

## PRODUCT APPLICATION

U Protect fire insulation solutions  
for ventilation ducts

## MANUFACTURER

Saint-Gobain Finland Oy / ISOVER  
Strömberginkuja 2  
FI-00380 HELSINKI



## INTRODUCTION

Saint-Gobain Finland Oy delivers components for U Protect ventilation duct fire insulation system consisting of Isover ULTIMATE Protect mineral wool slabs and wired mats and specified fastenings and sealants. The Isover ULTIMATE insulations are manufactured by Saint-Gobain Isover G+H AG. In this certificate the installation principles and fire resistance capability of the assembled system are presented. Suitable product is selected according to the type of ventilation duct and required fire resistance class.

The insulation materials used in the fire insulation system are CE-marked according to the product standard EN 14303. CE-marking according to EN 14303 cannot be used to declare fire resistance.

## CERTIFICATION PROCEDURE

This certificate has been issued by VTT Expert Services Ltd, which is a certification body (S017) accredited by FINAS.

This certificate is based on VTT Certification Rules no. VTT SERT R045/15, type testing of the product and inspection of the manufacturer's procedures to ensure the functionality of the fire insulation solutions according to section 3. The general certification procedures are based on the certification system of VTT Expert Services Ltd.

The conditions of validity of this certificate are described in section 10.

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## REGULATIONS, STANDARDS AND INSTRUCTIONS

### 1 Regulations and product requirement standards

According to the assessment of VTT Expert Services Oy, the insulation solutions presented in this certificate meet the essential requirements given in the following parts of the National Building Code of Finland that are essential to their use provided that also design of the construction project and installation are according to the requirements:

848/2017 *Degree on the fire safety of buildings, in accordance with section 7 of this certificate*

E7 *Fire safety of ventilation installations, Guidelines 2004, in accordance with section 7 of this certificate.*

### 2 Other instructions and requirements

Other instructions and requirements applicable to the insulation system:

EN 14303 Thermal insulation for building equipment and industrial installations - Factory made mineral wool (MW) products – Specification

VTT SERT R045/15 VTT Expert Services Ltd certification rules based on tests according to EN 1366-1 and partly applying EXAP EN 15882-1:2011

Installation manual HVAC Insulation, U Protect Installation Manual: System for Fire-Resistant Duct Insulation

## PRODUCT INFORMATION

### 3 Product description, marking and quality control

In the U Protect ventilation duct fire insulation solutions the following products are used:

|                                      |   |
|--------------------------------------|---|
| ULTIMATE Protect mineral wool mats   | U Protect Wired Mat 4.0 N<br>U Protect Wired Mat 4.0 Alu1 Black |
| ULTIMATE Protect mineral wool slabs  | U Protect Slab 4.0 N<br>U Protect Slab 4.0 Alu1 Black           |
| ULTIMATE Protect installation screws | Isover Fire Protect Screws                                      |
| Glue                                 | Isover Protect BSK  |
| Sealing mass                         | Isover Protect BSF  |

The required insulation material thicknesses for each fire resistance class are presented in section 7 of this certificate.

Essential characteristics of the insulation materials according to EN 14303 are declared in the manufacturer's declaration of performance. The declaration of performance and more detailed product descriptions and dimensional alternatives are available from the manufacturer.

Products are identified through the markings in the packages, which include product name, dimensions, manufacturer's name, production time and other country-specific information connected to product and approvals.

The manufacturer performs factory production control of the insulation materials according to the standard EN 14303. The manufacturer has certified ISO 9001 quality system.

The procedures to ensure the functionality of the fire insulation solutions are the following:

- The manufacturer ensures that the installation instruction manual and this certificate are made readily available.
- No changes to the fire insulation system or products are made before VTT Expert Services Ltd has evaluated the effect of the changes to the fire resistance given in this certificate.
- Insulation materials used in the fire insulation solutions are clearly and unambiguously marked with product label.
- The manufacturer ensures that the installation companies have been instructed to document the installation using the installation report according to Annex A1.
- The manufacturer ensures that the installation companies have been instructed to deliver a copy of the installation report together with the copy of this certificate for filing in the construction documentation.
- The installed fire insulations are identifiable.

The assessment of conformity of the installed insulation system is not covered by this certificate.

#### **4 Delivery and storage on site**

The insulation materials are packed into plastic and are delivered to site according to the manufacturer's quality control system.

Products are delivered and stored according to the manufacturer's instructions to prevent them from getting wet, dirty or damaged.

## **DESIGN INFORMATION**

### **5 General**

The design information given in this certificate is based on the assumption that the structural solutions, fastening methods and other initial data are accordant to this certificate and the given requirements, instructions and standards are followed.

## 6 Installation

The products are installed according to the manufacturer's installation guide, available from the manufacturer. Figures concerning the installation principles are given in Annex A2. The installation company shall prepare an installation report according to Annex A1.

## 7 Fire safety

The requirements for the fire safety of buildings and building products used in them are given in the National Building Code of Finland, 848/2017, Degree on the fire safety of buildings. Guidelines concerning the fire safety of ventilation installations are given in the National Building Code of Finland, part E7, Fire safety of ventilation installations, Guidelines 2004.

The results for fire resistance presented in this certificate are valid provided that the ducts meet the requirements given in the National Building Code of Finland part E7, the requirements given in this standard are fulfilled and the fire insulation of the ducts has been performed according to the manufacturer's instructions and as described in Annex A2.

In the declaration of performance for the insulation materials the manufacturer has declared the reaction to fire classes according to EN 13501-1 shown in Table 1.

*Table 1. Reaction to fire class of ULTIMATE mineral wool mat and slab used in the ventilation duct fire insulation system.*

| Product   | Reaction to fire class | Nominal density      | Facing                           |
|---|------------------------|----------------------|----------------------------------|
| U Protect Wired Mat 4.0 N<br>U Protect Wired Mat 4.0 Alu1 Black | A1                     | 66 kg/m <sup>3</sup> | Uncoated<br>Black aluminium foil |
| U Protect Slab 4.0 N<br>U Protect Slab 4.0 Alu1 Black           | A1                     | 66 kg/m <sup>3</sup> | Uncoated<br>Black aluminium foil |

The fire resistance of insulated circular spiral ducts made of galvanized steel or rectangular ducts made of steel sheet is presented in Tables 2 - 4.

Table 2. The insulation thickness and nominal density for internal and external fire exposure (o↔i) in different fire resistance classes of vertical (ve ho) circular ducts insulated with Isover ULTIMATE U Protect Wired Mat 4.0 N or Isover ULTIMATE U Protect Wired Mat 4.0 Alu1 Black.

| Insulation  | Class              | Insulation thickness | Nominal density      |
|---|--------------------|----------------------|----------------------|
| Isover ULTIMATE U Protect Wired Mat 4.0 N<br>Isover ULTIMATE U Protect Wired Mat 4.0 Alu1 Black | EI 15 (ve ho o↔i)  | 35 mm                | 66 kg/m <sup>3</sup> |
|   | EI 30 (ve ho o↔i)  | 50 mm                | 66 kg/m <sup>3</sup> |
|   | EI 60 (ve ho o↔i)  | 75 mm                | 66 kg/m <sup>3</sup> |
|   | EI 90 (ve ho o↔i)  | 95 mm                | 66 kg/m <sup>3</sup> |
|   | EI 120 (ve ho o↔i) | 115 mm <sup>1)</sup> | 66 kg/m <sup>3</sup> |

<sup>1)</sup> Exterior of the steel duct shall be stiffened using steel flanges with minimum dimensions of 40 x 5 mm.

Table 3. The insulation thickness and nominal density for internal and external fire exposure (o↔i) in different fire resistance classes of horizontal (ho) rectangular ducts insulated with Isover ULTIMATE U Protect Slab 4.0 N or Isover ULTIMATE U Protect Slab 4.0 Alu1 Black.

| Insulation   | Duct orientation: horizontal |                      |                      |
|--|------------------------------|----------------------|----------------------|
|  | Class                        | Insulation thickness | Nominal density      |
| Isover ULTIMATE U Protect Slab 4.0 N<br>Isover ULTIMATE U Protect Slab 4.0 Alu 1 Black | EI 15 (ho o↔i)               | 30 mm                | 66 kg/m <sup>3</sup> |
|  | EI 30 (ho o↔i)               | 40 mm                | 66 kg/m <sup>3</sup> |
|  | EI 60 (ho o↔i)               | 60 mm                | 66 kg/m <sup>3</sup> |
|  | EI 90 (ho o↔i)               | 70 mm                | 66 kg/m <sup>3</sup> |
|  | EI 120 (ho o↔i)              | 80 mm                | 66 kg/m <sup>3</sup> |

Table 4. The insulation thickness and nominal density for internal and external fire exposure (o↔i) in different fire resistance classes of vertical (ve) rectangular ducts insulated with Isover ULTIMATE U Protect Slab 4.0 N or Isover ULTIMATE U Protect Slab 4.0 Alu1 Black.

| Insulation   | Duct orientation: vertical |                      |                      |
|--|----------------------------|----------------------|----------------------|
|  | Class                      | Insulation thickness | Nominal density      |
| Isover ULTIMATE U Protect Slab 4.0 N<br>Isover ULTIMATE U Protect Slab 4.0 Alu 1 Black | EI 15 (ve o↔i)             | 35 mm                | 66 kg/m <sup>3</sup> |
|  | EI 30 (ve o↔i)             | 50 mm                | 66 kg/m <sup>3</sup> |
|  | EI 60 (ve o↔i)             | 80 mm                | 66 kg/m <sup>3</sup> |
|  | EI 90 (ve o↔i)             | 90 mm                | 66 kg/m <sup>3</sup> |
|  | EI 120 (ve o↔i)            | 100 mm               | 66 kg/m <sup>3</sup> |

Insulation thickness in each fire resistance class may be increased by maximum 20 %.

Diameter of the circular duct shall be  $\leq 1000$  mm, the thickness of the duct steel sheet  $\geq 0,7$  mm, and leakage class of the duct at least D.

Cross section dimensions of the duct shall be  $\leq 1250$  mm x 1000 mm (width x height), the thickness of the duct steel sheet  $\geq 0,7$  mm and the tightness class of the duct at least B.

Horizontally oriented ducts shall be supported so that the following requirements are fulfilled:

|  | Fire resistance class |                      |
|--|-----------------------|----------------------|
|  | EI 15 - EI 60         | EI 90 - EI 120       |
| Maximum tensile stress in all vertically orientated components | 9 N/mm <sup>2</sup>   | 6 N/mm <sup>2</sup>  |
| Shearing stress in screws <sup>1)</sup>                        | 15 N/mm <sup>2</sup>  | 10 N/mm <sup>2</sup> |

<sup>1)</sup> Screws of property class 4.6 according to EN 20898-1

The duct can penetrate rigid separating structures. The fire resistance of the rigid separating structure shall be equal to or higher than the fire resistance of the insulated duct. The separating structure shall have density of at least 575 kg/m<sup>3</sup>. The minimum thickness of the fire compartment wall shall be 100 mm in fire resistance class 90 min or lower, and 150 mm in fire resistance class 120 min. The thickness of the fire compartment slab shall be at least 150 mm in all fire resistance classes.

When one, two or three sided ventilation ducts are in question, the suspension of ducts is different from the requirements of the test standard. In that case the fire insulation of a ventilation duct can be performed using an insulation that has been tested for the required fire resistance class and installing it according to the alternative installation methods recommended by the manufacturer. In these cases it is recommended to select a solution fulfilling higher fire resistance class than the fire resistance class required for the building site.

## INSTRUCTIONS FOR INSTALLATION AND USE

### 8 Manufacturer's instructions

Fire insulation system shall be installed according to the manufacturer's instructions. The installation company shall prepare an installation report according to Annex A1.

Material safety data sheet of the insulation materials, declaration of performance and installation manual are available from the manufacturer.

## VALIDITY OF THE CERTIFICATE

### 9 Validity period of the certificate

This certificate is valid until 12.10.2020.

Real time information about the validity of the certificate is available at [www.vtt-todistus.fi](http://www.vtt-todistus.fi).

### 10 Conditions of validity

The certificate is valid assuming that no fundamental changes are made to the product, and that the manufacturer has a valid contract on quality control.

### 11 Other conditions

The references made in this certificate to standards and instructions are valid in the format used at the time the certificate was signed.

The recommendations in this certificate concerning the safe use of this product are minimum requirements that shall be satisfied when using the product. The certificate does not override current or future requirements imposed by laws and statutes. In addition to the issues presented in this certificate, design, manufacturing and use shall follow appropriate construction methods.

The manufacturer is in charge of the product's quality and factory production control. In awarding this certificate, VTT Expert Services Ltd does not bind itself to indemnification liability concerning personal injury or other damage that may directly or indirectly result from using the product described in this certificate.

VTT Expert Services Oy finds U Protect fire insulation systems for ventilation ducts to be suitable for use in construction as described in this certificate.

This updated certificate VTT-C-4805-09 (issued first on January 2, 2010) has been granted as described above to Saint-Gobain Finland Oy / ISOVER.

On behalf of VTT Expert Services Ltd on January 25, 2018

Tiina Ala-Outinen  
Business Manager

Tiina Tirkkonen  
Product Manager

This document is electronically approved

This certificate is the English version of the original certificate no. VTT-C-4805-09, signed January 25, 2018.

In case of dispute the Finnish original certificate is valid.



## ANNEX A1: Installation report

VTT CERTIFICATE NO. VTT-C-4805-09

| Products installed:   | Circular duct            | Rectangular duct         | Fire resistance class | Insulation thickness |                |
|---|--------------------------|--------------------------|-----------------------|----------------------|----------------|
|   |                          |                          |                       | Horizontal ducts     | Vertical ducts |
| U Protect Wired Mat 4.0 N <input type="checkbox"/>          | <input type="checkbox"/> | <input type="checkbox"/> | EI ____               |                      |                |
| U Protect Wired Mat 4.0 Alu1 Black <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | EI ____               |                      |                |
| U Protect Slab 4.0 N <input type="checkbox"/>               | <input type="checkbox"/> | <input type="checkbox"/> | EI ____               |                      |                |
| U Protect Slab 4.0 Alu1 Black <input type="checkbox"/>      | <input type="checkbox"/> | <input type="checkbox"/> | EI ____               |                      |                |
| Sealing products:   |                          |                          |                       |                      |                |

Installation site:

|  |  |
|--|--|
| Site identification  |  |
| Address  |  |
| Installation site specifications (building part, floor, rooms) |  |
| Installation time  |  |
| Additional information   |  |

Installation company:

|  |  |
|--|--|
| Name                                   |  |
| Address                                |  |
| Name of the installer                  |  |
| Contact information (phone and e-mail) |  |

Products have been installed according to the manufacturer's installation instructions 

Place and date: \_\_\_\_\_, \_\_\_\_\_.20\_\_\_\_

Signature: \_\_\_\_\_

Clarification of signature: \_\_\_\_\_

## ANNEX A2: Installation details

### Fire insulation of rectangular duct using U Protect 4.0 slabs

Figure 1. Positioning of the insulation slabs around the horizontally installed duct

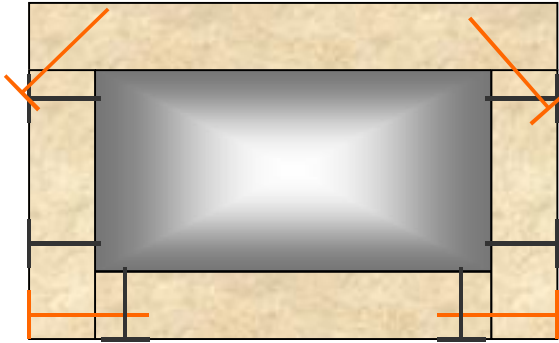


Figure 2. Positioning of the insulation slabs around the vertically installed duct

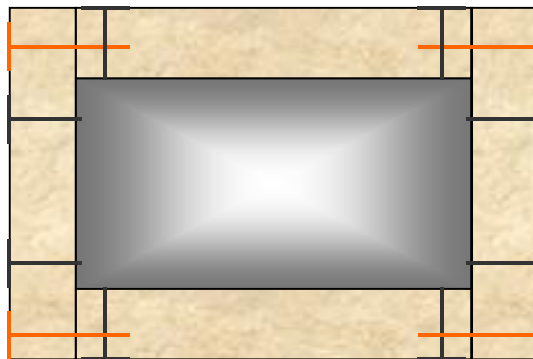


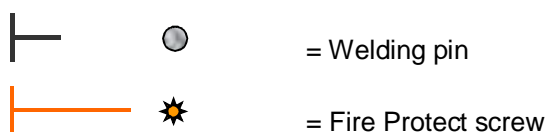
Figure 3. Size of the slab 1200mm x 600mm



#### Basic rules for installation:

- The distance from the edge of the duct or from the jointing points: max 80 mm
- The interval of the welding pins: max 260 mm

#### Markings:



**Rectangular duct, horizontal installation**

Figure 4. Pattern of rectangular duct installation

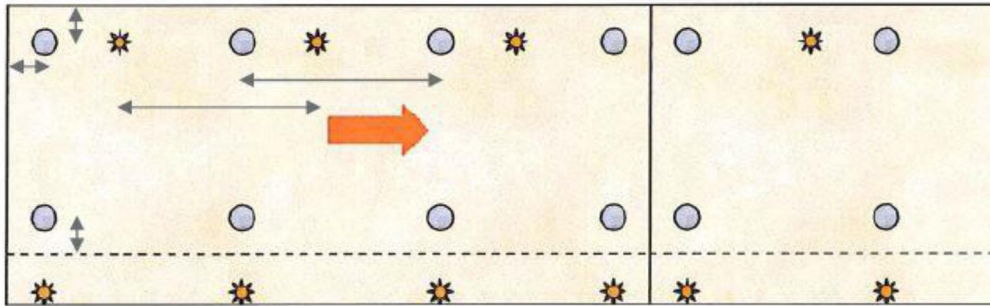


Figure 5. Overlapping of the slabs in jointing points

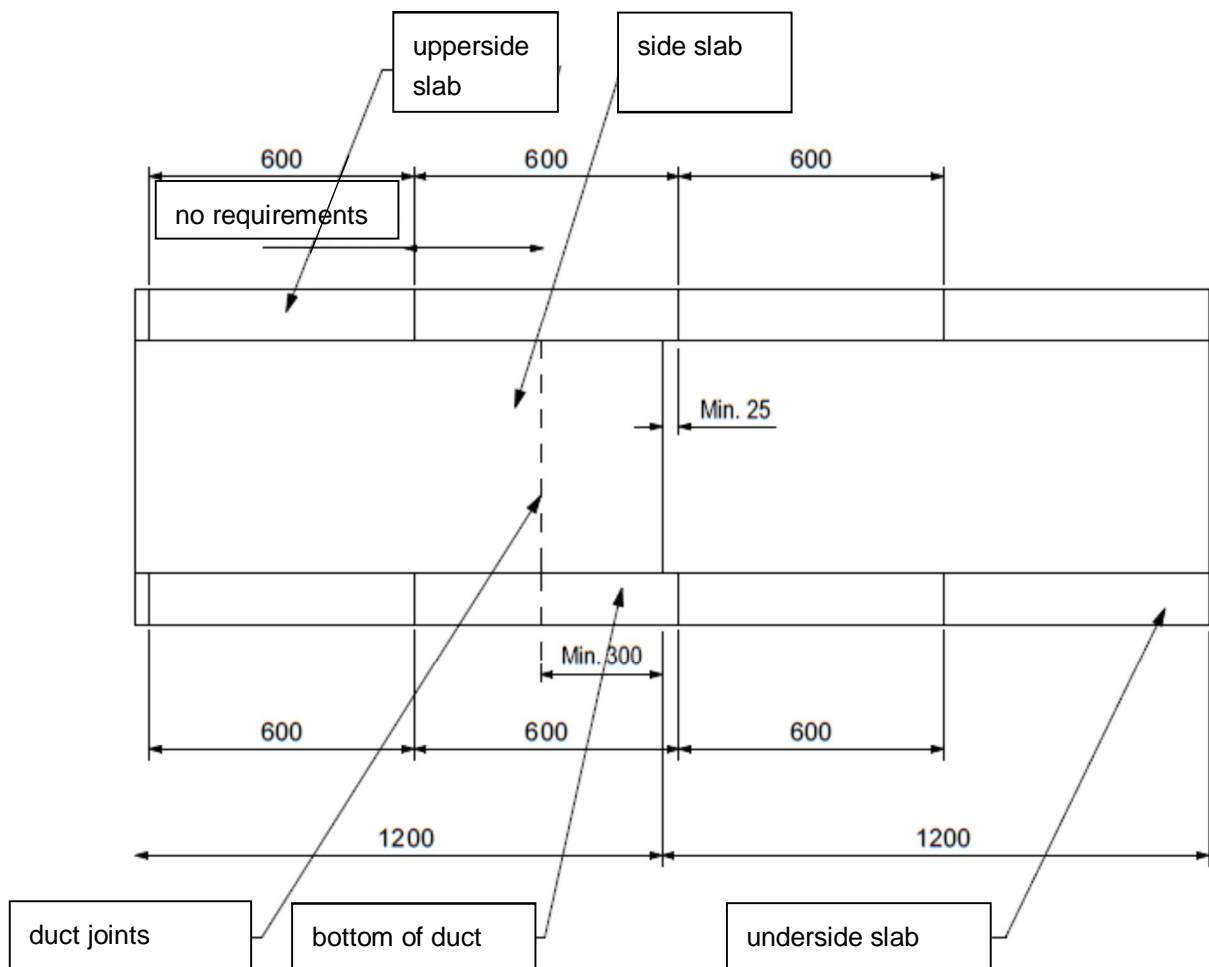
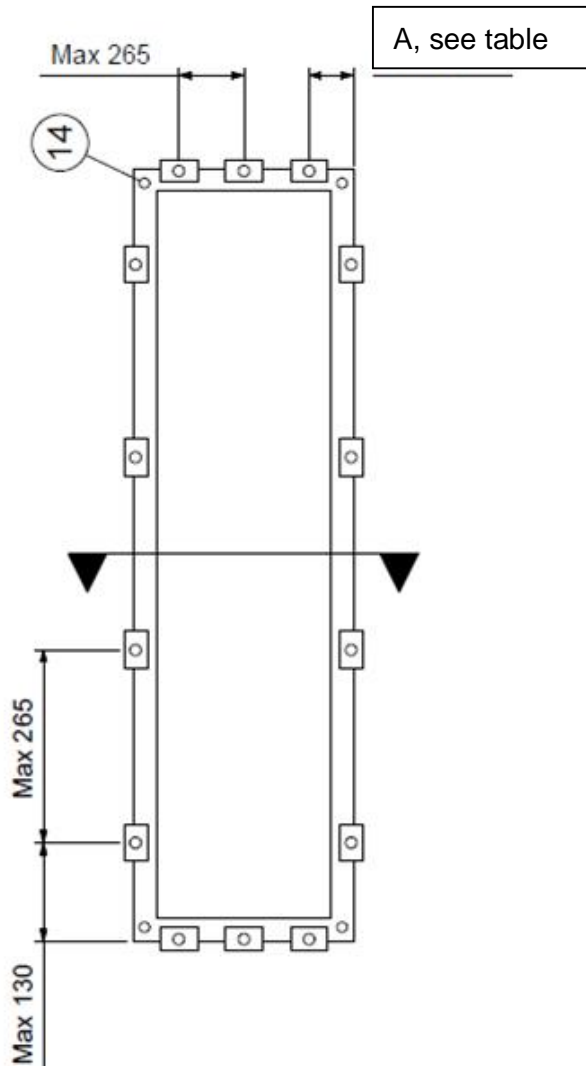


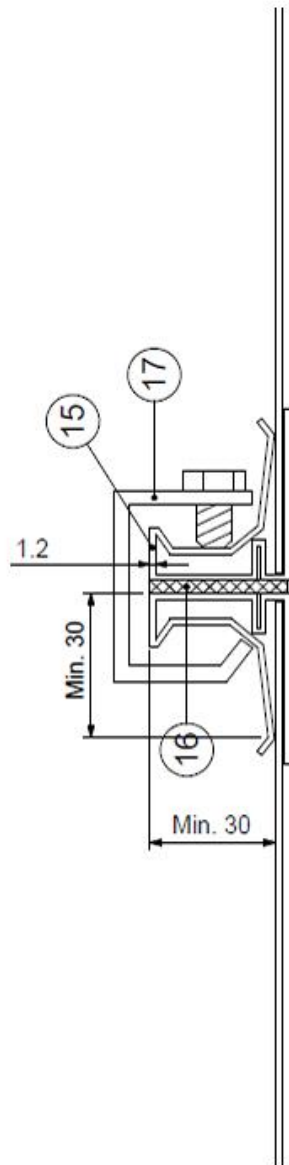
Figure 6. Installation of duct joint, location of the fasteners, technical drawing of principle



## Explanations for markings

| Number/symbol | Description                        | Specifier     |
|---------------|------------------------------------|---------------|
| 14            | Bolt                               | M8 steel bolt |
| A             | Duct width or height < 500 mm      | 100 mm        |
|               | Duct width or height $\geq$ 500 mm | 135 mm        |

Figure 7. Installation of duct joint, technical drawing of principle



Explanations for markings

| Number | Description | Specifier                             |
|--------|-------------|---------------------------------------|
| 15     | Duct list   | 30x30x0,8 mm                          |
| 16     | Seal        | Inorganic chemistry tape 3 mm / 20 mm |
| 17     | Fastener    | Bolt fastener M8, steel               |

Figure 8. Ensuring duct joint with insulation slab at the bottom and top of the duct, technical drawing of principle

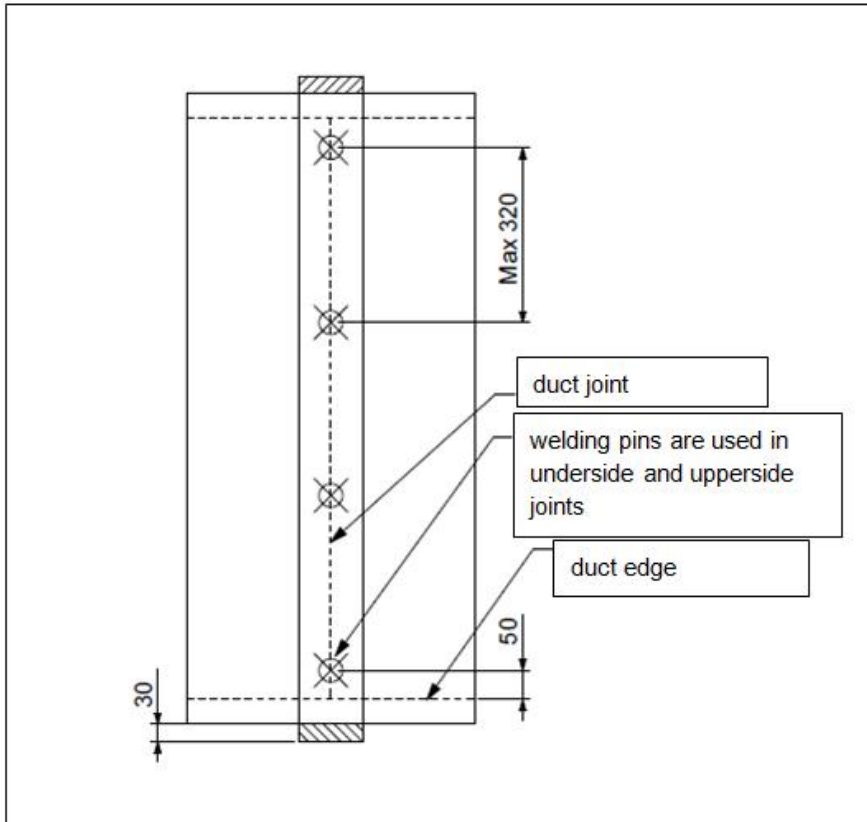


Figure 9. Ensuring duct joint with isolation slab from the side of the duct, technical drawing of principle

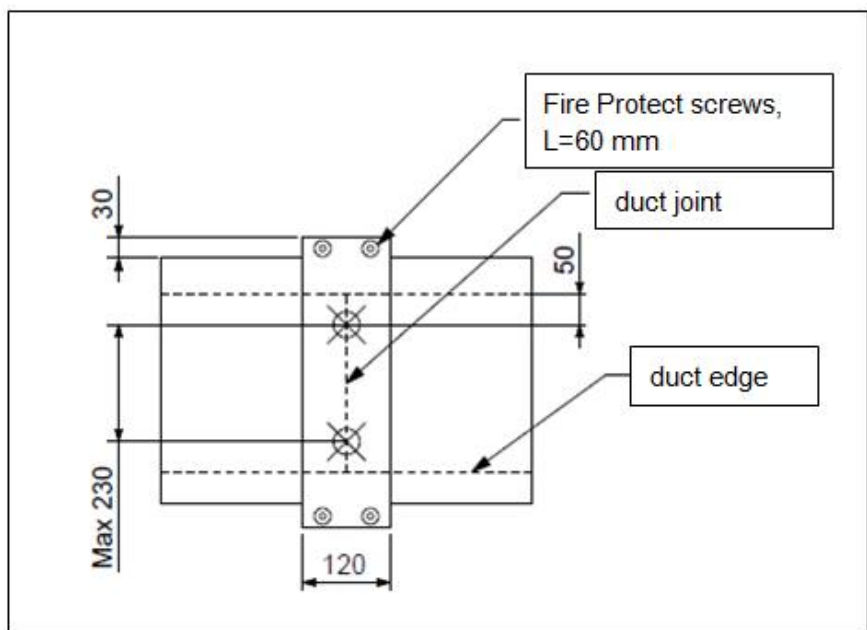


Figure 10. Crossing of duct joint with insulation

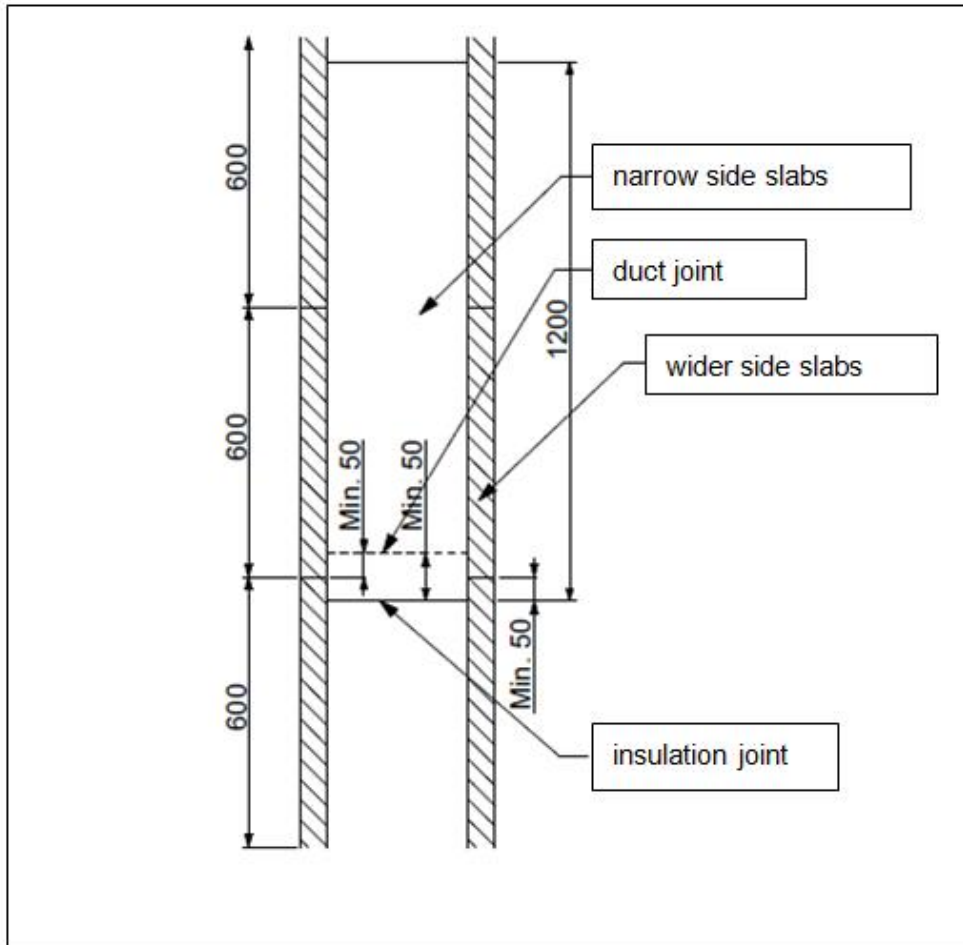


Figure 11. Ensuring duct joint with isolation slab, narrow side, technical drawing of principle

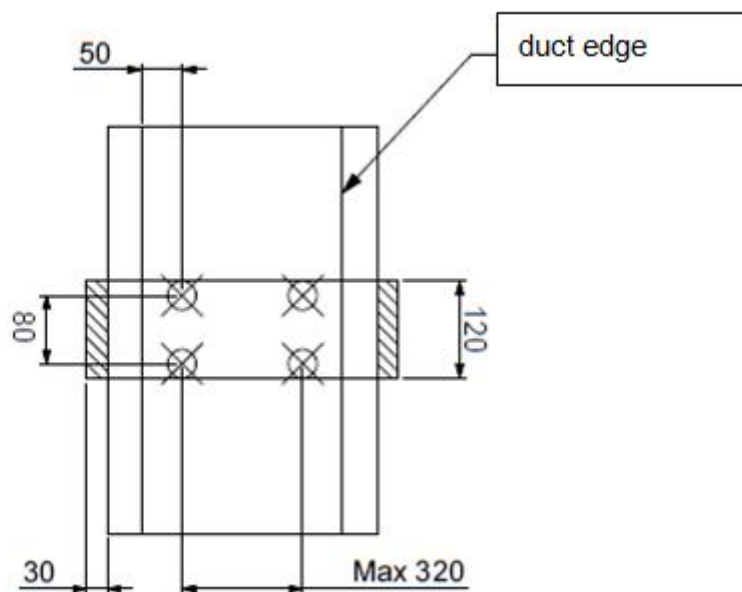
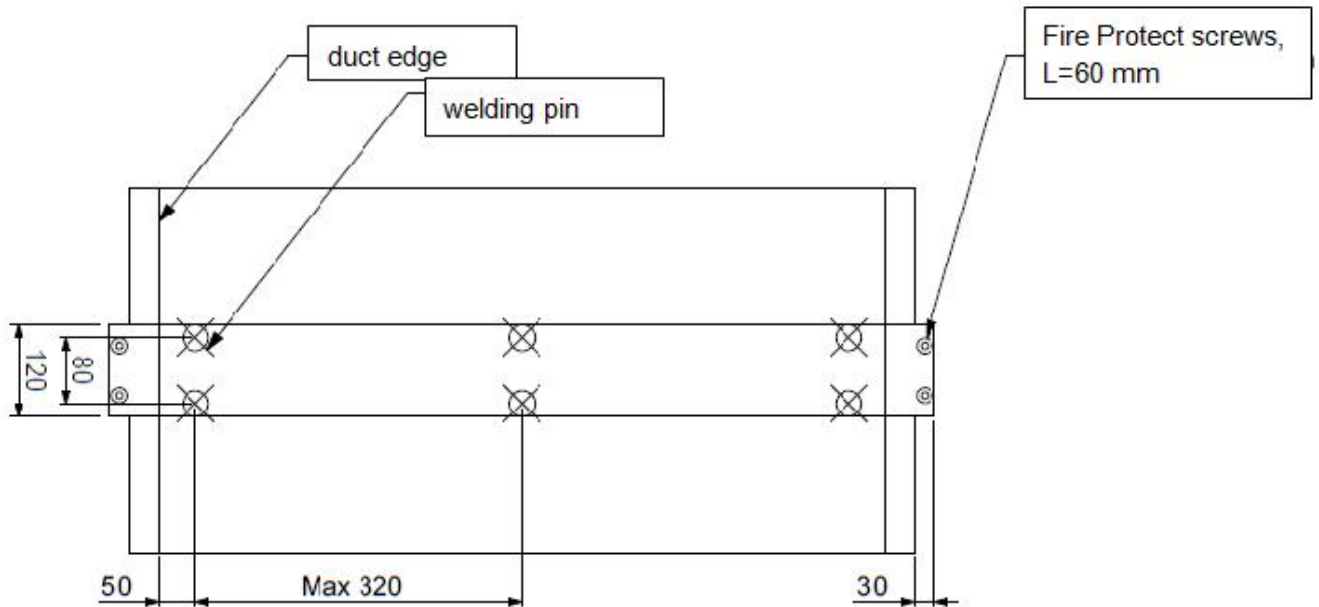


Figure 12. Ensuring duct joint with isolation slab, wide side, technical drawing of principle





## Fire insulation of rectangular ducts using U Protect 4.0 slab

### Fastening the insulation to the duct

Insulation slabs shall be fastened to the duct with welding pins with diameter of 2,7 mm and washer of 30 mm.

Welding pins shall be placed at intervals of max 260 mm and 80 mm distance from the duct edge or from the slab seam.

Slab on the upper side of the duct does not need fastening with the welding pins.

Corner joints shall be ensured with Isover Fire Protect screws (3 screws/side, at 300 mm interval).

Length of the screw shall be twice the thickness of the insulation.

With thin insulations (< 50 mm), the duct joint shall be covered with insulation strip (width min 120 mm and thickness min 30mm) regardless of the jointing method.

### Suspension

Ducts shall be supported with threaded rods and U-profiles. The tension in the hangers in cold condition shall not exceed:

- 9 N/mm<sup>2</sup> in fire resistance classes ≤ EI 60
- 6 N/mm<sup>2</sup> in fire resistance classes ≥ EI 90.

Maximum distance between suspension devices is 1500 mm in fire resistance classes ≤ EI 90 and 1250 mm in fire resistance class EI 120.

Maximum distance of suspension device from the separating structure is 650 mm in fire resistance classes ≤ EI 90 and 525 mm in fire resistance class EI 120

Maximum distance of suspension device from duct joint is 50 mm

Horizontal suspension profile shall not be positioned outside the insulation.

### Stiffening

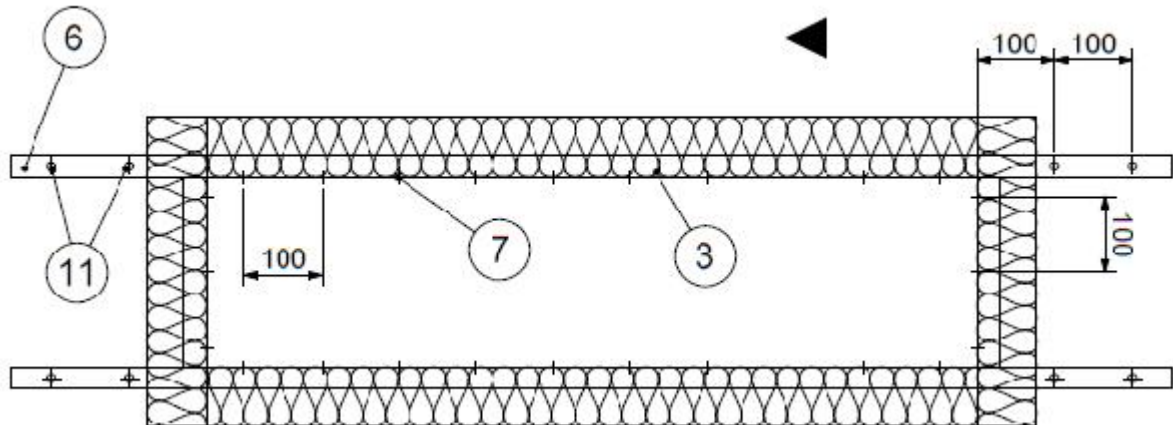
Stiffeners are fitted perpendicularly in midpoint of each duct section when any side length of the duct exceeds 500 mm. Stiffeners are fixed to both sides of the duct section. Steel pipe or threaded rod stiffeners may be used:

- Steel pipe stiffeners: diameter of at least 16 mm and wall thickness of at least 2 mm, fixing with 4 pieces of M72 washers with thickness of 1 mm and M6 bolts
- Threaded rod stiffeners: diameter of at least 8 mm, fixing with 4 pieces of M70 washers with thickness of 1 mm and minimum M8 nuts.

## Fire insulation of rectangular ducts using U Protect 4.0 slab

### Penetration through wall or ceiling/floor

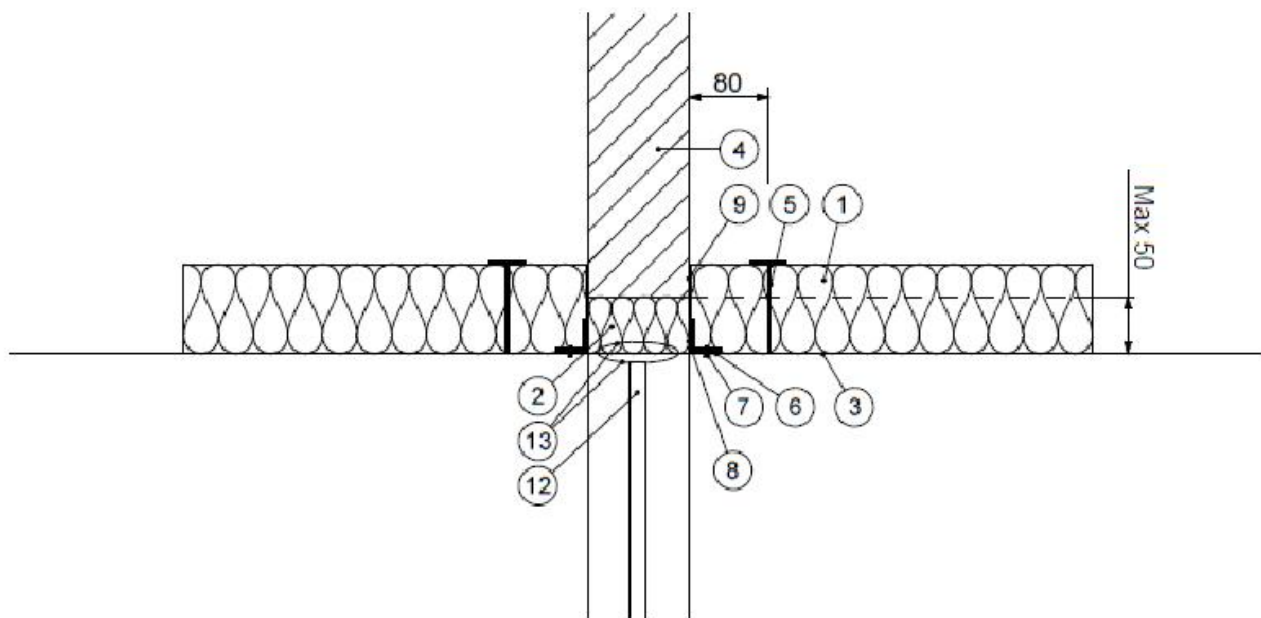
Figure 13. Fastening the duct to the construction, technical drawing of principle



Explanations for markings

| Number | Description     | Specifier                        |
|--------|-----------------|----------------------------------|
| 3      | Duct            | Steel duct, wall thickness 0,7mm |
| 6      | L-profile       | Steel profile 30x30x3 mm         |
| 7      | Pop-rivet       | Steel rivet 3,2x10 mm            |
| 11     | Fastening screw | Steel screw 7,6 x 60 mm          |

Figure 14. Sealing the penetration, technical drawing of principle



Explanations for markings

| Number | Description         | Specifier  |
|--------|---------------------|--|
| 1      | Insulation          | U Protect Slab 4.0                                   |
| 2      | Insulation          | U Protect Slab 4.0                                   |
| 3      | Duct                | Steel duct, wall thickness 0,7mm                     |
| 4      | Construction        | Load-bearing wall                                    |
| 5      | Welding pin         | Steel pin + washer, 2,7x 30 mm                       |
| 6      | L-profile           | Steel profile 30x30x3 mm                             |
| 7      | Pop-rivet           | Steel rivet 3,2x10 mm                                |
| 8      | Fire resistant mass | Protect BSF Isover, layer thickness $\geq 2$ mm      |
| 12     | Supporting bar      | Steel bar $\varnothing$ 16 mm, wall thickness 2,0 mm |
| 13     | Support plate       | Steel plate $\varnothing$ 72 mm, thickness 1,0 mm    |

## **Fire insulation of rectangular ducts using U Protect 4.0 slab**

### **Sealing of penetrations and fastening the duct to the structure**

#### **Duct positioning**

The duct is placed in the opening in the construction. The distance between the duct wall and the opening shall be 50 mm. The duct shall have an internal supporting bar placed where the duct passes the construction.

#### **Opening insulation**

The space between duct and construction shall be densely filled with U Protect Slab 4.0.

#### **Opening sealing**

The joint shall be hermetically sealed with Isover Protect BSF fire resistant mass. A layer of at least 2 mm shall be applied on both sides of the construction.

#### **Supporting the duct**

The duct shall be framed with fastening L-profile (30 x 30 x 3 mm) around it. L-profile shall be fastened to the duct with steel rivets (3,2 x 10 mm) at 100 mm intervals. Profiles at the top and bottom of the duct shall both be fastened to the structure with two steel screws. In horizontal installation profiles shall be installed on both sides of the structure. In vertical installation L-profiles are installed only on the upper side.

#### **Duct insulation**

The insulation slabs are installed so that they about the construction. The slabs shall be cut a little oversize in order to install them as slightly compressed. Isover Protect BSK fire resistant glue (layer thickness approx. 2 mm) shall be used to fasten the slabs to the construction.

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## Fire insulation of circular ducts using U Protect 4.0 wired mat

### Duct connections

Circular duct sections are connected using steel nipples. In both ends the nipples are fitted with EPDM-rubber sealing strip and 20 x 3 mm inorganic chemistry tape. Duct sections are fixed to nipples using self-tapping screws c/c 150 mm.

### Fastening the insulation

Wired mat is fastened around the duct from the steel wire net using either C-rings or hook tool.

### Suspension

Ducts shall be supported with threaded rods and steel profiles made of minimum 2 x 25 mm galvanized steel plates. The tension in the hangers in cold condition shall not exceed:

- 9 N/mm<sup>2</sup> in fire resistance classes ≤ EI 60
- 6 N/mm<sup>2</sup> in fire resistance classes ≥ EI 90.

Maximum distance between the suspension devices is 1500 mm

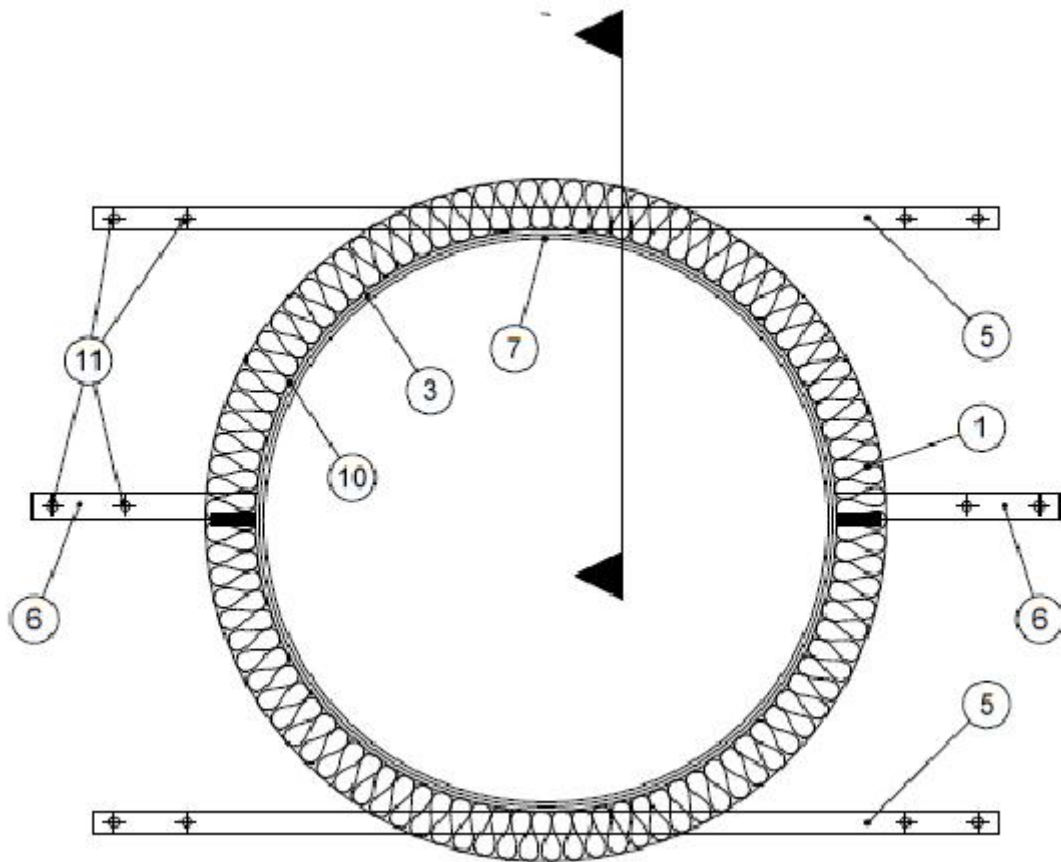
Maximum distance of suspension device from the separating structure is 600 mm

### Stiffening

In fire resistance class 120 mm exterior of the steel duct shall be stiffened using steel flanges with minimum dimensions of 40 x 5 mm. The flanges are positioned around the duct, midway between the hangers. Fixing the flanges mechanically to the duct is not needed.

### Wall or floor/ceiling penetrations

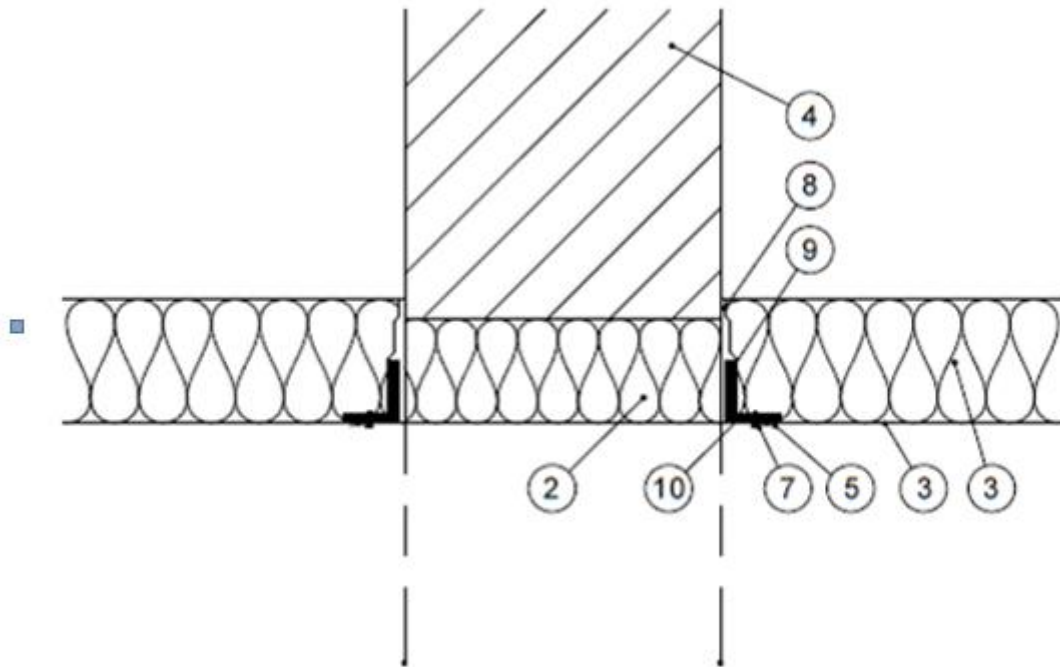
Figure 15. Fastening the duct to the construction, technical drawing of principle



#### Explanations for markings

| Number | Description     | Specifier                               |
|--------|-----------------|---|
| 1      | Insulation      | U Protect Wired Mat 4.0                 |
| 3      | Duct            | Steel duct, wall thickness 0,7 mm       |
| 5      | L-profile       | Steel profile 30x30x3 mm, length 250 mm |
| 6      | L-profile       | Steel profile 30x30x3 mm, length 250 mm |
| 7      | Rivet           | Aluminium rivet AlMg; 4,3x13 mm         |
| 10     | Duct band       | Steel band 30 x 2 mm                    |
| 11     | Fastening screw | Steel band 7,6 x 60 mm                  |

Figure 16. Sealing the penetration, technical drawing on principle



## Explanations for markings

| Number | Description         | Specifier  |
|--------|---------------------|--|
| 2      | Insulation          | U Protect Wired Mat 4.0                                |
| 3      | Duct                | Steel duct, wall thickness 0,7 mm                      |
| 4      | Structure           | Load-carrying concrete wall structure                  |
| 5      | L-profile           | Steel profile 30x30x3 mm, length 250 mm                |
| 7      | Rivet               | Aluminium rivet AIMg; 4,3x13 mm                        |
| 8      | Fire resistant mass | Protect BSF Isover, layer thickness $\geq 2$ mm        |
| 9      | Fire resistant glue | Inorganic glue, Dynamic viscosity at 20 °C, 20000 mPas |
| 10     | Duct band           | Steel band 30 x 2 mm                                   |

## **Fire insulation of circular ducts using U Protect 4.0 wired mat**

### **Sealing the penetrations and fastening the duct to the structure**

#### **Duct positioning**

The duct is placed in the opening in the construction. The distance between the duct wall and the opening shall be 50 mm, or 20 mm in fire resistance class up to EI 60.

#### **Opening insulation**

The space between duct and construction shall be densely filled with U Protect Wired Mat 4.0.

#### **Opening sealing**

In fire resistance classes EI 90 – EI 120 the joint shall be hermetically sealed with Isover Protect BSF fire resistant mass. A layer of at least 2 mm shall be applied on both sides of the construction.

#### **Supporting the duct**

The duct band (30 x 2 mm) shall be fastened to the duct with screws at 150 mm intervals on both sides of the construction. Above and below the duct band long L-profiles (30 x 30 x 3 mm) shall be fastened with one rivet each (4 x 13 mm). Short L-profiles (30 x 30 x 3 mm) shall be fastened with bolts (M8) and nuts through the eye of the band. Profiles shall be installed on both sides of the construction. In horizontal penetration, duct band and L-profiles are not necessary in fire resistance classes up to EI 60. In vertical penetration, duct band and L-profile is installed only on the upper side.

#### **Insulating the duct**

The insulation mat is installed so that it abuts the construction. The mat shall be cut a little oversize in order to install it as slightly compressed. The mat shall be glued to the structure with Isover Protect BSK fire resistant glue (layer thickness approx. 2 mm).