INSTYTUT TECHNIKI BUDOWLANEJ

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European Technical Assessment

ETA-24/0497 of 22/12/2025

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	INTU FR COLLAR L SLIM
Product family to which the construction product belongs	Fire Stopping and Fire Sealing Products. Penetration Seals
Manufacturer	ALFASEAL GROUP Sp. z o.o. ul. Kineskopowa 1 PL 05-500 Piaseczno, Poland
Manufacturing plant	Plant MPA1
This European Technical Assessment contains	55 pages including 4 Annexes 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	European Assessment Document (EAD) 350454-00-1104 “Fire Stopping and Fire Sealing Products. Penetration Seals”
This version replaces	ETA-24/0497 issued on 13/03/2025

This European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Specific Part

1 Technical description of the product

INTU FR COLLAR L SLIM is universal collar pipe closure devices used to form penetration seals where metal and combustible pipes, cables and conduits, single or in bundles, penetrate walls and floors.

INTU FR COLLAR L SLIM includes two or more layers of an intumescent, graphite based liner with a nominal thickness of 2 mm and width of 30 mm, inserted into a steel housing made of stainless steel sheet with a thickness of 0,5 mm. The housing of INTU FR COLLAR L SLIM is equipped with fixing elements, through which the collar is fixed to the separating element. The number of elements depends on the size of the collar.

The intumescent liner should be cut to a required length, equal or greater than external circumference of the pipe. The collar is wrapped around the service, closed and then fixed to the separating element with the specified type and number of fasteners. The number and type of brackets depends on the size of the collar.

Variants of INTU FR COLLAR L SLIM, type of fasteners and required number of fixing elements are presented in Annex A and Annex B.

Auxiliary products used with INTU FR COLLAR L SLIM are:
- INTU FR MASTIC according to ETA-19/0038,
- flexible elastomeric foam (FEF) Kaiflex ST, Kaimann company, according to EN 14304, with reaction to fire class B_L-s2, d0 according to EN 13501-1,
- polyethylene foam (PE) insulation Tubolit DG Plus, Armacell company, according to EN 14313, with reaction to fire class B_L-s1, d0 according to EN 13501-1,
- polyethylene foam (PE) insulation ThermaCompact TF, Thermaflex Izolacje company, according to EN 14313, with reaction to fire class E_L according to EN 13501-1.

2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

2.1 Intended use

The intended use of INTU FR COLLAR L SLIM is to reinstate the fire resistance performance of flexible wall, rigid wall or rigid floor constructions, where they are penetrated by metal pipes or combustible pipes, cables and conduits.

The specific elements of construction that INTU FR COLLAR L SLIM may be used to provide a penetration seal in, are:

Rigid walls: The wall must have a minimum thickness in accordance with Annex C, and comprise concrete or masonry separating elements, with a minimum density of 600 kg/m^3 in case of penetration seals given in Tables C3, C4 and C16 in Annex C or 450 kg/m^3 in case of penetration seals given in Tables C1, C2, C5 and C7 – C15 in Annex C.

Flexible walls: The wall must have a minimum thickness in accordance with Annex C, and comprise timber or steel studs lined on both faces with minimum two layers (with overall board layer thickness on one side equal to or greater than 25 mm) of type F or type DF gypsum plasterboards according to EN 520. In timber stud walls, no part of the penetration shall be closer than 100 mm to a stud, the cavity must be closed between the penetration seal and the stud and minimum 100 mm of insulation of reaction to fire class A1 or A2, according to EN 13501-1, is provided within the cavity between the penetration seal and the stud.

Rigid floors: The floor must have a minimum thickness in accordance with Annex C, and comprise aerated concrete, concrete or reinforced concrete, with a minimum density of 550 kg/m^3.

The supporting construction shall be classified in accordance with EN 13501-2 for the required fire resistance period (equal to or greater than specified in Annex C).

INTU FR COLLAR L SLIM may be used to provide a penetration seal with specific combustible and metal pipes, cables and conduits (according to Annex A and Annex C).

Details of penetration seals are provided in Annex C and Annex D. Additional provisions are provided in Annex A and Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the product of 25 years, when installed in the works, provided that the penetration seal is subject to appropriate installation, in accordance with the manufacturer's recommendations. The indications given on the working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body, 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.

2.2 Use category

Type Z_2: intended for use in internal conditions with humidity lower than 85% RH, excluding temperatures below 0°C, without exposure to rain or UV.

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

3.1 Performance of the product

3.1.1 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class E
Resistance to fire	Annex C

3.1.2 Hygiene, health and the environment (BWR 3)

No performance assessed.

3.1.3 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Mechanical resistance and stability	No performance assessed
Resistance to impact / movement	No performance assessed
Adhesion	No performance assessed
Durability	Use category: Type Z_2

3.1.4 Protection against noise (BWR 5)

No performance assessed.

3.1.5 Energy economy and heat retention (BWR 6)

No performance assessed.

3.2 Methods used for the assessment

The assessment has been made in accordance with EAD 350454-00-1104.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

According to the Decision 1999/454/EC of the European Commission, as amended by Decision 2001/596/EC of the European Commission, the system 1 of assessment and verification of constancy of performance applies (see Annex V to regulation (EU) No 305/2011).

5 Technical details necessary for the implementation of the AVCP system, as provided in the applicable European Assessment Document (EAD)

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited in Instytut Techniki Budowlanej.

For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

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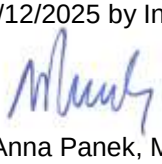


Anna Panek, MSc
Deputy Director of ITB

Additional provisions

- INTU FR COLLAR L SLIM shall be either fixed on one or both sides of the wall or fixed at the bottom or top of the floor (for details see Annex D).
- INTU FR COLLAR L SLIM shall be fixed to the wall or the floor by steel fasteners with dimensions of min. M6 x 50 mm. Different variants of fixing and number of fixing elements are given in Annex B.
- The distance between service and the seal edge shall be:
  - 0 to 20 mm – in case of penetration seals given in Tables C1 to C23 and C26 to C33 in Annex C,
  - 0 to 30 mm – in case of penetration seals given in Tables C24 and C25 in Annex C.
- Services are placed in angle between 45° and 90° to the supporting construction.
- The minimum distance between adjacent penetration seals (between adjacent collars) shall be 100 mm.
- Pipes shall be supported at maximum 400 mm away from both faces of the wall constructions and from the upper face of floor constructions.
- Classifications given in Annex C are valid for plastic pipes:
  - COOL FIT 2.0 produced by GF Piping Systems – PE-100 pipe, pre-insulated with GF-HE foam in PE sheet,
  - Geberit Silent dB20 produced by Geberit Company,
  - Geberit Silent PP produced by Geberit Company,
  - Magnaplast Ultra dB from PP-M according to EN 1451-1 or EN 14758-1,
  - PE-HD according to EN 1519-1 or EN 12666-1,
  - PE according to EN 12201-2, EN 1519-1, EN 12666-1 or EN ISO 15494,
  - PE-X according to EN ISO 15875-2,
  - ABS according to EN 1455-1 or EN ISO 15493,
  - SAN + PVC according to ISO 19220,
  - PP according to EN 1451-1, DIN 8077, DIN 8078, DIN 16962, EN 15874-2 or EN ISO 15494,
  - PVC-U according to EN 1329-1, EN 1453-1, EN ISO 1452-2 or EN ISO 15493,
  - PVC-C according to EN 1566-1, EN ISO 15493 or EN ISO 15877-2,
  - PE-Xa according to EN ISO 21003-1,
  - PP-HT according to EN 1451-1 or EN 14758-1,
  - PP-R according to EN ISO 15874-2, DIN 8077 or DIN 8078,
  - PE-RT according to EN ISO 21003-1,
  - Wavin SiTech+ produced by Wavin Company,
  - PP-MF SILERE from PP-MF according to EN 1451-1,
  - PP-ML TRIPLUS from PP-ML according to EN 1451-1,

  according to tables in Annex C.
- Classifications given in Annex C are valid for MLC pipes:
  - Geberit Mepla produced by Geberit Company,
  - PP-R/AL/PP-R according to EN ISO 23391-2, EN ISO 15874-1 or EN ISO 15874-2,
  - PE-X/AL/PE-X according to EN ISO 21003-2,
  - PE-Xb/AL/PE-Xb according to EN ISO 21003,
  - PE-RT/AL/PE-RT according to EN ISO 21003-2,

  according to tables in Annex C.

INTU FR COLLAR L SLIM	**Annex A** of European Technical Assessment ETA-24/0497
Additional provisions	

- Classifications given in Annex C are valid for composite pipes:
  - Raupiano Plus produced by Rehau Company,
  - PP/PP-MF/PP according to EN 1451-1 or EN 14758-1,
  - PP-R/PP-R-GF/PP-R according to EN ISO 15874-1 or EN ISO 15874-2,

  according to tables in Annex C.

- Classifications given in Annex C for copper and steel pipes are also valid for other metal pipe materials with:
  - thermal conductivity lower than respectively copper and steel, and
  - melting point at least equal to respectively copper and steel, and greater than:
    - 739°C for the fire resistance class EI 15 and E 15,
    - 781°C for the fire resistance class EI 20 and E 20,
    - 842°C for the fire resistance class EI 30 and E 30,
    - 902°C for the fire resistance class EI 45 and E 45,
    - 945°C for the fire resistance class EI 60 and E 60,
    - 1006°C for the fire resistance class EI 90 and E 90,
    - 1049°C for the fire resistance class EI 120 and E 120,
    - 1110°C for the fire resistance class EI 180 and E 180,
    - 1153°C for the fire resistance class EI 240 and E 240.

- Classifications given in Annex C are valid for specific conduits:
  - PVC according to EN 61386-21,
  - AROT DVK produced by Wavin Company,

  according to tables in Annex C.

- Classifications given in Annex C for cables are valid for:
  - small cables that are currently and commonly used in building practice in Europe, with maximum diameter of 21 mm, including optical fibre cables, except tied bundles, waveguides and non-sheathed cables (wires),
  - YDY 4 x 1,5 mm^2 according to EN 50525-1,
  - tied cable bundles with diameter of less than or equal to $ø_{bundle}$ given in the appropriate annex, made of cables commonly used in building practice in Europe to a maximum diameter of 21 mm, including optical fibre cables, except waveguides and non-sheathed cables (wires),
  - heating cable type DEVIPIPEGUARD of DEVI company with diameter equal or less than DEVIPIPEGUARD / 230V 25W cable,

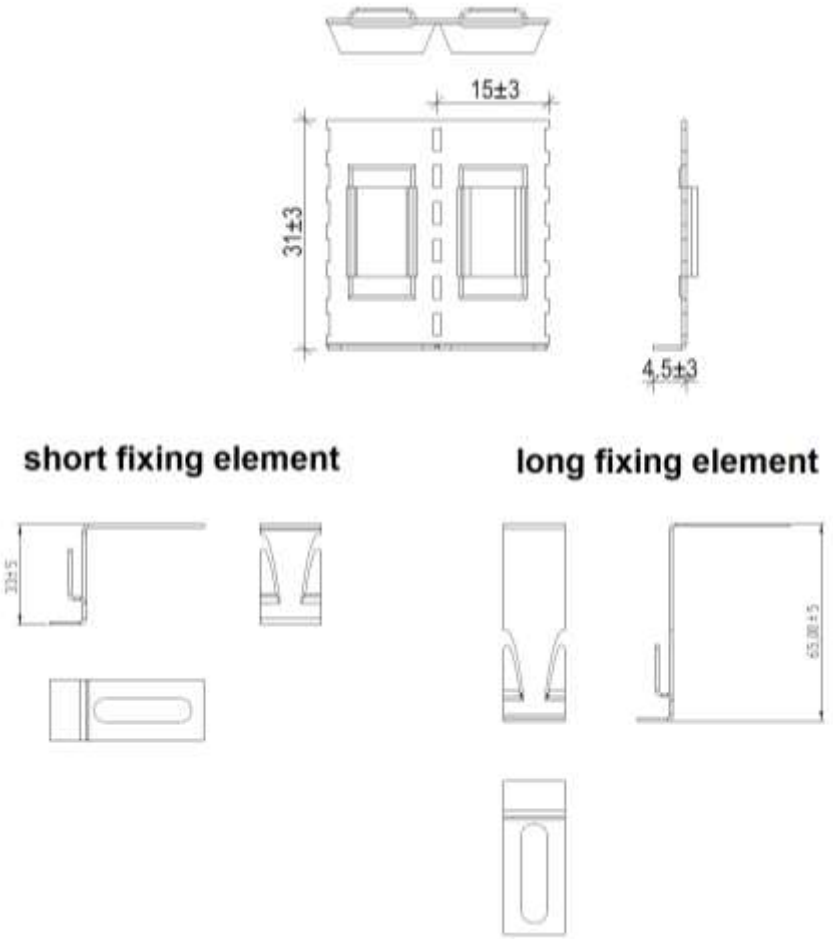
  in accordance with tables in Annex C.

- Classifications given in Annex C for insulated pipes are valid for pipes with sustained and continued insulation made of Kaiflex ST flexible elastomeric foam (FEF) or Tubolit DG Plus (PE) insulation (for details see clause 1 of ETA) and does not cover locally insulated or non-insulated pipes. The thickness of insulation shall remain in accordance with ETA provisions.

- Classifications given in Annex C for plastic pipes with local sustained ThermaCompact TF (PE) insulation concerns locally insulated pipes in case LS (local sustained) and does not cover locally insulated pipes in case LI (local interrupted) or non-insulated pipes. The length of insulation can be increased but may not be reduced. The thickness of insulation shall remain in accordance with ETA provisions.

INTU FR COLLAR L SLIM	**Annex A** of European Technical Assessment ETA-24/0497
Additional provisions	

dimensions in mm



Note
Collar casing made of steel sheet thickness of 0,5 mm.
Fixing elements made of steel sheet thickness of 1,0 mm.

Fig. B1. Details of INTU FR COLLAR L SLIM

INTU FR COLLAR L SLIM	**Annex B1** of European Technical Assessment ETA-24/0497
Housing of collar	

Fig. B2. Example for single collar – short fixing elements

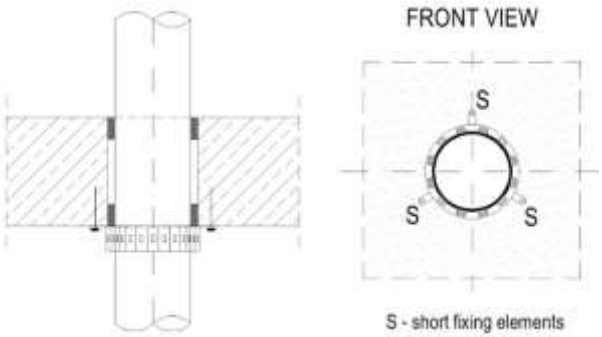


Fig. B3. Example for double collars – short and long fixing elements

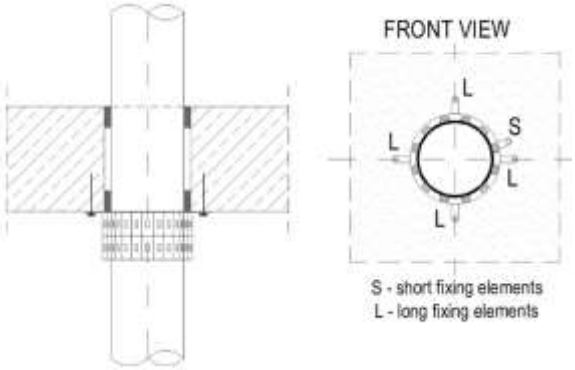


Table B1. Number of INTU FR COLLAR L SLIM collar fixing elements

Pipe diameter	Number of collars	Number of collar segments	Number of short fixing elements	Number of long fixing elements
32	1	9	2	-
40	1	11	2	-
50	1	15	2	-
63	1	17	3	-
75	1	19	3	-
82	1	22	3	-
90	1	23	3	-
110	1	28	3	-
125	1	1 x 33	4	-
125	2	2 x 33	1	4
160	1	1 x 42	4	-
160	2	2 x 42	1	4
200	2	2 x 52	1	4
225	2	2 x 61	1	5
250	2	2 x 66	1	5
315	2	2 x 80	1	6

INTU FR COLLAR L SLIM	**Annex B2** of European Technical Assessment ETA-24/0497
Fixing of collar and fixing elements	

Table C1. Resistance to fire classification of plastic pipes without insulation penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1a and D1b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
COOL-FIT 2.0 [1]	D = 75 / 125	6,8 / 3,8 [2]	50	4 x 30,0 x 14,0	**EI 120-U/C EI 120-C/C**	**Fig. D1b**
	D = 90 / 140	8,2 / 4,0 [2]	50	4 x 30,0 x 14,0		
Geberit Silent dB20	D ≤ 56	3,2	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a and D1b**
	56 < D ≤ 63	3,2	-	2 x 30,0 x 4,0		
	63 < D ≤ 75	3,6	-	2 x 30,0 x 4,0		
	75 < D ≤ 90	4,6	-	2 x 30,0 x 8,0		
	90 < D ≤ 110	6,0	-	2 x 30,0 x 10,0		
	110 < D ≤ 135	6,5	-	4 x 30,0 x 14,0		
	135 < D ≤ 160	7,0	-	4 x 30,0 x 18,0		
Magnaplast Ultra dB	D ≤ 50	2,0	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	50 < D ≤ 75	2,3	-	2 x 30,0 x 4,0		
	75 < D ≤ 110	3,4	-	2 x 30,0 x 10,0	**EI 90 / E 120-U/C EI 90 / E 120-C/C**	
PE-HD / PE / PE-X / ABS / SAN + PVC	D ≤ 32	2,0 – 2,3	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a and D1b**
		2,4 – 4,6	-	2 x 30,0 x 4,0	**EI 120-U/U**	
		4,7 – 6,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	32 < D ≤ 50	2,4 – 4,6	-	2 x 30,0 x 4,0	**EI 120-U/U**	
		4,7 – 6,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	50 < D ≤ 63	2,7	-	2 x 30,0 x 4,0		
		2,8 – 4,5	-	2 x 30,0 x 4,0		
			-	2 x 30,0 x 6,0	**EI 60-U/U**	
		4,6 – 6,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	63 < D ≤ 75	3,0 – 3,1	-	2 x 30,0 x 4,0		
		3,2 – 4,4	-	2 x 30,0 x 4,0		
			-	2 x 30,0 x 8,0	**EI 60-U/U**	
		4,5 – 6,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	75 < D ≤ 90	3,5	-	2 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		3,6 – 4,3	-	2 x 30,0 x 8,0		
			-	2 x 30,0 x 8,0	**EI 60-U/U**	
		4,4 – 8,2	-	2 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
	90 < D ≤ 110	4,2	-	2 x 30,0 x 10,0		
			-	2 x 30,0 x 10,0	**EI 60-U/U**	
		4,3 – 10,0	-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
	110 < D ≤ 125	4,4 – 9,9	-	4 x 30,0 x 14,0		
	125 < D ≤ 160	4,9 – 9,5	-	4 x 30,0 x 18,0		
	160 < D ≤ 180	8,4 – 10,7	-	4 x 30,0 x 20,0	**EI 90-U/C EI 90-C/C**	
	180 < D ≤ 200	11,9	-	4 x 30,0 x 20,0		

[1] PE-100 pipe, pre-insulated with GF-HE foam in PE sheet

[2] inside / outside pipe wall thickness

Table C2. Resistance to fire classification of MLC pipes without insulation penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1a in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PE-RT/AL/ PE-RT	D ≤ 20	2,0	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	20 < D ≤ 25	2,5	-	2 x 30,0 x 4,0	**EI 45 / E 120-U/C EI 45 / E 120-C/C**	
	25 < D ≤ 32	3,0	-	2 x 30,0 x 4,0		
	32 < D ≤ 40	4,0	-	2 x 30,0 x 4,0		
	40 < D ≤ 50	4,8	-	2 x 30,0 x 4,0		
	50 < D ≤ 63	6,0	-	2 x 30,0 x 4,0		
	63 < D ≤ 75	7,5	-	2 x 30,0 x 4,0		
PE-X/AL/ PE-X	D ≤ 20	2,0	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	20 < D ≤ 25	2,5	-	2 x 30,0 x 4,0	**EI 45 / E 120-U/C EI 45 / E 120-C/C**	
	25 < D ≤ 32	3,0	-	2 x 30,0 x 4,0		
	32 < D ≤ 40	4,0	-	2 x 30,0 x 4,0		
	40 < D ≤ 50	4,8	-	2 x 30,0 x 4,0		
	50 < D ≤ 63	6,0	-	2 x 30,0 x 4,0		
PE-Xb/AL/ PE-Xb	D ≤ 20	2,0	-	2 x 30,0 x 4,0	**EI 90 / E 120-U/C EI 90 / E 120-C/C**	**Fig. D1a**
	20 < D ≤ 26	3,0	-	2 x 30,0 x 4,0		
PP-R/AL/ PP-R	D ≤ 20	≥ 2,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	20 < D ≤ 25	≥ 3,3	-	2 x 30,0 x 4,0		
	25 < D ≤ 32	4,0 – 12,5	-	2 x 30,0 x 4,0		
	32 < D ≤ 40	4,8 – 12,5	-	2 x 30,0 x 4,0		
	40 < D ≤ 50	5,9 – 12,5	-	2 x 30,0 x 4,0		
	50 < D ≤ 63	7,2 – 12,5	-	2 x 30,0 x 4,0		
	63 < D ≤ 75	8,4 – 12,5	-	2 x 30,0 x 4,0		
	75 < D ≤ 90	10,1 – 15,0	-	2 x 30,0 x 8,0		
	90 < D ≤ 110	12,3 – 18,3	-	2 x 30,0 x 10,0		

Table C3. Resistance to fire classification of MLC pipes without insulation penetration seals in rigid wall thickness of: t ≥ 150 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1a in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
Geberit Mepla	D ≤ 20	2,5	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	20 < D ≤ 25	3,0	-	2 x 30,0 x 4,0		
	25 < D ≤ 32	3,0	-	2 x 30,0 x 4,0		
	32 < D ≤ 40	3,5	-	2 x 30,0 x 4,0	**EI 90 / E 120-U/C EI 90 / E 120-C/C**	
	40 < D ≤ 50	4,5	-	2 x 30,0 x 4,0	**EI 45 / E 120-U/C**	
	50 < D ≤ 63	4,5	-	2 x 30,0 x 4,0	**EI 45 / E 120-C/C**	

Table C4. Resistance to fire classification of plastic pipes without insulation at 45° angle penetration seals in rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1d in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PE-HD / PE / PE-X / ABS / SAN + PVC	D ≤ 110	4,2	-	2 x 30,0 x 10,0	**EI 60-U/C EI 60-C/C**	**Fig. D1d**
PP	D ≤ 110	2,7	-	2 x 30,0 x 10,0	**EI 45 / E 60-U/C EI 45 / E 60-C/C**	**Fig. D1d**
PVC-U / PVC-C	D ≤ 110	3,2	-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D1d**

Table C5. Resistance to fire classification of plastic pipes without insulation penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1a and D1b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PE-Xa	D ≤ 20	2,0	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	20 < D ≤ 25	2,3	-	2 x 30,0 x 4,0		
	25 < D ≤ 32	3,0	-	2 x 30,0 x 4,0		
	32 < D ≤ 40	3,7	-	2 x 30,0 x 4,0		
	40 < D ≤ 50	4,6	-	2 x 30,0 x 4,0		
	50 < D ≤ 63	5,8	-	2 x 30,0 x 4,0		
PP	D ≤ 32	1,8 – 8,3	-	2 x 30,0 x 4,0	**EI 120-U/U**	**Fig. D1a and D1b**
		8,4 – 12,5	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	32 < D ≤ 50	1,8 – 8,3	-	2 x 30,0 x 4,0	**EI 120-U/U**	
		8,4 – 12,5	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	50 < D ≤ 63	1,9	-	2 x 30,0 x 4,0		
		2,0 – 7,1	-	2 x 30,0 x 4,0		
			-	2 x 30,0 x 6,0	**EI 120-U/U**	
		7,2 – 7,3	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
			-	2 x 30,0 x 6,0	**EI 60-U/U**	
		7,4 – 12,5	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	63 < D ≤ 75	1,9 – 2,1	-	2 x 30,0 x 4,0		
		2,2 – 6,0	-	2 x 30,0 x 4,0		
			-	2 x 30,0 x 8,0	**EI 120-U/U**	
		6,1 – 6,4	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
			-	2 x 30,0 x 8,0	**EI 60-U/U**	
		6,5 – 12,5	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	75 < D ≤ 90	2,2 – 2,3	-	2 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		2,4 – 4,6	-	2 x 30,0 x 8,0	**EI 120-U/U**	
		4,7 – 5,3	-	2 x 30,0 x 8,0	**EI 60-U/U**	
			-	2 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		5,4 – 15,0	-	2 x 30,0 x 8,0		
	90 < D ≤ 110	2,7	-	2 x 30,0 x 10,0	**EI 120-U/U**	
		2,8 – 3,8	-	2 x 30,0 x 10,0	**EI 60-U/U**	
			-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
		3,9 – 18,3	-	2 x 30,0 x 10,0		
	110 < D ≤ 125	3,1 – 17,2	-	4 x 30,0 x 14,0		
	125 < D ≤ 160	4,0 – 14,6	-	4 x 30,0 x 18,0		
	160 < D ≤ 180	5,9 – 11,2	-	4 x 30,0 x 20,0	**EI 60-U/C EI 60-C/C**	
	180 < D ≤ 200	7,7	-	4 x 30,0 x 20,0		

Table C5, cont. Resistance to fire classification of plastic pipes without insulation penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1a and D1b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP-HT	D ≤ 50	1,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a and D1b**
	50 < D ≤ 75	1,9	-	2 x 30,0 x 4,0		
	75 < D ≤ 90	2,2	-	2 x 30,0 x 8,0		
	90 < D ≤ 110	2,7	-	2 x 30,0 x 10,0		
	110 < D ≤ 125	3,1	-	4 x 30,0 x 14,0	**EI 60-U/C EI 60-C/C**	
	125 < D ≤ 160	3,9	-	4 x 30,0 x 18,0		
PP-R	D ≤ 20	≥ 2,3	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	20 < D ≤ 25	≥ 2,5	-	2 x 30,0 x 4,0		
	25 < D ≤ 32	3,3 – 12,5	-	2 x 30,0 x 4,0		
	32 < D ≤ 40	3,9 – 12,5	-	2 x 30,0 x 4,0		
	40 < D ≤ 50	4,8 – 12,5	-	2 x 30,0 x 4,0		
	50 < D ≤ 63	5,8 – 12,5	-	2 x 30,0 x 4,0		
	63 < D ≤ 75	6,8 – 12,5	-	2 x 30,0 x 4,0		
	75 < D ≤ 90	8,2 – 15,0	-	2 x 30,0 x 8,0		
	90 < D ≤ 110	10,0 – 18,3	-	2 x 30,0 x 10,0		
PVC-U / PVC-C	D ≤ 32	1,2 – 5,6	-	2 x 30,0 x 4,0	**EI 120-U/U**	**Fig. D1a**
	32 < D ≤ 50	1,2 – 5,6	-	2 x 30,0 x 4,0		
	50 < D ≤ 63	1,4	-	2 x 30,0 x 6,0	**EI 120-U/C EI 120-C/C**	
			-	2 x 30,0 x 6,0	**EI 30-U/U**	
		1,5 – 2,6	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
			-	2 x 30,0 x 6,0	**EI 30-U/U**	
		2,7 – 5,6	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
			-	2 x 30,0 x 6,0	**EI 60-U/U**	
		5,7 – 6,1	-	2 x 30,0 x 6,0		
			-	2 x 30,0 x 6,0	**EI 120-U/C EI 120-C/C**	
	63 < D ≤ 75	1,5 – 1,7	-	2 x 30,0 x 8,0	**EI 30-U/U**	
		1,8 – 4,0	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
			-	2 x 30,0 x 8,0	**EI 30-U/U**	
		4,1 – 5,6	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
			-	2 x 30,0 x 8,0	**EI 60-U/U**	
		5,7 – 6,6	-	2 x 30,0 x 8,0		

Table C5, cont. Resistance to fire classification of plastic pipes without insulation penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1a and D1b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PVC-U / PVC-C	75 < D ≤ 90	1,7 – 5,7	-	2 x 30,0 x 8,0	**EI 30-U/U**	**Fig. D1a and D1b**
			-	2 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		5,8 – 7,3	-	2 x 30,0 x 8,0	**EI 60-U/U**	
			-	2 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
	90 < D ≤ 110	2,0 – 8,0	-	2 x 30,0 x 10,0	**EI 30-U/U**	
			-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
		8,1	-	2 x 30,0 x 10,0	**EI 60-U/U**	
			-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
	110 < D ≤ 125	2,4 – 8,5	-	4 x 30,0 x 14,0		
	125 < D ≤ 160	3,2 – 9,5	-	4 x 30,0 x 18,0		
	160 < D ≤ 180	4,4 – 5,4	-	4 x 30,0 x 22,0	**EI 60-U/C EI 60-C/C**	
		5,5 – 8,6	-	4 x 30,0 x 20,0	**EI 120-U/C EI 120-C/C**	
		8,7 – 9,3	-	4 x 30,0 x 22,0	**EI 60-U/C EI 60-C/C**	
	180 < D ≤ 200	5,6 – 7,6	-	4 x 30,0 x 24,0		
		7,7	-	4 x 30,0 x 20,0	**EI 120-U/C EI 120-C/C**	
		7,8 – 9,1	-	4 x 30,0 x 24,0	**EI 60-U/C EI 60-C/C**	
	200 < D ≤ 250	8,6	-	4 x 30,0 x 30,0		
Wavin SiTech+	D ≤ 50	1,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a and D1b**
	50 < D ≤ 75	2,6	-	2 x 30,0 x 4,0		
	75 < D ≤ 90	3,1	-	2 x 30,0 x 8,0		
	90 < D ≤ 110	3,4	-	2 x 30,0 x 10,0		
	110 < D ≤ 125	3,9	-	4 x 30,0 x 14,0		
	125 < D ≤ 160	4,9	-	4 x 30,0 x 18,0		

Table C6. Resistance to fire classification of plastic pipes without insulation at 45° angle penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1d in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP	D ≤ 110	2,7	-	2 x 30,0 x 10,0	**EI 45-U/C EI 45-C/C**	**Fig. D1d**

Table C7. Resistance to fire classification of plastic pipes without insulation at 87,5° pipe elbow penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM (U-shaped on elbow side), in accordance with Annex A and Fig. D1c in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP	D ≤ 110	2,7	-	2 x 30,0 x 10,0	**EI 90-U/C EI 90-C/C**	**Fig. D1c**
PVC-U / PVC-C	D ≤ 110	3,2	-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D1c**

Table C8. Resistance to fire classification of composite pipes without insulation penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D1a in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP-R/PP-R-GF/PP-R	D ≤ 20	≥ 2,8	-	2 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D1a**
	20 < D ≤ 25	≥ 3,5	-	2 x 30,0 x 4,0		
	25 < D ≤ 32	4,4 – 12,5	-	2 x 30,0 x 4,0		
	32 < D ≤ 40	5,5 – 12,5	-	2 x 30,0 x 4,0		
	40 < D ≤ 50	6,9 – 12,5	-	2 x 30,0 x 4,0		
	50 < D ≤ 63	8,7 – 12,5	-	2 x 30,0 x 4,0		
	63 < D ≤ 75	10,3 – 12,5	-	2 x 30,0 x 4,0		
	75 < D ≤ 90	11,2 – 12,3	-	2 x 30,0 x 8,0	**EI 90 / E 120-U/C EI 90 / E 120-C/C**	
		12,4 – 15,0	-	2 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
	90 < D ≤ 110	12,3 – 15,0	-	2 x 30,0 x 10,0	**EI 90 / E 120-U/C EI 90 / E 120-C/C**	
		15,1 – 18,3	-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	

Table C9. Resistance to fire classification of penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made in accordance with Annex A and Fig. D1e in Annex D, of following mixed bundle consisting of pipes without insulation:

- **PVC-U (plastic)**, diameter of: D ≤ 50 mm and pipe wall thickness of: t = 1,5 mm,
- **PP-R (plastic)**, diameter of: D ≤ 50 mm and pipe wall thickness of: t = 8,3 mm,
- **PP-R/PP-R-GF/PP-R (composite)**, diameter of: D ≤ 50 mm and pipe wall thickness of: t = 6,9 mm,

made with use of double-sided INTU FR COLLAR L SLIM (2 x 30,0 x 10,0 mm – number of collars x intumescent material length x thickness)

Fire resistance class:
EI 120-U/C
EI 120-C/C

Table C10. Resistance to fire classification of metal pipes with flexible elastomeric foam (FEF) continuous insulation (case CS) penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D2 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
copper	D ≤ 12,7	≥ 0,8	9	2 x 30,0 x 4,0	**EI 60 / E 120-C/U** **EI 60 / E 120-C/C**
	12,7 < D ≤ 22,23	≥ 1,0	9	2 x 30,0 x 4,0	
steel	D ≤ 18,0	≥ 1,2	9	2 x 30,0 x 4,0	**EI 120-C/U** **EI 120-C/C**
			10 – 25	2 x 30,0 x 6,0	
	18,0 < D ≤ 28,0	1,2 – 1,4	9	2 x 30,0 x 4,0	**EI 45 / E 120-C/U** **EI 45 / E 120-C/C**
		1,5 – 1,9	9	2 x 30,0 x 4,0	**EI 120-C/U** **EI 120-C/C**
			10 – 32	2 x 30,0 x 6,0	
		≥ 2,0	9	2 x 30,0 x 4,0	
			10 – 32	2 x 30,0 x 6,0	
			33 – 50	2 x 30,0 x 8,0	**EI 90 / E 120-C/U** **EI 90 / E 120-C/C**
	28,0 < D ≤ 42,4	1,2 – 1,4	9	2 x 30,0 x 4,0	**EI 45 / E 120-C/U** **EI 45 / E 120-C/C**
		1,5 – 1,9	9	2 x 30,0 x 4,0	**EI 90 / E 120-C/U** **EI 90 / E 120-C/C**
			10 – 31	2 x 30,0 x 6,0	
			32	2 x 30,0 x 6,0	**EI 120-C/U** **EI 120-C/C**
		≥ 2,0	9	2 x 30,0 x 4,0	**EI 90 / E 120-C/U** **EI 90 / E 120-C/C**
			10 – 31	2 x 30,0 x 6,0	
			32	2 x 30,0 x 6,0	**EI 120-C/U** **EI 120-C/C**
			33 – 50	2 x 30,0 x 8,0	**EI 90 / E 120-C/U** **EI 90 / E 120-C/C**
	42,4 < D ≤ 66,7	1,2 – 1,4	9	2 x 30,0 x 4,0	**EI 45 / E 120-C/U** **EI 45 / E 120-C/C**
		1,5 – 1,9	9	2 x 30,0 x 4,0	**EI 90 / E 120-C/U** **EI 90 / E 120-C/C**
			10 – 31	2 x 30,0 x 6,0	
			32	2 x 30,0 x 6,0	**EI 120-C/U** **EI 120-C/C**
		≥ 2,0	9	2 x 30,0 x 4,0	**EI 90 / E 120-C/U** **EI 90 / E 120-C/C**
			10 – 31	2 x 30,0 x 6,0	
			32	2 x 30,0 x 6,0	**EI 120-C/U** **EI 120-C/C**
			33 – 50	2 x 30,0 x 8,0	**EI 90 / E 120-C/U** **EI 90 / E 120-C/C**
	66,7 < D ≤ 108,0	≥ 2,0	32	2 x 30,0 x 6,0	
			33 – 50	2 x 30,0 x 8,0	
	108,0 < D ≤ 114,3	≥ 3,6	32	2 x 30,0 x 6,0	
			33 – 50	2 x 30,0 x 8,0	
	114,3 < D ≤ 168,3	≥ 4,0	32	2 x 30,0 x 6,0	**EI 60 / E 120-C/U** **EI 60 / E 120-C/C**
			33 – 49	2 x 30,0 x 8,0	**EI 60 / E 90-C/U** **EI 60 / E 90-C/C**
			50	2 x 30,0 x 8,0	**EI 90-C/U** **EI 90-C/C**

Table C11. Resistance to fire classification of mixed bundle of single copper pipe (C/U end configuration) with flexible elastomeric foam (FEF) continuous insulation (case CS), with additional single cable 4 x 1,5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D3 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
single copper pipe	D ≤ 12,7	≥ 0,8	9	2 x 30,0 x 4,0	**EI 60 / E 120**
	12,7 < D ≤ 22,23	≥ 1,0	9	2 x 30,0 x 4,0	

Table C12. Resistance to fire classification of mixed bundle of double copper pipe (C/U end configuration) with flexible elastomeric foam (FEF) continuous insulation (case CS), with additional single cable 4 x 1,5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D3 in Annex D:

Pipe material	Copper pipe No. 1 max. diameter x min. wall thickness [mm]	Copper pipe No. 2 max. diameter x min. wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
double copper pipe	12,7 x 0,8	12,7 x 0,8	9	2 x 30,0 x 4,0	**EI 60 / E 120**
	12,7 x 0,8	22,23 x 1,0	9	2 x 30,0 x 4,0	

Table C13. Resistance to fire classification of mixed bundle of single copper pipe (C/U end configuration) with polyethylene foam (PE) (with reaction to fire class B_L-s1, d0 according to EN 13501-1) continuous insulation (case CS), with additional single cable 4 x 1,5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D4 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
single copper pipe	D ≤ 12,7	≥ 0,8	9	2 x 30,0 x 4,0	**EI 60 / E 120**
	12,7 < D ≤ 22,23	≥ 1,0	9	2 x 30,0 x 4,0	

Table C14. Resistance to fire classification of mixed bundle of double copper pipe (C/U end configuration) with polyethylene foam (PE) (reaction to fire class B_L-s1, d0 according to EN 13501-1) continuous insulation (case CS), with additional single cable 4 x 1,5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D4 in Annex D:

Pipe material	Copper pipe No. 1 max. diameter x min. wall thickness [mm]	Copper pipe No. 2 max. diameter x min. wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
double copper pipe	12,7 x 0,8	12,7 x 0,8	9	2 x 30,0 x 4,0	**EI 60 / E 120**
	12,7 x 0,8	22,23 x 1,0	9	2 x 30,0 x 4,0	

Table C15. Resistance to fire classification of AROT DVK conduits bundle with or without small cables ($ø_{cable}$ ≤ 21 mm) or cable bundle ($ø_{bundle}$ ≤ conduit inner diameter, $ø_{cable}$ ≤ 21 mm) penetration seals in flexible or rigid wall thickness of: t ≥ 100 mm, made with use of double-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D5 in Annex D:

Diameter of single conduit in bundle [mm]	Conduit wave height [mm]	Service inside	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
D ≤ 50	3,0	empty	2 x 30,0 x 10,0	**EI 120-U/U**
		small cable: $ø_{cable}$ ≤ 21 mm	2 x 30,0 x 10,0	**EI 120-U/U**
		cable bundle: $ø_{bundle} ≤ D_{in}$ [1] $ø_{cable}$ ≤ 21 mm	2 x 30,0 x 10,0	**EI 120-U/U**

[1] D_{in} – conduit inner diameter

Table C16. Resistance to fire classification of PP pipes without insulation penetration seals in rigid wall thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D6a and D6b in Annex D:

Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x Intumescent material width x thickness [mm]	Fire resistance class [1)]	Figure in Annex D
D ≤ 32	1,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D6a and D6b**
32 < D ≤ 50	1,8	-	1 x 30,0 x 4,0		
50 < D ≤ 63	2,0	-	1 x 30,0 x 6,0	**EI 60-U/C EI 60-C/C**	
63 < D ≤ 75	2,2	-	1 x 30,0 x 8,0		
75 < D ≤ 90	2,4	-	1 x 30,0 x 8,0		
90 < D ≤ 110	2,7	-	1 x 30,0 x 10,0		
D ≤ 32	1,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D6a**
32 < D ≤ 50	1,8	-	1 x 30,0 x 4,0		
50 < D ≤ 63	2,0	-	1 x 30,0 x 6,0	**EI 90-U/C EI 90-C/C**	
63 < D ≤ 75	2,2	-	1 x 30,0 x 8,0		
75 < D ≤ 90	2,4	-	1 x 30,0 x 8,0		
90 < D ≤ 110	2,7	-	1 x 30,0 x 10,0		
D ≤ 32	1,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D6b**
32 < D ≤ 50	1,8	-	1 x 30,0 x 4,0		
50 < D ≤ 63	2,0	-	1 x 30,0 x 6,0	**EI 60-U/C EI 60-C/C**	
63 < D ≤ 75	2,2	-	1 x 30,0 x 8,0		
75 < D ≤ 90	2,4	-	1 x 30,0 x 8,0		
90 < D ≤ 110	2,7	-	1 x 30,0 x 10,0		

Table C17. Resistance to fire classification of plastic pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D7a and D7b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
COOL-FIT 2.0 [1)]	D = 90 / 140	8,2 / 4,0 [2)]	50	2 x 30,0 x 14,0	**EI 120-U/C EI 120-C/C**	**Fig. D7b**
Geberit Silent dB20	D ≤ 160	7,0	-	1 x 30,0 x 18,0	**EI 60-U/C EI 60-C/C**	**Fig. D7a**
Geberit Silent PP	D ≤ 50	1,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a and D7b**
	50 < D ≤ 75	2,6	-	1 x 30,0 x 4,0		
	75 < D ≤ 90	3,1	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	3,6	-	1 x 30,0 x 10,0		
	110 < D ≤ 125	4,2	-	2 x 30,0 x 14,0		
	125 < D ≤ 160	4,5	-	2 x 30,0 x 18,0		
Magnaplast Ultra dB	D ≤ 50	2,0	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a and D7b**
	50 < D ≤ 75	2,3	-	1 x 30,0 x 4,0		
	75 < D ≤ 110	3,4	-	1 x 30,0 x 10,0		
	110 < D ≤ 125	3,9	-	1 x 30,0 x 18,0	**EI 30-U/C EI 30-C/C**	
			-	2 x 30,0 x 18,0	**EI 120-U/C EI 120-C/C**	
	125 < D ≤ 160	4,9	-	1 x 30,0 x 18,0	**EI 30-U/C EI 30-C/C**	
			-	2 x 30,0 x 18,0	**EI 120-U/C EI 120-C/C**	
PE-HD / PE / PE-X / ABS / SAN + PVC	D ≤ 32	1,9	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
		2,0 – 4,6	-	1 x 30,0 x 4,0	**EI 120-U/U**	
		4,7 – 6,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	32 < D ≤ 50	2,4 – 4,6	-	1 x 30,0 x 4,0	**EI 120-U/U**	
		4,7 – 6,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	50 < D ≤ 63	2,7	-	1 x 30,0 x 4,0		
		2,8 – 3,9	-	1 x 30,0 x 4,0		
			-	1 x 30,0 x 6,0	**EI 45 / E 120-U/U**	

[1)] PE-100 pipe, pre-insulated with GF-HE foam in PE sheet

[2)] inside / outside pipe wall thickness

Table C17, cont. Resistance to fire classification of plastic pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D7a and D7b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PE-HD / PE / PE-X / ABS / SAN + PVC	50 < D ≤ 63	4,0 – 4,5	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
			-	1 x 30,0 x 6,0	**EI 45 / E 120-U/U**	
			-	1 x 30,0 x 6,0	**EI 60-U/U**	
		4,6 – 5,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
			-	1 x 30,0 x 6,0	**EI 60-U/U**	
		5,9 – 6,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	63 < D ≤ 75	3,0 – 3,1	-	1 x 30,0 x 4,0		
		3,2 – 4,4	-	1 x 30,0 x 4,0		
			-	1 x 30,0 x 8,0	**EI 45 / E 120-U/U**	
		4,5 – 5,5	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
		5,6 – 6,8	-	1 x 30,0 x 4,0		
			-	1 x 30,0 x 8,0	**EI 60-U/U**	
	75 < D ≤ 90	3,5	-	1 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		3,6 – 4,3	-	1 x 30,0 x 8,0		
			-	1 x 30,0 x 8,0	**EI 45 / E 120-U/U**	
		4,4 – 7,4	-	1 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		7,5 – 8,2	-	1 x 30,0 x 8,0		
			-	1 x 30,0 x 8,0	**EI 60-U/U**	
	90 < D ≤ 110	4,2 – 10,0	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
		4,2	-	1 x 30,0 x 10,0		
			-	1 x 30,0 x 10,0	**EI 45 / E 120-U/U**	
		4,3 – 9,9	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
			-	1 x 30,0 x 10,0	**EI 45 / E 60-U/U**	
		10,0	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
			-	1 x 30,0 x 10,0	**EI 60-U/U**	
	110 < D ≤ 125	4,4 – 9,9	-	2 x 30,0 x 14,0	**EI 120-U/C EI 120-C/C**	
	125 < D ≤ 160	4,9 – 9,5	-	2 x 30,0 x 18,0		
	160 < D ≤ 180	8,1 – 10,4	-	2 x 30,0 x 20,0		
	180 < D ≤ 200	11,3	-	2 x 30,0 x 20,0		
PE-Xa	D ≤ 20	2,0	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	20 < D ≤ 25	2,3	-	1 x 30,0 x 4,0		
	25 < D ≤ 32	3,0	-	1 x 30,0 x 4,0		
	32 < D ≤ 40	3,7	-	1 x 30,0 x 4,0		
	40 < D ≤ 50	4,6	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	5,8	-	1 x 30,0 x 4,0		
PP	D ≤ 32	1,8 – 8,3	-	1 x 30,0 x 4,0	**EI 120-U/U**	**Fig. D7a**
		8,4 – 12,5	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
	32 < D ≤ 50	1,8 – 8,3	-	1 x 30,0 x 4,0	**EI 120-U/U**	
		8,4 – 12,5	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	

Table C17, cont. Resistance to fire classification of plastic pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D7a and D7b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP	50 < D ≤ 63	1,9 – 2,1	-	1 x 30,0 x 4,0	**EI 120-U/C** **EI 120-C/C**	**Fig. D7a**
		2,2 – 7,3	-	1 x 30,0 x 4,0		
			-	1 x 30,0 x 6,0	**EI 120-U/U**	
		7,4 – 12,5	-	1 x 30,0 x 4,0	**EI 120-U/C** **EI 120-C/C**	
	63 < D ≤ 75	1,9 – 2,5	-	1 x 30,0 x 4,0		
		2,6 – 6,4	-	1 x 30,0 x 4,0		
			-	1 x 30,0 x 8,0	**EI 120-U/U**	
		6,5 – 12,5	-	1 x 30,0 x 4,0	**EI 120-U/C** **EI 120-C/C**	
	75 < D ≤ 90	2,2 – 3,0	-	1 x 30,0 x 8,0		
		3,1 – 5,3	-	1 x 30,0 x 8,0	**EI 120-U/U**	
		5,4 – 15,0	-	1 x 30,0 x 8,0	**EI 120-U/C** **EI 120-C/C**	
	90 < D ≤ 110	2,7 – 3,7	-	1 x 30,0 x 10,0	**EI 120-U/C** **EI 120-C/C**	
		3,8	-	1 x 30,0 x 10,0	**EI 120-U/U**	
		3,9 – 18,3	-	1 x 30,0 x 10,0	**EI 120-U/C** **EI 120-C/C**	
	110 < D ≤ 125	3,1 – 15,7	-	2 x 30,0 x 14,0		
	125 < D ≤ 160	3,9 – 9,5	-	2 x 30,0 x 18,0		
	160 < D ≤ 180	5,8 – 8,6	-	2 x 30,0 x 20,0	**EI 90-U/C** **EI 90-C/C**	
	180 < D ≤ 200	7,7	-	2 x 30,0 x 20,0		
PP-HT	D ≤ 50	1,8	-	1 x 30,0 x 4,0	**EI 120-U/C** **EI 120-C/C**	**Fig. D7a**
	50 < D ≤ 75	1,9	-	1 x 30,0 x 4,0		
	75 < D ≤ 90	2,2	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	2,7	-	1 x 30,0 x 10,0		
PP-MF SILERE	D ≤ 58	4,0	-	1 x 30,0 x 4,0	**EI 120-U/C** **EI 120-C/C**	**Fig. D7a and D7b**
	58 < D ≤ 78	4,5	-	1 x 30,0 x 8,0		
	78 < D ≤ 90	4,9	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	5,4	-	1 x 30,0 x 10,0		
	110 < D ≤ 135	5,6	-	2 x 30,0 x 14,0		
PP-ML TRIPLUS	D ≤ 50	1,8	-	1 x 30,0 x 4,0	**EI 120-U/C** **EI 120-C/C**	**Fig. D7a and D7b**
	50 < D ≤ 75	2,6	-	1 x 30,0 x 4,0		
	75 < D ≤ 90	3,1	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	3,4	-	1 x 30,0 x 10,0		
	110 < D ≤ 125	3,9	-	2 x 30,0 x 14,0		
	125 < D ≤ 160	4,9	-	2 x 30,0 x 18,0		

Table C17, cont. Resistance to fire classification of plastic pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D7a and D7b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP-R	D ≤ 20	≥ 2,3	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	20 < D ≤ 25	≥ 2,5	-	1 x 30,0 x 4,0		
	25 < D ≤ 32	3,3 – 12,5	-	1 x 30,0 x 4,0		
	32 < D ≤ 40	3,9 – 12,5	-	1 x 30,0 x 4,0		
	40 < D ≤ 50	4,8 – 12,5	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	5,8 – 12,5	-	1 x 30,0 x 4,0		
	63 < D ≤ 75	6,8 – 12,5	-	1 x 30,0 x 4,0		
	75 < D ≤ 90	8,2 – 15,0	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	10,0 – 18,3	-	1 x 30,0 x 10,0		
PVC-U / PVC-C	D ≤ 32	1,2 – 5,6	-	1 x 30,0 x 4,0	**EI 120-U/U**	**Fig. D7a and D7b**
	32 < D ≤ 50	1,2 – 5,6	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	1,4	-	1 x 30,0 x 6,0	**EI 30 / E 45-U/U**	
			-	1 x 30,0 x 6,0	**EI 120-U/C EI 120-C/C**	
		1,5 – 4,8	-	1 x 30,0 x 4,0		
			-	1 x 30,0 x 6,0	**EI 30 / E 45-U/U**	
		4,9 – 5,6	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
		5,7 – 6,1	-	1 x 30,0 x 6,0		
	63 < D ≤ 75	1,5 – 1,7	-	1 x 30,0 x 8,0	**EI 30 / E 45-U/U**	
			-	1 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		1,8 – 4,1	-	1 x 30,0 x 4,0		
			-	1 x 30,0 x 8,0	**EI 30 / E 45-U/U**	
		4,2 – 5,6	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	
		5,7 – 6,6	-	1 x 30,0 x 8,0		
	75 < D ≤ 90	1,7 – 3,2	-	1 x 30,0 x 8,0	**EI 30 / E 45-U/U**	
			-	1 x 30,0 x 8,0	**EI 120-U/C EI 120-C/C**	
		3,3 – 7.3	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	2,0	-	1 x 30,0 x 10,0	**EI 30 / E 45-U/U**	
			-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	
		2,1 – 8,1	-	1 x 30,0 x 10,0		
	110 < D ≤ 125	2,4 – 8,5	-	2 x 30,0 x 14,0		
	125 < D ≤ 160	3,2 – 9,5	-	2 x 30,0 x 18,0		
	160 < D ≤ 180	3,6 – 6,7	-	2 x 30,0 x 20,0		
		6,8 – 9,3	-	2 x 30,0 x 20,0	**EI 30-U/C EI 30-C/C**	
	180 < D ≤ 200	3,9	-	2 x 30,0 x 20,0	**EI 120-U/C EI 120-C/C**	
		4,0 – 9,0	-	2 x 30,0 x 22,0	**EI 30-U/C EI 30-C/C**	
	200 < D ≤ 250	5,8 – 8,5	-	2 x 30,0 x 26,0		
	250 < D ≤ 315	7,7	-	2 x 30,0 x 30,0	**EI 30-U/C EI 30-C/C**	

Table C18. Resistance to fire classification of MLC pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D7a in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
Geberit Mepla	D ≤ 20	2,5	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	20 < D ≤ 25	3,0	-	1 x 30,0 x 4,0		
	25 < D ≤ 32	3,0	-	1 x 30,0 x 4,0		
	32 < D ≤ 40	3,5	-	1 x 30,0 x 4,0		
	40 < D ≤ 50	4,5	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	4,5	-	1 x 30,0 x 4,0		
PE-RT/AL/ PE-RT	D ≤ 20	2,0	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	20 < D ≤ 25	2,5	-	1 x 30,0 x 4,0		
	25 < D ≤ 32	3,0	-	1 x 30,0 x 4,0		
	32 < D ≤ 40	4,0	-	1 x 30,0 x 4,0		
	40 < D ≤ 50	4,8	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	6,0	-	1 x 30,0 x 4,0		
	63 < D ≤ 75	7,5	-	1 x 30,0 x 4,0		
PE-X/AL/ PE-X	D ≤ 20	2,0	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	20 < D ≤ 25	2,5	-	1 x 30,0 x 4,0		
	25 < D ≤ 32	3,0	-	1 x 30,0 x 4,0		
	32 < D ≤ 40	4,0	-	1 x 30,0 x 4,0		
	40 < D ≤ 50	4,8	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	6,0	-	1 x 30,0 x 4,0		
PE-Xb/AL/ PE-Xb	D ≤ 32	3,0	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	32 < D ≤40	3,5	-	1 x 30,0 x 4,0		
	40 < D ≤ 63	4,5	-	1 x 30,0 x 4,0		
PP-R/AL/ PP-R	D ≤ 20	≥ 2,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	20 < D ≤ 25	≥ 3,3	-	1 x 30,0 x 4,0		
	25 < D ≤ 32	4,0 – 12,5	-	1 x 30,0 x 4,0		
	32 < D ≤ 40	4,8 – 12,5	-	1 x 30,0 x 4,0		
	40 < D ≤ 50	5,9 – 12,5	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	7,2 – 12,5	-	1 x 30,0 x 4,0		
	63 < D ≤ 75	8,4 – 12,5	-	1 x 30,0 x 4,0		
	75 < D ≤ 90	10,1 – 15,0	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	12,3 – 18,3	-	1 x 30,0 x 10,0		

Table C19. Resistance to fire classification of plastic pipes without insulation with 90° pipe elbow penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM (U-shaped on elbow side), in accordance with Annex A and Fig. D7d in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PE-HD / PE / PE-X / ABS / SAN + PVC	D ≤ 110	6,6	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D7d**
PP	D ≤ 110	2,7	-	1 x 30,0 x 10,0	**EI 90-U/C EI 90-C/C**	**Fig. D7d**

Table C20. Resistance to fire classification of plastic pipes without insulation with 87,5° pipe elbow penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM (U-shaped on elbow side), in accordance with Annex A and Fig. D7d in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PVC-U / PVC-C	D ≤ 110	3,2	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D7d**

Table C21. Resistance to fire classification of plastic pipes without insulation in wall corner penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM (U-shaped), in accordance with Annex A and Fig. D7c in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PE-HD / PE / PE-X / ABS / SAN + PVC	D ≤ 110	4,2	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D7c**
PP	D ≤ 110	3,9	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D7c**
PVC-U / PVC-C	D ≤ 110	3,2	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D7c**

Table C22. Resistance to fire classification of plastic pipes without insulation in pipe socket on collar side penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D7e in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP	D ≤ 110	3,9	-	2 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D7e**

Table C23. Resistance to fire classification of composite pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. F7a and D7b in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP-R/PP-R-GF/PP-R	D ≤ 20	≥ 2,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a**
	20 < D ≤ 25	≥ 3,5	-	1 x 30,0 x 4,0		
	25 < D ≤ 32	4,4 – 12,5	-	1 x 30,0 x 4,0		
	32 < D ≤ 40	5,5 – 12,5	-	1 x 30,0 x 4,0		
	40 < D ≤ 50	6,9 – 12,5	-	1 x 30,0 x 4,0		
	50 < D ≤ 63	8,7 – 12,5	-	1 x 30,0 x 4,0		
	63 < D ≤ 75	10,3 – 12,5	-	1 x 30,0 x 4,0		
	75 < D ≤ 90	12,4 – 15,0	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	15,1 – 18,3	-	1 x 30,0 x 10,0		
Raupiano Plus / PP/PP-MF/PP	D ≤ 50	1,8	-	1 x 30,0 x 4,0	**EI 120-U/C EI 120-C/C**	**Fig. D7a and D7b**
	50 < D ≤ 75	1,9	-	1 x 30,0 x 4,0		
	78 < D ≤ 90	2,2	-	1 x 30,0 x 8,0		
	90 < D ≤ 110	2,7	-	1 x 30,0 x 10,0		
	110 < D ≤ 125	3,1	-	2 x 30,0 x 14,0		
	125 < D ≤ 160	4,0	-	2 x 30,0 x 18,0		

Table C24. Resistance to fire classification of plastic pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D8 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PE-HD / PE / PE-X / ABS / SAN + PVC	D ≤ 110	4,2	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	**Fig. D8**
PP	D ≤ 110	2,7	-	1 x 30,0 x 10,0	**EI 60-U/C EI 60-C/C**	**Fig. D8**

Table C25. Resistance to fire classification of plastic pipes with or without heating cable, with flexible elastomeric foam (FEF) continuous insulation (case CS) penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D9 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
Geberit Silent dB20	D ≤ 110	6,0	13	2 x 30,0 x 14,0	**EI 90-U/C EI 90-C/C**	**Fig. D9**
PE-HD	D ≤ 110	4,2	13	2 x 30,0 x 14,0	**EI 120-U/C EI 120-C/C**	**Fig. D9**

Table C26. Resistance to fire classification of plastic pipes with polyethylene foam (PE) (with reaction to fire class E_L according to EN 13501-1) local sustained insulation (case LS) penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D10 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness x length [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PP	D ≤ 110	2,7	9 x 100	1 x 30,0 x 12,0	**EI 90-U/C EI 90-C/C**	**Fig. D10**

Table C27. Resistance to fire classification of steel pipes with flexible elastomeric foam (FEF) continuous insulation (case CS) penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D11 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
steel	D ≤ 18,0	≥ 1,2	9	1 x 30,0 x 4,0	**EI 120-C/U EI 120-C/C**	**Fig. D11**
			10 – 25	1 x 30,0 x 6,0		
	18,0 < D ≤ 28,0	1,5 – 1,9	9	1 x 30,0 x 4,0		
			10 – 32	1 x 30,0 x 6,0		
		2,0 – 3,9	9	1 x 30,0 x 4,0		
			10 – 32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0	**EI 90 / E 120-C/U EI 90 / E 120-C/C**	
		≥ 4,0	9	1 x 30,0 x 4,0	**EI 120-C/U EI 120-C/C**	
			10 – 32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0		
	28,0 < D ≤ 42,4	1,5 – 1,9	9	1 x 30,0 x 4,0		
			10 – 32	1 x 30,0 x 6,0		
		2,0 – 3,9	9	1 x 30,0 x 4,0		
			10 – 32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0	**EI 90 / E 120-C/U EI 90 / E 120-C/C**	
		≥ 4,0	9	1 x 30,0 x 4,0	**EI 120-C/U EI 120-C/C**	
			10 – 32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0		
	42,4 < D ≤ 66,7	1,5 – 1,9	9	1 x 30,0 x 4,0		
			10 – 32	1 x 30,0 x 6,0		
		2,0 – 3,9	9	1 x 30,0 x 4,0		
			10 – 32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0	**EI 90 / E 120-C/U EI 90 / E 120-C/C**	
		≥ 4,0	9	1 x 30,0 x 4,0	**EI 120-C/U EI 120-C/C**	
			10 – 32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0		
	66,7 < D ≤ 108,0	2,0 – 3,5	32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0	**EI 90 / E 120-C/U EI 90 / E 120-C/C**	
		≥ 3,6	33 – 50	1 x 30,0 x 8,0	**EI 120-C/U EI 120-C/C**	
	108,0 < D ≤ 114,3	≥ 3,6	32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0		
	114,3 < D ≤ 168,3	≥ 4,0	32	1 x 30,0 x 6,0		
			33 – 50	1 x 30,0 x 8,0		

Table C28. Resistance to fire classification of mixed bundle of single copper pipe (C/U end configuration) with flexible elastomeric foam (FEF) local sustained insulation (case LS), with additional single cable 4 x 1.5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D12 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness x length [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
single copper pipe	D ≤ 12,7	≥ 0,8	9 x 400	1 x 30,0 x 4,0	**EI 120**
	12,7 < D ≤ 22,23	≥ 1,0	9 x 400	1 x 30,0 x 4,0	

Table C29. Resistance to fire classification of mixed bundle of double copper pipe (C/U end configuration) with flexible elastomeric foam (FEF) local sustained insulation (case LS), with additional single cable 4 x 1.5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D12 in Annex D:

Pipe material	Copper pipe No. 1 max. diameter x min. wall thickness [mm]	Copper pipe No. 2 max. diameter x min. wall thickness [mm]	Insulation thickness x length [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
double copper pipe	12,7 x 0,8	12,7 x 0,8	9 x 400	1 x 30,0 x 4,0	**EI 120**
	12,7 x 0,8	22,23 x 1,0	9 x 400	1 x 30,0 x 4,0	

Table C30. Resistance to fire classification of mixed bundle of single copper pipe (C/U end configuration) with polyethylene foam (PE) (with reaction to fire class B_L-s1, d0 according to EN 13501-1) local sustained insulation (case LS), with additional single cable 4 x 1.5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D13 in Annex D:

Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness x length [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
single copper pipe	D ≤ 12,7	≥ 0,8	9 x 400	1 x 30,0 x 4,0	**EI 120**
	12,7 < D ≤ 22,23	≥ 1,0	9 x 400	1 x 30,0 x 4,0	

Table C31. Resistance to fire classification of mixed bundle of double copper pipe (C/U end configuration) with polyethylene foam (PE) (with reaction to fire class B_L-s1, d0 according to EN 13501-1) local sustained insulation (case LS), with additional single cable 4 x 1.5 mm² and single PVC-U pipe (U/C end configuration) diameter of: D ≤ 25 mm and pipe wall thickness of: 1,5 mm penetration seal in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D13 in Annex D:

Pipe material	Copper pipe No. 1 max. diameter x min. wall thickness [mm]	Copper pipe No. 2 max. diameter x min. wall thickness [mm]	Insulation thickness x length [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
double copper pipe	12,7 x 0,8	12,7 x 0,8	9 x 400	1 x 30,0 x 4,0	**EI 120**
	12,7 x 0,8	22,23 x 1,0	9 x 400	1 x 30,0 x 4,0	

Table C32. Resistance to fire classification of bundle of AROT DVK conduits consisting of max. 4 conduits, empty or filled with small cables ($ø_{cable}$ ≤ 21 mm) or cable bundles ($ø_{bundle}$ ≤ conduit inner diameter, $ø_{cable}$ ≤ 21 mm) penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D14 in Annex D:

Diameter of single conduit in bundle [mm]	Conduit wave height [mm]	Service inside	Number of collars x intumescent material width x thickness [mm]	Fire resistance class
D ≤ 50	3,0	empty	1 x 30,0 x 10,0	**EI 120-U/U**
		small cable: $ø_{cable}$ ≤ 21 mm	1 x 30,0 x 10,0	**EI 120-U/U**
		cable bundle: $ø_{bundle}$ ≤ D_{in} [1] $ø_{cable}$ ≤ 21 mm	1 x 30,0 x 10,0	**EI 120-U/U**

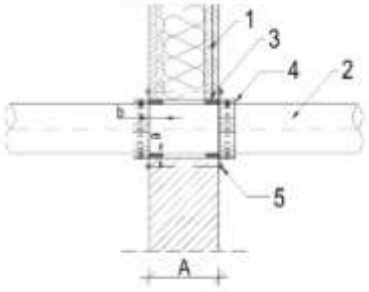
[1] D_{in} – conduit inner diameter

Table C33. Resistance to fire classification of PVC-U pipes without insulation penetration seals in rigid floor thickness of: t ≥ 150 mm, made with use of one-sided INTU FR COLLAR L SLIM, in accordance with Annex A and Fig. D15 in Annex D:

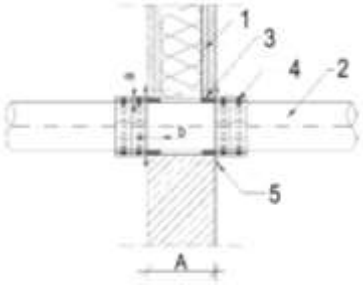
Pipe material	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation thickness [mm]	Number of collars x intumescent material width x thickness [mm]	Fire resistance class	Figure in Annex D
PVC-U / PVC-C	D ≤ 110	3,2 – 8,0	-	1 x 30,0 x 10,0	**EI 45 / E 60-U/C EI 45 / E 60-C/C**	**Fig. D15**
		8,1	-	1 x 30,0 x 10,0	**EI 120-U/C EI 120-C/C**	

Fig. D1. Plastic pipe, MLC pipe and composite pipe without insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (double-sided) in flexible or rigid wall

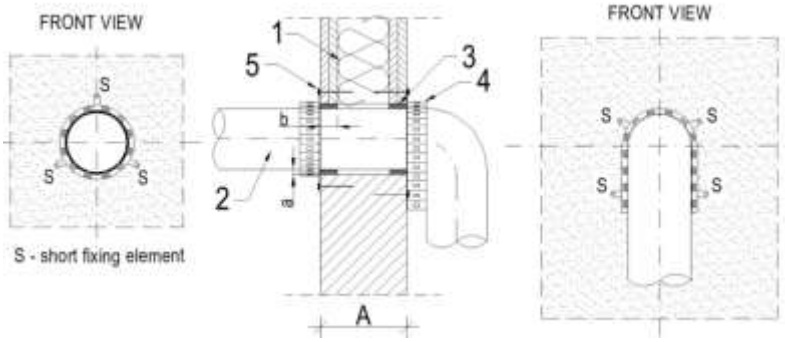
a)



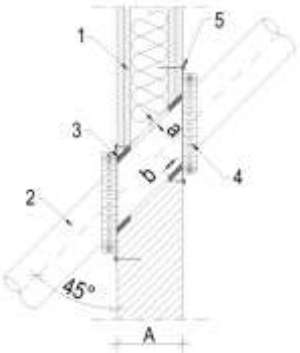
b)



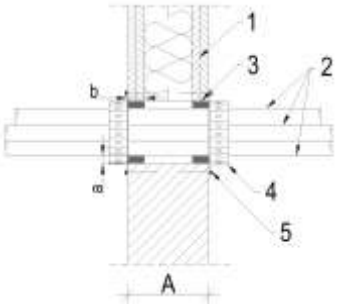
c)



d)



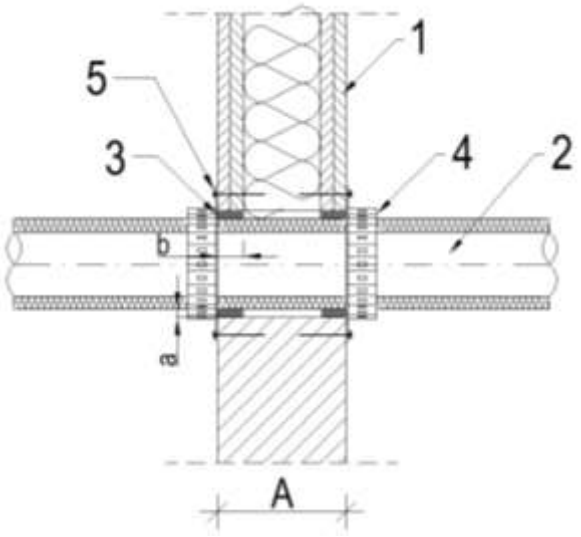
e)



1 Flexible or rigid wall supporting construction thickness of: A ≥ 100 mm
2 Plastic pipe, composite pipe and MLC pipe (pipe bundle in case of D2e)
3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the wall
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (double-sided – one or two collars on each side of the wall, depending on the pipe diameter)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D1** of European Technical Assessment ETA-24/0497
Construction details Plastic pipe, MLC pipe and composite pipe without insulation penetration seals in flexible or rigid wall	

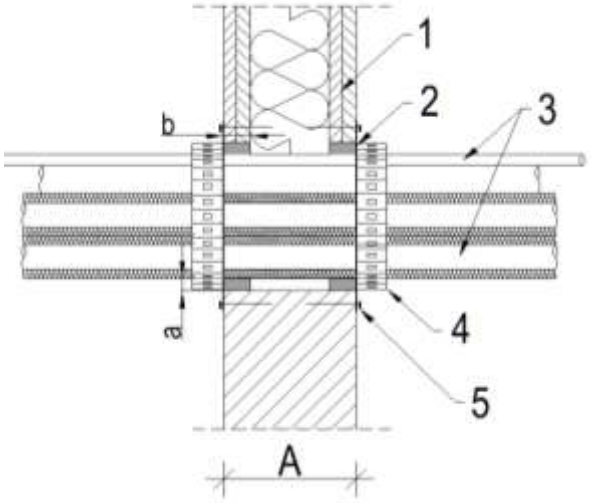
Fig. D2. Metal pipe with flexible elastomeric foam (FEF) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (double-sided) in flexible or rigid wall



1 Flexible or rigid wall supporting construction thickness of: A ≥ 100 mm
2 Metal pipe in continuous insulation – flexible elastomeric foam (FEF)
3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the wall
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (double-sided – one on each side of the wall)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D2** of European Technical Assessment ETA-24/0497
Construction details Metal pipe with insulation penetration seals in flexible or rigid wall	

Fig. D3. Mixed bundle with flexible elastomeric foam (FEF) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (double-sided) in flexible or rigid wall

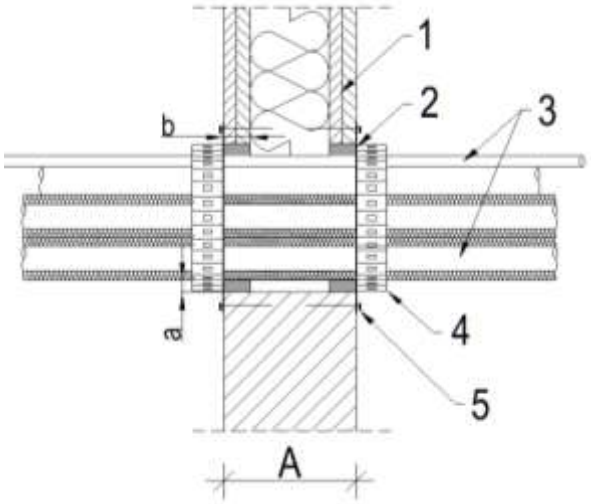


1 Flexible or rigid wall supporting construction thickness of: A ≥ 100 mm
2 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the wall
3 Mixed bundle of pipes and cables:
- max. 2 x copper pipes in continuous insulation – flexible elastomeric foam (FEF)
- max. 1 x plastic pipe
- max. 1 x electric cable

4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (double-sided – one on each side of the wall)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D3** of European Technical Assessment ETA-24/0497
Construction details Mixed bundle with insulation penetration seals in flexile or rigid wall	

Fig. D4. Mixed bundle with polyethylene foam (PE) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (double-sided) in flexible or rigid wall

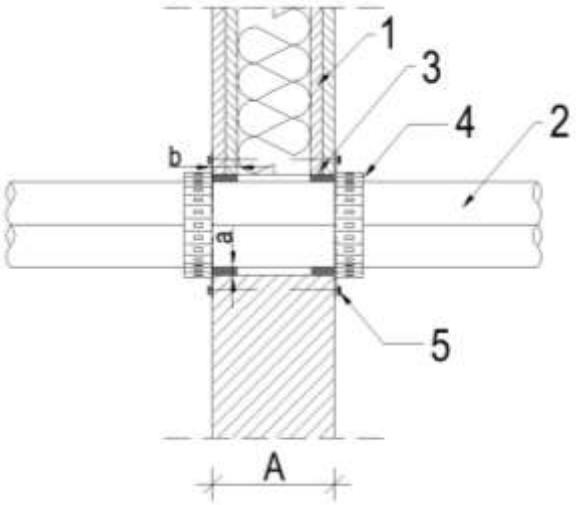


1 Flexible or rigid wall supporting construction thickness of: A ≥ 100 mm
2 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the wall
3 Mixed bundle of pipes and cables:
- max. 2 x copper pipes in continuous insulation – polyethylene foam (PE) according to EN 14313, with reaction to fire class B_L-s1, d0 according to EN 13501-1
- max. 1 x plastic pipe
- max. 1 x electric able

4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (double-sided – one on each side of the wall)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D4** of European Technical Assessment ETA-24/0497
Construction details Mixed bundle with insulation penetration seals in flexile or rigid wall	

Fig. D5. Plastic conduit bundle penetration seals made with use of INTU FR COLLAR L SLIM collars (double-sided) in flexible or rigid wall

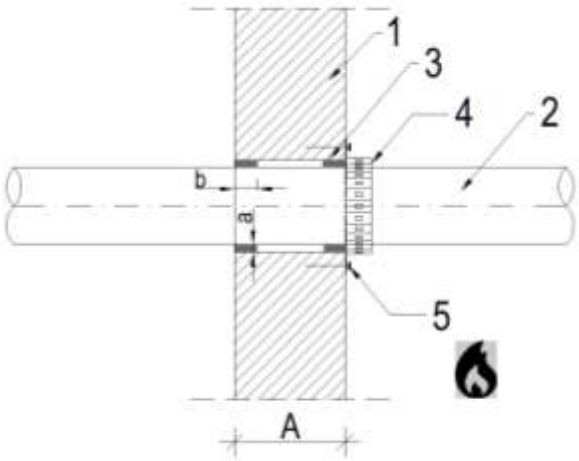


1 Flexible or rigid wall supporting construction thickness of: A ≥ 100 mm
2 Bundle of AROT DVK conduits – empty or with cables / bundle of cables
3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the wall
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (double-sided – one on each side of the wall)
5 Steel screws ø6 x 50 mm

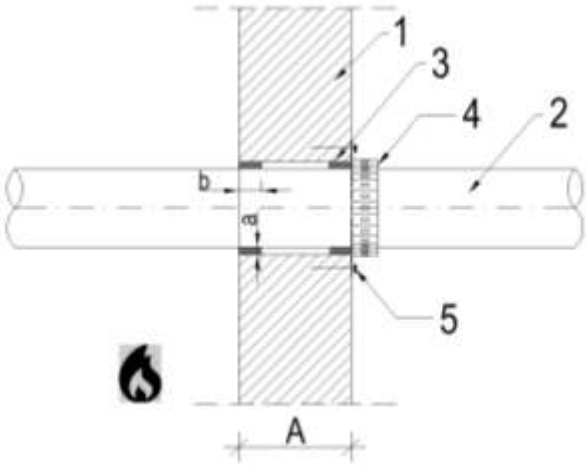
INTU FR COLLAR L SLIM	**Annex D5** of European Technical Assessment ETA-24/0497
Construction details Plastic conduit bundle penetration seals in flexible or rigid wall	

Fig. D6. Plastic pipe without insulation penetration seal made with use of INTU FR COLLAR L SLIM in rigid wall

a)



b)

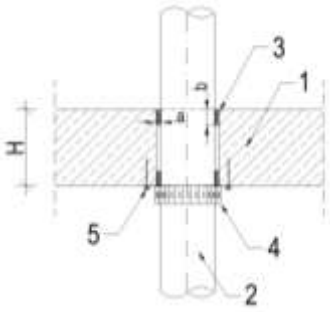


1 Rigid wall supporting construction thickness of: A ≥ 150 mm
2 Plastic pipe
3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the wall
4 Intumescent pipe collar INTU FR COLLAR L SLIM (single – placed on the one side of the wall)
5 Steel screw ø6 x 50 mm

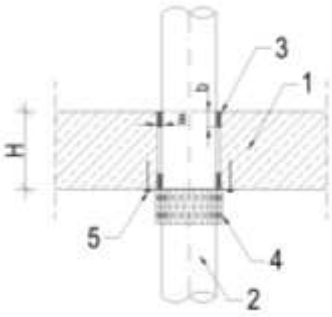
INTU FR COLLAR L SLIM	**Annex D6** of European Technical Assessment ETA-24/0497
Construction details Plastic pipes without insulation penetration seals in rigid wall	

Fig. D7. Plastic pipe, MLC pipe and composite pipe without insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor

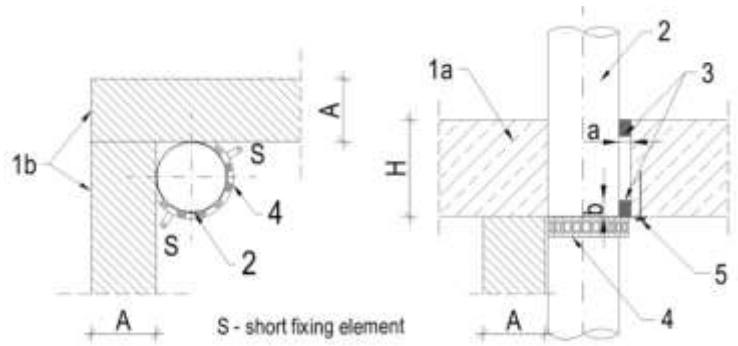
a)



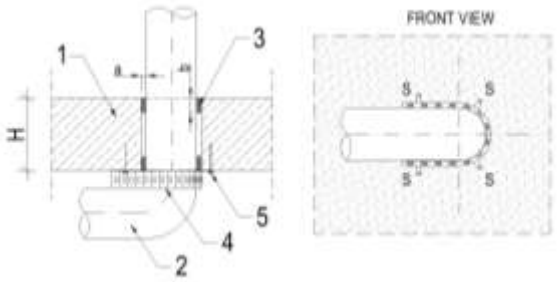
b)



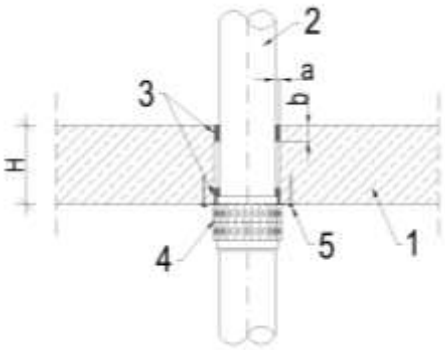
c)



d)



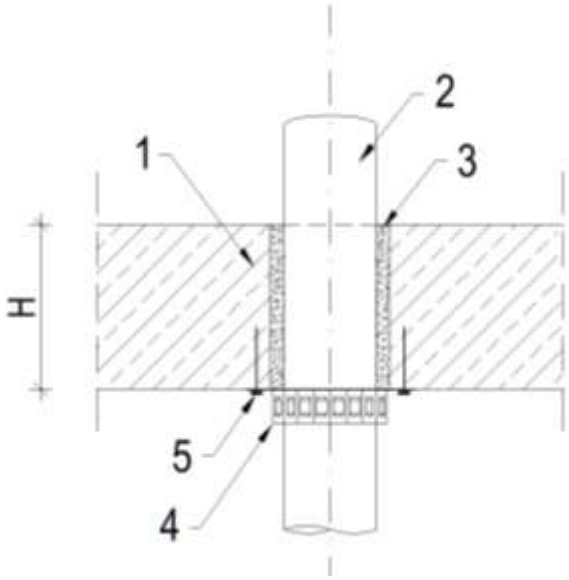
e)



1 / 1a Rigid floor supporting construction thickness of: H ≥ 150 mm
1b Rigid wall supporting construction thickness of: A ≥ 100 mm
2 Plastic pipe, composite pipe and MLC pipe
3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the floor
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single or double collar on the floor bottom side)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D7** of European Technical Assessment ETA-24/0497
Construction details Plastic pipe, MLC pipe and composite pipe without insulation penetration seals in rigid floor	

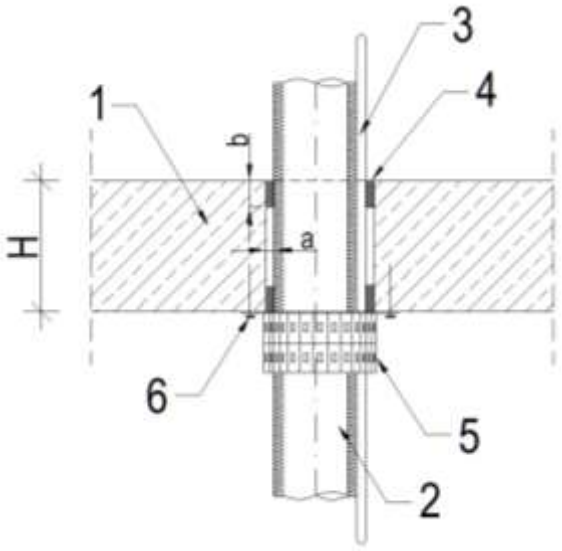
Fig. D8. Plastic pipe without insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor



1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Plastic pipe
3 Gap filled with cement mortar – area between the pipe and supporting construction ring with: maximum width a = 30 mm, on the whole depth of the floor
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single collar on the floor bottom side)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D8** of European Technical Assessment ETA-24/0497
Construction details Plastic pipes without insulation penetration seals in rigid floor	

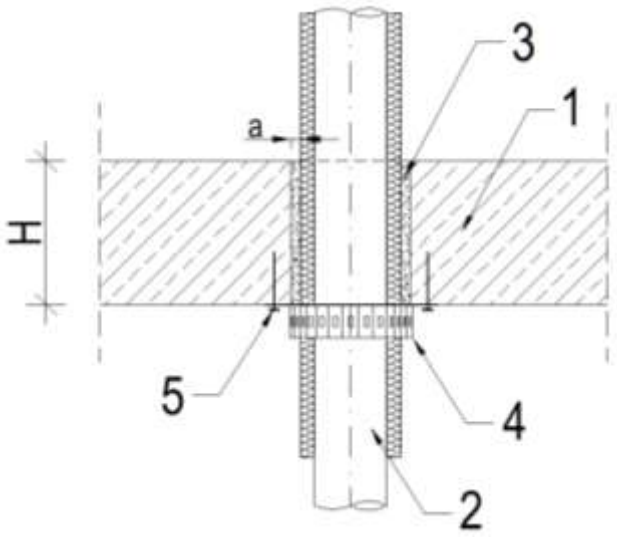
Fig. D9. Plastic pipe with or without heating cable with flexible elastomeric foam (FEF) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor



1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Plastic pipe in continuous insulation – flexible elastomeric foam (FEF)
3 Heating cable
4 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the floor
5 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – double collar on the floor bottom side)
6 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D9** of European Technical Assessment ETA-24/0497
Construction details Plastic pipes with insulation penetration seals in rigid floor	

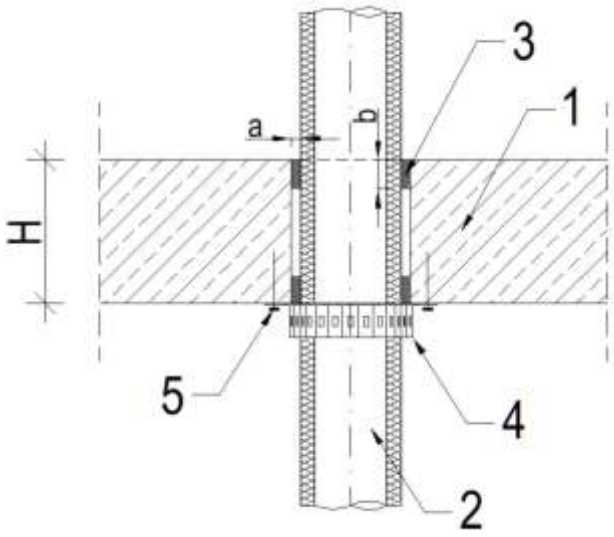
Fig. D10. Plastic pipe with polyethylene foam (PE) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor



1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Plastic pipe in continuous insulation – polyethylene foam (PE) according to EN 14313, with reaction to fire class E_L according to EN 13501-1
3 Gap filled with cement mortar – area between the pipe and supporting construction ring with: maximum width a = 30 mm, on the whole depth of the floor
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single collar on the floor bottom side)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D10** of European Technical Assessment ETA-24/0497
Construction details Plastic pipes with insulation penetration seals in rigid floor	

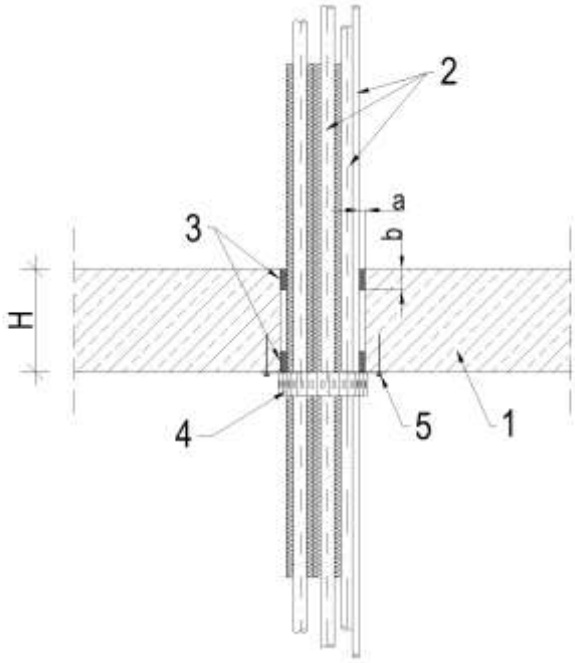
Fig. D11. Metal pipe with flexible elastomeric foam (FEF) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor



1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Metal pipe in continuous insulation – flexible elastomeric foam (FEF)
3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the floor
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single collar on the floor bottom side)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D11** of European Technical Assessment ETA-24/0497
Construction details Metal pipes with insulation penetration seals in rigid floor	

Fig. D12. Mixed bundle with flexible elastomeric foam (FEF) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor

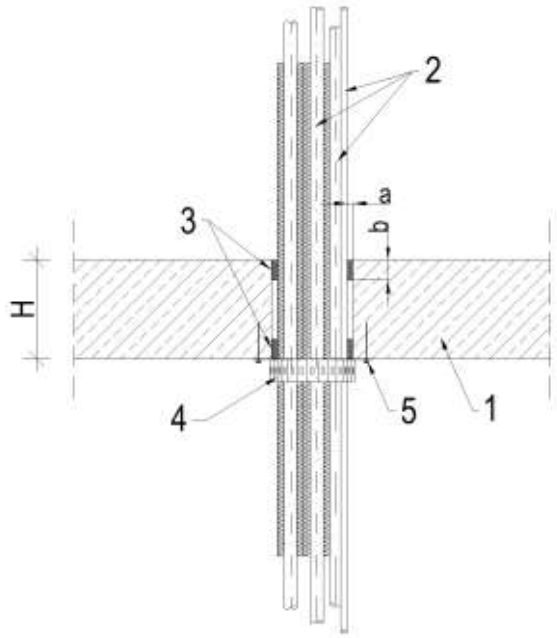


1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Mixed bundle of pipes and cables:
- max. 2 x copper pipes in local sustained insulation – flexible elastomeric foam (FEF)
- max. 1 x plastic pipe
- max. 1 x electric able

3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the floor
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single collar on the floor bottom side)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D12** of European Technical Assessment ETA-24/0497
Construction details Mixed bundle with insulation penetration seals in rigid floor	

Fig. D13. Mixed bundle with polyethylene foam (PE) insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor

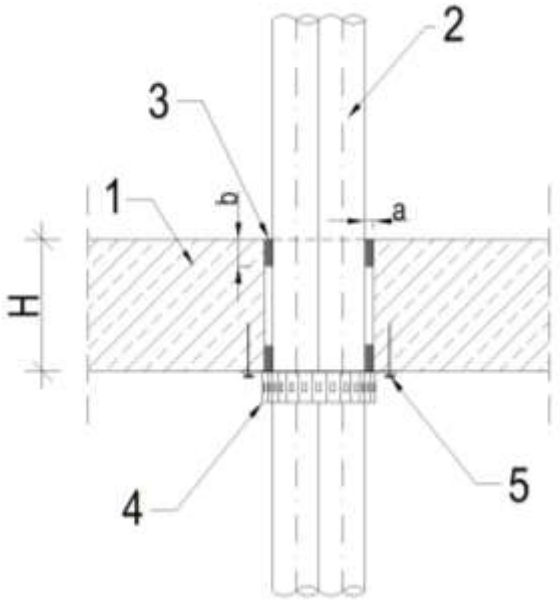


1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Mixed bundle of pipes and cables:
- max. 2 x copper pipes in local sustained insulation –polyethylene foam (PE) according to EN 14313, with reaction to fire class B_L-s1, d0 according to EN 13501-1
- max. 1 x plastic pipe
- max. 1 x electric able

3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the floor
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single collar on the floor bottom side)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D13** of European Technical Assessment ETA-24/0497
Construction details Mixed bundle with insulation penetration seals in rigid floor	

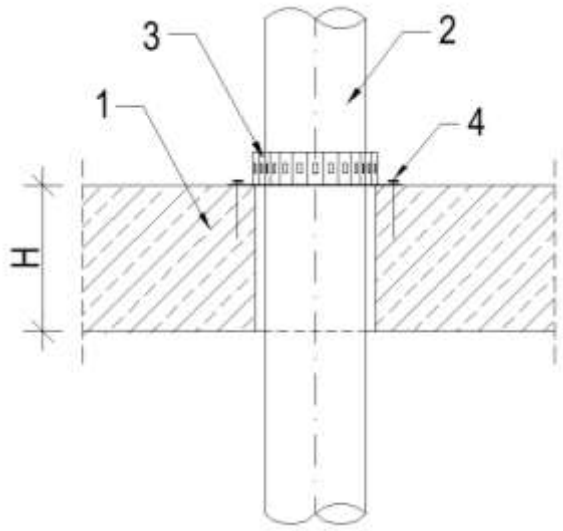
Fig. D14. Plastic conduit bundle penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor



1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Bundle of AROT DVK conduits – empty or with cables / bundle of cables
3 Gap filled with INTU FR MASTIC – area between the pipe and supporting construction ring with: maximum width a = 20 mm, on the minimum depth b = 25 mm on both sides of the floor
4 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single collar on the floor bottom side)
5 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D14** of European Technical Assessment ETA-24/0497
Construction details Plastic conduit bundle penetration seals in rigid floor	

Fig. D15. Plastic pipe without insulation penetration seals made with use of INTU FR COLLAR L SLIM collars (one-sided) in rigid floor



1 Rigid floor supporting construction thickness of: H ≥ 150 mm
2 Plastic pipe
3 Intumescent pipe collar roll INTU FR COLLAR L SLIM (one-sided – single collar on the floor top side)
4 Steel screws ø6 x 50 mm

INTU FR COLLAR L SLIM	**Annex D15** of European Technical Assessment ETA-24/0497
Construction details Plastic pipes without insulation penetration seals in rigid floor	