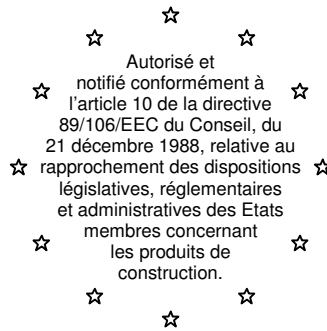


# Centre Scientifique et Technique du Bâtiment

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## European Technical Approval

## ETA-05/0112

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

Nom commercial :

**Trade name:**

**SPIT EPOMAX A4**

Titulaire :

**Holder of approval:**

**Société SPIT**

**Route de Lyon**

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

**France**

Type générique et utilisation prévue du produit de construction :

Cheville à scellement de type "à injection" en acier inoxydable pour fixation dans le béton non fissuré : diamètres M8, M10, M12, M16, M20, M24 et M30.

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

**Bonded injection type anchor made of stainless steel for use in non cracked concrete: sizes M8, M10, M12, M16, M20, M24 and M30.**

Validité du :  
au :

**Validity from / to:**

**01/06/2005**

**31/05/2010**

Usine de fabrication :

**Manufacturing plant:**

**Société SPIT**

**Route de Lyon**

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

**France**

Le présent Agrément technique européen contient :

**This European Technical Approval contains:**

17 pages incluant 8 annexes faisant partie intégrante du document.

**17 pages including 8 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 5 « Bonded 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.
3. This European Technical Approval is not to be transferred to manufacturers or agents of manufacturer other than those indicated on page 1; or manufacturing plants other than those indicated on page 1 of this European Technical Approval.
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6. The European Technical Approval is issued by the approval body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

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<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 EPOMAX A4 in the sizes M8 to M30 is a bonded anchor (injection type) made of stainless steel, which is placed into a drilled hole previously injected with a two components injection mortar using an applicator gun equipped with a special mixing nozzle. The threaded rod is inserted into the resin with a slow and slight twisting motion. The threaded rod is available for all diameters either with a one side 45° chamfer or with a two sides 45° chamfer. The threaded rod are either delivered with the mortar cartridges or commercial standard threaded rods purchased separately (A4/70 for M8 to M24 and A4/50 for M30). The mortar cartridges are available in different sizes (160 ml to 910 ml) and system (coaxial or side by side). The anchor is intended to be used with embedment depth from 8 diameters to 12 diameters. 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. Safety in case of fire (Essential Requirement 2) is not covered in this ETA. 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 at least to C50/60 at most according to ENV 206: 2000-12. It may be anchored in non-cracked concrete only.

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 anchor may be installed in dry or wet concrete or in flooded holes excepting sea water (use category 2) for all diameters.

Installation	Substrate		
	Dry concrete	Wet concrete	Flooded hole
All diameters	Yes	Yes	Yes

All the diameters (i.e. from M8 to M30) may be used overhead.

The anchor may be used in the following temperature ranges :

Temperature range : -40 °C to +40 °C (max short term temperature +40 °C and  
max long term temperature +24 °C)

Temperature range : -40 °C to +80 °C (max short term temperature +80 °C and

Temperature range : -40°C to +120°C (max short term temperature +120°C and  
max long term temperature +50°C)  
max long term temperature +72°C)

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 sizes of M8 to M30 and the mortar cartridges correspond to the drawings and provisions given in Annexes 1 and 2. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 3 and 4 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 5 to 8.

Each mortar cartridge is marked with the identifying mark of the producer, the trade name, the charge code, storage life, curing and processing time. The threaded rod are either delivered with the mortar cartridges or commercial standard threaded rods purchased separately (A4/70 for M8 to M24 and A4/50 for M30). If the threaded rods are supplied separately by another party than the approval holder, then it shall be ensured :

- Mechanical properties according to EN ISO 3506-1
- Quality affirmation of the mechanical properties with an inspection document according to EN 10204
- Marking of the rod with the identifying mark of the producer of the rod and the envisage embedment depth.

The two components of the SPIT injection mortar SPIT EPOMAX could be delivered in unmixed condition in mortar cartridges in a size of 160 ml, 200 ml, 300 ml and 410 ml in case of coaxial cartridges, 360 ml and 910 ml in case of side by side cartridges according to Annex 2.

### 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 5 « Bonded 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 UE Construction Products Directive, these requirements need also to be complied with, when and where they apply.*

<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.

### 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, threaded rods, resin, hardeners... 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, surface finish.

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

- Dimensions of components:  
Threaded rod (total length, nominal diameter, marking), washer (diameter, thickness), resin (fill quantity, fill weight), hardener (fill quantity, fill weight) nuts (diameter, good functioning).
- Material properties: Threaded rod (yielding and ultimate tensile strength), nuts (proof load), resin (composition, viscosity), hardener (composition, viscosity).
- Visual control of completeness of the anchor.
- Visual control of the aspect of cartridges

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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 frequency of controls and tests conducted during production 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 7);
- 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 bonded anchors under the responsibility of an engineer experienced in anchorages and concrete work.

For the verifications given below according to annex C the following shall be observed :

- For the verification “concrete cone failure” (clause 5.2.2.4, Annex C of the ETAG,  $N_{Rk,c}$  shall be determined according to (1) and (2) : the smaller of the values according to (1) and (2) is decisive.

(1)  $N_{Rk,c}$  according to equation (5.2), Annex C of the ETAG

where :  $N_{Rk,c}^0$  according to Table 6a Annex 5  
 $s_{cr,N}$  and  $c_{cr,N}$  according to Table 6b Annex 6  
 $\psi_{ucr,N} = 1,0$

(2)  $N_{Rk,c}$  according to equation (5.2), Annex C of the ETAG

where :  $N_{Rk,c}^0 = 0,75 \times 15,5 \times h_{ef}^{1,5} \times f_{ck,cube}^{0,5}$   
 $s_{cr,n} = 3 h_{ef}$  and  $c_{cr,n} = 1,5 h_{ef}$   
 $\psi_{ucr,N} = 1,0$

- For the verification “splitting failure due to loading” (clause 5.2.2.6, Annex C of the ETAG),  $N_{Rk,sp}$  shall be determined according to (3).

(3)  $N_{Rk,sp}$  according to equation (5.3), Annex C of the ETAG

where :  $N_{Rk,c}^0$  according to Table 6a Annex 5  
 $s_{cr,sp}$  and  $c_{cr,sp}$  according to Table 6b Annex 6

$$\psi_{ucr,N} = 1,0 \text{ and } \psi_{h,sp} = 1,0$$

- For the verification “concrete pryout failure” (clause 5.2.3.3, Annex C of the ETAG),  $N_{Rk,c}$  for equation (5.6), Annex C of the ETAG shall be determined according to (1).

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 using the tools indicated in the technical documentation of this European Technical Approval;
- 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;
- check of concrete being well compacted, e.g. without significant voids;
- keeping the effective anchorage 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 drill hole: the drill hole shall be filled with mortar;
- clearing the hole of drilling dust : the hole shall be cleaned by at least four blowing operations, by at least four brushing operations followed again by at least four blowing operations; before brushing cleaning the brush and checking whether the brush diameter according to Annex 3 Table 2 is sufficient;
- anchor installation ensuring the specified embedment depth, that is the appropriate depth marking of the anchor not exceeding the concrete surface;
- mortar injection by using the equipment including the special mixing nozzle shown in Annex 2; discarding the first swings of mortar of each new cartridge until an homogeneous colour is achieved; taking from the manufacturer instruction the admissible processing time (open time) of a cartridge as a function of the ambient temperature of the concrete; filling the drill hole uniformly from the drill hole bottom, in order to avoid entrapment of air; removing the special mixing nozzle slowly bit by bit during pressing-out; filling the drill hole with a quantity of the injection mortar corresponding to  $\frac{1}{2}$  of the drill hole; inserting immediately the anchor rod or threaded rod, slowly and with a slight twisting motion, removing excess of injection mortar around the rod; observing the curing time according to Annex 2 table 2 until the rod may be loaded; during curing of the injection mortar the temperature of the concrete must not fall below 0°C;
- application of the torque moment given in Annex 4 Table 4 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,
- required torque moment,
- admissible service temperature range,
- curing time of the bonding material depending on the installation temperature,
- 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.

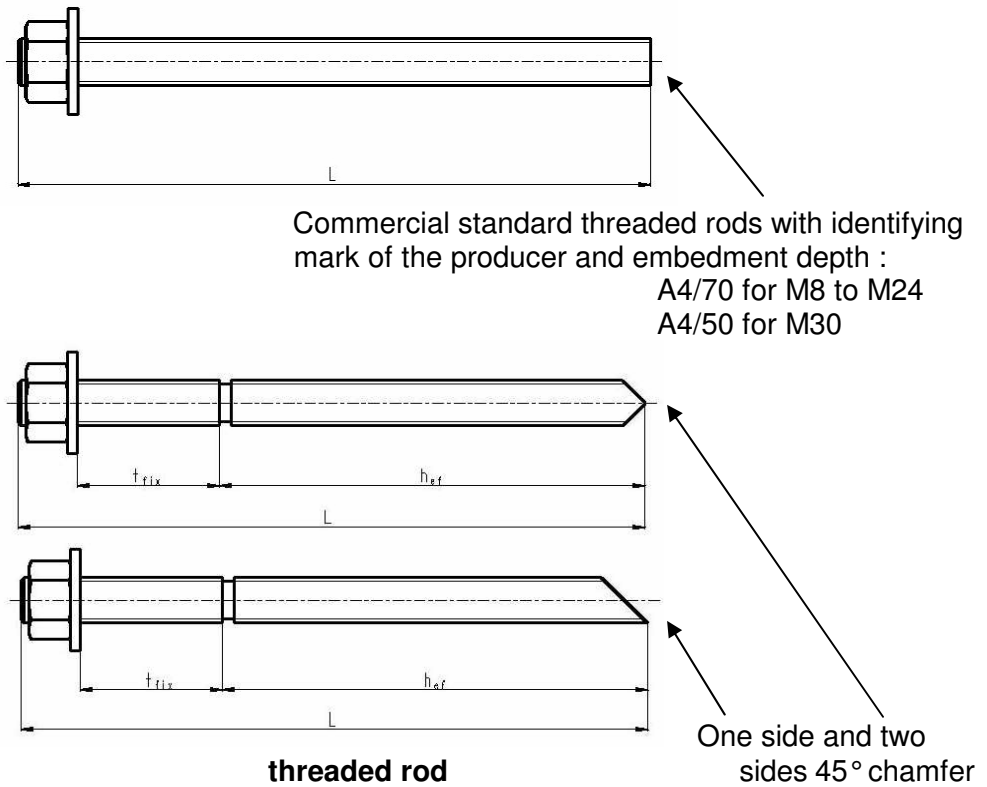
## **5 Recommendations concerning packaging, transport and storage.**

The mortar cartridges shall be protected against sun radiation and shall be stored according to the manufacturer's installation instructions in dry conditions at temperatures of at least 0°C to not more than +35°C.

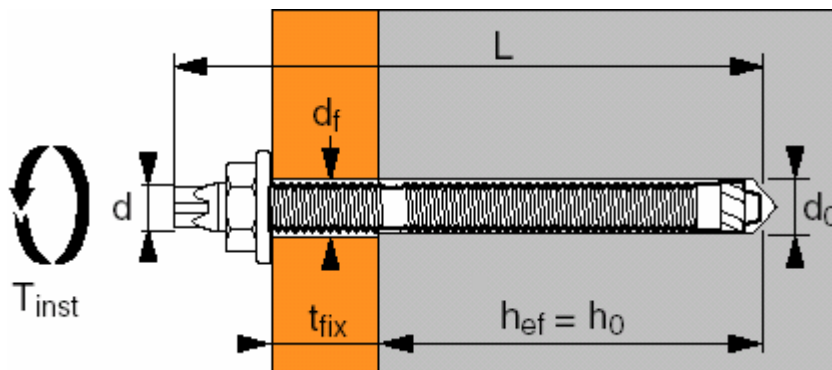
Mortar cartridges with expired shelf life must no longer be used.

**The original French version is signed by**  
**Le Directeur Technique**  
**H. BERRIER**

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



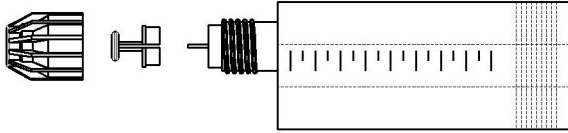
Marking on the anchor rod: letter S, bolt diameter and maximum thickness of the fixture :  
 Ex: SM10 / 20



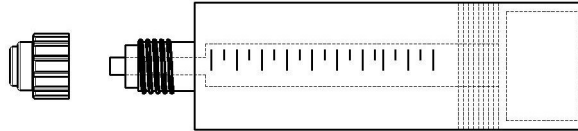
<p><b>SPIT EPOMAX A4</b></p>	<p><b>Annex 1</b></p>
<p><b>Product and intended use</b></p>	<p>of European              Technical Approval  <b>ETA- 05/0112</b></p>

**Mortar cartridges**

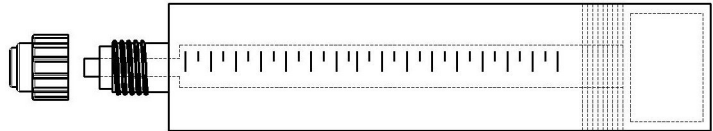
160ml coaxial cartridge



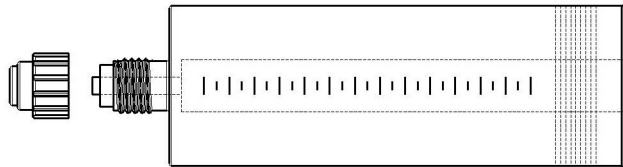
200ml coaxial cartridge



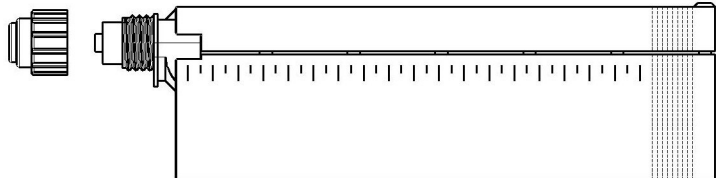
300ml coaxial cartridge



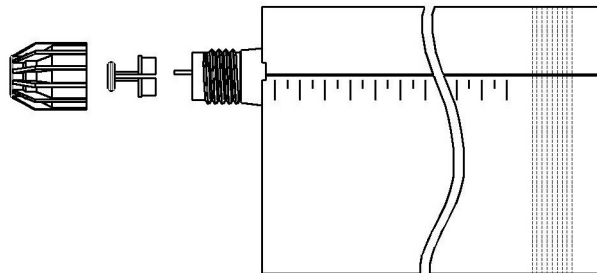
410ml coaxial cartridge



360 ml side by side cartridge



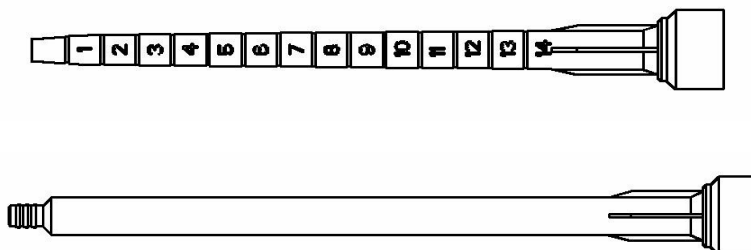
910 ml side by side cartridge



**Marking of the mortar cartridges :**

- Identifying mark of the producer
- Trade name
- Charge code number
- Storage life
- Curing and processing time

**Special mixing nozzle**



**SPIT EPOMAX A4**

**Mortar cartridges**

**Annex 2**

of European  
Technical Approval  
**ETA- 05/0112**

**Table 1 : Materials**

	Size	Material and EN/ISO reference
Injection mortar with styrene-free vinyl ester resin, hardener and inorganic agents		
Threaded rod	M8 to M30	X2CrNiMo 17.12.2 EN ISO 3506-1
Nut	-	Stainless steel A4-80 EN 20898-2
Washer	-	Stainless steel A4 EN 20898-2

**Table 2 : Cleaning method and minimum curing time**

Nominal diameter	All diameters
Cleaning method	4 blows + 4 brushing operation + 4 blows

Anchor size	M8	M10	M12	M16	M20	M24	M30
Brush diameter [mm]	10	12	14	18	25	28	35

Ambient temperature	0°C	10°C	20°C	30°C	40°C
Processing time	30mn	10mn	6mn 30s	4mn 30s	1mn 30s
Curing time in dry concrete	270mn	180mn	110mn	60mn	40mn
Curing time in wet concrete	540mn	360mn	220mn	120mn	80mn

**Brush for cleaning the drill hole**



**SPIT EPOMAX A4**

**Materials and cleaning method**

**Annex 3**

of European  
Technical Approval  
**ETA- 05/0112**

**Table 3: Dimensions**

M	D	Embedment depth		
		$h_{ef, std}$	$h_{ef, min}$	$h_{ef, max}$
<b>M8</b>	8	80	64	95
<b>M10</b>	10	90	80	120
<b>M12</b>	12	110	96	144
<b>M16</b>	16	125	128	192
<b>M20</b>	20	170	160	220
<b>M24</b>	24	210	192	280
<b>M30</b>	30	280	240	330

**Table 4: Installation data with standard, minimum and maximum embedment depth**

Nominal diameter	$\varnothing d_0$ Nominal diameter of the drill bit	$d_f$ Clearance hole in the fixture	$h_0$ depth of the hole			$h_{ef}$ effective anchoring depth			$T_{inst}$ Tightening torque	$h_{min}$ minimum thickness of the concrete slab		
			std	min	max	std	min	max		std	min	max
	[mm]	[mm]	[mm]			[mm]			[N.m]	[mm]		
<b>M8</b>	10	9	80	64	95	80	64	95	10	110	100	125
<b>M10</b>	12	12	90	80	120	90	80	120	20	120	110	150
<b>M12</b>	14	14	110	96	144	110	96	144	30	140	125	175
<b>M16</b>	18	18	125	128	192	125	128	192	60	160	165	230
<b>M20</b>	25	22	170	160	220	170	160	220	120	220	210	270
<b>M24</b>	28	26	210	192	280	210	192	280	200	265	250	335
<b>M30</b>	35	33	280	240	330	280	240	330	400	350	310	400

**Table 5 : Minimum spacing and edge distances**

			<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>M20</b>	<b>M24</b>	<b>M30</b>
Minimum spacing	$s_{min}$	mm	40	45	55	65	85	105	140
Minimum edge distance	$c_{min}$	mm	40	45	55	65	85	105	140

**SPIT EPOMAX A4****Installation data****Annex 4**of European  
Technical Approval  
**ETA- 05/0112**

**Table 6a: Characteristic values of resistance to tension loads of design method A in case of steel failure, pull-out failure and concrete cone failure**

			M8	M10	M12	M16	M20	M24	M30
<b>Steel failure</b>									
Characteristic resistance	$N_{Rk,s}$	[kN]	23	37	54	102	159	229	261
Partial safety factor	$\gamma_{Ms}$	-	1,87						2,86

<b>Pullout and concrete cone failure in non-cracked concrete C20/25</b>									
<b><math>h_{ef} min^*</math></b>		[mm]	64	80	96	128	160	192	240
Characteristic resistance C20/25 – $h_{ef} min$ T = - 40 °C to + 40 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	16	25	40	50	60	95	115
Characteristic resistance C20/25 – $h_{ef} min$ T = - 40 °C to + 80 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	12	20	30	40	50	75	95
Characteristic resistance C20/25 – $h_{ef} min$ T = - 40 °C to + 120 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	9	16	25	35	40	60	75
<b><math>h_{ef} std^*</math></b>		[mm]	80	90	110	125	170	210	280
Characteristic resistance C20/25 – $h_{ef} std$ T = - 40 °C to + 40 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	20	30	40	50	75	95	140
Characteristic resistance C20/25 – $h_{ef} std$ T = - 40 °C to + 80 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	16	25	35	40	60	75	115
Characteristic resistance C20/25 – $h_{ef} std$ T = - 40 °C to + 120 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	12	20	25	30	45	60	75
<b><math>h_{ef} max^*</math></b>		[mm]	95	120	144	192	220	280	330
Characteristic resistance C20/25 – $h_{ef} max$ T = - 40 °C to + 40 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	25	40	60	75	95	140	170
Characteristic resistance C20/25 – $h_{ef} max$ T = - 40 °C to + 80 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	16	25	40	50	75	115	140
Characteristic resistance C20/25 – $h_{ef} max$ T = - 40 °C to + 120 °C	$N_{Rk,p} = N_{Rk,c}^0$	[kN]	12	20	30	35	50	75	95
<b>Increasing and partial safety factors</b>									
Increasing factor	C30/37	$\psi_c$	-	1,14					
Increasing factor	C40/50			1,26					
Increasing factor	C50/60			1,34					
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc}$	-	2,16						

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**Table 6b: Characteristic values of resistance to tension loads of design method A in case of splitting failure**

Splitting failure			M8	M10	M12	M16	M20	M24	M30	
Effective anchorage depth	$h_{ef}$ min	[mm]	64	80	96	128	160	192	240	
	$h_{ef}$ std	[mm]	80	90	110	125	170	210	280	
	$h_{ef}$ max	[mm]	95	120	144	192	220	280	330	
Partial safety factor		$\gamma_{M,sp}$	-	2,16	2,16	2,16	2,16	2,16	2,16	
Spacing	min	$S_{cr,N}$	[mm]	128	160	192	256	320	384	480
	std			160	200	240	320	400	480	600
	max			192	240	288	384	480	576	720
	min	$S_{cr,sp}$	[mm]	256	320	384	384	320	384	480
	std			320	400	480	480	400	480	600
	max			384	480	576	576	480	576	720
Edge distance	min	$C_{cr,N}$	[mm]	64	80	96	128	160	192	240
	std			80	100	120	160	200	240	300
	max			96	120	144	192	240	288	360
	min	$C_{cr,sp}$	[mm]	128	160	192	192	160	192	240
	std			160	200	240	240	200	240	300
	max			192	240	288	288	240	288	360

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**Table 7: Characteristic values of resistance to shear loads of design method A**

			M8	M10	M12	M16	M20	M24	M30
<b>Steel failure without lever arm</b>									
Characteristic resistance	$V_{Rk,s}$	[kN]	11,4	18,5	27,0	51	80	114	131
Partial safety factor	$\gamma_{Ms}$	-	1,56						2,38

<b>Steel failure with lever arm</b>									
Characteristic resistance	$M_{Rk,s}$	[N.m]	22	45	80	207	405	700	1012
Partial safety factor	$\gamma_{Ms}$	-	1,56						2,38

<b>Pry out failure</b>									
Factor in equation (5.6)	k	-	2	2	2	2	2	2	2
Partial safety factor	$\gamma_{Mp}$	-	1,80	1,80	1,80	1,80	1,80	1,80	1,80

<b>Concrete edge failure</b>									
Effective length of anchor under shear loading	$l_f$	[mm]	80	90	110	125	170	210	280
Outside diameter of anchor	$d_{nom}$	[mm]	10	12	14	18	25	28	35
Partial safety factor	$\gamma_{Mc}$	-	1,80	1,80	1,80	1,80	1,80	1,80	1,80

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**Table 8: Characteristic displacements under axial tension loads**

Characteristic displacement in non-cracked C 20/25 to C50/60 concrete		M8	M10	M12	M16	M20	M24	M30
Admissible service load :N	[kN]	8,7	12,2	17,9	19,9	28,4	42,1	50,3
$\delta_{N0}$ short term	[mm]	0,1	0,1	0,1	0,1	0,2	0,3	0,4
$\delta_{N\infty}$ long term	[mm]	0,2	0,2	0,2	0,2	0,2	0,3	0,4

**Table 9: Characteristic displacements under shear loads**

Characteristic displacement in non-cracked C 20/25 to C50/60 concrete		M8	M10	M12	M16	M20	M24	M30
Admissible service load : V	[kN]	5,9	9,3	13,5	25,2	36,4	52,4	62,2
$\delta_{N0}$ short term	[mm]	2,0	2,0	2,0	3,5	3,5	3,5	3,5
$\delta_{N\infty}$ long term	[mm]	3,0	3,0	3,0	5,2	5,2	5,2	5,2

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