

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-15/0476  
of 4 May 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

TUF-S

Product family  
to which the construction product belongs

Fastener for the rear fixing of facade panels made of  
high-pressure decorative laminates (HPL) according to  
EN 438-7:2005

Manufacturer

SFS intec AG  
Rosenbergsaustraße 10  
9435 HEERBRUGG  
SCHWEIZ

Manufacturing plant

Plants of SFS intec AG

This European Technical Assessment  
contains

17 pages including 4 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 330030-00-0601, Edition 10/2018

This version replaces

ETA-15/0476 issued on 12 July 2017

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

**Specific Part**

**1 Technical description of the product**

The TUF-S-6xL is special anchor made of stainless steel for fixing HPL-facade panels according to EN 438-7:2005 to metal substructures. The anchor consist of a mandrel made of carbon steel zinced and a stainless steel sleeve. The anchor is put in a drill hole and placed by pulling out the mandrel. The pull out of the mandrel widens the body of the sleeve and punches the thread of the sleeve into the façade panel.

The product description is given in Annex A. The material values, dimensions and tolerances of the components of the fastener not indicated in the annexes shall correspond to the values laid down in the technical documentation<sup>1</sup>.

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

The performances given in Section 3 are only valid if the fastener is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fasteners of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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.

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

**3.1 Mechanical resistance and stability (BWR 1)**

| Essential characteristic  | Performance  |
|---|--|
| Characteristic resistance to breakout or pull-out failure under tension load                    | See Annex C 1 and C 2  |
| Characteristic resistance to breakout or pull-out failure under shear load                      | See Annex C 1 and C 2  |
| Characteristic resistance to breakout or pull-out failure under combined tension and shear load | See Annex C 1 and C 2  |
| Edge distance and spacing   | See Annex C 1 and C 2  |
| Durability  | Corrosion Resistance Class (CRC) III in accordance with EN 1993-1-4:2015 |
| Characteristic resistance to steel failure under tension and shear loads                        | See Annex C 2  |

**3.2 Safety in case of fire (BWR 2)**

| Essential characteristic | Performance |
|--------------------------|-------------|
| Reaction to fire         | Class A1    |

<sup>1</sup> The technical documentation comprises all information of the holder of this ETA necessary for the production, installation and maintenance of the fastener; these are in particular design drawings. The part to be treated confidentially is deposited with Deutsches Institut für Bautechnik and, as far as this is relevant to the tasks of the approved bodies involved in the procedure of attestation of conformity, shall be handed over to the approved body.

English translation prepared by DIBt

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

In accordance with EAD No. 330030-00-0601 the applicable European legal act is: [97/161/EG].  
The system to be applied is: 2+

**5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document**

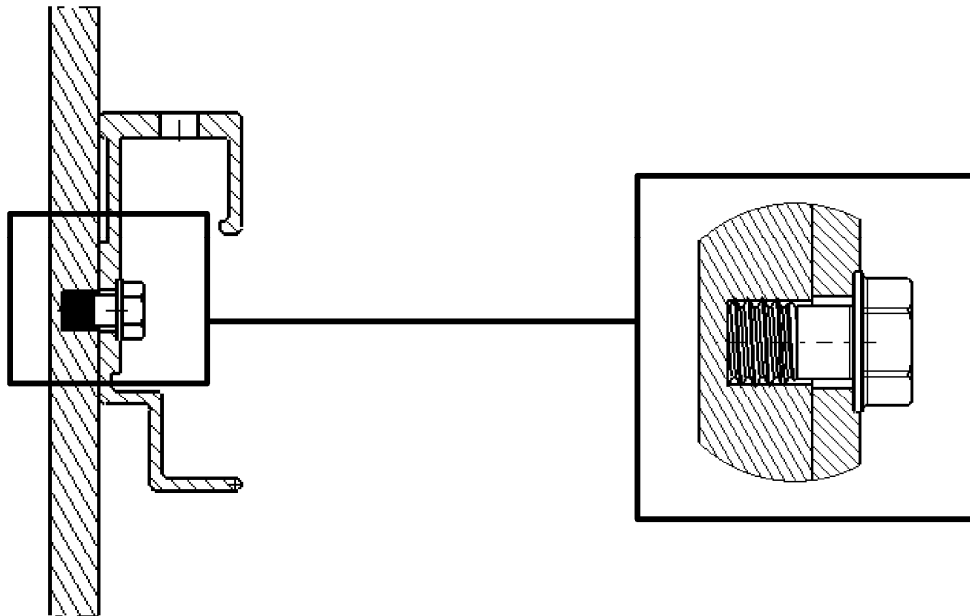
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 4 May 2021 by Deutsches Institut für Bautechnik

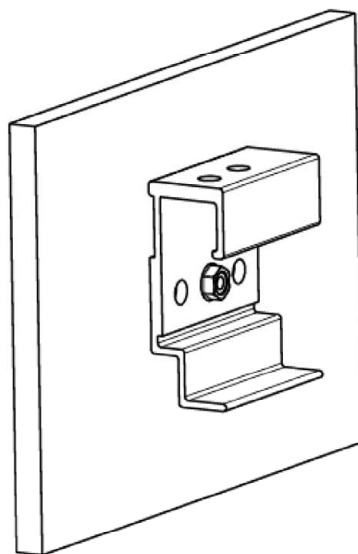
Dipl.-Ing. Beatrix Wittstock  
Head of Section

*beglaubigt:*  
Aksünger

### Installed Anchor



### Fixing example



TUF-S

**Product description**  
Installed anchor and fixing example

Annex A 1

Fastener

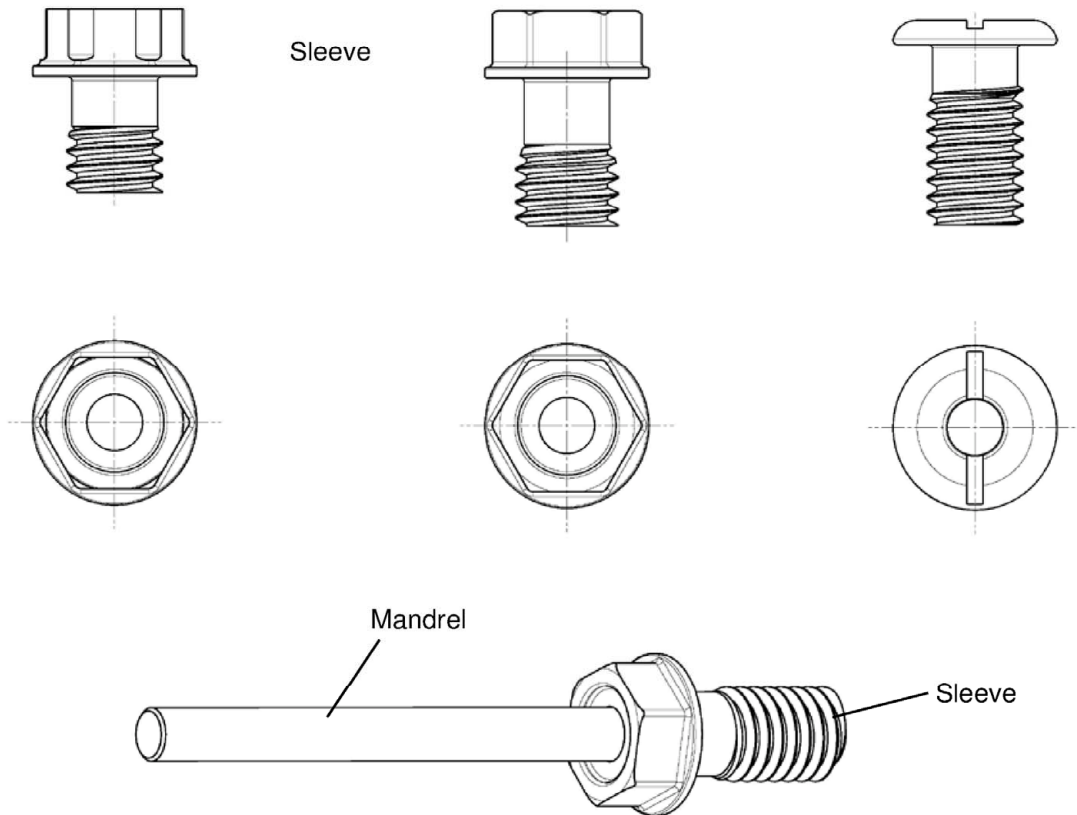


Table 1

| Anchor parts | Material            |
|--------------|---------------------|
| Sleeve       | Stainless steel A4  |
| Mandrel      | Carbon steel zinced |

TUF-S

**Product description**  
System components

Annex A 2

## Specifications of intended use

### Anchorage subject to

- Static and quasi-static loads

### Base material

- The HPL façade panels shall be classified “EDS” or “EDF” according to EN 438-6:2014
- The minimum requirements for the façade panels are documented in the following table

Table 2: Minimum requirements for the façade panel

|  |                              |                      |                   |            |
|--|------------------------------|----------------------|-------------------|------------|
| Characteristic values for the façade panel   | Thickness of the panel       | $h \geq$             | [mm]              | 8          |
|  | Bending stress <sup>1)</sup> | $\sigma_{fm,T}^{2)}$ | N/mm <sup>2</sup> | $\geq 100$ |
|  |                              | $\sigma_{fm,L}^{2)}$ |                   | $\geq 130$ |
|  | Bending modulus              | $E_T^{3)}$           | N/mm <sup>2</sup> | 10000      |
|  |                              | $E_L^{3)}$           |                   | 14000      |
| Maximum mass increase according to EN 438-2:2016-06, section 15 (Resistance to wet conditions) | $\delta_w$                   |                      | [%]               | 2,00       |

1)  $\sigma_{fm}$  according to EN ISO 178:2013-09

2)  $\sigma_{fm,T}$  : Bending strength transverse

$\sigma_{fm,L}$  : Bending strength longitudinal

3)  $E_T$  : Bending modulus transverse

$E_L$  : Bending modulus longitudinal

### Use conditions (Environmental conditions):

- According to EN 1993-1-4:2015 according to the Corrosion Resistance Class (CRC) of the fastener III

### Design:

- The design of the façade panels and their fixing is carried out according to the conditions given in Annex D 1 and D 2.

TUF-S

**Intended use**  
Specifications

Annex B 1

**Installation**

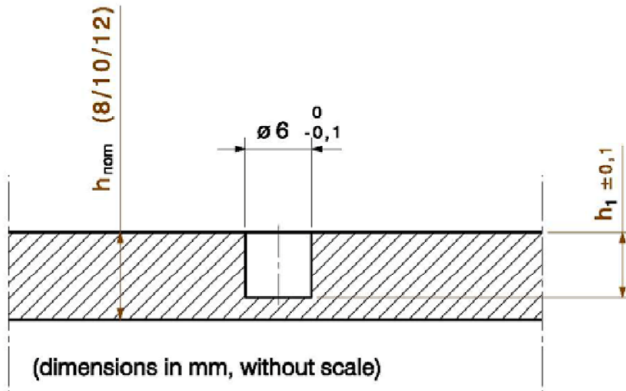
- Each façade panel shall be fixed technically strain-free with at least four anchors in a rectangular arrangement.
- The substructure is constructed such that the façade panels are fixed technically strain free via skids (loose bearings) and one fixed point (fixed bearing).
- The thickness of the fixing member (clamp or panel load-bearing profile) shall be at least 2,0 mm and shall be at least made of aluminum with  $R_m \geq 215 \text{ N/mm}^2$ .
- The drillings are done at the factory or on site. The drillings are executed with special drill bits made available by SFS intec AG. The drillings are executed by skilled personnel.
- The façade panel is pre-drilled with diameter  $\varnothing 5,9 \text{ mm}$  to  $6,0 \text{ mm}$ .
- The drilling is always in a  $90^\circ$ - angle to the panel's surface.
- The minimum edge distance of the drilling is  $40,0 \text{ mm}$ .
- The clamps are predrilled with diameter  $\varnothing 6,5 \text{ mm}$  to  $7,0 \text{ mm}$ .
- The geometry of the drill hole shall be checked minimum on 1% of all drillings.
- The façade panels, their fixings as well as the substructure including its connection to wall brackets and their connection to the construction works are designed for the respective case of application under the responsibility of an engineer skilled in the field of façade construction.
- The panels are installed by skilled specialists and the laying instructions of the manufacturer shall be paid attention to.
- Overhead mounting is for façade panels of Trespa International B.V and Fundermax GmbH allowed.

|  |           |
|--|-----------|
| TUF-S  | Annex B 2 |
| <b>Intended use</b><br>Requirements to the HPL-facade panels |           |



### Drill hole geometry and drill bit

#### Drill hole geometry

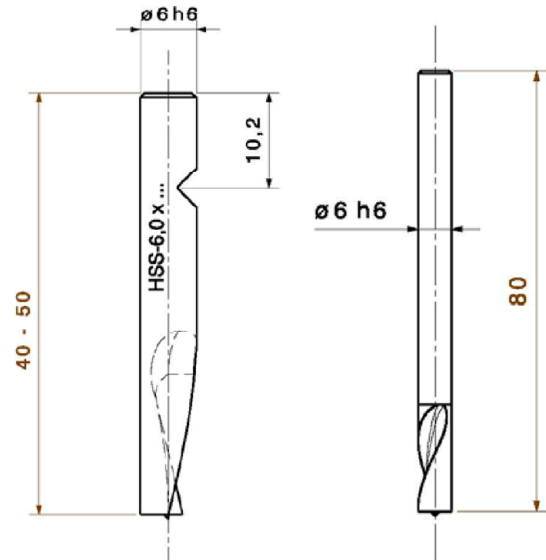


| $h_{nom}$ | 8 / 10 / 12 |     |   | 10 / 12 |   |     |   |
|-----------|-------------|-----|---|---------|---|-----|---|
| $h_1$     | 5           | 5.5 | 6 | 6.5     | 7 | 7.5 | 8 |
| $h_s$     | 5           | 5.5 | 6 | 6.5     | 7 | 7.5 | 8 |

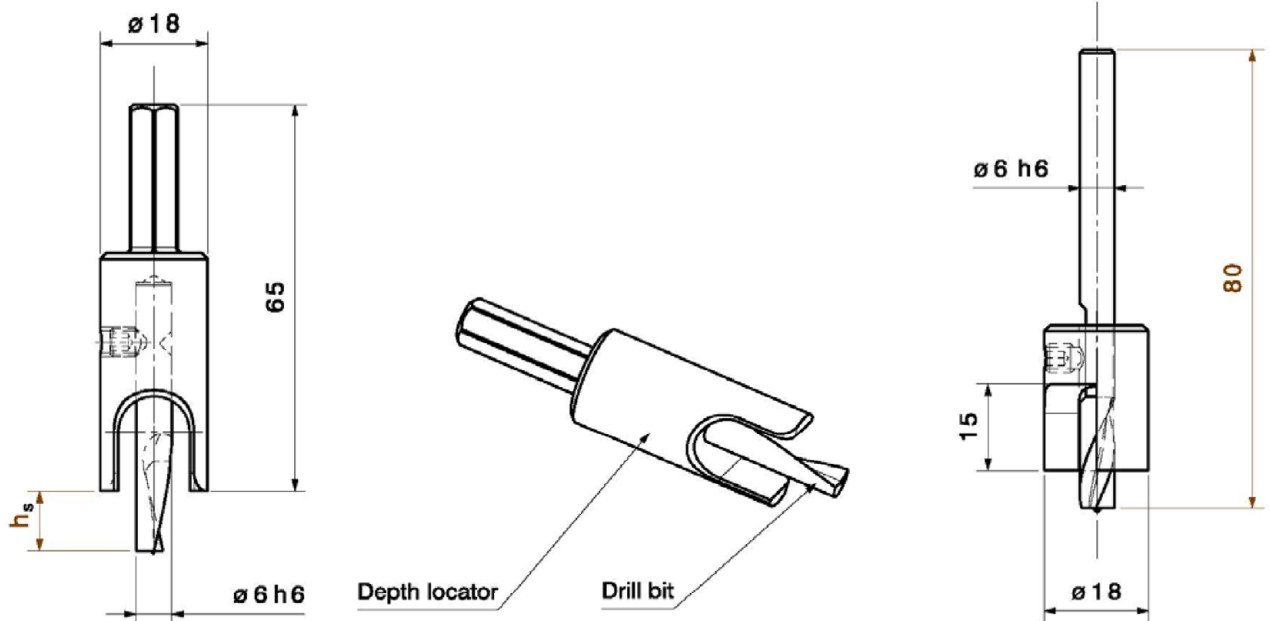
$h_{nom}$  = Panel nominal thickness  
 $h_s$  = anchorage depth  
 $h_1$  = depth of drill hole

### special drill bit

HSS-6xL



### Depth locator and Drill bit

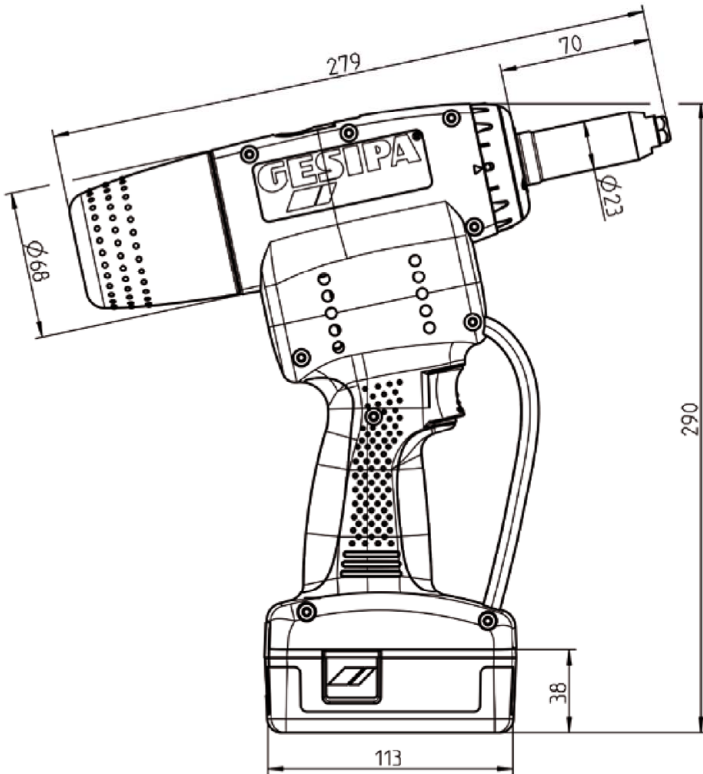


TUF-S

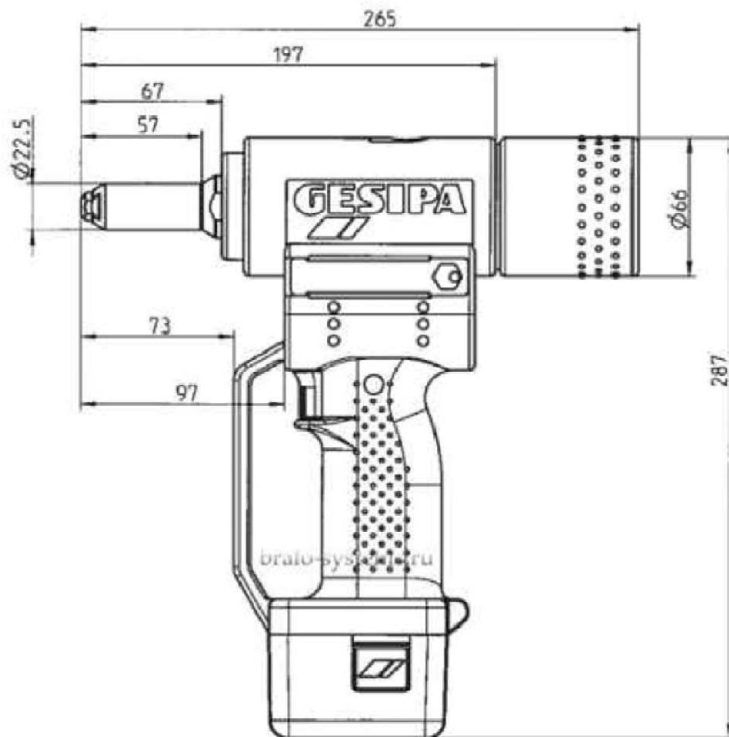
**Intended use**  
Drill hole dimensions and drill bit

Annex B 3

Setting tools



Riveting tool  
GESIPA PowerBird Pro



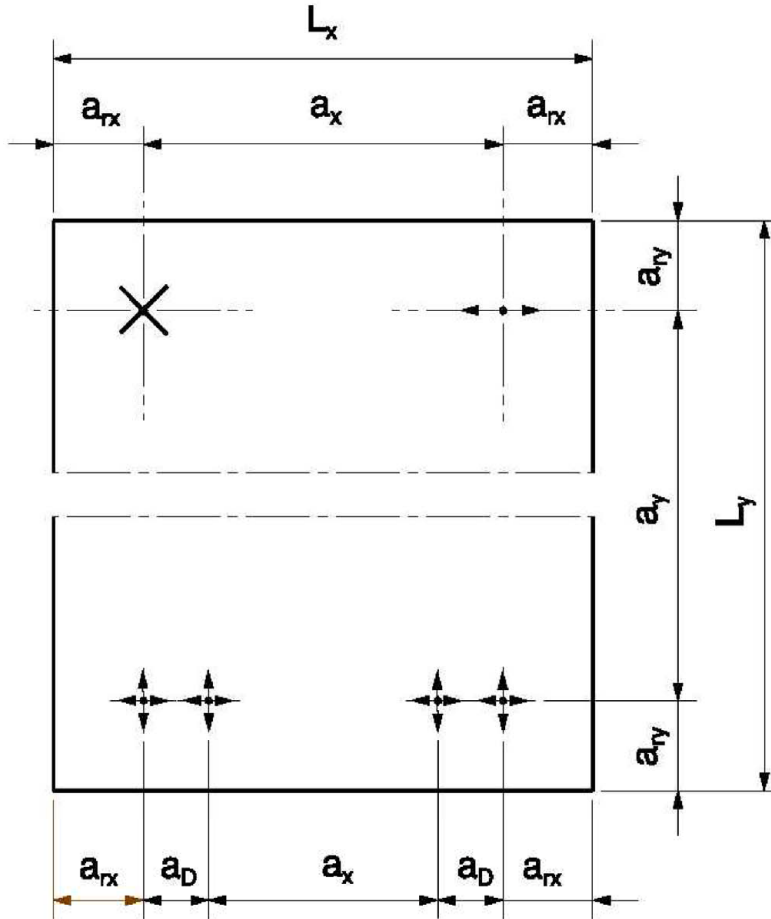
Riveting tool  
GESIPA PowerBird

TUF-S

**Intended use**  
Setting tool

Annex B 4

### Definition of edge distance and spacing



#### Legend:

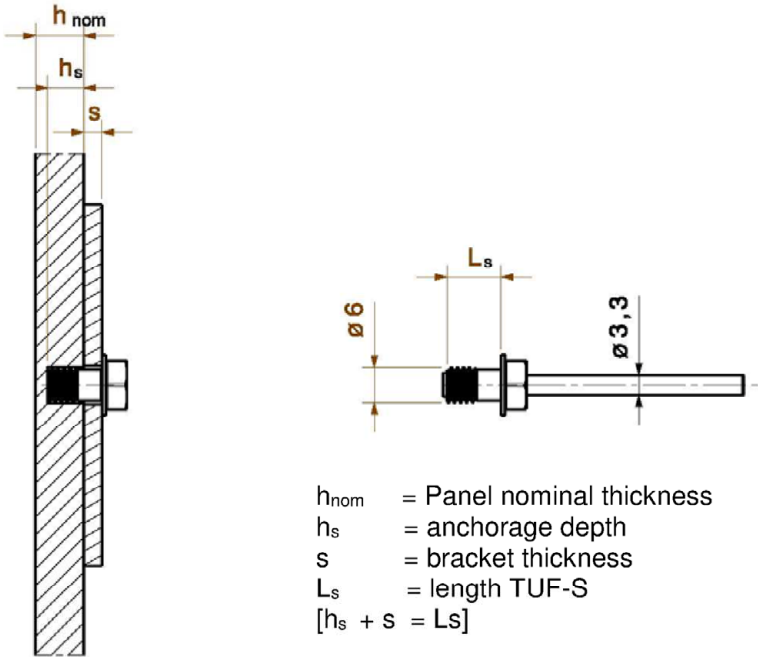
- $a_{R,x,y}$  = edge distance – distance of an anchor to the panel edge
- $a_{x,y}$  = spacing between outer anchors in adjoining groups or between single anchors distance between anchors
- $a_D$  = spacing of anchors in an anchor group
- $L_x$  = greater length of the façade panel
- $L_y$  = smaller length of the façade panel
- × = fixed point (fixed bearing)
- ↔ = horizontal skid (loose bearing)
- ↕ = horizontal and vertical skid (loose bearing)

TUF-S

**Intended use**  
Definition of edge distance and spacing

Annex B 5

Installation parameters



$h_{nom}$  = Panel nominal thickness  
 $h_s$  = anchorage depth  
 $s$  = bracket thickness  
 $L_s$  = length TUF-S  
 $[h_s + s = L_s]$

**TUF-S-6X7-A4**

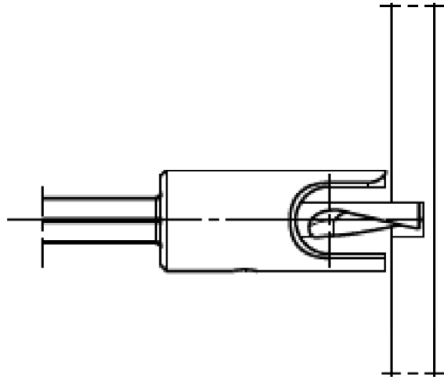
TUF...name product  
 S.....stainless steel  
 6..... $\emptyset$  (diameter)  
 7..... $L_s$  (length)  
 A4.....stainless steel A4 material

Table 4

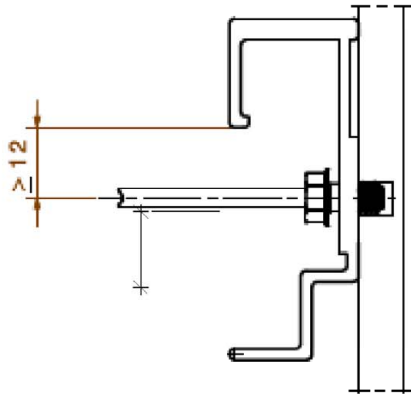
| Panel nominal thickness | Bracket thickness | anchorage depth | TUF-S          |                |
|-------------------------|-------------------|-----------------|----------------|----------------|
| 8,0 mm                  | 2,0 mm            | 5,0 mm          | TUF-S-6x7-A4   |                |
|                         |                   | 5,5 mm          | TUF-S-6x7.5-A4 |                |
|                         |                   | 6,0 mm          | TUF-S-6x8-A4   |                |
|                         | 2,5 mm            | 2,5 mm          | 5,0 mm         | TUF-S-6x7.5-A4 |
|                         |                   |                 | 5,5 mm         | TUF-S-6x8-A4   |
|                         |                   |                 | 6,0 mm         | TUF-S-6x8.5-A4 |
|                         | 3,0 mm            | 3,0 mm          | 5,0 mm         | TUF-S-6x8-A4   |
|                         |                   |                 | 5,5 mm         | TUF-S-6x8.5-A4 |
|                         | 3,5 mm            | 3,5 mm          | 5,0 mm         | TUF-S-6x8.5-A4 |
|                         |                   |                 | 5,5 mm         | TUF-S-6x9-A4   |
|                         | 5,0 mm            | 5,0 mm          | 5,0 mm         | TUF-S-6x10-A4  |
|                         |                   |                 | 6,0 mm         | TUF-S-6x11-A4  |
| 10,0 mm                 | 3,0 mm            | 6,0 mm          | TUF-S-6x9-A4   |                |
|                         |                   | 7,0 mm          | TUF-S-6x10-A4  |                |
|                         |                   | 8,0 mm          | TUF-S-6x11-A4  |                |
|                         | 3,5 mm            | 3,5 mm          | 6,5 mm         | TUF-S-6x10-A4  |
|                         |                   |                 | 7,5 mm         | TUF-S-6x11-A4  |
|                         | 5,0 mm            | 5,0 mm          | 7,0 mm         | TUF-S-6x12-A4  |
| 8,0 mm                  |                   |                 | TUF-S-6x13-A4  |                |
| 12.0 mm - 13.0 mm       | 3,0 mm            | 8,0 mm          | TUF-S-6x11-A4  |                |
|                         | 3,5 mm            | 8,5 mm          | TUF-S-6x12-A4  |                |
|                         | 5,0 mm            | 8,0 mm          | TUF-S-6x13-A4  |                |

|   |           |
|---|-----------|
| TUF-S                                   | Annex B 6 |
| Intended use<br>Installation parameters |           |

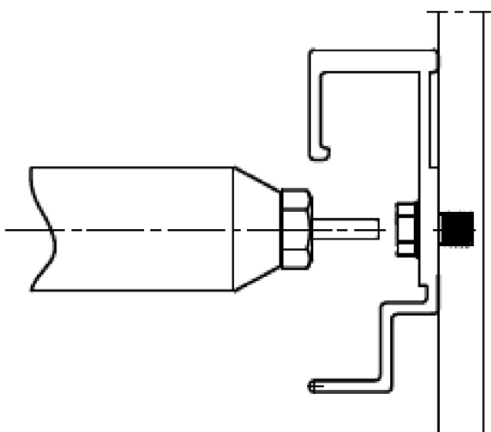
## Installation instructions



Pilot drilling in the panel with the  
6 mm dia. HSS drill bit with depth locator  
or CNC machine



Position the pre-drilled bracket over the  
hole in the panel and push through the TUF-S  
blind fastener



Apply pressure with the rivet setting tool during the  
setting process.  
Remove the mandrel completely with the riveting  
tool (GESIPA PowerBird, PowerBird Pro,  
use nosepiece 17/36 or 17/40)

TUF-S

**Intended use**  
Installation instructions

Annex B 7

### Characteristic value of the anchor

Table 5: Characteristic values of the anchor with single clamp

| Single clamp                         |  |                       |                              |      |       |      |      |      |      |      |      |
|--------------------------------------|--|-----------------------|------------------------------|------|-------|------|------|------|------|------|------|
| Characteristic values for the anchor | Setting depth <sup>2)</sup>  |                       |                              | [mm] | 5,0   | 5,5  | 6,0  | 6,5  | 7,0  | 7,5  | 8,0  |
|                                      | Characteristic resistance  | Tension <sup>1)</sup> | N <sub>Rk</sub>              | [kN] | 1,12  | 1,26 | 1,40 | 1,65 | 1,90 | 1,97 | 2,04 |
|                                      |  | Shear                 | V <sub>Rk</sub>              | [kN] | 2,78  | 2,89 | 2,99 | 3,28 | 3,57 | 3,79 | 4,00 |
|                                      | Partial safety factor  |                       | γ <sub>M</sub> <sup>3)</sup> | [-]  | 1,8   |      |      |      |      |      |      |
|                                      | Edge distance  |                       | a <sub>r</sub>               | [mm] | ≥ 40  |      |      |      |      |      |      |
|                                      | Spacing  |                       | a                            | [mm] | ≥ 100 |      |      |      |      |      |      |
|                                      | Value for tri-linear function with combined tension and shear load |                       | X                            | [-]  | 1,0   |      |      |      |      |      |      |

Table 6: Characteristic values of the anchor with double clamp (20,0 mm ≤ a<sub>D</sub> < 40,0 mm)

| Double clamp with 20,0 mm ≤ a <sub>D</sub> < 40,0 mm |  |                       |                              |      |       |      |      |      |      |      |      |
|--|--|-----------------------|------------------------------|------|-------|------|------|------|------|------|------|
| Characteristic values for two anchors                | Setting depth <sup>2)</sup>  |                       |                              | [mm] | 5,0   | 5,5  | 6,0  | 6,5  | 7,0  | 7,5  | 8,0  |
|  | Characteristic resistance  | Tension <sup>1)</sup> | N <sub>Rk</sub>              | [kN] | 1,93  | 2,03 | 2,11 | 2,41 | 2,71 | 2,71 | 2,71 |
|  |  | Shear                 | V <sub>Rk</sub>              | [kN] | 4,85  | 4,85 | 4,85 | 5,83 | 6,80 | 6,80 | 6,80 |
|  | Partial safety factor  |                       | γ <sub>M</sub> <sup>3)</sup> | [-]  | 1,8   |      |      |      |      |      |      |
|  | Edge distance  |                       | a <sub>r</sub>               | [mm] | ≥ 40  |      |      |      |      |      |      |
|  | Spacing  |                       | a                            | [mm] | ≥ 100 |      |      |      |      |      |      |
|  | Value for tri-linear function with combined tension and shear load |                       | X                            | [-]  | 1,0   |      |      |      |      |      |      |

- 1) Values valid for bending angle of the façade panels  $\beta \leq 1,0^\circ$  (Definition of  $\beta$  see Annex D 1)
- 2) A minimum remaining panel thickness (panel thickness – setting depth) of 2,0 mm is required.  
For intermediate values of the setting depth, linear interpolation is possible.
- 3) In absence of national regulations.

TUF-S

**Performances**  
Characteristic value of the anchor

Annex C 1

Table 7: Characteristic values of the anchor with double clamp ( $40,0 \text{ mm} \leq a_D < 100,0 \text{ mm}$ )

| Double clamp with $40,0 \text{ mm} \leq a_D < 100,0 \text{ mm}$ |  |                       |                 |      |            |      |      |      |      |      |      |
|---|--|-----------------------|-----------------|------|------------|------|------|------|------|------|------|
| Characteristic values for two anchors                           | Setting depth <sup>2)</sup>  |                       | [mm]            | 5,0  | 5,5        | 6,0  | 6,5  | 7,0  | 7,5  | 8,0  |      |
|   | Characteristic resistance  | Tension <sup>1)</sup> | $N_{Rk}$        | [kN] | 2,07       | 2,26 | 2,44 | 3,17 | 3,89 | 3,89 | 3,89 |
|   |  | Shear                 | $V_{Rk}$        | [kN] | 4,85       | 4,85 | 4,85 | 5,83 | 6,80 | 6,80 | 6,80 |
|   | Partial safety factor  |                       | $\gamma_M^{3)}$ | [-]  | 1,8        |      |      |      |      |      |      |
|   | Edge distance  |                       | $a_r$           | [mm] | $\geq 40$  |      |      |      |      |      |      |
|   | Spacing  |                       | $a$             | [mm] | $\geq 100$ |      |      |      |      |      |      |
|   | Value for tri-linear function with combined tension and shear load |                       | X               | [-]  | 1,0        |      |      |      |      |      |      |

- 1) Values valid for bending angle of the façade panels  $\beta \leq 1,0^\circ$  (Definition of  $\beta$  see Annex D 1)  
 2) A minimum remaining panel thickness (panel thickness – setting depth) of 2,0 mm is required.  
 For intermediate values of the setting depth, linear interpolation is possible.  
 3) In absence of national regulations.

Table 8: Characteristic resistance for steel failure

| Size   |                    |      | TUF-S-6xL |
|--|--------------------|------|-----------|
| Characteristic resistance under tension load | $N_{Rk,s}$         | [kN] | 7,19      |
| Partial safety factor                        | $\gamma_{Ms}^{3)}$ | [-]  | 2,5       |
| Characteristic resistance under shear load   | $V_{Rk,s}$         | [kN] | 5,23      |
| Partial safety factor                        | $\gamma_{Ms}^{3)}$ | [-]  | 2,5       |

- 3) In absence of national regulations.

TUF-S

Performances  
Characteristic resistance in steel resistance

Annex C 2

## Design method

### Loads

The design loads shall be calculated on basis of EN 1990:2010. The combination of loads shall be equal to EN 1990:2010. The loads shall be specified according to EN 1991-1-1:2010 to EN 1991-1-7:2010. Corresponding national regulations shall be taken into consideration. The unfavorable combination is decisive. Where necessary for the design of the anchor and the façade panel several combinations shall be analyzed separately.

The typical fundamental combination for façade panels considers loads from dead load  $F_{Ek,G}$  (permanent loads) and wind  $F_{Ek,w}$  (leading variable load)

According to EN 1990:2010 the following fundamental combination depending on the load direction results for a vertical façade panel:

Fundamental combination for loads parallel to the panel:  $F_{Ed||} = F_{Ek,G} \cdot \gamma_G$

Fundamental combination for loads perpendicular to the panel:  $F_{Ed\perp} = F_{Ek,w} \cdot \gamma_Q$

mit  $\gamma_G = 1,35$ ;  $\gamma_Q = 1,50$

### Resistance:

$$N_{Rd} = \frac{N_{Rk}}{\gamma_M} \cdot \alpha_{F0} \cdot \alpha_{bend} \cdot \alpha_{wet} \cdot \alpha_{oh}$$

$$V_{Rd} = \frac{V_{Rk}}{\gamma_M} \cdot \alpha_{F0} \cdot \alpha_{wet}$$

$$\sigma_{Rd} = \frac{\sigma_{Rk}}{\gamma_M}$$

with:

$N_{Rk}$  = characteristic tension resistance according to Annex C 1, Table 5 to 7

$V_{Rk}$  = characteristic shear resistance according to Annex C 1, Table 5 to 7

$\sigma_{Rk}$  = characterising bending stress according to EN 438:2005

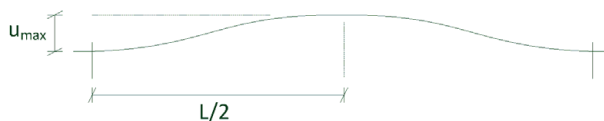
$\alpha_{F0}$  = If the façade panels do not meet the minimum requirements according to Annex B 1, Table 2, the characteristic values of load bearing capacity have to be multiplied additionally by  $\alpha_{F0}$ :

$$\alpha_{F0} = \min \left\{ \frac{\sigma_{f,L,min}}{130 \text{ N/mm}^2}; \frac{E_{L,min}}{14000 \text{ N/mm}^2}; \frac{\sigma_{f,T,min}}{100 \text{ N/mm}^2}; \frac{E_{T,min}}{10000 \text{ N/mm}^2}; 1 \right\}$$

$\alpha_{bend}$  = reduction factor of bearing of facade panel

The bending angle of the façade panel

$$\beta = \arctan \left( \frac{u_{max}}{L/2} \right)$$



$$\beta \leq 1,0^\circ \Rightarrow \alpha_{bend} = 1,0$$

$$1,0^\circ < \beta \leq 1,5^\circ \Rightarrow \alpha_{bend} = 0,89$$

$$1,5^\circ < \beta \leq 2,0^\circ \Rightarrow \alpha_{bend} = 0,80$$

$\alpha_{wet}$  = If the façade panels do not meet the minimum requirements regarding the maximum mass increase of  $\delta_w = 2.0\%$  according to Table 2, the characteristic values of load bearing capacity have to be multiplied additionally by  $\alpha_{wet} = 0,78$ .

$\alpha_{oh}$  = Overhead mounting, the characteristic tension resistance shall be reduced with 0,9

$$\gamma_M = 1,8$$

TUF-S

**Informativ**  
Design method

Annex D 1



### Verification

The calculation shall be carried out in a linear elastic manner. The stiffness of the substructure shall be considered for the respective case of application.

For the determined anchor loads it shall be verified, that the following equations are met.

Equation 1: 
$$\frac{N_{Ed}}{N_{Rd}} \leq 1$$

Equation 2: 
$$\frac{V_{Ed}}{V_{Rd}} \leq 1$$

Equation 3: 
$$\frac{V_{Ed}}{V_{Rd}} + \frac{N_{Ed}}{N_{Rd}} \leq X$$

with:

$N_{Ed}$  = design value of the tensile force acting on the anchor

$V_{Ed}$  = design value of the shear force acting on the anchor

$N_{Rd}$  = design value of the tensile load bearing capacity of the anchor

$V_{Rd}$  = design value of the shear load bearing capacity of the anchor

X = see Annex C 1

For the determined panel loads it shall be verified, that the following equation according is met:

Equation 4: 
$$\frac{\sigma_{Ed}}{\sigma_{Rd}} \leq 1$$

with:

$\sigma_{Ed}$  = design value of the bending stress of the façade panel

$\sigma_{Rd}$  = design value of the bending stress resistance of the façade panel

### Verification to steel failure

$$\frac{N_{Ed}}{N_{Rd,s}} \leq 1,0$$

$$\frac{V_{Ed}}{V_{Rd,s}} \leq 1,0$$

$$\left(\frac{N_{Ed}}{N_{Rd,s}}\right)^2 + \left(\frac{V_{Ed}}{V_{Rd,s}}\right)^2 \leq 1,0$$

$N_{Ed}$ : Design value of the tensile force

$N_{Rd,s}$ : design value of steel failure under tension load

$$N_{Rd,s} = N_{Rk,s} / \gamma_{Ms}$$

$N_{Rk,s}$  : Characteristic resistance to steel failure under tension

$V_{Ed}$ : design value of the shear force

$V_{Rd,s}$ : design value of steel failure under shear load

$$V_{Rd,s} = V_{Rk,s} / \gamma_{Ms}$$

$V_{Rk,s}$  : Characteristic resistance to steel failure shear load

TUF-S

**Informativ**  
Design method

Annex D 2