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# European Technical Assessment

**ETA-10/0404**  
**of 30/04/2015**

## General part

**Technical Assessment Body issuing the ETA**

Austrian Institute of Construction Engineering (OIB)

**Trade name of the construction product**

Hilti Firestop Collar CFS-C P

**Product family to which the construction product belongs**

Fire Stopping and Fire Sealing Products:  
 Penetration Seals

**Manufacturer**

Hilti AG  
 Feldkircherstrasse 100  
 9494 Schaan  
 Liechtenstein

**Manufacturing plant**

Hilti Plant 5a  
 Hilti Plant 5b

**This European Technical Assessment contains**

41 pages including Annexes 1 to 4 which form an integral part of this assessment

**This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of**

Guideline for European technical approval for "Fire Stopping and Fire Sealing Products", ETAG 026 Part 2: "Penetration Seals", edition August 2011, used as European Assessment Document (EAD)

**This European Technical Assessment replaces**

European technical approval ETA-10/0404 with validity from 31.01.2013 to 30.01.2018



## Specific part

### 1 Technical description of the product

#### 1.1 Definition of the construction product

This European Technical Assessment refers to the Hilti Firestop Collar for use in Penetration Seals with the designation Hilti Firestop Collar CFS-C P.

Hilti Firestop Collar CFS-C P is a pipe closure device installed around plastic pipes to form a penetration seal to reinstate the fire resistance performance of wall and floor constructions, where they have been provided with apertures for the penetration of services.

Ancillary products referred to in this European Technical Assessment within the framework of evaluating resistance to fire (see Annexes 1 and 2) are not covered by this ETA and cannot be CE-marked on the basis of it.

Type of penetration seal system: Pipe closure device – collar (see ETAG 026-2, clause 1.1, table 1-1). Hilti Firestop Collar CFS-C P consists of a steel housing, an intumescent inlay and fastening hooks.

Hilti Firestop Collar CFS-C P is supplied in several sizes – see table below. The collar is installed underneath floors or on both sides of a wall and fixed by hooks and metal anchors.

Collar size	For pipes with nominal outside diameters (mm)	Recommended opening size (mm)	Required number of fastening hooks
CFS-C P 50/1.5"	50	62	2
CFS-C P 63/2"	63	77	2
CFS-C P 75/2.5"	75	82	3
CFS-C P 90/3"	90	112	3
CFS-C P 110/4"	110	122	4
CFS-C P 125/5"	125	142	4
CFS-C P 160/6"	160	182	6
CFS-C P 180/7"	180	210	8
CFS-C P 200/8"	200	230	8
CFS-C P 225/9"	227	260	10
CFS-C P 250/10"	250	280	12

For the purpose of smoke and draft stop, air or water tightness and airborne sound insulation, the gap between opening edge and pipe or collar has to be sealed off by gypsum plaster, cementitious mortar or a construction sealant, the latter optionally in combination with mineral wool as backfilling material, considering the detailed prescriptions given in Annexes 1 and 2.

In case sound decoupling between the pipe and the wall/floor is required, but sound decoupling means around the pipe are missing it is recommended to use Hilti Firestop Acrylic Sealant CFS-S ACR (ETA-10/0292) as annular gap seal. If gypsum plaster or cementitious mortar is intended to be used it is recommended to install a PE foam strip around the pipe over the entire wall or floor thickness for sound decoupling of the pipe. For details see Annexes 1 and 2.

In case air permeability data according to 3.3.1 or airborne sound insulation data according to 3.5.2 are intended to be used, Hilti Firestop Acrylic Sealant CFS-S ACR must be used to seal off the annular gap between pipe and opening edge.

For a description of the installation procedure see Annex 2 and Annex 3.



This European Technical Assessment does not verify the prevention of destruction of adjacent building elements with fire separating function or of the pipes themselves due to distortion forces caused by extreme temperatures. These risks shall be accounted for by taking appropriate measures when designing or installing the pipe work.

The mounting or hanging of the pipes or the layout of the pipe work shall be implemented in such a way that the pipes and the fire-resistant building elements shall remain functional within a period of time which corresponds to the fire resistance period required.

The risk of downward spread of fire caused by burning material which drips through a pipe to floors below, is not considered in this ETA (see EN 1366-3:2009, section 1).

The durability assessment does not take account of the possible effect on the penetration seal of substances permeating through pipe walls.

**2.4 Manufacturing**

Hilti Firestop Collar CFS-C P shall be produced in accordance with the manufacturing process deposited with Österreichisches Institut für Bautechnik. The European Technical Assessment is issued for the product on the basis of agreed data/information, deposited with Österreichisches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Österreichisches Institut für Bautechnik before the changes are introduced. Österreichisches Institut für Bautechnik will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

**2.5 Installation**

The arrangement and installation of Hilti Firestop Collar CFS-C P shall be done in accordance with the details given in Annex 2 and Annex 3 for the penetration seal(s).

**3 Performance of the product and references to the methods used for its assessment**

Basic requirements for construction works	Essential characteristics	Method of verification	Performance
BWR 1	None	Not relevant	
BWR 2	Reaction to fire	EN 13501-1	See clause 3.2.1
	Resistance to fire	EN 13501-2:2007 +A1:2009	See Annex 2
BWR 3	Air permeability (material property)	See clause 3.3.1	
	Water permeability (material property)	See clause 3.3.2	
	Content and/or release of dangerous substances	European Council Directive 67/548/EEC and Regulation (EC) No 1272/2008, as well as EOTA TR 034, edition March 2012	Declaration of conformity by the manufacturer  See clause 3.3.3
BWR 4	Mechanical resistance and stability	No performance assessed	
	Resistance to impact / movement	No performance assessed	
	Adhesion	See clause 3.4.3	
BWR 5	Airborne sound insulation	See clause 3.5.1	
BWR 6	Thermal properties	No performance assessed	
	Water vapour permeability	No performance assessed	
BWR 7	No performance assessed		

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**3.1 Mechanical resistance and stability (BWR 1)**

Not relevant.

**3.2 Safety in case of fire (BWR 2)**

3.2.1 Reaction to fire

The components of construction product Hilti Firestop Collar CFS-C P were assessed according to ETAG 026-Part 2 used as EAD clause 2.4.1 and classified according to EN 13501-1.

Component	Class according to EN 13501-1
CFS-C P	E

The components of construction product Hilti Firestop Acrylic Sealant CFS-S ACR were assessed according to ETAG 026-Part 2 used as EAD clause 2.4.1 and classified according to EN 13501-1.

Component	Class according to EN 13501-1
CFS-S ACR	D-s1, d0

3.2.2 Resistance to fire

The resistance to fire performance according to EN 13501-2 of penetration seals made of Hilti Firestop Collar CFS-C P is given in Annex 2.

Information on ancillary products which were tested within the framework of this European Technical Assessment for evaluating resistance to fire is given in Annex 1.

**3.3 Hygiene, health and environment (BWR 3)**

3.3.1 Air permeability

Air tightness for a single penetration of a plastic pipe, fire stopped with Hilti Firestop Collar CFS-C P can only be achieved when the annular gap is sealed with a sealant, e.g. using Hilti Firestop Acrylic Sealant CFS-S ACR.

For Hilti Firestop Acrylic Sealant CFS-S ACR the gas permeability regarding the gases air, nitrogen (N<sub>2</sub>), carbon dioxide (CO<sub>2</sub>) and CH<sub>4</sub> (methane) has been tested according to the principles of EN 1026 for an Acrylic Sealant thickness of 10 mm. The following flow rates per area (q/A) have been achieved for the given air pressure differences (Δp). The flow rate index indicates the type of gas:

*Gas permeability of Hilti Firestop Acrylic Sealant CFS-S ACR*

Δp [ Pa ]	q/A air [m <sup>3</sup> /(h·m <sup>2</sup> )]	q/A N <sub>2</sub> [m <sup>3</sup> /(h·m <sup>2</sup> )]	q/A CO <sub>2</sub> [m <sup>3</sup> /(h·m <sup>2</sup> )]	q/A CH <sub>4</sub> [m <sup>3</sup> /(h·m <sup>2</sup> )]
50	≤ 1,9E-06	≤ 1,1E-06	≤ 6,4E-05	≤ 4,3E-05
250	≤ 9,7E-06	≤ 5,5E-06	≤ 3,2E-04	≤ 2,1E-04

The declared values refer to a body of pure Hilti Firestop Acrylic Sealant CFS-S ACR without any penetrating installation.

For annular gaps sealed with cementitious mortar or gypsum plaster no performance has been assessed.



### 3.3.2 Water permeability

Water tightness for a single penetration of a plastic pipe, fire stopped with Hilti Firestop Collar CFS-C P can only be achieved when the annular gap is sealed with a sealant, e.g. using Hilti Firestop Acrylic Sealant CFS-S ACR.

The water permeability of Hilti Firestop Acrylic Sealant CFS-S ACR has been tested according to the principles given in Annex C of ETAG 026-2. The specimen consisted of 2 mm Hilti Firestop Acrylic Sealant CFS-S ACR (dry film thickness) on mineral wool. Test result: Water tight to 1000 mm head of water or 9806 Pa.

For annular gaps sealed with cementitious mortar or gypsum plaster no performance has been assessed.

### 3.3.3 Release of dangerous substances

According to the manufacturer's declaration Hilti Firestop Collar CFS-C P does not contain dangerous substances detailed in Council Directive 67/548/EEC and Regulation (EC) no 1272/2008 as well as EOTA TR 034 (General ER 3 Checklist for ETAGs/CUAPs/ETAs-Content and/or release of dangerous substances in products/kits), edition March 2012 above the acceptable limits.

A written declaration in this respect was submitted by the ETA-holder.

In addition to the specific clauses relating to dangerous substances contained in this European Technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

## 3.4 Safety and accessibility in use (BWR 4)

### 3.4.1 Mechanical resistance and stability

No performance assessed.

### 3.4.2 Resistance to impact / movement

No performance assessed.

### 3.4.3 Adhesion

The fixing of the collars (number of hooks, material and dimensions of fasteners) must be done according to the provisions given in Annex 2 and Annex 3.

## 3.5 Protection against noise (BWR 5)

### 3.5.1 Airborne sound insulation

Airborne sound insulation for a single penetration of a plastic pipe, fire stopped with Hilti Firestop Collar CFS-C P can only be achieved when the annular gap is sealed. It has to be noted that the values given in 3.5.2 are only valid if the annular gap is sealed using stone wool as backfilling material (which is not necessary in all cases for fire resistance – see Annex 2).

### 3.5.2 Annular gap seal with Hilti Firestop Acrylic Sealant CFS-S ACR

Test reports from noise reduction according to EN ISO 140-3, EN ISO 20140-10 and EN ISO 717-1 have been provided.

The acoustic tests were performed in a flexible wall and in a rigid wall. Hilti Firestop Acrylic Sealant CFS-S ACR was tested as seal around a steel pipe, filled with concrete.

The seal was 50 mm wide (annular gap) and consisted of 160 mm mineral wool, covered by 20 mm Hilti Firestop Acrylic Sealant CFS-S ACR on both sides (rigid wall) and 50 mm mineral wool covered by 25 mm Hilti Firestop Acrylic Sealant CFS-S ACR on both sides (flexible wall). The area of Hilti Firestop Acrylic Sealant CFS-S ACR was 0,0236 m<sup>2</sup>.

The acoustic characteristics of the walls itself have not been measured. According to these tests reports the single number ratings are:

Flexible wall:

Weighted element-normalized level difference:  $D_{n,e,w} (C, C_{tr}) = 60 (-4; 12)$  dB

From this  $D_{n,e,w}$  the weighted sound reduction index calculates to:  $R_w (C; C_{tr}) = 53 (-4; -12)$  dB

Structure of the flexible wall: 2 x 12,5 mm plasterboard on both sides of a 50 mm metal stud frame. The void was filled with a 50 mm mineral wool slab.

Rigid wall:

Weighted element-normalized level difference:  $D_{n,e,w} (C; C_{tr}) = 58 (-2; -5)$  dB

From this  $D_{n,e,w}$  the weighted sound reduction index calculates to:  $R_w (C; C_{tr}) = 51 (-2; -5)$  dB

Structure of the rigid wall: 200 mm thick concrete wall with a density of 2000 kg/m<sup>3</sup> which was plastered on both sides.

It should be noticed that both above mentioned results apply to the total wall construction of the size  $S = 1,25 \text{ m} \times 1,50 \text{ m} (= 1,88 \text{ m}^2)$ , i.e. the given wall with 0,0236 m<sup>2</sup> Hilti Firestop Acrylic Sealant CFS-S ACR.

$D_{n,e,w}$ : weighted element-normalized level difference of small building elements (given with spectrum adaptation terms C and  $C_{tr}$ )

$R_w$ : weighted sound reduction index (given with spectrum adaptation terms C and  $C_{tr}$ )

### 3.5.3 Annular gap seal with cementitious mortar

Test reports from noise reduction according to EN ISO 140-3, EN ISO 20140-10 and EN ISO 717-1 have been provided.

The acoustic tests were performed in a rigid wall. Results are also applicable of floors of minimum the same thickness. The cementitious mortar was tested as a 500 x 600 x 175 mm block in a wall of 1,25 x 1,50 m. The area of mortar was 0,30 m<sup>2</sup>. The acoustic characteristics of the walls itself have not been measured. According to these tests reports the single number ratings are:

Weighted element-normalized level difference:  $D_{n,e,w} = 59 (-1; -4)$  dB

From this  $D_{n,w}$  the weighted sound reduction index calculates to:  $R_w = 52 (-1; -5)$  dB

Structure of the rigid wall: 175 mm thick blockwork wall with a density of 2000 kg/m<sup>3</sup> which was plastered on both sides.

It should be noticed that both above mentioned results apply to the total wall construction of the size  $S = 1,25 \text{ m} \times 1,50 \text{ m} (= 1,88 \text{ m}^2)$ , i.e. the given wall with 0,30 m<sup>2</sup> cementitious mortar. For smaller mortar seals in a wall of the same size the values will be higher.

$D_{n,e,w}$ : weighted element-normalized level difference of small building elements (given with spectrum adaptation terms C and  $C_{tr}$ )

$R_w$ : weighted sound reduction index (given with spectrum adaptation terms C and  $C_{tr}$ )

## 3.6 Energy economy and heat retention (BWR 6)

### 3.6.1 Thermal properties

No performance assessed.

### 3.6.2 Water vapour permeability

No performance assessed.









## ANNEX 1 DESCRIPTION OF THE PRODUCT AND ANCILLARY PRODUCT(S)

### 1.1 Product

#### Hilti Firestop Collar CFS-C P

The housing of the collar consists of electrolytic galvanized steel, the inlay consists of one or more intumescent strips. A detailed specification of the product is contained in document "Identification / Product Specification relating to ETA-10/0404 Hilti Firestop Collar CFS-C P" which is a non-public part of this ETA.

The Control Plan is defined in document "Control Plan of 29.03.2011 relating to ETA-10/0404 - Hilti Firestop Collar CFS-C P" which is a non-public part of this ETA.

#### Technical product literature:

- Technical Data Sheet Hilti Firestop Collar CFS-C P (including the use of ancillary products according to Annex 1.2).

### 1.2 Ancillary products

#### 1.2.1 Hilti Firestop Acrylic Sealant CFS-S ACR

A detailed specification of the product is contained in document "Identification / Product Specification and Control Plan of 19.05.2010 relating to ETA-10/0292 and ETA-10/0389 - Hilti Firestop Acrylic Sealant CFS-S ACR" which is a non-public part of the referenced ETAs.

#### 1.2.2 Gypsum plaster

Any gypsum plaster suitable for use with flexible wall constructions or the intended type of rigid walls or floors may be used.

#### 1.2.3 Cementitious mortar

Any cementitious mortar suitable for use with the intended type of rigid walls or floors may be used.

#### 1.2.4 Mineral wool

Loose mineral wool products suitable for being used as backfilling material of Hilti Firestop Acrylic Sealant CFS-S ACR

Product	Manufacturer	Specification
Heralan LS	Knauf Insulation GmbH	Product data sheet of Knauf
Isover loose wool SL	Saint-Gobain ISOVER	Product data sheet of Isover
Isover Universal-Stopfwole	Saint-Gobain ISOVER	Product data sheet of Isover
Rockwool RL	Rockwool	Product data sheet of Rockwool
Paroc Pro Loose Wool	Paroc OY AB	Product data sheet of Paroc

#### 1.2.5 Suitable insulation product – reaction to fire

Combustible insulation (closed cell flexible elastomeric foam, e.g. AF/Armaflex)	minimum B-s3, d0 (acc. to EN 13501-1)
Combustible insulation for sound decoupling (elastomeric foam, e.g. PE)	minimum E (acc. to EN 13501-1)

## ANNEX 2

### RESISTANCE TO FIRE CLASSIFICATION OF PENETRATION SEALS MADE OF HILTI FIRESTOP COLLAR CFS-C P

Intended use of pipes<sup>3</sup> and reference to relevant section

Application	Pipe material	Manufacturer, product	Insulation	see section			
				Flexible and rigid wall ≥ 100 mm	Rigid wall ≥ 150 mm	Rigid floor ≥ 550 kg/m <sup>3</sup>	Rigid floor ≥ 2400 kg/m <sup>3</sup>
Heating	Al-Composite	Geberit Mepla	-	-	-	2.4.2.1.1	2.3.2.1.1
			CS	2.1.2.1	2.1.2.1	2.4.2.1.2	2.3.2.1.2
		KeKelit KELOX KM 110	CS	2.1.2.2	2.1.2.2	2.4.2.2	2.3.2.2
		Rehau Rautitan stabil	CS	2.1.2.3	2.1.2.3	2.4.2.3	2.3.2.3
	PE-X	Rehau Rautitan flex	CS	2.1.3.5	2.1.3.5	2.4.3.3	2.3.3.5
Potable water	Al-Composite	Geberit Mepla	-	-	-	2.4.2.1.1	2.3.2.1.1
			CS	2.1.2.1	2.1.2.1	2.4.2.1.2	2.3.2.1.2
		KeKelit KELOX KM 110	CS	2.1.2.2	2.1.2.2	2.4.2.2	2.3.2.2
		Rehau Rautitan stabil	CS	2.1.2.3	2.1.2.3	2.4.2.3	2.3.2.3
	PE	EN 12201-2	-	2.1.3.1	2.1.3.1, 2.2.1	-	2.3.3.1
	PE-HD 100 RC	Wavin TS	-	2.1.3.4.1	2.1.3.4.1	-	2.3.3.4.1
			CS/LS	2.1.3.4.2	2.1.3.4.2	-	2.3.3.4.2
	PE-X	Rehau Rautitan flex	CS	2.1.3.5	2.1.3.5	2.4.3.3.1	2.3.3.5
	PP	EN ISO 15874, DIN 8077/8078 (e.g. Aquatherm green Aquatherm green faserverbund)	-	2.1.4.1.1, 2.1.4.1.2	2.1.4.1.1, 2.1.4.1.2, 4.1.2	2.4.4.1.1, 2.4.4.1.2	2.3.4.1.1, 2.3.4.1.2
			CS/LS	2.1.4.1.3	2.1.4.1.3	2.4.4.1.3	2.3.4.1.3
CS/LS			2.1.4.3	2.1.4.3		2.3.4.1	
	CS/LS	2.1.4.4	2.1.4.4				
PVC-C	Friatherm starr	CS/LS	2.1.5.2	2.1.5.2	-	2.3.5.3	
Refrigeration	ABS	+GF+ COOL-FIT	CS	2.1.1	-	2.4.1	2.3.1
Waste water Roof Drainage	PE	EN 1519, EN 12666-1	-	2.1.3.1.1	2.1.3.1, 2.2.1	-	2.3.3.1
			Cl/CS	2.1.3.1.2, 2.1.3.1.3			
	PE-HD 1000 RC	Wavin TS	-	2.1.3.4.1	2.1.3.4.1	2.4.3.2	2.3.3.4.1
			CS/LS	2.1.3.4.2	2.1.3.4.2	-	2.3.3.4.2
	PE-S2	Geberit Silent db20	-	2.1.3.3	2.1.3.3	2.4.4.5	2.3.3.3
	PP	EN 1451-1	-	2.1.4.5	2.1.4.5	-	2.3.4.2
		Aquathermblue Aquatherm blue faserverbund	-	2.1.4.1	2.1.4.1		2.3.4.1
		Magnaplast Skolan dB	-	2.1.4.1	2.1.4.1	-	2.3.4.3
		Pipelife Master 3	-	2.1.4.1	2.1.4.1	2.4.4.2	2.3.4.1
		Poloplast Polo Kal NG	-	2.1.4.1	2.1.4.1, 2.2.4	2.4.4.3	2.3.4.1
		Poloplast Polo Kal 3S	-	2.1.4.1	2.1.4.1	2.4.4.4	2.3.4.1
		Rehau Raupiano Plus	-	2.1.4.1	2.1.4.1, 2.2.4	-	2.3.4.4
		Wavin AS/KeKelit "Phonex AS"	-	2.1.4.1	2.1.4.1, 2.2.4	-	2.3.4.5
	Wavin SiTech	-	2.1.4.1	2.1.4.1	-	2.3.4.6	
	PVC-C	EN 1566-1	-	2.1.5.1	2.1.5.1	2.4.5.1	2.3.5.1
PVC-U	EN ISO 1452, EN 1329-1, EN 1453-1	-	2.1.5.1	2.1.5.1	2.4.5.1	2.3.5.1	

<sup>3</sup> According to technical literature of pipe manufacturers

Application	Pipe material	Manufacturer, product	Insulation	see section			
				Flexible and rigid wall $\geq 100$ mm	Rigid wall $\geq 150$ mm	Rigid floor $\geq 550$ kg/m <sup>3</sup>	Rigid floor $\geq 2400$ kg/m <sup>3</sup>
Pneumatic	Al-composite	Geberit Mepla	-	-	-	2.4.2.1	2.3.2.1.1
	PP	DIN 8077/8078	-	2.1.4.1.1, 2.1.4.1.2	2.1.4.1.1, 2.1.4.1.2	2.4.4.1	2.3.4.1.1
Sprinkler	PP-R	Aquatherm red	-	2.1.4.1.1, 2.1.4.1.2	2.1.4.1.1, 2.1.4.1.2	2.4.4.1	2.3.4.1
Industry	Al-Composite		-	2.1.2	2.1.2	2.4.2	2.3.2
	PE	EN ISO 15494, DIN 8074/8075	-	2.1.3.2	2.1.3.2, 2.2.2	2.4.3.1	2.3.3.2
	PP	DIN 8077/8078	-	2.1.4.1	2.1.4.1	2.4.4.1	2.3.4.1
		Aquatherm blue Aquatherm blue faserverbund	-	2.1.4.1	2.1.4.1	2.4.4.1	2.3.4.1
	PVC-U	EN ISO 15493, DIN 8061/8062	-	2.1.5.1	2.1.5.1, 2.2.3	2.4.5.1	2.3.5.1



## 2.1 Flexible and rigid walls, minimum wall thickness 100 mm

### Flexible walls:

The wall must have a minimum thickness of 100 mm and comprise timber or steel studs lined on both faces with minimum 2 layers of 12,5 mm thick boards. For timber stud walls there must be a minimum distance of 100 mm of the seal to any stud and the cavity between stud and seal must be closed and minimum 100 mm insulation of Class A1 or A2 (in accordance with EN 13501-1) in the cavity between stud and seal.

### Rigid walls:

The wall must have a minimum thickness of 100 mm and minimum density of 450 kg/m<sup>3</sup> and comprise concrete, aerated concrete or masonry.

### Penetration seal:

Single penetration;

Hilti Firestop Collar CFS-C P (A<sub>1</sub>) on both sides.

### Annular gap filled with:

Flexible walls:

Gypsum plaster (A<sub>3</sub>) over the entire thickness of the wall or

Hilti Firestop Acrylic Sealant CFS-S ACR (A<sub>2</sub>) on both sides with a depth of minimum 25 mm from the surface of the wall.

Rigid walls:

Gypsum plaster (A<sub>3</sub>) or cementitious mortar over the entire thickness of the wall or

Hilti Firestop Acrylic Sealant CFS-S ACR (A<sub>2</sub>) on both sides with a depth of minimum 15 mm from the surface of the wall. The sealant may be backfilled with mineral wool.

**Width of annular gap:** The opening diameter should not be larger than the collar outside diameter to allow a safe fixing of the collar to the wall.

### Distance between penetrations:

Minimum distance between collars / annular gap (s<sub>1</sub>):

Non-insulated pipes: 0 mm

Insulated pipes: 0 mm

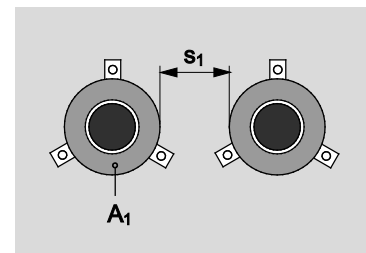
**Collars to be fixed** with hooks (F) and threaded rods M8 through the wall and nuts on both sides of the wall. In high density rigid walls alternatively metal anchors with minimum Ø 8 mm may be used.

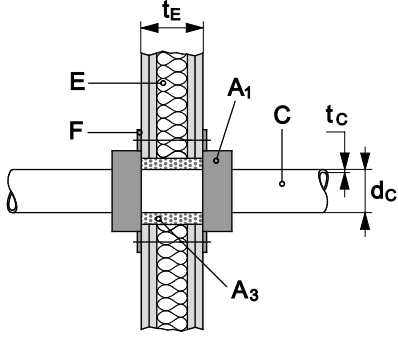
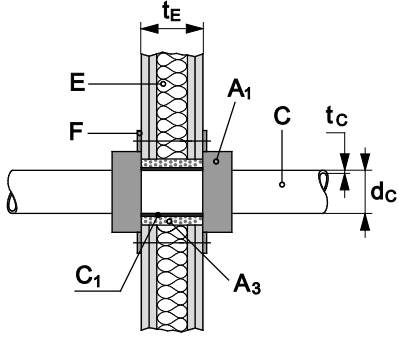
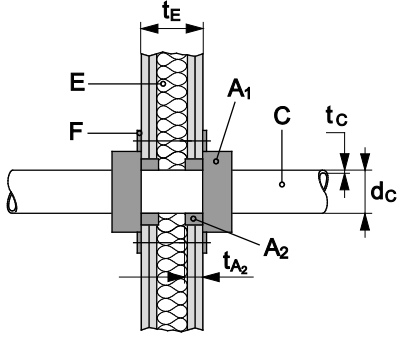
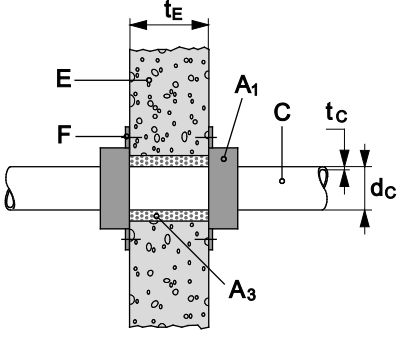
For minimum number of hooks see 1.1.

Pipes shall be supported at maximum 300 mm away from both faces of wall constructions.

**Sound decoupling:** Sound decoupling strips (C<sub>1</sub>) based on combustible insulation (elastomeric foam, e.g. PE) minimum E (acc. to EN 13501-1), used in combination with gypsum plaster or mortar as gap filler. Sound decoupling installed around the pipe within the wall. For maximum thickness see tables below.

**Pipe insulation:** Combustible insulation (closed cell flexible elastomeric foam, e.g. AF/Armaflex), reaction to fire minimum B-s3, d0 (acc. to EN 13501-1) installed in wall application. For maximum thickness see tables below.



<p>Annular gap seal (drawings show non-insulated pipes as example)</p>	
<p>Gypsum plaster (<math>A_3</math>)</p>	
<p>Gypsum plaster (<math>A_3</math>) together with sound decoupling (<math>C_1</math>)</p>	
<p>Hilti Firestop Acrylic Sealant CFS-S ACR (<math>A_2</math>)</p>	
<p>Gypsum plaster or cementitious mortar (<math>A_3</math>)</p>	

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<p>Gypsum plaster or cementitious mortar (<math>A_3</math>) together with sound decoupling (<math>C_1</math>)</p>	
<p>Hilti Firestop Acrylic Sealant CFS-S ACR (<math>A_2</math>)</p>	
<p><b>Pipe insulation</b> (drawings show mortar as an example for the annular gap seal)</p>	
<p>Local/Sustained pipe insulation (LS)</p>	<p>Continued/Sustained pipe insulation (CS)</p>

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<b>Penetrating services</b>				
<b>2.1.1 ABS pipes +GF+ "COOL-FIT" (ABS/PUR insulation/PE-HD)</b>				
Pipe diameter $d_c$ (mm)	Inner pipe diameter (mm)	Collar size ( $A_1$ )	Classification	
90	32	CFS-C P 90/3"	EI 120-U/C	
110	40	CFS-C P 110/4"	EI 120-U/C	
110	50	CFS-C P 110/4"	EI 120-U/C	
160	90	CFS-C P 160/6"	EI 120-U/C	
180	110	CFS-C P 180/7"	EI 120-U/C	
225	140	CFS-C P 225/9"	EI 120-U/C	
250	160	CFS-C P 250/10"	EI 60-U/C	
<b>2.1.2 Al-composite pipes</b>				
<b>2.1.2.1 Geberit "Mepla" pipes (PE-Xb/Al/PE-HD)</b>				
Combustible insulation (D) - arrangement CS				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
16	2,0	11,5	CFS-C P 50/1.5"	EI 120-U/C
20	2,5	11,5 - 13	CFS-C P 63/2"	EI 120-U/C
26	3,0	11,5 - 13	CFS-C P 63/2"	EI 120-U/C
32	3,0	13	CFS-C P 63/2"	EI 120-U/C
40	3,5	9	CFS-C P 63/2"	EI 120-U/C
50	4,0	9	CFS-C P 63/2"	EI 120-U/C
63	4,5	10	CFS-C P 75/2.5"	EI 60-U/C
75	4,7	10	CFS-C P 90/3"	EI 90-U/C
<b>2.1.2.2 KeKelit "KELOX KM 110" pipes (PE-X/Al/PE-X)</b>				
Combustible insulation (D) - arrangement CS				
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
16	2,0	11,5	CFS-C P 50/1.5"	EI 120-U/C
20	2,25	11,5 - 13	CFS-C P 63/2"	EI 120-U/C
25	2,5	11,5 - 13	CFS-C P 63/2"	EI 120-U/C
32	3,0	13	CFS-C P 63/2"	EI 120-U/C
32	3,0	9	CFS-C P 50/1.5"	EI 90-U/C
40	4,0	9	CFS-C P 50/1.5"	EI 90-U/C
50	4,5	9	CFS-C P 63/2"	EI 90-U/C
63	6,0	10	CFS-C P 75/2.5"	EI 90-U/C

### 2.1.2.3 Rehau "Rautitan stabil" pipes (PE-Xb/Al/PE-HD)

#### Combustible insulation (D) - arrangement CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
16	2,6	11,5	CFS-C P 50/1.5"	EI 120-U/C
20	2,9	11,5 - 13	CFS-C P 63/2"	EI 120-U/C
25	3,7	11,5 - 13	CFS-C P 63/2"	EI 120-U/C
32	4,7	13	CFS-C P 63/2"	EI 120-U/C
40	6,0	9	CFS-C P 63/2"	EI 120-U/C

### 2.1.3 PE pipes

#### 2.1.3.1 PE pipes according to EN 1519-1<sup>4</sup>

##### 2.1.3.1.1 Without insulation

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	3,0	CFS-C P 50/1.5"	EI 120-U/U
63	3,0	CFS-C P 63/2"	EI 120-U/U
75	3,0	CFS-C P 75/2.5"	EI 120-U/U
90	3,5	CFS-C P 90/3"	EI 120-U/U
110	4,2	CFS-C P 110/4"	EI 120-U/U
125	4,8	CFS-C P 125/5"	EI 120-U/U
160	6,2	CFS-C P 160/6"	EI 120-U/U

Maximum thickness of sound decoupling: 5 mm

The results of 2.1.2.2 are also valid for PE pipes according to EN 12201-2 and EN 12666-1.

##### 2.1.3.1.2 Combustible insulation (D) – arrangement CI

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
110	4,2	10	CFS-C P 125/5"	EI 90-U/U

##### 2.1.3.1.3 Combustible insulation (D) – arrangement CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
110	4,2	25	CFS-C P 160/6"	EI 90-U/U

<sup>4</sup> In Germany the pipes have additionally to comply with DIN 19535-10.

### 2.1.3.2 PE pipes according to EN ISO 15494 and DIN 8074/8075

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	2,9 – 4,6	CFS-C P 50/1.5"	EI 120-U/U
63	1,8 – 5,8	CFS-C P 63/2"	EI 90-U/U
63	3,6 – 5,8	CFS-C P 63/2"	EI 120-U/U
75	1,9 – 6,8	CFS-C P 75/2.5"	EI 120-U/U
90	2,2 – 8,2	CFS-C P 90/3"	EI 120-U/U
110	2,7 – 10,0	CFS-C P 110/4"	EI 120-U/U
125	3,1 – 7,1	CFS-C P 125/5"	EI 120-U/U
160	4,0 – 9,1	CFS-C P 160/6"	EI 120-U/U

Maximum thickness of sound decoupling: 5 mm

### 2.1.3.3 Geberit "Silent dB20" pipes (PE-S2)

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
56	3,2	CFS-C P 63/2"	EI 120-U/U
63	3,2	CFS-C P 63/2"	EI 120-U/U
75	3,6	CFS-C P 75/2.5"	EI 120-U/U
90	5,6	CFS-C P 90/3"	EI 120-U/U
110	6,0	CFS-C P 110/4"	EI 120-U/U

Maximum thickness of sound decoupling: 9 mm

### 2.3.3.1 Pipe end configuration C/U

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
135	6,0	CFS-C P 160/6"	EI 120-C/U
160	7,0	CFS-C P 160/6"	EI 120-C/U

Maximum thickness of sound decoupling: 9 mm

### 2.1.3.4 Wavin "TS" pipes (PE-HD 100 RC)

#### 2.1.3.4.1 Without insulation

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	4,6	CFS-C P 50/1.5"	EI 90-U/U
75	6,8	CFS-C P 75/2.5"	EI 120-U/U
90	8,2	CFS-C P 90/3"	EI 120-U/U
110	10,0	CFS-C P 110/4"	EI 120-U/U

Maximum thickness of sound decoupling: 9 mm



**2.1.3.4.2 Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 250$  mm) or CS**

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
50	4,6	9	CFS-C P 63/2"	EI 120-U/C
63	5,8	10	CFS-C P 75/2.5"	EI 120-U/C
75	6,8	10	CFS-C P 90/3"	EI 120-U/C
90	8,2	10	CFS-C P 110/4"	EI 120-U/C
110	10,0	10	CFS-C P 125/5"	EI 120-U/C

**2.1.3.5 PE-X pipes**

**2.1.3.5.1 Rehau "Rautitan flex" pipes (PE-Xa)**

**Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 250$  mm) or CS**

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
40	5,5	9	CFS-C P 63/2"	EI 120-U/C
50	6,9	9	CFS-C P 63/2"	EI 120-U/C
63	8,6	10	CFS-C P 75/2.5"	EI 120-U/C

**2.1.4 PP pipes**

**2.1.4.1 PP pipes according to EN ISO 15874<sup>5</sup> and/or DIN 8077/8078**

(e.g. Aquatherm blue , Aquatherm blue Faserverbundrohr, Aquatherm red , Aquatherm green , Aquatherm green Faserverbundrohr, +GF+ PROGEF Standard pipe, +GF+ Dekaprop Industry pipe)

**2.1.4.1.1 Without insulation – pipe end configuration U/U**

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	1,8 - 2,9	CFS-C P 50/1.5"	EI 90-U/U
63	1,8 - 5,8	CFS-C P 63/2"	EI 60-U/U
75	1,9 – 6,8	CFS-C P 75/2,5"	EI 60-U/U
75	6,8 - 12,5	CFS-C P 75/2.5"	EI 120 U/U
90	8,2 - 15,0	CFS-C P 90/3"	EI 120 U/U
110	2,7	CFS-C P 110/4"	EI 120 U/U

**2.1.4.1.2 Without insulation – pipe end configuration U/C**

50	4,6 - 8,3	CFS-C P 50/1.5"	EI 90-U/C
63	5,8 - 10,5	CFS-C P 63/2"	EI 60-U/C
63	10,5	CFS-C P 63/2"	EI 120 U/C
75	1,9- 6,8	CFS-C P 75/2.5"	EI 60 U/C
75	6,8 – 12,5	CFS-C P 75/2.5"	EI 120 U/C

Maximum thickness of sound decoupling: 9 mm

<sup>5</sup> Not all listed wall thicknesses may be available for pipes according to EN ISO 15874

### 2.1.4.1.3 Combustible insulation (D) - arrangement LS (length of insulation $L_D \geq 250$ mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
40	3,7 - 5,5	9	CFS-C P 50/1.5"	EI 120 U/C
50	4,6 - 6,9	9	CFS-C P 63/2"	EI 120 U/C
75	6,8 - 10,3	10	CFS-C P 90/3"	EI 120 U/C
90	10,0 - 15,1	22,5	CFS-C P 125/5"	EI 120 U/C

### 2.1.4.3 Aquatherm "green " pipes with insulation

Pipe series SDR 11; Combustible insulation (D) - arrangement LS (length of ins.  $L_D \geq 250$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
40	3,7	9	CFS-C P 50/1.5"	EI 120-U/C
50	4,6	9	CFS-C P 63/2"	EI 120-U/C
75	6,8	10	CFS-C P 90/3"	EI 120-U/C
110	10,0	10	CFS-C P 125/5"	EI 120-U/C

### 2.1.4.4 Aquatherm "green Faserverbundrohr" pipes with insulation

Combustible insulation (D) – arrangement LS (length of insulation  $L_D \geq 250$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
40	5,5	9	CFS-C P 50/1.5"	EI 120-U/C
50	6,9	9	CFS-C P 63/2"	EI 120-U/C
75	10,3	10	CFS-C P 90/3"	EI 120-U/C
110	15,1	10	CFS-C P 125/5"	EI 120-U/C

### 2.1.4.5 PP pipes according to EN 1451-1

(e.g. **Ostendorf** "Skolan-dB", "Phonex AS", Pipelife "Master 3", POLOPLAST "Polo Kal NG", POLOPLAST "Polo Kal 3S", Rehau "Raupiano Plus", Wavin "AS" /KeKelit "Phonex AS", Wavin "SiTech", Cloes "Blue Power", Cloes "PhoNoFire", Valsire "Triplus", Valsire "Silere", Marley "Silent", "Geberit Silent PP")

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
32	1,8	CFS-C P 50/1.5"	EI 120-U/U
40	1,8	CFS-C P 50/1.5"	EI 120-U/U
50	1,8 - 2,0	CFS-C P 50/1.5"	EI 120-U/U
56	4,0	CFS-C P 63/2"	EI 90-U/UG
70	4,5	CFS-C P 75/2.5"	EI 120-U/U
75	1,8 - 3,8	CFS-C P 75/2.5"	EI 120-U/U
90	2,8 - 4,5	CFS-C P 90/3"	EI 120-U/U
110	2,7 - 5,3	CFS-C P 110/4"	EI 120 U/U

Maximum thickness of sound decoupling: 9 mm

## 2.1.5 PVC pipes

### 2.1.5.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	2,4 – 5,6	CFS-C P 50/1.5"	EI 120-U/U
63	3,0 – 4,7	CFS-C P 63/2"	EI 120-U/U
75	2,2 – 3,6	CFS-C P 75/2.5"	EI 120-U/U
90	2,7 – 4,3	CFS-C P 90/3"	EI 120-U/U
110	2,2 – 8,1	CFS-C P 110/4"	EI 120-U/U
125	3,7 – 6,0	CFS-C P 125/5"	EI 120-U/U
160	2,5 – 11,8	CFS-C P 160/6"	EI 120-U/U

Maximum thickness of sound decoupling: 5 mm

The results of 2.1.5.1 are also valid for PVC-C pipes according to EN 1566-1<sup>6</sup> and PVC-U pipes according to EN 1329-1<sup>7</sup> and EN 1453-1<sup>7</sup>.

### 2.1.5.2 Friatec Friatherm-starr pipes (PVC-C)

Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 200$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
32	3,6	9	CFS-C P 50/1.5"	EI 120-U/C
40	4,5	9	CFS-C P 63/2"	EI 120-U/C
50	5,6	9	CFS-C P 75/2.5"	EI 120-U/C
63	7,1	10	CFS-C P 90/3"	EI 120-U/C

<sup>6</sup> It is recommended only to use gypsum plaster or cementitious mortar as annular gap seal for PVC-C pipes together with sound decoupling according to Annex 1.2.5

<sup>7</sup> In Germany the pipes have additionally to comply with DIN 19531-10

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**2.2 Rigid walls, minimum wall thickness 150 mm**

The wall must have a minimum thickness of 150 mm and a minimum density of 650 kg/m<sup>3</sup> and comprise concrete, aerated concrete or masonry.

**Penetration seal:**

Single penetration;

Hilti Firestop Collar CFS-C P (A<sub>1</sub>) on both sides.

**Annular gap** filled either with gypsum plaster or cementitious mortar (A<sub>3</sub>) over the entire thickness of the wall or with Hilti Firestop Acrylic Sealant CFS-S ACR (A<sub>2</sub>) with a depth of minimum 15 mm from the surface of the wall. The sealant may be backfilled with mineral wool.

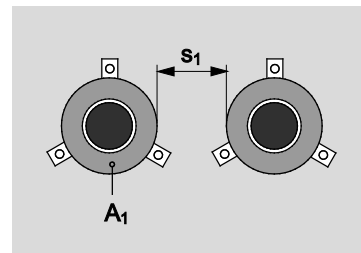
**Width of annular gap:** The opening diameter should not be larger than the collar outside diameter to allow a safe fixing of the collar to the wall except stated otherwise in the table below.

**Distance between penetrations:**

Minimum distance between collars / annular gap edge (s<sub>1</sub>):

Non insulated pipes: 0 mm

Insulated pipes: 0 mm



**Collars to be fixed** with hooks (F) and M8 metal anchors. In high density rigid walls alternatively metal anchors with minimum Ø 8 mm may be used. For minimum number of hooks see 1.1.

**Sound decoupling:** Sound decoupling strips (C<sub>1</sub>) based on combustible insulation (elastomeric foam, e.g. PE) minimum E (acc. to EN 13501-1), used in combination with gypsum plaster or mortar as gap filler. Sound decoupling installed around the pipe within the wall. For maximum thickness see tables below.

For further construction details see 2.1.

**Penetrating services**

**2.2.1 PE pipes according to EN 1519-1<sup>8</sup>**

Pipe diameter d <sub>c</sub> (mm)	Pipe wall thickness t <sub>c</sub> (mm)	Collar size (A <sub>1</sub> )	Classification
200	6,2	CFS-C P 200/8"	EI 120 U/U
250	7,8	CFS-C P 250/10"	EI 120 U/U

Maximum thickness of sound decoupling: 5 mm

The results of 2.2.1 are also valid for PE pipes according to EN 12201-2 and EN 12666-1.

**2.2.2 PE pipes according to EN ISO 15494 and DIN 8074/8075**

Distance between pipe and seal edge in wall (width of annular gap): ≤ 17,5 mm

**2.2.2.1 Pipe end configuration U/U**

Pipe diameter d <sub>c</sub> (mm)	Pipe wall thickness t <sub>c</sub> (mm)	Collar size (A <sub>1</sub> )	Classification
180	4,4 – 16,4	CFS-C P 180/7"	EI 120-U/U
200	4,9 – 11,4	CFS-C P 200/8"	EI 120-U/U
200	11,4	CFS-C P 200/8"	EI 180-U/U
225	5,5 – 12,8	CFS-C P 225/9"	EI 180-U/U
250	6,2 – 14,2	CFS-C P 250/10"	EI 180-U/U

<sup>8</sup> In Germany the pipes have additionally to comply with DIN 19535-10.

2.2.2.2 Pipe end configuration U/C			
50	2,9	CFS-C P 50/1.5"	EI 180-U/C
250	7,8	CFS-C P 250/10"	EI 180-U/C
250	7,8 – 22,7	CFS-C P 250/10"	EI 120-U/C

Maximum thickness of sound decoupling: 5 mm

2.2.3 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062			
Distance between pipe and seal edge in floor (width of annular gap): $\leq 17,5$ mm			
2.2.3.1 Pipe end configuration U/U			
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
180	3,6 – 8,6	CFS-C P 180/7"	EI 180 U/U
200	4,0 – 9,6	CFS-C P 200/8"	EI 180 U/U
225	4,5 – 10,8	CFS-C P 225/9"	EI 180 U/U
250	4,9 – 11,9	CFS-C P 250/10"	EI 180 U/U
2.2.3.2 Pipe end configuration U/C			
50	1,8	CFS-C P 50/1.5"	EI 180-U/C
250	4,9 – 11,9	CFS-C P 250/10"	EI 180-U/C
The results of 2.2.3 are also valid for PVC-C pipes according to EN 1566-1 <sup>6</sup> and PVC-U pipes according to EN 1329-1 <sup>7</sup> and EN 1453-1 <sup>7</sup> .			

2.2.4 PP pipes according to EN 1451-1 and DIN EN 12056			
(e.g. Ostendorf "Skolan-dB", "Phonex AS", Pipelife "Master 3", POLOPLAST "Polo Kal NG", POLOPLAST "Polo Kal 3S", Rehau "Raupiano Plus", Wavin "AS" /KeKelit "Phonex AS", Wavin "SiTech", Cloes "Blue Power", Cloes "PhoNoFire", Valsire "Triplus", Valsire "Silere", Marley "Silent", "Geberit Silent PP")			
Distance between pipe and seal edge in wall (width of annular gap): $\leq 30$ mm			
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
200	6,2 - 6,8	CFS-C P 200/8"	EI 120-C/U
250	8,6	CFS-C P 250/10"	EI 120-C/U
Maximum thickness of sound decoupling: 9 mm			

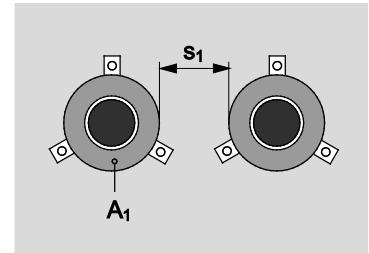
2.3 Rigid floor, minimum density of 2400 kg/m <sup>3</sup>
The floor must have a minimum thickness of 150 mm and comprise concrete with a minimum density of 2400 kg/m <sup>3</sup> .
<b>Penetration seal:</b> Single penetration; Hilti Firestop Collar CFS-C P ( $A_1$ ) on the underside of the floor.
<b>Annular gap</b> filled either with gypsum plaster or cementitious mortar ( $A_3$ ) over the entire thickness of the floor or with mineral wool of minimum density 60 kg/m <sup>3</sup> covered by Hilti Firestop Acrylic Sealant CFS-S ACR ( $A_2$ ) on top side (or on both sides) with a depth of minimum 10 mm.
<b>Width of annular gap:</b> Classifications EI 120 and lower (opening diameter up to 300 mm), classification EI 180 (opening diameter up to 260 mm): The opening diameter should not be larger than the collar outside diameter to allow a safe fixing of the collar to the floor. Classification EI 180 (opening diameter > 260 mm): see in tables below.

**Distance between penetrations:**

Minimum distance between collars / annular gap edge ( $s_1$ ):

Non-insulated pipes: 0 mm

Insulated pipes: 0 mm

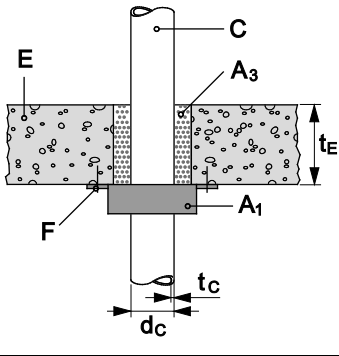
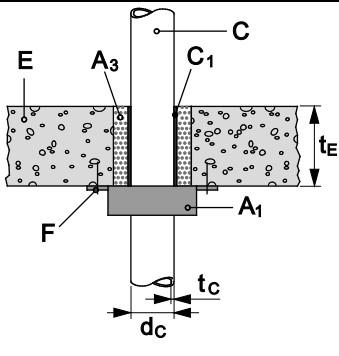
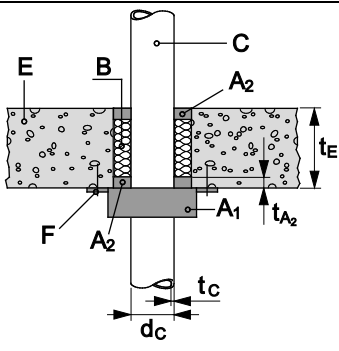


**Collars to be fixed** with hooks and metal anchors with minimum  $\varnothing$  6 mm (up to collar size 110/4") and minimum  $\varnothing$  10 mm (from collar size 125/5" to 250/10"). For minimum number of hooks see 1.1.

Pipes shall be supported at maximum 200 mm (pipes according to 2.3.1), at maximum 300 mm (all others) away from the upper face of the floor construction.

**Sound decoupling:** Sound decoupling strips ( $C_1$ ) based on combustible insulation (elastomeric foam, e.g. PE) minimum E (acc. to EN 13501-1), used in combination with gypsum plaster or mortar as gap filler. Sound decoupling installed around the pipe within the floor. For maximum thickness see tables below.

**Pipe insulation:** Combustible insulation (closed cell flexible elastomeric foam, e.g. AF/Armaflex), reaction to fire minimum B-s3, d0 (acc. to EN 13501-1) installed in floor application. For maximum thickness see tables below.

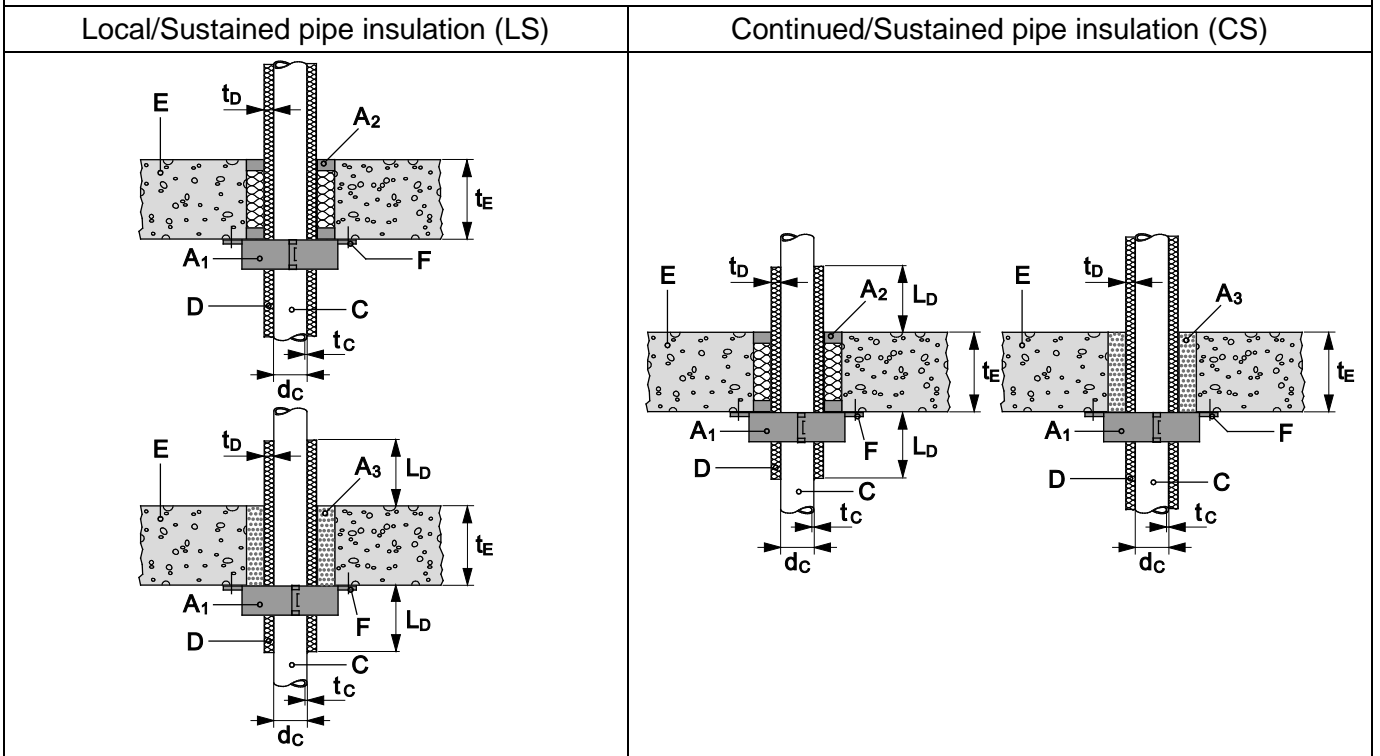
<p>Annular gap seal (drawings show non-insulated pipes as example)</p>	
<p>Gypsum plaster or cementitious mortar (<math>A_3</math>)</p>	
<p>Cementitious mortar (<math>A_3</math>) together with sound decoupling (<math>C_1</math>)</p>	
<p>Hilti Firestop Acrylic Sealant CFS-S ACR (<math>A_2</math>)</p>	



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**Pipe insulation**

(drawings show mortar as an example for the annular gap seal)



**Penetrating services**

**2.3.1 ABS pipes +GF+ "COOL-FIT" (ABS/PUR insulation/PE-HD)**

Pipe diameter $d_c$ (mm)	Inner pipe diameter (mm)	Collar size ( $A_1$ )	Classification
90	32	CFS-C P 90/3"	EI 120-U/C
110	40	CFS-C P 110/4"	EI 120-U/C
110	50	CFS-C P 110/4"	EI 120-U/C
160	90	CFS-C P 160/6"	EI 120-U/C
180	110	CFS-C P 180/7"	EI 60-U/C
225	140	CFS-C P 225/9"	EI 120-U/C
250	160	CFS-C P 250/10"	EI 120-U/C

**2.3.2 Al-composite pipes**

**2.3.2.1 Geberit "Mepla" pipes (PE-Xb/Al/PE-HD)**

2.3.2.1.1 Without insulation

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
40	3.5	CFS-C P 50/1.5"	EI 90-U/C
50	4.0	CFS-C P 50/1.5"	EI 120-U/C
63	4.5	CFS-C P 63/2"	EI 60-U/C
75	4.7	CFS-C P 75/2.5"	EI 30-U/C
110	6,0	CFS-C P 110/4"	EI 180-U/C

Maximum thickness of sound decoupling: 9 mm

**2.3.2.1.2 Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 250$  mm) or CS**

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
40	3.5	9	CFS-C P 63/2"	EI 180-U/C
50	4.0	9	CFS-C P 63/2"	EI 180-U/C
63	4.5	9	CFS-C P 75/2.5"	EI 180-U/C
75	4.7	10	CFS-C P 90/3"	EI 180-U/C
40	3.5	9 - 20,5	CFS-C P 63/2" - 75/2.5"	EI 120-U/C
50	4.0	9 - 21	CFS-C P 63/2" - 90/3"	EI 120-U/C
63	4.5	9 - 21,5	CFS-C P 75/2.5" - 110/4"	EI 120-U/C
75	4.7	10 - 22	CFS-C P 90/3" - 125/5"	EI 120-U/C

**2.3.2.2 KeKelit "KELOX KM 110" pipes (PE-X/Al/PE-X)**

Combustible insulation (D) - arrangement CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
32	3.0	9	CFS-C P 50/1.5"	EI 180-U/C
40	4.0	9	CFS-C P 50/1.5"	EI 180-U/C
50	4.5	9	CFS-C P 63/2"	EI 180-U/C
63	6.0	10	CFS-C P 75/2.5"	EI 120-U/C

Combustible insulation (D) - arrangement CS

32	3.0	9 - 19,5	CFS-C P 50/1.5" - 75/2.5"	EI 120-U/C
40	4.0	9 - 20,5	CFS-C P 50/1.5" - 75/2.5"	EI 120-U/C
50	4.5	9 - 21	CFS-C P 63/2" - 90/3"	EI 120-U/C
63	6.0	10 - 21,5	CFS-C P 75/2.5" - 110/4"	EI 120-U/C

Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 250$  mm)

32	3.0	19,5	CFS-C P 75/2.5"	EI 120-U/C
40	4.0	20,5	CFS-C P 75/2.5"	EI 120-U/C
50	4.5	21	CFS-C P 90/3"	EI 120-U/C
63	6.0	21,5	CFS-C P 110/4"	EI 120-U/C

**2.3.2.3 Rehau "Rautitan stabil" pipes (PE-Xb/Al/PE-HD)**

Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 250$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
40	6,0	9	CFS-C P 63/2"	EI 180-U/C
40	6,0	9 - 20,5	CFS-C P 63/2" - 75/2.5"	EI 120-U/C

### 2.3.3 PE pipes

#### 2.3.3.1 PE pipes according to EN 1519-1<sup>4</sup>

Pipe diameter d <sub>c</sub> (mm)	Pipe wall thickness t <sub>c</sub> (mm)	Collar size (A <sub>1</sub> )	Classification
50	3,0	CFS-C P 50/1.5"	EI 120-U/U
63	3,0	CFS-C P 63/2"	EI 120-U/U
75	3,0	CFS-C P 75/2.5"	EI 120-U/U
90	3,5	CFS-C P 90/3"	EI 120-U/U
110	4,2	CFS-C P 110/4"	EI 120-U/U
125	4,8	CFS-C P 125/5"	EI 120-U/U
160	6,2	CFS-C P 160/6"	EI 120-U/U
200	6,2	CFS-C P 200/8"	EI 120-U/U
250	7,7	CFS-C P 250/10"	EI 120-U/U

Maximum thickness of sound decoupling: 5 mm

The results of 2.3.3.3 are also valid for PE pipes according to EN 12201-2 and EN 12666-1.

#### 2.3.3.2 PE pipes according to EN ISO 15494 and DIN 8074/8075

##### 2.3.3.2.1 Pipe end configuration U/U

Pipe diameter d <sub>c</sub> (mm)	Pipe wall thickness t <sub>c</sub> (mm)	Collar size (A <sub>1</sub> )	Classification
20 *)	1,9 – 2,8	CFS-C P 50/1.5"	EI 90-U/U
20 - 50	1,9 / 2,9 - 2,8 / 4,6 <sup>9</sup>	CFS-C P 50/1.5"	EI 90-U/U
50	2,9 – 4,6	CFS-C P 50/1.5"	EI 120-U/U
63	1,8 – 5,8	CFS-C P 63/2"	EI 120-U/U
75	1,9 – 6,8	CFS-C P 75/2.5"	EI 120-U/U
90	2,2 – 8,2	CFS-C P 90/3"	EI 120-U/U
110	2,7 – 10,0	CFS-C P 110/4"	EI 120-U/U
125	3,1 – 7,1	CFS-C P 125/5"	EI 120-U/U
160	4,0 – 9,1	CFS-C P 160/6"	EI 120-U/U

##### 2.3.3.2.2 Pipe end configuration U/C

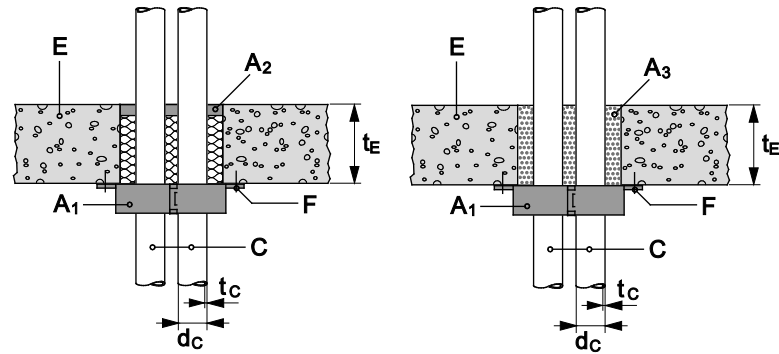
180	4,4 – 16,4	CFS-C P 180/7"	EI 120-U/C
200	4,9 – 11,4	CFS-C P 200/8"	EI 120-U/C
225	5,5 – 12,8	CFS-C P 225/9"	EI 120-U/C
250	6,2 – 22,7	CFS-C P 250/10"	EI 120-U/C
50	2,9	CFS-C P 50/1.5"	EI 180-U/C
250	7,8	CFS-C P 250/10"	EI 180-U/C

Maximum thickness of sound decoupling: 5 mm, for pipes indicated with \*): 9 mm

<sup>9</sup> Interpolation of minimum wall thickness between 1,9 mm for diameter 20 mm and 2,9 mm for diameter 50 mm, interpolation of maximum wall thickness between 2,8 mm for diameter 20 mm and 4,6 mm for diameter 50 mm for pipe diameters in between.

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2.3.3.2.3 2 Pipes in 1 collar



20	1,9	CFS-C P 50/1.5"	EI 90-U/U
20	2,8		

2.3.3.3 Geberit "Silent dB20" pipes (PE-S2)

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
75	3,6	CFS-C P 75/2.5"	EI 180-U/U
90	5,5	CFS-C P 90/3"	EI 180-U/U
110	6,0	CFS-C P 110/4"	EI 180-U/U
135	6,0	CFS-C P 160/6"	EI 120-U/U
160	7,0	CFS-C P 160/6"	EI 180-U/U

Maximum thickness of sound decoupling: 9 mm

2.3.3.4 Wavin "TS" pipes (PE-HD 100 RC)

2.3.3.4.1 Without insulation

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	4,6	CFS-C P 50/1.5"	EI 90-U/U
63	5,8	CFS-C P 63/2"	EI 120-U/U
75	6,8	CFS-C P 75/2.5"	EI 120-U/U
90	8,2	CFS-C P 90/3"	EI 120-U/U
110	10,0	CFS-C P 110/4"	EI 120-U/U

Maximum thickness of sound decoupling: 9 mm

2.3.3.4.2 Insulation (D): Combustible insulation (closed cell) flexible elastomeric foam - arrangement LS (length of insulation  $LD \geq 250$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
50	4,6	9	CFS-C P 63/2" or 75/2.5"	EI 180-U/C
63	5,8	10	CFS-C P 75/2.5"	EI 180-U/C
75	6,8	10	CFS-C P 90/3"	EI 180-U/C
90	8,2	9,5	CFS-C P 110/4"	EI 180-U/C
110	10,0	9,5	CFS-C P 125/5"	EI 180-U/C

### 2.3.3.5 PE-X pipes

#### 2.3.3.5.1 Rehau "Rautitan flex" pipes (PE-Xa)

Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 250$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
40	6,0	9	CFS-C P 63/2"	EI 180-U/C
50	6,9	9	CFS-C P 75/2.5"	EI 180-U/C
63	8,6	9	CFS-C P 90/3"	EI 180-U/C
40	6,0	9 - 20,5	CFS-C P 63/2" - 75/2.5"	EI 120-U/C
50	6,9	9 - 21	CFS-C P 75/2.5" - 90/3"	EI 120-U/C
63	8,6	9 - 21,5	CFS-C P 90/3" - 110/4"	EI 120-U/C

### 2.3.4 PP pipes

#### 2.3.4.1 PP pipes according to EN ISO 15874<sup>10</sup> and/or DIN 8077/8078

(e.g. Aquatherm blue , Aquatherm blue Faserverbundrohr, Aquatherm red , Aquathermgreen , Aquatherm green Faserverbundrohr, +GF+ PROGEF Standard pipe, +GF+ Dekaprop Industry pipe)

##### 2.3.4.1.1 Without insulation - pipe end configuration U/U

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
20	1,9 - 3,4	CFS-C P 50/1.5"	EI 120-U/U
50	1,8 - 2,9	CFS-C P 50/1.5"	EI 180-U/U
63	1,8 - 5,8	CFS-C P 63/2"	EI 180-U/U
75	1,9 - 6,8	CFS-C P 75/2.5"	EI 180-U/U
90	2,2 - 8,2	CFS-C P 90/3"	EI 180-U/U
110	2,7	CFS-C P 110/4"	EI 180-U/U
125	3,1	CFS-C P 125/5"	EI 180-U/U

##### 2.3.4.1.2 Without insulation - pipe end configuration U/C

40	3,7 - 5,5	CFS-C P 50/1.5"	EI 120-U/C
50	4,6 - 8,3	CFS-C P 50/1.5"	EI 180-U/C
63	5,8 - 10,5	CFS-C P 63/2"	EI 180-U/C
75	6,8	CFS-C P 75/2.5"	EI 180-U/C
75	6,8 - 12,5	CFS-C P 75/2.5"	EI 120-U/C
90	8,2	CFS-C P 90/3"	EI 180-U/C
90	8,2 - 15,0	CFS-C P 90/3"	EI 120-U/C
110	10,0 - 15,1	CFS-C P 110/4"	EI 120-U/C

Maximum thickness of sound decoupling: 9 mm

<sup>10</sup> Not all listed wall thicknesses may be available for pipes according to EN ISO 15874

### 2.3.4.1.3 Combustible insulation (D) – arrangement LS (length of insulation LD ≥ 250 mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
40	3,7 - 5,5	9	CFS-C P 63/2"	EI 180-U/C
50	4,6 - 6,9	9	CFS-C P 75/2.5"	EI 180-U/C
75	6,8 - 10,3	10	CFS-C P 90/3"	EI 180-U/C
90	12,3	22,5	CFS-C P 160/6"	EI 120-U/C
110	10,0 - 15,1	10	CFS-C P 125/5"	EI 180-U/C

### 2.3.4.2 PP pipes according to EN 1451-1

(e.g. Magnaplast "Skolan-dB", "Phonex AS", Pipelife "Master 3", POLOPLAST "Polo Kal NG", POLOPLAST "Polo Kal 3S", Rehau "Raupiano Plus", Wavin "AS"/KeKelit "Phonex AS", Wavin "SiTech") Cloes "Blue Power", Cloes "PhoNoFire", Valsire "Triplus", Valsire "Silere", "Geberit Silent PP")

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
32	1,2 - 1,8	CFS-C P 50/1.5"	EI 90-U/U
40	1,8	CFS-C P 50/1.5"	EI 90-U/U
50	1,8 - 2,0	CFS-C P 50/1.5"	EI 90-U/U
58	4,0	CFS-C P 63/2"	EI 90-U/U
75	1,9 - 4,5	CFS-C P 75/2.5"	EI 90-U/U
78	4,5	CFS-C P 75/2.5"	EI 90-U/U
90	2,8 - 4,5	CFS-C P 90/3"	EI 90-U/U
110	2,7 - 5,3	CFS-C P 110/4"	EI 90-U/U
125	3,9 - 5,3	CFS-C P 125/5"	EI 90-U/U
135	5,3	CFS-C P 160/6"	EI 90-U/U
160	4,9 - 5,3	CFS-C P 160/6"	EI 90-U/U

Maximum thickness of sound decoupling: 9 mm

### 2.3.4.3 Magnaplast "Skolan-dB" pipes

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
58	4,0	CFS-C P 90/3"	EI 180-U/U
78	4,5	CFS-C P 75/2.5"	EI 180-U/U
90	4,5	CFS-C P 90/3"	EI 180-U/U
110	5,3	CFS-C P 110/4"	EI 180-U/U
135	5,3	CFS-C P 160/6"	EI 180-U/U
160	5,3	CFS-C P 160/6"	EI 180-U/U

Maximum thickness of sound decoupling: 9 mm

#### 2.3.4.4 Rehau "Raupiano Plus" pipes (PP/PP-MV/PP)

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	1,8	CFS-C P 50/1.5"	EI 180-U/U
75	1,9	CFS-C P 75/2.5"	EI 180-U/U
110	2,7	CFS-C P 110/4"	EI 180-U/U

Maximum thickness of sound decoupling: 9 mm

#### 2.3.4.5 Wavin "AS" /KeKelit "Phonex AS" pipes

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
70	4,5	CFS-C P 75/2.5"	EI 180-U/U
90	4,5	CFS-C P 90/3"	EI 180-U/U
125	5,3	CFS-C P 125/5"	EI 180-U/U
160	5,3	CFS-C P 160/6"	EI 180-U/U

Maximum thickness of sound decoupling: 9 mm

#### 2.3.4.6 Wavin "SiTech" pipes

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
75	2,3	CFS-C P 75/2.5"	EI 180-U/U
90	2,8	CFS-C P 90/3"	EI 180-U/U
125	3,9	CFS-C P 125/5"	EI 180-U/U
160	4,9	CFS-C P 160/6"	EI 180-U/U

Maximum thickness of sound decoupling: 9 mm



## 2.3.5 PVC pipes

### 2.3.5.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062

#### 2.3.5.1.1 Pipe end configuration U/U

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
20 *)	1,5 – 2,2	CFS-C P 50/1.5"	EI 120-U/U
20 - 50	1,5/2,4 – 2,2/5,6 <sup>11</sup>	CFS-C P 50/1.5"	EI 120-U/U
50	2,4 – 5,6	CFS-C P 50/1.5"	EI 120-U/U
63	3,0 – 4,7	CFS-C P 63/2"	EI 120-U/U
75	2,2 – 3,6	CFS-C P 75/2.5"	EI 120-U/U
90	2,7 – 4,3	CFS-C P 90/3"	EI 120-U/U
110	1,8 – 8,1	CFS-C P 110/4"	EI 120-U/U
125	3,7 – 6,0	CFS-C P 125/5"	EI 120-U/U
160	2,5 – 11,8	CFS-C P 160/6"	EI 120-U/U
180	3,6 – 8,6	CFS-C P 180/7"	EI 120-U/U
200	4,0 – 9,6	CFS-C P 200/8"	EI 120-U/U
225	4,5 – 10,8	CFS-C P 225/9"	EI 120-U/U
250	4,9 – 11,9	CFS-C P 250/10"	EI 120-U/U

Maximum thickness of sound decoupling: 5 mm, for pipes indicated with \*): 9 mm

#### 2.3.5.1.2 Pipe end configuration U/C

50	1,8	CFS-C P 50/1.5"	EI 180-U/C
250	4,0 – 11,9	CFS-C P 250/10"	EI 180-U/C

The results of 2.3.5.1 are also valid for PVC-C pipes according to EN 1566-1<sup>6</sup> and PVC-U pipes according to EN 1329-1<sup>7</sup> and EN 1453-1<sup>7</sup>.

### 2.3.5.2 PVC-C pipes according to EN 1566-1

See 2.3.5.1

### 2.3.5.3 Friatec Friatherm-starr pipes (PVC-C)

Combustible insulation (D) - arrangement LS (length of insulation  $L_D \geq 200$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
32	3,6	9	CFS-C P 50/1.5"	EI 180-U/C
40	4,5	9	CFS-C P 63/2"	EI 180-U/C
50	5,6	9	CFS-C P 75/2.5"	EI 180-U/C
63	7,1	10	CFS-C P 90/3"	EI 180-U/C

<sup>11</sup> Interpolation of minimum wall thickness between 1,5 mm for diameter 20 mm and 2,4 mm for diameter 50 mm, interpolation of maximum wall thickness between 2,2 mm for diameter 20 mm and 5,6 mm for diameter 50 mm for pipe diameters in between.

**2.4 Rigid floors with a minimum density of 550 kg/m<sup>3</sup>**

The floor must have a minimum thickness of 150 mm and comprise concrete or aerated concrete with a minimum density of 550 kg/m<sup>3</sup>.

For details of the penetration seal design see 2.3.

Pipes shall be supported at maximum 200 mm (pipes according to 2.4.1), at maximum 250 mm (all others) away from the upper face of the floor construction.

**Penetrating services**

**2.4.1 ABS pipes +GF+ "COOL-FIT" (ABS/PUR insulation/PE-HD)**

Pipe diameter d <sub>c</sub> (mm)	Inner pipe diameter (mm)	Collar size (A <sub>1</sub> )	Classification
90	32	CFS-C P 90/3"	EI 120-U/C
110	40	CFS-C P 110/4"	EI 120-U/C
110	50	CFS-C P 110/4"	EI 120-U/C
160	90	CFS-C P 160/6"	EI 120-U/C
180	110	CFS-C P 180/7"	EI 60-U/C
225	140	CFS-C P 225/9"	EI 120-U/C
250	160	CFS-C P 250/10"	EI 120-U/C

**2.4.2 Al-composite pipes**

**2.4.2.1 Geberit "Mepla" pipes (PE-Xb/Al/PE-HD)**

2.4.2.1.1 Without insulation

Pipe diameter d <sub>c</sub> (mm)	Pipe wall thickness t <sub>c</sub> (mm)	Collar size (A <sub>1</sub> )	Classification
40	3.5	CFS-C P 50/1.5"	EI 90-U/C
50	4.0	CFS-C P 50/1.5"	EI 120-U/C
63	4.5	CFS-C P 63/2"	EI 60-U/C
75	4.7	CFS-C P 75/2.5"	EI 30-U/C

Maximum thickness of sound decoupling: 9 mm

2.4.2.1.2 Combustible insulation (D) - arrangement LS (length of insulation ≥ 250 mm) or CS

Pipe diameter d <sub>c</sub> (mm)	Pipe wall thickness t <sub>c</sub> (mm)	Insulation thickness t <sub>D</sub> (mm)	Collar size (A <sub>1</sub> )	Classification
40	3.5	20,5	CFS-C P 63/2" - 75/2.5"	EI 120-U/C
50	4.0	21	CFS-C P 63/2" - 90/3"	EI 120-U/C
63	4.5	21,5	CFS-C P 75/2.5" - 110/4"	EI 120-U/C
75	4.7	22	CFS-C P 90/3" - 125/5"	EI 120-U/C

### 2.4.2.2 KeKelit "KELOX KM 110" pipes (PE-X/Al/PE-X)

Combustible insulation (D) - Insulation arrangement LS (length of insulation  $\geq$  250 mm)

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
32	3.0	19,5	CFS-C P 75/2.5"	EI 120-U/C
40	4.0	20,5	CFS-C P 75/2.5"	EI 120-U/C
50	4.5	21	CFS-C P 90/3"	EI 120-U/C
63	6.0	21,5	CFS-C P 110/4"	EI 120-U/C

### 2.4.2.3 Rehau "Rautitan stabil" pipes (PE-Xb/Al/PE-HD)

Combustible insulation (D) - arrangement LS (length of insulation  $\geq$  250 mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_b$ (mm)	Collar size ( $A_1$ )	Classification
40	6,0	20,5	CFS-C P 63/2" - 75/2.5"	EI 120-U/C

### 2.4.3 PE pipes

#### 2.4.3.1 PE pipes according to EN ISO 15494 and DIN 8074/8075

##### 2.4.3.1.1 Pipe end configuration U/U

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
20 *)	1,9 – 2,8	CFS-C P 50/1.5"	EI 90-U/U
20 - 50	1,9 / 2,9 - 2,8 / 4,6 <sup>12</sup>	CFS-C P 50/1.5"	EI 90-U/U

##### 2.4.3.1.2 2 Pipes in 1 collar

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
20	1,9	CFS-C P 50/1.5"	EI 90-U/U
20	2,8		

The results of 2.4.3.1 are also valid for PE pipes according to EN 1519

#### 2.4.3.2 "Wavin TS" pipes (PE-HD 100 RC)

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
50	4,6	CFS-C P 50/1.5"	EI 90-U/U
63	5,8	CFS-C P 63/2"	EI 120-U/U
75	6,8	CFS-C P 75/2.5"	EI 120-U/U
90	8,2	CFS-C P 90/3"	EI 120-U/U
110	10,0	CFS-C P 110/4"	EI 120-U/U

Maximum thickness of sound decoupling: 9 mm

<sup>12</sup> Interpolation of minimum wall thickness between 1,9 mm for diameter 20 mm and 2,9 mm for diameter 50 mm, interpolation of maximum wall thickness between 2,8 mm for diameter 20 mm and 4,6 mm for diameter 50 mm for pipe diameters in between.

### 2.4.3.3 PE-X pipes

#### 2.4.3.3.1 Rehau "Rautitan flex" pipes (PE-Xa)

Combustible insulation (D) - arrangement LS (length of insulation  $\geq 250$  mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
40	6,0	20,5	CFS-C P 63/2" - 75/2.5"	EI 120-U/C
50	6,9	21	CFS-C P 75/2.5" - 90/3"	EI 120-U/C
63	8,6	21,5	CFS-C P 110/4"	EI 120-U/C

### 2.4.4 PP pipes

#### 2.4.4.1 PP pipes according to EN ISO 15874 and/or DIN 8077/8078

(e.g. Aquatherm blue, Aquatherm blue Faserverbundrohr, Aquatherm red, Aquathermgreen, Aquatherm green Faserverbundrohr, +GF+ PROGEF Standard pipe, +GF+ Dekaprop Industry pipe)

##### 2.4.4.1.1 Without insulation – pipe end configuration U/U

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
20	1,9 - 3,4	CFS-C P 50/1.5"	EI 120-U/U

##### 2.4.4.1.2 Without insulation – pipe end configuration U/C

40	3,7 - 5,5	CFS-C P 50/1.5"	EI 120-U/C
50	4,6 - 6,9	CFS-C P 50/1.5"	EI 120-U/C
75	6,8	CFS-C P 75/2.5"	EI 120-U/C
90	12,3	CFS-C P 90/3"	EI 120-U/C
110	10,0 - 15,1	CFS-C P 110/4"	EI 120-U/C

Maximum thickness of sound decoupling: 9 mm

##### 2.4.4.1.3 Combustible insulation (D) foam – arrangement LS (length of ins. $L_D \geq 250$ mm) or CS

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Insulation thickness $t_D$ (mm)	Collar size ( $A_1$ )	Classification
90	12,3	22,5	CFS-C P 160/6"	EI 120-U/C
110	15,1	10	CFS-C P 125/5"	EI 120-U/C

#### 2.4.4.2 Pipelife "Master 3" pipes (PP-CO/PP-MV/PP-CO)

Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
32	1,2	CFS-C P 50/1.5"	EI 90-U/U
40	1,8	CFS-C P 50/1.5"	EI 90-U/U
50	1,8	CFS-C P 50/1.5"	EI 90-U/U
75	1,8	CFS-C P 75/2.5"	EI 90-U/U
110	1,8	CFS-C P 110/4"	EI 90-U/U

Maximum thickness of sound decoupling: 9 mm

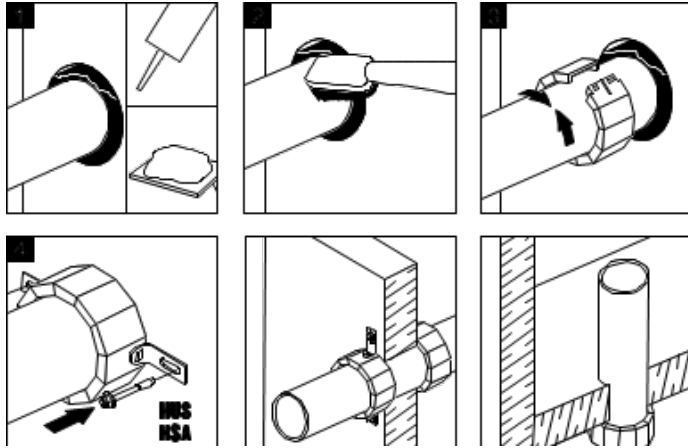
<b>2.4.4.3 POLOPLAST "Polo Kal NG" pipes (PP-CO/PP-MV/PP-CO)</b>			
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
32	1,8	CFS-C P 50/1.5"	EI 90-U/U
40	1,8	CFS-C P 50/1.5"	EI 90-U/U
50	2,0	CFS-C P 50/1.5"	EI 90-U/U
75	2,6	CFS-C P 75/2.5"	EI 90-U/U
90	3,0	CFS-C P 90/3"	EI 90-U/U
110	3,6	CFS-C P 110/4"	EI 90-U/U
Maximum thickness of sound decoupling: 9 mm			
<b>2.4.4.3.1 Without insulation – pipe end configuration C/U</b>			
200	6,8	CFS-C P 200/8"	EI 180-C/U
250	8,6	CFS-C P 250/10"	EI 180-C/U
Maximum thickness of sound decoupling: 9 mm			
<b>2.4.4.4 POLOPLAST "Polo Kal 3S" pipes (PP/PP-MV/PP)</b>			
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
75	3,8	CFS-C P 75/2.5"	EI 90-U/U
90	4,5	CFS-C P 90/3"	EI 90-U/U
110	4,8	CFS-C P 110/4"	EI 90-U/U
Maximum thickness of sound decoupling: 9 mm			
<b>2.4.4.5 Geberit "Silent dB20" pipes (PE-S2)</b>			
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
56	3,2	CFS-C P 63/2"	EI 180-U/U
63	3,2	CFS-C P 63/2"	EI 180-U/U
110	6,0	CFS-C P 110/4"	EI 180-U/U
Maximum thickness of sound decoupling: 9 mm			
<b>2.4.5 PVC pipes</b>			
<b>2.4.5.1 PVC-U pipes according to EN ISO 15493, EN ISO 1452 and DIN 8061/8062</b>			
Pipe diameter $d_c$ (mm)	Pipe wall thickness $t_c$ (mm)	Collar size ( $A_1$ )	Classification
20 *)	1,5 – 2,2	CFS-C P 50/1.5"	EI 120-U/U
20 - 50	1,5/2,4 – 2,2/5,6 <sup>13</sup>	CFS-C P 50/1.5"	EI 120-U/U
The results of 2.4.5.1 are also valid for PVC-C pipes according to EN 1566-1 <sup>6</sup> and PVC-U pipes according to EN 1329-1 <sup>7</sup> and EN 1453-1 <sup>7</sup> .			

<sup>13</sup> Interpolation of minimum wall thickness between 1,5 mm for diameter 20 mm and 2,4 mm for diameter 50 mm, interpolation of maximum wall thickness between 2,2 mm for diameter 20 mm and 5,6 mm for diameter 50 mm for pipe diameters in between.

### ANNEX 3

#### INSTALLATION OF THE PRODUCT AND ANCILLARY PRODUCT(S)

The arrangement and installation of Hilti Firestop Collar CFS-C P shall be done in accordance with the details given below and in Annex 2 for the penetration seal(s).



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## ANNEX 4

### ABBREVIATIONS AND REFERENCE DOCUMENTS

#### 4.1 Abbreviations used in drawings

Abbreviation	Description
A <sub>1</sub>	Hilti Firestop Collar CFS-C P
A <sub>2</sub>	Annular gap seal with Hilti Firestop Acrylic Sealant CFS-S ACR
A <sub>3</sub>	Annular gap seal with gypsum plaster or cementitious mortar
B	Backfilling material (mineral wool)
C	Plastic Pipe
C <sub>1</sub>	Sound decoupling
D	Pipe insulation
d <sub>c</sub>	Pipe diameter (nominal outside diameter)
E	Building element (wall, floor)
F	Fixing of the collar
s <sub>1</sub>	Minimum distance between single penetration seals
t <sub>A2</sub>	Thickness of Hilti Firestop Acrylic Sealant CFS-S ACR
t <sub>c</sub>	Pipe wall thickness
t <sub>D</sub>	Insulation thickness
t <sub>E</sub>	Thickness of the building element
L <sub>D</sub>	Length of Insulation

#### 4.2 References to standards mentioned in the ETA:

EN 1026	Windows and doors – Air permeability – Test method
EN 1329-1	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Unplasticized poly(vinyl chloride) (PVC-U)
EN 1366-3	Fire resistance tests for service installations - Part 3: Penetration seals
EN 1451-1	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polypropylene (PP) – Part 1: Specifications for pipes, fittings and the system
EN 1453-1	Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings - Unplasticized poly(vinyl chloride) (PVC-U)
EN 1519-1	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Polyethylene (PE) - Part 1: Specifications for pipes, fittings and the system
EN 1566-1	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure - Chlorinated poly(vinyl chloride) (PVC-C) - Part 1: Specifications for pipes, fittings and the system
EN 12201-2	Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 2: Pipes
EN 12666-1	Plastics piping systems for non-pressure underground drainage and sewerage – Polyethylene (PE) – Part 1: Specifications for pipes, fittings and the system
EN 13501	Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests Part 2: Classification using test data from fire resistance tests, excluding ventilation services



EN ISO 140-3	Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Laboratory measurements of airborne sound insulation of building elements <sup>14</sup>
EN ISO 717-1	Acoustics – Rating of sound insulation of buildings and of building elements – Part 1: Airborne sound insulation
EN ISO 1519	Paints and varnishes – Bend test (cylindrical mandrel)
EN ISO 1452	Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly(vinyl chloride) (PVC-U) <sup>15</sup>
EN ISO 15493	Plastics piping systems for industrial applications - Acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) - Specifications for components and the system; Metric series
EN ISO 15494	Plastics piping systems for industrial applications - Polybutene (PB), polyethylene (PE) and polypropylene (PP) - Specifications for components and the system; Metric series
EN ISO 15874	Plastics piping systems for hot and cold water installations - Polypropylene (PP)
EN ISO 20140-10	Acoustics – Measurements of sound insulation in buildings and of building elements – Part 10: Laboratory measurement of airborne sound insulation of small building elements <sup>14</sup>
DIN 8061	Unplasticized polyvinyl chloride (PVC-U) pipes - General quality requirements and testing
DIN 8062	Unplasticized polyvinyl chloride (PVC-U) pipes - Dimensions
DIN 8074	Polyethylene (PE) - Pipes PE 80, PE 100 - Dimensions
DIN 8075	Polyethylene (PE) pipes - PE 80, PE 100 - General quality requirements, testing
DIN 8077	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT – Dimensions
DIN 8078	Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - General quality requirements and testing
DIN 19531-10	Pipes and fittings made of unplasticized polyvinyl chloride (PVC-U) socket for waste and soil discharge systems inside buildings – Part 10: Fire behaviour, quality control and installation recommendations
DIN 19535-10	High-density polyethylene (PE-HD) pipes and fittings for hot-water resistant waste and soil discharge systems (HT) inside buildings – Part 10: Fire behaviour, quality control and installation recommendations

### 4.3 Other reference documents

EOTA TR 001	Determination of impact resistance of panels and panel assemblies
EOTA TR 024	Characterisation, Aspects of Durability and Factory Production Control for Reactive Materials, Components and Products

<sup>14</sup> In September 2010 substituted by the EN ISO 10140 series

<sup>15</sup> Successor of EN 1452 since December 2009