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to Article 29 of the Regulation (EU)
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Parliament and of the Council of 9
March 2011

MEMBER OF EOTA



European Technical Assessment ETA-22/0702 of 2023/05/26

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 66 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:

HENSOTHERM® GM 2000

Product family to which the above construction product belongs:

Fire stopping product – penetration seals.

Manufacturer:

Rudolf Hensel GmbH
Lauenburger Landstraße 11
DE-21039 Börnsen
Telephone: +49 40 72106210
www.rudolf-hensel.de

Manufacturing plant:

Rudolf Hensel GmbH
Plant 002

This European Technical Assessment contains:

30 pages including 2 annexes which form an integral part of the document

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, based on:

European Assessment Document (EAD) No. 350454-00-1104: Fire Stopping and fire sealing products – Penetration seals

This version replaces:

The ETA with the same number issued 2022-11-17

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of the product.

The HENSOTHERM® GM 2000 is a mineral gypsum mortar, consisting of expanded perlite (0-3 mm) and fibres (6-13 mm). The mineral gypsum mortar is used to form a penetration seal for single or multiple services to reinstate the fire resistance performance of rigid floor construction of min. 150 mm thickness and of aerated concrete or concrete with a minimum density of 650 kg/m³, temporarily or permanently, where they have been provided with apertures, which are penetrated by various services such like cable or pipe penetration.

HENSOTHERM® GM 2000 is used alone as filler and in combination with min. 50 mm thick mineral fibre boards serving as lost formwork, HENSOTHERM® RM pipe collars (ETA 19/0730), HENSOTHERM® 7 KS Gewebe 50 pipe wraps (ETA 16/0369) and HENSOTHERM® ST Service Transit (product types depending on the type and dimension of the penetrating services) to form a fire penetration seal.

The boards are cut to size and inserted into the aperture in the supporting element and around penetrating services. HENSOTHERM® GM 2000 gypsum mortar, that is available in bags of 20 litres (22 kg), is mixed with water and poured on top of the mineral fibre board in a minimum 50 mm thick layer. All cavities around and between the penetrating services must be completely filled with HENSOTHERM® GM 2000.

HENSOTHERM® Service Transits are also incorporated into the penetration seal, the type is depending on the type and dimension of the penetrating services.

More information in annex A of this ETA.

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

The construction product HENSOTHERM® GM 2000 is assessed on the basis of EAD 35054-00-1104, as a fire stopping product, penetration seal.

The construction product HENSOTHERM® GM 2000 is intended for use as a component with a fire protection effect in building elements, assembled systems or constructions that are subject to requirements related to fire protection. The reactive effect prevents heat transmission and fire spreading in

the event of fire.

More information in table 3: “Performance of the product and references to the methods used for its assessment”.

The fire sealing products are to be installed according to the manufacturer’s installation manual.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the HENSOTHERM® GM 2000 of 10 years, provided the manufacturers conditions laid down in the manufacturers data sheet for the packaging, transport, storage, installation, use, maintenance and repair are met.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by the Technical Assessment Body issuing an ETA based on the EAD No. 350454-00-1104 but are regarded only as means for expressing the expected economically reasonable working life of the product.

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

Characteristic	Assessment of characteristic
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The product is classified as Euroclass E in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
Resistance to fire	The product is classified according to EN 13501-2, information can be found in annex A.
3.3 Hygiene, health and the environment (BWR3)	
Air permeability (material property)	No performance assessed
Water Permeability (material property)	No performance assessed
Content, emission and/or release of dangerous substances*	No performance assessed
3.4 Safety in use (BWR4)	
Mechanical resistance and stability	No performance assessed
Resistance to impact/movement	No performance assessed
Adhesion	No performance assessed
Durability	Use condition: Y₁
3.5 Protection against noise (BWR5)	
Airborne sound insulation	No performance assessed
3.6 Energy Economy and heat retention (BWR6)	
Thermal properties	No performance assessed
Water vapour permeability	No performance assessed

See additional information in section 3.9 – 3.10.

*) In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g., transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.9 Methods of verification

The characteristic values of the joint sealing system are based on the EAD 350454-00-1104.

3.10 General aspects related to the fitness for use of the product.

The verification of durability is part of testing the essential characteristics. HENSOTHERM® GM 2000 may be used in end-use applications according to the provisions for use category Y₁ (intended for use at temperatures below 0 °C with exposure to UV but no exposure to rain) without expecting significant changes of the characteristics relevant for fire protection. Products that meet the requirements for type Y₁ also meet the requirement for type Y₂, Z₁ and Z₂.

The European Technical Assessment is issued for the product based on agreed data/information, deposited with ETA-Danmark, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to ETA-Danmark before the changes are introduced. ETA-Danmark will decide if such changes affect the ETA and consequently the validity of the CE marking based on the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

HENSOTHERM® GM 2000 is manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.

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

4.1 AVCP system

According to the decision 1999/454/EC of the European Commission, as amended, the system(s) of assessment and verification of constancy of performance is system 1 (see Annex V to Regulation (EU) No 305/2011).

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD.

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking

Issued in Copenhagen on 2023-05-26 by



Thomas Bruun
Managing Director, ETA-Danmark

ANNEX A – Resistance to Fire Classification – HENSOTHERM® GM 2000

A.1. Rigid floor constructions with floor thickness of minimum 150 mm

Seal constructions with minimum 50 mm depth of HENSOTHERM® GM 200 gypsum mortar compound layer.

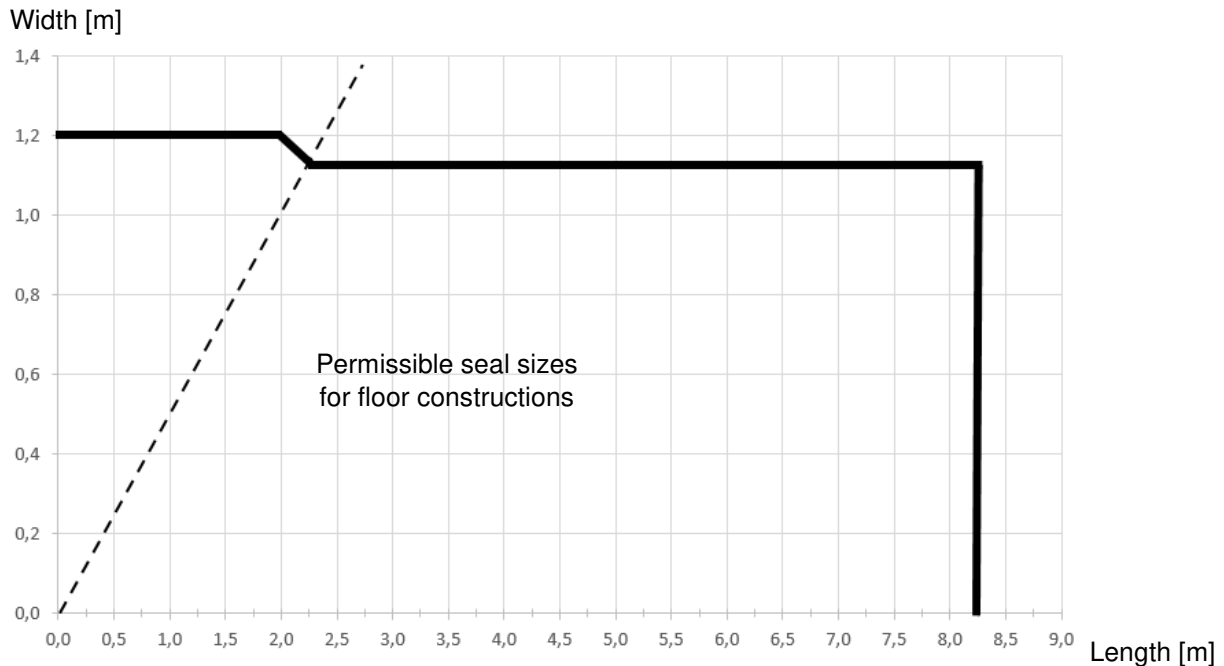
The depth of the HENSOTHERM® GM 2000 gypsum mortar compound layer may be increased but not reduced.

A.1.1. Maximum seal size

The maximum permissible seal area that can be occupied by penetrating services is 60 %.

Classifications are valid for any penetration seal equal to or smaller than that tested (height/length \leq tested and width \leq tested), i.e. in floors with or without services 1200 x 2000 mm (w x l) respectively 1125 x 8250 mm (w x l).

For floor constructions, according to H.8.8 of EN 1366-3, classifications apply to any penetration seal length as long as the width is reduced to an extent so that the perimeter length to seal area ratio is not smaller than that tested (see figure for permissible seal sizes). For floor constructions with length \geq 2000 mm \leq 8250 mm, maximum permissible seal width is 1125 mm.



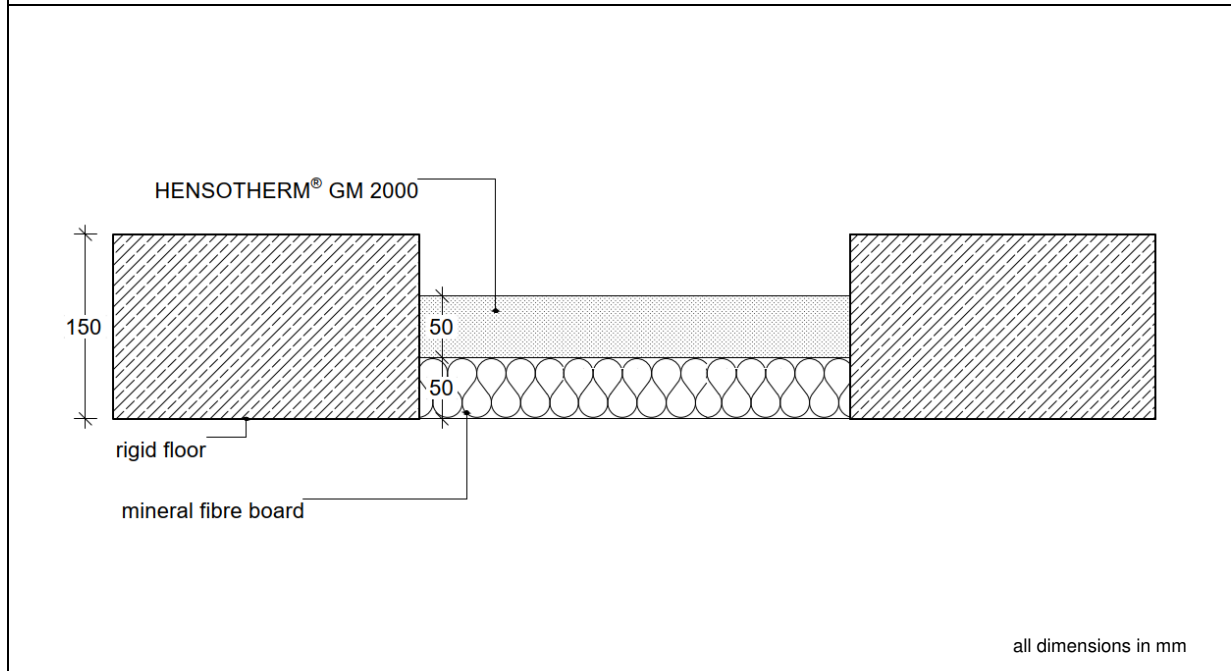
A.1.2. Minimum spacing and distance of the first support

- a₁₋₁: between cable/cable trays and metal pipes \geq 50 mm
- a₁₋₂: between cable/cable trays and plastic pipes \geq 45 mm
- a₁₋₃: between metal pipes and plastic pipes \geq 25 mm
- a₁₋₄: between plastic pipes \geq 40 mm
- a₁₋₅: between metal pipes \geq 100 mm
- a₁₋₆: between cable trays \geq 25 mm
- a₁₋₇: between pipes with pipe heating \geq 100 mm
- b₁₋₁: between cable/cable trays and the upper seal edge \geq 30 mm
- b₁₋₂: between cable/cable trays and the side seal edge \geq 20 mm
- b₁₋₃: between cable/cable trays and the lower seal edge \geq 25 mm
- b₁₋₄: between metal pipes and the side seal edge \geq 70 mm
- b₁₋₅: between plastic pipes and the side seal edge \geq 50 mm

Distance of first support of penetrating services \leq 250 mm from the top of the floor

A.2. Blank seal

Construction details: Blank HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm, i.e. no penetrating services in a rigid floor, comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction. A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top.



A.2.1. Blank seal

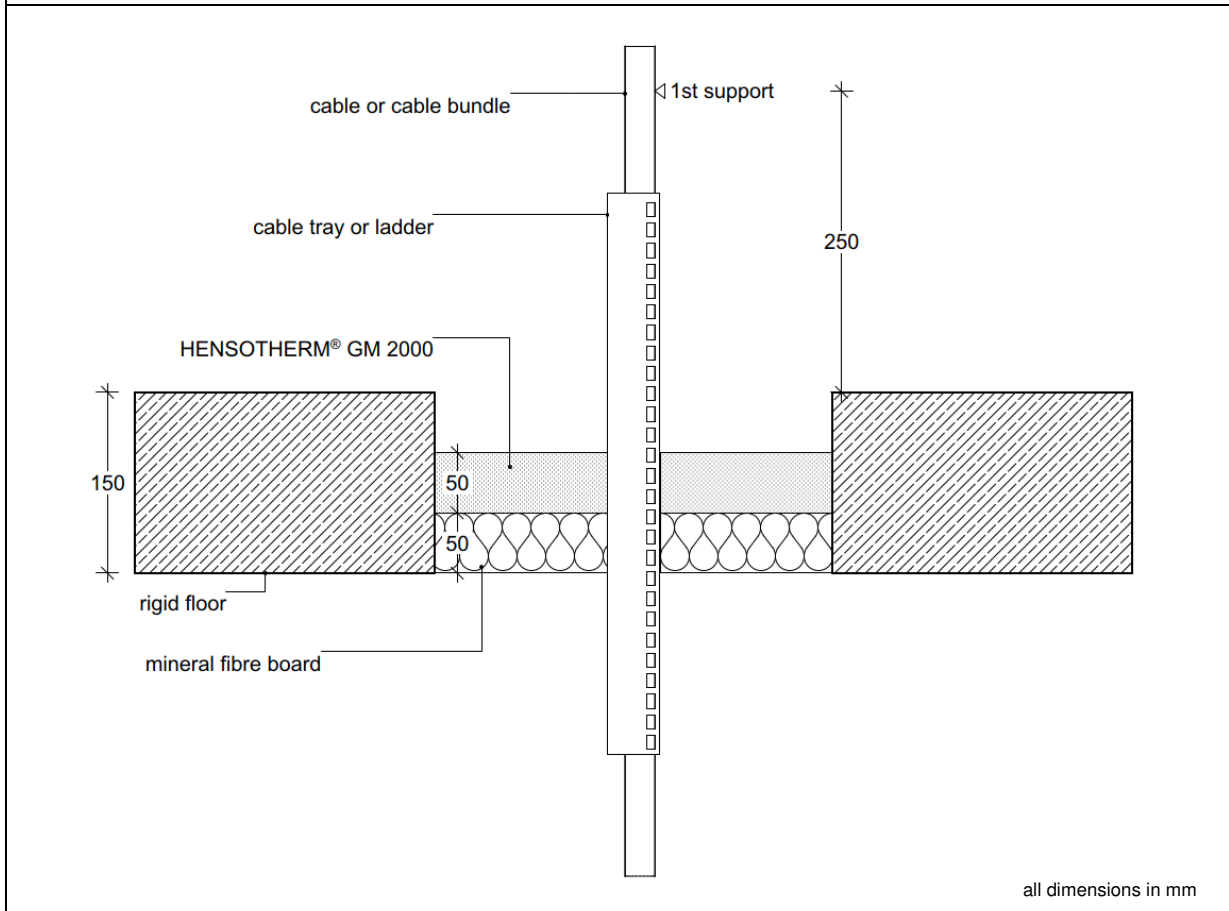
Services	Classification
No penetrating services	EI 90

A.3. Single cables, cable bundles, EIP with or without cables, cable trays and support structures

Construction details: Single cables, cable bundles, electrical installation pipes (steel or PVC) with or without cables, cable trays and support structures in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the penetrating services. Any remaining annular gap is stuffed with mineral wool (reaction to fire class A1 or A2 according to EN 13501-1) in full depth to achieve a tight fit. Allowed annular space width 0 mm, i.e. no annular gap.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.3.1. Single cables, cable bundles, EIP with or without cables, cable trays and support structures

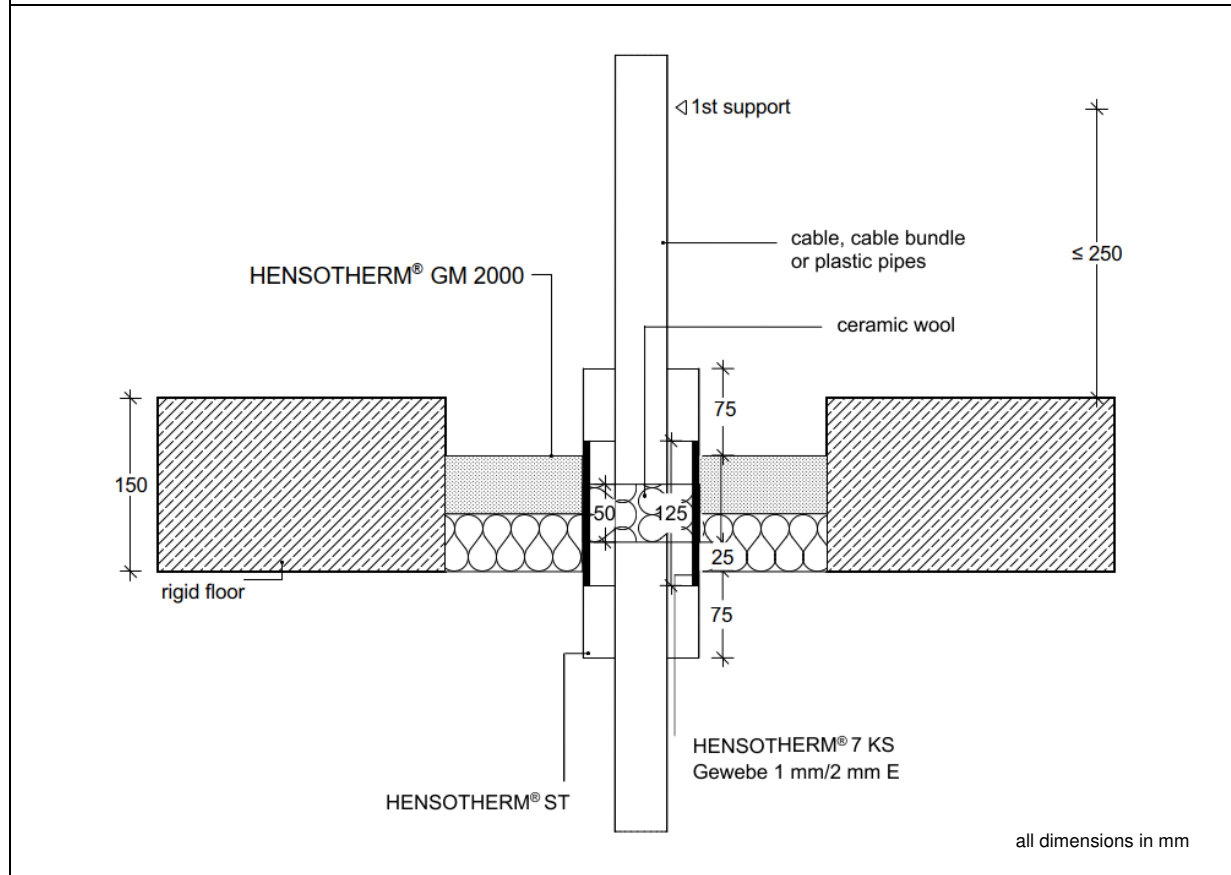
Services	Max. diameter bundle [mm]	Max. diameter single conduit [mm]	Max. diameter single cable [mm]	Classification
Sheathed cables of all types, single or in a bundle	100	-	21	EI 60
Telecommunications cables, single or in a bundle	100	-	21	EI 60
A1, A2 or A3 cable, single	-	-	21	EI 90
Aluminium cable type NAYY4x16RE, single	-	-	23	EI 60
C1, C2 or C3 cable, single	-	-	50	EI 90
Sheathed cables of all types, single	-	-	80	EI 60
D1 or D2 cable, single	-	-	80	EI 90
Cable conduit PVC, with or without cables, single	-	32	21	EI 90
Cable conduit steel, with or without cables, single	-	16	16	EI 60
Cable support, tray or ladder	-	500	-	EI 90

A.4. Single cables, cable bundles or EIP led through a HENSOTHERM® service transit

Construction details: Single cables, cable bundles or electrical installation pipes (PVC) with or without cables led through a HENSOTHERM® Service Transit type ST 250 (length 250 mm) friction fitted into a HENSOTHERM® GM 2000 Mixed Penetration Seal 50/50 mm installed in a rigid floor, comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the HENSOTHERM® Service Transit that is positioned centrally in the HENSOTHERM® GM 2000 Mixed Penetration Seal 50/50 mm, protruding 75 mm on the underside. Any remaining annular gap is stuffed with mineral wool (reaction to fire class A1 or A2 according to EN 13501-1) in full depth to achieve a tight fit. Alternatively, a hole saw fitting the diameter of the HENSOTHERM® Service Transit may be used. Allowed annular space width 0 mm, i.e. no annular gap.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.4.1. Single cables, cable bundles or EIP led through a HENSOTHERM® Service Transit

Services	Classification		
	HENSOTHERM® ST 250 Diameter 63 mm	HENSOTHERM® ST 250 Diameter 90 mm	HENSOTHERM® ST 250 Diameter 110 mm
PVC pipes $\leq 32 \text{ mm}$ without cables	EI 120	n. a.	n. a.
PVC pipes $\leq 32 \text{ mm}$ with sheathed cables of all types $\leq 21 \text{ mm}$, single or in a bundle	EI 120	n. a.	n. a.
PVC pipes $\leq 32 \text{ mm}$ with cables A1, A2, A3 or B, single or in a bundle	n. a.	EI 120	EI 120
With cables A1, A2, A3 or B, single or in a bundle	EI 120	EI 120	EI 120
No penetrating services	EI 120	EI 120	EI 120

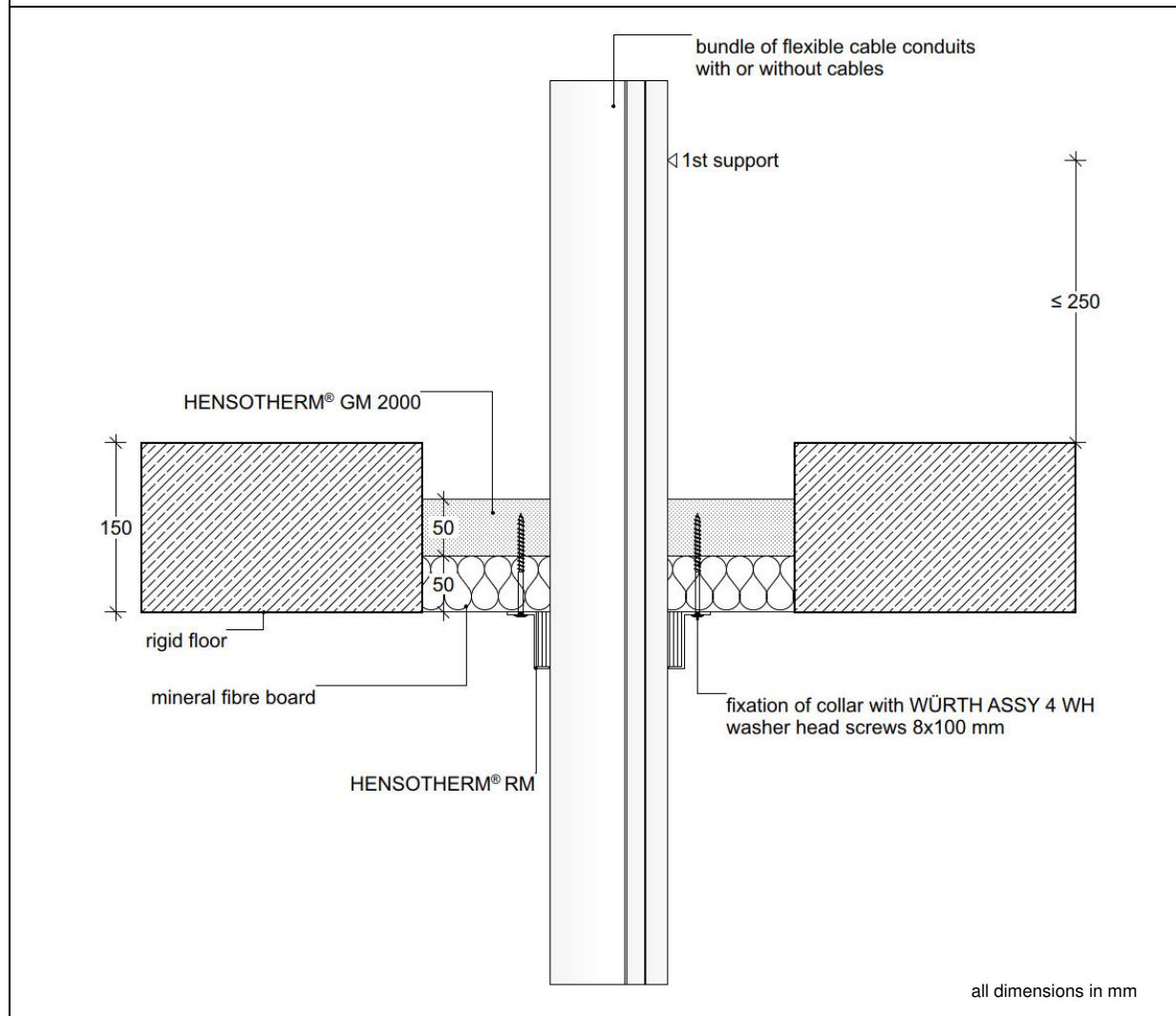
A.5. Polyolefin flexible cable conduits with or without cables with HENSOTHERM® RM

Construction details: Polyolefin flexible cable conduits with or without cables, single or in a bundle, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the penetrating services. Any remaining annular gap is stuffed with mineral wool (reaction to fire class A1 or A2 according to EN 13501-1) in full depth to achieve a tight fit. Allowed annular space width 0 mm, i.e. no annular gap.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.

From the underside of the seal, a HENSOTHERM® RM pipe collar is applied around the polyolefin flexible cable conduits in the appropriate collar type and size corresponding with the bundle diameter (see table), aligned flush to the mineral fibre board's surface, and closed with the locking lugs. The HENSOTHERM® RM pipe collar is secured in place with WÜRTH ASSY 4 WH washer head screws 8x100 mm at all fastening lugs.



A.5.1. Polyolefin flexible cable conduits with or without cables with HENSOTHERM® RM

Services	Max. diameter bundle [mm]	Max. diameter single cable conduit [mm]	Max. diameter single cable [mm]	HENSOTHERM® RM pipe collar [height-size, mm]	Classification
Polyolefin flexible cable conduits with or without cables, single or in a bundle	125	63	21	HENSOTHERM® RM 50-125	EI 90

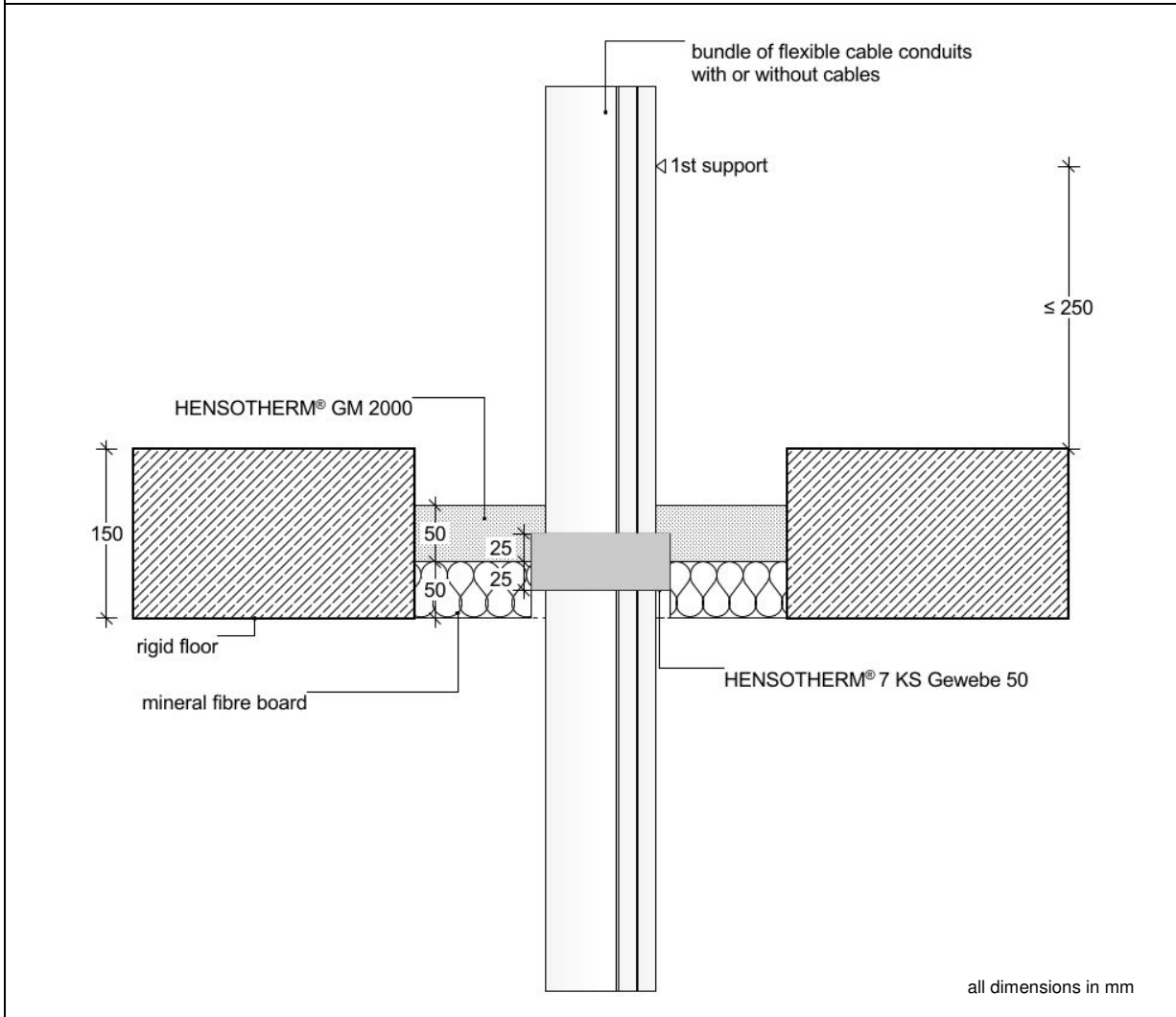
A.6. Polyolefin flexible cable conduits with or without cables with HENSOTHERM® 7 KS Gewebe 50

Construction details: Polyolefin flexible cable conduits with or without cables, single or in a bundle, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

Around the polyolefin flexible cable conduits, a wrapping of one length of HENSOTHERM® 7 KS Gewebe 50 endless pipe collar (thickness 2 mm), positioned at centre of the seal and protruding 25 mm on the topside of the mineral fibre board, with number of layers of according to table, and fixed with adhesive tape, is applied.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the HENSOTHERM® 7 KS Gewebe 50 wrap, resulting in an annular gap between penetrating services and mineral fibre boards so that the HENSOTHERM® 7 KS Gewebe 50 wrap is visible from the underside of the seal.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.6.1. Polyolefin flexible cable conduits with or without cables with HENSOTHERM® 7 KS Gewebe 50

Services	Max. diameter bundle [mm]	Max. diameter single cable conduit [mm]	Max. diameter single cable [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Polyolefin flexible cable conduits with or without cables, single or in a bundle	125	63	21	5	EI 120

A.7. Combustible plastic pipes with FEF-insulation with HENSOTHERM® RM

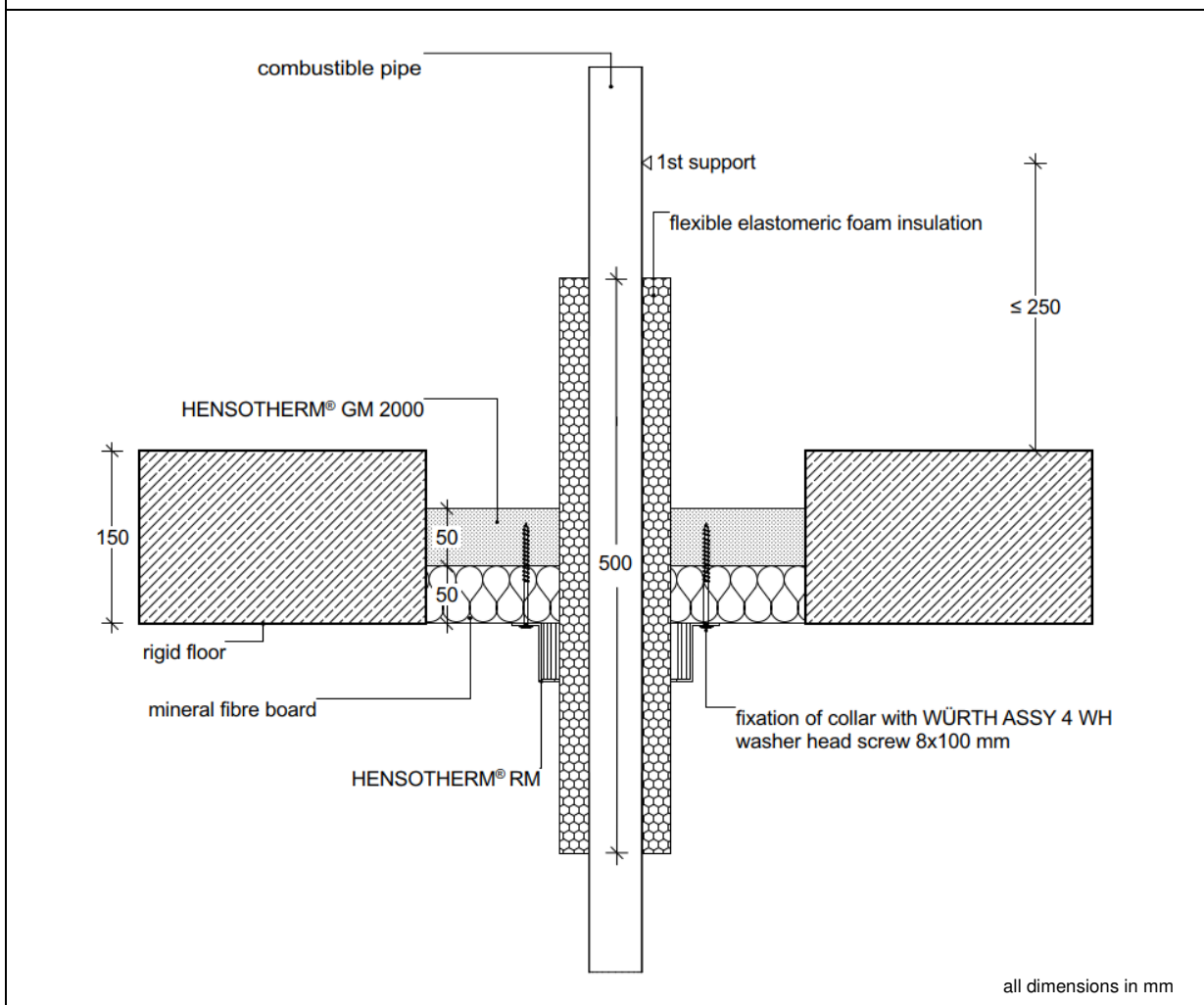
Construction details: Combustible plastic pipes with min. 500 mm long local sustained (LS) or continuous sustained (CS) flexible elastomeric foam (FEF) or synthetic rubber insulation with a with a building material class rated equal to or better than B-s3,d0 according to DIN EN 13501-1, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The min. 500 mm long local insulation is positioned at centre of the seal, protruding min. 200 mm on both sides. The length of the local insulation may be increased but not reduced, classification is also applicable to continuous sustained insulation (CS).

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the penetrating services. Any remaining annular gap is stuffed with mineral wool (reaction to fire class A1 or A2 according to EN 13501-1) in full depth to achieve a tight fit. Allowed annular space width 0 mm, i.e. no annular gap.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.

From the underside of the seal, a HENSOTHERM® RM pipe collar is applied around the insulation in the appropriate collar type and size corresponding with the service diameter (see table), aligned flush to the mineral fibre board's surface, and closed with the locking lugs. The HENSOTHERM® RM pipe collar is secured in place with WÜRTH ASSY 4 WH washer head screws 8x100 mm at all fastening lugs.



A.7.1. Geberit Silent-PP with FEF-insulation with HENSOTHERM® RM

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	HENSOTHERM® RM pipe collar [height-size, mm]	Classification
Geberit Silent-PP	110	3.6	$\leq \text{B-s3,d0}$	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 90 U/U
	125	4.2		15.0		HENSOTHERM® RM 50-160	

A.7.2. Geberit Silent-Pro with FEF-insulation with HENSOTHERM® RM

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	HENSOTHERM® RM pipe collar [height-size, mm]	Classification
Geberit Silent-Pro	110	4.5	≤ B-s3,d0	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 90 U/U
	125	5.0		15.0		HENSOTHERM® RM 50-160	

A.7.3. PE pipes with FEF-insulation with HENSOTHERM® RM

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	HENSOTHERM® RM pipe collar [height-size, mm]	Classification
PE incl. PE 100, PE-HD, PE-X, ABS, SAN+PVC	110	3.9 – 11.4	≤ B-s3,d0	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 90 U/U
	> 110 ≤ 125	3.9 – 11.4		15.0		HENSOTHERM® RM 50-160	
	> 125 ≤ 140	8.3		10.0		HENSOTHERM® RM 50-160	

Test results on single layer pipes made of PE in accordance with EN 1519-1, EN 12201-1, EN ISO 15494 or EN 12666-1 are valid for all single layer PE pipes in accordance with EN 1519-1, EN 12666-1, EN 12201-2 and EN ISO 15494, PE-X pipes in accordance with EN ISO 15875-2, ABS pipes in accordance with EN 1455-1 and EN ISO 15493 as well as SAN+PVC pipes in accordance with ISO 19220.

The following list contains suitable branded PE-X pipes in accordance with EN ISO 15875-2 under this rule but may not be exhaustive:

Manufacturer	Product Name / Pipe Series
FRANK GmbH, Germany	FRANK SurePEX
Jentro NV, Belgium	Jentro PEX pipe
REHAU Industries SE & Co. KG Germany	REHAU RAUTITAN flex
Uponor GmbH, Germany	Uponor Aqua Pipe
	Uponor Aqua Pipe Blue
	Uponor Combi Pipe
	Uponor Comfort Pipe PLUS Blue
	Uponor Radi Pipe

A.7.4. POLO-KAL NG with FEF-insulation with HENSOTHERM® RM

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	HENSOTHERM® RM pipe collar [height-size, mm]	Classification
POLO-KAL NG	110	3.4	≤ B-s3,d0	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 60 U/U
	125	3.9		15.0		HENSOTHERM® RM 50-160	

A.7.5. PP pipes with FEF-insulation with HENSOTHERM® RM

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	HENSOTHERM® RM pipe collar [height-size, mm]	Classification
PP	110	3.9 – 11.4	≤ B-s3,d0	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 90 U/U
	> 110 ≤ 125	3.9 – 11.4		15.0		HENSOTHERM® RM 50-160	
	> 125 ≤ 140	4.3 – 8.0		10.0		HENSOTHERM® RM 50-160	

Test results on single layer pipes made of PP in accordance with EN 1451-1 are valid for single layer PP pipes in accordance with EN 1451-1, EN ISO 15874 and EN ISO 15494.

A.7.6. PVC-U pipes with FEF-insulation with HENSOTHERM® RM

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	HENSOTHERM® RM pipe collar [height-size, mm]	Classification
PVC-U	110	3.7 – 6.0	≤ B-s3,d0	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 90 U/U
	> 110 ≤ 125	3.7 – 6.0		15.0		HENSOTHERM® RM 50-160	
	> 125 ≤ 140	4.1 – 6.7		10.0		HENSOTHERM® RM 50-160	EI 60 U/U
	> 125 ≤ 140	6.7		10.0		HENSOTHERM® RM 50-160	EI 90 U/U

Test results on single layer pipes made of PVC-U in accordance with EN 1329-1, EN 1453-1 or EN ISO 1452-2 are valid for single layer pipes made of PVC-U in accordance with EN 1329-1, EN 1453-1, EN ISO 15493 and EN ISO 1452-2 and for pipes made of PVC-C in accordance with EN 1566-1, EN ISO 15493 and EN ISO 15877-2.

A.8. Combustible plastic pipes with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

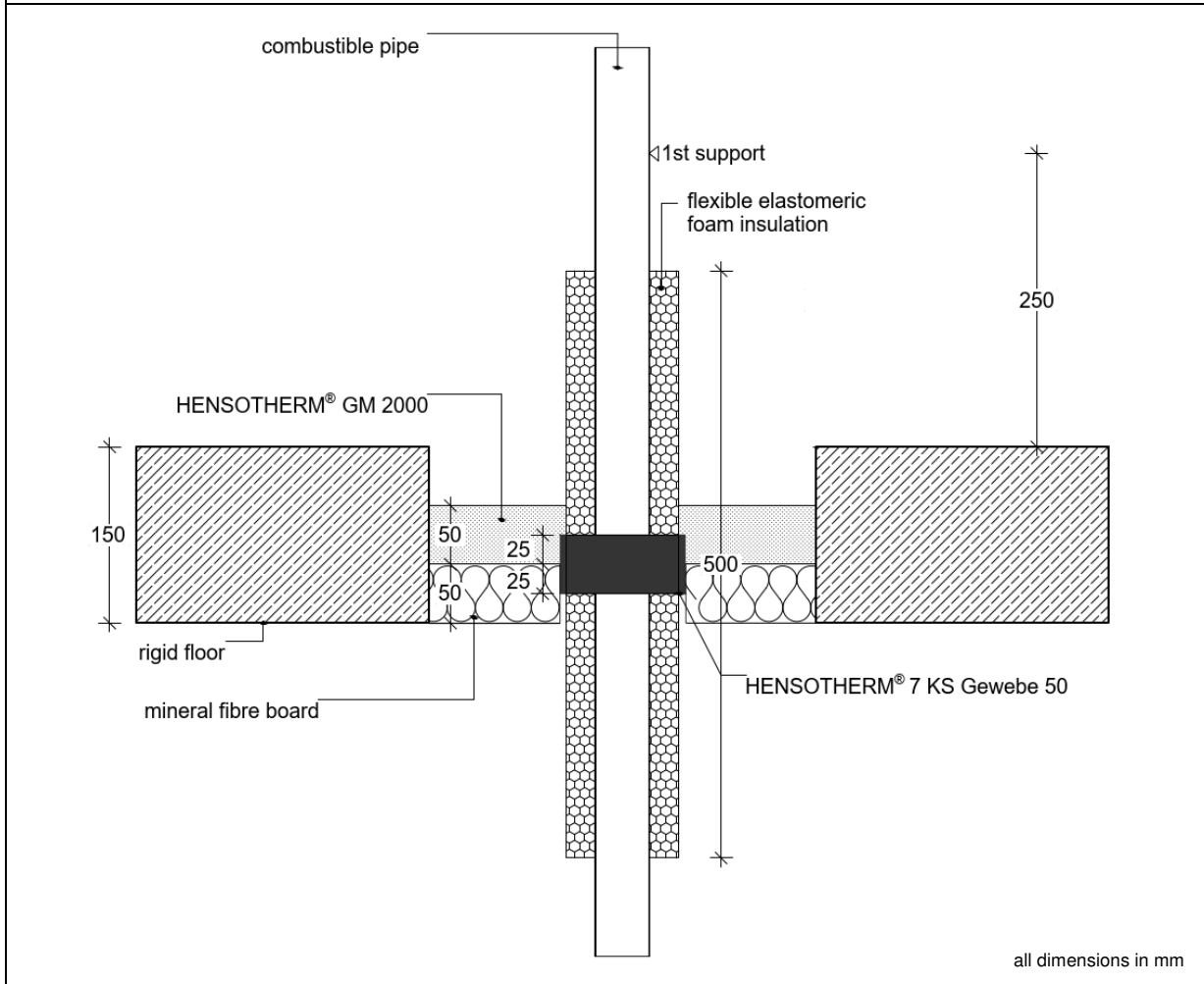
Construction details: Combustible plastic pipes with min. 500 mm long local sustained (LS) or continuous sustained (CS) flexible elastomeric foam (FEF) or synthetic rubber insulation with a with a building material class rated equal to or better than B-s3,d0 according to DIN EN 13501-1, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The min. 500 mm long local insulation is positioned at centre of the seal, protruding min. 200 mm on both sides. The length of the local insulation may be increased but not reduced, classification is also applicable to continuous sustained insulation (CS).

Around the insulation, a wrapping of one length of HENSOTHERM® 7 KS Gewebe 50 endless pipe collar (thickness 2 mm), positioned at centre of the seal and protruding 25 mm on the topside of the mineral fibre board, with number of layers of according to table, and fixed with adhesive tape, is applied.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the HENSOTHERM® 7 KS Gewebe 50 wrap, resulting in an annular gap between penetrating services and mineral fibre boards so that the HENSOTHERM® 7 KS Gewebe 50 wrap is visible from the underside of the seal.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.8.1. Aquatherm blue pipe with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
aquatherm blue pipe	90	8.2	$\leq \text{B-s3,d0}$	9.5	CS / LS 500	2	EI 90 U/C
	110	10.0		9.5		3	
	125	11.4		15.0		4	EI 60 U/C

A.8.2. Aquatherm green pipe with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
aquatherm green pipe	90	8.2 – 15.0	≤ B-s3,d0	9.5	CS / LS 500	2	EI 90 U/C
	110	10.0 – 18.3		9.5		3	
	125	11.4		15.0		4	

A.8.3. Aquatherm red pipe with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
aquatherm red pipe	90	12.3	≤ B-s3,d0	9.5	CS / LS 500	2	EI 90 U/C
	110	15.1		9.5		3	
	125	17.1		15.0		4	EI 60 U/C

A.8.4. Geberit Silent-PP with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Geberit Silent-PP	90	3.1	≤ B-s3,d0	9.5	CS / LS 500	4	EI 90 U/U
	110	3.6		9.5		5	

A.8.5. Geberit Silent-Pro with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Geberit Silent-Pro	90	4.3	≤ B-s3,d0	9.5	CS / LS 500	4	EI 90 U/U
	110	4.5		9.5		5	

A.8.6. PE pipes with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
PE incl. PE 100, PE-HD, PE-X, ABS, SAN+PVC	90	3.5 – 8.2	≤ B-s3,d0	9.5	CS / LS 500	4	EI 90 U/U
	> 90 ≤ 110	3.4 – 10.0		9.5		5	

Test results on single layer pipes made of PE in accordance with EN 1519-1, EN 12201-1, EN ISO 15494 or EN 12666-1 are valid for all single layer PE pipes in accordance with EN 1519-1, EN 12666-1, EN 12201-2 and EN ISO 15494, PE-X pipes in accordance with EN ISO 15875-2, ABS pipes in accordance with EN 1455-1 and EN ISO 15493 as well as SAN+PVC pipes in accordance with ISO 19220.

The following list contains suitable branded PE-X pipes in accordance with EN ISO 15875-2 under this rule but may not be exhaustive:

Manufacturer	Product Name / Pipe Series
FRANK GmbH, Germany	FRANK SurePEX
Jentro NV, Belgium	Jentro PEX pipe
REHAU Industries SE & Co. KG Germany	REHAU RAUTITAN flex
Uponor GmbH, Germany	Uponor Aqua Pipe
	Uponor Aqua Pipe Blue
	Uponor Combi Pipe
	Uponor Comfort Pipe PLUS Blue
	Uponor Radi Pipe

A.8.7. POLO-KAL NG with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
POLO-KAL NG	90	3.0	≤ B-s3,d0	15.0	CS / LS 500	4	EI 90 U/U
	110	3.4		15.0		5	

A.8.8. PP pipes with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
PP	90	2.8 – 8.2	≤ B-s3,d0	9.5	CS / LS 500	4	EI 90 U/U
	> 90 ≤ 110	3.4 – 10.0		9.5		5	

Test results on single layer pipes made of PP in accordance with EN 1451-1 are valid for single layer PP pipes in accordance with EN 1451-1, EN ISO 15874 and EN ISO 15494.

A.8.9. PVC-U pipes with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
PVC-U	90	2.7	≤ B-s3,d0	9.5	CS / LS 500	4	EI 90 U/U
	90	2.8 – 6.7		9.5		4	EI 60 U/U
	> 90 ≤ 110	3.2 – 8.1		9.5		5	EI 90 U/U

Test results on single layer pipes made of PVC-U in accordance with EN 1329-1, EN 1453-1 or EN ISO 1452-2 are valid for single layer pipes made of PVC-U in accordance with EN 1329-1, EN 1453-1, EN ISO 15493 and EN ISO 1452-2 and for pipes made of PVC-C in accordance with EN 1566-1, EN ISO 15493 and EN ISO 15877-2.

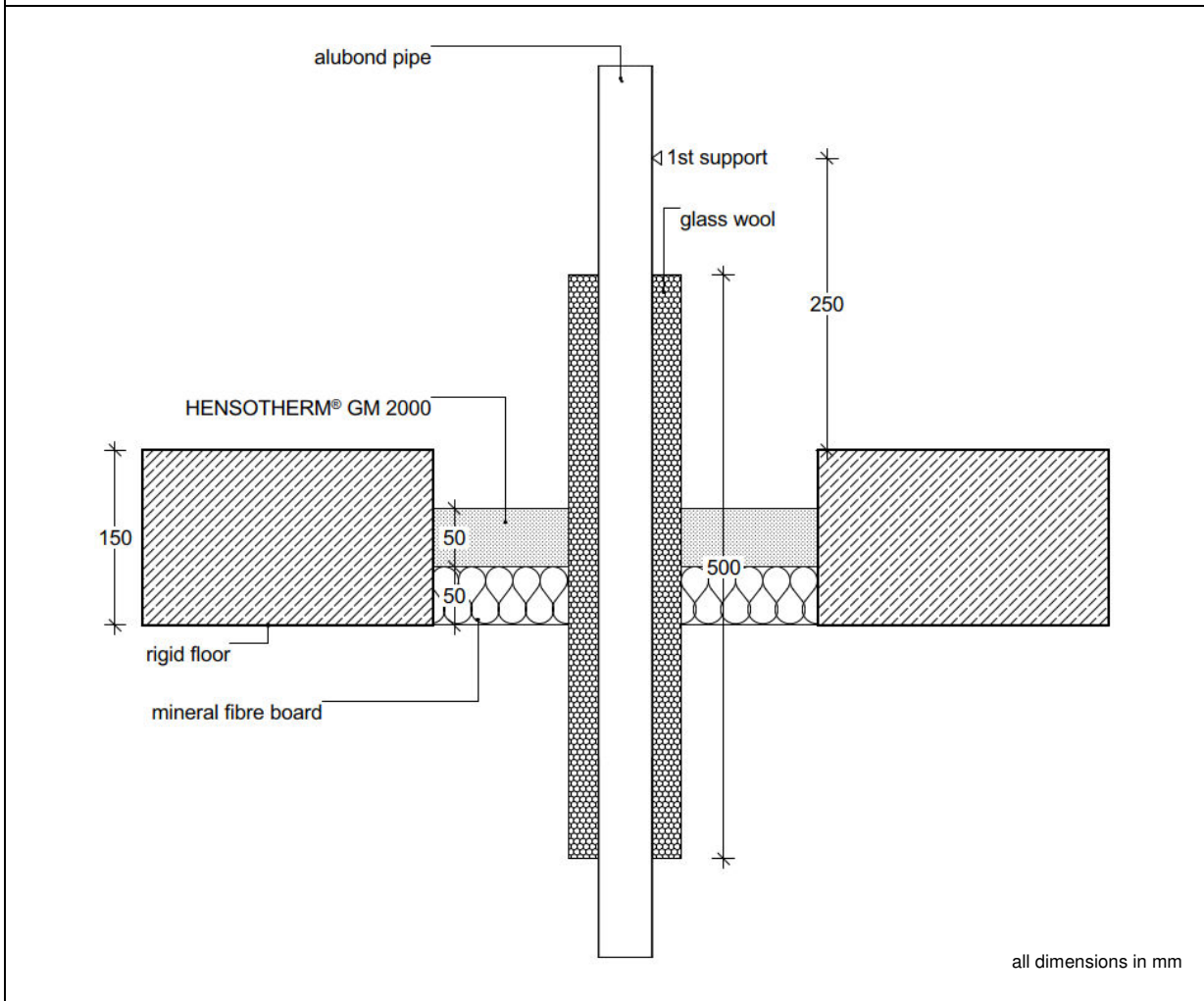
A.9. Aluminium-composite pipes with glass wool insulation

Construction details: Aluminium-composite pipes with min. 500 mm long local sustained (LS) or continuous sustained (CS) Isover CLIMPIPE Section Alu2 glass wool insulation with a with a building material class rated equal to or better than A2-s1,d0 according to DIN EN 13501-1, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The min. 500 mm long local insulation is positioned at centre of the seal, protruding min. 200 mm on both sides. The length of the local insulation may be increased but not reduced, classification is also applicable to continuous sustained insulation (CS).

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the penetrating services. Any remaining annular gap is stuffed with mineral wool (reaction to fire class A1 or A2 according to EN 13501-1) in full depth to achieve a tight fit. Allowed annular space width 0 mm, i.e. no annular gap.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.9.1. Geberit Mepla with glass wool insulation

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness [mm]	Insulation length [mm]	Classification
Geberit Mepla	16	2.25	Glass wool	20	CS / LS 500	EI 90 U/C
	40	3.5		20		
	63	4.5		30	EI 60 U/C	

A.9.2. Uponor MLC with glass wool insulation

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness [mm]	Insulation length [mm]	Classification
Uponor MLC	14	2.0	Glass wool	20	CS / LS 500	EI 90 U/C
	40	4.0		20		
	63	6.0		30		

A.9.3. Rehau RAUTITAN stabil with glass wool insulation

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness [mm]	Insulation length [mm]	Classification
Rehau RAUTITAN stabil	16.2	2.6	Glass wool	20	CS / LS 500	EI 90 U/C
	40	6.0		20		

A.9.4. Viega Raxofix with glass wool insulation

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness [mm]	Insulation length [mm]	Classification
Viega Raxofix	16	2.2	Glass wool	20	CS / LS 500	EI 90 U/C
	40	3.5		20		
	63	4.5		30		

A.10. Aluminium-composite pipes with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

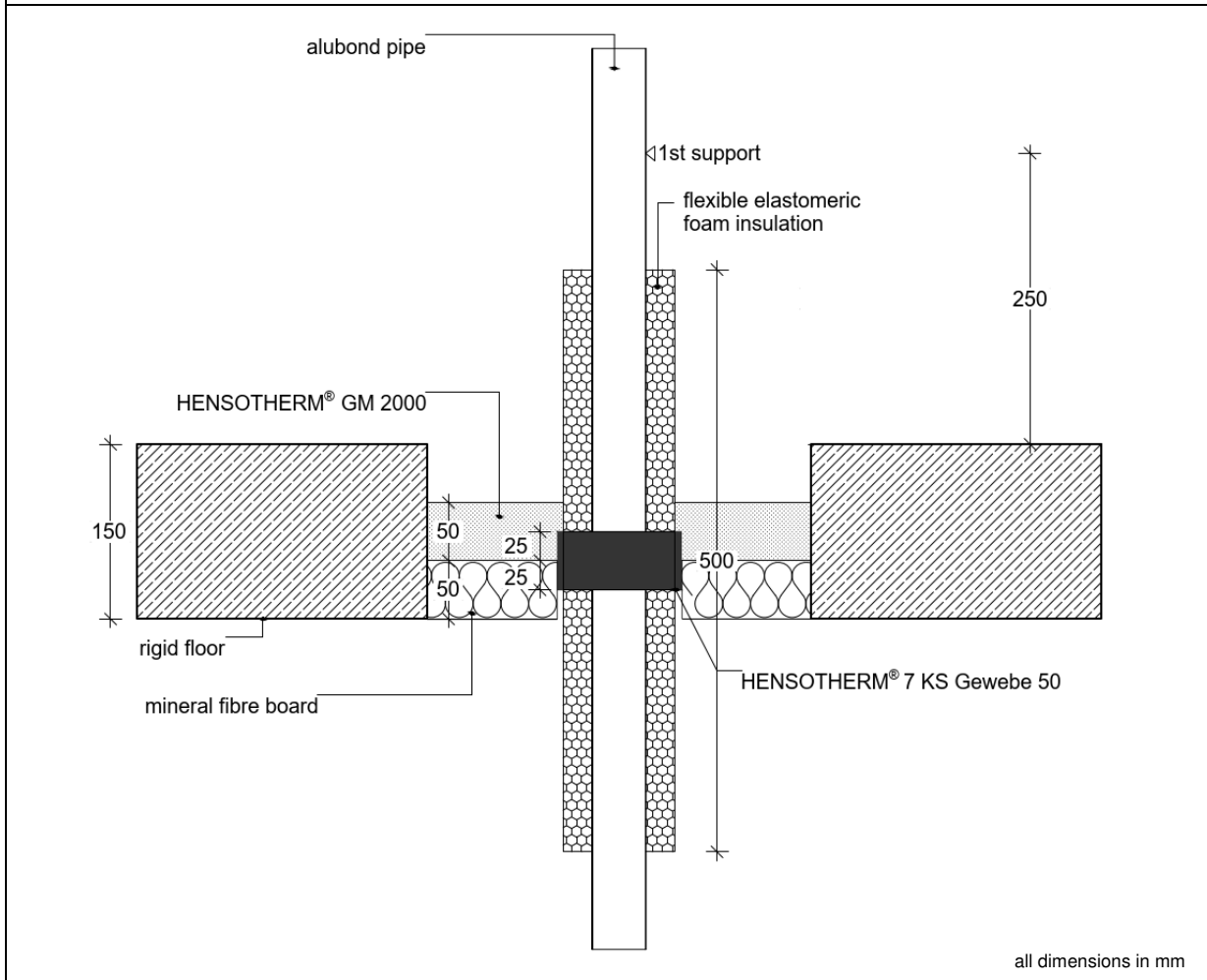
Construction details: Aluminium-composite pipes with min. 500 mm long local sustained (LS) or continuous sustained (CS) flexible elastomeric foam (FEF) or synthetic rubber insulation with a with a building material class rated equal to or better than B-s3,d0 according to DIN EN 13501-1, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The min. 500 mm long local insulation is positioned at centre of the seal, protruding min. 200 mm on both sides. The length of the local insulation may be increased but not reduced, classification is also applicable to continuous sustained insulation (CS).

Around the insulation, a wrapping of one length of HENSOTHERM® 7 KS Gewebe 50 endless pipe collar (thickness 2 mm), positioned at centre of the seal and protruding 25 mm on the topside of the mineral fibre board, with number of layers of according to table, and fixed with adhesive tape, is applied.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the HENSOTHERM® 7 KS Gewebe 50 wrap, resulting in an annular gap between penetrating services and mineral fibre boards so that the HENSOTHERM® 7 KS Gewebe 50 wrap is visible from the underside of the seal.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.10.1. Geberit Mepla with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Geberit Mepla	16	2.25	$\leq \text{B-s3,d0}$	8.0	CS/LS 500	1	EI 90 U/C
	40	3.5		9.0 – 19.5		1	
	63	4.5		9.0 – 21.5		2	

A.10.2. Uponor MLC with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Uponor MLC	14	2.0	≤ B-s3,d0	8.0	CS / LS 500	1	EI 90 U/C
	40	4.0		9.0 – 19.5		1	
	63	6.0		9.0 – 21.5		2	

A.10.3. Rehau RAUTITAN stabil with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Rehau RAUTITAN stabil	16.2	2.6	≤ B-s3,d0	8.0	CS / LS 500	1	EI 90 U/C
	40	6.0		9.0 – 19.5		1	

A.10.4. Viega Raxofix with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Viega Raxofix	16	2.2	≤ B-s3,d0	8.0	CS / LS 500	1	EI 90 U/C
	40	3.5		9.0 – 19.5		1	
	63	4.5		9.0 – 21.5		2	

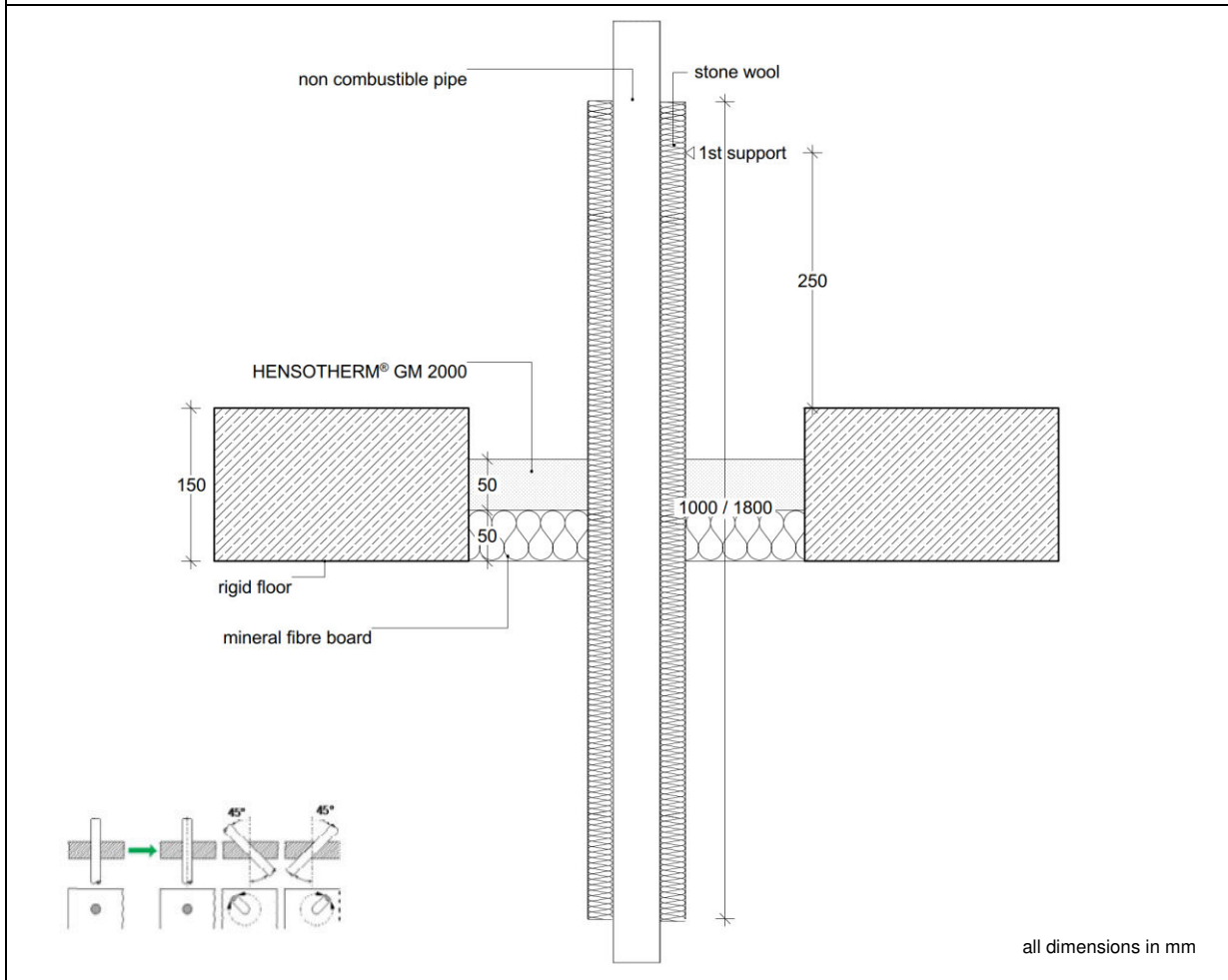
A.12. Metal pipes with stone wool insulation

Construction details: Non-combustible metal pipes with min. 1000/1800 mm long local sustained (LS) or continuous sustained (CS) stone wool insulation 80 kg/m³ or higher in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board ≥ 150 kg/m³ positioned flush with the bottom of the floor and fixed by friction.

The min. 1000/1800 mm long local insulation is positioned at centre of the seal, protruding min. 450/850 mm on both sides. The length of the local insulation may be increased but not reduced, classification is also applicable to continuous sustained insulation (CS). The insulation is secured in place with metal straps or wires ≥ 0.6 mm. The thickness (see table) of the insulation may be increased but not reduced. All penetration angles between 90° and 45° are covered in all directions (see pictogram).

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the penetrating services. Any remaining annular gap is stuffed with mineral wool (reaction to fire class A1 or A2 according to EN 13501-1) in full depth to achieve a tight fit. Allowed annular space width 0 mm, i.e. no annular gap.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.12.1. Metal pipes with stone wool insulation

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness min. [mm]	Insulation length [mm]	Classification
Copper	≤ 42	1.2 – 14.2	Stone wool ≥ 80 kg/m ³	20	CS / LS 1000	EI 120 C/U
	> 42 ≤ 88.9	2.0 – 14.2		30	CS / LS 1800	
Steel or cast iron	≤ 42	1.2 – 14.2	Stone wool ≥ 80 kg/m ³	20	CS / LS 1000	EI 120 C/U
	> 42 ≤ 88.9	2.0 – 14.2		30	CS / LS 1800	
	> 88.9 ≤ 139.7	4.0 – 14.2		30		

A.13. Metal pipes with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

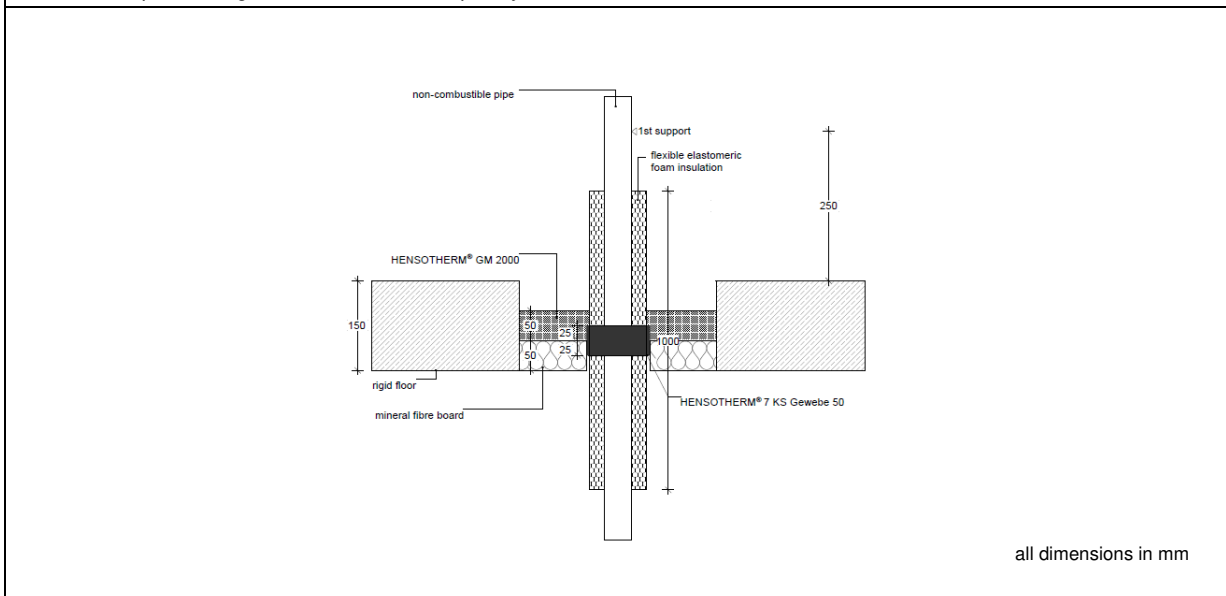
Construction details: Non-combustible metal pipes with min. 1000 mm long local sustained (LS) or continuous sustained (CS) flexible elastomeric foam (FEF) or synthetic rubber insulation with a with a building material class rated equal to or better than B-s3,d0 according to DIN EN 13501-1, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The min. 1000 mm long local insulation is positioned at centre of the seal, protruding min. 450 mm on both sides. The length of the local insulation may be increased but not reduced, classification is also applicable to continuous sustained insulation (CS).

Around the insulation, a wrapping of one length of HENSOTHERM® 7 KS Gewebe 50 endless pipe collar (thickness 2 mm), positioned at centre of the seal and protruding 25 mm on the topside of the mineral fibre board, with number of layers of according to table, and fixed with adhesive tape, is applied.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the HENSOTHERM® 7 KS Gewebe 50 wrap, resulting in an annular gap between penetrating services and mineral fibre boards so that the HENSOTHERM® 7 KS Gewebe 50 wrap is visible from the underside of the seal.

A min. 50 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



A.13.1. Metal pipes with FEF-insulation with HENSOTHERM® 7 KS Gewebe 50

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50 (2 mm)	Classification
Copper	≤ 15	1.0 – 7.5	$\leq \text{B-s3,d0}$	8.0	CS / LS 1000	1	EI 90 C/U
	≤ 42	1.2 – 14.2		13.5 – 20.5		1	
	$> 42 \leq 88.9$	2.0 – 14.2		18.0 – 30.5		2	EI 45 C/U
	$> 42 \leq 88.9$	2.0 – 14.2		30.5		2	EI 60 C/U
Steel or cast iron	≤ 15	1.0 – 7.5	$\leq \text{B-s3,d0}$	8.0	CS / LS 1000	1	EI 90 C/U
	≤ 42	1.2 – 14.2		13.5 – 20.5		1	
	$> 42 \leq 88.9$	2.0 – 14.2		18.0 – 30.5		2	EI 45 C/U
	$> 42 \leq 88.9$	2.0 – 14.2		30.5		2	EI 60 C/U
	$> 88.9 \leq 139.7$	4.0 – 14.2		19.0		2	EI 60 C/U
	$> 88.9 \leq 139.7$	4.0 – 14.2		19.0 – 32.0		2	EI 45 C/U

ANNEX A – Resistance to Fire Classification – HENSOTHERM® GM 2000

B.1. Rigid floor constructions with floor thickness of minimum 150 mm

Seal constructions with minimum 100 mm depth of HENSOTHERM® GM 2000 gypsum mortar compound layer.

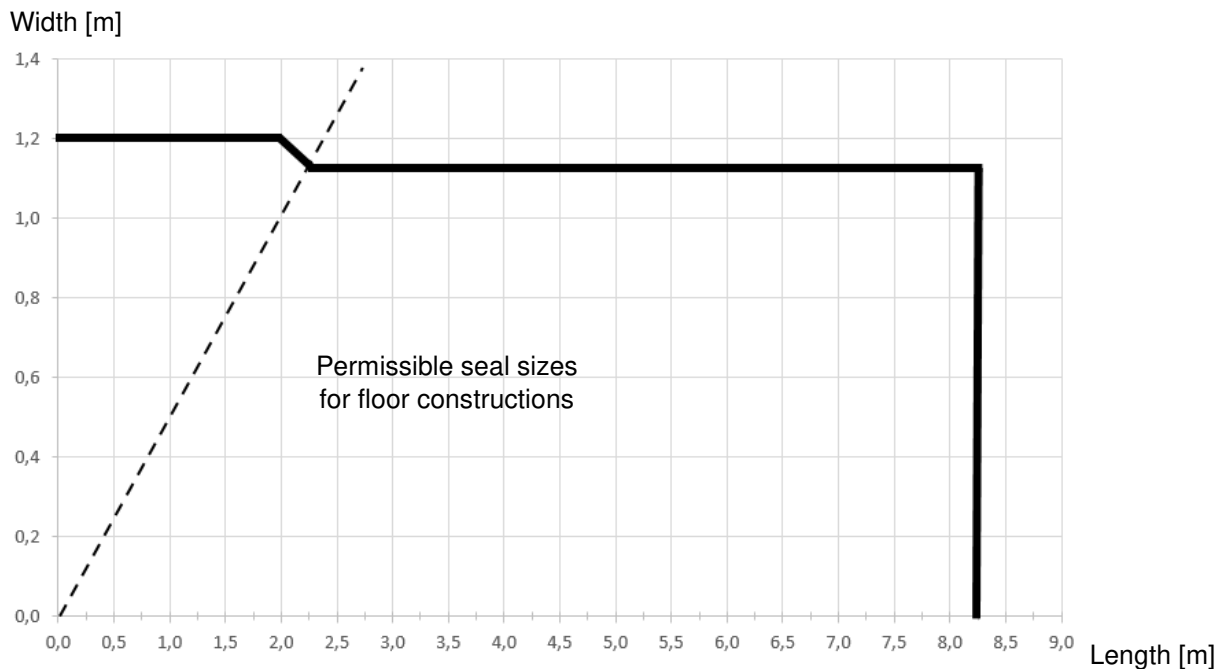
The depth of the HENSOTHERM® GM 2000 gypsum mortar compound layer may be increased but not reduced.

B.1.1. Maximum seal size

The maximum permissible seal area that can be occupied by penetrating services is 60 %.

Classifications are valid for any penetration seal equal to or smaller than that tested (height/length \leq tested and width \leq tested), i.e. in floors with or without services 1200 x 2000 mm (w x l) respectively 1125 x 8250 mm (w x l).

For floor constructions, according to H.8.8 of EN 1366-3, classifications apply to any penetration seal length as long as the width is reduced to an extent so that the perimeter length to seal area ratio is not smaller than that tested (see figure for permissible seal sizes). For floor constructions with length \geq 2000 mm \leq 8250 mm, maximum permissible seal width is 1125 mm.

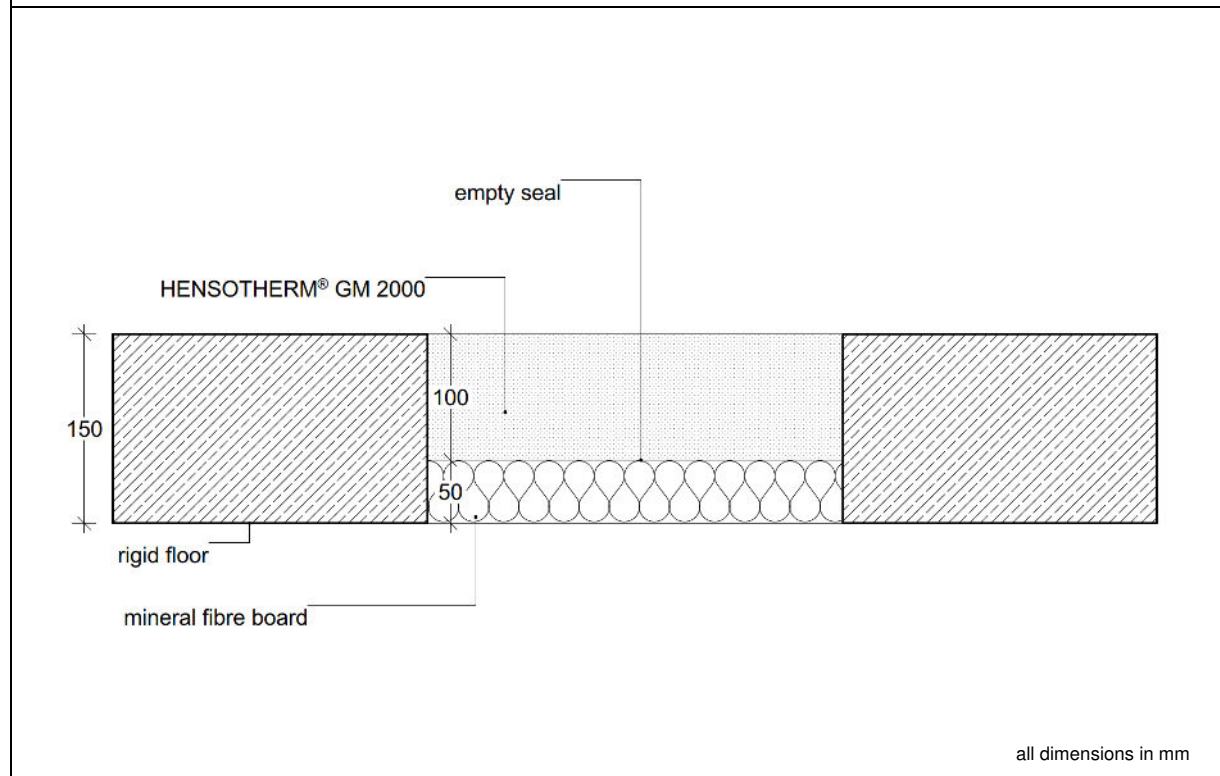


B.1.2. Minimum spacing and distance of the first support

Distance of first support of penetrating services \leq 250 mm from the top of the floor

B.2. Blank seal

Construction details: Blank HENSOTHERM® GM 2000 mixed penetration seal 100/50 mm, i.e. no penetrating services in a rigid floor, comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction. A min. 100 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top.



B.2.1. Blank seal

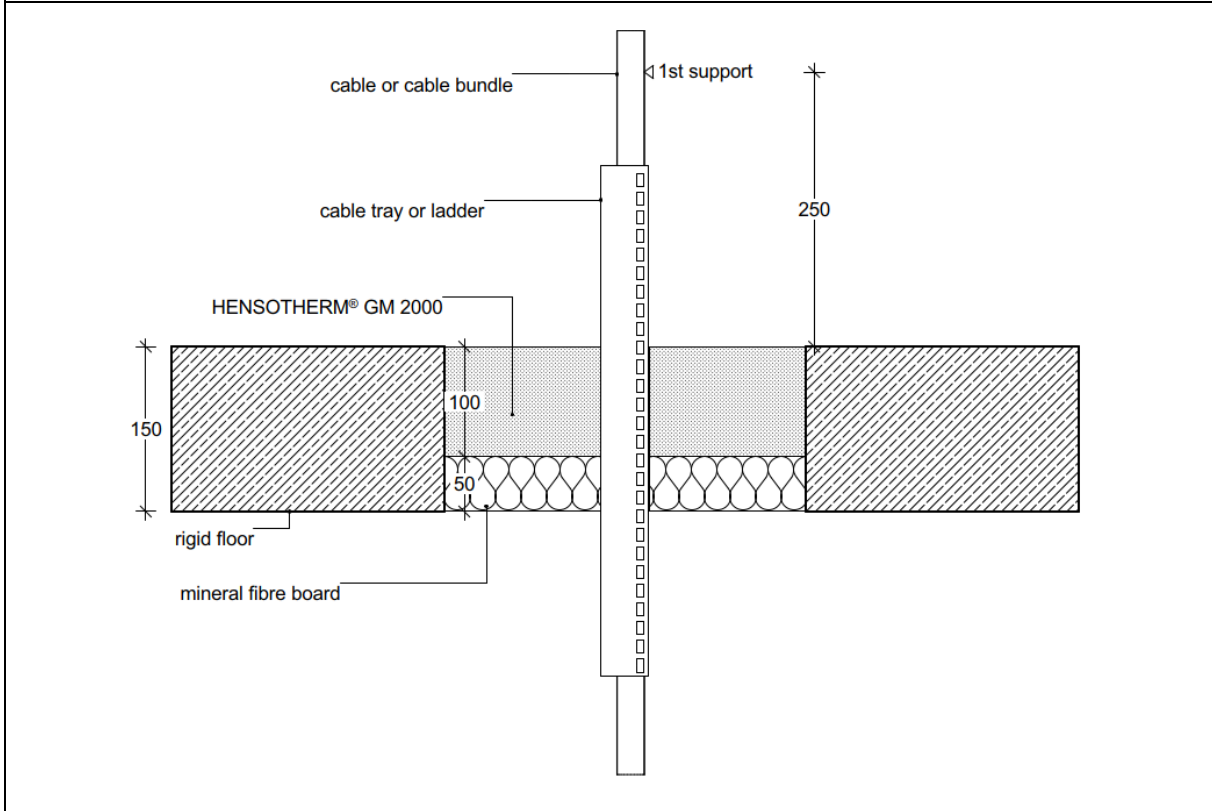
Services	Classification
No penetrating services	EI 120

B.3. Single cables, cable bundles, EIP with or without cables, cable trays and support structures

Construction details: Single cables, cable bundles, electrical installation pipes (steel or PVC) with or without cables, cable trays and support structures in a HENSOTHERM® GM 2000 mixed penetration seal 100/50 mm comprising a min. 50 mm mineral fibre board $\geq 150 \text{ kg/m}^3$ positioned flush with the bottom of the floor and fixed by friction.

The mineral fibre boards are cut to size, friction fitted into the supporting element and worked against the penetrating services. Any remaining annular gap is stuffed with mineral wool (reaction to fire class A1 or A2 according to EN 13501-1) in full depth to achieve a tight fit. Allowed annular space width 0 mm, i.e. no annular gap.

A min. 100 mm thick layer of HENSOTHERM® GM 2000 gypsum mortar compound is applied on top. All cavities around and between the penetrating services must be completely filled.



all dimensions in mm

B.3.1. Single cables, cable bundles, EIP with or without cables, cable trays and support structures

Services	Max. diameter bundle [mm]	Max. diameter single conduit [mm]	Max. diameter single cable [mm]	Classification
Sheathed cables of all types, single or in a bundle	100	-	21	EI 60
Telecommunications cables, single or in a bundle	100	-	21	EI 90
A1, A2 or A3 cable, single	-	-	21	EI 120
Aluminium cable type NAYY4x16RE, single	-	-	23	EI 90
C1 or C2 cable, single	-	-	50	EI 90
C3 cable, single	-	-	50	EI 120
Sheathed cables of all types, single	-	-	80	EI 60
D1 cable, single	-	-	80	EI 90
D2 cable, single	-	-	80	EI 120
Cable conduit PVC, with or without cables, single	-	16	16	EI 90
Cable conduit steel, with or without cables, single	-	16	16	EI 90
Cable support, tray or ladder	-	500	-	EI 120