



Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments



European Technical Assessment

ETA-19/0203 of 2 December 2020

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

Mungo Injection system MIT700RE for concrete

Bonded anchor for use in concrete

Mungo Befestigungstechnik AG Bornfeldstrasse 2 4603 OLTEN SCHWEIZ

Werk 13 / Plant 13

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

EAD 330499-01-0601, Edition 4/2020



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Z29384.19 8.06.01-101/19



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Specific Part

1 Technical description of the product

The "Mungo Injection system MIT700RE concrete" is a bonded anchor consisting of a cartridge with injection mortar Injection mortar MIT700RE 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 2 December 2020 by Deutsches Institut für Bautechnik

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

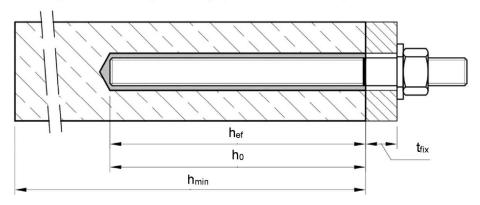
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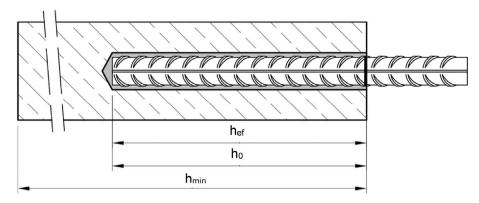
Installation threaded rod M8 up to M30

prepositioned installation or

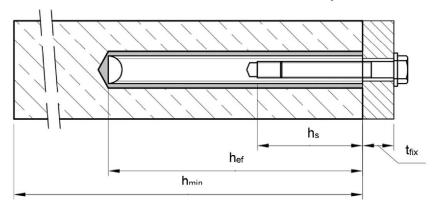
push through installation (annular gap filled with mortar)



Installation reinforcing bar Ø8 up to Ø32



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



 t_{fix} = thickness of fixture

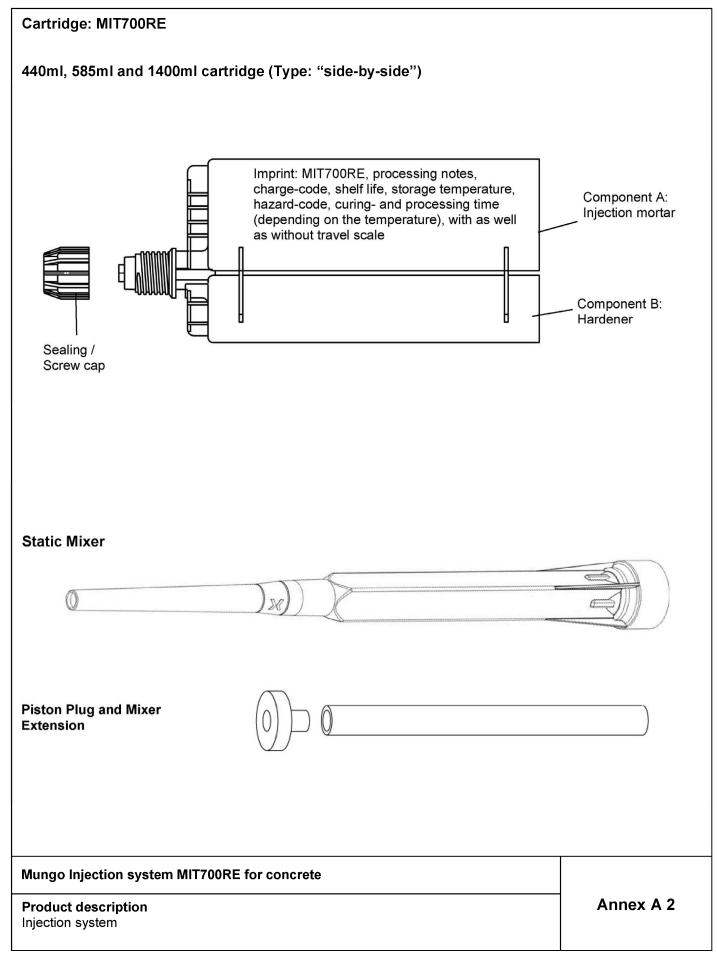
 h_{ef} = effective anchorage depth

 h_0 = depth of drill hole

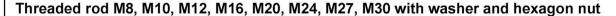
 h_{min} = minimum thickness of member

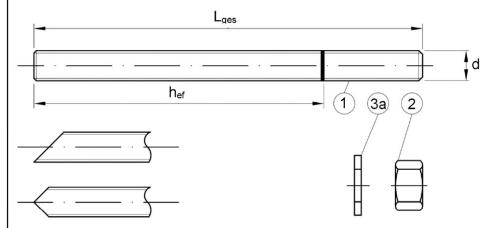
Mungo Injection system MIT700RE for concrete	
Product description Installed condition	Annex A 1







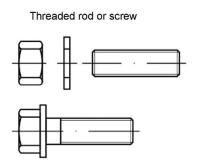


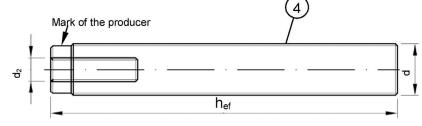


Commercial standard threaded rod with:

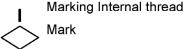
- Materials, dimensions and mechanical properties acc.
 Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth







Marking: e.g. Marking: Marking



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





Mungo Injection system MIT700RE for concrete

Product description

Threaded rod, internal threaded rod and filling washer

Annex A 3



Ta	ble A1: Materi	ials				
	Designation	Material				
zi ho	nc plated ≥ 5 ot-dip galvanised ≥ 4	acc. to EN 10087:1998 µm acc. to EN ISO 0 µm acc. to EN ISO 5 µm acc. to EN ISO	404 146	2:1999 or 1:2009 and EN ISO 10684:	2004+AC:2009 or	
		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
			4.6	f _{uk} = 400 N/mm²	f _{vk} = 240 N/mm²	A ₅ > 8%
1	Threaded rod	Threaded rod		f _{uk} = 400 N/mm²	f _{yk} = 320 N/mm²	A ₅ > 8%
	Timodada rod	acc. to EN ISO 898-1:2013		f _{uk} = 500 N/mm²	f _{yk} = 300 N/mm²	A ₅ > 8%
		EN 150 696-1.2013		f _{uk} = 500 N/mm²	f _{vk} = 400 N/mm²	A ₅ > 8%
				f _{uk} = 800 N/mm²	f _{yk} = 640 N/mm²	A ₅ ≥ 12% ³⁾
		ann to	4	for anchor rod class 4.6 o	r 4.8	_1
2	Hexagon nut	acc. to EN ISO 898-2:2012	5	for anchor rod class 5.6 o	r 5.8	
			8	for anchor rod class 8.8		
3a	Washer	(e.g.: EN ISO 887:20	06, E	galvanised or sherardized EN ISO 7089:2000, EN ISC	7093:2000 or EN ISO 7	094:2000)
3b	Filling washer	Steel, zinc plated, ho	t-dip	galvanised or sherardized		Ter
Internal threaded		Property class		Characteristic steel ultimate tensile strength	Characteristic steel yield strength	Elongation at fracture
4	anchor rod	acc. to		f _{uk} = 500 N/mm²	f _{yk} = 400 N/mm²	A ₅ > 8%
		EN ISO 898-1:2013	8.8	f _{uk} = 800 N/mm²	f _{yk} = 640 N/mm²	A ₅ > 8%
Stai	n less steel A4 (Matei	rial 1.4401 / 1.4404 / 1	.457	1 / 1.4567 or 1.4541, acc. t 1 / 1.4362 or 1.4578, acc. t r 1.4565, acc. to EN 10088	o EN 10088-1:2014)	
		Property class		Characteristic steel	Characteristic steel	Elongation at
			ΕO	ultimate tensile strength f _{uk} = 500 N/mm²	yield strength $f_{vk} = 210 \text{ N/mm}^2$	fracture A ₅ ≥ 8%
1	Threaded rod ¹⁾⁴⁾	acc. to			7.,	$A_5 \ge 0.0$ $A_5 \ge 12\%^{-3}$
		EN ISO 3506-1:2009		f _{uk} = 700 N/mm ²	f _{yk} = 450 N/mm ²	$A_5 \ge 12\%$ $A_5 \ge 12\%$ 3)
				f _{uk} = 800 N/mm ²	f _{yk} = 600 N/mm²	A ₅ ≥ 12% %
2	Hexagon nut ¹⁾⁴⁾	acc. to	<u>50</u>	for anchor rod class 50 for anchor rod class 70		
2	i iezagon nut 🗥	EN ISO 3506-1:2009		for anchor rod class 80		
3а	Washer	A4: Material 1.4401 / HCR: Material 1.4529	1.43 1.44 9 or 1	1.4565, acc. to EN 10088-1 EN ISO 7089:2000, EN ISO	578, acc. to EN 10088-1 : 2014	:2014
3b	Filling washer	Stainless steel A4, H	igh c	orrosion resistance steel		
Property class Characteristic steel Characteristic steel Flongation ultimate tensile strength yield strength fracture						
4	Internal threaded	acc. to	50	f _{uk} = 500 N/mm ²	f _{yk} = 210 N/mm²	A ₅ > 8%
4	anchor rod ¹⁾²⁾	EN ISO 3506-1:2009	70	f _{uk} = 700 N/mm²	f _{yk} = 450 N/mm²	A ₅ > 8%
1)	Dagaganti aleee 70 e 20) fan analasa sa da sa U		n musta um ta NACA 1 1 4	al thorough an are the constitution	

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

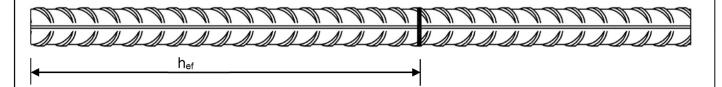
Mungo Injection system MIT700RE for concrete	
Product description Materials threaded rod and internal threaded rod	Annex A 4

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	orcing bars	
1	TENTIOUS TENTION AND A CONTRACTOR OF THE CONTRAC	Bars and de-coiled rods class B or C f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA $f_{uk} = f_{tk} = k \cdot f_{yk}$

Mungo Injection system MIT700RE for concrete	
Product description Materials reinforcing bar	Annex A 5



Specifications of intended use							
Anchorages subject to (Static	and quasi-static id	oads):					
	for a working I	ife of 50 years	for a working li	fe 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	Ø8 to Ø32, No performance		No performance assessed			
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, ∅8 to ∅32	M12 to M24				
Diamond drilling (DD)	No performance assessed	No performance assessed				
Temperature Range:	I: - 40 °C to +40 °C ¹⁾ II: - 40 °C to +72 °C ²⁾	I: -40 °C to +40 °C ¹⁾ II: -40 °C to +72 °C ²⁾				

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

Base materials:

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

Use conditions (Environmental conditions):

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

Mungo Injection system MIT700RE for concrete	
Intended Use Specifications	Annex B 1

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

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Design:

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

Installation:

- Dry, wet concrete or flooded bore holes (not sea-water).
- · Hole drilling 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.

Mungo Injection system MIT700RE 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 _{nom}	[mm]	8	10	12	16	20	24	27	30
Nominal drill hole di	ameter	d ₀	[mm]	10	12	14	18	22	28	30	35
Effective embedmer	at donth	h _{ef,min}	[mm]	60	60	70	80	90	96	108	120
Ellective ellibedillet	it deptil	h _{ef,max}	[mm]	160	200	240	320	400	480	540	600
Diameter of clearance hole in	Prepositioned ins	tallation d _f ≤	[mm]	9	12	14	18	22	26	30	33
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 _{min}	[mm]		_f + 30 m : 100 mr			l	h _{ef} + 2d ₀		
Minimum spacing s _{min}		[mm]	40	50	60	75	95	115	125	140	
Minimum edge distance 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 8 ¹⁾	Ø 10¹)	Ø 1	2 ¹⁾	Ø 14	Ø 16	Ø 20	Ø 24 ¹⁾	Ø 25 ¹⁾	Ø 28	Ø 32		
Diameter of element	d = d _{nom}	[mm]	8	10	12	2	14	16	20	24	25	28	32
Nominal drill hole diameter	d_0	[mm]	10 12	12 14	14	16	18	20	25	30 32	30 32	35	40
Effective embedment depth	$h_{ef,min}$	[mm]	60	60	70)	75	80	90	96	100	112	128
Enective embedment depth	h _{ef,max}	[mm]	160	200	24	0	280	320	400	480	500	560	640
Minimum thickness of member	h _{min}	[mm]	h _{ef} + 30 mm ≥ 100 mm						h _e	f + 2d ₀			
Minimum spacing	linimum spacing s _{min} [mm] 40 50 60)	70	75	95	120	120	130	150			
Minimum edge distance	c_{min}	[mm]	35	40	45	5	50	50	60	70	70	75	85

¹⁾ both nominal drill hole diameter can be used

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 denth	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]	h _{ef} + 30 mm ≥ 100 mm			h _{ef} +	- 2d₀	
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

Mungo Injection system MIT700RE for concrete Intended Use Installation parameters Annex B 3



Table B4	Table B4: Parameter cleaning and setting tools										
					manail						
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	on directio piston plu		
[mm]	[mm]	[mm]	[mm]	MIT-	[mm]	[mm]	MIT-	1	→	1	
M8	8		10	BS10	11,5	10,5					
M10	8 / 10	IG-M6	12	BS12	13,5	12,5		No olua	roguirod		
M12	10 / 12	IG-M8	14	BS14	15,5	14,5		No plug required			
	12		16	BS16	17,5	16,5					
M16	14	IG-M10	18	BS18	20,0	18,5	VS18				
	16		20	BS20	22,0	20,5	VS20				
M20		IG-M12	22	BS22	24,0	22,5	VS22				
	20		25	BS25	27,0	25,5	VS25	h .>	h _{ef} >		
M24		IG-M16	28	BS28	30,0	28,5	VS28	h _{ef} >	250 mm	all	
M27	24 / 25		30	BS30	31,8	30,5	VS30	250 mm	250 111111		
	24 / 25		32	BS32	34,0	32,5	VS32				
M30	28	IG-M20	35	BS35	37,0	35,5	VS35				
	32		40	BS40	43,5	40,5	VS40				

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

Drill bit diameter (d₀): all diameters

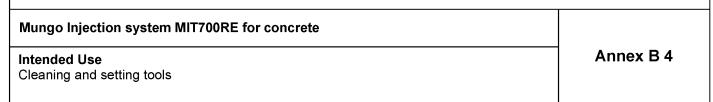




HDB - Hollow drill bit system

Drill bit diameter (d₀): all diameters

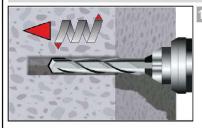
The hollow drill bit system contains the Mungo MHP-Clean / MHX-Clean hollow drill bit and a class M vacuum with minimum negative pressure of 253 hPa \underline{and} flow rate of minimum 150 m³/h (42 l/s).





Installation instructions

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

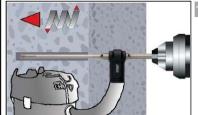


Hammer (HD) or compressed air drilling (CD)

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.



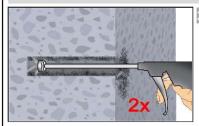
Hollow drill bit system (HDB) (see Annex B 3)

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.

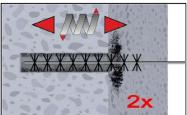
In case of aborted drill hole, the drill hole shall be filled with mortar.

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

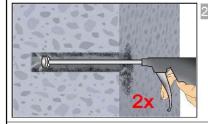
CAC: Cleaning for dry, wet and water-filled bore holes with all diameter in uncracked and cracked concrete



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.

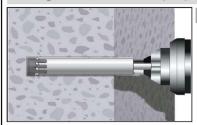
After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

Mungo Injection system MIT700RE for concrete	
Intended Use Installation instructions	Annex B 5



Installation instructions (continuation)

Drilling of the bore hole (DD)



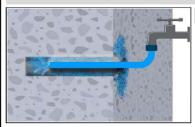
a. Diamond drilling (DD)

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.

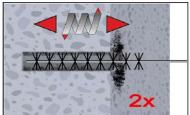
In case of aborted drill hole, the drill hole shall be filled with mortar.

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

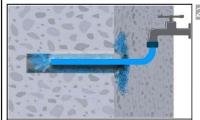


Rinsing with water until clear water comes out.

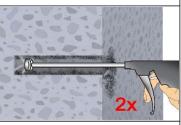


Check brush diameter (Table B4). Brush the hole with an appropriate sized wire brush > d_{b,min} (Table B4) a minimum of two times.

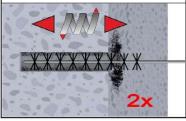
If the bore hole ground is not reached with the brush, a brush extension must be used.



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

Mungo Injection system MIT700RE for concrete

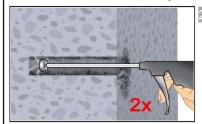
Intended Use

Installation instructions (continuation)

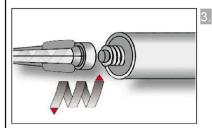
Annex B 6



Installation instructions (continuation)

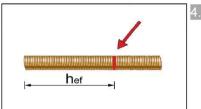


Finally blow the hole clean again with compressed air (min. 6 bar) (Annex B 4) a minimum of two times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used.

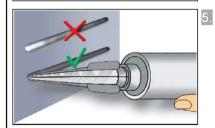


Attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool.

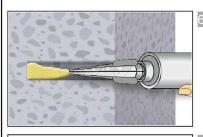
For every working interruption longer than the recommended working time (Table B5 as well as for new cartridges, a new static-mixer shall be used.



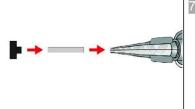
Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods.



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.



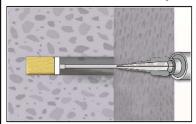
Piston plugs shall be used according to Table B4 for the following applications:

- Horizontal assembly (horizontal direction) and ground erection (vertical downwards direction): Drill bit-Ø $d_0 \ge 18$ mm and embedment depth $h_{\rm ef} > 250$ mm
- Overhead assembly (vertical upwards direction): Drill bit-Ø d₀ ≥ 18 mm
 Assemble mixing nozzle, mixer extension and piston plug before injecting mortar.

Mungo Injection system MIT700RE for concrete	
Intended Use Installation instructions (continuation)	Annex B 7

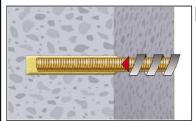


Installation instructions (continuation)



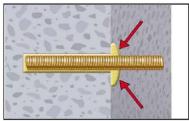
Insert piston plug to back of the hole and inject adhesive. If the bottom or back of the anchor hole is not reached, an appropriate extension nozzle must be used.

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.

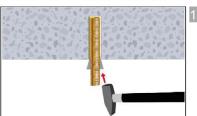


Push the fixing element into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment mark has reached the surface level.

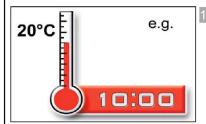
The anchor shall be free of dirt, grease, oil or other foreign material.



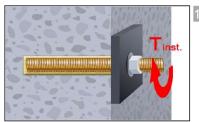
After inserting the anchor, the annular gab between anchor rod and concrete, in case of a push through installation additionally also the fixture, must be complete filled with mortar. If excess mortar is not visible at the top of the hole, the requirement is not fulfilled and the application has to be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

Mungo Injection system MIT700RE for concrete	
Intended Use Installation instructions (continuation)	Annex B 8



Table B5:	Ma	aximum w	orking time and mini	mum curing time		
Concrete	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	e temp	erature		+5°C to +40°C	•	

Mungo Injection system MIT700RE for concrete	
Intended Use Curing time	Annex B 9



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

³⁾ Anchor type not part of the ETA

Mungo Injection system MIT700RE for concrete	
Performances Characteristic values for steel tension resistance and steel shear resistance of threaded rods	Annex C 1



Table C2:	Characteristic values for Concrete cone failure and Splitting with all kind of action							
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}				

Mungo Injection system MIT700RE for concrete	
Performances Characteristic values for Concrete cone failure and Splitting with all kind of action	Annex C 2



Anchor size threaded r	od			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure		Tai		<u> </u>		Λ	/	- T-L	I- 04\		
Characteristic tension re	sistance	N _{Rk,s}	[kN]				ık (or s		le C1)		
Partial factor		γ _{Ms,N}	[-]				see Ta	ble C1			
Combined pull-out and											
Characteristic bond resis holes (CD)	stance in non-crac	ked concrete	C20/25 in har	nmer o	irilled h	oles (H	D) and	compr	essed	aır drill	ed
II: 72°C/50°C	Dry, wet concrete and	^τ Rk,ucr	[N/mm²]	20	20	19	19	18	17	16	16
ق اا: 72°C/50°C	flooded bore hole	*RK,ucr	[[V]]	15	15	15	14	13	13	12	12
Characteristic bond resis	stance in non-crac	ked concrete	C20/25 in har	nmer d	rilled h	oles wi	th hollo	w drill	bit (HD	В)	
<u> 일</u> I: 40°C/24°C	Dry, wet			17	16	16	16	15	14	14	13
eg II: 72°C/50°C	concrete		FA17 07	14	14	14	13	13	12	12	11
1: 40°C/24°C 1: 40°C/24°C 1: 40°C/24°C 1: 72°C/50°C	flooded bore	^τ Rk,ucr	[N/mm²]	16	16	16	15	15	14	14	13
Б <u>II: 72°C/50°C</u>	hole			14	14	14	13	13	12	12	11
Characteristic bond resis		concrete C20	/25 in hamme								s (CD
and with hollow drill bit (l											
II: 72°C/50°C	Dry, wet concrete and flooded bore	^τ Rk,cr	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5
ы II: 72°С/50°С	hole	·		6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0
Reduction factor ψ^0_{sus} ir holes (CD) and with hollo		-cracked con	crete C20/25 i	n hami	mer dril	led hol	es (HD), comp	oressec	d air dri	illed
II: 72°C/50°C	Dry, wet concrete and	Ψ ⁰ sus	[-]	0,80							
ور اا: 72°C/50°C	flooded bore hole	T SUS	1.1				0,0	68			
		C25/30						02			
		C30/37						04			
Increasing factors for co	ncrete	C35/45						07			
Ψс		C40/50 C45/55						08 00			
		C50/60						09 10			
Concrete cone failure		1000/00		<u> </u>			Ι,				
Relevant parameter							see Ta	ble C2			
Splitting											
Relevant parameter							see Ta	ble C2			
	//ID //DD 000	1		Ι							
Installation factor	(HD; HDB, CD)	γ_{inst}	[-]					,0 .2			
for dry and wet concrete). HDB CD/	1		<u> </u>			- 1,	,∠			
); HDB, CD)	•									
for dry and wet concrete for flooded bore hole (HD											
for dry and wet concrete		or concrete							Anne		



N 1 C-11	od			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure											
Characteristic tension res	sistance	$N_{Rk,s}$	[kN]			$A_{s} \cdot f_{l}$	_{ık} (or s	ee Tab	le C1)		
Partial factor		γMs,N	[-]				see Ta	ble C1			
Combined pull-out and			•								
Characteristic bond resis noles (CD)	tance in non-crac	ked concrete C	20/25 in har	mmer d	Irilled h	oles (H	D) and	compi	essed	air drill	led
					Ι						
Temperature range II: 40°C/24°C	Dry, wet concrete and	τ _{Rk,ucr,100}	[N/mm²]	20	20	19	19	18	17	16	16
G & II: 72°C/50°C	flooded bore hole	TXX,UCI, 100		15	15	15	14	13	13	12	12
Characteristic bond resis	tance in non-crac	ked concrete C	20/25 in har	nmer d	Irilled h	oles wi	th hollo	w drill	bit (HD	 В)	
<u>e</u> I: 40°C/24°C	Dry, wet			17	16	16	16	15	14	14	13
: 40°C/24°C : 40°C/24°C	concrete			14	14	14	13	13	12	12	11
II: 72°C/50°C	flooded bore	^τ Rk,ucr,100	[N/mm²]	16	16	16	15	15	14	14	13
Б II: 72°C/50°С	hole			14	14	14	13	13	12	12	11
Characteristic bond resis	⊥ tance in cracked o	oncrete C20/2	_⊥ !5 in hamme								
and with hollow drill bit (F						, ,,				•	
Temperature range range II: 40°C/24°C	Dry, wet concrete and	Τ	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5
อน II: 72°C/50°C	flooded bore hole	^T Rk,cr,100	[IN/IIIII-]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5
	1	C25/30	<u>'</u>				1,	02			
		C30/37						04			
ncreasing factors for cor	icrete	C35/45						07			
^V c		C40/50						80			
		C45/55 C50/60						09 10			
Concrete cone failure		1000/00		<u> </u>			.,	10			
Relevant parameter							see Ta	ble C2			
Splitting											
Relevant parameter							see Ta	ble C2			
nstallation factor			1	1							
or dry and wet concrete	•	$-\gamma_{inst}$	[-]					,0			
or flooded bore hole (HD	, חטס, טט)						1	,2			

Mungo Injection system MIT700RE for concrete	
Performances Characteristic values of tension loads under static and quasi-static action	Annex C 4



				0 and 10								
	or size threaded ro	od			M8	M10	M12	M16	M20	M24	M27	M30
Steel fa		·-1	N	P1 h 17	A _s ∙ f _{uk} (or see Table C1)							
	cteristic tension res	sistance	N _{Rk,s}	[kN]								
Partial			γMs,N	[-]	see Table C1							
	ined pull-out and											
	cteristic bond resist	tance in non-crac	ked concrete C	20/25 in dia	mond o	drilled h	oles (D	DD)				
Temperature range	l: 40°C/24°C	Dry, wet concrete and	^τ Rk,ucr	[N/mm²]	15	14	14	13	12	12	11	11
Temp ra	II: 72°C/50°C	flooded bore hole	TXR, UCI	[,]	12	12	11	10	9,5	9,5	9,0	9,0
Reduct	tion factor ψ ⁰ sus in	non-cracked con	crete C20/25 in	diamond di	rilled ho	oles (D	D)					
nperature range	l: 40°C/24°C	Dry, wet concrete and	0					0,	77			
Temperature range	II: 72°C/50°C	flooded bore hole	Ψ^0 sus	[-]				0,	72			
			C25/30	-				1,	04			
			C30/37					1,	80			
Increas	sing factors for con	crete	C35/45						12			
Ψ_{C}			C40/50						15			
			C45/55						17			
01-:			C50/60	l'C C 400				1,	19			
	ined pull-out and eteristic bond resist					drilled b	oles (F	וחו				
	Scriedo Dona Icelei		incu concrete O	Zorzo III ula	monu (armeu I	ioica (L	,,,				
Temperature range	I: 40°C/24°C	Dry, wet concrete and flooded bore	^τ Rk,ucr,100	[N/mm²]	15	14	14	13	12	12	11	11
Tem	II: 72°C/50°C	hole			11	11	10	10	9,5	9,0	8,5	8,5
			C25/30						04			
l	-: ft f		C30/37						08			
	sing factors for con	crete	C35/45						12			
Ψ_{C}			C40/50 C45/55						15 17			
			C50/60						17 19			
Concre	ete cone failure		1000/00		<u> </u>			1,	10			
	ant parameter							see Ta	ble C2	<u> </u>		
Splittir					<u> </u>			•				
	nt parameter							see Ta	ble C2			
	ation factor											
	and wet concrete (` '	γ:	r_1				1	,0			
for floo	ded bore hole (DD)	^γ inst	[-]		1,2				1,4		
Muna	go Injection syste	em MIT700RE fo	or concrete									



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 • \	N _{el} ∙ f _{uk}	(or see	Table C	(1)	
Elastic section modulus	W _{el}	[mm³]	31	62	109	277	541	935	1387	1874
Partial factor	γMs,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	I _f	[mm]		n	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	γinst	[-]					1,0			

Mungo Injection system MIT700RE for concrete	
Performances Characteristic values of shear loads under static and quasi-static action	Annex C 6
Characteristic values of shear loads under static and quasi-static action	

Performances



Anchor size internal thr	eaded anch	or rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure ¹⁾				'		•	•			
Characteristic tension res	sistance,	5.8	$N_{Rk,s}$	[kN]	10	17	29	42	76	123
Steel, strength class		8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
Partial factor, strength cla	ass 5.8 and 8	3.8	γ _{Ms,N}	[-]		ı	1	,5		
Characteristic tension res Steel A4 and HCR, Stren	istance, Sta	inless	N _{Rk,s}	[kN]	14	26	41	59	110	124
Partial factor	<u>g</u>		γ _{Ms,N}	[-]		2,86				
Combined pull-out and	concrete co	one failu								
Characteristic bond resi holes (CD)	stance in no	on-cracke	ed concre	ete C20/2	ō in hamn	ner drilled	holes (HD)) and com	npressed a	air drilled
Temperature : 40°C/2	4°C Dry, conc	wet rete and	_	[N]/m= m= 2]	20	19	19	18	17	16
range II: 72°C/5	0°C flood hole	ed bore	^τ Rk,ucr	[N/mm²]	15	15	14	13	13	12
Characteristic bond resis	tance in non	-cracked	concrete	C20/25 in	hammer	drilled hol	es with ho	llow drill b	it (HDB)	
l: 40°C/2		wet			16	16	16	15	14	13
Temperature II: 72°C/5	0°C conc	rete	TDI	[N/mm²]	14	14	13	13	12	11
range I: 40°C/2		ed bore	^τ Rk,ucr	ן ניייייין	16	16	15	15	14	13
II: 72°C/5					14	14	13	13	12	11
Characteristic bond resis and with hollow drill bit (H		cked cond	crete C20	/25 in ham	ımer drille	ed holes (F	HD), comp	ressed air	drilled ho	les (CD)
TemperatureI: 40°C/2	conc	rete and	^τ Rk,cr	[N/mm²]	7,0	8,5	8,5	8,5	8,5	8,5
range II: 72°C/5	hole	ed bore			6,0	7,0	7,0	7,0	7,0	7,0
Reduction factor ${\psi^0}_{ t sus}$ i	n cracked a	nd non-c	racked c	oncrete C	20/25 in I	hammer d	Irilled hole	s (HD), co	mpressed	air
drilled holes (CD) and w	th hollow dr	II bit (HD	B)							
Tamparatura 1: 40°C/2	4°C Dry,						0,	80		
Temperature II: 72°C/5	flood	rete and ed bore	Ψ^0 sus	[-]			0,	68		
	Tilole		C2	5/30			1	02		
				0/37				04		
Increasing factors for cor	crete		C3	5/45				07		
Ψс				0/50			1,	08		
			-	5/55				09		
Camanata a ana failuna			C5	0/60			1,	10		
Concrete cone failure				I			000 To	able C2		
Relevant parameter Splitting failure							See 12	able C2		
Relevant parameter							See Ta	able C2		
Installation factor							555 16	02		
for dry and wet concrete	(HD; HDB. C	D)					1	,0		
for flooded bore hole (HD	•	,	γinst	[-]				,2		
1) Fastenings (incl. nut an The characteristic tension	d washer) m									d rod.

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

Annex C 7



				00 year						
	nternal threade	d anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure ¹⁾			N			4-		40	70	400
	tension resistan	· —	N _{Rk,s}	[kN]	10	17	29	42	76	123
Steel, strength		8.8	N _{Rk,s}	[kN]	16	27	46	67	121	196
<u>:</u>	strength class 5.		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	ıll-out and conc	rete cone failu	re							
Characteristic holes (CD)	bond resistanc	e in non-crack	ed concrete	e C20/25	in hamme	er drilled h	noles (HD)) and com	pressed a	air drilled
	I: 40°C/24°C	Dry, wet			20	19	19	18	17	16
Temperature range	II: 72°C/50°C	concrete and flooded bore hole	^τ Rk,ucr,100	[N/mm²]	15	15	14	13	13	12
Characteristic	bond resistance	in non-cracked	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	[NI/mm21	14	14	13	13	12	11
range	I: 40°C/24°C	flooded bore	τRk,ucr,100	ן ניאיווווידי <u>ן</u> [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 con	crete 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	TDI 100	[N/mm²]	6,5	7,5	7,5	7,5	7,5	7,5
range	II: 72°C/50°C	flooded bore hole	^τ Rk,ucr,100		5,5	6,5	6,5	6,5	6,5	6,5
			C25					02		
lucrossina for	tora for concents		C30					04		
-	tors for concrete		C35					07		
Ψ_{c}			C40 C45					08 09		
			C50					10		
Concrete con	ne failure						.,			
Relevant para							see Ta	able C2		
Splitting failu										
Relevant para							see Ta	able C2		
Installation fa	actor			'						
for dry and we	et concrete (HD; I	HDB, CD)	γ _{inst}	[-]			1	,0		

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.

Mungo Injection system MIT700RE for concrete	
Performances Characteristic values of tension loads under static and quasi-static action	Annex C 8

⁴⁾ For IG-M20 strength class 50 is valid



Anchor size internal threade	d anchor rods			IG-M6	IG-M8	IG-M10	IG-M12	IG-M16	IG-M20
Steel failure ¹⁾				,		1	•		
Characteristic tension resistan	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
Partial factor, strength class 5.	8 and 8.8	γ _{Ms,N}	[-]			1	,5		
Characteristic tension resistan	ce, Stainless	N _{Rk,s}		14	26	41	59	110	124
Steel A4 and HCR, Strength cl	lass 70 ²⁾	T'RK,S	[kN]	14	20		39	110	
Partial factor		γ _{Ms,N}	[-]			1,87			2,86
Combined pull-out and conc									
Characteristic bond resistance		ed concrete	e C20/25	in diamor	d drilled	holes (DD) 	1 1	
Temperature : 40°C/24°C	Dry, wet concrete and flooded bore	τ _{Rk,ucr}	[N/mm²]	14	14	13	12	12	11
range II: 72°C/50°C	hole		:	12	11	10	9,5	9,5	9,0
Reduction factor ψ ⁰ sus in non-	_	ete C20/25	in diamo	na arilled	noies (Di	(ر			
Temperature I: 40°C/24°C	Dry, wet concrete and	Ψ ⁰ sus	[-]			0,	77		
range II: 72°C/50°C	flooded bore hole						72		
		C25					04		
Increasing factors for concrete		C30.				·	08 12		
$\Psi_{\mathbf{c}}$		C40					15		
† C		C45					17		
		C50					19		
Combined pull-out and conc	rete cone failu	re for a wo	rking life	of 100 ye	ars	,			
Characteristic bond resistanc	e in non-crack	ed concrete	C20/25 i	n diamon	d drilled l	noles (DD)		
Temperature I: 40°C/24°C	Dry, wet concrete and	τ _{Rk,ucr,100}	[N/mm²]	14	14	13	12	12	11
ranga	flooded bore hole	*RK,ucr,100		11	10	10	9,5	9,0	8,5
range II: 72°C/50°C			/				0.4		
II: 72°C/50°C	1	C25.					04		
II: 72°C/50°C		C30.	/37			1,	08		
Increasing factors for concrete		C30.	/37 /45			1, 1,	08 12		
Increasing factors for concrete		C30 C35 C40	/37 /45 /50			1, 1, 1,	08 12 15		
Increasing factors for concrete		C30.	/37 /45 /50 /55			1, 1, 1,	08 12		
range II: 72°C/50°C Increasing factors for concrete Ψc Concrete cone failure		C30. C35. C40. C45.	/37 /45 /50 /55			1, 1, 1,	08 12 15 17		
Increasing factors for concrete ∀c Concrete cone failure Relevant parameter		C30. C35. C40. C45.	/37 /45 /50 /55			1, 1, 1, 1,	08 12 15 17		
Increasing factors for concrete		C30. C35. C40. C45.	/37 /45 /50 /55			1, 1, 1, 1, 1,	08 12 15 17 19 able C2		
Increasing factors for concrete Ψ _c Concrete cone failure Relevant parameter Splitting failure Relevant parameter		C30. C35. C40. C45.	/37 /45 /50 /55			1, 1, 1, 1, 1,	08 12 15 17		
Increasing factors for concrete Ψ _c Concrete cone failure Relevant parameter Splitting failure Relevant parameter Installation factor		C30. C35. C40. C45.	/37 /45 /50 /55			1, 1, 1, 1, 1, see Ta	08 12 15 17 19 able C2		
Increasing factors for concrete \(\psi_c \) Concrete cone failure Relevant parameter Splitting failure Relevant parameter Installation factor for dry and wet concrete (DD)		C30. C35. C40. C45.	/37 /45 /50 /55	1	2	1, 1, 1, 1, 1, see Ta	08 12 15 17 19 able C2 able C2	4	
Increasing factors for concrete	washer) must co	C30. C35. C40. C45. C50.	/37 /45 /50 /55 /60		al and pro	1, 1, 1, 1, 1, 1, see Ta see Ta	08 12 15 17 19 able C2 ,0 1,s of the int		
Increasing factors for concrete Ψc Concrete cone failure Relevant parameter Splitting failure Relevant parameter Installation factor for dry and wet concrete (DD) for flooded bore hole (DD) Tastenings (incl. nut and vold. The characteristic ter	washer) must co nsion resistance s 50 is valid	C30. C35. C40. C45. C50.	/37 /45 /50 /55 /60	ate materi	al and pro	1, 1, 1, 1, 1, 1, see Ta see Ta	08 12 15 17 19 able C2 ,0 1,s of the int	ernal threa	



Table C10: Characteri	stic 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	[-]				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		γ _{Ms,V}	[-]			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	nd 8.8	γ _{Ms,V}	[-]				1,25		
Characteristic bending moment, Stainless Steel A4 and HCR, Strength class 70 ²⁾		M ⁰ _{Rk,s}	[Nm]	11	26	52	92	233	456
Partial factor		γMs,∨	[-]			1,56			2,38
Concrete pry-out failure									
Factor		k ₈	[-]				2,0		
Installation factor		γ _{inst}	[-]				1,0		
Concrete edge failure		-1	•	•					
Effective length of fastener		I _f	[mm]		min((h _{ef} ; 12 • d	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

Mungo Injection system MIT700RE for concrete	
Performances Characteristic values of shear loads under static and quasi-static action	Annex C 10



	naracteristic				ds u	nder	stati	c and	d qua	asi-st	atic		
Anchor size reinforci			y		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		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ _{Ms,N}	[-]					1,	4 ²⁾			•	
Combined pull-out ar				•									
Characteristic bond re	esistance in non	-cracked co	ncrete C2	20/25 i	n ham	mer dr	illed h	oles (H	ID) an	d com	presse	ed air d	Irilled
Temperature II: 40°C/24°C II: 72°C/50°C	Dry, wet concrete and	τ _{Rk,ucr}	[N/mm²]	16	16	16	16	16	16	15	15	15	15
हुँ II: 72°C/50°C	flooded bore hole	TKK,dGI	[12	12	12	12	12	12	12	12	11	11
Characteristic bond res	sistance in non-c	racked conc	rete C20/2	25 in ha	ammei	drille	holes	with I	nollow	drill bi	t (HDE	3)	ı
<u>ဗ</u> <u>l: 40°C/24°C</u>	<u>e</u> <u>I: 40°C/24°C</u> Dry, wet						13	13	13	13	13	13	13
E	concrete	TDI	[N/mm²]	12	12	12	11	11	11	11	11	11	11
हुँ हुँ ।: 40°C/24°C	flooded bore	^τ Rk,ucr	[[14/11111]	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 resistance in cracked concrete C20/25 in hammer drilled holes (HD), compressed air drilled holes (CD) and with hollow drill bit (HDB)													
ege 1: 40°C/24°C	Dry, wet concrete and		[N]/nn mn 21	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5
I: 40°C/24°C	flooded bore hole	^τ 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^0_{su} drilled holes (CD) and	_		ed concre	te C20)/25 in	hamm	ner dril	led ho	les (HI	D), cor	mpress	sed air	
II: 72°C/50°C	Dry, wet concrete and	Ψ ⁰ sus	[-]		0,80								
II: 72°C/50°C	flooded bore hole	T Sus		0,68									
		C25	/30					1,	02				
		C30							04				
Increasing factors for o	concrete	C35							07				
Ψс		C40.							08 09				
		C50							10				
Concrete cone failure				<u>I</u>				•,					
Relevant parameter								see Ta	ble C	2			
Splitting													
Relevant parameter								see Ta	ble C	2			
Installation factor		_											
for dry and wet concre	<u> </u>	γ _{inst}	[-]						,0				
for flooded bore hole (I	•							1	,2				
1) f _{uk} shall be taken from 2) in absence of nations		ns of reinforci	ing bars										
Mungo Injection sy	stem MIT700RI	E for concr	ete										
Performances Characteristic values of	Performances Characteristic values of tension loads under static and quasi-sta									A	nnex	C 11	



	r size reinforciı	ng bar			Ø 8	Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 3
Steel fa			T	1						- 4\				
Charac	teristic tension r	resistance	N _{Rk,s}	[kN]						f _{uk} 1)				
Cross s	section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	80
Partial			γMs,N	[-]					1,	4 ²⁾				
		id concrete faili												
holes (esistance in non	-cracked co	ncrete C2	0/25 ii	n ham	mer dr	illed ho	oles (F	ID) an	d com	oresse	ed air c	Irille
Temperature range	I: 40°C/24°C	Dry, wet concrete and	⁷ Rk,ucr,100	[N/mm²]	16	16	16	16	16	16	15	15	15	15
	II: 72°C/50°C	flooded bore hole			12	12	12	12	12	12	12	12	11	1′
Charac		sistance in non-c	racked conc	rete C20/2	5 in ha	ammer					drill bi	t (HDE	3)	
e n	l: 40°C/24°C	Dry, wet		14 14 13 13	13	13	13	13	13	13				
nperati range	II: 72°C/50°C	concrete	τ _{Rk,ucr,100}	[N/mm²]	12	12	12	11	11	11	11	11	11	11
Temperature range	l: 40°C/24°C	flooded bore	rkk,ucr, 100	[,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	13	13	13	13	13	13	13	13	13	13
Τe	II: 72°C/50°C	hole			11	11	11	11	11	11	11	11	11	11
and wit	teristic bond res th hollow drill bit	sistance in crack (HDB)	ed concrete	C20/25 in	hamm	er drill	ed hol	es (HD)), com	npress	ed air	drilled	holes	(CD
erature nge	0 -	concrete and	,.,.	[N/mm²]	6,5	6,5	7,5	7,5	7,5	7,5	7,5	7,5	7,5	7,
Temper		flooded bore hole		[[,4,,,,,,,,,,,]	5,5	5,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5	6,5
			C25							02				
			C30,		1,04									
increas Ψ _c	sing factors for c	oncrete	C35,		1,07 1,08									
ΨC			C40,		1,00									
			C50		1,10									
Concre	ete cone failure)	•											
	nt parameter								see Ta	ble C2	2			
Splittir														
	nt parameter								see Ta	ible C2	2			
	ation factor	(HD: HDB CD)		1					1	0				
	ded bore hole (F	e (HD; HDB, CD)	γ _{inst}	[-]						,0 ,2				
	hall be taken fron osence of nationa	n the specificatior al regulation	ns of reinforci	ng bars										
Muna	jo Injection sys	stom MIT700PI	E for concr	oto.										

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



	aracteristic tion for a wo						stati	c and	d qua	asi-st	atic		
Anchor size reinforcir							Ø 14	Ø 16	Ø 20	Ø 24	Ø 25	Ø 28	Ø 32
Steel failure		_				•	•	•	•	•	•	•	
Characteristic tension r	esistance	N _{Rk,s}	[kN]					A _s ·	f _{uk} 1)				
Cross section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor		γ _{Ms,N}	[-]					1,	4 ²⁾	•			
Combined pull-out an	d concrete failu			of 50	years			<u> </u>					
Characteristic bond re	sistance in non	-cracked co	ncrete C2	20/25 i	n diam	ond d	rilled h	oles (l	DD)				
Temperature range II: 40°C/24°C	Dry, wet concrete and	Tpl	[N/mm²]	14	13	13	13	12	12	11	11	11	11
Ten II: 72°C/50°C	flooded bore hole	[₹] Rk,ucr	[14/11111]	11	11	10	10	10	9,5	9,5	9,5	9,0	9,0
Reduction factor ${\psi^0}_{\sf sus}$	_s in non-cracked	l concrete C	20/25 in o	diamor	nd drill	ed hol	es (DE))					
Temperature range II: 40°C/24°C	Dry, wet concrete and flooded bore hole	Ψ ⁰ sus	[-]						77 72				
<u> </u>	11010	C25	/20						04				
		C30							08				
Increasing factors for co	/45												
Ψς		C40		1,12 1,15									
-	C45/55								17				
		C50.	/60					1,	19				
Combined pull-out an													
Characteristic bond re	sistance in non-	-cracked co	ncrete C2	20/25 i	n diam	ond d	rilled h	oles (l	DD)	1	1		
Temperature range II: 40°C/24°C	Dry, wet concrete and	TPk ucr 100	[N/mm²] -	14	13	13	13	12	12	11	11	11	11
d E II: 72°C/50°C	flooded bore hole	^T Rk,ucr,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 co	oncrete	C35							12				
$\Psi_{\mathbf{c}}$		C40							15				
		C45						•	17 19				
Concrete cone failure		L 030	,00					Ι,	10				
Relevant parameter								see Ta	able C	2			
Splitting				1									
Relevant parameter								see Ta	able C	2			
Installation factor				I									
for dry and wet concrete	e (DD)	24.	r 2					1	,0				
for flooded bore hole (D	` '	γinst	[-]		1	,2				1	,4		
¹⁾ f _{uk} shall be taken from ²⁾ in absence of nationa		ns of reinforci	ng bars										
Mungo Injection sys Performances Characteristic values of				tic acti	on					Aı	nnex	C 13	}



Table C14: Characteris	tic values	of she	ar lo	ads ı	unde	r sta	itic a	nd 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 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	γ _{Ms,V}	[-]	1,52)									
Ductility factor	k ₇	[-]						1,0				
Steel failure with lever arm			•									
Characteristic bending moment	M ⁰ _{Rk,s}	[Nm]					1.2	• W _{el}	• 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⁾	ı			
Concrete pry-out failure												
Factor	k ₈	[-]						2,0				
Installation factor	γ _{inst}	[-]						1,0				
Concrete edge failure	·		•									
Effective length of fastener	I _f	[mm]			min(h	ef; 12	• d _{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				

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

Mungo Injection system MIT700RE 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 ro	nd .		M8	M10	M12	M16	M20	M24	M27	M30		
									IVIZI	IVIOU		
Non-cracked concrete ι	Non-cracked concrete under static and quasi-static action for a working life of 50 and 100 years											
Temperature range I:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041		
40°C/24°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,028	0,029	0,030	0,033	0,035	0,038	0,039	0,041		
Temperature range II:	δ_{N0} -factor	[mm/(N/mm²)]	0,038	0,039	0,040	0,044	0,047	0,051	0,052	0,055		
72°C/50°C	$\delta_{ extsf{N}\infty}$ -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 c	uasi-static action	ı for a w	orking l	ife of 50	and 100) years					
Temperature range I:	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	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,100	0,115	0,122	0,128	0,135	0,142	0,155	0,171		
Temperature range II:	$\delta_{ extsf{N0}}$ -factor	[mm/(N/mm²)]	0,092	0,095	0,096	0,099	0,102	0,106	0,109	0,110		
72°C/50°C	$\delta_{ extsf{N}\infty}$ -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

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

 τ : action bond stress for tension

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

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

Anchor size threaded re	nchor size threaded rod				M12	M16	M20	M24	M27	M30	
Non-cracked concrete under static and quasi-static action for a working life of 50 years											
Temperature range I:	δ _{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015	
40°C/24°C δ _{N∞} -facto		[mm/(N/mm²)]	0,018	0,019	0,019	0,020	0,022	0,023	0,024	0,025	
Temperature range II:	[mm/(N/mm²)]	0,013	0,014	0,014	0,015	0,016	0,016	0,018	0,018		
72°C/50°C	$\delta_{ extsf{N}\infty}$ -factor	[mm/(N/mm²)]	0,052	0,053	0,055	0,058	0,062	0,065	0,068	0,070	
Non-cracked concrete u	ınder static a	nd quasi-static a	ction for	a worki	ng life c	f 100 ye	ars				
Temperature range I:	δ_{N0} -factor	[mm/(N/mm²)]	0,011	0,012	0,012	0,013	0,014	0,014	0,015	0,015	
40°C/24°C	$\delta_{N\infty}$ -factor	[mm/(N/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 δ _{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

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

 τ : action bond stress for tension

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

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

Anchor size thread	M8	M10	M12	M16	M20	M24	M27	M30		
Non-cracked and cracked concrete under static and quasi-static action										
All temperature	$\delta_{ extsf{V0}}$ -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

¹⁾ Calculation of the displacement

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

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

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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 ι	ınder static and	d quasi-static ac	tion for a v	vorking life	e of 50 and	100 years	3	
Temperature range l:	δ_{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:	δ_{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 unde	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	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,115	0,122	0,128	0,135	0,142	0,171
Temperature range II:	δ _{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

¹⁾ 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 C19: Displacements under tension load¹⁾ in diamond drilled holes (DD)

Anchor size Internal thr	eaded anchor	rod	IG-M6	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	working life	e of 50 yea	irs		
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	$\delta_{N\infty}$ -factor	[mm/(N/mm²)]	0,019	0,019	0,020	0,022	0,023	0,025
Temperature range II:	[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	working lif	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	$\delta_{N\infty}$ -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

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

τ: action bond stress for tension

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

Anchor size Inter	Anchor size Internal threaded anchor rod				IG-M10	IG-M12	IG-M16	IG-M20
Non-cracked and	cracked concrete	under static	and quasi-s	tatic action				
All temperature	$\delta_{ extsf{V0}}$ -factor	[mm/kN]	0,07	0,06	0,06	0,05	0,04	0,04
ranges	$\delta_{ m V}$ -factor	[mm/kN]	0,10	0,09	0,08	0,08	0,06	0,06

¹⁾ Calculation of the displacement

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

V: action shear load

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

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Performances

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

Annex C 16



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	Anchor size reinforcing bar					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 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	$\delta_{N\infty}$ -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:	$\delta_{ extsf{N0}}$ -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	workin	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:	$\delta_{ extsf{N0}}$ -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

¹⁾ Calculation of the displacement

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

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

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

Anchor size reinfo	nchor 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	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	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:	$\delta_{ extsf{N0}}$ -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:	$\delta_{ extsf{N0}} extsf{-factor}$	[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

¹⁾ Calculation of the displacement

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

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

Table 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	d cracked co	ncrete under s	tatic an	d quas	i-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

¹⁾ Calculation of the displacement

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

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

Mungo Injection system MIT700RE 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	M8	M10	M12	M16	M20	M2

Anchor size threaded rod			M8	M10	M12	M16	M20	M24	M27	M30
Steel failure										
Characteristic tension resistance	N _{Rk,s,eq,C1}	[kN]				1,0 •	$N_{Rk,s}$			
Partial factor	γ _{Ms,N}	[-]				see Ta	ble C1			

Combined pull-out and concrete failure

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)

uninea no	nes (CD) and with	Hollow drill bit (1	106)										
- 40 C/24 C		Dry, wet concrete and	^τ Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	
Temp ure ra	II: 72°C/50°C	flooded bore hole	^τ Rk,eq,C1	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	
Increasin	Increasing factors for concrete $\psi_{\mathbf{C}}$			C25/30 to C50/60 1,0									
Installati	ion factor												
for dry ar	for dry and wet concrete (HD; HDB, CD)		26	r 1	1,0								
for floode	for flooded bore hole (HD; HDB, CD)		γinst	[-]	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 _{Rk,s,eq,C1}	[kN]		0,70 ⋅ V ⁰ _{Rk,s}						
Partial factor	γ _{Ms,V}	[-]		see Table C1						
Factor for annular gap	$\alpha_{\sf gap}$	[-]				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.

Mungo Injection system MIT700RE 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

			•	•							_			
Ancho	r size reinforcin	ıg bar			Ø 8	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 _{Rk,s,eq,C1}	[kN]					1,0 • A	s • f _{uk}	1)			
Cross	section area		A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor $\gamma_{Ms,N}$ [-]					1,42)									
Combined pull-out and concrete failure														
	cteristic bond resi holes (CD) and v			cracked co	ncrete	C20/2	25 in h	amme	r drille	d hole	s (HD)	, comp	resse	d air
rature ge	I: 40°C/24°C	Dry, wet	^τ Rk,eq,C1	[N/mm²]	7,0	7,0	8,5	8,5	8,5	8,5	8,5	8,5	8,5	8,5
Temperature range	II: 72°C/50°C	flooded bore hole	^τ Rk,eq,C1	[N/mm²]	6,0	6,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0
Increas	sing factors for co	C50/60	1,0											
Install	ation factor		•		•									
for dry and wet concrete (HD; HDB, CD)				1,0										
for floo	or flooded bore hole (HD; HDB, CD)			[-]					1	.2				

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 _{Rk,s,eq,C1}	$_{q,C1}$ [kN] $0.35 \cdot A_s \cdot f_{uk}^{1)}$										
Cross section area	A _s	[mm²]	50	79	113	154	201	314	452	491	616	804
Partial factor	γ _{Ms,V}	[-]	1,5 ²⁾									
Factor for annular gap	$\alpha_{\sf gap}$	[-]	0,5 (1,0) ³⁾									

¹⁾ fuk shall be taken from the specifications of reinforcing bars

Mungo Injection system MIT700RE 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

¹⁾ fuk shall be taken from the specifications of reinforcing bars

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 C29: 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	$\gamma_{Ms,N}$	[-]		see Ta	ble C1	
Combined pull-out and concrete fail	lure					

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)

ariilea i	drilled notes (CD) and with notion drill bit (HDB)								
emperat re range	I: 40°C/24°C	Dry, wet concrete and	^τ Rk,eq,C2	[N/mm²]	5,8	4,8	5,0	5,1	
Tem ure r	flooded bore hole		^τ Rk,eq,C2	[N/mm²]	5,0	4,1	4,3	4,4	
Increasing factors for concrete ψ _C		C25/30 to C50/60		1,0					
Installation factor									
for dry and wet concrete (HD; HDB, CD)		26		1,0					
for flooded bore hole (HD; HDB, CD)		^γ inst	[-]	1,2					
1									

Table C28: 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	$\gamma_{Ms,V}$	[-]	see Table C1			
Factor for annular gap	$\alpha_{\sf gap}$	[-]		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.

Mungo Injection system MIT700RE 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 thread	Anchor size threaded rod M12 M16 M20 M24							
Non-cracked and c	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	$\delta_{ extsf{N}, ext{eq,C2(ULS)}}$	[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 under seismic action (performance 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

Mungo Injection system MIT700RE for concrete	
Performances Displacements under seismic action (performance category C2) (threaded rods)	Annex C 21