

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-16/0097**  
**of 20 October 2017**

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

FibreCem-undercut anchor Keil for FibreCem-facade  
panels

Product family  
to which the construction product belongs

Fastener for the rear fixing of façade panels made of fibre  
cement flat sheets according to EN 12467:2012

Manufacturer

FibreCem Deutschland GmbH  
Lohmener Straße 15  
01833 Porschendorf  
DEUTSCHLAND

Manufacturing plant

Plant 1

This European Technical Assessment  
contains

16 pages including 3 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

**European Technical Assessment  
ETA-16/0097**

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English translation prepared by DIBt

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**Specific Part****1 Technical description of the product**

The "FibreCem-undercut anchor Keil" for FibreCem-façade panels is a special anchor made of a crosswise slotted anchor sleeve with internal thread and a rectangular sheet metal at the top, a related screw and a shimer. The anchor sleeve, screw and shimer are made of stainless steel. The anchor is put into an undercut drill hole, locked against rotation by setting to the fixing member (single agraffe, double agraffe, long-span agraffe or panel load-bearing profile) and placed form-fitted and anchored way-controlled by pulling the screw.

The product description is given in Annex A.

**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 anchor 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 anchors 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 for tension and shear loads	See Annex C 1
Anchor distances and dimensions of members	See Annex C 1

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

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

**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.

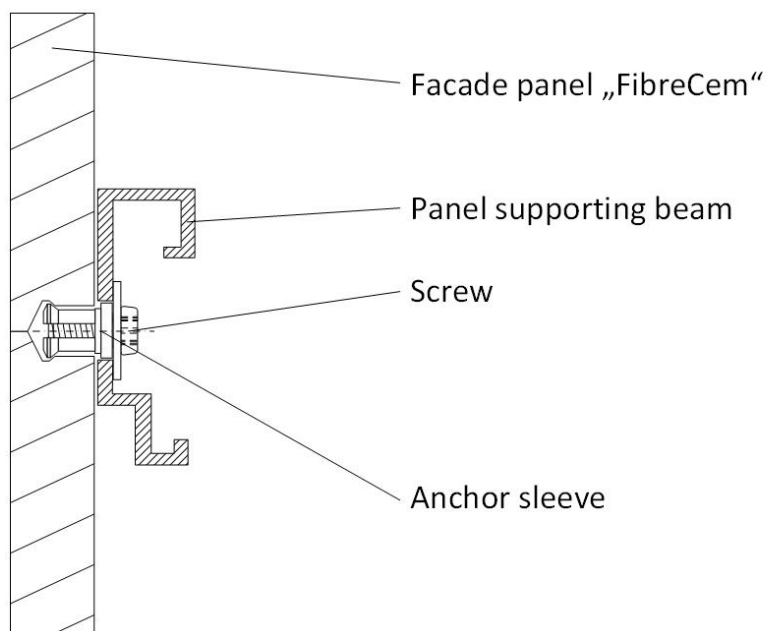
Issued in Berlin on 20 October 2017 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow  
Head of Department

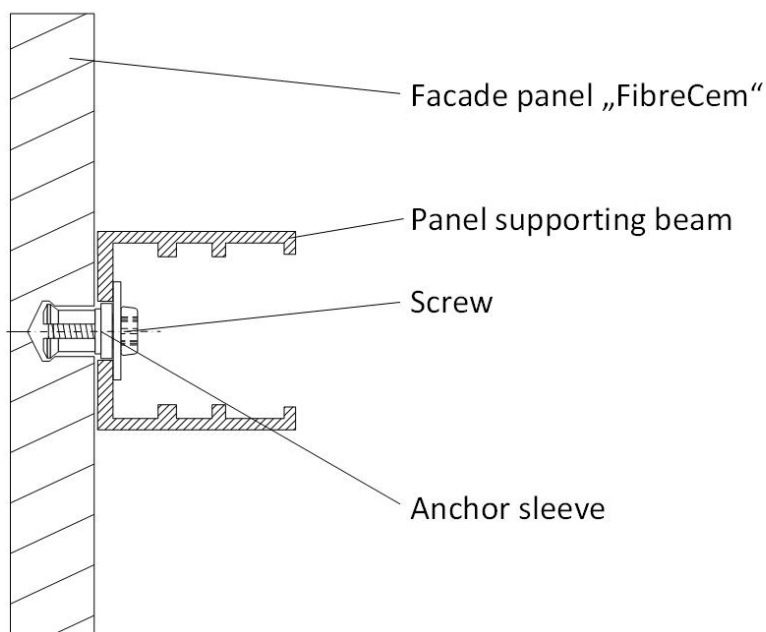
*beglaubigt:*  
Aksünger

# Installed fastener

## Fixing example agraffe with facade panel



## Fixing example panel supporting beam with facade panel

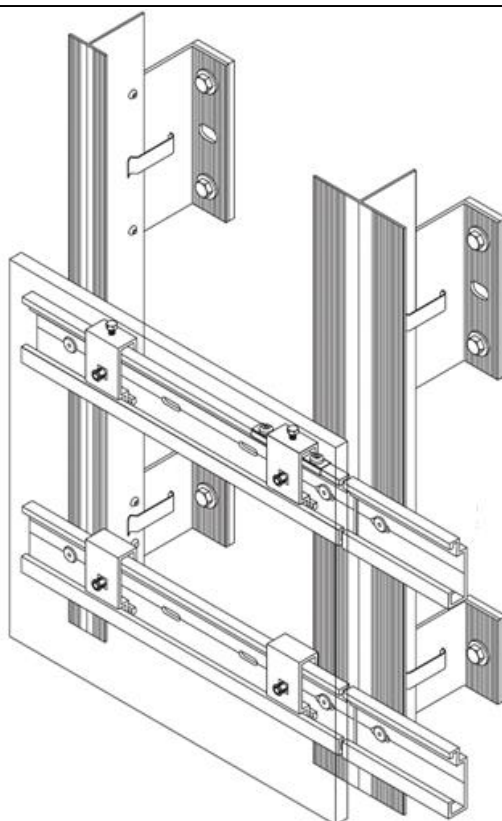


FibreCem-undercut anchor Keil for FibreCem-facade panels

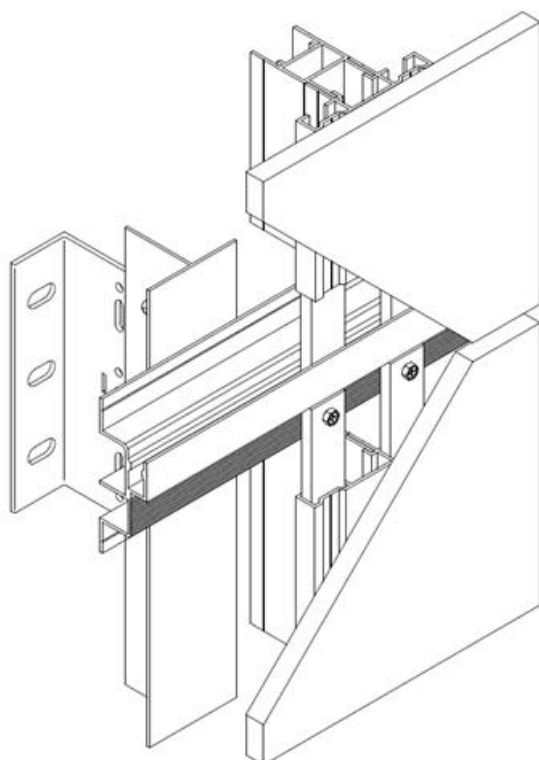
**Product description**  
Installed fastener

Annex A 1

**Example for a facade  
construction with  
agraffes**



**Example for a facade  
construction with panel  
supporting beam**

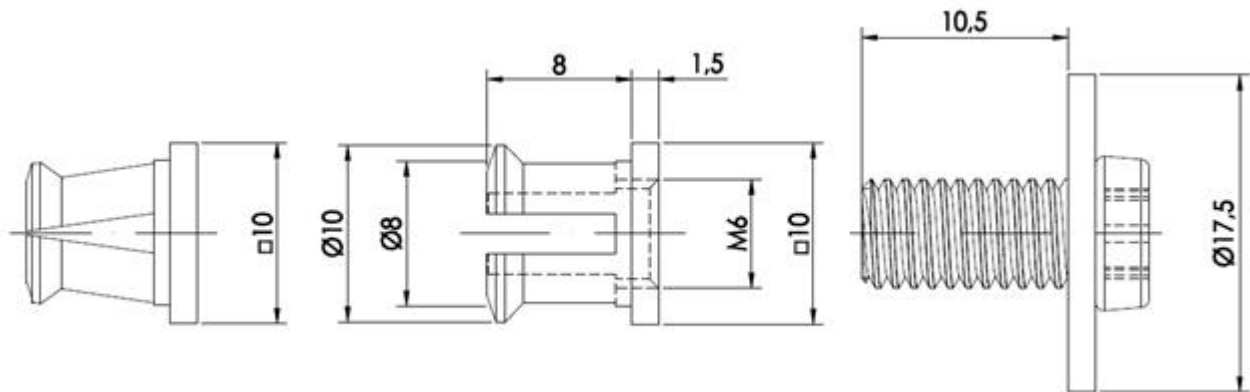


FibreCem-undercut anchor Keil for FibreCem-facade panels

**Product description**  
Fixing examples

Annex A 2

### Anchor sleeve and screw



Supplied condition of the anchor sleeve

anchor sleeve

flat hat screw with rolled shim

### Borehole geometry

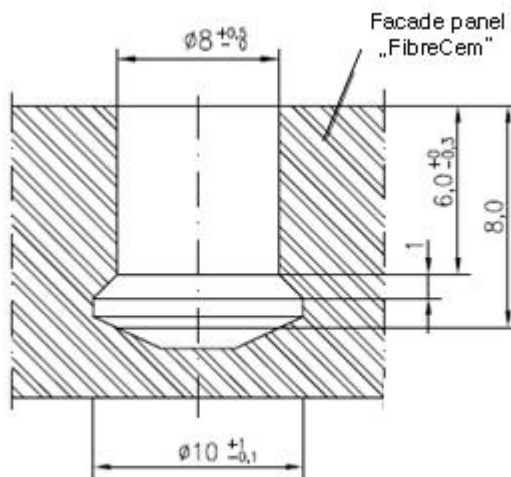


Table 1 Dimensions

embedment depth	$h_s =$	[mm]	8
panel thickness	$h_{nom} \geq$	[mm]	12
diameter of drill hole	$d_0 =$	[mm]	8
diameter of undercut	$d_1 =$	[mm]	10
installation torque moment	$T_{inst}$	[Nm]	$2,5 \leq T_{inst} \leq 4,0$

Table 2 Materials

anchor sleeve	Stainless steel 1.4404 according to EN 10088:2014
Screw with shim	Stainless steel 1.4401, 1.4404 or 1.4578 according to EN 10088:2014

FibreCem-undercut anchor Keil for FibreCem-facade panels

**Product description**  
Anchor sleeve and screw, borehole geometry

Annex A 3

## Specifications of intended use

### Anchorage subject to:

- Static and quasi-static loads.

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions.
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist.

Note: 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 desulphurization plants or road tunnels where de-icing materials are used).

### Base materials:

- FibreCem façade panels according to EN 12467:2012

In regard to the properties, composition and other requirement of fibre-cement flat sheets, the flat sheet type "FibreCem" comply with class 4, category A according EN 12467:2012.

For admissible deviation of the nominal dimensions apply level I according to EN 12467:2012. For admissible deviation of straightness of the edges and the admissible deviation of the rectangularity apply level I according to EN 12467:2012.

- The characteristic values of the façade plates correspond to Table B1.

Tabelle B1: characteristic values of the façade plates – geometrical und physical properties

Maximum panel size	$L_x \times L_y$ or $L_y \times L_x$	[mm]	3020 x 1270
Nominal thickness of façade panel	$h_{nom} \geq$	[mm]	12
Modulus of elastic	$E_{mean} =$	[N/mm <sup>2</sup> ]	13000
Poisson ratio	$\nu =$	[-]	0,25
Specific weight	$\gamma =$	[kN/m <sup>3</sup> ]	22,0
density - dry	$\rho$	[g/cm <sup>3</sup> ]	1,65 - 1,95
Bending stress (crossway direction) without climatic pre-stressing <sup>2)</sup>	$\sigma_{5\%}^{1)} \geq$	[N/mm <sup>2</sup> ]	18,5
Bending stress (crossway direction) after storage in water <sup>3)</sup>	$\sigma_{5\%,WL}^{1)} \geq$	[N/mm <sup>2</sup> ]	15,7

<sup>1)</sup> 5%-Quantil by a confidence level of 75 % and unknown standard deviation

<sup>2)</sup> Dry storage, according to EN 12467:2012, table 10, line 2; the visible face of bending pressure zone.

<sup>3)</sup> Storage in water, according to EN 12467:2012, table 10, line 2; the visible face of bending pressure zone.

FibreCem-undercut anchor Keil for FibreCem-facade panels

**Intended use**  
Specifications

Annex B 1



## Design:

### General:

- Each façade panel is fixed with at least four anchors in a rectangular arrangement via single agraffes on the substructure (for small panels or small fitted pieces, differential or fill- in pieces the number and position of the anchors shall be chosen constructively).
- Edge distance and spacing shall be observed. For small fitted pieces, differential and fill-in pieces the edge distance and spacing shall be chosen.
- 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 fixed point may be placed at the panel edge or in the panel field.
- Two fixing points of the façade panel are designed such that they are able to carry the dead load of the façade panel.
- Constraint loads shall be into account for design, If constraint loads exists.
- 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 thickness of the fixing member (agraffe or panel load-bearing profile) shall be at least 2,0mm and must not exceed 3,0 mm.
- At the agraffes or panel load-bearing profiles shall be arranged one square hole with 10.2 mm x 10.2 mm (fixed point). Agraffes with two anchors shall provide one rectangular hole with the dimension 10.2 mm x 14.2 mm (sliding point). At the panel load-bearing profile shall be arranged further holes with the dimension 10.2 mm x 20 mm to ensure a strain-free bearing of the façade panels at the panel load-bearing profile. Annex B 5 shows fixed points and loose points.
- Verifiable calculation notes and drawings shall be prepared taking account of the loads to be anchored, the nature and strength of the base materials and the dimensions of the anchorage members as well as of the relevant tolerances. The position of the anchor is indicated on the design drawings.

FibreCem-undercut anchor Keil for FibreCem-facade panels

**Intended use**  
Specifications

Annex B 2

Verification ultimate limit state

Anchorage are designed under the responsibility of an engineer experienced in anchorages and facade construction.

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

$$\frac{V_{Ed}}{V_{Rd}} \leq 1$$

$$\frac{N_{Ed}}{N_{Rd}} + \frac{V_{Ed}}{V_{Rd}} \leq 1$$

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

$$N_{Ed} = N_{Ek,w} \cdot \gamma_F + N_{Ek,v} \cdot \gamma_F$$

$N_{Ek,w}$ : characteristic value of the tensile force of wind load

$\gamma_F$ : partial safety factor according to EN 1990:2010

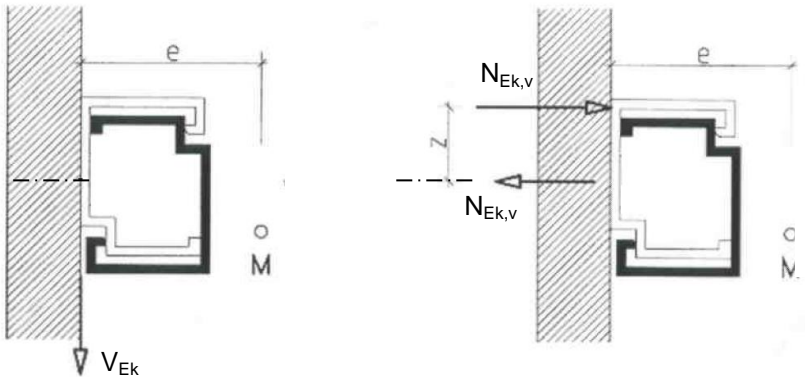
$N_{Ek,v}$ : For flush fixed anchors and for installation of horizontal load-bearing profiles permanent loads due to torsion of the profile shall be considered in addition to actions from dead load and wind in direction of the anchor axes. The verification can be omitted, if there is no horizontal distance between anchor and vertical load-bearing profile ( $N_{Ek,v} = 0$ ).

$$N_{Ek,v} = V_{Ek} \cdot e / z$$

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

$e$  and  $z$  [mm] see picture

$M$  shear centre



$N_{Rd}$ : design value of the tensile load-bearing capacity

$$N_{Rd} = N_{Rk} / \gamma_M$$

$N_{Rk}$ : characteristic value of the tensile load-bearing capacity according to Table C1

$\gamma_M = 1,8$ ; recommended partial safety factor, in absence of national regulations

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

$$V_{Ed} = V_{Ek} \cdot \gamma_F$$

$V_{Ek}$ : characteristic value of the shear force

$\gamma_F$ : partial safety factor according to EN 1990:2010

$V_{Rd}$ : design value of the shear load-bearing capacity

$$V_{Rd} = V_{Rk} / \gamma_M$$

$V_{Rk}$ : characteristic value of the shear load-bearing capacity according to Tabelle C1

$\gamma_M = 1,8$ ; recommended partial safety factor, in absence of national regulations.

FibreCem-undercut anchor Keil for FibreCem-facade panels

Intended use  
Specifications

Annex B 3

#### Installation:

- The drillings are done at the factory or on site under workshop conditions; when making the drillings on site the execution is supervised by the responsible project supervisor or a skilled representative of the project supervisor.
- Making of the undercut drilling is done with the drill bit according to Annex B 7 and a special drilling device in accordance with the information deposited with Deutsches Institut für Bautechnik.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole.
- the geometry of the drill hole is checked on 1 % of all drillings. The following dimensions shall be checked and documented according to manufacturer's information and testing instructions by means of a measuring device according to Annex B 7:

- Volume of the undercut drill hole.
- Depth position of the undercut; the distance between the lower edge of the measuring device and the façade panel is between 0,0 and 0,3 mm (see Annex B 5).

If the tolerances given in Annex A 3, Table 1 are exceeded, the geometry of the drill hole shall be checked on 25% of the drillings performed. No further drill hole may exceed the tolerances otherwise all the drill holes shall be controlled. Drilling holes falling below or exceeding the tolerances shall be rejected.

Note: Checking the geometry of the drill hole on 1 % of all drillings means that on one of the 25 panels (this corresponds to 100 drillings in façade panels with four anchors) one drilling shall be checked. If the tolerances given in Annex A 3, Table 1 are exceeded the extent of the control shall be increase to 25 % of the drillings, i.e. one drilling each shall be checked on all the 25 panels.

- During transport and storage on site the façade panels are protected from damages; the façade panels are not be hung up jerkily (if need be lifters shall be used for hanging up the façade panels); façade panels and reveal panels respectively with incipient cracks are not be installed.
- The façade are installed by skilled specialists and the laying instructions of the manufacturer shall be paid attention to.
- The anchor is put into an undercut drill hole, locked against rotation by setting to the fixing member and placed form-fitted and anchored way-controlled by pulling the screw. Fixing the screw is achieved with a torque moment ( $2,5 \text{ Nm} \leq T_{\text{inst}} \leq 4,0 \text{ Nm}$ ) using a calibrated torque.
- Installation of the anchor in rectangular holes (sliding points) needs additional spring washers between anchor sleeve and washer.
- The façade panels are arranged in a "reclined" or "upright" position.
- Overhead mounting is not possible

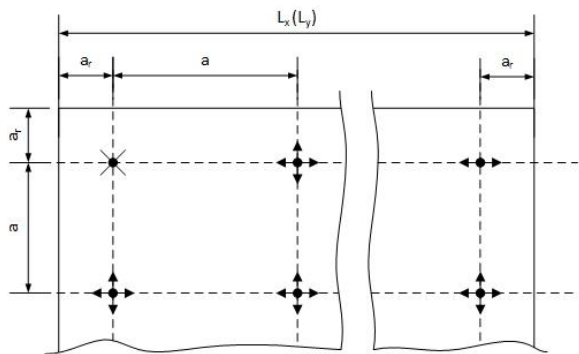
FibreCem-undercut anchor Keil for FibreCem-facade panels

**Intended use**  
Specifications

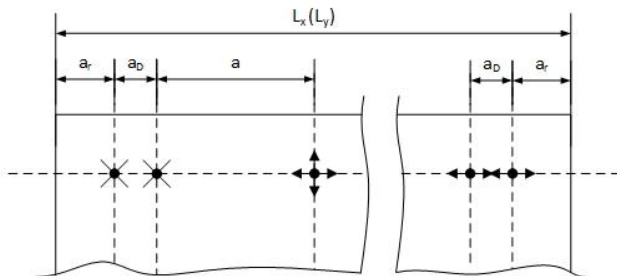
Annex B 4

Definition of edge distance and spacing




single fixing



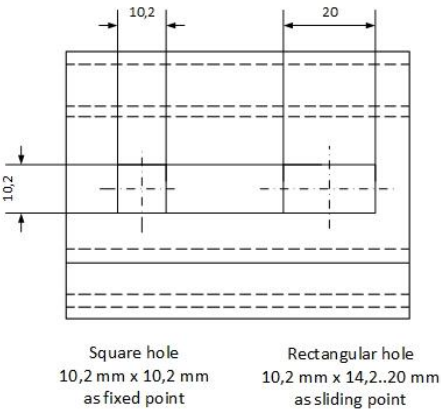
fixing with double agraffes



Legend

- $a$  = spacing – distance between anchors
- $a_D$  = spacing – distance between anchors of double agraffes
- $a_r$  = edge distance – distance between anchor and panel edge
- $L_x$  = length of the facade panel in horizontal direction
- $L_y$  = length of the facade panel in vertical direction
-  = fixed point (locating bearing) between facade panel and substructure
-  = horizontal sliding point (floating bearing) between panel and substructure
-  = horizontal and vertical sliding point between facade panel and substructure

Geometry of holes in the mounting part for fixed point and horizontal sliding point

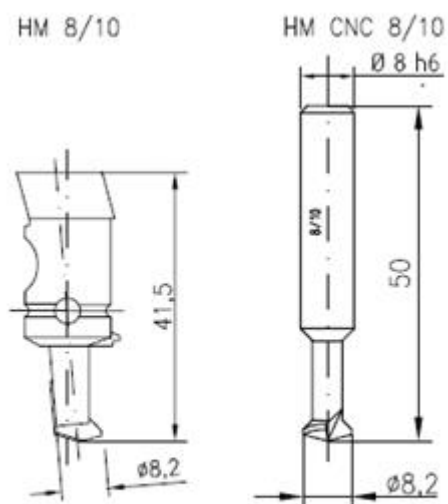


FibreCem-undercut anchor Keil for FibreCem-facade panels

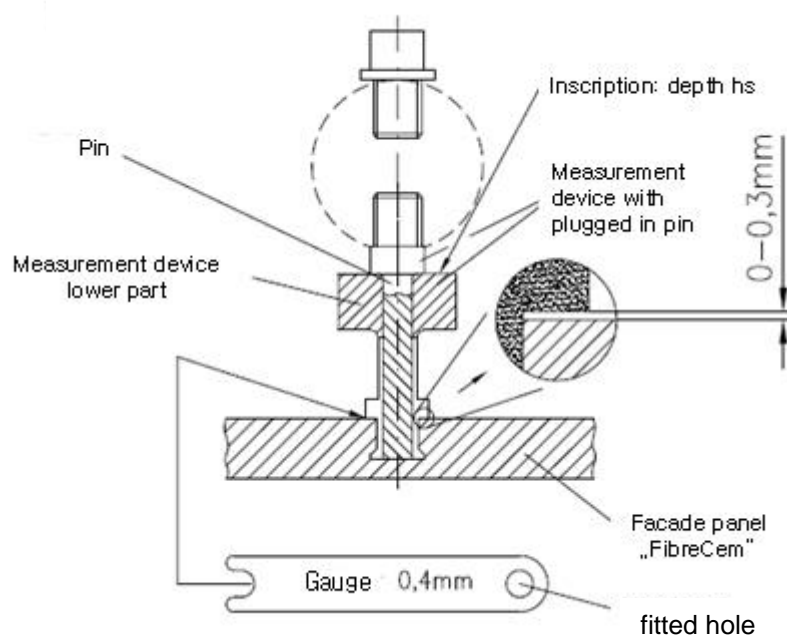
Intended use  
Definition of edge distance and spacing

Annex B 5

### Driller geometry



### Measurement device



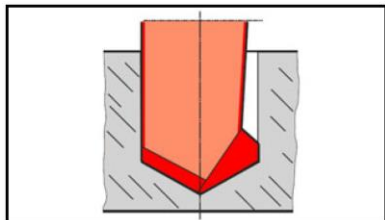
FibreCem-undercut anchor Keil for FibreCem-facade panels

**Intended use**  
Driller geometry and measurement device

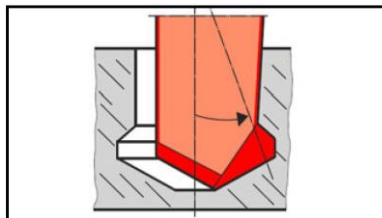
Annex B 6

## Installation instruction

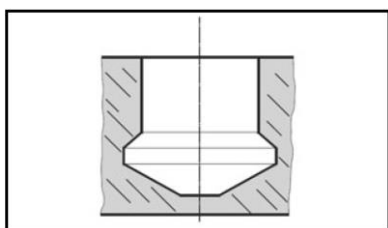
### 1. Generate of undercut hole



a) Drilling

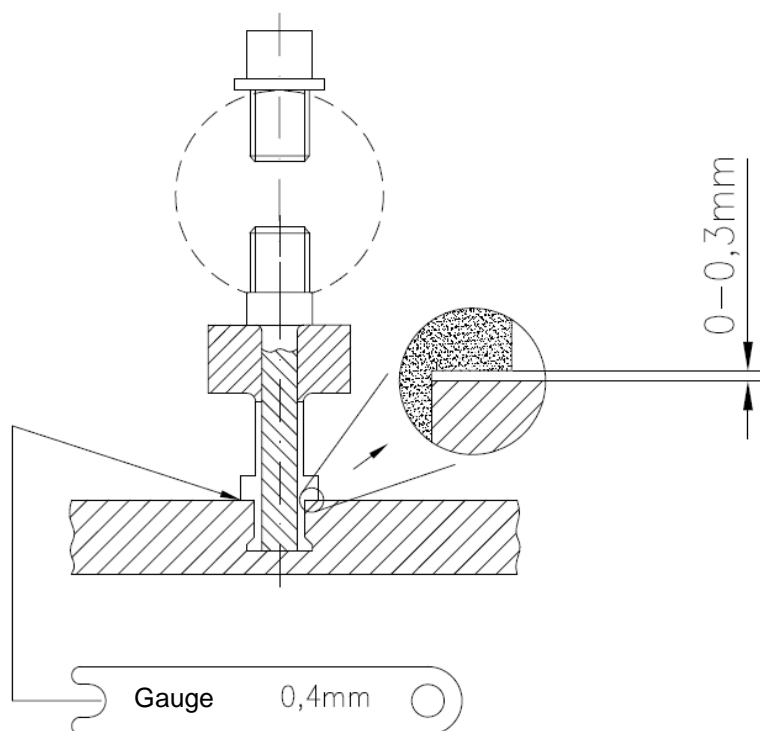


b) Undercutting



c) Undercut Hole

### 2. Checking the undercut hole

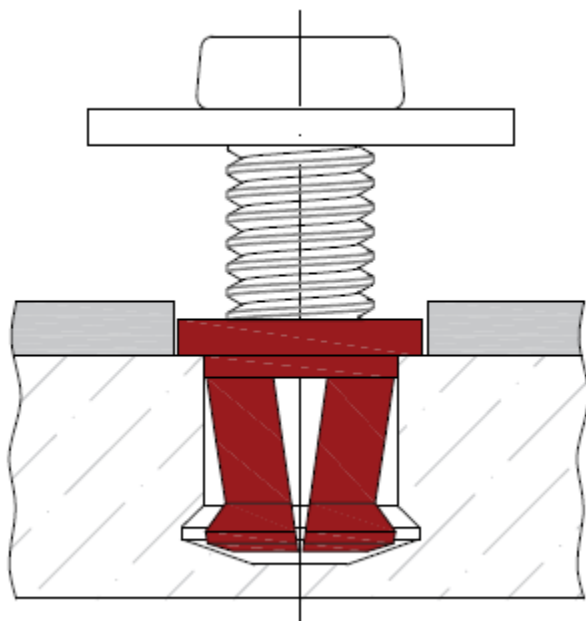


FibreCem-undercut anchor Keil for FibreCem-facade panels

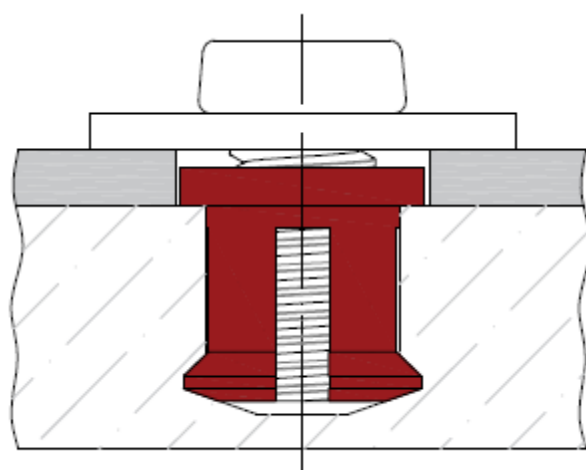
**Intended use**  
Installation instruction

Annex B 7

### 3. Installation (anchor sleeve and screw)



a) Form fit installation of anchor sleeve by tightening with screw



b) Installed undercut anchor

FibreCem-undercut anchor Keil for FibreCem-facade panels

**Intended use**  
Installation instruction

Annex B 8

# **Characteristic values of the anchor in FibreCem facade panel according Table B 1**

Table C1

Embedment depth	$h_s =$	[mm]	8
Characteristic resistance	tension load	$N_{Rk} =$	1,49
	shear load	$V_{Rk} =$	4,74
Edge distance	$a_r \geq$	[mm]	50
Spacing	$a$	[mm]	$100 \leq a \leq 700$
Spacing double agraffe	$a_D \geq$	[mm]	45

FibreCem-undercut anchor Keil for FibreCem-facade panels

## **Performance**

Characteristic values of the anchor in FibreCem facade panel

Annex C 1