



The new  
GYPSUM  
MASTER  
is here!

## HENSOTHERM® GM 2000

### Fire resistant sealing compound for mixed penetration seals

#### Technical Data Sheet and Installation Manual

Fire-resistant mineral gypsum mortar used to form a fire penetration seal for single or multiple services to reinstate the fire resistance performance of rigid floor constructions where they have been provided with apertures, which are penetrated by various services such like cable or pipe penetration.

- Fire resistance tested according to DIN EN 1366-3 up to EI 120, see ETA No. 22/0702
- Standard seal construction designs with 50 mm layers – highly economical!
- Simple to apply with a smooth surface finish
- Low emissions – environmental and user friendly
- High sound insulation




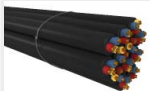






Member of  
**DGNB**  
Deutsche Gesellschaft für Nachhaltiges Bauen  
German Sustainable Building Council



# TECHNICAL INFORMATION

## Intended Use

The **HENSOTHERM® GM 2000** is a fire-resistant 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 constructions of min. 150 mm thickness and of aerated concrete or concrete with a minimum density of 650 kg/m<sup>3</sup>, 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, **HENSOTHERM® 7 KS Gewebe 50** pipe wraps and **HENSOTHERM® ST Service Transit** to form a fire penetration seal.

Permitted Services		max Ø [mm]
	Single cables	≤21.0
	Cable bundles	≤100.0
	HENSOTHERM® Service Transit ST 250	≤110.0
	Flexible electrical installation pipes with or without cables, bundle	≤125.0/63.0
	Combustible pipes with flexible elastomeric foam (FEF) insulation	≤140.0
	Aluminium composite pipes with flexible elastomeric foam (FEF) or glass wool insulation	≤63.0
	Non-combustible metal pipes with flexible elastomeric foam (FEF) insulation	≤139.7 [steel] ≤88.9 [copper]
	Non-combustible metal pipes with glass or stone wool insulation	≤139.7 [steel] ≤88.9 [copper]

## Product Characteristics

European Technical Assessment: In accordance with	ETA No. 22/0702 DIN EN 1366-3
Fire resistance classification:	up to EI 120
Reaction to fire (EN 13501-1)	Euroclass E
Max useable seal area:	60 %
Colour:	white, RAL 9010
Mixing ratio with water:	1.5 : 1 for casting 2 : 1 for use as filler
Curing time:	30 to 60 minutes
Yield, volume fully dried:	ca. 1.3 m <sup>3</sup> /t 1 bag + 10–14 litres water give ca. 28 litres casted
Durability classes:	Y <sub>1</sub> / Y <sub>2</sub> / Z <sub>1</sub> / Z <sub>2</sub>
Shelf life (at 20° C and dry storage):	min. 12 months
Storage and transport temperature:	+5 °C to +30 °C Keep free from frost!
Application temperature range:	+5 °C to +40 °C
Airborne sound insulation (EN ISO 10140-2):	R <sub>w,max</sub> = 59 dB

## Construction Elements

Rigid floors:	≥150 mm ≥650 kg/m <sup>3</sup>
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## Product Properties and Advantages

- Aluminium-composite and non-combustible metal pipes with all common FEF insulations ≤B-s3,d0
- Standard seal construction designs with 50 mm layers – highly economical!
- High sound insulation (R<sub>w,max</sub> = 59 dB) of standard seal constructions with a 50 mm layer of HENSOTHERM® GM 2000
- Fire resistance tested according to EN 1366-3 up to EI 120
- Mixing ration only 1.5 : 1 for casting – high yield!
- Simple to apply, surface can be smoothed out with a spatula
- No priming necessary, surfaces just need to be dusted off
- Can be over painted with most paints once fully cured
- Application temperature range from +5 to +40 °C
- Glass wool insulation tested up to EI 90
- Non-toxic, low smoke, and halogen-free
- Hardens quickly and tack free after 1 hour (the final fire performance specification is reached when the compound has cured for a month)




# TECHNICAL INFORMATION

## Single Products in this Product System


### HENSOTHERM® GM 2000 Gypsum Mortar

Product Name	Container / Packing Size	Article Number / EAN Code
 HENSOTHERM® GM 2000	Bag 20 litres (22 kg)	4250153545903


### HENSOTHERM® 7 KS Gewebe 50

Product Name	Container / Packing Size	Article Number / EAN Code
 HENSOTHERM® 7 KS Gewebe 50	Roll 15 m Width 50 mm, Thickness 2 mm	4250153511052

### HENSOTHERM® GM 2000 Gypsum Mortar

Product Name	Height [mm]	Pipe Dia. [mm]	Fastening lugs	Outer Dia. [mm]	Article Number / EAN Code
 HENSOTHERM® RM 50-40 HENSOTHERM® RM 50-56 HENSOTHERM® RM 50-63 HENSOTHERM® RM 50-75 HENSOTHERM® RM 50-90 HENSOTHERM® RM 50-110 HENSOTHERM® RM 50-125 HENSOTHERM® RM 50-140 HENSOTHERM® RM 50-160 HENSOTHERM® RM 50-180 HENSOTHERM® RM 50-200	50	32-40	2	53.7	4250153512608
	50	51-56	2	69.4	4250153512615
	50	57-63	2	85.0	4250153512622
	50	64-75	3	95.9	4250153512639
	50	76-90	3	112.1	4250153512646
	50	91-110	4	132.8	4250153512653
	50	111-125	4	150.6	4250153512660
	50	126-140	4	169.5	4250153512677
	50	141-160	5	193.7	4250153512684
	50	161-180	5	213.4	4250153512691
	50	181-200	5	240.3	4250153512707

### HENSOTHERM® GM 2000 Gypsum Mortar

Product Name	Diameter / Length	Container	Article Number / EAN Code
 HENSOTHERM® ST 250-63 HENSOTHERM® ST 250-90 HENSOTHERM® ST 250-110	DN 63 mm, Length 250 mm	24 pcs.	4250153545507
	DN 90 mm, Length 250 mm	12 pcs.	4250153545514
	DN 110 mm, Length 250 mm	9 pcs.	4250153545521

# GREEN BUILDING

## Green by Choice – Sustainable Construction with Hensel



### Sustainable construction in terms of the SDGs

In September 2015, all 193 member states of the United Nations adopted the "2030 Agenda for Sustainable Development" as a global plan to promote sustainable peace and prosperity and to protect our planet with 17 overarching ecological, economic and social goals (Sustainable Development Goals = SDGs) for a transformation of our world that meets the needs of the present and future generations. According to the World Green Building Council ([www.worldgbc.org](http://www.worldgbc.org)), sustainability in construction is one of the main starting points for addressing some of the world's most pressing problems according to this agenda, as up to 15

SDGs are addressed depending on the construction project. The construction sector is one of the largest emitters of environmentally harmful emissions - not only in terms of carbon footprint. It is therefore important to consider the entire life cycle of a building, i.e. not only whether the materials and products used are harmful to the health of the occupants or the environment, but also whether it is possible to reuse materials or whether they can be recycled. **Sustainability is a long-term strategic success factor, not only for Rudolf Hensel GmbH, but also for our customers, suppliers and subcontractors. As a company, we feel committed to this idea. We express this in our daily actions and thinking: we act responsibly. The environmental compatibility and sustainability of our products are our top priorities.**



### Low VOC and emission values for a healthy indoor climate

Modern people spend up to 90 % of their lives indoors. Sustainable building means creating liveable indoor and outdoor spaces by using, among other things, building products that do not endanger or impair human health and well-being. **Hensel products are emission-free, VOC-free or at least low-VOC formulated and offer certified excellent indoor air quality, acoustic comfort and sound insulation paired with the highest level of fire safety and ease of maintenance. Our HENSOMASTIK® 5 KS and HENSOTHERM® 7 KS products are generally halogen-free, i.e. they do not contain any chlorinated paraffins, TCEP or SVHC substances according to the current candidate list of the REACH regulation (as of April 2023). Furthermore, in accordance with the RoHS Directive 2011/65/EU, we do not use any of the above-mentioned substances such as lead, cadmium, mercury, bromine or flame retardants and plasticisers containing bromine.**

### Long-term success and flexibility in application thanks to extensive fire tests

The **HENSOMASTIK®** and **HENSOTHERM®** product systems for fire protection bulkheads not only stand for outstanding product quality, easy workability of all components and practical designs. The high degree of flexibility in the application of our products with all commercially available pipes and insulation ensures the long-term success of our business partners.



Regularly, new seal construction variants for new pipe and insulation materials from various manufacturers are tested in wall and floor constructions in conjunction with different product systems in up to 20 external tests per year – for fire penetration seals alone, i.e. not counting the numerous tests of fire protection coatings for steel, concrete or wood structures. In addition, there are numerous smaller fire tests in the company's own fire furnaces in order to investigate new materials, assembly variants or construction elements in smaller initial test series. **Hensel, as an innovation leader in the field of passive fire protection, assumes special responsibility for the state and society as a research-based company and has been awarded "Innovative through Research" by the German Stifterverband in 2022.**



### Reusable and recyclable constructions and packaging

Firmly committed to the idea of sustainability, Hensel had environmental product declarations drawn up as early as 2014 for the **HENSOMASTIK®** and **HENSOTHERM®** 'Green Product' fire protection products, which describe building materials, building products or building components with regard to their environmental impact on the basis of life cycle assessments as well as their functional and technical properties.

In an Environmental Product Declaration (EPD), as issued by the IBU ([www.ibu-epd.com](http://www.ibu-epd.com)), the scientifically determined values from the life cycle assessment of a product are summarised and documented according to a uniform scheme. Objective, neutral, scientifically sound and, above all, without evaluation. EPDs are based on the ISO 14025 and EN 15804 standards and are checked and verified by independent third parties for completeness, plausibility and conformity to standards before publication. This quantitative, objective and verified information can relate to the entire life cycle of the building product (so-called "cradle-to-cradle") or partial aspects. EPDs therefore form an important basis for the sustainability assessment of buildings.

# GREEN BUILDING

## Green by Choice – Sustainable Construction with Hensel

Our products are generally characterised by a long service life and freedom from maintenance. In addition, they help to significantly reduce waste generation through avoidance, reduction, recycling and reuse, e.g. through the possibility of reusing various components after deconstruction of a fire protection bulkhead (pipe collars, fabric strips), packaging on recycled materials (buckets, cardboard boxes) or reduced volume (tubular bags). In addition, there are short supply chains and optimised processes, which together enable safe and sustainable construction of affordable housing.



The (product) certificates listed below provide architects and planners with points for the sustainable assessment of buildings and thus enable excellent building certifications according to BREEAM, LEED, ÖGNI or the DGNB system. Please do not hesitate to contact us if you are aiming for a specific certification that may not yet be available. We are confident that we meet the criteria!



**Green Product.** Our development work focuses on the environmental compatibility and sustainability of our **HENSOMASTIK®** and **HENSOTHERM®** fire-protection coating systems for use in passive constructional fire protection. Over the years, this has developed into our "Green Product" line, which includes those fire-protection products which do not contain volatile organic compounds (non-VOC products) and thus qualify as building materials for ecological construction. [www.rudolf-hensel.de](http://www.rudolf-hensel.de)



**Member of DGNB.** The work of the German Sustainable Building Council (DGNB) focuses on designing living spaces so as to be sustainable. The association is the central platform for everyone who is interested in and committed to sustainable construction. The aim is for our built environment to be planned, built and used in a sustainable way. To this end the DGNB is developing a certification system which allows an objective assessment and thus the optimisation of our built environment. We at Rudolf Hensel GmbH support these objectives and make an active contribution to the sustainable design of our future living spaces through our membership of the association (since 2012).

[www.dgnb.de](http://www.dgnb.de)



**Member of ÖGNI.** The Austrian Society for Sustainable Real Estate is an NGO (non-governmental organisation) for establishing sustainability in the construction and real estate industry. The aim of the ÖGNI is to demonstrate the added value of building certifications in order to create environmentally and resource-friendly buildings, with high economic and social efficiency, which can be used flexibly over generations and have a positive impact on the health, well-being and performance of the users. [www.ogni.at](http://www.ogni.at)



**Environmental Product Declaration (EPD) available.** For the first "Green Product" fire protection products **HENSOMASTIK®** and **HENSOTHERM®**, Environmental Product Declarations (EPD) were developed very early on and verified by the Institute Construction and Environment (IBU). These EPDs are Type III ecolabels that not only make qualitative but also quantitative statements based on environmental declarations in accordance with ISO 14025, thus enabling a comparison with products from other manufacturers. [www.ibu-epd.com](http://www.ibu-epd.com)



**French A+ VOC classification.** The product was assessed as having class A+ VOC emissions based on the French regulation for labelling building products or wall claddings, flooring, paints, and lacquers with respect to their emissions of volatile contaminants, as published on 25 March 2011 (décret DEVL1101903D) and 13 April 2011 (arrêté DEVL1104875A).

[www.eco-institut.de](http://www.eco-institut.de)



**AgBB compliant.** The Committee for Health-related Evaluation of Building Products (AgBB) develops health-based testing and assessment criteria for the use of interior-relevant building products in buildings. The AgBB provides a uniform, transparent and comprehensible health-based assessment of building product emissions. The AgBB scheme is probably the most important European test scheme for product emissions and defines with the requirements an indoor suitability of the tested products (hazard prevention). With the evaluated parameters TVOC, TSVOC, VOC without NIK, C-substances and the R-value concept, it forms the basis for many voluntary test marks.

[www.eco-institut.de](http://www.eco-institut.de)



**Ecobau certified (eco1).** Ecobau sets the standard for healthy and ecological building in Switzerland. The three quality seals eco1, eco2 and ecoBasis are protected designations. The highest level eco1 means: The product meets the highest requirements of ecobau and Minergie-ECO with regard to ecological and health specifications and therefore receives the rating "eco1: Very well suited for Minergie-ECO 1st priority according to ecoBKP/ecoDevis".

[www.ecobau.ch](http://www.ecobau.ch)



**Emission classification of building materials M1.** The Finnish emission label for building products and furniture was first awarded in 1996 and is one of the leading quality labels in the Scandinavian region. The aim is to promote the development and use of low-emission building materials so that material emissions do not lead to an increased need for ventilation. The best category M1 stands for "low-pollutant". [www.eco-institut.de](http://www.eco-institut.de)

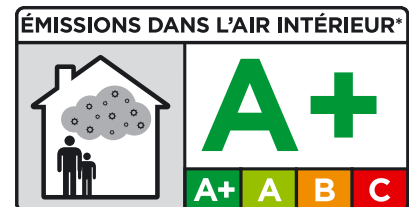
# TECHNICAL INFORMATION

## Environmental and emissions data

**HENSOTHERM® GM 2000** is free of solvents, halogens and asbestos with certified low emissions, is environmental and user friendly, and compliant to most common regulations or protocols for building materials. With its very low volatile organic compounds (VOC), **HENSOTHERM® GM 2000** gypsum mortar meets the requirements of German, Belgian and French emission regulations and for the latter was classified as class A+ with highest rating.

The **HENSOTHERM® 7 KS** intumescent strips used for the **HENSOTHERM® Gewebe 50**, **HENSOTHERM® RM 50** pipe collars and **HENSOTHERM® ST Service Transit** also are free of halogens, APEOs, borates, fibres and plasticizers. With its non-VOC property, the **HENSOTHERM® 7 KS** intumescent coating additionally meets the requirements of LEED credit EQ c4.2. and under French VOC emission regulations was classified A+ as well.

Rules and regulations	Assessment
ABG / AgBB guidelines DIBt, Germany	Compliant
French VOC regulation, France	A+
French CMR emissions regulation, France	Compliant



## Retrofits

Penetrating services sealed with **HENSOTHERM® GM 2000** may be retrofitted. Following a retrofit, the seal must be returned to its intended state. The specifications in the technical assessment document (ETA) and installation instructions must be observed.

## Inspection and Maintenance

The fire protection properties of **HENSOTHERM® GM 2000** seals are safeguarded over the service life only when the system is maintained in proper working condition, a regular inspection for possible damage and maintenance is recommended. All penetrations seals which are subsequently damaged or modified should be made good using **HENSOTHERM® GM 2000** and related single products in this product system only. The developer and/or principal must be referred thereto by the applicator.

## Reuse

Several components of a **HENSOTHERM® GM 2000** mixed penetration seal can be reused after a retrofit or deconstruction.

A **HENSOTHERM® Service Transit** can be reused, provided that the **HENSOTHERM® Service Transit** and its intumescent lining of **HENSOTHERM® 7 KS Gewebe** are not damaged. In particular, the **HENSOTHERM® Service Transit** must not be cut to length or slit for the removal.

A **HENSOTHERM® RM 30 / RM 50** pipe collar can be reused, provided that the metal casing, especially the closing and fastening lugs, and its intumescent lining of **HENSOTHERM® 7 KS Gewebe** are not damaged.

A **HENSOTHERM® 7 KS Gewebe 50** endless pipe collar can be reused, provided that no dirt, foreign substances or impurities are adhering to it and the surface is not visibly damaged. It is therefore recommended that the outer layer of a **HENSOTHERM® 7 KS Gewebe 50** endless pipe collar that has come into contact with the **HENSOTHERM® GM 2000** compound, is cut off lengthwise.

For a re-installation, the fire penetration seal must be returned to its intended state. The specifications in the technical assessment document (ETA) and installation instructions must be observed.

## Disposal

The materials of **HENSOTHERM® GM 2000** fire penetration seals must be handled like waste paints and varnishes. The applicable national laws and regulations must be observed.

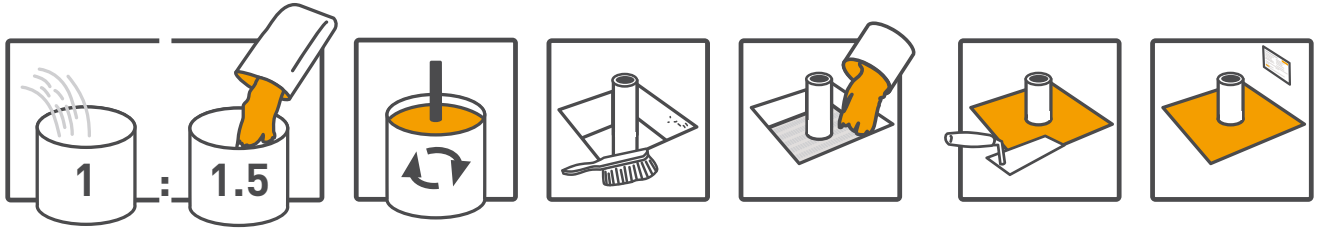
## Labelling

In Germany and Switzerland, following the installation, by law each **HENSOTHERM® GM 2000** seal must be marked in close proximity with a permanent label affixed to the wall/floor according to national laws and regulations. Such label is highly recommended also for other countries to inform succeeding applicator/commissioning companies on the materials used and where to look for further information.

# TECHNICAL INFORMATION

## Construction Details

First, check the individual construction details for all penetrating services in the seal! Any required local insulation and/or wrappings of **HENSOTHERM® 7 KS Gewebe 50** must be in place before the mineral fibre boards are cut to size.



The 50 mm thick mineral fibre boards, density  $\geq 150 \text{ kg/m}^3$ , are cut to size and inserted friction fitted and flush with the bottom of the floor into the aperture in the supporting element and around all penetrating services.

When using **HENSOTHERM® 7 KS Gewebe 50**, make sure to fit the mineral fibre boards against the **HENSOTHERM® 7 KS Gewebe 50** wrap so that it can be seen from the underside of the seal.

Before applying **HENSOTHERM® GM 2000**, thoroughly dust off all reveals and remove dirt from openings and surfaces to ensure optimum adhesion. Metal pipes and cable support structures in contact with **HENSOTHERM® GM 2000** must always be derusted and protected against rust before applying **HENSOTHERM® GM 2000**.

For casting, a fluid mixture is made with 1.5 parts **HENSOTHERM® GM 2000** and 1 part water. When used as filler, a firm mixture is made with 2 parts **HENSOTHERM® GM 2000** and 1 part water. It is recommended to add **HENSOTHERM® GM 2000** to a bucket already filled with a little water in the bottom to reduce dusting.

The **HENSOTHERM® GM 2000** gypsum mortar is mixed with a trowel or an electric mixer with 100 mm paddle for about 60 seconds to achieve a smooth mixture at the desired consistency. The curing time of **HENSOTHERM® GM 2000** is designed for professional installers and varies depending on temperature, mixing ratio and mixing time between 30 and 60 minutes.

Use masking tape and covering foil around apertures for a nice and clean final result.

At this point, any **HENSOTHERM® RM** pipe collars should be mounted to the underside of the mineral fibre boards to let the **HENSOTHERM® GM 2000** set around the fixing screws. However, a post-installation of **HENSOTHERM® RM** pipe collars is also possible.

Also, consider placing a **HENSOTHERM® ST Service Transit** as a reserve for post-installations of cables. The three available diameters of **HENSOTHERM® ST Service Transit** are matched to the common hole saw diameters for easy friction fitting.

Finally, the mixed **HENSOTHERM® GM 2000** gypsum mortar is poured on top of the mineral fibre board in a minimum 50 mm thick layer (see construction variants and applications). All cavities around and between the penetrating services must be completely filled with **HENSOTHERM® GM 2000**. To achieve the best results, a concrete vibrator is recommended for compaction. During compaction, any air that was still present when the **HENSOTHERM® GM 2000** was poured, should escape so that it does not contain any cavities or bubbles and fits tightly against the formwork and penetrating services.

Use a spatula or trowel to smooth the surface. **HENSOTHERM® GM 2000** hardens quickly and tack free after 1 hour, however, the final fire performance specification is reached when the compound has cured for at least a month.

## Work Safety

Use **HENSOTHERM® GM 2000** in accordance with all applicable local and national regulations.

## Permitted Construction Elements

The specific elements of construction that **HENSOTHERM® GM 2000** may be used to provide a fire penetration seal in, are:

Rigid floors: The floor must have a minimum thickness of 150 mm and comprise aerated concrete or concrete with a minimum density of  $650 \text{ kg/m}^3$ .

The supporting construction must be classified in accordance with EN 13501-2 for the required fire resistance period.

## Maximum Seal Size

The permissible maximum seal size in floors is 1200 mm x 2000 mm, or 1125 mm x 8250 mm.

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

# TECHNICAL INFORMATION

## Permitted Minimum Spacing and Distance of the First Support

The following minimum spacings apply for all construction variants and applications (see drawing for explanation).

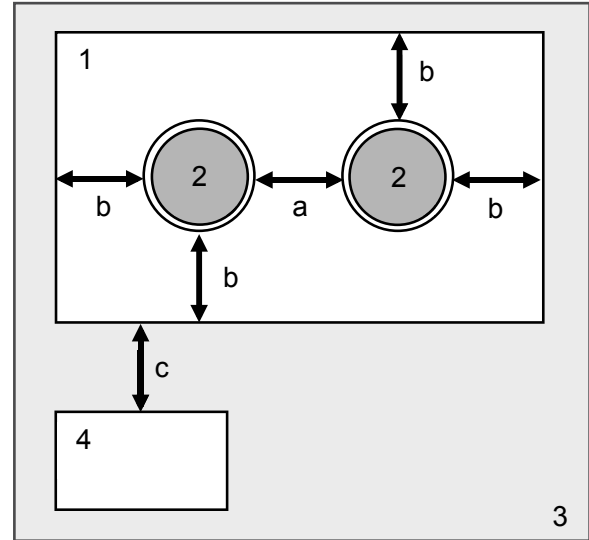
### Distance of the first support:

All services shall be supported at maximum 250 mm from the top of the floor.

- 1: HENSOTHERM® GM 2000 fire penetration seal
- 2: Penetrating services inside the seal area
- 3: Supporting construction element
- 4: Other fire penetration seals, openings or installations

### Minimum spacing between penetrating services:

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



### Minimum spacing to other openings or installations:

#### Other fire penetration seals:

≥20 cm, provided that one or both of the adjacent openings is larger than 40 x 40 cm, otherwise ≥10 cm.

#### Other apertures or installations:

≥20 cm, provided that one or both of the adjacent openings is larger than 20 x 20 cm, otherwise ≥10 cm.

## Pipe End Configuration

Proper pipe end configuration must be taken into account when choosing a suitable fire penetration seal solution for e.g. plastic rainwater or ventilated sewage pipes, or unventilated drinking or heating water pipes. The classifications stated in this manual include whether the ends of tested pipes were closed (Capped, marked C) inside and outside of the furnace or was open (Uncapped, marked U). According to EN 1366-3, configuration U/U includes all other configurations, but not vice versa:



## Flexible Elastomeric Foam (FEF) Insulation

On the basis of equivalent or more favourable fire resistance properties, a variety of flexible elastomeric foam (FEF) or synthetic rubber insulations with a classification equal to or better than B-s3,d0 according to EN 13501-1 may be used, for example (list may not be exhaustive or up to date, please reconfirm before installation):

AF/ArmaFlex	Eurobatex	Kaiflex KKplus s3
AF/ArmaFlex Evo	Eurobatex H	Kaiflex LS
ArmaFlex Class 0	Eurobatex Plus UF	Kaiflex ST
ArmaFlex LS	FLEXEN Heizungskautschuk plus	K-FLEX H
ArmaFlex Ultima	Kaiflex HTplus	K-FLEX SRC ECO
ArmaFlex XG	Kaiflex KKplus s1	K-FLEX ST
SH/ArmaFlex	Kaiflex KKplus s2	K-FLEX ST/SK



# PRODUCT SELECTOR



Product Selector for fire protection penetration seals

We have digitised for your use the general type approvals (aBG) and European Technical Assessments (ETA) affecting our fire protection systems for penetration seals!

### Your advantages in brief:

- ✓ The right product system in only 5 steps
- ✓ Access to all relevant product information and documents
- ✓ Planning, sizing, and implementation provisions at a glance
- ✓ Full text search and quick filter for tested lines
- ✓ MRP support
- ✓ Various print functions
- ✓ Fast and intuitive interface
- ✓ Compatible with all customary web browsers
- ✓ Optimised PC and tablet operability
- ✓ Freeware

### Additional advantages for registered users:

- ✓ Structured project management in a private area
- ✓ MRP support for major projects
- ✓ Project documentation simplified with personal notes and project partners' contact details
- ✓ Requests for quotations based on planning data
- ✓ Fast support for all conformity questions affecting project approval
- ✓ Creation of BIM objects

Try now without commitment at [www.rudolf-hensel.de/product-selector](http://www.rudolf-hensel.de/product-selector)

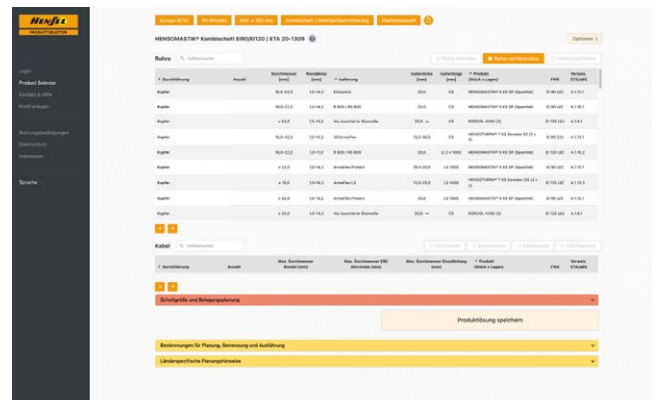


## FIRE PROTECTION SYSTEMS



Select the product system, and you can consult the innovative table of all tested conduits, featuring a full text search and quick filter for media types, to verify quickly and easily whether the planned fire protection penetration seal conforms with the technical requirements.

Important provisions for planning, sizing, and implementing the penetration seal can be consulted in an overview. The complete documentation, including approvals, ETAs, technical data sheets, and assembly instructions, can be retrieved via additional links. Various export options and print functions simplify collaboration with other project members.

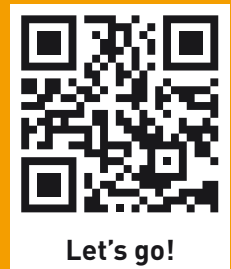


**Simple networking:** Once registered as a user, you can also assign the product system and the penetrations you have selected to a specific project and construction phase and commit these to a file under "Save Product Solution". You can then manage these, add additional details, and print them out for your hard-copy files at your convenience in a private area.

Use now the Product Selector to configure your first penetration seal solution.

The Product Selector opens in a new browser window in encrypted mode. You can immediately start configuring your own, approved penetration seal solution without first having to register.

Just give it a go.



**Let's go!**

# TECHNICAL INFORMATION

## Construction Details and Classification

### OVERVIEW OF APPLICATIONS, CONSTRUCTION DETAILS AND CLASSIFICATION

Seal construction variants are categorized based on applications with a min. 50 mm (A) or a min. 100 mm (B) thick layer of **HENSOTHERM® GM 2000** gypsum mortar compound, type of insulation material (FEF = Flexible Elastomeric Foam) and the use of **HENSOTHERM® RM** pipe collars or **HENSOTHERM® 7 KS Gewebe 50** wraps.

#### A. Rigid Floor ≥ 150 mm, HENSOTHERM® GM 2000 layer min. 50 mm

A.	Application	Insulation	HENSOTHERM® RM pipe collar	HENSOTHERM® 7 KS Gewebe 50	Page
1.	General information	-	-	-	9
2.	Blank seal	-	-	-	9
3.	Cables and cable support structures	-	-	-	10
4.	HENSOTHERM® Service Transit	-	-	-	11
5.	Polyolefin flexible cable conduits	-	●	-	12
6.		-	-	●	13
7.	Combustible plastic pipes	FEF	●	-	14
8.		FEF	-	●	17
9.	Aluminium-composite pipes	Glass Wool	-	-	20
10.		FEF	-	●	22
11.	Metal pipes	Glass Wool	-	-	24
12.		Stone Wool	-	-	25
13.		FEF	-	●	26

#### B. Rigid Floor ≥ 150 mm, HENSOTHERM® GM 2000 layer min. 100 mm

B.	Application	Insulation	HENSOTHERM® RM pipe collar	HENSOTHERM® 7 KS Gewebe 50	Page
1.	General information	-	-	-	27
2.	Blank seal	-	-	-	27
3.	Cables and cable support structures	-	-	-	28

# TECHNICAL INFORMATION

## Rigid Floor $\geq 150$ mm, HENSOTHERM® GM 2000 layer min. 50 mm

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

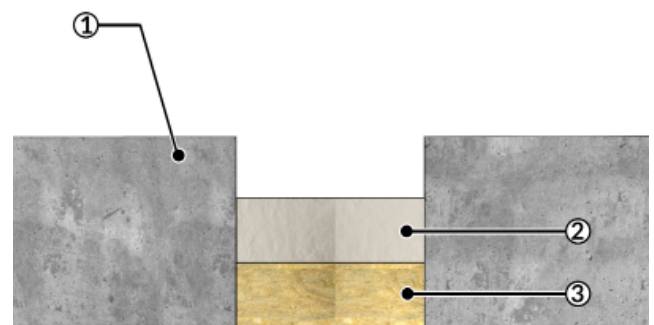
The supporting construction must be classified in accordance with EN 13501-2 for the required fire resistance period.

Seal constructions with a minimum 50 mm thick **HENSOTHERM® GM 2000** gypsum mortar compound layer. The minimum thickness of the **HENSOTHERM® GM 2000** gypsum mortar compound layer may be increased but not reduced, i.e. all applications and construction variants of chapter A may also be executed with a 100 mm thick layer of **HENSOTHERM® GM 2000** for combination with applications of chapter B. The permissible maximum seal size in floors is 1200 mm x 2000 mm, or 1125 mm x 8250 mm.

## Rigid Floor $\geq 150$ mm, HENSOTHERM® GM 2000 layer min. 50 mm | Blank seal

### 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  $\geq 150$  kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board

#### A.2.1. Blank seal

Services	Classification
No penetrating services	EI 90

# TECHNICAL INFORMATION

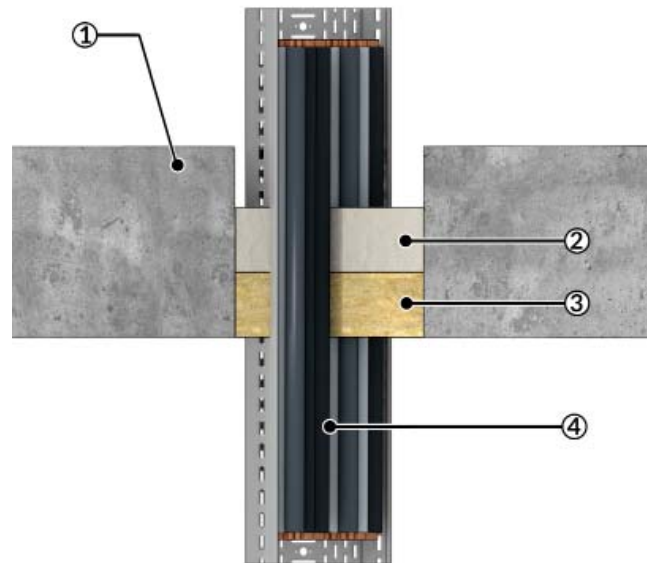
Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Cables and cable support structures

## 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  $\geq 150$  kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, 4 = Single cable, cable bundle, EIP with or without cables, cable tray or support structure

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

Services	Max. diameter cable 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

# TECHNICAL INFORMATION

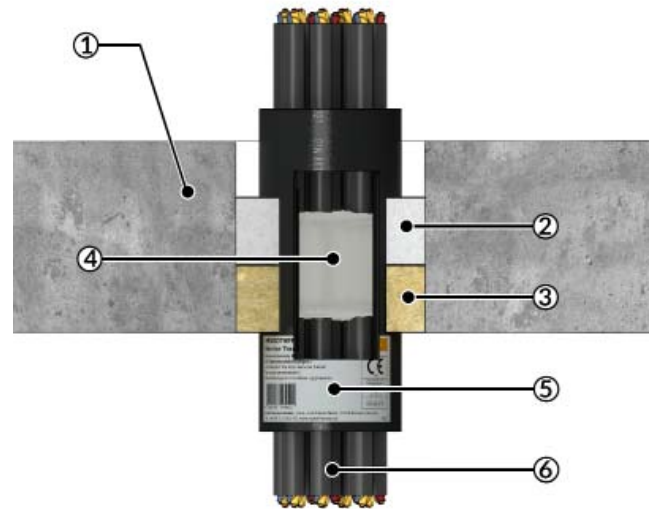
Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm || HENSOTHERM® Service Transit

## A.4. Single cables, cable bundles or cable conduits 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  $\geq 150$  kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, 4 = Ceramic wool plug (length must be adjusted to diameter of penetrating services), 5 = HENSOTHERM® Service Transit ST 250, 6 = Single cable, cable bundle or PVC cable conduit with or without cables

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

Services led through a HENSOTHERM® Service Transit	Classification		
	HENSOTHERM® ST 250 Diameter 63 mm	HENSOTHERM® ST 250 Diameter 90 mm	HENSOTHERM® ST 250 Diameter 110 mm
PVC pipes $\leq 32$ mm without cables	EI 120	-	-
PVC pipes $\leq 32$ mm with sheathed cables of all types $\leq 21$ mm, single or in a bundle	EI 120	-	-
PVC pipes $\leq 32$ mm with cables A1, A2, A3 or B, single or in a bundle	-	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

# TECHNICAL INFORMATION

**Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | EIP with HENSOTHERM® RM**

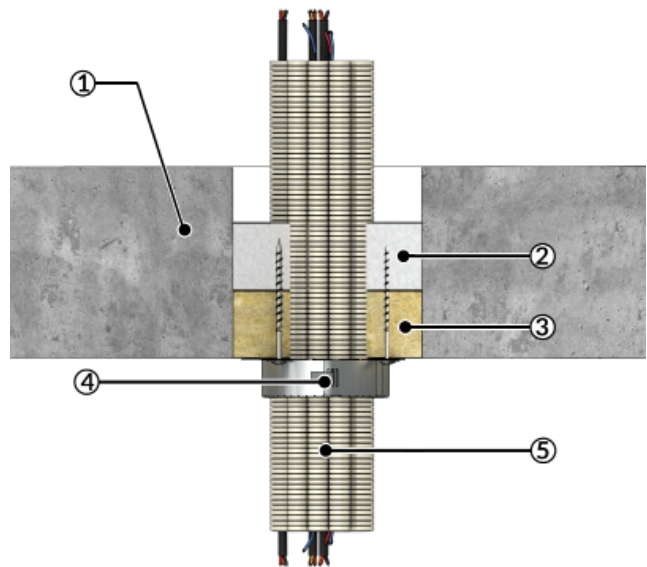
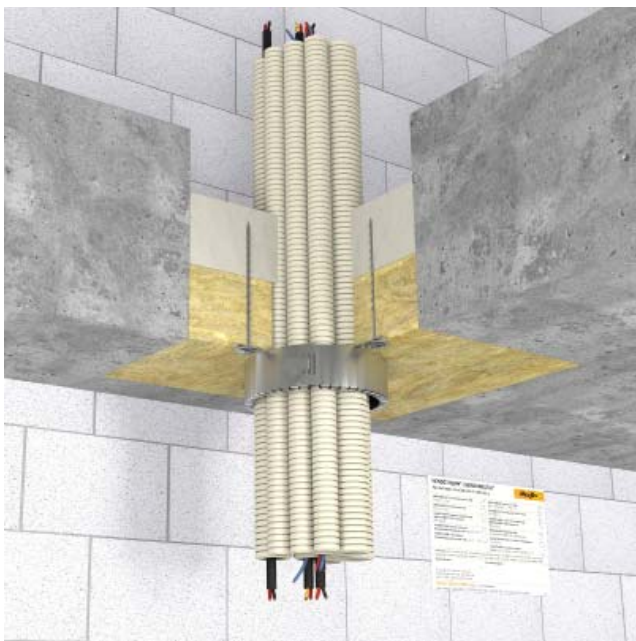
## A.5. Polyolefin flexible cable conduits with or without cables with HENSOTHERM® RM

**Construction details:** Polyolefin flexible cable conduits (electrical installation pipes, EIP) with or without cables, single or in a bundle, in a **HENSOTHERM® GM 2000** mixed penetration seal 50/50mm comprising a min. 50mm mineral fibre board  $\geq 150$  kg/m<sup>3</sup> 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 8x100mm at all fastening lugs.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, 4 = HENSOTHERM® RM pipe collar, 5 = Polyolefin flexible cable conduits with or without cables, single or in a bundle

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

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

# TECHNICAL INFORMATION

Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | EIP with HENSOTHERM® 7 KS Gewebe 50

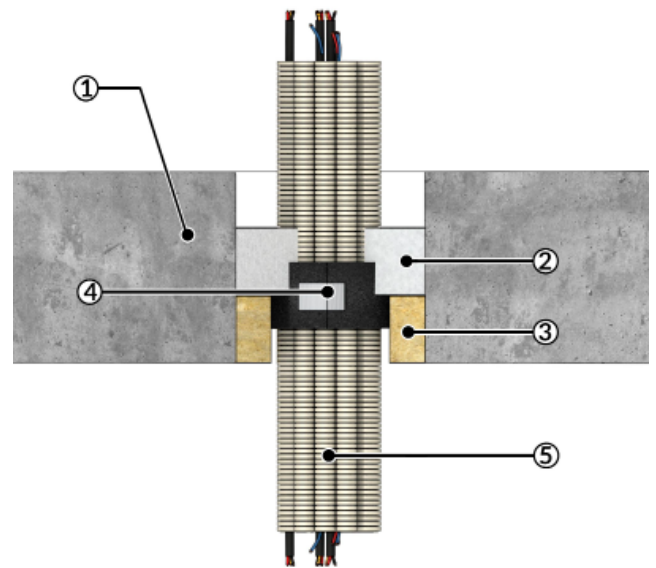
## A.6. Polyolefin flexible cable conduits with or without cables with HENSOTHERM® 7 KS Gewebe 50

**Construction details:** Polyolefin flexible cable conduits (electrical installation pipes, EIP) with or without cables, single or in a bundle, in a HENSOTHERM® GM 2000 mixedPolyolefin flexible cable conduits (electrical installation pipes, EIP) 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  $\geq 150$  kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, worked against the HENSOTHERM® 7 KS Gewebe 50, 4 = HENSOTHERM® 7 KS Gewebe 50, 5 = Polyolefin flexible cable conduits with or without cables, single or in a bundle

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

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

# TECHNICAL INFORMATION

**Rigid Floor  $\geq 150$  mm, HENSOTHERM<sup>®</sup> GM 2000 layer min. 50 mm | Plastic pipes with HENSOTHERM<sup>®</sup> RM**

## A.7. Combustible plastic pipes with FEF-insulation with HENSOTHERM<sup>®</sup> RM

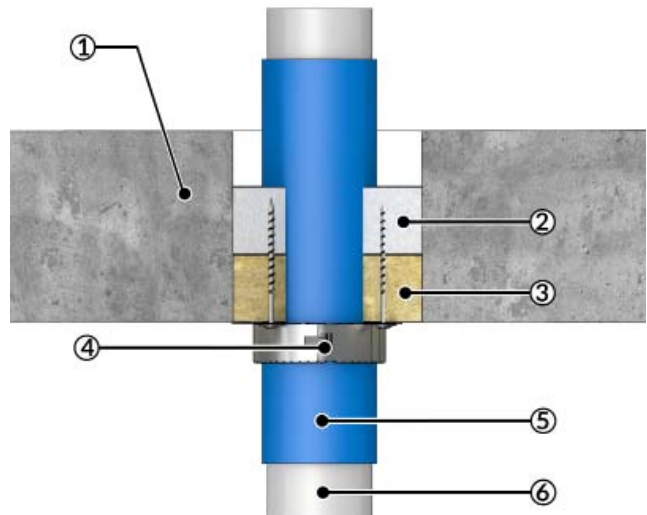
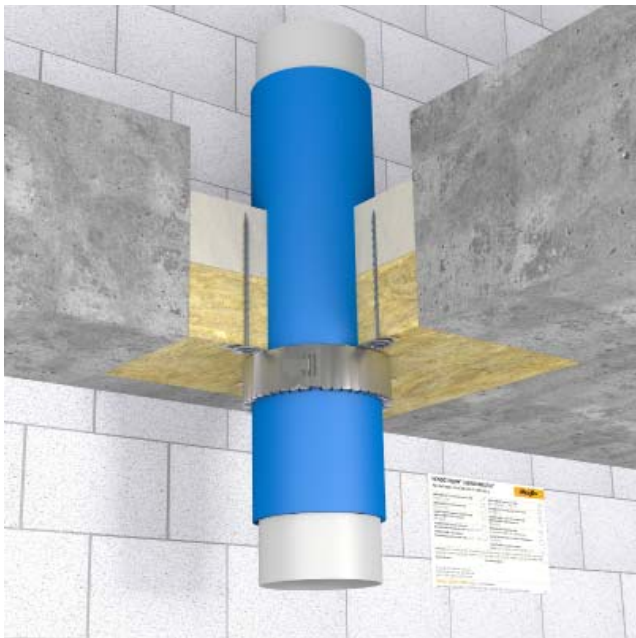
**Construction details:** Combustible plastic pipes with min. 500 mm long local sustained (LS) or continuous sustained (CS) flexible elastomeric foam (FEF) or synthetic rubber insulation (see table on page 6) with a building material class rated equal to or better than B-s3,d0 according to DIN EN 13501-1, in a **HENSOTHERM<sup>®</sup> GM 2000** mixed penetration seal 50/50mm comprising a min. 50 mm mineral fibre board  $\geq 150$  kg/m<sup>3</sup> 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<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> RM** pipe collar is secured in place with WÜRTH ASSY 4 WH washer head screws 8x100 mm at all fastening lugs.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM<sup>®</sup> GM 2000, 3 = Mineral fibre board, 4 = HENSOTHERM<sup>®</sup> RM pipe collar, 5 = FEF-insulation, 6 = Combustible plastic pipe

### A.7.1. Geberit Silent-PP with FEF-insulation with HENSOTHERM<sup>®</sup> RM

Services	Diameter [mm]	Wall thickness [mm]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	HENSOTHERM <sup>®</sup> RM pipe collar [height-size, mm]	Classification
Geberit Silent-PP	110	3.6	$\leq$ B-s3,d0	15.0	CS / LS 500	HENSOTHERM <sup>®</sup> RM 50-140	EI90 U/U
	125	4.2				HENSOTHERM <sup>®</sup> RM 50-160	



# TECHNICAL INFORMATION

Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Plastic pipes with HENSOTHERM® RM

## 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	$\leq B-s3,d0$	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 90 U/U
	125	5.0				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
PE incl. PE 100, PE-HD, PE-X, ABS, SAN+PVC	110	3.9 – 11.4	$\leq B-s3,d0$	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 90 U/U
	>110 $\leq 125$	3.9 – 11.4				HENSOTHERM® RM 50-160	
	>125 $\leq 140$	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	$\leq B-s3,d0$	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI 60 U/U
	125	3.9				HENSOTHERM® RM 50-160	

# TECHNICAL INFORMATION

Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Plastic pipes with HENSOTHERM® RM

## 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	$\leq B-s3,d0$	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI90 U/U
	>110 $\leq 125$	3.9 – 11.4				HENSOTHERM® RM 50-160	
	>125 $\leq 140$	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	$\leq B-s3,d0$	15.0	CS / LS 500	HENSOTHERM® RM 50-140	EI90 U/U
	>110 $\leq 125$	3.7 – 6.0				HENSOTHERM® RM 50-160	
	>125 $\leq 140$	4.1 – 6.7		10.0		HENSOTHERM® RM 50-160	EI60 U/U
	>125 $\leq 140$	6.7				HENSOTHERM® RM 50-160	EI90 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.

# TECHNICAL INFORMATION

Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Plastic pipes with HENSOTHERM® 7 KS Gewebe 50

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

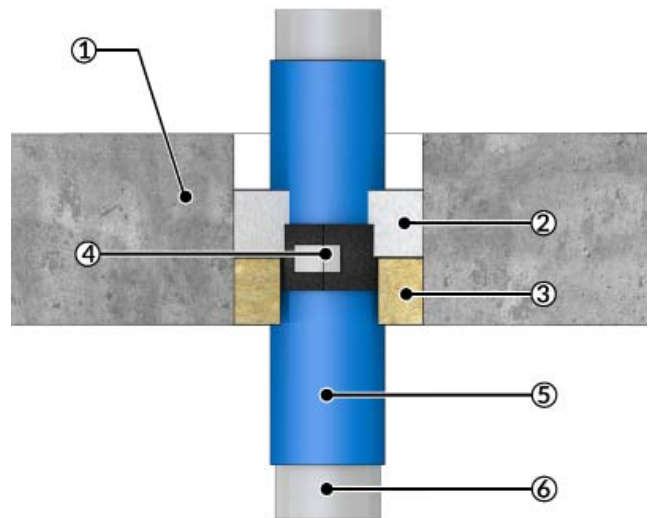
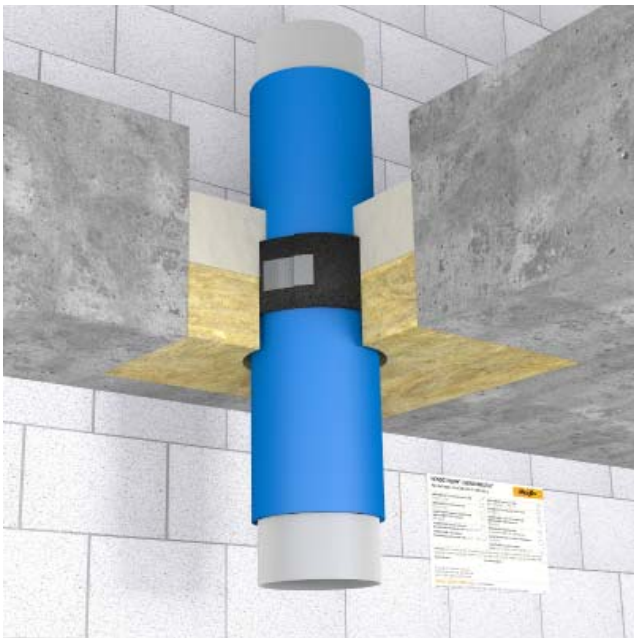
**Construction details:** Combustible plastic pipes with min. 500mm long local sustained (LS) or continuous sustained (CS) flexible elastomeric foam (FEF) or synthetic rubber insulation (see table on page 6) with a with a building material class rated equal to or better than B-s3,d0 according to DIN EN 13501-1, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50mm comprising a min. 50mm mineral fibre board  $\geq 150$ kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, worked against the HENSOTHERM® 7 KS Gewebe 50, 4 = HENSOTHERM® 7 KS Gewebe 50, 5 = FEF-insulation, 6 = Combustible plastic pipe

### 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	Classification
aquatherm blue pipe	90	8.2	$\leq B-s3,d0$	9.5	CS / LS 500	2	EI 90 U/C
	110	10.0				3	
	125	11.4		15.0		4	EI 60 U/C

# TECHNICAL INFORMATION

Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Plastic pipes with HENSOTHERM® 7 KS Gewebe 50

## 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	Classification
aquatherm green pipe	90	8.2–15.0	$\leq B-s3,d0$	9.5	CS / LS 500	2	EI90 U/C
	110	10.0–18.3				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]	FEF-Insulation	Insulation thickness [mm]	Insulation length [mm]	Layers of HENSOTHERM® 7 KS Gewebe 50	Classification
aquatherm red pipe	90	12.3	$\leq B-s3,d0$	9.5	CS / LS 500	2	EI90 U/C
	110	15.1				3	
	125	17.1		15.0		4	EI60 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	Classification
Geberit Silent-PP	90	3.1	$\leq B-s3,d0$	9.5	CS / LS 500	4	EI90 U/U
	110	3.6				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	Classification
Geberit Silent-Pro	90	4.3	$\leq B-s3,d0$	9.5	CS / LS 500	4	EI90 U/U
	110	4.5				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	Classification
PE incl. PE 100, PE-HD, PE-X, ABS, SAN+PVC	90	3.5–8.2	$\leq B-s3,d0$	9.5	CS / LS 500	4	EI90 U/U
	$>90$ $\leq 110$	3.4–10.0				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.

# TECHNICAL INFORMATION

## Rigid Floor $\geq 150$ mm, HENSOTHERM® GM 2000 layer min. 50 mm | Plastic pipes with HENSOTHERM® 7 KS Gewebe 50

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	Classification
POLO-KAL NG	90	3.0	$\leq B-s3,d0$	15.0	CS / LS 500	4	EI 90 U/U
	110	3.4				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	Classification
PP	90	2.8–8.2	$\leq B-s3,d0$	9.5	CS / LS 500	4	EI 90 U/U
	$>90$ $\leq 110$	3.4–10.0				5	

### 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	Classification
PVC-U	90	2.7	$\leq B-s3,d0$	9.5	CS / LS 500	4	EI 90 U/U
	90	2.8–6.7				4	EI 60 U/U
	$>90$ $\leq 110$	3.2–8.1				5	EI 60 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.

# TECHNICAL INFORMATION

**Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Aluminium-composite pipes with glass wool insulation**

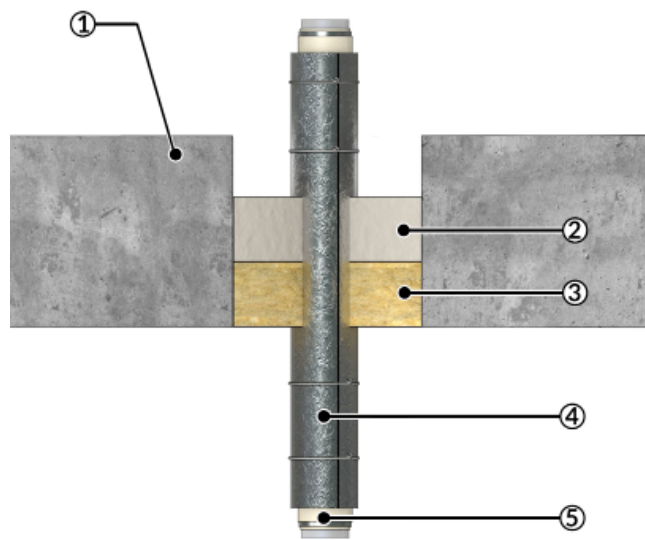
## A.9. Aluminium-composite pipes with glass wool insulation

**Construction details:** Aluminium-composite pipes with min. 500mm 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 50/50mm comprising a min. 50mm mineral fibre board  $\geq 150$ kg/m<sup>3</sup> positioned flush with the bottom of the floor and fixed by friction.

The min. 500mm long local insulation is positioned at centre of the seal, protruding min. 200mm 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 0mm, i.e. no annular gap.

A min. 50mm 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.



1 = Rigid floor, 2 = min. 50mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, 4 = Glass wool insulation, 5 = Aluminium-composite pipe

### 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	Isover CLIMPIPE Section Alu2	20	CS / LS 500	EI 90 U/C
	40	3.5				
	63	4.5		30		EI 60 U/C

# TECHNICAL INFORMATION

Rigid Floor  $\geq$  150 mm, HENSOTHERM® GM 2000 layer min. 50 mm | Aluminium-composite pipes with glass wool insulation

## 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	Isover CLIMPIPE Section Alu2	20	CS / LS 500	EI 90 U/C
	40	4.0		30		
	63	6.0				

## 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	Isover CLIMPIPE Section Alu2	20	CS / LS 500	EI 90 U/C
	40	6.0				

## 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	Isover CLIMPIPE Section Alu2	20	CS / LS 500	EI 90 U/C
	40	3.5		30		
	63	4.5				

# TECHNICAL INFORMATION

**Rigid Floor  $\geq$  150 mm, HENSOTHERM® GM 2000 layer min. 50 mm | Aluminium-composite pipes with FEF-insulation**

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

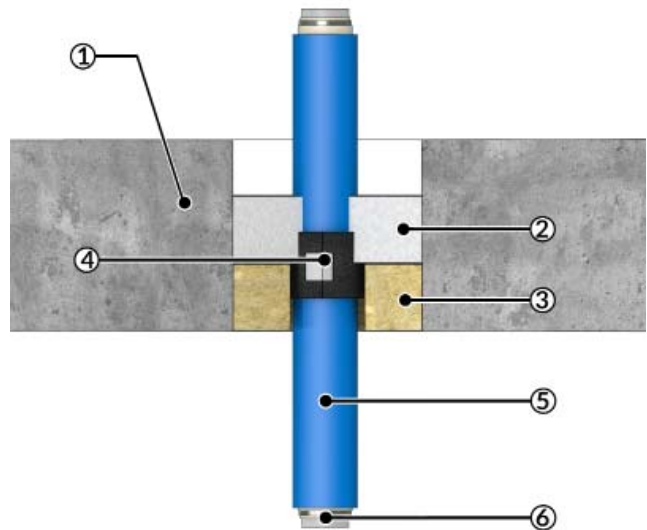
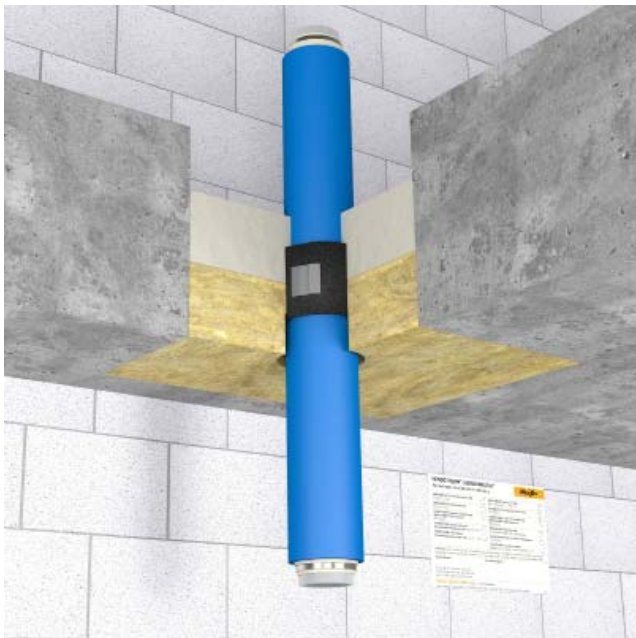
**Construction details:** Aluminium-composite pipes with min. 500 mm long local sustained (LS) or continuous sustained (CS) flexible elastomeric foam (FEF) or synthetic rubber insulation (see table on page 6) with a building material class rated equal to or better than B-s3,d0 according to DIN EN 13501-1, in a HENSOTHERM® GM 2000 mixed penetration seal 50/50 mm comprising a min. 50 mm mineral fibre board  $\geq$  150 kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, worked against the HENSOTHERM® 7 KS Gewebe 50, 4 = HENSOTHERM® 7 KS Gewebe 50, 5 = FEF-insulation, 6 = Aluminium-composite pipe

### 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	Classification
Geberit Mepla	16	2.25	$\leq$ B-s3,d0	8.0	CS / LS 500	1	EI 90 U/C
	40	3.5		9.0 – 19.5			
	63	4.5		9.0 – 21.5			



# TECHNICAL INFORMATION

Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Aluminium-composite pipes with FEF-insulation

## 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	Classification
Uponor MLC	14	2.0	$\leq B-s3,d0$	8.0	CS / LS 500	1	EI 90 U/C
	40	4.0		9.0–19.5			
	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	Classification
Rehau RAUTITAN stabil	16.2	2.6	$\leq B-s3,d0$	8.0	CS / LS 500	1	EI 90 U/C
	40	6.0		9.0–19.5			

## 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	Classification
Viega Raxofix	16	2.2	$\leq B-s3,d0$	8.0	CS / LS 500	1	EI 90 U/C
	40	3.5		9.0–19.5			
	63	4.5		9.0–21.5		2	

# TECHNICAL INFORMATION

**Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Metal pipes with glass wool insulation**

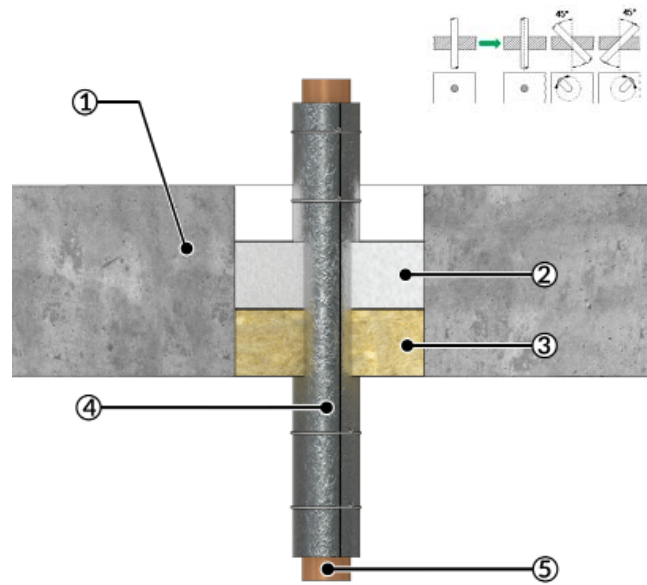
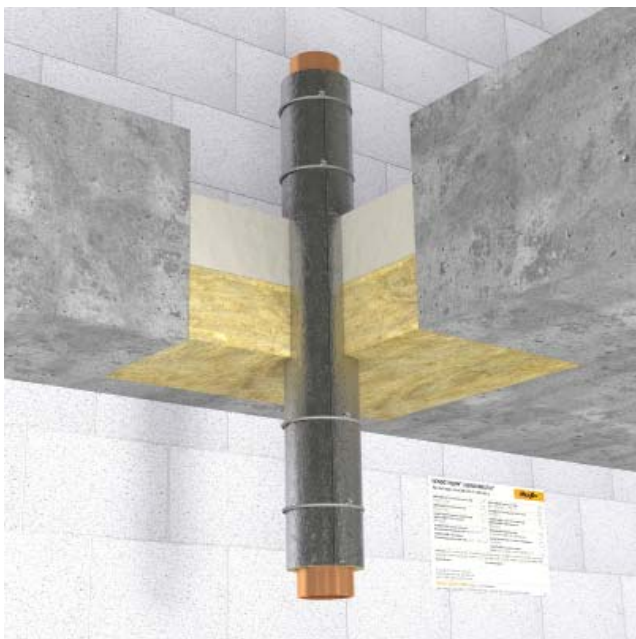
## A.11. Metal pipes with glass wool insulation

**Construction details:** Non-combustible metal pipes with min. 1000 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 50/50mm comprising a min. 50 mm mineral fibre board  $\geq 150$  kg/m<sup>3</sup> 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). The insulation is secured in place with metal straps or wires  $\geq 0.6$  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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, 4 = Glass wool insulation, 5 = Metal pipe

### A.11.1. Metal pipes with glass wool insulation

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness [mm]	Insulation length [mm]	Classification
Copper	$\leq 15$	1.0 – 7.5	Isover CLIMPIPE Section Alu2	20	CS / LS 500	EI 90 C/U
	$> 15 \leq 42$	1.5 – 14.2		30		EI 60 C/U
	$> 42 \leq 88.9$	2.0 – 14.2		20		EI 90 C/U
$> 88.9 \leq 139.7$	4.0 – 14.2	30		EI 60 C/U		

# TECHNICAL INFORMATION

## Rigid Floor $\geq 150$ mm, HENSOTHERM® GM 2000 layer min. 50 mm | Metal pipes with stone wool insulation

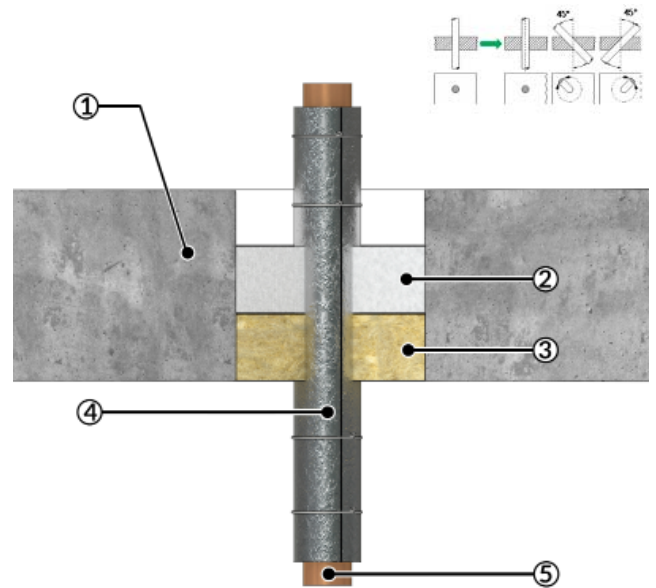
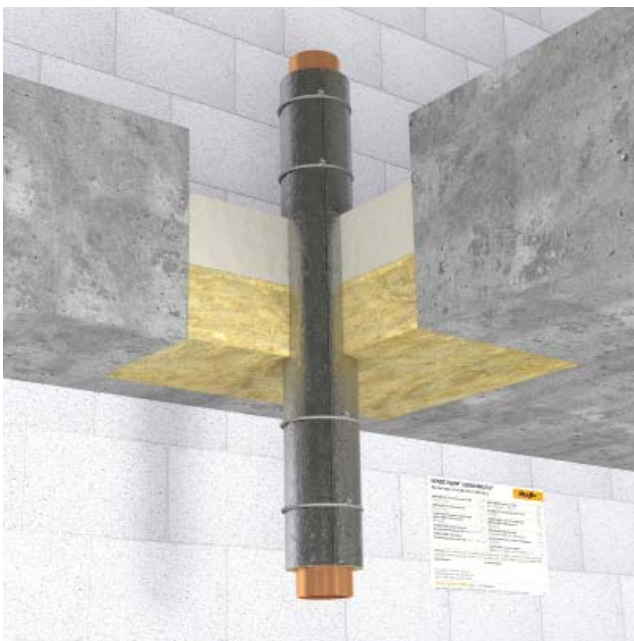
### A.12. Metal pipes with stone wool insulation

**Construction details:** Non-combustible metal pipes with min. 1000/1800 mm long local sustained (LS) or continuous sustained (CS) stone wool insulation  $80 \text{ kg/m}^3$  or higher 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. 1000/1800 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  $\geq 0.6 \text{ mm}$ . The thickness (see table) of the insulation may be increased but not reduced. All penetration angles between  $90^\circ$  and  $45^\circ$  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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, 4 = Stone wool insulation, 5 = Metal pipe

#### A.12.1. Metal pipes with stone wool insulation

Services	Diameter [mm]	Wall thickness [mm]	Insulation	Insulation thickness [mm]	Insulation length [mm]	Classification
Copper	$\leq 42$	1.2 - 14.2	Stone wool $\geq 80 \text{ kg/m}^3$	20	CS / LS 1000	EI 120 C/U
	$> 42 \leq 88.9$	2.0 - 14.2		30	CS / LS 1800	
Steel or cast iron	$\leq 42$	1.2 - 14.2		20	CS / LS 1000	
	$> 42 \leq 88.9$	2.0 - 14.2		30	CS / LS 1800	
	$> 88.9 \leq 139.7$	4.0 - 14.2				

# TECHNICAL INFORMATION

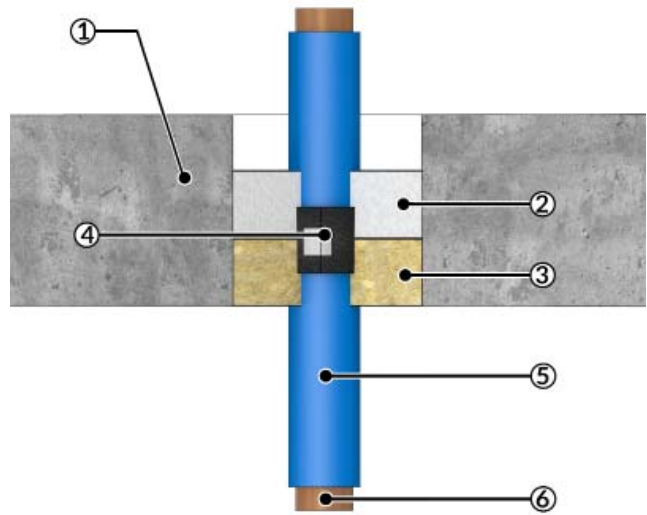
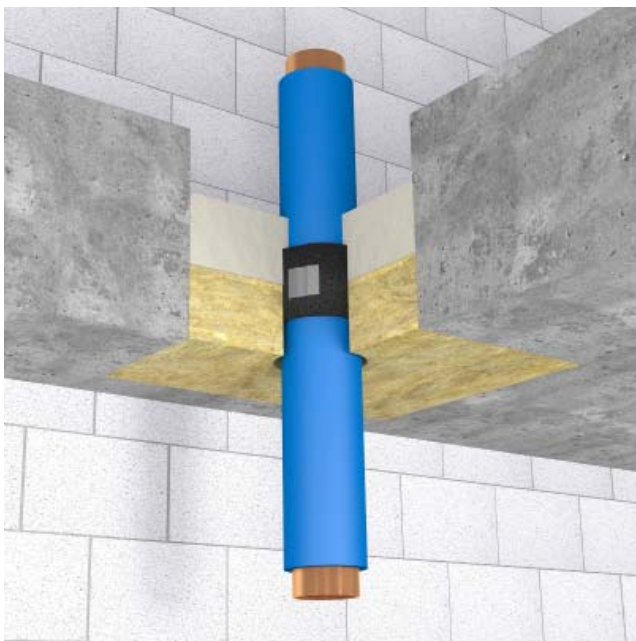
**Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Metal pipes with FEF-insulation**

## 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 (see table on page 6) 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 50/50mm comprising a min. 50 mm mineral fibre board  $\geq 150$  kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 50 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, worked against the HENSOTHERM® 7 KS Gewebe 50, 4 = HENSOTHERM® 7 KS Gewebe 50, 5 = FEF-insulation, 6 = Non-combustible metal pipe

### 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	Classification
Copper	$\leq 15$	1.0 – 7.5	$\leq B-s3,d0$	8.0	CS / LS 1000	1	EI 90 C/U
	$\leq 42$	1.2 – 14.2		13.5 – 20.5			
	$> 42 \leq 88.9$	2.0 – 14.2		30.5		2	EI 60 C/U
Steel or cast iron	$\leq 15$	1.0 – 7.5		8.0		1	EI 90 C/U
	$\leq 42$	1.2 – 14.2		13.5 – 20.5			
	$> 42 \leq 88.9$	2.0 – 14.2		30.5		2	EI 60 C/U
	$> 88.9 \leq 139.7$	4.0 – 14.2		19.0			

# TECHNICAL INFORMATION

## Rigid Floor $\geq$ 150 mm, HENSOTHERM<sup>®</sup> GM 2000 layer min. 100 mm

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

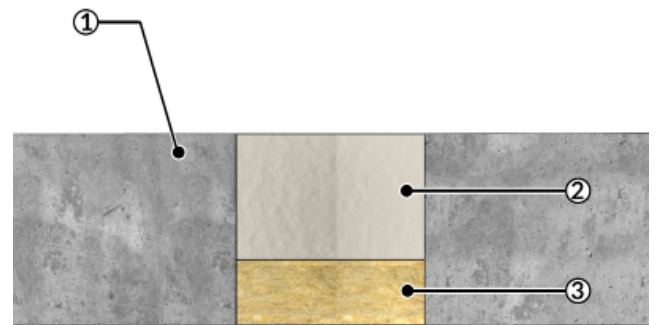
Seal constructions with a minimum 100 mm thick HENSOTHERM<sup>®</sup> GM 2000 gypsum mortar compound layer. The minimum thickness of the HENSOTHERM<sup>®</sup> GM 2000 gypsum mortar compound layer may be increased but not reduced, i.e. all applications and construction variants of chapter A may also be executed with a 100 mm thick layer of HENSOTHERM<sup>®</sup> GM 2000 for combination with applications of chapter B.

The permissible maximum seal size in floors is 1200 mm x 2000 mm, or 1125 mm x 8250 mm.

## Rigid Floor $\geq$ 150 mm, HENSOTHERM<sup>®</sup> GM 2000 layer min. 100 mm | Blank seal

### B.2. Blank seal

**Construction details:** Blank HENSOTHERM<sup>®</sup> 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 kg/m<sup>3</sup> positioned flush with the bottom of the floor and fixed by friction. A min. 100 mm thick layer of HENSOTHERM<sup>®</sup> GM 2000 gypsum mortar compound is applied on top.



1 = Rigid floor, 2 = min. 100 mm thick layer of HENSOTHERM<sup>®</sup> GM 2000, 3 = Mineral fibre board

#### B.2.1. Blank seal

Services	Classification
No penetrating services	EI 120

# TECHNICAL INFORMATION

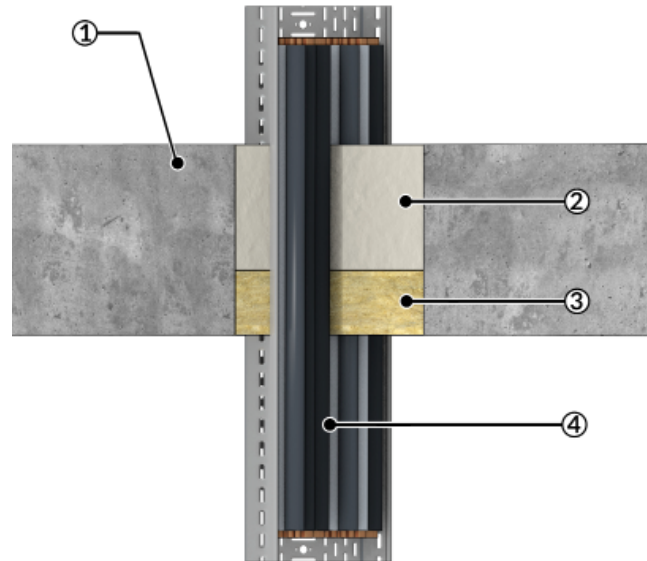
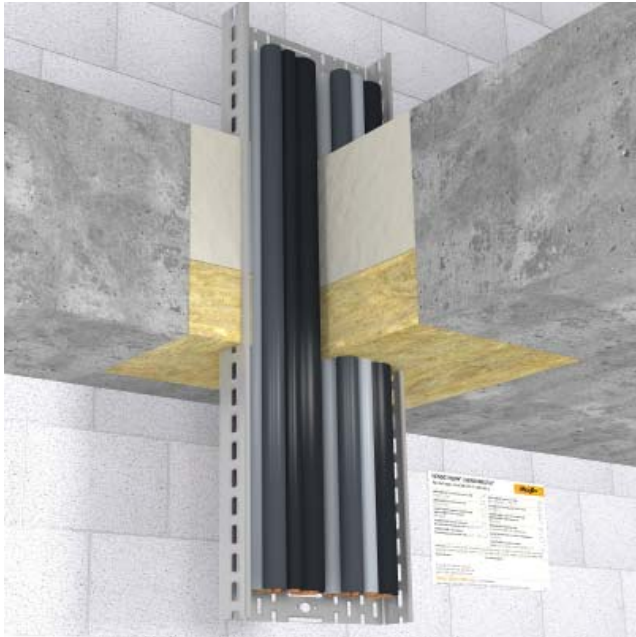
Rigid Floor  $\geq 150$  mm, HENSOTHERM® GM 2000 layer min. 50 mm | Cables and cable support structures

## 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  $\geq 150$  kg/m<sup>3</sup> 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.



1 = Rigid floor, 2 = min. 100 mm thick layer of HENSOTHERM® GM 2000, 3 = Mineral fibre board, 4 = Single cable, cable bundle, EIP with or without cables, cable tray or support structure

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

Services	Max. diameter cable 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

# NOTES

A large grid of dotted lines for taking notes, consisting of 20 columns and 30 rows of small dots.

Our technical advisers will be pleased to assist you with your enquiries.

Further details can be downloaded from: [www.rudolf-hensel.de](http://www.rudolf-hensel.de)

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