



Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

ETA-21/0354 of 12 May 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:

Trade name of the construction product

Product family to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment contains

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

Deutsches Institut für Bautechnik

Fosroc Injection system Lokfix E77 for concrete

Bonded fastener for use in concrete

Fosroc International Limited
Drayton Manor Business Park Coleshill Road
TAMWORTH STAFFORDSHIRE; B78 3XN
GROSSBRITANNIEN

Fosroc Plant RC1

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

EAD 330499-01-0601, Edition 04/2020



European Technical Assessment ETA-21/0354

Page 2 of 39 | 12 May 2021

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European Technical Assessment ETA-21/0354

Page 3 of 39 | 12 May 2021

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Specific Part

1 Technical description of the product

The "Fosroc Injection system Lokfix E77 for concrete" is a bonded anchor consisting of a cartridge with injection mortar Injection mortar Lokfix E77 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



European Technical Assessment ETA-21/0354

Page 4 of 39 | 12 May 2021

English translation prepared by DIBt

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

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

The system to be applied is: 1

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

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

Issued in Berlin on 12 May 2021 by Deutsches Institut für Bautechnik

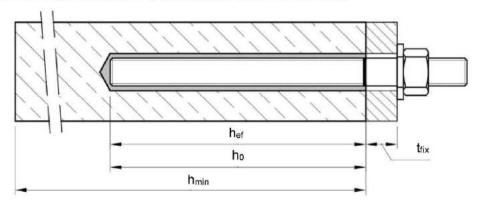
Dipl.-Ing. Beatrix Wittstock Head of Section beglaubigt: Baderschneider



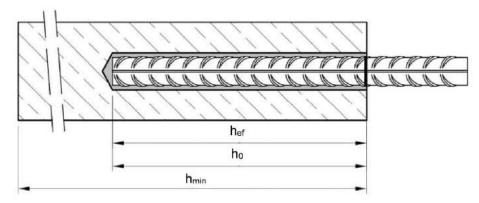
Installation threaded rod M8 up to M30

prepositioned installation or

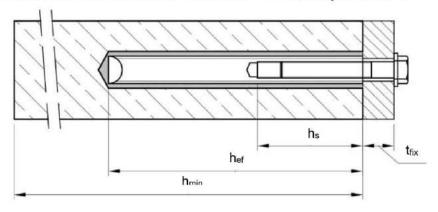
push through installation (annular gap filled with mortar)



Installation reinforcing bar Ø8 up to Ø32



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



 t_{fix} = thickness of fixture

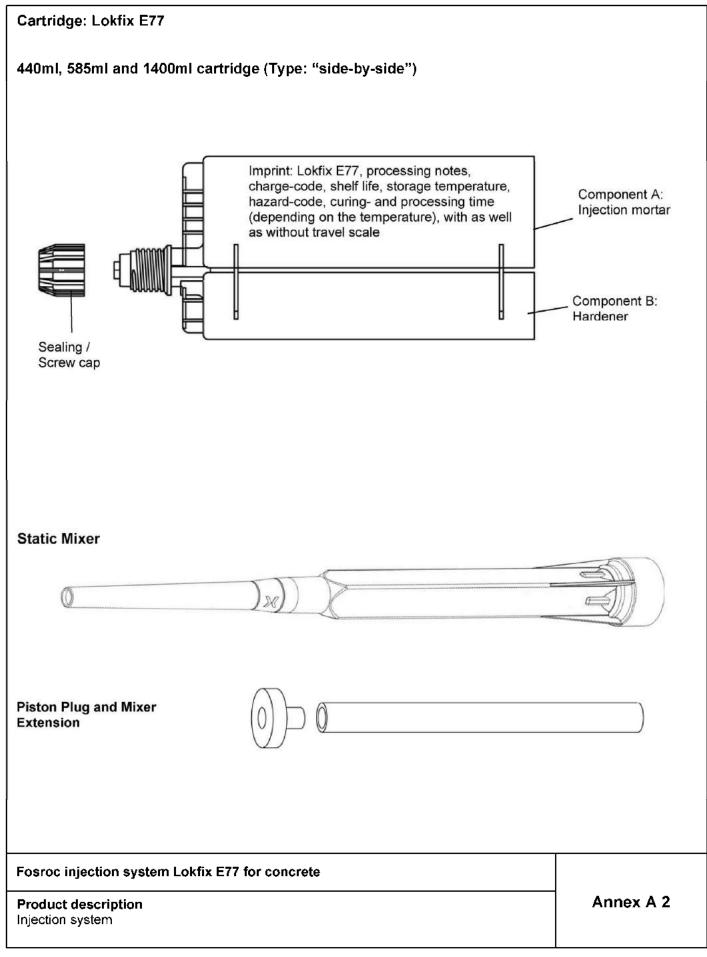
h_{ef} = effective anchorage depth

 h_0 = depth of drill hole

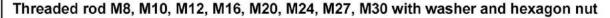
 h_{min} = minimum thickness of member

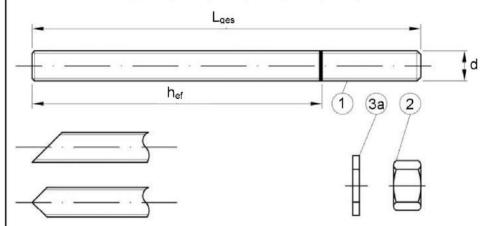
Fosroc injection system Lokfix E77 for concrete	
Product description Installed condition	Annex A 1







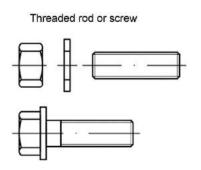


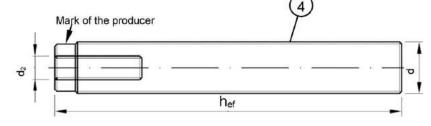


Commercial standard threaded rod with:

- 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

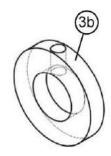
Marking Internal thread

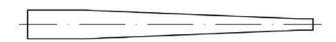
Mark

M8 Thread size (Internal thread)
A4 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





Fosroc injection system Lokfix E77 for concrete

Product description

Threaded rod, internal threaded rod and filling washer

Annex A 3



	ble A1: Materi	uis				
	Designation	Material				
zin hot	c plated ≥ 5 µ -dip galvanised ≥ 40		042:2 461.2	2018 or 2009 and EN ISO 10684:20	004+AC:2009 or	
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
			4.6	f _{uk} = 400 N/mm²	f _{yk} = 240 N/mm ²	A ₅ > 8%
1	Threaded rod		4.8	f _{uk} = 400 N/mm²	f _{yk} = 320 N/mm²	A ₅ > 8%
		acc. to EN ISO 898-1:2013	5.6	f _{uk} = 500 N/mm²	f _{yk} = 300 N/mm²	A ₅ > 8%
		EN 130 696-1.2013		f _{uk} = 500 N/mm²	f _{yk} = 400 N/mm²	A ₅ > 8%
			8.8	f _{uk} = 800 N/mm²	f _{yk} = 640 N/mm²	A ₅ ≥ 12% ³⁾
		acc. to	4	for anchor rod class 4.6 o	r 4.8	
2	Hexagon nut	EN ISO 898-2:2012	5	for anchor rod class 5.6 o	r 5.8	
			8	for anchor rod class 8.8		
3 a	Washer	(e.g.: EN ISO 887:20	06, E	galvanised or sherardized :N ISO 7089:2000, EN ISC	7093.2000 or EN ISO 7	7094:2000)
3b	Filling washer	Steel, zinc plated, ho	t-dip	galvanised or sherardized	Ta	T=
4 Internal threaded	Internal threaded	Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
		acc. to	6.0	f _{uk} = 500 N/mm²	f _{vk} = 400 N/mm²	A ₅ > 8%
					1	75 - 070
				f _{uk} = 800 N/mm²	f _{yk} = 640 N/mm²	A ₅ > 8%
itai	nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1	8.8 .431 .457	f _{uk} = 800 N/mm² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014)	
itai	nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45	8.8 .431 .457	f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t 1.4565, acc. to EN 10088 Characteristic steel	f _{yk} = 640 N/mm² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel	A ₅ > 8%
tai	nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1	8.8 .431 .457 29 ai	f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength	f _{yk} = 640 N/mm² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength	A ₅ > 8% Elongation at fracture
tai	nless steel A2 (Mater nless steel A4 (Mater	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 se steel (Material 1.45 Property class	8.8 .431 .457 29 oi	f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ²	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ²	$A_5 > 8\%$ Elongation at fracture $A_5 \ge 8\%$
tai ligh	nless steel A2 (Mater nless steel A4 (Mater n corrosion resistand	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 ce steel (Material 1.45	8.8 .431 .457 29 oi	f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ² f _{uk} = 700 N/mm ²	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ² f _{yk} = 450 N/mm ²	A ₅ > 8% Elongation at fracture A ₅ ≥ 8% A ₅ ≥ 12% ³
itai ligh	nless steel A2 (Mater nless steel A4 (Mater n corrosion resistand	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 re steel (Material 1.45 Property class acc. to	8.8 .431 .457 29 oi	f _{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f _{uk} = 500 N/mm ² f _{uk} = 700 N/mm ² f _{uk} = 800 N/mm ²	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ²	$A_5 > 8\%$ Elongation at fracture $A_5 \ge 8\%$
itai ligh	nless steel A2 (Materials steel A4 (Materials steel A4 (Materials standard) Threaded rod 1)4)	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 re steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020	8.8 .431 .457 29 oi 50 70 80 50	f_{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to EN 10088 Characteristic steel ultimate tensile strength f_{uk} = 500 N/mm ² f_{uk} = 700 N/mm ² f_{uk} = 800 N/mm ² for anchor rod class 50	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ² f _{yk} = 450 N/mm ²	A ₅ > 8% Elongation at fracture A ₅ ≥ 8% A ₅ ≥ 12% ³⁾
Stai Iigh	nless steel A2 (Mater nless steel A4 (Mater n corrosion resistand	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 re steel (Material 1.45 Property class acc. to	8.8 .431 .457 29 or 50 70 80 50 70	f_{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to EN 10088 Characteristic steel ultimate tensile strength f_{uk} = 500 N/mm ² f_{uk} = 700 N/mm ² f_{uk} = 800 N/mm ² for anchor rod class 50 for anchor rod class 70	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ² f _{yk} = 450 N/mm ²	A ₅ > 8% Elongation at fracture A ₅ ≥ 8% A ₅ ≥ 12% ³
Stai ligh	nless steel A2 (Materials steel A4 (Materials steel A4 (Materials standard) Threaded rod 1)4)	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 re steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4529	8.8 .431 .457 29 or 70 80 50 70 80 1.43 1.44	f_{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to EN 10088 Characteristic steel ultimate tensile strength f_{uk} = 500 N/mm ² f_{uk} = 700 N/mm ² f_{uk} = 800 N/mm ² for anchor rod class 50	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ² f _{yk} = 450 N/mm ² f _{yk} = 600 N/mm ² 541, acc. to EN 10088-1:2014	A ₅ > 8% Elongation at fracture A ₅ ≥ 8% A ₅ ≥ 12% ³⁾ A ₅ ≥ 12% ³⁾ E:2014 ::2014
Stai High	Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 re steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4529 (e.g.: EN ISO 887:20	8.8 .4311.457 29 or 70 80 70 80 1.43 1.44 9 or 1	f_{uk} = 800 N/mm ² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to EN 10088 Characteristic steel ultimate tensile strength f_{uk} = 500 N/mm ² f_{uk} = 700 N/mm ² f_{uk} = 800 N/mm ² for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 .4565, acc. to EN 10088-1 in ISO 7089:2000, EN ISO orrosion resistance steel	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ² f _{yk} = 450 N/mm ² f _{yk} = 600 N/mm ² 541, acc. to EN 10088-1:2014 7093.2000 or EN ISO 7	Elongation at fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$ El2014 El2014 F094:2000)
Stai ligh	Threaded rod 1)4) Hexagon nut 1)4) Washer Filling washer	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 re steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4529 (e.g.: EN ISO 887:20	8.8 .4311.457 29 or 70 80 70 80 1.43 1.44 9 or 1	f_{uk} = 800 N/mm² 1 / 1.4567 or 1.4541, acc. to 1 / 1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f_{uk} = 500 N/mm² f_{uk} = 700 N/mm² f_{uk} = 800 N/mm² for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.4 04 / 1.4571 / 1.4362 or 1.4 04 / 1.4571 / 1.4362 or 1.4 04 / 1.4565, acc. to EN 10088-1 IN ISO 7089:2000, EN ISO orrosion resistance steel Characteristic steel ultimate tensile strength	f _{yk} = 640 N/mm ² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm ² f _{yk} = 450 N/mm ² f _{yk} = 600 N/mm ² 541, acc. to EN 10088-1:2014	A ₅ > 8% Elongation at fracture A ₅ ≥ 8% A ₅ ≥ 12% ³⁾ A ₅ ≥ 12% ³⁾ E:2014 ::2014
1 2 3a	Threaded rod ¹⁾⁴⁾ Hexagon nut ¹⁾⁴⁾ Washer	EN ISO 898-1:2013 rial 1.4301 / 1.4307 / 1 rial 1.4401 / 1.4404 / 1 re steel (Material 1.45 Property class acc. to EN ISO 3506-1:2020 A2: Material 1.4301 / A4: Material 1.4401 / HCR: Material 1.4529 (e.g.: EN ISO 887:20 Stainless steel A4, H	8.8 .4311.457 29 or 70 80 70 80 1.43 1.44 9 or 1	f_{uk} = 800 N/mm² 1/1.4567 or 1.4541, acc. to 1/1.4362 or 1.4578, acc. to 1.4565, acc. to EN 10088 Characteristic steel ultimate tensile strength f_{uk} = 500 N/mm² f_{uk} = 700 N/mm² f_{uk} = 800 N/mm² for anchor rod class 50 for anchor rod class 70 for anchor rod class 80 07 / 1.4311 / 1.4567 or 1.404 / 1.4571 / 1.4362 or 1.404 / 1.4571 / 1.4362 or 1.4055, acc. to EN 10088-1 in ISO 7089:2000, EN ISO orrosion resistance steel Characteristic steel	f _{yk} = 640 N/mm² o EN 10088-1:2014) o EN 10088-1:2014) -1. 2014) Characteristic steel yield strength f _{yk} = 210 N/mm² f _{yk} = 450 N/mm² f _{yk} = 600 N/mm² 541, acc. to EN 10088-1:2014 7093.2000 or EN ISO 7	Elongation at fracture $A_5 \ge 8\%$ $A_5 \ge 8\%$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$ $A_5 \ge 12\%^{3}$ Elongation at 12014 12014 12014 12014 12014

¹⁾ Property class 70 or 80 for anchor rods and hexagon nuts up to M24 and Internal threaded anchor rods up to IG-M16

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

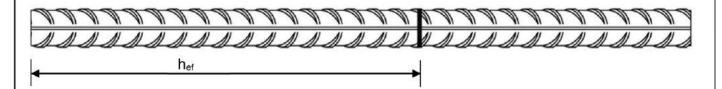
Fosroc injection system Lokfix E77 for concrete	
Product description Materials threaded rod and internal threaded rod	Annex A 4

²⁾ for IG-M20 only property class 50

 $^{^{3)}\,}A_5 > 8\%$ fracture elongation if \underline{no} 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	Rebar EN 1992-1-1:2004+AC:2010, Annex C	Bars and de-coiled rods class B or C f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$

Fosroc injection system Lokfix E77 for concrete	
Product description Materials reinforcing bar	Annex A 5



	Specificati	ons of intended us	e		
Anchorages subject to (Static	and quasi-static lo	oads):			
	for a working I	ife of 50 years	for a working li	ife of 100 years	
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	No performance assessed	M8 to M30, Ø8 to Ø32, IG-M6 to IG-M20	No performance assessed	
Temperature Range:		to +40 °C¹¹ to +72 °C²¹	I: -40 °C II: -40 °C		

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 °C¹) II: -40 °C to +72 °C²)	I: -40 °C to +40 °C ¹⁾ II: -40 °C to +72 °C ²⁾				

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

Base materials:

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

Use conditions (Environmental conditions):

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

Fosroc injection system Lokfix E77 for concrete	
Intended Use Specifications	Annex B 1

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

Page 11 of European Technical Assessment ETA-21/0354 of 12 May 2021

English translation prepared by DIBt



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.

Fosroc injection system Lokfix E77 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 element	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
5 #		h _{ef,min}	[mm]	60	60	70	80	90	96	108	120
Enective embedmer	Effective embedment depth			160	200	240	320	400	480	540	600
Diameter of	Prepositioned ins	tallation d _f ≤	[mm]	9	12	14	18	22	26	30	33
clearance hole in the fixture	Push through i	nstallation d _f	[mm]	12	14	16	20	24	30	33	40
Maximum torque mo	oment	max T _{inst} ≤	[Nm]	10	20	40 ¹⁾	60	100	170	250	300
Minimum thickness of member h _r		h _{min}	[mm]		_{if} + 30 m : 100 mr			ı	h _{ef} + 2d ₀		
Minimum spacing		s _{min}	[mm]	40	50	60	75	95	115	125	140
		c _{min}	[mm]	35	40	45	50	60	65	75	80

¹⁾ Maximum Torque moment for M12 with steel Grade 4.6 is 35 Nm

Table B2: Installation parameters for rebar

Anchor size				Ø 10¹)	Ø 12¹)	Ø 14	Ø 16	Ø 20	Ø 241)	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 depth	h _{ef,min}	[mm]	60	60	70	75	80	90	96	100	112	128
Enective 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 10 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

Anchor size	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20		
Internal diameter of anchor rod	d ₂	[mm]	6	8	10	12	16	20
Outer diameter of anchor rod ¹⁾	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 death	h _{ef,min}	[mm]	60	70	80	90	96	120
Effective embedment depth	h _{ef,max}	[mm]	200	240	320	400	480	600
Diameter of clearance hole in the fixture	d _f ≤	[mm]	7	9	12	14	18	22
Maximum torque moment	max T _{inst} ≤	[Nm]	10	10	20	40	60	100
Thread engagement length min/max	I _{IG}	[mm]	8/20	8/20	10/25	12/30	16/32	20/40
Minimum thickness of member	h _{min}	[mm]		30 mm 0 mm	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

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

Fosroc injection system Lokfix E77 for concrete	
Intended Use Installation parameters	Annex B 3

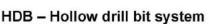


Table B4	Table B4: Parameter cleaning and setting tools									
		THE THREE PROPERTY OF THE PARTY			ename	HANKIN				
Threaded Rod	Rebar	Internal threaded anchor rod	d ₀ Drill bit - Ø HD, HDB, CD, DD	ı	l _b h - Ø	d _{b,min} min. Brush - Ø	Piston plug	Installatio of	n directio piston plu	
[mm]	[mm]	[mm]	[mm]		[mm]	[mm]		1	→	1
M8	8		10	BR10	11,5	10,5		•		
M10	8 / 10	IG-M6	12	BR12	13,5	12,5		No plue	roguirod	
M12	10 / 12	IG-M8	14	BR14	15,5	14,5		No plug	required	
	12		16	BR16	17,5	16,5				
M16	14	IG-M10	18	BR18	20,0	18,5	PP18			
	16		20	BR20	22,0	20,5	PP20			
M20		IG-M12	22	BR22	24,0	22,5	PP22			
	20		25	BR25	27,0	25,5	PP25	h . >	h _{ef} >	
M24		IG-M16	28	BR28	30,0	28,5	PP28	h _{ef} > 250 mm		all
M27	24 / 25		30	BR30	31,8	30,5	PP30		250 mm	
	24 / 25		32	BR32	34,0	32,5	PP32			
M30	28	IG-M20	35	BR35	37,0	35,5	PP35			
	32		40	BR40	43,5	40,5	PP40			

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

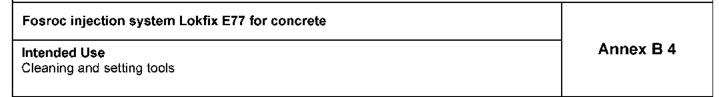
Drill bit diameter (d₀): all diameters





Drill bit diameter (d₀): all diameters

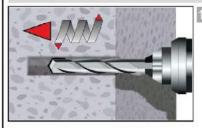
The hollow drill bit system contains the Heller Duster Expert hollow drill bit and a class M vacuum with minimum negative pressure of 253 hPa and flow rate of minimum 150 m³/h (42 l/s).





Installation instructions

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

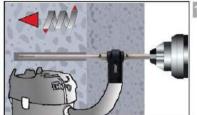


Hammer (HD) or compressed air drilling (CD)

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)

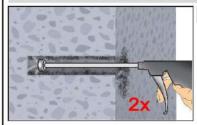
Drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1, B2 or B3). This drilling system removes the dust and cleans the bore hole during drilling (all conditions).

Proceed with Step 3.

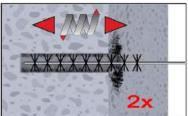
In case of aborted drill hole, the drill hole shall be filled with mortar.

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

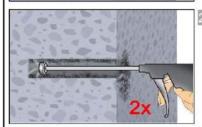
CAC: Cleaning for dry, wet and water-filled bore holes with all diameter in uncracked and cracked concrete



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.

Fosroc injection system Lokfix E77 for concrete	
Intended Use Installation instructions	Annex B 5



Installation instructions (continuation)

Drilling of the bore hole (DD)



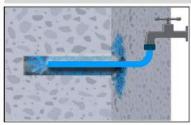
Diamond drilling (DD)

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.

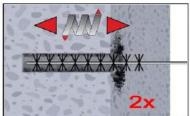
In case of aborted drill hole, the drill hole shall be filled with mortar.

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

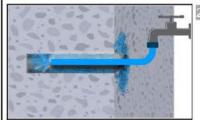


Rinsing with water until clear water comes out.

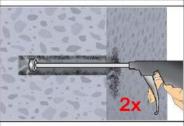


Check brush diameter (Table B4). Brush the hole with an appropriate sized wire brush > d_{b.min} (Table B4) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension must

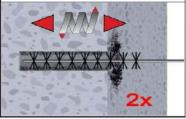
be used.



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



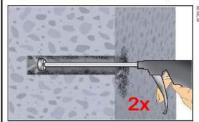
Check brush diameter (Table B4). Brush the hole with an appropriate sized wire brush > db,min (Table B4) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension must be used.

Fosroc injection system Lokfix E77 for concrete	
Intended Use Installation instructions (continuation)	Annex B 6

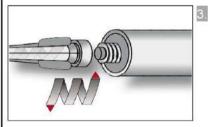
8.06.01-77/21 Z44660.21



Installation instructions (continuation)

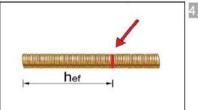


Finally blow the hole clean again with compressed air (min. 6 bar) (Annex B 4) a minimum of two times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used.

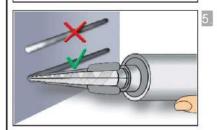


Attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool.

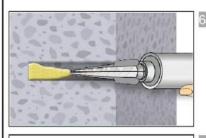
For every working interruption longer than the recommended working time (Table B5) as well as for new cartridges, a new static-mixer shall be used.



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.



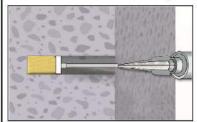
Piston plugs shall be used according to Table B4 for the following applications:

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

Fosroc injection system Lokfix E77 for concrete	
Intended Use Installation instructions (continuation)	Annex B 7

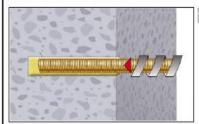


Installation instructions (continuation)



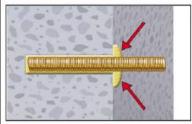
Insert piston plug to back of the hole and inject adhesive. If the bottom or back of the anchor hole is not reached, an appropriate extension nozzle must be used.

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.

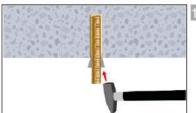


Push the fixing element into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment mark has reached the surface level.

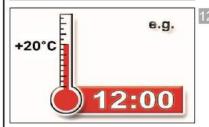
The anchor shall be free of dirt, grease, oil or other foreign material.



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.

Fosroc injection system Lokfix E77 for concrete	
Intended Use Installation instructions (continuation)	Annex B 8



Table B5:	Ma	aximum w	orking time and minir	num curing time				
Concrete temperature			Gelling working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete			
0°C	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	8 h				
Cartridge	temp	erature	+5°C to +40°C					

Fosroc injection system Lokfix E77 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	As	[mm²]	36,6	58	84,3	157	245	353	459	561
CI	naracteristic tension resistance, Steel failu	re 1)	•	'							
St	eel, Property class 4.6 and 4.8	N _{Rk,s}	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
St	eel, Property class 5.6 and 5.8	N _{Rk,s}	[kN]	18 (17)	29 (27)	42	78	122	176	230	280
St	eel, Property class 8.8	N _{Rk,s}	[kN]	29 (27)	46 (43)	67	125	196	282	368	449
St	ainless steel A2, A4 and HCR, class 50	N _{Rk,s}	[kN]	18	29	42	79	123	177	230	281
St	ainless steel A2, A4 and HCR, class 70	N _{Rk,s}	[kN]	26	41	59	1 10	171	247	_3)	_3)
St	ainless steel A4 and HCR, class 80	N _{Rk,s}	[kN]	29	46	67	126	196	282	_3)	_3)
CI	naracteristic tension resistance, Partial fac	tor 2)	_								
St	eel, Property class 4.6 and 5.6	^γ Ms,N	s,N [-] 2,0								
St	eel, Property class 4.8, 5.8 and 8.8	^γ Ms,N	[-]				1,5	5			
St	ainless steel A2, A4 and HCR, class 50	^γ Ms,N	[-]		2,86						
St	ainless steel A2, A4 and HCR, class 70	[-]	1,87								
Stainless steel A4 and HCR, class 80 Y _{Ms,N} [-]					1,6						
Characteristic shear resistance, Steel failure											
E	Steel, Property class 4.6 and 4.8	V ⁰ Rk,s	[kN]	9 (8)	14 (13)	20	38	59	85	110	135
rarm	Steel, Property class 5.6 and 5.8	V ⁰ Rk,s	[kN]	11 (10)	17 (16)	25	47	74	106	138	168
evel	Steel, Property class 8.8	V ⁰ Rk,s	[kN]	15 (13)	23 (21)	34	63	98	141	184	224
	Stainless steel A2, A4 and HCR, class 50	V ⁰ _{Rk,s}	[kN]	9	15	21	39	61	88	115	140
Without	Stainless steel A2, A4 and HCR, class 70	V ⁰ Rk,s	[kN]	13	20	30	55	86	124	_3)	_3)
5	Stainless steel A4 and HCR, class 80	V ⁰ Rk,s	[kN]	15	23	34	63	98	141	_3)	_3)
	Steel, Property class 4.6 and 4.8	M ⁰ Rk,s	[Nm]	15 (13)	30 (27)	52	133	260	449	666	900
arm	Steel, Property class 5.6 and 5.8	M ⁰ Rk,s	[Nm]	19 (16)	37 (33)	65	166	324	560	833	1123
e a	Steel, Property class 8.8	M ⁰ Rk,s	[Nm]	30 (26)	60 (53)	105	266	519	896	1333	1797
<u>e</u>	Stainless steel A2, A4 and HCR, class 50	M ⁰ Rk,s	[Nm]	19	37	66	167	325	561	832	1125
Steel, Property class 8.8 Stainless steel A2, A4 and HCR, class 50 Stainless steel A2, A4 and HCR, class 70			[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)
CI	naracteristic shear resistance, Partial facto	M ⁰ Rk,s		•			-	•	-		
St	eel, Property class 4.6 and 5.6	YMs,∨	[-]				1,6	7			
St	eel, Property class 4.8, 5.8 and 8.8	γMs,∨	[-]				1,2	:5			
Stainless steel A2, A4 and HCR, class 50 Y _{Ms,V} [-] 2,38											
St	ainless steel A2, A4 and HCR, class 70	YMs,∀	[-]				1,5	6			
St	ainless steel A4 and HCR, class 80	^γ Ms,V	[-]				1,3	3			

¹⁾ Values are only valid for the given stress area A_s. Values in brackets are valid for undersized threaded rods with smaller stress area A_s for hot-dip galvanised threaded rods according to EN ISO 10684:2004+AC:2009.

³⁾ Anchor type not part of the ETA

Fosroc injection system Lokfix E77 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 v	alues for C	oncrete con	e failure and Splitting with all kind
Anchor				All Anchor type and sizes
Concrete cone f	ailure			
Non-cracked con	crete	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	•	S _{cr,sp}	[mm]	2 c _{cr,sp}

Fosroc injection system Lokfix E77 for concrete	
Performances	Annex C 2
Characteristic values for Concrete cone failure and Splitting with all kind of action	



	characteristic va ction for a work			ls und	der st	atic a	and q	uasi-	static		
Anchor size threade	ed rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure		1									
Characteristic tension	n resistance	N _{Rk,s}	[kN]			A _s • f	_{uk} (or s				
Partial factor		YMs,N	[-]				see Ta	able C1			
Combined pull-out a											
Characteristic bond re holes (CD)	esistance in non-cracl	ked concrete (220/25 in hai	mmer c	irilled h	oles (F	ID) and	l compr	essed	air drill	ed
emperature 1: 40°C/24°C	Dry, wet concrete and flooded bore	[™] Rk,ucr	[N/mm²]	20	20	19	19	18	17	16	16
_ ਛੂੰ ਾਂ ।: 72°C/50°(hole			15	15	15	14	13	13	12	12
Characteristic bond r	esistance in non-cracl	ced concrete (220/25 in hai	mmer d	rilled h	oles w	ith hollo	w drill	bit (HD	B)	
<u> </u>				17	16	16	16	15	14	14	13
1: 40°C/24°C 1: 72°C/50°C 1: 40°C/24°C 1: 72°C/50°C	concrete		[N]/21	14	14	14	13	13	12	12	11
일 년 1. 40°C/24°C	flooded bore	TRk,ucr	[N/mm²]	16	16	16	15	15	14	14	13
<u>اق</u>				14	14	14	13	13	12	12	11
Characteristic bond re	esistance in cracked o	concrete C20/2	25 in hamme	r drilled	d holes	(HD) ,	compre	essed a	air drille	d hole:	s (CD
and with hollow drill b					Ι	, , , . 					`
40°C/24°C 1: 72°C/50°C	concrete and	τ _{Rk,cr}	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
				6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0
Reduction factor ψ^0_{SL} holes (CD) and with h	_{us} in cracked and non- nollow drill bit (HDB)	cracked conc	rete C20/25	in ham	mer drii	lled ho	les (HD), com _l	oressec	d air dr	lled
II: 72°C/50°C	Dry, wet concrete and	ψ ⁰ sus	[-]				0,	80			
변 II: 72°C/50°C	flooded bore hole	345					0,	68			
		C25/30						02			
		C30/37						04			
Increasing factors for	concrete	C35/45						07			
Ψc		C40/50 C45/55						08 09			
		C50/60						10			
Concrete cone failu	re	1000,00					'1	10			
Relevant parameter	- -						see Ta	able C2	<u> </u>		
Splitting				•							
Relevant parameter							see Ta	able C2			
Installation factor											
for dry and wet concr		Y _{inst}	[-]					,0			
for flooded bore hole	(HD; HDB, CD)	, illist	1 1				1	,2			
Fosroc injection s	system Lokfix E77 fo	or concrete									
Performances Characteristic values	of tension loads under	static and qua	si-static actio	n					Anne	x C 3	}

Performances



Characteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) Characteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) Characteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) Characteristic bond resistance in cracked bore hole TRK, ucr, 100 TRK, uc	see Table C1 s (HD) and compressed air drilled		rilled ho	nmer d	 			Steel failure		
Partial factor TMS, N [-] See Table C1	see Table C1 s (HD) and compressed air drilled		rilled ho	nmer d	 			_		
Combined pull-out and concrete failure Characteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes (HD) and compressed air of holes (CD) Take Concrete and flooded bore hole Take Tak	s (HD) and compressed air drilled		rilled ho	nmer d	[-]	V14. 11	sistance	Characteristic tension res		
Characteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes (HD) and compressed air of holes (CD) Parameteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes (HD) and compressed air of holes (CD) Table		oles (H	rilled ho	nmer d		TMS,N		Partial factor		
Notice N		oles (H	rilled ho	nmer d				<u> </u>		
Characteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) Fig. 40°C/24°C Dry, wet concrete II: 72°C/50°C II:	9 19 18 17 16 16				20/25 in han	ked concrete C	tance in non-cract			
Characteristic bond resistance in non-cracked concrete C20/25 in hammer drilled holes with hollow drill bit (HDB) Fig. 40°C/24°C Dry, wet concrete II: 72°C/50°C II:		19	20	20	[N/mm²]	TP:400	concrete and	entrage : 40°C/24°C		
1. 40°C/24°C Dry, wet concrete 1. 72°C/50°C 1. 10 1.	5 14 13 13 12 12	15	15	15	[[Willin]	*RK,ucr,100		മ് ഉ പ ല ല ല ല ല ല ല ല ല ല ല ല ല ല ല ല ല ല		
Text	s with hollow drill bit (HDB)	oles wi	rilled ho	nmer d	20/25 in han	ked concrete Ca	tance in non-cracl	Characteristic bond resis		
II: 72°C/50°C Concrete Text, ucr, 100 Text, ucr, ucr, ucr, ucr, ucr, ucr, ucr, ucr	6 16 15 14 14 13	16	16	17			Dry wet			
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD) , compressed air drilled hand with hollow drill bit (HDB) Problem I: 40°C/24°C Dry, wet concrete and flooded bore hole TRk,cr,100 [N/mm²] 6,5 6,5 7,5 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>- ·</td> <td>μ το ο/21 σ Σ φ Πι το ο/21 σ</td>							- ·	μ το ο/21 σ Σ φ Πι το ο/21 σ		
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD) , compressed air drilled hand with hollow drill bit (HDB) Dry, wet concrete and flooded bore hole TRk,cr,100 [N/mm²] 6,5 6,5 7,5					[N/mm²]	τ _{Rk,ucr,100}	 	0 E - 40°C (04°C		
Characteristic bond resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled hand with hollow drill bit (HDB) Problem I: 40°C/24°C Dry, wet concrete and flooded bore hole TRk,cr,100 [N/mm²] 6,5 6,5 7,5 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>E 1. 40 C/24 C</td>								E 1. 40 C/24 C		
And with hollow drill bit (HDB)					<u> </u>					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	D) , compressed air drilled holes (Cl	(HD),	noles	rarilled	o in hammei	concrete U20/2		and with hollow drill bit (F		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$,5 7,5 7,5 7,5 7,5 7,5	7,5	6,5	6,5	[N/mm²] -	TRk or 100	Dry, wet concrete and			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$,5 6,5 6,5 6,5 6,5 6,5	6,5	5,5	5,5		144,01,100		ф II: 72°C/50°C		
Increasing factors for concrete C35/45 1,07 V _C C40/50 1,08 C45/55 1,09 C50/60 1,10	-									
Ψ _C C40/50 1,08 C45/55 1,09 C50/60 1,10	·									
C45/55 1,09 C50/60 1,10	*						crete	-		
C50/60 1,10	· · · · · · · · · · · · · · · · · · ·							Ψ°C		
	1,10					1000,00		Concrete cone failure		
Relevant parameter see Table C2	see Table C2									
Splitting								Splitting		
Relevant parameter see Table C2	see Table C2							Relevant parameter		
Installation factor										
for dry and wet concrete (HD; HDB, CD) for flooded here hele (HD; HDB, CD) 7inst [-]	4.0				[-]	Yinst				
for flooded bore hale (HD; HDB, CD)					1 ''	-11100	; HDB, CD)	for flooded bore hole (HD		

Z44660.21 8.06.01-77/21

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

Annex C 4



Anchor	r size threaded ro	od			M8	M10	M12	M16	M20	M24	M27	M30
Steel fa		, u			14.0	,,,,,		141.15	71120	1412		77101
Charact	teristic tension res	sistance	N _{Rk,s}	[kN]			A _e · f	_{ık} (or s	ee Tab	le C1)		
Partial f				[-]			3 (see Ta				
		aanavata failuva	γMs,N					3CC 16	ible C I			
	ned pull-out and teristic bond resist					المطالما	- alaa (C	<u> </u>				
	teristic bond resis			-20/25 III ula	l long c	iriileu i	IOIES (L	,,,				
Temperature range	l: 40°C/24°C	Dry, wet concrete and	[₹] Rk,ucr	[N/mm²]	15	14	14	13	12	12	11	11
Temp	II: 72°C/50°C	flooded bore hole	,		12	12	11	10	9,5	9,5	9,0	9,0
Reducti	ion factor ψ ⁰ sus in	non-cracked con	crete C20/25 ir	diamond di	illed ho	oles (D	D)					
Temperature range	l: 40°C/24°C	Dry, wet concrete and	Ψ ⁰ sus	(1)				0,	77			
Tempe	II: 72°C/50°C	flooded bore hole	Ψ sus	[-]				0,	72			
			C25/30	•				1,	04			
			C30/37					1,	08			
Increasi	ing factors for con	crete	C35/45						12			
Ψс			C40/50						15			
			C45/55						17			
			C50/60					1,	19			
	ned pull-out and teristic bond resis					احتالمط ا	olog /F)D)				
	teristic bond resis	lance in non-crac		Z0/Z5 III ula	mona c	ırıneu i	IOIES (L) 				
Temperature range	l: 40°C/24°C	Dry, wet concrete and flooded bore	^T Rk,ucr,100	[N/mm²]	15	14	14	13	12	12	11	11
Temp	II: 72°C/50°C	hole			11	1 1	10	10	9,5	9,0	8,5	8,5
			C25/30						04			
_			C30/37						08			
	ing factors for con	crete	C35/45						12			
Ψο			C40/50						15			
			C45/55						17			
Canara	te cone failure		C50/60					Ι,	19			
	nt parameter							see Ta	hle Ca	,		
Splittin	<u> </u>				<u> </u>			356 16	.5.5 ()2	•		
	nt parameter							see Ta	ble C2	<u> </u>		
	ition factor				<u> </u>			220 10		-		
	and wet concrete	(DD)						1	,0			
	ded bore hole (DD		γ _{inst}	[-]		1,2		,		1,4		
Fosro	c injection syst	em Lokfix E77 f	or concrete									
	mances eteristic values of te	ension loads unde	r static and quas	si-static actio	n					Anne	x C 5	i



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 ⁰ Rk,s	[kN]			0,6 •	A _s •f _{uk}	(or see	Table C	1)	
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 C	1)	
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 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]		m	nin(h _{ef} ; 1	2 · d _{nor}	_n)		min(h _{ef}	300mm)
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	16	20	24	27	30
Installation factor	γ _{inst}	[-]					1,0			

Fosroc injection system Lokfix E77 for concrete	
Performances	Annex C 6
Characteristic values of shear loads under static and quasi-static action	



Anchor size int	ernal threade	d anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure ¹⁾										
Characteristic te	ension resistand	ce, 5.8	$N_{Rk,s}$	[kN]	10	17	29	42	76	123
Steel, strength o	:lass	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor, st	rength class 5.6	8 and 8.8	YMs,N	[-]		•	1	,5	•	
Characteristic te Steel A4 and H0			N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			γMs,N	[-]			1,87			2,86
Combined pull-										
Characteristic k holes (CD)	ond resistanc	e in non-cracke	ed concre	ete C20/2	5 in hamn	ner drilled	holes (HD) and com	npressed a	air drilled
Temperature –	: 40°C/24°C	Dry, wet concrete and	fpu	[N/mm²]	20	19	19	18	17	16
range	I: 72°C/50°C	flooded bore hole	[₹] Rk,ucr	[14/11011]	15	15	14	13	13	12
Characteristic be		in non-cracked	concrete	C20/25 in			es with ho		it (HDB)	
	: 40°C/24°C	Dry, wet			16	16	16	15	14	13
Temperature I		concrete	τ _{Rk,ucr}	[N/mm²]	14	14	13	13	12	11
_	: 40°C/24°C	flooded bore	TXX,GGI		16	16	15	15	14	13
	I: 72°C/50°C	hole		(85.)	14	14	13	13	12	11
Characteristic bo and with hollow		in cracked cond	crete C20	/25 in nam	ımer arılle	ea noies (i	וט), comp	ressed all	r arilled no	iles (CD)
	: 40°C/24°C	Dry, wet concrete and	_	[h]/as as 2]	7,0	8,5	8,5	8,5	8,5	8,5
rango	mperatureconcrete and		[₹] Rk,cr	[N/mm²]	6,0	7,0	7,0	7,0	7,0	7,0
Reduction facto	or ψ ⁰ sus in crac	ked and non-c	racked c	oncrete C	20/25 in	hammer d	rilled hole:	s (HD), co	mpressed	air
drilled holes (CE) and with hol	low drill bit (HD	B)							
Temperature _	: 40°C/24°C	Dry, wet concrete and	Ψ ⁰ sus	[-]			0,	80		
range	I: 72°C/50°C	flooded bore hole						68		
				5/30 0/37				02		
Increasing facto	rs for concrete			5/45				04 07		
Ψc				0/50				08		
ū				5/55				09		
			C5	0/60			1,	10		
Concrete cone										
Relevant param							see Ta	ble C2		
Splitting failure										
Relevant param							see la	ble C2		
Installation fact		IDD CD)	1				1	0		
for dry and wet o for flooded bore			Ÿinst	[-]				,0 ,2		
	cl. nut and was									

Z44660.21 8.06.01-77/21

Annex C 7

Fosroc injection system Lokfix E77 for concrete

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

Performances



Steel failure ¹⁾		d anchor rods	,		IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
`										
Characteristic	tension resistan	ce, 5.8	N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, strength	ı class	8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor, s	strength class 5.	8 and 8.8	γMs,N	[-]			1	,5	•	
	tension resistand HCR, Strength cl		N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor			γ _{Ms,N}	[-]			1,87			2,86
Combined pu	II-out and conc	rete cone faili								
Characteristic holes (CD)	bond resistand	e in non-cracl	ked concret	e C20/25	in hamme	er drilled l	noles (HD)	and com	pressed a	air drilled
Tomporatura	l: 40°C/24°C	Dry, wet concrete and			20	19	19	18	17	16
Temperature range	II: 72°C/50°C	flooded bore hole	^τ Rk,ucr,100	[N/mm²]	15	15	14	13	13	12
Characteristic	bond resistance	in non-cracke	d concrete C	20/25 in h	ammer d	rilled hole	s with hol	low drill b	it (HDB)	
	I: 40°C/24°C	Dry, wet			16	16	16	15	14	13
Temperature	II: 72°C/50°C	concrete	τ _{Rk,ucr,100}	[N/mm²]	14	14	13	13	12	11
range	I: 40°C/24°C	*RK,UCF,100	[[[]	16	16	15	15	14	13	
	II: 72°C/50°C	hole			14	14	13	13	12	11
	bond resistance w drill bit (HDB)	in cracked cor	ncrete C20/2	?5 in hamn	ner drilled	holes (H	D), compr	essed air	drilled ho	les (CD)
Temperature	I: 40°C/24°C	Dry, wet concrete and	[₹] Rk,ucr,100	[N/mm²]	6,5	7,5	7,5	7,5	7,5	7,5
range	II: 72°C/50°C	flooded bore hole			5,5	6,5	6,5	6,5	6,5	6,5
			C25					02		
laaraasiaa faa	tara far annarata		C30					04		
_	tors for concrete		C35					07 08		
Ψ¢			C40					08 09		
			C50					10		
Concrete con	e failure							, -		
Relevant para	meter						see Ta	able C2		
Splitting failu	re									
	meter						see Ta	able C2		
Relevant para.										
Relevant parai Installation fa	ctor									
Installation fa	t concrete (HD; I	HDB, CD)	Y _{inst}	[-]				,0 ,2		

³⁾ 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.

Fosroc injection system Lokfix E77 for concrete	
Performances	Annex C 8
Characteristic values of tension loads under static and quasi-static action	

⁴⁾ For IG-M20 strength class 50 is valid



	eristic value or a working				der stat	ic and (quasi-s	tatic	
Anchor size internal threader Steel failure ¹⁾	d anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Characteristic tension resistance	ce. 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
		1	<u> </u>	10	21			121	130
Partial factor, strength class 5.1 Characteristic tension resistant		γ _{Ms,N}	[-]		1	<u> </u>	,5		
Steel A4 and HCR, Strength cl	· -	N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor		γ _{Ms,N}	[-]			1,87			2,86
Combined pull-out and conc									
Characteristic bond resistance	1	ed concrete	e C20/25	in diamor	nd drilled	holes (DD)		
Temperature I: 40°C/24°C	Dry, wet concrete and	₹Rk,ucr	[N/mm²]	14	14	13	12	12	11
range II: 72°C/50°C	flooded bore hole		, ,	12	11	10	9,5	9,5	9,0
Reduction factor ψ ⁰ sus in non-	cracked concr	ete C20/25	in diamo	nd drilled	holes (Di	D)			
Temperature I: 40°C/24°C	Dry, wet concrete and	0	.,			0,	77		
range II: 72°C/50°C	flooded bore hole	Ψ ⁰ sus	[-]			0,	72		
	•	C25	/30			1,	04		
		Ç30	/37			1,	08		
Increasing factors for concrete		C35	/45				12		
Ψc		C40	/50			1,	15		
		C45	/55			1,	17		
		C50				1,	19		
Combined pull-out and conci									
Characteristic bond resistance		ed concrete	C20/25	n diamon	d drilled I	noles (DD)		
Temperature I: 40°C/24°C	Dry, wet	^T Rk,ucr,100	[N/mm²]	14	14	13	12	12	11
range II: 72°C/50°C	flooded bore hole			11	10	10	9,5	9,0	8,5
		C25					04		
		C30					08		
Increasing factors for concrete		C35					12		
Ψc		C40					15		
		C45				-	17		
Concrete cone failure			700			, , , , , , , , , , , , , , , , , , ,	19		
Relevant parameter						see Ta	able C2		
Splitting failure				I					
Relevant parameter						see Ta	able C2		
Installation factor									
for dry and wet concrete (DD)		١/٠ -	[]			1	,0		
for flooded bore hole (DD)		γinst	[-]	1,	,2		1,	4	
 Fastenings (incl. nut and v rod. The characteristic ten For IG-M20 strength class 	sion resistance								
Fosroc injection system Le	okfix E77 for o	concrete							
Performances Characteristic values of tension	loads under sta	itic and quas	i-static ac	tion			 	Annex C	9



Table C10: Characteri	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 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	ind 8.8	γ _{Ms,V}	[-]				1,25		
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		γMs,∨	[-]			1,56			2,38
Ductility factor		k ₇	[-]				1,0		
Steel failure with lever arm ¹⁾									
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	[-]				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		γinst	[-]				1,0		
Concrete edge failure		•							
Effective length of fastener		I _f	[mm]		min(h _{ef} : 12 · c	d _{nom})		min(h _{ef} ; 300mm
Outside diameter of fastener		d _{nom}	[mm]	10	12	16	20	24	30
Installation factor		γinst	[-]			•	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.

2) For IG-M20 strength class 50 is valid

Fosroc injection system Lokfix E77 for concrete	
Performances Characteristic values of shear loads under static and quasi-static action	Annex C 10



	naracteristic tion for a wo				ds u	nder	stati	c and	d qua	asi-st	atic		
Anchor size reinforci	ng bar		-	Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure		T											
Characteristic tension	resistance	N _{Rk,s}	[kN]					A _s ·	f _{uk} 1)				
Cross section area		As	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γMs,N	[-]					1,	4 ²⁾				
Combined pull-out ar	ıd concrete failı	ıre		•									
Characteristic bond re	esistance in non	-cracked co	ncrete C2	:0/25 i	n ham	mer dr	illed h	oles (F	ID) an	d com	presse	ed air d	Irilled
Temperature II: 40°C/24°C	Dry, wet concrete and	^T Rk,ucr	[N/mm²]	16	16	16	16	16	16	15	15	15	15
를 II: 72°C/50°C	flooded bore hole	*RK,uci	[17]	12	12	12	12	12	12	12	12	11	11
Characteristic bond res	sistance in non-c	racked conc	rete C20/2	5 in h	ammei	drilled	holes	with I	hollow	drill bi	t (HDE	3)	
<u>e</u> <u>I: 40°C/24°C</u>	Dry, wet			14	14	13	13	13	13	13	13	13	13
## ## ## ## ## ## ## ## ## ## ## ## ##	concrete		[N]/m m2]	12	12	12	11	11	11	11	11	11	11
E	flooded bore	[™] Rk,ucr	[N/mm²]	13	13	13	13	13	13	13	13	13	13
	hole			11	11	11	11	11	11	11	11	11	11
Characteristic bond res		ed concrete	C20/25 in	hamm	er drill	ed hol	es (HD)), con	npress	ed air	drilled	holes	(CD)
	L 1000/0490 Dry Wet			7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5
T: 40°C/24°C Lange II: 72°C/50°C	concrete and flooded bore hole	^T Rk,cr	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0
Reduction factor Ψ ^u suldrilled holes (CD) and Example 1: 40°C/24°C Example 1: 72°C/50°C	_		ed concre	te C20/25 in hammer drilled holes (HD), compressed air									
II: 72°C/50°C	hole			0,68									
		C25		1,02									
		C30							04				
Increasing factors for o	concrete	C35 C40		1,07									
$\Psi_{\mathbf{c}}$		C40		1,08									
		C50							10				
Concrete cone failure)	, 250		I				.,					
Relevant parameter								see Ta	able C	2			
Splitting				·									
Relevant parameter								see Ta	able C	2			
Installation factor				'									
for dry and wet concret		γ _{inst}	[-]						0,				
for flooded bore hale (H	HD; HDB, CD)	rinst	I-J					1	,2				
¹⁾ f _{uk} shall be taken fror ²⁾ in absence of nationa		ns of reinforci	ing bars										
Fosroc injection sy	stem Lokfix E7	7 for conc	rete										
Performances Characteristic values o	formances aracteristic values of tension loads under static and quasi-				on					A	nnex	C 11	



Anchor size reinforci	ng bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 3.
Steel failure	_												
Characteristic tension	resistance	N _{Rk,s}	[kN]					A _s ·	f _{uk} 1)				
Cross section area		As	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γMs.N	[-]					1,	4 ²⁾				
Combined pull-out ar	nd concrete failu	<u> </u>											
Characteristic bond re holes (CD)	esistance in non	-cracked co	ncrete C2	.0/25 i	n ham	mer dr	illed h	oles (F	ID) an	d com	presse	d air d	Irille
I: 40°C/24°C II: 72°C/50°C	Dry, wet concrete and	_	FN1/100 100 21	16	16	16	16	16	16	15	15	15	15
e li: 72°C/50°C	flooded bore hole	TRk,ucr,100	[N/mm²]	12	12	12	12	12	12	12	12	11	11
Characteristic bond res	sistance in non-c	racked conc	rete C20/2	5 in h	ammei	drilled	holes	with I	wollor	drill bi	t (HDE	3)	
<u>e</u> I: 40°C/24°C	Dry, wet			14	14	13	13	13	13	13	13	13	13
1: 40°C/24°C 1: 72°C/50°C 1: 40°C/24°C 1: 72°C/50°C 1: 7	concrete		,	12	12	12	11	11	11	11	11	11	11
The section of the se	flooded bore	^T Rk,ucr,100	[N/mm²]	13	13	13	13	13	13	13	13	13	13
<u>Ψ</u> II: 72°C/50°C	hole			1 1	11	11	11	11	11	11	11	11	11
Characteristic bond res	sistance in crack	ed concrete	C20/25 in	hamm	er drill	ed hol	es (HC)), con	npress	ed air	drilled	holes	(CD
and with hollow drill bit							`		•				
erat	Dry, wet concrete and flooded bore	Tp. 400	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,
ਲ ਜ਼ਿੰ II: 72°C/50°C	flooded bore hole	TRk,cr,100	[N/MINIT]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,
		C25	/30					1,	02				
		C30							04				
Increasing factors for o	concrete	C35		1,07									
Ψс		C40.		1,08 1,09									
		C50							10				
Concrete cone failure)							• • • • • • • • • • • • • • • • • • • •					
Relevant parameter							ļ	see Ta	ble C	2			
Splitting													
Relevant parameter							;	see Ta	ble C	2			
Installation factor													
for dry and wet concre		Yinst	[-]						,0				
for flooded bore hale (I								1	,2				
f_{uk} shall be taken frorin absence of national		is of Terriloid	ng bais										



	naracteristic tion for a wo						stati	c an	d qua	asi-si	tatic		
Anchor size reinforci	ng bar			Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure													
Characteristic tension	resistance	N _{Rk,s}	[kN]					A_s •	f _{uk} 1}				
Cross section area		As	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ M s,N	[-]					1,	4 ²⁾				
Combined pull-out ar	id concrete failu	<u> </u>		of 50	years								
Characteristic bond re						ond d	rilled h	oles (l	DD)				
Temperature Buge II: 40°C/24°C	Dry, wet concrete and	T	[N]/pp.pp.27	14	13	13	13	12	12	11	11	11	11
៥	flooded bore hole	[₹] Rk,ucr	[N/mm²]	11	11	10	10	10	9,5	9,5	9,5	9,0	9,0
Reduction factor ψ ⁰ su	s in non-cracked	concrete C	20/25 in (n diamond drilled holes (DD)									
II: 40°C/24°C	Dry, wet concrete and flooded bore	ψ ⁰ sus	[-]					0,	77				
- II: 72°C/50°C	hole	•	0,72 C25/30 1,04										
				1,04									
Increasing factors for o	onoroto	C30.		1,08									
$ \Psi_{\mathbf{c}} $	oncrete	C40							15				
[↑] C		C45							17				
									19				
Combined pull-out ar	C50/60 Combined pull-out and concrete failure for a working li												
Characteristic bond re							rilled h	oles (l	DD)				
Temperature II: 40°C/24°C	Dry, wet concrete and	₹Rk,ucr,100 [N/m		14	13	13	13	12	12	11	11	11	11
W	flooded bore hole		[N/mm*]	11	10	10	10	9,5	9,0	9,0	9,0	8,5	8,5
		C25	/30	1,04									
		C30.	/37					1,	80				
Increasing factors for o	concrete	C35							12				
$\Psi_{\mathbf{c}}$		C40.		1,15									
		C45							17				
Concrete cone failure	<u> </u>	C50.	/OU					٦,	19				
Relevant parameter	-			1				see Ta	hle C				
Splitting				<u> </u>				JCE 18	TOIC ()	-			
Relevant parameter								see Ta	able C	2			
Installation factor				<u> </u>					2010 ()	_			
for dry and wet concre	te (DD)		Ι					1	,0				
for flooded bore hole (I	<u> </u>	γinst	[-]		1	,2			· -	1	,4		
1) f _{uk} shall be taken from 2) in absence of nations	n the specification al regulation										·		
Performances	osroc injection system Lokfix E77 for concrete erformances naracteristic values of tension loads under static and quas				io n					A	nnex	C 13	3



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 ⁰ Rk,s	[kN]					0,5	· A _s ·	f _{uk} 1)			
Cross section area	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	γMs,∨	[-]	1,52)									
Ductility factor	k ₇	[-]	1,0									
Steel failure with lever arm	·	•	•									
Characteristic bending moment	M ⁰ _{Rk,s}	[Nm]	1.2 • W _{ef} • f _{uk} ¹⁾									
Elastic section modulus	W _{el}	[mm³]	50	98	170	269	402	785	1357	1534	2155	3217
Partial factor	γ _{Ms,V}	[-]		•			•	1,5 ²⁾				
Concrete pry-out failure		-1										
Factor	k ₈	[-]						2,0				
Installation factor	γinst	[-]						1,0				
Concrete edge failure		•										
Effective length of fastener	If	[mm]			min(h	n _{ef} ; 12	- d _{nor}	_n)		min(h _{ef} ; 300	mm)
Outside diameter of fastener	d _{nom}	[mm]	8	10	12	14	16	20	24	25	28	32
Installation factor	γinst	[-]				•	•	1,0		•		

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

Fosroc injection system Lokfix E77 for concrete	
Performances Characteristic values of shear loads under static and quasi-static action	Annex C 14



Table C15:	Displacements under tension load ¹⁾ 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 u	ınder static	and quasi-static a	action fo	r a work	ing life (of 50 and	d 100 ye	ars		
Temperature range l:	δ _{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	ბ _{N∞} -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041
Temperature range II: 72°C/50°C	δ _{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055
	ర్ _{N∞} -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 100) years			
Temperature range l:	δ _{N0} -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,074	0,076	0,079	0,081	0,082
40°C/24°C	δ _{N∞} -factor	[mm/(N/mm²)]	0,100	0,115	0,122	0,128	0,135	0,142	0,155	0,171
	გ _{N0} -factor	[mm/(N/mm²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110
72°C/50°C	δ _{N∞} -factor	[mm/(N/mm²)]	0,134	0,154	0,163	0,172	0,181	0,189	0,207	0,229

¹⁾ Calculation of the displacement

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

 $\tau_{\rm i}$ action bond stress for tension

 $\delta_{N,c} \equiv \delta_{N,c}\text{-factor} + \tau;$

Displacements under tension load¹⁾ in diamond drilled holes (DD) Table C16:

Anchor size threaded r	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 _{NO} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
40°C/24°C	ర్ _{N∞} -factor	[mm/(N/mm²)]	0,018	0,019	0,019	0,020	0,022	0,023	0,024	0,025
Temperature range II: 72°C/50°C	δ _{N0} -factor	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018
	გ _{N∞} -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	f 100 ye	ars			
Temperature range l:	δ _{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015
40°C/24°C	δ _{N∞} -factor	[mm/(N/mm²)]	0,020	0,021	0,021	0,023	0,024	0,025	0,026	0,027
Temperature range II:	δ _{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	გ _{N∞} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,043	0,045	0,047	0,049	0,051

¹⁾ Calculation of the displacement

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

 τ : action bond stress for tension

 $\delta_{N\infty} \equiv \delta_{N\infty}\text{-factor} + \tau;$

Displacements under shear load¹⁾ for all drilling methods Table C17:

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

¹⁾ Calculation of the displacement

 $\delta v_0 = \delta v_0$ -factor $\cdot V$; V: action shear load

 $\delta_{V^{a_i}} = \delta_{V^{a_i}} \text{-factor } \cdot V_i$

Fosroc injection system Lokfix E77 for concrete

Performances

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

Annex C 15



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

Anchor size Internal thr	eaded anchor	rod	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Non-cracked concrete u	nder static an	d quasi-static ac	tion for a v	vorking lif	e of 50 and	100 years	•	
Temperature range l:	ბ _{N0} -factor	[mm/(N/mm²)]	0,029	0,030	0,033	0,035	0,038	0,041
40°C/24°C	δ _{N∞} -factor	[mm/(N/mm²)]	0,029	0,030	0,033	0,035	0,038	0,041
Temperature range II: 72°C/50°C	δ _{N0} -factor	[mm/(N/mm²)]	0,039	0,040	0,044	0,047	0,051	0,055
	ნ _{N∞} -factor	[mm/(N/mm²)]	0,049	0,051	0,055	0,059	0,064	0,070
Cracked concrete under	r static and qua	asi-static action	for a work	ing life of	50 and 100	years		
Temperature range l:	δ _{N0} -factor	[mm/(N/mm²)]	0,071	0,072	0,074	0,076	0,079	0,082
40°C/24°C	δ _{N∞} -factor	[mm/(N/mm²)]	0,115	0,122	0,128	0,135	0,142	0,171
	δ _{N0} -factor	[mm/(N/mm²)]	0,095	0,096	0,099	0,102	0,106	0,110
72°C/50°C	δ _{N∞} -factor	[mm/(N/mm²)]	0,154	0,163	0,172	0,181	0,189	0,229

¹⁾ Calculation of the displacement

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

Displacements under tension load¹⁾ in diamond drilled holes (DD) Table C19:

Anchor size Internal thr	eaded anchor	rod	IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Non-cracked concrete u	ınder static an	d quasi-static ac	tion for a v	vorking life	e of 50 yea	irs		
Temperature range I:	$\delta_{ extsf{N0}} extsf{-factor}$	[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
1550505050505050		[mm/(N/mm²)]	0,014	0,014	0,015	0,016	0,016	0,018
'		[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 I:	δ_{N0} -factor	[mm/(N/mm²)]	0,012	0,012	0,013	0,014	0,014	0,015
40°C/24°C	$\delta_{N\omega}$ -factor	[mm/(N/mm²)]	0,021	0,021	0,023	0,024	0,025	0,027
Temperature range II:	δ_{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)]	0,039	0,040	0,043	0,045	0,047	0,051

¹⁾ Calculation of the displacement

 $\delta_{N0} = \delta_{N0}$ -factor $+\tau$; $\delta_{N_{20}} = \delta_{N_{20}}$ -factor $+\tau$; τ : action bond stress for tension

Table C20: Displacements under shear load¹⁾ for all drilling methods

Anchor size Inter	Anchor size Internal threaded anchor rod			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	$\delta_{ extsf{V}\infty}$ -factor	[mm/kN]	0,10	0,09	0,08	0,08	0,06	0,06

¹⁾ Calculation of the displacement

 $\delta v_0 = \delta v_0$ -factor $\cdot V$; V: action shear load

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

Fosroc injection system Lokfix E77 for concrete Annex C 16 **Performances** Displacements under static and quasi-static action (Internal threaded anchor rod)



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

Anchor size reinfo	orcing bar		Ø8	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) and 1	00 year	\$		
Temp range I:	δ _{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 $\delta_{N\infty}$ -factor [mm/(N/mm²)]		0,028	0,029	0,030	0,031	0,033	0,035	0,038	0,038	0,040	0,043	
Temp range II: δ _{N0} -factor [mm/(N/mm²)]		0,038	0,039	0,040	0,042	0,044	0,047	0,051	0,051	0,054	0,058	
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,047	0,049	0,051	0,053	0,055	0,059	0,065	0,065	0,068	0,072
Cracked concrete	under statio	and quasi-stat	ic actio	n for a	workin	g life of	f 50 and	l 100 ye	ears			
Temp range I:	δ _{N0} -factor	[mm/(N/mm²)]	0,069	0,071	0,072	0,073	0,074	0,076	0,079	0,079	0,081	0,084
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,115	0,122	0,128	0,135	0,142	0,155	0,171	0,171	0,181	0,194
Temp range II:	მ _{N0} -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	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,154	0,163	0,172	0,181	0,189	0,207	0,229	0,229	0,242	0,260

¹⁾ Calculation of the displacement

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

 $\delta_{Nw} = \delta_{Nw} - factor + \tau;$

Table C22: Displacements under tension load¹⁾ in diamond drilled holes (DD)

Anchor size reinfo	Anchor size reinforcing bar		Ø8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Non-cracked cond	Non-cracked concrete under static and quasi-static action for a working life 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	δ _{N∞} -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.	δ _{N0} -factor	[mm/(N/mm²)]	0,009	0,011	0,011	0,012	0,013	0,014	0,015	0,015	0,016	0,018
72°C/50°C	$\delta_{N\infty}$ -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 year:	5			
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	$\delta_{N\infty}$ -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.	δ_{N0} -factor	[mm/(N/mm²)]	0,009	0,011	0,011	0,012	0,013	0,014	0,015	0,015	0,016	0,018
72°C/50°C	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,035	0,037	0,040	0,042	0,045	0,049	0,055	0,055	0,059	0,064

¹⁾ Calculation of the displacement

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

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

Table C23: Displacements under shear load¹⁾ 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	tatic an	id quas	i-static	action								
All temperature	$\delta_{ m V0}$ -factor	[mm/kN]	0,06	0,05	0,05	0,04	0,04	0,04	0,03	0,03	0,03	0,03
ranges	δ _{V∞} -factor	[mm/kN]	0,09	0,08	0,08	0,06	0,06	0,05	0,05	0,05	0,04	0,04

¹⁾ Calculation of the displacement

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

 $\delta_{V^{\omega}}\equiv\delta_{V^{\omega}}\text{-factor}+V;$

Fosroc injection system L	okfix E77 for concrete
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Performances

Displacements under static and quasi-static action (rebar)

Annex C 17

for dry and wet concrete (HD; HDB, CD)

for flooded bore hole (HD; HDB, CD)

English translation prepared by DIBt



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Table	e C24:		Characteristic values of tension loads under seismic action (performance category C1) for a working life of 50 and 100 years										
Ancho	size threa	ded rod				M8	M10	M12	M16	M20	M24	M27	M30
Steel fa	ilure				•								
Characteristic tension resistance N _{Rk,s,eq,C1} [kN] 1,0 ⋅ N _{Rk,s}													
Partial factor													
Combii	ned pull-ou	ıt and co	ncrete failure										
drilled h			ce in cracked a hollow drill bit (F		d concrete (20/25	in ham	mer dr	illed ho	les (H[D), com	presse	ed air
Temperat ure range	l: 40°C/24	°C	Dry, wet concrete and	^T Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
											7,0		
Increas	ing factors	for concre	ete ψ _C	C25/30 to	C50/60				1	,0			
Installa	tion factor			•									

[-]

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

 γ_{inst}

Anchor size threaded rod		М8	M10	M12	M16	M20	M24	M27	M30	
Steel failure										
Characteristic shear resistance (Seismic C1)	[kN]				0,70) • V ⁰ Rk	.,s			
Partial factor	[-]				see	Table C	1			
Factor for annular gap	[-]	0,5 (1,0)1)								

¹⁾ 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.

Fosroc injection system Lokfix E77 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

A			~~	~ 40	~	~ 4 4	~ 40	~	~ •	~ ^=	~ ••	~ ••
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												
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 80						804			
Partial factor	γ _{Ms,N}	[-]	1,4 ²)									
Combined pull-out and concrete failure												
Characteristic bond resistance in cracke drilled holes (CD) and with hollow drill to	cracked co	ncrete	e C20/	25 in h	amme	r drille	d hole	s (HD)), comp	oresse	d air	
ਸ਼ੁਸ਼ੂ I: 40°C/24°C Dry, wet	[₹] 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
Dry, wet concrete and flooded bore hole	[₹] Rk,eq,C1	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0
ncreasing factors for concrete ψ _C C25/30 to C50/60			1,0									
Installation factor												
for dry and wet concrete (HD; HDB, CD)		[-1	1,0									

¹⁾ 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			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,C1}	[kN]	0,35 • A _s • f _{uk} ¹⁾									
Cross section area	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	γMs,∨	[-]	1,52)									
Factor for annular gap	αgap	[-]	0,5 (1,0)3}									

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

Fosroc injection system Lokfix E77 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

²⁾ in absence of national regulation

²⁾ in absence of national regulation

³⁾ 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 _{Rk,s,eq,C2}	[kN]		1,0 •	$N_{Rk,s}$	
Partial factor	YMs,N	[-]		see Ta	ble C1	
Combined pull-out and concrete fail	ure					

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)

urnieu	noies (CD) and with	nonew ann bit (i	(טטו						
Temperat ure range	l: 40°C/24°C	Dry, wet concrete and	^τ Rk,eq,C2	[N/mm²]	5,8	4,8	5,0	5,1	
Tem _l	II: 72°C/50°C	flooded bore hole	TRk,eq,C2	[N/mm²]	5,0	4 ,1	4 ,3	4,4	
Increas	Increasing factors for concrete ψ _C		C25/30 to C50/60		1,0				
Installa	Installation factor								
for dry and wet concrete (HD; HDB, CD)		26		1,0					
for floo	for flooded bore hole (HD; HDB, CD)		γinst [-]		1,2				
1									

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

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

¹⁾ 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.

Fosroc injection system Lokfix E77 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 cracked concrete under seismic action (performance category C2)								
All temperature	$\delta_{N,eq,C2(DLS)}$	[mm]	0,21	0,24	0,27	0,36		
ranges	δ N,eq,C2(ULS)	[mm]	0,54	0,51	0,54	0,63		

Table C31: Displacements under shear load (threaded rod)

Anchor size threaded rod			M12	M16	M20	M24
Non-cracked and	cracked concrete i	ion (performand	e category C2)			
All temperature	δ _{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

Fosroc injection system Lokfix E77 for concrete	
Performances Displacements under seismic action (performance category C2) (threaded rods)	Annex C 21