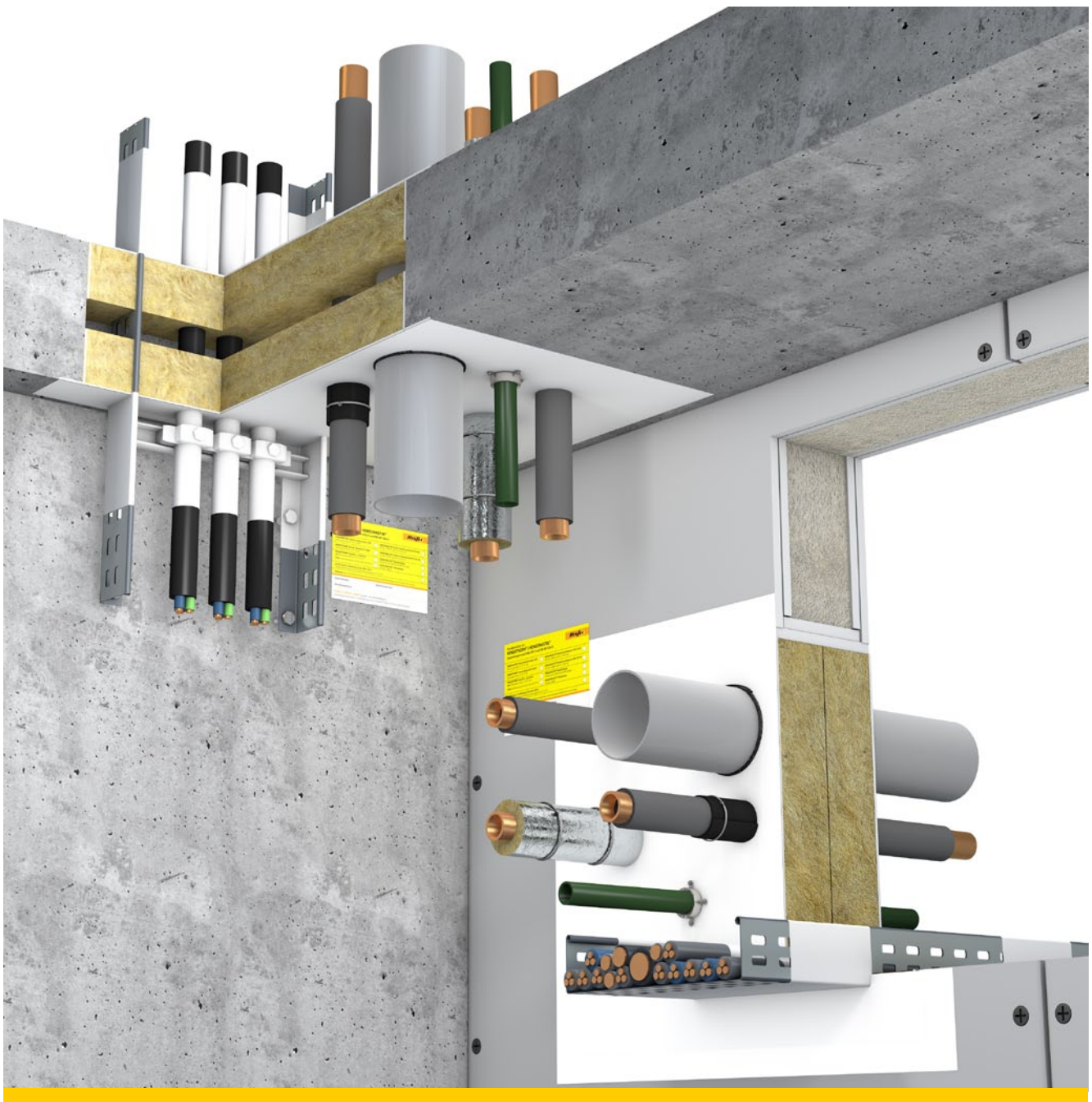


# HENSOMASTIK®

## Mixed Penetration Seal EI 90 / EI 120

According to the European Technical Assessment ETA 15/0295  
of 14/12/2017

Technical data sheet and assembly instructions for the  
HENSOMASTIK® Mixed Penetration Seal EI 90/EI 120



## 1. Technical description of the HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120

**HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120** is a system consisting of 2 × ≥50 mm thick mineral fibre boards coated on the outsides with **HENSOMASTIK® 5 KS Farbe/viskos** and designed as a seal for metal pipes, plastic pipes, and electric cables serving to restore the fire safety of flexible walls and solid wall structures and solid floor structures carrying the various metal supply lines with insulation, plastic pipes, composite pipes, and electric cables.

**HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120** does not contain any dangerous substances as defined in Directive 67/548/EEC and (EC) Directive No. 1272/2008 or on the EGDS Indicative List of Regulated Dangerous Substances with respect to the assembly conditions for the construction product and the resulting release scenarios.

The applicable usage category of **HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120** with respect to BWR 3 (hygiene, health, and environment) is IA/1, S/W3.

## 2. Technical data of the penetration seal system components

### 2.1 HENSOMASTIK® 5 KS Farbe, HENSOMASTIK® 5 KS viskos, HENSOMASTIK® 5 KS SP

**HENSOMASTIK® 5 KS** is an ablative, medium-viscosity, and non-hygroscopic, water-based fire protection coating in the versions “**Farbe**”, “**viskos**”, and “**SP**”.

This is a dispersion coating we manufacture ourselves with organic binders, water, mineral fillers, pigments, and additives.

The fire protection coating **HENSOMASTIK® 5 KS** is part of the **Green Product** line at Rudolf Hensel GmbH, classified as “low emission”, and it does not contain any solvents, borates, plasticisers, halogens, formaldehydes, or alkylphenol ethoxylates (APEs).

#### Properties of HENSOMASTIK® 5 KS

- Free from solvents and APEO, no VOC emissions
- Free from halogens, borates and plasticizers
- Resistant to mechanical stress
- Impermeable to water according to DIN 1048
- Resistant to oil and petrol
- Weatherproof and UV-resistant according to DIN 53 384
- Resistant against aging
- Also flexible in higher dry film thicknesses

#### Environment

- Environmental Product Declaration: EPD-RHG-20140204-IAA1-DE
- DGNB Navigator registered: CDDWRA
- AgBB-tested, VOC emission class A+

**Work safety:** Processing **HENSOMASTIK® 5 KS** must comply with the regulations for work safety and environmental protection **GISCODE:** M-DF01

Before using **HENSOMASTIK® 5 KS Farbe/SP/viskos**, please consult its safety data sheet available as a PDF download from [www.rudolf-hensel.de](http://www.rudolf-hensel.de)

**Storage:** The storage and transport temperatures must lie within +5 °C and +30 °C (free of frost!).

**HENSOMASTIK® 5 KS Farbe/SP/viskos** can be stored for up to twelve months in the original packaging. Carefully seal opened packaging after use!

## Technical data and properties

| Product versions   | HENSOMASTIK® 5 KS Farbe   | HENSOMASTIK® 5 KS viskos   | HENSOMASTIK® 5 KS SP   |
|--|---|--|--|
| <b>Colour</b>  | White   | White  | White  |
| <b>Consistency</b>                                       | Liquid  | Viscous  | Viscous  |
| <b>Apparent density</b>                                  | 1,28 – 1,42 g/cm <sup>3</sup>   | 1,27 – 1,41 g/cm <sup>3</sup>  | 1,28 – 1,45 g/cm <sup>3</sup>  |
| <b>Usage category with respect to weathering effects</b> | Typ X: Also designed for outdoor use  | Typ X: Also designed for outdoor use   | Typ X: Also designed for outdoor use   |
| <b>Fire properties as defined in DIN EN 13501-1</b>      | Class E   | Class E  | Class E  |
| <b>VOC content</b>                                       | < 1 g/l   | < 1 g/l  | < 1 g/l  |
| <b>Classified and approved according to</b>              | ETAG 026-2  | ETAG 026-2   | ETAG 026-2   |
| <b>Application</b>                                       | <ul style="list-style-type: none"> <li>• Material, surface and ambient air temperatures &gt; +5°C, relative humidity &lt; 80%</li> <li>• Before application stir up thoroughly with slow speed!</li> <li>• Application by brush, roller or airless spraying</li> <li>• Airless spraying: delivery capacity &gt; 5,5l/min; hose length max. 15m; material pressure min. 200bar</li> <li>• Remove filters from airless pump and spraying gun</li> <li>• Remove suction hose from airless pump</li> <li>• Nozzle size for airless spraying: 0.023" – 0.027"</li> <li>• Coverage rate: approx. 1.4 mm wet = 1.0 mm dry = approx. 1.8 kg/m<sup>2</sup></li> <li>• Thinning with max. 3% water</li> </ul> | <ul style="list-style-type: none"> <li>• Material, surface and ambient air temperatures &gt; +5°C, relative humidity &lt; 80%</li> <li>• Before application stir up thoroughly with slow speed!</li> <li>• Application by brush, roller or airless spraying</li> <li>• Airless spraying: delivery capacity &gt; 5,5l/min; hose length max. 15m; material pressure min. 200 bar</li> <li>• Remove filters from airless pump and spraying gun</li> <li>• Remove suction hose from airless pump</li> <li>• Nozzle size for airless spraying: 0.025" – 0.031"</li> <li>• Coverage rate: approx. 1.4 mm wet = 1.0 mm dry = approx. 1.8 kg/m<sup>2</sup></li> <li>• Thinning with max. 3% water</li> </ul> | <ul style="list-style-type: none"> <li>• Material, surface and ambient air temperatures &gt; +8°C to max. +30°C</li> <li>• Recommended material temperature &gt; +15°C</li> <li>• Application by trowel or out of the cartridge</li> </ul> |
|  | Check surface for appropriate adhesion!<br>Free from dust, dirt, grease or other separating layers.   |  |  |
|  | Clean working tools immediately after use with water!   |  |  |
| <b>Work Safety</b>                                       | Use HENSOMASTIK® 5 KS Farbe, viskos and SP in accordance with all applicable local and national regulations.  |  |  |
| <b>Giscode</b>   | M-DF01  |  |  |
| <b>Environment, Health and Safety</b>                    | As regulations are often revised please request for the actual safety data sheet before using the product.  |  |  |
| <b>Storage and transport</b>                             | Storage and transport at min. ≥ +5°C to max. +30°C.   |  |  |
|  | Free from frost!  |  |  |
|  | Opened containers must be sealed carefully after use!   |  |  |
| <b>Best before</b>                                       | At least 12 months in unopened containers.  |  |  |

## 2.2 Mineral fibre boards

The tested and approved Hardrock 040 mineral fibre boards (complying with DIN EN 13162) in **HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120** exhibit an apparent density of about 150 kg/m<sup>3</sup> and a melting point  $\geq 1.000$  °C and comply with EN 13501-1 construction material class A1 (non-combustible). Board thickness of the **HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120**:  $2x \geq 50$  mm

## 2.3 Pipe collars

**Air Fire Tech Rorcol V 30 / V 60 / AV 60**, ETA 13/0758  
**AWM II**, ETA-11/0208

**HENSOTHERM® 7 KS Gewebe 50** as an intumescent pipe wrap for plastic pipes **up to Ø 160 mm** in the HENSOMASTIK® Mixed Penetration Sealing up to EI 120 in flexible walls, solid walls and floors according to ETA 16/0369

## 2.4 Sectional insulation for non-combustible pipes

**ROCKWOOL RS 800** with a melting point  $\geq 1.000$  °C, non-combustible A2L-s1, d0 according to EN 13501-1

## 2.5 Sectional insulations wrapped in HENSOTHERM® 7 KS Gewebe 125

**HENSOTHERM® 7 KS Gewebe 125**: Construction material approval ETA 16/0369 and ETA 15/0295, indoor and outdoor applications, usage categories: Y2/Z1/Z2, highly flexible, fabric secured with clips, straps, or galvanised wire

 2.5.1 **Armaflex AF**: Euroclass B/BL-s3,d0 according to EN 13501-1

**Kaiflex ST**: Euroclass BL-s3,d0 according to EN 13501-1

**Armaflex Ultima**: Euroclass BL-s1, d0

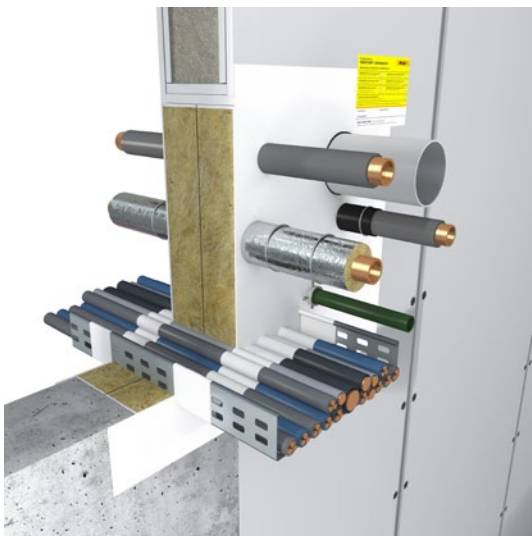
**Armaflex LS**: BL-s2, d0

**Kaiflex KK plus**: BL-s2, d0

**ROCKWOOL Klimarock**: Non-combustible, A1

| Product versions               | HENSOTHERM® 7 KS Gewebe  |   |
|--------------------------------|--|---|
|                                | 50<br>Measurement: 15.000 x 50 x 2 mm (LxWxH)  | 125<br>Measurement: 10.000 x 125 x 1 mm (LxWxH)   |
| Application                    | <ul style="list-style-type: none"> <li>• Application on combustible pipes and synthetic rubber</li> <li>• Wrapping with the required number of layers</li> <li>• Fixing of the finished wrappings with duct tape</li> <li>• For more details, please consult the respective assembly instruction.</li> </ul> | <ul style="list-style-type: none"> <li>• Application on synthetic rubber</li> <li>• Wrapping with the required number of layers</li> <li>• Fixing of the finished wrappings with wiring</li> <li>• For more details, please consult the respective assembly instruction.</li> </ul> |
|                                | <b>HENSOTHERM® 7 KS Gewebe 50 and 125</b> can easily be cut by knife or scissors.  |   |
|                                | <b>HENSOTHERM® 7 KS Gewebe 50 and 125</b> should not be overcoated!  |   |
| Work Safety                    | <b>Use HENSOTHERM® 7 KS Gewebe 50 and 125</b> in accordance with all applicable local and national regulations.  |   |
| Giscode                        | Inapplicable   |   |
| Environment, Health and Safety | As regulations are often revised please request for the actual safety data sheet before using the product.   |   |
| Storage and transport          | In dry conditions  |   |
| Best before                    | At least 24 months   |   |

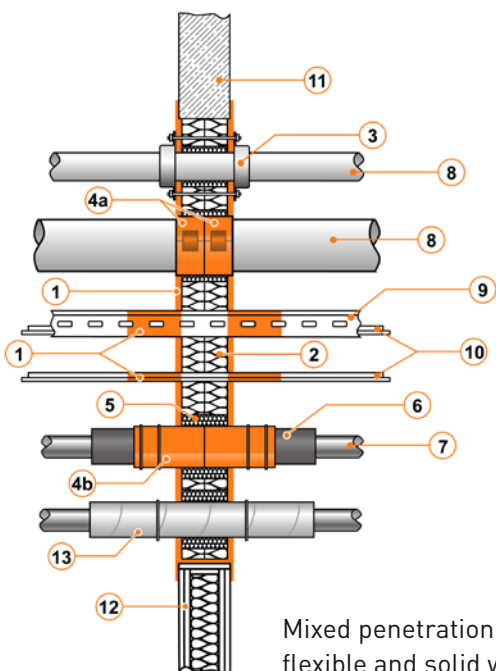
### 3. Overview of HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120



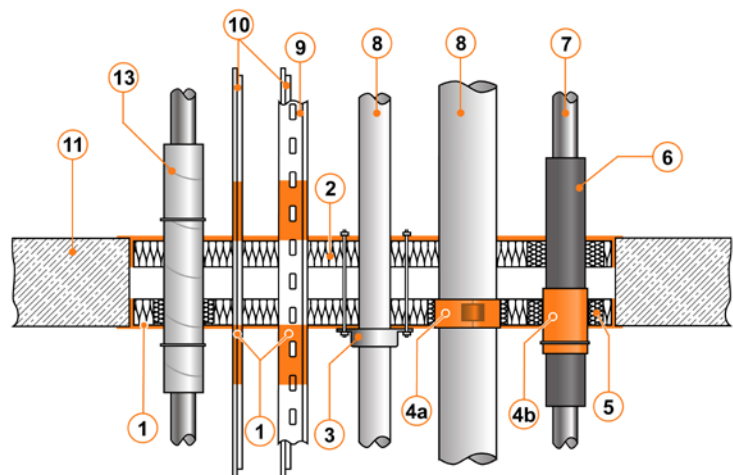
**HENSOMASTIK® Mixed Penetration Seal systems** are used to seal metal pipes, combustible pipes and electric cables, thereby restoring the fire safety of wall and floor structures provided with openings for supply lines.

#### HENSOMASTIK® Mixed Penetration Seals in flexible and solid walls

|    |   |
|----|---|
| 1  | HENSOMASTIK® 5 KS Farbe or HENSOMASTIK® 5 KS viskos |
| 2  | Mineral fibre boards 2x ≥ 50 mm                     |
| 3  | Air Fire Tech Rorcol V30 / V60 / AV60 or AWM II     |
| 4a | HENSOTHERM® 7 KS Gewebe 50 as pipe collar           |
| 4b | HENSOTHERM® 7 KS Gewebe 125 for section insulation  |
| 5  | HENSOMASTIK® 5 KS SP (Spachtel)                     |
| 6  | Sectional insulation (see pages 4, 2.5) 1 m         |
| 7  | Non-combustible pipes                               |
| 8  | Combustible pipes                                   |
| 9  | Cable tray  |
| 10 | Electric cables                                     |
| 11 | Solid wall  |
| 12 | Flexible wall                                       |
| 13 | ROCKWOOL RS 800                                     |
| 14 | Labelling plate                                     |



Mixed penetration seal in flexible and solid wall



Mixed penetration seal in solid floor

#### 4. Applications of HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120

##### Flexible walls

The wall must be at least 100 mm thick and consist of a wood or steel strut frame\* lined on both sides with at least two layers of 12.5 mm thick boards.

\* There must be a minimum distance of 100 mm between the seal and the supports, and this gap must be filled with at least 100 mm of Class A1 or A2 insulating material (as defined in EN 13501-1). The supporting structure must have been classified for the required fire resistance period as defined in EN 13501-2.

##### Solid structural walls

The wall must be at least 100 mm thick and be of concrete, aerated concrete, or masonry with a minimum density of 650 kg/m<sup>3</sup>.

##### HENSOMASTIK® Mixed Penetration Seal in flexible and solid walls

| Installation situation       | Thickness of mineral fibre boards for EI 90 / EI 120 | Max sealant size in m <sup>2</sup>          |
|------------------------------|--|---|
| Lightweight wall<br>≥ 100 mm | 2 x ≥ 50 mm  | 2.4 m <sup>2</sup><br>(2,000 mm x 1,200 mm) |
| Solid wall<br>≥ 100 mm       | 2 x ≥ 50 mm  | 2.4 m <sup>2</sup><br>(2,000 mm x 1,200 mm) |

##### Rigid floors

The floor thickness must be at least 150 mm thick and built out of concrete, aerated concrete, or masonry with a minimum density of 650 kg/m<sup>3</sup>.

##### HENSOMASTIK® Mixed Penetration Seal in rigid floors

| Installation situation   | Thickness of mineral fibre boards for EI 90 / EI 120 | Max sealant size in m <sup>2</sup>          |
|--------------------------|--|---|
| Rigid floors<br>≥ 150 mm | 2 x ≥ 50 mm  | 2.4 m <sup>2</sup><br>(2,000 mm x 1,200 mm) |

HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120 can be used as sealant in conjunction with insulated metal pipes, combustible pipes, and electric cables, single or bundled.

The maximum **sealing size in flexible and solid wall structures** is 2,000 mm × 1,200 mm (H × W) and in solid floor structures 2,000 mm × 1,200 mm.

Also an empty seal can be installed. Supply lines must be protected at a max distance of 250 mm from both sides of the wall structure and from the top of the floor structure.

LS = local sustained in the sealing area | LI = local interrupted in the sealing area

| Pipe end configuration | Test condition |          |          |
|------------------------|----------------|----------|----------|
|                        | U/U            | C/U      | U/C      |
| In the furnace         | Uncapped       | Capped   | Uncapped |
| On the outside         | Uncapped       | Uncapped | Capped   |

**NOTE:** These assembly instructions are for your consultation. They do not serve in lieu of the details in the underlying European Technical Assessment **ETA 15/0295**. The complete ETA 15/0295 must be printed out and made available at the installation site.

## 5. Assembly instructions for HENSOTHERM® 7 KS Gewebe 50

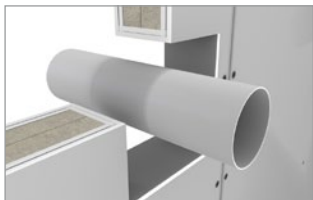
HENSOTHERM® 7 KS Gewebe 50 pipe wrap for plastic and composite pipes in the HENSOMASTIK® Mixed Penetration Seal EI 90/EI 120

- Intumescent pipe wrap for sealing plastic and composite pipes **up to Ø 160 mm** in flexible walls, solid walls and solid floors
- Flexible; easy and fast installation
- Low space requirement due to low installation height
- Measurements of the pipe wrap 50 mm width, 2 mm thick and 15 m long
- **The following combustible pipes are certified:** PVC-U, PE-HD, PP-HT, Geberit Silent-db20, Geberit Silent-PP, Geberit Mepla, KE KELIT KELOX, POLO-KAL NG, POLO-KAL 3S, RAUPIANO PLUS, Flex-Schlauch
- **ETA 16/0369** and **ETA 15/0295**

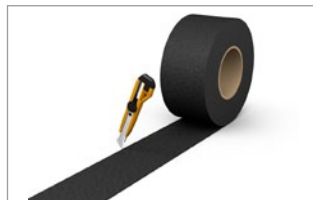
| Outer pipe diameter | Installation | Number of layers | Material requirements in wall installation | Material requirements in floor installation |
|---------------------|--------------|------------------|--|---|
| 32 mm               | Wall / Floor | 2                | 2x 250 mm                                  | 250 mm                                      |
| 40 mm               | Wall / Floor | 2                | 2x 300 mm                                  | 300 mm                                      |
| 50 mm               | Wall / Floor | 2                | 2x 360 mm                                  | 360 mm                                      |
| 56 mm               | Wall / Floor | 2                | 2x 420 mm                                  | 420 mm                                      |
| 63 mm               | Wall / Floor | 3                | 2x 680 mm                                  | 680 mm                                      |
| 75 mm               | Wall / Floor | 3                | 2x 790 mm                                  | 790 mm                                      |
| 90 mm               | Wall / Floor | 4                | 2x 1,250 mm                                | 1,250 mm                                    |
| 110 mm              | Wall / Floor | 4                | 2x 1,500 mm                                | 1,500 mm                                    |
| 110 mm              | Wall / Floor | 5                | 2x 1,930 mm                                | 1,930 mm                                    |
| 125 mm              | Wall / Floor | 5                | 2x 2,160 mm                                | 2,160 mm                                    |
| 140 mm              | Wall / Floor | 6                | 2x 5.780 mm                                | 2.890 mm                                    |
| 160 mm              | Wall / Floor | 6                | 2x 6.520 mm                                | 3.260 mm                                    |

The given specifications relate to PVC-U, PE-HD and PP-HT pipes.

### Assembly instructions:



Clean reveals and rough opening



Cut **HENSOTHERM® 7 KS Gewebe 50** to size acc. to the requirements



Wrapping\* of both sides of the combustible pipe flush with the surface of the penetration seal



Fixing of the finished wrappings with duct tape



Professional installation of the **HENSOMASTIK® Mixed Penetration Seal**



Sealing of the ring gap with **HENSOMASTIK® 5 KS SP**



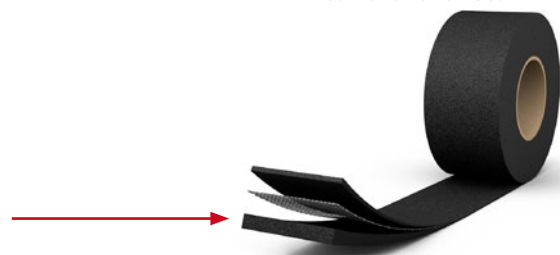
Smoothering of the surface with a spatula



Marking of the **HENSOMASTIK® Mixed Penetration Seal**

### \*IMPORTANT!

The **thick coated side of the HENSOTHERM® 7 KS Gewebe 50 must be** wrapped on the outer wall of the pipe!



## 6. Assembly instructions for HENSOTHERM® 7 KS Gewebe 125

HENSOTHERM® 7 KS Gewebe 125 pipe wrap for incombustible pipes with insulation in the HENSOMASTIK® Mixed Penetration Seal EI90/EI120



### Installation in lightweight and solid walls

Copper and steel pipes with Armaflex Ultima and HENSOTHERM® 7 KS Gewebe 125

| Pipes            | Pipe diameter [mm] | Pipe wall thickness [mm] | Layers of HENSOTHERM® 7KS Gewebe 125 | Insulation thickness [mm] | Insulation length [mm] | Classification |
|------------------|--------------------|--------------------------|--------------------------------------|---------------------------|------------------------|----------------|
| Copper and steel | ≤15                | 1.0 – 14.2               | 2                                    | 13 – 25                   | 1000 mm (LS)           | EI 120 U/C     |
|                  | ≤15                | 1.0 – 14.2               | 2                                    | 13 – 25                   | (CS)                   |                |
|                  | >15 ≤54            | 1.5 – 14.2               | 2                                    | 25                        | 1000 mm (LS)           | EI 90 U/C      |
|                  | >15 ≤54            | 1.5 – 14.2               | 2                                    | 25                        | (CS)                   |                |
| Steel            | >54 ≤88.9          | 3.2 – 14.2               | 2                                    | 25                        | 1000 mm (LS)           | EI 120 U/C     |
|                  | >54 ≤88.9          | 3.2 – 14.2               | 2                                    | 25                        | (CS)                   | EI 90 U/C      |

Copper and steel pipes with Armaflex LS and HENSOTHERM® 7 KS Gewebe 125

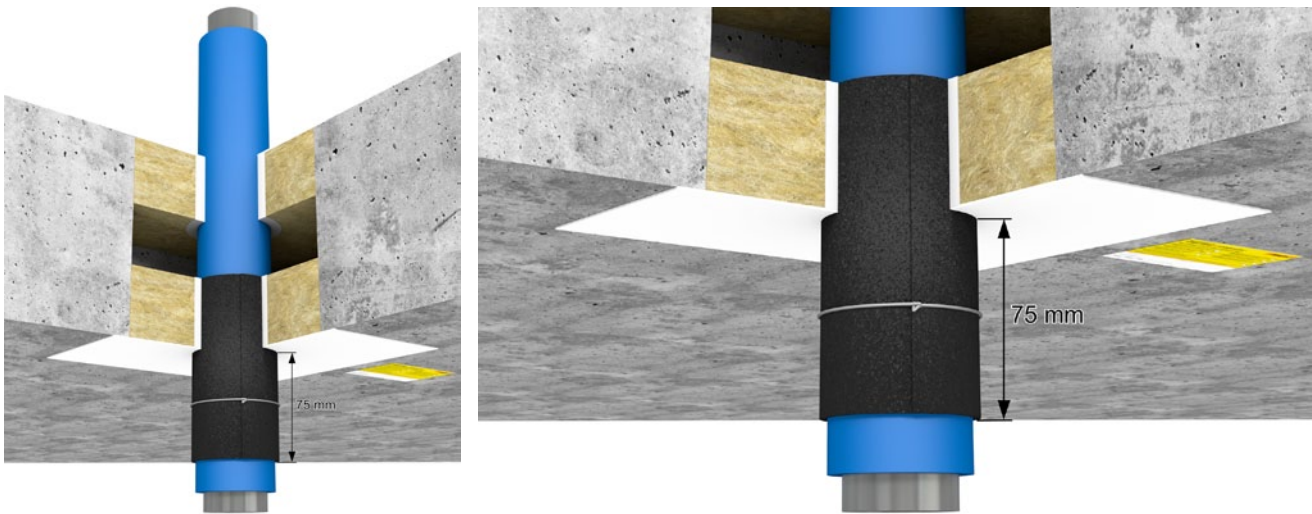
| Pipes            | Pipe diameter [mm] | Pipe wall thickness [mm] | Layers of HENSOTHERM® 7KS Gewebe 125 | Insulation thickness [mm] | Insulation length [mm] | Classification |
|------------------|--------------------|--------------------------|--------------------------------------|---------------------------|------------------------|----------------|
| Copper and steel | ≤15                | 1.0 – 14.2               | 2                                    | 13 – 25                   | 1000 mm (LS)           | EI 120 U/C     |
|                  | ≤15                | 1.0 – 14.2               | 2                                    | 13 – 25                   | (CS)                   | EI 120 U/C     |
|                  | >15 ≤54            | 1.5 – 14.2               | 2                                    | 25                        | (CS)                   |                |
| Steel            | 88.9               | 3.2 – 14.2               | 2                                    | 25                        | 1000 mm (LS)           | EI 90 U/C      |
|                  | >54 ≤88.9          | 3.2 – 14.2               | 2                                    | 25                        | (CS)                   |                |

Copper and steel pipes with Kaiflex KK plus and HENSOTHERM® 7 KS Gewebe 125

| Pipes | Pipe diameter [mm] | Pipe wall thickness [mm] | Layers of HENSOTHERM® 7KS Gewebe 125 | Insulation thickness [mm] | Insulation length [mm] | Classification |
|-------|--------------------|--------------------------|--------------------------------------|---------------------------|------------------------|----------------|
| Steel | 88.9               | 3.2 – 14.2               | 2                                    | 28.5                      | 1000 mm (LS)           | EI 120 U/C     |
|       | >54 ≤88.9          | 3.2 – 14.2               | 2                                    | 28.5                      | (CS)                   | EI 90 U/C      |
|       | 88.9               | 3.2 – 14.2               | 2                                    | 28.5                      | (CS)                   | EI 120 U/C     |



## 6.1 Assembly instructions for HENSOTHERM® 7 KS Gewebe 125



### Installation in rigid floors

#### Copper and steel pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 125

| Pipes               | Pipe diameter [mm] | Pipe wall thickness [mm] | Layers of HENSOTHERM® 7KS Gewebe 125 | Insulation thickness [mm] | Insulation length [mm] | Classification |
|---------------------|--------------------|--------------------------|--------------------------------------|---------------------------|------------------------|----------------|
| Steel and cast iron | ≤10                | 1.0–5.0                  | 2                                    | 11                        | 1000 mm (LS)           | EI 120 C/U     |
|                     | ≤22                | 1.0–11                   | 2                                    | 18                        | 1000 mm (LS)           |                |
|                     | ≤54                | 1.5–14.2                 | 2                                    | 28.5                      | 1000 mm (LS)           | EI 90 C/U      |
|                     | ≤60.3              | 2.9–14.2                 | 2                                    | 29                        | 1000 mm (LS)           | EI 120 C/U     |
|                     | ≤88.9              | 3.2–14.2                 | 2                                    | 30.5                      | 1000 mm (LS)           | EI 90 C/U      |
| Copper              | ≤10                | 1.0–5.0                  | 2                                    | 12.5                      | 1000 mm (LS)           | EI 120 C/U     |
|                     | ≤22                | 1.0–11                   | 2                                    | 18                        | 1000 mm (LS)           |                |
|                     | ≤54                | 1.5–14.2                 | 2                                    | 28.5                      | 1000 mm (LS)           | EI 90 C/U      |

#### Copper and steel pipes with Armaflex Ultima and HENSOTHERM® 7 KS Gewebe 125

| Pipes            | Pipe diameter [mm] | Pipe wall thickness [mm] | Layers of HENSOTHERM® 7KS Gewebe 125 | Insulation thickness [mm] | Insulation length [mm] | Classification |
|------------------|--------------------|--------------------------|--------------------------------------|---------------------------|------------------------|----------------|
| Copper and steel | ≤15                | 1.0–14.2                 | 2                                    | 13                        | 1000 mm (LS)           | EI 120 U/C     |
|                  | >15 ≤54            | 1.5–14.2                 | 2                                    | 25                        | 1000 mm (LS)           |                |
|                  | ≤15                | 1.0–14.2                 | 2                                    | 13                        | (CS)                   | EI 90 U/C      |
|                  | >15 ≤54            | 1.5–14.2                 | 2                                    | 25                        | (CS)                   |                |
| Steel            | 54                 | 1.5–14.2                 | 2                                    | 25                        | (CS)                   | EI 120 U/C     |
|                  | >54 ≤88.9          | 3.2–14.2                 | 2                                    | 25                        | 1000 mm (LS)           |                |
|                  | >54 ≤88.9          | 3.2–14.2                 | 2                                    | 25                        | (CS)                   |                |

## 6.1 Assembly instructions for HENSOTHERM® 7 KS Gewebe 125 in rigid floors

### Copper and steel pipes with Armaflex LS and HENSOTHERM® 7 KS Gewebe 125

| Pipes            | Pipe diameter [mm] | Pipe wall thickness [mm] | Layers of HENSOTHERM® 7KS Gewebe 125 | Insulation thickness [mm] | Insulation length [mm] | Classification |
|------------------|--------------------|--------------------------|--------------------------------------|---------------------------|------------------------|----------------|
| Copper and steel | ≤ 15               | 1.0 – 14.2               | 2                                    | 13                        | 1000 mm (LS)           | EI 90 U/C      |
|                  | ≥ 15 ≤ 54          | 1.5 – 14.2               | 2                                    | 25                        | 1000 mm (LS)           |                |
|                  | 54                 | 1.5 – 14.2               | 2                                    | 25                        | 1000 mm (LS)           | EI 120 U/C     |
|                  | ≤ 15               | 1.0 – 14.2               | 2                                    | 13                        | (CS)                   |                |
|                  | > 15 ≤ 54          | 1.5 – 14.2               | 2                                    | 25                        | (CS)                   |                |
| Steel            | > 54 ≤ 88.9        | 3.2 – 14.2               | 2                                    | 25                        | 1000 mm (LS)           | EI 120 U/C     |
|                  | > 54 ≤ 88.9        | 3.2 – 14.2               | 2                                    | 25                        | (CS)                   |                |

### Copper and steel pipes with Kaiflex KK plus and HENSOTHERM® 7 KS Gewebe 125

| Pipes            | Pipe diameter [mm] | Pipe wall thickness [mm] | Layers of HENSOTHERM® 7KS Gewebe 125 | Insulation thickness [mm] | Insulation length [mm] | Classification |
|------------------|--------------------|--------------------------|--------------------------------------|---------------------------|------------------------|----------------|
| Copper and steel | ≤ 15               | 1.0 – 14.2               | 2                                    | 11                        | 1000 mm (LS)           | EI 90 U/C      |
|                  | ≥ 15 < 54          | 1.0 – 14.2               | 2                                    | 21                        | 1000 mm (LS)           |                |
|                  | 54                 | 1.5 – 14.2               | 2                                    | 21                        | 1000 mm (LS)           | EI 60 U/C      |
|                  | ≤ 15               | 1.0 – 14.2               | 2                                    | 11                        | (CS)                   | EI 90 U/C      |
|                  | > 15 < 54          | 1.0 – 14.2               | 2                                    | 21                        | (CS)                   |                |
| Steel            | 88.9               | 3.2 – 14.2               | 2                                    | 21                        | 1000 mm (LS)           | EI 90 U/C      |
|                  | > 54 ≤ 88.9        | 3.2 – 14.2               | 2                                    | 21                        | (CS)                   | EI 90 U/C      |
|                  | 88.9               | 3.2 – 14.2               | 2                                    | 21                        | (CS)                   | EI 120 U/C     |

## 7. Assembly instructions for HENSOMASTIK® Mixed Penetration Seal EI 90 / EI 120 in flexible and solid wall with a wall thickness of minimum 100 mm

**HENSOMASTIK® Mixed Penetration Seals** may be applied by trained and qualified personnel only. The Mixed Penetration Seal system may not be processed at material, substrate, or air temperatures below +5 °C or at air humidities exceeding 80%. Before installation, the reveals and the rough opening of the structural element must be cleaned and all loose parts removed!

Up to 60% of **HENSOMASTIK® Mixed Penetration Seals** can be covered with supply lines. Retrofits on **HENSOMASTIK® Mixed Penetration Seals** are possible when 60% of the area has not yet been covered.

**Step 1:** Transfer the measurements of the rough opening of the structural element (length × width) to the boards, and cut these to size. These must be used to cut out the individual pieces that must be custom-fitted in all openings between the lines and between these and the reveal.

**TIP:** A contour gauge (template) can be used to transfer electric cables, pipes, and cable runs to the fire protection panel.

**Step 2:** The outsides of the cut mineral wool panels are coated with a fire protection coating at least 1 mm thick in the dried state.

**TIP:** This can be obtained in only the one operation with **HENSOMASTIK® 5 KS viskos** as the most cost-effective solution after the cut pieces have been fitted.

**Alternatively,** prefabricated or ready-coated mineral fibre boards can be used as the cut pieces.

**Step 3:** Before installation, the reveal and the cut edges of the mineral fibre boards or the reveal of the carcass opening must be coated with **HENSOMASTIK® 5 KS Farbe**, **HENSOMASTIK® 5 KS viskos**, or **HENSOMASTIK® 5 KS SP**. Not until afterwards may the cut pieces be installed in the rough opening.

**Step 4:** Gaps, joints, and gussets are filled completely with **HENSOMASTIK® 5 KS SP**. Gaps, joints, or gussets wider than 10 mm are first stuffed with loose mineral fibre material towards the centre of the mixed penetration seal and then filled with **HENSOMASTIK® 5 KS SP**. Bear in mind that the circumferential gap around pipes may not be wider than 10 mm!

**Step 5:** Tape off the circumference of the opening **2 cm** above the rough opening of the structural element. This will allow you to coat the circumferences of the transitions/join between the mineral fibre boards and the wall or the floor at least **2 cm** beyond the mineral fibre board with at least 1 mm (dry film thickness) of **HENSOMASTIK® 5 KS Farbe** or **HENSOMASTIK® 5 KS viskos**.

For **wall and floor installations**, cables and cable runs must be coated **30 cm** as measured from the wall/sealant with at least **1 mm** (dry film thickness) of **HENSOMASTIK® 5 KS Farbe** or **HENSOMASTIK® 5 KS viskos**.

**IMPORTANT! Floor sealant must be protected additionally against access!**

Finally, the ready **HENSOMASTIK® Mixed Penetration Seal** is fitted visibly and permanently with a **labelling plate** containing all the details and provided for this purpose. This labelling plate is available from Rudolf Hensel GmbH.

**Top coating of the penetration sealing** – If required it is possible to overcoat with HENSOTOP 84 or HENSOTOP 84 AQ (50–100 µm dry film thickness) in RAL or NCS colour shades. Individual colour shades on request.

**NOTE:** These assembly instructions are for your consultation. They do not serve in lieu of the details in the underlying European Technical Assessment **ETA 15/0295**. The complete ETA 15/0295 must be printed out and made available at the installation site.

|  |          |
|--|----------|
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## ANNEX A – Resistance to Fire Classification – HENSOMASTIK® Mixed Penetration Seal EI90/EI120

### A.1 Flexible and rigid wall constructions acc. to 1.2.1 with wall thickness of minimum 100 mm

#### A.1.1.1 Service Types

| Services   | Types   |
|--|---|
| Cables   | <ul style="list-style-type: none"> <li>• Sheathed electrical cables up to 80 mm diameter</li> <li>• Telecom cables up to 21 mm diameter</li> </ul>  |
| Cable bundles  | <ul style="list-style-type: none"> <li>• Bundles of the above up to 100 mm in diameter</li> </ul>   |
| Cable Supports   | <ul style="list-style-type: none"> <li>• Perforated and unperforated steel cable trays and ladders</li> </ul>   |
| Plastic pipes with AWM II pipe collars                           | <ul style="list-style-type: none"> <li>• PE pipes in accordance with EN 1519-1, EN 12666-1, EN12201-2</li> <li>• Friaphon (by FRIATEC) pipes</li> <li>• PVC-U pipes in accordance with EN 1329-1, EN 1453-1 and EN 1452-1</li> <li>• PP pipes in accordance with EN 1852-1: 2009</li> </ul>   |
| Plastic pipes with RORCOL V30/V60 pipe collars                   | <ul style="list-style-type: none"> <li>• PE pipes in accordance with EN 1519-1, EN 12666-1, EN12201-2, 1451-1</li> <li>• PVC-U pipes in accordance with EN 1329-1, EN 1453-1 and EN 1452-1</li> <li>• PP pipes in accordance with EN 1451-1</li> <li>• PP R pipes in accordance with EN ISO 15874-2</li> <li>• PP H pipes in accordance with EN ISO 15494</li> <li>• Raupiano Plus pipes</li> <li>• POLO-KAL 3S pipes</li> <li>• POLO-KAL NG pipes</li> <li>• FRIAPHON pipes</li> <li>• RAUTITAN pipes</li> </ul> |
| Metal, composite and plastic pipes with RORCOL AV60 pipe collars | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• FX flexible tubes with EN 61386</li> <li>• Geberit Mepla</li> <li>• HENCO multiple-layer</li> <li>• KO6 KELIT</li> <li>• RAUTITAN stabil</li> <li>• FRIATHERM multi-press</li> <li>• JRG Sanipex MT</li> <li>• PYTHON beverages line</li> <li>• TECEflex</li> </ul>  |
| Plastic pipes with HENSOTHERM® 7 KS Gewebe 50                    | <ul style="list-style-type: none"> <li>• PE pipes in accordance with EN 1519-1, EN 12666-1, EN12201-2</li> <li>• PVC-U pipes in accordance with EN 1329-1, EN 1453-1 and EN 1452-1</li> <li>• PP pipes in accordance with EN 1852-1: 2009</li> <li>• PP pipes in accordance with EN 1451-1</li> </ul>   |
| Composite pipes with Rockwool RS 800 insulation                  | <ul style="list-style-type: none"> <li>• KE KELIT KELOX</li> <li>• Geberit Mepla</li> <li>• Viega Raxofix</li> <li>• Viega Sanfix Fosta</li> </ul>  |
| Metal pipes with Rockwool RS800 insulation                       | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul>   |

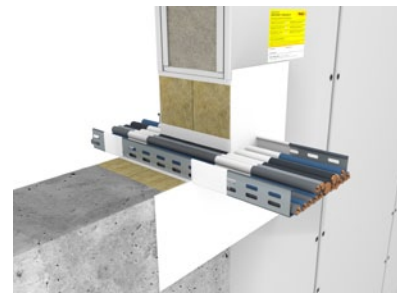
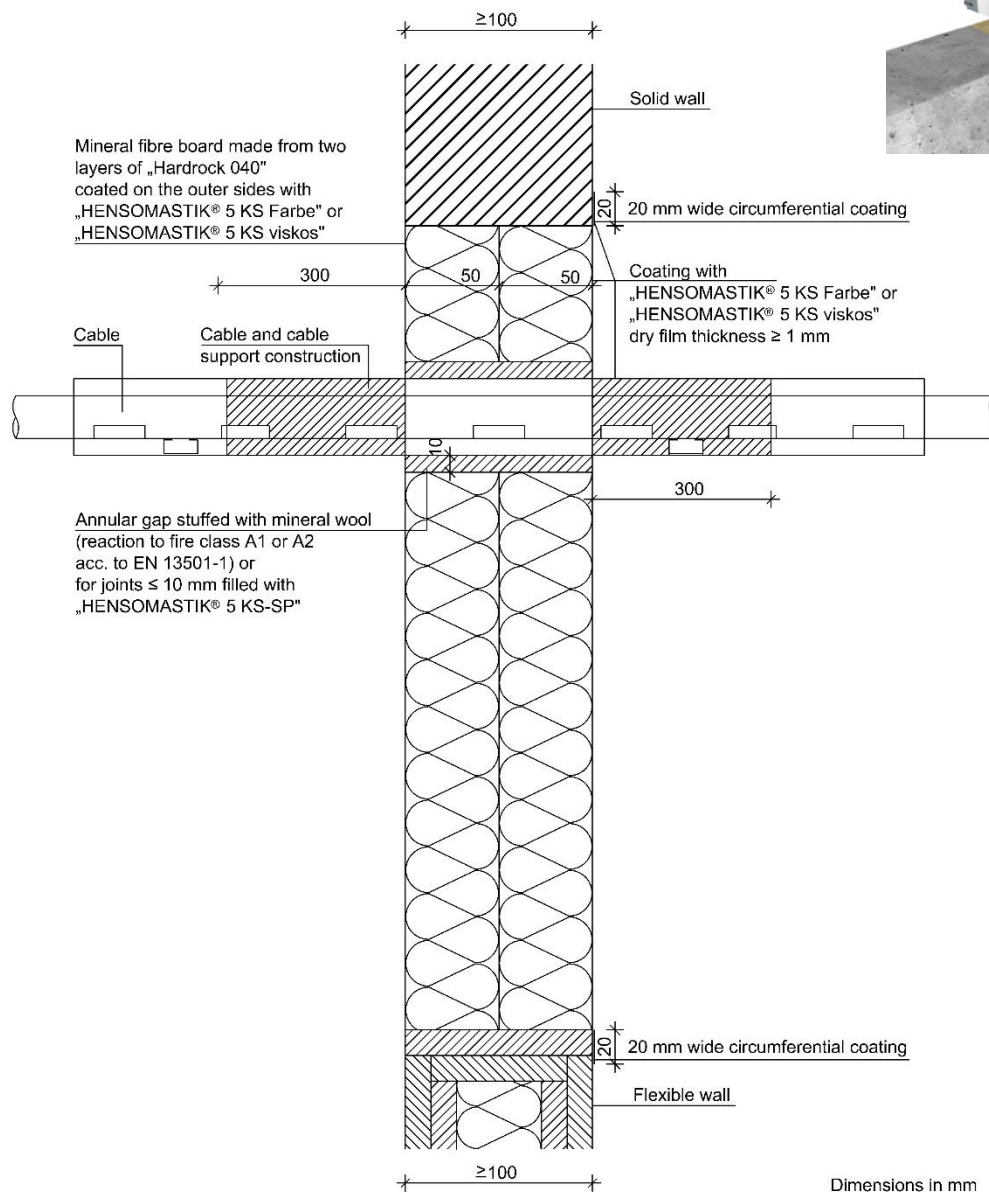
|  |   |
|--|---|
| Metal pipes with Armaflex Protect insulation                                 | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul> |
| Metal pipes with synthetic rubber insulation                                 | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul> |
| Composite pipes with synthetic rubber insulation and HENSOTHERM® 7 KS Gewebe | <ul style="list-style-type: none"> <li>• Geberit Mepla</li> <li>• KE KELIT KELOX</li> </ul>                           |

### A.1.1.2 Permitted Distances

|   |
|---|
| <p>Maximum seal size: 2000 mm high x 1200 mm wide</p> <p>a1: between cable/cable trays and metal pipes <math>\geq 50</math> mm<br/> a2: between cable/cable trays and plastic pipes <math>\geq 50</math> mm<br/> a3: between metal pipes and plastic pipes <math>\geq 25</math> mm<br/> a4: between plastic pipes <math>\geq 40</math> mm<br/> a5: between metal pipes <math>\geq 40</math> mm<br/> a6: between cable trays <math>\geq 30</math> mm<br/> b1: between cable/cable trays and the upper seal edge: <math>\geq 25</math> mm<br/> b2: between cable/cable trays and the side seal edge: <math>\geq 25</math> mm<br/> b3: between cable/cable trays and the lower seal edge: <math>\geq 50</math> mm<br/> b4: between metal pipes and the side seal edge: <math>\geq 30</math> mm<br/> b5: between plastic pipes and the side seal edge: <math>\geq 30</math> mm</p> <p>Distance 1st support service <math>\leq 250</math> mm</p> |
|---|

## A.1.2 Cables and Trays

Construction details:

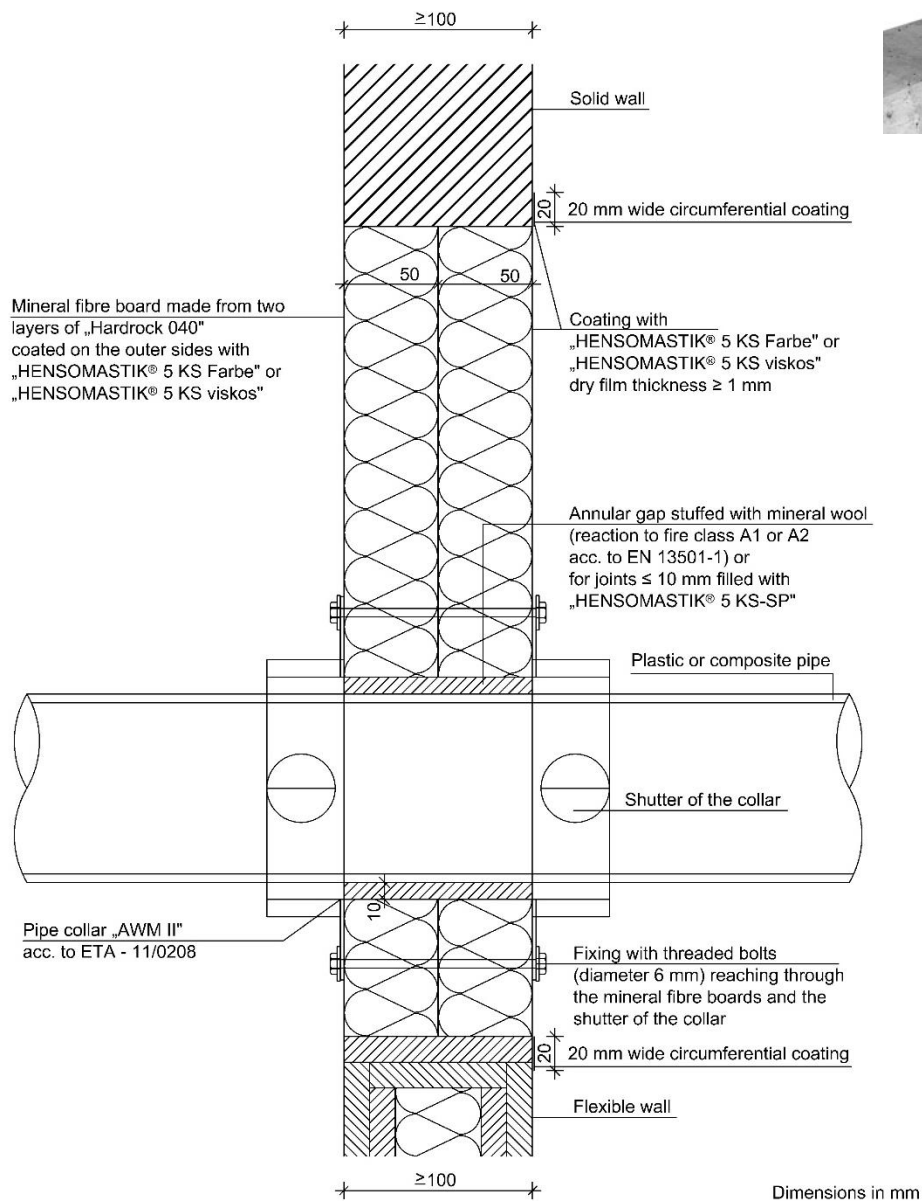


### A.1.2.1 Cables and trays with HENSOMASTIK® 5 KS Farbe

| Services  | Insulation/Coating   | Classification |
|---|--|----------------|
| Sheathed electrical cables up to 80 mm diameter | 1 mm DFT HENSOMASTIK® 5KS Farbe coating extending 300 mm from both faces of the seal | EI 90          |
| Telecoms cables up to 21 mm diameter            |  |                |
| Bundles of above cables up to 100 mm diameter   |  |                |
| Cable supports                                  |  |                |

### A.1.3 Plastic and composite pipes with AWM II pipe collars

Construction details:



#### A.1.3.1 Friaphon pipes with AWM II pipe collars

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Classification |
|---------------|------------------|------------------------|----------------|
| Friaphon pipe | 52               | 2.8                    | EI 90 U/U      |
|               | 78               | 4.9                    |                |
|               | 110              | 5.3                    |                |
|               | 135              | 5.6                    |                |



### A.1.3.2 KE KELIT KELOX pipes with AWM II pipe collars

| Pipes          | Pipe diameter mm | Pipe wall thickness mm | Classification |
|----------------|------------------|------------------------|----------------|
| KE KELIT KELOX | 63               | 4.5                    | EI 90 U/U      |

### A.1.3.3 Geberit Mepla pipes with AWM II pipe collars

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Classification |
|---------------|------------------|------------------------|----------------|
| Geberit Mepla | 63               | 4.5                    | EI 90 U/U      |

### A.1.3.4 PVC-U pipes with AWM II pipe collars

| Pipes | Pipe diameter mm    | Pipe wall thickness mm | Classification |
|-------|---------------------|------------------------|----------------|
| PVC-U | $\geq 32 \leq 50$   | 1.8-5.6                | EI 90 U/U      |
|       | $\geq 50 \leq 110$  | 1.8-12.3               |                |
|       | $> 110 \leq 125$    | 1.8-9.2                |                |
|       | $\geq 125 \leq 160$ | 2.5-3.2                |                |
|       | 160                 | 11.9                   | EI 60 U/U      |

### A.1.3.5 PE pipes with AWM II pipe collars

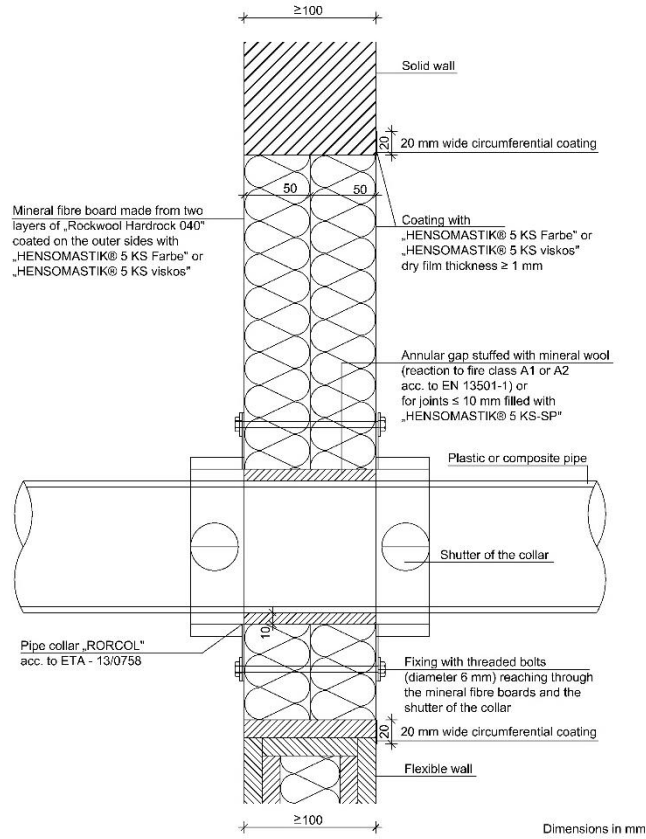
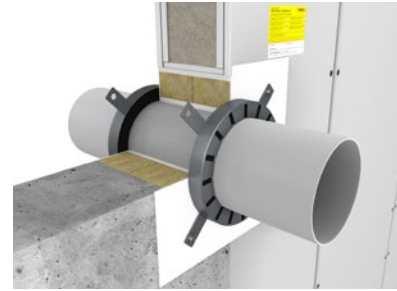
| Pipes | Pipe diameter mm  | Pipe wall thickness mm | Classification |
|-------|-------------------|------------------------|----------------|
| PE    | $\geq 32 \leq 50$ | 1.8-4.6                | EI 90 U/U      |
|       | $> 50 \leq 110$   | 2.7-3.1                |                |
|       | $> 110 \leq 125$  | 2.7-11.4               |                |
|       | $> 125 \leq 160$  | 3.1-11.4               |                |

### A.1.3.6 PP pipes with AWM II pipe collars

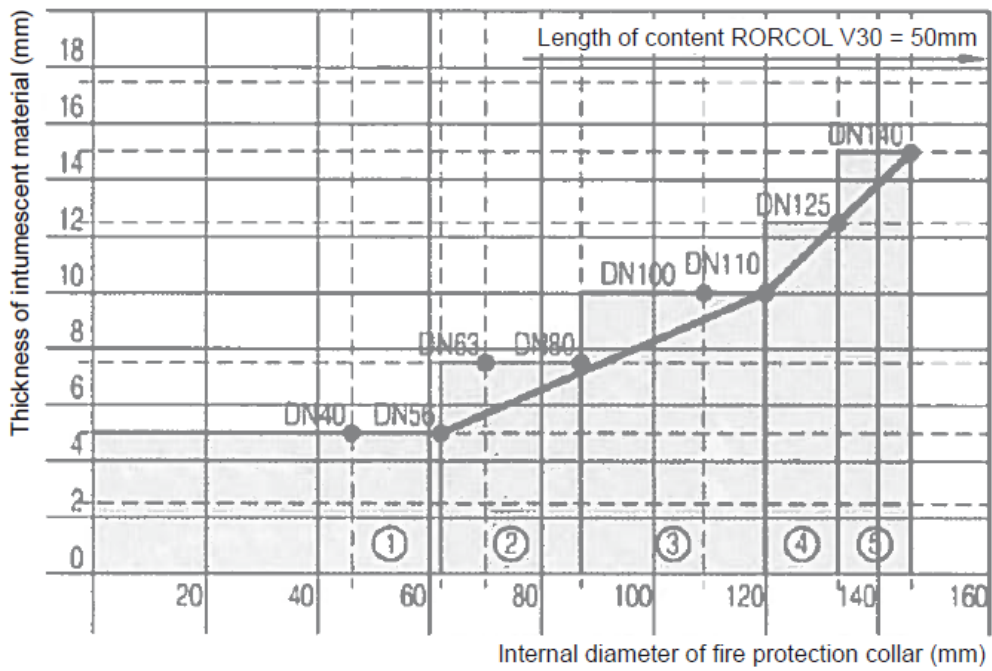
| Pipes | Pipe diameter mm | Pipe wall thickness mm | Classification |
|-------|------------------|------------------------|----------------|
| PP    | 32-50            | 1.8-4.6                | EI 90 U/U      |
|       | 110              | 2.7                    |                |
|       | 110              | 11.2                   | EI 60 U/U      |

### A.1.4 Plastic and composite pipes with RORCOL V30 pipe collars

Construction details:



Design groups for RORCOL V30 Collar:



#### A.1.4.1 PVC-U pipes to EN ISO 1452-1 with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PVC-U | 32               | 1.6 – 2.6              | None                              | EI 120 U/U     |
|       |                  |                        | PE / ≤ 5                          |                |
|       | >32 ≤62          | 2.6 – 3.4              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       | >62 ≤87          | 3.4 – 4.2              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       | >87 ≤110         | 4.2                    | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |

#### A.1.4.2 PE pipes to EN 1519-1, EN 12201-2, EN12666-1, ABS pipes to EN 1455-1 and SAN PVC to EN 1565-1 with RORCOL V30 pipe collars

| Pipes     | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-----------|------------------|------------------------|-----------------------------------|----------------|
| PE        | 32               | 3.0 – 3.6              | None                              | EI 120 U/U     |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 9                          |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           | >32 ≤56          | 3.0 – 3.6              | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 9                          |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           | >56 ≤62          | 3.6 – 4.9              | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 9                          |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           | >62 ≤87          | 4.9 – 6.0              | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 9                          |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           | >87 ≤110         | 6.0                    | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 9                          |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           | 110              | 4.3 – 6.0              | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 9                          |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
| >110 ≤125 | 4.3 – 4.9        | None                   |                                   |                |
|           |                  | Elastomer / ≤ 9        |                                   |                |
| >125 ≤135 | 6.0              | None                   |                                   |                |

#### A.1.4.3 PE pipes to EN 12201-2, with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PE    | 125              | 11.4                   | PE 5                              | EI 90 U/U      |

#### A.1.4.4 PE pipes to EN 1445-1, with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PE    | 32               | 1.8 – 2.5              | None                              | EI 120 U/U     |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | >32 ≤ 50         | 1.8 – 2.5              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | >50 ≤ 62         | 2.5 – 4.0              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >62 ≤ 87         | 4.0 – 5.4              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >87 ≤ 110        | 5.4                    | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | 125              | 3.1 – 3.5              | None                              |                |

#### A.1.4.5 PP pipes to EN 1451-1 with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PP    | 32               | 1.8 – 2.5              | None                              | EI 90 U/U      |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | >32 ≤ 50         | 1.8 – 2.5              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | >50 ≤ 62         | 2.5 – 4.0              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >62 ≤ 87         | 4.0 – 5.4              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >87 ≤ 110        | 5.4                    | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | 125              | 3.1 – 3.5              | None                              |                |

#### A.1.4.6 PP R pipes to EN ISO 15874-2, with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PP R  | 50               | 8.3                    | Uninstalled                       | EI 120 U/U     |
|       |                  |                        | PE / $\leq 10$                    |                |
|       |                  |                        | Elastomer / $\leq 25$             |                |

#### A.1.4.7 PP H pipes to EN ISO 15494, with RORCOL V30 pipe collars

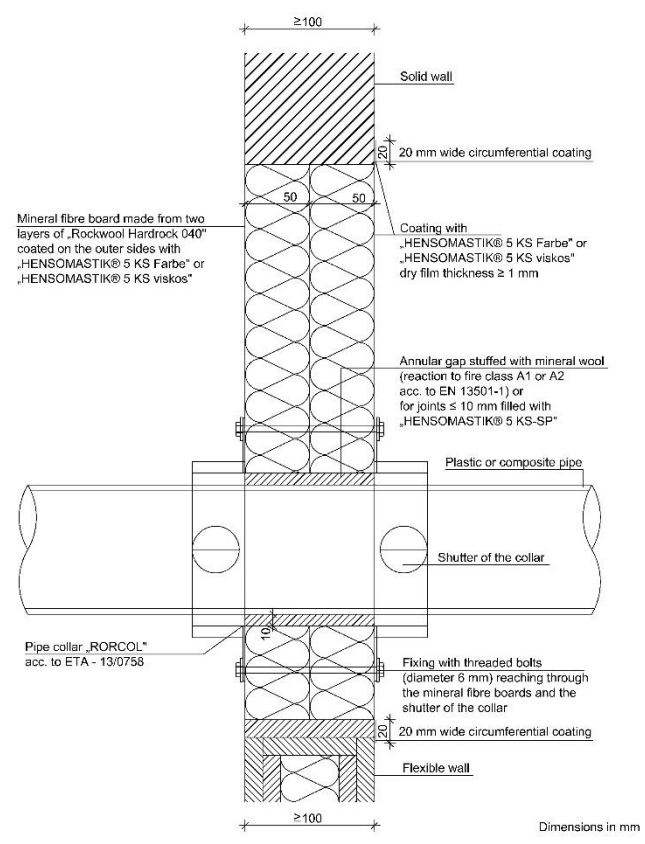
| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PP H  | 110              | 10.0                   | PE / 4                            | EI 90 U/U      |

#### A.1.4.8 Special pipes with RORCOL V30 pipe collars

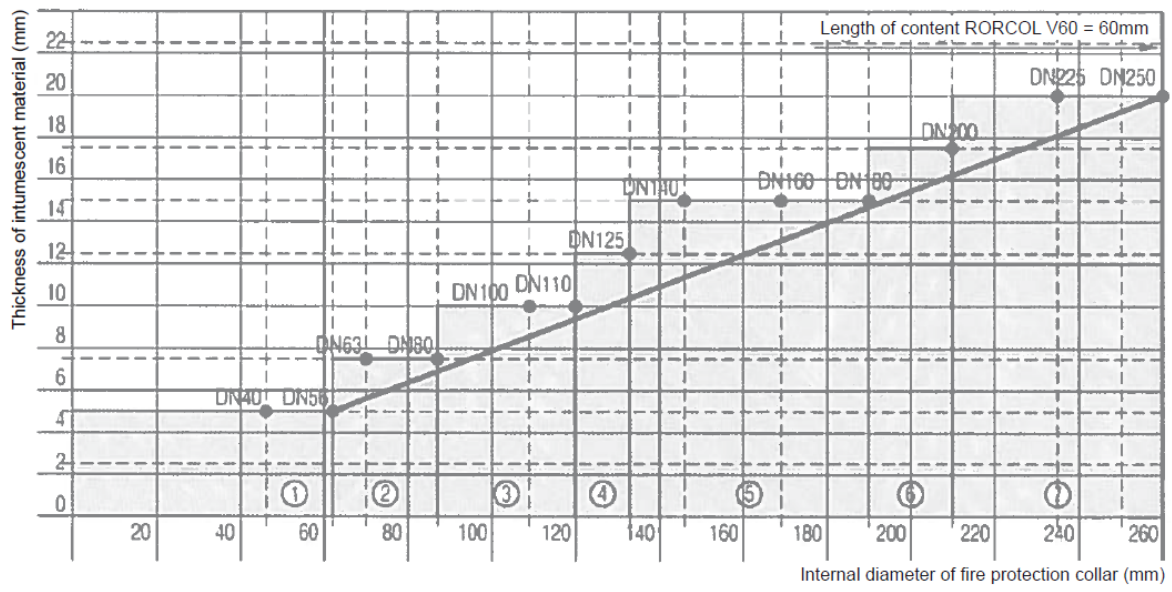
| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|---------------|------------------|------------------------|-----------------------------------|----------------|
| Raupiano Plus | 50               | 1.8                    | None                              | EI 120 U/U     |
|               |                  |                        | Elastomer / $\leq 9$              |                |
|               | 110              | 2.7                    | None                              |                |
|               |                  |                        | Elastomer / $\leq 9$              |                |
|               | 125              | 3.1                    | None                              |                |
|               |                  |                        | Elastomer / $\leq 9$              |                |
| POLO-KAL 3S   | 110              | 4.8                    | None                              |                |
|               | 125              | 5.3                    |                                   |                |
| POLO-KAL NG   | 50               | 2.0                    | None                              |                |
|               | 110              | 3.4                    |                                   |                |
|               | 125              | 3.9                    |                                   |                |
| FRIAPHON      | 52               | 2.8                    | Elastomer / $\leq 6$              | EI 120 U/U     |
|               | 110              | 5.3                    | None                              | EI 90 U/U      |
|               |                  |                        | Elastomer / $\leq 25$             |                |
| RAUTITAN flex | 50               | 6.9                    | None                              | EI 90 U/U      |
|               |                  |                        | Elastomer / $\leq 9$              | EI 120 U/U     |

### A.1.5 Plastic and composite pipes with RORCOL V60 pipe collars

Construction details:



Design groups for RORCOL V60 Collar:



### A.1.5.1 PVC-U pipes to EN ISO 1452-1 with RORCOL V60 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PVC-U | 32               | 1.6 – 2.6              | None                              | EI 120 U/U     |
|       |                  |                        | PE / ≤ 5                          |                |
|       | >32 ≤62          | 2.6 – 3.4              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       | >62 ≤87          | 3.4 – 4.2              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       | >87 ≤110         | 4.2                    | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |

### A.1.5.2 PE pipes to EN 1519-1, EN 12201-2, EN12666-1, ABS pipes to EN 1455-1 and SAN PVC to EN 1565-1 with RORCOL V60 pipe collars

| Pipes     | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-----------|------------------|------------------------|-----------------------------------|----------------|
| PE        | 32               | 3.0 – 3.3              | None                              | EI 120 U/U     |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 10                         |                |
|           |                  |                        | Geberit Isol / ≤ 17               |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           |                  |                        | Aluminium lined glass wool / ≤ 20 |                |
|           | >32 ≤56          | 3.0 – 3.3              | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 10                         |                |
|           |                  |                        | Geberit Isol / ≤ 17               |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           |                  |                        | Aluminium lined glass wool / ≤ 20 |                |
|           | >56 ≤62          | 3.6 – 4.8              | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 10                         |                |
|           |                  |                        | Geberit Isol / ≤ 17               |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           |                  |                        | Aluminium lined glass wool / ≤ 20 |                |
|           | >62 ≤87          | 4.8 – 6.0              | None                              |                |
|           |                  |                        | Elastomer / ≤ 9                   |                |
|           |                  |                        | PE / ≤ 10                         |                |
|           |                  |                        | Geberit Isol / ≤ 17               |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
|           |                  |                        | Aluminium lined glass wool / ≤ 20 |                |
|           | >87 ≤ 110        | 6.0                    | None                              |                |
|           |                  |                        | PE / ≤ 10                         |                |
|           |                  |                        | Geberit Isol / ≤ 17               |                |
|           |                  |                        | Elastomer / ≤ 25                  |                |
| >87 ≤125  | 6.0              | Elastomer / ≤ 9        |                                   |                |
|           |                  | None                   |                                   |                |
| >110 ≤200 | 6.2              | None                   |                                   |                |

#### A.1.5.3 PE pipes to EN 12201-2, with RORCOL V60 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PE    | 125              | 11.4                   | PE 5                              | EI 90 U/U      |

#### A.1.5.4 PP pipes to EN 1451-1 with RORCOL V60 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PP    | 32               | 1.8 – 2.5              | None                              | EI 90 U/U      |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | >32 ≤ 50         | 1.8 – 2.5              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | >50 ≤ 62         | 2.5 – 4.0              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >62 ≤ 87         | 4.0 – 5.4              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >87 ≤ 110        | 5.4                    | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | 125              | 3.1 – 3.5              | None                              |                |

#### A.1.5.5 PP R pipes to EN ISO 15874-2, with RORCOL V60 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PP R  | 16               | 8.3 – 10.3             | Elastomer / ≤ 43                  | EI 120 U/U     |
|       |                  |                        | None                              |                |
|       |                  |                        | Aluminium lined glass wool / ≤ 50 |                |
|       |                  |                        | PE / ≤ 10                         |                |
|       | >16 ≤ 50         | 8.3 – 10.3             | Elastomer / ≤ 43                  |                |
|       |                  |                        | None                              |                |
|       |                  |                        | Aluminium lined glass wool / ≤ 50 |                |
|       |                  |                        | PE / ≤ 10                         |                |
|       | >50 ≤ 63         | 10.5                   | Elastomer / ≤ 43                  |                |
|       |                  |                        | None                              |                |
|       |                  |                        | Aluminium lined glass wool / ≤ 50 |                |
|       | 63               | 10.5 – 14.5            | Elastomer / ≤ 43                  |                |
|       |                  |                        | None                              |                |
|       |                  |                        | Aluminium lined glass wool / ≤ 50 |                |
|       | >63 ≤ 90         | 14.5 – 15.0            | Elastomer / ≤ 43                  |                |

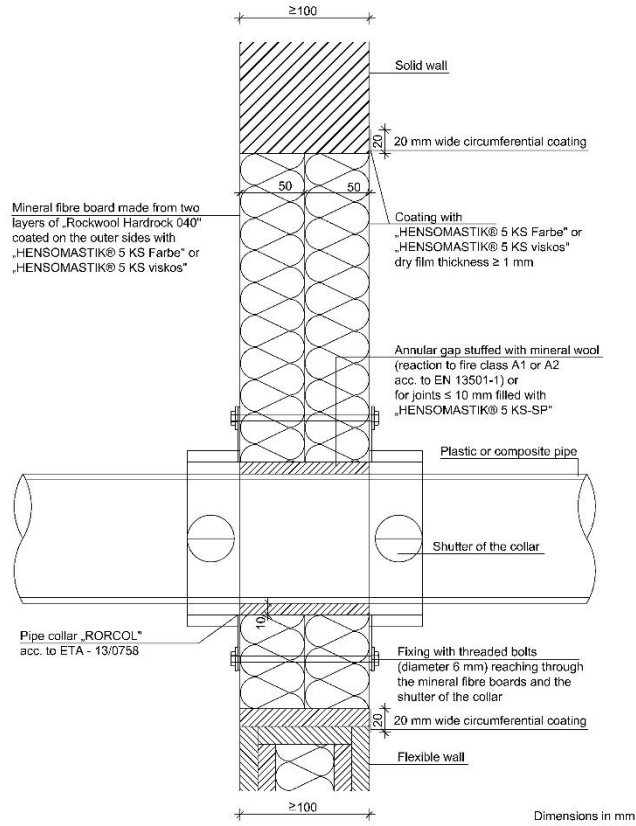


#### A.1.5.6 PP H pipes to EN ISO 15494, with RORCOL V60 pipe collars

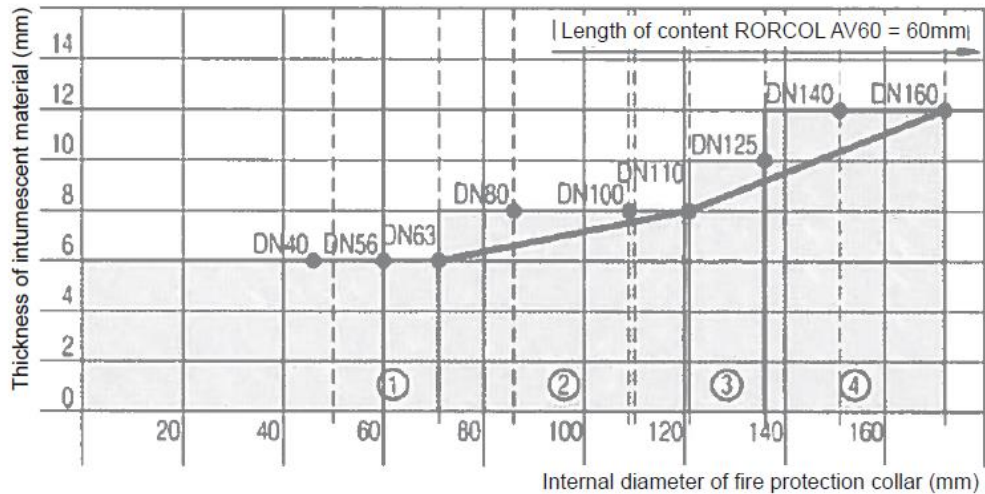
| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PP H  | 110              | 10.0                   | PE / 4                            | EI 90 U/U      |

### A.1.6 Metal, plastic and composite pipes with RORCOL AV60 pipe collars

Construction details:



Design groups for RORCOL AV60 Collar:



#### A.1.6.1 Metal pipes to EN 13501-1 with RORCOL AV60 pipe collars

| Pipes                            | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------------------------|------------------|------------------------|-----------------------------------|----------------|
| Copper<br>Mild & stainless steel | ≤ 22             | 1.0 – 14.2             | Aluminium lined glass wool / ≥ 20 | EI 120 U/U     |
|                                  | ≤ 54             | 1.5 – 14.2             | Aluminium lined glass wool / ≥ 20 |                |

#### A.1.6.2 Flex tubes to EN 61386-22 with RORCOL AV60 pipe collars

| Flex Tube    | Tube diameter mm | Cable size                | Number Cable / FX flexible tube | Classification |
|--------------|------------------|---------------------------|---------------------------------|----------------|
| FX flex tube | ≤ 50             | without cable             |                                 | EI 90          |
|              |                  | ≤ 5 x 2.5 mm <sup>2</sup> | ≤ 2                             |                |
|              | ≤ 40             | ≤ 5 x 6.0 mm <sup>2</sup> | 1                               |                |

#### A.1.6.3 Geberit av60 pipes with RORCOL AV60 pipe collars

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|---------------|------------------|------------------------|-----------------------------------|----------------|
| Geberit Mepla | 63               | 4.5                    | Elastomer / 9                     | EI 90 U/C      |

#### A.1.6.4 HENCO multiple-layer pipes with RORCOL AV60 pipe collars

| Pipes                | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------------|------------------|------------------------|-----------------------------------|----------------|
| HENCO multiple-layer | 20               | 2.0                    | PE / 4                            | EI 120 U/C     |
|                      |                  |                        | Elastomer / 6                     |                |

#### A.1.6.5 K06 KELIT PN20 pipes with RORCOL AV60 pipe collars

| Pipes          | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------|------------------|------------------------|-----------------------------------|----------------|
| K06 KELIT PN20 | 20               | 2.8                    | Aluminium lined glass wool / 20   | EI 120 U/C     |
|                |                  |                        | PE / 4                            |                |
|                | 26               | 3.5                    | PE / 10                           |                |
|                | 90               | 12.3                   | Elastomer / 19 - 43               |                |

#### A.1.6.6 RAUTITAN stabil pipes with RORCOL AV60 pipe collars

| Pipes           | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-----------------|------------------|------------------------|-----------------------------------|----------------|
| RAUTITAN stabil | 40               | 6.0                    | Elastomer / 32                    | EI 120 U/C     |

#### A.1.6.7 FRIATHERM multi-press pipes with RORCOL AV60 pipe collars

| Pipes                 | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-----------------------|------------------|------------------------|-----------------------------------|----------------|
| FRIATHERM multi-press | 16               | 2.0                    | PE / 4                            | EI 120 U/C     |
|                       |                  |                        | Elastomer / 6                     |                |

#### A.1.6.8 JRG Sanipex MT pipes with RORCOL AV60 pipe collars

| Pipes          | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------|------------------|------------------------|-----------------------------------|----------------|
| JRG Sanipex MT | 26               | 3.0                    | Aluminium lined glass wool / 20   | EI 120 U/C     |

#### A.1.6.9 PYTHON beverages line pipes with RORCOL AV60 pipe collars

| Pipes                 | Pipe diameter mm  | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-----------------------|---|------------------------|-----------------------------------|----------------|
| PYTHON beverages line | 40 mm bundle (8 pipes of 13 mm each)  | 1.7                    | None                              | EI 120 U/U     |
|                       | 80 mm bundle (2 pipes of 13 mm each, 2 pipes of 15 mm each, 6 cables of 3 x 1.5 mm <sup>2</sup> each) | 1.7 – 1.75             | Elastomer / 19                    |                |

#### A.1.6.10 TECEflex pipes with RORCOL AV60 pipe collars

| Pipes    | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm    | Classification |
|----------|------------------|------------------------|--------------------------------------|----------------|
| TECEflex | 26               | 4.0                    | None                                 | EI 120 U/C     |
|          |                  |                        | PE / ≤ 10                            |                |
|          |                  |                        | Elastomer / ≤ 9                      |                |
|          | 63               | 6.0                    | Elastomer / 9 – 32                   |                |
|          |                  |                        | Aluminium lined glass wool / 20 - 50 |                |

**A.1.6.11 OMEGA application #1 with RORCOL AV60 pipe collars and flex tubes to EN 61386-22**

| Flex Tube         | Tube diameter mm | Number of flexible tubes | Cable size                | Number Cable / FX flexible tube | Classification |
|-------------------|------------------|--------------------------|---------------------------|---------------------------------|----------------|
| FX flexible tubes | ≤ 20             | ≤ 5                      | without cable             |                                 | EI 120         |
|                   |                  | ≤ 4                      | ≤ 5 x 1.5 mm <sup>2</sup> | 1                               |                |
|                   |                  | 1                        | ≤ 5 x 2.5 mm <sup>2</sup> | 1                               |                |
|                   | ≤ 25             | ≤ 6                      | without cable             |                                 |                |
|                   |                  | ≤ 3                      | ≤ 5 x 1.5 mm <sup>2</sup> | 1                               |                |
|                   |                  | ≤ 2                      | ≤ 5 x 2.5 mm <sup>2</sup> | 1                               |                |
|                   |                  | 1                        | ≤ 5 x 6.0 mm <sup>2</sup> | 1                               |                |

**A.1.6.12 Multiple lead-throughs #1 with RORCOL AV60 pipe collars, HENCO multiple-layer and TECEflex pipes**

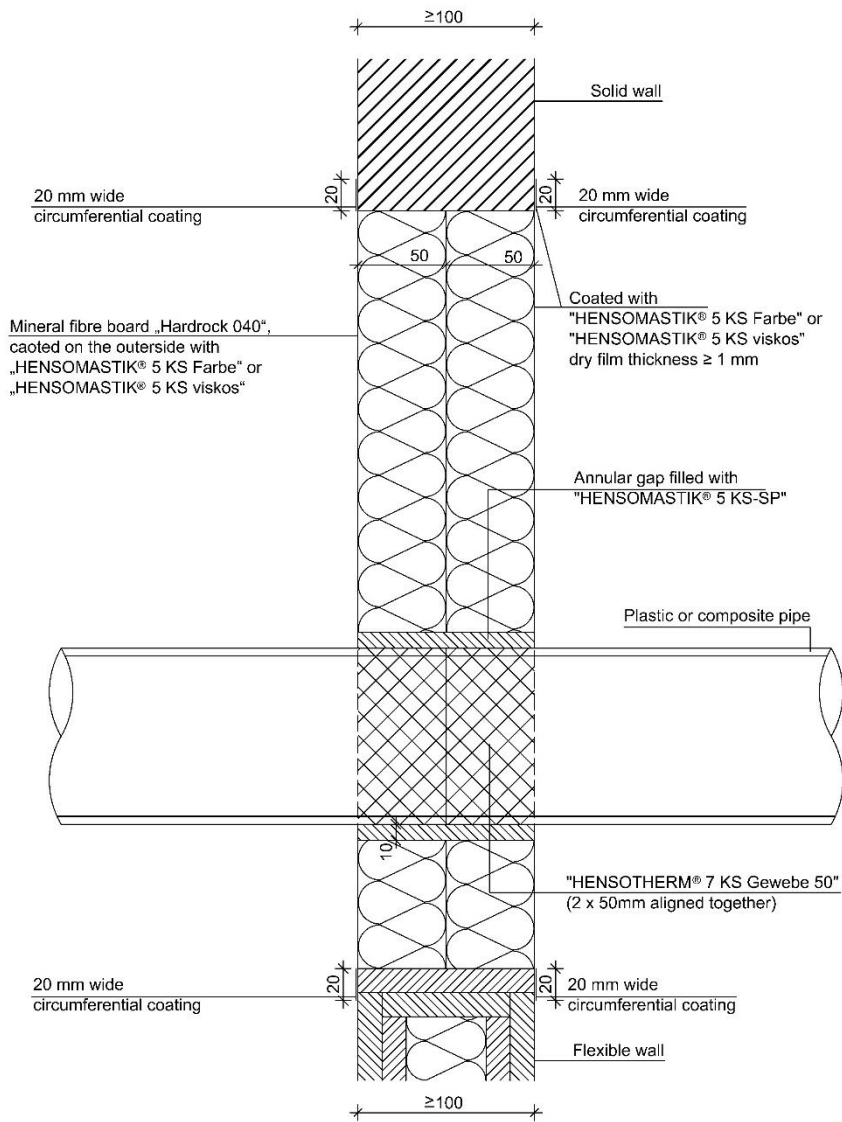
| Pipes                | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------------|------------------|------------------------|-----------------------------------|----------------|
| HENCO multiple-layer | 20               | 2.0                    | PE / 4                            | EI 120 U/C     |
|                      |                  |                        | Elastomer / 6                     |                |
| TECEflex             | 26               | 4.0                    | PE / 10                           |                |
|                      |                  |                        | Elastomer / 9                     |                |

**A.1.6.13 Multiple lead-throughs #2 (electrical) with RORCOL AV60 pipe collars and flex tubes to EN 61386-22**

| Flex Tube         | Tube diameter mm | Cable size                | Number Cable / FX flexible tube | Classification |
|-------------------|------------------|---------------------------|---------------------------------|----------------|
| FX flexible tubes | ≤ 50             | without cable             |                                 | EI 90          |
|                   |                  | ≤ 5 x 2.5 mm <sup>2</sup> | ≤ 2                             |                |
|                   | ≤ 40             | ≤ 5 x 6.0 mm <sup>2</sup> | 1                               |                |

### A.1.7 Plastic and composite pipes with HENSOTHERM® 7 KS Gewebe 50

Construction details:



Dimensions in mm

#### A.1.7.1 PVC-U pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes     | Maximum Pipe diameter mm | Pipe wall thickness Mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-----------|--------------------------|------------------------|--------------------------------------|----------------|
| PVC-U     | ≤ 50                     | 1.8-5.6                | 2                                    | EI 90 U/U      |
|           | ≥ 50 < 75                | 1.8-5.6                | 3                                    |                |
|           | ≥ 75 < 90                | 4.3- 6.7               | 4                                    |                |
|           | ≥ 90 ≤ 110               | 8.1                    | 4                                    |                |
|           | > 125 ≤ 140              | 4.1                    | 6                                    |                |
|           | ≤ 50                     | 1.8-5.6                | 2                                    | EI 120 U/U     |
| > 50 ≤ 75 | 1.9-5.6                  | 3                      |                                      |                |

#### A.1.7.2 PE-HD pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PE-HD | ≥ 50 ≤ 56                | 3.0                    | 2                                    | EI 90 U/U      |
|       | > 56 ≤ 75                | 3.0                    | 3                                    |                |
|       | > 75 ≤ 110               | 4.3                    | 4                                    |                |
|       | > 110 ≤ 125              | 4.8                    | 5                                    |                |
|       | 75                       | 3.0                    | 3                                    | EI 120 U/U     |
|       | 125                      | 4.8                    | 5                                    |                |

#### A.1.7.3 PE-HD pipes with Schallschutz PE4 with HENSOTHERM® 7 KS Gewebe 50

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PE-HD | 56                       | 3.0                    | 3                                    | EI 90 U/U      |

#### A.1.7.4 PP-HT pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PP-HT | ≤ 50                     | 1.8                    | 2                                    | EI 90 U/U      |
|       | > 50 ≤ 75                | 1.8-1.9                | 3                                    |                |
|       | > 75 ≤ 90                | 1.9-2.2                | 4                                    |                |
|       | > 90 ≤ 110               | 2.2-2.7                | 5                                    |                |

#### A.1.7.5 PP-HT pipes with Schallschutz PE 4 with HENSOTHERM® 7 KS Gewebe 50

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PP-HT | 50                       | 1.8                    | 3                                    | EI 90 U/U      |

#### A.1.7.6 Geberit Silent-PP pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes             | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------------|--------------------------|------------------------|--------------------------------------|----------------|
| Geberit Silent-PP | ≤50                      | 2.0                    | 2                                    | EI 90 U/U      |
|                   | >50 ≤75                  | 2.0-2.6                | 3                                    |                |
|                   | >75 ≤90                  | 2.6-3.1                | 4                                    |                |
|                   | >90 ≤110                 | 3.1-3.6                | 4                                    |                |
|                   | >110 ≤125                | 4.2                    | 5                                    | EI 120 U/U     |
|                   | 75                       | 2.6                    | 3                                    |                |
|                   | 125                      | 4.2                    | 5                                    |                |

#### A.1.7.7 Geberit Silent-db20 pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes               | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|---------------------|--------------------------|------------------------|--------------------------------------|----------------|
| Geberit Silent-db20 | ≤56                      | 3.2                    | 2                                    | EI 90 U/U      |
|                     | >56 ≤75                  | 3.2-3.6                | 3                                    |                |
|                     | >75 ≤90                  | 3.6-5.5                | 4                                    |                |
|                     | >90 ≤110                 | 6.0                    | 5                                    |                |
|                     | 75                       | 3.6                    | 3                                    | EI 120 U/U     |
|                     | 110                      | 6.0                    | 4                                    |                |

#### A.1.7.8 POLO-KAL NG pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes       | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------|--------------------------|------------------------|--------------------------------------|----------------|
| POLO-KAL NG | ≤50                      | 2.0                    | 2                                    | EI 90 U/U      |
|             | >50 ≤75                  | 2.0-2.6                | 3                                    |                |
|             | >75 ≤110                 | 2.6-3.4                | 4                                    |                |
|             | >110 ≤125                | 3.4-3.9                | 5                                    |                |
|             | >125 ≤160                | 4.9                    | 6                                    |                |
|             | 75                       | 2.6                    | 3                                    | EI 120 U/U     |
|             | >75 ≤110                 | 2.6-3.4                | 4                                    |                |
|             | >100 ≤125                | 3.4-3.9                | 5                                    |                |

#### A.1.7.9 POLO-KAL 3S pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes       | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------|--------------------------|------------------------|--------------------------------------|----------------|
| POLO-KAL 3S | ≤75                      | 3.8                    | 3                                    | EI 90 U/U      |
|             | >75 ≤110                 | 4.8                    | 4                                    |                |
|             | 110                      | 4.8                    | 4                                    | EI 120 U/U     |



#### A.1.7.10 RAUPIANO PLUS pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes         | Maximum Pipe diameter mm | Pipe wall thickness Mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|---------------|--------------------------|------------------------|--------------------------------------|----------------|
| RAUPIANO PLUS | ≤50                      | 1.8                    | 2                                    | EI 90 U/U      |
|               | >50 ≤75                  | 1.8-2.5                | 3                                    |                |
|               | >75 ≤110                 | 2.5-2.7                | 4                                    |                |
|               | >110 ≤125                | 3.1                    | 5                                    |                |
|               | 75                       | 2.5                    | 3                                    | EI 120 U/U     |
|               | 125                      | 3.1                    | 5                                    |                |

#### A.1.7.11 PE 80/PE 100 pipes with HENSOTHERM® 7 KS Gewebe 50

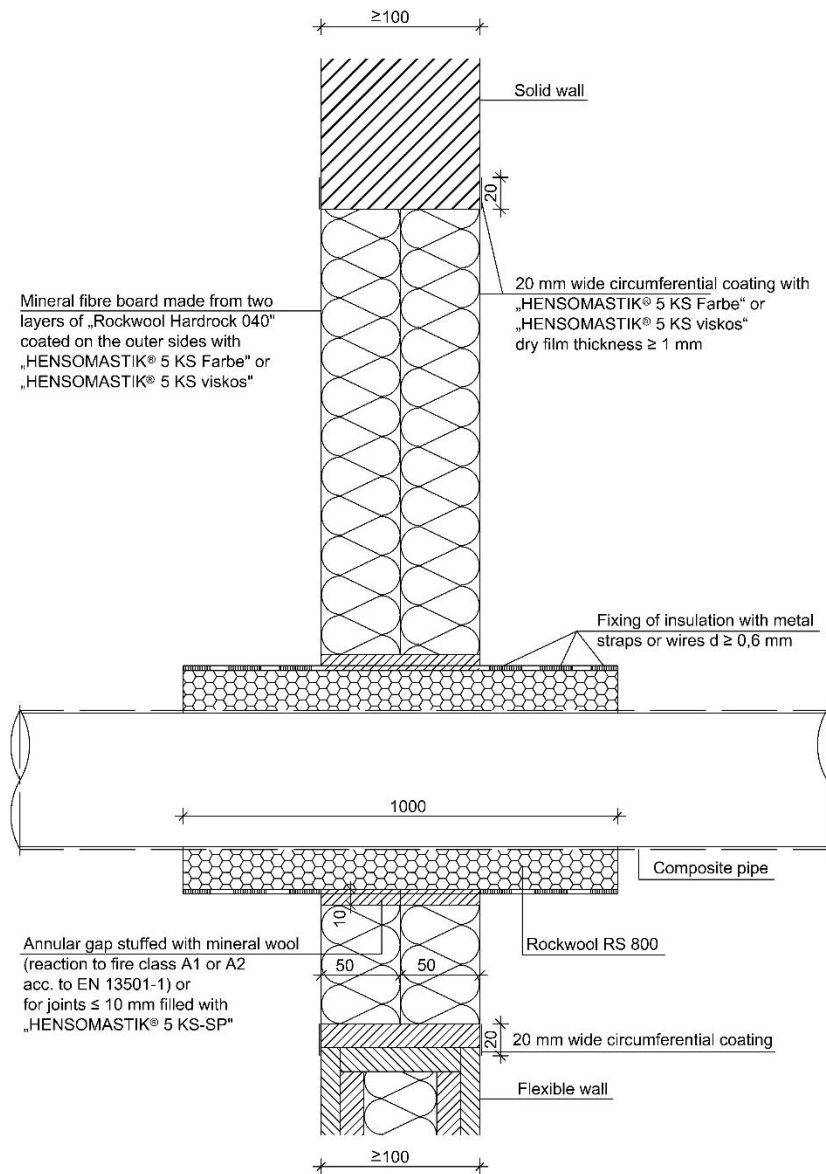
| Pipes        | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|--------------|--------------------------|------------------------|--------------------------------------|----------------|
| PE 80/PE 100 | ≤50                      | 3.0-6.9                | 2                                    | EI 120 U/C     |
|              | >50 ≤75                  | 3.0-6.9                | 3                                    | EI 90 U/C      |
|              | >75 ≤110                 | 2.7-6.6                | 4                                    | EI 90 U/C      |
|              | 110                      | 6.6                    | 4                                    | EI 120 U/C     |

#### A.1.7.12 Flex-Schlauch with/without cables with HENSOTHERM® 7 KS Gewebe 50

| Services      | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|---------------|--------------------------|------------------------|--------------------------------------|----------------|
| Flex-Schlauch | 25-32                    | 2.0                    | 2                                    | EI 90 C/C      |

### A.1.8 Composite pipes with Rockwool RS 800 insulation 1000 mm (LS)

Construction details:



The length of the local insulation may be increased but not reduced.

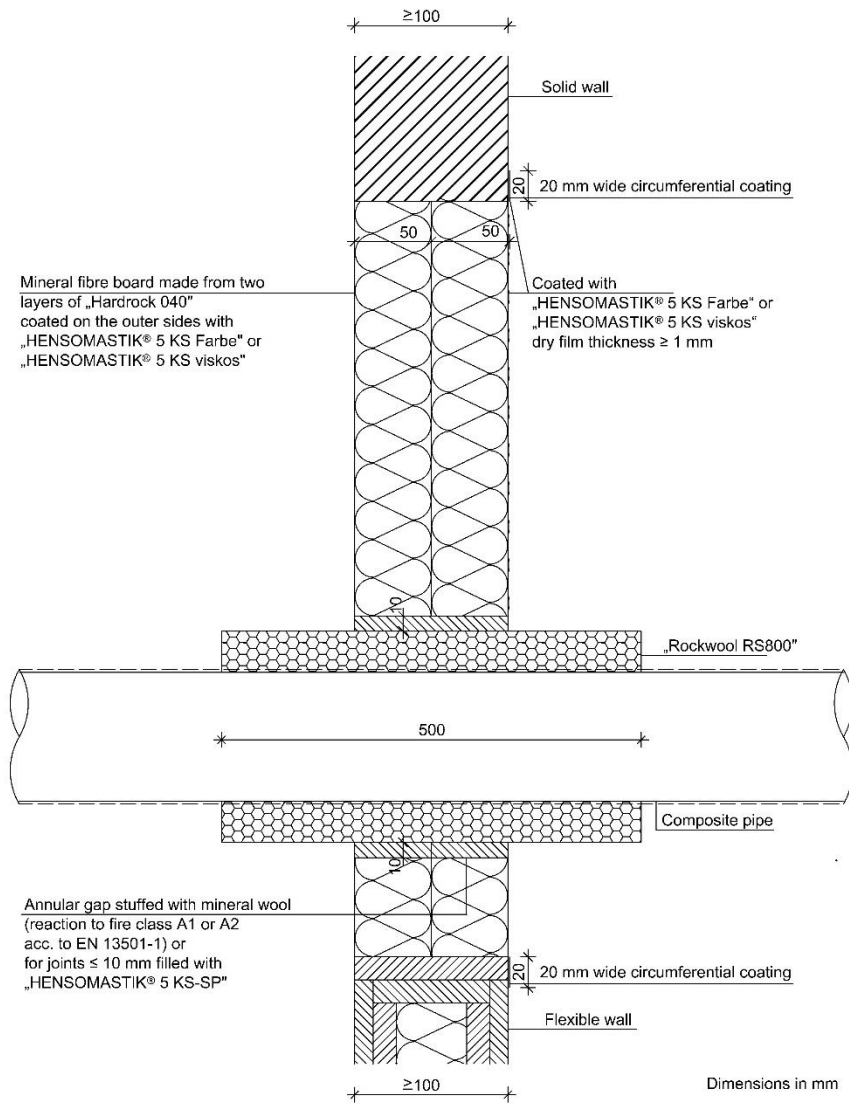
Dimensions in mm

#### A.1.8.1 KE KELIT KELOX pipes with Rockwool RS 800 insulation

| Pipes          | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|----------------|------------------|------------------------|-------------------------|----------------------|----------------|
| KE KELIT KELOX | 63               | 4.5                    | 30                      | 1000 mm (LS)         | EI 90 U/C      |

### A.1.9 Composite pipes with Rockwool RS 800 insulation 500 mm (LS)

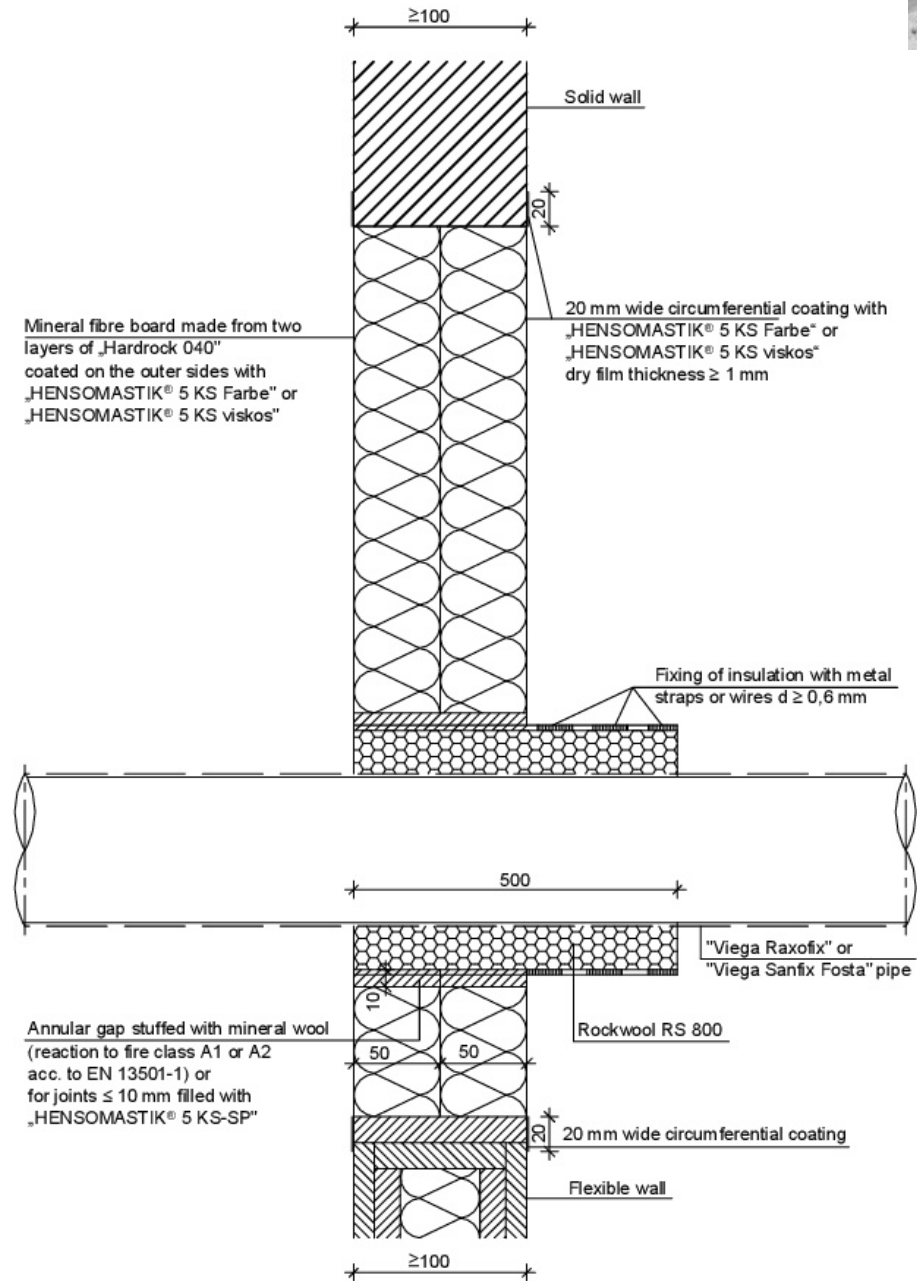
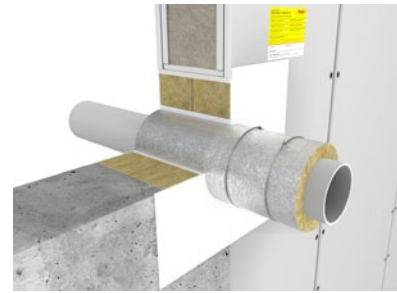
Construction details:



The length of the local insulation may be increased but not reduced.

### A.1.9 Composite pipes with Rockwool RS 800 insulation 500 mm (LS)

Construction details:



The length of the local insulation may be increased but not reduced.

Dimensions in mm

### A.1.9.1 Geberit Mepla pipes with Rockwool RS 800 insulation

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|---------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Geberit Mepla | 16               | 2.3                    | 20-80                   | 500 mm (LS)          | EI 90 U/C      |
|               | 32               | 3.0                    | 20-80                   | 500 mm (LS)          |                |
|               | 40               | 3.5                    | 20-80                   | 500 mm (LS)          |                |
|               | 50               | 4.0                    | 30-80                   | 500 mm (LS)          |                |
|               | 63               | 4.5                    | 30-80                   | 500 mm (LS)          |                |
|               | 75               | 5.0                    | 30-80                   | 500 mm (LS)          |                |

### A.1.9.2 Viega Raxofix pipes with Rockwool RS 800 insulation

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|---------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Viega Raxofix | 16               | 2.2                    | 20-60                   | 500 mm (LS)          | EI 120 U/C     |
|               | 63               | 4.5                    | 20-60                   | 500 mm (LS)          |                |

The insulation was flushed with the mineral fibre board fire side.

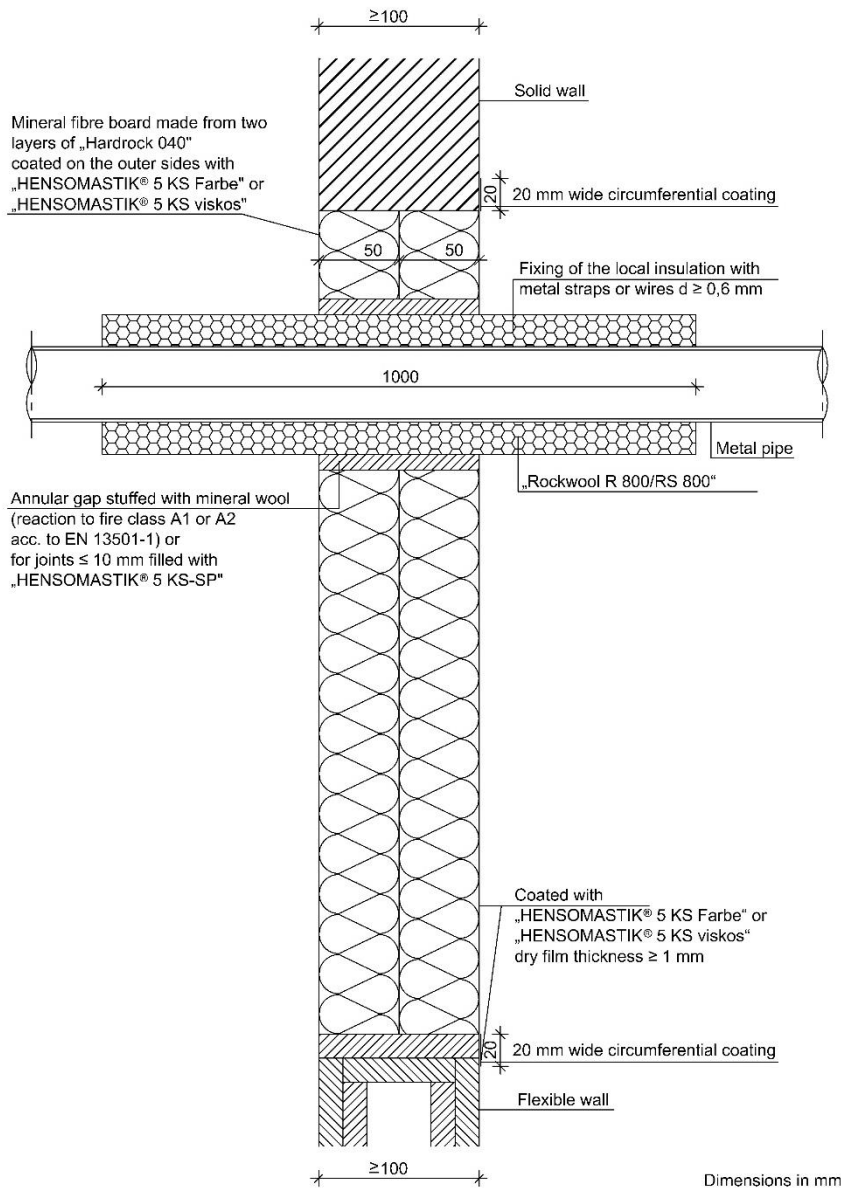
### A.1.9.3 Viega Sanfix Fosta pipes with Rockwool RS 800 insulation

| Pipes              | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|--------------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Viega Sanfix Fosta | 16               | 2.2                    | 20-60                   | 500 mm (LS)          | EI 120 U/C     |
|                    | 63               | 4.5                    | 20-60                   | 500 mm (LS)          |                |

The insulation was flushed with the mineral fibre board fire side.

### A.1.10 Metal pipes with Rockwool R 800 /RS 800 insulation, Local Sustained (LS)

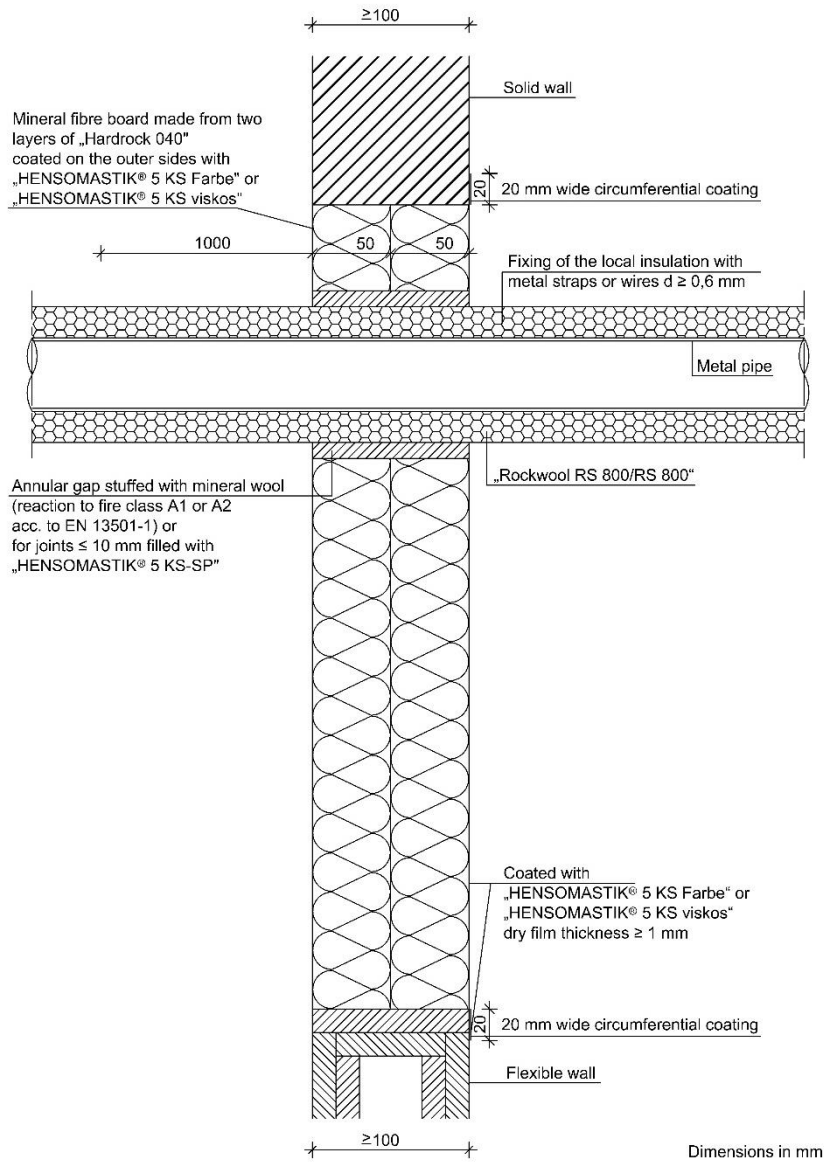
Construction details:



The length of the local insulation may be increased but not reduced.

### A.1.10 Metal pipes with Rockwool R 800 /RS 800 insulation, Continuous Sustained (CS)

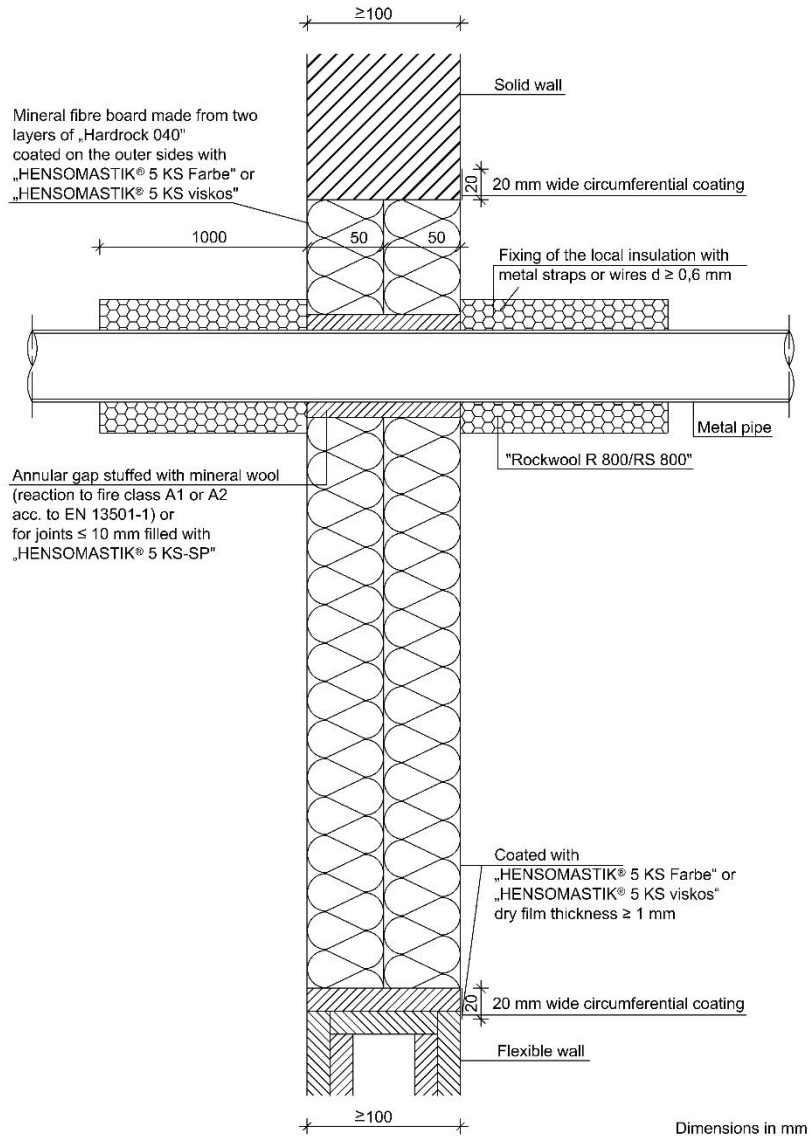
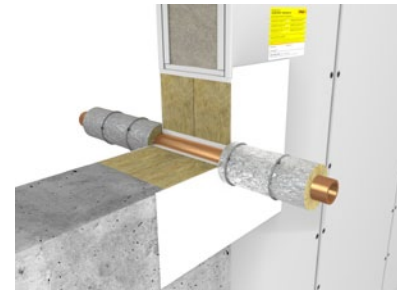
Construction details:



The length of the local insulation may be increased but not reduced.

### A.1.10 Metal pipes with Rockwool R 800 /RS 800 insulation, Local Interrupted (LI)

Construction details:



The length of the local insulation may be increased but not reduced.

#### A.1.10.1 Copper and steel pipes with Rockwool R 800 / RS 800 (CS/LS)

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Copper and steel | $\leq 15$        | 1.0-14.2               | 20                      | (CS)                 | EI 90 U/C      |
|                  | $>15 \leq 22$    | 1.0-14.2               | 20                      | (CS)                 |                |
|                  | $>22 \leq 42$    | 1.0-14.2               | 20                      | 1000 mm (LS)         |                |

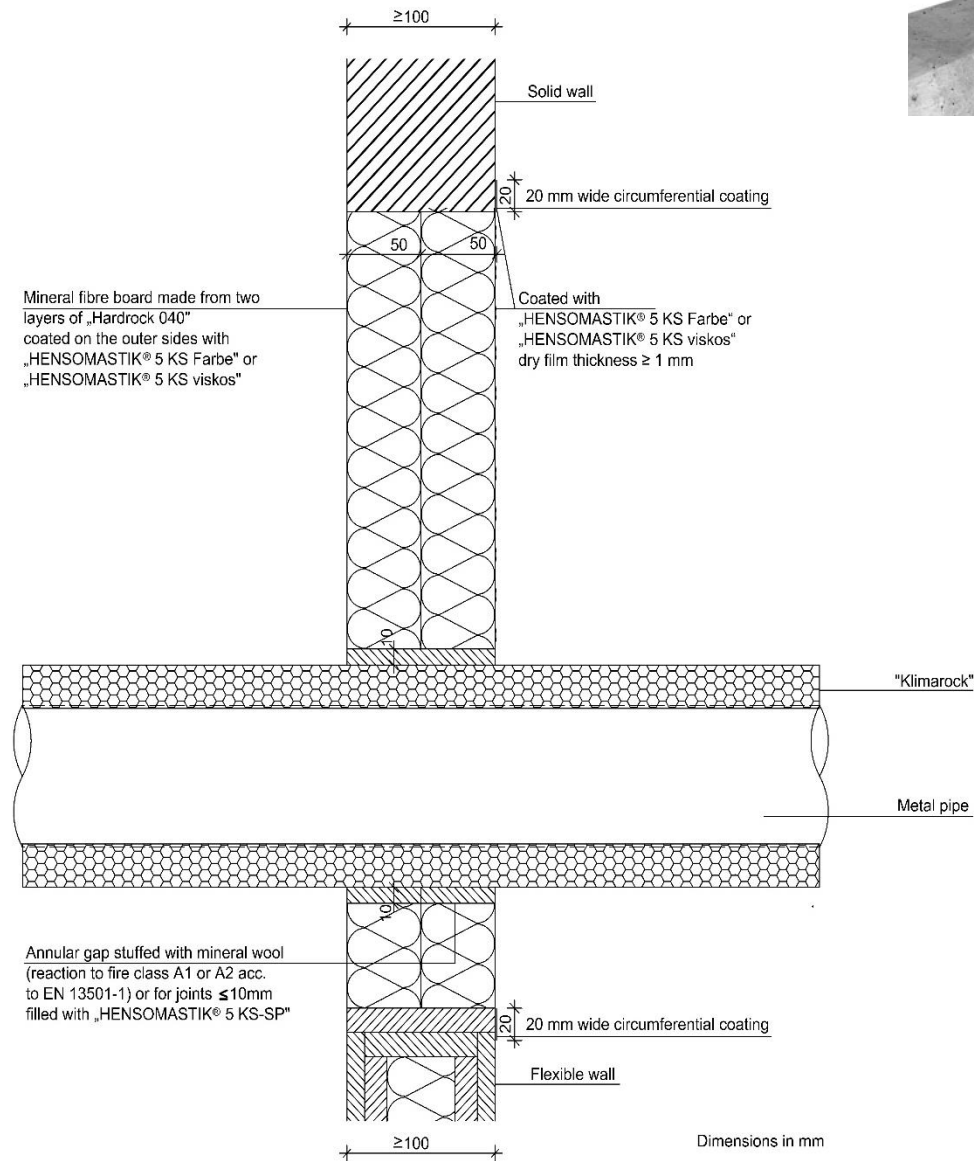


### A.1.10.2 Copper and steel pipes with Rockwool R 800 / RS 800 (LI)

| Pipes               | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|---------------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Copper              | ≤15              | 1.0-7.0                | 19                      | 2 x 1000 mm (LI)     | EI 120 U/C     |
|                     | >15 ≤22          | 1.0-11.0               | 20                      | 2 x 1000 mm (LI)     |                |
|                     | >22 ≤42          | 1.5-14.2               | 20                      | 2 x 1000 mm (LI)     |                |
|                     | >42 ≤76.1        | 2.0-14.2               | 25                      | 2 x 1000 mm (LI)     |                |
|                     | >76.1 ≤88.9      | 2.0-14.2               | 30                      | 2 x 1000 mm (LI)     |                |
| Steel and cast iron | ≤22              | 1.0-11                 | 20                      | 2 x 1000 mm (LI)     | EI 90 U/C      |
|                     | >22 ≤48.3        | 2.6-14.2               | 20                      | 2 x 1000 mm (LI)     |                |
|                     | >48.3 ≤139.7     | 4.0-14.2               | 30                      | 2 x 1000 mm (LI)     |                |

### A.1.11 Metal pipes with Klimarock insulation (CS)

Construction details:

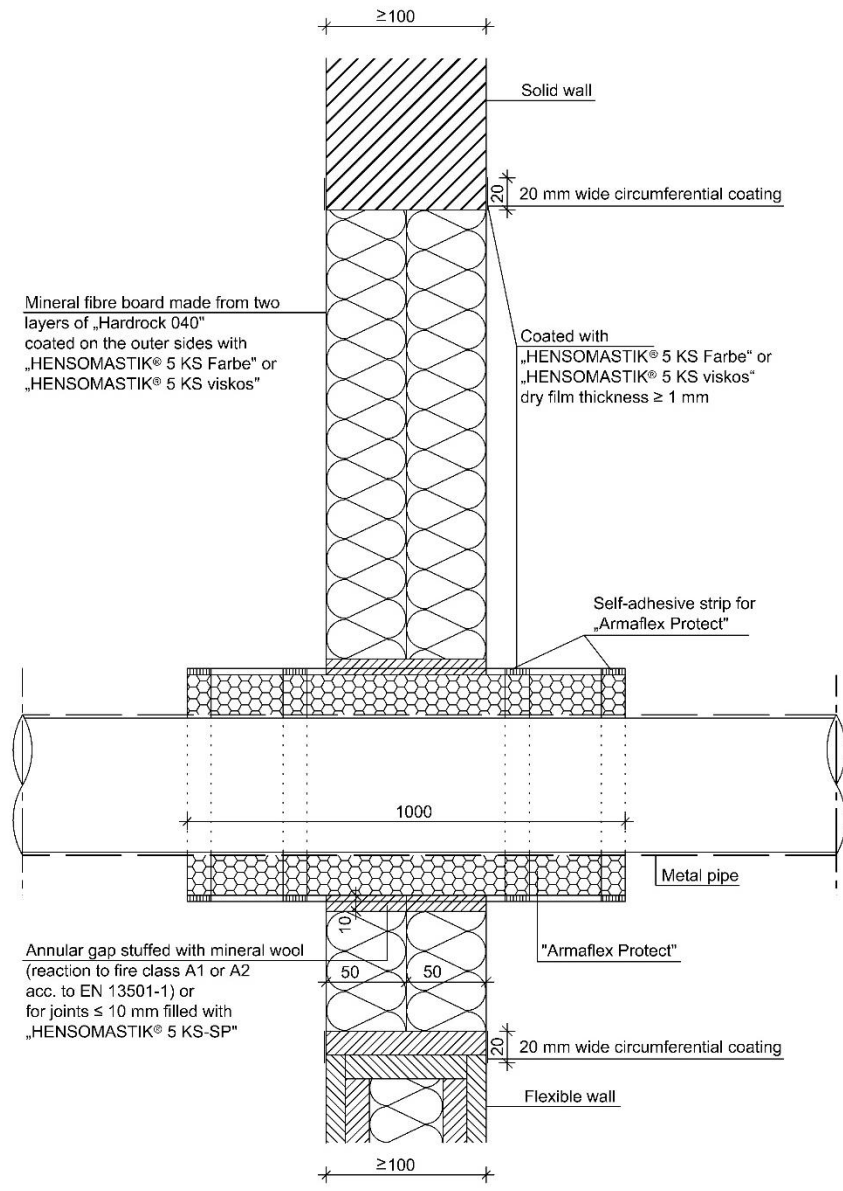
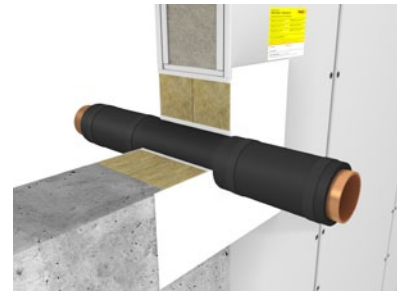


#### A.1.11.1 Copper and steel pipes with Klimarock insulation

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Copper and steel | ≤15              | 1.0-14.2               | 20                      | (CS)                 | EI 120 U/C     |
|                  | >15 ≤54          | 1.0-14.2               | 20                      | (CS)                 | EI 90 U/C      |
| steel            | >54 ≤ 89         | 4.5 – 14.2             | 30                      | (CS)                 | EI120 U/C      |

### A.1.12 Metal pipes with Armaflex Protect insulation 1000 mm (LS)

Construction details:



The length of the local insulation may be increased but not reduced.

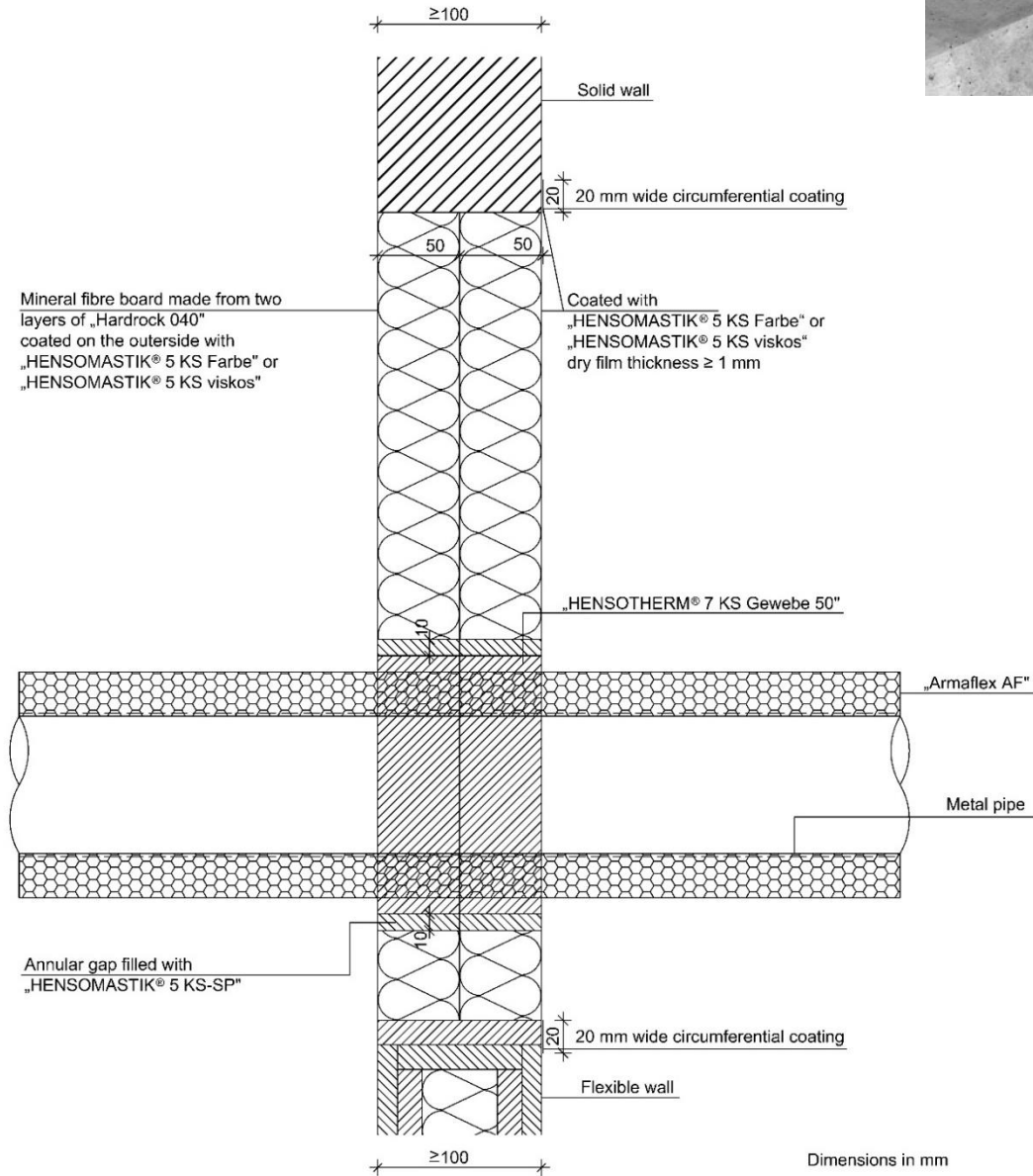
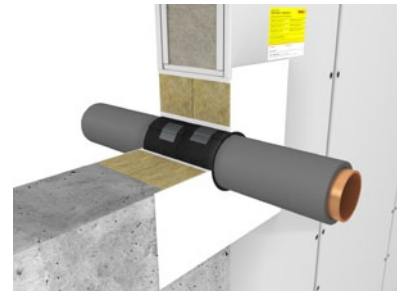
Dimensions in mm

#### A.1.12.1 Metal pipes with Armaflex Protect insulation

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Copper and steel | $\leq 22$        | 1.0-14.2               | 19-20                   | 1000 mm (LS)         | EI 90 U/C      |
|                  | $\leq 42$        | 1.5-14.2               | 25                      | 1000 mm (LS)         |                |
|                  | $\leq 76.1$      | 2.0-14.2               | 25                      | 1000 mm (LS)         |                |

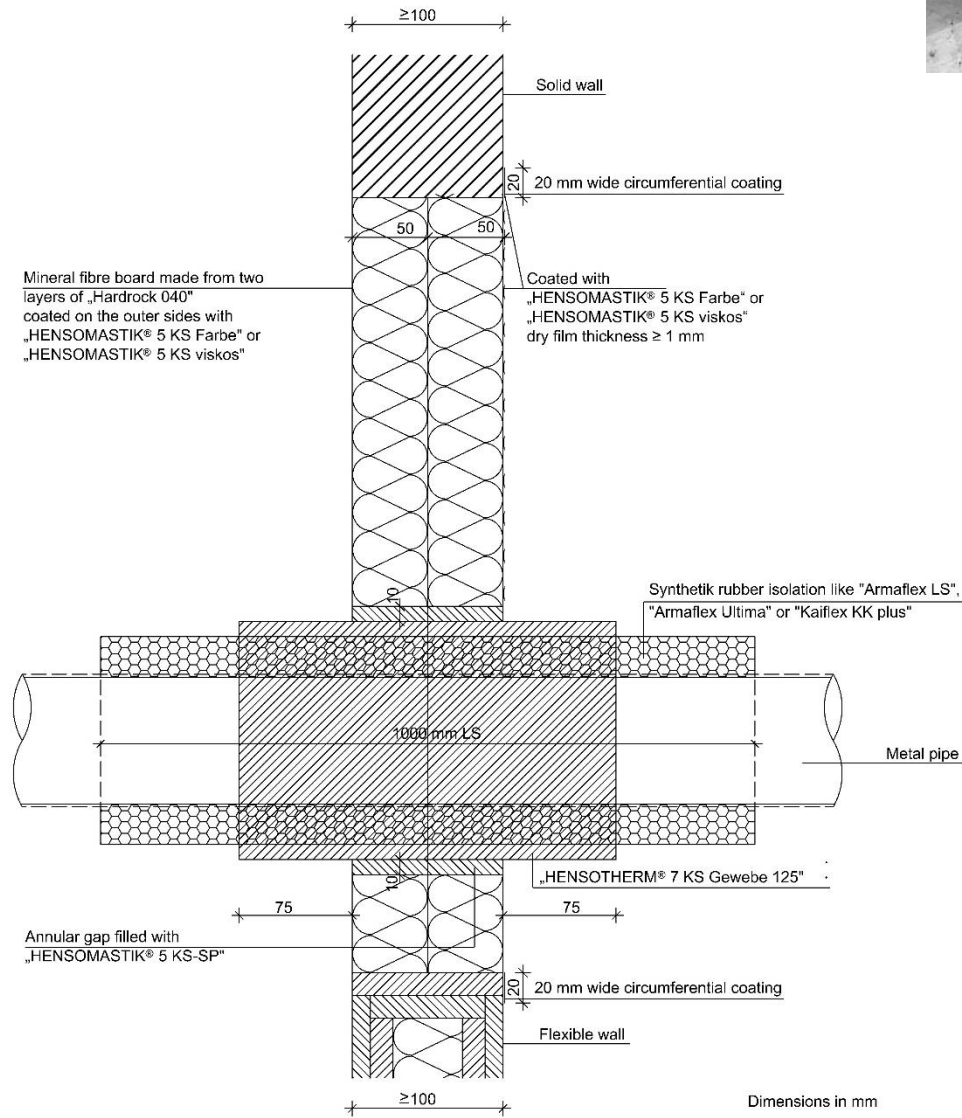
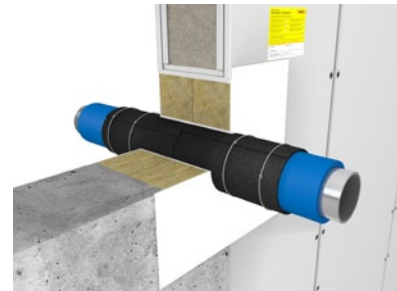
### A.1.13 Metal pipes with synthetic rubber insulation (CS)

Construction details:



### A.1.13 Metal pipes with synthetic rubber insulation (LS)

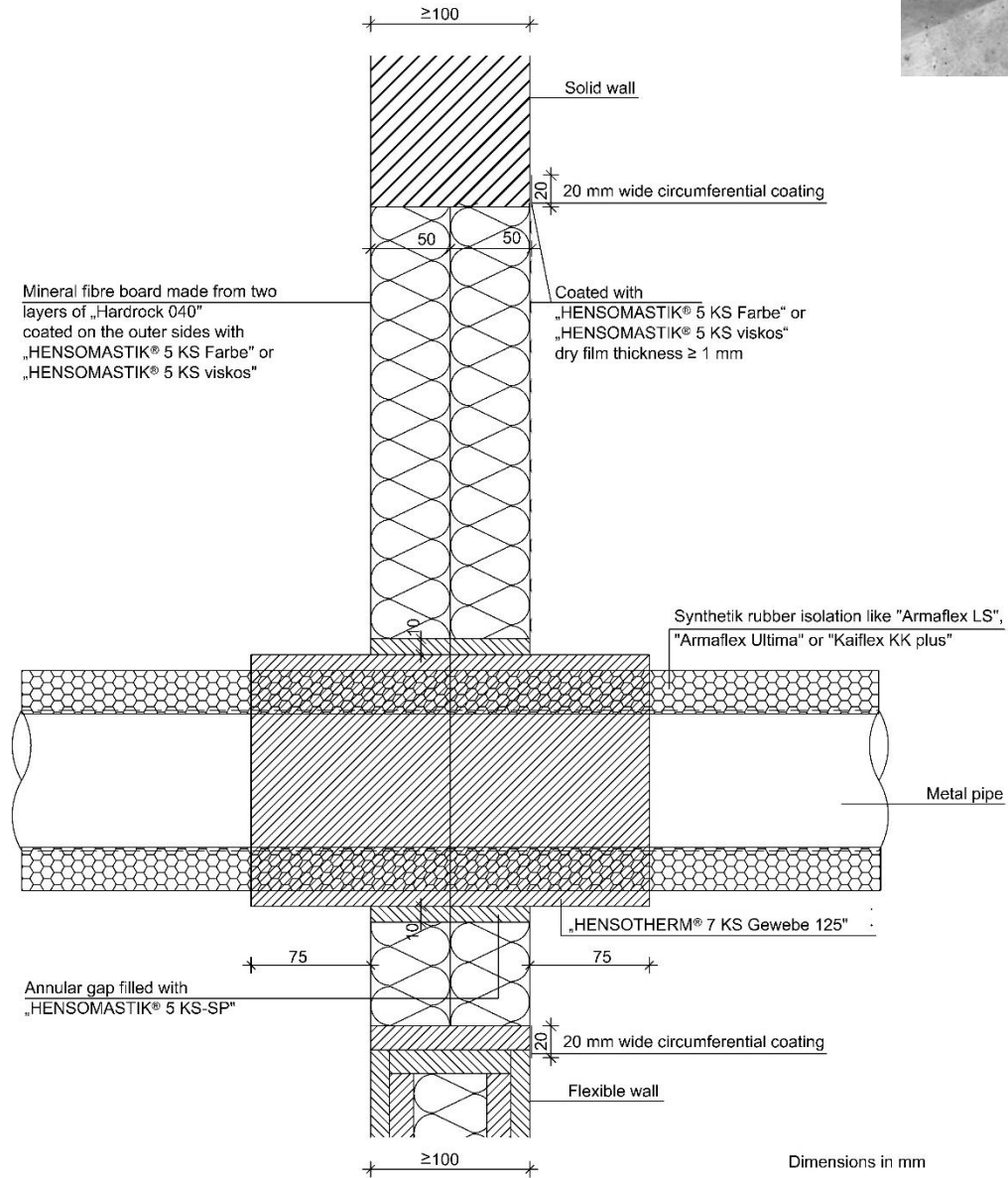
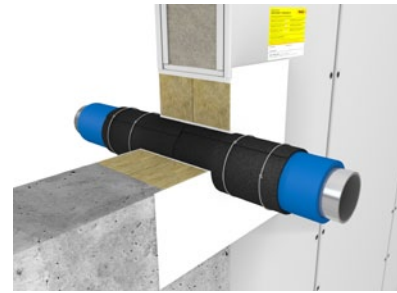
Construction details:



The length of the local insulation may be increased but not reduced.

### A.1.13 Metal pipes with synthetic rubber insulation (CS)

Construction details:



### A.1.13.1 Copper and steel pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|--------------------------------------|-------------------------|----------------------|----------------|
| Copper and steel | ≤15              | 1.0-14.2               | 1                                    | 11-36.5                 | (CS)                 | EI 90 C/U      |
|                  | >15 ≤42          | 1.0-14.2               | 2                                    | 13.5-36.5               | (CS)                 |                |
|                  | >42 ≤54          | 1.2-14.2               | 2                                    | 13.5-38                 | (CS)                 |                |
| Steel            | >54 ≤88.9        | 1.5-14.2               | 2                                    | 41.5                    | (CS)                 |                |
| Copper and steel | ≤15              | 1.0-14.2               | 1                                    | 11-36.5                 | (CS)                 | EI 120 C/U     |
|                  | >15 ≤42          | 1.0-14.2               | 2                                    | 11-13.5                 | (CS)                 |                |
|                  | 54               | 1.5-14.2               | 2                                    | 38.0                    | (CS)                 |                |

### A.1.13.2 Copper and steel pipes with Armaflex Ultima and HENSOTHERM® 7 KS Gewebe 125

| Pipes           | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 125 | Insulation thickness mm | Insulation length mm | Classification |
|-----------------|------------------|------------------------|---------------------------------------|-------------------------|----------------------|----------------|
| Copper or steel | ≤15              | 1.0-14.2               | 2                                     | 13-25                   | 1000 mm (LS)         | EI 120 U/C     |
|                 | ≤15              | 1.0-14.2               | 2                                     | 13-25                   | (CS)                 |                |
|                 | >15 ≤54          | 1.5-14.2               | 2                                     | 25                      | 1000 mm (LS)         | EI 90 U/C      |
|                 | >15 ≤54          | 1.5-14.2               | 2                                     | 25                      | (CS)                 |                |
| Steel           | >54 ≤88.9        | 3.2-14.2               | 2                                     | 25                      | 1000 mm (LS)         | EI 120 U/C     |
|                 | >54 ≤88.9        | 3.2- 14.2              | 2                                     | 25                      | (CS)                 | EI 90 U/C      |

### A.1.13.3 Copper and steel pipes with Armaflex LS and HENSOTHERM® 7 KS Gewebe 125

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 125 | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|---------------------------------------|-------------------------|----------------------|----------------|
| Copper and steel | ≤15              | 1.0-14.2               | 2                                     | 13-25                   | 1000 mm (LS)         | EI 120 U/C     |
|                  | >15 ≤54          | 1.5-14.2               | 2                                     | 25                      | 1000 mm (LS)         | EI 60 U/C      |
|                  | ≤15              | 1.0-14.2               | 2                                     | 13-25                   | (CS)                 | EI 120 U/C     |
|                  | >15 ≤54          | 1.5-14.2               | 2                                     | 25                      | (CS)                 |                |
| Steel            | >54 ≤88.9        | 3.2-14.2               | 2                                     | 25                      | 1000 mm (LS)         | EI 60 U/C      |
|                  | 88.9             | 3.2-14.2               | 2                                     | 25                      | 1000 mm (LS)         | EI 90 U/C      |
|                  | >54 ≤88.9        | 3.2-14.2               | 2                                     | 25                      | (CS)                 |                |

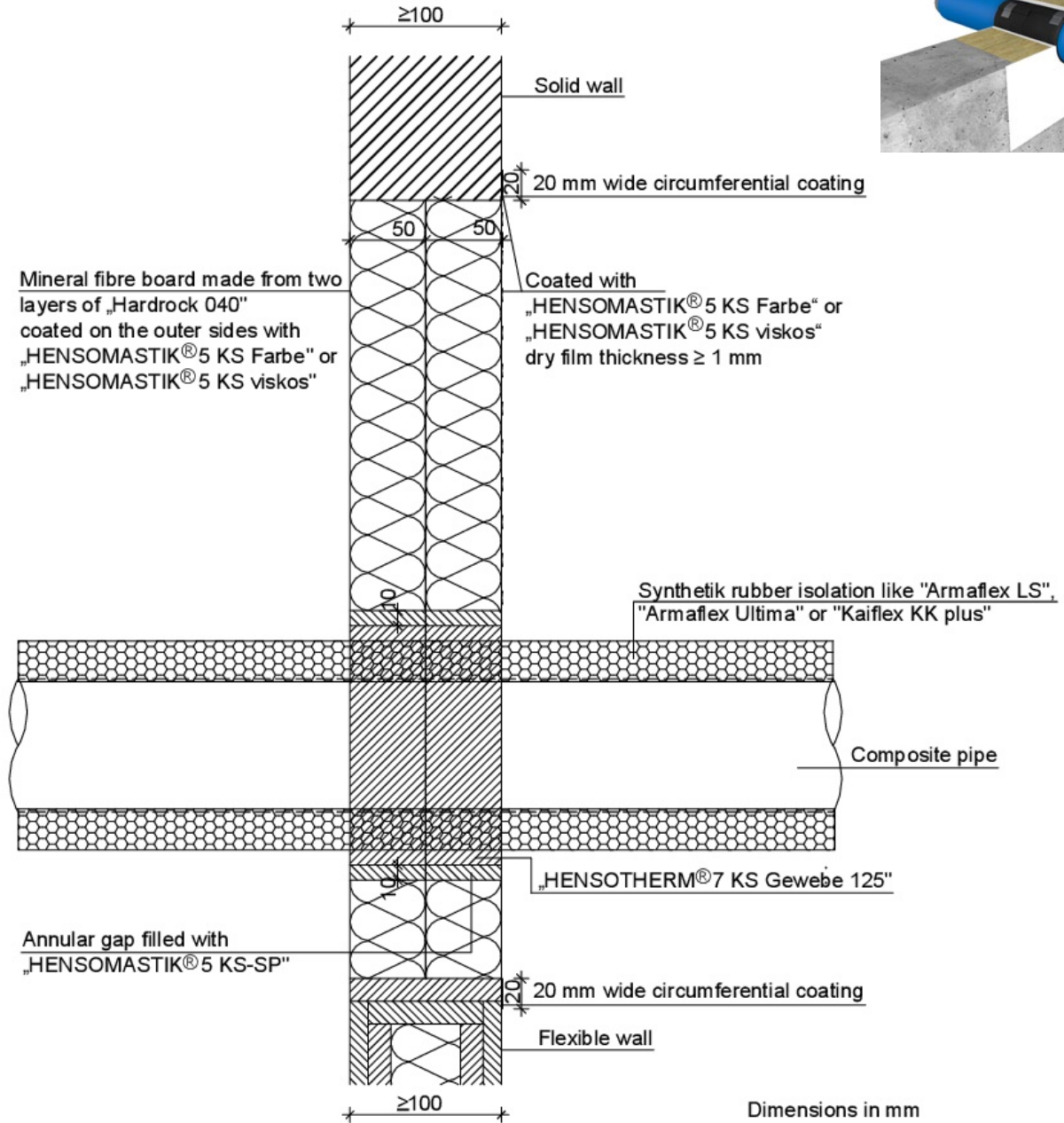
#### A.1.13.4 Copper and steel pipes with Kaiflex KK plus and HENSOTHERM® 7 KS Gewebe 125

| Pipes           | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 125 | Insulation thickness mm | Insulation length mm | Classification |
|-----------------|------------------|------------------------|---------------------------------------|-------------------------|----------------------|----------------|
| Copper or steel | 15               | 1.0-14.2               | 2                                     | 11                      | 1000 mm (LS)         | EI 60 U/C      |
|                 | 15               | 1.0-14.2               | 2                                     | 11                      | (CS)                 |                |
|                 | ≥15 ≤54          | 1.5-14.2               | 2                                     | 21                      | 1000 mm (LS)         | EI 45 U/C      |
|                 | ≥15 ≤54          | 1.5-14.2               | 2                                     | 21                      | (CS)                 |                |
| Steel           | >54 ≤88.9        | 3.2-14.2               | 2                                     | 28,5                    | 1000 mm (LS)         | EI 45 U/C      |
|                 | 88.9             | 3.2-14.2               | 2                                     | 28,5                    | 1000 mm (LS)         | EI 120 U/C     |
|                 | >54 ≤88.9        | 3.2-14.2               | 2                                     | 28,5                    | (CS)                 | EI 90 U/C      |
|                 | 88.9             | 3.2-14.2               | 2                                     | 28,5                    | (CS)                 | EI 120 U/C     |



### A.1.14 Composite pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

Construction details:



#### A.1.14.1 Geberit Mepla pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Insulation thickness mm | Insulation length mm | Classification |
|---------------|------------------|------------------------|--------------------------------------|-------------------------|----------------------|----------------|
| Geberit Mepla | 32               | 3.0                    | 1                                    | 9.0-36.5                | (CS)                 | EI90 U/C       |
|               | 40               | 3.5                    | 1                                    | 13.5-36.5               | (CS)                 |                |
|               | 50               | 4.0                    | 1                                    | 13.5-36.5               | (CS)                 |                |
|               | 63               | 4.5                    | 1                                    | 13.5-36.5               | (CS)                 |                |
|               | 75               | 5.0                    | 2                                    | 14-40.5                 | (CS)                 |                |
|               | 32               | 3.0                    | 1                                    | 9.0-13.5                | (CS)                 | EI 120 U/C     |
|               | 40               | 3.5                    | 1                                    | 9.0-13.5                | (CS)                 |                |

#### A.1.14.2 KE KELIT KELOX pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

| Pipes          | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Insulation thickness mm | Insulation length mm | Classification |
|----------------|------------------|------------------------|--------------------------------------|-------------------------|----------------------|----------------|
| KE KELIT KELOX | 16               | 2.0                    | 1                                    | 13.0-36.5               | (CS)                 | EI 120 U/C     |
|                | 20               | 2.25                   | 1                                    | 13.5-36.5               | (CS)                 |                |
|                | 25               | 2.5                    | 1                                    | 13.5-36.5               | (CS)                 |                |
|                | 32               | 3.0                    | 1                                    | 13.5-36.5               | (CS)                 |                |
|                | 40               | 4.0                    | 1                                    | 13.5-36.5               | (CS)                 |                |
|                | 50               | 4.5                    | 2                                    | 14.0-40.5               | (CS)                 |                |
|                | 63               | 6.0                    | 2                                    | 14.0-40.5               | (CS)                 |                |

## A.2 Rigid floor constructions acc. to 1.2.1 with floor thickness of minimum 150 mm

### A.2.1.1 Service Types

| Services   | Types   |
|--|---|
| Cables   | <ul style="list-style-type: none"> <li>• Sheathed electrical cables up to 80 mm diameter</li> <li>• Telecom cables up to 21 mm diameter</li> </ul>  |
| Cable bundles  | <ul style="list-style-type: none"> <li>• Bundles of the above up to 100 mm in diameter</li> </ul>   |
| Cable Supports   | <ul style="list-style-type: none"> <li>• Perforated and unperforated steel cable trays and ladders</li> </ul>   |
| Plastic pipes with AWM II pipe collars                           | <ul style="list-style-type: none"> <li>• PE pipes in accordance with EN 1519-1, EN 12666-1, EN12201-2</li> <li>• Friaphon (by FRIATEC) pipes</li> <li>• PVC-U pipes in accordance with EN 1329-1, EN 1453-1, EN 1452-1</li> <li>• PP pipes in accordance with EN 1451-1</li> </ul>  |
| Plastic pipes with RORCOL V30/V60 pipe collars                   | <ul style="list-style-type: none"> <li>• PE pipes in accordance with EN 1519-1, EN 12666-1, EN12201-2, 1451-1</li> <li>• PVC-U pipes in accordance with EN 1329-1, EN 1453-1 and EN 1452-1</li> <li>• PP pipes in accordance with EN 1451-1</li> <li>• PP R pipes in accordance with EN ISO 15874-2</li> <li>• PP H pipes in accordance with EN ISO 15494</li> <li>• Raupiano Plus pipes</li> <li>• POLO-KAL 3S pipes</li> <li>• POLO-KAL NG pipes</li> <li>• FRIAPHON pipes</li> <li>• RAUTITAN pipes</li> </ul> |
| Metal, composite and plastic pipes with RORCOL AV60 pipe collars | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• FX flexible tubes with EN 61386-22</li> <li>• Geberit Mepla</li> <li>• HENCO multiple-layer</li> <li>• K06 KELIT</li> <li>• RAUTITAN stabil</li> <li>• FRIATHERM multi-press</li> <li>• JRG Sanipex MT</li> <li>• TECEflex</li> </ul>  |
| Plastic pipes with HENSOTHERM® 7 KS Gewebe 50                    | <ul style="list-style-type: none"> <li>• PE pipes in accordance with EN 1519-1, EN 12666-1, EN12201-2</li> <li>• PVC-U pipes in accordance with EN 1329-1, EN 1453-1, EN 1452-1</li> <li>• PP pipes in accordance with EN 1451-1</li> </ul>   |
| Metal pipes with Rockwool RS800 (LI) insulation                  | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul>   |
| Metal pipes with Rockwool RS800 (LS) insulation                  | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul>   |
| Metal pipes with Armaflex AF (LS) insulation                     | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul>   |
| Metal pipes with Armaflex Protect (LS) insulation                | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul>   |
| Metal pipes with synthetic rubber insulation                     | <ul style="list-style-type: none"> <li>• Copper</li> <li>• Mild &amp; stainless steel</li> <li>• Cast Iron</li> </ul>   |

### A.2.1.2 Permitted Distances

Maximum seal size: 2000 mm x 1200 mm

a1: between cable/cable trays and metal pipes  $\geq 50$  mm

a2: between cable/cable trays and plastic pipes  $\geq 50$  mm

a3: between metal pipes and plastic pipes  $\geq 25$  mm

a4: between plastic pipes  $\geq 40$  mm

a5: between metal pipes  $\geq 40$  mm

a6: between cable trays  $\geq 30$  mm

b1: between cable/cable trays and the upper seal edge:  $\geq 25$  mm

b2: between cable/cable trays and the side seal edge:  $\geq 25$  mm

b3: between cable/cable trays and the lower seal edge:  $\geq 0$  mm

b4: between metal pipes and the side seal edge:  $\geq 30$  mm

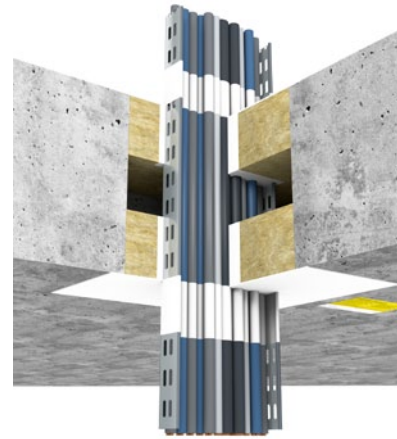
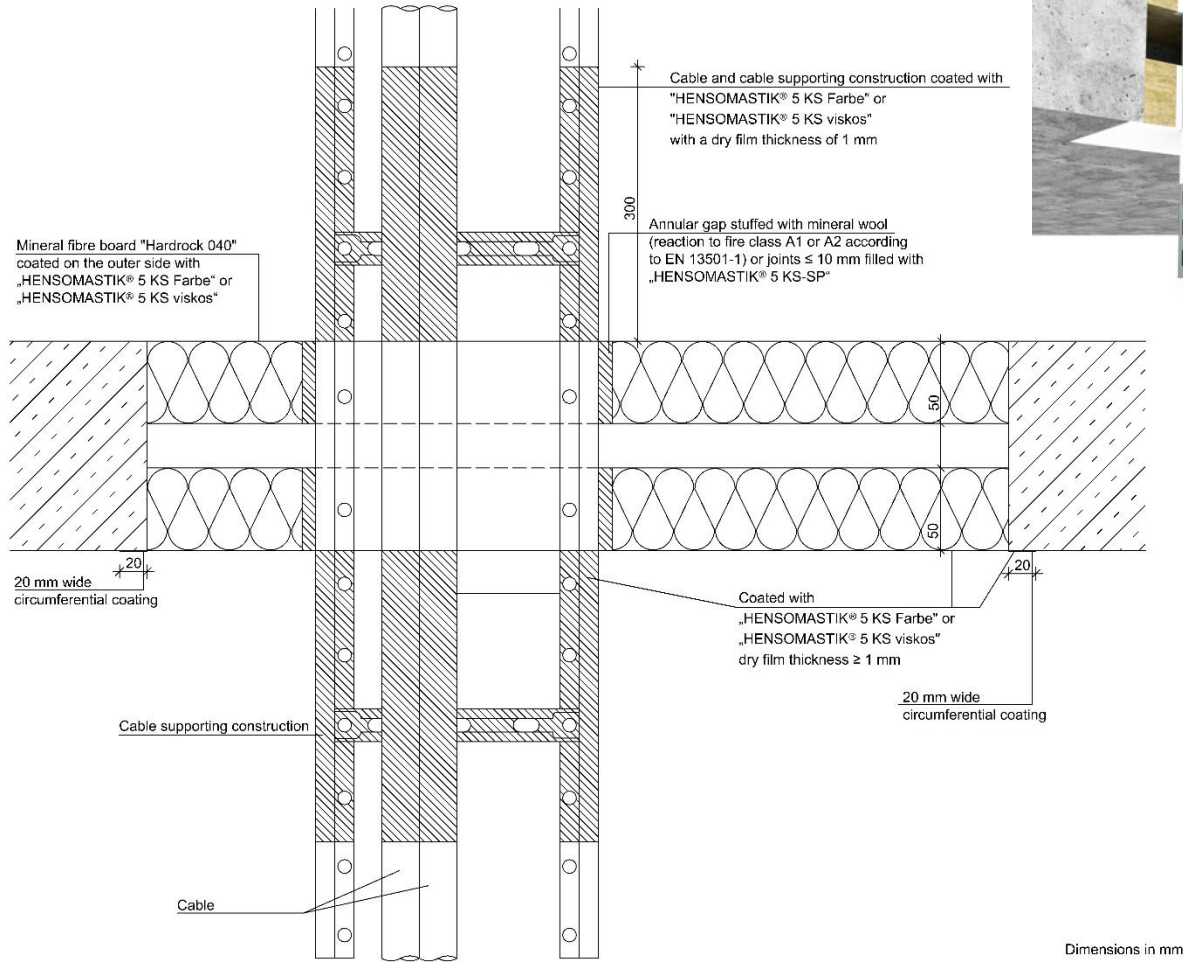
b5: between plastic pipes and the side seal edge:  $\geq 30$  mm

Distance 1<sup>st</sup> support pipe service  $\leq 450$  mm

Distance 1<sup>st</sup> support cable/cable trays  $\leq 240$  mm

## A.2.2 Cables and trays

Construction details:

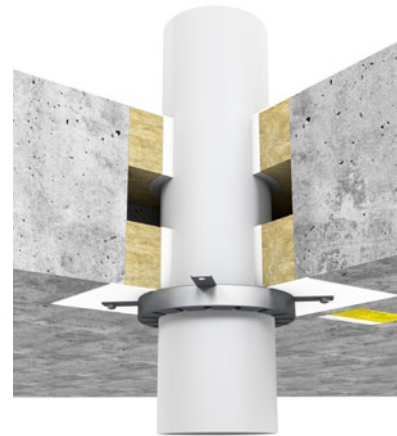
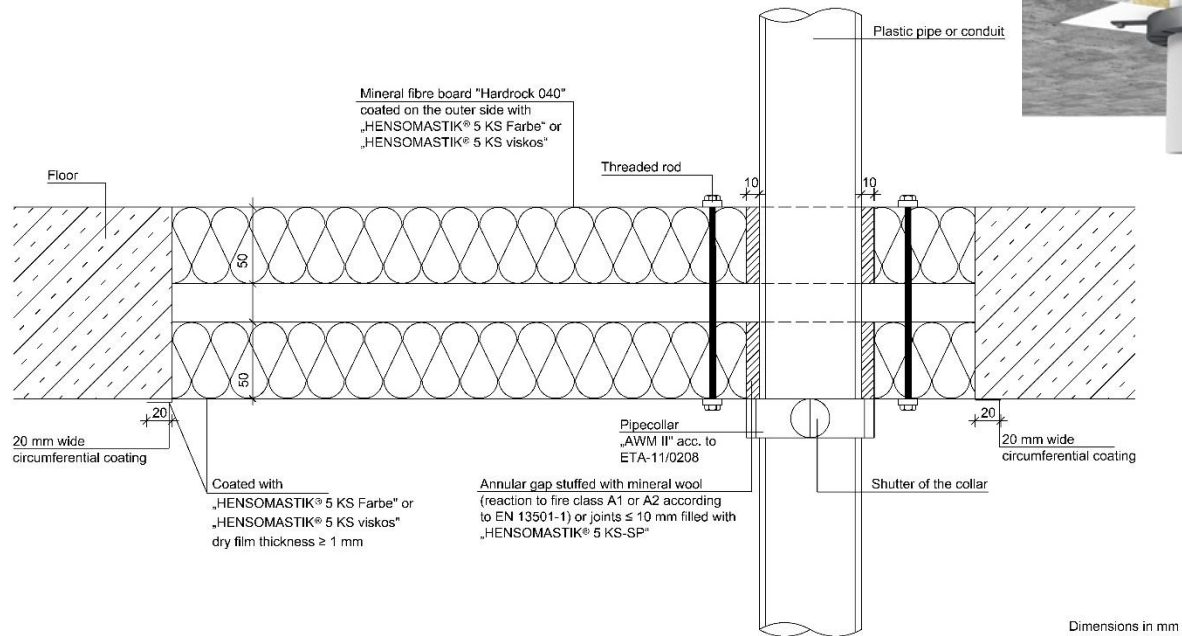


### A.2.2.1 Cables with HENSOMASTIK® 5 KS Farbe

| Services  | Insulation/Coating  | Classification |
|---|---|----------------|
| Sheathed electrical cables up to 21 mm diameter | 1 mm DFT HENSOMASTIK® 5 KS Farbe coating extending 300 mm from both faces of the seal | EI 90          |
| Telecoms cables up to 21 mm diameter            |   |                |
| Bundles of above cables up to 100 mm diameter   |   |                |
| Cable supports                                  |   |                |

### A.2.3 Plastic pipes and conduits with AWM II pipe collars

Construction details:



#### A.2.3.1 Friaphon pipes with AWM II pipe collars

| Pipes    | Pipe diameter mm | Pipe wall thickness mm | Classification |
|----------|------------------|------------------------|----------------|
| Friaphon | 52               | 2.8                    | EI 90 U/U      |
|          | 78               | 4.9                    |                |
|          | 110              | 5.3                    |                |
|          | 135              | 5.6                    |                |

#### A.2.3.2 PVC-U pipes with AWM II pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Classification |
|-------|------------------|------------------------|----------------|
| PVC-U | ≥32 ≤50          | 1.8-5.6                | EI 120 U/U     |
|       | ≥63 ≤110         | 1.8-12.3               |                |
|       | ≥140 ≤160        | 3.2                    | EI 90 U/U      |
|       | ≥140 ≤160        | 11.8                   | EI 60 U/U      |

#### A.2.3.3 PE-HD pipes with AWM II pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Classification |
|-------|------------------|------------------------|----------------|
| PE-HD | ≥32 ≤50          | 1.8-4.6                | EI 120 U/U     |
|       | ≥63 ≤110         | 2.7-10.0               |                |
|       | 125              | 3.1-11.4               |                |
|       | ≥140 ≤160        | 4.0-14.6               |                |

#### A.2.3.4 PP-HT pipes with AWM II pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Classification |
|-------|------------------|------------------------|----------------|
| PP-HT | ≥32 ≤50          | 1.8-4.6                | EI 120 U/U     |
|       | ≥63 ≤110         | 2.7-10.0               |                |

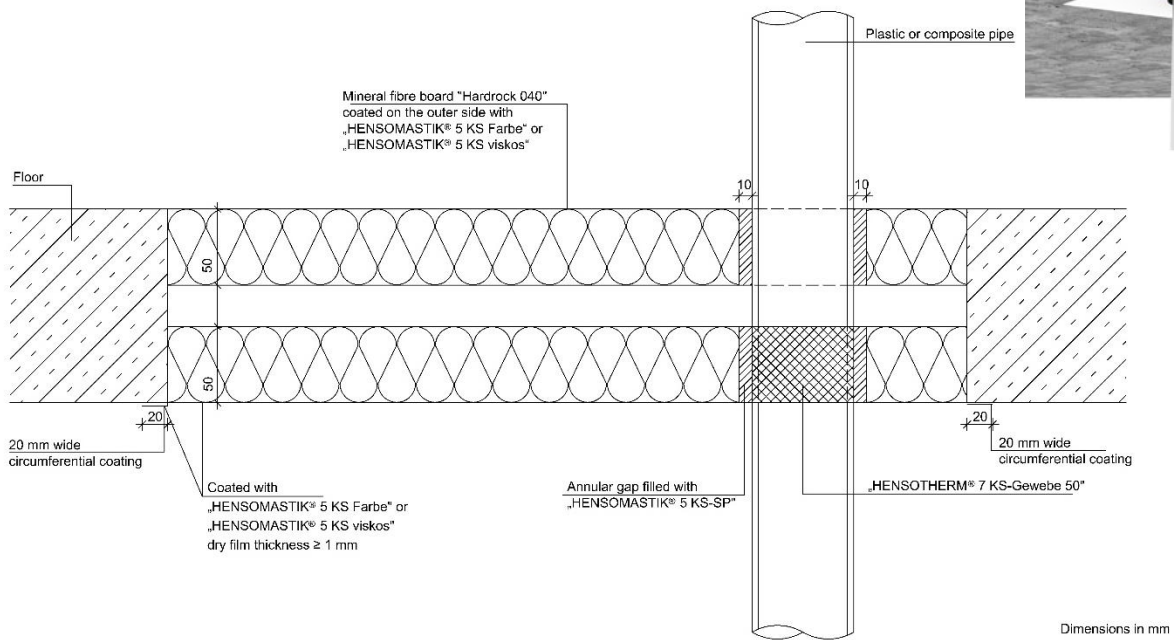
#### A.2.3.5 Polyolefin conduits with AWM II collars

| Services  | Pipe diameter mm | Cables*           | Classification |
|---|------------------|-------------------|----------------|
| Polyolefin conduits bundled to fill a 125 mm Ø collar | 16               | None              | EI 120 U/C     |
|   | 20               | None              |                |
|   | 25               | None              |                |
|   | 32               | None              |                |
|   | 40               | None              |                |
|   | 50               | None              |                |
|   | 63               | None              |                |
|   | 16               | 1x JY(ST) 2x2x0.6 |                |
|   | 20               | 1x A2             |                |
|   | 25               | 1x A1             |                |
|   | 32               | 1x F              |                |
|   | 40               | 2x A1             |                |
|   | 50               | 2x A1, 2x F       |                |
|   | 63               | 4x A1, 3x F       |                |

\* Cables as designated in EN 1366-3: 2009

## A.2.4 Plastic and composite pipes with HENSOTHERM® 7 KS Gewebe 50

Construction details:



### A.2.4.1 PVC-U pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes     | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-----------|--------------------------|------------------------|--------------------------------------|----------------|
| PVC-U     | $\leq 50$                | 2.4-3.7                | 2                                    | EI 90 U/U      |
|           | $> 50 \leq 75$           | 3.6-5.6                | 3                                    |                |
|           | $> 75 \leq 90$           | 4.3-6.7                | 4                                    |                |
|           | $\leq 50$                | 3.7                    | 2                                    | EI 120 U/U     |
| $\leq 75$ | 3.6                      | 3                      |                                      |                |

### A.2.4.2 PE-HD pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PE-HD | $\leq 50$                | 3.0                    | 2                                    | EI 90 U/U      |
|       | $> 50 \leq 56$           | 3.0                    | 2                                    |                |
|       | $> 56 \leq 75$           | 3.0                    | 3                                    |                |
|       | $> 75 \leq 90$           | 3.5                    | 4                                    |                |
|       | 90                       | 3.5                    | 4                                    | EI 120 U/U     |



#### A.2.4.3 PP-HT pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PP-HT | ≤50                      | 1.8                    | 2                                    | EI 60 U/U      |
|       | >50 ≤75                  | 1.8-1.9                | 3                                    | EI 90 U/U      |
|       | >75 ≤90                  | 1.9-2.2                | 4                                    |                |

#### A.2.4.4 Geberit Silent-PP pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes             | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------------|--------------------------|------------------------|--------------------------------------|----------------|
| Geberit Silent-PP | ≤50                      | 1.8                    | 2                                    | EI 90 U/U      |
|                   | >50 ≤75                  | 2.6                    | 3                                    |                |
|                   | >75 ≤90                  | 2.6-2.9                | 4                                    |                |
|                   | 75                       | 2.6                    | 3                                    | EI 120 U/U     |

#### A.2.4.5 Geberit Silent-db20 pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes               | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|---------------------|--------------------------|------------------------|--------------------------------------|----------------|
| Geberit Silent-db20 | ≤56                      | 3.2                    | 2                                    | EI 120 U/U     |
|                     | >56 ≤75                  | 3.6                    | 3                                    | EI 90 U/U      |
|                     | >75 ≤90                  | 5.5                    | 4                                    |                |
|                     | 90                       | 5.5                    | 4                                    | EI 120 U/U     |

#### A.2.4.6 POLO-KAL NG pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes       | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------|--------------------------|------------------------|--------------------------------------|----------------|
| POLO-KAL NG | ≤50                      | 2.0                    | 2                                    | EI 90 U/U      |
|             | >50 ≤75                  | 2.6                    | 3                                    | EI 120 U/U     |
|             | >75 ≤90                  | 3.0                    | 4                                    |                |

#### A.2.4.7 Flex-Schlauch with/without cables with HENSOTHERM® 7 KS Gewebe 50

| Services      | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|---------------|--------------------------|------------------------|--------------------------------------|----------------|
| Flex-Schlauch | 25                       | 2.0                    | 2                                    | EI 120 C/C     |
|               | 32                       | 2.0                    | 2                                    |                |

#### A.2.4.8 Geberit Mepla pipes with HENSOTHERM® 7 KS Gewebe 50

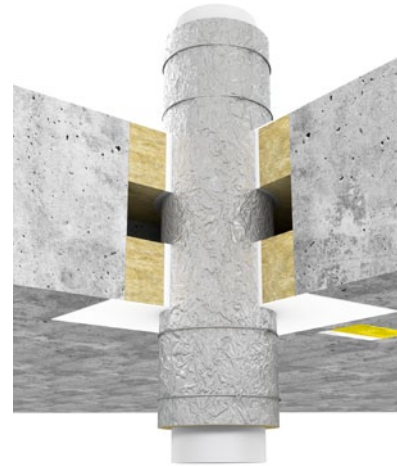
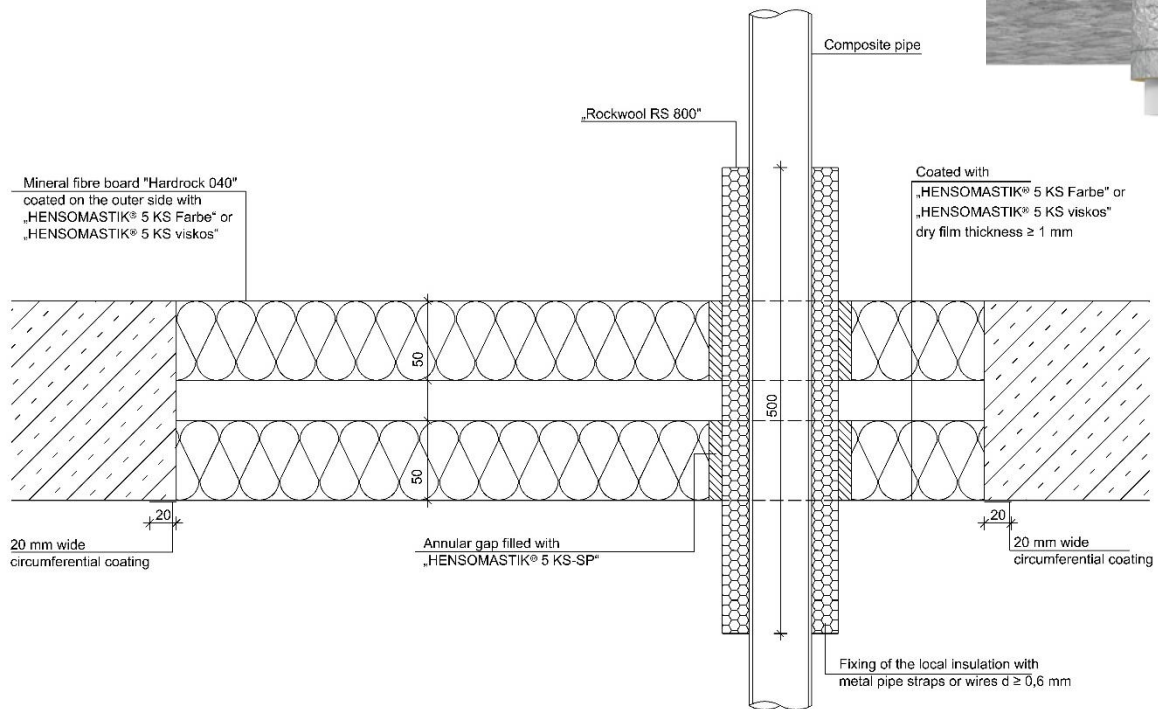
| Pipes         | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|---------------|--------------------------|------------------------|--------------------------------------|----------------|
| Geberit Mepla | ≤32                      | 3.0                    | 3                                    | EI 120 U/U     |
|               | >32 ≤63                  | 4.5                    | 4                                    |                |

#### A.2.4.9 POLO-KAL 3S pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes       | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------|--------------------------|------------------------|--------------------------------------|----------------|
| POLO-KAL 3S | 75                       | 3.8                    | 3                                    | EI 120 U/U     |
|             | 90                       | 4.5                    | 4                                    |                |

## A.2.5 Composite pipes with Rockwool RS 800 insulation (LS)

Construction details:



The length of the local insulation may be increased but not reduced.  
The density of the insulation may be increased but not reduced.

Dimensions in mm

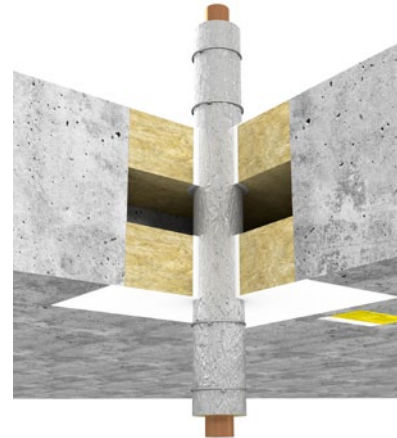
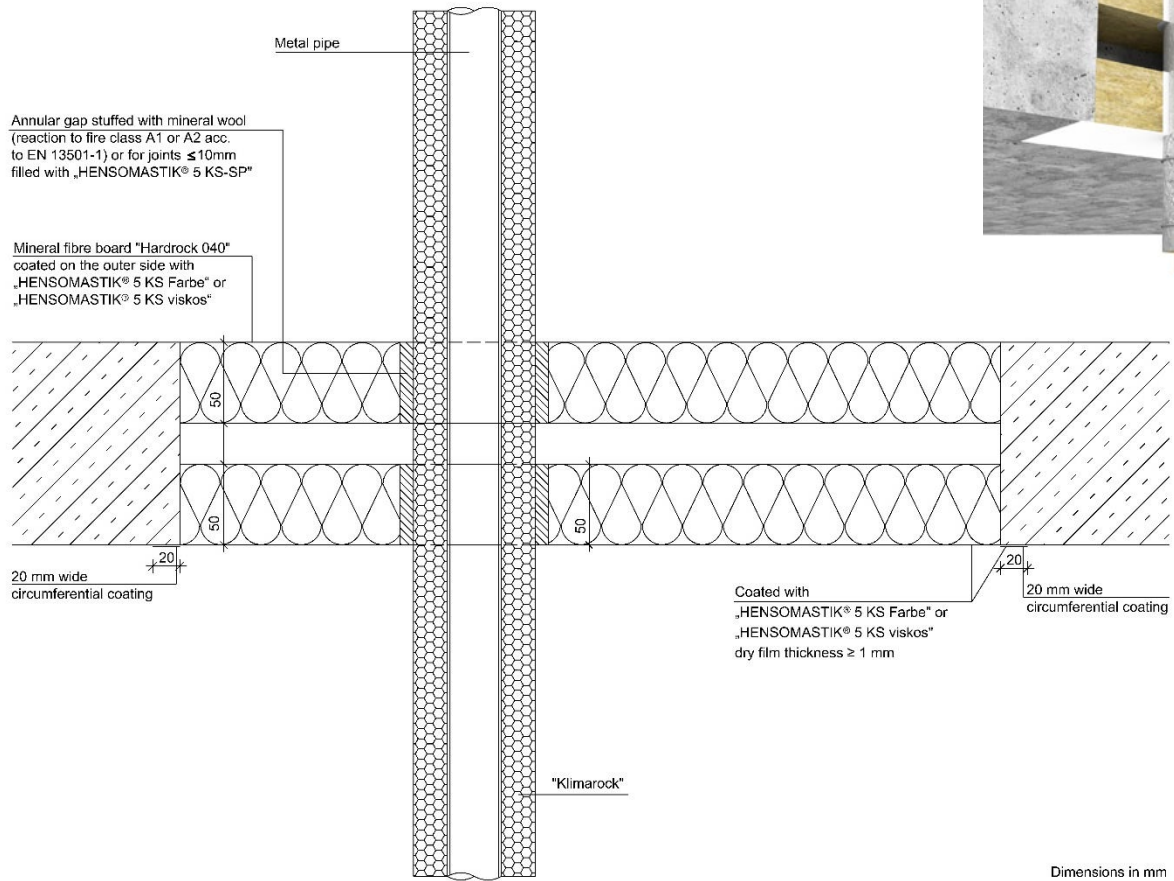
### A.2.5.1 Geberit Mepla pipes with Rockwool RS 800 insulation 500 mm (LS)

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|---------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Geberit Mepla | 32               | 3.0                    | 20-80                   | 500 mm (LS)          | EI 120 U/C     |
|               | 40               | 3.5                    | 20-80                   | 500 mm (LS)          |                |
|               | 50               | 4.0                    | 20-80                   | 500 mm (LS)          |                |
|               | 63               | 4.5                    | 20-80                   | 500 mm (LS)          |                |
|               | 75               | 5.0                    | 30-80                   | 500 mm (LS)          |                |



### A.2.7 Metal pipes with Klimarock insulation (CS)

Construction details:

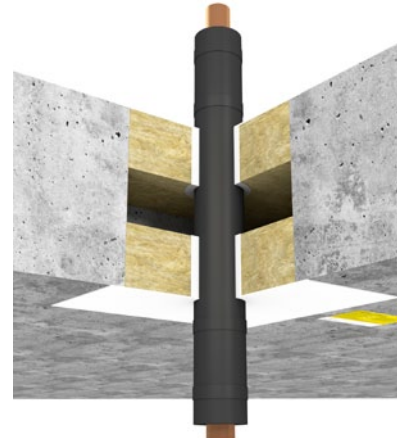
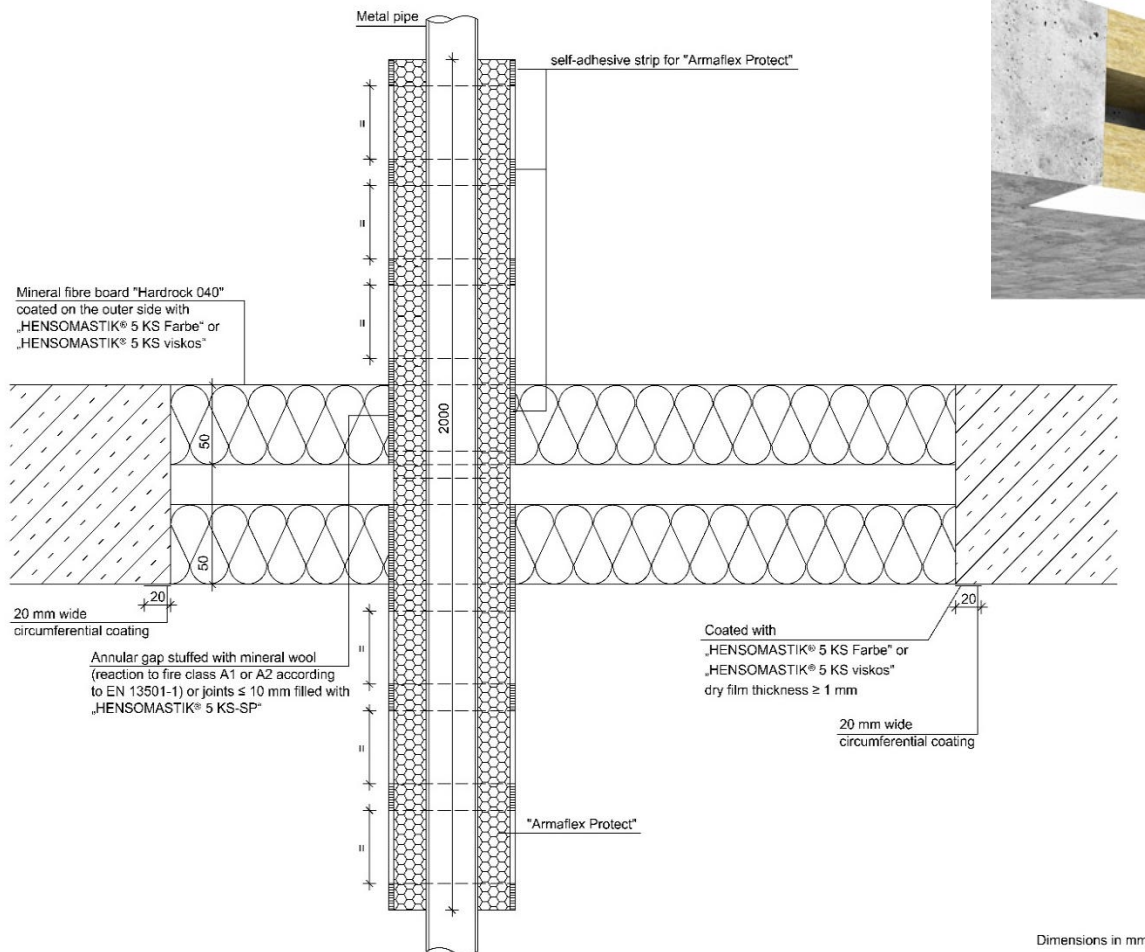


#### A.2.7.1 Copper and steel pipes with Klimarock insulation

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Copper and steel | ≤15              | 1.0-14.2               | 20                      | (CS)                 | EI 120 U/C     |
|                  | >15 ≤54          | 1.5-14.2               | 20                      | (CS)                 |                |
| Steel            | > 54 ≤88.9       | 3.2-14.2               | 30                      | (CS)                 | EI 90 U/C      |

## A.2.8 Metal pipes with Armaflex Protect insulation (LS)

Construction details:



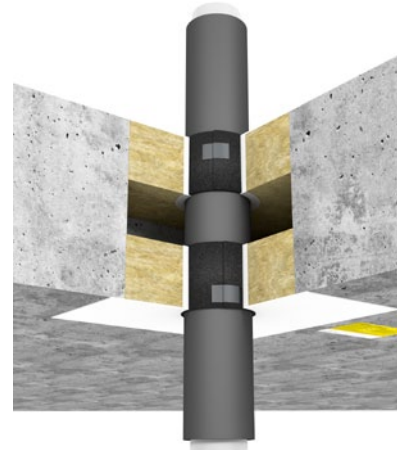
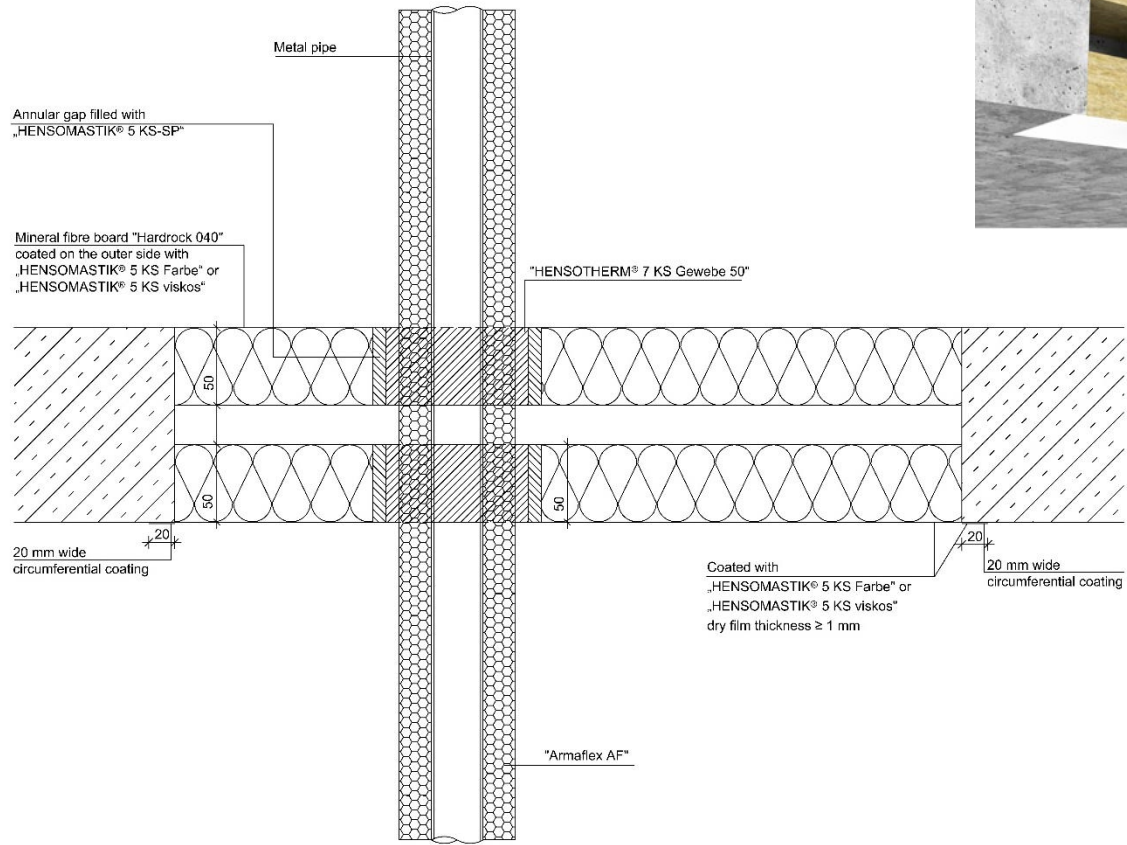
The length of the local insulation may be increased but not reduced.

### A.2.8.1 Steel or cast iron pipes with Armaflex Protect (LS) insulation, 2000 mm long

| Pipes                      | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|----------------------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Copper, steel or cast iron | ≤15              | 1.0-11.0               | 19                      | 2000 mm (LS)         | EI 120 U/C     |
|                            | >15 ≤22          | 1.0-11.0               | 20                      | 2000 mm (LS)         |                |
|                            | >22 ≤42          | 1.5-14.2               | 25                      | 2000 mm (LS)         |                |
|                            | >42 ≤76.1        | 2.0-14.2               | 25                      | 2000 mm (LS)         |                |

### A.2.9 Metal pipes with synthetic rubber insulation (CS)

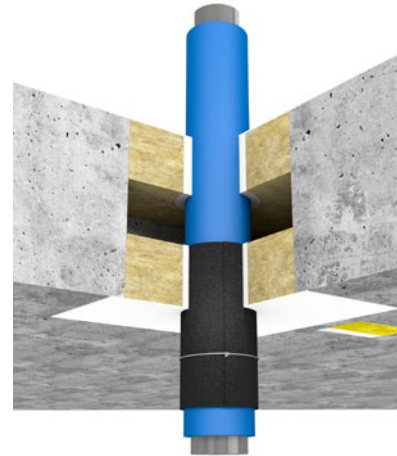
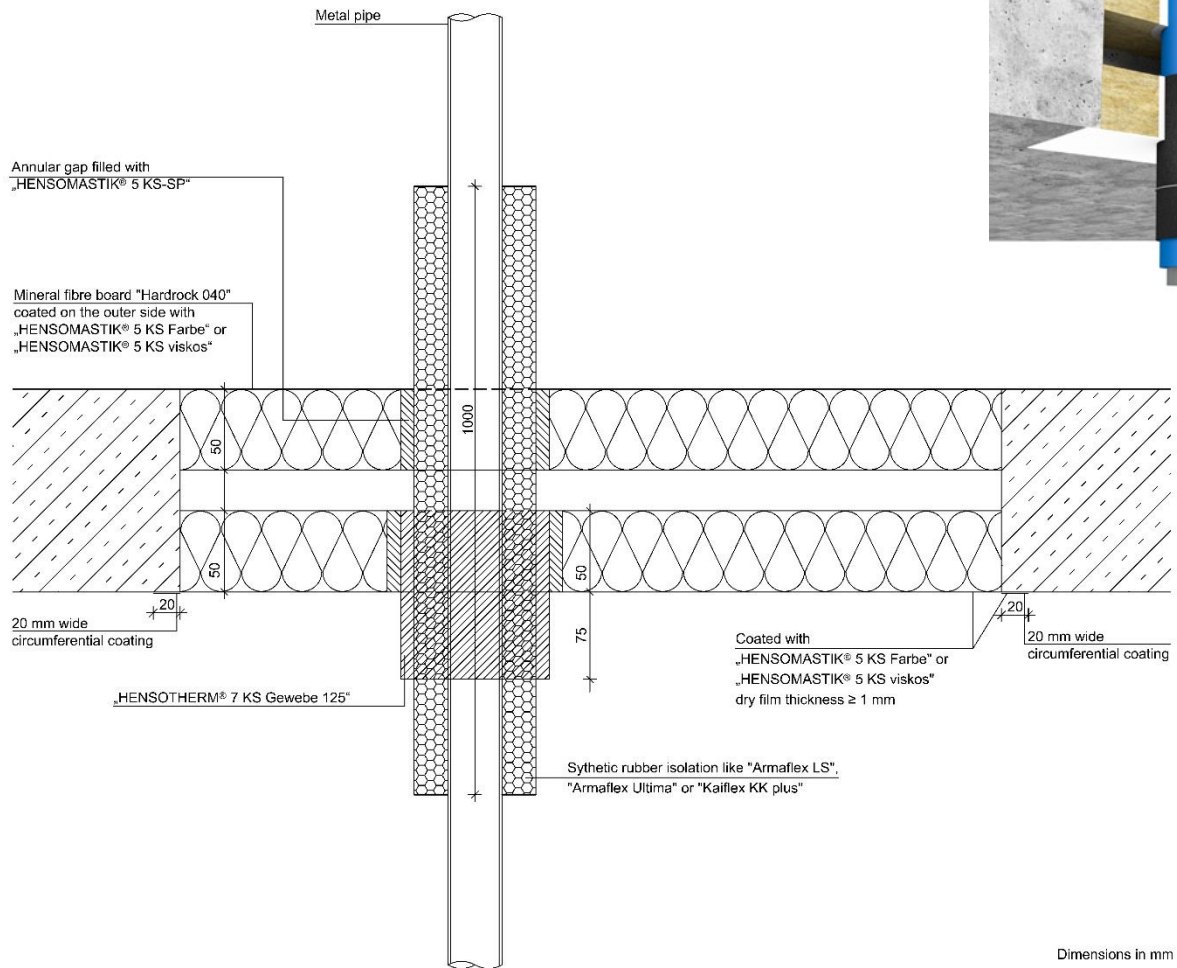
Construction details:



Dimensions in mm

## A.2.9 Metal pipes with synthetic rubber insulation (LS)

Construction details:

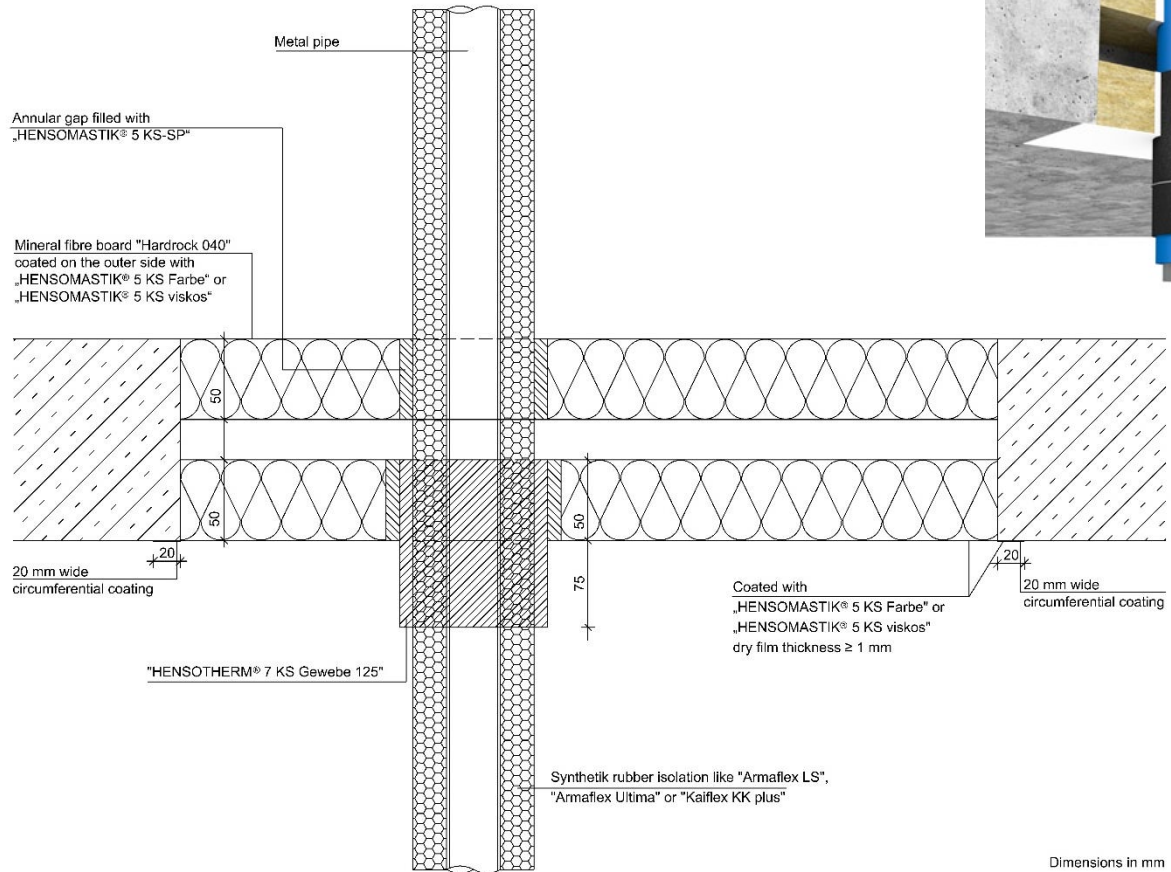


The length of the local insulation may be increased but not reduced.



## A.2.9 Metal pipes with synthetic rubber insulation (CS) / (LS)

Construction details:



### A.2.9.1 Copper and steel pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|--------------------------------------|-------------------------|----------------------|----------------|
| Copper and steel | $\leq 15$        | 1.0-14.2               | 1                                    | 11                      | (CS)                 | EI 120 C/U     |
|                  | $>15 \leq 42$    | 1.0-14.2               | 2                                    | 13.5-36.5               | (CS)                 |                |
|                  | $>42 \leq 54$    | 1.2-14.2               | 2                                    | 13.5-38                 | (CS)                 |                |
| Steel            | $>54 < 88.9$     | 3.2-14.2               | 2                                    | 14.5-41.5               | (CS)                 | EI 90 C/U      |
|                  | 88.9             | 3.2-14.2               | 2                                    | 41.5                    | (CS)                 | EI 120 C/U     |

### A.2.9.2 Copper and steel pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 125

| Pipes               | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 125 | Insulation thickness mm | Insulation length mm | Classification |
|---------------------|------------------|------------------------|---------------------------------------|-------------------------|----------------------|----------------|
| Steel and cast iron | ≤10              | 1.0-5.0                | 2                                     | 11                      | 1000 mm (LS)         | EI 120 C/U     |
|                     | ≤22              | 1.0-11                 | 2                                     | 18                      | 1000 mm (LS)         |                |
|                     | ≤54              | 1.5-14.2               | 2                                     | 28.5                    | 1000 mm (LS)         | EI 90 C/U      |
|                     | ≤60.3            | 2.9-14.2               | 2                                     | 29                      | 1000 mm (LS)         | EI 120 C/U     |
|                     | ≤88.9            | 3.2-14.2               | 2                                     | 30.5                    | 1000 mm (LS)         | EI 90 C/U      |
| Copper              | ≤10              | 1.0-5.0                | 2                                     | 12.5                    | 1000 mm (LS)         | EI 120 C/U     |
|                     | ≤22              | 1.0-11                 | 2                                     | 18                      | 1000 mm (LS)         |                |
|                     | ≤54              | 1.5-14.2               | 2                                     | 28.5                    | 1000 mm (LS)         | EI 90 C/U      |

### A.2.9.3 Copper and steel pipes with Armaflex Ultima and HENSOTHERM® 7 KS Gewebe 125

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 125 | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|---------------------------------------|-------------------------|----------------------|----------------|
| Copper and steel | ≤15              | 1.0-14.2               | 2                                     | 13                      | 1000 mm (LS)         | EI 120 U/C     |
|                  | >15 ≤54          | 1.5-14.2               | 2                                     | 25                      | 1000 mm (LS)         |                |
|                  | ≤15              | 1.0-14.2               | 2                                     | 13                      | (CS)                 | EI 90 U/C      |
|                  | >15 ≤54          | 1.5-14.2               | 2                                     | 25                      | (CS)                 |                |
| Steel            | 54               | 1.5-14.2               | 2                                     | 25                      | (CS)                 | EI 120 U/C     |
|                  | >54 ≤88.9        | 3.2-14.2               | 2                                     | 25                      | 1000 mm (LS)         |                |
|                  | >54 ≤88.9        | 3.2-14.2               | 2                                     | 25                      | (CS)                 |                |

### A.2.9.4 Copper and steel pipes with Armaflex LS and HENSOTHERM® 7 KS Gewebe 125

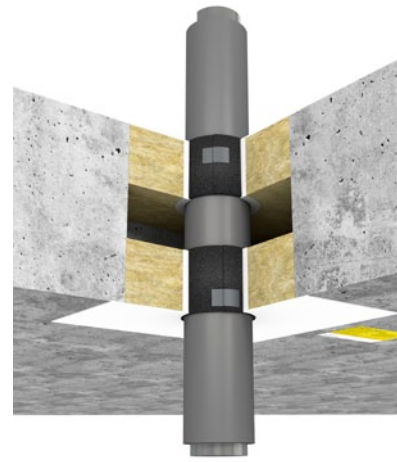
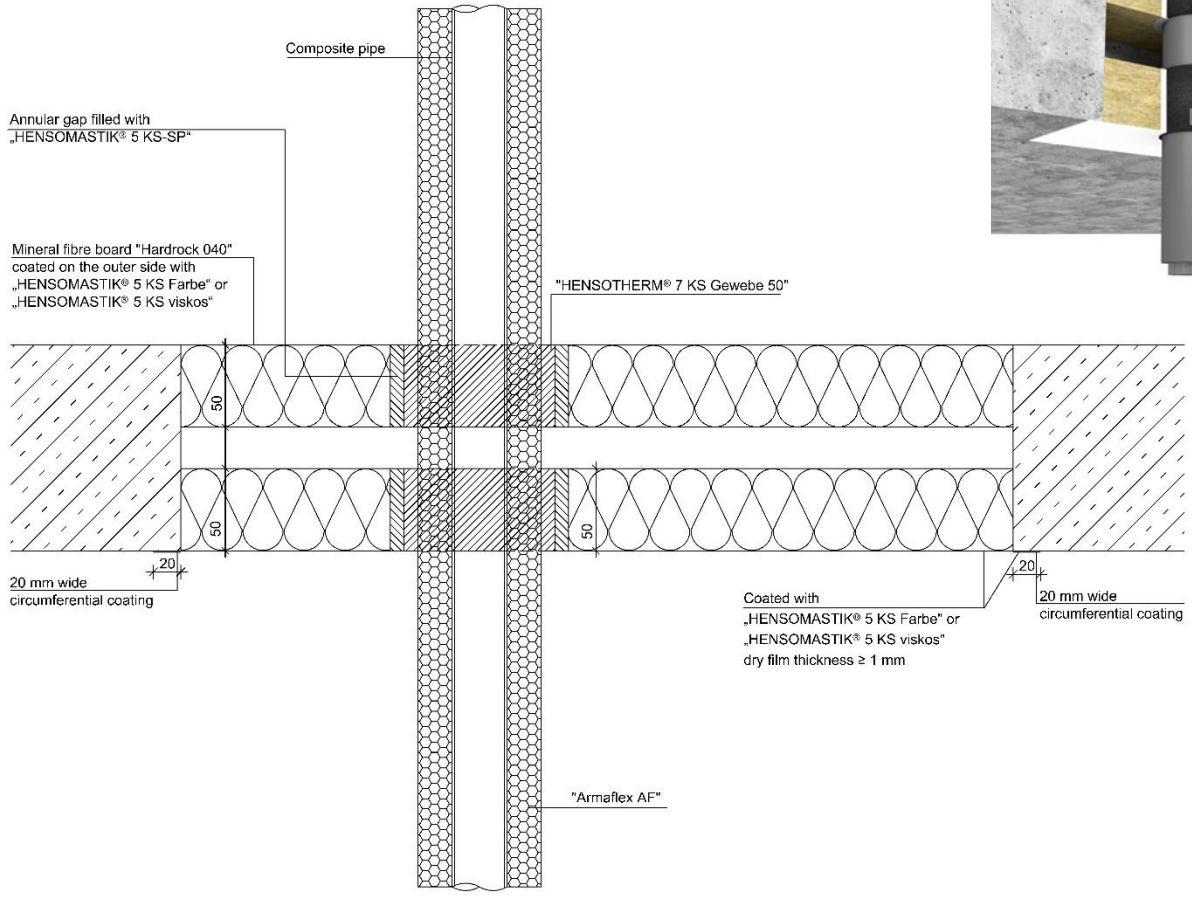
| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 125 | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|---------------------------------------|-------------------------|----------------------|----------------|
| Copper and steel | ≤15              | 1.0-14.2               | 2                                     | 13                      | 1000 mm (LS)         | EI 90 U/C      |
|                  | ≥15 ≤54          | 1.5-14.2               | 2                                     | 25                      | 1000 mm (LS)         |                |
|                  | 54               | 1.5-14.2               | 2                                     | 25                      | 1000 mm (LS)         | EI 120 U/C     |
|                  | ≤15              | 1.0-14.2               | 2                                     | 13                      | (CS)                 |                |
|                  | >15 ≤54          | 1.5-14.2               | 2                                     | 25                      | (CS)                 |                |
| Steel            | >54 ≤88.9        | 3.2-14.2               | 2                                     | 25                      | 1000 mm (LS)         | EI 120 U/C     |
|                  | >54 ≤88.9        | 3.2-14.2               | 2                                     | 25                      | (CS)                 |                |

### A.2.9.5 Copper and steel pipes with Kaiflex KK plus and HENSOTHERM® 7 KS Gewebe 125

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 125 | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|---------------------------------------|-------------------------|----------------------|----------------|
| Copper and steel | ≤15              | 1.0-14.2               | 2                                     | 11                      | 1000 mm (LS)         | EI 90 U/C      |
|                  | ≥15 <54          | 1.0-14.2               | 2                                     | 21                      | 1000 mm (LS)         |                |
|                  | 54               | 1.5-14.2               | 2                                     | 21                      | 1000 mm (LS)         | EI 60 U/C      |
|                  | ≤15              | 1.0-14.2               | 2                                     | 11                      | (CS)                 | EI 90 U/C      |
|                  | ≥15 <54          | 1.0-14.2               | 2                                     | 21                      | (CS)                 |                |
| Steel            | >54 ≤88.9        | 3.2-14.2               | 2                                     | 21                      | 1000 mm (LS)         | EI 60 U/C      |
|                  | 88.9             | 3.2-14.2               | 2                                     | 21                      | 1000 mm (LS)         | EI 90 U/C      |
|                  | >54 ≤88.9        | 3.2-14.2               | 2                                     | 21                      | (CS)                 | EI 90 U/C      |
|                  | 88.9             | 3.2-14.2               | 2                                     | 21                      | (CS)                 | EI 120 U/C     |

### A.2.10 Composite pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

Construction details:



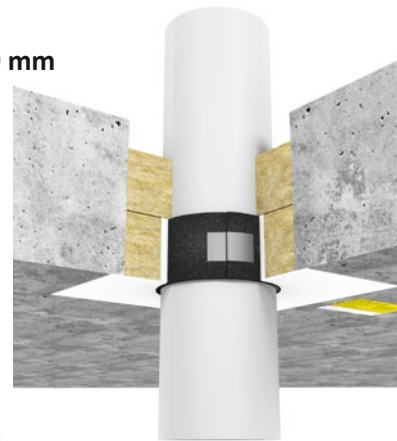
Dimensions in mm

#### A.2.10.1 Geberit Mepla pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

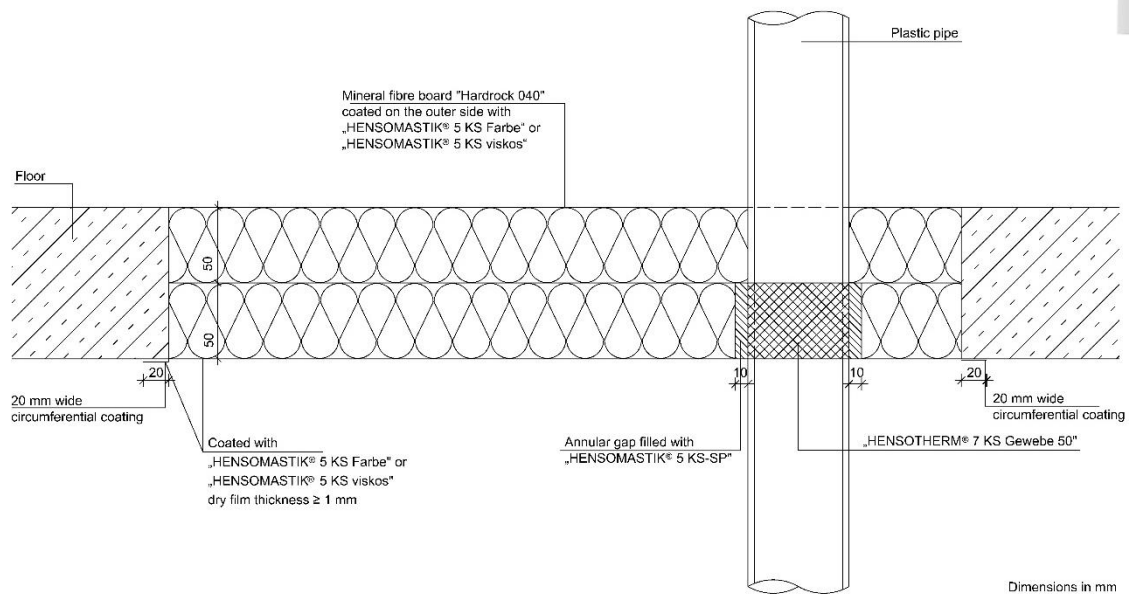
| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Insulation thickness mm | Insulation length mm | Classification |
|---------------|------------------|------------------------|--------------------------------------|-------------------------|----------------------|----------------|
| Geberit Mepla | ≤32              | 3.0                    | 1                                    | 13.0                    | (CS)                 | EI 120 U/C     |
|               | 40               | 3.5                    | 1                                    | 13.5-36.5               | (CS)                 |                |
|               | 50               | 4.0                    | 2                                    | 14.0-40.5               | (CS)                 |                |
|               | 63               | 4.5                    | 2                                    | 14.0-40.5               | (CS)                 |                |
|               | 75               | 5.0                    | 2                                    | 14.0-40.5               | (CS)                 |                |

**A.3 Rigid floor constructions acc. to 1.2.1 with floor thickness of minimum 150 mm (without distance)**

**A.3.1 Plastic pipes with HENSOTHERM® 7 KS Gewebe 50**



Construction details:



**A.3.1.1 PVC-U pipes with HENSOTHERM® 7 KS Gewebe 50**

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PVC-U | $\leq 50$                | 1.8-5.6                | 2                                    | EI 90 U/U      |
|       | $>50 \leq 75$            | 1.8-5.6                | 3                                    |                |
|       | $>75 \leq 110$           | 1.9-8.1                | 4                                    |                |
|       | $>110 \leq 125$          | 3.7                    | 5                                    | EI 60 U/U      |
|       | 125                      | 6.5                    | 5                                    | EI 120 U/U     |
|       | $>50 \leq 75$            | 5.6                    | 2                                    |                |
|       | 110                      | 2.2                    | 4                                    |                |

**A.3.1.2 PE-HD pipes with HENSOTHERM® 7 KS Gewebe 50**

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PE-HD | 56                       | 3.0                    | 2                                    | EI 90 U/U      |
|       | 110                      | 4.3                    | 4                                    | EI 120 U/U     |
|       | $>110 \leq 125$          | 4.8                    | 5                                    | EI 90 U/U      |

### A.3.1.3 PP-HT pipes with HENSOTHERM® 7 KS Gewebe 50

| Pipes | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------|--------------------------|------------------------|--------------------------------------|----------------|
| PP-HT | 50                       | 1.8                    | 2                                    | EI 120 U/U     |
|       | 125                      | 3.9                    | 5                                    | EI 90 U/U      |

### A.3.1.4 POLO-KAL NG pipes with HENSOTHERM® 7 KS Gewebe 50

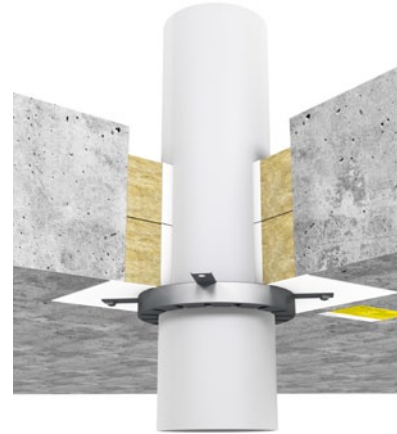
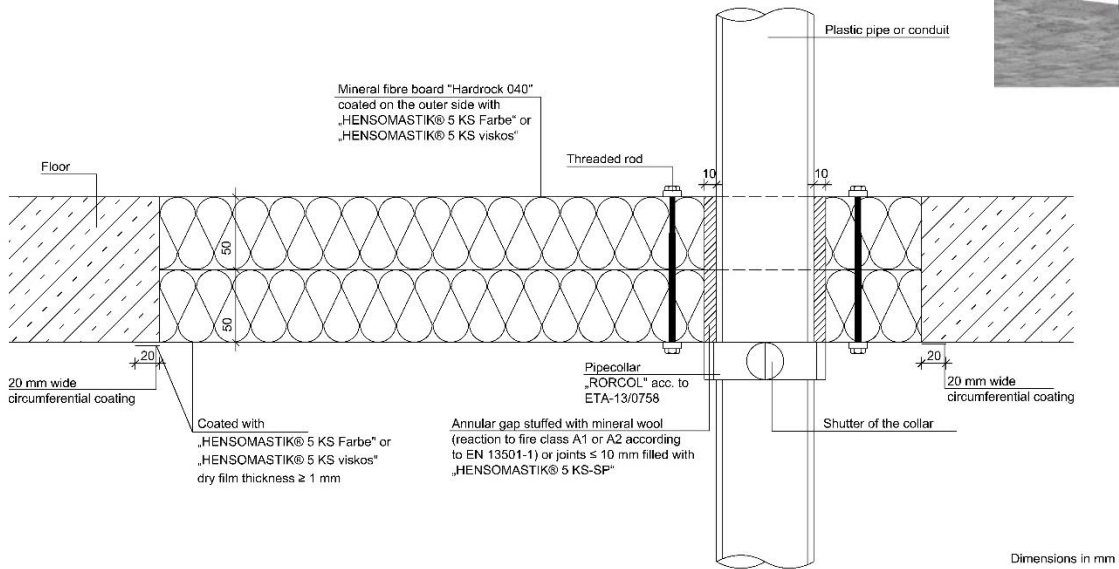
| Pipes       | Maximum Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------|--------------------------|------------------------|--------------------------------------|----------------|
| POLO-KAL NG | ≤50                      | 2.0                    | 2                                    | EI 120 U/U     |
|             | 110                      | 3.4                    | 4                                    |                |
|             | >110 ≤125                | 3.9                    | 5                                    |                |

### A.3.1.5 POLO-KAL 3S pipes with HENSOTHERM® 7 KS Gewebe 50

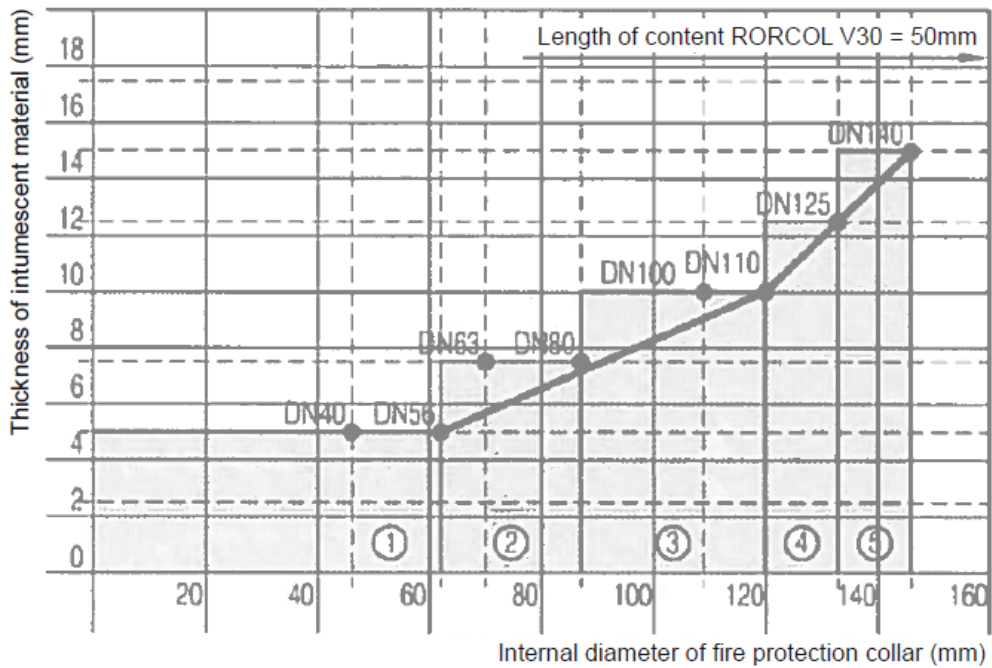
| Pipes       | Maximum Pipe diameter mm | Pipe wall thickness Mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Classification |
|-------------|--------------------------|------------------------|--------------------------------------|----------------|
| POLO-KAL 3S | ≤75                      | 3.8                    | 3                                    | EI 120 U/U     |
|             | >75 ≤110                 | 4.8                    | 4                                    | EI 90 U/U      |
|             | >110 ≤125                | 5.3                    | 5                                    | EI 120 U/U     |

### A.3.2 Plastic and composite pipes with RORCOL V30 pipe collars

Construction details:



Design groups for RORCOL V30 Collar:



### A.3.2.1 PVC-U pipes to EN ISO 1452-1 with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PVC-U | ≥20 ≤32          | 1.6 – 4.5              | None                              | EI 120 U/U     |
|       |                  |                        | Elastomer / ≤ 5                   |                |
|       |                  | 1.5 – 4.5              | PE / ≤ 5                          |                |
|       | >32 ≤62          | 4.5 – 5.1              | None                              |                |
|       |                  |                        | Elastomer / ≤ 5                   |                |
|       | >62 ≤87          | 5.1 – 6.7              | None                              |                |
|       |                  |                        | Elastomer / ≤ 5                   |                |
|       | >87 ≤90          | 6.7                    | Elastomer / ≤ 5                   |                |
|       | >87 ≤110         | 4.2                    | None                              |                |

### A.3.2.2 PVC-U pipes to EN ISO 1452-1 with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PVC-U | ≥20 ≤32          | 1.5 – 4.5              | None                              | EI 90 U/U      |
|       |                  |                        | PE / ≤ 5                          |                |
|       |                  |                        | Elastomer / ≤ 13                  |                |
|       | >32 ≤62          | 4.5 – 5.1              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       |                  |                        | Elastomer / ≤ 13                  |                |
|       | >62 ≤87          | 5.1 – 6.7              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       |                  |                        | Elastomer / ≤ 13                  |                |
|       | >87 ≤90          | 6.7                    | Elastomer / ≤ 13                  |                |
|       | >87 <110         | 6.6 – 6.7              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       |                  |                        | None                              |                |
|       | 110              | 4.2 – 6.6              | PE / ≤ 5                          |                |

### A.3.2.3 PE pipes to EN 1519-1, EN 12201-2, EN12666-1, ABS pipes to EN 1455-1 and SAN PVC to EN 1565-1 with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PE    | ≥32 ≤50          | 3.0 – 3.6              | PE / ≤ 9                          | EI 120 U/U     |
|       | ≥32 ≤56          | 3.0 – 3.6              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >56 ≤62          | 3.6 – 4.9              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >62 ≤87          | 4.9 – 6.0              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >87 <110         | 6.0                    | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | 110              | 4.3 – 6.0              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
| 125   | 4.9              | None                   |                                   |                |
| 135   | 6.0              | None                   |                                   |                |



#### A.3.2.4 PE pipes to EN 12201-2, with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PE    | 110              | 10.0                   | PE / 5                            | EI 90 U/U      |
|       | 125              | 11.4                   |                                   |                |

#### A.3.2.5 PP pipes to EN 1451-1 with RORCOL V30 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PP    | >32 ≤50          | 1.8 – 4.1              | None                              | EI 120 U/U     |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | ≤ 50             | 1.8 – 4.1              | Aluminium lined glass wool / ≤ 20 |                |
|       | >50 ≤58          | 4.1 – 4.8              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >58 ≤87          | 4.8 – 5.4              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >87 ≤ 110        | 5.4                    | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | 110              | 2.7 – 5.4              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
| 125   | 3.5              | None                   |                                   |                |

#### A.3.2.6 PP R pipes to EN ISO 15874-2, with RORCOL V30 pipe collars

| Pipes                              | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|------------------------------------|------------------|------------------------|-----------------------------------|----------------|
| PP R<br>K00 KELIT HIT<br>pipe PN20 | 50               | 8.3                    | Uninstalled                       | EI 120 U/U     |
|                                    |                  |                        | PE / ≤ 10                         | EI 90 U/U      |
|                                    |                  |                        | Elastomer / ≤ 25                  | EI 120 U/U     |
|                                    |                  |                        | Aluminium lined glass wool / ≤ 50 | EI 120 U/C     |

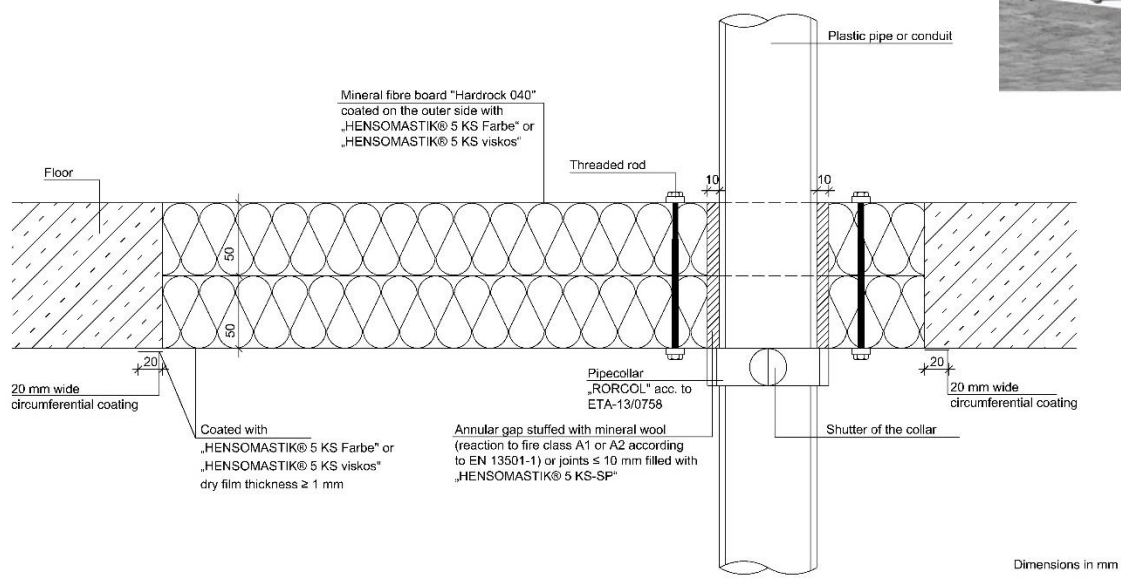
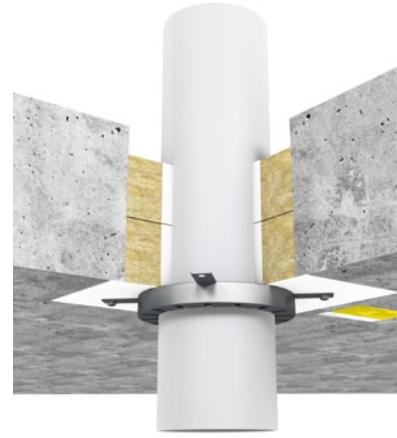
#### A.3.2.7 Special pipes with RORCOL V30 pipe collars

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|---------------|------------------|------------------------|-----------------------------------|----------------|
| Raupiano Plus | 50               | 1.8                    | None                              | EI 120 U/U     |
|               |                  |                        | Elastomer / ≤ 6                   |                |
|               | 75               | 1.9                    | None                              |                |
|               | 110              | 2.7                    |                                   |                |
| POLO-KAL 3S   | 125              | 3.1                    | None                              |                |
|               | 75               | 3.8                    |                                   |                |
|               | 110              | 4.8                    |                                   |                |
| POLO-KAL NG   | 125              | 5.3                    | None                              |                |
|               | 50               | 2.0                    |                                   |                |
|               | 75               | 2.6                    |                                   |                |
|               | 110              | 3.4                    |                                   |                |
| RAUTITAN flex | 50               | 6.9                    | None                              |                |
|               |                  |                        | PE / ≤ 10                         |                |
|               |                  |                        | Elastomer / ≤ 25                  |                |

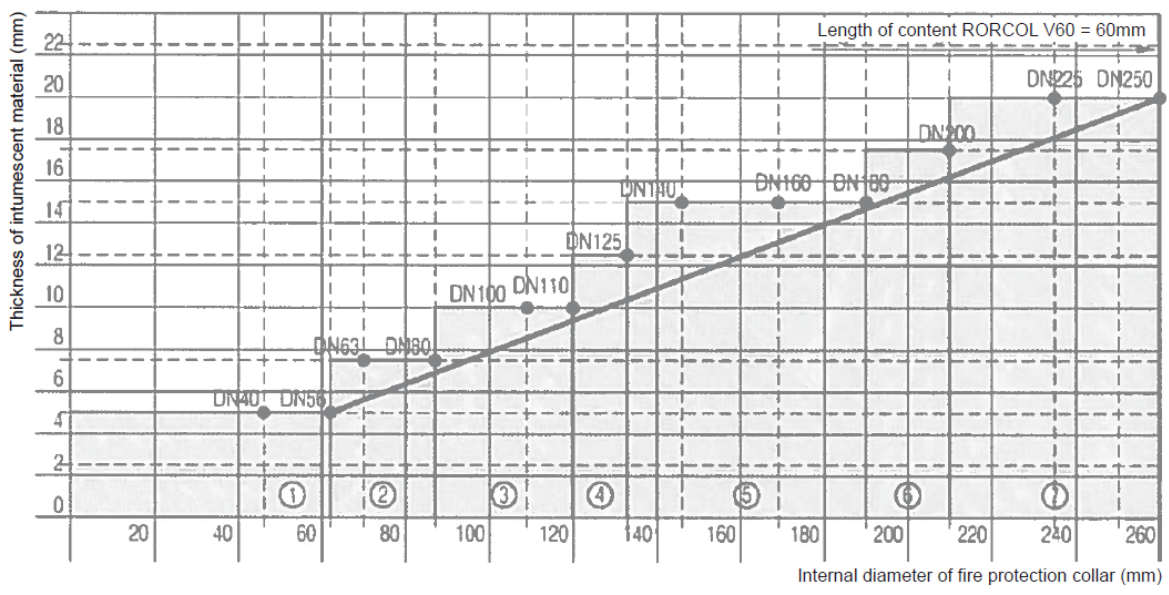


### A.3.3 Plastic and composite pipes with RORCOL V60 pipe collars

Construction details:



Design groups for RORCOL V60 Collar:



### A.3.3.1 PVC-U pipes to EN ISO 1452-1 with RORCOL V60 pipe collars

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|------------------|------------------|------------------------|-----------------------------------|----------------|
| PVC-U            | ≥20 ≤32          | 1.5 – 4.5              | PE / ≤ 5                          | EI 120 U/U     |
|                  | ≥20 ≤32          | 1.6 – 4.5              | None                              |                |
|                  |                  |                        | Elastomer / ≤ 13                  |                |
|                  | >32 ≤62          | 4.5 – 5.1              | None                              |                |
|                  |                  |                        | Elastomer / ≤ 13                  |                |
|                  | >62 ≤87          | 5.1 – 6.7              | None                              |                |
|                  | >62 ≤90          | 6.7                    | Elastomer / ≤ 13                  |                |
|                  | >87 ≤110         | 6.6 – 6.7              | None                              |                |
| Elastomer / ≤ 13 |                  |                        |                                   |                |

### A.3.3.2 PVC-U pipes to EN ISO 1452-1 with RORCOL V60 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PVC-U | ≥20 ≤32          | 1.5 – 4.5              | None                              | EI 90 U/U      |
|       |                  |                        | PE / ≤ 5                          |                |
|       |                  |                        | Elastomer / ≤ 13                  |                |
|       | >32 ≤62          | 4.5 – 5.1              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       |                  |                        | Elastomer / ≤ 13                  |                |
|       | >62 ≤87          | 5.1 – 6.7              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       |                  |                        | Elastomer / ≤ 13                  |                |
|       | >87 ≤90          | 6.6 – 6.7              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |
|       | >87 ≤90          | 6.7                    | Elastomer / ≤ 13                  |                |
|       | 110              | 4.2 – 6.6              | None                              |                |
|       |                  |                        | PE / ≤ 5                          |                |

### A.3.3.3 PE pipes to EN 1519-1, EN 12201-2, EN12666-1, ABS pipes to EN 1455-1 and SAN PVC to EN 1565-1 with RORCOL V60 pipe collars

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|------------------|------------------|------------------------|-----------------------------------|----------------|
| PE               | ≥32 ≤50          | 3.0 – 3.6              | PE / ≤ 5                          | EI 120 U/U     |
|                  | ≥32 ≤56          | 3.0 – 3.6              | None                              |                |
|                  |                  |                        | Elastomer / ≤ 25                  |                |
|                  | >56 ≤62          | 3.6 – 4.9              | None                              |                |
|                  |                  |                        | Elastomer / ≤ 25                  |                |
|                  | >62 ≤87          | 4.9 – 6.0              | None                              |                |
|                  |                  |                        | Elastomer / ≤ 25                  |                |
|                  | >87 ≤ 110        | 6.0                    | None                              |                |
|                  |                  |                        | Elastomer / ≤ 25                  |                |
|                  | 110              | 4.3 – 6.0              | None                              |                |
| Elastomer / ≤ 25 |                  |                        |                                   |                |
| 125              | 4.9              | None                   |                                   |                |
| 135              | 6.0              | None                   |                                   |                |

#### A.3.3.4 PE pipes to EN 12201-2, with RORCOL V60 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PE    | 110              | 10.0                   | PE / 5                            | EI 90 U/U      |
|       | 125              | 11.4                   |                                   |                |

#### A.3.3.5 PP pipes to EN 1451-1 with RORCOL V60 pipe collars

| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
|       | >32 ≤50          | 1.8 – 4.1              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       |                  |                        | PE / ≤ 4                          |                |
|       | ≤ 50             | 1.8 – 4.1              | Aluminium lined glass wool / ≤ 20 |                |
|       | >50 ≤58          | 4.1 – 4.8              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >58 ≤87          | 4.8 – 5.4              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | >87 ≤ 110        | 5.4                    | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | 110              | 2.7 – 5.4              | None                              |                |
|       |                  |                        | Elastomer / ≤ 25                  |                |
|       | 125              | 3.5                    | None                              |                |

#### A.3.3.6 PP R pipes to EN ISO 15874-2, with RORCOL V60 pipe collars

| Pipes   | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|---------|------------------|------------------------|-----------------------------------|----------------|
| PP R    | ≥16 ≤50          | 8.3 – 10.3             | Elastomer / ≤ 43                  | EI 120 U/C     |
|         |                  |                        | None                              | EI 120 U/U     |
|         |                  |                        | Elastomer / ≤ 25                  |                |
|         |                  |                        | PE / ≤ 10                         |                |
|         | >50 ≤62          | 10.3 – 14.5            | Aluminium lined glass wool / ≤ 50 | EI 90 U/U      |
|         |                  |                        | Elastomer / ≤ 43                  | EI 120 U/C     |
| >62 ≤90 | 14.5 – 15.0      | Elastomer / ≤ 43       | EI 120 U/C                        |                |

#### A.3.3.7 PVC-U pipes to EN 1401-1, with RORCOL V60 pipe collars

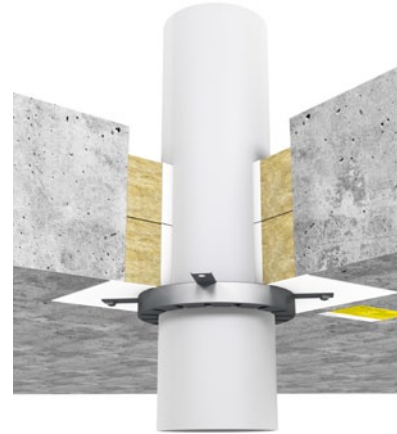
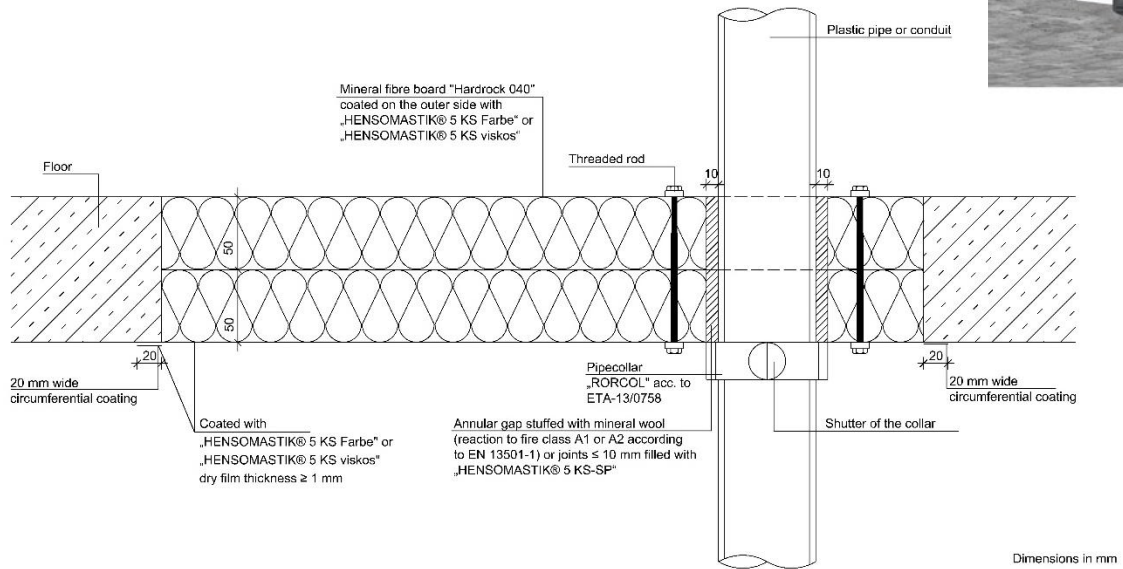
| Pipes | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-------|------------------|------------------------|-----------------------------------|----------------|
| PVC   | 110              | 3.2                    | PE / ≤5                           | EI 90 U/U      |
|       | 125              |                        | None                              | EI 120 U/U     |

### A.3.3.8 Special pipes with RORCOL V60 pipe collars

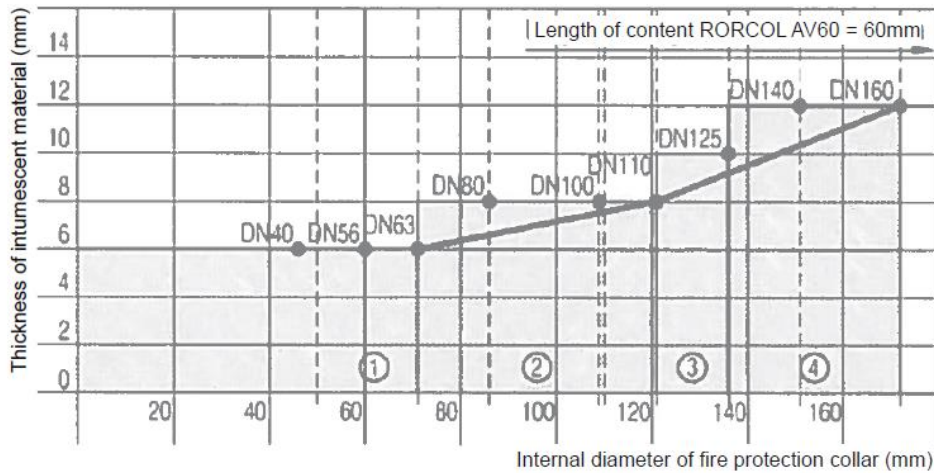
| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|---------------|------------------|------------------------|-----------------------------------|----------------|
| Raupiano Plus | 50               | 1.8                    | None                              | EI 120 U/U     |
|               |                  |                        | Elastomer / $\leq 6$              |                |
|               | 75               | 1.9                    | None                              |                |
|               | 110              | 2.7                    |                                   |                |
| 125           | 3.1              |                        |                                   |                |
| POLO-KAL 3S   | 75               | 3.8                    | None                              |                |
|               | 110              | 4.8                    |                                   |                |
|               | 125              | 5.3                    |                                   |                |
| POLO-KAL NG   | 50               | 2.0                    | None                              |                |
|               | 75               | 2.6                    |                                   |                |
|               | 110              | 3.4                    |                                   |                |
|               | 125              | 3.9                    |                                   |                |
| RAUTITAN flex | 50               | 6.9                    | None                              |                |
|               |                  |                        | PE / $\leq 10$                    |                |
|               |                  |                        | Elastomer / $\leq 25$             |                |

### A.3.4 Plastic and composite pipes with RORCOL AV60 pipe collars

Construction details:



Design groups for RORCOL AV60 Collar:



#### A.3.4.1 Metal pipes to EN 13501-1 with RORCOL AV60 pipe collars

| Pipes                            | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------------------------|------------------|------------------------|-----------------------------------|----------------|
| Copper<br>Mild & stainless steel | ≤ 12             | 1.0 – 14.2             | Elastomer / ≥ 6                   | EI 120 U/U     |
|                                  | ≤ 18             | 1.0 – 14.2             | Elastomer / ≥ 9                   |                |
|                                  | ≤ 22             | 1.0 – 14.2             | Elastomer / ≥ 13                  |                |
|                                  | ≤ 42             | 1.5 – 14.2             | Elastomer / ≥ 19                  |                |
|                                  | ≤ 42             | 1.0 – 14.2             | Aluminium lined glass wool / ≥ 20 | EI 90 U/U      |

#### A.3.4.2 Flex tubes to EN 61386-22 with RORCOL AV60 pipe collars

| Flex Tube    | Tube diameter mm | Cable size                | Number Cable / FX flexible tube | Classification |
|--------------|------------------|---------------------------|---------------------------------|----------------|
| FX flex tube | ≤ 50             | without cable             |                                 | EI 120         |
|              |                  | ≤ 5 x 6.0 mm <sup>2</sup> | ≤ 5                             |                |

#### A.3.4.3 Geberit Mepla pipes with RORCOL AV60 pipe collars

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|---------------|------------------|------------------------|-----------------------------------|----------------|
| Geberit Mepla | 32               | 3.0                    | Aluminium lined glass wool / 20   | EI 90 U/C      |
|               | 40               | 3.5                    | Elastomer / 13                    | EI 120 U/C     |
|               | 63               | 4.5                    | Aluminium lined glass wool / 50   |                |
|               | 63               | 4.5                    | Elastomer / 9                     | EI 90 U/C      |

#### A.3.4.4 HENCO multiple-layer pipes with RORCOL AV60 pipe collars

| Pipes                | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------------|------------------|------------------------|-----------------------------------|----------------|
| HENCO multiple-layer | 20               | 2.0                    | PE / 4                            | EI 90 U/C      |
|                      |                  |                        | Elastomer / 6                     |                |

#### A.3.4.5 RAUTITAN stabil pipes with RORCOL AV60 pipe collars

| Pipes           | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-----------------|------------------|------------------------|-----------------------------------|----------------|
| RAUTITAN stabil | 32               | 4.7                    | Elastomer / 9                     | EI 120 U/C     |
|                 | 40               | 6.0                    | Aluminium lined glass wool / 20   | EI 90 U/C      |

#### A.3.4.6 FRIATHERM multi-press pipes with RORCOL AV60 pipe collars

| Pipes                 | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|-----------------------|------------------|------------------------|-----------------------------------|----------------|
| FRIATHERM multi-press | 16               | 2.0                    | Elastomer / 6                     | EI 120 U/C     |



#### A.3.4.7 JRG Sanipex MT pipes with RORCOL AV60 pipe collars

| Pipes          | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------|------------------|------------------------|-----------------------------------|----------------|
| JRG Sanipex MT | 26               | 3.0                    | Aluminium lined glass wool / 20   | EI 120 U/C     |

#### A.3.4.8 TECEflex pipes with RORCOL AV60 pipe collars

| Pipes    | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm    | Classification |
|----------|------------------|------------------------|--------------------------------------|----------------|
| TECEflex | 20               | 3.4                    | PE / 4                               | EI 90 U/C      |
|          |                  |                        | Elastomer / 6                        |                |
|          | 26               | 4.0                    | PE / 10                              | EI 120 U/C     |
|          |                  |                        | Elastomer / 9                        | EI 90 U/C      |
|          | 32               | 4.0                    | Aluminium lined glass wool / 20      | EI 120 U/C     |
|          | 63               | 6.0                    | Elastomer / 9 – 32                   | EI 120 U/C     |
|          |                  |                        | Aluminium lined glass wool / 20      |                |
|          |                  |                        | Aluminium lined glass wool / 20 – 50 | EI 90 U/C      |

#### A.3.4.9 OMEGA application #1 with RORCOL AV60 pipe collars and flex tubes to EN 61386-22

| Flex Tube         | Tube diameter mm | Number of flexible tubes  | Cable size                | Number Cable / FX flexible tube | Classification |
|-------------------|------------------|---------------------------|---------------------------|---------------------------------|----------------|
| FX flexible tubes | ≤ 20             | ≤ 4                       | without cable             |                                 | EI 120         |
|                   |                  | ≤ 2                       | ≤ 5 x 1.5 mm <sup>2</sup> | 1                               |                |
|                   | ≤ 25             | ≤ 5                       | without cable             |                                 |                |
|                   |                  | ≤ 3                       | ≤ 5 x 2.5 mm <sup>2</sup> | 1                               |                |
|                   | ≤ 32             | ≤ 2                       | without cable             |                                 |                |
|                   |                  |                           | ≤ 5 x 2.5 mm <sup>2</sup> | 1                               |                |
|                   | ≤ 40             | 1                         | without cable             |                                 |                |
|                   |                  |                           | ≤ 5 x 6.0 mm <sup>2</sup> | 1                               |                |
| ≤ 50              | 1                | without cable             |                           |                                 |                |
|                   |                  | ≤ 5 x 2.5 mm <sup>2</sup> | ≤ 2                       |                                 |                |

#### A.3.4.10 OMEGA application #2 with RORCOL AV60 pipe collars, flex tubes to EN 61386-22 and metal pipes

| Flex Tube         | Tube diameter mm | Number of flexible tubes | Cable size                | Number Cable / FX flexible tube | Classification |
|-------------------|------------------|--------------------------|---------------------------|---------------------------------|----------------|
| FX flexible tubes | ≤ 25             | 1                        | without cable             |                                 | EI 120         |
|                   |                  |                          | ≤ 5 x 6.0 mm <sup>2</sup> | 1                               |                |
| Metal pipes       | ≤ 10             | -                        | 1.0 – 14.2                | Elastomer / ≥ 9                 |                |
|                   | ≤ 18             |                          |                           |                                 |                |

#### A.3.4.11 Multiple lead-throughs #1 with RORCOL AV60 pipe collars, HENCO multiple-layer and TECEflex pipes

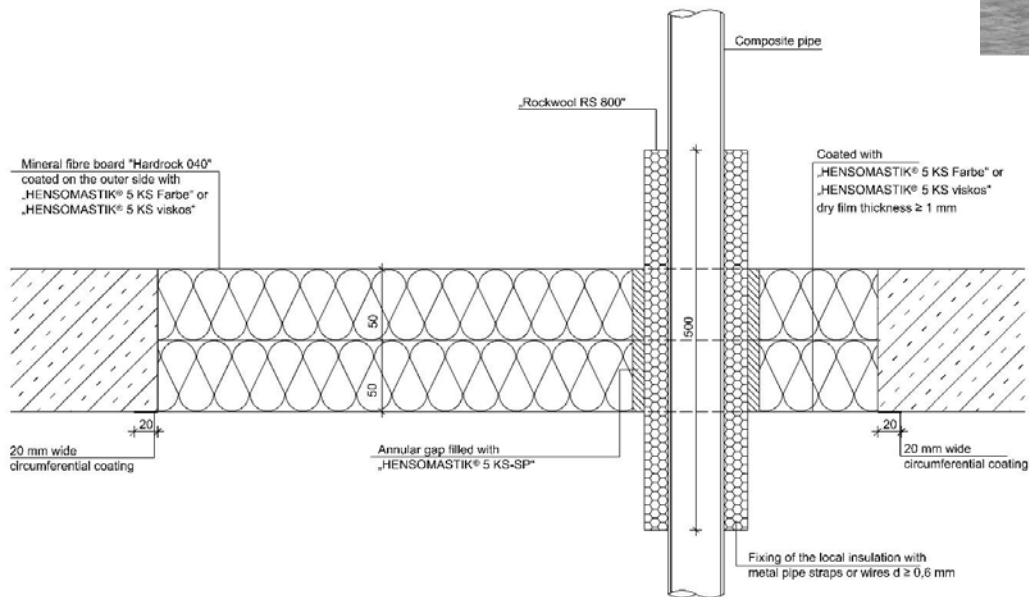
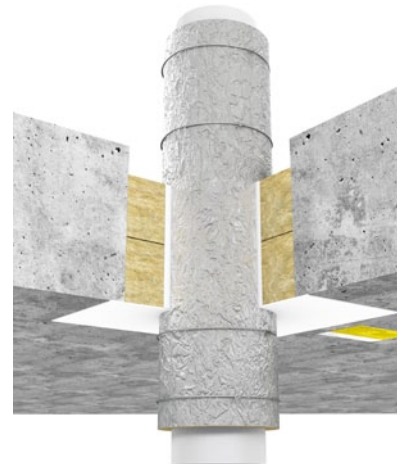
| Pipes                | Pipe diameter mm | Pipe wall thickness mm | Pipe insulation CS / thickness mm | Classification |
|----------------------|------------------|------------------------|-----------------------------------|----------------|
| HENCO multiple-layer | 20               | 2.0                    | PE / 4                            | EI 90 U/C      |
|                      |                  |                        | Elastomer / 6                     |                |
| TECEflex             | 26               | 4.0                    | PE / 4 – 10                       |                |
|                      |                  |                        | Elastomer / 6 - 9                 |                |

#### A.3.4.12 Multiple lead-throughs #2 with RORCOL AV60 pipe collars, flex tubes to EN 61386-22 and metal pipes

| Flex Tube         | Tube diameter mm | Number of flexible tubes | Cable size                | Number Cable / FX flexible tube | Classification |
|-------------------|------------------|--------------------------|---------------------------|---------------------------------|----------------|
| FX flexible tubes | ≤ 25             | 1                        | without cable             |                                 | EI 120         |
|                   |                  |                          | ≤ 5 x 6.0 mm <sup>2</sup> | 1                               |                |
| Metal pipes       | ≤ 10             | -                        | 1.0 – 14.2                | Elastomer / ≥ 9                 |                |
|                   | ≤ 18             |                          |                           |                                 |                |

### A.3.5 Composite pipes with Rockwool RS 800 insulation (LS)

Construction details:



The length of the local insulation may be increased but not reduced.  
The density of the insulation may be increased but not reduced.

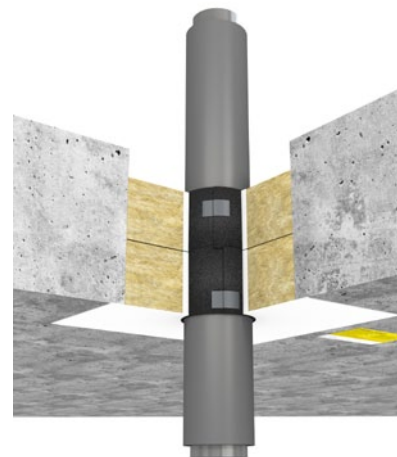
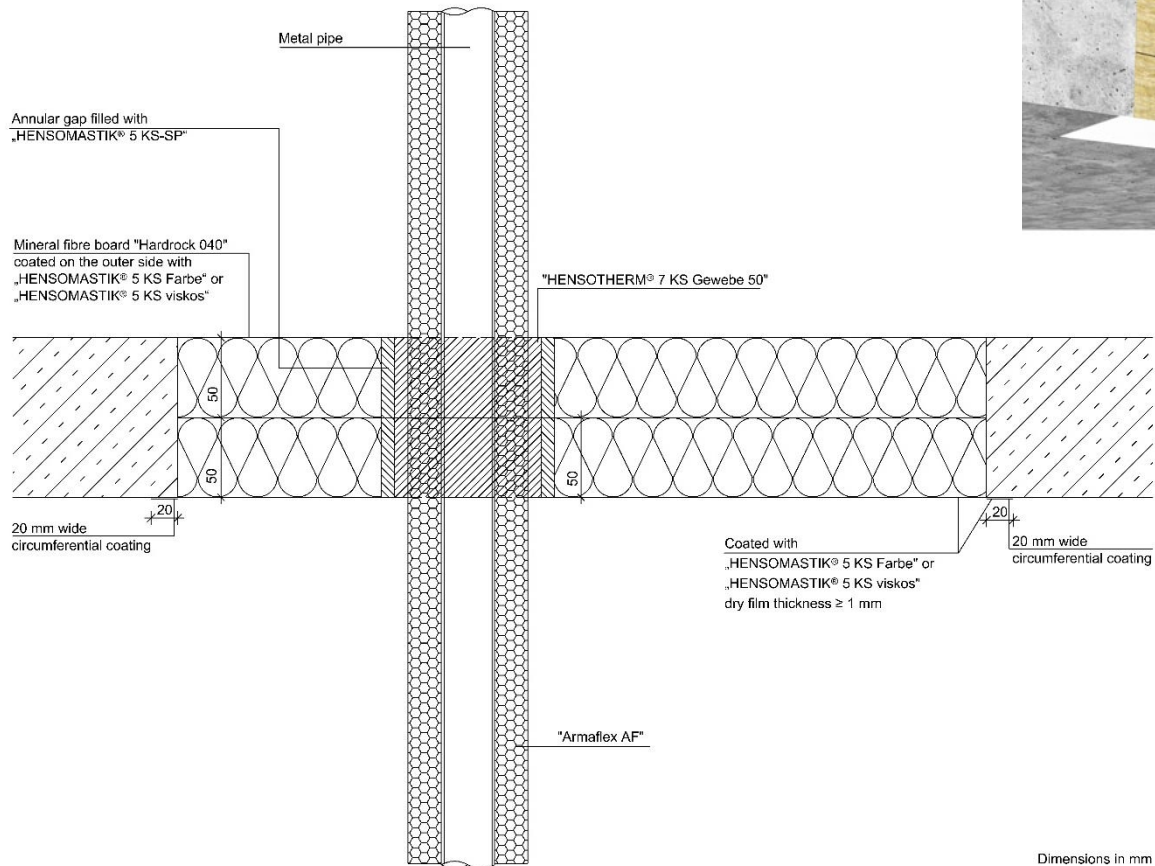
Dimensions in mm

#### A.3.5.1 Geberit Mepla pipes with Rockwool RS 800 insulation (LS)

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Insulation thickness mm | Insulation length mm | Classification |
|---------------|------------------|------------------------|-------------------------|----------------------|----------------|
| Geberit Mepla | 16               | 2.3                    | 20-80                   | 500 mm (LS)          | EI 120 U/C     |
|               | 32               | 3.0                    | 20-80                   | 500 mm (LS)          | EI 90 U/C      |
|               | 32               | 3.0                    | 80                      | 500 mm (LS)          | EI 120 U/C     |
|               | 40               | 4.0                    | 20-80                   | 500 mm (LS)          | EI 90 U/C      |
|               | 40               | 4.0                    | 80                      | 500 mm (LS)          | EI 120 U/C     |
|               | 50               | 4.5                    | 30-80                   | 500 mm (LS)          | EI 90 U/C      |
|               | 63               | 6.0                    | 30-80                   | 500 mm (LS)          | EI 90 U/C      |
|               | 75               | 7.5                    | 30-80                   | 500 mm (LS)          | EI 60 U/C      |
|               | 75               | 7.5                    | 30                      | 500 mm (LS)          | EI 120 U/C     |

### A.3.6 Metal pipes with synthetic rubber insulation (CS)

Construction details:

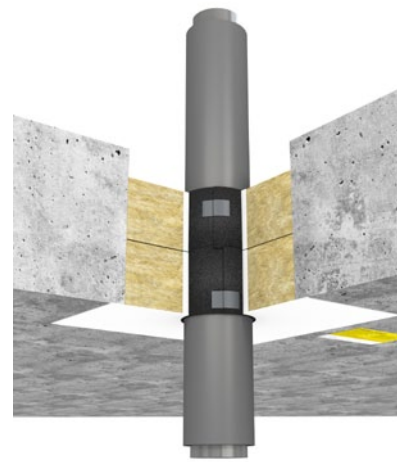
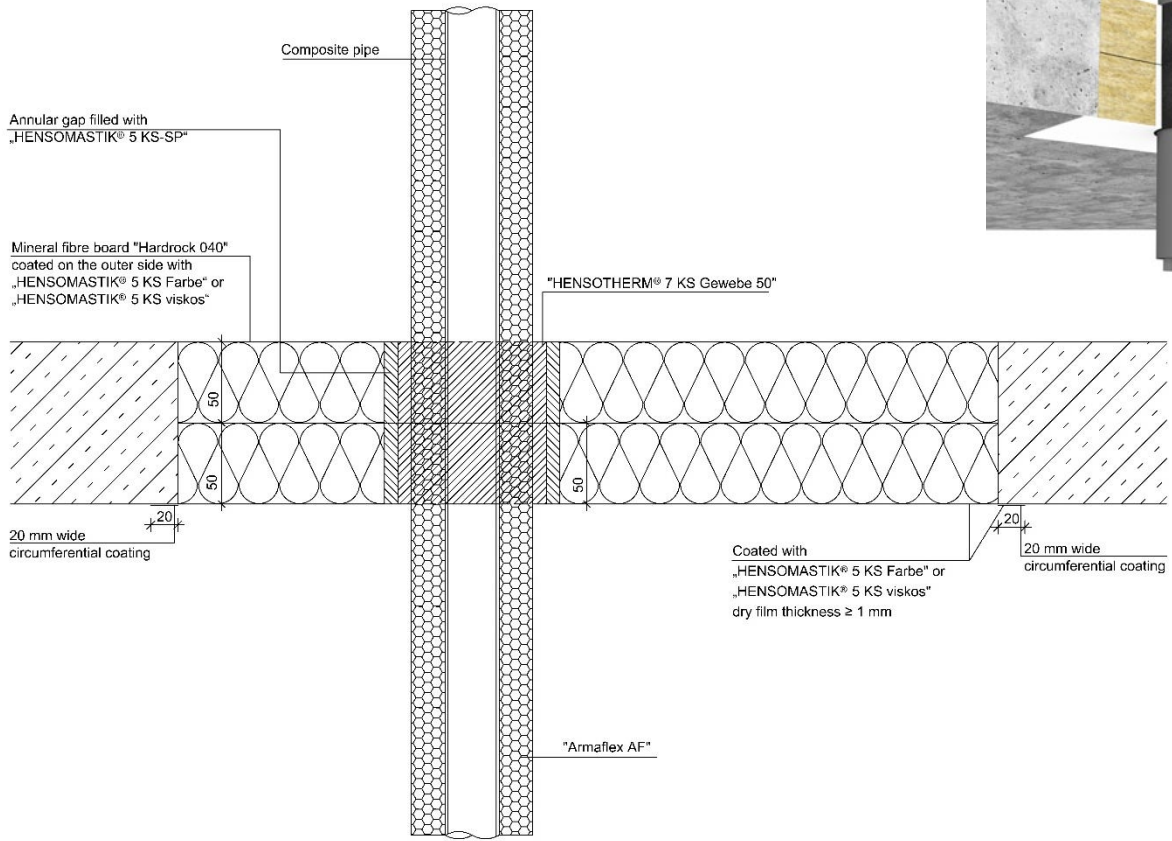


#### A.3.6.1 Copper and steel pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

| Pipes            | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Insulation thickness mm | Insulation length mm | Classification |
|------------------|------------------|------------------------|--------------------------------------|-------------------------|----------------------|----------------|
| Copper and steel | 15               | 1.0-14.2               | 1                                    | 11                      | (CS)                 | EI 120 C/U     |
|                  | >15 ≤42          | 1.2-14.2               | 2                                    | 13.5-36.5               | (CS)                 |                |
|                  | >42 ≤54          | 1.2-14.2               | 2                                    | 13.5                    | (CS)                 |                |
|                  | >42 ≤54          | 1.2-14.2               | 2                                    | 13.5-38                 | (CS)                 | EI 90 C/U      |
| Steel            | >54 ≤88.9        | 3.2-14.2               | 2                                    | 41.5                    | (CS)                 | EI 90 C/U      |
|                  | 88.9             | 3.2-14.2               | 2                                    | 14.5                    | (CS)                 | EI 60 C/U      |

### A.3.7 Composite pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50 (CS)

Construction details:



Dimensions in mm

#### A.3.7.1 Geberit Mepla pipes with Armaflex AF and HENSOTHERM® 7 KS Gewebe 50

| Pipes         | Pipe diameter mm | Pipe wall thickness mm | Layers of HENSOTHERM® 7 KS Gewebe 50 | Insulation thickness mm | Insulation length mm | Classification |
|---------------|------------------|------------------------|--------------------------------------|-------------------------|----------------------|----------------|
| Geberit Mepla | 32               | 3.0                    | 1                                    | 13.0-36.5               | (CS)                 | EI 120 U/C     |
|               | 40               | 4.0                    | 2                                    | 13.0-36.5               | (CS)                 |                |
|               | 50               | 4.5                    | 2                                    | 14.0-40.5               | (CS)                 |                |
|               | 63               | 6.0                    | 2                                    | 14.0-40.5               | (CS)                 |                |
|               | 75               | 7.5                    | 2                                    | 14.0-40.5               | (CS)                 |                |

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