

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-20/0613
of 3 December 2020

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Trade name of the construction product

Product family
to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment
contains

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

Deutsches Institut für Bautechnik

System FWK Plus

Service ducts and shafts

Tehalit GmbH
Seebergstraße 37
67716 Heltersberg
DEUTSCHLAND

1

34 pages including 29 annexes which form an integral
part of this assessment

EAD 350003-01-1109

European Technical Assessment

ETA-20/0613

English translation prepared by DIBt

Page 2 of 34 | 3 December 2020

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Specific Part

1 Technical description of the product

This European Technical Assessment (ETA) covers the "System FWK Plus" kit for the assembly of the "System FWK Plus" electrical service duct.

The kit, depending on the project, consists of the following components:

- a) - prefabricated special connecting pieces in four-sided, rectangular design in various dimensions – such as moulded duct parts in two pieces and length adapters – essentially made of sheet steel and an inlay of an intumescent material,
 - coupling pieces made of sheet steel with seals,
 - barrier strip made of sheet steel (optional),
 - cable retaining clips
 - wall connection piece.
- b) - prefabricated rectangular special end caps made of sheet steel,
 - cable outlet(s) in the form of cable glands, cable sleeves, a gypsum fibreboard or intumescent/ablative building materials
- c) - accessories such as fasteners, suspensions and construction products for sealing or closing remaining openings and gaps.

Details on the material and dimensions of the prefabricated connecting pieces and end caps, the cable outlets as well as the accessories are deposited with DIBt.

The components and the system structure of the kit are shown in Annex 1.

Further information on the components of the kit and its fire protection characteristics is provided in Annexes 2 to 18.

Note:

The characteristics listed may serve as a guide for the implementation of the manufacturer's factory production control system.

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

The "System FWK Plus" kit is intended for the assembly of the fire-resistant electrical service duct "System FWK Plus" for inside use.

In the case of fire exposure from the inside or outside, fire resistant service ducts prevent, when installed, the spread of fire from one fire compartment to another across the separating wall.

This ETA has served to verify the fire resistance of the service duct "System FWK Plus" assembled from the "System FWK Plus" kit in accordance with the specifications set out in Annexes 19 to 27 of this ETA.

The performances given in Section 3 of this ETA apply to the products specified by the manufacturer and used in the assessment procedure and to the variants of the electrical service ducts tested or listed in the European Assessment Document on which this ETA is based (e. g. with regard to the design, cross-section, type and arrangement of the electrical service ducts and the configuration with cables and services, type and position of cable outlets).

The testing and assessment methods on which this ETA is based lead to the assumption of a working life of installed fire resistant "System FWK Plus" service duct, assembled from the kit, of at least 10 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

The kit in end use conditions is suitable for fire-resistant electrical service ducts of use category Z₂ in accordance with EAD No. 350003-01-1109, Annex E.1, with no essential changes to the fire protection characteristics to be expected.

Fire resistant service ducts "System FWK Plus" may thus be exposed to the conditions of use category Z₂ (application in frost-free interiors with relative humidity below 85%).

Durability is ensured if the specifications for the intended use in accordance with Annexes 1 to 27 and the manufacturer's instructions are taken into account.

3 Performance of the products and references to the methods used for their assessment

3.1 Safety in case of fire (BWR 2)

| No. | Essential characteristic | Performance |
|-----|---|--|
| 1 | Reaction to fire of the components | Class(es) in accordance with EN 13501-1 See Annexes 3 to 7 |
| 2 | Propensity to undergo continuous smouldering of kit components | No performance assessed (NPA) |
| 3 | Fire resistance of the service duct | The fire resistance depends on the design/installation of the electrical service duct. Details of the variants tested and listed in the European Assessment Document and the associated fire resistance classes are given in Annexes 19 to 27. |
| 4 | Durability of the service duct | |
| 4.1 | Fire protective performance ¹ | Expansion ratio f_x 17.0 to 22.0 Expansion pressure p_{ex} 0.5 N/mm ² to 0.85 N/mm ² |
| 4.2 | Resistance to the effects of higher temperatures ¹ | Expansion ratio f_x 17.0 to 22.0 Expansion pressure p_{ex} 0.5 N/mm ² to 0.85 N/mm ² |
| 4.3 | Resistance to the effects of direct contact with metals and plastics (rigid PVC, PE) ¹ | Expansion ratio f_x 17.0 to 22.0 Expansion pressure p_{ex} 0.5 N/mm ² to 0.85 N/mm ² |
| 4.4 | Adhesion between the intumescent material and the substrate ¹ | NPA |
| 4.5 | Resistance to the effects of constant low temperatures (permanent frost) ¹ | Expansion ratio f_x 17.0 to 22.0 Expansion pressure p_{ex} 0.5 N/mm ² to 0.85 N/mm ² |
| 4.6 | Heat insulation efficiency (ablative component) | NPA ² |

¹ intumescent inlay

² not applicable to the kit

3.2 Hygiene, health and the environment (BWR 3)

| Essential characteristic | Performance |
|--|---|
| Content and/or release of dangerous substances | |
| Substances classified as Carc. 1A/1B ^a | The product does not contain any of these dangerous substances that are actively used. ^b |
| Substances classified as Muta. 1A/1B ^a | |
| Substances classified as Acute Tox. 1, 2, 3; Repr. 1A/1B; STOT SE 1 and STOT RE 1 ^a | |
| SVOC and VOC | NPA |
| Release scenarios regarding BWR 3 in accordance with EOTA TR 034: IA1, IA2 | |

a) In accordance with Regulation (EC) No. 1272/2008.

b) The assessment was based on the manufacturer's declaration substantiated by detailed information on the product composition.

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

In accordance with the European Assessment Document (EAD) No. 350003-01-1109, the legal basis is 1999/454/EC, as amended by 2001/596/EC.

The system to be applied is: 1.

In addition, the European legal basis for reaction to fire for products¹ covered by this EAD is: 1999/454/EC.

The following systems are to be applied: 1, 3 or 4.

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

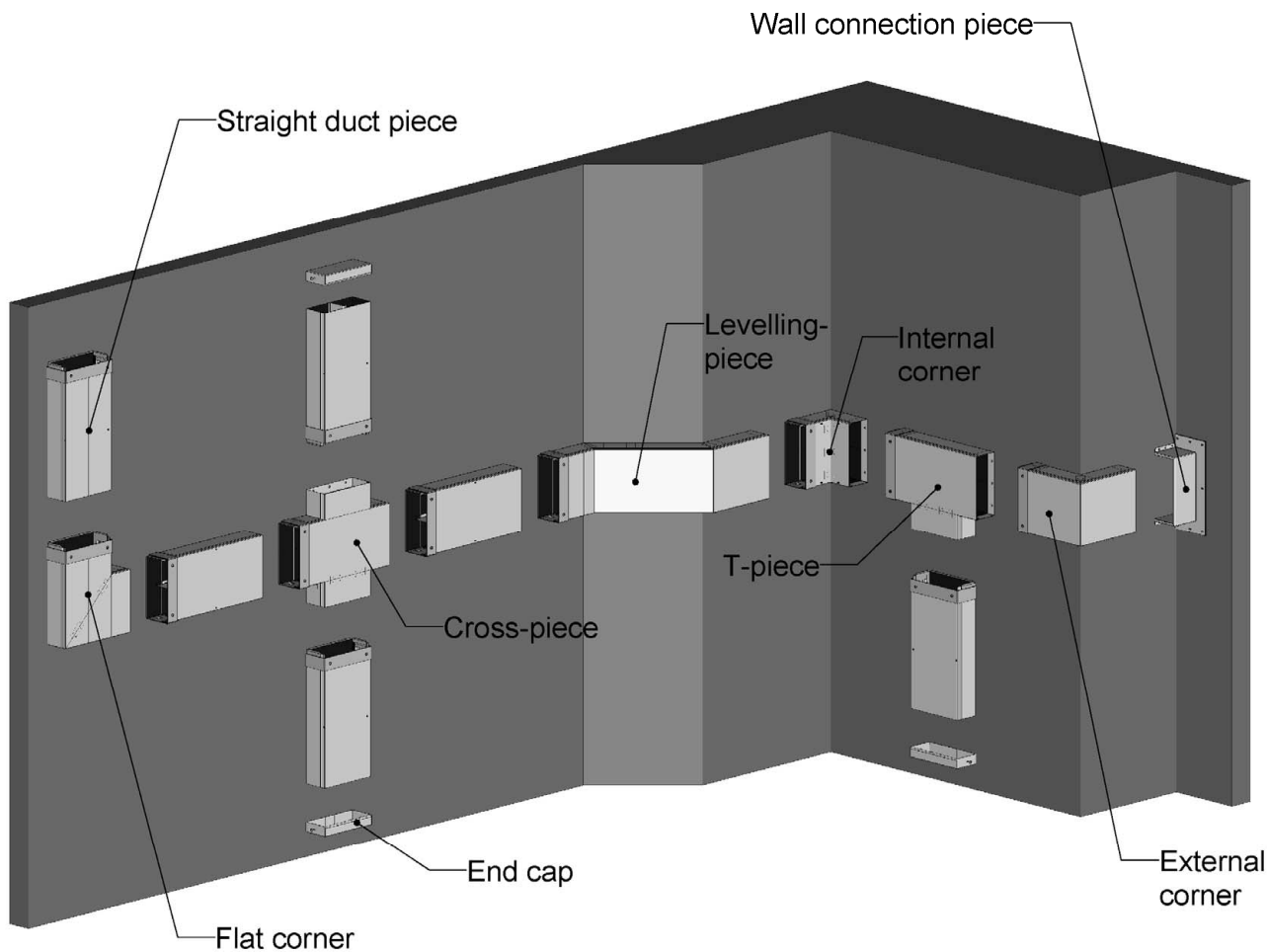
The technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with DIBt.

Issued in Berlin on 3 December 2020 by Deutsches Institut für Bautechnik

Dr.-Ing. Karsten Kathage
Vice President

beglaubigt:
Juliane Valerius

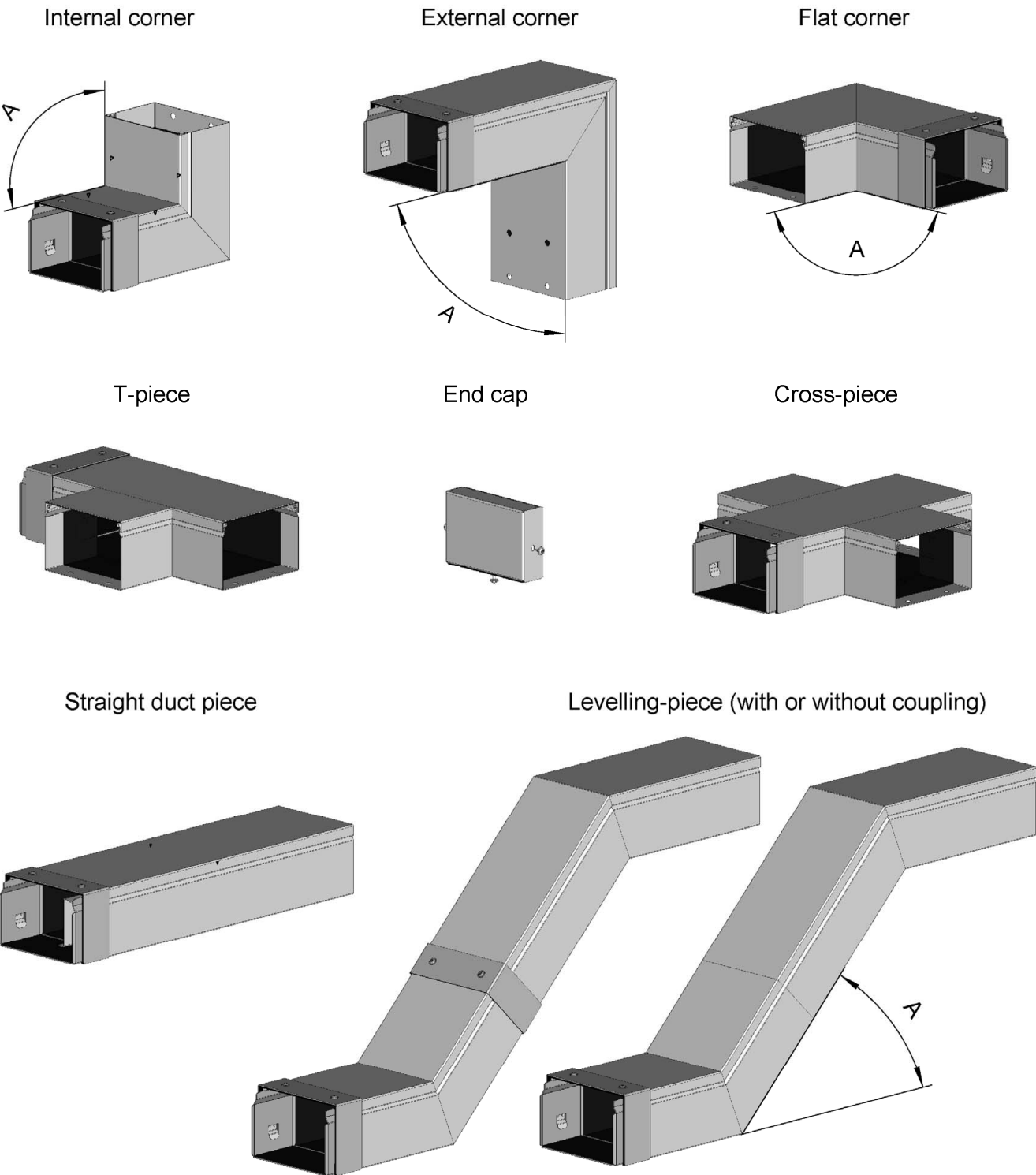
¹ including smouldering behaviour



System FWK Plus

Properties and performance criteria of the kit components:
System overview

Annex 1



Fittings angle A:
- $45^\circ \leq A < 180^\circ$ for external, internal and flat corner
- $0^\circ \leq A \leq 90^\circ$ for levelling-piece

| | |
|--|---------|
| System FWK Plus | Annex 2 |
| Properties and performance criteria of the kit components: Connecting pieces overview | |

Table 1 Prefabricated connecting pieces

| No. | Description/dimensions | Design/reaction to fire | Annex ETA |
|-----|---|---|--------------|
| 1 | Connecting piece¹ consisting of bottom and top part, in various designs: <ul style="list-style-type: none"> - straight duct piece, internal corner, external corner, flat angle, T-piece, cross piece, levelling piece <u>External dimensions:</u> Width: 60 to 250 mm Height: 60 to 100 mm Length: 100 to 3000 mm | Galvanised sheet steel ¹ of steel grade DX51D or DX52D, material number 1.0226 or 1.0350, in accordance with EN 10143, EN 10346 Or: Stainless sheet steel ¹ X5CrNi1810, material number 1.4301, in accordance with EN 10088-2 Sheet thickness: 1 mm Reaction to fire class A1 in accordance with Decision 96/602/EC Optionally sheet steel, sheet thickness 1 mm, with external epoxy-polyester powder coating, thickness ≤ 0.15 mm ¹ Reaction to fire class A2-s1, d0 in accordance with EN 13501-1 Intumescent building material, deposited with DIBt ¹ Thickness 1.2 mm Reaction to fire class B-s1, d0 in accordance with EN 13501-1 | 2, 8 and 9 |
| 2 | End cap¹ <u>Dimensions:</u> Width: 60 to 250 mm Height: 60 to 100 mm | Galvanised or stainless sheet steel, as in no. 1 Sheet thickness: 1 mm 2 to 4x button head screw, self-tapping 5x10, steel case hardened, deposited with DIBt ¹ Reaction to fire class A1 in accordance with Decision 96/602/EC | 2 |
| 3 | Coupling piece¹ consisting of bottom and top part suitable for dimensions of connecting pieces | Galvanised or stainless sheet steel, as in no. 1 Sheet thickness, top part: 1 mm Sheet thickness, bottom part: 1.5 mm Intumescent building material, as in no. 1 ¹ EPDM cellular rubber seal (in top parts), deposited with DIBt ¹ Width x height: 17 mm x 3 mm and 6 mm x 2 mm Reaction to fire class E in accordance with EN 13501-1 in joints between sheet steel components 2x button head screw M5x12, galvanised steel, 8.8, ISO 7380-2 Reaction to fire class A1 in accordance with Decision 96/602/EC | 10 |
| 4 | Length adapter¹ consisting of bottom part and top part suitable for dimensions of connecting pieces in accordance with no. 1 | Galvanised or stainless sheet steel, as in no. 1 Sheet thickness: 1.5 mm Intumescent building material, as in no. 1 ¹ Thickness: 1.2 mm EPDM cellular rubber seal, as in no. 3 ¹ 2x button head screw M5x12, as in no. 3 | 11 |

System FWK Plus

Characteristics and performance criteria of the kit components
Description and reaction to fire performance of components of the connecting pieces – Part 1

Annex 3

Table 1 – Continued

| No. | Description/dimensions | Design/reaction to fire | Annex ETA |
|-----|--|---|--------------|
| 5 | Wall connection piece ¹ consisting of wall connection plate and wall connection piece suitable for the dimensions of the connecting pieces in accordance with no. 1 | Galvanised or stainless sheet steel, as in no. 1 Sheet thickness: 1,5 mm Optionally sheet steel, sheet thickness 1,5 mm, with external epoxy-polyester powder coating, as in no. 1 Intumescent building material, as in no. 1 ¹ EPDM cellular rubber seal, 17 mm x 3 mm, as in no. 3 ¹ Fire protection board, deposited with DIBt ¹ Thickness: 8 mm Reaction to fire class A1 in accordance with EN 13501-1 4x button head screw M5x12, as in no. 3 (only four-sided wall connector) | 12 |

¹ Geometry or material, position and cut in accordance with the specifications deposited with DIBt

System FWK Plus

Characteristics and performance criteria of the kit components
Description and fire behaviour of components of the connecting pieces – Part 2

Annex 4

Table 2 Construction products for sealing remaining openings and gaps (wall penetrations, cable inlets and outlets)

| No. | Description/dimensions | Design/reaction to fire of components | Annex ETA |
|-----|---|--|------------------|
| 6a | Fire protection mortar 'System Ignitect Z' | The composition is deposited with DIBt, Reaction to fire class A in accordance with Decision 96/603/EC | 15, 18 and 25 |
| 6b | Fire protection foam 'Silikon-Brandschutzschaum 2K' and 'Formstück KR 150' | in accordance with ETA-17/0458 of 7 July 2017 with declaration of performance no. 1 of 6 February 2019 Reaction to fire class E in accordance with EN 13501-1 | 15, 18 and 25 |
| 6c | Fire protection pad 'KBS Sealbags' | The composition is deposited with DIBt Reaction to fire class E in accordance with EN 13501-1 | 15 and 18 |
| 6d | Fire protection stoppers and boards 'System ISO-FLAME plugs and bricks S90' | The composition is deposited with DIBt Reaction to fire class E in accordance with EN 13501 1 | 15 and 18 |
| 6e | Fire protection coating 'PYRO-SAFE FLAMMOTECT A' | in accordance with ETA-14/0418 and with declaration of performance no. 01155-PYRO-SAFE- FLAMMOTECT-A of 27 January 2015 Reaction to fire class E in accordance with EN 13501-1 | 15 and 18 |
| 6f | Fire protection putty 'KBS Foamcoat HS' | in accordance with ETA-15/0657 and with declaration of performance no. 0761-CPR-0550 of 2 May 2017 Reaction to fire class E in accordance with EN 13501-1 | 17 |
| 6g | Gypsum fibreboard <u>Maximum dimension:</u> Width x height x depth 200 mm x 75 mm x 18 mm | Material: GF-I-W2-C1 in accordance with EN 15283-2, apparent density $1150 \pm 50 \text{ kg/m}^3$ Reaction to fire class at least A2-s1, d0 in accordance with EN 13501-1 | 17 |

System FWK Plus

Characteristics and performance criteria of the kit components
Description and reaction to fire behaviour of construction products for sealing remaining
openings and gaps (wall penetrations, cable inlets and outlets)

Annex 5

Table 3 Accessories for the electrical service duct

| No. | Description/dimensions of the connecting pieces | Design/reaction to fire of components | Annex ETA |
|-----|--|---|-----------|
| 7 | Cable retaining clip (in conjunction with no. 1) <u>Width x length:</u> 60 mm x 25 mm 60 to 150 mm x 35 mm 150 to 250 mm x 45 mm | Galvanised or stainless sheet steel, as in no. 1 Sheet thickness: 1.5 mm | 13 |
| 8a | Barrier strip (in conjunction with no. 1) <u>Dimensions for the duct</u> Height: 60 to 100 mm Length: max. 3000 mm | Galvanised or stainless sheet steel, as in no. 1 Sheet thickness: 0.8 mm | 14 |
| 8b | Barrier strip adapter (in conjunction with no. 1 and no. 8a) | Galvanised or stainless sheet steel, as in no. 1 Sheet thickness: 1.5 mm Screws and nuts for suspended installation at least M6, steel, min. 8.8 in accordance with EN ISO 898-1/ EN 20898-2 Reaction to fire class A1 in accordance with Decision 96/602/EC | 14 |
| 9 | Cable gland, brass, with lock nut <u>Dimensions:</u> M 25 to M 63 | Material: brass in accordance with EN 60423 / EN 62444 Reaction to fire class A1 in accordance with Decision 96/603/EC | 16 |
| 10 | Cable gland, plastic, with lock nut for individual cables <u>Dimensions:</u> M 25 to M 63 | Material: PA6 polyamide in accordance with EN 60423 / EN 62444 | 16 |
| 11 | Cable sleeve for cable diameter ≤ 16 mm | Material: PVC, deposited with DIBt | 16 |

System FWK Plus

Characteristics and performance criteria of the kit components
Description and reaction to fire of accessories for the electrical service duct

Annex 6

Table 4 Accessories for fastening

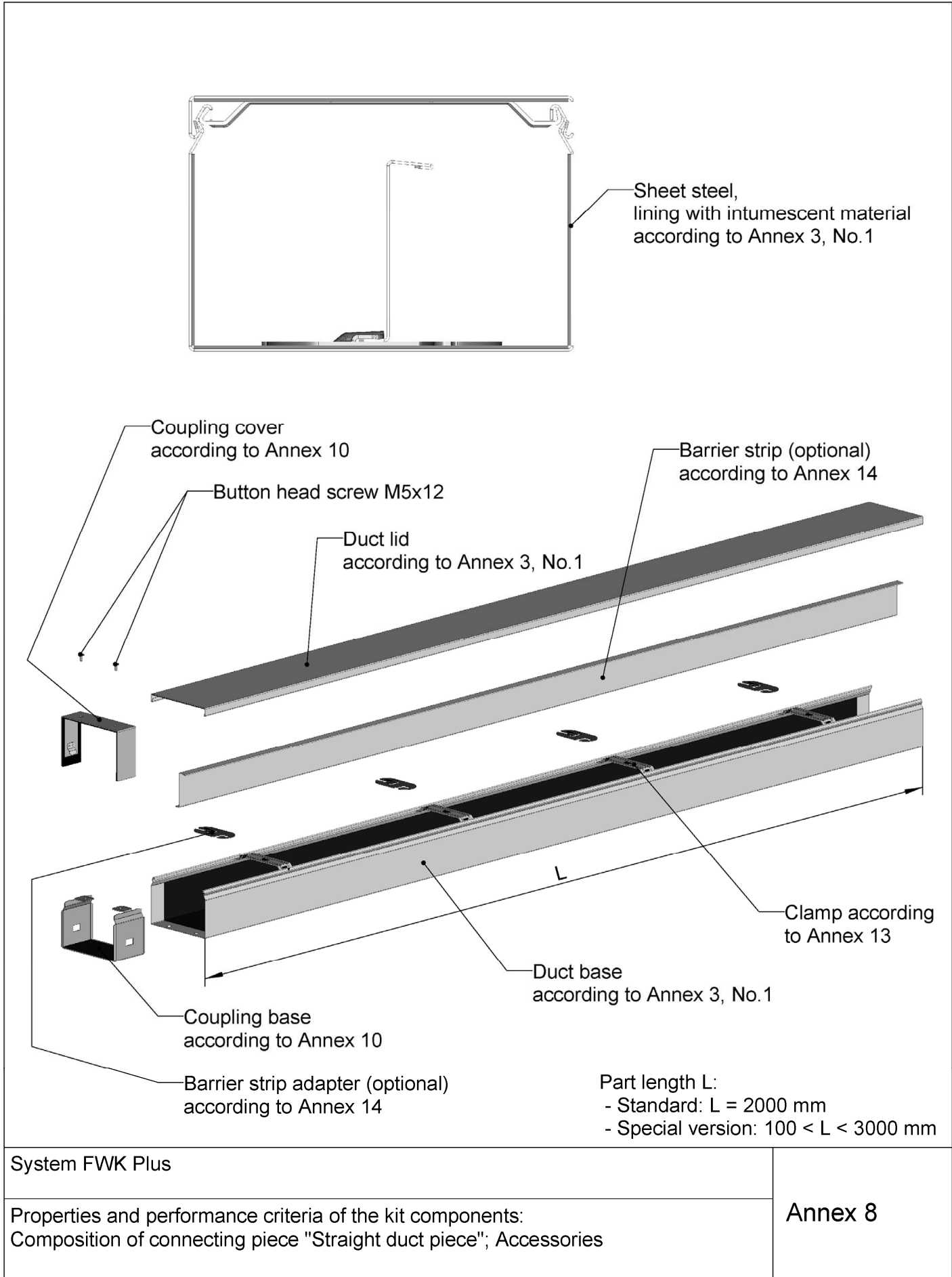
| No. | Description/dimensions of the connecting pieces | Design/reaction to fire of components | Annex ETA |
|-----|--|---|-----------|
| 12 | Wall bracket and suspension bracket | Steel, galvanised/electrolytically galvanised, material number: 1.0330 Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 to 26 |
| 13 | Screws and nuts for fastening wall bracket to suspension brackets | Steel in accordance with EN ISO898-1/EN 20898-2, min. 8.8 Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 to 26 |
| 14 | C-profile mounting rail <u>Dimensions</u> 25 x 50 mm (height x width), thickness 2.5 mm | Material: steel 1.0330 / 1.0332 in accordance with EN 10130 / EN 10111 Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 to 26 |
| 15 | Threaded rod M10 for suspension by means of crossbars and support for wall bracket tip | Material: galvanised/electrolytically galvanised steel, min. 8.8 in accordance with EN ISO 225 Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 to 26 |
| 16 | Washer (in conjunction with nos. 14 and 15) External diameter 30 mm, internal diameter 10.5 mm, thickness at least 1.25 mm | Material: steel, min. 8.8 in accordance with EN ISO 7093-1 Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 to 26 |
| 17 | Nut M10 (in conjunction with nos. 15 and 16) | Material: steel, min. 8.8 in accordance with ISO 4032 Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 to 26 |
| 18 | Screws and nuts M8 - for fastening duct pieces to C-profile rail (suspended or top-mounted), - for installation of gypsum fibreboard, see Annex 5, no. 6g and Annex 17 | Steel in accordance with EN ISO898-1/EN 20898-2, min. 8.8 Reaction to fire class A1 in accordance with Decision 96/603/EC | 17 and 23 |
| 19 | Washer (in conjunction with nos. 14 and 18 for installation variant 4, see Annex 23) External diameter 30 mm, internal diameter 8.4 mm, thickness at least 1.25 mm | Material: steel, min. 8.8 in accordance with EN ISO 4759-3 Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 |
| 20 | Connector for C-profile rails | Steel as in no. 1 (slot side); steel 1.0332 in accordance with EN 10111 (hole side) ² Reaction to fire class A1 in accordance with Decision 96/603/EC | 23 |

² Geometry in accordance with the specifications deposited with DIBt

System FWK Plus

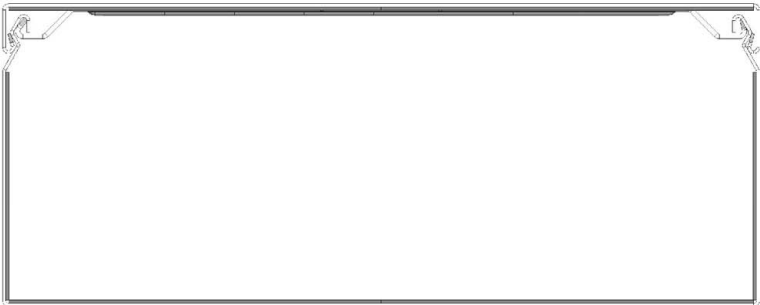
Characteristics and performance criteria of the kit components
Description and reaction to fire of accessories/fasteners

Annex 7

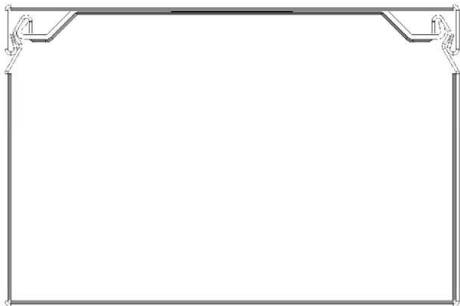


Standard dimensions:
(height x width [mm])

Duct 100x250



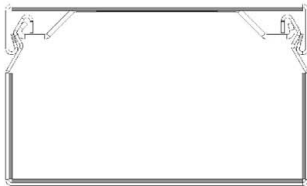
Duct 100x150



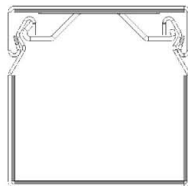
Duct 60x150



Duct 60x100



Duct 60x60

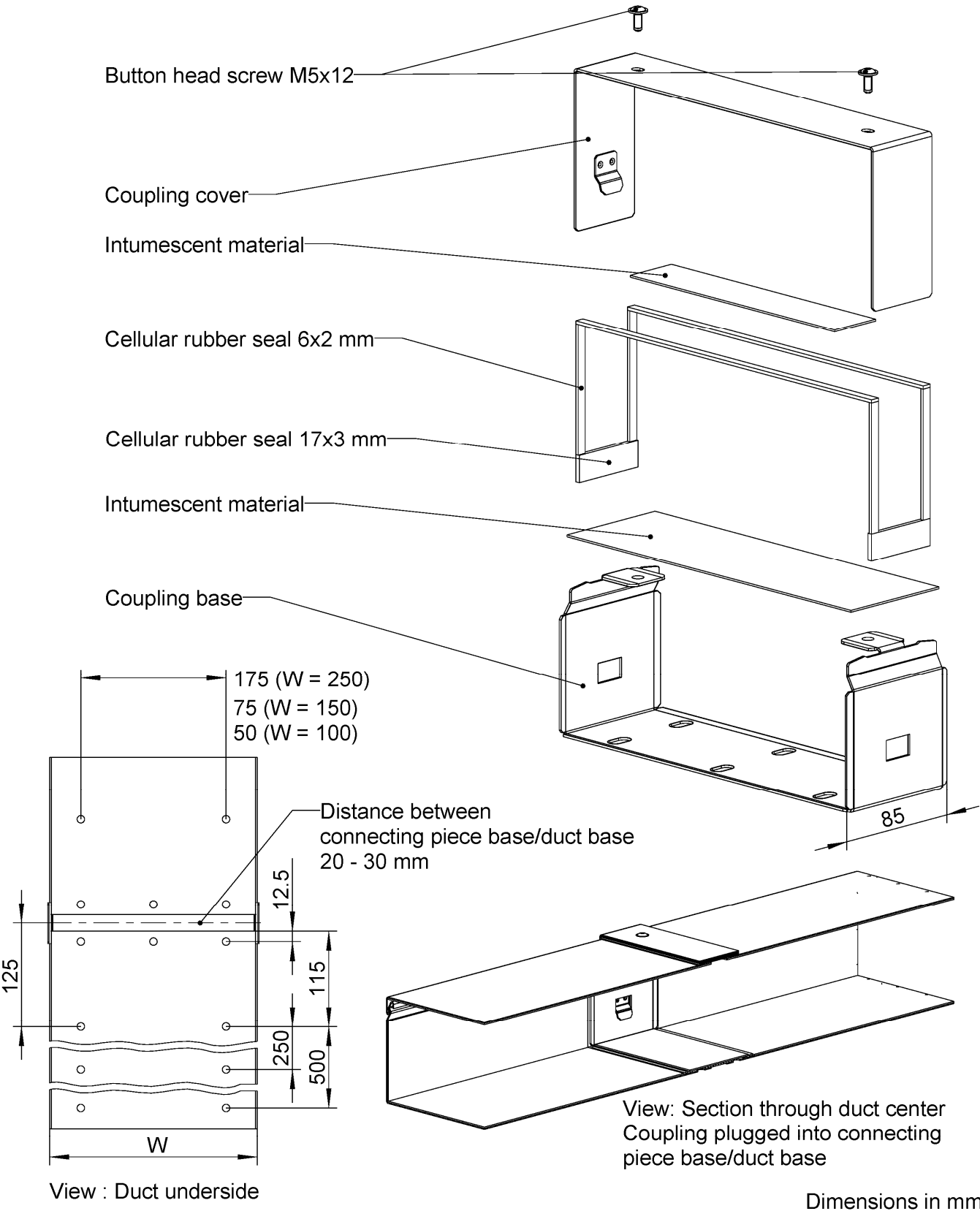


Intermediate sizes possible

System FWK Plus

Properties and performance criteria of the kit components:
Duct dimensions

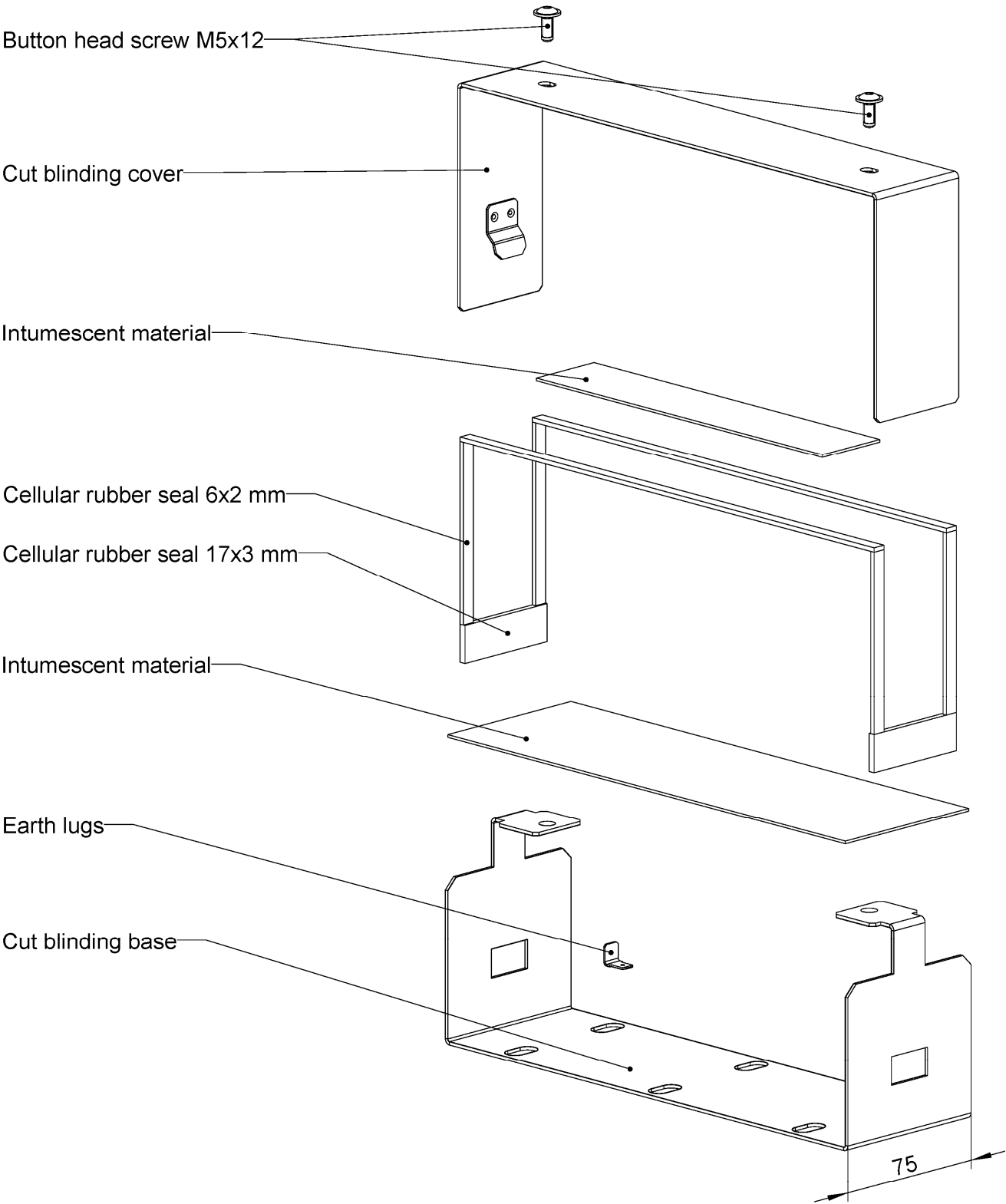
Annex 9



System FWK Plus

Properties and performance criteria of the kit components:
Composition and arrangement coupling

Annex 10

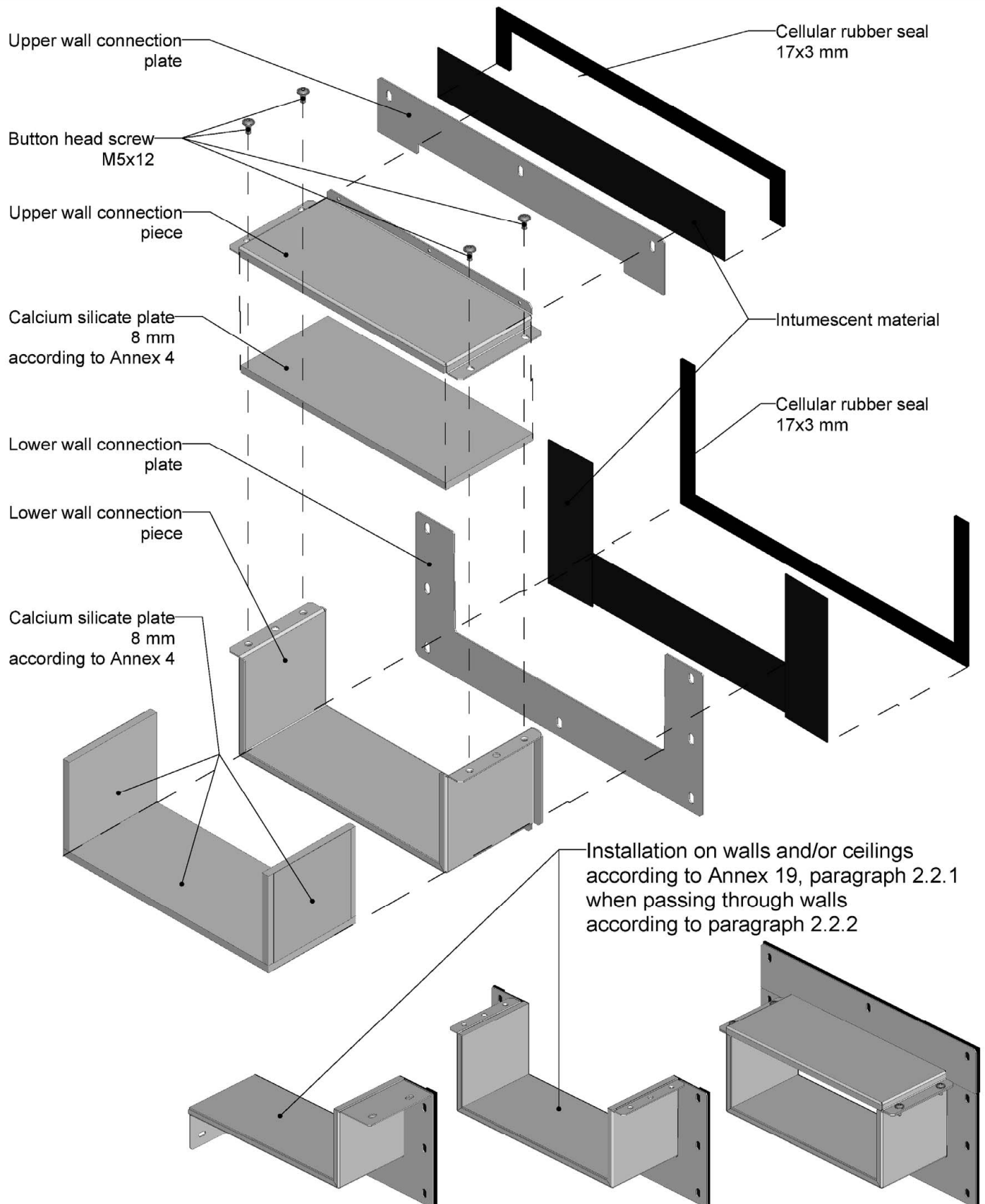


Dimensions in mm

System FWK Plus

Properties and performance criteria of the kit components:
Composition cut blinding

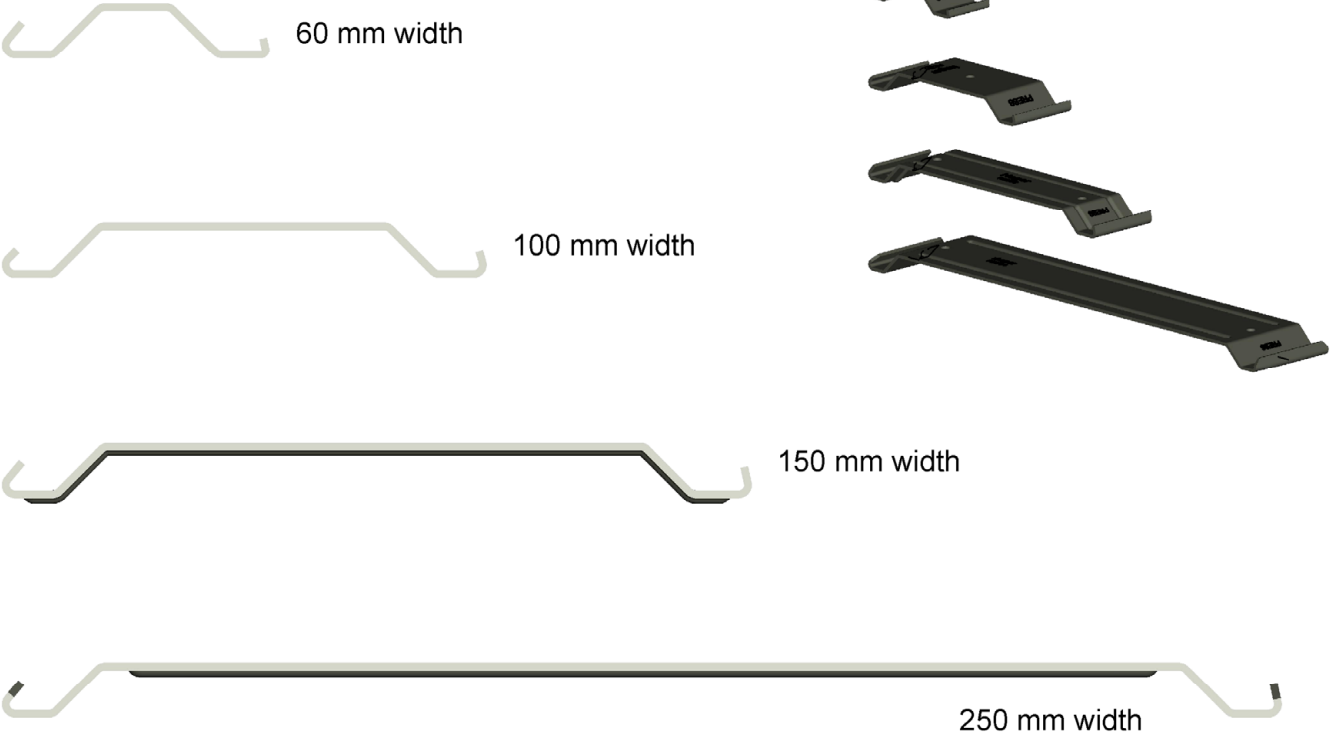
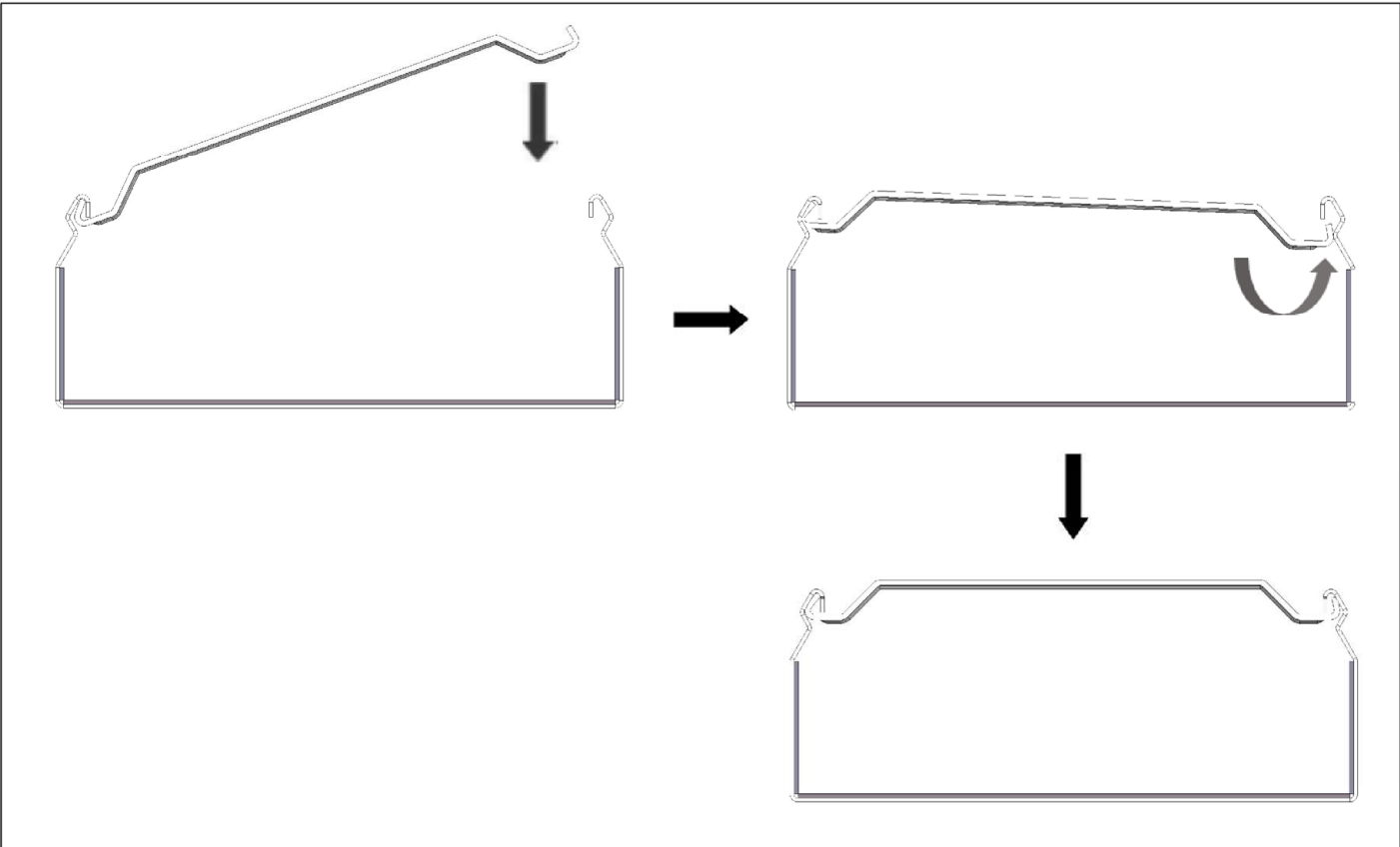
Annex 11



System FWK Plus

Properties and performance criteria of the kit components:
Composition wall connection piece (two, three and four-sides)

Annex 12



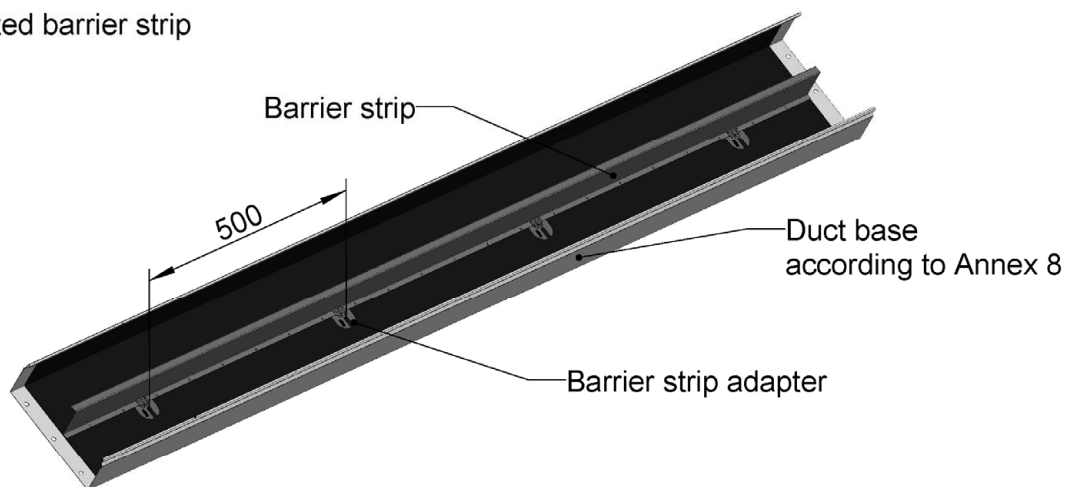
Intermediate sizes possible

System FWK Plus

Properties and performance criteria of the kit components:
Design clamp

Annex 13

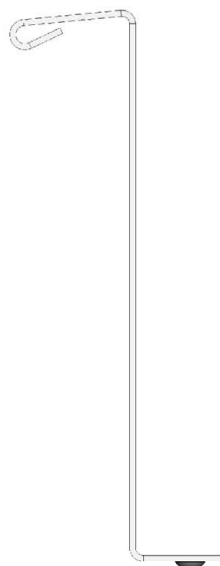
Duct with mounted barrier strip



Installation of barrier strip:

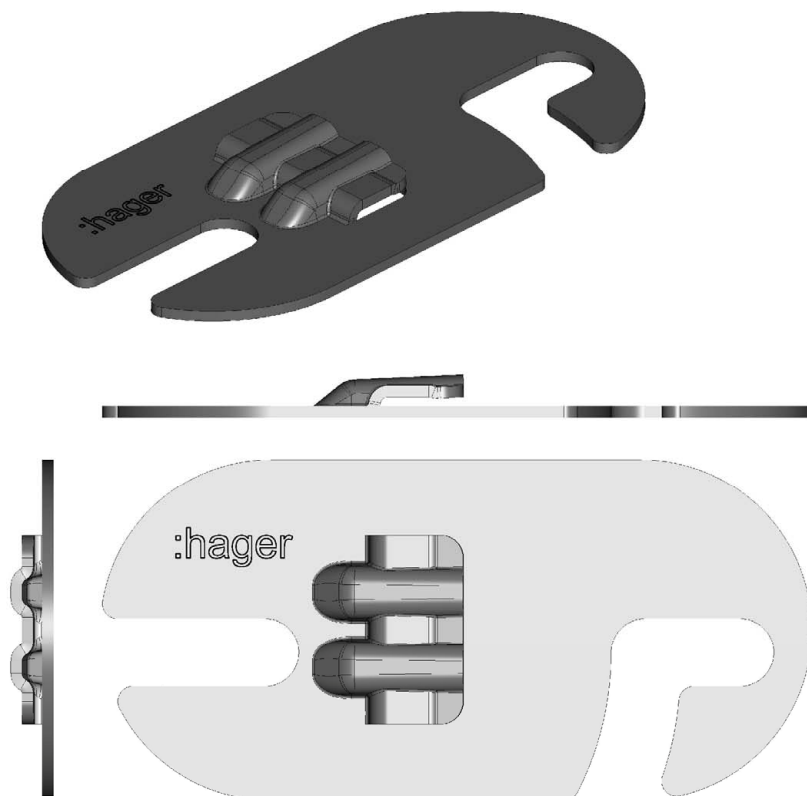
- direct wall/ceiling/floor mounting: fire protection approved fasteners, where appropriate, joint use of the fixing materials for the duct base
- suspended mounting: screw + nut at least M6, where appropriate, joint use of the fixing materials for the duct base

t=0.8mm



Barrier strip for duct
Height 60 to 100

t=1.5mm

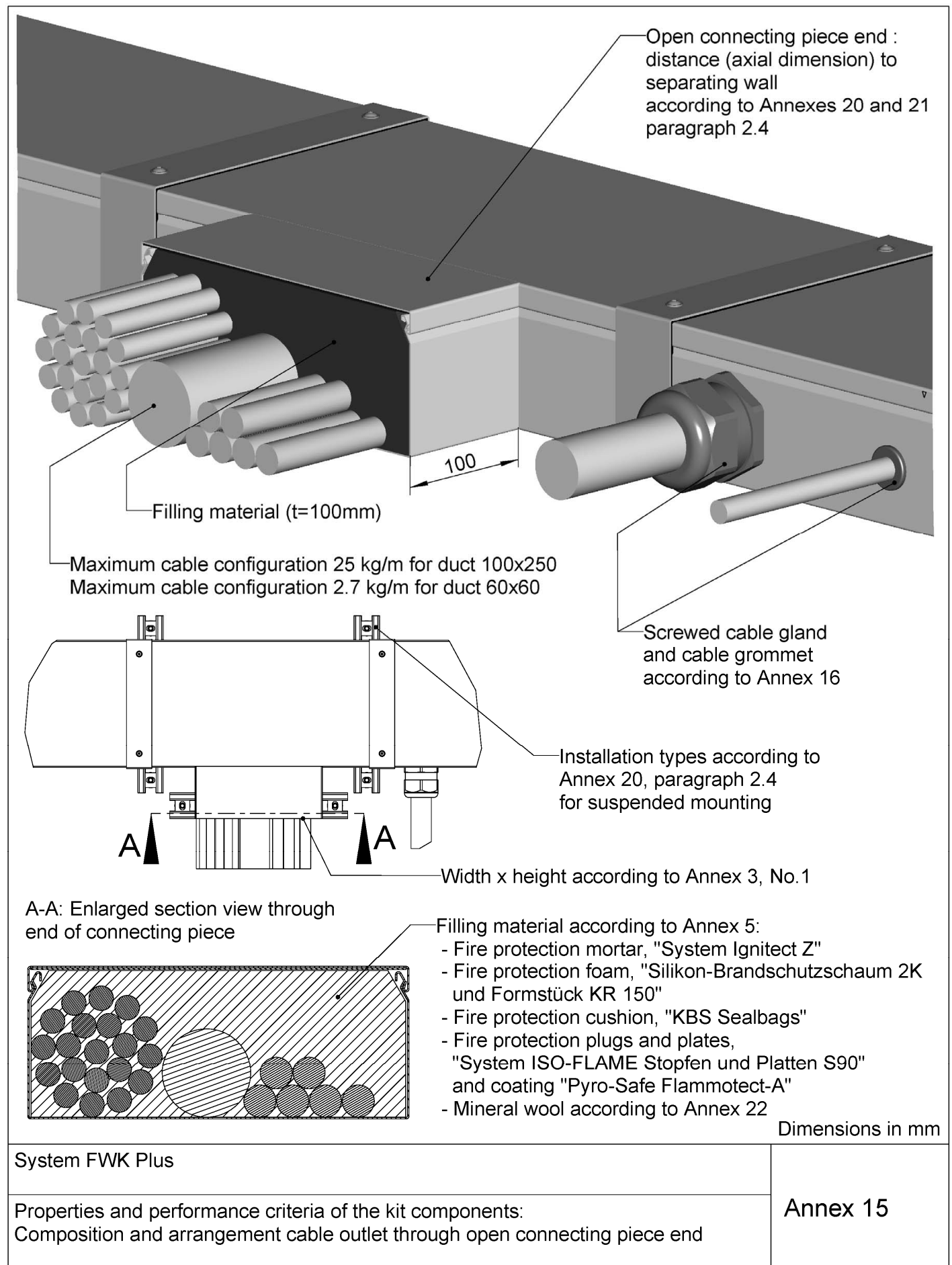


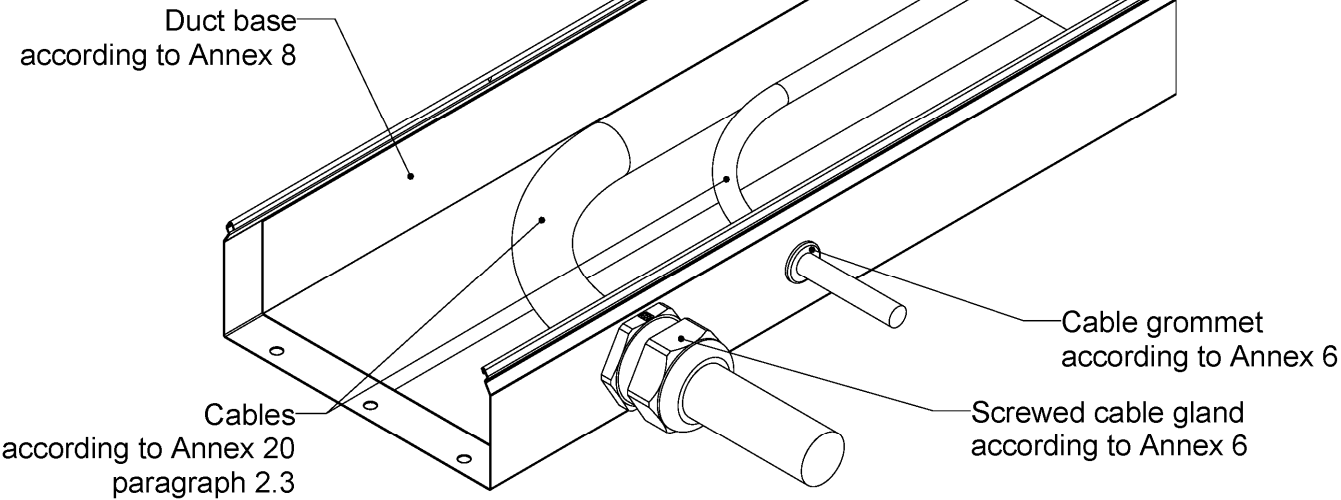
Barrier strip adapter

System FWK Plus

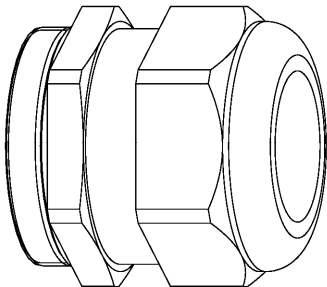
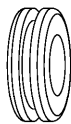
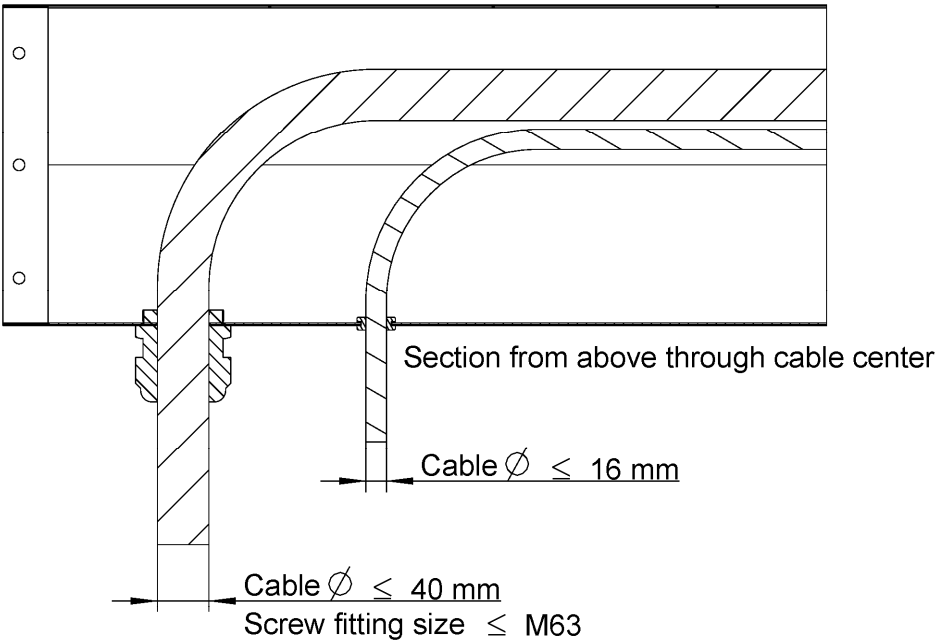
Properties and performance criteria of the kit components:
Design and arrangement of barrier strip and barrier strip adapter (optional)

Annex 14





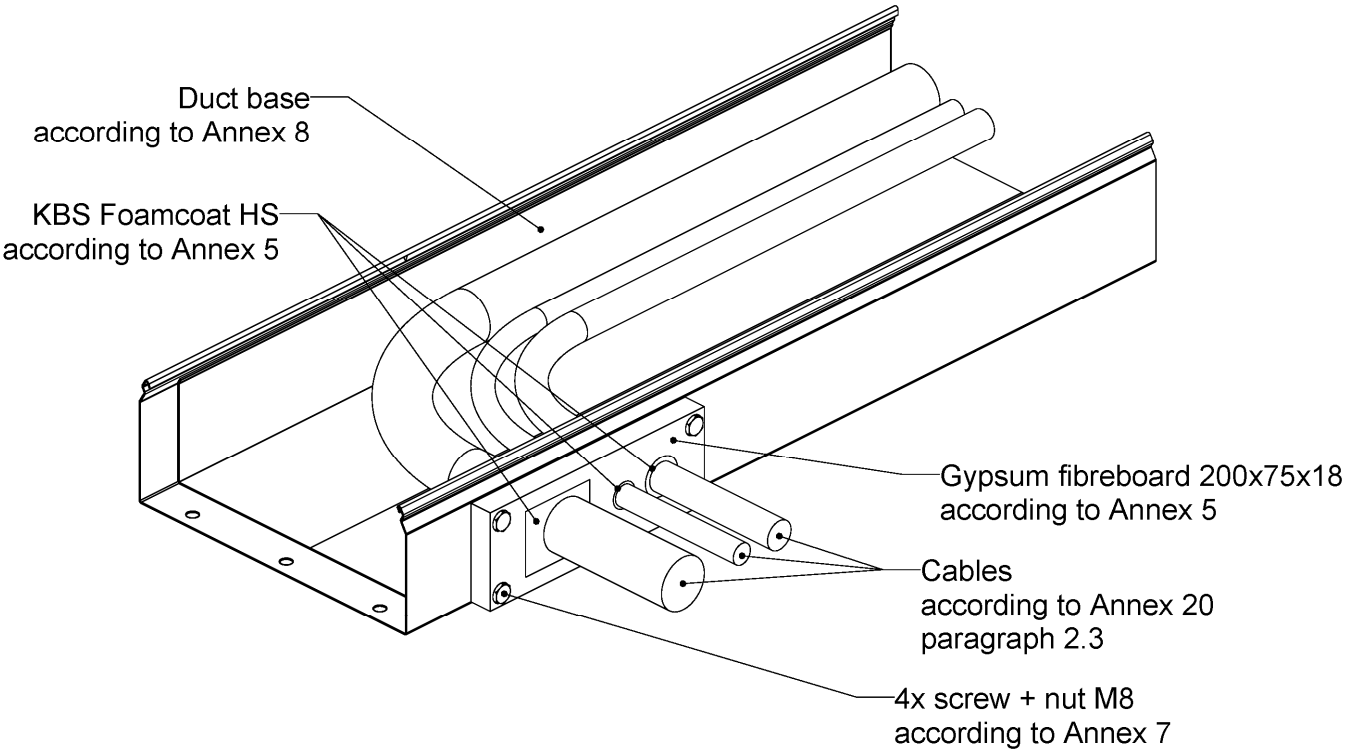
Distance between cable gland/cable grommet and separating wall according to Annex 20/21, paragraph 2.4



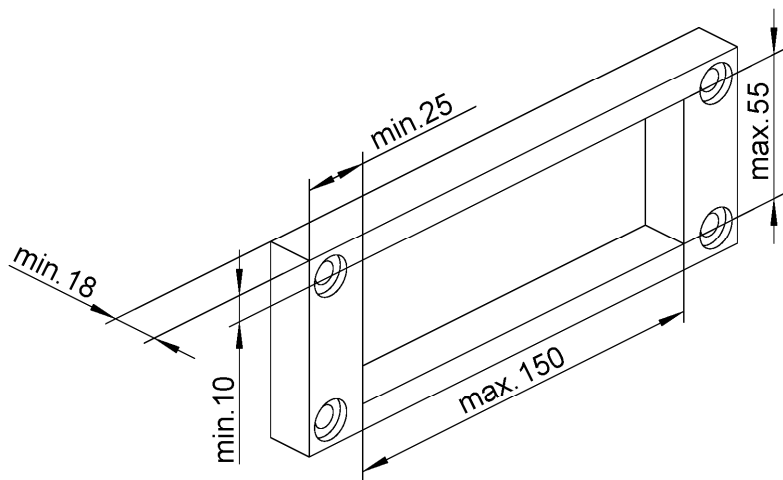
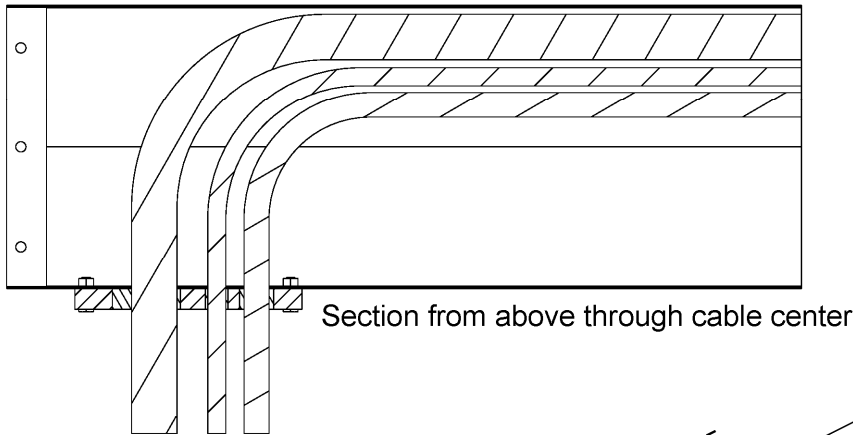
System FWK Plus

Properties and performance criteria of the kit components:
Cable outlet through screwed cable gland and cable grommet

Annex 16



Distance of cable inlet or outlet to separating wall according to Annex 20/21, paragraph 2.4



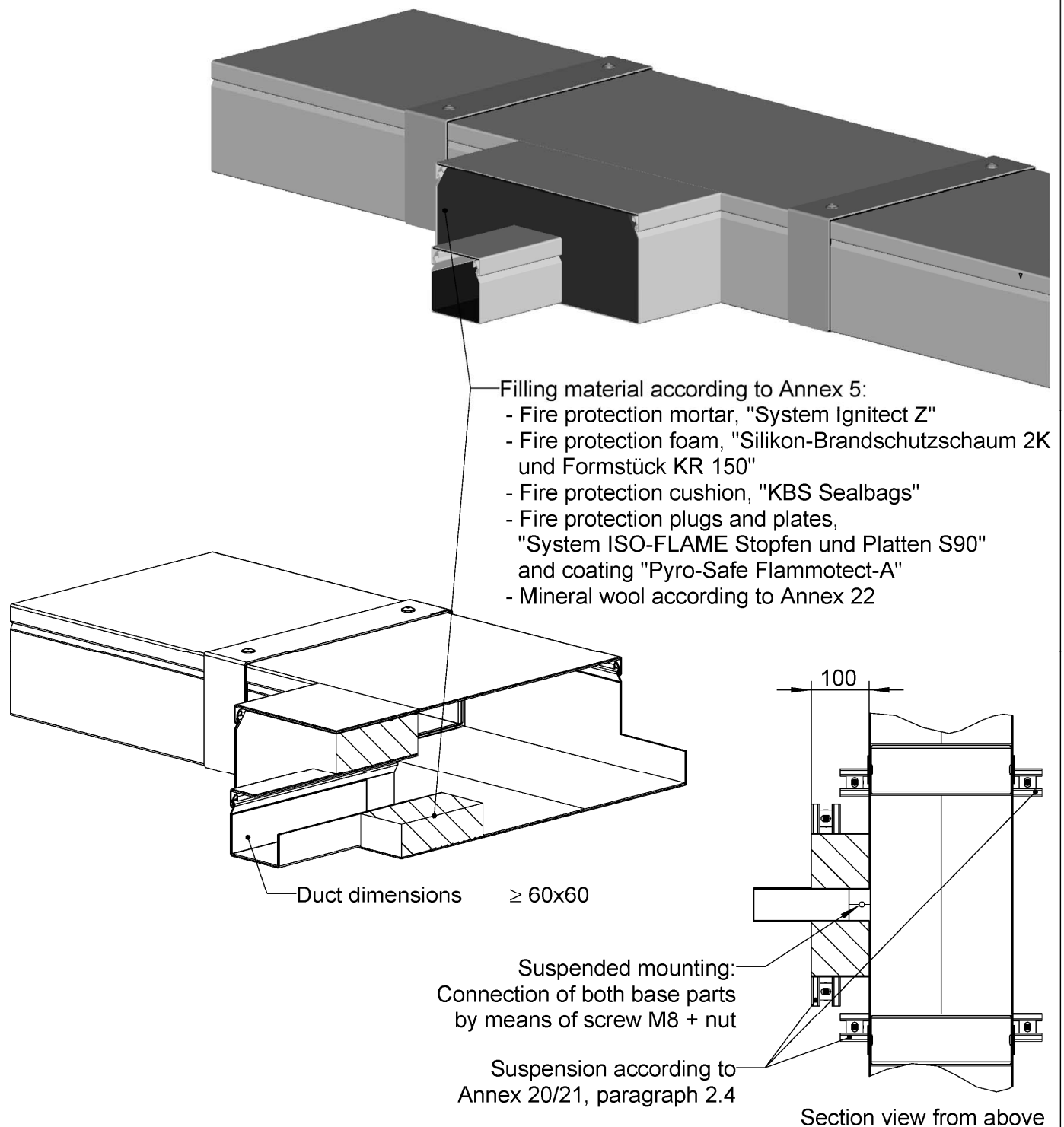
Dimensions in mm

System FWK Plus

Properties and performance criteria of the kit components:
Cable outlet through gypsum fibreboard

Annex 17

Distance between cable inlet or cable outlet by means of the "cross-section reduction" fitting and separating wall according to Annex 20/21, paragraph 2.4



Hint:
At least 100 mm overlap required.

Dimensions in mm

System FWK Plus

Properties and performance criteria of the kit components:
Composition cross-section reduction

Annex 18

2 Resistance to fire

2.1 Classification in accordance with EN 13501-2

The resistance to fire depends on the design/installation of the electrical service duct as well as on the associated components. Within the framework of this ETA, the resistance to fire of an electrical service duct assembled from the 'System FWK Plus' kit was verified at a penetration through a separating lightweight partition in accordance with EN 1363-1 of resistance to fire class EI90 in accordance with EN 13501-2

- configured with steel cables, cables and services
- with inlets and outlets for cables and services.

The electrical service duct fulfils the requirements of resistance to fire classes EI 30 ($h_o \leftrightarrow o$), EI 60 ($h_o \leftrightarrow o$) and EI 90 ($h_o \leftrightarrow o$) if the provisions of this ETA are met. Details of the variants tested and assessed in accordance with EAD 350003-01-1109 and the associated resistance to fire classes are listed below and in Annexes 20 to 27.

2.2 Separating elements

2.2.1 The electrical service duct has been verified for suspension from and direct fastening to rigid ceilings made of concrete, reinforced concrete or aerated concrete as well as for direct fastening to rigid walls made of masonry, concrete, reinforced concrete or aerated concrete – in each case with thicknesses in accordance with the structural requirements and depending on the required resistance to fire duration.

2.2.2 The electrical service duct has been verified for penetration through:

- a) rigid walls made of masonry, concrete, reinforced concrete or aerated concrete, thickness in accordance with structural requirements and depending on the required resistance to fire duration, but ≥ 100 mm
- b) Partitions
 - Thickness in accordance with structural requirements and depending on the required resistance to fire duration, but ≥ 100 mm and
 - design types 1), 2) or 3)
 - 1) Partitions with a steel substructure made of UW profiles (ceiling or floor profile) and CW profiles (stud profile) each 50 mm x 0.6 mm and
 - stud spacing ≤ 625 mm and
 - double-sided panelling made of at least two layers of ≥ 12.5 mm-thick cement- or gypsum-bonded boards, apparent density ≥ 800 kg/m³, reaction to fire class A1 or A2 in accordance with EN 13501-1 and
 - an internal insulation made of mineral wool from molten rock in accordance with EN 13162, thickness 40 mm, apparent density 100 kg/m³, reaction to fire class A1 in accordance with EN 13501-1
 - 2) Partitions as in 1) but without insulation or with an insulation differing from 1) but with reaction to fire class A1 in accordance with EN 13501-1
 - 3) Partitions with wooden substructure and
 - double-sided panelling as in 1)
 - with or without insulation
 - The distance between the opening through which the electrical service duct is fed and the wooden substructure shall be ≥ 100 mm. The cavities between the wall panelling, the wooden substructure and the opening reveal shall be tightly filled with mineral wool made of molten rock in accordance with EN 13162 of reaction to fire class A1 or A2 in accordance with EN 13501-1, over a depth of ≥ 100 mm.

System FWK Plus

Performance of the electrical service duct
Resistance to fire
Classification and information on the building components

Annex 19

For partitions of types 2) and 3), the opening reveal shall be fitted with a surrounding reveal made of ≥ 12.5 mm-thick cement- or gypsum-bonded boards, apparent density $\geq 800 \text{ kg/m}^3$, reaction to fire class A1 or A2 in accordance with EN 13501-1.

2.2.3 The ceilings and walls shall meet at least the resistance to fire class of the electrical service duct and be classified in accordance with EN 13501-2 (EI 30, EI 60 or EI 90).

2.3 Configuration of the electrical service duct

The electrical service duct assembled from the kit has been verified for configuration with cables and services with an external diameter $\leq 58 \text{ mm}$, a copper cross-section of the single cable $\leq 4 \times 185 \text{ mm}^2$ or with cable bundles $\varnothing \leq 90 \text{ mm}$ as well as for their inlet or outlet from the duct.

The cables and cable bundles are held in the electrical service duct by means of cable retaining clips (see Annex 13), with which the connecting pieces are fitted at a maximum distance of 500 mm.

Depending on the application, the duct connecting pieces are fitted with a barrier strip (see Annexes 8 and 14), which is inserted and locked into the support on the bottom part of the duct. The barrier strip adapter is clamped under the fastening screws of the bottom part of the duct (see Annex 7, Table 4).

The permitted total weight of the configuration of the electrical service ducts with cables and services is limited to:

- 2.7 kg/m for the external dimensions height = 60 mm, width = 60 mm and
- 25 kg/m for the external dimensions height $\leq 100 \text{ mm}$, width $\leq 250 \text{ mm}$.

The specifications and information of Annexes 5 to 7, 15 to 17 and – if mineral wool is used to seal the remaining cross-section – of Annex 22 apply to the inlets or outlets of the cables and services. The outlet of the cables and services through the end cap in accordance with Annexes 2 and 3 has not been verified within the framework of this ETA.

For the reduction of the duct cross-section, the specifications and information given in Annexes 5 and 18 and – if mineral wool is used to seal the remaining cross-section – in Annex 22 shall apply.

2.4 Arrangement and fastening of the service duct

The electrical service duct has been verified for

- suspension from adjacent rigid ceilings using threaded rods $\geq \text{M10}$ and mounting rails or
- suspension from adjacent rigid ceilings using ceiling hanger with a suspension bracket and threaded rod at the tip of the bracket or
- placement on brackets fastened to adjacent rigid walls with a threaded rod at the tip of the bracket or
- direct fastening to the rigid wall or rigid ceiling/floor

The execution is subject to Annexes 7 and 23 respectively.

The electrical service duct may be moved vertically within the storey (see Annex 1); separating ceilings shall not be penetrated. The ducts shall be fastened in accordance with the following provisions. For the arrangement of the cables and services in the duct the technical rules for electrical line systems at the place of application shall be observed; the distance between the cable retaining clips shall not exceed 500 mm.

An assessment of a change in the length of the electrical service duct due to operating conditions or fire exposure is not covered by this ETA.

The suspension devices and brackets including the threaded rods shall be made of steel and shall be dimensioned such that the calculated stresses do not exceed the values given in EN 1366-5, Table 5. The maximum suspension length shall be 1.50 m. EN 1366-5, Clause 13.4.2 shall be observed with regard to the elongation of the suspension devices or brackets.

System FWK Plus

Performance of the electrical service duct
Resistance to fire
Configuration, arrangement and fastening

Annex 20

The threaded rods at the bracket tips shall be fastened with washers and nuts in accordance with Annex 7 so that they cannot slip out when loaded or exposed to fire.

When the duct is suspended, each direction-changing piece of the electrical service duct shall be suspended in the area of the connections. (For examples, see Annexes 15 and 18).

The suspension devices and/or brackets as well as the electrical service ducts (direct fastening) shall be fastened to the rigid ceilings by means of anchors with steel screws suitable for the intended use in accordance with a European Technical Assessment covering the fire protection performance and the associated steel screws in accordance with the structural requirements.

Fasteners with a European Technical Assessment suitable for the intended use shall be used for fastening the electrical service duct directly to rigid walls.

Electrical service ducts arranged directly on rigid walls and/or ceilings in accordance with Section 2.2.1 or in the corner area of these walls and ceilings shall be connected to the walls to be penetrated in accordance with Section 2.2.2 by means of three- or two-sided wall connection pieces in accordance with Annex 12 and shall be fastened using the aforementioned fasteners.

The spacings and distances of the fasteners shall be in accordance with the structural requirements, but shall at least comply with the specifications given in Table 5.

Table 5 Spacing and distances of fasteners

| Type of fastener | Spacing |
|---|-----------|
| Electrical service ducts suspended from mounting rails | ≤ 1200 mm |
| Electrical service ducts mounted on top of mounting rails or brackets | ≤ 1500 mm |
| First suspension on both sides of the wall penetration | ≤ 500 mm |
| Electrical service ducts fastened directly to the wall/ceiling | ≤ 500 mm |
| Electrical service ducts fastened directly to the floor | ≤ 1500 mm |
| First fastening on both sides of the wall penetration for electrical service ducts directly fastened to the wall or ceiling | ≤ 250 mm |
| First suspension or fastening of cables and services upstream or downstream from cable inlets or outlets | ≤ 100 mm |

Furthermore, the distances listed in Table 6 shall be observed for the arrangement of the electrical service ducts:

Table 6 Distances

| Description | Distance |
|--|-------------------------------|
| Distance of the first connection of the connecting pieces from the separating wall penetrated by the electrical service duct | ≥ 265 mm |
| Distance of the cable inlets or outlets from the separating wall penetrated by the electrical service duct | ≥ 500 mm (Axial dimension) |
| Distance of the cable gland from the separating wall penetrated by the electrical service duct | ≥ 350 mm (Axial dimension) |
| Distance between two electrical service ducts | ≥ 100 mm |

System FWK Plus

Performance of the electrical service duct
Resistance to fire
Fastening and distances

Annex 21

2.5 Sealing of the remaining cross-section (annular gap) of the wall opening

The remaining cross-section (annular gap) around the electrical service duct at the penetration of separating walls in separate or continuous design in accordance with Annexes 25 and 26 shall be between 5 and 35 mm. If the electrical service duct is arranged directly on the separating rigid wall or in a room corner of the rigid building components, no gap is required on the duct sides adjacent to the respective rigid component.

The remaining cross-section (annular gap) shall be sealed with fire protection foam or fire protection mortar in accordance with Annex 5 or with materials in accordance with Table 7.

Table 7 Materials for sealing the remaining cross-section of the wall opening

| No. | Description/dimensions | Requirements regarding the material/reaction to fire of the components used | Annex ETA |
|-----|---|--|-----------|
| 1 | Gypsum mortar/bonding plaster | EN 13279-1 Reaction to fire class A1 in accordance with EN 13501-1 | 25 and 26 |
| 3 | Cement mortar | EN 998-1 or EN 998-2 Reaction to fire class at least A1 in accordance with Decision 96/603/EC | 25 and 26 |
| 4 | Mineral wool | Insulation wool made of molten rock in accordance with EN 13162 Apparent density $\geq 100 \text{ kg/m}^3$, melting point $> 1000 \text{ }^\circ\text{C}^*$ Reaction to fire class A1 in accordance with EN 13501-1** | 25 and 26 |
| * | to be verified by testing in accordance with DIN 4102-17 | | |
| ** | There is currently no possibility of declaring the characteristic 'propensity to undergo continuous smouldering' in declarations of performance for products in accordance with EN 13162. As long as the amendment of the standard is outstanding, the requirements relating to this characteristic applicable at the location where the kit is used shall be observed. | | |

2.6 Sealing of the remaining cross-section of the cable inlet or outlet and of the duct reducer piece with mineral wool in accordance with Annex 20, Section 2.3

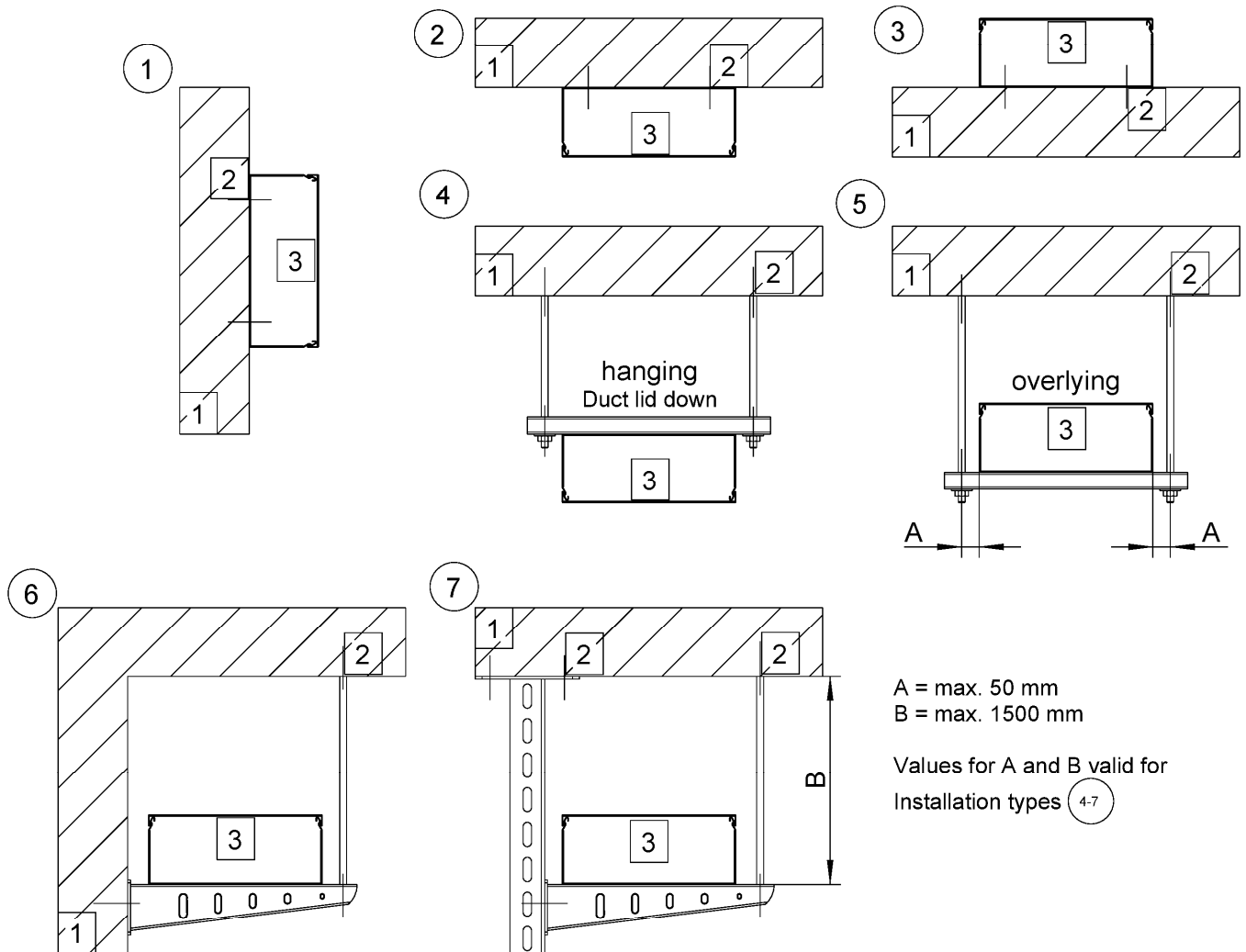
Within the framework of the ETA, the sealing of the remaining cross-section of the cable inlet or outlet and/or duct reducer piece in accordance with Annex 20, Section 2.3 with mineral wool in accordance with EN 13162, apparent density $\geq 100 \text{ kg/m}^3$, melting point $> 1000 \text{ }^\circ\text{C}^*$, resistance to fire class A1 in accordance with EN 13501-1** was verified. The provisions regarding the melting point and the 'propensity to undergo continuous smouldering' in accordance with Table 7, No. 4 shall be observed.

System FWK Plus

Performance of the electrical service duct
Resistance to fire
Sealing of remaining cross-section of wall opening

Annex 22

1-7 approved installation types

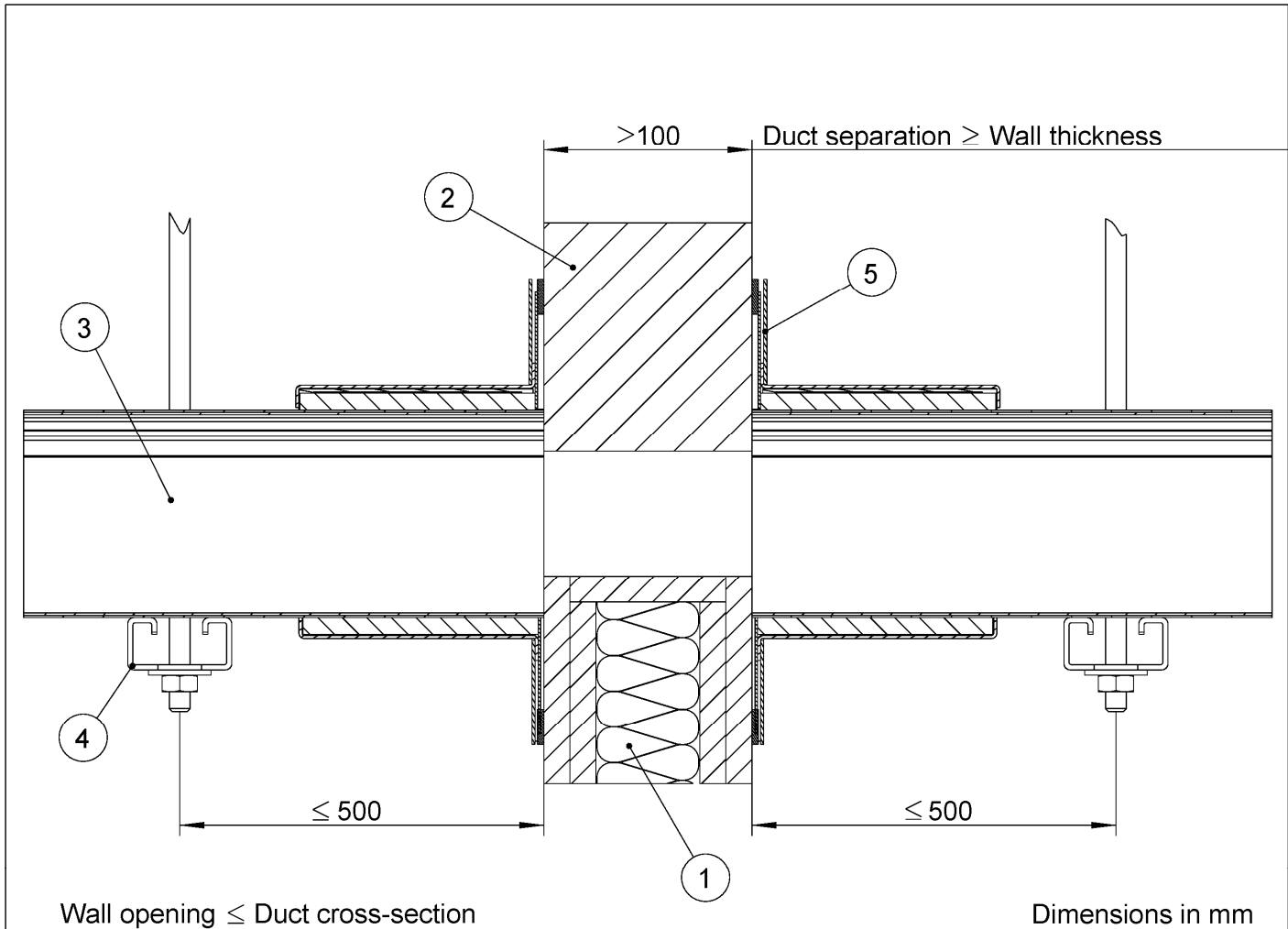


- 1 - Rigid wall and ceilings according to Annex 20, paragraph 2.2. Structure and thickness according to static requirements and the respective required fire resistance duration.
- 2 - Fasteners, dimensioning according to Annex 20, paragraph 2.4.
- Fastening distances according to Annex 21 and 27.
- 3 - Duct made of connecting pieces according to annexes 3, 8 to 11, 13, 14.
- Dimensions depending on the area of application, configuration according to appendix 20.
- Fix the duct to the C-rail with M8 screws and connectors according to Annex 7.
- 4-7 - Support system: Cantilever, ceiling hanger, C-profile rail, threaded rod, connectors and connecting elements according to Annex 7

System FWK Plus

Performance of the electrical service duct:
Fire resistance
Installation types

Annex 23

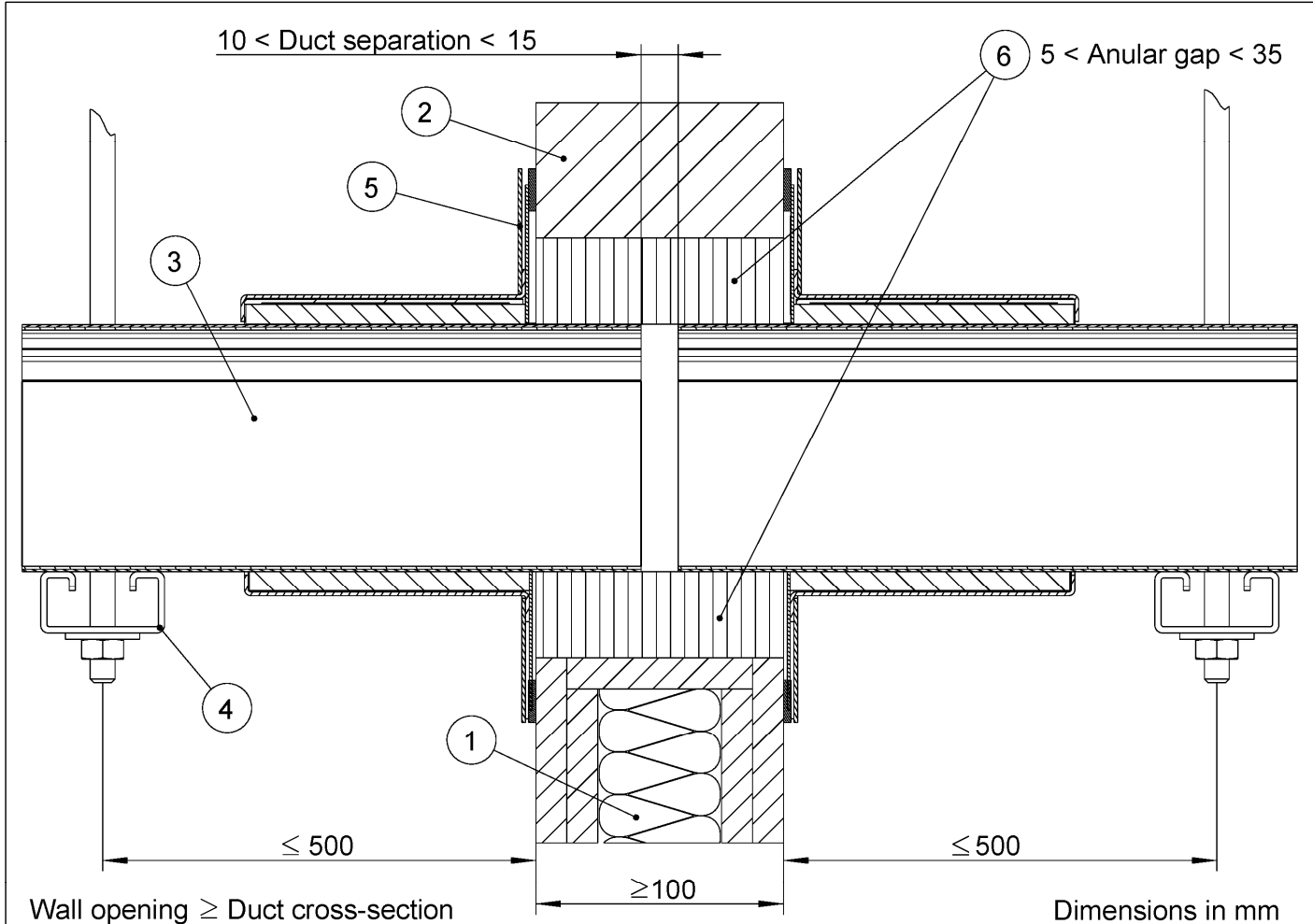


- ① Separation wall depending on the required fire resistance class EI30, EI60 Structure according to Annex 19, paragraph 2.2
- ② Rigid wall depending on the required fire resistance class EI30, EI60 Structure according to Annex 19, paragraph 2.2
- ③ Connecting pieces according to Annexes 3 and 8 to 11
Dimensions depending on the area of application
Configuration according to Annex 20
- ④ Suspension according to Annex 7 and Annexes 20 and 21, paragraph 2.4
Fixing with suitable anchors according to ETB according to Annex 20, paragraph 2.4
- ⑤ Wall connection piece according to Annex 12
Fixing with suitable anchors according to ETB according to Annex 20, paragraph 2.4

System FWK Plus

Performance of the installed electrical service duct:
Fire resistance
Installation in walls, fire resistance class EI30, EI60 - Butt joint -

Annex 24

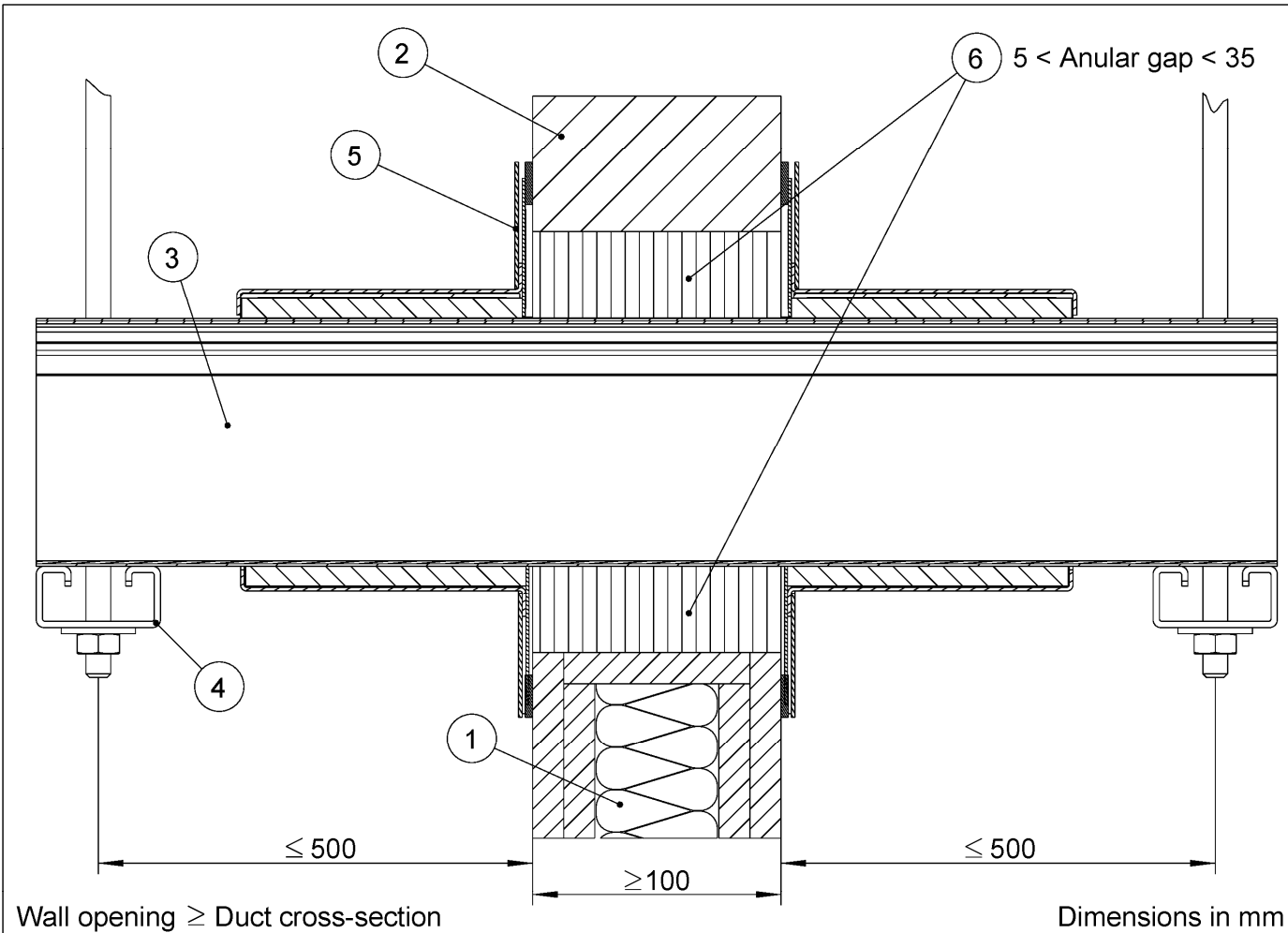


- ① Separation wall depending on the required fire resistance class EI30 to EI90 Structure according to Annex 19, paragraph 2.2
- ② Rigid wall depending on the required fire resistance class EI30 to EI90 Structure according to Annex 19, paragraph 2.2
- ③ Connecting pieces according to Annexes 3 and 8 to 11
Dimensions depending on the area of application
Configuration according to Annex 20
- ④ Suspension according to Annex 7 and Annexes 20 and 21, paragraph 2.4
Fixing with suitable anchors according to ETB according to Annex 20, paragraph 2.4
- ⑤ Wall connection piece according to Annex 12
Fixing with suitable anchors according to ETB according to Annex 20, paragraph 2.4
- ⑥ Closure with:
 - Fire protection mortar or fire protection foam according to Annex 5
 - Gypsum mortar, gypsum plaster, mineral wool according to Annex 22

System FWK Plus

Performance of the installed electrical service duct:
Fire resistance
Installation in walls, fire resistance class EI30 to EI90 - Separated -

Annex 25










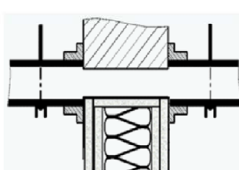
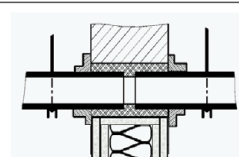
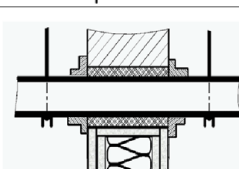
- ① Separation wall depending on the required fire resistance class EI30 to EI90 Structure according to Annex 19, paragraph 2.2
- ② Rigid wall depending on the required fire resistance class EI30 to EI90 Structure according to Annex 19, paragraph 2.2
- ③ Connecting pieces according to Annexes 3 and 8 to 11
Dimensions depending on the area of application
Configuration according to Annex 20
- ④ Suspension according to Annex 7 and Annexes 20 and 21, paragraph 2.4
Fixing with suitable anchors according to ETB according to Annex 20, paragraph 2.4
- ⑤ Wall connection piece according to Annex 12
Fixing with suitable anchors according to ETB according to Annex 20, paragraph 2.4
- ⑥ Closure with:
 - Fire protection mortar or fire protection foam according to Annex 5
 - Gypsum mortar, gypsum plaster, mineral wool according to Annex 22

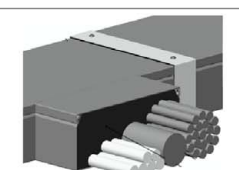
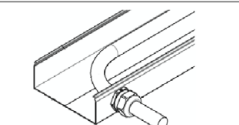
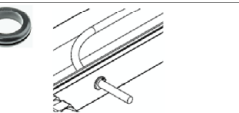
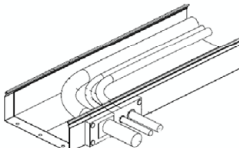
System FWK Plus

Performance of the installed electrical service duct:
Fire resistance
Installation in walls, fire resistance class EI30 to EI90 - Continuous -

Annex 26

| | | | Direct mounting | | | Suspended mounting | | | |
|---------------------------------|--|--|---|---|---|---|---|---|---|
| | | | Wall | Ceiling | Floor | Cross beam | | Cantiveler | |
| | | | | | | hanging | overlying | | |
| | | | | | | | | | |
| Numbering according to Annex 23 | | |  |  |  |  |  |  |  |
| Max. Fastening distance [mm] | | | 500 | | 1500 | 1200 | 1500 | | |
| Fitting part length [mm] | | | 100 to 3000 | | | | | | |

| | | | |
|-----------------------------------|---|---|--|
| Wall opening < Duct cross-section | 1 |  | EI 60 h_o i↔o |
| | | | |
| Wall opening > Duct cross-section | 2 |  | EI 90 h_o i↔o |
| | | | |
| | 3 |  | |
| | | | Filling of remaining cross-section of wall opening with: > Fire protection mortar according to Annex 5 > Mineral wool (Melting point > 1000 °C, Density > 100 kg/m²) according to Annex 22 > Fire protection foam and fitting piece according to Annex 5 > Gypsum / cement according to Annex 22 |

| | | | |
|--------------|------------------------------|---|--|
| Cable outlet | Open shaped part end |  | Cable outlet according to Annex 15: > Maximum cable diameter: 58 mm > Filling of remaining cross-section with fire protection mortar/bag/foam and shaped piece/plug, mineral wool (depth > 100 mm) |
| | Cable gland |  | Cable outlet according to Annex 16: > Material cable gland: PA6 or brass > Maximum size of cable gland: M63, maximum cable diameter: 40 mm |
| | Cable grommet |  | Cable outlet according to Annex 16: > Maximum cable diameter: 16 mm |
| | Gypsum fibreboard + Foamcoat |  | Cable outlet according to Annex 17: > Max. cut-out in duct/gypsum fibreboard [HxW]: 55 x 150 mm > Gypsum fibreboard thickness: > 18 mm , maximum cable diameter: 40 mm |

| | | | |
|--|--|--|----------|
| System FWK Plus | | | Annex 27 |
| Classification overview + cable outlet | | | |

Standards

| | |
|-----------------------|---|
| EN 13501-1:2018-12 | Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests |
| EN 13501-2:2016-12 | Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services |
| EN 1363-1:2012-10 | Fire resistance tests - Part 1: General requirements |
| EN 1366-5:2010-06 | Fire resistance tests for service installations - Part 5: Service ducts and shafts |
| EN 13823:2015-02 | Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item |
| EN 16733:2016 | Reaction to fire tests for building products - Determination of a building product's propensity to undergo continuous smouldering |
| EN 13162:2015-04 | Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification |
| EN 10088-2:2014-12 | Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes |
| EN 10143:2006-09 | Continuously hot-dip coated steel sheet and strip - Tolerances on dimensions and shape |
| EN 10346:2015-10 | Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions |
| EN 10111 :2008-06 | Continuously hot rolled low carbon steel sheet and strip for cold forming - Technical delivery conditions |
| EN 10130:2007-02 | Cold rolled low carbon steel flat products for cold forming - Technical delivery conditions |
| EN ISO 225:2011-02 | Fasteners - Bolts, screws, studs and nuts - Symbols and descriptions of dimensions |
| EN ISO 898-1:2013-05 | Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs with specified property classes - Coarse thread and fine pitch thread |
| EN ISO 898-2:2012-08 | Mechanical properties of fasteners made of carbon steel and alloy steel - Part 2: Nuts with specified property classes - Coarse thread and fine pitch thread |
| EN ISO 7093-1:2000-01 | Plain washers - Large series - Part 1: Product grade A |
| EN ISO 4759-3:2016-12 | Tolerances for fasteners - Part 3: Washers for bolts, screws and nuts - Product grades A, C and F |
| ISO 4032:2012-12 | Hexagon regular nuts (style 1) - Product grades A and B |
| ISO 7380-2:2011-08 | Button head screws - Part 2: Hexagon socket button head screws with collar |
| EN 15283-2:2009-12 | Gypsum boards with fibrous reinforcement - Definitions, requirements and test methods - Part 2: Gypsum fibre boards |
| EN 60423:2008-07 | Conduit systems for cable management - Outside diameters of conduits for electrical installations and threads for conduits and fittings |
| EN 62444:2014-05 | Cable glands for electrical installations |
| EN 13279-1:2008-11 | Gypsum binders and gypsum plasters - Part 1: Definitions and requirements |
| EN 998-1:2017-02 | Specification for mortar for masonry - Part 1: Rendering and plastering mortar |
| EN 998-2:2017-02 | Specification for mortar for masonry - Part 2: Masonry mortar |

System FWK Plus

List of documents referred to – Part 1

Annex 28

Other documents

| | |
|--------------------|--|
| Decision 96/603/EC | Decision of the European Commission on the establishment of a list of products to be classified in category A "No contribution to fire" in accordance with Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products amended by decision 2000/605/EG and by decision 2003/424 / EG |
| EAD 350003-01-1109 | Kit for fire resistant service ducts consisting of pre-fabricated connection pieces (made of steel sheet with an intumescent coating or lining) and accessories |
| TR 034 | General BWR3 Checklist for EADs/ETAs - Dangerous substances, (October 2015) |

System FWK Plus

List of documents referred to - Part 2

Annex 29