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-18/0110 of 21 June 2018

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	KALZ Injection system C-RE 385 for concrete
Product family to which the construction product belongs	Bonded fastener for use in concrete
Manufacturer	Shanghai Kalz Construction Technology Co., Ltd. No. 4958 Xinfeng Rd . SHANGHAI, FENG XIAN DISTRICT VOLKSREPUBLIK CHINA
Manufacturing plant	Shanghai Kalz Construction Technology Co., Ltd., Plant1 Germany
This European Technical Assessment contains	19 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330499-00-0601

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Specific Part

1 Technical description of the product

The "KALZ Injection system C-RE 385 for concrete" is a bonded anchor consisting of a cartridge with injection mortar C-RE 385 and a steel element. The steel element consists of a commercial threaded rod with washer and hexagon nut in the range of M10 to M24 or reinforcing bar in the range of diameter 10 to 25 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 to tension load (static and quasi-static loading)	See Annex C 1 and C 3
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 2 and C 4
Displacements (static and quasi-static loading)	See Annex C 5 and C 6
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

3.2 Hygiene, health and the environment (BWR 3)

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

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 330499-00-0601 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 21 June 2018 by Deutsches Institut für Bautechnik

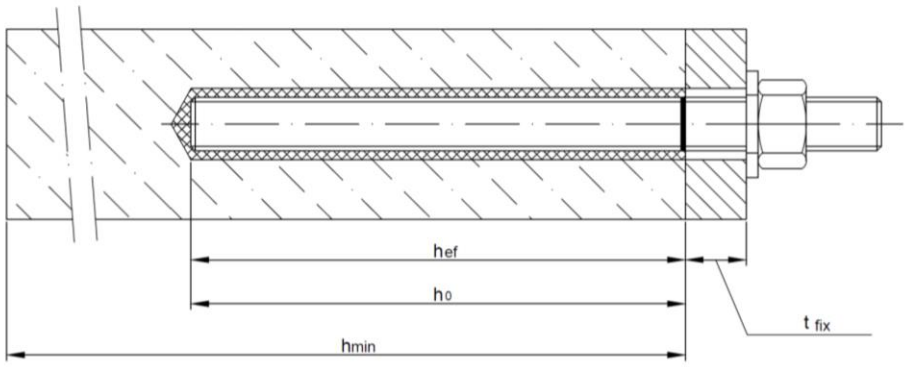
Dr.-Ing. Lars Eckfeldt
p.p. Head of Department

beglaubigt:
Baderschneider

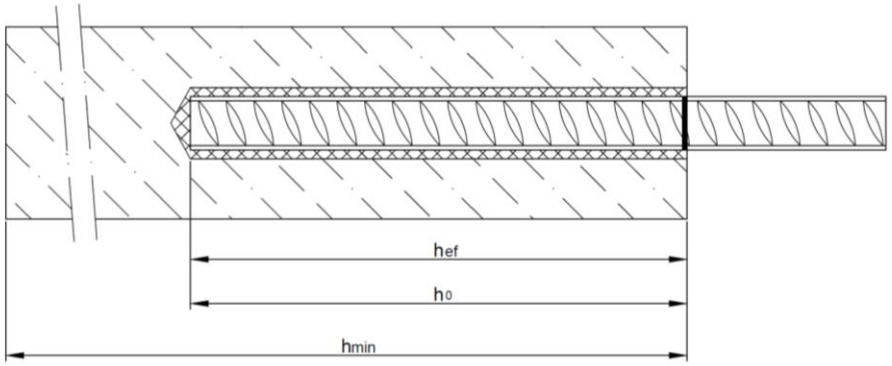
Deutsches Institut für Bautechnik

DIBt

Installation threaded rod M10 to M24



Installation reinforcing bar Ø10 to Ø25



t_{fix} = thickness of fixture
h_{ef} = effective anchorage depth
h_0 = depth of drill hole
h_{min} = minimum thickness of member

KALZ Injection System C-RE 385 for concrete	Annex A 1
Product description Installed condition	

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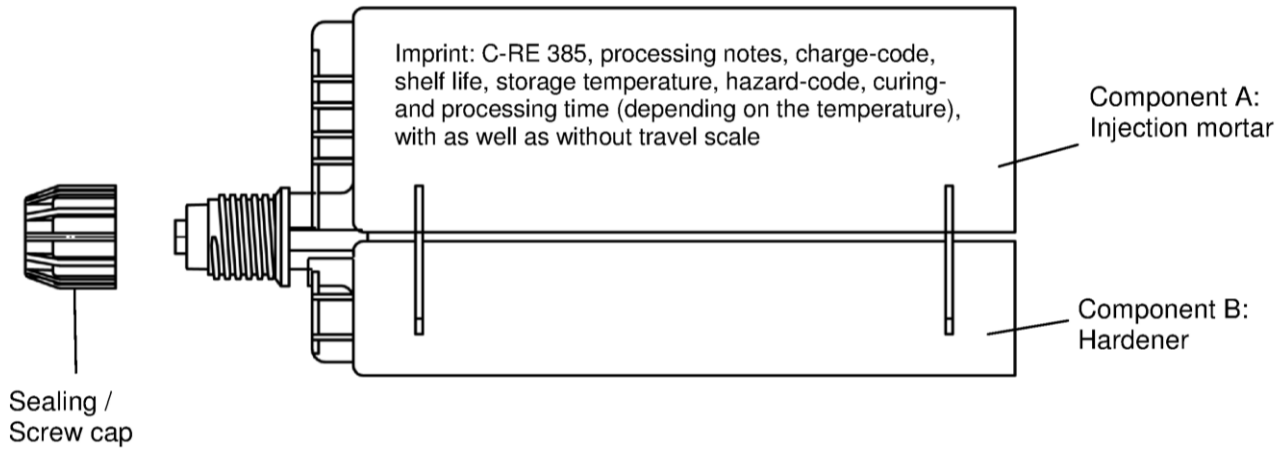
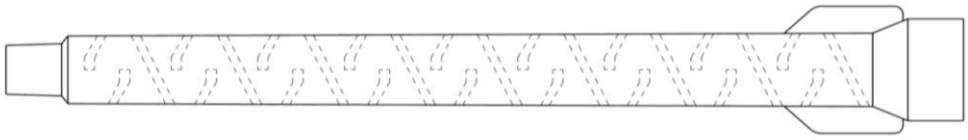
Cartridge: C-RE 385

385ml, 444ml, 585ml, 999ml and 1400ml injection mortar cartridge (Type: "side-by-side")



Static mixer



KALZ Injection System C-RE 385 for concrete	Annex A 2
Product description Injection system	

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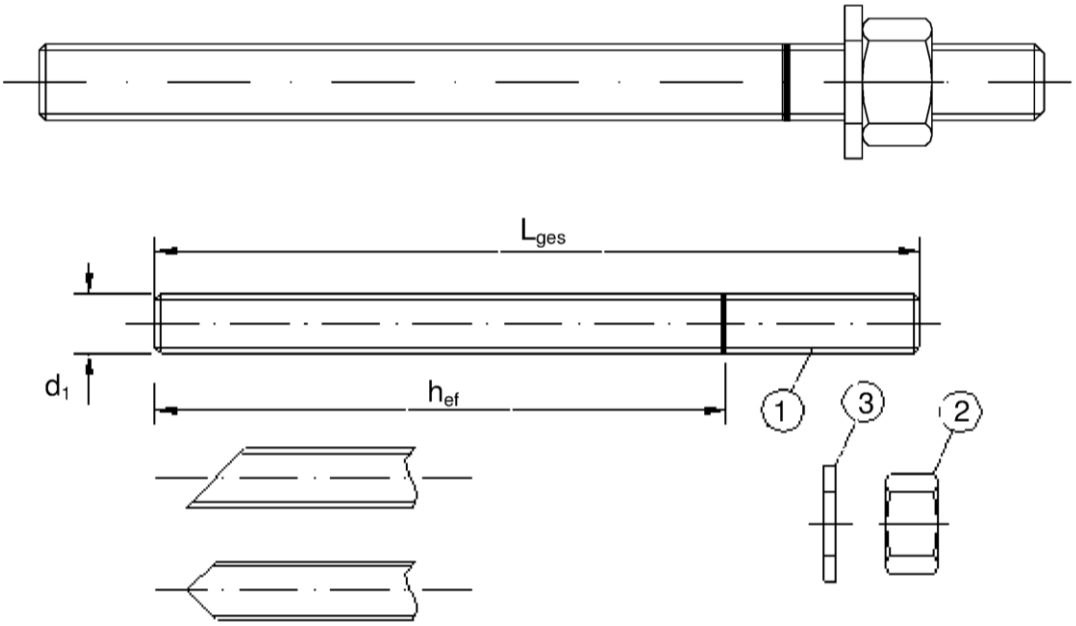
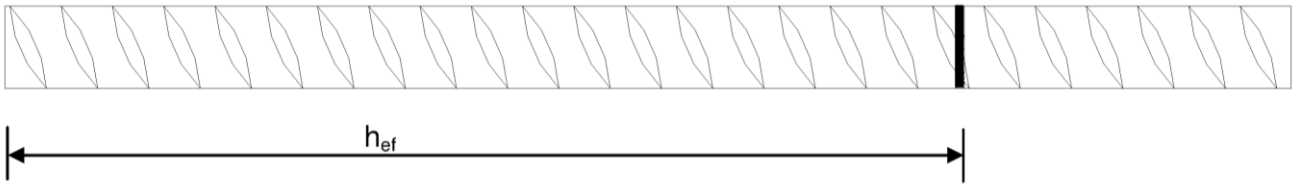
Threaded rod M10, M12, M16, M20, M24 with washer and hexagon nut



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

Reinforcing bar ∅ 10, ∅ 12, ∅ 14, ∅ 16, ∅ 20, ∅ 25



- 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)

KALZ Injection System C-RE 385 for concrete	Annex A 3
Product description Threaded rod and reinforcing bar	

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Table A1: Materials

Part	Designation	Material
Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999 or Steel, hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009		
1	Anchor rod	Steel, EN 10087:1998 or EN 10263:2001 Property class 4.6, 5.8, 8.8, EN 1993-1-8:2005+AC:2009
2	Hexagon nut, EN ISO 4032:2012	Steel acc. to EN 10087:1998 or EN 10263:2001 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 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanised
Stainless steel		
1	Anchor rod	Material 1.4401 / 1.4404 / 1.4571, EN 10088-1:2005, ≤ M24: Property class 70 EN ISO 3506-1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4401 / 1.4404 / 1.4571 EN 10088:2005, ≤ M24: Property class 70 (for class 70 rod) EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4401, 1.4404 or 1.4571, EN 10088-1:2005
High corrosion resistance steel		
1	Anchor rod	Material 1.4529 / 1.4565, EN 10088-1:2005, ≤ M24: Property class 70 EN ISO 3506-1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4529 / 1.4565 EN 10088-1:2005, ≤ M24: Property class 70 (for class 70 rod) EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, 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 to NDP or NCL of EN 1992-1-1/NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$

KALZ Injection System C-RE 385 for concrete	**Annex A 4**
Product description Materials	

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads: M10 to M24, Rebar Ø10 to Ø25.

Base materials:
- Reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Non-cracked concrete: M10 to M24, Rebar Ø10 to Ø25.

Temperature Range:
- I: - 40 °C to +40 °C (max long term temperature +24 °C and max short term temperature +40 °C)
- II: - 40 °C to +60 °C (max long term temperature +43 °C and max short term temperature +60 °C)
- III: - 40 °C to +72 °C (max long term temperature +43 °C and max short term temperature +72 °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:
- 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:
  - FprEN 1992-4:2017 and Technical Report TR055

Installation:
- Dry or wet concrete: M10 to M24, Rebar Ø10 to Ø25.
- Flooded holes (not sea water): M10 to M24, Rebar Ø10 to Ø25.
- Hole drilling by diamond drill mode.
- 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.

KALZ Injection System C-RE 385 for concrete	Annex B 1
Intended Use Specifications	

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Table B1: Installation parameters for threaded rod

Anchor size		**M 10**	**M 12**	**M 16**	**M 20**	**M 24**
Nominal drill hole diameter	d_0 [mm] =	12	14	18	24	28
Embedment depth and bore hole depth	$h_{ef,min}$ [mm] =	60	70	80	90	96
	$h_{ef,max}$ [mm] =	200	240	320	400	480
Diameter of clearance hole in the fixture	d_f [mm] ≤	12	14	18	22	26
Diameter of steel brush	d_b [mm] ≥	14	16	20	26	30
Maximum torque moment	T_{inst} [Nm]	20	40	80	120	160
Thickness of fixture	$t_{fix,min}$ [mm] >	0				
	$t_{fix,max}$ [mm] <	1500				
Minimum thickness of member	h_{min} [mm]	h_{ef} + 30 mm ≥ 100 mm		h_{ef} + $2d_0$		
Minimum spacing	s_{min} [mm]	50	60	80	100	120
Minimum edge distance	c_{min} [mm]	50	60	80	100	120

Table B2: Installation parameters for rebar

Rebar size		**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**
Nominal drill hole diameter	d_0 [mm] =	14	16	18	20	24	32
Embedment depth and bore hole depth	$h_{ef,min}$ [mm] =	60	70	75	80	90	100
	$h_{ef,max}$ [mm] =	200	240	280	320	400	500
Diameter of steel brush	d_b [mm] ≥	16	18	20	22	26	34
Minimum thickness of member	h_{min} [mm]	h_{ef} + 30 mm ≥ 100 mm	h_{ef} + $2d_0$				
Minimum spacing	s_{min} [mm]	50	60	70	80	100	125
Minimum edge distance	c_{min} [mm]	50	60	70	80	100	125

KALZ Injection System C-RE 385 for concrete

Intended Use
Installation parameters

Annex B 2

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Steel brush

Table B3: Parameter cleaning and setting tools

Threaded Rod	Rebar	d_0 Drill bit - Ø	d_b Brush - Ø	$d_{b,min}$ min. Brush - Ø	Piston plug
(mm)	(mm)	(mm)	(mm)	(mm)	(No.)
M10		12	14	12,5	No piston plug required
M12	10	14	16	14,5	
	12	16	18	16,5	
M16	14	18	20	18,5	
	16	20	22	20,5	
M20	20	24	26	24,5	# 24
M24		28	30	28,5	# 28
	25	32	34	32,5	# 32

Recommended compressed air tool (min 6 bar)
Drill bit diameter (d_0): 12 mm to 32 mm

Piston plug for overhead or horizontal installation
Drill bit diameter (d_0): 24 mm to 32 mm

KALZ Injection System C-RE 385 for concrete	Annex B 3
Intended Use Cleaning and setting tools	

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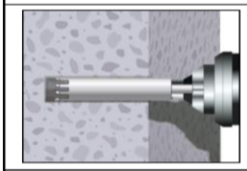
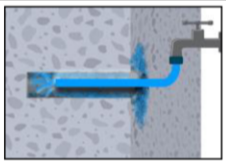
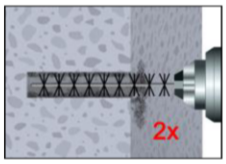
Installation instructions



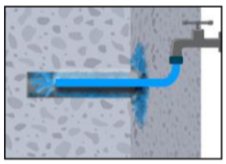
1b. Drill with diamond drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1 or Table B2).



2a. Rinsing with water until clear water comes out.

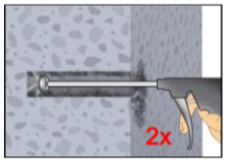


2b. Check brush diameter acc. Table B3 and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized wire brush > $d_{b,min}$ (Table B3) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension shall be used (Table B3).

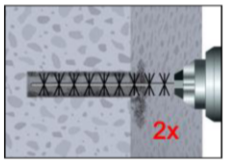


2c. Rinsing again with water until clear water comes out.

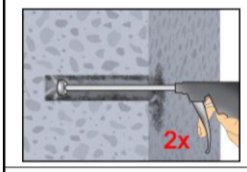
Attention! Standing water in the bore hole must be removed before cleaning.



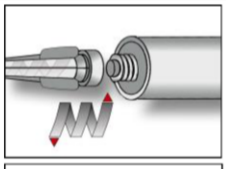
2d. Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (Annex B3) (min. 6 bar) a minimum of two times. If the bore hole ground is not reached an extension shall be used.



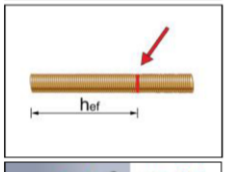
2e. Check brush diameter acc. Table B3 and attach the brush to a drilling machine or a battery screwdriver. Brush the hole with an appropriate sized wire brush > $d_{b,min}$ (Table B3) a minimum of two times. If the bore hole ground is not reached with the brush, a brush extension shall be used (Table B3).



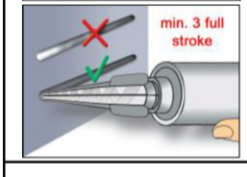
2f. Finally blow the hole clean again with compressed air acc. Annex B3 (min. 6 bar) a minimum of two times. If the bore hole ground is not reached an extension shall be used. **After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar 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.**



3. Attach a supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. Cut off the foil tube clip before use.
For every working interruption longer than the recommended working time (Table B4) as well as for new cartridges, a new static-mixer shall be used.



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



5. 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 colour. For foil tube cartridges is must be discarded a minimum of six full strokes.

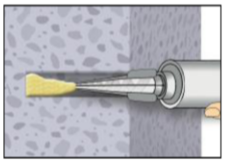
KALZ Injection System C-RE 385 for concrete

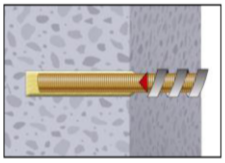
Intended Use
Installation instructions

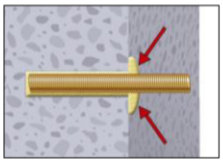
Annex B 4

Deutsches Institut für Bautechnik DIBt

Installation instructions (continuation)





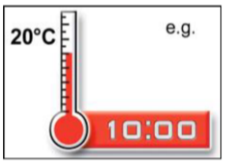


6. Starting from the bottom or back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. For embedment larger than 190 mm an extension nozzle shall be used. For overhead and horizontal installation a piston plug (Annex B 3) and extension nozzle shall be used. Observe the gel-/ working times given in Table B4.

7. 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.

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

8. 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 (e.g. wedges).



9. 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).

10. After full curing, the add-on part can be installed with the max. torque (Table B2) by using a calibrated torque wrench.

Table B4: Minimum curing time

Concrete temperature	Gelling-working time	Minimum curing time in dry concrete	Minimum curing time in wet concrete
≥ 5 °C	120 min	50 h	100 h
≥ + 10 °C	90 min	30 h	60 h
≥ + 20 °C	30 min	10 h	20 h
≥ + 30 °C	20 min	6 h	12 h
≥ + 40 °C	12 min	4 h	8 h

KALZ Injection System C-RE 385 for concrete

Intended Use
Installation instructions (continuation)
Curing time

Annex B 5

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values of tension loads under static and quasi-static action

Anchor size threaded rod				**M 10**	**M 12**	**M 16**	**M 20**	**M24**
Steel failure								
Characteristic tension resistance, Steel, property class 4.6		$N_{Rk,s}$	[kN]	23	34	63	98	141
Characteristic tension resistance, Steel, property class 5.8		$N_{Rk,s}$	[kN]	29	42	78	122	176
Characteristic tension resistance, Steel, property class 8.8		$N_{Rk,s}$	[kN]	46	67	125	196	282
Characteristic tension resistance, Stainless steel A4 and HCR, property class 70		$N_{Rk,s}$	[kN]	41	59	110	171	247
Combined pullout and concrete cone failure								
Characteristic bond resistance in non-cracked concrete C20/25								
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	11	10	10	9,5	9,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	9,0	10	9,5	9,5	8,5
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	7,0	6,5	6,0	6,0	5,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,5	6,5	6,0	6,0	5,5
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	6,0	6,0	5,5	5,0	5,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,0	6,0	5,0	5,0	5,0
Increasing factor ψ_c		C30/37		1,04				
		C40/50		1,08				
		C50/60		1,10				
Concrete cone failure								
Non-cracked concrete		$k_{ucr,N}$	[-]	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 failure								
Edge distance		$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2{,}5 - \frac{h}{h_{ef}}\right) \le 2{,}4 \cdot h_{ef}$				
Axial distance		$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$				
Installation factor		γ_{inst}	[-]	1,0	1,2			

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Annex C 1

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Table C2: Characteristic values of shear loads under static and quasi-static action

Anchor size threaded rod			**M 10**	**M 12**	**M 16**	**M 20**	**M24**
Steel failure without lever arm							
Characteristic shear resistance, Steel, property class 4.6	$V^0_{Rk,s}$	[kN]	12	17	31	49	71
Characteristic shear resistance, Steel, property class 5.8	$V^0_{Rk,s}$	[kN]	15	21	39	61	88
Characteristic shear resistance, Steel, property class 8.8	$V^0_{Rk,s}$	[kN]	23	34	63	98	141
Characteristic shear resistance, Stainless steel A4 and HCR, property class 70	$V^0_{Rk,s}$	[kN]	20	30	55	86	124
Ductility factor	k_7	[-]	1,0				
Steel failure with lever arm							
Characteristic bending moment, Steel, property class 4.6	$M^0_{Rk,s}$	[Nm]	30	52	133	260	449
Characteristic bending moment, Steel, property class 5.8	$M^0_{Rk,s}$	[Nm]	37	65	166	324	560
Characteristic bending moment, Steel, property class 8.8	$M^0_{Rk,s}$	[Nm]	60	105	266	519	896
Characteristic bending moment, Stainless steel A4 and HCR, property class 70	$M^0_{Rk,s}$	[Nm]	52	92	232	454	784
Concrete pry-out failure							
Factor	k_8	[-]	2,0				
Installation factor	γ_{inst}	[-]	1,0				
Concrete edge failure							
Effective length of fastener	l_f	[mm]	$l_f = \min(h_{ef}; 8\ d_{nom})$				
Outside diameter of fastener	d_{nom}	[mm]	10	12	16	20	24
Installation factor	γ_{inst}	[-]	1,0				

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Annex C 2

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Table C3: Characteristic values of tension loads under static and quasi-static action

Anchor size reinforcing bar				**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**
Steel failure									
Characteristic tension resistance		$N_{Rk,s}$	[kN]	$A_s \cdot f_{uk}$					
Combined pullout and concrete cone failure									
Characteristic bond resistance in non-cracked concrete C20/25									
Temperature range I: 40°C/24°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	11	10	10	10	9,5	9,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	9,0	10	10	9,5	9,5	8,5
Temperature range II: 60°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	7,0	6,5	6,5	6,0	6,0	5,5
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,5	6,5	6,5	6,0	6,0	5,5
Temperature range III: 72°C/43°C	dry and wet concrete	$\tau_{Rk,ucr}$	[N/mm²]	6,0	6,0	6,0	5,5	5,0	5,0
	flooded bore hole	$\tau_{Rk,ucr}$	[N/mm²]	5,0	6,0	5,5	5,5	5,0	5,0
Increasing factor ψ_c		C30/37		1,04					
		C40/50		1,08					
		C50/60		1,10					
Concrete cone failure									
Non-cracked concrete		$k_{ucr,N}$	[-]	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 failure									
Edge distance		$c_{cr,sp}$	[mm]	$1{,}0 \cdot h_{ef} \le 2 \cdot h_{ef}\left(2{,}5 - \frac{h}{h_{ef}}\right) \le 2{,}4 \cdot h_{ef}$					
Axial distance		$s_{cr,sp}$	[mm]	$2\ c_{cr,sp}$					
Installation factor		γ_{inst}	[-]	1,0	1,2				

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Annex C 3

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Table C4: Characteristic values of shear loads under static and quasi-static action

Anchor size reinforcing bar			**Ø 10**	**Ø 12**	**Ø 14**	**Ø 16**	**Ø 20**	**Ø 25**
Steel failure without lever arm								
Characteristic shear resistance	$V^0_{Rk,s}$	[kN]	$0{,}50 \cdot A_s \cdot f_{uk}$					
Ductility factor	k_7	[-]	1,0					
Steel failure with lever arm								
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	$1.2 \cdot W_{el} \cdot f_{uk}$					
Concrete pry-out failure								
Factor	k_8	[-]	2,0					
Installation factor	γ_{inst}	[-]	1,0					
Concrete edge failure								
Effective length of fastener	l_f	[mm]	$l_f = \min(h_{ef}; 8\, d_{nom})$					
Outside diameter of fastener	d_{nom}	[mm]	10	12	16	20	24	10
Installation factor	γ_{inst}	[-]	1,0					

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Annex C 4

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Table C5: Displacements under tension load[1)] (threaded rod)

Anchor size threaded rod			M 10	M 12	M 16	M 20	M24
Temperature range 40°C/24°C for non-cracked concrete C20/25							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,020	0,024	0,029
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,052	0,061	0,079	0,096	0,114
Temperature range 72°C/43°C and 60°C/43°C for non-cracked concrete C20/25							
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,015	0,018	0,023	0,028	0,033
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,060	0,070	0,091	0,111	0,131

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ: action bond strength
$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$;

Table C6: Displacements under shear load[1)] (threaded rod)

Anchor size threaded rod			M 10	M 12	M 16	M 20	M24
Displacement	δ_{V0}-factor	[mm/(kN)]	0,06	0,05	0,04	0,04	0,03
Displacement	$\delta_{V\infty}$-factor	[mm/(kN)]	0,08	0,08	0,06	0,06	0,05

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V: action shear load
$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$;

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Annex C 5

Performances
Displacements (threaded rods)

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Table C7: Displacements under tension load[1)] (rebar)

Anchor size reinforcing bar			Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
Temperature range 40°C/24°C for non-cracked concrete C20/25								
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,013	0,015	0,018	0,020	0,024	0,030
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,052	0,061	0,070	0,079	0,096	0,118
Temperature range 72°C/43°C and 60°C/43°C for non-cracked concrete C20/25								
Displacement	δ_{N0}-factor	[mm/(N/mm²)]	0,015	0,018	0,020	0,023	0,028	0,034
Displacement	$\delta_{N\infty}$-factor	[mm/(N/mm²)]	0,060	0,070	0,081	0,091	0,111	0,136

[1)] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; τ: action bond strength
$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$;

Table C8: Displacements under shear load[1)] (rebar)

Anchor size reinforcing bar			Ø 10	Ø 12	Ø 14	Ø 16	Ø 20	Ø 25
Displacement	δ_{V0}-factor	[mm/(kN)]	0,05	0,05	0,04	0,04	0,04	0,03
Displacement	$\delta_{V\infty}$-factor	[mm/(kN)]	0,08	0,07	0,06	0,06	0,05	0,05

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V: action shear load
$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$;

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Performances
Displacements (rebar)

Annex C 6