ETA-Danmark A/S
Göteborg Plads 1
DK-2150 Nordhavn
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet www.etadanmark.dk

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-20/0059 of 2020/01/15

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:** | TCM PE injection system for concrete |
| **Product family to which the above construction product belongs:** | Bonded injection type anchor for use in concrete |
| **Manufacturer:** | Trutek Fasteners Polska Sp z o.o.<br>Al. Krakowska 38<br>Janki<br>PL-05-090 Raszyn<br>Tel. +48 22 701 93 24<br>Fax +48 22 100 58 82<br>Internet www.trutek.com.pl |
| **Manufacturing plant:** | Trutek Fasteners Polska Sp z o.o.<br>Factory Plant 1 |
| **This European Technical Assessment contains:** | 25 pages including 20 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 330499-00-0601, “Bonded fasteners for use in concrete” |
| **This version replaces:** | |

# II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

## 1 Technical description of product and intended use

**Technical description of the product**
The TCM PE injection system for concrete is a bonded anchor consisting of a cartridge with TCM PE injection mortar and a steel element. The steel element consists of a commercial threaded rod with washer and hexagon nut in the range of M8 to M24 or a reinforcing bar in the range of diameter 8 to 25 mm.

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.

The product description is given in Annex A.

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.

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

The performances given in Section 3 are only valid if the anchor 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 (BWR 1):**
The essential characteristics are detailed in the Annex C.

**Safety in case of fire (BWR 2):**
Anchorages satisfy requirements for Class A1.

No performance is assessed for resistance to fire.

**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 assessed

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 EAD 330499-00-0601, “Bonded fasteners for use in concrete”.

# 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.

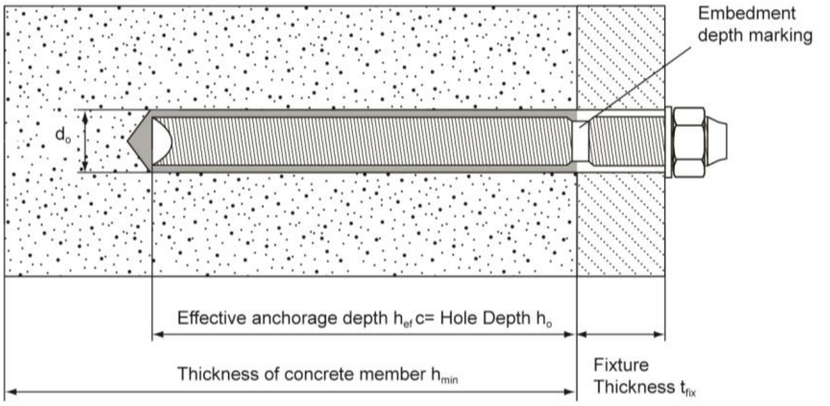
# 5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

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

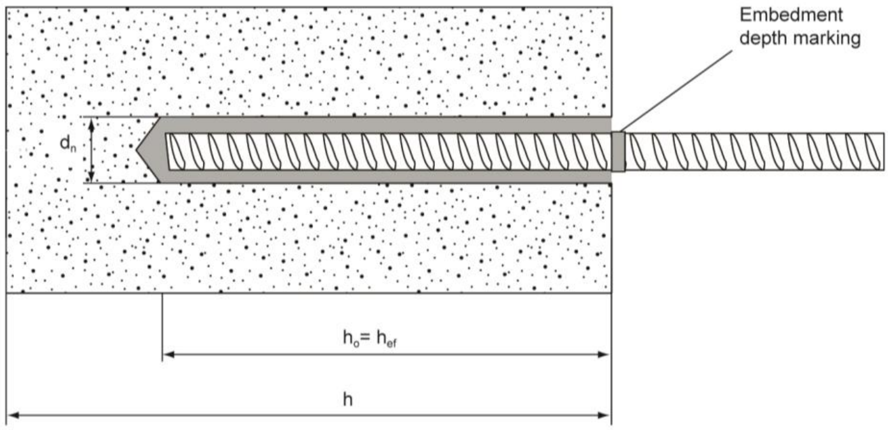
Issued in Copenhagen on 2020-01-15 by

Thomas Bruun
Managing Director, ETA-Danmark

**Installation threaded rod M8 up to M24**




**Installation reinforcing bar Ø8 up to Ø25**

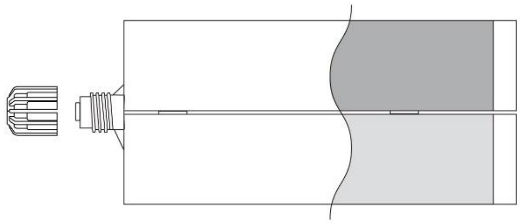



$t_{fix}$ = thickness of fixture
$h_{ef}$ = effective anchorage depth
$h_0$ = depth of drill hole
$h_{min}$ = minimum thickness of member

| TCM PE Injection System for concrete | Annex A1 |
|---|---|
| **Product description**<br>Installed condition | |

**TCM PE Injection System**

**Side by Side Cartridge 400ml / 600ml**

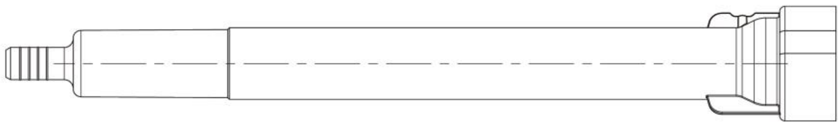


**Cartridge 250ml / 280ml / 300ml**

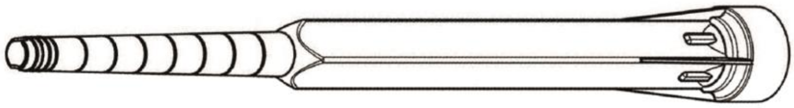
Cartridge Print: TCM PE
Including - Installation procedure, Production Batch code, Expiry Date, Storage conditions, Health & Safety warning, Gel & Cure time according to temperatures.

**Static Mixer**

Mixer



Epoxy mixer



**Mixer Extension**

Mixer Extension Short

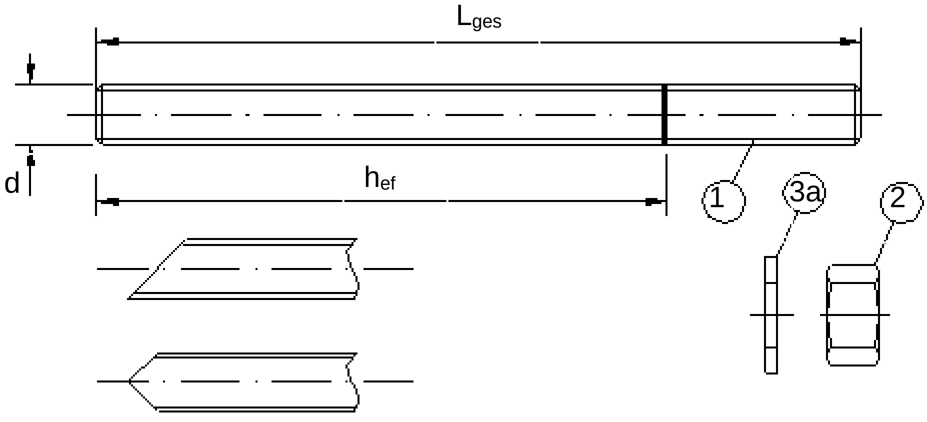
Mixer Extension Long

**TCM PE Injection System for concrete**

**Product description**
Injection system

**Annex A2**

**Threaded rod M8, M10, M12, M16, M20, M24, with washer and hexagon nut**




Commercial standard threaded rod with:

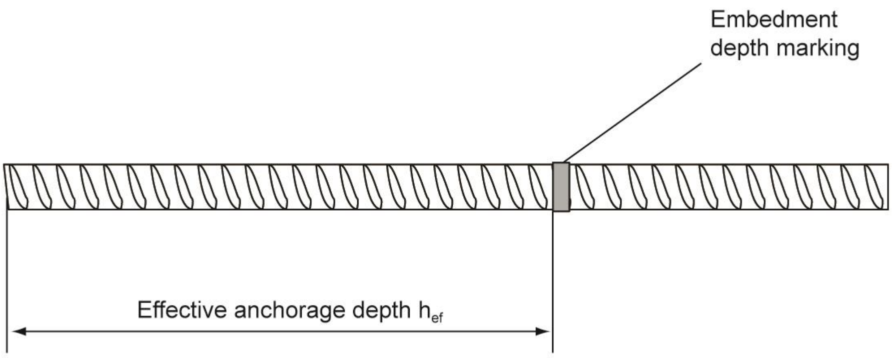
- Materials, dimensions and mechanical properties acc. Table A1
- Inspection certificate 3.1 acc. to EN 10204:2004
- Marking of embedment depth

## Table A1: Materials

| | Designation | Material | | |
|---|---|---|---|---|
| **Steel, zinc plated ( Steel acc. to EN 10087:1998 or EN 10263:2001)** zinc plated ≥ 5 µm acc. to EN ISO 4042:1999 or hot-dip galvanised ≥ 40 µm acc. to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009 or sherardized ≥ 40 µm acc. to DIN EN 17668:2016-06 | | | | |
| 1 | Anchor rod | Property class acc. to EN ISO 898-1:2013 | 4.6 | $f_{uk}$=400 N/mm²; $f_{yk}$=240 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| | | | 4.8 | $f_{uk}$=400 N/mm²; $f_{yk}$=320 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| | | | 5.6 | $f_{uk}$=500 N/mm²; $f_{yk}$=300 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| | | | 5.8 | $f_{uk}$=500 N/mm²; $f_{yk}$=400 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| | | | 8.8 | $f_{uk}$=800 N/mm²; $f_{yk}$=640 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| | | | 10.9 | $f_{uk}$=1000 N/mm²; $f_{yk}$=900 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| | | | 12.9 | $f_{uk}$=1200 N/mm²; $f_{yk}$=900 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| 2 | Hexagon nut | Property class acc. to EN ISO 898-2:2012 | 4 | for anchor rod class 4.6 or 4.8 |
| | | | 5 | for anchor rod class 5.6 or 5.8 |
| | | | 8 | for anchor rod class 8.8 |
| | | | 10 | for anchor rod class 10.9 |
| | | | 12 | for anchor rod class 12.9 |
| 3a | Washer, (z.B.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 oder EN ISO 7094:2000) | Steel, zinc plated, hot-dip galvanized or sherardized | | |
| **Stainless steel A2 ( Material 1.4301 / 1.4303 / 1.4307 / 1.4567 and 1.4541, acc. to EN 10088-1:2014) and Stainless steel A4 ( Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, acc. to EN 10088-1:2014)** | | | | |
| 1 | Anchor rod[1)2)] | Property class acc. to EN ISO 3506-1:2009 | 50 | $f_{uk}$=500 N/mm²; $f_{yk}$=210 N/mm²; $A_5$>8%[4)] fracture elongation |
| | | | 70 | $f_{uk}$=700 N/mm²; $f_{yk}$=450 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| | | | 80 | $f_{uk}$=800 N/mm²; $f_{yk}$=600 N/mm²; $A_5$ > 8%[4)] fracture elongation |
| 2 | Hexagon nut [1)2)] | Property class acc. to EN ISO 3506-1:2009 | 50 | for anchor rod class 50 |
| | | | 70 | for anchor rod class 70 |
| | | | 80 | for anchor rod class 80 |
| 3a | Washer, (z.B.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 oder EN ISO 7094:2000) | A2: Material 1.4301 / 1.4303 / 1.4307 / 1.4567 or 1.4541, EN 10088-1:2014<br>A4: Material 1.4401 / 1.4404 / 1.4571 / 1.4362 or 1.4578, EN 10088-1:2014 | | |
| **High corrosion resistance steel ( Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014)** | | | | |
| 1 | Anchor rod[1)] | Property class acc. to EN ISO 3506-1:2009 | 50 | $f_{uk}$=500 N/mm²; $f_{yk}$=210 N/mm²; $A_5$>8%[4)] fracture elongation |
| | | | 70 | $f_{uk}$=700 N/mm²; $f_{yk}$=450 N/mm²; $A_5$>8%[4)] fracture elongation |
| | | | 80 | $f_{uk}$=800 N/mm²; $f_{yk}$=600 N/mm²; $A_5$>8%[4)] fracture elongation |
| 2 | Hexagon nut [1)] | Property class acc. to EN ISO 3506-1:2009 | 50 | for anchor rod class 50 |
| | | | 70 | for anchor rod class 70 |
| | | | 80 | for anchor rod class 80 |
| 3a | Washer, (z.B.: EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 oder EN ISO 7094:2000) | Material 1.4529 or 1.4565, acc. to EN 10088-1: 2014 | | |

[1)] Property class 70 for anchor rods up to M24 and
[2)] Property class 70 only for stainless steel A4

**Reinforcing bar ∅ 8, ∅ 10, ∅ 12, ∅ 14, ∅ 16, ∅ 20, ∅ 24, ∅ 25,**




- 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 0,05d ≤ h ≤ 0,07d
  (d: Nominal diameter of the bar; h: Rip height of the bar)

## Table A2: Materials

| Part | Designation | Material |
|---|---|---|
| **Reinforcing bars** | | |
| 1 | Rebar<br>EN 1992-1-1:2004+AC:2010, Annex C | Rebar class B or C<br>$f_{yk}$ and k according to NDP or NCL of EN 1992-1-1/NA:2013<br>$f_{uk} = f_{tk} = k \cdot f_{yk}$ |

## Specifications of intended use

**Anchorages subject to:**

- Static and quasi-static loads: M8 to M24, Rebar Ø8 to Ø25.

**Base materials:**

- Reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Non-cracked concrete: M8 to M24, Rebar Ø8 to Ø25.
- Cracked concrete: M10 to M24, Rebar Ø10 to Ø25.

**Temperature Range:**

- I: - 40 °C to +40 °C (max long term temperature +24 °C and max short term temperature +40 °C)

**Use conditions (Environmental conditions):**

- Structures subject to dry internal conditions
  (zinc coated steel, stainless steel A2 resp. A4 or high corrosion resistant steel).
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist
  (stainless steel A4 or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions exist
  (high corrosion resistant steel).
  Note: 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).

**Design:**

- 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.).
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- The Anchorages are designed in accordance to:
  - EN 1992-4:2017
  - CEN/TS 1992-4-1:2009
  - Technical Report TR055

**Installation:**

- Dry or wet concrete: M8 to M24, Rebar Ø8 to Ø25.
- Flooded holes (not sea water): M8 to M24, Rebar Ø8 to Ø25.
- Hole drilling by hammer (HD) or compressed air drill mode (CD) used in Category 1 (dry and wet concrete) and Category 2 (flooded holes)
- Hole drilling by hollow drill bits for dust free drilling (self-cleaning system including vacuum cleaner) used in Category 1 – dry and wet concrete
- Hole drilling by diamond coring method (for non-cracked concrete only) used in Category 1 (dry and wet concrete) and Category 2 (flooded holes)
- Overhead installation allowed.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

**Table B1: Installation parameters for threaded rod**

| **Anchor size** | | **M 8** | **M 10** | **M 12** | **M 16** | **M 20** | **M 24** |
|---|---|---|---|---|---|---|---|
| Outer diameter of anchor | $d_{nom}$ [mm] = | 8 | 10 | 12 | 16 | 20 | 24 |
| Nominal drill hole diameter | $d_0$ [mm] = | 10 | 12 | 14 | 18 | 22/24 | 28 |
| Effective anchorage depth | $h_{ef,min}$ [mm] = | 60 | 60 | 70 | 80 | 90 | 96 |
| | $h_{ef,max}$ [mm] = | 160 (100 for Hollow Drilling) | 200 | 240 | 320 | 400 | 480 |
| Diameter of clearance hole in the fixture | $d_f$ [mm] ≤ | 9 | 12 | 14 | 18 | 22 | 26 |
| Diameter of steel brush | $d_b$ [mm] ≥ | 10 | 12 | 14 | 18 | 22/24 | 28 |
| Maximum torque moment | $T_{inst}$ [Nm] ≤ | 10 | 15 | 40 | 60 | 120 | 160 |
| Minimum thickness of member | $h_{min}$ [mm] | $h_{ef}$ + 30 mm ≥ 100 mm | | | $h_{ef} + 2d_0$ | | |
| Minimum spacing | $s_{min}$ [mm] | 40 | 40 | 60 | 80 | 100 | 120 |
| Minimum edge distance | $c_{min}$ [mm] | 40 | 40 | 60 | 80 | 100 | 120 |

**Table B2: Installation parameters for rebar**

| **Rebar size** | | **∅ 8** | **∅ 10** | **∅ 12** | **∅ 14** | **∅ 16** | **∅ 20** | **∅ 25** |
|---|---|---|---|---|---|---|---|---|
| Outer diameter of anchor | $d_{nom}$ [mm] = | 8 | 10 | 12 | 14 | 16 | 20 | 25 |
| Nominal drill hole diameter | $d_0$ [mm] = | 12 | 14 | 16 | 18 | 20 | 22/24 | 32 |
| Effective anchorage depth | $h_{ef,min}$ [mm] = | 60 | 60 | 70 | 75 | 80 | 90 | 100 |
| | $h_{ef,max}$ [mm] = | 160 | 200 | 240 | 280 | 320 | 400 | 500 |
| Diameter of steel brush | $d_b$ [mm] ≥ | 12 | 14 | 16 | 18 | 20 | 24 | 32 |
| Minimum thickness of member | $h_{min}$ [mm] | $h_{ef}$ + 30 mm ≥ 100 mm | | $h_{ef} + 2d_0$ | | | | |
| Minimum spacing | $s_{min}$ [mm] | 40 | 40 | 60 | 60 | 80 | 100 | 120 |
| Minimum edge distance | $c_{min}$ [mm] | 40 | 40 | 60 | 60 | 80 | 100 | 120 |

**Table B3: Parameter cleaning and setting tools**

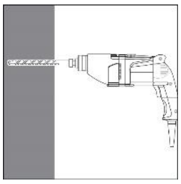
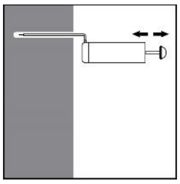
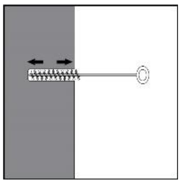
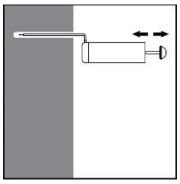
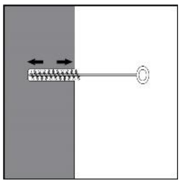
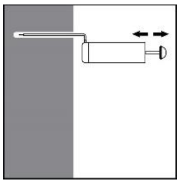
|  |  |  |  | |
|---|---|---|---|---|
| **Threaded Rod** | **Rebar** | **$d_0$ Drill bit - ∅** **HD, CD, HDB, Diamond** | **$d_b$ Brush - ∅** | **$d_{b,min}$ min. Brush - ∅** |
| **(mm)** | **(mm)** | **(mm)** | **(mm)** | **(mm)** |
| 8 | | 10 | 10 | 10 |
| M10 | 8 | 12 | 12 | 12 |
| M12 | 10 | 14 | 14 | 14 |
| | 12 | 16 | 16 | 16 |
| M16 | 14 | 18 | 18 | 18 |
| | 16 | 20 | 20 | 20 |
| M20 | 20 | 22 or 24 | 22 or 24 | 22 or 24 |
| M24 | | 28 | 28 | 28 |
| | 25 | 32 | 32 | 32 |

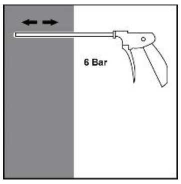
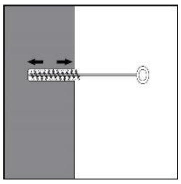
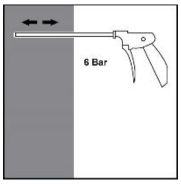
**Push Pump**
Drill bit diameter ($d_0$): 10 mm to 20 mm
Drill hole depth ($h_0$): < 10 $d_{nom}$
Only in non-cracked concrete

**CAC - Compressed air tool (min 6 bar)**
Drill bit diameter ($d_0$): all diameters


$d_h$

**Steel Brush**
Drill bit diameter ($d_0$): all diameters

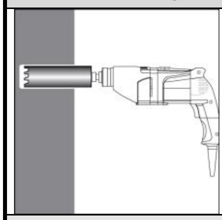
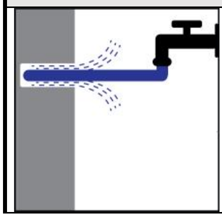
| **Instructions for use – Hammer drilling (HD) and Compressed air drilling (CD)** | |
|---|---|
| **Bore hole drilling** | |
|  | Drill hole to the required embedment depth with a hammer drill set in rotation-hammer mode using an appropriately sized carbide drill bit.(see table B3) |
| **Bore hole cleaning** Just before setting an anchor, the bore hole must be free of dust and debris. | |
| **a) Manual air cleaning (MAC)** for bore hole diameters $d_o \leq$ 18mm and bore hole depth $h_o \leq$ 10d | |
|  **X 2** | The Trutek manual pump may be used for blowing out bore holes up to diameters $d_o \leq$ 20mm and embedment depths up to $h_{ef} \leq$ 10d.<br><br>Blow out at least 2 times from the back of the bore hole until return air stream is free of noticeable dust. |
|  **X 2** | Brush 2 times with the specified brush size (brush Ø ≥ bore hole Ø, see Table B3) 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 manual pump at least 2 times until return air stream is free from noticeable dust. |
|  **X 2** | Brush 2 times again by inserting the Trutek 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 manual pump at least 2 times until return air stream is free from noticeable dust. |

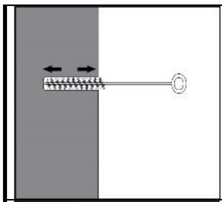
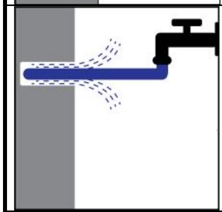
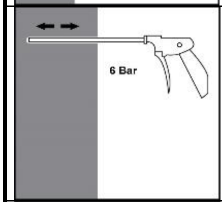
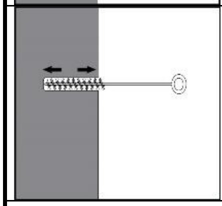
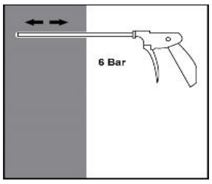
| **b) Compressed air cleaning (CAC)** for all bore hole diameters $d_o$ and all bore hole depth $h_o$ | | |
|---|---|---|
|  | **X 2** | Blow 2 times from the back of the hole (if needed with a nozzle extension) over the hole length with oil-free compressed air (min. 6 bar at 6m³/h) until return air stream is free from noticeable dust. |
|  | **X 2** | Brush 2 times with the specified brush size (brush Ø ≥ bore hole Ø, see Table B3) 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. |

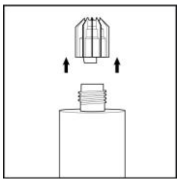
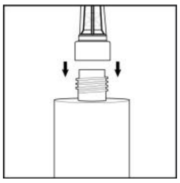
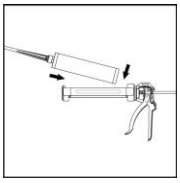
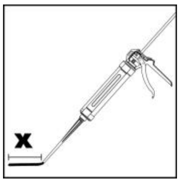
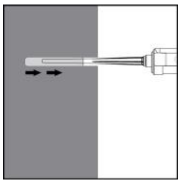
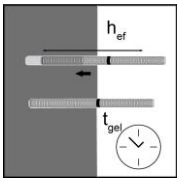
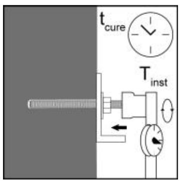
## Instructions for use – Hollow drill bits for dust free drilling

| **Bore hole drilling and cleaning** | | |
|---|---|---|
|  | | Select a suitable hollow drill bit (see table B3) and install it into the hammer drilling machine.<br>Connect the dust extraction system to the aperture in the hollow drill bit.<br>Drill hole to the required embedment depth with the hammer drill set in rotation-hammer mode and with the dust extraction system working permanently at full power. |
| **Bore hole cleaning**: Manual cleaning is not necessary when using the self-cleaning drilling method. | | |

## Instructions for use – Diamond drilling (wet drilling with diamond drill bits)

| **Bore hole drilling** | | |
|---|---|---|
|  | | Drill with a diamond drills a hole into the base material to size and embedment depth required by the selected anchor (see table B3) |
| **Bore hole cleaning** Just before setting an anchor, the bore hole must be free of dust and debris. | | |
|  | | Rinsing with water until clean water comes out. |

| | | |
|---|---|---|
|  | **X 2** | Brush 2 times with the specified brush size (brush Ø ≥ bore hole Ø, see Table B3) by inserting the Trutek 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. |
|  | | Rinsing with water until clean water comes out.<br>**ATTENTION! STANDING WATER IN THE BORE HOLE MUST BE REMOVED BEFORE CLEANING** |
|  | **X 2** | Starting from the bottom or back hole, blow the hole clean with a compressed air (min 6 bar at 6m³/h) a minimum of 2 times until return air stream is free from noticeable dust or concrete particle. If the bore hole ground is nor reached an extension shall be used. |
|  | **X 2** | Brush 2 times with the specified brush size (brush Ø ≥ bore hole Ø, see Table B3) by inserting the Trutek 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** | Finally blow the hole clean again with a compressed air (min 6 bar at 6m³/h) a minimum of 2 times until return air stream is free from noticeable dust or concrete particle. If the bore hole ground is nor reached an extension shall be used.<br>After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole**. If necessary, the cleaning has to be repeated directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.** |

| Instructions for use – all types of drilling | |
|---|---|
|  | Remove the threaded cap from the cartridge. |
|  | Attach the supplied mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. Cut off the foil tube clip before use if necessary.<br>For every working interruption longer than the recommended working time (Table B4) as well as for new cartridges, a new mixer shall be used. After changing the mixer, discard the waste until the mortar shows a consistent colour. |
|  | 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. Prior to inserting the anchor rod into the filled bore hole, the position of the embedment depth shall be marked on the anchor rods. |
|  | Prior to dispensing into the anchor hole, squeeze out separately a minimum of three full strokes and discard non-uniformly mixed adhesive components until the mortar shows a consistent colour. For foil tube cartridges it must be discarded a minimum of six full strokes. If you interrupt the job and restart using the same mixer inside the working time frame, discard the waste until the mortar shows a consistent colour. |
|  | Starting from the bottom or back of the cleaned anchor hole, fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets. If needed, an extension nozzle shall be used. Observe the gel-/ working times given in Table B4. |
|  | Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached.<br><br>The anchor shall be free of dirt, grease, oil or other foreign material.<br><br>Be sure that the anchor is fully seated at the bottom of the hole 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 application the anchor rod shall be fixed (e.g. wedges). |
|  | Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured (attend Table B4). After full curing, the add-on part can be installed with up to the max. torque (Table B1) by using a calibrated torque wrench. It can be optional filled the annular gap between anchor and fixture with mortar. |

## Table B4: Maximum Working time and minimum curing time TCM PE

| Concrete temperature | Gelling- / working time | Minimum curing time in dry concrete [1)] |
|---|---|---|
| + 5 °C | 70 min | 60 h |
| + 10 °C | 32 min | 40 h |
| + 15 °C | 28 min | 30 h |
| + 20 °C | 25 min | 18 h |
| + 25 °C | 22 min | 17 h |
| + 30 °C | 20 min | 16 h |
| + 40 °C | 18 min | 12 h |
| Cartridge temperature | + 15 °C to + 35 °C | |

[1)] In wet concrete the curing time must be doubled.

## Table B5: Dispensing tools

| Resin injection pump details | | |
|---|---|---|
| **Image** | **Size Cartridge** | **Type** |
|   | **400 ml 1:1**<br>**600 ml 1:1**<br>**250 / 280/ 300 ml** | **Manual** |
|  | **400 ml 1:1**<br>**600 ml 1:1**<br>**250 / 280/ 300 ml**<br>**7.4v Tool** | **Battery** |
|   | **400 ml 1:1**<br>**600 ml 1:1**<br>**250 / 280/ 300 ml** | **Pneumatic** |

**Table C1: Characteristic values for steel tension resistance and steel shear resistance of threaded rods**

| Size | | | | M 8 | M 10 | M 12 | M 16 | M 20 | M24 |
|---|---|---|---|---|---|---|---|---|---|
| **Characteristic tension resistance, Steel failure** | | | | | | | | | |
| Steel, Property class 4.6 and 4.8 | | $N_{Rk,s}$ | [kN] | 15 | 23 | 34 | 63 | 98 | 141 |
| Steel, Property class 5.6 and 5.8 | | $N_{Rk,s}$ | [kN] | 18 | 29 | 42 | 78 | 122 | 176 |
| Steel, Property class 8.8 | | $N_{Rk,s}$ | [kN] | 29 | 46 | 67 | 125 | 196 | 282 |
| Steel, Property class 10.9 | | $N_{Rk,s}$ | [kN] | 37 | 58 | 84 | 157 | 245 | 353 |
| Steel, Property class 12.9 | | $N_{Rk,s}$ | [kN] | 44 | 70 | 101 | 188 | 294 | 424 |
| Stainless steel A2, A4 and HCR, Property class 50 | | $N_{Rk,s}$ | [kN] | 18 | 29 | 42 | 79 | 123 | 177 |
| Stainless steel A2, A4 and HCR, Property class 70 | | $N_{Rk,s}$ | [kN] | 26 | 41 | 59 | 110 | 171 | 247 |
| Stainless steel A4 and HCR, Property class 80 | | $N_{Rk,s}$ | [kN] | 29 | 46 | 67 | 126 | 196 | 282 |
| **Characteristic tension resistance, Partial factor** | | | | | | | | | |
| Steel, Property class 4.6 and 5.6 | | $\gamma_{Ms,N}$ [1] | [-] | 2,0 | | | | | |
| Steel, Property class 4.8, 5.8 and 8.8 | | $\gamma_{Ms,N}$ [1] | [-] | 1,5 | | | | | |
| Steel, Property class 10.9 and 12.9 | | $\gamma_{Ms,N}$ [1] | [-] | 1.4 | | | | | |
| Stainless steel A2, A4 and HCR, Property class 50 | | $\gamma_{Ms,N}$ [1] | [-] | 2,86 | | | | | |
| Stainless steel A2, A4 and HCR, Property class 70 | | $\gamma_{Ms,N}$ [1] | [-] | 1,87 | | | | | |
| Stainless steel A4 and HCR, Property class 80 | | $\gamma_{Ms,N}$ [1] | [-] | 1,6 | | | | | |
| **Characteristic shear resistance, Steel failure** | | | | | | | | | |
| Without lever arm | Steel, Property class 4.6 and 4.8 | $V^0_{Rk,s}$ | [kN] | 7 | 12 | 17 | 31 | 49 | 71 |
| | Steel, Property class 5.6 and 5.8 | $V^0_{Rk,s}$ | [kN] | 9 | 15 | 21 | 39 | 61 | 88 |
| | Steel, Property class 8.8 | $V^0_{Rk,s}$ | [kN] | 15 | 23 | 34 | 63 | 98 | 141 |
| | Steel, Property class 10.9 | $V^0_{Rk,s}$ | [kN] | 18 | 29 | 42 | 79 | 123 | 177 |
| | Steel, Property class 12.9 | $V^0_{Rk,s}$ | [kN] | 22 | 35 | 51 | 94 | 147 | 212 |
| | Stainless steel A2, A4 and HCR, Property class 50 | $V^0_{Rk,s}$ | [kN] | 9 | 15 | 21 | 39 | 61 | 88 |
| | Stainless steel A2, A4 and HCR, Property class 70 | $V^0_{Rk,s}$ | [kN] | 13 | 20 | 30 | 55 | 86 | 124 |
| | Stainless steel A4 and HCR, Property class 80 | $V^0_{Rk,s}$ | [kN] | 15 | 23 | 34 | 63 | 98 | 141 |
| With lever arm | Steel, Property class 4.6 and 4.8 | $M^0_{Rk,s}$ | [Nm] | 15 | 30 | 52 | 133 | 260 | 449 |
| | Steel, Property class 5.6 and 5.8 | $M^0_{Rk,s}$ | [Nm] | 19 | 37 | 65 | 166 | 324 | 560 |
| | Steel, Property class 8.8 | $M^0_{Rk,s}$ | [Nm] | 30 | 60 | 105 | 266 | 519 | 896 |
| | Steel, Property class 10.9 | $M^0_{Rk,s}$ | [Nm] | 37 | 75 | 131 | 333 | 649 | 1123 |
| | Steel, Property class 12.9 | $M^0_{Rk,s}$ | [Nm] | 45 | 90 | 157 | 400 | 778 | 1347 |
| | Stainless steel A2, A4 and HCR, Property class 50 | $M^0_{Rk,s}$ | [Nm] | 19 | 37 | 66 | 167 | 325 | 561 |
| | Stainless steel A2, A4 and HCR, Property class 70 | $M^0_{Rk,s}$ | [Nm] | 26 | 52 | 92 | 232 | 454 | 784 |
| | Stainless steel A4 and HCR, Property class 80 | $M^0_{Rk,s}$ | [Nm] | 30 | 59 | 105 | 266 | 519 | 896 |
| **Characteristic shear resistance, Partial factor** | | | | | | | | | |
| Steel, Property class 4.6 and 5.8 | | $\gamma_{Ms,V}$ [1] | [-] | 1,67 | | | | | |
| Steel, Property class 4.8, 5.8 and 8.8 | | $\gamma_{Ms,V}$ [1] | [-] | 1,25 | | | | | |
| Steel, Property class 10.9 and 12.9 | | $\gamma_{Ms,V}$ [1] | [-] | 1,50 | | | | | |
| Stainless steel A2, A4 and HCR, Property class 50 | | $\gamma_{Ms,V}$ [1] | [-] | 2,38 | | | | | |
| Stainless steel A2, A4 and HCR, Property class 70 | | $\gamma_{Ms,V}$ [1] | [-] | 1,56 | | | | | |
| Stainless steel A4 and HCR, Property class 80 | | $\gamma_{Ms,V}$ [1] | [-] | 1,33 | | | | | |

[1] in absence of national regulation

**Table C2: Characteristic values of tension loads under static and quasi-static action for non-cracked and cracked concrete for threaded bars.**

| Anchor size threaded rod | | | | M 8 | M 10 | M 12 | M 16 | M 20 | M24 |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure** | | | | | | | | | |
| Characteristic tension resistance | | $N_{Rk,s}$ | [kN] | see Table C1 | | | | | |
| Partial factor | | $\gamma_{Ms,N}$ | [-] | see Table C1 | | | | | |
| **Combined pull-out and concrete failure** | | | | | | | | | |
| **Characteristic bond resistance in non-cracked concrete C20/25 hammer drilling (HD) and compressed air drilling (CD)** | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm²] | 9 | 10 | 16 | 15 | 15 | 15 |
| | flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm²] | 9 | 10 | 16 | 15 | 15 | 15 |
| **Characteristic bond resistance in cracked concrete C20/25 hammer drilling and compressed air drilling (CD)** | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,cr}$ | [N/mm²] | - | - | 7 | 7,5 | 8 | 8 |
| | flooded bore hole | $\tau_{Rk,cr}$ | [N/mm²] | - | - | 7 | 7,5 | 8 | 8 |
| Installation factor (dry and wet concrete) | | $\gamma_{inst}$ 1) | [-] | 1,4 | | | 1,2 | | |
| Installation factor (flooded bore hole) | | $\gamma_{inst}$ 1) | [-] | 1,4 | | | | | |
| **Characteristic bond resistance in non-cracked concrete C20/25 hollow drill bits for dust free drilling (HDB)** | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm²] | 16 | 16 | 16 | 15 | 15 | 14 |
| **Characteristic bond resistance in cracked concrete C20/25 hollow drill bits for dust free drilling (HDB)** | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,cr}$ | [N/mm²] | - | - | 7 | 7,5 | 8 | 8 |
| Installation factor (dry and wet concrete) | | $\gamma_{inst}$ 1) | [-] | 1,0 | | 1,2 | | 1,4 | |
| **Characteristic bond resistance in non-cracked concrete C20/25 Diamond drilling (DD)** | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm²] | 15 | 14 | 13 | 12 | 11 | 11 |
| | flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm²] | 15 | 14 | 13 | 12 | 11 | 11 |
| Installation factor (dry and wet concrete) | | $\gamma_{inst}$ 1) | [-] | 1,0 | 1,2 | | | | |
| Installation factor (flooded bore hole) | | $\gamma_{inst}$ 1) | [-] | 1,2 | | 1,4 | | | |
| Increasing factors for concrete (for all type of drilling in cracked and non-cracked concrete) $\psi_c$ | | C25/30 | | 1,05 | | | | | |
| | | C30/37 | | 1,10 | | | | | |
| | | C35/45 | | 1,15 | | | | | |
| | | C40/50 | | 1,18 | | | | | |
| | | C45/55 | | 1,20 | | | | | |
| | | C50/60 | | 1,23 | | | | | |
| **Concrete cone failure (all drilling methods)** | | | | | | | | | |
| Non-cracked concrete | | $k_{ucr,N}$ | [-] | 11,0 | | | | | |
| Cracked concrete | | $k_{cr,N}$ | [-] | 7,7 | | | | | |
| Edge distance | | $c_{cr,N}$ | [mm] | 1,5 $h_{ef}$ | | | | | |
| Axial distance | | $s_{cr,N}$ | [mm] | 2 $c_{cr,N}$ | | | | | |
| **Splitting (all drilling methods)** | | | | | | | | | |
| Edge distance | $h/h_{ef} \geq 2,0$ | $c_{cr,sp}$ | [mm] | 1,0 $h_{ef}$ | | | | | |
| | $2,0 > h/h_{ef} > 1,3$ | | | 3,86 $h_{ef}$ - 1,43 h | | | | | |
| | $h/h_{ef} \leq 1,3$ | | | 2 $h_{ef}$ | | | | | |
| Axial distance | | $s_{cr,sp}$ | [mm] | 2 $c_{cr,sp}$ | | | | | |

1) in absence of national regulation

**Table C3: Characteristic values of shear loads under static and quasi-static action for threaded bars, all drilling methods**

| Anchor size threaded rod | | | M 8 | M 10 | M 12 | M 16 | M 20 | M24 |
|---|---|---|---|---|---|---|---|---|
| **Steel failure without lever arm** | | | | | | | | |
| Characteristic shear resistance | $V^0_{Rk,s}$ | [kN] | see Table C1 | | | | | |
| Partial factor | $\gamma_{Ms,V}$ | [-] | see Table C1 | | | | | |
| Ductility factor | $k_7$ | [-] | 1,0 | | | | | |
| **Steel failure with lever arm** | | | | | | | | |
| Characteristic bending moment | $M^0_{Rk,s}$ | [Nm] | see Table C1 | | | | | |
| Partial factor | $\gamma_{Ms,V}$ | [-] | see Table C1 | | | | | |
| **Concrete pry-out failure** | | | | | | | | |
| Factor | $k_8$ | [-] | 2,0 | | | | | |
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | |
| **Concrete edge failure** | | | | | | | | |
| Effective length of fastener | $l_f$ | [mm] | $l_f = \min(h_{ef}; 12\ d_{nom})$ | | | | | |
| Outside diameter of fastener | $d_{nom}$ | [mm] | 8 | 10 | 12 | 16 | 20 | 24 |
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | |

## Table C4: Characteristic values of tension loads under static and quasi-static action for rebar

| Anchor size reinforcing bar | | | | Ø 8 | Ø 10 | Ø 12 | Ø 14 | Ø 16 | Ø 20 | Ø 25 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Steel failure** | | | | | | | | | | |
| Characteristic tension resistance | | $N_{Rk,s}$ | [kN] | $A_s \cdot f_{uk}$ [1)] | | | | | | |
| Cross section area | | $A_s$ | [mm²] | 50 | 79 | 113 | 154 | 201 | 314 | 491 |
| Partial factor | | $\gamma_{Ms,N}$ | [-] | 1,4 [2)] | | | | | | |
| **Combined pull-out and concrete failure** | | | | | | | | | | |
| **Characteristic bond resistance in non-cracked concrete C20/25 for hammer drilling ( HD) and compressed air drilling (CAD)** | | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm²] | 10 | 11 | 12 | 12 | 12 | 12 | 12 |
| | flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm²] | 10 | 11 | 12 | 12 | 12 | 12 | 12 |
| **Characteristic bond resistance in cracked concrete C20/25 for hammer drilling ( HD) and compressed air drilling (CAD)** | | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,cr}$ | [N/mm²] | - | - | 6,5 | 6,5 | 6,5 | 6,5 | 6,5 |
| | flooded bore hole | $\tau_{Rk,cr}$ | [N/mm²] | - | - | 6,5 | 6,5 | 6,5 | 6,5 | 6,5 |
| Installation factor (dry and wet concrete) | | $\gamma_{inst}$ [2)] | [-] | 1,4 | | | | 1,2 | | |
| Installation factor (flooded bore hole) | | $\gamma_{inst}$ [2)] | [-] | 1,4 | | | | | | |
| **Characteristic bond resistance in non-cracked concrete C20/25 for hollow drill bits for dust free system (HDB)** | | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm²] | 16 | 15 | 14 | 13 | 13 | 12 | 11 |
| **Characteristic bond resistance in cracked concrete C20/25 for hollow drill bits for dust free system (HDB)** | | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,cr}$ | [N/mm²] | - | - | 6,5 | 6,5 | 6,5 | 6,5 | 5,5 |
| Installation factor (dry and wet concrete) | | $\gamma_{inst}$ [2)] | [-] | 1,0 | | 1,2 | | | 1,4 | |
| **Characteristic bond resistance in non-cracked concrete C20/25 for Diamond drilling (DD)** | | | | | | | | | | |
| Temperature range I: 40°C/24°C | dry and wet concrete | $\tau_{Rk,ucr}$ | [N/mm²] | 11 | 11 | 11 | 11 | 11 | 11 | 10 |
| | flooded bore hole | $\tau_{Rk,ucr}$ | [N/mm²] | 11 | 11 | 11 | 11 | 11 | 11 | 10 |
| Installation factor (dry and wet concrete) | | $\gamma_{inst}$ [2)] | [-] | 1,0 | 1,2 | | | | | |
| Installation factor (flooded bore hole) | | $\gamma_{inst}$ [2)] | [-] | 1,2 | | | 1,4 | | | |
| Increasing factors for non-cracked concrete (all type of drilling) $\psi_c$ | | C25/30 | | 1,04 | | | | | | |
| | | C30/37 | | 1,08 | | | | | | |
| | | C35/45 | | 1,11 | | | | | | |
| | | C40/50 | | 1,15 | | | | | | |
| | | C45/55 | | 1,18 | | | | | | |
| | | C50/60 | | 1,21 | | | | | | |
| Increasing factors for cracked concrete (all type of drilling) $\psi_c$ | | C25/30 | | 1,0 | 1,0 | 1,08 | 1,08 | 1,08 | 1,08 | 1,11 |
| | | C30/37 | | 1,0 | 1,0 | 1,17 | 1,17 | 1,17 | 1,17 | 1,22 |
| | | C35/45 | | 1,0 | 1,0 | 1,24 | 1,24 | 1,24 | 1,24 | 1,31 |
| | | C40/50 | | 1,0 | 1,0 | 1,32 | 1,32 | 1,32 | 1,32 | 1,41 |
| | | C45/55 | | 1,0 | 1,0 | 1,37 | 1,37 | 1,37 | 1,37 | 1,48 |
| | | C50/60 | | 1,0 | 1,0 | 1,42 | 1,42 | 1,42 | 1,42 | 1,55 |
| **Concrete cone failure** | | | | | | | | | | |
| Non-cracked concrete | | $k_{ucr,N}$ | [-] | 11,0 | | | | | | |
| Cracked concrete | | $k_{cr,N}$ | [-] | 7,7 | | | | | | |
| Edge distance | | $c_{cr,N}$ | [mm] | 1,5 $h_{ef}$ | | | | | | |
| Axial distance | | $s_{cr,N}$ | [mm] | 2 $c_{cr,N}$ | | | | | | |
| **Splitting** | | | | | | | | | | |
| Edge distance | $h/h_{ef} \geq 2,0$ | $c_{cr,sp}$ | [mm] | 1,0 $h_{ef}$ | | | | | | |
| | $2,0 > h/h_{ef} > 1,3$ | | | 3,86 $h_{ef}$ - 1,43 h | | | | | | |
| | $h/h_{ef} \leq 1,3$ | | | 2 $h_{ef}$ | | | | | | |
| Axial distance | | $s_{cr,sp}$ | [mm] | 2 $c_{cr,sp}$ | | | | | | |

1) $f_{uk}$ shall be taken from the specifications of reinforcing bars
2) in absence of national regulation

## Table C5: Characteristic values of shear loads under static and quasi-static action for rebar (all drilling methods)

| **Anchor size reinforcing bar** | | | **∅ 8** | **∅ 10** | **∅ 12** | **∅ 14** | **∅ 16** | **∅ 20** | **∅ 25** |
|---|---|---|---|---|---|---|---|---|---|
| **Steel failure without lever arm** | | | | | | | | | |
| Characteristic shear resistance | $V^0_{Rk,s}$ | [kN] | $0,50 \cdot A_s \cdot f_{uk}$ 1) | | | | | | |
| Cross section area | $A_s$ | [mm²] | 50 | 79 | 113 | 154 | 201 | 314 | 491 |
| Partial factor | $\gamma_{Ms,V}$ | [-] | 1,5 2) | | | | | | |
| Ductility factor | $k_7$ | [-] | 1,0 | | | | | | |
| **Steel failure with lever arm** | | | | | | | | | |
| Characteristic bending moment | $M^0_{Rk,s}$ | [Nm] | $1.2 \cdot W_{el} \cdot f_{uk}$ 1) | | | | | | |
| Elastic section modulus | $W_{el}$ | [mm³] | 50 | 98 | 170 | 269 | 402 | 785 | 1534 |
| Partial factor | $\gamma_{Ms,V}$ | [-] | 1,5 2) | | | | | | |
| **Concrete pry-out failure** | | | | | | | | | |
| Factor | $k_8$ | [-] | 2,0 | | | | | | |
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |
| **Concrete edge failure** | | | | | | | | | |
| Effective length of fastener | $l_f$ | [mm] | $l_f = \min(h_{ef};\ 12\ d_{nom})$ | | | | | | |
| Outside diameter of fastener | $d_{nom}$ | [mm] | 8 | 10 | 12 | 14 | 16 | 20 | 25 |
| Installation factor | $\gamma_{inst}$ | [-] | 1,0 | | | | | | |

1) $f_{uk}$ shall be taken from the specifications of reinforcing bars
2) in absence of national regulation

## Table C6: Displacements under tension load[1)] (threaded rod)

| Anchor size threaded rod | | | M 8 | M 10 | M 12 | M 16 | M 20 | M24 |
|---|---|---|---|---|---|---|---|---|
| **Non-cracked concrete C20/25 Hammer Drilling** | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | 0,06 | 0,05 | 0,03 | 0,07 | 0,07 | 0,07 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | 0,09 | 0,08 | 0,06 | 0,11 | 0,12 | 0,13 |
| **Non-cracked concrete C20/25 Hollow Drilling** | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | 0,03 | 0,03 | 0,03 | 0,06 | 0,06 | 0,05 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | 0,06 | 0,06 | 0,06 | 0,11 | 0,10 | 0,09 |
| **Non-cracked concrete C20/25 Diamond Drilling** | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | 0,01 | 0,01 | 0,01 | 0,02 | 0,03 | 0,03 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | 0,02 | 0,02 | 0,06 | 0,03 | 0,04 | 0,05 |
| **Cracked concrete C20/25 Hammer Drilling and Hollow Drilling** | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | - | | 0,05 | 0,07 | 0,08 | 0,09 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | - | | 0,25 | 0,28 | 0,64 | 0,75 |

[1)] Calculation of the displacement

## Table C7: Displacements under shear load[1)] (threaded rod)

| Anchor size threaded rod | | | M 8 | M 10 | M 12 | M 16 | M 20 | M24 |
|---|---|---|---|---|---|---|---|---|
| **For non-cracked concrete C20/25** | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{V0}$-factor | [mm/(kN)] | 0,06 | 0,06 | 0,05 | 0,04 | 0,04 | 0,03 |
| | $\delta_{V\infty}$-factor | [mm/(kN)] | 0,09 | 0,08 | 0,08 | 0,06 | 0,06 | 0,05 |
| **For cracked concrete C20/25** | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{V0}$-factor | [mm/(kN)] | | | 0,11 | 0,10 | 0,09 | 0,08 |
| | $\delta_{V\infty}$-factor | [mm/(kN)] | | | 0,17 | 0,15 | 0,14 | 0,13 |

[1)] Calculation of the displacement
$\delta_{V0} = \delta_{V0}$-factor $\cdot$ V; V: action shear load
$\delta_{V\infty} = \delta_{V\infty}$-factor $\cdot$ V;

## Table C8: Displacements under tension load[1] (rebar)

| Anchor size reinforcing bar | | | ∅ 8 | ∅ 10 | ∅ 12 | ∅ 14 | ∅ 16 | ∅ 20 | ∅ 25 |
|---|---|---|---|---|---|---|---|---|---|
| **Non-cracked concrete C20/25 Hammer Drilling** | | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | 0,02 | 0,02 | 0,02 | 0,05 | 0,05 | 0,05 | 0,05 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | 0,06 | 0,06 | 0,06 | 0,16 | 0,17 | 0,17 | 0,19 |
| **Non-cracked concrete C20/25 Hollow Drilling** | | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | 0,01 | 0,02 | 0,03 | 0,04 | 0,04 | 0,04 | 0,05 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | 0,03 | 0,04 | 0,06 | 0,08 | 0,08 | 0,09 | 0,10 |
| **Non-cracked concrete C20/25 Diamond Drilling** | | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | 0,01 | 0,01 | 0,01 | 0,02 | 0,02 | 0,02 | 0,03 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | 0,08 | 0,08 | 0,06 | 0,13 | 0,13 | 0,18 | 0,23 |
| **Cracked concrete C20/25 Hammer Drilling and Hollow Drilling** | | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{N0}$-factor | [mm/(N/mm²)] | - | | 0,03 | 0,04 | 0,04 | 0,06 | 0,08 |
| | $\delta_{N\infty}$-factor | [mm/(N/mm²)] | - | | 0,16 | 0,21 | 0,21 | 0,28 | 0,35 |

[1] Calculation of the displacement
$\delta_{N0} = \delta_{N0}\text{-factor} \cdot \tau$; $\tau$: action bond stress for tension
$\delta_{N\infty} = \delta_{N\infty}\text{-factor} \cdot \tau$;

## Table C9: Displacement under shear load[1] (rebar)

| Anchor size reinforcing bar | | | ∅ 8 | ∅ 10 | ∅ 12 | ∅ 14 | ∅ 16 | ∅ 20 | ∅ 25 |
|---|---|---|---|---|---|---|---|---|---|
| **Non-cracked concrete C20/25** | | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{V0}$-factor | [mm/(kN)] | 0,06 | 0,05 | 0,05 | 0,04 | 0,04 | 0,04 | 0,03 |
| | $\delta_{V\infty}$-factor | [mm/(kN)] | 0,09 | 0,08 | 0,08 | 0,06 | 0,06 | 0,05 | 0,05 |
| **Cracked concrete C20/25** | | | | | | | | | |
| Temperature range I: 40°C/24°C | $\delta_{V0}$-factor | [mm/(kN)] | - | - | 0,11 | 0,11 | 0,10 | 0,09 | 0,08 |
| | $\delta_{V\infty}$-factor | [mm/(kN)] | - | - | 0,17 | 0,16 | 0,15 | 0,14 | 0,12 |

[1] Calculation of the displacement
$\delta_{V0} = \delta_{V0}\text{-factor} \cdot V$; V: action shear load
$\delta_{V\infty} = \delta_{V\infty}\text{-factor} \cdot V$;