

## FAQ - The new fastener mask in SandStat.

As of May 2018, SandStat delivered the new fastener mask, which was optically modified again in June 2019 and supplemented by the view of shear force. Below is a brief overview of the new mask and important topics.

The shear force analysis is not included in the basic version and must be purchased as an additional feature.

Furthermore, this mask is only available for elements according to the calculation method "General Technical Approval with DIN EN 14509, Appendix E" or according to "EN 14509".

The calculation principle according to the old approval "General Technical Approval, Annex A", which is not valid since at least the end of 2015, will no longer be developed in this area.

## Overview of the new mask

a) Choice and design of the fasteners with regard to the connection with the sub-construction

Filter Tools Hilfe

panel-width 1000 mm

basic information

Baltic  E.u.r.o. Tec  EJOT  End  Essve  Elanco  FastenerPoint  Hilti  IPEX  PMJ  Reisser  S + P  SFS  Würth  other

b)  support 5  
Hilti S-CD 75 GS 5,5 x L (Ø22)  
ETA-13/0179 ANX 25  
issued on 01.09.2017

all supports identical

c)

| no | variation | material | III/lef [mm] | asym.                               | fastener | type of fastening              | NSd [kN]                   | NRd [kN] | exist. [mm] | max u [mm] |      |       |
|----|-----------|----------|--------------|-------------------------------------|----------|--------------------------------|----------------------------|----------|-------------|------------|------|-------|
| 1  | visible   | S235     | 4,00         | <input type="checkbox"/>            | 2        | JT3-D-12H-5,5/6,3 x L (Ø16)    | w/ washer                  | 2,00     | 3,58        | 55,8%      | 0,84 | 22,50 |
| 2  | hidden    | S355     | 4,00         | <input type="checkbox"/>            | 1        | SXC5-S16-6,3 x L (Ø16)         | Typ 1 75°28°8°1,5 - S16    | 2,50     | 3,21        | 80,5%      | 0,84 | 7,50  |
| 3  | hidden    | S235     | 4,00         | <input type="checkbox"/>            | 2        | FABA-BZ-6,3 x L (Ø16)          | Typ 2 200°30,5°8°1,5 - S16 | 1,21     | 6,08        | 20,0%      | 0,84 | 9,00  |
| 4  | visible   | timber   | 35           | <input type="checkbox"/>            | 2        | Zebra Plasta 6,0 x L (Ø=19)    | w/ washer                  | 2,58     | 2,79        | 92,8%      | 0,84 | 12,00 |
| 5  | visible   | S235     | 4,00         | <input checked="" type="checkbox"/> | 2        | Hilti S-CD 75 GS 5,5 x L (Ø22) | w/ washer                  | 2,00     | 3,19        | 62,7%      | 0,84 | 11,50 |

d) OK cancel apply

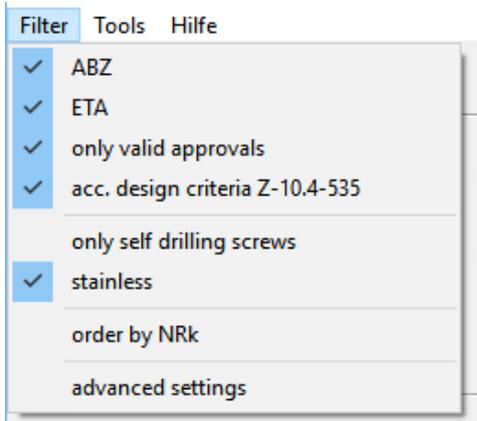
(arbitrary example without rating of the individual fasteners)

The screen is divided into the following sections:

- Menu bar: Specification of filters in relation to the calculation basis of the fastener
- Selection of the desired fastener manufacturer/s
- Information on the specific support formation and the connection
- Results for the resistance of the selected fastener

a) Calculation basis of the fastener

In the menu item "Filter" the calculation bases of the fastener can be defined:



|                           |   |
|---------------------------|---|
| ABZ                       | All fasteners with a Technical Approval of DIBt are displayed   |
| ETA                       | All fasteners according to an European Technical Approval or according to an European Technical Assesment) are displayed  |
| only valid approvals      | only fasteners with a valid approval are displayed. Please deactivate this option for the recalculation of old static calculations with expired screw approvals   |
| acc. Design crieteria     | ...with indication of the corresponding sandwich approval.<br>Some sandwich approvals and evaluations (usually in Appendix 2.x) define restrictions with regard to the use of fasteners. This restriction is taken into account when the check mark is activated. |
| only self drilling screws | only self drilling screws are displayed   |
| stainless                 | only fasteners made of stainless material are displayed   |
| order by NRk              | The selection list of fasteners is sorted by the resistance value $N_{Rk}$ of the fastener  |
| panel-width               | Specification of the element width in mm  |
| advanced settings         | Further settings can be defined for the selection of fasteners for concealed fastening. Please refer to page 10 of this document.   |

b) Selection of the desired manufacturer

In this section you can preselect the manufacturer(s) of fastener(s).

The designation corresponds to the designation in the approval/ETA.

The corresponding manufacturer information is displayed to the right of the selection.

If there are no suitable fasteners in the database from the manufacturer (e.g. due to the top layer quality of the sandwich element or the sandwich thickness), the manufacturer is highlighted in grey and cannot be selected.

To the right of the selection, the corresponding manufacturer information including its logo is displayed. When a fastener is selected, the corresponding manufacturer logo is displayed.

c) Information on support formation

| no | variation | material | tII/lef<br>[mm] | asyn                                |
|----|-----------|----------|-----------------|-------------------------------------|
| 1  | visible   | S235     | 4,00            | <input type="checkbox"/>            |
| 2  | hidden    | S355     | 3,00            | <input type="checkbox"/>            |
| 3  | hidden    | S235     | 3,00            | <input type="checkbox"/>            |
| 4  | hidden    | timber   | 35              | <input type="checkbox"/>            |
| 5  | visible   | S235     | 2,00            | <input checked="" type="checkbox"/> |

For each support of the system, starting with support no.1 at the left or bottom of the panel.

|           |   |
|-----------|---|
| variation | Selection of the "visible" variant for visible fastening or "hidden" for hidden/invisible fixings.<br>The option "hidden" is only available if this usage is regulated in the approval for the selected sandwich element. |
| material  | Material of the substructure  |
| tII/lef   | Thickness of the substructure (for steel substructure) or screw-in depth (for timber substructure)  |
| asym.     | the substructure (component II) is asymmetrical (Z- or C-profiles). For a component thickness $t_{II} < 5$ mm the characteristic value $N_{R,k}$ is reduced to 70 % if this option is activated.                          |

| n. | fastener                     | type of fastening        |
|----|------------------------------|--------------------------|
| 2  | JT3-18-5,5 x L (Ø16)         | w/ washer                |
| 1  | E× Bohr 3 HAT 5,5 x L (Ø19)  | w/ washer - S19          |
| 2  | E× Bohr 3 HAT 5,5 x L (Ø16)  | Z 200*50,5*8*8*1,5 - S16 |
| 1  | REISSER RP-r-P-6,0 (Ø19)     | w/ washer - S19          |
| 2  | Refabo Plus-K6,3 x L (Ø>=16) | w/ washer                |

(Arbitrary example without rating of the individual fasteners)

|                               |   |
|-------------------------------|---|
| <i>column without heading</i> | number of fasteners   |
| fastener                      | the selected fastener with the designation of the approval  |
| type of fastening             | depending on the selected fastener or the selected type of hidden fixings, further options are available here<br>e.g. with regard to the washer, the load distribution plate etc. |

d) Results

| NSd [kN] | NRd [kN] |        | exist. [mm] | max u [mm] |   |
|----------|----------|--------|-------------|------------|---|
| 2,24     | 3,61     | 62,0%  | 0,84        | 22,50      | ⓘ |
| 2,82     | 3,01     | 93,9%  | 0,84        | 12,00      | ⓘ |
| 1,37     | 6,02     | 22,9%  | 0,84        | 12,00      | ⓘ |
| 2,82     | 3,32     | 85,0%  | 0,84        | 12,00      | ⓘ |
| 2,24     | 2,21     | 101,2% | 0,84        | 23,00      | ⓘ |

|                               |   |
|-------------------------------|---|
| N <sub>Sd</sub>               | Design value of the tensile force for the decisive load combination in kN |
| N <sub>Rd</sub>               | Design value of the tensile strength of the selected fastener in kN       |
| <i>column without heading</i> | utilization factor for tensile strength                                   |
| exist u                       | Existing screw head deflection in mm                                      |
| max u                         | maximum allowable screw head deflection in mm                             |

If no proof has been provided, this is marked in red by a colour coding of the utilization.

In the case of hidden fixings, the place of failure is indicated by an index:

Example:

|      |                    |        |    |  |
|------|--------------------|--------|----|--|
| 3,52 | 3,01 <sup>II</sup> | 117,1% | II | failure of fastener<br>(pull out of the substructure, buttoning over or failure of the fastener) |
| 3,52 | 2,60 <sup>V</sup>  | 135,4% | V  | failure of hidden fixing (pull over)   |

Furthermore, the ratios are summarized in the lower right corner of the mask with 4 coloured spots:



Spot 1 – proof of tensile force

Spot 2 – screw head deflection

Spot 3 – Shear force analysis (in process)

Spot 4 – tensile force-transverse force interaction (in process)

| Colour | utilization         |  |
|--------|---------------------|--|
| green  | < 100 %             | fulfilled                                      |
| orange | < 103 %             | still okay (in the responsibility of the user) |
| red    | > 103 %             | not fulfilled                                  |
| grey   | not yet implemented |  |

This allows you to see at a glance - especially with a large number of supports - whether the selection is sufficiently load-bearing.

## Informations

By clicking the info  button, the basics of the design for this support are displayed.

Example on the support with hidden fixing:

support 2
✕

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**sub-construction**

|          |        |           |                              |
|----------|--------|-----------|------------------------------|
| material | : S355 | thickness | : 4,00 mm (symmetric profil) |
|----------|--------|-----------|------------------------------|

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**design of tensile forces**

$$\gamma_{ws} * \Psi_{0,ws} * w_s + \gamma_{g,s} * \Delta g_s$$

$$1.50 * 0.60 * -0.529 + 1.50 * -1.406 = -2.58 \text{ kN}$$

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**fastener**



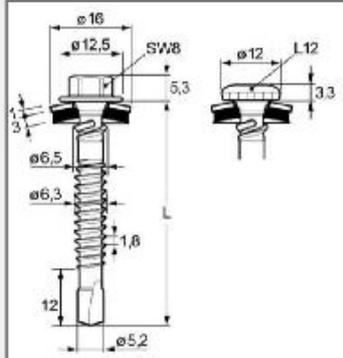
**SFS intec AG**  
 Rosenbergsaustraße 10  
 9435 HEERBRUGG  
 SCHWEIZ

1 × SXC5-S16-6,3 x L (Ø16)

approval : **ETA-13/0183 ANX. 5 issued on 25.01.2019**

NRIfd : 1 × 9,45kN / 1,33

pull-out : **7,11 kN**



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**fastening**

|                     |                           |   |   |
|---------------------|---------------------------|---|---|
| variation           | : <b>hidden fastening</b> |   |   |
| approval            | : Z-10.4-535              |  |   |
| type of fastening   | : Typ 1 75*28*8*1.5 - S16 |   |   |
| NRVd                | : 4,27kN / 1,33 =         |   |   |
| <u>pull-through</u> | <b>3,21 kN</b>            | ≥   | 2,58 kN = NSd  |



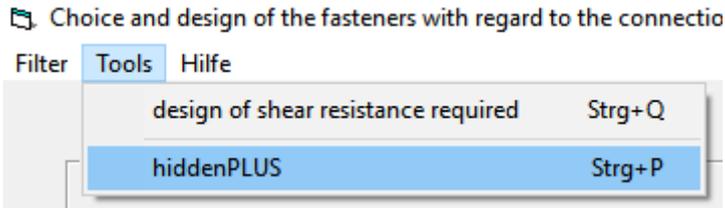
The sketches of the selected fasteners and load distribution plate are displayed partly. If the sketches are poorly displayed due to the resolution, you can click on the corresponding sketch with the mouse and the sketch will be enlarged.

By selecting the additional info  button - if available - the corresponding installation page of the approval is displayed as a pdf file. An appropriate pdf program is required to display this file.

## Hints for hidden fixing

### verdecktPLUS

The option "verdecktPLUS" can be selected for hidden fixing.



Please activate this option if you have an exceeding at the hidden fixing. Then the system determines how many additional fasteners are required directly (i.e. visibly). Both the output mask and the printout will then contain, for example, "1+2" - i.e. a fastener at hidden fixing and two additional visible fasteners.

The same fasteners are used both for the hidden fixing and for the visible fixing. Please note that, depending on the design conditions (e.g. required length), these can still have different order details.

Example without activation of „verdecktPLUS“:

|   |                              |                        |      |                   |        |
|---|------------------------------|------------------------|------|-------------------|--------|
| 2 | E-X Bohr 3 HAT 5,5 x L (Ø19) | mit Dichtscheibe - S19 | 3,52 | 3,08 <sup>V</sup> | 114,3% |
|---|------------------------------|------------------------|------|-------------------|--------|

Example with activation of „verdecktPLUS“:

|     |                              |                        |      |      |       |
|-----|------------------------------|------------------------|------|------|-------|
| 2+1 | E-X Bohr 3 HAT 5,5 x L (Ø19) | mit Dichtscheibe - S19 | 3,52 | 5,34 | 66,0% |
|-----|------------------------------|------------------------|------|------|-------|

## Hidden fixings limitations

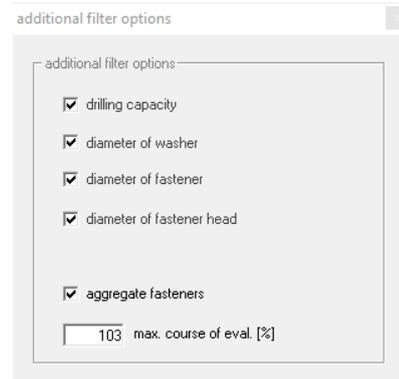
The specifications for hidden fixing are defined in the corresponding sandwich approval. For each approval, the specifications for the fasteners are also mentioned.

These can include the following specifications:

|                     | Example:  | german word at mask<br>"Schraubenfilter" |
|---------------------|---|--|
| washer              | <ul style="list-style-type: none"> <li>- without washer</li> <li>- with washer Ø 16</li> <li>- with washer &gt;= 19 mm</li> </ul>                         | Scheibendurchmesser                      |
| fastener diameter   | <ul style="list-style-type: none"> <li>- without specification</li> <li>- fastener diameter = 6,3 mm</li> <li>- fastener diameter &gt;= 5,5 mm</li> </ul> | Schraubendurchmesser                     |
| screw head diameter |   | Schraubenkopfdurchmesser                 |

These controls were not included in the old version of the fastener mask. Therefore, the new version may no longer display certain fasteners that were previously displayed to you.

If you want a specific fastener that is not displayed in the selection mask not anymore, please choose the option "advanced settings" at menu "Filter". Now you can deactivate the corresponding restriction in the mask that is then displayed:



**Please pay attention to the correct hidden fixing and check whether this deviation is feasible and also formally correct.**

A corresponding note is then printed in the printout:

Without considering the diameter of the washer.

Without considering the diameter of the fastener.

Without considering the diameter of the fastener head.

## Shear force resistance and combined loading by tension and shear force

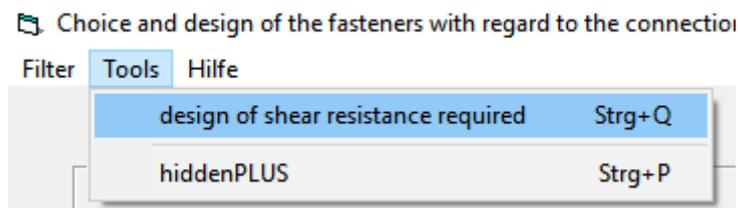
Depending on the static system, the shear load carrying capacity of the screw as well as the combined loading by tension and shear must also be taken into account.

This additional shear force for the fastener is determined from:

- Wall component: dead weight of the wall component; perpendicular to the wall surface
- Roof component: dead weight of the wall component and snow loads; converted as a function of the roof pitch parallel to the roof surface.

The shear forces are distributed according to load absorption surfaces for vertically clamped components and according to the static shear force system for horizontally clamped components.

To do this, select the option "Shear force check required" under "Extras":



The results for the shear forces and the interaction of tension and shear force are also displayed in the results area of the mask:

| NSd view |          | VSd view    |       |                                     |          |
|----------|----------|-------------|-------|-------------------------------------|----------|
| VSd [kN] | VRd [kN] | Interaktion |       |                                     |          |
| 0,37     | 1,47     | 25,2%       | 53,5% | <input checked="" type="checkbox"/> | <i>i</i> |
| -        | -        |             |       | <input type="checkbox"/>            | <i>i</i> |
| 0,74     | 2,03     | 36,4%       | 52,9% | <input checked="" type="checkbox"/> | <i>i</i> |
| -        | -        |             |       | <input type="checkbox"/>            | <i>i</i> |
| 0,37     | 0,98     | 37,8%       | 86,3% | <input checked="" type="checkbox"/> | <i>i</i> |

cancel      apply

• • • •

The check marks on the right side can be used to define which supports are used to derive the shear forces.

The checks are carried out according to the specifications of the corresponding approval / ETA.

The three checks tensile force, shear force and combined tension force and shear force interaction are carried out separately. In each case, the decisive load combination is determined.

By selecting the Info button, the overview screen for this support is displayed, in which the authoritative checks are listed.

The screenshot shows a software window titled "support 3" with the following sections:

- sub-construction:**
  - material: S235
  - thickness: 4.00 mm (symmetric profil)
- design of tensile forces:**
  - Equation:  $\gamma_{w,s} * W_k + \gamma_{d,s} * \Psi_{0,s,s} * \Delta S_k$
  - Result:  $1.50 * -0.510 + 1.50 * 0.60 + -0.499 = -1.21 \text{ kN}$
- fastener:**
  - Company: REISSER SCHRAUBENTECHNIK GmbH
  - Address: Fritz-Müller Straße 10, D-74653 Ingeltingen-Criesbach
  - Product: 2 \* FAB4-BZ-6.3 x L ( $\emptyset > 16$ )
  - Approval: Z-14.4-407 ANX. 3.5 issued on 01.02.2019
  - NRVd:  $2 * 4.30 \text{ kN} / 1.33$
  - pull-out: 7.37 kN
- fastening:**
  - variation: hidden fastening
  - approval: Z-10.4-535
  - type of fastening: Typ 2 200°30.5°B\*1.5 - S16
  - NRVd:  $8.08 \text{ kN} / 1.33 =$
  - pull-through: 6.08 kN  $\geq 1.21 \text{ kN} = \text{NSd}$  ✓
- design of shear forces:**
  - Equation:  $\gamma_d * G$
  - Result:  $1.35 * 0.822 = 1.11 \text{ kN}$
  - VRd:  $2 * 1.25 \text{ kN} / 1.33$
  - shear force failure: 2.03 kN  $\geq 1.11 \text{ kN} = \text{Vsd}$  ✓
- design of interaction:**
  - Equation:  $\max. ((\text{NSd} / \text{NRVd}) + (\text{Vsd} / \text{VRd}))$
  - tension force:  $\gamma_{w,s} * W_k + \gamma_{d,s} * \Psi_{0,s,s} * \Delta S_k$
  - Result:  $1.50 * -0.510 + 1.50 * 0.60 + -0.499 = -1.21 \text{ kN}$
  - shear force:  $\gamma_d * G$
  - Result:  $1.35 * 0.822 = 1.11 \text{ kN}$
  - interaction:  $1.21 / 7.37 + 1.11 / 2.03 = 0.71 < 1.00$  ✓