Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment

ETA-08/0290 of 13 February 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice
Product family to which the construction product belongs	Bonded fastener for use in concrete
Manufacturer	Stanley Black & Decker Deutschland GmbH Black & Decker Straße 40 65510 Idstein DEUTSCHLAND
Manufacturing plant	Herstellwerk 1
This European Technical Assessment contains	25 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330499-01-0601, Edition 04/2020
This version replaces	ETA-08/0290 issued on 11 May 2015

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Specific Part

1 Technical description of the product

The "AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice" is a bonded anchor consisting of a cartridge with injection mortar AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice 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 a reinforcing bar in the range of diameter 8 to 32 mm or threaded sleeves with internal thread of sizes M8 to M16.

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 B2, C1, C2, C4, C5, C7 und C8
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C3, C6 und C9
Displacements (static and quasi-static loading)	See Annex C10 bis C12
Characteristic resistance for seismic performance categories C1	See Annex C2, C3, C5 und C6
Characteristic resistance and displacements for seismic performance categories C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

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

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 13 February 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

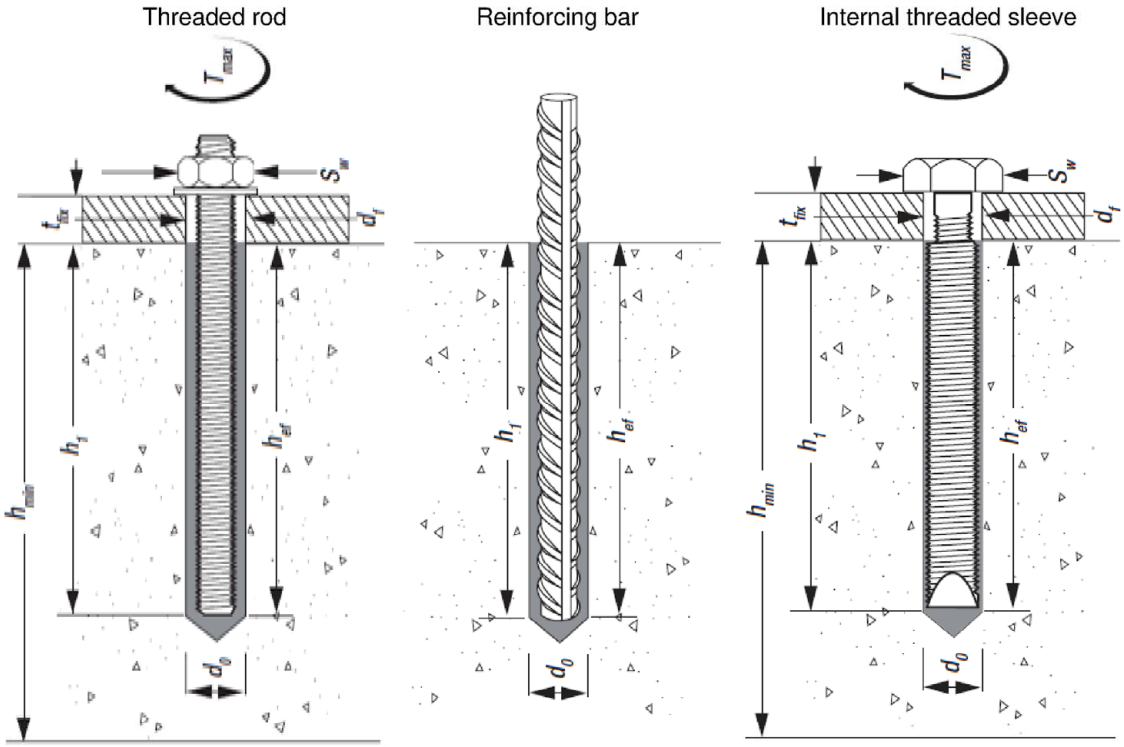
beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik

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

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

Internal threaded sleeve with metric external thread
M8, M10, M12, M16 and M20



AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex A1**
Product description Product and Installation	

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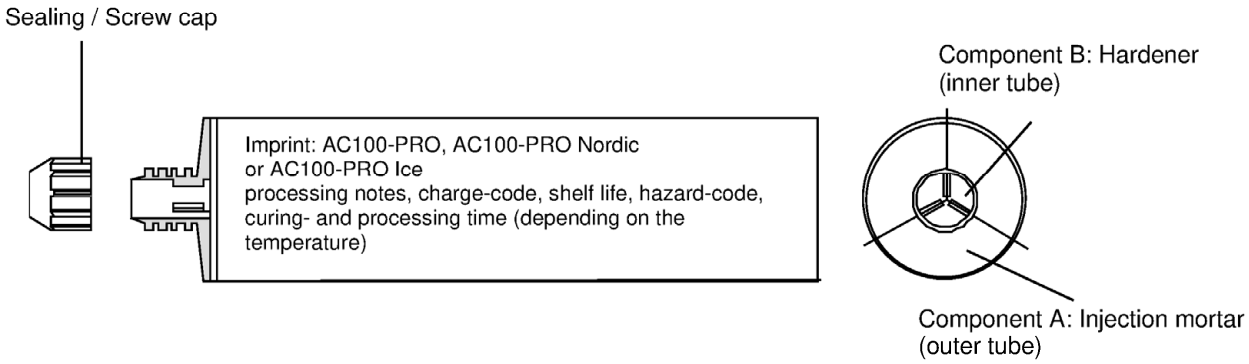
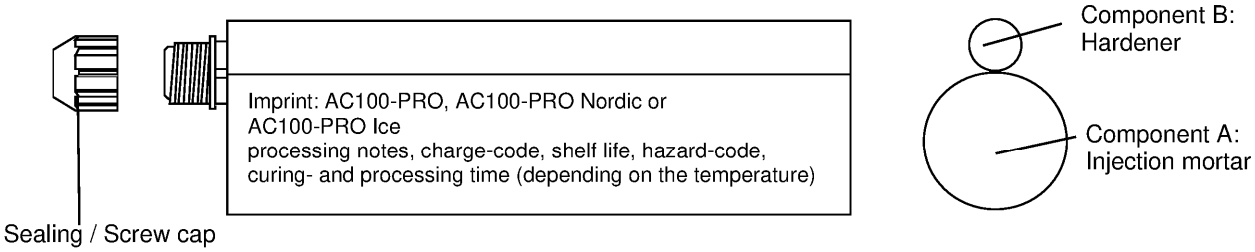
Cartridge: AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice

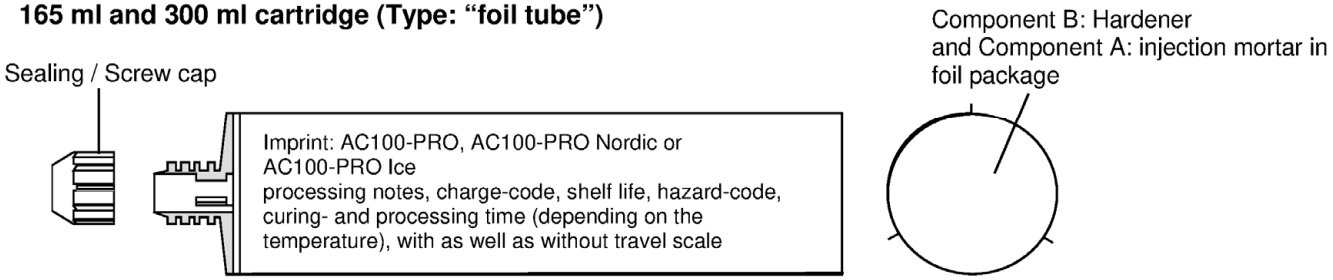
150 ml, 300 ml, and 380 to 420 ml cartridge (Type: "coaxial")



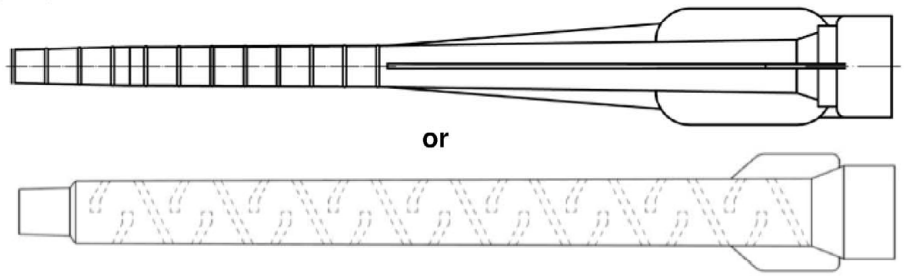
235 ml, 345 to 360 ml and 825 ml cartridge (Type: "side-by-side")



165 ml and 300 ml cartridge (Type: "foil tube")



Static mixing nozzle



AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex A2**
Product description Product (Injection mortar)	

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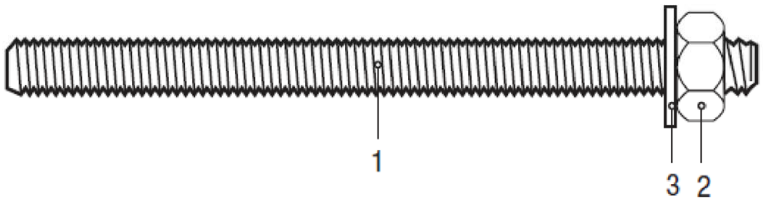
Table A1: Material: Threaded rod



Part	Designation	Material
Steel acc. to EN 10087:1998 or EN 10263:2001, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999 or Steel, hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461:2009, EN ISO 10684:2004+AC:2009 or sherardized ≥ 40 µm acc. to DIN EN 17668:2016-06		
1	Threaded rod	Acc. EN ISO 898-1:2013 Property class 4.6, 4.8, 5.6 5.8, 8.8 A_5 > 8% fracture elongation
2	Hexagon nut EN ISO 4032:2012	Acc. to EN ISO 898-2:2012 Property class 4 (for class 4.6 or 4.8 rod); f_{uk} = 400 MPa Property class 5 (for class 5.6 or 5.8 rod) ; f_{uk} = 500 MPa Property class 8 (for class 8.8 rod) ; f_{uk} = 800 MPa
3	Washer (EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)	Steel, zinc plated or hot dip galvanised, or sheradised
Stainless steel A2 (Material 1.4301 / 1.4311 / 1.4307 / 1.4541 / 1.4567) and A4 (Material 1.4362 / 1.4401 / 1.4404 / 1.4571 / 1.4578) acc. to EN 10088-1:2014		
1	Threaded rod	Acc. to EN ISO 3506-1:2009 Property class 50, 70 (≤ M24), 80 (only A4) A_5 > 8% fracture elongation
2	Hexagon nut EN ISO 4032:2012	Acc. to EN ISO 3506-1:2009 Property class 50 (for class 50 rod), 70 (≤ M24, for class 70 rod), 80 (only A4, for class 80 rod)
3	Washer (EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)	Acc. to EN 10088-1:2014 A2: Material 1.4301 / 1.4311 / 1.4307 / 1.4541 / 1.4567 A4: Material 1.4362 / 1.4401 / 1.4404 / 1.4571 / 1.4578
High corrosion resistance steel (Material 1.4529 / 1.4565 acc. to EN 10088-1:2014)		
1	Threaded rod	Acc. to EN ISO 3506-1:2009 Property class 50, 70 (≤ M24), 80 A_5 > 8% fracture elongation
2	Hexagon nut EN ISO 4032 :2012	Acc. to EN ISO 3506-1:2009 Property class 50 (for class 50 rod), 70 (≤ M24, for class 70 rod), 80 (for class 80 rod)
3	Washer (EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000)	Material 1.4529 or 1.4565, acc. to EN 10088-1:2014

Commercial standard rod with:
- Materials, dimensions and mechanical properties acc. to Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex A3**
Product description Material (Threaded rod)	

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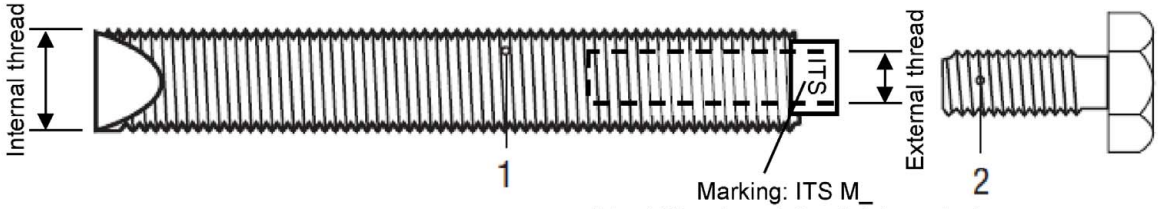
Table A2: Material: Reinforcing bar

- Minimum value of related rip area $f_{R,min}$ according to EN 1992-1-1:2004+AC:2010
- Rip height of the bar shall be in the range 0,05d≤h≤0,07d
  (d: Nominal diameter of the rebar, h: Rip height of the bar)

Reinforcing bar		
1	Rebar according 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 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$

Table A3: Material: Internal threaded sleeve (metric external thread)



Part	Designation	Material
Steel acc. to EN 10087:1998 or EN10263:2001, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999		
1	Internal threaded sleeve	Property class 5.8, EN 1993-1-8:2005+AC:2009
2	Corresponding steel screw	acc. to EN ISO 898-1:2013 Property class 5.8 or 8.8 (zinc plated)
Stainless steel A4 (Material 1.4362 / 1.4401 / 1.4404 / 1.4571 / 1.4578) acc. to EN 10088-1:2014		
1	Internal threaded sleeve	acc. to EN ISO 3506-1:2009 Property class 50, 70 (≤ M16)
2	Corresponding steel screw	acc. to EN ISO 3506-1:2009 Property class 50 or 70 (≤ M16)
High corrosion resistance steel HCR (Material 1.4529 / 1.4565 acc. to EN 10088-1:2014)		
1	Internal threaded sleeve	acc. to EN ISO 3506-1:2009 Property class 50, 70 (≤ M16)
2	Corresponding steel screw	acc. to EN ISO 3506-1:2009 Property class 50, 70 (≤ M16)

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex A4**
Product description Material (Reinforcing bar) Material (Internal threaded sleeve)	

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads: Threaded rod M8 to M30, Reinforcing bar Ø8 to Ø32, Internal threaded sleeve M8 to M20.
- Seismic action for Performance Category C1: Threaded rod M8 to M30, Reinforcing bar 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.
- Uncracked concrete: Threaded rod M8 to M30, Reinforcing bar Ø8 to Ø32, Internal threaded sleeve M8 to M20.
- Cracked concrete: Threaded rod M8 to M30, Reinforcing bar Ø8 to Ø32, Internal threaded sleeve M8 to 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 corrosion resistance class:
  - Stainless steel A2 according to Annex A3, Table A1: CRC II
  - Stainless steel A4 according to Annex A3, Table A1 and Annex A4, Table A3: CRC III
  - High corrosion resistance steel HCR according to Annex A3, Table A1 and Annex A4, Table A3: 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.
- Anchorages are designed according to EN 1992-4:2018 and Technical Report TR 055, Edition February 2018.

Installation:
- Dry or wet concrete.
- Flooded holes (not sea water): Threaded rod M8 to M16, Reinforcing bar Ø8 to Ø16, Internal threaded sleeve M8 to M10.
- Hole drilling by hammer drill mode (standard or hollow drill bit).
- 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.
- Fastening screws or threaded rods (incl. nut and washer) must comply with the appropriate material and property class of the internally threaded sleeve.
- 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.

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex B1**
Intended use Specifications	

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Table B1: Installation parameters for threaded rod

Threaded rod size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Nominal diameter	d_{nom} [mm]	8	10	12	16	20	24	27	30
Nominal drill hole diameter	d_0 [mm]	10	12	14	18	24	28	32	35
Effective embedment depth	$h_{ef,min}$ [mm]	60	60	70	80	90	96	108	120
	$h_{ef,max}$ [mm]	160	200	240	320	400	480	540	600
Diameter of clearance hole in the fixture	d_f [mm]	9	12	14	18	22	26	30	33
Torque moment	max T_{inst} [Nm]	10	20	40	80	120	160	180	200
Thickness of fixture	$t_{fix,min}$ [mm]	0							
	$t_{fix,max}$ [mm]	1500							
Minimum thickness of member	h_{min} [mm]	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + $2d_0$				
Minimum spacing	s_{min} [mm]	40	50	60	80	100	120	135	150
Minimum edge distance	c_{min} [mm]	40	50	60	80	100	120	135	150

Table B2: Installation parameters for reinforcing bar

Reinforcing bar size		**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø24**	**Ø25**	**Ø28**	**Ø32**
Nominal diameter	d_{nom} [mm]	8	10	12	14	16	20	24	25	28	32
Nominal drill hole diameter	d_0 [mm]	12	14	16	18	20	24	28	32	35	40
Effective embedment depth	$h_{ef,min}$ [mm]	60	60	70	75	80	90	96	100	112	128
	$h_{ef,max}$ [mm]	160	200	240	280	320	400	480	480	540	640
Minimum thickness of member	h_{min} [mm]	h_{ef} + 30 mm ≥ 100 mm		h_{ef} + $2d_0$							
Minimum spacing	s_{min} [mm]	40	50	60	70	80	100	120	125	140	160
Minimum edge distance	c_{min} [mm]	40	50	60	70	80	100	120	125	140	160

Table B3: Installation parameters for internal threaded sleeve (metric external thread)

Internal thread size		**M8**	**M10**	**M12**	**M16**	**M20**
Thread = internal diameter	[mm]	8	10	12	16	20
Nominal = external diameter	d_{nom} [mm]	12	16	20	24	30
Nominal drill hole diameter	d_0 [mm]	14	18	24	28	35
Effective embedment depth	h_{ef} [mm]	80	90	110	150	200
Diameter of clearance hole in the fixture	d_f [mm]	9	12	14	18	22
Torque moment	max T_{inst} [Nm]	10	20	40	60	100
Thread engagement length min-max	l_1 [mm]	8-20	10-25	12-30	16-32	20-40
Minimum thickness of member	h_{min} [mm]	110	130	160	210	270
Minimum spacing	s_{min} [mm]	60	80	100	120	150
Minimum edge distance	c_{min} [mm]	60	80	100	120	150

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice

Annex B2

Intended use
Installation parameters

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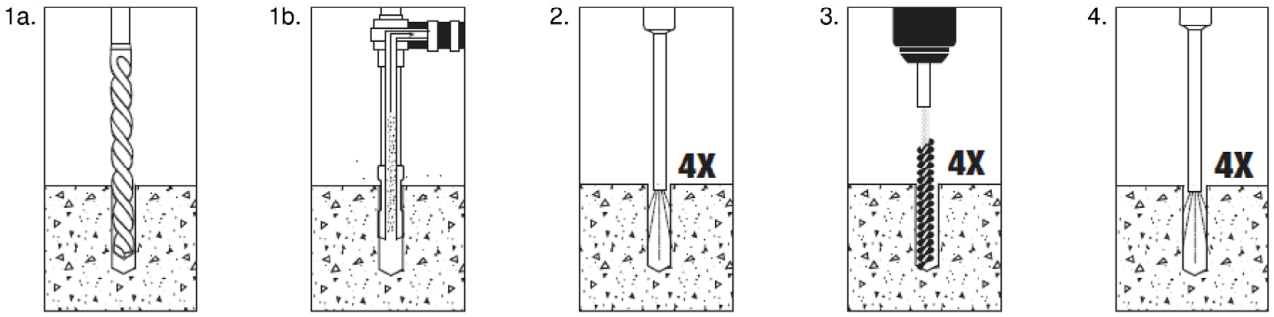
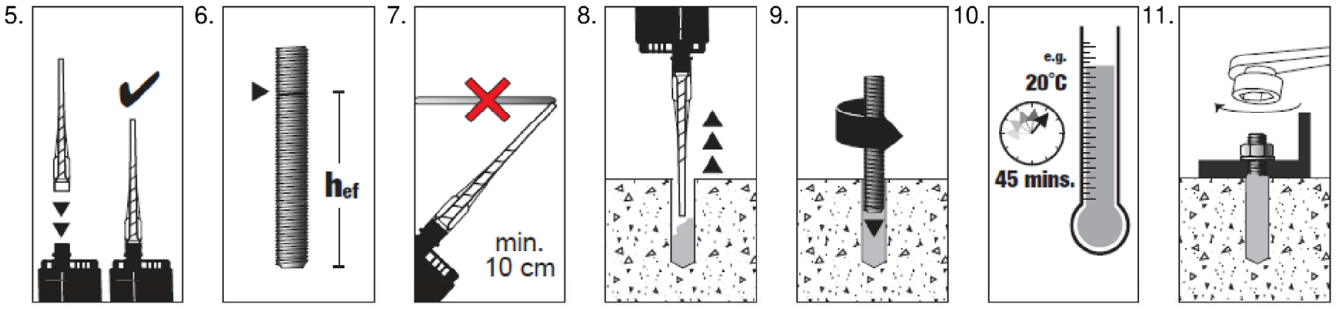
Installation instructions

Standard Drill Bit **Hollow Drill Bit**



1a.) Using the proper drill bit size, drill a hole into the base material to the required depth.
1b.) 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 dust is removed during the drilling process.
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) or a hand pump minimum of 4 times. A hand pump can be used for anchor sizes up to a borehole of 20 mm diameter. For boreholes larger than 20 mm or deeper than 240 mm, compressed air (min. 6 bar) **must** be used. If the hole ground cannot be reached, an extension must be used.
3.) Select a brush of the correct diameter and attach the brush to a drill or battery screwdriver. Starting from the hole ground, brush the hole a minimum of 4 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) or a hand pump minimum of 4 times. A hand pump can be used for anchor sizes up to a hole of 20 mm diameter. For holes larger than 20 mm or deeper than 240 mm, compressed air (min. 6 bar) **must** be used. If the hole ground cannot be reached, an extension must be used.



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 air voids. For holes with embedment depths greater than 190 mm, an extension nozzle must be used. For overhead and horizontal installation in holes larger than 20 mm diameter, a piston plug and extension nozzle must be used. Obeserve the gel / working times provided. Injecting the adhesive in water filled holes is allowed for drill diameters less than 18 mm.
9.) Push the anchor rod 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 should be visible at the top of the hole.
10.) Allow the adhesive to cure for the specified time prior to applying any load. Do not move the anchor before.
11.) After full curing, the fixture can be installed. Make sure the maximum torque is not exceeded.

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex B3**
Intended use Installation instructions	

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Table B4: Minimum curing time AC100-PRO

Concrete temperature			Gelling- / working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
-10°C	to	-6°C	90 min[1)]	24 h[1)]	48 h[1)]
-5°C	to	-1°C	90 min	14 h	28 h
0°C	to	+4°C	45 min	7 h	14 h
+5 °C	to	+9°C	25 min	2 h	4 h
+10°C	to	+19°C	15 min	80 min	160 min
+20°C	to	+29°C	6 min	45 min	90 min
+30°C	to	+34°C	4 min	25 min	50 min
+35°C	to	+39°C	2 min	20 min	40 min
≥ + 40°C			1,5 min	15 min	30 min
Cartridge temperature			+5°C to +40°C		

[1)] Cartridge temperature must be at min. +15°C

Table B5: Minimum curing time AC100-PRO Nordic or Ice

Concrete temperature			Gelling- / working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
-20°C	to	-16°C	75 min	24 h	48 h
-15°C	to	-11°C	55 min	16 h	32 h
-10°C	to	-6°C	35 min	10 h	20 h
-5°C	to	-1°C	20 min	5 h	10 h
0°C	to	+4°C	10 min	2,5 h	5 h
+5°C	to	+9°C	6 min	80 min	160 min
≥ + 10°C			6 min	60 min	120 min
Cartridge temperature			-20°C to +10°C		

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Steel brush and extension

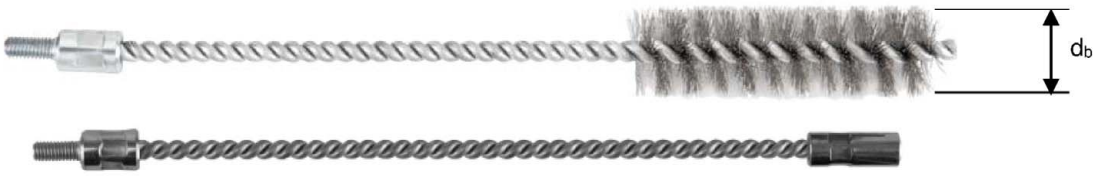

Table B6: Parameter cleaning and setting tools

Threaded rod [mm]	Internal threaded sleeve [mm]	Reinforcing bar [mm]	Drill bit diameter d_0 [mm]	Brush diameter nominal d_b [mm]	Brush diameter minimum $d_{b,min}$ [mm]	Piston plug denom. [mm]	
M8			10	12	10,5	-	
M10		8	12	14	12,5	-	
M12	M8	10	14	16	14,5	-	
		12	16	18	16,5	-	
M16	M10	14	18	20	18,5	#18	Required for h_{ef} > 250 mm; always required for overhead installations
		16	20	22	20,5	#20	
M20	M12	20	24	26	24,5	#24	
M24	M16	24	28	30	28,5	#28	
M27		25	32	34	32,5	#32	
M30	M20	28	35	37	35,5	#35	
		32	40	42	40,5	#40	

Hand pump (volume 750 ml)
Drill bit diameter (d_0): 10 mm to 20 mm
Drill hole depth (h_0): < 10 d_{nom}
Only in uncracked concrete

Recommended compressed air tool (min 6 bar)
Drill bit diameter (d_0): all diameters

Piston plug for overhead or horizontal installation
Drill bit diameter (d_0): 18 mm to 40 mm

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex B5**
Intended use Cleaning and setting tools	

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Table C1: Threaded rod | Characteristic resistance values under tension load in uncracked concrete

Anchor size threaded rod				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure $N_{Rk,s}= A_s f_{uk}$ (valid for the given A_s)[1)]											
Property class 4.6, 4.8		$N_{Rk,s}$	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
Property class 5.6, 5.8		$N_{Rk,s}$	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
Property class 8.8		$N_{Rk,s}$	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
A2, A4, HCR, Property class 50		$N_{Rk,s}$	[kN]	18	29	42	76	126	177	230	281
A2, A4, HCR, Property class 70		$N_{Rk,s}$	[kN]	26	41	59	110	171	147	-[2)]	-[2)]
A4, HCR, Property class 80		$N_{Rk,s}$	[kN]	29	46	67	126	196	282	-[2)]	-[2)]
Stressed cross section		A_s	[mm²]	36,6	58,0	84,3	157	245	353	459	561
Partial factor											
Property class 4.6, 5.6		$\gamma_{Ms,N}$	[-]	2,0							
Property class 4.8, 5.8, 8.8		$\gamma_{Ms,N}$	[-]	1,5							
A2, A4, HCR, Property class 50		$\gamma_{Ms,N}$	[-]	2,86							
A2, A4, HCR, Property class 70		$\gamma_{Ms,N}$	[-]	1,87							
A4, HCR, Property class 80		$\gamma_{Ms,N}$	[-]	1,6							
Combined pull-out and concrete cone failure											
Characteristic bond resistance in uncracked concrete C20/25											
dry and wet concrete	Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	11	13	13	13	13	12	11	9,5
	Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	8,0	9,5	9,5	9,5	9,5	9,0	8,0	7,0
	Temperature range III: 120°C/72°C	$\tau_{Rk,ucr}$	[N/mm²]	5,5	6,5	6,5	6,5	6,5	6,0	5,5	5,0
flooded bore hole	Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	8,0	9,5	9,5	9,5	No Performance Assessed			
	Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	6,0	7,0	7,0	7,0				
	Temperature range III: 120°C/72°C	$\tau_{Rk,ucr}$	[N/mm²]	4,5	5,5	5,5	5,5				
Reduction factors for Sustained loads ψ^0_{sus}		Temperature range I		0,73							
		Temperature range II		0,65							
		Temperature range III		0,57							
Increasing factors for concrete ψ_c		C30/37		1,04							
		C40/50		1,08							
		C50/60		1,10							
Concrete cone failure											
Factor in uncracked concrete		$k_{ucr,N}$	[-]	11,0							
Characteristic edge distance		$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$							
Characteristic spacing		$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$							
Splitting failure											
Characteristic edge distance		$c_{cr,sp}$	[mm]	$1,0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2,5 - \frac{h}{h_{ef}}\right) \le 2,4 \cdot h_{ef}$							
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$							
Installation factor	dry and wet concrete	γ_{inst}	[-]	1,0				1,2			
	flooded bore hole	γ_{inst}	[-]	1,4				No performance assessed			

[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.
[2)] Not part of the ETA

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice

Annex C1

Performances
Threaded rod: Characteristic resistance values under tension load in uncracked concrete

Deutsches Institut für Bautechnik DIBt

Table C2: Threaded rod
Characteristic resistance values under tension load in cracked concrete

Anchor size threaded rod				**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure $N_{Rk,s}$= A_s f_{uk} (valid for the given A_s)[1)]											
Property class 4.6, 4.8		$N_{Rk,s}$	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
Property class 5.6, 5.8		$N_{Rk,s}$	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
Property class 8.8		$N_{Rk,s}$	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
A2, A4, HCR, Property class 50		$N_{Rk,s}$	[kN]	18	29	42	76	126	177	230	281
A2, A4, HCR, Property class 70		$N_{Rk,s}$	[kN]	26	41	59	110	171	147	-[2)]	-[2)]
A4, HCR, Property class 80		$N_{Rk,s}$	[kN]	29	46	67	126	196	282	-[2)]	-[2)]
Characteristic tension resistance		$N_{Rk,s,eq,C1}$	[kN]	1,00 $N_{Rk,s}$							
Stressed cross section		A_s	[mm²]	36,6	58,0	84,3	157	245	353	459	561
Partial factor		$\gamma_{Ms,N}$	[-]	See Table C1							
Combined pull-out and concrete cone failure											
Characteristic bond resistance in cracked concrete C20/25											
dry and wet concrete	Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	4,0	5,0	5,5	5,5	5,5	5,5	6,5	6,5
		$\tau_{Rk,eq,C1}$	[N/mm²]	2,5	3,1	3,7	3,7	3,7	3,8	4,5	4,5
	Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	2,5	3,5	4,0	4,0	4,0	4,0	4,5	4,5
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,6	2,2	2,7	2,7	2,7	2,8	3,1	3,1
	Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	2,0	2,5	3,0	3,0	3,0	3,0	3,5	3,5
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,3	1,6	2,0	2,0	2,0	2,1	2,4	2,4
flooded bore hole	Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	6,0	6,0	No Performance Assessed			
		$\tau_{Rk,eq,C1}$	[N/mm²]	2,5	2,5	3,7	3,7				
	Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	2,5	3,0	4,5	4,5				
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,6	1,9	2,7	2,7				
	Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	2,0	2,5	3,5	3,5				
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,3	1,6	2,0	2,0				
Reduction factors for sustained loads ψ^0_{sus}		Temperature range I		0,73							
		Temperature range II		0,65							
		Temperature range III		0,57							
Increasing factors for concrete ψ_c		C30/37		1,04							
		C40/50		1,08							
		C50/60		1,10							
Concrete cone failure											
Factor for cracked concrete		$k_{cr,N}$	[-]	7,7							
Characteristic edge distance		$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$							
Characteristic spacing		$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$							
Splitting failure											
Characteristic edge distance		$c_{cr,sp}$	[mm]	$1,0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2,5 - \frac{h}{h_{ef}}\right) \le 2,4 \cdot h_{ef}$							
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$							
Installation factor	dry and wet concrete	γ_{inst}	[-]	1,0				1,2			
	flooded bore hole	γ_{inst}	[-]	1,4				No performance assessed			

[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.
[2)] Not part of the ETA

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice

Annex C2

Performances
Threaded rod: Characteristic resistance values under tension load in cracked concrete

Deutsches Institut für Bautechnik DIBt

Table C3: Threaded rod
Characteristic resistance values under shear load in cracked and uncracked concrete

Anchor size threaded rod			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel failure without lever arm $V_{Rk,s}=0,5\cdot A_s\cdot f_{uk}$ (valid for the given A_s)[1)]										
Property class 4.6 and 4.8	$V^0_{Rk,s}$	[kN]	9(8)	14(13)	20	38	59	85	110	135
Property class 5.6 and 5.8	$V^0_{Rk,s}$	[kN]	11(10)	17(16)	25	47	74	106	138	168
Property class 8.8	$V^0_{Rk,s}$	[kN]	15(13)	23(21)	34	63	98	141	184	224
A2, A4, HCR, Property class 50	$V^0_{Rk,s}$	[kN]	9	15	21	39	61	88	115	140
A2, A4, HCR, Property class 70	$V^0_{Rk,s}$	[kN]	13	20	30	55	86	124	-[2)]	-[2)]
A4, HCR, Property class 80	$V^0_{Rk,s}$	[kN]	15	23	34	63	98	141	-[2)]	-[2)]
Characteristic shear resistance	$V_{Rk,s,eq,C1}$	[kN]	0,70 $V^0_{Rk,s}$							
Stressed cross section	A_s	[mm²]	36,6	58,0	84,3	157	245	353	459	561
Factor for annular gap	α_{gap}	[-]	0,5							
Partial factor										
Property class 4.6, 5.6	$\gamma_{Ms,V}$	[-]	1,67							
Property class 4.8, 5.8, 8.8	$\gamma_{Ms,V}$	[-]	1,25							
A2, A4, HCR, Property class 50	$\gamma_{Ms,V}$	[-]	2,38							
A2, A4, HCR, Property class 70	$\gamma_{Ms,V}$	[-]	1,56							
A4, HCR, Property class 80	$\gamma_{Ms,V}$	[-]	1,33							
Ductility factor	k_7	[-]	1,0							
Steel failure with lever arm $M^0_{Rk,s}=1,2\cdot W_{el}\cdot f_{uk}$ (valid for the given W_{el})[1)]										
Property class 4.6 and 4.8	$M^0_{Rk,s}$	[Nm]	15(13)	30(27)	52	133	260	449	666	900
Property class 5.6 and 5.8	$M^0_{Rk,s}$	[Nm]	19(16)	37(33)	65	166	324	560	833	1123
Property class 8.8	$M^0_{Rk,s}$	[Nm]	30(26)	60(53)	105	266	519	896	1333	1797
A2, A4, HCR, class 50	$M^0_{Rk,s}$	[Nm]	19	37	66	167	325	561	832	1125
A2, A4, HCR, class 70	$M^0_{Rk,s}$	[Nm]	26	52	92	232	454	784	-[2)]	-[2)]
A4, HCR, class 80	$M^0_{Rk,s}$	[Nm]	30	59	105	266	519	896	-[2)]	-[2)]
Elastic section modulus	W_{el}	[mm³]	31,2	62,3	109,1	276,6	540,3	933,4	1388,8	1872,2
Partial factor										
Property class 4.6, 5.6	$\gamma_{Ms,V}$	[-]	1,67							
Property class 4.8, 5.8, 8.8	$\gamma_{Ms,V}$	[-]	1,25							
A2, A4, HCR, Property class 50	$\gamma_{Ms,V}$	[-]	2,38							
A2, A4, HCR, Property class 70	$\gamma_{Ms,V}$	[-]	1,56							
A4, HCR, Property class 80	$\gamma_{Ms,V}$	[-]	1,33							
Ductility factor	k_7	[-]	1,0							
Concrete pryout failure										
Pryout factor	k_8	[-]	2,0							
Concrete edge failure										
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 12\ d_{nom})$						$l_f = \min(h_{ef}; 300\ mm)$	
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	24	27	30
Installation factor	γ_{inst}	[-]	1,0							

[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.
[2)] Not part of the ETA

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex C3**
Performances Threaded rod: Characteristic resistance values under shear load in cracked and uncracked concrete	

Deutsches Institut für Bautechnik DIBt

Table C4: Reinforcing bar
Characteristic resistance values under tension load in uncracked concrete

Anchor size reinforcing bar				Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Steel failure $N_{Rk,s} = A_s f_{uk}$ (valid for the given A_s)													
Characteristic tension resistance		$N_{Rk,s}$	[kN]	$A_s f_{uk}$ [1]									
Stressed cross section		A_s	[mm²]	50,3	78,5	113	154	201	314	452	491	616	804
Partial factor		$\gamma_{Ms,N}$	[-]	1,4 [2]									
Combined pullout and concrete cone failure													
Characteristic bond resistance in uncracked concrete C20/25													
dry and wet concrete	Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	11	13	13	13	13	13	11,5	11,5	10,5	9,0
dry and wet concrete	Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	8,0	9,5	9,5	9,5	9,5	9,5	8,5	8,5	7,5	6,5
dry and wet concrete	Temperature range III: 120°C/72°C	$\tau_{Rk,ucr}$	[N/mm²]	5,5	6,5	6,5	6,5	6,5	6,5	6,0	6,0	5,0	4,5
flooded bore hole	Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	8,0	9,5	9,5	9,5	9,5	No Performance Assessed				
flooded bore hole	Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	6,0	7,0	7,0	7,0	7,0					
flooded bore hole	Temperature range III: 120°C/72°C	$\tau_{Rk,ucr}$	[N/mm²]	4,5	5,5	5,5	5,5	5,5					
Reduction factors for sustained loads ψ^0_{sus}		Temperature range I		0,73									
		Temperature range II		0,65									
		Temperature range III		0,57									
Increasing factors for concrete ψ_c		C30/37		1,04									
		C40/50		1,08									
		C50/60		1,10									
Concrete cone failure													
Factor in uncracked concrete		$k_{ucr,N}$	[-]	11,0									
Characteristic edge distance		$c_{cr,N}$	[mm]	$1{,}5 \cdot h_{ef}$									
Characteristic spacing		$s_{cr,N}$	[mm]	$3{,}0 \cdot h_{ef}$									
Splitting failure													
Characteristic edge distance		$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2{,}5 - \frac{h}{h_{ef}}\right) \le 2{,}4 \cdot h_{ef}$									
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$									
Installation factor	dry and wet concrete	γ_{inst}	[-]	1,0	1,2								
Installation factor	flooded bore hole	γ_{inst}	[-]	1,4					No Performance Assessed				

[1] f_{uk} shall be taken from the specifications of the reinforcing bar
[2] In absence of national regulations

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Table C5: Reinforcing bar
Characteristic resistance values under tension load in cracked concrete

Anchor size reinforcing bar				**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø24**	**Ø25**	**Ø28**	**Ø32**
Steel failure $N_{Rk,s} = A_s f_{uk}$ (valid for the given A_s)													
Characteristic tension resistance		$N_{Rk,s} = N_{Rk,s,eq,C1}$	[kN]	$A_s f_{uk}$ [1]									
Stressed cross section		A_s	[mm²]	50,3	78,5	113	154	201	314	452	491	616	804
Partial factor		$\gamma_{Ms,N}$	[-]	1,4 [2]									
Combined pullout and concrete cone failure													
Characteristic bond resistance in uncracked concrete C20/25													
dry and wet concrete	Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	4,0	5,0	5,5	5,5	5,5	5,5	5,5	5,5	6,5	6,5
		$\tau_{Rk,eq,C1}$	[N/mm²]	2,5	3,1	3,7	3,7	3,7	3,7	3,7	3,8	4,5	4,5
	Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	2,5	3,5	4,0	4,0	4,0	4,0	4,0	4,0	4,5	4,5
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,6	2,2	2,7	2,7	2,7	2,7	2,7	2,8	3,1	3,1
	Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	2,0	2,5	3,0	3,0	3,0	3,0	3,0	3,0	3,5	3,5
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,3	1,6	2,0	2,0	2,0	2,0	2,0	2,1	2,4	2,4
flooded bore hole	Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	6,0	6,0	6,0	No Performance Assessed				
		$\tau_{Rk,eq,C1}$	[N/mm²]	2,5	2,5	3,7	3,7	3,7					
	Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	2,5	3,0	4,5	4,5	4,5					
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,6	1,9	2,7	2,7	2,7					
	Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	2,0	2,5	3,5	3,5	3,5					
		$\tau_{Rk,eq,C1}$	[N/mm²]	1,3	1,6	2,0	2,0	2,0					
Reduction factors for sustained loads ψ^0_{sus}		Temperature range I		0,73									
		Temperature range II		0,65									
		Temperature range III		0,57									
Increasing factors for concrete ψ_c		C30/37		1,04									
		C40/50		1,08									
		C50/60		1,10									
Concrete cone failure													
Factor in cracked concrete		$k_{cr,N}$	[-]	7,7									
Characteristic edge distance		$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$									
Characteristic spacing		$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$									
Splitting failure													
Characteristic edge distance		$c_{cr,sp}$	[mm]	$1,0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2,5 - \frac{h}{h_{ef}}\right) \le 2,4 \cdot h_{ef}$									
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$									
Installation factor	dry and wet concrete	γ_{inst}	[-]	1,0	1,2								
	flooded bore hole	γ_{inst}	[-]	1,4					No Performance Assessed				

[1] f_{uk} shall be taken from the specifications of the reinforcing bar
[2] In absence of national regulations

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Table C6: Reinforcing bar
Characteristic resistance values under shear load in cracked and uncracked concrete

Anchor size reinforcing bar			**Ø8**	**Ø10**	**Ø12**	**Ø14**	**Ø16**	**Ø20**	**Ø24**	**Ø25**	**Ø28**	**Ø32**
Steel failure without lever arm (valid for the given A_s)												
Characteristic shear resistance	$V^0_{Rk,s}$	[kN]	$0{,}5 \cdot A_s \cdot f_{uk}$ [1]									
	$V_{Rk,s,eq,C1}$	[kN]	$0{,}35 \cdot A_s \cdot f_{uk}$ [1]									
Stressed cross section	A_s	[mm²]	8	10	12	14	16	20	24	25	28	30
Factor for annular gap	α_{gap}	[-]	0,5									
Partial factor	$\gamma_{Ms,V}$	[-]	1,5 [2]									
Ductility factor	k_7	[-]	1,0									
Steel failure with lever arm (valid for the given W_{el})												
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	$1{,}2 \cdot W_{el} \cdot f_{uk}$ [1]									
Elastic section modulus	W_{el}	[mm³]	50,3	98,2	170	269	402	785	1357	1534	2155	3217
Ductility factor	k_7	[-]	1,0									
Concrete pryout failure												
Pryout factor	k_8	[-]	2,0									
Concrete edge failure												
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 12\, d_{nom})$							$l_f = \min(h_{ef}; 300\text{ mm})$		
Outside diameter of anchor	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 the reinforcing bar
[2] In absence of national regulations

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Table C7: Internal threaded sleeve
Characteristic resistance values under tension load in uncracked concrete

Anchor size internal threaded sleeve				**M8**	**M10**	**M12**	**M16**	**M20**
External diameter		d	[mm]	12	16	20	24	30
Effective anchorage depth		h_{ef}	[mm]	80	90	110	150	200
Steel failure (internal threaded sleeve)								
Property class 5.8		$N_{Rk,s}$	[kN]	17	29	42	76	123
Property class 8.8		$N_{Rk,s}$	[kN]	27	46	67	121	196
A4 and HCR, Property class 70[2)]		$N_{Rk,s}$	[kN]	26	41	59	110	124
Partial factor								
Property class 5.8, 8.8		$\gamma_{Ms,N}$	[-]	1,5				
A4, HCR, Property class 70[2)]		$\gamma_{Ms,N}$	[-]	1,87				2,86
Combined pullout and concrete cone failure								
Characteristic bond resistance in uncracked concrete C20/25								
dry and wet concrete	Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	13	13	13	12	9,5
	Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	9,5	9,5	9,5	9,0	7,0
	Temperature range III: 120°C/72°C	$\tau_{Rk,ucr}$	[N/mm²]	6,5	6,5	6,5	6,0	5,0
flooded bore hole	Temperature range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	9,5	9,5	No Performance Assessed		
	Temperature range II: 80°C/50°C	$\tau_{Rk,ucr}$	[N/mm²]	7,0	7,0			
	Temperature range III: 120°C/72°C	$\tau_{Rk,ucr}$	[N/mm²]	5,5	5,5			
Reduction factors for sustained loads ψ^0_{sus}		Temperature range I		0,73				
		Temperature range II		0,65				
		Temperature range III		0,57				
Increasing factors for concrete ψ_c		C30/37		1,04				
		C40/50		1,08				
		C50/60		1,10				
Concrete cone failure								
Factor in uncracked concrete		$k_{ucr,N}$	[-]	11,0				
Characteristic edge distance		$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$				
Characteristic spacing		$s_{cr,N}$	[mm]	$3,0 \cdot h_{ef}$				
Splitting failure								
Characteristic edge distance		$c_{cr,sp}$	[mm]	$1,0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2,5 - \frac{h}{h_{ef}}\right) \le 2,4 \cdot h_{ef}$				
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$				
Installation factor	dry and wet concrete	γ_{inst}	[-]	1,2				
	flooded bore hole	γ_{inst}	[-]	1,4		No Performance Assessed		

[1)] f_{uk} shall be taken from the specifications of the threaded rod
[2)] For M20 Property class 50

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Table C8: Internal threaded sleeve
Characteristic resistance values under tension load in cracked concrete

Anchor size internal threaded sleeve				**M8**	**M10**	**M12**	**M16**	**M20**
External diameter		d	[mm]	12	16	20	24	30
Effective anchorage depth		h_{ef}	[mm]	80	90	110	150	200
Steel failure (internal threaded sleeve)								
Property class 5.8		$N_{Rk,s}$	[kN]	17	29	42	76	123
Property class 8.8		$N_{Rk,s}$	[kN]	27	46	67	121	196
A4 and HCR, Property class 70[2)]		$N_{Rk,s}$	[kN]	26	41	59	110	124
Partial factor								
Property class 5.8, 8.8		$\gamma_{Ms,N}$	[-]	1,5				
A4, HCR, Property class 70[2)]		$\gamma_{Ms,N}$	[-]	1,87				2,86
Combined pullout and concrete cone failure								
Characteristic bond resistance in uncracked concrete C20/25								
dry and wet concrete	Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	5,5	5,5	5,5	5,5	6,5
	Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	4,0	4,0	4,0	4,0	4,5
	Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	3,0	3,0	3,0	3,0	3,5
flooded bore hole	Temperature range I: 40°C/24°C	$\tau_{Rk,cr}$	[N/mm²]	6,0	6,0	No Performance Assessed		
	Temperature range II: 80°C/50°C	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5			
	Temperature range III: 120°C/72°C	$\tau_{Rk,cr}$	[N/mm²]	3,5	3,5			
Reduction factors for sustained loads ψ^0_{sus}		Temperature range I		0,73				
		Temperature range II		0,65				
		Temperature range III		0,57				
Increasing factors for concrete ψ_c		C30/37		1,04				
		C40/50		1,08				
		C50/60		1,10				
Concrete cone failure								
Factor in cracked concrete		$k_{cr,N}$	[-]	7,7				
Characteristic edge distance		$c_{cr,N}$	[mm]	$1{,}5 \cdot h_{ef}$				
Characteristic spacing		$s_{cr,N}$	[mm]	$3{,}0 \cdot h_{ef}$				
Splitting failure								
Characteristic edge distance		$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2{,}5 - \frac{h}{h_{ef}}\right) \le 2{,}4 \cdot h_{ef}$				
Characteristic spacing		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$				
Installation factor	dry and wet concrete	γ_{inst}	[-]	1,2				
	flooded bore hole	γ_{inst}	[-]	1,4		No Performance Assessed		

[1)] f_{uk} shall be taken from the specifications of the threaded rod
[2)] For M20 Property class 50

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex C8**
Performances Internal threaded sleeve: Characteristic resistance values under tension load in cracked concrete	

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Table C9: Internal threaded sleeve
Characteristic resistance values under shear load in cracked and uncracked concrete

Anchor size internal threaded sleeve			**M8**	**M10**	**M12**	**M16**	**M20**
External diameter	d	[mm]	12	16	20	24	30
Effective anchorage depth	h_{ef}	[mm]	80	90	110	150	200
Steel failure without lever arm (internal threaded sleeve)							
Property class 5.8 steel	$V^0_{Rk,s}$	[kN]	9	15	21	38	61
Property class 8.8 steel	$V^0_{Rk,s}$	[kN]	14	23	34	60	98
A4, HCR, Property class 70[2)]	$V^0_{Rk,s}$	[kN]	13	23	34	60	98
Partial factor							
Property class 5.8, 8.8	$\gamma_{Ms,V}$	[-]	1,25				
A4, HCR, Property class 70[2)]	$\gamma_{Ms,V}$	[-]	1,0				2,38
Ductility factor	k_7	[-]	1,0				
Steel failure with lever arm (internal threaded sleeve)							
Property class 5.8 steel	$M^0_{Rk,s}$	[Nm]	19	37	66	167	325
Property class 8.8 steel	$M^0_{Rk,s}$	[Nm]	30	60	105	267	519
A4, HCR, Property class 70[2)]	$M^0_{Rk,s}$	[Nm]	26	52	92	233	456
Partial factor							
Property class 5.8, 8.8	$\gamma_{Ms,V}$	[-]	1,25				
A4, HCR, Property class 70[2)]	$\gamma_{Ms,V}$	[-]	1,0				2,38
Ductility factor	k_7	[-]	1,0				
Concrete pryout failure							
Pryout factor	k_8	[-]	2,0				
Concrete edge failure							
Effective length of anchor	l_f	[mm]	$l_f = \min(h_{ef}; 12\ d_{nom})$				$l_f = \min(h_{ef}; 300\ mm)$
Outside diameter of anchor	d_{nom}	[mm]	12	16	20	24	30
Installation factor	γ_{inst}	[-]	1,0				

[1)] f_{uk} shall be taken from the specifications of the threaded rod
[2)] For M20 property class 50

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex C9**
Performances Internal threaded sleeve: Characteristic resistance values under shear load in cracked and uncracked concrete	

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Table C10: Threaded rod
Displacements under tension loads[1)]

Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete										
Temperature range I 40°C/24°C										
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,021	0,023	0,026	0,031	0,036	0,041	0,045	0,049
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,034	0,033	0,037	0,045	0,052	0,060	0,065	0,071
Temperature range II 80°C/50°C										
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Temperature range III 120°C/72°C										
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,075	0,088	0,100	0,110	0,119
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,108	0,127	0,145	0,159	0,172
Cracked concrete										
Temperature range I 40°C/24°C										
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,090	0,090	0,070	0,070	0,070	0,070	0,070	0,070
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,105	0,105	0,105	0,105	0,105	0,105	0,105	0,105
Temperature range II 80°C/50°C										
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,219	0,219	0,170	0,170	0,170	0,170	0,170	0,170
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,255	0,255	0,245	0,245	0,245	0,245	0,245	0,245
Temperature range III 120°C/72°C										
Displacement	δ_{N0} - factor	[mm/ (N/mm²)]	0,219	0,219	0,170	0,170	0,170	0,170	0,170	0,170
Displacement	$\delta_{N\infty}$ - factor	[mm/ (N/mm²)]	0,255	0,255	0,245	0,245	0,245	0,245	0,245	0,245

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}$ - factor $\cdot \tau$ with τ = action bond stress
$\delta_{N\infty} = \delta_{N\infty}$ - factor $\cdot \tau$ with τ = action bond stress

Table C11: Threaded rod
Displacements under shear load[1)]

Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete										
Displacement	δ_{V0} - factor	[mm/kN]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
Displacement	$\delta_{V\infty}$ - factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,04
Cracked concrete										
Displacement	δ_{V0} - factor	[mm/kN]	0,120	0,120	0,112	0,103	0,093	0,084	0,076	0,069
Displacement	$\delta_{V\infty}$ - factor	[mm/kN]	0,180	0,180	0,169	0,154	0,140	0,125	0,115	0,104

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}$ - factor $\cdot$ V with V = action shear load
$\delta_{V\infty} = \delta_{V\infty}$ - factor $\cdot$ V with V = action shear load

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex C10**
Performances Threaded rods: Displacements under tension and shear load	

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Table C12: Reinforcing bar
Displacements under tension loads[1)]

Anchor size reinforcing bar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Uncracked concrete												
Temperature range I 40°C/24°C												
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,021	0,023	0,026	0,028	0,031	0,036	0,042	0,043	0,047	0,052
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,034	0,033	0,037	0,041	0,045	0,052	0,057	0,061	0,071	0,075
Temperature range II 80°C/50°C												
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,103	0,104	0,113	0,126
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,144	0,149	0,163	0,181
Temperature range III 120°C/72°C												
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,050	0,056	0,063	0,069	0,075	0,088	0,103	0,104	0,113	0,126
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,072	0,081	0,090	0,099	0,108	0,127	0,144	0,149	0,163	0,181
Cracked concrete												
Temperature range I 40°C/24°C												
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,090	0,090	0,07	0,070	0,070	0,070	0,070	0,070	0,070	0,070
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,105	0,105	0,105	0,105	0,105	0,105	0,105	0,105	0,105	0,105
Temperature range II 80°C/50°C												
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,219	0,219	0,170	0,170	0,170	0,170	0,170	0,170	0,170	0,170
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,255	0,255	0,245	0,245	0,245	0,245	0,245	0,245	0,245	0,245
Temperature range III 120°C/72°C												
Displacement	δ_{N0} - factor	[mm/(N/mm²)]	0,219	0,219	0,170	0,170	0,170	0,170	0,170	0,170	0,170	0,170
Displacement	$\delta_{N\infty}$ - factor	[mm/(N/mm²)]	0,255	0,255	0,245	0,245	0,245	0,245	0,245	0,245	0,245	0,245

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}$ - factor $\cdot \tau$ with τ = action bond stress
$\delta_{N\infty} = \delta_{N\infty}$ - factor $\cdot \tau$ with τ = action bond stress

Table C13: Reinforcing bar
Displacements under **shear load[1)]**

Anchor size reinforcing bar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø32
Uncracked concrete												
Displacement	δ_{V0} - factor	[mm/(kN)]	0,06	0,05	0,05	0,04	0,04	0,04	0,04	0,03	0,03	0,03
Displacement	$\delta_{V\infty}$ - factor	[mm/(kN)]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05	0,04	0,04
Uncracked concrete												
Displacement	δ_{V0} - factor	[mm/(kN)]	0,120	0,120	0,112	0,108	0,103	0,093	0,083	0,081	0,074	0,064
Displacement	$\delta_{V\infty}$ - factor	[mm/(kN)]	0,180	0,180	0,169	0,161	0,154	0,140	0,126	0,122	0,111	0,097

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}$ - factor $\cdot$ V with V = action shear load
$\delta_{V\infty} = \delta_{V\infty}$ - factor $\cdot$ V with V = action shear load

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex C11**
Performances Reinforcing bar: Displacements under tension and shear load	

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Table C14: Internal threaded sleeve
Displacements under tension loads[1)]

Anchor size internal threaded sleeve			M8	M10	M12	M16	M20
Uncracked concrete							
Temperature range I 40°C/24°C							
Displacement	δ_{N0}- factor	[mm/(N/mm²)]	0,026	0,031	0,036	0,041	0,049
Displacement	$\delta_{N\infty}$- factor	[mm/(N/mm²)]	0,034	0,045	0,052	0,060	0,071
Temperature range II 80°C/50°C							
Displacement	δ_{N0}- factor	[mm/(N/mm²)]	0,063	0,075	0,088	0,100	0,119
Displacement	$\delta_{N\infty}$- factor	[mm/(N/mm²)]	0,090	0,108	0,127	0,145	0,172
Temperature range III 120°C/72°C							
Displacement	δ_{N0}- factor	[mm/(N/mm²)]	0,063	0,075	0,088	0,100	0,119
Displacement	$\delta_{N\infty}$- factor	[mm/(N/mm²)]	0,090	0,108	0,127	0,145	0,172
Cracked concrete							
Temperature range I 40°C/24°C							
Displacement	δ_{N0}- factor	[mm/(N/mm²)]	0,07	0,07	0,07	0,07	0,07
Displacement	$\delta_{N\infty}$- factor	[mm/(N/mm²)]	0,105	0,105	0,105	0,105	0,105
Temperature range II 80°C/50°C							
Displacement	δ_{N0}- factor	[mm/(N/mm²)]	0,17	0,17	0,17	0,17	0,17
Displacement	$\delta_{N\infty}$- factor	[mm/(N/mm²)]	0,245	0,245	0,245	0,245	0,245
Temperature range III 120°C/72°C							
Displacement	δ_{N0}- factor	[mm/(N/mm²)]	0,17	0,17	0,17	0,17	0,17
Displacement	$\delta_{N\infty}$- factor	[mm/(N/mm²)]	0,245	0,245	0,245	0,245	0,245

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}$ - factor · τ with τ = action bond stress
$\delta_{N\infty} = \delta_{N\infty}$ - factor · τ with τ = action bond stress

Table C15: Internal threaded sleeve
Displacements under **shear load[1)]**

Anchor size internal threaded sleeve			M8	M10	M12	M16	M20
Uncracked concrete							
Displacement	δ_{V0}- factor	[mm/kN]	0,05	0,04	0,04	0,03	0,03
Displacement	$\delta_{V\infty}$- factor	[mm/kN]	0,08	0,06	0,06	0,05	0,04
Cracked concrete							
Displacement	δ_{V0}- factor	[mm/kN]	0,112	0,103	0,093	0,084	0,069
Displacement	$\delta_{V\infty}$- factor	[mm/kN]	0,169	0,154	0,140	0,125	0,104

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}$ - factor · V with V = action shear load
$\delta_{V\infty} = \delta_{V\infty}$ - factor · V with V = action shear load

AC100-PRO, AC100-PRO Nordic or AC100-PRO Ice	**Annex C12**
Performances Internal threaded sleeve: Displacements under tension and shear load	