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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

European Technical Assessment ETA-18/0798 of 2018/10/22

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:	Chemfix CH 200 bonded anchor for post-installed rebar connections
Product family to which the above construction product belongs:	Post-installed rebar connections with Chemfix CH 200 injection mortar
Manufacturer:	Chemfix Products Ltd Mill Street East Dewsbury West Yorkshire WF12 9BQ, UK Tel. +44 (0) 1924 453886 Fax +44 (0) 1924 431658 Internet www.chemfix.co.uk
Manufacturing plant:	Chemfix Products Ltd Mill Street East Dewsbury West Yorkshire WF12 9BQ, UK
This European Technical Assessment contains:	18 pages including 13 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 Chemfix CH 200 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 32 mm and Chemfix CH 200 injection mortar are used for the post-installed rebar connections. The steel element is placed into a drilled hole filled 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 documentation[1] of this European Technical Assessment.

The product description is given in Annex A.

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

The performances given in Section 3 are only valid if the rebar connection is used in compliance with the specifications and conditions given in Annex B

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.

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.

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

3.1 Characteristics of product

Mechanical resistance and stability (BWR1):
The essential characteristics are detailed in the Annex C.

Safety in case of fire (BWR2):
Reaction to fire: Rebar connections satisfy requirements for Class A1.

Resistance to fire: See annex C

Hygiene, health and the environment (BWR3):
No performance assessed.

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 determined

Other Basic 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 the EAD 330087-00-06.01, Systems for post-installed rebar connections with mortar.

4 Assessment 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 2018-10-22 by

Thomas Bruun
Managing Director, ETA-Danmark

Installation post installed rebar

Figure A1: Overlapping joint for rebar connections of slabs and beams

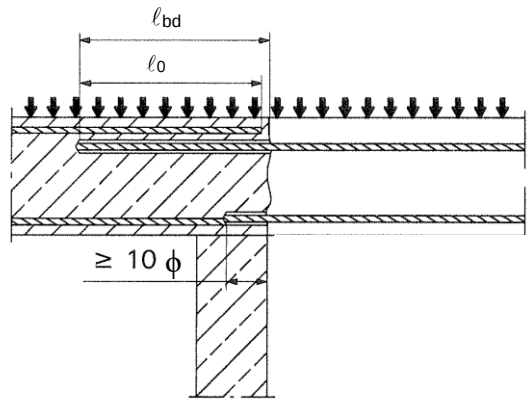


Figure A2: Overlapping joint at a foundation of a wall or column where the rebars are stressed in tension

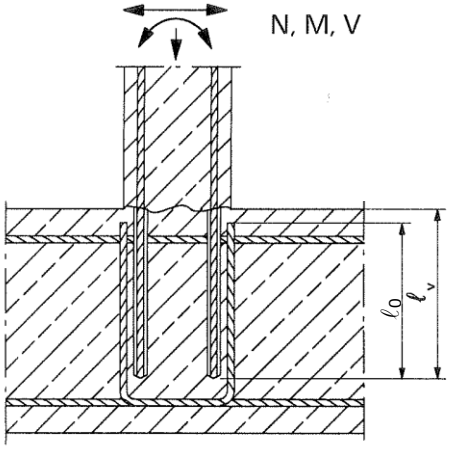


Figure A3: End anchoring of slabs or beams (e.g. designed as simply supported)

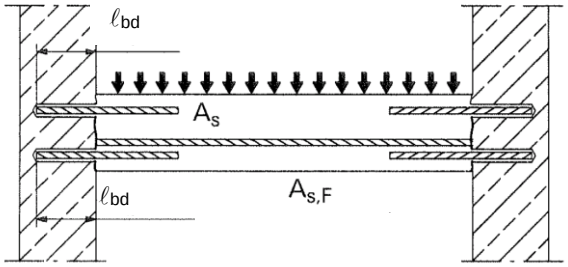


Figure A4: Rebar connection for components stressed primarily in compression. The rebars sre stressed in compression

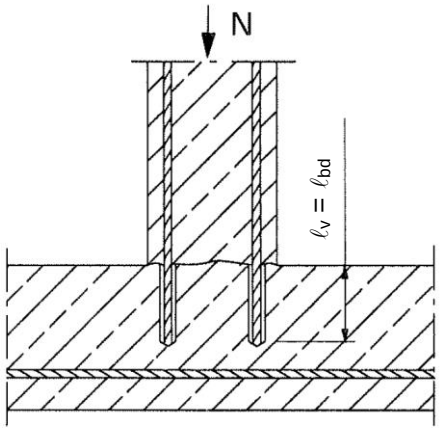
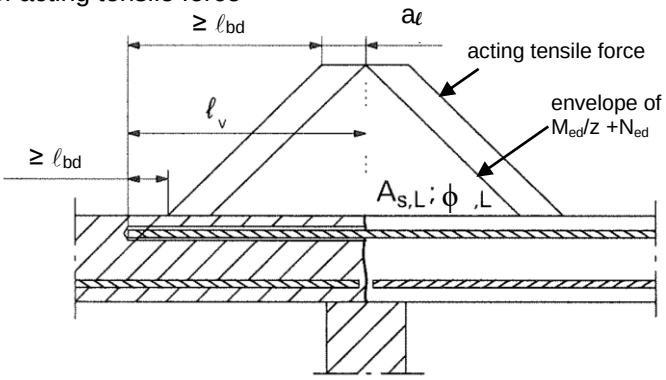


Figure A5: Anchoring of reinforcement to cover the line of acting tensile force



Note to Figure A1 to A5:

In the Figures no transverse reinforcement is plotted, the transverse reinforcement shall comply with EN 1992-1-1:2004+AC:2010.

Preparing of joints according to Annex B 2

Chemfix Injection System CH 200 for rebar connection	**Annex A1**
Product description Installed condition and examples of use for rebars	

Chemfix Injection System CH 200:

A) Foil Bag Cartridge 165ml/ 300ml. (ChubSeal® & Chubpack™)

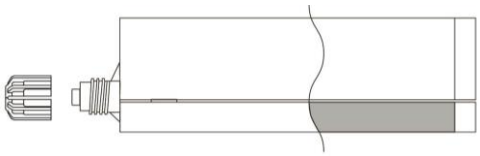
B) Coaxial Cartridge 380ml/ 400ml/ 410ml/ 420ml

C) Side by Side Cartridge 345ml/ 825ml

Cartridge Print : Chemfix CH200
Including - Installation procedure, Production Batch code, Expiry Date, Storage conditions, Health & Safety warning, Gel & Cure time according to temperatures.

A)

B)



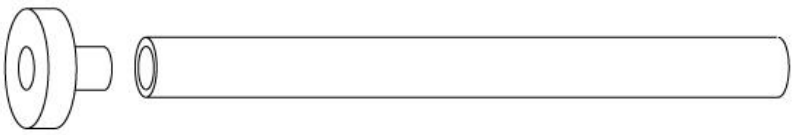
C)

Static Mixer

T-Flow™ Mixer

Chemfix 500 Mixer

Piston plug PL and mixer extension



Chemfix Injection System CH 200 for rebar connection

Product description
Injection mortar / Static mixer

Annex A2

Reinforcing bar (rebar): ø8, ø10, ø12, ø14, ø16, ø20, ø22, ø24, ø25, ø28, ø32

- Minimum value of related rip area $f_{R,min}$ according to EN 1992-1-1:2004+AC:2010
- Rib height of the bar shall be in the range $0{,}05\phi \le h \le 0{,}07\phi$
  (ϕ: Nominal diameter of the bar; h: Rip height of the bar)

Table A1: Materials

Designation	Material
Rebar EN 1992-1-1:2004+AC:2010, Annex C	Bars and de-coiled rods class B or C f_{yk} and k according to NDP or NCL of EN 1992-1-1/NA:2013 $f_{uk} = f_{tk} = k \cdot f_{yk}$

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads.
- Fire exposure

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C12/15 to C50/60 according to EN 206-1:2000.
- Maximum chloride concrete of 0,40% (CL 0.40) related to the cement content according to EN 206-1:2000.
- 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 1992-1-1:2004+AC:2010.

  The foregoing may be neglected if building components are new and not carbonated and if building components are in dry conditions.

Temperature Range:

- - 40°C to +80°C (max. short term temperature +80°C and max long term temperature +50°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 according to EN 1992-1-1:2004+AC: 2010 and Annex B 2.
- 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.
- Anchorages under fire exposure are designed in accordance with EN 1992 – 1- 2:2004+AC:2008

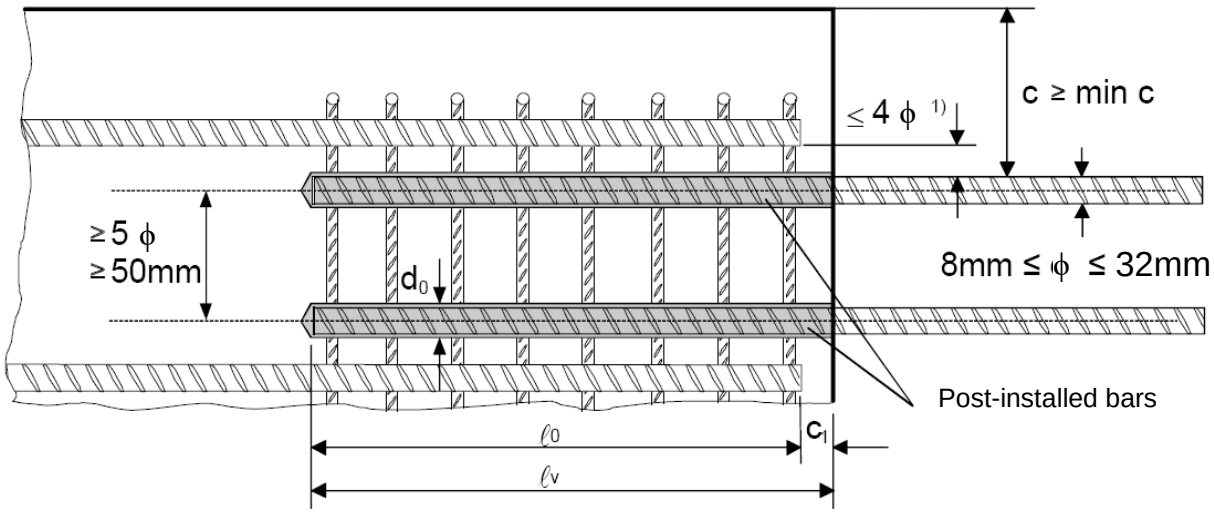
Installation:

- Dry or wet concrete.
- It must not be installed in flooded holes.
- Hole drilling by hammer drill (HD), hollow drill (HDB) or compressed air drill mode (CD).
- The installation of post-installed rebar resp. tension anchors shall be done only by suitable trained installer and under supervision on site; the conditions under which an installer may be considered as suitable trained and the conditions for supervision on site are up to the Member States in which the installation is done.
- 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).

Chemfix Injection System CH 200 for rebar connection	**Annex B1**
Intended use Specifications	

Figure B1: General construction rules 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 1992-1-1:2004+AC: 2010.
- The joints for concreting must be roughened to at least such an extent that aggregate protrude.

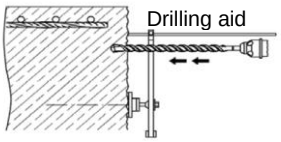


1) If the clear distance between lapped bars exceeds 4ϕ, then the lap length shall be increased by the difference between the clear bar distance and 4ϕ.

The following applies to Figure B1:

c	concrete cover of post-installed rebar
c_1	concrete cover at end-face of existing rebar
min c	minimum concrete cover according to Table B1 and to EN 1992-1-1:2004+AC:2010, Section 4.4.1.2
ϕ	diameter of post-installed rebar
ℓ_0	lap length, according to EN 1992-1-1:2004+AC: 2010, Section 8.7.3
ℓ_v	effective embedment depth, ≥ ℓ_0 + c_1
d_0	nominal drill bit diameter, see Annex B5

Table B1: Minimum concrete cover min c[1] of post-installed rebar depending of drilling method



Drilling method	Rebar diameter	Without drilling aid	With drilling aid
Hammer drilling (HD)	< 25 mm	30 mm + 0,06 · ℓ_v ≥ 2 ϕ	30 mm + 0,02 · ℓ_v ≥ 2 ϕ
	≥ 25 mm	40 mm + 0,06 · ℓ_v ≥ 2 ϕ	40 mm + 0,02 · ℓ_v ≥ 2 ϕ
Compressed air drilling (CD)	< 25 mm	50 mm + 0,08 · ℓ_v	50 mm + 0,02 · ℓ_v
	≥ 25 mm	60 mm + 0,08 · ℓ_v	60 mm + 0,02 · ℓ_v

1) see Annex B2 & Figures B1
Comments: The minimum concrete cover acc. EN 1992-1-1:2004+AC:2010 must be observed

Table B2: maximum embedment depth $\ell_{v,max}$

Rebar ϕ	$\ell_{v,max}$ [mm]
8 mm	1000
10 mm	1000
12 mm	1200
14 mm	1400
16 mm	1600
20 mm	2000
22 mm	2000
24 mm	2000
25 mm	2000
28 mm	1000
32 mm	1000

Table B3: Base material temperature, gelling time and curing time

Concrete temperature	Gelling working time[1]	Minimum curing time in dry concrete	Minimum curing time in wet concrete
-10°C to -6°C	90 min[2]	24 h	48 h
- 5 °C to - 1 °C	90 min[3]	14 h	28 h
0 °C to + 4 °C	45 min[3]	7 h	14 h
+ 5 °C to + 9 °C	25 min[3]	2 h	4 h
+ 10 °C to + 19 °C	15 min[3]	80 min	160 min
+ 20 °C to + 24 °C	6 min[3]	45 min	90 min
+ 25 °C to + 29 °C	4 min[3]	25 min	50 min
+ 30 °C to + 40 °C	2,5 min[4]	15 min	30 min

1) t_{gel}: maximum time from starting of mortar injection to completing of rebar setting.
2) Cartridge temperature **must** be at minimum +15°C
3) Cartridge temperature **must** be between +5°C and +25°C
4) Cartridge temperature **must** be below +20°C

Chemfix Injection System CH 200 for rebar connection

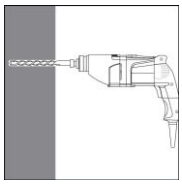
Annex B3

Intended use
Minimum concrete cover
Maximum embedment depth / working time and curing times

Table B4: Dispensing tools

Resin injection pump details		
Image	**Size Cartridge / Code**	**Type**
	**165 / 300ml** **Art 65463 – 165 / 300 ml 10:1**	**Manual**
	**345 / 380 / 400 / 410 / 420ml** **Art 65464 – 380 / 400 / 410 / 420 ml 10:1** **Art 65472 – 345 ml 10:1**	**Manual**
	**165 / 300 / 345 / 380 / 400 / 410 / 420ml** **Art 66399 165 / 300 ml 10:1** **Art 65486 345 ml 10:1** **Art 65484 380 / 400 / 410 / 420 ml 10:1** **7.4v Tool**	**Battery**
	**380 / 400 / 410 / 825ml** **Art 65461 380 / 400 / 410 / 420 ml 10:1** **Art 65462 825ml 10:1**	**Pneumatic**

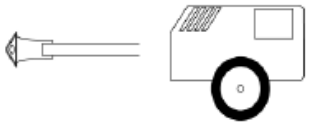
A) Bore hole drilling



1 Drill a hole into the base material to the size and embedment depth required by the selected reinforcing bar with carbide hammer drill (HD) or a compressed air drill (CD).
In case of aborted drill hole: the drill hole shall be filled with mortar.

Rebar - ϕ	Drill - ∅ [mm]
8 mm	12
10 mm	14
12 mm	16
14 mm	18
16 mm	20
20 mm	25
22 mm	28
24 mm	32
25 mm	32
28 mm	35
32 mm	40

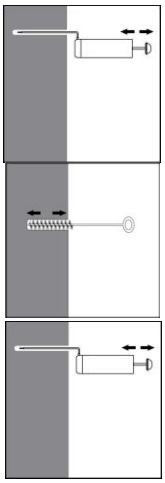
Hammer drill (HD)
Hollow drill (HDB)



Compressed air drill (CD)

B) Bore hole cleaning (HD, HDB and CD)

MAC: Cleaning for bore hole diameter $d_0 \leq 20$mm and bore hole depth $h_0 \leq 10d_s$

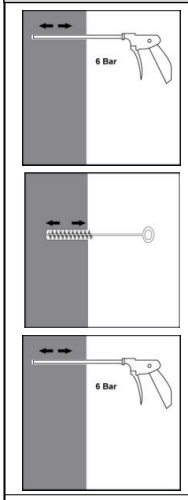


2a. Starting from the bottom or back of the bore hole, blow the hole clean a hand pump (Annex B6) a minimum of four times.

2b. Check brush diameter (Table B5). Brush the hole with an appropriate sized wire brush > $d_{b,min}$ (Table B5) a minimum of four times in a twisting motion.
If the bore hole ground is not reached with the brush, a brush extension shall be used.

2c. Finally blow the hole clean again with a hand pump (Annex B6) a minimum of four times.

CAC: Cleaning for all bore hole diameter and bore hole depth



2a. Starting from the bottom or back of the bore hole, blow the hole clean with compressed air (min. 6 bar) (Annex B6) a minimum of four times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used.

2b. Check brush diameter (Table B5). Brush the hole with an appropriate sized wire brush > $d_{b,min}$ (Table B5) a minimum of four times.
If the bore hole ground is not reached with the brush, a brush extension shall be used (Table B5).

2c. Finally blow the hole clean again with compressed air (min. 6 bar) (Annex B6) a minimum of four times until return air stream is free of noticeable dust. If the bore hole ground is not reached an extension shall be used.

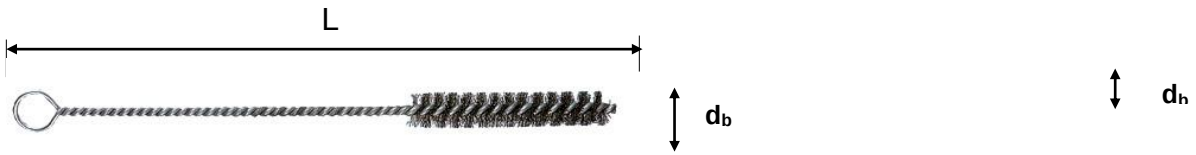
Chemfix Injection System CH 200 for rebar connection

Annex B5

Intended Use
Installation instruction: Bore hole drilling and
Bore hole cleaning

Table B5: Cleaning tools

Steel Brush



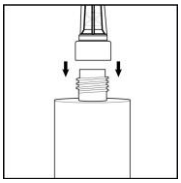
Brush extension:

ϕ Rebar	d_0 Drill bit - ∅	d_b Brush - ∅		$d_{b,min}$ min. Brush - ∅
(mm)	(mm)		(mm)	
8	12	66556	14	12,5
10	14	66557	16	14,5
12	16	65576	18	16,5
14	18	66558	20	18,5
16	20	66559	22	20,5
20	25	66560	27	25,5
22	28	66561	30	28,5
24	32	66563	34	32,5
25	32	66563	34	32,5
28	35	66564	37	35,5
32	40	66566	41,5	40,5

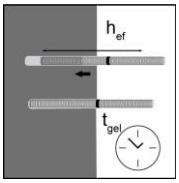
Push Pump

Rec. compressed air tool hand slide valve (min 6 bar)

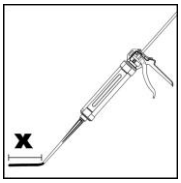
C) Preparation of bar and cartridge



3. Attach the supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool.
For every working interruption longer than the recommended working time (Table B3) as well as for every new cartridges, a new static-mixer shall be used.



4. Prior to inserting the reinforcing bar into the filled bore hole, the position of the embedment depth shall be marked (e.g. with tape) on the reinforcing bar and insert bar in empty hole to verify hole and depth ℓ_v.
The reinforcing bar should be free of dirt, grease, oil or other foreign material.



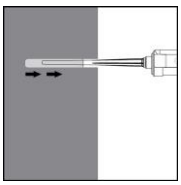
5. Prior to dispensing into the anchor hole, squeeze out separately the mortar until it shows a consistent grey colour, but a minimum of three full strokes, and discard non-uniformly mixed adhesive components.

Chemfix Injection System CH 200 for rebar connection

Annex B6

Intended Use
Installation instruction: Cleaning tools and
Preparation of bar and cartridge

D) Filling the bore hole



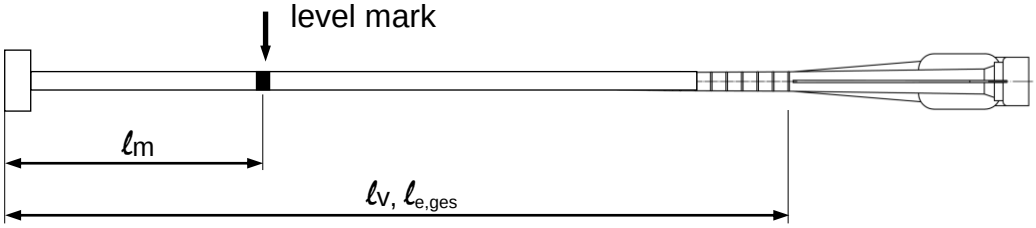
6. Starting from the bottom or back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. For embedment larger than 190 mm an extension nozzle shall be used.

For overhead and horizontal installation and bore holes deeper than 240 mm a piston plug and the appropriate mixer extension must be used.

Observe the gel-/ working times given in Table B3.

Table B6: Piston plugs, max anchorage depth and mixer extension

Bar size	Drill bit - ∅		Piston plug	Cartridge: All sizes				Cartridge: side-by-side (825 ml)	
				Hand or battery tool		Pneumatic tool		Pneumatic tool	
ϕ	HD, HDB	CD		$l_{v,max}$	Mixer extension	$l_{v,max}$	Mixer extension	$l_{v,max}$	Mixer extension
[mm]	[mm]			[cm]		[cm]		[cm]	
8	12	-	-	70	65579	80	65579	80	65579
10	14	PL14	PL14			100		100	
12	16		PL16			100		120	65579
14	18		PL18					140	
16	20		PL20					160	
20	25	PL25	PL25	50		70		200	
22	28		PL28						
24	32		PL32			50			
25	32		PL32						
28	35		PL35					200	
32	40		PL40						



Injection tool must be marked by mortar level mark ℓ_m and anchorage depth ℓ_v resp. $\ell_{e,ges}$ with tape or marker.

Quick estimation: $\ell_m = 1/3 \cdot \ell_v$

Continue injection until the mortar level mark ℓ_m becomes visible.

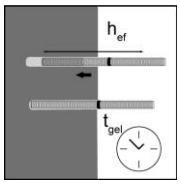
Optimum mortar volume: $\ell_m = \ell_v$ resp. $\ell_{e,ges} \cdot \left(1{,}2 \cdot \frac{\phi^2}{d_0^2} - 0{,}2\right)$ [mm]

Chemfix Injection System CH 200 for rebar connection

Annex B7

Intended Use
Installation instruction: Filling the bore hole

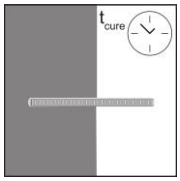
E) Inserting the rebar



7. Push the reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached.

   The bar should be free of dirt, grease, oil or other foreign material.

8. Be sure that the bar is inserted in the bore hole until the embedment mark is at the concrete surface and that excess mortar is visible at the top of the hole. If these requirements are not maintained, the application has to be renewed. For overhead installation fix embedded part (e.g. wedges).



9. Observe gelling time t_{gel}. Attend that the gelling time can vary according to the base material temperature (see Table B3). It is not allowed to move the bar after geling time t_{gel} has elapsed.
   Allow the adhesive to cure to the specified time prior to applying any load. Do not move or load the bar until it is fully cured (attend Table B3). After full curing time $\mathbf{t_{cure}}$ has elapsed, the add-on part can be installed.

Minimum anchorage length and minimum lap length

The minimum anchorage length $\ell_{b,min}$ and the minimum lap length $\ell_{0,min}$ according to EN 1992-1-1:2004+AC:2010 ($\ell_{b,min}$ acc. to Eq. 8.6 and Eq. 8.7 and $\ell_{0,min}$ acc. to Eq. 8.11) shall be multiply by the amplification factor α_{lb} according to Table C1.

Table C1: Amplification factor α_{lb} related to concrete class and drilling method

Concrete class	Drilling method	Rebar size	Amplification factor α_{lb}
C12/15 to C50/60	Hammer drilling (HD), hollow drilling (HDB) and compressed air drilling (CD)	8 mm to 32 mm	1,0

Table C2: Design values of the ultimate bond stress f_{bd} in N/mm² for all drilling methods for good conditions

according to EN 1992-1-1:2004+AC:2010 for good bond conditions

Rebar - ∅	Concrete class								
ϕ	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8 to 25 mm	1,6	2,0	2,3	2,7	3,0	3,4	3,7	4,0	4,3
28 to 32 mm	1,6	2,0	2,3	2,7	3,0	3,4	3,7	3,7	3,7

(for all other bond conditions multiply the values by 0.7)

Design value of the ultimate bond stress $f_{bd,fi}$ under fire exposure for concrete classes C12/15 to C50/60, (all drilling methods):

The design value of the bond strength $f_{bd,fi}$ under fire exposure has to be calculated by the following equation:

$$f_{bd,fi} = k_{b,fi}(\theta) \cdot f_{bd} \cdot \gamma_c / \gamma_{M,fi}$$

with: $\theta \leq 243°C$: $k_{b,fi}(\theta) = 18{,}88 \cdot e^{(\theta \cdot -0{,}016)} / (f_{bd} \cdot 4{,}3) \leq 1{,}0$

$\theta > 243°C$: $k_{b,fi}(\theta) = 0$

$f_{bd,fi}$ Design value of the ultimate bond stress in case of fire in N/mm²

θ Temperature in °C in the mortar layer.

$k_{b,fi}(\theta)$ Reduction factor under fire exposure.

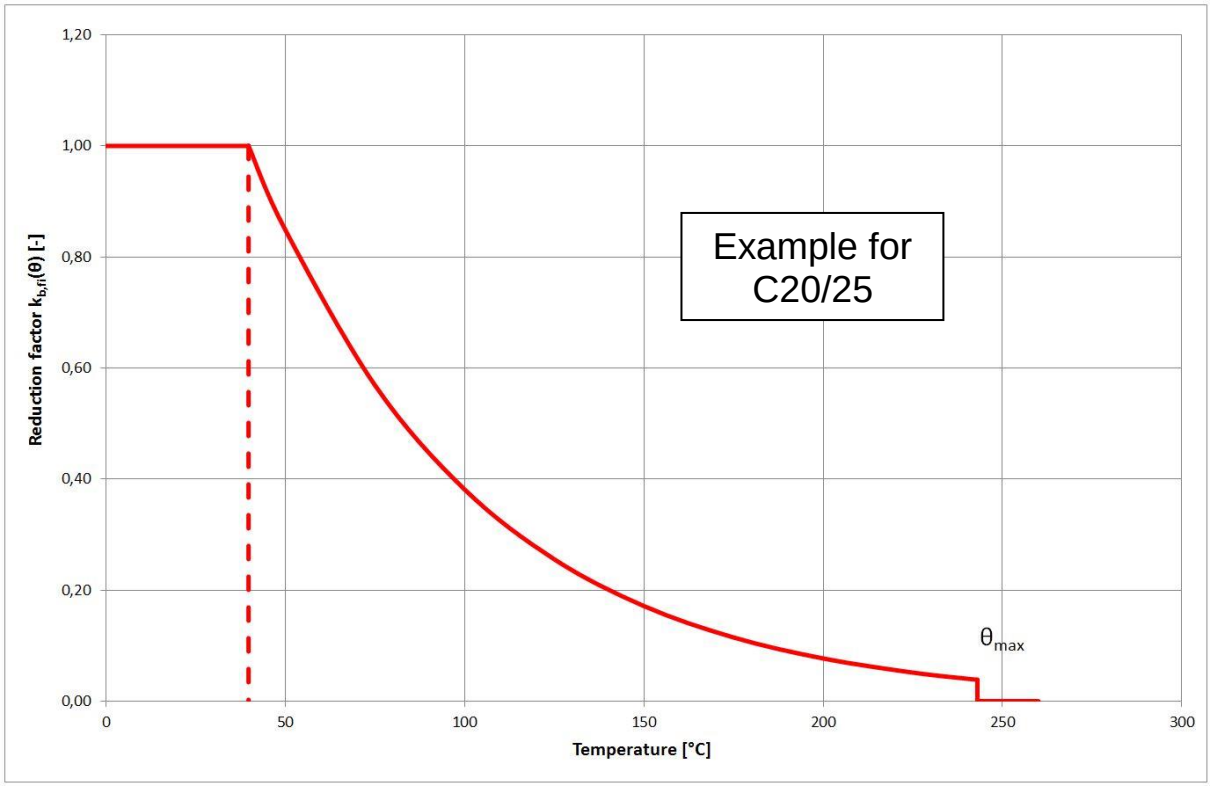
f_{bd} Design value of the ultimate bond stress in N/mm² in cold condition according to Table C2 considering the concrete classes, the rebar diameter, the drilling method and the bond conditions according to EN 1992-1-1.

γ_c partially safety factor according to EN 1992-1-1

$\gamma_{M,fi}$ partially safety factor according to EN 1992-1-2

For evidence under fire exposure the anchorage length shall be calculated according to EN 1992-1-1:2004+AC:2010 Equation 8.3 using the temperature-dependent ultimate bond stress $f_{bd,fi}$.

Example graph of Reduction factor $k_{b,fi}(\theta)$ for concrete classes C20/25 for good bond conditions:



Chemfix Injection System CH 200 for rebar connection

Annex C2

Performances
Design value of bond strength $f_{bd,fi}$ under fire exposure