

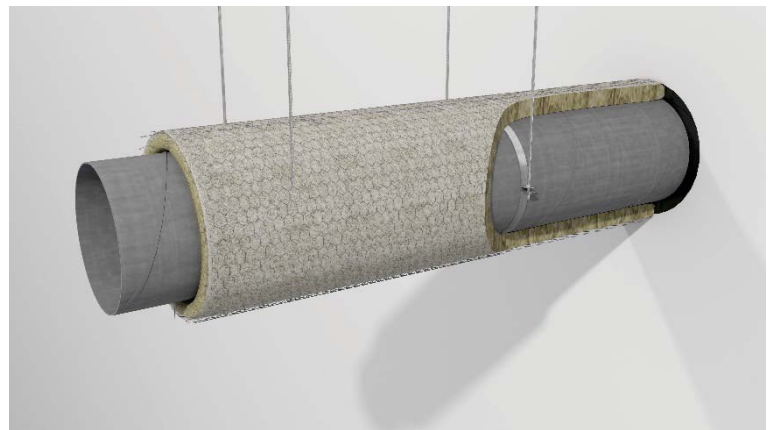
PRODUCT CERTIFICATE

PRODUCT APPLICATION

PAROC Hvac Fire insulation solutions for ventilation ducts

MANUFACTURER

Paroc Oy Ab
P.O. Box 240
FI-00181 Helsinki



INTRODUCTION

PAROC Hvac Fire insulation solutions consist of Paroc Oy Ab manufactured stone wool insulations specified in this certificate, fastenings and sealants. In this certificate the installation principles and fire resistance capability of the assembled PAROC Hvac Fire insulation solutions are presented. Suitable PAROC Hvac Fire insulation solution is selected according to the type of the ventilation duct and required fire resistance class.

The insulation materials used in the PAROC Hvac Fire insulation solutions 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 Eurofins Expert Services Oy, which is a certification body (S017) accredited by FINAS.

This certificate is based on certification criteria no. SERT R045/15, type testing of the insulation system and manufacturer's procedures to ensure the functionality of the fire insulation solutions according to section 3 of this certificate. The general certification procedures are based on the certification system of Eurofins Expert Services Oy.

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

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REGULATIONS, STANDARDS AND INSTRUCTIONS

1 Regulations

According to the assessment of Eurofins Expert Services Oy, the PAROC Hvac Fire insulation solutions 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*

2 Other instructions and requirements

Other instructions and requirements applicable to the product:

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

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

Ilmanvaihtolaitosten paloturvallisuus -opas, www.talotekniikkainfo.fi (manual for fire safety of ventilation plants, available in Finnish only).

Paroc Installation guide, September 2021.

PRODUCT INFORMATION

3 Products, markings and quality control

Products used in the PAROC Hvac Fire insulation solutions are presented in Table 1.

Table 1. Products used in the PAROC Hvac Fire insulation solutions

Stone wool wired mats	PAROC Hvac Fire Mat Comfort
Stone wool slabs	PAROC Hvac Fire Slab EI30 N1 PAROC Hvac Fire Slab EI60 N1 PAROC Hvac Fire Slab EI120 N1
Sealing products for penetrations	Silicate glue Sika® FireStop or similar PAROC stone wool, loose wool, nominal density at least 80 kg/m ³
Fastenings	As defined in the installation manual and Annex A2

The nominal densities and thicknesses required from the insulation materials of the fire insulation solutions are presented for each fire resistance class in section 7 of this certificate.

Essential characteristics according to standard EN 14303 are declared by the manufacturer in the declarations of performance, available from the manufacturer.

The insulation materials are identified by the markings on the packages, which include product name, dimensions, manufacturer's name, production time and other product information.

The manufacturer performs factory production control of the insulation materials according to the standard EN 14303.

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 solutions or products are made before Eurofins Expert Services Oy 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 insulations is not covered by this certificate.

4 Delivery and storage on site

The insulation materials are packed into plastic or cardboard packages and delivered to sites in a pallet protected with plastic film.

The insulation materials 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. Figures concerning the installation principles of stone wool mats, slabs and pipe sections as well as penetrations of circular and rectangular ducts are presented in Annex A2. A template of the installation report that the installation company shall prepare is presented in 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, Decree on the fire safety of buildings.

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

In the declarations of performance the manufacturer has declared the reaction to fire classes according to EN 13501-1 shown in Table 2. The nominal density and the facing material of the product are also shown in Table 2.

Table 2. Reaction to fire class, nominal density and facing of PAROC Hvac Fire insulating materials.

Product	Reaction to fire class	Nominal density	Facing
PAROC Hvac Fire Mat Comfort	A1	80 kg/m ³	Non-woven tissue
PAROC Hvac Fire Slab N1	A1	80 kg/m ³	Non-woven tissue

The fire resistance of insulated circular spiral ducts made of galvanized steel or rectangular ducts made of galvanized steel sheet for internal and external fire exposure (o↔i) in horizontal and vertical orientations (ve ho) are presented in Tables 3 - 5.

Circular ducts

The fire resistance of circular ducts insulated with stone wool wired mat PAROC Hvac Fire Mat Comfort is given in Table 3.

Table 3. The minimum insulation thickness of stone wool wired mat PAROC Hvac Fire Mat Comfort in different fire resistance classes of circular ducts and the nominal density of the insulation material.

Product	Class	Insulation thickness	Nominal density
PAROC Hvac Fire Mat Comfort	EI 15 (ve ho o↔i)	40 mm	80 kg/m ³
	EI 30 (ve ho o↔i)	60 mm	
	EI 60 (ve ho o↔i)	80 mm	
	EI 90 (ve ho o↔i)	80 mm	
	EI 120 (ve ho o↔i)	100 mm	

The diameter of the circular duct insulated with stone wool wired mat PAROC Hvac Fire Mat Comfort shall be ≤ 1000 mm and leakage class of the duct at least D. The thickness of the duct steel sheet in relation to the duct diameter shall fulfil the requirements given in Table 6 and in addition, strength as of the tested system or better.

The fire resistance of the 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 650 kg/m³. 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.

Rectangular ducts

The fire resistance of rectangular ventilation ducts insulated with stone wool wired mat PAROC Hvac Fire Mat Comfort is given in Table 4. The fire resistance of rectangular ventilation ducts insulated with stone wool slabs PAROC Hvac Fire Slab EI30 N1, PAROC Hvac Fire Slab EI60 N1 and PAROC Hvac Fire Slab EI120 N1 is given in Table 5.

Table 4. The minimum insulation thickness in different fire resistance classes of rectangular ducts insulated with stone wool wired mat PAROC Hvac Fire Mat and the nominal density of the insulation material.

Product	Class	Insulation thickness	Nominal density
PAROC Hvac Fire Mat Comfort	EI 15 (ve ho o↔i)	40 mm	80 kg/m ³
	EI 30 (ve ho o↔i)	60 mm	
	EI 60 (ve ho o↔i)	90 mm	
	EI 90 (ve ho o↔i)	100 mm	
	EI 120 (ve ho o↔i)	100 mm	

Table 5. The minimum nominal density in different fire resistance classes of rectangular ducts insulated with 60 mm insulation thickness of stone wool slabs PAROC Hvac Fire Slab EI30 N1, PAROC Hvac Fire Slab EI60 N1 and PAROC Hvac Fire Slab EI120 N1.

Insulation	Class	Nominal density	Insulation thickness
PAROC Hvac Fire Slab EI30 N1	EI 15 (ve ho o↔i)	80 kg/m ³	60 mm
PAROC Hvac Fire Slab EI30 N1	EI 30 (ve ho o↔i)	80 kg/m ³	60 mm
PAROC Hvac Fire Slab EI60 N1	EI 60 (ve ho o↔i)	120 kg/m ³	60 mm
PAROC Hvac Fire Slab EI120 N1	EI 90 (ve ho o↔i)	180 kg/m ³	60 mm
PAROC Hvac Fire Slab EI120 N1	EI 120 (ve ho o↔i)	180 kg/m ³	60 mm

The width of the cross section of the rectangular duct shall be ≤ 1250 mm and height ≤ 1000 mm and leakage class shall be at least B. The thickness of the duct steel sheet in relation to the cross section dimensions of the duct shall fulfil the requirements given in Table 6 and in addition, strength as of the tested system or better.

The fire resistance of the 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 650 kg/m³. 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.

Vertical ducts are fastened storey by storey, bracing distance not exceeding 5 m. Horizontal ducts are fastened by using steel collars and threaded steel rods. The maximum distance between suspension devices, and the distance from duct joint and from the fire compartment structure are given in Annex A2.

The penetrations of the rectangular and circular ducts are sealed according to the Figures 2 and 4 in Annex A2.

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 construction works.

Table 6. Minimum steel thickness of the ventilation duct to be insulated.

Duct type	Cross section dimensions of the duct	Steel thickness
Circular	Ø 63 - 315 mm	min. 0,5 mm
	Ø 400 - 1000 mm	min. 0,7 mm
Rectangular	longer side ≤ 300 mm	min. 0,5 mm
	longer side > 300 - 800 mm	min. 0,7 mm
	longer side > 800 - 1250 mm	min. 0,9 mm

INSTRUCTIONS FOR INSTALLATION AND USE

8 Manufacturer's instructions

Installation of the fire insulation solution shall be made according to the manufacturer's instructions. Installation company prepares an installation report according to the Annex A1.

Safety data sheet of the insulations is available from the manufacturer.

VALIDITY OF THE CERTIFICATE

9 Validity period of the certificate

This certificate is valid until September 24, 2026.

The validity of the certificate may be confirmed at Eurofins Expert Services Oy web pages.

10 Conditions of validity

The certificate is valid assuming that no fundamental changes are made to the product, and that the manufacturer and Eurofins Expert Services Oy have a valid contract on certification.

11 Other conditions

The references made in this certificate to the Finnish building legislation, standards and instructions apply in the form they were valid on the date 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, Eurofins Expert Services Oy 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.

This updated certificate VTT-C11685-16 (issued first on September 26, 2016) has been granted as described above to Paroc Oy Ab.

On behalf of Eurofins Expert Services Oy on September 24, 2021



Tiina Ala-Outinen
Manager, Building Structures



Tiina Tirkkonen
Senior Expert

This document has been signed electronically

This certificate is the English version of the original certificate no. C-11685-16, signed September 24, 2021.
In case of dispute the Finnish original certificate is valid.

APPENDIX A1: Installation report

CERTIFICATE NO. C-11685-16

Products installed:	Circular duct	Rectangular duct	Fire resistance class	Insulation thickness
PAROC Hvac Fire Mat Comfort <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	EI ____	
PAROC Hvac Fire Slab EI30 N1 <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	EI ____	
PAROC Hvac Fire Slab EI60 N1 <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	EI ____	
PAROC Hvac Fire Slab EI120 N1 <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	EI ____	
Sealing products:				

Installation site:

Site identification	
Address	
Installation site specifications (building part, floor, rooms)	
Date of installation	
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: _____

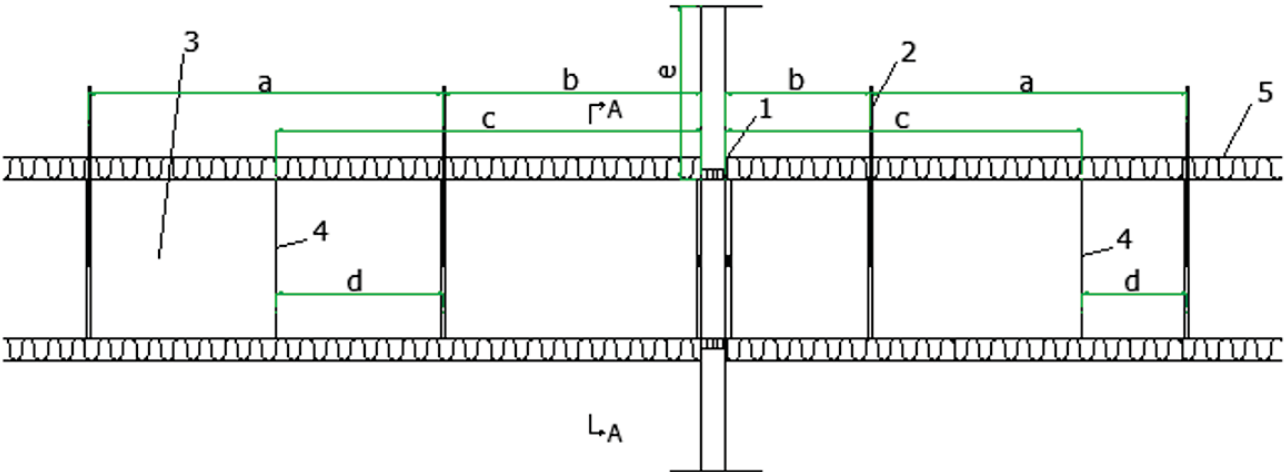
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APPENDIX A2: Fire insulation details

Figure 1. Duct suspension, duct joint and fire insulation.
Circular vertical or horizontal duct.
Fire insulation with stone wool wired mat PAROC Hvac Fire Mat Comfort

Note* Suspension of duct
 Ducts are suspended with 8 mm threaded rods.
 Suspension of circular ducts is attached to steel hangers 2 x 20 mm, Lindab UVH30 (or similar).

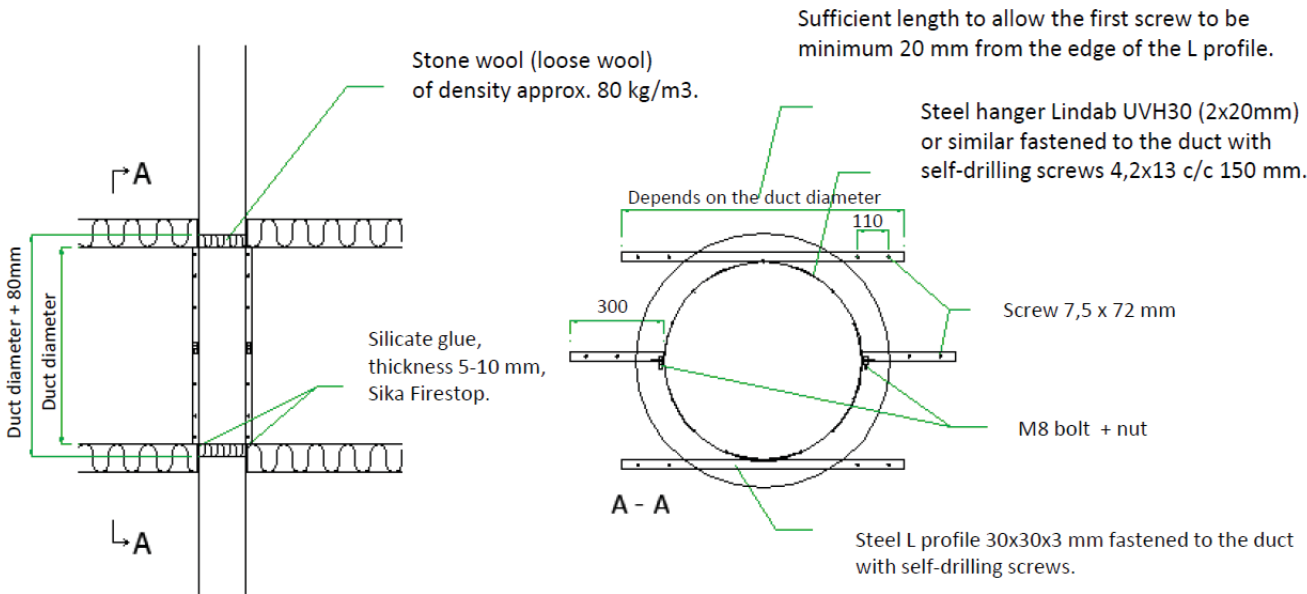
Note ** Duct joint
 Circular ducts are joined with a coupling connector Lindab NPU (or similar). Fastening is done with self-drilling screws 4,2x13 mm c/c 150 mm. Both ends of coupling connector are sealed with EPDM rubber gasket and fastened with a steel collar.



Circular ducts	Ducts insulated with stone wool wired mat	Ducts insulated with stone wool pipe section
a	1200 mm (max)	1100 mm (max)
b	600 mm (max)	900 mm (max)
c	1400 mm (min) horiz. 800 mm (min) vert.	1200 mm (min)
d	100 mm (min)	100 mm (min)
e	550 mm (max)	580 mm (max)

5	Insulation material	PAROC Hvac Fire Mat/Hvac AirCoat
4	Duct joint	Note **
3	Duct	Lindab SR (or similar)
2	Suspension	8 mm threaded rod + suspension, Note *
1	Penetration sealing	Section A-A
Circular ducts insulated with stone wool wired mat PAROC Hvac Fire Mat or stone wool pipe section PAROC Hvac AirCoat		
PAROC		JiLi/Ala

**Figure 2. Penetration sealing and duct suspension.
Circular vertical or horizontal duct.
Fire insulation with stone wool wired mat PAROC Hvac Fire Mat Comfort.**



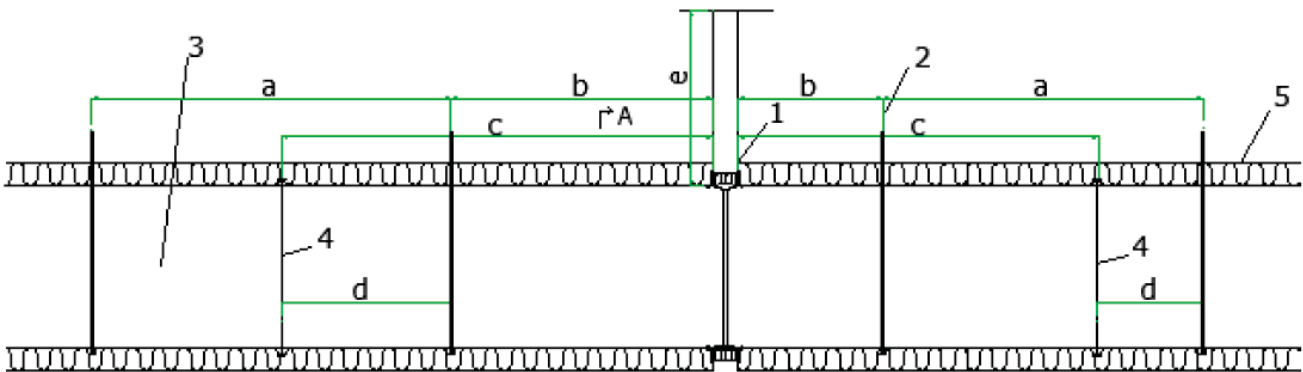
Penetration sealing
 Gap between the penetration and the duct is approx. 40 mm.
 Gap between the penetration and the duct is filled with stone wool (loose wool) of density approx. 80 kg/m³. Silicate glue is tightly applied over the loose wool and the separating structure for approx. 100 mm width around the duct, thickness of glue max. 15 mm. Glue is applied before and after the installation of the L profile.

Circular ducts insulated with stone wool wired mat PAROC Hvac Fire Mat	
Penetration of horizontal and vertical circular ducts Steel spiral duct and insulation	
PAROC	JiLi/ALa

Figure 3. Duct suspension, duct joint and fire insulation.
Rectangular vertical or horizontal duct.
Fire insulation with stone wool wired mat PAROC Hvac Fire Mat Comfort or stone wool slabs PAROC Hvac Fire Slab EI30 N1, PAROC Hvac Fire Slab EI60 N1 or PAROC Hvac Fire Slab EI120 N1.

Note * Suspension of duct
 Ducts are suspended with 10 mm threaded rods. Suspension of rectangular ducts is attached to the supporting U profile of size 30x30x3mm.

Note ** Duct joint
 Rectangular ducts are joined with a sliding C profile Lindab RJSP (or similar) that is attached to the square-edged duct ends.

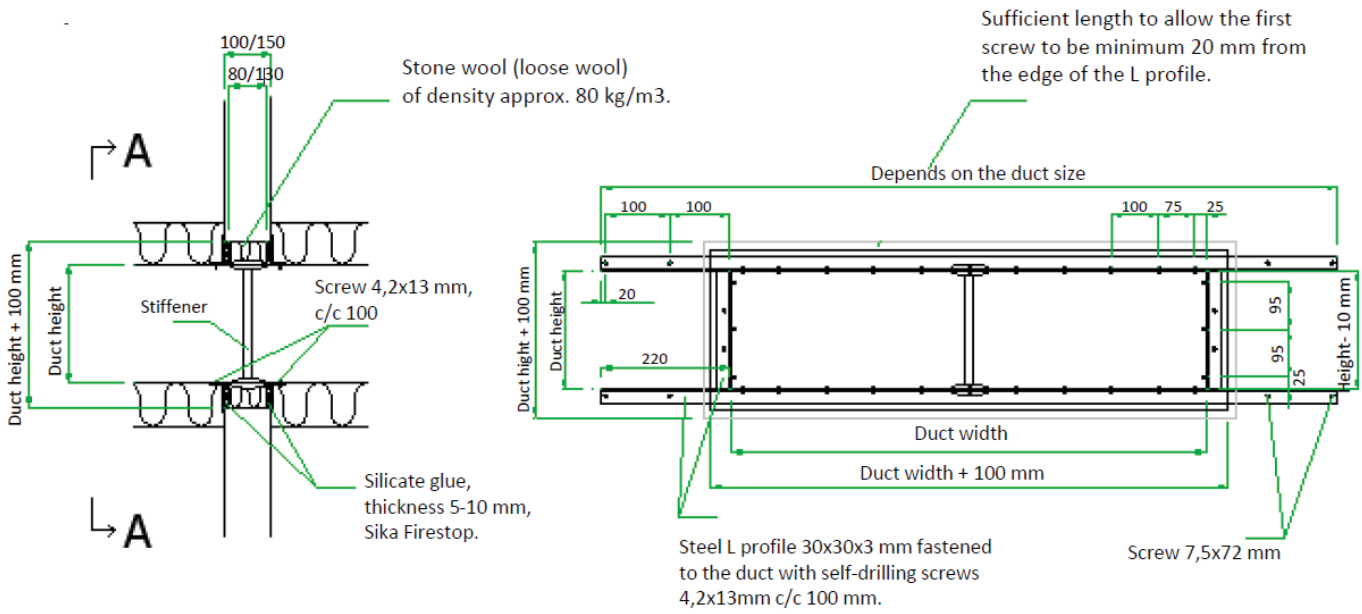


↳ A

	Rectangular ducts
a	1000 mm (max)
b	500 mm (max)
c	550 mm (min) horiz. 550 mm (min) vert.
d	65 mm (min)
e	650 mm (max)

5	Insulation material	PAROC Hvac Fire Mat/Hvac Fire Slab
4	Duct joint	Note **
3	Duct	Lindab LKR (or similar)
2	Suspension	10 mm threaded rod + suspension, Note *
1	Penetration sealing	Section A-A
Rectangular ducts insulated with stone wool wired mat PAROC Hvac Fire Mat or with stone wool slab PAROC Hvac Fire Slab		
PAROC		
	JiLi/Ala	

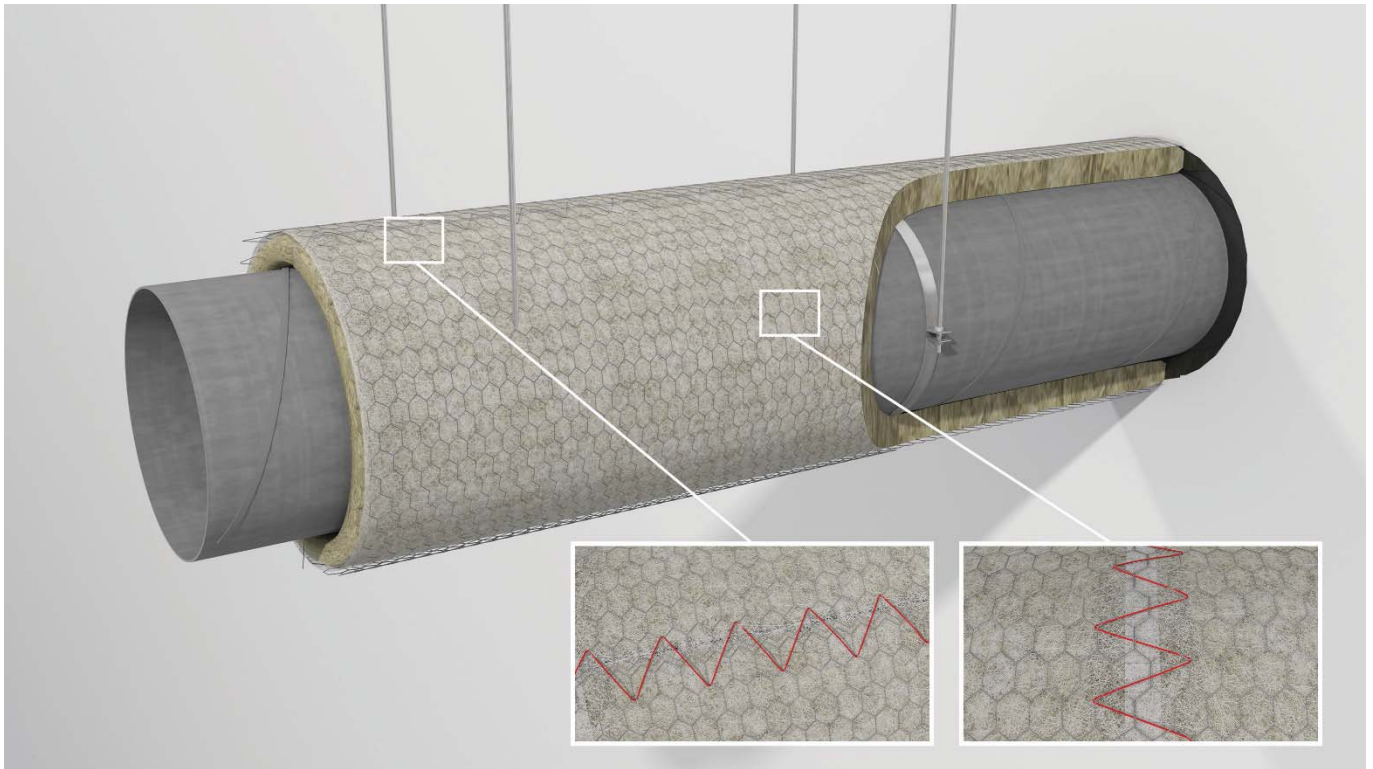
**Figure 4. Penetration sealing and duct suspension.
 Rectangular vertical or horizontal duct.
 Fire insulation with stone wool wired mat PAROC Hvac Fire Mat Comfort or stone wool slabs
 PAROC Hvac Fire Slab EI30 N1, PAROC Hvac Fire Slab EI60 N1 or PAROC Hvac Fire Slab EI120 N1.**



Penetration sealing
 Gap between the penetration and the duct is max. 50 mm.
 Gap between the penetration and the duct is filled with stone wool (loose wool) of density approx. 80 kg/m³. Silicate glue is tightly applied over the loose wool for approx. 100 mm width around the duct, thickness max. approx. 15 mm.

Rectangular ducts insulated with stone wool wired mat PAROC Hvac Fire Mat or stone wool slab PAROC Hvac Fire Slab	
Penetration of horizontal and vertical rectangular ducts	
Steel sheet duct and insulation	
PAROC	JiLi/ALa

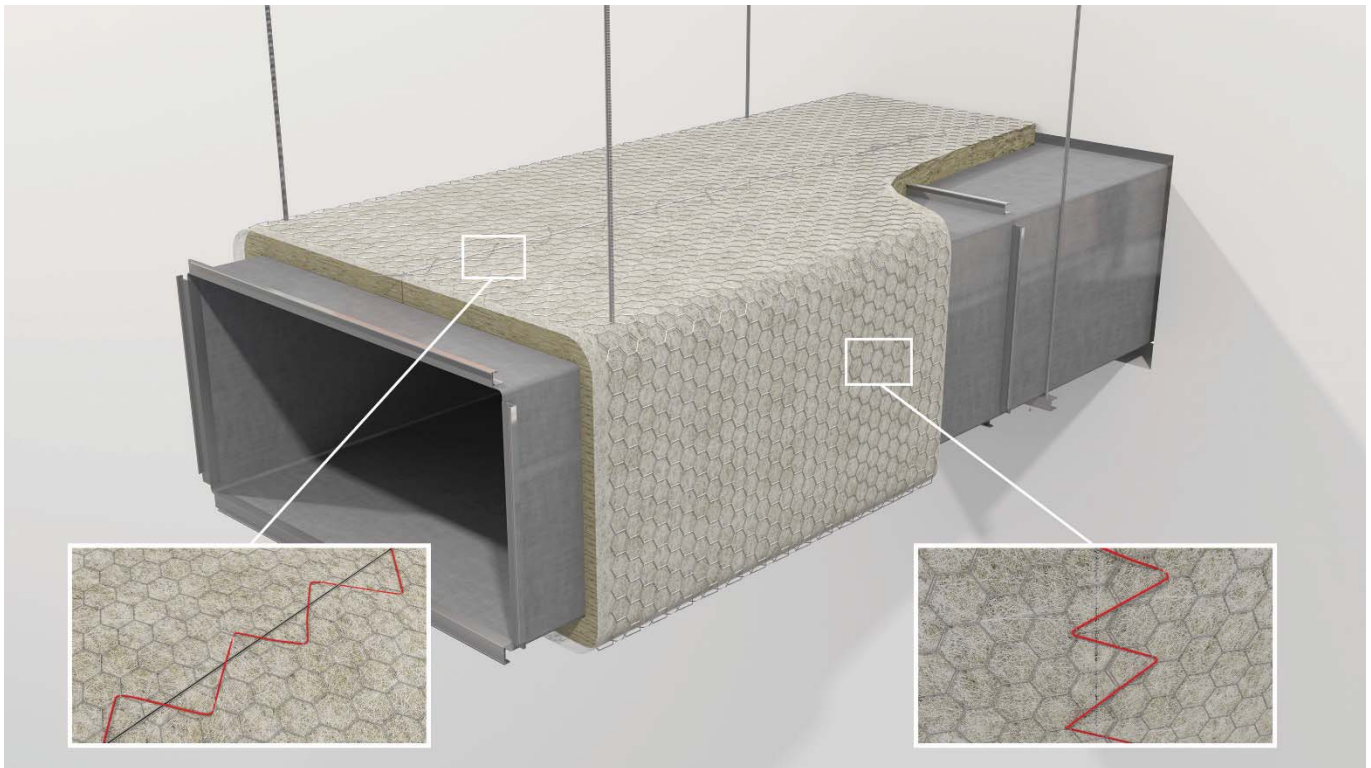
**Figure 5. Circular vertical or horizontal duct.
Fire insulation with stone wool wired mat Hvac Fire Mat Comfort.
Detailed installation instructions.**



Insulation of circular duct with stone wool wired mat PAROC Fire Mat Comfort

- Circular ducts are joined with factory-made steel coupling connectors, equipped with EPDM rubber gaskets. Ducts are fastened to coupling connectors with self-drilling screws or rivets c/c 150 mm.
- Wired mat is fastened around the duct with steel wire (d 0,9 mm) that is used for tying the steel wire net. Maximum distance between stitches is 100 mm. Steel wire stitches shall be made around complete and whole net mesh.
- Alternatively wire mat can be fastened according to manufacturer's instructions with the steel wire net itself using, e.g., rebar tying tool (hook) or steel rivets that have the same minimum thickness as the steel wire (d 0,9 mm).
- Both longitudinal and horizontal wired net joints are stitched according to guidance and the figure above.
- Wired net is installed on top of the suspension hangers as presented in the figure above. The suspension of the duct is made according to the Figures 1 and 2 in Annex A2.
- Penetration and penetration sealing are made according to the Figure 2 in Annex A2.

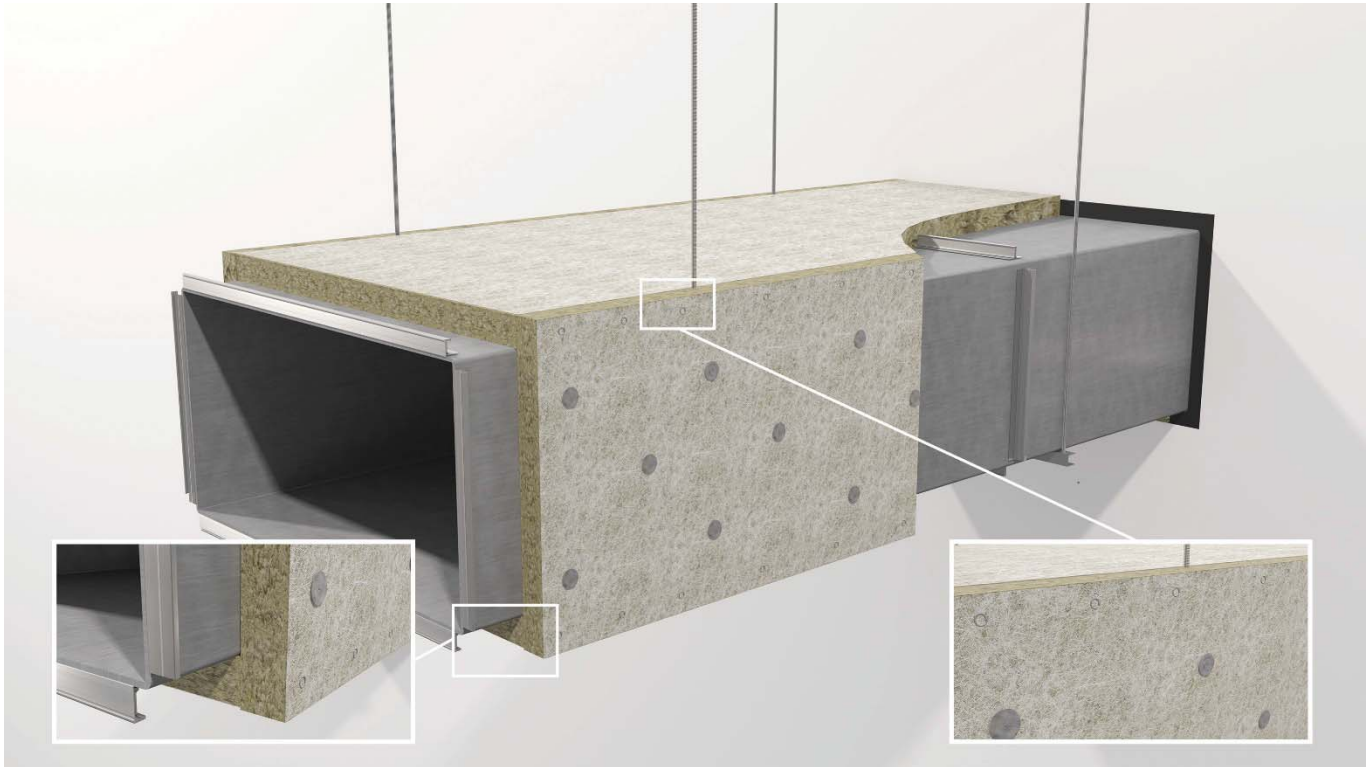
**Figure 6. Rectangular vertical or horizontal duct.
Fire insulation with stone wool wired mat PAROC Hvac Fire Mat Comfort.
Detailed installation instructions.**



Insulation of rectangular duct with stone wool wired mat PAROC Fire Mat Comfort

- The ends of rectangular ducts are square-edged and steel L profiles are attached to them with spot-welding c/c 150 mm. The size of L profiles is at least 30 x 30 x 1,2 mm. Ducts are joined with sliding C profiles, which have minimum thickness of 0,85 mm, and edge profiles. Joints are sealed with polybutene sealing compound and EPDM rubber gasket.
- When the length of the longer side of rectangular duct exceeds 500 mm, the duct shall be stiffened perpendicular to the longer side with stiffeners that are installed in the middle of the 1250-mm-long duct component. Steel rods of diameter 16 mm and thickness 2 mm are used as stiffeners that are fastened with four M72 mm washers (thickness 1 mm) to the duct (inside and outside) and with M6 bolts.
- Wired mat is fastened around the duct with steel wire (d 0,9 mm) that is used for tying the steel wire net. Maximum distance between stitches is 100 mm. Steel wire stitches shall be made around complete and whole net mesh.
- Alternatively wire mat can be fastened according to manufacturer's instructions with the steel wire net itself using, e.g., rebar tying tool (hook) or steel rivets that have the same minimum thickness as the steel wire (d 0,9 mm).
- Both longitudinal and horizontal wired net joints are stitched according to guidance and the figure above. It shall be ensured for rectangular ducts that the same insulation thickness is obtained also in the duct corners.
- When insulating the rectangular duct, wired net mat is installed over the support of the duct without cutting the insulation, according to the figure above.
- On the underside of the duct the insulation slabs are fastened to the duct with welded pins (Ø 3,0 mm) and washers (Ø 38 mm) 4 pieces per slab. The suspension of the duct is made according to the Figures 3 and 4 in Annex A2.
- Penetration and penetration sealing are made according to the Figure 4 in Annex A2.

**Figure 7. Rectangular horizontal or vertical duct.
Fire insulation with stone wool slabs PAROC Hvac Fire Slab EI30 N1, PAROC Hvac Fire Slab EI60 N1 or PAROC Hvac Fire Slab EI120 N1.
Detailed installation instructions.**



Insulation of rectangular duct with stone wool slabs PAROC Hvac Fire Slab EI30 N1, PAROC Hvac Fire Slab EI60 N1 or PAROC Hvac Fire Slab EI120 N1

- The ends of rectangular ducts are square-edged and steel L profiles are attached them with spot-welding c/c 150 mm. The size of L profiles is at least 30 x 30 x 1,2 mm. Ducts are joined with sliding C profiles, which have minimum thickness of 0,85 mm, and corner profiles. Joints are sealed with polybutene sealing compound and EPDM rubber gasket.
- When the length of the longer side of rectangular duct exceeds 500 mm, the duct shall be stiffened perpendicular with the longer side with stiffeners that are installed in the middle of the 1250-mm-long duct component. Steel rods of diameter 16 mm and thickness 2 mm are used as stiffeners that are fastened with four M72 mm washers (thickness 1 mm) to the duct (inside and outside) and with M6 bolts.
- Slabs are fastened to the duct walls with welded pins (Ø 3,0 mm) and washers (Ø 38 mm). The minimum number of welded pins is 20 pieces per m² or 2 pieces per slab.
- On top of the duct, slabs do not need to be fastened with pins and washers. Slabs are fastened to their position with stone wool fasteners (steel fastener, length 120 mm, c/c 250 mm) that are installed through the vertical slabs on the sides of the duct.
- When installing the slabs it shall be ensured that the corners are tightly insulated and the slab joints are fastened with stone wool fasteners. The stone wool fasteners attach the vertical slabs on the sides of the duct to the horizontal slabs above and below the duct.
- A cutting corresponding to the dimensions of the supporting profile is made to the slab at the supports, see the figure above. The suspension of the duct is made according to the Figures 3 and 4 in Annex A2.
- Penetration and penetration sealing are made according to Figure 4 in Annex A2.