Deutsches Institut für Bautechnik

Zulassungsstelle für Bauprodukte und Bauarten

Bautechnisches Prüfamt

Eine vom Bund und den Ländern gemeinsam getragene Anstalt des öffentlichen Rechts

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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-11/0360

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*		Simpson Strong-Tie® - Injektionssystem SET-XP Epoxy Adhesive *Simpson Strong-Tie® - SET-XP Epoxy Adhesive Injection System*
Zulassungsinhaber *Holder of approval*		SIMPSON STRONG -TIE® GmbH Riederhofstraße 27 60314 Frankfurt/Main DEUTSCHLAND
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*		Verbunddübel mit Ankerstange in den Größen M12 bis M27 und Bewehrungsstahl Ø12 bis Ø25 zur Verankerung im Beton *Bonded Anchor with Anchor rod of sizes M12 to M27 or rebar Ø12 to Ø25 for use in concrete*
Geltungsdauer: *Validity:*	vom *from* bis *to*	7 October 2011 7 October 2016
Herstellwerk *Manufacturing plant*		Simpson Strong-Tie Manufacturing Facilities

Diese Zulassung umfasst *This Approval contains*	24 Seiten einschließlich 16 Anhänge *24 pages including 16 annexes*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik 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 Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by law of 31 October 2006[5];
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6];
- Guideline for European technical approval of "Metal anchors for use in concrete - Part 5: Bonded anchors", ETAG 001-05.

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers 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 Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of 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 Deutsches Institut für Bautechnik. 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 fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2006*, p. 2407, 2416
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product/ products and intended use

1.1 Definition of the construction product

The Simpson Strong-Tie® - SET-XP Epoxy Adhesive is a bonded anchor consisting of a cartridge with injection mortar SET-XP and a steel element. The steel elements are either

- Threaded rods in the range of M 12 to M 27 or
- Reinforcing bar in the range of Ø 12 to Ø 25

The steel element is placed into a drilled hole filled with injection mortar and is anchored via the bond between metal part, injection mortar and concrete.

An illustration of the product and intended use is given in Annexes 1 and 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 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 European technical approval. 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 C20/25 at minimum and C50/60 at most according to EN 206:2000-12.

The anchor may be used in cracked or non-cracked concrete.

The anchor may be installed in dry or wet concrete, it must not be installed in flooded holes.

The anchor may be used in the following temperature ranges:

Temperature range I:	-40 °C to +43 °C	(max long term temperature +24 °C and max short term temperature +43 °C)
Temperature range II:	-40 °C to +65 °C	(max long term temperature +43 °C and max short term temperature +65 °C)

Elements made of zinc coated steel:

The element made of zinc plated or hot dipped galvanised steel may only be used in structures subject to dry internal conditions.

Elements made of stainless steel:

The element made of stainless steel 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 to 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).

Elements made of high corrosion resistant steel:

The element made of high corrosion resistant steel 1.4529 or 1.4565 may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions. Such particular 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 chemical pollution (e. g. in desulphurization plants or road tunnels where de-icing materials are used).

Elements made of reinforcing bars:

Post-installed reinforcing bars may only be used as anchor designed in accordance with the EOTA Technical Report TR 029. 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 provisions made in this European technical approval are based on an assumed 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 the product and methods of verification

2.1 Characteristics of the product

The anchor corresponds to the drawings and provisions given in Annexes 1 to 5. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annex 1 to 5 shall correspond to the respective values laid down in the technical documentation[7] of this European technical approval.

The characteristic values for the design of anchorages are given in Annexes 11 to 16.

The two components of the injection mortar Simpson Strong-Tie SET-XP Epoxy Adhesive are delivered in unmixed condition in side-by side-cartridges of sizes 650 ml or 1656 ml according to Annex 1. Each cartridge is marked with the imprint "Simpson Strong-Tie SET-XP", with Installation instruction, shelf life, expiration date, batch number and hazard code.

Elements made of reinforcing bars shall comply with the specifications given in Annex 4.

The marking of embedment depth may be done at the jobsite.

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 1.

[7] The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik 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.

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

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the Decision 96/582/EG of the European Commission[8] system 2(i) (referred to as System 1) of the attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 1: Certification of the conformity of the product by an approved certification body on the basis of:

(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 control 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.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use initial/raw/constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik.[9]

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

[8] Official Journal of the European Communities L 254 of 08.10.1996

[9] The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

3.2.1.2 Other tasks for 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 anchors in order to undertake the actions laid down in section 3.2.2 For this purpose, the control plan referred to in sections 3.2.1.1 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 for the approved bodies

The approved body shall perform the

- initial type-testing of the product,
- initial inspection of factory and of factory production control,
- continuous surveillance, assessment and approval of factory production control

in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

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.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

3.3 CE marking

The CE marking shall be affixed on each packaging of the anchor. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate of conformity for the product,
- the number of the European technical approval,
- the number of the guideline for European technical approval,
- use category (ETAG 001-1, Option 1),
- size.

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

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited at Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Design of anchorages

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

The anchorages are designed in accordance with the EOTA Technical Report TR 029 "Design of bonded anchors"[10] under the responsibility of an engineer experienced in anchorages and concrete work.

Post-installed reinforcing bars may only be used as anchor designed in accordance with the EOTA Technical Report TR 029. 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 reinforcing bars act as dowels to take up shear forces. Connections with reinforcing bars in concrete structures designed in accordance with EN 1992-1-1:2004 (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.

Commercial standard threaded rods, washers and hexagon nuts made of galvanised steel or stainless steel may be used if the following requirements are fulfilled:

- material, dimensions and mechanical properties of the metal parts according to the specifications given in Annex 3, Table 1a,
- 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.

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.).

4.3 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 of the site,
- anchor installation in accordance with the manufacturer's specifications and drawings using the tools indicated in the technical documentation of this European technical approval,
- use of the anchor only as supplied by the manufacturer without exchanging the components,
- reinforcing bars shall comply with specifications given in Annex 4,
- 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 given and is not lower than that of the concrete to which the characteristic loads apply,
- check of concrete being well compacted, e.g. without significant voids,
- marking and keeping the effective anchorage depth,
- edge distance and spacing not less than the specified values without minus tolerances,
- positioning of the drill holes without damaging the reinforcement,

[10] The Techncial Report TR 029 "Design of bonded anchors" is published in English on EOTA website www.eota.eu.

- drilling by hammer-drilling,
- in case of aborted drill hole: the drill hole shall be filled with mortar,
- cleaning the drill hole and installation in accordance with Annexes 8 and 9,
- during installation and curing of the chemical mortar the anchor component installation temperature shall be at least 10 °C;
- during curing of the chemical mortar the temperature of the concrete must not fall below +10 °C;
- extension tubes according to Annex 1 shall be used for installation in bore holes sizes either

  $d_0 \leq 14$ mm and $h_1 > 150$ mm or

  $d_0 > 14$ mm and $h_1 > 250$ mm
- observing the curing time according to Annex 9, Table 4 until the anchor may be loaded,
- installation torque moments are not required for functioning of the anchor. However, the torque moments given in Annex 5 Table 2 must not be exceeded.

5 Indications to the manufacturer

5.1 Responsibility of the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to as well as sections 4.2 and 4.3 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,
- diameter of anchor rod,
- information on the installation procedure, including cleaning of the hole with the cleaning equipments, preferably by means of an illustration,
- 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,
- identification of the manufacturing batch,

All data shall be presented in a clear and explicit form.

5.2 Packaging, transport and storage

The cartridges shall be protected against sun radiation and shall be stored according to the manufacturer's installation instructions in dry condition at temperatures of at least +7 °C to not more than +32 °C.

Cartridges with expired shelf life must no longer be used.

The anchor shall only be packaged and supplied as a complete unit.

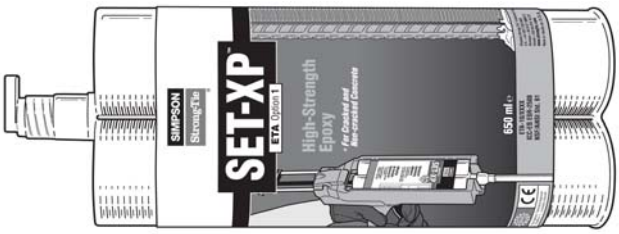
Georg Feistel
Head of Department

beglaubigt:
Baderschneider

Simpson Strong-Tie®

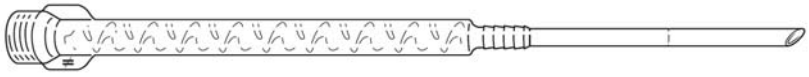
SET-XP Epoxy Adhesive

SET-XP Injection mortar cartridge (side-by-side): 650 ml and 1656 ml



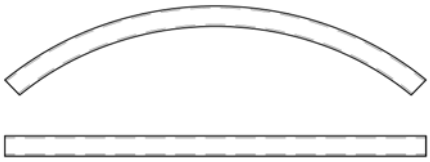
Imprints:
Commercial name, Manufacturer identification, Installation instructions, Shelf-life, Expiration date, Batch-no., Hazard codes

Mixing nozzle: MN2

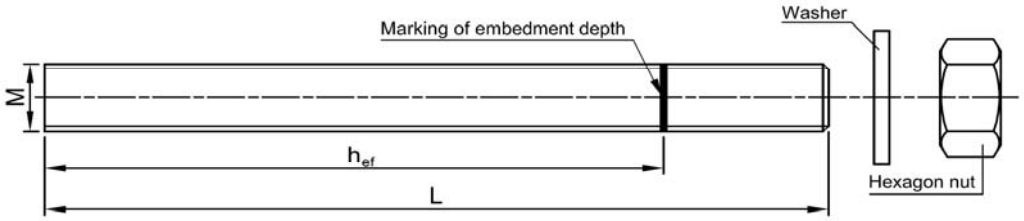


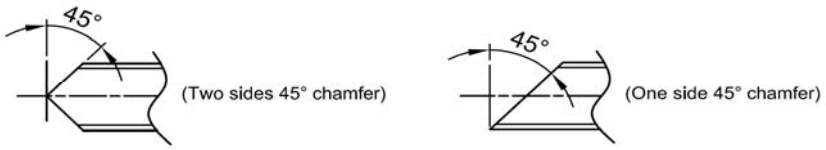
Extension tubes:

Flexible plastic hose: ø8,0 - ø8,5 mm
Rigid plastic tube: MNE

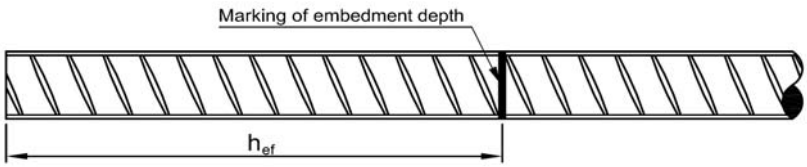


Threaded rod M12, M16, M20, M24 or M27





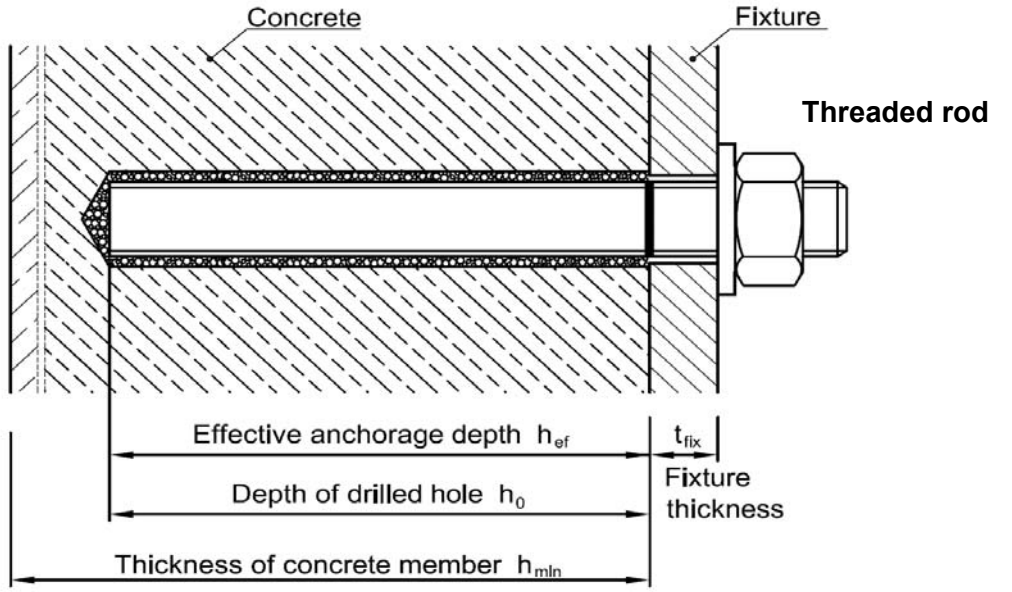
Reinforcing bar ø12, ø14, ø16, ø20 or ø25

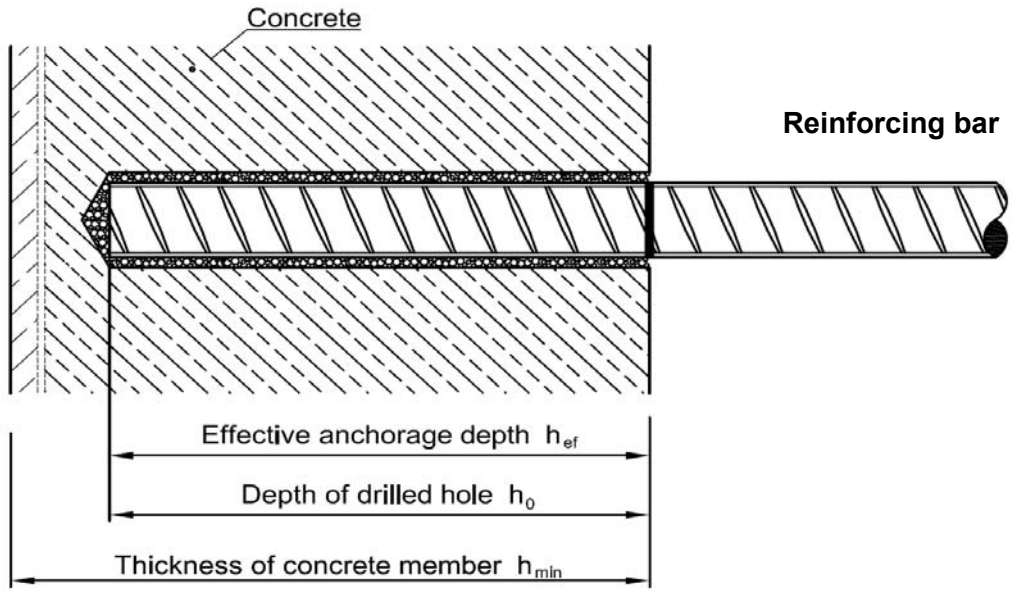


Simpson Strong-Tie® **SET-XP Epoxy Adhesive**	**Annex 1** of European technical approval **ETA-11/0360**
System description and components	

Simpson Strong-Tie®

SET-XP Epoxy Adhesive





Application range

1. Installation in dry or wet concrete

2. Temperature range:

I.	-40°C to +43°C	max long term temperature	+24°C
		max short term temperature	+43°C
II.	-40°C to +65°C	max long term temperature	+43°C
		max short term temperature	+65°C

3. Installation in water-filled drilled holes is not allowed!

Simpson Strong-Tie® **SET-XP Epoxy Adhesive**	**Annex 2** of European technical approval **ETA-11/0360**
Intended use and installation	

Simpson Strong-Tie®

SET-XP Epoxy Adhesive

Table 1a: Materials (Threaded rod)

Designation	Material
Steel, zinc plated ≥ 5µm according EN ISO 4042 (A2), Steel, hot-dip galvanised > 40 µm according EN ISO 10684	
Threaded rod	Carbon steel: Property class 5.8 and 8.8 acc. EN ISO 898-1; A5 ≥ 8% ductile
Washer	Steel: DIN 125 (EN ISO 7089), DIN 440 (EN ISO 7094), DIN 9021 (EN ISO 7093)
Hexagon nut	Steel: DIN 934 (EN ISO 4032), property class 8 acc. EN ISO 898-2
Stainless steel	
Threaded rod	Stainless steel: 1.4362; 1.4401; 1.4404; 1.4439; 1.4571; 1.4578 acc. EN10088 ≤ M24: Property class 70, EN ISO 3506-1; A5 ≥ 8% ductile > M24: Property class 50, EN ISO 3506-1; A5 ≥ 8% ductile
Washer	DIN 125 (EN ISO 7089), DIN 440 (EN ISO 7094), DIN 9021 (EN ISO 7093) Stainless steel: 1.4362; 1.4401; 1.4404; 1.4439; 1.4571; 1.4578 acc. EN 10088
Hexagon nut	DIN 934 (EN ISO 4032), ≤ M24. Property class 70, EN ISO 3506-2 > M24: Property class 50 or 70, EN ISO 3506-2 Stainless steel: 1.4362; 1.4401; 1.4404; 1.4439; 1.4571; 1.4578 acc. EN 10088
Stainless steel - High corrosion resistance steel	
Threaded rod	Stainless steel: 1.4529; 1.4565 acc. EN10088 ≤ M24: Property class 70, EN ISO 3506-1; A5 ≥ 8% ductile > M24: Property class 50, EN ISO 3506-1; A5 ≥ 8% ductile
Washer	DIN 125 (EN ISO 7089), DIN 440 (EN ISO 7094), DIN 9021 (EN ISO 7093) Stainless steel: 1.4529; 14565 acc. EN 10088
Hexagon nut	DIN 934 (EN ISO 4032) ≤ M24: Property class 70, EN ISO 3506-2 > M24: Property class 50 or 70, EN ISO 3506-2 Stainless steel: 1.4529; 14565 acc. EN 10088

Commercial threaded rods with:
Inspection certificate 3.1 according to EN 10204: 2004
Marking of embedment depth (This may be done by the manufacturer of the rod or by the worker on jobsite)

Simpson Strong-Tie®
SET-XP Epoxy Adhesive

Table 1b: Properties of reinforcement; Abstract of EN 1992-1-1, Annex C Table C.1 and Table C.2N

Product form		**Bars and de-coiled rods**	
Class		**B**	**C**
Characteristic yield strength f_{yk} or $f_{0,2k}$ (N/mm²)		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) (%)	Nominal bar size d (mm) ≥ 12	± 4,5	

Product form		**Bars and de-coiled rods**	
Class		**B**	**C**
Bond: Min. value of relative rip area $f_{R,min}$	Nominal diameter of the rebar d (mm) 12 > 12	 0,040 0,056	

The height of the bar rib (h_{rib}) shall be in the range: $0,05d \le h_{rib} \le 0,07d$
(d : Nominal diameter of the rebar)

Table 2: Installation data for threaded rods

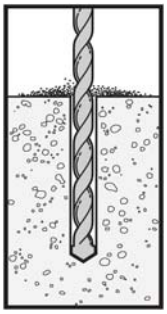
Simpson Strong-Tie® SET-XP Epoxy Adhesive			Threaded rod				
			M12	M16	M20	M24	M27
Nom. thread rod diameter	d	[mm]	12	16	20	24	27
Drill hole diameter	d_o	[mm]	14	18	24	28	30
Embedment depth and drill hole depth	$h_{ef,\,min}$	[mm]	70	80	90	100	110
	$h_{ef,\,max}$		240	320	400	480	540
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	14	18	22	26	30
Installation torque	$T_{inst,max}$	[Nm]	40	60	80	100	120
Minimum thickness of concrete member	h_{min}	[mm]	h_{ef} +30 mm ≥ 100 mm	$h_{ef} + 2d_0$			
Minimum allowable spacing	s_{min}	[mm]	45	60	70	80	90
Minimum allowable edge distance	c_{min}	[mm]	80	100	115	135	155

Table 3: Installation data for reinforcing bar

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Reinforcing bar				
			Ø12	Ø14	Ø16	Ø20	Ø25
Nom. rebar diameter	d	[mm]	12	14	16	20	25
Drill hole diameter	d_o	[mm]	16	18	20	25	32
Embedment depth and drill hole depth	$h_{ef,\,min}$	[mm]	70	75	80	90	100
	$h_{ef,\,max}$		240	280	320	400	500
Minimum thickness of concrete member	h_{min}	[mm]	h_{ef} +30 mm ≥ 100 mm	$h_{ef} + 2d_0$			
Minimum allowable spacing	s_{min}	[mm]	45	50	60	70	80
Minimum allowable edge distance	c_{min}	[mm]	80	90	100	115	135

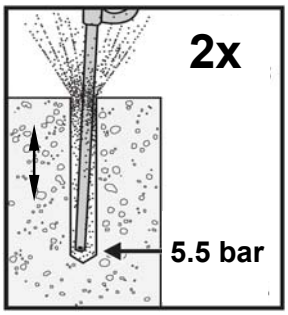
HOLE PREPARATION

1.



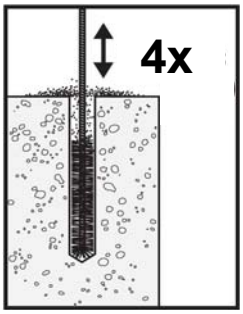
Drill hole to specified diameter and embedment depth.

2.



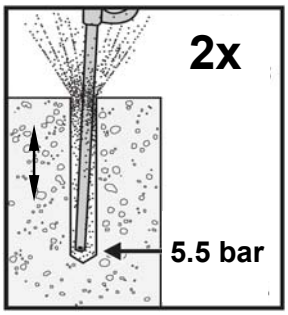
Blow dust from hole 2 times with oil-free compressed air (min. 5.5 bar) starting from the bottom of the hole.

3.



Brush 4 times with specified brush diameter.

4.



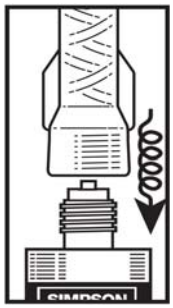
Blow 2 times with oil-free compressed air (min. 5.5 bar) and verify that the threaded rod and rebar can achieve the required embedment depth.

Simpson Strong-Tie® **SET-XP Epoxy Adhesive**	**Annex 6**
Installation instructions I	of European technical approval **ETA-11/0360**

CARTRIDGE PREPARATION AND HOLE FILLING

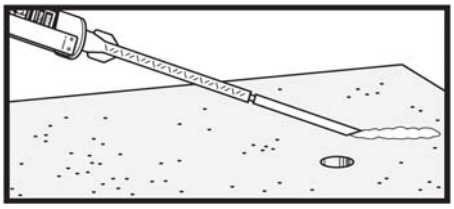
1. Check cartridge expiration date. **Do not use expired product.** Product is usable until end of printed expiration month. Open cartridge per package instructions.

2.



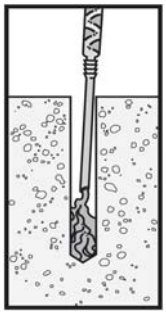
Attach proper mixing nozzle supplied by the manufacturer to the cartridge. Do not modify nozzle. Insert cartridge into dispensing tool.

3.



Dispense adhesive to the side until properly mixed (uniform teal color).

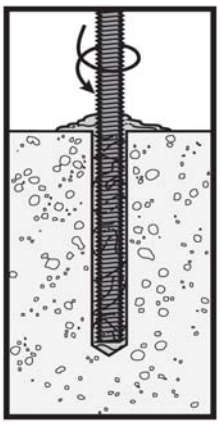
4.



Fill hole approximately 1/2 - 2/3 full, starting from bottom or back of the cleaned drilled hole. Withdraw the nozzle slowly to avoid creating air pockets.
For drilled holes deeper than 150 mm (when $d_0 \leq 16$mm) and drilled holes deeper than 250 mm (when $16 < d_0 \leq 30$ mm) an extension tube shall be used. Adhesive retaining caps shall be used in overhead and horizontal installations (Annex 9).

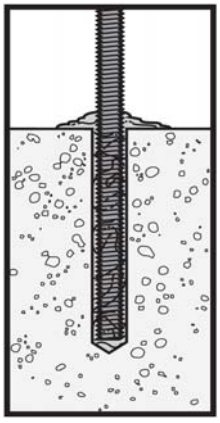
ANCHOR INSTALLATION (vertical downward anchorage)

1.



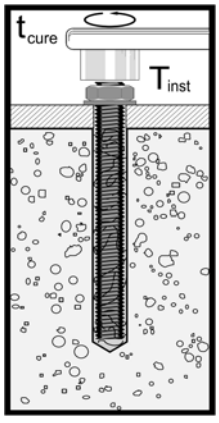
Insert clean, oil free anchor, turning slowly until the anchor contacts the bottom of the hole.

2.



Do not disturb the anchor until fully cured. The curing time t_{cure} is given in table 4.

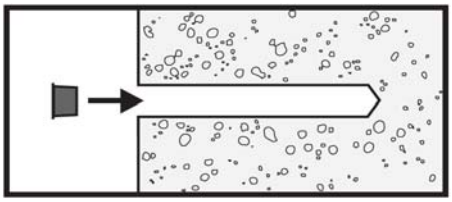
3.



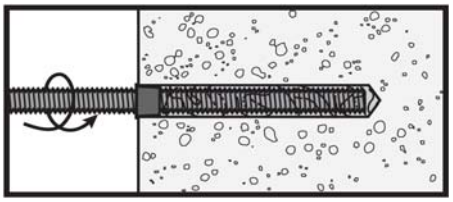
After required curing time, anchor can be loaded. Apply the installation torque T_{inst} using calibrated torque-wrench.

Simpson Strong-Tie® **SET-XP Epoxy Adhesive**	**Annex 8**
Installation instructions III	of European technical approval **ETA-11/0360**

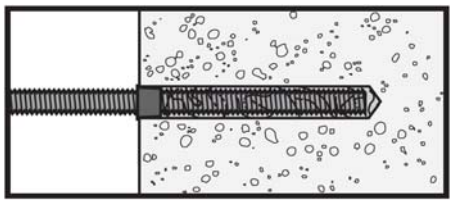
ANCHOR INSTALLATION (horizontal and overhead anchorage)

1. 

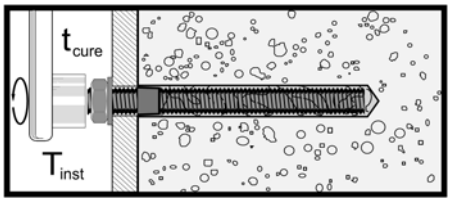
Install adhesive retaining cap.

2. 

Insert clean, oil free anchor, turning slowly until the anchor contacts the bottom of the hole.

3. 

Do not disturb the anchor until fully cured. The curing time t_{cure} is given in table 4.

4 

After required curing time, anchor can be loaded. Apply the installation torque T_{inst} using calibrated torque-wrench.

Table 4: Working and curing time

Temperature in the anchorage base $T_{anchorage\ base}$	Working time t_{gel}	Curing time [1] t_{cure}
$T_{anchorage\ base} \geq 10°$	60 minutes	72 hours
$T_{anchorage\ base} \geq 21°$	45 minutes	24 hours
$T_{anchorage\ base} \geq 32°$	25 minutes	24 hours
$T_{anchorage\ base} \geq 43°$	12 minutes	24 hours

[1] For installation in wet concrete, the curing times shall be doubled (installation in water-filled drilled holes is not allowed).

Table 5a: Cleaning equipment

Simpson Strong-Tie® SET-XP Epoxy Adhesive		Threaded rod				
		M12	M16	M20	M24	M27
Drill bit	Diameter d_0 [mm]	14	18	24	28	30
Cleaning brush	Diameter d_b [mm]	19,1	19,1	25,4	31,8	31,8
	Length l_b [mm]	100	100	100	100	100
	Part number	ETB6	ETB6	ETB8	ETB10	ETB10

Table 5b: Cleaning equipment

Simpson Strong-Tie® SET-XP Epoxy Adhesive		Reinforcing bar				
		Ø12	Ø14	Ø16	Ø20	Ø25
Drill bit	Diameter d_0 [mm]	16	18	20	25	32
Cleaning brush	Diameter d_b [mm]	19,1	19,1	25,4	31,8	41,3
	Length l_b [mm]	100	100	100	100	150
	Part number	ETB6	ETB6	ETB8	ETB10	ETB12

Cleaning brush (Nylon):

Compressed air cleaning tool

Air pressure: **min. 5,5 bar**
Orifice opening: **min. Ø3,5 mm**

Table 6: Characteristic values of resistance to tension loads. Design method TR 029

Simpson Strong-Tie® **SET-XP Epoxy Adhesive**			**Threaded rod**				
			M12	**M16**	**M20**	**M24**	**M27**
Steel failure							
Characteristic resistance, Steel grade 5.8	$N_{Rk,s}$	[kN]	42	79	123	177	230
Characteristic resistance; Steel grade 8.8	$N_{Rk,s}$	[kN]	67	126	196	282	367
Partial safety factor	γ_{Ms} [1)]	[-]	1,5				
Characteristic resistance, Stainless steel A4 and HCR, property class 50 (>M24) and 70 (≤M24)	$N_{Rk,s}$	[kN]	59	110	172	247	230
Partial safety factor	γ_{Ms} [1)]	[-]	1,87				2,86
Combined pull-out and concrete cone failure							
Nom. thread rod diameter	d	[mm]	12	16	20	24	27
Characteristic bond resistance in **non-cracked** concrete C20/25							
Temperature range I: 43°C / 24°C [3)]	$\tau_{Rk,ucr}$	[N/mm²]	17	10	10	9	7
Temperature range II: 65°C / 43°C [3)]	$\tau_{Rk,ucr}$	[N/mm²]	16	9,5	9,5	8,5	6,5
Characteristic bond resistance in **cracked** concrete C20/25							
Temperature range I: 43°C / 24°C [3)]	$\tau_{Rk,cr}$	[N/mm²]	6	4,5	3	3	3
Temperature range II: 65°C / 43°C [3)]	$\tau_{Rk,cr}$	[N/mm²]	5,5	4,5	3	3	3
Increasing factor for τ_{Rk} in non-cracked and cracked concrete	Ψ_c	C30/37	1,0				
		C40/50	1,0				
		C50/60	1,0				
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc}$ [1)]	[-]	2,1 [2)]				
Splitting failure							
Edge distance (splitting)	$c_{cr,sp}$	[mm]	3x h_{ef}				
Center spacing (splitting)	$s_{cr,sp}$	[mm]	2x $c_{cr,sp}$				
Partial safety factor	γ_{Msp} [1)]	[-]	2,1 [2)]				

1) In absence of other national regulations

2) The partial safety factor γ_2 = 1,4 is included.

3) Maximum short and long term temperatures

Table 7: Characteristic values of resistance to shear loads. Design method TR 029

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Threaded rod				
			M12	M16	M20	M24	M27
Steel failure without lever arm							
Characteristic resistance, Steel grade 5.8	$V_{Rk,s}$	[kN]	21	39	61	88	115
Characteristic resistance Steel grade 8.8	$V_{Rk,s}$	[kN]	34	63	98	141	184
Partial safety factor	γ_{Ms} 1)	[-]	1,25				
Characteristic resistance, Stainless steel A4 and HCR, property class 50 (>M24) and 70 (≤M24)	$V_{Rk,s}$	[kN]	30	55	86	124	115
Partial safety factor	γ_{Ms} 1)	[-]	1,56				2,38
Steel failure with lever arm							
Characteristic resistance, Steel grade 5.8	$M^0_{Rk,s}$	[Nm]	66	166	325	561	832
Characteristic resistance, Steel grade 8.8	$M^0_{Rk,s}$	[Nm]	105	266	519	898	1332
Partial safety factor	γ_{Ms} 1)	[-]	1,25				
Characteristic resistance, Stainless steel A4 and HCR, property class 50 (>M24) and 70 (≤M24)	$M^0_{Rk,s}$	[Nm]	92	233	454	786	832
Partial safety factor	γ_{Ms} 1)	[-]	1,56				2,38
Concrete pry-out failure							
Factor in equation (5.7) acc. 5.2.3.3 of TR 029 for Design of Bonded Anchors	k	[-]	2				
Partial safety factor	γ_{Mcp} 1)	[-]	1,5				
Concrete edge failure							
See section 5.2.3.4 of the Technical Report TR 029 for the Design of Bonded Anchors							
Partial safety factor	γ_{Mc} 1)	[-]	1,5 2)				

1) In absence of other national regulations

2) The partial safety factor γ_2 = 1,0 is included.

Table 8: Displacements under tension loads

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Threaded rod				
			M12	M16	M20	M24	M27
Non-cracked concrete							
Temperature range I: 43°C / 24°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,020	0,030	0,010	0,010	0,030
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,024	0,040	0,040	0,044	0,064
Temperature range II: 65°C / 43°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,020	0,030	0,010	0,012	0,031
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,025	0,042	0,042	0,047	0,070
Cracked concrete							
Temperature range I: 43°C / 24°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,100	0,100	0,230	0,200	0,170
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,133	0,180	0,270	0,300	0,300
Temperature range II: 65°C / 43°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,100	0,130	0,230	0,200	0,170
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,145	0,180	0,270	0,300	0,300

1) Calculation for the displacement for design load:
Displacement for short term load = δ_{N0} • [τ_{Sd} /1,4]
Displacement for long term load = $\delta_{N\infty}$ • [τ_{Sd} /1,4] (τ_{Sd} = design bond strength)

2) Maximum short and long term temperatures

Table 9: Displacements under shear loads

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Threaded rod				
			M12	M16	M20	M24	M27
Displacement [3)]	δ_{V0}	[mm/kN]	0,022	0,015	0,012	0,005	0,005
	$\delta_{V\infty}$	[mm/kN]	0,033	0,022	0,018	0,010	0,010

3) Calculation of the displacement for design load:
Displacement for short term load = δ_{V0} • [V_d /1,4]
Displacement for long term load = $\delta_{V\infty}$ • [V_d /1,4] (V_d = design shear load)

Table 10: Characteristic values of resistance to tension loads. Design method TR 029

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Reinforcing bar				
			Ø12	Ø14	Ø16	Ø20	Ø25
Steel failure							
Characteristic tension resistance for B500 acc. DIN 488-2:2009-08 [4]	$N_{Rk,s}$	[kN]	62	85	111	173	270
Partial safety factor	γ_{Ms} [1]	[-]	1,4				
Combined pull-out and concrete cone failure							
Nom. rebar diameter	d	[mm]	12	14	16	20	25
Characteristic bond resistance in **non-cracked** concrete C20/25							
Temperature range I: 43°C / 24°C [3]	$\tau_{Rk,ucr}$	[N/mm²]	13,5	8	8	7	5,5
Temperature range II: 65°C / 43°C [3]	$\tau_{Rk,ucr}$	[N/mm²]	12,5	7,5	7,5	6,5	5
Characteristic bond resistance in **cracked** concrete C20/25							
Temperature range I: 43°C / 24°C [3]	$\tau_{Rk,cr}$	[N/mm²]	5	3,5	2,5	2,5	2,5
Temperature range II: 65°C / 43°C [3]	$\tau_{Rk,cr}$	[N/mm²]	4,5	3,5	2,5	2,5	2,5
Increasing factor for τ_{Rk} in non-cracked and cracked concrete	Ψ_c	C30/37	1,0				
		C40/50	1,02				
		C50/60	1,04				
Partial safety factor	$\gamma_{Mp} = \gamma_{Mc}$ [1]	[-]	1,8 [2]				
Splitting failure							
Edge distance (splitting)	$c_{cr,sp}$	[mm]	3x h_{ef}				
Center spacing (splitting)	$s_{cr,sp}$	[mm]	2x $c_{cr,sp}$				
Partial safety factor	γ_{Msp} [1]	[-]	1,8 [2]				

1) In absence of other national regulations

2) The partial safety factor γ_2 =1,2 is included.

3) Maximum short and long term temperatures

4) For reinforcement bars that do not comply with DIN 488: The characteristic resistance $N_{Rk,s}$ shall be determined acc. Technical Report TR 029, equation (5.1)

Table 11: Characteristic values of resistance to shear loads. Design method TR 029

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Reinforcing bar				
			Ø12	Ø14	Ø16	Ø20	Ø25
Steel failure without lever arm							
Characteristic resistance for B500 acc. DIN 488-2:2009-8 [3]	$V_{Rk,s}$	[kN]	31	42	55	86	135
Partial safety factor	γ_{Ms} [1]	[-]	1,5				
Steel failure with lever arm							
Characteristic resistance B500 acc. DIN 488-2:2009-8 [4]	$M^0_{Rk,s}$	[Nm]	112	178	265	518	1012
Partial safety factor	γ_{Ms} [1]	[-]	1,5				
Concrete pry-out failure							
Factor in equation (5.7) acc. 5.2.3.3 of TR 029 for Design of Bonded Anchors	k	[-]	2				
Partial safety factor	γ_{Mcp} [1]	[-]	1,5				
Concrete edge failure							
See section 5.2.3.4 of the Technical Report TR 029 for the Design of Bonded Anchors							
Partial safety factor	γ_{Mc} [1]	[-]	1,5 [2]				

1) In absence of other national regulations

2) The partial safety factor γ_2 = 1,0 is included.

3) For reinforcing bars that do not comply with DIN 488: The characteristic resistance $V_{Rk,s}$ shall be determined acc. Technical report TR 029, equation (5.5)

4) For reinforcing bars that do not comply with DIN 488: The characteristic resistance $M^0_{Rk,s}$ shall be determined acc. Technical report TR 029, equation (5.6b)

Table 12: Displacements under tension loads

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Reinforcing bar Ø12	Ø14	Ø16	Ø20	Ø25
Non-cracked concrete							
Temperature range I: 43°C / 24°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,015	0,030	0,040	0,043	0,055
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,033	0,056	0,063	0,071	0,090
Temperature range II: 65°C / 43°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,020	0,030	0,040	0,045	0,050
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,036	0,060	0,066	0,077	0,100
Cracked concrete							
Temperature range I: 43°C / 24°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,100	0,170	0,280	0,240	0,200
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,160	0,220	0,320	0,440	0,440
Temperature range II: 65°C / 43°C [2)]							
Displacement [1)]	δ_{N0}	[mm/(N/mm²)]	0,110	0,170	0,280	0,240	0,200
	$\delta_{N\infty}$	[mm/(N/mm²)]	0,178	0,228	0,320	0,440	0,440

1) Calculation of the displacement for design load:
Displacement for short term load = $\delta_{N0} \bullet [\tau_{Sd} / 1,4]$
Displacement for long term load = $\delta_{N\infty} \bullet [\tau_{Sd} / 1,4]$ (τ_{Sd} = design bond strength)

2) Maximum short and long term temperatures

Table 13: Displacements under shear loads

Simpson Strong-Tie® SET-XP Epoxy Adhesive			Reinforcing bar Ø12	Ø14	Ø16	Ø20	Ø25
Displacement [3)]	δ_{V0}	[mm/kN]	0,010	0,010	0,013	0,015	0,015
	$\delta_{V\infty}$	[mm/kN]	0,013	0,015	0,019	0,023	0,023

3) Calculation of the displacement for design load:
Displacement for short term load = $\delta_{V0} \bullet [V_d / 1,4]$
Displacement for long term load = $\delta_{V\infty} \bullet [V_d / 1,4]$ (V_d = design shear load)