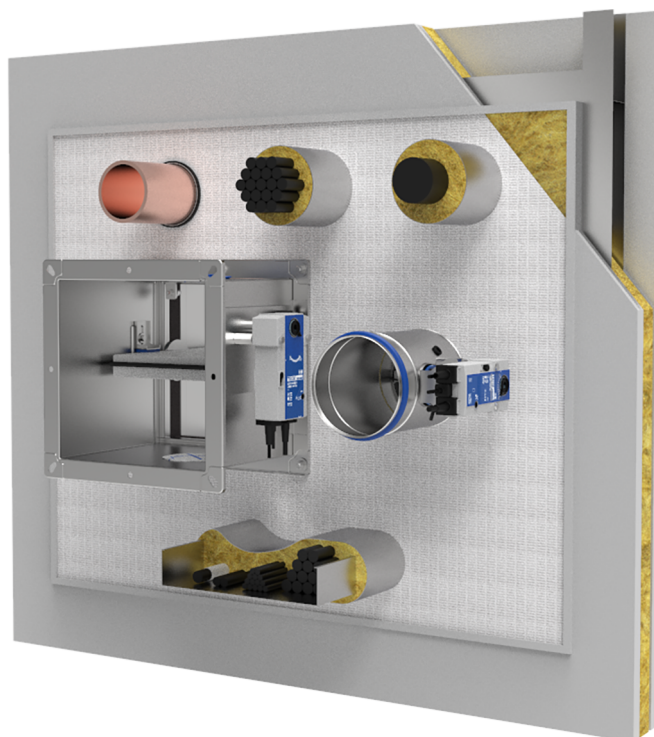# Combined penetration seal

Hilti coated board system and FK-EU / FKRS-EU fire dampers

according to Declaration of Performance

DoP / FK-EU / DE / 003 and DoP / FKRS-EU / DE / 003

Read the instructions prior to performing any task!

TROX® TECHNIK

The art of handling air

TROX® **TECHNIK**

1 General information

About this manual

This installation and operating manual enables operating or service personnel to correctly install the products described below and to use them safely and efficiently.

This operating and installation manual is intended for use by fitting and installation companies, in-house technicians, technical staff, instructed persons, and qualified electricians or air conditioning technicians.

It supplements the TROX installation and operating manuals for type FK-EU and FKRS-EU fire dampers, with the addition of installation with cables and pipes in the Hilti coated board system. This applies in particular for the safety sections (General Safety Instructions, Intended Use, Personnel Training).

1.1 Intended for use in Europe

- For use in Europe (outside Germany), the declarations of performance for fire dampers FK-EU and FKRS-EU apply and these have been extended to include use with combined penetration seal. The permitted materials and building products specified in this operating and installation manual are components and do not require any additional supporting documents.
- The national regulations on the labelling, fixing and use of Hilti coated board system must also be observed.

1.2 If this fire damper is used in Germany:

- In accordance with the national specifications in Germany, project-specific type approval is required for the installation described in this installation and operating manual. Application for this approval has to be submitted to the building supervisory authority of the federal state in which the construction project is to be implemented.

2 Technical data

2.1 General data

Combined penetration seal B1 × H1	Max. 3000 × 2000 mm [1]
Permitted fire dampers	FK-EU / FKRS-EU
Acceptable coated board system	Hilti Firestop coating, see table ⬧ *6*
Fire resistance duration of overall construction	EI 90 / EI 90 S (fire dampers)
Permitted penetrants	See tables from ⬧ *17*
Temperature range [2, 3, 4]	-20 °C – 50 (70) °C
EC conformity	- Construction Products Regulation (EU) no. 305/2011 - EN 15650 – Ventilation for buildings – Fire dampers - EN 13501-1 – Classification using data from fire resistance tests on products and elements used in building service installations: Fire resisting ducts and fire dampers - EN 13501-2 – Classification using data from fire resistance tests, with the exception of ventilation systems - EN 13501-3 – Classification: Fire resistant ducts and fire dampers - EN 1366-2 – Fire resistance tests for installations: Fire dampers - EN 1366-3 – Fire resistance tests for installations: Partitioning panels - EN 1751 – Ventilation for buildings – Air terminal devices
Declaration of performance	DoP / FK-EU / DE / 003 and DoP / FKRS-EU / DE / 003

[1] The maximum penetration seal dimensions of 3000 x 2000 mm only apply in compliance with the "600 mm rule" This means that the first penetrant (non-combustible) must be installed at a distance of ≤ 600 mm. Failing this, the maximum penetration seal dimensions are restricted to the dimensions of the fire damper and its perimeter of 600 mm. See also Page 9.

[2] Temperatures may differ for units with attachments. Details for other applications are available on request.

[3] Fire dampers -20 °C – 50 °C, Hilti Firestop coating -20 °C – 70 °C (without the influence of rain or UV radiation), application temperature for coating during assembly 5 °C – 40 °C.

[4] Condensation and the intake of humid fresh air have to be avoided as otherwise operation will be impaired or not possible.

3 Parts and function

Combined penetration seal is a term given to describe the combination of the Hilti coated board system with fire dampers, cables and pipes in one combined penetration seal. The building products permitted for this installation are listed in this manual.

Hilti provides further information on the cables and pipe penetrations, particularly on the components of the coated board systems CFS-CT and CP 673.

3.1 Hilti coated board system

Hilti CFS-CT coated board system	Part no.
Firestop coating CFS-CT, white, pail 18 kg	2036607
Firestop coating CFS-CT, white, pail 6 kg	2036605
Firestop acrylic sealant CFS-S ACR CW, white, cartridge 310 ml	435859
Firestop acrylic sealant CFS-S ACR PW, white, pail 5 L	435864
Firestop acrylic sealant CFS-S ACR PW L, white, pail 10 L	2046766
Firestop board * CFS-CT B 1S, 1000 × 600 × 50 mm	2036608
Firestop wrap strip CFS-W P, 10 m	2133384
Firestop collar endless CFS-C EL, 2580 × 52 × 5.6 mm	2075120

* Mineral wool slabs, see ↻ *16*

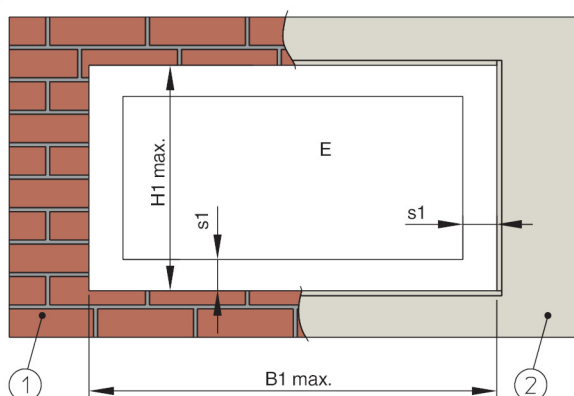| Coated board system Hilti CP 673	Part no.
Firestop coating CP 673, white, pail 17.5 kg	378246
Firestop coating CP 673, white, pail 12 kg	282686
Firestop coating CP 673, white, pail 6 kg	286935
Firestop acrylic sealant CFS-S ACR CW, white, cartridge 310 ml	435859
Firestop acrylic sealant CFS-S ACR PW, white, pail 5 L	435864
Firestop acrylic sealant CFS-S ACR PW L, white, pail 10 L	2046766
Firestop board * CP 673 1S, 1000 × 600 × 50 mm	203913
Firestop wrap strip CFS-W P, 10 m	2133384
Firestop collar endless CFS-C EL, 2580 × 52 × 5.6 mm	2075120

* Mineral wool slabs, see ↻ *16*

4 Installation

4.1 General installation information

- The combined penetration seal must be installed in wall systems if these walls have been erected in compliance with regulations and the manufacturers' instructions, and if the information on the respective installation situation applies and the following requirements are met.

- Installation is in solid walls, lightweight partition walls with metal or timber support structure, solid wood / cross-laminated timber. Details on the wall structure, trim panels etc. based on the installation and operating manual for the fire damper.

- The maximum penetration seal dimensions B1 × H1 are 3000 × 2000 mm.

  The maximum penetration seal dimensions B1 x H1 (3000 x 2000 mm) are only applicable in compliance with the "600 mm rule" This means that the first penetrant (non-combustible) must be installed at a distance of ≤ 600 mm. Failing this, the maximum penetration seal dimensions (b1 / h1) are restricted to the dimensions of the fire damper and its perimeter of 600 mm. For more information, see Fig. 3 and Fig. 4 (grey-shaded area).

- The minimum distance between the casings of the fire dampers and the ducts (cable / pipes) is 100 mm.

- The minimum distance between the fire damper and the wall is 40 mm.

- Permitted cables and pipes (⬦ page ⬦ 17 ff) must be arranged anywhere in the combined penetration seal in compliance with the specified distances.

- The position of the fire dampers in the combined penetration seal is irrelevant, but must comply with the specified distances.

- All traversing supply lines (fire dampers, cable, cable bundles, cable trays, conduits and plastic pipes) can be laid individually, in multiples or so that they are mixed (mixed penetration seal).

Fig. 1: General dimensions

1	Solid wall	B1×H1	Max. penetration seal dimensions 3000 × 2000 mm (the permitted penetration seal dimensions are determined using the 600 mm rule, see Page 9)
2	Lightweight partition wall		
E	Installation area	B×H	FK-EU nominal sizes 200 × 200 – 1500 × 800 mm
		ØDN	FKRS-EU nominal sizes 100 – 315 mm
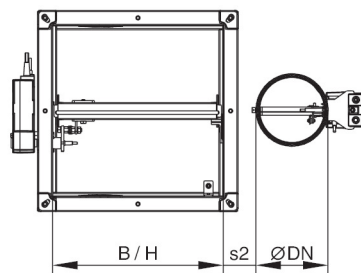
Damper combination up to EI 90 S	s1 min. [mm]	s1 max. [mm]	s2 min. [mm]
FK-EU – FKRS-EU	40	600	≥ 50

Fig. 2: Arrangement in the combined penetration seal FK-EU and FKRS-EU

1a	FK-EU
1b	FKRS-EU
2	Minimum distance to other lines (or operating penetrants)

3 Arrangement of fire dampers and ducts irrelevant, as long as the minimum distances and the distances are maintained according to Fig. 3 and Fig. 4

4 Solid wall, lightweight partition wall with metal or timber support structure, solid wood or cross-laminated timber

Fig. 3: Arrangement in combined penetration seal FK-EU – distances to the first duct

1a FK-EU

5 Distance to the second duct (600 mm rule). The first penetrant (non-combustible) must be installed at a distance of ≤ 600 mm. Failing this, the maximum penetration seal dimensions (b1 / h1) are restricted to the fire damper and its perimeter of 600 mm (grey-shaded area).
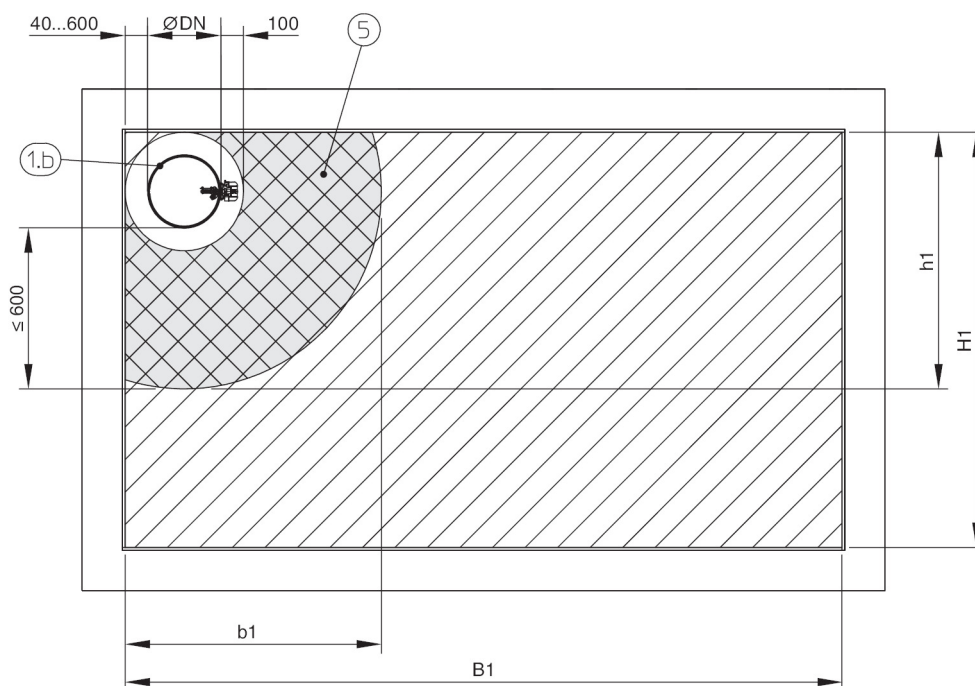
Fig. 4: Arrangement in combined penetration seal FKRS-EU – distances to first duct

1b FKRS-EU
5   Distance to the second duct (600 mm rule). The first penetrant (non-combustible) must be installed at a distance of ≤ 600 mm. Failing this, the maximum penetration seal dimensions (b1 / h1) are restricted to the fire damper and its perimeter of 600 mm (grey-shaded area).
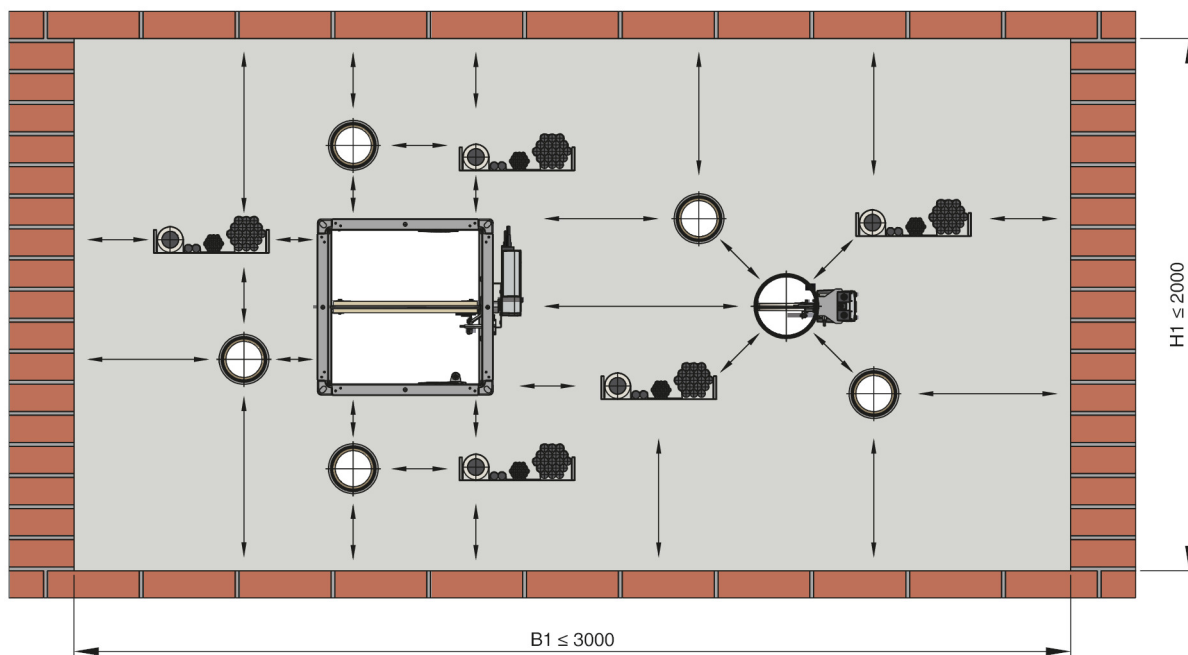
4.2 Distances

Fig. 5: Distances of combined penetration seal (marked on solid wall)

Applications with Hilti Firestop wrap strip

Distance from – to [mm]	FKRS-EU fire damper	Cables / cable bundles / cable trays	Conduits up to ∅16 mm	Plastic pipes	Metal pipes	Aluminium composite pipes	Penetration seal edge
FK-EU fire damper	50	85	85	85	85	85	40
Cables / cable bundles / cable trays	100	0	0	40	20	50	0
Conduits up to ∅16 mm	50	0	0	40	20	50	0
Plastic pipes	50	40	40	30	0	50	17
Metal pipes	50	20	20	0	0	50	3
Aluminium composite pipes	50	50	50	50	50	50	25
Penetration seal edge	40	0	0	17	3	25	–

Applications with Hilti Firestop collar endless

Distance from – to [mm]	FKRS-EU fire damper	Cables / cable bundles / cable trays	Conduits up to ∅16 mm	Plastic pipes	Metal pipes	Penetration seal edge
FK-EU fire damper	50	85	85	85	85	40
Cables / cable bundles / cable trays	100	0	0	50	20	0
Conduits up to ∅16 mm	50	0	0	50	20	0
Plastic pipes	50	40	40	200	0	17
Metal pipes	50	20	20	0	0	3
Penetration seal edge	40	0	0	0	3	–

4.3 Installation information for coated board system

- The coated board system always consists of two 50 mm thick, coated mineral wool slabs (Firestop Boards), bulk density ≥ 140 kg/m³.
- The installation opening must be cleaned. The cable and cable supports must be dry, in good condition and free of dust and grease.
- The mineral wool slabs, bars and bridges on mineral wool slabs, damage to the pre-coated mineral wool slabs and gaps fitted with mineral wool must be coated with min. 0.7 mm (dry layer thickness) Firestop coating (actuator and release mechanism must not be coated).
- To obtain a dry layer thickness of 0.7 mm, a wet layer thickness of approx. 1.1 mm is required.
- Stir the Firestop coating well before use. It can be applied using brushes, rollers or airless devices (alternatively, the Firestop coating can be applied to the mineral fibre board before the actual installation.).
- All interfaces must be coated with Firestop acrylic sealants.
- Cut the mineral wool slabs. Coat the edges of the mineral fibre boards with Firestop acrylic sealant and stick them tightly into the installation opening with fire-resistant sealant.
- Fill any gaps between the boards and the installation opening, gaps between the cut faces of cut-to-size pieces, and gaps between boards and the fire damper with Hilti Firestop acrylic sealant.
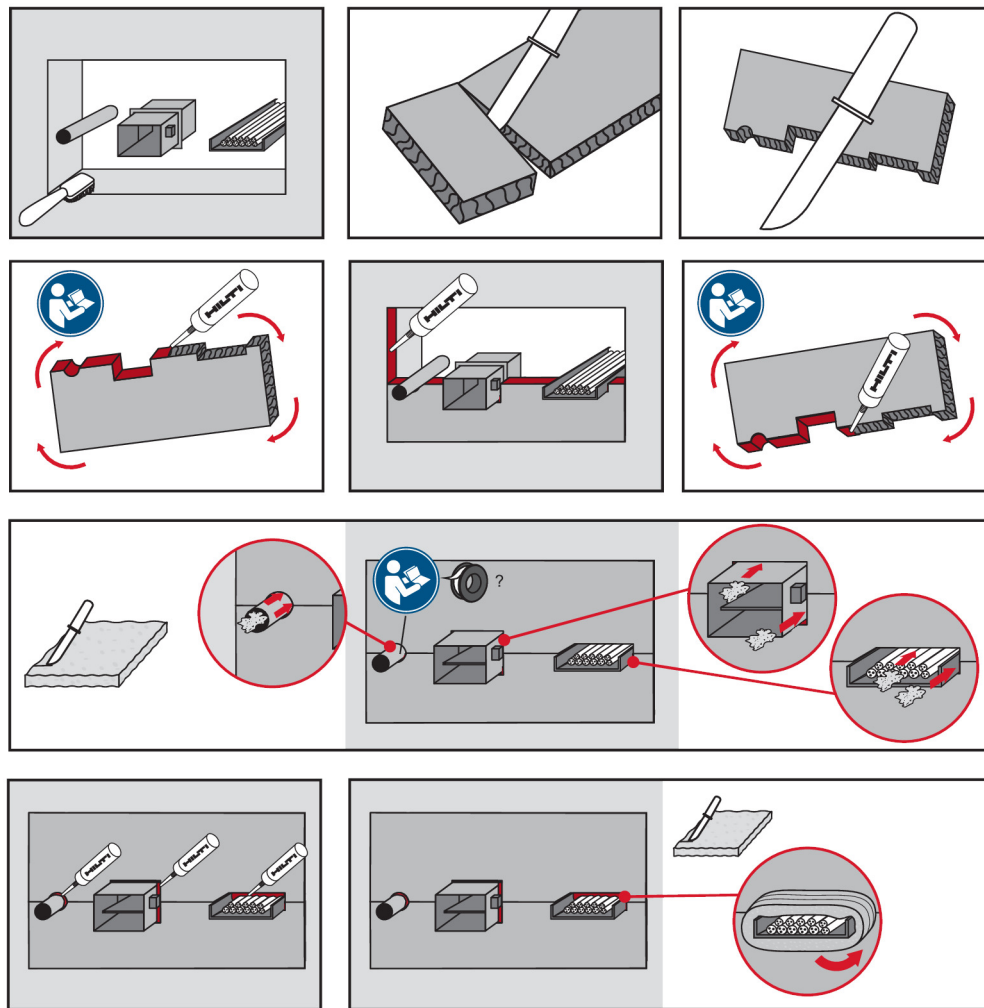
Fig. 6: Assembly of coated board system

## 4.4 Installation information for operating penetrants

- The installations must be fixed to the next supporting component (not to the penetration seal) in accordance with the relevant regulations so that no additional mechanical load is transferred to the penetration seal.
- Maximum distance of the first support: 320 mm.
- Depending on the application and the classification to be achieved, additional protection measures are required (e.g. using a mineral wool mat). For the installation of additional components, e.g. Hilti Firestop wrap strip or Hilti Firestop collar endless, see separate installation manual.
- If required, fasten the identification plate.

Fig. 7: Assembly of Firestop wrap strip

Fig. 8: Assembly of Firestop collar endless

4.5 Installation information for fire dampers

- With regard to installation in the coated board system, the distance dimensions from the flange of the operation side to the wall with the FK-EU 260 mm and with the FKRS-EU is 220 mm.
- Fire dampers must be fixed to both sides of the wall, see installation and operating manual of the type FK-EU and FKRS-EU fire dampers.
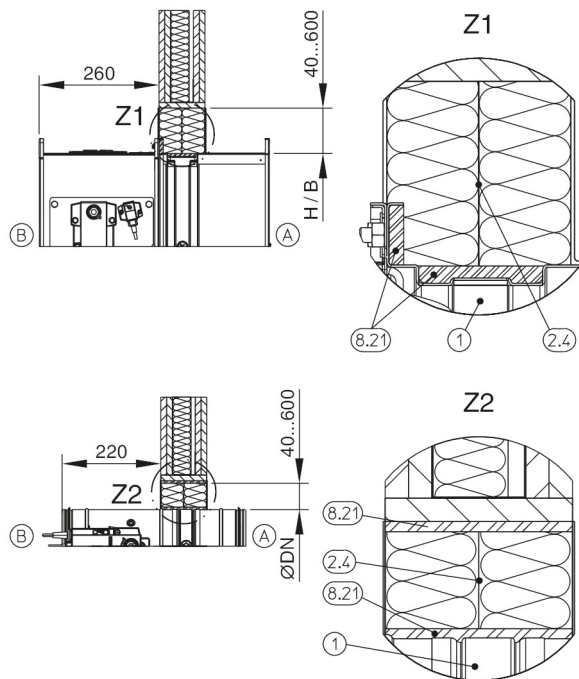
Fig. 9: Fire-resistant sealant

1   FK-EU / FKRS-EU
2.4   Coated board system
8.21   Firestop sealant
A   Installation side
B   Operating side

5 Suitable building products

5.1 Mineral wool slabs

Suitable mineral wool slabs for use with Hilti coated board system

- Flumroc 341
- Isover Fireprotect 150, Orsil Pyro, Orsil S, Orsil T, Protect BSP 150, Stropoterm
- Knauf Heralan BS-15, Heralan DDP-S, Heralan DP-15
- Paroc FPS 14, FPS 17, Pyrotech Slab 140, Pyrotech Slab 160
- Rockwool Hardrock II, Hardrock 040, RP-XV, RPB-15, ProRox SL 980

5.2 Other mineral wool products

Suitable mineral wool products for use as additional protection for cables and cable support systems

- Isover Ultimate U TFA 34
- Knauf Lamella Forte LLMF AluR
- Paroc Lamella Mat 35 AluCoat
- Rockwool Klimafix, Klimarock or 133 (lamella mat)

Suitable mineral wool products for use as pipe insulation

- Interrupted insulation: stone wool in accordance with EN 14303, fire rating class A2 or A1 in accordance with EN 13501-2, Al-coated
- Continuous insulation: Isover Coquilla AT-LR, Protect BSR 90 alu, Paroc Section AluCoat T, Rockwool Conlit Rohrschalen, Klimarock, RS 800 Rohrschalen, TP Termoprodukt TP-Protect RS 1, TP-Protect RS 105, TP-Protect RS 120, TP-Protect RS 150

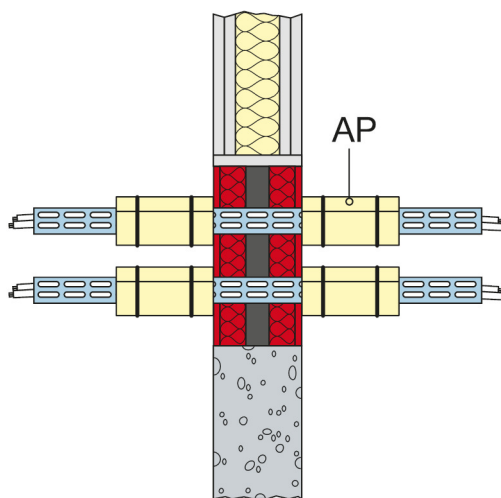## 5.3 Cables, cable bundles, cable trays, conduits in walls

Applications with EI 90

Fig. 10: Classification with or without cable support systems

Cable	Permitted insulating measure [AP]	Classification E = fire integrity I = insulation
All sheathed cables ≤ 80 mm	Wrapping	EI 90
All unsheathed cables ≤ 24 mm		
Cable bundles up to a diameter of 100 mm, max. individual diameter of cable: 21 mm		
Plastic conduits ≤ 16 mm, with and without cables		
Steel conduits ≤ 16 mm, with and without cables		

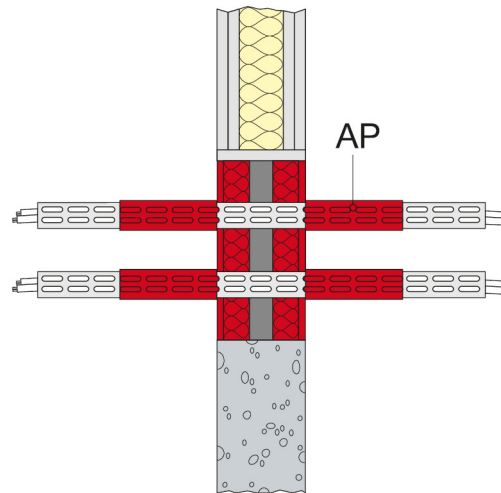| Cable insulation measures	Thickness [mm]	Length [mm]
Wrapping with mineral wool	20	200

Applications with EI 60

Fig. 11: Classification with or without cable support systems

Cable	Permitted insulating measure [AP]	Classification E = fire integrity I = insulation
All sheathed cables ≤ 80 mm	Coating with Firestop coating over a length of 250 mm, dry film thickness: approx. 1.5 mm	EI 60
All unsheathed cables ≤ 24 mm		
Cable bundles up to a diameter of 100 mm, max. individual diameter of cable: 21 mm		
Plastic conduits ≤ 16 mm, with and without cables		
Steel conduits ≤ 16 mm, with and without cables		

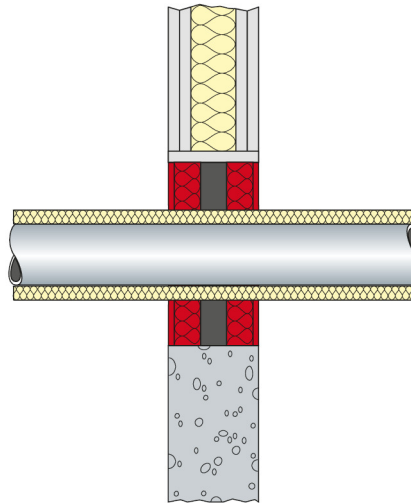## 5.4 Metal pipes with mineral wool insulation in walls

Fig. 12: Classification with mineral wool insulation

Copper pipes

Pipe diameter / pipe wall thickness [mm]	Thickness of insulation [mm]	Insulation	Classification E = fire integrity I = insulation
16 × 1.0 – 28 × 1.5 Up to 14.2 mm pipe wall thickness	20	local, continuous, length on both sides ≥ 500 mm	EI 90-C/U

Also valid for steel, cast iron, stainless steel, Ni alloys (NiCu, NrCr, NiMo alloys) and Ni

Steel pipes

Pipe diameter / pipe wall thickness [mm]	Thickness of insulation [mm]	Insulation	Classification E = fire integrity I = insulation
16 × 1.0 – 76 × 2.3 Up to 14.2 mm pipe wall thickness	20	local, continuous, length on both sides ≥ 500 mm	EI 90-C/U
76 × 2.3 – 168.3 × 3.2 Up to 14.2 mm pipe wall thickness	40	local, continuous, length on both sides ≥ 1000 mm	EI 90-C/U

Also valid for cast iron, stainless steel, Ni alloys (NiCu, NrCr, NiMo alloys)

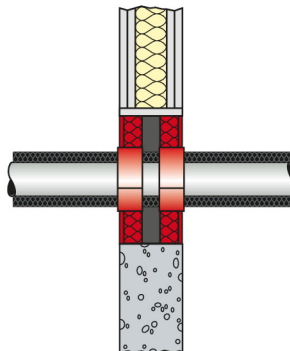## 5.5 Aluminium composite pipes with combustible insulation in walls

Fig. 13: Classification with Hilti Firestop wrap strip

Pipe manufac-turer / pipe name	Pipe diameter / pipe wall thickness [mm]	Insulation	Locations of Firestop wrap strip	Classification E = fire integrity I = insulation
Geberit / Mepla	16 × 2.25 – 32 × 3.0	Continuous, synthetic rubber 8 – 35 mm	2	EI 90-U/C
Rehau / Rautian stable	16 × 2.6 – 40 × 6.0		2	
Uponor / MLC	16 × 2.0 – 32 × 3.0		2	
Kekelit / Kelox	16 × 2.0 – 32 × 3.0		2	
Viega / Sanfix	16 × 2.2 – 50 × 4.0		2	
Fosta	63 × 4.5		4	
Geberit / Push Fit system pipe (ML)	20 × 1.5 – 25 × 2.5		2	

5.6 Plastic pipes in walls

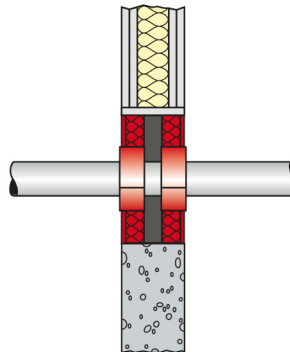### 5.6.1 Applications with Hilti Firestop wrap strip

Fig. 14: Classification with Hilti Firestop wrap strip

PVC and PE pipes

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Locations of Firestop wrap strip	Insulation	Classification E = fire integrity I = insulation
PVC pipes according to EN 1452-2	≤ 50	1.8 – 5.6	2		EI 90-U/U
	> 50 ≤ 75	1.8/2.2 – 5.6	3		
	> 75 ≤ 110	1.8/3.2 – 8.1	4		
PE/PE-HD in accordance with EN 1519-1, EN 15494, EN 12201	≤ 50	1.8 – 6.9	2		
	> 50 ≤ 75	3.0 – 6.8	3		
	> 75 ≤ 110	3.5/4.2 – 4.4	4		
PE/PE-HD in accordance with EN 1519-1, EN 15494, EN 12201	90 – 110	3.5 – 4.4	5	With continued insulation (Armaflex AF), sustained over the pipe length (CS) Thickness of insulation: 9.0 – 22.0 mm	

Non-regulated pipes

Pipe manufacturer / pipe name	Pipe material	Pipe wall thickness / pipe diameter [mm]	Locations of Firestop wrap strip	Classification E = fire integrity I = insulation
Poloplast / Polokal 3S	PP	90 × 4.5	4	EI 90-U/U
Rehau / Raupiano Plus	PP	50 × 1.8	2	
Wavin / AS	PP	58 × 4.0	2	
Poloplast / Polokal NG	PP / PP-MV / PP	75 × 3.8	3	

Pipe manufacturer / pipe name	Pipe material	Pipe wall thickness / pipe diameter [mm]	Locations of Firestop wrap strip	Classification E = fire integrity I = insulation
Geberit Silent-DB20	PE-S2	56 × 3.2	2	EI 90-U/U
		63 × 3.2	3	
		75 × 3.2	3	
		110 × 3.2	4	

Pipe	Pipe diameter [mm]	Pipe wall thickness [mm]	Locations of Firestop wrap strip	Insulation	Classification E = fire integrity I = insulation
Kekelit Kelox pipe (aluminium composite PE-X/Al/PE-X)	32	3.0	1	With continued insulation (Armaflex AF), sustained over the pipe length (CS) Thickness of insulation: 9.0 – 35.0 mm	EI 90-U/U
	75	7.5	2	With continued insulation (Armaflex AF), sustained over the pipe length (CS) Thickness of insulation: 9.0 – 40.5 mm	

Application	Minimum distance between the wraps [mm]
Wrapping with Firestop wrap on both sides of the penetration seal	10

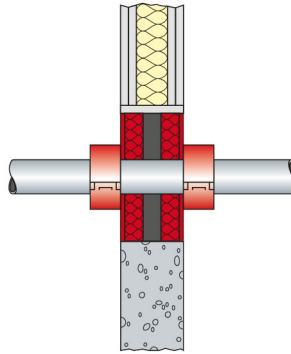## 5.6.2 Applications with Hilti Firestop collar endless

Fig. 15: Classification with Hilti Firestop collar endless

PVC, PE, ABS and PP pipes

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Number of hooks on Firestop collar endless	Classification E = fire integrity I = insulation
PVC pipes according to EN 1452-2	32 – 50 > 50 – 110	1.8/2.2 – 4.8 1.8/2.2 – 5.6 1.8/3.2 – 8.1	2 3	EI 90-U/U
PE/PE-HD in accordance with EN 1519-1, EN 15494, EN 12201 ABS pipes in accordance with EN 1455-1 PP pipes in accordance with EN 1455-1 / 8077-78	32 – 50 > 50 – 110	1.8/2.7 – 6.6	2 3	

Non-regulated pipes

Pipe manufacturer / pipe name	Pipe material	Pipe wall thickness / pipe diameter [mm]	Number of hooks on Firestop collar endless	Classification E = fire integrity I = insulation
Poloplast / Polokal NG	PP / PP mineral reinforced / PP (Z-42.1-241)	32 × 1.8	2	EI 90-U/U
Rehau / Raupiano Plus	PP / PP mineral reinforced / PP (Z-42.1-223)	75 × 1.9 110 × 2.7	3	
Wavin / AS	PP mineral reinforced (Z-42.1-228)	110 × 5.3	3	
Geberit Silent-DB20	PE-S2	56 × 3.2 75 × 3.6 110 × 6.0	3 3 3	

6 Index

Combined penetration seal Hilti coated board system and FK-EU / FKRS-EU fire dampers

Combined penetration seal Hilti coated board system and FK-EU / FKRS-EU fire dampers