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European Technical Assessment ETA-07/0189 dated 06/07/2022

English translation prepared by CSTB - Original version in French language

General Part

Nom commercia: Trade name	**SPIT EPCON C8 XTREM**
Famille de produit : Product family	*Scellement d'armatures rapportées, diamètres 8 à 40 mm, avec résine d'injection SPIT EPCON C8 XTREM.* **Post installed rebar connections diameter 8 to 40 mm made with SPIT EPCON C8 XTREM injection adhesive.**
Titulaire: Manufacturer	Société SPIT Route de Lyon F-26501 BOURG-LES-VALENCE France
Usine de fabrication: Manufacturing plants	Société SPIT Route de Lyon F-26501 BOURG-LES-VALENCE France
Cette evaluation contient: This Assessment contains	*18 pages incluant 15 pages d'annexes qui font partie intégrante de cette évaluation* 18 pages including 15 pages of annexes which form an integral part of this assessment
Base de l'ETE: Basis of ETA	*DEE 330087-01-0601* EAD 330087-01-0601
Cette evaluation remplace: This Assessment replaces	*ETE-07/0189 du 02/08/2017* ETA-07/0189 dated *02/08/2017*

Specific Part

1 Technical description of the product

The EPCON C8 XTREM is used for the connection, by anchoring or overlap joint, of reinforcing bars (rebars) in existing structures made of ordinary non-carbonated concrete C12/15 to C50/60.

Covered are rebar anchoring systems consisting of EPCON C8 XTREM bonding material and an embedded straight deformed reinforcing bar with properties according to Annex C of EN 1992-1-1:2004 and EN 10080:2005. The classes B and C of the rebar are recommended. The illustration and the description of the product are given in Annexes A.

The ETA covers rebar connections with a diameter, ϕ, from 8 to 40 mm.

2 Specification of the intended use

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annexes B.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of at least 50 and/or 100 years for hammer drilling, compressed air drilling and diamond core drilling. 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.

3 Performance of the product

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance under static and quasi-static loading	See Annex C1 and C2
Characteristic resistance under seismic loading	NPD

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	NPD
Resistance to fire	NPD

3.3 Hygiene, health, and the environment (BWR 3)

Regarding dangerous substances contained in this European Technical Assessment, there may be 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.

3.4 Safety in use (BWR 4)

For Basic requirement Safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources ((BWR 7)

For the sustainable use of natural resources, no performance was determined for this product.

3.8 General aspects relating to fitness for use

Durability and Serviceability are only ensured if the specifications of intended use according to Annex B1 are kept.

4 Assessment and verification of constancy of performance (AVCP)

According to the Decision 96/582/EC of the European Commission[1], as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	—	1

5 Technical details necessary for the implementation of the AVCP system

Technical details necessary for the implementation of the Assessment and verification of constancy of performance (AVCP) system are laid down in the control plan deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, based on a contract, involve a notified body approved in the field of anchors for issuing the certificate of conformity CE based on the control plan.

The original French version is signed by

Anca Cronopol
Head of the division

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

Installed condition

Figure A1:

Overlap joint with existing reinforcement for rebar connections of slabs and beams

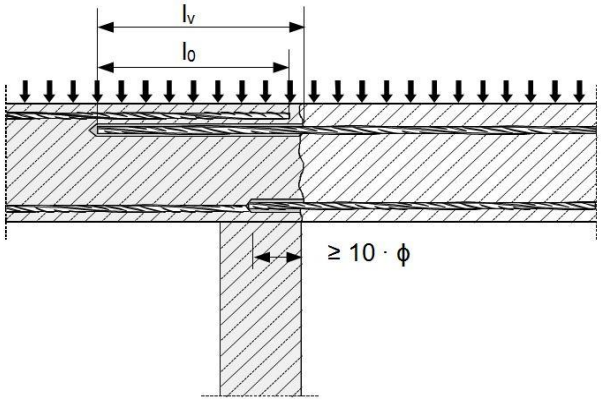


Figure A2:

Overlap joint with existing reinforcement at a foundation of a column or wall where the rebars are stressed in tension

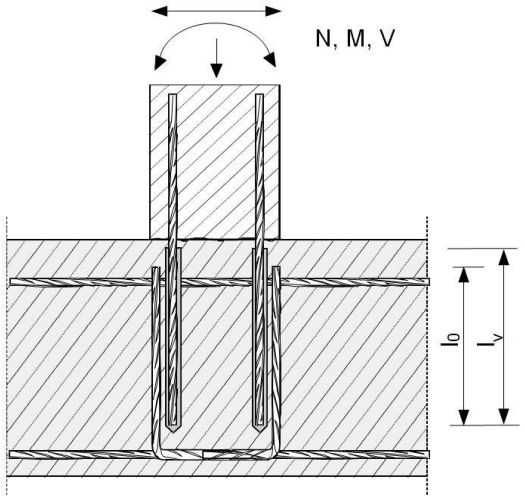
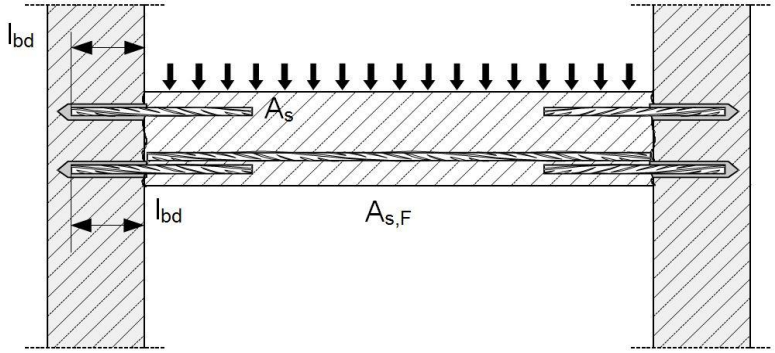


Figure A3:

End anchoring of slabs or beams



SPIT EPCON C8 XTREM	
Product description Installed condition – application examples of post-installed rebars	**Annex A1**

Figure A4:
Rebar connection for components stressed primarily in compression

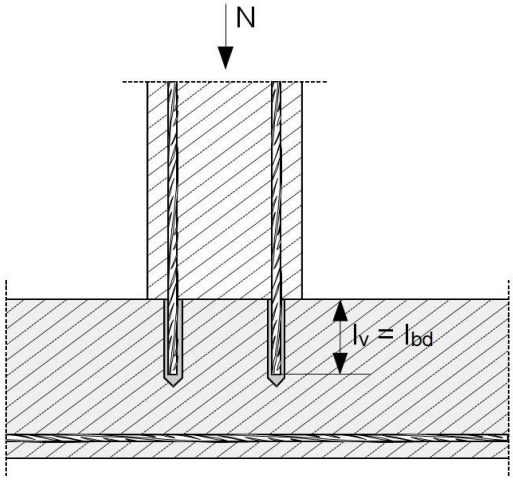
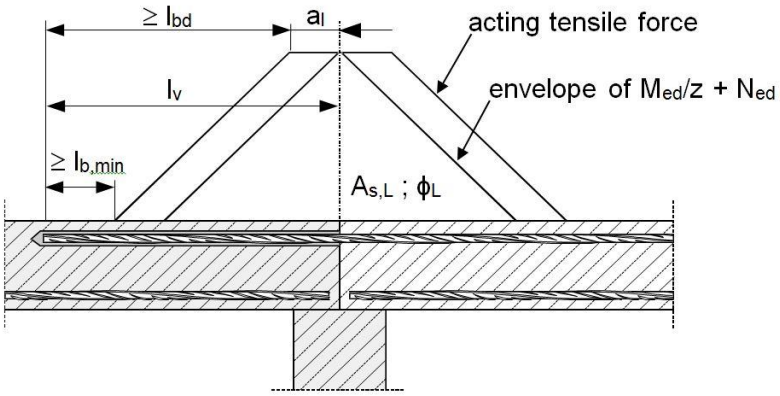


Figure A5:
Anchoring of reinforcement to cover the enveloped line of acting tensile force in the bending member



Note to Figure A1 to Figure A5:

- In the Figures no transverse reinforcement is plotted, the transverse reinforcement as required by EN 1992-1-1:2004+AC:2010 shall be present.
- The shear transfer between existing and new concrete shall be designed according to EN 1992-1-1:2004+AC:2010.
- Preparing of joints according to Annex B2.

The reference to EN 1992-1-1:2004+AC:2010 is cited in the following as EN 1992-1-1 only.

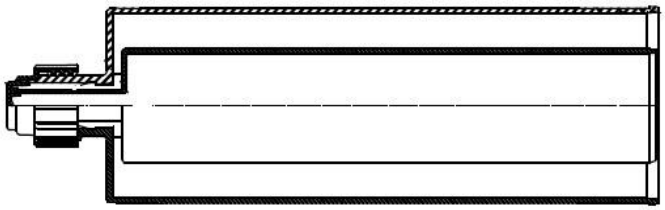
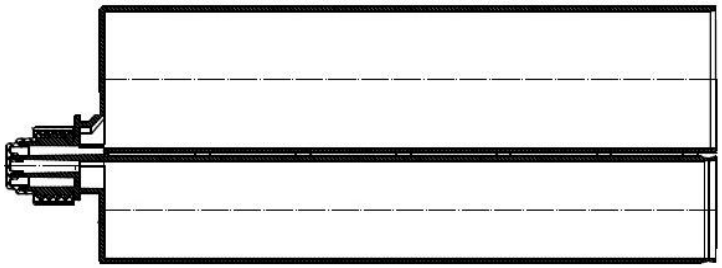
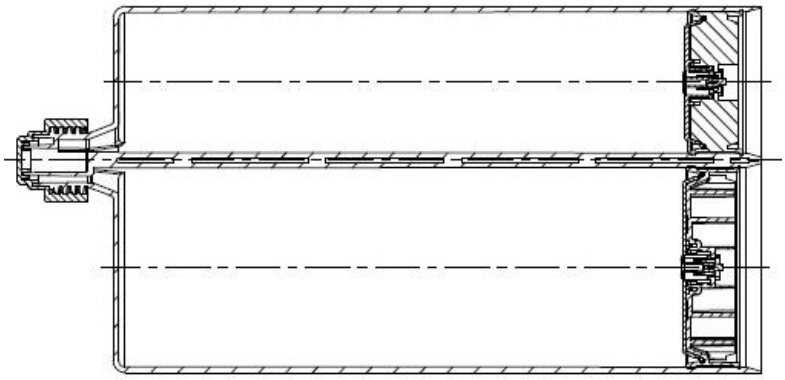
Product description: Injection mortar and steel elements

Two components epoxy system

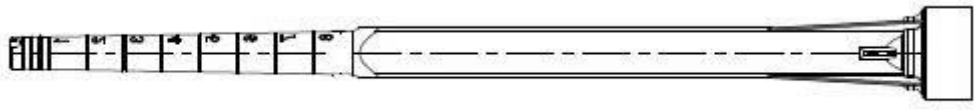
Marking

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

Cartridge

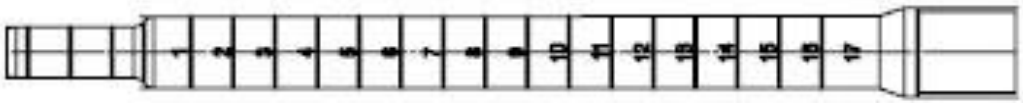
400ml coaxial cartridge	
450ml side by side cartridge	
900ml side by side cartridge	

Mixing nozzles



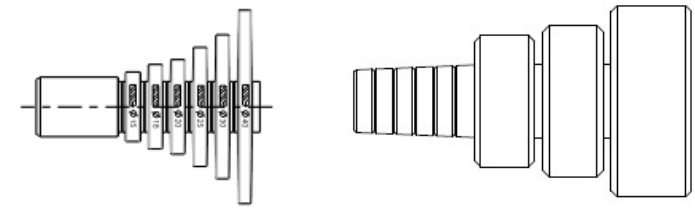
Standard 400-450-900

High flow mixing nozzle

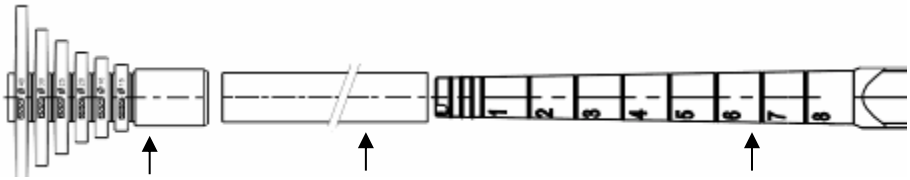


Reduction for mixing nozzles

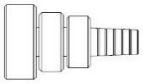
Piston Plug



SPIT EPCON C8 XTREM	
Product description Mixing nozzles and piston plug	**Annex A4**



Piston plug Plastic extension Nozzle

Ø Drilling	Plastic extension for mixing nozzle Φ_{ext} x l	Mixing nozzle		Piston plug
[mm]	[mm]	[-]	[-]	[-]
10 à 40	9x196 9x1000	Standard mixing nozzle 400-450-900		
15 à 40	13x1000	Standard mixing nozzle 400-450-900	High flow mixing nozzle + Reduction	
35 à 50	20 x 1000	High flow mixing nozzle		

Dispensers

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

Metallic brush
+
Extension

SPIT EPCON C8 XTREM

Annex A5

Product description

Plastic extension, dispenser, and metallic brush

Steel elements

Reinforcing bar (rebar): ϕ 8 to ϕ 40

- Materials and mechanical properties according to Table A1.
- Minimum value of related rib area f_R according to EN 1992-1-1.
- Rib height of the bar hrib shall be in the range:
  0,05 x ϕ ≤ hrib ≤ 0,07 x ϕ
- The maximum outer rebar diameter over the ribs shall be:
  ϕ + 2 x 0,07 · ϕ = 1,14 x ϕ

(ϕ: Nominal diameter of the bar; h_{rib}: Rib height of the bar)

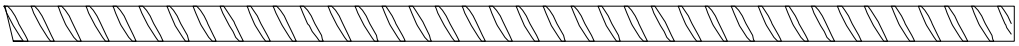


Table A1: Materials

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

Specifications of intended use

Anchorages subject to:

- Static and quasi static loading.

Base material:

- Reinforced or unreinforced normal weight concrete according to EN 206:2013+A1:2016.
- Strength classes C12/15 to C50/60 according to EN 206:2013+A1:2016.
- Maximum chloride content of 0,40 % (CL 0.40) related to the cement content according to EN 206:2013+A1:2016.
- Non-carbonated concrete.

  Note: In case of a carbonated surface of the existing concrete structure the carbonated layer shall be removed in the area of the post-installed rebar connection with a diameter of ϕ + 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 in accordance with EN 1992-1-1. The foregoing may be neglected if building components are new and not carbonated and if building components are in dry conditions.

Temperature in the base material:

- **at installation**

  +5 °C to +40 °C
- **in-service**

  -40 °C to +80 °C (max. long term temperature +50 °C and max. short term temperature +80 °C)

Design:

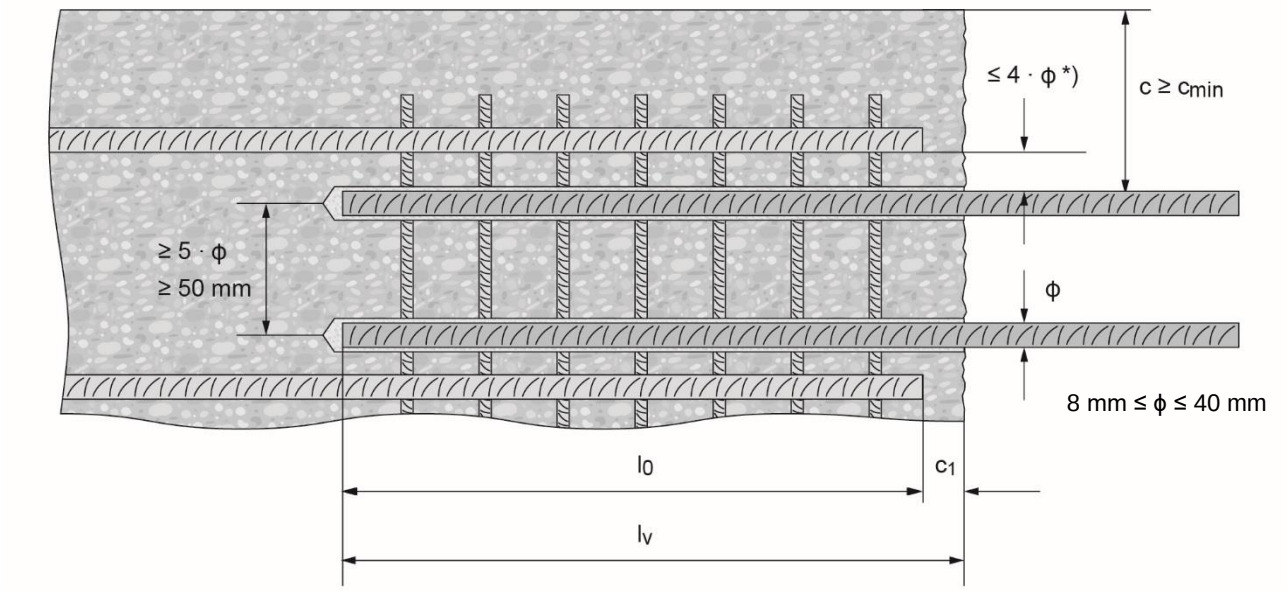
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the forces to be transmitted.
- Design under static or quasi-static loading in accordance with EN 1992-1-1, Annex B2.
- 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:

- Use category: dry or wet concrete (not in flooded holes).
- Drilling technique:
  - hammer drilling,
  - diamond core drilling,
  - compressed air drilling
- Overhead installation is permitted for sizes up to 25mm.
- Rebar installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of 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).

Figure B1: General construction rules for post-installed rebars

- Post-installed rebar may be designed for tension forces only.
- 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 protrudes.



*) If the clear distance between lapped bars exceeds 4 x ϕ, then the lap length shall be increased by the difference between the clear bar distance and 4 x ϕ.

Minimum clear spacing between two post-installed bars a = 40 mm ≥ 4 x ϕ. When using a drilling aid the requirement of 4 x ϕ may be replaced by 2 x ϕ.

c concrete cover of post-installed rebar
c_1 concrete cover at end-face of existing rebar
c_{min} minimum concrete cover according to Table B1 and to EN 1992-1-1
ϕ diameter of reinforcement bar
l_0 lap length, according to EN 1992-1-1
l_v effective embedment depth ≥ $l_0 + c_1$
d_0 nominal drill bit diameter, see Table B2

Table B1: Minimum concrete cover c_{min}[1)] of the post-installed rebar depending on drilling method and drilling tolerance

Drilling method	Bar diameter [mm]	Minimum concrete cover c_{min}[1)] [mm]	
		Without drilling aid	With drilling aid
Hammer drilling	$\phi < 25$	$30 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
	$\phi \geq 25$	$40 + 0{,}06 \cdot l_v \geq 2 \cdot \phi$	$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
Compressed air drilling	$\phi < 25$	$50 + 0{,}08 \cdot l_v$	$50 + 0{,}02 \cdot l_v$
	$\phi \geq 25$	$60 + 0{,}08 \cdot l_v \geq 2 \cdot \phi$	$60 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
Diamond Core drilling	$\phi < 25$	Drill stand is used as drilling aid	$30 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$
	$\phi \geq 25$		$40 + 0{,}02 \cdot l_v \geq 2 \cdot \phi$

[1)] See Annex B2, Figure B1.
Comments: The minimum concrete cover acc. EN 1992-1-1.

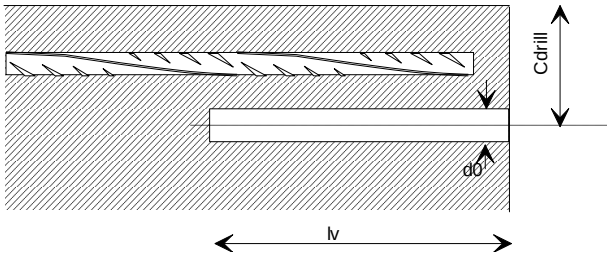
Table B2: Drilling diameter and maximum anchorage length

Rebar diameter	Nominal drilling diameter d_0		Maximum anchorage length l_v		
			Dispenser		
	Drill bit	Diamond core	M450	P450 P900	EGI 450
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
8	10	10	900	1500	1500
10	12	12			
12	15	15			
14	18	18			
16	20	20			
20	25	25			
25	30	30			
28	35	35			
32	40	40			
40	50	50	-		

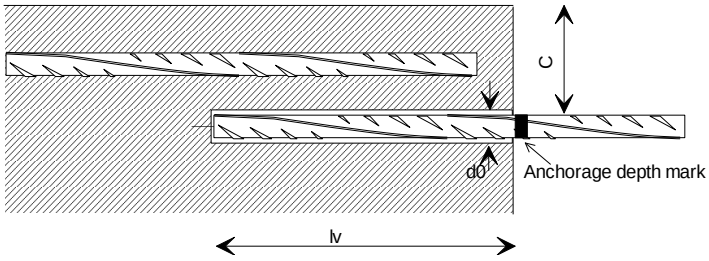
Drilling the hole

Rotary hammer drilling or compressed air drilling

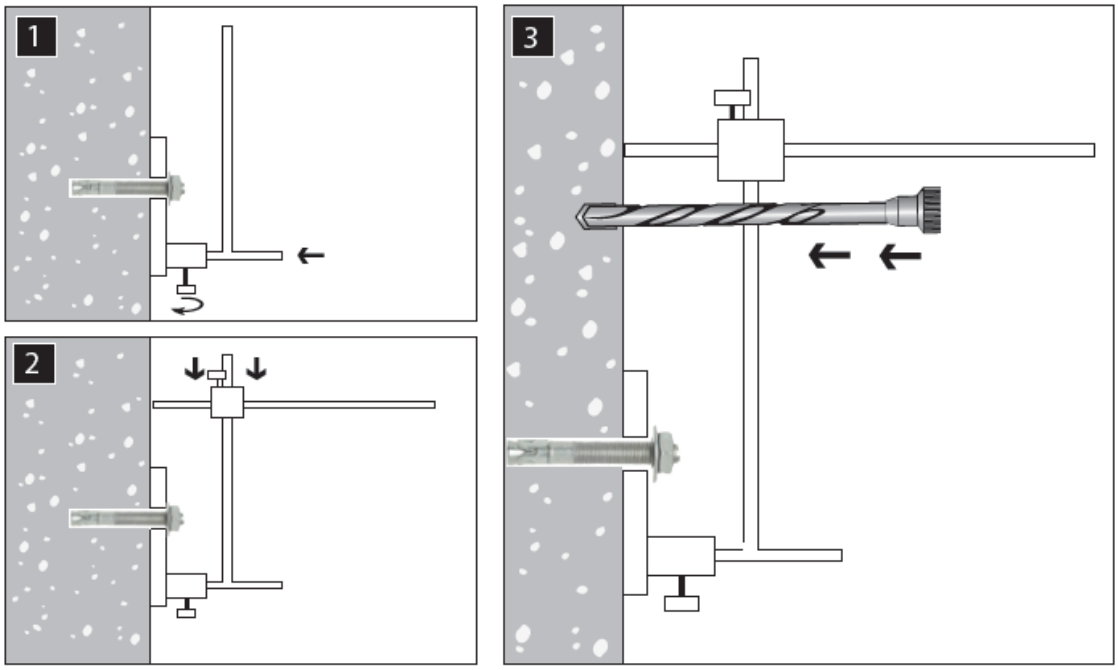
Diamond core drilling
(Water in the hole is not permitted)



- Observe concrete coverage , c, as per setting plan.
- Drill parallel to the edge (when appropriate use the drilling aid for minimum concrete cover)



- Put the anchorage depth mark on the rebar

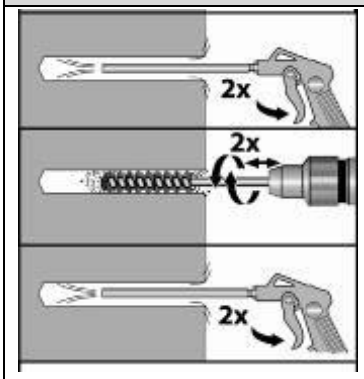
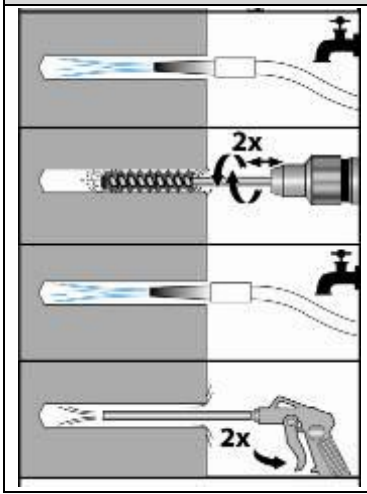


SPIT EPCON C8 XTREM

Intended Use
Installation instructions

Annex B4

Cleaning the hole:

Hammer drilling technique	
	1. Insert air nozzle fitted with the relevant plastic extension to bottom of the hole and blow out at least 2 times using oil free compressed air and until no dust is evacuated. 2. Using the relevant brush and extension fitted on a drilling machine, starting from the top of the hole, move downward to the bottom of the hole (duration 5s) then move upward to the top of the hole (duration 5s). Repeat this operation. 3. Insert air nozzle fitted with the relevant plastic extension to bottom of the hole and blow out at least 2 times using oil free compressed air and until no dust is evacuated.
Diamond core drilling technique	
	1. Clean the hole with tap water 2. Using the relevant brush and extension fitted on a drilling machine, starting from the top of the hole, move downward to the bottom of the hole (duration 5s) then move upward to the top of the hole (duration 5s). Repeat this operation. 3. Clean the hole with tap water 4. Insert air nozzle fitted with the relevant plastic extension to bottom of the hole and blow out at least 2 times using oil free compressed air and until no dust is evacuated.

Rebar diameter [mm]	Brushes Diameter [mm]	Extension for brushes [-]	Plastic Extension for compressed air [-]
8	11	Lg 325 mm	9x196 9x1000
10	13		
12	16		
14	20		
16	22		
20	26		
25	32		
28	37		
32	42		
40	52		

The diameter of the round steel brush shall be checked before use. The minimum brush diameter has to be at least equal to the borehole diameter d_0. The round steel brush shall produce natural resistance as it enters the drill hole. If this is not the case, please use a new brush or a brush with a larger diameter.

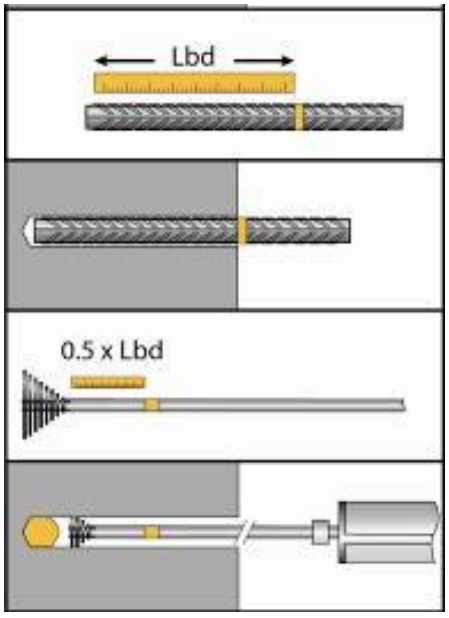
Dispensing into the hole:

EPCON C8 XTREM

- Storage temperature of cartridge +0°C to +35 °C
- Cartridge temperature at time of installation: Must be ≥ +5°C
- Minimum building component temperature ≥ +5°C
- Check the date of expiry of the cartridge

Safety precaution

The safety data sheet must be red before using the product and the safety instructions must be followed.

	1. Put the anchorage depth mark on the rebar 2. Check the anchorage depth 3. Cut the piston plug at the relevant diameter. The volume of resin that need to be injected in the hole must be indicated on the mixing nozzle or its extension. The marking must be placed at 0.5 time the anchorage depth 4. Screw the mixing nozzle onto the cartridge and dispense the first part to waste until an even color is achieved for each new cartridge or mixing nozzle. Insert the nozzle to the far end of the hole, and inject the resin, withdrawing the nozzle as the hole fills. Fill the hole until the mark appear.

Inserting the rebar:

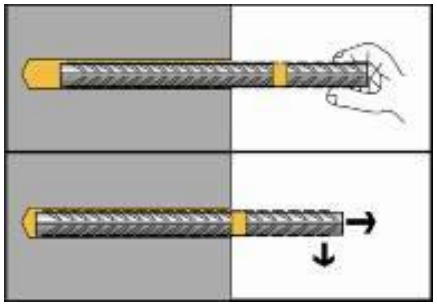
	1. Immediately insert the rebar, slowly and with a slight twisting motion. Remove excess resin from around the mouth of the hole before it sets. Control the embedment depth. 2. Leave the rebar undisturbed until the cure time has elapse.

Table B3 : Processing and curing time

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

Essential characteristics under static and quasi-static loading

Minimum anchorage length, minimum lap length and design values of the bond strength for a working life of 50 and 100 years for following drilling techniques:

- hammer drilling,
- compressed air drilling,

The minimum anchorage length $l_{b,min}$ and the minimum lap length $l_{0,min}$ according to EN 1992-1-1 shall be multiplied by the amplification factor $\alpha_{lb} = \alpha_{lb,100y}$ given in Table C1.

The design values of the bond strength $f_{bd,PIR}$ and $f_{bd,PIR,100y}$ are given in Table C3. It is obtained by multiplying the design value of the bond strength f_{bd} according to EN 1992-1-1 (Eq. 8.3) by the bond efficiency factor $k_b = k_{b,100y}$ according to Table C2.

The minimum anchorage length $l_{b,min}$ and the minimum lap length $l_{0,min}$ according to EN 1992-1-1 shall be multiplied by the relevant amplification factor α_{lb} given in Table C1.

Table C1: Amplification factor $\alpha_{lb} = \alpha_{lb,100y}$ for a working life of 50 or 100 years

Bar diameter	Amplification factor $\alpha_{lb} = \alpha_{lb,100y}$ [-]								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ 40	1,0								

Table C2: Bond efficiency value $k_b = k_{b,100y}$ for a working life of 50 or 100 years

Bar diameter	Bond efficiency value $k_b = k_{b,100y}$ [-]								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8-ϕ40	1,0								

Table C3: Design values of the ultimate bond resistance $f_{bd} = f_{bd,PIR,100y}$ in N/mm² for a working life of 50 or 100 years

$f_{bd,PIR} = k_b \cdot f_{bd}$
$f_{bd,PIR,100y} = k_{b,100y} \cdot f_{bd}$

f_{bd} : Design value of the bond strength in N/mm² considering the concrete strength classes and the rebar diameter for good bond condition (for all other bond conditions multiply the values by $\eta_1 = 0,7$) and recommended partial factor $\gamma_c = 1,5$ according to EN 1992-1-1.

k_b et $k_{b,100y}$: Bond efficiency factor according to Table C2

Bar diameter	Design values of the ultimate bond resistance $f_{bd,PIR} = f_{bd,PIR,100y}$ [N/mm²]								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8-ϕ40	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3

Essential characteristics under static and quasi-static loading

Minimum anchorage length, minimum lap length and design values of the bond strength for a working life of 50 and 100 years for following drilling techniques:

- diamond coring

The minimum anchorage length $l_{b,min}$ and the minimum lap length $l_{0,min}$ according to EN 1992-1-1 shall be multiplied by the amplification factor $\alpha_{lb} = \alpha_{lb,100y}$ given in Table C4.

The design values of the bond strength $f_{bd,PIR}$ and $f_{bd,PIR,100y}$ are given in Table C6. It is obtained by multiplying the design value of the bond strength f_{bd} according to EN 1992-1-1 (Eq. 8.3) by the bond efficiency factor $k_b = k_{b,100y}$ according to Table C5.

The minimum anchorage length $l_{b,min}$ and the minimum lap length $l_{0,min}$ according to EN 1992-1-1 shall be multiplied by the relevant amplification factor α_{lb} given in Table C4.

Table C4: Amplification factor $\alpha_{lb} = \alpha_{lb,100y}$ for a working life of 50 or 100 years

Rebar diameter	**Amplification factor $\alpha_{lb} = \alpha_{lb,100y}$ [-]**								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ40	1,0								

Table C5: Bond efficiency factor $k_b = k_{b,100y}$ for a working life of 50 or 100 years

Rebar diameter	**Bond efficiency factor $k_b = k_{b,100y}$ [-]**								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ 40	1,00				0,89	0,80	0,73	0,67	0,63

Table C6: Design values of the bond strength $f_{bd} = f_{bd,PIR,100y}$ in N/mm² for a working life of 50 or 100 years

$f_{bd,PIR} = k_b \cdot f_{bd}$
$f_{bd,PIR,100y} = k_{b,100y} \cdot f_{bd}$

f_{bd} : Design value of the bond strength in N/mm² considering the concrete strength classes and the rebar diameter for good bond condition (for all other bond conditions multiply the values by $\eta_1 = 0,7$) and recommended partial factor $\gamma_c = 1,5$ according to EN 1992-1-1.

k_b et $k_{b,100y}$: Bond efficiency factor according to Table C5

Rebar diameter	**Bond strength $f_{bd,PIR} = f_{bd,PIR,100y}$ [N/mm²]**								
	Concrete class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
ϕ8 - ϕ40	1,6	2,0	2,3	2,7					