

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-21/0174
of 22 February 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

FOX-VT and FOX-HT

Product family
to which the construction product belongs

Thermal bridge reduced wall brackets as part of the
subframe of ventilated external wall cladding systems

Manufacturer

HILTI Corporation
Feldkircherstraße 100
9494 SCHAAN
FÜRSTENTUM LIECHTENSTEIN

Manufacturing plant

This European Technical Assessment
contains

36 pages including 31 annexes 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

EAD 090018-00-0404

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Specific Part

1 Technical description of the product

The thermal bridge-reducing brackets Hilti MFT-FOX VT and MFT-FOX HT for rear-ventilated external wall claddings fall within the scope of EAD 090018-00-0404.

The construction products are thermal bridge-reducing L-shaped brackets made of aluminium and plastic. The front part and the rear part are made of aluminium; the middle part is made of plastic. The parts are joined together in a form-fitting manner in an injection-moulding process.

The construction products (brackets) can be subdivided in the following variants:

product	field of application	length [mm]	height [mm]
"MFT-FOX VT"	Bracket for vertical substructures	$140 \leq L \leq 200$	80
		$200 \leq L \leq 320$	150
"MFT-FOX HT"	Bracket for horizontal substructures	$140 \leq L \leq 200$	80
		$200 \leq L \leq 320$	150

The substructure profiles and its fastening as well as the anchoring of the brackets to the construction works are not covered by this European Technical Assessment.

Detailed information and data of all the components are given in the annexes of this ETA and in the associated test reports.

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

The construction products (brackets) are intended for use in external wall cladding systems in rear-ventilated facades. The brackets are anchored or fixed to the external walls of buildings as load-transferring structural components of the facade.

For brackets MFT-FOX VT used in vertical substructure, the vertical substructure profiles are screwed to the bracket in round holes or slots at the front end of the cantilever by means of self-drilling screws. (see Annex A 1.3)

For brackets MFT-FOX HT used in horizontal substructures, the brackets featuring a horizontal slit at the front end of the cantilever for accommodating the substructure profiles are used. In addition, the bracket has an integrated screw channel at the front end for fastening of the substructure profiles. For vertical adjustment of the bracket, a vertical slot is provided on the base plate of the bracket that is against the wall. To prevent later displacement, the surface surrounding of the slit is serrated and is covered with a special serrated lock washer.

The characteristics of the walls shall be verified prior to use of the brackets, especially regarding fire classification and suitability for mechanical anchoring.

The tests and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the brackets of at least 25 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 brackets are non-load bearing in relation to the construction works, i.e. they do not contribute directly to the stability of the wall on which they are installed. At the same time, the brackets are load-transferring in relation to the facade (for self-weight and wind actions).

Detailed information and data regarding installation, maintenance and repair are given in Annex B.

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

3.1 Safety in case of fire (BWR 2)

Essential characteristic	Performance (class acc. to EN 13501-1)
Reaction to fire	C-s1,d0 ¹⁾
	E ²⁾
¹⁾ for application of the brackets on substrates of class A1 or A2-s1,d0 acc. to EN 13501-1 (density $\geq 650 \text{ kg/m}^3$, thickness $\geq 12 \text{ mm}$), with or without additional thermal insulation of class A1 or A2-s1,d0 acc. to EN 13501-1 ²⁾ for all other applications not covered by footnote "1"	

Note: There is currently no European reference scenario for the reaction to fire assessment of facades. In some Member States, the classification of external wall claddings in accordance with EN 13501-1 might not be sufficient for use in facades. An additional assessment of external wall claddings in accordance with national provisions (e.g. on the basis of large-scale testing) might be necessary to comply with Member State regulations until the European classification system has been supplemented.

3.2 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Glass fibre content Acc. EAD 09-0018-00-0404, clause 2.2.2	49%
Mechanical properties of aluminium	See Annex C 1.
Mechanical resistance of bracket	See Annexes C 1 – C 3.
Mechanical resistance of screw connection	See Annex C 4.
Influencing factors	See Annex C 5.

3.3 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal conductivity and heat losses	$\lambda = 0.37 \text{ W/(mK)}$ *
* Thermal conductivity of the plastic part	

English translation prepared by DIBt

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

For the European Assessment Document EAD 090018-00-0404 (May 2018), the following legal basis shall apply: [2003/640/EC].

The following system of assessment and verification of constancy of performance (AVCP) is to be used for the brackets: 2+.

The following system of assessment and verification of constancy of performance (AVCP) is to be used for brackets in terms of reaction to fire: 1, or 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 Deutsches Institut für Bautechnik.

Issued in Berlin on 22 February 2021 by Deutsches Institut für Bautechnik

Renée Kamanzi-Fechner
Head of Section

beglaubigt:
Beckmann

The "MFT-FOX VT" and "MFT-FOX HT" brackets must consist of the components: profile mounting plate, plastic part of cantilever arm and base plate. The "MFT-FOX HT" brackets must, if necessary, be used in connection with serrated washers. The individual types of profile mounting plates, plastic part of cantilever arms and base plates can be combined as follows:

Overview of brackets – Combination of profile mounting plates, plastic part of cantilever arms and base plates

Type of profile mounting plate with Type of plastic part of cantilever arm	Type of base plate									
	MFT-FOX VT M 11	MFT-FOX VT M 6,5	MFT-FOX VT L 11	MFT-FOX VT L 6,5	MFT-FOX HT M 11	MFT-FOX HT M 5	MFT-FOX HT M 6,5	MFT-FOX HT L 11	MFT-FOX HT L 5	MFT-FOX HT L 6,5
MFT-FOX VT M with MFT-FOX VT/HT 140-160	x	x								
MFT-FOX VT M with MFT-FOX VT/HT 180-200	x	x								
MFT-FOX VT L with MFT-FOX VT/HT 220-240			x	x						
MFT-FOX VT L with MFT-FOX VT/HT 260-280			x	x						
MFT-FOX VT L with MFT-FOX VT/HT 300-320			x	x						
MFT-FOX HT M with MFT-FOX VT/HT 140-160					x	x	x			
MFT-FOX HT M with MFT-FOX VT/HT 180-200					x	x	x			
MFT-FOX HT L with MFT-FOX VT/HT 220-240								x	x	x
MFT-FOX HT L with MFT-FOX VT/HT 260-280								x	x	x
MFT-FOX HT L with MFT-FOX VT/HT 300-320								x	x	x

FOX-VT and FOX-HT

Product description
Brackets "MFT-FOX VT" and "MFT-FOX HT"

Annex A 1.1

Overview of components for brackets

Base plates

	Base plates	Annex
VT	MFT-FOX VT M 11	A 2.1
	MFT-FOX VT M 6,5	
	MFT-FOX VT L 11	
	MFT-FOX VT L 6.5	
HT	MFT-FOX HT M 11	A 2.2
	MFT-FOX HT M 5	
	MFT-FOX HT M 6.5	
	MFT-FOX HT L 11	
	MFT-FOX HT L 5	
	MFT-FOX HT L 6.5	

Profile mounting plates

Profile mounting plate	Annex
MFT-FOX VT M	A 3.1
MFT-FOX VT L	
MFT-FOX HT M	A 3.2
MFT-FOX HT L	

Plastic part of cantilever arm

Plastic part of cantilever arms	Annex
MFT-FOX VT/HT 140-160	A 4
MFT-FOX VT/HT 180-200	
MFT-FOX VT/HT 220-240	
MFT-FOX VT/HT 260-280	
MFT-FOX VT/HT 300-320	

Serrated washer

Serrated washer	Annex
Medium	A 5
Large	

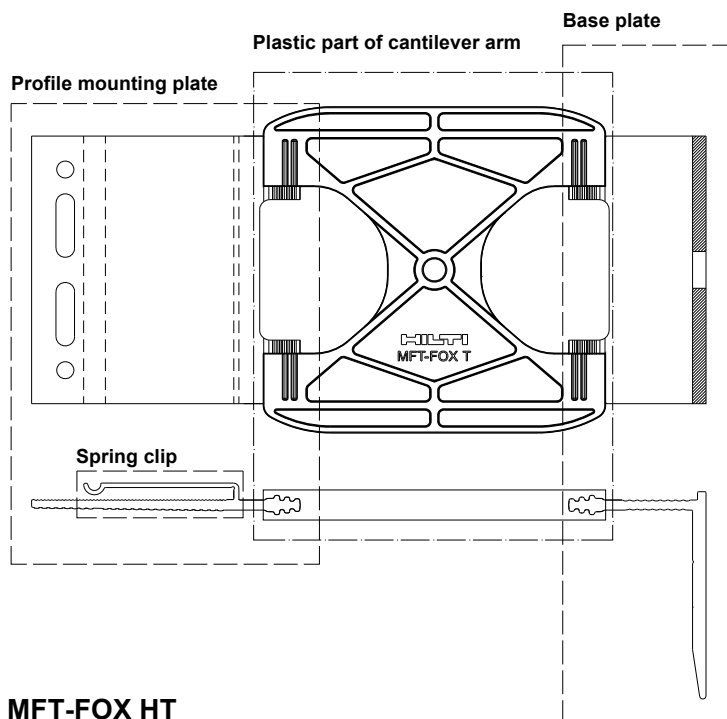
FOX-VT and FOX-HT

Product description
Overview of components for "MFT-FOX VT" and "MFT-FOX HT"

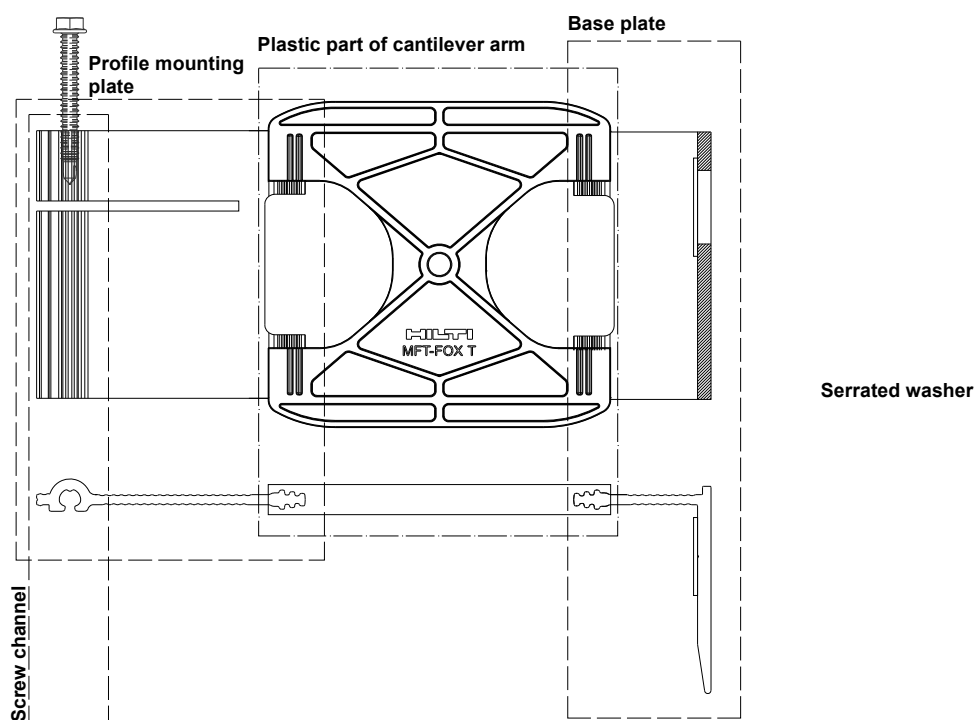
Annex A 1.2

Component Overview of MFT-FOX VT and MFT-FOX HT brackets

Components MFT-FOX VT



Components MFT-FOX HT



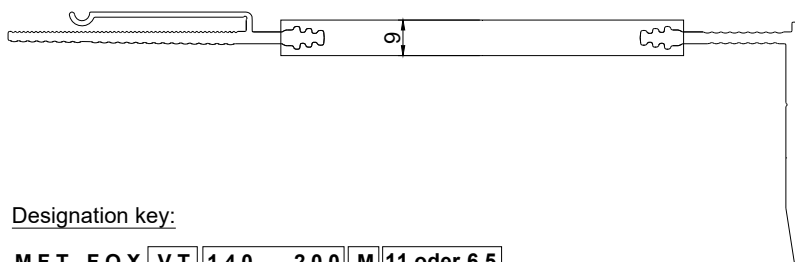
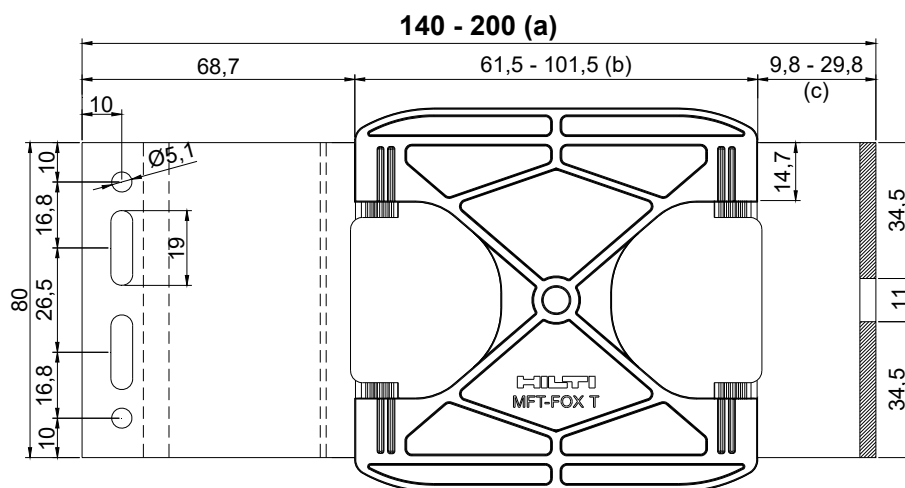
FOX-VT and FOX-HT

Product description
Overview of components for "MFT-FOX VT" and "MFT-FOX HT"

Annex A 1.3

Overview MFT-FOX VT 140 - 200 M11/6,5

Anchor/direct fastening/Screw connection



Designation key:

MFT-FOX **VT** **140 - 200** **M** **11 oder 6,5**

- ▶ **VT** ... vertical version
- ▶ **HT** ... horizontale version
- ▶ **Length of bracket in mm**
- ▶ **M** ... Bracket version "Medium"
Bracket height 80 mm
- ▶ **L** ... Bracket version "Large"
Bracket height 150 mm
- ▶ **Anchorage on base**
- ▶ 11 ... Anchorage with approved anchor of Ø 10 mm
- ▶ 6,5 ... Anchorage with approved screws of Ø 6,5 mm and approved power acuated fasteners

Relationship of cantilever arm length to plastic part length and base plate protrusion

a	b	c
140	61,5	9,8
160	61,5	29,8
180	101,5	9,8
200	101,5	29,8

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt.
A comma is used as the decimal marker.

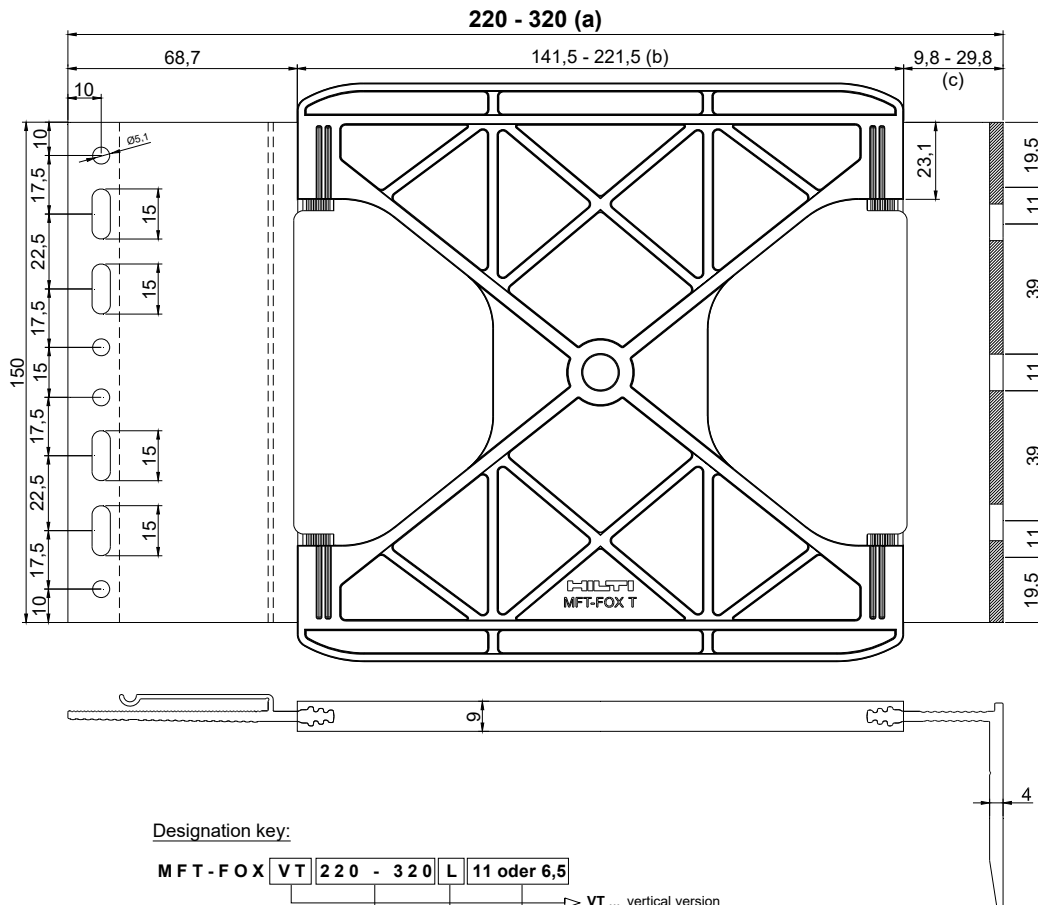
FOX-VT and FOX-HT

Product description
"MFT-FOX VT" bracket with length 140 - 200 mm ("Medium")

Annex A 1.4

Overview MFT-FOX VT 220 - 320 L11/6,5

Anchor/direct fastening/Screw connection



Designation key:

MFT-FOX **VT** **220 - 320** **L** **11 oder 6,5**

- ▶ **VT** ... vertical version
HT ... horizontale version
- ▶ **Length of bracket in mm**
- ▶ **M** ... Bracket version "Medium"
Bracket height 80 mm
- ▶ **L** ... Bracket version "Large"
Bracket height 150 mm
- ▶ **Anchorage on base**
11 ... Anchorage with approved anchor of Ø 10 mm
6,5 ... Anchorage with approved screws of Ø 6,5 mm and approved power acuated fasteners

Relationship of cantilever arm length to plastic part length and base plate protrusion

a	b	c
220	141,5	9,8
240	141,5	29,8
260	181,5	9,8
280	181,5	29,8
300	221,5	9,8
320	221,5	29,8

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt.
A comma is used as the decimal marker.

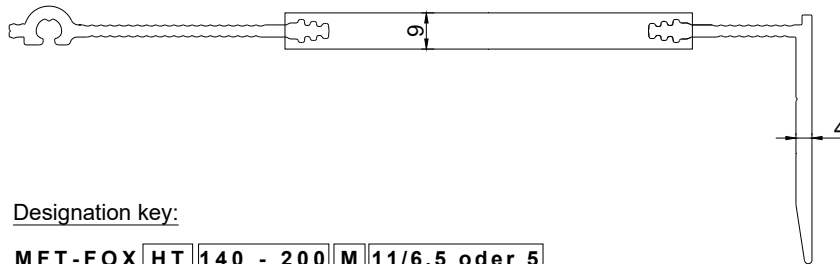
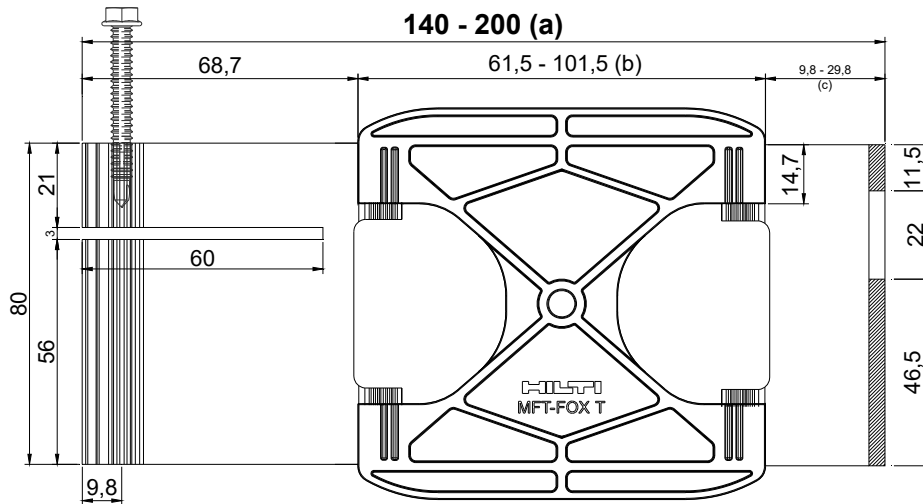
FOX-VT and FOX-HT

MFT-FOX VT" bracket with length 220 - 320 mm ("Large")

Annex A 1.5

Overview MFT-FOX HT 140 - 200 M11/6,5/5

Anchor/direct fastening/Screw connection



Designation key:

MFT-FOX HT 140 - 200 M 11/6,5 oder 5

- ▶ **VT** ... vertical version
- ▶ **HT** ... horizontale version
- ▶ **Length of bracket in mm**
- ▶ **M** ... Bracket version "Medium"
Bracket height 80 mm
- ▶ **L** ... Bracket version "Large"
Bracket height 150 mm
- ▶ **Anchorage on base**
- ▶ 11 ... Anchorage with approved anchor of \varnothing 10 mm
- ▶ 6,5 ... Anchorage with approved screws of \varnothing 6,5 mm and approved power acuated fasteners

Relationship of cantilever arm length to plastic part length and base plate protrusion

a	b	c
140	61,5	9,8
160	61,5	29,8
180	101,5	9,8
200	101,5	29,8

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt.
A comma is used as the decimal marker.

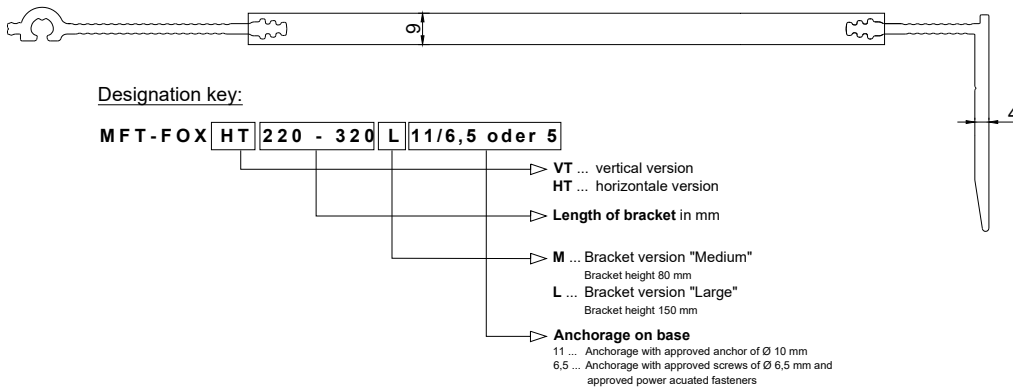
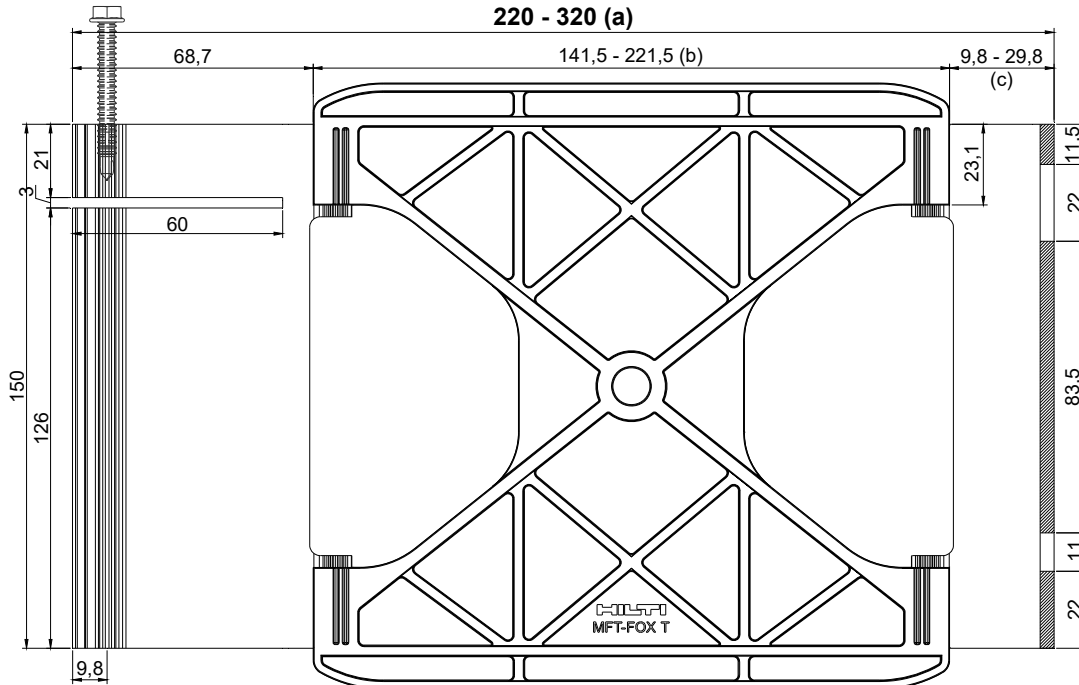
FOX-VT and FOX-HT

Product description
"MFT-FOX HT" bracket with length 140 - 200 mm ("Medium")

Annex A 1.6

Overview MFT-FOX HT 220 - 320 L11/6,5/5

Anchor/direct fastening/Screw connection



Relationship of cantilever arm length to plastic part length and base plate protrusion

a	b	c
220	141,5	9,8
240	141,5	29,8
260	181,5	9,8
280	181,5	29,8
300	221,5	9,8
320	221,5	29,8

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt. A comma is used as the decimal marker.

FOX-VT and FOX-HT

Product description
"MFT-FOX HT" bracket with length 220 - 320 mm ("Large")

Annex A 1.7

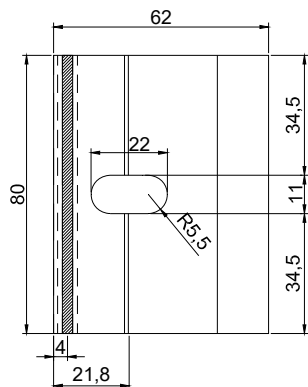
English translation prepared by DIBt

Overview base plate MFT - FOX VT

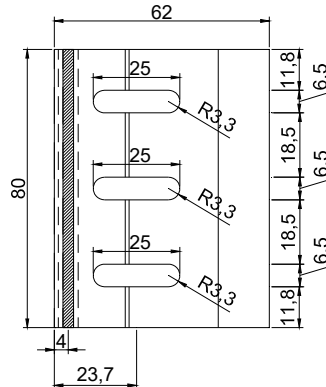
Medium/Large

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt.

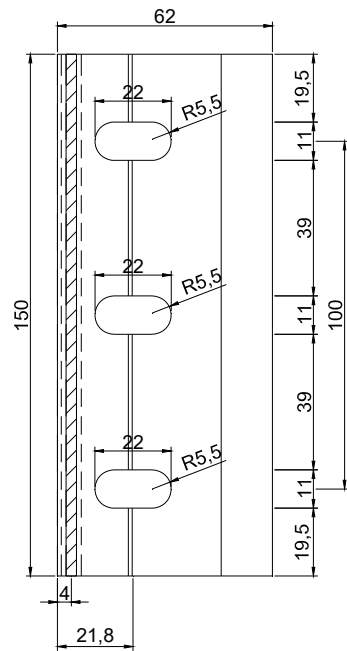
MFT-FOX VT M 11 (Medium)
Cantilever arm height 9.8 oder 29,8
Anchor



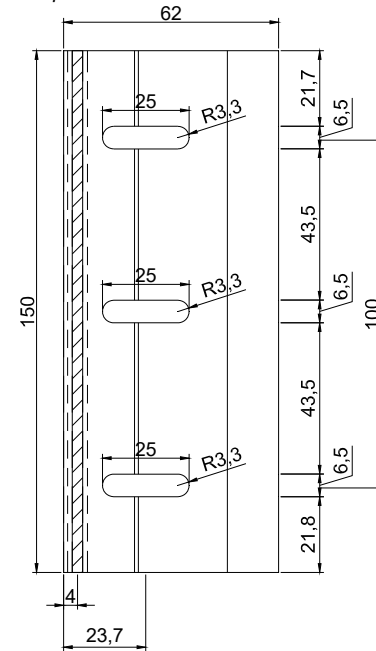
MFT-FOX VT M 6,5 (Medium)
Cantilever arm height 9.8 oder 29,8
power actuated fastener/Screw fastening



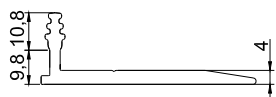
MFT-FOX VT L 11 (Medium)
Cantilever arm height 9.8 oder 29,8
Anchor



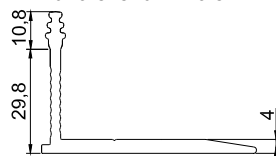
MFT-FOX VT L 6,5 (Medium)
Cantilever arm height 9.8 oder 29,8
power actuated fastener/Screw fastening



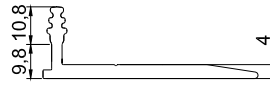
Cantilever arm 9.8



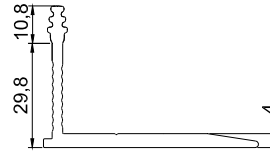
Cantilever arm 29.8



Cantilever arm 9.8



Cantilever arm 29.8



FOX-VT and FOX-HT

Product description
Base plates for "MFT-FOX VT" bracket

Annex A 2.1

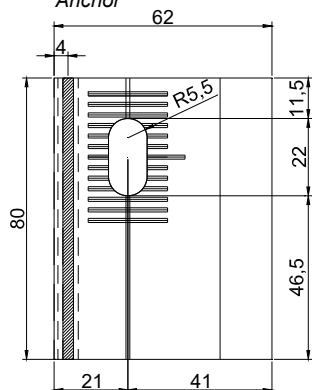
English translation prepared by DIBt

Overview base plate MFT-FOX HT

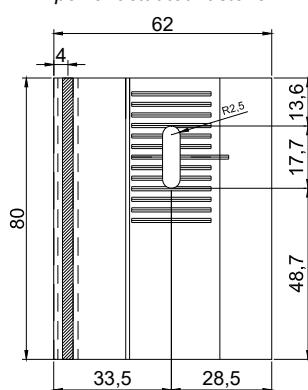
Medium/Large

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt.

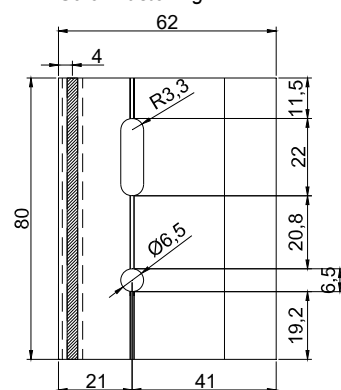
MFT-FOX HT - M 11 (Medium)
Cantilever arm height 9,8 oder 29,8
Anchor



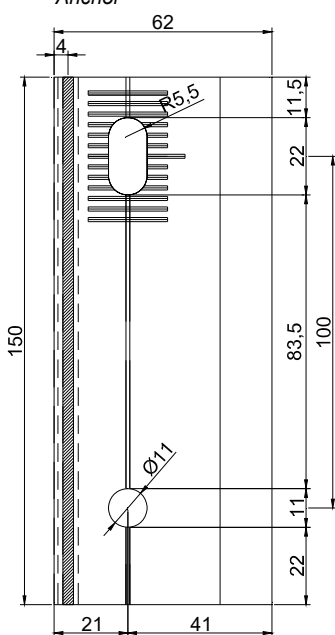
MFT-FOX HT - M 5 (Medium)
Cantilever arm height 9,8 oder 29,8
power actuated fastener



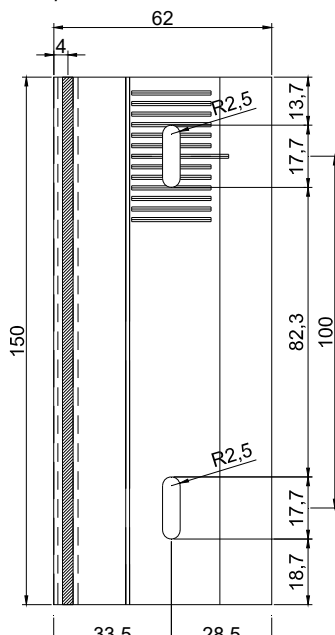
MFT-FOX HT - M 6,5 (Medium)
Cantilever arm height 9,8 oder 29,8
Screw fastening



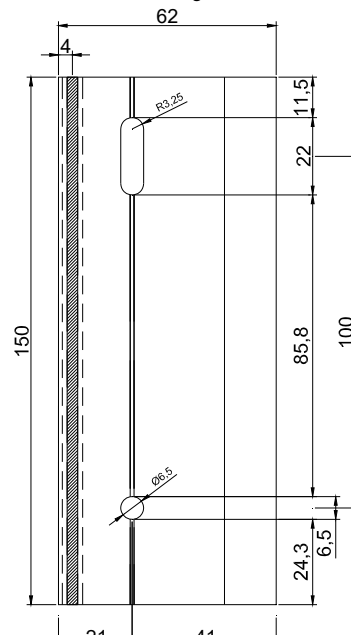
MFT-FOX HT - L 11 (Large)
Cantilever arm height 9,8 oder 29,8
Anchor



MFT-FOX HT - L 5 (Large)
Cantilever arm height 9,8 oder 29,8
power actuated fastener



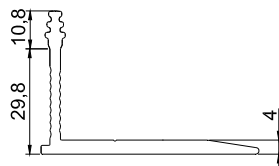
MFT-FOX HT - L 6,5 (Large)
Cantilever arm height 9,8 oder 29,8
Screw fastening



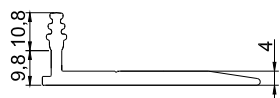
Cantilever arm 9.8



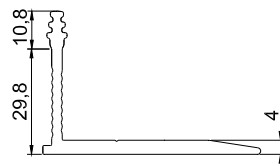
Cantilever arm 29.8



Cantilever arm 9.8



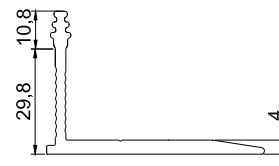
Cantilever arm 29.8



Cantilever arm 9.8



Cantilever arm 29.8



FOX-VT and FOX-HT

Product description
Base plates for "MFT-FOX HT" bracket

Annex A 2.2

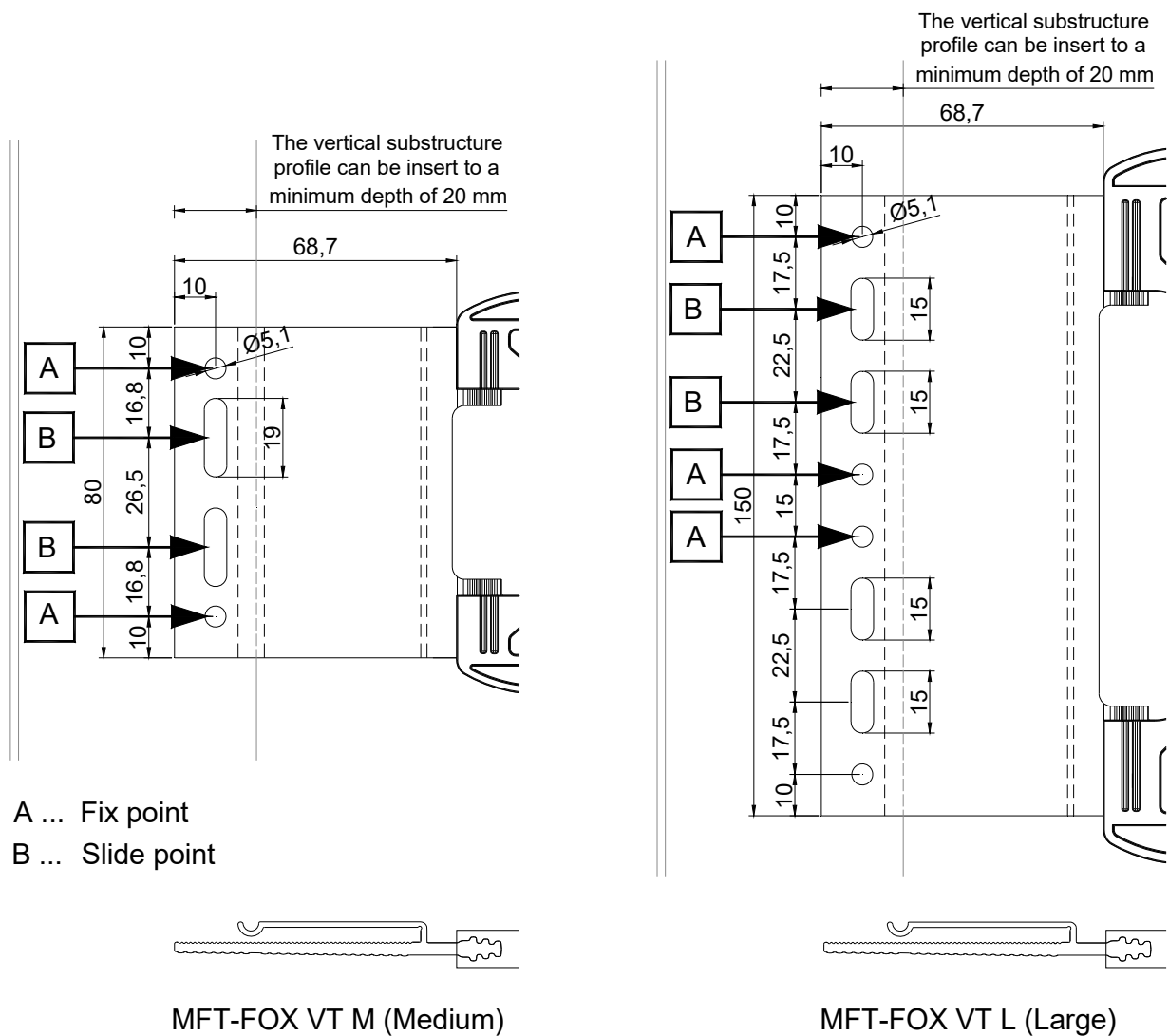
English translation prepared by DIBt

Profile mounting plate MFT-FOX VT

Medium/Large

All dimensions given are nominal dimensions in "mm" not including the tolerances deposite with DIBt

The screw devices - **Hilti S-AD 01 SS 5,5x19**
- shall always be arranged symmetrically and in pairs



FOX-VT and FOX-HT

Product description
Profile mounting for "MFT-FOX VT" bracket with definition of hole types

Annex A 3.1

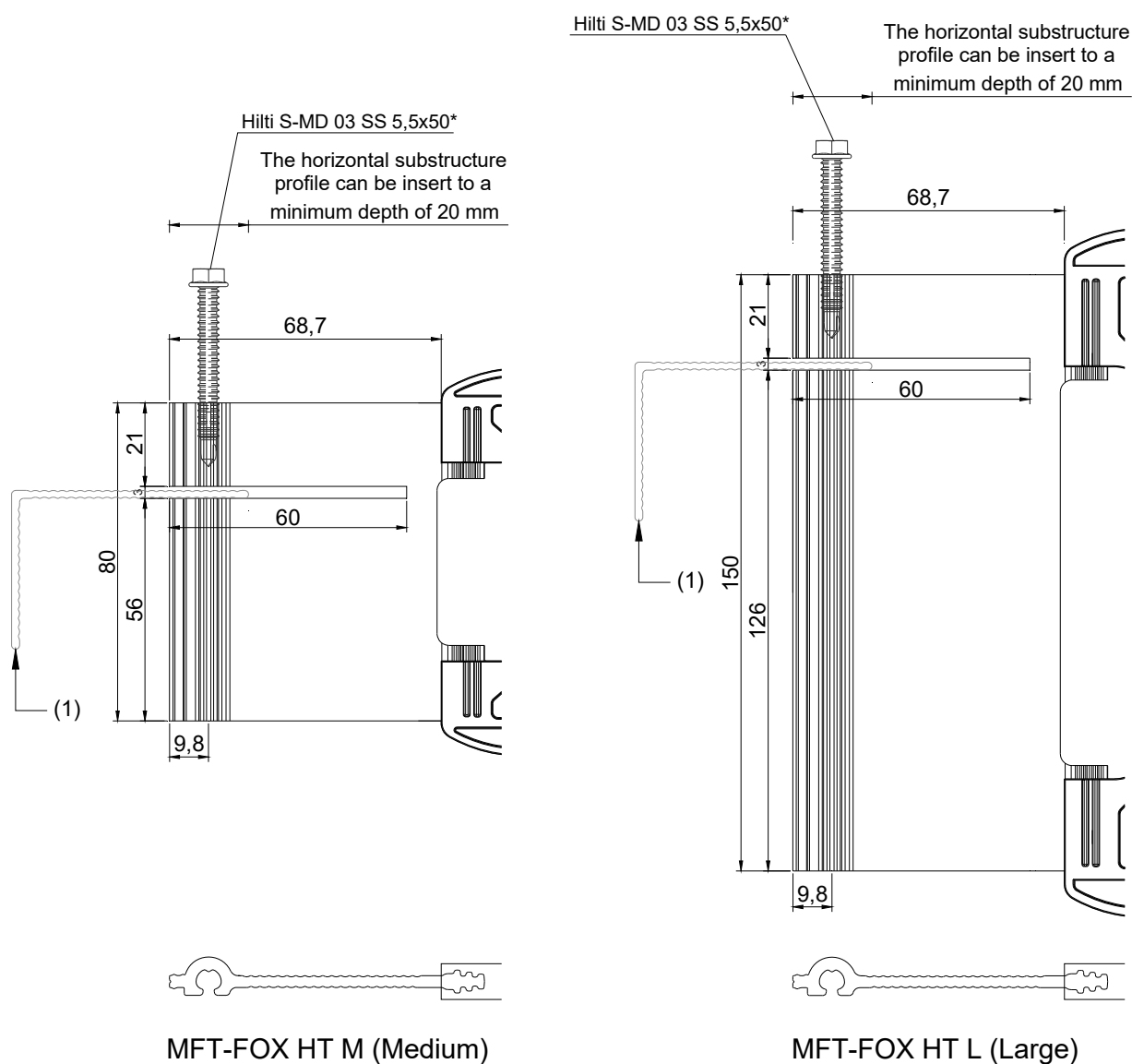
Profile mounting plate MFT-FOX HT

Medium/Large

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt

The profile screw connection and mounting slit shall be positioned at the top of the bracket

*The self-drilling screw must be screwed fully into the screw channel and shall not be loosened



(1) Limb of horizontal substructure profile shall point downwards

FOX-VT and FOX-HT

Product description

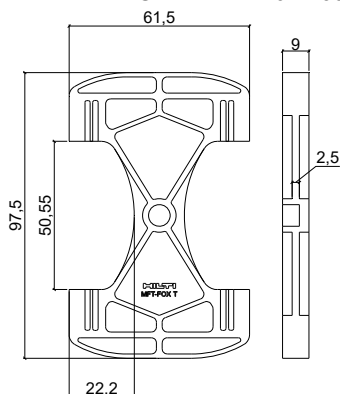
Profile mounting for "MFT-FOX HT" bracket with schematic drawing of installation position of horizontal substructure profile

Annex A 3.2

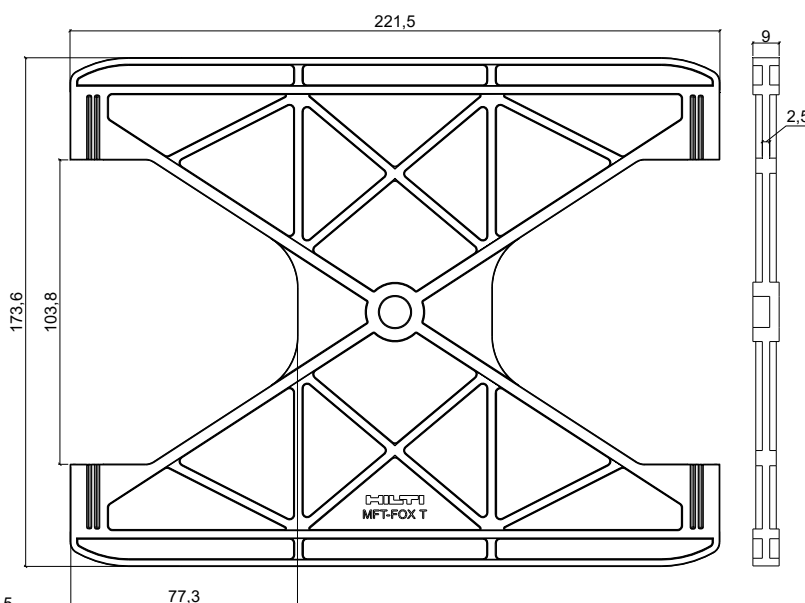
Overview of plastic geometries

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt

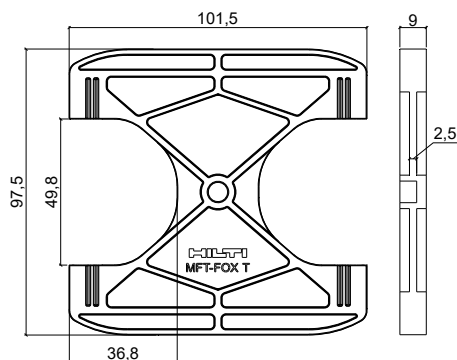
MFT-FOX VT/HT 140 - 160



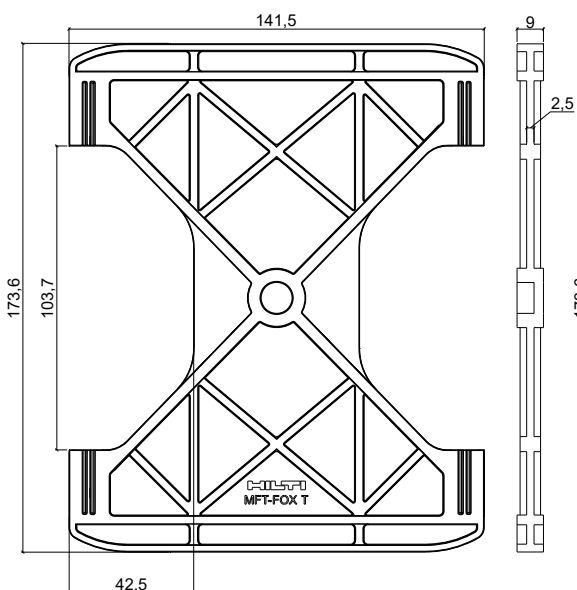
MFT-FOX VT/HT 300 - 320



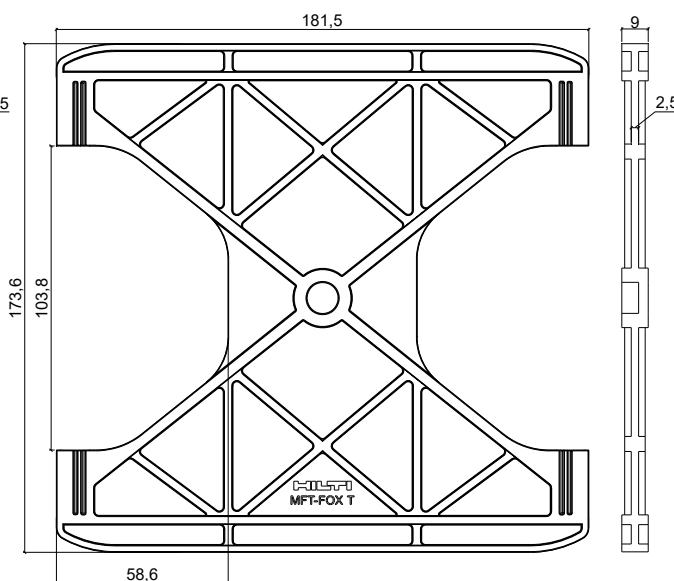
MFT-FOX VT/HT 180 - 200



MFT-FOX VT/HT 220 - 240



MFT-FOX VT/HT 260 - 280



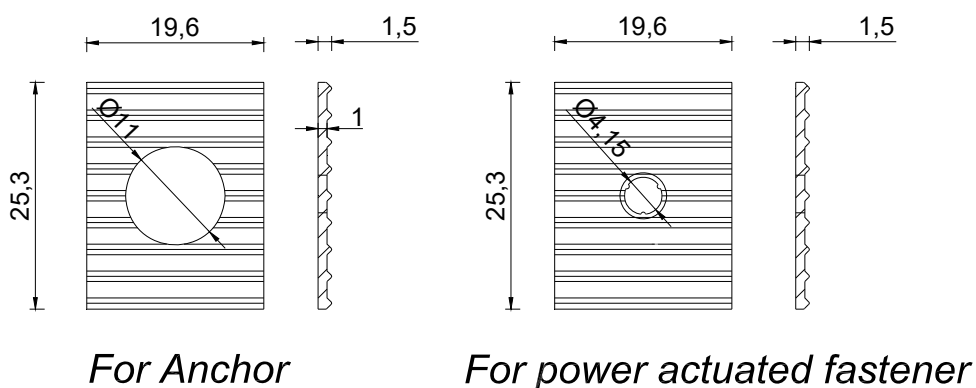
FOX-VT and FOX-HT

Product description
Plastic part of cantilever arms for "MFT-FOX VT" and "MFT-FOX HT" brackets

Annex A 4

System specific serrated washer for MFT-FOX HT Medium/Large

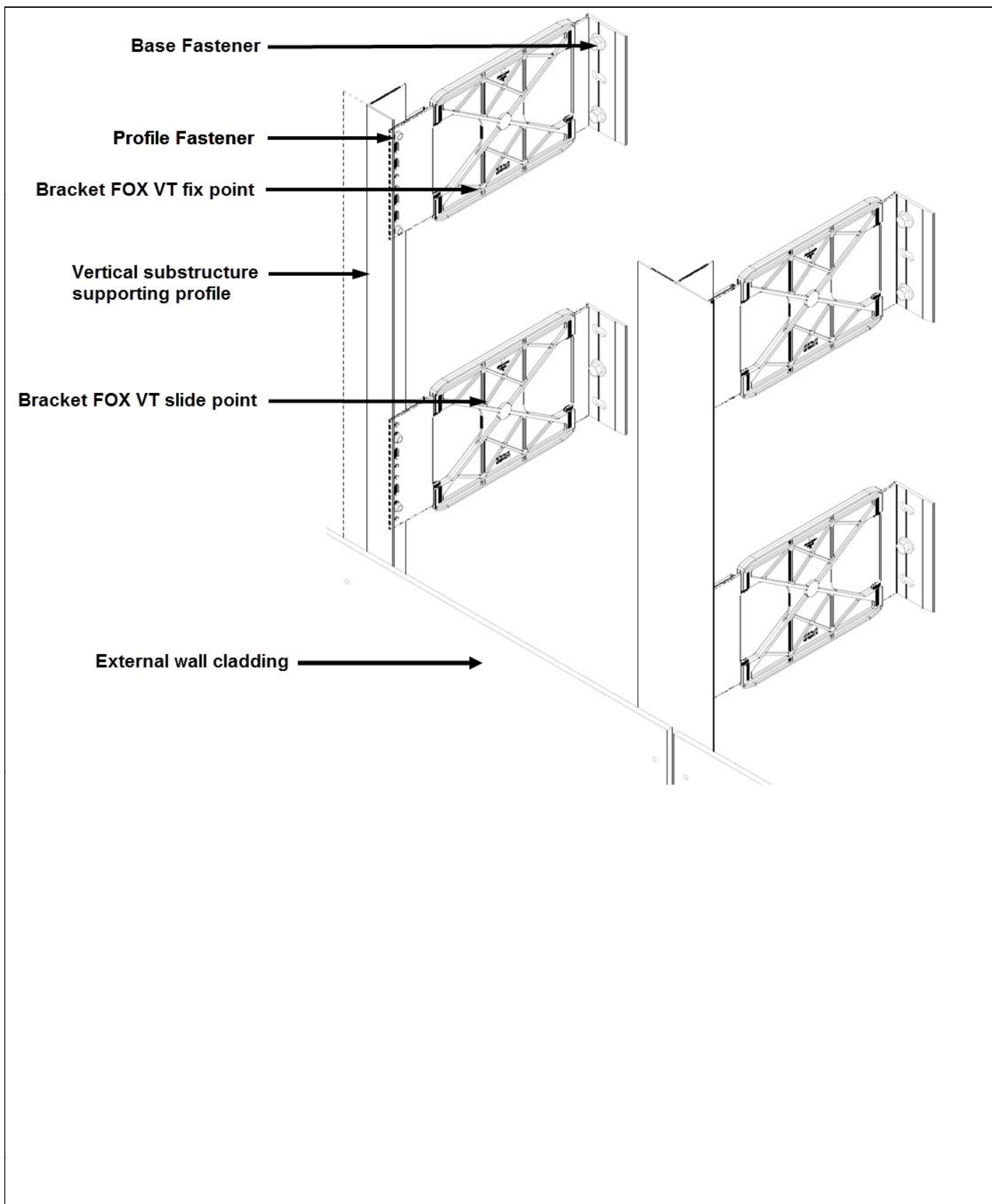
All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt.



FOX-VT and FOX-HT

Product description
Serrated washers for "MFT-FOX HT" bracket

Annex A 5



FOX-VT and FOX-HT

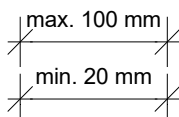
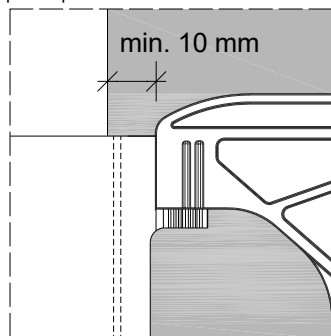
Intended use
Facade construction with "MFT-FOX VT" bracket with vertical substructure

Annex B 1.1

Vertical section MFT-FOX VT

Detail A

Insulation has to cover the plastic part at least 10mm



Profile Fastener
Hilti S-AD 01 SS 5,5x19

Facade Panel

Insulation

Base material

Vertical Profile

Profile Fastener
Hilti S-AD 01 SS 5,5x19

FIX POINT

Detail A

Base Fastener

Detail A

Base Fastener

SLIDE POINT

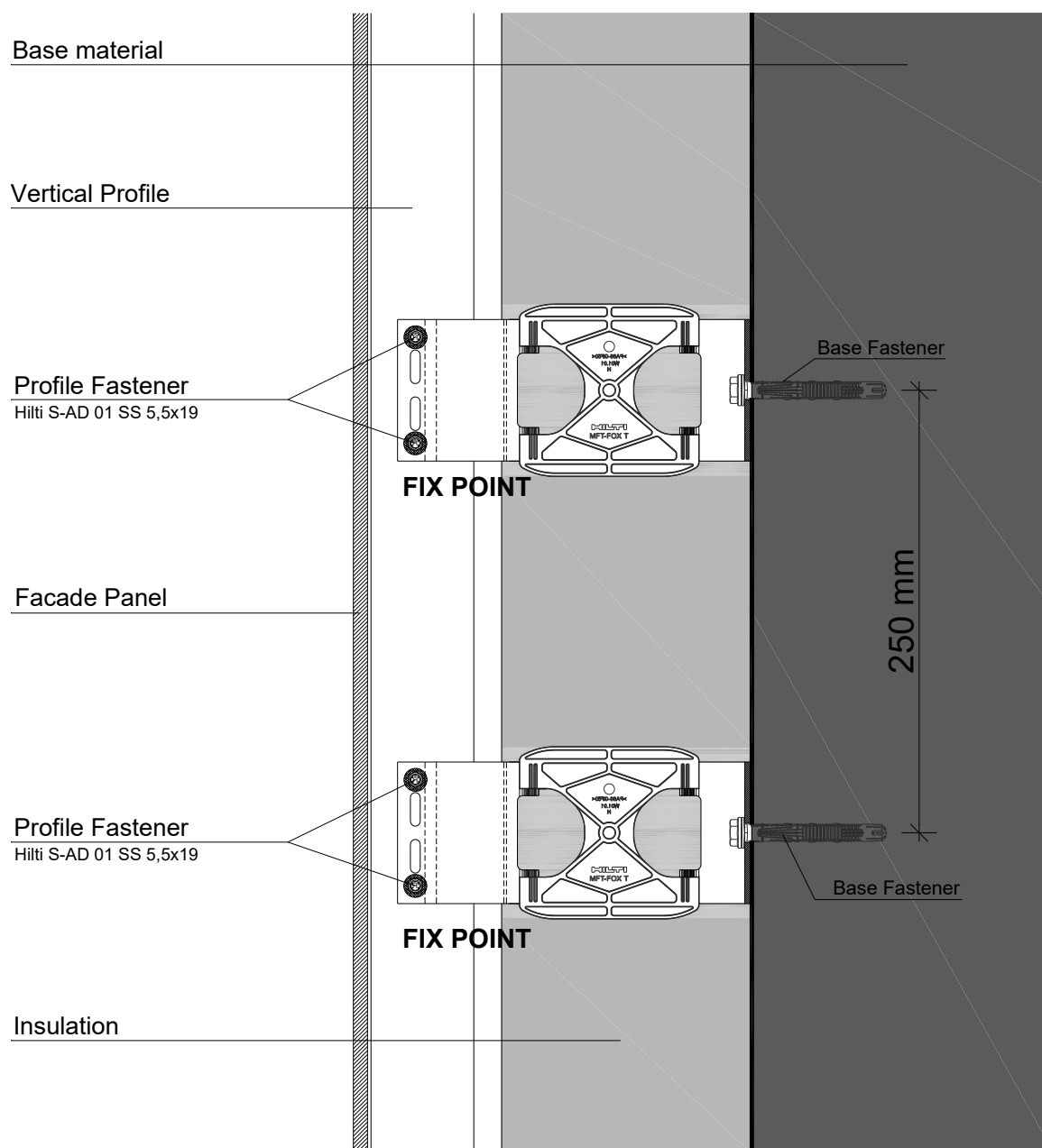
FOX-VT and FOX-HT

Intended use

Facade construction – Vertical section with "MFT-FOX VT" bracket with vertical substructure

Annex B 1.2

Vertical section MFT-FOX VT Double Fix Point - DFP

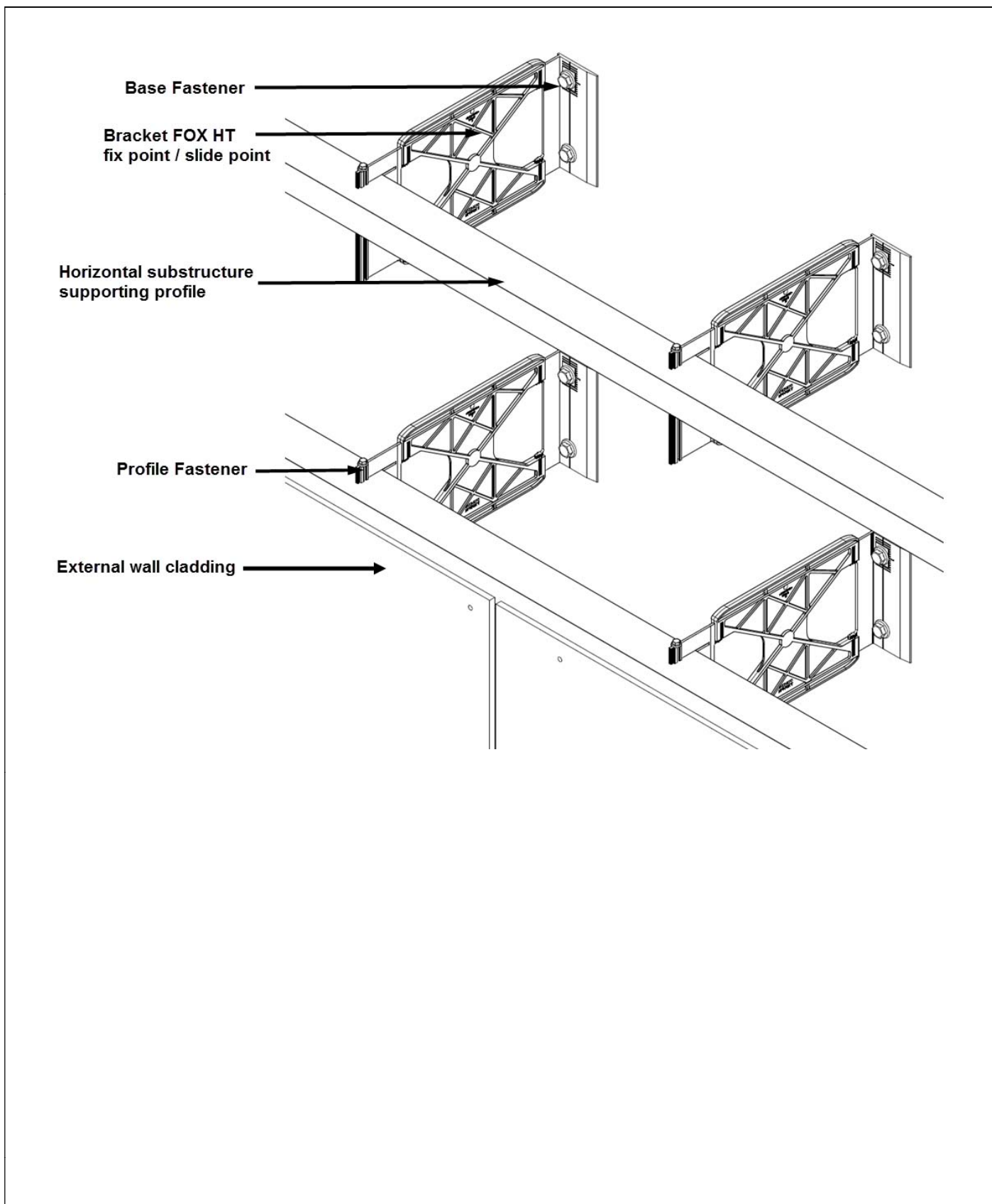


FOX-VT and FOX-HT

Intended use

Facade construction – Vertical section with "MFT-FOX VT" bracket as double fixed point connection with vertical substructure

Annex B 1.3



FOX-VT and FOX-HT

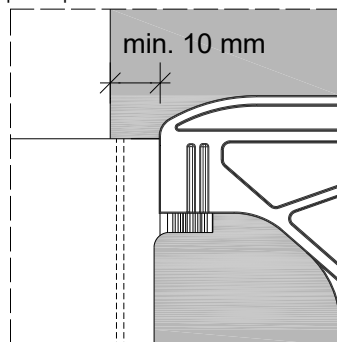
Intended use
Facade construction with "MFT-FOX HT" bracket with horizontal substructure

Annex B 1.4

Vertical section MFT-FOX HT

Detail A

Insulation has to cover the plastic part at least 10mm



max. 100 mm
min. 20 mm

Horizontal Profile

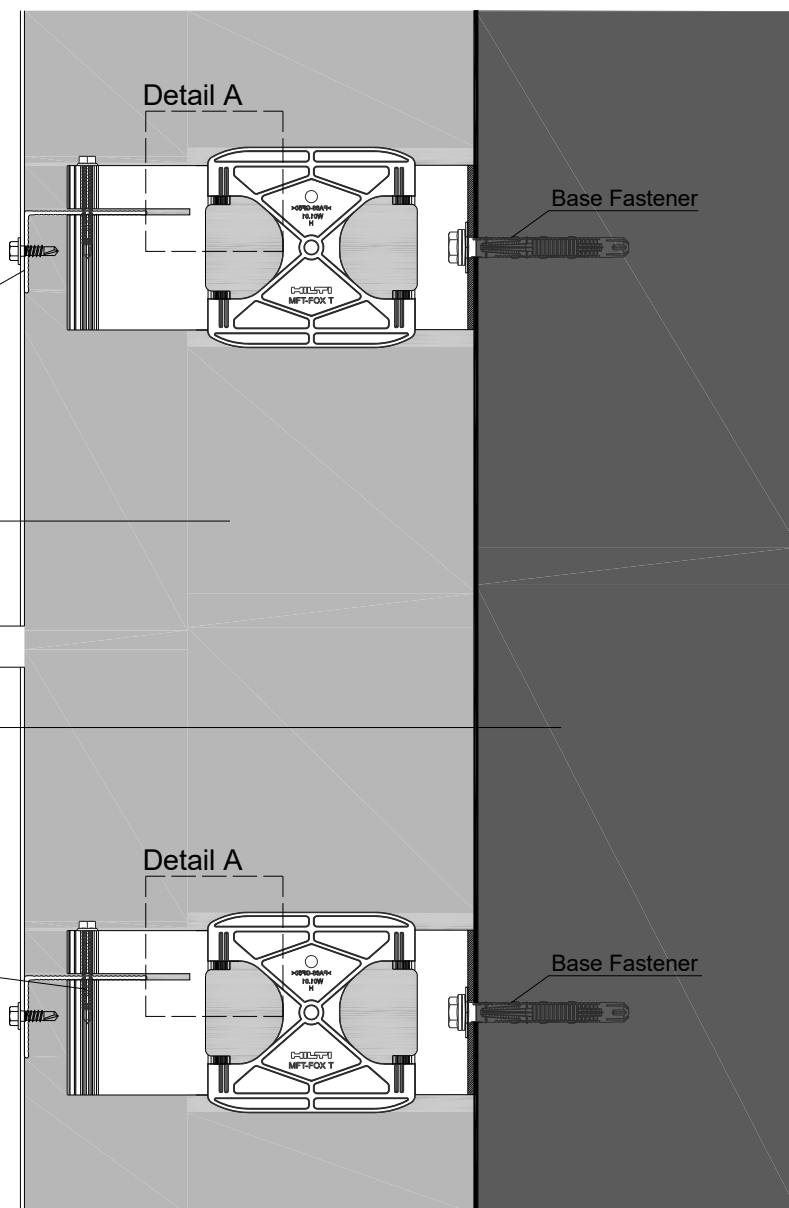
Insulation

Base material

Vertical Profile (optional)

Profile Fastener
Hilti S-MD 03 SS 5,5x50

Facade Panel

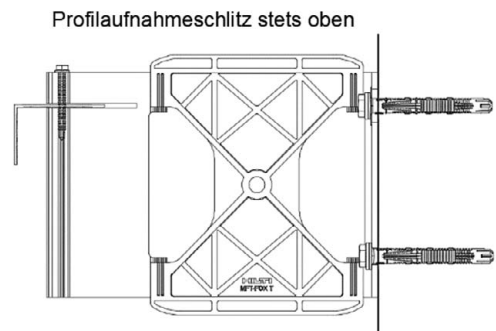
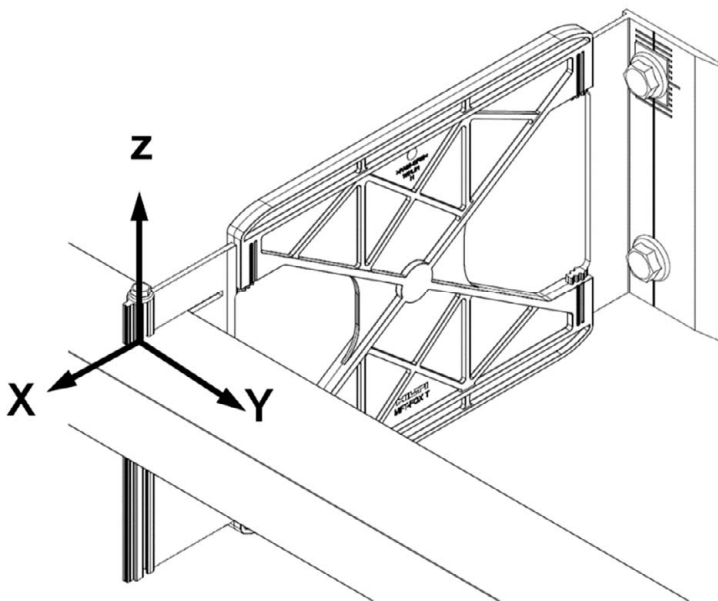
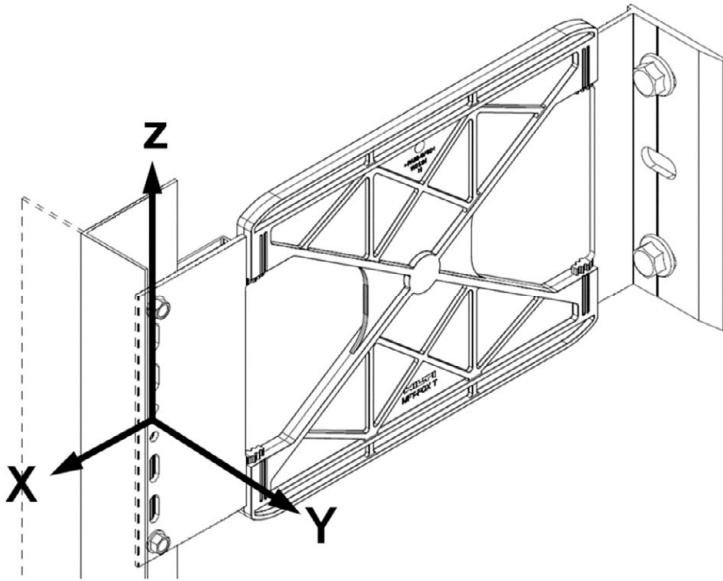


FOX-VT and FOX-HT

Intended use

Facade construction – Vertical section with "MFT-FOX HT" bracket with horizontal substructure

Annex B 1.5



x-Axis for wind
y-Axis for restoring force
z-Axis for self-weight of the facade

FOX-VT and FOX-HT

Intended use
Illustration of axes

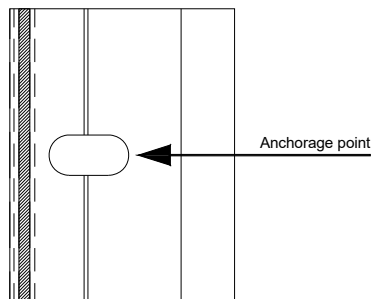
Annex B 1.6

Overview MFT-FOX VT - Anchorage

Medium/Large

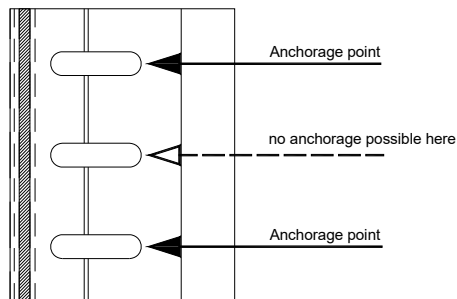
MFT-FOX VT - M 11 (Medium)

Anchor



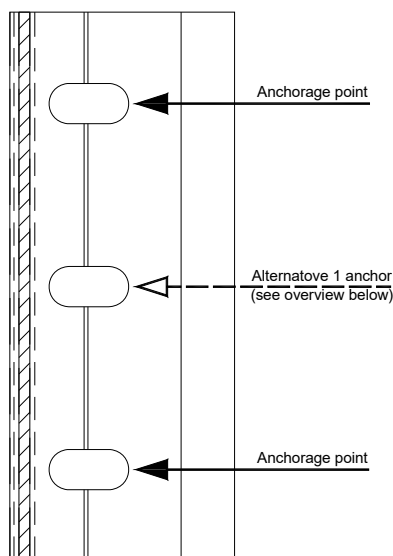
MFT-FOX VT - M 6,5 (Medium)

power actuated fastener/screw fastening



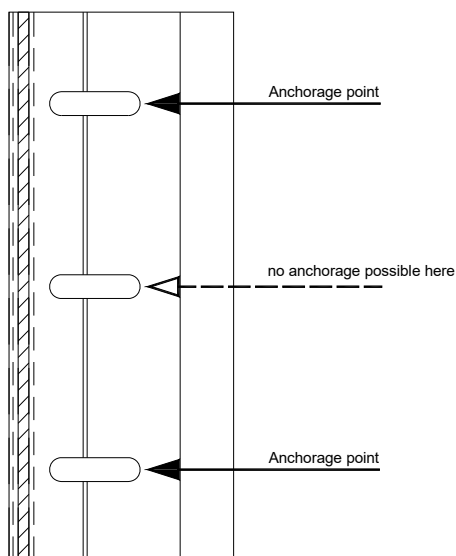
MFT-FOX VT - L 11 (Large)

Anchor



MFT-FOX VT - L 6,5 (Large)

power actuated fastener/screw fastening



Overview of number of anchor devices required per bracket and anchorage type

Anchorage options acc. to section 2.2.7	MFT-FOX HT M (Medium)			MFT-FOX HT L (Large)		
	Anchor	Screw fastening	Powder-actuated fastener	Anchor	Screw fastening	Powder-actuated fastener
slide point	1	2	2	1	2	2
fix point	1	2	2	2	2	2
Doppel - fixpunkt	1	2	2	1	2	2

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt

FOX-VT and FOX-HT

Intended use

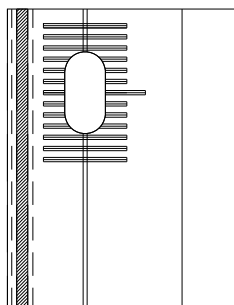
Anchorage arrangement for "MFT-FOX VT" bracket

Annex 1.7

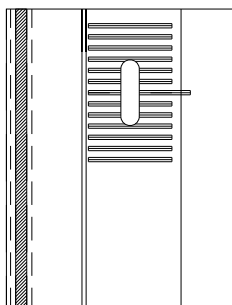
Overview MFT-FOX HT - Anchorage

Medium/Large

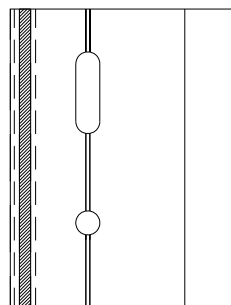
MFT-FOX HT - M 11 (Medium)*
Anchor



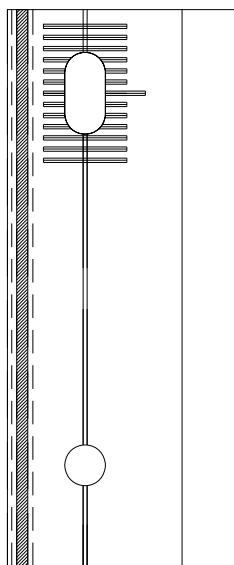
MFT-FOX HT - M (Medium)*
power actuated fastener



MFT-FOX HT - M (Medium)
Screw fastening



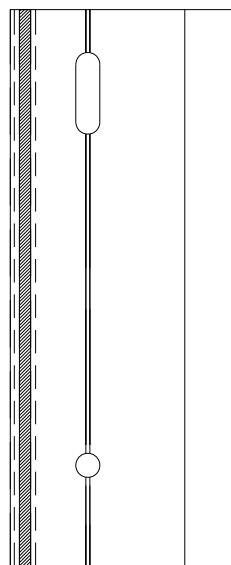
MFT-FOX HT - L (Large)*
Anchor



MFT-FOX HT - L (Large)*
power actuated fastener



MFT-FOX HT - L (Large)
Screw fastening



*Serrated washer needed

Overview of number of anchor devices required per bracket and anchorage type

Anchorage options acc. to section 2.2.7	MFT-FOX HT M (Medium)			MFT-FOX HT L (Large)		
	Anchor	Screw fastening	Powder-actuated fastener	Anchor	Screw fastening	Powder-actuated fastener
slide point	1	2	1	2	2	2
fix point	1	2	1	2	2	2

All dimensions given are nominal dimensions in "mm" not including the tolerances deposited with DIBt

FOX-VT and FOX-HT

Intended use
Anchorage arrangement for "MFT-FOX HT" bracket

Annex 1.8

Intended use and design of "MFT-FOX VT" and "MFT-FOX HT" brackets

General

The installation of the "MFT-FOX VT" and "MFT-FOX HT" brackets must be designed in line with engineering practice and under observation of the national provisions. With facade planning, it must be taken into account that the vertical deformations of the brackets can be up to 3 mm under dead load. Connection joints to adjacent components must be designed accordingly.

The support area of the brackets may, due to substrate unevenness, create a tilt of the projecting bracket cantilever arm of maximum 2 mm in relation to 10 cm projection. The influence of this tilt on the load bearing capacity of the brackets is already taken into account in the load bearing capacity values in tables C 1.2 - C 3.2. The technical provisions for anchorage and structural fasteners must be observed.

"MFT-FOX VT" brackets

The designations of the "MFT-FOX VT" brackets used in the following as fixed point connection, double fixed point connection and sliding point connection relate to the type of screw fastening with the vertical substructure profiles made of aluminium (see B 1.2, B 1.3 und A 3.1):

- Fixed connection point (see Annex A 3.1):

Connection of a bracket with an aluminium profile, whereby 2 or 4 structural fasteners are inserted in round holes in the cantilever arm of the brackets, depending on the load and the bracket type.

- Double fixed connection point (see Annex B 1.3):

Consists of two fixed connection points that are arranged above each other at an anchor-to-anchor distance of 250 mm. The performances of the double fixed connection points indicated in tables C2.2, C3.1 und C3.2 relate to the bracket pair in each case.

- Sliding connection point (see Annex A3.1):

Connection of the brackets with an aluminium profile, whereby 2 or 4 structural fasteners are inserted in slotted holes in the cantilever arm of the brackets, depending on the load and the bracket type.

The external wall cladding and the substructure must be designed to be technically tension-free; fixed and sliding connection points enable you to ensure the tension-free extension of the aluminium profiles as a result of temperature changes.

Horizontal loading of the brackets in the facade plane must be excluded.

The structural fastener between brackets and the vertical support profile must be arranged symmetrically and in pairs in accordance with Annex A 3.1.

The number and arrangement of anchorage on the base plate of the brackets must be selected according to the specifications in Annex B 1.7 in connection with the holder type (fixed connection point, double fixed connection point, sliding connection point), the holder size (Medium and Large) and the designated anchorage in each case (anchor, power-actuated fastener, screw fastening).

FOX-VT and FOX-HT	Annex B 2.1
Intended use Use and dimensioning	

"MFT-FOX HT" brackets

The external wall cladding and the substructure must be designed to be technically tension-free. In the area of the screw connection between the horizontal support profiles and the brackets, tension-free design is not possible, due to the construction. Based on a maximum temperature difference of $\Delta T = 70 \text{ K}$ and a maximum permissible length of the horizontal support profiles of 6.0 m, horizontal deflections of the brackets of up to 5 mm must be taken into account, which generate the restoring forces in y-direction shown in Table B2.2-1 (see Annex B 1.6) at the height of the screw channel. These restoring forces must be taken into account for the object-specific verification of stability of the anchorage, whereby the forces can occur positively or negatively in y-direction.

For the verification of stability of the screw connection between brackets and the support profile, the restoring forces in Table B2.2-1 must be disregarded.

For the verification of stability of the brackets, the constraint strains must not be taken into account, as the load bearing capacities shown in Tables C1.2 to C3.2 already take this influence into account.

Horizontal loading of the brackets in the facade plane, in addition to the constraint forces shown in Table B2.2-1, must be excluded.

Table B2.2-1 - characteristic horizontal restoring forces at the connection between the "MFT-FOX HT" bracket and the horizontal support profile as a result of a thermal length modification of up to 5 mm

Bracket type	Restoring forces $F_{R,k,y}$ in [N]
MFT-FOX HT 140 - 160 M5 / M6.5 / M11	40
MFT-FOX HT 180 - 200 M5 / M6.5 / M11	17
MFT-FOX HT 220 - 240 L5 / L6.5 / L11	14
MFT-FOX HT 260 - 280 L5 / L6.5 / L11	10
MFT-FOX HT 300 - 320 L5 / L6.5 / L11	7

The number and arrangement of the anchorage on the base plate of the brackets must be selected according to the specifications in Annex B 1.7 in connection with the holder size (Medium and Large) and the designated anchorage in each case (anchor, power-actuated fastener, screw fastening). Depending on the anchorage, the use of a serrated washer might be required according to Annex A 5.

FOX-VT and FOX-HT	Annex B 2.2
Intended use Use and dimensioning	

Design of "MFT-FOX VT" and "MFT-FOX HT" brackets

In the absence of other national provisions, the dimensioning of the brackets can be carried out in relation to the object, under observation of the following provisions.

It must be proven that condition $E_d < R_d$ is adhered to, whereby:

E_d : Design value of action

R_d : Design value of component resistance

$E_d = \gamma_F \times E_k$ with

E_k : characteristic value of action EN 1991

γ_F : Partial safety factor of action in accordance with EN 1990

$R_d = R_k / (\gamma_m \times A_{mod})$

R_k : Characteristic value of component resistance in accordance with C1.2 to C3.2

$\gamma_m = 1.5$ example material-related partial safety factor; partial safety factor for component resistance to be determined nationally

$A_{mod} = A_0 \times A_1 \times A_2 \times A_3 \times A_4$ (modification factor)

Reduction factors according to Annex C5.1: A0 - Influence of excess strength;

A1 - Temperature influence; A2 - Ageing/environmental influences; A3 - Influence of repeated loading; A4 - Influence of load duration

The component resistances indicated in Tables C1.2 to C3.2 apply based on the load application in the point of origin of the coordinate system specified in Annex B 1.6. For "MFT-FOX VT" brackets, a horizontal displacement of the load application of up to + 20 mm as a result of wind action is covered by the load bearing resistances shown in Tables 2 to 6, whereby the use of symmetric (e.g. T-profiles) and asymmetric (e.g. L-profiles) support profiles is possible.

The load bearing resistances of the "MFT-FOX HT" brackets shown in Tables C1.2 to C3.2 apply to wind action that impacts at the height of the profile mounting slot or up to 20 mm below the profile mounting slot. "MFT-FOX HT" brackets may only be used in connection with horizontal L- and T-profiles whose vertical limb is directed downwards (see Annex B 1.4).

FOX-VT and FOX-HT

Intended use
Use and dimensioning

Annex B 2.3

Design of the screw connection between the "MFT-FOX VT" brackets and vertical support profiles

The stability of the screw connection between the "MFT-FOX VT" brackets and the vertical support profiles must be verified on an object-specific basis using the load bearing capacity resistances indicated in Table C4.1. For this, you must use the drilling screws indicated in the tables. The drilling screws must always be arranged symmetrically and in pairs, whereby depending on the bracket type and the height of the load action, 2 or 4 screws must be used for each connection.

The height of the load resistance depends on the selected connection point (holes A and B) and the direction of force (vertical or horizontal). With regard to the hole designation, Annex A3.1 must be observed.

It must be proven that condition $E_d < R_d$ is adhered to, whereby

E_d : Design value of action

R_d : Design value of component resistance per screw

$E_d = \gamma_F \times E_k$ with

E_k : characteristic value of action according to EN 1991

γ_F : Partial safety factor of action in accordance with EN 1990

$R_d = F_{R,k} / \gamma_M$

$F_{R,k}$: Characteristic component resistance in accordance with Table C4.1

γ_M : partial safety factor for component resistance to be determined nationally, e.g. $\gamma_M = 2.0$

With a combined stress on the screw connection, the degree of utilisation η for the acting forces in x-direction and z-direction must be superimposed linearly. The following must be fulfilled:

$$\eta_x + \eta_z < 1.0 \quad \text{with} \quad \eta_x = E_{d,x} / R_{d,x} \quad \text{and} \quad \eta_z = E_{d,z} / R_{d,z}$$

FOX-VT and FOX-HT

Intended use
Use and dimensioning

Annex B 2.4

Design of the screw connection between the "MFT-FOX HT" brackets and horizontal support profiles

The stability of the screw connection between the "MFT-FOX HT" brackets and the horizontal support profiles must be verified on an object-specific basis using the performances indicated in Table C4.2. For this, you must use the drilling screws indicated in the performance tables. The drilling screw must be completely screwed into the drilling channel and must not be loosened.

It must be proven that condition $E_d < R_d$ is adhered to, whereby

E_d : Design value of action

R_d : Design value of component resistance per screw

$E_d = \gamma_F \times E_k$ with

E_k : characteristic value of action according to EN 1991

γ_F : Partial safety factor of action in accordance with EN 1990

$R_d = R_k / \gamma_M$

R_k : Characteristic component resistance in accordance with Table C4.2 in x-, y- or z-direction

γ_M : recommended partial safety factor of component resistance in absence of other national regulations, e.g. $\gamma_M = 2.0$

The following must be fulfilled:

$$E_{d,x} / R_{d,x} < 1.0; \quad E_{d,y} / R_{d,y} < 1.0; \quad E_{d,z} / R_{d,z} < 1.0$$

FOX-VT and FOX-HT

Intended use
Use and dimensioning

Annex B 2.5

Tab. C1.1: Mechanical properties of aluminium parts

Aluminium parts	Annex	Alloying*	$R_m \geq^*$	$R_{p0.2} \geq^*$
Base plate	A 2.1 – 2.2	EN AW 6063 T66	245 N/mm ²	200 N/mm ²
Profile feeder plate	A 3.1 – 3.2			
Serrated washers	A 5			
Vertical support profiles for connection with the MFT-FOX VT brackets	220 - 320			
Horizontal support profiles for connection with the MFT-FOX HT brackets	140 - 200			
* in accordance with EN 755-2				

Tab. C1.2 - characteristic component resistances for the brackets under uniaxial loading from suction wind loading (sliding fixing connection) (Check according to section 2.2.4.1 in the EAD)

Bracket type	Outreach [mm]	Number of Anchorage*	Characteristic component resistance R_k in [kN]
MFT-FOX HT M11	140 - 200	1	7,09
MFT-FOX HT L11	220 - 320	2	
MFT-FOX HT M6,5	140 - 200		
MFT-FOX HT L5/L6.5	220 - 320	1	6,00
MFT-FOX HT M5	140 - 200		1
MFT-FOX VT M11	140 - 200		
MFT-FOX VT L11	220 - 320		
MFT-FOX HT VT M6.5	140 - 200	2	11,85
MFT-FOX VT L6,5	220 - 320	2	
MFT-FOX VT L11	220 - 320	2	
* Number of anchorages according to Table B 1.7+ B 1.8			

FOX-VT and FOX-HT

Performance
Mechanical properties of aluminium parts
Component resistances for brackets under uniaxial loading (suction wind loading)

Annex C 1

Tab. C2.1 - characteristic component resistances for the brackets under uniaxial loading from wind pressure stress (sliding fixing connection) (Check according to section 2.2.4.1 in the EAD)

Bracket type	Outreach [mm]	Number of Anchorage*	Characteristic component resistance R_k in [kN]
MFT-FOX HT M5/M6.5/M11	140 - 160	2 / 1	3,51
MFT-FOX HT M5/M6.5/M11	180 - 200		2,88
MFT-FOX HT L5/L6.5/L11	220 - 240		2,76
MFT-FOX HT L5/L6.5/L11	260 - 280		2,03
MFT-FOX HT L5/L6.5/L11	300 - 320		1,67
MFT-FOX VT M6.5/M11	140 - 160		3,20
MFT-FOX VT M6.5/M11	180 - 200		2,57
MFT-FOX VT L6.5/L11	220 - 240		2,52
MFT-FOX VT L6.5/L11	260 - 280		2,09
MFT-FOX VT L6.5/L11	300 - 320		1,66

* Number of anchorages Table B 1.7+ B 1.8

Tab. C2.2- characteristic component resistances for the brackets under uniaxial loading from dead load stress (fixed connection point) (Check in accordance with section 2.2.4.2 in the EAD)

Bracket type	Outreach [mm]	Number of Anchorage*	Characteristic component resistance R_k in [kN]
MFT-FOX HT M5/M6.5/M11	140 - 160	2 / 1	1,93
MFT-FOX HT M5/M6.5/M11	180 - 200		1,20
MFT-FOX HT L6.5/L11	220 - 240	2	1,52
MFT-FOX HT L6.5/L11	260 - 280		1,17
MFT-FOX HT L6.5/L11	300 - 320		0,87
MFT-FOX HT L5	220 - 240		1,19
MFT-FOX HT L5	260 - 280		0,91
MFT-FOX HT L5	300 - 320		0,75
MFT-FOX VT M6.5/M11	140 - 160	2 / 1	2,91
MFT-FOX VT M6.5/M11	180 - 200		2,55
MFT-FOX VT L6.5/L11	220 - 240	2	2,21
MFT-FOX VT L6.5/L11	260 - 280		1,62
MFT-FOX VT L6.5/L11	300 - 320		1,42
MFT-FOX VT M6.5/M11-DFP**	140 - 160	2 / 1	5,92
MFT-FOX VT M6.5/M11-DFP**	180 - 200		5,01
MFT-FOX VT L6.5/L11-DFP**	220 - 240		4,51
MFT-FOX VT L6.5/L11-DFP**	260 - 280		3,49
MFT-FOX VT L6.5/L11-DFP**	300 - 320		2,78

* Number of anchorages according to Table B 1.7+ B 1.8 / ** DFP double fixed connection point in accord. with Annex B 1.3

FOX-VT and FOX-HT

Performance

Component resistances for brackets under uniaxial loading (wind pressure)
Component resistances for the brackets under uniaxial loading (dead load)

Annex C 2

Tab. C3.1 - characteristic component resistances for the brackets under suction wind loading with simultaneous dead load stress up to component resistance under dead load in accordance with Table C2.2 (Check according to section 2.2.4.3 in the EAD)

Bracket type	Outreach [mm]	Number of Anchorage*	Characteristic component resistance R_k in [kN]
MFT-FOX HT M6.5/M11	140 - 200	2 / 1	7,00
MFT-FOX HT L5/L6.5/L11	220 - 320	2	
MFT-FOX HT M5	140 - 200	1	5,60
MFT-FOX VT M6.5/M11	140 - 200	2 / 1	6,70
MFT-FOX VT L6,5	220 - 320	2	
MFT-FOX VT L11	220 - 320	2	11,15
MFT-FOX VT M11-DFP**	140 - 200	1	12,35
MFT-FOX VT L11-DFP**	220 - 320		13,60
MFT-FOX VT M6.5/L6.5-DFP**	140 - 320	2	6,70

* Number of anchorages according to Table B 1.7+ B 1.8 / ** DFP double fixed connection point in accord. with Annex B 1.3

Tab. C3.2 - characteristic component resistances for the brackets under wind pressure stress with simultaneous dead load stress up to component resistance under dead load in accordance with Table C2.2 (Check according to section 2.2.4.3 in the EAD)

Bracket type	Outreach [mm]	Number of Anchorage*	Characteristic component resistance R_k in [kN]
MFT-FOX HT M5/M6.5/M11	140 - 160	2 / 1	3,51
MFT-FOX HT M5/M6.5/M11	180 - 200		2,88
MFT-FOX HT L5/L6.5/L11	220 - 240	2	2,76
MFT-FOX HT L5/L6.5/L11	260 - 280		2,03
MFT-FOX HT L5/L6.5/L11	300 - 320		1,67
MFT-FOX VT M6.5/M11	140 - 160	2 / 1	3,20
MFT-FOX VT M6.5/M11	180 - 200		2,47
MFT-FOX VT L6.5/L11	220 - 240	2	2,44
MFT-FOX VT L6.5/L11	260 - 280		2,00
MFT-FOX VT L6.5/L11	300 - 320		1,59
MFT-FOX VT M6.5/M11-DFP**	140 - 160	2 / 1	3,20
MFT-FOX VT M6.5/M11-DFP**	180 - 200		2,47
MFT-FOX VT L6.5/L11-DFP**	220 - 240		2,44
MFT-FOX VT L6.5/L11-DFP**	260 - 280		2,00
MFT-FOX VT L6.5/L11-DFP**	300 - 320		1,59

* Number of anchorages according to Table B 1.7+ B 1.8 / ** DFP double fixed connection point in accord. with Annex B 1.3

FOX-VT and FOX-HT

Performance

Component resistances for the brackets under uniaxial loading (suction wind loading + dead load)

Annex C 3

Tab. C4.1 - characteristic component resistances of the screw connection (per screw) between the "MFT-FOX VT" brackets and the vertical support profiles (Check according to section 2.2.4.4 in the EAD)

Arrangement in acc. with Annex A 3.1	characteristic component resistance R_k in [kN]	
	$F_{R,k,x}$	$F_{R,k,z}$
A – Fixed point connection	3,58	3,58
B – Sliding point connection	3,28	-

Test boundary conditions:

- Drilling screw "Hilti S-AD01 SS 5.5x19 (A4)"
- Always arrange drilling screws symmetrically and in pairs
- Depending on the bracket type and the required load bearing capacity, you must insert 2 or 4 screws per bracket. The minimum edge distances according to A 3.1 must be observed.
- With regard to the x-, y- and z-direction, Annex B 1.6 must be observed.
- Vertical support profiles with tensile strength $R_m > 245 \text{ N/mm}^2$ and tensile yield point $R_{p0.2} > 200 \text{ N/mm}^2$
- Material strength in the area of the screw connection $1.8 < t < 4 \text{ mm}$

Tab. C4.2 - characteristic component resistances of the screw connection between the "MFT-FOX HT" brackets and the horizontal support profiles (Check according to section 2.2.4.4 in the EAD)

Arrangement in acc. with Annex A 3.1	characteristic component resistance R_k in [kN]		
	$F_{R,k,x}$	$F_{R,k,y}$	$F_{R,k,z}$
MFT-L 40x40x1.8	3,40	3,58	0,80
MFT-L 60x40x1.8			
MFT-L 50x20x2.0	3,20		
MFT-L 60x40x2.0			
MFT-L 60x50x2.0			
MFT-L 60x40x2.2			
MFT-L 60x40x2.5	6,00		

Test boundary conditions:

- Drilling screw "Hilti S-MD03 SS 5.5x50 (A4)"
- The minimum edge distances according to Annex A 3.2 must be observed.
- Horizontal support profiles with tensile strength $R_m > 245 \text{ N/mm}^2$ and tensile yield point $R_{p0.2} > 200 \text{ N/mm}^2$
- Material strength in the area of the screw connection $1.8 < t < 2.5 \text{ mm}$
- With regard to the x-, y- and z-direction, Annex B 1.6 must be observed.
- The drilling screw must be completely screwed into the drilling channel and must not be loosened.

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Performance
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Annex C 4

Tab. C5.1 Modification factors A_{mod} depending on the bracket type and the type of stress (Test according to section 2.2.5 in the EAD)

Type of stress	A0	A1	A2	A3	A4
Suction wind loading*	1,18	1,0	1,0	1,25	1,0
Suction wind loading**		1,53			
Wind pressure		1,08			
Dead load		1,53		1,0	
<p>* All brackets except MFT-FOX VT 220 - 320 (L11) with 2 anchorages ** Only MFT-FOX VT 220 - 320 (L11) with 2 anchorages</p> <p>Tests</p> <ul style="list-style-type: none"> - Factor A0 for taking into account the excess strength for aluminium and plastic parts - Factor A1 for taking into account temperature influences (-20°C / +80°C) - Factor A2 for taking into account ageing and environmental influences - Factor A3 for taking into account repeated loads (stress of dynamic pulsating loading and alternating loading); repeated loadings of "MFT-FOX HT" brackets due to thermal length modifications of the support profiles of up to +5 mm have no negative influence upon the load bearing capacity - Factor A4 for taking into account permanent loading (dead load) 					

FOX-VT and FOX-HT

Performance
Modification factors

Annex C 5