



Approval body for construction products and types of construction

**Bautechnisches Prüfamt** 

An institution established by the Federal and Laender Governments



# **European Technical Assessment**

ETA-20/1280 of 9 March 2021

English translation prepared by DIBt - Original version in German language

#### **General Part**

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment contains

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

Deutsches Institut für Bautechnik

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete

Bonded fastener for use in concrete

EJOT Baubefestigungen GmbH In der Stockwiese 35 57334 Bad Laasphe DEUTSCHLAND

**EJOT Herstellwerk 24** 

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

EAD 330499-01-0601, Edition 04/2020



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#### **Specific Part**

#### 1 Technical description of the product

The "Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete" is a bonded anchor consisting of a cartridge with injection mortar Injection mortar Multifix SE1000 Seismic and a steel element according to Annex A3 and A5.

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

The product description is given in Annex A.

## 2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 and/or 100 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

#### 3 Performance of the product and references to the methods used for its assessment

#### 3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	See Annex B 3, C 1 to C 5, C 7 to C 9, C 11 to C13
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 1, C 6, C 10, C 14
Displacements under short-term and long-term loading	See Annex C 15 to C 17
Characteristic resistance and displacements for seismic performance categories C1 and C2	See Annex C 18 to C 21

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

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



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

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

The system to be applied is: 1

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

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

Issued in Berlin on 9 March 2021 by Deutsches Institut für Bautechnik

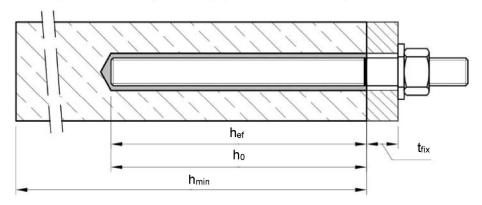
Dipl.-Ing. Beatrix Wittstock Head of Section beglaubigt: Baderschneider



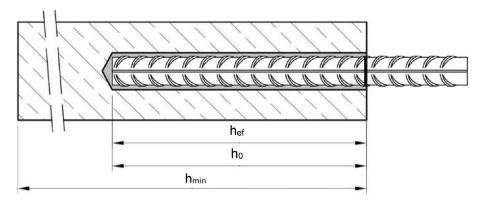
### Installation threaded rod M8 up to M30

prepositioned installation or

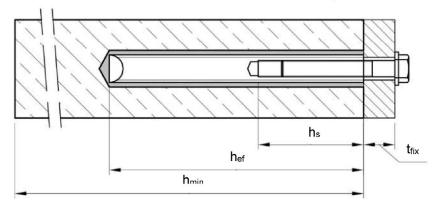
push through installation (annular gap filled with mortar)



## Installation reinforcing bar Ø8 up to Ø32



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



 $t_{fix}$  = thickness of fixture

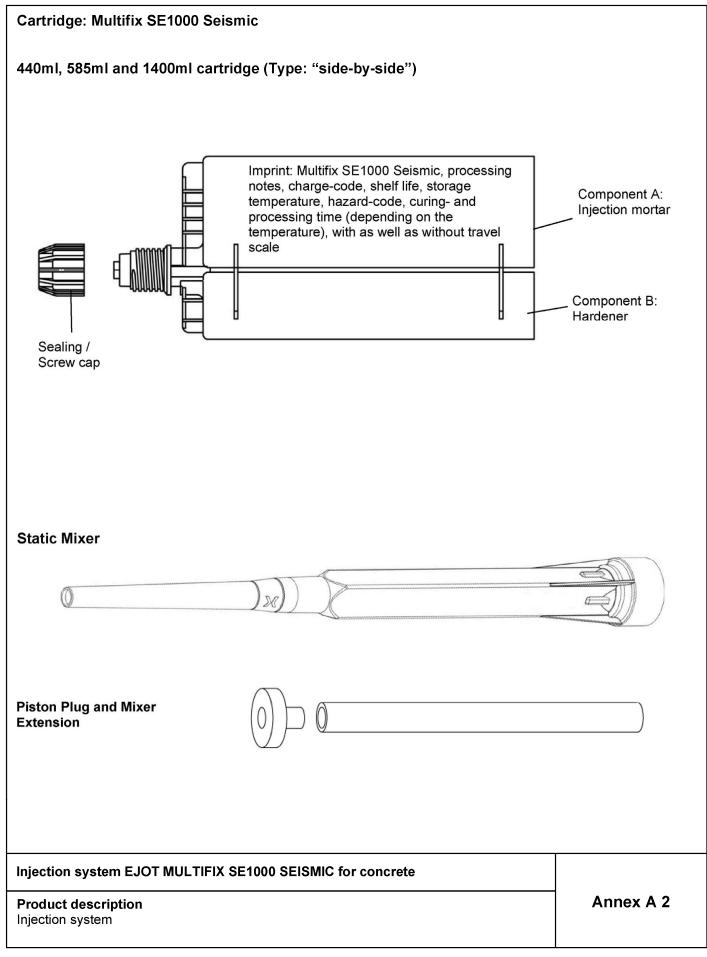
h<sub>ef</sub> = effective anchorage depth

 $h_0$  = depth of drill hole

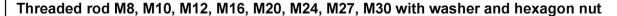
 $h_{min}$  = minimum thickness of member

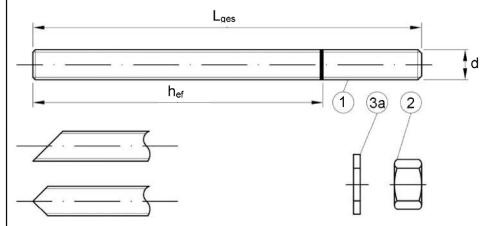
Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Product description Installed condition	Annex A 1







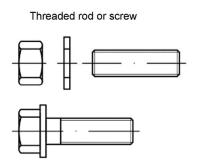


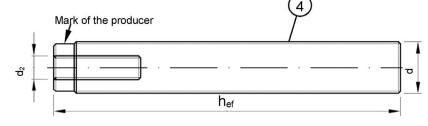


Commercial standard threaded rod with:

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







Marking: e.g. M8

Marking Internal thread

Mark

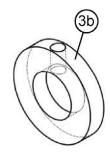
Thread size (Internal thread)

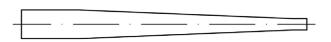
additional mark for stainless steel

HCR additional mark for high-corrosion resistance steel

## Filling washer and mixer reduction nozzle for filling the annular gap between anchor rod and fixture

Α4





### Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete

#### **Product description**

Threaded rod, internal threaded rod and filling washer

Annex A 3



Та	ble A1: Mater	ials						
Part	Designation	Material						
- zi - h	nc plated ≥ 5 ot-dip galvanised ≥ 4	acc. to EN 10087:1998  µm acc. to EN ISO  µm acc. to EN ISO  5 µm acc. to EN ISO	4042 146	2:1999 or 1:2009 and EN ISO 10684:	:2004+AC:2009 or			
Property class  Characteristic steel ultimate tensile strength  Property class  Characteristic steel yield strength  frac								
			4.6	f <sub>uk</sub> = 400 N/mm <sup>2</sup>	f <sub>vk</sub> = 240 N/mm <sup>2</sup>	A <sub>5</sub> > 8%		
1	Threaded rod		4.8	f <sub>uk</sub> = 400 N/mm²	f <sub>yk</sub> = 320 N/mm <sup>2</sup>	A <sub>5</sub> > 8%		
•	- moduod rod	acc. to EN ISO 898-1:2013	5.6	f <sub>uk</sub> = 500 N/mm²	f <sub>yk</sub> = 300 N/mm²	A <sub>5</sub> > 8%		
		EN 130 696-1.2013	5.8	f <sub>uk</sub> = 500 N/mm²	f <sub>yk</sub> = 400 N/mm²	A <sub>5</sub> > 8%		
			8.8	f <sub>uk</sub> = 800 N/mm²	f <sub>yk</sub> = 640 N/mm <sup>2</sup>	A <sub>5</sub> ≥ 12% <sup>3)</sup>		
		acc. to	4	for anchor rod class 4.6 o		•		
2	Hexagon nut	EN ISO 898-2:2012	5	for anchor rod class 5.6 o	r 5.8			
 3а	Washer			for anchor rod class 8.8 galvanised or sherardized EN ISO 7089:2000, EN ISC		7094·2000)		
3b	Filling washer			galvanised or sherardized				
, Internal threaded		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture		
4 anchor rod	acc. to	5.8	f <sub>uk</sub> = 500 N/mm <sup>2</sup>	f <sub>yk</sub> = 400 N/mm <sup>2</sup>	A <sub>5</sub> > 8%			
		EN ISO 898-1:2013	8.8	f <sub>uk</sub> = 800 N/mm²	f <sub>yk</sub> = 640 N/mm <sup>2</sup>	A <sub>5</sub> > 8%		
Stai	<b>nless steel A4</b> (Mate	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	to EN 10088-1:2014)			
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture		
1	Threaded rod <sup>1)4)</sup>	aded rod <sup>1)4)</sup>		f <sub>uk</sub> = 500 N/mm <sup>2</sup>	f <sub>yk</sub> = 210 N/mm²	A <sub>5</sub> ≥ 8%		
•		acc. to EN ISO 3506-1:2009	70	f <sub>uk</sub> = 700 N/mm²	f <sub>yk</sub> = 450 N/mm²	A <sub>5</sub> ≥ 12% <sup>3)</sup>		
		LN 130 3300-1.2009	80	f <sub>uk</sub> = 800 N/mm <sup>2</sup>	f <sub>yk</sub> = 600 N/mm <sup>2</sup>	A <sub>5</sub> ≥ 12% <sup>3)</sup>		
2	Hexagon nut 1)4)	acc. to EN ISO 3506-1:2009	70	for anchor rod class 50 for anchor rod class 70 for anchor rod class 80				
3а	Washer	A4: Material 1.4401 / HCR: Material 1.4529	' 1.44 9 or 1	.007 / 1.4311 / 1.4567 or 1.4 .04 / 1.4571 / 1.4362 or 1.4 1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISC	1578, acc. to EN 10088- I: 2014	1:2014		
3b	Filling washer	Stainless steel A4, H	igh c	orrosion resistance steel				
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture		
	Internal threaded			<u> </u>				
4	Internal threaded anchor rod <sup>1)2)</sup>	acc. to EN ISO 3506-1:2009	50	f <sub>uk</sub> = 500 N/mm <sup>2</sup> f <sub>uk</sub> = 700 N/mm <sup>2</sup>	$f_{yk} = 210 \text{ N/mm}^2$ $f_{vk} = 450 \text{ N/mm}^2$	A <sub>5</sub> > 8% A <sub>5</sub> > 8%		

<sup>&</sup>lt;sup>1)</sup> Property class 70 or 80 for anchor rods and hexagon nuts up to M24 and Internal threaded anchor rods up to IG-M16

<sup>4)</sup> Property class 80 only for stainless steel A4 and HCR

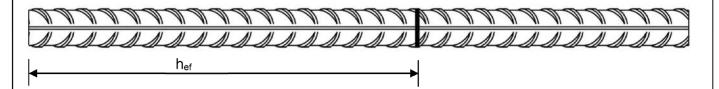
Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Product description Materials threaded rod and internal threaded rod	Annex A 4

<sup>&</sup>lt;sup>2)</sup> for IG-M20 only property class 50

 $<sup>^{3)}</sup>$  A<sub>5</sub> > 8% fracture elongation if <u>no</u> use for seismic performance category C2



Reinforcing bar  $\varnothing$  8,  $\varnothing$  10,  $\varnothing$  12,  $\varnothing$  14,  $\varnothing$  16,  $\varnothing$  20,  $\varnothing$  24,  $\varnothing$  25,  $\varnothing$  28,  $\varnothing$  32



- 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 ≤ h ≤ 0,07d
   (d: Nominal diameter of the bar; h: Rip height of the bar)

### Table A2: Materials

Part	Designation	Material
Reinf	forcing bars	
1	1 + N + 1997 - 1 - 1 - 2002 + 20 - 2010 + 2002 +	Bars and de-coiled rods class B or C $f_{yk}$ and k according to NDP or NCL of EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Product description Materials reinforcing bar	Annex A 5



Specifications of intended use  Anchorages subject to (Static and quasi-static loads):								
		ife of 50 years	for a working li	cracked concrete M30, Ø32, IG-M20 No performance assessed to +40 °C1)				
Base material	Non-cracked concrete	cracked concrete	Non-cracked concrete	cracked concrete				
Hammer drilling (HD), Hammer drilling with hollow drill bit (HDB) or compressed air drilling (CD)	Ø8 to	M30, Ø32, IG-M20	M8 to M30, Ø8 to Ø32, IG-M6 to IG-M20					
Diamond drilling (DD)	M8 to M30, Ø8 to Ø32, IG-M6 to IG-M20	Ø8 to Ø32, No репогмалсе		-				
Temperature Range:		to +40 °C¹) to +72 °C²)		to +40 °C¹) to +72 °C²)				

#### Anchorages subject to (Seismic action):

	for Performance Category C1	for Performance Category C2					
Base material	Cracked and non-	cracked concrete					
Hammer drilling (HD), Hammer drilling with hollow drill bit (HDB) or compressed air drilling (CD)	M8 to M30, Ø8 to Ø32	M12 to M24					
Diamond drilling (DD)	No performance assessed	No performance assessed					
Temperature Range:	I: -40 °C to +40 °C <sup>1)</sup> II: -40 °C to +72 °C <sup>2)</sup>	I: -40 °C to +40 °C <sup>1)</sup> II: -40 °C to +72 °C <sup>2)</sup>					

<sup>1) (</sup>max long term temperature +24 °C and max short term temperature +40 °C)

#### Base materials:

- Compacted, reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013 + A1:2016.
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A1:2016.

#### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials).
- For all other conditions according to EN 1993-1-4:2006+A1:2015 corresponding to corrosion resistance class:
  - Stainless steel Stahl A2 according to Annex 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

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Intended Use Specifications	Annex B 1

<sup>2) (</sup>max long term temperature +50 °C and max short term temperature +72 °C)

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#### Design:

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

#### Installation:

- Dry, wet concrete or flooded bore holes (not sea-water).
- · Hole drilling by hammer (HD), hollow (HDB), compressed air (CD) or diamond drill mode (DD).
- Overhead installation allowed.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Intended Use Specifications	Annex B 2



Table B1: Installation parameters for threaded rod											
Anchor size				M8	M10	M12	M16	M20	M24	M27	M30
Diameter of elemen	t	d = d <sub>nom</sub>	[mm]	8	10	12	16	20	24	27	30
Nominal drill hole di	ameter	d <sub>0</sub>	[mm]	10	12	14	18	22	28	30	35
Effective embedmer	at donth	h <sub>ef,min</sub>	[mm]	60	60	70	80	90	96	108	120
Ellective embedmen	it deptil	h <sub>ef,max</sub>	[mm]	160	200	240	320	400	480	540	600
Diameter of clearance hole in	Prepositioned ins		[mm]	9	12	14	18	22	26	30	33
the fixture	Push through i	nstallation d <sub>f</sub>	[mm]	12	14	16	20	24	30	33	40
Maximum torque mo	oment	max T <sub>inst</sub> ≤	[Nm]	10	20	40 <sup>1)</sup>	60	100	170	250	300
Minimum thickness of member h		h <sub>min</sub>	[mm]		<sub>f</sub> + 30 m : 100 mr			I	h <sub>ef</sub> + 2d <sub>0</sub>		
Minimum spacing s <sub>min</sub>		[mm]	40	50	60	75	95	115	125	140	
Minimum edge distance c <sub>min</sub>		[mm]	35	40	45	50	60	65	75	80	

<sup>&</sup>lt;sup>1)</sup> Maximum Torque moment for M12 with steel Grade 4.6 is 35 Nm

## Table B2: Installation parameters for rebar

Anchor size	Ø 8 <sup>1)</sup>	Ø 10¹)	Ø1	2 <sup>1)</sup>	Ø 14	Ø 16	Ø 20	Ø 24 <sup>1)</sup>	Ø 25 <sup>1)</sup>	Ø 28	Ø 32		
Diameter of element	d = d <sub>nom</sub>	[mm]	8	10	12	2	14	16	20	24	25	28	32
Nominal drill hole diameter	$d_0$	[mm]	10 12	12 14	14	16	18	20	25	30 32	30 32	35	40
Effective embedment depth	h <sub>ef,min</sub>	[mm]	60	60	70	)	75	80	90	96	100	112	128
Enective embedment depth	h <sub>ef,max</sub>	[mm]	160	200	24	0	280	320	400	480	500	560	640
Minimum thickness of member	h <sub>min</sub>	[mm]		30 mm 00 mm	2	h <sub>ef</sub> + 2d <sub>0</sub>							
Minimum spacing	s <sub>min</sub>	[mm]	40	50	60	כ כ	70	75	95	120	120	130	150
Minimum edge distance	c <sub>min</sub>	[mm]	35	40	45	5	50	50	60	70	70	75	85

<sup>1)</sup> both nominal drill hole diameter can be used

### Table B3: Installation parameters for Internal threaded anchor rod

Anchor size			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Internal diameter of anchor rod	d <sub>2</sub>	[mm]	6	8	10	12	16	20
Outer diameter of anchor rod <sup>1)</sup>	d = d <sub>nom</sub>	[mm]	10	12	16	20	24	30
Nominal drill hole diameter	d <sub>0</sub>	[mm]	12	14	18	22	28	35
Effective embedment death	h <sub>ef,min</sub>	[mm]	60	70	80	90	96	120
Effective embedment depth	h <sub>ef,max</sub>		200	240	320	400	480	600
Diameter of clearance hole in the fixture	d <sub>f</sub> ≤	[mm]	7	9	12	14	18	22
Maximum torque moment	max T <sub>inst</sub> ≤	[Nm]	10	10	20	40	60	100
Thread engagement length min/max	I <sub>IG</sub>	[mm]	8/20	8/20	10/25	12/30	16/32	20/40
Minimum thickness of member	h <sub>min</sub>	[mm]	h <sub>ef</sub> + 30 mm ≥ 100 mm			h <sub>ef</sub> +	- 2d <sub>0</sub>	
Minimum spacing	s <sub>min</sub>	[mm]	50	60	75	95	115	140
Minimum edge distance	c <sub>min</sub>	[mm]	40	45	50	60	65	80

<sup>1)</sup> With metric threads according to EN 1993-1-8:2005+AC:2009

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Intended Use Installation parameters	Annex B 3

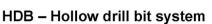


Table B4: Parameter cleaning and setting tools										
				The same of the sa						
Threaded Rod	Rebar	Internal threaded anchor rod	d <sub>0</sub> Drill bit - Ø HD, HDB, CD, DD	'l min. I		Piston plug	Installatio of	n directio piston plu		
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]		1	<b>→</b>	1
M8	8		10	RB10	11,5	10,5		•		
M10	8 / 10	IG-M6	12	RB12	13,5	12,5		No plue	roguirod	
M12	10 / 12	IG-M8	14	RB14	15,5	14,5		No plug	required	
	12		16	RB16	17,5	16,5				
M16	14	IG-M10	18	RB18	20,0	18,5	VS18			
	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 <sub>ef</sub> >	h <sub>ef</sub> >	
M24		IG-M16	28	RB28	30,0	28,5	VS28			all
M27	24 / 25		30	RB30	31,8	30,5	VS30	250 mm	250 mm	
	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			

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

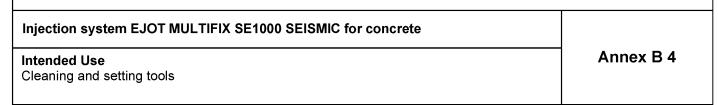
Drill bit diameter (d<sub>0</sub>): all diameters





Drill bit diameter (d<sub>0</sub>): all diameters

The hollow drill bit system contains the Heller Duster Expert hollow drill bit and a class M vacuum with minimum negative pressure of 253 hPa <u>and</u> flow rate of minimum 150 m³/h (42 l/s).





#### Installation instructions

#### Drilling of the bore hole (HD, HDB, CD)

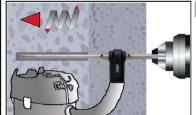


#### Hammer (HD) or compressed air drilling (CD)

Drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1, B2 or B3).

Proceed with Step 2.

In case of aborted drill hole, the drill hole shall be filled with mortar.



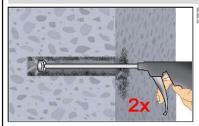
#### Hollow drill bit system (HDB) (see Annex B 3)

Drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1, B2 or B3). This drilling system removes the dust and cleans the bore hole during drilling (all conditions). Proceed with Step 3.

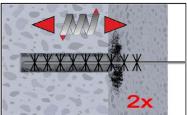
In case of aborted drill hole, the drill hole shall be filled with mortar.

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

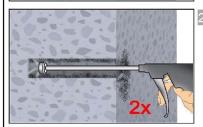
#### CAC: Cleaning for dry, wet and water-filled bore holes with all diameter in uncracked and cracked concrete



Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) (Annex B 4) a minimum of two times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used



Check brush diameter (Table B4). Brush the hole with an appropriate sized wire brush  $> d_{b,min}$  (Table B4) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension must be used.



Finally blow the hole clean again with compressed air (min. 6 bar) (Annex B 4) a minimum of two times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used.

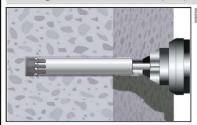
After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Intended Use Installation instructions	Annex B 5



#### Installation instructions (continuation)

#### Drilling of the bore hole (DD)



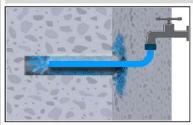
#### Diamond drilling (DD)

Drill with diamond drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1, B2, or B3). Proceed with Step 2.

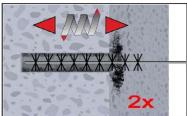
In case of aborted drill hole, the drill hole shall be filled with mortar.

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

#### SPCAC: Cleaning for dry, wet and water-filled bore holes with all diameter in uncracked and cracked concrete

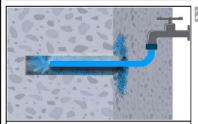


Rinsing with water until clear water comes out.

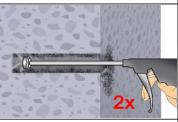


Check brush diameter (Table B4). Brush the hole with an appropriate sized wire brush > d<sub>b,min</sub> (Table B4) a minimum of two times.

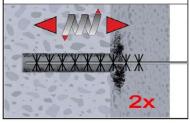
If the bore hole ground is not reached with the brush, a brush extension must be used.



Rinsing again with water until clear water comes out.



Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) (Annex B 4) a minimum of two times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used



Check brush diameter (Table B4). Brush the hole with an appropriate sized wire brush > d<sub>b,min</sub> (Table B4) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension must be used.

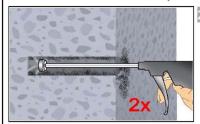
#### **Intended Use**

Installation instructions (continuation)

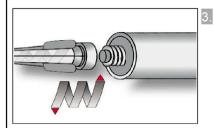
Annex B 6



#### Installation instructions (continuation)

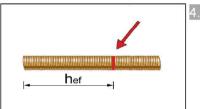


Finally blow the hole clean again with compressed air (min. 6 bar) (Annex B 4) a minimum of two times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used.

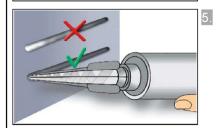


Attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool.

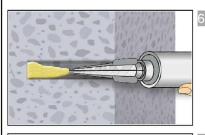
For every working interruption longer than the recommended working time (Table B5) as well as for new cartridges, a new static-mixer shall be used.



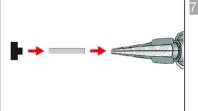
Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods.



Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent grey or red colour.



Starting from the bottom or back of the cleaned anchor hole, fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. If the bottom or back of the anchor hole is not reached, an appropriate extension nozzle must be used. Observe the gel-/ working times given in Table B5.



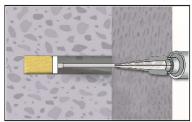
Piston plugs shall be used according to Table B4 for the following applications:

- Horizontal assembly (horizontal direction) and ground erection (vertical downwards direction): Drill bit-Ø d<sub>0</sub> ≥ 18 mm and embedment depth h<sub>ef</sub> > 250mm
- Overhead assembly (vertical upwards direction): Drill bit-Ø d<sub>0</sub> ≥ 18 mm
   Assemble mixing nozzle, mixer extension and piston plug before injecting mortar.

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Intended Use Installation instructions (continuation)	Annex B 7



#### Installation instructions (continuation)



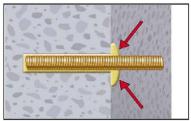
Insert piston plug to back of the hole and inject adhesive. If the bottom or back of the anchor hole is not reached, an appropriate extension nozzle must be used.

During injection the piston plug is naturally pushed out of the borehole by the back pressure of the mortar. Observe the gel-/ working times given in Table B5.

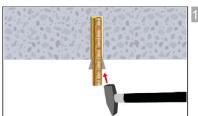


Push the fixing element into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment mark has reached the surface level.

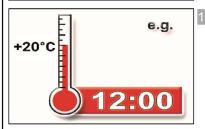
The anchor shall be free of dirt, grease, oil or other foreign material.



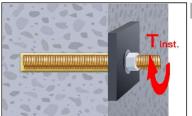
After inserting the anchor, the annular gab between anchor rod and concrete, in case of a push through installation additionally also the fixture, must be complete filled with mortar. If excess mortar is not visible at the top of the hole, the requirement is not fulfilled and the application has to be renewed.



For overhead application the anchor rod shall be fixed (e.g. wedges) until the mortar has started to harden.



Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B5).



After full curing, the add-on part can be installed with up to the max. torque (Table B1 or B3) by using a calibrated torque wrench. In case of prepositioned installation the annular gab between anchor and fixture can be optional filled with mortar. Therefor substitute the washer by the filling washer and connect the mixer reduction nozzle to the tip of the mixer. The annular gap is filled with mortar, when mortar oozes out of the washer.

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Intended Use Installation instructions (continuation)	Annex B 8



Table B5:	Ma	aximum w	orking time and mini	mum curing time			
Concrete temperature			Gelling working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete		
0 °C	to	+ 4 °C	90 min	144 h	288 h		
+ 5 °C	to	+ 9 °C	80 min	48 h	96 h		
+ 10 °C	to	+ 14 °C	60 min	28 h	56 h		
+ 15 °C	to	+ 19 °C	40 min	18 h	36 h		
+ 20 °C	to	+ 24 °C	30 min	12 h	24 h		
+ 25 °C	to	+ 34 °C	12 min	9 h	18 h		
+ 35 °C	to	+ 39 °C	8 min	6 h	12 h		
+4	0 °C		8 min	4 h	8 h		
Cartridge	temp	mperature +5°C to +40°C					

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Intended Use Curing time	Annex B 9



Table C1: Characteristic values for steel tension resistance and steel shear resistance of threaded rods											
Si	ze			M8	M10	M12	M16	M20	M24	M27	M30
Cr	oss section area	A <sub>s</sub>	[mm²]	36,6	58	84,3	157	245	353	459	561
Cr	naracteristic tension resistance, Steel failu	re <sup>1)</sup>		•							
Ste	eel, Property class 4.6 and 4.8	N <sub>Rk,s</sub>	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
Ste	eel, Property class 5.6 and 5.8	N <sub>Rk,s</sub>	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
Ste	eel, Property class 8.8	N <sub>Rk,s</sub>	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
Sta	ainless steel A2, A4 and HCR, class 50	N <sub>Rk,s</sub>	[kN]	18	29	42	79	123	177	230	281
Sta	ainless steel A2, A4 and HCR, class 70	N <sub>Rk,s</sub>	[kN]	26	41	59	110	171	247	_3)	_3)
Sta	ainless steel A4 and HCR, class 80	N <sub>Rk,s</sub>	[kN]	29	46	67	126	196	282	_3)	_3)
Cr	naracteristic tension resistance, Partial fac	tor <sup>2)</sup>									
Ste	eel, Property class 4.6 and 5.6	γ <sub>Ms,N</sub>	[-]				2,0	)			
Ste	eel, Property class 4.8, 5.8 and 8.8	γ <sub>Ms,N</sub>	[-]				1,5	5			
Sta	ainless steel A2, A4 and HCR, class 50	γMs,N	[-]				2,8	6			
Sta	ainless steel A2, A4 and HCR, class 70	γ <sub>Ms,N</sub>	[-]	1,87							
Stainless steel A4 and HCR, class 80 $\gamma_{Ms,N}$ [-] 1,6											
Cr	naracteristic shear resistance, Steel failure			•							ı
u	Steel, Property class 4.6 and 4.8	V <sup>0</sup> Rk,s	[kN]	9 (8)	14 (13)	20	38	59	85	110	135
r arm	Steel, Property class 5.6 and 5.8	V <sup>0</sup> Rk,s	[kN]	11 (10)	17 (16)	25	47	74	106	138	168
eve	Steel, Property class 8.8	V <sup>0</sup> Rk,s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
out	Stainless steel A2, A4 and HCR, class 50	V <sup>0</sup> Rk,s	[kN]	9	15	21	39	61	88	115	140
Without lever	Stainless steel A2, A4 and HCR, class 70	V <sup>0</sup> Rk,s	[kN]	13	20	30	55	86	124	_3)	_3)
>	Stainless steel A4 and HCR, class 80	V <sup>0</sup> Rk,s	[kN]	15	23	34	63	98	141	_3)	_3)
	Steel, Property class 4.6 and 4.8	M <sup>0</sup> Rk,s	[Nm]	15 (13)	30 (27)	52	133	260	449	666	900
arm	Steel, Property class 5.6 and 5.8	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123
	Steel, Property class 8.8	M <sup>0</sup> Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797
With lever	Stainless steel A2, A4 and HCR, class 50	M <sup>0</sup> Rk,s	[Nm]	19	37	66	167	325	561	832	1125
Wit	Stainless steel A2, A4 and HCR, class 70	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	26	52	92	232	454	784	_3)	_3)
	Stainless steel A4 and HCR, class 80	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	30	59	105	266	519	896	_3)	_3)
Cr	naracteristic shear resistance, Partial facto	r <sup>2)</sup>									
Ste	eel, Property class 4.6 and 5.6	γ <sub>Ms,V</sub>	[-]				1,6	7			
Ste	eel, Property class 4.8, 5.8 and 8.8	$\gamma_{Ms,V}$	[-]				1,2	5			
Sta	ainless steel A2, A4 and HCR, class 50	γ <sub>Ms,V</sub>	[-]				2,3	8			
Sta	ainless steel A2, A4 and HCR, class 70	γ <sub>Ms,V</sub>	[-]				1,5	6			
Sta	ainless steel A4 and HCR, class 80	$\gamma_{Ms,V}$	[-]	1,33							

<sup>&</sup>lt;sup>1)</sup> Values are only valid for the given stress area A<sub>s</sub>. Values in brackets are valid for undersized threaded rods with smaller stress area A<sub>s</sub> for hot-dip galvanised threaded rods according to EN ISO 10684:2004+AC:2009.

<sup>3)</sup> Anchor type not part of the ETA

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values for steel tension resistance and steel shear resistance of threaded rods	Annex C 1

<sup>&</sup>lt;sup>2)</sup> in absence of national regulation



Table C2:	Characteristic v	alues for C	Concrete co	one failure and Splitting with all kind
Anchor				All Anchor type and sizes
Concrete cone f	ailure			
Non-cracked con	crete	k <sub>ucr,N</sub>	[-]	11,0
Cracked concrete	<del></del>	k <sub>cr,N</sub>	[-]	7,7
Edge distance		c <sub>cr,N</sub>	[mm]	1,5 h <sub>ef</sub>
Axial distance		s <sub>cr,N</sub>	[mm]	2 c <sub>cr,N</sub>
Splitting		<u>.</u>		
	h/h <sub>ef</sub> ≥ 2,0			1,0 h <sub>ef</sub>
Edge distance	2,0 > h/h <sub>ef</sub> > 1,3	c <sub>cr,sp</sub>	[mm]	$2 \cdot h_{ef} \left( 2,5 - \frac{h}{h_{ef}} \right)$
	h/h <sub>ef</sub> ≤ 1,3			2,4 h <sub>ef</sub>
Axial distance		s <sub>cr,sp</sub>	[mm]	2 c <sub>cr,sp</sub>

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values for Concrete cone failure and Splitting with all kind of action	Annex C 2



	racteristic va on for a work			ls und	der st	atic a	and q	uasi-	static			
Anchor size threaded ro	d			M8	M10	M12	M16	M20	M24	M27	M30	
Steel failure		_										
Characteristic tension resi	istance	N <sub>Rk,s</sub>	[kN]			$A_{s} \cdot f_{l}$	<sub>uk</sub> (or s	ee Tab	le C1)			
Partial factor		$\gamma_{Ms,N}$	[-]	see Table C1								
Combined pull-out and o												
Characteristic bond resistant holes (CD)	ance in non-cracl	ked concrete C2	20/25 in hai	ammer drilled holes (HD) and compressed air drilled							ed	
Gmperature   range	°C/24°C Dry, wet concrete and flooded bore		[N/mm²] -	20	20	19	19	18	17	16	16	
d e II: 72°C/50°C	hole	<sup>τ</sup> Rk,ucr		15	15	15	14	13	13	12	12	
Characteristic bond resista	ance in non-cracl	ked concrete C2	20/25 in haı	mmer d	Irilled h	oles wi	th hollo	w drill	bit (HD	B)		
일 I: 40°C/24°C	Dry, wet			17	16	16	16	15	14	14	13	
1: 40°C/24°C     1: 72°C/50°C     1: 7	concrete		INI/	14	14	14	13	13	12	12	11	
1: 72°C/50°C 1: 40°C/24°C	flooded bore	<sup>τ</sup> Rk,ucr	[N/mm²]	16	16	16	15	15	14	14	13	
II: 72°C/50°C	hole			14	14	14	13	13	12	12	11	
Characteristic bond resista	□ ance in cracked o	oncrete C20/25	in hamme		d holes	(HD) .						
and with hollow drill bit (H		<u> </u>		l		,	'					
Temperature range II: 72°C/24°C	Dry, wet concrete and	<sup>τ</sup> Rk,cr	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	
-	flooded bore hole			6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	
Reduction factor $\psi^0_{sus}$ in holes (CD) and with hollow		cracked concre	ete C20/25 i	in hamı	mer dril	led hol	es (HD	), com <sub>l</sub>	oressed	d air dri	illed	
II: 72°C/24°C	Dry, wet	Ψ <sup>0</sup> sus	[-]	0,80								
II: 72°C/50°C	flooded bore hole			0,68								
		C25/30		1,02								
luoroosina footoro for con		C30/37						04				
Increasing factors for cond Ψ <sub>c</sub>	crete	C35/45 C40/50						07 08				
ΥC		C45/55						09				
		C50/60						10				
Concrete cone failure		1					-,					
Relevant parameter							see Ta	able C2				
Splitting												
Relevant parameter							see Ta	able C2				
Installation factor		1	T									
for dry and wet concrete (		$\gamma_{inst}$	[-]					,0				
for flooded bore hole (HD;	HDB, CD)						1	,2				
Injection system EJO	T MULTIFIX SE1	1000 SEISMIC	for concr	ete								
Performances Characteristic values of te	erformances haracteristic values of tension loads under static and quasi-static action								Anne	x C 3	}	
								<u> </u>				



Anchor size thread				00 years										
01 16 11	led ro	od			M8	M10	M12	M16	M20	M24	M27	M30		
Steel failure														
Characteristic tension	on res	istance	N <sub>Rk,s</sub>	[kN]	A <sub>s</sub> ⋅ f <sub>uk</sub> (or see Table C1)									
Partial factor			γ <sub>Ms,N</sub>	[-]	see Table C1									
Combined pull-out	and	concrete failure												
Characteristic bond holes (CD)	resist	ance in non-cracl	ked concrete C	20/25 in har	nmer d	rilled h	oles (H	D) and	compr	essed	air drill	ed		
II: 72°C/50°C	Dry, wet concrete and	Tou	[N/mm²]	20	20	19	19	18	17	16	16			
90 E II: 72°C/50°	,C	flooded bore hole	<sup>τ</sup> Rk,ucr,100	[14/111111-]	15	15	15	14	13	13	12	12		
Characteristic bond	resist	ance in non-cracl	ked concrete C	20/25 in har	nmer d	rilled h	oles wi	th hollo	w drill	bit (HD	B)			
인 I: 40°C/24°	,C	Dry, wet			17	16	16	16	15	14	14	13		
京		concrete		[N/mm²]	14	14	14	13	13	12	12	11		
II: 72°C/50°		flandad basa	<sup>τ</sup> Rk,ucr,100		16	16	16	15	15	14	14	13		
H: 40°C/24°C   H: 72°C/50°C   H: 72°C/50°C   H: 72°C/50°C		flooded bore hole			14	14	14	13	13	12	12	11		
Characteristic bond			 	E in hamma										
and with hollow drill			Concrete C20/2	3 III Hallille	uillec	1110162	(по) ,	compre	sseu a	iii uiiile	iu noie:	s (CD)		
I: 40°C/24		Dry, wet		[N] /ma .ma 27	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5		
90 Eg	,C	flooded bore hole	<sup>τ</sup> Rk,cr,100	[N/mm²]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5		
			C25/30		1,02									
			C30/37		1,04									
Increasing factors for	or con	crete	C35/45		1,07									
Ψc			C40/50		1,08									
			C45/55					1,	09					
			C50/60					1,	10					
Concrete cone fail														
Relevant parameter								see Ta	ble C2					
Splitting								200 To	bla CO					
Relevant parameter								see Ta	ble CZ					
Installation factor	erete (		T	<u> </u>				1	0					
for dry and wet concrete (HD; HDB, CD) for flooded bore hole (HD; HDB, CD)			$\gamma_{inst}$	[-]					2					
Tot hooded bole hol	, ערו)	, רוטם, סטו	1					- 1						

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values of tension loads under static and quasi-static action	Annex C 4



Table		racteristic va on for a work					atic a	ınd q	uasi-	static			
	r size threaded ro	d			M8	M10	M12	M16	M20	M24	M27	M30	
Steel fa													
Charac	teristic tension res	istance	N <sub>Rk,s</sub>	[kN]	A <sub>s</sub> ⋅ f <sub>uk</sub> (or see Table C1)								
Partial f	factor		γ <sub>Ms,N</sub> [-] see Table C1										
	ned pull-out and o												
Charac	teristic bond resist	ance in non-cracl	ked concrete C2	20/25 in dia	mond o	drilled h	oles ([	DD)	ı				
Temperature range	I: 40°C/24°C	Dry, wet concrete and	τ <sub>Rk,ucr</sub>	[N/mm²]	15	14	14	13	12	12	11	11	
	II: 72°C/50°C	flooded bore hole	,		12	12	11	10	9,5	9,5	9,0	9,0	
Reducti	ion factor ψ <sup>0</sup> sus in	non-cracked con	crete C20/25 in	diamond d	rilled ho	oles (Di	D)						
Temperature range	l: 40°C/24°C	Dry, wet concrete and	Ψ <sup>0</sup> sus	F 3				0,	77				
Tempe	Flooded bore hole		Ψ sus	[-]				0,	72				
			C25/30				1,	04					
			C30/37						08				
	ing factors for con	crete	C35/45					12					
$\Psi_{C}$			C40/50 C45/55		1,15 1,17								
			C45/55						17 19				
Combin	ned pull-out and o	concrete failure		life of 100 v	vears				10				
	teristic bond resist					drilled h	oles ([	)D)					
nt a l: 40°C/24°C □	Dry, wet concrete and	TDI: 100	[N/mm²]	15	14	14	13	12	12	11	11		
Tempe	II: 72°C/50°C	flooded bore hole	<sup>τ</sup> Rk,ucr,100		11 11 10 10 9,5 9,0 8,5 8							8,5	
		•	C25/30	1,04									
			C30/37					1,	08				
	ing factors for con	crete	C35/45						12				
$\Psi_{c}$			C40/50		1,15								
			C45/55		1,17								
Conera	ete cone failure		C50/60		1,19								
	nt parameter				Ι			see Ta	able C2	ı			
Splittin	•				<u>I</u>			330 16	02	•			
	nt parameter							see Ta	able C2	l 1			
	ition factor												
for dry a	and wet concrete (	DD)	γ	F 1				1	,0				
for flood	ded bore hole (DD)		γinst	[-]		1,2				1,4			
Injecti	ion system EJO	Γ MULTIFIX SE1	1000 SEISMIC	for concre	ete								
	Performances Characteristic values of tension loads under static and quasi-static action									Annex C 5			



Anchor size 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 <sup>0</sup> Rk,s	[kN]			0,6 •	A <sub>s</sub> ·f <sub>uk</sub>	(or see	Table C	1)	
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A2, A4 and HCR, all strength classes	V <sup>0</sup> Rk,s	[kN]			0,5 •	A <sub>s</sub> ∙ f <sub>uk</sub>	(or see	Table C	1)	
Partial factor	γ <sub>Ms,V</sub>	[-]				see	Table C	:1		
Ductility factor	k <sub>7</sub>	[-]	1,0							
Steel failure with lever arm										
Characteristic bending moment	M <sup>0</sup> Rk,s	[Nm]			1,2 • \	N <sub>el</sub> ∙ f <sub>uk</sub>	(or see	Table C	(1)	
Elastic section modulus	W <sub>el</sub>	[mm³]	31	62	109	277	541	935	1387	1874
Partial factor	γMs,V	[-]				see	Table C	:1		
Concrete pry-out failure	•									
Factor	k <sub>8</sub>	[-]					2,0			
Installation factor	γinst	[-]					1,0			
Concrete edge failure										
Effective length of fastener	I <sub>f</sub>	[mm]	min(h <sub>ef</sub> ; 12 · d <sub>nom</sub> ) min(h <sub>ef</sub> ; 300mm							300mm)
Outside diameter of fastener	d <sub>nom</sub>	[mm]	8	10	12	16	20	24	27	30
Installation factor	γinst	[-]					1,0			

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values of shear loads under static and quasi-static action	Annex C 6



Anchor size internal threade	ed anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure <sup>1)</sup>									•
Characteristic tension resistar	ice, <u>5.8</u>	N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123
Steel, strength class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196
Partial factor, strength class 5	.8 and 8.8	γ <sub>Ms,N</sub>	[-]			1	,5		
Characteristic tension resistar Steel A4 and HCR, Strength o		N <sub>Rk,s</sub>	[kN]	14	26	41	59	110	124
Partial factor		γ <sub>Ms,N</sub>	[-]			1,87			2,86
Combined pull-out and cond	rete cone failu								· · ·
Characteristic bond resistant holes (CD)			ete C20/2	5 in hamn	ner drilled	holes (HD	) and com	npressed a	air drilled
l: 40°C/24°C	Dry, wet			20	19	19	18	17	16
Temperature II: 72°C/50°C	concrete and flooded bore hole	<sup>τ</sup> Rk,ucr	[N/mm²]	15	15	14	13	13	12
Characteristic bond resistance	in non-cracked	concrete	C20/25 in	hammer	drilled hol	es with ho	llow drill b	oit (HDB)	
l: 40°C/24°C	Dry, wet			16	16	16	15	14	13
Temperature II: 72°C/50°C	concrete	_	[N1/27	14	14	13	13	12	11
range   1: 40°C/24°C	flooded bore	<sup>τ</sup> Rk,ucr	[N/mm²]	16	16	15	15	14	13
II: 72°C/50°C	hole			14	14	13	13	12	11
Characteristic bond resistance and with hollow drill bit (HDB)		crete C20	/25 in ham	nmer drille	ed holes (F	HD), comp	ressed air	drilled ho	les (CD)
emperature : 40°C/24°C	Dry, wet concrete and	<sup>τ</sup> Rk,cr	[N/mm²]	7,0	8,5	8,5	8,5	8,5	8,5
range II: 72°C/50°C	flooded bore hole			6,0	7,0	7,0	7,0	7,0	7,0
Reduction factor $\psi^0_{sus}$ in cradrilled holes (CD) and with ho			oncrete C	20/25 in I	hammer d	rilled hole:	s (HD), co	mpressed	l air
TemperatureI: 40°C/24°C	Dry, wet concrete and	0	[-]	0,80					
range II: 72°C/50°C	flooded bore hole	Ψ <sup>0</sup> sus		0,68					
	•	C2	5/30			1,	02		
			0/37				04		
Increasing factors for concrete	•		5/45 0/50				07 08		
Ψс			5/55				08 09		
			0/60				10		
Concrete cone failure									
Relevant parameter						see Ta	ble C2		
Splitting failure									
Relevant parameter						see Ta	ble C2		
Installation factor	LIDD OF:	1							
for dry and wet concrete (HD; for flooded bore hole (HD; HD)		γ <sub>inst</sub>	[-]				,0 ,2		
Fastenings (incl. nut and was     The characteristic tension re     For IG-M20 strength class 50	sher) must compl sistance for steel					rty class of	f the intern		d rod.
Injection system EJOT M		0 SEISM	IC for co	ncrete					
Performances Characteristic values of tension	n loads under sta	tic and qu	asi-static a	ction			/	Annex (	7



1,2

Table C8:		eristic value er a working				der stat	ic and o	quasi-s	tatic		
Anchor size int	ternal threaded	d anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
Steel failure <sup>1)</sup>						l					
Characteristic te	ension resistand	ce, 5.8	N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123	
Steel, strength of	class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196	
Partial factor, st	rength class 5.8	3 and 8.8	γ <sub>Ms,N</sub>	[-]	1,5					l	
Characteristic tension resistance, Stainless Steel A4 and HCR, Strength class 70 <sup>2)</sup>			N <sub>Rk,s</sub>	[kN]	14	26	41	59	110	124	
Partial factor			γ <sub>Ms,N</sub>	[-]		•	1,87			2,86	
Combined pull	-out and concr	ete cone failu	· ·								
Characteristic tholes (CD)	oond resistance	e in non-crack	ed concrete	e C20/25	in hamme	er drilled h	noles (HD)	and com	pressed a	air drilled	
<u> </u>	: 40°C/24°C	Dry, wet			20	19	19	18	17	16	
Temperature – range <sub> </sub>	l: 72°C/50°C	concrete and flooded bore hole	<sup>τ</sup> Rk,ucr,100		15	15	14	13	13	12	
Characteristic b	ond resistance	in non-cracked	concrete C	20/25 in h	ammer d	rilled hole	s with hol	low drill b	it (HDB)		
	l: 40°C/24°C [				16	16	16	15	14	13	
Temperature _		concrete	τRk,ucr,100	  [N/mm²]	14	14	13	13	12	11	
_	: 40°C/24°C	flooded bore		[[, (,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	16	16	15	15	14	13	
	1: 72°C/50°C	hole		E in hame	14	14	13	13	12	11	
Characteristic b and with hollow			crete C20/2	5 in hamn	ner drilled	i holes (H	D), compr	essed air	drilled ho	oles (CD)	
Temperature _	: 40°C/24°C	Dry, wet concrete and	τ <sub>Rk,ucr,100</sub>	[N]/mm <sup>2</sup> ]	6,5	7,5	7,5	7,5	7,5	7,5	
range <sub> </sub>	I: 72°C/50°C	flooded bore hole			5,5	6,5	6,5	6,5	6,5	6,5	
			C25					02			
Increasing facto	ere for concrete		C30					04			
$ \Psi_{C} $	is for concrete		C35					07 08			
ΨC			C40					09			
				/60	1,10						
Concrete cone	failure		•	'			•				
Relevant param	eter						see Ta	able C2			
Splitting failure											
Relevant param							see Ta	able C2			
Installation fac			T								
for dry and wet	concrete (HD; H	IDB, CD)	γ <sub>inst</sub>	[-]			1	,0			

<sup>&</sup>lt;sup>3)</sup> 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.

 $\gamma_{\text{inst}}$ 

[-]

for flooded bore hole (HD; HDB, CD)

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances	Annex C 8
Characteristic values of tension loads under static and quasi-static action	

<sup>&</sup>lt;sup>4)</sup> For IG-M20 strength class 50 is valid



	eristic value or a working				der stat	ic and o	quasi-s	tatic		
Anchor size internal threaded				IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20	
Steel failure <sup>1)</sup>						10				
Characteristic tension resistand	ce. 5.8	N <sub>Rk,s</sub>	[kN]	10	17	29	42	76	123	
Steel, strength class	8.8	N <sub>Rk,s</sub>	[kN]	16	27	46	67	121	196	
Partial factor, strength class 5.8		γ <sub>Ms,N</sub>	[-]				,5			
Characteristic tension resistant										
Steel A4 and HCR, Strength cla	, -	N <sub>Rk,s</sub>	[kN]	14	26	41	59	110	124	
Partial factor		γ <sub>Ms,N</sub>	[-]			1,87			2,86	
Combined pull-out and conci										
Characteristic bond resistance		ed concrete	e C20/25	ın dıamor	nd drilled	holes (DD I	)			
Temperature  : 40°C/24°C	Dry, wet	τ <sub>Rk,ucr</sub>	[N/mm²]	14	14	13	12	12	11	
range II: 72°C/50°C	flooded bore hole		<u> </u>	12	11	10	9,5	9,5	9,0	
Reduction factor $\psi^0_{sus}$ in non-	cracked concr	ete C20/25	in diamo	nd drilled	holes (Di	D)				
l: 40°C/24°C	Dry, wet concrete and	Ψ <sup>0</sup> sus	.,			0,	77			
range II: 72°C/50°C	flooded bore hole	Ψ sus	[-]			0,	72			
		C25	/30			1,	04			
		C30,	/37				08			
Increasing factors for concrete		C35					12			
Ψc		C40		1,15 1 17						
		C45		1,17 1,19						
		C50,		- ( 400 -		1,	19			
Combined pull-out and concr						nalaa (DD	<u> </u>			
Characteristic bond resistance	Dry, wet		C20/23 I							
Temperature I: 40°C/24°C range	concrete and flooded bore	τ <sub>Rk,ucr,100</sub>	[N/mm²]	14	14	13	12	12	11	
ll: 72°C/50°C	hole			11	10	10	9,5	9,0	8,5	
		C25	/30		•	1,	04			
		C30,				·	08			
Increasing factors for concrete		C35,					12			
$\Psi_{c}$		C40					15 17			
		C45					17 19			
Concrete cone failure		1 030	50			1,	10			
Relevant parameter						see Ta	able C2			
Splitting failure										
Relevant parameter						see Ta	able C2			
Installation factor										
for dry and wet concrete (DD)		] γ <sub>inst</sub>	[-]			1	,0			
for flooded bore hole (DD)				1,			1,			
<ol> <li>Fastenings (incl. nut and v rod. The characteristic ten</li> <li>For IG-M20 strength class</li> </ol>	sion resistance									
Injection system EJOT MU	LTIFIX SE100	0 SEISMIC	for cond	crete						
Performances Characteristic values of tension	loads under sta	tic and quas	i-static act	tion				Annex C	9	



Table C10: Character	istic va	alues of	shear	loads	under	static a	nd qua	si-stati	c action
Anchor size for internal threade	ed anch	or rods		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure without lever arm <sup>1)</sup>	1								
Characteristic shear resistance,	5.8	V <sup>0</sup> Rk,s	[kN]	5	9	15	21	38	61
Steel, strength class	8.8	V <sup>0</sup> Rk,s	[kN]	8	14	23	34	60	98
Partial factor, strength class 5.8 a	nd 8.8	γMs,∨	[-]				1,25		
Characteristic shear resistance, Stainless Steel A4 and HCR, Strength class 70 <sup>2)</sup>		V <sup>0</sup> Rk,s	[kN]	7	13	20	30	55	40
Partial factor		γ <sub>Ms,V</sub>	[-]			1,56			2,38
Ductility factor		k <sub>7</sub>	[-]				1,0		
Steel failure with lever arm <sup>1)</sup>									
Characteristic bending moment,	5.8	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	8	19	37	66	167	325
Steel, strength class	8.8	M <sup>0</sup> Rk,s	[Nm]	12	30	60	105	267	519
Partial factor, strength class 5.8 a	nd 8.8	γ <sub>Ms,V</sub>	[-]				1,25		
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 <sup>2)</sup>		M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	11	26	52	92	233	456
Partial factor		γMs,∨	[-]			1,56			2,38
Concrete pry-out failure									
Factor		k <sub>8</sub>	[-]				2,0		
Installation factor		γ <sub>inst</sub>	[-]				1,0		
Concrete edge failure		•	•	•					
Effective length of fastener		I <sub>f</sub>	[mm]		min(	(h <sub>ef</sub> ; 12 • o	d <sub>nom</sub> )		min(h <sub>ef</sub> ; 300mm
Outside diameter of fastener		d <sub>nom</sub>	[mm]	10	12	16	20	24	30
Installation factor		γ <sub>inst</sub>	[-]			•	1,0	•	

<sup>1)</sup> 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. <sup>2)</sup> For IG-M20 strength class 50 is valid

Annex C 10



Anchor size reinforcin Steel failure	g bar		o. 00 y		C 40	~						Table C11: Characteristic values of tension loads under static and quasi-static action for a working life of 50 years											
Characteristic tension re Cross section area	esistance	1			Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32										
Cross section area	esistance	acteristic tension resistance N <sub>Rk,s</sub>																					
		N <sub>Rk,s</sub>	[kN]					$A_s$ •	$f_{uk}^{1)}$														
Partial factor		A <sub>s</sub>	[mm²]	50	79	113	154	201	314	452	491	616	804										
artiar ractor		γ <sub>Ms,N</sub>	[-]					1,	<b>4</b> <sup>2)</sup>			•											
Combined pull-out and	d concrete failu	ire																					
Characteristic bond res	sistance in non-	-cracked co	ncrete C2	0/25 iı	n hami	mer dr	illed h	oles (F	ID) an	d com	presse	ed air c	Irilled										
ge ara	Dry, wet concrete and	<sup>⊄</sup> Rk,ucr	[N/mm²]	16	16	16	16	16	16	15	15	15	15										
	flooded bore hole			12	12	12	12	12	12	12	12	11	11										
Characteristic bond resi	stance in non-ci	racked conc	rete C20/2	5 in ha	ammer	drilled	holes	with I	nollow	drill bi	t (HDE	3)											
<u>ဗ</u> ္ဗ <u>l</u> : 40°C/24°C	Dry, wet			14	14	13	13	13	13	13	13	13	13										
1: 72°C/50°C	concrete	τ	[N]/mares 21	12	12	12	11	11	11	11	11	11	11										
en	flooded bore	<sup>₹</sup> Rk,ucr	[N/mm²]	13	13	13	13	13	13	13	13	13	13										
<sup>Ψ</sup> II: 72°C/50°C	hole			11	11	11	11	11	11	11	11	11	11										
Characteristic bond resi and with hollow drill bit (	Characteristic bond resistance in cracked concrete C20/25							)), con	press	ed air	drilled	holes	(CD)										
	Dry, wet			7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5										
ran	concrete and flooded bore hole	, -	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0										
drilled holes (CD) and v	ed concre	rete C20/25 in hammer drilled holes (HD), compressed air																					
era nge	Dry, wet concrete and	$\Psi^0$ sus	[-]	0,80																			
Hi: 72°C/50°C	flooded bore hole	1 343		0,68																			
		C25		1,02																			
		C30		1,04																			
Increasing factors for $\cos \Psi_{c}$	oncrete	C35,							07 08														
Ψ¢		C40/							08 09														
		C50							10														
Concrete cone failure																							
Relevant parameter								see Ta	ble C2	2													
Splitting																							
Relevant parameter							;	see Ta	ble C2	2													
Installation factor																							
for dry and wet concrete		γ <sub>inst</sub>	[-]	1,0																			
for flooded bore hole (H	•							1	,2														
1) f <sub>uk</sub> shall be taken from 2) in absence of national		is ot reintorci	ng pars																				
Injection system EJ0	OT MULTIFIX	SE1000 SE	ISMIC for	conc	rete																		
Performances Characteristic values of	Performances Characteristic values of tension loads under static and quasi-static action						Annex C 11																



Anchor size reinforcir	ng bar	<del>-</del>		Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 3
Steel failure													
Characteristic tension r	esistance	N <sub>Rk,s</sub>	[kN]					A <sub>s</sub> •	f <sub>uk</sub> 1)				
Cross section area		A <sub>s</sub>	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ <sub>Ms,N</sub>	[-]	1,4 <sup>2</sup> )									
Combined pull-out an	d concrete failu	· ·											
Characteristic bond re holes (CD)	sistance in non-	-cracked co	ncrete C2	20/25 i	n ham	mer dr	illed h	oles (F	HD) an	d com	presse	ed air c	Irilled
erature ge I: 40°C/24°C	Dry, wet concrete and	<i>T</i>	[N]/ma ma 21	16	16	16	16	16	16	15	15	15	15
II 7000/E000 I	flooded bore hole	<sup>T</sup> Rk,ucr,100	[N/mm²]	12	12	12	12	12	12	12	12	11	11
Characteristic bond res	rete C20/2	25 in h	amme	drilled	holes	with I	hollow	drill bi	t (HDE	3)			
စ္ l: 40°C/24°C	Dry, wet			14	14	13	13	13	13	13	13	13	13
	concrete		FA.17 23	12	12	12	11	11	11	11	11	11	11
1: 40°C/24°C   1: 40°C/24°C	flooded bore	<sup>τ</sup> Rk,ucr,100	[N/mm²]	13	13	13	13	13	13	13	13	13	13
□ II: 72°C/50°C	hole			11	11	11	11	11	11	11	11	11	11
Characteristic bond res and with hollow drill bit		ed concrete	C20/25 in	hamm	er drill	ed hol	es (HD	), con	npress	ed air	drilled	holes	(CD)
	Dry, wet concrete and	T	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5
اا: 72°C/50°C	flooded bore hole	<sup>τ</sup> Rk,cr,100	[[14/11111]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
		C25		1,02									
		C30.		1,04									
Increasing factors for co	oncrete	C35							07				
Ψс		C40,							08 09				
		C50							10				
Concrete cone failure								,					
Relevant parameter								see Ta	able C	2			
Splitting													
Relevant parameter					:	see Ta	able C2	2					
Installation factor		1											
for dry and wet concrete		γ <sub>inst</sub>	[-]	1,0									
for flooded bore hole (H	<u> </u>							1	,2				
1) f <sub>uk</sub> shall be taken from 2) in absence of nationa		s of reinforci	ng bars										

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values of tension loads under static and quasi-static action	Annex C 12



Table C13: Characteristic values of tension loads under static and quasi-static action for a working life of 50 and 100 years  Anchor size reinforcing bar    Ø 8   Ø 10   Ø 12   Ø 14   Ø 16   Ø 20   Ø 24   Ø 25   Ø 28   Ø 32													
Anchor size reinforci							Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure							ı					ı	
Characteristic tension	resistance	N <sub>Rk,s</sub>	[kN]					A <sub>s</sub> ·	f <sub>uk</sub> 1)				
Cross section area		As	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ <sub>Ms,N</sub>	[-]			l	l	1.	<b>4</b> <sup>2)</sup>		l	l	
Combined pull-out ar	nd concrete failu			of 50	vears			-,					
				0/25 in diamond drilled holes (DD)									
	Dry, wet			14	13	13	13	12	12	11	11	11	11
peratr   1: 40°C/24°C	concrete and	<sup>τ</sup> Rk,ucr	  [N/mm²]	'-	13	13	13	12	12	''	''	''	' '
Temperature Tange II: 72°C/50°C	flooded bore hole	- KK,UCI	[	11	11	10	10	10	9,5	9,5	9,5	9,0	9,0
Reduction factor ψ <sup>0</sup> su	<sub>s</sub> in non-cracked	concrete C	20/25 in o	diamor	nd drill	ed hol	es (DE	))					
हु है ।: 40°C/24°C	Dry, wet concrete and							0,	77				
emperation	flooded bore hole	$\Psi^0$ sus	[-]					0,	72				
'		C25	/30					1.	04				
	C30/37 1,08												
Increasing factors for o	concrete	/45	1,12										
$\Psi_{c}$		C40	/50					1,	15				
		C45							17				
	/60					1,	19						
Combined pull-out ar													
Characteristic bond re	esistance in non- T	-cracked co □	ncrete C2	20/25 i	n diam	iond d	rilled h	oles (l	(טכ)			I	
He	I: 40°C/24°C Dry wet	τ <sub>Rk,ucr,100</sub>	[N/mm²]	14	13	13	13	12	12	11	11	11	11
B 명 II: 72°C/50°C	flooded bore hole	148,461,100		11	10	10	10	9,5	9,0	9,0	9,0	8,5	8,5
		C25	/30					1,	04				
		C30							80				
Increasing factors for c	concrete	C35.							12				
Ψc		C40.		1,15 1,17									
		C45							17 19				
Concrete cone failure			, 50	<u> </u>				1,	10				
Relevant parameter	-							see Ta	able C	2			
Splitting				I						•			
Relevant parameter								see Ta	able C	2			
Installation factor				<u> </u>									
for dry and wet concre	te (DD)		.,					1	,0				
for flooded bore hole (I	• •	γinst	[-]		1	,2				1	,4		
1) f <sub>uk</sub> shall be taken from 2) in absence of nationa		ns of reinforci	ng bars										
Injection system E.	JOT MULTIFIX	SE1000 SE	ISMIC for	conc	rete								
Performances Characteristic values o	<b>Performances</b> Characteristic values of tension loads under static and quasi-s				on					Aı	nnex	C 13	<b>}</b>



Table C14: Characteris	tic values	of she	ar lo	ads ı	unde	er sta	itic a	ınd q	ıuasi-	static	actio	า
Anchor size 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			•	•			•					•
Characteristic shear resistance	V <sup>0</sup> Rk,s	[kN]					0,5	· A <sub>s</sub> ·	f <sub>uk</sub> 1)			
Cross section area	A <sub>s</sub>	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	γ <sub>Ms,V</sub>	[-]						1,5 <sup>2)</sup>	1			
Ductility factor	k <sub>7</sub>	[-]	1,0									
Steel failure with lever arm	•		•									
Characteristic bending moment	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	1.2 • W <sub>el</sub> • f <sub>uk</sub> <sup>1)</sup>									
Elastic section modulus	W <sub>el</sub>	[mm³]	50	98	170	269	402	785	1357	1534	2155	3217
Partial factor	γ <sub>Ms,V</sub>	[-]					•	1,5 <sup>2)</sup>				•
Concrete pry-out failure		•	•									
Factor	k <sub>8</sub>	[-]						2,0				
Installation factor	γinst	[-]						1,0				
Concrete edge failure	•	•										
Effective length of fastener	I <sub>f</sub>	[mm]	min(h <sub>ef</sub> ; 12 · d <sub>nom</sub> ) min(h <sub>ef</sub> ; 300mm)								mm)	
Outside diameter of fastener	d <sub>nom</sub>	[mm]	8	10	12	14	16	20	24	25	28	32
Installation factor	γinst	[-]		•	•	•	•	1,0		•		

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

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values of shear loads under static and quasi-static action	Annex C 14



Table C15:	Displacements under tension load <sup>1)</sup> in hammer drilled holes (HD),
	compressed air drilled holes (CD) and with hollow drill bit (HDB)

Anchor size threaded re	od		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete	under static	and quasi-static a	ction fo	r a work	ing life	of 50 an	d 100 ye	ars		
Temperature range l:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
Temperature range II:	δ <sub>N0</sub> -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,055	0,059	0,064	0,067	0,070
Cracked concrete unde	r static and	quasi-static actio	n for a w	orking l	ife of 50	and 10	) years			
Temperature range l:	δ <sub>N0</sub> -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,074	0,076	0,079	0,081	0,082
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,100	0,115	0,122	0,128	0,135	0,142	0,155	0,171
	$\delta_{ extsf{N0}} extsf{-factor}$	[mm/(N/mm²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
72°C/50°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229

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

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

#### Displacements under tension load<sup>1)</sup> in diamond drilled holes (DD) Table C16:

Anchor size threaded re	od		M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked concrete	under static	and quasi-static a	ction fo	r a work	ing life	of 50 yea	ars			
Temperature range l:	δ <sub>N0</sub> -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,018	0,019	0,019	0,020	0,022	0,023	0,024	0,025
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018
	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,052	0,053	0,055	0,058	0,062	0,065	0,068	0,070
Non-cracked concrete ι	ınder static a	ınd quasi-static a	ction for	a worki	ng life c	of 100 ye	ars			
Temperature range I:	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,020	0,021	0,021	0,023	0,024	0,025	0,026	0,027
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051

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

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

## Table C17: Displacements under shear load<sup>1)</sup> for all drilling methods

Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Non-cracked and cracked concrete under static and quasi-static action										
All temperature	$\delta_{ extsf{V0}} extsf{-} extsf{factor}$	[mm/kN]	0,06	0,06	0,05	0,04	0,04	0,03	0,03	0,03
ranges	$\delta_{ m V\infty}$ -factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05

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

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

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

### Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete

#### **Performances**

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

Annex C 15



Table C18:	Displacements under tension load <sup>1)</sup> in hammer drilled holes (HD),
	compressed air drilled holes (CD) and with hollow drill bit (HDB)

Anchor size Internal thro	eaded anchor i	rod	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Non-cracked concrete u								10 11120
Temperature range I:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,029	0,030	0,033	0,035	0,038	0,041
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,029	0,030	0,033	0,035	0,038	0,041
Temperature range II:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,039	0,040	0,044	0,047	0,051	0,055
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,049	0,051	0,055	0,059	0,064	0,070
Cracked concrete under	static and qua	si-static action	for a work	ing life of	50 and 100	years		
Temperature range I:	δ <sub>N0</sub> -factor	[mm/(N/mm²)]	0,071	0,072	0,074	0,076	0,079	0,082
40°C/24°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,115	0,122	0,128	0,135	0,142	0,171
Temperature range II:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,095	0,096	0,099	0,102	0,106	0,110
72°C/50°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,154	0,163	0,172	0,181	0,189	0,229

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

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

## Table C19: Displacements under tension load<sup>1)</sup> in diamond drilled holes (DD)

Anchor size Internal thr	nchor size Internal threaded anchor rod			IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Non-cracked concrete ι	ınder static an	d quasi-static ac	tion for a v	vorking life	e of 50 yea	irs		
Temperature range l:	δ <sub>N0</sub> -factor	[mm/(N/mm²)]	0,012	0,012	0,013	0,014	0,014	0,015
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,019	0,019	0,020	0,022	0,023	0,025
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,014	0,014	0,015	0,016	0,016	0,018
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,053	0,055	0,058	0,062	0,065	0,070
Non-cracked concrete ι	ınder static an	d quasi-static ac	tion for a v	vorking life	e of 100 ye	ars		
Temperature range l:	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,012	0,012	0,013	0,014	0,014	0,015
40°C/24°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,021	0,021	0,023	0,024	0,025	0,027
Temperature range II:	$\delta_{N0}$ -factor	[mm/(N/mm²)]	0,014	0,014	0,015	0,016	0,016	0,018
72°C/50°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,039	0,040	0,043	0,045	0,047	0,051

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

$$\begin{split} \delta_{\text{N0}} &= \delta_{\text{N0}}\text{-factor} \cdot \tau; \\ \delta_{\text{N}\infty} &= \delta_{\text{N}\infty}\text{-factor} \cdot \tau; \end{split}$$

τ: action bond stress for tension

## Table C20: Displacements under shear load<sup>1)</sup> for all drilling methods

Anchor size Inter	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20					
Non-cracked and cracked concrete under static and quasi-static action											
All temperature	$\delta_{ m V0}$ -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			

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

 $\delta_{V0} = \delta_{V0}$ -factor · V;

V: action shear load

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

## Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete

#### **Performances**

Displacements under static and quasi-static action (Internal threaded anchor rod)

Annex C 16



Table C21:	Displacements under tension load <sup>1)</sup> in hammer drilled holes (HD),
	compressed air drilled holes (CD) and with hollow drill bit (HDB)

Anchor size reinfo	rcing bar		Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Non-cracked cond	rete under s	static and quasi	-static a	action f	or a wo	rking li	ife of 50	and 10	00 year	S		
Temp range I:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,031	0,033	0,035	0,038	0,038	0,040	0,043
40°C/24°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,031	0,033	0,035	0,038	0,038	0,040	0,043
	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,042	0,044	0,047	0,051	0,051	0,054	0,058
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,053	0,055	0,059	0,065	0,065	0,068	0,072
Cracked concrete	under statio	and quasi-stat	ic actio	n for a	working	g life of	50 and	l 100 ye	ears			
Temp range I:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,073	0,074	0,076	0,079	0,079	0,081	0,084
40°C/24°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,115	0,122	0,128	0,135	0,142	0,155	0,171	0,171	0,181	0,194
Temp range II:	$\delta_{ extsf{N0}} extsf{-factor}$	[mm/(N/mm²)]	0,092	0,095	0,096	0,098	0,099	0,102	0,106	0,106	0,109	0,113
72°C/50°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,154	0,163	0,172	0,181	0,189	0,207	0,229	0,229	0,242	0,260

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

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

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

## Table C22: Displacements under tension load<sup>1)</sup> in diamond drilled holes (DD)

Anchor size reinfo	orcing bar		Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Non-cracked cond	rete under s	static and quasi	-static a	action f	or a wo	rking l	ife of 50	) years				
Temp range I:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,008	0,009	0,009	0,01	0,011	0,012	0,013	0,013	0,014	0,015
40°C/24°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,018	0,018	0,019	0,020	0,021	0,024	0,027	0,027	0,028	0,031
Temp range II:	$\delta_{\text{N0}}$ -factor	[mm/(N/mm²)]	0,009	0,011	0,011	0,012	0,013	0,014	0,015	0,015	0,016	0,018
72°C/50°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,048	0,051	0,054	0,058	0,061	0,068	0,076	0,076	0,081	0,088
Non-cracked cond	rete under s	static and quasi	-static a	action f	or a wo	rking l	ife of 10	00 years	S			
Temp range I:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,008	0,009	0,009	0,010	0,011	0,012	0,013	0,013	0,014	0,015
40°C/24°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,018	0,020	0,021	0,022	0,024	0,026	0,029	0,029	0,031	0,034
Temp range II:	$\delta_{ extsf{N0}} extsf{-factor}$	[mm/(N/mm²)]	0,009	0,011	0,011	0,012	0,013	0,014	0,015	0,015	0,016	0,018
72°C/50°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,035	0,037	0,040	0,042	0,045	0,049	0,055	0,055	0,059	0,064

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

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

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

## Table C23: Displacements under shear load<sup>1)</sup> for all drilling methods

Anchor size rein	Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32		
Non-cracked and cracked concrete under static and quasi-static action												
All temperature	$\delta_{ extsf{V0}}$ -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

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

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

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

## Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete

#### **Performances**

Displacements under static and quasi-static action (rebar)

Annex C 17



Table C24:	Characteristic values of tension load (performance category C1) for a work						ırs
Anchor size thre	aded rod	MR	M10	M12	M16	M20	М2

Anchor size threaded rod		M8	M10	M12	M16	M20	M24	M27	M30		
Steel failure											
Characteristic tension resistance	N <sub>Rk,s,eq,C1</sub>	[kN]	1,0 • N <sub>Rk,s</sub>								
Partial factor	γ <sub>Ms,N</sub>	[-]	see Table C1								
Combined pull-out and concrete fai	lure										
Characteristic bond resistance in cracked and non-cracked concrete C20/25 in hammer drilled holes (HD), compressed air											

Characteristic bond resistance in cracked and non-cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (CD) and with hollow drill bit (HDB)

arilled no	oles (CD) and with	nollow arill bit (F	1DB)									
Temperat ure range			<sup>τ</sup> Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
Tem ure r	II: 72°C/50°C	flooded bore hole	<sup>τ</sup> Rk,eq,C1	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0
Increasing factors for concrete ψ <sub>C</sub> C25.			C25/30 to	C50/60	1,0							
Installat	tion factor											
for dry a	and wet concrete (HD	D; HDB, CD)	γ <sub>inst</sub>	F 1	1,0							
for flood	for flooded bore hole (HD; HDB, CD)			[-]	1,2							
		-										

## Table C25: Characteristic values of shear loads under seismic action (performance category C1)

Anchor size threaded rod		M8	M10	M12	M16	M20	M24	M27	M30		
Steel failure											
Characteristic shear resistance (Seismic C1)	V <sub>Rk,s,eq,C1</sub>	[kN]	0,70 • V <sup>0</sup> <sub>Rk,s</sub>								
Partial factor	γ <sub>Ms,V</sub>	[-]		see Table C1							
Factor for annular gap	[-]	0,5 (1,0)1)									

<sup>&</sup>lt;sup>1)</sup> Value in brackets valid for filled annular gab between anchor and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended.

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values of tension and shear loads under seismic action (performance category C1) for a working life of 50 and 100 years (threaded rod)	Annex C 18



1,2

Table C26:	Characteristic values of tension loads under seismic action
	(performance category C1) for a working life of 50 and 100 years

Anchor size reinforcing bar					Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel f	ailure													
Charac	cteristic tension re	esistance	N <sub>Rk,s,eq,C1</sub>	[kN]					1,0 • A	s • f <sub>uk</sub>	1)			
Cross	section area		$A_s$	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial	factor		$\gamma_{Ms,N}$	[-]		•			1,	<b>4</b> <sup>2)</sup>				
Combi	ined pull-out an	d concrete failu	ire											
	cteristic bond res holes (CD) and v			cracked co	ncrete	C20/2	25 in h	amme	r drille	d hole	s (HD)	), comp	oresse	d air
rature ge	I: 40°C/24°C	Dry, wet	<sup>τ</sup> Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5
d flooded bore				[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0
Increasing factors for concrete $\psi_{\text{C}}$ C25/30 to C50/60					1,0									
Installation factor														
for dry and wet concrete (HD; HDB, CD)			1,0											
for flooded bore hole (HD: HDB, CD)			<sup>γ</sup> inst	[-]					1	2				

<sup>1)</sup> fuk shall be taken from the specifications of reinforcing bars

for flooded bore hole (HD; HDB, CD)

#### Table C27: Characteristic values of shear loads under seismic action (performance category C1)

Anchor size reinforcing bar				Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure												
Characteristic shear resistance	V <sub>Rk,s,eq,C1</sub>	[kN]	0,35 • A <sub>s</sub> • f <sub>uk</sub> <sup>1)</sup>									
Cross section area	A <sub>s</sub>	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	γ <sub>Ms,V</sub>	[-]	1,52)									
Factor for annular gap	$\alpha_{\sf gap}$	$\alpha_{\sf gap}$ [-] 0,5 (1,0) <sup>3)</sup>										

 $<sup>^{1)}\,</sup>f_{uk}$  shall be taken from the specifications of reinforcing bars

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values of tension and shear loads under seismic action (performance category C1) for a working life of 50 and 100 years (rebar)	Annex C 19

8.06.01-771/20 Z23550.21

<sup>2)</sup> in absence of national regulation

<sup>2)</sup> in absence of national regulation

<sup>3)</sup> Value in brackets valid for filled annular gab between anchor and clearance hole in the fixture. Use of special filling washer Annex A 3 is recommended.



#### Table C28: Characteristic values of tension loads under seismic action (performance category C2) for a working life of 50 and 100 years

Anchor size threaded rod		M12	M16	M20	M24	
Steel failure						
Characteristic tension resistance, Steel, strength class 8.8 Stainless Steel A4 and HCR, Strength class ≥70	N <sub>Rk,s,eq,C2</sub>	[kN]		1,0 •	$N_{Rk,s}$	
Partial factor	$\gamma_{Ms,N}$	[-]		see Ta	able C1	
Combined pull-out and concrete fail	ure					
Characteristic bond resistance in crack	ed and non-cracked	concrete C	20/25 in ham	mer drilled ho	oles (HD), con	npressed air

arillea i	noies (CD) and with	nollow arill bit (F	1DB)							
emperat re range	I: 40°C/24°C	Dry, wet concrete and	<sup>τ</sup> Rk,eq,C2	[N/mm²]	5,8	4,8	5,0	5,1		
Tem ure r	II: 72°C/50°C	flooded hore		[N/mm²]	5,0	4,1	4,3	4,4		
Increas	sing factors for concr	ete $\psi_{\mathbf{C}}$	C25/30 to	C50/60		1	,0			
Installa	ation factor									
for dry and wet concrete (HD; HDB, CD)			γ	α []		1,0				
for flooded bore hole (HD; HDB, CD)		$\gamma$ inst	[-]	1,2						
1										

#### Characteristic values of shear loads under seismic action Table C29: (performance category C2)

Anchor size threaded rod			M12	M16	M20	M24
Steel failure						
Characteristic shear resistance Steel, strength class 8.8 Stainless Steel A4 and HCR, Strength class ≥70	$V_{Rk,s,eq,C2}$	[kN]		0,70 •	V <sup>0</sup> Rk,s	
Partial factor	$\gamma_{Ms,V}$	[-]		see Ta	able C1	
Factor for annular gap	$\alpha_{\sf gap}$	[-]		0,5 (	(1,0) <sup>1)</sup>	

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

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Characteristic values of tension and shear loads under seismic action (performance category C2) for a working life of 50 and 100 years (threaded rod)	Annex C 20



Table C30: Displacements under tension load (threaded rod)										
Anchor size threaded rod M12 M16 M20 M24										
Non-cracked and c	racked concrete ur	nder seismic ac	tion (performan	ce category C2)						
All temperature	All temperature δ <sub>N,eq,C2(DLS)</sub> [mm] 0,21 0,24 0,27 0,36									
ranges	$\delta_{\text{N,eq,C2(ULS)}}$	[mm]	0,54	0,51	0,54	0,63				

## Table C31: Displacements under shear load (threaded rod)

Anchor size threa	ded rod		M12	M16	M20	M24
Non-cracked and	cracked concrete ι	ınder seismic act	ion (performand	e category C2)		
All temperature	$\delta_{V,eq,C2(DLS)}$	[mm]	3,1	3,4	3,5	4,2
ranges	$\delta_{V,eq,C2(ULS)}$	[mm]	6,0	7,6	7,3	10,9

Injection system EJOT MULTIFIX SE1000 SEISMIC for concrete	
Performances Displacements under seismic action (performance category C2) (threaded rods)	Annex C 21