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-16/0338 of 17 August 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 Anchor FZA-Q
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 GmbH & Co. KG
This European Technical Assessment contains	15 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.

Deutsches Institut für Bautechnik
Kolonnenstraße 30 B | 10829 Berlin | GERMANY | Phone: +49 30 78730-0 | Fax: +49 30 78730-320 | Email: dibt@dibt.de | www.dibt.de

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Specific Part

1 Technical description of the product

The fischer Zykon Anchor FZA-Q is an anchor made of hot-dip galvanized steel which is placed in a cylindrical hole and anchored in the undercut created by the installation process by mechanical interlock with displacement-controlled installation.

The anchor consists of a conical bolt with external thread, an expansion sleeve and a hexagon nut with washer.

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 to tension	See Annex C1
Characteristic resistance for static and quasi static action to shear load	See Annex C2
Characteristic resistance for seismic performance categories C1 and C2	See Annex C4
Displacements	See Annex C5

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 C3

3.3 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

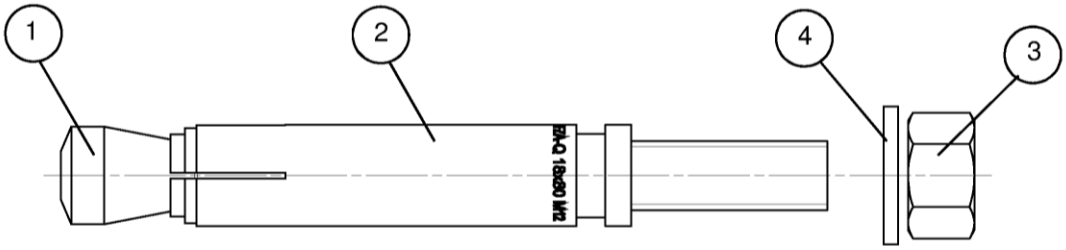
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

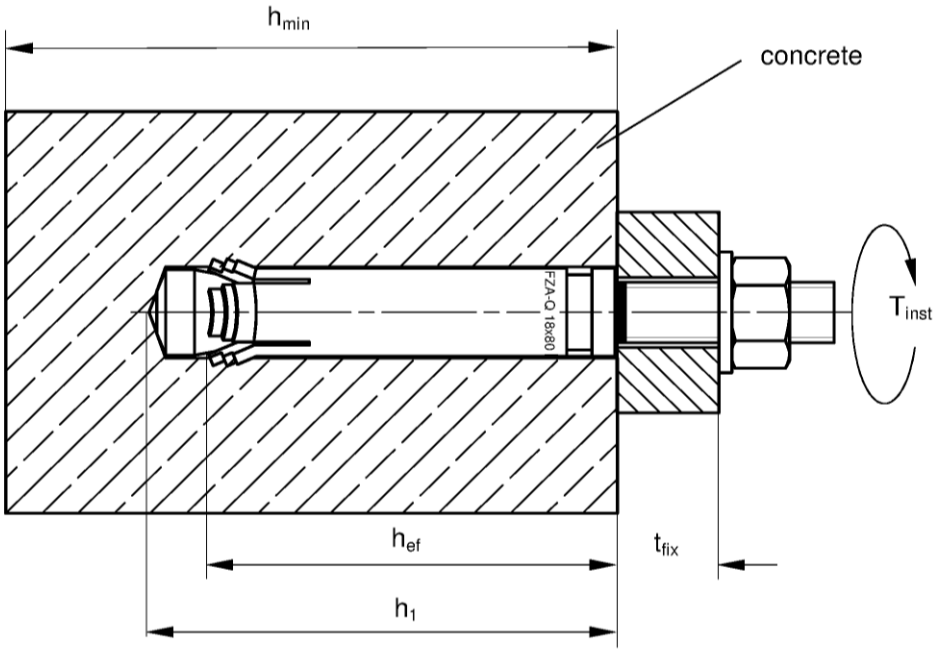
Issued in Berlin on 17 August 2016 by Deutsches Institut für Bautechnik

Uwe Bender
Head of Department

beglaubigt:
Lange

Deutsches Institut für Bautechnik DIBt





① Cone bolt
② Expansion sleeve
③ Hexagon nut
④ Washer

h_{ef} = Effective anchorage depth
t_{fix} = Thickness of fixture
h_1 = Drill hole depth
h_{min} = Min. thickness of concrete member
T_{inst} ≤ Max. installation torque

fischer Zykon Anchor FZA-Q

Product description
Installed condition

Annex A 1

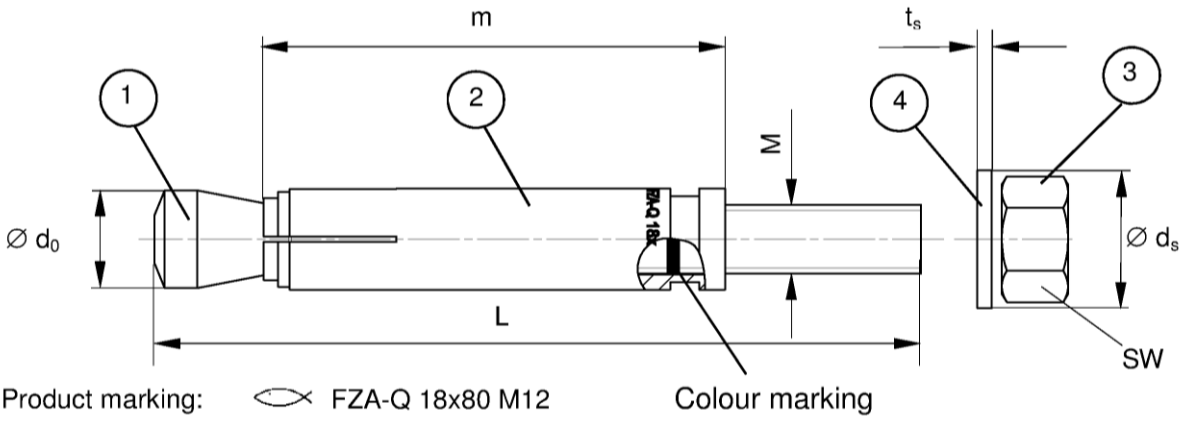


Table A1: Anchor dimensions [mm]

Part	Designation			
1	Cone bolt	M	=	M12
		∅ d_0	=	17
2	Expansion sleeve	m	=	80
3	Hexagon nut	SW	=	19
4	Washer	t_S	≥	2,3
		∅ d_s	≥	23
	Thickness of fixture t_{fix}	min	≥	0
		max	≤	200
	Length of anchor	L_{min}	-	108
		L_{max}	-	308

Table A2: Materials FZA-Q (hot-dip galvanized ≥ 50µm, ISO 10684: 2004 [1])

Part	Designation	Material
1	Cone bolt [2]	Cold form steel or free cutting steel class 8.8 acc. to EN ISO 898-1:2013 Nominal steel tensile strength $f_{uk} \leq 1000$ N/mm²
2	Expansion sleeve [2]	Steel tube $f_{yk} = 275$ N/mm², $f_{uk} = 415$ N/mm²; $A_5 > 20\%$
3	Hexagon nut	Steel, property class min. 8, EN ISO 898-2:2012
4	Washer	Cold strip, EN 10139:2016

[1] Alternative method sherardized ≥ 50 µm, EN 13811:2003
[2] Clear paint

fischer Zykon Anchor FZA-Q	**Annex A 2**
Product description Anchor dimension and material	

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Specifications of intended use

fischer Zykon Anchor FZA-Q	
Hot-dip galvanized	✓
Static and quasi-static action	✓
Cracked and uncracked concrete	✓
Seismic action for performance category C1	✓
Seismic action for performance category C2	✓
Fire exposure	✓

Base materials:

- Reinforced and unreinforced normal weight concrete (cracked and non-cracked) according to EN 206-1:2013
- Strength classes C20/25 to C50/60 according to EN 206-1:2013

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions

Design:

- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are to be 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 to be 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
- Anchorages under seismic actions (cracked concrete) are to be designed in accordance with:
  - EOTA Technical Report TR 045, Edition February 2013
  - Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure
  - Fastenings in stand-off installation or with a grout layer under seismic action are not allowed
- Anchorages under fire exposure are to be designed in accordance with:
  - EOTA Technical Report TR 020, Edition May 2004
  - CEN/TS 1992-4:2009, Annex D
  - It must be ensured that local spalling of the concrete cover does not occur

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- In case of aborted hole: New hole must be drilled at a minimum distance of twice the depth of the aborted hole or closer, if the hole is filled with a high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load

fischer Zykon Anchor FZA-Q	**Annex B 1**
Intended Use Specifications	

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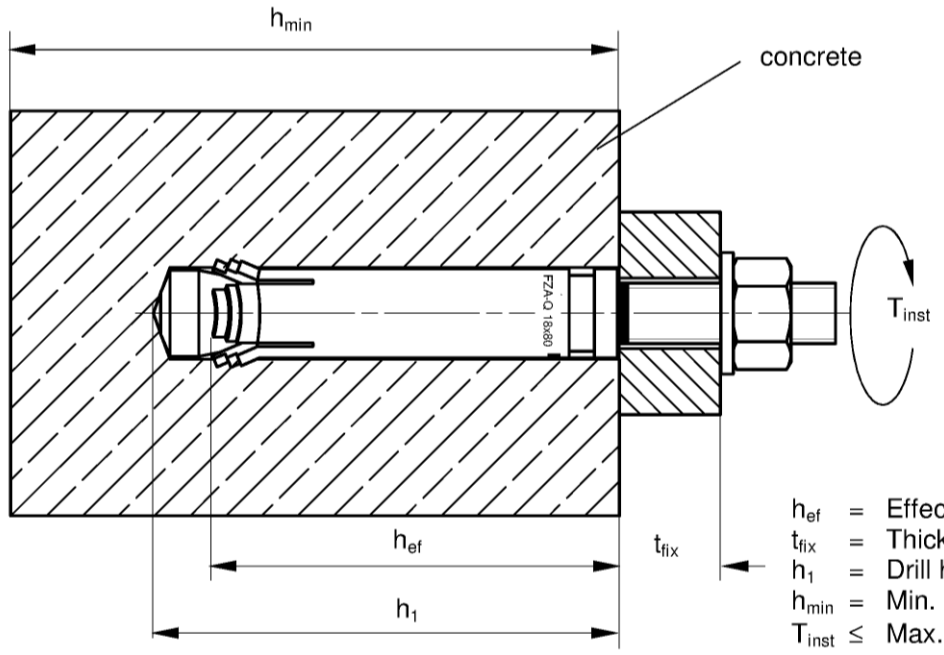
Table B1: Installation parameters

FZA-Q				18x80 M12
Nominal drill hole diameter	d_0	=	[mm]	18
Cutting diameter of drill bit	d_{cut}	≤	[mm]	18,50
Effective anchorage depth	h_{ef}	=	[mm]	80
Depth of drill hole in concrete	h_1	=	[mm]	94
Diameter of clearance hole in the fixture	d_f	≤	[mm]	14
Max. installation torque [1)]	T_{inst}	≤	[Nm]	45

[1)] Min. installation torque = hand-tightening

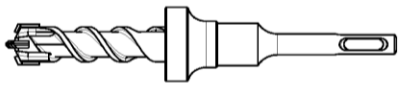


h_{ef} = Effective anchorage depth
t_{fix} = Thickness of fixture
h_1 = Drill hole depth
h_{min} = Min. thickness of concrete member
T_{inst} ≤ Max. installation torque

Tools (drills and setting tools)

Drill bit

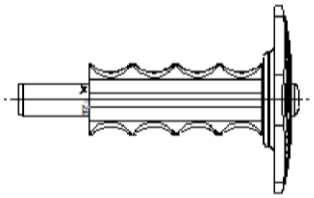
Marking: FZBB 18x80



Standard drill bit d_{cut} ≤ 18,5 mm

Setting tool FZE 18

Marking: FZE 18



Machine setting tool FZA-Q M12

Marking: FZA-Q

fischer Zykon Anchor FZA-Q

Intended Use
Installation instructions

Annex B 2

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Table B2: Minimum thickness of concrete members, minimum spacing and minimum edge distance

FZA-Q		**18x80 M12**
Minimum thickness of concrete member	h_{min} [mm]	160
Uncracked concrete		
Minimum spacing	s_{min} [mm]	75
Minimum edge distance	c_{min} [mm]	90
Cracked concrete		
Minimum spacing	s_{min} [mm]	75
Minimum edge distance	c_{min} [mm]	75

Intermediate values for s_{min} and c_{min} by linear interpolation.

Table B3: Minimum spacing and minimum edge distances 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**

FZA-Q		**18x80 M12**
Spacing	$s_{cr,fi} = 4h_{ef}$ [mm]	320
Edge distance	$c_{cr,fi} = 2h_{ef}$ [mm]	160

TR 020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} \geq 300$ mm.

fischer Zykon Anchor FZA-Q	**Annex B 3**
Intended Use Minimum thickness of concrete members, minimum spacing and minimum edge distance	

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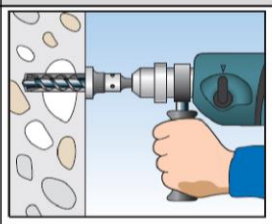
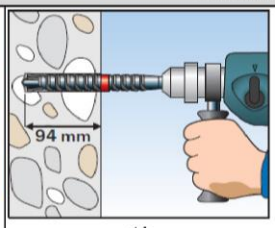
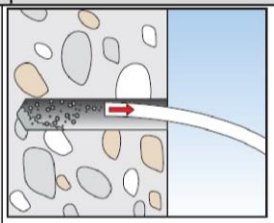
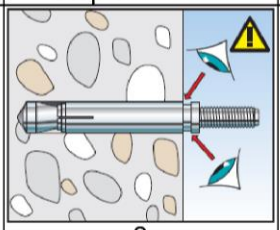
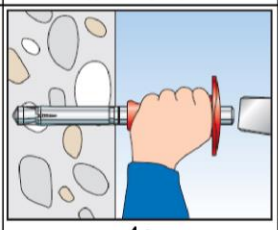
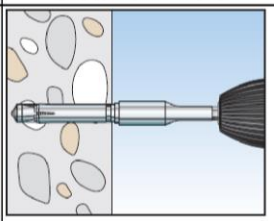
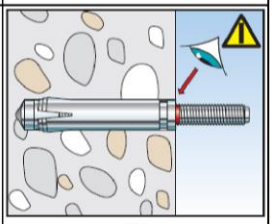
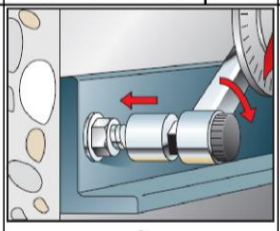
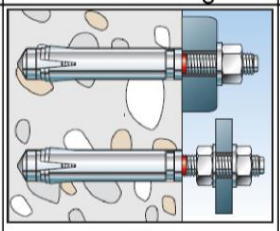
Installation instructions

Steps	Description			
Drill and clean	 1a Stop drill FZBB	 1b Hammer drill	 2 Clean drill hole	
Set anchor	 3 Check drill depth	 4a Hand-setting	 4b Machine-setting	 5 Check control colour
Installation information	 6 $T_{inst} \leq 45$ Nm	 7 Installation options		

fischer Zykon Anchor FZA-Q

Intended Use
Installation instructions

Annex B 4

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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 1992-4:2009**)

FZA-Q			**18x80 M12**
Steel failure			
Characteristic resistance	$N_{Rk,s}$	[kN]	60,1
Partial safety factor	γ_{Ms} [1)]	[-]	1,5
Pullout failure			
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	20,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	[2)]
Increasing factors for $N_{Rk,p}$ for cracked and non – cracked 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	γ_2 [3)] = γ_{inst} [4)]	[-]	1,0
Concrete cone and splitting failure			
Effective anchorage depth	h_{ef}	[mm]	80
Factor for non-cracked concrete	k_{ucr} [4)]	[-]	10,1
Factor for cracked concrete	k_{cr} [4)]	[-]	7,2
Min. thickness of concrete member	h_{min}	[mm]	160
Characteristic spacing	$s_{cr,N}$	[mm]	$3h_{ef}$
Characteristic edge distance	$c_{cr,N}$	[mm]	$1,5h_{ef}$
Characteristic spacing	$s_{cr,sp}$	[mm]	$3,5h_{ef}$
Characteristic edge distance	$c_{cr,sp}$	[mm]	$1,75h_{ef}$

1) In absence of other national regulations
2) Pullout failure not relevant
3) Parameter relevant for design according to ETAG 001, Annex C
4) Parameter relevant for design according to CEN/TS 1992-4:2009

fischer Zykon Anchor FZA-Q

Performances
Characteristic values of tension resistance under static and quasi-static action

Annex C 1

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**)

FZA-Q			**18x80 M12**
Steel failure without lever arm			
Characteristic resistance	$V_{Rk,s}$	[kN]	33,7
Partial safety factor	γ_{Ms}	[-]	1,25
Factor for ductility	k_2 [2)]	[-]	1,0
Steel failure with lever arm			
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	105,0
Partial safety factor	γ_{Ms}	[-]	1,25
Factor for ductility	k_2 [2)]	[-]	1,0
Concrete pryout failure			
Factor k according to ETAG 001, Annex C or k_3 according to CEN/TS 1992-4	k [1)] $= k_3$ [2)]	[-]	2,0
Concrete edge failure			
Effective length of anchor in shear loading	l_f	[mm]	80
Effective diameter of anchor	d_{nom}	[mm]	18
Installation safety factor	γ_2 [1)] $= \gamma_{inst}$ [2)]	[-]	1,0

[1)] Parameter relevant for design according to ETAG 001, Annex C
[2)] Parameter relevant for design according to CEN/TS 1992-4:2009

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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**)

	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]
FZA-Q 18x80 M12	1,7	5,0	10,3	1,3	5,0	10,3

	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]
FZA-Q 18x80 M12	1,1	5,0	10,3	0,8	4,0	8,2

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**)

	R30 Fire resistance 30 minutes			**R60** Fire resistance 60 minutes		
	$V_{Rk,s,fi,30}$ [kN]	$M^0_{Rk,s,fi,30}$ [Nm]	k	$V_{Rk,s,fi,60}$ [kN]	$M^0_{Rk,s,fi,60}$ [Nm]	k
FZA-Q 18x80 M12	1,7	4,1	2	1,3	3,1	2

	R90 Fire resistance 90 minutes			**R120** Fire resistance 120 minutes		
	$V_{Rk,s,fi,90}$ [kN]	$M^0_{Rk,s,fi,90}$ [Nm]	k	$V_{Rk,s,fi,120}$ [kN]	$M^0_{Rk,s,fi,120}$ [Nm]	k
FZA-Q 18x80 M12	1,1	2,6	2	0,8	2,0	2

Concrete pryout failure: In Equation (5.6) of ETAG 001, Annex C, 5.2.3.3 the 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 Anchor FZA-Q

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

Annex C 3

Deutsches Institut für Bautechnik DIBt

Table C5: Characteristic values of **tension and shear** resistance under **seismic action** (Design according to **TR 045: Performance category C1**)

FZA-Q		**18x80 M12**
Steel failure		
Characteristic resistance tension load C1	$N_{Rk,s,C1}$ [kN]	60,1
Partial safety factor	$\gamma_{Ms,C1}$ [1] [-]	1,5
Pullout failure		
Characteristic resistance tension load in cracked concrete C1	$N_{Rk,p,C1}$ [kN]	20,0
Installation safety factor	$\gamma_{2,C1}$ [-]	1,0
Steel failure without lever arm		
Characteristic resistance shear load C1	$V_{Rk,s,C1}$ [kN]	30,3
Partial safety factor	$\gamma_{Ms,C1}$ [1] [-]	1,25

[1] In absence of other national regulations

Table C6: Characteristic values of **tension and shear** resistance under **seismic action** (Design according to **TR 045: Performance category C2**)

FZA-Q		**18x80 M12**
Steel failure		
Characteristic resistance tension load C2	$N_{Rk,s,C2}$ [kN]	60,1
Partial safety factor	$\gamma_{Ms,C2}$ [1] [-]	1,5
Pullout failure		
Characteristic resistance tension load in cracked concrete C2	$N_{Rk,p,C2}$ [kN]	6,5
Installation safety factor	$\gamma_{2,C2}$ [-]	1,0
Steel failure without lever arm		
Characteristic resistance shear load C2	$V_{Rk,s,C2}$ [kN]	23,3
Partial safety factor	$\gamma_{Ms,C2}$ [1] [-]	1,25

[1] In absence of other national regulations

fischer Zykon Anchor FZA-Q

Performances:
Characteristic values of resistance under tension and shear loads under seismic action category C1 and C2

Annex C 4

Deutsches Institut für Bautechnik DIBt

Table C7: Displacements due to tension loads in uncracked and cracked concrete C20/25

FZA-Q			**18x80 M12**
Tension load in uncracked concrete C20/25	N	[kN]	10,5
Displacements	δ_{N0}	[mm]	0,8
	$\delta_{N\infty}$	[mm]	1,7
Tension load in cracked concrete C20/25	N	[kN]	16,2
Displacements	δ_{N0}	[mm]	1,0
	$\delta_{N\infty}$	[mm]	1,7

Table C8: Displacements due to shear loads

FZA-Q			**18x80 M12**
Shear load	V	[kN]	19,3
Displacements	δ_{V0}	[mm]	2,1
	$\delta_{V\infty}$	[mm]	3,1

Table C9: Displacements due to tension loads (Design according to TR 045: Performance category C2)

FZA-Q			**18x80 M12**
Displacement DLS	$\delta_{N,C2\ (DLS)}$	[mm]	4,04
Displacement ULS	$\delta_{N,C2\ (ULS)}$	[mm]	12,87

Table C10: Displacements due to shear loads (Design according to TR 045: Performance category C2)

FZA-Q			**18x80 M12**
Displacement DLS	$\delta_{V,C2\ (DLS)}$	[mm]	4,63
Displacement ULS	$\delta_{V,C2\ (ULS)}$	[mm]	6,59

fischer Zykon Anchor FZA-Q	**Annex C 5**
Performances Displacement under tension and shear loads	