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to Article 29 of the Regulation (EU)  
No 305/2011 of the European  
Parliament and of the Council of 9  
March 2011

MEMBER OF EOTA



## European Technical Assessment ETA-21/0714 of 2023/04/04

### I General Part

**Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011:** ETA-Danmark A/S

**Trade name of the construction product:**

KEIL undercut anchor KH for fixing in CR Fibre GFC Elements facade panels made of manufactured stone

**Product family to which the above construction product belongs:**

Fastener of external wall claddings. Special anchor for the rear fixing of facade panels made of CR Fibre GFC Elements facade panels

**Manufacturer:**

Concrete Rudolph GmbH  
Steinbißstraße 15  
88171 Weiler-Simmerberg  
Tel +49 · 8384 · 8210 · 0  
Internet [www.concrete-rudolph.de](http://www.concrete-rudolph.de)

**Manufacturing plant:**

Concrete Rudolph GmbH  
Steinbißstraße 15  
88171 Weiler-Simmerberg  
KEIL Befestigungstechnik GmbH  
Manufacturing plant 2

**This European Technical Assessment contains:**

11 pages including 6 Annexes which form an integral part of the document

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

EAD 330030-00-0601 – Fastener of external wall claddings

**This version is a corrigenda and replaces:**

The ETA with the same number issued on 2021-09-21

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

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## II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

### 1 Technical description of product and intended use

#### Technical description of the product

The KEIL undercut anchor KH for façade panels is a special anchor made of stainless steel, consisting of a crosswise slotted anchor sleeve with an M6 internal thread, at the upper edge of which a hexagon is formed to it and a respective hexagon bolt with an integrated tooth lock washer. The anchor is put into an undercut drill hole and by driving-in the screw it is placed form-fitted and deformation-controlled.

The CR Fibre GFC Elements facade panels are made from manufactured stone and have the following characteristics:

|                                        | <b>Color: grey, crème and dark rey</b> |
|----------------------------------------|----------------------------------------|
| E-Module, average [N/mm <sup>2</sup> ] | 8000±2000                              |
| Thermal Expansion (µm/mK)              | 8 – 12 x 10 <sup>-6</sup> 1/K          |
| 5% Fractile bending resistance         | 4,15 N/mm <sup>2</sup>                 |
| Density [g/cm <sup>3</sup> ]           | 2,28 ± 0,02                            |
| Water absorption (24h) [%]             | 1,0                                    |
| Swelling dimension [mm/m]              | 0,2 – 0,5                              |
| Shrinkage [mm/m]                       | 0,9 – 1,5                              |
| Frost resistance                       | Yes                                    |

For the installed anchor see figure in Annex A1.

### 2 Specification of the intended use in accordance with the applicable EAD

The KEIL undercut anchor KH are intended to be used for the rear fixing of façade panels CR Fibre GFC Elements made of manufactured stone for which requirements for mechanical resistance and stability in the sense of the Basic Works Requirements 1 of Regulation 305/2011 shall be fulfilled. The façade panels shall correspond to the drawings and specifications of this European Technical Assessment. The intended use specifications of the product are detailed in the Annex B1.

The façade panels with rear fixing by the anchor may only be used for rear ventilated front curtain walls. Each façade panel shall be fixed technically strain-free with at least four anchors in a rectangular arrangement via single agraffes on a capable substructure (for small panels or small fitted pieces, differential or fill- in pieces

the number and position of the anchors shall be chosen constructively).

The anchor may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), if no particular aggressive conditions exist. Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurisation plants or road tunnels where de-icing materials are used).

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, 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

| Characteristic                                                                                  | Assessment of characteristic                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>3.1 Mechanical resistance and stability (BWR1)</b>                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Characteristic load bearing capacity and displacements<br>Edge distance and spacing             | The anchor corresponds to the drawings and specifications given in Annex A2-A3. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annex A2-A3 shall correspond to the respective values laid down in the technical documentation of this European Technical Assessment.<br><br>The characteristic values for the design of the façade panels with rear fixing by the anchor are given in Annex C1-C2. |
| Characteristic resistance to breakout or pull-out failure under combined tension and shear load | No performance assessed                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Durability                                                                                      | The anchors are made from stainless steel (material no. 1.4401, 1.4571 or 1.4404) corresponding to a corrosion resistance class CRC III in EN 1993-1-4                                                                                                                                                                                                                                                                                           |
| <b>3.2 Safety in case of fire (BWR2)</b>                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Reaction to fire                                                                                | The anchors are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364                                                                                                                                                                                                                                                                                                            |

## **4 Attestation and verification of constancy of performance (AVCP)**

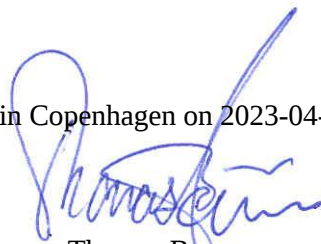
### **4.1 AVCP system**

According to the decision 97/161/EC the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

## **5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD**

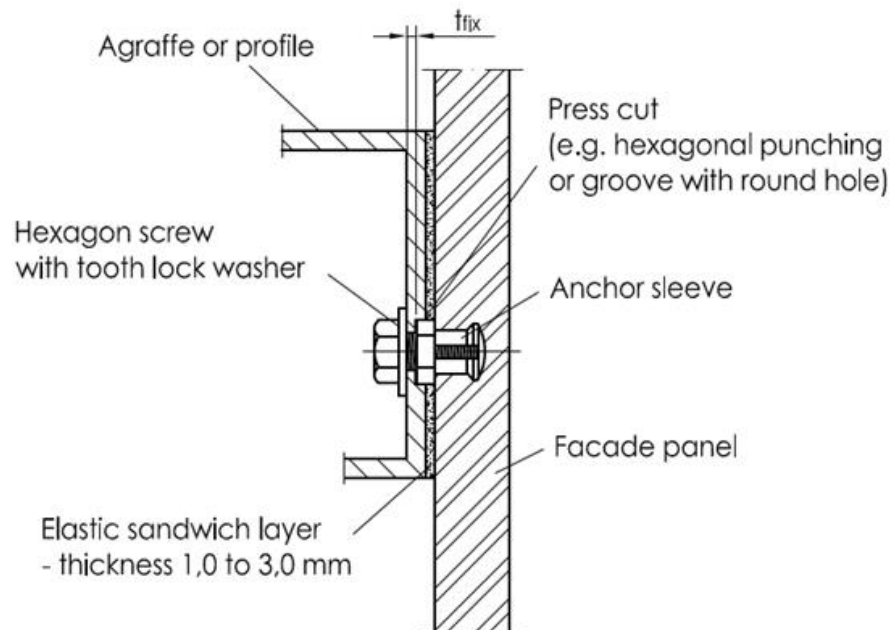
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking

Issued in Copenhagen on 2023-04-04 by

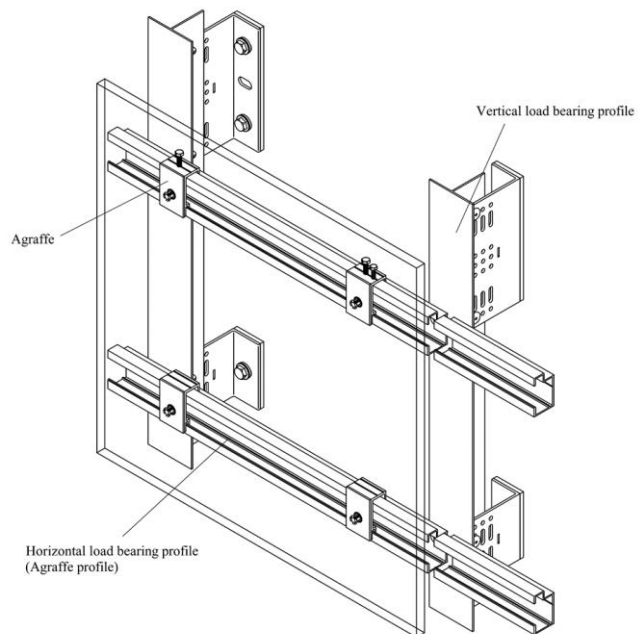


Thomas Bruun  
Managing Director, ETA-Danmark

### Example without distance washer



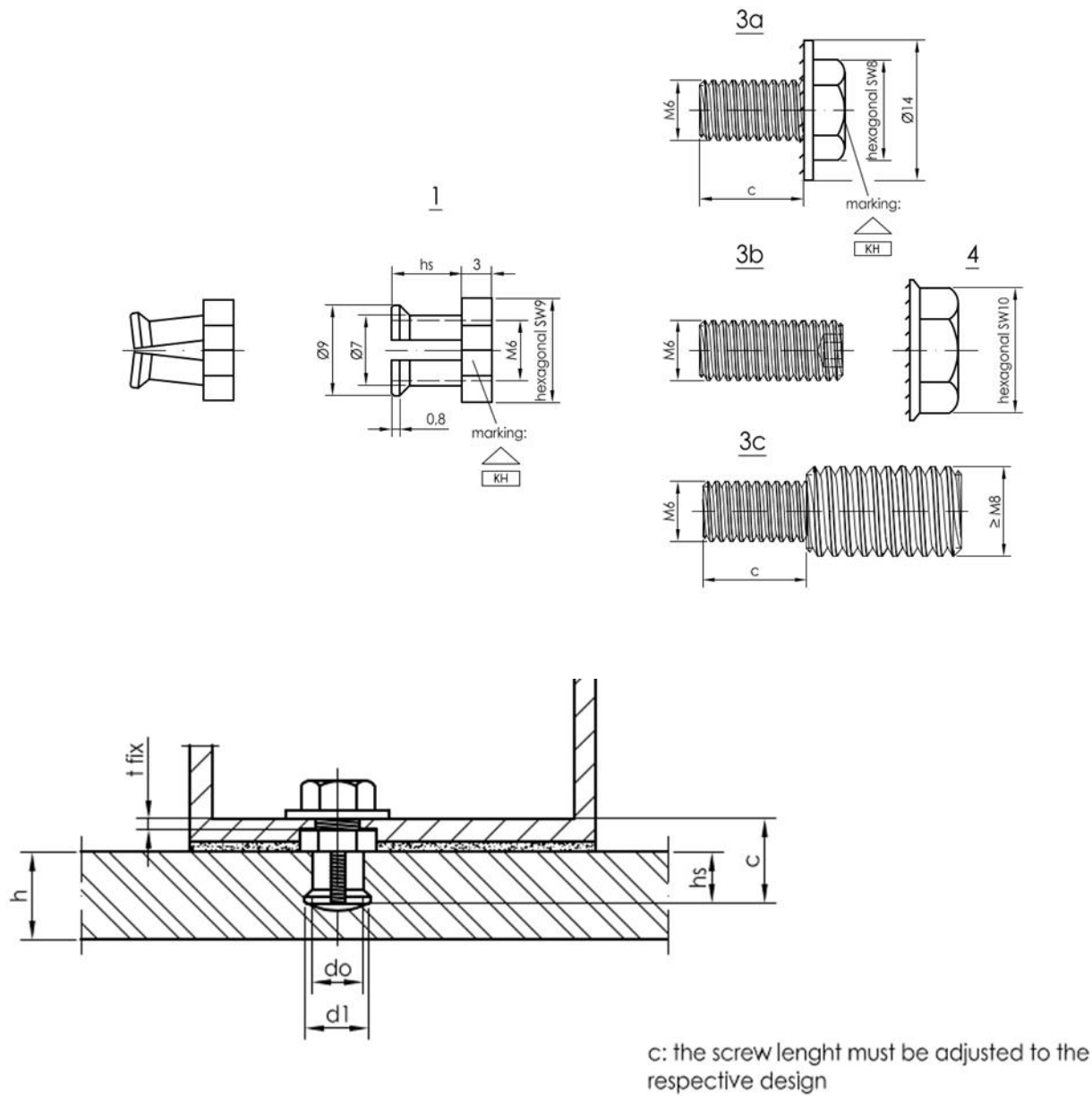
### Fixing example



**KEIL undercut anchor for fixing in facade panels made of CR Fibre GFC Elements**

Product and intended use

**Annex A1**  
of European  
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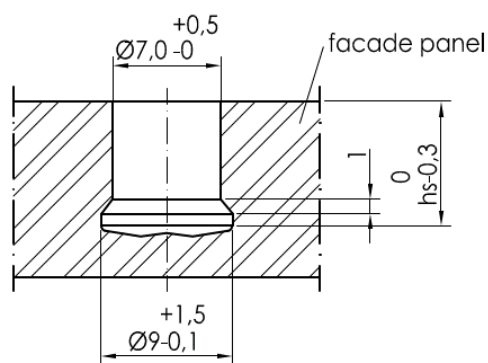
**Anchors sleeve dimension**

| <i>Characteristic values of installation</i> |                          | <b>KH 11,5 mm</b> |
|----------------------------------------------|--------------------------|-------------------|
| thickness of facade panel                    | $h$ [mm] =               | $18 < h < 22$     |
| Embedment depth / drill hole depth           | $h_s$ =                  | 11,5              |
| diameter of drill hole                       | $\varnothing d_0$ [mm] = | 7                 |
| diameter of undercut                         | $\varnothing d_1$ [mm] = | 9                 |
| thickness of agraffe material                | $t_{fix}$ [mm] =         | $2 < t_{fix} < 3$ |
| threaded length of screw                     | $c$ [mm] =               | $14,5 + t_{fix}$  |

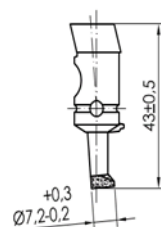
**KEIL undercut anchor for fixing in facade panels made of CR Fibre GFC Elements**

Parts of anchor and characteristic values for anchor installation

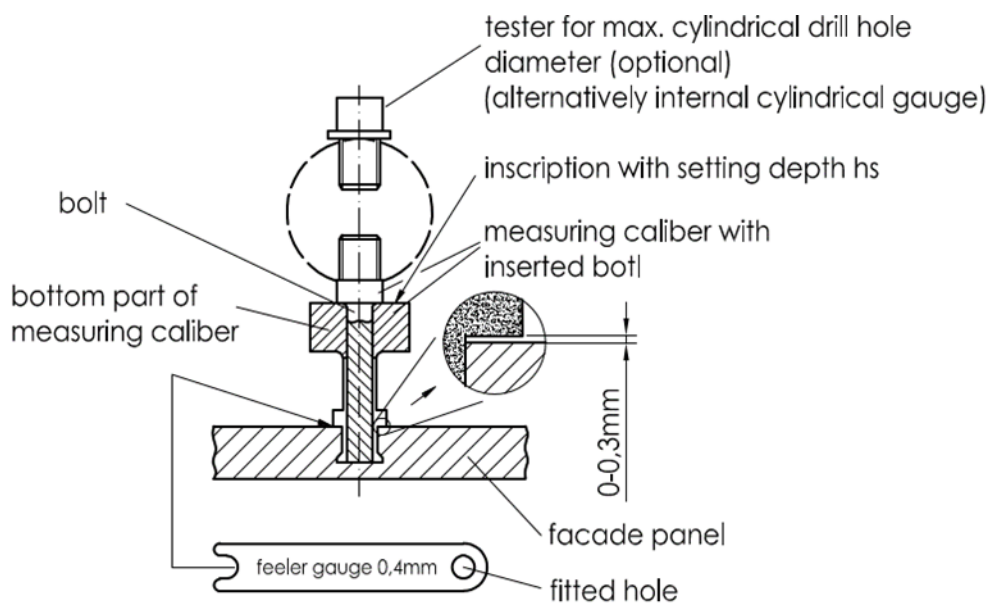
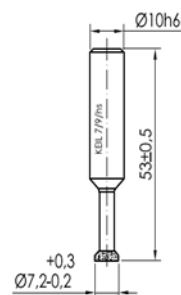
**Annex A2**  
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Diamond tipped facade drill bit



Diamond tipped facade drill bit CNC



**KEIL undercut anchor for fixing in facade panels made of CR Fibre GFC Elements**

Drill hole dimensions  
Setting tools and testing equipment

**Annex A3**  
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**Use:**

The anchors are intended to be used for anchorages for which requirements for mechanical resistance and stability in the sense of the Basic Requirements 1 of Regulation 305/2011 (EU) shall be fulfilled and failure of anchorages made with these products would compromise the stability of the works, cause risk to human life and/or lead to considerable economic consequences.

**Use conditions (Environmental conditions):**

Elements made of and stainless steel may be used in structures subject to the following conditions:

- Internal dry conditions
- Dry internal conditions, external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist.
  - o Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater, splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

**Installation:**

- The CR Fibre GFC Elements façade panels made from manufactured stone correspond to the drawings and specifications of the annexes. The characteristic material values, dimensions and tolerances of the façade panels not indicated in the annexes shall correspond to the respective values laid down in the technical documentation of this European Technical Assessment.
- Each façade panel is fixed with at least four anchors in rectangular arrangement via single agraffes to the substructure; the substructure is constructed such that the façade panels are fixed technically strain-free via skids (loose bearings) and one fixed bearing.
- The façade panels are arranged in a "reclined" or "upright" position, they also may be fixed at façade soffits.
- Two fixing points of the façade panel are designed such that they are able to carry the dead load of the façade panel.
- The load-bearing profiles are arranged symmetrically. The arrangement of the agraffes ensures a symmetric introduction of the load into the substructure.
- When using agraffes on horizontal load-bearing profiles the fixing points of a façade panel situated horizontally at the same height are fastened in each case to the same load-bearing profile.
- The façade panels neither are used to transmit impact loads nor for guard rail.
- Joint construction between the façade panels is done by a joint filler or is kept open. It is ensured that additional stresses (e.g. by temperature) do not lead to important additional loadings.

**Proposed design methods:**

The design values of the actions shall be calculated on basis of EN 1990 in consideration of the existing loads. The combinations of actions shall be equal to EN 1990. The actions shall be specified according to EN 1991-1-1 to EN 1991-1-7. The typical fundamental combination for façade panels considers actions from dead load  $F_{Sk,G}$  (permanent action) and wind  $F_{Sk,w}$  (leading variable action)

|                                                                                       |                                                                       |
|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>KEIL undercut anchor for fixing in facade panels made of CR Fibre GFC Elements</b> | <b>Annex B1</b><br>of European<br>Technical Assessment<br>ETA-21/0714 |
| Intended use - Specification                                                          |                                                                       |

**Table C1 Characteristic values for the design of the anchor and façade panel**

|                                      |                                             |                            |                                  |                   |                         |             |         |
|--------------------------------------|---------------------------------------------|----------------------------|----------------------------------|-------------------|-------------------------|-------------|---------|
| Characteristic values of facade pane | Maximum side ratio                          |                            | $L_x/L_y$ respectively $L_y/L_x$ | -                 | 1/3                     |             |         |
|                                      | panel thickness                             |                            | h                                | mm                | $18 < h < 22$           |             |         |
|                                      | characteristic resistance to bending stress |                            | $\sigma_{rk, 5\%} =$             | N/mm <sup>2</sup> | 4,15                    |             |         |
|                                      | partial safety factor <sup>1)</sup>         |                            | $\gamma_M =$                     | -                 | 1,8                     |             |         |
|                                      | modulus of elasticity, average value        |                            | E =                              | N/mm <sup>2</sup> | 8000±2000               |             |         |
|                                      | thermal coefficient                         |                            | $\alpha_T =$                     | 1/K               | $8 - 12 \times 10^{-6}$ |             |         |
|                                      | density                                     |                            | $\delta =$                       | g/cm <sup>3</sup> | 2,28                    |             |         |
| Characteristic values of the anchor  | characteristic resistance to                | tension load <sup>2)</sup> | $N_{rk,5\%} =$                   | kN                | 1,33                    | 1,25        | 0,69    |
|                                      |                                             | shear <sup>2)</sup>        | $V_{rk,5\%} =$                   | kN                | 2,36                    | 2,20        | 1,23    |
|                                      | Embedment depth/drill hole depth            |                            | $h_s =$                          | mm                | 11,5                    |             |         |
|                                      | edge distance <sup>3)</sup>                 |                            | $a_{rx}$ or $a_{ry} \geq$        | mm                | 50                      |             |         |
|                                      | Spacing <sup>4)</sup>                       |                            | $a_x$ or $a_y$                   | mm                | $\leq 400$              | $> 400$     | $> 700$ |
|                                      |                                             |                            |                                  |                   | $\leq 700$              | $\leq 1250$ |         |
|                                      | partial safety factor <sup>1)</sup>         |                            | $\gamma_M =$                     | -                 | 1,8                     |             |         |

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup> In case of coincident stress of an anchor due to tension and shear load following equation shall be observed:

$$\frac{N_{Ed}}{N_{Rd}} + \frac{V_{Ed}}{V_{Rd}} \leq 1.0$$

<sup>3)</sup> For small fitted pieces, differential and fill-in pieces the edge distance and spacing shall be chosen constructively

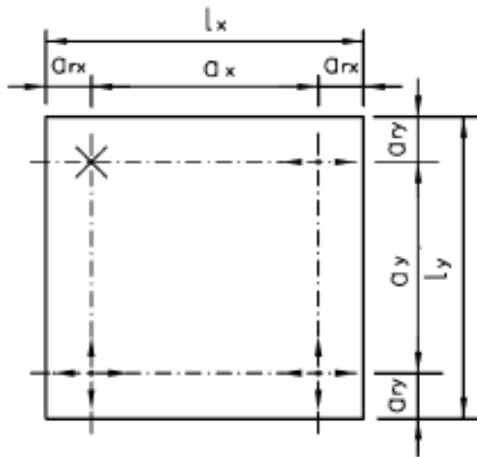
<sup>4)</sup> The maximum of distance is governed by the load bearing capacity of the panel and determined through the static calculation

**KEIL undercut anchor for fixing in facade panels made of CR Fibre GFC Elements**

Characteristic values for the design of the anchor and façade panel

**Annex C1**  
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### Definition of edge distance and spacing



#### Legend:

$a_{Rx,y}$  = edge distance – distance of an anchor to the panel edge

$a_{x,y}$  = spacing – distance between anchors

$L_x$  = 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)

### Torsion of the load-bearing profile due to dead loads of the façade panel

In case of flush fixing of the anchor and when using horizontal load-bearing profiles:

Due to torsion of the load-bearing profile resulting from dead load of the façade panel the following load  $N_{Sk,V}$  shall be considered in direction to the anchor axes:

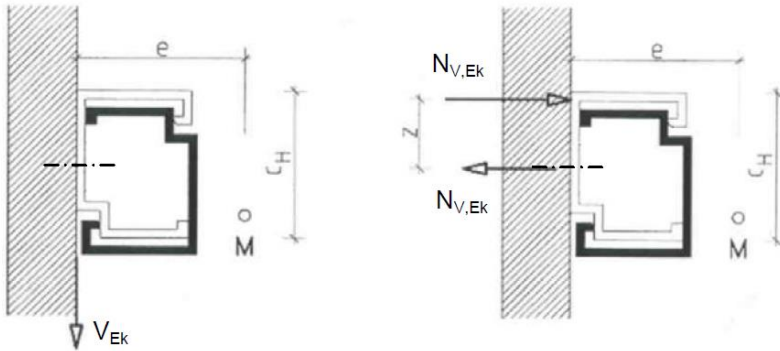
$$N_{V,Ek} = V_{Ek} \cdot 2e/c_H$$

Where

$V_{Ek}$  = shear load due to dead load of the façade panel

$e$  and  $c_H$  [mm] see figure

$M$  shear centre



**KEIL undercut anchor for fixing in facade panels made of CR Fibre GFC Elements**

Definition of edge distance and spacing  
Torsion of load-bearing profile

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