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European Technical Assessment Body for construction products



European Technical Assessment

ETA-24/0044 of 19 April 2024

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	ABS Injection system VK for concrete
Product family to which the construction product belongs	Injection system for use in concrete
Manufacturer	ABS Safety GmbH Gewerbering 3 47623 Kevelaer
Manufacturing plant	Plant 1
This European Technical Assessment contains	31 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 330499-01-0601, Edition 04/2020

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Specific Part

1 Technical description of the product

The "ABS Injection system VK for concrete" is a bonded anchor consisting of a cartridge with injection mortar ABS VK or ABS VK Nordic and a steel element. The steel element consists of a commercial threaded rod with washer and hexagon nut in the range of M8 to M30 or reinforcing bar in the range of \emptyset 8 to \emptyset 32 mm or an internal threaded anchor rod IG-M6 to IG-M20. The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

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 fastener 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 fastener 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 to tension load (static and quasi-static loading)	See Annex B 3, C 1, C 2, C 3, C 5 and C 7
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1, C 4, C 6 and C 8
Displacements (static and quasi-static loading)	See Annex C 9 to C 11
Characteristic resistance for seismic performance categories C1	See Annex C 12 and C 13
Characteristic resistance and displacements for seismic performance categories C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content, emission and/or release of dangerous substances	No performance assessed



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

In accordance with the European Assessment Document EAD 330499-01-0601 the applicable European legal act is: [96/582/EC]. The system to be applied is: 1

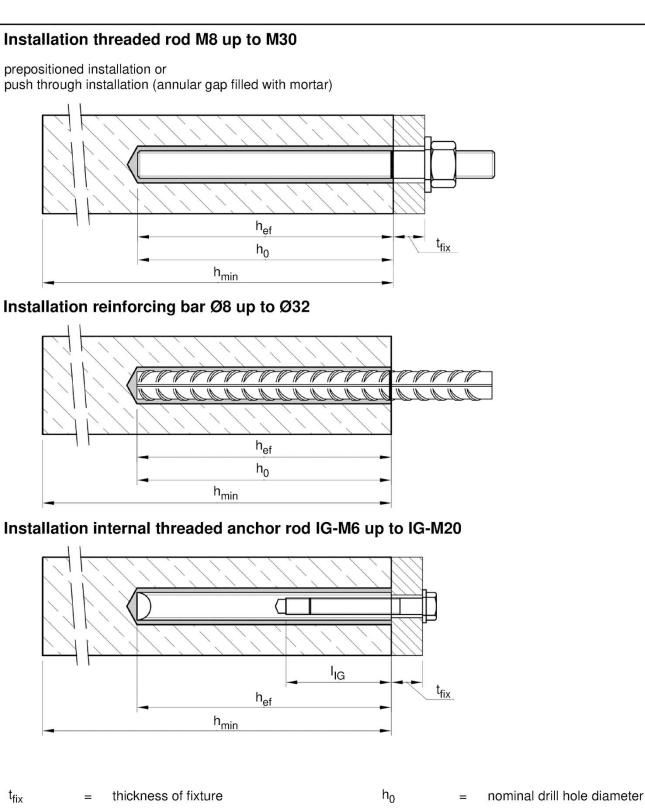
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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 19 April 2024 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock Head of Section *beglaubigt:* Baderschneider





IIG

h_{min} = minum thickness of member

effective embedment depth

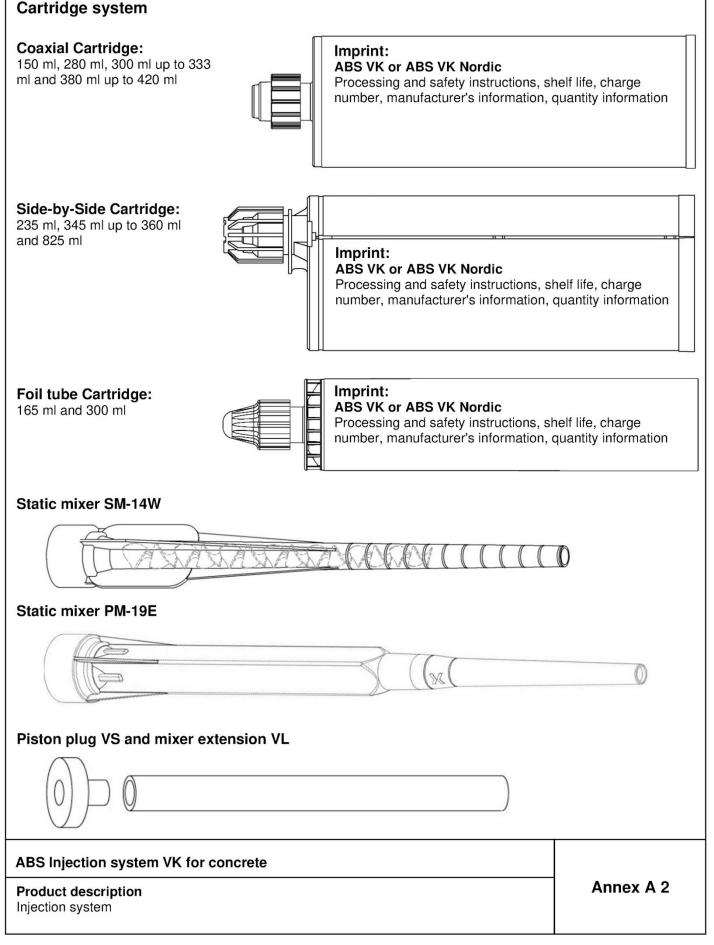
ABS Injection system VK for concrete

Product description Installed condition

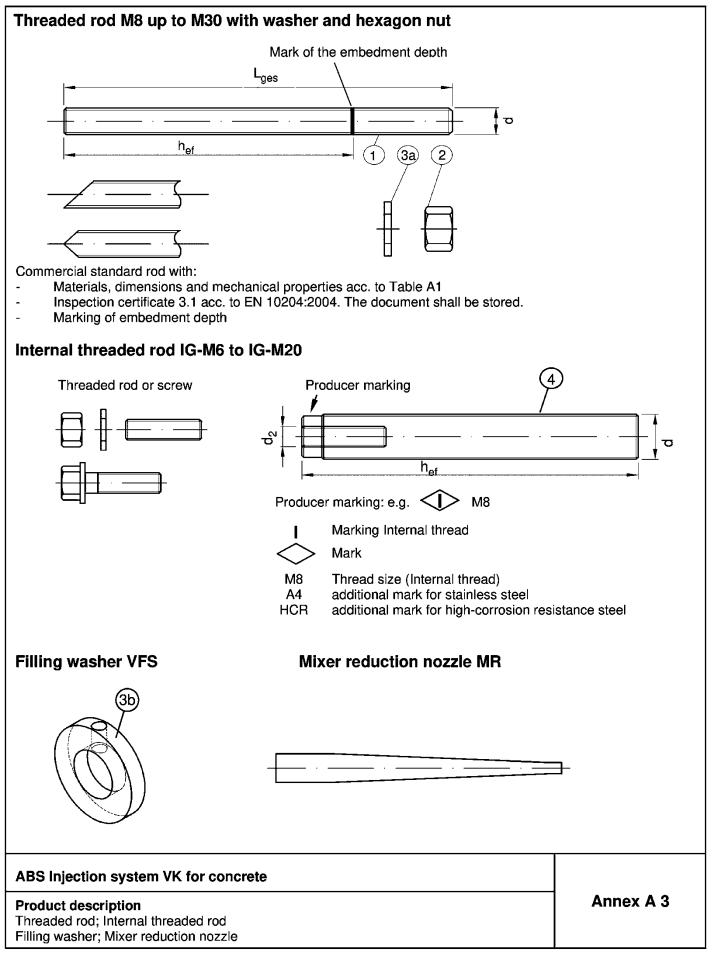
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h_{ef}











Steel, zinc plated (Steel acc. to EN ISO 683-4:2018 or EN 10263:2017)- zinc plated $\geq 5 \ \mu\text{m}$ acc. to EN ISO 4042:2022 or- hording paivanised $\geq 45 \ \mu\text{m}$ acc. to EN ISO 17668:20161Threaded rod $\geq 45 \ \mu\text{m}$ acc. to EN ISO 17668:20161Threaded rod $\geq 45 \ \mu\text{m}$ acc. to EN ISO 17668:20161Threaded rod $= 45 \ \mu\text{m}$ acc. to EN ISO 17668:20162Acc. toEN ISO 898-1:2013 $= 4.6 \ f_{uk} = 400 \ N/mm^2$ $f_{yk} = 240 \ N/mm^2$ $A_5 > 8\%$ 3 $= 6.0 \ N/mm^2$ $f_{yk} = 320 \ N/mm^2$ $A_5 > 8\%$ $5.8 \ f_{uk} = 500 \ N/mm^2$ $f_{yk} = 400 \ N/mm^2$ $A_5 > 8\%$ 2Hexagon nutacc. to $= 1.50 \ 888 \ -2:2012$ $= 4.6 \ f_{uk} = 800 \ N/mm^2$ $f_{yk} = 400 \ N/mm^2$ $A_5 > 8\%$ 3WasherSteel, zinc plated, hot-dip galvanised or sherardized(e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)3Filling washerSteel, zinc plated, hot-dip galvanised or sherardizedCharacteristic steelUltimate tensile strengthyield strength4Internal threaded anchor rodacc. to $5.8 \ f_{uk} = 500 \ N/mm^2$ $f_{yk} = 400 \ N/mm^2$ $A_5 > 8\%$ 5Stainless steel A2 (Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4561, acc. to EN 10088-1:2014) $F_{uk} = 400 \ N/mm^2$ $A_5 > 8\%$ 1Threaded rod ¹¹³¹ $Property \ class$ $G_{uk} = 500 \ N/mm^2$ $f_{yk} = 400 \ N/mm^2$ $A_5 > 8\%$ 1Threaded rod ¹¹³¹ $Property \ class$ $G_{uk} = 50$	teel, zinc plated (Steel acc. to EN ISO 633-4:2018 or EN 10263:2017) zinc plated $\geq 5 \ \mu m$ acc. to EN ISO 1461:2022 and EN ISO 10684:2004+AC:2009 or sherardized $\geq 45 \ \mu m$ acc. to EN ISO 17668:2016 Property class Characteristic steel ultimate tensile strength $\frac{1}{y_{tk}} = 240 \ N/mm^2$ $A_5 > 8\%$ EN ISO 898-1:2013 EN ISO 898-1:2013 $\frac{4.6}{5.6} \ \frac{1}{y_{tk}} = 400 \ N/mm^2$ $\frac{1}{y_{tk}} = 240 \ N/mm^2$ $A_5 > 8\%$ $\frac{4.6}{5.6} \ \frac{1}{y_{tk}} = 400 \ N/mm^2$ $\frac{1}{y_{tk}} = 400 \ N/mm^2$ $A_5 > 8\%$ $\frac{4.8}{5.6} \ \frac{1}{y_{tk}} = 500 \ N/mm^2$ $\frac{1}{y_{tk}} = 400 \ N/mm^2$ $A_5 > 8\%$ $\frac{4.8}{5.6} \ \frac{1}{y_{tk}} = 500 \ N/mm^2$ $\frac{1}{y_{tk}} = 400 \ N/mm^2$ $A_5 > 8\%$ $\frac{4.8}{5.6} \ \frac{1}{y_{tk}} = 500 \ N/mm^2$ $\frac{1}{y_{tk}} = 400 \ N/mm^2$ $A_5 > 8\%$ $\frac{1}{5.8} \ \frac{1}{y_{tk}} = 500 \ N/mm^2$ $\frac{1}{y_{tk}} = 400 \ N/mm^2$ $A_5 > 8\%$ $\frac{1}{5.8} \ \frac{1}{y_{tk}} = 800 \ N/mm^2$ $\frac{1}{y_{tk}} = 400 \ N/mm^2$ $A_5 > 8\%$ $\frac{1}{5} \ \frac{1}{5} \$	rar	Designation	Material					
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$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{ c c c c c c } \hline Property class & ultimate tensile strength & yield strength & fracture \\ \hline acc. to & EN ISO 898-1:2013 & \frac{5.8}{8.8} & f_{uk} = 500 \ N/mm^2 & f_{yk} = 400 \ N/mm^2 & A_5 > 8\% \\ \hline stainless steel A2 (Material 1.4301 / 1.4307 / 1.4311 / 1.4567 \ or 1.4541, acc. to EN 10088-1:2014) \\ \hline tainless steel A4 (Material 1.4401 / 1.4404 / 1.4571 / 1.4362 \ or 1.4578, acc. to EN 10088-1:2014) \\ \hline tainless steel A4 (Material 1.4401 / 1.4404 / 1.4571 / 1.4362 \ or 1.4578, acc. to EN 10088-1:2014) \\ \hline tainless steel A4 (Material 1.4401 / 1.4571 / 1.4362 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A4 (Material 1.4401 / 1.4571 / 1.4365 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A4 (Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A4 (Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A4 (Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A5 (Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A5 (Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A6 (Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014) \\ \hline tainless steel A6 (Material 1.4301 / 1.4307 / 1.4311 / 1.4567 \ or 1.4571, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (Material 1.4401 / 1.4404 / 1.4571 / 1.4362 \ or 1.4578, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (Material 1.4401 / 1.4404 / 1.4571 / 1.4362 \ or 1.4578, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (HCR: Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (HCR: Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (HCR: Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (HCR: Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (HCR: Material 1.4529 \ or 1.4565, acc. to EN 10088-1:2014 \\ \hline tainless Steel A6 (High corrosion resistance steel \ \hline tainless Steel A6 (High corrosion $	3b	Filling washer	Steel, zinc plated, ho	ot-dip				
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Property class ultimate tensile strength yield strength fracture 1 Threaded rod ¹⁾⁽³⁾ acc. to EN ISO 3506-1:2020 50 $f_{uk} = 500 \text{ N/mm}^2$ $f_{yk} = 210 \text{ N/mm}^2$ $A_5 \ge 8\%$ 2 Hexagon nut ¹⁾⁽³⁾ acc. to EN ISO 3506-1:2020 50 $f_{uk} = 800 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ $A_5 \ge 8\%$ 2 Hexagon nut ¹⁾⁽³⁾ acc. to EN ISO 3506-1:2020 50 for anchor rod class 50 70 for anchor rod class 70 3a Washer A2: Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2014 A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014	$\begin{array}{ c c c c c c } \hline Property class & ultimate tensile strength & yield strength & fracture \\ \hline Property class & ultimate tensile strength & yield strength & fracture \\ \hline Property class & ultimate tensile strength & yield strength & fracture \\ \hline Property class & f_{uk} = 500 \text{ N/mm}^2 & f_{yk} = 210 \text{ N/mm}^2 & A_5 \ge 8\% \\ \hline Property class & P$					r 1.4565, acc. to EN 10088	-1: 2014)		
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$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	acc. to EN ISO 3506-1:2020 70 $f_{uk} = 700 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $A_5 \ge 8\%$ Hexagon nut ¹⁾³⁾ acc. to EN ISO 3506-1:2020 50 for anchor rod class 50 $A_5 \ge 8\%$ a Washer A2: Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2014 A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014 HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1:2014 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000) b Filling washer Stainless steel A4, High corrosion resistance steel Characteristic steel	<u>a</u>							
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All Histors 3000-1.2020 80 for anchor rod class 80 80 A2: Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2014 A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014	In ISO 3006-1.2020 80 for anchor rod class 80 a Washer A2: Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2014 A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014 HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000) b Filling washer Stainless steel A4, High corrosion resistance steel			Property class acc. to EN ISO 3506-1:2020	50 70 80	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$	
A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014	a Washer A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014 HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000) b Filling washer Stainless steel A4, High corrosion resistance steel	1	Threaded rod ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to	50 70 80 50 70	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$	
	a Washer HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000) b Filling washer Stainless steel A4, High corrosion resistance steel	1	Threaded rod ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020	50 70 80 50 70 80	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50for anchor rod class 70for anchor rod class 80	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$	
UNCR: Material 1 4529 or 1 4565, acc. to EN 10089-1: 2014	(e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000) b Filling washer Stainless steel A4, High corrosion resistance steel Characteristic steel Characteristic steel	1	Threaded rod ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 /	50 70 80 50 70 80 70 80	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50for anchor rod class 70for anchor rod class 80307 / 1.4311 / 1.4567 or 1.4	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014	
	b Filling washer Stainless steel A4, High corrosion resistance steel	1	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 /	50 70 80 50 70 80 71.43 71.43	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 $307 / 1.4311 / 1.4567 \text{ or } 1.4$ $404 / 1.4571 / 1.4362 \text{ or } 1.4$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014	
	Characteristic steel Characteristic steel Elongation at	1	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452	50 70 80 50 70 80 71.43 9 or	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 $307 / 1.4311 / 1.4567 \text{ or } 1.4$ $404 / 1.4571 / 1.4362 \text{ or } 1.4$ 1.4565 , acc. to EN 10088-1	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 : 2014	fracture A5 ≥ 8% A5 ≥ 8% A5 ≥ 8% -1:2014 -1:2014	
Property class Characteristic steel Characteristic steel Elongation		1 2 3a	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20	50 70 80 50 70 80 71.43 7 1.44 9 or 50 006, E	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 807 / 1.4311 / 1.4567 or 1.4 104 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 : 2014	fracture A5 ≥ 8% A5 ≥ 8% A5 ≥ 8% -1:2014 -1:2014	
Internal threaded Unitmate tensile strength yield strength fracture	Internal threaded I Internate tensile strength yield strength Internation	1 2 3a	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4301 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H	50 70 80 50 70 80 71.43 7 1.44 9 or 50 006, E	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 2541, acc. to EN 10088 578, acc. to EN 10088 : 2014 27093:2000 or EN ISO Characteristic steel	fracture $A_5 ≥ 8\%$ $A_5 ≥ 8\%$ $A_5 ≥ 8\%$ $A_5 ≥ 8\%$ -1:2014 -1:2014 -1:2014 Flongation at	
$ a_{\rm pchor \ rod}^{1/2} \rangle _{\rm acc. \ to} = 50 t_{\rm uk} = 500 \text{ N/mm}^2 t_{\rm vk} = 210 \text{ N/mm}^2 A_5 > 8\%$		1 2 3a <u>3b</u>	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20	50 70 80 50 70 80 71.43 7 1.44 9 or 006, E ligh c	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 2541, acc. to EN 10088 578, acc. to EN 10088 : 2014 27093:2000 or EN ISO Characteristic steel yield strength	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 -7094:2000) Elongation at fracture	
	anchor rod ¹⁾²⁾ acc. to 50 $ f_{uk} = 500 \text{ N/mm}^2$ $ f_{yk} = 210 \text{ N/mm}^2$ $ A_5 > 8\%$	1 2 3a <u>3b</u>	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4301 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to	50 70 80 50 70 80 71.43 9 or - 006, E ligh c	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 : 2014 0 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 -1:2014 -1:2014 Elongation at fracture $A_5 > 8\%$	
	HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014 (e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2 b Filling washer Stainless steel A4, High corrosion resistance steel Characteristic steel	1		Property class	50	ultimate tensile strength f _{uk} = 500 N/mm ²	yield strength f _{yk} = 210 N/mm ²	frac A ₅ ≥	
a 19900101 UCD. Motorial 1 4500 or 1 4565 and to EN 10000 1, 0014	(e.g.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000) b Filling washer Stainless steel A4, High corrosion resistance steel		Threaded rod ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 /	50 70 80 50 70 80 70 80	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50for anchor rod class 70for anchor rod class 80307 / 1.4311 / 1.4567 or 1.4	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014	
	Characteristic steel Characteristic steel Elongation at		Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 /	50 70 80 50 70 80 71.43 71.43	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 $307 / 1.4311 / 1.4567 \text{ or } 1.4$ $404 / 1.4571 / 1.4362 \text{ or } 1.4$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014	
	Characteristic steel Characteristic steel Elongation at	1	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20	50 70 80 50 70 80 71.43 7 1.44 9 or 50 006, E	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 807 / 1.4311 / 1.4567 or 1.4 104 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 : 2014	fracture A5 ≥ 8% A5 ≥ 8% A5 ≥ 8% -1:2014 -1:2014	
	Property class	1 2 3a	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20	50 70 80 50 70 80 71.43 7 1.44 9 or 50 006, E	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 $307 / 1.4311 / 1.4567 \text{ or } 1.4$ 1.4565 , acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 2014 27093:2000 or EN ISO	fracture A ₅ ≥ 8% A ₅ ≥ 8% A ₅ ≥ 8% -1:2014 -1:2014 7094:2000)	
Internal threaded	Internal threaded I fracture I utimate tensile strength yield strength fracture	1 2 3a	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4301 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H	50 70 80 50 70 80 71.43 7 1.44 9 or 50 006, E	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 2541, acc. to EN 10088 578, acc. to EN 10088 : 2014 27093:2000 or EN ISO Characteristic steel	fracture $A_5 ≥ 8\%$ $A_5 ≥ 8\%$ $A_5 ≥ 8\%$ -1:2014 -1:2014 -1:2014 Flongation at	
$ anchor rod^{1/2}\rangle$ acc. to 50 $ u_k = 500 \text{ N/mm}^2$ $ T_{vk} = 210 \text{ N/mm}^2$ $A_5 > 8\%$		1 2 3a <u>3b</u>	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4301 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class	50 70 80 50 70 80 71.43 7 1.44 9 or 006, E ligh c	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 2541, acc. to EN 10088 578, acc. to EN 10088 : 2014 27093:2000 or EN ISO Characteristic steel yield strength	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 -7094:2000) Elongation at fracture	
	anchor rod ¹⁾²⁾ acc. to 50 $f_{uk} = 500 \text{ N/mm}^2$ $f_{yk} = 210 \text{ N/mm}^2$ $A_5 > 8\%$	1 2 3a <u>3b</u>	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4301 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to	50 70 80 50 70 80 71.43 9 or - 006, E ligh c	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 : 2014 0 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 -1:2014 -1:2014 Elongation at fracture $A_5 > 8\%$	
1 anchor rod (1/2) = 1 acc. to 30 1/4 = 300 1/4 = 10 1/4 = 210 1/11 1/2 = 1/2 1/2 1/2 = 1/2 1/2 = 1/2 1/2 1/2 = 1/2 1/2 1/2 1/2 = 1/2 1		1 2 3a <u>3b</u>	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4301 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class	50 70 80 50 70 80 71.43 7 1.44 9 or 006, E ligh c	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 2541, acc. to EN 10088 578, acc. to EN 10088 : 2014 27093:2000 or EN ISO Characteristic steel yield strength	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 -7094:2000) Elongation at fracture	
	anchor rod ¹⁾²⁾ acc. to 50 $f_{uk} = 500 \text{ N/mm}^2$ $f_{yk} = 210 \text{ N/mm}^2$ $A_5 > 8\%$	1 2 3a <u>3b</u>	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4301 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to	50 70 80 50 70 80 71.43 9 or - 006, E ligh c	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 404 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 : 2014 0 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 -1:2014 -1:2014 Elongation at fracture $A_5 > 8\%$	
EN ISO 3506-1:2020 70 $f_{uk} = 700 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $A_5 > 8\%$	$ \begin{array}{ c c c c c c c c } \mbox{anchor rod}^{1)2} & \mbox{acc. to} & \begin{tabular}{ c c c c c c c } \hline 50 & \end{tabular} & \en$	1 2 3a <u>3b</u> 4	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded anchor rod ¹⁾²⁾	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to EN ISO 3506-1:2020	50 70 80 70 80 71.43 9 or 9006, E ligh c 50 70	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 2014 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 • 7094:2000) Elongation al fracture $A_5 > 8\%$ $A_5 > 8\%$	
	$ \begin{array}{ c c c c c c c } \hline anchor \ rod^{1)2} & acc. \ to & f_{uk} = 500 \ N/mm^2 & f_{yk} = 210 \ N/mm^2 & A_5 > 8\% \\ \hline EN \ ISO \ 3506-1:2020 & \hline 70 & f_{uk} = 700 \ N/mm^2 & f_{yk} = 450 \ N/mm^2 & A_5 > 8\% \\ \hline 1) & Property \ class \ 70 \ or \ 80 \ for \ anchor \ rods \ and \ hexagon \ nuts \ up \ to \ M24 \ and \ Internal \ threaded \ anchor \ rods \ up \ to \ IG-M16 \\ \hline 2) \ for \ IG-M20 \ only \ property \ class \ 50 & \hline \end{array} $	1 2 3a 3b 4 	Threaded rod ¹⁾³⁾ Hexagon nut ¹⁾³⁾ Washer Filling washer Internal threaded anchor rod ¹⁾²⁾ Property class 70 or 80 f for IG-M20 only property	Property class acc. to EN ISO 3506-1:2020 acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4401 / HCR: Material 1.452 (e.g.: EN ISO 887:20 Stainless steel A4, H Property class acc. to EN ISO 3506-1:2020 or anchor rods and hexago class 50	50 70 80 50 70 80 71.43 9 or 9 or 9 or 1.44 9 or 50 50 70 70 70	ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 307 / 1.4311 / 1.4567 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC corrosion resistance steel Characteristic steel ultimate tensile strength $f_{uk} = 500 \text{ N/mm}^2$	yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$ $f_{yk} = 600 \text{ N/mm}^2$ 541, acc. to EN 10088 578, acc. to EN 10088 2014 7093:2000 or EN ISO Characteristic steel yield strength $f_{yk} = 210 \text{ N/mm}^2$ $f_{yk} = 450 \text{ N/mm}^2$	fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 8\%$ -1:2014 -1:2014 7094:2000) Elongation al fracture $A_5 > 8\%$ $A_5 > 8\%$	



J -					
Re	inforcing bar: ø8 up to ø32				
$\label{eq:constraint}$ Minimum value of related rip area f_{R,min} according to EN 1992-1-1:2004+AC:2010 Rib height of the bar shall be in the range 0,05d \leq h_{rib} \leq 0,07d (d: Nominal diameter of the bar; h_{rib}: Rib height of the bar) $\mbox{Table A2:} \qquad \mbox{Materials Reinforcing bar}$					
Dort	Designation	Material			
Reba	-	Material			
1	Reinforcing steel according to EN 1992 1 1:2004+AC:2010, Annex C	Bars and rebars from ring class B or C f_{yk} and k according to NDP or NCI according $f_{uk} = f_{tk} = k \cdot f_{yk}$	to EN 1992-1-1/NA		
	S Injection outom VIK for concrete				
	S Injection system VK for concrete		Annex A 5		

Product description Materials reinforcing bar



	Working life !	50 years	Working	life 100 years
Base material	uncracked concrete	cracked concrete	Base material	uncracked concrete
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to M30,			nance assessed
Femperature Range	I: - 40°C to II: - 40°C to III: - 40°C to		No perform	nance assessed
Fasteners subject to (seismic a	ction):			
	Performance C	ategory C1	Performan	ice Category C2
Base material		Cracked and ur	cracked concrete	
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to M Ø8 to Ø		No perform	nance assessed
Temperature Range	I: - 40°C to II: - 40°C to III: - 40°C to		No perform	nance assessed
 Stainless steel Stahl 	C and max. short-term terr C and max. short-term terr Inreinforced normal wei C 50/60 according to E Conditions): ternal conditions (all ma	apperature +80°C) aperature +120°C) ght concrete witho N 206:2013 + A1: aterials). 2006+A1:2015 con A 4, Table A1: CF A 4, Table A1: CF	2016. rresponding to corro RC II RC III	
ABS Injection system VK for c	concrete			
Intended Use				Annex B 1

Intended Use Specifications



Design:

- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e.g. position of the fastener relative to reinforcement or to supports, etc.).
- Fasteners are designed under the responsibility of an engineer experienced in fasteners and concrete work.
- The fasteners are designed in accordance to EN 1992-4:2018 and Technical Report TR 055, Edition February 2018

Installation:

- Dry, wet concrete or flooded bore holes (not sea-water).
- Hole drilling by hammer (HD), hollow (HDB) or compressed air (CD).
- Overhead installation allowed.
- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Installation temperature in concrete:
 - ABS VK:-10°C up to +40°C for the standard variation of temperature after installation.ABS VK Nordic:-20°C up to +10°C for the standard variation of temperature after installation.

ABS Injection system VK for concrete

Intended Use Specifications (Continued)

Deutsches Institut für Bautechnik

clearance hole in the fixture Maximum installation	t depth Prepositione Push throu		d = c	. T		M8	M10	M12		M20		M27	M30
Effective embedment Diameter of F clearance hole in the fixture Maximum installation	t depth Prepositione Push throu			nom	[mm]	8	10	12	16	20	24	27	30
Diameter of F clearance hole in the fixture Maximum installation	Prepositione Push throu			d ₀	[mm]	10	12	14	18	22	28	30	35
Diameter of F clearance hole in the fixture Maximum installation	Prepositione Push throu		h _e	f,min	[mm]	60	60	70	80	90	96	108	120
clearance hole in the fixture Maximum installation	Push throu			f,max	[mm]	160	200	240	320	400	480	540	600
the fixture Maximum installation		ed insta	allation	d _f ≤	[mm]	9	12	14	18	22	26	30	33
Maximum installation	torque	ugh ins	stallatio	on d _f	[mm]	12	14	16	20	24	30	33	40
		_	max	T _{inet}	[Nm]	10	20	40	60	100	170	250	300
•	Minimum thickness of member			h _{min}	[mm]	he	ef + 30 n ≥ 100 mi				n _{ef} + 2d		1
Minimum spacing				s _{min}	[mm]	40	50	60	80	100	120	135	150
Minimum edge distand	nce			C _{min}	[mm]	40	50	60	80	100	120	135	150
Reinforcing bar Diameter of element	motor	d = 0		[mm]	Ø 8 ¹⁾ 8	Ø 10 ¹⁾ 10	Ø 12 ¹⁾ 12	Ø 14 14	Ø 16 16	Ø 20 20	Ø 25 ¹⁾ 25	Ø 28 28	Ø3 32
Nominal drill hole dian	meter		-	[mm]	10 12		14 16	18	20	25	32	35	40
Effective embedment	t depth		•.,	[mm]	60	60	70	75	80	90	100	112	128
	Effective embedment depth		ef,max	[mm]	160	200	240	280	320	400	500	560	640
Minimum thickness of member			h	[mm]	<u>≥ 100 mm</u>		h _{ef} + 2	d ₀					
				[mm]	1		<u> </u>				-		
Minimum spacing	f member		s _{min} c _{min}	[mm] [mm]	≥ 1 40 40	00 mm 50 50	60 60	70 70	80 80	100 100	125 125	140 140	
Minimum spacing Minimum edge distand ¹⁾ both nominal drill ho Table B3: In	f member nce nole diameter	r can be	s _{min} C _{min} e used	[mm] [mm]	40 40	50 50 ernal t	60 hreade	70 ed and	80 chor r	100 100	125	140	160
Minimum spacing Minimum edge distand ¹⁾ both nominal drill ho Table B3: In Internal threaded and	f member nce nole diameter nstallatio	r can be	s _{min} c _{min} e used	[mm] [mm]	40 40 for Inte	50 50 ernal t -M6	60 hreade	70 ed and IG-N	80 chor r //10	100 100 od IG-M12	125 IG-M	140	160 3- M2 0
Minimum spacing Minimum edge distand ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of an	f member nce nole diameter nstallatio nchor rod inchor rod	r can be	s _{min} c _{min} e used r ame t	[mm] [mm] ters f	40 40 for Inte 1G	50 50 ernal t -M6 6	60 hreade IG-M8 8	70 ed and IG-N 1(80 chor r //10	100 100 rod IG-M12 12	125 IG-M 16	140	160 3-M20 20
Minimum spacing Minimum edge distand ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of an Outer diameter of ancl	f member nce nole diameter nstallatio nchor rod nchor rod	r can be	s _{min} c _{min} e used ramei d	[mm] [mm] ters 1	40 40 for Inte 1G n]	50 50 ernal t -M6 6 10	60 hreade IG-M8 8 12	70 ed and IG-N 1(1(80 chor r //10 0 6	100 100 od IG-M12 12 20	125 IG-M 16 24	140	30
Minimum spacing Minimum edge distand ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of an Outer diameter of ancl	f member nce nole diameter nstallatio nchor rod nchor rod	r can be	s _{min} c _{min} e used r amet d l = d _{nor}	[mm] [mm] ters f	40 40 for Inte n] n]	50 50 ernal t -M6 6 10 12	60 hreade IG-M8 8 12 14	70 ed and IG-N 10 10 11	80 chor r //10 0 6 8	100 100 od IG-M12 12 20 22	125 IG-M 16 24 28	140	160 3-M20 20 30 35
Minimum spacing Minimum edge distand ¹⁾ both nominal drill ho	f member nce nole diameter nstallatio nchor rod nchor rod chor rod ¹⁾ meter	r can be	s _{min} c _{min} e used ramet d l = d _{nor} d h _{ef,mi}	[mm] [mm] ters 1 2 [mm m [mm 0 [mm n [mm	40 40 for Inte n] n] n] n]	50 50 ernal t -M6 6 10 12 50	60 hreade IG-M8 8 12 14 70	70 ed and IG-N 10 10 11 80	80 chor r //10 0 6 8 0	100 100 rod IG-M12 12 20 22 90	125 IG-M 16 24 28 96	140 16 IC	160 20 30 35 120
Minimum spacing Minimum edge distanc ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of and Outer diameter of and Nominal drill hole diam Effective embedment of Diameter of clearance	f member nce nole diameter nstallatio nchor rod unchor rod chor rod ¹⁾ meter	r can be	$\frac{s_{min}}{c_{min}}$ e used $ramei$ d $l = d_{nor}$ d $h_{ef,ma}$ d_{f}	[mm] [mm] ters f 2 [mr m [mr 0 [mr in [mr ix [mr × [mr	40 40 for Inte n] n] n] n] n] n] n] (n] n]	50 50 ernal t -M6 6 10 12	60 hreade IG-M8 8 12 14	70 ed and IG-N 10 10 11	80 chor r 110 0 6 8 0 20	100 100 od IG-M12 12 20 22	125 IG-M 16 24 28	140 16 IC	160 3-M20 20 30 35
Minimum spacing Minimum edge distance ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of and Outer diameter of and Nominal drill hole diam Effective embedment of Diameter of clearance hole in the fixture	f member nce nole diameter nstallatio nchor rod nchor rod chor rod ¹⁾ meter	r can be	$\frac{s_{min}}{c_{min}}$ e used $ramei$ d $l = d_{nor}$ d $h_{ef,ma}$ d_{f}	[mm] [mm] ters f 2 [mr m [mr 0 [mr in [mr ix [mr × [mr	40 40 for Inte n] n] n] n] n] n] n] 2 n]	50 50 ernal t -M6 6 10 12 50 00	60 hreade IG-M8 8 12 14 70 240	70 ed and 1G-N 10 10 10 10 10 10 10 10 10 10 10 10 10	80 chor r 110 0 6 8 0 20 2	100 100 rod IG-M12 12 20 22 90 400	125 IG-M 16 24 28 96 480	140 16 IC	160 20 20 30 35 120 600
Minimum spacing Minimum edge distand ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of and Outer diameter of and Nominal drill hole diam	f member nce nole diameter nstallatio nchor rod nchor rod chor rod ¹⁾ meter depth e torque	r can be	s _{min} c _{min} e used ramet d l = d _{nor} d h _{ef,ma}	[mm] [mm] ters f 2 [mr m [mr 0 [mr m [mr m [mr m [mr m [mr st [Nr	40 40 for Inte n] n] n] n] n] n] n] n] n] n] n] 8,	50 50 ernal t -M6 6 10 12 50 00 7 10 /20	60 hreade IG-M8 8 12 14 70 240 9 10 8/20	70 ed and 16-N 10 10 10 10 10 10 10 10 10 10 10 10 10	80 chor r A10 0 6 8 0 2 0 2 0	100 100 0d IG-M12 12 20 22 90 400 14	125 IG-M 16 24 28 96 480 18	140 16 IC	160 20 30 35 120 600 22
Minimum spacing Minimum edge distance ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of and Outer diameter of and Nominal drill hole diam Effective embedment of Diameter of clearance hole in the fixture Maximum installation to Thread engagement leffinition to min/max Minimum thickness of	f member nce nole diameter nstallatio nchor rod nchor rod chor rod ¹⁾ meter depth e torque length	r can be	$\frac{s_{min}}{c_{min}}$ $\frac{c_{min}}{c_{min}}$ $\frac{c_{min}}{c_{min}}$ $\frac{d}{r}$ $\frac{d}{r}$ $\frac{d}{r}$ $\frac{d}{r}$ $\frac{d}{r}$ $\frac{d}{r}$ $\frac{d}{r}$	[mm] [mm] ters f 2 [mr n [mr 0 [mr in [mr ix [mr ≤ [mr st [Nr G [mr	40 40 for Inte n] n] n] n] n] n] n] n] n] n] n] n] n]	50 50 ernal t -M6 6 10 12 50 00 7 10	60 hreade IG-M8 8 12 14 70 240 9 10 8/20	70 ed and 16-N 10 10 10 10 10 10 10 10 10 10 10 10 10	80 chor r A10 0 6 8 0 2 0 2 0	100 100 100 100 0 12 20 22 90 400 12/30	125 IG-M 16 24 28 96 480 18 60	140 16 IC	160 20 30 35 120 600 22 100
Minimum spacing Minimum edge distance ¹⁾ both nominal drill ho Table B3: In Internal threaded and Internal diameter of and Outer diameter of and Nominal drill hole diam Effective embedment of Diameter of clearance hole in the fixture Maximum installation to Thread engagement leffinition to min/max	f member nce nole diameter nstallatio nchor rod nchor rod chor rod ¹⁾ meter depth e torque length f member	r can be	$\frac{s_{min}}{c_{min}}$ e used $ramet$ d d d d d $h_{ef,ma}$ d d d d d d d d	[mm] [mm] [mm] ters f 2 [mr m [mr w [mr ≤ [mr st [Nr G [mr G [mr in [mr	40 40 for Inte n] n] n] n] n] n] n] n] n] n] n] n] (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	50 50 Ernal t -M6 6 10 12 50 00 7 10 /20 h _{ef} + 30	60 hreade IG-M8 8 12 14 70 240 9 10 8/20	70 ed and 16-N 10 10 10 10 10 10 10 10 10 10 10 10 10	80 2 2 2 2 2 2 0 2 0 2 0	100 100 100 100 0 12 20 22 90 400 12/30	125 IG-M 16 24 28 96 480 18 60 16/3	140 16 IC 2 2	160 20 30 35 120 600 22 100



	C C C C C C C				annan	and the second second				
Threaded Rod	Re- inforcing bar	Internal threaded anchor rod	d ₀ Drill bit - Ø HD, HDB, CD	d _t Brusł	- 1	d _{b,min} min. Brush - Ø	Piston plug		on direction piston plu	
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]			\rightarrow	1
M8	8		10	RBT10	12	10,5		~		_
M10	8/10	IG-M6	12	RBT12		12,5	1	NI	ا منابعهم ا	
M12	10/12	IG-M8	14	RBT14	16	14,5]	No plug	required	
	12		16	RBT16		16,5				
M16	14	IG-M10	18	RBT18		18,5	VS18			
	16		20	RBT20		20,5	VS20	4		
M20		IG-M12	24	RBT24		24,5	VS24	-		
MOA	20		25	RBT25		25,5	VS25	h _{ef} >	h _{ef} >	all
M24 M27	25	IG-M16	28 32	RBT28 RBT32		28,5 32,5	VS28 VS32	250 mm	250 mm	
		10 1400	32	RBT32		32,5	VS32 VS35	-		
M30	28	1 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1				00.0	0000			
	_	IG-M20	40	RBT40	41,5	40,5	VS40	1		
Cleaning Hand purr	32 g and insta		40 ols	-	41,5		VS40			
Cleaning Hand purr	32 g and insta	allation to	40 ols	-	41,5	40,5 Compressed	VS40			
Cleaning Hand purr	32 g and inst a p 0 ml, h _o ≦ 10 c	allation to	40 ols	-	41,5	40,5 Compressed	VS40			
Cleaning Hand pum (Volume 75	32 g and inst a p 0 ml, h _o ≦ 10 c	allation to	40 ols	-	41,5	40,5 Compressed (min 6 bar)	VS40			
Cleaning Hand purr (Volume 75 Orf Brush RB	32 g and insta p 0 ml, h ₀ ≦ 10 c	allation to d _s , d _o ≤ 20mm)	40 ols	-	41,5	40,5 Compressed (min 6 bar)	VS40			
Cleaning Hand purr (Volume 75 Brush RB	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool			
Cleaning Hand purr (Volume 75 Brush RB	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool			
Cleaning Hand purr (Volume 75 Brush RB	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool			
Cleaning Hand purr (Volume 75 Brush RB	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool			
Cleaning Hand purr (Volume 75 Brush RB	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool			
Cleaning Hand purr (Volume 75 Brush RB	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool			
Cleaning Hand purr (Volume 75 Brush RB Brush ext	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤ 20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool			
Cleaning Hand purr (Volume 75 Brush RB	32 g and instanp 0 ml, h ₀ ≦ 10 c T ension RBL	allation to d _s , d ₀ ≤20mm)	40 ols	RBT40	41,5	40,5 Compressed (min 6 bar)	VS40 I air tool		Annex	



Table B5:	Worki	ng time and c	uring time ABS VK	
Tempera	ture in bas	e material	Maximum working time	Minimum curing time ¹⁾
	Т		t _{gel}	t _{cure}
- 10°C	to	- 6 °C	90 min ²⁾	24 h
- 5 °C	to	- 1 °C	90 min	14 h
0°C	to	+ 4 °C	45 min	7 h
+ 5 °C	to	+ 9°C	25 min	2 h
+ 10°C	to	+ 19°C	15 min	80 min
+ 20 °C	to	+ 29 °C	6 min	45 min
+ 30 °C	to	+ 34 °C	4 min	25 min
+ 35 °C	to	+ 39 °C	2 min	20 min
	+40°C		1,5 min	15 min
Cartr	idge tempe	erature	+5°C to	+40°C

¹⁾ The minimum curing time is only valid for dry base material.

In wet base material the curing time must be doubled.

2) Cartridge temperature must be at least +15°C

Table B6: Working time and curing time ABS VK Nordic

Tempera	ture in bas	e material	Maximum working time	Minimum curing time ¹⁾
	Т		t _{gel}	t _{cure}
- 20 °C	to	- 16 °C	75 min	24 h
- 15 °C	to	- 11 °C	55 min	16 h
- 10°C	to	- 6 °C	35 min	10 h
- 5 °C	to	- 1 °C	20 min	5 h
0°C	to	+ 4 °C	10 min	2,5 h
+ 5 °C	to	+ 9 °C	6 min	80 min
	+ 10 °C		6 min	60 min
Cart	ridge tempe	rature	-20°C to	o +10°C

 The minimum curing time is only valid for dry base material. In wet base material the curing time must be doubled.

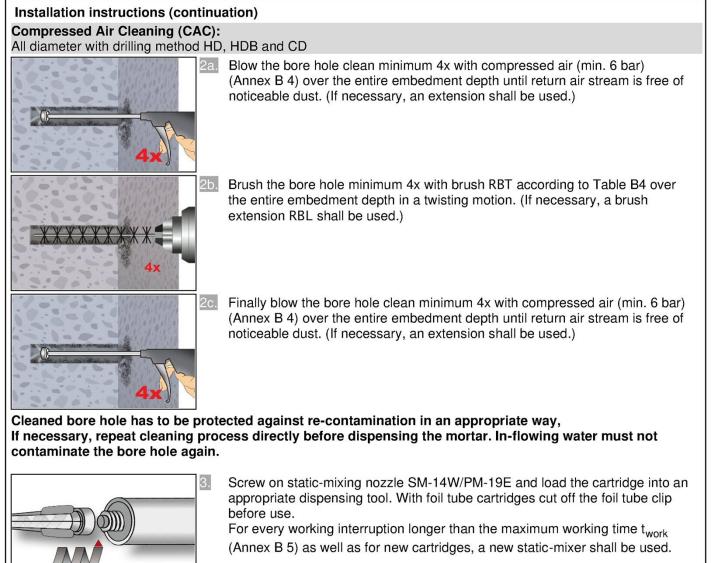
ABS Injection system VK for concrete

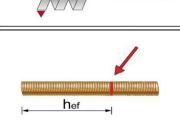
Intended Use Working time and curing time



Installation instructions		
Drilling of the bore hole		
	 Hammer drilling (HD) / Compressed air drilling (CD) Drill a hole to the required embedment depth. Drill bit diameter according to Table B1, B2 or B3. Aborted drill holes shall be filled with mortar. Proceed with Step 2 (CAC and MAC). 	
	 Hollow drill bit system (HDB) Drill a hole to the required embedment depth. Drill bit diameter according to Table B1, B2 or B3. Aborted drill holes shall be filled with mortar. Proceed with Step 2 (CAC and MAC). 	
	Attention! Standing water in the bore hole must be rem	oved before cleaning
Manual Air Cleaning (MAC)	and bore hole depth $h_0 \le 10d_{nom}$ (d ₀ < 14mm uncracked of	concrete only)
with drilling method HD, HDB and		Soliciele only)
2 4x	 Blow the bore hole clean minimum 4x from the bottom o (Annex B 4). 	r back by hand pump
2 <u>*******</u> *** 4x	Brush the bore hole minimum 4x with brush RBT accord the entire embedment depth in a twisting motion. (If new extension RBL shall be used.)	
e dx	c. Finally blow the bore hole clean minimum 4x from the bore pump (Annex B 4).	ottom or back by hand
ABS Injection system VK for	concrete	
Intended Use Installation instructions		Annex B 6







4.

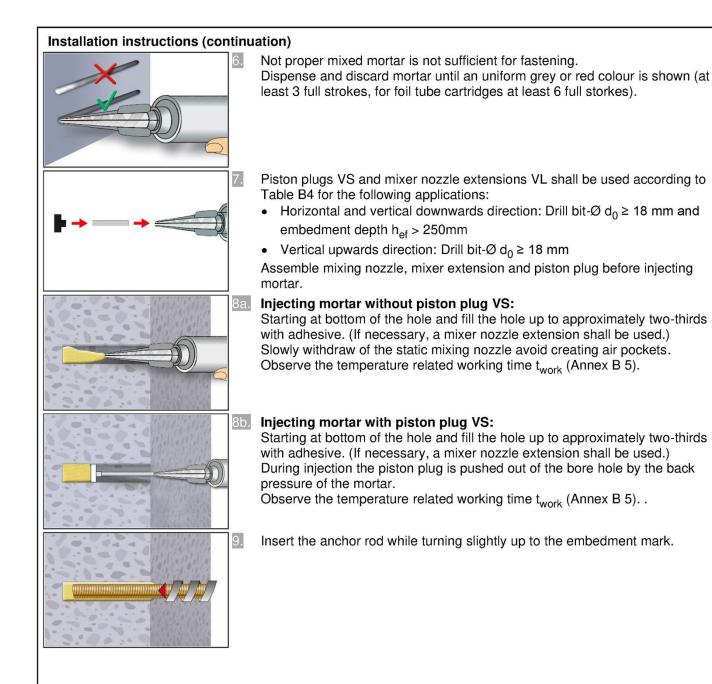
Mark embedment depth on the anchor rod.

The anchor rod shall be free of dirt, grease, oil or other foreign material.

ABS Injection system VK for concrete

Intended Use Installation instructions (continuation)





ABS Injection system VK for concrete

Intended Use Installation instructions (continuation)



Installation instructions (continu	ation)
10.	Annular gap between anchor rod and base material must be completely filled with mortar. In case of push through installation the annular gap in the fixture must be filled with mortar also. Otherwise, the installation must be repeated starting from step 7 before the maximum working time t_{work} has expired.
	For application in vertical upwards direction the anchor rod shall be fixed (e.g. wedges).
+20°C	Temperature related curing time t _{cure} (Annex B 5) must be observed. Do not move or load the fastener during curing time.
12.	Install the fixture by using a calibrated torque wrench. Observe maximum installation torque (Table B1, B2 or B3). In case of static requirements (e.g. seismic), fill the annular gab in the fixture with mortar (Annex A 3). Therefore replace the washer by the filling washer VFS and use the mixer reduction nozzle MR.

ABS Injection system VK for concrete

Intended Use Installation instructions (continuation)



T	able C1: Characteristic values resistance of threade			ension	resist	ance	and s	teel s	hear		
Th	ireaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Cr	oss section area	A _s	[mm²]	36,6	58	84,3	157	245	353	459	561
Cł	naracteristic tension resistance, Steel failu	re ¹⁾									
	eel, Property class 4.6 and 4.8	N _{Rk,s}	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
St	eel, Property class 5.6 and 5.8	N _{Rk,s}	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
St	eel, Property class 8.8	N _{Rk,s}	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
St	ainless steel A2, A4 and HCR, class 50	N _{Rk,s}	[kN]	18	29	42	79	123	177	230	281
St	ainless steel A2, A4 and HCR, class 70	N _{Rk,s}	[kN]	26	41	59	110	171	247	_3)	_3)
St	ainless steel A4 and HCR, class 80	N _{Rk,s}	[kN]	29	46	67	126	196	282	_3)	_3)
Cł	naracteristic tension resistance, Partial fac	tor ²⁾									
St	eel, Property class 4.6 and 5.6	γ _{Ms,N}	[-]				2,0	0			
St	eel, Property class 4.8, 5.8 and 8.8	γ _{Ms,N}	[-]				1,	5			
St	ainless steel A2, A4 and HCR, class 50	γ _{Ms,N}	[-]				2,8	6			
St	ainless steel A2, A4 and HCR, class 70	γ _{Ms,N}	[-]				1,8	37			
St	ainless steel A4 and HCR, class 80	γ _{Ms,N}	[-]				1,6	6			
Cł	naracteristic shear resistance, Steel failure	, 1)									
Ę	Steel, Property class 4.6 and 4.8	V ⁰ _{Rk,s}	[kN]	9 (8)	14 (13)	20	38	59	85	110	135
arm	Steel, Property class 5.6 and 5.8	V ⁰ Rk,s	[kN]	11 (10)	17 (16)	25	47	74	106	138	168
evel	Steel, Property class 8.8	V ⁰ Rk,s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
ort i	Stainless steel A2, A4 and HCR, class 50	V ⁰ Rk,s	[kN]	9	15	21	39	61	88	115	140
Without lever	Stainless steel A2, A4 and HCR, class 70	V ⁰ Rk,s	[kN]	13	20	30	55	86	124	_3)	_3)
5	Stainless steel A4 and HCR, class 80	V ⁰ _{Rk,s}	[kN]	15	23	34	63	98	141	_3)	_3)
	Steel, Property class 4.6 and 4.8	M ⁰ _{Rk,s}	[Nm]	15 (13)	30 (27)	52	133	260	449	666	900
arm	Steel, Property class 5.6 and 5.8	M ⁰ Rk,s	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123
er a	Steel, Property class 8.8	M ⁰ Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797
th lever	Stainless steel A2, A4 and HCR, class 50	M ⁰ Rk,s	[Nm]	19	37	66	167	325	561	832	1125
	Stainless steel A2, A4 and HCR, class 70	M ⁰ _{Rk,s}	[Nm]	26	52	92	232	454	784	_3)	_3)
	Stainless steel A4 and HCR, class 80	M ⁰ Rk,s	[Nm]	30	59	105	266	519	896	_3)	_3)
Cł	haracteristic shear resistance, Partial facto		•	•							
	eel, Property class 4.6 and 5.6	γ _{Ms,V}	[-]				1,6	57			
St	eel, Property class 4.8, 5.8 and 8.8	γ _{Ms,V}	[-]				1,2	25			
St	ainless steel A2, A4 and HCR, class 50	γ _{Ms,V}	[-]				2,3	8			
St	ainless steel A2, A4 and HCR, class 70	γ _{Ms,V}	[-]				1,5	6			
St	ainless steel A4 and HCR, class 80	γ _{Ms,V}	[-]				1,3	3			
1	Values are only valid for the given stress area	A _s . Value	s in bra	ckets are	e valid for	unders	ized thr	eaded r	ods with	smaller	r

 Values are only valid for the given stress area A_s. Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot-dip galvanised threaded rods according to EN ISO 10684:2004+AC:2009.

2) in absence of national regulation

3) Fastener type not part of the ETA

ABS Injection system VK for concrete

Performances

Characteristic values for steel tension resistance and steel shear resistance of threaded rods

Annex C 1



Table C2:	Characteristic v	alues of te	nsion loads ur	nder static and quasi-static action
Fastener				All Anchor types and sizes
Concrete cone fa	ailure			
Uncracked concre	ete	k _{ucr,N}	[-]	11,0
Cracked concrete	;	k _{cr,N}	[-]	7,7
Edge distance		C _{cr,N}	[mm]	1,5 h _{ef}
Axial distance		s _{cr,N}	[mm]	2 c _{cr,N}
Splitting		•	· · ·	
	h/h _{ef} ≥ 2,0			1,0 h _{ef}
Edge distance	2,0 > h/h _{ef} > 1,3	C _{cr,sp}	[mm]	$2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right)$
	h/h _{ef} ≤ 1,3			2,4 h _{ef}
Axial distance		s _{cr,sp}	[mm]	2 c _{cr,sp}

ABS Injection system VK for concrete

Performances Characteristic values for Concrete cone failure and Splitting with all kind of action

Annex C 2



	ded rod				M8	M10	M12	M16	M20	M24	M27	M30
<u>Steel f</u> Charac	ailure cteristic tension resi	istance	N _{Rk,s}	[kN]			A _a • f _i	or s) ا	ee Tab	le C1)		
Partial		Blance	γ _{Ms,N}	[-]					uble C1			
	ined pull-out and	concrete failure	1 1415,11	[]				000 10				
Charao	cteristic bond resist	ance in uncracke	d concrete C20)/25								-
-	l: 40°C/24°C				10	12	12	12	12	11	10	9,0
ange	II: 80°C/50°C	Dry, wet concrete			7,5	9,0	9,0	9,0	9,0	8,5	7,5	6,5
Temperature range	III: 120°C/72°C			[N1/mam2]	5,5	6,5	6,5	6,5	6,5	6,5	5,5	5,0
berat	l: 40°C/24°C		^τ Rk,ucr	[N/mm ²]	7,5	8,5	8,5	8,5				
Temp	II: 80°C/50°C	flooded bore			5,5	6,5	6,5	6,5		lo Perfo Asse		e
•	III: 120°C/72°C				4,0	5,0	5,0	5,0				
Charao	cteristic bond resist	ance in cracked o	oncrete C20/2	5						1		
¢)	l: 40°C/24°C				4,0	5,0	5,5	5,5	5,5	5,5	6,5	6,5
ange	II: 80°C/50°C	Dry, wet concrete			2,5	3,5	4,0	4,0	4,0	4,0	4,5	4,5
ure r	III: 120°C/72°C			[N/mm ²]	2,0	2,5	3,0	3,0	3,0	3,0	3,5	3,5
Temperature range	l: 40°C/24°C		^τ Rk,cr		4,0	4,0	5,5	5,5				
Tem	II: 80°C/50°C	flooded bore hole			2,5	3,0	4,0	4,0		lo Perfo Asse		e
·	III: 120°C/72°C				2,0	2,5	3,0	3,0				
Reduk	tion factor ψ^0 sus in	racked and und	racked concre	te C20/25								
nre	l: 40°C/24°C	Dry, wet						0,	73			
Temperature range	II: 80°C/50°C	concrete and flooded bore	Ψ^0_{sus}	[-]				0,	65			
Temp	III: 120°C/72°C	hole						0	57			
	sing factors for con	 crete	Ψc	[-]					20) ^{0,11}			
	cteristic bond resist		10	τ _{Rk,ucr} =			Ψε			(25)		
	concrete strength of			τ _{Rk,cr} =					;r(C20/2			
	ete cone failure		1	,			-					
Releva Splitti	ant parameter							see Ta	ble C2			
	ant parameter							see Ta	ible C2			
	ation factor		1	1								
	and wet concrete] γ _{inst}	[-]	1,0				1,2	lo Perfo	vmano	- <u></u>
for floc	oded bore hole					1	,4			Asse		
									1			
ABS	Injection system	n VK for concre	ete							-	– –	
Dorfo	ormances								I I	Anne	x C 3	5



Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm		·								
Characteristic shear resistance Steel, strength class 4.6, 4.8, 5.6 and 5.8	V ⁰ Rk,s	[kN]			0,6 ·	A _s ∙f _{uk}	(or see	Table C	1)	
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A2, A4 and HCR, all classes	V ⁰ Rk,s	[kN]			0,5 ·	A _s ∙ f _{uk}	(or see	Table C	1)	
Partial factor	γ _{Ms,} γ	[-]				see	Table C	:1		
Ductility factor	k7	[-]					1,0			
Steel failure with lever arm	1									
Characteristic bending moment	M ⁰ Rk,s	[Nm]			1,2 • \	W _{el} ∙ f _{uk}	(or see	Table C	;1)	
Elastic section modulus	W _{el}	[mm³]	31	62	109	277	541	935	1387	1874
Partial factor	γ _{Ms} ,v	[-]				see	Table C	:1		
Concrete pry-out failure										
Factor	k ₈	[-]					2,0			
Installation factor	γ _{inst}	[-]					1,0			
Concrete edge failure										
Effective length of fastener	lf	[mm]		m	in(h _{ef} ; 1	2 · d _{nor}	n)		min(h _{ef} ;	300mm
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	16	20	24	27	30
Installation factor	γ _{inst}	[-]					1,0			

ABS Injection	system	VK for	concrete
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Performances

Characteristic values of shear loads under static and quasi-static action (Threaded rod)

Annex C 4



Internal threaded anchor ro	ds			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure ¹⁾	5.0	N	TL-NIT	10	47	00	10	70	100
Characteristic tension resistar		N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, strength class	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor, strength class 5		γMs,N	[-]			1	,5		
Characteristic tension resistar Steel A4 and HCR, Strength c		N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			[-]			1,87			2,86
Combined pull-out and con	crete cone failu	γMs,N	[-]			1,07			2,00
Characteristic bond resistance			C20/25						
1: 40°C/24°C				12	12	12	12	11	9,0
II: 80°C/50°C	Dry, wet			9,0	9,0	9,0	9,0	8,5	6,5
en and a second	concrete	π	[NI/mm2]	6,5	6,5	6,5	6,5	6,5	5,0
ຍີ່ຫຼີ I: 40°C/24°C	flooded bore	^T Rk,ucr	[N/mm ²]	8,5	8,5	8,5		•	
ច៍ <u>II: 80°C/50°C</u>	hole			6,5	6,5	6,5	No Per	formance A	ssessec
III: 120°C/72°C				5,0	5,0	5,0			
Characteristic bond resistance	e in cracked con	crete C2	20/25						
φ <u>I: 40°C/24°C</u>	Dry, wet			5,0	5,5	5,5	5,5	5,5	6,5
II: 80°C/50°C	concrete			3,5	4,0	4,0	4,0	4,0	4,5
II: 40°C/50°C III: 120°C/72°C III: 120°C/24°C III: 80°C/50°C		^τ Rk,cr	[N/mm ²]	2,5 4,0	3,0 5,5	3,0 5,5	3,0	3,0	3,5
	flooded bore			3,0	4,0	4,0	No Por	formance A	
⊢ <u>III: 120°C/72°C</u>	hole			2,5	3,0	3,0	NOFEI	ormance P	15565560
Reduktion factor ψ^0_{SUS} in cra	cked and uncra		crete C2		0,0	0,0			
				0/20					
B I: 40°C/24°C	Dry, wet					0,	73		
L: 40°C/24°C II: 80°C/50°C III: 120°C/72°C	concrete and flooded bore	Ψ^0 sus	[-]			0,	65		
<u>⊢</u> III: 120°C/72°C	hole					0,	57		
Increasing factors for concrete	9	Ψc	[-]			(f _{ck} / 2	20) ^{0,11}		
Characteristic bond resistance	e depending on		Rk,ucr =			Ψc • ^τ Rk,u)	
the concrete strength class	s depending en		$\tau_{Rk,cr} =$			Wo • Tok	_{cr} (C20/25)	°	
Concrete cone failure						τ υ - πκ ,ι	<u> </u>		
Relevant parameter						see Ta	able C2		
Splitting failure									
Relevant parameter						see Ta	able C2		
Installation factor									
for dry and wet concrete		γ _{inst}	[-]		1,4	1	,2	formance A	
 Fastenings (incl. nut and wa The characteristic tension re 2) For IG-M20 strength class 5 	esistance for stee				ial and pro		of the inte	ernal thread	
ABS Injection system V	/ tou								

(Internal threaded anchor rod)



nternal threaded anchor rods				IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure without lever arm ¹⁾									
Characteristic shear resistance,	5.8	V ⁰ Rk,s	[kN]	5	9	15	21	38	61
Steel, strength class	8.8	V ⁰ Rk,s	[kN]	8	14	23	34	60	98
Partial factor, strength class 5.8 a	nd 8.8	γ _{Ms,V}	[-]		•		1,25		
Characteristic shear resistance, Stainless Steel A4 and HCR, Strength class 70 ²⁾		V ⁰ Rk,s	[kN]	7	13	20	30	55	40
Partial factor		γ _{Ms,V}	[-]			1,56			2,38
Ductility factor		k ₇	[-]				1,0		
Steel failure with lever arm ¹⁾									
Characteristic bending moment,	5.8	M ⁰ Rk,s	[Nm]	8	19	37	66	167	325
Steel, strength class	8.8	M ⁰ Rk,s	[Nm]	12	30	60	105	267	519
Partial factor, strength class 5.8 a	nd 8.8	γ _{Ms,V}	[-]		•		1,25	•	
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 ²⁾		M ⁰ Rk,s	[Nm]	11	26	52	92	233	456
Partial factor		γ _{Ms,V}	[-]			1,56			2,38
Concrete pry-out failure		1							1
actor		k ₈	[-]				2,0		
nstallation factor		γ _{inst}	[-]				1,0		
Concrete edge failure		•							
Effective length of fastener		lf	[mm]		min	(h _{ef} ; 12 ∙ d	nom)		min (h _{ef} ; 300mr
Dutside diameter of fastener		d _{nom}	[mm]	10	12	16	20	24	30
nstallation factor		γ _{inst}	[-]		•		1,0		
 Fastenings (incl. nut and washe The characteristic tension resist For IG-M20 strength class 50 is 	ance for								

ABS Injection system VK for concrete

Performances

Characteristic values of shear loads under static and quasi-static action (Internal threaded anchor rod)

Annex C 6



Table C7: Characteristic	values o	of tensio	n Ioa	ds un	der s	tatic	and q	luasi-	statio	c actio	on
Reinforcing bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure										1	
Characteristic tension resistance	N _{Rk,s}	[kN]					A _s ∙f _{uk}	1}			
Cross section area	A _s	[mm ²]	50	79	113	154	201	314	491	616	804
Partial factor	γ _{Ms,N}	[-]					1,4 ²⁾				
Combined pull-out and concrete fail											
Characteristic bond resistance in uncra	acked concr	ete C20/25			-	-			-		
$\underline{\mathfrak{Q}}$ $\underline{\mathfrak{l}}$ $\underline{\mathfrak{Q}}$ $\mathfrak{$			10	12	12	12	12	12	11	10	8,5
			7,5	9,0	9,0	9,0	9,0	9,0	8,0	7,0	6,0
Image: Second state Image: Second state Concrete Image: Second state Image: Second state Second state Image: Second state Image: Second state Second state	^τ Rk,ucr	[N/mm ²]	5,5 7,5	6,5 8,5	6,5 8,5	6,5 8,5	6,5 8,5	6,5	6,0	5,0	4,5
□ <u><u><u></u></u> <u><u></u> <u></u> <u></u> <u></u> <u></u> 1. 40 C/24 C</u> flooded <u><u></u> <u></u> <u></u> </u></u>			5,5	6,5	6,5	6,5 6,5	6,5	- N		ormanc	e
☐ ☐ <u>III: 120°C/72°C</u> bore hole			4,0	5,0	5,0	5,0	5,0	-	Asse	essed	
Characteristic bond resistance in crack	ed concrete	e C20/25	, -		/ -	- 1 -		1			
$\underline{\bullet}$ <u>I: 40°C/24°C</u> Dry, wet			4,0	5,0	5,5	5,5	5,5	5,5	5,5	6,5	6,5
II: 80°C/50°C Dry, wet			2,5	3,5	4,0	4,0	4,0	4,0	4,0	4,5	4,5
변 한 III: 120°C/72°C Concrete	τ _{Rk,cr}	[N/mm²]	2,0	2,5	3,0	3,0	3,0	3,0	3,0	3,5	3,5
	116,01	[]	4,0	4,0	5,5	5,5	5,5		lo Perf	ormanc	e
II: 80°C/50°C nooded III: 120°C/72°C bore hole			2,5 2,0	3,0 2,5	4,0 3,0	4,0 3,0	4,0 3,0	-		essed	
Reduktion factor ψ^0_{sus} in cracked and	uncracked	concrete C		2,5	3,0	3,0	_ 3,0				
							0,73				
L: 40°C/24°C Dry, wet concrete and flooded bore hole	Ψ ⁰ sus	[-]					0,65				
III: 120°C/72°C bore hole	+ sus						0,57				
$\mu^{\text{\tiny D}}$ III: 120°C/72°C bore hole Increasing factors for concrete	Ψc	[-]				(fe	(,37 k / 20)	0,11			
Characteristic bond resistance	ΨC										
depending on the concrete strength		$\tau_{\text{Rk,ucr}} =$					Rk,ucr(C				
class Concrete cone failure		^τ Rk,cr =				Ψς	Rk,cr(C	20/23)			
Relevant parameter						50	e Table	0.02			
Splitting						30		02			
Relevant parameter						se	e Table	02			
Installation factor											
for dry and wet concrete			1,0				1	,2			
for flooded bore hole	Yinst	[-]		1	1,4				lo Perf	ormanc	e
					1,4				Asse	essed	
¹⁾ f_{uk} shall be taken from the specificati	ons of reinfol	rcing bars									
²⁾ in absence of national regulation											
ABS Injection system VK for co	ncrete										
Performances								1	Anne	ex C 7	,
Characteristic values of tension load (Reinforcing bar)	ds under sta	atic and qu	asi-sta	tic acti	on						



Table C8: Characteristic	values	of shea	ir loa d	ds un	der si	tatic a	and q	uasi-s	static	actio	n
Reinforcing bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure without lever arm			•	•	•				•		
Characteristic shear resistance	V ⁰ Rk,s	[kN]				0,5	0 · A _s ·	f _{uk} 1)			
Cross section area	A _s	[mm²]	50	79	113	154	201	314	491	616	804
Partial factor	γ _{Ms} ,V	[-]					1,5 ²⁾				
Ductility factor	k ₇	[-]					1,0				
Steel failure with lever arm											
Characteristic bending moment	M ⁰ Rk,s	[Nm]				1.2	• w _{el} •	f _{uk} 1)			
Elastic section modulus	W _{el}	[mm³]	50	98	170	269	402	785	1534	2155	3217
Partial factor	γ _{Ms} ,v	[-]					1,5 ²⁾				
Concrete pry-out failure											
Factor	k ₈	[-]					2,0				
Installation factor	γinst	[-]					1,0				
Concrete edge failure											
Effective length of fastener	l _f	[mm]		mi	n(h _{ef} ; 1	2∙d _{no}	m)		min(h _{ef} ; 300	mm)
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	14	16	20	25	28	32
Installation factor	γ _{inst}	[-]					1,0				
¹⁾ f_{uk} shall be taken from the specification	ons of reinfo	orcing bars	S								
²⁾ in absence of national regulation											

ABS Injection system VK for concrete

Performances Characteristic values of shear loads under static and quasi-static action (Reinforcing bar)

Annex C 8



Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete	e C20/25 und	der static and quasi-	static action	on			•		•	
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,021	0,023	0,026	0,031	0,036	0,041	0,045	0,049
I: 40°C/24°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,030	0,033	0,037	0,045	0,052	0,060	0,065	0,07
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,11
II: 80°C/50°C	δ _{N∞} -f actor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,17
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,11
III: 120°C/72°C	δ _№ -f actor	[mm/(N/mm²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,17
Cracked concrete C	20/25 under	static and quasi-sta	tic action							
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,0	90			0,0)70		
I: 40°C/24°C	δ _№ -factor	[mm/(N/mm ²)]	0,1	05			0,	105		
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,2	219			0,	170		
II: 80°C/50°C	δ _№ -factor	[mm/(N/mm ²)]	0,2	255			0,2	245		
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,2	219			0,	170		
III: 120°C/72°C	δ _{N∞} -factor	[mm/(N/mm ²)]	02	255			0,2	245		
¹⁾ Calculation of the c $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C10:	τ; · τ;	τ: action bond stress	for tension	M10	M12	M16	M20	M24	M27	МЗС
¹⁾ Calculation of the c $\delta_{N0} = \delta_{N0}$ -factor · $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C10: E Threaded rod	τ; τ; Displacem	τ: action bond stress	for tension ar load ¹⁾ M8	M10	M12	M16	M20	M24	M27	МЗС
 ¹⁾ Calculation of the c δ_{N0} = δ_{N0}-factor · δ_{N∞} = δ_{N∞}-factor Table C10: E Threaded rod Uncracked concrete 	τ; τ; Displacem	τ: action bond stress	for tension ar load ¹⁾ M8	M10	M12 0,05	M16	M20	M24	M27	
 ¹⁾ Calculation of the c δ_{N0} = δ_{N0}-factor · δ_{N∞} = δ_{N∞}-factor Table C10: C Threaded rod Uncracked concrete All temperature 	τ; τ; Displacem	τ: action bond stress nents under shea der static and quasi-	for tension ar load ¹⁾ M8 static actio	M10 on		I	I			0,03
¹⁾ Calculation of the c $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C10: D Threaded rod Uncracked concrete All temperature ranges	τ; τ; Displacem C20/25 und δvo-factor δv∞-factor	τ: action bond stress eents under shea der static and quasi- [mm/kN]	for tension ar load ¹⁾ M8 static action 0,06 0,09	M10 on 0,06	0,05	0,04	0,04	0,03	0,03	0,03
¹⁾ Calculation of the c $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor Table C10: D Threaded rod Uncracked concrete All temperature ranges Cracked concrete C	τ; τ; Displacem C20/25 und δvo-factor δv∞-factor	τ: action bond stress eents under shea der static and quasi- [mm/kN] [mm/kN]	for tension ar load ¹⁾ M8 static action 0,06 0,09	M10 on 0,06	0,05	0,04	0,04	0,03	0,03	M30 0,03 0,05
 ¹⁾ Calculation of the c δ_{N0} = δ_{N0}-factor · δ_{N∞} = δ_{N∞}-factor Table C10: E Threaded rod Uncracked concrete All temperature ranges Cracked concrete C All temperature ranges 	τ; τ; Displacem C20/25 und δvo-factor δ v∞-factor 20/25 under δv∞-factor δv∞-factor	t: action bond stress tents under shea der static and quasi- [mm/kN] [mm/kN] static and quasi-sta [mm/kN] [mm/kN]	for tension ar load ¹⁾ M8 static action 0,06 0,09 attic action	M10 on 0,06 0,08	0,05	0,04	0,04	0,03	0,03	0,03
 ¹⁾ Calculation of the c δ_{N0} = δ_{N0}-factor · δ_{N∞} = δ_{N∞}-factor Table C10: D Threaded rod Uncracked concrete All temperature ranges Cracked concrete C All temperature 	τ; τ; Displacem C20/25 und δ_{vo} -factor $\delta_{v\infty}$ -factor 20/25 under $\delta_{v\infty}$ -factor $\delta_{v\infty}$ -factor displacement V;	t: action bond stress tents under shea der static and quasi- [mm/kN] [mm/kN] static and quasi-sta [mm/kN] [mm/kN]	for tension ar load ¹⁾ M8 static actio 0,06 0,09 atic action 0,12	M10 on 0,06 0,08 0,12	0,05 0,08 0,11	0,04 0,06 0,10	0,04 0,06 0,09	0,03 0,05 0,08	0,03 0,05 0,08	0,03



nternal threaded a	anchor rod		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Jncracked concrete	e C20/25 unde	r static and quas	i-static act	ion	-	•	•	
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,023	0,026	0,031	0,036	0,041	0,049
I: 40°C/24°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,033	0,037	0,045	0,052	0,060	0,071
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,056	0,063	0,075	0,088	0,100	0,119
II: 80°C/50°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,081	0,090	0,108	0,127	0,145	0,172
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,056	0,063	0,075	0,088	0,100	0,119
III: 120°C/72°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,081	0,090	0,108	0,127	0,145	0,172
Cracked concrete C	20/25 under s	tatic and quasi-s	tatic action	ļ				
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,090			0,070		
I: 40°C/24°C	δ _{N∞} -f acto r	[mm/(N/mm ²)]	0,105			0,105		
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,219			0,170		
II: 80°C/50°C	δ _{N∞} -f acto r	[mm/(N/mm ²)]	0,255			0,245		
Temperature range	δ _{N0} -factor	[mm/(N/mm ²)]	0,219	ļ		0,170		
III: 120°C/72°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,255			0,245		
$\delta_{N\infty} = \delta_{N\infty}$ -factor Table C12: [nts under she	ear load ¹					
			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
nternal threaded a	anchor rod							
		C20/25 under sta		asi-static a	ction			
Jncracked and cra		C20/25 under sta		asi-static a	ction 0,06	0,05	0,04	0,04
Jncracked and crac	cked concrete ivo-factor iv∞-factor displacement		atic and qua 0,07 0,10			0,05 0,08	0,04	0,04 0,06
Incracked and cracked and cracked and cracked and cracked angles All temperature angles 1) Calculation of the second cracked and cracked and cracked and cracked and cracked angles	cked concrete	[mm/kN] [mm/kN]	atic and qua 0,07 0,10	0,06	0,06		-	



Anchor size rein	forcing bar		Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Uncracked concr	rete C20/25 u	Inder static and	quasi-s	tatic act	ion		1	1			1
Temperature	δ _{N0} -factor	[mm/(N/mm ²)]	0,021	0,023	0,026	0,028	0,031	0,036	0,043	0,047	0,052
range I: 40°C/24°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,030	0,033	0,037	0,041	0,045	0,052	0,061	0,071	0,075
Temperature	δ _{N0} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,126
range II: 80°C/50°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,18
Temperature	δ _{N0} -factor	[mm/(N/mm ²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,12
range III: 120°C/72°C	δ _{N∞} -factor	[mm/(N/mm ²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,18
Cracked concrete	e C20/25 und	ler static and qu	uasi-stat	ic actior	1		I		1		
Temperature	δ _{N0} -factor	[mm/(N/mm²)]	1)90				0,070			
range I: 40°C/24°C	δ _{N∞} -factor	[mm/(N/mm ²)]		105				0,105			
Temperature	δ _{N0} -factor	[mm/(N/mm ²)]		219				0,170			
range II: 80°C/50°C	δ _{N∞} -factor	[mm/(N/mm ²)]	-	255				0,245			
Temperature	δ _{N0} -factor	[mm/(N/mm ²)]		219				0,170			
range III: 120°C/72°C	δ _{N∞} -factor	[mm/(N/mm ²)]	-	255				0,245			
1) Calculation of th $\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C14:	or ·τ; or ·τ;	τ: action bond			ebar)						
δ _{N0} = δ _{N0} -facto δ _{N∞} = δ _{N∞} -facto Table C14:	or · τ; or · τ; Displacen	τ: action bond	hear lo	ad ¹⁾ (r	-	014	Ø 16	Ø 20	Ø 25	<i>(</i> 7 28	032
$\delta_{N0} = \delta_{N0} - facto\delta_{N\infty} = \delta_{N\infty} - factoTable C14:$	or · τ; or · τ; Displacen forcing bar	τ: action bond	hear lo Ø 8	9 ad ¹⁾ (r	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
$\delta_{N0} = \delta_{N0} - facto\delta_{N\infty} = \delta_{N\infty} - factoTable C14: Anchor size reinUncracked concr$	or · τ; or · τ; Displacen forcing bar ete C20/25 u	τ: action bond	hear lo Ø 8 quasi-si	oad ¹⁾ (r Ø 10 tatic acti	Ø 12 ion	I		I	1		Ø 32
$\delta_{N0} = \delta_{N0} - facto\delta_{N\infty} = \delta_{N\infty} - factoTable C14:$	or · τ; Displacen forcing bar ete C20/25 u δvo-factor	τ: action bond	hear lo Ø 8 quasi-s 0,06	øad ¹⁾ (r Ø 10 tatic acti 0,05	Ø 12 ion 0,05	0,04	0,04	0,04	0,03	0,03	0,03
δ _{N0} = δ _{N0} -facto δ _{N∞} = δ _{N∞} -facto Table C14: I Anchor size rein Uncracked concr All temperature	or · τ; or · τ; Displacen forcing bar ete C20/25 u δvo-factor δv∞-factor	τ: action bond	hear lo Ø 8 quasi-sa 0,06 0,09	Ø 10 Ø 10 tatic acti 0,05 0,08	Ø 12 ion 0,05 0,08	I		I	1		0,03
δ _{N0} = δ _{N0} -facto δ _{N∞} = δ _{N∞} -facto Table C14: Anchor size rein Uncracked concr All temperature ranges Cracked concrete	or · τ; or · τ; Displacen forcing bar ete C20/25 u δvo-factor δv∞-factor	r: action bond	hear lo Ø 8 quasi-s 0,06 0,09 lasi-stat	ad ¹⁾ (r Ø 10 tatic acti 0,05 0,08 ic action	Ø 12 ion 0,05 0,08	0,04	0,04	0,04	0,03	0,03	0,03
$\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C14: Anchor size rein Uncracked concr All temperature ranges Cracked concrete All temperature ranges 1) Calculation of th	pr · τ; pr · τ; Displacen forcing bar ete C20/25 u $\delta_{V_{0}}$ -factor $\delta_{V_{0}}$ -factor $\delta_{V_{0}}$ -factor $\delta_{V_{0}}$ -factor a C20/25 und $\delta_{V_{0}}$ -factor build by the second	r: action bond	hear lo Ø 8 quasi-si 0,06 0,09 uasi-stat 0,12 0,18	Ø 10 Ø 10 tatic acti 0,05 0,08	Ø 12 ion 0,05 0,08	0,04	0,04	0,04	0,03	0,03	0,03
$\delta_{N0} = \delta_{N0}$ -facto $\delta_{N\infty} = \delta_{N\infty}$ -facto Table C14: Anchor size rein Uncracked concr All temperature ranges Cracked concrete All temperature ranges	pr · τ; pr · τ; Displacen forcing bar ete C20/25 u δ_{vo} -factor δv _∞ -factor δv _∞ -factor bv _∞ -factor bv _∞ -factor ie displaceme pr · V; pr · V;	r: action bond	hear lo Ø 8 quasi-si 0,06 0,09 uasi-stat 0,12 0,18	ad ¹⁾ (r Ø 10 tatic acti 0,05 0,08 ic action 0,12	Ø 12 ion 0,05 0,08 0,11	0,04 0,06 0,11	0,04 0,06 0,10	0,04 0,05 0,09	0,03 0,05 0,08	0,03 0,04 0,07	0,03



Table C15: Characteristic values of tension loads under seismic action (performance category C1)

Threaded rod						M8	M10	M12	M16	M20	M24	M27	M30	
Steel fa	ailure	!		1										
Characteristic tension resistance				N _{Rk,s,eq,C1}	[kN]	1,0 • N _{Rk,s}								
Partial factor				γ _{Ms,N}	[-]	see Table C1								
			concrete failure											
Charac	cterist	tic bond resista	ance in uncracke	d and cracked (concrete C2	20/25			1					
Temperature range	l:	40°C/24°C	Dry, wet concrete	^{- τ} Rk,eq,C1	[N/mm²]	2,5	3,1	3,7	3,7	3,7	3,8	4,5	4,5	
	II:	80°C/50°C				1,6	2,2	2,7	2,7	2,7	2,8	3,1	3,1	
	111:	120°C/72°C				1,3	1,6	2,0	2,0	2,0	2,1	2,4	2,4	
	I:	40°C/24°C	flooded bore			2,5	2,5	3,7	3,7					
	II:	80°C/50°C				1,6	1,9	2,7	2,7	No Performance Assessed				
·	III:	120°C/72°C				1,3	1,6	2,0	2,0					
Increasing factors for concrete				Ψc	[-]	1,0								
Characteristic bond resistance depending on the concrete strength class				τ	$\tau_{Rk,eq,C1} = \qquad \qquad \psi_{C} \cdot \tau_{Rk,eq,C1}(C20/25)$									
Install	ation	factor												
for dry and wet concrete]		1,0 1,2								
for flooded bore hole				^y inst [-]		1,4				No Performance Assessed				

Table C16:Characteristic values of shear loads under seismic action
(performance category C1)

Threaded rod				M10	M12	M16	M20	M24	M27	M30	
Steel failure without lever arm								<u> </u>			
Characteristic shear resistance (Seismic C1) V _{Rk,s,eq,C1} [kN]			0,70 · V ⁰ _{Rk,s}								
Partial factor Y _{Ms,V} [see Table C1								
Factor for annular gap α_{gap} [-			0,5 (1,0) ¹⁾								
¹⁾ Value in brackets valid for filled as Annex A 3 is recommended	nnular gab betwe	en faste	ener and	l clearan	ice ho l e	in the fix	ture. Us	se of spe	cial filling [.]	washer	

ABS Injection system VK for concrete

Performances
Characteristic values of tension loads and shear loads under seismic action
(performance category C1) (Threaded rod)

Annex C 12



Table C17: Characteristic values of tension loads under seismic action (performance category C1) **Reinforcing bar** Ø 8 | Ø 10 | Ø 12 | Ø 14 | Ø 16 | Ø 20 | Ø 25 | Ø 28 | Ø 32 Steel failure $1,0 \cdot A_{s} \cdot f_{uk}^{1}$ Characteristic tension resistance N_{Rk,s,eq,C1} [kN] A_s 113 314 491 50 79 154 201 616 804 Cross section area [mm²] 1,4²⁾ Partial factor [-] γ<u>Ms,N</u> Combined pull-out and concrete failure Characteristic bond resistance in uncracked and cracked concrete C20/25 1: 40°C/24°C 2.5 3.1 3.7 3.7 3,7 3,7 3.8 4.5 4.5 Dry, wet Temperatur range II: 80°C/50°C 1,6 2,2 2,7 2.7 2,7 2.7 2.8 3.1 3,1 concrete III: 120°C/72°C 1,3 1,6 2,0 2.0 2,0 2,0 2,1 2.4 2.4 τ Rk, eq,C1 [N/mm²] l: 40°C/24°C 2,5 2,5 3,7 3,7 3,7 flooded No Performance 80°C/50°C II: 1,6 1,9 2,7 2,7 2,7 bore hole Assessed III: 120°C/72°C 1,3 1,6 2,0 2,0 2,0 Increasing factors for concrete Ψ_{c} [-] 1.0 Characteristic bond resistance ψ_c • τ_{Rk,eq,C1}(C20/25) depending on the concrete strength ^τRk,eq,C1 = class Installation factor for dry and wet concrete 1,2 1.2 No Performance [-] γinst for flooded bore hole 1.4 Assessed 1) f_{uk} shall be taken from the specifications of reinforcing bars 2) in absence of national regulation Characteristic values of shear loads under seismic action Table C18: (performance category C1) Ø 10 Ø 12 Ø 14 Ø 20 Ø 28 Reinforcing bar Ø8 Ø 16 Ø 25 Ø 32 Steel failure without lever arm V_{Rk,s,eq,C1} $0,35 \cdot A_{s} \cdot f_{uk}^{2}$ Characteristic shear resistance [kN] A_s 50 79 113 154 201 314 491 616 804 Cross section area [mm²] 1,52) Partial factor [-] γMs,V 0,5 (1,0)3) Factor for annular gap [-] α_{gap} ¹⁾ $f_{\mu k}$ shall be taken from the specifications of reinforcing bars 2) in absence of national regulation 3) Value in brackets valid for filled annular gab between fastener and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended ABS Injection system VK for concrete Annex C 13 Performances Characteristic values of tension loads and shear loads under seismic action (performance category C1) (Reinforcing bar)