Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-15/0506 of 29 January 2016

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	MC-AnchorSolid E820
Product family to which the construction product belongs	Bonded anchor for use in uncracked concrete
Manufacturer	MC-Bauchemie Müller GmbH & Co. KG Am Kruppwald 1-8 46238 Bottrop DEUTSCHLAND
Manufacturing plant	MC-Bauchemie Müller GmbH & Co. KG Am Kruppwald 1-8 46238 Bottrop DEUTSCHLAND
This European Technical Assessment contains	17 pages including 3 annexes
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 5: "Bonded anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The anchor adhesive system "MC AnchorSolid E820 for rebar and threaded rod" is a bonded anchor consisting of a cartridge with injection mortar MC AnchorSolid E820 and a steel element. The steel element consist of a commercial threaded rod with washer and hexagon nut in the range of M8 to M20 or a reinforcing bar in the range of diameter 8 to 20 mm.

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

The product description is given in Annex A.

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

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

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

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance tension and shear loads, displacements	See Annex C 1 to C 4

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance assessed

3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances there may be requirements (e.g. transposed European legislation and national laws, regulations and administrative provisions) applicable to the products falling within the scope of this European Technical Assessment. In order to meet the provisions of Regulation (EU) No 305/2011, these requirements need also to be complied with, when and where they apply.

3.4 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 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 EAD

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

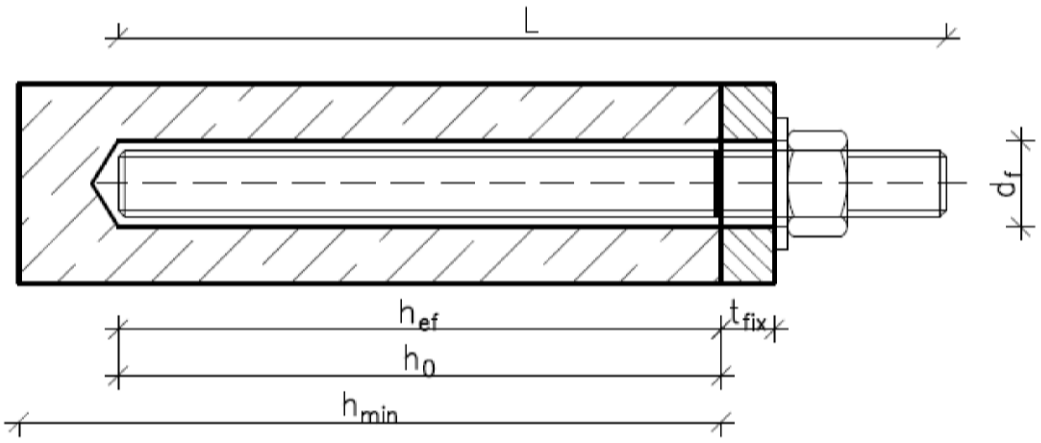
Issued in Berlin on 29 January 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

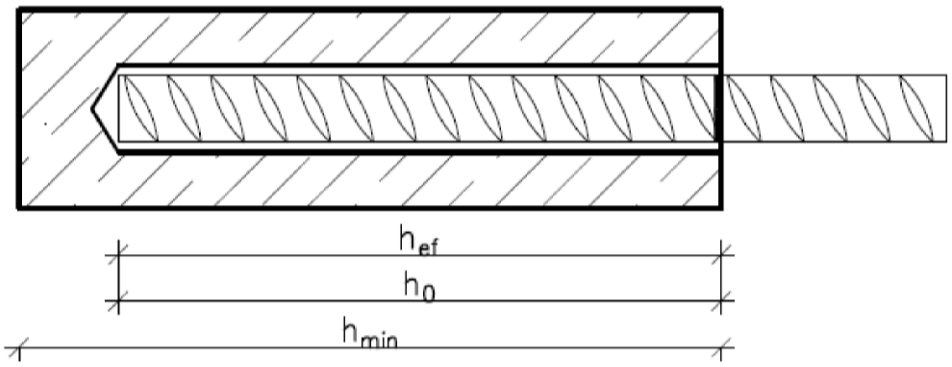
beglaubigt:
Lange

Deutsches Institut für Bautechnik

Installation threaded rod



Installation reinforcing bar



d_f	=	diameter of clearance hole in the fixture
t_{fix}	=	thickness of fixture
h_{ef}	=	effective anchorage depth
h_0	=	depth of drill hole
h_{min}	=	minimum thickness of the concrete member

Anchor adhesive system MC-AnchorSolid E820

Product description
Installed condition

Annex A 1

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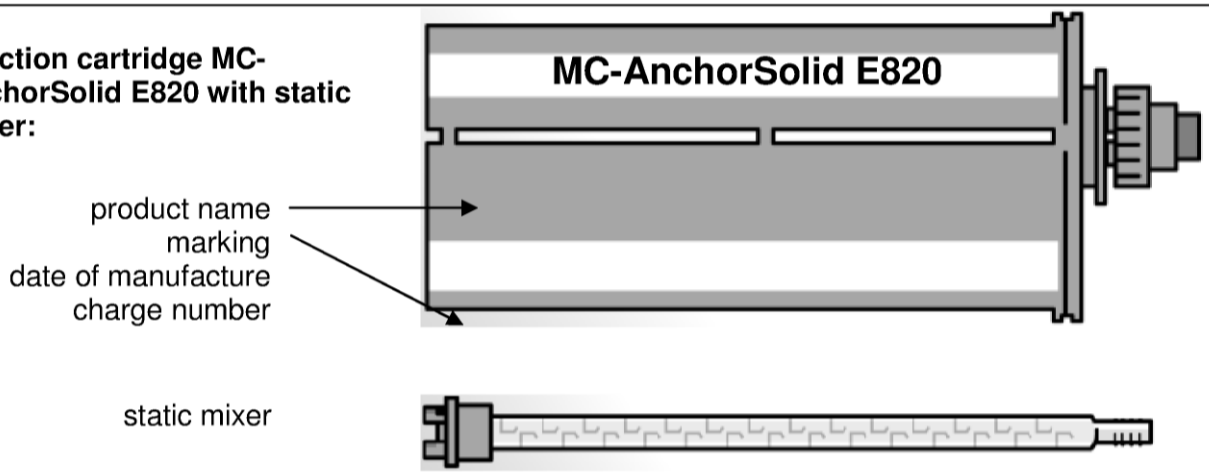
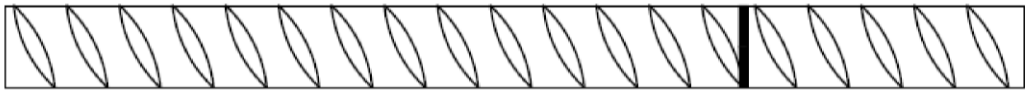
Injection cartridge MC-AnchorSolid E820 with static mixer:

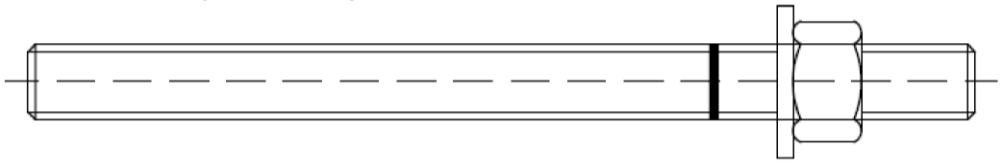


Reinforcing bar (Ø8 to Ø20)



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

Threaded rod (M8 to M20)



Commercial standard threaded rod with:
- Materials, dimensions and mechanical properties acc. Table A2
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

Table A1: Minimum and maximum dimensions

Reinforcing bar			Threaded rod		
ø	min [mm]	max [mm]	ø	min [mm]	max [mm]
Ø8	60	96	M8	60	96
Ø10	60	120	M10	60	120
Ø12	70	144	M12	70	144
Ø14	70	168	M14	70	168
Ø16	80	192	M16	80	192
			M18	80	192
Ø20	120	240	M20	120	240

Anchor adhesive system MC-AnchorSolid E820	**Annex A 2**
Product description Injection system, threaded rod and reinforcing bar	

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Table A2: Materials

Threaded rod

Part	Designation	Material
Steel, galvanised ≥ 5 µm acc. to EN ISO 4042 or Steel, hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461		
1	Threaded rod	Steel, EN 10087:1998 or EN 10263:2001 Property class 4.6, 5.8, 8.8, EN ISO 898-1 A_5 > 8% fracture elongation
2	Hexagon nut, DIN 934	Property class 4 (for class 4.6 rod) EN ISO 898-2:2012 Property class 5 (for class 5.8 rod) EN ISO 898-2:2012 Property class 8 (for class 8.8 rod) EN ISO 898-2:2012
3	Washer, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanised
Stainless steel A4		
1	Threaded rod	Material 1.4401/ 1.4404/ 1.457, EN 10088-1:2005, Property class 70, EN ISO 3506-1:2009 A_5 > 8% fracture elongation
2	Hexagon nut, DIN 934	Material 1.4401/ 1.4404/ 1.4571, EN 10088:2005, Property class 70, EN ISO 3506-2:2009
3	Washer, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4401/ 1.4404/ 1.4571, EN 10088-1:2005
High corrosion resistance steel HCR		
1	Threaded rod	Material 1.4529/ 1.4565, EN 10088-1:2005, Property class 70, EN ISO 3506-1:2009 A_5 > 8% fracture elongation
2	Hexagon nut, DIN 934	Material 1.4529/ 1.4565, EN 10088-1:2005, Property class 70, EN ISO 3506-2:2009
3	Washer, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4529/ 1.4565, EN 10088-1:2005

Reinforcing 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 toNDP or NCL of EN 1992-1-1/NA:2013 $f_{uk}=f_{tk}=k \cdot f_{yk}$

Anchor adhesive system MC-AnchorSolid E820	**Annex A 3**
Product description Materials	

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads.

Base materials:
- Reinforced or unreinforced normal weight concrete according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Uncracked concrete.

Temperature Range:
- I: + 5°C to + 40 °C (max. long term temperature + 35 °C and max short term temperature + 60°C)

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist
  (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist
  (high corrosion resistant steel).
  Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Design:
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- 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 under static or quasi-static actions are designed in accordance with:
- EOTA Technical Report TR 029, Edition September 2010

Installation:
- Dry or wet concrete: M8 to M20, Rebar Ø8 to Ø20.
- Hole drilling by hammer or compressed air drill mode.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Anchor adhesive system MC-AnchorSolid E820	**Annex B 1**
Intended use Specifications	

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Installation parameters for concrete C20/25

Table B1: Installation parameters for threaded rod and rebar

Diameter	$h_{ef,min}$	$h_{ef,max}$	d_0	h_{min}	c_{min}	s_{min}	T_{inst}
[-]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[Nm]
M8	60	96	10	$h_{ef} + 2d_0$ ≥100mm	50	100	8.0
M10	60	120	12		62,5	125	8.0
M12	70	144	16		75	150	20.0
M14	70	168	18		90	175	20.0
M16	80	192	20		95	190	40.0
M20	120	240	24		100	200	70.0
Diameter	$h_{ef,min}$	$h_{ef,max}$	d_0	h_{min}	c_{min}	s_{min}	T_{inst}
[-]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[Nm]
Ø 8	60	96	10	$h_{ef} + 2d_0$ ≥100mm	50	100	8.0
Ø 10	60	120	12		62,5	125	8.0
Ø 12	70	144	16		75	150	20.0
Ø 14	70	168	18		90	175	20.0
Ø 16	80	192	20		95	190	40.0
Ø 20	120	240	24		100	200	70.0

Anchor adhesive system MC-AnchorSolid E820

Intended use
Installation parameters

Anhang B 2

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Table B2: Cleaning and setting tools

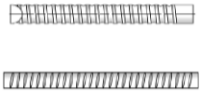
Anchor Ø	Drill hole Ø	MC-Anchor B	MC-Anchor AB	MC-Anchor FP
				
[mm]	[mm]	Steel brush [mm]	Air nozzle [mm]	Piston plug [mm]
Threaded rod				
8	10	10		
10	12	12	10	12
12	14	14	12	14
14	16	16	14	16
16	18	18	16	18
20	24	24	20	24
Reinforcing bar				
8	10	10		
10	12	12	10	12
12	16	16	12	16
14	18	18	14	18
16	20	20	16	20
20	24	24	20	24

Table B3: Designation of cleaning and setting tools

Artikel	Description
MC-Anchor BF	Clamping shank for MC-Anchor BE and MC-Anchor B
MC-Anchor BE	Extension member for MC-Anchor B
MC-Anchor BM	Extension member for manual drill hole cleaning
MC-Anchor D	Drill hole template
MC-Anchor FX	Wedge for fixing
MC-Anchor PTF	Flexible extension hose for static-mixer
MC-Anchor PTS	Inflexible extension hose for static-mixer

Anchor adhesive system MC-AnchorSolid E820	**Annex B 3**
Intended use Cleaning and setting tools	

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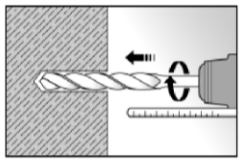
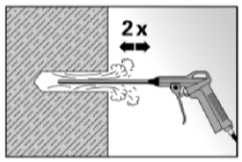
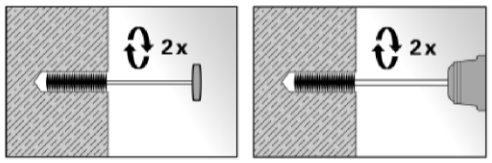
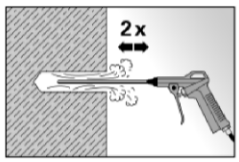
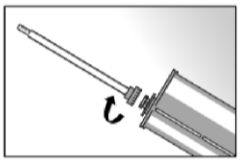
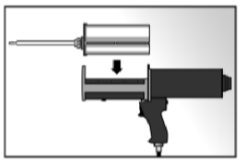
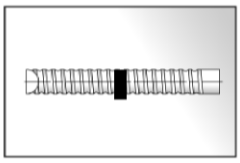
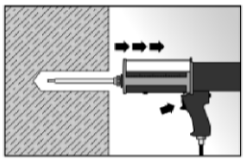
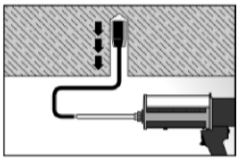
Drilling	
	Drill with hammer drill a hole into the base material tot he size and embedment depth required by the selected anchor (Table B1 or B2).
Cleaning	The drill hole must be free of dust and debris just before setting the fixture element and the mortar. The air nozzle MC-Anchor AB with corresponding diameter may be use for blowing out drill holes.
	Starting from the bottom of the bore hole, blow the hole clean with compressed air (min. 6 bar) or a hand pump a minimum of two times. If the bore hole ground is not reached an extension MC-Anchor PTS shall be used.
	Check brush diameter (Table B2) and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized wire brush MC-Anchor B (Table B2) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension MC-Anchor BE shall be used.
	Finally blow the hole clean again with compressed air (min. 6 bar) or a hand pump a minimum of two times. If the bore hole ground is not reached an extension MC-Anchor PTS shall be used.

Anchor adhesive system MC-AnchorSolid E820

Intended use
Installation instructions

Annex B 4

Deutsches Institut für Bautechnik DIBt

Preparation of the injection	
	Screw the union nut off and remove the lock washer at the adhesive cartridge. Attach the provided static-mixer tightly on the cartridge and fix it with the union nut. With every working interruption longer than the recommended working time acc. the technical data sheet as well as for every new cartridge the static-mixer must be replaced.
	Insert the cartridge with fixed static-mixer into the dispenser MC-Fastpack Power-Tool and latch. Do not use untight or damaged cartridges.
	Mark the requested embedment depth on the threaded rod before injection of the mortar.
	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 mixture.
Injection	
	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. For embedment larger than 190 mm an extension nozzle MC-Anchor PTS or MC-Anchor PTF shall be used. For overhead and horizontal installation a piston plug MC-Anchor FP (Table B2) shall be used.
 	For overhead installation assemble the static-mixer with the provided flexible extension hose MC-Anchor PTF and the appropriately seized piston plug MC-Anchor FP (see table B2). Lead the piston plug to the bottom of the drill hole. 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.

Anchor adhesive system MC-AnchorSolid E820	**Annex B 5**
Intended use Installation instructions (continuation)	

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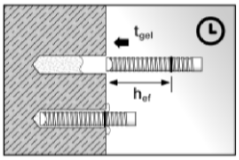
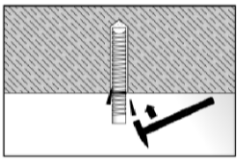
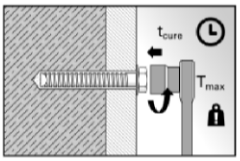
Introduction of the anchor	
	The anchor should be free of moisture, dirt, grease, oil or other foreign material. The Gelling-/working time $\mathbf{t_{gel}}$ according to table B4 and technical data sheet has to be considered. Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Be sure that the anchor is fully seated at the bottom of the hole and that excess mortar is visible at the top of the hole. If these requirements are not maintained, the application has to be renewed.
	For overhead application the anchor rod should be fixed with a wedge (MC-Anchor FX).
	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 B4).
	After full curing ($\mathbf{t_{cure}}$ acc. Table B4), the add-on part can be installed with the max. torque ($\mathbf{T_{inst}}$ acc table B1) by using a calibrated torque wrench.

Table B4: Minimum curing time

Concrete temperature [°C]	Curing time t_{cure} [h]		Gelling- / working time at 20°C t_{gel}
	Dry concrete	Wet concrete	
5 to 9	48	96	7 minutes
10 to 14	36	72	
14 to 19	24	48	
20 to 29	12	24	
30 to 39	12	24	
40	12	24	

Anchor adhesive system MC-AnchorSolid E820	**Annex B 6**
Intended use Installation instructions (continuation) Curing time	

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values of resistance for threaded rods under tension loads

Threaded rod			M8	M10	M12	M16	M20
Combined pull-out and concrete cone failure							
Diameter	d	[mm]	8	10	12	16	20
Characteristic bond resistance in non-cracked concrete C20/25							
Temp. range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	4,5	7,5	6,5	5,0	4,5
Temp. range II: 60°C/35°C	$\tau_{Rk,ucr}$	[N/mm²]	3,5	5,5	5,0	4,0	3,5
Increasing factors τ_{Rk}	ψ_c	C30/37	1,04				
		C35/45	1,08				
		C40/50	1,11				
		C45/55	1,14				
		C50/60	1,16				
Splitting failure							
Edge distance $c_{cr,sp}$ [mm] for	$h/h_{ef} \geq 2,0$		$1,2 * h_{ef}$				
	$2,0 > h/h_{ef} > 1,3$		$2,6 * h_{ef} - 0,6\ h$				
	$h/h_{ef} \leq 1,3$		$2,26 * h_{ef}$				
Axial spacing	$s_{cr,sp}$	[mm]	$2 * c_{cr,sp}$				
Installation safety factor	γ_2	[-]	1,4				

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Table C2: Characteristic values of resistance for threaded rods under shear loads

Threaded rod			M8	M10	M12	M16	M20
Concrete pry-out failure							
Factor k in equation (5.7) of Technical Report TR 029	k	[-]	2,0 (h_{ef} > 60mm) 1,0 (h_{ef} < 60mm)				
Installation safety factor	γ_2	[-]	1,0				

Table C3: Displacements under tension load[1] for threaded rod

Threaded rod			M8	M10	M12	M16	M20
Non-cracked concrete, Temperature range I: 40°C/24°C							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,33	0,42	0,49	0,49	0,49
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]					
Non-cracked concrete, Temperature range II: 60°C/35°C							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,92	1,18	1,37	1,37	1,37
	$\delta_{N\infty}$-factor	[mm/(N/mm²)]					

1) Calculation for the displacement

$\delta_{N0} = \delta_{N0}\text{-Faktor} \cdot \tau$ (τ: action bond stress for tension)

$\delta_{N0} = \delta_{N\infty}\text{-Faktor} \cdot \tau$

Table C4: Displacements under shear load[1] for threaded rod

Threaded rod			M8	M10	M12	M16	M20
Displacement	δ_{V0}-factor	[mm/(N/mm²)]	0,5	0,6	0,8	0,8	0,8
	$\delta_{V\infty}$-factor	[mm/(N/mm²)]					

1) Calculation for the displacement

$\delta_{V0} = \delta_{V0}\text{-Faktor} \cdot V$ (V: action shear load)

$\delta_{V0} = \delta_{V\infty}\text{-Faktor} \cdot V$

Anchor adhesive system MC-AnchorSolid E820

Annex C 2

Performances
Characteristic values of resistance for threaded rods under shear loads
Displacements (threaded rods)

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Table C5: Characteristic values of resistance for rebar under tension loads

Rebar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20
Combined pull-out and concrete failure								
Diameter	d	[mm]	8	10	12	14	16	20
Characteristic bond resistance in non-cracked concrete C20/25								
Temp. range I: 40°C/24°C	$\tau_{Rk,ucr}$	[N/mm²]	4,5	4,5	4,5	4,5	4,5	4,0
Temp. range II: 60°C/35°C	$\tau_{Rk,ucr}$	[N/mm²]	3,5	3,5	3,5	3,5	3,5	3,0
Increasing factors for τ_{Rk}	ψ_c	C30/37	1,04					
		C35/45	1,08					
		C40/50	1,11					
		C45/55	1,14					
		C50/60	1,16					
Splitting failure								
Edge distance $c_{cr,sp}$ [mm] for	$h/h_{ef} \geq 2,0$		$1,2 * h_{ef}$					
	$2,0 > h/h_{ef} > 1,3$		$2,6 * h_{ef} - 0,6 h$					
Axial spacing	$s_{cr,sp}$	[mm]	$2 * c_{cr,sp}$					
Installation safety factor	γ_2	[-]	1,4					

Anchor adhesive system MC-AnchorSolid E820

Annex C 3

Performances
Characteristic values of resistance for rebar under tension loads

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Table C6: Characteristic values of resistance for rebar under shear loads

Rebar			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20
Concrete pry-out failure								
Factor k in equation (5.7) of Technical Report TR 029	k	[-]	2,0 (h_{ef} > 60mm)					
Installation safety factor	γ_2	[-]	1,0					

Table C7: Displacements under tension loads[1] for rebar

Rebar		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20
Non-cracked concrete, temperature range I: 40°C/24°C							
Displacement	$\frac{\delta_{N0}\text{-Faktor} \quad [mm/(N/mm^2)]}{\delta_{N\infty}\text{-Faktor} \quad [mm/(N/mm^2)]}$	0,35	0,36	0,36	0,52	0,52	0,52
Non-cracked concrete, temperature range II: 60°C/35°C							
Displacement	$\frac{\delta_{N0}\text{-Faktor} \quad [mm/(N/mm^2)]}{\delta_{N\infty}\text{-Faktor} \quad [mm/(N/mm^2)]}$	0,98	1,01	1,01	1,46	1,46	1,46

1) Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-Faktor} \cdot \tau$ (τ: action bond stress for tension)
$\delta_{N0} = \delta_{N\infty}\text{-Faktor} \cdot \tau$

Table C8: Displacements under shear load[1] for rebar

Rebar		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20
Displacement	$\frac{\delta_{V0}\text{-Faktor} \quad [mm/(N/mm^2)]}{\delta_{V\infty}\text{-Faktor} \quad [mm/(N/mm^2)]}$	0,5	0,6	0,8	0,8	1,0	1,0

1) Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-Faktor} \cdot V$ (V: action shear load)
$\delta_{V0} = \delta_{V\infty}\text{-Faktor} \cdot V$

Anchor adhesive system MC-AnchorSolid E820

Annex C 4

Performances
Characteristic values of resistance for rebar under shear loads
Displacements (rebar)