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European Technical Assessment Body for construction products



European Technical Assessment

ETA-24/0646 of 8 August 2024

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 EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

Bonded fasteners and bonded expansion fasteners for use in concrete

EJOT SE & Co. KG Market Unit Construction In der Stockwiese 35 57334 Bad Laasphe **GERMANY**

EJOT Plant 24

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

EAD 330499-02-0601, Edition 12/2023

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Specific Part

1 Technical description of the product

The "Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete" is a bonded anchor consisting of a cartridge with injection mortar MULTIFIX HSF SEISMIC / Sormat ITH-HY Seismic and a steel element according to Annex A 3 and A 5.

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 C 1 to C 4, C 6 to C 7, C 9 to C 10, B 3
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1, C 5, C 8, C 11
Displacements under short-term and long-term loading	See Annex C 12 to C 14
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 15 to C 23

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance				
Reaction to fire	Class A1				
Resistance to fire	See Annex C 24 to C 26				

3.3 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 EAD 330499-02-0601 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 8 August 2024 by Deutsches Institut für Bautechnik

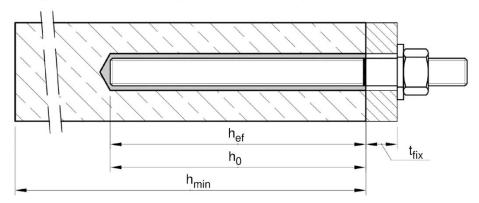
Beatrix Wittstock beglaubigt:
Head of Section Baderschneider



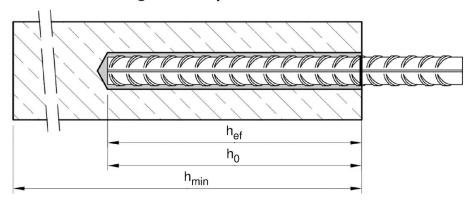
drill hole depth

Installation threaded rod M8 up to M30

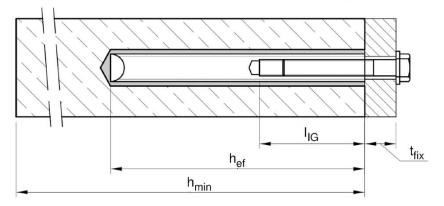
prepositioned installation or push through installation (annular gap filled with mortar)



Installation reinforcing bar Ø8 up to Ø32



Installation internal threaded anchor rod IG-M6 up to IG-M20



 t_{fix} = thickness of fixture h_0

 h_{ef} = effective embedment depth I_{IG} = thread engagement length

 h_{min} = minum thickness of member

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

Product description
Installed condition

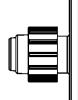
Annex A 1



Cartridge system

Coaxial Cartridge:

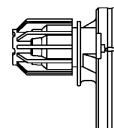
150 ml, 280 ml, 300 ml up to 333 ml and 380 ml up to 420 ml



Imprint:

MULTIFIX HSF SEISMIC / Sormat ITH-HY Seismic Processing and safety instructions, shelf life, charge number, manufacturer's information, quantity information

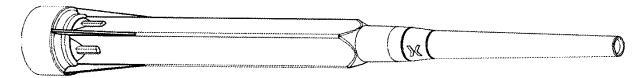
Side-by-Side Cartridge: 235 ml, 345 ml up to 360 ml and 825 ml



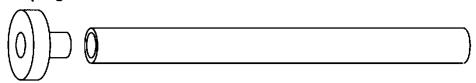
Imprint:

MULTIFIX HSF SEISMIC / Sormat ITH-HY Seismic Processing and safety instructions, shelf life, charge number, manufacturer's information, quantity information

Static mixer PM-19E



Piston plug VS and mixer extension VL



Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

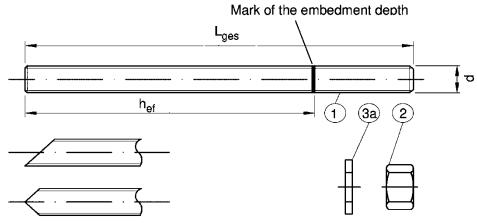
Product description

Injection system

Annex A 2



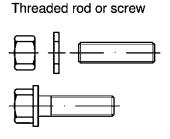
Threaded rod M8 up to M30 with washer and hexagon nut

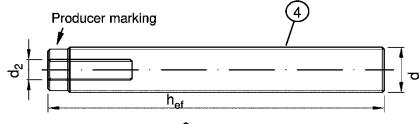


Commercial standard rod with:

- Materials, dimensions and mechanical properties acc. to Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004. The document shall be stored.
- Marking of embedment depth

Internal threaded rod IG-M6 to IG-M20





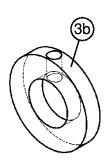
Marking Internal thread

Mark

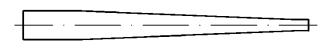
M8 Thread size (Internal thread)
A4 additional mark for stainless steel

HCR additional mark for high-corrosion resistance steel

Filling washer VFS



Mixer reduction nozzle MR



Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

Product description

Threaded rod; Internal threaded rod Filling washer; Mixer reduction nozzle

Annex A 3

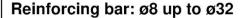


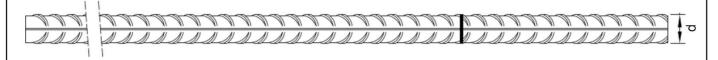
Та	ble A1: Mate	rials				
Part	Designation	Material				
- zi - ho	nc plated ≥ 5 ot-dip galvanised ≥ 4	pm acc. to EN ISO 683-4:2 μm acc. to EN ISO 0 μm acc. to EN ISO 5 μm acc. to EN ISO	4042 146	2:2022 or 1:2022 and EN ISO 10684:	2004+AC:2009 or	
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
			4.6	f _{uk} = 400 N/mm ²	f _{yk} = 240 N/mm ²	A ₅ > 8%
1	Threaded rod		4.8	f _{uk} = 400 N/mm ²	f _{yk} = 320 N/mm ²	A ₅ > 8%
•	Threaded rod	acc. to		f _{uk} = 500 N/mm²	f _{yk} = 300 N/mm ²	A ₅ > 8%
		EN ISO 898-1:2013		f _{uk} = 500 N/mm²	f _{yk} = 400 N/mm ²	A ₅ > 8%
				f _{uk} = 800 N/mm ²	f _{yk} = 640 N/mm ²	$A_5 \ge 12\%^{(3)}$
		1 .	4	for anchor rod class 4.6 or	ı •	
2	Hexagon nut	acc. to EN ISO 898-2:2022	5	for anchor rod class 5.6 or	r 5.8	
			8	for anchor rod class 8.8		
3a	Washer	(e.g.: EN ISO 887:20	06, E	galvanised or sherardized EN ISO 7089:2000, EN ISO	7093:2000 or EN ISO 7	094:2000)
3b	Filling washer	Steel, zinc plated, ho	t-dip	galvanised or sherardized	T =	T=: .
	Internal threaded	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
4	anchor rod	acc. to		f _{uk} = 500 N/mm²	f _{yk} = 400 N/mm ²	A ₅ > 8%
		EN ISO 898-1:2013	8.8	f _{uk} = 800 N/mm²	f _{yk} = 640 N/mm ²	A ₅ > 8%
Stai	nless steel A4 (Mater	rial 1.4401 / 1.4404 / 1	.457	1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088	o EN 10088-1:2014)	
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
1	Threaded rod ¹⁾⁴⁾		50	f _{uk} = 500 N/mm ²	f _{yk} = 210 N/mm ²	A ₅ ≥ 8%
'	Tilleaded Tod //	acc. to EN ISO 3506-1:2020	70	f _{uk} = 700 N/mm ²	f _{yk} = 450 N/mm ²	$A_5 \ge 12\%^{(3)}$
		EN 130 3506-1.2020	80	f _{uk} = 800 N/mm²	f _{yk} = 600 N/mm ²	$A_5 \ge 12\%^{(3)}$
			50	for anchor rod class 50		
2	Hexagon nut 1)4)	acc. to EN ISO 3506-1:2020		for anchor rod class 70		
			80	for anchor rod class 80		
3a	Washer	A4: Material 1.4401 / HCR: Material 1.4529 (e.g.: EN ISO 887:20	′ 1.44 9 or 1 06, E	07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO	578, acc. to EN 10088-1: : 2014	2014
3b	Filling washer	Stainless steel A4, H	igh c	orrosion resistance steel	T	
	Internal threaded	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
4	anchor rod 1)2)	acc. to	50	f _{uk} = 500 N/mm²	f _{yk} = 210 N/mm ²	A ₅ > 8%
		EN ISO 3506-1:2020		f _{uk} = 700 N/mm ²	f _{yk} = 450 N/mm ²	A ₅ > 8%
2) 3)	for IG-M20 only property of A ₅ > 8% fracture elongation		erforma	up to M24 and Internal threade ance category C2	d anchor rods up to IG-M16	

⁴⁾ Property class 80 only for stainless steel A4 and HCR

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Product description Materials threaded rod and internal threaded rod	Annex A 4







Minimum value of related rip area $f_{R,min}$ according to EN 1992-1-1:2004+AC:2010 Rib height of the bar shall be in the range $0.05d \le h_{rib} \le 0.07d$ (d: Nominal diameter of the bar; h_{rib} : Rib height of the bar)

Table A2: Materials Reinforcing bar

Part	Designation	Material
Reba	ar	
1	Reinforcing steel according to EN 1992 1 1:2004+AC:2010, Annex C	Bars and rebars from ring class B or C f_{yk} and k according to NDP or NCI according to EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

Product description
Materials reinforcing bar

Annex A 5



Specification of the intende Fasteners subject to (Static and		:				
	Working life	e 50 years	Workin	ng life 100 years		
Base material	uncracked concrete	uncracked concrete	cracked concrete			
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to Ø8 to IG-M6 to	M8 to M30, Ø8 to Ø32, M6 to IG-M20				
Temperature Range:	II: - 40 °C III: - 40 °C	to +40 °C¹) to +80 °C²) to +120 °C³) to +160 °C⁴)		°C to +40 °C ¹⁾ °C to +80 °C ²⁾		
Fasteners subject to (seismic act	tion):					
	Performance	Category C1	Performa	ance Category C2		
Base material		Cracked and und	cracked concrete	•		
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling	M8 to Ø8 to		M	112 to M24		
Temperature Range:	II: - 40 °C III: - 40 °C	to +40 °C¹) to +80 °C²) to +120 °C³) 5) to +160 °C⁴) 5)	II: - 40 III: - 40) °C to +40 °C ¹⁾) °C to +80 °C ²⁾) °C to +120 °C ^{3) 5)}) °C to +160 °C ^{4) 5)}		
Fasteners subject to (Fire exposu	ıre):					
Base material		uncracked and o	racked concrete			
HD: Hammer drilling HDB: Hammer drilling with hollow drill bit CD: Compressed air drilling		M8 to Ø8 to IG-M6 to	Ø32,			
Temperature Range:		II: - 40 °C III: - 40 °C	to +40 °C¹) to +80 °C²) to +120 °C³) to +160 °C⁴)			
1) (max. long-term temperature +24°C a 2) (max. long-term temperature +50°C a 3) (max. long-term temperature +72°C a 4) (max. long-term temperature +100°C 5) Only for working life of 50 years	and max. short-term te and max. short-term te	mperature +80°C) mperature +120°C)				
Injection System EJOT Multifix	Hybrid / SORMAT	ITH Hybrid for co	ncrete			
Intended use Specifications	Annex B 1					



Base materials:

- Compacted, reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013 + A2:2021.
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A2:2021.

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4:2006+ A2:2020 corresponding to corrosion resistance class:
 - Stainless steel Stahl A2 according to Annex A 4, Table A1: CRC II
 - Stainless steel Stahl A4 according to Annex A 4, Table A1: CRC III
 - High corrosion resistance steel HCR according to Annex A 4. Table A1: CRC V

Design:

- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored.
 The position of the fastener is indicated on the design drawings (e. g. position of the fastener relative to reinforcement or to supports, etc.).
- Fasteners are designed under the responsibility of an engineer experienced in fasteners and concrete work.
- The fasteners are designed in accordance to EN 1992-4:2018 and Technical Report TR 055, Edition February 2018
- The fasteners under fire exposure are designed in accordance to Technical Report TR 082, Edition June 2023.

Installation:

- Dry, wet concrete or flooded bore holes (not sea-water).
- Hole drilling by hammer (HD), hollow (HDB) or compressed air (CD).
- Overhead installation allowed.
- Fastener installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Installationtemperature in concrete:
 - -5°C up to +40°C for the standard variation of temperature after installation.

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Intended use Specifications (Continued)	Annex B 2



Table B1: Installation parameters for threaded rod											
Threaded rod			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 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	Prepositioned ins		[mm]	9	12	14	18	22	26	30	33
clearance hole in the fixture ¹⁾	Push through i	Push through installation df		12	14	16	20	24	30	33	40
Maximum installatio	n torque	max T _{inst}	[Nm]	10	20	40 ²⁾	60	100	170	250	300
Minimum thickness of member		h _{min}	[mm]	_	h _{ef} + 30 mm ≥ 100 mm		h _{ef} + 30 mm ≥ 100 mm)	
Minimum spacing		S _{min}	[mm]	40	50	60	75	95	115	125	140
Minimum edge dista	ince	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

Reinforcing bar				Ø 10 ¹⁾	Ø 12 ¹⁾	Ø 14	Ø 16	Ø 20	Ø 24 ¹⁾	Ø 25 ¹⁾	Ø 28	Ø 32
Diameter of element	$d = d_{nom}$	[mm]	8	10	12	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 denth	h _{ef,min}	[mm]	60	60	70	75	80	90	96	100	112	128
Effective embedment depth	h _{ef,max}	[mm]	160	200	240	280	320	400	480	500	560	640
Minimum thickness of member	h _{min}	[mm]		30 mm)0 mm	≥	h _{ef} + 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	50	50	60	70	70	75	85

¹⁾ both nominal drill hole diameter can be used

Table B3: Installation parameters for Internal threaded anchor rod

Internal diameter of anchor rod	ا				IG-M10	IG-M12	IG-M16	IG-M20
	$ d_2 $	[mm]	6	8	10	12	16	20
Outer diameter of anchor rod1)	d = d _{nom}	[mm]	10	12	16	20	24	30
Nominal drill hole diameter	d ₀	[mm]	12	14	18	22	28	35
Effective embedment depth	h _{ef,min}	[mm]	60	70	80	90	96	120
Effective embedment depth	h _{ef,max}		200	240	320	400	480	600
Diameter of clearance hole in the fixture	d _f ≤	[mm]	7	9	12	14	18	22
Maximum installation torque	max T _{inst}	[Nm]	10	10	20	40	60	100
Thread engagement length min/max	l _{IG}	[mm]	8/20	8/20	10/25	12/30	16/32	20/40
Minimum thickness of member	h _{min}	[mm]	h _{ef} + 3 ≥ 100		h _{ef} + 2d ₀			
Minimum spacing	s _{min}	[mm]	50	60	75	95	115	140
Minimum edge distance	C _{min}	[mm]	40	45	50	60	65	80
Minimum thickness of member Minimum spacing	s _{min}	[mm]	≥ 100 50	0 mm 60		95	1	

¹⁾ With metric threads

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

Intended use

Installation parameters

Annex B 3

²⁾ Maximum installation torque for M12 with steel Grade 4.6 is 35 Nm



				manus Market Mark																																							
Threaded Rod		Internal threaded anchor rod	d ₀ Drill bit - Ø HD, HDB, CD	d _t Brush	-	d _{b,min} min. Brush - Ø	Piston plug	1	Installation direction and เ of piston plug																																		
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]		↓	\rightarrow	1																																	
M8	8		10	RB10	11,5	10,5			,																																		
M10	8 / 10	IG-M6	12	RB12	13,5	12,5	9	NI																																			
M12	10 / 12	IG-M8	14	RB14	15,5	14,5	V.	No plug required																																			
	12		16	RB16	17,5	16,5																																					
M16	14	IG-M10	18	RB18	20,0	18,5	VS18	h _{ef} > 250 mm																																			
	16		20	RB20	22,0	20,5	VS20																																				
M20		IG-M12	22	RB22	24,0	22,5	VS22																																				
	20		25	RB25	27,0	25,5	VS25																												h _{ef} >								
M24		IG-M16	28 RB	RB28 3	30,0	28,5	VS28																												250 mm	250 mm	250 mm		250 mm	050 mm) 050 mm	250 mm	all
M27	24 / 25		30	RB30	31,8	30,5	VS30																															250 111111					
	24 / 25		32	RB32	34,0	32,5	VS32																																				
M30	28	IG-M20	35	RB35	37,0	35,5	VS35																																				
	32		40	RB40	43,5	40,5	VS40																																				
_	and installow drill bit	allation to	ols	þ		The hollow drill nollow drill bit a minimum nega minimum 150 r	and a class tive pressi	s M vacuum ure of 253 hl	cleaner with	a																																	

Hand pump (Volume 750 ml, $h_0 \le 10 d_s$, $d_0 \le 20$ mm)



Compressed air tool

(min 6 bar)



Brush RB



Piston Plug VS



Brush extension RBL



Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Intended use Cleaning and setting tools	Annex B 4



Table B5:	Workin	g time and cu	ring time	
Tempera	ature in bas	se material	Maximum working time	Minimum curing time 1)
	Т		t _{work}	t _{cure}
- 5°C	to	- 1 °C	50 min	5 h
0°C	to	+ 4°C	25 min	3,5 h
+ 5°C	to	+ 9°C	15 min	2 h
+ 10°C	to	+ 14°C	10 min	1 h
+ 15°C	to	+ 19°C	6 min	40 min
+ 20 °C	to	+ 29 °C	3 min	30 min
+ 30 °C	to	+ 40 °C	2 min	30 min
Car	tridge tempe	erature	+5°C to	+40°C

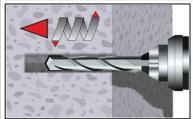
¹⁾ The minimum curing time is only valid for dry base material. In wet base material the curing time must be doubled.

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Intended use Working time and curing time	Annex B 5



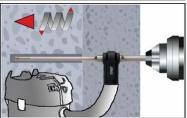
Installation instructions

Drilling of the bore hole



Hammer drilling (HD) / Compressed air drilling (CD)

Drill a hole to the required embedment depth.
Drill bit diameter according to Table B1, B2 or B3.
Aborted drill holes shall be filled with mortar.
Proceed with Step 2 (MAC or CAC).



Hollow drill bit system (HDB) (see Annex B 4)

Drill a hole to the required embedment depth.

Drill bit diameter according to Table B1, B2 or B3.

The hollow drilling system removes the dust and cleans the bore hole.

Proceed with Step 3.

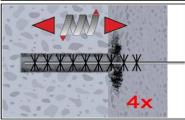
Attention! Standing water in the bore hole must be removed before cleaning.

Manual Air Cleaning (MAC)

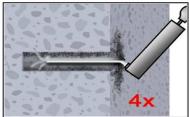
for bore hole diameter $d_0 \le 20$ mm and bore hole depth $h_0 \le 10d_{nom}$ (uncracked concrete only)



Blow the bore hole clean minimum 4x from the bottom or back by hand pump (Annex B 4).



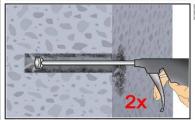
Brush the bore hole minimum 4x with brush RB according to Table B4 over the entire embedment depth in a twisting motion (if necessary, use a brush extension RBL).



Finally blow the bore hole clean minimum 4x from the bottom or back by hand pump (Annex B 4).

Compressed Air Cleaning (CAC):

All diameter in cracked and uncracked concrete, all drilling methods



2a. Blow the bore hole clean minimum 2x with compressed air (min. 6 bar) (Annex B 4) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

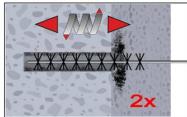
Intended use

Installation instructions

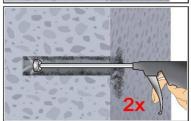
Annex B 6



Installation instructions (continuation)

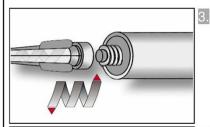


Brush the bore hole minimum 2x with brush RB according to Table B4 over the entire embedment depth in a twisting motion. (If necessary, a brush extension shall be used .RBL)



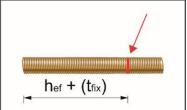
Finally blow the bore hole clean minimum 2x with compressed air (min. 6 bar) (Annex B 4) over the entire embedment depth until return air stream is free of noticeable dust. (If necessary, an extension shall be used.)

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



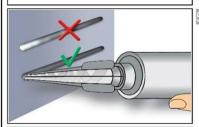
Screw on static-mixing nozzle PM-19E and load the cartridge into an appropriate dispensing tool.

For every working interruption longer than the maximum working time t_{work} (Annex B 5) as well as for new cartridges, a new static-mixer shall be used.

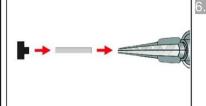


Mark embedment depth on the anchor rod. Consider t_{fix} in case of push through installations.

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



Not proper mixed mortar is not sufficient for fastening. Dispense and discard mortar until an uniform grey colour is shown (at least 3 full strokes).



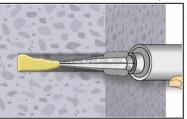
Piston plugs VS and mixer nozzle extensions VL shall be used according to Table B4 for the following applications:

- Horizontal and vertical downwards direction: Drill bit-Ø d₀ ≥ 18 mm and embedment depth h_{ef} > 250mm
- Vertical upwards direction: Drill bit-Ø d₀ ≥ 18 mm
 Assemble mixing nozzle, mixer extension and piston plug before injecting mortar.

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete Intended use Installation instructions (continuation) Annex B 7

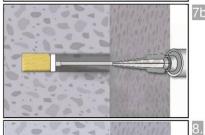


Installation instructions (continuation)



7a. Injecting mortar without piston plug VS

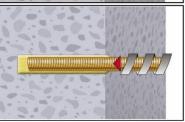
Starting at bottom of the hole and fill the hole up to approximately two-thirds with mortar. (If necessary, a mixer nozzle extension shall be used.) Slowly withdraw of the static mixing nozzle avoid creating air pockets Observe the temperature related working time t_{work} (Annex B 5).



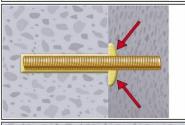
Injecting mortar with piston plug VS

Starting at bottom of the hole and fill the hole up to approximately two-thirds with mortar. (If necessary, a mixer nozzle extension shall be used.) During injection the piston plug is pushed out of the bore hole by the back pressure of the mortar.

Observe the temperature related working time twork (Annex B 5).

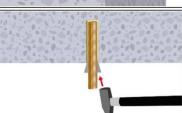


Insert the anchor rod while turning slightly up to the embedment mark.

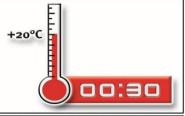


Annular gap between anchor rod and base material must be completely filled with mortar. In case of push through installation the annular gap in the fixture must be filled with mortar also.

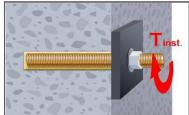
Otherwise, the installation must be repeated starting from step 7 before the maximum working time t_{work} has expired.



For application in vertical upwards direction the anchor rod shall be fixed (e.g. wedges).



Temperature related curing time t_{cure} (Annex B 5) must be observed. Do not move or load the fastener during curing time.



Install the fixture by using a calibrated torque wrench. Observe maximum installation torque (Table B1 or B3).

In case of static requirements (e.g. seismic), fill the annular gab in the fixture with mortar (Annex A 2). Therefore replace the washer by the filling washer VFS and use the mixer reduction nozzle MR.

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

Intended use

Installation instructions (continuation)

Annex B 8



resistance, Steel failure and 4.8 and 5.8 and HCR, class 50 and HCR, class 70 HCR, class 80 resistance, Partial factorial fact	re 1) N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s}	[kN] [kN] [kN] [kN] [kN] [ch] [ch] [ch]	15 (13) 18 (17) 29 (27) 18 26 29	23 (21) 29 (27) 46 (43) 29 41 46	84,3 34 42 67 42 59 67	63 78 125 79 110 126	98 122 196 123 171 196	141 176 282 177 247 282	184 230 368 230 -3) -3)	224 280 449 281 -3)	
6 and 4.8 6 and 5.8 6 and 5.8 7 and HCR, class 50 7 and HCR, class 70 7 HCR, class 80 7 resistance, Partial fac 6 and 5.6 7 5.8 and 8.8 7 and HCR, class 50	re 1) N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} V _{Rk,s}	[kN] [kN] [kN] [kN] [kN] [ch] [ch] [ch]	15 (13) 18 (17) 29 (27) 18 26	23 (21) 29 (27) 46 (43) 29 41	34 42 67 42 59	63 78 125 79 110 126	98 122 196 123 171 196	141 176 282 177 247	184 230 368 230 -3)	224 280 449 281	
6 and 4.8 6 and 5.8 6 and 5.8 7 and HCR, class 50 7 and HCR, class 70 7 HCR, class 80 7 resistance, Partial fac 6 and 5.6 7 5.8 and 8.8 7 and HCR, class 50	N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} V _{Rk,s} N _{Rk,s} V _{Rk,s}	[kN] [kN] [kN] [kN] [ch] [ch] [ch]	18 (17) 29 (27) 18 26	29 (27) 46 (43) 29 41	42 67 42 59	78 125 79 110 126	122 196 123 171 196	176 282 177 247	230 368 230 -3)	280 449 281 _3)	
6 and 5.8 3 and HCR, class 50 and HCR, class 70 HCR, class 80 resistance, Partial fac 6 and 5.6 8, 5.8 and 8.8 and HCR, class 50	$\begin{array}{c} N_{Rk,s} \\ N_{R$	[kN] [kN] [kN] [kN] [ch] [ch] [ch]	18 (17) 29 (27) 18 26	29 (27) 46 (43) 29 41	42 67 42 59	78 125 79 110 126	122 196 123 171 196	176 282 177 247	230 368 230 -3)	280 449 281 _3)	
and HCR, class 50 and HCR, class 70 HCR, class 80 resistance, Partial fac and 5.6 3, 5.8 and 8.8 and HCR, class 50	N _{Rk,s} N _{Rk,s} N _{Rk,s} N _{Rk,s} V _{Rk,s} V _{Rk,s} tor 2) γ _{Ms,N} γ _{Ms,N}	[kN] [kN] [kN] [kN]	29 (27) 18 26	46 (43) 29 41	67 42 59	125 79 110 126	196 123 171 196	282 177 247	368 230 -3)	449 281	
and HCR, class 50 and HCR, class 70 HCR, class 80 resistance, Partial fac 5 and 5.6 8, 5.8 and 8.8 and HCR, class 50	$\begin{array}{c} N_{Rk,s} \\ N_{Rk,s} \\ N_{Rk,s} \\ \end{array}$ $\begin{array}{c} N_{Rk,s} \\ \text{tor} \end{array}$ $\begin{array}{c} 2) \\ \gamma_{Ms,N} \\ \gamma_{Ms,N} \\ \end{array}$	[kN] [kN] [kN]	18 26	29 41	42 59	79 110 126	123 171 196	177 247	230 _3)	281 _3)	
and HCR, class 70 HCR, class 80 resistance, Partial fac 6 and 5.6 8, 5.8 and 8.8 and HCR, class 50	N _{Rk,s} N _{Rk,s} tor ²⁾ γ _{Ms,N}	[kN] [kN]	26	41	59	110 126	171 196	247	_3)	_3)	
HCR, class 80 resistance, Partial fac and 5.6 3, 5.8 and 8.8 and HCR, class 50	N _{Rk,s} tor ²⁾ γ _{Ms,N} γ _{Ms,N}	[kN]	 			126	196		_3)	_3)	
resistance, Partial fac 6 and 5.6 3, 5.8 and 8.8 and HCR, class 50	tor ²⁾ γ _{Ms,N} γ _{Ms,N}	[-]				2.0			l	l .	
6 and 5.6 8, 5.8 and 8.8 and HCR, class 50	γ _{Ms,N} γ _{Ms,N}	[-]				2.0					
nd HCR, class 50	 					_,.	י				
	γ _{Ms,N}					1,5	5				
ind HCR, class 70		[-]				2,8	6				
· · · · · · · · · · · · · · · · · · ·	γ _{Ms,N}	[-]	1,87								
Stainless steel A4 and HCR, class 80				1,6							
esistance, Steel failure	1)	ı	1								
s 4.6 and 4.8	V ⁰ Rk,s	[kN]	9 (8)	14 (13)	20	38	59	85	110	135	
s 5.6 and 5.8	$V^0_{Rk,s}$	[kN]	11 (10)	17 (16)	25	47	74	106	138	168	
8.8	V ⁰ Rk,s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224	
4 and HCR, class 50	V ⁰ Rk,s	[kN]	9	15	21	39	61	88	115	140	
4 and HCR, class 70	V ⁰ Rk,s	[kN]	13	20	30	55	86	124	_3)	_3)	
nd HCR, class 80	$V^{0}_{Rk,s}$	[kN]	15	23	34	63	98	141	_3)	_3)	
s 4.6 and 4.8	M ⁰ Rk,s	[Nm]	15 (13)	30 (27)	52	133	260	449	666	900	
5.6 and 5.8	М ⁰ Rk,s	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123	
8.8	M ⁰ Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797	
4 and HCR, class 50	M ⁰ Rk,s	[Nm]	19	37	66	167	325	561	832	1125	
4 and HCR, class 70	M ⁰ Rk,s	[Nm]	26	52	92	232	454	784	_3)	_3)	
Stainless steel A4 and HCR, class 80		[Nm]	30	59	105	266	519	896	_3)	_3)	
esistance, Partial facto											
6 and 5.6	γ _{Ms,V}	[-]				1,6	7				
8, 5.8 and 8.8	γ _{Ms,V}	[-]				1,2	:5				
nd HCR, class 50	γ _{Ms,V}	[-]				2,3	8				
ind HCR, class 70	γ _{Ms,V}	[-]				1,5	6				
HCR, class 80	γ _{Ms,V}	[-]				1,3	3				
	HCR, class 80 esistance, Steel failure s 4.6 and 4.8 s 5.6 and 5.8 s 8.8 4 and HCR, class 50 A4 and HCR, class 70 and HCR, class 80 s 4.6 and 4.8 s 5.6 and 5.8 s 8.8 A4 and HCR, class 50 A4 and HCR, class 50 A4 and HCR, class 50 A4 and HCR, class 70 A6 and HCR, class 70 A7 and HCR, class 80 A8 and HCR, class 80 A9 and HCR, class 80 A9 and HCR, class 80	HCR, class 80 PMs,N Pesistance, Steel failure 1) S 4.6 and 4.8 PO Rk,s S 5.6 and 5.8 A4 and HCR, class 50 A4 and HCR, class 70 A5 4.6 and 4.8 A6 And 4.8 A6 And HCR, class 70 A6 And HCR, class 80 A7 And HCR, class 80 A6 And HCR, class 80 A7 And HCR, class 80 A6 And HCR, class 50 A7 And HCR, class 70 A7 And HCR, class 80 A6 And HCR, class 70 A7 And HCR, class 80 A7 And HCR,	HCR, class 80 PMS,N Esistance, Steel failure 4.6 and 4.8 VORK,S END A4 and HCR, class 50 HCR, class 80 FIND A4 and HCR, class 70 FIND A5 4.6 and 4.8 FIND A6 4.6 and HCR, class 50 FIND A6 4.6 and HCR, class 70 FIND A6 4.6 and HCR, cla	HCR, class 80 PMS,N Pesistance, Steel failure A 4.6 and 4.8 A 4.6 and 5.8 A 4 and HCR, class 50 A 4 and HCR, class 70 A 4.6 and 4.8 A 4.6 and 4.8 A 4 and HCR, class 70 A 4.6 and 4.8 A 5.6 and 5.8 A 6 and 4.8 A 6 and 4.8 A 70 A 70	HCR, class 80 PMS,N Fig. 19 Pesistance, Steel failure 1) 10 11 12 13 14 16 16 16 16 17 18 18 18 18 18 18 18 18 18	HCR, class 80 PMS,N Pesistance, Steel failure 3 4.6 and 4.8 PORK,S PRIK,S PORK,S PRIK,S PRIK,S	HCR, class 80 PMS,N HCR,S HCR, class 50 HCR,Class 50 HCR,Class 70 HCR,Class 70 HCR,Class 80 HC	HCR, class 80 PMS,N HCR, class 80 PMS,N PRIK,S RESISTANCE, Steel failure 1) 1,6 1,6 1,6 1,6 1,6 1,6 1,6	HCR, class 80 $\gamma_{MS,N}$ [-] 1,6 $\gamma_{Rk,S}$ [sistance, Steel failure 1) $\gamma_{Rk,S}$ [kN] 9 (8) 14 (13) 20 38 59 85 5.6 and 5.8 $\gamma_{Rk,S}$ [kN] 11 (10) 17 (16) 25 47 74 106 5.8 8.8 $\gamma_{Rk,S}$ [kN] 15 (13) 23 (21) 34 63 98 141 $\gamma_{Rk,S}$ [kN] 15 (13) 23 (21) 34 63 98 141 $\gamma_{Rk,S}$ [kN] 15 (13) 20 30 55 86 124 $\gamma_{Rk,S}$ [kN] 15 23 34 63 98 141 $\gamma_{Rk,S}$ [kN] 15 (13) 30 (27) 52 133 260 449 $\gamma_{Rk,S}$ [kN] 15 (13) 30 (27) 52 133 260 449 $\gamma_{Rk,S}$ [kN] 19 (16) 37 (33) 65 166 324 560 $\gamma_{Rk,S}$ [kN] 19 (16) 37 (33) 65 166 324 560 $\gamma_{Rk,S}$ [kN] 19 37 66 167 325 561 $\gamma_{Rk,S}$ [kN] 19 37 66 167 325 561 $\gamma_{Rk,S}$ [kN] 19 37 66 167 325 561 $\gamma_{Rk,S}$ [kN] 30 59 105 266 519 896 $\gamma_{Rk,S}$ [kN] 30 59 105 266 519 $\gamma_{Rk,S}$ [kN] 30 5	HCR, class 80 YMS,N [-] 1,6 Pesistance, Steel failure YORK,S KN 9 (8) 14 (13) 20 38 59 85 110 138 110 125 139 140	

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⁾ Fastener type not part of the ETA

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values for steel tension resistance and steel shear resistance of threaded rods	Annex C 1

²⁾ in absence of national regulation



Table C2: Characteristic values of tension loads under static and quasi-static action for a working life of 50 and 100 years									
Fastener				All Anchor types and sizes					
Concrete cone f	ailure								
Uncracked concr	ete	k _{ucr,N}	[-]	11,0					
Cracked concrete		k _{cr,N}	[-]	7,7					
Edge distance		c _{cr,N}	[mm]	1,5 h _{ef}					
Axial distance		s _{cr,N}	[mm]	2 c _{cr,N}					
Splitting									
	h/h _{ef} ≥ 2,0			1,0 h _{ef}					
Edge distance	2,0 > h/h _{ef} > 1,3	c _{cr,sp}	[mm]	$2 \cdot h_{ef} \left(2,5 - \frac{h}{h_{ef}} \right)$					
	h/h _{ef} ≤ 1,3			2,4 h _{ef}					
Axial distance	<u> </u>	s _{cr,sp}	[mm]	2 c _{cr,sp}					

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 50 and 100 years	Annex C 2



Tabl		racteristic va working life			ls und	der st	atic a	and q	uasi-	static	actio	on
	ded rod				М8	M10	M12	M16	M20	M24	M27	M30
Steel failure								. /01.0	oo Tob	Jo (C1)		
Characteristic tension resistance N _{Rk,s} [kN]							As 'I	_{Jk} (or s				
Partial	tactor ined pull-out and o	nonoroto failuro	γMs,N	[-]				see Ta	ible C1			
	cteristic bond resist		d concrete C2	0/25								
	I: 24°C/40°C		τ _{Rk,ucr}	[N/mm²]	17	17	16	15	14	13	13	13
ire ra	II: 50°C/80°C	Dry, wet concrete and	τ _{Rk,ucr}	[N/mm²]	17	17	16	15	14	13	13	13
Temperature range	III: 72°C/120°C	flooded bore	^τ Rk,ucr	[N/mm²]	15	14	14	13	12	12	11	11
Temp	IV: 100°C/160°C	1	τ _{Rk,ucr}	[N/mm²]	12	11	11	10	9,5	9,0	9,0	9,0
Charac	cteristic bond resist	ance in cracked o	concrete C20/2	25								
ange	I: 24°C/40°C		τ _{Rk,cr}	[N/mm²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
Temperature range	II: 50°C/80°C	Dry, wet concrete and	^τ Rk,cr	[N/mm²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
ıperat	III: 72°C/120°C	flooded bore hole	^τ Rk,cr	[N/mm²]	6,0	6,5	7,0	7,5	7,0	6,0	6,0	6,0
	IV: 100°C/160°C		τ _{Rk,cr}	[N/mm²]	5,5	5,5	6,0	6,5	6,0	5,5	5,5	5,5
Redukt	tion factor ψ ⁰ sus in t	cracked and uncr	acked concret	e C20/25								
ange	I: 24°C/40°C			, [-]	0,90							
ure r	II: 50°C/80°C	Dry, wet concrete and flooded bore hole	Ψ ⁰ sus		0,87							
Femperature range	III: 72°C/120°C		Ψ sus	[[-]		0,75						
Tem	IV: 100°C/160°C				0,66							
Increas	sing factors for con	crete	Ψc	[-]	(f _{ck} / 20) ^{0,1}							
	cteristic bond resista concrete strength o			τ _{Rk,ucr} =				Ψ _c • τ _{Rk,ucr,(C20/25)}				
	ete cone failure	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		τ _{Rk,cr} =			Ψ	c * τ _{Rk,}	cr,(C20/	25)		
	ete cone lallure int parameter							see Ta	ble C2	,		
Splitti					<u> </u>			000 10		·		
Releva	ınt parameter							see Ta	ıble C2			
Install	ation factor											
.		MAC					1,2			No Per ass	formar essed	nce
tor ary	and wet concrete	CAC	γ_{inst}	[-]					,0			
HDB			_						,2			
for floo	ded bore hole	CAC	ı					1	, 4			
Perfo	tion System EJC	nsion loads under				r conc	rete			Anne	x C 3	}
tor a v	vorking life of 50 yea	urs (threaded rod)										



	racteristic va working life			ls un	der s	tatic	and q	uasi-	statio	action	on
Threaded rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel failure		_			•		•	•			
Characteristic tension res	istance	N _{Rk,s}	[kN]			A _s • f	_{uk} (or s	ee Tab	le C1)		
Partial factor		γ _{Ms,N}	[-]				see Ta	able C1			
Combined pull-out and	concrete failure										
Characteristic bond resist	tance in uncracke	d concrete C20	0/25								
Temperature range II: 20°C/80°C	Dry, wet concrete and	^τ Rk,ucr,100	[N/mm²]	17	17	16	15	14	13	13	13
Hempe II: 20°C\80°C	flooded bore hole	^τ Rk,ucr,100	[N/mm²]	17	17	16	15	14	13	13	13
Characteristic bond resist	tance in cracked	concrete C20/2	!5								
Temperature range C/80°C :I 2°08/O°C :I 2°08/O°C	Dry, wet concrete and	^τ Rk,cr,100	[N/mm²]	5,5	6,0	6,5	6,5	6,5	6,5	6,5	6,5
Tempe range II: 20°C/80°C	flooded bore hole	^τ Rk,cr,100	[N/mm²]	5,5	6,0	6,5	6,5	6,5	6,5	6,5	6,5
Reduktion factor ψ ⁰ sus,10	0 in cracked and	uncracked con	crete C20/2	5			•	•			
	Dry, wet concrete and				0,90						
Temperature range II: 20°C\80°C	flooded bore hole	Ψ ⁰ sus,100	[-]	0,87							
Increasing factors for con	crete	Ψς	[-]				(f _{ck} /	20) ^{0,1}			
Characteristic bond resist	tance denending	τρ	Rk,ucr,100 =	Ψc * ^τ Rk,ucr,100,(C20/25)							
on the concrete strength			Ψc * τ _{Rk,cr,100,(C20/25)}								
Concrete cone failure		_1	Rk,cr,100 =				i in,ci	,100,(02	.0/23)		
Relevant parameter					see Ta	able C2	2				
Splitting											
Relevant parameter					see Ta	able C2	?				
Installation factor											
for dry and wet concrete	MAC			1,2 No Performance assessed					ice		
ary aria trot bolloroto	CAC	γinst	[-]					,0			
for flooded bore hole	HDB CAC	-						<u>,2</u> ,4			

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (threaded rod)	Annex C 4



Table C5: Characteristic for a working					nder s	tatic a	nd qu	asi-st	atic acti	on
Threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure without lever arm		•		•		•	•	•	•	
Characteristic shear resistance Steel, strength class 4.6, 4.8 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 C	; 1		
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	C1)	
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	γinst	[-]	1,0							
Concrete edge failure										
Effective length of fastener	l _f	[mm]	$\min(h_{ef}; 12 \cdot d_{nom})$ $\min(h_{ef}; 300)$					300mm)		
Outside diameter of fastener	d _{nom}	[mm]	8 10 12 16 20 24 27					30		
Installation factor	γinst	[-]	1,0							

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of shear loads under static and quasi-static action for a working life of 50 and 100 years (threaded rod)	Annex C 5



1,4

Tabl		acteristic value working life of			oads un	ider sta	tic and	quasi-s	static ac	etion			
Interna	al threaded anchor	rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20			
Steel fa	ailure ¹⁾					•	•	•	•	•			
Charac	teristic tension resi	stance, 5.8	N _{Rk,s}	[kN]	10	17	29	42	76	123			
	strength class	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196			
Partial	factor, strength clas	ss 5.8 and 8.8	γ _{Ms,N}	[-]		1,5							
	eteristic tension resi A4 and HCR, Streng		N _{Rk,s}	[kN]	14								
Partial	factor		$\gamma_{Ms,N}$	[-]			1,87			2,86			
Combi	ned pull-out and o	concrete cone failu	re										
	teristic bond resista	ance in uncracked co	oncrete C	20/25					1	1			
ure	I: 24°C/40°C		τ _{Rk,ucr}	[N/mm ²]	17	16	15	14	13	13			
nperat range	II: 50°C/80°C	Dry, wet concrete	^τ Rk,ucr	[N/mm²]	17	16	15	14	13	13			
Temperature range	E 현 III: 72°C/120°C flooded		τ _{Rk,ucr}	[N/mm ²]	14	14	13	12	12	11			
<u>Te</u>	IV: 100°C/160°C		^τ Rk,ucr	[N/mm²]	11	11	10	9,5	9,0	9,0			
Charac	teristic bond resista	ance in cracked con	crete C20	/25									
<u>1</u>	I: 24°C/40°C	flooded bore hole	τ _{Rk,cr}	[N/mm ²]	7,5	8,0	9,0	8,5	7,0	7,0			
nperatı range	II: 50°C/80°C		τ _{Rk,cr}	[N/mm ²]	7,5	8,0	9,0	8,5	7,0	7,0			
Temperature range	III: 72°C/120°C		τ _{Rk,cr}	[N/mm²]	6,5	7,0	7,5	7,0	6,0	6,0			
Ter	IV: 100°C/160°C		τ _{Rk,cr}	[N/mm²]	5,5	6,0	6,5	6,0	5,5	5,5			
Redukt	tion factor ψ ⁰ sus in α	cracked and uncrack	ed concr	ete C20/2	5	•	•	•					
	I: 24°C/40°C				0,90								
Temperature range	II: 50°C/80°C	Dry, wet concrete			0,87								
nperat range	III: 72°C/120°C	and flooded bore hole	Ψ ⁰ sus	[-]	0,75								
Ten_	IV: 100°C/160°C	Illooded bore fible						66					
	sing factors for cond	rete	Ψς	[-]				20) ^{0,1}					
			10					ucr,(C20/25)					
	cteristic bond resista acrete strength clas	, ,		τ _{Rk,ucr} =					1				
	ete cone failure			τ _{Rk,cr} =			Ψc 'Rk,	cr,(C20/25)					
	int parameter					see Ta	able C2						
	ng failure				<u> </u>		200 10						
	nt parameter						see Ta	able C2					
Installa	ation factor		_										
		MAC				1,2			ormance a	assessed			
for dry	and wet concrete	CAC	γinst	[-]				,0					
		HDB		`			1	,2					

¹⁾ Fastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded rod. The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

CAC

for flooded bore hole

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 50 years (internal threaded anchor rod)	Annex C 6

²⁾ For IG-M20 strength class 50 is valid



1,2

1,4

	racteristic val			oads ur	nder sta	atic and	quasi-s	static ac	etion
Internal threaded ancho	r rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure ¹⁾									
Characteristic tension res	istance, 5.8	N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, strength class	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor, strength cla	ss 5.8 and 8.8	γ _{Ms,N}	[-]						
Characteristic tension res Steel A4 and HCR, Strenç		N _{Rk,s}	[kN]	14 26 41 59 110					
Partial factor		γ _{Ms,N}	[-]			1,87			2,86
Combined pull-out and	concrete cone fai	lure							
Characteristic bond resist	ance in uncracked	concrete Ca	20/25						
II: 24°C/40°C	Dry, wet concrete	τRk,ucr,100	[N/mm²]	17	16	15	14	13	13
ਜੂ ਕੁ ≅ ਗ: 20°C\80°C	flooded bore hole	^τ Rk,ucr,100	[N/mm²]	17	16	15	14	13	13
Characteristic bond resist	ance in cracked co	ncrete C20/	25				•	•	
	Dry, wet concrete	τRk,cr,100	[N/mm²]	6,0	6,5	6,5	6,5	6,5	6,5
Temperature range range II: 24°C/40°C	and flooded bore hole	^τ Rk,cr,100	[N/mm²]	6,0	6,5	6,5	6,5	6,5	6,5
Reduktion factor ψ ⁰ sus,100	in cracked and u	ncracked co	ncrete C2	20/25		•			
II: 50°C/80°C	Dry, wet concrete		[-]			0,	,90		
E II: 50°C/80°C	flooded bore hole	Ψ sus,100	[[]			0,	.87		
Increasing factors for con-	crete	Ψς	[-]			(f _{ck} /	20) ^{0,1}		
Characteristic bond resist	ance depending	τ _{Bk} ι	ucr,100 =		ų	^γ c • ^τ Rk,uci		25)	
on the concrete strength of	, ,		,cr,100 =			Ψc * ^τ Rk,cr			
Concrete cone failure		TIK	,01,100			TC TIK,CI	,100,(020/2	<i>3)</i>	
Relevant parameter						see Ta	able C2		
Splitting failure									
Relevant parameter						see Ta	able C2		
Installation factor									
	MAC				1,2			ormance a	assesse
for dry and wet concrete	CAC	γ _{inst}	[_1			1	,0		

¹⁾ Fastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded rod. The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

[-]

 γ_{inst}

for flooded bore hole

HDB

CAC

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (internal threaded anchor rod)	Annex C 7

²⁾ For IG-M20 strength class 50 is valid



1,0

Table C8: Character for a work						r static a	and qua	asi-stat	ic action	
Internal threaded anchor rods				IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
Steel failure without lever arm ¹)				•	•	•	•	•	
Characteristic shear resistance,	5.8	V ⁰ Rk,s	[kN]	5	9	15	21	38	61	
Steel, strength class	8.8	V ⁰ Rk,s	[kN]	8	14	23	34	60	98	
Partial factor, strength class 5.8 a	and 8.8	γ _{Ms,V}	[-]							
Characteristic shear resistance, Stainless Steel A4 and HCR, Strength class 70 ²⁾		V ⁰ Rk,s	[kN]	7	13	20	30	55	40	
Partial factor		γ _{Ms,V}	[-]			1,56			2,38	
Ductility factor		k ₇	[-]				1,0			
Steel failure with lever arm1)										
Characteristic bending moment,	5.8	M ⁰ Rk,s	[Nm]	8	19	37	66	167	325	
Steel, strength class	8.8	M ⁰ Rk,s	[Nm]	12	30	60	105	267	519	
Partial factor, strength class 5.8 a	and 8.8	γ _{Ms,V}	[-]	1,25						
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 ²⁾		M ⁰ _{Rk,s}	[Nm]	11	26	52	92	233	456	
Partial factor		γ _{Ms,V}	[-]			1,56			2,38	
Concrete pry-out failure										
Factor		k ₈	[-]				2,0			
Installation factor	[-]	1,0								
Concrete edge failure		•								
Effective length of fastener		I _f	[mm]		min	(h _{ef} ; 12 • c	n _{om})		min(h _{ef} ; 300m	
Outside diameter of fastener		d _{nom}	[mm]	10	12	16	20	24	30	

¹⁾ Fastenings (incl. nut and washer) must comply with the appropriate material and property class of the internal threaded rod. The characteristic tension resistance for steel failure is valid for the internal threaded rod and the fastening element.

[-]

 γ_{inst}

Installation factor

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of shear loads under static and quasi-static action for a working life of 50 and 100 years (internal threaded anchor rod)	Annex C 8

²⁾ For IG-M20 strength class 50 is valid



	rcing bar				Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø3	
Steel f			TM	FI - N II					۸.	£ 1)					
	cteristic tension resi	stance	N _{Rk,s}	[kN]		70	440	154		f _{uk} 1)	450	404	616	-00	
	section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	80	
Partial Combi	ined pull-out and o	oporoto fail	γ _{Ms,N}	[-]					1,	4 ²⁾					
	cteristic bond resista			ete C20/25											
	I: 24°C/40°C	Dry, wet	τ _{Rk,ucr}	[N/mm²]	14	14	14	14	13	13	13	13	13	13	
ratu ge	II: 50°C/80°C	concrete	τ _{Rk,ucr}	[N/mm²]	14	14	14	14	13	13	13	13	13	13	
Temperature range	III: 72°C/120°C	and flooded	τ _{Rk,ucr}	[N/mm²]	13	12	12	12	12	11	11	11	11	11	
Te	IV: 100°C/160°C	bore hole	τ _{Rk,ucr}	[N/mm²]	9,5	9,5	9,5	9,0	9,0	9,0	9,0	9,0	8,5	8,5	
Charac	teristic bond resista	ance in crack		e C20/25									-		
<u>re</u>	I: 24°C/40°C	Dry, wet	τ _{Rk,cr}	[N/mm²]	5,5	5,5	6,0	6,5	6,5	6,5	6,5	7,0	7,0	7,0	
nperatu range	II: 50°C/80°C	concrete	τ _{Rk,cr}	[N/mm²]	5,5	5,5	6,0	6,5	6,5	6,5	6,5	7,0	7,0	7,0	
Temperature range	III: 72°C/120°C	and flooded	τ _{Rk,cr}	[N/mm²]	4,5	5,0	5,0	5,5	5,5	5,5	5,5	6,0	6,0	6,0	
<u>e</u>	IV: 100°C/160°C	bore hole	τ _{Rk,cr}	[N/mm²]	4,0	4,5	4,5	5,0	5,0	5,0	5,0	5,0	5,0	5,0	
Redukt	tion factor ψ ⁰ sus in a	cracked and	uncracked (concrete C2	0/25										
e	I: 24°C/40°C	Dry, wet							0,	90					
atur Ie	II: 50°C/80°C	concrete	Ψ^0 sus						0.	87					
_ j⊒ jg -	III: 72°C/120°C	and flooded bore hole		[-]					-	75					
Ter															
	IV: 100°C/160°C				0,66 (f , /20) ^{0,1}										
	sing factors for cond		Ψc	[-]	(f _{ck} / 20) ^{0,1}										
	cteristic bond resista ding on the concrete			τ _{Rk,ucr} =	Ψ _c • τ _{Rk,ucr,(C20/25)}										
class				$\tau_{Rk,cr} =$	Ψc * ^τ Rk,cr,(C20/25)										
	ete cone failure														
Releva Splittir	int parameter								see 1	able C					
_	int parameter								ee Ta	able C					
	ation factor							•	SCC 16	abie Oa	_				
motani	ation labtor	MAC					1,2			No	Perfor	mance	asses	sed	
for dry	and wet concrete	CAC	γ_{inst}	[-]						,0					
		HDB	Inst	"						,2					
1) f _{uk} :	ded bore hole shall be taken from t bsence of national r		ons of reinfo	orcing bars					l	,4					
	tion System EJC	OT Multifix		ORMAT IT	'H Hv	brid f	or co	ncrete		1					



Reinfo	rcing bar				Øβ	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 2'
Steel fa					טשן	טו שן	W 12	דו ש	טו ש	20	W 24	W 23	20 20	W 32
Charac	teristic tension res	istance	N _{Rk,s}	[kN]					A _s ·	f _{uk} 1)				
Cross s	section area		As	[mm²]	50 79 113 154 201 314 452 491 616 80								804	
Partial 1	factor		γ _{Ms,N}	[-]	1,42)									
Combi	ned pull-out and	concrete fail	ure	•										
Charac	teristic bond resist	ance in uncra	cked concre	te C20/25										
nperature range	I: 24°C/40°C	Dry, wet concrete and	^τ Rk,ucr,100	[N/mm²]	14	14	14	14	13	13	13	13	13	13
Temperature range	II: 50°C/80°C	flooded bore hole	^τ Rk,ucr,100	[N/mm²]	14	14	14	14	13	13	13	13	13	13
Charac	teristic bond resist	ance in crack	ed concrete	C20/25			•							
nperature range	I: 24°C/40°C	Dry, wet concrete	^τ Rk,cr,100	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0
हि II: 50°C/80°	II: 50°C/80°C	and flooded bore hole	^τ Rk,cr,100	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0
Redukt	ion factor ψ ⁰ sus,100	n cracked a	ınd uncracke	d concrete	C20/	25								
nperature range	I: 24°C/40°C	Dry, wet concrete		.,	0,90									
Temperature range	II: 50°C/80°C	and flooded bore hole	Ψ ⁰ sus,100	[-]	0,87									
Increas	sing factors for con	crete	Ψς	[-]	(f _{ck} / 20) ^{0,1}									
	teristic bond resist		τ _{Rk}	ucr,100 =				Ψc •	[₹] Rk,ucr	:.100.(C	20/25)			
depend class	ling on the concret	e strength		k,cr,100 =					τ _{Rk,cr,}				-	
	ete cone failure		<u>'</u>	,,					, •1,	, ().				
	nt parameter								see Ta	ble C	2			
Splittin	ıg													
Releva	nt parameter							1	see Ta	ble C	2			
Installa	ation factor			,										
for dry	and wet concrete	MAC CAC	γ_{inst}	[-]			1,2			,0	Perfor	mance	asses	ssed
		HDB	- inst	"						,2				
tor floor	ded bore hole	CAC	1	i	I				- 1	,4				

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under static and quasi-static action for a working life of 100 years (rebar)	Annex C 10

²⁾ in absence of national regulation



Table C11: Characteris for a working					nde	r stat	tic aı	nd qı	uasi-	static	actio	1
Reinforcing bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure without lever arm						•	I.		•			
Characteristic shear resistance	V ⁰ _{Rk,s}	[kN]					0,50	· A _s ·	f _{uk} 1)			
Cross section area	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	[-]						1,52)					
Ductility factor	k ₇	[-]						1,0				
Steel failure with lever arm	•	•										
Characteristic bending moment	M ⁰ Rk,s	[Nm]					1.2	w _{el} ·	fuk 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	I _f	[mm]	min(h _{ef} ; 12 · d _{nom}) min(h _{ef} ; 300mm)							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

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of shear loads under static and quasi-static action for a working life of 50 and 100 years (rebar)	Annex C 11

²⁾ in absence of national regulation



Table C12: Dis	placement	s under tensi	on load	1 1)						
Threaded rod			М8	M10	M12	M16	M20	M24	M27	M30
Uncracked concrete Ca	20/25 under s	tatic and quasi-s	tatic acti	on for a	working	g life of	50 and 1	00 year	s	
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,031	0,032	0,034	0,037	0,039	0,042	0,044	0,046
I: 24°C/40°C II: 50°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,040	0,042	0,044	0,047	0,051	0,054	0,057	0,060
Temperature range	δ_{N0} -factor	[mm/(N/mm²)]	0,032	0,034	0,035	0,038	0,041	0,044	0,046	0,048
III: 72°C/120°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,042	0,044	0,045	0,049	0,053	0,056	0,059	0,062
Temperature range	δ_{N0} -factor	[mm/(N/mm²)]	0,121	0,126	0,131	0,142	0,153	0,163	0,171	0,179
IV: 100°C/160°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,124	0,129	0,135	0,146	0,157	0,168	0,176	0,184
Cracked concrete unde	er static and o	quasi-static actio	n for a w	orking l	ife of 50	and 10	0 years			
Temperature range	δ_{N0} -factor	[mm/(N/mm²)]	0,081	0,083	0,085	0,090	0,095	0,099	0,103	0,106
I: 24°C/40°C II: 50°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,104	0,107	0,110	0,116	0,122	0,128	0,133	0,137
Temperature range	δ_{N0} -factor	[mm/(N/mm²)]	0,084	0,086	0,088	0,093	0,098	0,103	0,107	0,110
III: 72°C/120°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,108	0,111	0,114	0,121	0,127	0,133	0,138	0,143
Temperature range	δ_{N0} -factor	[mm/(N/mm²)]	0,312	0,321	0,330	0,349	0,367	0,385	0,399	0,412
IV: 100°C/160°Č	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,321	0,330	0,340	0,358	0,377	0,396	0,410	0,424

¹⁾ Calculation of the displacement

 $\delta_{\text{N0}} = \delta_{\text{N0}}\text{-factor } \cdot \tau; \hspace{1cm} \tau\text{: action bond stress for tension}$

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

Table C13: Displacements under shear load¹⁾

Threaded rod	M8	M10	M12	M16	M20	M24	M27	M30		
Uncracked and cracked concrete under static and quasi-static action for a working life of 50 and 100 years										
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]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05

¹⁾ Calculation of the displacement

 $\delta v_0 = \delta v_0 \text{-factor } \cdot V; \hspace{1cm} V \text{: action shear load}$

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

Performances

Displacements under static and quasi-static action for a working life of 50 and 100 years (threaded rod)

Annex C 12



Table C14: Displ	acements u	ınder tension	load ¹⁾					
Internal threaded anche	or rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Uncracked concrete un	der static and	quasi-static actio	n for a wo	rking life	of 50 and 1	00 years		
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,032	0,034	0,037	0,039	0,042	0,046
I: 24°C/40°C II: 50°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,042	0,044	0,047	0,051	0,054	0,060
Temperature range III: 72°C/120°C	δ _{N0} -factor	[mm/(N/mm²)]	0,034	0,035	0,038	0,041	0,044	0,048
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,044	0,045	0,049	0,053	0,056	0,062
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,126	0,131	0,142	0,153	0,163	0,179
IV: 100°C/160°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,129	0,135	0,146	0,157	0,168	0,184
Cracked concrete unde	r static and qu	asi-static action	ior a work	ing life of	50 and 100	years		
Temperature range I: 24°C/40°C	δ_{N0} -factor	[mm/(N/mm²)]	0,083	0,085	0,090	0,095	0,099	0,106
II: 50°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,170	0,110	0,116	0,122	0,128	0,137
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,086	0,088	0,093	0,098	0,103	0,110
III: 72°C/120°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,111	0,114	0,121	0,127	0,133	0,143
Temperature range	δ_{N0} -factor	[mm/(N/mm²)]	0,321	0,330	0,349	0,367	0,385	0,412
IV: 100°C/160°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,330	0,340	0,358	0,377	0,396	0,424

¹⁾ Calculation of the displacement

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

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

Table C15: Displacements under shear load¹⁾

Internal threaded	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20			
Uncracked and cracked concrete under static and quasi-static action for a working life of 50 and 100 years									
All temperature	δ _{V0} -factor	[mm/kN]	0,07	0,06	0,06	0,05	0,04	0,04	
ranges	$\delta_{V\infty}$ -factor	[mm/kN]	0,10	0,09	0,08	0,08	0,06	0,06	

¹⁾ Calculation of the displacement

 $\delta_{V0} = \delta_{V0} \text{-factor } \cdot \text{V}; \hspace{1cm} \text{V: action shear load}$

 $\delta v_{\infty} = \delta v_{\infty}$ -factor $\cdot V$;

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete
Performances

Annex C 13

PerformancesDisplacements under static and quasi-static action for a working life of 50 and 100 years (internal threaded anchor rod)



Table C16:	Displace	ments under	tensi	on loa	ad ¹⁾							
Reinforcing bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Uncracked concre	ete under sta	atic and quasi-s	tatic ac	tion for	a work	ing life	of 50 a	nd 100	years			
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,031	0,032	0,034	0,035	0,037	0,039	0,042	0,043	0,045	0,048
I: 24°C/40°C II: 50°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,040	0,042	0,044	0,045	0,047	0,051	0,054	0,055	0,058	0,063
Temperature	δ_{N0} -factor	[mm/(N/mm²)]	0,032	0,034	0,035	0,036	0,038	0,041	0,044	0,045	0,047	0,050
range III: 72°C/120°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,042	0,044	0,045	0,047	0,049	0,053	0,056	0,057	0,060	0,065
Temperature	δ_{N0} -factor	[mm/(N/mm²)]	0,121	0,126	0,131	0,137	0,142	0,153	0,163	0,164	0,172	0,186
range IV: 100°C/160°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,124	0,129	0,135	0,141	0,146	0,157	0,168	0,169	0,177	0,192
Cracked concrete	under statio	and quasi-stat	ic actio	n for a	workin	g life of	f 50 and	100 ye	ears			
Temperature range	δ _{N0} -factor	[mm/(N/mm²)]	0,081	0,083	0,085	0,087	0,090	0,095	0,099	0,099	0,103	0,108
I: 24°C/40°C II: 50°C/80°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,104	0,107	0,110	0,113	0,116	0,122	0,128	0,128	0,133	0,141
Temperature	δ_{N0} -factor	[mm/(N/mm²)]	0,084	0,086	0,088	0,090	0,093	0,098	0,103	0,103	0,107	0,113
range III: 72°C/120°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,108	0,111	0,114	0,118	0,121	0,127	0,133	0,133	0,138	0,148
Temperature	δ _{N0} -factor	[mm/(N/mm²)]	0,312	0,321	0,330	0,340	0,349	0,367	0,385	0,385	0,399	0,425
range IV: 100°C/160°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,321	0,330	0,340	0,349	0,358	0,377	0,396	0,396	0,410	0,449

¹⁾ Calculation of the displacement

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

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

Table C17: Displacements under shear load¹⁾

Reinforcing bar				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Uncracked and cracked concrete under static and quasi-static action for a working life of 50 and 100 years												
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	$\delta_{V\infty}$ -factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05	0,04	0,04

¹⁾ Calculation of the displacement

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

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

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete

Performances

Displacements under static and quasi-static action for a working life of 50 and 100 years (rebar)

Annex C 14



Tab		racteristic va formance cat							ion			
Thread	M8	M10	M12	M16	M20	M24	M27	M30				
Steel f	ailure											
Charac	teristic tension res	stance	N _{Rk,s,eq,C1}	[kN]				1,0 •	N _{Rk,s}			
Partial	factor		γ _{Ms,N}	[-]				see Ta	able C1			
Combi	ined pull-out and	concrete failure										
Charac	teristic bond resist	ance in cracked a	nd uncracked	concrete C2	20/25							
<u>a</u>	I: 24°C/40°C	D	^τ Rk,eq,C1	[N/mm ²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
nperatu range	II: 50°C/80°C	Dry, wet concrete and	τRk,eq,C1	[N/mm ²]	7,0	7,5	8,0	9,0	8,5	7,0	7,0	7,0
Temperature range	III: 72°C/120°C	flooded bore hole	τ _{Rk,eq,C1}	[N/mm²]	6,0	6,5	7,0	7,5	7,0	6,0	6,0	6,0
"	IV: 100°C/160°C	Tible	τ _{Rk,eq,C1}	[N/mm ²]	5,5	5,5	6,0	6,5	6,0	5,5	5,5	5,5
Increas	sing factors for con-	crete	Ψc	[-]	1,0							
	cteristic bond resist concrete strength o	,	$\tau_{Rk,eq,C1} = \psi_{c} \cdot \tau_{Rk,eq,C1,(C20/25)}$									
Install	ation factor											
for dry	for dry and wet concrete HDB							1	,0			
			γ_{inst}	[-]	1,2							
for floo	ded bore hole	CAC						1	,4			

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 years (threaded rod)	Annex C 15



Table C19:		cteristic val										
Threaded rod	M8	M10	M12	M16	M20	M24	M27	M30				
Steel failure												
Characteristic tension	on resist	ance	N _{Rk,s,eq,C1}	[kN]				1,0 •	$N_{Rk,s}$			
Partial factor			γ _{Ms,N}	[-]				see Ta	able C1			
Combined pull-out and concrete failure												
Characteristic bond	resistar	ce in cracked a	nd uncracked o	concrete C2	0/25							
1: 24°C/40°C		Dry, wet concrete and	^τ Rk,eq,C1	[N/mm²]	5,5	6	6,5	6,5	6,5	6,5	6,5	6,5
Temperature angle II: 24°C/40°	flooded t		^τ Rk,eq,C1	[N/mm²]	5,5	6	6,5	6,5	6,5	6,5	6,5	6,5
Increasing factors for	or concre	ete	Ψc	[-]	1,0							
Characteristic bond resistance depending on the concrete strength class			τ	Rk,eq,C1 =	= Ψc * τ _{Rk,eq,C1,(C20/25)}							
Installation factor												
for dry and wet concrete CAC HDB				1,0								
		+	γ _{inst}	[-]					,2			
for flooded bore hol	е	CAC		1,4								

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 100 years (threaded rod)	Annex C 16



Table C20:	: Characteristic values of shear loads under seismic action (performance category C1) for a working life of 50 and 100 years											
Threaded rod				М8	M10	M12	M16	M20	M24	M27	M30	
Steel failure												
Characteristic she (Seismic C1)	ear resistance	V _{Rk,s,eq,C1}	[kN]				0,70) ∙ V ⁰ Rk	,s			
Partial factor		γ _{Ms,V}	[-]	see Table C1								
Factor for annula	Factor for annular gap $\alpha_{\rm gap}$ [-] 0,5 (1,0) ¹⁾											

¹⁾ Value in brackets valid for filled annular gab between fastener and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of shear loads under seismic action (performance category C1) (threaded rod)	Annex C 17



Table C21: Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 years

Reinfo	Reinforcing bar					Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32			
Steel f																	
Charac	Characteristic tension resistance N _{Rk,s,eq,C1} [kN]								1,0 • A	s fuk	1)						
Cross	section area		As	[mm²]	50	79	113	154	201	314	452	491	616	804			
Partial	factor		γ _{Ms,N}	[-]					1,	4 ²⁾							
Combi	Combined pull-out and concrete failure																
Charac	teristic bond resista	ance in crack	ed and uncra	cked cond	crete C	20/25											
ਯੂ ——	I: 24°C/40°C	Dry, wet	^τ Rk,eq,C1	[N/mm²]	5,5	5,5	6,0	6,5	6,5	6,5	6,5	7,0	7,0	7,0			
	II: 50°C/80°C	concrete and	^τ Rk,eq,C1	[N/mm²]	5,5	5,5	6,0	6,5	6,5	6,5	6,5	7,0	7,0	7,0			
perat	III: 72°C/120°C	flooded	^τ Rk,eq,C1	[N/mm²]	4,5	5,0	5,0	5,5	5,5	5,5	5,5	6,0	6,0	6,0			
Tem	IV: 100°C/160°C	bore hole	^τ Rk,eq,C1	[N/mm²]	4,0	4,5	4,5	5,0	5,0	5,0	5,0	5,0	5,0	5,0			
Increas	sing factors for cond	crete	Ψc	[-]	1,0												
	Characteristic bond resistance depending on the concrete strength			k,eq,C1 =				Ψ _c •	^τ Rk,ec	,C1,(C	20/25)		7,0 7,0 7,0 7,0 7,0 7,0 6,0 6,0 6,0				
Install	ation factor																
for dry	for dry and wet concrete CAC HDB									,0							
			γ _{inst}	Yinst [-]						,2							
for floo	ded bore hole	CAC							1	,4							

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

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 years (rebar)	Annex C 18

²⁾ in absence of national regulation



Table C22:	Characteristic values of tension loads under seismic action
	(performance category C1) for a working life of 100 years

Reinfo	orcing bar		Ø8	Ø 10	<i>(</i> X 12	CX 1/I	Ø 16	Ø 20	Ø 24	Ø 25	(X 28	(X 32		
Steel f					20	2 10	W 12	W 14	טו ש	N 20	X) 24	10 23	20 20	20 32
	Characteristic tension resistance N _{Rk,s,eq,C1} [kN]					1,0 • 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}				[-]	1,42)									
Combi	ined pull-out and o	concrete fail	ure											
Charac	cteristic bond resist	ance in crack	ed and uncra	acked cond	crete C	20/25								
Femperature range	I: 24°C/40°C	Dry, wet concrete	^τ Rk,eq,C1	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0
Tempe ran	II: 50°C/80°C	and flooded bore hole	τ _{Rk,eq,C1}	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,0	4,0	4,0	4,0	4,0
Increas	sing factors for con-	crete	Ψc	[-]	1,0									
Characteristic bond resistance depending on the concrete strength class			τ _R	ik,eq,C1 =	Ψ _C * ^τ Rk,eq,C1,(C20/25)									
Install	ation factor		•											
for day	for dry and wet concrete CAC HDB								1	,0				
loi dry			γinst	[-]					1	,2				
for floo	ded bore hole	CAC		$\tau_{\text{Rk,eq,C1}} = \qquad \qquad \psi_{\text{c}} \cdot \tau_{\text{Rk,eq,C}}$										

 $^{^{1)}\,\}mathbf{f}_{\mathrm{uk}}\,\mathrm{shall}$ be taken from the specifications of reinforcing bars

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C1) for a working life of 100 years (rebar)	Annex C 19

²⁾ in absence of national regulation



Table C23: Characteristic values of shear loads under seismic action (performance category C1) for a working life of 50 and 100 years												
Reinforcing bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure												
Characteristic shear resistance	$V_{Rk,s,eq}$	[kN]					0,35	· A _s	f _{uk} 1)			
Cross section area	A _s	[mm²]	1 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 (1,0)3)									

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

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of shear loads under seismic action (performance category C1) for a working life of 50 and 100 years (rebar)	Annex C 20

 ²⁾ in absence of national regulation
 3) Value in brackets valid for filled annular gab between fastener and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended



Tabl		ecteristic va ermance cat					on				
Thread	ed rod				M12	M12 M16 M20					
Steel fa	ailure			•							
Steel, s Stainles	teristic tension resisl trength class 8.8 ss Steel A4 and HCF h class ≥70	·	N _{Rk,s,eq,C2}	[kN]	1,0 ⋅ N _{Rk,s}						
Partial f	actor		γ _{Ms,N}	[-]		see Ta	ıble C1				
Combi	ned pull-out and co	ncrete failure		•							
Charac	teristic bond resistar	nce in cracked a	nd uncracked	concrete C20	/25						
ē	I: 24°C/40°C	Dr. wet	τ _{Rk,eq,C2}	[N/mm²]	3,6	3,5	3,3	2,3			
Temperature range	II: 50°C/80°C	Dry, wet concrete and	τ _{Rk,eq,C2}	[N/mm²]	3,6	3,5	3,3	2,3			
npe	III: 72°C/120°C	flooded bore	τ _{Rk,eq,C2}	[N/mm²]	3,1	3,0	2,8	2,0			
<u>a</u>	IV: 160°C/100°C	hole	τ _{Rk,eq,C2}	[N/mm²]	2,5	2,7	2,5	1,8			
Increas	ing factors for concr	ete	Ψс	[-]		1	,0				
	teristic bond resistar concrete strength cla			τ _{Rk,eq,C2} =	Ψc * [†] Rk,eq,C2,(C20/25)						
Installa	tion factor										
for dry and wet concrete CAC		γ _{inst}	[-]			1,0 1,2					
for flood	ded bore hole	CAC					,4				

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C2) for a working life of 50 years (threaded rod)	Annex C 21



Table C25:		ecteristic va ermance cat									
Threaded rod					M12	M16	M20	M24			
Steel failure								,			
Characteristic tensi Steel, strength clas Stainless Steel A4 Strength class ≥70	s 8.8	·	N _{Rk,s,eq,C2}	[kN]	1,0 • N _{Rk,s}						
Partial factor	tor Y _{Ms,N} [-] see Table C1										
Combined pull-ou	t and co	ncrete failure	•	•							
Characteristic bond	l resistar	nce in cracked a	nd uncracked	concrete C20	/25						
nperature range I: 54,0,40,0	.C	Dry, wet concrete and	^τ Rk,eq,C2	[N/mm²]	3,6	3,5	3,3	2,3			
Temperature range II: 50°C/80	°C	flooded bore hole	^τ Rk,eq,C2	[N/mm²]	3,6	3,5	3,3	2,3			
Increasing factors f	or concr	ete	Ψс	[-]		1,0					
Characteristic bond on the concrete stre				τ _{Rk,eq,C2} =	Ψc * ^τ Rk,eq,C2,(C20/25)						
Installation factor			•	<u>'</u>							
for dry and wet con	crete	CAC HDB	γinst	[-]	[-] 1,0						
for flooded bore ho	le	CAC	1	',			.4				

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension loads under seismic action (performance category C2) for a working life of 100 years (threaded rod)	Annex C 22



Table C26: Characteristic values of shear loads under seismic action (performance category C2) for a working life of 50 and 100 years											
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 T	see Table C1						
Factor for annular gap	$\alpha_{ m gap}$	[-]		0,5	(1,0)1)						

¹⁾ Value in brackets valid for filled annular gab between fastener and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended

Displacements under tension load Table C27:

Threaded rod		M12	M16	M20 M24				
Cracked concrete under seismic action (performance category C2) for a working life of 50 and 100 years								
All temperature	$\delta_{N,eq,C2(50\%)} = \delta_{N,eq,C2(DLS)}$	[mm]	0,24	0,27	0,29	0,27		
ranges	$\delta_{N,eq,C2(100\%)} = \delta_{N,eq,C2(ULS)}$	[mm]	0,55	0,51	0,50	0,58		

Displacements under shear load Table C28:

Threaded rod			M12 M16				
Cracked concrete under seismic action (performance category C2) for a working life of 50 and 100 years							
All temperature	$\delta_{V,eq,C2(50\%)} = \delta_{V,eq,C2(DLS)}$	[mm]	3,6	3,0	3,1	3,5	
ranges	$\delta_{V,eq,C2(100\%)} = \delta_{V,eq,C2(ULS)}$	[mm]	7,0	6,6	7,0	9,3	

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of shear loads Displacements under seismic action (performance category C2) for a working life of 50 and 100 years (threaded rod)	Annex C 23



Table C29: Characte hammer drilled he	drilled h	oles	(HD), co	mpres	sed ai							ner
Threaded rod					М8	M10	M12	M16	M20	M24	M27	M30
Steel failure												
Characteristic tension			Fire	30	1,1	1,7	3,0	5,7	8,8	12,7	16,5	20,2
resistance; Steel, Stainless Steel A2, A4 and HCR,	N _{Rk,s,fi}	[kN]	exposure	60	0,9	1,4	2,3	4,2	6,6	9,5	12,4	15,1
strength class 5.8 resp. 50	110,5,11	[]	time [min]	90	0,7	1,0	1,6	3,0	4,7	6,7	8,7	10,7
and higher	<u> </u>	<u> </u>		120	0,5	0,8	1,2	2,2	3,4	4,9	6,4	7,9
Characteristic bond resistagiven temperature θ	ance in cra	cked a	and uncrac	cked con	crete C	:20/25 ι	ip to C	50/60 u	nder fi	re cond	ditions	tor a
			θ < 2	4°C				1,	,0			
Temperature reduction factor	$k_{fi,p}(\theta)$	[-]	·] 24°C ≤ θ ≤ 379°C				1,30	01 • e ⁻⁰),011∙θ≤	1,0		
			θ > 37	79°C				0,	,0			
Reduction Factor K _{fi} (θ) [-]	100		150	200	250		00	350	4	00	450	
Characteristic bond		T	Te	emperatu	re θ [°C _.	J						
resistance for a given temperature (θ)	$\tau_{Rk,fi}(\theta)$		[N/mm²]			k _{fi,p} (θ) • τ _{Rk}	,cr,(C20/	⁽²⁵⁾ (25)		
Steel failure without lever	arm 	T		00		4 7	0.0	-	0.0	10.7	10.5	00.0
Characteristic shear resistance; Steel, Stainless			Fire	30 60	1,1 0,9	1,7 1,4	3,0 2,3	5,7 4,2	8,8 6,6	12,7 9,5	16,5 12,4	20,2 15,1
Steel A2, A4 and HCR,	$V_{Rk,s,fi}$	[kN]	exposure time	90	0,3	1,0	1,6	3,0	4,7	6,7	8,7	10,7
			[min]	120	0,5	0,8	1,2	2,2	3,4	4,9	6,4	7,9
		1			0,0	0,0	.,_	_,_	σ, .	.,0	0, .	1,0
and higher	(Server 1	0.000.00	111000000000000000000000000000000000000	Michigan Control
and higher Steel failure with lever arm Characteristic bending	<u> </u> 		Fire	30	1,1	2,2	4,7	12,0	23,4	40,4	59,9	81,0
and higher Steel failure with lever arm Characteristic bending moment; Steel, Stainless		[Nm¹	Fire -	30 60	1,1	2,2 1,8	4,7 3,5	12,0 9,0	23,4 17,5	40,4 30,3	59,9 44,9	81,0 60,7
and higher Steel failure with lever arm Characteristic bending moment; Steel, Stainless Steel A2, A4 and HCR, strength class 5.8 resp. 50	M ⁰ Rk,s,fi	[Nm]	exposure time	60 90	0,9 0,7	1,8 1,3	3,5 2,5	9,0 6,3	17,5 12,3	30,3 21,3	44,9 31,6	60,7 42,7
strength class 5.8 resp. 50 and higher Steel failure with lever arm Characteristic bending moment; Steel, Stainless Steel A2, A4 and HCR, strength class 5.8 resp. 50 and higher 1) \(\tau_{Rk,cr,(C20/25)} \) characterist	M ⁰ Rk,s,fi		exposure time [min]	60 90 120	0,9 0,7 0,5	1,8 1,3 1,0	3,5 2,5 1,8	9,0 6,3 4,7	17,5 12,3 9,1	30,3 21,3 15,7	44,9 31,6 23,3	60,7
and higher Steel failure with lever arm Characteristic bending moment; Steel, Stainless Steel A2, A4 and HCR, strength class 5.8 resp. 50 and higher	M ⁰ Rk,s,fi		exposure time [min]	60 90 120	0,9 0,7 0,5	1,8 1,3 1,0	3,5 2,5 1,8	9,0 6,3 4,7	17,5 12,3 9,1	30,3 21,3 15,7	44,9 31,6 23,3	60,7 42,7

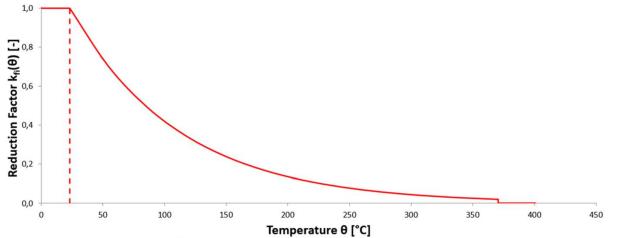


Table C30: Characteristic values of tension and shear loads under fire exposure in hammer drilled holes (HD), compressed air drilled holes (CD) and in hammer drilled holes with hollow drill bit (HDB)

Internal threaded anchor rods					IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure					•					
Characteristic tension resistance; Steel, Stainless Steel A4 and HCR, strength class 5.8 and 8.8 resp. 70	N _{Rk,s,fi}	[kN]	Fire exposure time [min]	30	0,3	1,1	1,7	3,0	5,7	8,8
				60	0,2	0,9	1,4	2,3	4,2	6,6
				90	0,2	0,7	1,0	1,6	3,0	4,7
				120	0,1	0,5	0,8	1,2	2,2	3,4

Characteristic bond resistance in cracked and uncracked concrete C20/25 up to C50/60 under fire conditions for a given temperature θ

Temperature reduction factor $\begin{vmatrix} k_{fi,p}(\theta) & \vdots \\ k_{fi,p}(\theta) & \vdots \end{vmatrix} = \begin{vmatrix} \theta < 24^{\circ}C & 1,0 \\ 24^{\circ}C \leq \theta \leq 379^{\circ}C & 1,301 \cdot e^{-0,011 \cdot \theta} \leq 1,0 \\ \theta > 379^{\circ}C & 0,0 \end{vmatrix}$



l .														
Characteristic bond resistance for a given temperature (θ)	$\tau_{Rk,fi}(\theta)$		[N/mm²]			$k_{fi,p}(\theta) \cdot \tau_{Rk,cr,(C20/25)}^{1)}$								
Steel failure without lever a	r arm Sh V _{Rk,s,fi} [kN] Fire exposure time [min]		20.			9		o:	200	350				
Characteristic shear			- Ciro	30	0,3	1,1	1,7	3,0	5,7	8,8				
resistance; Steel, Stainless	V	[LANI]	exposure time	60	0,2	0,9	1,4	2,3	4,2	6,6				
Steel A4 and HCR, strength	V Rk,s,fi	[KIN]		90	0,2	0,7	1,0	1,6	3,0	4,7				
class 5.8 and 8.8 resp. 70			[min]	120	0,1	0,5	0,8	1,2	2,2	3,4				
Steel failure with lever arm									201					
Characteristic bending			Fire	30	0,2	1,1	2,2	4,7	12,0	23,4				
	N/O	[Nlm]	evnosure	60	0,2	0,9	1,8	3,5	9,0	17,5				
	M ⁰ Rk,s,fi	[Nm]	ume	90	0,1	0,7	1,3	2,5	6,3	12,3				
class 5.8 and 8.8 resp. 70			[min]	120	0.1	0.5	1.0	1.8	47	9.1				

τ_{Rk,cr,(C20/25)} characteristic bond resistance for cracked concrete for concrete strength class C20/25 for the relevant temperature range

Injection System EJOT Multifix Hybrid / SORMAT ITH Hybrid for concrete	
Performances Characteristic values of tension and shear loads under fire exposure (internal threaded anchor rod)	Annex C 25



	teristic v r drilled holes wi	hole	s (HD), d	compre	esse	d air								er
Reinforcing bar					Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure								<u> </u>		2000				
				30	0,5	1,2	2,3	3,1	4,0	6,3	9,0	9,8	12,3	16,1
Characteristic tension			Fire	60	0,5	1,0	1,7	2,3	3,0	4,7	6,8	7,4	9,2	12,1
resistance; BSt 500	N _{Rk,s,fi}	[kN]	exposure time [min]	90	0,4	0,8	1,5	2,0	2,6	4,1	5,9	6,4	8,0	10,5
				120	0,3	0,6	1,1	1,5	2,0	3,1	4,5	4,9	6,2	8,0
Characteristic bond resis	stance in c	racke	d and unci	racked c	oncre	te C20)/25 u	p to C	50/60	unde	r fire o	condit	ions f	or a
given temperature θ			θ < 2	2°C					1	,0				
Temperature reduction	k _{fi n} (θ)	$k_{fi,p}(\theta)$ [-] $22^{\circ}C \le \theta \le 370^{\circ}C$						1.26	8 · e -	2000000	≤ 1.0			
factor	i,p(°)	$\theta > 370^{\circ}$.,		,0	,_			
Reduction Factor k _{ff} (θ) [-]	0 100	0	150	200 Tempera		250 250	30	0	350		400		450	
Characteristic bond				•	itui e (, [0]					-41			
resistance for a given temperature (θ)	$\tau_{Rk,fi}(\theta)$		[N/mm ²]		$k_{fi,p}(\theta) \cdot \tau_{Rk,cr,(C20/25)}^{1)}$									
Steel failure without leve	r arm													
				30	0,5	1,2	2,3	3,1	4,0	6,3	9,0	9,8	12,3	16,1
Characteristic shear	V	[LAN]	Fire	60	0,5	1,0	1,7	2,3	3,0	4,7	6,8	7,4	9,2	12,1
resistance; BSt 500	$V_{Rk,s,fi}$	[kN]	exposure time [min]	90	0,4	0,8	1,5	2,0	2,6	4,1	5,9	6,4	8,0	10,5
				120	0,3	0,6	1,1	1,5	2,0	3,1	4,5	4,9	6,2	8,0
Steel failure with lever ar	m													
			Fire	30	0,6	1,8	4,1	6,5	9,7	18,8	32,6		51,7	
Characteristic bending moment; BSt 500	M ⁰ Rk,s,fi	[Nm]	exposure	60	0,5	1,5	3,1	4,8	7,2	14,1		27,6	38,8	1000 1000
moment, Dot 500	4.8		time [min]	90	0,4	1,2	2,6	4,2	6,3	12,3		23,9	33,6	00 100/20
1) $ au_{ ext{Rk,cr,(C20/25)}}$ characteri temperature range	stic bond re	sistan	ce for crack	120 ed concre	0,3 ete for	0,9 concre	2,0 te stre	3,2 ngth c	4,8 lass C	9,4 20/25 1		18,4 releva	gen a recessored	38,6
Injection System EJOT	Multifix H	lybric	I / SORMA	т ітн н	ybrid	for co	oncre	te						