

**Allgemeine
bauaufsichtliche
Zulassung/
Allgemeine
Bauartgenehmigung**

Approval Body for construction products and
construction products and techniques

Structural design control authority

Institution of public law, jointly supported by the
federal states and the Federation

Member of EOTA, UEAtc and WFTAO

Date:

01/11/2018

Reference:

I 3-1.14.4-102/17

**(National technical approval/
General construction technique permission)
English translation of the German original
by ibvm – not verified by Deutsches Institut
für Bautechnik**

Number:

Z-14.4-769

Validity

from: **1st November 2018**

to: **18th August 2021**

Applicant:

Hilti AG

Feldkircherstrasse 100

9494 Schaan

PRINCIPALITY OF LIECHTENSTEIN

Subject of this decision:

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

The above-mentioned subject of concerned is herewith national technical approved/accepted.

This decision contains nine pages and 35 annexes.

This national technical approval/general construction technique permission replaces the national technical approval No. Z-14.4-769 of 18th August 2016. For the subject was granted the first national technical approval on 18th August 2016.

I GENERAL PROVISIONS

- 1 This decision confirms the fitness for use and application of the subject of concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 This decision does not replace the permits, approvals and certificates required by law for carrying out building projects.
- 3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Notwithstanding further provisions in the 'Special Provisions', copies of this decision shall be made available to the user and installer of the subject concerned. The user and installer shall also be made aware that this decision must be made available at the place of use or place of application. Upon request, copies of the decision shall be provided to the authorities involved.
- 5 This decision may be reproduced in full only. Partial publication requires the consent of Deutsches Institut für Bautechnik. Texts and drawings in promotional material shall not contradict this decision. Translations shall contain the note 'Translation of the German original not verified by Deutsches Institut für Bautechnik'.
- 6 This decision may be revoked. The provisions contained therein may subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant. Alterations to this basis are not covered by this decision and shall be notified to Deutsches Institut für Bautechnik without delay.
- 8 The general construction technique permit included in this decision also serves as a national technical approval for the construction technique.

II SPECIAL PROVISIONS

1 Subject of concerned and field of application

Subject of concerned are self-drilling or thread-forming screws according to Annex 2 to 5 used for static and quasi static loaded anchorages, connections or fastening of

- supporting structures of ventilated curtain facades,
- plate-like components or
- other metal components made of steel or aluminium

on surfaces made of steel, aluminium, timber or timber-based materials.

The screws are used for anchoring brackets, connecting linear supported and point fixed components made of aluminium or steel and fastening plate-like components.

2 Provisions for the screws

2.1 Characteristics and composition

2.1.1 Dimensions

The main dimensions of the metal construction screws shall be taken from Annex 2 to 5. Further information to the dimensions are deposited at Deutsches Institut für Bautechnik.

2.1.2 Materials

The metal construction screws are made of stainless steel group A2 (e.g. 1.4301 or 1.4567) or stainless steel group A4 (e.g. 1.4401 or 1.4404) according to DIN EN 10088-5¹. In the case of the screws in Annexes 2 and 3, the drill tip is made of case-hardened steel. The screws in Annexes 4 and 5 are all made of stainless steel, including the drill tip.

Further information on the mechanical material properties of the screws are deposited at Deutsches Institut für Bautechnik.

2.2 Marking

The packaging of the metal construction screws shall be marked by the manufacturer with the national conformity mark (*Ü-Zeichen*) in accordance with the Conformity Marking Ordinances (*Übereinstimmungszeichen-Verordnungen*) of the federal states. The mark shall only be applied if the conditions given in Section 2.3 are met.

Each packaging shall be provided with a label containing information on the manufacturing plant (manufacturer's mark), designation, geometry and material of the metal construction screws.

The screws shall have an additional head mark (manufacturer's mark).

2.3 Confirmation of conformity

2.3.1 General

The confirmation of conformity of the metal construction screws with the provisions of the national technical approval covered by this decision shall be made for each manufacturing plant with a declaration of conformity of the manufacturer on the basis of a factory production control and a certificate of conformity of a certification body recognized for this purpose as well as regular external surveillance by a recognized approved body in accordance with the following provisions.

¹ DIN EN 10088-5:2009-07 Stainless steels - Part 5: Technical delivery conditions for bars, rods, wire, sections and bright products of corrosion resisting steels for construction purposes

To issue the certificate of conformity and for external surveillance, including the associated product testing to be carried out in the process, the manufacturer of the Metal construction screws shall use an appropriately recognised certification body and an appropriately recognised inspection body.

The declaration of conformity shall be issued by the manufacturer by marking the Metal construction screws with the conformity mark (Ü mark) indicating the intended use.

The certification body shall submit a copy of the issued certificate of conformity to Deutsches Institut für Bautechnik.

For the scope, way and frequency of the factory production control and the continuous surveillance by a notified body the "Grundsätze für den Übereinstimmungsnachweis für Verbindungselemente im Metalleichtbau, Fassung August 1999" ('Principles for the proof of conformity of fastening elements for light weight metal structures, version August 1999') (see issue 6/1999 of "DIBt Mitteilungen") apply.

2.3.2 Factory production control

A factory production control system shall be set up and implemented in each manufacturing plant. Factory production control is understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured metal construction screws satisfy the provisions of this national technical approval covered by this decision.

The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- designation of the construction product or the starting materials and the components,
- type of check or test,
- date of manufacture and testing of the construction product or the raw materials and the components,
- results of the checks and tests and, where applicable, comparison with requirements,
- signature of the person responsible for factory production control.

The records shall be kept for at least five years and be submitted to the inspection body used for external surveillance. They shall be submitted to Deutsches Institut für Bautechnik and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the problem. Construction products which do not meet the requirements shall not be used and be handled in such a way that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately - where technically feasible and necessary to show that the defect has been eliminated.

2.3.3 External surveillance

The factory production control system shall be inspected regularly, i.e. at least once a year, by means of external surveillance at each manufacturing plant.

In the framework of surveillance, an initial-type testing of the construction product shall be performed and also samples can be taken for audit-testing.

Sampling and testing are in the responsibility of the certification body.

The results of the certification and surveillance shall be kept for at least five years. On request, it shall be presented by the certification body or inspection body to the Deutsches Institut für Bautechnik and to the relevant supreme building authority.

3 Provisions for design, calculation and execution

3.1 Design

In the following and in the Annexes the structural components to be fastened are referred to as component I and the supporting structure on which will be fastened is referred to as component II.

For all connections the component thicknesses (supporting structures, brackets, supporting profiles, mounting brackets, cladding panels), the material strength as well as the minimum spacing, end and edge distances (screw pattern) shall be in accordance with provisions in the Annexes 9 to 35. The thickness of possibly existing thermal separation elements for brackets (bases / insulation plates) shall not exceed 5 mm.

When fastening in solid timber, glued-laminated timber or OSB panels the minimum raw densities and minimum strength classes specified in Annexes 12 to 14, 32, 33 and 35 shall be observed for timber and timber-based supporting structures.

3.2 Calculation

3.2.1 General

The verification concept specified in DIN EN 1990² in conjunction with the National Annex DIN EN 1990/NA³ applies.

For the minimum strengths of steel and aluminium supporting structures and the minimum raw densities and minimum strength classes for timber and timber-based supporting structures, the specifications in the Annexes apply.

When using aluminum components with a minimum strength of $185 \text{ N/mm}^2 \leq R_m \leq 245 \text{ N/mm}^2$, the characteristic values of the load-bearing capacity shall be reduced in the ratio $R_m / 245 \text{ N/mm}^2$.

For the anchoring of brackets and the linear supported and point-fixed connection of components, an additional tensile force ΔN_{Ed} due to the eccentricity of the load application shall be taken into account when determining the screw load.

3.2.2 Characteristic values of resistance

The characteristic values of resistance for the individual screws depending on the materials used are given in Annexes 10 to 35.

The following applies:

- $N_{R,k}$ - characteristic value of tension resistance
- $N_{R,I,k}$ - characteristic value of pull-through resistance for component I
- $N_{R,II,k}$ - characteristic value of pull-out resistance for component II
- $V_{R,k}$ - characteristic value of shear resistance
- $V_{R,I,k}$ - characteristic bearing resistance for component I
- $V_{R,II,k}$ - characteristic bearing resistance for component II
- $M_{y,Rk}$ - characteristic value of yield moment of the screw (for component II made of timber or timber based material)
- $f_{ax,k}$ - characteristic value of withdrawal strength (for component II made of timber or timber based material)

For intermediate values of component thicknesses I or II, the characteristic values of resistance of the lower component thickness shall be selected in each case.

The characteristic values of resistance refer to one screw, except in Annex 32. For perforated components with slotted holes, the transverse forces may only act perpendicular to the slotted hole.

2 DIN EN 1990:2010-12 Eurocode: Basis of structural design

3 DIN EN 1990/NA:2010-12 National Annex - Eurocode: Basis of structural design

3.2.3 Additional provisions for connections with timber components

3.2.3.1 General

The additional rules of this section do only apply to screws specified in the Annexes for the fastening of brackets to timber or timber based supporting structures or for the fastening of linear shaped timber components.

DIN EN 1995-1-1⁴ in conjunction with the National Annex DIN EN 1995-1-1/NA⁵ apply unless no other provisions are made in the following.

The following applies:

- d - nominal screw diameter (is equal to the external thread diameter)
- l_g - screw-in length (part of thread extended into component II inclusive probably existing tip or drill tip)
- for screws with sealing washer

$$l_g = l - t_1 - s_M - s_K$$
 - for screws without sealing washer

$$l_g = l - t_1$$
- with:
- l - screw length
 - t_1 - thickness component I (interlayer / insulation plates included)
 - s_M - thickness of the metal part of the sealing washer
 - s_K - thickness of the sealing of the sealing washer
- l_{ef} - effective screw-in length (equal to penetration depth of the threaded part)
- $$l_{ef} = l_g - l_b \text{ with } l_{ef} \geq 4d$$
- with:
- l_b - length of the unthreaded part of the drill tip ($l_b = 0$ for screws without drill tip)

3.2.3.2 Shear resistance $V_{R,II,k}$ (bearing resistance of timber)

$$V_{R,II,k} = F_{v,Rk} \cdot k_{mod}$$

with:

$F_{v,Rk}$ according to DIN EN 1995-1-1⁴, section 8.2.3, equation (8.9) or (8.10)

$$F_{ax,Rk} = F_{ax,\alpha,Rk} \text{ for } \alpha = 90^\circ$$

$F_{ax,\alpha,Rk}$ according to DIN EN 1995-1-1⁴, equation (8.40a)

$f_{ax,k}, \rho_k, \rho_a$ according to Annexes 12, 13, 14 and 35

ρ_k characteristic raw density of timber supporting structure in kg/m³

ρ_a corresponding value of raw density

$\rho_a = 350 \text{ kg/m}^3$ for solid timber of strength class C24

$= 385 \text{ kg/m}^3$ for glued-laminated timber of strength class GL 24h

$= 550 \text{ kg/m}^3$ for OSB/3- and OSB/4-panels

k_{mod} according to DIN EN 1995-1-1⁴, Table 3.1, as far as no other values are given in DIN EN 1995-1-1/NA⁵, Table NA.4

$$f_{h,0,k} = f_{h,k} \text{ for } \alpha = 90^\circ$$

$f_{h,k}$ according to DIN EN 1995-1-1⁴, equation (8.16)

$M_{y,Rk}$ according to Annexes 12, 13, 32 and 35

4 DIN EN 1995-1-1:2010-12 Design of timber structures
 Part 1-1: General - Common rules and rules for buildings

5 DIN EN 1995-1-1/NA:2013-08 National Annex - Design of timber structures
 Part 1-1: General - Common rules and rules for buildings

The characteristic values for shear resistance $V_{R,II,k}$ (bearing resistance of timber) calculated according to this section for component II shall be compared with the characteristic values $V_{R,I,k}$ (bearing resistance of steel, stainless steel or aluminum) for component I obtained from the appropriate Annexes. The lower value shall be used for further calculations. The Annexes 15 and 33 contain already calculated values $V_{R,II,k}$ for special applications.

3.2.3.3 Pull-out resistance for fastening to timber supporting structures

$$N_{R,II,k} = F_{ax,Rk} \cdot k_{mod}$$

with:

$$F_{ax,Rk}, k_{mod} \quad \text{see section 3.2.3.2}$$

The characteristic values for tension resistance $N_{R,II,k}$ (pull-out from timber structure) calculated according to this section for component II shall be compared with the characteristic values $N_{R,I,k}$ (pull-through) for component I obtained from the appropriate Annexes. The lower value shall be used for further calculations. Annex 15 contains already calculated values $N_{R,II,k}$ for special applications.

3.2.4 Calculation and verification

The following verification shall be done:

$$\frac{N_{Ed}}{N_{Rk}/\gamma_M} \leq 1.0; \quad \frac{V_{Ed}}{V_{Rk}/\gamma_M} \leq 1.0$$

as well as the verification procedure for interaction for combined acting tensile forces and shear forces:

$$\frac{N_{Ed}}{N_{Rk}/\gamma_M} + \frac{V_{Ed}}{V_{Rk}/\gamma_M} \leq 1.0$$

with:

N_{Ed} Design value of acting tensile force

V_{Ed} Design value of acting shear force

$$N_{Rk} = \min \{N_{R,I,k}; N_{R,II,k}\}$$

$$V_{Rk} = \min \{V_{R,I,k}; V_{R,II,k}\}$$

Partial safety factor $\gamma_M = 1.33$

3.2.5 Shear forces due to temperature

The use of the fastening elements for not constraint-free connections is only allowed with verification of the temperature-related restraints (shear forces). Without this verification the fastening elements shall only be used for constraint-free connections. This restriction does not apply to connections with slotted holes where due to the displacement of the screws in the slotted hole no or only negligible small temperature-related restraints may occur.

4 Provisions for use, maintenance and servicing

Anchorage, connections and fastenings in accordance with section 1 may only be executed by companies which have the necessary experience, unless the installation personnel have been instructed by specialists with experience in this field.

Screws that are exposed to weathering or other humidity without additional protection shall be made of stainless steel. This does not apply to the welded-on drill tip. The design must also ensure that no bimetal corrosion can occur.

The screws shall be inserted rectangular to the component surface in order to ensure a perfectly load-bearing connection.

For regular shear forces the structural parts to be connected shall be in contact with each other and the shear joint shall be at the contact point of component I and component II so that the fastening element does not get additional bending. The additional use of compression resistant thermal insulation plates up to a thickness of 5 mm is allowed for brackets. An exception are the screws in Appendix 11, whose characteristic load-bearing capacity values were determined on the basis of tests with a pressure-resistant intermediate layer of 12.5 mm.

If self-drilling screws are used, pre-drilling should only be carried out for supporting structures made of construction timber with a characteristic raw density of over 500 kg/m³ and for Douglas fir timber over the entire screw-in depth l_g with a drilling diameter corresponding to the diameter of the drilling tip.

The effective screw-in depth in solid timber and glued-laminated timber shall be at least 4·d, unless higher values are required in the installation sheets or in the execution documents (installation plans). The effective screw-in depth into supporting structures made of OSB/3 or OSB/4 panels must be at least 19 mm, unless higher values are required in the installation sheets or in the execution documents (installation plans).

Screws for steel or aluminium supporting structures shall be screwed-in with the cylindrical part of the thread

- through the material if component II has a thickness up to 6 mm
- at least 6 mm if component II has a thickness of over 6 mm.

Welded drill tips or hardened tips shall therefore not be taken into account.

The information on the drilling capacities as well as the type of screw connection in the systems shall be observed. The use of impact wrenches is not allowed.

Already loaded fastening screws in regular load bearing connections shall only be replaced by thread forming screws with a larger diameter. Therefore the hole has to be predrilled for the thicker fastening screw.

The minimum edge distances and minimum spacing according to the Annexes shall be observed.

For Hilti brackets, Hilti support profiles, Hilti mounting elements and Hilti mounting brackets factory punched, no proof of the minimum edge and hole distances is required. This also applies to non-perforated Hilti support profiles and Hilti mounting elements which are screwed together with the Hilti brackets according to the manufacturer's instructions.

Otherwise the following minimum edge distances and minimum spacing shall be maintained for all types of fastening elements for steel, stainless steel and aluminium components:

- edge distance in load direction $e_1 \geq 2.0 \cdot d$, but at least 15 mm
- edge distance perpendicular to load direction $e_2 \geq 1.5 \cdot d$, but at least 10 mm
- spacing in load direction $p_1 \geq 4 \cdot d$, but at least 30 mm
- spacing perpendicular to load direction $p_2 \geq 2 \cdot d$, but at least 20 mm

In the case of supporting structures made of timber or timber-based materials, the specifications in Table 1 apply to the edge distances and the distances between the screws. The screws in Appendix 32 are an exception, whose characteristic values of resistance were determined on the basis of tests with the actual screw distances and edge distances.

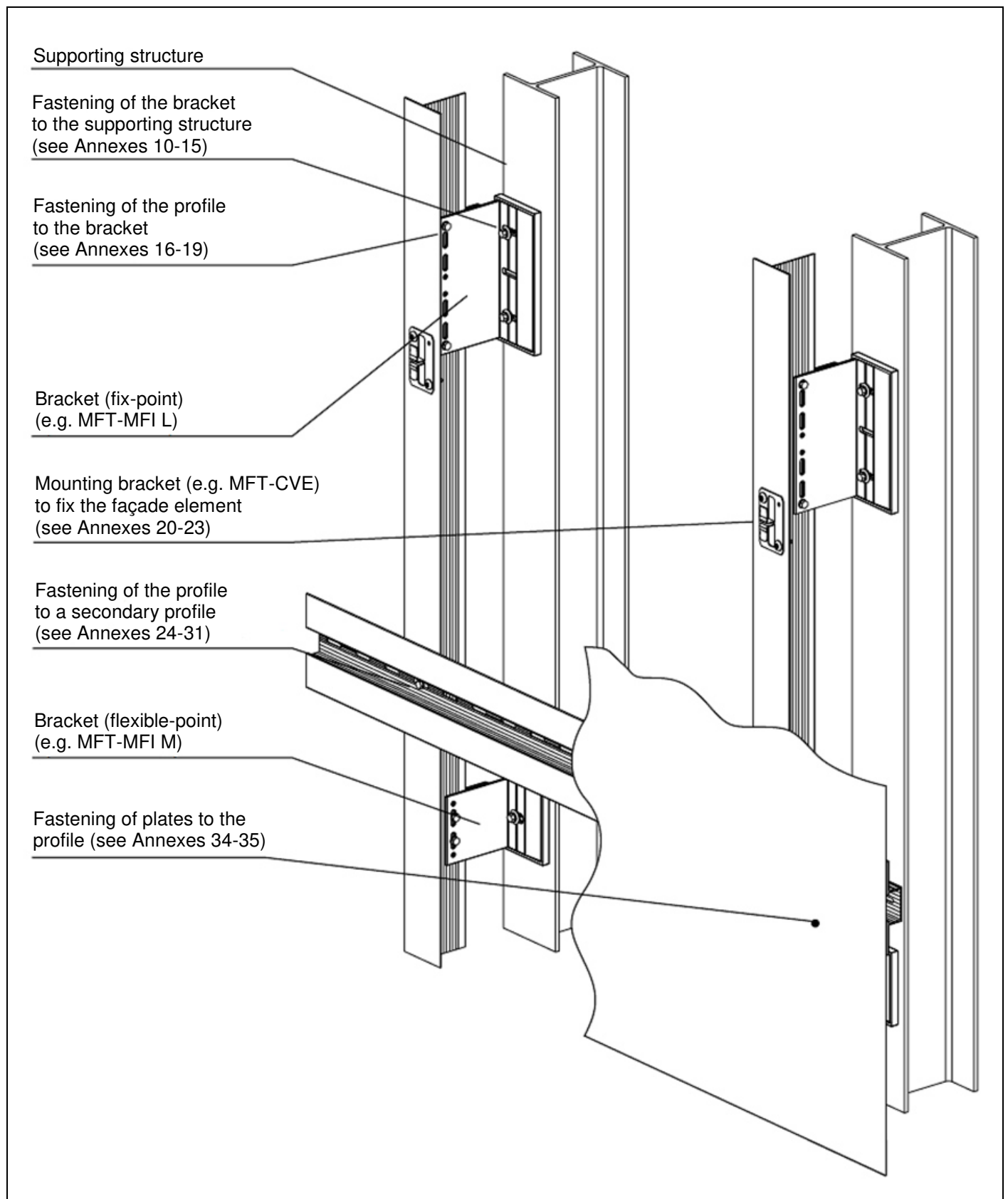
Table 1: Spacing for timber and timber based supporting structures

	Spacing							
	Among each other		In load direction				Rectangular to load direction	
			Loaded edge		Unloaded edge			
Designation	a ₁	a ₂	a _{1,t}	a _{2,t}	a _{1,c}	a _{2,c}	a _{1,c}	a _{2,c}
Direction of fiber		⊥		⊥		⊥		⊥
d [mm]	Spacing [mm]							
4.0	20	12	48	20	28	12	28	12
5.5	28	17	66	39	39	17	39	17
6.5	33	20	78	46	46	20	46	20
Designation acc. to DIN EN 1995-1-1:2010-12, Fig. 8.7, see also Annex 6 of this decision.								

The spacing between screws, rectangular loaded to the screw axis, does also apply to axial loaded screws.

Dr.-Ing. Lars Eckfeldt
 Head of section

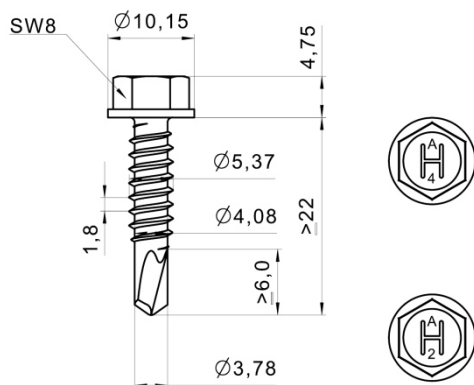
Beglaubigt ('confirmed')



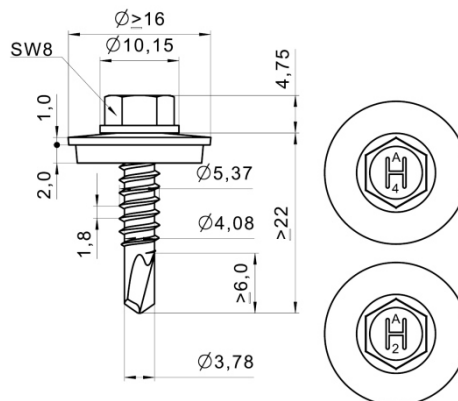
Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Annex 1

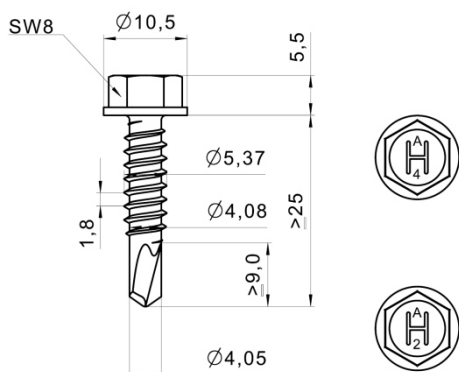
Sample of a supporting structure for a light ventilated curtain facade



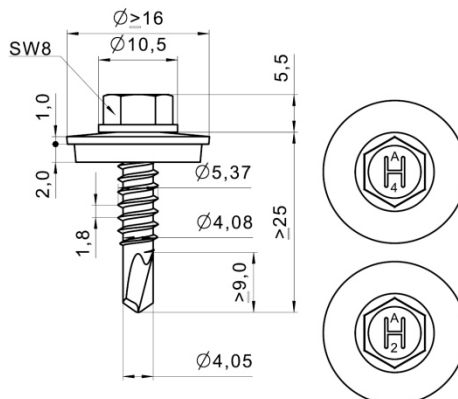
Hilti S-MD 01 S 5,5xL* (Type A1)
 Hilti S-MD 01 SS 5,5xL** (Type A1)



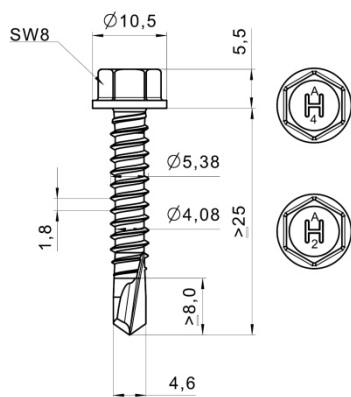
Hilti S-MD 51 S 5,5xL* (Type A2)
 Hilti S-MD 51 SS 5,5xL** (Type A2)



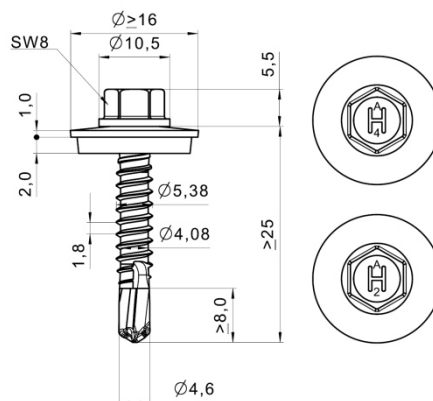
Hilti S-MD 01 LS 5,5xL* (Type B1)
 Hilti S-MD 01 LSS 5,5xL** (Type B1)



Hilti S-MD 51 LS 5,5xL* (Type B2)
 Hilti S-MD 51 LSS 5,5xL** (Type B2)



Hilti S-MD 03 S 5,5xL* (Type C1)
 Hilti S-MD 03 SS 5,5xL** (Type C1)



Hilti S-MD 53 S 5,5xL* (Type C2)
 Hilti S-MD 53 SS 5,5xL** (Type C2)

* Corrosion resistant steel A2, material-No. 1.4301 - DIN EN 10088

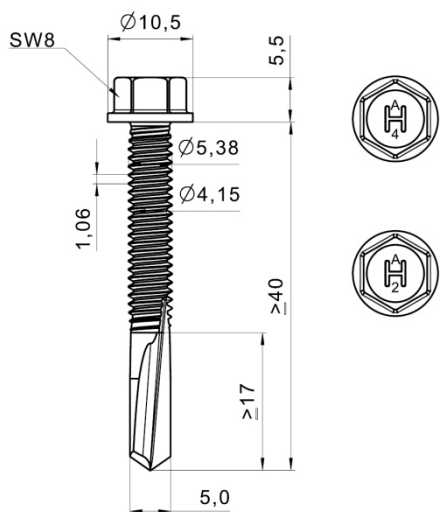
** Corrosion resistant steel A4, material-No. 1.4404 - DIN EN 10088

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

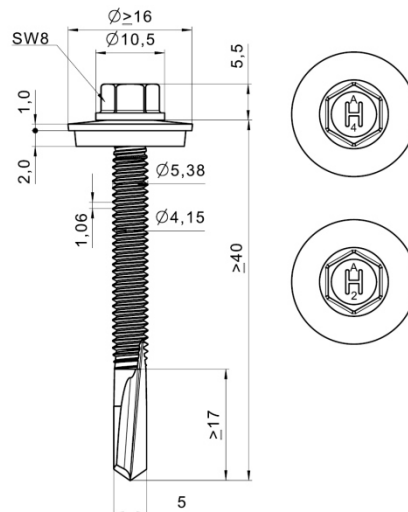
Screws

S-MD 01 S 5,5xL, S-MD 01 SS 5,5xL, S-MD 51 S 5,5xL, S-MD 51 SS 5,5xL,
 S-MD 01 LS 5,5xL, S-MD 01 LSS 5,5xL, S-MD 51 LS 5,5xL, S-MD 51 LSS 5,5xL,
 S-MD 03 S 5,5xL, S-MD 03 SS 5,5xL, S-MD 53 S 5,5xL, S-MD 53 SS 5,5xL

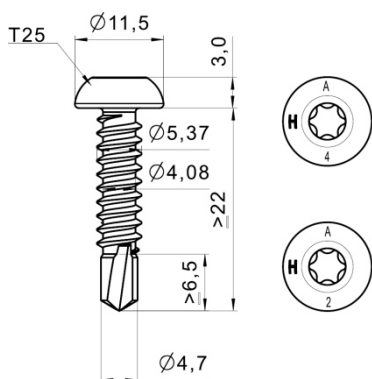
Annex 2



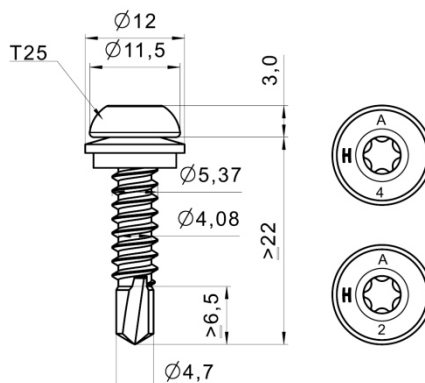
Hilti S-MD 05 S 5,5xL * (Type D1)
 Hilti S-MD 05 SS 5,5xL ** (Type D1)



Hilti S-MD 55 S 5,5xL * (Type D2)
 Hilti S-MD 55 SS 5,5xL ** (Type D2)



Hilti S-MD 03 PS 5,5xL * (Type E1)
 Hilti S-MD 03 PSS 5,5xL ** (Type E1)



Hilti S-MD 33 PS 5,5xL * (Type E2)
 Hilti S-MD 33 PSS 5,5xL ** (Type E2)

* Corrosion resistant steel A2, material-No. 1.4301 - DIN EN 10088

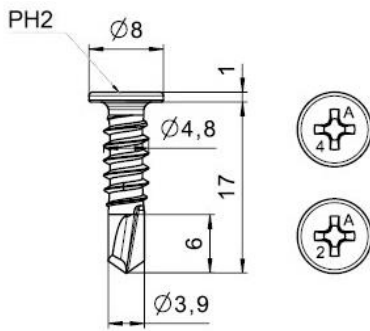
** Corrosion resistant steel A4, material-No. 1.4404 - DIN EN 10088

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

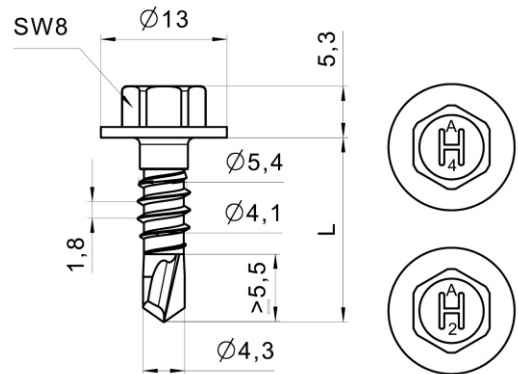
Screws

S-MD 05 S 5,5xL, S-MD 05 SS 5,5xL, S-MD 55 S 5,5xL, S-MD 55 SS 5,5xL,
 S-MD 03 PS 5,5xL, S-MD 03 PSS 5,5xL, S-MD 33 PS 5,5xL, S-MD 33 PSS 5,5xL

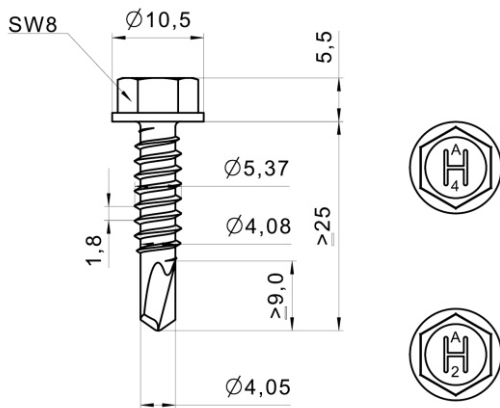
Annex 3



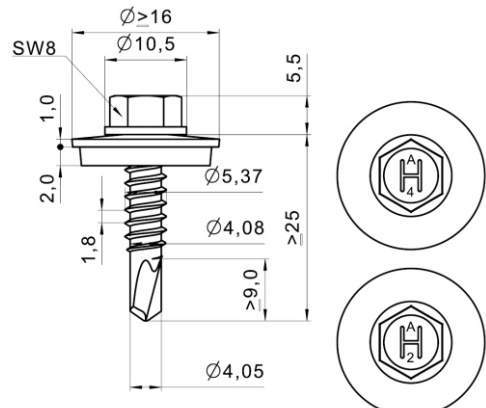
Hilti S-AD 01 LHS 4,8xL * (Type F)
 Hilti S-AD 01 LHSS 4,8xL ** (Type F)



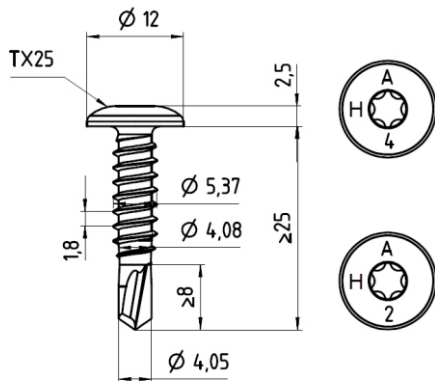
Hilti S-AD 01 S 5,5xL * (Type G)
 Hilti S-AD 01 SS 5,5xL ** (Type G)



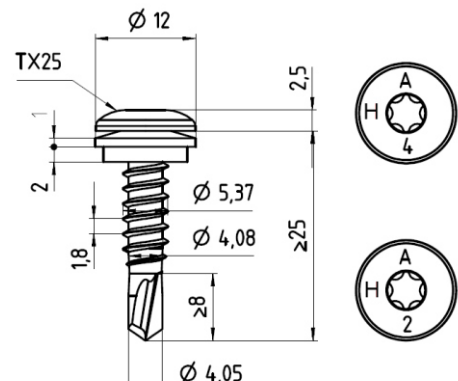
Hilti S-AD 01 LS 5,5xL * (Type H1)
 Hilti S-AD 01 LSS 5,5xL ** (Type H1)



Hilti S-AD 51 LS 5,5xL * (Type H2)
 Hilti S-AD 51 LSS 5,5xL ** (Type H2)



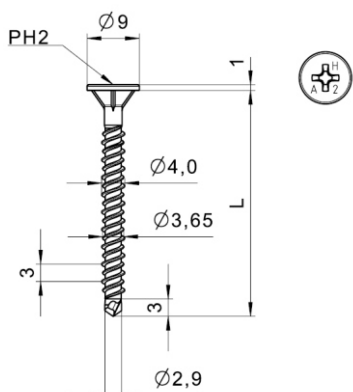
Hilti S-AD 01 LPS 5,5xL * (Type I1)
 Hilti S-AD 01 LPSS 5,5xL ** (Type I1)



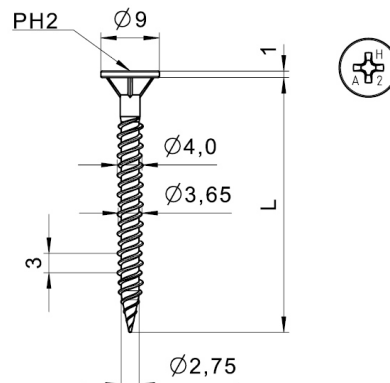
Hilti S-AD 31 LPS 5,5xL * (Type I2)
 Hilti S-AD 31 LPSS 5,5xL ** (Type I2)

* Corrosion resistant steel A2, material-No. 1.4301 - DIN EN 10088
 ** Corrosion resistant steel A4, material-No. 1.4404 - DIN EN 10088

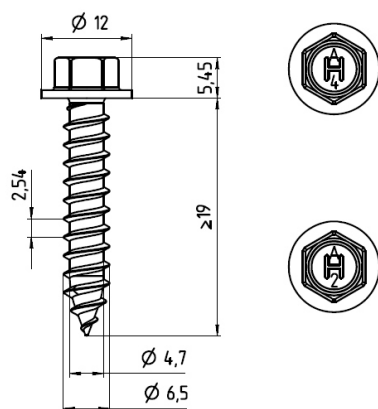
Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS		Annex 4
Screws		
S-AD 01 LHS 4,8xL, S-AD 01 LHSS 4,8xL, S-AD 01 S 5,5xL, S-AD 01 SS 5,5xL S-AD 01 LS 5,5xL, S-AD 01 LSS 5,5xL, S-AD 51 LS 5,5xL, S-AD 51 LSS 5,5xL S-AD 01 LPS 5,5xL, S-AD 01 LPSS 5,5xL, S-AD 31 LPS 5,5xL, S-AD 31 LPSS 5,5xL		



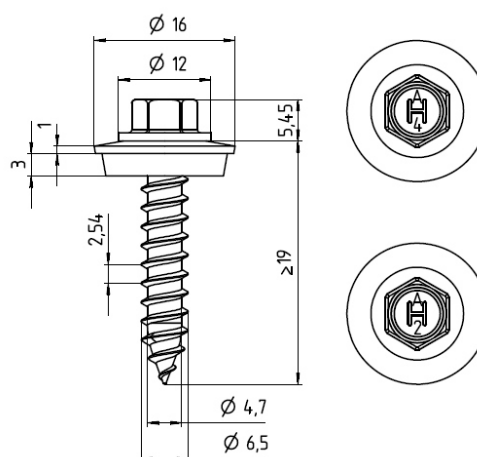
Hilti S-PD 01 S 4,0xL * (Type J)



Hilti S-PS 01 S 4,0xL * (Type K)



Hilti S-MP 03 S 6,5xL * (Type L1)
 Hilti S-MP 03 SS 6,5xL ** (Type L1)



Hilti S-MP 53 S 6,5xL * (Type L2)
 Hilti S-MP 53 SS 6,5xL ** (Type L2)

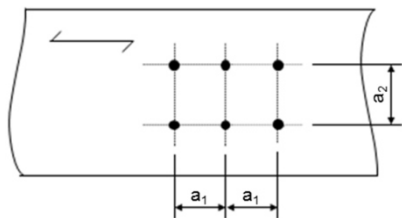
* Corrosion resistant steel A2, material-No. 1.4301 - DIN EN 10088

** Corrosion resistant steel A4, material-No. 1.4404 - DIN EN 10088

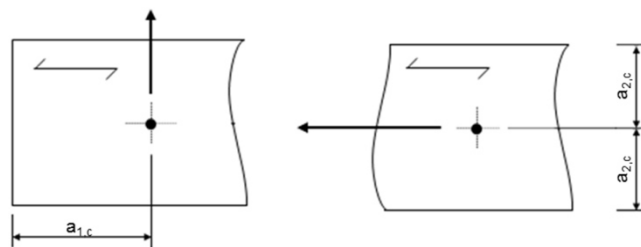
Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS		Annex 5
Screws S-PD 01 S 4,0xL, S-PS 01 S 4,0xL, S-MP 03 S 6,5xL, S-MP 03 SS 6,5xL, S-MP 53 S 6,5xL, S-MP 53 SS 6,5xL		

Spacing and edge distance for timber and timber based material for component II

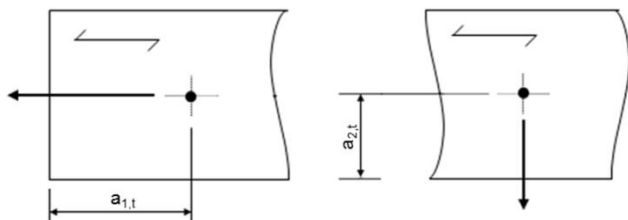
Spacing of the fastening elements among each other



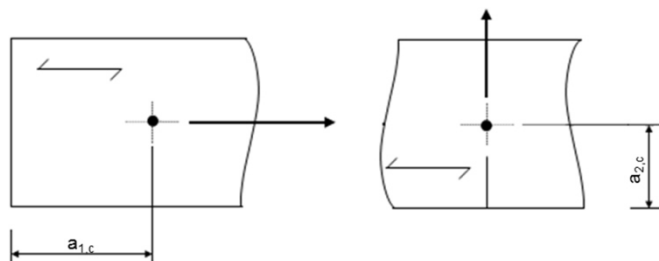
Edge distances rectangular to load direction



Edge distances in load direction – loaded edge



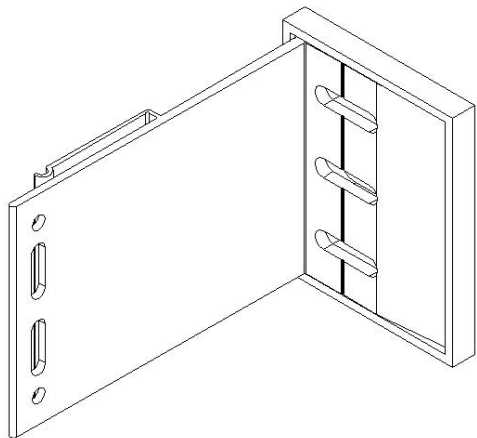
Edge distances in load direction – unloaded edge



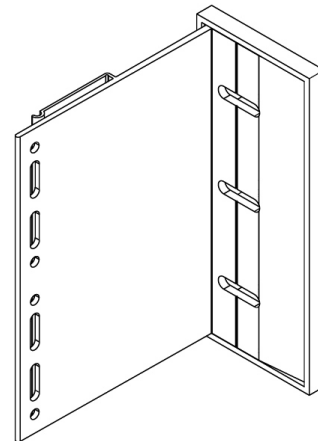
Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Spacing of the fastening elements among each other and edge distance for timber and timber based material for component II

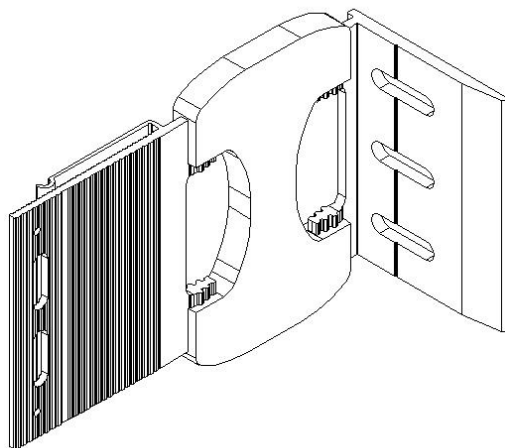
Annex 6



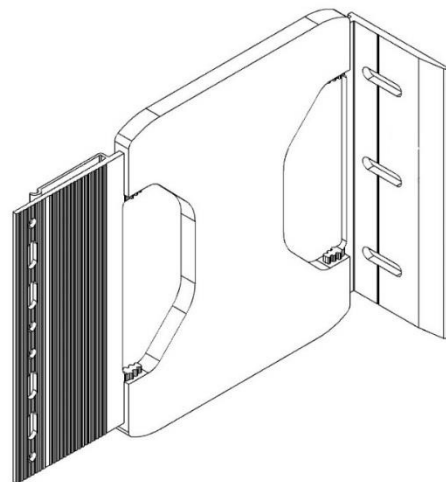
Bracket MFT-MF M 6.5 / MFT-MFI* M 6.5



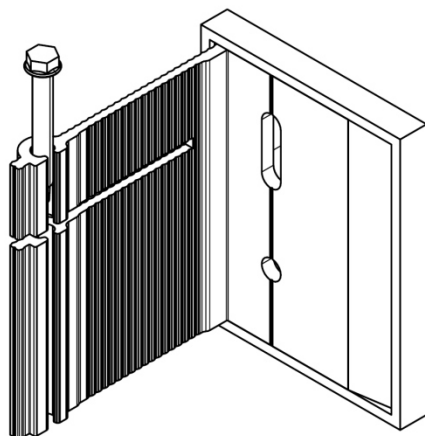
Bracket MFT-MF L 6.5 / MFT-MFI* L 6.5



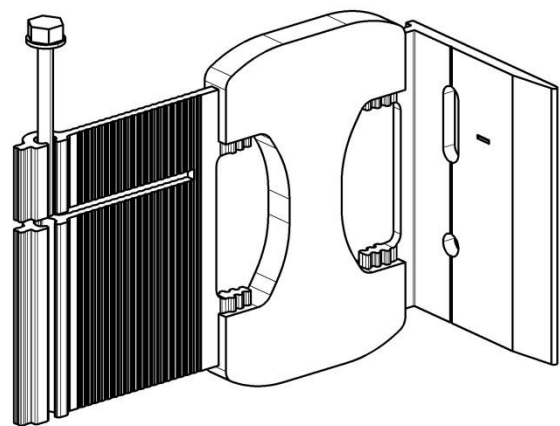
Bracket MFT-FOX VT M 6.5



Bracket MFT-FOX VT L 6.5



Bracket MFT-FOX H M 6.5 / MFT-FOX HI M 6.5*



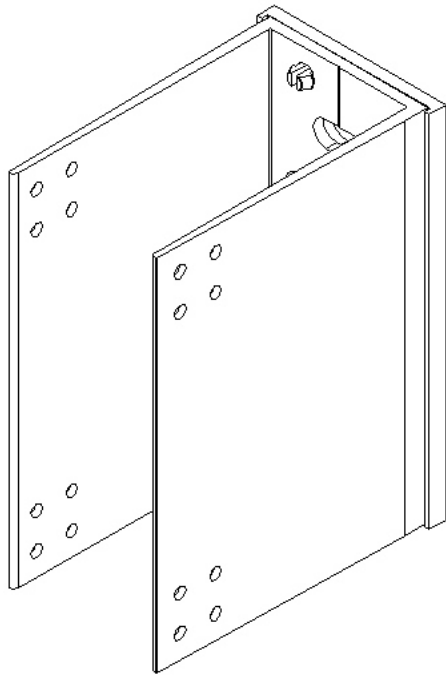
Bracket MFT-FOX HT M 6.5

* Bracket with pressure-resistant insulation plate 5 mm

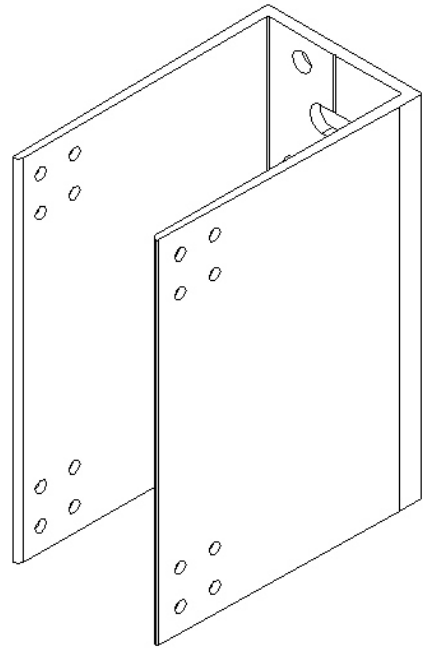
Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Samples for Hilti-brackets with round and slotted holes for realisation of fix- and flexible-points for anchoring on steel, timber and timber based supporting structures

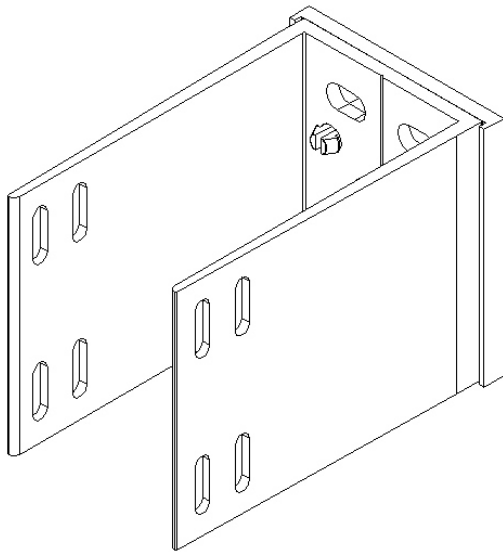
Annex 7



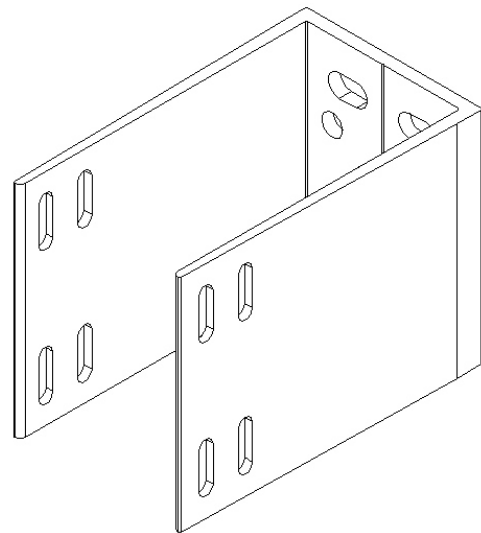
Bracket MFT-S2S UI L*



Bracket MFT-S2S U L



Bracket MFT-S2S UI M*



Bracket MFT-S2S U M

* Bracket with pressure-resistant insulation plate 5 mm

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

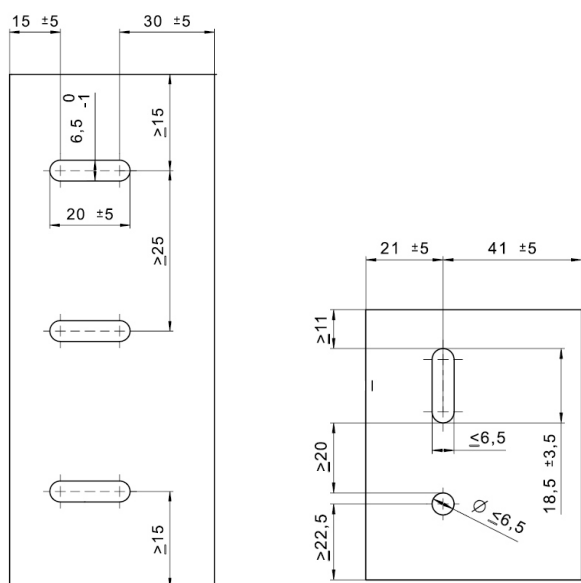
Samples for Hilti-brackets with round and slotted holes for realisation of fix- and flexible-points for anchoring on steel, timber and timber based supporting structures

Annex 8

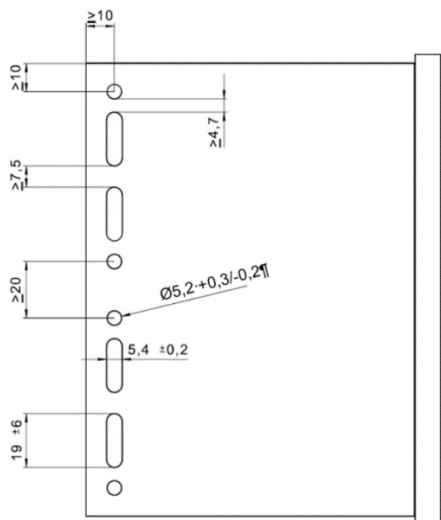
Technical specification

Material composition	Aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245 \text{ N/mm}^2$); calculation according to DIN EN 1999-1-1 stainless steel – DIN EN 10088; calculation according to DIN EN 1993-1-4 S280GD, S320GD, S350GD – DIN EN10346; calculation according to DIN EN 1993-1-1 / DIN EN 1993-1-3
Kind of fixing	Fix-point, flexible-point
Nominal thickness of base plate	$\geq 4 \text{ mm}$ (aluminium); $\geq 2.50 \text{ mm}$ (steel / stainless steel)
Nominal thickness of side piece	$\geq 2.20 \text{ mm}$

Dimensions of base plate (fastening bracket to supporting structure)



Dimensions of side piece (fastening bracket to profile)

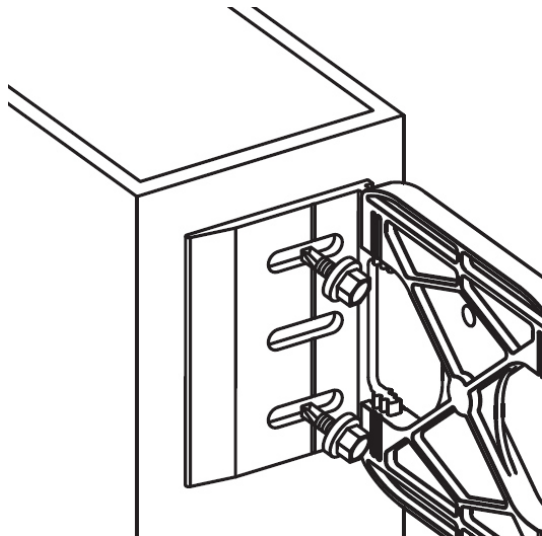


Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Geometrical minimum dimensions universal brackets in aluminium, steel or stainless steel with round and slotted holes for realisation of fix- and flexible-points for anchoring on steel, timber and timber based supporting structures

Annex 9

Bracket on steel supporting structure



Fastening element *
 S-MD x1 LSS 5,5xL (Type B1, B2)
 S-MD x3 SS 5,5xL (Type C1, C2)
 S-MD x5 SS 5,5xL (Type D1, D2)

Material
Screw:
 stainless steel
 (1.4301, 1.4404) – DIN EN 10088
Washer:
 stainless steel
 (1.4301) – DIN EN 10088

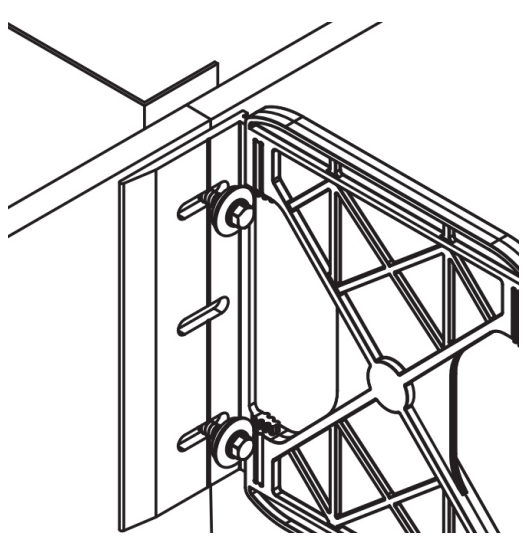
Drilling capacity $\sum t_i$
 (Type B1, B2): 1.20 - 4.00 mm
 (Type C1, C2): 2.10 - 6.00 mm
 (Type D1, D2): 4.60 - 12.00 mm

$t_i \geq 4$ mm (aluminium) $t_i \geq 2.5$ mm (steel)		Component II with t_{II} [mm]: in steel S235, S275, S355 - DIN EN 10025, S280GD, S320GD, S350GD - DIN EN 10346				
		2.00	3.00	4.00	5.00	≥ 6.00
Self-drilling screw Type		B1, B2	B1, B2, C1, C2	B1, B2, C1, C2	C1, C2	D1, D2
Component I Hilti-brackets according to Annex 7 and 8 or brackets according to Annex 9	Shear force $V_{R,k}$ in [kN]	6.24	6.24	6.24	6.24	6.24
	Tensile force $N_{R,k}$ in [kN]	3.78	4.37	5.92	7.50	8.00

- The characteristic values of resistance are valid for one screw in a round or slotted hole.
- Shear forces act rectangular to the slotted hole.
- The characteristic values of resistance are also valid for pressure-resistant bases/insulation plates with a thickness $t \leq 5$ mm.
- For calculation of the screw loads an additional tensile load ΔN_{Ed} due to eccentric load application on the brackets shall be considered eventually.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 10
Characteristic values of resistance in kN for the fastening of aluminium, steel or stainless steel brackets on steel supporting structures with screws: S-MD x1 LSS 5,5xL, S-MD x3 SS 5,5xL, S-MD x5 SS 5,5xL	

Bracket on steel supporting structure with intermediate layer	
	<p>Fastening element * S-MD x1 LSS 5,5xL (Type B1, B2)</p> <p>Material Screw: stainless steel (1.4301, 1.4404) - DIN EN 10088 Washer: stainless steel (1.4301) - DIN EN 10088</p> <p>Drilling capacity $\sum t_i$ 1.20 - 4.00 mm</p>

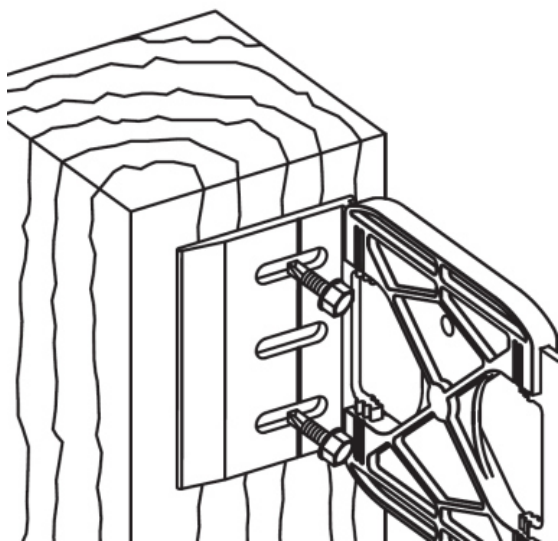
$t_i \geq 4.0$ mm (aluminium) $t_i \geq 2.5$ mm (steel)		Component II with t_{II} [mm]: in steel S235, S275, S355, S450 - DIN EN 10025, S280GD, S320GD, S350GD, S420GD - DIN EN 10346				
		1.20	1.50	1.80	2.00	3.00
Component I Hilti-brackets according to Annex 7 and 8 or brackets according to Annex 9	Shear force $V_{R,k}$ in [kN]	2.11	2.60	2.97	3.15	3.35
	Tensile force $N_{R,k}$ in [kN]	1.70	2.47	3.24	3.78	6.49

- The characteristic values of resistance are valid for one screw in a round or slotted hole.
- Shear forces act rectangular to the slotted hole.
- The characteristic values of resistance apply to pressure-resistant planking with a thickness $t \leq 12.5$ mm, e.g. gypsum board to DIN 18180 or mineral-based panels. The brackets according to Annex 7 and 8 can additionally be equipped with pressure-resistant insulator plates (max. 5 mm thick).
- For calculation of the screw loads an additional tensile load ΔN_{Ed} due to eccentric load application on the brackets shall eventually be considered.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 11
Characteristic values of resistance in kN for the fastening of aluminium, steel or stainless steel brackets on steel supporting structures with intermediate layer with screws: S-MD x1 LSS 5,5xL	

Bracket on solid timber and glued-laminated timber



Fastening element *
 S-MD x1 SS 5,5xL (Type A1, A2)
 S-MP x3 SS 6,5xL (Type L1, L2)

Material
Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 stainless steel
 (1.4301) - DIN EN 10088

Timber supporting structure
 Properties determined with:
 S-MP x1 SS 5,5xL (Type A1, A2)
 $M_{y,Rk} = 6.310 \text{ Nm}$
 $f_{ax,k} = 7.856 \text{ N/mm}^2$ for $l_{ef} \geq 22 \text{ mm}$
 S-MP x3 SS 6,5xL (Type L1, L2)
 $M_{y,Rk} = 9.742 \text{ Nm}$
 $f_{ax,k} = 8.575 \text{ N/mm}^2$ for $l_{ef} \geq 26 \text{ mm}$

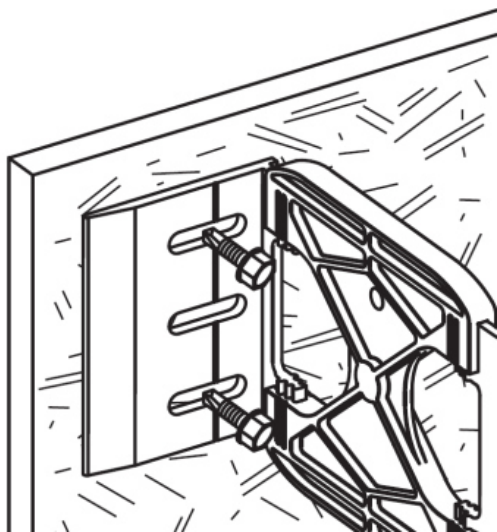
Component I Hilti-brackets according to Annex 7 and 8 or brackets according to Annex 9	Aluminium EN AW-XXX - DIN EN 755-2	Steel Stainless steel according to DIN EN 10088 S280GD, S320GD, S350GD - DIN EN10346
	$R_m \geq 245 \text{ N/mm}^2$	$R_m \geq 360 \text{ N/mm}^2$
Shear load $V_{R,I,k}$ in [kN]	6.24	
Tensile load $N_{R,I,k}$ in [kN]	6.75	

- The characteristic values of resistance $V_{R,I,k}$ and $N_{R,I,k}$ are valid for one screw in a round or slotted hole.
- Shear forces act rectangular to the slotted hole.
- The value $f_{ax,k}$ is valid for a minimum raw density of 350 kg/m^3 of the timber supporting structure.
- The load bearing capacity of all screws may be fully utilized for fastening of brackets according to Annex 7 and 8 or Annex 9 with the there indicated arrangement of fastening elements.
- The calculation of the characteristic values of resistance for the screws for timber supporting structures (pull-out and load bearing resistance) shall be in accordance with DIN EN 1995-1-1 and section 3.2.3. Annex 15 contains already calculated values for $V_{R,II,k}$ and $N_{R,II,k}$ for special applications. The lower value shall be used for further calculation.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 12
Characteristic values of resistance in kN for the fastening of aluminium, steel or stainless steel brackets to supporting structures made of timber or timber based material with screws: S-MD x1 SS 5,5xL, S-MP x3 SS 6,5xL	

Bracket on OSB panels



Fastening element *
 S-MD x1 SS 5,5xL (Type A1, A2)
 S-MP x3 SS 6,5xL (Type L1, L2)

Material
Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 stainless steel
 (1.4301) - DIN EN 10088

Timber supporting structure
 Properties determined with:
 S-MD x1 SS 5,5xL (Type A1, A2)
 $M_{y,Rk} = 6.310 \text{ Nm}$
 $f_{ax,k} = 11.285 \text{ N/mm}^2$ for $l_{ef} \geq 19 \text{ mm}$
 S-MP x3 SS 6,5xL (Type L1, L2)
 $M_{y,Rk} = 9.742 \text{ Nm}$
 $f_{ax,k} = 9.486 \text{ N/mm}^2$ for $l_{ef} \geq 19 \text{ mm}$

Component I Hilti-brackets according to Annex 7 and 8 or brackets according to Annex 9	Aluminium EN AW-XXX - DIN EN 755-2	Steel Stainless steel according to DIN EN 10088 S280GD, S320GD, S350GD - DIN EN 10346
	$R_m \geq 245 \text{ N/mm}^2$	$R_m \geq 360 \text{ N/mm}^2$
Shear load $V_{R,I,k}$ in [kN]	6.24	
Tensile load $N_{R,I,k}$ in [kN]	6.75	

- The characteristic values of resistance $V_{R,I,k}$ and $N_{R,I,k}$ are valid for one screw in a round or slotted hole.
- Shear forces act rectangular to the slotted hole.
- The value $f_{ax,k}$ is valid for a minimum raw density of 550 kg/m³ of the OSB/3 and OSB/4 panels.
- The load bearing capacity of all screws may be fully utilized for fastening of brackets according to Annex 7 and 8 or Annex 9 with the there indicated arrangement of fastening elements.
- The calculation of the characteristic values of resistance for the screws for timber supporting structures (pull-out and load bearing resistance) shall be in accordance with DIN EN 1995-1-1 and section 3.2.3. Annex 15 contains already calculated values for $V_{R,II,k}$ and $N_{R,II,k}$ for special applications. The lower value shall be used for further calculation.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 13
Characteristic values of resistance in kN for the fastening of aluminium, steel or stainless steel brackets to supporting structures made of timber or timber based material with screws: S-MD x1 SS 5,5xL, S-MP x3 SS 6,5xL	

Component II:

Values to determine characteristic values of resistance according to DIN EN 1995-1-1

Supporting structure (component II)	ρ_k [kg/m ³]	ρ_a [kg/m ³]	t_{\min} or l_{ef} [mm]	$f_{ax,k}$ [N/mm ²]	k_{mod} for load duration (constant and short) and service class			
						1	2	3
Solid timber \geq C24	≥ 350	350	≥ 22 Type of screw A1, A2	7.856	constant short	0.60 0.90	0.60 0.90	0.50 0.70
			≥ 26 Type of screw L1, L2	8.575	constant short	0.60 0.90	0.60 0.90	0.50 0.70
glued-laminated timber \geq GL 24h	≥ 385	385	≥ 22 Type of screw A1, A2	7.856	constant short	0.60 0.90	0.60 0.90	0.50 0.70
			Type of screw L1, L2	8.575	constant short	0.60 0.90	0.60 0.90	0.50 0.70
OSB/3 -, OSB/4 - panels	≥ 550	550	≥ 19 (screwed through) Type of screw A1, A2	11.285	constant short	0.40 0.90	0.30 0.70	--- ---
			≥ 19 (screwed through) Type of screw L1, L2	9.486	constant short	0.40 0.90	0.30 0.70	--- ---

- Characteristic values of shear resistance according to DIN EN 1995-1-1 with: $d = 5.50$ mm, $M_{y,Rk} = 6.310$ Nm for S-MD x1 SS 5,5xL (Type A1, A2) or $d = 6.50$ mm, $M_{y,Rk} = 9.742$ Nm for S-MP x3 SS 6,5xL (Type L1, L2).
- The Tables in Annex 15 contain already calculated characteristic values of resistance depending on k_{mod} and effective screw-in length l_{ef} . Linear interpolation is allowed for intermediate values of effective screw-in length.
- Verifications shall be done in accordance with section 3.2.3. For calculation of the screw loads an additional tensile load ΔN_{Ed} due to eccentric load application on the brackets shall eventually be considered.

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Values to determine characteristic values of resistance (pull-out and load bearing resistance) for screws in supporting structures made of timber or timber based material:
 S-MD x1 SS 5,5xL, S-MP x3 SS 6,5xL

Annex 14

Characteristic value of resistance for component II made of solid timber \geq C24

Type of screw		Effective screw-in length l_{ef} [mm]									
		35		40		55		65		80	
		A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2
	k_{mod}										
$V_{R,II,k}$ [kN]	0.60	1.35	1.60	1.38	1.73	1.48	1.85	1.55	1.94	1.64	2.06
	0.50	1.13	1.33	1.15	1.44	1.23	1.54	1.29	1.61	1.37	1.72
$N_{R,II,k}$ [kN]	0.90	1.36	1.76	1.56	2.01	2.14	2.76	2.53	3.26	3.11	4.01
	0.70	1.06	1.37	1.21	1.56	1.66	2.15	1.97	2.54	2.42	3.12

Characteristic value of resistance for component II made of glued-laminated timber \geq GL 24h

Type of screw		Effective screw-in length l_{ef} [mm]									
		35		40		55		65		80	
		A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2
	k_{mod}										
$V_{R,II,k}$ [kN]	0.60	1.42	1.75	1.46	1.82	1.56	1.96	1.63	2.05	1.74	2.18
	0.50	1.19	1.46	1.22	1.52	1.30	1.63	1.36	1.71	1.45	1.82
$N_{R,II,k}$ [kN]	0.90	1.47	1.89	1.68	2.17	2.31	2.98	2.73	3.52	3.36	4.33
	0.70	1.14	1.47	1.31	1.68	1.80	2.32	2.12	2.74	2.61	3.37

Characteristic value of resistance for component II made of OSB/3 or OSB/4 panels

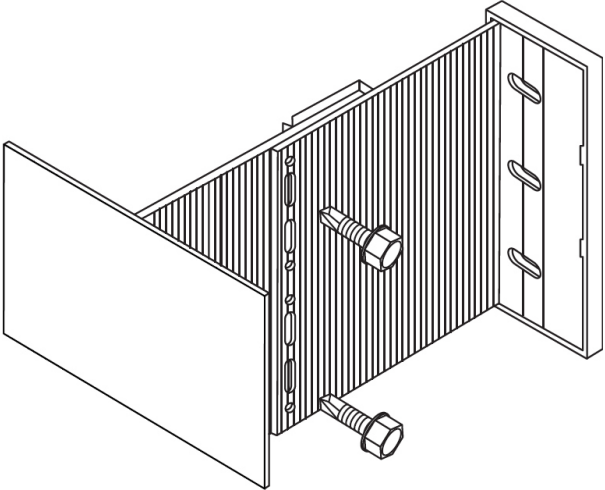
Type of screw		Effective screw-in length l_{ef} or panel thickness t [mm], fully screwed through							
		19		22		25		30	
		A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2	A1, A2	L1, L2
	k_{mod}								
$V_{R,II,k}$ [kN]	0.40	0.86	0.93	0.97	1.06	1.09	1.19	1.13	1.35
	0.30	0.65	0.70	0.73	0.79	0.82	0.89	0.84	1.01
$N_{R,II,k}$ [kN]	0.90	1.06	1.05	1.23	1.22	1.40	1.39	1.68	1.66
	0.70	0.83	0.82	0.96	0.95	1.09	1.08	1.30	1.29

- The characteristic values of resistance $V_{R,II,k}$ and $N_{R,II,k}$ are valid for one screw.
- The load bearing capacity of all screws may be fully utilized for fastening of brackets according to Annex 7 and 8 or Annex 9 with the there indicated arrangement of fastening elements.
- k_{mod} shall be determined according to DIN EN 1995-1-1 or Annex 14.

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Characteristic values of resistance in kN for the fastening of aluminium, steel or stainless steel brackets to supporting structures made of timber or timber based material with screw:
 S-MD x1 SS 5,5xL, S-MP x3 SS 6,5xL

Annex 15

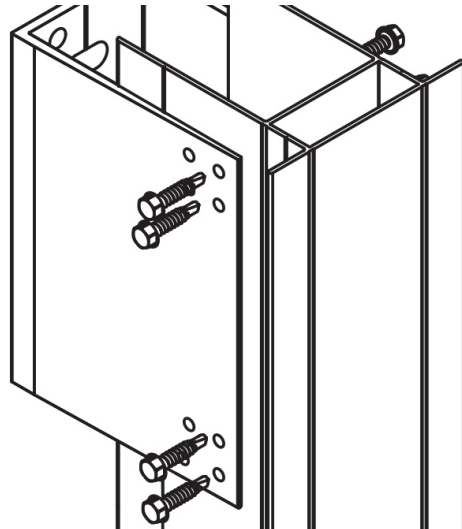
Hilti-profile to Hilti-bracket	
	<p>Fastening element * S-AD 01 SS 5,5xL (Type G)</p> <p>Material <u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088 <u>Washer:</u> none</p> <p>Drilling capacity $\sum t_i$ 1.50 – 4.00 mm</p>

$t_i \geq 2.20$ mm		Component II Hilti-profile in Aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245$ MPa) with material thickness in [mm]:								
		MFT-L, MFT-T				MFT-CP T	MFT-OT	MFT-PCT L MFT-PCT T		
		1.80	2.00	2.20	2.50	1.90	2.00	2.00		
Component I Hilti-Brackets acc. to Annex 7	Shear load $V_{R,k}$ in [kN]	in slotted hole		2.51	2.51	2.99	2.99	2.51	2.51	2.51
	in round hole		2.76	3.11	3.11	3.11	2.94	3.11	2.76	

- The characteristic values of resistance are valid for one screw in a round or slotted hole.
- Shear forces act rectangular to the slotted hole.
- The screws shall be screwed in over-twisted.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 16
Characteristic values of resistance in kN for the fastening of Hilti-profiles MFT-L, MFT-T, MFT-CP T, MFT-OT, MFT-PCT L, MFT-PCT T to Hilti-Brackets with screw: S-AD 01 SS 5,5xL	

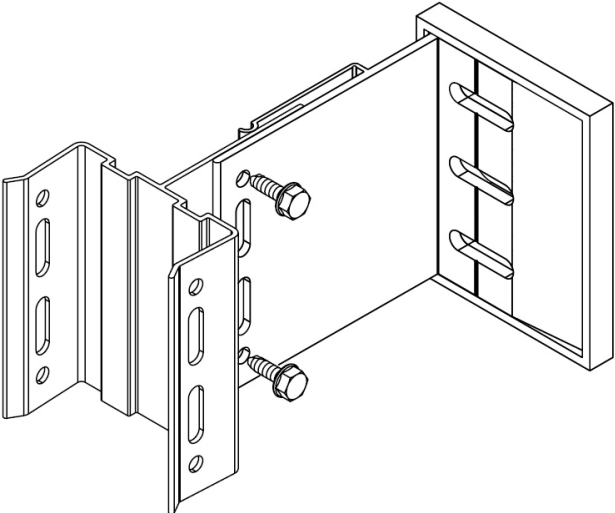
Hilti-S2S-Profile on Hilti-S2S-Bracket	
	<p>Fastening element *</p> <p>S-AD x1 LSS 5,5xL (Type H1, H2) S-AD x1 LPSS 5,5xL (Type I1, I2)</p> <p>Material</p> <p><u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088 <u>Washer:</u> stainless steel 1.4301 - DIN EN 10088</p> <p>Drilling capacity $\sum t_i$</p> <p>1.50 – 6.00 mm</p>

		Component II	
		Hilti-profile in Aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245\text{MPa}$) with material thickness in [mm]:	
$t_i \geq 2.20 \text{ mm}$		MFT-S2S TT	
		2.00	
Component I Hilti-Brackets MFT-S2S U L acc. to Annex 8	Shear load $V_{R,k}$ in [kN]	4 Screws	17.60
		8 Screws	35.30

- The characteristic values of resistance refer to 4 or 8 fastened screws in the round holes of the bracket.
- The screws shall be screwed in pairwise and positioned symmetrically on both sides of the bracket.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 17
Characteristic values of resistance in kN for the fastening of Hilti-profiles MFT-S2S TT to Hilti-Brackets MFT-S2S U L with screw: S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	

Hilti-mounting element to Hilti-bracket	
	<p>Fastening element * S-AD 01 SS 5,5xL (Type G)</p> <p>Material <u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088 <u>Washer:</u> none</p> <p>Drilling capacity $\sum t_i$ 1.50 – 4.00 mm</p>

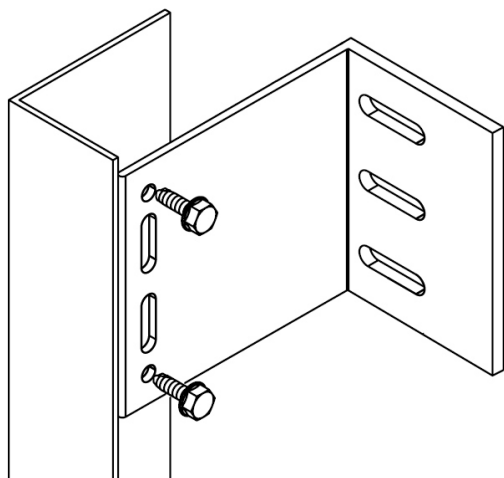
$t_i \geq 2.20$ mm		Component II Hilti-mounting element in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245$ MPa) with material thickness in [mm]:		
		MFT-UNI 050, 060, 080	MFT-UNI 100	MFT-DF
Component I Hilti-brackets acc. to Annex 7	Shear load $V_{R,k}$ in [kN]			
	in slotted hole	1.60	1.80	3.00
	in round hole	2.51	2.51	2.99
		2.94	3.12	3.12

- The characteristic values of resistance are valid for one screw in a round or slotted hole.
- Shear forces act rectangular to the slotted hole.
- The screws shall be screwed in over-twisted.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 18
Characteristic values of resistance in kN for the fastening of Hilti-mounting elements MFT-UNI, MFT-DF to Hilti-brackets with screw: S-AD 01 SS 5,5xL	

Profile to Bracket – generally valid



Fastening element *

S-AD 01 SS 5,5xL (Type G)

Material

Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 none

Drilling capacity $\sum t_i$

1.50 – 4.00 mm

t_i [mm]:				Component II with t_{II} [mm]: Profile in aluminium EN AW-XXX – DIN EN 755-2 (R _m ≥ 245MPa)					
				1.50	1.80	2.00	2.20	2.50	≥ 3.00
Component I brackets acc. to Annex 9	Shear load V_{R,k} in [kN]	in slotted hole	2.20	2.51	2.51	2.99	2.99	2.99	2.99
			≥ 2.70	2.85	3.37	3.74	3.74	3.74	3.74
		in round hole	2.20	2.77	3.12	3.12	3.12	3.12	3.12
			≥ 2.70	3.08	3.78	4.23	4.23	4.23	4.23

- The characteristic values of resistance are valid for one screw in a round or slotted hole.
- Shear forces act rectangular to the slotted hole.
- The screws shall be screwed in over-twisted for a clamping range ≤ 6.3 mm.
 For bigger clamping ranges the screws shall be screwed in without over-twisting but in contact of the screw head to component I. Component I and component II shall be in contact to each other. The right tool setting is realised by means of the depth stop or slipping clutch.

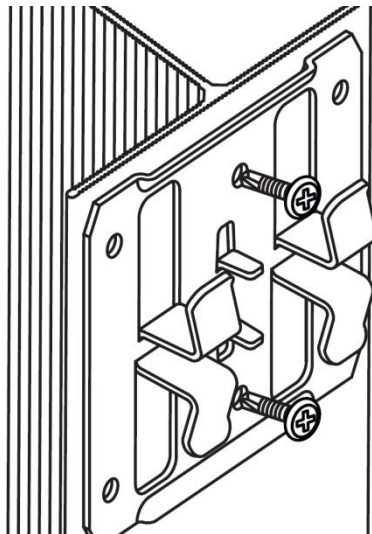
* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Characteristic values of resistance in kN for the fastening of general profiles made of aluminium to general brackets made of aluminium, steel or stainless steel with screw:
 S-AD 01 SS 5,5xL

Annex 19

Hilti-mounting bracket to Hilti-profile



Fastening element *

S-AD 01 LHSS 4,8xL (Type F)

Material

Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 none

Drilling capacity $\sum t_i$

0.75 – 4.00 mm

		Component II Hilti-profiles MFT-L, MFT-T, MFT-S2S TT in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245\text{MPa}$) with material thickness in [mm]:					
		MFT-L, MFT-T				MFT-S2S TT	
		1.80	2.00	2.20	2.50	2.00	2.50
Component I Hilti-mounting brackets MFT-CVE 8 A2, MFT-CVE 9-12 A2, MFT-CVM 8 A2, MFT-CVM 9-12 A2 in stainless steel A2 1.4301 – DIN EN 10088	Shear load $V_{R,k}$ in [kN]	2.78	3.29	3.79	4.54	3.66	4.54
	Tensile load $N_{R,k}$ in [kN]	1.23	1.53	1.83	2.28	1.72	2.28

- The characteristic values of resistance are valid for one screw in a round hole.
- The holding capacity of the cladding elements in the mounting brackets shall be verified separately.

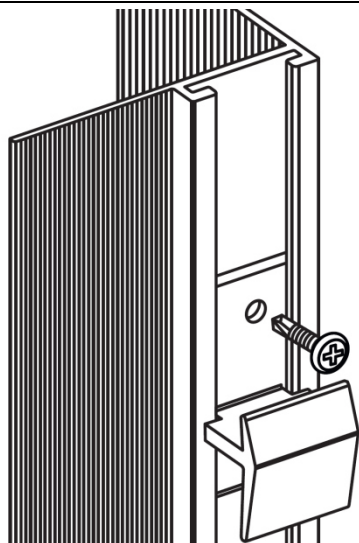
* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Characteristic values of resistance in kN for the fastening of Hilti-mounting brackets MFT-CVE, MFT-CVM to Hilti-profiles MFT-T, MFT-L with screw: S-AD 01 LHSS 4,8xL

Annex 20

Hilti-mounting bracket to Hilti-profile



Fastening element *

S-AD 01 LHSS 4,8xL (Type F)
 S-AD 01 LPSS 5,5xL (Type I1)

Material

Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 none

Drilling capacity $\sum t_i$

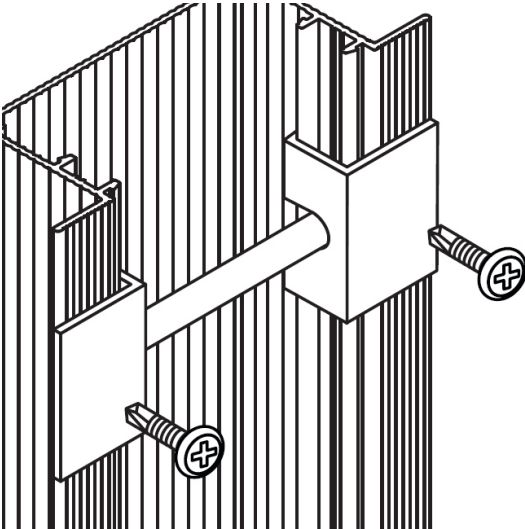
(Type F): 0.75 – 4.00 mm
 (Type I1): 1.50 – 6.00 mm

t_i = 2.30 mm	Component II Hilti-profiles MFT-PCT L, MFT-PCT T in aluminium EN AW-XXX – DIN EN 755-2 (R _m ≥ 245MPa) with material thickness in [mm]:	
	MFT-PCT L	MFT-PCT T
	2.00	2.00
Component I Hilti-mounting brackets MFT-CTT, MFT-CTM, MFT-CTB in aluminium EN AW-6063 T66	Shear load V _{R,k} in [kN]	3.26
		3.26

- The characteristic values of resistance are valid for one screw in a round hole.
- The holding capacity of the cladding elements in the mounting brackets shall be verified separately.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 21
Characteristic values of resistance in kN for the fastening of Hilti-mounting brackets MFT-CTT, MFT-CTM, MFT-CTB to Hilti-profiles MFT-PCT L, MFT-PCT T with self-drilling screws: S-AD 01 LHSS 4,8xL, S-AD 01 LPSS 5,5xL	

Hilti-mounting bracket to Hilti-profile	
	<p>Fastening element *</p> <p>S-AD 01 LHSS 4,8xL (Type F) S-AD 01 LPSS 5,5xL (Type I1)</p> <p>Material</p> <p><u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088 <u>Washer:</u> none</p> <p>Drilling capacity $\sum t_i$</p> <p>(Type F): 0.75 – 4.00 mm (Type I1): 1.50 – 6.00 mm</p>

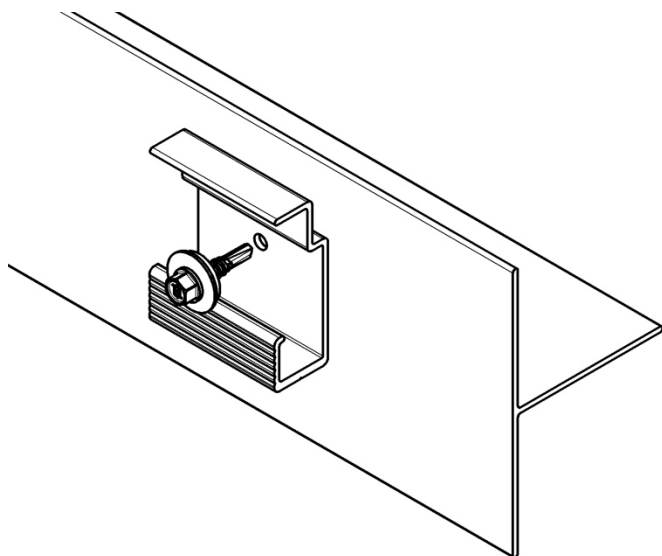
$t_i = 1.60 \text{ mm}$	<p>Component II Hilti-profile MFT-CP T in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$) with material thickness in [mm]:</p> <p style="text-align: center;">1.90</p>
<p>Component I Hilti-mounting bracket MFT-C in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$)</p>	<p>Shear load $V_{R,k}$ in [kN]</p> <p style="text-align: center;">2.27</p>

- The characteristic values of resistance are valid for one screw.
- The holding capacity of the cladding elements in the mounting brackets shall be verified separately.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 22
Characteristic values of resistance in kN for the fastening of Hilti-mounting bracket MFT-C to Hilti-profile MFT-CP T with screw: S-AD 01 LHSS 4,8xL, S-AD 01 LPSS 5,5xL	

Mounting bracket to profile – generally valid



Fastening element *

S-MD x1 LSS 5,5xL (Type B1, B2)
 S-AD x1 LSS 5,5xL (Type H1, H2)
 S-AD x1 LPSS 5,5xL (Type I1, I2)

Material

Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 stainless steel
 (1.4301) - DIN EN 10088
 (Typ B2, H2, I2)

Drilling capacity Σt_i

1.50 – 6.00 mm

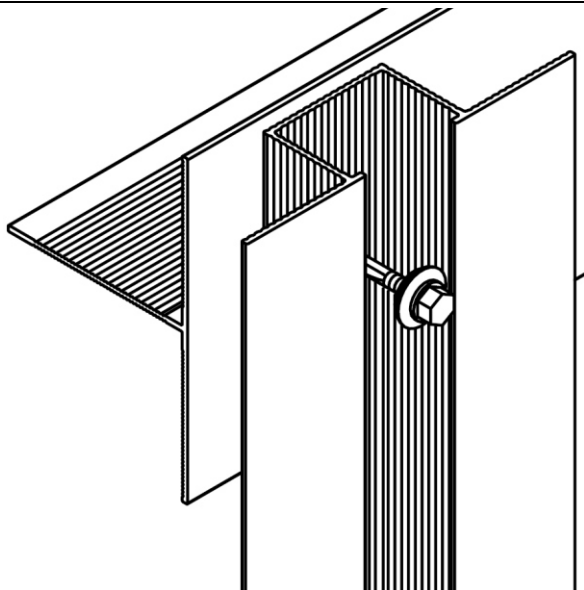
$t_i \geq 1.60$ mm		Component II with t_{II} [mm]: in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245$ MPa)				
		1.65	1.85	2.00	2.35	≥ 2.50
Component I in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245$ MPa) round hole \varnothing 5.2mm +/- 0.2mm or un-perforated	Shear load $V_{R,k}$ in [kN]	2.82	3.00	3.18	3.73	4.00
	Tensile load $N_{R,k}$ in [kN]	1.80	1.80	2.22	2.76	2.84

- The characteristic values of resistance are valid for one screw.
- The holding capacity of the cladding elements in the mounting brackets shall be verified separately.
- in the case of exceeding the maximum drilling capacity of the drill tip component I may be pre-drilled with \varnothing 5.0 mm.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 23
Characteristic values of resistance in kN for the fastening of mounting brackets in aluminium to profiles in aluminium with screws: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	

Hilti-profile to Hilti-profile



Fastening element *

S-MD x1 LSS 5,5xL (Type B1, B2)
 S-AD x1 LSS 5,5xL (Type H1, H2)
 S-AD x1 LPSS 5,5xL (Type I1, I2)

Material

Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 stainless steel
 (1.4301) - DIN EN 10088
 (Type B2, H2, I2)

Drilling capacity $\geq t_i$

1.50 – 6.00 mm

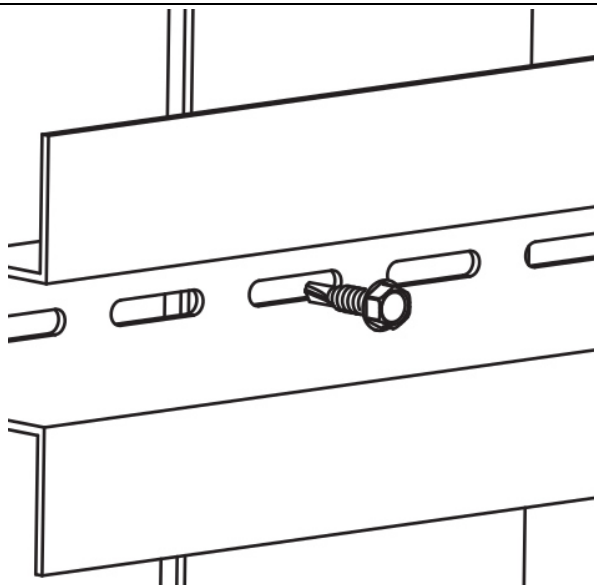
Component I Hilti-profile MFT-O; MFT-CP, MFT-UZ in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$)		Component II Hilti-profile MFT-L, MFT-T, MFT-OT, MFT-S2S in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$) with material thickness in [mm]:						
		MFT-L, MFT-T				MFT-OT	MFT-S2S	
		1.80	2.00	2.20	2.50	2.00**	2.00	2.50
Shear load $V_{R,k}$ in [kN]	Tensile load $N_{R,k}$ in [kN]	2.82	3.00	3.24	3.73	4.00	3.18	4.00
		1.80	1.80	2.32	2.84	2.84	2.22	2.84

- The characteristic values of resistance are valid for one screw for perforated profiles (hole \varnothing 5.5 mm or slotted hole 5.5x25 mm) as well as for un-perforated profiles.
- Shear forces act rectangular to the slotted hole.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

** Within the screwing area the material thickness of the profile is 3.00 mm

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 24
Characteristic values of resistance in kN for the fastening of Hilti-profiles MFT-O, MFT-CP, MFT-UZ to Hilti-profiles MFT-L/T/OT, MFT-S2S with screw: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	

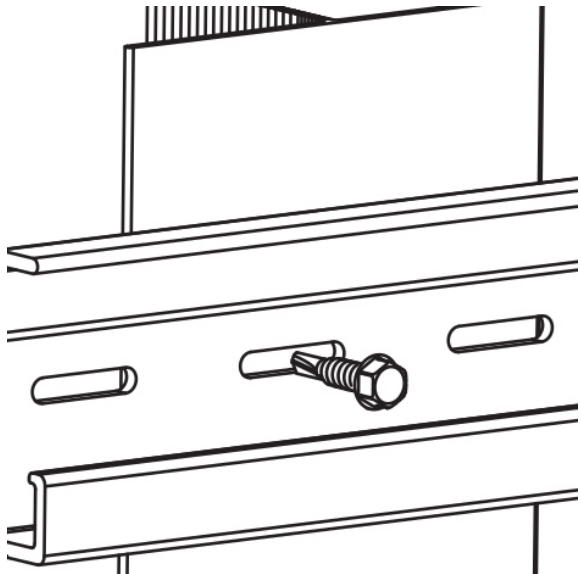
Profile to profile – generally valid	
	<p>Fastening element *</p> <p>S-MD x1 LSS 5,5xL (Type B1, B2) S-AD x1 LSS 5,5xL (Type H1, H2) S-AD x1 LPSS 5,5xL (Type I1, I2)</p> <p>Material</p> <p><u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088 <u>Washer:</u> stainless steel (1.4301) - DIN EN 10088 (Type B2, H2, I2)</p> <p>Drilling capacity $\sum t_i$</p> <p>1.50 – 6.00 mm</p>

$t_i \geq 1.80 \text{ mm}$		Component II profile L or T in Aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$) with material thickness in [mm]:				
		1.80	2.00	2.20	2.50	3.00
Component I profile in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$)	Shear load $V_{R,k}$ in [kN]	2.95	3.18	3.52	4.00	4.00
	Tensile load $N_{R,k}$ in [kN]	2.02	2.22	2.60	2.84	2.84

- The characteristic values of resistance are valid for one screw for perforated profiles (hole $\varnothing 5.5 \text{ mm}$ or slotted hole $5.5 \times 25 \text{ mm}$) as well as for un-perforated profiles.
- Shear forces act rectangular to the slotted hole.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annexe 25
Characteristic values of resistance in kN for the fastening of profiles to profiles with screw: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	

Hilti-profile to Hilti-profile	
	<p>Fastening element *</p> <p>S-MD x1 LSS 5,5xL (Type B1, B2) S-AD x1 LSS 5,5xL (Type H1, H2) S-AD x1 LPSS 5,5xL (Type I1, I2)</p> <p>Material</p> <p><u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088</p> <p><u>Washer:</u> stainless steel (1.4301) - DIN EN 10088 (Type B2, H2, I2)</p> <p>Drilling capacity $\sum t_i$</p> <p>1.50 – 6.00 mm</p>

$t_i \geq 2.00$ mm		Component II Hilti-profile MFT-L, MFT-T, MFT-OT, MFT-S2S in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245$ MPa) with material thickness in [mm]:						
		MFT-L, MFT-T				MFT-OT	MFT-S2S	
		1.80	2.00	2.20	2.50	2.00**	2.00	2.50
Component I Hilti-profile MFT-HP200/300; MFT-STULP in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245$ MPa)	Shear load $V_{R,k}$ in [kN]	2.82	3.00	3.24	3.73	4.00	3.18	4.00
	Tensile load $N_{R,k}$ in [kN]	1.80	1.80	2.32	2.84	2.84	2.22	2.84

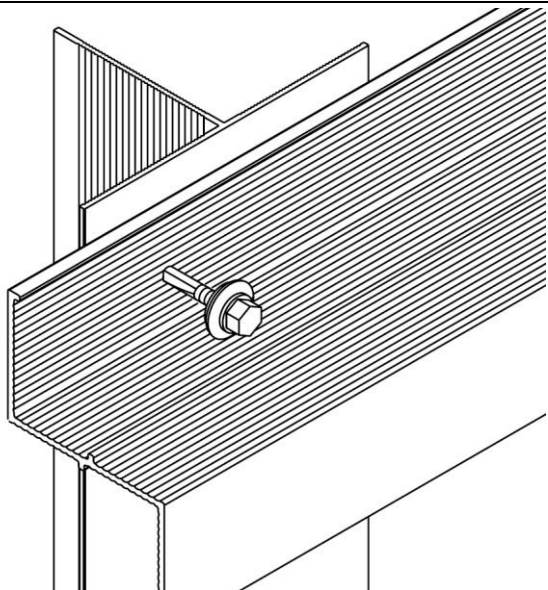
- The characteristic values of resistance are valid for one screw for perforated profiles (hole \varnothing 5.5 mm or slotted hole 5.5x25 mm) as well as for un-perforated profiles.
- Shear forces act rectangular to the slotted hole.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

** Within the screwing area the material thickness of the profile is 3.00 mm

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 26
Characteristic values of resistance in kN for the fastening of Hilti-profiles MFT-HP 200/300 and MFT-STULP to Hilti-profiles MFT-L/-T/-OT, MFT-S2S with screw: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	

Hilti-profile to Hilti-profile



Fastening element *

S-MD x1 LSS 5,5xL (Type B1, B2)
 S-AD x1 LSS 5,5xL (Type H1, H2)
 S-AD x1 LPSS 5,5xL (Type I1, I2)

Material

Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 stainless steel
 (1.4301) - DIN EN 10088
 (Type B2, H2, I2)

Drilling capacity Σt_i

1.50 – 6.00 mm

$t_i \geq 1.90$ mm		Component II Hilti-profile MFT-L, MFT-T, MFT-OT, MFT-S2S in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245$ MPa) material thickness in [mm]:						
		MFT-L, MFT-T				MFT-OT	MFT-S2S	
		1.80	2.00	2.20	2.50	2.00**	2.00	2.50
Component I Hilti-profile MFT-Z in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245$ MPa)	Shear load $V_{R,k}$ in [kN]	2.82	3.00	3.24	3.73	4.00	3.18	4.00
	Tensile load $N_{R,k}$ in [kN]	1.80	1.80	2.32	2.84	2.84	2.22	2.84

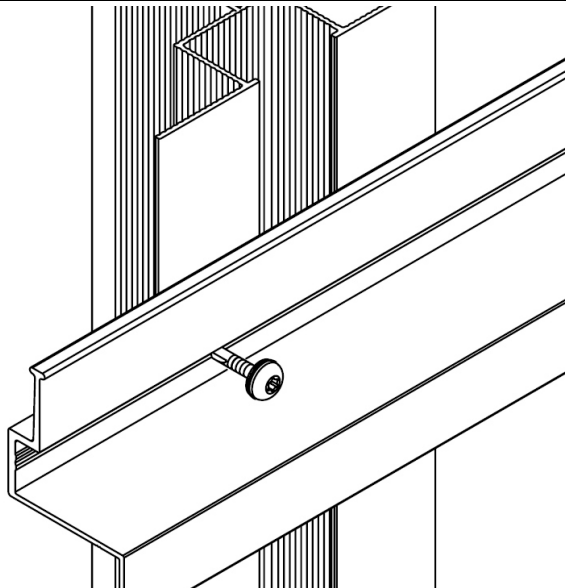
- The characteristic values of resistance are valid for one screw for perforated profiles (hole \varnothing 5.5 mm or slotted hole 5.5x25 mm) as well as for un-perforated profiles.
- Shear forces act rectangular to the slotted hole.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

** Within the screwing area the material thickness of the profile is 3.00 mm

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 27
Characteristic values of resistance in kN for the fastening of Hilti-profile MFT-Z to Hilti-profiles MFT-L, MFT-T, MFT-OT, MFT-S2S with screw: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	

Hilti-profile to Hilti-profile



Fastening element * S-AD x1 LPSS 5,5xL (Type I1, I2)

Material
Screw:
 stainless steel
 (1.4301, 1.4404) - DIN EN 10088
Washer:
 stainless steel
 (1.4301) - DIN EN 10088
 (Type I2)

Drilling capacity Σt_i 1.50 – 6.00 mm

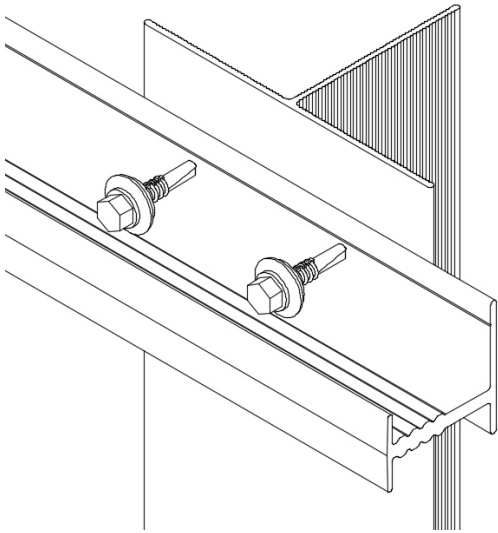
Component I Hilti-profile MFT-SZ 20 in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$)		Component II Hilti-profile MFT-L, MFT-T, MFT-OT, MFT-S2S in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245\text{MPa}$) with material thickness in [mm]:						
		MFT-L, MFT-T				MFT-OT	MFT-S2S	
		1.80	2.00	2.20	2.50	2.00**	2.00	2.50
	Shear load $V_{R,k}$ in [kN]	2.82	3.00	3.24	3.73	4.00	3.18	4.00
	Tensile load $N_{R,k}$ in [kN]	1.80	1.80	2.32	2.84	2.84	2.22	2.84

- The characteristic values of resistance are valid for one screw for perforated profiles (hole \varnothing 5.5 mm or slotted hole 5.5x25 mm) as well as for un-perforated profiles.
- Shear forces act rectangular to the slotted hole.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

** Within the screwing area the material thickness is of the profile 3.00 mm

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 28
Characteristic values of resistance in kN for the fastening of Hilti-profile MFT-SZ 20 to Hilti-profiles MFT-L, MFT-T, MFT-OT, MFT-S2S with screw: S-AD x1 LPSS 5,5xL	

Hilti-profile to Hilti-profile	
	<p>Fastening element *</p> <p>S-MD x1 LSS 5,5xL (Type B1, B2) S-AD x1 LSS 5,5xL (Type H1, H2) S-AD x1 LPSS 5,5xL (Type I1, I2)</p> <p>Material</p> <p><u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088 <u>Washer:</u> stainless steel (1.4301) - DIN EN 10088 (Type B2, H2, I2)</p> <p>Drilling capacity $\sum t_i$</p> <p>1.50 – 6.00 mm</p>

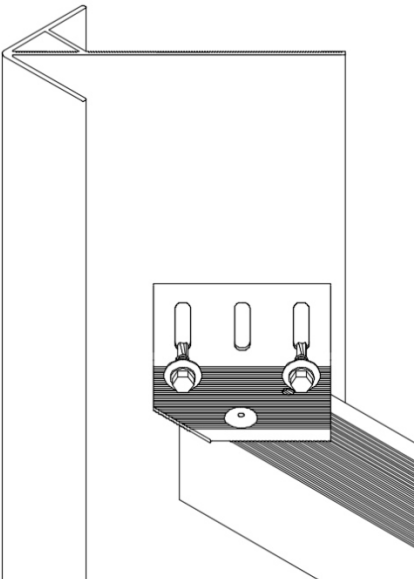
Component I Hilti-profile MFT-SPB/M/T/J 38 in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245\text{MPa}$)		Component II Hilti-profile MFT-L, MFT-T, MFT-OT, MFT-S2S in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245\text{MPa}$) with material thickness in [mm]:						
		MFT-L, MFT-T				MFT-OT	MFT-S2S	
		1.80	2.00	2.20	2.50	2.00**	2.00	2.50
Shear load $V_{R,k}$ in [kN]	$t_i = 2.00\text{ mm}$	2.82	3.00	3.24	3.73	4.00	3.18	4.00
	Tensile load $N_{R,k}$ in [kN]	1.80	1.80	2.32	2.84	2.84	2.22	2.84

- The characteristic values of resistance are valid for one screw for perforated profiles (hole \varnothing 5.5 mm or slotted hole 5.5x25 mm) as well as for un-perforated profiles.
- Shear forces act rectangular to the slotted hole.

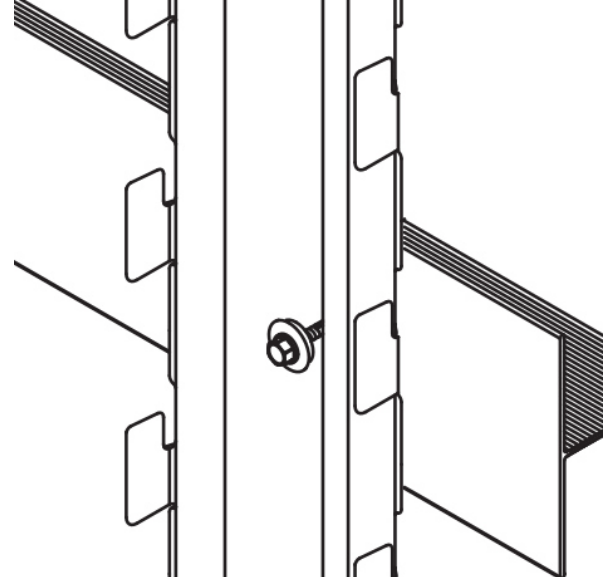
* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

** Within the screwing area the material thickness is of the profile 3.00 mm

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 29
Characteristic values of resistance in kN for the fastening of Hilti-profile MFT-SPB/M/T/J 38 to Hilti-profiles MFT-L/-T/-OT, MFT-S2S with screw: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	

Hilti-corner-connector to Hilti-corner-profile					
	<p>Fastening element *</p> <p>S-MD x1 LSS 5,5xL (Type B1, B2) S-AD x1 LSS 5,5xL (Type H1, H2) S-AD x1 LPSS 5,5xL (Type I1, I2)</p> <p>Material</p> <p><u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088 <u>Washer:</u> stainless steel (1.4301) - DIN EN 10088 (Type B2, H2, I2)</p> <p>Drilling capacity $\sum t_i$</p> <p>1.50 – 6.00 mm</p>				
$t_i = 2.00$ mm	<p>Component II Hilti-corner-profile MFT-CSP in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245$MPa) with material thickness in [mm]:</p> <p style="text-align: center;">2.50</p>				
Component I Hilti-corner-connector MFT-CSC in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245$ MPa)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; vertical-align: middle;">Shear load $V_{R,k}$ in [kN]</td> <td style="text-align: center; vertical-align: middle;">4.00</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">Tensile load $N_{R,k}$ in [kN]</td> <td style="text-align: center; vertical-align: middle;">2.84</td> </tr> </table>	Shear load $V_{R,k}$ in [kN]	4.00	Tensile load $N_{R,k}$ in [kN]	2.84
Shear load $V_{R,k}$ in [kN]	4.00				
Tensile load $N_{R,k}$ in [kN]	2.84				
<ul style="list-style-type: none"> - The characteristic values of resistance are valid for one screw. - Shear forces act rectangular to the slotted hole. <p>* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)</p>					
Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS					
Characteristic values of resistance in kN for the fastening of Hilti-corner-connector MFT-CSC to Hilti-corner-profile MFT-CSP with screw: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1 LPSS 5,5xL	Annex 30				

Profile to profile – generally valid

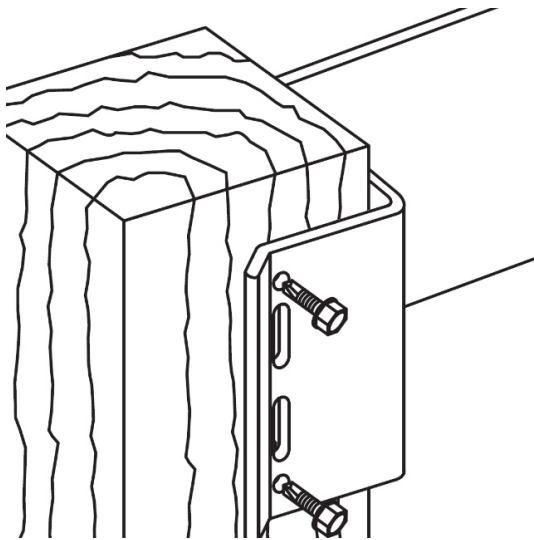
	<p>Fastening element *</p> <p>S-MD x1 LSS 5,5xL (Type B1, B2) S-AD x1 LSS 5,5xL (Type H1, H2) S-AD x1 LPSS 5,5xL (Type I1, I2)</p> <p>Material</p> <p><u>Screw:</u> stainless steel (1.4301, 1.4404) - DIN EN 10088</p> <p><u>Washer:</u> stainless steel (1.4301) - DIN EN 10088 (Type B2, H2, I2)</p> <p>Drilling capacity $\sum t_i$</p> <p>1.50 - 6.00 mm</p>
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$t_i \geq 1.50$ mm		Component II with t_{II} [mm]: Profiles in aluminium EN AW-XXX – DIN EN 755-2 ($R_m \geq 245$ MPa)			
		1.65	2.00	2.50	3.00
Component I S280GD, S320GD, S350GD – DIN EN 10346 stainless steel acc. to DIN EN 10088**	Shear load $V_{R,k}$ in [kN]	3.09	3.09	3.09	3.09
	Tensile load $N_{R,k}$ in [kN]	1.80	2.22	2.84	2.84

- The characteristic values of resistance are valid for perforated profiles (round or slotted hole) as well as for un-perforated profiles.
- Screw types H1, H2, I1, I2 shall be used for pre-perforated component I only
- Shear loads act rectangular to the slotted hole.
- Hole geometry: round hole $\varnothing 5.2 \pm 0.2$ mm, slotted hole 25 mm x 5.0 mm

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)
 ** Profiles (component I) made of stainless steel shall be pre-perforated. With screw types H1, H2, I1, I2 profiles (component I) made of steel shall be pre-perforated as well

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 31
Characteristic values of resistance in kN for the fastening of general profiles made of steel or stainless steel to general brackets made of aluminium with screw: S-MD x1 LSS 5,5xL, S-AD x1 LSS 5,5xL, S-AD x1LPSS 5,5xL	

Hilti-mounting bracket MFT-UNI to timber profiles	
	<p>Fastening element * S-MD x1 SS 5,5xL (Type A1, A2)</p> <p>Material Screw: stainless steel (1.4301, 1.4404) - DIN EN 10088 Washer: stainless steel (1.4301) - DIN EN 10088 (Type A2)</p> <p>Timber supporting structure Properties determined with solid timber or glued-laminated timber $M_{y,Rk} = 6.310 \text{ Nm}$</p>

Component I $t_i \geq 1.60 \text{ mm}$		Hilti-mounting bracket MFT-UNI 60; 80; 100 Aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245 \text{ MPa}$)		
		MFT-UNI 60 S-MD x1 SS 5.5x32 screw length 32 mm	MFT-UNI 80 S-MD x1 SS 5.5x38 screw length 38 mm	MFT-UNI 100 S-MD x1 SS 5.5x50 screw length 50 mm
Shear load $V_{R,I,k}$ in [kN]	2 Screws	1.30	1.30	2.76
	4 Screws	2.60	2.60	5.52

- The characteristic values of shear resistance $V_{R,I,k}$ refer to the fastening of the Hilti-mounting bracket MFT-UNI with 4 or 8 screws in the round or slotted holes of the bracket.
- Shear forces act rectangular to the slotted hole.
- The timber component shall always be pushed into the Hilti-mounting bracket MFT-UNI as far as it will go. The edge distances $a_{2,t}$ and $a_{2,c}$ according to Table 1 may be undercut.
- The calculation of the characteristic values of shear resistance $V_{R,II,k}$ for the screws for timber supporting structures (load bearing resistance) shall be in accordance with DIN EN 1995-1-1 and section 3.2.3. Annex 33 contains already calculated values for $V_{R,II,k}$ for special applications. The lower value shall be used for further calculation.

* The characteristic values of resistance are also valid for screws made of stainless steel 1.4301 (A2)

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 32
Characteristic values of shear resistance in kN of fastening of timber profiles to Hilti-mounting bracket MFT-UNI with screw: S-MD x1 SS 5,5xL	

Component II:

Characteristic values of shear resistance $V_{R,II,k}$ for component II in solid timber \geq C24

Type of screw		Effective screw-in length l_{ef} [mm]					
		24	21	30	27	42	39
		A1	A2	A1	A2	A1	A2
k_{mod}							
$V_{R,II,k}$ [kN]	0.90	1.31	1.15	1.63	1.47	1.83	1.80
	0.70	1.02	0.89	1.27	1.14	1.42	1.40
	0.60	0.87	0.77	1.09	0.98	1.22	1.20
	0.50	0.73	0.64	0.91	0.82	1.02	1.00

Characteristic values of shear resistance $V_{R,II,k}$ for component II in glued-laminated timber \geq GL 24h

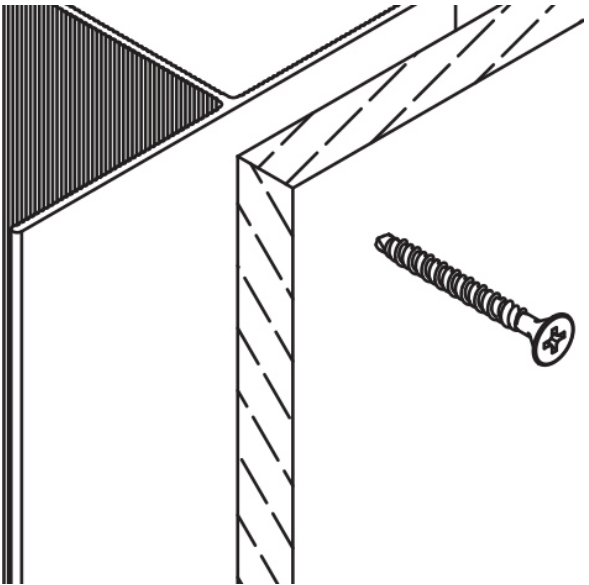
Type of screw		Effective screw-in length l_{ef} [mm]					
		24	21	30	27	42	39
		A1	A2	A1	A2	A1	A2
k_{mod}							
$V_{R,II,k}$ [kN]	0.90	1.44	1.26	1.78	1.62	1.90	1.87
	0.70	1.12	0.98	1.39	1.26	1.48	1.45
	0.60	0.96	0.84	1.19	1.08	1.27	1.25
	0.50	0.80	0.70	0.99	0.90	1.06	1.04

- Characteristic values of shear resistance $V_{R,II,k}$ according to DIN EN 1995-1-1 with: $d = 5.50$ mm, $M_{y,Rk} = 6.310$ Nm.
- The Tables contain already calculated characteristic values of shear resistance $V_{R,II,k}$ depending on k_{mod} and effective screw-in length l_{ef} . The values are valid for fastening of Hilti-mounting brackets MFT-UNI made of aluminium. The characteristic values of shear resistance are valid for one screw.
- For fastening of the Hilti-mounting bracket MFT-UNI through existing round or slotted holes the full load bearing capacity of all screws may be considered.
- Verifications shall be done in accordance with section 3.2.3.
- k_{mod} shall be determined according to DIN EN 1995-1-1 or to Annex 14.

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS

Characteristic values of shear resistance in kN of fastening of timber profiles to Hilti-mounting brackets MFT-UNI with screw: S-MD x1 SS 5,5xL

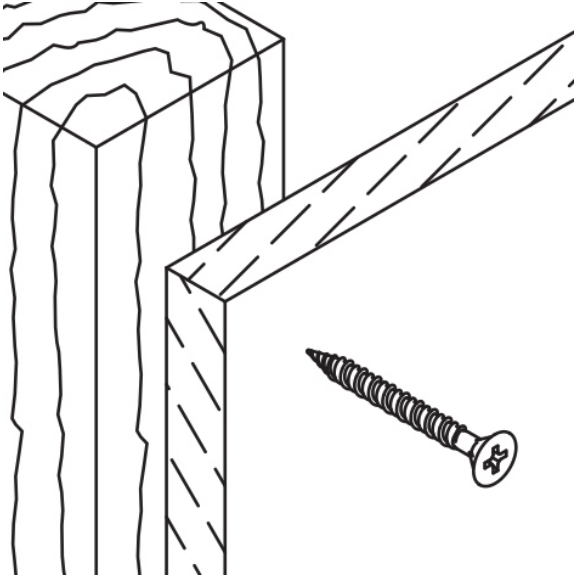
Annex 33

Fastening of panels to Hilti-profile	
	<p>Fastening element * S-PD 01S 4,0xL (Type J)</p> <p>Material <u>Screw:</u> stainless steel (1.4301) - DIN EN 10088</p> <p>Drilling capacity $\geq t_i$ 0.50 – 2.50 mm</p>

$t_i \leq 12.50$ mm		Component II Hilti-profile MFT-L, MFT-T, MFT-S2S in aluminium EN AW-XXX - DIN EN 755-2 ($R_m \geq 245$ MPa) with material thickness in [mm]:				
		MFT-L, MFT-T			MFT-S2S	
		2.00	2.20	2.50	2.00	2.50
Component I pressure-resistant cladding panels	Shear load $V_{R,i,k}$ in [kN]	2.79	2.79	2.79	2.79	2.79
	Tensile load $N_{R,i,k}$ in [kN]	1.34	1.86	2.39	1.76	2.55

- The characteristic values of resistance are valid for one screw.
- Transmission of forces into cladding panels shall be verified separately.
- The characteristic values of resistance $N_{R,i,k}$ and $V_{R,i,k}$ depend on the panels used and should be obtained from the panels manufacturer.

Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS	Annex 34
Characteristic values of resistance in kN of fastening of cladding panels to Hilti-profiles MFT-L, MFT-T and MFT-S2S with screw: S-PD 01 S 4,0xL	

Fastening of cladding panels to solid timber, glued-laminated timber and OSB panels	
	<p><u>Fastening element</u> * S-PS 01 S 4,0xL (Type K)</p> <p><u>Material</u> <u>Screw:</u> stainless steel (1.4301) - DIN EN 10088</p> <p><u>Timber supporting structure</u> Properties determined with solid timber or glued-laminated timber $M_{y,Rk} = 2.757 \text{ Nm}$ $f_{ax,k} = 15.168 \text{ N/mm}^2$ for $l_{ef} \geq 26 \text{ mm}$</p> <p>OSB/3 - or OSB/4 - panels $M_{y,Rk} = 2.757 \text{ Nm}$ $f_{ax,k} = 12.457 \text{ N/mm}^2$ for $l_{ef} \geq 19 \text{ mm}$</p>
<p>Component I pressure-resistant cladding panels: $t_i \leq 12.50 \text{ mm}$</p>	<p>e.g. gypsum board acc. to DIN 18180 or mineral-based panels</p>
<p>Shear load $V_{R,I,k}$ in [kN]</p>	<p>The characteristic values of resistance $N_{R,I,k}$ and $V_{R,I,k}$ depend on the panels used and should be obtained from the panels manufacturer.</p>
<p>Tensile load $N_{R,I,k}$ in [kN]</p>	
<ul style="list-style-type: none"> - The cladding panels shall at least meet the strength requirements of DIN 18180. - The value $f_{ax,k}$ applies to a minimum raw density of the timber supporting structure of 350 kg/m^3 (solid timber or glued-laminated timber) or 550 kg/m^3 (OSB/3 or OSB/4 panels). - The determination of the characteristic values of resistance of the screws in the timber supporting structure is carried out according to DIN EN 1995-1-1. The lower value is used for further calculation. 	
<p>Hilti metal construction screws S-MD, S-AD, S-MP, S-PD and S-PS</p>	
<p>Characteristic values of resistance in kN of fastening of cladding panels to timber or timber-based supporting structures with screw: S-PS 01 S 4,0xL</p>	<p>Annex 35</p>