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European technical approval

ETA-10/0404

(English language translation, the original version is in German language)

Handelsbezeichnung:
Trade name:

Hilti Firestop Collar CFS-C P

Zulassungsinhaber:
Holder of approval:

**Hilti AG
Feldkircherstrasse 100
9494 Schaan
Liechtenstein**

Zulassungsgegenstand
und Verwendungszweck:

**Brandschutzmanschette für die Verwendung in
Abschottungen**

*Generic type and use of
construction product:*

Firestop Collar for Use in Penetration Seals

Geltungsdauer vom:
Validity from:
bis:
to:

31.01.2013

30.01.2018

Herstellwerk:
Manufacturing plant:

**Hilti Werk 5a
Hilti Werk 5b**

Diese Europäische
technische Zulassung umfasst:
*This European technical approval
contains:*

40 Seiten inklusive 29 Anhängen

40 pages including 29 Annexes

Diese Europäische
technische Zulassung ersetzt:
*This European technical approval
replaces:*

**ETA-10/0404 mit Geltungsdauer vom 22.02.2011 bis
21.02.2016**

ETA-10/0404 with validity from 22.02.2011 to 21.02.2016



European Organisation for Technical Approvals
Europäische Organisation für Technische Zulassungen
Organisation Européenne pour l'Agrément Technique

I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Österreichisches Institut für Bautechnik in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹ modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - Bauproduktengesetz. LGBl. V Nr. 33/1994;
 - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC⁴;
 - Guideline for European technical approval of Fire Stopping and Fire Sealing Products: Part 2: Penetration Seals.
- 2 The Österreichisches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant(s). Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
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- 6 The European technical approval is issued by the approval body in English. This version corresponds fully to the version circulated in EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities N° L 40, 11.2.1989, p. 12

² Official Journal of the European Communities N° L 220, 30.8.1993, p. 1

³ Official Journal of the European Union N° L 284, 31.10.2003, p.1

⁴ Official Journal of the European Communities N° L 17, 20.1.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product(s) and intended use

1.1 Definition of the construction product

This European technical approval 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 approval 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 2.3 or airborne sound insulation data according to 2.9.1 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 4.3.

1.2 Intended Use

The Hilti Firestop Collar CFS-C P is intended to form a part of a penetration seal, which is used to maintain the fire resistance of a separating element (flexible wall, rigid wall or rigid floor) when and where services pass through.

Annex 2 gives details of penetration seals for which fire resistance tests were carried out. This ETA covers assemblies installed in accordance with the provisions given in Annex 2.

Hilti Firestop Collar CFS-C P may be used to provide a penetration seal with plastic and composite pipes as single penetrations. For details on diameters, wall thicknesses, pipe materials and pipe standards see Annex 2.

Pipes shall be perpendicular to the seal surface. The pipe penetration seal is intended for plastic pipes in piping systems for non-combustible liquids and fluids, for pneumatic dispatch systems and for pipes in centralised vacuum-cleaning systems.

The assessment does not cover the avoidance of destruction of the seal or of the abutting building element(s) by forces caused by temperature changes in case of fire. This has to be considered when designing the piping system.

The Hilti Firestop Collar CFS-C P is intended for environmental conditions as defined by use category Z₂, internal conditions with humidity lower than 85% RH excluding temperatures below 0°C, without exposure to rain or UV according to EOTA TR 024.

The provisions made in this European technical approval are based on an assumed working life of Hilti Firestop Collar CFS-C P of 10 years provided the conditions laid down in sections 4 and 5 relating to manufacturing, installation, use and repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of the product and methods of verification

The identification tests and the assessment of the fitness for use according to the Essential Requirements were carried out in compliance with the "ETA Guidance no. 026-Part 2" concerning Penetration Seals (called ETAG 026-2 in this ETA).

ETAG Clause No.	ETA clause No.	Characteristic	Assessment of characteristic
		Mechanical resistance and stability	Not relevant
		Safety in case of fire	
2.4.1	2.1	Reaction to fire	Class E according to EN 13501-1:2007
2.4.2	2.2	Resistance to fire	See clause 2.2
		Hygiene, Health and the Environment	
2.4.3	2.3	Air permeability	See clause 2.3
2.4.4	2.4	Water permeability	See clause 2.4
2.4.5	2.5	Dangerous substances	See clause 2.5
		Safety in use	

2.4.6	2.6	Mechanical resistance and stability	No performance determined
2.4.7	2.7	Resistance to impact/movement	No performance determined
2.4.8	2.8	Adhesion	No performance determined
		Protection against noise	
2.4.9	2.9	Airborne sound insulation	See clause 2.9
		Energy, Economy and Heat Retention	
2.4.10	2.10	Thermal properties	No performance determined
2.4.11	2.11	Water vapour permeability	No performance determined
		General aspects relating to fitness for use	
2.4.12	2.12	Durability and serviceability	Z ₂

2.1 Reaction to fire

The inlay of the Hilti Firestop Collar CFS-C P fulfils the requirements for reaction to fire class "E" according to EN 13501-1.

Hilti Firestop Acrylic Sealant CFS-S ACR fulfils the requirements for reaction to fire class "D - s1 d0" according to EN 13501-1.

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 approval for evaluating resistance to fire is given in Annex 1.

2.3 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 (N₂), carbon dioxide (CO₂) and CH₄ (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 ³ /(h·m ²)]	q/A N ₂ [m ³ /(h·m ²)]	q/A CO ₂ [m ³ /(h·m ²)]	q/A CH ₄ [m ³ /(h·m ²)]
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 determined.

2.4 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 determined.

2.5 Dangerous substances

According to the manufacturer's declaration, the product specification has been compared with the list of dangerous substances of the European Commission to verify that it does not contain such substances above the acceptable limits.

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

Note: In addition to the specific clauses relating to dangerous substances contained in this ETA, 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 Product Directive, these requirements need also to be complied with, when and where they apply.

2.6 Mechanical resistance and stability

No performance determined.

2.7 Resistance to impact/movement

No performance determined.

2.8 Adhesion

The fixing of the collars (number of hooks, material and dimensions of fasteners) must be done according to the provisions given in 4.3 and Annex 2.

2.9 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 2.9.1 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).

2.9.1 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 m². 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: $D_{n,e,w}(C; C_{tr}) = 60 \text{ (-4;12) dB}$

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

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: $D_{n,e,w}(C; C_{tr}) = 58 \text{ (-2;-5) dB}$

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

Structure of the rigid wall: 200 mm thick concrete wall with a density of 2000 kg/m³ 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 m² 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})

2.9.2 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 m². 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: $D_{n,e,w} = 59 \text{ (-1;-4) dB}$

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

Structure of the rigid wall: 175 mm thick blockwork wall with a density of 2000 kg/m³ 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 m² 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})

2.10 Thermal properties

No performance determined.

2.11 Water vapour permeability

No performance determined.

2.12 Durability

Hilti Firestop Collar CFS-C P fulfils the requirements of use category Z_2 in accordance with ETAG 026-2, Section 1.2.

Type Z_2 : Products intended for uses at internal conditions

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the decision 1999/454/EC of the European Commission⁵ the system 1 of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by a notified certification body on the basis of:

(a) Tasks for the manufacturer:

- (1) factory production control;
- (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed test plan;

(b) Tasks for the notified body

- (3) initial type-testing of the product;
- (4) initial inspection of factory and of factory production control;
- (5) continuous surveillance, assessment and approval of factory production control.

3.2 Responsibilities

3.2.1 Tasks of the Manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this European technical approval.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the Control Plan relating to the valid European technical approval ETA-10/404 which is part of the technical documentation of this European technical approval. The "Control Plan" is laid down in the context of the factory production control system operated by the manufacturer and deposited at the Österreichisches Institut für Bautechnik.

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the "Control Plan".

3.2.1.2 Other tasks of manufacturer

Additional information

The manufacturer shall provide a technical data sheet and an installation instruction with the following minimum information (as far as relevant):

Technical data sheet:

- Field of application:
 - Building elements in which the product may be installed, type and properties of the building elements like minimum thickness, density, and - in case of lightweight constructions - the construction requirements.

⁵ Official Journal of the European Communities N° L 178, 14.7.1999, p. 52

- Services which may penetrate the building element, type and properties of the services like material, diameter, thickness etc. in case of pipes including insulation materials; necessary/allowed supports/fixings, separations etc.
- Design of the penetration seal(s) including limits in size, minimum thickness, separations etc. of the penetration seal(s)
- Definition of ancillary products (e.g. backfilling material) with clear indication whether they are generic or specific.
- Environmental conditions covered by the ETA.

Installation instruction:

- Steps to be followed
- Procedure in case of retrofitting
- Stipulations on maintenance, repair and replacement

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of firestopping products in order to allow the manufacturer to undertake the actions laid down in section 3.3. For this purpose, the "control plan" referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the notified body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of the European technical approval ETA-10/404.

3.2.2 Tasks of Notified Bodies

The notified body shall perform the

- initial type-testing of the product
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control,

in accordance with the provisions laid down in the control plan of this European technical approval.

The notified body shall retain the essential points of its (their) actions referred to above and state the results obtained and conclusions drawn in a written report.

The notified product certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform the Österreichisches Institut für Bautechnik without delay.

3.3 CE marking

The CE marking shall be affixed on the product itself, on a label attached to it, on its packaging or on the commercial documents accompanying the components of the product. The letters „CE“ shall be followed by the identification number of the Notified Body involved and be accompanied by the following additional information:

- the name or identifying mark and address of the ETA holder,
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- the number of the ETAG (ETAG N° 026 part 2)
- the name and intended use of the product
- “see ETA-10/0404 for relevant characteristics”

4. Assumptions under which the fitness of the product(s) for the intended use was favourably assessed

4.1 General

- 4.1.1 For evaluating resistance to fire of the penetration seal using "Hilti Firestop Collar CFS-C P" as specified in Annex 2 it is assumed that
- the installation of the penetration seal does not affect the stability of the adjacent building elements – even in case of fire,
 - the installations are fixed to the adjacent building elements (not to the seal) in accordance with the relevant regulations in such a way that, in case of fire, no additional mechanical load is imposed on the seal,
 - the support of the installations is maintained for the classification period required and
 - pneumatic dispatch systems, compressed air systems, etc. are switched off by additional means in case of fire.
- 4.1.2 This European technical approval does not address any risks associated with the emission of dangerous liquids or gases caused by failure of the pipe(s) in case of fire nor does it prove the prevention of the transmission of fire through heat transfer via the medium in the pipes.
- 4.1.3 This European technical approval 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 for at least ... minutes (corresponding to the target period of fire resistance).
- 4.1.4 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: 2009-07, section 1).
- 4.1.5 The durability assessment does not take account of the possible effect on the penetration seal of substances permeating through pipe walls.

4.2 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 approval 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.

4.3 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).

5 Indications to the manufacturer

5.1 Packaging, transport and storage

In the accompanying document and/or on the packaging the manufacturer shall give information as to transport and storage.

At least the following shall be indicated: storing temperature, type of storage, maximum duration of storage and required data related to minimum temperature for transport and storage.

Storage: Store in a dry place protected from moisture

Storage temperature: -5° up to max. +50°C

5.2 Use, maintenance, repair

The fire resistance of penetration seals executed using Hilti Firestop Collar CFS-C P shall not be negatively affected by future changes to buildings or building elements.

The assessment of the fitness for use is based on the assumption that damaged seals are replaced or repaired. It is also assumed that replacement of components during maintenance/repair will be undertaken using materials specified by the European technical approval.

On behalf of Österreichisches Institut für Bautechnik



Rainer Mikulits
Managing Director

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 the European technical approval 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 relating to the European technical approval 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 relating to the European technical approval ETA-10/0292 and ETA-10/0389 - Hilti Firestop Acrylic Sealant CFS-S ACR" which is a non-public part of the referenced ETAs.

The Control Plan is defined in document "Control Plan relating to the European technical approval 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-Stopfwolle	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 Sound decoupling means

Any sound decoupling means based on PE (foam) may be used with a maximum thickness as given in Annex 2.

ANNEX 2

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

Intended use of pipes⁶ 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 ³	Rigid floor ≥ 2400 kg/m ³
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	-	2.1.4.1.1, 2.1.4.1.2	2.1.4.1.1, 2.1.4.1.2	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
		Aquatherm fusiotherm	CS/LS	2.1.4.3	2.1.4.3	-	2.3.4.1
		Aquatherm Faserverbundrohr	CS/LS	2.1.4.4	2.1.4.4	-	2.3.4.1
	PVC-C	Friatherm starr	CS/LS	2.1.5.2	2.1.5.2	-	2.3.5.3
Refrige-ration	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	2.1.3.1, 2.2.1	-	2.3.3.1
	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	-	2.3.3.3
	PP	EN 1451-1	-	2.1.4.5	2.1.4.5	-	2.3.4.2
		Aquatherm climatherm Faserverbundrohr	-	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	2.4.4.3	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	-	2.3.4.4
		Wavin AS/KeKelit "Phonex AS"	-	2.1.4.1	2.1.4.1	-	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
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 firestop	-	2.1.4.1.1,	2.1.4.1.1,	2.4.4.1	2.3.4.1

⁶ According to technical literature of pipe manufacturers

Application	Pipe material	Manufacturer, product	Insulation	see section			
				Flexible and rigid wall ≥ 100 mm	Rigid wall ≥ 150 mm	Rigid floor ≥ 550 kg/m ³	Rigid floor ≥ 2400 kg/m ³
				2.1.4.1.2	2.1.4.1.2		
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 climatherm Faserverbundrohr	-	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^3 and comprise concrete, aerated concrete or masonry.

Penetration seal:

Single penetration;

Hilti Firestop Collar CFS-C P (A_1) on both sides.

Annular gap filled with:

Flexible walls:

Gypsum plaster (A_3) over the entire thickness of the wall or

Hilti Firestop Acrylic Sealant CFS-S ACR (A_2) on both sides with a depth of minimum 25 mm from the surface of the wall.

Rigid walls:

Gypsum plaster (A_3) or cementitious mortar over the entire thickness of the wall or

Hilti Firestop Acrylic Sealant CFS-S ACR (A_2) 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_1):

Non-insulated pipes: 0 mm

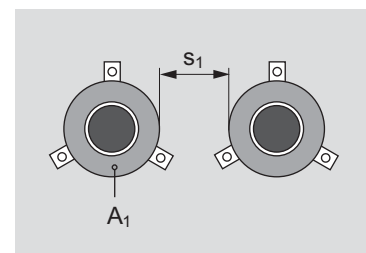
Insulated pipes: 0 mm

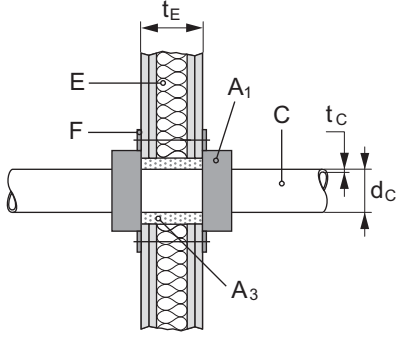
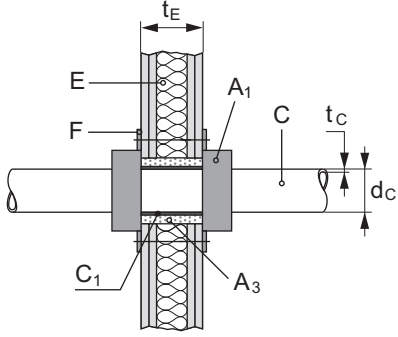
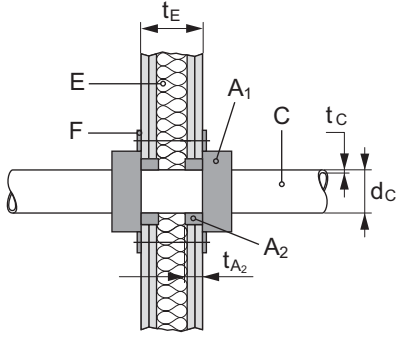
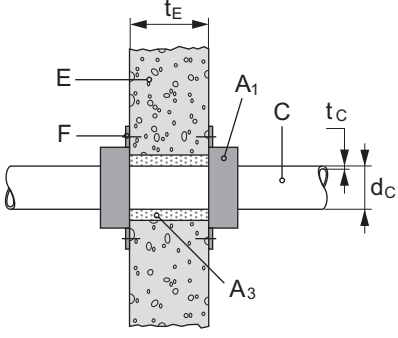
Collars to be fixed with hooks (F) and threaded rods M8 through the wall and nuts on both sides of the wall. In high density rigid walls alternatively metal anchors with minimum $\varnothing 8 \text{ mm}$ may be used.

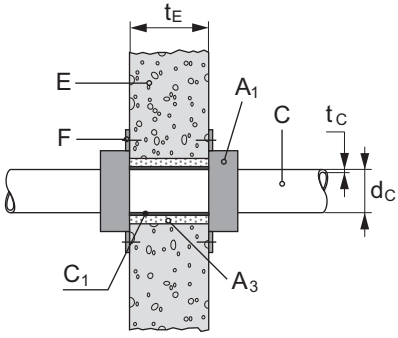
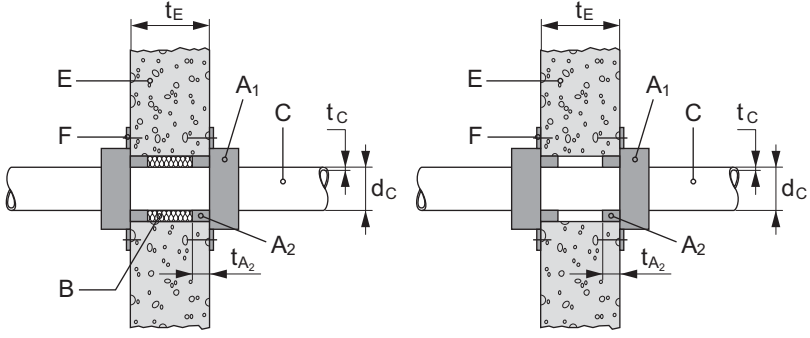
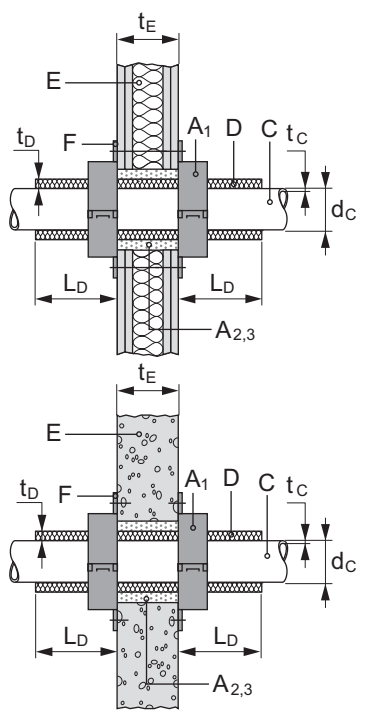
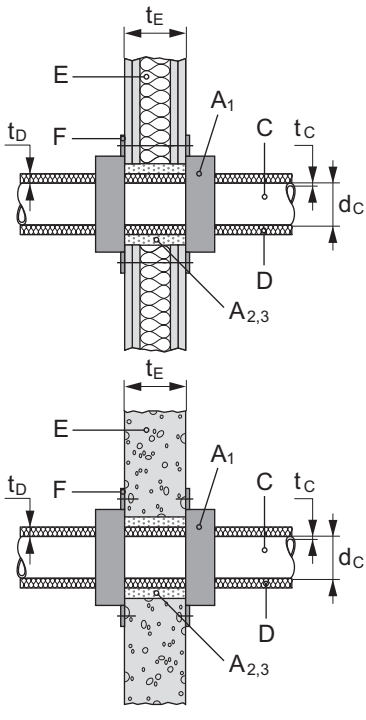
For minimum number of hooks see 1.1.

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

Sound decoupling: Sound decoupling strips (C_1) based on PE foam, 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.



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

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

Penetrating services				
2.1.1 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 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	
2.1.2 Al-composite pipes				
2.1.2.1 Geberit "Mepla" pipes (PE-Xb/Al/PE-HD)				
Insulation (D): Armaflex AF - 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
2.1.2.2 KeKelit "KELOX KM 110" pipes (PE-X/Al/PE-X)				
Insulation (D): Armaflex AF - 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)

Insulation (D): Armaflex AF - arrangement CS

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Insulation thickness t_D (mm)	Collar size (A_1)	Classification
16	2,6	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 1519-17

Pipe diameter d_c (mm)	Inner pipe diameter (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.

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

Pipe diameter d_c (mm)	Inner pipe diameter (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

⁷ In Germany the pipes have additionally to comply with DIN 19535-10.

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
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
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)	Inner pipe diameter (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 Insulation (D): Armaflex AF - 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)

Insulation (D): Armaflex AF - 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 15874⁸ and/or DIN 8077/8078

(e.g. Aquatherm climatherm, Aquatherm climatherm Faserverbundrohr, Aquatherm firestop, Aquatherm fusiotherm, Aquatherm fusiotherm 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)	Inner pipe diameter (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	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

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	CFS-C P 75/2.5"	EI 120 U/C

Maximum thickness of sound decoupling: 9 mm

2.1.4.1.3 Insulation (D): Armaflex AF - arrangement LS (length of insulation $L_D \geq 250$ mm) or CS

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 - 10,3	CFS-C P 75/2.5"	EI 120 U/C
90	10,0 - 15,1	CFS-C P 90/3"	EI 120 U/C

2.1.4.3 Aquatherm "fusiotherm" pipes

Pipe series SDR 11; Insulation (D): Armaflex AF - 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	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

⁸ Not all listed wall thicknesses may be available for pipes according to EN ISO 15874

2.1.4.4 Aquatherm “fusiotherm Faserverbundrohr” pipes

Insulation (D): Armaflex AF – 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. 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”)

Pipe diameter d_c (mm)	Inner pipe diameter (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/C
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 1566-1⁹ and PVC-U pipes according to EN 1329-1¹⁰ and EN 1453-1¹⁰.

⁹ 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

¹⁰ In Germany the pipes have additionally to comply with DIN 19531-10

2.1.5.2 Friatec Friatherm-starr pipes (PVC-C)

Insulation (D): Armaflex AF - 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

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^3 and comprise concrete, aerated concrete or masonry.

Penetration seal:

Single penetration;

Hilti Firestop Collar CFS-C P (A_1) on both sides.

Annular gap filled either with gypsum plaster or cementitious mortar (A_3) over the entire thickness of the wall or with Hilti Firestop Acrylic Sealant CFS-S ACR (A_2) 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.

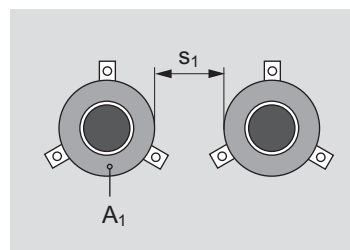
Distance between penetrations:

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

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 $\varnothing 8$ mm may be used. For minimum number of hooks see 1.1.



Sound decoupling: Sound decoupling strips (C_1) based on PE foam, 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 1519-1¹¹

Pipe diameter d_c (mm)	Inner pipe diameter (mm)	Collar size (A_1)	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.

¹¹ In Germany the pipes have additionally to comply with DIN 19535-10.

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): $\leq 17,5$ mm

2.2.2.1 Pipe end configuration U/U

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Collar size (A_1)	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

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 1566-1⁹ and PVC-U pipes according to EN 1329-1¹⁰ and EN 1453-1¹⁰.

2.3 Rigid floor, minimum density of 2400 kg/m³

The floor must have a minimum thickness of 150 mm and comprise concrete with a minimum density of 2400 kg/m³.

Penetration seal:

Single penetration;

Hilti Firestop Collar CFS-C P (A₁) on the underside of the floor.

Annular gap filled either with gypsum plaster or cementitious mortar (A₃) over the entire thickness of the floor or with mineral wool of minimum density 60 kg/m³ covered by Hilti Firestop Acrylic Sealant CFS-S ACR (A₂) on top side (or on both sides) with a depth of minimum 10 mm.

Width of annular gap:

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:

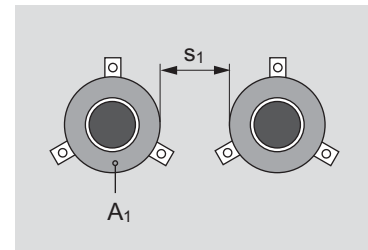
Minimum distance between collars / annular gap edge (s₁):

Non-insulated pipes: 0 mm

Insulated pipes: 0 mm

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

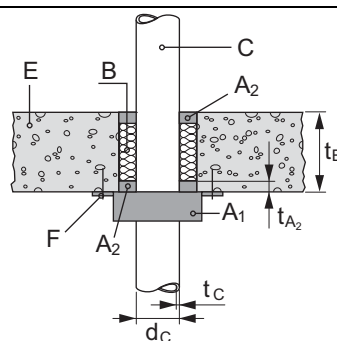
Pipes shall be supported at maximum 200 mm (pipes according to 2.3.1), at maximum 300 mm (all others) away from the upper face of the floor construction.



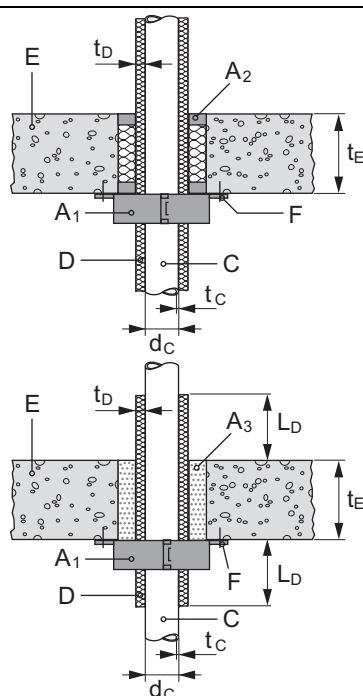
Sound decoupling: Sound decoupling strips (C₁) based on PE foam, used in combination with gypsum plaster or mortar as gap filler. Sound decoupling installed around the pipe within the floor. For maximum thickness see tables below.

Annular gap seal (drawings show non-insulated pipes as example)	
Gypsum plaster or cementitious mortar (A ₃)	
Cementitious mortar (A ₃) together with sound decoupling (C ₁)	

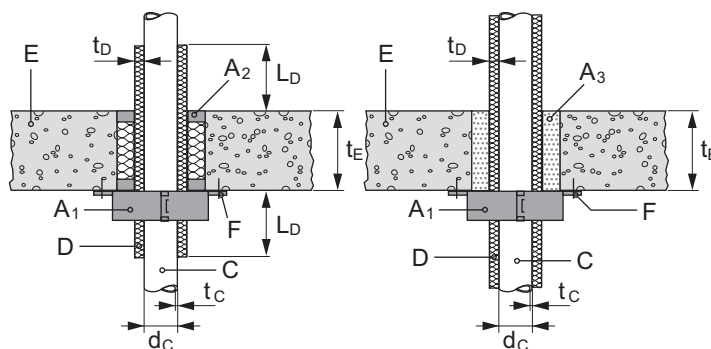
Hilti Firestop Acrylic Sealant CFS-S ACR
(A₂)



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

Local/Sustained pipe insulation (LS)

Continued/Sustained pipe insulation (CS)



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 AI-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

Maximum thickness of sound decoupling: 9 mm

2.3.2.1.2 Insulation (D): Armaflex AF - 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	3.5	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)

Insulation (D): Armaflex AF - arrangement CS

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Insulation thickness t_D (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

Insulation (D): Armaflex AF - 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

Insulation (D): Armaflex AF - 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)

Insulation (D): Armaflex AF - 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	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 7

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
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

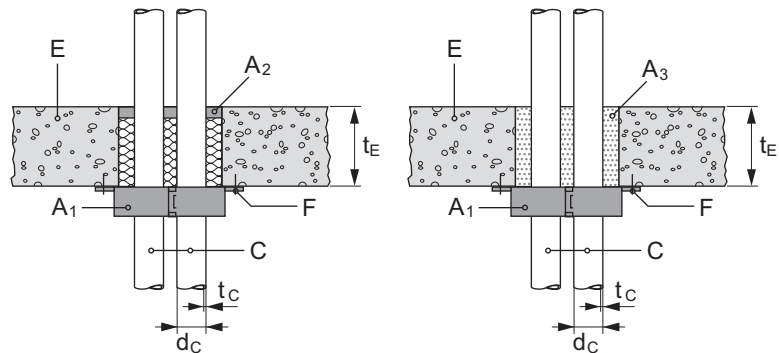
The results of 2.3.3.3 are also valid for PE pipes according to EN 12201-2 and EN 12666-1.

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_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 ¹²	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

¹² 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.

2.3.3.2.2 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			
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
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): Armaflex AF - 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
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)				
Insulation (D): Armaflex AF - arrangement LS (length of insulation L _D ≥ 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	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 ¹³ and/or DIN 8077/8078 (e.g. Aquatherm climatherm, Aquatherm climatherm Faserverbundrohr, Aquatherm firestop, Aquatherm fusiotherm, Aquatherm fusiotherm 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

¹³ Not all listed wall thicknesses may be available for pipes according to EN ISO 15874

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

2.3.4.1.3 Insulation (D): Armaflex AF – 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")

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 ¹⁴	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 ⁹ and PVC-U pipes according to EN 1329-1 ¹⁰ and EN 1453-1 ¹⁰.

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)

Insulation (D): Armaflex AF - 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

¹⁴ 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/m³

The floor must have a minimum thickness of 150 mm and comprise concrete or aerated concrete with a minimum density of 550 kg/m³.

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 _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

2.4.2 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 _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

Maximum thickness of sound decoupling: 9 mm

2.4.2.1.2 Insulation (D): Armaflex AF - arrangement LS (length of insulation ≥ 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	3.5	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)

Insulation (D): Armaflex AF - Insulation arrangement LS (length of insulation ≥ 250 mm)

Pipe diameter d_c (mm)	Pipe wall thickness t_c (mm)	Insulation thickness t_D (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)

Insulation (D): Armaflex AF - arrangement LS (length of insulation ≥ 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

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 ¹⁵	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 12201-2 and EN 12666-1.

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

¹⁵ 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)

Insulation (D): Armaflex AF - arrangement LS (length of insulation ≥ 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 climatherm, Aquatherm climatherm Faserverbundrohr, Aquatherm firestop, Aquatherm fusiotherm, Aquatherm fusiotherm 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 Insulation (D): Armaflex AF – 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
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

2.4.4.3 POLOPLAST "Polo Kal NG" pipes (PP-CO/PP-MV/PP-CO)

Pipe diameter d _c (mm)	Pipe wall thickness t _c (mm)	Collar size (A ₁)	Classification
32	1,8	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

2.4.4.4 POLOPLAST "Polo Kal 3S" pipes (PP/PP-MV/PP)

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

2.4.5 PVC pipes

2.4.5.1 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
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 ¹⁶	CFS-C P 50/1.5"	EI 120-U/U

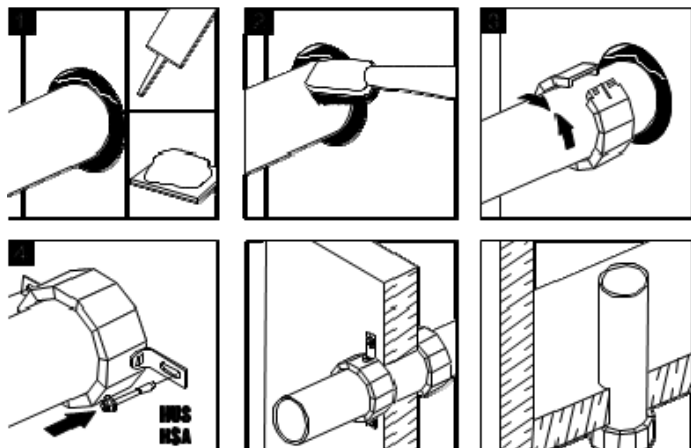
The results of 2.4.5.1 are also valid for PVC-C pipes according to EN 1566-1 ⁹ and PVC-U pipes according to EN 1329-1 ¹⁰ and EN 1453-1 ¹⁰.

¹⁶ 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).



ANNEX 4

ABBREVIATIONS AND REFERENCE DOCUMENTS

4.1 Abbreviations used in drawings

Abbreviation	Description
A ₁	Hilti Firestop Collar CFS-C P
A ₂	Annular gap seal with Hilti Firestop Acrylic Sealant CFS-S ACR
A ₃	Annular gap seal with gypsum plaster or cementitious mortar
B	Backfilling material (mineral wool)
C	Plastic Pipe
C ₁	Sound decoupling
D	Pipe insulation
d _C	Pipe diameter (nominal outside diameter)
E	Building element (wall, floor)
F	Fixing of the collar
s ₁	Minimum distance between single penetration seals
t _{A2}	Thickness of Hilti Firestop Acrylic Sealant CFS-S ACR
t _C	Pipe wall thickness
t _D	Insulation thickness
t _E	Thickness of the building element
L _D	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 ¹⁷
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) ¹⁸
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 ¹⁷
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

3.3 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

¹⁷ In September 2010 substituted by the EN ISO 10140 series

¹⁸ Successor of EN 1452 since December 2009