Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment

ETA-06/0271 of 30 November 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	fischer Zykon-Hammerset anchor FZEA II
Product family to which the construction product belongs	Undercut anchor for use in concrete
Manufacturer	fischerwerke GmbH & Co. KG Klaus-Fischer-Straße 1 72178 Waldachtal DEUTSCHLAND
Manufacturing plant	fischerwerke
This European Technical Assessment contains	13 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 3: "Undercut 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 fischer Zykon-Hammerset anchor FZEA II is an anchor made of galvanised or stainless or high corrosion resistant steel which is placed in an undercut hole and anchored by mechanical interlock with displacement-controlled installation.

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 for static and quasi static action	See Annex C 1 to C 2
Displacements	See Annex 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	See Annex C 3

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

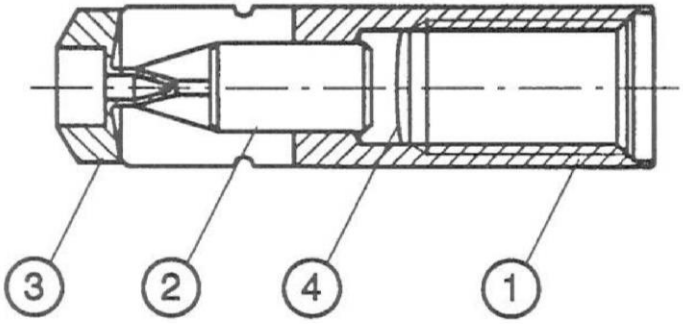
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

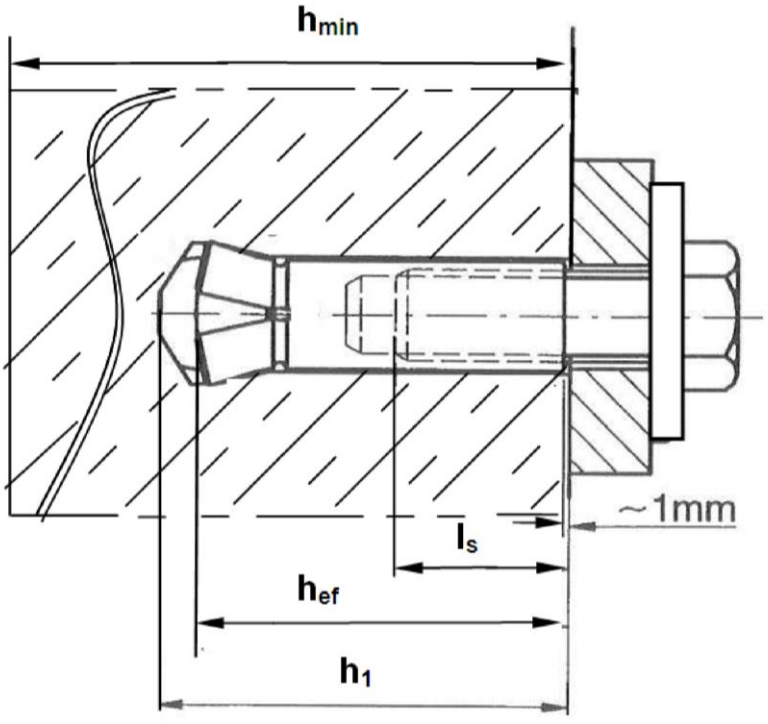
Issued in Berlin on 30 November 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Lange



① Expansion sleeve
② Expansion pin
③ Plastic cap
④ Safety disk



h_{ef} = Effective anchorage depth
l_s = Screw-in depth
h_1 = Drill hole depth
h_{min} = Minimum thickness of concrete member

fischer Zykon-Hammerset anchor FZEA II

Product description
Installed condition

Annex A 1

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Marking e.g.:

	FZEA II 12x40	(galvanized steel)
	FZEA II 12x40 A4	(stainless steel)
	FZEA II 12x40 C	(high corrosion resistant steel)

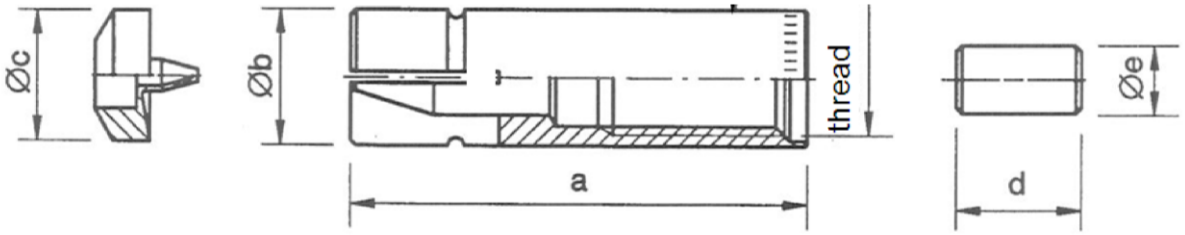

Table A1: Dimensions [mm]

Anchor type	thread	a [mm]	Øb [mm]	Øc [mm]	d [mm]	Øe [mm]
FZEA II 10 x 40 M8	M8	39	10	9,5	11	6,5
FZEA II 12 x 40 M10	M10		12	11,5		6,5
FZEA II 14 x 40 M12	M12		14	13,5		9,5

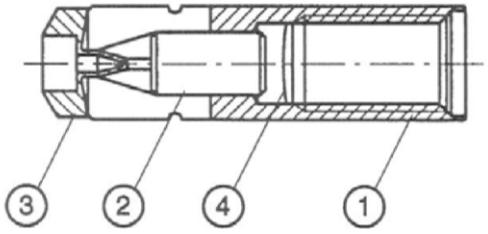

Table A2: Materials

Part	Designation	Material FZEA II	Material FZEA II A4	Material FZEA II C
1	Expansion sleeve	Steel, EN 10277:2008 EN ISO 4042:2001 ≥ 5 µm	Stainless steel, EN 10088:2014	High corrosion resistant steel EN 10088:2014
2	Expansion pin	Steel, EN 10277:2008 or EN ISO 10263-1:2014 EN ISO 4042:2001 ≥ 5 µm	Stainless steel, EN 10088:2014	High corrosion resistant steel EN 10088:2014
3	Plastic cap	Plastic		
4	Safety disk	Foil		
Requirements for the fastening screw / threaded rod [1]		Steel, EN ISO 898-1:2013 EN ISO 4042:2001 ≥ 5 µm strength class 5.6 / 8.8	Stainless steel EN ISO 3506-1:2010 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 strength class 50 / 70	High corrosion resistant steel EN ISO 3506-1:2010 1.4529, 1.4565 strength class 50 / 70

[1] The length of the fastening screw shall be determined depending on the thickness of the fixture t_{fix}, admissible tolerances, existing thread length (= maximum screwing depth) and minimum screwing depth (according to Table B2)

fischer Zykon-Hammerset anchor FZEA II

Product description
Anchor types and dimensions
Materials

Annex A 2

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads
- Fire exposure in concrete

Base materials:
- Reinforced and unreinforced normal weight concrete according to EN 206-1:2000
- Strength classes C20/25 to C50/60 according to EN 206-1:2000
- Cracked or uncracked concrete

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions
  (Zinc plated steel, stainless steel, high corrosion- resistant steel) FZEA II, FZEA II A4, FZEA II C
- 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, high corrosion-resistant steel) FZEA II A4, FZEA II C
- Structures subject to external atmospheric exposure and permanently damp internal condition, if other particular aggressive conditions exist
  (high corrosion-resistant steel) FZEA II C
  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 deicing 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 (please choose the relevant design method):
  - ETAG 001, Annex C, design method A, Edition August 2010 or
  - CEN/TS 1992-4:2009, design method A
- Fire **exposure** in cracked and uncracked concrete
  - Design according to TR 020 and ETAG 001, Annex C or CEN/TS 1992-4: 2009, Annex D

Installation:
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Correct installation is ensured when front face of sleeve is approximately 1 mm below the concrete surface and the control mark on the sleeve is visible as illustrated in Annex B2

fischer Zykon-Hammerset anchor FZEA II	**Annex B 1**
Intended Use Specifications	

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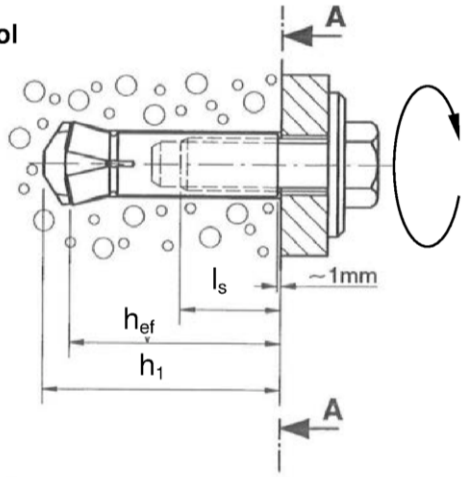
Description installation control

plan view A-A

unexpanded

expanded [1)]



h_{ef} = Effecitve anchorage depth
l_s = Screw-in depth
h_1 = Drill hole depth
T_{inst} = Max. installation torque

[1)] By setting the anchor with the machine setting tool stop the rotation, otherwise a round flange is formed instead of the notch

Table B1: Assembly tools

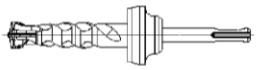
Anchor type	**FZEA II 10x40 M8**	**FZEA II 12x40 M10**	**FZEA II 14x40 M12**
Universal drill 	FZUB 10x40	FZUB 12x40	FZUB 14x40
Impact thorn 	FZED 10x40	FZED 12x40	FZED 14x40
Machine setting tool 	FZEM 10x40	FZEM 12x40	FZEM 14x40

Table B2: Installation and anchor parameters

Anchor type	Drill hole depth h_1 [mm]	Anchorage depth h_{ef} [mm]	Fastening screw or threaded rod: Max. installation torque $T_{inst.}$ [Nm] FZEA II	FZEA II A4 FZEA II C	Screw-in depth l_s [mm] max	min
FZEA II 10 x 40 M8	43	40	≤ 10	≤ 15	17	11
FZEA II 12 x 40 M10	43	40	≤ 15	≤ 20	19	13
FZEA II 14 x 40 M12	43	40	≤ 20	≤ 40	21	15

Table B3: Minimum thickness of concrete members, minimum spacing and minimum edge distance

Anchor type and size		**FZEA II 10x40 M8**	**FZEA II 12x40 M10**	**FZEA II 14x40 M12**
Minimum thickness of concrete member	h_{min} [mm]	80	80	80
Minimum spacing	s_{min} [mm]	40	45	50
Minimum edge distance	c_{min} [mm]	40	45	50

fischer Zykon-Hammerset anchor FZEA II

Intended Use
Assembly tools, Installation and anchor parameters

Annex B 2

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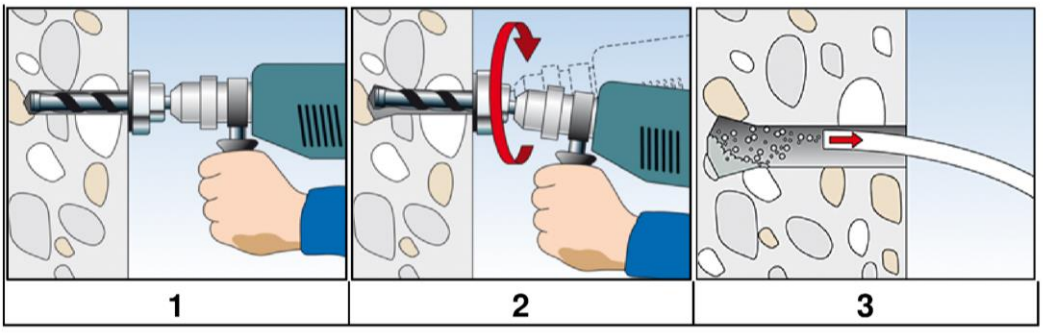
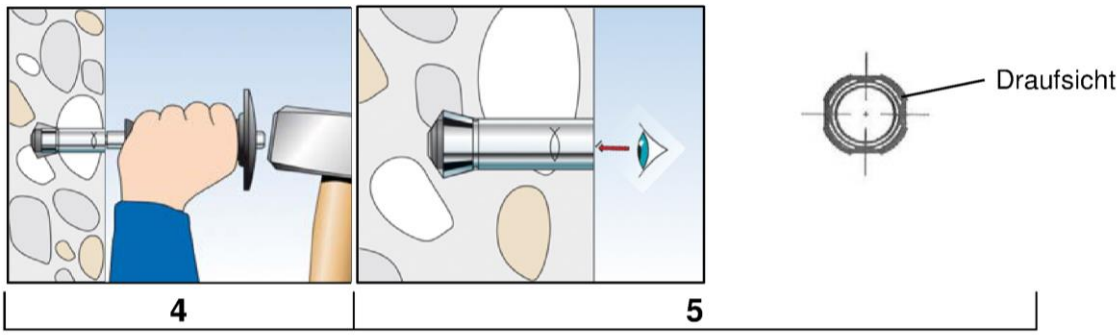
Table B4: Minimum spacings and minimum edge distances of anchors according to **TR 020 and ETAG 001, Annex C** under **fire exposure** and according to **CEN/TS 1992-4: 2009, Annex D** under **fire exposure**

Type of anchor / size			FZEA II 10x40 M8	FZEA II 12x40 M10	FZEA II 14x40 M12
Spacing	$s_{cr,N}$	[mm]	$4 \times h_{ef}$		
	s_{min}		40	45	50
Edge distance	$c_{cr,N}$		$2 \times h_{ef}$		
	c_{min}		40	45	50
	c_{min}		$c_{min} = 2 \times h_{ef}$, for fire exposure from more than one side $c_{min} \geq 300$ mm		

Installation instructions





No.	Description
1	Create a drill hole at right angles to the surface of the anchor base with a hammer drill, using the corresponding Zykon universal drill bit FZUB. The required drill depth is reached once the FZUB depth stop meets the concrete.
2	Once the FZUB depth stop meets the concrete, create the drill hole undercut by making circular swiveling movements with the hammer drill while the hammer mechanism is engaged. Press the hammer drill firmly against the anchor base: 2-3 swiveling movements are sufficient
3	Clean bore hole
4	Drive in the pin with the setting tool
5	Check of the setting notch for correct installation

fischer Zykon-Hammerset anchor FZEA II

Intended Use
Minimum spacing and edge distance
Installation instructions

Annex B 3

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Table C1: Characteristic values of **tension** resistance under static and quasi-static action (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4**)

Type of anchor				**FZEA II 10x40 M8**	**FZEA II 12x40 M10**	**FZEA II 14x40 M12**
Steel failure						
Characteristic resistance **FZEA II**	$N_{Rk,s}$	[kN]		9,60	17,00	19,70
Partial safety factor	γ_{Ms} [1]			1,5		
Characteristic resistance **FZEA II A4, FZEA II C**	$N_{Rk,s}$	[kN]		12,20	21,60	25,00
Partial safety factor strength class 70 / 50	γ_{Ms} [1]			1,5		
				2,86		
Pullout failure						
Characteristic resistance in cracked concrete	$N_{Rk,p}$ [kN]		C20/25	4	7,5	9
Characteristic resistance in uncracked concrete	$N_{Rk,p}$ [kN]		C20/25	9	9	9
Increasing factors for $N_{Rk,p}$ for cracked and uncracked concrete	ψ_c		C25/30	1,10		
			C30/37	1,22		
			C35/45	1,34		
			C40/50	1,41		
			C45/55	1,48		
			C50/60	1,55		
Installation safety factor	$\gamma_2 = \gamma_{inst}$			1,2		
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]		40	40	40
Factor for uncracked concrete	k_{ucr}	[-]		10,1		
Factor for cracked concrete	k_{cr}	[-]		7,2		
Minimal member thickness	h_{min}	[mm]		80	80	80
Spacing	$s_{cr,N}$	[mm]		120	120	120
Edge distance	$c_{cr,N}$	[mm]		60	60	60
Spacing (splitting)	$s_{cr,sp}$	[mm]		170	170	170
Edge distance (splitting)	$c_{cr,sp}$	[mm]		85	85	85
Installation safety factor	$\gamma_2 = \gamma_{inst}$			1,2		

[1] In absence of other national regulations
[2] γ_{Ms} = 2,2 for screws strength class A 50, otherwise γ_{Ms} = 1,5

fischer Zykon-Hammerset anchor FZEA II

Performances
Characteristic values of tension resistance

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values of **shear** resistance under static and quasi-static action (Design method A, according to **ETAG 001, Annex C or CEN/TS 1992-4:2009**)

Type of anchor				FZEA II 10x40 M8	FZEA II 12x40 M10	FZEA II 14x40 M12
Steel failure without lever arm						
Characteristic resistance **FZEA II**		$V_{Rk,s}$	[kN]	8,30	13,60	19,10
Partial safety factor **FZEA II** strength class	8.8	γ_{Ms} [1]		1,25		
	5.6			1,67		
Factor for ductility		k_2	[-]	1,0		
Characteristic resistance **FZEA II A4, FZEA II C**		$V_{Rk,s}$	[kN]	10,00	15,00	20,60
Partial safety factor **FZEA II A4, FZEA II C** strength class	70	γ_{Ms} [1]		1,56		
	50			2,38		
Factor for ductility		k_2	[-]	1,0		
Steel failure with lever arm						
Characteristic resistance **FZEA II** [2]		$M^0_{Rk,s}$	[Nm]	15	23	31
Partial safety factor **FZEA II** strength class	8.8	γ_{Ms}		1,25		
	5.6			1,67		
Factor for ductility		k_2	[-]	1,0		
Characteristic resistance **FZEA II A4, FZEA II C** [2]		$M^0_{Rk,s}$	[Nm]	19	29	39
Partial safety factor **FZEA II A4, FZEA II C** strength class	70	γ_{Ms} [1]		1,25		
	50			2,38		
Factor for ductility		k_2	[-]	1,0		
Concrete pryout failure						
Factor k according to ETAG 001, Annex C or k_3 according to CEN/TS 1992-4		$k = k_3$	[-]	1,3		
Concrete edge failure						
Effective length of anchor for shear loading		l_f	[mm]	40	40	40
Effective diameter of anchor		d_{nom}	[mm]	10	12	14
Installation safety factor		$\gamma_2 = \gamma_{inst}$		1,0		

[1] In absence of other national regulations
[2] Thread diameter of the anchor decisive

fischer Zykon-Hammerset anchor FZEA II

Performances
Characteristic values of resistance under shear loads

Annex C 2

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic values of **tension** resistance under **fire exposure** in cracked and uncracked concrete (Design according to **TR 020 and ETAG 001, Annex C** or **CEN/TS 1992-4: 2009, Annex D**)

Type of anchor	R30 Fire resistance 30 minutes			R60 Fire resistance 60 minutes		
	$N_{Rk,s,fi,30}$ [kN]	$N_{Rk,p,fi,30}$ [kN]	$N^0_{Rk,c,fi,30}$ [kN]	$N_{Rk,s,fi,60}$ [kN]	$N_{Rk,p,fi,60}$ [kN]	$N^0_{Rk,c,fi,60}$ [kN]
FZEA II 10x40 M8 (A4, C)	1,1	1,0	1,8	0,9	1,0	1,8
FZEA II 12x40 M10 (A4, C)	3,2	1,9	1,8	2,4	1,9	1,8
FZEA II 14x40 M12 (A4, C)	4,7	2,3	1,8	3,5	2,3	1,8

Type of anchor	R90 Fire resistance 90 minutes			R120 Fire resistance 120 minutes		
	$N_{Rk,s,fi,90}$ [kN]	$N_{Rk,p,fi,90}$ [kN]	$N^0_{Rk,c,fi,90}$ [kN]	$N_{Rk,s,fi,120}$ [kN]	$N_{Rk,p,fi,120}$ [kN]	$N^0_{Rk,c,fi,120}$ [kN]
FZEA II 10x40 M8 (A4, C)	0,8	1,0	1,8	0,7	0,8	1,5
FZEA II 12x40 M10 (A4, C)	1,6	1,9	1,8	1,2	1,5	1,5
FZEA II 14x40 M12 (A4, C)	2,3	2,3	1,8	1,8	1,8	1,5

Table C4: Characteristic values of **shear** resistance under **fire exposure** in cracked and uncracked concrete (Design according to **TR 020 and ETAG 001, Annex C** or **CENT/TS 1992-4:2009, Annex D**)

Type of anchor	R30 Fire resistance 30 minutes			R60 Fire resistance 60 minutes		
	$V_{Rk,s,fi,30}$ [kN]	$M^0_{Rk,s,fi,30}$ [Nm]	$k = k_3$	$V_{Rk,s,fi,60}$ [kN]	$M^0_{Rk,s,fi,60}$ [Nm]	$k = k_3$
FZEA II 10x40 M8 (A4, C)	0,9	1,1	1,3	0,8	0,9	1,3
FZEA II 12x40 M10 (A4, C)	2,3	4,1	1,3	1,7	3,1	1,3
FZEA II 14x40 M12 (A4, C)	2,8	7,3	1,3	2,1	5,4	1,3

Type of anchor	R90 Fire resistance 90 minutes			R120 Fire resistance 120 minutes		
	$V_{Rk,s,fi,90}$ [kN]	$M^0_{Rk,s,fi,90}$ [Nm]	$k = k_3$	$V_{Rk,s,fi,120}$ [kN]	$M^0_{Rk,s,fi,120}$ [Nm]	$k = k_3$
FZEA II 10x40 M8 (A4, C)	0,7	0,8	1,3	0,6	0,7	1,3
FZEA II 12x40 M10 (A4, C)	1,1	2,1	1,3	0,9	1,5	1,3
FZEA II 14x40 M12 (A4, C)	1,4	3,6	1,3	1,0	2,7	1,3

Concrete pryout failure: In Equation (5.6) of ETAG 001, Annex C, 5.2.3.3 the k or k_3-factor of Table C2 and the relevant values of $N^0_{Rk,c,fi}$ of Table C3 have to be considered.
Concrete edge failure: The characteristic resistance $V^0_{Rk,c,fi}$ in concrete C20/25 to C50/60 is determined by: $V^0_{Rk,c,fi} = 0{,}25 \times V^0_{Rk,c}$ (R30, R60, R90), $V^0_{Rk,c,fi} = 0{,}20 \times V^0_{Rk,c}$ (R120) with $V^0_{Rk,c}$ as initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature according to ETAG 001, Annex C, 5.2.3.4.

fischer Zykon-Hammerset anchor FZEA II

Performances
Characteristic values of resistance under tension and shear loads under fire exposure

Annex C 3

Deutsches Institut für Bautechnik DIBt

Table C5: Displacements of anchors due to tension load

Type of anchor			FZEA II 10x40 M8	FZEA II 12x40 M10	FZEA II 14x40 M12
Tension load in cracked concrete	N	[kN]	1,56	2,93	3,50
Displacement	δ_{N0}	[mm]	1,30		
	$\delta_{N\infty}$	[mm]	1,40		
Tension load in uncracked concrete	N	[kN]	3,52		
Displacement	δ_{N0}	[mm]	1,30		
	$\delta_{N\infty}$	[mm]	1,40		

Table C6: Displacements of anchors due to shear load

Type of anchor			FZEA II 10x40 M8	FZEA II 12x40 M10	FZEA II 14x40 M12
Shear load in cracked an uncracked concrete, **FZEA II**	V	[kN]	4,70	7,60	10,70
Displacement	δ_{V0}	[mm]	1,3	1,8	2,0
	$\delta_{V\infty}$	[mm]	1,9	2,6	3,0
Shear load in cracked an uncracked concrete, **FZEA II A4, FZEA II C**	V	[kN]	5,60	8,40	11,60
Displacement	δ_{V0}	[mm]	1,8	2,0	2,0
	$\delta_{V\infty}$	[mm]	2,7	3,0	3,0

fischer Zykon-Hammerset anchor FZEA II

Performances
Displacements due to tension and shear loads

Annex C 4