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Authorised and notified according
to Article 29 of the Regulation (EU)
No 305/2011 of the European
Parliament and of the Council of 9
March 2011

MEMBER OF EOTA



European Technical Assessment ETA-19/0418 of 2019/06/19

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:

AT-HP / AT-HP PLUS / S&P ResAC-19 bonded anchor for rebar connections

Product family to which the above construction product belongs:

Post-installed rebar connections of the sizes 8 to 16 mm with AT-HP / AT-HP PLUS / S&P ResAC-19 injection mortar

Manufacturer:

Simpson Strong-Tie®
Rue du Camp
Z.A.C. des Quatre Chemins
F-85400 Sainte Gemme La Plaine
Tel. +33 2 51 28 44 00
Fax +33 2 51 28 44 01
Internet www.simpson.fr

Manufacturing plant:

Simpson Strong-Tie®
Manufacturing facilities

This European Technical Assessment contains:

16 pages including 11 annexes which form an integral part of the document

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:

EAD 330087-00-0601, Systems for post-installed rebar connections with mortar

This version replaces:

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product

The subject of this assessment are the post-installed connections, by anchoring or overlap connection joint consisting of steel reinforcing bars (rebars) in existing structures made of normal weight concrete, using injection mortar AT-HP / AT-HP PLUS / S&P ResAC-19 in accordance with the regulations for reinforced concrete construction. The design of the post-installed rebar connections shall be done in accordance with EN 1992-1-1 (Eurocode 2).

Reinforcing bars with diameters from 8 to 16 mm and AT-HP / AT-HP PLUS / S&P ResAC-19 injection mortar according to Annex A3 are used for the post-installed rebar connections covered by this ETA. The steel element is placed into a drilled hole previously injected with a mortar and is anchored by the bond between embedded element, injection mortar and concrete.

The characteristic material values, dimensions and tolerances of the anchors not indicated in Annexes shall correspond to the respective values laid down in the technical documentation¹ of this European Technical Assessment.

Each mortar cartridge is marked with the identifying mark of the producer and with the trade name. The rebars are either delivered with the mortar cartridges or commercial standard rebars purchased separately.

The AT-HP / AT-HP PLUS / S&P ResAC-19 injection mortar is delivered in mortar cartridges in of different sizes in accordance with Annex A3.

The intended use specifications of the product are detailed in the Annex B1.

2 Specification of the intended use in accordance with the applicable EAD

The post-installed rebar connections may be used in normal weight concrete of a minimum grade C12/15 and

¹ The technical documentation of this European Technical Assessment is deposited at ETA-Danmark and, as far as relevant for the tasks of the Notified bodies involved in the attestation of conformity procedure, is handed over to the notified bodies.

maximum grade C50/60 according to EN 206-1. They may be used in non-carbonated concrete with the allowable chloride content of 0,40 % (Cl 0,40) related to the cement content according to EN 206-1

The rebar connections may be used for predominantly static loads.

Fatigue, dynamic or seismic loading of post-installed rebar connections are not covered by this ETA.

The fire resistance of the post-installed rebar connections is not covered by this ETA.

The rebar connections may only be carried out in the manner, which is also possible with reinforcing bars, e.g. those in the following applications:

- an overlapping joint with existing reinforcement in a building component (Figures 1 and 2, Annex A1),
- anchoring of the reinforcement at a slab or beam support (Figure 3, Annex A1; end support of a slab, designed as simply supported, as well as appropriate reinforcement for restraint forces),
- anchoring of reinforcement of building components stressed primarily in compression (Figure 4, Annex A1),
- anchoring of reinforcement to cover the line of acting tensile force (Figure 5, Annex A1).

The post-installed rebar connections may be used in dry or wet concrete and it must not be installed in flooded holes. The post-installed rebar connections may be used overhead.

The post-installed rebar connections may be used in the temperature range -40°C to +40°C (max. short term temperature +80°C and max. long term temperature +50°C).

This ETA covers anchoring in bore holes made with hammer drilling and compresses air drilling.

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B1 to B7

The provisions made in this European Technical Assessment 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 or Assessment Body, 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.

3 Performance of the product and references to the methods used for its assessment

3.1 Characteristics of product

Mechanical resistance and stability (BWR 1):

The essential characteristics are detailed in the Annex C1.

Safety in case of fire (BWR 2):

The essential characteristics are detailed in the Annex C1.

Safety in use (BWR4):

For basic requirement Safety in use the same criteria are valid for Basic Requirement Mechanical resistance and stability (BWR1).

Sustainable use of natural resources (BWR7)

No performance assessed

Other Basic Works Requirements are not relevant.

3.2 Methods of assessment

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 Basic Requirements 1 and 4 has been made in accordance with EAD 330087-00-06.01, Systems for post-installed rebar connections with mortar.

4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 96/582/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 1.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2019-06-19 by



Thomas Bruun
Manager, ETA-Danmark

Examples of use for rebars

Figure 1: Overlapping joint for rebar connections of slabs and beams

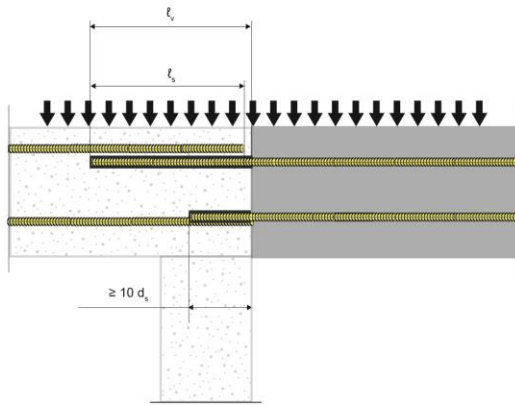


Figure 2: Overlapping joint at a foundation of a wall or column where the rebars are stressed in tension

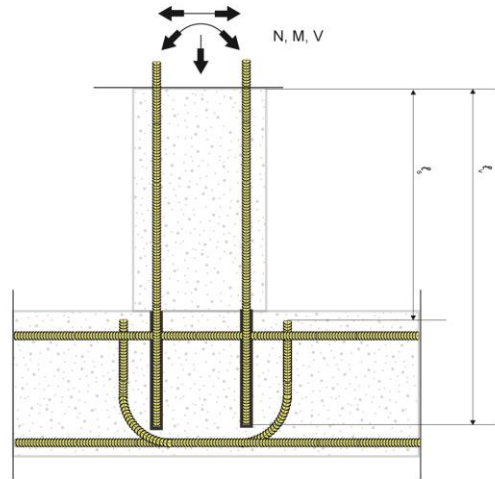


Figure 3: End anchoring of slabs or beams, designed as simply supported

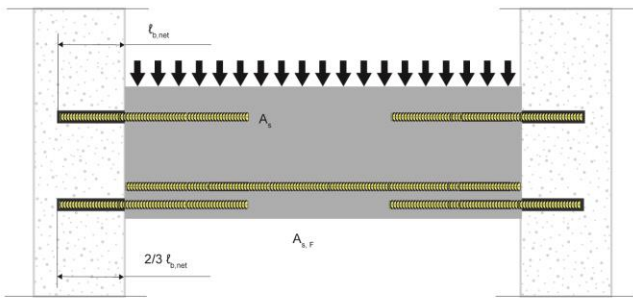


Figure 4: Rebar connection for components stressed primarily in compression. The rebars are stressed in compression.

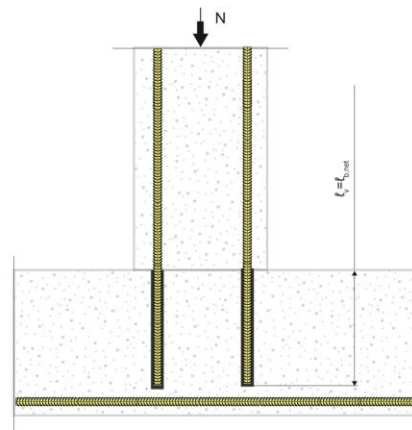
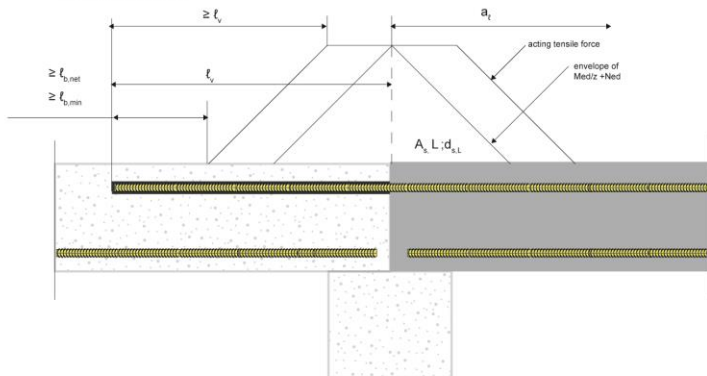


Figure 5: Anchoring of reinforcement to cover the line of acting tensile force.



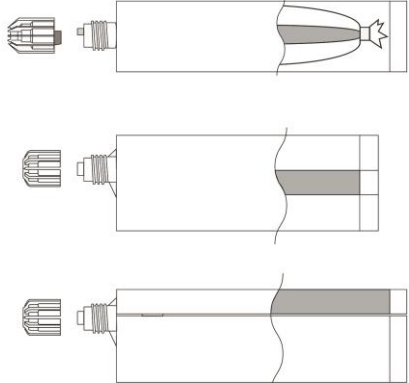



Note to Figure 1 to 5:
In the figures no transverse reinforcement is plotted, the transverse reinforcement as required by EN 1992-1-1 shall be present.

The shear transfer between old and new concrete shall be designed according to EN 1992-1-1

Concerning general rules for construction and design, see annex B2

<p>AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection</p>	<p>Annex A1 of European Technical Assessment ETA-19/YYYY</p>
<p>Use of the product</p>	

<p>Hole Cleaning Brush</p>	
<p>Push Pump</p>	
<p>Injection Mortar :</p> <p>AT-HP / AT-HP PLUS / S&P ResAC-19 Styrene Free Resin System</p> <p>A. Foil Bag Cartridge 165ml, 300ml, 410ml B. Coaxial Cartridge 380ml, 400ml, 410ml C. Side by Side Cartridge 345ml, 350ml, 825ml</p>	
<p>Mixer</p>	
<p>AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection</p>	
<p>Product description</p>	<p>Annex A2 of European Technical Assessment ETA-19/YYYY</p>

Properties of reinforcement

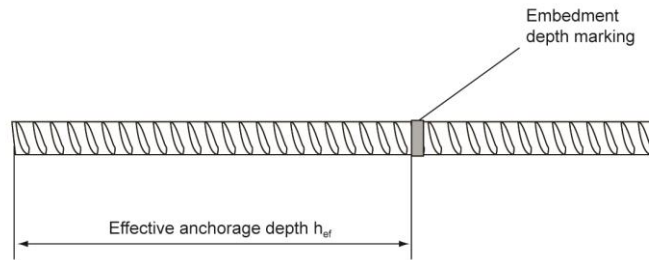


Table A1: Abstract of EN 1992-1-1 Annex C Table C.1 Properties of reinforcement

Product form		Bars and de-coiled rods	
Class		B	C
Characteristic yield strength f_{yk} or $f_{0,2k}$ (N/mm ²)		400 to 600	
Minimum value of $k = (f_t / f_y)k$		$\geq 1,08$	$\geq 1,15$ < 1,35
Characteristic strain at maximum force, ϵ_{uk} (%)		$\geq 5,0$	$\geq 7,5$
Bendability		Bend / Rebend test	
Maximum deviation from nominal mass (individual bar) (%)	Nominal bar size (mm)	$\pm 6,0$	
	≤ 8	$\pm 4,5$	
Bond: Minimum relative rib area, $f_{R,min}$ (determination according to EN 15630)	Nominal bar size (mm)	0,040	
	8 to 12	0,056	
	> 12		

Rip height of the bar shall be in the range $0,05d \geq h \geq 0,07d$
(d: Nominal diameter of the bar; h: Rip height of the bar)

Table A2: Injection mortar

Product	Composition
AT-HP / AT-HP PLUS / S&P ResAC-19 injection mortar	Styrene Free Resin System

AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection	Annex A3 of European Technical Assessment ETA-19/YYYY
Materials	

Specification of intended use

Anchorage subject to:

- Static and quasi-static loads.

Base materials:

- Reinforced or unreinforced normal weight concrete of strength class C12/15 at minimum to C50/60 at maximum according to EN 206-1.
- Maximum chloride content of 0,40% (CL 0,40) related to the cement content according to EN 206-1.
- Non-carbonated concrete.

Note: In case of a carbonated surface of the existing concrete structure the carbonate layer shall be removed in the area of the post-installed rebar connection with a diameter of $d_s + 60$ mm prior to the installation of the new rebar. The depth of concrete to be removed shall correspond to at least the minimum concrete cover according to EN 1992-1-1. The above may be neglected if building components are new and not carbonated and if building components are in dry conditions.

Temperature range:

- The anchors may be used in the following temperature range:
 -40°C to +40°C (max. short term temperature +80°C and max. long term temperature +50°C).

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions, i.e. exposure class X0 and XC1 of EC2 §3.3.4.

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking into account of the forces to be transmitted.
- Design according to EN 1992-1-1 and Annex B2.
- The actual position of the reinforcement in the existing structure shall be determined on the basis of the construction documentation and taken into account when designing.

Installation:

- Dry or wet concrete (use category 1).
- It must not be installed in flooded holes.
- Overhead installation is permissible.
- Hole drilling by hammer drill or by compressed air drilling
- Installation of the post-installed rebars shall be done only by suitable trained installer and under supervision on the site.
- Check the position of the existing rebars (if the position of existing rebars is not known it shall be determined using a rebar detector suitable for this purpose as well as on the basis of the construction documentation and then marked on the building component for the overlap joint).

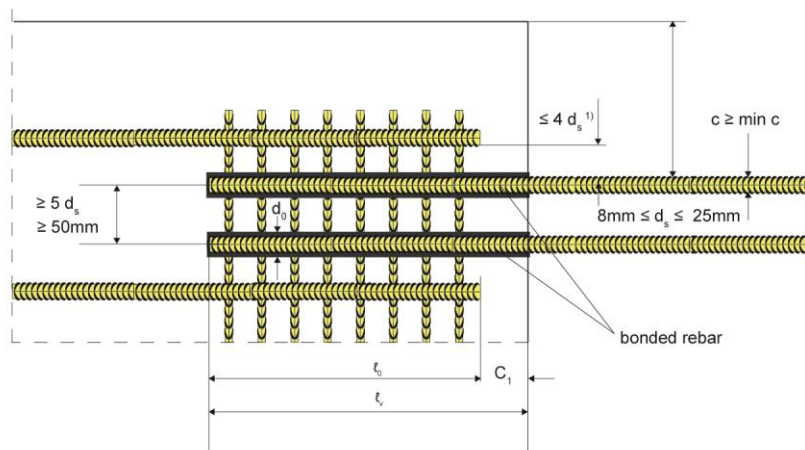
AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection	Annex B1
Intended use - Specification	of European Technical Approval ETA-19/YYYY

General design rules of construction for post-installed rebars

Only tension forces in the axis of the rebar may be transmitted.

The transfer of shear forces between new concrete and existing structure shall be designed additionally according to EN 1992-1-1.

The joints for concreting must be roughened to at least such an extent that aggregate protrude.



1) If the clear distance between lapped bars exceeds $4d_s$ then the lap length shall be increased by the difference between the clear bar distance and $4d_s$.

- c concrete cover post installed rebar
- c_1 concrete cover at end-face of bond-in bar
- c_{min} minimum concrete cover according to annex B3
- d_s diameter bonded-in bar
- l_0 lap length EN 1992-1-1, clause 8.7.3
- l_v effective embedment depth $l_v \geq l_0 + c_1$
- d_o normal drill bit diameter see Annex B3

AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection

Intended use. General construction rules for post-installed rebars

Annex B2
of European
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Table B1: Drill bit diameter and setting depth

Rebar Diameter		Ø8	Ø10	Ø12	Ø14	Ø16
Diameter of element	d_s [mm]	8	10	12	14	16
Nominal diameter of drill bit	d_o [mm]	10-12*	12-14*	14-16*	18	20

* Both given values for drill diameter can be used

Height of the rebar rib h_{rib} :

The height of the rebar rib h_{rib} shall fulfil the following requirement: $0,05 \cdot d \leq h_{rib} \leq 0,07 \cdot d$

with: d = nominal diameter of the rebar element.

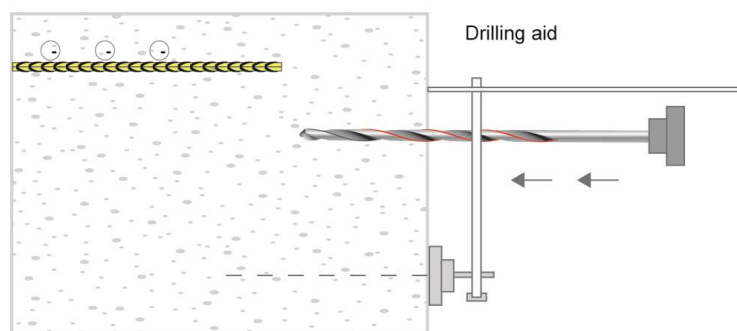


Table B2: Minimum concrete cover $\min c$ of bonded-in rebar depending on drilling method

Drilling method	Rebar diameter	Without drilling aid	With drilling aid
Hammer drilling	< 25mm	$30\text{mm} + 0.06 \cdot \ell_v \geq 2d_s$	$30\text{mm} + 0.02 \cdot \ell_v \geq 2d_s$
Compressed air drilling	< 25mm	$50\text{mm} + 0.08 \cdot \ell_v$	$50\text{mm} + 0.02 \cdot \ell_v$

The minimum concrete cover must be observed according EN 1992-1-1:2004

Table B3: Minimum anchorage length¹⁾ and lap splice length for C20/25 and maximum installation length l_{max}

Rebar		$l_{b,min}$ (mm)	$l_{o,min}$ (mm)	l_{max} (mm)
$\text{Ø}d_s$	$F_{y,k}$ [N/mm ²]			
8mm	500	113	200	1000
10mm	500	142	200	1000
12mm	500	170	200	1200
14mm	500	198	210	1400
16mm	500	227	240	1600

1) according to EN 1992-1-1:2004: $l_{b,min}$ (8.6) and $l_{o,min}$ (8.11) for good bond conditions and $a_6 = 1.0$ with maximum yield stress for rebar B500 B and $\gamma_M = 1.15$.

AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection

Installation data

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Table B4: Minimum curing time

Temperature in the concrete member	Gel time (working time) t_{gel} In dry/wet concrete	Cure time
$\geq -5 - 0^{\circ}\text{C}$	80 min	160 min
$\geq +0 - 5^{\circ}\text{C}$	25 min	90 min
$\geq +5 - 10^{\circ}\text{C}$	17 min	70 min
$\geq +10 - 20^{\circ}\text{C}$	12 min	65 min
$\geq +20 - 30^{\circ}\text{C}$	6 min	60 min
$\geq +30 - 40^{\circ}\text{C}$	3 min	45 min

Note. For a value of anchorage length or lap splice length higher than 400mm the maximum temperature in the concrete member shall be limited to 20 °C”

AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection

Curing time

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Manual Cleaning (MAC):

Hand pump recommended for
Blowing out bore holes with diameters
 $d_o \leq 18$ mm and bore holes depth $h_o \leq 10d$






Compressed air cleaning (CAC):

Recommended air nozzle with an
Orifice opening of minimum
3,5mm in diameter.



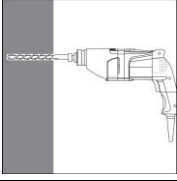
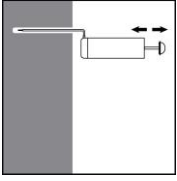
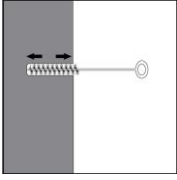
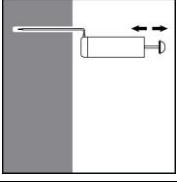
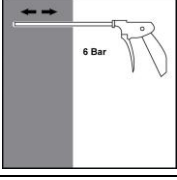
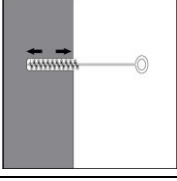
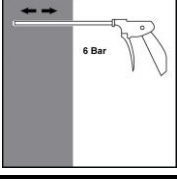
Table B5: Bore hole cleaning: Steel brush

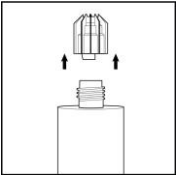
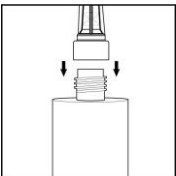
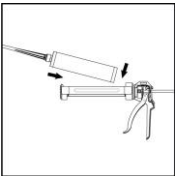
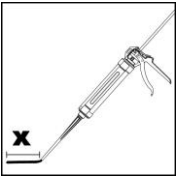
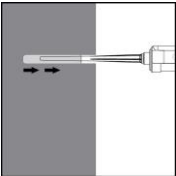
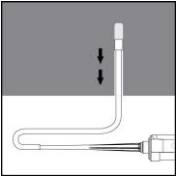
Element	Size	Nominal drill bit diameter d_o (mm)	Steel Brush	Cleaning methods	
				Manual cleaning (MAC)	Compressed air cleaning (CAC)
					
Rebar 	Ø8	10 to 12	10mm	Yes ... $h_{ef} \leq 80$ mm	Yes
	Ø10	12 to 14	10mm	Yes ... $h_{ef} \leq 100$ mm	Yes
	Ø12	14 to 16	13mm	Yes ... $h_{ef} \leq 120$ mm	Yes
	Ø14	18	18mm	Yes ... $h_{ef} \leq 140$ mm	Yes
	Ø16	20	18mm	No	Yes

AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection

Cleaning tools (1)

Annex B5
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Instructions for use	
Bore hole drilling	
	Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.
Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris.	
a) Manual air cleaning (MAC) for bore hole diameters $d_o \leq 18\text{mm}$ and bore hole depth $h_o \leq 10d$	
 X 4	The manual pump may be used for blowing out bore holes up to diameters $d_o \leq 18\text{mm}$ and embedment depths up to $h_{ef} \leq 10d$. Blow out at least 4 times from the back of the bore hole until return air stream is free of noticeable dust.
 X 4	Brush 4 times with the specified brush size (brush $\varnothing \geq$ bore hole \varnothing , see Table 6) by inserting the steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the bore hole. If not, the brush is too small and must be replaced with the proper brush diameter.
 X 4	Blow out again with manual pump at least 4 times until return air stream is free from noticeable dust.
b) Compressed air cleaning (CAC) for all bore hole diameters d_o and all bore hole depth h_o	
 X 2	Blow 2 times from the back of the hole (if needed with a nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at $6\text{m}^3/\text{h}$) until return air stream is free from noticeable dust.
 X 2	Brush 2 times with the specified brush size (brush $\varnothing \geq$ bore hole \varnothing , see Table 6) by inserting the steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it. The brush must produce natural resistance as it enters the bore hole. If not, the brush is too small and must be replaced with the proper brush diameter.
 X 2	Blow out again with compressed air at least 2 times until return air stream is free from noticeable dust.
AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection	Annex B6
Instructions for use	of European Technical Assessment ETA-19/YYYY

Instructions for use	
	Remove the threaded cap from the cartridge without cutting.
	Tightly attach the mixing nozzle. Do not modify the mixer in any way. Make sure the mixing element is inside the mixer. Use only the supplied mixer with the adhesive.
	Insert the cartridge into the dispenser. Press the release trigger to retract the plunger and insert the cartridge neatly into the cradle without any distortion.
	Discard the initial trigger pulls of adhesive. Resin will flow from the cartridge as soon as dispensing is initiated. Depending on the size of the cartridge, an initial amount of adhesive mix must be discarded. Discard quantities are - 5cm for between 150ml & 300ml Foil Pack - 10cm for all other sizes
Metal parts made of zinc coated steel	
	Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full, or as required to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment depth. After injection is completed, depressurize the dispenser by pressing the release trigger. This will prevent further adhesive discharge from the mixer.
	Overhead installation and installation with embedment depth $h_{ef} > 250\text{mm}$ For overhead installation the injection is only possible with the aid of extensions and piston plugs. Assemble mixer, extension(s) and appropriately sized piston plug (see Table 6). Insert piston plug to back of hole and inject adhesive. During injection the piston plug will be naturally extruded out of the bore hole by the adhesive pressure.
AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection	Annex B7 of European Technical Assessment ETA-19/YYYY
Instructions for use	

Design values of the ultimate bond resistance $f_{bd}^{1)}$ [N/mm²] according to EN 1992-1-1:2004+AC 2010

Rebar - Ø	Concrete class									
	d_s	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 mm		1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6
10 mm		1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,6
12 mm		1,6	2	2,3	2,3	2,3	2,3	2,3	2,3	2,3
14 mm		1,6	2	2,3	2,7	3	3,4	3,4	3,4	3,4
16 mm		1,6	2	2,3	2,7	3	3,4	3,7	4	4,3

1) Tabulated values are for f_{bd} are valid for good bond conditions according to EN 1992-1-1:2004+AC 2010. For all other bond conditions multiply the values for f_{bd} by 0,7.

Table C2: Resistance to fire

ESSENTIAL CHARACTERISTICS	PERFORMANCE
Resistance to fire	NPD

Table C3: Reaction to fire

ESSENTIAL CHARACTERISTICS	PERFORMANCE
Reaction to fire	In the final application the thickness of the mortar layer is about 1 to 2 mm and most of the mortar is material classified class A1 according to EC Decision 96/603/EC. Therefore it may be assumed that the bonding material (synthetic mortar or a mixture of synthetic mortar and cementitious mortar) in connection with the metal anchor in the end use application do not make any contribution to fire growth or to the fully developed fire and they have no influence to the smoke hazard.

AT-HP / AT-HP PLUS / S&P ResAC-19 for post-installed rebar connection

Performance for static and quasi-static loads: Resistances

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