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Member of EOTA
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European Technical Assessment

ETA-13/0756 of 26.04.2021

General part

Technical Assessment Body issuing the European Technical Assessment	Österreichisches Institut für Bautechnik (OIB) Austrian Institute of Construction Engineering
Trade name of the construction product	FLAMRO® Multi-Kombischott EN
Product family to which the construction product belongs	Fire Stopping and Fire Sealing Products: Penetration Seals
Manufacturer	FLAMRO Brandschutz-Systeme GmbH Glüsinger Straße 86 21217 Seevetal GERMANY
Manufacturing plant	FLAMRO Brandschutz-Systeme GmbH Am Sportplatz 2 56291 Leiningen GERMANY
This European Technical Assessment contains	56 pages including Annexes A-1 to H-5 which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	European Assessment Document (EAD) 350454-00-1104 “Fire stopping and fire sealing products – Penetration seals”
This European Technical Assessment replaces	European technical approval ETA-13/0756 with validity from 28.06.2013 to 27.06.2018

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Specific parts

1 Technical description of the product

"FLAMRO® Multi-Kombischott EN" is a kit to be used as cable- and/or pipe penetration seal (mixed penetration seal) based on the following components and additional insulations.

Components of "FLAMRO® Multi-Kombischott EN"	Characteristics
FLAMRO® BMA	Ablative fire stop coating – filled in buckets
FLAMRO® BMS	Ablative fire stop mastic – filled in buckets
FLAMRO® BMK	Ablative fire stop mastic – filled in cartridges
FLAMRO® UBB	Flexible intumescent strip (without self-adhesive layer) with a nominal thickness of 2,0 mm and a width of minimum 65 mm for walls and minimum 60 mm for floors
FLAMRO® BS	Mineral wool board "RPI-15" pre-coated with 1 mm (dry layer thickness) "FLAMRO® BMA" on the visible surface
RPI-15	Mineral wool board from manufacturer "DEUTSCHE ROCKWOOL GmbH & Co. KG" according to EN 13162 with classification A1 according to EN 13501-1 with a nominal thickness of 60 mm and a nominal density of 160 kg/m³ and a melting point > 1000 °C according to DIN 4102-17
FLAMRO® Variant N II A	Pipe collar according to Annex B-1 of the ETA with coated sheet steel housing and an inlay made of intumescent material – only for use in "FLAMRO® Multi-Kombischott EN" in horizontal separating elements as defined in clause 2.1 of the ETA

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Insulations (additional components)	Characteristics
ProRox PS 960 / Rockwool 880	Prefabricated pipe shell according to EN 14303 made from stone wool with classification $A1_L$ according to EN 13501-1, a minimum nominal apparent density of 130 kg/m^3 and a melting point > 1000 °C according to DIN 4102-17 from manufacturer “DEUTSCHE ROCKWOOL GmbH & Co. KG”
Armaflex Protect	Closed cell elastomeric foam insulation with intumescent fire protection additives in form of tubes and sheets with classification E (sheets) / E_L (tubes) according to EN 13501-1 – including “Armaflex Band selbstklebend” (Armaflex self-adhesive tape) and “Armaflex 520” – from manufacturer “Armacell GmbH”
Armaflex Band selbstklebend (Armaflex self-adhesive tape)	Closed cell, flexible elastomeric foam (FEF) insulation in form of tapes with a self-adhesive from manufacturer “Armacell GmbH”
Armaflex 520	Polychlorene-based adhesive, free from aromatic compounds (special adhesive for processing of all flexible Armaflex insulating material – except “HT/Armaflex”) from manufacturer “Armacell GmbH”

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

2.1 Intended use

"FLAMRO® Multi-Kombischott EN" is intended to be used as a cable- and/or pipe penetration seal (mixed penetration seal) to temporarily or permanently reinstate the fire resistance performance of flexible wall constructions, rigid wall constructions and rigid floor constructions where they have been provided with apertures which are penetrated by various cables, conduits / tubes, metal pipes, plastic pipes and cable support constructions (perforated or non-perforated steel cable trays and steel ladders).

The thickness of the penetration seal in flexible walls or rigid walls has to be minimum 130 mm (two layers of mineral wool boards according to clause 1 of the ETA with a nominal thickness of 60 mm and a gap width of 10 mm between the two layers of boards).

The thickness of the penetration seal in rigid floors has to be minimum 150 mm (two layers of mineral wool boards according to clause 1 of the ETA with a nominal thickness of 60 mm and a gap width of 30 mm between the two layers of boards).

The maximum opening size of the penetration seal has to comply with the dimensions as specified in the following table.

The minimum perimeter length to seal area ratio of the penetration seal in rigid floors is – according to clause 13.5.2 of EN 1366-3:2009 – 3,729 m/m², resp. 0,003729 mm/mm².

Blank penetration seals with maximum opening sizes as specified in the following table have been tested.

"FLAMRO® Multi-Kombischott EN" can be installed only in the types of separating elements as specified in the following table.

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Separating element	Construction	Maximum opening size of the penetration seal (width x height)
Flexible walls	> Steel studs or timber studs lined on both faces with minimum 2 layer of boards (minimum thickness 15,0 mm) with classification A2-s1,d0 or A1 according to EN 13501-1 > For timber stud walls there shall be a minimum distance of 100 mm of the penetration seal to any timber stud. The cavity between the penetration seal and the timber stud has to be closed with minimum 100 mm of insulation with classification A1 or A2 according to EN 13501-1 > Minimum thickness 122 mm > Classification according to EN 13501-2: ≥ EI 120 > The aperture lining shall be made from steel studs with a thickness of minimum 0,6 mm and boards of the same specification as those used in the wall in practice > This European Technical Assessment does not cover sandwich panel constructions and flexible walls were the lining does not cover studs on both sides. Penetrations in such constructions shall be tested on a case by case basis	970 mm x 1200 mm
Rigid walls	> Aerated concrete, concrete, masonry > Minimum thickness 122 mm > The rigid wall shall be classified in accordance with EN 13501-2 for the required fire resistance period	970 mm x 1200 mm
Rigid floors	> Aerated concrete, concrete > Minimum density 650 kg/m³ > Minimum thickness 150 mm > The rigid floor shall be classified in accordance with EN 13501-2 for the required fire resistance period	see Annex F-2 of the ETA

“FLAMRO® Multi-Kombischott EN” can only be configured as specified in the following tables. Other parts or service support constructions shall not penetrate the penetration seal.

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Penetrating element	Construction characteristics of the penetrating element in "FLAMRO® Multi-Kombischott EN" in flexible walls and rigid walls
Cables	> All types of sheathed cables[1] (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 80 mm > Tied bundles[2] up to 100 mm overall diameter containing sheathed cables (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 21 mm
Conduits	> Steel conduits / tubes, Ø ≤ 16 mm (without cables): steel conduits acc. to EN 61386-21 and / or EN 10305-4 or -6 > Plastic conduits, Ø ≤ 16 (without cables) acc. to EN 61386-21 > Bundles[3] of up to 3 steel conduits (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness ≥ 0,9 mm (for Ø ≤ 20 mm) or ≥ 1,0 mm (for Ø 25 mm) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness ≥ 1,24 mm > Bundles[4] of up to 3 plastic conduits (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness 1,8 mm to 2,2 mm (for polyolefine) or 0,6 mm to 0,7 mm (for PVC-U) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness 0,2 mm (for polyolefine) or 0,15 mm (for PVC-U)
Plastic pipes	> PVC-U pipes according to EN ISO 1452-1 and DIN 8061 / DIN 8062 with diameters and wall thicknesses as defined in Annex D-4 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-3 of the ETA. > PE-HD pipes according to EN 1519-1 or EN 12666-1 and DIN 8074 / DIN 8075 with diameters and wall thicknesses as defined in Annex D-4 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-3 of the ETA. > PP pipes according to EN ISO 15874-2 and DIN 8077 / DIN 8078 with a diameter and a wall thickness as defined in Annex D-4 of the ETA.

1 Single or multicore cable with individual insulation of the cores and an additional protective covering of the assembly
2 Several cables running in the same direction, densely packed and bound tightly together by mechanical means
3 Including single penetrations
4 Including single penetrations

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Penetrating element	Construction characteristics of the penetrating element in "FLAMRO® Multi-Kombischott EN" in flexible walls and rigid walls
Metal pipes	> Metal pipes of reaction to fire class A1 according to EN 13501-1 with a melting or decomposition point greater or equal than copper (1006 °C for EI 90; 1049 °C for EI 120) and a thermal conductivity smaller or equal than copper with diameters and wall thicknesses as defined in Annex D-2 and D-3 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-1 and E-2 of the ETA. > Metal pipes of reaction to fire class A1 according to EN 13501-1 with a melting or decomposition point greater or equal than steel (1006 °C for EI 90; 1049 °C for EI 120) and a thermal conductivity smaller or equal than steel with diameters and wall thicknesses as defined in Annex D-2 and D-3 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex E-1 and E-2 of the ETA.
Cable support constructions	> Steel cable trays (perforated or non-perforated) > Steel ladders > Steel cable trays (perforated or non-perforated) and steel ladders with organic coatings shall at least be classified A2 according to EN 13501-1

Penetrating element	Construction characteristics of the penetrating element in "FLAMRO® Multi-Kombischott EN" in rigid floors
Cables	> All types of sheathed cables[5] (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 80 mm > Tied bundles[6] up to 100 mm overall diameter containing sheathed cables (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 21 mm
Conduits	> Steel conduits / tubes, Ø ≤ 16 mm (without cables): steel conduits acc. to EN 61386-21 and / or EN 10305-4 or -6 > Plastic conduits, Ø ≤ 16 (without cables) acc. to EN 61386-21 > Bundles[7] of up to 3 steel conduits (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness ≥ 0,9 mm (for Ø ≤ 20 mm) or ≥ 1,0 mm (for Ø 25 mm) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness ≥ 1,24 mm > Bundles[8] of up to 3 plastic conduits (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness 1,8 mm to 2,2 mm (for polyolefine) or 0,6 to 0,7 mm (for PVC-U) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness 0,2 mm (for polyolefine) or 0,15 mm (for PVC-U)

5 Single or multicore cable with individual insulation of the cores and an additional protective covering of the assembly
6 Several cables running in the same direction, densely packed and bound tightly together by mechanical means
7 Including single penetrations
8 Including single penetrations

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Penetrating element	Construction characteristics of the penetrating element in "FLAMRO® Multi-Kombischott EN" in rigid floors
Plastic pipes	> PVC-U pipes according to EN ISO 1452-1 and DIN 8061 / DIN 8062 with diameters and wall thicknesses as defined in Annex G-5 and G-6 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex H-4 and H-5 of the ETA. > PE-HD pipes according to EN 1519-1 or EN 12666-1 and DIN 8074 / DIN 8075 with diameters and wall thicknesses as defined in Annex G-5 and G-6 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex H-4 and H-5 of the ETA. > PP pipes according to EN ISO 15874-2 and DIN 8077 / DIN 8078 with a diameter and a wall thickness as defined in Annex G-5 of the ETA.
Metal pipes	> Metal pipes of reaction to fire class A1 according to EN 13501-1 with a melting or decomposition point greater or equal than copper (1006 °C for EI 90; 1049 °C for EI 120) and a thermal conductivity smaller or equal than copper with diameters and wall thicknesses as defined in Annex G-2 and G-4 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex H-1 to H-3 of the ETA. > Metal pipes of reaction to fire class A1 according to EN 13501-1 with a melting or decomposition point greater or equal than steel (1006 °C for EI 90; 1049 °C for EI 120) and a thermal conductivity smaller or equal than steel with diameters and wall thicknesses as defined in Annex G-3 and G-4 of the ETA. For interpolation between pipe diameters and wall thicknesses see Annex H-1 to H-3 of the ETA.
Cable support constructions	> Steel cable trays (perforated or non-perforated) > Steel ladders > Steel cable trays (perforated or non-perforated) and steel ladders with organic coatings shall at least be classified A2 according to EN 13501-1

2.2 Use condition

"FLAMRO® Multi-Kombischott EN" is intended for use at temperatures below 0 °C, but with no exposure to rain nor UV, and can therefore – according to EAD 350454-00-1104 clause 2.2.9.3.1 – be categorized as Type Y_2. Since the requirements for Type Y_2 are met, also the requirements for Type Z_1 and Z_2 are fulfilled.

Although a penetration seal is intended for indoor applications only, the construction process may result in it being subjected to more exposed conditions for a period before the building envelope is closed. For this case provisions shall be made to protect temporarily exposed penetration seals according to the ETA-holder's installation instructions.

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2.3 Working life

The provisions made in this European Technical Assessment are based on an assumed working life of "FLAMRO® Multi-Kombischott EN" of 10 years, provided the conditions laid down in the technical literature of the manufacturer relating to packaging, transport, storage, installation, use and repair are met.

The indications given on the intended working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body, but are to be regarded only as a means for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

The real working life might be, in normal use conditions, considerably longer without major degradation affecting the Basic requirements for construction works.

2.4 General assumptions

2.4.1 It is assumed that

- damages to the penetration seal are repaired accordingly,
- the installation of the penetration seal does not affect the stability of the adjacent building element – even in case of fire,
- the lintel or floor above the penetration seal is designed structurally and in terms of fire protection such that no additional mechanical load (other than its own weight) is imposed on the penetration seal,
- the aperture lining within a flexible wall is supported by the studs (transoms and mullions) in such a way that the mechanical load imposed to the aperture lining by the penetration seal does not affect the stability of the aperture lining and the flexible wall,
- the thermal movement in the pipe work will be accommodated in such way that it does not impose a load on the penetration seal,
- the installations are fixed to the adjacent building element (not to the penetration seal) in accordance with the relevant regulations in such a way that, in case of fire, no additional mechanical load is imposed to the penetration seal,
- the support of the installations is maintained for the required period of fire resistance and
- pneumatic dispatch systems, compressed air systems, etc. are switched off by additional means in case of fire.

2.4.2 This European Technical Assessment does not address any risks associated with the emission of dangerous liquids or gases caused by failure of the pipe(s) in case of fire nor does it prove the prevention of the transmission of fire through heat transfer via the medium in the pipes.

2.4.3 This European Technical Assessment does not verify the prevention of destruction of adjacent building elements with fire separating function or of the pipes themselves due to distortion forces caused by extreme temperatures. These risks shall be accounted for by taking appropriate measures when designing or installing the pipe work.

The mounting or hanging of the pipes or the layout of the pipe work shall be implemented in such a way that the pipes and the fire resistant building elements shall remain functional within a period of time which corresponds to the fire resistance period required.

2.4.4 The risk of downward spread of fire caused by burning material which drips through a pipe to floors below, is not considered in this European Technical Assessment (see EN 1366-3:2009, clause 1).

2.4.5 The durability assessment does not take account of the possible effect on the penetration seal of substances permeating through the pipe walls.

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2.4.6 The assessment does not cover the avoidance of destruction of the penetration seal or of the adjacent building element(s) by forces caused by temperature changes in case of fire. This has to be considered when designing the piping system.

2.5 Manufacturing

The European Technical Assessment is issued for the product on the basis of agreed data / information, deposited with the Österreichisches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data / information being incorrect, should be notified to the Österreichisches Institut für Bautechnik before the changes are introduced.

The Österreichisches Institut für Bautechnik will decide whether or not such changes affect the European Technical Assessment and consequently the validity of the CE marking on the basis of the European Technical Assessment and if so whether further assessment or alterations to the European Technical Assessment, shall be necessary.

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

Basic requirements for construction works	Essential characteristic	Method of verification	Performance
BWR 2	Reaction to fire	EN 13501-1: 2018	Clause 3.1.1 of the ETA
	Resistance to fire	EN 13501-2: 2016	Clause 3.1.2 of the ETA and Annex D-1 to D-4 and Annex G-1 to G-6 of the ETA
BWR 3	Air permeability	No performance assessed	
	Water permeability	No performance assessed	
	Content, emission and/or release of dangerous substances	No performance assessed	
BWR 4	Mechanical resistance and stability	No performance assessed	
	Resistance to impact / movement	No performance assessed	
	Adhesion	No performance assessed	
	Durability	EAD 350454-00-1104 clause 2.2.9	Clause 3.3.4 of the ETA
BWR 5	Airborne sound insulation	No performance assessed	
BWR 6	Thermal properties	No performance assessed	
	Water vapour permeability	No performance assessed	

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3.1 Safety in case of fire (BWR 2)

3.1.1 Reaction to fire

The components of "FLAMRO® Multi-Kombischott EN" were assessed according to EAD 350454-00-1104 clause 2.2.1 and classified according to EN 13501-1:2018.

Component	Class according to EN 13501-1:2018
FLAMRO® BMA	**E**
FLAMRO® BMS	**E**
FLAMRO® BMK	**E**
FLAMRO® UBB (without self-adhesive layer)	**E**
FLAMRO® BS	**No performance assessed**
RPI-15	**A1**
Intumescent inlay of FLAMRO® Variant N II A	**E**
Sheet steel housing of FLAMRO® Variant N II A	**A1**

3.1.2 Resistance to fire

"FLAMRO® Multi-Kombischott EN" was tested according to EAD 350454-00-1104 clause 2.2.2 and EN 1366-3:2009 in conjunction with EN 1363-1:1999 and EN 1363-1:2012.

Based upon the gained test results and the field of application specified within EN 1366-3:2009 the cable- and/or pipe penetration seal (mixed penetration seal) "FLAMRO® Multi-Kombischott EN" has been classified according to EN 13501-2:2016. The individual fire resistance classes are listed in Annex D-1 to D-4 and Annex G-1 to G-6 of the ETA.

The maximum fire resistance class of the penetration seal in vertical or horizontal separating element depends on the fire resistance class of the penetrating elements. The fire resistance class of the penetration seal is reduced to the fire resistance class of the penetrating element with the lowest fire resistance classification.

The resistance to fire classification listed in Annex D-1 to D-4 and Annex G-1 to G-6 of the ETA is only valid if "FLAMRO® Multi-Kombischott EN" is installed according to Annex A-1 to A-10 of the ETA.

3.2 Hygiene, health and the environment (BWR 3)

3.2.1 Air permeability

No performance assessed.

3.2.2 Water permeability

No performance assessed.

3.2.3 Content, emission and/or release of dangerous substances

No performance assessed.

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3.3 Safety and accessibility in use (BWR 4)

3.3.1 Mechanical resistance and stability

No performance assessed.

3.3.2 Resistance to impact / movement

No performance assessed.

Provisions shall be taken to prevent a person from stepping onto a horizontal penetration seal or falling against a vertical penetration seal (e.g. by covering with a wire mesh).

3.3.3 Adhesion

No performance assessed.

3.3.4 Durability

All components of “FLAMRO® Multi-Kombischott EN” fulfil the requirements for the intended use condition.

“FLAMRO® Multi-Kombischott EN” is therefore appropriate for use at temperatures below 0 °C, but with no exposure to rain nor UV, and can – according to EAD 350454-00-1104 clause 2.2.9.3.1 – be categorized as Type Y_2. Since the requirements for Type Y_2 are met, also the requirements for Type Z_1 and Z_2 are fulfilled.

It is assumed that the sheet steel housing of “FLAMRO® Variant N II A” is sufficiently protected against corrosion by the used type of powder coating.

3.4 Protection against noise (BWR 5)

3.4.1 Airborne sound insulation

No performance assessed.

3.5 Energy economy and heat retention (BWR 6)

3.5.1 Thermal properties

No performance assessed.

3.5.2 Water vapour permeability

No performance assessed.

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

4.1 AVCP system

According to the Decision 1999/454/EC[9], amended by Decision 2001/596/EC[10] of the European Commission the system(s) of assessment and verification of constancy of performance (see Annex V of Regulation (EU) No 305/2011) is given in the following table.

Product(s)	**Intended use(s)**	**Level(s) or class(es)** (resistance to fire)	**System** of assessment and verification of constancy of performance
Fire Stopping and Fire Sealing Products	for fire compartmentation and/or fire protection or fire performance	any	1

In addition, according to the Decision 1999/454/EC, amended by Decision 2001/596/EC of the European Commission the system(s) of assessment and verification of constancy of performance, with regard to reaction to fire, is given in the following table.

Product(s)	**Intended use(s)**	**Level(s) or class(es)** (reaction to fire)	**System** of assessment and verification of constancy of performance
Fire Stopping and Fire Sealing Products	for uses subject to regulations on reaction to fire	A1*, A2*, B*, C*	1
		A1**, A2**, B**, C**, D, E	3
		(A1 to E)***, F	4

* Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material)

** Products/materials not covered by footnote (*)

*** Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of class A1 according to Commission Decision 96/603/EC, as amended)

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the Technical Assessment Body Österreichisches Institut für Bautechnik.

The notified product certification body shall visit the factory at least twice a year for surveillance of the manufacturer.

Issued in Vienna on 26.04.2021
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits
Managing Director

[9] Official Journal of the European Communities no. L 178, 14.7.1999, p. 52
[10] Official Journal of the European Communities no. L 209, 2.8.2001, p. 33

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1 General

> "FLAMRO® Multi-Kombischott EN" can be used in apertures in walls (vertical separating element) and floors (horizontal separating element) according to clause 2.1 of the ETA.

> The penetration of cables, conduits / tubes, metal pipes, plastic pipes and cable support constructions according to clause 2.1 of the ETA is permitted.

> The total cross section of the installations (including insulation and cable support constructions) must not be more than 60 % of the opening size of the penetration seal.

> Each metal pipe or plastic pipe which is to be sealed off has to be protected separately by the appropriate additional precaution as described in Annex A-5 to Annex A-9 of the ETA.

1.1 Pipe end configuration

> For plastic pipes insulated with "Armaflex Protect" classified with pipe end configuration U/C the pipe end configuration can be U/C, C/C.

> For plastic pipes equipped with "FLAMRO® Variant N II A" classified with pipe end configuration U/U the pipe end configuration can be U/U, C/U, U/C, C/C.

> For metal pipes insulated with "Armaflex Protect" or "ProRox PS 960" / "Rockwool 880" classified with pipe end configuration C/U the pipe end configuration can be C/U and C/C.

> Plastic conduits were tested C/C.

> Steel conduits / tubes were tested C/C.

1.2 Orientation of the penetrating elements

> Conduits / tubes, metal pipes and plastic pipes have to be installed perpendicular to the surface of the penetration seal.

1.3 Service support constructions

> All types of cables, conduits / tubes, metal pipes and plastic pipes – in flexible walls and rigid walls – have to be supported on both side of the separating element by steel cable trays (perforated or non-perforated), steel ladders or alternative service support constructions (e.g. pipe hangers) made of metal with a melting or decomposition point greater or equal than 1006 °C for EI 90 or 1049 °C for EI 120 (e.g. stainless steel or galvanized steel) according to the ETA-holder's installation instructions.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-1**

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- All types of cables, conduits / tubes, metal pipes and plastic pipes – in rigid floors – have to be supported at least on the top side of the separating element by steel cable trays (perforated or non-perforated), steel ladders or alternative service support constructions (e.g. pipe hangers) made of metal with a melting or decomposition point greater or equal than 1006 °C for EI 90 or 1049 °C for EI 120 (e.g. stainless steel or galvanized steel) according to the ETA-holder's installation instructions.
- Steel cable trays (perforated or non-perforated) or steel ladders can pass through or end at the surface of the penetration seal.
- Lidded cable trays / trunkings must not pass through the penetration seal.
- For metal pipes insulated with "ProRox PS 960" / "Rockwool 880" the service support constructions (e.g. pipe hangers) can also be installed inside the insulation.
- The first support (service support construction) for cables and conduits / tubes in flexible walls and rigid walls has to be at maximum 250 mm (measured from the surface of the penetration seal).
- The first support (service support construction) for plastic pipes insulated with "Armaflex Protect" and metal pipes insulated with "Armaflex Protect" or "ProRox PS 960" / "Rockwool 880" in flexible walls and rigid walls has to be at maximum 400 mm (measured from the surface of the penetration seal).
- The first support (service support construction) for cables and conduits / tubes in rigid floors has to be at maximum 500 mm (measured from the surface of the penetration seal).
- The first support (service support construction) for plastic pipes insulated with "Armaflex Protect" or equipped with "FLAMRO® Variant N II A" and metal pipes insulated with "Armaflex Protect" or "ProRox PS 960" / "Rockwool 880" in rigid floors has to be at maximum 500 mm (measured from the surface of the penetration seal).
- All types of cables, conduits / tubes, metal pipes and plastic pipes have to be fixed according to the ETA-holder's installation instructions to the service support construction.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-2**

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1.4 Aperture lining

> For flexible walls according to clause 2.1 of the ETA the aperture lining shall be made from steel studs and boards of the same specification as those used in the wall in practice.

> The reveal of the aperture has to be delimited with an all-around trimming made from steel studs (sheet steel profiles) with a thickness of minimum 0,6 mm which are connected to each other and force-fitted at the vertical steel studs (mullions).

> The reveal of the aperture has to be lined with minimum two layers of boards (minimum thickness 15 mm) with classification A2-s1,d0 or A1 according to EN 13501-1 and a width of minimum 130 mm. For flexible walls with a thickness of 122 mm the boards have to be installed centred within the reveal of the aperture so that they protrude the flexible wall by ≥ 4 mm on both sides of the flexible wall. The boards have to be fixed to the all-around trimming (sheet steel profiles) with steel drywall screws with a distance of maximum 200 mm between the steel drywall screws.

> The flexible wall around the reveal of the aperture has to be lined with minimum two layers of boards (minimum thickness 15 mm) with classification A2-s1,d0 or A1 according to EN 13501-1. Each layer has to be fixed separately to the all-around trimming (sheet steel profiles) with steel drywall screws with a distance of maximum 300 mm between the steel drywall screws. The length of the steel drywall screws has to be sufficient so that they project at least 15 mm into the all-around trimming (sheet steel profiles) resp. the flexible wall.

> Joints between the aperture lining and the flexible wall have to be filled with gypsum joint filler (non-combustible material with classification A2-s1,d0 or A1 according to EN 13501-1 which is dimensionally stable) on both sides of the penetration seal according to the ETA-holder's installation instructions.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-3**

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2 Details for installation of "FLAMRO® Multi-Kombischott EN" (see Annex A-1 to H-5 of the ETA)

> "FLAMRO® Multi-Kombischott EN" (including all additional precautions as described in Annex D-1 to D-4 and Annex G-1 to G-6 of the ETA) has to be installed according to the ETA-holder's installation instructions.

> For the installation of "FLAMRO® Multi-Kombischott EN" two layers of mineral wool boards according to clause 1 of the ETA ("FLAMRO® BS" or "RPI-15") with a nominal thickness of 60 mm have to be used.

> In vertical separating elements the two layers of mineral wool boards have to be installed centred within the separating element.

> In horizontal separating elements with a thickness of 150 mm the two layers of mineral wool boards have to be installed flushed to the surface of the separating element. In horizontal separating elements with a thickness > 150 mm the two layers of mineral wool boards have to be installed centred within the separating element.

> The gap between the two layers of mineral wool boards in vertical separating elements has to be 10 mm.

> The gap between the two layers of mineral wool boards in horizontal separating elements has to be 30 mm.

> For penetration seals in vertical separating elements with blank areas of size > 0,43 m² within the penetration seal, the two layers of mineral wool boards of these blank area have to be additionally connected to each other with threaded steel bolts with thread size ≥ M6 (minimum 4 threaded steel bolts / m²) and fixed with washers (outer diameter ≥ 25 mm; inner diameter corresponding to the outer diameter of the threaded steel rods) on both sides and nuts (corresponding to the outer diameter of the threaded steel rods).

> For penetration seals in horizontal separating elements with blank areas of size > 0,32 m² within the penetration seal, the two layers of mineral wool boards of these blank area have to be additionally connected to each other with threaded steel bolts with thread size ≥ M6 (minimum 4 threaded steel bolts / m²) and fixed with washers (outer diameter ≥ 25 mm; inner diameter corresponding to the outer diameter of the threaded steel rods) on both sides and nuts (corresponding to the outer diameter of the threaded steel rods).

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-3**

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- All the edges of the mineral wool boards “FLAMRO® BS” or “RPI-15” or the reveal of the aperture in the area of the mineral wool boards have to be coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of minimum 1 mm (wet layer thickness).
- All mineral wool boards “FLAMRO® BS” or “RPI-15” have to be bonded with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK”.
- Gaps and joints (maximum width 5 mm) between the mineral wool boards as well as the mineral wool boards and the separating element have to be completely filled with “FLAMRO® BMS” / “FLAMRO® BMK” on both sides of the penetration seal.
- Gaps and joints (maximum width 5 mm) between the mineral wool boards and the penetrating elements (cables, conduits / tubes, metal pipes, plastic pipes and cable support constructions) have to be completely filled with “FLAMRO® BMS” / “FLAMRO® BMK” on both sides of the penetration seal.
- For tied cable bundles the space between the cables need not be filled.
- The mineral wool boards have to be coated single-sided on the visible surface with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of minimum 2 mm (total dry layer thickness) on both sides of the penetration seal.
- The transition area between mineral wool boards and the vertical separating element has to be coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of minimum 1 mm (total dry layer thickness) on both sides of the penetration seal so that the layer extends at least 25 mm beyond the mineral wool boards.
- All penetrating elements (cables, conduits / tubes, metal pipes, plastic pipes and cable support constructions) have to be protected by the appropriate additional precautions as described in Annex D-1 to D-4 and Annex G-1 to G-6 of the ETA.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-4**

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3 Additional precautions

3.1 Cables, conduits / tubes and cable support constructions in vertical separating elements and in horizontal separating elements

> All cable trays / cable ladders (plate and flanges), cables, conduits / tubes (including conduit bundles) have to be coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of ≥ 2 mm (total dry layer thickness) at a length of ≥ 250 mm on both sides of the penetration seal (measured from the surface of the penetration seal) and at the penetration area (area below and in between the two mineral wool boards) with a thickness of ≥ 3 mm (total dry layer thickness).

> All conduits / tubes (including conduit bundles) resp. the annular gap between the cable(s) and the conduit / tube has to be filled to a depth of minimum 10 mm on both sides of the penetration seal with “FLAMRO® BMS” / “FLAMRO® BMK”. Empty conduits / tubes (including conduit bundles) have to be filled to a depth of minimum 20 mm on both sides of the penetration seal with “FLAMRO® BMS” / “FLAMRO® BMK” or mineral wool (stone wool with classification A1 according to EN 13501-1, a minimum compacted apparent density of 100 kg/m³ and a melting point > 1000 °C according to DIN 4102-17) and additionally “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of ≥ 2 mm (total dry layer thickness).

> Plastic conduit bundles in vertical separating elements have additionally to be wrapped by one layer “FLAMRO® UBB” (strip thickness 2 mm, two strips with a width ≥ 65 mm) which has to be installed flushed within the penetration seal and if needed additionally fixed with plastic wire or steel wire and coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of ≥ 3 mm (total dry layer thickness).

> Plastic conduit bundles in horizontal separating elements have additionally to be wrapped by two layers “FLAMRO® UBB” (strip thickness 2 mm, two strips with a width ≥ 60 mm) which have to be installed flushed within the penetration seal and if needed additionally fixed with plastic wire or steel wire and coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of ≥ 3 mm (total dry layer thickness).

> Conduit bundles (minimum length on both sides of the penetration seal 350 mm; measured from the surface of the penetration seal) have to be fixed (bound together) on both sides of the penetration seal with at least one winding of steel wire (minimum diameter 2 mm) at maximum 250 mm (measured from the surface of the penetration seal).

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-5**

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3.2 Metal pipes in vertical separating elements and horizontal separating elements

> Metal pipes have to be insulated (local-sustained or continued-sustained) with “Armaflex Protect” or (local-interrupted or continued-interrupted) “ProRox PS 960” / “Rockwool 880” and coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK”.

3.2.1 Installation of “Armaflex Protect“

> The tubes or sheets of “Armaflex Protect” with an overall length of ≥ 2000 mm have to be installed centred in the opening of the penetration seal.

> In vertical separating elements the length of tubes or sheets of “Armaflex Protect” has to be ≥ 935 mm on both sides of the penetration seal (measured from the surface of the penetration seal).

> In horizontal separating elements the length of tubes or sheets of “Armaflex Protect” has to be ≥ 925 mm on both sides of the penetration seal (measured from the surface of the penetration seal).

> The tube or sheet of “Armaflex Protect” used can be continuous along the required minimum insulation length (≥ 2000 mm) or bonded at the centre of the penetration seal whereas the length of each of the two tubes or sheets has to be ≥ 1000 mm.

> For pipes with diameter ≤ 88,9 mm “Armaflex Protect” in form of a tube has to be used. The tube of “Armaflex Protect” can be either pushed onto the pipe or slotted and glued at the longitudinal joint.

> For pipes with diameter > 88,9 mm “Armaflex Protect” in form of a sheet has to be used. The sheet of “Armaflex Protect” has to be wrapped around the pipe, bonded at the longitudinal joint and additionally fixed by a winding wire (steel wire with diameter ≥ 2 mm; minimum 6 windings per meter) in place.

> When installing “Armaflex Protect” all butt joints and longitudinal joints have to be glued with “Armaflex 520” and covered with “Armaflex Band selbstklebend” (Armaflex self-adhesive tape).

> The amount of “Armaflex 520” shall not be more than 300 g/m².

> The strip of “Armaflex Band selbstklebend” (Armaflex self-adhesive tape) has to be 50 mm x 3 mm (width x thickness).

> The thickness of the tube or sheet of “Armaflex Protect” has to be – depending on the relevant pipe to be sealed off – 16 mm, 19 mm, 20 mm, 25 mm or 26 mm (for details see Annex D-2 and Annex G-2 to G-3 of the ETA).

> The tubes or sheets have to be coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of ≥ 2 mm (total dry layer thickness) at a length of ≥ 100 mm on both sides of the penetration seal (measured from the surface of the penetration seal).

> For further details see technical literature of the manufacturer.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-6**

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3.2.2 Installation of “ProRox PS 960” / “Rockwool 880”

> “ProRox PS 960” / “Rockwool 880” with a length of ≥ 1000 mm (measured from the surface of the penetration seal) has to be installed on both sides of the penetration seal.

> The longitudinal joints of “ProRox PS 960” / “Rockwool 880” have to be fully bonded with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of minimum 1 mm (wet layer thickness).

> “ProRox PS 960” / “Rockwool 880” has to be fully bonded to the surface of the penetration seal with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of minimum 1 mm (wet layer thickness).

> “ProRox PS 960” / “Rockwool 880” has to be fixed along the required minimum insulation length by a winding wire (steel wire with diameter ≥ 2 mm; minimum 3 windings per meter; first winding at a distance of 100 mm – measured from the surface of the separating element; last winding at a distance of 100 mm – measured from the edge of the insulation; windings in between shall be equally distributed) on both sides of the separating element in place.

> The thickness of “ProRox PS 960” / “Rockwool 880” has to be – depending on the relevant pipe to be sealed off – 30 mm or 40 mm (for details see Annex D-3 and Annex G-4 of the ETA).

> “ProRox PS 960” / “Rockwool 880” has to be coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of ≥ 2 mm (total dry layer thickness) at a length of ≥ 100 mm on both sides of the penetration seal (measured from the surface of the penetration seal).

> For further details see technical literature of the manufacturer.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-7**

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3.3 Plastic pipes in vertical separating elements and horizontal separating elements

> Plastic pipes have to be insulated (local-sustained or continued-sustained) with “Armaflex Protect” and coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” or equipped with “FLAMRO® Variant N II A” (only valid for horizontal separating elements; see Annex G-6 of the ETA).

3.3.1 Installation of “Armaflex Protect”

> The tubes or sheets of “Armaflex Protect” with an overall length of ≥ 2000 mm have to be installed centred in the opening of the penetration seal.

> In vertical separating elements the length of tubes or sheets of “Armaflex Protect” has to be ≥ 935 mm on both sides of the penetration seal (measured from the surface of the penetration seal).

> In horizontal separating elements the length of tubes or sheets of “Armaflex Protect” has to be ≥ 925 mm on both sides of the penetration seal (measured from the surface of the penetration seal).

> The tube or sheet of “Armaflex Protect” used can be continuous along the required minimum insulation length (≥ 2000 mm) or bonded at the centre of the penetration seal whereas the length of each of the two tubes or sheets has to be ≥ 1000 mm.

> For pipes with diameter ≤ 88,9 mm “Armaflex Protect” in form of a tube has to be used. The tube of “Armaflex Protect” can be either pushed onto the pipe or slotted and glued at the longitudinal joint.

> When installing “Armaflex Protect” all butt joints and longitudinal joints have to be glued with “Armaflex 520” and covered with “Armaflex Band selbstklebend” (Armaflex self-adhesive tape).

> The amount of “Armaflex 520” shall not be more than 300 g/m².

> The strip of “Armaflex Band selbstklebend” (Armaflex self-adhesive tape) has to be 50 mm x 3 mm (width x thickness).

> The thickness of the tube or sheet of “Armaflex Protect” has to be – depending on the relevant pipe to be sealed off – 20 mm or 25 mm (for details see Annex D-4 and Annex G-5 of the ETA).

> The tubes or sheets have to be coated with “FLAMRO® BMA” or “FLAMRO® BMS” / “FLAMRO® BMK” with a thickness of ≥ 2 mm (total dry layer thickness) at a length of ≥ 100 mm on both sides of the penetration seal (measured from the surface of the penetration seal).

> For further details see technical literature of the manufacturer.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-8**

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3.3.2 Installation of “FLAMRO® Variant N II A”

> Plastic pipes in horizontal separating elements have to be equipped with “FLAMRO® Variant N II A”.

> The smallest pipe collar corresponding to the relevant outer diameter of the pipe to be sealed off has to be used (see Annex B-1 of the ETA).

> In horizontal separating elements the pipe collars have to be installed at the bottom side of the penetration seal.

> The pipe collars in horizontal separating elements have to be fixed by threaded steel bolts (thread size M6 for type DN 32 to DN 75 or thread size M8 for type DN 90 to DN 160, corresponding to the diameter of the bores within the fixing lugs; length ≥ thickness of the penetration seal) and on both sides of the penetration seal with washers and nuts (corresponding to the outer diameter of the threaded steel bolts).

> In horizontal separating elements the cavity (for a gap width of 30 mm) between the two mineral wool boards (pre-coated mineral wool board “FLAMRO® BS” or mineral wool board “RPI-15”) where the threaded steel bolts pass through the penetration seal has to be filled with a piece of mineral wool board “RPI-15” of dimension ≥ 60 mm x ≥ 60 mm x gap width (w x h x th).

> The number of fixing lugs shall not be reduced.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-9**

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4 Minimum working clearances

> The minimum working clearances are defined in Annex C-1 and Annex F-1 of the ETA.

5 Subsequent addition (retrofitting) and removal

> Subsequent addition (retrofitting) and removal of cables, conduits / tubes, pipes and cable support constructions according to the ETA holder's installation instructions is permitted.

> Retrofitting shall be done according to the ETA holder's installation instructions and the regulations of Annex A-3, clause 2 of the ETA.

> If cables, conduits / tubes, pipes and cable support constructions are removed the remaining opening (hole) has to be completely closed with a fitting piece of "FLAMRO® BS" or "RPI-15" (nominal thickness 60 mm) on both sides of the penetration seal according to the ETA-holder's installation instructions. Gaps and joints (maximum width 5 mm) between the adjusted piece of "FLAMRO® BS" or "RPI-15" and the mineral wool boards have to be completely filled with "FLAMRO® BMS" / "FLAMRO® BMK" on both sides of the penetration seal. The fitted piece of "FLAMRO® BS" or "RPI-15" has to be coated on the visible surface with "FLAMRO® BMA" or "FLAMRO® BMS" / "FLAMRO® BMK" with a thickness of minimum 2 mm (total dry layer thickness) on both sides of the penetration seal.

6 Transport and storage

> The indications of the manufacturer regarding transport and storage (minimum and maximum storing temperature, maximum duration of storage) have to be followed.

7 Use, maintenance and repair

> The fire resistance of the penetration seal shall not be negatively affected by future changes to buildings or building elements.

> The assessment of the fitness for use is based on the assumption that necessary maintenance and repair if required is carried out in accordance with the manufacturer's instructions during the assumed intended working life.

FLAMRO® Multi-Kombischott EN **- Details for installation -**	**ANNEX A-10**

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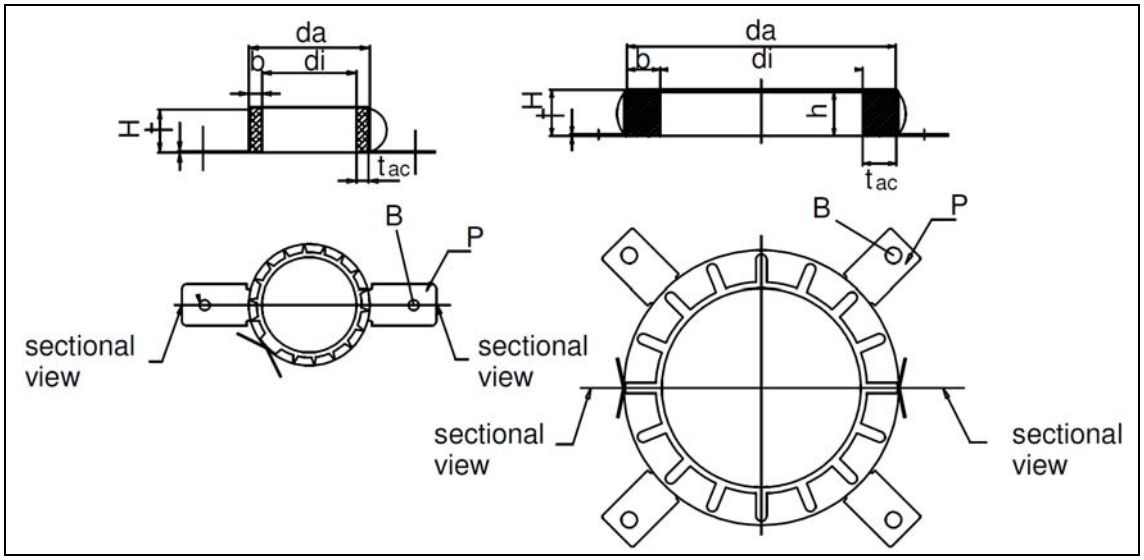


collar						active component		fixing lugs	
type (DN)	**di** (mm)	**da** (mm)	**H** (mm)	**t** (mm)	**b** (mm)	**t_{ac}** (mm)	**h** (mm)	**P** (pcs)	**B** (mm)
32	36	50	26,0	0,6	7,0	6,4 ± 0,5	25,4	2	6,0
40	44	58	26,0	0,6	7,0	6,4 ± 0,5	25,4	2	6,0
50	54	68	26,0	0,6	7,0	6,4 ± 0,5	25,4	2	6,0
63	67	94	26,0	0,6	13,5	12,8 ± 1,0	25,4	4	6,0
75	79	106	26,0	0,6	13,5	12,8 ± 1,0	25,4	4	6,0
90	94	132	26,6	1,1	18,3	19,2 ± 1,0	25,4	4	9,0
110	114	155	26,6	1,1	20,5	19,2 ± 1,5	25,4	4	9,0
125	129	172	40,0	1,1	28,0	25,6 -0/+2,0	38,1	4	9,0
140	144	200	40,0	1,1	28,0	25,6 -0/+2,0	38,1	6	9,0
160	164	220	40,0	1,1	28,0	25,6 -0/+2,0	38,1	6	9,0

di…inner diameter of collar
da…outer diameter of collar
H…height of collar
t…thickness of sheet steel
b…width of sheet steel
t_{ac} …thickness of active component
h…height of active component
P…number of fixing lugs
B…diameter of bores
dimensions of fixing lugs 35 mm x 20 mm (length x width)

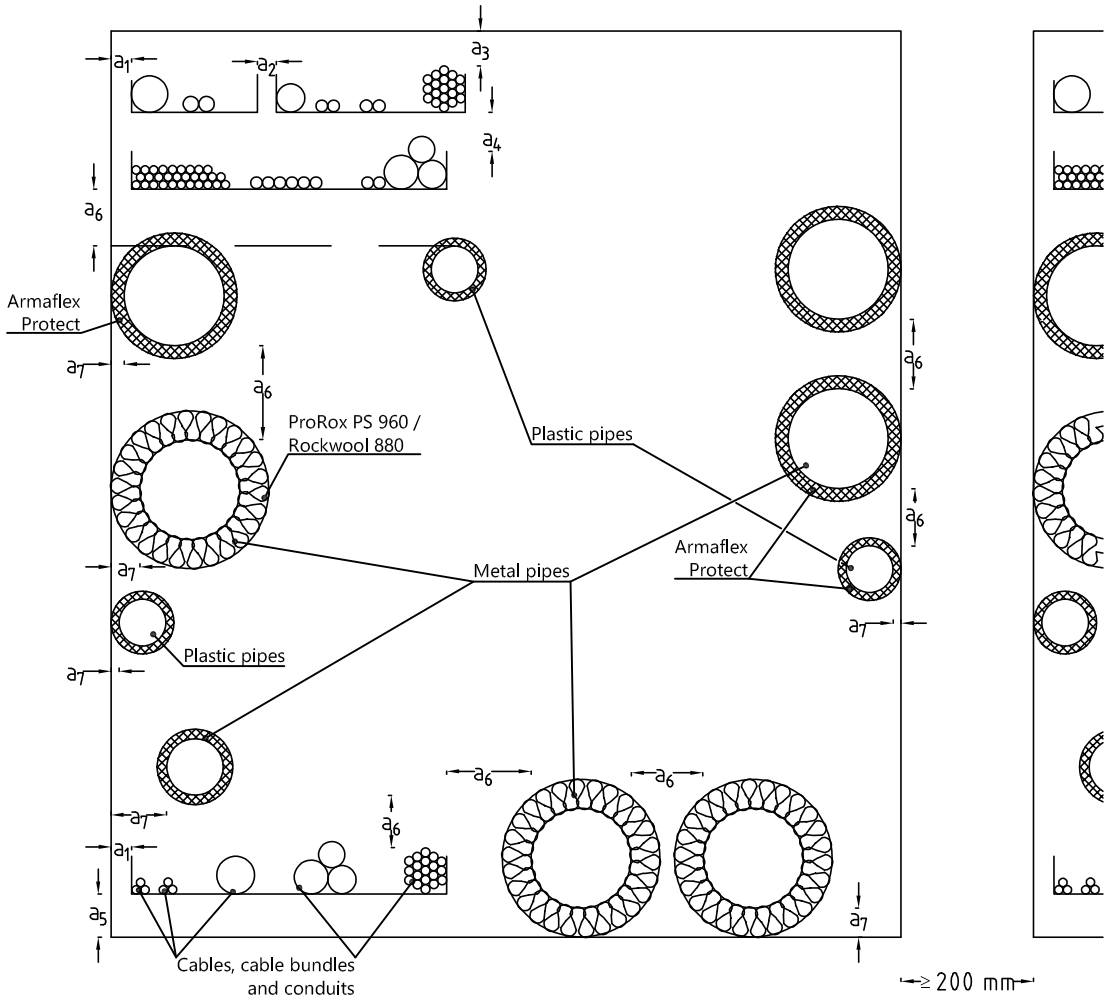
FLAMRO® Multi-Kombischott EN

- Description of "FLAMRO® Variant N II A" -

ANNEX B-1

Member of EOTA

FLAMRO® Multi-Kombischott EN in flexible walls and rigid walls according to clause 2.1 of the ETA – Minimum working clearances / Installation drawing – top view



Minimum working clearances:

$a_1 \geq 0$ mm
$a_2 \geq 0$ mm
$a_3 \geq 41$ mm
$a_4 \geq 60$ mm
$a_5 \geq 0$ mm
$a_6 \geq 100$ mm, measured from the surfaces of the pipes
$a_7 \geq 0$ mm, measured from surfaces of the pipe insulations

rigid and flexible plastic conduits and rigid steel conduits Ø ≤ 16 mm:
to rigid and flexible plastic conduits and rigid steel conduits, Ø ≤ 16 mm, ≥ 0 mm,
to conduits/ conduit bundles ≥ 63 mm,
to cables ≥ 0 mm,
to plastic and metal pipes ≥ 100 mm,
to the reveals ≥ 0 mm,
conduit bundles:
to condiut bundles ≥ 63 mm,
to cables ≥ 72 mm,
to plastic and metal pipes ≥ 100 mm
to the reveals ≥ 0 mm

Horizontal and vertical distances / minimum working clearances – regarding penetrating elements – not given in the installation drawing have to be ≥ 100 mm in practice

FLAMRO® Multi-Kombischott EN - Installation in flexible wall / rigid wall -	ANNEX C-1

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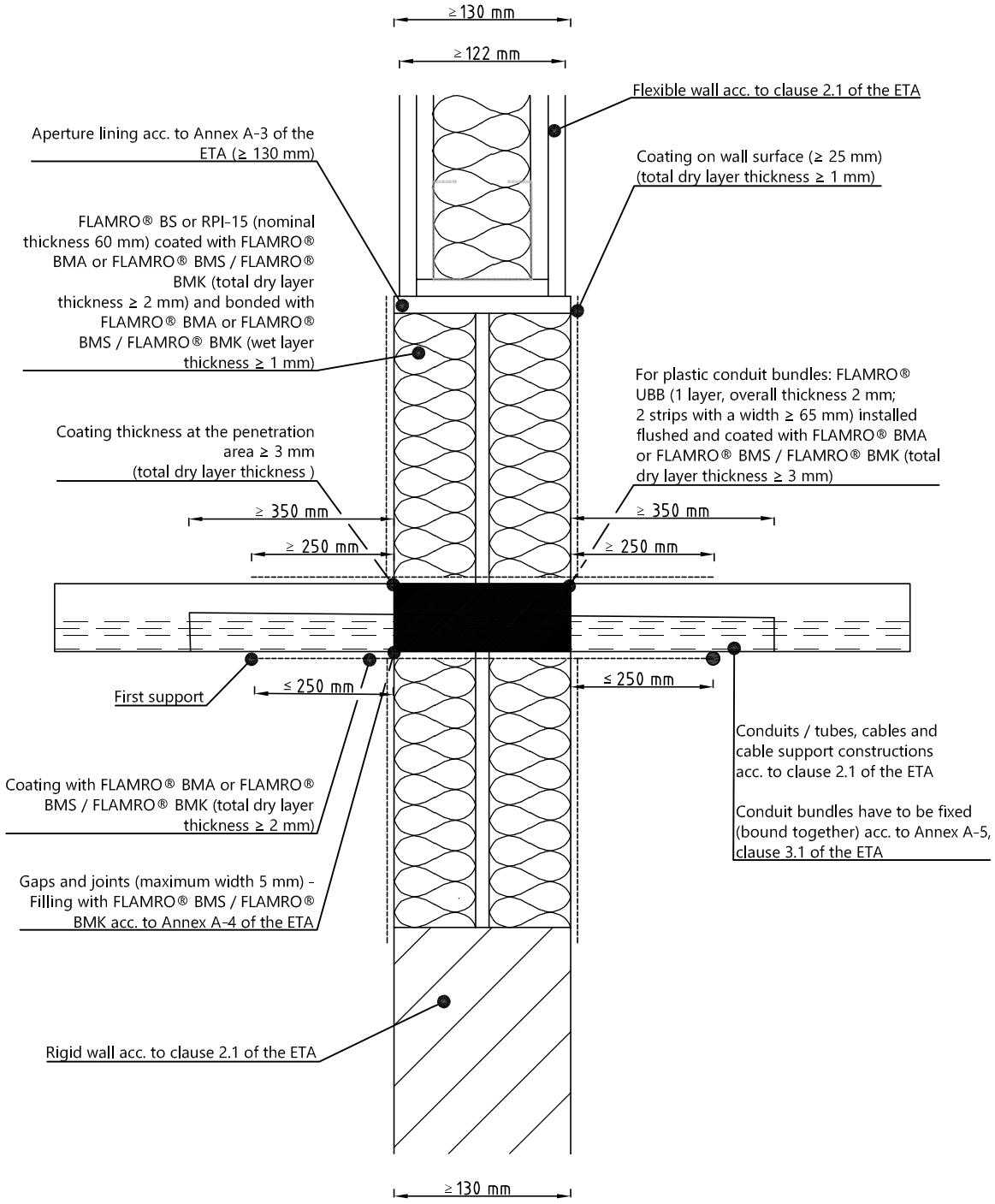
FLAMRO® Multi-Kombischott EN in flexible walls and rigid walls according to clause 2.1 of the ETA – penetrated by cables and conduits / tubes according to clause 2.1 of the ETA – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN - Installation in flexible wall and rigid wall -	ANNEX C-2

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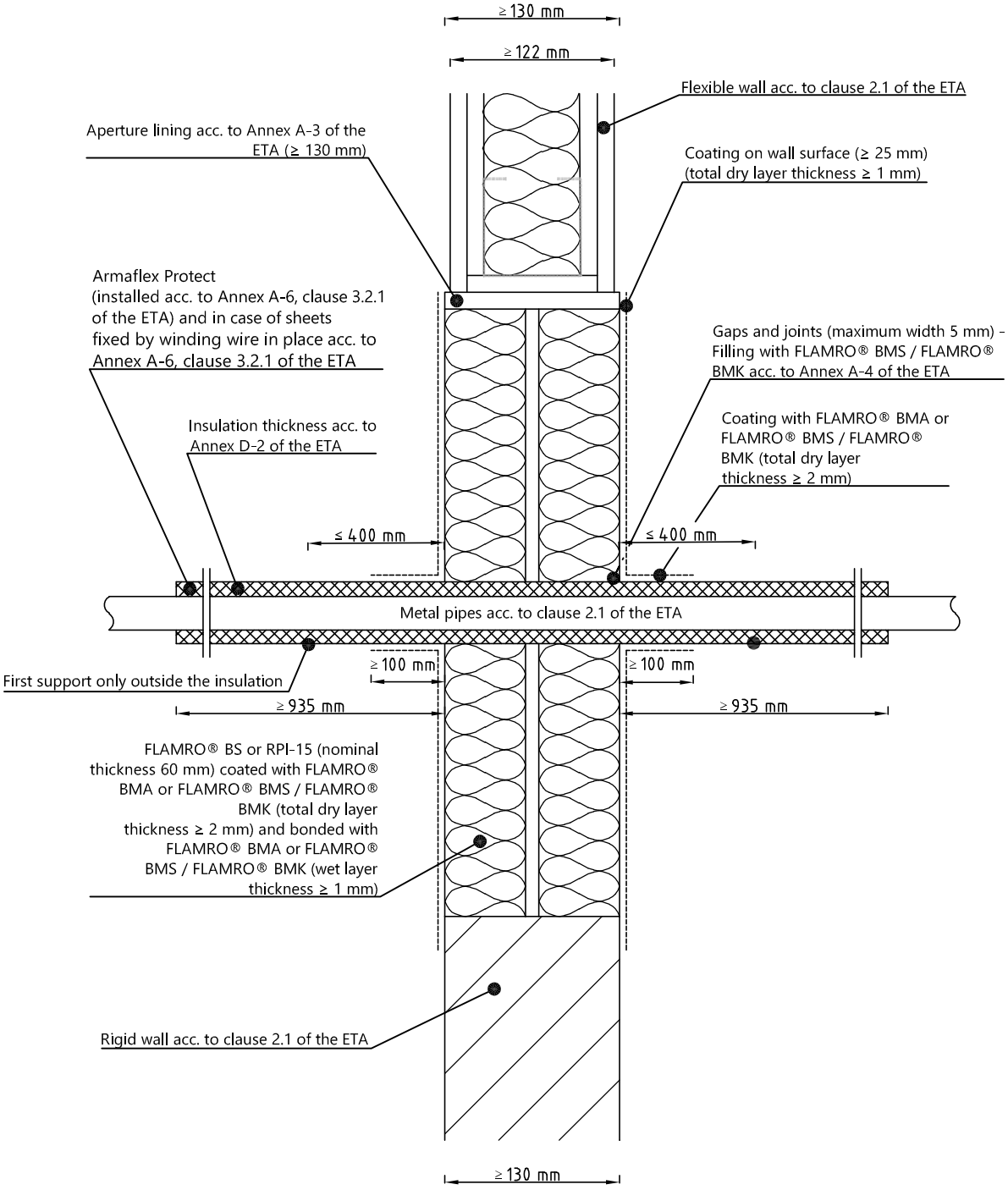
FLAMRO® Multi-Kombischott EN in flexible walls and rigid walls according to clause 2.1 of the ETA – penetrated by metal pipes according to clause 2.1 of the ETA insulated with "Armaflex Protect" – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN **- Installation in flexible wall and rigid wall -**	**ANNEX C-3**

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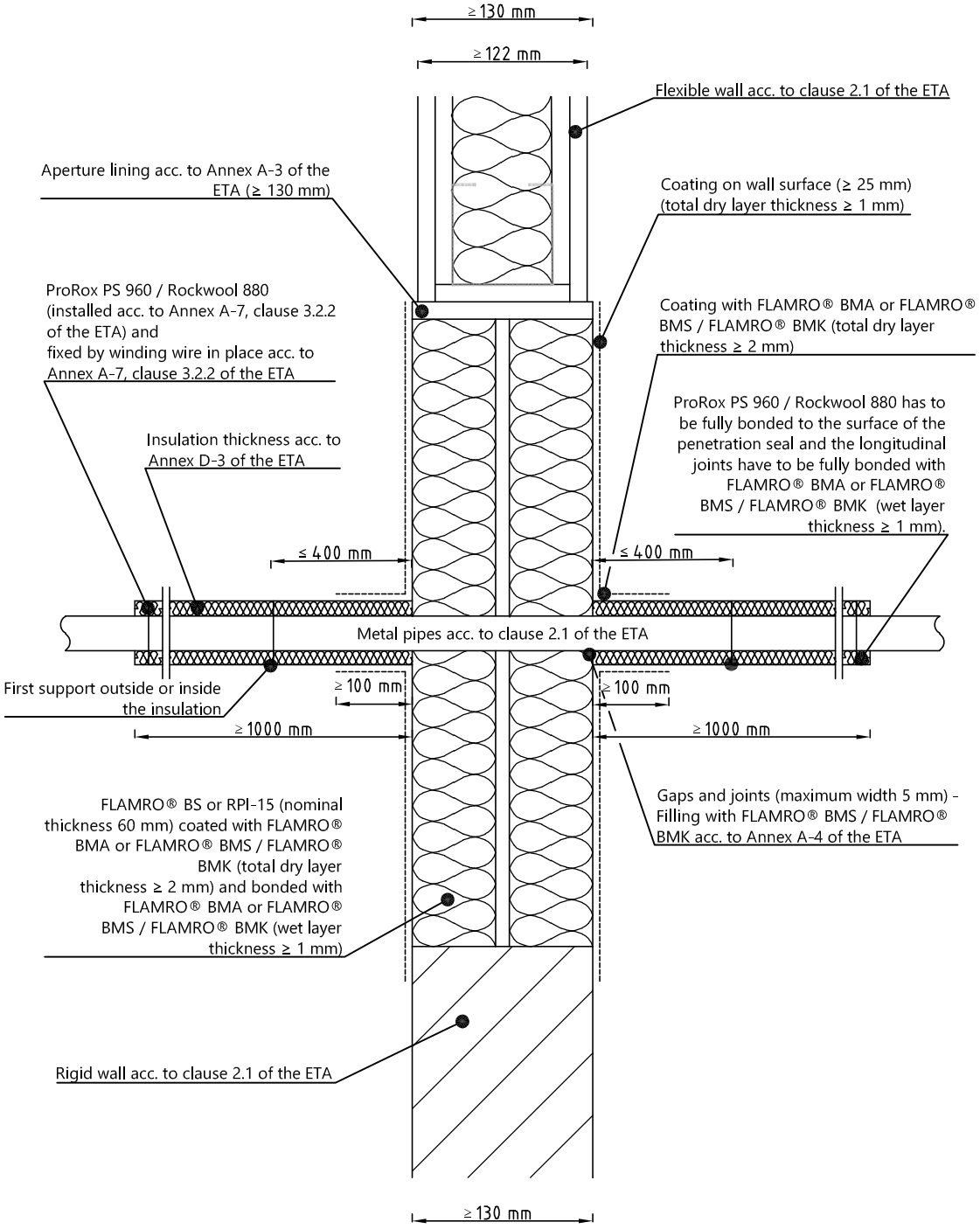
FLAMRO® Multi-Kombischott EN in flexible walls and rigid walls according to clause 2.1 of the ETA – penetrated by metal pipes according to clause 2.1 of the ETA insulated with "ProRox PS 960" / "Rockwool 880" – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN - Installation in flexible wall and rigid wall -	ANNEX C-4

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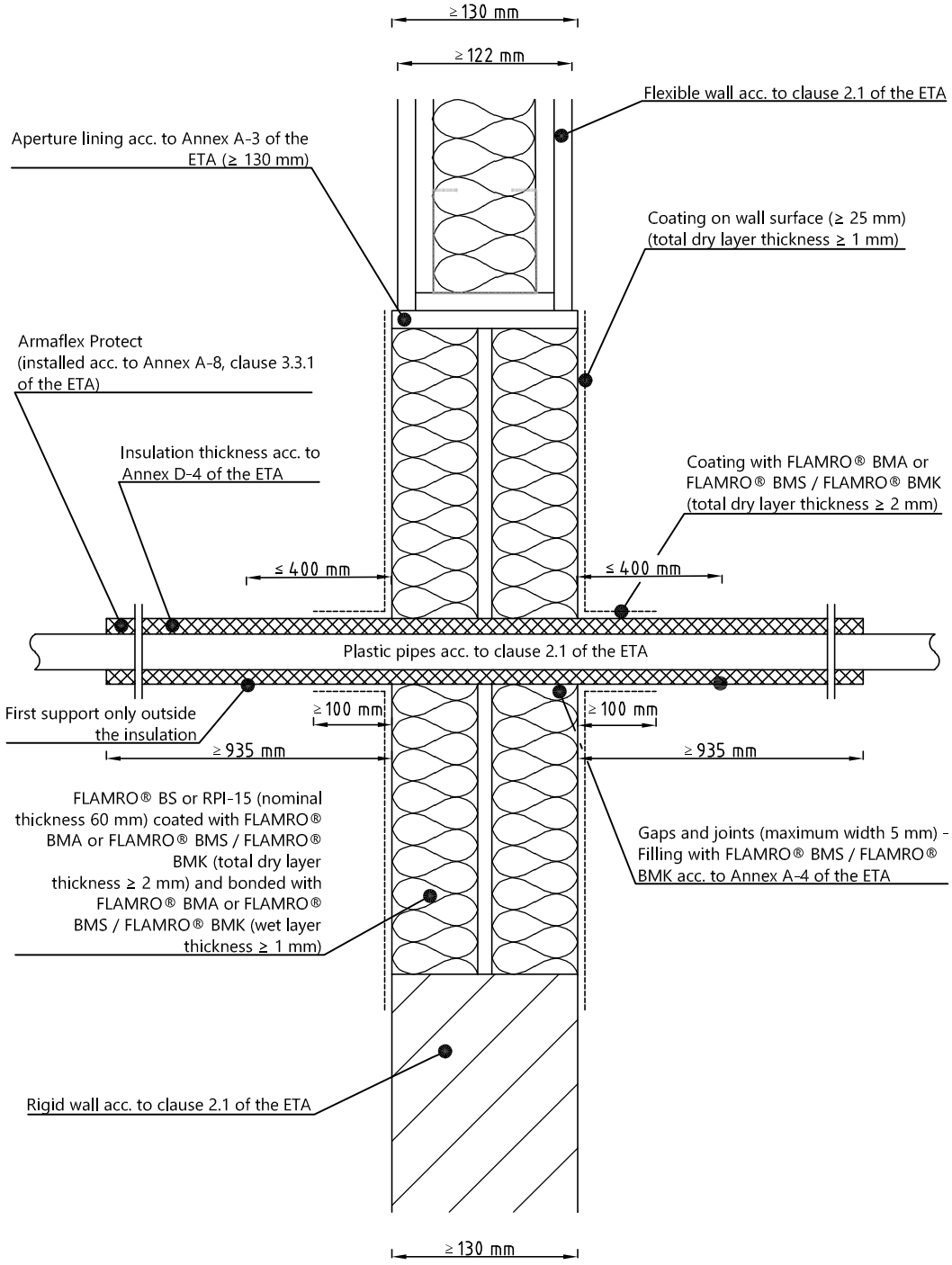
FLAMRO® Multi-Kombischott EN in flexible walls and rigid walls according to clause 2.1 of the ETA – penetrated by plastic pipes according to clause 2.1 of the ETA insulated with "Armaflex Protect" – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN - Installation in flexible wall and rigid wall -	ANNEX C-5

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FLAMRO® Multi-Kombischott EN penetrated by cables and / or conduits / tubes acc. to cl. 2.1 of the ETA – installed in flexible walls and rigid walls acc. to cl. 2.1 of the ETA	
Penetrating elements	**Fire resistance classification**
All types of sheathed cables (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 80 mm	EI 90 E 120
Tied bundles up to 100 mm overall diameter containing sheathed cables (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 21 mm	EI 120 E 120
Steel conduits / tubes, Ø ≤ 16 mm (without cables): steel conduits acc. to EN 61386-21 and / or EN 10305-4 or -6	EI 120 E 120
Plastic conduits, Ø ≤ 16 (without cables) acc. to EN 61386-21	EI 120 E 120
Bundles of up to 3 steel conduits (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness ≥ 0,9 mm (for Ø ≤ 20 mm) or ≥ 1,0 mm (for Ø 25 mm) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness ≥ 1,24 mm	EI 120 E 120
Bundles of up to 3 plastic conduits* (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness 1,8 mm to 2,2 mm (for polyolefine) or 0,6 mm to 0,7 mm (for PVC-U) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness 0,2 mm (for polyolefine) or 0,15 mm (for PVC-U)	EI 120 E 120
Note: The fire resistance class of "FLAMRO® Multi-Kombischott EN" - when penetrated by sheathed cables with classification EI 90 / E 120 - is **EI 90 / E 120**	

* wrapped on both sides of the penetration seal with "FLAMRO® UBB"

FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX D-1**

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FLAMRO® Multi-Kombischott EN penetrated by metal pipes acc. to cl. 2.1 of the ETA insulated on both sides of the penetration seal with "Armaflex Protect" (local-sustained LS or continued-sustained CS) – installed in flexible walls and rigid walls acc. to cl. 2.1 of the ETA		
Penetrating elements* **Copper pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 8 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 16 mm	EI 120-C/U E 120-C/U
Outer diameter > 8 mm to 15 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 19 mm	EI 120-C/U E 120-C/U
Outer diameter > 15 mm to 25 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 88,9 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 25 mm	EI 120-C/U E 120-C/U
Penetrating elements* **Steel pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 8 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 16 mm	EI 120-C/U E 120-C/U
Outer diameter > 8 mm to 15 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 19 mm	EI 120-C/U E 120-C/U
Outer diameter > 15 mm to 25 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 88,9 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 25 mm	EI 120-C/U E 120-C/U
Outer diameter > 88,9 mm to 168,3 mm Wall thickness > 2,0 mm to 14,2 mm	Armaflex Protect (sheet): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 26 mm (double layer – 2 x 13 mm)	EI 90-C/U E 120-C/U
Note: The fire resistance class of "FLAMRO® Multi-Kombischott EN" - when penetrated by steel pipes with classification EI 90 / E 120 - is **EI 90 / E 120**		

* For interpolation between pipe diameters and wall thicknesses see Annex E-1 of the ETA.
** required minimum insulation length (measured from the surface of the penetration seal)

FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX D-2**

electronic copy

FLAMRO® Multi-Kombischott EN penetrated by metal pipes acc. to cl. 2.1 of the ETA insulated on both sides of the penetration seal with "ProRox PS 960" / "Rockwool 880" (local-interrupted LI or continued-interrupted CI) – installed in flexible walls and rigid walls acc. to cl. 2.1 of the ETA		
Penetrating elements* **Copper pipes:**	**Additional precaution: "ProRox PS 960" / "Rockwool 880"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm**, on both sides of the penetration seal Thickness 30 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 88,9 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm**, on both sides of the penetration seal Thickness 40 mm	EI 120-C/U E 120-C/U
Penetrating elements* **Steel pipes:**	**Additional precaution: "ProRox PS 960" / "Rockwool 880"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm**, on both sides of the penetration seal Thickness 30 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 168,3 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm**, on both sides of the penetration seal Thickness 40 mm	EI 120-C/U E 120-C/U

* For interpolation between pipe diameters and wall thicknesses see Annex E-2 of the ETA.
** required minimum insulation length (measured from the surface of the penetration seal)

FLAMRO® Multi-Kombischott EN - Fire resistance classification -	ANNEX D-3

electronic copy

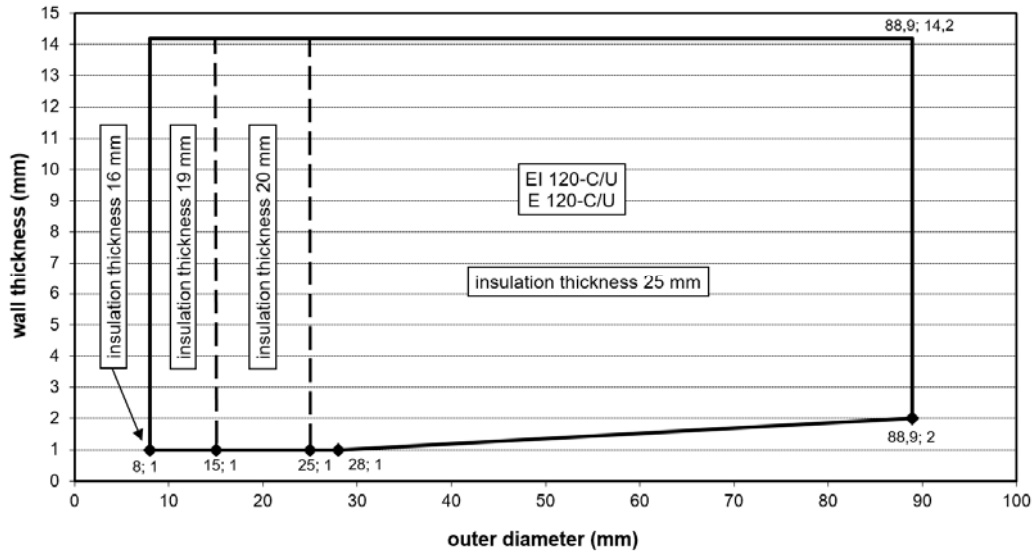
FLAMRO® Multi-Kombischott EN penetrated by plastic pipes acc. to cl. 2.1 of the ETA insulated on both sides of the penetration seal with "Armaflex Protect" (local-sustained LS or continued-sustained CS) – installed in flexible walls and rigid walls acc. to cl. 2.1 of the ETA		
Penetrating elements* **PVC-U pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 1,5 mm to 2,8 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-U/C E 120-U/C
Outer diameter 32 mm to 75 mm Wall thickness 1,8 mm to 5,6 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 25 mm	EI 120-U/C E 120-U/C
Penetrating elements* **PE-HD pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 20 mm to 25 mm Wall thickness 1,9 mm to 2,3 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-U/C E 120-U/C
Outer diameter 32 mm to 75 mm Wall thickness 1,9 mm to 6,8 mm	Length ≥ 2000 mm, sustained Thickness 25 mm	EI 120-U/C E 120-U/C
Penetrating elements **PP pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 2,3 mm	Armaflex Protect (tube): Length ≥ 935 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-U/C E 120-U/C

* For interpolation between pipe diameters and wall thicknesses see Annex E-3 of the ETA.
** required minimum insulation length (measured from the surface of the penetration seal)

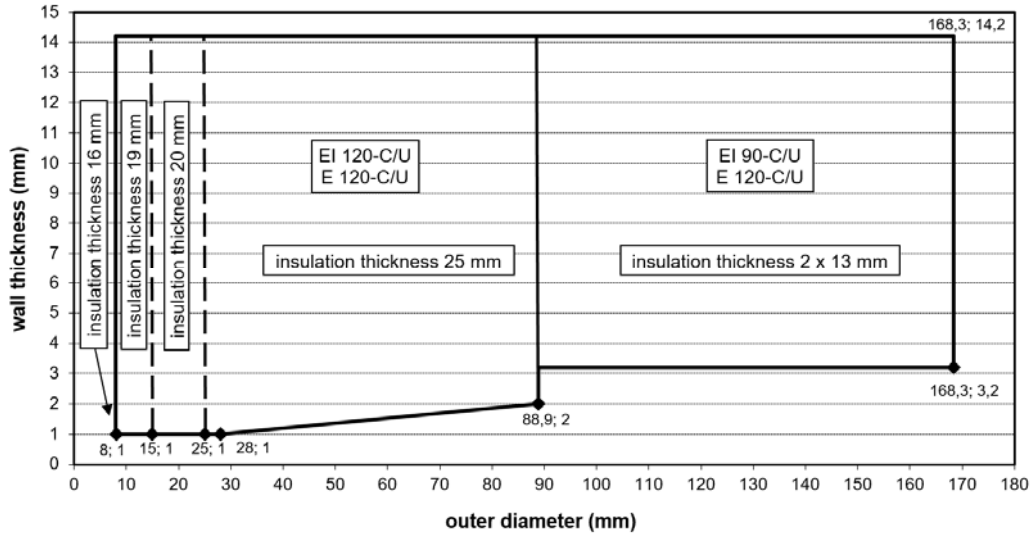
FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX D-4**

electronic copy

**Copper pipes – insulated on both sides of the penetration seal with "Armaflex Protect"
(length ≥ 935 mm, LS or CS) – in flexible walls and rigid walls**



**Steel pipes – insulated on both sides of the penetration seal with "Armaflex Protect"
(length ≥ 935 mm, LS or CS) – in flexible walls and rigid walls**



Note: The given graphs and therein enclosed fire resistance classes according to EN 13501-2:2016 are only valid for metal pipes according to clause 2.1 of the ETA.

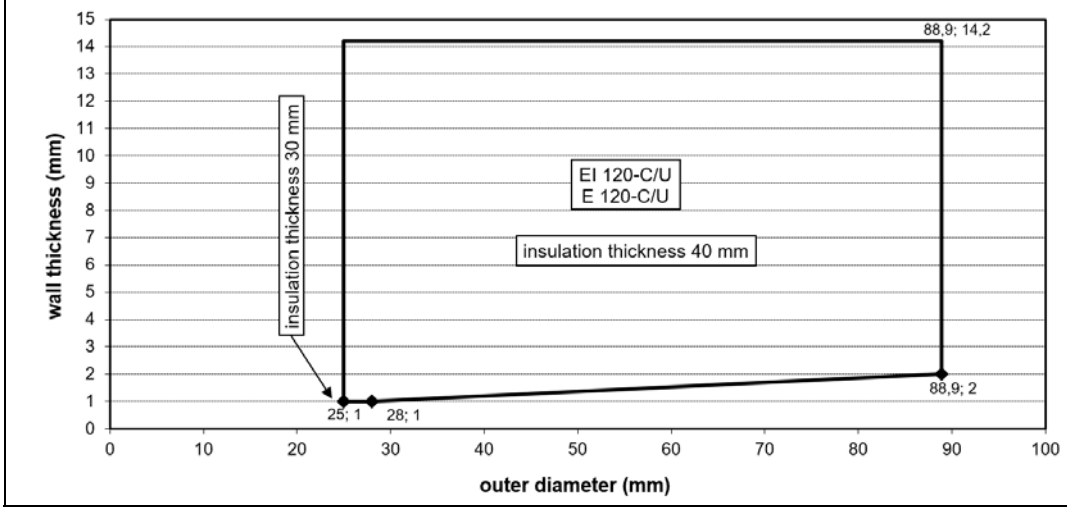
Note: The dashed vertical lines mark the upper limits of the required insulation thickness. The drawn vertical line marks the limit of the fire resistance classes.

Note: The dimensions of the graphs are not true to scale.

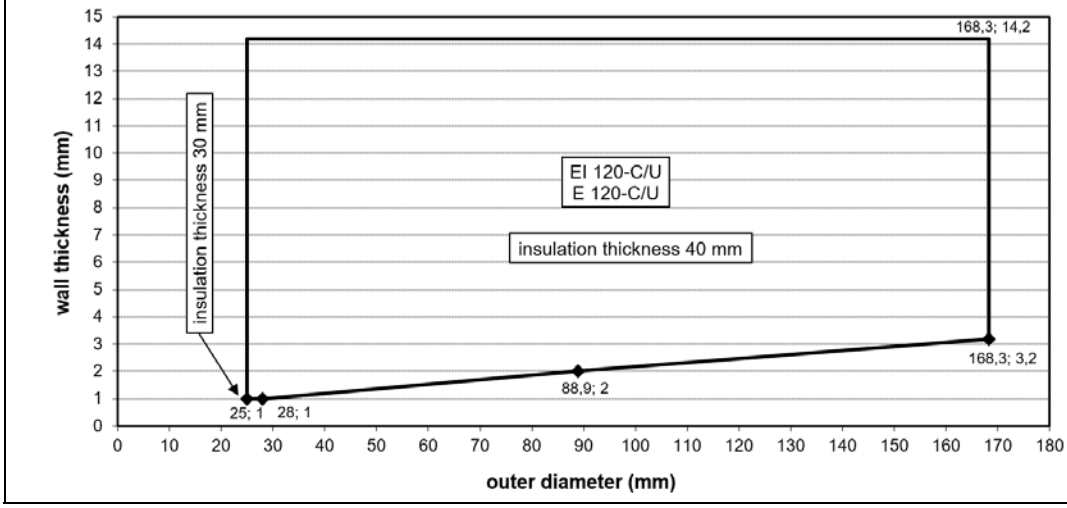
Interpolation between pipe diameters and wall thicknesses for metal pipes according to clause 2.1 of the ETA in flexible walls and rigid walls	**ANNEX E-1**

electronic copy

Copper pipes – insulated on both sides of the penetration seal with "ProRox PS 960" / "Rockwool 880" (length ≥ 1000 mm, LI or CI) – in flexible walls and rigid walls



Steel pipes – insulated on both sides of the penetration seal with "ProRox PS 960" / "Rockwool 880" (length ≥ 1000 mm, LI or CI) – in flexible walls and rigid walls



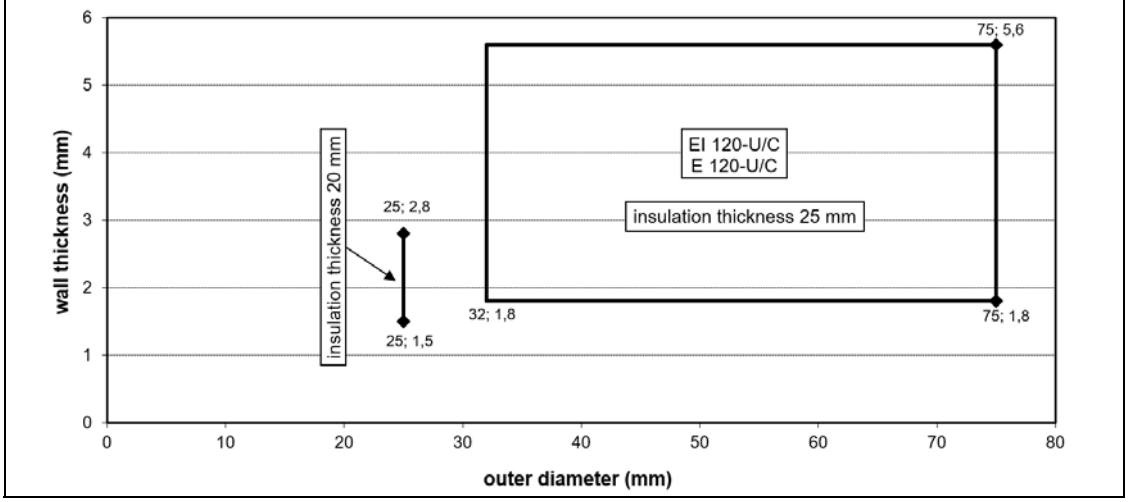
Note: The given graphs and therein enclosed fire resistance classes according to EN 13501-2:2016 are only valid for metal pipes according to clause 2.1 of the ETA.

Note: The dimensions of the graphs are not true to scale.

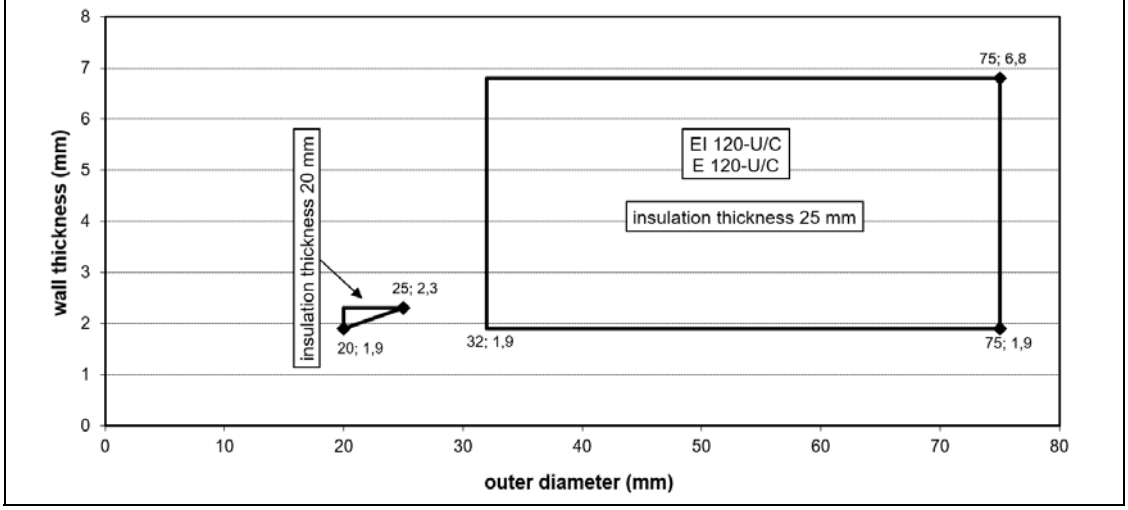
Interpolation between pipe diameters and wall thicknesses for metal pipes according to clause 2.1 of the ETA in flexible walls and rigid walls	**ANNEX E-2**

Member of EOTA

PVC-U pipes – insulated on both sides of the penetration seal with "Armaflex Protect" (length ≥ 935 mm, LS or CS) – in flexible walls and rigid walls



PE-HD pipes – insulated on both sides of the penetration seal with "Armaflex Protect" (length ≥ 935 mm, LS or CS) – in flexible walls and rigid walls



Note: The given graphs and therein enclosed fire resistance classes according to EN 13501-2:2016 are only valid for plastic pipes according to clause 2.1 of the ETA.

Note: The dimensions of the graphs are not true to scale.

Interpolation between pipe diameters and wall thicknesses for plastic pipes according to clause 2.1 of the ETA in flexible walls and rigid walls	**ANNEX E-3**

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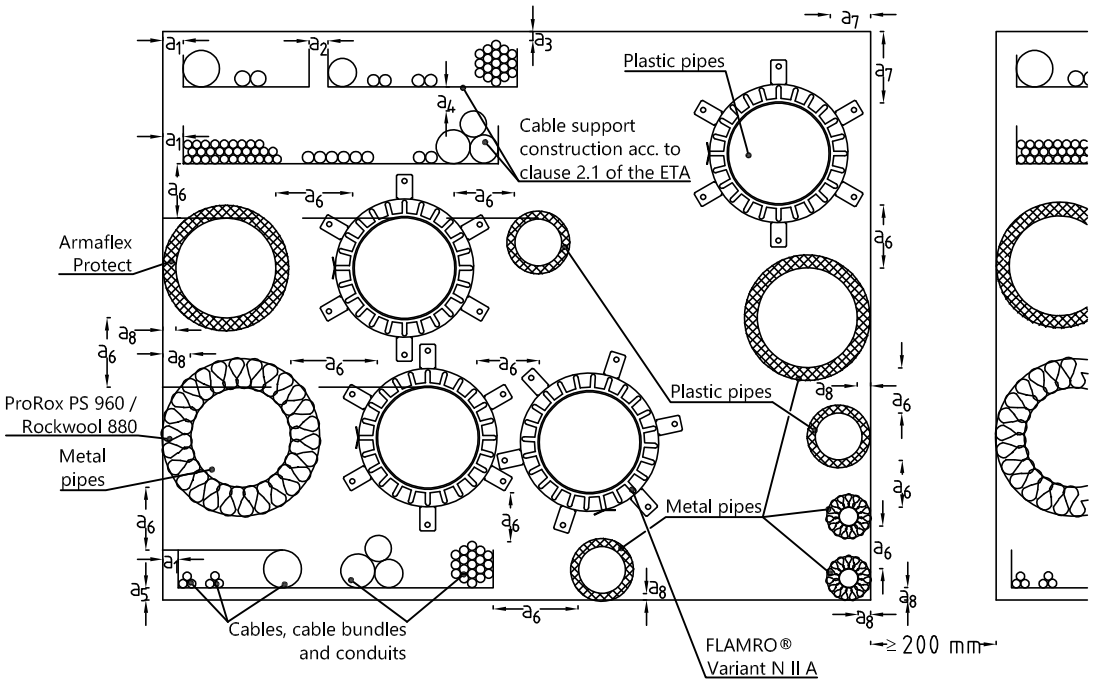
FLAMRO® Multi-Kombischott EN in rigid floors according to clause 2.1 of the ETA – Minimum working clearances / Installation drawing – top view



Minimum working clearances:

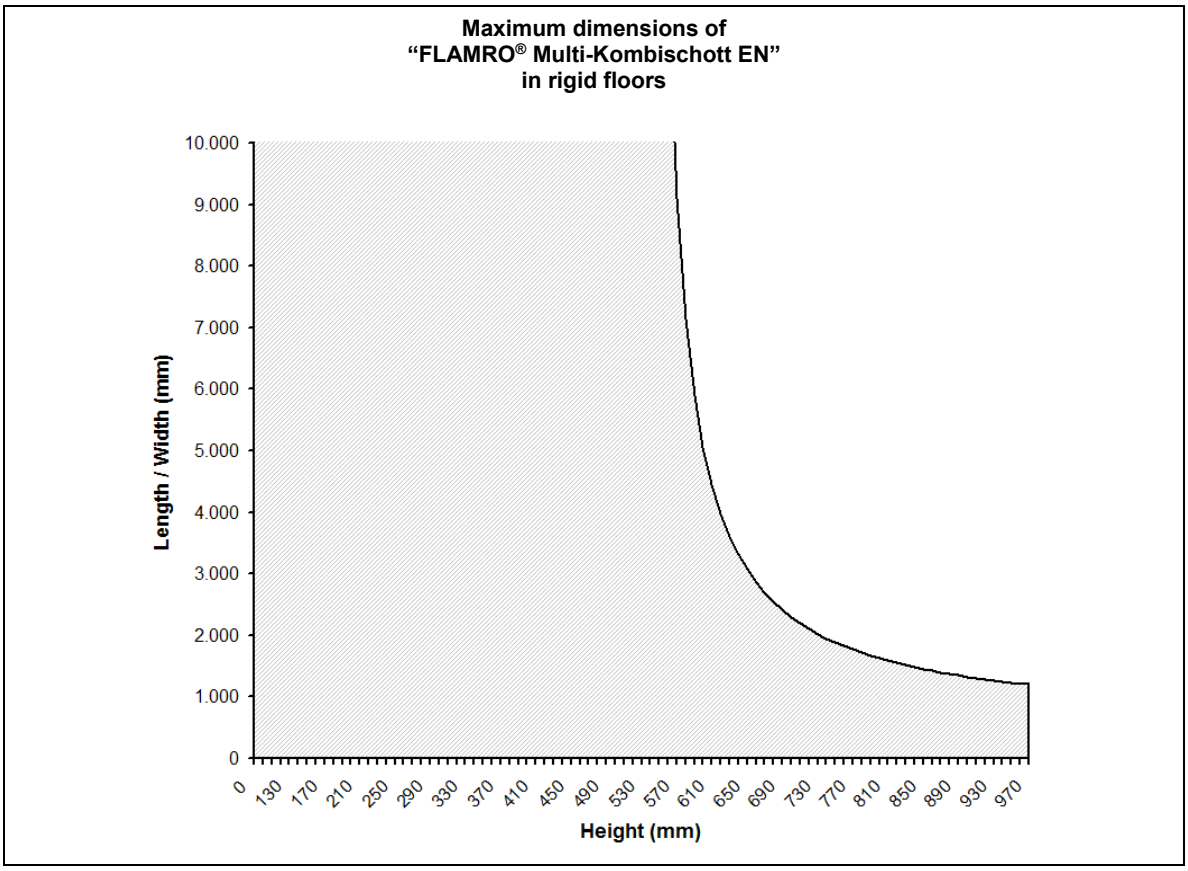
$a_1 \geq 0$ mm
$a_2 \geq 0$ mm
$a_3 \geq 25$ mm
$a_4 \geq 60$ mm
$a_5 \geq 0$ mm
$a_6 \geq 100$ mm, between pipes and pipes and cables, measured from the surfaces of the pipes
$a_7 \geq 55$ mm, surfaces of the pipes to the reveals
$a_8 \geq 0$ mm, measured from surfaces of the pipe insulations to the reveals

rigid and flexible plastic conduits and rigid steel conduits Ø ≤ 16 mm:
to rigid and flexible plastic conduits and rigid steel conduits, Ø ≤ 16 mm, ≥ 0 mm,
to conduits/ conduit bundles ≥ 63 mm,
to cables ≥ 0 mm,
to plastic and metal pipes ≥ 100 mm,
to the reveals ≥ 0 mm,
conduit bundles:
to condiut bundles ≥ 63 mm,
to cables ≥ 72 mm,
to plastic and metal pipes ≥ 100 mm
to the reveals ≥ 0 mm

Horizontal and vertical distances / minimum working clearances – regarding penetrating elements – not given in the installation drawing have to be ≥ 100 mm in practice.

FLAMRO® Multi-Kombischott EN - Installation in rigid floor -	ANNEX F-1

Member of EOTA



The maximum height of the penetration seal in rigid floors is 970 mm.

The maximum length (width) of the penetration seal in rigid floors has to be calculated as follows:

$$Length\ \ (Width) = \frac{Height}{(((c_{tested} / 2) * Height) - 1)}$$

$$c_{tested} = \frac{Perimeter\ length_{tested}}{Seal\ area_{tested}} = 3{,}729\ m/m^2; resp.\ 0{,}003729\ mm/mm^2$$

The minimum perimeter length to seal area ratio of the penetration seal in rigid floors is 3,729 m/m², resp. 0,003729 mm/mm².

c_{tested} was calculated from the dimensions of the tested penetration seal (1200 mm x 970 mm).

The area on the left side of the graph gives an overview of all possible combinations of length (width) and height where the minimum perimeter length to seal area ratio is ≥ c_{tested}.

For a length (width) of e.g. 1200 mm the allowed height is 970 mm; for a length (width) of e.g. 2300 mm the allowed height is 700 mm.

For a height smaller than 538 mm no limitation of length (width) is required.

Note: The dimensions of the graph are not true to scale.

FLAMRO® Multi-Kombischott EN **- Installation in rigid floor – perimeter length to seal area ratio -**	**ANNEX F-2**

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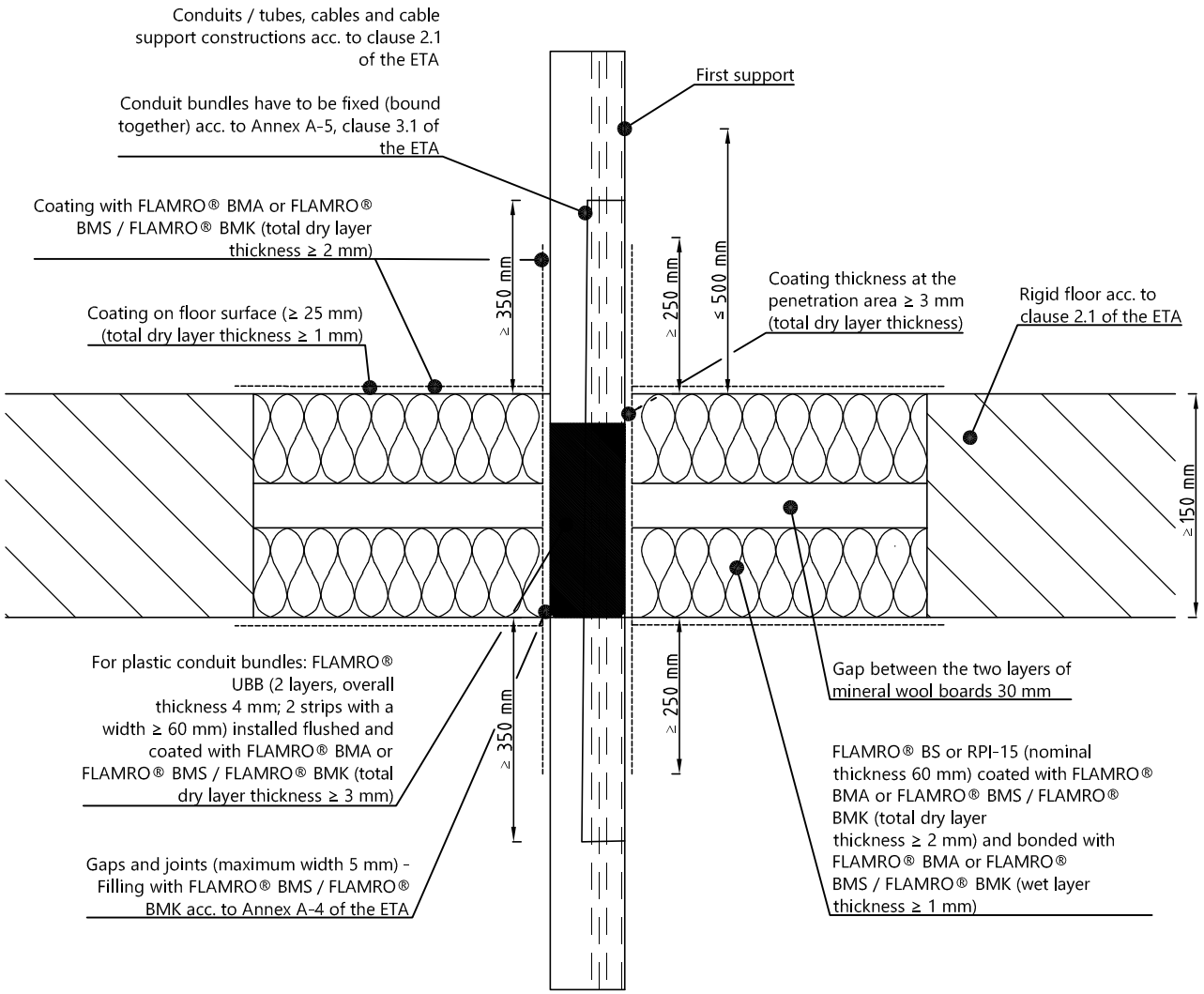
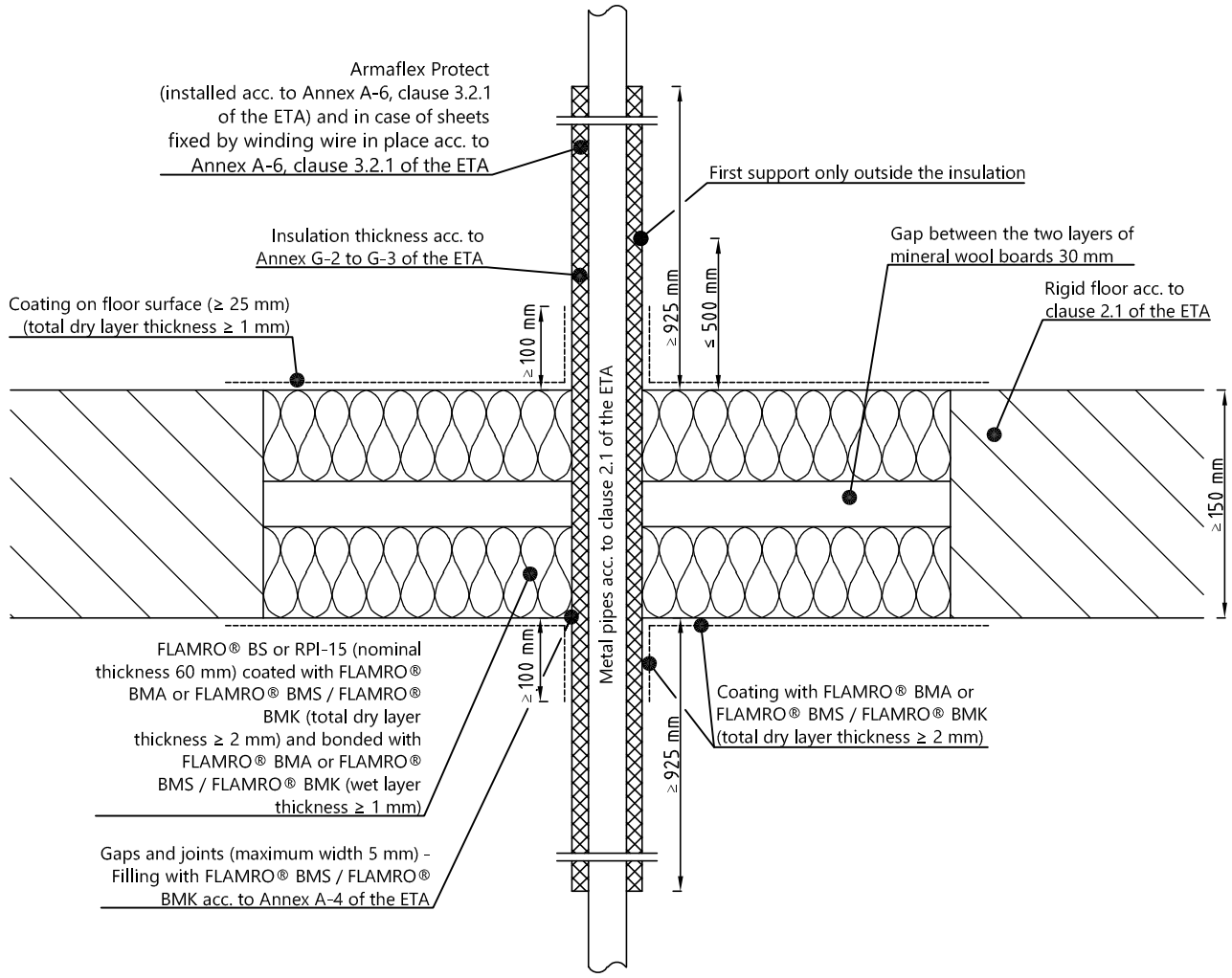
FLAMRO® Multi-Kombischott EN in rigid floors according to clause 2.1 of the ETA – penetrated by cables and conduits / tubes according to clause 2.1 of the ETA – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN - Installation in rigid floor -	ANNEX F-3

electronic copy

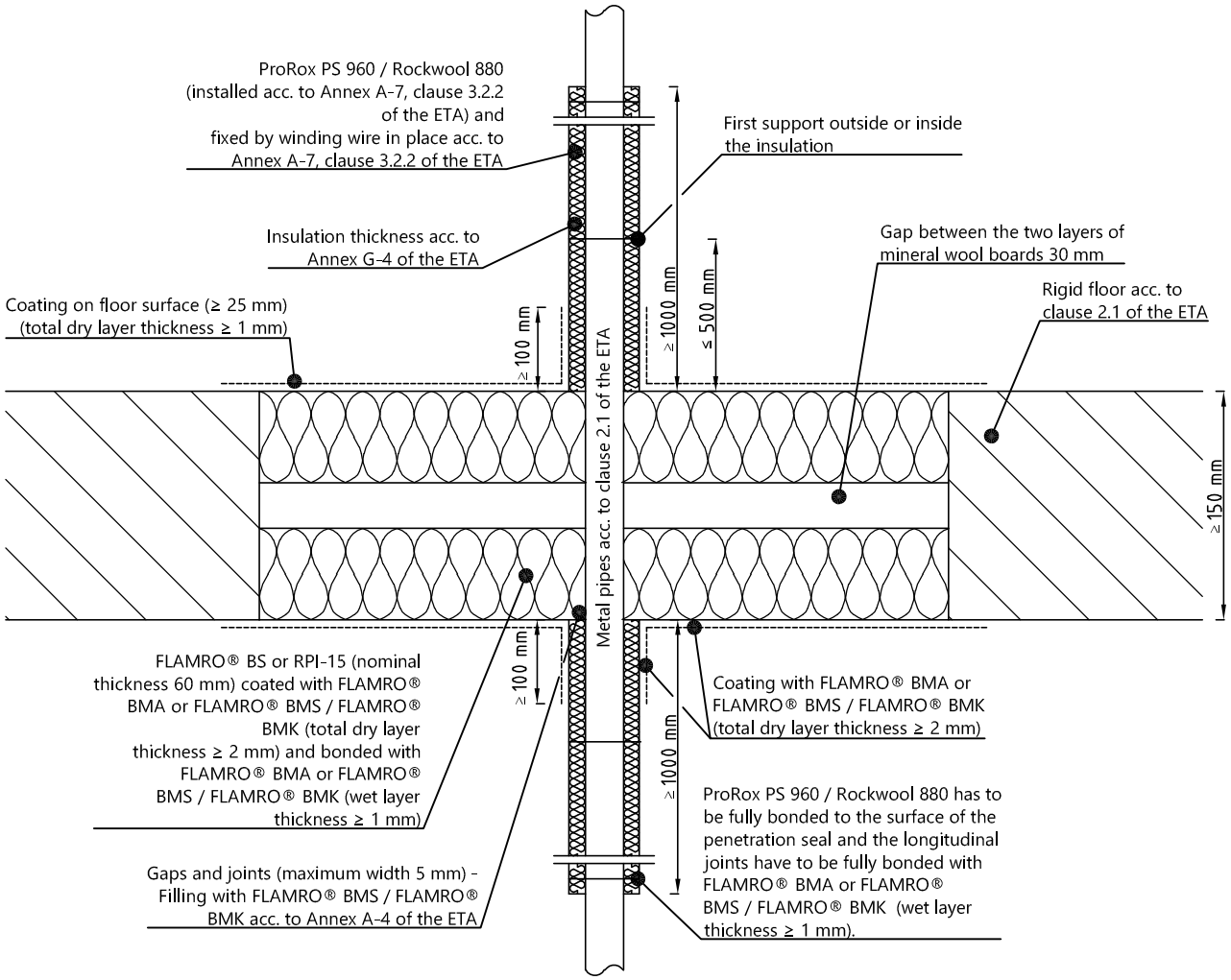
FLAMRO® Multi-Kombischott EN in rigid floors according to clause 2.1 of the ETA – penetrated by metal pipes according to clause 2.1 of the ETA insulated with "Armaflex Protect" – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN **- Installation in rigid floor -**	**ANNEX F-4**

electronic copy

FLAMRO® Multi-Kombischott EN in rigid floors according to clause 2.1 of the ETA – penetrated by metal pipes according to clause 2.1 of the ETA insulated with "ProRox PS 960" / "Rockwool 880" – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN - Installation in rigid floor -	ANNEX F-5

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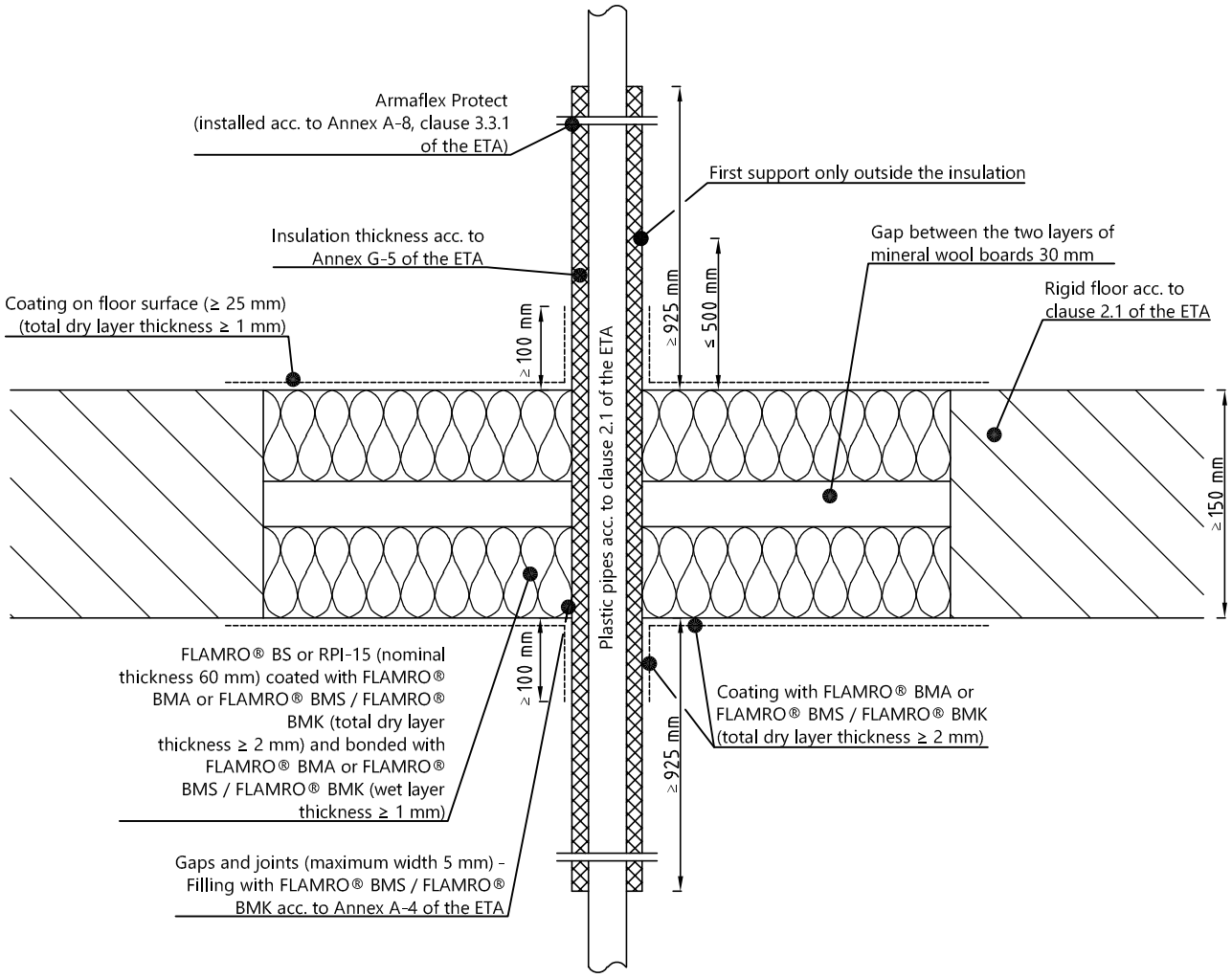
FLAMRO® Multi-Kombischott EN in rigid floors according to clause 2.1 of the ETA – penetrated by plastic pipes according to clause 2.1 of the ETA insulated with "Armaflex Protect" – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN **- Installation in rigid floor -**	**ANNEX F-6**

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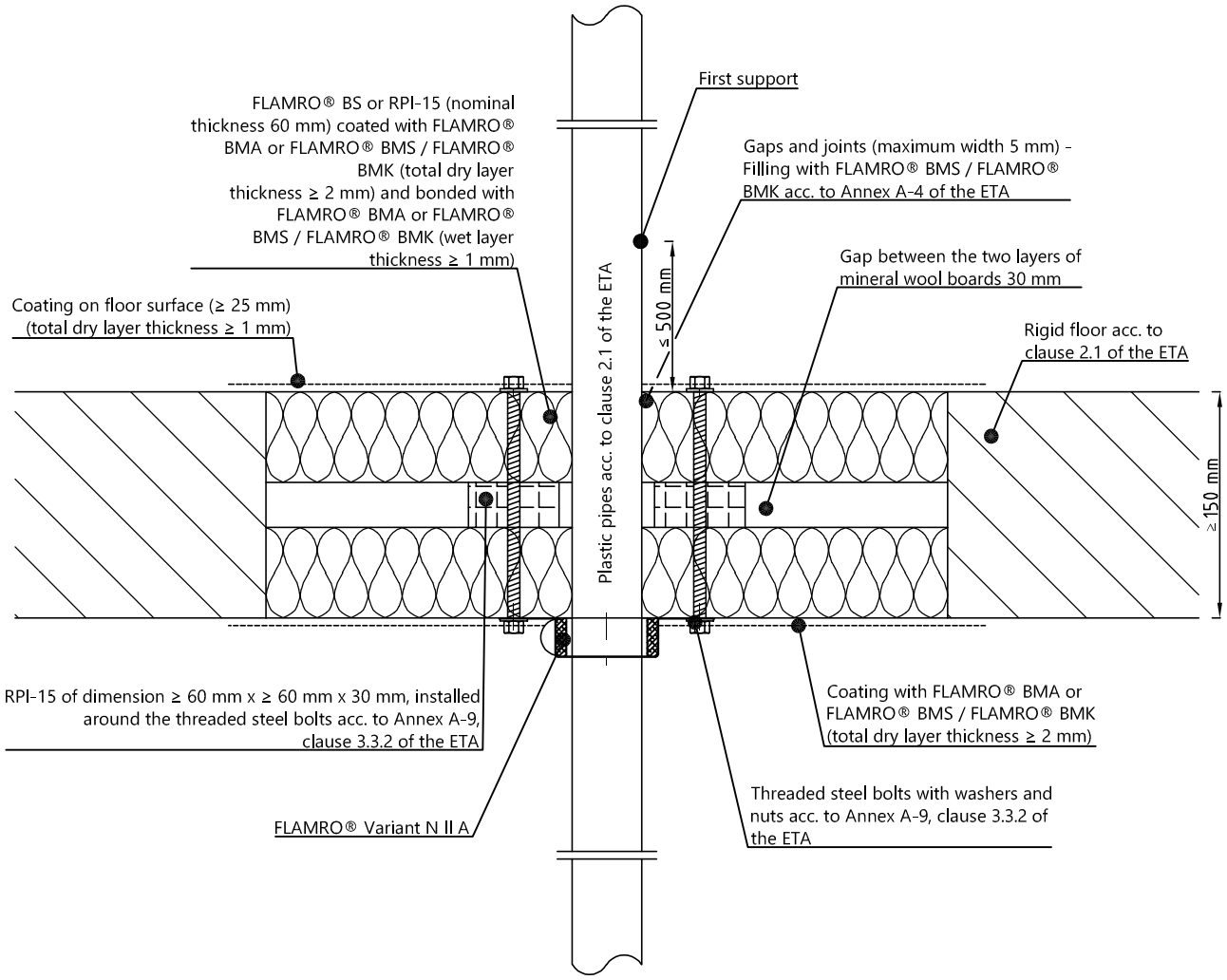
FLAMRO® Multi-Kombischott EN in rigid floors according to clause 2.1 of the ETA – penetrated by plastic pipes according to clause 2.1 of the ETA equipped with "FLAMRO® Variant N II A" – Installation drawing – sectional view



FLAMRO® Multi-Kombischott EN - Installation in rigid floor -	ANNEX F-7

electronic copy

FLAMRO® Multi-Kombischott EN penetrated by cables and / or conduits / tubes acc. to cl. 2.1 of the ETA – installed in rigid floors acc. to cl. 2.1 of the ETA	
Penetrating elements	**Fire resistance classification**
All types of sheathed cables (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 80 mm	EI 120 E 120
Tied bundles up to 100 mm overall diameter containing sheathed cables (except waveguides) currently and commonly used in building practice in Europe (e.g. electrical / telecommunication / data / optical fibre cables) with a diameter ≤ 21 mm	EI 120 E 120
Steel conduits / tubes, Ø ≤ 16 mm (without cables): steel conduits acc. to EN 61386-21 and / or EN 10305-4 or -6	EI 120 E 120
Plastic conduits, Ø ≤ 16 (without cables) acc. to EN 61386-21	EI 120 E 120
Bundles of up to 3 steel conduits (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness ≥ 0,9 mm (for Ø ≤ 20 mm) or ≥ 1,0 mm (for Ø 25 mm) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness ≥ 1,24 mm	EI 120 E 120
Bundles of up to 3 plastic conduits* (with / without cables Ø ≤ 14 mm): conduits acc. to EN 61386-21 with Ø 16 mm to 25 mm, wall thickness 1,8 mm to 2,2 mm (for polyolefine) or 0,6 mm to 0,7 mm (for PVC-U) and conduits acc. to EN 61386-22 with Ø 16 mm to 25 mm, wall thickness 0,2 mm (for polyolefine) or 0,15 mm (for PVC-U)	EI 120 E 120

* wrapped on both sides of the penetration seal with “FLAMRO® UBB”

FLAMRO® Multi-Kombischott EN

- Fire resistance classification -

ANNEX G-1

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FLAMRO® Multi-Kombischott EN penetrated by metal pipes acc. to cl. 2.1 of the ETA insulated on both sides of the penetration seal with "Armaflex Protect" (local-sustained LS or continued sustained CS) – installed in rigid floors acc. to cl. 2.1 of the ETA		
Penetrating elements* **Copper pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 8 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 16 mm	EI 120-C/U E 120-C/U
Outer diameter > 8 mm to 15 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 19 mm	EI 120-C/U E 120-C/U
Outer diameter > 15 mm to 25 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 28 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 25 mm	EI 120-C/U E 120-C/U
Outer diameter > 28 mm to 88,9 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 25 mm	EI 90-C/U E 120-C/U
Note: The fire resistance class of "FLAMRO® Multi-Kombischott EN" - when penetrated by copper pipes with classification EI 90 / E 120 - is **EI 90 / E 120**		

* For interpolation between pipe diameters and wall thicknesses see Annex H-1 and H-2 of the ETA.
** required minimum insulation length (measured from the surface of the penetration seal)

FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX G-2**

electronic copy

FLAMRO® Multi-Kombischott EN penetrated by metal pipes acc. to cl. 2.1 of the ETA insulated on both sides of the penetration seal with "Armaflex Protect" (local-sustained LS or continued sustained CS) – installed in rigid floors acc. to cl. 2.1 of the ETA		
Penetrating elements* **Steel pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 8 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 16 mm	EI 120-C/U E 120-C/U
Outer diameter > 8 mm to 15 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 19 mm	EI 120-C/U E 120-C/U
Outer diameter > 15 mm to 25 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 28 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 25 mm	EI 120-C/U E 120-C/U
Outer diameter > 28 mm to 88,9 mm Wall thickness 1,0 mm to 14,2 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 25 mm	EI 90-C/U E 120-C/U
Outer diameter > 88,9 mm to 168,3 mm Wall thickness > 2,0 mm to 14,2 mm	Armaflex Protect (sheet): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 26 mm (double layer – 2 x 13 mm)	EI 90-C/U E 120-C/U
Note: The fire resistance class of "FLAMRO® Multi-Kombischott EN" - when penetrated by steel pipes with classification EI 90 / E 120 - is **EI 90 / E 120**		

* For interpolation between pipe diameters and wall thicknesses see Annex H-1 and H-2 of the ETA.
** required minimum insulation length (measured from the surface of the penetration seal)

FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX G-3**

electronic copy

FLAMRO® Multi-Kombischott EN penetrated by metal pipes acc. to cl. 2.1 of the ETA insulated on both sides of the penetration seal with "ProRox PS 960" / "Rockwool 880" (local-interrupted LI or continued-interrupted CI) – installed in rigid floors acc. to cl. 2.1 of the ETA		
Penetrating elements* **Copper pipes:**	**Additional precaution: "ProRox PS 960" / "Rockwool 880"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm**, on both sides of the penetration seal Thickness 30 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 88,9 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm, on both sides of the penetration seal Thickness 40 mm	EI 120-C/U E 120-C/U
Penetrating elements* **Steel pipes:**	**Additional precaution: "ProRox PS 960" / "Rockwool 880"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm**, on both sides of the penetration seal Thickness 30 mm	EI 120-C/U E 120-C/U
Outer diameter > 25 mm to 168,3 mm Wall thickness 1,0 mm to 14,2 mm	ProRox PS 960 / Rockwool 880: Length ≥ 1000 mm**, on both sides of the penetration seal Thickness 40 mm	EI 120-C/U E 120-C/U

* For interpolation between pipe diameters and wall thicknesses see Annex H-3 of the ETA.
** required minimum insulation length (measured from the surface of the penetration seal)

FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX G-4**

electronic copy

FLAMRO® Multi-Kombischott EN penetrated by plastic pipes acc. to cl. 2.1 of the ETA insulated on both sides of the penetration seal with "Armaflex Protect" (local-sustained LS or continued sustained CS) – installed in rigid floors acc. to cl. 2.1 of the ETA		
Penetrating elements* **PVC-U pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 1,5 mm to 2,8 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-U/C E 120-U/C
Outer diameter 32 mm to 75 mm Wall thickness 1,8 mm to 5,6 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 25 mm	EI 120-U/C E 120-U/C
Penetrating elements* **PE-HD pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 20 mm to 25 mm Wall thickness 1,9 mm to 2,3 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-U/C E 120-U/C
Outer diameter 32 mm to 75 mm Wall thickness 1,9 mm to 6,8 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 25 mm	EI 120-U/C E 120-U/C
Penetrating elements **PP pipes:**	**Additional precaution: "Armaflex Protect"**	**Fire resistance classification**
Outer diameter 25 mm Wall thickness 2,3 mm	Armaflex Protect (tube): Length ≥ 925 mm**, on both sides of the penetration seal Thickness 20 mm	EI 120-U/C E 120-U/C

* For interpolation between pipe diameters and wall thicknesses see Annex H-4 of the ETA.
** required minimum insulation length (measured from the surface of the penetration seal)

FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX G-5**

electronic copy

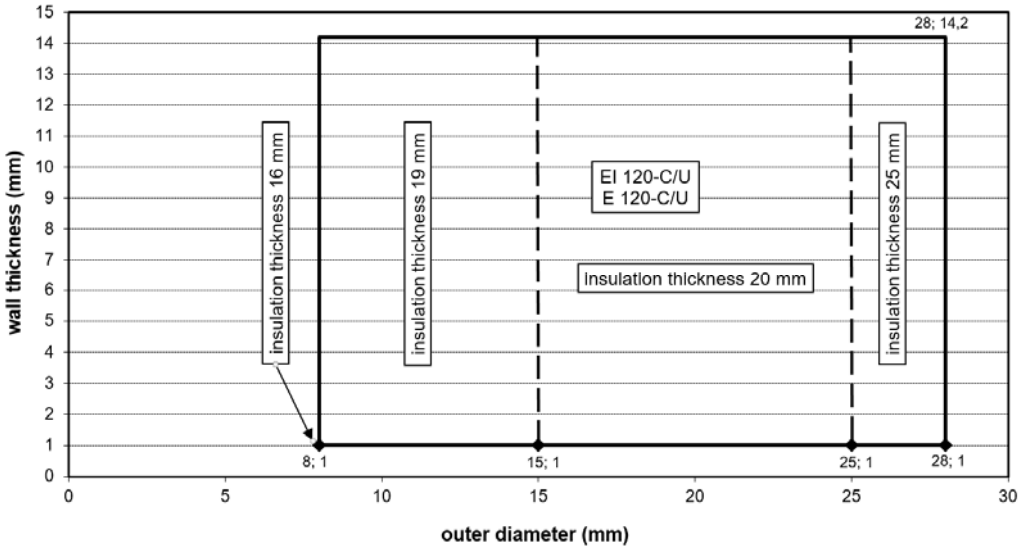
FLAMRO® Multi-Kombischott EN penetrated by plastic pipes acc. to cl. 2.1 of the ETA equipped at the bottom side of the penetration seal with "FLAMRO® Variant N II A" – installed in rigid floors acc. to cl. 2.1 of the ETA		
Penetrating elements* **PVC-U pipes:**	**Additional precaution: "FLAMRO® Variant N II A"** [dimensions of intumescent inlay [thickness (t_{ac}) x height (h)]	**Fire resistance classification**
Outer diameter 32 mm Wall thickness 1,8 mm to 5,6 mm	6,4 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 40 mm Wall thickness 1,8 mm to 5,6 mm	6,4 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 50 mm Wall thickness 1,8 mm to 5,6 mm	6,4 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 63 mm Wall thickness 1,8 mm to 8,2 mm	12,8 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 75 mm Wall thickness 1,8 mm to 8,2 mm	12,8 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 90 mm Wall thickness 1,8 mm to 10 mm	17,1 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 110 mm Wall thickness 1,8 mm to 12,3 mm	19,2 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 125 mm Wall thickness 3,2 mm to 11,9 mm	25,6 mm x 38,1 mm	EI 120-U/U E 120-U/U
Outer diameter 140 mm Wall thickness 3,2 mm to 11,9 mm	25,6 mm x 38,1 mm	EI 120-U/U E 120-U/U
Outer diameter 160 mm Wall thickness 3,2 mm to 11,9 mm	25,6 mm x 38,1 mm	EI 120-U/U E 120-U/U
Penetrating elements* **PE-HD pipes:**	**Additional precaution: "FLAMRO® Variant N II A"** [dimensions of intumescent inlay [thickness (t_{ac}) x height (h)]	**Fire resistance classification**
Outer diameter 32 mm Wall thickness 1,8 mm to 4,6 mm	6,4 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 40 mm Wall thickness 1,8 mm to 4,6 mm	6,4 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 50 mm Wall thickness 1,8 mm to 4,6 mm	6,4 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 63 mm Wall thickness 2,7 mm to 6,7 mm	12,8 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 75 mm Wall thickness 2,7 mm to 6,7 mm	12,8 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 90 mm Wall thickness 2,7 mm to 8,1 mm	17,1 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 110 mm Wall thickness 2,7 mm to 10 mm	19,2 mm x 25,4 mm	EI 120-U/U E 120-U/U
Outer diameter 125 mm Wall thickness 4,0 mm to 14,6 mm	25,6 mm x 38,1 mm	EI 120-U/U E 120-U/U
Outer diameter 140 mm Wall thickness 4,0 mm to 14,6 mm	25,6 mm x 38,1 mm	EI 120-U/U E 120-U/U
Outer diameter 160 mm Wall thickness 4,0 mm to 14,6 mm	25,6 mm x 38,1 mm	EI 120-U/U E 120-U/U

* For interpolation between pipe diameters and wall thicknesses see Annex H-5 of the ETA.

FLAMRO® Multi-Kombischott EN **- Fire resistance classification -**	**ANNEX G-6**

electronic copy

Copper pipes and steel pipes – insulated on both sides of the penetration seal with "Armaflex Protect" (length ≥ 925 mm, LS or CS) – in rigid floors



Note: The given graphs and therein enclosed fire resistance classes according to EN 13501-2:2016 are only valid for metal pipes according to clause 2.1 of the ETA.

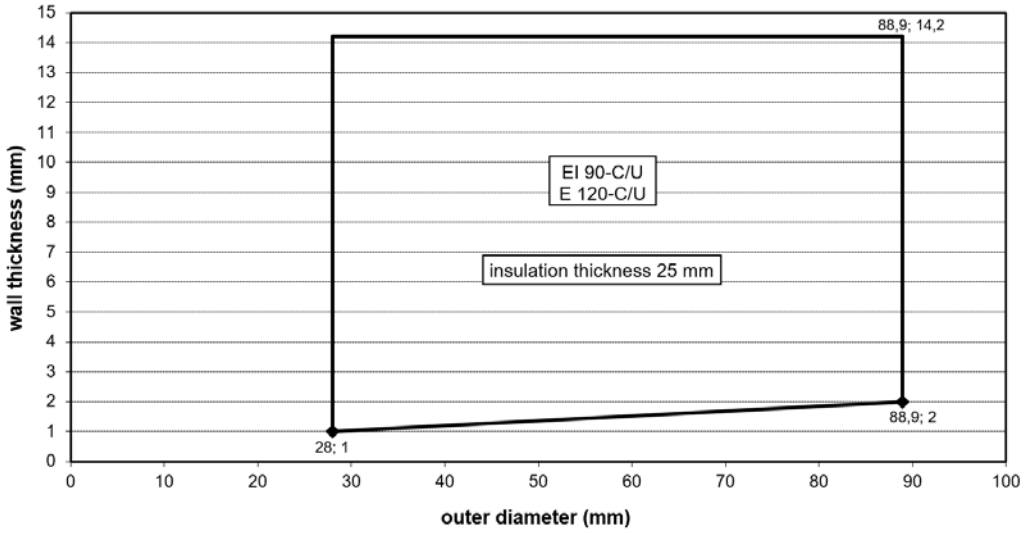
Note: The dashed vertical lines mark the upper limits of the required insulation thickness.

Note: The dimensions of the graphs are not true to scale.

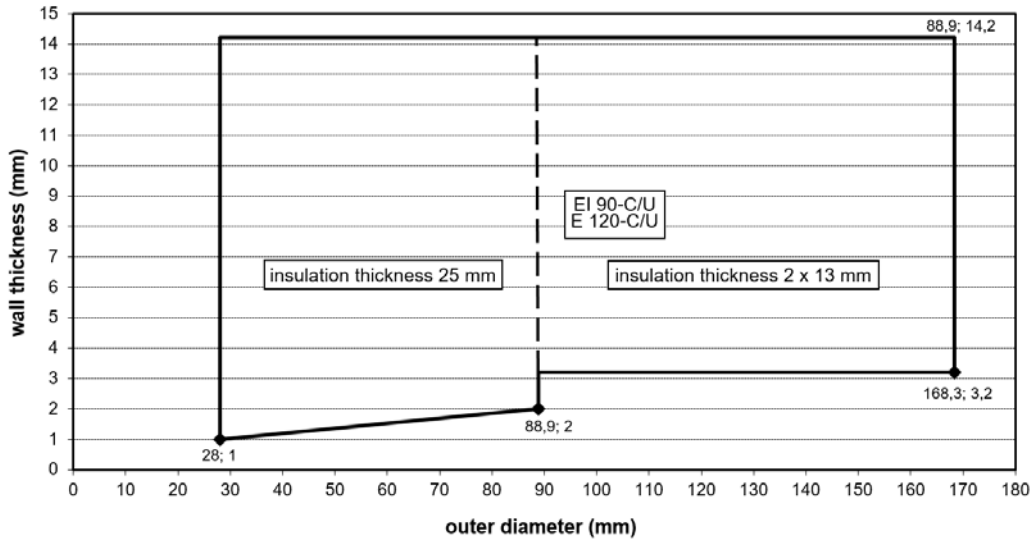
Interpolation between pipe diameters and wall thicknesses for metal pipes according to clause 2.1 of the ETA in rigid floors	**ANNEX H-1**

Member of EOTA

Copper pipes – insulated on both sides of the penetration seal with "Armaflex Protect" (length ≥ 925 mm, LS or CS) – in rigid floors



Steel pipes – insulated on both sides of the penetration seal with "Armaflex Protect" (length ≥ 925 mm, LS or CS) – in rigid floors



Note: The given graphs and therein enclosed fire resistance classes according to EN 13501-2:2016 are only valid for metal pipes according to clause 2.1 of the ETA.

Note: The dashed vertical lines mark the upper limits of the required insulation thickness.

Note: The dimensions of the graphs are not true to scale.

Interpolation between pipe diameters and wall thicknesses for metal pipes according to clause 2.1 of the ETA in rigid floors	**ANNEX H-2**

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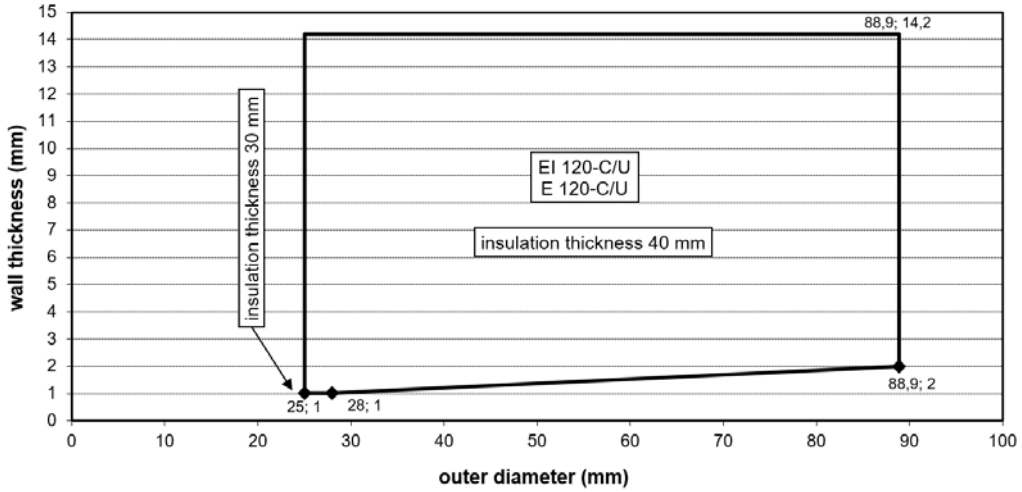
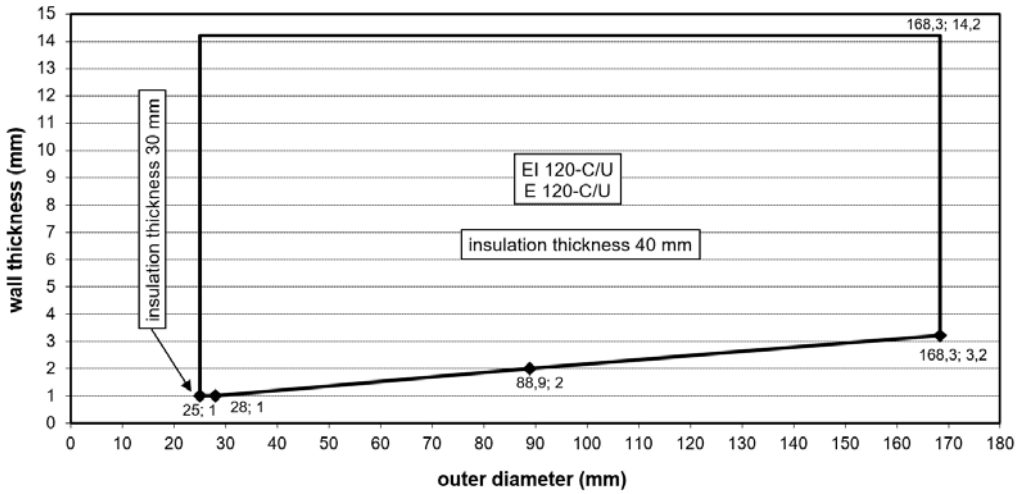
Copper pipes – insulated on both sides of the penetration seal with "ProRox PS 960" / "Rockwool 880" (length ≥ 1000 mm, LI or CI) – in rigid floors



Steel pipes – insulated on both sides of the penetration seal with "ProRox PS 960" / "Rockwool 880" (length ≥ 1000 mm, LI or CI) – in rigid floors



Note: The given graphs and therein enclosed fire resistance classes according to EN 13501-2:2016 are only valid for metal pipes according to clause 2.1 of the ETA.

Note: The dimensions of the graphs are not true to scale.

Interpolation between pipe diameters and wall thicknesses for metal pipes according to clause 2.1 of the ETA in rigid floors	**ANNEX H-3**

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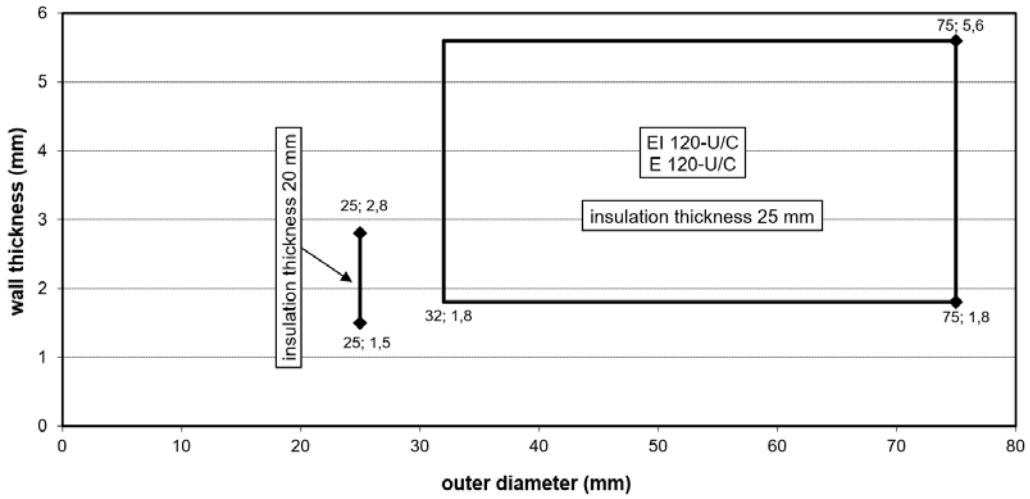
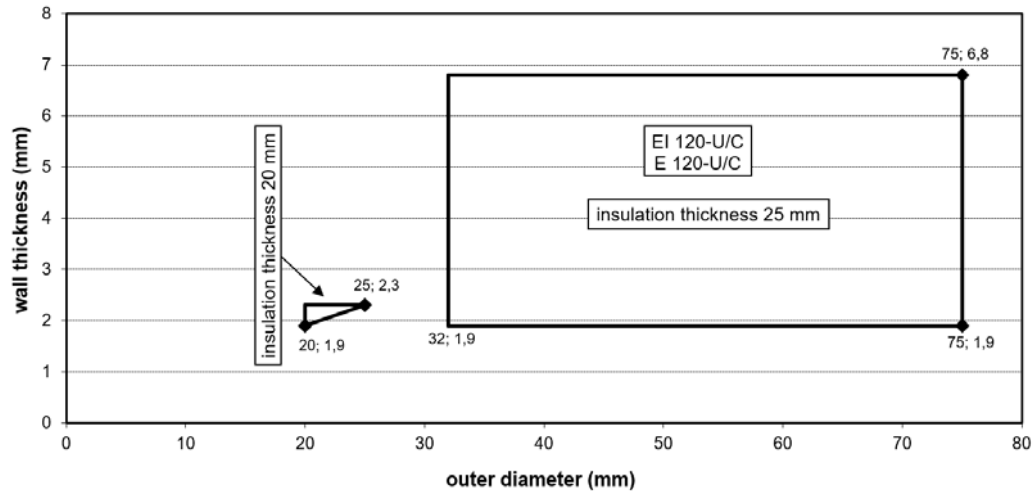
PVC-U pipes – insulated on both sides of the penetration seal with "Armaflex Protect" (length ≥ 925 mm, LS or CS) – in rigid floors



PE-HD pipes – insulated on both sides of the penetration seal with "Armaflex Protect" (length ≥ 925 mm, LS or CS) – in rigid floors

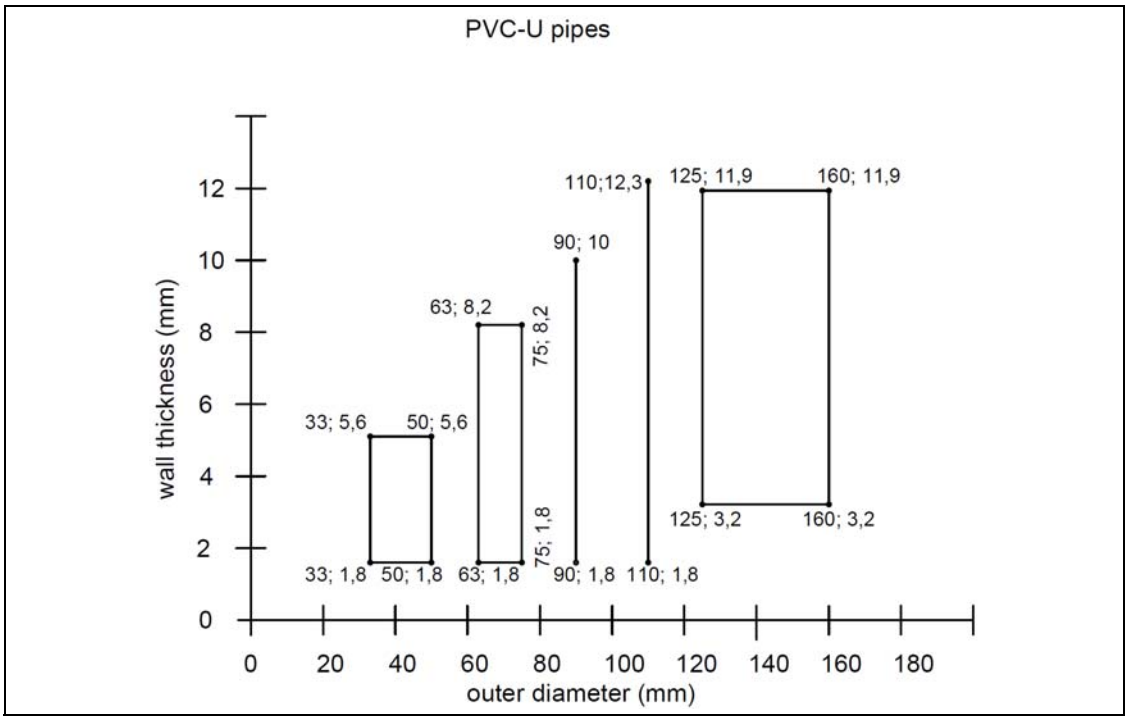


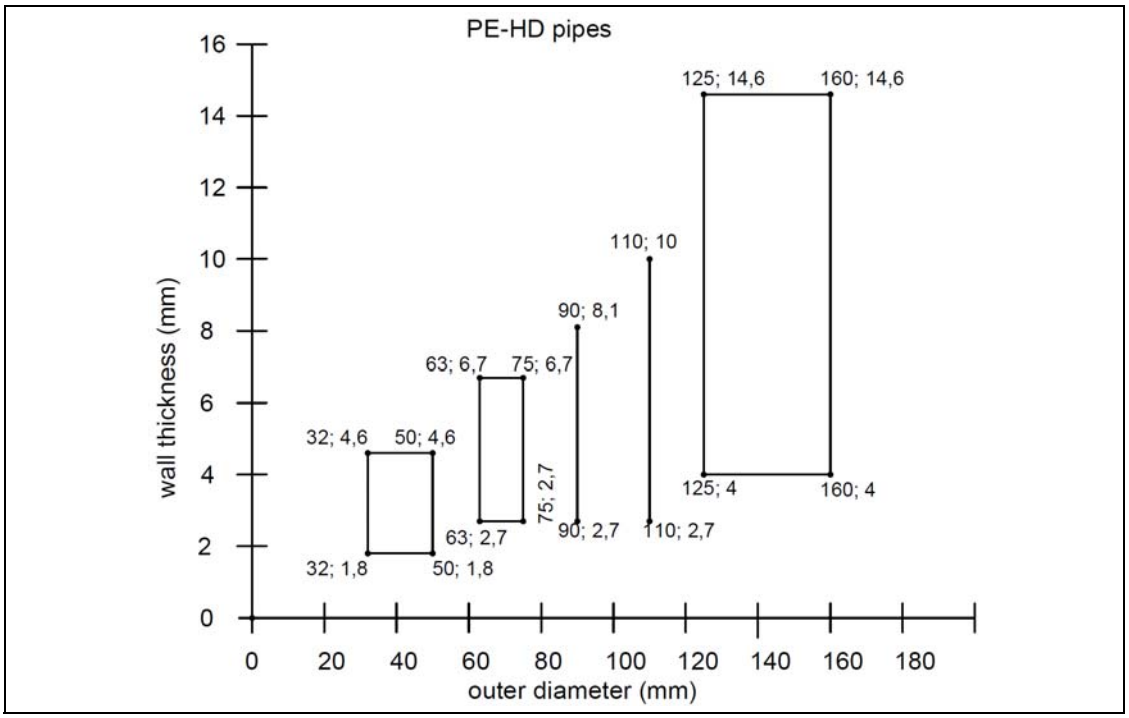
Note: The given graphs and therein enclosed fire resistance classes according to EN 13501-2:2016 are only valid for plastic pipes according to clause 2.1 of the ETA.

Note: The dimensions of the graphs are not true to scale.

Interpolation between pipe diameters and wall thicknesses for plastic pipes according to clause 2.1 of the ETA in rigid floors	**ANNEX H-4**

Member of EOTA





——— Direct field of application according to clauses E.2.7.2.1 and E.2.7.5.1 of EN 1366-3:2009

Note: The given graphs are only valid for plastic pipes according to clause 2.1 of the ETA.

Note: The dimensions of the graphs are not true to scale.

Interpolation between pipe diameters and wall thicknesses for plastic pipes according to clause 2.1 of the ETA in rigid floors	**ANNEX H-5**

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