



Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

ETA-20/1287 of 12 May 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment contains

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

Deutsches Institut für Bautechnik

Injection system PURE500+ for concrete

Bonded fastener for use in concrete

Stanley Black & Decker Deutschland GmbH Richard-Klinger-Straße 11 65510 Idstein DEUTSCHLAND

Plant 1

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

EAD 330499-01-0601, Edition 04/2020



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Specific Part

1 Technical description of the product

The "Injection system PURE500+ for concrete" is a bonded anchor consisting of a cartridge with injection mortar Injection mortar PURE500+ and a steel element according to Annex A3 and A4.

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 and/or 100 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 to C 5, C 7 to C 9
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1, C 6, C 10
Displacements under short-term and long-term loading	See Annex C 11 and C 12
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 13 to C 16

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 12 May 2021 by Deutsches Institut für Bautechnik

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



Threaded rod M8, M10, M12, M16, M20, M24, M27, M30 with washer and hexagon nut

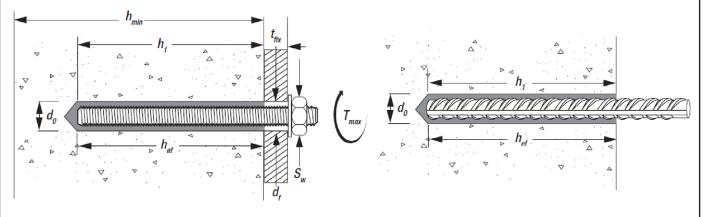


Reinforcing bar Ø8, Ø10, Ø12, Ø14, Ø16, Ø20, Ø24, Ø25, Ø28, Ø32



Installation threaded rod M8 to M30

Installation reinforcing bar Ø8 to Ø32



 t_{fix} = thickness of fixture

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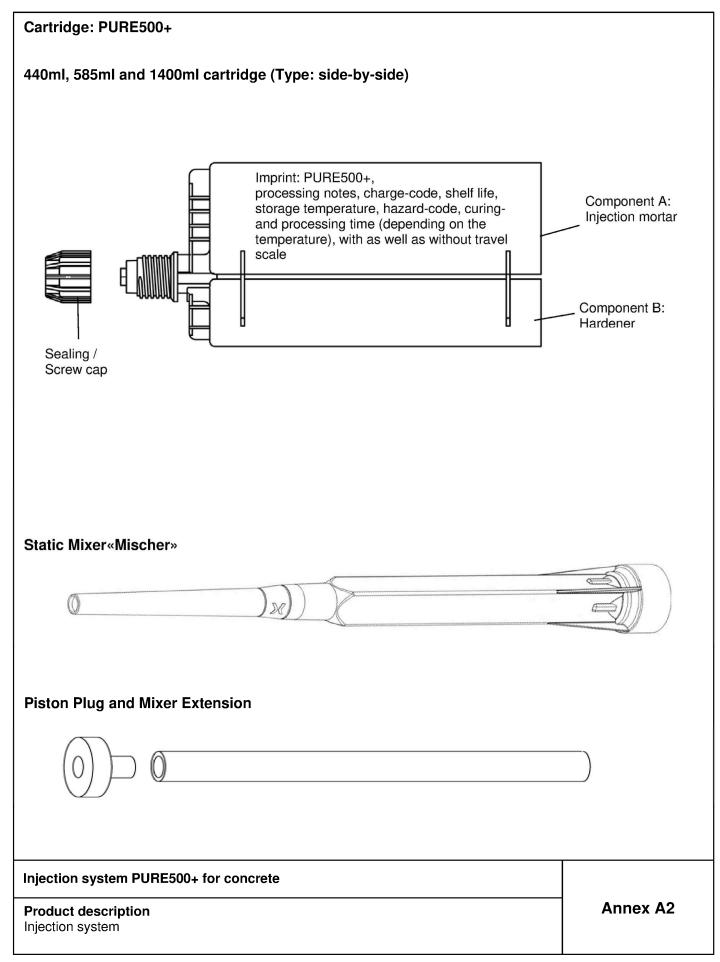
hef = effective anchorage depth

 h_1 = depth of drill hole

 h_{min} = minimum thickness of member

Injection system PURE500+ for concrete	
Product description Installed condition	Annex A1

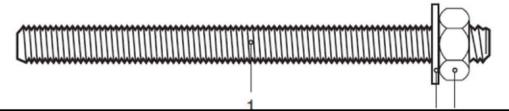




Part Designation



Table A1: Materials (Threaded rod)



Zinc plated steel: Material acc. to EN ISO 683-4:2018 or EN 10263:2001;

electro plated ≥ 5 µm acc. to EN ISO 4042:2018 or

Material

hot-dip galvanised ≥ 40 μm acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009 or

sherardized ≥ 45 µm acc. to EN ISO 17688:2016

Siler	Sherardized ≥ 45 µm acc. to EN ISO 17688:2016					
		Property class acc. to	Characteristic	Characteristic	Fracture	
		EN ISO 898-1:2013	ultimate strength fuk	yield strength fyk	elongation A ₅	
	Threaded rod	4.6	400 N/mm²	240 N/mm²	> 8%	
1		4.8	400 N/mm ²	320 N/mm ²	> 8%	
		5.6	500 N/mm ²	300 N/mm ²	> 8%	
		5.8	500 N/mm ²	400 N/mm ²	> 8%	
		8.8	800 N/mm ²	640 N/mm ²	> 12%3)	
	Hexagon nut	Property class acc. to	for threaded rod class			
		EN ISO 898-2:2012	Tor threaded rod class	•		
2		4	4.6 & 4.8			
		5	5.6 & 5.8			
		8	8.8			
		511100 007 0000 51110	0 7000 0000 511100	7000 0000 FN 100 F	70040000	
3	Washer	EN ISO 887:2006; EN ISO 7089:2000; EN ISO 7093:2000; EN ISO 7094:2000				

Stainless steel A2: Material 1.4301 / 1.4307 / 1.4311 / 1.4567 or 1.4541, acc. to EN 10088-1:2014 Stainless steel A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014 High corrosion resistance steel HCR: Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014

111911	Thigh corrosion resistance steer flort. Material 1.4323 of 1.4303, acc. to Ely 10000-1. 2014				
		Property class acc. to	Characteristic	Characteristic	Fracture
		EN ISO 3506-1:2020	ultimate strength fuk	yield strength fyk	elongation A ₅
1 Threaded rod ¹⁾²		50	500 N/mm ²	210 N/mm ²	> 8%
		70 ¹⁾	700 N/mm²	450 N/mm ²	> 12%3)
		80 ¹⁾²⁾	800 N/mm²	600 N/mm ²	> 12%3)
		Property class acc. to EN ISO 3506-1:2020	for threaded rod class		
2 Hexagon nut		50	50		
		70 ¹⁾	70		
		80 ¹⁾²⁾	80		
3	Washer	EN ISO 887:2006; EN IS	O 7089:2000; EN ISO	7093:2000; EN ISO 7	7094:2000

¹⁾ Property class 70 or 80 for threaded rods and hexagon nuts up to M24

Injection system PURE500+ for concrete	
Product description	Annex A3
Materials threaded rod	

²⁾ Property class 80 only for stainless steel A4 and high corrosion resistance steel HCR

 $^{^{3)}}$ A₅ > 8% fracture elongation if <u>no</u> use for seismic performance category C2





Table A2: Materials (Reinforcing bar)



- Minimum value of related rib area f_{R,min} according to EN 1992-1-1:2009+AC:2010
- Rib height of the bar shall be in the range 0,05d ≤ h ≤ 0,07d (d: Nominal diameter of the rebar, h: Rib height of the bar)

Part	Designation	Material
1	Rebar according EN 1992-1-1:2009+AC:2010, Annex C	Bars and de-coiled rods class B or C f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA2013 $f_{uk}=f_{tk}=k\cdot f_{yk}$

Injection system PURE500+ for concrete	
Product description	Annex A4
Materials reinforcing bar	



Specifications of intended use

Anchorages subject to static and quasi-static loads:

Working life	50 years		rking life 50 years		100	years
Base material	Uncracked Cracked Uncracked concrete concrete		Cracked concrete			
Hammer drilling (HD) Hammer drilling with hollow drill bit (HDB) or compressed air drilling (CD)	M8 to M30; Ø8 to Ø32		,		, , , , , , , , , , , , , , , , , , ,	
Diamond drilling (DD)	M8 to M30; Ø8 to Ø32	No Performance Assessed	M8 to M30; Ø8 to Ø32	No Performance Assessed		
Temperature Range:	l: - 40 °C II: - 40 °C	C to +40 °C ¹⁾ C to +72 °C ²⁾		°C to +40 °C ¹⁾ °C to +72 °C ²⁾		

Anchorages subject to seismic action:

Performance category	C1	C2	
Base material	Uncracked and cracked concrete Uncracked and cracked concre		
Hammer drilling (HD) Hammer drilling with hollow drill bit (HDB) or compressed air drilling (CD)	M8 to M30, Ø8 to Ø32	M12 to M24	
Diamond drilling (DD)	No Performance Assessed No Performance Assesse		
Temperature Range:	I: -40 °C to +40 °C ¹⁾ II: -40 °C to +72 °C ²⁾	I: -40 °C to +40 °C ¹⁾ II: -40 °C to +72 °C ²⁾	

^{1) (}max long-term temperature +24 °C and max short-term temperature +40 °C)

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.

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 A3, Table A1: CRC II
 - Stainless steel Stahl A4 according to Annex A3, Table A1: CRC III
 - High corrosion resistance steel HCR according to Annex A3, Table A1: CRC V

Injection system PURE500+ for concrete	
Intended use Specifications	Annex B1

²⁾ (max long-term temperature +50 °C and max short-term temperature +72 °C)

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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 TR 055, Edition February 2018

Installation:

- Dry, wet concrete or flooded bore holes (not sea-water).
- Hole drilling in hammer drill mode with standard drill bit (HD) or with hollow drill bit (HDB), or in compressed air drill mode (CD), or with core drill bit in diamond drill mode (DD).
- 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.

Injection system PURE500+ for concrete	
Intended use Specifications	Annex B2
	Annex B2



Table B1: Ir	Table B1: Installation parameters for threaded rod										
Size of threaded ro	od			M8	M10	M12	M16	M20	M24	M27	M30
Diameter of elemen	t	$d = d_{nom}$	[mm]	8	10	12	16	20	24	27	30
Nominal drill hole di	ameter	d ₀	[mm]	10	12	14	18	22	28	30	35
Effective embedme	at donth	h _{ef,min}	[mm]	60	60	70	80	90	96	108	120
Effective embedment depth		h _{ef,max}	[mm]	160	200	240	320	400	480	540	600
Diameter of	Preset ins	Preset installation d _f ≤		9	12	14	18	22	26	30	33
clearance hole in the fixture ¹⁾ Through	nstallation d _f	[mm]	12	14	16	20	24	30	33	40	
Maximum torque me	Maximum torque moment max T _{inst} ≤			10	20	40 ¹⁾	60	100	170	250	300
Minimum thickness	of member	h _{min}	[mm]		_f + 30 m : 100 mr			ı	$h_{ef} + 2d_0$		
Minimum spacing		s _{min}	[mm]	40	50	60	75	95	115	125	140
Minimum edge dista	ance	C _{min}	[mm]	35	40	45	50	60	65	75	80

¹⁾ For application under seismic loading the diameter of clearance hole in the fixture shall be at maximum d₁ + 1mm or alternatively the annular gap between fixture and threaded rod shall be filled force-fit with mortar.

Table B2: Installation parameters for reinforcing bar

Size of reinforcing bar			Ø8 ¹⁾	Ø10 ¹⁾	Ø12	21)	Ø14	Ø16	Ø20	Ø24 ¹⁾	Ø25 ¹⁾	Ø28	Ø32
Diameter of element	d = d _{nom}	[mm]	8	10	12	2	14	16	20	24	25	28	32
Nominal drill hole diameter	d ₀	[mm]	10 12	12 14	14	16	18	20	25	30 32	30 32	35	40
Effective embedment depth	h _{ef,min}	[mm]	60	60	70)	75	80	90	96	100	112	128
Ellective embedment depth	h _{ef,max}	[mm]	160	200	240	0	280	320	400	480	500	560	640
Minimum thickness of member	h _{min}	[mm]		- 30 mm 00 mm					h _e	_f + 2d ₀			
Minimum spacing	s _{min}	[mm]	40	50	60)	70	75	95	120	120	130	150
Minimum edge distance	C _{min}	[mm]	35	40	45	5	50	50	60	70	70	75	85

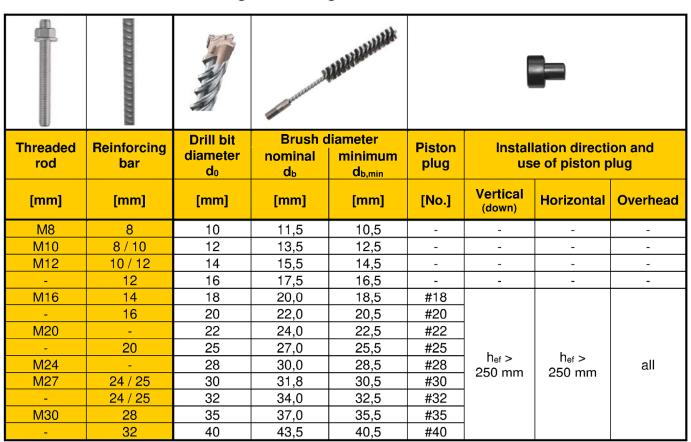
¹⁾ Both nominal drill hole diameter can be used

Injection system PURE500+ for concrete	
Intended use Installation parameters	Annex B3

²⁾ Maximum Torque moment for M12 with steel Grade 4.6 is 35 Nm



Table B3: Parameter cleaning and setting tools



CAC - Rec. compressed air tool (min 6 bar)

Drill bit diameter (d₀): all diameters



HDB - Hollow drill bit system

Drill bit diameter (d₀): all diameters

The hollow drill bit system consists of the DEWALT hollow drill dit and a class M vacuum with minimum negative pressure of 253 hPa and flow rate of minimum 150 m^3/h (42 l/s).



Injection system PURE500+ for concrete	
Intended use Cleaning and setting tools	Annex B4

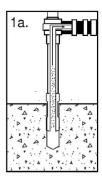


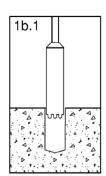
Installation instructions

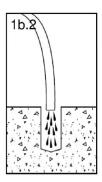
Compressed Air Cleaning (CAC)

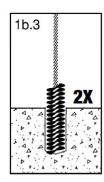
Cleaning for dry, wet and water filled bore hole with all diameter and hole depth, uncracked and cracked concrete

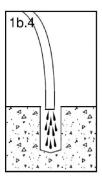
Hollow Drill Bit (HDB) Core Drill Bit, diamond drill mode (DD)





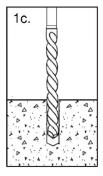


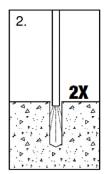


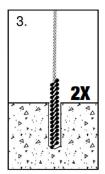


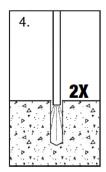
- 1a.) Connect the hollow drill bit of proper size to the vacuum and drill a hole into the base material to the required depth while the vac is running. The drill dust is removed during the drilling process. Proceed with Step 5.
- 1b.) 1 Using the proper drill bit size, drill a hole to the required depth.
 - 2 Rinse the hole until access water is clear.
 - 3 Brush the hole with the proper wire brush 2 times minimum.
 - 4 Rinse the hole until access water is clear. Proceed with Step 2.

Standard Drill Bit, hammer drill mode (HD) or compressed air drill mode (CD)









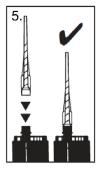
- 1c.) Using the proper drill bit size, drill a hole into the base material to the required depth. Proceed with Step 2
- 2.) Before cleaning, remove any standing water out of the drilled hole. Starting from the bottom of the hole, blow the hole clean with compressed air (min. 6 bar) minimum of 2 times. If the hole ground cannot be reached, an extension must be used.
- 3.) Select a brush of the correct diameter. Starting from the hole ground, brush the hole a minimum of 2 times. If the hole ground is not reached, a brush extension must be used.
- 4.) Finally, blow the hole clean again with compressed air (min. 6 bar) minimum of 2 times. If the hole ground cannot be reached, an extension must be used.

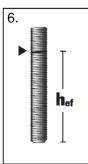
After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

Injection system PURE500+ for concrete	
Intended use Installation instructions	Annex B5

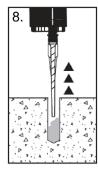


Installation instructions (continued)

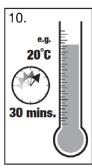


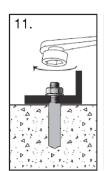












- 5.) Attach a supplied static mixing nozzle to the cartridge and load the cartidge into the correct dispensing tool. For foil tube type cartridges, cut off the foil clip before use. For every working interruption longer than the recommneded working time as well as for new cartridges, a new mixer nozzle must be used.
- 6.) Mark the required embedment depth on the anchor rod.
- 7.) Squeeze out a minimum of 3 full strokes and discard non-balanced adhesive until the adhesive shows a consistent colour.
- 8.) Starting from the back of the cleaned hole, fill the hole approximately two thirds with adhesive. Slowly withdraw the nozzle as the hole fills to avoid creating air pockets. For holes with embedment depths greater than 190 mm, a proper extension nozzle must be used. For horizontal and floor installations in holes deeper than 250 mm, and for overhead installation always, use a piston plug if the hole is 18 mm or larger.
- 9.) Push the threaded rod or reinforcing bar into the hole while turning slightly to properly distribute the adhesive. The anchor should be clean and free of dirt, grease or oil. Be sure that the gap is completedly filled with adhesive. Excess adhesive must be visible at the top of the hole. For overhead application, the threaded rod or reinforcing bar must be fixed (e.g. wedges) until the mortar has started to harden.
- 10.) Allow the adhesive to cure for the specified time prior to applying any load. Do not load the anchor until it is fully
- 11.) After full curing, the fixture can be installed. Make sure the maximum torque is not exceeded.

Injection system PURE500+ for concrete

Intended Use
Installation instructions

Annex B6





Table B4: Maximum working time and minimum curing time

Concrete temperature	Gelling working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
0 °C to + 4 °C	90 min	144 h	288 h
+ 5 °C to + 9 °C	80 min	48 h	96 h
+ 10 °C to + 14 °C	60 min	28 h	56 h
+ 15 °C to + 19 °C	40 min	18 h	36 h
+ 20 °C to + 24 °C	30 min	12 h	24 h
+ 25 °C to + 34 °C	12 min	9 h	18 h
+ 35 °C to + 39 °C	8 min	6 h	12 h
+40 °C	8 min	4 h	8 h
Cartridge temperature		+5 °C to +40 °C	

Injection system PURE500+ for concrete	
Intended use Curing time	Annex B7



Т	able C1: Characteristic values resistance of threade			ension	resista	ance a	and st	teel sl	near		
Αı	nchor size			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
CI	naracteristic tension resistance, Steel failu	re ¹⁾								'	
St	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)
Cl	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	86			
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										
_	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
ever	Steel, Property class 8.8	V ⁰ _{Rk,s}	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
	Stainless steel A2, A4 and HCR, class 50	V ⁰ Rk,s	[kN]	9	15	21	39	61	88	115	140
Without	Stainless steel A2, A4 and HCR, class 70	V ⁰ _{Rk,s}	[kN]	13	20	30	55	86	124	_3)	_3)
>	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
E	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
le\	Stainless steel A2, A4 and HCR, class 50 Stainless steel A2, A4 and HCR, class 70	M ⁰ _{Rk,s}	[Nm]	19	37	66	167	325	561	832	1125
Witt	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)
Cl	naracteristic shear resistance, Partial facto	r ²⁾								'	
St	eel, Property class 4.6 and 5.6	γ _{Ms,V}	[-]	1,67							
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 are	.α Λ \/al	uoc in	brackote	ara valid	d for up	dorcizo	d throad	dod rod	c with	

¹⁾ 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.

³⁾ Anchor type not part of the ETA

Injection system PURE500+ for concrete	
Performances Characteristic values for steel tension resistance and steel shear resistance of threaded rods	Annex C1

²⁾ In absence of national regulation



Table C2:	Characteristic v	alues for c	oncrete co	ne failure and splitting failure
Anchor size				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	dge distance		[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}

Injection system PURE500+ for concrete

Performances
Characteristic values for concrete cone failure and splitting failure

Annex C2

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	acteristic va on for a work			s und	der st	atic a	nd q	uasi-s	static		
Anchor size threaded ro	d			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure		1	1								
Characteristic tension res	istance	N _{Rk,s}	[kN]					ee Tab			
Partial factor		γ _{Ms,N}	[-]				See Ta	able C1			
Combined pull-out and											
Characteristic bond resist (CD)	ance in uncracke	d concrete G20	/25 in hamr	ner dril	led hol	es (HD) and c	ompres	ssed an	r drilled	holes
II: 72°C/50°C	Dry, wet concrete and	^τ Rk,ucr	[N/mm²]	20	20	19	19	18	17	16	16
II: 72°C/50°C	flooded bore hole	*HK,ucr	[N/mm²] -	15	15	15	14	13	13	12	12
Characteristic bond resist	ance in uncracke	d concrete C20	/25 in hamr	ner dril	led hol	es with	hollow	drill bit	t (HDB)		
<u>열</u> I: 40°C/24°C	Dry, wet			17	16	16	16	15	14	14	13
1: 40°C/24°C 1: 40°C/24°C 1: 40°C/24°C 1: 72°C/50°C	concrete	_	INI/ma 07	14	14	14	13	13	12	12	11
e	flooded bore	^τ Rk,ucr	[IN/mm²]	16	16	16	15	15	14	14	13
Ⅱ: 72°C/50°C	hole			14	14	14	13	13	12	12	11
Characteristic bond resist		oncrete C20/25	in hamme	r drilled	holes	(HD), (compre	ssed a	ir drille	d holes	(CD)
and with hollow drill bit (H	DB)	1	1								
II: 72°C/50°C	Dry, wet concrete and	τ _{Rk,cr}		7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
ਹੁੰ ਛੁ H: 72°C/50°C	flooded bore hole	- nk,ci		6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0
Reduction factor ψ^0_{sus} in		acked concrete	e C20/25 in	hamme	er drille	d holes	(HD),	compre	essed a	ir drille	ed
holes (CD) and with hollow and a superior of the control of the c	Dry, wet concrete and		[-]),80			
直 間: 72°C/50°C	flooded bore hole	* Sus	[N/mm²] — [N/mm²] — [N/mm²] — [N/mm²] — [N/mm²] —	0,68							
		C25/30					1,	02			
		C30/37						04			
Increasing factors for con-	crete	C35/45						07			
Ψc		C40/50 C45/55						08 09			
		C50/60						10			
Concrete cone failure		1000,00					- ,				
Relevant parameter							See Ta	able C2	:		
Splitting											
Relevant parameter							See Ta	able C2	:		
Installation factor	(UD UDD OD)							0			
For dry and wet concrete For flooded bore hole (HD	, , , , , , , , , , , , , , , , , , , 	γ _{inst}	[-]					<u>,0</u> ,2			
TO HOUSE DOTE HOTE (HL	, 1106, 00)			<u> </u>				, <u>c</u>			
Injection system PUR	E500+ for conc	rete							A	00	
Performances Characteristic values of	tension loads u	nder static and	quasi-stat	ic actic	n				Anne	x C3	



Characteristic tension resistance N _{Rk,8} [kN] A _S · f _{uk} (or see Table C1)	Anchor size threaded ro	od			M8	M10	M12	M16	M20	M24	M27	M30	
Partial factor	Steel failure												
Partial factor YMS.N [-] See Table C1	Characteristic tension res	sistance	N _{Rk,s}	[kN]			A _s · f _l	ık (or se	ee Tab	le C1)			
Combined pull-out and concrete failure Characteristic bond resistance in uncracked concrete C20/25 in hammer drilled holes (HD) and compressed air drilled hole (ND)	Partial factor			[-]				See Ta	able C1				
Characteristic bond resistance in uncracked concrete C20/25 in hammer drilled holes (HD) and compressed air drilled holes (CD)	Combined pull-out and	concrete failure	1010,14										
Characteristic bond resistance in uncracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) 1: 40°C/24°C Dry, wet concrete 1: 72°C/50°C biole TRIK,ucr,100	Characteristic bond resis		d concrete C20	0/25 in hamr	ner dril	led hole	es (HD) and c	ompres	sed ai	r drilled	hole	
Characteristic bond resistance in uncracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) 1: 40°C/24°C Dry, wet concrete 1: 72°C/50°C biole TRIK,ucr,100	de l: 40°C/24°C			Bu a	20	20	19	19	18	17	16	16	
Characteristic bond resistance in uncracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) 1: 40°C/24°C Dry, wet concrete 1: 72°C/50°C biole TRIK,ucr,100	ed no	flooded bore	^τ Rk,ucr,100	[N/mm²]	15	15	15	14	13	13	12	12	
II: 72°C/50°C Concrete TRk,ucr,100 [N/mm²] 14 14 13 13 12 12 12 16 16 16 15 15 14 14 14 13 13 12 12 12 15 14 14 14 14 15 15 14 14		tance in uncracke	d concrete C20	0/25 in hamr	ner dril	led hole	es with	hollow	drill bit	(HDB))		
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (Cand with hollow drill bit (HDB) 1	<u>⊕</u> I: 40°C/24°C	Drv. wet			17	16	16	16	15	14	14	13	
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (Cand with hollow drill bit (HDB) 1	n				14					12	12	11	
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (Cand with hollow drill bit (HDB) 1	☐ B I: 40°C\54°C	fleeded besse	^τ Rk,ucr,100	[N/mm ²]								13	
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (Cand with hollow drill bit (HDB) 1	1. 70°C/E0°C											11	
Telegraph Tele				E in hamana									
C25/30	and with hollow drill bit (F		concrete G20/2	5 in namme	r arilled	noies	(HD), (compre	ssea a	ir arille	a noies	(GD	
C25/30	erature I: 40°C/24°C	concrete and	TDk 21 100	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	
C30/37	II: 72°C/50°C		*HK,Cr,100	20/25 in hammer	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	
C35/45													
C40/50 1,08 C45/55 1,09 C50/60 1,10 Concrete cone failure Relevant parameter see Table C2 Splitting Relevant parameter see Table C2 Installation factor For dry and wet concrete (HD, HDB, CD)													
C45/55 1,09 C50/60 1,10 Concrete cone failure Relevant parameter see Table C2 Splitting Relevant parameter see Table C2 Installation factor For dry and wet concrete (HD, HDB, CD) Total Captallation 1,09 Table C2 Table C2 Table C2 Table C2 Table C2 Table C2	•	crete											
C50/60 1,10 Concrete cone failure Relevant parameter see Table C2 Splitting Relevant parameter see Table C2 Installation factor For dry and wet concrete (HD, HDB, CD) To the contract of the contract	Ψc												
Concrete cone failure Relevant parameter see Table C2 Splitting Relevant parameter see Table C2 Installation factor For dry and wet concrete (HD, HDB, CD) To the contract of the contra													
Relevant parameter Splitting Relevant parameter See Table C2 Installation factor For dry and wet concrete (HD, HDB, CD) To the see Table C2 Installation factor The see Table C2 Installation factor The see Table C2 Installation factor	Concrete cone failure		1000/00					- ',	10				
Relevant parameter see Table C2 Installation factor For dry and wet concrete (HD, HDB, CD) 7. 1,0								see Ta	ıble C2				
Installation factor For dry and wet concrete (HD, HDB, CD)													
For dry and wet concrete (HD, HDB, CD)	<u> </u>							see Ta	ıble C2				
For flooded bore note (HD, HDB, CD)			γ _{inst}	[-]						22 44 77 88 99 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			
	Splitting Relevant parameter Installation factor For dry and wet concrete		γ _{inst}	[-]				see Ta	ible C2				



	r size threaded ro	od			M8	M10	M12	M16	M20	M24	M27	M30		
Steel fa	ilure													
Charact	teristic tension res	sistance	N _{Rk,s}	[kN]			$A_s \cdot f_l$	_{ık} (or s	ee Tab	le C1)				
artial f	factor		γ _{Ms,N}	[-]				See Ta						
Combir	ned pull-out and	concrete failure	<u>'</u>		ears									
	teristic bond resis					lled hol	es (DD))						
							,	ĺ						
ratu Je	I: 40°C/24°C	Dry, wet concrete and			15	14	14	13	12	12	11	11		
nperatu range		flooded bore	^τ Rk,ucr	[N/mm ²]										
Temperature range	II: 72°C/50°C	hole			12	12	11	10	9,5	9,5	9,0	9,0		
	ion factor w ⁰ in	uporackad coper	oto C20/25 in d	liamond drill	od bolo	o (DD)								
	ion factor ψ ⁰ sus in	T T T T T T T T T T T T T T T T T T T		liamona anii		יטט)								
ture	I: 40°C/24°C	Dry, wet						0.	77					
Temperature range		concrete and	Ψ^0_{sus}	[-]										
mp	II: 72°C/50°C	flooded bore	₩ sus	[]	0,72									
Te	II. 72 6/50 C	hole						U,	1 4					
C25/30					1,04									
C30/37					1,08									
Increasing factors for concrete C35/45					1,12 1,15									
γc			C40/50											
			C45/55		1,17 1,19									
			C50/60					1,	19					
	ned pull-out and teristic bond resist					llad bal	00 (DD	1)						
	lensuc bond resis			J/25 III diami	ona an	ilea noi	es (DD	')						
Temperature range	I: 40°C/24°C	Dry, wet			15	14	14	13	12	12	11	11		
nperatu range		concrete and flooded bore	τ _{Rk,ucr,100}	[N/mm ²]										
emp	II: 72°C/50°C	hole	, .,		11	11	10	10	9,5	9,0	8,5	8,5		
ř			005/00											
			C25/30						04					
nereaci	ing factors for con	icrete	C30/37						08					
μ _c	ing factors for con	iorete	C35/45 C40/50						12 15					
C			C45/55						17					
			C50/60						19					
Concre	ete cone failure		1 2 3 7 0 0					.,	-					
	nt parameter							See Ta	able C2	<u> </u>				
Splittin	<u> </u>													
Relevar	nt parameter							See Ta	able C2	<u> </u>				
	tion factor													
	and wet concrete		γ _{inst}	[-]				1	,0					
or floo	ded bore hole (DI	0)	Tillot			1,2				1,4				
									1					
Injecti	ion system PUR	E500+ for conc	rete											
	-								I					



Table C6: Characteristic				1						I		
Anchor size threaded rod			Υ	M10	M12	M16	M20	M24	M27	M30		
Steel failure without lever arm												
Characteristic shear resistance Steel, strength class 4.6, 4.8 and 5.6, 5.8	V ⁰ _{Rk,s}	[kN]	0,6 ⋅ A _s ⋅ f _{uk} (or see Table C1)									
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A2, A4 and HCR, all strength classes	V ⁰ _{Rk,s}	[kN]	0,5 · A _s · f _{uk} (or see Table C1)									
Partial factor γ _{Ms,V} [-] See Table C1												
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}	(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	l _f	[mm]		n	nin(h _{ef} ; 1	I2 · d _{nor}	n)		min(h _{ef} ;	300mm)		
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	16	20	24	27	30		
Installation factor	[-]	1,0										

Injection system PURE500+ for concrete	
Performances Characteristic values of shear loads under static and quasi-static action	Annex C6



Anchor size reinforci	tion for a wo	z. King iiic	. 3. 30 y	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Steel failure													
Characteristic tension	resistance	N _{Rk,s}	[kN]					A _s ·	$f_{uk}^{1)}$				
Cross section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ _{Ms,N}	[-]					1,	4 ²⁾				
Combined pull-out a													
Characteristic bond re holes (CD)	esistance in und	racked cond	crete C20/	25 in h	namme	er drille	ed hole	es (HD) and	compr	essed	air dril	led
T: 40°C/24°C II: 72°C/50°C	Dry, wet concrete and	^τ Rk,ucr	[N/mm²]	16	16	16	16	16	16	15	15	15	15
<u> </u>	flooded bore hole			12	12	12	12	12	12	12	12	11	11
Characteristic bond res	1	icked concre	te C20/25									4.0	4.0
E 40°C/24°C 40°C/24°C 40°C/24°C 40°C/24°C 40°C/24°C	Dry, wet concrete			14	14	13	13	13	13	13	13	13	13
II: 72°C/50°C		τ _{Rk,ucr}	[N/mm ²]	12	12	12	11	11	11	11	11	11	11
1: 40°C/24°C	flooded bore hole	'		13	13	13	13	13	13	13	13	13	13
11. 72 0/00 0			000/05 :	11	11	11	11	11	11	11	11	11	11
Characteristic bond rea		ed concrete	G20/25 In	namm	er arılı	ea noi	es (HL), con	ipress	ed air	arillea	noies	(GD)
I: 40°C/24°C	Dry, wet concrete and	τ _{Rk,cr}	[N/mm2]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5
0											ı	ı	
ы: /2°С/50°С Н	11010		[N/mm ²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	_
Reduction factor ψ ⁰ su	hole s in cracked and	d uncracked			-		·		_	-			_
Reduction factor ψ^0_{su} holes (CD) and with ho	hole in cracked and bllow drill bit (HD Dry, wet	d uncracked B)	concrete		-		·	d holes	_				_
Reduction factor ψ ⁰ _{su} holes (CD) and with ho	hole s in cracked and bllow drill bit (HD	d uncracked			-		·	d holes	s (HD)				_
Reduction factor ψ^0_{su} holes (CD) and with ho	hole is in cracked and billow drill bit (HD) Dry, wet concrete and flooded bore	d uncracked B) Ψ ⁰ sus	[-]		-		·	0, 0,	80 68				_
Reduction factor ψ ⁰ _{su} holes (CD) and with holes I: 40°C/24°C II: 72°C/50°C	hole is in cracked and pllow drill bit (HD) Dry, wet concrete and flooded bore hole	d uncracked B) Ψ ⁰ sus C25 C30	[-] /30 /37		-		·	0, 0, 1,	80 68 02 04				7,0
Reduction factor ψ ⁰ _{su} holes (CD) and with holes (ED) and with	hole is in cracked and pllow drill bit (HD) Dry, wet concrete and flooded bore hole	d uncracked B) Ψ ⁰ sus C25 C30 C35	[-] /30 /37 /45		-		·	0, 0, 1, 1,	80 68 02 04 07				_
Reduction factor ψ ⁰ _{su} holes (CD) and with holes I: 40°C/24°C II: 72°C/50°C	hole is in cracked and pllow drill bit (HD) Dry, wet concrete and flooded bore hole	d uncracked B) Ψ ⁰ sus C25 C30	[-] /30 /37 /45		-		·	0, 0, 1, 1, 1,	80 68 02 04 07 08				_
Reduction factor ψ ⁰ _{su} holes (CD) and with holes (ED) and with	hole is in cracked and pllow drill bit (HD) Dry, wet concrete and flooded bore hole	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40	[-] /30 /37 /45 /50		-		·	0, 0, 1, 1, 1, 1,	80 68 02 04 07				_
Reduction factor ψ^0_{su} holes (CD) and with holes (ED) and with holes (CD) and wit	hole s in cracked and pillow drill bit (HD) Dry, wet concrete and flooded bore hole concrete	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45	[-] /30 /37 /45 /50		-		r drille	0, 0, 1, 1, 1, 1, 1,	80 68 02 04 07 08 09	, comp			_
Reduction factor ψ^0_{su} holes (CD) and with holes (CD) and wit	hole s in cracked and pillow drill bit (HD) Dry, wet concrete and flooded bore hole concrete	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45	[-] /30 /37 /45 /50		-		r drilled	0, 0, 1, 1, 1, 1,	80 68 02 04 07 08 09	, comp			_
Reduction factor ψ^0_{su} holes (CD) and with holes (CD) and wit	hole s in cracked and pillow drill bit (HD) Dry, wet concrete and flooded bore hole concrete	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45	[-] /30 /37 /45 /50		-		r drille	0, 0, 1, 1, 1, 1, See Ta	80 68 02 04 07 08 09 10	, comp			_
Reduction factor ψ^0_{su} holes (CD) and with holes (CD) and wit	hole s in cracked and pillow drill bit (HD) Dry, wet concrete and flooded bore hole concrete	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45	[-] /30 /37 /45 /50		-		r drille	0, 0, 1, 1, 1, 1, 1,	80 68 02 04 07 08 09 10	, comp			_
Reduction factor ψ^0_{su} holes (CD) and with holes (CD) and wit	hole is in cracked and pllow drill bit (HD) Dry, wet concrete and flooded bore hole concrete	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45 C50	[-] /30 /37 /45 /50 /55 /60		-		r drille	0, 0, 1, 1, 1, 1, See Ta	80 68 02 04 07 08 09 10 able C	, comp			_
Reduction factor ψ^0_{su} holes (CD) and with holes (CD) and wit	hole s in cracked and pollow drill bit (HD) Dry, wet concrete and flooded bore hole concrete	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45	[-] /30 /37 /45 /50		-		r drille	0, 0, 1, 1, 1, See Ta	80 68 02 04 07 08 09 10	, comp			_
Reduction factor ψ^0_{su} holes (CD) and with holes (CD) and wit	hole s in cracked and pllow drill bit (HD) Dry, wet concrete and flooded bore hole concrete ete (HD,HDB,CD) om the specificat	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45 C50	[-] /30 /37 /45 /50 /55 /60	C20/2	-		r drilled	0, 0, 1, 1, 1, See Ta	80 68 02 04 07 08 09 10 able Ca	, comp			-
Reduction factor ψ^0_{su} holes (CD) and with holes (CD) and we concrete cone failure (CD) and with holes (CD) a	hole s in cracked and pllow drill bit (HD) Dry, wet concrete and flooded bore hole concrete ete (HD,HDB,CD) Om the specification al regulation	d uncracked B) Ψ ⁰ sus C25 C30 C35 C40 C45 C50 Yinst ions of reinfo	[-] /30 /37 /45 /50 /55 /60	C20/2	-		r drilled	0, 0, 1, 1, 1, See Ta	80 68 02 04 07 08 09 10 able Ca	, comp			_

English translation prepared by DIBt



Steel failure	ng bar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
		ls:							r 1)				
Characteristic tension r	esistance	N _{Rk,s}	[kN]						f _{uk} 1)			l	I
Cross section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ _{Ms,N}	[-]					1,	4 ²⁾				
Combined pull-out an			O00	(OF : I				- (LID	\			- 111	UI
Characteristic bond re noles (CD)	isistance in unc	racked cond	crete G20/	25 IN I	namme	er arılı	ea noie	es (HD) and	compr	essea	air drii	liea
II: 72°C/50°C	Dry, wet concrete and	_	[N]/m= m= 2]	16	16	16	16	16	16	15	15	15	15
II: 72°C/50°C	flooded bore hole	^τ Rk,ucr,100	[N/mm ²]	12	12	12	12	12	12	12	12	11	11
Characteristic bond res	istance in uncra	cked concre	te C20/25	in han	nmer c	rilled I	noles v	vith ho	llow d	rill bit (HDB)		
<u>е</u> <u>I: 40°С/24°С</u>	Dry, wet			14	14	13	13	13	13	13	13	13	13
1: 40°C/24°C 1: 72°C/50°C 1: 40°C/24°C 1: 72°C/50°C	concrete	π	[N/mm ²]	12	12	12	11	11	11	11	11	11	11
I: 40°C/24°C	flooded bore	^τ Rk,ucr,100	[[N/11111-]	13	13	13	13	13	13	13	13	13	13
ш: 72°С/50°С	hole			11	11	11	11	11	11	11	11	11	11
Characteristic bond res and with hollow drill bit		ed concrete	C20/25 in	hamm	er drill	ed hol	es (HE), con	press	ed air	drilled	holes	(CD
Temperature range II: 40°C/24°C O°C/20°C	Dry, wet concrete and	^τ Rk,cr,100	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5
II: 72°C/50°C	flooded bore hole	*HK,Cr,TUU	[14/11111]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
		C25	1,02										
paragaing factors for a	anarata	C30.		1,04									
ncreasing factors for c	oncrete	C40		1,07 1,08									
		C45											
		C50		1,09 1,10									
Concrete cone failure				1,10									
Relevant parameter								see Ta	ible C	2			
Splitting								see Ta	bla O	<u> </u>			
Relevant parameter								see 12	ible C				
For dry and wet concre	te (HD.HDB.CD)							1	,0				
For flooded bore hole (γ _{inst}	[-]						,2				

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



	naracteristic tion for a wo						stati	c and	d qua	asi-st	atic		
Anchor size reinforci	ng bar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
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	452	491	616	804
Partial factor		γ _{Ms,N}	[-]						4 ²⁾				
Combined pull-out ar	nd concrete failu	<u> </u>		of 50	years								
Characteristic bond re	esistance in unc	racked cond	rete C20/	25 in d	diamor	nd drill	ed hole	es (DE))				
I: 40°C/24°C II: 72°C/50°C	Dry, wet concrete and flooded bore	^τ Rk,ucr	[N/mm²]	14	13	13 10	13	12 10	12 9,5	11 9,5	11 9,5	9,0	9,0
<u> </u>	hole							10	3,3	3,3	3,5	3,0	3,0
Reduction factor ψ ⁰ su	s in uncracked c	oncrete C2	0/25 in dia	ımond	drilled	holes	(DD)						
England II: 40°C/24°C Dry, wet concrete and flooded bore hole Ψ ⁰ _{sus} [-]								0,	77				
д в II: 72°C/50°С	hole								72				
C25/30 C30/37									04				
ncreasing factors for concrete C30/37				1,08									
Increasing factors for concrete $\frac{\text{C35/45}}{\text{C40/50}}$				1,12 1,15									
		C45/		1,17									
		C50/		1,19									
Combined pull-out ar				e of 100 years 0/25 in diamond drilled holes (DD)									
	esistance in unci 	racked cond	rete C20/	25 In (alamor	na ariii	ea noi	es (DL)) 				
I: 40°C/24°C II: 72°C/50°C	Dry, wet concrete and flooded bore	^τ Rk,ucr,100	[N/mm²]	14	13	13	13	12	12	11	11	11	11
II: 72°C/50°C				11	10	10	10	9,5	9,0	9,0	9,0	8,5	8,5
		C25/							04				
Increasing factors for o	concrete	C30/		1,08 1,12									
Ψ_{c}	oncrete	C40							15				
		C45/							17				
		C50/	/60					1,	19				
Concrete cone failure	•												
Relevant parameter							,	See Ta	able C	2			
Splitting Relevant parameter								Con T	abla O	2			
Relevant parameter Installation factor							,	See Ta	able C	_			
For dry and wet concre	ete (DD)							1	,0				
For flooded bore hole (γ _{inst}	[-]		1	,2		<u>'</u>	, .	1	,4		
1) f _{uk} shall be taken fro 2) In absence of nation Injection system PU	nal regulation		rcing bars			-					-		
Performances Characteristic values	ic and qua	asi-sta	ıtic ac	tion				£	Anne	x C9			

English translation prepared by DIBt



Table C10: Characteristic	values	of shea	ar loa	ads ı	ınde	r sta	tic a	nd q	uasi-	static	actior	1
Anchor size reinforcing bar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Steel failure without lever arm												
Characteristic shear resistance	V ⁰ Rk,s	[kN]					0,5	· A _s ·	f _{uk} ¹⁾			
Cross section area	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	[-]						1,5 ²⁾					
Ductility factor	[-]						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	1357	1534	2155	3217
Partial factor	γ _{Ms,V}	[-]						1,5 ²⁾				
Concrete pry-out failure												
Factor	k ₈	[-]						2,0				
Installation factor	γ _{inst}	[-]	1,0									
Concrete edge failure												
Effective length of fastener	[mm]			min(h	n _{ef} ; 12	· d _{non}	n)		min(h _{ef} ; 300	mm)	
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	14	16	20	24	25	28	32
Installation factor	γ _{inst}	[-]	1,0									

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

Annex C10



Table C11:	Displacements under tension load ¹⁾ in hammer drilled holes (HD),
	compressed air drilled holes (CD) and with hollow drill bit (HDB)

Anchor size threaded ro	od		M8	M10	M12	M16	M20	M24	M27	M30	
Uncracked concrete un	der static an	d quasi-static act	ion for a	workin	g life of	50 and	100 year	'S			
Temperature range I:	δ _{N0} -factor	[mm/(N/mm ²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041	
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041	
Temperature range II:	δ_{N0} -factor	[mm/(N/mm ²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055	
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070	
Cracked concrete unde	r static and	quasi-static action	n for a w	orking l	ife of 50	and 100) years				
Temperature range I:	δ _{N0} -factor	[mm/(N/mm ²)]	0,069	0,071	0,072	0,074	0,076	0,079	0,081	0,082	
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,100	0,115	0,122	0,128	0,135	0,142	0,155	0,171	
Temperature range II:	δ_{N0} -factor	[mm/(N/mm ²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110	
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229	

¹⁾ Calculation of the displacement

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

 τ : action bond stress for tension

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

Table C12: Displacements under tension load¹⁾ in diamond drilled holes (DD)

Anchor size threaded ro	Anchor size threaded rod				M12	M16	M20	M24	M27	M30			
Uncracked concrete under static and quasi-static action for a working life of 50 years													
Temperature range I:	δ _{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015			
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,018	0,019	0,019	0,020	0,022	0,023	0,024	0,025			
Temperature range II:	δ_{N0} -factor	[mm/(N/mm ²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018			
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,052	0,053	0,055	0,058	0,062	0,065	0,068	0,070			
Uncracked concrete und	der static and	d quasi-static acti	on for a	working	g life of	100 year	'S						
Temperature range I:	δ_{N0} -factor	[mm/(N/mm ²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015			
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,020	0,021	0,021	0,023	0,024	0,025	0,026	0,027			
Temperature range II:	δ_{N0} -factor	[mm/(N/mm ²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018			
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051			

¹⁾ Calculation of the displacement

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

 τ : action bond stress for tension

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

Displacements under shear load¹⁾ for all drilling methods Table C13:

Anchor size thread	ed rod		M8	M10	M12	M16	M20	M24	M27	M30		
Uncracked and cracked concrete under static and quasi-static action												
All temperature	δ_{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]				0,08	0,08	0,06	0,06	0,05	0,05	0,05		

¹⁾ Calculation of the displacement

 $\delta_{V0} = \delta_{V0}$ -factor · V; V: action shear load

 $\delta_{V\infty} = \delta_{V\infty}$ -factor · V;

Injection system PURE500+ for concrete

Performances

Displacements under static and quasi-static action (threaded rods)

Annex C11

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Table C14:	Displacements under tension load ¹⁾ in hammer drilled holes (HD),
	compressed air drilled holes (CD) and with hollow drill bit (HDB)

Anchor size reinfo	orcing bar		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Uncracked concre	ete under sta	atic and quasi-s	tatic ac	tion for	a work	ing life	of 50 a	nd 100	years			
Temp range I:	δ_{N0} -factor	[mm/(N/mm ²)]	0,028	0,029	0,030	0,031	0,033	0,035	0,038	0,038	0,040	0,043
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,031	0,033	0,035	0,038	0,038	0,040	0,043
Temp range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,042	0,044	0,047	0,051	0,051	0,054	0,058
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,053	0,055	0,059	0,065	0,065	0,068	0,072
Cracked concrete	under statio	and quasi-stat	ic actio	n for a	workin	g life of	50 and	l 100 ye	ears			
Temp range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,073	0,074	0,076	0,079	0,079	0,081	0,084
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,115	0,122	0,128	0,135	0,142	0,155	0,171	0,171	0,181	0,194
	δ _{N0} -factor	[mm/(N/mm ²)]	0,092	0,095	0,096	0,098	0,099	0,102	0,106	0,106	0,109	0,113
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,154	0,163	0,172	0,181	0,189	0,207	0,229	0,229	0,242	0,260

¹⁾ Calculation of the displacement

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

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

Table C15: Displacements under tension load¹⁾ in diamond drilled holes (DD)

Anchor size reinfo	orcing bar		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Uncracked concre	ete under sta	atic and quasi-s	tatic ac	tion for	a work	ing life	of 50 y	ears				
Temp range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,008	0,009	0,009	0,01	0,011	0,012	0,013	0,013	0,014	0,015
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,018	0,018	0,019	0,020	0,021	0,024	0,027	0,027	0,028	0,031
Temp range II: 72°C/50°C	δ_{N0} -factor	[mm/(N/mm²)]	0,009	0,011	0,011	0,012	0,013	0,014	0,015	0,015	0,016	0,018
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,048	0,051	0,054	0,058	0,061	0,068	0,076	0,076	0,081	0,088
Uncracked concre	ete under sta	atic and quasi-s	tatic ac	tion for	a work	ing life	of 100	years				
Temp range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,008	0,009	0,009	0,010	0,011	0,012	0,013	0,013	0,014	0,015
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,018	0,020	0,021	0,022	0,024	0,026	0,029	0,029	0,031	0,034
	δ_{N0} -factor	[mm/(N/mm ²)]	0,009	0,011	0,011	0,012	0,013	0,014	0,015	0,015	0,016	0,018
	$\delta_{N\infty}$ -factor	[mm/(N/mm ²)]	0,035	0,037	0,040	0,042	0,045	0,049	0,055	0,055	0,059	0,064

¹⁾ Calculation of the displacement

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

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

Table C16: Displacements under shear load¹⁾ for all drilling methods

Anchor size rein	forcing bar	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32	
Uncracked and cracked concrete under static and quasi-static action												
All temperature	δ_{V0} -factor	[mm/kN]	0,06	0,05	0,05	0,04	0,04	0,04	0,03	0,03	0,03	0,03
ranges	δ _{V∞} -factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05	0,04	0,04

¹⁾ Calculation of the displacement

 $\delta_{V0} = \delta_{V0}$ -factor \cdot V; V: action shear load

 $\delta_{V\infty} = \delta_{V\infty}$ -factor · V;

Injection system PURE500+ for concrete

Performances

Displacements under static and quasi-static action (reinforcing bar)

Annex C12

Increasing factors for concrete ψ_{C}

For dry and wet concrete (HD, HDB, CD)

For flooded bore hole (HD, HDB, CD)

Installation factor



1,0

1,0

1,2

Table C1	Table C17: Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 and 100 years											
Anchor size	Anchor size threaded rod M8 M10 M12 M16 M20 M24 M27 M30											
Steel failure												
Characteristic tension resistance N _{Rk,s,eq,C1} [kN] 1,0 · N _{Rk,s}												
Partial factor	r		γ _{Ms,N}	[-]				See Ta	able C1			
Combined	oull-out and co	ncrete failure										
drilled holes		ce in cracked a nollow drill bit (H		oncrete C2	0/25 in	hamm	er drille	ed hole	s (HD)	, compi	ressed	air
Temperat ure range := :)°C/24°C	Dry, wet concrete and	^τ Rk,eq,C1	[N/mm ²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
Tem ure r II: 7	2°C/50°C	flooded bore hole	^τ Rk,eq,C1	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0

[-]

C25/30 to C50/60

Table C18: Characteristic values of shear loads under seismic action (performance category C1)

 γ_{inst}

Anchor size threaded rod		M8	M10	M12	M16	M20	M24	M27	M30	
Steel failure										
Characteristic shear resistance	V _{Rk,s,eq,C1}	[kN]	0,70 · V ⁰ _{Rk,s}							
Partial factor	$\gamma_{Ms,V}$	[-]	See Table C1							
Factor for annular gap	$\alpha_{\sf gap}$	[-]								

Injection system PURE500+ for concrete	
Performances Characteristic values of tension and shear loads under seismic action (performance category C1) for a working life of 50 and 100 years (threaded rod)	Annex C13



1,2

Table C19: Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 and 100 years

				-		_					-			
Ancho	r size reinforcin	g bar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Steel f	ailure													
Characteristic tension resistance N _{Rk,s,eq,C1} [kN]						$1.0 \cdot A_s \cdot f_{uk}^{1)}$								
Cross	section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial	factor		γ _{Ms,N}	[-]					1,	4 ²⁾				
Combi	ned pull-out and	l concrete failu	ire											
	cteristic bond resist holes (CD) and w			icked cond	crete C	C20/25	in har	nmer d	drilled	holes	(HD), (compre	essed	air
emperature range	I: 40°C/24°C	Dry, wet concrete and	^τ Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5
empe ran	II: 72°C/50°C	flooded bore hole	τ _{Rk,eq,C1}	[N/mm ²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0

Increasing factors for concrete ψ_C C25/30 to C50/60 1,0

Installation factor

For dry and wet concrete (HD,HDB,CD) 1,0

For flooded bore hole (HD, HDB, CD)

1) fuk shall be taken from the specifications of reinforcing bars
2) In absence of national regulation

Table C20: Characteristic values of shear loads under seismic action (performance category C1)

Anchor size reinforcing bar	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø 2 5	Ø28	Ø32		
Steel failure												
Characteristic shear resistance	V _{Rk,s,eq,C1}	[kN]	$0.35 \cdot A_s \cdot f_{uk}^{(1)}$									
Cross section area	A _s	[mm ²]	50 79 113 154 201 314 452 491 616 8						804			
Partial factor	γ _{Ms,V}	[-]	1,5 ²⁾									
Factor for annular gap	$\alpha_{\sf gap}$	[-]	0,5									

 $^{1)}$ f_{uk} shall be taken from the specifications of reinforcing bars

2) In absence of national regulation

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Injection system PURE500+ for concrete	
Performances	Annex C14
Characteristic values of tension and shear loads under seismic action (performance category C1) for a working life of 50 and 100 years (reinforcing bar)	



Table C21: Characteristic values of tension loads under seismic action (performance category C2) for a working life of 50 and 100 years

Anchor size threaded rod			M12	M16	M20	M24				
Steel failure										
Characteristic tension resistance, Steel, strength class 8.8 Stainless Steel A4 and HCR, Strength class ≥70	Nov				1,0 · N _{Rk,s}					
Partial factor	$\gamma_{Ms,N}$	[-]		See Ta	able C1					
Combined pull-out and concrete failure										
Characteristic bond resistance in cracked a drilled holes (CD) and with hollow drill bit (H		concrete C2	20/25 in hamm	er drilled hole	es (HD), comp	ressed air				
T: 40°C/24°C Dry, wet concrete and flooded bore hole	^τ Rk,eq,C2	[N/mm ²]	5,8	4,8	5,0	5,1				
II: 72°C/50°C flooded bore hole	τ _{Rk,eq,C2}	[N/mm ²]	5,0	4,1	4,3	4,4				
Increasing factors for concrete ψ _C C25/30 to C50/60 1,0										
Installation factor										
For dry and wet concrete (HD, HDB, CD)	Vinet	[-]	1,0							
For flooded bore hole (HD, HDB, CD) Yinst 1,2										

Table C22: Characteristic values of shear loads under seismic action (performance category C2)

Anchor size threaded rod			M12	M16	M20	M24					
Steel failure											
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A4 and HCR, Strength class ≥70	V _{Rk,s,eq,C2}	[kN]		0,70 ·	V ⁰ _{Rk,s}						
Partial factor	γ _{Ms,V}	[-]		See Ta	able C1						
Factor for annular gap	$\alpha_{\sf gap}$	[-]	[-]								

Injection system PURE500+ for concrete	
Performances	Annex C15
Characteristic values of tension and shear loads under seismic action (performance category C2) for a working life of 50 and 100 years (threaded rod)	

English translation prepared by DIBt



Table C23: Displacements under tension load (threaded rod)						
Anchor size thread	led rod		M12	M16	M20	M24
Uncracked and cracked concrete under seismic action (performance category C2)						
All temperature ranges	$\delta_{\text{N,eq,C2(DLS)}}$	[mm]	0,21	0,24	0,27	0,36
	δ _{N,eq,C2(ULS)}	[mm]	0,54	0,51	0,54	0,63

Table C24: Displacements under shear load (threaded rod)

Anchor size thread	ed rod		M12	M16	M20	M24
Uncracked and cracked concrete under seismic action (performance category C2)						
All temperature ranges	$\delta_{V,eq,C2(DLS)}$	[mm]	3,1	3,4	3,5	4,2
	$\delta_{V,eq,C2(ULS)}$	[mm]	6,0	7,6	7,3	10,9

Injection system PURE500+ for concrete	
Performances Displacements under seismic action (performance category C2) (threaded rods)	Annex C16