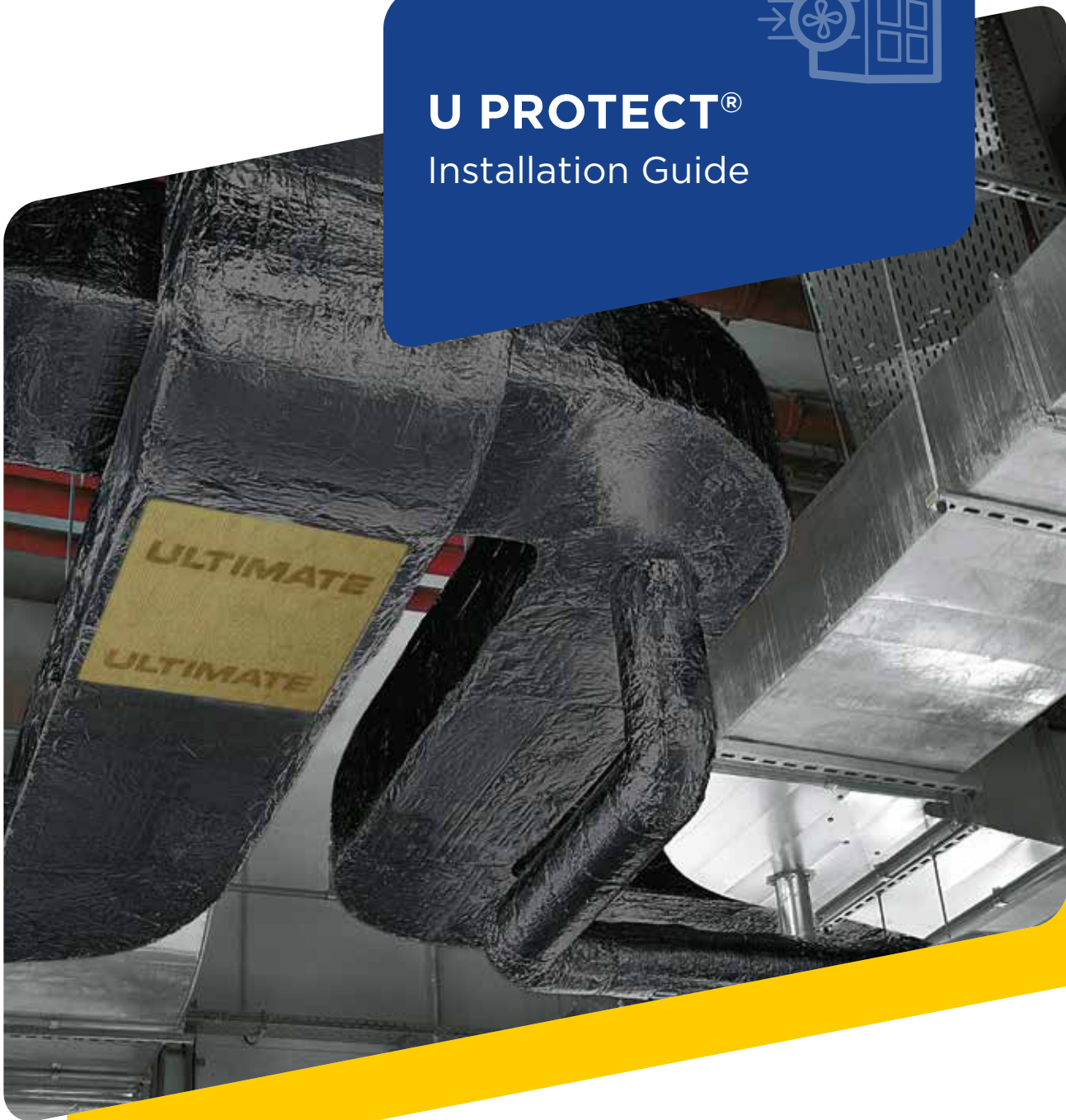
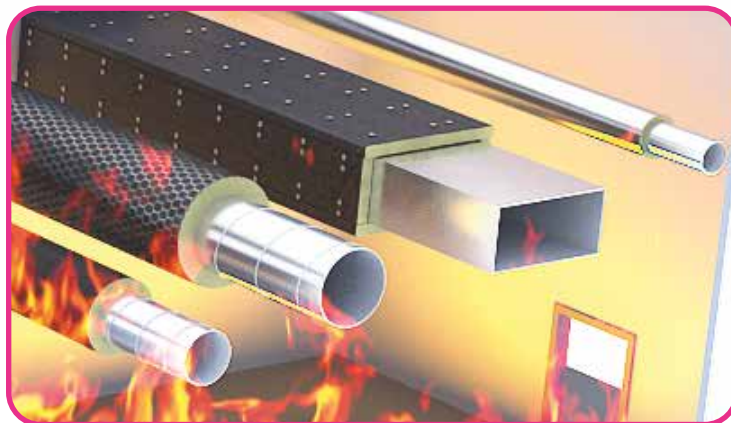
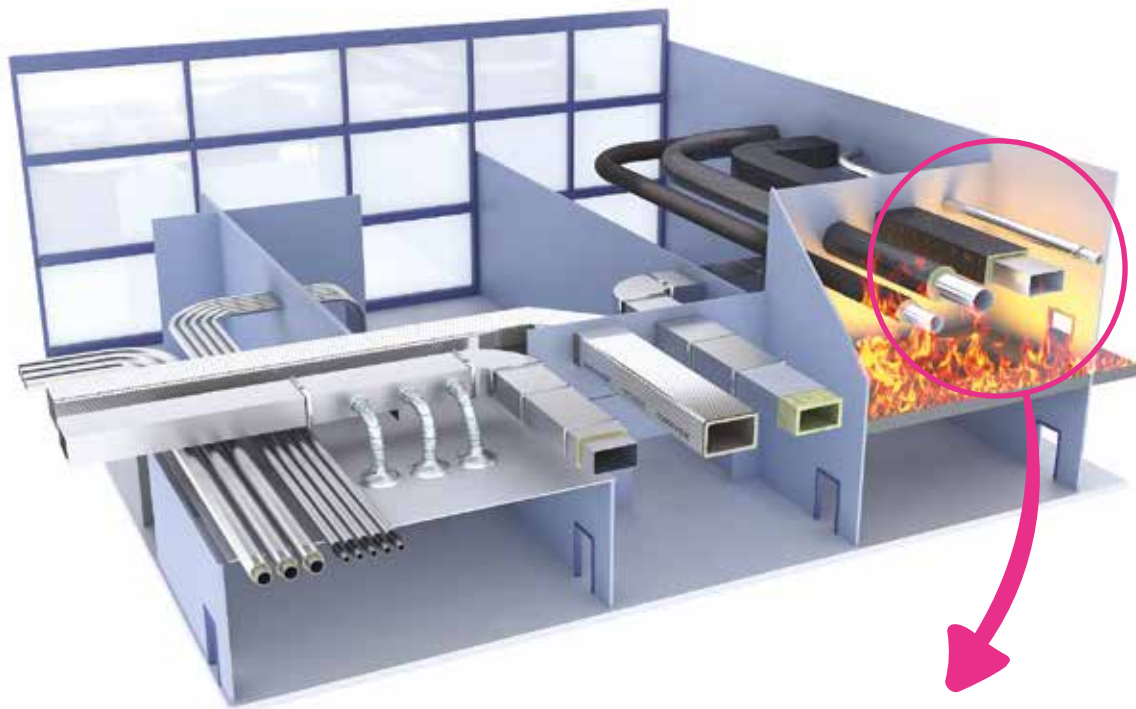




**U PROTECT®**  
Installation Guide



# Inside YOUR HVAC SYSTEM



**FIRE RATED HVAC APPLICATIONS**

## GOOD REASONS TO CHOOSE ULTIMATE AND U PROTECT® SYSTEM

### BENEFITS



**Certified system according to the latest EN standards  
Non-combustible**



**Meets all thermal building regulations for higher energy savings**



**High-quality aesthetics**



**Easy to check**



**Easy to handle, easy to carry**



**Easy to cut**



**Faster installation**



**Cost saving  
Minimizes wastes on site**



**No need for pre-fabrication**



**Easy logistics,  
saves storage space**

### FEATURES

**Fulfills EN 1366-1 and EN 1366-8  
Certified with ETA up to EI120  
Reaction to Fire: A1**

**Low thermal conductivity:  
0,031 W/mK at 10°C  
mean temperature**

**Innovation black facing:  
signature for fire protection**

**Up to 50% lighter than  
conventional solutions**

**Standard insulation knife  
can be used for slabs**

**Optimized dimensions for  
easy jobsite handling**

**No glue between insulation joints  
Off-cuts can be used**

**On-site installation possible**

**Compressed packaging**

# ULTIMATE AND U PROTECT® SYSTEM

ULTIMATE and U PROTECT® -  
the standard for high perfor-  
mance

# The standard for high performance **ULTIMATE AND U PROTECT®**



**ULTIMATE** results from more than 30 years of intense research carried out by Isover. **ULTIMATE** is produced thanks to a unique and patented fiberizing process, which ensures fine control of the fibre diameter.

It results in a totally shot-free product, made of long interwoven fibres: a mineral wool with excellent fire protection properties, high flexibility and a drastically reduced weight when compared to traditional stone wool solutions.

## **U PROTECT® solutions for HVAC**

Isover has developed with **U PROTECT®** a new innovative system for fire-resistant duct insulation in HVAC applications: The **U PROTECT®** system does not only include high-performance **ULTIMATE** products but also all accessories necessary for efficient fire protection: intumescent paint, glue, screws, tape, pins & washers. Tested and certified to provide maximum safety and comfort during installation: The Isover **U PROTECT®** system is certified with ETA up to EI120 resistance to fire according to EN1366-1 and EN1366-8 standards..

### **U PROTECT® IN BLACK**



#### **AESTHETICS**

**U PROTECT®**, now faced with an innovative black facing gives good aesthetics, especially when installations are visible.



#### **EASY TO CHECK**

Black color enables to control that fire rated system has been installed on jobsites. Certified according to the latest version of the standard (EN 1366).



#### **LIGHTWEIGHT**

**U PROTECT®** weights up to 50% of conventional solutions.



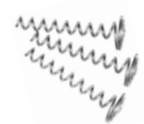
#### **FIRE PROTECTION**

**U PROTECT®** meets the highest standard for fire protection: Non-combustible Euroclass A1. Excellent fire resistance up to 2 hours solutions for ventilation and smoke extraction ducts according to EN 1366.



#### **FAST & COST EFFICIENT INSTALLATION**

**ULTIMATE** high resiliency makes cutting, bending or filling faster and more efficient than ever to insulate both air ducts and penetrations. It enables to benefit from time and material savings: one layer at penetration instead of two, no glue between joints.



## What do you need?

# PRODUCT OVERVIEW



**U PROTECT® Vent Section Alu2**  
Section: 1200 x up to Ø 250 mm  
Facing: Black aluminium



**U PROTECT® Slab 4.0 Alu1**  
Slab: 1200 x 600 mm  
Facing: black aluminium



**U PROTECT® Wired Mat 4.0 Alu1**  
Wired Mat: L x 600 - 1200 mm  
Facing: black aluminium

## Protect Accessories



### Isover Protect BSF

Solvent-free and pH-neutral, white, aqueous intumescent dispersion



### Isover Protect BSK

Non-combustible, inorganic adhesive based on alkali sodium silicate



### Isover Protect Black Tape

Self-adhesive aluminum tape



### Isover FireProtect Screw

Spiral shaped screw made of galvanized steel



### Welding pins with black washers

## Dimensions and facings

U PROTECT® Slab 4.0 Alu1			
Thickness (mm)	Length (m)	Width (mm)	Facing
30	1.2	600	Black Aluminium
40			
50			
60			
70			
80			
90			
100			

U PROTECT® Wired Mat 4.0 Alu1			
Thickness (mm)	Length (m)	Width (mm)	Facing
30	10.0	600 - 1200	Black Aluminium
40	7.5		
50	6.0		
60	5.0		
70	4.3		
75	4.0		
80	3.7		
90	3.3		
100	3.0		
120	2.5		

U PROTECT® Vent Section Alu2			
Thickness (mm)	Length (m)	Width (mm)	Facing
50 - 80	1.2	80	Black Aluminium
		100	
		125	
		150	
		160	
		180	
		200	
		224	
		250	



**Please contact  
the local Isover  
team for specific  
requirements  
and installation  
details.**

## Key performances

		Product Name		
		U PROTECT® Slab 4.0 Alu1	U PROTECT® Wired Mat 4.0 Alu1	U PROTECT® Vent Section Alu2
Fire Reaction Euroclass EN 13501		A1		A2L-s1, d0
Thermal Properties  Declared Thermal Conductivity in W/m.K (EN 12667, EN ISO 13787)	10 °C	0.031		0.032
	50 °C	0.035		0.037
	100 °C	0.040		0.043
	150 °C	0.047		0.052
	200 °C	0.054		0.062
	300 °C	0.072		0.092
	400 °C	0.096		-

Products are CE marked according to EN 14303



# U PROTECT® SYSTEM



**U PROTECT® -  
the standard for high  
performance**

# Rectangular duct INSULATION

## Specifications for the wall / floor

The wall/floor is a fire-rated construction. The duct can penetrate:

Construction	Wall / floor thickness (mm)	Wall / floor density (kg/m <sup>3</sup> )
Rigid floor	≥ 150	> 575
Rigid wall	≥ 100 up to EI90	> 575
	≥ 150 for EI120	

All fire rated light-weight partitions equal to or greater than the resistance to fire of the ducts.

## Characteristics of rectangular ductwork prior to insulation installation

### Duct sections



The duct section must be made of one folded steel sheet. Galvanized steel must be used with minimum thickness of 0,7mm according to EN 1366. The ductwork must have an airtightness of minimum class B (i.e. classes C and D are accepted), according to EN 1507: 2006 in cold condition. The use of an inorganic chemistry based band between ducts' sections is required.

According to EN 1366-1, the maximum duct section is 1250mm x 1000 mm. The maximum duct length is given by the following table:

Fire class	Maximum duct length (mm)
Up to EI90	1500
EI120	1250

### Stiffeners



Stiffeners must be fitted perpendicularly to any side length that exceeds 500 mm. It should be positioned at midpoint in each duct section. The stiffener must be:

- › Either a steel pipe, minimum diameter 3/8" or 17.1 mm and thickness 2.3 mm. The steel pipe must be fixed to the ducts using 4 pieces of M70 washers with thickness 1 mm and minimum M6 bolts.
- › Or a steel thread rod, minimum 8 mm diameter. It must be fixed to both sides of the duct section using 4 pieces of M70 washers with thickness 1 mm and minimum M8 nuts.

## Steel flanges



The duct sections shall be connected using steel flanges of minimum 30 x 30 mm and thickness 0.8 mm fixed to the duct using spot welding or steel screws at 150 mm centers. The flanges must not contain any grease and ceramic tape type of 3 mm x 20 mm is installed between the flanges.

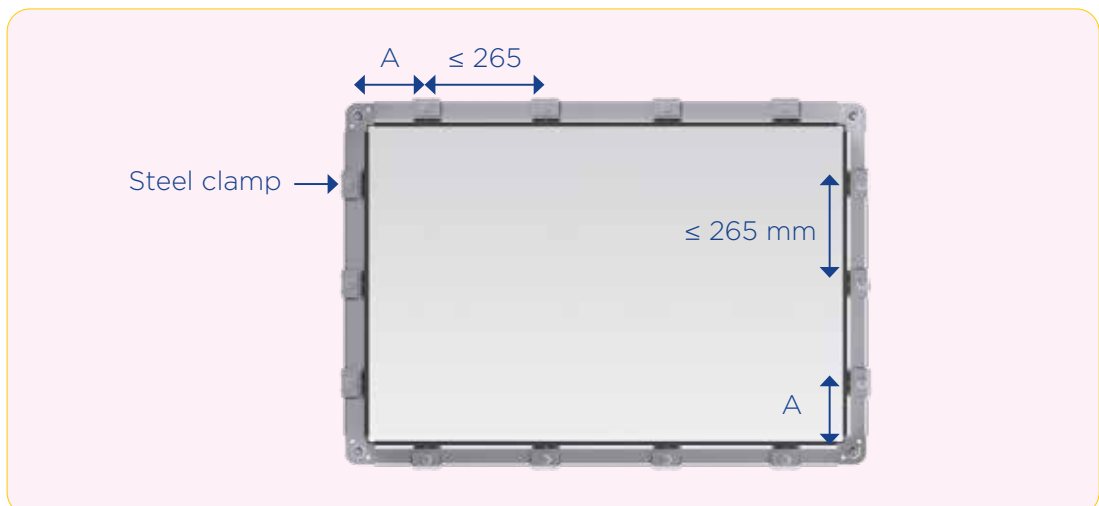
## Steel clamps



The flanges shall be held together using steel clamps (minimum M8 bolts) not exceeding the maximum distances stated in the below drawing.

The maximum distance between 2 clamps must be 265 mm. The maximum distance from the edge to the first clamp (see distance A on the picture) is given by the following table:

Duct width or height (mm)	Distance A (mm)
≤ 500	100
> 500	135





## Choosing the insulation thickness

The insulated duct going through the wall / floor must provide the same or higher fire resistance as the wall / floor.

Insulating rectangular ducts we recommend to use **U PROTECT® Slab 4.0 Alu1** for up to EI120 (ve ho o<->i) S 500 multi with following thickness (mm):

Resistance to Fire, EI (ve-ho i ↔ o) S				
E15 *	EI30	EI60	EI90	EI120
40	50	70	80	90

For smoke extraction - EI120 (ve-ho i ↔ o) S 500 multi

Based on European Technical Assessment issued in accordance with Regulation (EU) 305/2011, on the basis of European Assessment Document EAD 350142-00-1106. The insulation thicknesses to ensure fire resistance up to EI120 for ventilation and smoke extraction rectangular ducts are tested and certified with U PROTECT® Slab 4.0 Alu1.

Alternative method for rectangular ducts is to use **U PROTECT® Wired Mat 4.0** for up to EI60 (ve ho o<->i) with following thickness (mm):

**For further information please contact our Isover sales offices.**

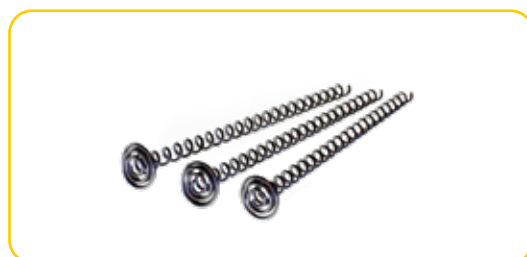
Resistance to Fire, EI (ve-ho i ↔ o)			
EI15	EI30	EI45	EI60
40	60	70	100

\* Based on Fire Technical Assessment by accredited laboratory for ventilation ducts with U PROTECT® Wired Mat 4.0.

## Choosing the pins and fire screws



The insulation is fixed to the duct using stud-welded pins of minimum 2.7 mm diameter and spring steel washers, minimum 30 mm diameter. We advise you to choose a length of pin a bit longer than the insulation thickness (-3 mm longer).



Joints at the corners are secured with Isover Fire Protect Screws, which are spiral shaped screws made of galvanised steel. Their length must be 2 times the insulation thickness.



### Pins and fire screws for horizontal ducts with U PROTECT® 4.0 Slab

Height of the duct (mm)	Width of the duct (mm)				
	$w \leq 420$	$420 < w \leq 600$	$600 < w \leq 680$	$680 < w \leq 940$	$940 < w \leq 1200$
$h \leq 420$	25	29	32	37	42
	15	15	15	15	15
$420 < h \leq (600\text{-thickness})$	33	38	40	45	50
	15	15	15	15	15
$(600\text{-thickness}) < h \leq 680$	39	43	45	50	55
	17	17	17	17	17
$680 < h \leq 940$	49	53	55	60	65
	17	17	17	17	17
$940 < h \leq 1000$	59	63	65	70	75
	17	17	17	17	17

- Number of pins / linear meter of duct (average)
- Number of FireProtect Screws / linear meter of duct (average)



### Pins and fire screws for vertical ducts with U PROTECT® 4.0 Slab

Height of the duct (mm)	Width of the duct (mm)				
	$w \leq 420$	$420 < w \leq 600$	$600 < w \leq 680$	$680 < w \leq 940$	$940 < w \leq 1200$
$h \leq 420$	34	42	47	57	67
	17	17	17	17	17
$420 < h \leq 680$	47	55	60	70	80
	20	20	20	20	20
$680 < h \leq 940$	57	65	70	80	90
	20	20	20	20	20

- Number of pins / linear meter of duct (average)
- Number of FireProtect Screws / linear meter of duct (average)

Example:

For a vertical ductwork of 10 m with a section of 1000 x 600 (w x h), you will need to use  $80 \times 10 = 800$  pins and  $20 \times 10 = 200$  FireProtect Screws. For fixation details, please refer to page 20.

## Calculating the amount of glue and paint

The gap between the steel duct and the supporting construction is fitted with compressed **U PROTECT® Slab 4.0**. The insulation is coated at both sides of the penetration with intumescent paint Isover Protect BSF which is needed only for EI120 installations.. At both sides of the penetration, the duct fire protective insulation **U PROTECT® Slab** is glued to the penetration surface using silicate glue Isover Protect BSK.

### Isover Protect BSF intumescent paint



Isover Protect BSF must be used to seal the penetration. It is supplied in 15 kg buckets (11.6 l) or cartridges of 400g (310 ml). Coverage rates are given below per linear meter of joint in **U PROTECT® Slab**, based on a thickness of 2 mm. On-site usage of paint will vary: these coverage rates should therefore be used for guidance purpose only. The opening is the distance between the duct and the wall/floor at penetration.

Size of the opening (mm)	Approximate weight (kg) of BSF paint per linear meter at penetration	Average number of penetrations (2 sides) that can be done with one bucket for a duct section of 600 x 1000 mm and an insulation thickness of 80 mm
20	0.05	44
30	0.08	29
40	0.10	22
50	0.13	17

### Isover Protect BSK glue



Isover Protect BSK must only be used to glue the insulation products to the wall, floor or ceiling. It is supplied in 15 kg buckets (9.3 l) or cartridges of 500g (310 ml). Coverage rates are given below per linear meter of joint in **U PROTECT® Slab**, based on an applied quantity of 0,66 g/cm<sup>2</sup>. On-site usage of glue will vary: these coverage rates should therefore be used for guidance purpose only. The opening is the distance between the duct and the wall/floor at penetration.

Size of the opening (mm)	Approximate weight (kg) of BSK glue per linear meter at penetration	Average number of penetrations (2 sides) that can be done with one bucket for a duct section of 600 x 1000 mm
30	0.20	12
40	0.26	9
50	0.33	7
60	0.40	6
70	0.46	5
80	0.53	4
90	0.59	4
100	0.66	3

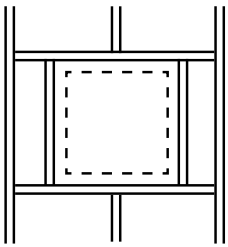
#### To calculate how much paint and glue is required

- Calculate the total length of the penetration (2 sides of the wall/floor):  
For BSF:  $2 \times [(2 \times \text{width of duct}) + (2 \times \text{height of duct}) + (4 \times \text{size of the opening})]$  with all values in meters.  
For BSK:  $2 \times [(2 \times \text{width of duct}) + (2 \times \text{height of duct}) + (4 \times \text{insulation thickness})]$  with all values in meters
- Read in previous tables the weight per linear meter corresponding to your configuration.
- Multiply the 2 values obtained in 1. and 2.: this is the total paint/glue required!

## Complete fire separation wall / floor penetrations with U PROTECT® Slab 4.0 Alu1

(Based on European Technical Assessment issued in accordance with Regulation (EU) 305/2011, on the basis of European Assessment Document EAD 350142-00-1106).

The wall/floor is a fire-rated construction. The duct can penetrate: All fire rated light-weight partitions equal to or greater than the resistance to fire of the ducts.



### › STEP 1: POSITIONING

The duct is placed in the opening of the construction. The distance between duct wall and opening has to be  $\leq 50$  mm. The duct should have an internal stiffener (support rod) placed where the duct passes the construction.

Note that internal stiffener is not needed in EI30 installations for ventilation ducts. One stiffener required for the installations of ventilation ducts of EI60 and above.

For **light-weight partition** walls: the wall opening should be reinforced with a metal frame using same or similar profile as use for wall studs. Frame is installed on all four sides.



### › STEP 2: INSULATION OF THE PENETRATION

Fill the space between duct and construction with the insulation slab (it should be slightly compressed to completely fill the opening).



### › STEP 3: SEALING

Seal the penetration with Isover Protect BSF to prevent leakages. This must be done on both sides of the construction. Use a spatula to apply a layer of  $\sim 2$  mm thickness. Isover Protect BSF is applied only for EI120 installations.



### › STEP 4: REINFORCING THE DUCT

Frame the duct by fixing an L-profile (30 x 30 x 3 mm) around it (see picture 4). The L-profile is fixed to the duct with steel rivets (3.2 x 10 mm) at 100 mm centers. The top and bottom profiles are fixed to the construction with four wall anchors each. The profiles need to be installed on both sides of the construction in horizontal installation. In case of vertical insulation, profiles are only needed on the upper side of the floor.



### › STEP 5: DUCT INSULATION

Install the insulation slabs so that they stick to the construction. To avoid leakage caused by elongation of the steel in case of fire, the first slabs need to be glued to the construction using Isover Protect BSK (thickness ~ 2 mm).

For the slabs fixation with pins and fire screws, please refer to fixation part page 20.



### › STEP 6: COMPLETION

Use Isover Protect Black Tape to cover the edges and joints of U Protect Slab.

All joints are secured by pressing the slabs together (no additional glue needed).

To see the video of installation:



## Fixation

Welded pins with washers are used to fix the insulation to the duct. Corner joints are secured with Isover FireProtect Screws. To know how many pins and fire screws you need for the installation, please refer to page 16.

### Isover Slabs, FireProtect Screws and Pin pattern

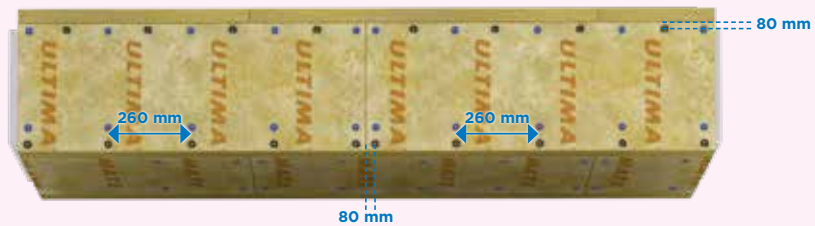
Use 2 simple rules whatever the duct orientation is:

- Distance of the pins to the duct's edges or slab joints: 80 mm
- Maximum distance between pins: 260 mm

#### Horizontal duct

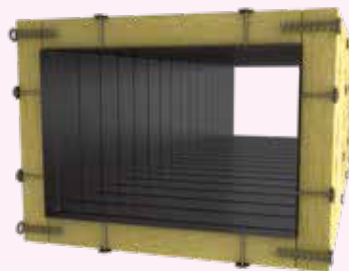


No pins are needed to fix the top slabs.



● Isover FireProtect Screw ● Pin

#### Vertical duct



Top boards overlapping side boards which are overlapping downside boards!

## Cutting for insulating a duct joint



At duct flanges, the slabs need to be cut to fit the duct as tightly as possible. There is no thickness increase or double layer necessary on flanges.

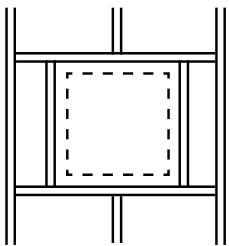
EI15\* - For insulation thicknesses  $\leq 50$  mm, a layer of 30 mm collar with width 120 mm must be added on top of the insulation at the duct joints to cover the flanges. (\* Based on Fire Technical Assessment by accredited laboratory for ventilation ducts with U PROTECT® Slab 4.0.)



## Complete fire separation wall / floor penetrations with U PROTECT® Wired Mat 4.0

(Based on Fire Technical Assessment by accredited laboratory)

The same principle of installation is used for both horizontal and vertical ducts as well as for masonry and light-weight partition walls. This installation is done in 5 steps.



### › STEP 1: POSITIONING

The duct is placed in the opening of the construction. The distance between duct wall and opening has to be  $\leq 50$  mm. The duct should have an internal stiffener (support rod) placed where the duct passes the construction.

For **light-weight** partition walls: the wall opening should be reinforced with a metal frame using same or similar profile as use for wall studs. Frame is installed on all four sides.



### › STEP 2: INSULATION OF THE PENETRATION

Fill the space between duct and construction with the insulation mat removed from wired. It should be compressed to completely fill the opening.



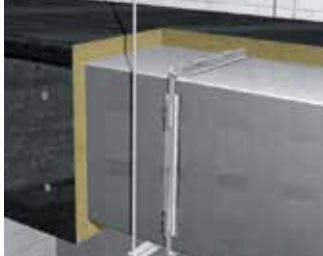
### › STEP 3: SEALING

Seal the penetration with Isover Protect BSF to prevent leakages. This must be done on both sides of the construction. Use a spatula to apply a layer of ~ 2 mm thickness.



### › STEP 4: REINFORCING THE DUCT

Frame the duct by fixing an L-profile (30 x 30 x 3 mm) around it (see picture 4). The L-profile is fixed to the duct with steel rivets (3.2 x 10 mm) at 100 mm centers. The top and bottom profiles are fixed to the construction with four wall anchors each. The profiles need to be installed on both sides of the construction in horizontal installation. For rigid floors, in case of vertical insulation, profiles are only needed on the upper side.



## › STEP 5: DUCT INSULATION

Install the insulation wired mat so that they stick to the construction. To avoid leakage caused by elongation of the steel in case of fire, the first wired mat need to be glued to the construction using Isover Protect BSK (thickness ~ 2 mm).

## Fixation

Welded pins with washers are used to fix the wired mat to the rectangular duct.

## U PROTECT® Wired Mat Pin pattern

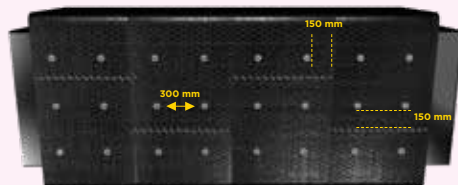
Use 2 simple rules whatever the duct orientation is:

- Distance of the pins to the duct's edges or wired mat joints: 150 mm
- Maximum distance between pins: 300 mm

### Horizontal duct



No pins are needed to fix the top side.



### Vertical duct



Fixing the wired mat refer to page 32.

## Smoke Extraction (according to EN 1366-8)

Stiffeners must be used and fitted perpendicular to any side of the duct where dimension exceeds 500 mm. One stiffener per every 0.3 [m<sup>2</sup>] surface of the duct side is needed.

The stiffeners must be:

- › Either a steel thread rod diameter 8 mm, inside a 3/8" diameter steel pipe or steel pipe diameter 17.1 mm, thickness 2.3 mm.
- › Or a stiffener made of steel with an equal stiffness as described above.

The steel rod must be fixed to the ducts using 4 pieces of M70 mm washers with thickness 1 mm and M8 nuts.



Up to EI90, the minimum steel thickness is 0.7 mm.

For EI120 smoke extraction ducts, the minimum steel thickness is 1 mm and C-profiles with minimum steel thickness of 1 mm must be used over the steel flanges, together with the clamps. (Note: Only for EI90, use C-profiles continuous along the flanges instead of the clamps.)



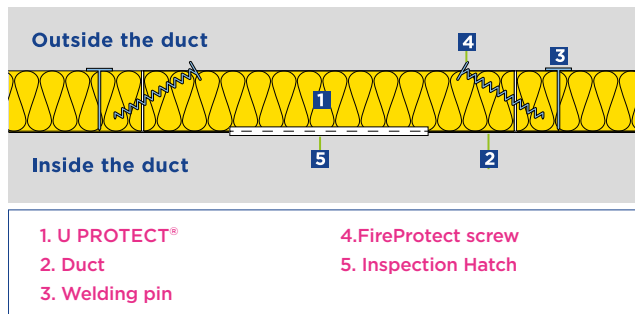
## Special cases (Based on Fire Technical Assessment by accredited laboratory)

### INSTALLATION OF ACCESS PANEL

The installation of a ventilation system in a building is complex. A system is normally passing through the whole building. The duct system must be adapted to the building, as well allowing inspection and maintenance with maintaining level of fire safety.

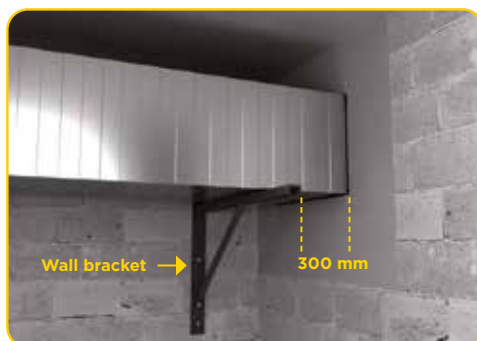
In the case when a nonfire rated inspection hatch is installed to the duct it's important to have a fire safe solution that can be easily removed and installed again (see picture). The opening is limited to a size of 290x420 mm, in case of bigger hatches, it is recommended to use a fire rated one

- The access panel is made of steel.
- The access panel hatch is mechanical fixed in each end using steel hardware.
- The frame size of the access panel should not exceed 290 x 420 mm.
- The EPDM-sealing shall be removed from the access panel.
- 3 x 20 mm inorganic chemistry tape must be added between the access panel frame and the duct
- The access panel frame shall be fixed to the duct using steel screws, 3 in each corner and approx. per c/c 60 mm along the sides.
- The insulation covering the access panel shall be fixed as prescribed below.



### 2 AND 3-SIDED DUCT INSULATION

This solution can be used if the gap between duct and the closest wall/floor is lower than 300 mm. The construction must be symmetrical to the penetration (both sides of the wall/floor).



#### STEP 1: POSITIONING

The duct is placed in the opening of the construction. The hangers are positioned as for the classical solution.

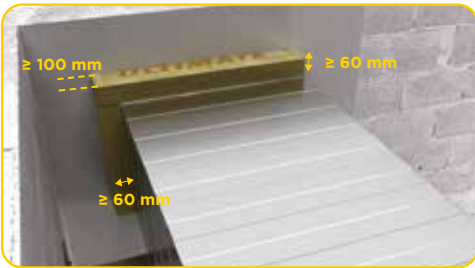


## STEP 2: SEALING

Close the opening with mortar with a minimum density of  $575 \text{ kg/m}^3$ .

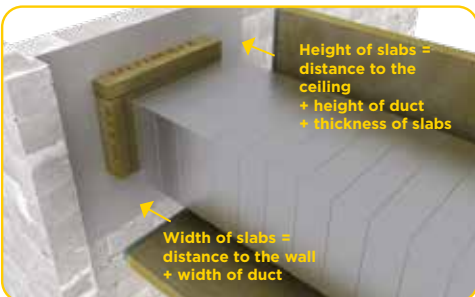
For a 3-sided installation: frame the duct by fixing an L-profile (30x30x3 mm) around it. The L-profile is fixed to the duct with steel rivets (3.2x10 mm) at 100 mm centers. The top and bottom profiles are fixed to the construction with 4 wall anchors each. The profiles need to be installed on both sides of the construction in horizontal installations. In case of vertical installations profiles are only needed on the upper side.

For a 2-sided installation: no need of L-profile. Use instead a wall bracket positioned 300 mm from the penetration, on both sides. It must be fixed using self-drilling steel screws at 300 mm centers.

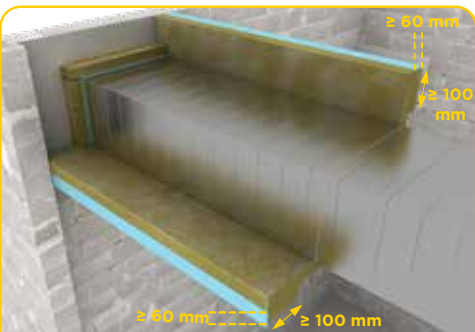


## STEP 3: DUCT INSULATION

a. Position collars of insulation at the penetration (2 for a 2-sided duct insulation, only one for a 3-sided) and glue them to the duct using Isover Protect BSK. The height of the collar should be minimum 60 mm and the width should be minimum 100 mm.



b. The duct insulation is mounted on the duct on the free sides. The slabs must be in contact with the floor/wall. The slabs in contact with the penetration must be glued to the mortar using Isover Protect BSK (see yellow arrow). Pins and fire screws are positioned according to classical pin pattern.



c. A collar with a minimum width of 60 mm and minimum height 100 mm should be positioned next to the duct insulation, and only glued to the surface of the floor/wall. A pin or a fire screw can help to hold this collar in place during the glue drying, but it must be removed afterwards.



Pins and fire screws are positioned according to classical pin pattern.

# Circular duct INSULATION

## Specifications for the wall / floor

	Construction	Wall / floor thickness (mm)	Wall / floor density (kg/m <sup>3</sup> )
The wall/floor is a fire-rated construction. The duct can penetrate:	<b>Rigid floor</b>	≥ 150	> 575
All fire rated light-weight partitions are covered.	<b>Rigid wall</b>	≥ 100 up to EI90	> 575
		≥ 150 for EI120	

## Characteristics of circular ductwork prior to insulation installation

### Duct sections

The circular duct sections must be made of at least 0.7 mm spiral folded steel sheet. It should be galvanised steel. The ductwork must have air tightness class D according to EN12237.

According to EN 1366, the maximum diameter of the steel duct is 1000 mm and the maximum length of the steel duct is 3000 m.



### Connections

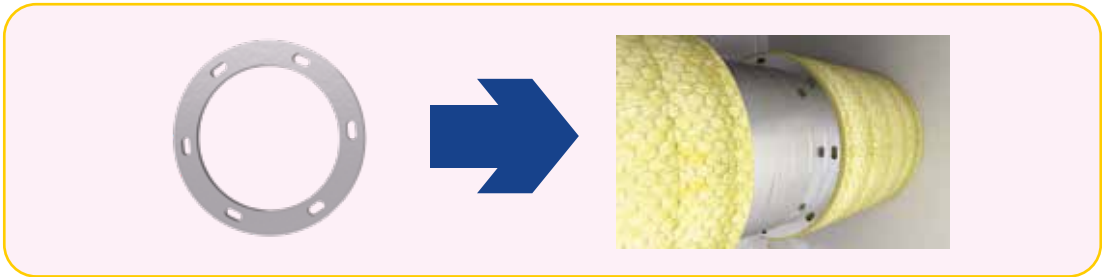
The circular duct sections must be connected using steel nipples. The nipple should in both ends be fitted with a sealing strip of EPDM-rubber and a 20 x 3 mm inorganic chemistry based band.

The duct sections should be fixed to the nipples using self tapping screws at 150 mm centres.



**EI120**

Steel ducts used for EI120 shall be fitted with 40 x 5 mm flat bar flanges positioned midway between the hangers (at 1200 mm centers).



**Suspension for horizontal ducts**



The horizontal circular ducts should be suspended using steel rod hangers. The tension in the hangers in cold condition should not exceed 9 N/mm<sup>2</sup> for resistance to fire equal to or lower than 60 minutes and 6 N/mm<sup>2</sup> for resistance to fire higher than 60 minutes. The maximum distance between the suspensions should not exceed 1500 mm.

The suspension rods should be fixed to the steel duct using profiles made from 2 x 25 mm galvanized steel plates.

Hangers' Ø (mm)	Duct's Ø (mm)										
	100	125	160	200	250	315	400	500	630	800	1000
	5	6	6	6	6	6	6	6	8	10	10

The table above shows diameters of the threaded rod to be used in case of U PROTECT® Wired Mat 4.0, 120 mm thick (duct thickness of 0.7 mm, duct length 3000 mm) and for a tension not exceeding 6N/mm<sup>2</sup>

Hangers' Ø (mm)	Duct's Ø (mm)										
	100	125	160	200	250	315	400	500	630	800	1000
	4	4	4	4	5	5	5	6	8	8	8

The table above shows diameters of the threaded rod to be used in case of U PROTECT® Wired Mat 4.0, 75 mm thick (duct thickness of 0.7 mm, duct length 3000 mm) and for a tension not exceeding 9N/mm<sup>2</sup>

## Choosing the insulation thickness

The insulated duct going through the wall / floor must provide the same fire resistance as the wall / floor. Insulating circular ducts up to 1000 mm diameter we recommend to use **U PROTECT® Wire Mat 4.0 Alu1 for up to EI120** (ve ho o<->i) S 1000 multi with following thickness (mm):

**For further information please contact our Isover sales offices.**

Resistance to Fire, EI (ve-ho i ↔ o) S				
EI15 *	EI30	EI60	EI90	EI120
40	40 - 50	80	-	120

For smoke extraction - EI120 (ve-ho i ↔ o) S 1000 multi  
Based on European Technical Assessment issued in accordance with Regulation (EU) 305/2011, on the basis of European Assessment Document EAD 350142-00-1106. The insulation thicknesses to ensure fire resistance up to EI120 for ventilation and smoke extraction circular ducts are tested and certified with U PROTECT® Wired Mat 4.0 Alu1.

\* Based on Fire Technical Assessment by accredited laboratory for ventilation ducts with U PROTECT® Wired Mat 4.0.

## Calculating the length of wired mats

To calculate the length of wired mats needed (in mm), the following formula can be used:

$$\text{Length} = (\text{diameter of the circular duct} + 2 \times \text{thickness of the wired mat}) \times 3.14$$

This is the theoretical length of the mat.

- One wired mat
- Two wired mats

		Thickness of wired mats (mm)			
		40	80	100	120
Diameter of the circular duct (mm)	200	880	1130	1260	1390
	250	1040	1290	1420	1540
	300	1200	1450	1580	1700
	350	1350	1600	1730	1860
	400	1510	1760	1890	2020
	450	1670	1920	2050	2170
	500	1820	2080	2200	2330
	550	1980	2230	2360	2490
	600	2140	2390	2520	2640
	650	2300	2550	2670	2800
	700	2450	2700	2830	2960
	750	2610	2860	2990	3110
	800	2770	3020	3150	3270
850	2920	3170	3300	3430	
900	3080	3330	3460	3590	
950	3240	3490	3620	3740	
1000	3340	3640	3770	3900	



### Save time:

Add a distance of around 10 cm and cut the wired mat to have the wire mesh overlapping by removing the Ultimate wool. It will be necessary for the fixation.



## Calculating the amount of glue and paint

The gap between the steel duct and the supporting construction is fitted with compressed U PROTECT® Wired Mat 4.0. The insulation is coated at both sides of the penetration with intumescent paint Isover Protect BSF which is needed only for EI120 installations. At both sides of the penetration, the duct fire protective insulation U Protect Wired Mat is glued to the penetration surface using silicate glue Isover Protect BSK.

### Isover Protect BSF intumescent paint



Isover Protect BSF must be used to seal the penetration. It is supplied in 15 kg buckets (11.6 l) or cartridges of 400g (310 ml). Coverage rates are given below per linear meter of joint in U PROTECT® Wired Mat, based on a thickness of 2 mm. On-site usage of paint will vary: these coverage rates should therefore be used for guidance purpose only. The opening is the distance between the duct and the wall/floor at penetration.

Size of the opening (mm)	Approximate weight (kg) of BSF paint per linear meter at penetration	Average number of penetrations (2 sides) that can be done with one bucket for a duct diameter of 1000 mm and a n insulation thickness of 80 mm
20	0.05	44
30	0.08	29
40	0.10	22
50	0.13	17

### Isover Protect BSK glue



Isover Protect BSK must only be used to glue the insulation products to the wall, floor or ceiling. It is supplied in 15 kg buckets (9.3 l) or cartridges of 500g (310 ml). Coverage rates are given below per linear meter of joint in U PROTECT® Wired Mat, based on an applied quantity of 0,66 g/cm<sup>2</sup>. On-site usage of glue will vary: these coverage rates should therefore be used for guidance purpose only. The opening is the distance between the duct and the wall/floor at penetration.

Insulation thickness (mm)	Approximate weight (kg) of BSK glue per linear meter at penetration	Average number of penetrations (2 sides) that can be done with one bucket for a duct diameter of 1000 mm and an insulation thickness of 80 mm
30	0.20	11
40	0.26	8
50	0.33	7
60	0.40	6
70	0.46	5
80	0.53	4
90	0.59	4
100	0.66	3

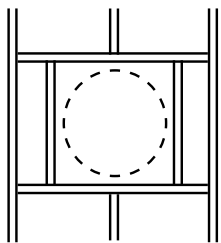
#### To calculate how much paint and glue is required

- Calculate the total length of the penetration (2 sides of the wall/floor):  
For BSF:  $2 \times [3.14 \times (\text{diameter of the duct} + \text{size of the opening})]$  with all values in meters.  
For BSK:  $2 \times [3.14 \times (\text{diameter of the duct} + (2 \times \text{thickness of insulation}))]$  with all values in meters
- Read in previous tables the weight per linear meter corresponding to your configuration.
- Multiply the 2 values obtained in 1. and 2.: this is the total paint/glue required!

## Complete fire separation wall / floor penetrations

### Standard installation

The same principle of installing wired mat is used for both horizontal and vertical ducts as well as for with masonry and lightweight partition walls. This installation is done in 5 steps.



#### › STEP 1: POSITIONING

The duct is installed in the opening of the construction. The distance between duct and wall/floor surface should be  $\leq 50$  mm (ventilation: 20 mm below EI120 and 50 mm for EI120, smoke extraction: 45 mm for EI120).

For light-weight partition walls only: the wall opening should be reinforced with a metal frame using same profile or similar as used for wall studs. Frame is installed on all four sides (see sketch).



#### › STEP 2: INSULATION OF THE PENETRATION

Fill the space between duct and construction with insulation mat removed from wire. It should be compressed to completely fill the opening.



#### › STEP 3: SEALING

Isover Protect BSF is applied only for EI120 installations. Seal the penetration with Isover Protect BSF to prevent leakages. This must be done on both sides of the construction. Use a spatula to apply a layer of ~ 2 mm thickness.



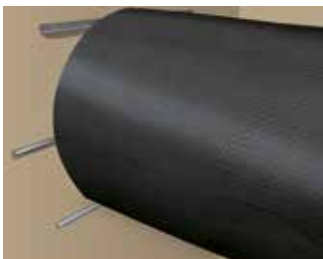
#### › STEP 4: REINFORCING THE DUCT

No mechanical fixing of the circular duct to the wall is required below EI120. For EI30 with 40 mm U Protect Wired Mat 4.0 Alu1: The duct is fixed to the top of the floor only with four angel brackets. The dimensions of the angle brackets are 90 x 90 x 40 x 3 mm. Each bracket is fixed to the duct by using four self-tapping steel screws with dimensions of 4.2 x 13 mm and fixed to the supporting construction by using one concrete steel screw with dimensions of 8 x 60 mm.

For EI30 with 50 mm U Protect Wired Mat 4.0 Alu1: The duct is fixed to the top of the floor with two L-profiles (30 mm x 30 mm x 3 mm and length of at least the duct diameter + 270 mm), using 2 screws of diameter 7,5 mm and length 60 mm at each end of the profile and the L-profiles are fixed to the duct using steel rivet of diameter 3,2 mm and length 10 mm. No suspension brackets required.

For EI60 & EI90: The duct is fixed to the top of the floor with a suspension bracket (30 x 2 mm) which is screwed to the duct (at 150mm centers) and short L-profiles (30 x 30 x 3 mm) are fixed with nuts and bolts (M8) to the bracket eye. Fixation to the construction is done with floor anchors.

For EI120: At both sides of the penetration, two L-profiles (30 mm x 30 mm x 3 mm and length of at least the duct diameter) are mounted at the sides of the duct (top and bottom for horizontal duct), which is fixed to the L-profiles with a steel rivet of diameter 4 mm and length 16 mm. Also, at both sides of the penetration, a suspension bracket of minimum 30 mm x 2 mm galvanized steel plates is screwed to the duct c/c 150 mm. Two L-profiles (30 mm x 30 mm x 3 mm and 250 mm length) are fixed with M8 bolts and nuts to the bracket eye. The L-profiles are fixed to the supporting construction using two screws of diameter 7,5 mm and length 80 mm at each end of the profile.



#### › STEP 5: DUCT INSULATION

Install the wired mats so that they stick to the construction. To avoid leakage caused by elongation of the steel in case of fire, the wired mat needs to be glued to the construction using Icover Protect BSK (thickness ~ 2 mm). For the wired mat fixation, please refer to the page 32.

## Fixation

For both vertical and horizontal installations, the wired mats do not need to be fixed with pins and fire screws. All joints are secured by pressing the mats together (no additional glue needed).

Two fixation methods can be used to close the joints between the wired mats:

### 1 C-Rings method



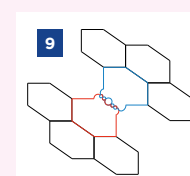
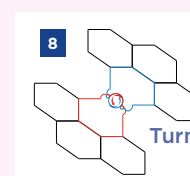
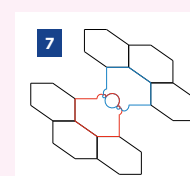
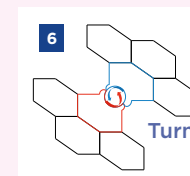
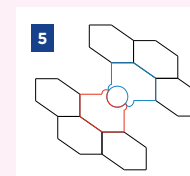
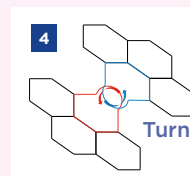
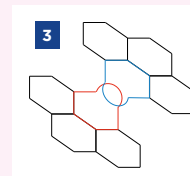
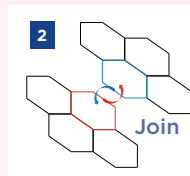
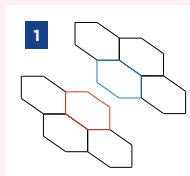
C-rings can be attached to fix the two parts of wired mesh together.

### 2 Hook tool method



The wired mesh can be attached one to each other by use of a hook tool.

Detailed method:



## Smoke Extraction (according to EN 1366-8)

For horizontal ducts, the exterior of the steel duct is stiffened using steel flat bar flanges with minimum dimensions 40 mm x 5 mm. The flanges are positioned around the duct, midway between the hangers (at 1200 mm centers). It is not needed to fix the flanges mechanically to the steel duct.

For vertical ducts, the flanges are laid on top of a suspension bracket fixed together with M10 bolts and nuts. At the fixing of the bracket, a 25 mm x 60 mm L-fastener is installed as support for the flat bar flange.

(Note: Vertical circular ducts do not require stiffener for EI120 ventilation duct installations).



## Special cases (Based on Fire Technical Assessment by accredited laboratory)

### CIRCULAR DUCTS INSTALLED CLOSE TO WALLS AND FLOORS

This solution can be used if the gap between duct and wall / floor is lower than 200 mm which prevents the standard installation for circular ducts. The construction must be symmetrical to the penetration.



#### › STEP 1: POSITIONING

The duct is placed in the opening of the construction. The hangers are positioned as for the classical solution.

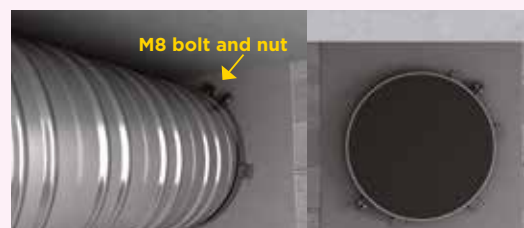
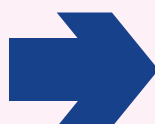
#### › STEP 2: SEALING

Close the opening with mortar with a minimum density of 575 kg/m<sup>3</sup>.

#### › STEP 3: REINFORCING THE DUCT

If the duct has a diameter  $\leq 400$  mm: there is no need to secure the duct with suspension profile and steel angles.

**If the duct has a diameter > 400 mm:** The duct is fixed on both sides to the aperture wall using two sets of suspension profiles (2x25 mm) with steel angle brackets (2x30x30 mm) fixed to the duct with self drilling screws (2 pieces, 4.2x25 mm - not screwed to the wall but only to the duct). These angle brackets should be positioned at 400 mm centres, minimum 2.



For the next step, there are 2 cases depending on the distance to the wall or floor:

#### › STEP 4: DUCT INSULATION

##### Case a

###### Insulation thickness < distance D

The distance D from the wall or floor is lower than 200 mm but higher than the thickness of the insulation: with this distance it is possible to wrap entirely the insulation around the duct.



Install the wired mats so that they stick to the construction. The wired mat needs to be glued to the mortar using Isover Protect BSK (thickness ~ 2 mm).

The fixation is done according to the classical methods (see p.32)

##### Case b

###### Insulation thickness $\geq$ distance D

The distance D from the wall or floor is equal or lower than insulation thickness: it is impossible to wrap entirely the insulation around the duct.



Install the wired mats so that they stick to the construction. The wired mat needs to be glued to the mortar using Isover Protect BSK.

Because the distance to the wall or floor doesn't allow to wrap the insulation all around the duct, the wired mat must be glued to the wall or floor with Isover Protect BSK as seen in the drawing. The width of the glue band should be equal to minimum the thickness of the insulation.

The insulation should be fixed to the duct using steel welding pins (diameter 3 mm, washer 30 mm) positioned every 300 mm in the longitudinal direction of the duct, fixed as close as possible to the insulation edge.

## Insulating with U PROTECT® Vent Section Alu2

The wall/floor is a fire-rated construction. The duct can penetrate:

Construction	Wall / floor thickness (mm)	Wall / floor density (kg/m <sup>3</sup> )
Rigid floor	≥ 100	≥ 575
Rigid wall	≥ 70	≥ 450

All fire rated light-weight partitions are covered.

### Characteristics of circular ductwork prior to insulation installation

#### Duct sections

The circular duct sections must be made of at least 0.4 mm spiral folded steel sheet. It should be galvanised steel. The ductwork must have a tightness class D according to EN 12237. According to EN 1366-1, the maximum diameter of the steel duct is 250 mm.

#### Connections

The circular duct sections must be connected using steel nipples. The nipple should in both ends be fitted with a sealing strip of EPDM-rubber and a 20 x 3 mm inorganic chemistry based band. The duct sections should be fixed to the nipples using self-tapping screws at 100 mm centres.

#### Suspension for horizontal ducts

The horizontal circular ducts should be suspended using steel rod hangers. The tension in the hangers in cold condition should not exceed 9 N/mm<sup>2</sup>. The maximum distance between the suspensions should not exceed 1525 mm. The suspension rods should be fixed to the steel duct using circular suspension profiles made from 3 x 30 mm galvanized steel plates, encircling and fixed to the duct with 3.2 x 10 mm steel rivets in the top and bottom. 3 x 30 mm inorganic chemistry taper was fastened to the inside of the suspension profiles.

The maximum distance from the suspension devices to the closest duct joint must not exceed 340 ± 100 mm. The maximum distance from the suspension devices to the closest insulation joint must not exceed 40 ± 100 mm.

### Choosing the insulation thickness

The insulated duct going through the wall / floor must provide the same fire resistance as the wall / floor.

Insulating circular ducts up to 250 mm diameter, we recommend to use U PROTECT® Vent Section Alu2 for up to EI60 (ve ho o<->i) S with following thickness (mm):

Resistance to Fire, EI (ve-ho i ↔ o) S	
EI30	EI60
50	80

Based on European Technical Assessment issued in accordance with Regulation (EU) 305/2011, on the basis of European Assessment Document EAD 350142-00-1106. The insulation thicknesses to ensure fire resistance up to EI60 for ventilation circular ducts are tested and certified with U PROTECT® Vent Section Alu2.

## Complete fire separation wall / floor penetrations

The principle is similar which is used for both horizontal and vertical circular ducts with floors, masonry or light-weight partition walls. The installation is done in 4 steps.



### › STEP 1: POSITIONING

The duct is placed in the centre of the opening in the construction. The opening must be dimensioned so that when the insulation is added, the gap between the insulation and the support construction is < 25 mm. For horizontal ducts, use steel drop rods for the hangers. The maximum distance between the hangers should not exceed 1525 mm. For vertical ducts, the distance between supporting constructions should not exceed 5000 mm.



### › STEP 2: REINFORCING THE DUCT

Fix two steel L-profiles with a minimum length of 280 mm and dimensions 30 x 30 x 3 mm to the wall on each side of the penetration or to the top side of the floor penetration. The steel profiles are fixed to clamps of dimensions 30 x 3 mm, encircling and fixed to the duct with rivets. The L-profiles shall be fixed to the wall with screws designed for the type of rigid wall used, to the flexible wall with hollow wall anchors M6 x 71 mm and to the deck for rigid floors with 7.5 x 80 mm steel screws.



### › STEP 3: INSULATION AND SEALING

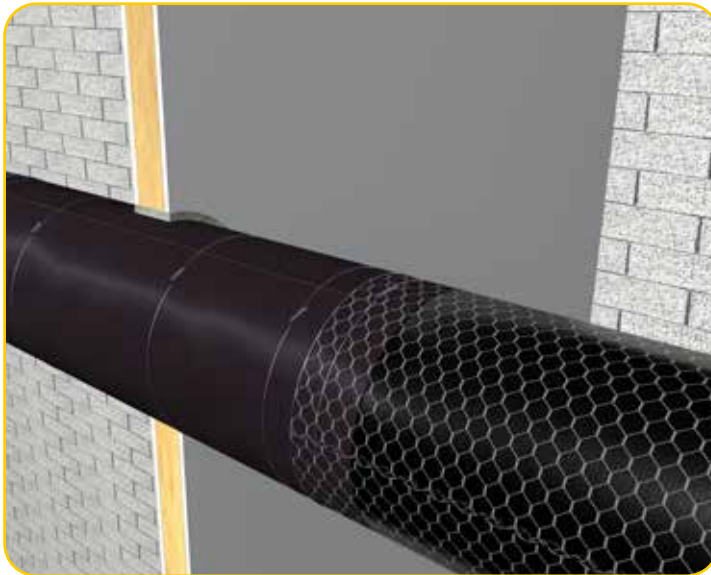
Install the U PROTECT® Vent Section around the duct. Make a small cut and push it against the L-profile into the opening. The insulation goes through the penetration and fill the remaining gap fully with gypsum plaster. The gap for floors can be also filled with mortar.



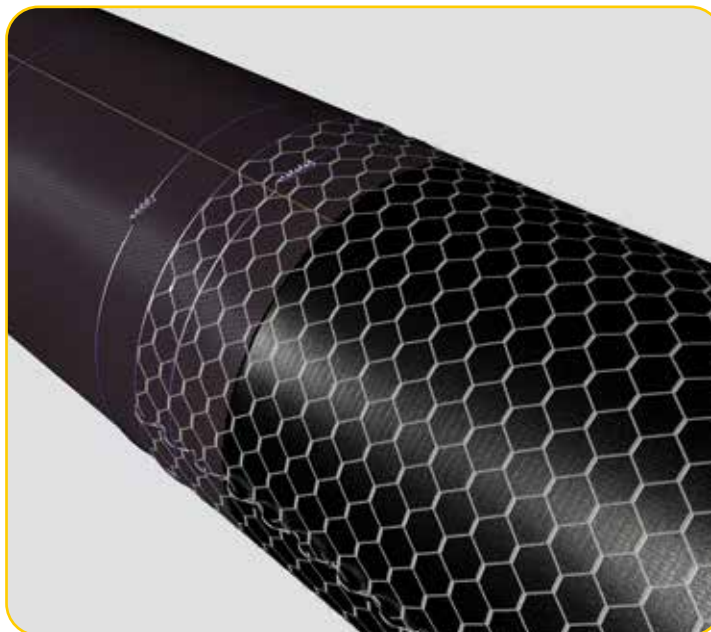
### › STEP 4: DUCT INSULATION

Install the remaining U PROTECT® Vent Section and seal the seams with self-adhesive overlap of U PROTECT® Black Tape. Fix the insulation with 0,7 mm steel binding wire in every 250 mm.

## Connecting U PROTECT® VENT SECTIONS with U PROTECT® WIRED MAT



Remove 100 mm of the insulation from the **U PROTECT® Wired Mat** and pull the wired mat over the edges of the **U PROTECT® Vent Section**.



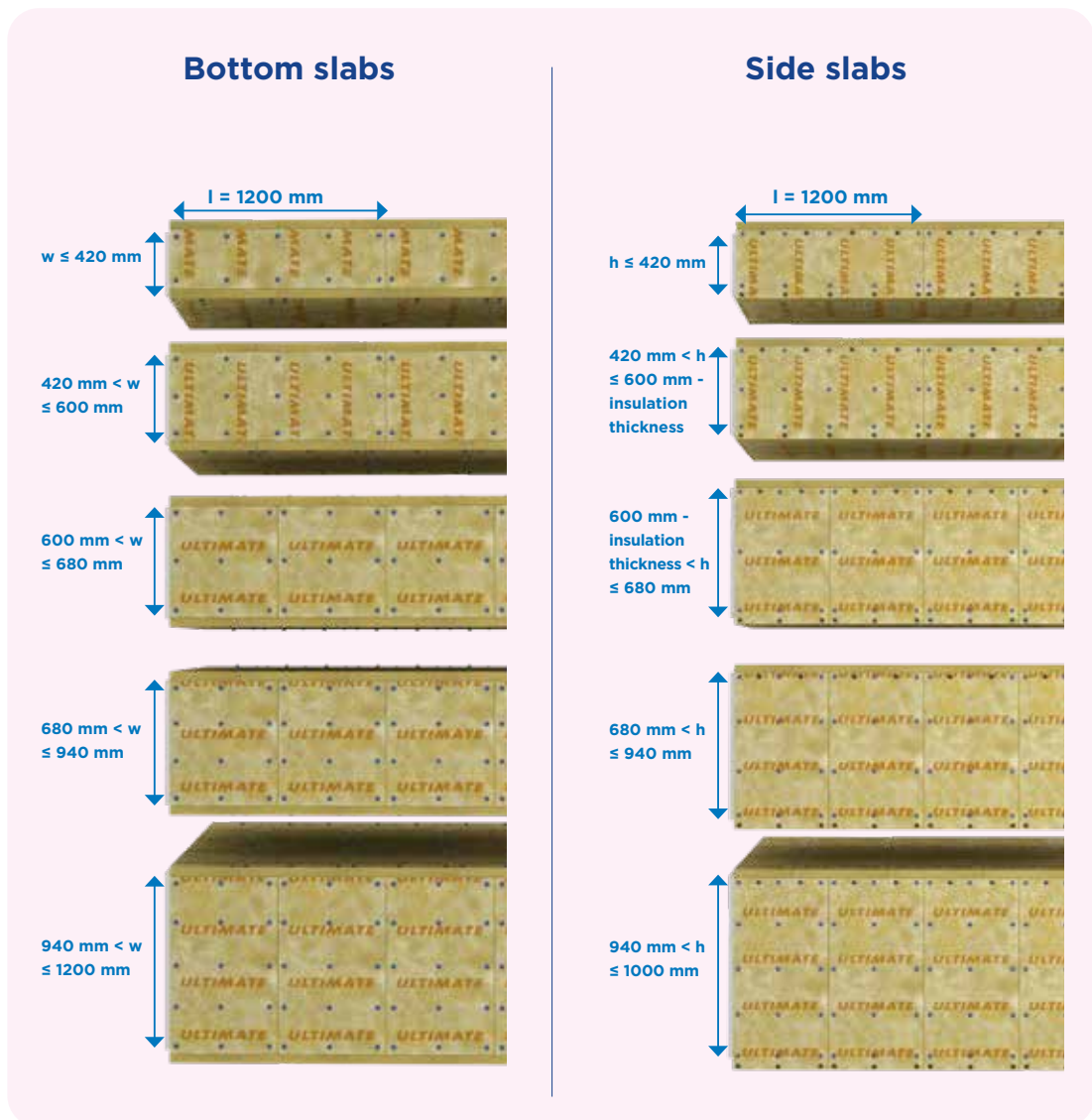
The wired mesh overlap should be a minimum of 100 mm in order to guarantee the perfect connection of the **U PROTECT® Vent Section** with the **U PROTECT® Wired Mat**.

**For further information please contact our Isover sales offices.**

# Appendix: PIN PATTERN

## Rectangular horizontal ducts with U PROTECT® Slab 4.0

- Distance of the pins to the duct's edges or slab joints: 80mm
- Maximum distance between pins: 260mm

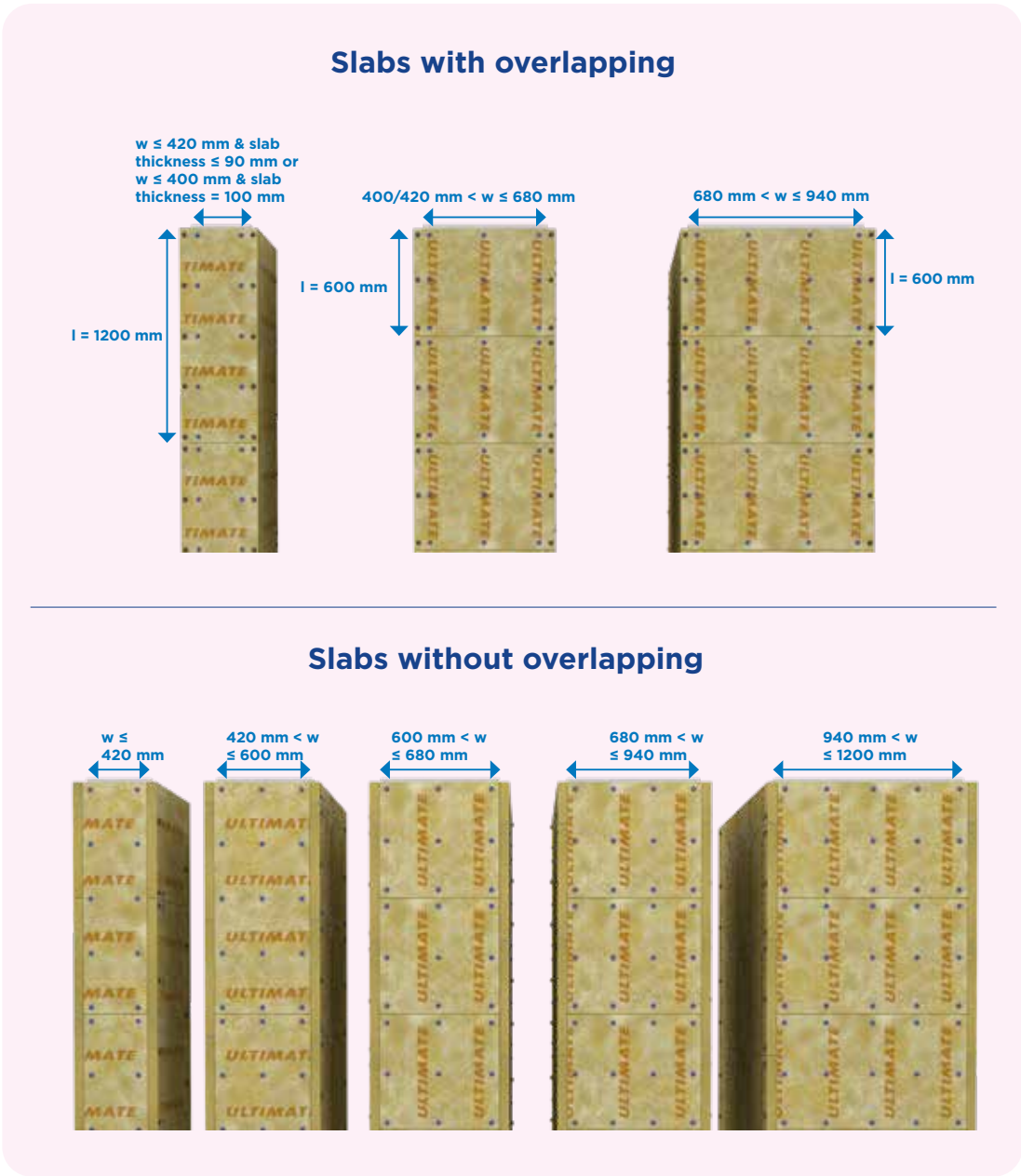


- Isover FireProtect Screw
- Pin

- w** Duct width
- l** Duct length
- h** Duct height

## Rectangular vertical ducts with U PROTECT® Slab 4.0

- Distance of the pins to the duct's edges or slab joints: 80mm
- Maximum distance between pins: 260mm



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# ABOUT US



**Discover the Saint-Gobain Group, and read more about Isover, the world leading supplier of sustainable insulation solutions**



# MAKING THE WORLD A BETTER HOME



Saint-Gobain designs, manufactures and distributes solutions for the construction, mobility, healthcare and other industrial application markets. Developed through a continuous innovation process, they provide wellbeing, performance and safety while addressing the challenges of sustainable construction, resource efficiency and the fight against climate change.

This strategy of responsible growth is guided by the Saint-Gobain purpose, “MAKING THE WORLD A BETTER HOME”, which responds to the shared ambition of the women and men in the Group to act every day to make the world a more beautiful and sustainable place to live in.



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