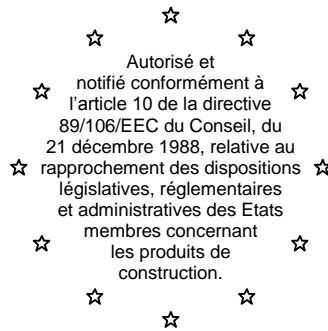


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CSTB
le futur en construction

MEMBRE DE L'EOTA

European Technical Approval

ETA-11/0151

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

Nom commercial :

Trade name:

AT-HP Galvanised Steel

Titulaire :

Holder of approval:

**SIMPSON STRONGTIE,
ZI Les 4 chemins
85400 St-Gemme-la-Plaine
France**

Type générique et utilisation prévue du produit de construction :

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

Generic type and use of construction product:

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

Validité du :
au :

Validity from / to:

**14/03/2011
20/01/2016**

Usine de fabrication :

Manufacturing plant:

Usine France

Le présent Agrément technique européen contient :

This European Technical Approval contains:

15 pages incluant 7 annexes faisant partie intégrante du document.

15 pages including 7 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;
 - Décret n° 92-647 du 8 juillet 1992³ 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/EC⁴;
 - 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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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 SIMPSON STRONGTIE AT-HP galvanized in the sizes M8 to M20 is a bonded anchor (injection type) made of galvanised steel, which is placed into a drilled hole previously injected with a two components injection mortar using an applicator gun equipped with a special mixing nozzle. The threaded rod is inserted into the resin with a slow and slight twisting motion. The threaded rod can be used with a one side 45° chamfer, with a two sides 45° chamfer or with a flat tip end. The mortar cartridges are coaxial cartridges available in two different sizes as coaxial cartridges (280 ml and 345 ml) and two different sizes as side-by-side cartridges (380 ml and 825ml). The anchor is intended to be used with embedment depth from 8 diameters to 12 diameters.

For the installed anchor see Figure given in Annex 1.

1.2. Intended use

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106/EEC shall be fulfilled and failure of anchorages made with these products would compromise the stability of the works, cause risk to human life and/or lead to considerable economic consequences. Safety in case of fire (Essential Requirement 2) is not covered in this ETA. The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C 20/25 at least to C50/60 at most according to ENV 206-1: 2000. It may be anchored in non-cracked concrete only.

The anchor may only be used in concrete subject to dry internal conditions.

The anchor may be installed in dry or wet concrete (use category 1) for all diameters.

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

All the diameters (i.e. from M8 to M20) may be used overhead.

The anchor may be used in the following temperature range :

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 in the sizes of M8 to M20 and the mortar cartridges correspond to the drawings and provisions given in Annexes 1 and 2. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annexes 3 and 4 shall correspond to the respective values laid down in the technical documentation⁵ of this European Technical Approval. The characteristic anchor values for the design of anchorages are given in Annexes 5 to 7.

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 as metal part of the anchor system. 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 of the threaded rod with the identifying mark of the producer of the rod and the envisage embedment depth.

The two components of the injection mortar AT-HP could be delivered in unmixed condition in mortar cartridges of two different sizes as coaxial cartridges (280 ml, 345 ml) and two different sizes as side-by-side cartridges (380 ml, 825ml) as shown in Annex 2.

2.2. Methods of verification

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 has been made in accordance with the « Guideline for European Technical Approval of Metal Anchors for use in Concrete », Part 1 « Anchors in general » and Part 5 « Bonded anchors », on the basis of Option 8.

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.

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.

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 plan⁶. 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 the relevant material properties.

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

- Physical properties: resin (fill quantity, fill weight), hardener (fill quantity, fill weight).
- Material properties: resin (composition, viscosity), hardener (composition, viscosity).
- Visual control of the aspect of cartridges.

The frequency of controls and tests conducted during production is laid down in the prescribed test plan taking account of the automated manufacturing process of the anchor.

The results of factory production control are recorded and evaluated. The records include at least the following information:

- designation of the product, basic material and components;
- type of control or testing;
- date of manufacture of the product and date of testing of the product or basic material and components;
- result of control and testing and, if appropriate, comparison with requirements;
- signature of person responsible for factory production control.

The records shall be presented to the inspection body during the continuous surveillance. On request, they shall be presented to the Centre Scientifique et Technique du Bâtiment.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control shall correspond to the prescribed test plan which is part of the technical documentation of this European Technical Approval.

3.2.2. Tasks of approved bodies

3.2.2.1. Initial type-testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary initial type-testing has to be agreed between the Centre Scientifique et Technique du Bâtiment and the approved bodies involved.

3.2.2.2. Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed test plan, the factory and the factory production control are suitable to ensure continuous and orderly manufacturing of the anchor according to the specifications mentioned in 2.1. as well as to the Annexes to the European Technical Approval.

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.

3.2.2.3. Continuous surveillance

The approved body shall visit the factory at least once a year for regular inspection. It has to be verified that the system of factory production control and the specified automated manufacturing process are maintained taking account of the prescribed test plan.

Continuous surveillance and assessment of factory production control have to be performed according to the prescribed test plan.

The results of product certification and continuous surveillance shall be made available on demand by the certification body or inspection body, respectively, to the Centre Scientifique et Technique du Bâtiment. In cases where the provisions of the European Technical Approval and the prescribed test plan are no longer fulfilled the conformity certificate shall be withdrawn.

3.3. CE-Marking

The CE marking shall be affixed on each packaging of anchors. The symbol « CE » shall be accompanied by the following information:

- identification number of the certification body;
- name or identifying mark of the producer and manufacturing plant;
- the last two digits of the year in which the CE-marking was affixed;
- number of the EC certificate of conformity;
- number of the European Technical Approval;
- use category (ETAG 001-1 Option 8);
- size.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1. Manufacturing

The anchor is manufactured in accordance with the provisions of the European Technical Approval using the automated manufacturing process as identified during inspection of the plant by the Centre Scientifique et Technique du Bâtiment and the approved body and laid down in the technical documentation.

4.2. Installation

4.2.1. Design of anchorages

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

The anchorages are designed in accordance with the « Guideline for European Technical Approval of Metal Anchors for Use in Concrete », Annex C, Method A, for bonded anchors under the responsibility of an engineer experienced in anchorages and concrete work.

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

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

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

where : $N_{Rk,c}^0$ according to Table 6a Annex 5

$s_{cr,N}$ and $c_{cr,N}$ according to Table 6b Annex 6

$\psi_{ucr,N} = 1,0$

In special cases according to clause 5.2.2.4 g, Annex C of the ETAG the method given there is valid. However the value $N_{Rk,c}^0$ shall be calculated according to the following equation :

$$N_{Rk,c}^0 = N_{Rk,c}^0 (\text{Table 5}) \times (h'_{ef} / h_{ef})$$

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

$$\text{where : } N_{Rk,c}^0 = 0,75 \times 15,5 \times h_{ef}^{1,5} \times f_{ck,cube}^{0,5}$$

$$s_{cr,N} = 3 h_{ef} \text{ and } c_{cr,N} = 1,5 h_{ef}$$

$$\psi_{ucr,N} = 1,0$$

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

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

$$\text{where : } N_{Rk,c}^0 \text{ according to Table 6a Annex 5}$$

$$s_{cr,sp} \text{ and } c_{cr,sp} \text{ according to Table 6b Annex 6}$$

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

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

Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored.

The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to support, etc.).

4.2.2. Installation of anchors

The fitness for use of the anchor can only be assumed if the anchor is installed as follows:

- anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters on the site;
- use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor;
- anchor installation in accordance with the manufacturer's specifications and drawings using the tools indicated in the technical documentation of this European Technical Approval;
- checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range;
- check of concrete being well compacted, e.g. without significant voids;
- keeping the effective anchorage depth;
- keeping of the edge distance and spacing to the specified values without minus tolerances;
- positioning of the drill holes without damaging the reinforcement;
- in case of aborted drill hole: the drill hole shall be filled with mortar;
- clearing the hole of drilling dust : the hole shall be cleaned by at least two blowing operations, by at least two brushing operations followed again by at least two blowing, and again two brushing and two blowing operations; before brushing cleaning the brush and checking whether the brush diameter according to Annex 3 Table 2 is sufficient;
- anchor installation ensuring the specified embedment depth, that is the appropriate depth marking of the anchor not exceeding the concrete surface;
- mortar injection by using the equipment including the special mixing nozzle shown in Annex 2; discarding the first swings of mortar of each new cartridge until an homogeneous colour is achieved; taking from the manufacturer instruction the admissible processing time (open time) of a cartridge as a function of the ambient temperature of the concrete; filling the drill hole uniformly from the drill hole bottom, in order to avoid entrapment of air; removing the special mixing nozzle slowly bit by bit during pressing-out; filling the drill hole with a quantity of the injection mortar corresponding to $\frac{1}{2}$ of the drill hole; inserting immediately the anchor rod or threaded rod, slowly and with a slight twisting motion, removing excess of injection

mortar around the rod; observing the curing time according to Annex 2 table 2 until the rod may be loaded; during curing of the injection mortar the temperature of the concrete must not fall below 0°C;

- application of the torque moment given in Annex 4 Table 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 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.

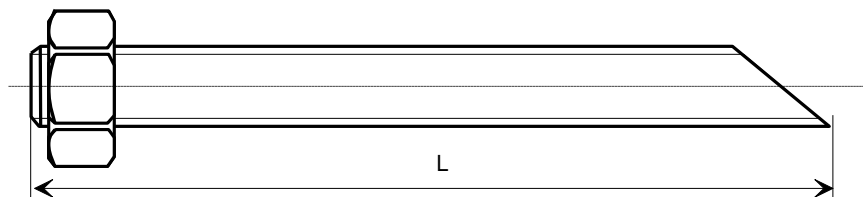
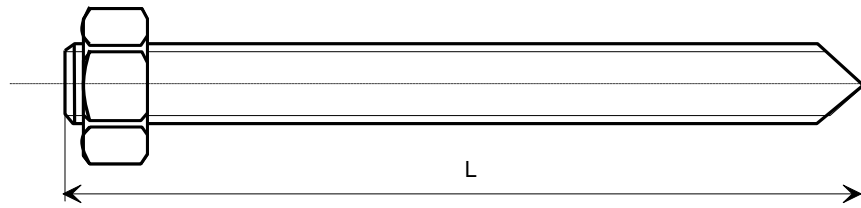
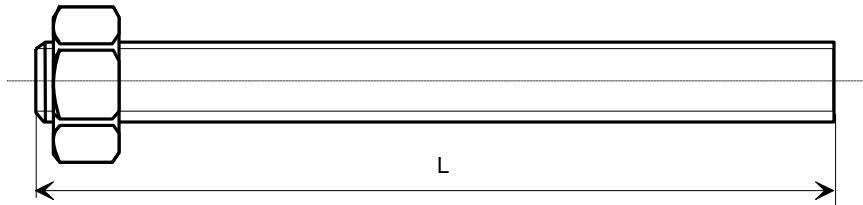
Mortar cartridges with expired shelf life must no longer be used.

The original French version is signed by

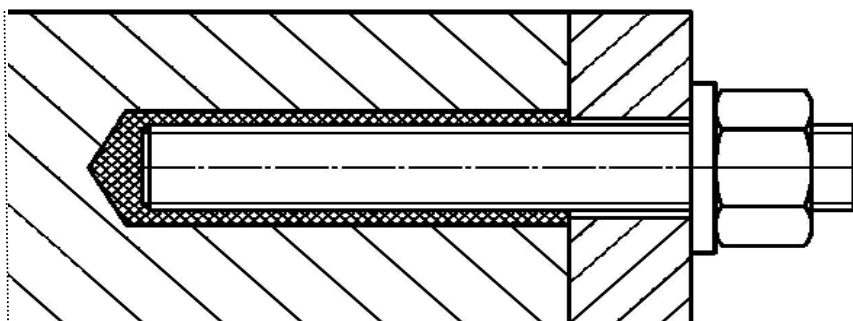
**Le Directeur Technique
C. BALOCHE**

Assembled anchor and schema of the anchor in use :

Commercial standard threaded rods with identifying mark of the producer and embedment depth :
Galvanised carbon steel grade 5.8 to 10.9



Different shapes of threaded rod ends : flat end, tow sides and one side 45° chamfer



| | |
|--|--|
| <p>SIMPSON STRONGTIE AT-HP Galvanised</p> | <p>Annex 1</p> |
| <p>Product and intended use</p> | <p>of European Technical Approval ETA-11/0151</p> |

Mortar cartridges and marking:



280 ml



345 ml



380 ml



825ml

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

Special mixing nozzles



SIMPSON STRONGTIE AT-HP Galvanised

Mortar cartridges and mixing nozzle

Annex 2

of European
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ETA-11/0151

Table 1 : Materials

| Part | Size | Material and EN/ISO reference | Coating |
|---|---|---|----------------------------------|
| Injection mortar with styrene-free metacrylate resin, hardener and inorganic agents | | | |
| Threaded rod | M8 to M20 (standard commercial rods) | Carbon steel grade 5.8; 8.8 and 10.9 according to ISO 898 | Zinc coating 5µm min. NF E25-009 |
| Nut | - | Steel, EN 20898-2 Grade 6 or 8 | |
| Washer | - | Steel DIN 513 | |

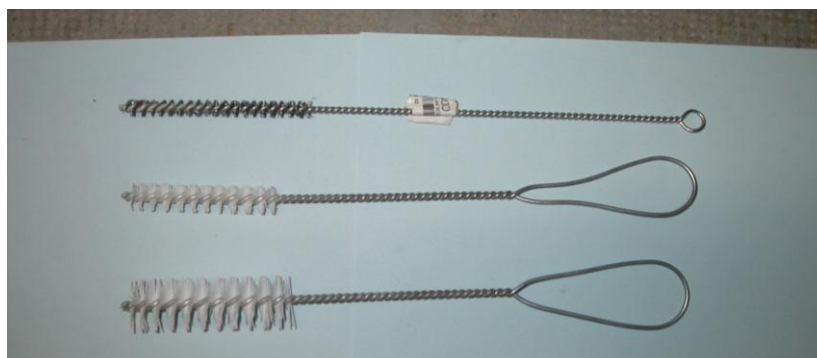
Table 2 : Cleaning method and minimum curing time

| Nominal diameter | All diameters |
|------------------|---|
| Cleaning method | 2 blows+ 2 brushing operation + 2 blows + 2 brushing operations + 2 blows |

| Anchor size | [Unit] | M8 | M10 | M12 | M16 | M20 |
|----------------------|--------|------------|------------|-----|-----|-----|
| Type of wire | [-] | Metal wire | Nylon wire | | | |
| Diameter of the wire | [mm] | 0,15 | 0,50 | | | |
| Brush head diameter | [mm] | 10 | 17 | 17 | 30 | 30 |
| Brush head length | [mm] | 100 | 80 | 80 | 90 | 90 |

| | | | | | |
|------------------------------------|-------------------------------------|------------|-------------|--------------|--------------|
| Ambient temperature | Minimum cartridge temperature = 5°C | | 5°C to 10°C | 10°C to 20°C | 20°C to 35°C |
| Base material temperature | -5°C to 0°C | 0°C to 5°C | 5°C to 10°C | 10°C to 20°C | 20°C to 35°C |
| Processing time | Minimum cartridge temperature = 5°C | | 10mn | 4mn | 1mn 30s |
| Curing time in dry concrete | 5h | 150mn | 105mn | 75mn | 45mn |
| Curing time in wet concrete | 7h30 | 225mn | 160mn | 110mn | 70mn |

Brush for cleaning the drilled hole : metal wires and nylon wires



SIMPSON STRONGTIE AT-HP Galvanised

Materials and cleaning method

Annex 3

of European
Technical Approval
ETA-11/0151

Table 3: Installation data with minimum and maximum embedment depth

| Nominal diameter | $\varnothing d_0$ Nominal diameter of the drill bit | d_f Clearance hole in the fixture | h_0 depth of the hole | | h_{ef} effective anchoring depth | | T_{inst} Tightening torque | h_{min} minimum thickness of the concrete slab | |
|------------------|--|--|----------------------------|----------------|---------------------------------------|----------------|---------------------------------|---|----------------|
| | | | [mm] | | [mm] | | | [N.m] | [mm] |
| [-] | [mm] | [mm] | h_{ef} "8d" | h_{ef} "12d" | h_{ef} "8d" | h_{ef} "12d" | | h_{ef} "8d" | h_{ef} "12d" |
| M8 | 10 | 9 | 64 | 96 | 64 | 96 | 10 | 100 | 130 |
| M10 | 12 | 12 | 80 | 120 | 80 | 120 | 20 | 110 | 150 |
| M12 | 14 | 14 | 96 | 144 | 96 | 144 | 40 | 130 | 175 |
| M16 | 18 | 18 | 128 | 192 | 128 | 192 | 80 | 160 | 225 |
| M20 | 22 | 22 | 160 | 240 | 160 | 240 | 150 | 200 | 280 |

Table 4 : Minimum spacing and edge distances

| $h_{ef} = 8d$ | | [Unit] | M8 | M10 | M12 | M16 | M20 |
|-----------------------|-----------|--------|-----------|------------|------------|------------|------------|
| Minimum spacing | s_{min} | [mm] | 35 | 40 | 48 | 64 | 80 |
| Minimum edge distance | c_{min} | [mm] | 35 | 40 | 48 | 64 | 80 |

| $h_{ef} = 12d$ | | [Unit] | M8 | M10 | M12 | M16 | M20 |
|-----------------------|-----------|--------|-----------|------------|------------|------------|------------|
| Minimum spacing | s_{min} | [mm] | 48 | 60 | 72 | 96 | 120 |
| Minimum edge distance | c_{min} | [mm] | 48 | 60 | 72 | 96 | 120 |

SIMPSON STRONGTIE AT-HP Galvanised**Installation data****Annex 4**of European
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ETA-11/0151

Table 5: Characteristic values of resistance to tension loads of design method A in case of steel failure, pull-out failure and concrete cone failure

| | | | M8 | M10 | M12 | M16 | M20 |
|--|-----------------------------|------|------|-----|-----|-----|-----|
| Steel failure with threaded rod steel grade 5.8 | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 19 | 30 | 43 | 81 | 127 |
| Partial safety factor | γ_{Ms} | - | 1,49 | | | | |
| Steel failure with threaded rod steel grade 8.8 | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 29 | 46 | 67 | 126 | 196 |
| Partial safety factor | γ_{Ms} | - | 1,50 | | | | |
| Steel failure with threaded rod steel grade 10.9 | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 37 | 58 | 84 | 157 | 245 |
| Partial safety factor | γ_{Ms} | - | 1,40 | | | | |
| Pullout and concrete cone failure in non cracked concrete C20/25 to C50/60 | | | | | | | |
| h_{ef} "8d" | | [mm] | 64 | 80 | 96 | 128 | 160 |
| Characteristic resistance C20/25 to C50/60 – h_{ef} "8d" T = - 40°C to + 40°C | $N_{Rk,p} = N^0_{Rk,c}$ | [kN] | 25 | 30 | 40 | 60 | 75 |
| h_{ef} "12d" | | [mm] | 96 | 120 | 144 | 192 | 240 |
| Characteristic resistance C20/25 to C50/60 – h_{ef} "12d" T = - 40°C to + 40°C | $N_{Rk,p} = N^0_{Rk,c}$ | [kN] | 35 | 40 | 60 | 95 | 115 |
| Partial safety factor | $\gamma_{Mp} = \gamma_{Mc}$ | - | 1,50 | | | | |

Table 6: Characteristic parameters for resistance to tension loads of design method A in case of splitting failure

| Splitting failure | | | M8 | M10 | M12 | M16 | M20 | |
|---------------------------|----------------------|-------------|------|------|------|------|------|-----|
| Effective anchorage depth | $h_{ef} \ll 8d \gg$ | [mm] | 64 | 80 | 96 | 128 | 160 | |
| | $h_{ef} \ll 12d \gg$ | [mm] | 95 | 120 | 144 | 192 | 220 | |
| Partial safety factor | $\gamma_{M,sp}$ | - | 1,50 | 1,50 | 1,50 | 1,50 | 1,50 | |
| Spacing | min | $S_{cr,N}$ | [mm] | 128 | 160 | 192 | 256 | 320 |
| | | | [mm] | 192 | 240 | 288 | 384 | 480 |
| | max | $S_{cr,sp}$ | [mm] | 256 | 320 | 384 | 512 | 640 |
| | | | [mm] | 384 | 480 | 576 | 768 | 960 |
| Edge distance | min | $C_{cr,N}$ | [mm] | 64 | 80 | 96 | 128 | 160 |
| | | | [mm] | 96 | 120 | 144 | 192 | 240 |
| | max | $C_{cr,sp}$ | [mm] | 128 | 160 | 192 | 256 | 320 |
| | | | [mm] | 192 | 240 | 288 | 384 | 480 |

SIMPSON STRONGTIE AT-HP Galvanised**Characteristic resistance
under tension loads – design method A****Annex 5**of European
Technical Approval
ETA-11/0151

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

| | | | M8 | M10 | M12 | M16 | M20 |
|--|---------------|------|------|------|------|------|-------|
| Steel failure without lever arm with standard threaded rod steel grade 5.8 | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 9,5 | 15,1 | 21,9 | 40,8 | 63,7 |
| Partial safety factor | γ_{Ms} | - | 1,50 | | | | |
| Steel failure without lever arm with standard threaded rod steel grade 8.8 | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 14,6 | 23,2 | 33,7 | 62,8 | 98,0 |
| Partial safety factor | γ_{Ms} | - | 1,25 | | | | |
| Steel failure without lever arm with standard threaded rod steel grade 10.9 | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 18,3 | 29,0 | 42,2 | 78,5 | 122,5 |
| Partial safety factor | γ_{Ms} | - | 1,50 | | | | |

| | | | M8 | M10 | M12 | M16 | M20 |
|---|---------------|-------|------|-----|-----|-----|-----|
| Steel failure with lever arm with standard threaded rod steel grade 5.8 | | | | | | | |
| Characteristic resistance | $M_{Rk,s}$ | [N.m] | 19 | 39 | 68 | 173 | 337 |
| Partial safety factor | γ_{Ms} | - | 1,50 | | | | |
| Steel failure with lever arm with standard threaded rod steel grade 8.8 | | | | | | | |
| Characteristic resistance | $M_{Rk,s}$ | [N.m] | 30 | 60 | 105 | 266 | 519 |
| Partial safety factor | γ_{Ms} | - | 1,25 | | | | |
| Steel failure with lever arm with standard threaded rod steel grade 10.9 | | | | | | | |
| Characteristic resistance | $M_{Rk,s}$ | [N.m] | 37 | 75 | 131 | 333 | 649 |
| Partial safety factor | γ_{Ms} | - | 1,50 | | | | |

| | | | M8 | M10 | M12 | M16 | M20 |
|--------------------------|---------------|---|------|------|------|------|------|
| Pry out failure | | | | | | | |
| Factor in equation (5.6) | k | - | 2 | 2 | 2 | 2 | 2 |
| Partial safety factor | γ_{Mp} | - | 1,50 | 1,50 | 1,50 | 1,50 | 1,50 |

| Concrete edge failure | | | | | | | | |
|--|---------------|-------|------|------|------|------|------|-----|
| Effective length of anchor under shear loading | If | "8d" | [mm] | 64 | 80 | 96 | 128 | 160 |
| | | "12d" | [mm] | 96 | 120 | 144 | 192 | 240 |
| Outside diameter of anchor | d_{nom} | [mm] | 8 | 10 | 12 | 16 | 20 | |
| Partial safety factor | γ_{Mc} | - | 1,50 | 1,50 | 1,50 | 1,50 | 1,50 | |

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Table 8: Characteristic displacements under axial tension loads

| Characteristic displacement in non-cracked C 20/25 to C50/60 concrete | | M8 | M10 | M12 | M16 | M20 |
|--|------|-----|-----|-----|-----|-----|
| Admissible service load :N | [kN] | 12 | 14 | 18 | 33 | 38 |
| δ_{N0} short term | [mm] | 0,3 | 0,3 | 0,3 | 0,3 | 0,3 |
| $\delta_{N\infty}$ long term | [mm] | 0,5 | 0,5 | 0,5 | 0,5 | 0,5 |

Table 9: Characteristic displacements under shear loads

| Characteristic displacement in non-cracked C 20/25 to C50/60 concrete | | M8 | M10 | M12 | M16 | M20 |
|--|------|-----|-----|------|------|------|
| Admissible service load : V | [kN] | 5,4 | 8,6 | 12,5 | 23,3 | 36,4 |
| δ_{N0} short term | [mm] | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 |
| $\delta_{N\infty}$ long term | [mm] | 4,0 | 4,0 | 4,0 | 4,0 | 4,0 |

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**Characteristic displacements
under tension and shear loads**

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