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Bautechnisches Prüfamt
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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-11/0465

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	fischer-Zykon-Plattenanker FZP II T für "Royal Mosa Feinsteinzeug" *fischer-Zykon-panel anchor FZP II T for "Royal Mosa stoneware"*
Zulassungsinhaber *Holder of approval*	fischerwerke GmbH & Co. KG Weinhalde 14-18 72178 Waldachtal DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Spezialanker zur rückseitigen Befestigung von Fassadenplatten aus keramischen Platten "Royal Mosa Feinsteinzeug" nach EN 14411 *Special Anchor for the rear fixing of façade panels made of ceramic plates "Royal Mosa stoneware" according to EN 14411*
Geltungsdauer: *Validity:*	vom *from* 13 December 2011 bis *to* 13 December 2016
Herstellwerk *Manufacturing plant*	fischerwerke

Diese Zulassung umfasst *This Approval contains*	19 Seiten einschließlich 11 Anhänge *19 pages including 11 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], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- 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[4], as amended by law of 31 October 2006[5];
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6].

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
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 fischer-Zykon-panel anchor FZP II T is a special anchor of size M 6 which consists of a cone bolt with external thread, made of stainless steel, an expansion part made of stainless steel, a shim washer made of polyamide and, if need to be, a hexagon nut made of stainless steel or aluminium. The anchor is put into an undercut drill hole in the façade panels and is placed form-fit by driving-in the shim washer or by applying a torque moment to the hexagon nut.

Annex 1 shows the anchor at built-in state.

1.2 Intended use

The fischer-Zykon-panel anchor FZP II T may be used for the rear fixing of "Royal Mosa stoneware" - façade panels. The "Royal Mosa stoneware" - façade panels shall correspond to the group BI_a according to EN 14411 and to the specifications given in this European technical approval.

The façade panels with rear fixing by the anchor may only be used for front curtain walls. As a rule each façade panel shall be fixed technically restrain-free with at least four anchors in a rectangular arrangement via single agraffes on a capable substructure (for small panels or small fitted pieces, differential or fill- in pieces the number and position of the anchors shall be chosen constructively).

The anchor may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), 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 desulphurisation 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 method of verification

2.1 Characteristics of the product

The anchor corresponds to the drawings and specifications given in Annex 2 and 3. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annex 2 and 3 shall correspond to the respective values laid down in the technical documentation[7] of this European technical approval.

[7] The technical documentation comprises all information necessary for the production, installation and maintenance of the anchor; these are in particular the design drawings and the installation instructions. The part to be treated confidentially is deposited with Deutsches Institut für Bautechnik and, as far as this is relevant to the tasks of the approved bodies involved in the procedure of attestation of conformity, shall only be handed over to the approved body.

The anchor is considered to satisfy the requirements for performance class A1 of the characteristic reaction to fire, in accordance with the provisions of EC decision 96/603/EC (as amended) without the need for testing on the basis of its listing in that decision.

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.

The characteristic values for the design of the façade panels with rear fixing by the anchor are given in Annex 6.

Every anchor is marked with the identifying mark of the producer and the anchorage depth according to Annex 3. The hexagon nut is marked with "Al" for Aluminium or "A4" for stainless steel according to Annex 3.

The anchor shall be packed and delivered as fixing unit (cone bolt, expansion part and shim washer). The hexagon nut may be packed and delivered separately.

2.2 Methods of verification

The assessment of fitness of the anchor for the intended use in relation to the requirement for safety in use in the sense of the essential requirement N°4 of Council Directive 89/106/EEC has been made based on the following tests carried out:

(1) Axial tension tests
(2) Shear tests
(3) Tests with combined tension and shear loading
(4) Tests on structural members
(5) Tests on functioning under repeated loads
(6) Tests on functioning under sustained loads
(7) Tests on functioning under freeze/thaw conditions (25 freeze/thaw cycles)
(8) Tests on functioning after immersion in water.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the communication of the European Commission[8] the system 2 (ii)-1 (referred to as System 2+) of attestation of conformity applies.

These systems of attestation of conformity are defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

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

[8] Letter of the European Commission of 22/07/2002 to EOTA

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 materials and components stated in the technical documentation of this European Technical Approval.

The factory production control shall be in accordance with the control plan[9] 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.

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.

3.2.2 Tasks of approved bodies

The approved body shall perform the following tasks in accordance with the provisions laid down in the control plan:

- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control.

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 factory production control 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.

[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.

3.3 CE marking

The CE marking shall be affixed on the packaging or accompanying commercial document, e.g. the EC declaration of conformity. 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 manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,
- the number of the European technical approval,
- use category (25 freeze/thaw cycles),
- size.

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

4.1 Manufacture

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 ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alterations to the ETA shall be necessary.

4.2 Installation

4.2.1 Design of the fixings

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

- The "Royal Mosa stoneware" - façade panels shall correspond to the group BI_a according to EN 14411 and to the specifications given in Annex 6.
- As a rule each façade panel is fixed with at least four anchors in rectangular arrangement via single agraffes to the substructure (for small panels or small fitted pieces, differential or fill- in pieces the number and position of the anchors shall be chosen constructively); the characteristic values of the anchor, the edge distances and spacing, as well as the characteristic values of the panels according to Annex 6 are observed.
- The façade panels are arranged in a "reclined" or "upright" position, they also may be fixed at façade soffits.
- The façade panels neither are used to transmit impact loads nor for guard rail.
- The substructure is constructed such that the façade panels are fixed technically restrain-free via sliding bearings and one fixed bearing (see Annex 11). Two fixing points of the façade panel are designed such that they are able to carry the dead load of the façade panel. When using agraffes on horizontal load-bearing profiles the fixing points of a façade panel situated horizontally at the same height are fastened in each case to the same load-bearing profile.
- Joint constructions between the façade panels are done by a joint profile, permanently elastic filler or are kept open; it is ensured that additional stresses (e.g. by temperature) do not lead to important additional loadings.

- The façade panels, their fixings as well as the substructure including its connection to wall brackets and their connection to the construction works are designed under the responsibility of an engineer skilled in the field of façade construction taking account the load effects (dead load, wind load) for the respective case of application; the stiffness of the substructure will be considered for the respective case of application; taking account of the loads to be fixed checkable calculations and construction drawings are prepared; the position of the anchor is given in the construction drawings.
- When using horizontal load-bearing profiles the following shall be verified:
  - The agraffes do not prop on the façade panel due to torsion of the horizontal load-bearing profile and twisting of the façade panel.
  - The total of the angle α results from torsion of the horizontal load-bearing profile and twisting of the façade panel at the fixing point does not exceed the value $\alpha = 2°$.
- Design of the anchor and the façade panels is carried out according to the design method according to Annexes 7 to 11.
- The characteristic wind loads for selective panel sizes and bearing conditions given in Annex 9, Table 5 apply only, if the substructure (horizontal and vertical profiles) and their fixings are arranged symmetrically.

4.2.2 Installation of the anchors

The fitness for use of the anchor can be assumed only, if the following installation conditions are observed:

- Installation by appropriately qualified personnel under the supervision of the project supervisor
- Installation only as delivered by the manufacturer without exchanging the individual parts.
- Installation according to manufacturer's specifications and construction drawings using the tools indicated in the installation instructions.
- Keeping of the edge distance and spacing to the specified values.
- Making of the undercut drilling is done with the drill bit according to Annex 4 and a special drilling device in according with the information deposited with Deutsches Institut für Bautechnik.
- The drillings are done at the factory or on site under workshop conditions; when making the drillings on site the execution is supervised by the responsible project supervisor or a skilled representative of the project supervisor.
- Keeping the setting depth according to Annex 4
- The drillings are removed from the drill hole; the nominal diameter of the drill corresponds to the values of Annex 4; in case of aborted drill hole a new drilling at a minimum spacing of at least twice the depth of the aborted drill hole is arranged.
- The geometry of the drill hole is checked on 1 % of all drillings. The following dimensions shall be checked and documented according to manufacturer's information and testing instructions by means of a measuring device according to Annex 5:
  - Diameter of the cylindrical drill hole
  - Diameter of the undercut (gauges according to Annex 5)
  - Remaining wall thickness (drill hole depth and panel thickness respectively)

  If the tolerances given in Annex 4 are exceeded, the geometry of the drill hole shall be checked on 25 % of the drillings performed. No further drill hole may exceed the tolerances otherwise all the drill holes shall be controlled. Drilling holes falling below or exceeding the tolerances shall be rejected.

Note: Checking the geometry of the drill hole on 1 % of all drillings means that on one of the 25 panels (this corresponds to 100 drillings) one drilling shall be checked. If the tolerances given in Annex 4 are exceeded the extent of the control shall be increase to 25 % of the drillings, i.e. one drilling each shall be checked on all the 25 panels.

- The installation of the anchor is performed with a torque wrench only or with a drive-in device specifically for this purpose and a setting device respectively (see Annex 4)
- The positive fit of the anchor in the drill hole is checked as follows:
  - Stand-off fixing anchor → Measuring the projection of the bolt "b" acc. Annex 2
- During transport and storage on site the façade panels are protected from damages; the façade panels are not be hung up jerkily (if need be lifters shall be used for hanging up the façade panels); façade panels with incipient cracks are not be installed.
- The façade are installed by skilled specialists and the laying instructions of the manufacturer shall be paid attention to.

5 Indications to the manufacturer

It is the responsibility of the manufacturer 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 illustrate on(s).

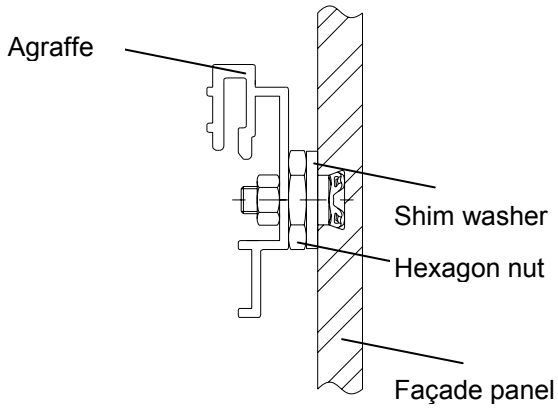
The minimum data required are:

- maximum possible anchorage depth;
- diameter of the cylindrical drilling;
- free thread length after setting anchor (bolt projection length "b" according Annex 2).

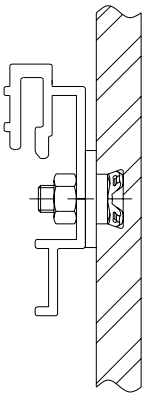
All data shall be presented in a clear and explicit form.

Georg Feistel
Head of Department

beglaubigt:
Scheller

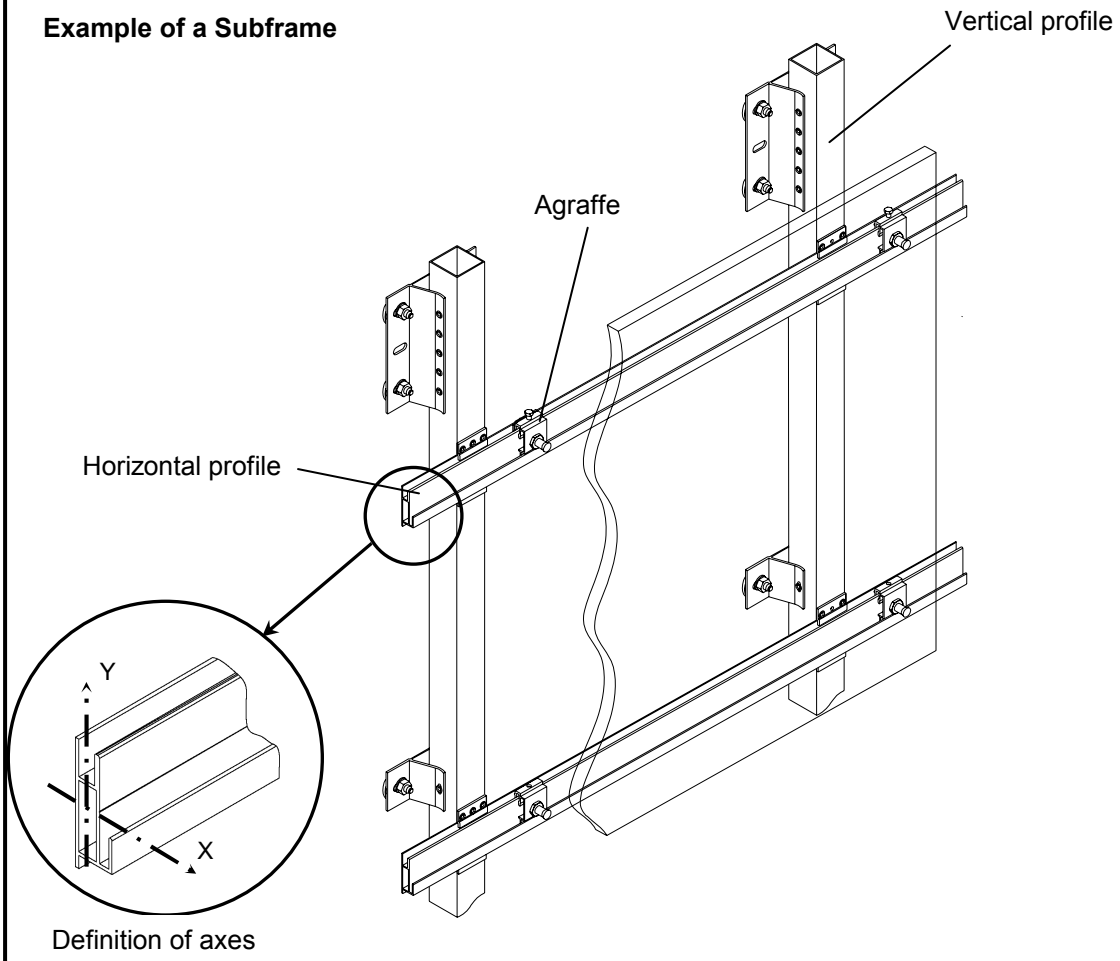


with hexagon nut



without hexagon nut

Example of a Subframe



Definition of axes

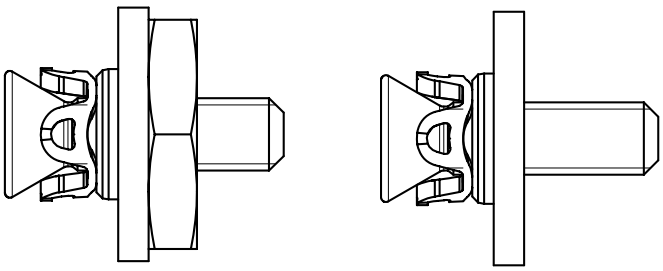
fischer-Zykon-panel anchor FZP II T	**Annex 1**
Product and application	**of European Technical Approval** **ETA-11/0465**

Types of anchors

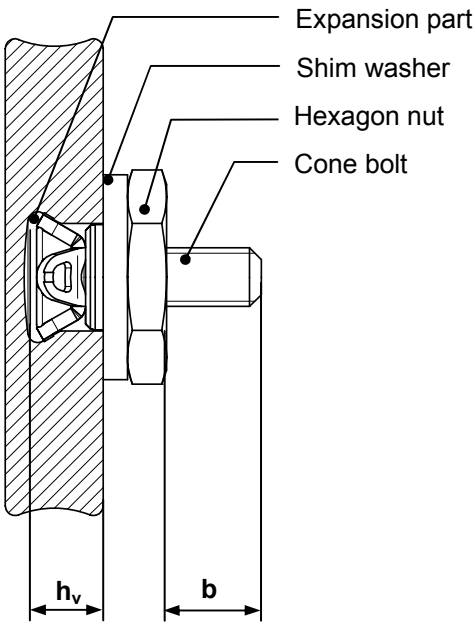
Anchor with external thread M6

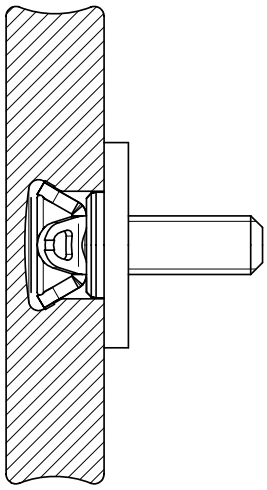
with hexagon nut **without hexagon nut**

FZP II T



Types of mounting / System of designation





Optional without hexagon nut

Example:

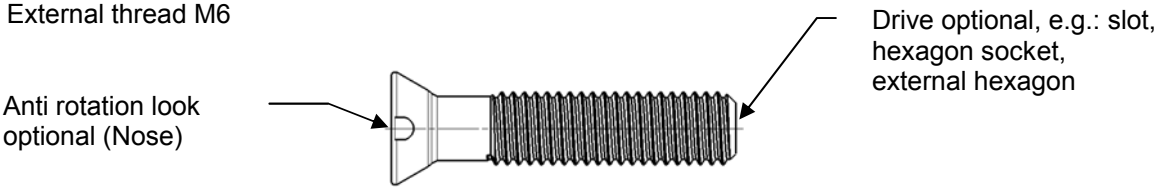
FZP II 11x6 M6 T/9 AI

- AI: Hexagon nut material (optional)
- T/9: Bolt projection length **b**
- T: Thin materials
- M6: Thread diameter
- 6: Installed anchor length
- 11: Cylindrical drill hole ∅
- FZP II: **F**ischer **Z**ykon **P**anel anchor II
  Drill hole geometry: cylindrical conical

fischer-Zykon-panel anchor FZP II T	**Annex 2** **of European Technical Approval** **ETA-11/0465**
Product and built-in state	

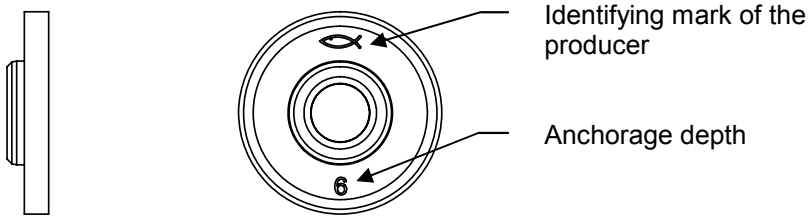
Anchor parts and materials

Cone bolt
External thread M6



Expansion part
For cone bolts with external thread M6

Shim washer
For cone bolts with external thread M6



Hexagon nut
For cone bolts with external thread M6

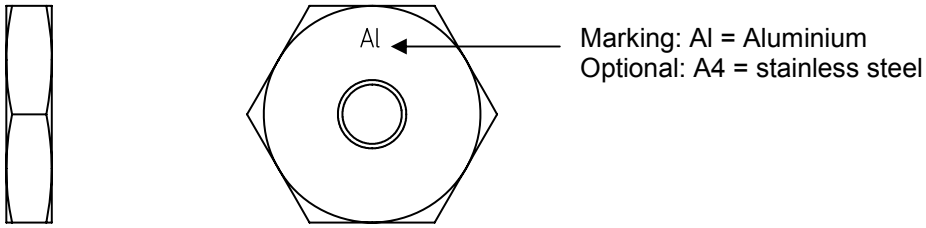


Table 1: Material of anchor parts

Anchor parts	Material
Cone bolt	Stainless steel, EN 10088 (Corrosion resistance class III, Z-30.3-6)
Expansion part	Stainless steel, EN 10088 (Corrosion resistance class III, Z-30.3-6)
Shim washer	Polyamide 6.6
Hexagon nut	Aluminium, EN 755 optional: Stainless steel, EN 10088 (Corrosion resistance class III, Z-30.3-6)

fischer-Zykon-panel anchor FZP II T	**Annex 3** **of European Technical Approval** **ETA-11/0465**
Parts of anchor and material	

Drill bit | **Dimension of drill hole**

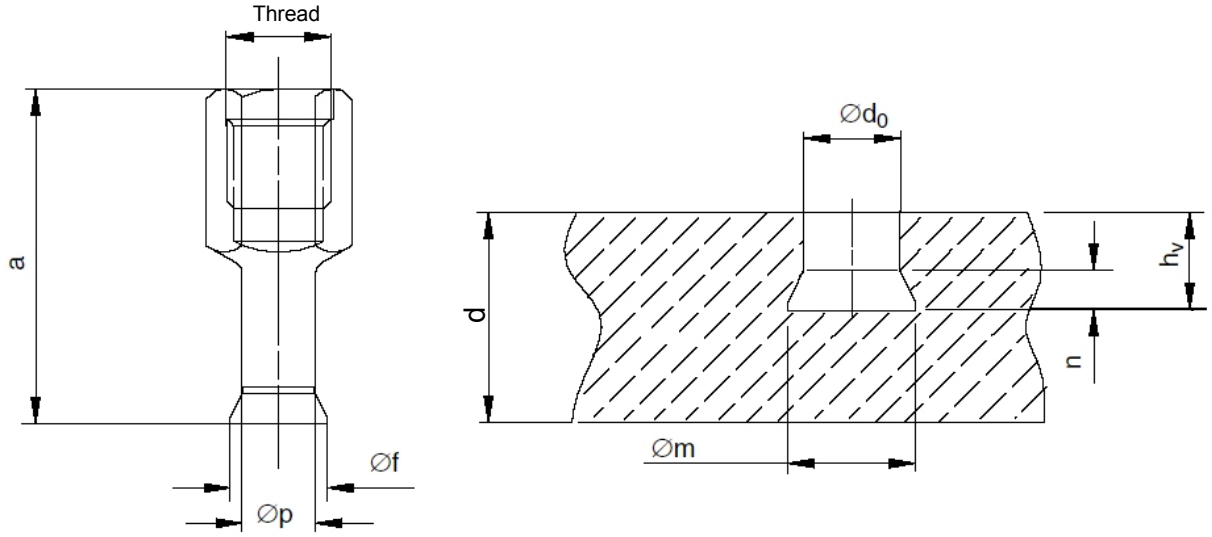


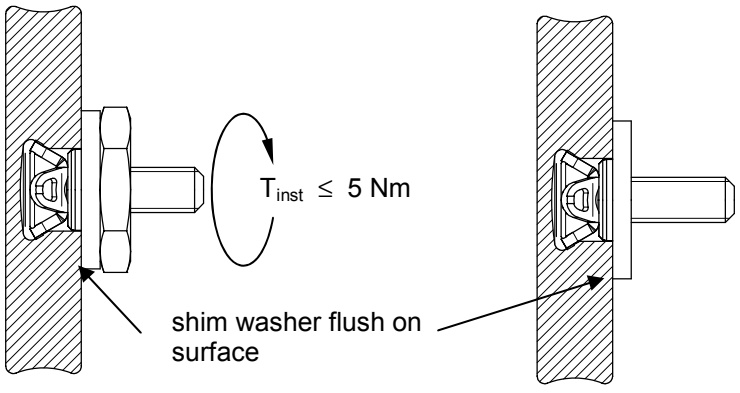
Table 2: Drill bit assignment and dimensions of drill bit and drill hole [mm]

Drill bit					
Type	Thread		a	∅ p	∅ f
FZPB 11 (9)[2)]	M14		45	8,5 (6,5)[2)]	11 (9)[2)]
Drill hole	∅ d_0 [1)]	∅ m [1)]	FZP II T	n	h_v
	11 $^{+0,4}_{-0,2}$	13,5 ± 0,3	M6	≈ 4	6; 8; 9; $^{+0,4}_{-0,1}$

[1)] Measurements can be proved by diameter or volume gauge (see Annex 5)
[2)] Drill bit for different drill methods respectively drilling machine

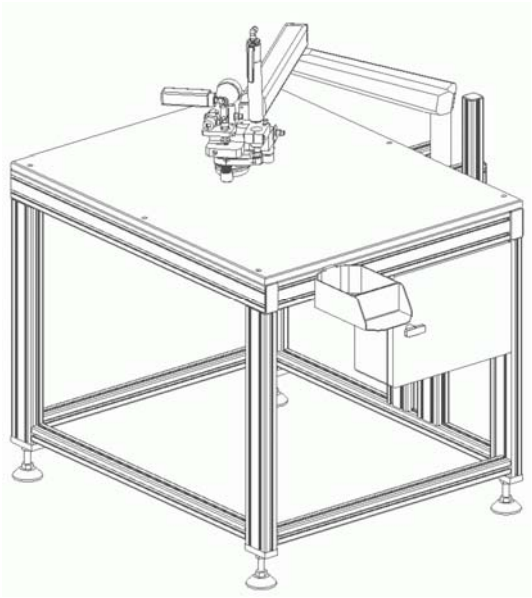
Table 3: Installation parameters

Anchor type			FZP II T 11x6	FZP II T 11x8	FZP II T 11x9
Anchorage depth	h_v =	[mm]	6	8	9
Panel thickness	d ≥	[mm]	10	12	13

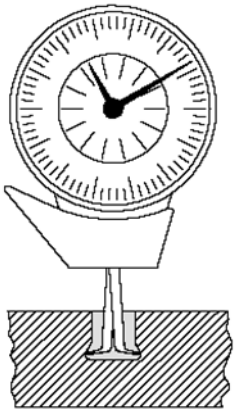


fischer-Zykon-panel anchor FZP II T	**Annex 4** **of European Technical Approval** **ETA-11/0465**
Drill bit, geometry of the drill hole and Installation parameters	

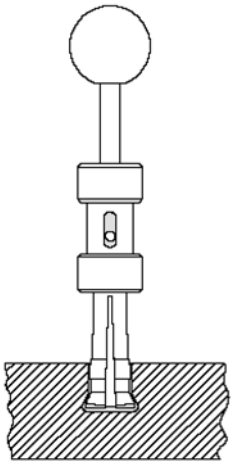
Example of an anchor setting device



Testing equipment for checking the undercut

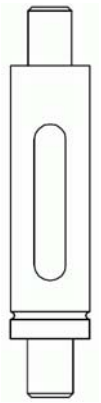


Dial gauge



Undercut minimum volume gauge

Go/ no Go gauge for checking cylindrical drill hole diameter



fischer-Zykon-panel anchor FZP II T	**Annex 5**
Setting devices and testing equipment	**of European Technical Approval** **ETA-11/0465**

Characteristic values of anchors and panels

Table 4: Characteristic values

panel values[1)]	Nominal panel thickness	$d \geq$	[mm]	10; 12 and 13		
	Maximum size of panel	A =	[m²]	1,5		
	Maximum side length	L =	[m]	1,5		
	Minimum number of anchors in rectangular arrangement [2)]		[St]	4		
	Characteristic bending strength [3)]	σ_{Rk} =	class	A	B	C
			[N/mm²]	≥ 35	≥ 40	≥ 45
	Elastic modulus	E =	[N/mm²]	30.000		
	Poisson ratio	ν =	[-]	0,2		
	Density	γ =	[kN/m³]	25		
	Partial safety factor [4)]	γ_M =	[-]	1,8		

anchor values FZP II T	Nominal panel thickness	$d \geq$	[mm]	10	12	13
	Anchorage depth	h_v =	[mm]	6	8	9
	Characteristic tension load [5,6)]	N_{Rk} =	[kN]	1,8	3,1	3,5
	Characteristic shear load [5,6)]	V_{Rk} =	[kN]	3,0	3,6	3,8
	Edge distance [7)]	$a_r \geq$	[mm]	50		
	Spacing [7)]	$a \geq$	[mm]	100		
	Partial safety factor [4)]	γ_M =	[-]	1,8		

1) The façade panels have to be classified according to EN 14411 "Ceramic tiles" and have to fulfil the requirement of class BI_a according to EN 14411.

2) For panels smaller than 0,3 m² the number of anchors might be reduced to 3, due to the low level of loading.

3) The test of the bending strength is according to EN ISO 10545-4 with the visible layer on the top. Differing to EN ISO 10545-4 the length of the testing body is l/b = 400/200 mm and the width between the supports l_s = 300 mm.

4) In absence of other national regulations.

5) For interaction of tension and shear load equation (3) (Annex 8) is decisive.

6) The characteristic resistance is independent of the characteristic bending strength class.

7) For small fitted pieces, differential or fill-in pieces the minimum edge distance or spacing shall be chosen constructively.

Design method

General

The design values of the actions shall be calculated on basis of EN 1990 in consideration of the existing loads. The combinations of actions shall be equal to EN 1990. The actions shall be specified according to EN 1991-1-1 to EN 1991-1-7. Corresponding national regulations shall be taken into consideration. The unfavourable combination is decisive. Where necessary for the design of the anchor and the façade panel several combinations shall be analysed separately.
The typical fundamental combination for façade panels considers actions from dead load $F_{Sk.G}$ (permanent action) and wind $F_{Sk.w}$ (leading variable action).
According to EN 1990 the following fundamental combination depending on the load direction results for a vertical façade panel:

Fundamental combination for loads parallel to the panel: $F_{Sd||} = F_{Sk,G} \bullet \gamma_G$

Fundamental combination for loads perpendicular to the panel: $F_{Sd\perp} = F_{Sk,w} \bullet \gamma_Q$

with $\gamma_G = 1{,}35$; $\gamma_Q = 1{,}50$

For hanging panels (over head mounting) or reveals respectively the load direction shall be taken into consideration and the combinations of actions shall be based on EN 1990.
The calculation shall be carried out in a linear elastic manner. The stiffness of the subframe shall be considered for the respective case of application. The design values of the actions shall be compared with the design values of the resistance.

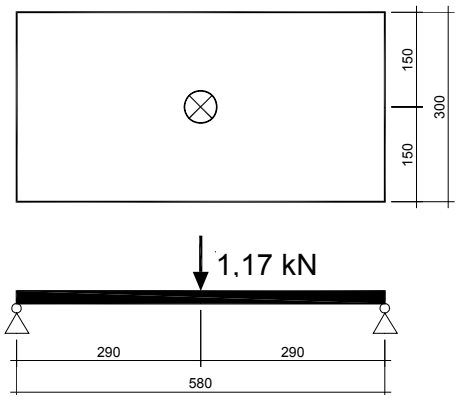
Guideline for structural calculation by means of FE - method

For structural calculation by means of the Finite-Element-Method the façade panels are to be idealized with their effective dimensions (size and thickness) as panel elements; the system chosen shall have the capacity to sufficiently precise represent the tension and the deformation state as well as the support reactions of the façade panels. The mesh size at fixing range shall not exceed 10 mm.

The modelling of the façade panel is to be calibrated on the basis of the following points:

- modelling a panel section of 580 mm x 300 mm with a panel thickness of 12 mm
- support at the short sides with rotable restraint
- loading at centre with a single load of 1,17 kN
- determination of a factor $f_{cal.FE} = 58{,}8 / \sigma_{FE}$
- the determined bending stresses shall be multiplied with factor $f_{cal.FE}$ ($\sigma_{Sk} = \sigma_{FE} \bullet f_{cal.FE}$); the factor $f_{cal.FE}$ shall only be considered for stresses due to support moments.

  σ_{FE} = maximum of main tensile stress [N/mm²]



fischer-Zykon-panel anchor FZP II T	Annex 7 of European Technical Approval ETA-11/0465
Design	

Verification of the anchor loads

For the determined anchor forces it shall be verified that the equation (1) and (2) are fulfilled. For combined tension and shear forces additional equation (3) has to be fulfilled.

Tension / compression load: $$\frac{N_{Sd}}{N_{Rd}} \leq 1{,}0 \quad \textbf{(1)}$$

Shear load: $$\frac{V_{Sd}}{V_{Rd}} \leq 1{,}0 \quad \textbf{(2)}$$

interaction oblique tension: $$\frac{N_{Sd}}{N_{Rd}} + \frac{V_{Sd}}{V_{Rd}} \leq 1{,}0 \quad \textbf{(3)}$$

with:

N_{Sd} = design value of existing anchor tension load

V_{Sd} = design value of existing anchor shear load

N_{Rd} = design value of anchor load-bearing capacity for tension load: $N_{Rd} = \frac{N_{Rk}}{\gamma_M}$

V_{Rd} = design value of anchor load-bearing capacity for shear load: $V_{Rd} = \frac{V_{Rk}}{\gamma_M}$

N_{Rk} = characteristic resistance tension (Annex 6)

V_{Rk} = characteristic resistance shear (Annex 6)

γ_M = partial safety factor (Annex 6)

Verification of the bending stresses

For the determined bending stresses it shall be verified, that the following equation is met:

$$\sigma_{Sd} \leq \sigma_{Rd} \quad \textbf{(4)}$$

with

σ_{Sd} = design value of existing bending stress in the façade panel

σ_{Rd} = design value of bending strength: $\sigma_{Rd} = \frac{\sigma_{Rk}}{\gamma_M}$

σ_{Rk} = characteristic design value of bending strength (Annex 6)

Characteristic wind loads for selective panel sizes and bearing conditions

In Table 5 (Annex 9) several panel systems are listed as a function of the slap thickness, the anchorage depth, the edge distance, the panel size, the number of agraffes and the kind of support.
The prove of structural stability is fulfilled if the characteristic wind load w_{Sk} does not exceed the values of $w_{Sk,Tab}$ in Table 5.

$$w_{Sk} \leq w_{Sk,Tab}$$

with:

w_{Sk} = characteristic wind load

$w_{Sk,Tab}$ = Table value of characteristic wind loads

fischer-Zykon-panel anchor FZP II T	**Annex 8**
Design method	**of European Technical Approval** **ETA-11/0465**

Table 5: Characteristic wind loads

System	d ≥ [mm]	h_v = [mm]	$a_{rx,1}$ $a_{ry,2}$ [mm]	$a_{ry,1}$ $a_{rx,2}$ [mm]	Panel length x width [mm]	Agraffes	Kind of supports acc. Annex 11	Strength class A Characteristic wind load $w_{Sk,Tab}$ [kN/m²]	Strength class B Characteristic wind load $w_{Sk,Tab}$ [kN/m²]	Strength class C Characteristic wind load $w_{Sk,Tab}$ [kN/m²]
1	10	6	50-150	50-150	600 x 600	4	Figure 5	3,5	3,9	4,4
	12	8						5,0	5,7	6,4
	13	9						5,8	6,7	7,5
2	10	6	50-150	50-200	600 x 900	4	Figure 5	2,1	2,4	2,7
	12	8						3,1	3,5	3,9
	13	9						3,6	4,1	4,6
3	10	6	50-150	100-250	600 x 1200	4	Figure 5	1,5	1,7	1,9
	12	8						2,1	2,4	2,8
	13	9						2,5	2,9	3,2
4	10	6	50-200	50-200	750 x 750	4	Figure 5	1,9	2,2	2,5
	12	8						2,8	3,2	3,6
	13	9						3,3	3,7	4,2
5	10	6	100-200	100-200	900 x 900	4	Figure 5	1,6	1,8	2,0
	12	8						2,3	2,6	2,9
	13	9						2,7	3,0	3,4
6	10	6	100-225	150-250	900 x 1200	4	Figure 5	1,1	1,3	1,4
	12	8						1,6	1,8	2,1
	13	9						1,9	2,1	2,4
7	10	6	100-200	100-200	1000 x 1000	4	Figure 5	1,3	1,5	1,6
	12	8						1,8	2,1	2,4
	13	9						2,2	2,5	2,8
8	10	6	100-250	100-250	1200 x 1200	4	Figure 5	0,8	0,9	1,0
	12	8						1,2	1,3	1,5
	13	9						1,4	1,6	1,8
9	10	6	50-100	125-150	600 x 1200	6[1)]	Figure 6 and 7	1,8	2,0	2,3
	12	8						2,6	2,9	3,3
	13	9						3,0	3,4	3,9
10	10	6	150-200	125-175	900 x 1200	6[1)]	Figure 6 and 7	1,2	1,4	1,6
	12	8						1,8	2,0	2,3
	13	9						2,1	2,4	2,7
11	10	6	150-200	100-150	1000 x 1000	6[1)]	Figure 6 and 7	1,4	1,6	1,8
	12	8						2,1	2,3	2,6
	13	9						2,4	2,7	3,1
12	10	6	200-250	150-200	1200 x 1200	6[1)]	Figure 6 and 7	1,0	1,2	1,3
	12	8						1,5	1,7	1,9
	13	9						1,7	2,0	2,3

[1)] - The subframe has to be symmetrical.
For further constructional requirements refer to Annex 10, Figure 1-4.

- The moment of inertia of profiles, supporting three fixing points of a panel, must be minimum

  I_Y [cm⁴] = 26,1 • L_i [m] – 19,4.

  valid for: $0,75 \leq L_i \leq 1,4$ L_i : equivalent support width (Annex 10, Figure 4)

  I_y : The moment of inertia of profiles, in direction parallel to the façade panel layer (resistance normal to the façade panel layer – see Annex 1).
  The module of elasticity of the profiles has to be E ≥ 70000 N/mm².

fischer-Zykon-panel anchor FZP II T	**Annex 9**
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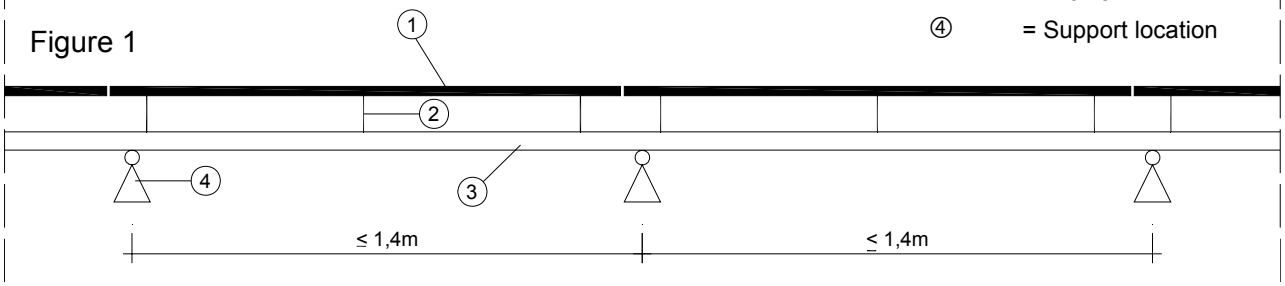
Maximum support spacing and location of the subframe fixings

Caption:

① = Panel
② = Fixing point
③ = Profile
④ = Support location

Figure 1



- Profiles, supporting three fixing points of a panel, have a maximum spacing of the supports of 1,4 m (see Figure 1)

Figure 2

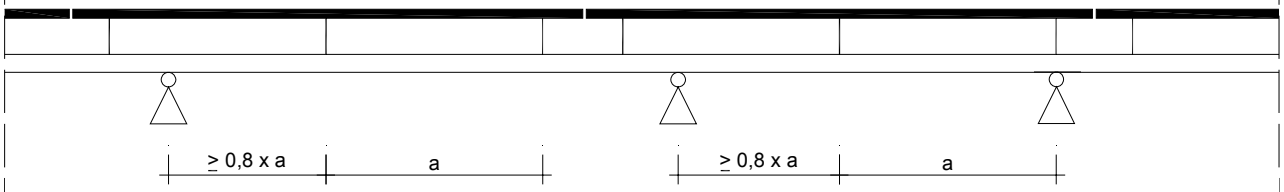
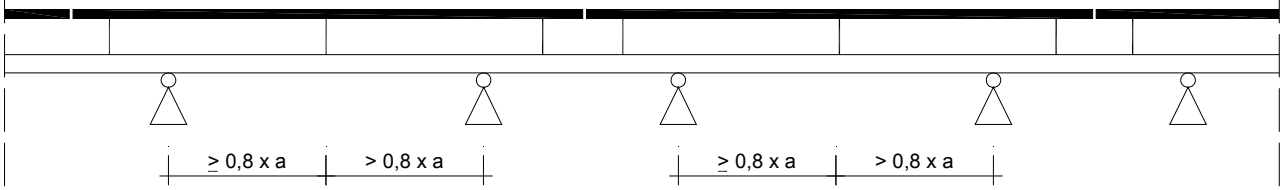
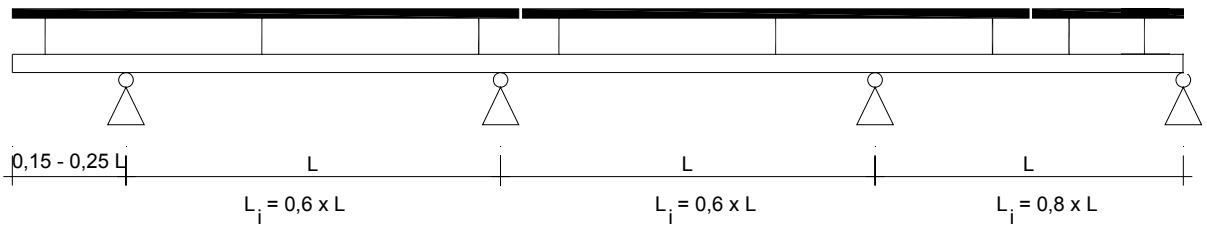


Figure 3



- In profiles, supporting three fixing points of a panel, the central fixing points must have a minimum distance of 0,8 • a to the supports.
  Whereby “a” is the spacing of the fixing points of the panel

Figure 4: Equivalent support spacing



fischer-Zykon-panel anchor FZP II T	Annex 10 of European Technical Approval ETA-11/0465
Support	

Supports – Definition of edge distances and spacing

Figure 5

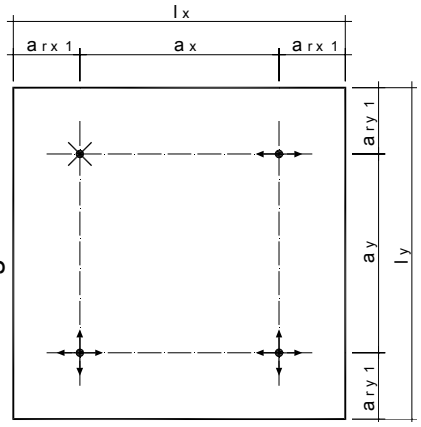


Figure 6

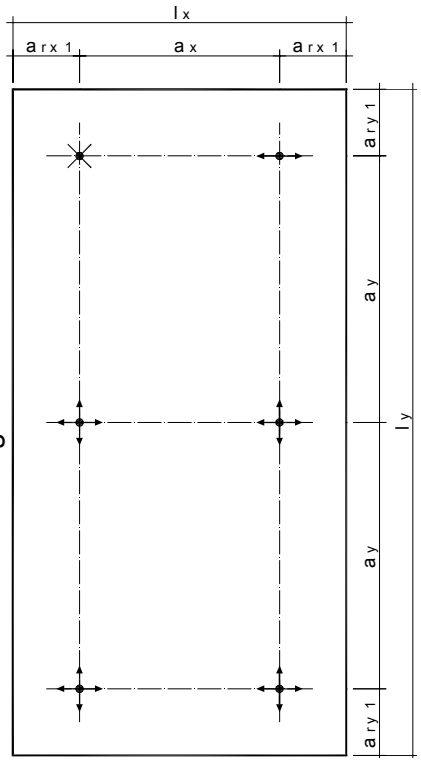
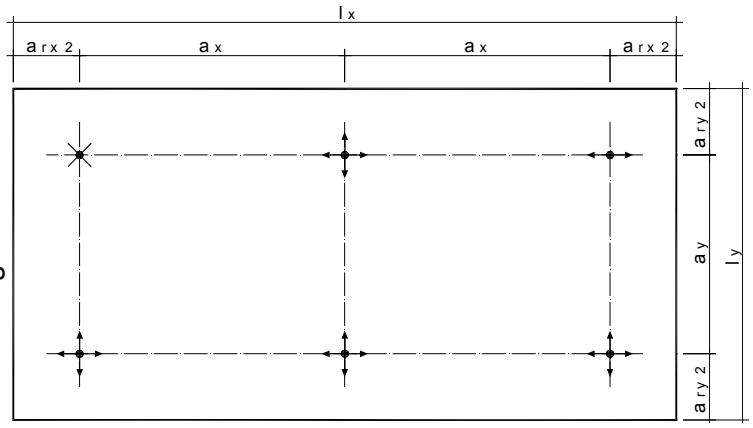


Figure 7



Caption:

a_{rx}, a_{ry}	=	Edge distance – anchor distance to the panel edge
a_x, a_y	=	Spacing – Distance between the anchors
l_x	=	Length of the panel in horizontal direction
l_y	=	Length of the panel in vertical direction
	=	Fixed bearing (fixed support)
	=	Horizontal slide bearing (slide support)
	=	Horizontal and vertical slide bearing (slide support)

fischer-Zykon-panel anchor FZP II T	**Annex 11** **of European Technical Approval** **ETA-11/0465**
Supports - Definition of edge distance and spacing	