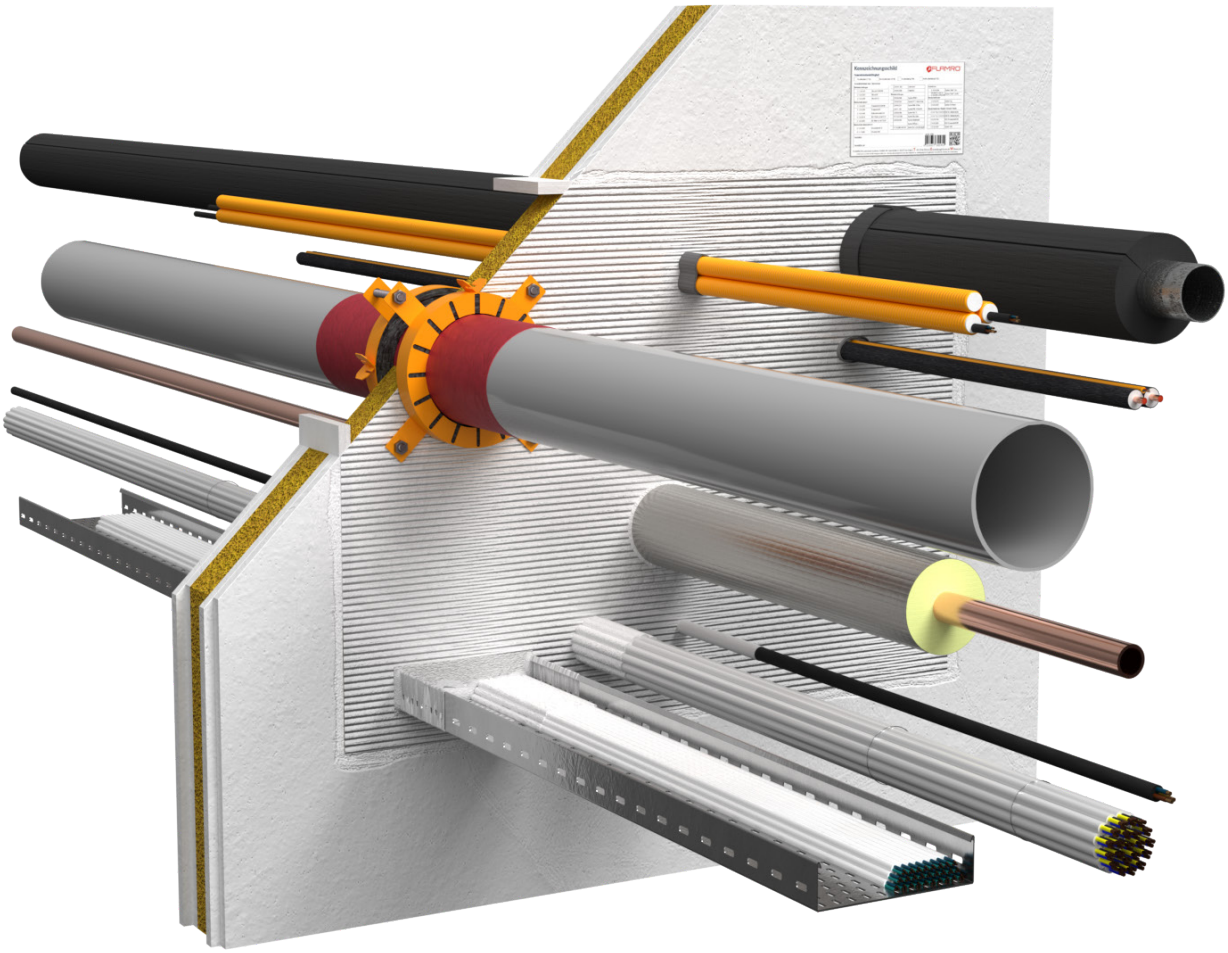
KSL single layer

Ablative mineral fibre board seal

Mixed penetration sealing system made of a single mineral fibre board with an ablative coating for electrical installations, combustible/non-combustible pipes and other services in accordance with KB 321100704-A, KB 321100703-A, KB 322042005-A, KB 323032803-A and KB 322081804-A.

Fire resistance class: EI 30 – EI 60 (maximum EI 90) in accordance with EN 13501-2.



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1. Preliminary remarks / overview

1.1 Target group

The installation instructions are intended solely for personnel trained in fire protection.

1.2 Use of the instructions

Before starting work, read through these installation instructions completely once. Pay particular attention to the following safety instructions.

The authorisation holder assumes no liability for damage caused by failure to comply with these instructions.

Pictorial representations serve as examples only. Installation results may differ in appearance.

Unless stated otherwise, all lengths are specified in mm.

All information in this document represents the state of the art at the time of writing or the current version of the standard.

Upon request, flamro will be pleased to provide the relevant legal and technical framework and manufacturer specifications for each individual case.

1.2.1 Safety instructions

Consult the respective safety information for the individual penetration seal components.

Personal protective equipment:

	Wear protective clothing and non-slip shoes.
	Use safety goggles, safety glasses.
	P2 particle filter in case of short-term or low level exposure. For intensive or prolonged exposure use a breathing apparatus with independent air supply. Use breathing protection in compliance with international/national standards.
	Use chemically resistant gloves. Recommended materials: butyl rubber, nitrile rubber, fluorinated rubber, PVC.

Safety instructions for the installation of floor penetration seals

	The area below the floor penetration seal must be cordoned off against entry during penetration seal work (barrier tape and warning sign: warning of possible falling objects, do not enter the area, penetration seal work in floor openings).
	The contractor for the production of floor penetration seals must inform the client in writing (for forwarding to the client or appointed representative) that after the production of the fire penetration seals in floors, these must be secured on site against loads, in particular against being stepped on, by suitable measures (e.g. by fencing or by covering with grating).

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1.3 Field of application

The mixed penetration sealing system KSL double-layer in wall and floor openings has been assessed in accordance with ETAG 026-2, 2.4.1 and classified in accordance with EN 13501-1 in terms of the „Reaction to fire“, „Fire resistance“, „Release of dangerous substances“ and „Durability and serviceability“ product characteristics.

Reaction to fire			
Product		**Reaction class**	**In acc. with standard**
BML, BMS, BMK, KSL-W		E	EN 13501-1
BSL		F	
Hardrock 040, Hardrock II		A1	
Variant N II A	**intumescent inlay**	E	
	steel sheet housing	A1	
NBR-plus		B-s1, d0	

Fire resistance				
Tested	**Included configurations**			
	U/U	**C/U**	**U/C**	**C/C**
U/U	✓	✓	✓	✓
C/U	–	✓	–	✓
U/C	–	✓	✓	✓
C/C	–	–	–	✓

KSL double layer maximally meets the requirements of class EI 90 in accordance with EN 13501-2.
The maximum fire resistance class of the seal in vertical or horizontal separating elements depends on the fire resistance class of the penetrating services. The fire resistance class of the seal is reduced to the fire resistance class of the penetrating service with the lowest fire resistance class.

Release of dangerous substances

The components of KSL do not contain any substances identified as dangerous in the list of the European Commission.

The mineral fibre board, the mineral fibre mats and the mineral wool do not contain any dangerous substances listed in Directive 67/548/EC or Regulation (EC) No. 1272/2008 or the Indicative List on Dangerous Substances.

Durability and serviceability

All components of KSL meet the requirements of type Y_2 in accordance with EOTA TR024. The intumescent material NBR-plus meets the requirements of type X in accordance with EOTA TR 024.

KSL can therefore be used at temperatures below 0 °C but must not be exposed to rain or UV radiation. As the system meets the requirements of type Y_2, it also meets those of types Z_1 und Z_2.

It is assumed that the steel sheet housing of the Variant N II A is sufficiently protected from corrosion by the coating powder.

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1.4 Building elements

Plasterboard walls

Plasterboard walls must have a thickness of ≥ 100 mm.

Cladding must have at least 1 layer with a thickness of ≥ 12.5 mm.

Plasterboard walls with wooden studs must be declared and installed with at least the same number of layers as tested. The distance between the opening and the studs and transoms must be ≥ 100 mm and the hollow spaces between the cladding of the wall, studs and transoms and the opening reveal must be tightly sealed to a depth of ≥ 100 mm with mineral wool, reaction to fire class A1 or A2 according to EN 13501-1.

If one or more studs need to be cut because of the seal installation, horizontal girts must be installed.

Standard plasterboard wall construction is not applicable for construction on the basis of sandwich panels or for plasterboard walls with one-sided cladding (shaft walls).

The supporting structure must be classified for the required fire resistance rating according to EN 13501-2.

Solid walls

Made of e.g. aerated concrete, concrete or masonry with a density of ≥ 350 kg/m^3. The wall must have a thickness of ≥ 100 mm. The walls must be classified for the necessary fire resistance duration according to EN 13501-2.

Solid floors

Made of e.g. aerated concrete, concrete or masonry with a density of ≥ 650 kg/m^3. The floor must have a thickness of ≥ 150 mm. The floors must be classified for the necessary fire resistance duration according to EN 13501-2.

Timber walls and floors

Made of cross laminated timber (CLT) by the manufacturer STORA ENSO.
Wall: thickness 100 mm / layers: 30/40/30
Floor: thickness 140 mm / layers: 40/20/20/20/40

A wall or floor of cross laminated timber can be regarded as equivalent to the tested wall and floor if the following requirements are met.

- The construction of the wall/floor is identical.
- The fire resistance class of the wall/floor is identical or higher.
- The construction is certified as per EN 13501-2.
- The construction is based on the same solid wood panels as tested.
- The solid wood panels are of the same building material category as tested or of a better category.
- The strength class of the solid wood panels as per EN 338 ist equivalent to the class of the tested panels or a higher class.
- The mass burning rate of the solid wood panels as per EN 1995-1-2 is equivalent to the class of the tested panels or a higher class.
- The thickness of the solid wood panel is at least equivalent to that of the tested panel.

Since particularly critical walls and floors were tested with this construction, we are also able to offer our sealing systems for timber components by other manufacturers, such as KLH, Mayr-Melnhof, Binderholz et al. Our technical service will be glad to assist you with any enquiry.

Sandwich panel walls

Sandwich panel walls PAROC AST-S/F with a thickness of ≥ 100 mm.

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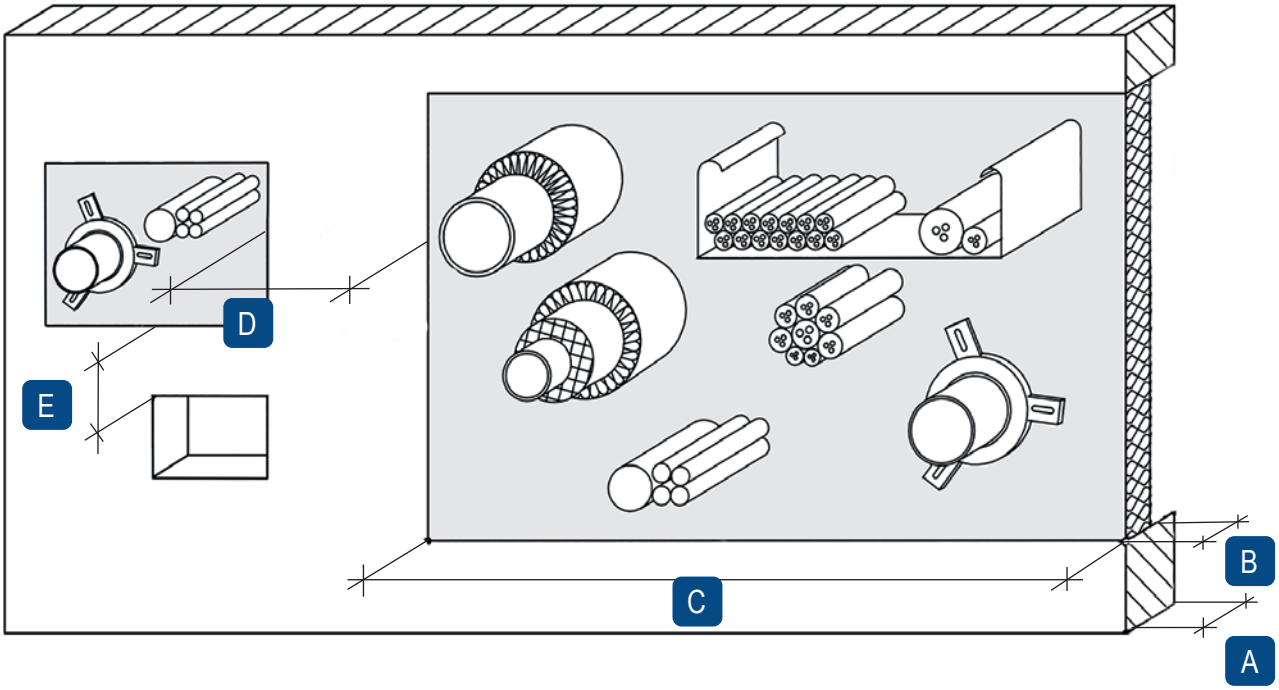
1.5 Thicknesses / penetration seal distances

Dimensions							
		Plasterboard wall [mm]	Solid wall [mm]	Solid floor [mm]	Timber wall [mm]	Timber floor [mm]	Sandwich panel wall [mm]
A	Thickness of building element	≥ 100	≥ 100	≥ 150	≥ 100	≥ 140	≥ 100
B	Thickness of penetration seal	≥ 60	≥ 60	≥ 60	≥ 60	≥ 60	≥ 60
C	Maximum dimensions of the opening (width × height)	≤ 2000 × 1224 or ≤ 1224 × 2000	≤ 2000 × 1224 or ≤ 1224 × 2000	≤ 10 000 × 1000	600 × 1000 or 1000 × 600	600 × 1000	1000 × 1000
D	Distance to other cable or pipe penetration seals	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100
E	Distance to other openings or installations	≥ 200	≥ 200	≥ 200	≥ 200	≥ 200	≥ 200



The total allowable cross section of the installations (outer dimensions) is ≤ 60% of the construction opening.

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2. Fire resistance classes

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.

2.1 Walls

Cables, cable bundles and cable trays	Measure	Fire resistance class	Source[1]
Cables Ø ≤ 21 mm	coating on both sides with BML ≥ 100 mm × ≥ ≥ 0.75 mm dry film thickness	EI 60 / E 90	1
Cables Ø ≤ 50 mm		EI 60 / E 90	1
Cables Ø ≤ 80 mm		EI 60 / E 90	1
Cable bundles Ø ≤ 100 mm		EI 60 / E 90	1
Conduits made of steel Ø ≤ 16 mm		EI 60 U/C / E 90 U/C	1
Conduits made of plastic Ø ≤ 16 mm		EI 90 U/U	1

Coaxial cables and wave guides	Measure	Fire resistance class	Source[1]
CommScope HELIAX®, Ø ≤ 51.1	coating on both sides with BML ≥ 100 mm × ≥ 1.0 mm dry film thickness	EI 45 U/C / E 90 U/C	1
RFS CELLFLEX®, Ø ≤ 50.3		EI 60 U/C / E 90 U/C	
RFS RADIAFLEX®, Ø ≤ 48.2		EI 60 U/C / E 90 U/C	

Electrical installation conduits (EIC)	Measure	Fire resistance class	Source[1]
EIR made of plastic Ø ≤ 32 mm, single or bundled to Ø ≤ 100 mm with/without cables Ø ≤ 21 mm	NBR-plus, 2 layers	EI 60 U/U / E 90 U/U	1

speedpipes	Measure	Fire resistance class	Source[1]
Bundled Ø ≤ 40 mm with single pipes Ø ≤ 7 mm	NBR-plus, 1 layer	EI 90 U/U	1
Bundled Ø ≤ 40 mm with single pipes Ø ≤ 14 mm		EI 60 U/U / E 90 U/U	

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Installation in walls			
HVAC split line combinations	**Measure**	**Fire resistance class**	**Source[1]**
up to two copper pipes Ø ≤ 18.0 mm, wall thickness 1.0–14.2 mm, 9 mm PE foam, + 1 pipe PVC-U/PVC-C Ø ≤ 25.0 mm, wall thickness 1.5 mm, + up to 3 cables Ø ≤ 14.0 mm	NBR-plus, 2 layers	**EI 60**	**1**

Standard combustible pipes with fire protection wrap KSL-W					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**KSL-W**	**Fire resistance class**	**Source[1]**
PVC-U, PVC-C	32.0–50.0	2.4–5.6	2 × 2 layers	**EI 60 U/U**	**1**
	63.0–75.0	2.8–4.6	2 × 3 layers	**EI 60 U/U**	
	90.0–110.0	3.2	2 × 4 layers	**EI 60 U/U**	
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6	2 × 2 layers	**EI 60 U/U**	
	63.0–75.0	2.2–5.4	2 × 3 layers	**EI 60 U/U**	
		> 5.4–6.9	2 × 4 layers	**EI 30 U/U**	
	90.0–110.0	2.7–6.6	2 × 4 layers	**EI 60 U/U**	
		> 6.6–10.0	2 × 4 layers	**EI 30 U/U**	
PP-H	32.0–50.0	2.0–6.9	2 × 2 layers	**EI 90 U/U**	
	63.0–75.0	2.2–8.1	2 × 3 layers	**EI 60 U/U**	
		2.6–5.5	2 × 3 layers	**EI 90 U/U**	
	90.0	2.9–4.5	2 × 4 layers	**EI 90 U/U**	
	90.0–110.0	2.7–10.0	2 × 4 layers	**EI 60 U/U**	
	110.0	3.4	2 × 4 layers	**EI 90 U/U**	

Non-standard combustible pipes with fire protection wrap KSL-W				
Pipe material/type	**Pipe outer Ø [mm]**	**KSL-W**	**Fire resistance class**	**Source[1]**
REHAU RAUPIANO LIGHT, CONEL DRAIN	50	2 × 2 layers	**EI 90 U/U**	**1**
	≤ 110.0	2 × 4 layers	**EI 90 U/U**	
Geberit Silent-db20	56	2 × 2 layers	**EI 90 U/U**	
	≤ 110.0	2 × 4 layers		
Geberit Silent-PP	50	2 × 2 layers	**EI 60 U/U / E 90 U/U**	
	≤ 110.0	2 × 4 layers		
Geberit Silent-Pro	50	2 × 2 layers	**EI 60 U/U / E 90 U/U**	
	≤ 110.0	2 × 4 layers		
POLOPLAST POLO-KAL 3S	75.0	2 × 3 layers	**EI 60 U/U / E 90 U/U**	
	≤ 110.0	2 × 4 layers		
POLOPLAST POLO-KAL NG POLOPLAST POLO-KAL XS	50	2 × 2 layers	**EI 90 U/U**	
	≤ 110.0	2 × 4 layers		
REHAU RAUPIANO PLUS	50.0	2 × 2 layers	**EI 90 U/U**	
	≤ 110.0	2 × 4 layers	**EI 90 U/U**	
Wavin AS+	50	2 × 2 layers	**EI 90 U/U**	
	≤ 110.0	2 × 4 layers		

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Installation in walls

Standard combustible pipes with fire protection collar Variant N II A					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Variant N II A**	**Fire resistance class**	**Source[1]**
PVC-U, PVC-C	32.0–50.0	1.5–5.6	on both sides	**EI 90 U/U**	1
	63.0–75.0	1.6–6.6		**EI 90 U/U**	
	90.0–110.0	1.8–8.1		**EI 90 U/U**	
	125.0–160.0	3.2–11.8		**EI 90 U/U**	
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6		**EI 90 U/U**	
	63.0–75.0	2.2–6.6		**EI 60 U/U / E 90 U/U**	
		5.1–6.6		**EI 90 U/U**	
	90.0–110.0	2.7–10.0		**EI 60 U/U / E 90 U/U**	
		10.0		**EI 90 U/U**	
	125.0–160.0	4.0–14.6		**EI 90 U/U**	
PP-H	32.0–50.0	1.8–4.6		**EI 90 U/U**	
	63.0–75.0	2.2–6.6		**EI 90 U/U**	
	90.0–110.0	2.7–10.0		**EI 90 U/U**	
	125.0–160.0	4.0–14.6		**EI 60 U/U / E 90 U/U**	
		4.0		**EI 90 U/U**	

Non-standard combustible pipes with fire protection collar Variant N II A				
Pipe material/type	**Pipe outer Ø [mm]**	**Variant N II A**	**Fire resistance class**	**Source[1]**
REHAU RAUPIANO LIGHT, CONEL DRAIN	≤ 75.0	on both sides	**EI 90 U/U**	1
	90.0		**EI 60 U/U / E 90 U/U**	
	110.0		**EI 90 U/U**	
Geberit Silent-db20	≤ 160.0		**EI 90 U/U**	
Geberit Silent-PP	≤ 160.0		**EI 90 U/U**	
Geberit Silent-Pro	≤ 160.0		**EI 90 U/U**	
POLOPLAST POLO-KAL 3S	≤ 160.0		**EI 90 U/U**	
POLOPLAST POLO-KAL NG POLOPLAST POLO-KAL XS	≤ 160.0		**EI 90 U/U**	
REHAU RAUPIANO PLUS	50.0		**EI 90 U/U**	
	75.0		**EI 60 U/U / E 90 U/U**	
	≤ 160.0		**EI 90 U/U**	
Wavin AS+	≤ 160.0		**EI 90 U/U**	

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Installation in walls

Multilayer pipes with FEF insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure / insulation**	**Fire resistance class**	**Source[1]**
Geberit Mepla	16.0	2.25	KSL-W, 1 layer + sustained insulation – continuous, thickness 8.0–35.0 mm	**EI 60 U/C / E 90 U/C**	**1**
	20.0	2.5	KSL-W, 1 layer + sustained insulation – continuous, thickness 16.0–35.0 mm		
	26.0	3.0	KSL-W, 1 layer + sustained insulation – continuous, thickness 16.0–35.0 mm		
	32.0	3.0	KSL-W, 1 layer + sustained insulation – continuous, thickness 16.0–35.0 mm		
	40.0	3.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 13.5–39.0 mm		
	50.0	4.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 14.0–39.0 mm		
	63.0	4.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 14.0–40.5 mm		
	75.0	4.7			
Geberit FlowFit	16.0	2.0	KSL-W, 1 layer + sustained insulation – continuous, thickness 8.5–33.5 mm		
	20.0	2.0	KSL-W, 1 layer + sustained insulation – continuous, thickness 13.0–33.5 mm		
	26.0	2.5	KSL-W, 1 layer + sustained insulation – continuous, thickness 13.0–33.5 mm		
	32.0	2.8	KSL-W, 1 layer + sustained insulation – continuous, thickness 13.0–33.5 mm		
	40.0	3.0	KSL-W, 2 layers + sustained insulation – continuous, thickness 16.5–40.5 mm		
	50.0	3.8	KSL-W, 2 layers + sustained insulation – continuous, thickness 17.0–40.5 mm		
	63.0	4.0	KSL-W, 2 layers + sustained insulation – continuous, thickness 17.0–40.5 mm		
	75.0	4.6	KSL-W, 2 layers + sustained insulation – continuous, thickness 17.5–40.5 mm		

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Installation in walls

Multilayer pipes with FEF insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure / insulation**	**Fire resistance class**	**Source[1]**
KE KELIT KELOX KM 100 KE KELIT KELOX KM 110	16.0	2.0	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.0–35.0 mm	**EI 60 U/C / E 90 U/C**	**1**
	18.0	2.0	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.0–35.0 mm		
	20.0	2.25	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.5–35.0 mm		
	25.0	2.5	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.5–35.0 mm		
	32.0	3.0	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 9.0–35.0 mm		
	40.0	4.0	KSL-W, 2 layers + insulation ≥ 250 mm on both sides, thickness 13.0–40.5 mm		
	50.0	4.5	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 13.0–40.5 mm		
	63.0	6.0	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 13.0–40.5 mm		
	75.0	7.5	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 13.0–40.5 mm		

Multilayer pipes with PEF insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure / insulation**	**Fire resistance class**	**Source[1]**
Geberit Mepla	16.5	2.25	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm	**EI 60 U/C / E 90 U/C**	**1**
	20.0	2.5	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		
	26.0	3.0	KSL-W, 1 layer, pre-insulated with PEF 6–13 mm		
	26.0	3.0	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm	**EI 45 U/C / E 90 U/C**	
Geberit FlowFit	16.0	2.0	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm	**EI 60 U/C / E 90 U/C**	
	20.0	2.0	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		
	25.0	2.5	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		

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Multilayer pipes with PEF insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure / insulation**	**Fire resistance class**	**Source[1]**
KE KELIT KELOX KM 100 KE KELIT KELOX KM 110	16.0	2.0	KSL-W, 1 layer, pre-insulated with PEF 4-13 mm	**EI 60 U/C / E 90 U/C**	**1**
	18.0	2.0	KSL-W, 1 layer, pre-insulated with PEF 4-13 mm		
	20.0	2.25	KSL-W, 1 layer, pre-insulated with PEF 4-13 mm		
	25.0	2.5	KSL-W, 1 layer, pre-insulated with PEF 4-13 mm		
	32.0	3.0	KSL-W, 1 layer, pre-insulated with PEF 9-13 mm		
	32.0	3.0	KSL-W, 1 layer, pre-insulated with PEF 4-13 mm	**EI 45 U/C / E 90 U/C**	

Multilayer pipes with insulation made of mineral wool					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Lamella mat insulation**	**Fire resistance class**	**Source[1]**
Geberit Mepla	16.0	2.25	≥ 250 mm on both sides, thickness 20.0–60.0 mm	**EI 90 U/C**	**1**
	20.0	2.5	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	26.0	3.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	32.0	3.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	40.0	3.5	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	50.0	4.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	63.0	4.5	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	75.0	4.7	≥ 250 mm on both sides, thickness 30.0–60.0 mm		

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Installation in walls					
Multilayer pipes with insulation made of mineral wool					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Lamella mat insulation**	**Fire resistance class**	**Source[1]**
Geberit FlowFit	16.0	2.0	≥ 250 mm on both sides, thickness 20.0–60.0 mm	**EI 60 U/C / E 90 U/C**	**1**
			≥ 250 mm on both sides, thickness 30.0–60.0 mm	**EI 90 U/C**	
	20.0	2.0	≥ 250 mm on both sides, thickness 20.0–60.0 mm		
	26.0	2.5	≥ 250 mm on both sides, thickness 20.0–60.0 mm		
	32.0	2.8	≥ 250 mm on both sides, thickness 20.0–60.0 mm		
	40.0	3.0	≥ 250 mm on both sides, thickness 20.0–60.0 mm		
	50.0	3.8	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	63.0	4.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	75.0	4.6	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
KE KELIT KELOX KM 100 KE KELIT KELOX KM 110	16.0	2.0	≥ 250 mm on both sides, thickness 20.0–80.0 mm	**EI 90 U/C**	
	18.0	2.0	≥ 250 mm on both sides, thickness 20.0–80.0 mm		
	20.0	2.25	≥ 250 mm on both sides, thickness 20.0–80.0 mm		
	25.0	2.5	≥ 250 mm on both sides, thickness 20.0–80.0 mm		
	32.0	3.0	≥ 250 mm on both sides, thickness 20.0–80.0 mm		
	40.0	4.0	≥ 250 mm on both sides, thickness 30.0–80.0 mm		
	50.0	4.5	≥ 250 mm on both sides, thickness 30.0–80.0 mm		
	63.0	6.0	≥ 250 mm on both sides, thickness 30.0–80.0 mm		
	75.0	7.5	≥ 250 mm on both sides, thickness 30.0–80.0 mm		

[1] 1 →KB 321100704-A

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Installation in walls					
Non-combustible pipes with insulation made of mineral wool					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
Copper, steel, stainless steel or cast iron	≤ 60.0	0.6–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 470.0 × 30.0–100.0 mm	**EI 60 U/C / E 90 U/C**	**1**
	≥ 60.0 – 88.9	0.6 / 2.0–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 720.0 × 30.0–100.0 mm		
Steel, stainless steel or cast iron	≥ 60.0 – 114.3	0.6 / 2.8–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 470.0 × 30.0–100.0 mm	**EI 60 U/C / E 90 U/C**	
	≥ 114.3 – 219.1	2.8 / 4.5–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 970.0 × 30.0–100.0 mm		

Non-combustible pipes with insulation made of mineral wool (multiple penetration)					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
up to three pipes made of copper, steel, stainless steel or cast iron	≤ 22.0	1.0–14.2	lamella mat on both sides ≥ 470.0 × 30.0 mm	**EI 60 U/C / E 90 U/C**	**1**

Non-combustible pipes with FEF insulation and fire protection wrap					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
90 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 10–26 mm	**EI 90 U/C**	**1**
	≤ 42.0		NBR-plus 2 layers + sustained insulation – continuous, thickness 16.5–26 mm		
	≤ 60.0		NBR-plus 2 layers + sustained insulation – continuous, thickness 19 mm		
60 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 10–38 mm	**EI 60 U/C**	**1**
	≤ 42.0		NBR-plus 2 layers + sustained insulation – continuous, thickness 12–38 mm		
	≤ 60.0		NBR-plus 2 layers + sustained insulation – continuous, thickness 19–38 mm		
	≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 22.5–38 mm		
30 minutes					
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 10–38 mm	**EI 30 U/C**	**1**
	≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 18–38 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in walls

Non-combustible pipes with FEF insulation and fire protection wrap					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
90 minutes					
Steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 18 mm	**EI 90 U/C**	**1**
60 minutes					
Steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 15.5–38 mm	**EI 60 U/C**	**1**
	≤ 114.3		NBR-plus 2 layers + sustained insulation – continuous, thickness 19–38 mm		
	≤ 159.0		NBR-plus 2 layers + sustained insulation – continuous, thickness 25–38 mm + protective FEF insulation 250 × 19 mm		
	≤ 219.1		NBR-plus 2 layers + sustained insulation – continuous, thickness 25–38 mm + protective FEF insulation 250 × 38 mm		

Non-combustible pipes with PIR insulation and fire protection wrap					
Pipe material/ type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
60 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 60 U/C**	**1**
	> 15 – ≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	108.0	2.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 40–80 mm		
45 minutes					
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 45 U/C**	**1**
	> 42 – ≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	108.0	2.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 50–80 mm		
30 minutes					
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 30 U/C**	**1**
	108.0	2.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 30-80 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in walls

Non-combustible pipes with PIR insulation and fire protection wrap					
Pipe material/ type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
60 minutes					
Steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 60 U/C**	**1**
	> 15.0 – ≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	> 88.9 – ≤ 108.0	2.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 40–80 mm		
	> 108.0 – ≤ 168.3	4.0–14.2			
	> 168.3 – ≤ 219.1	4.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 50 mm		
45 minutes					
Steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 45 U/C**	**1**
	> 42.0 – ≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	> 88.9 – ≤ 108.0	2.5–14.2			
	> 108.0 – ≤ 168.3	4.0–14.2			
	> 168.3 – ≤ 219.1	4.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 50 mm		
30 minutes					
Steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20 mm	**EI 30 U/C**	**1**
	> 88.9 – ≤ 108.0	2.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	> 108.0 – ≤ 168.3	4.0–14.2			
	> 168.3 – ≤ 219.1	4.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 50 mm		

Service	Fire resistance class	Source[1]
Blank seal	**EI 90**	**1**

[1] 1 →KB 321100704-A

KSL single layer

2.2 Floors

Cables, cable bundles and cable trays	Measure	Fire resistance class	Source[1]
Cables Ø ≤ 21 mm	oating on both sides with BML ≥ 100 mm × ≥ 0.75 mm dry film thickness	EI 60 / E 90	1
Cables Ø ≤ 50 mm		EI 60 / E 90	
Cables Ø ≤ 80 mm		EI 60 / E 90	
Cable bundles Ø ≤ 100 mm		EI 60 / E 90	
Conduits made of steel Ø ≤ 16 mm		EI 90 U/C	
Conduits made of plastic Ø ≤ 16 mm		EI 90 U/U	

Coaxial cables and wave guides	Measure	Fire resistance class	Source[1]
CommScope HELIAX®, Ø ≤ 51.1	coating on both sides with BML ≥ 100 mm × ≥ 1.0 mm dry film thickness	EI 45 U/C / E 90 U/C	1
RFS CELLFLEX®, Ø ≤ 50.3		EI 45 U/C / E 90 U/C	
RFS RADIAFLEX®, Ø ≤ 48.2		EI 60 U/C / E 90 U/C	

Electrical installation conduits (EIC)	Measure	Fire resistance class	Source[1]
EIR made of plastic Ø ≤ 32 mm, single with/without cables Ø ≤ 21 mm	NBR-plus, 2 layers	EI 90 U/U	1
EIR made of plastic Ø ≤ 32 mm, single or bundled at Ø ≤ 70 mm with/without cables Ø ≤ 21 mm	NBR-plus, 2 layers	EI 90 U/U	
EIR made of plastic Ø ≤ 32 mm, single or bundled at Ø ≤ 80 mm with/without cables Ø ≤ 21 mm	NBR-plus, 2 layers	EI 60 U/U	
EIR made of plastic Ø ≤ 32 mm, single or bundled at Ø ≤ 100 mm with/without cables Ø ≤ 21 mm	NBR-plus, 2 layers	EI 45 U/U / E 90 U/U	

speedpipes	Measure	Fire resistance class	Source[1]
Bundled Ø ≤ 40 mm with single pipes Ø ≤ 7 mm	NBR-plus, 1 layer	EI 90 U/U	1
Bundled Ø ≤ 40 mm with single pipes Ø ≤ 14 mm		EI 90 U/U	

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors			
HVAC split line combinations	**Measure**	**Fire resistance class**	**Source[1]**
up to two copper pipes Ø ≤ 18.0 mm, wall thickness 1.0–14.2 mm, 9 mm PE foam, + 1 pipe PVC-U/PVC-C Ø ≤ 25.0 mm, wall thickness 1.5 mm, + up to 3 cables Ø ≤ 14.0 mm	NBR-plus, 2 layers	**EI 60**	**1**

Standard combustible pipes with fire protection wrap KSL-W					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**KSL-W**	**Fire resistance class**	**Source[1]**
PVC-U, PVC-C	32.0–50.0	2.4	2 × 2 layers	**EI 60 U/U**	**1**
		2.4–3.7		**EI 30 U/U**	
	63.0	3.7–5.5	2 × 3 layers	**EI 30 U/U**	
	75.0	4.8–5.5	2 × 3 layers	**EI 30 U/U**	
	90.0	6.0–6.5	2 × 4 layers	**EI 30 U/U**	
	110.0	8.1	2 × 4 layers	**EI 30 U/U**	
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6	2 × 2 layers	**EI 90 U/U**	
	63.0–75.0	2.2–6.9	2 × 3 layers	**EI 90 U/U**	
	90.0–110.0	2.7–10.0	2 × 4 layers	**EI 90 U/U**	
PP-H	32.0	6.9	2 × 2 layers	**EI 90 U/U**	
	32.0–50.0	2.0–6.9	2 × 2 layers	**EI 60 U/U / E 90 U/U**	
	63.0–75.0	2.3–8.1	2 × 3 layers	**EI 60 U/U / E 90 U/U**	
		5.1–6.7	2 × 3 layers	**EI 90 U/U**	
	90.0–110.0	2.7–6.3	2 × 4 layers	**EI 90 U/U**	
		2.7–10.0	2 × 4 layers	**EI 60 U/U / E 90 U/U**	

Non-standard combustible pipes with fire protection wrap KSL-W				
Type of pipe	**Pipe outer Ø [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
REHAU RAUPIANO LIGHT, CONEL DRAIN	50	KSL-W, 2 × 50 mm, 2 layers	**EI 60 U/U / E 90 U/U**	**1**
Geberit Silent-db20	56	KSL-W, 2 × 50 mm, 2 layers	**EI 90 U/U**	
	≤ 110	KSL-W, 2 × 50 mm, 4 layers	**EI 90 U/U**	
Geberit Silent-PP	50	KSL-W, 2 × 50 mm, 2 layers	**EI 60 U/U / E 90 U/U**	
	≤ 110	KSL-W, 2 × 50 mm, 4 layers	**EI 60 U/U / E 90 U/U**	
Geberit Silent-Pro	50	KSL-W, 2 × 50 mm, 2 layers	**EI 90 U/U**	
	≤ 110	KSL-W, 2 × 50 mm, 4 layers	**EI 90 U/U**	
POLOPLAST POLO-KAL 3S	75	KSL-W, 2 × 50 mm, 3 layers	**EI 60 U/U / E 90 U/U**	
	≤ 110	KSL-W, 2 × 50 mm, 4 layers	**EI 60 U/U / E 90 U/U**	
POLOPLAST POLO-KAL NG POLOPLAST POLO-KAL XS	50	KSL-W, 2 × 50 mm, 2 layers	**EI 60 U/U**	
	≤ 110	KSL-W, 2 × 50 mm, 4 layers	**EI 60 U/U**	
REHAU RAUPIANO PLUS	50	KSL-W, 2 × 50 mm, 2 layers	**EI 60 U/U / E 90 U/U**	
Wavin AS+	50	KSL-W, 2 × 50 mm, 2 layers	**EI 90 U/U**	
	≤ 110	KSL-W, 2 × 50 mm, 4 layers	**EI 90 U/U**	

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KSL single layer

Installation in floors

Standard combustible pipes with fire protection collar Variant N II A					
Pipe material/type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Variant N II A**	**Fire resistance class**	**Source[1]**
PVC-U, PVC-C	32.0–50.0	1.5–5.6	below floor	**EI 60 U/U / E 90 U/U**	**1**
	63.0–75.0	1.6–6.6		**EI 60 U/U / E 90 U/U**	
	90.0–110.0	1.8–7.0/8.1		**EI 60 U/U / E 90 U/U**	
	125	2.5–9.2		**EI 60 U/U / E 90 U/U**	
	140.0–160.0	3.2–11.8		**EI 60 U/U / E 90 U/U**	
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6		**EI 60 U/U**	
	63.0–75.0	2.3–6.6		**EI 90 U/U**	
	90.0	2.8–8.2		**EI 90 U/U**	
	110.0	3.4–10.0		**EI 90 U/U**	
	125.0 – ≤ 160.0	4.0–14.6		**EI 60 U/U**	
PP-H	32.0–50.0	1.8–4.6		**EI 60 U/U**	
	63.0–75.0	1.9–8.6		**EI 90 U/U**	
	90.0	2.2–8.2		**EI 90 U/U**	
	110.0	2.7–10.0		**EI 90 U/U**	
	125.0	3.1–3.9		**EI 90 U/U**	
	125.0–160.0	4.0–14.6		**EI 60 U/U**	

Non-standard combustible pipes with fire protection collar Variant N II A				
Type of pipe	**Pipe outer Ø [mm]**	**Variant N II A**	**Fire resistance class**	**Source[1]**
Geberit Silent-db20	≤ 160	below floor	**EI 90 U/U**	**1**
Geberit Silent-PP	≤ 160		**EI 90 U/U**	
Geberit Silent-Pro	≤ 110		**EI 90 U/U**	
	≤ 160		**EI 60 U/U / E 90 U/U**	

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KSL single layer

Installation in floors

Multilayer pipes with FEF insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure/insulation**	**Fire resistance class**	**Source[1]**
90 minutes					
Geberit Mepla	≥ 40.0 – ≤ 63.0	3.5–4.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 35.0–39.0 mm	**EI 90 U/C**	**1**
	63.0	4.5			
Geberit FlowFit	16.0	2.0	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.5–35.0 mm		
	20.0	2.0	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.5–35.0 mm		
	26.0	2.5	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 13.0–35.0 mm		
	32.0	2.8	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 13.0–35.0 mm		
	40.0	3.0	KSL-W, 2 layers + insulation ≥ 250 mm on both sides, thickness 20.5–40.5 mm		
	50.0	3.8	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 40.5 mm		
	63.0	4.0	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 40.5 mm		
	75.0	4.6	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 40.5 mm		
60 minutes					
Geberit Mepla	16.0	2.25	KSL-W, 1 layer + sustained insulation – continuous, thickness 8.0–35.0 mm	**EI 60 U/C / E 90 U/C**	**1**
	20.0	2.5	KSL-W, 1 layer + sustained insulation – continuous, thickness 8.0–35.0 mm		
	26.0	3.0			
	32.0				
	40.0	3.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 9.0–40.5 mm		
	50.0	4.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 14.0–40.5 mm		
	63.0	4.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 14.0–40.5 mm		
	75.0	4.7	KSL-W, 2 layers + sustained insulation – continuous, thickness 17.0–40.5 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors

Multilayer pipes with FEF insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure/insulation**	**Fire resistance class**	**Source[1]**
60 minutes					
Geberit FlowFit	16.0	2.0	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.5–35.0 mm	**EI 60 U/C / E 90 U/C**	**1**
	20.0	2.0	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 8.5–35.0 mm		
	26.0	2.5	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 13.0–35.0 mm		
	32.0	2.8	KSL-W, 1 layer + insulation ≥ 250 mm on both sides, thickness 13.0–35.0 mm		
	40.0	3.0	KSL-W, 2 layers + insulation ≥ 250 mm on both sides, thickness 16.5–40.5 mm		
	50.0	3.8	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 17.0–40.5 mm		
	63.0	4.0	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 17.0–40.5 mm		
	75.0	4.6	KSL-W, 2 layers + insulation ≥ 500 mm on both sides, thickness 17.5–40.5 mm		
45 minutes					
Geberit Mepla	16.0	2.25	KSL-W, 1 layer + sustained insulation – continuous, thickness 8.0-35.0 mm	**EI 45 U/C / E 90 U/C**	**1**
	20.0	2.5			
	26.0	3.0			
	32.0	3.0			
			KSL-W, 2 layers + sustained insulation – continuous, thickness 35.0-39.0 mm		
	40.0	3.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 8.0-39.0 mm		
	50.0	4.5	KSL-W, 2 layers + sustained insulation – continuous, thickness 9.0-39.0 mm		
	63.0		KSL-W, 2 layers + sustained insulation – continuous, thickness 9.0-40.5 mm		
	75.0	4.7	KSL-W, 2 layers + sustained insulation – continuous, thickness 9.5-40.5 mm		

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KSL single layer

Installation in floors

Multilayer pipes with PEF insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure/insulation**	**Fire resistance class**	**Source[1]**
Geberit Mepla	16.0	2.25	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm	**EI 90 U/C**	**1**
	20.0	2.5	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		
	26.0	3.0	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		
Geberit FlowFit	16.0	2.0	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		
	20.0	2.0	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		
	25.0	2.5	KSL-W, 1 layer, pre-insulated with PEF 6–26 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors					
Multilayer pipes with insulation made of mineral wool					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Lamella mat insulation**	**Fire resistance class**	**Source[1]**
Geberit Mepla	16.0	2.25	≥ 250 mm on both sides, thickness 20.0–60.0 mm	**EI 90 U/C**	**1**
	20.0	2.5	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	26.0	3.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	32.0	3.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	40.0	3.5	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	50.0	4.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	63.0	4.5	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	75.0	4.7	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
Geberit FlowFit	16.0	2.0	≥ 250 mm on both sides, thickness 20.0–60.0 mm		
	20.0	2.0	≥ 250 mm on both sides, thickness 20.0–60.0 mm		
	26.0	2.5	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	32.0	2.8	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	40.0	3.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	50.0	3.8	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	63.0	4.0	≥ 250 mm on both sides, thickness 30.0–60.0 mm		
	75.0	4.6	≥ 250 mm on both sides, thickness 30.0–60.0 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors

Non-combustible pipes with insulation made of mineral wool					
Pipe material	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
60 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.8–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 220 × 30–100 mm	**EI 60 U/C**	**1**
	≥ 15.0 – ≤ 42.0	1.0–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 470 × 30–100 mm		
	≥ 42.0 – ≤ 88.9	1.0 / 2.0–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 970 × 30–100 mm		
45 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 220 × 30–100 mm	**EI 45 U/C**	**1**
	≥ 15.0 – ≤ 60.0	0.6–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 470 × 30–100 mm		
	≥ 60.0 – ≤ 88.9	0.6 / 2.0–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 720 × 30–100 mm		

Non-combustible pipes with insulation made of mineral wool					
Pipe material	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
90 minutes					
Steel, stainless steel or cast iron	≤ 63.5	0.8 / 2.3–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 220 × 30–100 mm	**EI 90 U/C**	**1**
	≥ 63.5 – ≤ 114.3	2.3 / 3.2–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 470 × 30–100 mm		
	≥ 114.3 – ≤ 159.0	2.3 / 3.6–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 970 × 30–100 mm		
60 minutes					
Steel, stainless steel or cast iron	≥ 159.0 – ≤ 219.1	3.6 / 4.0–14.2	lamella mat (LS/CS – LI/CI) on both sides ≥ 970 × 30–100 mm	**EI 60 U/C**	**1**

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors

Non-combustible pipes with insulation made of mineral wool (multiple penetration)					
Pipe material	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
up to three pipes made of copper, steel, stainless steel or cast iron	≤ 22.0	1.0–14.2	lamella mat on both sides ≥ 425.0 × 30.0 mm	**EI 45 U/C / E 90 U/C**	**1**

Non-combustible pipes with FEF insulation and fire protection wrap					
Pipe material	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
90 minutes					
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 38 mm	**EI 90 U/C**	**1**
60 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 10–38 mm	**EI 60 U/C**	**1**
	≤ 42.0		NBR-plus 2 layers + sustained insulation – continuous, thickness 12–38 mm		
	≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 19–38 mm		
30 minutes					
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 10–38 mm	**EI 30 U/C**	**1**
	≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 19–38 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors

Non-combustible pipes with FEF insulation and fire protection wrap					
Pipe material	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
60 minutes					
Steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 10–38 mm	**EI 60 U/C**	**1**
	≤ 42.0		NBR-plus 2 layers + sustained insulation – continuous, thickness 15–38 mm		
	≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 18.5–38 mm		
	≤ 114.3	3.2–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 18.5–38 mm		
	≤ 159.0	4.0–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 25–38 mm + protective FEF insulation 250 × 19 mm		
	≤ 219.1	4.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 25–38 mm + protective FEF insulation 250 × 38 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors					
Non-combustible pipes with PIR insulation and fire protection wrap					
Pipe material/ type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
90 minutes					
Copper, steel, stainless steel or cast iron	≤ 42.0	1.0–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 40 mm	**EI 90 U/C**	**1**
60 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 60 U/C**	**1**
	> 15 – < 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	> 88.9 – < 108.0	2.5–14.2			
45 minutes					
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 45 U/C**	**1**
	> 42 – ≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	> 88.9 – ≤ 108.0	2.5–14.2			
30 minutes					
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 30 U/C**	**1**
	> 88.9 – ≤ 108.0	2.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		

[1] 1 →KB 321100704-A

KSL single layer

Installation in floors

Non-combustible pipes with PIR insulation and fire protection wrap					
Pipe material/ type	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Measure**	**Fire resistance class**	**Source[1]**
60 minutes					
Steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 20–80 mm	**EI 60 U/C**	**1**
	> 15.0 – ≤ 88.9		NBR-plus 2 layers + sustained insulation – continuous, thickness 30–80 mm		
	> 88.9 – ≤ 108.0	2.5–14.2			
	> 108.0 – ≤ 168.3	4.0–14.2			
	> 168.3 – ≤ 219.1	4.5–14.2	NBR-plus 2 layers + sustained insulation – continuous, thickness 100 mm		

Service	Fire resistance class	Source[1]
Blank seal	**EI 90**	**1**

[1] 1 →KB 321100704-A

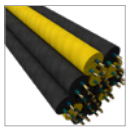
KSL single layer

3. Allowed services

3.1 Cables / cable bundles / cable trays / electrical installation conduits

Electrical cables and lines of all types

Sheathed cables with outer Ø ≤ 80 mm



Cable bundles

Outer Ø ≤ 100 mm with single cables Ø ≤ 21 mm

Cable trays

Cable trays and cable ladders made of steel

Conduits made of steel or plastic

Steel pipes (C/U) or plastic pipes (U/U) with outer Ø ≤ 16 mm

Coaxial cables and wave guides

CommScope HELIAX®, Ø ≤ 51.1
RFS CELLFLEX®, Ø ≤ 50.3
RFS RADIAFLEX®, Ø ≤ 48.2

Electrical installation conduits (EIC), single, made of plastic

Outer Ø ≤ 32 mm

Electrical installation conduits (EIC), bundled, made of plastic

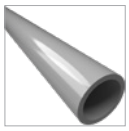
Outer Ø ≤ 100 mm

PE lines speedpipes

bundled Ø [mm]	≤ 40	≤ 40
single Ø [mm]	≤ 14	≤ 7

KSL single layer

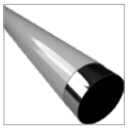
3.2 Combustible pipes



Pipe material	According to standard	Pipe outer Ø [mm]	Pipe wall thickness [mm]
PVC-U pipes	EN 1329-1, EN 1452-2, EN 1453-1, EN ISO 15493	32.0–160.0	1.8–11.8
PVC-C pipes	EN 1566-1, EN ISO 15493, EN ISO 15877	32.0–160.0	1.8–11.8
PE-HD pipes	EN 1519-1, EN 12201-2, EN ISO 15494, EN 12666-1	32.0–160.0	1.8–14.6
PP-H pipes	EN 1451-1, EN ISO 15874, EN 15494	32.0–160.0	1.8–14.6
ABS pipes	EN 1455-1, EN ISO 15493	32.0–160.0	1.8–14.6
SAN + PVC pipes	EN 1565-1	32.0–160.0	1.8–14.6

Type of pipe	Pipe outer Ø [mm]
Geberit Silent-PP	32.0–160.0
Geberit Silent-Pro	50.0–160.0
Geberit Silent-dB20	56.0–160.0
POLOPLAST POLO-KAL 3S	75.0–110.0
POLOPLAST POLO-KAL NG	40.0–160.0
POLOPLAST POLO-KAL XS	40.0–160.0
CONEL DRAIN	40.0–110.0
Wavin AS+	50.0–160.0
REHAU RAUPIANO PLUS	50.0–160.0
REHAU RAUPIANO LIGHT	40.0–110.0

3.3 Multilayer pipes

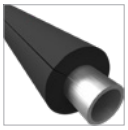


Type of pipe	Pipe outer Ø [mm]	Pipe wall thickness [mm]
Geberit Mepla	16.0–75.0	2.25–4.7
Geberit FlowFit	16.0–75.0	2.0–4.6
KE KELIT KELOX KM 100, KE KELIT KELOX KM 110	16.0–75.0	2.0–7.5

KSL single layer

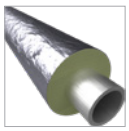
3.4 Non-combustible pipes

3.4.1 Non-combustible pipes with FEF insulation



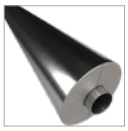
Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6–14.2
Steel, stainless steel or cast iron	≤ 219.1	0.6–14.2

3.4.2 Non-combustible pipes with insulation made of mineral wool



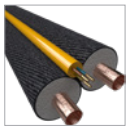
Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6–14.2
Steel, stainless steel or cast iron	≤ 219.1	0.6–14.2

3.4.3 Non-combustible pipes with insulation made of PIR



Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]
Copper, steel, stainless steel or cast iron	≤ 108.0	0.6–14.2
Steel, stainless steel or cast iron	≤ 219.1	0.6–14.2

3.5 Other



HVAC split line combinations

up to 2 copper pipes Ø ≤ 18.0 mm, pipe wall thickness 1.0–14.2 mm, 9 mm PE foam,
1 pipe PVC-U/PVC-C Ø ≤ 25.0 mm, pipe wall thickness 1.5 mm, up to 3 cables Ø ≤ 14.0 mm

4. Spacing distances for services

KSL single layer – spacing distances in walls and floors

	Cables	Cable bundles	Cable trays	Wave guides / coaxial cables	speedpipes	EIC, single/bundled, made of plastic	Combustible pipes	Non-combustible pipes with FEF insulation	Non-combustible pipes with insulation made of mineral wool	Non-combustible pipes with PIR insulation	Multilayer pipes	HVAC split line combinations	Seal edge		
													Upper	Lower	Side
Cables	≥ 0	≥ 0	≥ 0	≥ 40	≥ 100	≥ 75	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 0		
Cable bundles	≥ 0	≥ 0	≥ 0	≥ 40	≥ 100	≥ 75	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 0		
Cable trays	≥ 0	≥ 0	≥ 0 (horizontally) ≥ 100 (vertically)	≥ 40	≥ 100	≥ 75	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 0		
Wave guides / coaxial cables	≥ 40	≥ 40	≥ 40	≥ 25	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 25		
speedpipes	≥ 100	≥ 100	≥ 100	≥ 100	≥ 0	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 25		
EIC, single/bundled, made of plastic	≥ 75	≥ 75	≥ 75	≥ 100	≥ 100	≥ 0	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 25		
Combustible pipes	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 25		
Non-combustible pipes with FEF insulation	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 100	≥ 100	≥ 100	≥ 100	≥ 25		
Non-combustible pipes with insulation made of mineral wool	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 25	≥ 100	≥ 100	≥ 100	≥ 25		
Non-combustible pipes with PIR insulation	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 0	≥ 100	≥ 100	≥ 20		
Multilayer pipes	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 100	≥ 25		
HVAC split line combinations	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 25		

All specifications in mm

KSL single layer – spacing distances in timber walls, timber floors and sandwich panel walls

	Cables	Cable bundles	Cable trays	Wave guides / coaxial cables	speedpipes	EIC, single/bundled, made of plastic	Combustible pipes	Non-combustible pipes with FEF insulation	Non-combustible pipes with insulation made of mineral wool	Non-combustible pipes with PIR insulation	Multilayer pipes	HVAC split line combinations	Seal edge		
													Upper	Lower	Side
Cables	≥ 0	≥ 0	≥ 0	≥ 40	≥ 100	≥ 75	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
Cable bundles	≥ 0	≥ 0	≥ 0	≥ 40	≥ 100	≥ 75	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
Cable trays	≥ 0	≥ 0	≥ 0 (horizontally) ≥ 100 (vertically)	≥ 40	≥ 100	≥ 75	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
Wave guides / coaxial cables	≥ 40	≥ 40	≥ 40	≥ 25	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
speedpipes	≥ 100	≥ 100	≥ 100	≥ 100	≥ 0	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
EIC, single/bundled, made of plastic	≥ 75	≥ 75	≥ 75	≥ 100	≥ 100	≥ 0	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
Combustible pipes	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
Non-combustible pipes with FEF insulation	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100		
Non-combustible pipes with insulation made of mineral wool	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 25	≥ 100	≥ 100	≥ 100	≥ 100		
Non-combustible pipes with PIR insulation	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 0	≥ 100	≥ 100	≥ 100		
Multilayer pipes	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 100	≥ 100		
HVAC split line combinations	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 100	≥ 50	≥ 100		

All specifications in mm

KSL single layer

5. Included Products

BML fire stop compound

5 kg pail – Art. no. 40050
12.5 kg pail – Art. no. 40125

BMS fire stop filler

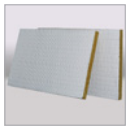
5 kg pail – Art. no. 10500
12.5 kg pail – Art. no. 10125

BMK filler

0.4 kg cartridge – Art. no. 30004

Mineral wool A1

Reaction to fire class acc. to EN 13501-1: A1
Melting point ≥ 1000 °C
10 kg bag – Art. no. 01183000

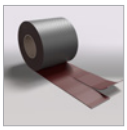


BSL mineral fibre board

Pre-coated on both sides with BML fire stop compound
(dry film thickness = approx. 1.0 mm)
Dimensions 1000 × 625 × 60 mm –
Art. no. 52036

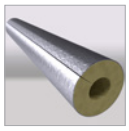
Variant N II A
fire protection collar
Ø 32–160 mm – Art. no. 15032–15160

KSL-W
fire protection wrap
Roll, 10 m × 50 mm self-adhesive
– Art. no. 15510
Roll, 20 m × 50 mm self-adhesive
– Art. no. 15520
Roll, 10 m × 100 mm self-adhesive
– Art. no. 15530



NBR-plus
fire protection wrap
Roll, 10 m × 125 mm
pre-slotted (separable into 2× 62.5 mm)
– Art. no. 01261941

KSL single layer

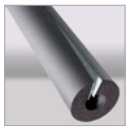


Mineral fibre lamella mat or pipe sleeves

Classification: A2-S1, d0 or A1 in accordance with EN 13501-1
Minimum bulk density: 35 kg/m³
Melting point ≥ 1000 °C

for example:

Name	Nominal bulk density [kg/m³]	DIN/ abZ/abP
Rockwool lamella mat KLIMAROCK Roll à 3.05 m² – Art. no. 01187100	40-50	DE0628031801 of 14.03.2018
Rockwool ProRox PS 960 (formerly ROCKWOOL Lapimus Pipe sleeve 880)	95-150	PROPS960NL-03
Rockwool 800	90-115	DE0721011801 of 15.01.2018
Rockwool ProRox WM 950 (formerly WM 80/RTD-2)	85	PROWM950D-03 of 04.05.2017
Rockwool ProRox WM WM 960 (formerly WM 100/ RBM)	100	PROWM960D-03 of 04.05.2017
Rockwool Conlit 150 U	150	P-NDS04-417
Isover Schalen Protect 1000 S, Isover Schalen Protect 1000 S Alu	70-90	DE0002-Pipe_Sections 001 of 10.06.2013
Isover mineral fibre mat MD2 and MD2/A	80	DE0002-Protect_EN14303 002 of 09.02.2015
Isover mineral fibre mat MDD and MDD/A	115	
PAROC Hvac Section AluCoat T	85–120	40361
PAROC Pro Section 100	100	40080
PAROC Hvac Lamella Mat AluCoat Fix	50	40236

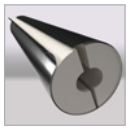


Section and protective insulations

made of flexible elastomeric foam (FEF)
in accordance with EN 14304

for example:

Name	DIN/abZ/abP
ArmaFlex Protect	(0543-CPR-2016-001, 01.04.2015)
AF/ArmaFlex	0543-CPR-2016-001, 01.04.2015
AF/ArmaFlex Evo	0543-CPR-2020-101
SH/ArmaFlex	0543-CPR-2013-013, 01.01.2015
NH/ArmaFlex	0552-CPR-2013-015, 08.08.2018
NH/ArmaFlex Smart	0543-CPR-2020-102
ArmaFlex LS	0551-CPR-2016-066
ArmaFlex Ultima	0543-CPR-2016-017
FEF Kaiflex KKplus s1	DoP KKplus s1 01032018001, 01.03.2018
FEF Kaiflex HTplus	DoP HTplus s1 01032018001 01.03.2018
K-Flex R90	P-2300/871/16-MPA BS, 04.10.2016
flexen Heizungskautschuk	LE_5258006015_00_M_flexen_Heizungskautschuk, 30.06.2013
flexen Kältekautschuk	LE_0869806006_00_M_flexen_Kältekautschuk, 30.06.2013
EUROBATEX	01/20190610
EUROBATEX HF	03/20171201



PIR pipe shells

made of polyisocyanurate
in accordance with EN 14308

for example:

Name	Declaration of Performance
REGOPIR HF	R0115, 21.08.2020
REGOPIR HF ALU GLATT SCHALEN	R0116, 06.10.2021
REGOPIR HF ALU GITTER	R0117, 06.10.2021
REGOPIR HF ALU STUCCO	R0118, 21.08.2020

5.1 Declarations of Performance

The Declarations of Performance for the featured products are available for download on our website:
https://svt-global.com/downloads

KSL single layer

6. Design variants

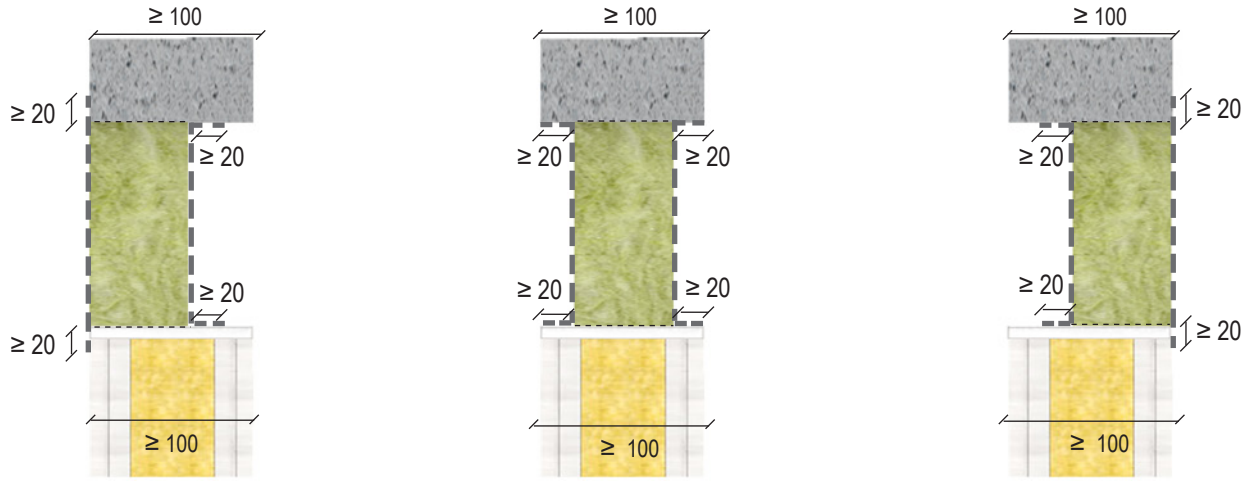
The mineral fibre boards must be glued along all edges with BML, BMS or BMK.

The mineral fibre boards must be glued to the seal edge with BMS/BMK.

Annular gaps ≤ 5 mm must be completely filled with BMS/BMK.

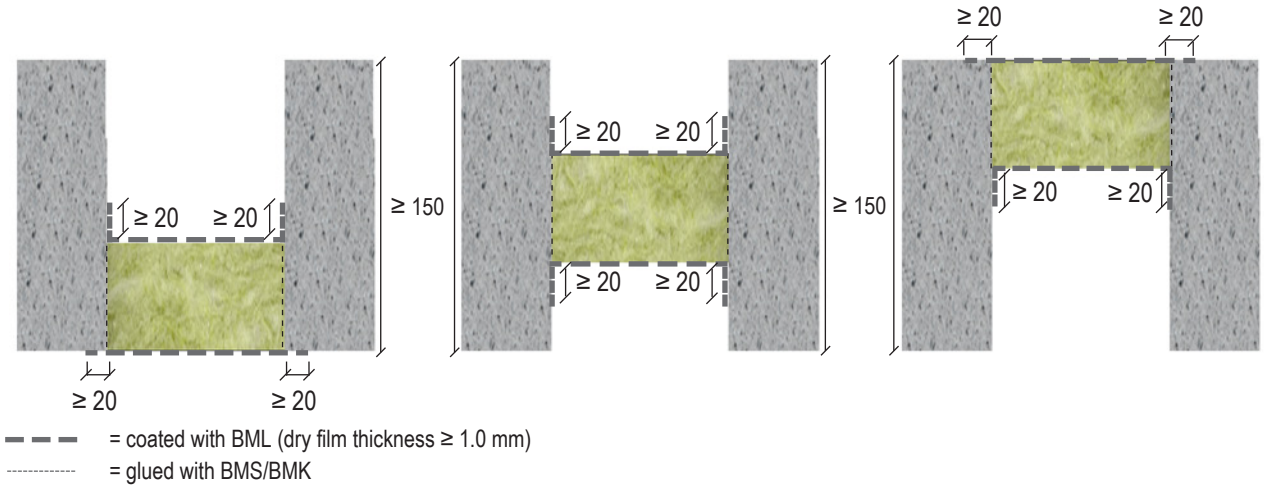
Annular gaps ≤ 25 mm must be filled with mineral wool and coated with BML/BMS/BMK (dry film thickness ≥ 1 mm).

Design variants in walls



All specifications in mm

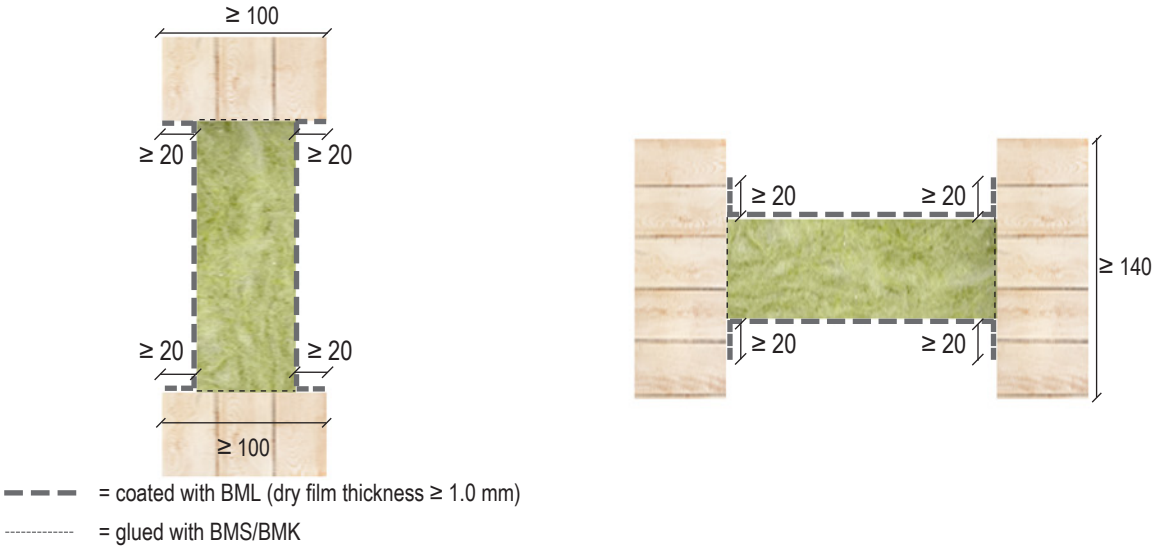
Design variants in floors



All specifications in mm

KSL single layer

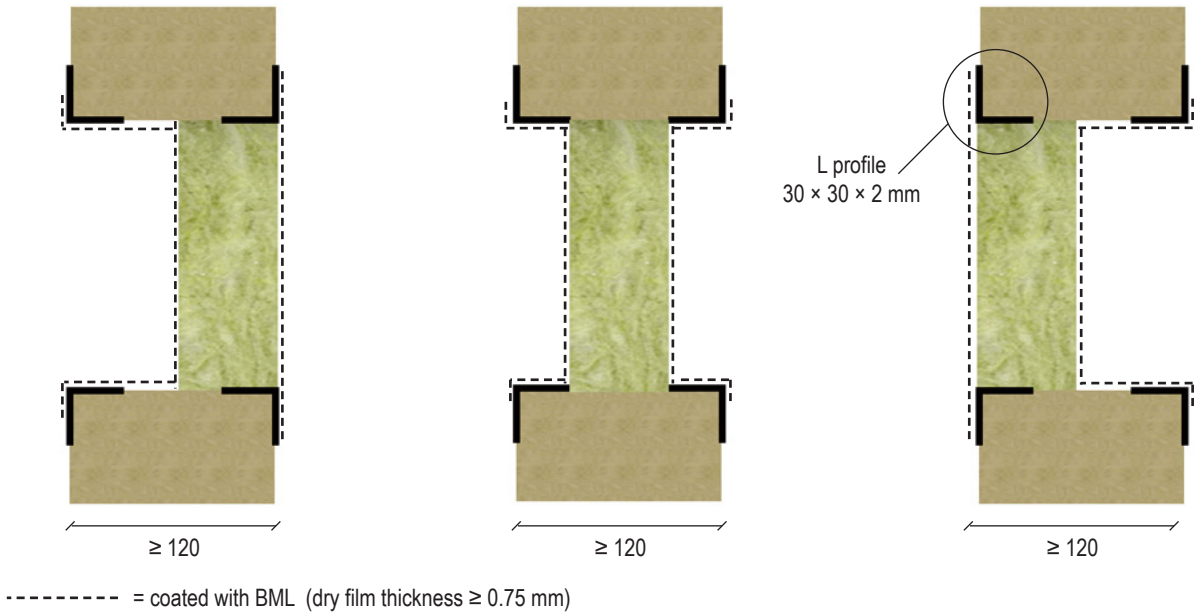
Design variants in timber walls



All specifications in mm

- In timber walls and floors, the spacing distance between applied services and seal edge must always be at least 100 mm (see chapter 4. “Spacing distances for services”).

Design variants in sandwich panel walls



All specifications in mm

- On both sides of the seal, L profiles with the dimensions 30 × 30 × 2 mm must be attached alongside the reveal.
- In sandwich panel walls, the spacing distance between applied services and seal edge must always be at least 100 mm (see chapter 4. “Spacing distances for services”).

KSL single layer

6.1 Initial brackets (supports)

Essential parts of the brackets/supports for the installations in front of the penetration sealing system must be non-combustible and must be configured with a spacing as per the overview.

	wall [mm]	floor [mm]
Cables, cable bundles, cable trays	≤ 350 mm on both sides	≤ 350 mm above
Coaxial cables, wave guides	≤ 350 mm on both sides	≤ 500 mm above
Electrical installation conduits	≤ 500 mm on both sides	≤ 500 mm above
speedpipes	≤ 500 mm on both sides	≤ 500 mm above
HVAC split line combinations	≤ 250 mm on both sides	≤ 500 mm above
Non-combustible pipes with mineral wool insulation	≤ 850 mm on both sides	≤ 850 mm above
Non-combustible pipes with FEF insulation	≤ 650 mm on both sides	≤ 650 mm above
Non-combustible pipes with PIR insulation	≤ 650 mm on both sides	≤ 650 mm above
Combustible pipes	≤ 500 mm on both sides	≤ 650 mm above
Multilayer pipes	≤ 650 mm on both sides	≤ 650 mm above

KSL single layer

7. Fire protection measures

7.1 Cables / cable bundles / cable trays

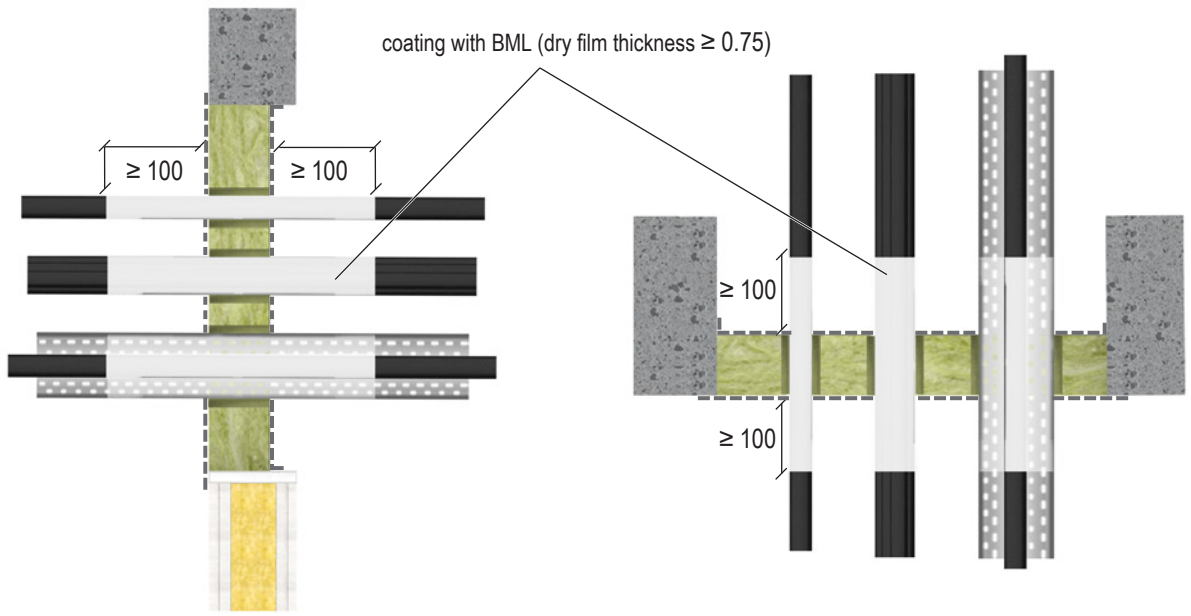
All cables, cable bundles and cable trays (as measured from the seal surface) must be coated over a length of ≥ 100 mm with BML on both sides of the penetration seal.

All cables must be coated inside the penetration area (below the mineral fibre boards) with a thickness of ≥ 0.75 mm (total dry film thickness).

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Single strands with Ø ≤ 21 mm do not require coating.

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall		
Service	**Coating with BML on both sides**	**Fire resistance class**
Cables Ø ≤ 21 mm	≥ 100 mm × ≥ 0.75 mm dry film thickness	**EI 60 / E 90**
Cables Ø ≤ 50 mm		**EI 60 / E 90**
Cables Ø ≤ 80 mm		**EI 60 / E 90**
Cable bundles Ø ≤ 100 mm		**EI 60 / E 90**
Conduits made of steel Ø ≤ 16 mm		**EI 60 U/C / E 90 U/C**
Conduits made of plastic Ø ≤ 16 mm		**EI 90 U/U**

Floor		
Service	**Coating with BML on both sides**	**Fire resistance class**
Cables Ø ≤ 21 mm	≥ 100 mm × ≥ 0.75 mm dry film thickness	**EI 60 / E 90**
Cables Ø ≤ 50 mm		**EI 60 / E 90**
Cables Ø ≤ 80 mm		**EI 60 / E 90**
Cable bundles Ø ≤ 100 mm		**EI 60 / E 90**
Conduits made of steel Ø ≤ 16 mm		**EI 90 U/C**
Conduits made of plastic Ø ≤ 16 mm		**EI 90 U/U**

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

KSL single layer

7.2 Coaxial cables and wave guides

All coaxial cables and wave guides (as measured from the seal surface) must be coated with BML over a length ≥ 100 mm of on both sides of the penetration seal.

All coaxial cables and wave guides must be coated inside the penetration area (below the mineral fibre boards) with a thickness of ≥ 1.0 mm (total dry film thickness).

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall penetration seals

For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall		
Service	**Coating with BML on both sides**	**Fire resistance class**
CommScope HELIAX®, Ø ≤ 51.1	≥ 100 mm × ≥ 1.0 mm dry film thickness	**EI 45 U/C / E 90 U/C**
RFS CELLFLEX®, Ø ≤ 50.3		**EI 60 U/C / E 90 U/C**
RFS RADIAFLEX®, Ø ≤ 48.2		**EI 60 U/C / E 90 U/C**

Floor		
Service	**Coating with BML on both sides**	**Fire resistance class**
CommScope HELIAX®, Ø ≤ 51.1	≥ 100 mm × ≥ 1.0 mm dry film thickness	**EI 45 U/C / E 90 U/C**
RFS CELLFLEX®, Ø ≤ 50.3		**EI 45 U/C / E 90 U/C**
RFS RADIAFLEX®, Ø ≤ 48.2		**EI 60 U/C / E 90 U/C**

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

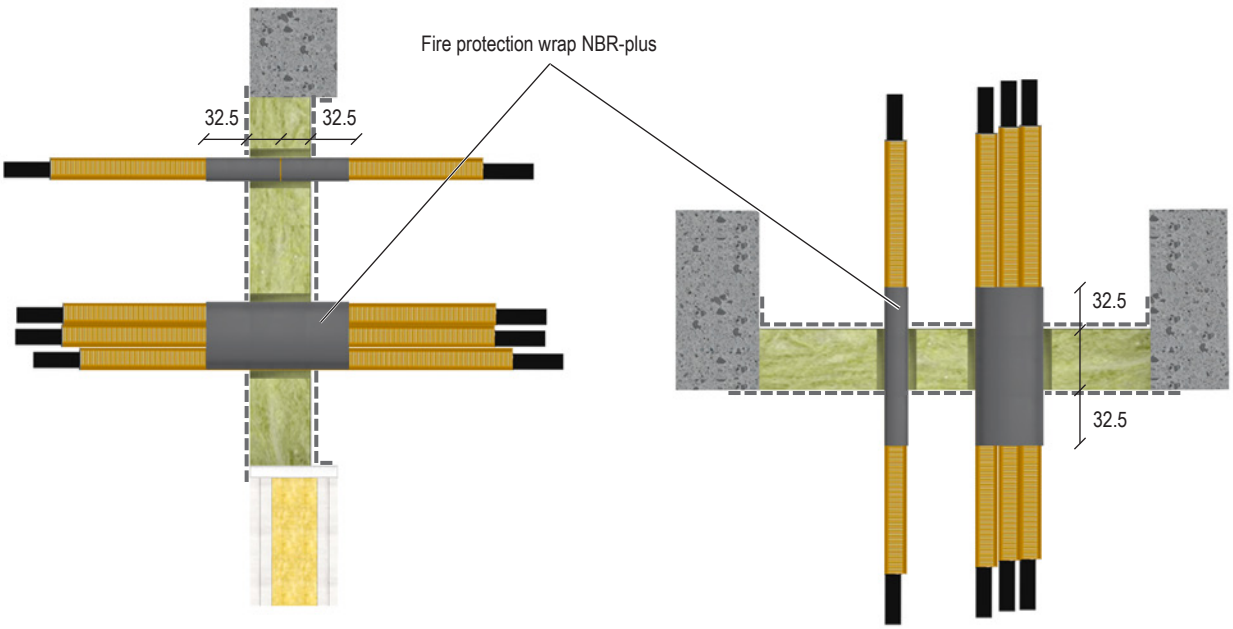
KSL single layer

7.3 Electrical installation conduits (EIC)

Electrical installation conduits must be installed with the fire protection wrap NBR-plus. The wrap must protrude at a length of 32.5 mm (± 5.0 mm) from both sides of the seal. It is possible to use either a single wrap width a width of 125 mm or two wraps with a width of 62.5 mm. The wrap must be fastened with adhesive tape.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall							
Service	Outer Ø [mm]	Fire protection wrap NBR-plus					Fire resistance class
		Wrap width [mm]	Number of layers [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	
Electrical installation conduits made of plastic, single, with/without cables ≤ 21 mm	≤ 32.0	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	EI 60 U/U / E 90 U/U
Electrical installation conduits made of plastic, bundled, with/without cables ≤ 21 mm	≤ 100.0						

Floor							
Service	Outer Ø [mm]	Fire protection wrap NBR-plus					Fire resistance class
		Wrap width [mm]	Number of layers [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	
Electrical installation conduits made of plastic, single, with/without cables ≤ 21 mm	≤ 32.0	2 × 62.5 oder 1 × 125	2	0	2 × 30 oder 1 × 60	2 × 32.5	EI 90 U/U
Electrical installation conduits made of plastic, bundled, with/without cables ≤ 21 mm	≤ 70.0		2				EI 90 U/U
	≤ 80.0		2				EI 60 U/U
	≤ 100.0		2				EI 45 U/U / E 90 U/U

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

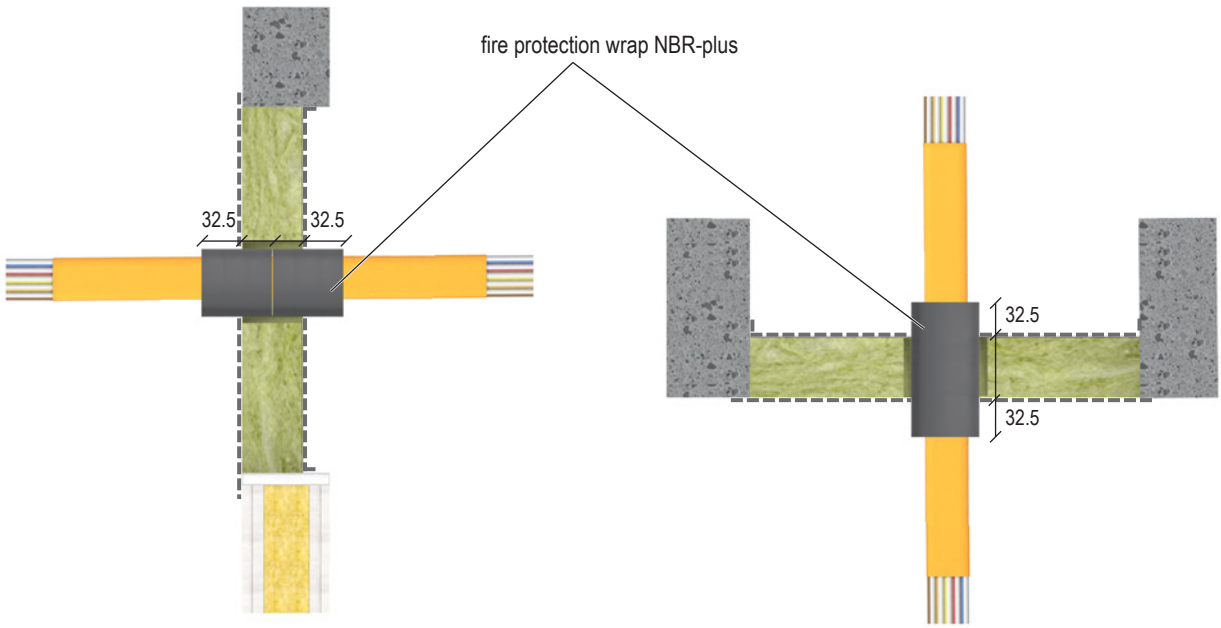
KSL single layer

7.4 speedpipes

Speedpipes must be installed with the fire protection wrap NBR-plus. The wrap must protrude at a length of 32.5 mm (± 5.0 mm) from both sides of the seal. It is possible to use either a single wrap width a width of 125 mm or two wraps with a width of 62.5 mm.
The wrap must be fastened with adhesive tape.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall						
Service	Fire protection wrap NBR-plus					Fire resistance class
	Wrap width [mm]	Number of layers [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	
Bundle Ø ≤ 40 mm with single pipes Ø ≤ 7 mm	2× 62.5 or 1× 125	1	0	2× 30 or 1× 60	2× 32.5	EI 90 U/U
Bundle Ø ≤ 40 mm with single pipes Ø ≤ 14 mm						EI 60 U/U / E 90 U/U

Floor						
Service	Fire protection wrap NBR-plus					Fire resistance class
	Wrap width [mm]	Number of layers [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	
Bundle Ø ≤ 40 mm with single pipes Ø ≤ 7 mm	2× 62.5 or 1× 125	1	0	2× 30 or 1× 60	2× 32.5	EI 90 U/U
Bundle Ø ≤ 40 mm with single pipes Ø ≤ 14 mm						

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

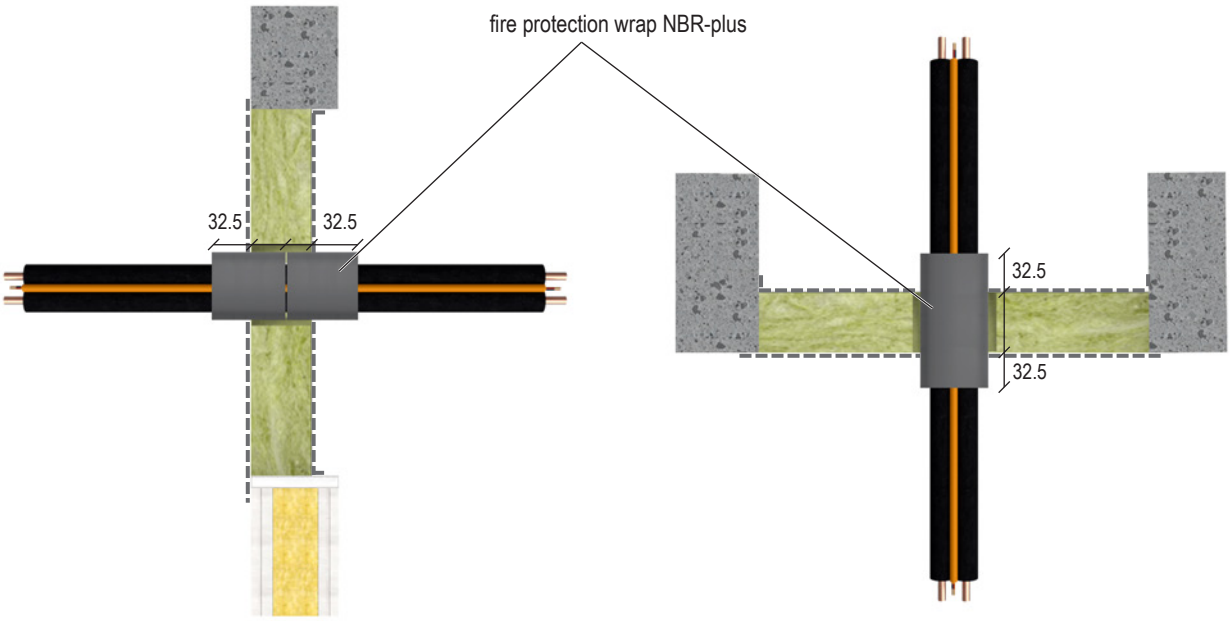
KSL single layer

7.5 HVAC split line combinations

HVAC split line combinations must be installed with the fire protection wrap NBR-plus.The wrap must protrude at a length of 32.5 mm (± 5.0 mm) from both sides of the seal. It is possible to use either a single wrap with a width of 125 mm or two wraps with a width of 62.5 mm. The wrap must be fastened with adhesive tape.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

Wall/floor

Service	Fire protection wrap NBR-plus					Fire resistance class
	Wrap width [mm]	Number of layers [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	
Up to 2 copper pipes Ø ≤ 18.0 mm, pipe wall thickness 1.0–14.2 mm, 9 mm PE foam, 1 pipe PVC-U/PVC-C Ø ≤ 25.0 mm, pipe wall thickness 1.5 mm, up to 3 cables Ø ≤ 14.0 mm	2× 62.5 or 1× 125	0	2× 30 or 1× 60	2× 32.5	2	**EI 60**

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

KSL single layer

7.6 Combustible pipes

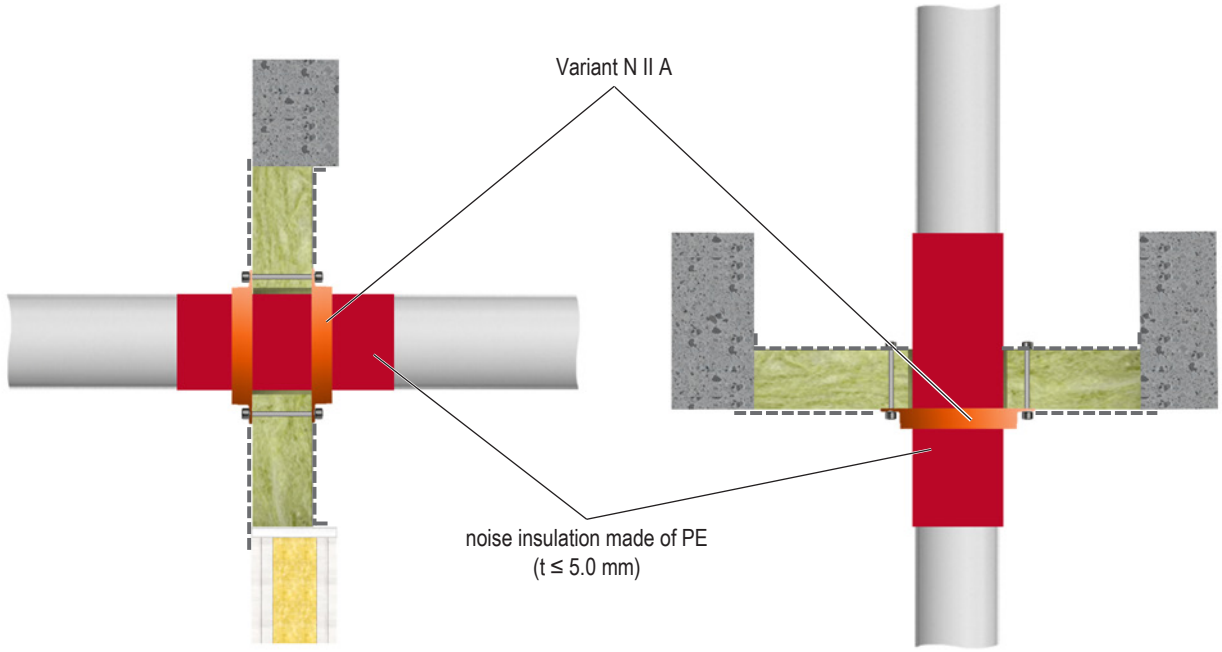
7.6.1 Installation with fire protection collar Variant N II A

Combustible pipes must be installed with the fire protection collar Variant N II A. The collar must installed on both sides of the wall and on the lower side of the floor. Always use the smallest possible pipe collar in relation to the diameter of the pipe.

Pipe collars are fastened with continuous threaded rods Ø M6–M8.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall				
Pipe material	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Fire protection collar**	**Fire resistance class**
PVC-U, PVC-C	32.0–50.0	1.5–5.6	Variant N II A on both sides	**EI 90 U/U**
	63.0–75.0	1.6–6.6		
	90.0–110.0	1.8–8.1		
	125.0–160.0	3.2–11.8		
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6		**EI 90 U/U**
	63.0–75.0	2.2–6.6		**EI 60 U/U / E 90 U/U**
		5.1–6.6		**EI 90 U/U**
	90.0–110.0	2.7–10.0		**EI 60 U/U / E 90 U/U**
		10.0		**EI 90 U/U**
	125.0–160.0	4.0–14.6		**EI 90 U/U**
PP-H	32.0–50.0	1.8–4.6		**EI 90 U/U**
	63.0–75.0	2.2–6.6		
	90.0–110.0	2.7–10.0		
	125.0–160.0	4.0–14.6		

Wall			
Type of pipe	**Pipe outer Ø [mm]**	**Fire protection collar**	**Fire resistance class**
REHAU RAUPIANO LIGHT, CONEL DRAIN	≤ 75.0	Variant N II A on both sides	**EI 90 U/U**
	90.0		**EI 60 U/U / E 90 U/U**
	110.0		**EI 90 U/U**
Geberit Silent-db20	≤ 160.0		**EI 90 U/U**
Geberit Silent-PP	≤ 160.0		**EI 90 U/U**
Geberit Silent-Pro	≤ 160.0		**EI 90 U/U**
POLOPLAST POLO-KAL 3S POLOPLAST POLO-KAL NG POLOPLAST POLO-KAL XS	≤ 160.0		**EI 90 U/U**
REHAU RAUPIANO PLUS	50.0		**EI 90 U/U**
	75.0		**EI 60 U/U / E 90 U/U**
	≤ 110.0		**EI 90 U/U**
Wavin AS+	≤ 160.0		**EI 90 U/U**

KSL single layer

Floor				
Pipe material	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Fire protection collar**	**Fire resistance class**
PVC-U, PVC-C	32.0–50.0	1.5–5.6	Variant N II A below floor	**EI 60 U/U / E 90 U/U**
	63.0–75.0	1.6–6.6		**EI 60 U/U / E 90 U/U**
	90.0–110.0	1.8–7.0/8.1		**EI 60 U/U / E 90 U/U**
	125	2.5–9.2		**EI 60 U/U / E 90 U/U**
	140.0–160.0	3.2–11.8		**EI 60 U/U / E 90 U/U**
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6		**EI 60 U/U**
	63.0–75.0	2.3–6.6		**EI 90 U/U**
	90.0	2.8–8.2		**EI 90 U/U**
	110.0	3.4–10.0		**EI 90 U/U**
	125.0– ≤ 160.0	4.0–14.6		**EI 60 U/U**
PP-H	32.0–50.0	1.8–4.6		**EI 60 U/U**
	63.0–75.0	1.9–8.6		**EI 90 U/U**
	90.0	2.2–8.2		**EI 90 U/U**
	110.0	2.7–10.0		**EI 90 U/U**
	125.0	3.1–3.9		**EI 90 U/U**
	125.0–160.0	4.0–14.6		**EI 60 U/U**

Floor			
Type of pipe	**Pipe outer Ø [mm]**	**Fire protection collar**	**Fire resistance class**
Geberit Silent-db20	≤ 160	Variant N II A below floor	**EI 90 U/U**
Geberit Silent-PP	≤ 160		**EI 90 U/U**
Geberit Silent-Pro	≤ 110		**EI 90 U/U**
	≤ 160		**EI 60 U/U / E 90 U/U**

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

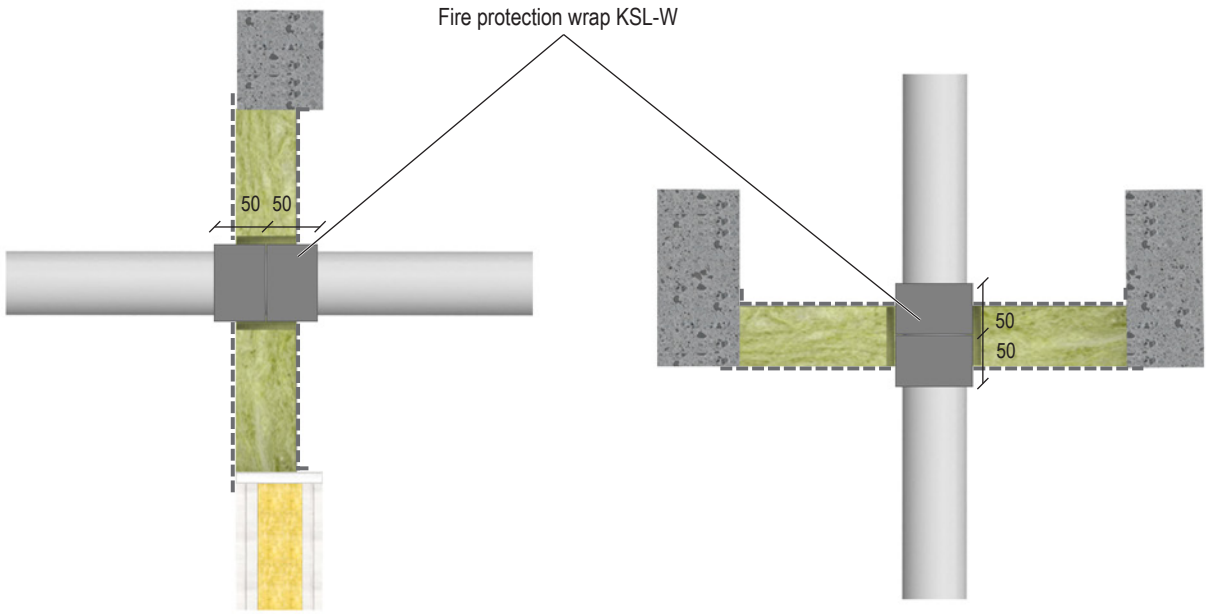
KSL single layer

7.6.2 Installation with fire protection wrap KSL-W

The wrap must protrude at a length of 20.0 mm (± 5.0 mm) from both sides of the seal.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

Wall

Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]	KSL-W						Fire resistance class
			Wrap width [mm]	Number of wraps [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
PVC-U, PVC-C	32.0–50.0	2.4–5.6	50	2	0	2 × 30	2 × 20	2	EI 60 U/U
	63.0–75.0	2.8–4.6						3	EI 60 U/U
	90.0–110.0	3.2						4	EI 60 U/U
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6						2	EI 60 U/U
	63.0–75.0	2.2–5.4						3	EI 60 U/U
		> 5.4–6.9						4	EI 30 U/U
	90.0–110.0	2.7–6.6						4	EI 60 U/U
		> 6.6–10.0						4	EI 30 U/U
PP-H	32.0–50.0	2.0–6.9						2	EI 90 U/U
	63.0–75.0	2.2–8.1						3	EI 60 U/U
		2.6–5.5						3	EI 90 U/U
	90.0	2.9–4.5						4	EI 90 U/U
	90.0–110.0	2.7–10.0						4	EI 60 U/U
	110.0	3.4						4	EI 90 U/U

KSL single layer

Wall								
Type of pipe	Pipe outer Ø [mm]	KSL-W						Fire resistance class
		Wrap width [mm]	Number of wraps [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
REHAU RAUPIANO LIGHT, CONEL DRAIN	50	50	2	0	2 × 30	2 × 20	2	EI 90 U/U
	≤ 110.0						4	EI 90 U/U
Geberit Silent-db20	56						2	EI 90 U/U
	≤ 110.0						4	
Geberit Silent-PP	50						2	EI 60 U/U / E 90 U/U
	≤ 110.0						4	
Geberit Silent-Pro	50						2	EI 60 U/U / E 90 U/U
	≤ 110.0						4	
POLOPLAST POLO-KAL 3S	75.0						3	EI 60 U/U / E 90 U/U
	≤ 110.0						4	
POLOPLAST POLO-KAL NG POLOPLAST POLO-KAL XS	50						2	EI 90 U/U
	≤ 110.0						4	
REHAU RAUPIANO PLUS	50.0						2	EI 90 U/U
	≤ 110.0						4	EI 90 U/U
Wavin AS+	50						2	EI 90 U/U
	≤ 110.0						4	

Floor									
Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]	KSL-W						Fire resistance class
			Wrap width [mm]	Number of wraps [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
PVC-U, PVC-C	32.0–50.0	2.4	50	2	0	2 × 30	2 × 20	2	EI 60 U/U
		2.4–3.7							EI 30 U/U
	63.0	3.7–5.5						3	EI 30 U/U
	75.0	4.8–5.5						3	EI 30 U/U
	90.0	6.0–6.5						4	EI 30 U/U
	110.0	8.1						4	EI 30 U/U
PE-HD, ABS, SAN + PVC	32.0–50.0	1.8–4.6						2	EI 90 U/U
	63.0–75.0	2.2–6.9						3	EI 90 U/U
	90.0–110.0	2.7–10.0						4	EI 90 U/U
PP-H	32.0	6.9						2	EI 90 U/U
	32.0–50.0	2.0–6.9						2	EI 60 U/U / E 90 U/U
	63.0–75.0	2.3–8.1						3	EI 60 U/U / E 90 U/U
		5.1–6.7						3	EI 90 U/U
	90.0–110.0	2.7–6.3						4	EI 90 U/U
		2.7–10.0						4	EI 60 U/U / E 90 U/U

KSL single layer

Floor								
Type of pipe	Pipe outer Ø [mm]	KSL-W						Fire resistance class
		Wrap width [mm]	Number of wraps [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
REHAU RAUPIANO LIGHT, CONEL DRAIN	50	50	2	0	2 × 30	2 × 20	2	EI 60 U/U / E 90 U/U
Geberit Silent-db20	56						2	EI 90 U/U
	≤ 110						4	EI 90 U/U
Geberit Silent-PP	50						2	EI 60 U/U / E 90 U/U
	≤ 110						4	EI 60 U/U / E 90 U/U
Geberit Silent-Pro	50						2	EI 90 U/U
	≤ 110						4	EI 90 U/U
POLOPLAST POLO-KAL 3S	75						3	EI 60 U/U / E 90 U/U
	≤ 110						4	EI 60 U/U / E 90 U/U
POLOPLAST POLO-KAL NG POLOPLAST POLO-KAL XS	50						2	EI 60 U/U
	≤ 110						4	EI 60 U/U
REHAU RAUPIANO PLUS	50						2	EI 60 U/U / E 90 U/U
Wavin AS+	50						2	EI 90 U/U
	≤ 110						4	EI 90 U/U

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

KSL single layer

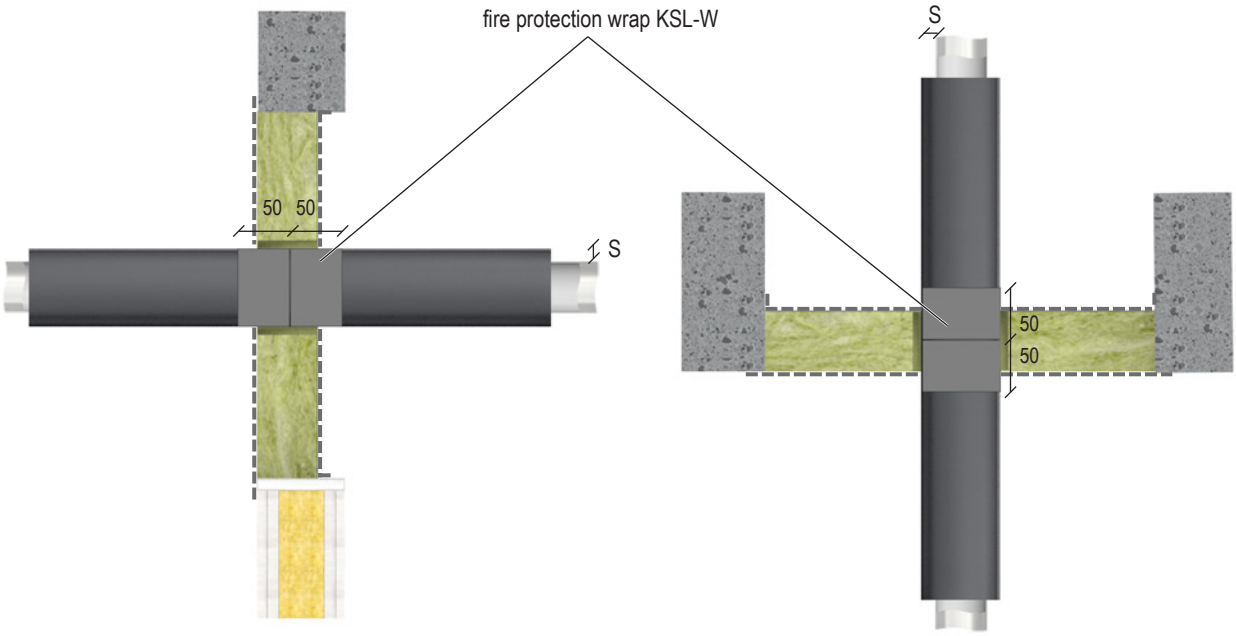
7.7 Multilayer pipes

7.7.1 Installation with FEF insulation and fire protection wrap KSL-W

The wrap must protrude at a length of 20.0 mm (± 5.0 mm) from both sides of the seal.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall												
Type of pipe	Pipe outer Ø [mm]	Pipe wall thick-ness [mm]	Type of insula-tion	Insu-lation length	Insulation thickness T [mm]	KSL-W						Fire resistance class
						Wrap width [mm]	Number of wraps [n]	Overlap [mm]]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
Geberit Mepla	16.0	2.25	FEF	CS	8.0–35.0	50	2	0	2 × 30	2 × 20	1	EI 60 U/C / E 90 U/C
	20.0	2.5			16.0–35.0						1	EI 60 U/C / E 90 U/C
	26.0	3.0			16.0–35.0						1	EI 60 U/C / E 90 U/C
	32.0	3.0			16.0–35.0						1	EI 60 U/C / E 90 U/C
	40.0	3.5			13.5–39.0						2	EI 60 U/C / E 90 U/C
	50.0	4.5			14.0–39.0						2	EI 60 U/C / E 90 U/C
	63.0	4.5			14.0–40.5						2	EI 60 U/C / E 90 U/C
	75.0	4.7			14.0–40.5						2	EI 60 U/C / E 90 U/C
Geberit FlowFit	16.0	2.0	FEF	CS	8.5–33.5	50	2	0	2 × 30	2 × 20	1	EI 60 U/C / E 90 U/C
	20.0	2.0			13.0–33.5						1	EI 60 U/C / E 90 U/C
	26.0	2.5			13.0–33.5						1	EI 60 U/C / E 90 U/C
	32.0	2.8			13.0–33.5						1	EI 60 U/C / E 90 U/C
	40.0	3.0			16.5–40.5						2	EI 60 U/C / E 90 U/C
	50.0	3.8			17.0–40.5						2	EI 60 U/C / E 90 U/C
	63.0	4.0			17.0–40.5						2	EI 60 U/C / E 90 U/C
	75.0	4.6			17.0–40.5						2	EI 60 U/C / E 90 U/C
KE KELIT KELOX KM 100, KE KELIT KELOX KM 110	16.0	2.0	FEF	≥ 250 on both sides	8.0–35.0	50	2	0	2 × 30	2 × 20	1	EI 60 U/C / E 90 U/C
	18.0	2.0			8.0–35.0						1	EI 60 U/C / E 90 U/C
	20.0	2.25			8.5–35.0						1	EI 60 U/C / E 90 U/C
	25.0	2.5			8.5–35.0						1	EI 60 U/C / E 90 U/C
	32.0	3.0			9.0–35.0						1	EI 60 U/C / E 90 U/C
	40.0	4.0			13.0–40.5						2	EI 60 U/C / E 90 U/C
	50.0	4.5		≥ 500 on both sides	13.0–40.5						2	EI 60 U/C / E 90 U/C
	63.0	6.0			13.0–40.5						2	EI 60 U/C / E 90 U/C
	75.0	7.5			13.0–40.5						2	EI 60 U/C / E 90 U/C

KSL single layer

Floor												
Type of pipe	Pipe outer Ø [mm]	Pipe wall thick-ness [mm]	Type of insula-tion	Insu-lation length	Insulation thickness T [mm]	KSL-W						Fire resistance class
						Wrap width [mm]	Number of wraps [n]	Overlap [mm]]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
90 minutes												
Geberit Mepla	≥ 40.0 – ≤ 63.0	3.5–4.5	FEF	CS	35.0–39.0	50	2	0	2 × 30	2 × 20	2	**EI 90 U/C**
	63.0	4.5										
Geberit FlowFit	16.0	2.0		≥ 250 on both sides	8.5–35.0						1	
	20.0	2.0			8.5–35.0						1	
	26.0	2.5			13.0–35.0						1	
	32.0	2.8			13.0–35.0						1	
	40.0	3.0			20.5–40.5						2	
	50.0	3.8		≥ 500 on both sides	40.5						2	
	63.0	4.0			40.5						2	
	75.0	4.6			40.5						2	
60 minutes												
Geberit Mepla	16.0	2.25	FEF	CS	8.0–35.0	50	2	0	2 × 30	2 × 20	1	**EI 60 U/C / E 90 U/C**
	20.0	2.5			8.0–35.0						1	
	26.0	3.0			8.0–35.0						1	
	32.0				8.0–35.0						1	
	40.0	3.5			9.0–40.5						2	
	50.0	4.5			14.0–40.5						2	
	63.0	4.5			14.0–40.5						2	
	75.0	4.7			17.0–40.5						2	

KSL single layer

Floor												
Type of pipe	Pipe outer Ø [mm]	Pipe wall thick-ness [mm]	Type of insula-tion	Insu-lation length	Insulation thickness T [mm]	KSL-W						Fire resistance class
						Wrap width [mm]	Number of wraps [n]	Overlap [mm]]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
60 minutes												
Geberit Mepla	16.0	2.0	FEF	≥ 250 on both sides	8.5–35.0	50	2	0	2 × 30	2 × 20	1	**EI 60 U/C / E 90 U/C**
	20.0	2.0			8.5–35.0						1	
	26.0	2.5			13.0–35.0						1	
	32.0	2.8			13.0–35.0						1	
	40.0	3.0			16.5–40.5						2	
	50.0	3.8		≥ 500 on both sides	17.0–40.5						2	
	63.0	4.0			17.0–40.5						2	
	75.0	4.6			17.0–40.5						2	

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

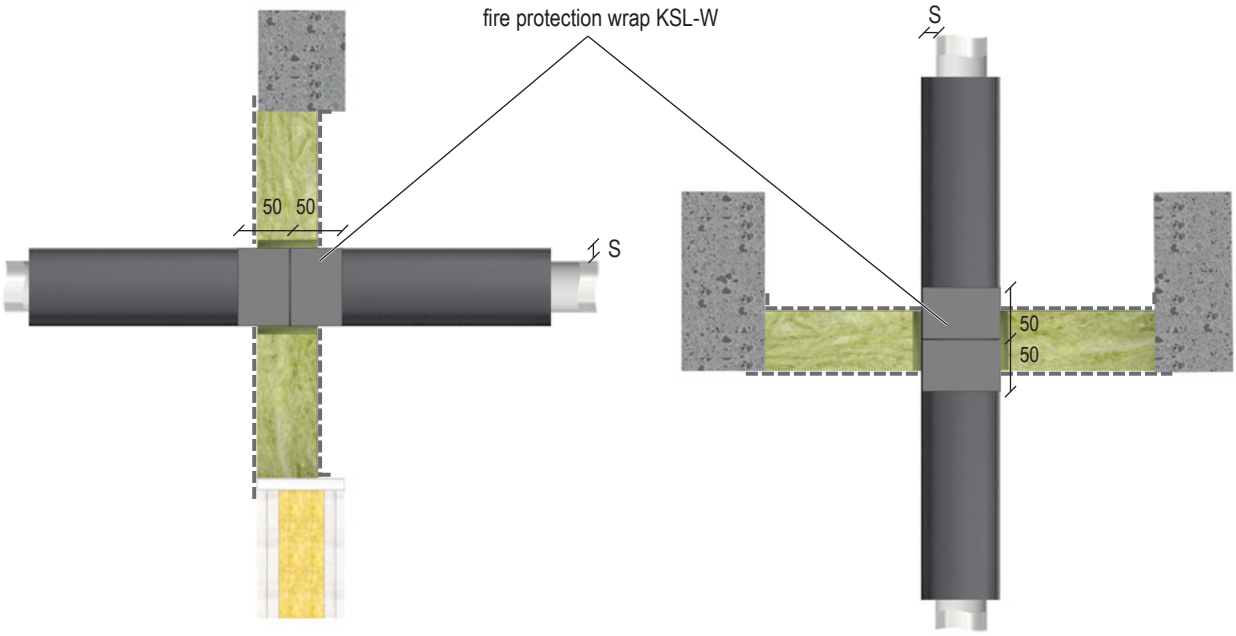
KSL single layer

7.7.2 Installation with PEF insulation and fire protection wrap KSL-W

The wrap must protrude at a length of 20.0 mm (± 5.0 mm) from both sides of the seal.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

Wall

Type of pipe	Pipe outer Ø [mm]	Pipe wall thick-ness [mm]	Type of insula-tion	Insu-lation length	Insulation thickness S [mm]	KSL-W						Fire resistance class
						Wrap width [mm]	Number of wraps [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
Geberit Mepla	16.5	2.25	PEF	CS	6–26	50	2	0	2 × 30	2 × 20	1	EI 60 U/C / E 90 U/C
	20.0	2.5			6–26						1	
	26.0	3.0			6–13						1	
	26.0	3.0			6–26						1	EI 45 U/C / E 90 U/C
Geberit FlowFit	16.0	2.0			6–26						1	EI 60 U/C / E 90 U/C
	20.0	2.0			6–26						1	
	25.0	2.5			6–26						1	

KSL single layer

Wall												
Type of pipe	Pipe outer Ø [mm]	Pipe wall thick-ness [mm]	Type of insula-tion	Insu-lation length	Insulation thickness S [mm]	KSL-W						Fire resistance class
						Wrap width [mm]	Number of wraps [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
KE KELIT KELOX KM 100, KE KELIT KELOX KM 110	16.0	2.0	PEF	CS	4-13	50	2	0	2 × 30	2 × 20	1	EI 60 U/C / E 90 U/C
	18.0	2.0			4-13						1	
	20.0	2.25			4-13						1	
	25.0	2.5			4-13						1	
	32.0	3.0			9-13						1	
	32.0	3.0			4-13						1	EI 45 U/C / E 90 U/C

Floor												
Type of pipe	Pipe outer Ø [mm]	Pipe wall thick-ness [mm]	Type of insula-tion	Insu-lation length	Insulation thickness S [mm]	KSL-W						Fire resistance class
						Wrap width [mm]	Number of wraps [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
Geberit Mepla	16.0	2.25	PEF	CS	6–26	50	2	0	2 × 30	2 × 20	1	EI 90 U/C
	20.0	2.5			6–26						1	
	26.0	3.0			6–26						1	
Geberit FlowFit	16.0	2.0			6–26						1	
	20.0	2.0			6–26						1	
	25.0	2.5			6–26						1	

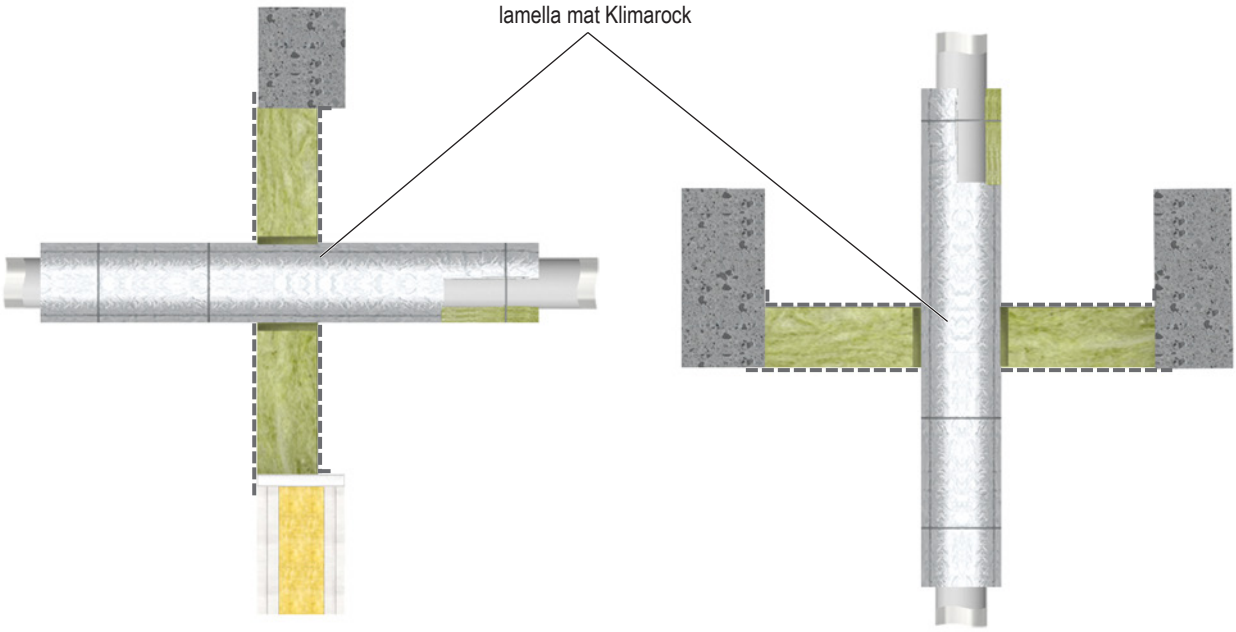
NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

KSL single layer

7.7.3 Installation with lamella mat

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

Wall					
Multilayer pipes with mineral wool insulation					
Type of pipe	**Pipe outer Ø [mm]**	**Pipe wall thickness [mm]**	**Lamella mat insulation**		**Fire resistance class**
			Insulation length [mm]	**Insulation thickness [mm]**	
Geberit Mepla	16.0	2.25	≥ 250 on both sides	20.0–60.0	**EI 90 U/C**
	20.0	2.5		30.0–60.0	
	26.0	3.0			
	32.0	3.0			
	40.0	3.5			
	50.0	4.0			
	63.0	4.5			
	75.0	4.7			

KSL single layer

Wall					
Multilayer pipes with mineral wool insulation					
Type of pipe	Pipe outer Ø [mm]	Pipe wall thickness [mm]	Lamella mat insulation		Fire resistance class
			Insulation length [mm]	Insulation thickness [mm]	
Geberit FlowFit	16.0	2.0	≥ 250 on both sides	20.0–60.0	EI 60 U/C / E 90 U/C
				30.0–60.0	EI 90 U/C
	20.0	2.0		20.0–60.0	
	26.0	2.5		20.0–60.0	
	32.0	2.8		20.0–60.0	
	40.0	3.0		20.0–60.0	
	50.0	3.8		30.0–60.0	
	63.0	4.0		30.0–60.0	
	75.0	4.6		30.0–60.0	
KE KELIT KELOX KM 100 KE KELIT KELOX KM 110	16.0	2.0		20.0–80.0	EI 90 U/C
	18.0	2.0		20.0–80.0	
	20.0	2.25		20.0–80.0	
	25.0	2.5		20.0–80.0	
	32.0	3.0		20.0–80.0	
	40.0	4.0		30.0–80.0	
	50.0	4.5		30.0–80.0	
	63.0	6.0		30.0–80.0	
	75.0	7.5		30.0–80.0	

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

KSL single layer

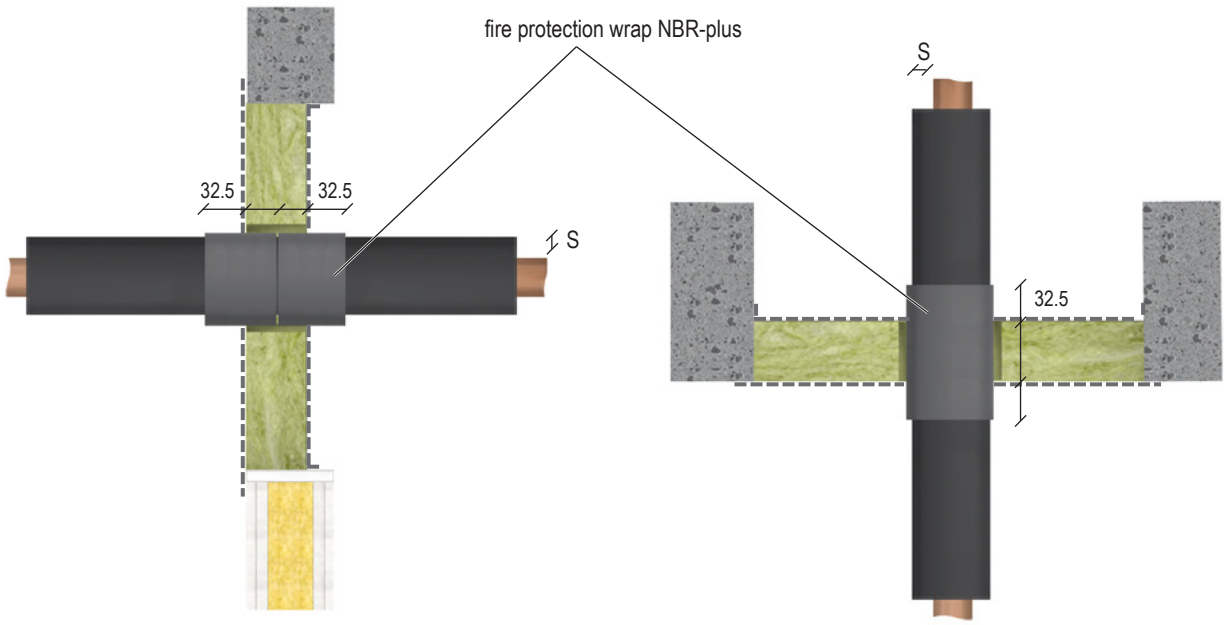
7.8 Non-combustible pipes

7.8.1 Installation with FEF insulation and fire protection wrap NBR-plus

Non-combustible pipes must be installed with the fire protection wrap NBR-plus. The wrap must protrude at a length of 32.5 mm (± 5.0 mm) from both sides of the seal. It is possible to use either a single wrap with a width of 125 mm or two wraps with a width of 62.5 mm.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall												
Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]	Section insulation		Protective insulation		NBR-plus					Fire resistance class
			Insu-lation length	Insulation thickness S [mm]	Insu-lation length [mm]	Insu-lation thick-ness S [mm]	Wrap width [mm]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
90 minutes												
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	CS	10.0–26.0	–	–	2 × 62.5 or 1 × 125	0	2 × 30 or 1 × 60	2 × 32.5	2	**EI 90 U/C**
	≤ 42.0			16.5–26.0	–	–					2	
	≤ 60.0			19.0	–	–					2	
Steel, stainless steel or cast iron	≤ 88.9			18.0	–	–					2	
60 minutes												
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	CS	10.0–38.0	–	–	2 × 62.5 or 1 × 125	0	2 × 30 or 1 × 60	2 × 32.5	2	**EI 60 U/C**
	≤ 42.0			12.0–38.0	–	–					2	
	≤ 60.0			19.0–38.0	–	–					2	
	≤ 88.9			22.5–38.0	–	–					2	
Steel, stainless steel or cast iron	≤ 88.9			15.5–38.0	–	–					2	
	≤ 114.3			15.0–38.0	–	–					2	
	≤ 159.0			25.0–38.0	250.0	19.0					2	
	≤ 219.1			25.0–38.0	250.0	38.0					2	
30 minutes												
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	CS	10.0–38.0	–	–	2 × 62.5 or 1 × 125	0	2 × 30 or 1 × 60	2 × 32.5	2	**EI 30 U/C**
	≤ 88.9			18.0–38.0	–	–					2	

KSL single layer

Floor												
Pipe material	Pipe outer Ø [mm]	Pipe wall thick-ness [mm]	Section insulation		Protective insulation		NBR-plus					Fire resistance class
			Insu-lation length	Insulation thickness S [mm]	Insu-lation length [mm]	Insu-lation thick-ness S [mm]	Wrap width [mm]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	Number of layers [n]	
90 minutes												
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	CS	38.0	–	–	2 × 62.5 or 1 × 125	0	2 × 30 or 1 × 60	2× 32.5	2	**EI 90 U/C**
60 minutes												
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	CS	10.0–38.0	–	–	2 × 62.5 or 1 × 125	0	2 × 30 or 1 × 60	2 × 32.5	2	**EI 60 U/C**
	≤ 42.0			12.0–38.0	–	–					2	
	> 42.0 – ≤ 88.9			19.0	–	–					2	
	≤ 88.9			22.5–38.0	–	–					2	
Steel, stainless steel or cast iron	≤ 15.0			10.0–38.0	–	–					2	
	≤ 42.0			15.0–38.0	–	–					2	
	≤ 88.9			18.5–38.0	–	–					2	
	≤ 114.3	3.2–14.2		18.5–38.0	–	–					2	
	≤ 159.0	4.0–14.2		25.0–38.0	250.0	19.0					2	
	≤ 219.1	4.5–14.2		25.0–38.0	250.0	38.0					2	
30 minutes												
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	CS	10.0–38.0	–	–	2 × 62.5 or 1 × 125	0	2 × 30 or 1 × 60	2 × 32.5	2	**EI 30 U/C**
	≤ 88.9			19.0–38.0	–	–					2	

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

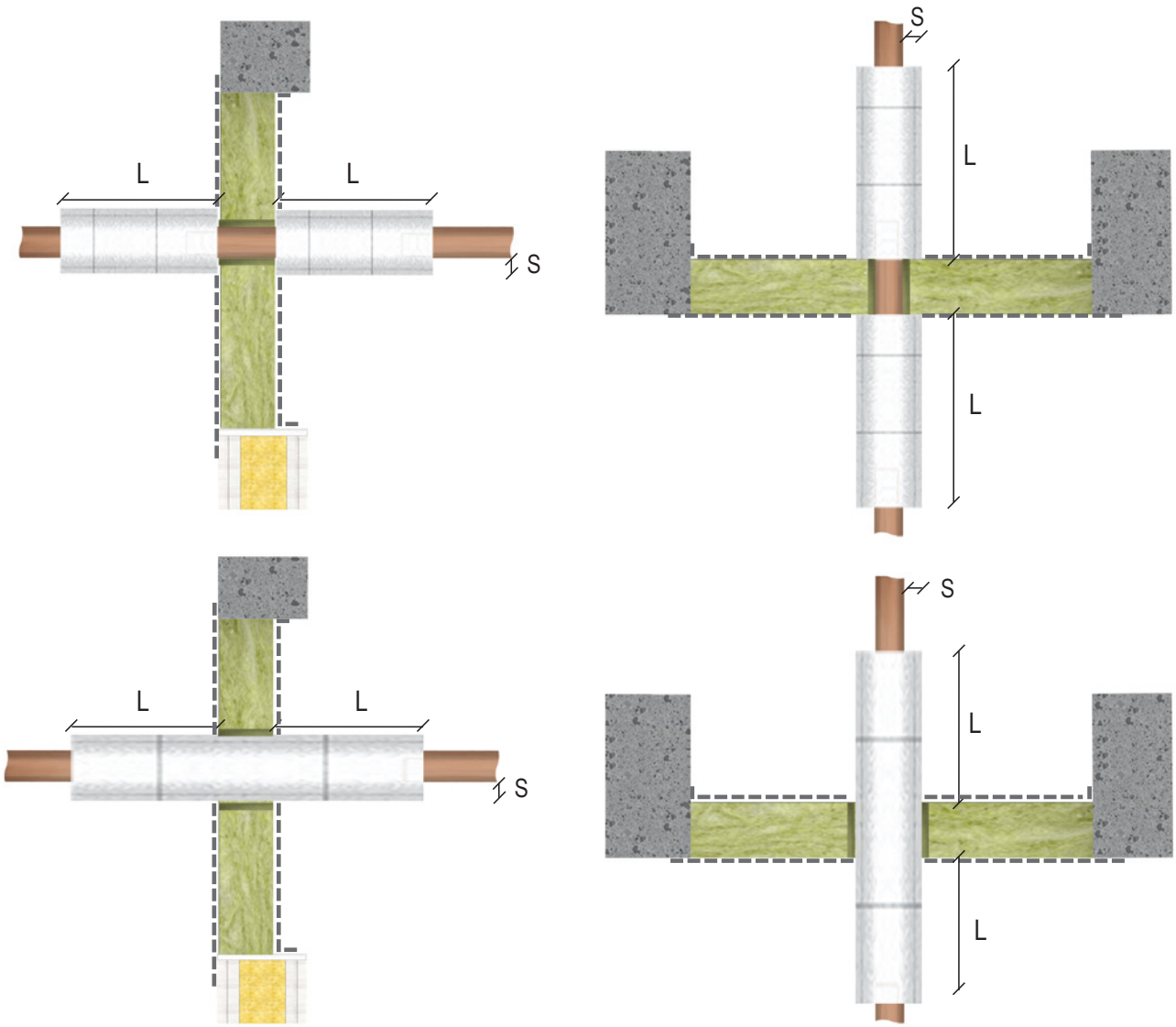
KSL single layer

7.8.2 Installation with lamella mat

The insulation may either penetrate the seal (LS, CS) or end at the seal surface (LI, CI).

Pipes may be installed at all angles between 90° und 45°.

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall					
Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]	Lamella mat		Fire resistance class
			Insulation length L [mm]	Insulation thickness S [mm]	
60 minutes					
Copper, steel, stainless steel or cast iron	≤ 60.0	0.6–14.2	≥ 470.0 on both sides	30.0–100.0	**EI 60 U/C / E 90 U/C**
	≥ 60.0 – 88.9	0.6 / 2.0–14.2	≥ 720.0 on both sides		
Steel, stainless steel or cast iron	≥ 60.0 – < 114.3	0.6 / 2.8–14.2	≥ 470.0 on both sides		
	≥ 114.3 – < 219.1	2.8–14.2	≥ 470.0 on both sides		
		2.8 / 4.5–14.2	≥ 970.0 on both sides		
	219.1	4.5–14.2	≥ 970.0 on both sides		
Multiple penetration					
up to three pipes made of copper, steel, stainless steel or cast iron	≤ 22.0	1.0–14.2	≥ 470.0 on both sides	30.0	**EI 60 U/C / E 90 U/C**

KSL single layer

Floor					
Pipe material	Pipe outer Ø [mm]	Pipe wall thickness [mm]	Lamella mat		Fire resistance class
			Insulation length L [mm]	Insulation thickness S [mm]	
90 minutes					
Copper, steel, stainless steel or cast iron	≤ 42.0	1.0–14.2	≥ 470.0 on both sides	30.0	EI 90 U/C
	≥ 42.0 – ≤ 88.9	1.0 / 2.0–14.2	≥ 970.0 on both sides		
Steel, stainless steel or cast iron	≤ 63.5	0.8 / 2.3–14.2	≥ 220.0 on both sides	30.0–100.0	
	≥ 63.5 – ≤ 114.3	2.3 / 3.2–14.2	≥ 470.0 on both sides		
	≥ 114.3 – ≤ 159.0	2.3 / 3.6–14.2	≥ 970.0 on both sides		
60 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.8–14.2	≥ 220.0 on both sides	30.0–100.0	EI 60 U/C
	≥ 15.0 – ≤ 42.0	1.0–14.2	≥ 470.0 on both sides		
	≥ 42.0 – ≤ 88.9	1.0 / 2.0–14.2	≥ 970.0 on both sides		
Steel, stainless steel or cast iron	≥ 159.0 – ≤ 219.1	3.6 / 4.0–14.2	≥ 970.0 on both sides		
45 minutes					
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	≥ 220.0 on both sides	30.0–100.0	EI 45 U/C
	≥ 15.0 – ≤ 60.0	0.6–14.2	≥ 470.0 on both sides		
	≥ 60.0 – ≤ 88.9	0.6 / 2.0–14.2	≥ 720.0 on both sides		
Multiple penetration					
up to three pipes made of copper, steel, stainless steel or cast iron	≤ 22.0	1.0–14.2	≥ 425.0 on both sides	30.0	EI 45 U/C / E 90 U/C

NOTE:
In timber components and sandwich panel walls the fire resistance class is reduced to max. EI 60.
In timber walls and floors the penetration seal must always be positioned in the centre.

KSL single layer

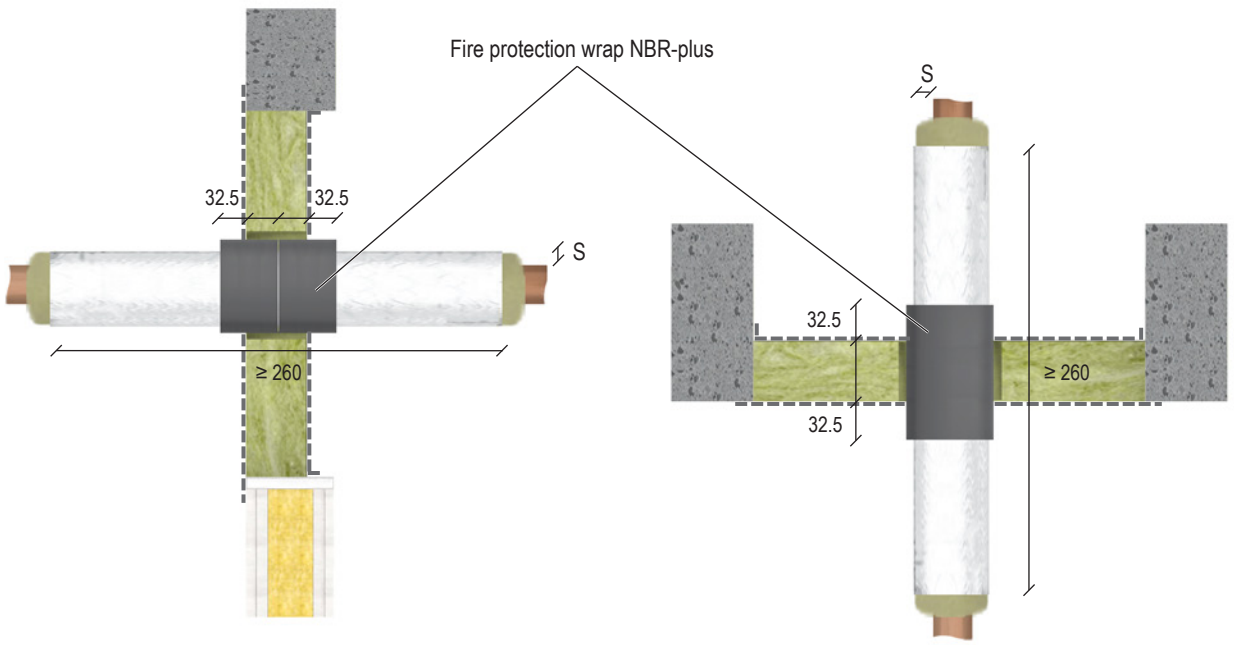
7.8.3 Installation with PIR insulation and fire protection wrap NBR-plus

Non-combustible pipes must be installed with the fire protection wrap NBR-plus. The wrap must protrude at a length of 32.5 mm (± 5.0 mm) from both sides of the seal. It is possible to use either a single wrap width a width of 125 mm or two wraps with a width of 62.5 mm. The wrap must be fastened with adhesive tape.

Inside the seal, the pipe shells must be laminated with aluminium at a length of ≥ 260 mm.

Annular gaps up to 25 mm must be filed completely with mineral wool of ≥ 40 kg/m³ density and coated on the outside with BML/BMS/BMK (dry film thickness ≥ 1.0 mm).

Design for wall and floor penetration seals



For thicknesses and design variants, see page 36

All specifications in mm

KSL single layer

Wall									
Pipe material	Outer Ø [mm]	Pipe wall thickness [mm]	PIR insulation	Fire protection wrap NBR-plus					Fire resistance class
			Thickness S [mm]	Wrap width [mm]	Number of layers [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	
60 minutes									
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	20–80	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	**EI 60 U/C**
	> 15 – ≤ 88.9		30–80						
	108.0	2.5–14.2	80						
Steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	20–80						
	> 15.0 – ≤ 88.9		30–80						
	> 88.9 – ≤ 108.0	2.5–14.2	40–80						
	> 108.0 – ≤ 168.3	4.0–14.2							
	> 168.3 – ≤ 219.1	4.5–14.2	50						
45 minutes									
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	20–80	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	**EI 45 U/C**
	> 42 – ≤ 88.9		30–80						
	108.0	2.5–14.2	50–80						
Steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	20–80						
	> 42.0 – ≤ 88.9		30–80						
	> 88.9 – ≤ 108.0	2.5–14.2							
	> 108.0 – ≤ 168.3	4.0–14.2							
	> 168.3 – ≤ 219.1	4.5–14.2	50						
30 minutes									
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	20–80	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	**EI 30 U/C**
	108.0	2.5–14.2	30–80						
Steel, stainless steel or cast iron	≤ 88.9	0.6–14.2	20–80						
	> 88.9 – ≤ 108.0	2.5–14.2	30–80						
	> 108.0 – ≤ 168.3	4.0–14.2							
	> 168.3 – ≤ 219.1	4.5–14.2	50						

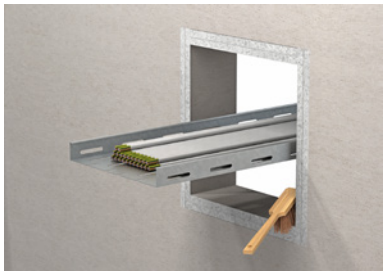
KSL single layer

Floor									
Pipe material	Outer Ø [mm]	Pipe wall thickness [mm]	PIR insulation	Fire protection wrap NBR-plus					Fire resistance class
			Thickness S [mm]	Wrap width [mm]	Number of layers [n]	Overlap [mm]	Inside seal [mm]	Outside seal [mm]	
90 minutes									
Copper, steel, stainless steel or cast iron	≤ 42.0	1.0–14.2	40	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	**EI 90 U/C**
60 minutes									
Copper, steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	20–80	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	**EI 60 U/C**
	> 15 – < 88.9		30–80						
	> 88.9 – ≤ 108.0	2.5–14.2							
Steel, stainless steel or cast iron	≤ 15.0	0.6–14.2	20–80						
	> 15.0 – ≤ 88.9		30–80						
	> 88.9 – ≤ 108.0	2.5–14.2							
	> 108.0 – ≤ 168.3	4.0–14.2							
	> 168.3 – ≤ 219.1	4.5–14.2	100						
45 minutes									
Copper, steel, stainless steel or cast iron	≤ 42.0	0.6–14.2	20–80	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	**EI 45 U/C**
	> 42 – ≤ 88.9		30–80						
	> 88.9 – ≤ 108.0	2.5–14.2							
30 minutes									
Copper, steel, stainless steel or cast iron	≤ 88.9	0.6	20–80	2 × 62.5 or 1 × 125	2	0	2 × 30 or 1 × 60	2 × 32.5	**EI 30 U/C**
	> 88.9 – ≤ 108.0	2.5–14.2	30–80						

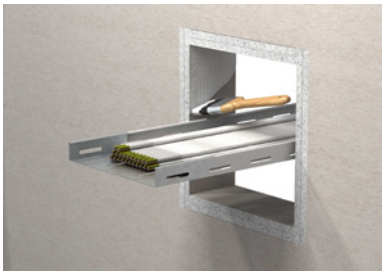
KSL single layer

8. Installation steps

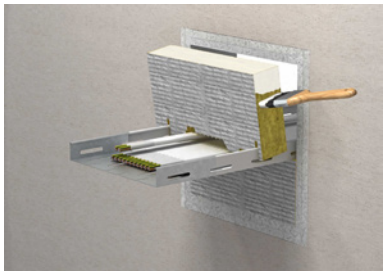
1. Clean reveal and installations and mask them with crepe tape.



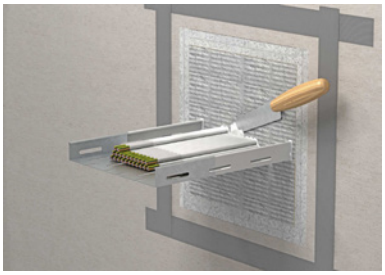
2. Coat cables, penetration seal area and 100 mm of the installations on both sides outside the seal with BML.



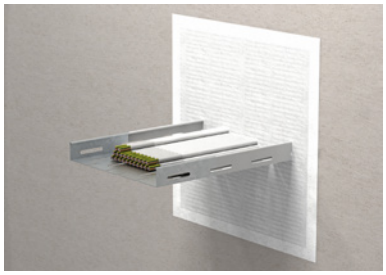
3. Cut the mineral fibre boards to size and coat the surrounding edges with BMS. Close the openings.



4. Seal the remaining openings with mineral fibre or fill them throughout the entire depth with BMS/BMK.



5. Coat the seal surface.



6. Label the penetration seal.