

Approval body for construction products
and types of construction

Bautechnisches Prüfamnt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-15/0615
of 19 September 2016

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Trade name of the construction product

Product family
to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment
contains

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

Deutsches Institut für Bautechnik

Keep-nut

Fastener for the rear fixing of facade panels according to
EN 14411:2012

Specialinsert
Via Monfalcone 144
10136 TORINO
ITALIEN

Specialinsert - Factory in Maerne di Martellago (Venice)
ITALY

14 pages including 3 annexes which form an integral part
of this assessment

European Assessment Document (EAD)
330030-00-0601

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Specific part

1 Technical description of the product

The Specialinsert Keep-Nut is an anchor consisting of a press in self-anchoring threaded sleeve with two or four crowns and an internal thread sleeve. The anchors are made of stainless steel assembled together with a PA6. The anchor is placed in a drill hole in the façade panel and it is anchored by deformation controlled mechanical interlock which is induced by insertion.

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

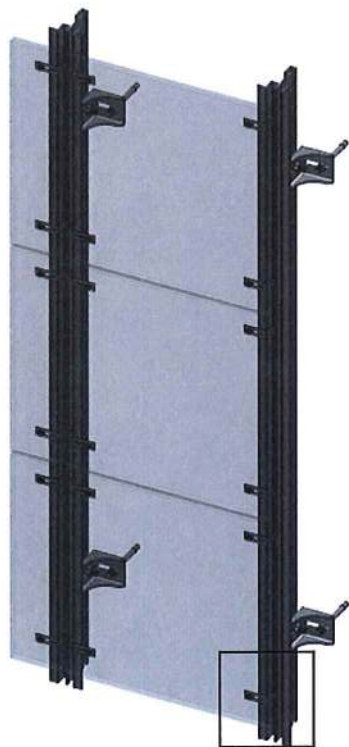
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 19 September 2016 by Deutsches Institut für Bautechnik

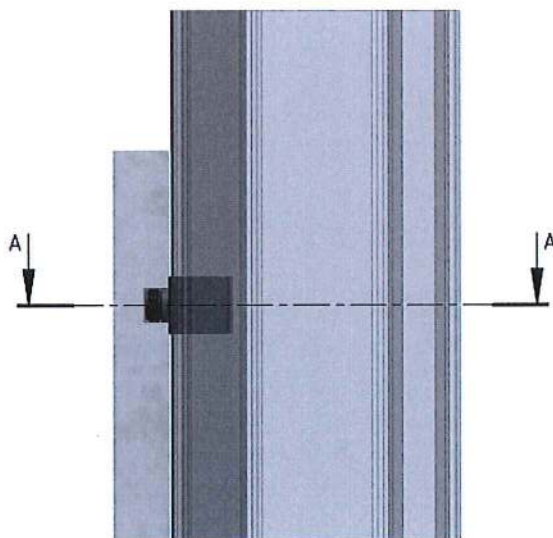
Andreas Kummerow
p. p. Head of Department

beglaubigt:
Aksünger

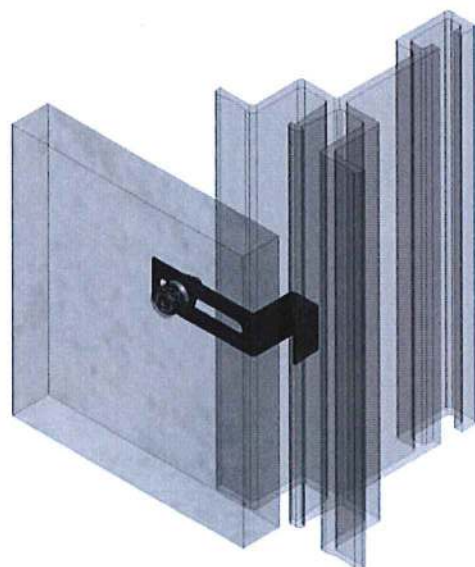
Fixing example



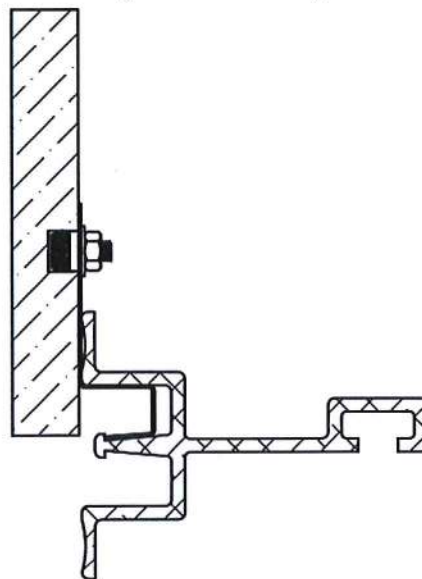
**Installed fastener
(Side view)**



**Installed fastener
(3D view)**



**Installed fastener
(Section A - A)**

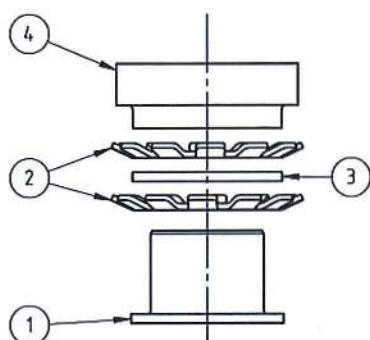


Keep-nut

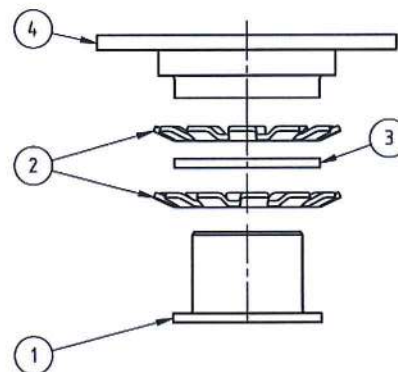
Product description
Fixing example and installed fastener

Annex A 1

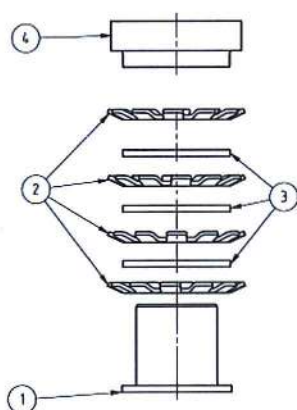
IM2S/M.../H6/K



IM2T/M.../H6/K



IM4S/M.../H8.5/K



IM4T/M.../H8.5/K

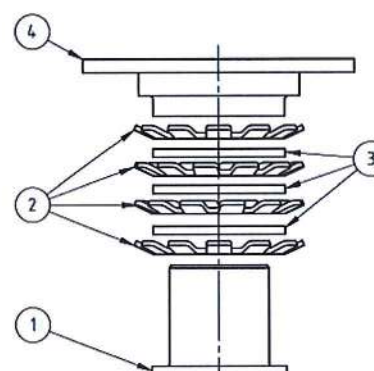


Table 1 Materials

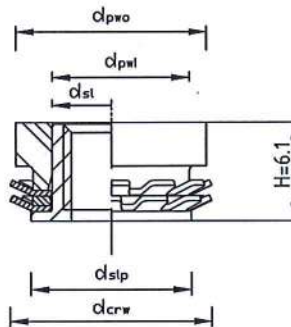
Anchor type	IM2S/M.../H6/K	IM2T/M.../H6/K	IM4S/M.../H8.5/K	IM4T/M.../H8.5/K
① Sleeve	stainless steel 1.4404 according to EN 10088:2014			
② Crown				
③ Intermediate washer				
④ Plastic washer	Polyamide PA6			

Keep-nut

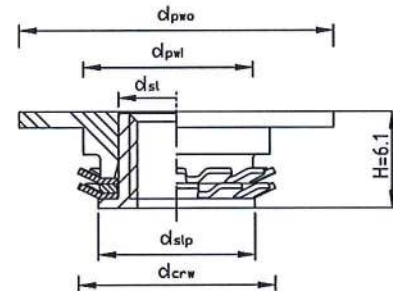
Product description
Materials

Annex A 2

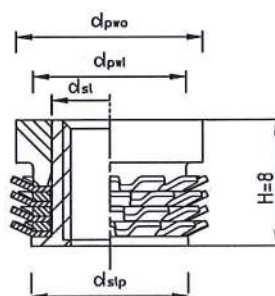
IM2S/M.../H6/K



IM2T/M.../H6/K



IM4S/M.../H8.5/K



IM4T/M.../H8.5/K

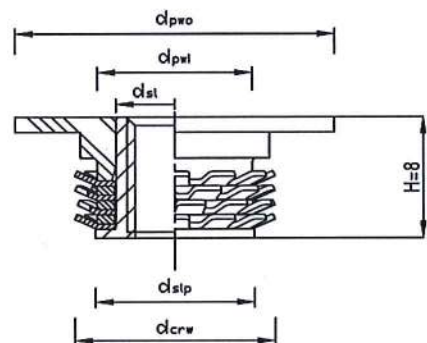


Table 2 Dimensions

Anchor type		IM2S/M.../H6/K	IM2T/M.../H6/K	IM4S/M.../H8.5/K	IM4T/M.../H8.5/K
diameter of sleeve	$d_{sl} =$ [mm]	7,4			
diameter of sleeve plate	$d_{slp} =$ [mm]	10			
Internal thread of sleeve	$d_{slt} =$ [mm]	M4, M5, M6			
diameter of crown	$d_{crw} =$ [mm]	12,6			
diameter of intermediate washer	$d_{iw} =$ [mm]	9,8			
inside diameter of plastic washer	$d_{pwl} =$ [mm]	9,8			
outside diameter of plastic washer	$d_{pwo} =$ [mm]	11,9	19,9	11,9	19,9

Keep-nut

Product description
Dimensions

Annex A 3

Specifications of intended use

Anchorage subject to:

- Static and quasi-static loads.

Base materials:

- The stoneware façade panels shall be made of porcelain gres in accordance with EN 14411:2012. The façade panels shall belong to group AI_a, AI_b, BI_a or BI_b according to EN 14411:2012 and comply with the specifications given in Annex B 1 and B 2.

Use conditions (Environmental conditions):

- Structures subjected to dry internal conditions.
- Structures subjected to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist. For structures subjected to external atmospheric exposure or to permanently damp internal condition, the panels shall belong to group AI_a, BI_a according to EN 14411:2012 only and shall be resistant to freeze/thaw cycles and permanent water saturation.

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).

Installation:

- During transport and storage on site the panels must be protected from damages.
- The façade panels shall be handled with care; When appropriate, a lifter may be used to put in place the panels;
- Panels with visible cracks shall not be used.
- The drilling hole may be executed at the factory or on site under workshop conditions; the execution shall be supervised by the responsible project supervisor or a representative of the project supervisor.
- The drilling hole shall comply to the specification given in Annex B 3; every drilling hole shall be checked by means of the appropriate "GO / NO GO" measuring gauge depicted in Annex B 4 in accordance with the procedure detailed in Annexes B 5 and B 6. Holes exceeding the tolerances shall be rejected.
- In case of aborted hole, a new drilling shall be made at a minimum distance of at least three times the diameter of the aborted hole.
- The panels shall be installed by skilled specialists in accordance with the specifications provided by the designer and the manufacturer instructions.
- The anchor shall be perfectly flat to the surface (or, when applicable, with the flange in perfect contact with the surface) of the facade panel and there shall be no gap between the anchor and the fixture.

Keep-nut

Intended use
Specifications

Annex B 1

Requirements to stoneware panels

Classification test (Initial Type Test)

The stoneware panels shall be made of porcelain gres in accordance with EN 14411:2012 "Ceramic tiles - Definitions, classification, characteristics, evaluation of conformity and marking". The panels shall belong to group AI_a, AI_b, BI_a or BI_b according to EN 14411:2012.

The following values shall be checked on at least 10 samples:

- Bending strength – determined according to EN ISO 10545-4:2014 with the "anchoring" face subjected to tension; deviating from EN ISO 10545-4:2014 the dimension of the test specimen is $L \times b = 200 \text{ mm} \times 200 \text{ mm}$ and the support span is $l_2 = 180 \text{ mm}$.
- Axial tension load – determined on test specimens with dimensions of $L \times b = 200 \text{ mm} \times 200 \text{ mm}$, an edge distance of 100 mm and a support diameter of $\varnothing = 135 \text{ mm}$.
- Shear load – determined on test specimens with dimensions $L \times b = 200 \text{ mm} \times 200 \text{ mm}$, an edge distance of 100 mm and a support diameter of $\varnothing = 135 \text{ mm}$.

Acceptance test (Verification of Constancy of Performance)

For each construction project the following values shall be checked on at least 10 samples independent of the scope of delivery:

- Axial tension load – determined on test specimens with dimensions of $L \times b = 200 \text{ mm} \times 200 \text{ mm}$, an edge distance of 100 mm and a support diameter of $\varnothing = 135 \text{ mm}$.

From the test results (Classification and Acceptance tests) the 5%-Fractile (confidence level of 75%, unknown standard deviation and lognormal distribution) shall be determined. The 5%-Fractile values shall comply with the specification of Table 3.

Table 3 Geometrical and mechanical properties for stoneware panels

		Anchor code				U.M.
		IM2S/M.../H6/K	IM2T/M.../H6/K	IM4S/M.../H8.5/K	IM4T/M.../H8.5/K	
Borehole depth	$h_1 =$	6,5	5,5	8,5	8	(mm)
Panel thickness	$h \geq$	9	9	12	12	(mm)
Characteristic bending strength of the the panel	$R_k \geq$	35				(MPa)
Characteristic resistance to tensile loads	$N_{u5\%} \geq$	1,5		1,8		(kN)
Characteristic resistance to shear loads	$V_{u5\%} \geq$	1,6				(kN)

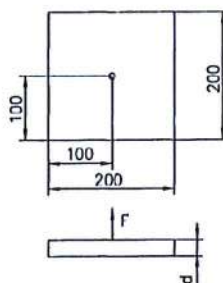


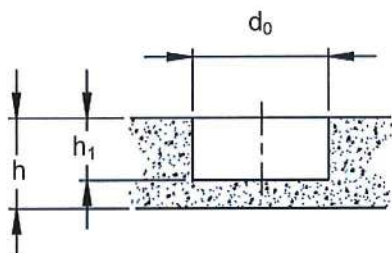
Figure 3.1 Test specimen for tension test

Keep-nut

Intended use
Requirements to stoneware panels

Annex B 2

Drill hole geometry



Bolt / threaded rod length

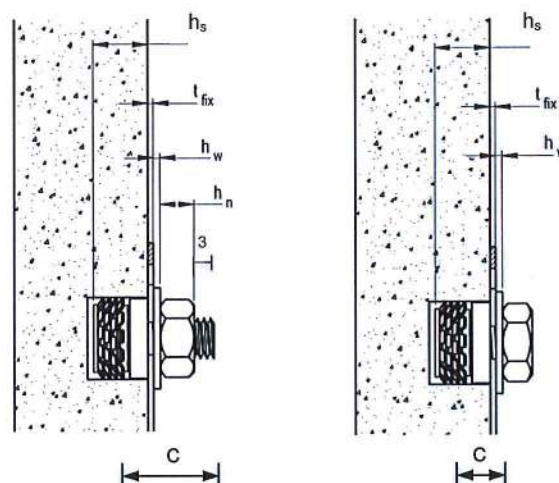


Table 4 Installation parameters

Anchor type		IM2S/M.../H6/K	IM2T/M.../H6/K	IM4S/M.../H8.5/K	IM4T/M.../H8.5/K
embedment depth	$h_s =$ [mm]	6,1	5,1	8	7,5
borehole depth	$h_1 =$ [mm]	6,5	5,5	8,5	8
panel thickness	$h \geq$ [mm]	9		12	
diameter of the drill hole	$d_0 =$ [mm]	12			
tightening torque moment	$T =$ [Nm]	1 for M4; 2,5 for M5; 4 for M6			
bolt length	$c =$ [mm]	$H - 1 + t_{fix} + h_w$			
Length of threaded rod with hexagonal nut	$c =$ [mm]	$H + 3 + t_{fix} + h_w + h_n$			

Requirement of the bolt

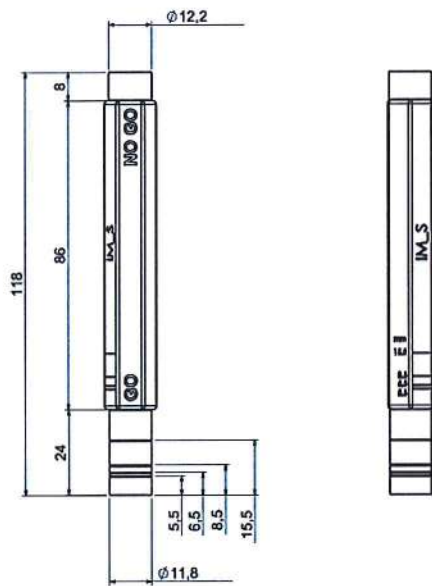
- Bolt size: M4, M5 or M6 according to EN ISO 3506-1:2009
- Threaded rod size: M4, M5, M6 according to EN ISO 3506-3:2009
- Hexagonal nut size: M4, M5, M6 according to EN ISO 3506-2:2009
- Materials: stainless steel 1.4301 or 1.4401 according to EN 10088:2014 with $f_{yk} \geq 200 \text{ N/mm}^2$ and $f_{uk} \geq 400 \text{ N/mm}^2$
- Only flush mounting
- The load-bearing capacity of the bolt or threaded rod shall be verified separately.

Keep-nut

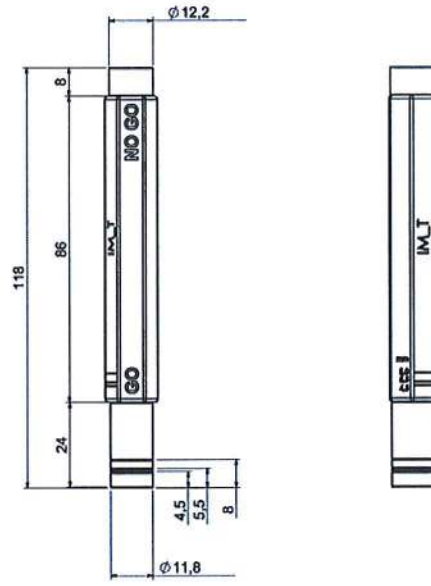
Intended use
Installation requirements

Annex B 3

Measuring gauge for IM_S



Measuring gauge for IM_T



Insertion tool



Keep-nut

Intended use
Measuring gauges, insertion tool

Annex B 4

Installation instructions

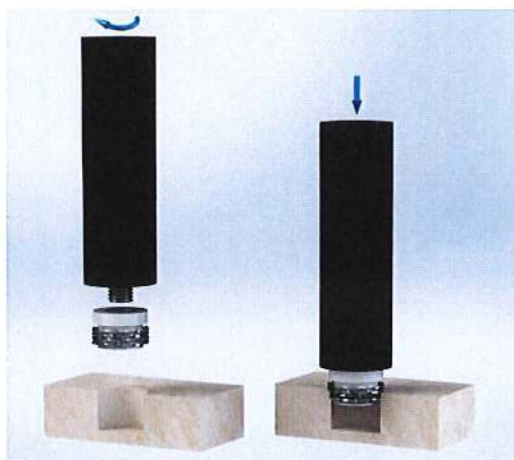
1. Prepare the hole in the facade panel ($\varnothing 12 \pm 0,2 \text{ mm}$)



2. Check the correct hole dimension with the GO / NO GO measuring gauge



3. Install the anchor by pressure using the insertion tool

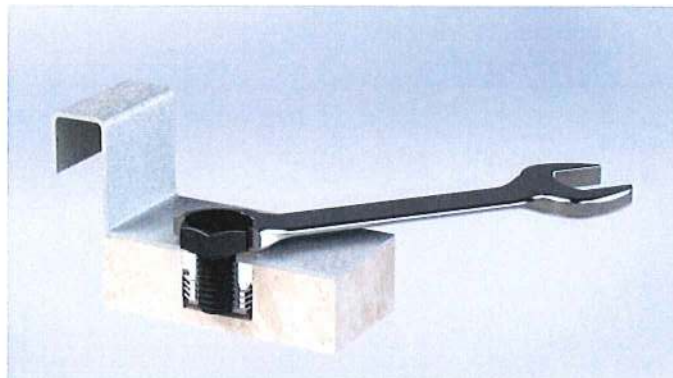
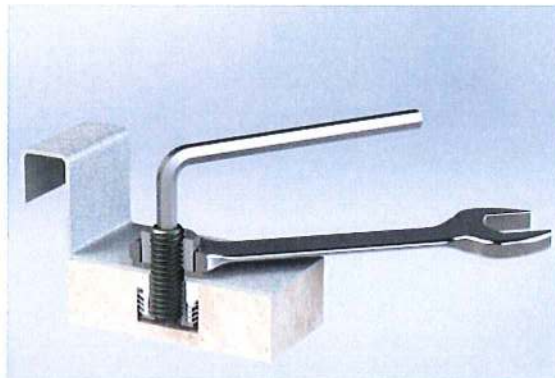


Keep-nut

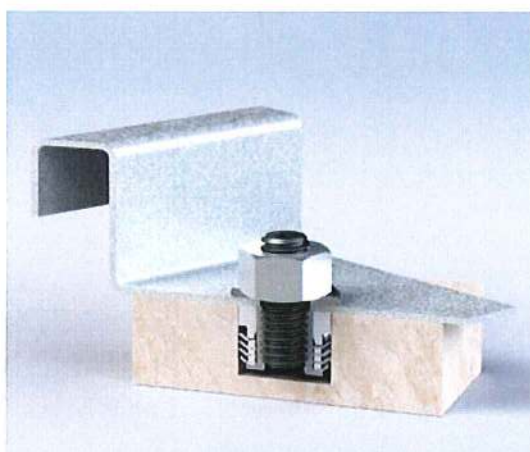
Intended use
Installation instructions

Annex B 5

4. Screw the pin or the bolt to fasten the fixture



5. Check the anchor is perfectly flat to the surface of the tile and there is no gap between the anchor and the fixture. The anchor is now correctly installed



Keep-nut

Intended use
Installation instructions

Annex B 6

Table 5 Performances of the anchor

		Anchor code				U.M.
		IM2T/M.../H6/K	IM2S/M.../H6/K	IM4T/M.../H8.5/K	IM4S/M.../H8.5/K	
Bore hole depth	$h_1 =$	5,5	6,5	8	8,5	(mm)
Panel thickness	$h \geq$	9	9	12	12	(mm)
Characteristic bending strength of the the panel ¹⁾	$R_k \geq$	35				(MPa)
Mean density of the panel ²⁾	$\rho \geq$	2100				(kg/m ³)
Water absorption ³⁾	$E_b \leq$	0,5				(%)
		3				
Characteristic resistance to tensile loads ⁴⁾	$N_{Rk} =$	1,5		1,8		(kN)
Characteristic resistance to shear loads ⁴⁾	$V_{Rk} =$	1,6				(kN)
Edge distance ^{5) 6)}	$a_r =$	100				(mm)
Spacing ⁶⁾	$a =$	200				(mm)
Partial safety factor ⁷⁾	$\gamma_M =$	1,8				(-)

¹⁾ The bending strength of the panel shall be declared in accordance with EN ISO 10545-4:2014 with the "anchoring" face subjected to tension.

²⁾ The density of the panels shall be declared in accordance with EN ISO 10545-3:1997.

³⁾ The water absorption of the panels shall be determined in accordance with EN ISO 10545-3:1997. The panels shall belong to group A₁, B₁, A₂, B₂ in accordance with EN 14411:2012. For structures subjected to external atmospheric exposure or to permanently damp internal condition, the panels shall belong to group A₁, B₁ only and shall be resistant to freeze/thaw cycles and permanent water saturation. Detailed specifications about use conditions are reported in Annexes B1 and B2.

⁴⁾ For the design forces acting on the anchor it shall be verified that the following equations are satisfied:

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

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

Equation 3: $\frac{N_{Ed}}{N_{Rd}} + \frac{V_{Ed}}{V_{Rd}} \leq 1$

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;

$N_{Rd} = N_{Rk} / \gamma_M$ design value of the tensile load-bearing capacity of the anchor;

$V_{Rd} = N_{Rk} / \gamma_M$ design value of the shear load-bearing capacity of the anchor.

The verification of the panel and the verification of the bending resistance of the screw is not taken into account by the above mentioned expressions and it must be carried out separately.

⁵⁾ The edge distance may be reduced up to 50 mm. For edge distances $50 \text{ mm} \leq a_r \leq 100 \text{ mm}$ the characteristic values of resistance for shear loads shall be reduced by the factor $a_r/100$ (a_r in mm is the smaller edge distance); in case of different edge distances the smaller value is decisive.

⁶⁾ For small fitted pieces, differential and fill-in pieces, the edge distances and spacing shall be chosen as detailed in construction drawings.

⁷⁾ In absence of prevailing national regulations.

Keep-nut

Performances
Performances of the anchor

Annex C 1