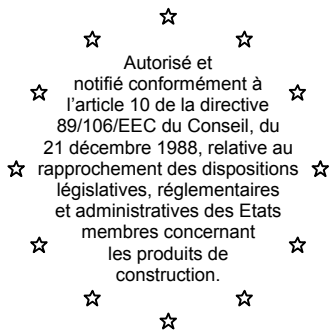


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CSTB
le futur en construction

MEMBRE DE L'EOTA

European Technical Approval

ETA-13/0435

(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 MULTI-MAX

Société SPIT

Route de Lyon

F-26501 BOURG-LES-VALENCE

France

Cheville à scellement de type "à injection" avec tige
d'ancrage diamètres M8, M10, M12, M16, M20 et M24 pour
fixation dans le béton non fissuré.

**Bonded injection type anchor with anchor rod sizes M8,
M10, M12, M16, M20 and M24 for use in non-cracked
concrete.**

31/05/2013

31/05/2018

Société SPIT

Route de Lyon

F-26501 BOURG-LES-VALENCE

France

16 pages incluant 8 annexes faisant partie intégrante du
document.

**16 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 products¹, modified by the Council Directive 93/68/EEC of 22 July 1993²; and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council³;
 - Décret n° 92-647 du 8 juillet 1992⁴ 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/EC⁵;
 - 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.
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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.

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 SPIT MULTI-MAX is a bonded anchor (injection type) with anchor rod made of galvanized steel or stainless steel or stainless steel high corrosion resistance (HCR), 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 anchor rod is inserted into the resin with a slow and slight twisting motion. The mortar cartridges are available in different sizes 280 ml to 410 ml The anchor rod is intended to be used with embedment depth from 8 diameters to 12 diameters

For the installed anchor see Figure given in Annex 2.

1.2. Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106/EEC shall be fulfilled and failure of anchorages made with these products would 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.

Galvanized steel anchor elements: The anchor may only be used in concrete subject to dry internal conditions.

Stainless steel elements: 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).

High corrosion resistant (HCR) stainless steel elements: (commercial standard threaded rods) 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.

Installation	Substrate		
	Dry concrete	Wet concrete	Flooded hole
All diameters	Yes	Yes	No

All the diameters (i.e. from M8 to M24) 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)

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 rods in the sizes of M8 to M24 and the mortar cartridges 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 the Annexes shall correspond to the respective values laid down in the technical documentation⁶ of this European Technical Approval. The characteristic anchor values for the design of anchorages are given in Annexes 7 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. Commercial standard threaded rods can be used. 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 898-1
- Quality affirmation of the mechanical properties with an inspection document according to EN 10204
- Marking the envisage embedment depth.

The two components of the SPIT injection mortar MULTI-MAX could be delivered in unmixed condition in mortar cartridges in a size of 280 ml to 410 ml in coaxial cartridges according to Annex 1.

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.

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,

⁶ 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.

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 shall have a factory production control system in the plant and shall exercise 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 plan⁷. 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.

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.

⁷ 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 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 suitability 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 029⁸ "Design of bonded anchors" under the responsibility of an engineer experienced in anchorages and

⁸ The Technical Report TR 029 "Design of Bonded Anchors" is published in English on EOTA website: www.eota.eu.

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;
- 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;
- Cleaning of the hole: Standard cleaning
 - cleaning the hole of drilling dust : the hole shall be cleaned by at least four blowing operations with hand pump, by at least four manual 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 3 is sufficient;
 - Cleaning of the hole: Premium cleaning
 - cleaning the hole of drilling dust : the hole shall be cleaned by at least two blowing operations with compressed air & an air pistol, by at least two mechanical brushing operations followed again by at two blowing operations; before brushing cleaning the brush and checking whether the brush diameter according to Annex 3 Table 3 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 1; 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 3 table 4 until the rod may be loaded; during curing of the injection mortar the temperature of the concrete must not fall below -5°C ;
- application of the torque moment given in Annex 6 Table 5 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 as well as in sections 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.

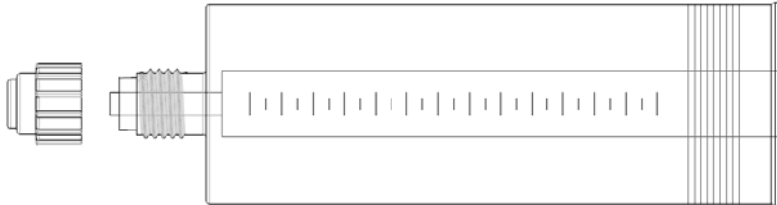
The original French version is signed
by
Le Directeur Technique
C. BALOCHE

Product description and intended use

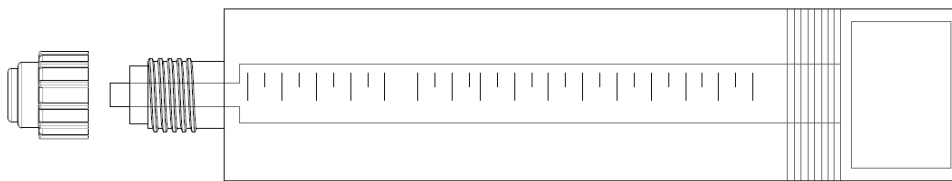
The bonded anchor consists of injection mortar Spit MULTI-MAX and metric threaded rod

Injection mortar MULTI-MAX

Cartridge 380 ml and 410 ml



Cartridge 280 ml and 300 ml



Mixing nozzles



Commercial standard threaded rods with identifying mark of the embedment depth

Intended use:

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

- ✓ Installation in dry or wet concrete

Overhead installation is permitted

Temperature ranges:

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

SPIT MULTI-MAX

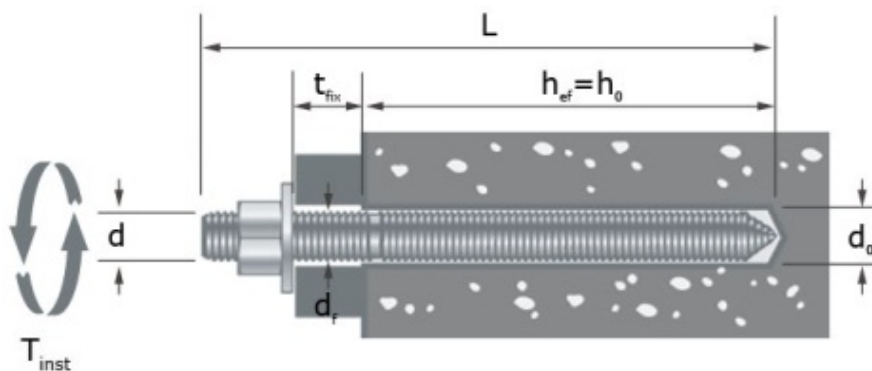
Product and intended use

**Annex 1
of European Technical Approval
ETA-13/0435**

Table 1: Materials

Designation	Material
Injection mortar	Methacrylate resin, hardener and inorganic agents
Elements made of zinc coated steel	
Threaded rod M8 – M24 (standard commercial rods)	Strength class 5.8,6.8, 8.8, 10.9 EN ISO 898-1, Zinc coating $\geq 5\mu\text{m}$ NF E25-009,
Washer	Steel DIN 513 Zinc coating $\geq 5\mu\text{m}$ NF E25-009,
Nut	Steel, EN 20898-2 Grade 6 or 8 Zinc coating $\geq 5\mu\text{m}$ NF E25-009,
Elements made of stainless steel A4	
Threaded rod M8 – M24	Stainless steel A4-70: 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 acc. EN 10088
Washer	Stainless steel A4-70: 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088
Nut	Strength class 80 EN ISO 3506-2 Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 acc. EN 10088
Elements made of high corrosion resistant stainless steel	
Threaded rod M8 – M24	Stainless steel HCR $R_m \geq 650$ MPa Acc. EN 10088, 1.4529 / 1.4565
Washer	Stainless steel HCR Acc. EN 10088, 1.4529 / 1.4565
Nut	Stainless steel HCR $R_m \geq 650$ MPa Acc. EN 10088, 1.4529 / 1.4565

Product in use:



SPIT MULTI-MAX

Material

**Annex 2
 of European Technical Approval
 ETA-13/0435**

Table 2 : Cleaning method

	Standard cleaning	Premium cleaning
Nominal diameter	All diameters	All diameters
Cleaning method	4 blows+ 4 brushing operation + 4 blows Blowing operation: using a hand pomp, blow 4 times. Brushing operation: using the relevant brush, starting from the top of the hole, move downward to the bottom of the hole then move upward to the top of the hole.	2 blows+ 2 brushing operation + 2 blows Blowing operation: using oil free compressed air (mini 6 bars), starting from the bottom of the hole, move upward until no dust is evacuated. Brushing operation: using the relevant brush fitted on a SPIT drilling machine, starting from the top of the hole, move downward to the bottom of the hole (duration 5s) then move upward to the top of the hole (duration 5s)

Table 3 : Brush sizes

	Threaded rods					
Anchor size	M8	M10	M12	M16	M20	M24
Brush diameter [mm]	11	13	15	20	26	30

Brush for cleaning the drill hole



Table 4: Processing and curing time

Temperature of base material	Gel time	Curing time in dry concrete
-5°C > T to 0°C	-	360 min
0°C > T _{base material} to 5°C	18 min	180 min
5°C > T _{base material} to 10°C	12 min	90 min
10°C > T _{base material} to 20°C	6 min	60 min
20°C > T _{base material} to 30°C	4 min	45 min
30°C > T _{base material} to 40°C	2 min	35 min

Note: The temperature of the cartridge must be $\geq 0^{\circ}\text{C}$

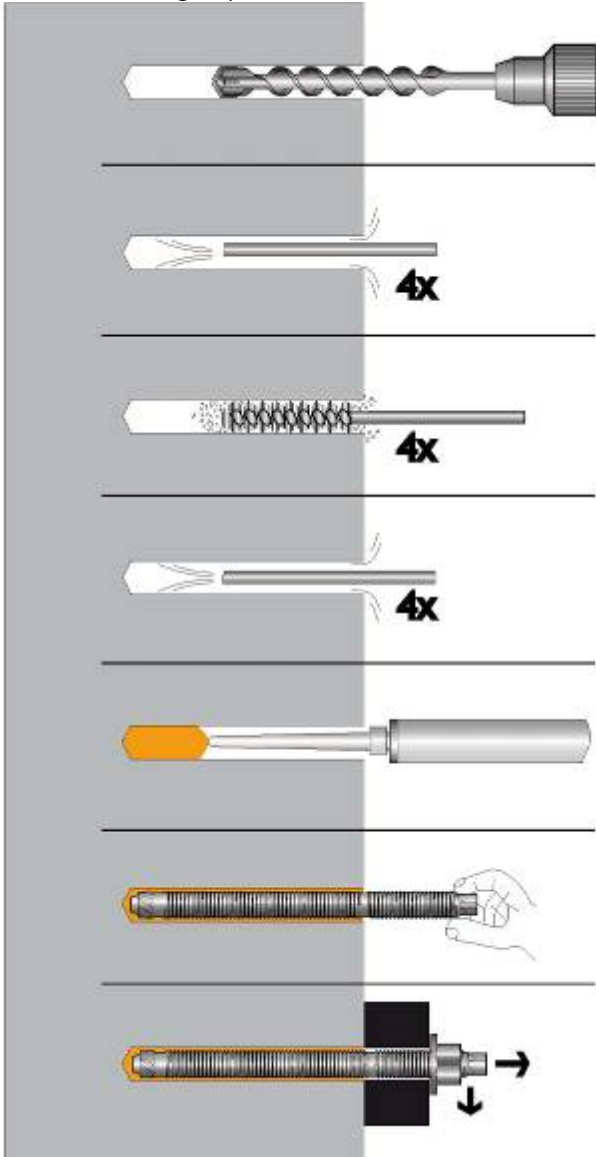
SPIT MULTI-MAX

Cleaning methods

**Annex 3
 of European Technical Approval
 ETA-13/0435**

Instruction For Use: Standard cleaning

Manual cleaning is permitted for hammer drilled holes up to hole diameters $d_0 \leq 16\text{mm}$.



Drill hole of diameter (d_0) and depth (h_0) with a hammer drill set in rotation-hammer mode using an appropriately carbide drill bit.

4 strokes with SPIT blow-out pump from the back of the hole until return air stream is free of noticeable dust.

4 times with the specified brush size (brush diameter \geq borehole diameter d_0) by inserting the SPIT steel wire brush to the back of the hole with a twisting motion and removing.

4 strokes with SPIT blow-out pump from the back of the hole until return air stream is free of noticeable dust.

Screw the mixing nozzle onto the cartridge and dispense the first part to waste until an even colour is achieved for each new cartridge or mixing nozzle. Use tube extensions for holes deeper than 250 mm. Starting from the bottom of the hole fill uniformly. In order to avoid air pocket, withdraw slowly the mixing nozzle while injecting the resin. Fill the hole until 1/2 full.

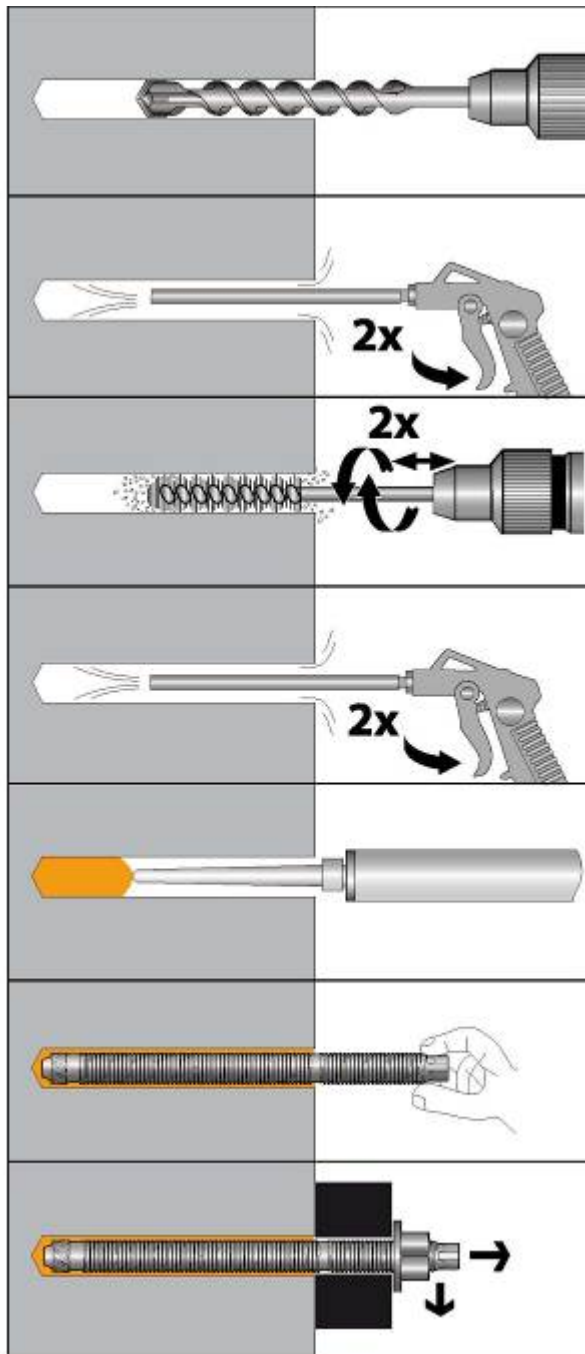
Insert the rod or rebar, slowly and with a slight twisting motion in respect of the gel time indicated in table 4. Remove excess resin from around the mouth of the hole before it sets. Control the embedment depth

Do not disturb anchor between specified cure time (acc. to table 4)
 Attach the fixture and tight the nut at the specified torque

SPIT MULTI-MAX

Instruction For Use: Standard cleaning

**Annex 4
 of European Technical Approval
 ETA-13/0435**



Drill hole of diameter (d_0) and depth (h_0) with a hammer drill set in rotation-hammer mode using an appropriately carbide drill bit.

Using compress air cleaning (mini 6 bars), use the appropriate extension and air nozzle, starting from the bottom of the hole blow out at least 2 times and until no dust is evacuated.

Using the relevant SPIT brush and extension fitted on a drilling machine (dimensions of the brush see table 8 & 9), starting from the top of the hole in rotation, move downward to the bottom of the hole then move upward to the top of the hole. Repeat this operation.

Using compress air cleaning (mini 6 bars), use the appropriate extension and air nozzle, starting from the bottom of the hole blow out at least 2 times and until no dust is evacuated.

Screw the mixing nozzle onto the cartridge and dispense the first part to waste until an even colour is achieved for each new cartridge or mixing nozzle. Use tube extensions for holes deeper than 250 mm. Starting from the bottom of the hole fill uniformly. In order to avoid air pocket, withdraw slowly the mixing nozzle while injecting the resin. Fill the hole until 1/2 full.

Insert the rod or rebar, slowly and with a slight twisting motion in respect of the gel time indicated in table 4. Remove excess resin from around the mouth of the hole before it sets. Control the embedment depth

Do not disturb anchor between specified cure time (acc. to table 4)
 Attach the fixture and tight the nut at the specified torque

Instruction For Use: Premium cleaning

SPIT MULTI-MAX

Instruction For Use: Premium cleaning

**Annex 5
 of European Technical Approval
 ETA-13/0435**

Table 5: Installation data

Nominal diameter	$\varnothing d_0$ Nominal diameter of the drill bit [mm]	d_f Clearance hole in the fixture [mm]	h_0 depth of the hole [mm]		h_{ef} effective anchoring depth [mm]		T_{inst} Tightening torque [N.m]	h_{min} minimum thickness of the concrete slab [mm]	
			min	max	min	max		min	max
M8	10	9	64	96	64	96	10	100	126
M10	12	12	80	120	80	120	20	110	150
M12	14	14	96	144	96	144	30	126	174
M16	18	18	128	192	128	192	60	164	228
M20	25	22	160	240	160	240	120	210	290
M24	28	26	192	288	192	288	200	248	344

Table 6 : Minimum spacing and edge distances

			Threaded rods					
			M8	M10	M12	M16	M20	M24
Minimum spacing	s_{min}	mm	40	50	60	80	100	120
Minimum edge distance	c_{min}	mm	40	50	60	80	100	120

SPIT MULTI-MAX

Installation data

**Annex 6
 of European Technical Approval
 ETA-13/0435**

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

SPIT MULTI-MAX with threaded rod			M8	M10	M12	M16	M20	M24
Carbon Steel failure								
Characteristic resistance grade 5.8	$N_{Rk,s}$	[kN]	18.3	29.0	42.2	78.5	122.5	176.5
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,50					
Characteristic resistance grade 6.8	$N_{Rk,s}$	[kN]	22.0	34.8	50.6	94.2	147.0	211.8
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,50					
Characteristic resistance grade 8.8	$N_{Rk,s}$	[kN]	29.3	46.4	67.4	125.6	196.0	282.4
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,50					
Characteristic resistance grade 10.9	$N_{Rk,s}$	[kN]	36.6	58.0	84.3	157.0	245.0	353.0
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,40					
Stainless Steel failure								
Characteristic resistance grade A4-70	$N_{Rk,s}$	[kN]	25.6	40.6	59.0	109.9	171.5	247.1
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,87					
Characteristic resistance HCR	$N_{Rk,s}$	[kN]	23.8	37.7	54.8	102.1	159.3	229.5
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	2.60					
Combined Pull-out and Concrete cone failure²⁾								
Diameter of threaded rod	d	[mm]	8	10	12	16	20	24
Characteristic bond resistance in non-cracked concrete C20/25								
Temperature range I ³⁾ : -40°C / 40°C	τ_{Rk}	[N/mm ²]	9,0	9,0	8,5	8,0	8,0	7,5
Increasing factor for τ_{Rkp} in non-cracked concrete	ψ_c	C30/37	1,04					
		C40/50	1,07					
		C50/60	1,09					
Splitting failure²⁾								
Edge distance $c_{cr,sp}$ [mm] for	$h / h_{ef} \geq 2,0$	$1,0 h_{ef}$						
	$2,0 > h / h_{ef} > 1,3$	$4,6 h_{ef} - 1,8 h$						
	$h / h_{ef} \leq 1,3$	$2,26 h_{ef}$						
Spacing	$s_{cr,sp}$	[mm]	$2 c_{cr,sp}$					
Partial safety factor $\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$	Dry and wet concrete	Standard cleaning	$1,5^{5)}$	$1,8^{6)}$			-	-
		Premium cleaning	$1,5^{5)}$	$1,8^6$				

¹⁾ In absence of national regulations

²⁾ Calculation of concrete and splitting, see chapter 4.2.1

³⁾ Explanations, see chapter 1.2

⁴⁾ h_{ef} - effective anchorage depth

⁵⁾ The partial safety factor $\gamma_2 = 1,0$ is included

⁶⁾ The partial safety factor $\gamma_2 = 1,2$ is included

Table 8: Characteristic displacements under axial tension loads [mm/(N/mm²)]

C 20/25 to C50/60 concrete	Temperature range I ³⁾ :	δ_{N0} short term	Threaded rods					
			M8	M10	M12	M16	M20	M24
40°C / 24°C		δ_{N0} short term	0,038	0,025	0,018	0,011	0,007	0,005
		$\delta_{N\infty}$ long term	0,256	0,169	0,121	0,071	0,047	0,034

SPIT MULTI-MAX

Characteristic values under tension loads and displacements for threaded rods

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Table 9: Characteristic values of resistance to shear loads of design method A

SPIT MULTI-MAX with threaded rod			M8	M10	M12	M16	M20	M24
Steel failure without lever arm								
Characteristic resistance rod grade 5.8	$V_{Rk,s}$	[kN]	9.2	14.5	21.1	39.3	61.3	88.3
Characteristic resistance rod grade 6.8	$V_{Rk,s}$	[kN]	11.0	17.4	25.3	47.1	73.5	105.9
Characteristic resistance rod grade 8.8	$V_{Rk,s}$	[kN]	14.6	23.2	33.7	62.8	98.0	141.2
Characteristic resistance rod grade 10.9	$V_{Rk,s}$	[kN]	18.3	29.0	42.2	78.5	122.5	176.5
Characteristic resistance rod grade A4-70	$V_{Rk,s}$	[kN]	12.8	20.3	29.5	55.0	85.8	123.6
Characteristic resistance rod grade HCR	$V_{Rk,s}$	[kN]	11.9	18.9	27.4	51.0	79.6	114.7
Steel failure with lever arm								
Characteristic resistance rod grade 5.8	$M^0_{Rk,s}$	[N.m]	18.7	37.4	65.5	166.5	324.5	561.3
Characteristic resistance rod grade 6.8	$M^0_{Rk,s}$	[N.m]	22.5	44.9	78.6	199.8	389.4	673.5
Characteristic resistance rod grade 8.8	$M^0_{Rk,s}$	[N.m]	30.0	59.8	104.8	266.4	519.3	898.0
Characteristic resistance rod grade 10.9	$M^0_{Rk,s}$	[N.m]	37.5	74.8	131.0	333.0	649.1	1122.6
Characteristic resistance rod grade A4-70	$M^0_{Rk,s}$	[N.m]	26.2	52.3	91.7	233.1	454.4	785.8
Characteristic resistance rod grade HCR	$M^0_{Rk,s}$	[N.m]	24.4	48.6	85.2	216.4	421.9	729.7
Partial safety factor steel failure								
Rod grade 5.8	γ_{Ms}	[-]	1,25					
Rod grade 6.8	γ_{Ms}	[-]	1,25					
Rod grade 8.8	γ_{Ms}	[-]	1,25					
Rod grade 10.9	γ_{Ms}	[-]	1,50					
Rod grade A4-70	γ_{Ms}	[-]	1,56					
Rod grade HCR	γ_{Ms}	[-]	2,17					
Concrete Pry out failure								
Factor in equation (5.7) of technical report TR029 for the design of bonded anchors	k	[-]	2,0 for $h_{ef} \geq 60\text{mm}$					
Partial safety factor	γ_{Mcp} ¹⁾	[-]	1,5 ²⁾					
Concrete edge failure³⁾								
Partial safety factor	γ_{Mc} ¹⁾	[-]	1,5 ²⁾					

¹⁾ In absence of national regulations

²⁾ The partial safety factor $\gamma_2 = 1,0$ is included.

³⁾ Concrete edge failure see chapter 5.2.3.4 of Technical Report TR 029.

Table 10: Characteristic displacements under shear loads

C 20/25 to C50/60 concrete		Threaded rods					
		M8	M10	M12	M16	M20	M24
δ_{V0} short term	[mm/kN]	0,11	0,10	0,09	0,08	0,06	0,04
$\delta_{V\infty}$ long term	[mm/kN]	0,17	0,15	0,14	0,12	0,09	0,06

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Characteristic values under shear loads and displacements for threaded rods

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 of European Technical Approval
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