

INTU FR WRAP L

Intumescent pipe roll

TDS Technical Data Sheet



•INTUSEAL®
passive fire protection manufacturer



CE

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→ PRODUCT DESCRIPTION

The firestop tape **INTU FR WRAP L** is made of graphite-based material. The material swells under the influence of high temperature (about 140°C), and fills the entire space created after burned flammable systems.

→ APPLICATION

The **INTU FR WRAP L** is used for fire protection of penetrations with plastic pipes (PVC, PP, PE, HDPE, PEX/Al/PEX, PE-RT/Al/PE-RT, PP-R/Al/PP-R, PP-R GLASS) running through fire partitions. It is also possible to protect non-flammable pipes with insulation made of synthetic Armaflex /K-flex or PE foam, penetrating floors or walls.

- protection of flammable and non-flammable pipes insulated with synthetic rubber Armaflex / K-Flex or PE foam
- fire resistance up to 240 minutes
- installation on pipes with large diameters is possible
- easy to cut
- high swelling ratio
- ideal for installation in very tight spaces

Rigid walls:

- rigid wall supporting construction thickness ≥ 100 mm
- concrete or masonry structure, with minimum density 600 kg/m³

Rigid floors:

- rigid floor supporting construction thickness ≥ 150 mm
- concrete, cellular concrete or masonry structure, with min density 550 kg/m³

Flexible walls:

- flexible wall supporting construction thickness ≥ 100 mm
- steel profile structure covered on both sides with minimum 2 layers of boards with a thickness 12,5 mm

→ AVAILABILITY

Dimensions	Type	Box	Pallet	Article number
60 mm x 10 m	without adhesive tape	1	375	INWRL60X10
100 mm x 10 m	without adhesive tape	1	225	INWRL100X10
60 mm x 10 m	with adhesive tape	1	375	INWRL60X10AT
100 mm x 10 m	with adhesive tape	1	225	INWRL100X10AT
60 mm x 25 m	without adhesive tape	1	72	INWRL60X25
100 mm x 25 m	without adhesive tape	1	72	INWRL100X25
60 mm x 25 m	with adhesive tape	1	72	INWRL60X25AT
100 mm x 25 m	with adhesive tape	1	72	INWRL100X25AT

→ INSTALLATION METHOD

- Prepare the appropriate length of the tape (cut off from the roll).
- Wrap the pipe.
- Slide it inside the partition.
- Fill the gap with mortar or fire protection sealant (e.g. **INTU FR MASTIC**).



→ TRANSPORT AND STORAGE

It is recommended to store in dry internal conditions at temp. between + 5°C and + 35°C.

→ COMPLIANCE

- Reference standard:
EN 1366-3 / ETAG 026-2 /
EAD 350454-00-1104
- DoP 11/2019
- ETA-18/0593
- Classification report no.:
01988.2/23/Z00NZP
- CoC 1488-CPR-0722/W
- BREEAM Certification
- LEED Certification
- SDS

INTU FR WRAP L

Intumescent pipe wrap roll

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➔ APPROXIMATE CONSUMPTION of INTU FR WRAP L

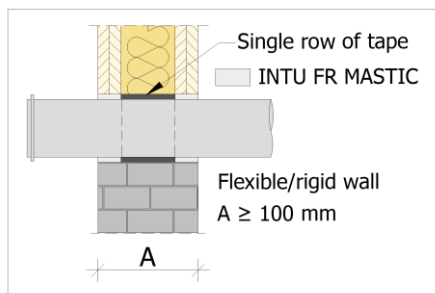


Pipe diameter Ø [mm]	INTU FR WRAP L Length [cm]	Quantity of layers	Quantity wrapped pipes/10m roll
32	10	1	100
40	13	1	79
50	16	1	63
55	18	1	57
63	20	1	50
75	24	1	42
90	58	2	17
110	71	2	14
125	165	4	6
160	264	5	3
200	538	8	1



Pipe Ø [mm]	Insulation thickness [mm]	INTU FR WRAP L Length [cm]	Quantity of layers	Quantity wrapped pipes/10m roll
21,3	9	12	1	80
	13	31	2	32
42,4	9	19	1	52
	13	45	2	22
88,9	13	74	2	13
	25	135	3	7
114,3	25	159	3	6
	50	277	4	3
168,3	25	210	3	4
	50	345	4	2
219,1	50	409	4	2

➔ FIRE RESISTANCE CLASSIFICATION for combustible pipe in walls



Combustible pipes penetration seals with single row of band in flexible or rigid wall with thickness $A \geq 100$ mm

Fig.1 str.35

PE-HD pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 32$	2.0	1	EI 60-U/C
	2.1 – 9.9	2	EI 60-U/C
	10.0	2	EI 90-U/C
$32 < \varnothing \leq 50$	2.5 – 9.9	2	EI 60-U/C
	10.0	2	EI 90-U/C
$50 < \varnothing \leq 75$	3.2 – 9.9	2	EI 60-U/C
	10.0	2	EI 90-U/C
$75 < \varnothing \leq 110$	4.2 – 9.9	2	EI 60-U/C
	10.0	2	EI 90-U/C

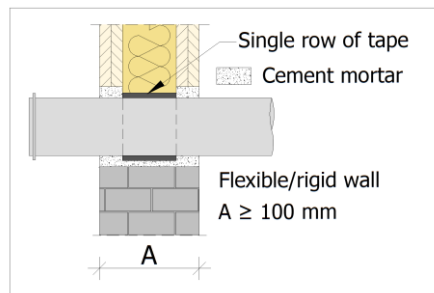
PP pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 32$	1.8	1	EI 90-U/C
			E 120-U/C
	1.9 – 2.7	2	EI 60-U/C
			EI 45-U/C
$32 < \varnothing \leq 50$	2.0 – 2.7	2	EI 60-U/C
	2.8 – 18.3	2	EI 45-U/C
$50 < \varnothing \leq 75$	2.3 – 2.7	2	EI 60-U/C
	2.8 – 18.3	2	EI 45-U/C
$75 < \varnothing \leq 110$	2.7	2	EI 60-U/C
	2.8 – 18.3	2	EI 45-U/C

PVC-U pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 32$	1.8	1	EI 120-U/C
	1.9 – 4.2	2	EI 60-U/C
$32 < \varnothing \leq 50$	1.9 – 4.1	2	EI 45-U/C
	4.2	2	EI 60-U/C

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$50 < \varnothing \leq 75$	2.0 – 4.1	2	EI 45-U/C
	4.2	2	EI 60-U/C
$75 < \varnothing \leq 110$	2.2 – 4.1	2	EI 45-U/C
	4.2	2	EI 60-U/C



Combustible pipes penetration seals with single row of band in flexible or rigid wall with thickness $A \geq 100$ mm

Fig.2 str.35

PE-RT/AL/PE-RT pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0	1	EI 120-U/C
	2.1 – 7.5	1	EI 45-U/C E 90-U/C
$20 < \varnothing \leq 25$	2.5	1	
$25 < \varnothing \leq 40$	4.0	1	
$40 < \varnothing \leq 63$	6.3	1	
$63 < \varnothing \leq 75$	7.5	1	

PE-X/AL/PE-X pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0	1	EI 120-U/C
	2.1 – 7.5	1	EI 45-U/C E 90-U/C
$20 < \varnothing \leq 25$	2.5	1	
$25 < \varnothing \leq 40$	4.0	1	
$40 < \varnothing \leq 63$	6.3	1	
$63 < \varnothing \leq 75$	7.5	1	

PP-R/AL/PP-R pipe penetration

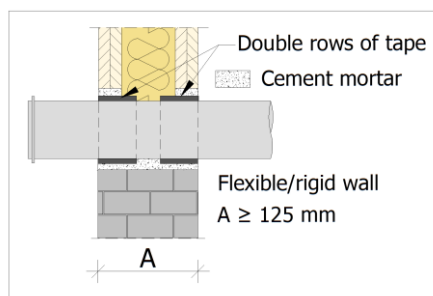
Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	3.4	1	EI 120-U/C
	3.5 – 10.0	2	
$20 < \varnothing \leq 50$	8.3	2	
$50 < \varnothing \leq 63$	10.5	2	
$63 < \varnothing \leq 75$	12.5	2	
$75 < \varnothing \leq 90$	15.0	2	
$90 < \varnothing \leq 110$	18.3	2	

PP-R/PP-R-GF/PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.8 – 3.4	1	EI 120-U/C
$20 < \varnothing \leq 32$	4.1 – 4.8	2	EI 60-U/C
	4.9 – 5.4	2	EI 120-U/C
$32 < \varnothing \leq 40$	5.0 – 6.1	2	EI 60-U/C
	6.2 – 6.7	2	EI 120-U/C
$40 < \varnothing \leq 50$	6.0 – 7.9	2	EI 60-U/C
	8.0 – 8.4	2	EI 120-U/C
$50 < \varnothing \leq 75$	8.7 – 12.2	2	EI 60-U/C
	12.3 – 12.5	2	EI 120-U/C
$75 < \varnothing \leq 90$	10.3 – 14.8	2	EI 60-U/C
	14.9 – 15.0	2	EI 120-U/C
$90 < \varnothing \leq 110$	12.5 – 18.2	2	EI 60-U/C
$90 < \varnothing \leq 110$	18.3	2	EI 120-U/C

PP-M (Magnaplast UltradB)

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$D \leq 110$	3.4	2	EI 60-U/C



Combustible pipes penetration seals with double row of bands in flexible or rigid wall with thickness $A \geq 125$ mm

Fig.3 str.35

PE-HD pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 32$	2.0 – 6.8	2 x 1	EI 120-U/C
	6.9 – 10.0	2 x 2	
$32 < \varnothing \leq 50$	2.4 – 6.8	2 x 1	
	6.9 – 10.0	2 x 2	
$50 < \varnothing \leq 75$	3.0 – 6.8	2 x 1	
	6.9 – 10.0	2 x 2	
$75 < \varnothing \leq 90$	3.5 – 10.0	2 x 2	
$90 < \varnothing \leq 110$	4.2 – 10.0	2 x 2	

PP pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 50$	1.8	2 x 1	EI 120-U/C
	1.9	2 x 1	EI 120-U/C E 180-U/C
	2.0 – 12.5	2 x 1	EI 120-U/C
	12.6 – 18.4	2 x 2	
$50 < \varnothing \leq 75$	1.9	2 x 1	EI 120-U/C E 180-U/C
	2.0 – 12.5	2 x 1	EI 120-U/C
	12.6 – 18.4	2 x 2	
$75 < \varnothing \leq 90$	2.2 – 18.4	2 x 2	EI 120-U/C
$90 < \varnothing \leq 110$	2.7 – 18.4	2 x 2	

PVC pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 50$	1.8 – 3.6	2 x 1	EI 120-U/C
	3.7 – 4.2	2 x 2	
$50 < \varnothing \leq 75$	1.9 – 3.6	2 x 1	
	3.7 – 4.2	2 x 2	
$75 < \varnothing \leq 90$	2.0 – 4.2	2 x 2	
$90 < \varnothing \leq 110$	2.2 – 4.2	2 x 2	

PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.3 – 10.0	2 x 1	EI 120-U/C
$20 < \varnothing \leq 32$	3.3 – 12.5	2 x 1	
	12.6 – 16.0	2 x 2	
$32 < \varnothing \leq 50$	4.8 – 12.5	2 x 1	
	12.6 – 18.3	2 x 2	
$50 < \varnothing \leq 75$	6.8 – 12.5	2 x 1	
	12.6 – 18.3	2 x 2	
$75 < \varnothing \leq 90$	8.2 – 18.3	2 x 2	
$90 < \varnothing \leq 110$	10.0 – 18.3	2 x 2	

PP-R/AL/PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.8 – 10.0	2 x 1	EI 120-U/C
$20 < \varnothing \leq 32$	4.4 – 12.5	2 x 1	
	12.6 – 16.0	2 x 2	
$32 < \varnothing \leq 50$	6.9 – 12.5	2 x 1	
	12.6 – 18.3	2 x 2	
$50 < \varnothing \leq 63$	8.7 – 12.5	2 x 1	
	12.6 – 18.3	2 x 2	
$63 < \varnothing \leq 75$	10.3 – 12.5	2 x 1	
	12.6 – 18.3	2 x 2	
$75 < \varnothing \leq 90$	12.4 – 18.3	2 x 2	
$90 < \varnothing \leq 110$	15.1 – 18.3	2 x 2	

PE-RT/AL/PE-RT pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$D \leq 20$	2.0 – 3.0	2 x 1	EI 120-U/C
$20 < D \leq 25$	2.5	2 x 1	EI 120-U/C
$25 < D \leq 32$	3.0	2 x 1	EI 120-U/C
$32 < D \leq 40$	4.0	2 x 1	EI 90-U/C E 120-U/C
$40 < D \leq 63$	6.0	2 x 1	EI 90-U/C E 120-U/C

PE-X/AL/PE-X pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 32$	3.0 – 6.0	2 x 1	EI 120-U/C
$32 < \varnothing \leq 40$	3.8	2 x 1	
$40 < \varnothing \leq 63$	6.0	2 x 1	

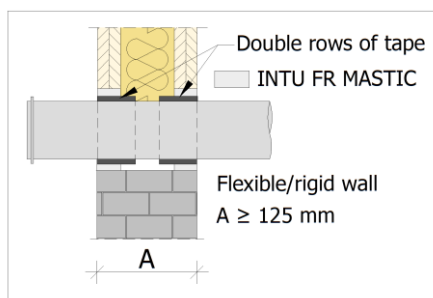
PE-Xa pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0 – 5.8	2 x 1	EI 120-U/C
$20 < \varnothing \leq 32$	3.0	2 x 1	
$32 < \varnothing \leq 40$	3.7	2 x 1	
$40 < \varnothing \leq 50$	4.6	2 x 1	
$50 < \varnothing \leq 63$	5.8	2 x 1	

PP-R/PP-R-GF/PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.8 – 10.0	2 x 1	EI 120-U/C
$20 < \varnothing \leq 32$	4.4 – 12.5	2 x 1	
	12.6 – 15.1	2 x 2	
$32 < \varnothing \leq 50$	6.7 – 12.5	2 x 1	
	12.6 – 15.1	2 x 2	

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$50 < \varnothing \leq 63$	8.4 – 12.5	2 x 1	EI 120-U/C
	12.6 – 15.1	2 x 2	
$63 < \varnothing \leq 75$	10.0 – 12.5	2 x 1	
	12.6 – 15.1	2 x 2	
$75 < \varnothing \leq 110$	15.1	2 x 2	



Combustibles pipes penetration seals with double row of bands in flexible or rigid wall with thickness $A \geq 125$ mm

Fig.4 str.35

PEHD pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	4.2	2 x 2	EI 120-U/C

PVC pipe penetration

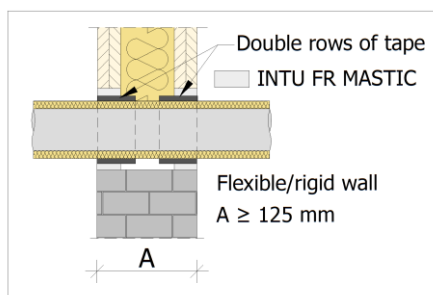
Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	3.2	2 x 2	EI 120-U/C

PP pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	2.7	2 x 2	EI 90-U/C

PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	18.3	2 x 2	EI 120-U/C



Combustibles pipes penetration seals in continuous insulation with double rows of bands in flexible or rigid wall with thickness $A \geq 125$ mm

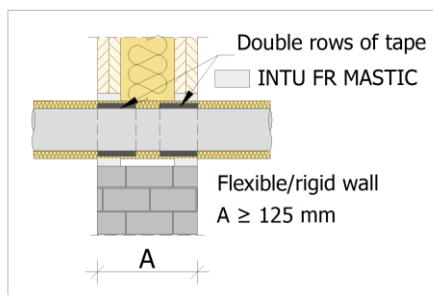
Fig.5 str.36

Combustibles pipes with polyethylene foam (PE) continuous insulation (case CS) type Tubolit DG / Tubolit DG PLUS

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation type	Insulation thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
PE-RT/AL/PE-RT	$\varnothing \leq 32$	3.0	PE (Tubolit DG)	9	2 x 1	EI 120-U/C
PE-X/AL/PE-X	$\varnothing \leq 32$	3.0				
PP-R/PP-R-GF/PP-R	$\varnothing \leq 50$	5.9 – 8.9				
PE-RT/AL/PE-RT	$\varnothing \leq 20$	2.0	PE (Tubolit DG PLUS)			
PE-X/AL/PE-X	$\varnothing \leq 20$	2.0				
PP-R/PP-R-GF/PP-R	$\varnothing \leq 20$	2.8 – 3.4				

Combustible pipes with mineral wool (MW)
continuous insulation (case CS) type Paroc Hvac Lamella Mat AluCoat

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation type INTU FR WRAP L bands placed on the insulation	Insulation thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
PP-R	$\varnothing \leq 20$	2.3	Mineral wool (Paroc Hvac Lamella Mat AluCoat)	20	2 x 1	EI 120-U/C
		6.8 – 12.5		30	2 x 3	
	$20 < \varnothing \leq 75$	6.8 – 12.5				



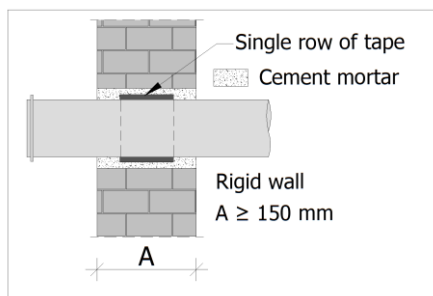
Combustible pipes penetration seals in continuous insulation with double rows of bands in flexible or rigid wall with thickness $A \geq 125$ mm

INTU FR WRAP L on pipe

Fig.6 str.36

Combustible pipes with mineral wool (MW)
continuous insulation (case CS) type Paroc Hvac Lamella Mat AluCoat

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation type INTU FR WRAP L bands placed on the pipe	Insulation thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
PP-R	$\varnothing \leq 20$	2.3	Mineral wool (Paroc Hvac Lamella Mat AluCoat)	20	2 x 1	EI 120-U/C
		6.8 – 12.5		30		
	$20 < \varnothing \leq 75$	6.8 – 12.5				



Combustible pipes penetration seals with single row of band in rigid wall with thickness $A \geq 150$ mm

Fig.7 str.36

PE-Xa pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0 – 5.8	1	EI 120-U/C
$20 < \varnothing \leq 32$	3.0	1	
$32 < \varnothing \leq 40$	3.7	1	
$40 < \varnothing \leq 50$	4.6	1	
$50 < \varnothing \leq 63$	5.8	1	

PE-X/AL/PE-X pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0– 7.5	1	EI 120-U/C
$20 < \varnothing \leq 25$	2.5	1	
$25 < \varnothing \leq 32$	3.0	1	
$32 < \varnothing \leq 40$	4.0	1	
$40 < \varnothing \leq 50$	5.5	1	
$50 < \varnothing \leq 63$	6.0	1	
$63 < \varnothing \leq 75$	7.5	1	

PE-HD pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 32$	2.0 – 6.8	1	EI 240-U/C
	6.9 – 10.0	1	EI 120-U/C
$32 < \varnothing \leq 50$	2.6 – 6.7	1	EI 120-U/C
	6.8	1	EI 240-U/C
	6.9 – 10.0	1	EI 120-U/C
$50 < \varnothing \leq 63$	2.9 – 6.7	1	EI 120-U/C
	6.8	1	EI 240-U/C
	6.9 – 10.0	1	EI 120-U/C
$63 < \varnothing \leq 75$	3.3 – 6.7	1	EI 120-U/C
	6.8	1	EI 240-U/C
	6.9 – 10.0	1	EI 120-U/C
$75 < \varnothing \leq 90$	3.5 – 4.1	2	EI 120-U/C
	4.2	2	EI 180-U/C
	4.2 – 10.0	1	EI 120-U/C
$90 < \varnothing \leq 110$	4.2	2	EI 180-U/C
	4.2 – 10.0	1	EI 120-U/C

PP pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 50$	1.8 – 12.5	1	EI 240-U/C
$50 < \varnothing \leq 75$	1.9 – 12.4	1	EI 180-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.4	1	EI 180-U/C
$75 < \varnothing \leq 90$	2.3 – 18.3	1	EI 120-U/C E 180-U/C
	2.3 – 18.3	2	EI 180-U/C
	18.4	1	EI 180-U/C
$90 < \varnothing \leq 110$	2.7 – 18.3	1	EI 120-U/C E 180-U/C
	2.7 – 18.3	2	EI 180-U/C
	18.4	1	EI 180-U/C

PE-HD pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 100 mm band width	Fire resistance class
$110 < \varnothing \leq 125$	4.8 – 9.5	3	EI 120-U/C
	9.5	5	EI 180-U/C
	9.6 – 10.0	3	EI 120-U/C
$125 < \varnothing \leq 160$	6.2 – 9.4	5	EI 120-U/C
	9.5	5	EI 180-U/C
	9.6 – 10.0	5	EI 120-U/C
$160 < \varnothing \leq 200$	7.7	8	EI 90-U/C
	7.8 – 11.9	8	EI 60-U/C

PP pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 100 mm band width	Fire resistance class
$110 < \varnothing \leq 125$	3.8 – 16.7	3	EI 60-U/C
$125 < \varnothing \leq 160$	5.5 – 12.5	5	
$160 < \varnothing \leq 170$	6.1 – 11.3	6	
$170 < \varnothing \leq 185$	6.9 – 9.5	7	
$160 < \varnothing \leq 200$	7.7	8	

PE-RT/AL/PE-RT pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0	1	EI 240-U/C
$20 < \varnothing \leq 25$	2.5	1	
$25 < \varnothing \leq 40$	4.0	1	
$40 < \varnothing \leq 63$	6.0	1	
	6.3	1	
$20 < \varnothing \leq 75$	7.5	1	

PP-R/AL/PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	3.2 – 3.4	1	EI 120-U/C
$20 < \varnothing \leq 32$	4.7 – 5.4	1	
$32 < \varnothing \leq 40$	5.7 – 6.7	1	
$40 < \varnothing \leq 50$	6.9 – 8.3	1	
$50 < \varnothing \leq 63$	8.5 – 10.5	1	
$63 < \varnothing \leq 75$	10.0 – 12.5	1	
$75 < \varnothing \leq 90$	12.3 – 15.0	2	
$90 < \varnothing \leq 110$	15.1 – 18.2	2	
	18.3	2	EI 240-U/C

PVC pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 25$	1.5 – 1.7	2	EI 120-U/C
	1.8 – 3.6	1	EI 240-U/C
	3.7 – 4.2	1	EI 180-U/C
$25 < \varnothing \leq 50$	1.8 – 3.6	1	EI 240-U/C
	3.7 – 4.2	1	EI 180-U/C
	4.3 – 8.1	2	EI 120-U/C
$50 < \varnothing \leq 75$	1.9 – 3.5	1	EI 180-U/C
	3.6	1	EI 240-U/C
	3.7 – 4.2	1	EI 180-U/C
	4.3 – 8.1	2	EI 120-U/C
$75 < \varnothing \leq 110$	2.2 – 3.5	1	EI 120-U/C
	3.6	1	EI 120-U/C
		2	EI 240-U/C
	3.6 – 4.1	1	EI 120-U/C
		2	EI 180-U/C
	4.2	1	EI 180-U/C
	4.3 – 8.1	2	EI 120-U/C

PVC pipe penetration

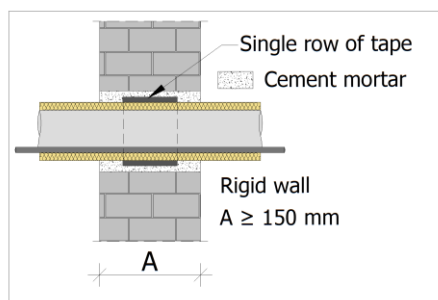
Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 100 mm band width	Fire resistance class
$110 < \varnothing \leq 125$	3.4 – 6.1	4	EI 120-U/C
	6.2	4	EI 120-U/C
		5	EI 240-U/C
	6.3 – 9.5	3	EI 180-U/C
$125 < \varnothing \leq 160$	6.2	5	EI 240-U/C
	6.3 – 9.5	5	EI 180-U/C
$160 < \varnothing \leq 200$	5.9	8	EI 180-U/C
	6.0 – 7.7	8	EI 120-U/C

PP-R/PP-R-GF/PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.8 – 10.0	1	EI 120-U/C
$20 < \varnothing \leq 32$	3.7 – 4.3	2	EI 120-U/C
	4.4 – 5.4	1	EI 120-U/C
$32 < \varnothing \leq 40$	4.4 – 5.4	2	EI 120-U/C
	5.5 – 6.7	1	EI 120-U/C
$20 < \varnothing \leq 50$	5.2 – 6.8	2	EI 120-U/C
	6.9 – 12.5	1	EI 120-U/C
	12.6 – 18.2	2	EI 120-U/C
	18.3	2	EI 180-U/C
$50 < \varnothing \leq 63$	6.3 – 8.6	2	EI 120-U/C
	8.7 – 12.5	1	EI 120-U/C
	12.6 – 18.2	2	EI 120-U/C
	18.3	2	EI 180-U/C
$63 < \varnothing \leq 75$	7.2 – 10.2	2	EI 120-U/C
	10.3 – 12.5	1	EI 120-U/C
	12.6 – 18.2	2	EI 120-U/C
	18.3	2	EI 180-U/C
$75 < \varnothing \leq 90$	8.4 – 18.2	2	EI 120-U/C
	18.3	2	EI 180-U/C
$90 < \varnothing \leq 110$	10.0 – 18.2	2	EI 120-U/C
	18.3	2	EI 180-U/C

PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.3 – 3.3	1	EI 120-U/C
	3.4	1	EI 240-U/C
$20 < \varnothing \leq 25$	3.2 – 4.1	1	EI 120-U/C
	4.2	1	EI 240-U/C
$25 < \varnothing \leq 32$	3.8 – 5.3	1	EI 120-U/C
	5.4	1	EI 240-U/C
$32 < \varnothing \leq 40$	4.4 – 6.6	1	EI 120-U/C
	6.7	1	EI 240-U/C
$40 < \varnothing \leq 50$	5.2 – 8.2	1	EI 120-U/C
	8.3	1	EI 240-U/C
$50 < \varnothing \leq 63$	6.1 – 10.4	1	EI 120-U/C
	10.5	1	EI 240-U/C
$63 < \varnothing \leq 75$	6.8 – 12.4	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.3	2	EI 120-U/C
$75 < \varnothing \leq 90$	8.2 – 18.3	2	EI 120-U/C
$90 < \varnothing \leq 110$	10.0 – 18.3	2	EI 120-U/C



Combustible pipes (with/without heating cable) in continuous insulation penetration seals with single row of band in rigid wall with thickness $A \geq 150$ mm

Fig.8 str.37

**Combustible pipes with flexible elastomeric foam (FEF)
continuous insulation (case CS) type Armaflex**

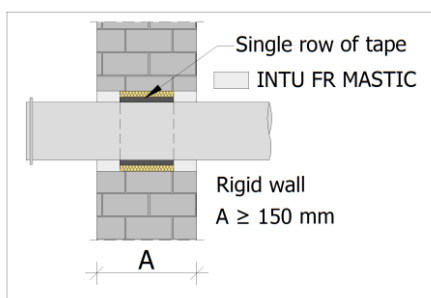
Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
PE-HD	$\varnothing \leq 110$	10.0	9	2	EI 240-U/C
PP	$\varnothing \leq 110$	2.7			EI 120-U/C
PP-R	$\varnothing \leq 110$	18.3			
PP-R/PP-R-GF/PP-R	$\varnothing \leq 110$	18.3			

**Combustible pipes with flexible elastomeric foam (FEF)
continuous insulation (case CS) type Kaiflex ST**

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Kaiflex ST type) insulation thick. [mm]	Width of INTU FR WRAP L band	Number of wrapping layers [pcs] of 100 mm band width	Fire resistance class
PE-HD	$\varnothing \leq 110$	4.2 – 10.0	13	60 mm	3	EI 120-U/C
	$110 < \varnothing \leq 125$	4.8 – 14.5		100 mm	4	EI 60-U/C
		14.6			4	EI 90-U/C
	$125 < \varnothing \leq 160$	6.2 – 14.5			6	EI 60-U/C
		14.6			6	EI 90-U/C
PP	$\varnothing \leq 110$	2.7 – 18.3	13	60 mm	3	EI 120-U/C

**Combustible pipes with polyethylene foam (PE)
continuous insulation (case CS) type Tubolit / Tubolit DG / Tubolit DG PLUS**

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	PE (Tubolit type) insulation thick. [mm]	Type insulation	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
PP	$\varnothing \leq 75$	2.7	9	Tubolit	1	EI 60-U/C
		12.5	13		2	
	$75 < \varnothing \leq 110$	12.5	13		2	
PVC-U	$\varnothing \leq 32$	2.0	9	Tubolit DG	2	EI 120 / E 180-U/C
PE-X/AL/PE-X	$\varnothing \leq 32$	3.0	9		2	EI 120-U/C
PP-R/PP-R-GF/PP-R	$\varnothing \leq 50$	6.9 – 8.3	9		1	
PE-RT/AL/PE-RT	$\varnothing \leq 20$	2.0 – 3.0	9	Tubolit DG PLUS	1	EI 120-U/C
PE-X/AL/PE-X	$20 < \varnothing \leq 32$	3.0	9			
PP-R/PP-R-GF/PP-R	$\varnothing \leq 20$	2.0	9			



Combustible pipes penetration seals with single row of band in rigid wall with thickness $A \geq 150$ mm

Fig.9 str.37

PEHD pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	4.2	2	EI 120-U/C

PVC pipe penetration

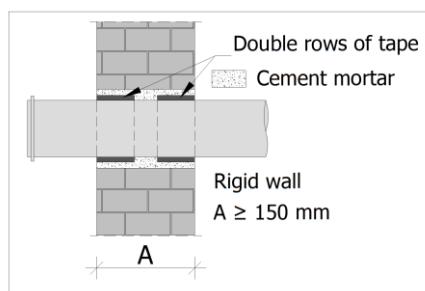
Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	4.0	2	EI 120-U/C

PP pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	2.7	2	EI 90-U/C

PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	18.3	2	EI 120-U/C



Combustible pipes penetration seals with double rows of band in rigid wall with thickness $A \geq 150$ mm

Fig.10 str.36

PP pipe penetration

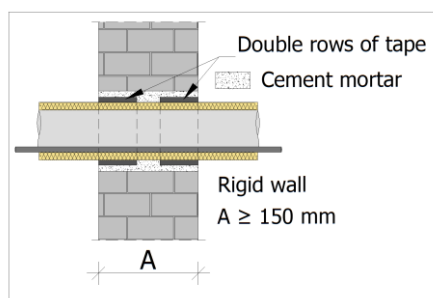
Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 50$	1.8	2 x 1	EI 120-U/C
	1.9	2 x 1	EI 120-U/C E 180-U/C
	2.0 – 12.5	2 x 1	EI 120-U/C
	12.6 – 18.4	2 x 2	EI 120-U/C
50 < $\varnothing \leq 75$	1.9	2 x 1	EI 120-U/C E 180-U/C
	2.0 – 12.5	2 x 1	EI 120-U/C
	12.6 – 18.4	2 x 2	EI 120-U/C
75 < $\varnothing \leq 90$	2.2 – 18.4	2 x 2	EI 120-U/C
90 < $\varnothing \leq 110$	2.7 – 18.4	2 x 2	EI 120-U/C
110 < $\varnothing \leq 125$	3.4 – 14.5	2 x 3	EI 60-U/C
	14.6	2 x 3	EI 120-U/C
125 < $\varnothing \leq 160$	4.9 – 14.5	2 x 5	EI 60-U/C
	14.6	2 x 5	EI 120-U/C

AROT pipe penetration

Pipe diameter [mm]	Conduit wave height [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	3.0	2 x 2	EI 120-U/C

Plastic AROT conduit can be:

- empty
- with small cable: $\varnothing_{\text{cable}} \leq 21$ mm
- with cable bundle: $\varnothing_{\text{bundle}} \leq 100$ mm, $\varnothing_{\text{cable}} \leq 21$ mm



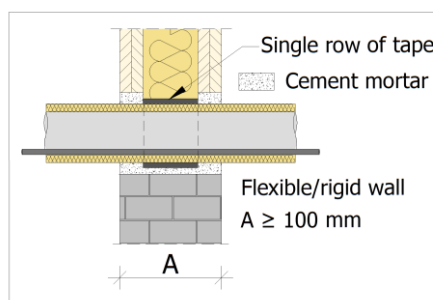
Combustible pipes (with/without heating cable) in continuous insulation penetration seals with double rows of band in rigid wall with thickness $A \geq 150$ mm

Fig.11 str.37

Combustible pipes with flexible elastomeric foam (FEF) continuous insulation (case CS) type Kaiflex ST

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation type	Insulation thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
PP	$\varnothing \leq 160$	4.9 – 14.5	Kaiflex ST	13	2 x 6	EI 30-U/C
		14.6		13	2 x 6	EI 120-U/C

➔ FIRE RESISTANCE CLASSIFICATION for non-combustible pipe in walls



Non-combustible pipes (with/without heating cable) in continuous insulation penetration seals with single row of band in flexible or rigid wall with thickness $A \geq 100$ mm

Fig.12 str.37

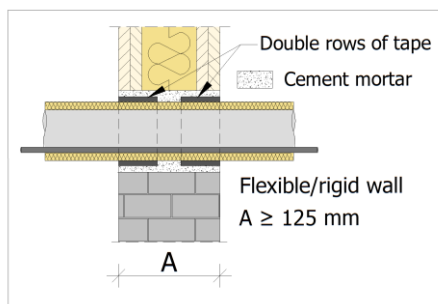
STEEL / CAST IRON pipe with flexible elastomeric foam (FEF) continuous insulation (case CS) type Armaflex

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 42.4$	2.0 – 2.8	9	1	EI 120-C/U
		10 - 22	2	EI 90-C/U E 120-C/U
		23 – 36	3	
		37 – 50	4	
	≥ 2.9	9	1	EI 120-C/U
		10 - 22	2	
		23 – 36	3	
		37 – 50	4	
$42.4 < \varnothing \leq 48.3$	≥ 2.1	9	1	EI 60-C/U E 120-C/U
		10 - 22	2	
		23 – 36	3	
		37 – 49	4	
		50	4	EI 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick.	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$48.3 < \varnothing \leq 60.3$	≥ 2.3	9	1	EI 60-C/U E 120-C/U
		10 - 22	2	
		23 – 36	3	
		37 – 49	4	
		50	4	EI 120-C/U
$60.3 < \varnothing \leq 76.1$	≥ 2.7	9	1	EI 60-C/U E 120-C/U
		10 - 22	2	
		23 – 36	3	
		37 – 49	4	
		50	4	EI 120-C/U
$76.1 < \varnothing \leq 88.9$	≥ 2.9	9	1	EI 60-C/U E 120-C/U
		10 - 22	2	
		23 – 36	3	
		37 – 49	4	
		50	4	EI 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick.	Number of wrapping layers [pcs] of 60 mm	Fire resistance class
88.9 < Ø ≤ 114.3	≥ 3.3	9	1	EI 45-C/U
		10 - 22	2	EI 45-C/U
		23 - 36	3	E 90-C/U
		37 - 49	4	EI 90-C/U
		50	4	EI 90-C/U
114.3 < Ø ≤ 139.7	≥ 3.6	9	1	EI 45-C/U
		10 - 22	2	EI 45-C/U
		23 - 36	3	E 90-C/U
		37 - 49	4	E 90-C/U
		50	4	EI 90-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick.	Number of wrapping layers [pcs] of 60 mm	Fire resistance class
139.7 < Ø ≤ 168.3	≥ 4.0	9	1	EI 45-C/U
		10 - 22	2	E 120-C/U
		23 - 36	3	EI 45-C/U
		37 - 49	4	E 90-C/U
		50	4	EI 90-C/U



Non-combustible pipes (with/without heating cable) in continuous insulation (case CS) penetration seals with double rows of band in flexible or rigid wall with thickness $A \geq 125$ mm

Fig.13 str.38

COPPER / STEEL / CAST IRON pipe with flexible elastomeric foam (FEF) continuous insulation (case CS) type Armaflex

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 15.0$	≥ 1.0	9	2 x 1	EI 120-C/U
		10 - 22	2 x 2	EI 120-C/U
		23 - 36	2 x 3	EI 120-C/U
		37 - 50	2 x 4	EI 120-C/U
$15.0 < \varnothing \leq 22.0$	≥ 1.1	9	2 x 1	EI 30-C/U
		10 - 22	2 x 2	EI 30-C/U
		23 - 36	2 x 3	EI 30-C/U
		37 - 49	2 x 4	EI 30-C/U
		50	2 x 4	EI 90-C/U E 120-C/U
$22.0 < \varnothing \leq 28.0$	≥ 1.2	9	2 x 1	EI 30-C/U
		10 - 22	2 x 2	EI 30-C/U
		23 - 36	2 x 3	EI 30-C/U
		37 - 49	2 x 4	EI 30-C/U
		50	2 x 4	EI 90-C/U E 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$28.0 < \varnothing \leq 42.0$	≥ 1.3	9	2 x 1	EI 30-C/U
		10 - 22	2 x 2	EI 30-C/U
		23 - 36	2 x 3	EI 30-C/U
		37 - 49	2 x 4	EI 30-C/U
		50	2 x 4	EI 90-C/U E 120-C/U
$42.0 < \varnothing \leq 54.0$	≥ 1.5	9	2 x 1	EI 30-C/U
		10 - 22	2 x 2	EI 30-C/U
		23 - 36	2 x 3	EI 30-C/U
		37 - 49	2 x 4	EI 30-C/U
		50	2 x 4	EI 90 / E 120-C/U

**COPPER / STEEL / CAST IRON pipe with flexible elastomeric foam (FEF)
 continuous insulation (case CS) type Kaiflex ST**

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Kaiflex ST type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 12.7$	≥ 0.8	9	2 x 2	EI 90 / E 120-C/U
		9 ¹⁾		EI 120-C/U
$12.7 < \varnothing \leq 15.0$	≥ 0.9	9		EI 90 / E 120-C/U
		9 ¹⁾		EI 120-C/U
$15.0 < \varnothing \leq 22.23$	≥ 1.0	9		EI 90 / E 120-C/U
		9 ¹⁾		EI 120-C/U

1) Pipe additionally insulated with mineral wool density of 35 kg/m³, type Paroc Hvac Lamella Mat AluCoat, local insulation (case LI) dimensions of: 20 x 200 mm (thickness x length)

**COPPER / STEEL / CAST IRON pipe with polyethylene foam (PE)
 continuous insulation (case CS) type Tubolit DG PLUS**

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Tubolit DG PLUS type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 12.7$	≥ 0.8	9	2 x 2	EI 90 / E 120-C/U
		9 ¹⁾		EI 120-C/U
$12.7 < \varnothing \leq 15.0$	≥ 0.9	9		EI 90 / E 120-C/U
		9 ¹⁾		EI 120-C/U
$15.0 < \varnothing \leq 22.23$	≥ 1.0	9		EI 90 / E 120-C/U
		9 ¹⁾		EI 120-C/U

1) Pipe additionally insulated with mineral wool density of 35 kg/m³, type Paroc Hvac Lamella Mat AluCoat, local insulation (case LI) dimensions of: 20 x 200 mm (thickness x length)

**STEEL / CAST IRON pipe penetration with flexible elastomeric foam (FEF)
 continuous insulation (case CS) type Armaflex**

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class	Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
Ø ≤ 42.4	≥ 2.0	9	2 x 1	EI 120-C/U	48.3 < Ø ≤ 60.3	≥ 2.2	9	2 x 1	EI 90-C/U E 120-C/U
		10 - 22	2 x 2				10 - 22	2 x 2	
		23 – 36	2 x 3				23 – 36	2 x 3	
		37 – 50	2 x 4				37 – 49	2 x 4	
42.4 < Ø ≤ 48.3	≥ 2.1	9	2 x 1	EI 90-C/U E 120-C/U			50	2 x 4	EI 120-C/U
		10 - 22	2 x 2		EI 90-C/U E 120-C/U	9	2 x 1		
		23 – 36	2 x 3			10 - 22	2 x 2		
		37 – 49	2 x 4			23 – 36	2 x 3		
		50	2 x 4	EI 120-C/U		37 – 49	2 x 4		
					50	2 x 4	EI 120-C/U		

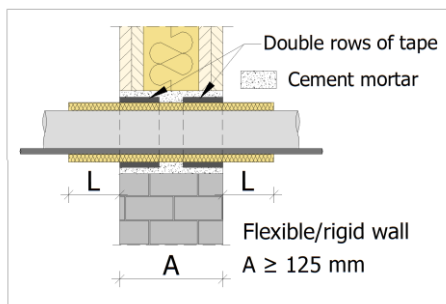
Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$76.1 < \varnothing \leq 88.9$	≥ 2.6	9	2 x 1	EI 90-C/U E 120-C/U
		10 - 22	2 x 2	
		23 - 36	2 x 3	
		37 - 49	2 x 4	
		50	2 x 4	EI 120-C/U
$88.9 < \varnothing \leq 114.3$	≥ 3.1	9	2 x 1	EI 60-C/U
		10 - 22	2 x 2	EI 30-C/U
		23 - 36	2 x 3	
		37 - 50	2 x 4	
		23 - 36	2 x 3	
		37 - 50	2 x 4	

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$114.3 < \varnothing \leq 139.7$	≥ 3.6	9	2 x 1	EI 60-C/U E 120-C/U
		10 - 22	2 x 2	EI 30-C/U
		23 - 36	2 x 3	
		37 - 50	2 x 4	
$139.7 < \varnothing \leq 159.0$	≥ 4.0	9	2 x 1	EI 60-C/U E 120-C/U
		10 - 22	2 x 2	EI 30-C/U
		23 - 36	2 x 3	
		37 - 50	2 x 4	

STEEL / CAST IRON pipe penetration with flexible elastomeric foam (FEF) continuous insulation (case CS) type Kaiflex ST

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Kaiflex ST type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 18.0$	1.2 - 1.4	9	2 x 1	EI 120-C/U
		10 - 25	2 x 2	
	≥ 1.5	9	2 x 1	
		10 - 25	2 x 2	
		26 - 37	2 x 3	EI 90-C/U E 120-C/U
		38 - 50	2 x 4	
$18.0 < \varnothing \leq 28.0$	1.3 - 1.4	13	2 x 1	EI 60-C/U E 120-C/U
		14 - 24	2 x 2	
		25	2 x 2	EI 120-C/U
		26 - 37	2 x 3	EI 90-C/U E 120-C/U
		38 - 50	2 x 4	
	≥ 1.5	9	2 x 1	EI 120-C/U
		10 - 25	2 x 2	
		26 - 37	2 x 3	EI 90-C/U E 120-C/U
$28.0 < \varnothing \leq 48.3$	≥ 1.4	38 - 50	2 x 4	
		13	2 x 1	EI 60-C/U E 120-C/U
		14 - 24	2 x 2	
		25	2 x 2	EI 120-C/U
		26 - 37	2 x 3	EI 90-C/U E 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Kaiflex ST type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$48.3 < \varnothing \leq 66.7$	≥ 1.5	13	2 x 1	EI 60-C/U E 120-C/U
		14 - 24	2 x 2	
		25	2 x 2	EI 120-C/U
		26 - 37	2 x 3	EI 90-C/U E 120-C/U
		38 - 50	2 x 4	
$66.7 < \varnothing \leq 76.1$	≥ 1.6	13	2 x 1	EI 45-C/U E 120-C/U
		14 - 24	2 x 2	
		25	2 x 2	EI 60-C/U E 120-C/U
		26 - 37	2 x 3	
		38 - 49	2 x 4	EI 90-C/U E 120-C/U
$76.1 < \varnothing \leq 88.9$	≥ 1.8	50	2 x 4	EI 90-C/U E 120-C/U
		13	2 x 1	EI 45-C/U E 120-C/U
		14 - 24	2 x 2	
		25	2 x 2	EI 60-C/U E 120-C/U
		26 - 37	2 x 3	
$88.9 < \varnothing \leq 108.0$	≥ 2.0	38 - 49	2 x 4	EI 90-C/U E 120-C/U
		50	2 x 4	
		13	2 x 1	EI 45-C/U E 120-C/U
		14 - 24	2 x 2	
		25	2 x 2	EI 60-C/U E 120-C/U

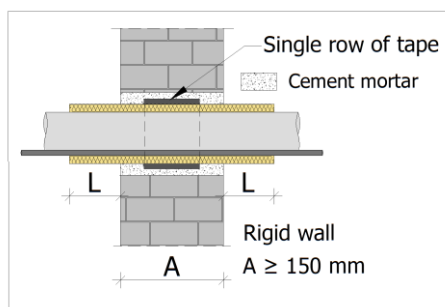


Non-combustible pipes (with/without heating cable) in local sustained insulation (case LS) seals with double rows of band in flexible or rigid wall with thickness $A \geq 125$ mm

Fig.14 str.38

STEEL / CAST IRON pipe penetration with mineral wool (MW) local sustained insulation (case LS) type Paroc Hvac Lamella Mat AluCoat

Pipe diameter [mm]	Pipe wall thickness [mm]	Mineral wool insulation thickness [mm]	Mineral wool insulation length – L [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
Ø ≤ 42.4	≥ 1.5	20	300	2 x 1	EI 120-C/U
		21 – 30	500		EI 120-C/U
	≥ 2.0	21 – 40	600		EI 120-C/U
	≥ 4.0	41 – 50	600		EI 90 / E 120-C/U
	≥ 5.6	41 – 50	750		EI 120-C/U
42.4 < Ø ≤ 66.7	≥ 1.5	30	500	2 x 1	EI 120-C/U
	≥ 2.0	31 – 40	600		EI 120-C/U
	≥ 4.0	41 – 50	600		EI 90 / E 120-C/U
	≥ 5.6	41 – 50	750		EI 120-C/U
66.7 < Ø ≤ 108.0	≥ 2.0	40	600	2 x 1	EI 120-C/U
	≥ 4.0	41 – 50	600		EI 90 / E 120-C/U
	≥ 5.6	41 – 50	750		EI 120-C/U
108.0 < Ø ≤ 114.3	≥ 3.6	40	600	2 x 1	EI 120-C/U
		41 – 50	600		EI 90 / E 120-C/U
		41 – 50	750		EI 120-C/U
114.3 < Ø ≤ 168.3	≥ 4.0	50	600	2 x 1	EI 90 / E 120-C/U
	≥ 5.6	50	750		EI 120-C/U
168.3 < Ø ≤ 219.1	≥ 4.0	50	600	2 x 1	EI 90 / E 120-C/U
	≥ 5.6	50	750		EI 120-C/U
219.1 < Ø ≤ 273.0	≥ 5.6	50	750	2 x 1	EI 120-C/U
273.0 < Ø ≤ 323.9	≥ 5.6	50	750	2 x 1	EI 120-C/U
323.9 < Ø ≤ 355.6	≥ 5.6	50	750	2 x 1	EI 120-C/U

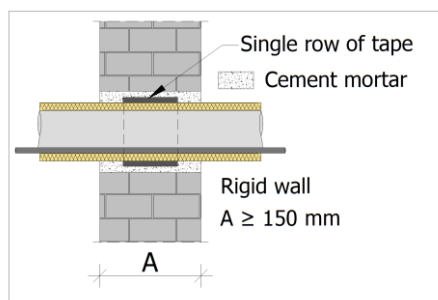


Non-combustible pipes (with/without heating cable) in local sustained insulation (case LS) seals with single row of band in rigid wall with thickness $A \geq 150$ mm

Fig.15 str.38

STEEL / CAST IRON pipe penetration with mineral wool (MW) local sustained insulation (case LS) type Paroc Hvac Lamella Mat AluCoat

Pipe diameter [mm]	Pipe wall thickness [mm]	Mineral wool insulation thickness [mm]	Mineral wool insulation length - L [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 42.4$	≥ 1.5	20	300	1	EI 120-C/U
		21 - 30	500		
$42.4 < \varnothing \leq 66.7$	≥ 2.0	21 - 40	600		
	≥ 1.5	30	500		
$66.7 < \varnothing \leq 108.0$	≥ 2.0	31 - 40	600		
	≥ 2.0	40	600		



Non-combustible pipes with continuous insulation penetration seals with single row of band in rigid wall with thickness $A \geq 150$ mm

Fig.16 str.38

COPPER / STEEL / CAST IRON pipe with flexible elastomeric foam (FEF) continuous insulation (case CS) type Armaflex

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class	Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 15.0$	1.0 - 1.4	9	1	EI 180-C/U E 240-C/U	$15 < \varnothing \leq 22.0$	1.1 - 1.4	9	1	EI 180-C/U E 240-C/U
		10 - 22	2	EI 180-C/U			10 - 22	2	EI 120-C/U
		23 - 36	3	EI 180-C/U			23 - 36	3	EI 120-C/U
		37 - 50	4	EI 180-C/U			37 - 50	4	EI 120-C/U
	≥ 1.5	9	1	EI 240-C/U		≥ 1.5	9	1	EI 240-C/U
		10 - 22	2	EI 180-C/U			10 - 22	2	EI 120-C/U
		23 - 36	3	EI 180-C/U			23 - 36	3	EI 120-C/U
		37 - 50	4	EI 180-C/U			37 - 50	4	EI 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
22.0 < Ø ≤ 28.0	1.2 – 1.4	9	1	EI 180-C/U E 240-C/U
		10 - 22	2	EI 120-C/U
		23 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U
	≥ 1.5	9	1	EI 240-C/U
		10 - 22	2	EI 120-C/U
		23 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U
28.0 < Ø ≤ 42.0	1.3 – 1.4	9	1	EI 180-C/U E 240-C/U
		10 - 22	2	EI 120-C/U
		23 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U
	≥ 1.5	9	1	EI 240-C/U
		10 - 22	2	EI 120-C/U
		23 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U
42.0 < Ø ≤ 54.0	≥ 1.5	9	1	EI 240-C/U
		10 - 22	2	EI 120-C/U
		23 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick.	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
54.0 < Ø ≤ 64.0	≥ 1.6	9	1	EI 30-C/U E 240-C/U
		10 - 22	2	EI 30-C/U E 60-C/U
		23 – 36	3	
		37 – 49	4	EI 60-C/U
		50	4	
64.0 < Ø ≤ 76.1	≥ 1.7	9	1	EI 30-C/U E 240-C/U
		10 - 22	2	EI 30-C/U E 60-C/U
		23 – 36	3	
		37 – 49	4	EI 60-C/U
		50	4	
76.1 < Ø ≤ 88.9	≥ 1.8	9	1	EI 30-C/U E 240-C/U
		10 - 22	2	EI 30-C/U E 60-C/U
		23 – 36	3	
		37 – 49	4	EI 60-C/U
		50	4	
88.9 < Ø ≤ 108.0	≥ 2.0	9	1	EI 30-C/U E 240-C/U
		10 - 22	2	EI 30-C/U E 60-C/U
		23 – 36	3	
		37 – 49	4	EI 60-C/U
		50	4	

COPPER / STEEL / CAST IRON pipe with flexible elastomeric foam (FEF) continuous insulation (case CS) type Kaiflex ST

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Kaiflex ST type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
Ø ≤ 12.7	≥ 0.8	9	2	EI 120-C/U
12.7 < Ø ≤ 15.0	≥ 0.9	9	2	EI 120-C/U
15.0 < Ø ≤ 22.23	≥ 1.0	9	2	EI 120-C/U

COPPER / STEEL / CAST IRON pipe with polyethylene foam (PE) continuous insulation (case CS) type Tubolit

Pipe diameter [mm]	Pipe wall thickness [mm]	PE (Tubolit type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
Ø ≤ 6.35	≥ 0.8	9	2	EI 240-C/U
6.35 < Ø ≤ 15.88	≥ 1.0	9	2	EI 180 / E 240-C/U

**COPPER / STEEL / CAST IRON pipe with polyethylene foam (PE)
 continuous insulation (case CS) type Tubolit DG PLUS**

Pipe diameter [mm]	Pipe wall thickness [mm]	PE (Tubolit DG PLUS type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 12.7$	≥ 0.8	9	2	EI 120-C/U
$12.7 < \varnothing \leq 22.23$	≥ 1.0	9	2	

**STEEL / CAST IRON pipe penetration with flexible elastomeric foam (FEF)
 continuous insulation (case CS) type Armaflex**

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 42.4$	2.0 – 2.5	9	1	EI 180-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	EI 180-C/U
		37 – 50	4	EI 180-C/U
	≥ 2.6	9	1	EI 240-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	EI 180-C/U
		37 – 50	4	E 240-C/U
$42.4 < \varnothing \leq 48.3$	2.1 – 2.5	9	1	EI 180-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	EI 180-C/U
		37 – 50	4	EI 180-C/U
	≥ 2.6	9	1	EI 240-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	E 240-C/U
		37 – 50	4	E 240-C/U
$48.3 < \varnothing \leq 60.3$	2.2 – 2.5	9	1	EI 180-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	EI 180-C/U
		37 – 50	4	EI 180-C/U
	≥ 2.6	9	1	EI 240-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	E 240-C/U
		37 – 50	4	E 240-C/U
$60.3 < \varnothing \leq 76.1$	2.4 – 2.5	9	1	EI 180-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	EI 180-C/U
		37 – 50	4	EI 180-C/U
	≥ 2.6	9	1	EI 240-C/U
		10 – 22	2	EI 180-C/U
		23 – 36	3	E 240-C/U
		37 – 50	4	E 240-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Armaflex type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$76.1 < \varnothing \leq 88.9$	≥ 2.6	9	1	EI 240-C/U
		10 – 22	2	EI 180-C/U E 240-C/U
		23 – 36	3	
		37 – 50	4	E 240-C/U
$88.9 < \varnothing \leq 114.3$	≥ 3.1	9	1	EI 90-C/U
		10 – 23	2	E 240-C/U
		24 – 36	3	EI 90-C/U
		37 – 49	4	E 180-C/U
		50	4	EI 180-C/U
$114.3 < \varnothing \leq 139.7$	≥ 3.6	9	1	EI 90-C/U
		10 – 23	2	E 240-C/U
		24 – 36	3	EI 90-C/U
		37 – 49	4	E 180-C/U
		50	4	EI 180-C/U
$139.7 < \varnothing \leq 159.0$	≥ 4.0	9	1	EI 90-C/U
		10 – 23	2	E 240-C/U
		24 – 36	3	EI 90-C/U
		37 – 49	4	E 180-C/U
$159.0 < \varnothing \leq 168.3$	≥ 4.0	50	1	EI 90-C/U
		50	1	EI 90-C/U
$168.3 < \varnothing \leq 219.0$	≥ 4.0	50	1	EI 90-C/U

**STEEL / CAST IRON pipe penetration with flexible elastomeric foam (FEF)
continuous insulation (case CS) type Kaiflex ST**

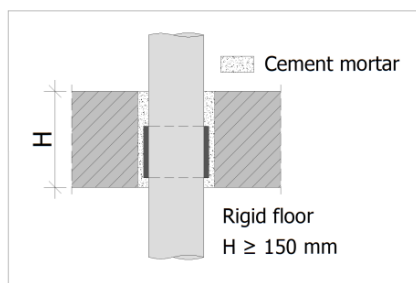
Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Kaiflex ST type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 18.0$	1.2 – 1.4	9	1	EI 120 C/U
		10 - 25	2	
	≥ 1.5	9	1	
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	
$18.0 < \varnothing \leq 28.0$	1.3 – 1.4	9	1	EI 120 C/U
		10 - 25	2	
	≥ 1.5	9	1	
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	
$28.0 < \varnothing \leq 48.3$	1.4	9	1	EI 120 C/U
		10 - 25	2	
	≥ 1.5	9	1	
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	
$48.3 < \varnothing \leq 66.7$	≥ 1.5	9	1	EI 120 C/U
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF (Kaiflex ST type) insulation thick. [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$66.7 < \varnothing \leq 76.1$	≥ 1.6	25	2	EI 120-C/U
		26 – 37	3	
		38 - 50	4	
$76.1 < \varnothing \leq 88.9$	≥ 1.8	25	2	EI 120-C/U
		26 – 37	3	
		38 - 50	4	
$88.9 < \varnothing \leq 108.0$	≥ 2.0	25	2	EI 120-C/U
		26 – 37	3	
		38 - 50	4	
$108.0 < \varnothing \leq 114.3$	≥ 2.2	50	4	EI 120-C/U
$114.3 < \varnothing \leq 139.7$	≥ 3.1	50	4	EI 120-C/U
$139.7 < \varnothing \leq 168.3$	≥ 4.0	50	4	EI 120-C/U
$168.3 < \varnothing \leq 219.1$	≥ 4.0	50 ¹⁾	4	EI 120-C/U
$219.1 < \varnothing \leq 273.0$	≥ 4.6	50 ²⁾	4	EI 120-C/U
$273.0 < \varnothing \leq 323.9$	≥ 5.2	50 ²⁾	4	EI 120-C/U
$323.9 < \varnothing \leq 355.6$	≥ 5.6	50 ²⁾	4	EI 120-C/U

1) Pipe additionally insulated with mineral wool density of 35 kg/m³, type Paroc Hvac Lamella Mat AluCoat, local insulation (case LI) dimensions of: 40 x 500 mm (thickness x length)

2) Pipe additionally insulated with mineral wool density of 35 kg/m³, type Paroc Hvac Lamella Mat AluCoat, local insulation (case LI) dimensions of: 50 x 500 mm (thickness x length)

➔ **FIRE RESISTANCE CLASSIFICATION for combustible pipe in floors**



Combustible pipes in rigid floor with thickness $H \geq 150$ mm

Density of partition: $\rho \geq 550$ kg/m³

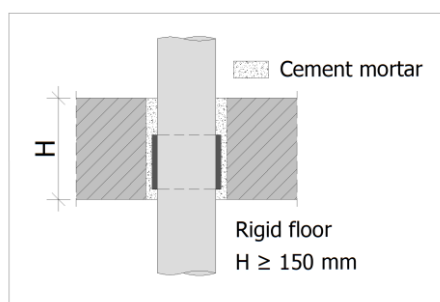
Fig.17 str.39

PP-HT pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Width of INTU FR WRAP L band	No of wrapping layers [pcs]	Fire resistance class
$\varnothing \leq 50$	1.8 – 1.9	60 mm	1	EI 120-U/C
	2.0 – 2.7	60 mm	2	
	2.8 – 3.9	100 mm	5	
$50 < \varnothing \leq 75$	1.9	60 mm	1	
	2.0 – 2.7	60 mm	2	
	2.8 – 3.9	100 mm	5	
$75 < \varnothing \leq 110$	2.7	60 mm	2	
	2.8 – 3.9	100 mm	5	
$110 < \varnothing \leq 125$	3.9	100 mm	5	
$125 < \varnothing \leq 160$	3.9	100 mm	5	

PP-M Magnaplast UltradB

Pipe diameter [mm]	Pipe wall thickness [mm]	Width of INTU FR WRAP L band	No of wrapping layers [pcs]	Fire resistance class
$\varnothing \leq 50$	2.0	60 mm	1	EI 120-U/C
	2.1 – 3.4	60 mm	2	EI 120-U/C
	3.5 – 4.9	100 mm	5	EI 60-U/C
$50 < \varnothing \leq 75$	2.6	60 mm	2	EI 120-U/C
	2.7 – 4.9	100 mm	5	EI 60-U/C
$75 < \varnothing \leq 110$	3.4	60 mm	2	EI 120-U/C
	3.5 – 4.9	100 mm	5	EI 60-U/C
$110 < \varnothing \leq 160$	4.9	100 mm	5	EI 60-U/C



Combustible pipes in rigid floor with thickness $H \geq 150$ mm

Density of partition: $\rho \geq 1700$ kg/m³

Fig.17 str.39

PP-R/AL/PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.8 – 3.3	1	EI 120-U/C
	3.4 – 10.0	1	EI 240-U/C
$20 < \varnothing \leq 32$	4.4 – 12.4	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.4	2	EI 240-U/C
$32 < \varnothing \leq 50$	6.9 – 12.4	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.4	2	EI 240-U/C
$50 < \varnothing \leq 63$	8.7 – 12.4	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.4	2	EI 240-U/C
$63 < \varnothing \leq 75$	10.3 – 12.4	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.4	2	EI 240-U/C
$75 < \varnothing \leq 90$	12.4 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C
$90 < \varnothing \leq 110$	15.1 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C

PP-R/PP-R-GF/PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.8 – 10.0	1	EI 240-U/C
$20 < \varnothing \leq 32$	4.4 – 12.4	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C
$32 < \varnothing \leq 50$	6.9 – 12.4	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C
$50 < \varnothing \leq 63$	8.7 – 12.5	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C
$63 < \varnothing \leq 75$	10.3 – 12.5	1	EI 120-U/C
	12.5	1	EI 240-U/C
	12.6 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C
$75 < \varnothing \leq 90$	11.2 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C
$90 < \varnothing \leq 110$	12.3 – 18.3	2	EI 120-U/C
	18.4	2	EI 240-U/C

PE-Xa pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0 – 5.8	1	EI 120-U/C
$20 < \varnothing \leq 32$	3.0	1	EI 120-U/C
$32 < \varnothing \leq 40$	3.7	1	EI 120-U/C
$40 < \varnothing \leq 50$	4.6	1	EI 120-U/C
$50 < \varnothing \leq 63$	5.8	1	EI 120-U/C

PP pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Width of INTU FR WRAP L band	No of wrapping layers [pcs]	Fire resistance class
$\varnothing \leq 50$	1.5 – 12.5	60 mm	1	EI 240-U/C
	12.6 – 18.4	60 mm	2	EI 240-U/C
$50 < \varnothing \leq 75$	1.9 – 12.5	60 mm	1	EI 240-U/C
	12.6 – 18.4	60 mm	2	EI 240-U/C
$75 < \varnothing \leq 90$	2.3 – 18.4	60 mm	2	EI 240-U/C
$90 < \varnothing \leq 110$	2.7 – 18.4	60 mm	2	EI 240-U/C
$110 < \varnothing \leq 125$	3.1 – 15.2	100 mm	3	EI 120-U/C
$125 < \varnothing \leq 160$	4.0 – 7.7	100 mm	5	EI 120-U/C
$160 < \varnothing \leq 200$	7.7	100 mm	8	EI 45-U/C

PP-R pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.3 – 4.1	1	EI 120-U/C
	4.2	1	EI 180-U/C
	4.3 – 10.0	1	EI 120-U/C
$20 < \varnothing \leq 32$	2.7 – 4.1	1	EI 120-U/C
	4.2	1	EI 180-U/C
	4.3 – 12.5	1	EI 120-U/C
$32 < \varnothing \leq 40$	3.0 – 4.1	1	EI 120-U/C
	4.2	1	EI 180-U/C
	4.3 – 12.5	1	EI 120-U/C
$40 < \varnothing \leq 50$	3.3 – 4.1	1	EI 120-U/C
	4.2	1	EI 180-U/C
	4.3 – 12.5	1	EI 120-U/C
$50 < \varnothing \leq 63$	3.8 – 4.1	1	EI 120-U/C
	4.2	1	EI 180-U/C
	4.3 – 12.5	1	EI 120-U/C
$63 < \varnothing \leq 75$	4.2	1	EI 180-U/C
	4.3 – 12.5	1	EI 120-U/C
$75 < \varnothing \leq 90$	7.7 – 12.2	2	EI 180-U/C
	12.3	2	EI 240-U/C
	12.4 – 18.3	2	EI 120-U/C
$90 < \varnothing \leq 110$	12.3	2	EI 240-U/C
	12.4 – 18.3	2	EI 120-U/C

PVC-U pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 25$	1.5	2	EI 120-U/U
	1.5 – 4.2	1	EI 240-U/C
$25 < \varnothing \leq 32$	1.5 – 4.2	1	EI 240-U/C
$32 < \varnothing \leq 50$	1.8 – 4.2	1	EI 240-U/C
$50 < \varnothing \leq 75$	1.9 – 4.2	1	EI 240-U/C
$75 < \varnothing \leq 90$	2.1 – 3.4	2	EI 240-U/C
	3.5 – 4.2	2	EI 180-U/C
$90 < \varnothing \leq 110$	2.2	2	EI 240-U/C
	2.3 – 4.2	2	EI 180-U/C

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 100 mm band width	Fire resistance class
$110 < \varnothing \leq 125$	2.5 – 3.9	3	EI 120-U/C
	4.0 – 5.3	3	EI 240-U/C
	5.4 – 7.7	5	EI 240-U/C
$125 < \varnothing \leq 160$	3.2 – 7.6	5	EI 120-U/C
	7.7	5	EI 240-U/C
$160 < \varnothing \leq 170$	4.4 – 7.6	6	EI 120-U/C
	7.7	6	EI 240-U/C
$170 < \varnothing \leq 185$	6.1 – 7.6	7	EI 120-U/C
	7.7	7	EI 240-U/C
$185 < \varnothing \leq 200$	7.7	8	EI 240-U/C

PE-HD pipe penetration

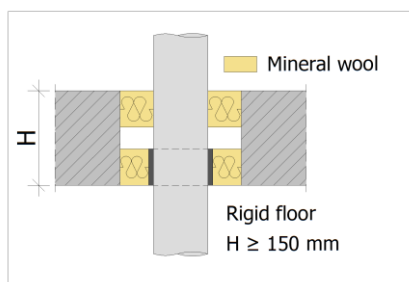
Pipe diameter [mm]	Pipe wall thickness [mm]	Width of INTU FR WRAP L band	No of wrapping layers [pcs]	Fire resistance class
$\varnothing \leq 32$	2.0 – 6.8	60 mm	1	EI 240-U/C
	6.9 – 10.0	60 mm	2	EI 120-U/C
$32 < \varnothing \leq 50$	2.5 – 6.8	60 mm	1	EI 240-U/C
	6.9 – 10.0	60 mm	2	EI 120-U/C
$50 < \varnothing \leq 63$	2.8 – 6.8	60 mm	1	EI 240-U/C
	6.9 – 10.0	60 mm	2	EI 120-U/C
$63 < \varnothing \leq 75$	3.0 – 6.8	60 mm	1	EI 240-U/C
	6.9 – 10.0	60 mm	2	EI 120-U/C
$75 < \varnothing \leq 90$	3.5 – 4.1	60 mm	2	EI 120-U/C
	4.2	60 mm	2	EI 240-U/C
	4.3 – 9.5	60 mm	2	EI 120-U/C
	4.3 – 9.5	100 mm	5	EI 240-U/C
	9.6 – 10.0	60 mm	2	EI 120-U/C
$90 < \varnothing \leq 110$	4.2	60 mm	2	EI 240-U/C
	4.3 – 9.5	60 mm	2	EI 120-U/C
	4.3 – 9.5	100 mm	5	EI 240-U/C
	9.6 – 10.0	60 mm	2	EI 120-U/C
$110 < \varnothing \leq 125$	4.8 – 5.8	100 mm	3	EI 240-U/C
	5.9 – 6.2	100 mm	3	EI 120-U/C
	5.9 – 6.2	100 mm	5	EI 240-U/C
	6.3 – 9.5	100 mm	3	EI 120-U/C
	6.3 – 9.5	100 mm	5	EI 240-U/C
$125 < \varnothing \leq 160$	6.2 – 9.5	100 mm	5	EI 240-U/C
$160 < \varnothing \leq 200$	6.3 – 11.9	100 mm	8	EI 120-U/C

PE-RT/AL/PE-RT pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0	1	EI 240-U/C
	2.1 – 7.5	1	EI 180 E 240-U/C
$20 < \varnothing \leq 25$	2.5	1	EI 180 E 240-U/C
$25 < \varnothing \leq 32$	3.2	1	EI 180 E 240-U/C
$32 < \varnothing \leq 40$	4.0	1	EI 180 E 240-U/C
	6.0	1	EI 120-U/C
$40 < \varnothing \leq 63$	6.3	1	EI 180 E 240-U/C
	7.5	1	EI 180 E 240-U/C

PE-X/AL/PE-X pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 20$	2.0 – 7.5	1	EI 240-U/C
$20 < \varnothing \leq 32$	3.0 – 7.4	1	EI 120-U/C
	7.5	1	EI 240-U/C
$32 < \varnothing \leq 40$	4.0	1	EI 120-U/C
$40 < \varnothing \leq 63$	6.0 – 7.4	1	EI 120-U/C
	7.5	1	EI 240-U/C
$63 < \varnothing \leq 75$	7.5	1	EI 240-U/C



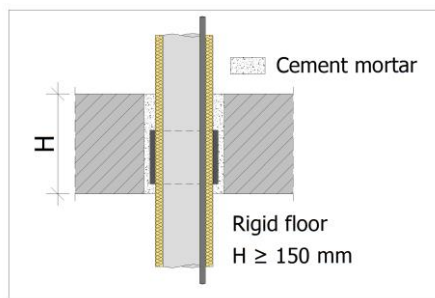
Combustible pipes penetration seals in rigid floor filled with 2 x mineral boards, floor with thickness $H \geq 150$ mm

Density of partition: $\rho \geq 550 \text{ kg/m}^3$

Fig.18 str.39

PVC-U pipe penetration

Pipe diameter [mm]	Pipe wall thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 110$	4.2	2	EI 120-U/C



Combustible pipes (with/without heating cable) in continuous insulation (case CS) penetration seals in rigid floor with thickness $H \geq 150$ mm

Density of partition: $\rho \geq 1700 \text{ kg/m}^3$

Fig.19 str.39

Combustible pipes penetration with flexible elastomeric foam (FEF) continuous insulation (case CS) type Armaflex

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Armaflex) thickness [mm]	Width of INTU FR WRAP L band	Number of wrapping layers [pcs]	Fire resistance class
PE-HD	$\varnothing \leq 110$	6.2	23	60 mm	8	EI 120-U/C
		10.0	9 – 13	60 mm	4	
	$110 < \varnothing \leq 160$	6.2	23	60 mm	8	
PP	$\varnothing \leq 110$	2.7	9	60 mm	4	EI 120-U/C
PP-R	$\varnothing \leq 110$	18.3	9	60 mm	4	EI 120-U/C
PP-R/PP-R-GF/PP-R	$\varnothing \leq 110$	15.1	9	60 mm	4	EI 120-U/C

Combustible pipes penetration with flexible elastomeric foam (FEF) continuous insulation (case CS) type Kaiflex ST

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Kaiflex ST) thickness [mm]	Width of INTU FR WRAP L band	Number of wrapping layers [pcs]	Fire resistance class
PE-HD	$\varnothing \leq 110$	4.2	13	60 mm	3	EI 120-U/C
		4.3 – 10.0	13	60 mm	3	EI 90-U/C
	$110 < \varnothing \leq 125$	4.8 – 14.5	13	100 mm	4	EI 45-U/C
		14.6	13	100 mm	4	EI 90-U/C
	$125 < \varnothing \leq 160$	6.2 – 14.5	13	100 mm	6	EI 45-U/C
		14.6	13	100 mm	6	EI 90-U/C
PP	$\varnothing \leq 160$	4.0 – 14.5	13	100 mm	6	EI 30-U/C
		14.6	13	100 mm	6	EI 60-U/C

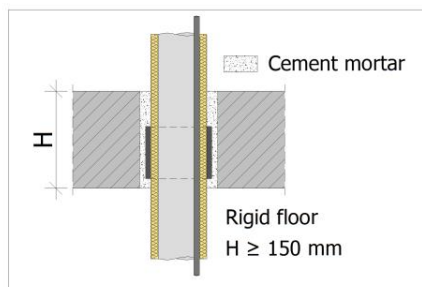
Combustible pipes penetration with polyethylene foam (PE) continuous insulation (case CS) type Tubolit / Tubolit DG

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	PE insulation thickness [mm]	Width of INTU FR WRAP L band	Number of wrapping layers [pcs]	Fire resistance class
PP	Ø ≤ 75	12.5	9 (Tubolit type)	60 mm	2	EI 240-U/C
PVC-U	Ø ≤ 32	2.0				
PE-RT/AL/PE-RT	Ø ≤ 20	2.0 – 3.0	9 (Tubolit DG type)	60 mm	1	EI 120-U/C
	20 < Ø ≤ 32	3.0				
PE-X/AL/PE-X	Ø ≤ 20	2.0 – 3.0	9 (Tubolit DG type)	60 mm	1	EI 120-U/C
	20 < Ø ≤ 32	3.0				
PP-R/PP-R-GF/PP-R	Ø ≤ 20	2.8	9 (Tubolit DG type)	60 mm	1	EI 120-U/C
		6.9 – 8.3	13 (Tubolit DG type)			
	20 < Ø ≤ 50	6.9 – 8.3				

Combustible pipes penetration with mineral wool (MW)
 continuous insulation (case CS) type Paroc Hvac Lamella Mat AluCoat

Pipe type	Pipe diameter [mm]	Pipe wall thickness [mm]	Mineral wool insulation thickness [mm]	Width of INTU FR WRAP L band	Number of wrapping layers [pcs]	Fire resistance class
PP-R	Ø ≤ 20	2.3 – 3.4	20	60 mm	1	EI 120-U/C
		6.8 – 12.5	30		3	
	20 < Ø ≤ 75	6.8 – 12.5			3	

➔ FIRE RESISTANCE CLASSIFICATION for non-combustible pipe in floors



Non-combustible pipes (with/without heating cable) in continuous insulation (case CS) penetration seals in rigid floor with thickness $H \geq 150$ mm

Density of partition: $\rho \geq 1700$ kg/m³

Fig.20 str.39

COPPER / STEEL / CAST IRON pipes penetration with flexible elastomeric foam (FEF)
 continuous insulation (case CS) type Armaflex

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Armaflex) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 15.0$	≥ 1.0	9	1	EI 240-C/U
		10 – 22	2	EI 240-C/U
		23 – 36	3	EI 240-C/U
		37 – 50	4	EI 240-C/U
$15.0 < \varnothing \leq 22.0$	≥ 1.1	9	1	EI 120 / E 240-C/U
		10 – 22	2	EI 120 / E 180-C/U
		23 – 36	3	EI 120 / E 180-C/U
		37 – 49	4	EI 120 / E 180-C/U
		50	4	EI 180-C/U
$22.0 < \varnothing \leq 28.0$	≥ 1.2	9	1	EI 120 / E 240-C/U
		10 – 22	2	EI 120 / E 180-C/U
		23 – 36	3	EI 120 / E 180-C/U
		37 – 49	4	EI 120 / E 180-C/U
		50	4	EI 180-C/U
$28.0 < \varnothing \leq 42.0$	≥ 1.3	9	1	EI 120 / E 240-C/U
		10 – 22	2	EI 120 / E 180-C/U
		23 – 36	3	EI 120 / E 180-C/U
		37 – 49	4	EI 120 / E 180-C/U
		50	4	EI 180-C/U
$42.0 < \varnothing \leq 54.0$	≥ 1.5	9	1	EI 120 / E 240-C/U
		10 – 22	2	EI 120 / E 180-C/U
		23 – 36	3	EI 120 / E 180-C/U
		37 – 49	4	EI 120 / E 180-C/U
		50	4	EI 180-C/U

**COPPER / STEEL / CAST IRON pipes penetration with flexible elastomeric foam (FEF)
 continuous insulation (case CS) type Kaiflex ST**

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Kaiflex) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 12.7$	≥ 0.8	9	2	EI 120-C/U
$12.7 < \varnothing \leq 15.0$	≥ 0.9			
$15.0 < \varnothing \leq 22.23$	≥ 1.0			

**COPPER / STEEL / CAST IRON pipes penetration with polyethylene foam (PE)
 continuous insulation (case CS) type Tubolit**

Pipe diameter [mm]	Pipe wall thickness [mm]	PE insulation (type Tubolit) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 6.0$	≥ 0.8	9	1	EI 240-C/U
$6.0 < \varnothing \leq 15.88$	≥ 1.0			

**STEEL / CAST IRON pipes penetration with flexible elastomeric foam (FEF)
 continuous insulation (case CS) type Armaflex**

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Armaflex) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 42.4$	≥ 2.0	9	1	EI 240-C/U
		10 – 22	2	EI 240-C/U
		23 – 36	3	EI 240-C/U
		37 – 50	4	EI 240-C/U
$42.4 < \varnothing \leq 48.3$	2.1 – 2.5	9	1	EI 120-C/U E 240-C/U
		10 – 22	2	EI 120-C/U
		23 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U
	≥ 2.6	9 – 12	1	EI 120-C/U EI 240-C/U
		13	1	EI 180-C/U E 240-C/U
		14 – 22	2	EI 120-C/U
		24 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Armaflex) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$48.3 < \varnothing \leq 60.3$	2.3 – 2.5	9	1	EI 120-C/U E 240-C/U
		10 – 22	2	EI 120-C/U
		23 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U
	≥ 2.6	9 – 12	1	EI 120-C/U E 240-C/U
		13	1	EI 180-C/U E 240-C/U
		14 – 22	2	EI 120-C/U
		24 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U
$60.3 < \varnothing \leq 76.1$	≥ 2.6	9 – 12	1	EI 120-C/U E 240-C/U
		13	1	EI 180-C/U E 240-C/U
		14 – 22	2	EI 120-C/U
		24 – 36	3	EI 120-C/U
		37 – 50	4	EI 120-C/U

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Armaflex) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
76.1 < Ø ≤ 88.9	2.6 – 2.7	13	1	EI 180-C/U E 240-C/U
	≥ 2.8	9 – 12	1	EI 120 / E 240-C/U
		13	1	EI 180-C/U E 240-C/U
		14 – 22	2	EI 120-C/U
		24 – 36	3	
		37 – 50	4	
88.9 < Ø ≤ 114.3	≥ 3.2	9	1	EI 120-C/U E 240-C/U
		10 – 22	2	EI 120-C/U
		23 – 36	3	
		37 – 50	4	
114.3 < Ø ≤ 139.7	≥ 3.7	9	1	EI 120-C/U E 240-C/U
		10 – 22	2	EI 120-C/U
		23 – 36	3	
		37 – 50	4	

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Armaflex) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
139.7 < Ø ≤ 159.0	≥ 4.0	9	1	EI 120-C/U E 240-C/U
		10 – 22	2	EI 120-C/U
		23 – 36	3	
		37 – 50	4	
159.0 < Ø ≤ 168.3	≥ 4.1	9	1	EI 90-C/U
		10 – 22	2	EI 60-C/U E 90-C/U
		23 – 36	3	
		37 – 49	4	
		50	4	EI 60-C/U E 120-C/U
168.3 < Ø ≤ 219.0	≥ 4.5	9	1	EI 90-C/U
		10 – 22	2	EI 60-C/U E 90-C/U
		23 – 36	3	
		37 – 49	4	
		50	4	EI 60-C/U E 120-C/U

STEEL / CAST IRON pipes penetration with flexible elastomeric foam (FEF) continuous insulation (case CS) type Kaiflex ST

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Kaiflex ST) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
Ø ≤ 18.0	1.2 – 1.4	9	1	EI 120-C/U
		10 - 25	2	
	≥ 1.5	9	1	
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	
18.0 < Ø ≤ 28.0	1.3 – 1.4	9	1	
		10 - 25	2	
	≥ 1.5	9	1	
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	

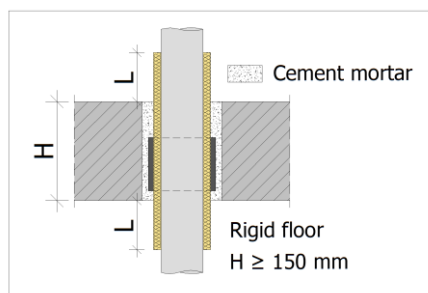
Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Kaiflex ST) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
28.0 < Ø ≤ 48.3	1.4	9	1	EI 120-C/U
		10 - 25	2	
	≥ 1.5	9	1	
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	
48.3 < Ø ≤ 66.7	≥ 1.5	9	1	
		10 - 25	2	
		26 – 37	3	
		38 - 50	4	

Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Kaiflex ST) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class	Pipe diameter [mm]	Pipe wall thickness [mm]	FEF insulation (type Kaiflex ST) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$66.7 < \varnothing \leq 76.1$	≥ 1.6	25	2	EI 120-C/U	$108.0 < \varnothing \leq 114.3$	≥ 2.2	50	4	EI 120-C/U
		26 – 37	3		$114.3 < \varnothing \leq 139.7$	≥ 3.1	50	4	
		38 – 50	4		$139.7 < \varnothing \leq 168.3$	≥ 4.0	50	4	
$76.1 < \varnothing \leq 88.9$	≥ 1.8	25	2		$168.3 < \varnothing \leq 219.1$	≥ 4.4	50 ¹⁾	4	EI 90 / E 120-C/U
		26 – 37	3		$219.1 < \varnothing \leq 273.0$	≥ 4.9	50 ¹⁾	4	
		38 – 50	4		$273.0 < \varnothing \leq 323.9$	≥ 5.3	50 ¹⁾	4	
$88.9 < \varnothing \leq 108.0$	≥ 2.0	25	2		$323.9 < \varnothing \leq 355.6$	≥ 5.6	50 ¹⁾	4	
		26 – 37	3						
		38 – 50	4						

1) Pipe additionally insulated with mineral wool density of 35 kg/m³, type Paroc Hvac Lamella Mat AluCoat, local insulation (case LI) dimensions of: 50 x 700 mm (thickness x length)

STEEL / CAST IRON pipes penetration with polyethylene foam (PE) continuous insulation (case CS) type Tubolit

Pipe diameter [mm]	Pipe wall thickness [mm]	PE insulation (type Tubolit) thickness [mm]	Intumescent material length x thickness [mm]	Fire resistance class
$\varnothing \leq 42.4$	2.1 – 2.8	20	1	EI 180 / E 240-C/U
	≥ 2.9	20	1	EI 180 / E 240-C/U
		21 – 25	2	EI 180 / E 240-C/U
$42.4 < \varnothing \leq 48.3$	≥ 2.1	25	2	EI 180 / E 240-C/U
$48.3 < \varnothing \leq 60.3$	≥ 2.3	25	2	EI 180 / E 240-C/U
$60.3 < \varnothing \leq 76.1$	≥ 2.7	25	2	EI 180 / E 240-C/U
$76.1 < \varnothing \leq 88.9$	≥ 2.9	25	2	EI 180 / E 240-C/U
$88.9 < \varnothing \leq 108.0$	≥ 4.0	25	2	EI 60-C/U



Non-combustible pipes (with/without heating cable) in sustained insulation (case LS) penetration seals in rigid floor with thickness $H \geq 150 \text{ mm}$

Density of partition: $\rho \geq 1700 \text{ kg/m}^3$

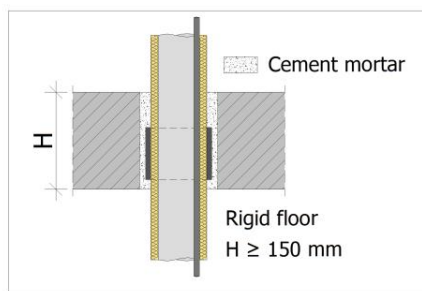
Fig.21 str.39

**COPPER / STEEL / CAST IRON pipes penetration with polyethylene foam (PE)
 continuous insulation (case CS) type Tubolit DG PLUS**

Pipe diameter [mm]	Pipe wall thickness [mm]	PE insulation (type Tubolit DG PLUS) thickness [mm]	PE insulation length – L [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 12.7$	≥ 0.8	9	400	2	EI 120-C/U
$12.7 < \varnothing \leq 22.23$	≥ 1.0				

**STEEL / CAST IRON pipes penetration mineral wool (MW)
 local sustained insulation (case LS) type Paroc Hvac Lamella Mat AluCoat**

Pipe diameter [mm]	Pipe wall thickness [mm]	Mineral wool insulation thickness [mm]	Mineral wool insulation length – L [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
Ø ≤ 42.4	≥ 1.5	20	300	1	EI 120-C/U
		21 – 30			
	≥ 2.0	21 – 40			
	≥ 4.0	21 – 50			
42.4 < Ø ≤ 66.7	≥ 1.5	30	500		
	≥ 2.0	31 – 40			
	≥ 4.0	31 – 50			
66.7 < Ø ≤ 108.0	≥ 2.0	40	600		
	≥ 4.0	41 – 50			
108.0 < Ø ≤ 114.3	≥ 4.0	50			
114.3 < Ø ≤ 139.7	≥ 4.0				
139.7 < Ø ≤ 168.3	≥ 4.0				



Non-combustible pipes (with/without heating cable) in continuous insulation (case CS) penetration seals in rigid floor with thickness $H \geq 150$ mm

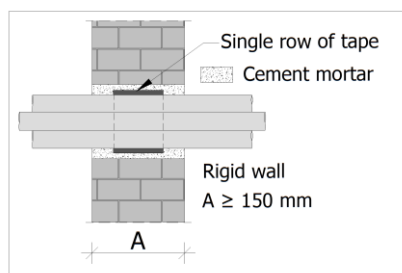
Density of partition: $\rho \geq 550$ kg/m³

Fig.20 str.39

COPPER / STEEL / CAST IRON pipes penetration with flexible elastomeric foam (FEF)
continuous insulation (case CS) type Armaflex

Pipe diameter [mm]	Pipe wall thickness [mm]	Insulation (type Armaflex) thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class
$\varnothing \leq 168.3$	≥ 4.0	23	2	EI 60-C/U

➔ **FIRE RESISTANCE CLASSIFICATION for bundle of pipes**

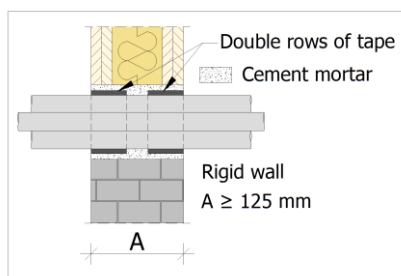


Bundle of combustible / noncombustible pipes without insulation or with continuous insulation (case CS) in rigid wall with thickness $A \geq 150$ mm

Fig.22 str.40

Bundle characteristic (maximum in one bundle)	Bundle elements	Pipe diameter / cable size [mm]	Pipe wall thickness [mm]	Insulation type	Insulation thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class C/U or U/C
2 x PE-HD + 1 x PVC-U	2 x PE-HD	Ø ≤ 32	2.0	-	-	1	EI 240
	1 x PVC-U	Ø ≤ 50	1.8				
3 x COPPER pipes	2 x COPPER	Ø ≤ 6.35	0.8	PE foam type Tubolit	9	2	EI 180
	1 x COPPER	Ø ≤ 6.35	1.0				
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	Ø ≤ 12.7	0.8	FEF type Kaiflex ST	9	2	EI 120
	1 x COPPER	Ø ≤ 22.23	1.0				
	1 x PVC-U	Ø ≤ 25	1.5	-	-		
	1 x Cable	4 x 1.5 mm ²	-				
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	Ø ≤ 6.0	0.8	PE foam type Tubolit	9	2	EI 120 E 180
	1 x COPPER	Ø ≤ 15.0	1.0				
	1 x PVC-U	Ø ≤ 32	2.0	-	-		
	1 x Cable	5 x 1.5 mm ²	-				

Bundle characteristic	Bundle elements	Pipe diameter / cable size [mm]	Pipe wall thickness [mm]	Insulation type	Insulation thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class C/U or U/C
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	Ø ≤ 12.7	0.8	PE foam type Tubolit DG PLUS	9	2	EI 120
	1 x COPPER	Ø ≤ 22.23	1.0				
	1 x PVC-U	Ø ≤ 25	1.5	-	-		
	1 x Cable	4 x 1.5 mm²	-				

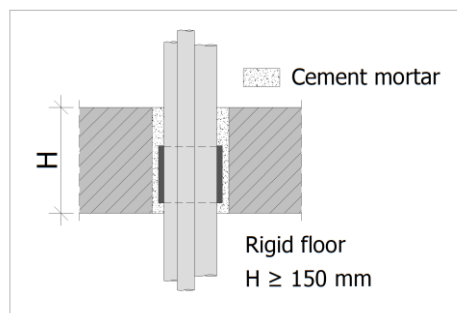


Bundle of combustible / noncombustible pipes without insulation or with continuous insulation (case CS) in flexible / rigid wall with thickness A ≥ 125 mm

Fig.23 str.40

Bundle characteristic (maximum in one bundle)	Bundle elements	Pipe diameter / cable size [mm]	Pipe wall thickness [mm]	Insulation type	Insulation thickness [mm]	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class C/U or U/C
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	$\varnothing \leq 22.23$	1.0	FEF type Kaiflex ST	9	2 x 2	EI 90
	1 x COPPER	$\varnothing \leq 12.7$	0.8				
	1 x PVC-U	$\varnothing \leq 25$	1.5	-	-		
	1 x Cable	4 x 1.5 mm ²	-				
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	$\varnothing \leq 22.23$	1.0	FEF type Kaiflex ST	9 ¹⁾	2 x 2	EI 120
	1 x COPPER	$\varnothing \leq 12.7$	0.8				
	1 x PVC-U	$\varnothing \leq 25$	1.5	-	-		
	1 x Cable	4 x 1.5 mm ²	-				
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	$\varnothing \leq 22.23$	1.0	PE type Tubolit DG PLUS	9	2 x 2	EI 90 E 120
	1 x COPPER	$\varnothing \leq 12.7$	0.8				
	1 x PVC-U	$\varnothing \leq 25$	1.5	-	-		
	1 x Cable	4 x 1.5 mm ²	-				
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	$\varnothing \leq 22.23$	1.0	PE type Tubolit DG PLUS	9 ¹⁾	2 x 2	EI 90 E 120
	1 x COPPER	$\varnothing \leq 12.7$	0.8				
	1 x PVC-U	$\varnothing \leq 25$	1.5	-	-		
	1 x Cable	4 x 1.5 mm ²	-				

1) Mixed bundle additionally insulated with mineral wool density of 35 kg/m³, type Paroc Hvac Lamella Mat AluCoat, local insulation (case LI) dimensions of: 20 x 200 mm (thickness x length).



Bundle of combustible / noncombustible pipes without insulation or with continuous insulation (case CS) in rigid floor with thickness $H \geq 150$ mm

Density of partition: $\rho \geq 1700$ kg/m³

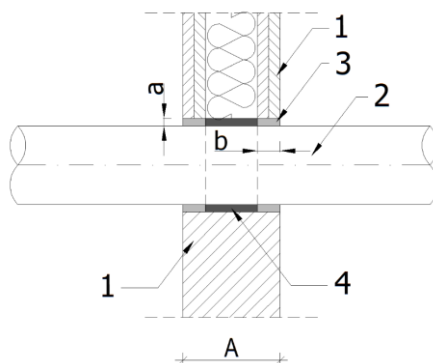
Fig.24 str.40

Bundle characteristic (maximum in one bundle)	Bundle elements	Pipe diameter / cable size [mm]	Pipe wall thickness [mm]	Insulation type	Insulation thickness [mm]	Case LS - insulation length [mm] / Case CS - continuous	Number of wrapping layers [pcs] of 60 mm band width	Fire resistance class C/U or U/C
3 x PE-HD	3 x PE-HD	Ø ≤ 32	2.0	-	-	-	2	EI 240
3 x COPPER pipe	1 x COPPER	Ø ≤ 6.35	0.8	PE type Tubolit	9	continuous	2	EI 180 E 240
	2 x COPPER	Ø ≤ 15.88	1.0					
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	Ø ≤ 22.23	1.0	FEF type Kaiflex ST	9	continuous	2	EI 120
	1 x COPPER	Ø ≤ 12.7	0.8					
	1 x PVC-U	Ø ≤ 25	1.5	-	-	-		
	1 x Cable	4 x 1.5 mm²	-					
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	Ø ≤ 6.0	1.0	PE type Tubolit	9	continuous	2	EI 240
	1 x COPPER	Ø ≤ 15.9	0.8					
	1 x PVC-U	Ø ≤ 32	2.0	-	-	-		
	1 x Cable	5 x 1.5 mm²	-					
2 x COPPER pipe + 1 x PVC-U pipes + cable	1 x COPPER	Ø ≤ 22.23	1.0	PE type TubolitDG PLUS	9	400	2	EI 120
	1 x COPPER	Ø ≤ 12.7	0.8					
	1 x PVC-U	Ø ≤ 32	1.5	-	-	-		
	1 x Cable	4 x 1.5 mm²	-					

→ SOLUTION DETAILS

Fig.1

Combustible pipes penetration seals with single row of band in flexible or rigid wall with thickness $A \geq 100$ mm



1. Flexible or rigid wall with thickness of: $A \geq 100$ mm.
2. Combustible pipe.
3. Gap filler – **INTU FR MASTIC** (ring with max. width: $a = 25$ mm) sealant minimum depth: $b = 25$ mm, on both sides of the wall)
4. **INTU FR WRAP L** band (single row, placed in the wall thickness center).

Combustible pipes penetration seals with single / double row of band in flexible or rigid wall with thickness $A \geq 100$ mm

Fig.2

single row

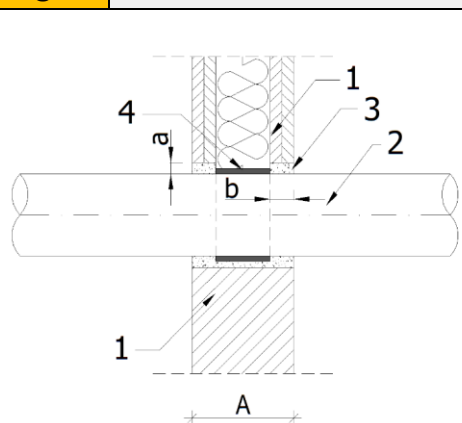
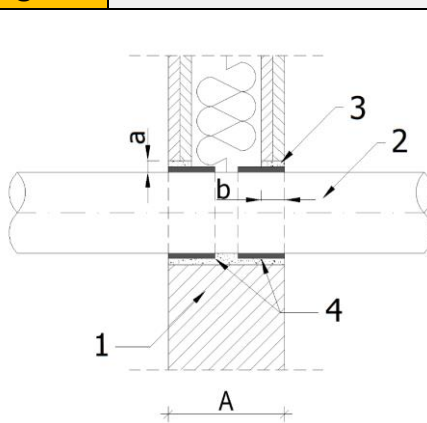


Fig.3

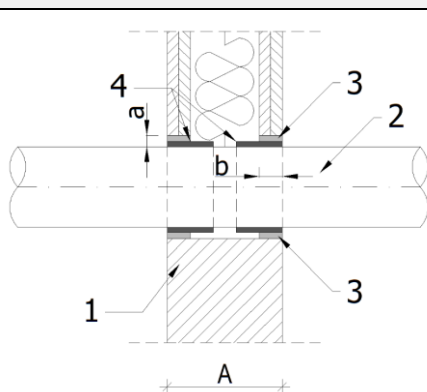
double rows



1. Flexible or rigid wall with thickness of: $A \geq 100$ mm.
2. Combustible pipe.
3. Gap filled with cement mortar:
-for flexible walls cement mortar ring with max. width: $a = 25$ mm, on the minimum depth: 25 mm on both sides of the wall
-for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band:
-single row placed in the wall thickness center
-double rows placed on both sides, flush with the wall surface.

Fig.4

Combustible pipes penetration seals with double row of bands in flexible or rigid wall with thickness $A \geq 125$ mm



1. Flexible or rigid wall with thickness of: $A \geq 125$ mm.
2. Combustible pipe.
3. Gap filler – **INTU FR MASTIC** (ring with max. width: $a = 25$ mm) sealant minimum depth: $b = 25$ mm, on both sides of the wall)
4. **INTU FR WRAP L** band (single row, placed in the wall thickness center).

Combustible pipes penetration seals in continuous insulation with double rows of bands in flexible or rigid wall $A \geq 125$ mm

Fig.5

band on insulation

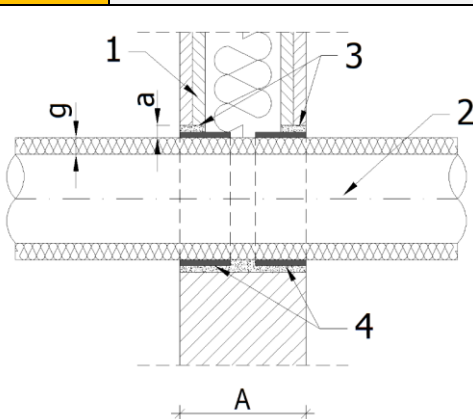
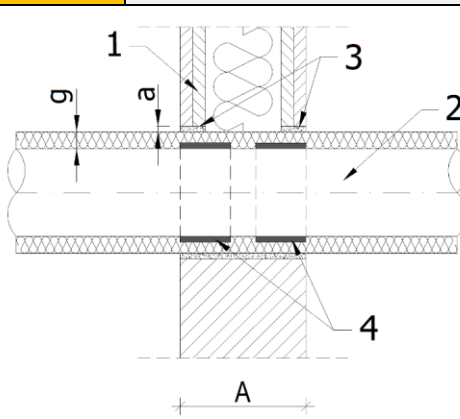


Fig.6

band on pipe



1. Flexible or rigid wall with thickness of: $A \geq 125$ mm.
2. Combustible pipe.
3. Gap filled with cement mortar:
-for flexible walls cement mortar ring with max. width: $a = 25$ mm, on the minimum depth: 25 mm on both sides of the wall
-for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band:
-double rows placed on both sides, flush with the wall surface (directly on the insulation or on the pipe).

Combustible pipes penetration seals with single row / double rows of band in rigid wall with thickness $A \geq 150$ mm

Fig.7

single row

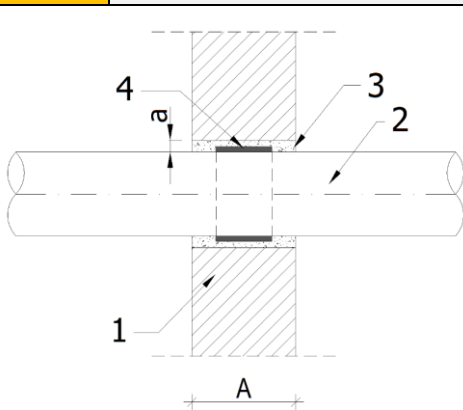
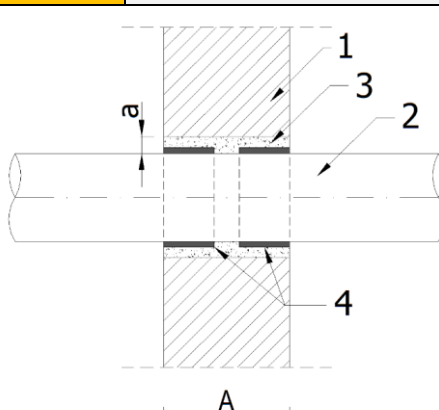


Fig.10

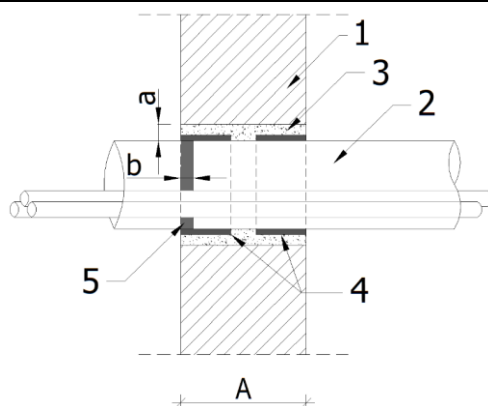
double rows



1. Rigid wall with thickness of: $A \geq 150$ mm.
2. Combustible pipe.
3. Gap filled with cement mortar:
-for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band:
-single row placed in the wall thickness center
-double rows placed on both sides, flush with the wall surface.

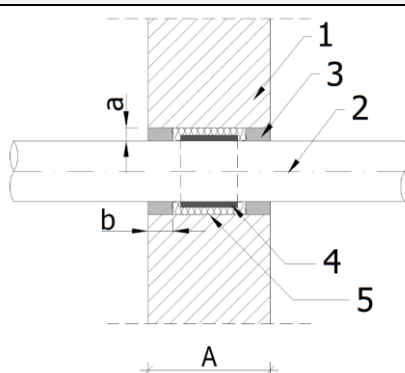
Fig.10

AROT pipe penetration seals with / without cables in rigid wall with thickness $A \geq 150$ mm



1. Rigid wall with thickness of: $A \geq 150$ mm.
2. Combustible pipe.
3. Gap filled with cement mortar, ring with max. width: $a = 50$ mm, on the whole depth of the partition.
4. **INTU FR WRAP L** band (double – placed on both sides, flush with the wall surface).
5. **INTU FR MASTIC** sealant on one side of the wall, depth of: $b \geq 15$ mm.

Fig.9 Combustible pipes penetration seals with single row of band in rigid wall with thickness $A \geq 150$ mm



1. Rigid wall with thickness of: $A \geq 150$ mm.
2. Combustible pipe.
3. Gap filler – **INTU FR MASTIC** (ring with max. width: $a = 50$ mm) sealant minimum depth: $b = 15$ mm, on both sides of the wall)
4. **INTU FR WRAP L** band (single row, placed in the wall thickness center).
5. Loose mineral wool of Paroc Group company, compressed to the density of: $\rho = 100$ kg/m³.

Combustible pipes (with/without heating cable) in continuous insulation penetration seals with single row of band in rigid wall with thickness $A \geq 150$ mm

Fig.8 single row

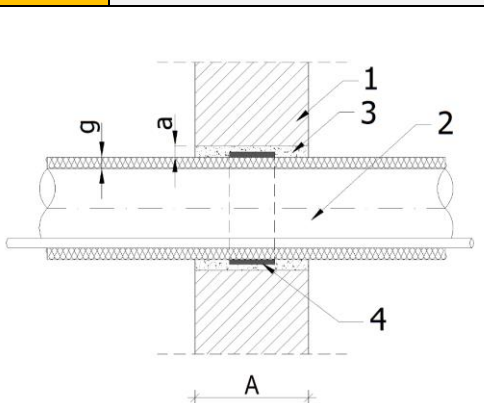
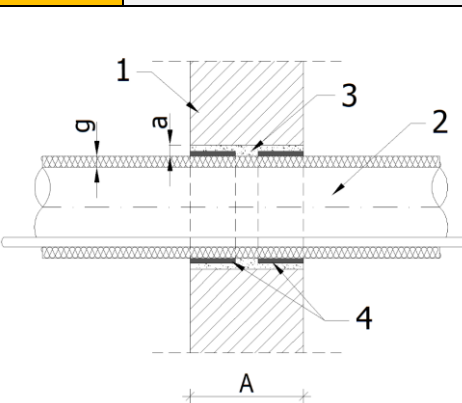
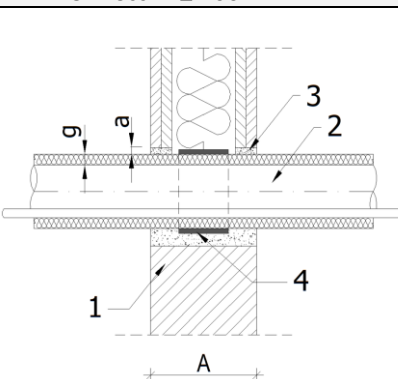
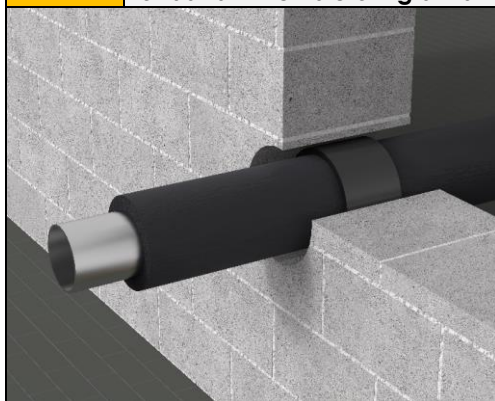


Fig.11 double rows



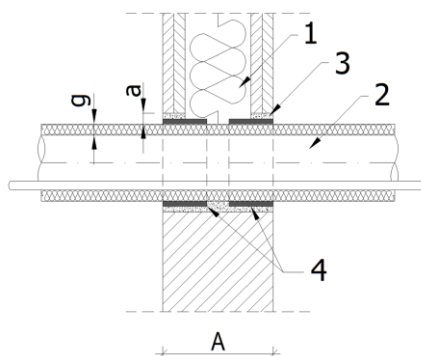
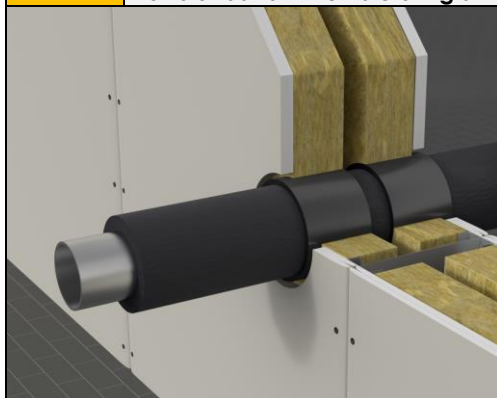
1. Rigid wall with thickness of: $A \geq 150$ mm.
2. Combustible pipe with/without heating cable in continuous insulation.
3. Gap filled with cement mortar: -for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band: -single row placed in the wall thickness center -double rows placed on both sides, flush with the wall surface.

Fig.12 Non-combustible pipes with/without heating cable in continuous insulation penetration seals with single row of band in flexible or rigid wall with thickness $A \geq 100$ mm



1. Flexible or rigid wall with thickness of: $A \geq 100$ mm.
2. Metal pipe with/without heating cable in continuous insulation.
3. Gap filled with cement mortar: -for flexible walls cement mortar ring with max. width: $a = 25$ mm, on the minimum depth: 25 mm on both sides of the wall -for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band (single row, placed in the wall thickness center).

Fig.13 Non-combustible pipes with/without heating cable in continuous insulation (case CS) penetration seals with double rows of band in flexible or rigid wall with thickness $A \geq 125$ mm



1. Flexible or rigid wall with thickness of: $A \geq 125$ mm.
2. Metal pipe with/without heating cable in continuous insulation.
3. Gap filled with cement mortar:
-for flexible walls cement mortar ring with max. width: $a = 25$ mm, on the minimum depth: 25 mm on both sides of the wall / for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band (double rows placed on both sides, flush with the wall surface).

Non-combustible pipes with/without heating cable in local sustained insulation (case LS) seals with single/double rows of band

Fig.14 Flexible / rigid wall $A \geq 125$ mm double rows

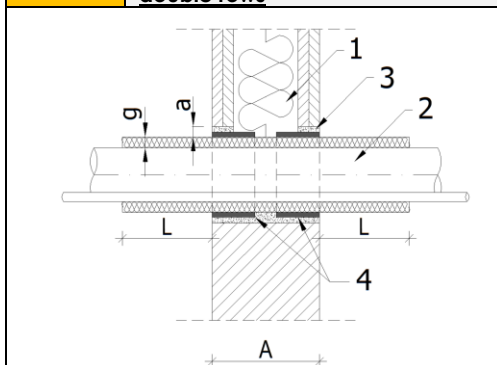
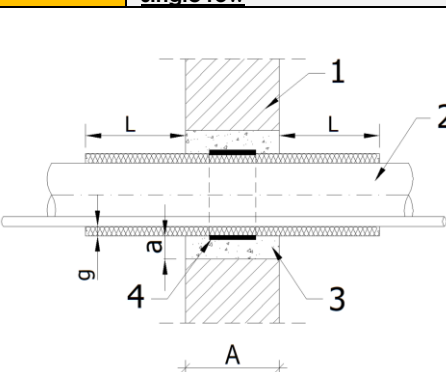
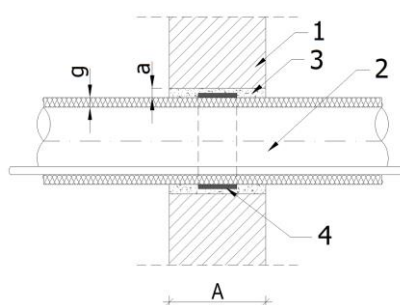


Fig.15 Rigid wall $A \geq 150$ mm single row



1. Flexible or rigid wall.
2. Metal pipe with/without heating cable in local sustained insulation.
3. Gap filled with cement mortar:
-for flexible walls cement mortar ring with max. width: $a = 25$ mm, on the minimum depth: 25 mm on both sides of the wall / for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band:
-single row placed in the wall thickness center
-double rows placed on both sides, flush with the wall surface.

Fig.16 Non-combustible pipes with continuous insulation penetration seals with single row of band in rigid wall with thickness $A \geq 150$ mm



1. Rigid wall with thickness of: $A \geq 150$ mm.
2. Metal pipe with/without heating cable in continuous insulation.
3. Gap filled with cement mortar:
-for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band (single row, placed in the wall thickness center).

Combustible pipes with or without heating cable in rigid floor with thickness $H \geq 150$ mm

Fig.17 $\rho \geq 550 \text{ kg/m}^3$ or $\rho \geq 1700 \text{ kg/m}^3$
without insulation

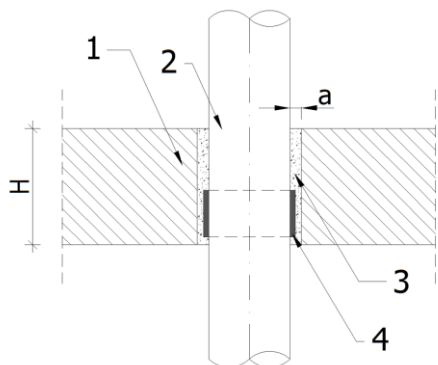
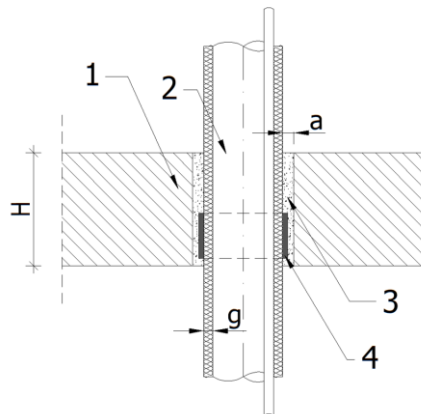
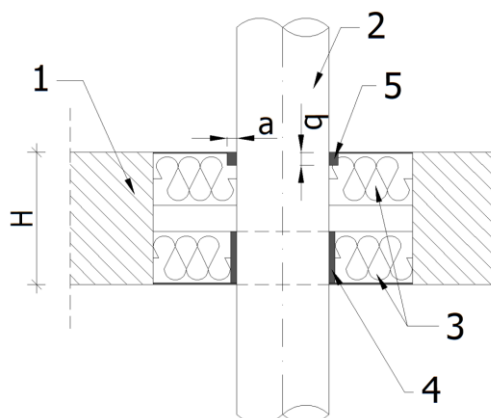


Fig.19 $\rho \geq 550 \text{ kg/m}^3$
with continuous insulation



1. Rigid floor with thickness of: $H \geq 150$ mm and density $\rho \geq 550 \text{ kg/m}^3$ or $\rho \geq 1700 \text{ kg/m}^3$.
2. Combustible pipe with/without heating cable without insulation or in continuous insulation.
3. Gap filled with cement mortar - area between the wrap / band and supporting construction ring with max. width: $a = 110$ mm, on the whole depth of the floor.
4. **INTU FR WRAP L** band, single – placed inside the floor on the bottom side, max. 10 mm from the floor bottom surface.

Fig.18 Combustible pipes penetration seals in rigid floor filled with 2 x mineral boards, floor with thickness $H \geq 150$ mm and density $\rho \geq 550 \text{ kg/m}^3$



1. Rigid floor with thickness of: $H \geq 150$ mm and density $\rho \geq 550 \text{ kg/m}^3$
2. Combustible pipe.
3. Mineral wool board type **INTU FR BOARD A** (density of 150 kg/m^3), thickness of 60 mm, installed from both sides of the floor. Mineral wool painted with **INTU FR COAT A** on the outer side, dry layer thickness of 1 mm.
4. **INTU FR WRAP L** band (single – placed on pipe inside the bottom mineral wool).
5. **INTU FR MASTIC** sealant (area between the pipe and the top mineral wool board, ring with width of: $a = 10$ mm, sealant depth of: $b = 10$ mm).

Non-combustible pipes with/without heating cable in insulation penetration seals in rigid floor with thickness $H \geq 150$ mm

Fig.20 $\rho \geq 550 \text{ kg/m}^3$ or $\rho \geq 1700 \text{ kg/m}^3$
with continuous insulation (CS)

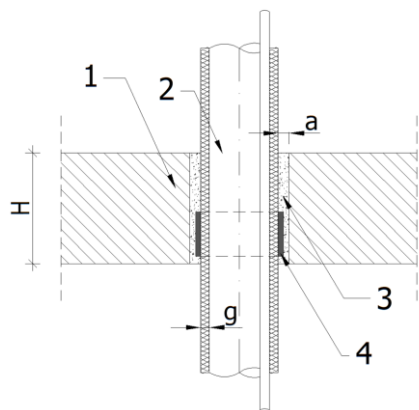
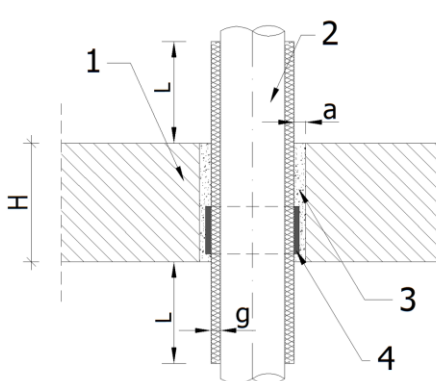
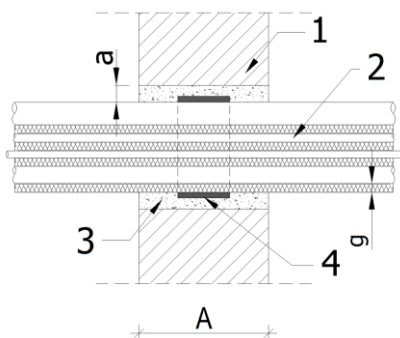


Fig.21 $\rho \geq 1700 \text{ kg/m}^3$
with sustained insulation (LS)



1. Rigid floor with thickness of: $H \geq 150$ mm and density $\rho \geq 550 \text{ kg/m}^3$ or $\rho \geq 1700 \text{ kg/m}^3$.
2. Combustible pipe with/without heating cable with continuous insulation (CS) or local sustained insulation (LS).
3. Gap filled with cement mortar - area between the wrap / band and supporting construction ring with max. width: $a = 110$ mm, on the whole depth of the floor.
4. **INTU FR WRAP L** band, single – placed inside the floor on the bottom side, max. 10 mm from the floor bottom surface.

Fig.22 Bundle of combustible pipes / noncombustible pipes and cables in rigid wall with thickness $A \geq 150$ mm



1. Rigid wall with thickness of: $A \geq 150$ mm.
2. Bundle of combustible pipes / noncombustible pipes and cables.
3. Gap filled with cement mortar, for rigid walls cement mortar ring with max. width: $a = 110$ mm, on the whole depth of the wall.
4. **INTU FR WRAP L** band (single row, placed in the wall thickness center).

Bundle of combustible / noncombustible pipes without insulation or with continuous insulation (case CS)

Fig.23 Flexible / rigid wall
 $A \geq 125$ mm

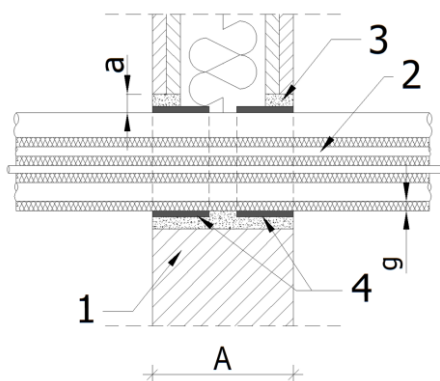
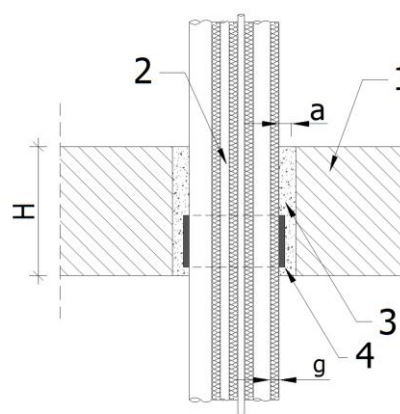


Fig.24 Rigid floor
 $H \geq 150$ mm and $\rho \geq 1700$ kg/m³



1. Flexible / rigid wall or rigid floor.
2. Maximum in one bundle:
2 x metal pipe with insulation,
1 x plastic pipe and 1 x cable.
3. Gap filled with cement mortar.
Construction ring with max. width:
 $a = 110$ mm, on the whole depth of the floor or rigid wall. For flexible walls cement mortar ring with max. width: $a = 25$ mm, on the minimum depth: 25 mm on both sides of the wall.
4. **INTU FR WRAP L** band
For floor: single – placed on the bottom side, max. 10 mm from the floor bottom surface
Wall: double - placed on both sides, flush with the wall surface.

General rules

More than single bundle in one penetration seal

Fig.25 Flexible / rigid wall
 $A \geq 125$ mm

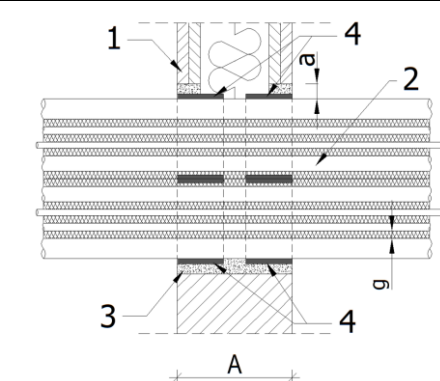
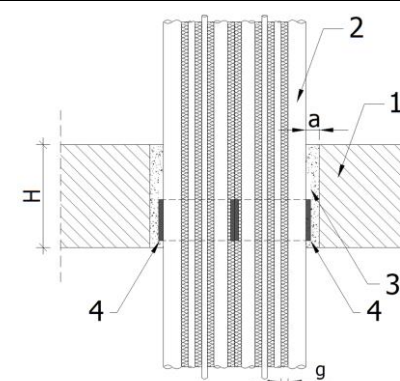


Fig.26 Rigid floor
 $H \geq 150$ mm and $\rho \geq 1700$ kg/m³



1. Flexible / rigid wall or rigid floor.
2. Maximum in one bundle:
2 x metal pipe with insulation,
1 x plastic pipe and 1 x cable.
3. Gap filled with cement mortar.
4. **INTU FR WRAP L** band. For floor: single – placed on the bottom side, max. 10 mm from the floor bottom surface. Wall: double - placed on both sides, flush with the wall surface.

Distance between wrapping bundles:
 $a \geq 0$ mm

Additional mineral wool lamella		
Fig.27	Rigid wall $A \geq 150$ mm	Fig.28 Rigid wall $A \geq 150$ mm
		1. Rigid wall $A \geq 150$ mm. 2. Maximum in one bundle: 2 x metal pipe with insulation, 1 x plastic pipe and 1 x cable. 3. Gap filled with cement mortar. 4. INTU FR WRAP L band. For floor: single – placed on the bottom side, max. 10 mm from the floor bottom surface. Wall: double - placed on both sides, flush with the wall surface.

Additional mineral wool lamella		
Fig.29	Flexible / rigid wall $A \geq 125$ mm	Fig.30 Rigid floor $H \geq 150$ mm and $\rho \geq 1700$ kg/m ³
		1. Flexible / rigid wall or rigid floor. 2. Maximum in one bundle: 2 x metal pipe with insulation, 1 x plastic pipe and 1 x cable. 3. Gap filled with cement mortar. 4. INTU FR WRAP L band. For floor: single – placed on the bottom side, max. 10 mm from the floor bottom surface. Wall: double - placed on both sides, flush with the wall surface. 5. Additional insulation with mineral wool, length - L and thickness - g. * Distance of pipe from the edge of the hole should be 10-50 mm

Two pipes in one penetration seal		
Fig.31	COMBUSTIBLE PIPE + NONCOMBUSTIBLE PIPE	Fig.32 COMBUSTIBLE PIPE + COMBUSTIBLE PIPE
		1 - flammable pipe. 1a - non-flammable pipe with FEF insulation. 2 – cement mortar. 3 – rigid wall, $A \geq 150$ mm. 4 – INTU FR WRAP L firestop tape, installed in wall axis, on each pipe separately. Distance of pipe from the edge of hole is from 25 mm to 100 mm. Distance between wrapping bundles: $a_1 \geq 0$ mm