



Approval body for construction products and types of construction

#### **Bautechnisches Prüfamt**

An institution established by the Federal and Laender Governments



# European Technical Assessment

# ETA-08/0237 of 18 November 2019

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

This version replaces

Deutsches Institut für Bautechnik

Chemofast Injection System STVK or STVK Nordic for concrete

Bonded anchor for use in concrete

CHEMOFAST Anchoring GmbH Hanns-Martin-Schleyer-Straße 23 47877 Willich DEUTSCHLAND

CHEMOFAST Anchoring GmbH

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

EAD 330499-01-0601

ETA-08/0237 issued on 7 September 2017



European Technical Assessment ETA-08/0237 English translation prepared by DIBt

Page 2 of 31 | 18 November 2019

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Page 3 of 31 | 18 November 2019

## Specific Part

### 1 Technical description of the product

The "Chemofast Injection System STVK or STVK Nordic for concrete" is a bonded anchor consisting of a cartridge with injection mortar Chemofast STVK or Chemofast STVK 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 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 anchor 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 C 1 to C 3, C 5, C 7,
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 4, C 6, C 8,
Displacements (static and quasi-static loading)	See Anne C 9 to C 11
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Anne C 12 to C 16
Durability	See Annex B 1

## 3.2 Hygiene, health and the environment (BWR 3)

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

# 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



# European Technical Assessment ETA-08/0237 English translation prepared by DIBt

Page 4 of 31 | 18 November 2019

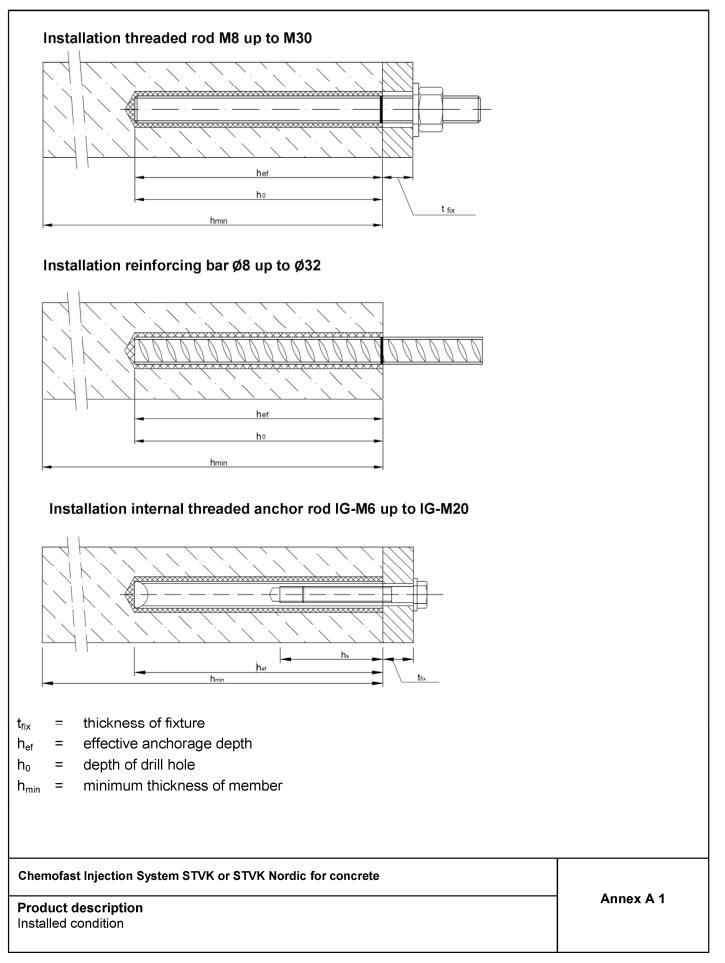
# 5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

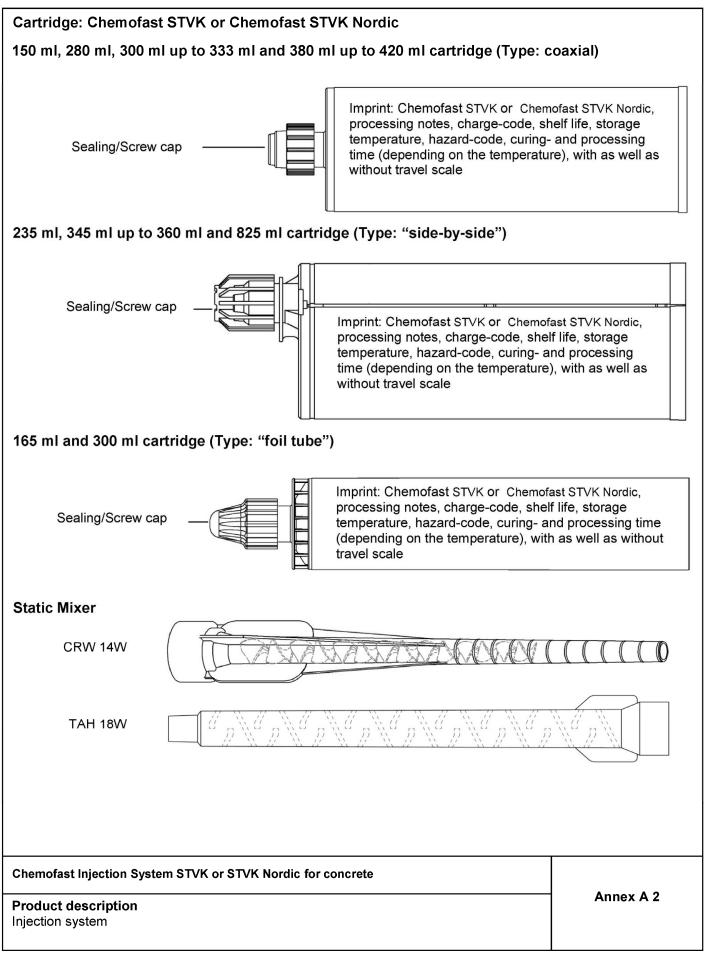
Issued in Berlin on 18 November 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerwo Abteilungsleiter Beglaubigt











Threaded rod M8, M10, M12, M16, M2	20, M24, M27, M30 with washer and hexag	on nut
	Commercia rod with: - Mater mecha - 1 (3a) - Inspect to EN	ction certificate 3.1 acc. 10204:2004 ng of embedment
Internal threaded anchor rod IG-M6,	IG-M8, IG-M10, IG-M12, IG-M16, IG-M20	
Threaded rod or screw	Mark of the producer	4)
		σ
	Marking: e.g. M8	
	Marking Internal thread	
	Mark M8 Thread size (Internal thread) A4 additional mark for stainless steel HCR additional mark for high-corrosion resi	istance steel
Filling washer and mixer reduction n fixture	nozzle for filling the annular gap between a	anchor rod and
() () () () () () () () () () () () () (		
Chemofast Injection System STVK or STVK I	Nordic for concrete	
<b>Product description</b> Threaded rod, internal threaded rod and fill	ling washer	Annex A 3



'art	Designation	Material				
		DEN 10087:1998 or EN 1026	63·200	1)		
zii ho	inc plated ≥ 5 μm bt-dip galvanised ≥ 40 μm	acc. to EN ISO 4042:1999 ( acc. to EN ISO 1461:2009 a acc. to EN ISO 17668:2016	or and EN	,	AC:2009 or	
		Property class	<u> </u>	Characteristic tensile strength	Characteristic yield strength	Elongation at fracture
			4.6	f <sub>uk</sub> = 400 N/mm <sup>2</sup>	f <sub>yk</sub> = 240 N/mr	n² A <sub>5</sub> > 8%
1	Threaded rod			f <sub>uk</sub> = 400 N/mm²	f <sub>vk</sub> = 320 N/mr	n² A <sub>5</sub> > 8%
		acc. to	5.6	f <sub>uk</sub> = 500 N/mm²	f <sub>yk</sub> = 300 N/mr	n² A <sub>5</sub> > 8%
		EN ISO 898-1:2013		f <sub>uk</sub> = 500 N/mm <sup>2</sup>	f <sub>vk</sub> = 400 N/mr	
				$f_{uk} = 800 \text{ N/mm}^2$	f <sub>vk</sub> = 640 N/mr	
			4	for threaded rod c	1.1	
2	Hexagon nut	acc. to EN ISO 898-2:2012	5	for threaded rod c	lass 5.6 or 5.8	
			8	for threaded rod c		
3a	Washer	Steel, zinc plated, hot-di (e.g.: EN ISO 887:2006,	ENIS	O 7089:2000, EN I	SO 7093:2000 d	or EN ISO 7094:200
3b	Filling washer	Steel, zinc plated, hot-di	p galva			
	Internal threaded	Property class		Characteristic tensile strength	Characteristic yield strength	Elongation at fracture
4	anchor rod	acc. to		f <sub>uk</sub> = 500 N/mm²	f <sub>yk</sub> = 400 N/mr	-
		EN ISO 898-1:2013	8.8	f <sub>uk</sub> = 800 N/mm²	f <sub>yk</sub> = 640 N/mr	n² A <sub>5</sub> > 8%
Staiı	nless steel A4 (Material 1.4	4301 / 1.4307 / 1.4311 / 1.45 4401 / 1.4404 / 1.4571 / 1.43 9el (Material 1 4529 or 1 4565	62 or 1	.4578, acc. to EN	10088-1:2014)	
Staiı	nless steel A4 (Material 1.4		62 or 1	.4578, acc. to EN	10088-1:2014)	Elongation at fracture
Staiı	nless steel A4 (Material 1.4	4401 / 1.4404 / 1.4571 / 1.430 eel (Material 1.4529 or 1.4565 Property class	62 or 1 5, acc.	.4578, acc. to EN <sup>2</sup> to EN 10088-1: 20 Characteristic	10088-1:2014) 14) Characteristic	fracture
Staiı ligh	nless steel A4 (Material 1.4 corrosion resistance ste	4401 / 1.4404 / 1.4571 / 1.430 eel (Material 1.4529 or 1.4565 Property class acc. to	62 or 1 5, acc. 50	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength	10088-1:2014) 14) Characteristic yield strength	$\begin{array}{c} \text{fracture} \\ \text{n}^2  \text{A}_5 \geq 8\% \end{array}$
Staiı ligh	nless steel A4 (Material 1.4 corrosion resistance ste	4401 / 1.4404 / 1.4571 / 1.430 eel (Material 1.4529 or 1.4565 Property class	62 or 1 5, acc. 50 70	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength f <sub>uk</sub> = 500 N/mm <sup>2</sup>	10088-1:2014) 14) Characteristic yield strength f <sub>yk</sub> = 210 N/mr	fracturen² $A_5 \ge 8\%$ n² $A_5 \ge 8\%$
Staiı ligh	Threaded rod <sup>1)3)</sup>	4401 / 1.4404 / 1.4571 / 1.430 eel (Material 1.4529 or 1.4565 Property class acc. to EN ISO 3506-1:2009	62 or 1 5, acc. 50 70 80	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength f <sub>uk</sub> = 500 N/mm <sup>2</sup> f <sub>uk</sub> = 700 N/mm <sup>2</sup>	10088-1:2014) 14) Characteristic yield strength f <sub>yk</sub> = 210 N/mr f <sub>yk</sub> = 450 N/mr f <sub>yk</sub> = 600 N/mr	fracturen² $A_5 \ge 8\%$ n² $A_5 \ge 8\%$
Staiı ligh	nless steel A4 (Material 1.4 corrosion resistance ste	4401 / 1.4404 / 1.4571 / 1.430 eel (Material 1.4529 or 1.4565 Property class acc. to	62 or 1 5, acc. 50 70 80 50 70	.4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	10088-1:2014) 14) Characteristic yield strength $f_{yk}$ = 210 N/mr $f_{yk}$ = 450 N/mr $f_{yk}$ = 600 N/mr lass 50 lass 70	fracturen² $A_5 \ge 8\%$ n² $A_5 \ge 8\%$
itaii ligh 1 2	Threaded rod <sup>1)3)</sup>	4401 / 1.4404 / 1.4571 / 1.430 eel (Material 1.4529 or 1.4565 Property class acc. to EN ISO 3506-1:2009 acc. to	62 or 1 5, acc. 70 80 50 70 80 307 / 1 404 / 1 1.456	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	10088-1:2014) 14) Characteristic yield strength $f_{yk} = 210 \text{ N/mr}$ $f_{yk} = 450 \text{ N/mr}$ $f_{yk} = 600 \text{ N/mr}$ lass 50 lass 70 lass 80 1.4541, acc. to 1.4578, acc. to 3-1: 2014	fracture $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ EN 10088-1:2014         EN 10088-1:2014
itaii ligh 1 2 3a	Threaded rod <sup>1)3)</sup>	4401 / 1.4404 / 1.4571 / 1.430 eel (Material 1.4529 or 1.4565 Property class acc. to EN ISO 3506-1:2009 A2: Material 1.4301 / 1.4 A4: Material 1.4401 / 1.4 HCR: Material 1.4529 or	62 or 1 5, acc. 50 70 80 50 70 80 1307 / 1 1404 / 1 1.4563 EN IS	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	10088-1:2014) 14) Characteristic yield strength $f_{yk} = 210 \text{ N/mr}$ $f_{yk} = 450 \text{ N/mr}$ $f_{yk} = 600 \text{ N/mr}$ lass 50 lass 70 lass 80 1.4541, acc. to 1 1.4578, acc. to 1 3-1: 2014 SO 7093:2000 c	fracture $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ main fracture $A_5 \ge 100000000000000000000000000000000000$
itaii ligh	Iess steel A4 (Material 1.4       corrosion resistance steel       Threaded rod <sup>1)3)</sup> Hexagon nut <sup>1)3)</sup> Washer	4401 / 1.4404 / 1.4571 / 1.430 el (Material 1.4529 or 1.4565 Property class acc. to EN ISO 3506-1:2009 Ac: Material 1.4301 / 1.4 A4: Material 1.4401 / 1.4 HCR: Material 1.4529 or (e.g.: EN ISO 887:2006,	62 or 1 5, acc. 70 80 50 70 80 307 / 1 404 / 1 1.4563 EN IS corros	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	$\begin{array}{c} 10088-1:2014 \\ \hline 14) \\ \hline Characteristic \\ yield strength \\ \hline f_{yk} = 210 \ N/mr \\ \hline f_{yk} = 450 \ N/mr \\ \hline f_{yk} = 600 \ N/mr \\ \hline lass 50 \\ \hline lass 70 \\ \hline lass 80 \\ \hline 1.4541, \ acc. \ to \\ \hline 1.4578, \ acc. \ to \\ \hline 3-1: \ 2014 \\ \hline SO \ 7093:2000 \ o \\ \hline \\ \hline Characteristic \\ yield strength \\ \end{array}$	fracture $n^2$ $A_5 ≥ 8\%$ $n^2$ $A_5 ≥ 8\%$ $n^2$ $A_5 ≥ 8\%$ EN 10088-1:2014         EN 10088-1:2014         EN 10088-1:2014         EN 10088-1:2014         EN 10088-1:2014         Elongation at fracture
itaii ligh 1 2 3a	Iess steel A4 (Material 1.4         corrosion resistance ste         Threaded rod <sup>1)3)</sup> Hexagon nut <sup>1)3)</sup> Washer         Filling washer         Internal threaded	4401 / 1.4404 / 1.4571 / 1.430         tel (Material 1.4529 or 1.4565         Property class         acc. to         EN ISO 3506-1:2009         acc. to         EN ISO 3506-1:2009         A2: Material 1.4301 / 1.4         A4: Material 1.4301 / 1.4         HCR: Material 1.4529 or (e.g.: EN ISO 887:2006,         Stainless steel A4, High         Property class         acc. to	62 or 1 5, acc. 70 80 50 70 80 307 / 1 404 / 1 1.4563 EN IS corros 50	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	10088-1:2014)         14)         Characteristic         yield strength $f_{yk} = 210$ N/mr $f_{yk} = 450$ N/mr $f_{yk} = 600$ N/mr         lass 50         lass 70         lass 80         1.4578, acc. to         3-1: 2014         SO 7093:2000 of         Characteristic         yield strength $f_{yk} = 210$ N/mr	fracture $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ EN 10088-1:2014         EN 10088-1:2014         or EN 1SO 7094:2000         Elongation at fracture $n^2$ $A_5 \ge 8\%$
itaii ligh 1 2 3a 3b 4	Iess steel A4 (Material 1.4         corrosion resistance ste         Threaded rod <sup>1)3)</sup> Hexagon nut <sup>1)3)</sup> Washer         Filling washer         Internal threaded anchor rod <sup>1)2)</sup>	4401 / 1.4404 / 1.4571 / 1.430         iel (Material 1.4529 or 1.4565         Property class         acc. to         EN ISO 3506-1:2009         Acc. to         EN ISO 3506-1:2009         A2: Material 1.4301 / 1.4         A4: Material 1.4301 / 1.4         HCR: Material 1.4529 or (e.g.: EN ISO 887:2006,         Stainless steel A4, High         Property class         acc. to         EN ISO 3506-1:2009	62 or 1 5, acc. 50 70 80 50 70 80 307 / 1 404 / 1 1.4563 EN IS corros 50 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 70 80 70 70 70 70 70 70 70 70 70 7	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	$\begin{array}{c} 10088-1:2014 \\ \hline 14) \\ \hline Characteristic \\ yield strength \\ \hline f_{yk} = 210 \ N/mr \\ \hline f_{yk} = 450 \ N/mr \\ \hline f_{yk} = 600 \ N/mr \\ \hline f_{yk} = 600 \ N/mr \\ \hline lass 50 \\ \hline lass 70 \\ \hline lass 80 \\ \hline 1.4541, acc. to \\ \hline 3.1:2014 \\ \hline SO 7093:2000 \ otherwise \\ \hline SO 7093:2000 \ otherwise \\ \hline Characteristic \\ yield strength \\ \hline f_{yk} = 210 \ N/mr \\ \hline f_{yk} = 450 \ N/mr \\ \hline \end{array}$	fracture $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ EN 10088-1:2014         EN 10088-1:2014         or EN 1SO 7094:2001         Elongation at fracture $n^2$ $A_5 \ge 8\%$
taii igh 1 2 3a 3b 4 1) (2)	Iess steel A4 (Material 1.4         corrosion resistance ste         Threaded rod <sup>1)3)</sup> Hexagon nut <sup>1)3)</sup> Washer         Filling washer         Internal threaded anchor rod <sup>1)2)</sup> Property class 70 for threaded or IG-M20 only property class	4401 / 1.4404 / 1.4571 / 1.430         Property class         acc. to         EN ISO 3506-1:2009         acc. to         EN ISO 3506-1:2009         A2: Material 1.4301 / 1.4         A4: Material 1.4301 / 1.4         HCR: Material 1.4529 or (e.g.: EN ISO 887:2006,         Stainless steel A4, High         Property class         acc. to         EN ISO 3506-1:2009	62 or 1 5, acc. 50 70 80 50 70 80 307 / 1 404 / 1 1.4563 EN IS corros 50 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 70 80 70 70 70 70 70 70 70 70 70 7	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	$\begin{array}{c} 10088-1:2014 \\ \hline 14) \\ \hline Characteristic \\ yield strength \\ \hline f_{yk} = 210 \ N/mr \\ \hline f_{yk} = 450 \ N/mr \\ \hline f_{yk} = 600 \ N/mr \\ \hline f_{yk} = 600 \ N/mr \\ \hline lass 50 \\ \hline lass 70 \\ \hline lass 80 \\ \hline 1.4541, acc. to \\ \hline 3.1:2014 \\ \hline SO 7093:2000 \ otherwise \\ \hline SO 7093:2000 \ otherwise \\ \hline Characteristic \\ yield strength \\ \hline f_{yk} = 210 \ N/mr \\ \hline f_{yk} = 450 \ N/mr \\ \hline \end{array}$	fracture $n^2$ $A_5 ≥ 8\%$ $n^2$ $A_5 ≥ 8\%$ $n^2$ $A_5 ≥ 8\%$ m² $A_5 ≥ 8\%$ EN 10088-1:2014         EN 10088-1:2014         or EN ISO 7094:200         Elongation at fracture         n² $A_5 > 8\%$
1 1 2 3a 3b 4	Itess steel A4 (Material 1.4         corrosion resistance ste         Threaded rod <sup>1)3)</sup> Hexagon nut <sup>1)3)</sup> Washer         Filling washer         Internal threaded anchor rod <sup>1)2)</sup> Property class 70 for threaded	4401 / 1.4404 / 1.4571 / 1.430         Property class         acc. to         EN ISO 3506-1:2009         acc. to         EN ISO 3506-1:2009         A2: Material 1.4301 / 1.4         A4: Material 1.4301 / 1.4         HCR: Material 1.4529 or (e.g.: EN ISO 887:2006,         Stainless steel A4, High         Property class         acc. to         EN ISO 3506-1:2009	62 or 1 5, acc. 50 70 80 50 70 80 307 / 1 404 / 1 1.4563 EN IS corros 50 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 80 70 70 70 80 70 70 70 70 70 70 70 70 70 7	4578, acc. to EN to EN 10088-1: 20 Characteristic tensile strength $f_{uk} = 500 \text{ N/mm}^2$ $f_{uk} = 700 \text{ N/mm}^2$ $f_{uk} = 800 \text{ N/mm}^2$ for threaded rod c for threaded rod c	$\begin{array}{c} 10088-1:2014 \\ \hline 14) \\ \hline Characteristic \\ yield strength \\ \hline f_{yk} = 210 \ N/mr \\ \hline f_{yk} = 450 \ N/mr \\ \hline f_{yk} = 600 \ N/mr \\ \hline f_{yk} = 600 \ N/mr \\ \hline lass 50 \\ \hline lass 70 \\ \hline lass 80 \\ \hline 1.4541, acc. to \\ \hline 3.1:2014 \\ \hline SO 7093:2000 \ otherwise \\ \hline SO 7093:2000 \ otherwise \\ \hline Characteristic \\ yield strength \\ \hline f_{yk} = 210 \ N/mr \\ \hline f_{yk} = 450 \ N/mr \\ \hline \end{array}$	fracture $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ $n^2$ $A_5 \ge 8\%$ EN 10088-1:2014         EN 10088-1:2014         or EN 1SO 7094:200         Elongation at fracture $n^2$ $A_5 > 8\%$



Reir	nforcing bar Ø 8, Ø 10, Ø 12, Ø 14, Ø 10	6, Ø 20, Ø 25, Ø 28, Ø 32						
	h <sub>ef</sub>	J						
	<ul> <li>Minimum value of related rip area f<sub>R,min</sub> ac</li> <li>Rib height of the bar shall be in the range</li> </ul>	-						
	(d: Nominal diameter of the bar; h: Rip he							
   Tabl	e A2: Materials							
	[	1						
Part	Designation	Material						
Reinf	orcing bars							
1	Rebar EN 1992-1-1:2004+AC:2010, Annex C	Bars and de-coiled rods class B or C $f_{yk}$ and k according to NDP or NCL of EN $f_{uk} = f_{tk} = k \cdot f_{yk}$	1992-1-1/NA					
Cher	nofast Injection System STVK or STVK Nordic	for concrete						
Proc	luct description		Annex A 5					
	rials reinforcing bar							



# Specifications of intended use

#### Anchorages subject to:

- Static and quasi-static loads: M8 to M30, Rebar Ø8 to Ø32, IG-M6 to IG-M20.
- · Seismic action for Performance Category C1: M8 to M30, Rebar Ø8 to Ø32.

#### **Base materials:**

- Compacted, reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013 + A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A1:2016.
- Non-cracked concrete: M8 to M30, Rebar Ø8 to Ø32, IG-M6 to IG-M20.
- Cracked concrete: M8 to M30, Rebar Ø8 to Ø32, IG-M6 to IG-M20.

#### **Temperature Range:**

- I: 40 °C to +40 °C (max long term temperature +24 °C and max short term temperature +40 °C)
- II: 40 °C to +80 °C (max long term temperature +50 °C and max short term temperature +80 °C)
- III: 40 °C to +120 °C (max long term temperature +72 °C and max short term temperature +120 °C)

#### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4:2006+A1:2015 corresponding to corrosion resistance class:
  - Stainless steel Stahl A2 according to Annex A 4, Table A1: CRC II
  - Stainless steel Stahl A4 according to Annex A 4, Table A1: CRC III
  - High corrosion resistance steel HCR according to Annex A 4, Table A1: CRC V

#### Design:

- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e. g. position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- The anchorages are designed in accordance to EN 1992-4:2018 and Technical Report TR055, Edition February 2018

#### Installation:

- Dry or wet concrete: M8 to M30, Rebar Ø8 to Ø32, IG-M6 to IG-M20.
- Flooded holes (not sea water): M8 to M16, Rebar Ø8 to Ø16, IG-M6 to IG-M10.
- Hole drilling by hammer (HD), hollow (HDB) or compressed air drill mode (CD).
- · Overhead installation allowed.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- The injection mortar is assessed for installation at minimum concrete temperature of -10°C resp. -20°C, where subsequently the temperature in the concrete does not rise at a rapid rate, i.e. from the minimum installation temperature to 24°C within a 12-hour period.

#### Chemofast Injection System STVK or STVK Nordic for concrete

Intended Use Specifications Annex B 1

#### Deutsches Institut für Bautechnik

Anchor size			M8	M1	1 O O	<b>M12</b>	M1	6	M20	M24	M	27	M30
Outer diameter of anchor	d <sub>nom</sub> [mm	] =	8	10	<b>D</b>	12	16	;	20	24	2	7	30
Nominal drill hole diameter	d₀ [mm	] =	10	12	2	14	18	;	24	28	3	2	35
Effective embedment denth	h <sub>ef,min</sub> [mm	] =	60	60	)	70	80		90	96	10	)8	120
Effective embedment depth	h <sub>ef,max</sub> [mm	] =	160	20	0 :	240	32	2 C	400	480	54	0	600
Diameter of clearance hole in the fixture	d <sub>f</sub> [mm	ı] ≤	9	12	2	14	18	;	22	26	3	0	33
Diameter of steel brush	d <sub>b</sub> [mm	i]≥	12	14	4	16	20		26	30	3	4	37
Maximum torque moment	T <sub>inst</sub> [Nm	]≤	10	20	)	40	80		120	160	18	80	200
Minimum thickness of member	er h <sub>min</sub> [m	ım] h	า <sub>ef</sub> + 3(	) mm	≥ 100	mm			ł	า <sub>ef</sub> + 2ต	d <sup>o</sup>		
Minimum spacing	s <sub>min</sub> [m	ım]	40	50	)	60	80		100	120	13	35	150
Minimum edge distance	c <sub>min</sub> [m	im]	40	50	)	60	80		100	120	13	35	150
Rebar size	parameters for	Ø 8	ø		Ø 12	Ø1		ð 16	Ø 20	Ø 2		28	Ø 32
Outer diameter of anchor	d <sub>nom</sub> [mm] =	8	1	0	12	14		16	20	25		28	32
Nominal drill hole diameter	d <sub>0</sub> [mm] =	12	1	4	16	18	;	20	24	32	:	35	40
Effective embedment depth -	h <sub>ef,min</sub> [mm] =	60	6	0	70	75	5	80	90	100	) 1	12	128
Effective embedment depth -	h <sub>ef,max</sub> [mm] =	160	) 20	00	240	28	C	320	400	500	) 5	80	640
Diameter of steel brush	d <sub>⊳</sub> [mm] ≥	14	1		18	20		22	26	34		37	41,5
Minimum thickness of member	h <sub>min</sub> [mm]		+ 30 m 100 mr						h <sub>ef</sub> + 2c	l <sub>o</sub>			
Minimum spacing	s <sub>min</sub> [mm]	40	5		60	70		80	100	125		40	160
Minimum edge distance	c <sub>min</sub> [mm]	40	5	0	60	70		80	100	125	5   1	40	160
Table B3: Installation Size internal threaded anchor	parameters for	inter		reade -M6		hor ro M8	od IG-I	И10	IG-M <sup>2</sup>	12   10	G-M16		G-M20
Internal diameter of anchor		[mm] =		6	_	3	1		12		16		20
Outer diameter of anchor <sup>1)</sup>		mm]		10	1	2	1	6	20		24		30
Nominal drill hole diameter		[mm] =		12		4	1	8	22		28		35
Effective embedment depth	h <sub>ef,min</sub> h <sub>ef,max</sub>			50 :00	_	0 40	8 32		90 400		96 480		120 600
Diameter of clearance hole in the fixture		 [mm] :		7		Э		2	14		18		22
Maximum torque moment	T <sub>inst</sub>	[Nm] :	<u>·</u>	10	1	0	2	0	40		60		100
Thread engagement length	l <sub>IG</sub>	[mm] =		/20		20	10/	25	12/3	0	16/32		20/40
min/max			,	h <sub>ef</sub> +	30 mn		h <sub>ef</sub> + 2d <sub>0</sub>						
	er h <sub>m</sub>	<sub>in</sub> [mm	IJ	≥ 10	)0 mm						<u> </u>		
Minimum thickness of member Minimum spacing Minimum edge distance	S <sub>m</sub>	<sub>in</sub> [mm <sub>in</sub> [mm <sub>in</sub> [mm	ני ז] ל	≥ 10 50 50	6	0	8	0	100		120 120		150 150

# Chemofast Injection System STVK or STVK Nordic for concrete

Intended Use Installation parameters Annex B 2



2	1111111111111111111111		2		272722222	- ALL CONTRACTOR				
Threaded Rod	Rebar	Internal threaded Anchor rod	d₀ Drill bit - Ø HD, HDB, CA	d Brusl		d <sub>b,min</sub> min. Brush - Ø	Piston plug		on direction f piston plu	
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]			$\Rightarrow$	1
M8			10	RBT10	12	10,5		1	11	
M10	8	IG-M6	12	RBT12	14	12,5	]	No nistan -		4
M12	10	IG-M8	14	RBT14	16	14,5		NO PISTON P	olug require	u
	12		16	RBT16	18	16,5				
M16	14	IG-M10	18	RBT18	20	18,5	VS18			
	16		20	RBT20	22	20,5	VS20			
M20	20	IG-M12	24	RBT24	26	24,5	VS24	h <sub>ef</sub> >	h <sub>ef</sub> >	
M24		IG-M16	28	RBT28	30	28,5	VS28	250 mm	250 mm	all
M27	25		32	RBT32	34	32,5	VS32	250 1111		
			35	RBT35	37	35,5	VS35			
M30	28	IG-M20						_		
M30	<u>28</u> 32		40	RBT40		40,5	VS40	1		
	32	(volume 7	40		41,5	40,5	VS40		(min 6 bar	 ()
MAC - Ha Drill bit dia Drill hole c	32	(volume 7 10 mm to 20 10 d <sub>nom</sub>	40		41,5	40,5	VS40		(min 6 bar	•)
MAC - Ha Drill bit dia Drill hole c	32 and pump umeter (d <sub>0</sub> ): lepth (h <sub>0</sub> ): <	(volume 7 10 mm to 20 10 d <sub>nom</sub>	40		41,5	40,5	VS40		(min 6 bar	-) ∃ ↓ d
MAC - Ha Drill bit dia Drill hole c Only in no Piston p installati	32 and pump imeter (d <sub>0</sub> ): lepth (h <sub>0</sub> ): < n-cracked co lug for ov	(volume 7 10 mm to 20 10 d <sub>nom</sub>	40		41,5 CAC Drill I	40,5	VS40		(min 6 bar	r) ∃



Installation instruct	ions	
Drilling of the bore	hole	
	1. Drill with hammer drill a hole into the base material to the size an required by the selected anchor (Table B1, B2, or B3), with hammer or compressed air (CD) drilling. The use of a hollow drill bit is onl sufficient vacuum permitted. In case of aborted drill hole: The drill hole shall be filled with mort	ner (HD), hollow (HDB) y in combination with a
	Attention! Standing water in the bore hole must be removed bef	ore cleaning.
MAC: Cleaning for b	pore hole diameter $d_0 \le 20$ mm and bore hole depth $h_0 \le 10d_{nom}$ (un	cracked concrete only!)
4x	<ul><li>2a. Starting from the bottom or back of the bore hole, blow the hole of (Annex B 3) a minimum of four times.</li></ul>	lean by a hand pump <sup>1)</sup>
<u>***********</u> ****	<ul> <li>2b. Check brush diameter (Table B4). Brush the hole with an appropriate of the second s</li></ul>	
	2c. Finally blow the hole clean again with a hand pump (Annex B 3) a	a minimum of four times.
4x	<sup>1)</sup> It is permitted to blow bore holes with diameter between 14 mm and 20 mm up to 10d <sub>nom</sub> also in cracked concrete with hand-pump.	and an embedment depth
CAC: Cleaning for a	II bore hole diameter in uncracked and cracked concrete	
452	2a. Starting from the bottom or back of the bore hole, blow the hole of compressed air (min. 6 bar) (Annex B 3) a minimum of four times stream is free of noticeable dust. If the bore hole ground is not re extension must be used.	s until return air
<u>*********</u> **	<ul> <li>2b. Check brush diameter (Table B4). Brush the hole with an appropriate of the second s</li></ul>	
4x	2c. Finally blow the hole clean again with compressed air (min. 6 bar minimum of four times until return air stream is free of noticeable ground is not reached an extension must be used.	
	After cleaning, the bore hole has to be protected against re-c an appropriate way, until dispensing the mortar in the bore h the cleaning has to be repeated directly before dispensing th In-flowing water must not contaminate the bore hole again.	ole. If necessary,
Chemofast Injection S	System STVK or STVK Nordic for concrete	
Intended Use Installation instructio	ns	Annex B 4



Installation instruc	ctions (continuation)	
	3 Attach the supplied static-mixing nozzle to the cartridge and load th correct dispensing tool. Cut off the foil tube clip before use. For every working interruption longer than the recommended work well as for new cartridges, a new static-mixer shall be used.	-
- her -	Prior to inserting the anchor rod into the filled bore hole, the positio depth shall be marked on the anchor rods.	n of the embedment
min. 3 full stroke	5. Prior to dispensing into the anchor hole, squeeze out separately a r strokes and discard non-uniformly mixed adhesive components unt consistent grey colour. For foil tube cartridges it must be discarded strokes.	il the mortar shows a
	6 Starting from the bottom or back of the cleaned anchor hole, fill the approximately two-thirds with adhesive. Slowly withdraw the static r hole fills to avoid creating air pockets. If the bottom or back of the a reached, an appropriate extension nozzle must be used. Observe the given in Annex B 6.	nixing nozzle as the nchor hole is not
	<ul> <li>Piston plugs and mixer nozzle extensions shall be used according to following applications:</li> <li>Horizontal assembly (horizontal direction) and ground erection direction): Drill bit-Ø d₀ ≥ 18 mm and embedment depth h<sub>ef</sub> &gt; 2</li> <li>Overhead assembly (vertical upwards direction): Drill bit-Ø d₀ ≥</li> </ul>	(vertical downwards 50mm
	8. Push the threaded rod or reinforcing bar into the anchor hole while ensure positive distribution of the adhesive until the embedment de	
	The anchor shall be free of dirt, grease, oil or other foreign material	
	9. Be sure that the anchor is fully seated at the bottom of the hole and visible at the top of the hole. If these requirements are not maintain to be renewed. For overhead application the anchor rod shall be fixed applied application the anchor rod shall be fixed applied application the anchor rod shall be fixed applied applie	ned, the application has
+20°C	10. Allow the adhesive to cure to the specified time prior to applying ar not move or load the anchor until it is fully cured (attend Annex B 6	
Tinet	11. After full curing, the add-on part can be installed with up to the max (Table B1 or B3) by using a calibrated torque wrench. It can be opt gap between anchor and fixture with mortar. Therefor substitute the washer and connect the mixer reduction nozzle to the tip of the mix filled with mortar, when mortar oozes out of the washer.	tional filled the annular e washer by the filling
Chemofast Injection	System STVK or STVK Nordic for concrete	
Intended Use		Annex B 5

Installation instructions (continuation)





Т	able C1: Characteristic values for s rods	teel ten:	sion re	esistanc	e and s	teel sh	ear res	sistanc	e of th	readec	1
Si	ze			M8	M10	M12	M16	M20	M24	M27	M30
Cr	ross section area	A <sub>s</sub>	[mm²]	36,6	58	84,3	157	245	353	459	561
C	haracteristic tension resistance, Steel failure	4									
St	eel, Property class 4.6 and 4.8	N <sub>Rk,s</sub>	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
St	eel, Property class 5.6 and 5.8	N <sub>Rk,s</sub>	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
St	eel, Property class 8.8	N <sub>Rk,s</sub>	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
St	ainless steel A2, A4 and HCR, class 50	N <sub>Rk,s</sub>	[kN]	18	29	42	79	123	177	230	281
St	ainless steel A2, A4 and HCR, class 70	N <sub>Rk,s</sub>	[kN]	26	41	59	110	171	247	-	-
	ainless steel A4 and HCR, class 80	N <sub>Rk,s</sub>	[kN]	29	46	67	126	196	282	-	-
C	haracteristic tension resistance, Partial facto	or <sup>2)</sup>									
St	eel, Property class 4.6 and 5.6	γMs,N	[-]				2,0	C			
St	eel, Property class 4.8, 5.8 and 8.8	Y <sub>Ms,N</sub>	[-]				1,5	5			
St	ainless steel A2, A4 and HCR, class 50	Y <sub>Ms,N</sub>	[-]				2,8	6			
St	ainless steel A2, A4 and HCR, class 70	Y <sub>Ms,N</sub>	[-]				1,8	7			
St	ainless steel A4 and HCR, class 80	Y <sub>Ms,N</sub>									
С	haracteristic shear resistance, Steel failure	1)	1			1		I	I	1	I
F	Steel, Property class 4.6 and 4.8	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	9 (8)	14 (13)	20	38	59	85	110	135
arm	Steel, Property class 5.6 and 5.8	V <sup>0</sup> Rk.s	[kN]	11 (10)	17 (16)	25	47	74	106	138	168
evel	Steel, Property class 8.8	V <sup>0</sup> Rk.s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
utle	Stainless steel A2, A4 and HCR, class 50	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	9	15	21	39	61	88	115	140
Without lever	Stainless steel A2, A4 and HCR, class 70	V <sup>0</sup> Rk.s	[kN]	13	20	30	55	86	124	-	-
3	Stainless steel A4 and HCR, class 80	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	15	23	34	63	98	141	-	-
	Steel, Property class 4.6 and 4.8	M <sup>0</sup> Rk,s		15 (13)	30 (27)	52	133	260	449	666	900
arm	Steel, Property class 5.6 and 5.8	M <sup>0</sup> Rk,s	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123
	Steel, Property class 8.8	M <sup>0</sup> Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797
With lever	Stainless steel A2, A4 and HCR, class 50	M <sup>0</sup> Rk,s	[Nm]	19	37	66	167	325	561	832	1125
<u>Vit</u>	Stainless steel A2, A4 and HCR, class 70	M <sup>0</sup> Rk,s	[Nm]	26	52	92	232	454	784	-	-
	Stainless steel A4 and HCR, class 80	M <sup>0</sup> Rk,s	[Nm]	30	59	105	266	519	896	-	-
Cl	haracteristic shear resistance, Partial factor										
St	eel, Property class 4.6 and 5.6	γ <sub>Ms,V</sub>	[-]				1,6	7			
St	eel, Property class 4.8, 5.8 and 8.8	Y <sub>Ms,V</sub>	[-]				1,2	5			
St	ainless steel A2, A4 and HCR, class 50	Y <sub>Ms,</sub> ∨	[-]				2,3	8			
St	ainless steel A2, A4 and HCR, class 70	Y <sub>Ms,∨</sub>	[-]				1,5	6			
	ainless steel A4 and HCR, class 80	Y <sub>Ms,V</sub>	[-]				1,3	3			

<sup>1)</sup> Values are only valid for the given stress area A<sub>s</sub>. 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. <sup>2)</sup> in absence of national regulation

# Chemofast Injection System STVK or STVK Nordic for concrete

# Performances

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

Annex C 1



Anchor size				All Anchor types and sizes		
Concrete cone fai	ilure	1				
Non-cracked conci	rete	k <sub>ucr,N</sub>	[-]	11,0		
Cracked concrete		k <sub>cr,N</sub>	[-]	7,7		
Edge distance		c <sub>cr,N</sub>	[mm]	1,5 h <sub>ef</sub>		
Axial distance		s <sub>cr,N</sub>	[mm]	2 c <sub>cr,N</sub>		
Splitting						
	h/h <sub>ef</sub> ≥ 2,0			1,0 h <sub>ef</sub>		
Edge distance	2,0 > h/h <sub>ef</sub> > 1,3	C <sub>cr,sp</sub>	[mm]	$2 \cdot h_{ef}\left(2,5 - \frac{h}{h_{ef}}\right)$		
	h/h <sub>ef</sub> ≤ 1,3			2,4 h <sub>ef</sub>		
Axial distance	·	s <sub>cr,sp</sub>	[mm]	2 c <sub>cr,sp</sub>		

## Chemofast Injection System STVK or STVK Nordic for concrete

Performances

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

Annex C 2



	or size threaded	rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel f		• •	N				۸.۴	(07.0	aa Tab			
_	cteristic tension re	esistance	N <sub>Rk,s</sub>	[kN]					ee Tab			
	factor		γMs,N	[-]				see Ta	ble C1			
		d concrete failure istance in non-crac		C20/25								
Chara					10	10	10	10	10	44	10	
ge	l: 40°C/24°C II: 80°C/50°C	Dry, wet			10 7,5	12 9	12 9	12 9	12 9	11 8,5	10 7,5	9 6,5
Temperature range	III: 120°C/72°				5,5	6,5	6,5	6,5	6,5	6,5	5,5	5,0
eratur	l: 40°C/24°C		<sup>τ</sup> Rk,ucr	[N/mm²]	7,5	8,5	8,5	8,5	•,•	•,•	0,0	
empe	ll: 80°C/50°C	flooded bore			5,5	6,5	6,5	6,5		o Perfo		
F	III: 120°C/72°	hole C			4,0	5,0	5,0	5,0		ssesse	a (NP/	
Chara	cteristic bond res	istance in cracked	concrete C20	/25								
	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
Temperature range	III: 120°C/72°		-	[]] (	2,0	2,5	3,0	3,0	3,0	3,0	3,5	3,5
oeratı	l: 40°C/24°C		<sup>T</sup> Rk,cr	[N/mm²]	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 ssesse		
	III: 120°C/72°				2,0	2,5	3,0	3,0				
Reduk	tion factor $\psi^0$ sus	in cracked and no	n-cracked cor	ncrete C20/25								
ure	l: 40°C/24°C	Dry, wet						0,	73			
Temperature range	ll: 80°C/50°C		$\Psi^0$ sus	[-]				0,	65			
Tem r	III: 120°C/72°	hole						0,	57			
		I	C25/30					1,	02			
			C30/37					,	04			
	sing factors for co	DINCRETE	C35/45 C40/50					,	07			
Ψc			C40/50 C45/55					,	08 09			
			C50/60						10			
Concr	rete cone failure		I					,				
	ant parameter							see Ta	ble C2			
Splitti					1				<u> </u>			-
	ant parameter lation factor							see 1a	ble C2			
	and wet concrete	<u> </u>			1,0				1,2			
	ded bore hole	<i>.</i>	γ <sub>inst</sub>	[-]	1,0	1	,4		1,2	NI	PA	
						<u> </u>	, <b>-</b>				<u> </u>	
Chem	nofast Injection S	ystem STVK or ST	VK Nordic for	<sup>,</sup> concrete						A	ex C 3	



Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm							1			
Characteristic shear resistance Steel, strength class 4.6, 4.8, 5.6 and 5.8	V <sup>0</sup> Rk,s	[kN]			0,6 •	A <sub>s</sub> ∙f <sub>uk</sub>	(or see	Table C	1)	
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A2, A4 and HCR, all classes	V <sup>0</sup> <sub>Rk,s</sub>	[kN]			0,5 ·	A <sub>s</sub> ∙f <sub>uk</sub>	(or see	Table C	1)	
Partial factor	γMs,∨	[-]				see	Table C	1		
Ductility factor	k <sub>7</sub>	[-]					1,0			
Steel failure with lever arm	1	II								
Characteristic bending moment	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]			1,2 • V	N <sub>el</sub> ∙ f <sub>uk</sub>	(or see	Table C	:1)	
Elastic section modulus	W <sub>el</sub>	[mm³]	31	62	109	277	541	935	1387	1874
Partial factor	γMs,V	[-]				see	Table C	:1		
Concrete pry-out failure										
Factor	k <sub>8</sub>	[-]					2,0			
Installation factor	γinst	[-]					1,0			
Concrete edge failure	•									
Effective length of fastener	۱ <sub>f</sub>	[mm]		n	nin(h <sub>ef</sub> ; 1	2 • d <sub>nor</sub>	n)		min(h <sub>ef</sub> ;	300mm)
Outside diameter of fastener	d <sub>nom</sub>	[mm]	8	10	12	16	20	24	27	30
Installation factor	γ <sub>inst</sub>	[-]					1,0			

Chemofast Injection	System STVK or S	STVK Nordic for concrete
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Annex C 4

Performances Characteristic values of shear loads under static and quasi-static action



Anchor size internal threaded	anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure <sup>1)</sup>			ľ						•
Characteristic tension resistance	∍, 5.8	N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123
Steel, strength class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196
Partial factor, strength class 5.8	and 8.8	γMs,N	[-]		I	1	,5		I
Characteristic tension resistance								440	404
Steel A4 and HCR, Strength cla		N <sub>Rk,s</sub>	[kN]	14	26	41	59	110	124
Partial factor		γMs,N	[-]			1,87			2,86
Combined pull-out and concre									
Characteristic bond resistance i	n non-cracked	concret	e C20/25						
<u>e</u> <u>I: 40°C/24°C</u> <u>I</u> <u>β</u>	Dry, wet			12	12	12	12	11	9
	concrete			9 6,5	9 6,5	9 6,5	9 6,5	8,5 6,5	6,5 5,0
Bill:         120°C/72°C           I:         40°C/24°C		<sup>T</sup> Rk,ucr	[N/mm <sup>2</sup> ]	<u> </u>	8,5	8,5	0,5	0,5	5,0
■ <u>1: 40 0/24 0</u> ■ <u>II: 80°C/50°C</u>	flooded bore			6,5	6,5	6,5	No Perfe	ormance A	ssessec
⊢ <u>III: 120°C/72°C</u>	hole			5,0	5,0	5,0	-	(NPA)	
Characteristic bond resistance i	n cracked con	crete C2	20/25	- ) -	- , -				
0 I: 40°C/24°C	Day wat			5,0	5,5	5,5	5,5	5,5	6,5
μ Π: 80°C/50°C	Dry, wet concrete			3,5	4,0	4,0	4,0	4,0	4,5
Beg         III:         120°C/72°C           I:         40°C/24°C	concrete	<sup>τ</sup> Rk,cr	[N/mm²]	2,5	3,0	3,0	3,0	3,0	3,5
	flooded bore	rkk,cr		4,0	5,5	5,5	No Perf	ormance A	
<u>اا: 80°C/50°C</u>	hole			3,0	4,0	4,0		(NPA)	
<u> </u>		L		2,5	3,0	3,0			
Reduktion factor $\psi^0$ sus in crack	ed and non-cr	racked c	oncrete C	20/25					
eg l: 40°C/24°C	Dry, wet					0,	73		
de alle de all	concrete and	0				•	05		
ال: 80°C/50°C	flooded bore	$\Psi^0_{sus}$	[-]			U,	65		
I:         40°C/24°C           II:         80°C/50°C           III:         120°C/72°C	hole					0,	57		
-		C2	5/30			1.	02		
			0/37				04		
Increasing factors for concrete			5/45				07		
Ψc			0/50				08		
			5/55				09		
Concrete cone failure		C5	0/60			1,	10		
Relevant parameter						see Ta	able C2		
Splitting failure			1						
Relevant parameter						see Ta	able C2		
Installation factor									
		Yinst	[-]			1	,2		
for dry and wet concrete for flooded bore hole <sup>1)</sup> Fastenings (incl. nut and wash The characteristic tension resis <sup>2)</sup> For IG-M20 strength class 50 is	stance for steel					perty class			ed rod.
Chemofast Injection System S	TVK or STVK	Nordic f	or concre	ete					



Anchor size for internal threade	ed ancho	or rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure without lever arm <sup>1)</sup>									
Characteristic shear resistance.	5.8	V <sup>0</sup> Rk,s	[kN]	5	9	15	21	38	61
Steel, strength class	8.8	V <sup>0</sup> <sub>Rk,s</sub>	[kN]	8	14	23	34	60	98
Partial factor, strength class 5.8 a	nd 8.8	γMs,V	[-]		•	•	1,25		
Characteristic shear resistance, Stainless Steel A4 and HCR, Strength class 70 <sup>2)</sup>		V <sup>0</sup> Rk,s	[kN]	7	13	20	30	55	40
Partial factor		γMs,∨	[-]			1,56			2,38
Ductility factor		k <sub>7</sub>	[-]				1,0		
Steel failure with lever arm <sup>1)</sup>									
Characteristic bending moment,	5.8	M <sup>0</sup> Rk,s	[Nm]	8	19	37	66	167	325
Steel, strength class	8.8	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	12	30	60	105	267	519
Partial factor, strength class 5.8 a	nd 8.8	γMs,∨	[-]			•	1,25		
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 <sup>2)</sup>		M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	11	26	52	92	233	456
Partial factor		γMs,∨	[-]			1,56			2,38
Concrete pry-out failure		•							
actor		k <sub>8</sub>	[-]				2,0		
nstallation factor		γ <sub>inst</sub>	[-]				1,0		
Concrete edge failure									
Effective length of fastener		۱ <sub>f</sub>	[mm]		min	(h <sub>ef</sub> ; 12 ⋅ d	<sub>nom</sub> )		min (h <sub>ef</sub> ; 300mn
Outside diameter of fastener		d <sub>nom</sub>	[mm]	10	12	16	20	24	30
nstallation factor		γ <sub>inst</sub>	[-]				1,0		
<ol> <li><sup>1)</sup> Fastenings (incl. nut and washer The characteristic tension resista <sup>2)</sup> For IG-M20 strength class 50 is <sup>1</sup></li> </ol>	ance for s	omply with steel failure	the appr	opriate ma	aterial and	property cla	ass of the i	nternal thro	eaded rod. nt.

Chemofast Injection System STVK or STVK Nordic for concrete

Performances

Characteristic values of shear loads under static and quasi-static action

Annex C 6



Table C7: Characte	eristic values	s of tensior	n loads ui	nder si	tatic a	nd qua	asi-sta	tic act	ion			
Anchor size reinforcing Steel failure	bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Characteristic tension resi	stance	N <sub>Rk,s</sub>	[kN]					۹ <sub>s</sub> •f <sub>uk</sub>	1)			
Cross section area	Stance	A <sub>s</sub>	[mm <sup>2</sup> ]	50	79	113	154	<sup>'s 'uk</sup> 201	314	491	616	804
		-		50	79	113	104	1,4 <sup>2)</sup>	514	491	010	004
Partial factor	a marata fail.	γ <sub>Ms,N</sub>	[-]					1,4				
Combined pull-out and c Characteristic bond resista			rata C20/2	25								
L: 40°C/24°C				10	12	12	12	12	12	11	10	8,5
1:         40°C/24°C           11:         80°C/50°C           111:         120°C/72°C           11:         40°C/24°C           11:         40°C/24°C           11:         80°C/50°C           11:         80°C/50°C	Dry, wet			7,5	9	9	9	9	9	8,0	7,0	6,0
₩ <u>500,000</u>	concrete	_		5,5	6,5	6,5	6,5	6,5	6,5	6,0	5,0	4,5
te e e l: 120°C/72°C	flaadad	<sup>τ</sup> Rk,ucr	[N/mm²]	7,5	8,5	8,5	8,5	8,5				•
= <u>  :</u> 80°C/50°C	flooded bore hole			5,5	6,5	6,5	6,5	6,5		lo Perfo ssesse		
111: 120°C/72°C				4,0	5,0	5,0	5,0	5,0				9
Characteristic bond resista	ance in crack	ed concrete	C20/25									
<u>⊎</u> <u>I: 40°C/24°C</u> <u>II: 80°C/50°C</u>	Dry, wet			4,0	5,0	5,5	5,5	5,5	5,5	5,5	6,5	6,5
<u>וו: 80°C/50°C</u> שני שני 100 ווו: 120°C/72°C	concrete			2,5 2,0	3,5 2,5	4,0 3,0	4,0 3,0	4,0 3,0	4,0 3,0	4,0 3,0	4,5 3,5	4,5 3,5
III:         120°C/72°C           III:         40°C/24°C		<sup>τ</sup> Rk,cr	[N/mm²]	4,0	4,0	5,5	5,5	5,5	3,0	3,0	3,5	3,5
1:         40 C/24 C           1::         80°C/50°C           1::         120°C/72°C           1::         40°C/24°C           1::         80°C/50°C           1::         80°C/50°C	flooded			2,5	3,0	4,0	4,0	4,0		lo Perfe		
⊢ <u>III: 120°C/72°C</u>	bore hole			2,0	2,5	3,0	3,0	3,0		ssesse	ed (NP/	4)
Reduktion factor $\psi^0_{\ sus}$ in	cracked and	non-cracked	l concrete		5			,	1			
l: 40°C/24°C	Dry, wet concrete							0,73				
L: 40°C/24°C H: 80°C/50°C H: 120°C/72°C HI: 120°C/72°C	and flooded	$\Psi^0$ sus	[-]					0,65				
□ = III: 120°C/72°C	bore hole							0,57				
		C25/						1,02				
		C30/						1,04				
Increasing factors for cond	crete	C35/						1,07				
Ψc		C40/						1,08				
		C45/ C50/						1,09 1,10				
Concrete cone failure		0.00/	00					1,10				
Relevant parameter							see	Table	C2			
Splitting												
Relevant parameter							see	Table	C2			
Installation factor												
for dry and wet concrete				1,2				1	,2			
for flooded bore hole		γinst	[-]			1,4				NF	PA	
<sup>1)</sup> f <sub>uk</sub> shall be taken from th <sup>2)</sup> in absence of national re	e specificatior gulation	ns of reinforci	ng bars									
Chemofast Injection Sys	tem STVK or	STVK Nordi	c for conc	rete						۸	~ ~ ~	
<b>Performances</b> Characteristic values of ter	nsion loads un	der static an	d quasi-sta	tic actio	on					Anne	ex C 7	



Table C8: Characteristic valu	es of shea	r loads u	nder s	static a	nd qua	asi-sta	tic act	ion			
Anchor size reinforcing bar			Ø 8	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 <sup>0</sup> Rk,s	[kN]				0,5	0•A <sub>s</sub> •	f <sub>uk</sub> <sup>1)</sup>			
Cross section area	A <sub>s</sub>	[mm²]	50	79	113	154	201	314	491	616	804
Partial factor	γMs,V	[-]					1,5 <sup>2)</sup>				
Ductility factor	k <sub>7</sub>	[-]					1,0				
Steel failure with lever arm											
Characteristic bending moment	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]				1.2	• W <sub>el</sub> •	f <sub>uk</sub> <sup>1)</sup>			
Elastic section modulus	W <sub>el</sub>	[mm³]	50	98	170	269	402	785	1534	2155	3217
Partial factor	γ <sub>Ms,V</sub>	[-]					1,5 <sup>2)</sup>				
Concrete pry-out failure											
Factor	k <sub>8</sub>	[-]					2,0				
Installation factor	γ <sub>inst</sub>	[-]					1,0				
Concrete edge failure											
Effective length of fastener	۱ <sub>f</sub>	[mm]		mi	n(h <sub>ef</sub> ; 1	2 • d <sub>noi</sub>	m)		min(	h <sub>ef</sub> ; 300	mm)
Outside diameter of fastener	d <sub>nom</sub>	[mm]	8	10	12	14	16	20	25	28	32
Installation factor	γ <sub>inst</sub>	[-]					1,0				
	e · · e										

 $^{1)}\,f_{uk}$  shall be taken from the specifications of reinforcing bars  $^{2)}$  in absence of national regulation

Chemofast Injection System STVK or STVK Nordic for concrete

Annex C 8

Performances Characteristic values of shear loads under static and quasi-static action



Anchor size thread	ed rod		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concre	ete C20/25 u	nder static and quas	si-static ac	tion	1	I	I	1	I	
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,021	0,023	0,026	0,031	0,036	0,041	0,045	0,049
l: 40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,030	0,033	0,037	0,045	0,052	0,060	0,065	0,071
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Cracked concrete C	20/25 under	static and quasi-sta	atic action							
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,0	90			0,0	070		
l: 40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,1	05			0,1	05		
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,2	219			0,1	70		
II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,2	255			0,2	245		
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,2	219			0,1	70		
III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,2	255			0,2	245		

 $\delta_{N0} = \delta_{N0} - factor \cdot \tau;$ 

 $\delta_{N\infty} = \delta_{N\infty} \text{-factor} \ \cdot \tau;$ 

#### Displacements under shear load<sup>1)</sup> (threaded rod) Table C10:

	aded rod		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked cond	crete C20/25 u	Inder static and qua	asi-static ac	tion						
All temperature	$\delta_{V0}$ -factor	[mm/kN]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
ranges	$\delta_{V\infty}$ -factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05
Cracked concrete	C20/25 under	r static and quasi-s	tatic action							
All temperature	$\delta_{V0}$ -factor	[mm/kN]	0,12	0,12	0,11	0,10	0,09	0,08	0,08	0,07
ranges	$\delta_{V\infty}$ -factor	[mm/kN]	0,18	0,18	0,17	0,15	0,14	0,13	0,12	0,10
$\delta_{V\infty} = \delta_{V\infty}$ -facto										
Chamafaat Iniaati		VK or STVK Nordic f								



Table C11: Dis	placements u	nder tension loa	ad <sup>1)</sup> (Intern	al threade	d anchor r	od)		
Anchor size Intern	al threaded an	chor rod	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Non-cracked concre	ete C20/25 und	er static and qua	si-static ad	tion			1	
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,023	0,026	0,031	0,036	0,041	0,049
l: 40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,033	0,037	0,045	0,052	0,060	0,071
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,056	0,063	0,075	0,088	0,100	0,119
II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,081	0,090	0,108	0,127	0,145	0,172
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,056	0,063	0,075	0,088	0,100	0,119
III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,081	0,090	0,108	0,127	0,145	0,172
Cracked concrete C	20/25 under st	atic and quasi-st	atic action			•		
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,090			0,070		
l: 40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,105			0,105		
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,219			0,170		
II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,255			0,245		
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,219			0,170		
III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,255			0,245		

<sup>1)</sup> Calculation of the displacement

 $\delta_{\text{N0}} = \delta_{\text{N0}} \text{-factor} \cdot \tau; \qquad \tau: \text{ action bond stress for tension}$ 

 $\delta_{N\infty} = \delta_{N\infty}$ -factor  $\cdot \tau$ ;

# Table C12: Displacements under shear load<sup>1)</sup> (Internal threaded anchor rod)

Anchor size Inte	ernal threaded	anchor rod	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Non-cracked and	d cracked conc	rete C20/25 unde	er static and	quasi-stati	c action			
All temperature	$\delta_{V0}$ -factor	[mm/kN]	0,07	0,06	0,06	0,05	0,04	0,04
ranges	$\delta_{V\infty}$ -factor	[mm/kN]	0,10	0,09	0,08	0,08	0,06	0,06
$\delta_{V0}$ = $\delta_{V0}$ -fact $\delta_{V\infty}$ = $\delta_{V\infty}$ -fact		V: action shear lo						

# Chemofast Injection System STVK or STVK Nordic for concrete

**Performances** Displacements (Internal threaded anchor rod) Annex C 10



Anchor size reinf	orcing bar		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Non-cracked conc	rete C20/25	5 under static ar	nd quasi	-static a	ction	I				1	
Temperature	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )]	0,021	0,023	0,026	0,028	0,031	0,036	0,043	0,047	0,052
range I: 40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,030	0,033	0,037	0,041	0,045	0,052	0,061	0,071	0,07
Temperature	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,126
range ll: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,18
Temperature	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,104	0,113	0,120
range III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,149	0,163	0,18
Cracked concrete	C20/25 und	ler static and qu	iasi-stat	ic actior	1						
Temperature	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,0	90				0,070			
range I: 40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,1	105				0,105			
Temperature	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,2	219				0,170			
range II: 80°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,2	255				0,245			
Temperature	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,2	219				0,170			
range III: 120°C/72°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,2	255				0,245			
<sup>1)</sup> Calculation of th $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor <b>Table C14:</b> D	·τ; ·τ;	τ: action bond τ: action bond									
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C14: D	τ; τ; isplaceme	τ: action bond nt under shear			Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
$\begin{array}{l} \delta_{N0}=\delta_{N0}\text{-factor}\\ \delta_{N\infty}=\delta_{N\infty}\text{-factor}\\ \end{array}$	τ; τ; isplaceme orcing bar	τ: action bond nt under shear	load <sup>1)</sup> (I Ø 8	rebar) Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
$\begin{array}{lll} \delta_{N0} = \delta_{N0} \text{-factor} \\ \delta_{N\infty} = \delta_{N\infty} \text{-factor} \end{array}$	τ; τ; isplaceme orcing bar	τ: action bond nt under shear	load <sup>1)</sup> (I Ø 8	rebar) Ø 10	Ø 12	Ø <b>14</b> 0,04	Ø <b>16</b> 0,04	Ø <b>20</b> 0,04	Ø <b>25</b> 0,03	Ø <b>28</b> 0,03	
$\begin{array}{lll} \delta_{N0} = \delta_{N0} \text{-factor} \\ \delta_{N\infty} = \delta_{N\infty} \text{-factor} \end{array}$	τ; τ; orcing bar rete C20/28	τ: action bond nt under shear 5 under static ar	load <sup>1)</sup> (i Ø 8 nd quasi	rebar) Ø 10 -static a	Ø 12 ction						0,03
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$	τ; τ; isplaceme orcing bar rete C20/28 $\delta_{Vo}$ -factor $\delta_{V\infty}$ - factor	τ: action bond nt under shear under static ar [mm/kN] [mm/kN]	load <sup>1)</sup> (n Ø 8 nd quasi 0,06 0,09	rebar) Ø 10 -static a 0,05 0,08	Ø 12 ction 0,05 0,08	0,04	0,04	0,04	0,03	0,03	0,03
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-} \text{factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-} \text{factor} \end{split}$ Table C14: D Anchor size reinformation of the second state of t	τ; τ; isplaceme orcing bar rete C20/28 $\delta_{Vo}$ -factor $\delta_{V\infty}$ - factor	τ: action bond nt under shear under static ar [mm/kN] [mm/kN]	load <sup>1)</sup> (n Ø 8 nd quasi 0,06 0,09	rebar) Ø 10 -static a 0,05 0,08	Ø 12 ction 0,05 0,08	0,04	0,04	0,04	0,03	0,03	Ø <b>32</b> 0,03 0,04 0,06
$\delta_{N0} = \delta_{N0} - \text{factor}$ $\delta_{N\infty} = \delta_{N\infty} - \text{factor}$ <b>Table C14:</b> D <b>Anchor size reinfo Non-cracked conc</b> All temperature ranges <b>Cracked concrete</b> All temperature ranges	τ; τ; isplaceme orcing bar rete C20/28 $δ_{V0}$ -factor $\delta_{V\infty}$ - factor C20/25 unc $\delta_{V0}$ -factor $\delta_{V\infty}$ - factor $\delta_{V\infty}$ -	r: action bond nt under shear under static ar [mm/kN] [mm/kN] ler static and qu [mm/kN] [mm/kN]	load <sup>1)</sup> (i Ø 8 nd quasi 0,06 0,09 uasi-stat	rebar) Ø 10 -static a 0,05 0,08 ic action	Ø 12 ction 0,05 0,08	0,04 0,06	0,04 0,06	0,04	0,03	0,03	0,03
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$	τ; τ; isplaceme orcing bar rete C20/28 $δ_{V0}$ -factor $\delta_{V\infty}$ - factor C20/25 unc $\delta_{V0}$ -factor $\delta_{V\infty}$ - factor he displaceme	r: action bond nt under shear under static ar [mm/kN] [mm/kN] ler static and qu [mm/kN] [mm/kN]	load <sup>1)</sup> (r Ø 8 nd quasi 0,06 0,09 nasi-stat 0,12 0,18	rebar) Ø 10 -static a 0,05 0,08 ic action 0,12	Ø 12 ction 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



	or size threaded ro	d			M8	M10	M12	M16	M20	M24	M27	M3(	
<u>Steel fa</u> Charac	ailure teristic tension resi	stance	N <sub>Rk,s,eq</sub>	[kN]				1,0 •	Npire				
Partial		otanog	<sup>γ</sup> Ms,N	[-]				see Ta	,				
	ined pull-out and	concrete failure		[-]				300 10					
Charao	cteristic bond resist	ance in non-crac	ked and cracl	ked concrete	C20/25								
	l: 40°C/24°C				2,5	3,1	3,7	3,7	3,7	3,8	4,5	4,	
range	ll: 80°C/50°C	Dry, wet concrete			1,6	2,2	2,7	2,7	2,7	2,8	3,1	3,7	
anre	III: 120°C/72°C	flooded bore	<sub>τ</sub> ,	[N/mm²]	1,3	1,6	2,0	2,0	2,0	2,1	2,4	2,4	
Temperature range	l: 40°C/24°C		<sup>−</sup> <sup>7</sup> Rk,eq		2,5	2,5	3,7	3,7					
	II: 80°C/50°C				1,6	1,9	2,7	2,7	No Performand Assessed (NP				
•	III: 120°C/72°C				1,3	1,6	2,0	2,0				·)	
Reduk	tion factor $\psi^0_{sus}$ in	cracked and no	n-cracked cor	ncrete C20/25		L							
ture	l: 40°C/24°C	Dry, wet						0,	73				
Temperature range	II: 80°C/50°C	concrete and flooded bore	$\Psi^0$ sus	[-]				0,0	65				
Tem R	III: 120°C/72°C	hole					0,73 0,65 0,57						
Increas	sing factors for con	crete ψ <sub>c</sub>	C25/30 to C	250/60				1	,0				
	ete cone failure												
Releva Splittii	ant parameter ng							see Ta	ble C2				
Releva	ant parameter							see Ta	ble C2				
	ation factor and wet concrete				1,0				1,2				
	ded bore hole		γ <sub>inst</sub>	[-]	1,0	1	,4		I,2 NPA				
Chem	ofast Injection Sys	tem STVK or ST	VK Nordic for	concrete						Anno	x C 12		



Table C16: Characteristic valu (performance cate		loads u	Inder	seismic	action	l				
Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm										
Characteristic shear resistance (Seismic C1)	V <sub>Rk,s,eq</sub>	[kN]				0,70	)∙V <sup>0</sup> Rk	,S		
Partial factor	γ <sub>Ms,V</sub>	[-]				see	Table C	:1		
Ductility factor	k <sub>7</sub>	[-]					1,0			
Steel failure with lever arm										
Characteristic bending moment	M <sup>0</sup> Rk,s,eq	[Nm ]			No Per	forman	ce Asse	essed (N	PA)	
Concrete pry-out failure										
Factor	k <sub>8</sub>	[-]					2,0			
Installation factor	$\gamma_{inst}$	[-]					1,0			
Concrete edge failure										
Effective length of fastener	۱ <sub>f</sub>	[mm ]		m	in(h <sub>ef</sub> ; 1	2 • d <sub>nor</sub>	n)		min(h <sub>ef</sub> ;	300mm)
Outside diameter of fastener	d <sub>nom</sub>	[mm ]	8	10	12	16	20	24	27	30
Installation factor	<sup>γ</sup> inst	[-]					1,0			
Factor for annular gap	$\alpha_{\sf gap}$	[-]				0,9	5 (1,0) <sup>1)</sup>			
<sup>1)</sup> Value in brackets valid for filled annu Annex A 3 is required										
Chemofast Injection System STVK o	or STVK Nord	lic for co	oncrete	!				4	Annex C	13
Performances Characteristic values of shear loads ur	nder seismic a	action (pe	erforma	nce cate	gory C1)	)				-



Table C17:         Characteristic values           (performance catego)		n loads ui	nder s	eismic	actio	n					
Anchor size reinforcing bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Steel failure Characteristic tension resistance	Nousa	[kN]				1.0	۰A <sub>s</sub> ・I	: 1)			
Cross section area	N <sub>Rk,s,eq</sub> A <sub>s</sub>	[mm <sup>2</sup> ]	50	79	113	154	201	ик 314	491	616	804
Partial factor		[-]	50	13	115	134	1,4 <sup>2)</sup>	514	431	010	004
Combined pull-out and concrete failu	<sup>γ</sup> Ms,N	[-]					1,4				
Characteristic bond resistance in non-c		cracked co	ncrete	C20/2	5						
			2,5	3,1	3,7	3,7	3,7	3,7	3,8	4,5	4,5
$ \begin{array}{c} 1. 40 C/24 C \\ \text{Dry, wet} \\ \text{concrete} \\ 111 120^{\circ}C/72^{\circ}C \\ 111 120^{\circ}C/24^{\circ}C \\ 111 80^{\circ}C/50^{\circ}C \\ 111 80^{\circ}C/5$			1,6	2,2	2,7	2,7	2,7	2,7	2,8	3,1	3,1
III:     120°C/72°C     concrete       III:     120°C/24°C     floodod	<sup>τ</sup> Rk, eq	[N/mm²]	1,3	1,6	2,0	2,0	2,0	2,0	2,1	2,4	2,4
ال: 40°C/24°C flooded ال: 80°C/50°C here hale			2,5 1,6	2,5 1,9	3,7	3,7 2,7	3,7	1	lo Perf	ormanc	e
$\stackrel{\text{\tiny III:}}{\vdash}  \frac{11.20^{\circ} \text{C}/30^{\circ} \text{C}}{\text{III:} 120^{\circ} \text{C}/72^{\circ} \text{C}} \text{ bore hole}$			1,8	1,9	2,7 2,0	2,7	2,7 2,0	<i>–</i>	lssesse	ed (NP/	4)
Reduktion factor $\psi^0_{sus}$ in cracked and	non-cracked	d concrete	,	,	_,-	_,-	,-	1			
∯ I: 40°C/24°C Dry, wet							0,73				
L: 40°C/24°C Dry, wet concrete and flooded bore hole	$\Psi^0_{sus}$	[-]					0,65				
E ≝ flooded							0,57				
Increasing factors for concrete $\psi_{\text{C}}$	C25/30 to	C50/60					1,0				
Concrete cone failure											
Relevant parameter						see	e Table	C2			
Splitting											
Relevant parameter						see	e Table	C2			
Installation factor	1	1	1 0	1			1	2			
for dry and wet concrete for flooded bore hole	γinst	[-]	1,2		1,4		I	,2 	N	PA	
<sup>1)</sup> f <sub>uk</sub> shall be taken from the specification <sup>2)</sup> in absence of national regulation	s of reinforci	ng bars									
Chemofast Injection System STVK or	STVK Nordi	c for conc	rete						٨٥٩٥	x C 14	
<b>Performances</b> Characteristic values of tension loads un	der seismic a	action (perf	ormano	ce cateç	jory C1)	)			Anne		



Table C18:Characteristic val(performance cate		loads u	nder s	eismic	actio	n					
Anchor size reinforcing bar			Ø 8	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 <sub>Rk,s,eq</sub>	[kN]				0,3	5 • A <sub>s</sub> •	r f <sub>uk</sub> <sup>2)</sup>			
Cross section area	A <sub>s</sub>	[mm²]	50	79	113	154	201	314	491	616	804
Partial factor	γ <sub>Ms,</sub> ∨	[-]					1,5 <sup>2)</sup>				
Ductility factor	k <sub>7</sub>	[-]					1,0				
Steel failure with lever arm											
Characteristic bending moment	M <sup>0</sup> <sub>Rk,s,eq</sub>	[Nm]			No Po	erforma	ance As	sessec	l (NPA)		
Concrete pry-out failure			•								
Factor	k <sub>8</sub>	[-]					2,0				
Installation factor	γ <sub>inst</sub>	[-]					1,0				
Concrete edge failure											
Effective length of fastener	۱ <sub>f</sub>	[mm]		mi	n(h <sub>ef</sub> ; 1	2 • d <sub>no</sub>	m)		min(	h <sub>ef</sub> ; 300	mm)
Outside diameter of fastener	d <sub>nom</sub>	[mm]	8	10	12	14	16	20	25	28	32
Installation factor	$\gamma_{inst}$	[-]					1,0				
Factor for annular gap	$\alpha_{\sf gap}$	[-]				(	0,5 (1,0	) <sup>3)</sup>			
<ol> <li>f<sub>uk</sub> shall be taken from the specifica</li> <li>in absence of national regulation</li> <li>Value in brackets valid for filled anr Annex A 3 is required</li> </ol>	tions of reinford	en anchc	or and c	learance	e hole ir	n the fix	ture. Us	se of sp	ecial fill	ing wasł	ner

### Chemofast Injection System STVK or STVK Nordic for concrete

Annex C 15

Performances

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



Anchor size threa	ded rod			M8	M10	M12	M16	M20	M24	M27	M30
Cracked and non-c	racked cond	crete C20/25 un	ıder seis	smic C1	action				I	1	
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm²)	]	0,	090			0,0	070		
l: 40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm <sup>2</sup> )	]	0,	105			0,	105		
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )	]	0,	219			0,	170		
II: 80°C/50°C	δ <sub>N∞</sub> -factor	[mm/(N/mm²)	]	0,	255			0,2	245		
Temperature range	$\delta_{N0}$ -factor	[mm/(N/mm <sup>2</sup> )	]	0,	219			0,	170		
III: 120°C/72°C	δ <sub>N∞</sub> -factor	[mm/(N/mm <sup>2</sup> )	]	0,	255			0,2	245		
Table C20: Di	splacement	s under tensio	on load	<sup>1)</sup> (rebar	<u>,</u>						
Anchor size reinfo	-		Ø 8	Ø 10	, Ø 12	Ø 14	Ø 16	Ø 20	Ø 25	Ø 28	Ø 32
Cracked and non-c		rete C20/25 un									
Temperature range	δ <sub>N0</sub> -factor	[mm/(N/mm²)]		090				0,070			
l: 40°C/24°C	δ <sub>N∞</sub> -factor	[mm/(N/mm <sup>2</sup> )]	,	105				0,105			
Temperature range $\delta_{No}$ -factor         [mm/(N/mm <sup>2</sup> )]         0,219         0,170           II: 80°C/50°C $\delta_{N\infty}$ -factor         [mm/(N/mm <sup>2</sup> )]         0,255         0,245											
			-					,			
Temperature range $\delta_{N0}$ -factor[mm/(N/mm <sup>2</sup> )]0,2190,7		0,170									
<sup>1)</sup> Calculation of the $\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	e displaceme · τ;							0,245			
$\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	e displaceme · τ; · τ;	nt	stress for	r tension	ed rod)			0,245			
$\delta_{N0} = \delta_{N0}$ -factor $\delta_{N\infty} = \delta_{N\infty}$ -factor	e displaceme · τ; · τ; splacement	nt τ: action bond :	stress for	r tension	ed rod)	M12	M16	0,245	M24	M27	M30
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ $\begin{aligned} \textbf{Table C21: Discussion} \end{split}$	e displaceme · τ; · τ; splacement	nt τ: action bond : s under shear	stress for	r tension (threado M8	M10	M12	M16	1	M24	M27	M30
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C21: Dis Anchor size thread Cracked and non-c All temperature	e displaceme · τ; · τ; splacement	nt τ: action bond : s under shear	stress for	r tension (threado M8	M10	<b>M12</b>	<b>M16</b>	1	<b>M24</b>	<b>M27</b>	<b>M30</b> 0,07
$\begin{split} \delta_{N0} &= \delta_{N0} \text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty} \text{-factor} \end{split}$ Table C21: Dis Anchor size thread Cracked and non-c All temperature	e displaceme · τ; · τ; splacement ded rod racked cond	nt τ: action bond : s under shear	stress for	r tension (thread M8 smic C1	M10 action	 	I	M20	I		I
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$	e displaceme $\cdot \tau;$ $\cdot \tau;$ splacement ded rod racked conc $\delta_{V0}$ -factor $\delta_{V\infty}$ -factor	nt τ: action bond a s under shear crete C20/25 un [mm/kN]	stress for ' load <sup>2)</sup> ider seis	r tension (threade M8 smic C1 0,12 0,18	M10 action	0,11	0,10	<b>M20</b>	0,08	0,08	0,07
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$	e displaceme • $\tau$ ; • $\tau$ ; splacement ded rod racked conc $\delta_{V0}$ -factor $\delta_{V\infty}$ -factor splacement	nt τ: action bond a s under shear crete C20/25 un [mm/kN] [mm/kN]	stress for ' load <sup>2)</sup> ider seis	r tension (threade M8 smic C1 0,12 0,18	M10 action	0,11	0,10	<b>M20</b>	0,08	0,08	0,07
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$ Table C21: Distribution Distributication Di	e displaceme • $\tau$ ; • $\tau$ ; splacement ded rod racked conc $\delta_{V0}$ -factor $\delta_{V0}$ -factor splacement prcing bar	nt τ: action bond a <b>crete C20/25 un</b> [mm/kN] [mm/kN] <b>cunder shear l</b>	stress for load <sup>2)</sup> der seis	r tension (thread) 8 8 9 9 0,12 0,12 0,12 0,18 7 9 9 10	M10 action 0,12 0,18	0,11	0,10	<b>M20</b> 0,09 0,14	0,08	0,08	0,07
$\delta_{N0} = \delta_{N0}-factor$ $\delta_{N\infty} = \delta_{N\infty}-factor$ Table C21: Dis Anchor size thread Cracked and non-c All temperature ranges Table C22: Dis Anchor size reinfo Cracked and non-c	e displaceme • $\tau$ ; • $\tau$ ; splacement ded rod racked conc $\delta_{V0}$ -factor $\delta_{V0}$ -factor splacement prcing bar	nt τ: action bond a <b>crete C20/25 un</b> [mm/kN] [mm/kN] <b>cunder shear l</b>	stress for load <sup>2)</sup> der seis	r tension (thread) 8 8 9 9 0,12 0,12 0,12 0,18 7 9 9 10	M10 action 0,12 0,18	0,11	0,10	<b>M20</b> 0,09 0,14	0,08	0,08	0,07
$\delta_{N0} = \delta_{N0} - factor$ $\delta_{N\infty} = \delta_{N\infty} - factor$ Table C21: Distinguished the descent of the descent form of the descent form of the descent form of the descent form of the descent of the descent form	e displaceme • $\tau$ ; • $\tau$ ; splacement ded rod racked conc $\delta_{V0}$ -factor splacement prcing bar racked conc $\delta_{V0}$ -factor	nt τ: action bond a s under shear [mm/kN] [mm/kN] under shear l crete C20/25 un	stress for load <sup>2)</sup> der seis load <sup>1)</sup> (r Ø 8	r tension (threado 8mic C1 0,12 0,18 (0,18 (0,18 (0,18 (0,18) (0,18) (0,18) (0,18) (0,18) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,12) (0,	M10 action 0,12 0,18 Ø 12 action	0,11 0,17 Ø <b>14</b>	0,10 0,15 Ø 16	M20 0,09 0,14 Ø 20	0,08 0,13 Ø <b>25</b>	0,08 0,12 Ø <b>28</b>	0,07 0,10 Ø 32
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-factor} \\ \delta_{N\infty} &= \delta_{N\infty}\text{-factor} \end{split}$ Table C21: Distribution Distributication Di	e displaceme • $\tau$ ; • $\tau$ ; splacement ded rod racked cond $\delta_{V0}$ -factor splacement orcing bar racked cond $\delta_{V0}$ -factor splacement $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor $\delta_{V0}$ -factor	nt τ: action bond a s under shear crete C20/25 un [mm/kN] cunder shear I crete C20/25 un [mm/kN] crete C20/25 un [mm/kN]	stress for load <sup>2)</sup> der seis 0,12 0,18	r tension (threado M8 smic C1 0,12 0,12 0,18 rebar) Ø 10 smic C1 0,12	M10 action 0,12 0,18 Ø 12 action 0,11	0,11 0,17 Ø 14 0,11	0,10 0,15 Ø 16 0,10	M20 0,09 0,14 Ø 20 0,09	0,08 0,13 Ø <b>25</b> 0,08	0,08 0,12 Ø 28 0,07	0,07 0,10 Ø <b>32</b> 0,06
$\begin{split} \delta_{N0} &= \delta_{N0}\text{-}factor\\ \delta_{N\infty} &= \delta_{N\infty}\text{-}factor \end{split}$ Table C21: Distribution Distributicatina Distributication Distributicatina Distributicatina Dist	e displaceme • $\tau$ ; • $\tau$ ; splacement ded rod racked conc $\delta_{V0}$ -factor splacement orcing bar racked conc $\delta_{V0}$ -factor brcing bar racked conc $\delta_{V0}$ -factor e displaceme • V; • V;	nt τ: action bond a <b>crete C20/25 un</b> [mm/kN] [mm/kN] <b>crete C20/25 un</b> [mm/kN] <b>crete C20/25 un</b> [mm/kN] [mm/kN] [mm/kN] [mm/kN] [mm/kN]	stress for load <sup>2)</sup> ider seis 0,12 0,18 load	r tension (threade 8mic C1 0,12 0,12 0,18 7ebar) Ø 10 8mic C1 0,12 0,18	M10 action 0,12 0,18 Ø 12 action 0,11 0,17	0,11 0,17 Ø 14 0,11	0,10 0,15 Ø 16 0,10	M20 0,09 0,14 Ø 20 0,09	0,08 0,13 Ø <b>25</b> 0,08	0,08 0,12 Ø 28 0,07	0,07 0,10 Ø <b>32</b> 0,06