

European Technical Approval ETA-10/0453

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung <i>Trade name</i>	Tecfi Stahldübel DXE <i>Tecfi Steel Anchor DXE</i>
Zulassungsinhaber <i>Holder of approval</i>	Tecfi S.p.A Strada Statale Appia, Km. 193 81050 PASTORANO (CE) ITALIEN
Zulassungsgegenstand und Verwendungszweck <i>Generic type and use of construction product</i>	Kraftkontrolliert spreizender Dübel in den Größen M6, M8, M10 und M12 zur Verankerung im ungerissenen Beton <i>Torque controlled expansion anchor of sizes M6, M8, M10 and M12 for use in non-cracked concrete</i>
Geltungsdauer: <i>Validity:</i>	vom <i>from</i> 13 January 2011 bis <i>to</i> 13 January 2016
Herstellwerk <i>Manufacturing plant</i>	Tecfi S.p.A, Italy

Diese Zulassung umfasst
This Approval contains

15 Seiten einschließlich 8 Anhänge
15 pages including 8 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 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 law of 31 October 2006⁵;
 - 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.
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- 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
² 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 2006, p. 2407, 2416
⁶ Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the construction product

The Tecfi Steel Anchor DXE in the sizes of M6, M8, M10 and M12 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 Annexes 1 and 2.

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.

It may be anchored in non-cracked concrete only.

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 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 Annex 3. The characteristic material values, dimensions and tolerances of the anchor not given in Annex 3 shall correspond to the respective values laid down in the technical documentation⁷ of this European technical approval.

The characteristic values for the design of anchorages are given in Annexes 7 and 8.

Each anchor is marked with the identifying mark of the producer, the trade name, the anchor diameter, the thread size of screw and the effective embedment depth according to Annex 3.

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

⁷ 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 7.

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.

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 system 2(i) (referred to as system 1) of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

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 test 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 for 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 with Deutsches Institut für Bautechnik.⁹

⁸ Official Journal of the European Communities L 254 of 08.10.1996

⁹ The control plan is a confidential part of 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.

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 of 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 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.

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 producer (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 7),
- 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 the 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 the Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 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, 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).

4.3 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,
- anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools,
- use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor,
- hexagonal head screw and washer may be used if the following requirements are fulfilled:
 - material, dimensions and mechanical properties of the metal parts according to the specifications given in Annex 6,
 - 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,
 - Length of hexagonal head screw according to Annex 5, Table 3 shall be complied with.
- 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 in accordance with Annex 5,
- anchor installation such that the effective anchorage depth is complied with. This compliance is ensured, if the leading edge of expander does not more exceed the concrete surface,
- application of the torque moment given in Annex 4 using a calibrated torque wrench.

5 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 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:

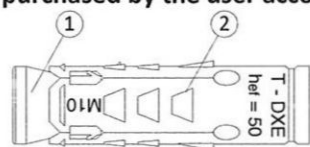
- diameter of drill bit,
- thread diameter,
- maximum thickness of the fixture,
- minimum effective anchorage depth,
- minimum hole depth,
- torque moment,
- information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- reference to any special installation equipment needed,
- identification of the manufacturing batch.

All data shall be presented in a clear and explicit form.

Georg Feistel
Head of Department

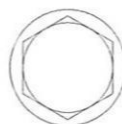
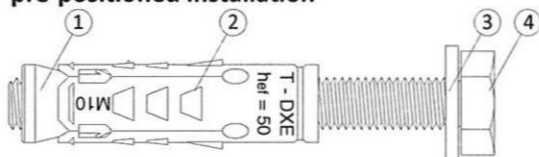
beglaubigt
Tempel

Anchor type DXE00. The hexagon head screw and the washer must be purchased by the user according to table 4 and 5.



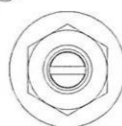
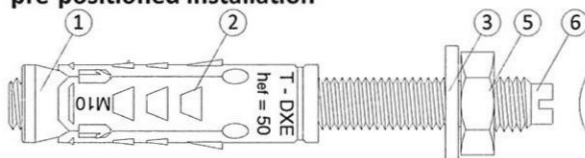
**DXE00
(M6-M12)**

Anchor type DXE01 with hexagon head screw, pre-positioned installation



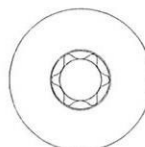
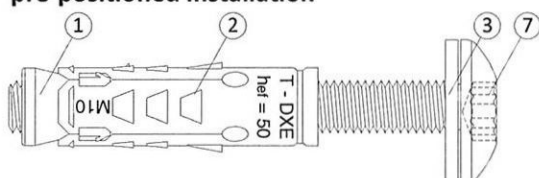
**DXE01
(M6-M12)**

Anchor type DXE03 with threaded stud, pre-positioned installation

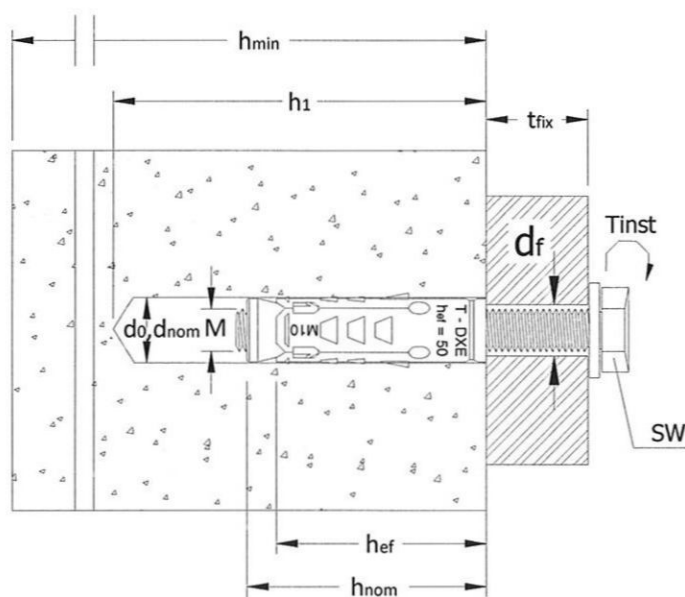


**DXE03
(M6-M12)**

Anchor type DXE04 with mushroom head screw, pre-positioned installation



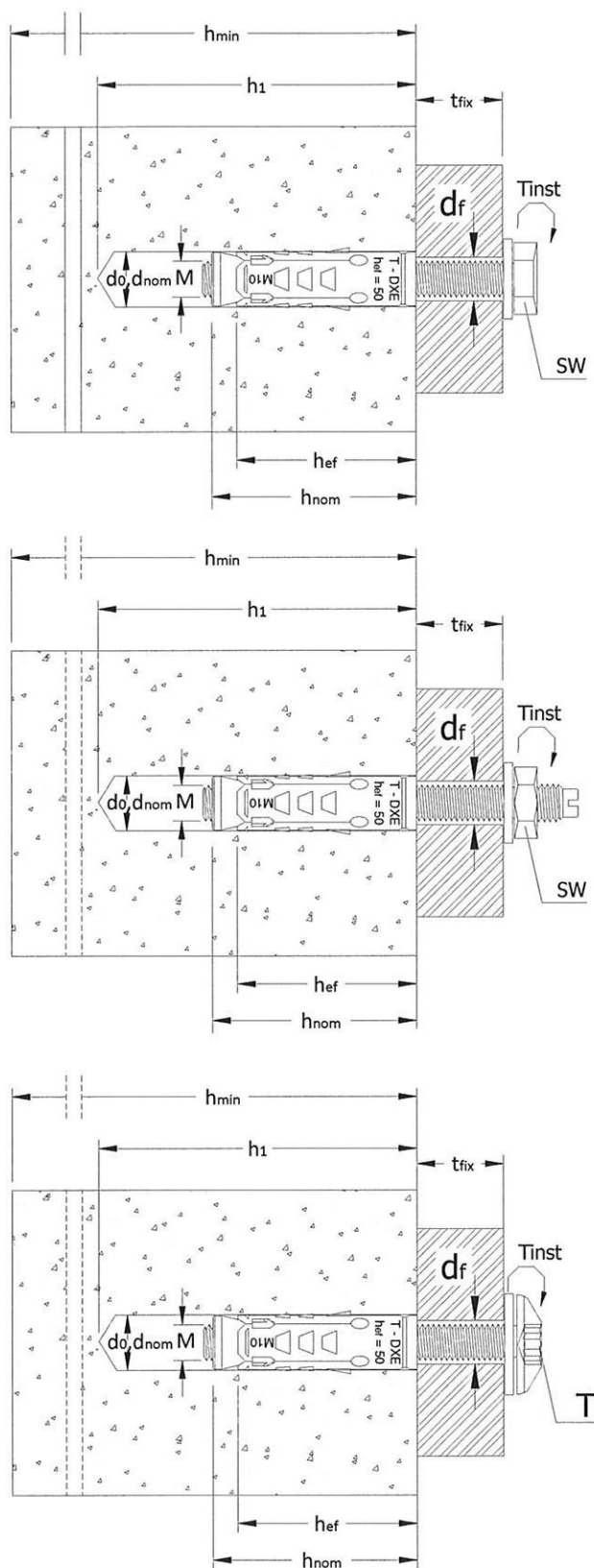
**DXE04
(M8-M10)**



Tecfi Steel Anchor DXE

Product and intended use

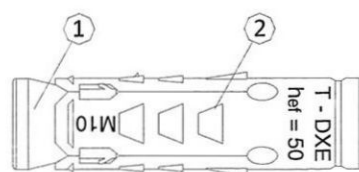
**Annex 1
of European
technical approval
ETA-10/0453**



Tecfi Steel Anchor DXE

Intended use

Annex 2
of European
technical approval
ETA-10/0453

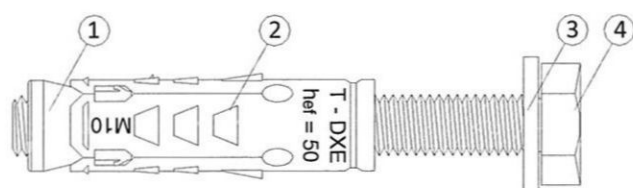


**DXE00
(M6-M12)**

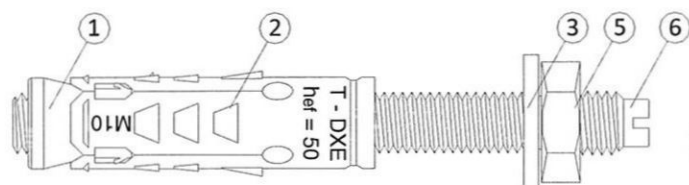
Marking

Expansion sleeve :

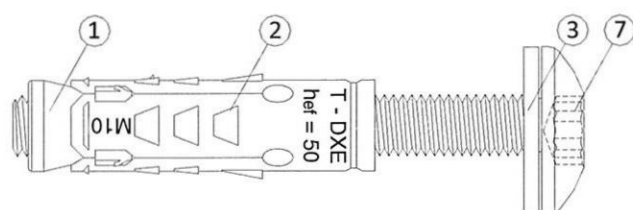
- Identifying mark of producer
- Trade name
- Anchor diameter
- Screw diameter
- Effective embedment depth



**DXE01
(M6-M12)**



**DXE03
(M6-M12)**



**DXE04
(M8-M10)**

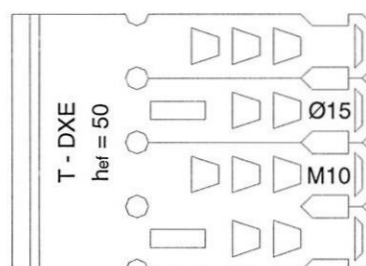


Table 1 : Designation of anchor parts and materials

Part	Description	Materials, (galvanised $\geq 5\mu\text{m}$ according to EN ISO 4042)
1	Conical nut	Steel, Strength class 8, EN ISO 898-2 ¹⁾
2	Expansion sleeve	Steel, EN 10130 - EN 10111
3	Washer	Steel, EN 10263
4	Hexagonal head screw	Steel, Strength class 8.8, EN ISO 898-1
5	Hexagonal nut	Steel, Strength class 8, EN ISO 898-2
6	Threaded stud	Steel, Strength class 8.8, EN ISO 898-1
7	Mushroom head screw	Steel, Strength class 8.8, EN ISO 898-1

¹⁾ Functional coating

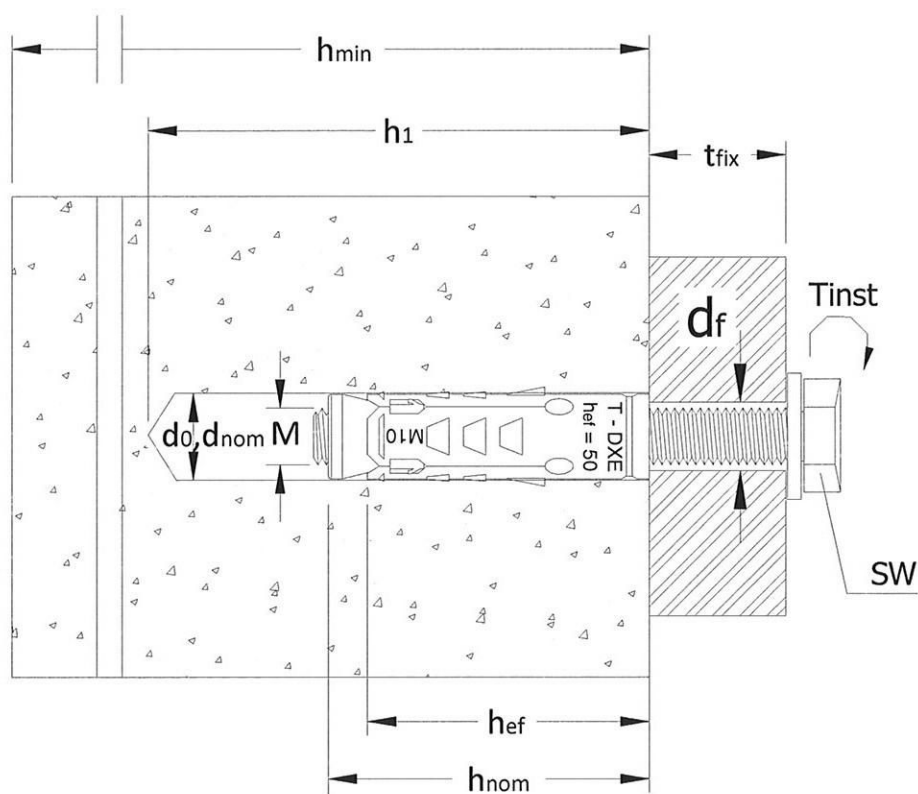
Tecfi Steel Anchor DXE

Marking, Designation of anchor parts and materials

Annex 3
of European
technical approval
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Table 2 : Installation parameters

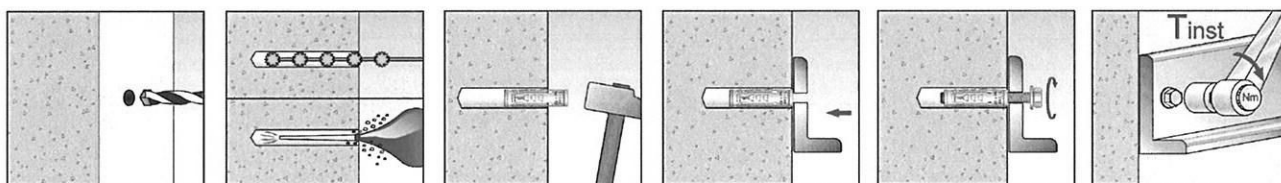
Denomination		DXE M6	DXE M8	DXE M10	DXE M12
Nominal drill hole diameter	$d_o = [\text{mm}]$	10	12	15	18
Cutting diameter of drill bit	$d_{\text{cut}} \leq [\text{mm}]$	10,45	12,50	15,50	18,50
Effective anchorage depth	$h_{\text{ef}} = [\text{mm}]$	40	45	50	65
Depth of drill hole	$h_1 = [\text{mm}]$	60	65	70	95
Diameter of clearance in the fixture	$d_f = [\text{mm}]$	7	9	12	14
Embedment depth of anchor in concrete	$h_{\text{nom}} = [\text{mm}]$	45	50	60	75
Required torque moment	$T_{\text{inst}} = [\text{Nm}]$	8	20	35	60
External diameter of anchor	$d_{\text{nom}} = [\text{mm}]$	10	12	15	18

**Tecfi Steel Anchor DXE****Installation parameters**

Annex 4
of European
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Table 3 : Installation parameters

	Denomination	DXE M6	DXE M8	DXE M10	DXE M12
DXE 00	Length of hexagonal head screw [mm]	$t_{fix} + 45$	$t_{fix} + 50$	$t_{fix} + 60$	$t_{fix} + 80$
	Thickness of fixture $t_{fix,min} = [mm]$	1	1	1	1
	Wrench size $SW = [mm]$	10	13	17	19
DXE 01	Thickness of fixture $t_{fix,min} = [mm]$	5	10	20	20
	$t_{fix,max} = [mm]$	5	10	20	20
	Wrench size $SW = [mm]$	10	13	17	19
DXE 03	Thickness of fixture $t_{fix,min} = [mm]$	5	10	20	20
	$t_{fix,max} = [mm]$	5	10	20	20
	Size of hexagonal socket $SW = [mm]$	10	13	17	19
DXE 04	Thickness of fixture $t_{fix,min} = [mm]$		10	20	
	$t_{fix,max} = [mm]$		70	60	
	6 lobe recess T		40	40	



- Make a drill hole with a hammer drilling.
- Clean the drill hole with a brush.
- Put the anchor (sleeve plus conical nut) into the drilled hole.
- Placing the fixture.
- Setting the screw.
- Apply the required installation torque.

Tecfi Steel Anchor DXE**Installation parameters and installation instruction**

Annex 5
of European
technical approval
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Table 4 : Selection criteria for hexagonal head screw for DXE 00

Description	DXE M6	DXE M8	DXE M10	DXE M12
Length of hexagonal head screw (mm)	$t_{fix} + 45$	$t_{fix} + 50$	$t_{fix} + 60$	$t_{fix} + 80$
Thread size	M6	M8	M10	M12
Standardization	EN ISO 4017 / DIN 933			
Material	Steel, Strength class 8.8, EN ISO 898-1			
Treatment	Zinc Plated acc. to EN ISO 4042, min. 5µm			

Table 5 : Selection criteria for the washer for DXE 00

Description	DXE M6	DXE M8	DXE M10	DXE M12
Size	M6	M8	M10	M12
Standardization	EN ISO 7089			
Material	Steel, Hardness class HV200			
Treatment	Zinc Plated acc. to EN ISO 4042, min. 5µm			

Table 6 : Minimum thickness of concrete member, minimum spacing and minimum edge distance

Denomination		DXE M6	DXE M8	DXE M10	DXE M12
Minimum thickness of concrete member	$h_{min} = [mm]$	100	100	100	130
Minimum edge distance	$c_{min} = [mm]$	50	80	100	130
Minimum spacing	$s_{min} = [mm]$	70	110	130	160

Tecfi Steel Anchor DXE**Selection criteria for screw and washer (for DXE00),
minimum spacing and edge distance****Annex 6**
of European
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Table 7 : Design Method A, Characteristic values to tension loads

Type of anchor / Size			DXE M6	DXE M8	DXE M10	DXE M12
Steel Failure						
Characteristic Resistance	N _{Rk,s}	[kN]	16	29	46	67
Partial safety factor	γ _{Ms} ¹⁾		1,5			
Pull-out failure						
Effective embedment depth	h _{ef}	[mm]	40	45	50	65
Characteristic Resistance in uncracked concrete C20/25	N _{Rk,p}	[kN]	6	9	12	16
Increasing factors for N _{Rk,p} in uncracked concrete	Ψ _c	C30/37	1,04	1,22	1,12	1,08
		C40/50	1,08	1,41	1,23	1,15
		C50/60	1,10	1,55	1,30	1,19
Partial safety factor	γ _{Mp} ¹⁾		1,5 ²⁾	1,5 ²⁾	1,8 ³⁾	1,5 ²⁾
Concrete cone failure and splitting failure						
Effective embedment depth	h _{ef}	[mm]	40	45	50	65
Spacing	s _{cr,N}	[mm]	120	135	150	195
Edge distance	c _{cr,N}	[mm]	60	67,5	75	97,5
Spacing (splitting)	s _{cr,sp}	[mm]	390	410	560	540
Edge distance (splitting)	c _{cr,sp}	[mm]	195	205	280	270
Partial safety factor	γ _{Mc} ¹⁾		1,5 ²⁾	1,5 ²⁾	1,8 ³⁾	1,5 ²⁾

¹⁾ In absence of other national regulations²⁾ The partial safety factor $\gamma_2=1,0$ is included³⁾ The partial safety factor $\gamma_2=1,2$ is included**Table 8 : Displacements under tension loads**

Type of anchor / Size			DXE M6	DXE M8	DXE M10	DXE M12
Tension load	N	[kN]	2,9	4,3	4,8	7,6
Displacements	δ_{N0}	[mm]	0,29	0,04	0,07	0,16
	$\delta_{N\infty}$	[mm]	0,48			

Tecfi Steel Anchor DXE

Design Method A,
Characteristic values of resistance and displacement
under tension loads

Annex 7
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Table 9 : Design Method A, Characteristic values to shear loads

Type of anchor / Size			DXE M6	DXE M8	DXE M10	DXE M12
Steel Failure without level arm						
Characteristic Resistance	$V_{Rk,s}$	[kN]	7,5	12	20	30
Partial safety factor	$\gamma_{Ms}^{1)}$		1,5			
Steel Failure with level arm						
Characteristic bending moment	$M_{Rk,s}^0$	[Nm]	12,2	30,0	59,8	104,8
Partial safety factor	$\gamma_{Ms}^{1)}$		1,5			
Concrete pryout failure						
Effective embedment depth	h_{ef}	[mm]	40	45	50	65
Factor in equation (5.6) ETAG 001, Annex C, Section 5.2.3.3	K		1	1	1	2
Partial safety factor	$\gamma_{Mp}^{1)}$		1,5 ²⁾	1,5 ²⁾	1,8 ³⁾	1,5 ²⁾
Concrete edge failure						
Effective anchorage leghth	l_{ef}	[mm]	40	45	50	65
Effective external diameter anchor	d_{nom}	[mm]	10	12	15	18
Partial safety factor	$\gamma_{Mc}^{1)}$		1,5 ²⁾	1,5 ²⁾	1,8 ³⁾	1,5 ²⁾

¹⁾ In absence of other national regulations²⁾ The partial safety factor $\gamma_2=1,0$ is included³⁾ The partial safety factor $\gamma_2=1,2$ is included**Table 10 : Displacements under shear loads**

Type of anchor / Size			DXE M6	DXE M8	DXE M10	DXE M12
Shear load	V	[kN]	4,3	7,6	11,9	14,3
Displacements	δ_{N0}	[mm]	1,12	1,40	2,19	2,05
	$\delta_{N\infty}$	[mm]	1,68	2,11	3,29	3,07

Tecfi Steel Anchor DXE

Design Method A,
Characteristic values of resistance and displacement
under shear loads

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