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Autorisé et notifié conformément à l'article 10 de la directive 89/106/EEC du Conseil, du 21 décembre 1988, relative au rapprochement des dispositions législatives, réglementaires et administratives des Etats membres concernant les produits de construction.

MEMBRE DE L'EOTA

European Technical Approval ETA-10/0309

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

Nom commercial : **Trade name:**	**Injection system SPIT EPCON C8 for cracked concrete**
Titulaire : **Holder of approval:**	**Société SPIT Route de Lyon - B.P. 104 26501 BOURG-LES-VALENCE FRANCE**
Type générique et utilisation prévue du produit de construction : **Generic type and use of construction product:**	Cheville à scellement de type "à injection" pour fixation dans le béton fissuré et non fissuré : tiges filetées M8 à M30 et barres d'armatures Ø8 à Ø32. **Bonded injection type anchor for use in cracked and non cracked concrete: Threaded rods M8 to M30 and rebars Ø8 to Ø32**
Validité du : au : **Validity from / to:**	**11/10/2010 11/10/2015**
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:**	25 pages incluant 16 annexes faisant partie intégrante du document. **25 pages including 16 annexes which form an integral part of the document.**

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[1], modified by the Council Directive 93/68/EEC of 22 July 1993[2];
- Décret n° 92-647 du 8 juillet 1992[3] 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[4];
- 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 suitability 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.

[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] Journal officiel de la République française du 14 juillet 1992
[4] 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 EPCON C8 injection adhesive is a two component system delivered in unmixed condition in cartridges of sizes according to annex 3 and a steel element.
The steel element can be made of zinc plated carbon steel, reinforcing bar, stainless steel, or high corrosion resistant stainless steel.
The steel element is placed into a rotary/percussion drilled hole filled with the injection mortar and is anchored via the bond between the metal part and concrete.
An illustration of the product is provided in Annex 1 to 3.

1.2. Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and long-duration 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 cracked or non-cracked concrete.

The elements made of zinc plated carbon steel (Threaded rods Maxima and commercial standard threaded rods electroplated or hot dip galvanized) may only be used in concrete subject to dry internal conditions.

The elements made of stainless steel A4 (Threaded rods Maxima and commercial standard threaded rods) 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 elements made of high corrosion resistant stainless steel (HCR) (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).

Elements made of rebar:

Post-installed reinforcing bars may be used as anchor designed in accordance with the EOTA Technical Report TR 029 only. Such applications are e.g. concrete overlay or shear dowel connections or the connections of a wall predominantly loaded by shear and compression forces with the foundation, where the reinforcing bars act as dowels to take up shear forces. Connections with post-installed reinforcing bars in concrete structures designed in accordance with EN1992-1-1: 2004 are not covered by this European technical approval.

The anchor may be installed in dry or wet concrete for all diameters (use category 2).

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

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 steel elements and the mortar cartridges correspond to the drawings and provisions given in Annexes 1 to 4. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 5 to 9 shall correspond to the respective values provided in the technical documentation[5] of this European Technical Approval. The characteristic anchor values for the design of anchorages are provided in Annexes 11 to 16.

[5] The technical documentation of this European Technical Approval is deposited at the Centre Scientifique et Technique du Bâtiment and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

The two components of the EPCON C8 injection mortar are delivered in an unmixed condition in cartridges of sizes 400 ml, 450 ml or 900 ml according to Annex 3. Each cartridge is marked with the identifying, the trade name “SPIT EPCON C8”, storage life, curing and processing time and charge code number.

Each threaded rod Maxima is marked with the letter "S", bolt diameter and maximum thickness of the fixture.

Elements made of threaded rod shall comply with the specifications given in Annex 7.

Elements made of reinforcing bar shall comply with the specifications given in Annex 8.

Explanations of the markings are given in Annex 1.

The marking of embedment depth for the commercial standard threaded rods and reinforcing bar may be done on jobsite.

2.2. Methods of verification

The assessment of suitability 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 1.

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,
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[6]. 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) that verify appropriate materials 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 include at least the following information:

- designation of the product, basic materials and components;
- type of control or testing;
- date of manufacture of the product and date of testing of the product or basic materials 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

[6] 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 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;
- number of the European Technical Guideline;
- use category (ETAG 001-5 Option 1);
- size.

4 Assumptions under which the suitability 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 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 029[7] "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.).

Post-installed reinforcing bars may be used as anchor designed in accordance with the EOTA Technical Report TR 029 only. The basic assumptions for the design according to anchor theory shall be observed. This includes the consideration of tension and shear loads and the corresponding failure modes as well as the assumption that the base material (concrete structural element) remains essentially in the serviceability limit state (either non-cracked or cracked) when the connection is loaded to failure. Such applications are e.g. concrete overlay or shear dowel connections or the connections of a wall predominantly loaded by shear and compression forces with the foundation, where the rebars act as dowels to take up shear forces. Connections with reinforcing bars in concrete structures designed in accordance with EN1992-1-1: 2004 (e.g. connection of a wall loaded with tension forces in one layer of the reinforcement with the foundation) are not covered by this European technical approval.

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

4.2.2. Installation of anchors

The suitability 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 7 and 8,
  - confirmation of material and mechanical properties of the metal parts by inspection certificate 3.1 according to EN 10204:2004, the documents should 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 air 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;
- clean the hole in accordance with Annexe 10; before brushing clean the brush and checking whether the brush diameter according to Annex 9 Table 7 or 8 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;
- for overhead installation, embedded metal parts shall be fixed during the curing time, e.g. with wedges;
- for injection of the mortar in bore holes ≥ 350 mm piston plugs shall be used;
- mortar injection by using the equipment including the special mixing nozzle shown in Annex 4; discarding the first trigger pulls of mortar of each cartridge or mixing nozzle 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 1/2 of the drill hole; inserting immediately the threaded rod, slowly and with a slight twisting motion, removing excess of injection mortar around the rod; observing the curing time according to Annex 9 table 9 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 5 table 1 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,
- hole depth,
- diameter of anchor rod,
- minimum effective anchorage depth,
- information on the installation procedure, including cleaning of the hole with the cleaning equipments, preferably by means of an illustration,
- material and property class of metal parts acc. to Annex 7 and 8,
- anchor component installation temperature,
- ambient temperature of the concrete during installation of the anchor,
- admissible processing time (open time) of the mortar,
- curing time until the anchor may be loaded as a function of the ambient temperature in the concrete during installation,
- maximum torque moment,
- 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 +5°C to not more than +35°C.

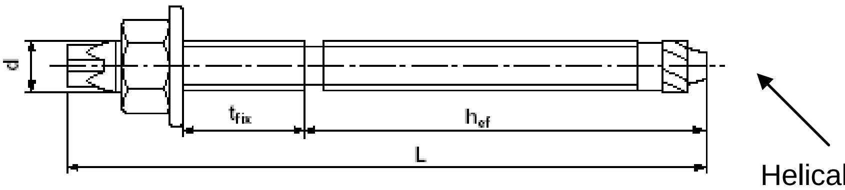
Mortar cartridges with expired shelf life must no longer be used.

The anchor shall only be packaged and supplied as a complete unit. Cartridges may be packed separately from metal parts.

The original French version is signed by

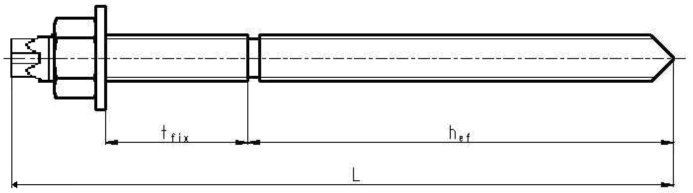
Le Directeur Technique
C. BALOCHE

Assembled anchor:

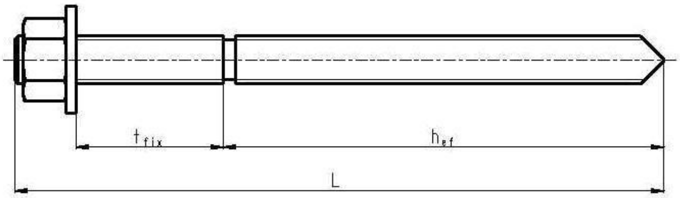


Helical end

Anchor rods SPIT MAXIMA M8 to M16 (Electroplated version)



Anchor rods SPIT MAXIMA M8 to M16 (Stainless steel version)



One side and two sides 45° chamfer

Anchor rods SPIT MAXIMA M20 to M30 (Electroplated / Stainless steel versions)

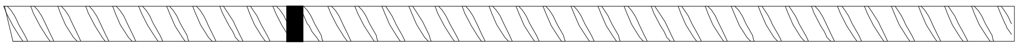
<u>Marking on the anchor rod SPIT MAXIMA</u> : letter S, bolt diameter and maximum thickness of the fixture: Ex: S M10 / 20

Table 1: Dimensions Anchor rods SPIT MAXIMA

M	d	L	Standard	
			$h_{ef,std}$	$t_{fix\ max}$ (1)
M8	8	110	80	15
M10	10	130	90	20
M12	12	160	110	25
M16	16	190	125	35
M20	20	260	170	65
M24	24	300	210	63
M30	30	380	280	70

(1) Maximum thickness of the fixture for threaded rods SPIT MAXIMA only

Commercial standard threaded rods M8 to M30 with identifying mark of the embedment depth: Electroplated carbon steel grade 5.8 to 10.9, Stainless stell A4 and HCR.



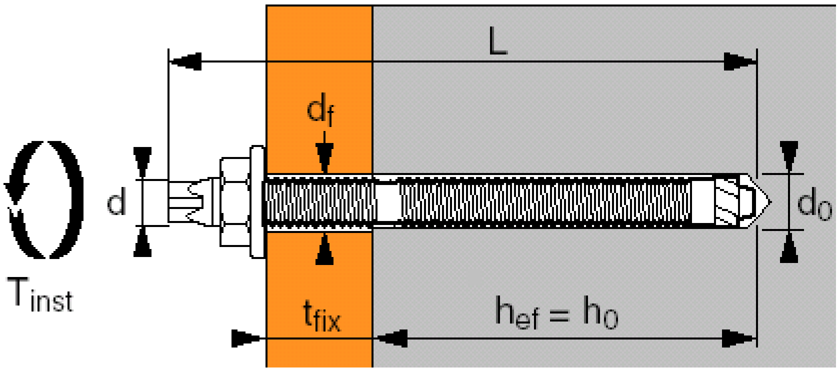
Rebars Ø8, Ø10, Ø12, Ø16, Ø20, Ø25, Ø28, Ø30, Ø32 with properties according to Annex C of EN 1992-1-1

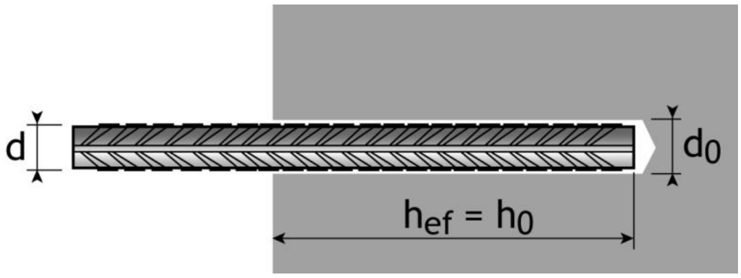
SPIT EPCON C8	Annex 1. of European Technical Approval ETA-10/0309
Product and intended use	

Intended use:

- Installation in dry or wet concrete (category 1) and in flooded holes (category 2).
- All the diameters may be used in all the direction (floor, wall, overhead).
- The anchor may be used in the following temperature ranges:
  - ¬Temperature range -40°C to +40°C (max short term temperature +40°C
    max long term temperature +24°C)
  - ¬Temperature range -40°C to +80°C (max short term temperature +80°C
    max long term temperature +50°C)

Schema of the anchor in use:





SPIT EPCON C8	**Annex 2.** **of European Technical Approval** **ETA-10/0309**
Product and intended use	

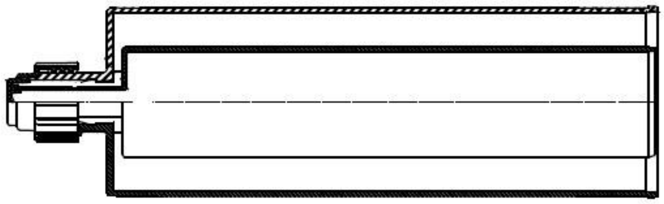
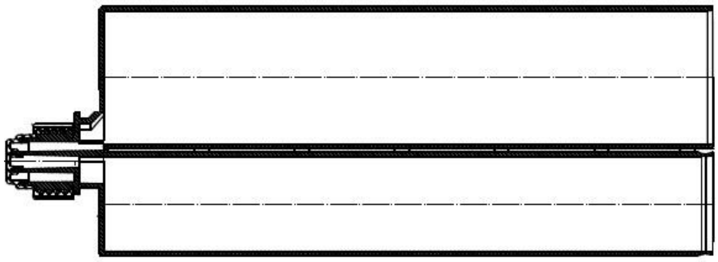
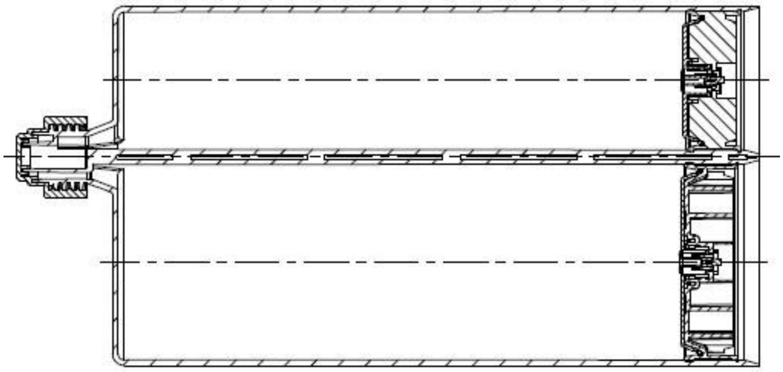
Injection mortar

Two components epoxy system

Marking

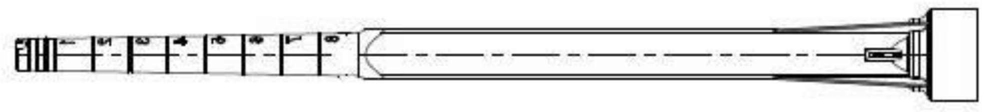
- Identifying mark of the producer **SPIT**
- Trade name **EPCON C8**
- Expire date
- Curing and processing time
- Charge code number

Cartridge

400ml coaxial cartridge	
450ml side by side cartridge	
900ml side by side cartridge	

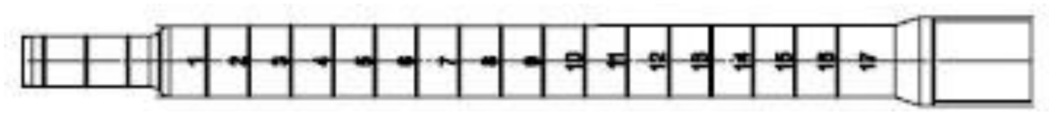
SPIT EPCON C8	**Annex 3.** **of European Technical Approval** **ETA-10/0309**
Mortar cartridges	

Mixing nozzles

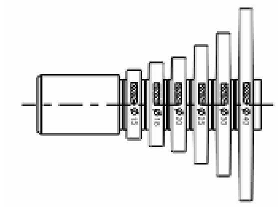


Standard 400-450-900

High flow mixing nozzle



Reduction for mixing nozzles



Piston Plug

Extensions

Ø Drilling	Plastic extension for mixing nozzle ϕ_{ext} x l	Mixing nozzle	
[mm]	[mm]	[-]	[-]
10 à 40	9x196 9x1000	standard mixing nozzle 400-450-900	
15 à 40	13x1000	standard mixing nozzle 400-450-900	High flow mixing nozzle + Reduction
25 à 40	20 x 1000	High flow mixing nozzle	

Dispensers

- Electric dispenser EGI 450
- Pneumatic dispenser P450 / P900 / P400
- Manual dispenser M450 / M450 premium / M400

SPIT EPCON C8	**Annex 4.** **of European Technical Approval** **ETA-10/0309**
Mixing nozzles, extensions and dispensers	

Table 1 : Installation data with standard, minimum and maximum embedment depth for threaded rods

Nominal diameter	Ø d_0 Nominal diameter of the drill bit	d_f Clearance hole in the fixture	h_{ef} effective anchoring depth and h_0 minimum depth of drilled hole			T_{inst} Tightening torque	h_{min} minimum thickness of the concrete slab	
			Std (1)	min	max		std	min max
	[mm]	[mm]	[mm]			[N.m]	[mm]	
M8	10	9	80	40	160	10	110	h_{ef} + 30 mm ≥ 100 mm
M10	12	12	90	40	200	20	120	
M12	14	14	110	48	240	30	140	
M16	18	18	125	64	320	60	160	h_{ef} + $2d_o$
M20	25	22	170	80	400	120	220	
M24	28	26	210	96	480	200	265	
M30	35	33	280	120	600	400	350	

(1) Effective anchoring depth for SPIT MAXIMA threaded rods.

Table 2 : Minimum spacing and edge distances

			Threaded rods						
			M8	M10	M12	M16	M20	M24	M30
Minimum spacing	s_{min}	[mm]	40	50	60	80	100	120	150
Minimum edge distance	c_{min}	[mm]	40	50	60	80	100	120	150

Table 3 : Installation data with minimum and maximum embedment depth for rebars

Nominal diameter	Ø d_0 Nominal diameter of the drill bit	h_{ef} effective anchoring depth and h_0 minimum depth of drilled hole		h_{min} minimum thickness of the concrete slab
		min	max	
	[mm]	[mm]		[mm]
Ø8	10	40	160	h_{ef} + 30 mm ≥ 100 mm
Ø10	12	60	200	
Ø12	15	70	240	
Ø16	20	80	320	$h_{ef} + 2d_o$
Ø20	25	90	400	
Ø25	30	100	500	
Ø26	30	104	520	
Ø28	35	112	560	
Ø32	40	128	640	

Table 4 : Minimum spacing and edge distances

			Rebars								
			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø26	Ø28	Ø32
Minimum spacing	Smin	[mm]	40	50	60	80	100	125	130	140	160
Minimum edge distance	Cmin	[mm]	40	50	60	80	100	125	130	140	160

Table 5 : Materials properties for threaded rods

Designation	Size	Material and EN/ISO reference
Electroplated Version		
Threaded rods	M8 to M30 (standard commercial rods)	Carbon steel grade 5.8; 8.8 and 10.9 according to ISO 898 Zinc coating 5µm min. NF E25-009 Hot dip galvanized NF EN ISO 1461
	MAXIMA M8 (produced by the manufacturer)	DIN 1654 part 2 or 4, cold formed steel or NFA 35053, cold formed steel. Zinc coating 5µm min. NF E25-009
	MAXIMA M10 to M16 (produced by the manufacturer)	NFA 35053 cold formed steel Zinc coating 5µm min. NF E25-009
	MAXIMA M20 to M30 (produced by the manufacturer)	11SMnPb37 according to NF A35-561 Zinc coating 5µm min. NF E25-009
Nut	-	Steel, EN 20898-2 Grade 6 or 8 Zinc coating 5µm min. NF E25-009
Washer	-	Steel DIN 513 Zinc coating 5µm min. NF E25-009
Stainless steel version		
Threaded rods (Maxima or Commercial std rods)	Grade A4-80: M8 to M24 Grade A4-70: M30	X2CrNiMo 17.12.2 according to EN 10088-3
Nut		Stainless steel A4-80 according to EN 20898-2
Washer		Stainless steel A4 according to EN 20898-2
High resistance corrosion version (HCR)		
Threaded rods	M8 to M30	Stainless steel HCR acc. EN 10088, 1.4529 / 1.4565 Rm ≥ 650 MPa acc.EN 10088
Nut	-	Stainless steel HCR acc.EN 10088, 1.4529 / 1.4565 Rm ≥ 650 MPa acc.EN 10088
Washer	-	Stainless steel HCR acc.EN 10088, 1.4529 / 1.4565 EN ISO 7089

Table 6 : Materials properties for rebars

(Refer to EN 1992-1-1 Annex C Table C.1 and C.2N)

Product form		**Bars and de-coiled rods**	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (MPa)		400 to 600	
Minimum value of $k = (f_t/f_y)_k$		≥ 1,08	≥ 1,15 < 1,35
Characteristic strain at maximum force, ε_{uk} (%)		≥ 5,0	≥ 7,5
Bendability		Bend / Rebend test	
Maximum deviation from nominal mass (individual bar or wire) (%)	Nominal bar size (mm) ≤ 8 > 8	± 6,0 ± 4,5	
Minimum relative rib area, $f_{R,min}$	Nominal bar size (mm) 8 to 12 > 12	0,040 0,056	

High of the rib h_{rib}:

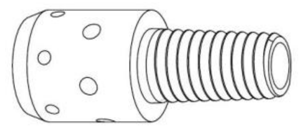
The high of the rib h_{rib} must satisfy the equation $0,05\ d \leq h_{rib} \leq 0,07\ d$
with d = nominal diameter of the rebar.

Table 7 and 8 : Dimensions of the cleaning tools

	Threaded rods						
Dimensions	M8	M10	M12	M16	M20	M24	M30
Ø drilled hole [mm]	10	12	14	18	25	28	35
Ø Air nozzle [mm]	6	8	12	14	20	24	29
Ø Brush [mm]	11	13	15	20	26	30	37

	Rebars								
Dimensions	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø26	Ø28	Ø32
Ø drilled hole [mm]	10	12	15	20	25	30	30	35	40
Ø Air nozzle [mm]	6	8	12	14	20	24	24	29	29
Ø Brush [mm]	11	13	16	22	26	32	32	37	42

Air nozzle



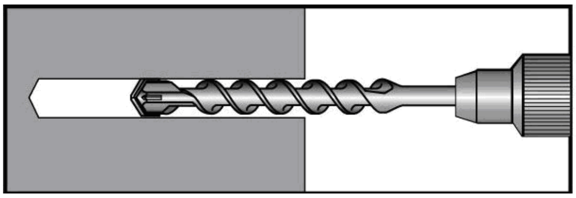
Metal brush and extention

Table 9 : Curing time

Temperature of base material	Gel time	Curing time in dry concrete	Curing time in wet concrete
5°C à 9°C	20 min	30 h	60 h
10°C à 19°C	14 min	23 h	46 h
20°C à 24°C	11 min	16 h	32 h
25°C à 29°C	8 min	12 h	24 h
30°C à 39°C	5 min	8 h	16 h
40°C	5 min	6 h	12 h

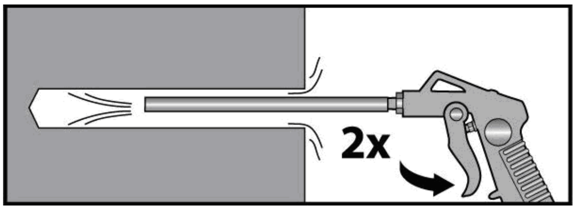
Bore hole drilling

1 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.

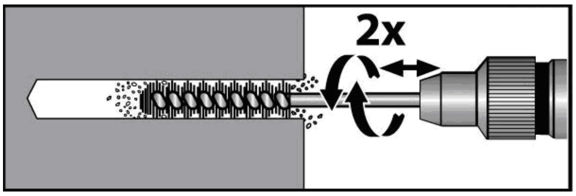


Bore hole cleaning

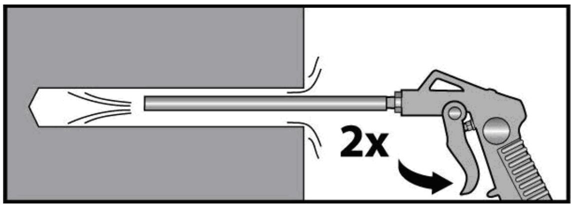
2 Using compress air cleaning (mini 6 bars), use the appropriate extension and air nozzle, starting from the bottom of the hole blow out at least 2 times and until no dust is evacuated



3 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.

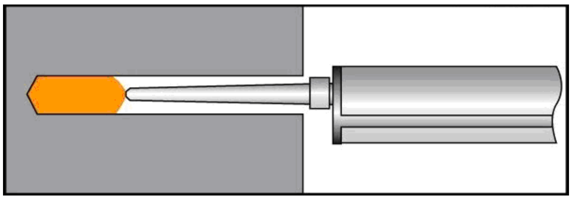


4 Using compress air cleaning (mini 6 bars), use the appropriate extension and air nozzle, starting from the bottom of the hole blow out at least 2 times and until no dust is evacuated.

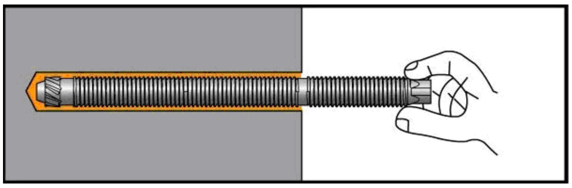


Injection

5 Screw the mixing nozzle onto the cartridge and dispense the first part to waste until an even color 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. for hole deeper than 350mm use piston plug.

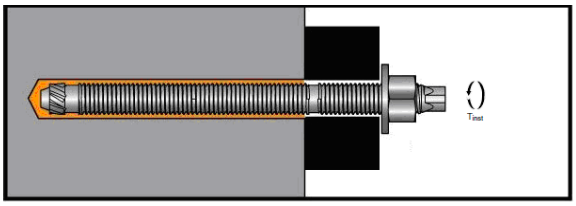


6 Insert the rod or rebar, slowly and with a slight twisting motion in respect of the gel time indicated in table 10. Remove excess resin from around the mouth of the hole before it sets. Control the embedment depth



Setting the element

Do not disturb anchor between specified cure time (acc. to table 10)
Attach the fixture and tight the nut at the specified torque



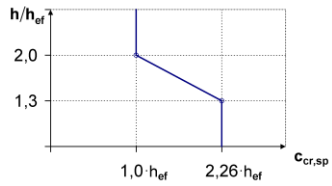
SPIT EPCON C8	**Annex 10.** **of European Technical Approval** **ETA-10/0309**
Installation instructions	

Table 10: Design method A, Characteristic tension load values

Threaded rods			M8	M10	M12	M16	M20	M24	M30
Steel failure									
Characteristic resistance “Maxima” rods	$N_{Rk,s}$	[kN]	22	35	51	94	118	170	272
Partial safety factor	$\gamma_{Ms,N}$ [1)]	[-]	1,71				1,49		
Characteristic resistance “Grade 5.8”	$N_{Rk,s}$	[kN]	18	29	42	79	123	177	281
Partial safety factor	$\gamma_{Ms,N}$ [1)]	[-]	1,5						
Characteristic resistance “Grade 8.8”	$N_{Rk,s}$	[kN]	29	46	67	126	196	282	449
Partial safety factor	$\gamma_{Ms,N}$ [1)]	[-]	1,5						
Characteristic resistance “Grade 10.9”	$N_{Rk,s}$		37	58	84	157	245	353	561
Partial safety factor	$\gamma_{Ms,N}$ [1)]		1,4						
Characteristic resistance “Stainless steel A4”	$N_{Rk,s}$	[kN]	26	41	59	110	172	247	281
Partial safety factor	$\gamma_{Ms,N}$ [1)]	[-]	1,87						2,86
Characteristic resistance “Stainless steel HCR”	$N_{Rk,s}$	[kN]	24	38	55	102	159	229	365
Partial safety factor	$\gamma_{Ms,N}$ [1)]	[-]	2,6						
Combined Pull-out and Concrete cone failure [2)]									
Diameter of threaded rod	d	[mm]	8	10	12	16	20	24	30
Characteristic bond resistance in non-cracked concrete C20/25 **(used category 1)**									
Temperature range I [3)]: **40°C / 24°**	$\tau_{Rk,uncr}$	[N/mm²]	16,0	16,0	16,0	15,0	14,0	13,0	13,0
Temperature range II [3)]: **80°C / 50°**	$\tau_{Rk,uncr}$	[N/mm²]	9,0	9,0	9,0	8,5	8,0	7,5	7,0
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1)]	[-]	1,8 [4)]						
Characteristic bond resistance in non-cracked concrete C20/25 **(used category 2)**									
Temperature range I [3)]: **40°C / 24°**	$\tau_{Rk,uncr}$	[N/mm²]	14,0	14,0	14,0	13,0	13,0	12,0	11,0
Temperature range II [3)]: **80°C / 50°**	$\tau_{Rk,uncr}$	[N/mm²]	8,0	8,0	8,0	7,5	7,0	6,5	6,0
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1)]	[-]	2,1 [5)]						
Characteristic bond resistance in cracked concrete C20/25 **(used category 1)**									
Temperature range I [3)]: **40°C / 24°**	$\tau_{Rk,cr}$	[N/mm²]	9,5	9,5	9,0	8,5	8,5	8,5	7,0
Temperature range II [3)]: **80°C / 50°**	$\tau_{Rk,cr}$	[N/mm²]	5,5	5,5	5,0	4,5	4,5	4,5	4,0
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1)]	[-]	1,8 [4)]						
Characteristic bond resistance in cracked concrete C20/25 **(used category 2)**									
Temperature range I [3)]: **40°C / 24°**	$\tau_{Rk,cr}$	[N/mm²]	8,5	8,5	8,0	7,5	7,5	7,5	6,0
Temperature range II [3)]: **80°C / 50°**	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5	4,5	4,0	4,0	4,0	3,5
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1)]	[-]	2,1 [5)]						
Increasing factor for $\tau_{Rk,p}$ in non cracked concrete	ψ_c	C25/30	1,02	1,03	1,03	1,04	1,05	1,06	1,07
		C30/37	1,05	1,06	1,07	1,09	1,11	1,13	1,16
		C35/40	1,08	1,10	1,11	1,14	1,17	1,21	1,26
		C40/50	1,10	1,12	1,13	1,17	1,21	1,25	1,31
		C45/55	1,11	1,13	1,15	1,20	1,24	1,29	1,36
		C50/60	1,12	1,15	1,17	1,22	1,27	1,32	1,41
Increasing factor for $\tau_{Rk,p}$ in cracked concrete	ψ_c	C25/30	1,02	1,02	1,02	1,03	1,03	1,04	1,05
		C30/37	1,04	1,05	1,05	1,06	1,07	1,09	1,10
		C35/40	1,06	1,07	1,08	1,10	1,11	1,13	1,16
		C40/50	1,07	1,08	1,09	1,11	1,14	1,16	1,19
		C45/55	1,08	1,09	1,11	1,13	1,16	1,18	1,22
		C50/60	1,09	1,10	1,12	1,15	1,17	1,20	1,25

[1)] In absence of national regulations.
[2)] Calculation of concrete failure and splitting see chapter 4.2.1.
[3)] Explanation see chapter 1.2
[4)] The partial safety factor γ_2 = 1,2 is included.
[5)] The partial safety factor γ_2 = 1,4 is included.

Table 11: Design method A, Splitting failure[1)]

Threaded rods		M8	M10	M12	M16	M20	M24	M30
Splitting failure [1)]								
	$h / h_{ef} \geq 2,0$	**$1,0\ h_{ef}$**						
Edge distance $c_{cr,sp}$ [mm] for	$2,0 > h / h_{ef} > 1,3$	**$4,6\ h_{ef}$ - $1,8\ h$**						
	$h / h_{ef} \leq 1,3$	**$2,26\ h_{ef}$**						
Spacing	$s_{cr,sp}$ [mm]	$2\ c_{cr,sp}$						

[1)] Calculation of concrete failure and splitting see chapter 4.2.1.

Table 12: Design method A, Characteristic shear load values

Threaded rods			M8	M10	M12	M16	M20	M24	M30
Steel failure without lever arm									
Characteristic resistance “Maxima” rods	$V_{Rk,s}$	[kN]	11	17	25	47	59	85	136
Characteristic resistance “Grade 5.8”	$V_{Rk,s}$	[kN]	9	15	21	39	61	88	140
Characteristic resistance “Grade 8.8”	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	224
Characteristic resistance “Grade 10.9”	$V_{Rk,s}$	[kN]	18	29	42	79	123	177	281
Characteristic resistance “Stainless steel A4”	$V_{Rk,s}$	[kN]	13	20	30	55	86	124	140
Characteristic resistance “Stainless steel HCR”	$V_{Rk,s}$	[kN]	12	19	27	51	80	115	182
Steel failure without lever arm									
Characteristic resistance “Maxima” rods	$M^0_{Rk,s}$	[m.N]	22	45	79	200	301	520	1052
Characteristic resistance “Grade 5.8”	$M^0_{Rk,s}$	[m.N]	19	37	66	166	325	561	1125
Characteristic resistance “Grade 8.8”	$M^0_{Rk,s}$	[m.N]	30	60	105	266	519	898	1799
Characteristic resistance “Grade 10.9”	$M^0_{Rk,s}$	[m.N]	37	75	131	333	649	1123	2249
Characteristic resistance “Stainless steel A4”	$M^0_{Rk,s}$	[m.N]	26	52	92	233	454	786	1125
Characteristic resistance “Stainless steel HCR”	$M^0_{Rk,s}$	[m.N]	24	49	85	216	422	730	1462
Partial safety factor									
Partial safety factor “Maxima” rods	$\gamma_{Ms,V}$ [1)]	[-]	1,43				1,5		
Partial safety factor “Grade 5.8”	$\gamma_{Ms,V}$ [1)]	[-]	1,25						
Partial safety factor “Grade 8.8”	$\gamma_{Ms,V}$ [1)]	[-]	1,25						
Partial safety factor “Grade 10.9”	$\gamma_{Ms,V}$ [1)]		1,5						
Partial safety factor “Stainless steel A4”	$\gamma_{Ms,V}$ [1)]	[-]	1,56						2,38
Partial safety factor “Stainless steel HCR”	$\gamma_{Ms,V}$ [1)]	[-]	2,17						
Concrete pryout failure									
Factor in equation (5.7) of Technical Report TR 029 for the design of bonded anchors	k	[-]	1,0 for $h_{ef} < 60$mm 2,0 for $h_{ef} \geq 60$mm						
Partial safety factor	γ_{Mcp} [1)]	[-]	1,5 [2)]						
Concrete edge failure [3)]									
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 13: Displacement under tension loads[1)]

Threaded rods			M8	M10	M12	M16	M20	M24	M30
Non-cracked concrete Temperature range I [2)]: 40°C / 24°C									
Displacement	δ_{N0}	[mm/(N/mm²)]	0,02	0,02	0,03	0,04	0,06	0,07	0,09
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,05	0,07	0,09	0,12	0,16	0,20	0,25
Non-cracked concrete Temperature range II[2)]: 80°C / 50°C									
Displacement	δ_{N0}	[mm/(N/mm²)]	0,02	0,02	0,03	0,04	0,06	0,07	0,09
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,05	0,07	0,07	0,12	0,16	0,20	0,25
Cracked concrete Temperature range I[2)] : 40°C / 24°C									
Displacement	δ_{N0}	[mm/(N/mm²)]	0,06	0,06	0,06	0,07	0,07	0,07	0,08
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,16	0,17	0,18	0,19	0,20	0,22	0,24
Cracked concrete Temperature range II[2)]: 80°C / 50°C									
Displacement	δ_{N0}	[mm/(N/mm²)]	0,06	0,06	0,06	0,07	0,07	0,07	0,08
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,16	0,17	0,18	0,19	0,20	0,22	0,24

[1)] Calculation of displacement under tension load: τ_{Sd} design value of bond stress.
Displacement under short term loading = $\delta_{N0} \cdot \tau_{Sd}$ / 1,4
Displacement under long term loading = $\delta_{N\infty} \cdot \tau_{Sd}$ / 1,4

[2)] Explanation see chapter 1.2.

Table 14: Displacement under shear loads[1)]

Threaded rods			M8	M10	M12	M16	M20	M24	M30
Displacement	δ_{V0}	[mm/kN]	0,11	0,10	0,09	0,08	0,06	0,04	0,02
Displacement	$\delta_{V\infty}$	[mm/kN]	0,17	0,15	0,14	0,12	0,09	0,06	0,03

[1)] Calculation of displacement under shear load: V_{Sd} design value of shear load.
Displacement under short term loading = $\delta_{V0} \cdot V_{Sd}$ / 1,4
Displacement under long term loading = $\delta_{v\infty} \cdot V_{Sd}$ / 1,4

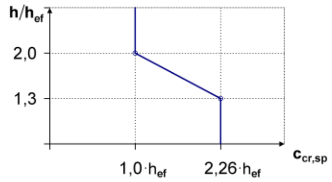
Table 15: Design method A, Characteristic tension load values

Rebars Bst 500s			ϕ8	ϕ 10	ϕ 12	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 32
Steel failure											
Characteristic resistance [6]	$N_{Rk,s}$	[kN]	28	43	62	111	173	270	292	339	442
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,4								
Combined Pull-out and Concrete cone failure [2]											
Diameter of rod	d	[mm]	8	10	12	16	20	25	26	28	32
Characteristic bond resistance in non-cracked concrete C20/25 **(used category 1)**											
Temperature range I [3]: **40°C / 24°C**	$\tau_{Rk,uncr}$	[N/mm²]	14,0	14,0	14,0	14,0	13,0	13,0	13,0	13,0	12,0
Temperature range II [3]: **80°C / 50°C**	$\tau_{Rk,uncr}$	[N/mm²]	8,0	8,0	7,5	7,5	7,5	7,5	7,0	7,0	7,0
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1]	[-]	1,8 [4]								
Characteristic bond resistance in non-cracked concrete C20/25 **(used category 2)**											
Temperature range I [3]: **40°C / 24°C**	$\tau_{Rk,uncr}$	[N/mm²]	13,0	13,0	12,0	12,0	12,0	12,0	12,0	11,0	11,0
Temperature range II [3]: **80°C / 50°C**	$\tau_{Rk,uncr}$	[N/mm²]	7,0	7,0	7,0	7,0	6,5	6,5	6,5	6,5	6,0
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1]	[-]	2,1 [5]								
Characteristic bond resistance in cracked concrete C20/25 **(used category 1)**											
Temperature range I [3]: **40°C / 24°C**	$\tau_{Rk,cr}$	[N/mm²]	9,5	9,5	9,0	8,5	8,5	8,0	8,0	7,5	6,5
Temperature range II [3]: **80°C / 50°C**	$\tau_{Rk,cr}$	[N/mm²]	5,5	5,5	5,0	4,5	4,5	4,5	4,5	4,0	3,5
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1]	[-]	1,8 [4]								
Characteristic bond resistance in cracked concrete C20/25 **(used category 2)**											
Temperature range I [3]: **40°C / 24°C**	$\tau_{Rk,cr}$	[N/mm²]	8,5	8,5	8,0	7,5	7,5	7,5	7,0	6,5	6,0
Temperature range II [3]: **80°C / 50°C**	$\tau_{Rk,cr}$	[N/mm²]	4,5	4,5	4,5	4,0	4,0	4,0	4,0	3,5	3,0
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc} = \gamma_{Msp}$ [1]	[-]	2,1 [5]								
Increasing factor for $\tau_{Rk,p}$ in non cracked concrete	ψ_c	C25/30	1,02	1,03	1,03	1,04	1,05	1,06	1,06	1,07	1,08
		C30/37	1,05	1,06	1,07	1,09	1,11	1,14	1,14	1,15	1,18
		C35/40	1,08	1,10	1,11	1,14	1,17	1,22	1,22	1,24	1,27
		C40/50	1,10	1,12	1,13	1,17	1,21	1,26	1,27	1,29	1,33
		C45/55	1,11	1,13	1,15	1,20	1,24	1,30	1,31	1,33	1,38
		C50/60	1,12	1,15	1,17	1,22	1,27	1,34	1,35	1,38	1,44
Increasing factor for $\tau_{Rk,p}$ in cracked concrete	ψ_c	C25/30	1,02	1,02	1,02	1,03	1,03	1,04	1,04	1,04	1,05
		C30/37	1,04	1,05	1,05	1,06	1,07	1,09	1,09	1,10	1,11
		C35/40	1,06	1,07	1,08	1,10	1,11	1,14	1,14	1,15	1,17
		C40/50	1,07	1,08	1,09	1,11	1,14	1,16	1,17	1,18	1,20
		C45/55	1,08	1,09	1,11	1,13	1,16	1,19	1,19	1,21	1,23
		C50/60	1,09	1,10	1,12	1,15	1,17	1,21	1,22	1,23	1,26

1) In absence of national regulations.
2) Calculation of concrete failure and splitting see chapter 4.2.1.
3) Explanation see chapter 1.2.
4) The partial safety factor γ_2 = 1,2 is included.
5) The partial safety factor γ_2 = 1,4 is included.
6) The characteristic tension resistance NRk,s for rebars that do not fulfill the requirements acc. DIN 488 shall be calculated acc. Technical Report TR 029, Equation (5.1).

Regarding design of post-installed rebar as anchor see chapter 4.2.1

Table 16: Design method A, Splitting failure[1)]

Rebars Bst 500s		ϕ8	ϕ 10	ϕ 12	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 32
Splitting failure [1)]										
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]	$2\ c_{cr,sp}$								

[1)] Calculation of concrete failure and splitting see chapter 4.2.1.

Table 17: Design method A, Characteristic shear load values

Rebars Bst 500s			ϕ8	ϕ 10	ϕ 12	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 32
Steel failure without lever arm											
Characteristic resistance[4)]	$V_{Rk,s}$	[kN]	14	22	31	55	86	135	146	169	221
Steel failure without lever arm											
Characteristic resistance	$M^0_{Rk,s}$	[m.N]	33	65	112	265	518	1012	1139	1422	2123
Partial safety factor											
Partial safety factor	$\gamma_{Ms,V}$ [1)]	[-]	1,5								
Concrete pryout failure											
Factor in equation (5.7) of Technical Report TR 029 for the design of bonded anchors	k	[-]	1,0 for $h_{ef} < 60$mm 2,0 for $h_{ef} \geq 60$mm								
Partial safety factor	γ_{Mcp} [1)]	[-]	1,5 [2)]								
Concrete edge failure [3)]											
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.
[4)] The characteristic tension resistance NRk,s for rebars that do not fulfill the requirements acc. DIN 488 shall be calculated acc. Technical Report TR 029, Equation (5.5).

Regarding design of post-installed rebar as anchor see chapter 4.2.1

Table 18: Displacement under tension loads[1)]

Rebars Bst 500s			ϕ8	ϕ 10	ϕ 12	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 32
Non-cracked concrete Temperature range I[2)] : 40°C / 24°C											
Displacement	δ_{N0}	[mm/(N/mm²)]	0,02	0,02	0,03	0,04	0,06	0,07	0,07	0,08	0,09
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,05	0,07	0,00	0,12	0,16	0,20	0,21	0,23	0,27
Non-cracked concrete Temperature range II[2)]: 80°C / 50°C											
Displacement	δ_{N0}	[mm/(N/mm²)]	0,02	0,02	0,03	0,04	0,06	0,07	0,07	0,08	0,09
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,05	0,07	0,00	0,12	0,16	0,20	0,21	0,23	0,27
Cracked concrete Temperature range I [2)]: 40°C / 24°C											
Displacement	δ_{N0}	[mm/(N/mm²)]	0,06	0,06	0,06	0,07	0,07	0,08	0,08	0,08	0,08
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,16	0,17	0,18	0,19	0,20	0,22	0,22	0,23	0,24
Cracked concrete Temperature range II[2)]: 80°C / 50°C											
Displacement	δ_{N0}	[mm/(N/mm²)]	0,06	0,06	0,06	0,07	0,07	0,08	0,08	0,08	0,08
Displacement	$\delta_{N\infty}$	[mm/(N/mm²)]	0,16	0,17	0,18	0,19	0,20	0,22	0,22	0,23	0,24

[1)] Calculation of displacement under tension load: τ_{Sd} design value of bond stress.
Displacement under short term loading = $\delta_{N0} \cdot \tau_{Sd}$ / 1,4
Displacement under long term loading = $\delta_{N\infty} \cdot \tau_{Sd}$ / 1,4

[2)] Explanation see chapter 1.2.

Table 19: Displacement under shear loads[1)]

Rebars Bst 500s			ϕ8	ϕ 10	ϕ 12	ϕ 16	ϕ 20	ϕ 25	ϕ 26	ϕ 28	ϕ 32
Displacement	δ_{V0}	[mm/kN]	0,11	0,10	0,09	0,08	0,06	0,04	0,03	0,03	0,03
Displacement	$\delta_{V\infty}$	[mm/kN]	0,17	0,15	0,14	0,12	0,09	0,06	0,05	0,04	0,04

[1)] Calculation of displacement under shear load: V_{Sd} design value of shear load.
Displacement under short term loading = $\delta_{V0} \cdot V_{Sd}$ / 1,4
Displacement under long term loading = $\delta_{V\infty} \cdot V_{Sd}$ / 1,4