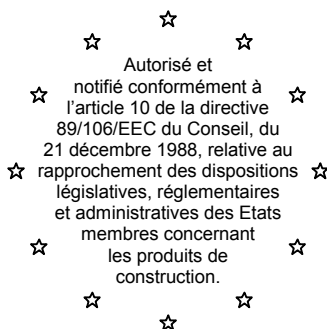


# Centre Scientifique et Technique du Bâtiment

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## European Technical Approval

## ETA-11/0473

(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:**

**Powers Spinning capsule SC-PRO**

**Powers Fasteners Europe BV  
Westrak 208  
1771 SV Wieringerwerf  
Netherlands**

Cheville à scellement de type "capsule" pour fixation dans le  
béton non fissuré M8, M10, M12, M14, M16, M20, M22, M24 et  
M30.

**Bonded capsule anchor for use in non cracked concrete:  
sizes M8, M10, M12, M14, M16, M20, M22, M24 and M30**

**24/06/2013  
24/06/2018**

**Plant 3**

13 pages incluant 5 annexes faisant partie intégrante du  
document.

**13 pages including 5 annexes which form an integral part of  
the document.**

This European Technical Approval replaces ETA-11/0473 with validity from 09/02/2012 to 04/01/2015  
Cet Agrément Technique Européen remplace l'Agrément ETA-11/0473 valide du 09/02/2012 au 04/01/2015



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> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council <sup>3</sup>;
- Décret n° 92-647 du 8 juillet 1992<sup>4</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>5</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.

4. This European Technical Approval may be withdrawn by the Centre Scientifique et Technique du Bâtiment pursuant to Article 5 (1) of the Council Directive 89/106/EEC.

5. Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of the Centre Scientifique et Technique du Bâtiment. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6. The European Technical Approval is issued by the approval body in its official language. This version corresponds to the version circulated within EOTA. Translations into other languages have to be designated as such.

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1 Official Journal of the European Communities n° L 40, 11.2.1989, p. 12

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

3 Official Journal of the European Union n° L 284, 31.10.2003, p. 25

4 Journal officiel de la République française du 14 juillet 1992

5 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 Powers Spinning capsule SC-PRO adhesive system is a bonded anchor system (capsule type) consisting of glass capsule SC-PRO with a threaded rod with hexagon nut and washer of sizes M8, M10, M12, M14, M16, M20, M22, M24 and M30.

The standard threaded rod can be made of zinc plated carbon steel, stainless steel or high corrosion resistant stainless steel.

The glass capsule is placed into a rotary/percussion drilled hole previously and the threaded rod is driven by machine with simultaneous hammering and turning.

The anchor rod is anchored via the bond between anchor rod, chemical mortar and concrete.

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 minimum and C50/60 at most according to EN 206-1: 2000-12. It may be anchored in non-cracked concrete only.

**The anchors with zinc plated or hot dip galvanised carbon steel threaded rod** may only be used in concrete subject to dry internal conditions.

**The anchors with stainless steel threaded rod A4 (1.4401, 1.4404, 1.4571)** may be used in structures subject to dry internal conditions and also in structures 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 anchors with high corrosion resistant stainless steel threaded rod (1.4529, 1.4565)** may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions. Such particular conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with 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 for all diameters (use category 1).

Installation	Substrate		
	Dry concrete	Wet concrete	Flooded hole
All diameters	Yes	Yes	Not qualified

All the diameters (i.e. from M8 to M30) may be used in all directions.

The anchor may be used in the following temperature ranges:

- Temperature range I: -40 °C to +40 °C  
(max long term temperature +24 °C and max short term temperature +40 °C).
- Temperature range II: -40 °C to +80 °C  
(max long term temperature +50 °C and max short term temperature +80 °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 anchors correspond 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>6</sup> of this European Technical Approval. The characteristic anchor values for the design of anchorages are given in Annexes 4 to 5.

Each capsule is marked with the identifying mark of the producer, the capsule type and the capsule size.

Threaded rod produced by the manufacturer shall be marked with the identifying mark of the producer, marking of the embedment depth (blue paint or undercut), the anchor size and additional one letter for the material properties in accordance with annex 1. Commercial standard threaded rods, washers and hexagon nuts may also be used if the requirements given in § 4.2.2 are fulfilled.

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

## 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

##### 3.2.1.1. 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>7</sup>. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of incoming materials such as resin and hardener shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying appropriate properties.

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 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.

#### 3.2.1.2. Other tasks of 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 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 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

##### 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. The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the product stating the conformity with the provisions of this European technical approval.

##### 3.2.2.3. Continuous surveillance

The approved certification body involved by the manufacturer 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 and CSTB informed without delay.

### 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:

- Commercial name;
- Name or identifying mark of the producer and manufacturing plant;
- Name of approval body and ETA number;
- Identification number of the certification body;
- Number of the EC certificate of conformity;
- Use category (ETAG 001-5 Option 7);
- The last two digits of the year in which the CE-marking was affixed;
- 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. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to the Centre Scientifique et Technique du Bâtiment before the changes are introduced. The Centre Scientifique et Technique du Bâtiment 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 anchorages

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

The anchorages are designed in accordance with the EOTA Technical Report TR 029<sup>8</sup> "Design of bonded 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 supports, 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;
- commercial standard threaded rods, washers and hexagon nuts may also be used if the following requirements are fulfilled:
  - material, dimensions and mechanical properties of the metal parts according to the specifications given in Annex 2, Table 1,
  - confirmation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents shall be stored,
  - marking of the threaded rod with the envisage embedment depth. This may be done by the manufacturer of the rod or the person on jobsite.
- 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 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 two blowing operations + two brushing operations + two blowing operations; before brushing cleaning the brush and checking

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<sup>8</sup> The Technical Report TR 029 "Design of Bonded Anchors" is published in English on EOTA website [www.eota.eu](http://www.eota.eu).

whether the brush diameter according to Annex 3 Table 3 is sufficient. The brush shall produce natural resistance as it enters the anchor hole. If this is not the case a new brush or a brush with a larger diameter must be used;

- anchor installation ensuring the specified embedment depth, that is the appropriate depth marking of the anchor not exceeding the concrete surface;
- the anchor component installation temperature shall be at least +5 °C; during curing of the chemical mortar the temperature of the concrete must not fall below -5 °C; observing the curing time according to Annex 3, Table 5 until the anchor may be loaded;
- application of the torque moment given in Annex 3 table 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,
- 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 glass capsules 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 +5°C to not more than +25°C.

Glass capsules with expired shelf life must no longer be used.

**Le Directeur Technique**  
**C. BALOCHE**





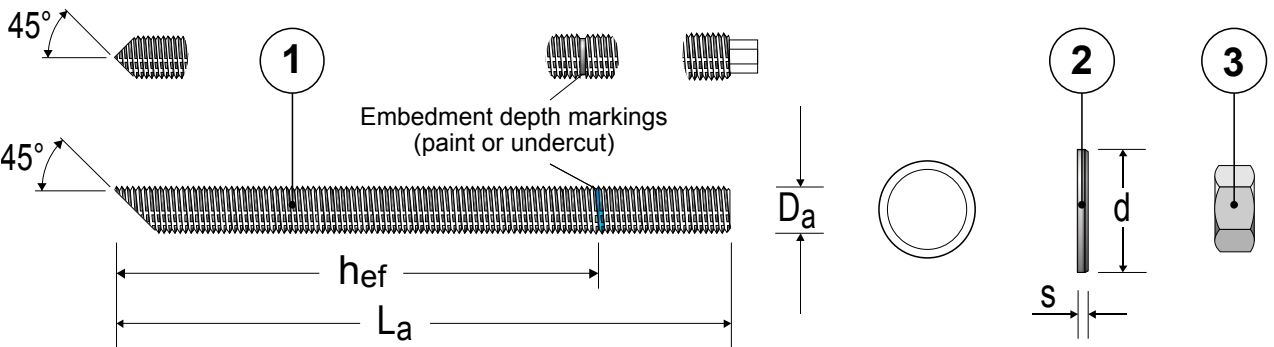
**Powers spinning capsule SC-PRO**



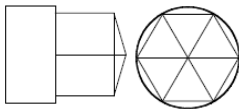
**Capsule marking**

Manufacturer:	Powers
Capsule type:	SC-PRO
Capsule size:	M..

**Anchor rod**

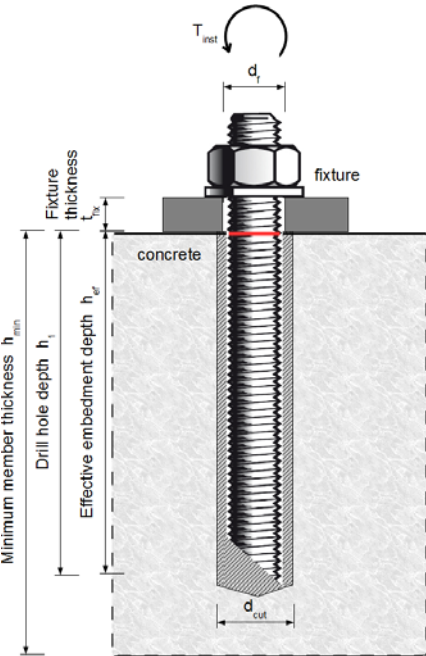


**Powers plastic installation cap:**



Usage for installation of commercial standard rods  
with one flat end (with no hexagonal tip)

**Intended use**



**Use category 1  
(according to ETAG 001-5):**

Installation in dry or wet concrete.  
(Not permitted in flooded holes)

**Overhead installation is permitted!**

**Temperature ranges**

-40°C to +40°C  
(max. short term temperature +40°C and max.  
long term temperature +24°C)

-40°C to +80°C  
(max. short term temperature +80°C and max.  
long term temperature +50°C)

**Powers Spinning capsule SC-PRO**

**Product and intended use**



**Annex 1**  
of European  
technical approval

**ETA-11/0473**

**Table 1 Materials**

Part	Designation	Material
<b>Steel, zinc plated <math>\geq 5 \mu\text{m}</math> according to EN ISO 4042 or Steel, hot-dip galvanised <math>\geq 40 \mu\text{m}</math> according to EN ISO 1461</b>		
1	Anchor rod	Steel, EN 10087 or EN 10263 Property class 5.8, 8.8, EN ISO 898-1:1999
2	Hexagon nut, EN ISO 4032	Property class 5 (for class 5.8 rod) EN 20898-2, Property class 8 (for class 8.8 rod) EN 20898-2
3	Washer, EN ISO 7089, EN ISO 7093, or EN ISO 7094	Steel, zinc plated
<b>Stainless steel</b>		
1	Anchor rod	Material 1.4401 / 1.4571, EN 10088-1:2005, > M24: Property class 50 EN ISO 3506 $\leq$ M24: Property class 70 EN ISO 3506
2	Hexagon nut, EN ISO 4032	Material 1.4401 / 1.4571 EN 10088, > M24: Property class 50 (for class 50 rod) EN ISO 3506 $\leq$ M24: Property class 70 (for class 70 rod) EN ISO 3506
3	Washer, EN ISO 7089, EN ISO 7093, or EN ISO 7094	Material 1.4401 or 1.4571, EN 10088
<b>High corrosion resistance steel</b>		
1	Anchor rod	Material 1.4529 / 1.4565, EN 10088-1:2005, > M24: Property class 50 EN ISO 3506 $\leq$ M24: Property class 70 EN ISO 3506
2	Hexagon nut, EN ISO 4032	Material 1.4529 / 1.4565 EN 10088, > M24: Property class 50 (for class 50 rod) EN ISO 3506 $\leq$ M24: Property class 70 (for class 70 rod) EN ISO 3506
3	Washer, EN ISO 7089, EN ISO 7093, or EN ISO 7094	Material 1.4529 / 1.4565, EN 10088
<b>Spinning capsule</b>		
4	Glas capsule	Glass, Quartz, Resin, Hardener

Commercial standard rod with:

- Materials, dimensions and mechanical properties (Table 1)
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

**Table 2 Dimensions in mm**

Part	Description	M8	M10	M12	M12 /L	M14	M16	M16 /L	M20	M20 /L	M22	M24	M24 /L	M30
1	Threaded rod $D_a$ $L_a \geq$ $h_{ef}$	M8 95 80	M10 100 90	M12 120 175 110 165		M14 135 120	M16 140 205 125 190		M20 190 275 170 255		M22 210 190	M24 235 340 210 315		M30 320 280
2	Washer S d	1.6 16	2.1 21	2.5 24		2.5 28	3.0 30		3.0 37		3.0 39	4.0 44		4.0 56
3	Hexagon nut SW	13	17	19		22	24		30		32	36		46
4	Glass capsule $D_p$ $L_p$	9 80	11 80	13 95 125		15 95	17 95 125		17 160 250		22 160	22 175 245		25 230

**Powers Spinning capsule SC-PRO**

Materials and Dimensions



**Annex 2**

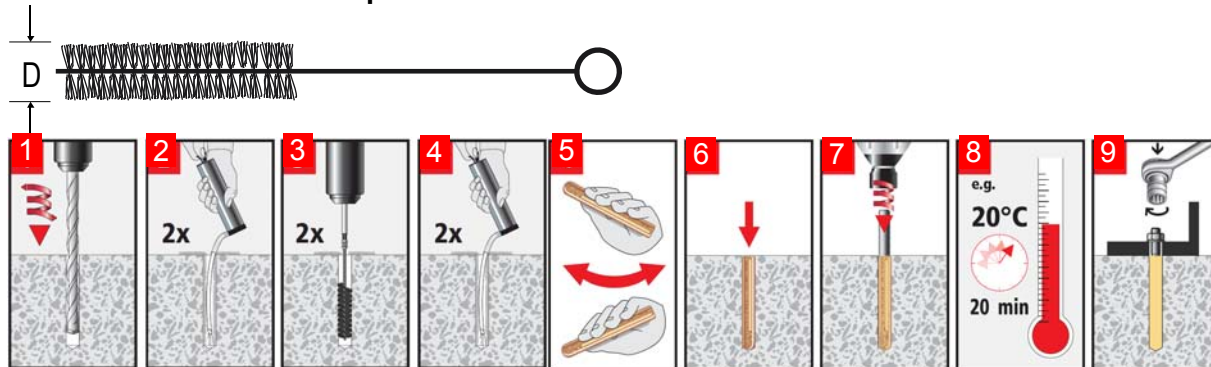
of European  
technical approval

**ETA-11/0473**

**Table 3 Installation parameters**

Anchor size		M8	M10	M12	M12 /L	M14	M16	M16 /L	M20	M20 /L	M22	M24	M24 /L	M30
Nom. drill hole diameter	$d_0$ [mm]	10	12	14		16	18		22		24	26		32
Cutting diameter	$d_{cut} \leq$ [mm]	10.5	12.5	14.5		16.5	18.5		22.5		24.5	26.5		32.5
Depth of drill hole	$h_0$ [mm]	80	90	110	165	120	125	190	170	255	190	210	315	280
Diameter of clearance hole in the fixture	$d_f$ [mm]	9	12	14		16	18		22		24	26		33
Diameter of steel brush	$D$ [mm]	11	13	16		18	20		24		26	28		34
Installation torque	$T_{inst}$ [Nm]	10	20	40		60	80		120		135	150		300

**Steel brush and installation procedure**



**Table 4 Minimum member thickness, edge distance and spacing**

Anchor size		M8	M10	M12	M12 /L	M14	M16	M16 /L	M20	M20 /L	M22	M24	M24 /L	M30
Min. member thickness	$h_{min}$ [mm]	110	120	140	195	150	160	225	220	300	240	260	370	340
Min. edge distance	$c_{min}$ [mm]	40	45	55	55	60	65	65	85	85	95	105	105	140
Min. spacing	$s_{min}$ [mm]	40	45	55	55	60	65	65	85	85	95	105	105	140

**Table 5 Minimum curing time**

Temperature in the concrete member	Minimum curing time in dry concrete	Minimum curing time in wet concrete
$\geq -5$ °C	5 hrs.	10 hrs.
$\geq +5$ °C	1 hr.	2 hrs.
$\geq +20$ °C	20 min.	40 min.
$\geq +30$ °C	10 min.	20 min.

**Powers Spinning capsule SC-PRO**

Installation parameters and minimum curing time



**Annex 3**  
of European  
technical approval

**ETA-11/0473**

**Table 6 Design method A TR029: Characteristic values for tension loads in non- cracked concrete**

Anchor size			M8	M10	M12	M12 /L	M14	M16	M16 /L	M20	M20 /L	M22	M24	M24 /L	M30	
Steel failure																
Characteristic resistance property class 5.8	N <sub>Rk,S</sub>	[kN]	18	29	42		58	78		123		152	177		281	
Characteristic resistance property class 8.8	N <sub>Rk,S</sub>	[kN]	29	46	67		92	126		196		242	282		449	
Partial safety factor property class 5.8, 8.8	γ <sub>Ms</sub> <sup>1)</sup>	[-]	1.5													
Characteristic resistance Stainless steel A4 and HCR property class 70	N <sub>Rk,S</sub>	[kN]	26	40	59		81	110		172		212	247		281 <sup>4)</sup>	
Partial safety factor Stainless steel A4 and HCR property class 70	γ <sub>Ms</sub> <sup>1)</sup>	[-]	1.87													2.86 <sup>4)</sup>
Combined Pull-out and Concrete cone failure																
Characteristic bond resistance in non-cracked concrete C20/25																
Temperature range I: 40°C/24°C	τ <sub>Rk,ucr</sub>	[N/mm²]	12	12	12	12	12	12	12	11	11	11	11	11	10	
Temperature range II: 80°C/50°C	τ <sub>Rk,ucr</sub>	[N/mm²]	10	10	10	10	10	10	10	9.5	9.5	9.5	9.5	9.5	9.0	
Partial safety factor	γ <sub>Mp</sub> = γ <sub>Mc</sub> <sup>1)</sup>	[-]	1.5 <sup>2)</sup>													1.8 <sup>3)</sup>
Effective anchorage depth	h <sub>ef</sub>	[mm]	80	90	110	165	120	125	190	170	255	190	210	315	280	
Increasing factors for non- cracked concrete	Ψ <sub>c</sub>	C25/30	1.06													
		C30/37	1.14													
		C35/45	1.22													
		C40/50	1.26													
		C45/55	1.30													
		C50/60	1.34													
Splitting failure																
Char. edge distance	C <sub>cr,sp</sub>	[mm]	160	135	140	205	150	160	240	215	320	240	265	395	350	
Char. spacing	S <sub>cr,sp</sub>	[mm]	2 · C <sub>cr,sp</sub>													
Partial safety factor	γ <sub>Msp</sub> <sup>1)</sup>	[-]	1.5 <sup>2)</sup>													1.8 <sup>3)</sup>

<sup>1)</sup> In absence of other national regulations

<sup>2)</sup> The partial safety factor  $\gamma_2 = 1.0$  is included

<sup>3)</sup> The partial safety factor  $\gamma_2 = 1.2$  is included

<sup>4)</sup> Property class 50

**Table 7 Displacements under tension loads**

Anchor size		M8	M10	M12	M12 /L	M14	M16	M16 /L	M20	M20 /L	M22	M24	M24 /L	M30
Tension load	N [kN]	9.6	13.5	19.7	29.6	25.1	29.9	45.5	48.3	72.5	59.4	71.6	107.4	94.2
Displacements	$\delta_{N0}$ [mm]	0.17	0.18	0.18	0.18	0.18	0.19	0.19	0.19	0.19	0.20	0.20	0.20	0.21
	$\delta_{N\infty}$ [mm]	0.50												

**Powers Spinning capsule SC-PRO**

Design acc. to TR029 Characteristic values for tension loads  
Displacements



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**Table 8 Design method A TR 029: Characteristic values for shear loads in non-cracked concrete**

Anchor size			M8	M10	M12	M12 /L	M14	M16	M16 /L	M20	M20 /L	M22	M24	M24 /L	M30
Steel failure without lever arm															
Characteristic resistance property class 5.8	$V_{Rk,S}$	[kN]	9	14	21	29	39	61	76	88	140				
Characteristic resistance property class 8.8	$V_{Rk,S}$	[kN]	15	23	34	46	63	98	121	141	224				
Partial safety factor property class 5.8, 8.8	$\gamma_{Ms}^{1)}$	[-]	1.25												
Characteristic resistance Stainless steel A4 and HCR property class 70	$V_{Rk,S}$	[kN]	13	20	30	40	55	86	106	124	140 <sup>4)</sup>				
Partial safety factor Stainless steel A4 and HCR property class 70	$\gamma_{Ms}^{1)}$	[-]	1.56											2.38 <sup>4)</sup>	
Steel failure with lever arm															
Char. bending moment property class 5.8	$M^0_{Rk,S}$	[Nm]	19	37	66	105	166	325	448	561	1125				
Char. bending moment property class 8.8	$M^0_{Rk,S}$	[Nm]	30	60	105	168	266	519	716	898	1799				
Partial safety factor property class 5.8, 8.8	$\gamma_{Ms}^{1)}$	[-]	1.25												
Char. bending moment Stainless steel A4 and HCR property class 70	$M^0_{Rk,S}$	[Nm]	26	52	92	146	233	454	627	786	1125 <sup>4)</sup>				
Partial safety factor Stainless steel A4 and HCR property class 70	$\gamma_{Ms}^{1)}$	[-]	1.56											2.38 <sup>4)</sup>	
Concrete pryout failure															
Factor in equation (5.7) of TR 029, Section 5.2.3.3	k	[-]	2.0												
Partial safety factor	$\gamma_{Mc}^{1)}$	[-]	1.5 <sup>2)</sup>												
Concrete edge failure <sup>3)</sup>															
Partial safety factor	$\gamma_{Mc}^{1)}$	[-]	1.5 <sup>2)</sup>												

<sup>1)</sup> In absence of other national regulations

<sup>2)</sup> The partial safety factor  $\gamma_2 = 1.0$  is included

<sup>3)</sup> Concrete edge failure see chapter 5.2.3.4 of Technical Report TR 029

<sup>4)</sup> Property class 50

**Table 9 Displacements under shear loads**

Anchor size			M8	M10	M12	M12 /L	M14	M16	M16 /L	M20	M20 /L	M22	M24	M24 /L	M30
Shear load	V	[kN]	5.2	8.3	12.0	12.0	16.4	22.4	22.4	35.0	35.0	43.3	50.4	50.4	80.1
Displacements	$\delta_{V0}$	[mm]	2.0	2.1	2.2	2.2	2.3	2.5	2.5	2.6	2.6	2.8	2.8	2.8	3.0
	$\delta_{V\infty}$	[mm]	2.9	3.1	3.3	3.3	3.5	3.7	3.7	4.0	4.0	4.1	4.1	4.1	4.4

**Powers Spinning capsule SC-PRO**

Design acc. to TR029 Characteristic values for shear loads  
Displacements



**Annex 5**  
of European  
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