

European Technical Approval ETA-99/0011

Handelsbezeichnung <i>Trade name</i>	Würth Fixanker W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanker W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR
Zulassungsinhaber Holder of approval	Adolf Würth GmbH & Co. KG Reinhold-Würth-Straße 12 -17 74653 Künzelsau DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck	Kraftkontrolliert spreizender Dübel zur Verankerung im Beton
Generic type and use of construction product	Torque controlled expansion anchor for use in concrete
Geltungsdauer: vom Validity: from	30 May 2013
bis to	15 May 2018
Herstellwerk Manufacturing plant	Herstellwerk W1, Deutschland

English translation prepared by DIBt - Original version in German language

Diese Zulassung umfasst
This Approval contains41 Seiten einschließlich 33 Anhänge
41 pages including 33 annexes

Diese Zulassung ersetzt This Approval replaces



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ETA-99/0011 mit Geltungsdauer vom 08.03.2011 bis 30.01.2014

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8.06.01-283/12



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I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
 - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by Council Directive 93/68/EEC² and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998⁴, as amended by Article 2 of the law of 8 November 2011⁵;
 - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC⁶;
 - Guideline for European technical approval of "Metal anchors for use in concrete Part 2: Torque controlled expansion anchors ", ETAG 001-02.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
- 5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.
- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities L 40, 11 February 1989, p. 12

Official Journal of the European Communities L 220, 30 August 1993, p. 1

³ Official Journal of the European Union L 284, 31 October 2003, p. 25

⁴ Bundesgesetzblatt Teil I 1998, p. 812

⁵ Bundesgesetzblatt Teil I 2011, p. 2178

Official Journal of the European Communities L 17, 20 January 1994, p. 34



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II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the construction product

The Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR and W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR is an anchor made of galvanised steel or made of stainless steel or high corrosions resistant steel which is placed into a drilled hole and anchored by torque-controlled expansion. This European technical approval comprises the following anchor types:

- Anchor type W-FAZ with external thread, washer and hexagon nut, sizes M8 to M27,
- Anchor type W-FAZ-IG S with internal thread, hexagon head nut and washer S-IG, sizes M6 to M12,
- Anchor type W-FAZ-IG SK with internal thread, countersunk head screw and countersunk washer SK-IG, sizes M6 to M12,
- Anchor type W-FAZ-IG B with internal thread, hexagon nut and washer MU-IG, sizes M6 to M12.

An illustration of the product and intended use is given in Annexes 1, 2 and 20.

1.2 Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences.

The anchor may be used for anchorages with requirements related to resistance to fire.

The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at least and C50/60 at most according to EN 206:2000-12. It may be anchored in cracked and non-cracked concrete.

Anchor made of galvanised steel:

The anchor made of galvanised steel may only be used in structures subject to dry internal conditions.

Anchor made of stainless steel

The anchor made of stainless steel may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such 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).



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Anchor made of high corrosion resistant steel

The anchor made of high corrosion resistant steel may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions. Such 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 chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

The provisions made in this European technical approval are based on an assumed 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, 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.

2 Characteristics of the product and methods of verification

2.1 Characteristics of the product

The anchor corresponds to the drawings and provisions given in the Annexes. The characteristic material values, dimensions and tolerances of the anchor not given in the Annexes shall correspond to the respective values laid down in the technical documentation⁷ of this European technical approval.

Regarding the requirements concerning safety in case of fire it is assumed that the anchor meets the requirements of class A1 in relation to reaction to fire in accordance with the stipulations of the Commission decision 96/603/EC, amended by 2000/605/EC.

The characteristic values for the design of anchorages are given in the Annexes.

Each Würth Fixanchor W-FAZ is marked in accordance with Annex 3. Each Würth Fixanchor W-FAZ-IG is marked in accordance with Annex 21.

The anchor shall only be packaged and supplied as a complete unit.

2.2 Methods of verification

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Part 1 "Anchors in general" and Part 2 "Torque-controlled expansion anchors", on the basis of Option 1.

The assessment of the anchor for the intended use in relation to the requirements for resistance to fire has been made in accordance with the technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire".

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

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The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.



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3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the decision 96/582/EG of the European Commission⁸ the system 2(i) (referred to as system 1) of attestation of conformity applies.

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

- (a) Tasks for the manufacturer:
 - (1) factory production control;
 - (2) further testing of samples taken at the factory by the manufacturer in accordance with a prescribed control plan;
- (b) Tasks for the approved body:
 - (3) initial type-testing of the product;
 - (4) initial inspection of factory and of factory production control;
 - (5) continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial/ raw/ constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik⁹.

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchors in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

⁸ Official Journal of the European Communities L 254 of 08.10.1996.

The control plan is a confidential part of the documentation of the European technical approval, but not published together with the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.



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3.2.2 Tasks for the approved bodies

The approved body shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control
- in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

3.3 CE marking

The CE marking shall be affixed on each packaging of the anchor. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the holder of the approval (legal entity responsible for the manufacturer),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- the number of the guideline for European technical approval
- use category (ETAG 001-1 Option 1),
- size.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval shall be necessary.



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4.2 Design of anchorages

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed either in accordance with

ETAG 001 "Guideline for European technical approval of Metal Anchors for use in concrete", Annex C, method A

or in accordance with

CEN/TS 1992-4:2009, design method A

under the responsibility of an engineer experienced in anchorages and concrete work.

Verifiable calculation notes and drawings are 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).

The design of anchorages under fire exposure has to consider the conditions given in the technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire". The relevant characteristic anchor values are given in Annexes. The design method covers anchors with a fire attack from one side only. If the fire attack is from more than one side, the design method may be taken only, if the edge distance of the anchor is $c \ge 300$ mm.

4.3 Installation of anchors

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- 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 an anchor,
- For anchor version W-FAZ-IG B according to Annex 20 the commercial standard rod may only be used if the following requirements are fulfilled:
 - Material, Dimensions and mechanical properties according to Annex 22, Table 22,
 - Confirmation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents should be stored,
 - Use of the hexagon nut and washer with special coating as supplied by the holder of the approval.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools,
- Checks 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,
- Edge distances and spacing not less than the specified values without minus tolerances,
- Positioning of the drill holes without damaging the reinforcement,
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted 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,



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- Cleaning of the hole of drilling dust,
- Anchor installation such that the effective anchorage depth is complied with. This compliance is ensured when the embedment mark of the anchor does no more exceed the concrete surface,
- Application of the torque moment given in the Annexes using a calibrated torque wrench.

5 Indications to the manufacturer

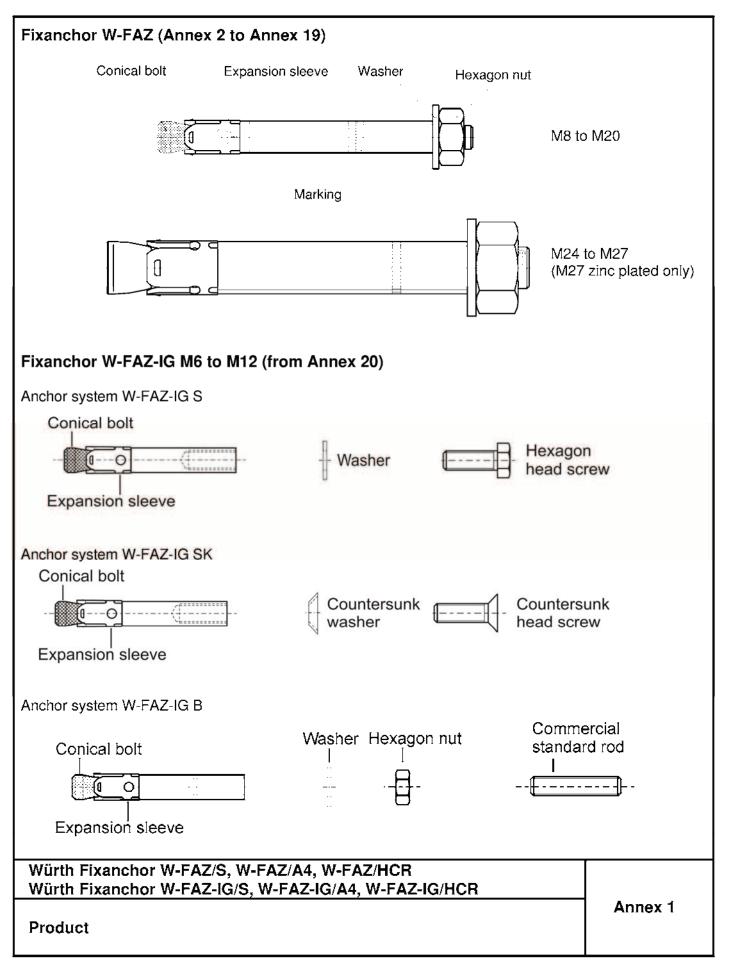
The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to as well as sections 4.2 and 4.3 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

The minimum data required are:

- Diameter of drill bit,
- Thread diameter,
- Maximum diameter of clearance hole in the fixture,
- Maximum thickness of the fixture,
- Minimum effective anchorage depth,
- Minimum hole depth,
- Torque moment,
- Information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- Reference to any special installation equipment needed,
- Identification of the manufacturing batch.
- All data shall be presented in a clear and explicit form.

Uwe Bender Head of Department *beglaubigt:* Baderschneider

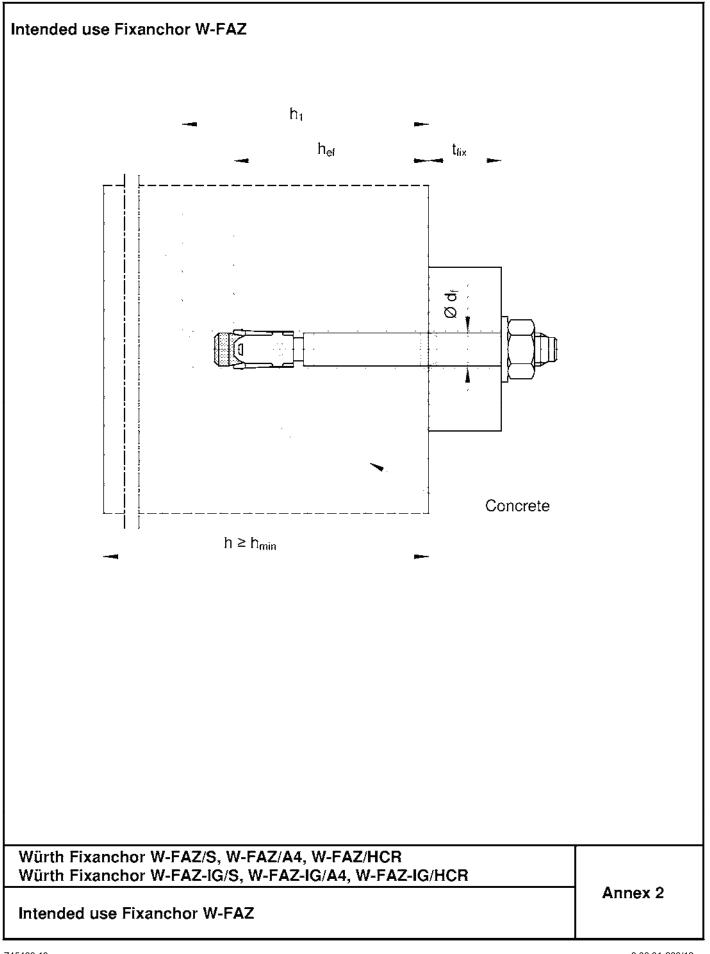




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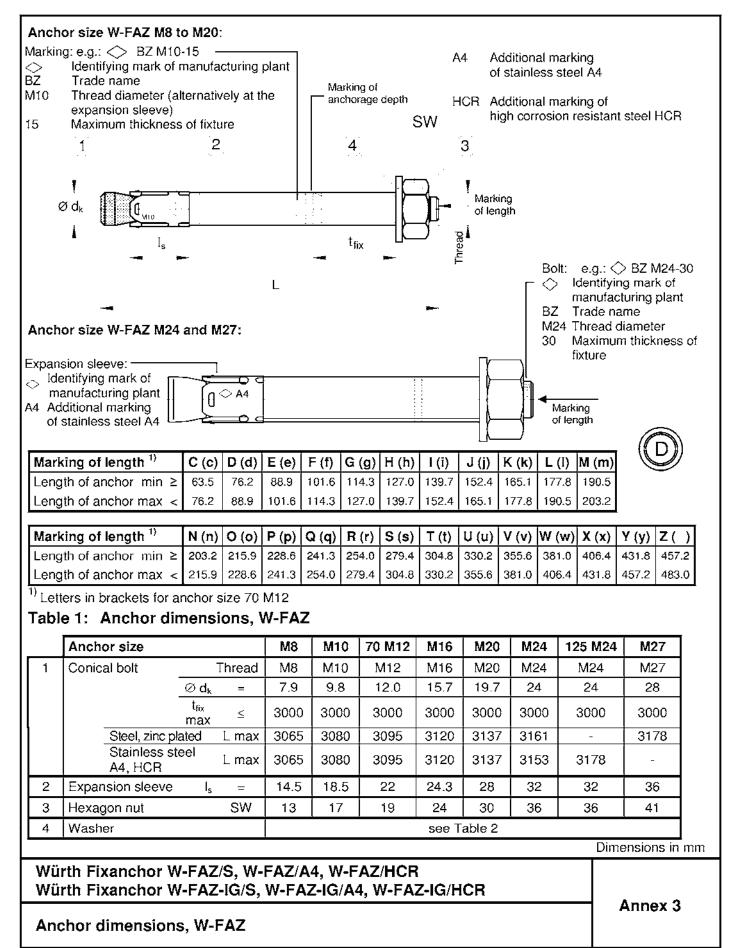




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Tabl	e 2: Materials,	W-FAZ				
Part	Anchor size	Steel, zinc plated M8 to M20	Steel, zinc plated M24 and M27	Stainless steel A4	High corrosion resistant steel (HCR)	
1	Conical bolt	Cold formed or machined steel, Cone plastic coated (M8 to M20)	Threaded bolt, steel property class 8.8, EN ISO 898-1 Threaded cone, steel, property class 8, EN ISO 898-2	Stainless steel 1.4401, 1.4404, 1.4571 or 1.4578, EN 10088 Cone plastic coated	High corrosion resistant steel 1.4529 or 1.4565, EN 10088 Cone plastic coated	
2	Expansion sleeve	Steel acc. to EN 100 1.4301 or 1.4401 for Steel EN 10139 for	r M8-M20;	Stainless steel 1.4401 or 1.4571, EN 10088	Stainless steel 1.4401 or 1.4571, EN 10088	
3	Hexagon nut	Property class 8 acc galvanised, coated	p. to EN ISO 898-2,	ISO 3506, property class 70, stainless steel 1.4401 or 1.4571, EN 10088, coated	ISO 3506, property class 70, high corrosion resistant steel 1.4529 or 1.4565, EN 10088, coated	
4	Washer acc. to EN ISO 7089, or EN ISO 7093, or EN ISO 7094	Steel, galvanised		Stainless steel 1.4401 or 1.4571, EN 10088	High corrosion resistant steel 1.4529 or 1.4565, EN 10088	

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Annex 4

Materials, W-FAZ

Deutsches Institut für Bautechnik

Anchor siz	e			M8	M10	70 M12	M16	M20	M24	125 M24	M27
Nominal dri	II hole diameter	d_0	[mm]	8	10	12	16	20	24	24	28
Cutting diar	neter of drill bit	$d_{\text{cut}} \leq$	[mm]	8.45	10.45	12.5	16.5	20.55	24.55	24.55	28.55
Depth of	Steel, zinc plated	$h_1 \ge$	[mm]	60	75	90	110	125	145	-	160
drill hole	Stainless steel A4, HCR	$h_1 \ge$	[mm]	60	75	90	110	125	130	160	-
Effective	Steel, zinc plated	h _{ef}	[mm]	46	60	70	85	100	115	-	125
anchorage depth	Stainless steel A4, HCR	h _{ef}	[m m]	46	60	70	85	100	100	125	-
Installation	Steel, zinc plated	T_{inst}	[Nm]	20	25	45	90	160	200	-	300
torque	Stainless steel A4, HCR	T _{inst}	[Nm]	20	35	50	110	200	200	290	-
Diameter of in the fixture	f clearance hole	d _f ≤	[mm]	9	12	14	18	22	26	26	30
		h _{cl} ')			(ix 3)		0				
	h≥h min		· · · · · · · · · · · · · · · · · · ·			T	³⁾ Thi	ective anch imum thic ckness of	horage der kness of c fixture t _{ilx}	oth h _{of} oncrete me	mber h _{rr}



Installa	tion instructions, W-FAZ		
1	90°	Drill hole perpendicular to concrete surface.	
2		Blow out dust.	
3		Drive in anchor.	
4	Tinst	Max. tightening torque T _{inst} shall be applied by using torque wrench.	

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Installation instructions, W-FAZ



Table 4: Standard thickness of concrete member and respective minimum spacing and edge distance, W-FAZ

Anchor size			M8	M10	70 M12	M16	M20	M24	125 M24	M27
Steel zinc plated										
Minimum thickness of member	h _{sid}	[mm]	100	120	140	170	200	230	-	250
Cracked concrete										
Minimum spacing	S _{min}	[mm]	40	45	60	60	95	100	-	125
	for c ≥	[mm]	70	70	100	100	150	180	-	300
Minimum edge distance	C _{min}	[mm]	40	45	60	60	95	100	-	180
	for $s \ge$	[mm]	80	90	140	180	200	220	-	540
Non-cracked concrete										
Minimum spacing	S _{min}	[mm]	40	45	60	65	90	100	-	125
	for c ≥	[mm]	80	70	120	120	180	180	-	300
Minimum edge distance	C _{min}	[mm]	50	50	75	80	130	100	-	180
	for $s \ge$	[mm]	100	100	150	150	240	220	-	540
Stainless steel A4, HCR										
Minimum thickness of member	h _{sid}	[mm]	100	120	140	160	200	200	250	-
Cracked concrete										
Minimum spacing	S _{min}	[mm]	40	50	60	60	95	180	125	-
	für c ≥	[mm]	70	75	100	100	150	180	125	-
Minimum edge distance	C _{min}	[mm]	40	55	60	60	95	180	125	-
	für s ≥	[mm]	80	90	140	180	200	180	125	-
Non-cracked concrete										
Minimum spacing	S _{min}	[mm]	40	50	60	65	90	180	125	-
	für c ≥	[mm]	80	75	120	120	180	180	125	-
Minimum edge distance	C _{min}	[mm]	50	60	75	80	130	180	125	-
	für s ≥	[mm]	100	120	150	150	240	180	125	-

Intermediate values by linear interpolation.

Table 5: Minimum thickness of concrete of member and respective minimum spacing and edge distance, W-FAZ

Anchor size			M8	M10	70 M12	M16	M20	M24	125 M24	M27		
Steel zinc plated and Stainles	s steel A	4, HCR										
Minimum thickness of member	h _{min}	[mm]	80	100	120	140	-	-	-	-		
Cracked concrete												
Minimum spacing	Smin	[mm]	40	45	60	70	-	-	-	-		
	for c ≥	[mm]	70	90	100	160	-	-	-	-		
Minimum edge distance	Cmin	[mm]	40	50	60	80	-	-	-	-		
	for s ≥	[mm]	80	115	140	180	-	-	-	-		
Non-cracked concrete												
Minimum spacing	Smin	[mm]	40	60	60	80	-	-	-	-		
	für c ≥	[mm]	80	140	120	180	-	-	-	-		
Minimum edge distance	Cmin	[mm]	50	90	75	90	-	-	-	-		
	für s ≥	[mm]	100	140	150	200	-	-	-	-		
ntermediate values by linear interpo	lation.											
	rmediate values by linear interpolation. /ürth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR /ürth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR											
Minimum thickness of m Minimum spacing and ea			W-FA	z					Anne	ex 7		



Characteristic values for tension loads, ETAG 001, Annex C, W-FAZ, steel Table 6: zinc plated

-									
Anchor size			M8	M10	70 M12	M16	M20	M24	M27
Steel failure									
Characteristic resistance	N _{Rk.s}	[kN]	16	27	40	60	86	126	196
Partial safety factor	7∕Ms	[•]	1.	53	1.	5	1.6	1.	5
Pullout									
Characteristic resistance in cracked concrete C20/25	N _{Rk.p}	[kN]	5	9	16	25	3)	3)	3)
Characteristic resistance in non-cracked concrete C20/25	N _{Rk.p}	[kN]	12	16	25	35	3)	3)	3)
Splitting for standard thickness o	f concrete n	nember	· (The high	ner resista	nce of Cas	e 1 and C	ase 2 may	be applied	d.)
Standard thickness of concrete	h _{sid} ≥	[mm]	100	120	140	170	200	230	250
Case 1									
Characteristic resistance in concrete C20/25	N ⁰ Rk.sp	[kN]	9 ¹⁾	12 ¹⁾	20 ¹⁾	30 ¹⁾	40 ¹⁾	3)	50 ¹⁾
Respective spacing	S _{cr.sp}	[mm]				3 h _{ef}			
Respective edge distance	C _{cr.sp}	[mm]				1.5 h _{ef}			
Case 2				-					
Characteristic resistance in concrete C20/25		[kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	3)	3)	3)
Respective spacing	Scr.sp ²⁾	[mm]		4	h _{ef}		4.4 h _{of}	3 h _{ef}	5 h _{ol}
Respective edge distance	C _{cr,sp} ²⁾	[mm]		2	h _{ef}		2.2 h _{cf}	1.5 h _{ef}	2.5 h _c
Splitting for minimum thickness of			r						
Minimum thickness of concrete	h _{min} ≥	[mm]	80	100	120	140	-	-	-
Characteristic resistance in concrete C20/25	N ⁰ Rk,sp	[kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	-	-	-
Respective spacing	S _{cr,sp} ²⁾	[mm]		5	h _{ef}		-	-	-
Respective edge distance	C _{cr.sp} ²⁾	[mm]		2.5	h _{ef}		-	-	-
Increasing factors	C30/37	[-]				1.22			
for $N_{\text{Fit},p}$ and $N^0_{\text{Fit},ap}$ ψ_C	C40/50	[-]				1.41			
	C50/60	[-]				1.55			
Concrete cone failure									
Effective anchorage depth	h _{ef}	[mm]	46	60	70	85	100	115	125
Spacing	S _{cr.N}	[mm]				3 h _{ef}			
Edge distance	C _{cr.N}	[mm]				1.5 h _{ef}			
Partial safety factor yM	p= γMsp =γMc	[-]				1.5			

¹⁾ For the proof against splitting failure according to ETAG 001, Annex C, N⁰_{Rk,p} in equation (5.3) has to be replaced by N⁰_{Rk,p} with consideration of the member thickness ($\psi_{uer,N} = 1.0$). ²⁾ The values $s_{or,sp}$ and $c_{or,sp}$ may be linearly interpolated for the member thickness $h_{rvin} < h < h_{s:d}$ (Case 2) ($\psi_{h,sp} = 1.0$).

³¹ Pullout is not decisive

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR	
Characteristic values for tension loads, ETAG 001, Annex C, W-FAZ, steel zinc plated	Annex 8



Characteristic values for tension loads, ETAG 001, Annex C, W-FAZ, Table 7: stainless steel A4, HCR

Anchor size			M8	M10	70 M12	M16	M20	M24	125 M24
Steel failure									
Characteristic resistance	N _{Rk.s}	[kN]	16	27	40	64	108	11	-
Partial safety factor	Ϋ́Ms	[•]		1.	.5		1.68	1.	5
Pullout									
Characteristic resistance in cracked concrete C20/25	N _{Rk.p}	[kN]	5	9	16	25	3)	3)	40
Characteristic resistance in non-cracked concrete C20/25	N _{Bk.p}	[kN]	12	16	25	35	3)	3)	3)
Splitting for standard thickness o	f concrete m	ember	(The higt	ner resista	nce of Cas	e 1 and C	ase 2 may	be applie	d.)
Standard thickness of concrete	h _{sid} ≥	[mm]	100	120	140	160	200	200	250
Case 1				•					
Characteristic resistance in concrete C20/25	N ⁰ Rk.sp	[kN]	9 ¹⁾	12 ¹⁾	20 ¹⁾	30 ¹⁾	40 ¹⁾	-	-
Respective spacing	S _{cr.sp}	[mm]			3 h _{ef}			-	-
Respective edge distance	C _{cr.sp}	[mm]			1.5 h _{el}			-	-
Case 2	· ·								
Characteristic resistance in concrete C20/25	N ⁰ Rk.sp	[kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	3)	3)	3)
Respective spacing	S _{cr.sp} ²⁾	[mm]	230	250	280	400	440	600	500
Respective edge distance	C _{cr.sp} ²⁾	[mm]	115	125	140	200	220	300	250
Splitting for minimum thickness o	f concrete n	tembe	r						•
Minimum thickness of concrete	h _{min} ≥	[mm]	80	100	120	140	-	-	-
Characteristic resistance in concrete C20/25	N ⁰ rk.sp	[kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	-	-	-
Respective spacing	Scr.sp ²⁾	[mm]		5	h _{ef}		-	-	-
Respective edge distance	C _{cr.sp} ²⁾	[mm]		2.5	h _{ef}		-	-	-
ncreasing factors	C30/37	[-]				1.22			
for $N_{Bk,p}$ and $N_{Bk,sp}^{0}$ ψ_{C}	C40/50	[-]				1.41			
- inde indep	C50/60	[-]				1.55			
Concrete cone failure									
Effective anchorage depth	h _{ef}	[mm]	46	60	70	85	100	100	125
Spacing	S _{cr.N}	[mm]			•	3 h _{ef}			
Edge distance	C _{cr.N}	[mm]				1.5 h _{ef}			
	p= YMsp =YMc	[-]				1.5			

15 For the proof against splitting failure according to ETAG 001, Annex C, N⁰_{Bk,c} in equation (5.3) has to be replaced by N⁰_{Bk,sp} with consideration of the member thickness ($\psi_{ucr,N} = 1.0$). ²¹ The values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min} < h < h_{scl}$ (Case 2) ($\psi_{h,sp} = 1.0$). ³⁰ Pullout is not decisive

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR	
Characteristic values for tension loads, ETAG 001, Annex C, W-FAZ, stainless steel A4, HCR	Annex 9



Anchor size			M8	M10	70 M12	M16	M20	M24	125 M24	M27
Steel zinc plated										
Tension load in cracked concrete	N	[kN]	2.4	4.3	7.6	11.9	17.1	21.1	-	24
Displacement	δ _{N0}	[mm]	0.6	1.0	0.4	1.0	0.9	0.7	-	0.9
	δ _{N×}	[mm]	1.4	1.2	1.4	1.3	1.0	1.2	-	1.4
Tension load in non-cracked concrete	Ν	[kN]	5.7	7.6	11.9	16.7	23.8	29.6	-	34
Displacement	δ _{N0}	[mm]	0.4	0.5	0.7	0.3	0.4	0.5	-	0.3
	δ _{N×}	[mm]	0.	.8	1.4		0.8		-	1.4
Stainless steel A4, HCF	3									
Tension load in cracked concrete	N	[kN]	2.4	4.3	7.6	11.9	17.1	17.0	19.0	-
Displacement	δ_{N0}	[mm]	0.7	1.8	0.4	0.7	0.9	0.5	0.5	-
	δ _{N#}	[mm]	1.2	1.4	1.4	1.4	1.0	1.6	1.8	-
Tension load in non-cracked concrete	N	[kN]	5.8	7.6	11.9	16.7	23.8	24.1	33.5	-
Displacement	δ_{N0}	[mm]	0.6	0.5	0.7	0.2	0.4	1.5	0.5	-
	δ _{N#}	[mm]	1.2	1.0	1.4	0.4	0.8	1.1	1.1	-

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Displacements under tension loads, W-FAZ



Anchor size				M8	M10	70 M12	M16	M20	M24	125 M24	M27
Steel failure wit	hout lever arm, S	teel zinc	plated		•			1	•		•
Characteristic res	sistance	$V_{Rk,s}$	[kN]	15	22	30	60	69	114	-	169.4
Partial safety fac	tor	γ́мs	[-]		1	.25		1.33	1.25	-	1.25
Steel failure wit	hout lever arm, S	tainless	steel A	4, HCR							
Characteristic rea	sistance	$V_{Rk,s}$	[kN]	13	20	30	55	86	123	.6	-
Partial safety fac	tor	γ̈́Ms	[-]		1	.25		1.4	1.	25	-
Steel failure wit	h lever arm, Steel	zinc pla	ted								
Characteristic be	nding resistance	M ⁰ _{Bk,s}	[Nm]	23	47	82	209	363	898	-	1331.5
Partial safety fac	tor	γмs	[-]		1	.25		1.33	1.25	-	1.25
Steel failure wit	h lever arm, Stain	less ste	el A4, I	HCR							
Characteristic be	nding resistance	M ⁰ _{Bk,s}	[Nm]	26	52	92	233	454	785	.4	-
Partial safety fac	tor	γ́мs	[-]		1	.25		1.4	1.	25	-
Concrete pryou	t failure		·								
Factor in equatio ETAG 001, Anne		k	[-]				2.0				
Partial safety fac	tor	γмер	[-]				1.5				
Concrete edge f	failure										
Effective length	Steel zinc plated	l,	[mm]	46	60	70	85	100	115	-	125
of anchor in shear loading	Stainless steel A4, HCR	l,	[mm]	46	60	70	85	100	100	125	-
Outside diameter	r of anchor	d _{nom}	[mm]	8	10	12	16	20	2	4	27
Partial safety fac	tor	Ϋмс	[-]				1.	5			

Table 10: Displacements under shear loads, W-FAZ

Anchor size			M8	M10	70 M12	M16	M20	M24	125 M24	M27
Steel zinc plated										
Shear load in cracked and non-cracked concrete	۷	[kN]	8.6	12.6	17.1	34.3	36.8	64.9	-	96.8
Displacement	δ_{V0}	[mm]	2.3	2.2	2.2	4.0	1.8	3.5	-	3.6
	$\delta_{V_{2}}$	[mm]	3.5	3.3	3.4	6.0	2.7	5.3	-	5.4
Stainless steel A4, HCR										
Shear load in cracked and non-cracked concrete	۷	[kN]	7.3	11.6	16.9	31.3	43.8	70	.6	-
Displacement	δ_{V0}	[mm]	3.2	4.4	5.2	6.5	2.9	2.	8	-
-	δ_{Vr}	[mm]	4.8	6.6	7.8	9.8	4.3	4.	2	-

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Characteristic values for shear loads, ETAG 001, Annex C, Displacements under shear loads, W-FAZ

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English translation prepared by DIBt



Table 11: Characteristic values of tension resistance under fire exposure in cracked and non-cracked concrete C20/25 to C 50(6), ET42001, Annex C, W-FAZ Table 11: Characteristic values of tension resistance under fire exposure in cracked and non-cracked concrete C20/25 to C 50(6), ET42001, Annex C, W-FAZ Table 11: Characteristic values of tension resistance under fire exposure in cracked and non-cracked concrete C20/25 to C 50(6), ET42001, Annex C, W-FAZ Table 11: Characteristic values of tension resistance R: Mining M	tance under fire exposure in 20/25 to C 50/60, ETAG001, A 20/25 to C 50/20 to C 10/25 to C 50/20 to C 20000 to C 4/20 to C 4/2	ETAG001, A ETAG001, A 120 30 60 90 128 33.5 25.0 16.4 7.8 33.5 25.0 16.4 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10	4 0 0 0 60 4 33 33 33 5 5 5 5 3 7 7 6 0 0 0 60 4 4 7 7 5 3 3 7 7 6 0 0 8 8 8 7 7 7 7 6 7 8 8 8 8 7 7 7 7 8 8 8 8	27 90 120 13.0 11.8
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		120		18.6			8.0				
		90 1		19.0			69.0 68.0				
	M27	60		19.8	1		72.0 6				
		30		20.6			75.0 7				
ZA	A4	120		14.0	17.4		46.0	55.5			
W-F	M24	06		15.0	23.6		47.0	75.1			
ပ်	125	60		15.0	35.9		48.0	14.3			
fire exposure C20/25 to C50/60, ETAG001, Annex C, W-FAZ	M24 / 125 M24	30		16.0	48.2		50.0	153.5 114.3 75.1	ëd		
, An	-	120		10.0	12.1		26.0 5	32.1 1	he k-factor 2.0 and the relevant values of N $^{\rm hk, \epsilon, t}$ of Table 11 have to be considered	; A	
001		90 1		10.0	16.4		27.0 2	43.4 3	be cor	lined I	
AG	M20	60		11.0	25.0		28:0	66.1	ve to t	eterm 20)	ġ
Ë		30		11.0	33.5		29.0	88.8	11 hav	y be d (R1:	nende
/(60,		120		6.4	7.8		14.0 13.0	22.2 16.4	able 1	r fire exposure may be dete V ^a ե⊾եղ= 0.20 x V ^a եեշ (R120) iormal temperature.	factor for resistance under fire exposure $\gamma_{Mil} = 1.0$ recommended.
ure C50	M16	06		6.5	10.5				, of T	posur 0.20 smper	1.0 re
to	M	60		6.8	16.0		14.0	33.9	N ⁼ Bk.c	fire ex Rk.c'i ≕ mal te	а ЧЧ-
ext 0/25		30		7.0	215		15.0	45.5	ies of	nder f	osure
fire C2(0 120		5 3.4	6 4 2		4 5.3	8 6.5	ıt valu	0/60 u	e expe
der ste	70 M12	60 90		9 9	6 5.6		9 9	13.3 8.8	evar	o C50 0))20/25	der fire
unere	7	30 6		3.8 3.	11.5 8.		5.9 5.	17.9 13	the re	0/25 t- 0, R9- rete C	e nuc
r resistance under fire exposure -cracked concrete C20/25 to C50		120 3		2.0 3	2.7 1		2.5	3.4 1	0 and	istic resistance in concrete C20/25 to V ^{II} _{Risc1} = 0.25 x V ^{II} _{Risc} (R30, R60, R90) stic resistance in cracked concrete C2	istano
ista ked	M10	06		2.1	3.5		2.7	4.5	tor 2.4	oncre .c (R3 acked	or res
resi	M	30 60		2.6 2.5	6.9 5.2		3.3 3.2	9.0 6.8	e k-fac	e in c × V _e ⊮in cn	actor f
		120 3		1.0 2.	1.6 6.		1.1 3.	1.6 9.		istanc 0.25 stance	
she d no	M8	06		1 Z	2.0		N	2.1	5.2.3.3	ic res ⊮en = c resis	he pa
stic ane	-	30 60	e	.6 1.5	8 2.9		1.7 1.6 1.	8 2.9	lex C,	cterist V" teristi	tions 1
teri ked		е С	er arn	vz. 1	A4 / HCR 3.	E	vz.	A4 / HCR ^{3.}	1, Anr	charae	egulat
Characteristic shea in cracked and non-		R [min]	thout leve		I ≼ ⊥ [V¥]	th lever a	M ⁰ Rks. ⁶ V.	H [Nm]	t failure: if ETAG 001, Annex C,	failure: Ink.c.1 of the lue of the c	r national r
Table 12:	Anchor size	Fire resistance duration	Steel failure without lever arm	Characteristic	resistance	Steel failure with lever arm	Characteristic	resistance	concrete pryout failure: In Equation (5.6) of ETAG 00	Concrete edge failure: The initial value V ^{II} _{RA,6.1} of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by: V ^{II} _{RA,6.1} = 0.25 x V ^{II} _{RA,6.1} = 0.25 x V ^{II} _{RA,6.1} = 0.20 x V	In absence of other national regulations the partial
Würth Fixancho Würth Fixancho			-			-				R	
Characteristic sl under fire expos	hea	r resis	star	nce							Annex 13



Z45463.13



Characteristic values for tension loads, CEN/TS 1992-4, W-FAZ, steel zinc Table 13: plated

plated									
Anchor size		M8	M10	70 M12	M16	M20	M24	M27	
Steel failure									
Characteristic resistance	N _{Rk.s} [kN]	16	27	40	60	86	126	196	
Partial safety factor	γ _{Ms} [-]	1.	.53	1.5	1.6	1.6 1.5			
Pullout									
Characteristic resistance in cracked concrete C20/25	N _{Rk.p} [kN]	5	9	16	25	3)	3)	3)	
Characteristic resistance in non-cracked concrete C20/25	N _{Bk.p} [kN]	12	16	25	35	3)	3)	3)	
Splitting for standard thickness of	of concrete member	(The high	ner resista	nce of Cas	e 1 and C	ase 2 may	be applied	d.)	
Standard thickness of concrete	h _{sid} ≥ [mm]	100	120	14	170	200	230	250	
Case 1									
Characteristic resistance in concrete C20/25	N ⁰ _{Rk.sp} [kN]	9 ¹⁾	12 ¹⁾	20 ¹⁾	30 ¹⁾	40 ¹⁾	3)	50 ¹⁾	
Respective spacing	s _{cr.sp} [mm]				3 h _{ef}				
Respective edge distance	c _{cr.sp} [mm]				1.5 h _{et}				
Case 2									
Characteristic resistance in concrete C20/25	N ⁰ _{Fk.sp} [kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	3)	3)	3)	
Respective spacing	s _{cr.sp} ²⁾ [mm]		4	h _{el}		4.4 h _{ef}	3 h _{of}	5 h _{el}	
Respective edge distance	C _{cr.sp} ²⁾ [mm]		2	? h _{el}		2.2 h _{of}	1.5 h _{ef}	2.5 h _{et}	
Splitting for minimum thickness of	of concrete member								
Minimum thickness of concrete	h _{min} ≥ [[mm]	80	100	120	140	-	-	-	
Characteristic resistance in concrete C20/25	N ⁰ Rk.sp [kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	-	-	-	
Respective spacing	s _{cr.sp} ²⁾ [mm]		5	i h _{el}		-	-	-	
Respective edge distance	c _{cr.sp} ²⁾ [m]		2.5	i h _{el}		-	-	-	
Increa ing factors	C30/37 I-				1.22				
for $N_{Bk,p}$ and $N_{Bk,sp}^0$ ψ_C					1.41				
- map map 10	C50/60 [-]				1.55				
Concrete cone failure									
Effective anchorage depth	h _{ef} [mm]	46	60	70	85	100	115	125	
Spacing	S _{cr.N} [mm]	-)	3 h _{ef}				
Edge distance	C _{cr.N} [mm]				1.5 h _{el}				
					1.5				
	4p= 7Мsp =7Мс [-]				1.9				

¹² For the proof against splitting failure according to CEN/TS 1992-4-4, N⁶_{Rk,c} in equation (12) has to be replaced by N⁶_{Rk,sp} with consideration of the member thickness ($\psi_{uor,N} = 1.0$).

The values $s_{\alpha,sp}$ and $c_{\alpha,sp}$ may be linearly interpolated for the member thickness $h_{rsin} < h < h_{s:d}$ (Case 2) ($\psi_{h,sp}=1.0$). ³⁾ Pullout is not decisive

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR	
Characteristic values for tension loads, CEN/TS 1992-4, W-FAZ, steel zinc plated	Annex 14



Characteristic values for tension loads, CEN/TS 1992-4, W-FAZ, stainless Table 14: steel A4, HCR

Anchor size		M8	M10	70 M12	M16	M20	M24	125 M24
Steel failure								
Characteristic resistance	N _{Rk.s} [kN]	16	27	40	64	108	. 11	0
Partial safety factor	7Ms [-]		1	.5		1.68	1.	5
Pullout								
Characteristic resistance in cracked concrete C20/25	N _{Rk.p} [kN]	5	9	16	25	3)	3)	40
Characteristic resistance in non-cracked concrete C20/25	N _{Rk.p} [kN]	12	16	25	35	3)	3)	3)
Splitting for standard thickness of e	concrete member	(The high	ier resista	nce of Case	e 1 and C	ase 2 may	be applie	d.)
Standard thickness of concrete	h _{sid} ≥ [mm]	100	120	140	160	200	200	250
Case 1								
Characteristic resistance in concrete C20/25	N ⁰ _{Rk.sp} [kN]	9 ¹⁾	12 ¹⁾	20 ¹⁾	30 ¹⁾	40 ¹⁾	-	-
Respective spacing	s _{cr.sp} [mm]			3	h _{el}		-	-
Respective edge distance	c _{cr.sp} [mm]			-	-			
Case 2								
Characteristic resistance in concrete C20/25	N ⁰ _{Bk.sp} [kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	3)	3)	3)
Respective spacing	s _{cr.sp} ²⁾ [mm]	230	250	280	400	440	600	500
Respective edge distance	c _{cr.sp} ²⁾ [mm]	115	125	140	200	220	300	250
Splitting for minimum thickness of	concrete member							
Minimum thickness of concrete	h _{min} ≥ [[mm]	80	100	120	140	-	-	-
Characteristic resistance in concrete C20/25	N ⁰ _{Rk.sp} [kN]	12 ¹⁾	16 ¹⁾	25 ¹⁾	35 ¹⁾	-	-	-
Respective spacing	s _{cr.sp} ²⁾ [mm]		5	i h _{of}		-	-	-
Respective edge distance	c _{cr,sp} ²⁾ [mm]		2.5	i h _{ef}		-	-	-
Increasing factors	C30/37 [-]				1.22			
for NRK.p and N ⁰ RK.sp Wc	C40/50 [-]				1.41			
	C50/60 [-]				1.55			
Concrete cone failure								
Effective anchorage depth	h _{ef} [mm]	46	60	70	85	100	100	125
Spacing	S _{cr.N} [mm]				3 h _{of}			
Edge distance	C _{cr.N} [mm]				1.5 h _{ef}			
Partial safety factor YMP=	- '/Msp ='/Mc [-]				1.5			

¹⁾ For the proof against splitting failure according to CEN/TS 1992-4-4, N⁰_{Rk,c} in equation (12) has to be replaced by N⁰_{Rk,p} with consideration of the member thickness ($\psi_{\text{tor,N}} = 1.0$). ²⁾ The values $s_{\text{cr.sp}}$ and $c_{\text{cr.sp}}$ may be linearly interpolated for the member thickness $h_{\text{rsin}} < h < h_{\text{s:d}}$ (Case 2) ($\psi_{\text{h.sp}} = 1.0$). ³⁾ Pullout is not decisive

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR	
Characteristic values for tension loads, CEN/TS 1992-4, W-FAZ, stainless steel A4, HCR	Annex 15



Anchor size			M8	M10	70 M12	M16	M20	M24	125 M24	M27
Steel zinc plated										
Tension load in cracked concrete	N	[kN]	2.4	4.3	7.6	11.9	17.1	21.1	-	24
Displacement	δ_{N0}	[mm]	0.6	1.0	0.4	1.0	0.9	0.7	-	0.9
	$\delta_{N \star}$	[mm]	1.4	1.2	1.4	1.3	1.0	1.2	-	1.4
Tension load in non-cracked concrete	N	[kN]	5.7	7.6	11.9	16.7	23.8	29.6	-	34
Displacement	δ _{N0}	[mm]	0.4	0.5	0.7	0.3	0.4	0.5	-	0.3
	$\delta_{N\star}$	[mm]	0.	.8	1.4		0.8		-	1.4
Stainless steel A4, HCR										
Tension load in cracked concrete	N	[kN]	2.4	4.3	7.6	11.9	17.1	17.0	19.0	-
Displacement	δ_{N0}	[mm]	0.7	1.8	0.4	0.7	0.9	0.5	0.5	-
	δ_{N*}	[mm]	1.2	1.4	1.4	1.4	1.0	1.6	1.8	-
Tension load in non-cracked concrete	N	[kN]	5.8	7.6	11.9	16.7	23.8	24.1	33.5	-
Displacement	δ _{N0}	[mm]	0.6	0.5	0.7	0.2	0.4	1.5	0.5	-
	δ _{N#}	[mm]	1.2	1.0	1.4	0.4	0.8	1.1	1.1	-

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Displacements under tension loads, W-FAZ



Anchor size				M8	M10	70 M12	M16	M20	M24	125 M24	M27
Steel failure witho	ut lever arm, Ste	el zinc	plated						•	-	
Characteristic resis	tance	V _{Rk.s}	[kN]	15	22	30	60	69	114	-	169.4
Factor of ductility		k_2	[-]			1.	0			-	1.0
Partial safety factor		γ _{Ms}	[-]		1	.25		1.33	1.25	-	1.25
Steel failure witho	ut lever arm, Sta	inless :	steel A4	, HCR				-			
Characteristic resis	tance	$V_{Rk.s}$	[kN]	13	20	30	55	86	123	3.6	-
Factor of ductility		k ₂	[-]				1.0		•		-
Partial safety factor		γMs	[-]		1	.25		1.4	1.	.25	-
Steel failure with I	ever arm, Steel a	zinc plai	ted								
Characteristic bend	ling resistance	M ⁰ _{Rk.s}	[Nm]	23	47	82	209	363	898	-	1331.5
Partial safety factor		γмs	[-]		1	.25		1.33	1.25	-	1.25
Steel failure with I	ever arm, Stainle	ess stee	el A4, H	CR						•	
Characteristic bend	ling resistance	M ⁰ _{Rk.s}	[Nm]	26	52	92	233	454	785	5.4	-
Partial safety factor		γ́Ms	[-]		1	.25		1.4	1.	-	
Concrete pryout fa	ailure								•		
Factor in equation (CEN/TS 1992-4-4,		k_3	[-]				2.	0			
Partial safety factor		γмср	[-]				1.	5			
Concrete edge fai	lure										
Effective length of Steel zinc plated		l _f	[mm]	46	60	70	85	100	115	-	125
anchor in shear Ioading	Stainless steel A4, HCR	l _f	[mm]	46	60	70	85	100	100	125	-
Outside diameter o	f anchor	d _{nom}	[mm]	l 8 10 12 16 20 24					24	27	
Partial safety factor		γмс	[-]				1.	5			

Table 17: Displacements under shear loads, W-FAZ

Anchor size			M8	M10	70 M12	M16	M20	M24	125 M24	M27
Steel zinc plated										
Shear load in cracked and non-cracked concrete	V	[kN]	8.6	12.6	17.1	34.3	36.8	64.9	-	96.8
Displacement	δ_{VO}	[mm]	2.3	2.2	2.2	4.0	1.8	3.5	-	3.6
	δ _{Va}	[mm]	3.5	3.3	3.4	6.0	2.7	5.3	-	5.4
Stainless steel A4, HCR										
Shear load in cracked and non-cracked concrete	V	[kN]	7.3	11.6	16.9	31.3	43.8	70	.6	-
Displacement	δ _{vo}	[mm]	3.2	4.4	5.2	6.5	2.9	2.	.8	-
	$\delta_{V_{T}}$	[mm]	4.8	6.6	7.8	9.8	4.3	4.	.2	-

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Characteristic values for shear loads, CEN/TS 1992-4, Displacements under shear loads, W-FAZ

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English translation prepared by DIBt



	\Box	120		0 11.8	1		10.1		25.2						
	M27	66		13.0	1										
	2	60		15.3	'		12.6		31.5						
		30		17.6	'										
	4 A4	120		9.1	23.6 17.4		8.8 7.2 10.1		20.4 14.4 7 25.2						
	M2	06		10.0	23.6		- - - - -		1.5						
∀ H	M24/125 M24 A4	60		11.8	48.2 35.9		11.0 9.0 / 12.6 ¹		25.5 18.1 / 31.5 ¹⁾						
, ×	M2,	80		13.6											
2-4		120		6.3	25.0 16.4 12.1		7.2		14.4				_		
e in 199	M20	06		6.9	16.4								uu (
LS	Σ	<u> 09</u>		8.2	525.0		0.6		18.0				300		
Öd III		30		9.4	33.5							lex 7	Cmin		
ăŭ		120		4.0	5 7.8		5.0		9.6	eí,	leí	According to Annex 7	s _{min} according to Annex 7; c _{min} ≥ 300 mm		
fire /60	M16	06		4.4	10.5					4 x h _{ef}	2 x h _{ef}	ng to	Anne	1.0	
der 50	Z	60		5.2	21.5 16.0 10.5		6.3		12.0			cordi	a to		
lo n		ଳ		6.0	21.12							Ao	ordin		
1ce		120		2.2	4.2		3.2		5.9				aco		
stal 20/	70 M12	06		3 2.4	5.6		_						e Su Jir		
esi: te C	2	60		2.8	5 8.6		4.0		7.4						
on r		30		ന്	7 11.5		m		0	•					
l sic		90 120		1.4 1.2	3.5 2.7		1.8		4.0						
ed e	M10	60 9		1.8	5.2 3		53		5.0						
s of		30		2.2	6.9				47						
-cra		120	1	0.7	1.6		1.0	1	5.	1					
lon-	M8	06		0.8	2.0			1		1					
stic nd n		<u>6</u>		+	3 2.9		1.3 2		9 2						
Characteristic values of tension resistance under fire exposure in cracked and non-cracked concrete C20/25 to C 50/60, CEN/TS 1992-4, W-FAZ		8		1.4	, 3.8 R		- œ								
irac Ske				, vz.	A4 / HCR		vz. A4 / HCR	0	vz. A4 / HCR			۵	ە		
Cha		R		Ч Бk.s.†	[kN]		Nek _{ip.ti} [KN]	ailur	N ⁰ _{Rk,c,ti} /	S _{cr.} N.fi	C _{C1,N,f}	and Jer e sidu	and Jer mor	^{γ_{M,6}}	
					-	e	° 1 1/25 [ne fa	° 1 1/25	0,0		e unc n ont	e unc from		24 A4
18:	size	Fire resistance duration	ilure	Characteristic	e	Pullout failure	Characteristic resistance in N _{Rk} , concrete C20/25 [kN] to C50/60	Concrete cone failure	Characteristic resistance in N ⁰ _R , concrete C20/25 [kN] to C50/60		Edge distance	Minimum spacing and edge distance under fire exposure from one side	Minimum spacing and edge distance under fire exposure from more than one side	afety	¹⁾ Only 125 M24 A4
Table 18:	Anchor size	Fire resis duration	Steel failure	Iracte	resistance	lout	Characteristi resistance in concrete C20 to C50/60	ncre	Characteristi resistance in concrete C20 to C50/60	Spacing	le dis	imun e dis osure	imun e dis expo t one	Partial safety factor	1 YINC
Tat	Anc	Fire dura	Ste	Cha	resi	ЪЧ	Cha resi cont to C	ŝ	Cha resi conc to C	Spa	Edg	Mini edg fire exp	Mini edg fire	Partial factor	÷
AFA	- :				7/0	147		F •	7/400						
							FAZ/A4, W∙ W-FAZ-IG//		Z/HCR W-FAZ-IG/I	HĊF	3				
						-	n resistan	-			•		△	nnex	18
							992-4, W-F								
•															

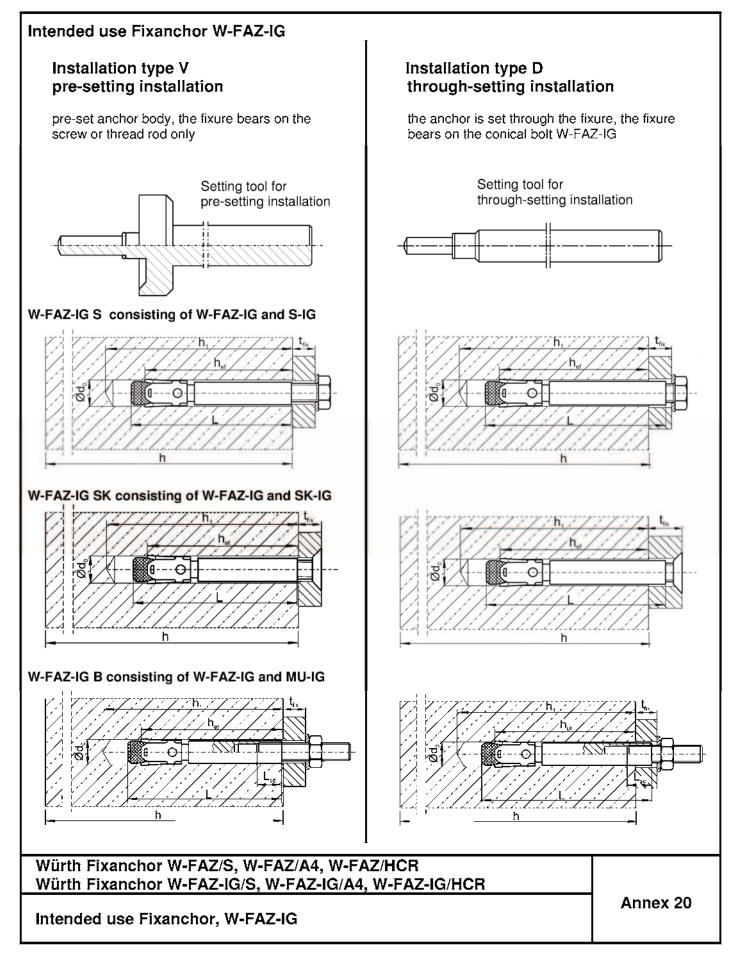
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		0	1	ω	1	1	0	1		Т				
		120		0 18.6	' 		0 68.0	•	able					
	M27	6		8 19.0	'		0 69.0		o f T					
		60		20.6 19.8	' 		75.0 72.0		N" Bk.c					
		30			4			ب	les of					
И	4 A4	120		15.0 14.0	6 17.4		47.0 46.0	1 55.5	ıt valu					
₹ ∃":	5 M2	06			23.6			3 75.1	levan					
4, K	M24 / 125 M24 A4	60		15.0	35.9		48.0	153.5 114.3	the re					
fire exposure C20/25 to C50/60, CEN/TS 1992-4, W-FAZ	M24	30		16.0	48.2		50.0	153.5	Annex D,D.3.3.2 the k-factor is similar to the k ₃ -factor for normal temperature and the relevant values of N ^{II} _{An.2.1} of Table		÷			
5 19		120		11.0 11.0 10.0 10.0	12.1		26.0	32.1	eratur		ned by			
V/TS	M20	66		10.0	0 16.4		27.0	43.4	tempe		termir D)			
CE	2	- 60		0 11.0	5 25.0		0 28.0	8 66.1	ormal		be de (R12(
60,		0 30			8 33.5		0 29.0	4 88.8	for nc		' may ∣ V ^a k.c	ture.		
.50/(0 120		5 6.4	5 7.8		0 13.0	2 16.4	factor		er fire exposure may be dete V" _{Pk.6.1} = 0.20 x V ^{P_{N.6} (R120)}	nperai	1.0	
osu to C	M16	06 0		.8 6.5	6.0 10.5		14.0 14.0	33.9 222	le k₃-t		e exp e₁ = 0	lal ten		
expi 251		30 60		7.0 6.8	21.5 16.0		15.0 14	45.5 33	ar to th		der fir V ["] _{Rk}	norm		
ire (120 3	1	3.4 7	4.2 21		5.3 15	6.5 45	simile		90 NU	under		
ler f te (112	60		3.5 3	5.6 4		5.4	8.8	tor is		C50/I	20/25		
rr resistance under -cracked concrete	70 M12	60]	3.6	8.6]	5.0	က် မ	k-faci		ance in concrete C20/25 to ¹ 25 x V ^{II} _{Pkc} (R30, R60, R90)	ste C2		
con		30		3.8	11.5		5.9	17.9	2 the		è C20, R60	concre		
stan ed (120		1 2.0	5 2.7		7 2.5	5 3.4	D.3.3.		ncrete (R30	cked (
esis ack	M10	60 90		2.5 2.1	5.2 3.5		3.2 2.7	3.8 4.5	ex D,		⊺in coi V ["] Rkc	in crat		
ar n 1-cr		30		2.6 2.5	6.9 5		3.3 3	9.0 6.8			tance	ance i		
shei		120		1.0	1.6			1.6	CEN/TS 1992-4-1		istic resist V ^{II} _{Rk,c,1} = 0.	resist		
tic : and	M8	60 90		.5 1.2	.9 2.0		1.6 1.2	.9 2.1	S 196		eristic V ["] _{Rk}	ristic I		
eris ed a		30 6	arm	1.6 1.	3.8		1.7.1	3.8 2.	SEN/T		aracte	aracte		
acte acke			ever	vz.	HCH /	r arm	VZ.	A4 / HCR			the ch	te cha		
Characteristic shear resistance under fire exposure in cracked and non-cracked concrete C20/25 to C50		R [min]	Steel failure without lever arm		[KN]	Steel failure with lever arm	Bk s fi	[MM]	concrete pryout failure: In Equations (D.6 and D.7) c	00000	Concrete edge failure: The initial value V ^a _{h,c,1} of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by: V ^a _{h,c,1} = 0.25 x V ^a _{h,c,1} = 0.25 x V ^a _{h,c} (R30, R60, R90) V ^a _{h,c,1} = 0.20 x V ^a _{h,c} (R120)	with $V^0_{nk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature.	Ę	
<u>=</u> .0			with			with			yout 2.6 an		lgefa e √ [≞]	ıl valu	γ _{M,fi} [-]	
19:	size	Fire resistance duration	ilure	ristic	e A	ilure	ristic	e U	te pr ons (I		te ed Il valu	_e initia	safety	
Table 19:	Anchor size	Fire resis duration	≿el fa	Characteristic	resistance	≳el fa	Characteristic	resistance	ncrel Equati		ncre initia	ر الم		
Tak	An	Fire dura	Ste	Cha Cha	resi	Ste	Cha	resk	COI E	2	[⊥] ^{µ∉}	with	Partial factor	
Würth Eivanaha	• \ \/	EA7/	<u>c v</u>		7/8/	۱۸٫			•					
Würth Fixanchor Würth Fixanchor											R			
Characteristic sl	nea	r resis	star	nce										Annex 19
under fire expos	ure	, CEN	I/TS	199	2-4,	W-F	AZ							

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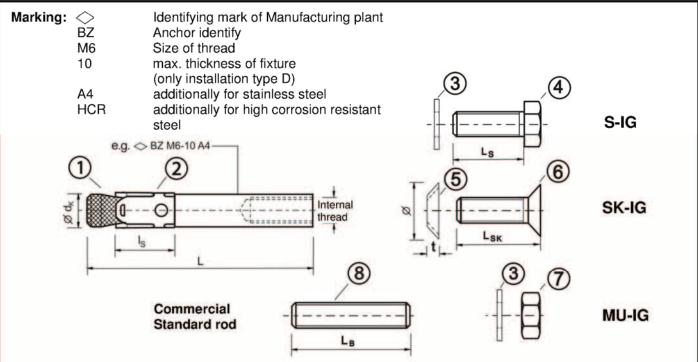


Table 20: Anchor dimensions, W-FAZ-IG

No.	Anchor size		M6	M8	M10	M12
_	Conical bolt with Internal thread	$\oslash d_k$	7.9	9.8	11.8	15.7
1	Installation type V	L	50	62	70	86
	Installation type D	L	50 + t _{fix}	62 + t _{fix}	70 + t _{fix}	86 + t _{fix}
2	Expansion sleeve	l _s	14.5	18.5	22.0	24.3
3	Washer			see ta	able 21	
4	Hexagon head screw	width accross flats	10	13	17	19
4	Installation type V	Ls	t _{fix} + (13 to 21)	t _{fix} + (17 to 23)	t _{fix} + (21 to 25)	t _{fix} + (24 to 29)
	Installation type D	Ls	14 to 20	18 to 22	20 to 22	25 to 28
5		ð countersink	17.3	21.5	25.9	30.9
5	washer	t	3.9	5.0	5.7	6.7
6	Countersunk head screw	bit size	Torx T30	Torx T45 (Steel. zinc plated) T40 (Stainless steel A4. HCR)	Hexagon socket 6 mm	Hexagon socke 8 mm
	Installation type V	Lsk	t _{fix} + (11 to 19)	t _{fix} + (15 to 21)	t _{fix} + (19 to 23)	t _{fix} + (21 to 27)
	Installation type D	L _{SK}	16 to 20	20 to 25	25	30
7	Hexagon nut widt	h accross flats	10	13	17	19
8	Commercial typ	beV L _B ≥	t _{fix} + 21	t _{inx} + 28	t _{inx} + 34	t _{fix} + 41
0	Standard rod ¹⁾ typ	eD L _B ≥	21	28	34	41
acc. to	o specifications (Table 2	21)			D	imensions in mm
	h Fixanchor W-FA h Fixanchor W-FA		•			A
Anch	or dimensions, W	-FAZ-IG				Annex 21



Table 21: Materials, W-FAZ-IG

No.	Part	Steel, zinc plated ≥ 5 μm acc. to EN ISO 4042	Stainless steel A4	High corrosion resistant steel HCR
1	Conical bolt W-FAZ-IG With internal thread	Machined steel, Cone plastic coated	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4362, EN 10088, Cone plastic coated	Stainless steel, 1.4529, 1.4565, EN 10088, Cone plastic coated
2	Expansion sleeve W-FAZ-IG	Stainless steel, 1.4301, 1.4303, EN 10088	Stainless steel, 1.4401, 1.4571, EN 10088	Stainless steel, 1.4401, 1.4571, EN 10088
3	Washer S-IG / MU-IG acc. to DIN EN 7089 or DIN EN 7093 or DIN EN 7094	Steel, EN 10025-2	Stainless steel, 1.4401, 1.4571, EN 10088	Stainless steel, 1.4529, 1.4565, EN 10088
4	Hexagon head screw S-IG	Steel, Property class 8.8, EN ISO 898-1, coated	Stainless steel, 1.4401, 1.4571, EN 10088, Property class 70, EN ISO 3506, coated	Stainless steel, 1.4529, 1.4565, EN 10088, Property class 70, EN ISO 3506, coated
5	Countersunk washer SK-IG	Steel, EN 10083-2	Stainless steel, 1.4401, 1.4404, 1.4571, EN 10088, zinc plated, coated	Stainless steel, 1.4529, 1.4565, EN 10088, zinc plated, coated
6	Countersunk head screw SK-IG	Steel, Property class 8.8, acc. to EN ISO 898-1, coated	Stainless steel, 1.4401, 1.4571, EN 10088, Property class 70, EN ISO 3506, coated	Stainless steel, 1.4529, 1.4565, EN 10088, Property class 70, EN ISO 3506, coated
7	Hexagon nut MU-IG	Steel, Property class 8, acc. to EN ISO 898-2, coated	Stainless steel, 1.4401, 1.4571, EN 10088, Property class 70, EN ISO 3506, coated	Stainless steel, 1.4529, 1.4565, EN 10088, Property class 70, EN ISO 3506, coated
8	Commercial standard rod	Property class 8.8, acc. to EN ISO 898-1 A ₅ > 8 % ductile	Stainless steel, 1.4401, 1.4571, EN 10088, Property class 70, EN ISO 3506	Stainless steel, 1.4529, 1.4565, EN 10088, Property class 70, EN ISO 3506

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Materials, W-FAZ-IG



Anchor size				M6	M8	M10	M12
Effective anchorage depth		h _{et}	[mm]	45	58	65	80
Drill hole diameter		d ₀	[mm]	8	10	12	16
Cutting diameter of drill bit		d _{cut} ≤	[mm]	8.45	10.45	12.5	16.5
Depth of drill hole		$h_1 \ge$	[mm]	60	75	90	105
Screwing depth of thread rod		$L_{sd}^{(2)} \geq$	[mm]	9	12	15	18
Installation manage		S	[Nm]	10	30	30	55
Installation moment, zinc plated steel	Tinst	SK	[Nm]	10	25	40	50
Zine plated steel		В	[Nm]	8	25	30	45
Installation moment,		S	[Nm]	15	40	50	100
stainless steel A4 and high	T _{inst}	SK	[Nm]	12	25	45	60
corrosion resistant steel HCR		В	[Nm]	8	25	40	80
Installation type V							
Diameter of clearance hole in the	fixture	$d_{f} \leq$	[mm]	7	9	12	14
		S	[mm]	i	1	1	1
Minimum thickness of fixture	t _{fix} ≥	SK	[mm]	5	7	8	9
		В	[mm]	1	1	1	1
Installation type D							
Diameter of clearance hole in the	fixture	$d_{f} \leq$	[mm]	9	12	14	18
		S	[mm]	5	7	8	9
Minimum thickness of fixture ¹⁾	$t_{fix} \geq$	SK	[mm]	9	12	14	16
		В	[mm]	5	7	8	9

¹⁾ The minimum thickness of fixture can be reduced to the value of installation type V, if the shear load at steel failure is designed with lever arm according to equation (5.5) of ETAG 001, Annex C. Marking

²⁾ see Annex 21

Setting check for Installation type V:

The anchor is placed correctly in the drill hole if the setting tool leaves a visible marking on the concrete surface.

Drill hole Minimum thickness of concrete member, minimum spacing and minimum Table 23: edge distance, W-FAZ-IG

Anchor size			M6	M8	M10	M12
Minimum thickness of concrete member	h _{min}	[mm]	100	120	130	160
Cracked concrete		•				
Minimum spacing	Smin	[mm]	50	60	70	80
	für c ≥	[mm]	60	80	100	120
Minimum edge distance	C _{min}	[mm]	50	60	70	80
	für s ≥	[mm]	75	100	100	120
Non-cracked concrete		· · · · · ·				
Minimum spacing	S _{mi⊓}	[mm]	50	60	65	80
	für c ≥	[mm]	80	100	120	160
Minimum edge distance	Cmin	[mm]	50	60	70	100
	für s ≥	[mm]	115	155	170	210
Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR						
nstallation parameters Minimum	memb	or thick	noce M	inimum s	pacing	Anne

Installation parameters, Minimum member thickness, Minimum spacing and edge distance, W-FAZ-IG



Installation	instructions pre-setting instructions	stallation, W-FAZ-IG
1	90°	Drill hole perpendicular to concrete surface.
2		Blow out dust.
3	₽ State BZ-IGS	Setting tool insert in anchor.
4		Drive in anchor with setting tool.
5		Check screwing depth by the excess length (K) of the screw.
6	Tinst	Max. tightening torque T _{inst} may be applied by using torque wrench.

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Installation instructions, W-FAZ-IG



Installation	instructions through-settin	ng installation, W-FAZ-IG	
1	90° 	Drill hole perpendicular to concrete surfa	ce.
2		Blow out dust.	
3	E of BZ-IGS	Setting tool insert in anchor.	
4	BZ-IGS	Drive in anchor with setting tool.	
5		Drive in screw.	
6	T _{INST}	Max. tightening torque T _{inst} may be applied by using torque wrench.	ed
	chor W-FAZ/S, W-FAZ/A4, V chor W-FAZ-IG/S, W-FAZ-IG		Annoy OF
Installation i	nstructions through-setting	installation, W-FAZ-IG	Annex 25



Table 24: Characteristic values for tension loads, ETAG 001, Annex C, W-FAZ-IG

Anchor size			M6	M8	M10	M12
Steel failure						
Characteristic resistance, steel zinc plated	N _{Rk,s}	[kN]	16.1	22.6	26.0	56.6
Partial safety factor	γ_{Ms}	[-]		1	.5	
Characteristic resistance, stainless steel A4 and high corrosic resistant steel HCR	on N _{Rk,s}	[kN]	14.1	25.6	35.8	59.0
Partial safety factor	γ_{Ms}	[-]		1.	87	
Pullout failure						
Characteristic resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	5	9	12	20
Pullout and splitting (Choice of	of minimum spa	icing and	d edge distar	ice)		
Characteristic resistance in non-cracked concrete C20/25	N _{Rk,p}	[kN]	9	12	16	25
Respective spacing	S _{cr,sp}	[mm]		3	h _{ef}	
Respective edge distance	C _{cr,sp}	[mm]		1.5	i h _{et}	
Pullout and splitting (Choice of	f maximum res	sistance)				
Characteristic resistance in non-cracked concrete C20/25	N _{Rk,p}	[kN]	12	16	20	30
Respective spacing	S _{cr,sp}	[mm]		5	h _{ef}	
Respective edge distance	C _{cr,sp}	[mm]		2.5	i h _{et}	
Increasing factors for N _{Rkp} for	C30/37	[-]		1.	22	
cracked and non-cracked	Ψc C40/50	[-]		1.	41	
concrete	C50/60	[-]		1.	55	
Concrete cone failure						
Effective anchoring depth	h _{ef}	[mm]	45	58	65	80
Spacing	S _{cr,N}	[mm]			h _{ef}	
Edge distance	C _{cr,N}	[mm]			i h _{et}	
Partial safety factor γ	$M_{\text{Mp}} = \gamma_{\text{Msp}} = \gamma_{\text{Mc}}$	[-]		1	.8	

Table 25: Displacements under tension loads

Anchor size			M6	M8	M10	M12
Tension load in cracked concrete	Ν	[kN]	2.0	3.6	4.8	8.0
Displacement	δ _{N0}	[mm]	0.6	0.6	0.8	1.0
	$\delta_{N \times}$	[mm]	0.8	0.8	1.2	1.4
Tension load in non-cracked concrete	Ν	[kN]	4.8	6.4	8.0	12.0
Displacement	δ _{N0}	[mm]	0.4	0.5	0.7	0.8
Displacement -	$\delta_{N_{\mathcal{R}}}$	[mm]	0.8	0.8	1.2	1.4

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Characteristic values for tension loads, ETAG 001, Annex C Displacements under tension loads, W-FAZ-IG



Table 26: Characteristic values for shear loads, ETAG 001, Annex C, W-FAZ-IG

Anchor size			M6	M8	M10	M12
W-FAZ-IG zinc plated						•
Steel failure without lever arm, Install	ation typ	e V				
Characteristic resistance	V _{Rk,s}	[kN]	5.8	6.9	10.4	25.8
Steel failure without lever arm, install	ation typ	e D			•	
Characteristic resistance	V _{Rk.s}	[kN]	5.1	7.6	10.8	24.3
Steel failure with lever arm, Installatio						
Characteristic bending resistance	M ⁰ _{Rk.s}	[Nm]	12.2	30.0	59.8	104.6
Steel failure with lever arm, Installatio						
Characteristic bending resistance	M ⁰ Rk,s	[Nm]	36.0	53.2	76.0	207
Partial safety factor for $V_{Rk,s}$ (type V, D) and $M^0_{Rk,s}$ (type V, D)	γ _{Ms}	[-]		1.	.25	
W-FAZ-IG stainless steel A4 and high	corrosic	n resist	ant steel H	CR		
Steel failure without lever arm, Install	ation typ	e V				
Characteristic resistance	V _{Rk,s}	[[kN]]	5.7	9.2	10.6	23.6
Partial safety factor	γ _{Ms}	[-]		1.	.25	
Steel failure without lever arm, install						
Characteristic resistance	V _{Rk.s}	[kN]	7.3	7.6	9.7	29.6
Partial safety factor	γ _{Ms}	[-]		1.	.25	
Steel failure with lever arm, Installatio						
Characteristic bending resistance	M ⁰ Rk,s	[[Nm]	10.7	26.2	52.3	91.6
Partial safety factor	γ _{Ms}	[-]		-	.56	
Steel failure with lever arm, Installatio						
Characteristic bending resistance	M ⁰ _{Bks}	[Nm] [28.2	44.3	69.9	191.2
Partial safety factor		[-]		_	.25	
Concrete pryout failure	11415] [] []				
Factor in equation (5.6) ETAG 001, Annex C, 5.2.3.3	k	[-]	1.5	1.5	2.0	2.0
Partial safety factor	γмор	[-]		1	.5	
Concrete edge failure	1.00					
Effective length of anchor in shear loading	li	[mm]	45	58	65	80
Effective diameter of anchor	d _{nom}	[mm]	8	10	12	16
Partial safety factor	γ _{Mc}	[-]		1	.5	•

Table 27: Displacements under shear loads, W-FAZ-IG

Anchor size			M6	M8	M10	M12
Shear load in cracked and non-cracked concrete	V	[kN]	4.2	5.3	6.2	16.9
Displacements	δ _{vo}	[mm]	2.8	2.9	2.5	3.6
	δγ∞	[mm]	4.2	4.4	3.8	5.3

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Characteristic values for shear loads, ETAG 001, Annex C, Displacements under shear loads, W-FAZ-IG

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Ssure M 60, ETAG 001, Ani 8 M 90 120 30 60 90 120 30 60 90 120 30 60 90 120 30 60 91 1.3 8.7 6.3 2.1 1.3 8.7 6.3 2.1 1.3 8.7 6.3 90 91 90 90 91 1.8 3.0 92 5.1 6.1 13 2.5 hef 19 Annex 23; cmin 2 16 Annex 23; cmin 2 16 Annex 23; cmin 2 17 6.1	Table 28: C Anchor size in Anchor size consistance du Fire resistance du consistance Steel tailure: consistance Pullout failure: concrete C20/25 t Characteristic resistance concrete C20/25 t Spacing concrete C20/25 t Spacing concrete C20/25 t Spacing constrate from on Minimum spacing exposure from on Minimum spacing exposure from on In absence of oth for	Characteristic values to tension loads under fire exposure In cracked and non-cracked concrete C20/25 to C50/60, ETAG 001, nce duration R 30 60 30 120 30 60 30 120 30 nce duration R 30 60 30 120 30 60 30 120 30 25 ite Nation R 30 60 30 120 30 120 30 25 ite Nation R 30 60 30 120 30 25 25 33 21 13 27 ite Nation Nation 13 1.0 2.3 2.1 1.3 3.7 At / HCR Stationes in Nation Nation 3.8 3.1 1.3 3.7 At / HCR Stationes in Nation Nation 2.3 2.1 1.3 3.7 Stationes in Nation Nation 2.4 3.8 2.1 1.3 3.7 3.7	In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,H} = 1.0$ is recommended.
	Haracteristic values to tension loads und Intracteristic values to tension loads und Intracted and non-cracked concrete C20/ Intration Intration M 6 Intration R 30 60 90 12c Intration R Steel 0.7 0.6 0.5 0.4 Intration R Steel 0.7 0.6 0.5 0.4 Intration R Steel 0.7 0.6 0.5 0.4 Intration R Stainless steel 2.9 1.0 0.5 0.4 Intration R.N A4 / HCR 2.9 1.3 1.0 0.5 Istance in New.n. 2.9 1.3 1.0 0.5 0.4 Istance in New.n. 2.0 2.0 2.0 2.0 2.0 Interest Interest Interest Interest Interest 2.0 2.0 2.0 Interest Interest Interest Interest Interest 2.0 2.0 2.0 2.0 2.0 2.0	er fire exposit 25 to C50/60, 30 60 90 31 1.2 0.9 5.4 3.8 2.1 5.4 3.8 2.1 8 2.3 2.3 8 2.3 3.6 8 2.3 3.8 8 2.3 3.8 8 4.6 3.8 8 4.6 3.8 8 3.6 3.6	istance under fire
Prince exponent	haracteristic values to te I cracked and non-cracke I ration R I ration Steel I ration Stainless steel I ration RNI I ration RNI I ration RNI I ration RNI I ratione Sc.N.I.I I rational regulations the partia I rational regulations the partia	nsion loads under di concrete C20/2 30 60 90 120 30 60 90 120 2:9 1.9 1.0 0.5 2:9 1.3 1.0 0.5 2:9 2:4 2:0 1.0	I safety factor for resi
Image: second		<u> </u>	

6.2 0 120 ∞. -4.0 8. 10 10 In Equation (5.6) of ETAG 001, Annex C, 5.2.3.3 the k-factor of Table 26 and the relevant values of N⁰ _{Rk.c.h} of Table 28 have to be The initial value V⁶ _{Rkoli} of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by In absence of other national regulations the partial safety factor for resistance under fire exposure YMA = 1.0 is recommended 25 8.9 5.7 3.4 6 M12 14,3 2.9 2,0 4.6 60 in cracked and non-cracked concrete C20/25 to C50/60, ETAG 001, Annex C, W-FAZ-IG 12.6 19.6 3.7 5.7 30 with $V^0_{
m Rko}$ initial value if the characteristic resistance in cracked concrete C20/25 under normal temperature. 3.5 2 2.7 120 1.3 1.6 <u>9</u> 3.9 2.0 5.1 8 M10 5.0 2 ල. ය 2.6 8.1 60 $V^{0}_{Hk,c,li} = 0.20 \times V^{0}_{Hk,c}$ (R120) Characteristic values to tension loads under fire exposure 1 1 2.5 8.7 3.3 30 ຕຸ ل. ب 120 0.8 0.8 0.0 25 Г. 0.9 8 **M8** 3.9 3.8 č ¢. 8 5.5 4 5,4 4 30 120 4.0 0.5 0.3 0,4 0.5 0. 1 0.7 0.4 8 M6 0.6 0.4 ດ. -ក់ ហ 60 V⁰_{Rk,c,li} = 0.25 x V⁰_{Rk,c} (R30, R60, R90) 5.9 5 5 5 0.5 0.7 80 Stainless steel Zinc plated **A4 / HCR** [Nm] A4 / HCR Steel failure without lever arm Steel Steel R... [min] Steel failure with lever arm: Concrete pryout failure: Concrete edge failure: Fire resistance duration V_{Rk.s.ti} resistance Characteristic Characteristic Anchor size: Resistance **Fable 29:** considered M⁰ _{Rk.s,11} Ž Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR Annex 29 Characteristic values of shear resistance under fire exposure, ETAG 001, Annex C, W-FAZ-IG





Anchor size			M6	M8	M10	M12
Steel failure					•	•
Characteristic resistance, steel zinc plated	N _{Rk,s}	[kN]	16.1	22.6	26.0	56.6
Partial safety factor	γ́мs	[-]		1	.5	
Characteristic resistance, stainless steel A4 and high corrosion resistant steel HCR	$N_{\mathbf{R}^{\mathbf{k},\mathbf{S}}}$	[kN]	14.1	25.6	35.8	59.0
Partial safety factor	γ́мs	[-]		1.	87	
Pullout failure						
Characteristic resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	5	9	12	20
Pullout and splitting (Choice of mi	nimum spa	cing and	edge distan	ice)		
Characteristic resistance in non-cracked concrete C20/25	N _{Rk,p}	[kN]	9	12	16	25
Respective spacing	S _{cr,sp}	[mm]		3	h _{ef}	
Respective edge distance	C _{cr,sp}	[mm]		1.5	h _{ei}	
Pullout and splitting (Choice of ma	aximum res	sistance)				
Characteristic resistance in non-cracked concrete C20/25	N _{Rk,p}	[kN]	12	16	20	30
Respective spacing	S _{cr,sp}	[mm]		5	h _{ef}	
Respective edge distance	C _{cr,sp}	[mm]		2.5	h _{et}	
Increasing factors for N _{Bkp} for	C30/37	[-]		1.	22	
cracked and non-cracked ψ_{C}	C40/50	[-]		1.	41	
concrete	C50/60	[-]		1.	55	
Concrete cone failure						
Effective anchoring depth	h _{ef}	[mm]	45	58	65	80
Factor for cracked concrete	k _{cr}	[-]		7.		
Factor for non-cracked concrete	k _{ucr}	[-]		10		
Spacing	S _{cr,N}	[mm]			h _{ef}	
Edge distance	C _{cr,N}	[mm]		1.5	h _{ei}	
Partial safety factor $\gamma_{Min} =$	$\gamma_{Msp} = \gamma_{Mc}$	[-]		1	.8	

Table 31: Displacements under tension loads

Anchor size			M6	M8	M10	M12
Tension load in cracked concrete	Ν	[kN]	2.0	3.6	4.8	8.0
Displacement	δ _{N0}	[mm]	0.6	0.6	0.8	1.0
Displacement -	$\delta_{N \star}$	[mm]	0.8	0.8	1.2	1.4
Tension load in non-cracked concrete	Ν	[kN]	4.8	6.4	8.0	12.0
Dieplocement	δ _{N0}	[mm]	0.4	0.5	0.7	0.8
Displacement -	δ _{N×}	[mm]	0.8	0.8	1.2	1.4

Würth Fixanchor W-FAZ/S, W-FAZ/A4, W-FAZ/HCR Würth Fixanchor W-FAZ-IG/S, W-FAZ-IG/A4, W-FAZ-IG/HCR

Characteristic values for tension loads, CEN/TS 1992-4, Displacements under tension loads, W-FAZ-IG



Table 32: Characteristic values for shear loads, CEN/TS 1992-4, W-FAZ-IG

Anchor size			M6	M8	M10	M12
W-FAZ-IG zinc plated						•
Steel failure without lever arm, Installa	ation typ	e V				
Characteristic resistance	V _{Rk,s}	[kN]	5.8	6.9	10.4	25.8
Steel failure without lever arm, installa		e D		•	•	
Characteristic resistance	V _{Rk.s}	[kN]	5.1	7.6	10.8	24.3
Steel failure with lever arm, Installatio	n type V			•		
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	12.2	30.0	59.8	104.6
Steel failure with lever arm, Installatio		· · · · · · · ·		•		•
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	36.0	53.2	76.0	207
Partial safety factor for $V_{Rk,s}$ (type V, D) and $M^0_{Rk,s}$ (type V, D)	Ŷмs	[-]		1.1	25	·
Factor of ductility	k ₂	[-]		1.	0	
W-FAZ-IG stainless steel A4 and high	corrosio	n resista	ant steel H	CR		
Steel failure without lever arm, installa	ation typ	e V				
Characteristic resistance	V _{Rk.s}	[kN]	5.7	9.2	10.6	23.6
Partial safety factor	Ýмs	[-]		1.3	25	
Steel failure without lever arm, installa	I					
Characteristic resistance	V _{Bk.s}	[kN]	7.3	7.6	9.7	29.6
Partial safety factor	Ýмs	[-]		. 1.3	25	-
Steel failure with lever arm, Installatio						
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	10.7	26.2	52.3	91.6
Partial safety factor	γMs	[-]		, 1.{	56	_1
Steel failure with lever arm, Installatio						
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	28.2	44.3	69.9	191.2
Partial safety factor	Yms	[-]		1.2		
Factor of ductility	/Ms k₂	[-]		1.		
Concrete pryout failure	<u>Z</u>				-	
Factor in equation (16) CEN/TS 1992-4-4, 5.2.2.3	k ₃	[-]	1.5	1.5	2.0	2.0
Partial safety factor	ŶМср	[-]		1.	5	
Concrete edge failure	,					
Effective length of anchor in shear loading	l _f	[mm]	45	58	65	80
Effective diameter of anchor	d _{nom}	[mm]	8	10	12	16
Partial safety factor	Ύмс	[-]		1.	5	

Table 33: Displacements under shear loads, W-FAZ-IG

Anchor size			M6	M8	M10	M12
Shear load in cracked and non-cracked concrete	V	[kN]	4.2	5.3	6.2	16.9
Displacements	δ _{vo}	[mm]	2.8	2.9	2.5	3.6
	δγ∞	[mm]	4.2	4.4	3.8	5.3
/ürth Fixanchor W-FAZ/S, W /ürth Fixanchor W-FAZ-IG/S	,			R		
haracteristic values for she EN/TS 1992-4, Displacemen		ar loade	W_FA7			Annex 31

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English translation prepared by DIBt



		120		1.8	4.0		4.0		8.2							
	M 12	06		2.2	5.7											
	W	60		2.9	9.2		5.0		10.3							
5 1-7		30		3.7	12.6											
V-FA		120		1.3	2.7		2.4		4.9				4	İ		
-4, V	M 10	06		1.5	3.9									1 000		
1992	M	60		2.0	6.3		3.0		6.1			x 23		N E E		
ST/I		30		2.5	8.7					h _{eŕ}	h _{eŕ}	Anne		X 60, 4	1.0	
CEN CEN		120		0.8	1.3		1.8		3.7	4 X h _{ef}	2 X	according to Annex 23				
post)/60,	M 8	6		0.9	2.1							accor		əmin accurating to Attriex 23, cmin 2 300 tritti.		
e ex	N	09		1,2	3.8		5.3		4.6					accord		
er fir 25 to		30		1.4	5.4									umin D		
und C20/		120		0.4	0.5		1.0		2.0							
oads rete	Мб	06		0.5	1.0											
ion le conc	M	60		0.6	1.9		1 . ن		2.4							
tens		30		0.7	2.9											
Characteristic values to tension loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60, CEN/TS 1992-4, W-FAZ-IG		e duration [min]			[kN] Stainless steel A4 / HCR	e:	Characteristic resistance in N _{Hk.p.1} concrete C20/25 to C50/60 [kN]	ne failure:	Characteristic resistance in N ⁰ _{Rk.c.fi} concrete C20/25 to C50/60 [kN]	S _{cr,} N,fi	e Ccr,N,fi	Minimum spacing and edge distance under fire exposure from one side	Minimum spacing and edge distance under	fire exposure from more than one size	factor ^{%M,t}	
Taple 34: Würth Fib				-	/-FAZ/	-	W-FAZ		R	Spacing	Edge Distance	Minimum spa fire exposure	Minimum spa	fire exposure	Partial safety factor	
Würth Fix Characte under fire	risti	c value	es o	f tens	ion re	sista	ance		AZ-IG	HC	R				Anne	x 32

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		In cracked and non-cracked concrete UZU/20 to UDU/60, UEN/10 1892-4, W-FAZ-1G												F				
Anchor size:				MG	9			M8				M10	0			M12	5	
Fire resistance duration	Iration	R [min]	30	60	06	120	30	60	90	120	30	60	06	120	30	60	06	120
Steel failure without lever arm:	out leve	er arm:																
Characteristic	N N N N N N N N N N N N N N N N N N N	Steel zinc plated	0.7	0.6	0.5	0.4	1.4	51	0.9 (0.8	2.5	2.0	1.5	1.3	3.7	2.9	2.2	1.8
resistance	[kN]	Stainless steel A4 / HCR	2.9	1.9	1,0	0.5	5.4	3.8	5.1	1.3	8.7	6.3	3.9	2.7	12,6	9.2	5.7	4.0
Steel failure with lever arm:	lever a	: :																
	M ⁰ _{Hk s f}	Steel	0.5	0.4	0.4	0.3	4.1	€.	0.9 (0.8	3.3	2.6	2.0	1.6	5.7	4.6	3.4	2.8
Resistance	[Nm]	A4 / HCR	2.2	1.5	0.7	0.4	5.5	3.9	2.2	1.3 1	11.2	8.1	5.1	3.5	19.6	14.3	8.9	6.2
Concrete pryout failure: In Equations (D.6 snd D.7) of CEN/TS the relevant values of N ⁰ _{Rkoli} of Table (failure: snd D.7 s of N ⁰ _{Ph}		3 1992-4-1, Annex D,D.3.3 34 have to be considered	Ann∈ be cc	ex D,I onside	D.3.3 ered.	1992-4-1, Annex D,D.3.3.2 the k-factor is similar to the k ₃ -factor for normal temperature and 34 have to be considered.	k-fact	or is s	imilar	to the	s k ₃ -fe	ictor f	or no	rmal t	emper	ature	anc
Concrete edge failure: The initial value V ⁶ _{6k.c.ft} of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by:	ailure: ⁰ _{Rk,c,fi} of 1	the characteristic	resist:	ance	in co	ncrete	● C20/	25 to	C50/6	o nnd	ler fire	expc	sure	may	be de	ermin	ed by	
with V ^{erkici} initial value if the characteristic resistance in cracked concrete C20/25 under normal temperature.	alue if th	Y Recti = U.23 X V Rec (1900, 1900, initial value if the characteristic re	stic resistan	nce in	ו crac	xed c	v Rkic	te C2(v Bkath = 0.50 × v Bka (m 120) increte C20/25 under normal	nder r	Jorme	u N tem	perati	ure.				
Partial safety factor	ΥΜ.tı [-]									1.0								