wall/door diffuser
Transfer
Outdoor air application
Damp-resistant

Available types

WDBBOO

- W** wall/door diffuser
- D** transfer
- B** fire-resistant
- B** rectangular, thickness 44 mm, 120 minutes fire-resistant
- O** none
- O** not applicable

Enkelvoudig afdekrooster

WDOEOO

- W** wall/door diffuser
- D** transfer
- O** not applicable
- O** not applicable
- E** cover diffuser
- O** not applicable

SA-Select

Check SA-Select to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The fire-resistant element type WDBB is suitable for use in fire-retardant wall or door constructions, including in damp conditions. It should be fixed mechanically in the recess or it can be fitted between two cover diffusers (optional). The gap between the recess and the element should be filled with intumescent sealant. The fire-resistant element consists of thermal foam material, enclosed by metal profiles. In temperatures above 190 °C it expands strongly in volume and consequently closes the opening.

Characteristics

Free passage: approx. 42 to 64 %

Finish

Fire-resistant element

Metal profiles filled with heat-sensitive foam material.

Post-treatment: none

Colour: grey

Fitting: intumescent sealant

Internal cover diffusers (optional)

Material: pressed steel

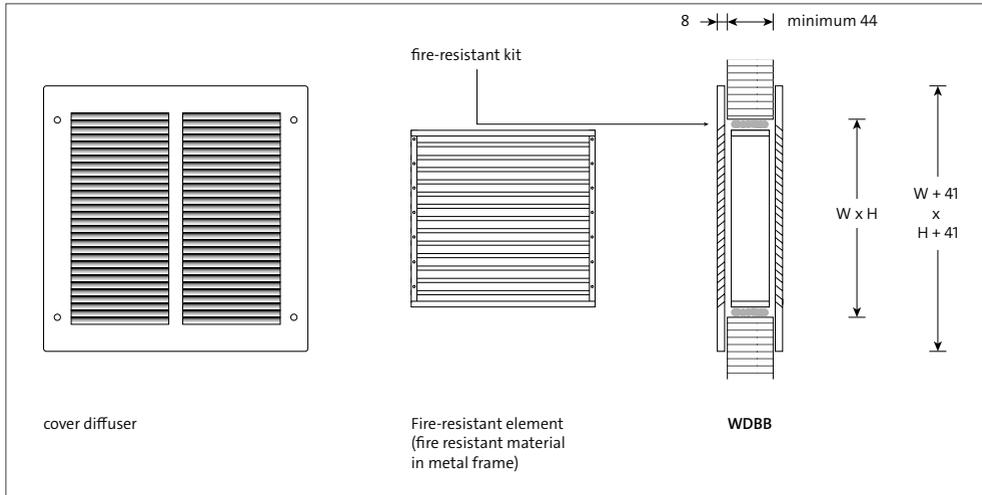
Post-treatment: none

Colour: white RAL 9010

External cover diffusers (optional)

See documentation: BM diffusers page 205 ff. type B M - -.

Dimensions



Available dimensions

H	W									
	100	150	200	250	300	350	400	450	500	600
100	■	■	■	■	■	■	■	■	■	■
150	■	■	■	■	■	■	■	■	■	■
200	■	■	■	■	■	■	■	■	■	■
250	■	■	■	■	■	■	■	■	■	■
300	■	■	■	■	■	■	■	■	■	■
350	■	■	■	■	■	■	■	■	■	■
400	■	■	■	■	■	■	■	■	■	■
450	■	■	■	■	■	■	■	■	■	■
500	■	■	■	■	■	■	■	■	■	■
600	■	■	■	■	■	■	■	■	■	■

Comment

- The listed dimensions are in mm.
- $W \times H$ is the recess size.
- The actual width is $W - 2$ mm.
- The actual height is $H - 2$ mm.
- Any sizes in between are available on request.
- Fire resistance of 60 minutes in accordance with BS 476:part 20:1987.

Selection details

WDBB

air volume		free passage in cm ²																	
		50		60		80		100		125		150		200		250		300	
m ³ /s	m ³ /h	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p
0.0100	36	5	-																
0.0125	45	8	11	6	7														
0.0150	54	12	15	9	12	5	-												
0.0175	63	17	20	12	16	7	-	4	-										
0.0200	72	22	23	15	19	9	13	5	-	4	-								
0.0250	90	34	29	24	25	13	19	9	14	6	-	4	-						
0.0300	108			34	30	19	23	12	19	8	14	6	10						
0.0400	144					34	31	22	26	14	21	10	17	6	11	4	-		
0.0500	180							34	32	22	27	15	23	9	17	6	12	4	-
0.0600	216									32	32	22	28	13	22	8	17	6	13
0.0800	288											40	35	22	29	15	25	10	21
0.1000	360													35	35	23	30	16	27
0.1250	450															36	36	25	32
0.1500	540																	36	37

air volume		free passage in cm ²																	
		400		500		600		800		1000		1250		1500		2000		2500	
m ³ /s	m ³ /h	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p	P _s	L _p
0.0800	288	6	15	4	10														
0.1000	360	9	21	6	16	4	12												
0.1250	450	14	26	9	22	7	18	4	12										
0.1500	540	21	31	14	27	10	23	6	17	4	13								
0.1750	630	28	35	18	31	13	27	8	21	5	17	4	-						
0.2000	720			24	34	17	30	10	25	7	20	5	16	3	13				
0.2500	900					27	36	16	30	11	26	7	22	5	19				
0.3000	1080							23	35	15	31	10	27	8	23	5	19	4	15
0.4000	1440									27	38	18	34	14	31	9	26	6	23
0.5000	1800											29	40	21	37	14	32	10	29
0.6000	2160															20	37	14	33
0.8000	2880																	26	41

Preferred range for use in doors: 8 - 10 Pa.

Free passage in cm²

H	W									
	100	150	200	250	300	350	400	450	500	600
100	42	67	94	139	179	208	241	273	302	363
150	68	108	143	210	283	329	332	365	478	575
200	97	145	226	281	387	450	520	591	653	786
250	141	210	279	354	491	570	660	750	829	997
300	187	283	378	487	550	691	800	909	1004	1209
350	220	332	444	572	700	822	940	1067	1180	1420
400	252	381	510	657	804	933	982	1226	1355	1631
450	285	431	577	742	908	1054	1219	1211	1531	1842
500	318	480	643	827	1012	1175	1359	1544	1578	2054
600	383	579	775	998	1220	1416	1639	1862	2058	2316

Important information

Fire-resistant products based on thermal foam material, such as the WDBB, are tested in accordance with Fpr EN 1364-5 : 2017; or similar products tested in accordance with NEN-EN 1366-3, or NEN 6069 pertain to “dividing constructions”.

The NEN-EN 1366-2 (or NEN 6077) regarding ‘fire dampers in air ducts’ applies to using fire-resistant elements in air ducts, such as fire dampers, where tests take place under much greater pressure differences. Therefore, the aforementioned products cannot simply be used in air ducts.

General

- Static pressure loss Ps in Pa.
- The assumed space attenuation is 10 dB.
- Sound pressure Lp in dB(A).
- It is permitted to interpolate the interim values.
- The selection details apply to the WDBBOO and in combination with the BMXN, WDVC/WRHA.



WDBE

**Fire-resistant wall/door diffuser
Transfer
Tested in accordance with EN1634-1,
EN1364-1, EN1364-2**

Available types

WDBE-O

- W** wall/door diffuser
- D** transfer
- B** fire-resistant
- E** rectangular, aesthetic, thickness 55 mm, 60 minutes fire resistance

- Edging

- O** none
- K** fixed flange
- L** fixed flange, separate counter flange for 50 mm door application*
- O** not applicable

*For doors > 50 mm and ≤ 60 mm you need the WDBEEO (diffuser only) to order + 2 x WDBOOO (separate flange).

SA-Select

Check SA-Select to create extended order codes and selection details online. **NB!** At this moment, SA-Select is only available in Dutch. But it is possible to create extended order codes and selection details online.

Use

The fire-resistant element type WDBE is suitable for use in fire-retardant wall or door constructions. The gap between the recess and the element should be filled with mastic BCM. The element consists of thermal foam material, enclosed by plastic profiles. In temperatures above 100 °C it expands strongly in volume and consequently closes the opening. For certified application in the wall, the diffusers must be mounted horizontally with the blades. As the foam material is hygroscopic, the element should be stored and used in dry conditions only. For the classification, please see the table on the next page. For certified application, the assembly must be carried out in accordance with the supplied assembly instructions of the diffuser and the corresponding classification report in door and floor/wall.

Characteristics

Free passage: approx. 56 to 69 %

Fitting

In accordance with supplied instructions.

Finish

Fire-resistant element

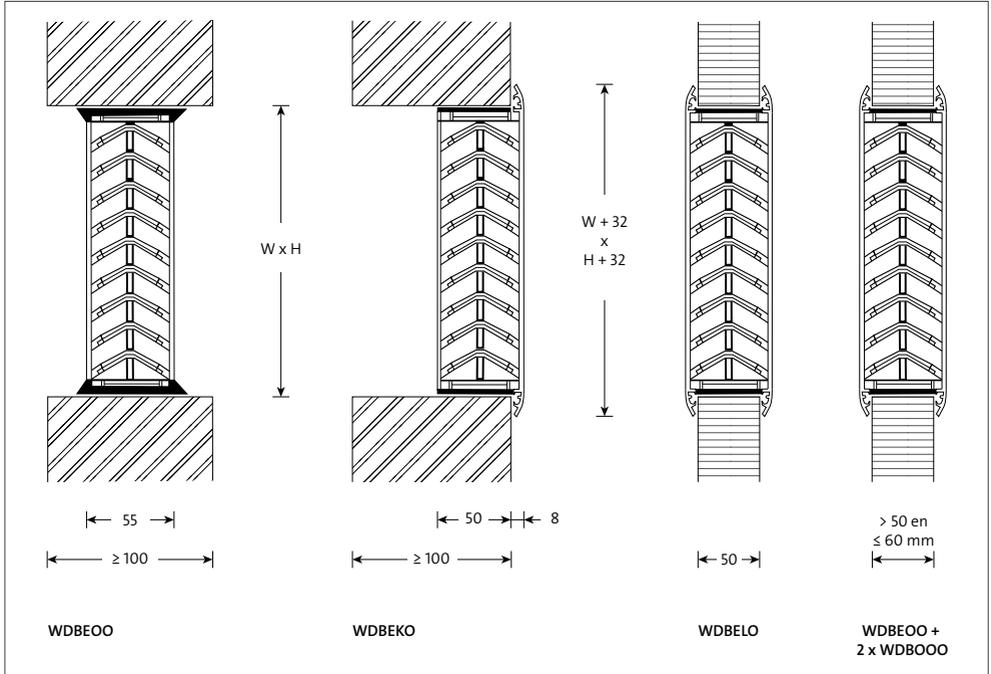
Plastic profiles filled with heat-sensitive foam material.

Post-treatment:	none
Colour:	RAL 9022 (light aluminium)

Optional

Colour:	RAL 7024 (anthracite grey) RAL 9016 (glossy white)
Counter flange:	WDBOOO (supplied individually)
Mastic BCM:	tube 310 ml

Dimensions



Available dimensions

Minimum $W \times H$ 100 x 100 mm to maximum 800 x 400 mm in increments of 50 mm. For use in a door, the upward range is limited to 600 x 400 mm. Sizes in between in steps of 1 mm in width and 10 mm in height are available at additional cost.

Comment

- The listed dimensions are in mm.
- $W \times H$ is the recess size.
- The actual width is $W - 5$ mm.
- The actual height is $H - 5$ mm.

Classified in accordance with EN 13501-2

Description	Separation construction	Material separation construction	Thickness	Seal	Installation	Classification	Classification report
WDBE00 100x100 mm up to and including 800x400 mm	Wall	Aerated concrete 550 kg/m ³	≥ 100 mm	Mastic BCM	Blades horizontal	EI60 (ve i↔o) and EW90 (ve i↔o)	WDBE Classification in wall and floor_14040_EN
	Flexible wall	Metal stud drywall Type A (EN520)	≥ 100 mm	Mastic BCM	Blades horizontal	EI60 (ve i↔o) and EW60 (ve i↔o)	
	Floor	Aerated concrete 650 kg/m ³	≥ 100 mm	Not applicable	Blades horizontal	EI60 (ho i↔o) and EW60 (ho i↔o)	
WDBE00 100x100 mm up to and including 600x400 mm	Door	Wooden fiber door panel 450 kg/m ³ with HDF fiberboard 3.2 mm 950 kg/m ³ on both sides.	≥ 50 mm	Mastic BCM	Blades horizontal	EI60 (ve i↔o) and EW60 (ve i↔o)	WDBE Classification in door_14086_EN

These classifications are achieved if the diffuser is incorporated in accordance with the prescribed method. We refer to the supplied fitting instructions for the diffuser and accompanying classification report in [door](#) and [floor/wall](#).

Selection details

Free passage in cm²

H	W														
	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
100	49	79	107	136	164	192	221	249	277	306	334	362	391	419	447
150	77	125	170	216	261	306	351	397	442	487	533	578	623	669	714
200	97	160	218	276	334	393	451	509	567	626	684	742	800	859	917
250	126	206	281	356	432	507	582	657	732	808	883	958	1033	1108	1184
300	146	241	329	417	505	593	681	770	858	946	1034	1122	1210	1298	1386
350	174	287	392	497	602	707	812	917	1023	1128	1233	1338	1443	1548	1653
400	194	322	440	558	676	794	912	1030	1148	1266	1384	1502	1620	1738	1856

Air volume in m³/h with 10 Pa pressure loss

H	W														
	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800
100	20	31	42	54	65	77	88	100	111	123	135	146	158	170	182
150	39	61	84	107	131	154	178	202	226	250	274	299	324	349	374
200	51	82	112	144	175	207	239	272	304	338	371	405	439	474	508
250	70	112	155	199	243	288	333	379	426	473	521	570	619	669	720
300	83	133	184	236	289	343	398	453	510	567	625	684	744	805	867
350	102	164	228	293	360	427	496	567	639	712	786	862	939	1017	1097
400	115	185	258	332	407	485	564	645	727	811	897	984	1074	1165	1257

Important information:

Fire-resistant products based on thermal foam material can be used in pressureless overflow systems, pressure loss max. 10 Pa. Fire dampers should be used in dividing constructions that have air ducts. Fire dampers are tested under higher pressure in accordance with EN 1366-2.

General

- Static pressure loss Ps in Pa.
- It is permitted to interpolate the interim values.