

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-98/0004
of 22 December 2015

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, FZA-I, FZA-D

Product family
to which the construction product belongs

Undercut anchor of sizes M6, M8, M10, M12 and M16 for
use in concrete

Manufacturer

fischerwerke GmbH & Co. KG
Klaus-Fischer-Straße 1
72178 Waldachtal
DEUTSCHLAND

Manufacturing plant

fischerwerke

This European Technical Assessment
contains

30 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.

The European Technical Assessment is issued by the Technical Assessment Body in its official language. Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and shall be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may only be made with the written consent of the issuing Technical Assessment Body. Any partial reproduction shall be identified as such.

This European Technical Assessment may be withdrawn by the issuing Technical Assessment Body, in particular pursuant to information by the Commission in accordance with Article 25(3) of Regulation (EU) No 305/2011.

Specific Part

1 Technical description of the product

The fischer-Zykon-Anchor FZA, FZA-D and FZA-I 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 bolt projection anchor FZA and the through bolt anchor FZA-D consists of a conical bolt with external thread, an expansion sleeve and a hexagon nut with washer.

The internal threaded anchor FZA-I consists of a conical bolt with internal thread and an expansion sleeve. The anchor is anchored by impact acting on the expansion sleeve over the cone bolts in the undercuts of the borehole.

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 – C5
Characteristic resistance for static and quasi static action to shear load	See Annex C6 – C10
Characteristic resistance for seismic performance category C1	See Annex C11 – C12
Displacements	See Annex C13 - C15

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorage satisfy requirements for Class A1
Resistance to fire	No performance determined

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: (1996/582/EC, OJ)

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

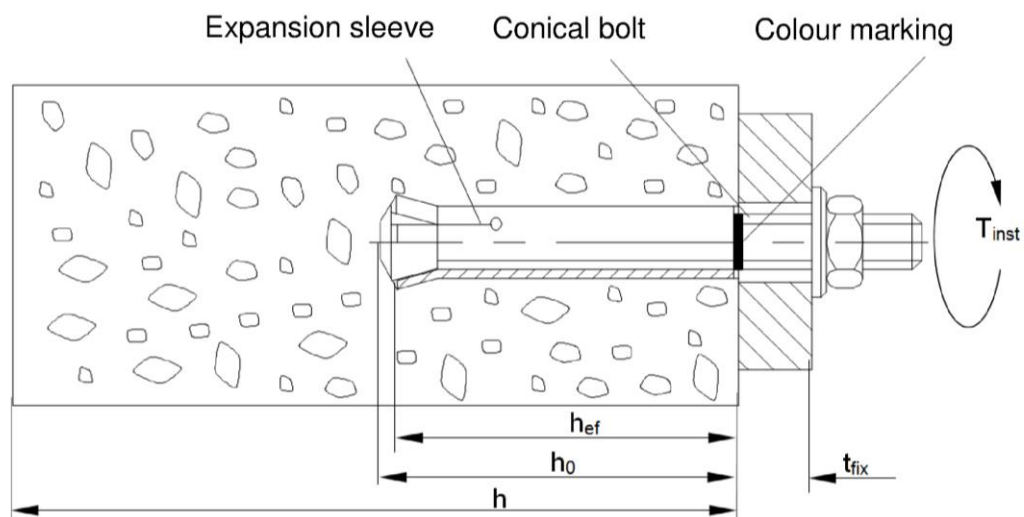
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 22 December 2015 by Deutsches Institut für Bautechnik

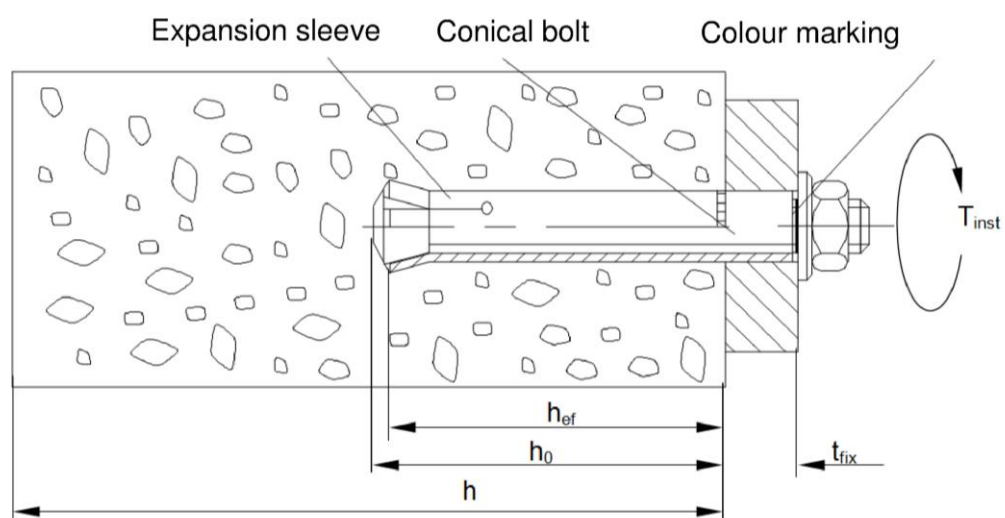
Andreas Kummerow
p. p. Head of Department

beglaubigt:
Lange

Bolt projecting anchor FZA:



Through bolt anchor FZA-D:

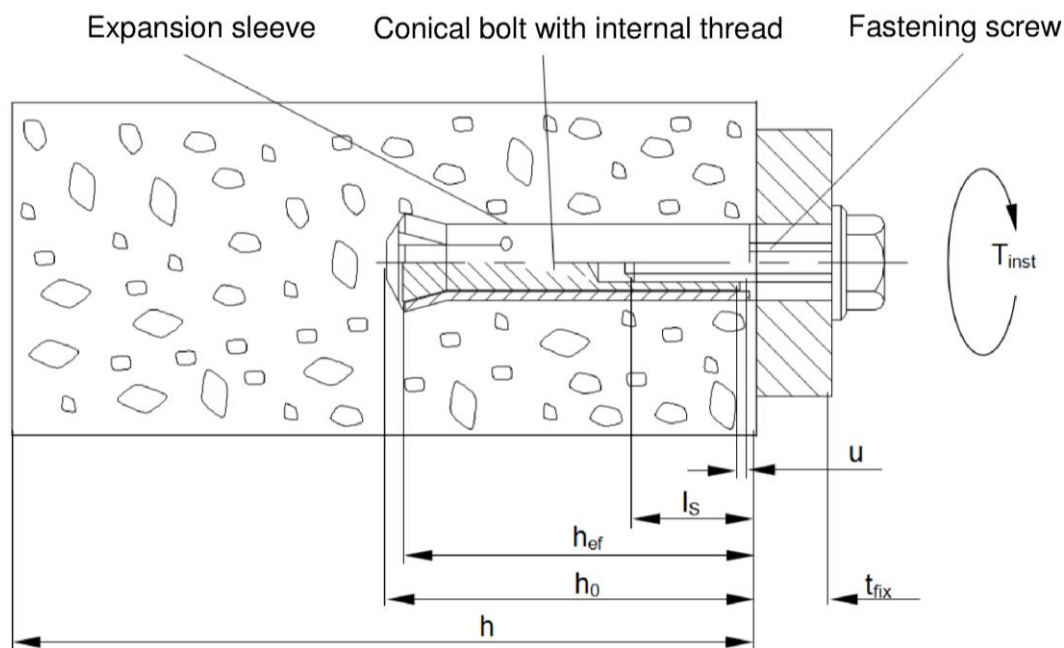


fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Product description
Installed condition

Annex A1

Internal thread anchor FZA-I:



Legend:

- h_{ef} : Effective anchorage depth
- h_0 : Drill hole depth
- t_{fix} : Thickness of fixture
- l_s : Reach of screw
- u : Gap between conical bolt and expansion sleeve
- h : Thickness of concrete member

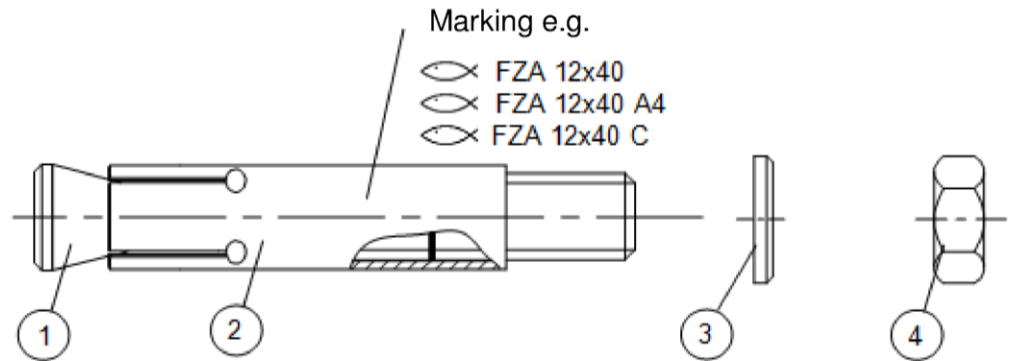
fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Product description
Installed condition

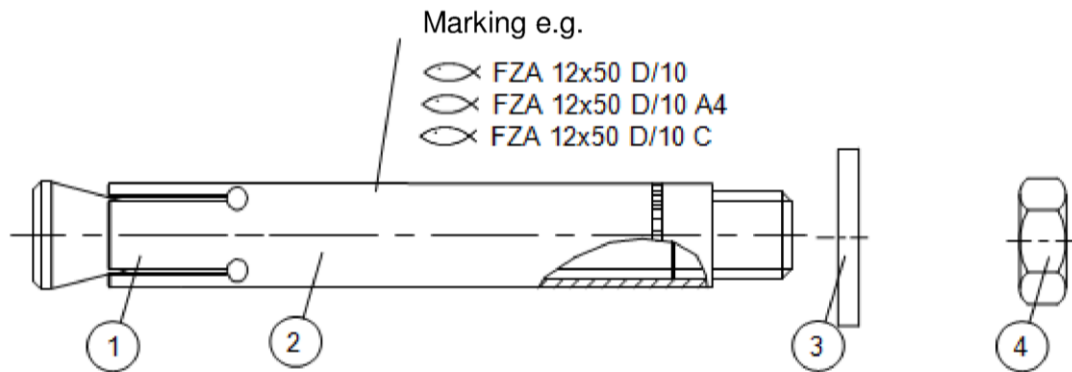
Annex A2

Type of anchors:

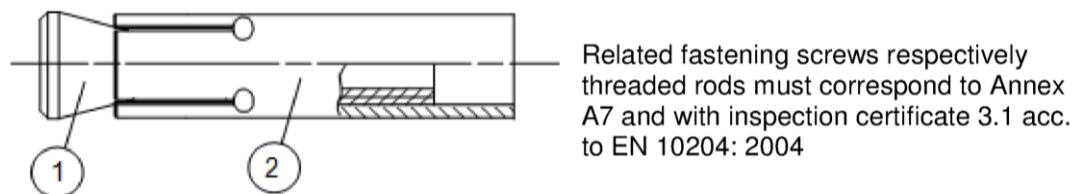
Bolt projecting
anchor
FZA:



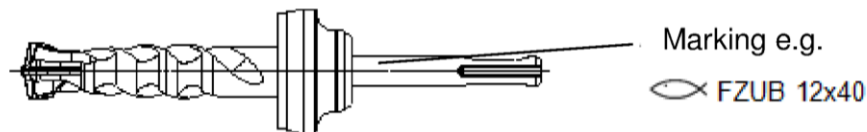
Through bolt anchor
FZA-D:



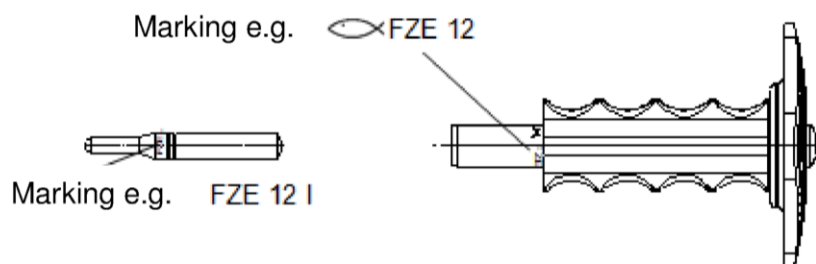
Internal
thread anchor
FZA-I:



Zykon drill
FZUB:



Setting tool FZE Plus
centring pin for
internal thread anchor

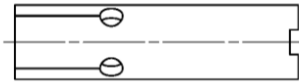


fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Annex A3

Product description
Anchor Types and tools

Types of expansion-sleeve



manufactured by punching



manufactured by turning

FZA

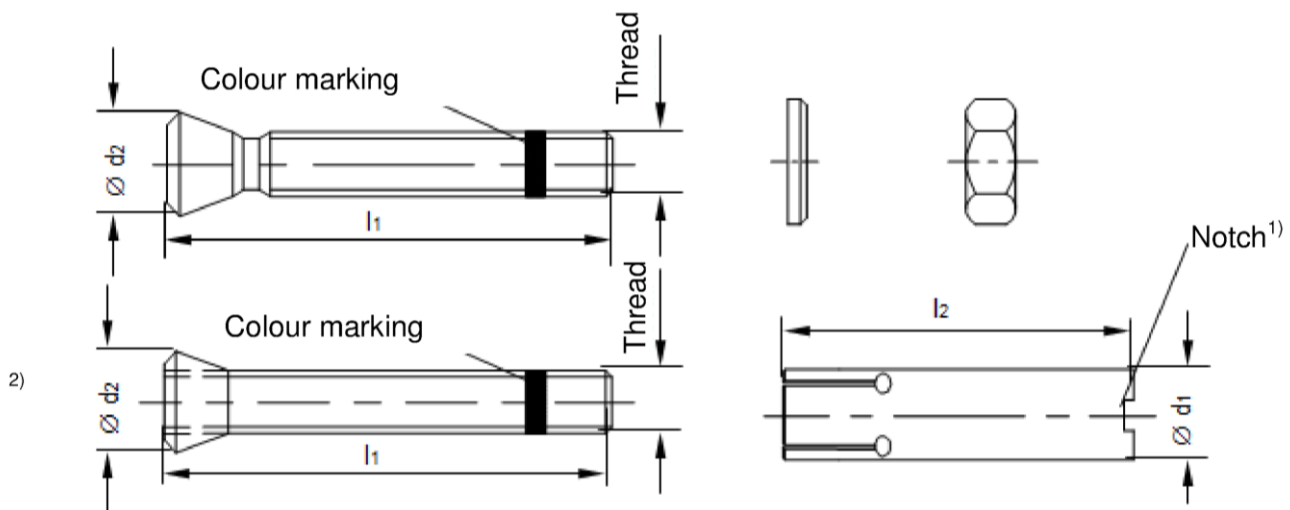


Table A1: Dimensions bolt projecting anchor FZA

Type of anchor	Thread	t_{fix} min	t_{fix} max	l_1 min	l_1 max	l_2	$\varnothing d_1$	$\varnothing d_2$
FZA 10 x 40 M 6 / $t_{fix}^{1)}$	M6	1	50	50	100	40	10	10
FZA 12 x 40 M 8 / $t_{fix}^{1)}$	M8	1	100	52	154	40	12	12
FZA 14 x 40 M 10 / $t_{fix}^{1)}$	M10	1	150	54	204	40	14	14
FZA 12 x 50 M 8 / t_{fix}	M8	1	100	62	164	50	12	12
FZA 14 x 60 M 10 / t_{fix}	M10	1	150	80	232	60	14	14
FZA 18 x 80 M 12 / t_{fix}	M12	1	200	99	301	80	18	18
FZA 22 x 100 M16 / t_{fix}	M16	1	250	122	374	100	22	22
FZA 22 x 125 M16 / $t_{fix}^{1)}$	M16	1	250	147	399	125	22	22

¹⁾ Expansion sleeve with notch

²⁾ Design: threaded bolt with cone nut

Dimensions in [mm]

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Product description
Anchor dimensions

Annex A4

FZA-D

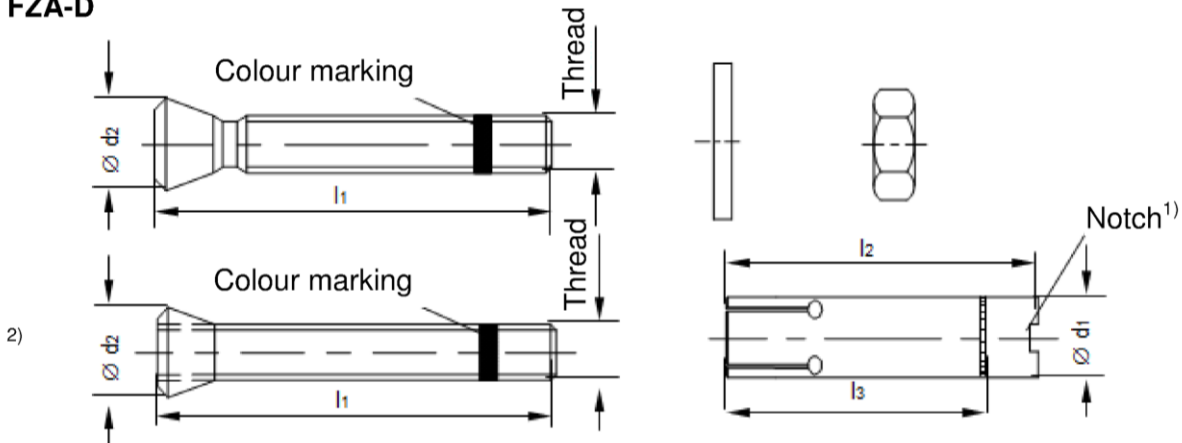


Table A2: Dimensions through bolt anchor FZA-D

Type of anchor	Thread	t_{fix} min	t_{fix} max	l_1	l_2	l_3	$\varnothing d_1$	$\varnothing d_2$
FZA 12 x 50 M 8 D / 10 ¹⁾	M8	1	10	69	50	40	12	12
FZA 12 x 60 M 8 D / 10	M8	1	10	79	60	50	12	12
FZA 12 x 80 M 8 D / 30	M8	1	30	99	80	50	12	12
FZA 14 x 80 M 10 D / 20	M10	1	20	102	80	60	14	14
FZA 14 x 100 M 10 D / 40	M10	1	40	126	100	60	14	14
FZA 18 x 100 M 12 D / 20	M12	1	20	126	100	80	18	18
FZA 18 x 130 M 12 D / 50	M12	1	50	156	130	80	18	18
FZA 22 x 125 M 16 D / 25	M16	1	25	156	125	100	22	22

¹⁾ Expansion sleeve with notch

²⁾ Design: threaded bolt with cone nut

FZA-I

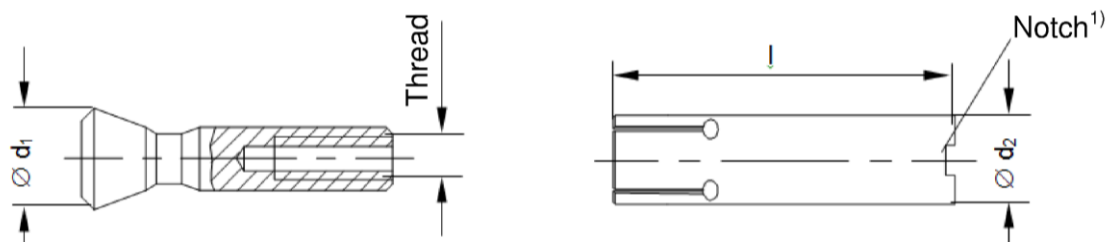


Table A3: Dimensions internal thread anchor FZA - I

Type of anchor	Thread	$\varnothing d_1$	$\varnothing d_2$	l
FZA 12 x 40 M 6 I ¹⁾	M6	12	12	40
FZA 12 x 50 M 6 I	M6	12	12	50
FZA 14 x 60 M 8 I	M8	14	14	60
FZA 18 x 80 M 10 I	M10	18	18	80
FZA 22 x 100 M 12 I	M12	22	22	100
FZA 22 x 125 M 12 I ¹⁾	M12	22	22	125

¹⁾ Expansion sleeve with notch

Dimensions in [mm]

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Product description
Anchor dimensions

Annex A5

Zykon drill FZUB

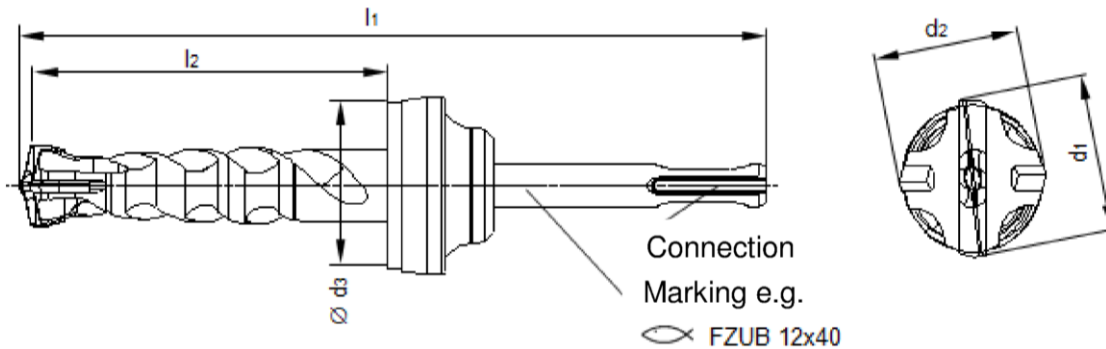
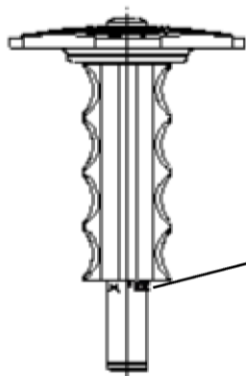


Table A4: Dimensions Zykon drill FZUB

Type of drill	Connection	l_1	$l_2 \geq$	$d_1 \leq$	d_2	$\varnothing d_3 \leq$
FZUB 10 x 40	SDS plus	126	40	10,80	$d_2 \leq d_1$	39,5
FZUB 12 x 40		127	40	12,82		
FZUB 12 x 50		137	50	12,82		
FZUB 12 x 60		147	60	12,82		
FZUB 12 x 80		167	80	12,82		
FZUB 14 x 40		130	40	14,82		
FZUB 14 x 60		152	60	14,82		
FZUB 14 x 80		172	80	14,82		
FZUB 14 x 100		192	100	14,82		
FZUB 18 x 80		172	80	19,40		
FZUB 18 x 100		192	100	19,40		
FZUB 18 x 130		222	130	19,40		
FZUB 22 x 100		197	100	22,95		43,5
FZUB 22 x 125		222	125	22,95		

Setting tool FZE Plus:



Centring pin for setting tool FZE Plus



Zykon drills FZUB and setting tools to use, acc. to Annex B2

Dimensions in [mm]

fischer-Zykon-Anchor FZA, FZA-D, FZA-I

Product description

Zykon drill FZUB and setting tool FZE Plus

Annex A6

Table A5: Materials FZA, FZA-D, FZA-I (zinc plated $\geq 5\mu\text{m}$, ISO 4042:1999)
FZA, FZA-D (hot-dip galvanized ¹⁾, ISO 10684: 2004 $\geq 50\mu\text{m}$)

Part	Designation	Material
1	Cone bolt with external thread	Cold form steel or free cutting steel Nominal steel tensile strength: $f_{uk} \leq 1000\text{ N/mm}^2$
	Conical bolt with internal thread ²⁾	Steel, EN 10277:2008 Nominal steel tensile strength $f_{uk} \leq 1000\text{ N/mm}^2$
2	Expansion sleeve seamless or rolled	Steel
3	Washer	Cold strip, EN 10139:2013
4	Hexagon nut	Steel, property class min. 8, EN ISO 898-2:2012

Table A6: Materials FZA A4, FZA-D A4, FZA-I A4

Part	Designation	Material
1	Cone bolt with external thread	Stainless steel EN 10088:2014 Nominal steel tensile strength: $f_{uk} \leq 1000\text{ N/mm}^2$
	Conical bolt with internal thread ³⁾	Stainless steel EN 10088:2014 Nominal steel tensile strength: $f_{uk} \leq 1000\text{ N/mm}^2$
2	Expansion sleeve seamless or rolled	Stainless steel EN 10088:2014
3	Washer	Stainless steel EN 10088:2014
4	Hexagon nut	Stainless steel EN 10088:2014; ISO 3506-2: 2009; property class – min. 70

Table A7: Materials FZA C, FZA-D C, FZA-I C

Part	Designation	Material
1	Cone bolt with external thread	High corrosion resistant steel EN 10088:2014 Nominal steel tensile strength: $f_{uk} \leq 1000\text{ N/mm}^2$
	Conical bolt with internal thread ⁴⁾	High corrosion resistant steel EN 10088:2014 Nominal steel tensile strength: $f_{uk} \leq 1000\text{ N/mm}^2$
2	Expansion sleeve seamless or rolled	High corrosion resistant steel EN 10088:2014
3	Washer	High corrosion resistant steel EN 10088:2014
4	Hexagon nut	High corrosion resistant steel EN 10088:2014; ISO 3506-2:2009; property class – min. 70

¹⁾ Alternative method sherardized, EN 13811:2003 $\geq 50\mu\text{m}$

²⁾ Related screws or threaded rods: property class 8.8 according to EN ISO 989-1; ductility $A_5 > 8\%$; zinc plated.

³⁾ Related screws or threaded rods: property class ≥ 70 according to EN ISO 3506-1; ductility $A_5 > 8\%$; Stainless steel 1.4401, 1.4404, 1.4578, 1.4571, 1.4439, 1.4362 according EN 10088.

⁴⁾ Related screws or threaded rods: property class ≥ 70 according to EN ISO 3506-1; ductility $A_5 > 8\%$; High corrosion resistant steel 1.4529, 1.4565 according EN 10088.

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Product description
Materials

Annex A7

Specifications of intended use

Anchorage subject to:

- Static and quasi-static loads
- Seismic Performance Category C1 sizes FZA14x40, FZA14x60, FZA18x80, FZA22x100, FZA 22x125 and FZA14x80D/20, FZA14x100D/40, FZA18x100D/20, FZA18x130D/50, FZA22x125D/25

Base materials:

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

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
(Zinc plated steel, hot-dip galvanized steel, stainless steel, 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, high corrosion-resistant steel)
- Structures subject to external atmospheric exposure and 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 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.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Anchor installation such that the effective anchorage depth is complied with. This requirement is ensured when the expansion sleeve in the case of bolt anchor and anchor with internal thread is placed about 1mm under the concrete surface and in case of the through bolt anchor is placed about 1mm under the surface of the fixture.

fischer Zykon Anchor FZA, FZA-I , FZA-D

Annex B1

Intended Use
Specifications

Table B1: Installation parameters for FZA, FZA-D, FZA-I

Type of anchor	Drill hole depth h_0 [mm]	Drill FZUB	Setting tool FZE Plus	$d_f^{2)}$ $\leq$ [mm]	Torque moment ¹⁾ T_{inst} [Nm]	Gap u [mm]	Reach of screw l_s [mm]	
							max	min
FZA 10 x 40 M 6 / t_{fix}	≥ 43	10 x 40	10	7	8,5	-	-	-
FZA 12 x 40 M 8 / t_{fix}	≥ 43	12 x 40	12	9	20	-	-	-
FZA 14 x 40 M 10 / t_{fix}	≥ 43	14 x 40	14	12	40	-	-	-
FZA 12 x 50 M 8 / t_{fix}	≥ 54	12 x 50	12	9	20	-	-	-
FZA 14 x 60 M 10 / t_{fix}	≥ 63	14 x 60	14	12	40	-	-	-
FZA 18 x 80 M 12 / t_{fix}	≥ 83	18 x 80	18	14	60	-	-	-
FZA 22 x 100 M16 / t_{fix}	≥ 103	22 x 100	22	18	100	-	-	-
FZA 22 x 125 M16 / t_{fix}	≥ 127	22 x 125	22	18	100	-	-	-
FZA 12 x 50 M 8 D / 10	≥ 43	12 x 50	12	14	20	-	-	-
FZA 12 x 60 M 8 D / 10	≥ 53	12 x 60	12	14	20	-	-	-
FZA 12 x 80 M 8 D / 30	≥ 53	12 x 80	12	14	20	-	-	-
FZA 14 x 80 M 10 D / 20	≥ 63	14 x 80	14	16	40	-	-	-
FZA 14 x 100 M 10 D / 40	≥ 63	14 x 100	14	16	40	-	-	-
FZA 18 x 100 M 12 D / 20	≥ 83	18 x 100	18	20	60	-	-	-
FZA 18 x 130 M 12 D / 50	≥ 83	18 x 130	18	20	60	-	-	-
FZA 22 x 125 M 16 D / 25	≥ 105	22 x 125	22	24	100	-	-	-
FZA 12 x 40 M 6 I	≥ 43	12 x 40	¹² + FZE 12 I	7	8,5	0 – 4,0	15	10
FZA 12 x 50 M 6 I	≥ 53	12 x 50	¹² + FZE 12 I	7	8,5	0 – 4,0	15	10
FZA 14 x 60 M 8 I	≥ 63	14 x 60	¹⁴ + FZE 14 I	9	15	0 – 4,0	18	12
FZA 18 x 80 M 10 I	≥ 83	18 x 80	¹⁸ + FZE 18 I	12	30	0 – 4,5	24	16
FZA 22 x 100 M 12 I	≥ 103	22 x 100	²² + FZE 22 I	14	60	0 – 4,5	26	16
FZA 22 x 125 M 12 I	≥ 127	22 x 125	²² + FZE 22 I	14	60	0 – 4,5	26	16

¹⁾ If the FZA with an internal thread (FZA-I) is used with a threaded rod or a screw according to Annex A7 the torque moment must be applied as given in the table.

²⁾ Diameter of the clearance hole in the fixture

fischer Zykon Anchor FZA, FZA-I, FZA-D

Intended Use
Installation parameters

Annex B2

Table B2: Minimum thickness of concrete members, minimum spacings and minimum edge distances of **bolt projecting anchor FZA**

Type of anchor		FZA 10x40 M6 / t _{fix}	FZA 12x40 M8 / t _{fix}	FZA 14x40 M10 / t _{fix}	FZA 12x50 M8 / t _{fix}
Minimum thickness of concrete member, minimum spacings and minimum edge distances of anchors FZA, FZA A4, FZA C					
Minimum spacing	s _{min} [mm]	40	40	70	50
Minimum edge distance	c _{min} [mm]	35	40	70	45
Minimum thickness of concrete member	h _{min} [mm]	100	100	100	110
Type of anchor		FZA 14x60 M10 / t _{fix}	FZA 18x80 M12 / t _{fix}	FZA 22x100 M16 / t _{fix}	FZA 22x125 M16 / t _{fix}
Minimum thickness of concrete member, minimum spacings and minimum edge distances of anchors FZA, FZA A4, FZA C					
Minimum spacing	s _{min} [mm]	60	80	100	125
Minimum edge distance	c _{min} [mm]	55	70	100	125
Minimum thickness of concrete member	h _{min} [mm]	130	160	200	250

Table B3: Minimum thickness of concrete members, minimum spacings and minimum edge distances of **through bolt anchor FZA D**

Type of anchor		FZA 12x50 M8D/10	FZA 12x60 M8D/10	FZA 12x80 M8D/30	FZA 14x80 M10D/20
Minimum thickness of concrete member, minimum spacings and minimum edge distances of anchors FZA D, FZA D A4, FZA D C					
Minimum spacing	s _{min} [mm]	40	50	50	60
Minimum edge distance	c _{min} [mm]	35	45	45	55
Minimum thickness of concrete member	h _{min} [mm]	100	110	110	130
Type of anchor		FZA 14x100 M10D/40	FZA 18x100 M12D/20	FZA 18x130 M12D/50	FZA 22x125 M16D/25
Minimum thickness of concrete member, minimum spacings and minimum edge distances of anchors FZA D, FZA D A4, FZA D C					
Minimum spacing	s _{min} [mm]	60	80	80	100
Minimum edge distance	c _{min} [mm]	55	70	70	100
Minimum thickness of concrete member	h _{min} [mm]	130	160	160	200

Table B4: Minimum thickness of concrete members, minimum spacings and minimum edge distances of **internal thread anchor FZA-I**

Type of anchor		FZA 12x40 M6 I	FZA 12x50 M6 I	FZA 14x60 M8 I	FZA 18x80 M10 I	FZA 22x100 M12 I	FZA 22x125 M12 I
Minimum thickness of concrete member, minimum spacings and minimum edge distances of anchors FZA I, FZA I A4, FZA I C							
Minimum spacing	s _{min} [mm]	40	50	60	80	100	125
Minimum edge distance	c _{min} [mm]	35	45	55	70	100	125
Minimum thickness of concrete member	h _{min} [mm]	100	110	130	160	200	250

fischer Zykon Anchor FZA, FZA-I, FZA-D

Intended Use

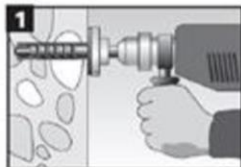
Installation parameters - Minimum thickness of concrete member, minimum spacings and minimum edge distances

Annex B3

Installation instructions for FZA, FZA-D, FZA-I Pre-positioned anchorage



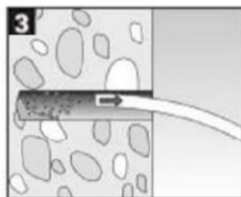
Push-through installation



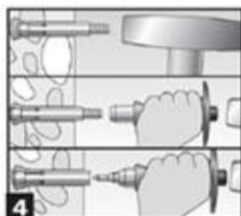
1 Create a drill hole at right angles to the surface of the anchor base with a hammer drill, using the corresponding Zykron universal drill bit FZUB. The required drill depth is reached once the FZUB depth stop meets the concrete.



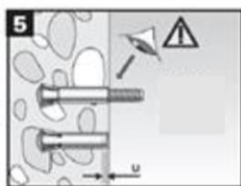
2 Once the FZUB depth stop meets the concrete, create the drill hole undercut by making circular swiveling movements with the hammer drill while the hammer mechanism is engaged. Press the hammer drill firmly against the anchor base: 1-2 swiveling movements are sufficient for $\varnothing 14$ mm, with 3-5 movements for $\varnothing 18$ mm and $\varnothing 22$ mm.



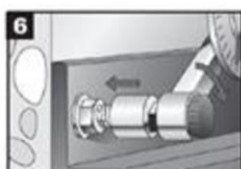
3 Clean drill hole.



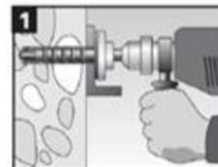
4 Insert the anchor into the drill hole and then drive the expansion sleeve in with hammer-set device FZE Plus, using a manual hammer. The setting depth marking (knurl) is approx. 1mm behind the surface of the concrete or the non-load-bearing layer (see Fig. 5).



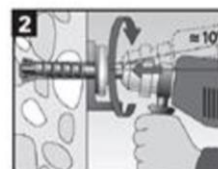
5 The anchor is correctly expanded if the colour marking on the thread of the tapered bolt is visible or the gap u is fulfilled.



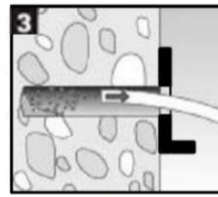
6 Mount installation object (e.g. anchor plate), washer and nut, screw (for FZA-I) or threaded rod with washer and nut (for FZA-I) and apply installation torque with torque spanner.



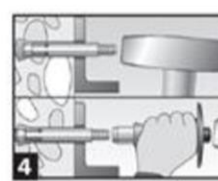
1 Create a drill hole through the installation object at right angles to the surface of the anchor base with a hammer drill, using the corresponding Zykron universal drill bit FZUB. The required drill depth is reached once the FZUB depth stop meets the fixture.



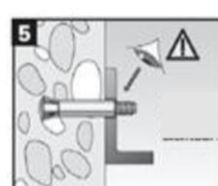
2 Once the FZUB depth stop meets the fixture, create the drill hole undercut by making circular swiveling movements with the hammer drill while the hammer mechanism is engaged. Press the hammer drill firmly against the anchor base: 1-2 swiveling movements are sufficient for $\varnothing 14$ mm, with 3-5 movements for $\varnothing 18$ mm and $\varnothing 22$ mm.



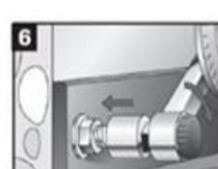
3 Clean drill hole.



4 Insert the anchor into the drill hole and then drive the expansion sleeve in with hammer-set device FZE Plus, using a manual hammer. The setting depth marking (knurl) is approx. 1mm behind the surface of the concrete or the non-load-bearing layer (see Fig. 5).



5 The anchor is correctly expanded if the colour marking on the thread of the tapered bolt is visible.



6 Mount installation object (e.g. anchor plate), washer and nut and apply installation torque with torque spanner.

fischer Zykon Anchor FZA, FZA-I, FZA-D

Intended Use

Installation instructions for FZA, FZA-D and FZA I

Annex B4

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

Type of anchor / size			FZA (bolt projecting anchor)			
			10x40 M6 / t _{fix}	12x40 M8 / t _{fix}	14x40 M10 / t _{fix}	12x50 M8 / t _{fix}
Steel failure for FZA						
Characteristic resistance	N _{RK,s}	[kN]	16,1	29,3	46,4	29,3
Partial safety factor	γ _{Ms} ¹⁾		1,5			
Steel failure for FZA A4						
Characteristic resistance	N _{RK,s}	[kN]	14,1	25,6	40,6	25,6
Partial safety factor	γ _{Ms} ¹⁾		1,87			
Steel failure for FZA C						
Characteristic resistance	N _{RK,s}	[kN]	14,1	25,6	40,6	25,6
Partial safety factor	γ _{Ms} ¹⁾		1,5			
Pullout failure for FZA, FZA A4, FZA C						
Characteristic resistance in cracked concrete C20/25	N _{RK,p}	[kN]	6	6	6	9
Characteristic resistance in non - cracked concrete C20/25	N _{RK,p}	[kN]	9	9	9	12
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 = γ _{inst}		1,2			1,0
Concrete cone failure and splitting failure for FZA, FZA A4, FZA C						
Effective anchorage depth	h _{ef}	[mm]	40	40	40	50
Factor for non-cracked concrete	k _{ucr}	[-]	10,1			
Factor for cracked concrete	k _{cr}	[-]	7,2			
Min. thickness of concrete member	h _{min}	[mm]	100	100	100	110
Characteristic spacing	s _{cr,N} = s _{cr,sp}	[mm]	3 h _{ef}			
Characteristic edge distance	c _{cr,N} = c _{cr,sp}	[mm]	1,5 h _{ef}			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances:

Characteristic values of resistance under **tension** loads for **bolt projecting anchor FZA**
(Design according to **ETAG 001, Annex C** or **CEN/TS 1992-4: 2009, Annex D**)

Annex C1

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

Type of anchor / size			FZA (bolt projecting anchor)			
			14x60 M10 / t _{fix}	18x80 M12 / t _{fix}	22x100 M16 / t _{fix}	22x125 M16 / t _{fix}
Steel failure for FZA						
Characteristic resistance	N _{Rk,s}	[kN]	46,4	67,4	126	126
Partial safety factor	γ _{Ms} ¹⁾		1,5			
Steel failure for FZA A4						
Characteristic resistance	N _{Rk,s}	[kN]	40,6	59,0	110	110
Partial safety factor	γ _{Ms} ¹⁾		1,87			
Steel failure for FZA C						
Characteristic resistance	N _{Rk,s}	[kN]	40,6	59,0	110	110
Partial safety factor	γ _{Ms} ¹⁾		1,5			
Pullout failure for FZA, FZA A4, FZA C						
Characteristic resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	12	20	40	40
Characteristic resistance in non - cracked concrete C20/25	N _{Rk,p}	[kN]	20	30	40	40
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 = γ _{inst}		1,0			
Concrete cone failure and splitting failure for FZA, FZA A4, FZA C						
Effective anchorage depth	h _{ef}	[mm]	60	80	100	125
Factor for non-cracked concrete	k _{ucr}	[-]	10,1			
Factor for cracked concrete	k _{cr}	[-]	7,2			
Min. thickness of concrete member	h _{min}	[mm]	130	160	200	250
Characteristic spacing	s _{cr,N} = s _{cr,sp}	[mm]	3 h _{ef}			
Characteristic edge distance	c _{cr,N} = c _{cr,sp}	[mm]	1,5 h _{ef}			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances:

Characteristic values of resistance under **tension** loads for **bolt projecting anchor FZA**
(Design according to **ETAG 001, Annex C** or **CEN/TS 1992-4: 2009, Annex D**)

Annex C2

Table C3: Characteristic values of **tension** resistance under static and quasi-static action **for through bolt anchor FZA D** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4**)

Type of anchor / size			FZA D (through bolt anchor)			
			12x50 M8D/10	12x60 M8D/10	12x80 M8D/30	14x80 M10D/20
Steel failure for FZA						
Characteristic resistance	$N_{RK,s}$	[kN]	29,3	29,3	29,3	46,4
Partial safety factor	γ_{Ms}	¹⁾	1,5			
Steel failure for FZA A4						
Characteristic resistance	$N_{RK,s}$	[kN]	25,6	25,6	25,6	40,6
Partial safety factor	γ_{Ms}	¹⁾	1,87			
Steel failure for FZA C						
Characteristic resistance	$N_{RK,s}$	[kN]	25,6	25,6	25,6	40,6
Partial safety factor	γ_{Ms}	¹⁾	1,5			
Pullout failure for FZA, FZA A4, FZA C						
Characteristic resistance in cracked concrete C20/25	$N_{RK,p}$	[kN]	6	9	9	12
Characteristic resistance in non - cracked concrete C20/25	$N_{RK,p}$	[kN]	9	12	12	20
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	$\gamma_2 = \gamma_{inst}$		1,2	1,0		
Concrete cone failure and splitting failure for FZA, FZA A4, FZA C						
Effective anchorage depth	h_{ef}	[mm]	40	50	50	60
Factor for non-cracked concrete	k_{ucr}	[-]	10,1			
Factor for cracked concrete	k_{cr}	[-]	7,2			
Min. thickness of concrete member	h_{min}	[mm]	100	110	110	130
Characteristic spacing	$s_{cr,N} = s_{cr,sp}$	[mm]	3 h_{ef}			
Characteristic edge distance	$C_{cr,N} = C_{cr,sp}$	[mm]	1,5 h_{ef}			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances:

Characteristic values of resistance under **tension** loads for **through bolt anchor FZA D**
(Design according to **ETAG 001, Annex C** or **CEN/TS 1992-4: 2009, Annex D**)

Annex C3

Table C4: Characteristic values of **tension** resistance under static and quasi-static action for **through bolt anchor FZA D** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4**)

Type of anchor / size			FZA D (through bolt anchor)			
			14x100 M10D/40	18x100 M12D/20	18x130 M12D/50	22x125 M16D/25
Steel failure for FZA						
Characteristic resistance	$N_{Rk,s}$	[kN]	46,6	67,4	67,4	126,0
Partial safety factor	$\gamma_{Ms}^{1)}$		1,5			
Steel failure for FZA A4						
Characteristic resistance	$N_{Rk,s}$	[kN]	40,6	59,0	59,0	110,0
Partial safety factor	$\gamma_{Ms}^{1)}$		1,87			
Steel failure for FZA C						
Characteristic resistance	$N_{Rk,s}$	[kN]	40,6	59,0	59,0	110,0
Partial safety factor	$\gamma_{Ms}^{1)}$		1,5			
Pullout failure for FZA, FZA A4, FZA C						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	20	20	40
Characteristic resistance in non - cracked concrete C20/25	$N_{Rk,p}$	[kN]	20	30	30	40
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	$\gamma_2 = \gamma_{inst}$		1,0			
Concrete cone failure and splitting failure for FZA, FZA A4, FZA C						
Effective anchorage depth	h_{ef}	[mm]	60	80	80	100
Factor for non-cracked concrete	k_{ucr}	[-]	10,1			
Factor for cracked concrete	k_{cr}	[-]	7,2			
Min. thickness of concrete member	h_{min}	[mm]	130	160	160	200
Characteristic spacing	$s_{cr,N} = s_{cr,sp}$	[mm]	3 h_{ef}			
Characteristic edge distance	$c_{cr,N} = c_{cr,sp}$	[mm]	1,5 h_{ef}			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances:

Characteristic values of resistance under **tension** loads for **through bolt anchor FZA D** (Design according to **ETAG 001, Annex C** or **CEN/TS 1992-4: 2009, Annex D**)

Annex C4

Table C5: Characteristic values of **tension** resistance under static and quasi-static action for **internal thread anchor FZA I** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4**)

Type of anchor / size			FZA I (internal thread anchor)					
			12x40 M6 I	12x50 M6 I	14x60 M8 I	18x80 M10 I	22x100 M12 I	22x125 M12 I
Steel failure for FZA								
Characteristic resistance	$N_{Rk,s}$	[kN]	16,1	16,1	22,9	26,9	63,0	63,0
Partial safety factor	γ_{Ms} ¹⁾		1,75			2,0		
Steel failure for FZA A4								
Characteristic resistance	$N_{Rk,s}$	[kN]	13,5	13,5	17,9	22,7	53,1	53,1
Partial safety factor	γ_{Ms} ¹⁾		1,8					
Steel failure for FZA C								
Characteristic resistance	$N_{Rk,s}$	[kN]	13,5	13,5	17,9	22,7	53,1	53,1
Partial safety factor	γ_{Ms} ¹⁾		1,8					
Pullout failure for FZA, FZA A4, FZA C								
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	6	9	12	20	40	40
Characteristic resistance in non - cracked concrete C20/25	$N_{Rk,p}$	[kN]	9	12	20	30	40	40
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	$\gamma_2 = \gamma_{inst}$		1,2	1,0				
Concrete cone failure and splitting failure for FZA, FZA A4, FZA C								
Effective anchorage depth	h_{ef}	[mm]	40	50	60	80	100	125
Factor for non-cracked concrete	k_{ucr}	[-]	10,1					
Factor for cracked concrete	k_{cr}	[-]	7,2					
Min. thickness of concrete member	h_{min}	[mm]	100	110	130	160	200	250
Characteristic spacing	$s_{cr,N} = s_{cr,sp}$	[mm]	3 h_{ef}					
Characteristic edge distance	$c_{cr,N} = c_{cr,sp}$	[mm]	1,5 h_{ef}					

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances:

Characteristic values of resistance under **tension** loads for **internal thread anchor FZA I**
(Design according to **ETAG 001, Annex C** or **CEN/TS 1992-4: 2009, Annex D**)

Annex C5

Table C6: Characteristic values of **shear** resistance under static and quasi-static action for **bolt projecting anchor FZA** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size		FZA (bolt projecting anchor)				
		10x40 M6 / t _{fix}	12x40 M8 / t _{fix}	14x40 M10 / t _{fix}	12x50 M8 / t _{fix}	
Steel failure without lever arm FZA						
Characteristic resistance	V _{Rk,s}	[kN]	8,0	14,7	23,2	14,7
Partial safety factor	γ _{Ms} ¹⁾		1,25			
Factor for ductility	k ₂	[-]	1,0			
Steel failure with lever arm FZA						
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	12,2	30,0	59,8	30,0
Partial safety factor	γ _{Ms} ¹⁾		1,25			
Factor for ductility	k ₂	[-]	1,0			
Steel failure without lever arm FZA A4						
Characteristic resistance	V _{Rk,s}	[kN]	7,0	12,8	20,3	12,8
Partial safety factor	γ _{Ms} ¹⁾		1,56			
Factor for ductility	k ₂	[-]	1,0			
Steel failure with lever arm FZA A4						
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	10,7	26,2	52,3	26,2
Partial safety factor	γ _{Ms} ¹⁾		1,56			
Factor for ductility	k ₂	[-]	1,0			
Steel failure without lever arm FZA C						
Characteristic resistance	V _{Rk,s}	[kN]	7,0	12,8	20,3	12,8
Partial safety factor	γ _{Ms} ¹⁾		1,25			
Factor for ductility	k ₂	[-]	1,0			
Steel failure with lever arm FZA C						
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	10,7	26,2	52,3	26,2
Partial safety factor	γ _{Ms} ¹⁾		1,25			
Factor for ductility	k ₂	[-]	1,0			
Concrete pryout failure FZA, FZA A4, FZA C						
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 in shear loading	l _f	[mm]	40	40	40	50
Effective diameter of anchor	d _{nom}	[mm]	10	12	14	12
Installation safety factor	γ ₂ = γ _{inst}		1,0			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Characteristic values of resistance under **shear** loads for **bolt projecting anchor FZA** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Annex C6

Table C7: Characteristic values of **shear** resistance under static and quasi-static action for **bolt projecting anchor FZA** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size		FZA (bolt projecting anchor)			
		14x60 M10 / t _{fix}	18x80 M12 / t _{fix}	22x100 M16 / t _{fix}	22x125 M16 / t _{fix}
Steel failure without lever arm FZA					
Characteristic resistance	V _{Rk,s} [kN]	23,2	33,8	62,8	62,8
Partial safety factor	γ _{Ms} ¹⁾	1,25			
Factor for ductility	k ₂ [-]	1,0			
Steel failure with lever arm FZA					
Characteristic bending resistance	M ⁰ _{Rk,s} [Nm]	59,8	105	266	266
Partial safety factor	γ _{Ms} ¹⁾	1,25			
Factor for ductility	k ₂ [-]	1,0			
Steel failure without lever arm FZA A4					
Characteristic resistance	V _{Rk,s} [kN]	20,3	29,5	55,0	55,0
Partial safety factor	γ _{Ms} ¹⁾	1,56			
Factor for ductility	k ₂ [-]	1,0			
Steel failure with lever arm FZA A4					
Characteristic bending resistance	M ⁰ _{Rk,s} [Nm]	52,3	91,6	232	232
Partial safety factor	γ _{Ms} ¹⁾	1,56			
Factor for ductility	k ₂ [-]	1,0			
Steel failure without lever arm FZA C					
Characteristic resistance	V _{Rk,s} [kN]	20,3	29,5	55,0	55,0
Partial safety factor	γ _{Ms} ¹⁾	1,25			
Factor for ductility	k ₂ [-]	1,0			
Steel failure with lever arm FZA C					
Characteristic bending resistance	M ⁰ _{Rk,s} [Nm]	52,3	91,6	232	232
Partial safety factor	γ _{Ms} ¹⁾	1,25			
Factor for ductility	k ₂ [-]	1,0			
Concrete pryout failure FZA, FZA A4, FZA C					
Factor k according to ETAG 001, Annex C or k ₃ according to CEN/TS 1992-4	k = k ₃ [-]	2,0			
Concrete edge failure					
Effective length of anchor in shear loading	l _f [mm]	60	80	100	125
Effective diameter of anchor	d _{nom} [mm]	14	18	22	22
Installation safety factor	γ ₂ = γ _{inst}	1,0			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Characteristic values of resistance under **shear** loads for **bolt projecting anchor FZA** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Annex C7

Table C8: Characteristic values of **shear** resistance under static and quasi-static action
for through bolt anchor FZA D (Design method A, according to **ETAG 001, Annex C** or
CEN/TS 1992-4:2009)

Type of anchor / size		FZA D (through bolt anchor)			
		12x50 M8D/10	12x60 M8D/10	12x80 M8D/30	14x80 M10D/20
Steel failure without lever arm FZA					
Characteristic resistance	$V_{Rk,s}$ [kN]	14,7	14,7	14,7	23,2
Partial safety factor	$\gamma_{Ms}^{1)}$	1,25			
Factor for ductility	k_2 [-]	1,0			
Steel failure with lever arm FZA					
Characteristic bending resistance	$M^0_{Rk,s}$ [Nm]	30,0	30,0	30,0	59,8
Partial safety factor	$\gamma_{Ms}^{1)}$	1,25			
Factor for ductility	k_2 [-]	1,0			
Steel failure without lever arm FZA A4					
Characteristic resistance	$V_{Rk,s}$ [kN]	12,8	12,8	12,8	20,3
Partial safety factor	$\gamma_{Ms}^{1)}$	1,56			
Factor for ductility	k_2 [-]	1,0			
Steel failure with lever arm FZA A4					
Characteristic bending resistance	$M^0_{Rk,s}$ [Nm]	26,2	26,2	26,2	52,3
Partial safety factor	$\gamma_{Ms}^{1)}$	1,56			
Factor for ductility	k_2 [-]	1,0			
Steel failure without lever arm FZA C					
Characteristic resistance	$V_{Rk,s}$ [kN]	12,8	12,8	12,8	20,3
Partial safety factor	$\gamma_{Ms}^{1)}$	1,25			
Factor for ductility	k_2 [-]	1,0			
Steel failure with lever arm FZA C					
Characteristic bending resistance	$M^0_{Rk,s}$ [Nm]	26,2	26,2	26,2	52,3
Partial safety factor	$\gamma_{Ms}^{1)}$	1,25			
Factor for ductility	k_2 [-]	1,0			
Concrete pryout failure FZA, FZA A4, FZA C					
Factor k according to ETAG 001, Annex C or k_3 according to CEN/TS 1992-4	$k = k_3$ [-]	1,3	1,3	1,3	2,0
Concrete edge failure					
Effective length of anchor in shear loading	l_f [mm]	40	50	50	60
Effective diameter of anchor	d_{nom} [mm]	12	12	12	14
Installation safety factor	$\gamma_2 = \gamma_{inst}$	1,0			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Characteristic values of resistance under **shear** loads for **through bolt anchor FZA D**
(Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Annex C8

Table C9: Characteristic values of **shear** resistance under static and quasi-static action **for through bolt anchor FZA D** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA D (through bolt anchor)			
			14x100 M10D/40	18x100 M12D/20	18x130 M12D/50	22x125 M16D/25
Steel failure without lever arm FZA						
Characteristic resistance	$V_{Rk,s}$	[kN]	23,2	33,8	33,8	62,8
Partial safety factor	γ_{Ms}	¹⁾	1,25			
Factor for ductility	k_2	[-]	1,0			
Steel failure with lever arm FZA						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	59,8	105	105	266
Partial safety factor	γ_{Ms}	¹⁾	1,25			
Factor for ductility	k_2	[-]	1,0			
Steel failure without lever arm FZA A4						
Characteristic resistance	$V_{Rk,s}$	[kN]	20,3	29,5	29,5	55,0
Partial safety factor	γ_{Ms}	¹⁾	1,56			
Factor for ductility	k_2	[-]	1,0			
Steel failure with lever arm FZA A4						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	52,3	91,6	91,6	232
Partial safety factor	γ_{Ms}	¹⁾	1,56			
Factor for ductility	k_2	[-]	1,0			
Steel failure without lever arm FZA C						
Characteristic resistance	$V_{Rk,s}$	[kN]	20,3	29,5	29,5	55,0
Partial safety factor	γ_{Ms}	¹⁾	1,25			
Factor for ductility	k_2	[-]	1,0			
Steel failure with lever arm FZA C						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	52,3	91,6	91,6	232
Partial safety factor	γ_{Ms}	¹⁾	1,25			
Factor for ductility	k_2	[-]	1,0			
Concrete pryout failure FZA, FZA A4, FZA C						
Factor k according to ETAG 001, Annex C or k_3 according to CEN/TS 1992-4	$k = k_3$	[-]	2,0			
Concrete edge failure						
Effective length of anchor in shear loading	l_f	[mm]	60	80	80	100
Effective diameter of anchor	d_{nom}	[mm]	14	18	18	22
Installation safety factor	$\gamma_2 = \gamma_{inst}$		1,0			

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Characteristic values of resistance under **shear** loads for **through bolt anchor FZA D** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Annex C9

Table C10: Characteristic values of **shear** resistance under static and quasi-static action **internal thread anchor FZA I** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA I (internal thread anchor)					
			12x40 M6 I	12x50 M6 I	14x60 M8 I	18x80 M10 I	22x100 M12 I	22x125 M12 I
Steel failure without lever arm FZA								
Characteristic resistance	$V_{Rk,s}$	[kN]	8,6	8,6	11,4	13,4	31,5	31,5
Partial safety factor	$\gamma_{Ms}^{1)}$		1,5	1,5	1,5	1,7	1,7	1,7
Factor for ductility	k_2	[-]	1,0					
Steel failure with lever arm FZA								
Characteristic bending resistance	$M_{Rk,s}^0$	[Nm]	12,2	12,2	30,0	59,8	105	105
Partial safety factor	$\gamma_{Ms}^{1)}$		1,25					
Factor for ductility	k_2	[-]	1,0					
Steel failure without lever arm FZA A4								
Characteristic resistance	$V_{Rk,s}$	[kN]	6,7	6,7	9,0	11,3	26,6	26,6
Partial safety factor	$\gamma_{Ms}^{1)}$		1,5					
Factor for ductility	k_2	[-]	1,0					
Steel failure with lever arm FZA A4								
Characteristic bending resistance	$M_{Rk,s}^0$	[Nm]	10,7	10,7	26,2	52,3	91,6	91,6
Partial safety factor	$\gamma_{Ms}^{1)}$		1,56					
Factor for ductility	k_2	[-]	1,0					
Steel failure without lever arm FZA C								
Characteristic resistance	$V_{Rk,s}$	[kN]	6,7	6,7	9,0	11,3	26,6	26,6
Partial safety factor	$\gamma_{Ms}^{1)}$		1,5					
Factor for ductility	k_2	[-]	1,0					
Steel failure with lever arm FZA C								
Characteristic bending resistance	$M_{Rk,s}^0$	[Nm]	10,7	10,7	26,2	52,3	91,6	91,6
Partial safety factor	$\gamma_{Ms}^{1)}$		1,56					
Factor for ductility	k_2	[-]	1,0					
Concrete pryout failure FZA, FZA A4, FZA C								
Factor k according to ETAG 001, Annex C or k_3 according to CEN/TS 1992-4	$k = k_3$	[-]	1,3	1,3	2,0	2,0	2,0	2,0
Concrete edge failure								
Effective length of anchor in shear loading	l_f	[mm]	40	50	60	80	100	125
Effective diameter of anchor	d_{nom}	[mm]	12	12	14	18	22	22
Installation safety factor	$\gamma_2 = \gamma_{inst}$		1,0					

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Characteristic values of resistance under **shear** loads for **internal thread anchor FZA I** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Annex C10

Table C11: Characteristic values of **tension and shear** resistance under **seismic action** for **bolt projecting anchor FZA** (Design according to **TR 045: Performance category C1**)

Type of anchor / size	FZA (bolt projecting anchor)					
	14x40 M10 / t _{fix}	14x60 M10 / t _{fix}	18x80 M12 / t _{fix}	22x100 M16 / t _{fix}	22x125 M16 / t _{fix}	
Steel failure FZA						
Characteristic resistance tension load C1	N _{Rk,s,C1} [kN]	46,4	46,4	67,4	126	126
Partial safety factor	γ _{Ms,C1} ¹⁾ [-]	1,5				
Steel failure FZA A4						
Characteristic resistance tension load C1	N _{Rk,s,C1} [kN]	40,6	40,6	59,0	110	110
Partial safety factor	γ _{Ms,C1} ¹⁾ [-]	1,87				
Steel failure FZA C						
Characteristic resistance tension load C1	N _{Rk,s,C1} [kN]	40,6	40,6	59,0	110	110
Partial safety factor	γ _{Ms,C1} ¹⁾ [-]	1,5				
Pullout failure						
Characteristic resistance tension load in cracked concrete C1	N _{Rk,p,C1} [kN]	6,0	6,0	20,0	40,0	40,0
Installation safety factor	γ _{2,C1} [-]	1,0				
Steel failure without lever arm FZA						
Characteristic resistance shear load C1	V _{Rk,s,C1} [kN]	20,9	20,9	33,8	62,8	62,8
Partial safety factor	γ _{Ms,C1} ¹⁾ [-]	1,25				
Steel failure without lever arm FZA A4						
Characteristic resistance shear load C1	V _{Rk,s,C1} [kN]	18,3	18,3	29,5	55,0	55,0
Partial safety factor	γ _{Ms,C1} ¹⁾ [-]	1,56				
Steel failure without lever arm FZA C						
Characteristic resistance shear load C1	V _{Rk,s,C1} [kN]	18,3	18,3	29,5	55,0	55,0
Partial safety factor	γ _{Ms,C1} ¹⁾ [-]	1,25				

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Characteristic values of tension and shear resistance under seismic action for bolt projecting anchor FZA (Design according to TR 045: Performance category C1)

Annex C11

Table C12: Characteristic values of **tension and shear** resistance under **seismic action for through bolt anchor FZA D** (Design according to **TR 045: Performance category C1**)

Type of anchor / size	FZA D (through bolt anchor)					
	14x80 M10D/20	14x100 M10D/40	18x100 M12D/20	18x130 M12D/50	22x125 M16D/25	
Steel failure FZA						
Characteristic resistance tension load C1	$N_{Rk,s,C1}$ [kN]	46,4	46,4	67,4	67,4	126
Partial safety factor	$\gamma_{Ms,C1}^{1)}$ [-]	1,5				
Steel failure FZA A4						
Characteristic resistance tension load C1	$N_{Rk,s,C1}$ [kN]	40,6	40,6	59,0	59,0	110
Partial safety factor	$\gamma_{Ms,C1}^{1)}$ [-]	1,87				
Steel failure FZA C						
Characteristic resistance tension load C1	$N_{Rk,s,C1}$ [kN]	40,6	40,6	59,0	59,0	110
Partial safety factor	$\gamma_{Ms,C1}^{1)}$ [-]	1,5				
Pullout failure						
Characteristic resistance tension load in cracked concrete C1	$N_{Rk,p,C1}$ [kN]	6,0	6,0	20,0	20,0	40,0
Installation safety factor	$\gamma_{2,C1}$ [-]	1,0				
Steel failure without lever arm FZA						
Characteristic resistance shear load C1	$V_{Rk,s,C1}$ [kN]	20,9	20,9	33,8	33,8	62,8
Partial safety factor	$\gamma_{Ms,C1}^{1)}$ [-]	1,25				
Steel failure without lever arm FZA A4						
Characteristic resistance shear load C1	$V_{Rk,s,C1}$ [kN]	18,3	18,3	29,5	29,5	55,0
Partial safety factor	$\gamma_{Ms,C1}^{1)}$ [-]	1,56				
Steel failure without lever arm FZA C						
Characteristic resistance shear load C1	$V_{Rk,s,C1}$ [kN]	18,3	18,3	29,5	29,5	55,0
Partial safety factor	$\gamma_{Ms,C1}^{1)}$ [-]	1,25				

¹⁾ In absence of other national regulations

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Characteristic values of tension and shear resistance under seismic action for through bolt anchor FZA D (Design according to TR 045: Performance category C1)

Annex C12

Table C13: Displacements due to tension loads for **bolt projecting anchor FZA** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA (bolt projecting anchor)			
			10x40 M6 / t _{fix}	12x40 M8 / t _{fix}	14x40 M10 / t _{fix}	12x50 M8 / t _{fix}
Tension load in cracked concrete	N	[kN]	2,0	2,0	2,0	3,5
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			
Tension load in non - cracked concrete	N	[kN]	3,3	3,3	3,3	4,8
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			
			14x60 M10 / t _{fix}	18x80 M12 / t _{fix}	22x100 M16 / t _{fix}	22x125 M16 / t _{fix}
Tension load in cracked concrete	N	[kN]	5,0	8,0	16,0	16,0
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			
Tension load in non - cracked concrete	N	[kN]	7,5	12,7	17,9	17,9
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			

Table C14: Displacements due to tension loads for **through bolt anchor FZA D** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA (through bolt anchor FZA D)			
			12x50 M8D/10	12x60 M8D/10	12x80 M8D/30	14x80 M10D/20
Tension load in cracked concrete	N	[kN]	2,0	3,5	3,5	5,0
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			
Tension load in non - cracked concrete	N	[kN]	3,3	4,8	4,8	7,5
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			
			14x100 M10D/40	18x100 M12D/20	18x130 M12D/50	22x125 M16D/25
Tension load in cracked concrete	N	[kN]	5,0	8,0	8,0	16,0
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			
Tension load in non - cracked concrete	N	[kN]	7,5	12,7	12,7	17,9
Displacement	δ_{N0}	[mm]	0,8			
	$\delta_{N\infty}$	[mm]	1,1			

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Displacements due to tension loads for **bolt projecting anchor FZA** and **through bolt anchor FZA D** (Design method A, according to ETAG 001, Annex C or CEN/TS 1992-4:2009)

Annex C13

Table C15: Displacements due to tension loads for **internal thread anchor FZA I**
(Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA I (internal thread anchor FZA I)					
			12x40 M6 I	12x50 M6 I	14x60 M8 I	18x80 M10 I	22x100 M12 I	22x125 M12 I
Tension load in cracked concrete	N	[kN]	2,0	3,5	5,0	8,0	16,0	16,0
Displacement	δ_{N0}	[mm]	0,8					
	$\delta_{N\infty}$	[mm]	1,1					
Tension load in non - cracked concrete	N	[kN]	3,3	4,8	7,5	12,7	17,9	17,9
Displacement	δ_{N0}	[mm]	0,8					
	$\delta_{N\infty}$	[mm]	1,1					

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Displacements due to tension loads for **internal thread anchor FZA I** (Design method A, according to ETAG 001, Annex C or CEN/TS 1992-4:2009)

Annex C14

Table C16: Displacements due to shear loads for **bolt projecting anchor FZA** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA (bolt projecting anchor)			
			10x40 M6 / t _{fix}	12x40 M8 / t _{fix}	14x40 M10 / t _{fix}	12x50 M8 / t _{fix}
Shear load in cracked and non-cracked concrete	V	[kN]	4,0	5,0	9,0	5,0
Displacement	δ_{V0}	[mm]	2,0	0,7	1,9	0,7
	$\delta_{V\infty}$	[mm]	3,0	1,0	2,8	1,0
			14x60 M10 / t _{fix}	18x80 M12 / t _{fix}	22x100 M16 / t _{fix}	22x125 M16 / t _{fix}
Shear load in cracked and non-cracked concrete	V	[kN]	12,5	19,0	30,0	30,0
Displacement	δ_{V0}	[mm]	1,9	2,1	2,1	2,1
	$\delta_{V\infty}$	[mm]	2,8	3,1	3,1	3,1

Table C17: Displacements due to shear loads for **through bolt anchor FZA D** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA D (through bolt anchor)			
			12x50 M8D/10	12x60 M8D/10	12x80 M8D/30	14x80 M10D/20
Shear load in cracked and non-cracked concrete	V	[kN]	5,0	5,0	5,0	12,5
Displacement	δ_{V0}	[mm]	0,7	0,7	0,7	1,9
	$\delta_{V\infty}$	[mm]	1,0	1,0	1,0	2,8
			14x100 M10D/40	18x100 M12D/20	18x130 M12D/50	22x125 M16D/25
Shear load in cracked and non-cracked concrete	V	[kN]	12,5	19,0	19,0	30,0
Displacement	δ_{V0}	[mm]	1,9	2,1	2,1	2,1
	$\delta_{V\infty}$	[mm]	2,8	3,1	3,1	3,1

Table C18: Displacements due to shear loads for **internal thread anchor FZA I** (Design method A, according to **ETAG 001, Annex C** or **CEN/TS 1992-4:2009**)

Type of anchor / size			FZA I (internal thread anchor)					
			12x40 M6 I	12x50 M6 I	14x60 M8 I	18x80 M10 I	22x100 M12 I	22x125 M12 I
Shear load in cracked and non-cracked concrete	V	[kN]	5,0	5,0	12,5	19,0	30,0	30,0
Displacement	δ_{N0}	[mm]	0,7	0,7	1,9	2,1	2,1	2,1
	$\delta_{N\infty}$	[mm]	1,0	1,0	2,8	3,1	3,1	3,1

fischer-Zykon-Anchor FZA, FZA-D , FZA-I

Performances

Displacements due to **shear** loads (Design method A, according to ETAG 001, Annex C or CEN/TS 1992-4:2009)

Annex C15