EKSPLUATĀCIJAS ĪPAŠĪBU DEKLARĀCIJA

DoP 0426
fischer FAZ II Classic (mehāniskais enkurs betonam)

LV

1. Unikāls izstrādājuma tipa identifikācijas numurs: **DoP 0426**

2. Paredzētais izmantojums: **Pēc uzstādīšanas iestrādājams mehāniskais enkurs lietošanai plaisājušā vai neplaisājušā betonā, Skatīt papildinājumu, īpaši pielikumus B1 - B5.**

3. Ražotājs: **fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Vācija**

4. Pilnvarotais pārstāvis: **–**

5. Ekspluatācijas īpašību noturības novērtējuma un pārbaudes (AVCP) sistēma(-as): **1**

6. Eiropas novērtējuma dokuments: **EAD 330232-02-0601, 2024-09 (Decision (EU) 2025/2355)**
   Eiropas tehniskais novērtējums: **ETA-23/0162; 2026-10-15**
   Tehniskā novērtējuma iestāde: **ETA-Danmark A/S**
   Paziņotā(-ās) iestāde(-es): **2873 TU Darmstadt**

7. Deklarētā(-ās) ekspluatācijas īpašība(-as):

Mehāniskā izturība un stabilitāte (BWR 1)

Raksturīgā izturība pret vilkmi (statiskā un kvazistatiskā slodze) metode A:

1 Izturība pret tērauda bojājumiem: Pielikums C1
2 Izturība pret izraušanas bojājumu: Pielikums C1
3 Izturība pret betona konusa bojājumu: Pielikums C1
4 Robustums: Pielikums C1
5 Minimālais malas attālums un atstatums: Pielikumi B3, C3
6 Malu attālums, lai novērstu plaisāšanu zem slodzes: Pielikums C1

Raksturīgā izturība pret bīdes slodzi (statiskā un kvazistatiskā slodze):

7 Izturība pret tērauda bojājumiem (bīdes slodze): Pielikums C2
8 Izturība pret izraušanas bojājumu no malas: Pielikums C2

Raksturīgā izturība vienkāršotam projektējumam:

9 Metode B: NPD
10 Metode C: NPD

Pārvietojumi:

11 Pārvietojumi statiskās un kvazistatiskās slodzes apstākļos: Pielikums C6

Stingrība

12 Stingrība elastīgajā diapazonā pie stiepes slodzes NPD
13 Stingrības raksturlielumi nelineāriem atsperu modeļiem pie stiepes slodzes NPD

Raksturīgā izturība un pārvietojumi seismiskās veiktspējas kategorijām C1:

14 Stiepes slodzes nestspēja: Pielikums C4
15 Bīdes slodzes nestspēja, Gredzenveida spraugas koeficients: Pielikums C4

Seismiskās veiktspējas kategorijas C2 raksturīgā nestspēja un pārvietojumi:

16 Stiepes slodzes nestspēja, pārvietojumi: Pielikumi C5, C6
17 Bīdes slodzes nestspēja un pārvietojumi, gredzenveida spraugas koeficients: Pielikumi C5, C6

Drošība ugunsgrēka gadījumā (BWR 2)

18 Reakcija uz uguni: Klase (A1)

Izturība pret uguni:

19 Ugunsizturība pret tērauda bojājumiem (vilces slodze): Pielikums C7
20 Ugunsizturība pret izraušanas bojājumu (vilces slodze): Pielikums C7
21 Ugunsizturība pret tērauda bojājumiem (bīdes slodze): Pielikums C7

Izturība:

22 Izturība: Pielikumi A4, B1

8. Atbilstīgā tehniskā dokumentācija un/vai īpašā tehniskā dokumentācija: **–**

Iepriekš norādītā izstrādājuma ekspluatācijas īpašības atbilst deklarēto ekspluatācijas īpašību kopumam. Šī ekspluatācijas īpašību deklarācija izdota saskaņā ar Regulu (ES) Nr. 305/2011, un par to ir atbildīgs vienīgi iepriekš norādītais ražotājs.

Parakstīts ražotāja vārdā:

i.V.

Dr. Christian Weber, Attīstības vadītājs

Dieter Pfaff, Starptautiskās ražošanas federācijas un kvalitātes vadības vadītājs

Tumlingen, 2026-11-02

Šī deklarācija par tehniskajiem raksturojumiem ir sagatavota dažādās valodās. Gadījumos, ja rodas strīdi attiecībā uz skaidrojumu, prioritāte vienmēr ir angļu versijai. Pielikums satur brīvprātīgi sniegtu papildu informāciju angļu valodā, kas pārsniedz (norādīts neatkarīgi no valodas) likumā noteiktās prasības.

Translation guidance Essential Characteristics and Performance Parameters for Annexes

Tulkošanas norādījumi Pielikumu būtiskie raksturlielumi un darbības parametri

Mechanical resistance and stability (BWR 1) **Mehāniskā izturība un stabilitāte (BWR 1)**		
Characteristic resistance under static and quasi-static loading, Method A **Raksturīgā izturība pret vilkmi (statiskā un kvazistatiskā slodze) metode A:**		
1	Resistance to steel failure: **Izturība pret tērauda bojājumiem:**	$N_{Rk,s}$ [kN], E_s [N/mm^2]
2	Resistance to pull- out failure: **Izturība pret izraušanas bojājumu:**	$N_{Rk,p}$ [kN], ψ_c
3	Resistance to concrete cone failure: **Izturība pret betona konusa bojājumu:**	$k_{cr,N}$, $k_{ucr,N}$ [-], h_{ef}, $c_{cr,N}$ [mm]
4	Robustness: **Robustums:**	γ_{inst} [-]
5	Minimum edge distance and spacing: **Minimālais malas attālums un atstatums:**	c_{min}, s_{min}, h_{min} [mm]
6	Edge distance to prevent splitting under load: **Malu attālums, lai novērstu plaisāšanu zem slodzes:**	$N^0_{Rk,sp}$ [kN], $c_{cr,sp}$ [mm]
Characteristic resistance to shear load (static and quasi-static loading), Method A **Raksturīgā izturība pret bīdes slodzi (statiskā un kvazistatiskā slodze):**		
7	Resistance to steel failure under shear load: **Izturība pret tērauda bojājumiem (bīdes slodze):**	$V^0_{Rk,s}$ [kN], $M^0_{Rk,s}$ [Nm], k_7 [-]
8	Resistance to pry-out failure: **Izturība pret izraušanas bojājumu no malas:**	k_8 [-]
Characteristic Resistance for simplified design: **Raksturīgā izturība vienkāršotam projektējumam:**		
9	Method B: **Metode B:**	F^0_{Rk} [kN], $M^0_{Rk,s}$ [Nm] ψ_c [-], c_{cr}, s_{cr}, c_{min}, s_{min}, h_{min} [mm]
10	Method C: **Metode C:**	F_{Rk} [kN], $M^0_{Rk,s}$ [Nm], c_{cr}, s_{cr}, h_{min} [mm]
Displacements **Pārvietojumi:**		
11	Displacements under static and quasi-static loading: **Pārvietojumi statiskās un kvazistatiskās slodzes apstākļos:**	δ_{N0}, $\delta N_{50years}$, $\delta N_{100years}$, δ_{V0}, $\delta_{V\infty}$ [mm]
12	Stiffness characteristics for tension loading for non-linear spring models: **Stingrība**	$k_{1,ucr}$, $k_{2,ucr}$, $k_{3,ucr}$, $k_{4,ucr}$,
12	Stiffness in the elastic range under tension loading **Stingrība elastīgajā diapazonā pie stiepes slodzes**	$k_{A,ucr}$, $k_{A,cr}$ [N/mm]
13	Stiffness characteristics for tension loading for non-linear spring models **Stingrības raksturlielumi nelineāriem atsperu modeļiem pie stiepes slodzes**	$k_{A,ucr}$, $k_{B,ucr}$, $k_{C,ucr}$, $k_{D,ucr}$ [N/mm] $k_{A,cr}$, $k_{B,cr}$, $k_{C,cr}$, $k_{D,cr}$ [N/mm]
Characteristic resistance for seismic performance category C1: **Raksturīgā izturība un pārvietojumi seismiskās veiktspējas kategorijām C1:**		
14	Resistance to tension load: **Stiepes slodzes nestspēja:**	$N_{Rk,s,C1}$ [kN], $N_{Rk,p,C1}$ [kN]
15	Resistance to shear load:, Factor annular gap: **Bīdes slodzes nestspēja, Gredzenveida spraugas koeficients:**	$V_{Rk,s,C1}$ [kN]
Characteristic resistance and displacements for seismic performance categorie C2: **Seismiskās veiktspējas kategorijas C2 raksturīgā nestspēja un pārvietojumi:**		
16	Resistance to tension load, displacements: **Stiepes slodzes nestspēja, pārvietojumi:**	$N_{Rk,s,C2}$ [kN], $N_{Rk,p,C2}$ [kN] $\delta_{N,C2(0,5)}$, $\delta_{N,C2(0,8)}$ [mm]
17	Resistance to shear load and displacements, factor annular gap: **Bīdes slodzes nestspēja un pārvietojumi, gredzenveida spraugas koeficients:**	$V_{Rk,s,C2}$ [kN], $\delta_{V,C2(0,5)}$, $\delta_{V,C2(0,8)}$ [mm]
Safety in case of fire (BWR 2) **Drošība ugunsgrēka gadījumā (BWR 2)**		
18	Reaction to fire: **Reakcija uz uguni:**	Class
Resistance to fire: **Izturība pret uguni:**		
19	Fire resistance to steel failure (tension load): **Ugunsizturība pret tērauda bojājumiem (vilces slodze):**	$N_{Rk,s,fi}$ [kN]
20	Fire resistance to pull-out failure (tension load): **Ugunsizturība pret izraušanas bojājumu (vilces slodze):**	$N_{Rk,p,fi}$ [kN]
21	Fire resistance to steel failure (shear load): **Ugunsizturība pret tērauda bojājumiem (bīdes slodze):**	$V_{Rk,s,fi}$ [kN], $M^0_{Rk,s,fi}$ [Nm]
Aspects of durability **Izturība:**		
22	Durability: **Izturība:**	Class

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

fischer FAZ II Classic anchor is a torque-controlled expansion anchor consisting of six sizes: M6, M8, M10, M12, M16 and M20. The fasteners are made of:
Galvanised steel (FAZ II Classic) or
stainless steel (FAZ II Classic R).

The single parts are given in the Figure 1. The materials and dimensions of the anchors are summarised in:
Table A4.1, annex A4 and table A3.1, annex A3, respectively.

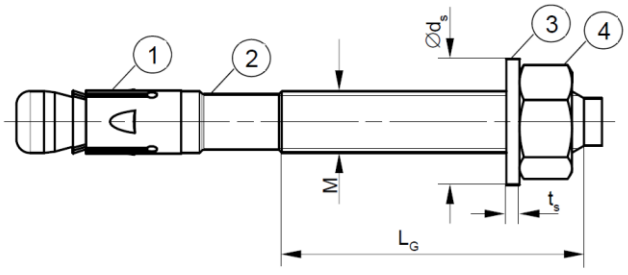


Figure 1: Technical drawing of the fischer FAZ II Classic anchor.

The characteristic material values, dimensions and tolerances of the anchors not indicated in Annexes shall correspond to the respective values laid down in the technical documentation of this European Technical Assessment.

2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

The anchors are intended to be used with embedment depth given in Annex B2, Table B2.1. The intended use specifications of the product are detailed in Annex B1.

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annexes.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the anchor of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body 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

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR 1)	
Resistance to steel failure $N_{Rk,s}$ [kN]	**See annex C1**
Resistance to pull-out failure $N_{Rk,p}$[kN] ψc [-]	**See annex C1**
Resistance to concrete cone failure $k_{cr,N}$ [-] $k_{ucr,N}$ [-] h_{ef} [mm] $c_{cr,N}$ [mm]	**See annex C1**
Robustness γ_{inst} [-]	**See annex C1**
Mininum edge distance and spacing c_{min} [mm] s_{min} [mm] h_{min} [mm]	**See annexes B3 & C3**
Resistance to splitting $N^0_{Rk,sp}$ [kN] $c_{cr,sp}$ [mm]	**See annex C1**
Characteristic resistance to shear load (static and quasi-static loading)	
Resistance to steel failure under shear load $V^0_{Rk,s}$ [kN] $M^0_{Rk,s}$ [Nm] k_7 [-]	**See annex C2**
Resistance to pry-out failure k_8 [-]	**See annex C2**
Displacements	
Displacements under static and quasi-static loading δ_{N0} [mm] $\delta_{\underline{N}}$ [mm] δ_{v0} [mm] $\delta_{\underline{v}}$ [mm]	**See annex C6**

Characteristic	Assessment of characteristic
Characteristic resistance and displacements for seismic performance categories C1 and C2	
Resistance to tension load, displacements	
C1	
$N_{Rk,s,C1}$ [kN]	**See annex C4**
$N_{Rk,p,C1}$ [kN]	
C2	
$N_{Rk,s,C2}$ [kN]	**See annex C5 & C6**
$N_{Rk,p,C2}$ [kN]	
Resistance to shear load, displacements	
C1	**See annex C4**
$V_{Rk,s,C1}$ [kN]	
C2	
$V_{Rk,s,C2}$ [kN]	**See annex C5 & C6**
$\delta_{v,C2}$ [mm]	
Factor for annular gap	**See annex C4 & C5**
α_{gap} [-]	
3.2 Safety in case of fire (BWR2)	
Fire resistance to steel failure (tension load)	
$N_{Rk,sfl}$ [kN]	**See annex C7**
Fire resistance to pull-out failure (tension lad)	**See annex C7**
$N_{Rk,p,fl}$ [kN]	
Fire resistance to steel failure (shear load)	
$V_{Rk,s,fl}$ [kN]	**See annex C7**
$M^0_{Rk,s,fl}$ [Nm]	
Aspects of durability	
Durability	**No performance assessed**

See additional information in sections 3.3 and 3.4

3.3 Methods of assessment

The assessment of the performance of fischer Bolt Anchor FAZ II Classic in relation to the applicable BWR's has been made in accordance with the European Assessment Document (EAD) No. EAD 330232-02-0601; Mechanical fasteners for use in concrete.

3.4 General aspects related to the fitness for use of the product.

The European Technical Assessment is issued for the fischer Bolt Anchor FAZ II Classic based on agreed data/information, deposited with ETA-Danmark, which identifies the product that has been assessed. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to ETA-Danmark before the changes are introduced. ETA-Danmark will decide if such changes affect the ETA and consequently the validity of the CE marking based on the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

The bolt anchors are manufactured in accordance with the provisions of the European Technical Assessment using the automated manufacturing process as identified during the inspection of the plant by the assessment body issuing the ETA and the notified body and laid down in the technical documentation.

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

4.1 AVCP system

According to the decision 1996/582/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No. 305/2011) is 1.

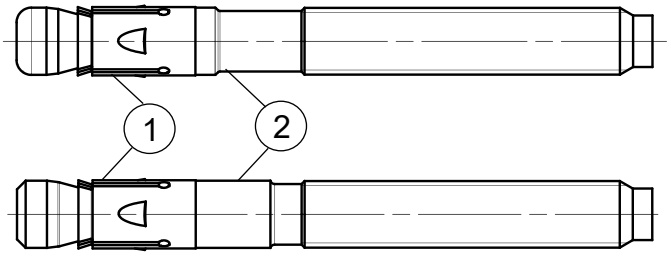
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

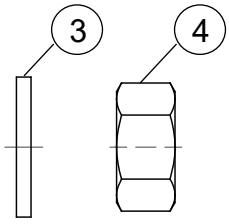
The following standards and documents are referred to in this European Technical Assessment:

- EAD 330232-02-0601: European Assessment Document Mechanical fasteners for use in concrete
- EN 206:2013+A2:2021: Concrete - Specification, performance, production and conformity
- EN ISO 898-2:2022: Fasteners - Mechanical properties of fasteners made of carbon steel and alloy steel - Part 2: Nuts with specified property classes
- EN 1992-4:2018: Eurocode 2 - Design of concrete structures - Part 4: Design of fastenings for use in concrete
- EN 1993-1-4:2025: Eurocode 3 - Design of steel structures - Part 1-4: Stainless steel structure
- EN 10088-1:2023: Stainless steels - Part 1: List of stainless steels
- EN 10139:2016+A1:2020: Cold rolled uncoated low carbon steel narrow strip for cold forming - Technical delivery conditions
- ISO 3506-2:2020: Fasteners - Mechanical properties of corrosion-resistant stainless steel fasteners - Part 2: Nuts with specified grades and property classes
- ISO 4042:2022: Fasteners - Electroplated coating systems

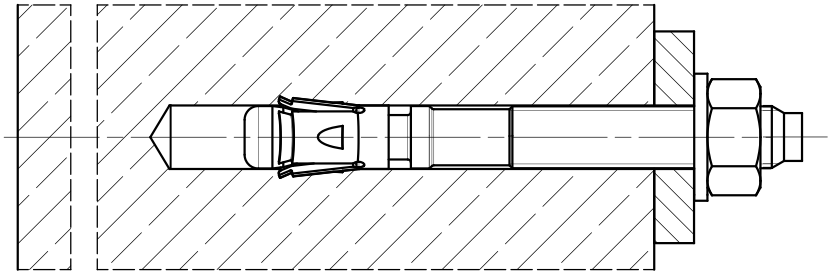
Cone bolt manufactured by cold - forming:



Cone bolt manufactured by turning:

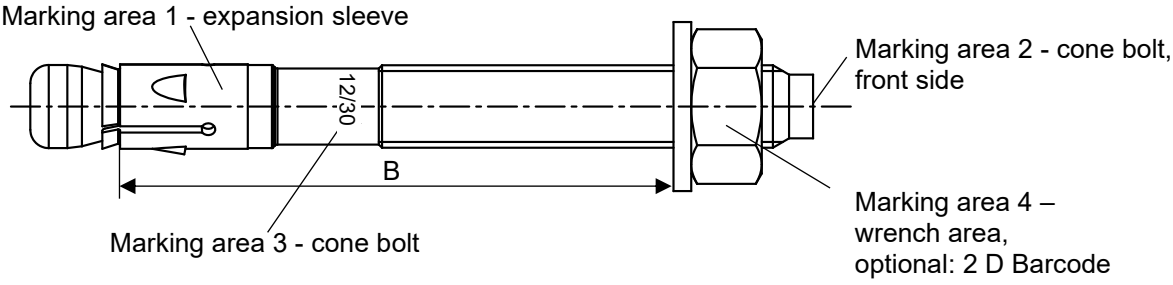


① Expansion sleeve
② Cone bolt (cold – formed or turned)
③ Washer
④ Hexagon nut



(Figure not to scale)

Product marking and letter-code:



Product marking, example: FAZ II Classic 12/30 R

Brand | type of fastener placed at marking area 1 or 3

Thread size / max. thickness of the fixture (t_{fix}) identification R placed at marking area 1 or 3

FAZ II Classic: carbon steel, galvanised
FAZ II Classic R: stainless steel

Table A2.1: Letter - code at marking area 2

Marking		(a)	(b)	(c)	(d)	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(K)
Max. t_{fix} [mm]		5	10	15	20	5	10	15	20	25	30	35	40	45	50
B ≥ [mm]	M6	-				45	50	55	60	65	70	75	80	85	90
	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} [mm]		60	70	80	90	100	120	140	160	180	200	250	300	350	400
B ≥ [mm]	M6	100	110	120	130	140	160	180	200	220	240	290	340	390	440
	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

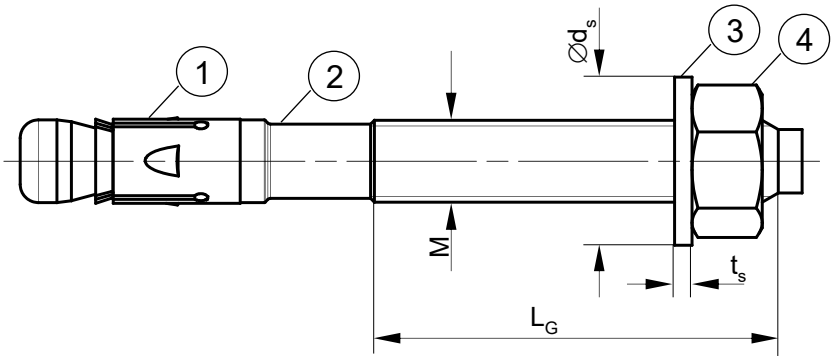
Calculation existing h_{ef} for installed fasteners:

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

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

(Figure not to scale)

Product dimensions



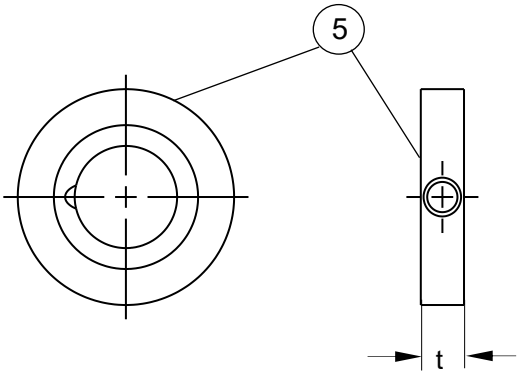


Table A3.1: Dimensions [mm]

Part	Designation			FAZ II Classic, FAZ II Classic R					
				M6	**M8**	**M10**	**M12**	**M16**	**M20**
1	Expansion sleeve	Sheet thickness		0,8	1,3	1,4	1,6	2,4	
2	Cone bolt	Thread size M		6	8	10	12	16	20
		L_G	≥	10	19	26	31	40	50
3	Washer	t_S		1,4		1,8	2,3	2,7	
		∅ d_s		11	15	19	23	29	36
4	Hexagon nut	Wrench size SW		10	13	17	19	24	30
5	fischer filling conical washer FFD	t	=	6				7	8

(Figure not to scale)

Table A4.1: Materials FAZ II Classic

Part	Designation	Material	
		FAZ II Classic	**FAZ II Classic R**
	Steel grade	**Steel**	**Stainless steel R**
		Zinc plated ≥ 5 µm, ISO 4042	Acc. to EN 10088 Corrosion resistance class CRC III acc. to EN 1993-1-4
1	Expansion sleeve	Cold strip, EN 10139 or stainless steel EN 10088	Stainless steel EN 10088
2	Cone bolt	Cold formed steel or free cutting steel	Stainless steel EN 10088
3	Washer	Cold strip, EN 10139	Stainless steel EN 10088
4	Hexagon nut	Steel, EN ISO 898-2	Stainless steel ISO 3506-2
5	fischer filling disc FFD	Cold formed steel or free cutting steel	Stainless steel EN 10088

Specifications of intended use

Fastenings subject to:

Size		FAZ II Classic, FAZ II Classic R					
		M6	M8	M10	M12	M16	M20
Hammer drilling with standard drill bit 		✓					
Static and quasi-static loads		✓					
Cracked and uncracked concrete							
Fire exposure							
Seismic performance category	C1	-[1]	✓				
	C2	-[1]		✓			

[1] No performance assessed.

Base materials:

- Compacted reinforced and unreinforced normal weight concrete without fibres (cracked or uncracked) according to EN 206.
- Strength classes C12/15 to C50/60 according to EN 206.

Use conditions (Environmental conditions):

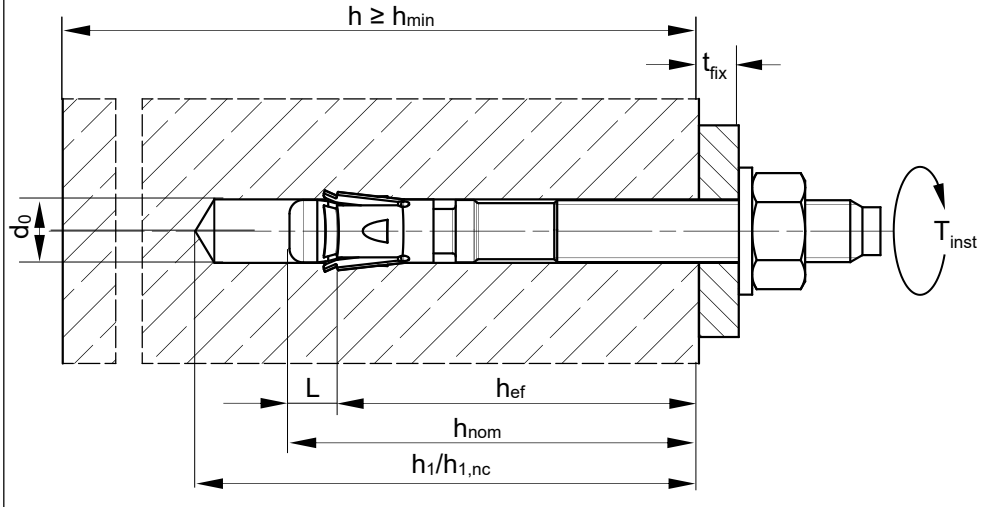
- Structures subject to dry internal conditions (FAZ II Classic, FAZ II Classic R).
- For all other conditions according to EN 1993-1-4 corresponding to corrosion resistance class
  - CRC III: for FAZ II Classic R.

Design:

- The structural design is conducted under responsibility of a designer experienced in the field of anchorages and concrete works.
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the fastener is indicated on the design drawings (e.g. position of the fastener relative to reinforcement or to supports, etc.).
- Fastenings in stand-off installation or with a grout layer under seismic action are not covered.
- In case of seismic applications the fastener shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure.
- Design of fastenings according to EN 1992-4.

Table B2.1: Installation parameters

Size				FAZ II Classic, FAZ II Classic R					
				M6	**M8**	**M10**	**M12**	**M16**	**M20**
Nominal drill hole diameter		d_0 =	[mm]	6	8	10	12	16	20
Effective embedment depth		$h_{ef} \geq$	[mm]	40-80	35-90	40-100	50-125	65-160	100-180
Length from h_{ef} to end of cone bolt		L	[mm]	6,5	9,5	11,5	13,5	17,5	20
Overall fastener embedment depth in the concrete		$h_{nom} \geq$	[mm]	h_{ef} + L					
Depth of drill hole to deepest point	**With** drill hole cleaning	$h_1 \geq$	[mm]	h_{nom} + 3			h_{nom} + 5		h_{nom} + 10
	Without drill hole cleaning	$h_{1,nc} \geq$	[mm]	h_{nom} + 18			h_{nom} + 20		h_{nom} + 25
Diameter of clearance hole in the fixture		$d_f \leq$	[mm]	7	9	12	14	18	22
Required setting torque		T_{inst} =	[Nm]	8	20	45	60	110	200



Legend :

d_0 = Nominal drill hole diameter
h_{ef} = Effective embedment depth
t_{fix} = Thickness of the fixture
h_1 = Depth of drill hole to deepest point
$h_{1,nc}$ = Depth of drill hole to deepest point without cleaning (= nc)
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
L = Length from h_{ef} to end of cone bolt

(Figure not to scale)

Table B3.1: Minimum thickness of concrete members, minimum spacing and minimum edge distance[1)]

Size			FAZ II Classic, FAZ II Classic R					
			M6	M8	M10	M12	M16	M20
Minimum edge distance								
Uncracked concrete	c_{min}	[mm]	40	40	45	55	65	95
Cracked concrete	c_{min}	[mm]	40	40	45	55	65	85
Corresponding spacing	s	[mm]	according to Annex C3					
Minimum thickness of concrete member	h_{min}	[mm]	80			100	140	160
Thickness of concrete member	h ≥	[mm]	max. {h_{min}; 1,5 · h_{ef}; h_1[2)] + 25}				max. {h_{min}; 1,5 · h_{ef}; h_1[2)] + 30}	
Minimum spacing								
Uncracked concrete	s_{min}	[mm]	35	40	40	50	65	95
Cracked concrete	s_{min}	[mm]	35	35	40	50	65	95
Corresponding edge distance	c	[mm]	according to Annex C3					
Minimum thickness of concrete member	h_{min}	[mm]	80			100	140	160
Thickness of concrete member	h ≥	[mm]	max. {h_{min}; 1,5 · h_{ef}; h_1[2)] + 25}				max. {h_{min}; 1,5 · h_{ef}; h_1[2)] + 30}	
Minimum splitting area								
Uncracked concrete	$A_{sp,req}$	[·1000 mm²]	5,1	18	37	54	67	100
Cracked concrete	$A_{sp,req}$	[·1000 mm²]	1,5	12	27	40	50	77

[1)] For cracked and uncracked concrete C12/15 and C16/20: $c_{min} = 1,5 \cdot h_{ef}$ and $s_{min} = 3 \cdot h_{ef}$.

[2)] If borehole cleaning is omitted, h_1 is replaced by $h_{1,nc} = h_1 + 15$ mm.

The thickness of the concrete member has to be increased by 15 mm, if drill hole cleaning has not been carried out.

Table B3.2: Minimum spacing and minimum edge distances - calculated values for for cracked concrete with one edge (c_2 and $c_3 \geq 1,5\ c_1$)[1)]

Size		FAZ II Classic, FAZ II Classic R									
		M6	M8		M10		M12		M16		M20
Effective anchorage depth	$h_{ef} \geq$ [mm]	40	35	45	40	60	50	70	65	85	100
Minimum thickness of concrete member	h ≥ [mm]	80		85	80	120	100	140	140	180	160
Minimum spacing	s_{min} [mm]	35			40		50		65		95
	for c ≥ [mm]	40			100	65	120	80	100	75	130
Minimum edge distance	c_{min} [mm]	40			60	45	70	55	65		85
	for s ≥ [mm]	35			160	90	190	125	165	85	230

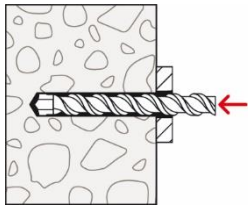
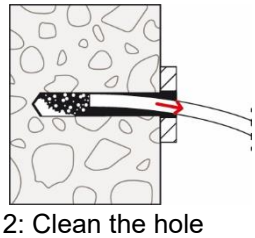
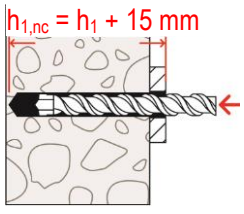
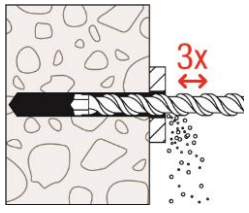
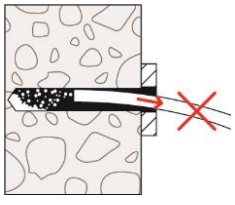
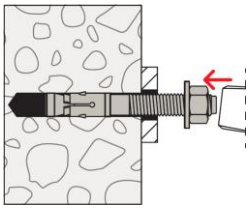
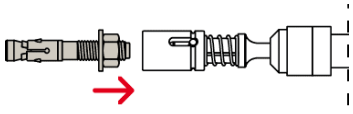
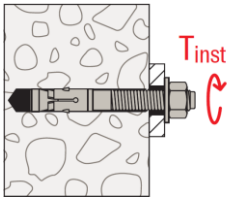
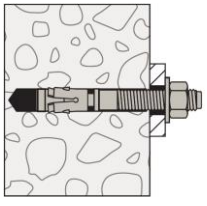
[1)] For cracked and uncracked concrete C12/15 and C16/20: $c_{min} = 1,5 \cdot h_{ef}$ and $s_{min} = 3 \cdot h_{ef}$.

Installation instructions:

- Fastener installation carried out by appropriately qualified personnel according to the design drawings and under the supervision of the person responsible for technical matters on the site.
- Use of the fastener only as supplied by the manufacturer without exchanging the components of the fastener
- Hammer drilling according to Annex B2.
- Cleaning of the bohrehole can be omitted, if drilling vertically upwards. For horizontal boreholes or those drilled vertically downwards, the drilling depth h_1 is increased by 15 mm ($h_{1,nc}$).
- 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.

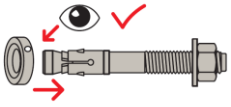
Installation instructions: Drilling with or without cleaning the hole

Types of installation

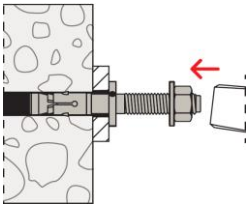
Hammer drill (e.g. fischer Quattric II) with cleaning		 1: Drill the hole	 2: Clean the hole	Continue with step 5
Hammer drill (e.g. fischer Quattric II) without cleaning		 1: Drill the hole	 2: When $h_{1,nc}$ is reached: Pull out drill 3 x	 3: Cleaning not necessary Continue with step 5
Setting of the hexagon nut	 5 a: Set the fastener e.g. with a hammer	 5.b: Set the anchor e.g. with FA-ST II	 6: Apply T_{inst}	 7: Installed anchor

fischer filling disc optional for e.g. seismic application or minimising the annular gap:

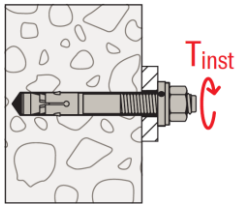
The gap between bolt and fixture may be filled with mortar (compressive strength ≥ 50 N/mm² e.g. fischer FIS SB, fischer FIS EM Plus, fischer FIS V Plus, fischer FIS VL) after last step (for eliminating the annular gap). The FFD can be used in addition to the standard washer. The thickness of the FFD must be considered for definition of t_{fix}. Countersunk of the FFD in direction to the anchor plate.



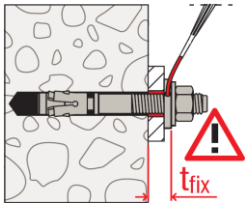
1: Set the fischer filling disc FFD on the bolt



2: Set the fastener e.g. with a hammer



3: Apply T_{inst}



4: Fill the annular gap with mortar, e.g. with fischer FIS SB, FIS EM Plus, FIS V Plus, FIS VL

The fischer filling disc FFD is installed after step 3 according to Annex B4.

Table C1.1: Characteristic values of tension resistance under static and quasi-static action

Size				FAZ II Classic, FAZ II Classic R					
				M6	M8		M10	M12	M16	M20
Steel failure										
Characteristic resistance	FAZ II Classic	$N_{Rk,s}$	[kN]	11,3	17,2		28,3	43,4	67,1	108,4
	FAZ II Classic R			12,0	17,6		29,0	44,5	70,7	127,5
Partial factor for steel failure	FAZ II Classic	γ_{Ms} [1]	[-]	1,5						
	FAZ II Classic R									
Pullout failure										
Effective embedment depth for calculation		h_{ef}	[mm]	40-80	40 [3] -< 45	45-90	40-100	50-125	65-160	100-180
Characteristic resistance in cracked concrete C12/15		$N_{Rk,p}$ C12/15	[kN]	- [5]	3,1		6,2	11,4	23,6	30,9
Characteristic resistance in uncracked concrete C12/15				- [5]	7,5		11,6	17,1	28,2	30,9
Increasing factor ψ_c for cracked or uncracked $N_{Rk,p} = \psi_c \cdot N_{Rk,p}$ (C12/15)		ψ_c C16/20	[-]	1,15						
Characteristic resistance in cracked concrete C20/25		$N_{Rk,p}$ (C20/25)	[kN]	1,3	5,5	8,0	13,0	20,0	27,0	31,0
Characteristic resistance in uncracked concrete C20/25				9,5	14,0		20,0	22,0	38,6	42,0
Increasing factor ψ_c for cracked or uncracked concrete $N_{Rk,p} = \psi_c \cdot N_{Rk,p}$ (C20/25)			[-]	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										
Factor for uncracked concrete		$k_{ucr,N}$	[-]	11,0 [2]						
Factor for cracked concrete		$k_{cr,N}$		7,7 [2]						
Characteristic spacing		$s_{cr,N}$	[mm]	$3 \cdot h_{ef}$						
Characteristic edge distance		$c_{cr,N}$		$1,5 \cdot h_{ef}$						
Characteristic spacing for splitting failure		$s_{cr,sp}$	[mm]	$2 \cdot c_{cr,sp}$						
Characteristic edge distance for splitting failure h	≥ 80	$c_{cr,sp}$ [6]	[mm]	40	$2,4 \cdot h_{ef}$		$2 \cdot h_{ef}$			
	≥ 100				$2 \cdot h_{ef}$		$2,4 \cdot h_{ef}$	$2 \cdot h_{ef}$	- [5]	
	≥ 120						$1,9 \cdot h_{ef}$	$2,1 \cdot h_{ef}$		
	≥ 140							$1,5 \cdot h_{ef}$	$2 \cdot h_{ef}$	$2,4 \cdot h_{ef}$
	≥ 160									
	≥ 200									
Characteristic resistance to splitting		$N^0_{Rk,sp}$	[kN]	$\min \{N^0_{Rk,c}; N_{Rk,p}\}$ [4]						

[1] In absence of other national regulations.
[2] Based on concrete cylinder strength.
[3] For dry internal exposure and statically indeterminate redundant components, the minimum effective embedment depth can be reduced to 35 mm without reduction of $N_{Rk,p}$.
[4] $N^0_{Rk,c}$ according to EN 1992-4:2018.
[5] No performance assessed.
[6] Increase of $c_{cr,sp}$ by factor 1,75 for concrete C12/15 and C16/20.

/Table C2.1: Characteristic values of shear resistance under static and quasi-static action

Size				FAZ II Classic, FAZ II Classic R					
				M6	**M8**	**M10**	**M12**	**M16**	**M20**
Steel failure without lever arm									
Characteristic resistance	FAZ II Classic	$V^0_{Rk,s}$	[kN]	6,5	13,3	21,0	31,3	55,1	70,0
	FAZ II Classic R			7,5	14,4	19,2	38,7	64,6	80,0
Partial factor for steel failure		γ_{Ms} [1]	[-]	1,25					
Factor for ductility		k_7		1,0					
Steel failure with lever arm and Concrete pryout failure									
Effective embedment depth for calculation		h_{ef}	[mm]	40-80	45-90	60-100	70-125	85-160	100-180
Characteristic bending resistance	FAZ II Classic	$M^0_{Rk,s}$	[Nm]	10,0	27,0	54,0	93,0	241,0	400,0
	FAZ II Classic R								500,0
Factor for pryout failure		k_8	[-]	2,6	2,8	3,2			
Effective embedment depth for calculation		h_{ef}	[mm]	-[3]	40[2]-<45	40-<60	50-<70	65-<85	-[3]
Characteristic bending resistance	FAZ II Classic	$M^0_{Rk,s}$	[Nm]		21,0	52,0	92,0	241,0	
	FAZ II Classic R								
Factor for pryout failure		k_8	[-]		2,5	2,6	3,1	3,2	
Partial factor for steel failure		γ_{Ms} [1]	[-]	1,25					
Factor for ductility		k_7		1,0					
Concrete edge failure									
Effective embedment depth for calculation		l_f	[mm]	h_{ef}					
Outside diameter of a fastener		d_{nom}		6	8	10	12	16	20

[1] In absence of other national regulations.

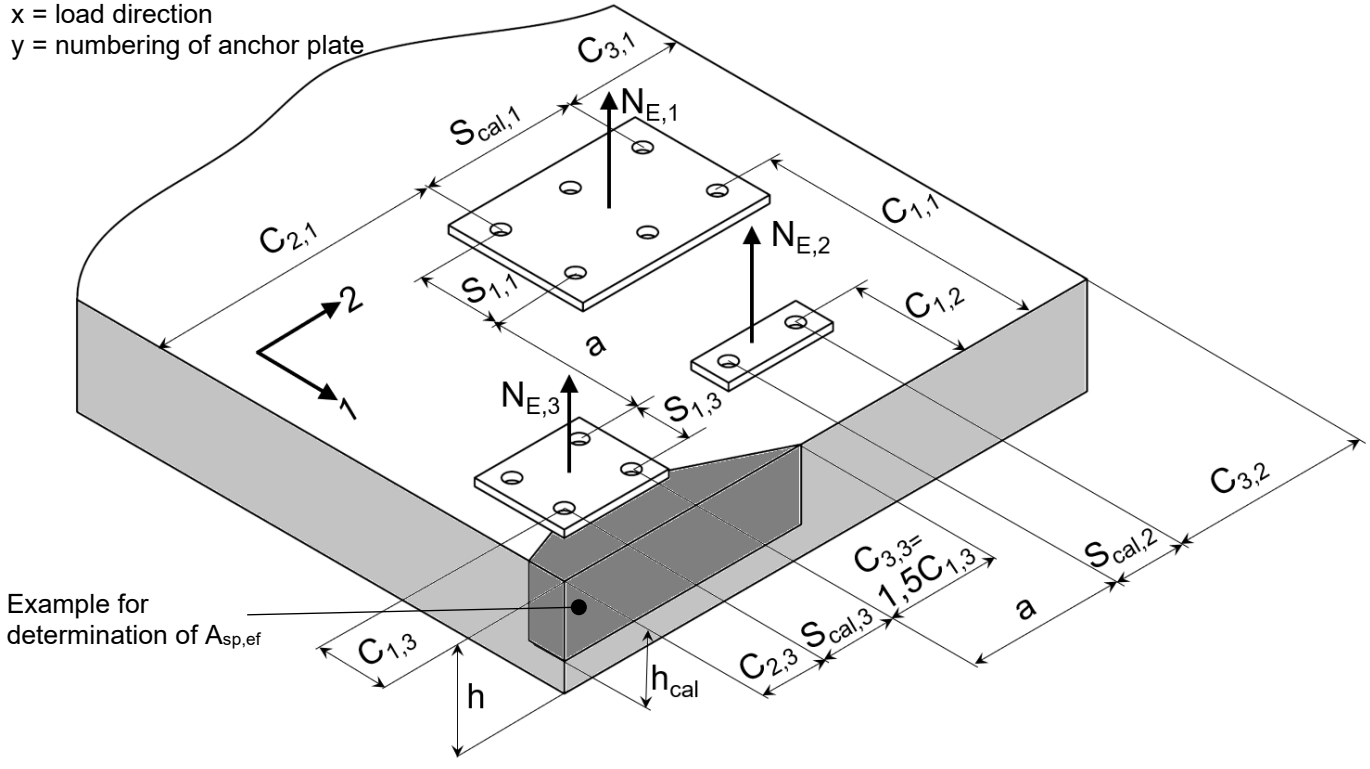
[2] For dry internal exposure and statically indeterminate redundant components, the minimum effective embedment depth can be reduced to 35 mm without reduction of $N_{Rk,p}$.

[3] No performance assessed.

Determination of $A_{sp,ef}$ for each existing free edge

Splitting failure applied for minimum edge distance and spacing in depending on h_{ef}

Definition Index:
cal = calculatory
e.g.: $s_{x,y}$
x = load direction
y = numbering of anchor plate



Example for different anchor plates: For considering all free edges the direction 1 and 2 must be swaped.

General formulation for each free edge: $A_{sp,ef} = (c_2 + s_{cal} + c_3) \cdot h_{cal} \geq (n/2) \cdot A_{sp,req}$
with:
Edge distance c_1: $c_{min} \leq c_1$
Edge distance c_2: $c_{min} \leq c_2 \leq 1{,}5 \cdot c_1$
Edge distance c_3: $c_{min} \leq c_3 \leq 1{,}5 \cdot c_1$
Calculation spacing, distance between outer anchors s_{cal}: $s_{min} \leq s_{cal} \leq 3{,}0 \cdot c_1$
Distance between group of anchors a: For $a \geq 3{,}0\ c_1$ no influence between the anchor groups is taken into account.
Number of anchors n of an anchor plate as well close and parallel to the edge
Effective member thickness h_{cal}: $h_{min} \leq h$; $h_{cal} \leq h$; $h_{cal} \leq (h_{ef} + 1{,}5 \cdot c_1)$
c_1, c_2, c_3, h and s_{cal} have to be set in way that the requirement is fullfiled

For the calculation of minimum spacing and minimum edge distance of fasteners in combination with different embedment depths and thicknesses of concrete members the following equation shall be fulfilled:

$$\mathbf{A_{sp,req} < A_{sp,ef}}$$

$A_{sp,req}$ = required splitting area (according to Annex B3)
$A_{sp,ef}$ = effective splitting area

(Figure not to scale)

Table C4.1: Characteristic values of tension and shear resistance under seismic action category C1

Size			FAZ II Classic, FAZ II Classic R					
			M6	**M8**		**M10**	**M12**	**M16**	**M20**
Effective embedment depth	h_{ef}	[mm]	-[2)]	40-<45	45-90	40-100	50-125	85-160	100-180
With filling of the annular gap	α_{gap}	[-]	1,0						
Without filling of the annular gap			0,5						
Steel failure $N_{Rk,s,C1} = N_{Rk,s}$; $\gamma_{Ms,C1} = \gamma_{Ms}$ (see Annex C1)									
Pullout failure									
Characteristic resistance in cracked concrete C1	$N_{Rk,p,C1}$	[kN]	-[2)]	5,1	7,4	11,6	20,0	27,0	31,5
Installation sensitivity factor	γ_{inst}	[-]	1,0						
Concrete cone failure and splitting failure $N_{Rk,c,C1} = N_{Rk,c}$; $N_{Rk,sp,C1} = N_{Rk,sp}$ (see Annex C1)									
Steel failure without lever arm									
Effective embedment depth	h_{ef}	[mm]	-[2)]	45-90		40-100	50-125	65-160	100-180
Charakteristic resistance C1 Without filling	$V_{Rk,s,C1}$	[kN]		11,0		17,0	27,0	47,0	63,0/78,0[3)]
Partial factor for steel failure	$\gamma_{Ms,C1}$[1)]	[-]	1,25						

1) In absence of other national regulations.
2) No performance assessed.
3) FAZ II Classic R.

Table C5.1: Characteristic values of tension and shear resistance under seismic action category C2

Size			FAZ II Classic, FAZ II Classic R					
			M6	M8	M10	M12	M16	M20
With filling of the annular gap	α_{gap}	[-]	-[3]		1,0			
Without filling of the annular gap					0,5			
Steel failure $N_{Rk,s,C2} = N_{Rk,s}$; $\gamma_{Ms,C2} = \gamma_{Ms}$ (see Annex C1)								
Pullout failure								
Characteristic resistance tension load in cracked concrete C2	h_{ef}	[mm]	-[3]		60-100	70-125	85-160	100-180
	$N_{Rk,p,C2}$	[kN]			5,1	7,4	21,5	27,5
	h_{ef}	[mm]			40-<60	50-<70	65-<85	-[3]
	$N_{Rk,p,C2}$	[kN]			2,7	4,4	16,4	
Installation sensitivity factor	γ_{inst}	[-]	1,0					
Concrete cone failture and splitting failure $N_{rk,c,C2} = N_{Rk,c}$; $N_{Rk,sp,C2} = N_{Rk,sp}$ (see Annex C1)								

Steel failure without lever arm								
					FAZ II Classic, FAZ II Classic R			
Characteristic resistance C2		h_{ef}	[mm]	-[3]	60-100	70-125	85-160	100-180
	Without filling	$V_{Rk,s,C2}$	[kN]		10,0	17,4	27,5	56,0/63,0[2]
	With filling				13,2	19,0	35,1	61,0/94,0[2]
		h_{ef}	[mm]		40-<60	50-<70	65-<85	-[3]
	Without filling	$V_{Rk,s,C2}$	[kN]		7,0	12,7	22,0	
	With filling				9,5	19,2	23,9	
Partial factor for steel failure	$\gamma_{Ms,C1}$[1]	[-]	1,25					

[1] In absence of other national regulations.
[2] FAZ II Classic R.
[3] No performance assessed.

Table C6.1: Displacements under static and quasi static tension loads

Size			FAZ II Classic, FAZ II Classic R					
			M6	**M8**	**M10**	**M12**	**M16**	**M20**
Displacement – factor for tensile load[1)]								
δ_{N0} - factor	in cracked concrete	[mm/kN]	0,13	0,22	0,20	0,13	0,11	0,07
$\delta_{N\infty}$ - factor			1,00	0,78	0,48	0,28	0,90	0,90
δ_{N0} - factor	in uncracked concrete		0,16	0,07	0,09	0,12	0,08	0,07
$\delta_{N\infty}$ - factor			0,24	0,78	0,48	0,28	0,90	0,90

[1)] Calculation of effective displacement:
$\delta_{N0} = \delta_{N0}$ - factor · N (acting tension load).
$\delta_{N\infty} = \delta_{N\infty}$ - factor · N (acting tension load).

Table C6.2: Displacements under static and quasi static shear loads

Size			**M6**	**M8**	**M10**	**M12**	**M16**	**M20**
Displacement – factor for shear load[2)]								
			FAZ II Classic					
δ_{V0} - factor	in cracked or uncracked concrete	[mm/kN]	0,60	0,35	0,37	0,27	0,10	0,09
$\delta_{V\infty}$ - factor			0,90	0,52	0,55	0,40	0,14	0,15
			FAZ II Classic R					
δ_{V0} - factor	in cracked or uncracked concrete	[mm/kN]	0,60	0,23	0,19	0,18	0,10	0,11
$\delta_{V\infty}$ - factor			0,90	0,27	0,22	0,16	0,11	0,05

[2)] Calculation of effective displacement:
$\delta_{V0} = \delta_{V0}$ - factor · V (acting shear load).
$\delta_{V\infty} = \delta_{V\infty}$ - factor · V (acting shear load).

Table C6.3: Displacements under tension loads for category C2 for all embedment depths

Size			FAZ II Classic, FAZ II Classic R					
			M6	**M8**	**M10**	**M12**	**M16**	**M20**
Displacement DLS	$\delta_{N,C2(DLS)}$	[mm]	-[1)]		2,7	4,4	4,4	5,6
Displacement ULS	$\delta_{N,C2\ (ULS)}$				11,5	13,0	12,3	14,4

[1)] No performance assessed.

Table C6.4: Displacements under shear loads for category C2 for all embedment depths

Size			FAZ II Classic, FAZ II Classic R					
			M6	**M8**	**M10**	**M12**	**M16**	**M20**
Displacement DLS without filling	$\delta_{V,C2\ (DLS)}$	[mm]	-[1)]		4,1	4,7	5,5	4,8
Displacement ULS without filling	$\delta_{V,C2\ (ULS)}$				6,2	7,8	10,1	6,3
Displacement DLS with filling	$\delta_{V,C2\ (DLS)}$		-[1)]		4,1	4,7	5,5	2,0
Displacement ULS with filling	$\delta_{V,C2\ (ULS)}$				6,2	7,8	10,1	4,4

[1)] No performance assessed.

Table C7.1: Characteristic values of tension resistance under fire exposure

Size				FAZ II Classic, FAZ II Classic R											
				M6	M8		M10		M12		M16		M20
		$h_{ef} \geq$ [mm]		40	35	45	40	60	50	70	65	85	100
Characteristic resistance **steel failure**	$N_{Rk,s,fi}$	R30	[kN]	0,6/0,9[1)]	1,4		2,8		5,0		9,4		14,7
		R60		0,4/0,9[1)]	1,2		2,3		4,1		7,7		12,0
		R90		0,3/0,9[1)]	0,9		1,9		3,2		6,0		9,4
		R120		0,2/0,7[1)]	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 R60 R90		$0{,}25 \cdot N_{Rk,p,cr,C20/25}$									
		R120		$0{,}2 \cdot N_{Rk,p,cr,C20/25}$									

[1)] FAZ II Classic R.

Table C7.2: Characteristic values of shear resistance under fire exposure

FAZ II Classic, FAZ II Classic R				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]
M6	$h_{ef} \geq$	40	[mm]	0,6/0,9[1)]	0,5/0,2[1)]	0,4/0,9[1)]	0,3/0,1[1)]
M8		35		1,8	1,4	1,6	1,2
M10		40		3,6	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

FAZ II Classic, FAZ II Classic R				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]
M6	$h_{ef} \geq$	40	[mm]	0,3/0,9[1)]	0,2/0,1[1)]	0,2/0,7[1)]	0,2/0,1[1)]
M8		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

[1)] FAZ II Classic R.

Concrete pryout failure according to EN 1992.

Table C7.3: Minimum spacings and minimum edge distances of fasteners under fire exposure for tension and shear load

Size			FAZ II Classic, FAZ II Classic R					
			M6	M8	M10	M12	M16	M20
Spacing	s_{min}	[mm]	Annex C4					
Edge distance	c_{min}		$c_{min} = 2 \cdot h_{ef}$, for fire exposure from more than one side $c_{min} \geq 300$ mm					

fischer Bolt Anchor FAZ II Classic, FAZ II Classic R

Performances
Characteristic values of resistance under fire exposure

Annex C7
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