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European Technical Assessment

**ETA 15/0168
of 27/03/15**

English translation prepared by IETcc. Original version in Spanish language

General Part

Technical Assessment Body issuing the ETA designated according to Art. 29 of Regulation (EU) 305/2011:

Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)

Trade name of the construction product

**Anchor Kraftool MTP
Anchor Kraftool MTP-G**

Product family to which the construction product belongs

Torque controlled expansion anchor made of zinc plated or sherardized steel of sizes M8, M10, M12, M16 and M20 for use in cracked and non-cracked concrete.

Manufacturer

Kraftool I/E GmbH
Otto-Lilienthal-Str, 25. 71034 Böblingen
Germany
website: www.kraftool.de

Manufacturing plant

Kraftool plant 2

This European Technical Assessment contains

11 pages including 4 annexes which form an integral part of this assessment. **Annex E contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available.**

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

Guideline for European Technical Approval ETAG 001 "Metal anchors for use in concrete", ed. April 2013, Parts 1 and 2 used as European Assessment Document (EAD)

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SPECIFIC PART

1. Technical description of the product

The Kraftool MTP through bolt is an anchor made of zinc plated steel. The Kraftool MTP-G through bolt is an anchor made of sherardized steel. The anchors are made in sizes M8, M10, M12, M16 and M20 and are placed into a drilled hole and anchored by torque-controlled expansion.

The Kraftool MTP and Kraftool MTP-G anchors in the range of M8 to M20 correspond to the pictures and provisions given in annexes A and B. The characteristic material values, dimensions and tolerances of the anchors not indicated in annexes A and B shall correspond to the respective values laid down in the technical documentations⁽¹⁾ of this European Technical Assessment.

For the installation process see figure given in annex C; for the installed anchor see figure given in annex D.

Each expansion sleeve is marked with the identifying mark of the producer, the trade name and the anchor diameter; each anchor bolt is marked with the diameter (metric) and the total anchor length. Additionally a letter mark on the anchor tip shows the length, according to annexes. A blue colour ring marking identifies the embedment depth.

The performance of the anchors, including installation data, characteristic anchor values, displacements and fire resistance, for the design of anchorages is given in chapter 3.

The anchors shall only be packaged and supplied as complete units.

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

2.1 Intended use

The anchors are intended to be used for anchorages for which requirements for mechanical resistance and stability, safety in case of fire and safety and accessibility in use in the sense of the basic requirements 1, 2 and 4 of Construction Product Regulation no 305/21011 shall be fulfilled and failure of anchorages made with these products would compromise the stability of the works, cause risk to human life and/or lead to considerable economic consequences.

The anchors are to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength class C20/25 to C50/60, according to ENV 206: 1990-03. It may be anchored in cracked and non-cracked concrete.

The Kraftool MTP and Kraftool MTP-G anchors may only be used in concrete subject to dry internal conditions.

The anchors may be used for anchorages with requirements related to resistance to fire.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The assumed working life is the foreseen period of time throughout which the construction product, as installed into the construction work, will keep its performances allowing the construction work, behaving under predictable actions and with normal maintenance, to meet the basic requirements for construction works.

(1) The quality plan has been deposited at Instituto de Ciencias de la Construcción Eduardo Torroja and is only made available to the approved bodies involved in the AVCP procedure.

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

The identification tests and the assessment for the intended use of this anchor according to the basic work requirements (BWR) were carried out in compliance with the ETAG 001. The characteristics of the components shall correspond to the respective values laid down in the technical documentation of this ETA, checked by IETcc.

3.1 Mechanical resistance and stability (BWR 1)

Mechanical resistance and stability has been assessed according to ETAG 001 "Metal anchors to be used in concrete", parts 1 and 2.

| Installation parameters | | Performance | | | | | |
|-------------------------|--|---------------------|--------|--------|----------------------|-----------------------|-----|
| | | M8 | M10 | M12 | M16 | M20 | |
| d_o | Nominal diameter of drill bit: [mm] | 8 | 10 | 12 | 16 | 20 | |
| d_f | Fixture clearance hole diameter: [mm] | 9 | 12 | 14 | 18 | 22 | |
| T_{inst} | Nominal installation torque: [Nm] | 20/15 ^{*)} | 40 | 60 | 100 | 200 | |
| L_{min} | Total length of the bolt | [mm] | 68 | 82 | 98 | 119 | 140 |
| L_{max} | | [mm] | 200 | 200 | 250 | 250 | 300 |
| h_{min} | Minimum thickness of concrete member: [mm] | 100 | 120 | 140 | 170 | 200 | |
| h_1 | Depth of drilled hole: [mm] | 60 | 75 | 85 | 105 | 125 | |
| h_{nom} | Overall anchor embedment depth in the concrete: [mm] | 55 | 68 | 80 | 97 | 114 | |
| h_{ef} | Effective anchorage depth: [mm] | 48 | 60 | 70 | 85 | 100 | |
| t_{fix} | Thickness of fixture [mm] | L - 66 | L - 80 | L - 96 | L - 117 | L - 138 | |
| s_{min} | Minimum allowable spacing: [mm] | 50 | 60 | 70 | 85/128 ^{*)} | 100/150 ^{*)} | |
| c_{min} | Minimum allowable distance: [mm] | 50 | 60 | 70 | 85/128 ^{*)} | 100/150 ^{*)} | |

(*) Respective values for anchors Kraftool MTP / Kraftool MTP-G

| Characteristic values of resistance to tension loads of design method A | | Performance | | | | |
|---|--|-------------|------|------|-----------------------|-----------------------|
| | | M8 | M10 | M12 | M16 | M20 |
| Tension loads: steel failure | | | | | | |
| $N_{Rk,s}$ | Tension steel characteristic resistance: [kN] | 18.1 | 31.4 | 40.4 | 72.7 | 116.6 |
| γ_{Ms} | Partial safety factor: **) [-] | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Tension loads: pull-out failure in concrete | | | | | | |
| $N_{Rk,p,ucr}$ | Kraftool MTP: Tension characteristic resistance in C20/25 uncracked concrete: [kN] | 9 | 16 | 20 | 35 | 50 |
| $N_{Rk,p,cr}$ | Kraftool MTP: Tension characteristic resistance in C20/25 cracked concrete: [kN] | 5 | 9 | 12 | 25 | 30 |
| $N_{Rk,p,ucr}$ | Kraftool MTP-G: Tension characteristic resistance in C20/25 uncracked concrete: [kN] | 9 | 16 | 30 | 35 | 50 |
| $N_{Rk,p,cr}$ | Kraftool MTP-G: Tension characteristic resistance in C20/25 cracked concrete: [kN] | 6 | 9 | 16 | 25 | 30 |
| ψ_c | C30/37 [-] | 1.22 | 1.16 | 1.22 | 1.22 | 1.16 |
| ψ_c | C40/45 [-] | 1.41 | 1.31 | 1.41 | 1.41 | 1.31 |
| ψ_c | C50/60 [-] | 1.55 | 1.41 | 1.55 | 1.55 | 1.41 |
| γ_{Mp} | Partial safety factor: **) [-] | 1.8 | 1.5 | 1.5 | 1.5 | 1.5 |
| Tension loads: concrete cone and splitting failure | | | | | | |
| h_{ef} | Effective embedment depth: [mm] | 48 | 60 | 70 | 85 | 100 |
| γ_{Mc} | Partial safety factor: **) [-] | 1.8 | 1.5 | 1.5 | 1.5 | 1.5 |
| $s_{cr,N}$ | Critical spacing: [mm] | 144 | 180 | 210 | 255 | 300 |
| $c_{cr,N}$ | Critical edge distance: [mm] | 72 | 90 | 105 | 128 | 150 |
| $s_{cr,sp}$ | Critical spacing (splitting): [mm] | 288 | 300 | 350 | 425/510 ^{*)} | 500/600 ^{*)} |
| $c_{cr,sp}$ | Critical edge distance (splitting): [mm] | 144 | 150 | 175 | 213/255 ^{*)} | 250/300 ^{*)} |
| γ_{Msp} | Partial safety factor: **) [-] | 1.8 | 1.5 | 1.5 | 1.5 | 1.5 |

*) Respective values for anchors Kraftool MTP / Kraftool MTP-G

**) In absence of other national regulations

| Displacements under tension loads | | | Performance | | | | |
|-----------------------------------|--|------|-------------|-----|-----|------|------|
| | | | M8 | M10 | M12 | M16 | M20 |
| N | Service tension load in cracked and uncracked concrete C20/25 to C50/60: | [kN] | 2.5 | 4.3 | 6.3 | 10.4 | 13.9 |
| δ_{N0} | Kraftool MTP: Short term displacement under tension loads: | [mm] | 1.1 | 0.7 | 1.0 | 0.4 | 1.6 |
| δ_{N0} | Kraftool MTP-G: Short term displacement under tension loads: | [mm] | 1.0 | 1.1 | 0.9 | 1.5 | 1.2 |
| $\delta_{N\infty}$ | Long term displacement under tension loads: | [mm] | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 |

| Characteristic values of resistance to shear loads of design method A | | | Performance | | | | |
|---|--|------|-------------|------|------|-------|-------|
| | | | M8 | M10 | M12 | M16 | M20 |
| Shear loads: steel failure without lever arm | | | | | | | |
| $V_{Rk,s}$ | Shear steel characteristic resistance: | [kN] | 11.0 | 17.4 | 25.3 | 47.1 | 73.1 |
| γ_{Ms} | Partial safety factor: **) | [-] | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Shear loads: steel failure with lever arm | | | | | | | |
| $M^0_{Rk,s}$ | Characteristic bending moment: | [Nm] | 22.5 | 44.8 | 78.6 | 199.8 | 389.4 |
| γ_{Ms} | Partial safety factor: **) | [-] | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Shear loads: concrete pryout failure | | | | | | | |
| K | K factor: | [-] | 1 | 2 | 2 | 2 | 2 |
| γ_{Mpr} | Partial safety factor: **) | [-] | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Shear loads: concrete edge failure | | | | | | | |
| l_f | Effective anchorage depth under shear loads: | [mm] | 48 | 60 | 70 | 85 | 100 |
| d_{nom} | Outside anchor diameter: | [mm] | 8 | 10 | 12 | 16 | 20 |
| γ_{Mc} | Partial safety factor: **) | [-] | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |

**) In absence of other national regulations

| Displacements under shear loads | | | Performances | | | | |
|---------------------------------|--|------|--------------|-----|-----|------|------|
| | | | M8 | M10 | M12 | M16 | M20 |
| V | Service shear load in cracked and uncracked concrete C20/25 to C50/60: | [kN] | 4.9 | 6.8 | 8.5 | 15.1 | 24.6 |
| δ_{V0} | Short term displacement under shear loads: | [mm] | 1.0 | 1.5 | 1.8 | 1.9 | 3.1 |
| $\delta_{V\infty}$ | Long term displacement under shear loads: | [mm] | 1.5 | 2.3 | 2.7 | 2.9 | 4.7 |

3.2 Safety in case of fire (BWR 2)

Reaction to fire has been assessed according to Commission Decision 96/603/EC, amended by 2000/605/EC. See class in table below:

| Reaction to fire | M8 | M10 | M12 | M16 | M20 |
|---|--------------|-----|-----|-----|-----|
| Reaction to fire anchors Kraftool MTP, Kraftool MTP-G | [-] Class A1 | | | | |

Resistance to fire has been assessed according to Technical Report 020: "Evaluation of anchorages in concrete concerning resistance to fire"

| Fire resistance duration = 30 minutes | | M8 | M10 | M12 | M16 | M20 | |
|--|--|------|-----|-----|-----|------|------|
| Tension loads steel failure | | | | | | | |
| $N_{Rk,s,fi,30}$ | Characteristic resistance | [kN] | 0,4 | 0,9 | 1,7 | 3,1 | 4,9 |
| Pull-out failure | | | | | | | |
| $N_{Rk,p,fi,30}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,3 | 2,3 | 3,0 | 6,3 | 7,5 |
| Concrete cone failure ***) | | | | | | | |
| $N_{Rk,c,fi,30}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,5 | 3,2 | 5,6 | 11,2 | 17,6 |
| Shear loads steel failure without lever arm | | | | | | | |
| $V_{Rk,s,fi,30}$ | Characteristic resistance | [kN] | 0,4 | 0,9 | 1,7 | 3,1 | 4,9 |
| Shear loads steel failure with lever arm | | | | | | | |
| $M_{Rk,s,fi,60}$ | Characteristic bending resistance | [Nm] | 0,6 | 1,8 | 4,1 | 9,7 | 18,8 |

| Fire resistance duration = 60 minutes | | | M8 | M10 | M12 | M16 | M20 |
|--|--|------|-----|-----|-----|------|------|
| Tension loads steel failure | | | | | | | |
| $N_{Rk,s,fi,60}$ | Characteristic resistance | [kN] | 0,3 | 0,8 | 1,3 | 2,4 | 3,7 |
| Pull-out failure | | | | | | | |
| $N_{Rk,p,fi,60}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,3 | 2,3 | 3,0 | 6,3 | 7,5 |
| Concrete cone failure ***) | | | | | | | |
| $N_{Rk,c,fi,60}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,5 | 3,2 | 5,6 | 11,2 | 17,6 |
| Steel failure without lever arm | | | | | | | |
| $V_{Rk,s,fi,60}$ | Characteristic resistance | [kN] | 0,3 | 0,8 | 1,3 | 2,4 | 3,7 |
| Steel failure with lever arm | | | | | | | |
| $M_{Rk,s,fi,60}$ | Characteristic bending resistance | [Nm] | 0,5 | 1,5 | 3,1 | 7,2 | 14,1 |

| Fire resistance duration = 90 minutes | | | M8 | M10 | M12 | M16 | M20 |
|--|--|------|-----|-----|-----|------|------|
| Tension loads steel failure | | | | | | | |
| $N_{Rk,s,fi,90}$ | Characteristic resistance | [kN] | 0,3 | 0,6 | 1,1 | 2,0 | 3,2 |
| Pull-out failure | | | | | | | |
| $N_{Rk,p,fi,90}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,3 | 2,3 | 3,0 | 6,3 | 7,5 |
| Concrete cone failure***) | | | | | | | |
| $N_{Rk,c,fi,90}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,5 | 3,2 | 5,6 | 11,2 | 17,6 |
| Steel failure without lever arm | | | | | | | |
| $V_{Rk,s,fi,90}$ | Characteristic resistance | [kN] | 0,3 | 0,6 | 1,1 | 2,0 | 3,2 |
| Steel failure with lever arm | | | | | | | |
| $M_{Rk,s,fi,90}$ | Characteristic bending resistance | [Nm] | 0,4 | 1,3 | 2,6 | 6,3 | 12,3 |

| Fire resistance duration = 120 minutes | | | M8 | M10 | M12 | M16 | M20 |
|--|--|------|-----|-----|-----|-----|------|
| Tension loads steel failure | | | | | | | |
| $N_{Rk,s,fi,120}$ | Characteristic resistance | [kN] | 0,2 | 0,5 | 0,8 | 1,6 | 2,5 |
| Pull-out failure | | | | | | | |
| $N_{Rk,p,fi,120}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,0 | 1,8 | 2,4 | 5,0 | 6,0 |
| Concrete cone failure***) | | | | | | | |
| $N_{Rk,c,fi,120}$ | Character. resistance in concrete C20/25 to C50/60 | [kN] | 1,2 | 2,6 | 4,5 | 8,9 | 14,0 |
| Steel failure without lever arm | | | | | | | |
| $V_{Rk,s,fi,120}$ | Characteristic resistance | [kN] | 0,2 | 0,5 | 0,8 | 1,6 | 2,5 |
| Steel failure with lever arm | | | | | | | |
| $M_{Rk,s,fi,120}$ | Characteristic bending resistance | [Nm] | 0,3 | 0,9 | 2,0 | 4,8 | 9,4 |

| Spacing and minimum edge distance | | | M8 | M10 | M12 | M16 | M20 |
|-----------------------------------|--|------|-----|-----|-----|-----------|------------|
| $S_{cr,N}$ | Spacing | [mm] | 192 | 240 | 280 | 340 | 400 |
| S_{min} | Minimum spacing | [mm] | 50 | 60 | 70 | 85/128 *) | 100/150 *) |
| $C_{cr,N}$ | Edge distance | [mm] | 96 | 120 | 140 | 170 | 200 |
| C_{min} | Minimum edge distance (one side fire) | [mm] | 96 | 120 | 140 | 170 | 200 |
| C_{min} | Minimum edge distance (two sides fire) | [mm] | 300 | 300 | 300 | 300 | 300 |
| γ_{Msp} | Partial safety factor**) | [-] | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

*) Respective values for anchors Kraftool MTP / Kraftool MTP-G

***) In absence of other national regulations

****) As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

| Concrete pry-out failure | | | M8 | M10 | M12 | M16 | M20 |
|---|--|-----|-----|-----|-----|-----|-----|
| K factor | | [-] | 1,0 | 2,0 | 2,0 | 2,0 | 2,0 |
| In Eq. (5.6) of ETAG 001 Annex C, 5.2.2.3, these values of k factor and the relevant values of $N_{Rk,c,fi}$ given in the above tables have to be considered in the design. | | | | | | | |

Concrete edge failure

The characteristic resistance $V_{RK,c,fi}^0$ in C20/25 to C50/60 concrete is determined by:
 $V_{RK,c,fi}^0 = 0,25 \times V_{RK,c}^0$ ($\leq R90$) and $V_{RK,c,fi}^0 = 0,20 \times V_{RK,c}^0$ (R120)
With $V_{RK,c}^0$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature according to ETAG 001, Annex C, 5.2.3.4.

3.3 Hygiene, health and the environment (BWR 3)

This requirement is not relevant for the anchors.

3.4 Safety in use (BWR 4)

Requirements with respect to the safety in use are not included in this Essential Requirement but are treated under the Essential Requirement Mechanical Resistance and Stability (see section 3.1)

3.5 Protection against noise (BWR 5)

This requirement is not relevant for the anchors.

3.6 Energy economy and heat retention (BWR 6)

This requirement is not relevant for the anchors.

3.7 Sustainable use of natural resources (BWR 7)

No Performance Determined

4. System of assessment and verification of constancy of performance

According to the decision 96/582/EC of the European Commission ⁽²⁾ the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table applies:

| Product | Intended use | Level or class | System |
|--|---|----------------|--------|
| Kraftool MTP anchor Kraftool MTP-G anchor | To be used for fixing and/or supporting structural elements | All / any | 1 |

The system 1 referred above is described in Construction Products Regulation (EU) no. 305/2011 Annex V §. 1.3 as follows:

- a) The manufacturer shall carry out:
 - (i.) Factory production control.
 - (ii.) Further testing of samples taken at the factory by the manufacturer in accordance with the prescribed quality plan;
- b) The notified production control certification body shall issue the certificate of constancy of performance on the basis of:
 - (i.) Determination of the product-type on the basis of type testing (including sampling) calculation, tabulated values of descriptive documentation of the product:
 - (ii.) Initial inspection of factory and of factory production control.
 - (iii.) Continuous surveillance, assessment and evaluation of factory production

(2) Published in the Official Journal of the European Union (OJEU) L254 of 24.06.1996 See www.new.eur-lex.europa.eu/oj/direct-access.html

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

The ETA is issued for these anchors on the basis of agreed data/information which identifies the product that has been assessed and judged. Detailed description and conditions of the manufacturing process of the anchors, and all the relevant design and installation criteria of these anchors are specified in the manufacturer's technical documentation deposited with the IETcc. The main aspects of this information are specified in the following sections. It is the manufacturer's responsibility to make sure that all those who use the anchors are appropriately informed of specific conditions according to sections 1, 2, 4 and 5 including the annexes of this ETA.

5.1 Tasks of the manufacturer

5.1.1 Factory production control

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

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the quality plan ⁽³⁾. The incoming raw materials shall be subjected to controls by the manufacturer before acceptance. Check of materials shall include control of the inspection documents presented by suppliers by verifying dimension and material properties, e.g. chemical composition, mechanical properties etc. The manufactured components are checked visually, for dimensions and properties, where appropriate.

The quality plan which is part of the Technical Documentation of this ETA, includes details of the extent, nature and frequency of testing and controls to be performed within the factory production control and has been agreed between the assessment holder and IETcc. The results of factory production control shall be recorded and evaluated in accordance with the provisions of the quality plan. The records include at least the following information:

- Designation of the product, the basic materials and components;
- Type of control or testing and minimum frequencies of them;
- Date of manufacture of the product and date testing of the product or basic material and components;
- Results of controls and testing and, if appropriate, comparison with requirements;
- Signature of person responsible for factory production control.

The records shall be presented to the notified body involved in the continuous surveillance. On request, they shall be presented to the IETcc.

⁽³⁾ the quality plan has been deposited at IETcc and is only made available to the approval bodies involved in the ACVP procedure.

5.2 Tasks of notified bodies

5.2.1 Determination of the product-type on the basis of type testing

For type-testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between ETA holder and the notified body.

5.2.2 Initial inspection of factory and of factory production control

The notified body shall ascertain that, in accordance with the quality plan, the factory and the factory production control are suitable to ensure continuous and orderly manufacturing of the product according to the specifications mentioned in Annexes of this the European Technical Assessment.

5.2.3 Continuous surveillance, assessment and evaluation of factory production control

The notified body shall visit the factory at least once a year for regular inspection.

This continuous surveillance and assessment of factory production control have to be performed according to the quality plan. The system of factory production control and the specified manufacturing process have to be verified that they are maintained as the quality plan defined. The results of product certification and continuous surveillance shall be made available on demand by the product certification body or factory production control body, respectively, to IETcc. In cases where the provisions of the European Technical Assessment and the quality plan are no longer fulfilled the certificate of constancy of performance shall be withdrawn.



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On behalf of the Instituto de Ciencias de la Construcción Eduardo Torroja
Madrid, 27th of March 2015

Marta M^a Castellote Armero
Director

INDEX OF ANNEXES:

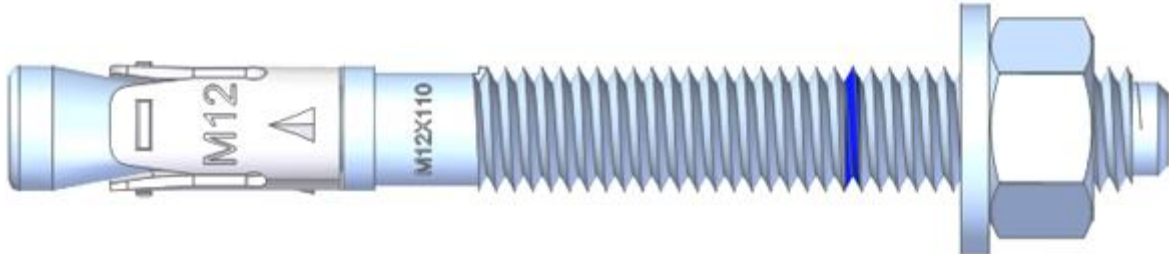
Annex A: Assembled anchor

Annex B. Materials

Annex C. Installation process

Annex D. Schema of the anchor in use

Annex A: Assembled anchor



Identification on anchor:

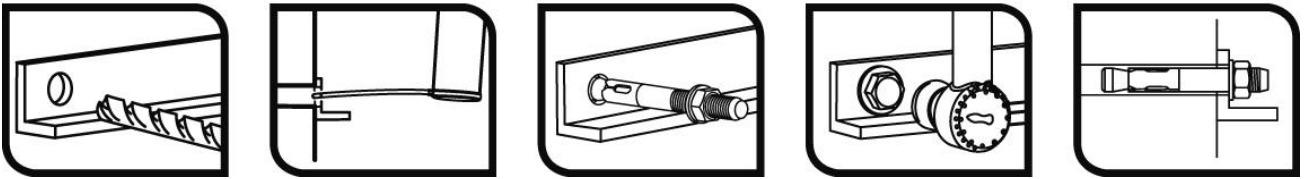
- Expansion clip:
 - Anchor Kraftool MTP: Kraftool logo + “MTP” + Metric.
 - Anchor Kraftool MTP-G: Kraftool logo + “MTP-G” + Metric
- Anchor body: Metric x Length
- Anchor tip: Length letter code, as per table below

| Letter code | Length [mm] |
|-------------|-------------|
| C | 68 ÷ 76 |
| D | 76 ÷ 89 |
| E | 89 ÷ 102 |
| F | 102 ÷ 114 |
| G | 114 ÷ 127 |
| H | 127 ÷ 139 |
| I | 140 ÷ 152 |
| J | 152 ÷ 165 |
| K | 165 ÷ 178 |
| L | 178 ÷ 191 |
| M | 191 ÷ 203 |
| N | 203 ÷ 216 |
| O | 216 ÷ 229 |
| P | 229 ÷ 241 |
| Q | 241 ÷ 254 |
| R | 254 ÷ 267 |
| S | 267 ÷ 300 |

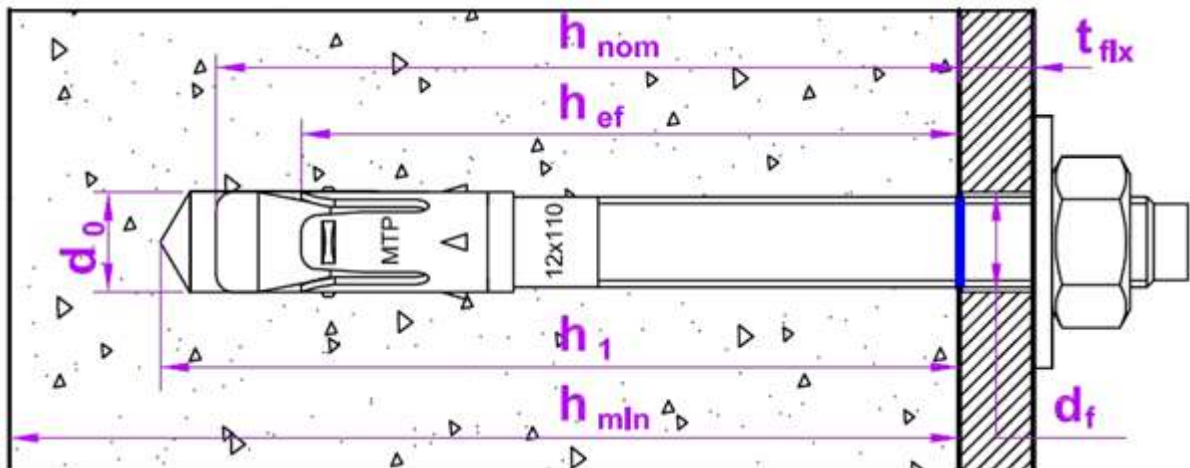
Annex B. Materials

| Item | Designation | Kraftool MTP anchor | Kraftool MTP-G anchor |
|------|----------------|--|---|
| 1 | Anchor Body | Carbon steel wire rod cold forged, electro zinc plated $\geq 5 \mu\text{m}$ ISO 4042 A2, with antifriction coating | Carbon steel wire rod cold forged, sherardized EN 13811 $\geq 40 \mu\text{m}$ |
| 2 | Washer | DIN 125 or DIN 9021 electro zinc plated $\geq 5\mu\text{m}$, ISO 4042 A2 | DIN 125 or DIN 9021, hot dip galvanized EN ISO 1461 $\geq 40 \mu\text{m}$ |
| 3 | Nut | DIN 934 electro zinc plated $\geq 5 \mu\text{m}$ ISO 4042 A2, class 6 | DIN 934 class 6, sherardized EN 13811 $\geq 40 \mu\text{m}$ |
| 4 | Expansion clip | Stainless steel, grade A4 | Stainless steel, grade A4 |

Annex C. Installation process



Annex D. Schema of the anchor in use



- h_{ef} : Effective anchorage depth
- h_1 : Depth of drilled hole
- h_{nom} : Overall anchor embedment depth in the concrete
- h_{min} : Minimum thickness of concrete member
- t_{fix} : Thickness of fixture
- d_0 : Nominal diameter of drill bit
- d_f : Fixture clearance hole diameter