Deutsches Institut für Bautechnik

Anstalt des öffentlichen Rechts

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Ermächtigt und notifiziert gemäß Artikel 10 der Richtlinie des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte (89/106/EWG)

DIBt

Mitglied der EOTA

European Technical Approval ETA-00/0001

English translation prepared by DIBt

Handelsbezeichnung *Trade name*	fischer Ankerbolzen FAZ *fischer Anchor Bolt FAZ*
Zulassungsinhaber *Holder of approval*	fischerwerke Artur Fischer GmbH & Co. KG Weinhalde 14-18 72178 Waldachtal
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Kraftkontrolliert spreizender Dübel aus galvanisch verzinktem Stahl in den Größen M 8, M 10, M 12, M 16, M 20 und M 24 zur Verankerung im Beton *Torque-controlled expansion anchor made of galvanized steel of sizes M 8, M 10, M 12, M 16, M 20 and M 24 for use in concrete*
Geltungsdauer vom *Validity from* bis *to* verlängert vom *extended from* bis *to*	9. Mai 2001 14.Februar 2005 18. Februar 2005 14. Februar 2010
Herstellwerk *Manufacturing plant*	fischer, Herstellwerk 1, Deutschland fischer, Herstellwerk 2, Deutschland fischer, Herstellwerk 3, Tschechien
Diese europäische technische Zulassung umfasst *This European Technical Approval contains*	12 Seiten einschließlich 5 Anhänge *12 pages including 5 annexes*

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 products[1], amended by the Council Directive 93/68/EEC of 22 July 1993[2];
- *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 1998[3];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex of Commission Decision 94/23/EC[4];
- Guideline for European Technical Approval of "Metal Anchors for Use in Concrete" ETAG 001, edition 1997, Part 1 "Anchors in general" and Part 2 "Torque-controlled expansion anchors".

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 after information by the Commission on the basis of 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 the 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 to the version circulated within EOTA. Translations into other languages have to be designated as such.

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1 Official Journal of the European Communities N° L 40, 11.02.1989, p. 12

2 Official Journal of the European Communities N° L 220, 30.08.1993, p. 1

3 *Bundesgesetzblatt I, p. 812, zuletzt geändert durch Gesetz* ('last amended by law on') *vom 15.12.2001, Bundesgesetzblatt I, p. 3762*

4 Official Journal of the European Communities N° L 17, 20.01.1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of product

The fischer Anchor Bolt FAZ in the range of M 8, M 10, M 12, M 16, M 20 and M 24 is an anchor made of galvanised steel which is placed into a drilled hole and anchored by torque-controlled expansion.

An illustration of the product and intended use is given in Annex 1.

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 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 minimum and C50/60 at most according to EN 206:2000-12.

The anchor may be used in cracked and non-cracked concrete.

The anchor may only be used in structures subject to dry internal conditions.

The provisions made in this European Technical Approval 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, 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 product and methods of verification

2.1 Characteristics of product

The anchor corresponds to the drawings and provisions given in Annex 2. The characteristic material values, dimensions and tolerances of the anchor not given in Annex 2 shall correspond to the respective values laid down in the technical documentation[5] of this European Technical Approval.

The characteristic values for the design of anchorages are given in Annexes 4 and 5.

Each anchor is marked with the identifying mark of the producer, the type of anchor, the thread size and the maximum thickness of fixture according to Annex 2. Anchor-lengths for the smallest thickness of fixture have additional a colour marking or a slot on anchor head corresponding Annex 2.

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

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5 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.

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.

3 Evaluation of Conformity and CE marking

3.1 Attestation of Conformity system

The system of attestation of conformity 2(i) (referred to as System 1) according to Council Directive 89/106/EEC Annex III laid down by the European Commission provides:

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 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.

3.2 Responsibilities

3.2.1 Tasks of the manufacturer; factory production control

The manufacturer has established a factory production control system in the plant and exercises permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. The production control system ensures that the product is in conformity with the European Technical Approval.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of materials such as nuts, washers, wire for cone bolts and metal band for expansion sleeves shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimensions and determining material properties, e.g. tensile strength, hardness, surface finish

The manufactured components of the anchor shall be subjected to the following tests:

- Dimensions of component parts:
  cone bolt (diameter, length, angle of the cone, thread);
  expansion sleeve (length, thickness);
  hexagon nut (well running, wrench size across flats);
  washer (diameter, thickness).
- Material properties:
  cone bolt (tensile strength, yield limit, hardness);
  expansion sleeve (tensile strength, yield limit);
  hexagon nut (proof load);
  washer (hardness).
- Thickness of the zinc plate and control of the additional anti-friction coating
- Visual control of correct assembling and of completeness of the anchor.

The frequency of controls and tests conducted during production and on the assembled anchor is laid down in the control plan taking account of the automated manufacturing process of the anchor.

The results of factory production control are recorded and evaluated. The records include at least the following information:

- Designation of the product, raw material and components,
- Type of control or testing,
- Date of manufacture of the product and date of testing of the product or basic-material and components,
- Result of control and testing and, if appropriate, comparison with requirements,
- Signature of person responsible for factory production control.

The records shall be presented to the inspection body involved in the continuous surveillance. On request they shall be presented to the Deutsches Institut für Bautechnik.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control shall correspond to the control plan[6] which is part of the technical documentation of this European Technical Approval.

3.2.2 Tasks of approved bodies

3.2.2.1 Initial type-testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary initial type-testing has to be agreed between the Deutsches Institut für Bautechnik and the approved bodies involved.

3.2.2.2 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the control plan, the factory, in particular the staff and equipment, and the factory production control are suitable to ensure a continuous and orderly manufacturing of the anchor with the specifications mentioned in 2.1 as well as in the Annexes to the European Technical Approval.

3.2.2.3 Continuous surveillance

The approved body shall visit the factory at least once a year for surveillance. It has to be verified that the system of factory production control and the specified automated manufacturing process are maintained taking account of the control plan.

Continuous surveillance and assessment of factory production control have to be performed according to the control plan.

The results of product certification and continuous surveillance shall be made available on demand by the certification body or inspection body, respectively, to the Deutsches Institut für Bautechnik.

In cases where the provisions of the European Technical Approval and the control plan are no longer fulfilled the conformity certificate shall be withdrawn.

3.3 CE marking

The CE marking shall be affixed on each packaging of anchors. The symbol "CE" shall be followed by the identification number of the certification body and shall be accompanied by the additional information:

- name or identifying mark of producer and manufacturing plant,
- the last two digits of the year in which the CE marking was affixed,
- number of the EC certificate of conformity,

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6 The control plan is deposited at the Deutsches Institut für Bautechnik and is handed over only to the approved bodies involved in the conformity attestation procedure.

- number of the European Technical Approval,
- use category (ETAG 001-1 Option 1),
- anchor size.

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

4.1 Manufacturing

The anchor is manufactured in accordance with the provisions of the European Technical Approval using the automated manufacturing process as identified in the inspection of the plant by the Deutsches Institut für Bautechnik and the approved body and laid down in the technical documentation.

4.2 Installation

4.2.1 Design of anchorages

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

The anchorages are designed in accordance with the "Guideline for European Technical Approval of Metal Anchors for Use in Concrete", Annex C, Method A, for torque controlled expansion anchors 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).

4.2.2 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,
- 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 spacings 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,
- Cleaning of the hole of drilling dust,
- Anchor installation such that the effective anchorage depth is complied with. This compliance is ensured, if the exist thickness of fixture is not greater than the maximum thickness of fixture marked on the anchor,
- Application of the torque moment given in Annex 3 using a calibrated torque wrench.

4.2.3 Responsibility of the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to and 4.2.1 and 4.2.2 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 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.

Dipl.-Ing. Jasch

Beglaubigt:
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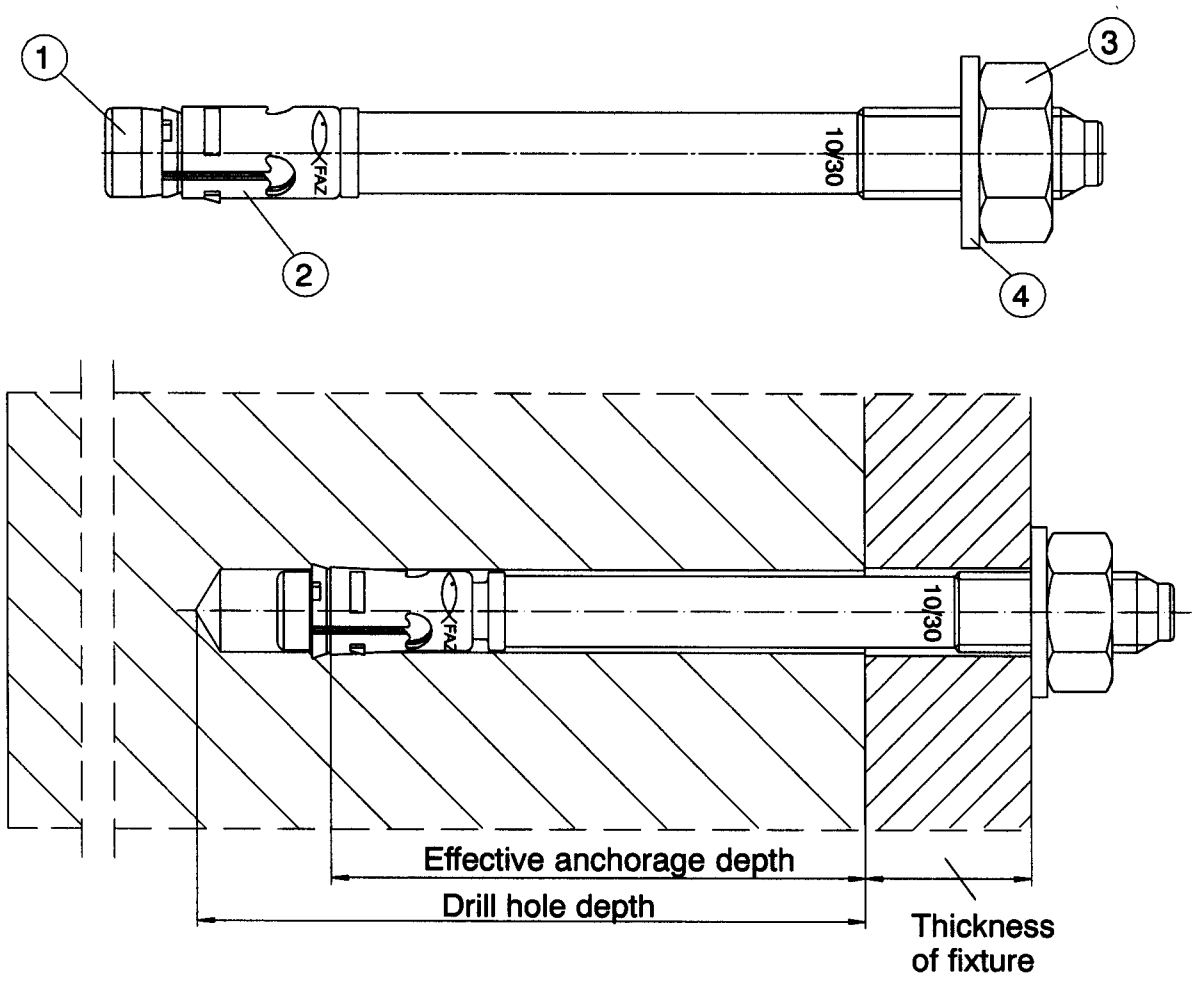


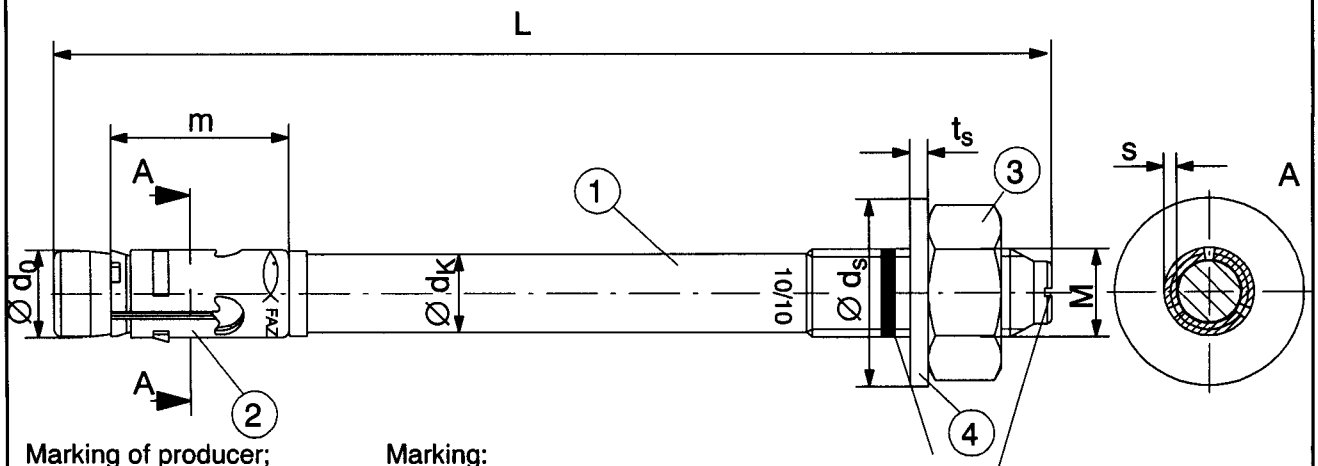
(1) Cone Bolt

(2) Expansion sleeve

(3) Hexagon nut

(4) Washer

fischer Anchor bolt FAZ	**Annex 1** of European Technical Approval ETA-00/0001
Product and intended use	



Marking of producer;
Expansion sleeve
FAZ
Type of anchor
Works symbol

Marking:
Cone Bolt
10/10
Thickness of fixture
Thread size

Additional colour marking for
M8/10; M10/10; M12/10; M16/25; M20/30 und M24/30
(alternatively slot on anchor head)

Table 1: Anchor dimensions [mm]

Type of anchor / size			FAZ M 8	FAZ M 10	FAZ M 12	FAZ M 16	FAZ M 20	FAZ M 24
Bolt	M		M 8	M 10	M 12	M 16	M 20	M 24
	$\varnothing d_0$	=	7,8	9,8	11,8	15,7	19,8	23,5
	$\varnothing d_k$	=	7,1	8,9	10,7	14,6	19,8	23,5
Expansion sleeve	m	=	18	19,6	21	28	35,2	42,5
	s	=	1,2	1,4	1,6	2,0	2,5	3,0
Hexagon nut	SW		13	17	19	24	30	36
Washer	t_s	≥	1,4	1,8	2,3	2,7	2,7	3,7
	$\varnothing d_s$	≥	15	19	23	29	36	43
t_{fix} [1]	min	≥	2	2	2	2	0	0
	max	≤	200	250	300	400	500	600
	L_{min}		67	85	100	123	142	174
	L_{max}		265	333	398	521	642	774

[1] t_{fix} = thickness of fixture

Table 2: Materials

Part	Designation	Materials
1	Cone Bolt [1]	Cold form steel (FAZ M 8 - M 16) free cutting steel EN 10 277 (FAZ M 20 / M 24)
2	Expansion sleeve	Stainless steel EN 10 088 - 2; 1.4401 ; 1.4571
3	Hexagon nut [2]	Steel, Property class 8; EN 20 898 - 2
4	Washer [1]	Cold strip EN 10 139

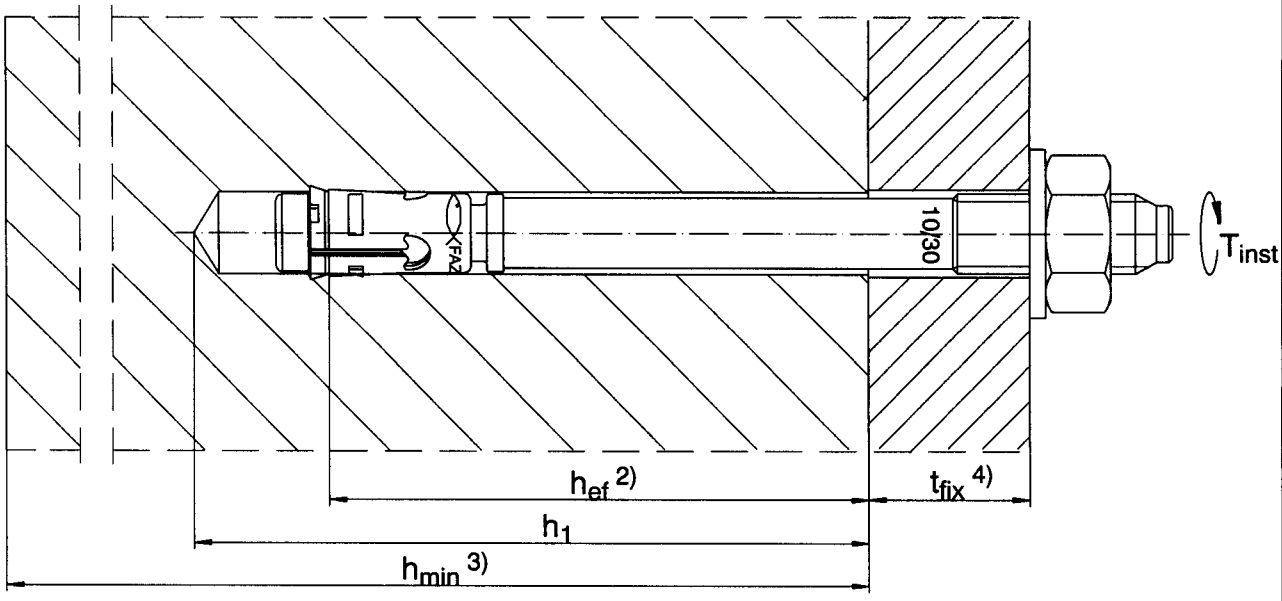
[1] Zinc plated ≥ 5 µm according to DIN ISO 4042 and friction reduce coating.
[2] Zinc plated ≥ 5 µm according to DIN ISO 4042; FAZ M 8 - M 16 additional friction reduce coating.

fischer Anchor bolt FAZ	**Annex 2** of European Technical Approval ETA-00/0001
Anchor Dimensions and Materials	

Doc: ETA-FAZE

Table 3: Installation parameters

Type of anchor / size		FAZ M 8	FAZ M 10	FAZ M 12	FAZ M 16	FAZ M 20	FAZ M 24
Nominal drill hole diameter	d_0 = [mm]	8	10	12	16	20	24
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	8,45	10,45	12,5	16,5	20,55	24,55
Depth of drill hole	$h_1 \geq$ [mm]	65	80	95	115	130	155
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	9	12	14	18	22	26
Required torque moment	T_{inst} = [Nm]	20	45	60	110	200	270



2) Effektive anchorage depth h_{ef} see Annex 4
3) Minimum thickness of concrete member h_{min} see below.
4) Thickness of fixture t_{fix} see Annex 2 / Table 1

Table 4: Minimum thickness of concrete member, minimum spacings and minimum edge distances of anchors

Type of anchor / size		FAZ M 8	FAZ M 10	FAZ M 12	FAZ M 16	FAZ M 20	FAZ M 24
Minimum thickness of concrete member	h_{min} [mm]	100	120	140	170	200	250
non-cracked concrete							
Minimum spacing	s_{min} [mm]	50	55	65	75	95	120
	for c ≥ [mm]	60	90	120	170	200	200
Minimum edge distance	c_{min} [mm]	50	55	65	95	130	150
	for s ≥ [mm]	70	120	150	185	245	270
cracked concrete							
Minimum spacing	s_{min} [mm]	50	55	65	75	95	120
	for c ≥ [mm]	60	80	95	125	160	165
Minimum edge distance	c_{min} [mm]	50	55	65	75	100	120
	for s ≥ [mm]	70	90	120	175	220	220

Intermediate values by linear interpolation

fischer Anchor bolt FAZ	**Annex 3** of European Technical Approval ETA-00/0001
Parameters of installation	

Table 5: Design method A, characteristic values of resistance to tension loads

				FAZ M 8	FAZ M 10	FAZ M 12	FAZ M 16	FAZ M 20	FAZ M 24
Steel failure									
Characteristic resistance	$N_{Rk,s}$		[kN]	21	33	45	74	95	128
Partial safety factor	γ_{Ms} [1]			1,67	1,57	1,6	1,4	1,5	1,4
Pullout failure									
Characteristic resistance in cracked concrete	$N_{Rk,p}$	[kN]	C20/25	**5**	**9**	**12**	**20**	**30**	**40**
Characteristic resistance in non-cracked concrete	$N_{Rk,p}$	[kN]	C20/25	**9**	**16**	**20**	**35**	**40**	**60**
Increasing factors for $N_{Rk,p}$ for cracked and non-cracked concrete			C25/30	1,10					
			C30/37	1,22					
			C35/45	1,34					
			C40/50	1,41					
			C45/55	1,48					
			C50/60	1,55					
Partial safety factor	γ_{Mp} [1]			1,8 [2]	1,5 [3]				
Concrete cone failure and splitting failure									
Effektive anchorage depth	h_{ef}		[mm]	45	60	70	85	100	125
Spacing	$s_{cr,N} = s_{cr,sp}$		[mm]	140	180	210	260	300	380
Edge distance	$c_{cr,N} = c_{cr,sp}$		[mm]	70	90	105	130	150	190
Partial safety factor	γ_{Mc} [1]			1,8 [2]	1,5 [3]				

[1] In absence of other national regulations.
[2] The partial safety factor $\gamma_2 = 1,2$ is included.
[3] The partial safety factor $\gamma_2 = 1,0$ is included.

Table 6: Displacements due to tension loads

			FAZ M 8	FAZ M 10	FAZ M 12	FAZ M 16	FAZ M 20	FAZ M 24
Tension load in cracked concrete	N	[kN]	1,7	3,6	4,8	7,9	11,9	15,9
Displacement	δ_{N0}	[mm]	0,4	0,7	0,9	0,9	1,0	
	$\delta_{N\infty}$	[mm]	1,0				1,3	
Tension load in non-cracked concrete	N	[kN]	3,0	6,3	7,9	13,9	15,9	23,8
Displacement	δ_{N0}	[mm]	0,1	0,1	0,2	0,6	0,9	
	$\delta_{N\infty}$	[mm]	1,0				1,3	

fischer Anchor bolt FAZ

Design method A, characteristic values of resistance to tension loads; displacements

Annex 4
of European Technical Approval
ETA-00/0001

Table 7: Design method A, characteristic values of resistance to shear loads

			FAZ M 8	FAZ M 10	FAZ M 12	FAZ M 16	FAZ M 20	FAZ M 24
Steel failure without lever arm								
Characteristic resistance	$V_{Rk,s}$	[kN]	13	20	30	40	52	86
Partial safety factor	γ_{Ms} [1]		1,5				1,25	1,5
Steel failure with lever arm								
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	389	606
Partial safety factor	γ_{Ms} [1]		1,5				1,25	1,5
Concrete pryout failure								
Factor in equation (5.6) of ETAG Annex C, 5.2.3.3	k		1,0	2,0				
Partial safety factor	$\gamma_{Mc,p}$ [1]		1,5 [2]					
Concrete edge failure								
Effective length of anchor in shear loading	l_f	[mm]	45	60	70	85	100	125
Effective diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	24
Partial safety factor	γ_{Mc} [1]		1,5 [2]					

[1] In absence of other national regulations.
[2] The partial safety factor γ_2 = 1,0 is included.

Table 8: Displacements due to shear loads

			FAZ M 8	FAZ M 10	FAZ M 12	FAZ M 16	FAZ M 20	FAZ M 24
Shear load in cracked and non-cracked concrete	V	[kN]	6,3	12,1	16,2	18,6	29,7	41,0
Displacement	δ_{V0}	[mm]	1,5	2,5	4,0	3,0	5,0	
	$\delta_{V\infty}$	[mm]	2,2	3,7	4,5	6	7,5	