

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-13/0725**  
**of 26 September 2017**

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

Vorpa frame/multi-purpose anchor VP C

Plastic anchor for multiple use in concrete and masonry  
for non-structural applications

VORPA srl  
Via S. Leo 5  
47838 Riccione (RN)  
ITALIEN

Vorpa Herstellwerk 1  
Vorpa Plant 1

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

ETAG 020, edition March 2012,  
used as EAD according to Article 66 Paragraph 3 of  
Regulation (EU) No 305/2011.

**European Technical Assessment**

**ETA-13/0725**

English translation prepared by DIBt

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## Specific Part

### 1 Technical description of the product

The frame anchor VP C is a plastic anchor consisting of a plastic sleeve made of polyamide and an accompanying specific screw of galvanised steel or of stainless steel.

The plastic sleeve is expanded by screwing in the specific screw which presses the sleeve against the wall of the drilled hole.

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)

The essential characteristics regarding mechanical resistance and stability are included under the Basic Works Requirement Safety in use.

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

Essential characteristic	Performance
Reaction to fire	Anchorage satisfy requirements for Class A 1
Resistance to fire	See Annex C 1

#### 3.3 Safety and accessibility (BWR 4)

Essential characteristic	Performance
Characteristic resistance for tension and shear loads	See Annexes C 1 - C 4, C 9
Characteristic resistance for bending moments	See Annex C 1
Displacements under shear and tension loads	See Annex C 5 – C 9
Anchor distances and dimensions of members	See Annex B 2 - B 5

#### 3.4 General aspects

The verification of durability is part of testing the essential characteristics. Durability is only ensured if the specifications of intended use according to Annex B are taken into account.

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

In accordance with guideline for European technical approval ETAG 020, March 2012 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: 97/463/EC.

The system to be applied is: 2+

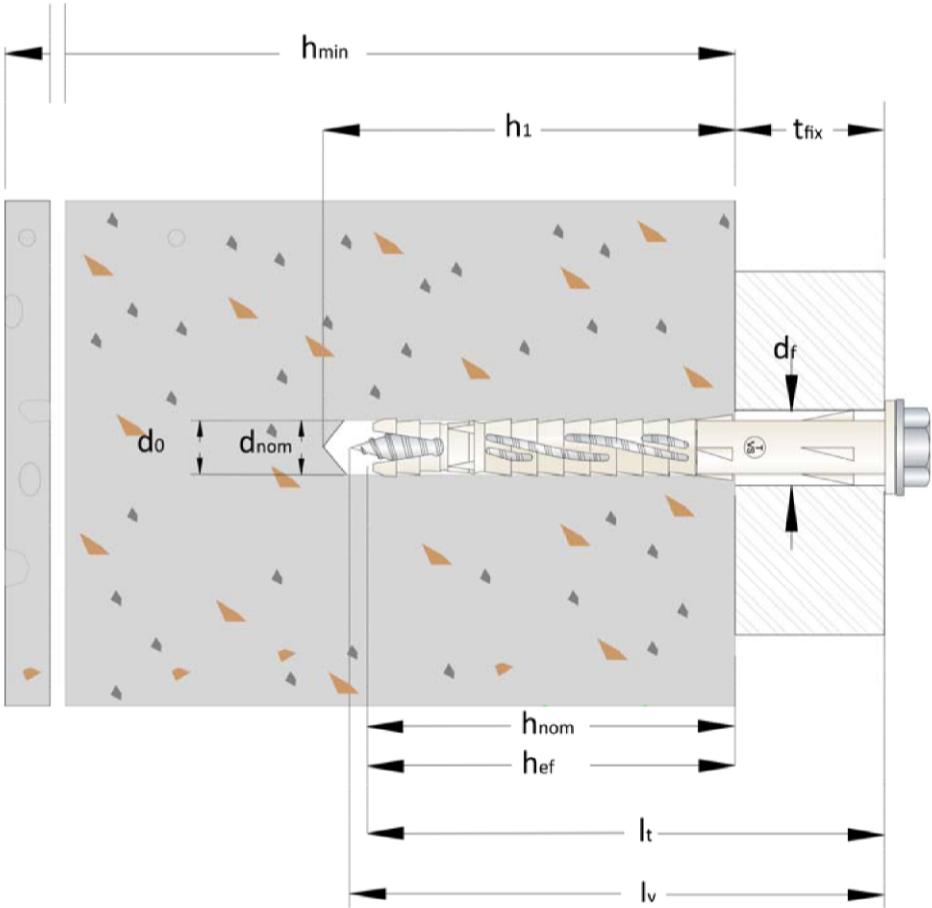
**5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document**

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

Issued in Berlin on 25 September 2017 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow  
Head of Department

*beglaubigt:*  
Ziegler



**Intended use:**

Fixing in concrete and different types of masonry.

**Legend:**

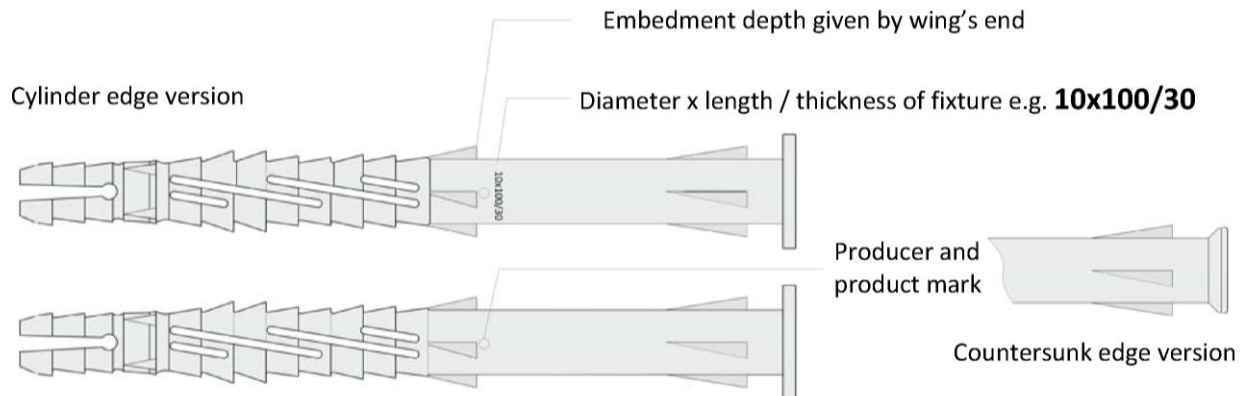
$h_{min}$ :	minimum thickness of concrete member
$h_{nom}$ :	minimum overall embedment depth
$h_{ef}$ :	minimum effective embedment depth
$d_{nom}$ :	anchor diameter
$l_t$ :	anchor length
$l_v$ :	screw length
$d_0$ :	drill hole diameter
$h_1$ :	minimum depth of drill hole
$t_{fix}$ :	maximum thickness of fixture
$d_f$ :	diameter of clearance hole in the fixture

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

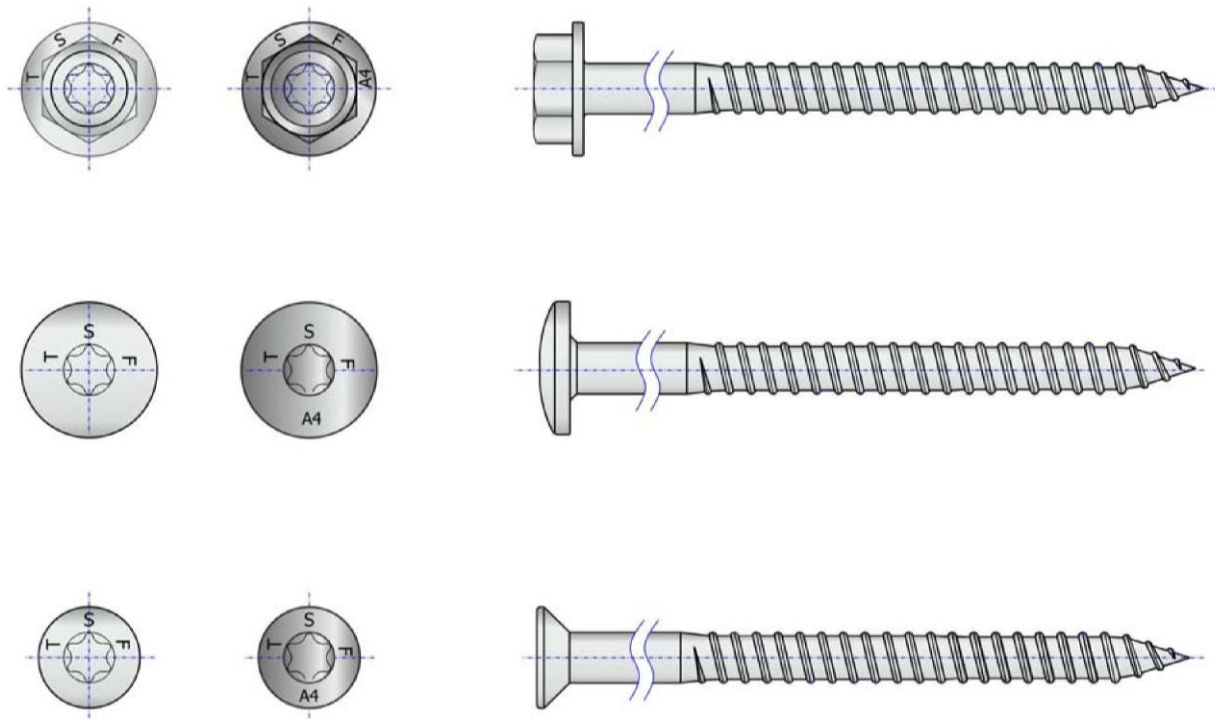
**Product description**  
Installed condition

**Annex A 1**

### Anchor sleeve



### Special screw (Carbon steel version and stainless steel A4 version)



Vorpa Frame/Multi purpose Nylon Anchor VP C

**Product description**  
Anchor types / specific screw – marking and dimensions

**Annex A 2**

**Table 1 : Dimensions**

Anchor type		VP C Ø 8	VP C Ø 10
Outside diameter of anchor	$d_{nom} = [mm]$	8	10
Length of the anchor	$l_t = [mm]$	$\geq 80$	
Screw diameter	$d_v = [mm]$	6	7
Screw length	$l_v = [mm]$	$\geq 85$	$\geq 85$

**Table 2 : Materials**

<b>Anchor sleeve</b>	Polyamide, PA 6, light grey color
<b>Carbon steel screw</b>	Carbon Steel grade 5.8, gvz min 5 $\mu m$ acc. to ISO 2081:2008
<b>Stainless steel screw</b>	SS A4/70 (AISI 316) acc. to ISO 3506-1:2009 and EN 10088-3:2014

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Product description**  
Dimensions and materials

**Annex A 3**

## Specifications of intended use

### Anchorage subject to:

- Static and quasi-static loads:
- Multiple fixing of non-structural applications

### Base materials:

- Reinforced or unreinforced normal weight concrete with strength classes  $\geq$  C16/20 (use category a), according to EN 206-1:2000, Annex C1.
- Solid brick masonry (use category b), according to Annex C2.

Note: The characteristic resistance is also valid for larger brick sizes and larger compressive strength of the masonry unit.

- Hollow brick masonry (use category c), according to Annexes C3 and C4.
- Autoclaved aerated concrete (use category d), according to Annex C9
- Mortar strength class of the masonry  $\geq$  M2,5 at minimum according to EN 998-2:2010.
- For other base materials of the use categories a, b, c and d the characteristic resistance of the anchor may be determined by job site tests according to ETAG 020, Annex B Edition March 2012.

### Temperature Range:

- a: - 40 °C to 40 °C (max. short term temperature + 40 °C and max long term temperature + 24 °C)
- b: - 40 °C to 80 °C (max. short term temperature + 80 °C and max long term temperature + 50 °C)

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (zinc coated steel, stainless steel).
- The specific screw made of galvanized steel may also be used in structures subject to external atmospheric exposure, if the area of the head of the screw is protected against moisture and driving rain after mounting of the fixing unit in this way, that intrusion of moisture into the anchor shaft is prevented. Therefore there shall be an external cladding or a ventilated rainscreen mounted in front of the head of the screw and the head of the screw itself shall be coated with a soft plastic, permanently elastic bitumen-oil-combination coating (e. g. undercoating or body cavity protection for cars).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel).

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).

### Design:

- The anchorages are designed in accordance with the ETAG 020, Annex C Edition March 2012 under the responsibility of an engineer experienced in anchorages and masonry work.
- 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.
- Fasteners are only to be used for multiple use for non-structural application, according to ETAG 020 Edition March 2012.

### Installation:

- Hole drilling by the drill modes according to Annex C1, C2, C3, C4, C9.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Installation temperature  $\geq$  0°C
- Exposure to UV due to solar radiation of the anchor not protected  $\leq$  6 weeks

Vorpa Frame/Multi purpose Nylon Anchor VP C

Intended use  
Specifications

Annex B 1



**Table 3 : Installation parameters**

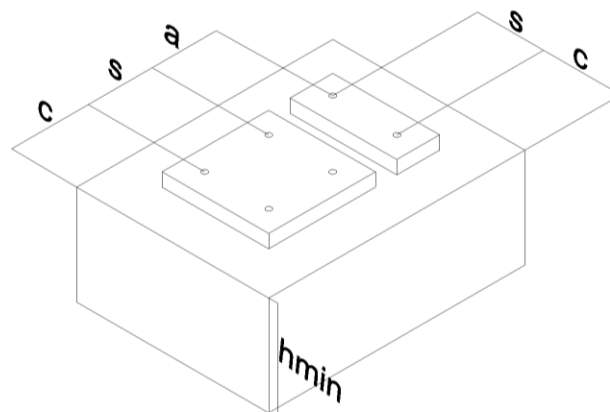
Parameter / Size		VP C Ø 8	VP C Ø 10
Nominal drill hole diameter	$d_o$ [mm]	8	10
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	8.45	10.45
Depth of drill hole	$h_1$ [mm]	90	90
Effective anchorage depth	$h_{ef}$ [mm]	70	70
Diameter of clearance hole in the fixture	$d_f$ [mm]	9	11
Thickness of fixture	$t_{fix}$ [mm]	$\geq 10$	
Hexalobular socket number (ISO 10664)	T [-]	30	40
Wrench size (for hexagonal head only)	SW [mm]	10	13

**Table 4 : Minimum thickness of the member, edge distance and spacing in concrete**

Parameter / Size		VP C Ø 8	VP C Ø 10
Concrete class		$\geq 16/20$	
Minimum thickness of the member	$h_{min}$ [mm]	140	
Characteristic edge distance	$c_{cr,N}^{1)}$ [mm]	105	105
Characteristic spacing	$s_{cr,N}^{1)}$ [mm]	75	90
Minimum allowable spacing and edge distance <sup>1)</sup>	$s_{min}$ [mm]	90	100
	$c_{min}$ [mm]	90	100

<sup>1)</sup> Intermediate value by linear interpolation

**Scheme of edge distance and spacing in concrete and masonry**



Fixing points with a spacing  $a \leq s_{cr,N}$  are considered as a group with a maximum characteristic resistance  $N_{Rk,p}$  acc. to Table 17 – Table 27. For a spacing  $a > s_{cr,N}$  the anchors are considered as single anchors, each with a characteristic resistance  $N_{Rk,p}$  acc. to Table 17 – Table 27.

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Intended use**

Installation parameters, edge distances and spacing for use in concrete

**Annex B 2**

**Table 5 : Minimum distances and dimensions in solid masonry – Type “A”**

Minimum thickness of the member	$h_{\min}$ [mm]	110
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	120
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	240
Spacing parallel to free edge	$S_{2,\min}$ [mm]	480
Minimum edge distance	$c_{\min}$ [mm]	120

**Table 6 : Minimum distances and dimensions in solid masonry – Type “B”**

Minimum thickness of the member	$h_{\min}$ [mm]	120
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	125
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	250
Spacing parallel to free edge	$S_{2,\min}$ [mm]	500
Minimum edge distance	$c_{\min}$ [mm]	125

**Table 7 : Minimum distances and dimensions in solid masonry – Type “E”**

Minimum thickness of the member	$h_{\min}$ [mm]	370
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	185
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	370
Spacing parallel to free edge	$S_{2,\min}$ [mm]	740
Minimum edge distance	$c_{\min}$ [mm]	185

**Table 8 : Minimum distances and dimensions in solid masonry – Type “F”**

Minimum thickness of the member	$h_{\min}$ [mm]	240
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	120
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	240
Spacing parallel to free edge	$S_{2,\min}$ [mm]	480
Minimum edge distance	$c_{\min}$ [mm]	120

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Intended use**

Edge distances and spacing for use in solid masonry

**Annex B 3**

**Table 9 : Minimum distances and dimensions in hollow masonry – Type “C”**

Minimum thickness of the member	$h_{\min}$ [mm]	120
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	125
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	250
Spacing parallel to free edge	$S_{2,\min}$ [mm]	500
Minimum edge distance	$c_{\min}$ [mm]	125

**Table 10 : Minimum distances and dimensions in hollow masonry – Type “D”**

Minimum thickness of the member	$h_{\min}$ [mm]	120
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	125
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	250
Spacing parallel to free edge	$S_{2,\min}$ [mm]	500
Minimum edge distance	$c_{\min}$ [mm]	75

**Table 11 : Minimum distances and dimensions in hollow masonry – Type “G”**

Minimum thickness of the member	$h_{\min}$ [mm]	240
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	120
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	240
Spacing parallel to free edge	$S_{2,\min}$ [mm]	480
Minimum edge distance	$c_{\min}$ [mm]	120

**Table 12 : Minimum distances and dimensions in hollow masonry – Type “H”**

Minimum thickness of the member	$h_{\min}$ [mm]	115
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	120
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	240
Spacing parallel to free edge	$S_{2,\min}$ [mm]	480
Minimum edge distance	$c_{\min}$ [mm]	120

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Intended use**

Edge distances and spacing for use in hollow masonry

**Annex B 4**

**Table 13 : Minimum distances and dimensions in hollow masonry – Type “I”**

Minimum thickness of the member	$h_{\min}$ [mm]	175
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	120
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	240
Spacing parallel to free edge	$S_{2,\min}$ [mm]	480
Minimum edge distance	$c_{\min}$ [mm]	120

**Table 14 : Minimum distances and dimensions in AAC**

Minimum thickness of the member	$h_{\min}$ [mm]	240
<b>Single anchor</b>		
Minimum edge distance	$c_{\min}$ [mm]	120
<b>Anchor Group</b>		
Spacing perpendicular to free edge	$S_{1,\min}$ [mm]	240
Spacing parallel to free edge	$S_{2,\min}$ [mm]	480
Minimum edge distance	$c_{\min}$ [mm]	120

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

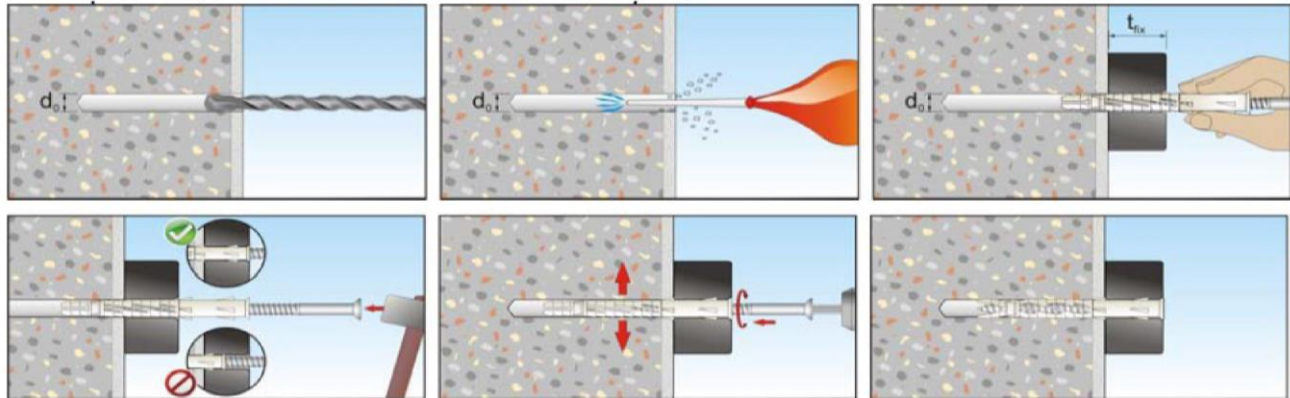
**Intended use**

Edge distances and spacing for use in hollow masonry and AAC

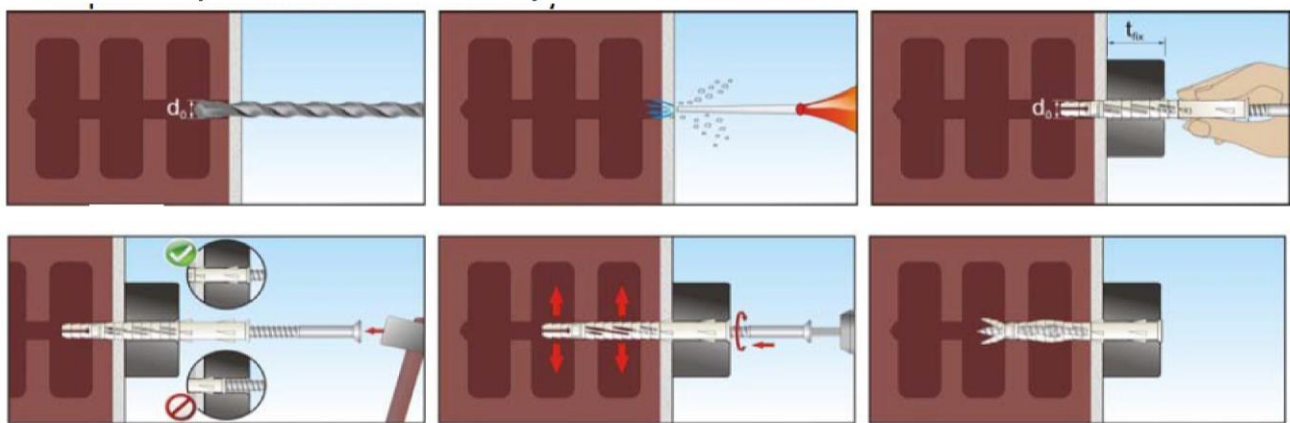
**Annex B 5**

Setting instructions

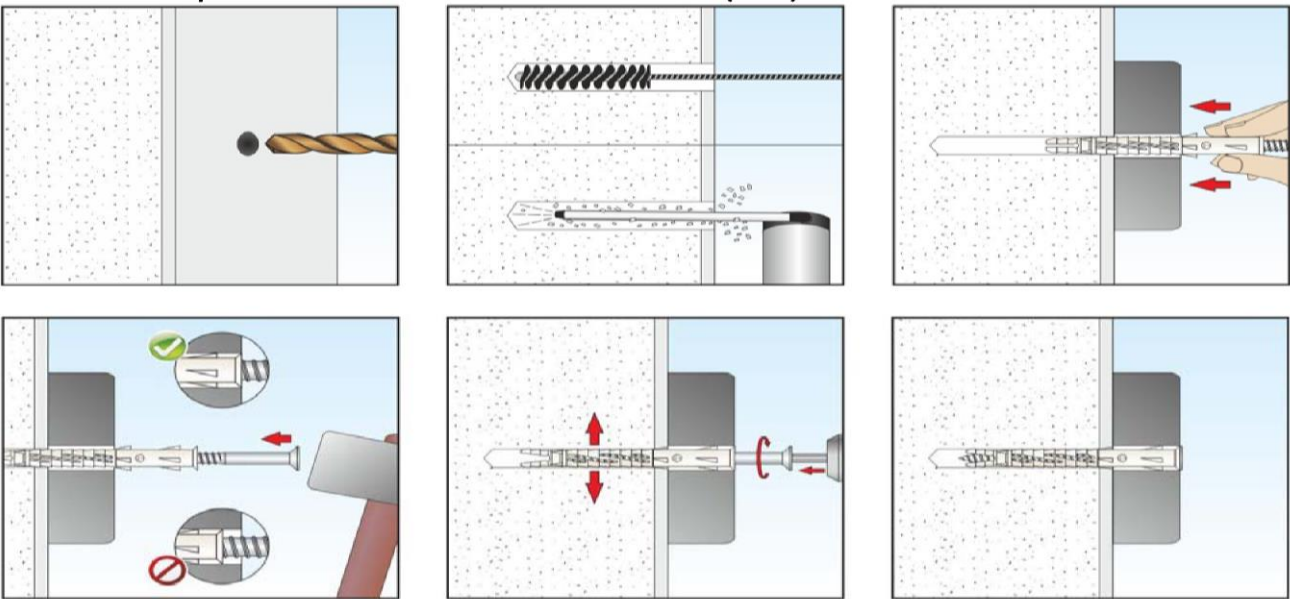
Installation sequence in concrete and solid masonry



Installation sequence in Hollow Masonry



Installation sequence in Aerated Autoclaved Concrete (AAC)



Vorpa Frame/Multi purpose Nylon Anchor VP C

Intended use  
Setting instructions

Annex B 6



**Table 15 : Characteristic bending resistance of the screw**

Parameter / Size			VP C Ø 8		VP C Ø 10	
			Galvanized steel	Stainless steel	Galvanized steel	Stainless steel
Characteristic bending resistance	$M_{Rk,s}$	[Nm]	12,1	16,9	19,3	27,1
Partial safety factor	$\gamma_{Ms}$	-	1,25			

**Table 16 : Characteristic resistance of the screw**

Parameter / Size			VP C Ø 8		VP C Ø 10	
			Galvanized steel	Stainless steel	Galvanized steel	Stainless steel
Characteristic tension resistance	$N_{Rk,s}$	[kN]	11,3	15,8	15,4	21,6
Partial safety factor	$\gamma_{Ms}$	-	1,5			
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,6	7,9	7,7	10,8
Partial safety factor	$\gamma_{Ms}$	-	1,25			

**Table 17 : Characteristic resistance for use in concrete<sup>1)</sup>**

Plastic sleeve pull-out failure			VP C Ø 8		VP C Ø 10	
Temperature range			24/40 °C	50/80 °C	24/40 °C	50/80 °C
Characteristic tension resistance	$N_{Rk,p}$	[kN]	3,5	3,0	4,5	4,0
Partial safety factor	$\gamma_{Mc}$ <sup>2)</sup>	[-]	1,8			

<sup>1)</sup> Concrete strength  $f_{ck} \geq 16 \text{ N/mm}^2$  (strength class C16/20 acc. to EN 206-1:2000)

Drill method: hammer drilling

<sup>2)</sup> In absence of other national regulations

**Table 18 : Characteristic resistance under fire exposure in concrete<sup>1)</sup> in any load direction, no permanent centric tension load and without lever arm, fastening of façade systems**

Anchor type	Fire resistance class	$F_{Rk}$ [kN]
VP C Handyplug	R 90	0,8

<sup>1)</sup> Concrete strength  $f_{ck} \geq 16 \text{ N/mm}^2$  (strength class C16/20 acc. to EN 206-1:2000)

Drill method: hammer drilling

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Performances**

Characteristic resistance of the screw, characteristic resistance for use in concrete

**Annex C 1**

**Table 19 : Characteristic resistance – Solid masonry type “A” (use category “b”)**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
Solid clay brick acc. to EN 771-1:2011 Mattone pieno 110x60x240 “Danesi”	Rotary + hammer	1,7	39,0	3,0	2,0

**Table 20 : Characteristic resistance – Solid masonry type “B” (use category “b”)**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
Solid clay brick acc. to EN 771-1:2011 Mattone pieno 250x120x55 “Terreal Italia”	Rotary + hammer	1,7	27,0	4,0	5,0

**Table 21 : Characteristic resistance – Solid masonry type “E” (use category “b”)**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
Vulcanic tuff brick, acc. to EN 771-3:2011 Fior di tufo 370x370x110 “Cave riunite”	Rotary + hammer	2,4	7,5	-	0,3

**Table 22 : Characteristic resistance – Solid masonry type “F” (use category “b”)**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
Calcium silicate solid brick, acc. EN 771-2:2011 Kalksandsteine KS-Plansteine KS-R(P)- 20-2,0-8DF (240) “Heidelberger- Kalksandstein”	Rotary + hammer	1,9	28,2	5,5	6,0

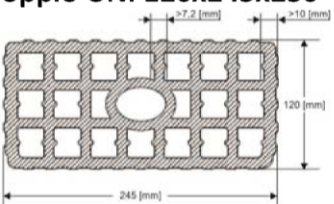
**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Performances**

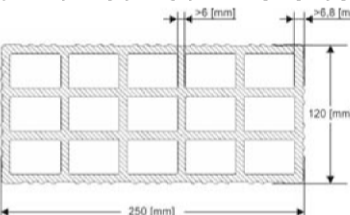
Characteristic resistance for use in solid masonry

**Annex C 2**

**Table 23 : Characteristic resistance – masonry type “C” (use category “c”)**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
<b>Perforated clay brick, acc. EN 771-1:2011</b> <b>Doppio doppio UNI 120x245x250 “Danesi”</b> 	Rotary	0.9	13.0	-	0,3

**Table 24 : Characteristic resistance - masonry type “D” (use category “c”)**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
<b>Perforated clay brick, acc. EN 771-1:2011</b> <b>Forati 120x250x250 “Wienerberger”</b> 	Rotary	0.6	2.0	0,3	-

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

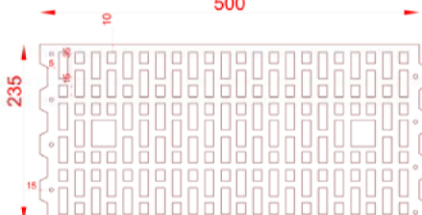
**Performances**

Characteristic resistance for use in hollow or perforated masonry

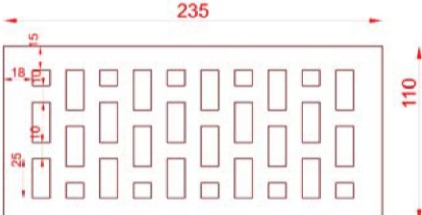
**Annex C 3**



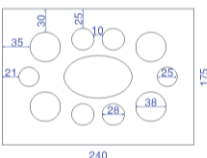
**Table 25 : Characteristic resistance - masonry type "G" (use category "c")**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
<b>Perforated clay brick, acc. EN 771-1:2011</b> <b>Poroton-Hochlochziegel-Block-T-24,0-0,9 L</b> <b>"Wienerberger"</b> 	Rotary	0,9	7,0	0,9	0,9

**Table 26 : Characteristic resistance - masonry type "H" (use category "c")**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
<b>Perforated clay brick, acc. EN 771-1:2011</b> <b>Poroton-Kleinformat HlzB- 2DF -0,9</b> <b>"Wienerberger"</b> 	Rotary	0,9	16,4	0,9	0,9

**Table 27 : Characteristic resistance - masonry type "I" (use category "c")**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
<b>Hollow calcium silicate brick acc. EN 771-2:2011 "Heidelberger-Kalksandstein" KS-L</b> 	Rotary	1,5	16,3	5,0	5,5

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Performances**

Characteristic resistance for use in hollow or perforated masonry

**Annex C 4**

**Table 28 : Displacements under tension load in concrete**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service tension load in concrete	N	[kN]	1,2	1,6
Displacements	$\delta_{N0}$	[mm]	0,24	0,29
	$\delta_{N\infty}$	[mm]	0,48	0,58

**Table 29 : Displacements under shear load in concrete**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service shear load in concrete	V	[kN]	3,2	4,4
Displacements	$\delta_{V0}$	[mm]	2,00	1,67
	$\delta_{V\infty}$	[mm]	3,00	2,50

**Table 30 : Displacements under tension load in solid masonry – type “A”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service tension load in solid masonry	N	[kN]	0,9	0,6
Displacements	$\delta_{N0}$	[mm]	0,04	0,06
	$\delta_{N\infty}$	[mm]	0,08	0,12

**Table 31 : Displacements under tension load in solid masonry – type “B”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service tension load in solid masonry	N	[kN]	1,1	1,4
Displacements	$\delta_{N0}$	[mm]	0,25	0,67
	$\delta_{N\infty}$	[mm]	0,50	1,34

Vorpa Frame/Multi purpose Nylon Anchor VP C

**Performances**

Displacements in concrete and solid masonry

**Annex C 5**

**Table 32 : Displacements under tension load in solid masonry – type “E”**

Parameter / Size			VP C Ø 8
Service tension load in solid masonry	N	[kN]	0,09
Displacements	$\delta_{N0}$	[mm]	0,01
	$\delta_{N\infty}$	[mm]	0,02

**Table 33 : Displacements under tension load in solid masonry – type “F”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service tension load in solid masonry	N	[kN]	1,57	1,71
Displacements	$\delta_{N0}$	[mm]	0,14	0,07
	$\delta_{N\infty}$	[mm]	0,29	0,15

**Table 34 : Displacements under shear load in solid masonry type “A”, “B” and “E”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service shear load in solid masonry	V	[kN]	3,2	4,4
Displacements	$\delta_{V0}$	[mm]	2,67	3,67
	$\delta_{V\infty}$	[mm]	4,00	5,50

**Table 35 : Displacements under shear load in solid masonry type “F”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service shear load in solid masonry	V	[kN]	1,57	1,71
Displacements	$\delta_{V0}$	[mm]	1,31	1,43
	$\delta_{V\infty}$	[mm]	1,96	2,14

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**Performances**  
Displacements in solid masonry

**Annex C 6**

**Table 36 : Displacements under tension load in hollow masonry – type “C”**

Parameter / Size			VP C Ø 10
Service tension load in hollow masonry	N	[kN]	0,09
Displacements	$\delta_{N0}$	[mm]	0,12
	$\delta_{N\infty}$	[mm]	0,24

**Table 37 : Displacements under tension load in hollow masonry – type “D”**

Parameter / Size			VP C Ø 8
Service tension load in hollow masonry	N	[kN]	0,09
Displacements	$\delta_{N0}$	[mm]	0,03
	$\delta_{N\infty}$	[mm]	0,06

**Table 38 : Displacements under tension load in hollow masonry – type “G”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service tension load in hollow masonry	N	[kN]	0,26	0,26
Displacements	$\delta_{N0}$	[mm]	0,01	0,01
	$\delta_{N\infty}$	[mm]	0,02	0,02

**Table 39 : Displacements under tension load in hollow masonry – type “H”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service tension load in hollow masonry	N	[kN]	0,26	0,26
Displacements	$\delta_{N0}$	[mm]	0,01	0,01
	$\delta_{N\infty}$	[mm]	0,02	0,02

Vorpa Frame/Multi purpose Nylon Anchor VP C

**Performances**  
Displacements in hollow masonry

**Annex C 7**

**Table 40 : Displacements under tension load in hollow masonry – type “I”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service tension load in hollow masonry	N	[kN]	1,43	1,57
Displacements	$\delta_{N0}$	[mm]	0,11	0,08
	$\delta_{N\infty}$	[mm]	0,21	0,17

**Table 41 : Displacements under shear load in hollow masonry type “C” and “D”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service shear load in hollow masonry	V	[kN]	3,2	4,4
Displacements	$\delta_{V0}$	[mm]	6,40	8,80
	$\delta_{V\infty}$	[mm]	9,60	13,20

**Table 42 : Displacements under shear load in hollow masonry type “G” and “H”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service shear load in hollow masonry	V	[kN]	0,26	0,26
Displacements	$\delta_{V0}$	[mm]	0,21	0,21
	$\delta_{V\infty}$	[mm]	0,32	0,32

**Table 43 : Displacements under shear load in hollow masonry type “I”**

Parameter / Size			VP C Ø 8	VP C Ø 10
Service shear load in hollow masonry	V	[kN]	1,43	1,57
Displacements	$\delta_{V0}$	[mm]	1,19	1,31
	$\delta_{V\infty}$	[mm]	1,79	1,96

Vorpa Frame/Multi purpose Nylon Anchor VP C

**Performances**  
Displacements in hollow masonry

**Annex C 8**

**Table 44 : Characteristic resistance in autoclaved aerated concrete (use category “d”)**

Base material	Drill method	Bulk density class $\rho$	Minimum compressive strength $f_b$	VP C $\varnothing 8$ $F_{Rk}$	VP C $\varnothing 10$ $F_{Rk}$
description	-	[kg/dm <sup>3</sup> ]	[N/mm <sup>2</sup> ]	[kN]	[kN]
Non-cracked aerated autoclaved concrete (AAC Blocks) EN 771-4: 2011	Rotary only	0,5	3,5	0,5	0,6

**Table 45 : Displacements under tension load in autoclaved aerated concrete**

Parameter / Size			VP C $\varnothing 8$	VP C $\varnothing 10$
Service tension load	N	[kN]	0,18	0,21
Displacements	$\delta_{N0}$	[mm]	0,01	0,01
	$\delta_{N\infty}$	[mm]	0,02	0,02

**Table 46 : Displacements under shear load in autoclaved aerated concrete**

Parameter / Size			VP C $\varnothing 8$	VP C $\varnothing 10$
Service shear load	V	[kN]	0,18	0,21
Displacements	$\delta_{V0}$	[mm]	0,36	0,43
	$\delta_{V\infty}$	[mm]	0,54	0,64

**Vorpa Frame/Multi purpose Nylon Anchor VP C**

**Performances**

Characteristic resistance and displacements for use in autoclaved aerated concrete

**Annex C 9**