LEISTUNGSERKLÄRUNG

DoP: 0122

für fischer Bolzenanker FBZ, FBZ A4 (Metalldübel zur Verwendung im Beton (hoch belastbar)) – **DE**

1. Eindeutiger Kenncode des Produkttyps: **DoP: 0122**

2. Verwendungszweck(e): **Nachträgliche Befestigung im gerissenen und ungerissenen Beton, siehe Anhang, insbesondere Anhänge B 1 bis B 4**

3. Hersteller: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Straße 1, 72178 Waldachtal, Deutschland**

4. Bevollmächtigter: **--**

5. System(e) zur Bewertung und Überprüfung der Leistungsbeständigkeit: **1**

6. Europäisches Bewertungsdokument: **EAD 330232-00-0601**

   Europäische Technische Bewertung: **ETA-17/0624; 2017-09-08**

   Technische Bewertungsstelle: **DIBt**

   Notifizierte Stelle(n): **1343 – MPA Darmstadt**

7. Erklärte Leistung(en):

Mechanische Festigkeit und Standsicherheit (BWR 1)

- **Charakteristischer Widerstand für statische und quasi-statische Einwirkungen: Siehe Anhang, insbesondere Anhänge C 1 bis C 4**
- **Verschiebungen: Siehe Anhang, insbesondere Anhang C 5**

Brandschutz (BWR 2)

- **Brandverhalten: Der Dübel erfüllt die Anforderungen der Klasse A 1**
- **Charakteristischer Widerstand unter Brandbeanspruchung: Siehe Anhang, insbesondere Anhang C 4**

8. Angemessene Technische Dokumentation und/oder Spezifische Technische Dokumentation: ---

Die Leistung des vorstehenden Produkts entspricht der erklärten Leistung/den erklärten Leistungen. Für die Erstellung der Leistungserklärung im Einklang mit der Verordnung (EU) Nr. 305/2011 ist allein der obengenannte Hersteller verantwortlich.

Unterzeichnet für den Hersteller und im Namen des Herstellers von:

Andreas Bucher, Dipl.-Ing. | Wolfgang Hengesbach, Dipl.-Ing., Dipl.-Wirtsch.-Ing.

Tumlingen, 2017-09-15

- Diese Leistungserklärung wurde in verschiedenen Sprachversionen erstellt. Für den Fall unterschiedlicher Auslegung hat immer die englische Version Vorrang.
- Der Anhang enthält freiwillige und ergänzende Informationen in englischer Sprache. Diese gehen über die (sprachneutral angegebenen) gesetzlichen Anforderungen hinaus.

Specific Part

1 Technical description of the product

The fischer Bolt Anchor FBZ is an anchor made of galvanised steel (FBZ) or made of stainless steel (FBZ A4) which is placed into a drilled hole and anchored by torque-controlled expansion.

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 4
Displacements	See Annex C 5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Characteristic resistance under fire exposure	See Annex C 4

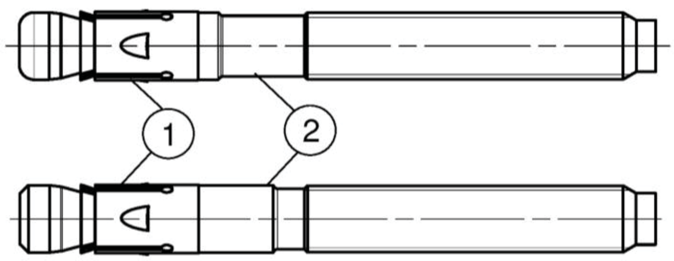
4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

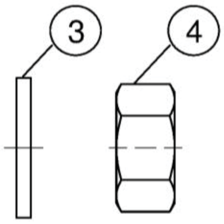
In accordance with the European Assessment Document EAD Nr. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

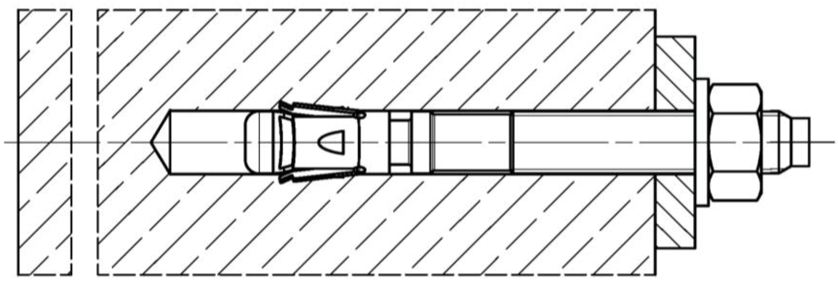
Cone bolt manufactured by cold - forming:

Cone bolt manufactured by turning:





① Expansion sleeve
② Cone bolt (cold – formed or turned)
③ Washer
④ Hexagon nut



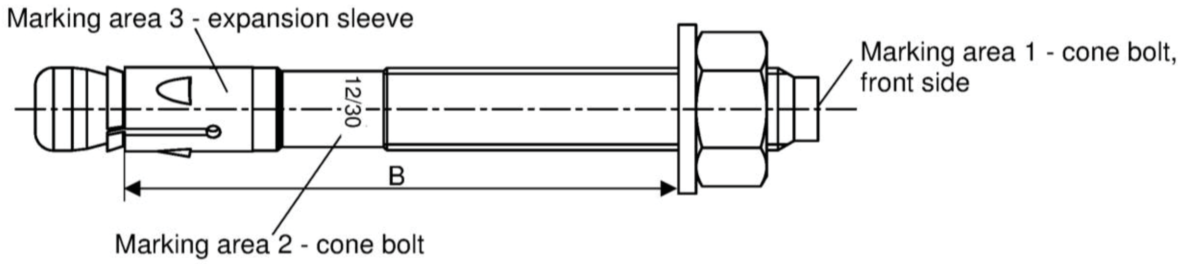
(Fig. not to scaled)

fischer Bolt Anchor FBZ, FBZ A4

Product description
Installed condition

Annex A 1

Product marking and letter-code:



Product marking, example: FBZ 12/30 A4

Brand | type of fastener placed at marking area 2 or marking area 3

Thread size / max. thickness of the fixture (t_{fix}) identification A4 placed at marking area 2

FBZ: carbon steel, galvanized
FBZ A4: stainless steel

Table A2.1: Letter - code at marking area 1:

Marking		(a)	(b)	(c)	(d)	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(K)
Max. t_{fix}		5	10	15	20	5	10	15	20	25	30	35	40	45	50
B ≥ [mm]	M8	40	45	-		50	55	60	65	70	75	80	85	90	95
	M10	45	50	55	60	65	70	75	80	85	90	95	100	105	110
	M12	55	60	65	70	75	80	85	90	95	100	105	110	115	120
	M16	70	75	80	85	90	95	100	105	110	115	120	125	130	135
	M20	-				105	110	115	120	125	130	135	140	145	150
Marking		(L)	(M)	(N)	(O)	(P)	(R)	(S)	(T)	(U)	(V)	(W)	(X)	(Y)	(Z)
Max. t_{fix}		60	70	80	90	100	120	140	160	180	200	250	300	350	400
B ≥ [mm]	M8	105	115	125	135	145	165	185	205	225	245	295	345	395	445
	M10	120	130	140	150	160	180	200	220	240	260	310	360	410	460
	M12	130	140	150	160	170	190	210	230	250	270	320	370	420	470
	M16	145	155	165	175	185	205	225	245	265	285	335	385	435	485
	M20	160	170	180	190	200	220	240	260	280	300	350	400	450	500

Calculation existing h_{ef} for installed fasteners:

$$\textbf{existing } h_{ef} = B_{(\text{according to table A2.1})} - \textbf{existing } t_{fix}$$

Thickness of the fixture t_{fix} including thickness of fastener plate t and e.g. thickness of grout layer t_{grout} or other non-structural layers

(Fig. not to scaled)

fischer Bolt Anchor FBZ, FBZ A4

Product description
Product marking and letter code

Annex A 2

Product dimensions

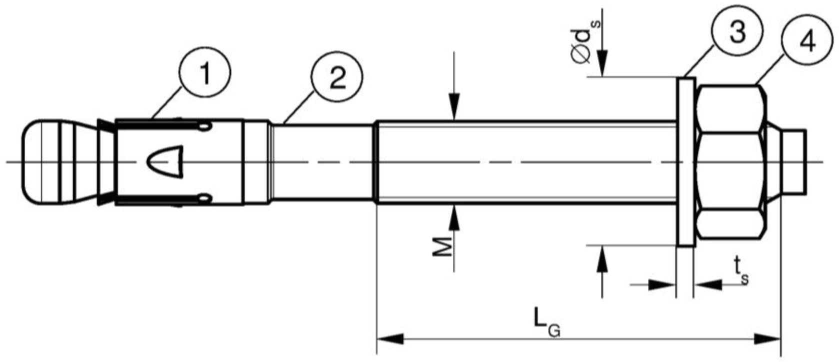


Table A3.1: Dimensions [mm]

Part	Designation			FBZ, FBZ A4				
				M8	M10	M12	M16	M20
1	Expansion sleeve	Sheet thickness		1,3	1,4	1,6	2,4	
2	Cone bolt	Thread size M		8	10	12	16	20
		L_G	≥	19	26	31	40	50
3	Washer	t_S		1,4	1,8	2,3	2,7	
		$\varnothing d_s$		15	19	23	29	36
4	Hexagon nut	Wrench size		13	17	19	24	30

(Fig. not to scaled)

fischer Bolt Anchor FBZ, FBZ A4

Product description
Dimensions

Annex A 3

Specifications of intended use

Anchorages subject to:

Size	FBZ, FBZ A4				
	M8	**M10**	**M12**	**M16**	**M20**
Static and quasi-static loads	✓				
Cracked and uncracked concrete					
Fire exposure					

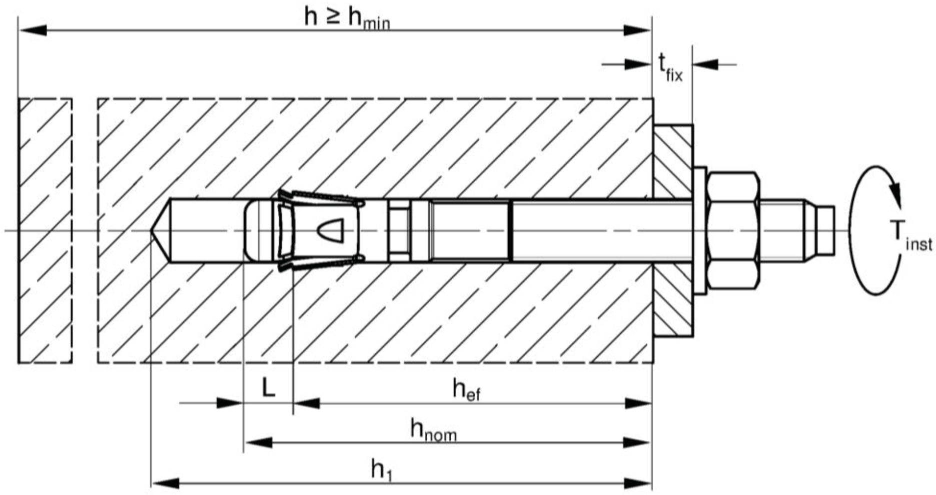
Base materials:
- Reinforced and unreinforced normal weight concrete (cracked and uncracked) according to EN 206-1: 2000
- Strength classes C20/25 to C50/60 according to EN 206-1: 2000

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions (FBZ, FBZ A4)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist
(FBZ A4)
Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor 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.)
- Design of fastenings according to FprEN 1992-4: 2016 and EOTA Technical Report TR 055
- For effective embedment depth h_{ef} < 40 mm and h_{min} ≥ 80 mm and / or < 100 mm only statically indeterminate fixings (e.g. lightweight suspended ceilings with internal exposure) are covered by the ETA

Table B2.1: Installation parameters

Size			FBZ, FBZ A4				
			M8	**M10**	**M12**	**M16**	**M20**
Nominal drill hole diameter	$d_0 =$	[mm]	8	10	12	16	20
Maximum bit diameter with hammer or hollow drilling	$d_{cut,max}$		8,45	10,45	12,5	16,5	20,55
Maximum bit diameter with diamond drilling			8,15		12,25	16,45	20,50
Overall fastener embedment depth in the concrete	$h_{nom} \geq$ (L)	[mm]	44,5 (9,5)	52,0 (12)	63,5 (13,5)	82,5 (17,5)	120 (20)
			Existing h_{ef} + L = h_{nom}				
Depth of drill hole to deepest point	$h_1 \geq$		h_{nom} + 5				h_{nom} + 10
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18	22
Required setting torque	$T_{inst} =$	[Nm]	20	45	60	110	200



h_{ef} = Effective embedment depth
t_{fix} = Thickness of the fixture
h_1 = Depth of drill hole to deepest point
h = Thickness of the concrete member
h_{min} = Minimum thickness of concrete member
h_{nom} = Overall fastener embedment depth in the concrete
T_{inst} = Required setting torque

(Fig. not to scaled)

Table B3.1: Minimum thickness of concrete members, minimum spacings and minimum edge distances of anchors for **standard anchorage depth ($h_{ef, sta}$)**

Size				FBZ, FBZ A4				
				M8	**M10**	**M12**	**M16**	**M20**
Standard anchorage depth		$h_{ef,sta} \geq$	[mm]	**45**	**60**	**70**	**85**	**100**
Concrete members with thickness $\geq 2 \times h_{ef,sta}$	Minimum thickness of concrete member	$h_{min, 1}$	[mm]	**100**	**120**	**140**	**170**	**200**
	Uncracked concrete							
	Minimum spacing	s_{min}	[mm]	40		50	65	95
		for $c \geq$	[mm]	50	60	70	95	180
	Minimum edge distance	c_{min}	[mm]	40	45	55	65	95
		for $s \geq$	[mm]	100	80	110	150	190
	Cracked concrete							
	Minimum spacing	s_{min}	[mm]	35	40	50	65	95
		for $c \geq$	[mm]	50	55	70	95	140
	Minimum edge distance	c_{min}	[mm]	40	45	55	65	85
		for $s \geq$	[mm]	70	80	110	150	190
Concrete members with thickness $< 2 \times h_{ef,sta}$	Minimum thickness of concrete member	$h_{min, 2}$	[mm]	**80**	**100**	**120**	**140**	**160**
	Cracked and uncracked concrete							
	Minimum spacing	s_{min}	[mm]	35	40	50	80	125
		for $c \geq$	[mm]	70	100	90	130	220
	Minimum edge distance	c_{min}	[mm]	40	60		65	125
		for $s \geq$	[mm]	100	90	120	180	230

Intermediate values for s_{min} and c_{min} inside of the same thickness of concrete member by linear interpolation

Table B3.2: Minimum thickness of concrete members, minimum spacings and minimum edge distances of anchors for **reduced anchorage depth ($h_{ef, red}$)**

Size				FBZ, FBZ A4			
				M8	**M10**	**M12**	**M16**
Reduced anchorage depth		$h_{ef,red} \geq$	[mm]	**35**[1)]	**40**	**50**	**65**
Concrete members with thickness $\geq 2 \times h_{ef,red}$	Minimum thickness of concrete member	$h_{min, 3}$	[mm]	**80**		**100**	**140**
	Uncracked concrete						
	Minimum spacing	s_{min}	[mm]	40		50	65
		for $c \geq$	[mm]	100		110	130
	Minimum edge distance	c_{min}	[mm]	45		55	65
		for $s \geq$	[mm]	180		220	250
	Cracked concrete						
	Minimum spacing	s_{min}	[mm]	40		50	65
		for $c \geq$	[mm]	90		110	130
	Minimum edge distance	c_{min}	[mm]	45		55	65
		for $s \geq$	[mm]	180		220	250

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

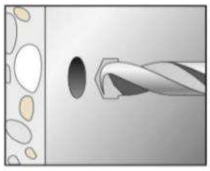
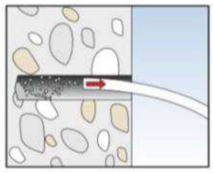
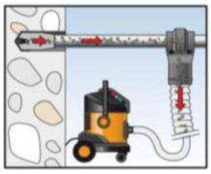
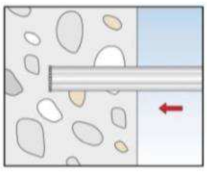
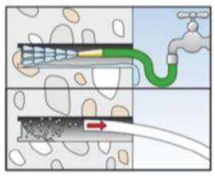
1) Only in anchoring structural components which are statically indeterminate

Installation instructions:

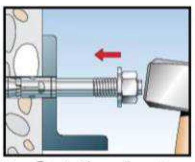
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Use of the anchor only as supplied by the manufacturer without exchanging the components of the anchor
- Checking before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply
- Check of concrete being well compacted, e.g. without significant voids
- Hammer, hollow or diamond drilling according to Annex B4
- Drill hole created perpendicular +/- 5° to concrete surface, positioning without damaging the reinforcement
- In case of aborted hole: new drilling at a minimum distance twice the depth of the aborted drill hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application
- It must be ensured that in case of fire local spalling of the concrete cover does not occur

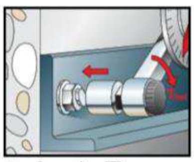
Installation instructions: Drilling and cleaning the hole

Types of drills and cleaning

Hammer drill		 1: Drill the hole	 2: Clean the hole
Hollow drill		 1: Drill the hole with automatic cleaning	-
Diamond drill		 1: Drill the hole	 2: Clean the hole

Installation instructions: Installation of the anchor


3: Set the fastener


4: Apply T_{inst}

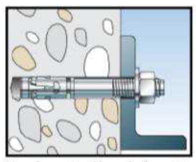

5: Installed fastener

Table C1.1: Characteristic values of **tension** resistance for **standard anchorage depth**

Size				FBZ, FBZ A4 M8	M10	M12	M16	M20
Steel failure for standard anchorage depth								
Characteristic resistance	FBZ	$N_{Rk,s}$	[kN]	16,6	28,3	43,2	67,0	123,3
Characteristic resistance	FBZ A4	$N_{Rk,s}$	[kN]	17,0	29,0	44,3	70,6	124,9
Partial factor for steel failure		γ_{Ms} [3]	[-]	1,5				
Pullout failure for standard anchorage depth								
Effective anchorage depth for calculation		$h_{ef,sta} \geq$	[mm]	45	60	70	85	100
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	6	10	16	26	30
Characteristic resistance in uncracked concrete C20/25		$N_{Rk,p}$	[kN]	11	16	17	34	42
Increasing factors for $N_{Rk,p}$ for cracked and uncracked concrete	ψ_c	C25/30		1,12				
		C30/37		1,22				
		C35/45		1,32				
		C40/50		1,41				
		C45/55		1,50				
		C50/60		1,58				
Installation sensitivity factor		γ_{inst}	[-]	1,0				
Concrete cone and splitting failure for standard anchorage depth in applications with concrete members of thickness ≥ 2x $h_{ef,sta}$								
Effective anchorage depth		h_{ef}	[mm]	45	60	70	85	100
Factor for uncracked concrete		$k_1 = k_{ucr,N}$	[-]	11,0 [2]				
Factor for cracked concrete		$k_1 = k_{cr,N}$	[-]	7,7 [2]				
Minimum thickness of concrete member		$h_{min,1}$	[mm]	100	120	140	170	200
Characteristic spacing		$s_{cr,N}$	[mm]	3 h_{ef}				
Characteristic edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}				
Spacing (splitting failure) [1]		$s_{cr,sp}$	[mm]	140	180	210	260	370
Edge distance (splitting failure) [1]		$c_{cr,sp}$	[mm]	70	90	105	130	185
Concrete cone and splitting failure for standard anchorage depth in applications with concrete members of thickness < 2x $h_{ef,sta}$								
Effective anchorage depth		h_{ef}	[mm]	45	60	70	85	100
Factor for uncracked concrete		$k_1 = k_{ucr,N}$	[-]	11,0 [2]				
Factor for cracked concrete		$k_1 = k_{cr,N}$	[-]	7,7 [2]				
Minimum thickness of concrete member		$h_{min,2}$	[mm]	80	100	120	140	160
Characteristic spacing		$s_{cr,N}$	[mm]	3 h_{ef}				
Characteristic edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}				
Spacing (splitting failure) [1]		$s_{cr,sp}$	[mm]	180	240	280	340	480
Edge distance (splitting failure) [1]		$c_{cr,sp}$	[mm]	90	120	140	170	240

[1] Intermediate values for $s_{cr,sp}$ and $c_{cr,sp}$ between concrete thickness $h_{min,2}$ and $h_{min,1}$ by linear interpolation
[2] Based on concrete strength as cylinder strength
[3] In absence of other national regulations

Table C2.1: Characteristic values of **tension** resistance for **reduced anchorage depth**

Size				FBZ, FBZ A4			
				M8	M10	M12	M16
Steel failure for reduced anchorage depth							
Characteristic resistance	FBZ	$N_{Rk,s}$	[kN]	16,6	28,3	43,2	67,0
	FBZ A4	$N_{Rk,s}$	[kN]	17,0	29,0	44,3	70,6
Partial factor for steel failure		γ_{Ms} 3)	[-]	1,5			
Pullout failure for reduced anchorage depth							
Effective anchorage depth for calculation		$h_{ef,red} \geq$	[mm]	35 1)	40	50	65
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$	[kN]	4	7	10	15
Characteristic resistance in uncracked concrete 20/25		$N_{Rk,p}$	[kN]	8	10	15	22
Increasing factors for $N_{Rk,p}$ for cracked and uncracked concrete		ψ_c	C25/30	1,12			
			C30/37	1,22			
			C35/45	1,32			
			C40/50	1,41			
			C45/55	1,50			
			C50/60	1,58			
Installation sensitivity factor		γ_{inst}	[-]	1,0			
Concrete cone and splitting failure for reduced anchorage depth							
Effective anchorage depth		h_{ef}	[mm]	35 1)	40	50	65
Factor for uncracked concrete		$k_1 = k_{ucr,N}$	[-]	11 2)			
Factor for cracked concrete		$k_1 = k_{cr,N}$	[-]	7,7 2)			
Min. thickness of concrete member		$h_{min,3}$	[mm]	80		100	140
Characteristic spacing		$s_{cr,N}$	[mm]	3 h_{ef}			
Characteristic edge distance		$c_{cr,N}$	[mm]	1,5 h_{ef}			
Spacing (splitting failure)		$s_{cr,sp}$	[mm]	140	160	200	260
Edge distance (splitting failure)		$c_{cr,sp}$	[mm]	70	80	100	130

1) Use restricted to anchoring of structural components which are statically indeterminate
2) Based on concrete strength as cylinder strength
3) In absence of other national regulations

Table C3.1: Characteristic values of **shear** resistance for **standard and reduced anchorage depth**

Size					M8	M10	M12	M16	M20
					FBZ, FBZ A4				
Steel failure without lever arm for standard and reduced anchorage depth									
Characteristic resistance	FBZ	$V_{Rk,s}$	[kN]		12,0	21,4	30,6	55,0	70,0
	FBZ A4	$V_{Rk,s}$	[kN]		16,1	26,5	37,4	57,2	
Partial factor for steel failure		γ_{Ms} [1)]	[-]		1,25				
Factor for ductility		k_7	[-]		1,0				
Standard anchorage depth									
Steel failure with lever arm									
Characteristic bending resistance	FBZ	$M^0_{Rk,s}$	[Nm]		26	52	92	233	513
	FBZ A4	$M^0_{Rk,s}$	[Nm]		29	59	100	256	519
Partial factor for steel failure		γ_{Ms} [1)]	[-]		1,25				
Factor for ductility		k_7	[-]		1,0				
Concrete pryout failure									
Factor for pryout failure		k_8	[-]		2,8	3,2		3,0	2,6
Concrete edge failure									
Effective embedment depth for calculation		l_f	[mm]		45	60	70	85	100
Outside diameter of a fastener		d_{nom}	[mm]		8	10	12	16	20
Installation sensitivity factor		γ_{inst}	[-]		1,0				
Reduced anchorage depth									
Steel failure with lever arm									
Characteristic bending resistance	FBZ	$M^0_{Rk,s}$	[Nm]		20	44	92	184	-
	FBZ A4	$M^0_{Rk,s}$	[Nm]		21	45	100	193	-
Partial factor for steel failure		γ_{Ms} [1)]	[-]		1,25				
Factor for ductility		k_2	[-]		1,0				
Concrete pryout failure									
Factor for pryout failure		k_8	[-]		2,5	2,6	3,1	3,2	-
Concrete edge failure									
Effective embedment depth for calculation		l_f	[mm]		35	40	50	65	-
Outside diameter of a fastener		d_{nom}	[mm]		8	10	12	16	-

[1)] In absence of other national regulations

Table C4.1: Characteristic values of **tension** resistance under **fire exposure**

Size					FBZ, FBZ A4				
					M8	**M10**	**M12**	**M16**	**M20**
			$h_{ef} \geq$	[mm]	35 / 45	40 / 60	50 / 70	65 / 85	100
Characteristic resistance **steel failure**	$N_{Rk,s,fi}$		R30	[kN]	1,4	2,8	5,0	9,4	14,7
			R60		1,2	2,3	4,1	7,7	12,0
			R90		0,9	1,9	3,2	6,0	9,4
			R120		0,8	1,6	2,8	5,2	8,1
Characteristic resistance **Concrete cone failure**	$N_{Rk,c,fi}$		R30 - R90		$7{,}7 \cdot h_{ef}^{1,5} \cdot (20)^{0,5} \cdot h_{ef} / 200 / 1000$				
			R120		$7{,}7 \cdot h_{ef}^{1,5} \cdot (20)^{0,5} \cdot h_{ef} / 200 / 1000 \cdot 0{,}8$				
Characteristic resistance **pullout failure**	$N_{Rk,p,fi}$		R30		0,9 / 2,0	2,2 / 3,3	3,0 / 5,0	4,5 / 6,8	8,6
			R60		0,8 / 2,0				
			R90		0,5 / 2,0				
			R120		0,3 / 1,6	1,7 / 2,6	2,4 / 4,0	3,6 / 5,4	6,9

Table C4.2: Characteristic values of **shear** resistance under **fire exposure**

Size **FBZ, FBZ A4**			R30		R60	
			$V_{Rk,s,fi,30}$ [kN]	$M^0_{Rk,s,fi,30}$ [Nm]	$V_{Rk,s,fi,60}$ [kN]	$M^0_{Rk,s,fi,60}$ [Nm]
M8	$h_{ef} \geq$	35	1,8	1,4	1,6	1,2
M10		40	3,6		2,9	3,0
M12		50	6,3	7,8	4,9	6,4
M16		65	11,7	19,9	9,1	16,3
M20		100	18,2	39,0	14,2	31,8

Size **FBZ, FBZ A4**			R90		R120	
			$V_{Rk,s,fi,90}$ [kN]	$M^0_{Rk,s,fi,90}$ [Nm]	$V_{Rk,s,fi,120}$ [kN]	$M^0_{Rk,s,fi,120}$ [Nm]
M8	$h_{ef} \geq$	35	1,3	1,0	1,2	0,8
M10		40	2,2	2,4	1,9	2,1
M12		50	3,5	5,0	2,8	4,3
M16		65	6,6	12,6	5,3	11,0
M20		100	10,3	24,6	8,3	21,4

Table C4.3: Minimum spacings and minimum edge distances of anchors under **fire exposure** for **tension** and **shear** load

Size			FBZ, FBZ A4				
			M8	**M10**	**M12**	**M16**	**M20**
Spacing	s_{min}	[mm]	Annex B3				
Edge distance	c_{min}		$c_{min} = 2 \cdot h_{ef}$, for fire exposure from more than one side $c_{min} \geq 300$ mm				

Table C5.1: Displacements under static and quasi static **tension** loads

Size			FBZ, FBZ A4				
			M8	**M10**	**M12**	**M16**	**M20**
Displacement – factor for tensile load[1]							
δ_{N0} - factor	in cracked concrete	[mm/kN]	0,22	0,12	0,09	0,08	0,07
$\delta_{N\infty}$ - factor	in cracked concrete	[mm/kN]	0,78	0,40	0,19	0,09	
δ_{N0} - factor	in uncracked concrete	[mm/kN]	0,07	0,05	0,06		0,05
$\delta_{N\infty}$ - factor	in uncracked concrete	[mm/kN]	0,29	0,21	0,14	0,10	0,06

Table C5.2: Displacements under static and quasi static **shear** loads

Size			FBZ				
			M8	**M10**	**M12**	**M16**	**M20**
Displacement – factor for shear load[2]							
δ_{V0} - factor	in cracked concrete	[mm/kN]	0,35	0,37	0,27	0,10	0,09
$\delta_{V\infty}$ - factor	in cracked concrete	[mm/kN]	0,52	0,55	0,40	0,14	0,15
			FBZ A4				
δ_{V0} - factor	in uncracked concrete	[mm/kN]	0,23	0,19	0,18	0,10	0,11
$\delta_{V\infty}$ - factor	in uncracked concrete	[mm/kN]	0,27	0,22	0,16	0,11	0,05

[1] Calculation of effective displacement:
$\delta_{N0} = \delta_{N0} - \text{factor} \cdot N_{ED}$
$\delta_{N\infty} = \delta_{N\infty} - \text{factor} \cdot N_{ED}$
(N_{ED}: Design value of the applied tension force)

[2] Calculation of effective displacement:
$\delta_{V0} = \delta_{V0} - \text{factor} \cdot V_{ED}$
$\delta_{V\infty} = \delta_{V\infty} - \text{factor} \cdot V_{ED}$
(V_{ED}: Design value of the applied shear force)