

# INTU FR WRAP L

*Intumescent pipe roll*

TDS Technical Data Sheet



**•INTUSEAL®**  
*passive fire protection manufacturer*



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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:

The wall must be minimum thickness 150 mm. Must have concrete, cellular concrete or masonry structure, with minimum density 600 kg/m<sup>3</sup>.

### Rigid floors:

The floor must minimum thickness 150 mm. Must have concrete, cellular concrete or masonry structure, with minimum density 1700 kg/m<sup>3</sup>.

### Flexible walls:

The wall must be minimum thickness 125 mm. Must have 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

1. Prepare the appropriate length of the tape (cut off from the roll).
2. Wrap the pipe.
3. Slide it inside the partition.
4. 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
- CoC 1488-CPR-0722/W
- BREEAM Certification
- LEED Certification
- TDS
- SDS

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## ➔ APPROXIMATE CONSUMPTION of INTU FR WRAP L

Pipe diameter Ø [mm]	INTU FR WRAP L		Quantity wrapped pipes/10m roll	Pipe Ø [mm]	Insulation thickness [mm]	INTU FR WRAP L		Quantity wrapped pipes/10m roll
	Length [cm]	Quantity of layers				Length [cm]	Quantity of layers	
32	10	1	100	21,3	9	12	1	80
40	13	1	79		13	31	2	32
50	16	1	63	42,4	9	19	1	52
55	18	1	57		13	45	2	22
63	20	1	50	88,9	13	74	2	13
75	24	1	42		25	135	3	7
90	58	2	17	114,3	25	159	3	6
110	71	2	14		50	277	4	3
125	165	4	6	168,3	25	210	3	4
160	264	5	3		50	345	4	2
200	538	8	1	219,1	50	409	4	2

## ➔ FIRE RESISTANCE CLASSIFICATION for combustible pipes

Table 1 Fire resistance classification penetration seal for PVC-U or PVC-C pipes Ø ≤ 110

Pipe material: PVC-U or PVC-C										
Diameter Ø [mm]	Pipe wall thickness [mm]	RIGID WALL thickness ≥ 150 mm			RIGID FLOOR thickness ≥ 150 mm			FLEXIBLE */ RIGID WALL thickness ≥ 125 mm		
		Number of wrapping layers [pcs]	EI classification		Number of wrapping layers [pcs]	EI classification		Number of wrapping layers* [pcs]	EI classification	
			U/C	C/C		U/C	C/C		U/C	C/C
Type of wrap: <b>WRAP L 60</b> for Ø ≤ 110 mm										
Ø ≤ 32	1,8 - 3,6	1	240	240	1	240	240	1	120	120
	3,7 - 4,2	1	180	180	1	240	240	2	120	120
32 < Ø ≤ 40	1,8 - 3,6	1	240	240	1	240	240	1	120	120
	3,7 - 4,2	1	180	180	1	240	240	2	120	120
40 < Ø ≤ 50	1,8 - 3,6	1	240	240	1	240	240	1	120	120
	3,7 - 4,2	1	180	180	1	240	240	2	120	120
50 < Ø ≤ 55	1,9 - 3,5	1	180	180	1	240	240	1	120	120
	3,6	1	240	240	1	240	240	1	120	120
55 < Ø ≤ 63	3,7 - 4,2	1	180	180	1	240	240	2	120	120
	1,9 - 3,5	1	180	180	1	240	240	1	120	120
63 < Ø ≤ 75	3,6	1	240	240	1	240	240	1	120	120
	3,7 - 4,2	1	180	180	1	240	240	2	120	120
75 < Ø ≤ 90	2,1 - 3,4	2	120	120	2	240	240	2	120	120
	3,5	2	120	120	2	180	180	2	120	120
	3,6	2	240	240	2	180	180	2	120	120
	3,6 - 4,1	2	180	180	2	180	180	2	120	120
90 < Ø ≤ 110	4,2	2	180	180	2	180	180	2	120	120
	2,2	2	120	120	2	240	240	2	120	120
	2,3 - 3,5	2	120	120	2	180	180	2	120	120
	3,6	2	240	240	2	180	180	2	120	120
	3,6 - 4,1	2	180	180	2	180	180	2	120	120
	4,2	1	180	180	2	180	180	2	120	120

\* For flexible wall use INTU FR WRAP L in two rows according with SOLUTION DETAILS below

Table 2 Fire resistance classification penetration seal for PVC-U or PVC-C pipes  $\varnothing \leq 200$

Pipe material: <b>PVC-U or PVC-C</b>							
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	RIGID WALL			RIGID FLOOR		
		Number of wrapping layers [pcs]	EI classification		Number of wrapping layers [pcs]	EI classification	
			U/C	C/C		U/C	C/C
Type of wrap: <b>WRAP L 100</b> for $\varnothing > 110$ mm							
110 < $\varnothing \leq 125$	2,5 – 3,3	-	-	-	4	120	120
	3,4 – 3,9	4	120	120	4	120	120
	4,0 – 5,3	4	120	120	4	240	240
	5,4 – 6,1	4	120	120	5	240	240
	6,2	4	120	120	5	240	240
		4	240	240	5	240	240
125 < $\varnothing \leq 160$	6,3 – 7,7	5	180	180	5	240	240
	7,8 – 9,5	5	180	180	-	-	-
	3,2 – 6,1	-	-	-	5	120	120
	6,2	5	240	240	5	120	120
	6,3 – 7,6	5	180	180	5	120	120
160 < $\varnothing \leq 170$	7,7	5	180	180	5	240	240
	7,8 – 9,5	5	180	180	-	-	-
	4,4 – 5,8	-	-	-	6	120	120
	5,9	8	180	180	6	120	120
	6,0 – 6,1	7	180	180	6	120	120
	6,2 – 7,6	6	120	120	6	120	120
170 < $\varnothing \leq 185$	7,7	6	120	120	6	240	240
	7,8 – 9,1	6	120	120	-	-	-
	5,9	8	180	180	-	-	-
	6,0	7	180	180	-	-	-
	6,1 – 7,6	6	120	120	7	120	120
185 < $\varnothing \leq 200$	7,7	6	120	120	7	240	240
	6,1 – 8,4	6	120	120	-	-	-
	5,9	8	180	180	-	-	-
	7,7	8	120	120	8	240	240

Table 3 Fire resistance classification penetration seal for PP pipes  $\varnothing \leq 110$

Pipe material: <b>PP</b>										
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	RIGID WALL thickness $\geq 150$ mm			RIGID FLOOR thickness $\geq 150$ mm			FLEXIBLE *1 / RIGID WALL thickness $\geq 125$ mm		
		Number of wrapping layers [pcs]	EI classification		Number of wrapping layers [pcs]	EI classification		Number of wrapping layers*1 [pcs]	EI classification	
			U/C	C/C		U/C	C/C		U/C	C/C
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm										
$\varnothing \leq 32$	1,8	1	240	240	1	240	240	1	120	120
	1,9 – 12,5	1	180	180	2	240	240	2	90/120*2	90/120*2
	12,6 – 18,4	1	180	180	2	240	240	2	90/120*2	90/120*2
32 < $\varnothing \leq 40$	1,8	1	240	240	1	240	240	1	120	120
	1,9 – 12,5	1	180	180	2	240	240	2	90/120*2	90/120*2
	12,6 – 18,4	1	180	180	2	240	240	2	90/120*2	90/120*2
40 < $\varnothing \leq 50$	1,8	1	240	240	1	240	240	1	120	120
	1,9 – 12,5	1	180	180	2	240	240	2	90/120*2	90/120*2
	12,6 – 18,4	1	180	180	2	240	240	2	90/120*2	90/120*2
50 < $\varnothing \leq 55$	1,9 – 12,5	1	180	180	1	240	240	1	120	120
	12,6 – 18,4	1	180	180	2	240	240	2	90/120*2	90/120*2
	1,9 – 12,5	1	180	180	2	240	240	2	90/120*2	90/120*2
55 < $\varnothing \leq 63$	1,9 – 12,5	1	180	180	1	240	240	1	120	120
	12,6 – 18,4	1	180	180	2	240	240	2	90/120*2	90/120*2
	1,9 – 12,5	1	180	180	2	240	240	2	90/120*2	90/120*2
63 < $\varnothing \leq 75$	12,6 – 18,4	1	180	180	1	240	240	1	120	120
	2,3 – 8,3	2	180	180	2	240	240	2	120	120
	8,4 – 18,4	2	180	180	2	240	240	2	90/120*2	90/120*2
75 < $\varnothing \leq 90$	2,7	2	180	180	2	240	240	2	120	120
	2,8 – 18,4	2	180	180	2	240	240	2	90/120*2	90/120*2
	2,8 – 18,4	2	180	180	2	240	240	2	90/120*2	90/120*2

\*1 For flexible wall use INTU FR WRAP L in two rows according with SOLUTION DETAILS below, \*2 „E” fire-resistant class

Table 4 Fire resistance classification penetration seal for PP pipes  $\varnothing \leq 200$

Pipe material: PP							
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	RIGID WALL			RIGID FLOOR		
		No. of wrapping layers [pcs]	EI classification		No. of wrapping layers [pcs]	EI classification	
			U/C	C/C		U/C	C/C
Type of wrap: <b>WRAP L 100</b> for $\varnothing > 110$ mm							
110 < $\varnothing \leq 125$	3,6 – 3,7	-	-	-	4	45	45
	3,8 – 14,8	4	60	60	4	90	90
	14,9 – 16,7	4	60	60	4	45	45
125 < $\varnothing \leq 160$	5,5 – 6,1	5	60	60	5	45	45
	6,2				5	90	90
	6,3 – 12,5				5	45	45
160 < $\varnothing \leq 170$	6,1 – 11,3	6	60	60	6	45	45
170 < $\varnothing \leq 185$	6,9 – 9,5	7	60	60	7	45	45
185 < $\varnothing \leq 200$	7,7	8	60	60	8	45	45

Table 5 Penetration seal for PE-RT, PE-RT/AI/PE-RT, PE-X, PE-X/AI/PE-X, PP-R, PP-R/AI/PP-R, PP-R/PP-R-GF/PP-R pipes

Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	RIGID WALL thickness $\geq 150$ mm			RIGID FLOOR thickness $\geq 150$ mm		
		No. of wrapping layers [pcs]	EI classification		Number of wrapping layers [pcs]	EI classification	
			U/C	C/C		U/C	C/C
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm Pipe material: <b>PE-RT</b>							
$\varnothing \leq 20$	2,0	1	240	240	-	-	-
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm Pipe material: <b>PE-RT/AI/PE-RT</b>							
$\varnothing \leq 20$	2,0	1	240	240	1	240	240
	2,1 – 7,5				1	180/240*2	180/240*2
20 < $\varnothing \leq 75$	7,5						
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm Pipe material: <b>PE-X</b>							
$\varnothing \leq 20$	2,0	1	240	240	-	-	-
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm Pipe material: <b>PE-X/AI/PE-X</b>							
20 < $\varnothing \leq 75$	2,0 - 7,4	-	-	-	1	240	240
$\varnothing \leq 75$	7,5	1	120	120			
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm Pipe material: <b>PP-R</b>							
$\varnothing \leq 20$	3,4	1	240	240	-	-	-
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm Pipe material: <b>PP-R/AI/PP-R</b>							
$\varnothing \leq 20$	3,4 - 12,5	-	-	-	1	240	240
	12,6 - 18,2	-	-	-	2	240	240
	18,3	1	240	240			
20 < $\varnothing \leq 75$	18,4	-	-	-	1	240	240
	12,5	-	-	-	2	240	240
	12,6 - 18,2	-	-	-			
18,3	1	240	240				
$\varnothing \leq 110$	18,4	-	-	-	2	240	240
	18,3	1	240	240			
	18,4	-	-	-			
Type of wrap: <b>WRAP L 60</b> for $\varnothing \leq 110$ mm Pipe material: <b>PP-R/PP-R-GF/PP-R</b>							
$\varnothing \leq 20$	2,8 - 12,5	-	-	-	1	240	240
	12,6 - 18,2	-	-	-	2	240	240
	18,3	1	180	180			
	18,4	-	-	-			
12,5	-	-	-				
20 < $\varnothing \leq 75$	12,6 - 18,2	-	-	-	2	240	240
	18,3	1	180	180			
	18,4	-	-	-			
	18,3	1	180	180			
$\varnothing \leq 110$	18,4	-	-	-	2	240	240
	18,3	1	180	180			
	18,4	-	-	-			

\*1 For flexible wall use INTU FR WRAP L in two rows according with SOLUTION DETAILS below, \*2 „E” fire-resistant class

Table 6 Fire resistance classification for PE-HD, PE, ABS or SAN+PVC pipes  $\varnothing \leq 110$

Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	Pipe material: PE-HD, PE, ABS or SAN+PVC								
		RIGID WALL thickness $\geq 150$ mm			RIGID FLOOR thickness $\geq 150$ mm			FLEXIBLE *1 / RIGID WALL thickness $\geq 125$ mm		
		Number of wrapping layers [pcs]	EI class		Number of wrapping layers [pcs]	EI class		Number of wrapping layers*1 [pcs]	EI class	
			U/C	C/C		U/C	C/C		U/C	C/C
Type of wrap: WRAP L 60 for $\varnothing \leq 110$ mm										
$\varnothing \leq 32$	2,0 – 3,0	1	240	240	1	240	240	1	120	120
	3,1 – 6,8							1	90/120*2	90/120*2
	6,9 – 10,0							1	120	120
$32 < \varnothing \leq 40$	2,2	-	-	-	1	240	240	1	120	120
	2,3 – 3,0	1	120	120	1	240	240	1	120	120
	3,1 – 6,7							1	90/120*2	90/120*2
	6,8	1	240	240	1	240	240	2	120	120
	6,9 – 10,0	1	120	120	2	120	120	2	120	120
$40 < \varnothing \leq 50$	2,5	-	-	-	1	240	240	1	120	120
	2,6 – 3,0	1	120	120	1	240	240	1	120	120
	3,1 – 6,7	1	120	120	1	240	240	1	90/120*2	90/120*2
	3,1 – 6,7							2	120	120
	6,8	1	240	240	1	240	240	1	90/120*2	90/120*2
	6,8	1	240	240	2	120	120	2	120	120
	6,9 – 10,0	1	120	120	2	120	120	2	120	120
$50 < \varnothing \leq 55$	2,6	-	-	-	1	240	240	1	120	120
	2,7 – 3,0	1	120	120	1	240	240	1	120	120
	3,1 – 6,7	1	120	120	1	240	240	1	90/120*2	90/120*2
	3,1 – 6,7							2	120	120
	6,8	1	240	240	1	240	240	1	90/120*2	90/120*2
	6,8	1	240	240	2	120	120	2	120	120
6,9 – 10,0	1	120	120	2	120	120	2	120	120	
$55 < \varnothing \leq 63$	2,8	-	-	-	1	240	240	1	120	120
	2,9 – 3,0	1	120	120	1	240	240	1	120	120
	3,1 – 6,7	1	120	120	1	240	240	1	90/120*2	90/120*2
	3,1 – 6,7							2	120	120
	6,8	1	240	240	1	240	240	1	90/120*2	90/120*2
	6,8	1	240	240	2	120	120	2	120	120
	6,9 – 10,0	1	120	120	2	120	120	2	120	120
$63 < \varnothing \leq 75$	3,0	-	-	-	1	240	240	1	120	120
	3,1 – 3,2	-	-	-	1	240	240	1	90/120*2	90/120*2
	3,1 – 3,2	-	-	-	1	240	240	2	120	120
	3,3 – 6,7	1	120	120	1	240	240	1	90/120*2	90/120*2
	3,3 – 6,7							2	120	120
	6,8	1	240	240	1	240	240	1	90/120*2	90/120*2
	6,8	1	240	240	2	120	120	2	120	120
6,9 – 10,0	1	120	120	2	120	120	2	120	120	
$75 < \varnothing \leq 90$	3,6	-	-	-	2	240	240	2	120	120
	3,7 – 5,7	2	120	120	2	240	240	2	120	120
	5,8 – 10,0	2	120	120	2	120	120	2	120	120
$90 < \varnothing \leq 110$	4,2 – 5,6	2	120	120	-	-	-	2	120	120
	5,7	2	120	120	2	240	240	2	120	120
	5,8 – 10,0	2	120	120	2	120	120	2	120	120

\*1 For flexible wall use INTU FR WRAP L in two rows according with SOLUTION DETAILS below

\*2 „E” fire-resistant class

Table 7 Fire resistance classification for PE-HD, PE, ABS or SAN+PVC pipes  $\varnothing \leq 200$

Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	Pipe material: PE-HD, PE, ABS or SAN+PVC					
		RIGID WALL thickness $\geq 150$ mm			RIGID FLOOR thickness $\geq 150$ mm		
		Number of wrapping layers [pcs]	EI class		Number of wrapping layers [pcs]	EI class	
U/C	C/C		U/C	C/C			
Type of wrap: <b>WRAP L 100</b> for $\varnothing > 110$ mm							
110 < $\varnothing \leq 125$	4,8 – 5,8	4	120	120	4	240	240
	5,9 – 6,2	4	120	120	4	120	120
	5,9 – 6,2				5	240	240
	6,3 – 9,4	4	120	120	4	120	120
	6,3 – 9,4				5	240	240
	9,5	4	120	120	4	120	120
	9,5	5	180	180	5	240	240
9,6 – 9,9	-	-	-	4	120	120	
125 < $\varnothing \leq 160$	6,2 – 9,4	5	120	120	5	240	240
	9,5	5	180	180			
160 < $\varnothing \leq 170$	6,6 – 9,1	6	90	90	6	90	90
	9,2 – 10,1	6	60	60			
	10,2 – 11,0	7	60	60	7	90	90
	11,1 – 11,9	8	60	60	8	90	90
170 < $\varnothing \leq 185$	7,2 – 8,4	7	90	90	7	90	90
	8,5 – 11,0	7	60	60			
	11,1 – 11,9	8	60	60	8	90	90
185 < $\varnothing \leq 200$	7,7	8	90	90	8	90	90
	7,8 – 11,9	8	60	60			

### ➔ FIRE RESISTANCE CLASSIFICATION for flammable pipes with insulation

Table 8 Fire resistance class. penetration seal for PE-HD, PE, ABS or SAN+PVC, PP, PP-R, PP-R/PP-R-GF/PP-R pipes  $\varnothing \leq 110$

Pipe material	Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID FLOOR thickness $\geq 150$ mm		
				No. of wrapping layers [pcs]	EI classification	
					U/C	C/C
Type of wrap: <b>WRAP L 60</b>						
PE-HD, PE, ABS or SAN+PVC	$\varnothing \leq 110,0$	10,0	9 - 13	4	120	120
PP		2,7	9	4	120	120
PP-R		18,9	9	4	120	120
PP-R/PP-R-GF/PP-R		15,1	9	4	120	120



### ➔ FIRE RESISTANCE CLASSIFICATION for non-combustible pipes

Table 9 Fire resistance classification penetration seal for COPPER pipes in FEF insulation  $\varnothing \leq 54$

Pipe material: <b>COPPER</b> Type of wrap: <b>WRAP L 60</b> Pipe diameter: $\varnothing \leq 54,0$											
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID WALL thickness $\geq 150$ mm			Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID FLOOR thickness $\geq 150$ mm			
			No. of wrapping layers [pcs]	EI classification				No. of wrapping layers [pcs]	EI classification		
				C/U	C/C				C/U	C/C	
$\varnothing \leq 15,0$	$\geq 1,0$	9	1	180	180	$\geq 1,0$	9	1	240	240	
		10 – 19	2	180	180		10 – 22	2	240	240	
		20 – 22	2	180	180		23 – 36	3	240	240	
		23 – 36	3	180	180		37 – 38	4	240	240	
		37 – 49	4	180	180		39 – 40	4	240	240	
		50	4	180	180		41 – 49	4	240	240	
	$\geq 1,5$	9	1	240	240	50	4	240	240		
	$15,0 < \varnothing \leq 42,4$	1,4 – 14,2	9	1	180	180	1,4 – 14,4	9	1	120/180*1	120/180*1
			10 – 19	2	180	180		10 – 22	2	120/180*1	120/180*1
20 – 22			2	180	180	23 – 36		3	120/180*1	120/180*1	
23 – 36			3	120	120	37 – 38		4	120/180*1	120/180*1	
37 – 49			4	120	120	39 – 40		4	180	180	
50			4	120	120	41 – 49		4	180	180	
1,5 – 14,2		9	1	240	240	50	4	180	180		
		10 – 19	2	180	180						
		20 – 22	2	180	180						
		23 – 36	3	120	120						
$42,4 < \varnothing \leq 44,5$	1,4	9	1	180	180	1,4 – 14,4	9	1	120/180*1	120/180*1	
		10 – 19	2	180	180		10 – 22	2	120/180*1	120/180*1	
		20 – 22	2	120	120		23 – 36	3	120/180*1	120/180*1	
		23 – 36	3	120	120		37 – 38	4	120/180*1	120/180*1	
		37 – 49	4	120	120		39 – 40	4	120/180*1	120/180*1	
		50	4	120	120		41 – 49	4	180	180	
	1,5 – 14,2	9	1	240	240	50	4	180	180		
		10 – 19	2	180	180						
		20 – 22	2	120	120						
		23 – 36	3	120	120						
$44,5 < \varnothing \leq 54,0$	1,5 – 14,2	9	1	240	240	1,5 – 14,4	9	1	120/180*1	120/180*1	
		10 – 19	2	120	120		10 – 22	2	120/180*1	120/180*1	
		20 – 22	2	120	120		23 – 36	3	120/180*1	120/180*1	
		23 – 36	3	120	120		37 – 38	4	120/180*1	120/180*1	
		37 – 49	4	120	120		39 – 40	4	120/180*1	120/180*1	
		50	4	120	120		41 – 49	4	120/180*1	120/180*1	
	1,5 – 14,2	9	1	240	240	50	4	180	180		
		10 – 19	2	120	120						
		20 – 22	2	120	120						
		23 – 36	3	120	120						

\*1 „E” fire-resistant class

Table 10 Fire resistance classification penetration seal for COPPER pipes in FEF insulation  $\varnothing \leq 108$

Pipe material: <b>COPPER</b> Type of wrap: <b>WRAP L 60</b> Pipe diameter: <b>54,0 &lt; <math>\varnothing</math> ≤ 76,1</b>					
Diameter $\varnothing$ [mm]	Pipe wall thick. [mm]	FEF insulation thickn. [mm]	RIGID WALL thickness $\geq 150$ mm		
			No. of wrap. layers [pcs]	EI classification	
				C/U	C/C
54,0 < $\varnothing$ ≤ 57,0	1,6 - 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	60	60
		17 - 22	2	60	60
		23 - 25	3	60	60
		26 - 30	3	60	60
		31 - 36	3	60	60
		37 - 45	4	60	60
		46 - 49	4	60	60
57,0 < $\varnothing$ ≤ 63,5	1,6 - 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	30/60*1	30/60*1
		17 - 22	2	60	60
		23 - 25	3	60	60
		26 - 30	3	60	60
		31 - 36	3	60	60
		37 - 45	4	60	60
		46 - 49	4	60	60
63,5 < $\varnothing$ ≤ 70,0	1,7 - 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	30/60*1	30/60*1
		17 - 22	2	30/60*1	30/60*1
		23 - 25	3	60	60
		26 - 30	3	60	60
		31 - 36	3	60	60
		37 - 45	4	60	60
		46 - 49	4	60	60
70,0 < $\varnothing$ ≤ 76,1	1,7 - 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	30/60*1	30/60*1
		17 - 22	2	30/60*1	30/60*1
		23 - 25	3	30/60*1	30/60*1
		26 - 30	3	60	60
		31 - 36	3	60	60
		37 - 45	4	60	60
		46 - 49	4	60	60

\*1 „E” fire-resistant class

Pipe material: <b>COPPER</b> Type of wrap: <b>WRAP L 60</b> Pipe diameter: <b>76,1 &lt; <math>\varnothing</math> ≤ 108</b>					
Diameter $\varnothing$ [mm]	Pipe wall thick. [mm]	FEF insulation thickn. [mm]	RIGID WALL thickness $\geq 150$ mm		
			No. of wrap. layers [pcs]	EI classification	
				C/U	C/C
76,1 < $\varnothing$ ≤ 82,5	1,8- 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	30/60*1	30/60*1
		17 - 22	2	30/60*1	30/60*1
		23 - 25	3	30/60*1	30/60*1
		26 - 30	3	30/60*1	30/60*1
		31 - 36	3	60	60
		37 - 45	4	60	60
		46 - 49	4	60	60
82,5 < $\varnothing$ ≤ 88,9	1,9- 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	30/60*1	30/60*1
		17 - 22	2	30/60*1	30/60*1
		23 - 25	3	30/60*1	30/60*1
		26 - 30	3	30/60*1	30/60*1
		31 - 36	3	30/60*1	30/60*1
		37 - 45	4	60	60
		46 - 49	4	60	60
88,9 < $\varnothing$ ≤ 101,6	2,0- 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	30/60*1	30/60*1
		17 - 22	2	30/60*1	30/60*1
		23 - 25	3	30/60*1	30/60*1
		26 - 30	3	30/60*1	30/60*1
		31 - 36	3	30/60*1	30/60*1
		37 - 45	4	30/60*1	30/60*1
		46 - 49	4	60	60
101,6 < $\varnothing$ ≤ 108	2,0- 14,2	9	1	30/60*1	30/60*1
		10 - 11	2	30/60*1	30/60*1
		12 - 16	2	30/60*1	30/60*1
		17 - 22	2	30/60*1	30/60*1
		23 - 25	3	30/60*1	30/60*1
		26 - 30	3	30/60*1	30/60*1
		31 - 36	3	30/60*1	30/60*1
		37 - 45	4	30/60*1	30/60*1
		46 - 49	4	30/60*1	30/60*1

\*1 „E” fire-resistant class

Table 11 Fire resistance classification penetration seal for COPPER pipes in PE insulation  $\varnothing \leq 15,88$

Pipe material: <b>COPPER</b> Type of wrap: <b>WRAP L 60</b>										
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	PE insulation thickness [mm]	RIGID WALL thickness $\geq 150$ mm			Pipe wall thickness [mm]	PE insulation thickness [mm]	RIGID FLOOR thickness $\geq 150$ mm		
			No. of wrapping layers [pcs]	EI classification				No. of wrapping layers [pcs]	EI classification	
				C/U	C/C				C/U	C/C
$\varnothing \leq 6,35$	$\geq 0,8$	9	2	240	240	$\geq 0,8$	9	2	240	240
<b>6,35 &lt; <math>\varnothing</math> ≤ 15,88</b>	$\geq 1,0$	9	2	180/240*1	180/240*1	$\geq 1,0$	9	2	240	240

\*1 „E” fire-resistant class

Table 12 Fire resistance classification penetration seal for STEEL pipes in FEF insulation  $\varnothing \leq 88,9$

Pipe material: <b>STEEL</b> Type of wrap: <b>WRAP L 60</b> Pipe diameter: $\varnothing \leq 88,9$										
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID WALL thickness $\geq 150$ mm			Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID FLOOR thickness $\geq 150$ mm		
			No. of wrapping layers [pcs]	EI classification				No. of wrapping layers [pcs]	EI classification	
				C/U	C/C				C/U	C/C
$\varnothing \leq 42,4$	2,0 – 14,2	9	1	180	180	2,0 – 14,2	9	1	240	240
		10 – 23	2	180	180		10 – 22	2	240	240
		24 – 36	3	180	180		23 – 36	3	240	240
		37 – 49	4	180	180		37 – 49	4	240	240
		50	4	180	180		50	4	240	240
$42,4 < \varnothing \leq 44,5$	2,1 – 2,5	9	1	180	180	2,1 – 2,5	9	1	120	120
		10 – 23	2	180	180		10 – 22	2	120	120
		24 – 36	3	180	180		23 – 36	3	120	120
		37 – 49	4	180	180		37 – 49	4	120	120
		50	4	180	180		50	4	120	120
$44,5 < \varnothing \leq 54,0$	2,2 – 2,5	9	1	180	180	2,2 – 2,5	9	1	120	120
		10 – 23	2	180	180		10 – 22	2	120	120
		24 – 36	3	180	180		23 – 36	3	120	120
		37 – 49	4	180	180		37 – 49	4	120	120
		50	4	180	180		50	4	120	120
$54,0 < \varnothing \leq 57,0$	2,2 – 2,5	9	1	180	180	2,3 – 2,5	9	1	120	120
		10 – 23	2	180	180		10 – 22	2	120	120
		24 – 36	3	180	180		23 – 36	3	120	120
		37 – 49	4	180	180		37 – 49	4	120	120
		50	4	180	180		50	4	120	120
$57,0 < \varnothing \leq 63,5$	2,3 – 2,5	9	1	180	180	2,4 – 2,5	9	1	120	120
		10 – 23	2	180	180		10 – 22	2	120	120
		24 – 36	3	180	180		23 – 36	3	120	120
		37 – 49	4	180	180		37 – 49	4	120	120
		50	4	180	180		50	4	120	120
$63,5 < \varnothing \leq 70,0$	2,4 – 2,5	9	1	180	180	2,5	9	1	120	120
		10 – 23	2	180	180		10 – 22	2	120	120
		24 – 36	3	180	180		23 – 36	3	120	120
		37 – 49	4	180	180		37 – 49	4	120	120
		50	4	180	180		50	4	120	120
$70,0 < \varnothing \leq 76,1$	2,5	9	1	180	180	2,6 – 14,2	9	1	120	120
		10 – 23	2	180	180		10 – 12	1	120	120
		24 – 36	3	180	180		13	1	180/240*1	180/240*1
		37 – 49	4	180	180		14 – 22	2	120	120
		50	4	180	180		24 – 36	3	120	120
$76,1 < \varnothing \leq 88,9$	2,6 – 14,2	9	1	60/240*1	60/240*1	2,6 – 14,2	9	1	120	120
		10 – 16	2	60/180*1	60/180*1		10 – 12	1	120	120
		17 – 20	2	60/180*1	60/180*1		13	1	180/240*1	180/240*1
		21 – 23	2	180	180		14 – 22	2	120	120
		24 – 31	3	180	180		24 – 36	3	120	120
		32 – 34	3	180	180		37 – 49	4	120	120
		35 – 38	4	180	180		50	4	120	120
		39 – 46	4	180	180					
		47 – 49	4	180	180					
		50	4	180	180					

\*1 „E” fire-resistant class

Table 13 Fire resistance classification penetration seal for STEEL pipes in FEF insulation  $\varnothing \leq 133,0$

Pipe material: <b>STEEL</b> Type of wrap: <b>WRAP L 60</b> Pipe diameter: <b>88,9 &lt; <math>\varnothing</math> <math>\leq</math> 133,0</b>										
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID WALL thickness $\geq 150$ mm			Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID FLOOR thickness $\geq 150$ mm		
			No. of wrapping layers [pcs]	EI classification				No. of wrapping layers [pcs]	EI classification	
				C/U	C/C				C/U	C/C
88,9 < $\varnothing$ $\leq$ 101,6	2,9 - 14,2	9	1	60/240*1	60/240*1	3,1 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	180	180		23 - 36	3	120	120
		21 - 23	2	180	180		37 - 49	4	120	120
		24 - 31	3	180	180		50	4	120	120
		32 - 34	3	180	180					
		35 - 38	4	180	180					
		39 - 46	4	180	180					
		47 - 49	4	180	180					
101,6 < $\varnothing$ $\leq$ 108	3,0 - 14,2	9	1	60/240*1	60/240*1	3,2 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	60/180*1	60/180*1		23 - 36	3	120	120
		21 - 23	2	180	180		37 - 49	4	120	120
		24 - 31	3	180	180		50	4	120	120
		32 - 34	3	180	180					
		35 - 38	4	180	180					
		39 - 46	4	180	180					
		47 - 49	4	180	180					
108 < $\varnothing$ $\leq$ 114,3	3,2 - 14,2	9	1	60/240*1	60/240*1	3,3 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	60/180*1	60/180*1		23 - 36	3	120	120
		21 - 23	2	60/180*1	60/180*1		37 - 49	4	120	120
		24 - 31	3	180	180		50	4	120	120
		32 - 34	3	180	180					
		35 - 38	4	180	180					
		39 - 46	4	180	180					
		47 - 49	4	180	180					
114,3 < $\varnothing$ $\leq$ 127,0	3,4 - 14,2	9	1	60/240*1	60/240*1	3,5 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	60/180*1	60/180*1		23 - 36	3	120	120
		21 - 23	2	60/180*1	60/180*1		37 - 49	4	120	120
		24 - 31	3	90/180*1	90/180*1		50	4	120	120
		32 - 34	3	180	180					
		35 - 38	4	180	180					
		39 - 46	4	180	180					
		47 - 49	4	180	180					
127,0 < $\varnothing$ $\leq$ 133,0	3,5 - 14,2	9	1	60/240*1	60/240*1	3,6 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	60/180*1	60/180*1		23 - 36	3	120	120
		21 - 23	2	60/180*1	60/180*1		37 - 49	4	120	120
		24 - 31	3	90/180*1	90/180*1		50	4	120	120
		32 - 34	3	90/180*1	90/180*1					
		35 - 38	4	180	180					
		39 - 46	4	180	180					
		47 - 49	4	180	180					
		50	4	180	180					

\*1 „E” fire-resistant class

Table 14 Fire resistance classification penetration seal for STEEL pipes in FEF insulation  $\varnothing \leq 219$

Pipe material: <b>STEEL</b> Type of wrap: <b>WRAP L 60</b> Pipe diameter: <b>133,0 &lt; <math>\varnothing</math> <math>\leq</math> 219,0</b>										
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID WALL thickness $\geq 150$ mm			Pipe wall thickness [mm]	FEF insulation thickness [mm]	RIGID FLOOR thickness $\geq 150$ mm		
			No. of wrapping layers [pcs]	EI classification				No. of wrapping layers [pcs]	EI classification	
				C/U	C/C				C/U	C/C
133,0 < $\varnothing$ $\leq$ 139,7	3,7 - 14,2	9	1	60/240*1	60/240*1	3,7 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	60/180*1	60/180*1		23 - 36	3	120	120
		21 - 23	2	60/180*1	60/180*1		37 - 49	4	120	120
		24 - 31	3	90/180*1	90/180*1		50	4	120	120
		32 - 34	3	90/180*1	90/180*1					
		35 - 38	4	90/180*1	90/180*1					
		39 - 46	4	180	180					
		47 - 49	4	180	180					
139,7 < $\varnothing$ $\leq$ 152,4	3,9 - 14,2	9	1	60/240*1	60/240*1	3,9 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	60/180*1	60/180*1		23 - 36	3	120	120
		21 - 23	2	60/180*1	60/180*1		37 - 49	4	120	120
		24 - 31	3	90/180*1	90/180*1		50	4	120	120
		32 - 34	3	90/180*1	90/180*1					
		35 - 38	4	90/180*1	90/180*1					
		39 - 46	4	90/180*1	90/180*1					
		47 - 49	4	180	180					
152,4 < $\varnothing$ $\leq$ 159,0	4,0 - 14,2	9	1	60/240*1	60/240*1	4,0 - 14,2	9	1	120	120
		10 - 16	2	60/180*1	60/180*1		10 - 22	2	120	120
		17 - 20	2	60/180*1	60/180*1		23 - 36	3	120	120
		21 - 23	2	60/180*1	60/180*1		37 - 49	4	120	120
		24 - 31	3	90/180*1	90/180*1		50	4	120	120
		32 - 34	3	90/180*1	90/180*1					
		35 - 38	4	90/180*1	90/180*1					
		39 - 46	4	90/180*1	90/180*1					
		47 - 49	4	90/180*1	90/180*1					
159,0 < $\varnothing$ $\leq$ 169,0	4,0 - 14,2	16 - 23	2	60/90*1	60/90*1	4,1 - 14,2	16 - 23	2	45	45
		24 - 36	3	60/90*1	60/90*1		24 - 36	3	45	45
		37 - 49	4	60/90*1	60/90*1		37 - 49	4	45	45
		50	4	90	90		50	4	45	45
169,0 < $\varnothing$ $\leq$ 180,0	4,0 - 14,2	24 - 36	3	60/90*1	60/90*1	4,2 - 14,2	24 - 36	3	45	45
		37 - 49	4	60/90*1	60/90*1		37 - 49	4	45	45
		50	4	90	90		50	4	45	45
180,0 < $\varnothing$ $\leq$ 200,0	4,0 - 14,2	38 - 49	4	60/90*1	60/90*1	4,4 - 14,2	38 - 49	4	45	45
		50	4	90	90		50	4	45	45
200,0 < $\varnothing$ $\leq$ 219,0	4,0 - 14,2	50	4	90	90	4,5 - 14,2	50	4	45	45

\*1 „E” fire-resistant class

Table 15 Fire resistance classification penetration seal for STEEL pipes in FEF insulation  $\varnothing \leq 88,9$

Pipe material: <b>STEEL</b> Type of wrap: <b>WRAP L 60</b> Pipe diameter: <b><math>\varnothing \leq 88,9</math></b>					
Diameter $\varnothing$ [mm]	Pipe wall thickness [mm]	FEF insulation thickness [mm]	FLEXIBLE *1 / RIGID WALL thickness $\geq 125$ mm No. of wrapping layers [pcs]	EI classification	
				C/U	C/C
$\varnothing \leq 42,4$	2,0 - 14,2	9	1	120	120
		10 - 22	2	120	120
		23 - 34	3	120	120
		35 - 50	4	120	120
$42,4 < \varnothing \leq 44,5$	2,1 - 14,2	9	1	90 / 120*2	90 / 120*2
		10 - 11	2	90 / 120*2	90 / 120*2
		12 - 22	2	120	120
		23 - 28	3	120	120
		29 - 34	3	120	120
$44,5 < \varnothing \leq 54,0$	2,2 - 14,2	35 - 50	4	120	120
		9	1	90 / 120*2	90 / 120*2
		10 - 11	2	90 / 120*2	90 / 120*2
		12 - 20	2	90 / 120*2	90 / 120*2
		21 - 22	2	120	120
		23 - 28	3	120	120
$54,0 < \varnothing \leq 57,0$	2,2 - 14,2	29 - 34	3	120	120
		35 - 50	4	120	120
		9	1	90 / 120*2	90 / 120*2
		10 - 11	2	90 / 120*2	90 / 120*2
		12 - 22	2	90 / 120*2	90 / 120*2
$57,0 < \varnothing \leq 63,5$	2,3 - 14,2	23 - 28	3	120	120
		29 - 34	3	120	120
		35 - 50	4	120	120
		9	1	90 / 120*2	90 / 120*2
		10 - 11	2	90 / 120*2	90 / 120*2
$63,5 < \varnothing \leq 70,0$	2,4 - 14,2	12 - 22	2	90 / 120*2	90 / 120*2
		23 - 34	3	90 / 120*2	90 / 120*2
		35 - 39	4	120	120
		40 - 45	4	120	120
		46 - 49	4	120	120
		50	4	120	120
$70,0 < \varnothing \leq 76,1$	2,5 - 14,2	9	1	90 / 120*2	90 / 120*2
		10 - 22	2	90 / 120*2	90 / 120*2
		23 - 34	3	90 / 120*2	90 / 120*2
		35 - 39	4	90 / 120*2	90 / 120*2
		40 - 45	4	120	120
		46 - 49	4	120	120
$76,1 < \varnothing \leq 82,5$	2,6 - 14,2	50	4	120	120
		9	1	90 / 120*2	90 / 120*2
		10 - 22	2	90 / 120*2	90 / 120*2
		23 - 34	3	90 / 120*2	90 / 120*2
		35 - 45	4	90 / 120*2	90 / 120*2
$82,5 < \varnothing \leq 88,9$	2,6 - 14,2	46 - 49	4	120	120
		9	1	90 / 120*2	90 / 120*2
		10 - 22	2	90 / 120*2	90 / 120*2
		23 - 34	3	90 / 120*2	90 / 120*2
		35 - 49	4	90 / 120*2	90 / 120*2
		50	4	120	120

\*1 For flexible wall use INTU FR WRAP L in two rows according with SOLUTION DETAILS below

\*2 „E” fire-resistant class

### ➔ FIRE RESISTANCE CLASSIFICATION for bundle of copper pipes

Table 16 Fire resistance classification penetration seal for bundle of copper pipes

COPPER						
Bundle characteristics	Diameter Ø [mm]	Pipe wall thick. [mm]	PE insulation thicken. [mm]	common or separate wrapping number of wrapping layers [pcs]	EI classification	
					C/U	C/C
RIGID WALL thickness ≥ 150 mm   Type of wrap: WRAP L 60						
Maximum in one bundle (3 copper pipes)	1) Ø ≤ 6,35 mm	0,8	9	2	180	180
	2) Ø ≤ 6,35 mm	0,8	9			
	3) Ø ≤ 15,88 mm	1,0	9			
RIGID FLOOR thickness ≥ 150 mm   Type of wrap: WRAP L 60						
Maximum in one bundle (3 copper pipes)	1) Ø ≤ 6,35 mm	0,8	9	2	180/240*	180/240*
	2) Ø ≤ 6,35 mm	0,8	9			
	3) Ø ≤ 15,88 mm	1,0	9			

\* „E” fire-resistant class

### ➔ FIRE RESISTANCE CLASSIFICATION for bundle of combustible pipes

Table 17 Fire resistance classification penetration seal for bundle of PE-HD, PE, ABS, SAN+PVC, PVC-U, PVC-C pipes

PE-HD, PE, ABS, SAN+PVC, PVC-U, PVC-C						
Bundle characteristics	Diameter Ø [mm]	Pipe material	Pipe wall thick. [mm]	common or separate wrapping number of wrapping layers [pcs]	EI classification	
					U/C	C/C
RIGID WALL thickness ≥ 150 mm   Type of wrap: WRAP L 60						
Maximum in one bundle (3 plastic pipes)	1) Ø ≤ 32 mm	PE-HD, PE, ABS, SAN+PVC	2,0	2	240	240
	1) Ø ≤ 32 mm	PE-HD, PE, ABS, SAN+PVC	2,0			
	3) Ø ≤ 50 mm	PVC-U, PVC-C	1,8			

## Fire Resistance Classification – outside ETA

### ➔ FIRE RESISTANCE CLASSIFICATION for bundle of combustible pipe, non-combustible pipe and cables

Table 18 Fire resistance classification penetration seal for bundle of PVC-U pipe, COPPER pipe with insulation and cable

COPPER + PVC-U + cable							
Bundle characteristics	Diameter Ø [mm]	Pipe material	Pipe wall thick. [mm]	Insulation type	PE / FEF insulation thicken. [mm]	common or separate wrap. number of wrapping layers [pcs]	EI class
							C/U
RIGID WALL thickness ≥ 150 mm   Type of wrap: WRAP L 60							
Maximum in one bundle (3 pipes + 1 cable)	1) Ø ≤ 12,7 mm	COPPER	0,8		9	2	120
	2) Ø ≤ 22,3	COPPER	1,0		9		
	3) Ø ≤ 25 mm	PVC-U	1,0		-		
	4) 4 x 1,5 mm <sup>2</sup>	cable	-		-		
RIGID FLOOR thickness ≥ 150 mm   Type of wrap: WRAP L 60							
Maximum in one bundle (3 pipes + 1 cable)	1) Ø ≤ 12,7 mm	COPPER	0,8		9	2	120
	2) Ø ≤ 22,3	COPPER	1,0		9		
	3) Ø ≤ 25 mm	PVC-U	1,0		-		
	4) 4 x 1,5 mm <sup>2</sup>	cable	-		-		

Table 19 Fire resistance class. penetration seal for bundle of PVC-U pipe, COPPER pipe with insulation and cable

COPPER + PVC-U + cable								
Bundle characteristics	Diameter Ø [mm]	Pipe material	Pipe wall thick. [mm]	PE (TUBOLIT DG PLUS) / FEF [mm]	Additional mineral wool insulation		common or separate wrapping number of wrapping layers [pcs]	EI classification
					Min. wool insulation thick. [mm]	Min. wool insulation length [mm]		C/U
FLEXIBLE / RIGID WALL thickness ≥ 125 mm   Type of wrap: WRAP L 60								
Maximum in one bundle ( 3 pipes + 1 cable )	1) Ø ≤ 12,7mm	COPPER	0,8	9	-	-	2*1	60
	2) Ø ≤ 22,3	COPPER	1,0	9				
	3) Ø ≤ 25 mm	PVC-U	1,0	-				
	4) 4 x 1,5 mm <sup>2</sup>	cable	-	-				
Maximum in one bundle ( 3 pipes + 1 cable )	1) Ø ≤ 12,7mm	COPPER	0,8	9	20	200	2*1	120
	2) Ø ≤ 22,3	COPPER	1,0	9				
	3) Ø ≤ 25 mm	PVC-U	1,0	-				
	4) 4 x 1,5 mm <sup>2</sup>	cable	-	-				

\*1 The bundle must be wrapped in two rows flush with edge of wall (total number of wrapping: 2 x 2) with firestop tape INTU FR WRAP – check SOLUTION DETAILS below

### ➔ FIRE RESISTANCE CLASSIFICATION for two pipes in one penetration seal

Table 20 Fire resistance class. penetration seal for f PVC-U pipe and STEEL pipe in FEF insulation in one penetration seal

STEEL + PVC-U						
Bundle characteristics	Diameter Ø [mm]	Pipe material	Pipe wall thick. [mm]	FEF [mm]	separate wrapping number of wrapping layers [pcs]	EI classification
						C/U
RIGID WALL thickness ≥ 150 mm   Type of wrap: WRAP L 60						
Maximum in one bundle ( 2 pipes )	1) Ø ≤ 168,3 mm	STEEL	4,0	50	4	120
	2) Ø ≤ 110 mm	PVC	8,1	-	2	

Table 21 Fire resistance class. penetration seal for PE-HD pipe and PVC-U pipe in one penetration seal

PE-HD + PVC-U					
Bundle characteristics	Diameter Ø [mm]	Pipe material	Pipe wall thick. [mm]	separate wrapping number of wrapping layers [pcs]	EI classification
					U/C
RIGID WALL thickness ≥ 150 mm Type of wrap: WRAP L 60					
Maximum in one bundle ( 2 pipes )	1) Ø ≤ 110 mm	PE-HD	10,0	2	120
	2) Ø ≤ 110 mm	PVC-U	3,2	2	
RIGID WALL thickness ≥ 150 mm Type of wrap: WRAP L 100					
Maximum in one bundle ( 2 pipes )	1) Ø ≤ 160 mm	PE-HD	10,0	5	90
	2) Ø ≤ 160 mm	PVC-U	4,0	5	



### ➔ FIRE RESISTANCE CLASSIFICATION for insulated pipe with heater cable

Table 22 Fire resistance classification penetration seal for insulated STEEL pipe with heater cable

STEEL (thin-walled) PIPE WITH/WITHOUT INSULATION with HEATER CABLE											
Pipe diam. Ø [mm]	Pipe wall thick. [mm]	Pipe insulation type	Insulation thickness [mm]	Additional mineral wool insulation		FLEXIBLE/RIGID WALL thickness ≥ 125 mm		RIGID WALL thickness ≥ 150 mm		RIGID FLOOR thickness ≥ 150 mm	
				Minimum wool insulation thick. - g [mm]	Min. wool insulation length - L [mm]	No. of wrapping layers [pcs]	EI class	No. of wrapping layers [pcs]	EI class	No. of wrap. layers [pcs]	EI class
108,0	2,0	-	-	40	600	1*1	120	1	120	1	120
	2,0	FEF	13	-	-	2*1	30	-	-	-	-
	2,0	FEF	25	-	-	4*1	60	2	120	2	120
	2,0	FEF	50	-	-	4*1	90	4	120	4	120
168,3	4,0	-	-	50	600	1*1	90	-	-	-	-

\*1 The bundle must be wrapped in two rows flush with edge of wall with firestop tape INTU FR WRAP – check SOLUTION DETAILS below

Table 23 Fire resistance classification penetration seal for insulated PP, PE-HD pipe with heater cable

Pipe material	INTU FR WRAP L type	Pipe diam. Ø [mm]	Pipe wall thick. [mm]	Pipe insulation type	Insulation thickness [mm]	RIGID WALL thickness ≥ 150 mm	
						No. of wrapping layers [pcs]	EI class U/C
PP	60	110	2,7	FEF	13	3	120
	60	110	18,3	FEF	13	3	120
PE-HD	60	110	4,2	FEF	13	3	120
	60	110	10,0	FEF	13	3	120
	100	160	6,2	FEF	13	6	60
	100	160	14,6	FEF	13	6	90

### ➔ FIRE RESISTANCE CLASSIFICATION for non-combustible pipe with insulation

Table 24 Fire resistance classification penetration seal for STEEL (thin-walled) with insulation

Pipe diam. Ø [mm]	Pipe wall thick. [mm]	Pipe insulation type	Insulation thick. [mm]	Additional mineral wool insulation		FLEXIBLE/RIGID WALL thickness ≥ 125 mm		RIGID WALL thickness ≥ 150 mm		RIGID FLOOR thickness ≥ 150 mm	
				Minimum wool insulation thick. [mm]	Min. wool insulation length [mm]	No. of wrap. layers [pcs]	EI class	No. of wrap. layers [pcs]	EI class	No. of wrap. layers [pcs]	EI class
18,0	1,2	FEF	9	-	-	1	120	1	120	1	120
18,0	1,2	FEF	25	-	-	2	120	2	120	2	120
28,0	1,5	FEF	9	-	-	1	120	1	120	1	120
28,0	1,5	FEF	25	-	-	2	120	2	120	2	120
42,0	1,5	-	-	20	300	-	-	1	120	1	120
66,7	1,5	FEF	9	-	-	1	60	1	120	1	120
66,7	1,5	FEF	25	-	-	2	120	2	120	2	120
66,7	1,5	FEF	50	-	-	4	90	4	120	4	120
66,7	1,5	-	-	30	400	-	-	1	120	1	120
114,3	3,6	-	-	40	600	1	-	-	-	-	-
168,3	4,0	FEF	50	-	-	-	-	4	120	4	120
168,3	4,0	FEF	50	50	600	-	-	-	-	1	120
219,1	4,0	FEF	50	50	500	4	-	-	-	-	-
355,6	5,6	-	-	50	700	-	-	-	-	4	90
355,6	5,6	FEF	50	50	500	4	120	-	-	-	-

#### ➔ FIRE RESISTANCE CLASSIFICATION for cable / bundle of cable in AROT pipe

Table 25 Fire resistance class, penetration seal for cable / bundle of cable in AROT pipe

Bundle characteristics	Diameter Ø [mm]	Type	Number of wraps on AROT pipe [pcs]	EI classification
				U/C
<b>RIGID WALL</b> thickness ≥ 150 mm Type of wrap: <b>WRAP L 60</b>				
Maximum in one AROT pipe	1) Ø ≤ 21 mm	cable	2	120
<b>RIGID WALL</b> thickness ≥ 150 mm Type of wrap: <b>WRAP L 60</b>				
Maximum in one AROT pipe	1) Ø <sub>bundle</sub> ≤ 100 mm In bundle: Ø <sub>cable</sub> ≤ 21 mm	Bundle of cables	2	120

#### ➔ FIRE RESISTANCE CLASSIFICATION for combustible pipe with insulation

Table 26 Fire resistance classification penetration seal for combustible pipe with insulation

Pipe material	Pipe diam. Ø [mm]	Pipe wall thickness [mm]	Insulation type	Insulation thickness [mm]	FLEXIBLE/ RIGID WALL thick. ≥ 125 mm		RIGID WALL		RIGID FLOOR	
					No. of wrapping layers [pcs]	EI class	No. of wrapping layers [pcs]	EI class	No. of wrapping layers [pcs]	EI class
						U/C		U/C		U/C
Type of wrap: <b>WRAP L 60</b>										
PP-R/PP-RGF/PP-R	20	2,8	PE	9	1	120	1	120	1	120
	20	3,4	PE	9	1	120	1	120	-	-
	50	6,9	PE	9	1	120	1	120	1	120
	50	8,3	PE	9	1	120	1	120	1	120
PE-RT/AI/PE-RT	20	2,0	PE	9	1	120	1	120	1	120
	32	3,0	PE	9	1	120	1	120	1	120
PE-X/AI/PE-X	20	2,0	PE	9	1	120	1	120	1	120
	32	3,0	PE	9	1	120	1	120	1	120
PP-R	20	2,3	mineral wool	20	1	120	-	-	1	120
PP-R	20	3,4	mineral wool	20	1	120	-	-	1	120
PP-R	75	6,8	mineral wool	30	3	120	-	-	3	120
PP-R	75	12,5	mineral wool	30	3	120	-	-	3	120
PE-HD	110	4,2	FEF	13	-	-	-	-	3	120
	110	10,0	FEF	13	-	-	-	-	3	120
Type of wrap: <b>WRAP L 100</b>										
PE-HD	160	6,2	FEF	13	-	-	-	-	6	30
	160	14,6	FEF	13	-	-	-	-	6	90
PP	160	4,9	FEF	13	-	-	-	-	6	30
	160	14,6	FEF	13	-	-	-	-	6	60

#### ➔ FIRE RESISTANCE CLASSIFICATION for combustible pipe

Table 27 Fire resistance classification penetration seal for combustible pipe

Pipe type	Diam. Ø [mm]	Pipe wall thick. [mm]	RIGID WALL thickness ≥ 150 mm		RIGID FLOOR thickness ≥ 150 mm		FLEXIBLE *1 / RIGID WALL thickness ≥ 125 mm	
			No. of wrapping layers [pcs]	El class	No. of wrapping layers [pcs]	El class	No. of wrapping layers*1 [pcs]	El class
				U/C		U/C		U/C
Type of wrap: <b>WRAP L 60</b>								
PE-HD	90	3,5	2	120	-	-	2	120
	110	4,2	2*1	120	-	-	2	120
PVC-U	110	3,2	-	-	-	-	2	120
	110	4,0	2*1	120	-	-	-	-
	110	8,1	1	120	-	-	-	-
PP-R / PP-GF/PP-R	20	2,8	-	-	-	-	1	120
	20	3,4	-	-	1	120	1	120
	75	10,0	-	-	-	-	1	120
	75	10,3	1	120	-	-	-	-
	75	12,5	1	120	-	-	1	120
	110	10,0	2	120	-	-	-	-
	110	12,3	-	-	2	120	-	-
PE-RT/Al/PE-RT	20	2,0	-	-	-	-	1	120
	32	3,0	-	-	-	-	1	120
	63	6,0	1	120	-	-	1	90
PP-R	20	2,3	1	120	-	-	1	120
	20	3,4	-	-	-	-	1	120
	75	6,8	1	120	-	-	1	120
	75	12,5	-	-	-	-	1	120
	110	10,0	2	120	-	-	1	120
PP-R/Al/PP-R	110	18,3	2	120	-	-	2	120
	20	2,8	-	-	-	-	1	120
	20	3,2	1	120	-	-	-	-
	20	3,4	1	120	-	-	1	120
	75	10,3	1	120	1	120	1	120
	75	12,5	1	120	-	-	1	120
PE-X/Al/PE-X	110	15,1	2	120	2	120	2	120
	110	18,8	-	-	-	-	2	120
	32	3,0	1	120	1	120	1	120
	63	6,0	1	120	1	120	1	120
	PE-Xα	20	2,0	1	120	-	-	1
63		5,8	1	120	-	-	1	120
PP	110	2,7	2*1	60	-	-	2	120
	110	18,3	-	-	-	-	2	120
	160	4,9	5*2	60	-	-	-	-
	160	14,6	5*2	120	-	-	-	-
PP-HT	50	1,8	-	-	1	120	-	-
	75	1,9	-	-	1	120	-	-
	110	2,7	-	-	2	120	-	-
Magnaplast Ultra dB	50	1,8	-	-	1	120	-	-
	110	3,4	-	-	2	120	-	-
Type of wrap: <b>WRAP L 100</b>								
PP-HT	160	3,9	-	-	5	120	-	-
Magnaplast Ultra dB	160	4,9	-	-	5	60	-	-

\*1 check SOLUTION DETAILS below

\*2 The pipe must be wrapped in two rows flush with edge of wall (total number of wrapping: 2 x 5) with firestop tape INTU FR WRAP – check SOLUTION DETAILS below

#### ➔ SOLUTION DETAILS

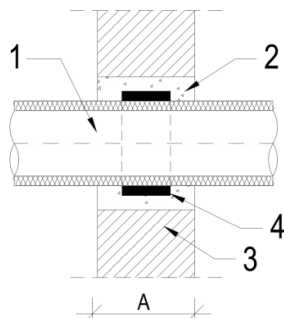
COMBUSTIBLE PIPE penetration seal in FLEXIBLE / RIGID WALLS		
	<p><b>Fig. 1 Pipe in flexible wall <math>A \geq 125</math> mm</b></p>	<p>1 – combustible pipe; 2 – INTU FR MASTIC sealant: width <math>0 \leq a \leq 20</math> mm; depth <math>b \geq 25</math> mm; 3 – flexible wall, <math>A \geq 125</math> mm; 4 – 2 x INTU FR WRAP L, installed two-side flush with face of the partition.</p>
	<p><b>Fig. 2. Pipe in rigid wall <math>A \geq 150</math> mm</b></p>	<p>1 – combustible pipe; 2 – cement mortar; 3 – rigid wall, <math>A \geq 150</math> mm; 4 – INTU FR WRAP L installed in wall axis.</p>

COMBUSTIBLE PIPE penetration seal in RIGID FLOOR	NON-COMBUSTIBLE PIPE penetration seal in RIGID FLOOR
<p><b>Fig. 3. Pipe in floor <math>H \geq 150</math> mm</b></p>	<p><b>Fig. 4. Pipe in floor <math>H \geq 150</math> mm</b></p>
<p>1 – flammable pipe; 2 – cement mortar; 3 – rigid floor, <math>H \geq 150</math> mm; 4 – INTU FR WRAP L, installed maximum <math>a \leq 10</math> mm from the floor bottom.</p>	<p>1 – non-flammable pipe with FEF insulation; 2 – cement mortar; 3 – rigid floor, <math>H \geq 150</math> mm; 4 – INTU FR WRAP L, installed maximum <math>a \leq 10</math> mm from the floor bottom.</p>

#### NON-COMBUSTIBLE PIPE penetration seal in FLEXIBLE / RIGID WALLS



Fig. 5. Pipe in rigid wall  $A \geq 150$  mm



- 1 – non - flammable pipe with rubber (flammable insulation);
- 2 – cement mortar;
- 3 – rigid wall,  $A \geq 150$  mm;
- 4 – **INTU FR WRAP L** installed in wall axis.

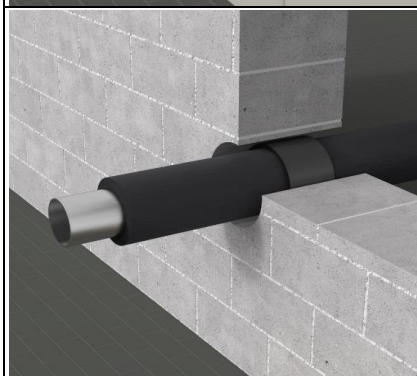
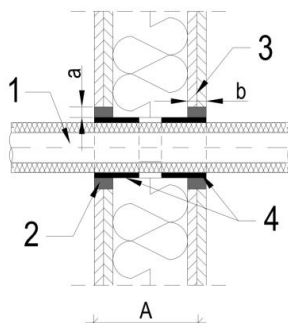


Fig. 6. Pipe in flexible wall  $A \geq 125$  mm



- 1 – non - flammable pipe with rubber (flammable insulation);
- 2 - **INTU FR MASTIC** sealant: width  $0 \leq a \leq 20$  mm; depth  $b \geq 25$ mm;
- 3 – flexible wall,  $A \geq 125$  mm;
- 4 – **2 x INTU FR WRAP L**, installed two-side flush with face of the partition.

#### BUNDLE OF COPPER PIPES penetration seals

Fig. 7. Pipes in floor  $H \geq 150$  mm

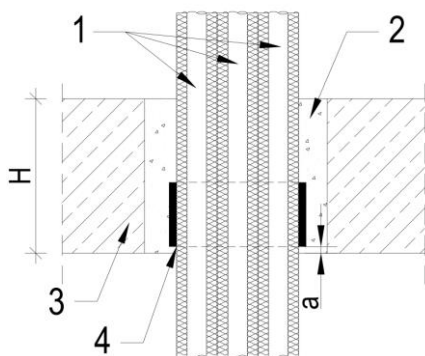
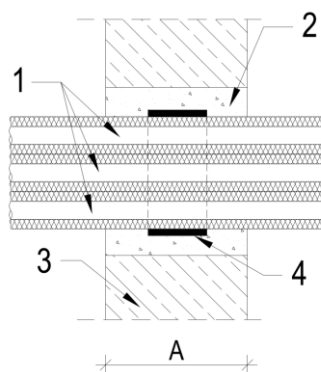


Fig. 8. Pipes in rigid wall  $A \geq 150$  mm

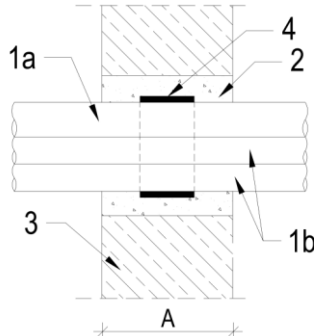


- 1 – bundle of copper pipes  $\leq \varnothing 5/8''$  in PE foam insulation;
- 2 – cement mortar filling;
- 3 – floor,  $H \geq 150$  mm / rigid wall,  $A \geq 150$  mm;
- 4 – **INTU FR WRAP L** firestop tape, installation place:
  - for floor: maximum  $a \leq 10$  mm from the floor bottom;
  - for wall: in wall axis;

#### BUNDLE OF COMBUSTIBLE PIPES penetration seals in RIGID WALL


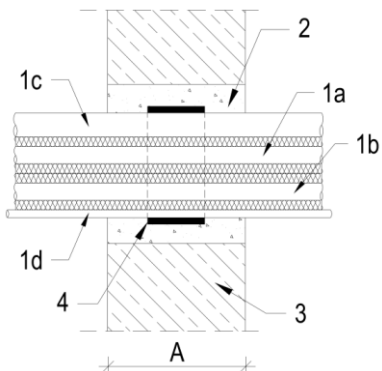


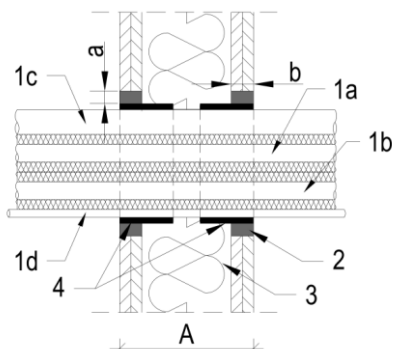
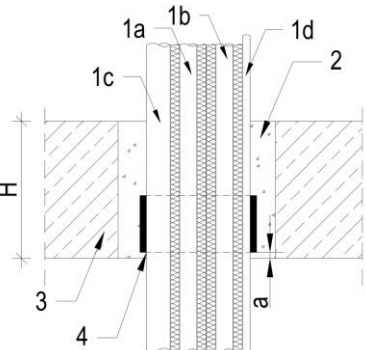
Fig. 9. Bundle of pipes in rigid wall  $A \geq 150$  mm

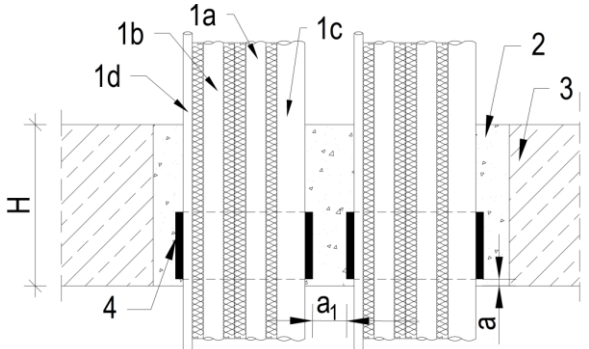


- Bundle of flammable pipes:
- 1a - PVC-U or PVC-C,  $\varnothing \leq 50$  mm;
  - 1b – 2 x combustible pipe (PE-HD or PE or ABS or SAN+PVC),  $\varnothing \leq 32$  mm;
  - 2 – cement mortar filling;
  - 3 – rigid wall,  $A \geq 150$  mm;
  - 4 – **INTU FR WRAP L** firestop tape, installed in wall axis.

#### ➔ SOLUTION DETAILS – outside ETA

BUNDLE OF COPPER pipe with insulation + PVC-U pipe + cable penetration seals in RIGID WALL		
	<p><b>Fig. 10. Bundle of pipes in rigid wall <math>A \geq 150</math> mm</b></p> 	<p>Bundle of pipes and cable:                      1a -copper pipe with PE / FEF insulation, <math>\text{Ø} \leq 12,7</math> mm;                      1b -copper pipe with PE / FEF insulation, <math>\text{Ø} \leq 22,3</math> mm;                      1c - combustible pipe (PVC-U), <math>\text{Ø} \leq 25</math> mm;                      1d - cable, max. <math>4 \times 1,5</math> mm<sup>2</sup>;                      2 - cement mortar filling;                      3 - rigid wall, <math>A \geq 150</math> mm;                      4 - <b>INTU FR WRAP L</b> firestop tape, installed in wall axis.</p>

BUNDLE OF COPPER pipe with insulation + PVC-U pipe + cable penetration seals		
in FLEXIBLE / RIGID WALL	in RIGID FLOOR	
<p><b>Fig. 11. Pipe in flexible/rigid wall <math>A \geq 125</math> mm</b></p> 	<p><b>Fig. 12. Pipe in floor <math>H \geq 150</math> mm</b></p> 	<p>Bundle of pipes and cable:                      1a -copper pipe with PE / FEF insulation, <math>\text{Ø} \leq 12,7</math> mm;                      1b -copper pipe with PE / FEF insulation, <math>\text{Ø} \leq 22,3</math> mm;                      1c - combustible pipe (PVC-U), <math>\text{Ø} \leq 25</math> mm;                      1d - cable, max. <math>4 \times 1,5</math> mm<sup>2</sup>;</p>
<p>2 - <b>INTU FR MASTIC</b> sealant:                      width <math>0 \leq a \leq 20</math> mm; depth <math>b \geq 25</math> mm;                      3 - flexible / rigid wall, <math>A \geq 125</math> mm;                      4 - <b>2 x INTU FR WRAP L</b>, installed two-side flush with face of the partition.</p>	<p>2 - cement mortar filling;                      3 - rigid floor, <math>H \geq 150</math> mm;                      4 - <b>INTU FR WRAP L</b>, installed maximum <math>a \leq 10</math> mm from the floor bottom.</p>	

More than one BUNDLE OF COPPER pipe with insulation + PVC-U pipe + cable penetration seals	
<p><b>Fig. 13. Pipe in rigid floor <math>H \geq 150</math> mm</b></p> 	<p>One bundle of pipes and cable:                      1a -copper pipe with PE / FEF insulation, <math>\text{Ø} \leq 12,7</math> mm;                      1b -copper pipe with PE / FEF insulation, <math>\text{Ø} \leq 22,3</math> mm;                      1c - combustible pipe (PVC-U), <math>\text{Ø} \leq 25</math> mm;                      1d - cable, max. <math>4 \times 1,5</math> mm<sup>2</sup>;                      2 - cement mortar filling;                      3 - rigid floor, <math>A \geq 150</math> mm;                      4 - <b>INTU FR WRAP L</b>, installed maximum <math>a \leq 10</math> mm from the floor bottom.</p> <p>Distance between wrapping bundles: <math>a_1 \geq 0</math> mm</p>

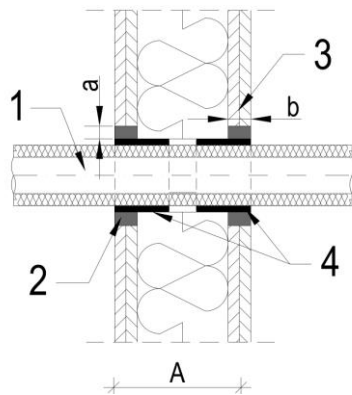
More than one BUNDLE OF COPPER pipe with insulation + PVC-U pipe + cable penetration seals		
in FLEXIBLE / RIGID WALL	in RIGID FLOOR	
<p><b>Fig. 14. Bundles in flexible/rigid wall <math>A \geq 125</math> mm</b></p>	<p><b>Fig. 15. Bundles in floor <math>H \geq 150</math> mm</b></p>	<p>One bundle of pipes and cable:                      1a - copper pipe with PE / FEF insulation, <math>\varnothing \leq 12,7</math> mm;                      1b - copper pipe with PE / FEF insulation, <math>\varnothing \leq 22,3</math> mm;                      1c - combustible pipe (PVC-U), <math>\varnothing \leq 25</math> mm;                      1d - cable, max. <math>4 \times 1,5</math> mm<sup>2</sup>;                      Distance between wrapping bundles: <math>a_1 \geq 0</math> mm</p>
<p>2 - cement mortar filling;                      3 - rigid wall, <math>A \geq 150</math> mm;                      4 - <b>INTU FR WRAP L</b> firestop tape, installed in wall axis.</p>	<p>2 - <b>INTU FR MASTIC</b> sealant:                      width <math>0 \leq a \leq 20</math> mm; depth <math>b \geq 25</math> mm;                      3 - flexible / rigid wall, <math>A \geq 125</math> mm;                      4 - <b>2 x INTU FR WRAP L</b>, installed two-side flush with face of the partition.</p>	

Two pipe in one penetration seal		
COMBUSTIBLE PIPE + NON-COMBUSTIBLE PIPE	COMBUSTIBLE PIPE + COMBUSTIBLE PIPE	
<p><b>Fig. 16. Pipes in rigid wall <math>A \geq 150</math> mm</b></p>	<p><b>Fig. 17. Pipes in rigid wall <math>A \geq 150</math> mm</b></p>	<p>1 - flammable pipe;                      1a - non-flammable pipe with FEF insulation;                      2 - cement mortar;                      3 - rigid wall, <math>A \geq 150</math> mm;                      4 - <b>INTU FR WRAP L</b> 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: <math>a_1 \geq 0</math> mm</p>

#### COMBUSTIBLE PIPE / NON-COMBUSTIBLE pipe with insulation

##### with or without HEATER CABLE

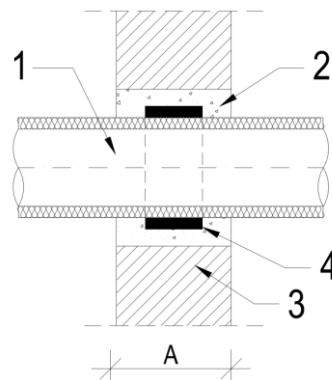
Fig. 18. Pipe with insulation in flexible/rigid wall  $A \geq 125$  mm



- 1 – combustible / non-combustible pipe with flammable insulation (PE / FEF) or non-flammable insulation (mineral wool); with or without heater cable;  
 2 – **INTU FR MASTIC** sealant: width  $0 \leq a \leq 20$  mm; depth  $b \geq 25$  mm;  
 3 – flexible wall,  $A \geq 125$  mm;  
 4 – **2 x INTU FR WRAP L**, installed two-side flush with face of the partition.

\* Distance of pipe from the edge of the hole should be 10-25 mm

Fig. 19. Pipe with insulation in rigid wall  $A \geq 150$  mm



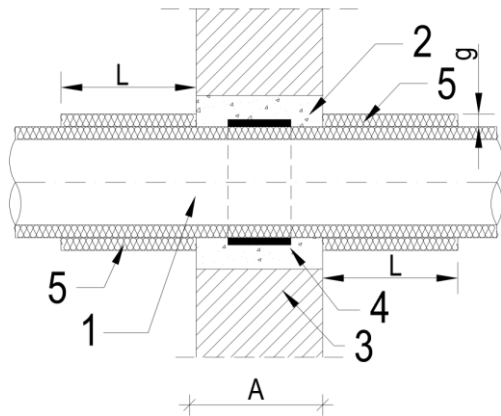
- 1 – combustible / non-combustible pipe with flammable insulation (PE / FEF) or non-flammable insulation (mineral wool); with or without heater cable;  
 2 – cement mortar;  
 3 – rigid wall,  $A \geq 150$  mm;  
 4 – **INTU FR WRAP L** installed in wall axis.

\* Distance of pipe from the edge of the hole should be 10-50 mm

#### NON-COMBUSTIBLE PIPE with insulation and with additional insulation - mineral wool

##### with or without HEATER CABLE

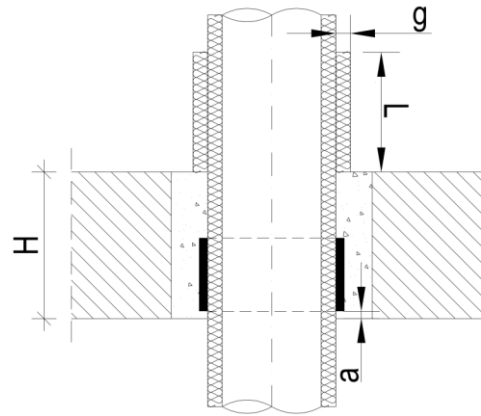
Fig. 20. Pipe with insulation in rigid wall  $A \geq 150$  mm



- 1 – non-combustible pipe with flammable insulation (FEF); with or without heater cable;  
 2 – cement mortar;  
 3 – rigid wall,  $A \geq 150$  mm;  
 4 – **INTU FR WRAP L** installed in wall axis;  
 5 – additional insulation with mineral wool, length - L and thickness - g (values of „L” and „g” are given in the tables above)

\* Distance of pipe from the edge of the hole should be 10-50 mm

Fig. 21 Pipe with insulation in rigid floor  $A \geq 150$  mm



- 1 – non-combustible pipe with flammable insulation (FEF); with or without heater cable;  
 2 – cement mortar;  
 3 – rigid floor,  $H \geq 150$  mm;  
 4 – **INTU FR WRAP L**, installed maximum  $a \leq 10$  mm from the floor bottom.  
 5 – additional insulation with mineral wool, length - L and thickness - g (values of „L” and „g” are given in the tables above)

\* Distance of pipe from the edge of the hole should be 10-50 mm



COMBUSTIBLE PIPE without insulation	COMBUSTIBLE / NON-COMBUSTIBLE PIPE with insulation
<p><b>Fig. 22. Pipe in floor <math>H \geq 150</math> mm</b></p>	<p><b>Fig. 23. Pipe in floor <math>H \geq 150</math> mm</b></p>
<p>1 – combustible pipe without insulation;                  2 – cement mortar;                  3 – floor, <math>H \geq 150</math> mm:                  • rigid floor (reinforced concrete <math>\rho \geq 1700</math> kg / m<sup>3</sup>).                  • light floor (aerated concrete <math>\rho \geq 550</math> kg / m<sup>3</sup>)                  4 – <b>INTU FR WRAP L</b>, installed maximum <math>a \leq 10</math> mm from the floor bottom.</p>	<p>1 – combustible / non-combustible pipe with flammable insulation (FEF / PE) or non-flammable insulation (mineral wool);                  2 – cement mortar;                  3 – floor, <math>H \geq 150</math> mm:                  • rigid floor (reinforced concrete <math>\rho \geq 1700</math> kg / m<sup>3</sup>). Distance of pipe from the edge of the hole should be 10-50 mm;                  • light floor (aerated concrete <math>\rho \geq 550</math> kg / m<sup>3</sup>). Distance of pipe from the edge of the hole should be 10-25 mm;                  4 – <b>INTU FR WRAP L</b>, installed maximum <math>a \leq 10</math> mm from the floor bottom.</p>

COMBUSTIBLE PIPE without insulation	CABLE or BUNDLE OF CABLE in AROT pipe
<p><b>Fig. 24. Pipe without insulation in flexible/rigid wall <math>A \geq 125</math> mm</b></p>	<p><b>Fig. 25 BUNDLE OF CABLE / CABLE in AROT pipe, rigid wall <math>A \geq 150</math> mm</b></p>
<p>1 - combustible pipe without insulation;                  2 – flexible / rigid wall; <math>A \geq 125</math> mm;                  3 - cement mortar;                  4 - <b>2 x INTU FR WRAP L</b>, installed two-side flush with face of the partition.                   * Distance of pipe from the edge of the hole should be 10-50 mm</p>	<p>1 – AROT pipe (casing pipe);                  2 – rigid wall, <math>A \geq 150</math> mm;                  3 – cement mortar;                  4 – <b>2 x INTU FR WRAP L</b>, installed two-side flush with face of the partition;                  5 – <b>INTU FR MASTIC</b> sealant: minimum depth <math>g \geq 15</math>mm;                  6 – single cable <math>\varnothing_{\text{cable}} \leq 21</math> mm                  or bundle of cables <math>\varnothing_{\text{bundle}} \leq 100</math> mm, in bundle: <math>\varnothing_{\text{cable}} \leq 21</math> mm.                   * The AROT pipe can be cut from any side.</p>