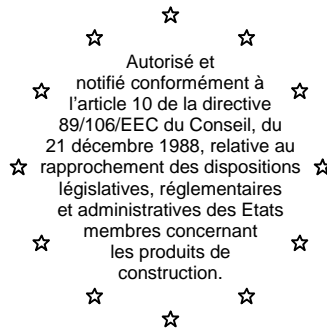


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## European Technical Approval

## ETA-04/0010

(English language translation, the original version is in French language)

Nom commercial :

**Trade name:**

Titulaire :

**Holder of approval:**

Type générique et utilisation prévue du  
produit de construction :

**Generic type and use of  
construction product:**

Validité du :  
au :

**Validity from / to:**

Usine de fabrication :

**Manufacturing plant:**

Le présent Agrément technique européen  
contient :

**This European Technical Approval  
contains:**

**SPIT FIX Z A4**

**Société SPIT**

**Route de Lyon**

**F-26501 BOURG-LES-VALENCE**

Cheville métallique en acier inoxydable, à expansion par vissage à couple contrôlé, de fixation dans le béton: diamètres M8, M10, M12 et M16.

**Torque-controlled expansion anchor, made of stainless steel, for use in concrete: sizes M8, M10, M12 and M16.**

**13/04/2004**

**13/04/2009**

**Société SPIT**

**Route de Lyon**

**F-26501 BOURG-LES-VALENCE**

**France**

13 pages incluant 6 annexes faisant partie intégrante du document.

**13 pages including 6 annexes which form an integral part of the document.**



Organisation pour l'Agrément Technique Européen  
European Organisation for Technical Approvals

## I LEGAL BASES AND GENERAL CONDITIONS

1. This European Technical Approval is issued by the Centre Scientifique et Technique du Bâtiment 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<sup>1</sup>, modified by the Council Directive 93/68/EEC of 22 July 1993<sup>2</sup>;
  - Décret n° 92-647 du 8 juillet 1992<sup>3</sup> concernant l'aptitude à l'usage des produits de construction;
  - Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex of Commission Decision 94/23/EC<sup>4</sup>;
  - 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. The Centre Scientifique et Technique du Bâtiment is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant (for example concerning the fulfilment of assumptions made in this European Technical Approval with regard to manufacturing). Nevertheless, the responsibility for the conformity of the products with the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.
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<sup>1</sup> Official Journal of the European Communities n° L 40, 11.2.1989, p. 12

<sup>2</sup> Official Journal of the European Communities n° L 220, 30.8.1993, p. 1

<sup>3</sup> Journal officiel de la République française du 14 juillet 1992

<sup>4</sup> Official Journal of the European Communities n° L 17, 20.1.1994, p. 34

## **II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL**

### **1 Definition of product and intended use**

#### **1.1. Definition of product**

The SPIT FIX Z A4 anchor in the range of M8 to M16 is an anchor made of stainless steel, which is placed into a drilled hole and anchored by torque-controlled expansion. For the installed anchor see Figure 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 compromise the stability of the works, 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 C 20/25 minimum to C50/60 maximum according to ENV 206-1: 2000-12. It may be anchored in cracked and non-cracked concrete.

The anchor may be used in concrete subject to dry internal conditions and also in concrete 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).

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 in the range of M8 to M16 corresponds to the drawings and provisions given in Annexes 1 to 3. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 2 and 3 shall correspond to the respective values laid down in the technical documentation<sup>5</sup> of this European Technical Approval. The characteristic anchor values for the design of anchorages are given in Annexes 3 to 5.

Each anchor is marked with the commercial name, the nominal diameter of the anchor and the two maximum thickness of the fixture according to Annex 1. A letter code corresponding to the total length of the bolt is punched on the head of the bolt.

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<sup>5</sup> The technical documentation of this European Technical Approval is deposited at the Centre Scientifique et Technique du Bâtiment 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.

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.

## **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 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.

### **3.2. Responsibilities**

#### **3.2.1. Tasks of the manufacturer, factory production control**

The manufacturer has 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. This 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 prescribed test plan<sup>6</sup>. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of incoming materials such as nuts, washers, wire for bolts and metal band for expansion sleeves shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimension and determining material properties, e.g. tensile strength, hardness, surface finish.

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<sup>6</sup> The prescribed test plan has been deposited at the Centre Scientifique et Technique du Bâtiment and is only made available to the approved bodies involved in the conformity attestation procedure.

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

- Dimensions of component parts:
  - bolt (diameters, lengths, thread, geometry of the cone, marking);
  - sleeve (length, thickness, catch sizes);
  - hexagonal nut (proper running, wrench size across flats);
  - washer (diameters, thickness).
- Material properties: bolt (yielding and ultimate tensile strengths), sleeve (ultimate tensile strength), hexagonal nut (proof load), washer (hardness).
- Visual control of correct assembly 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 prescribed test 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, basic 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 during the continuous surveillance. On request, they shall be presented to the Centre Scientifique et Technique du Bâtiment.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control shall correspond to the prescribed test plan 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 Centre Scientifique et Technique du Bâtiment 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 prescribed test plan, the factory and the factory production control are suitable to ensure continuous and orderly manufacturing of the anchor according to the specifications mentioned in 2.1. as well as to 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 regular inspection. It has to be verified that the system of factory production control and the specified automated manufacturing process are maintained taking account of the prescribed test plan.

Continuous surveillance and assessment of factory production control have to be performed according to the prescribed test 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 Centre Scientifique et Technique du Bâtiment. In cases where the provisions of the European Technical Approval and the prescribed test 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 accompanied by the following information:

- identification number of the certification body;
- name or identifying mark of the 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;
- number of the 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 anchor is manufactured in accordance with the provisions of the European Technical Approval using the automated manufacturing process as identified during inspection of the plant by the Centre Scientifique et Technique du Bâtiment and the approved body and laid down in the technical documentation.

### **4.2. Installation**

#### **4.2.1. Design of anchorages**

The fitness of the anchors 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 prepared 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 support, etc.).

#### 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 on 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 prepared for that purpose and using the appropriate special tools;
- thickness of the fixture corresponding to the range of required thickness values for the type of anchor;
- 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;
- clearing the hole of drilling dust;
- anchor installation ensuring the specified embedment depth;
- keeping of the edge distance and spacing to 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 to the anchor in the direction of load application;
- application of the torque moment given in Annex 3 using a calibrated torque wrench.

#### 4.2.3. Responsibility of the manufacturer

It is the manufacturer's responsibility to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to in 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:

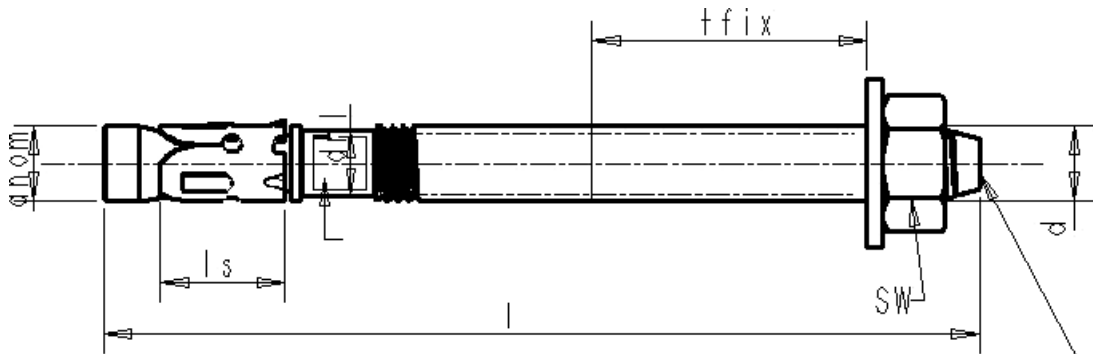
- drill bit diameter,
- thread diameter,
- maximum thickness of the fixture,
- minimum installation depth,
- minimum hole depth,
- required torque moment,
- information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- reference to any special installation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

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

**The original French version is signed by**

**Le Directeur Technique  
J.-D. MERLET**

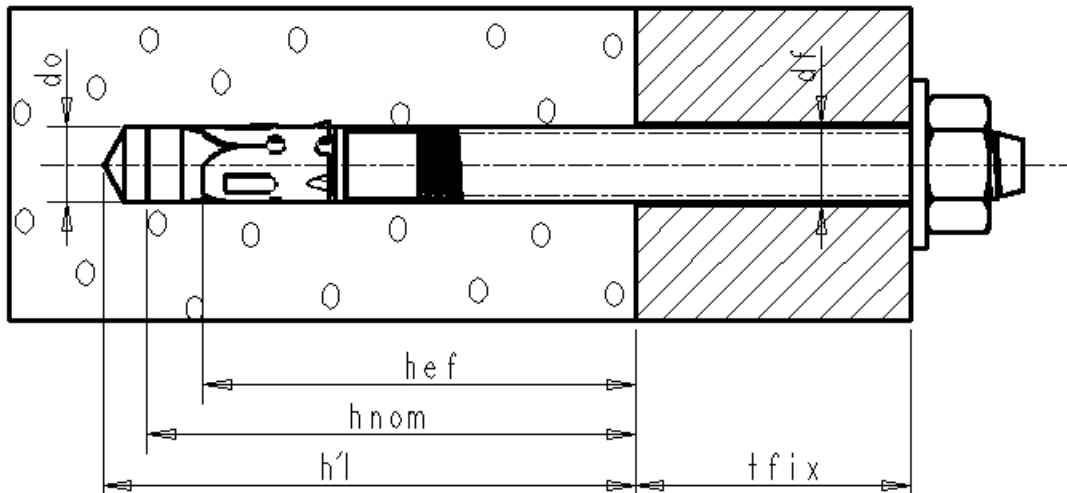
**Assembled anchor and schema of the anchor in use :**



Marking SPIT FIX Z A4 on the bolt, with indication of the nominal diameter and different fixture thickness.

Letter code marking

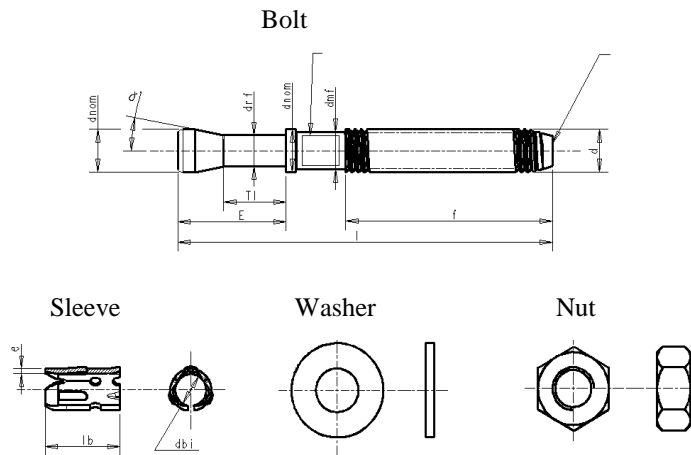
Example : SPIT FIX Z A4 M12/30-10



$h_{ef}$  : effective anchorage depth  
 $h_{nom}$  : embedment depth  
 $h_1$  : drilling hole depth  
 $t_{fix}$  : fixture thickness

|  |  |
|--|--|
| <p><b>SPIT FIX Z A4 torque-controlled expansion anchor</b></p> | <p><b>Annex 1</b></p>  |
| <p><b>Product and intended use</b></p>                         | <p>of European<br/>                 Technical Approval<br/> <b>ETA-04/0010</b></p> |

**Different parts of the anchor :**



**Table 1 : Matériaux**

| Part | Designation   | Material  |
|------|---------------|---|
| 1    | Bolt          | M8, M10, M12 et M16<br>NF EN 10088.3 : steel n°1.4404, 1.4578 |
| 2    | Sleeve        | NF EN 10088.3 : steel n°1.4404 cold laminated,                |
| 3    | Washer        | Stainless steel A4, NF EN 20898                               |
| 4    | Hexagonal nut | Stainless steel A4-80, NF EN 20898-2                          |

**Table 2: Dimensions**

| Anchor type       | L (mm) |       | M   | d <sub>r</sub><br>(mm) | d <sub>nom</sub><br>(mm) | l <sub>b</sub><br>(mm) |
|-------------------|--------|-------|-----|------------------------|--------------------------|------------------------|
|                   | de     | à     |     |                        |                          |                        |
| SPIT FIX Z A4 M8  | 55     | 90    | M8  | 5,6                    | 8,0                      | 14,7                   |
| SPIT FIX Z A4 M10 | 76,2   | 121,2 | M10 | 7,3                    | 9,9                      | 18                     |
| SPIT FIX Z A4 M12 | 78,7   | 140   | M12 | 8,6                    | 11,9                     | 20                     |
| SPIT FIX Z A4 M16 | 125,2  | 170,2 | M16 | 11,7                   | 15,9                     | 24                     |

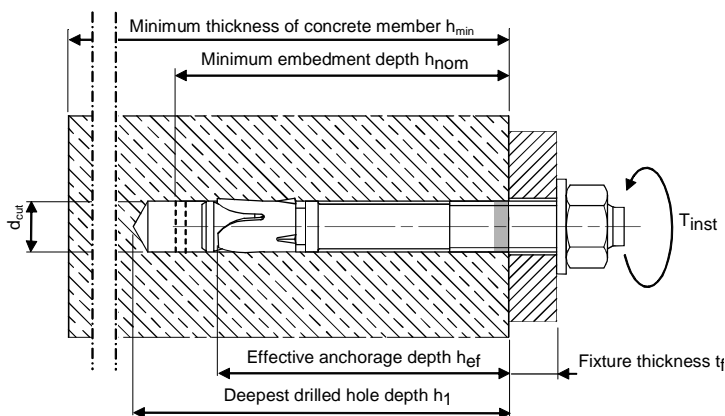
**SPIT FIX Z A4 torque-controlled expansion anchor**

**Materials and dimensions of anchors**

**Annex 2**

of European  
Technical Approval  
**ETA-04/0010**

**Schema of the anchor in use :**



**Table 3: Installation data**

| Anchor type | L (mm)<br>(0) | Letter code marking | d <sub>cut</sub> (mm)<br>(1) | d <sub>f</sub> (mm)<br>(2) | T <sub>inst</sub> (Nm)<br>(3) | Minimum embedment depth h <sub>ef,min</sub> |                            |                              |                                 |                                  | Maximum embedment depth h <sub>ef,max</sub> |                            |                              |                                 |                                  |
|-------------|---------------|---------------------|------------------------------|----------------------------|-------------------------------|---|----------------------------|------------------------------|---------------------------------|----------------------------------|---|----------------------------|------------------------------|---------------------------------|----------------------------------|
|             |               |                     |                              |                            |                               | h <sub>min</sub> (mm)<br>(4)                | h <sub>1</sub> (mm)<br>(5) | h <sub>nom</sub> (mm)<br>(6) | h <sub>ef,min</sub> (mm)<br>(7) | t <sub>fix,max</sub> (mm)<br>(8) | h <sub>min</sub> (mm)<br>(4)                | h <sub>1</sub> (mm)<br>(5) | h <sub>nom</sub> (mm)<br>(6) | h <sub>ef,max</sub> (mm)<br>(7) | t <sub>fix,max</sub> (mm)<br>(8) |
| M8/5        | 56            | -                   |                              |                            |                               |   |                            |                              |                                 | 5                                |   |                            |                              |                                 |                                  |
| M8/20-7     | 71            | C                   | 8                            | 9                          | 20                            | 100   | 52                         | 42                           | 35*                             | 20                               | 100   | 65                         | 55                           | 48                              | 7                                |
| M8/40-27    | 91            | E                   |                              |                            |                               |   |                            |                              |                                 | 40                               |   |                            |                              |                                 | 27                               |
| M10/15      | 76,2          | C                   |                              |                            |                               |   |                            |                              |                                 | 15                               |   |                            |                              |                                 |                                  |
| M10/35-20   | 96,2          | E                   | 10                           | 12                         | 35                            | 100   | 62                         | 50                           | 42                              | 35                               | 116   | 78                         | 66                           | 58                              | 20                               |
| M10/60-45   | 121,2         | G                   |                              |                            |                               |   |                            |                              |                                 | 60                               |   |                            |                              |                                 | 45                               |
| M12/5       | 78,7          | -                   |                              |                            |                               |   |                            |                              |                                 | 5                                |   |                            |                              |                                 |                                  |
| M12/25-6    | 100           | E                   | 12                           | 14                         | 50                            | 100   | 75                         | 60                           | 50                              | 25                               | 140   | 95                         | 80                           | 70                              | 6                                |
| M12/65-46   | 140           | I                   |                              |                            |                               |   |                            |                              |                                 | 65                               |   |                            |                              |                                 | 46                               |
| M16/30-8    | 125,2         | G                   |                              |                            |                               |   |                            |                              |                                 | 30                               |   |                            |                              |                                 | 8                                |
| M16/55-33   | 150,2         | I                   |                              |                            |                               |   |                            |                              |                                 | 55                               |   |                            |                              |                                 | 33                               |
| M16/75-53   | 170,2         | K                   | 16                           | 18                         | 100                           | 128   | 95                         | 78                           | 64                              | 75                               | 172   | 117                        | 100                          | 86                              | 53                               |

\* use restricted to anchoring of structural components statically indetermined.

- (0) Total length of the bolt (mm)
- (1) Nominal diameter of drill bit, d<sub>cut</sub> (mm)
- (2) Diameter of clearance hole in the fixture, d<sub>f</sub> (mm)
- (3) Required torque moment, T<sub>inst</sub> (Nm)
- (4) Minimum thickness of concrete member, h<sub>min</sub> (mm)
- (5) Depth of drilled hole to deepest point, h<sub>1</sub> (mm)
- (6) Minimum installation depth, h<sub>nom</sub> (mm)
- (7) Effective anchorage depth, h<sub>ef</sub> (mm)
- (8) Maximum thickness of the fixture, t<sub>fix,max</sub> (mm)

| Cracked and Non-cracked concrete              |                       | M8                    | M10 | M12 | M16 |     |
|---|-----------------------|-----------------------|-----|-----|-----|-----|
| Effective anchorage depth h <sub>ef,min</sub> | Minimum spacing       | S <sub>min</sub> (mm) | 60  | 75  | 170 | 150 |
|   | Minimum edge distance | C <sub>min</sub> (mm) | 60  | 65  | 100 | 100 |
| Effective anchorage depth h <sub>ef,max</sub> | Minimum spacing       | S <sub>min</sub> (mm) | 50  | 55  | 75  | 90  |
|   | Minimum edge distance | C <sub>min</sub> (mm) | 60  | 65  | 90  | 105 |

|   |   |
|---|---|
| <b>SPIT FIX Z A4 torque-controlled expansion anchor</b> | <b>Annex 3</b><br>of European<br>Technical Approval<br><b>ETA-04/0010</b> |
| <b>Installation data</b>                                |   |

**Table 4: Characteristic values of resistance to tension loads of design method A**

|  |                               |          | M8   | M10  | M12 | M16  |
|--|-------------------------------|----------|------|------|-----|------|
| <b>Steel failure</b>                                     |                               |          |      |      |     |      |
| Characteristic resistance (reduced part)                 | $N_{Rk,s}$                    | (kN)     | 15,3 | 25,9 | 36  | 62,4 |
| Partial safety factor                                    | $\gamma_{Ms}$                 | -        | 1,8  | 1,8  | 1,8 | 2,1  |
| <b>Pull through failure</b>                              |                               |          |      |      |     |      |
| <b>Minimum embedment depth</b> $h_{ef,min}$              |                               |          |      |      |     |      |
| Characteristic resistance in cracked concrete C20/25     | $N_{Rk,p}$                    | (kN)     | 3    | 6    | 7,5 | 12   |
| Characteristic resistance in non-cracked concrete C20/25 | $N_{Rk,p}$                    | (kN)     | 9    | 9    | 12  | 20   |
| Partial safety factor                                    | $\gamma_2$                    | -        | 1,0  | 1,0  | 1,0 | 1,0  |
|  | $\gamma_{Mp}$                 | -        | 1,8  | 1,8  | 1,8 | 1,8  |
| Increasing factor for $N_{Rk}$ for non-cracked Concrete  | C30/37                        | $\psi_c$ | -    | 1,22 |     |      |
|  | C40/50                        |          |      | 1,41 |     |      |
|  | C50/60                        |          |      | 1,55 |     |      |
| <b>Maximum embedment depth</b> $h_{ef,max}$              |                               |          |      |      |     |      |
| Characteristic resistance in cracked concrete C20/25     | $N_{Rk,p}$                    | (kN)     | 4    | 7,5  | 9   | 16   |
| Characteristic resistance in non-cracked concrete C20/25 | $N_{Rk,p}$                    | (kN)     | 12   | 16   | 16  | 30   |
| Partial safety factor                                    | $\gamma_2$                    | -        | 1,0  | 1,0  | 1,0 | 1,0  |
|  | $\gamma_{Mp}$                 | -        | 1,8  | 1,8  | 1,8 | 1,8  |
| Increasing factor for $N_{Rk}$ for non-cracked Concrete  | C30/37                        | $\psi_c$ | -    | 1,22 |     |      |
|  | C40/50                        |          |      | 1,41 |     |      |
|  | C50/60                        |          |      | 1,55 |     |      |
| <b>Concrete cone failure *and splitting failure</b>      |                               |          |      |      |     |      |
| <b>Minimum embedment depth</b> $h_{ef,min}$              |                               |          |      |      |     |      |
| Effective anchorage depth                                | $h_{ef,min}$                  | (mm)     | 35** | 42   | 50  | 64   |
| Partial safety factor                                    | $\gamma_2$                    | -        | 1,0  | 1,0  | 1,0 | 1,0  |
|  | $\gamma_{Mc} = \gamma_{M,sp}$ | -        | 1,8  | 1,8  | 1,8 | 1,8  |
| Spacing  | $s_{cr,N}$                    | (mm)     | 105  | 126  | 150 | 192  |
|  | $s_{cr,sp}$                   | (mm)     | 210  | 210  | 250 | 320  |
| Edge distance  | $c_{cr,N}$                    | (mm)     | 53   | 63   | 75  | 96   |
|  | $c_{cr,sp}$                   | (mm)     | 105  | 105  | 125 | 160  |
| <b>Maximum anchorage depth</b> $h_{ef,max}$              |                               |          |      |      |     |      |
| Effective anchorage depth                                | $h_{ef,max}$                  | (mm)     | 48   | 58   | 70  | 86   |
| Partial safety factor                                    | $\gamma_2$                    | -        | 1,0  | 1,0  | 1,0 | 1,0  |
|  | $\gamma_{Mc} = \gamma_{M,sp}$ | -        | 1,8  | 1,8  | 1,8 | 1,8  |
| Spacing  | $s_{cr,N}$                    | (mm)     | 144  | 174  | 210 | 258  |
|  | $s_{cr,sp}$                   | (mm)     | 290  | 290  | 350 | 430  |
| Edge distance  | $c_{cr,N}$                    | (mm)     | 72   | 87   | 105 | 129  |
|  | $c_{cr,sp}$                   | (mm)     | 145  | 145  | 175 | 215  |

\* For concrete of characteristic resistance  $f_{ck}$ , the factor  $\psi_c = (f_{ck/20})^{0,5}$  is applied.

\*\* Use restricted to anchoring of structural components statically indeterminate.

**SPIT FIX Z A4 torque-controlled expansion anchor**

**Design method A : characteristic values of resistance to tension loads**

**Annex 4**

of European  
Technical Approval  
**ETA-04/0010**

**Table 5 : Displacements under tension loads**

|   |                         | <b>M8</b>                               | <b>M10</b> | <b>M12</b> | <b>M16</b> | <b>M8</b>                               | <b>M10</b> | <b>M12</b> | <b>M16</b> |
|---|-------------------------|---|------------|------------|------------|---|------------|------------|------------|
|   |                         | Minimum embedment<br>depth $h_{ef,min}$ |            |            |            | Maximum embedment<br>depth $h_{ef,max}$ |            |            |            |
| Tension load in non-cracked<br>concrete C20/25 (kN) |                         | 3,6                                     | 3,6        | 4,8        | 7,9        | 3,6                                     | 6,4        | 6,4        | 11,9       |
| Displacement  | $\delta_{N0}$ (mm)      | 0,1                                     | 0,1        | 0,1        | 0,1        | 0,1                                     | 0,1        | 0,1        | 0,1        |
|   | $\delta_{N\infty}$ (mm) | 0,4                                     | 0,4        | 0,4        | 0,4        | 0,4                                     | 0,4        | 0,4        | 0,4        |
| Tension load in non-cracked<br>concrete C50/60 (kN) |                         | 5,5                                     | 5,5        | 7,4        | 12,3       | 5,5                                     | 9,8        | 9,8        | 18,5       |
| Displacement  | $\delta_{N0}$ (mm)      | 0,1                                     | 0,1        | 0,1        | 0,9        | 0,1                                     | 0,1        | 0,1        | 4,1        |
|   | $\delta_{N\infty}$ (mm) | 0,4                                     | 0,4        | 0,4        | 0,9        | 0,4                                     | 0,4        | 0,4        | 4,1        |

|   |                         | <b>M8</b>                               | <b>M10</b> | <b>M12</b> | <b>M16</b> | <b>M8</b>                               | <b>M10</b> | <b>M12</b> | <b>M16</b> |
|---|-------------------------|---|------------|------------|------------|---|------------|------------|------------|
|   |                         | Minimum embedment<br>depth $h_{ef,min}$ |            |            |            | Maximum embedment<br>depth $h_{ef,max}$ |            |            |            |
| Tension load in cracked<br>concrete C20/25 (kN) |                         | 1,2                                     | 2,4        | 3,0        | 4,8        | 1,6                                     | 3,0        | 3,6        | 6,4        |
| Displacement                                    | $\delta_{N0}$ (mm)      | 0,4                                     | 0,4        | 0,5        | 0,6        | 0,6                                     | 0,6        | 0,6        | 0,3        |
|   | $\delta_{N\infty}$ (mm) | 0,5                                     | 0,8        | 0,8        | 1,0        | 1,0                                     | 1,0        | 1,0        | 1,0        |
| Tension load in cracked<br>concrete C50/60 (kN) |                         | 1,9                                     | 3,7        | 4,6        | 7,4        | 2,5                                     | 4,6        | 5,5        | 9,8        |
| Displacement                                    | $\delta_{N0}$ (mm)      | 0,8                                     | 1,1        | 0,5        | 0,5        | 0,8                                     | 1,1        | 0,6        | 0,6        |
|   | $\delta_{N\infty}$ (mm) | 0,8                                     | 1,1        | 0,8        | 1,0        | 1,0                                     | 1,1        | 1,0        | 1,0        |

**SPIT FIX Z A4 torque-controlled expansion anchor****Design method A : displacements under tension loads****Annex 5**of European  
Technical Approval  
**ETA-04/0010**

**Tableau 6: Characteristics values of resistance to shear loads of design method A.**

|   |                |       | M8   | M10  | M12  | M16  |    |
|---|----------------|-------|------|------|------|------|----|
| <b>Steel failure without lever arm</b>              |                |       |      |      |      |      |    |
| Characteristic resistance                           | $V_{Rk,s}$     | (kN)  | 11,3 | 18,0 | 26,1 | 45,5 |    |
| Partial safety factor                               | $\gamma_{Ms}$  | -     | 1,5  | 1,5  | 1,5  | 1,8  |    |
| <b>Steel failure with lever arm</b>                 |                |       |      |      |      |      |    |
| Characteristic resistance                           | $M_{Rk,s}$     | (Nm)  | 23   | 46   | 81   | 193  |    |
| Partial safety factor                               | $\gamma_{Ms}$  | -     | 1,5  | 1,5  | 1,5  | 1,8  |    |
| <b>Concrete pryout failure</b>                      |                |       |      |      |      |      |    |
| Factor in equation (5.6) of ETAG Annex C, § 5.2.3.3 | $h_{ef,min}$   | k     | -    | 1    | 1    | 1    | 2  |
|   | $h_{ef,max}$   | k     | -    | 1    | 1    | 2    | 2  |
| Partial safety factor                               | $\gamma_2$     | -     | 1,00 |      |      |      |    |
|   | $\gamma_{Mpr}$ | -     | 1,80 |      |      |      |    |
| <b>Concrete edge failure</b>                        |                |       |      |      |      |      |    |
| Effective length of anchor under shear loading      | $h_{ef,min}$   | $l_f$ | (mm) | 20   | 24   | 30   | 40 |
|   | $h_{ef,max}$   | $l_f$ | (mm) | 33   | 34   | 48   | 62 |
| Outside diameter of anchor                          | $d_{nom}$      | (mm)  | 8    | 10   | 12   | 16   |    |
| Partial safety factor                               | $\gamma_2$     | -     | 1,00 |      |      |      |    |
|   | $\gamma_{Mc}$  | -     | 1,80 |      |      |      |    |

**Tableau 7: Displacements under shear loads**

|   |                         | M8                                   | M10           | M12           | M16           | M8                                   | M10           | M12           | M16           |
|---|-------------------------|--------------------------------------|---------------|---------------|---------------|--------------------------------------|---------------|---------------|---------------|
|   |                         | Minimum embedment depth $h_{ef,min}$ |               |               |               | Maximum embedment depth $h_{ef,max}$ |               |               |               |
| Shear load in non-cracked concrete C20/25 à C50/60 (kN) |                         | 5,4                                  | 8,6           | 12,4          | 18,1          | 5,4                                  | 8,6           | 12,4          | 18,1          |
| Displacement  | $\delta_{v0}$ (mm)      | 3,4<br>(+0,7)                        | 3,5<br>(+1,2) | 3,6<br>(+1,2) | 3,8<br>(+1,2) | 3,4<br>(+0,7)                        | 3,5<br>(+1,2) | 3,6<br>(+1,2) | 3,8<br>(+1,2) |
|   | $\delta_{v\infty}$ (mm) | 5,1<br>(+0,7)                        | 5,2<br>(+1,2) | 5,4<br>(+1,2) | 5,7<br>(+1,2) | 5,1<br>(+0,7)                        | 5,2<br>(+1,2) | 5,4<br>(+1,2) | 5,7<br>(+1,2) |

|   |                         | M8                                   | M10           | M12           | M16           | M8                                   | M10           | M12           | M16           |
|---|-------------------------|--------------------------------------|---------------|---------------|---------------|--------------------------------------|---------------|---------------|---------------|
|   |                         | Minimum embedment depth $h_{ef,min}$ |               |               |               | Maximum embedment depth $h_{ef,max}$ |               |               |               |
| Shear load in cracked concrete C20/25 à C50/60 (kN) |                         | 5,4                                  | 8,6           | 12,4          | 18,1          | 5,4                                  | 8,6           | 12,4          | 18,1          |
| Displacement  | $\delta_{v0}$ (mm)      | 4,2<br>(+0,7)                        | 4,4<br>(+1,2) | 4,6<br>(+1,2) | 5,0<br>(+1,2) | 4,2<br>(+0,7)                        | 4,4<br>(+1,2) | 4,6<br>(+1,2) | 5,0<br>(+1,2) |
|   | $\delta_{v\infty}$ (mm) | 4,2<br>(+0,7)                        | 4,4<br>(+1,2) | 4,6<br>(+1,2) | 5,0<br>(+1,2) | 4,2<br>(+0,7)                        | 4,4<br>(+1,2) | 4,6<br>(+1,2) | 5,0<br>(+1,2) |

Displacement : the table shows the deformation to be expected from the anchor itself, whilst the bracket value indicates the movement between the anchor body and the hole drilled in the concrete member or the hole in the fixture.

**SPIT FIX Z A4 torque-controlled expansion anchor****Design method A : characteristic values of resistance to shear loads and displacements****Annex 6**of European  
Technical Approval  
**ETA-04/0010**