

# MULTI-MONTI®

## European Technical Approval ETA-05/0011

Concrete screw made of stainless steel  
for use in concrete

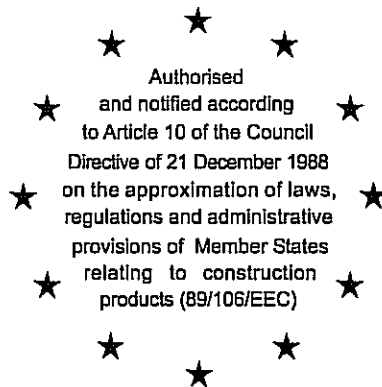


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# DIBt

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## European Technical Approval ETA-05/0011

English translation prepared by DIBt - Original version in German language

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| <b>Handelsbezeichnung</b><br><i>Trade name</i>  | HECO MULTI-MONTI MMS A4  |
| <b>Zulassungsinhaber</b><br><i>Holder of approval</i>   | HECO-Schrauben GmbH & Co. KG<br>Dr.-Kurt-Steim-Straße 28<br>78713 Schramberg   |
| <b>Zulassungsgegenstand<br/>und Verwendungszweck</b><br><i>Generic type and use<br/>of construction product</i> | Betonschraube aus nichtrostendem Stahl in den Größen 7,5,<br>10 und 12 zur Verankerung im Beton<br><i>Concrete screw made of stainless steel of sizes 7.5, 10 and 12 for use in<br/>concrete</i> |
| <b>Geltungsdauer:</b><br><i>Validity:</i>   | 29 March 2007  |
|   | 20 January 2010  |
| <b>verlängert vom</b><br><i>extended from</i>   | 6 January 2010   |
|   | 20 January 2015  |
| <b>Herstellwerk</b><br><i>Manufacturing plant</i>   | HECO-Schrauben GmbH & Co. KG<br>Dr.-Kurt-Steim-Straße 28<br>78713 Schramberg   |

Diese Zulassung umfasst  
*This Approval contains*

14 Seiten einschließlich 7 Anhänge  
*14 pages including 7 annexes*



Europäische Organisation für Technische Zulassungen  
European Organisation for Technical Approvals

## I LEGAL BASES AND GENERAL CONDITIONS

- 1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:
  - Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products<sup>1</sup>, modified by Council Directive 93/68/EEC<sup>2</sup> and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council<sup>3</sup>;
  - Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauprodukten-gesetz - BauPG) vom 28. April 1998<sup>4</sup>, as amended by law of 31 October 2006<sup>5</sup>;
  - Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC<sup>6</sup>.
- 2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.
- 3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European technical approval.
- 4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5(1) of Council Directive 89/106/EEC.
- 5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.
- 6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated in EOTA. Translations into other languages have to be designated as such.

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1 Official Journal of the European Communities N° L 40, 11 February 1989, p. 12

2 Official Journal of the European Communities N° L 220, 30 August 1993, p. 1

3 Official Journal of the European Union N° L 284, 31 October 2003, p. 25

4 *Bundesgesetzblatt Teil I 1998*, p. 812

5 *Bundesgesetzblatt Teil I 2006*, p.2407, 2416

6 Official Journal of the European Communities N° L 17, 20 January 1994, p. 34

## **II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL**

### **1 Definition of the construction product and intended use**

#### **1.1 Definition of the product**

The HECO MULTI-MONTI MMS A4 is an anchor made of stainless steel of sizes 7.5, 10 and 12. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

An illustration of the product and intended use is given in Annex 1.

#### **1.2 Intended use**

The anchor is intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106 EEC shall be fulfilled and failure of anchorages made with these products would cause risk to human life and/or lead to considerable economic consequences.

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

The anchor is to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at most according to EN 206:2000-12. It may be anchored in cracked and non-cracked concrete.

The anchor may be used in structures subject to dry internal conditions and also in structures subject to external atmospheric exposure (including industrial and marine environment), or exposure in permanently damp internal conditions, if no particular aggressive conditions exist. Such 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).

The provisions made in this European technical approval are based on an assumed 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, 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.

### **2 Characteristics of the product and methods of verification**

#### **2.1 Characteristics of the product**

The anchor corresponds to the drawings and information given in Annex 2. The characteristic material values, dimensions and tolerances of the anchor not indicated in Annex 2 shall correspond to the respective values laid down in the technical documentation<sup>7</sup> of this European technical approval.

Regarding the requirements concerning safety in case of fire it is assumed that the anchor meets the requirements of class A1 in relation to reaction to fire in accordance with the stipulations of the Commission decision 96/603/EC, amended by 2000/605/EC.

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<sup>7</sup> The technical documentation of this European technical approval is deposited at the Deutsches Institut für Bautechnik and, as far as relevant for the tasks of the approved bodies involved in the attestation of conformity procedure, is handed over to the approved bodies.

The characteristic values for the design of the anchorages are given in Annex 4 and 5.

The characteristic values for the design of anchorages regarding resistance to fire are given in Annex 6. They are valid for use in a system that is required to provide a specific fire resistance class.

Each anchor shall be marked with the identifying mark of the producer, the anchor type, the diameter, the length of the anchor, the maximum thickness of fixture and the letters "A4" according to Annex 2.

## 2.2 Methods of verification

The assessment of the fitness of the anchor for the intended use with regard to the requirements of mechanical resistance and stability as well as safety in use in the sense of the Essential Requirements 1 and 4 was performed based on ETAG 001 "Guideline for European technical approval of Metal Anchors for Use in Concrete", Option 1, and the following additional tests:

1. Setting tests in high strength concrete;
2. Setting tests in low strength concrete;
3. Setting tests with impact screw driver;
4. Modified test under repeated loads;
5. Tests in respect to brittle fracture.

The assessment of the anchor for the intended use in relation to the requirements for resistance to fire has been made in accordance with the technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire".

In addition to the specific clauses relating to dangerous substances contained in this European technical approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

## 3 Evaluation and attestation of conformity and CE marking

### 3.1 System of attestation of conformity

According to the communication of the European Commission<sup>8</sup> the system 2+ of attestation of conformity applies.

This system of attestation of conformity is defined as follows:

System 2+: Declaration of conformity of the product by the manufacturer on the basis of:

- (a) Tasks for the manufacturer:
  - (1) initial type-testing of the product;
  - (2) factory production control;
  - (3) testing of samples taken at the factory in accordance with a prescribed test plan.
- (b) Tasks for the approved body:
  - (4) certification of factory production control on the basis of:
    - initial inspection of factory and of factory production control;
    - continuous surveillance, assessment and approval of factory production control.

Note: Approved bodies are also referred to as "notified bodies".

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<sup>8</sup> Letter of the European Commission of 13/02/2004 to EOTA

## 3.2 Responsibilities

### 3.2.1 Tasks of the manufacturer

#### 3.2.1.1 Factory production control

The manufacturer 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 European technical approval.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European technical approval.

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited at Deutsches Institut für Bautechnik.<sup>9</sup>

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

#### 3.2.1.2 Other tasks of manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of anchors in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

### 3.2.2 Tasks of approved bodies

The approved body shall perform the

- initial inspection of factory and of factory production control,
  - continuous surveillance, assessment and approval of factory production control,
- in accordance with the provisions laid down in the control plan.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the factory production control of this European technical approval.

In cases where the provisions of the European technical approval and its control plan are no longer fulfilled the certification body shall withdraw the certificate of conformity and inform Deutsches Institut für Bautechnik without delay.

## 3.3 CE marking

The CE marking shall be affixed on each packaging of the anchors. The letters "CE" shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacturer),
- the last two digits of the year in which the CE marking was affixed,
- the number of the EC certificate for the factory production control,

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<sup>9</sup> The control plan is a confidential part of the documentation of the European technical approval, but not published together with the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity.  
See section 3.2.2.

- the number of the European technical approval,
- use category (ETAG 001-1, Option 1),
- size.

#### **4 Assumptions under which the fitness of the product for the intended use was favourably assessed**

##### **4.1 Manufacturing**

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the European technical approval and consequently the validity of the CE marking on the basis of the European technical approval and if so whether further assessment or alterations to the European technical approval shall be necessary.

##### **4.2 Design of anchorages**

The fitness of the anchor for the intended use is given under the following conditions:

The anchorages are designed in accordance with the "Guideline for European technical approval of Metal Anchors for Use in Concrete", Annex C, Method A under the responsibility of an engineer experienced in anchorages and concrete work.

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, in cracked or non-cracked concrete, etc.).

The design of anchorages under fire exposure has to consider the conditions given in the technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire". The relevant characteristic anchor values are given in Annex 6. The design method covers anchors with a fire attack from one side only. If the fire attack is from more than one side, the design method may be taken only, if the edge distance of the anchor is  $c \geq 300$  mm.

##### **4.3 Installation of anchors**

The fitness for use of the anchor can only be assumed if the following conditions of installation are met:

- Anchor installation carried out by appropriately qualified personnel under the supervision of the person responsible for technical matters on site,
- Use of the anchor only as supplied by the manufacturer,
- Anchor installation in accordance with the manufacturer's specifications and drawings,
- Checks before placing the anchor, to ensure that the characteristic values of the base material in which the anchor is to be placed, is identical with the values, which the characteristic loads apply,
- Check of the concrete being well compacted, e.g. without significant voids,
- Edge distances and spacings not less than the specified values without minus tolerances,
- Placing drill holes without damaging the reinforcement,

- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application,
- Cleaning of the hole of drilling dust,
- The anchor may be used only once,
- Anchor installation such that the embedment depth of the anchor in the concrete is not smaller than the value  $h_{nom}$  given in Annex 3, Table 2,
- The fixture is fully pressed on the concrete surface without intermediate layers,
- Further turning of the anchor is not easy,
- The head of the anchor is fully supported on the fixture and is not damaged.

## 5 Responsibility of the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to 4.2 and 4.3 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition, all installation data shall be shown clearly on the packaging and/or on an enclosed instruction sheet, preferably using illustrations.

The minimum data required are:

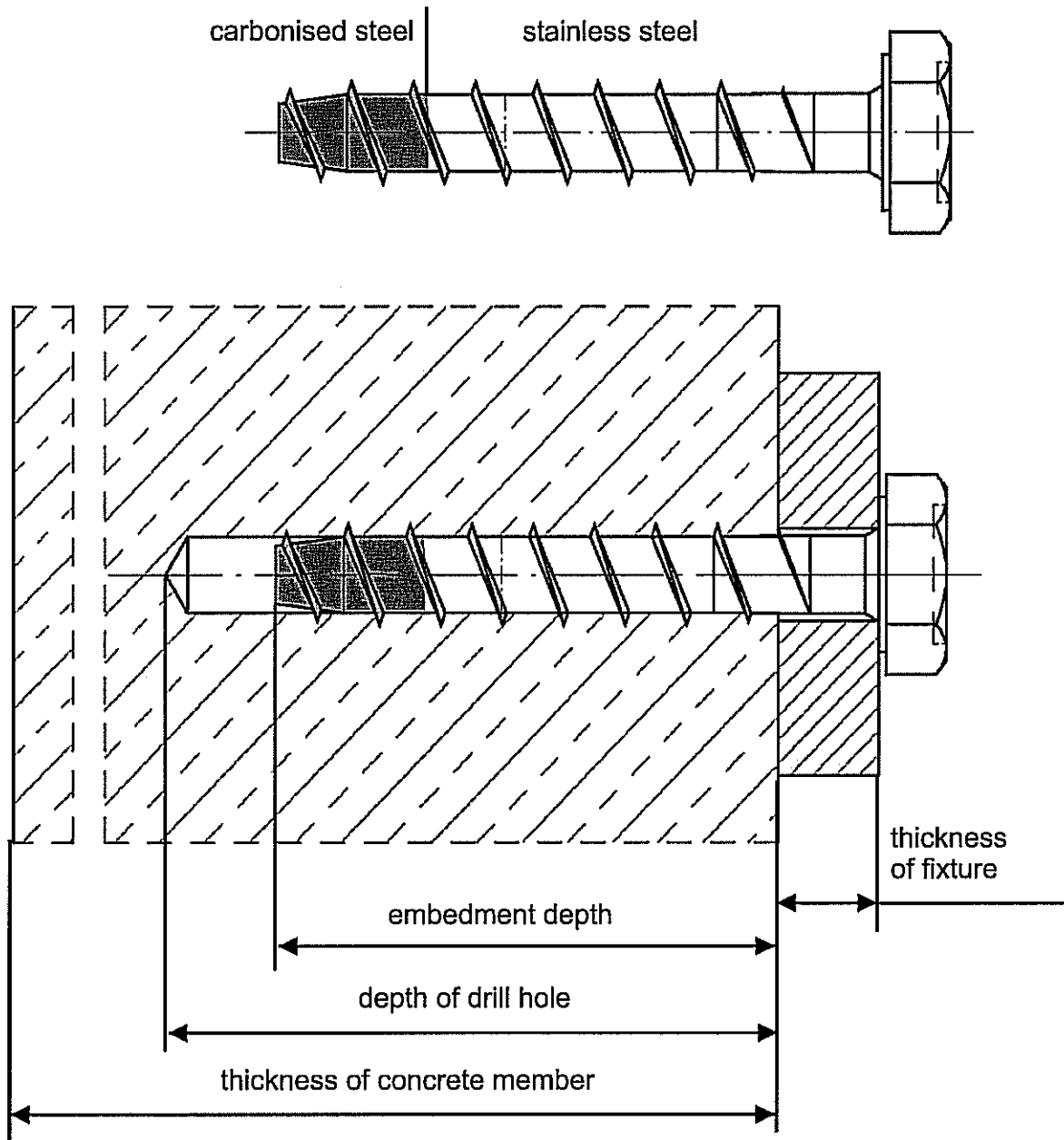
- Drill bit diameter,
- Size of the anchor,
- Maximum thickness of the fixture,
- Minimum embedment depth,
- Minimum hole depth,
- Information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- Reference to any special installation equipment needed,
- Identification of the manufacturing batch.

All data shall be presented in a clear and explicit form.

Dipl.-Ing. Georg Feistel  
Head of Division Construction Engineering  
of Deutsches Institut für Bautechnik  
Berlin, 6 January 2010

*beglaubigt*  
G. Lange

## MULTI-MONTI MMS A4 stainless steel

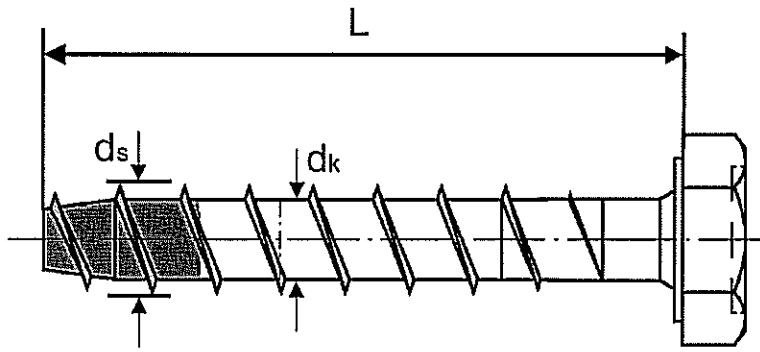


**HECO MULTI-MONTI MMS A4**

Product and intended use

**Annex 1**

of European  
technical approval  
ETA-05/0011



head versions

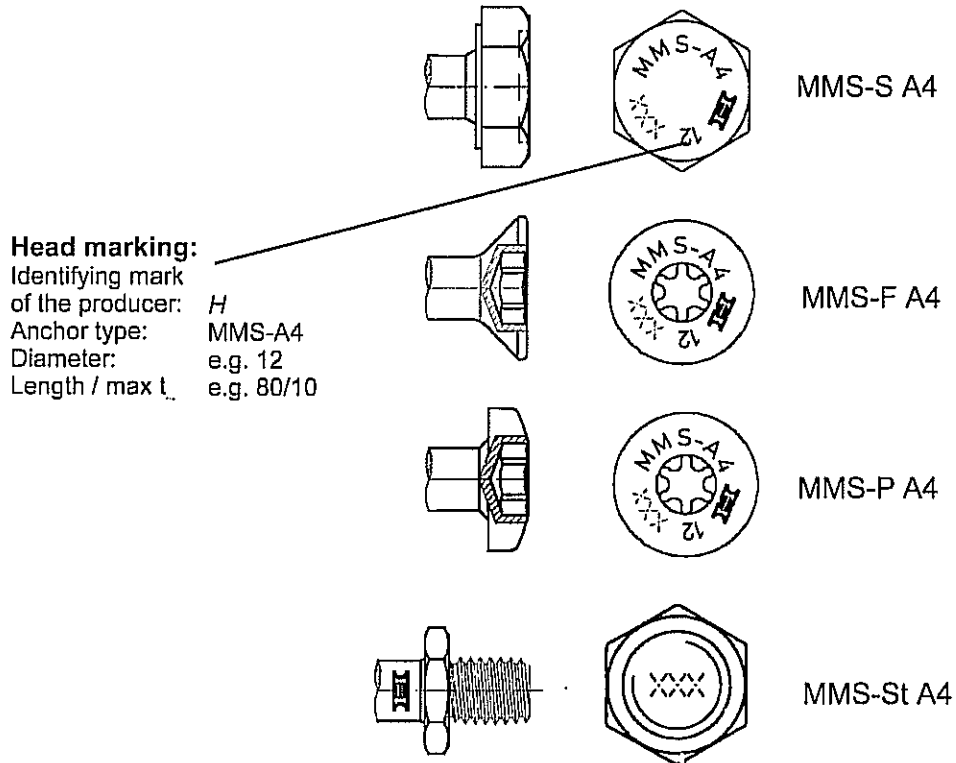


Table 1: Dimensions and materials

| Anchor size         |               | MMS-7,5 A4   | MMS-10 A4 | MMS-12 A4 |
|---------------------|---------------|--|-----------|-----------|
| Length              | $L \geq$ [mm] | 70   | 80        | 90        |
| Length              | $L \leq$ [mm] | 160  | 160       | 320       |
| Bolt diameter       | $d_k$ [mm]    | 5.7  | 7.6       | 9.6       |
| Thread diameter     | $d_s$ [mm]    | 7.5  | 10.1      | 12.4      |
| Material            |               | stainless steel 1.4401 and 1.4571 acc. to EN 10263-5 |           |           |
| Material of the tip |               | steel acc. to EN 10263-4                             |           |           |

## HECO MULTI-MONTI MMS A4

Head versions, dimensions and materials

## Annex 2

of European technical approval  
ETA-05/0011

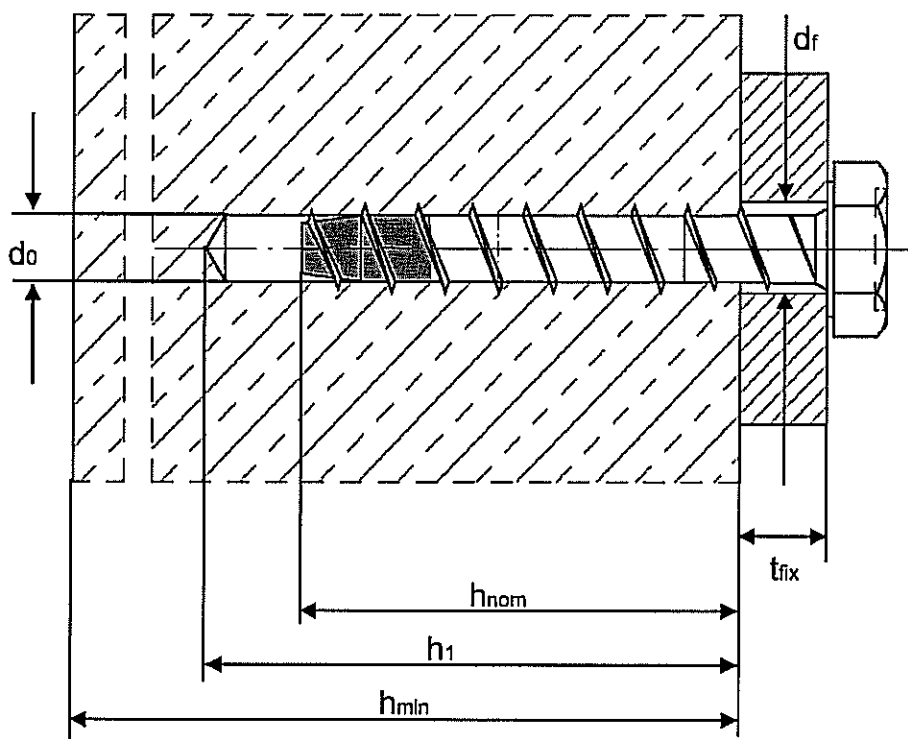


Table 2: Installation parameters

| Anchor size                               |                |      | MMS-7,5 A4 | MMS-10 A4 | MMS-12 A4 |
|---|----------------|------|------------|-----------|-----------|
| Nominal drill diameter                    | $d_o$          | [mm] | 6.0        | 8.0       | 10.0      |
| Cutting diameter of the drill bit         | $d_{cut} \leq$ | [mm] | 6.4        | 8.45      | 10.45     |
| Depth of drill hole                       | $h_1 \geq$     | [mm] | 75         | 90        | 100       |
| Embedment depth                           | $h_{nom} \geq$ | [mm] | 65         | 75        | 90        |
| Diameter of clearance hole in the fixture | $d_f \leq$     | [mm] | 9          | 12.0      | 14.0      |

Table 3: Minimum thickness of concrete member, minimum spacing and minimum edge distances of anchors

| Anchor size                             |             |      | MMS-7,5 A4 | MMS-10 A4 | MMS-12 A4 |
|---|-------------|------|------------|-----------|-----------|
| Min. thickness of the concrete member   | $h_{min}$   | [mm] | 105        | 130       | 140       |
| <b>Cracked and non-cracked concrete</b> |             |      |            |           |           |
| Minimum spacing                         | $s_{min} =$ | [mm] | 40         | 50        | 60        |
| Minimum edge distance                   | $c_{min} =$ | [mm] | 40         | 50        | 60        |

## HECO MULTI-MONTI MMS A4

Installation parameters,  
minimum thickness of concrete member,  
minimum spacing and edge distances

## Annex 3

of European  
technical approval  
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Table 4: Design method A, characteristic values to tension loads

| Anchor size  |                             |        | MMS-7,5 A4        | MMS-10 A4         | MMS-12 A4 |
|--|-----------------------------|--------|-------------------|-------------------|-----------|
| <b>Steel failure</b>   |                             |        |                   |                   |           |
| Characteristic resistance  | $N_{Rk,s}$                  | [kN]   | 23                | 16                | 25        |
| Partial safety factor  | $\gamma_{Ms}$ <sup>1)</sup> |        | 1.4               |                   |           |
| <b>Pullout</b>   |                             |        |                   |                   |           |
| Characteristic resistance in cracked concrete C20/25                 | $N_{Rk,p}$                  | [kN]   | 5                 | 9                 | 12        |
| Characteristic resistance in non-cracked concrete C20/25             | $N_{Rk,p}$                  | [kN]   | 7.5               | 12                | 16        |
| Increasing factor for $N_{Rk,p}$ in cracked and non-cracked concrete | $\psi_c$                    | C30/37 | 1.22              |                   |           |
|  |                             | C40/50 | 1.41              |                   |           |
|  |                             | C50/60 | 1.55              |                   |           |
| Partial safety factor  | $\gamma_{Mp}$ <sup>1)</sup> |        | 2.1 <sup>3)</sup> | 1.8 <sup>2)</sup> |           |
| <b>Concrete cone failure, splitting failure</b>                      |                             |        |                   |                   |           |
| Effective anchorage depth  | $h_{ef}$                    | [mm]   | 40                | 47.5              | 54.5      |
| Spacing  | $s_{cr,N} = s_{cr,sp}$      | [mm]   | 3 $h_{ef}$        |                   |           |
| Edge distance  | $c_{cr,N} = c_{cr,sp}$      | [mm]   | 1.5 $h_{ef}$      |                   |           |
| Partial safety factor  | $\gamma_{Mc}$ <sup>1)</sup> |        | 2.1 <sup>3)</sup> | 1.8 <sup>2)</sup> |           |

<sup>1)</sup> in absence of other national regulations

<sup>2)</sup> the installation safety factor  $\gamma_2 = 1.2$  is included

<sup>3)</sup> the installation safety factor  $\gamma_2 = 1.4$  is included

Table 5: Displacements under tension loads

| Anchor size                          |                    |      | MMS-7,5 A4 | MMS-10 A4 | MMS-12 A4 |
|--------------------------------------|--------------------|------|------------|-----------|-----------|
| Tension load in cracked concrete     | <b>N</b>           | [kN] | 1.7        | 3.0       | 4.0       |
| Displacement                         | $\delta_{N0}$      | [mm] | 0.1        | 0.1       | 0.2       |
|                                      | $\delta_{N\infty}$ | [mm] | 0.2        | 0.2       | 0.6       |
| Tension load in non-cracked concrete | <b>N</b>           | [kN] | 2.6        | 4.0       | 5.3       |
| Displacement                         | $\delta_{N0}$      | [mm] | 0.1        | 0.1       | 0.2       |
|                                      | $\delta_{N\infty}$ | [mm] | 0.2        | 0.2       | 0.6       |

**HECO MULTI-MONTI MMS A4**

Design method A,  
characteristic values to tension loads;  
displacements

**Annex 4**

of European  
technical approval  
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Table 6: Design method A, characteristic values to shear loads

| Anchor size  |                             |      | MMS-7,5 A4        | MMS-10 A4 | MMS-12 A4 |
|--|-----------------------------|------|-------------------|-----------|-----------|
| <b>Steel failure without lever arm</b>                   |                             |      |                   |           |           |
| Characteristic resistance                                | $V_{Rk,s}$                  | [kN] | 12.3              | 20        | 33        |
| Partial safety factor                                    | $\gamma_{Ms}$ <sup>1)</sup> |      | 1.5               |           |           |
| <b>Steel failure with lever arm</b>                      |                             |      |                   |           |           |
| Characteristic anchor resistance                         | $M_{Rk,s}^0$                | [Nm] | 22                | 45        | 93        |
| Partial safety factor                                    | $\gamma_{Ms}$ <sup>1)</sup> |      | 1.5               |           |           |
| <b>Concrete pryout failure</b>                           |                             |      |                   |           |           |
| Factor in equation 5.6 of ETAG, Annex C, section 5.2.3.3 | k                           |      | 1.0               | 2.0       |           |
| Partial safety factor                                    | $\gamma_{Mc}$ <sup>1)</sup> |      | 1.5 <sup>2)</sup> |           |           |
| <b>Concrete edge failure</b>                             |                             |      |                   |           |           |
| Effective length of the anchor in shear loading          | $e_t$                       | [mm] | 40                | 47.5      | 54.5      |
| Effective diameter of the anchor                         | $d_{nom}$                   | [mm] | 6                 | 8         | 10        |
| Partial safety factor                                    | $\gamma_{Mc}$ <sup>1)</sup> |      | 1.5 <sup>2)</sup> |           |           |

<sup>1)</sup> in absence of other national regulations

<sup>2)</sup> the installation safety factor  $\gamma_2 = 1.0$  is included

Table 7: Displacements under shear loads

| Anchor size                                    |                    |      | MMS-7,5 A4 | MMS-10 A4 | MMS-12 A4 |
|--|--------------------|------|------------|-----------|-----------|
| Shear load in cracked and non-cracked concrete | V                  | [kN] | 5.9        | 9.7       | 15.7      |
| Displacement                                   | $\delta_{V  }$     | [mm] | 1.7        | 3.0       | 3.2       |
|  | $\delta_{V\infty}$ | [mm] | 2.6        | 4.5       | 4.8       |

#### Information for design of anchorage under shear load:

In general, the conditions given in ETAG 001 Annex C, section 4.2.2.1 a) and section 4.2.2.2 b) are not fulfilled because the diameter of clearance hole in the fixture according to Annex 3 Table 2 is greater than the values given in Annex C Table 4.1 for the corresponding diameter of the anchor.

However for each specific anchor length the manufacturer may specify the thickness of fixture for which these conditions are fulfilled.

## HECO MULTI-MONTI MMS A4

Design method A,  
characteristic values to shear loads;  
displacements

## Annex 5

of European  
technical approval  
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Table 8: Characteristic values to tension loads under fire exposure in cracked and non-cracked concrete C 20/25 to C 50/60

| Anchor size  |               |       | MMS-7,5  |     |     |     | MMS-10 |     |     |     | MMS-12 |     |     |     |
|--|---------------|-------|--|-----|-----|-----|--------|-----|-----|-----|--------|-----|-----|-----|
| Fire resistance duration                               | R             | [min] | 30   | 60  | 90  | 120 | 30     | 60  | 90  | 120 | 30     | 60  | 90  | 120 |
| <b>Steel failure</b>                                   |               |       |  |     |     |     |        |     |     |     |        |     |     |     |
| Characteristic resistance                              | $N_{Rk,s,fi}$ | [kN]  | 1,7  | 1,2 | 0,8 | 0,6 | 3,4    | 2,5 | 1,7 | 1,2 | 5,9    | 4,4 | 3,0 | 2,2 |
| Characteristic resistance for MMS-St with metric stud  | $N_{Rk,s,fi}$ | [kN]  | 1,7  | 1,2 | 0,8 | 0,6 | 1,8    | 1,5 | 1,1 | 1,0 | -      | -   | -   | -   |
| <b>Pullout</b>   |               |       |  |     |     |     |        |     |     |     |        |     |     |     |
| Characteristic resistance in concrete C20/25 to C50/60 | $N_{Rk,p,fi}$ | [kN]  | 1,3  |     | 1,0 |     | 2,3    |     | 1,8 |     | 3,0    |     | 2,4 |     |
| <b>Concrete cone failure</b>                           |               |       |  |     |     |     |        |     |     |     |        |     |     |     |
| Characteristic resistance in concrete C20/25 to C50/60 | $N_{Rk,c,fi}$ | [kN]  | 1,8  |     | 1,5 |     | 2,8    |     | 2,2 |     | 3,9    |     | 3,2 |     |
| Spacing  | $s_{cr,N}$    | [mm]  | 4 x $h_{ef}$   |     |     |     |        |     |     |     |        |     |     |     |
|  | $s_{min}$     | [mm]  | $s_{min}$ according to Annex 3   |     |     |     |        |     |     |     |        |     |     |     |
| Edge distance  | $c_{cr,N}$    | [mm]  | 2 x $h_{ef}$   |     |     |     |        |     |     |     |        |     |     |     |
|  | $c_{minN}$    | [mm]  | $c_{min} = 2 \times h_{ef}$ ; if fire attack is from more than one side, the edge distance of the anchor has to be bigger than 300 mm. |     |     |     |        |     |     |     |        |     |     |     |

in absence of other national regulations the partial safety factor for resistance under fire exposure  $\gamma_{M,fi} = 1.0$  is recommended

Table 9: Characteristic values to shear loads under fire exposure in cracked and non-cracked concrete C 20/25 to C 50/60

| Anchor size  |                 |       | MMS-7,5 |     |     |     | MMS-10  |     |     |     | MMS-12 |     |     |     |
|--|-----------------|-------|---------|-----|-----|-----|---|-----|-----|-----|--------|-----|-----|-----|
| Fire resistance duration   | R               | [min] | 30      | 60  | 90  | 120 | 30  | 60  | 90  | 120 | 30     | 60  | 90  | 120 |
| <b>Steel failure without lever arm</b>   |                 |       |         |     |     |     |   |     |     |     |        |     |     |     |
| Characteristic resistance  | $V_{Rk,s,fi}$   | [kN]  | 1,7     | 1,2 | 0,8 | 0,6 | 3,4   | 2,5 | 1,7 | 1,2 | 5,9    | 4,4 | 3,0 | 2,2 |
| <b>Steel failure with lever arm</b>  |                 |       |         |     |     |     |   |     |     |     |        |     |     |     |
| Characteristic anchor resistance   | $M_{Rk,s,fi}^0$ | [Nm]  | 1,5     | 1,1 | 0,7 | 0,5 | 4,0   | 3,0 | 2,0 | 1,5 | 8,8    | 6,6 | 4,4 | 3,3 |
| <b>Concrete pryout failure</b>   |                 |       |         |     |     |     |   |     |     |     |        |     |     |     |
| In Equation (5.6) of ETAG 001, Annex C, 5.2.3.3 the k-factor 2.0 (1.0 for MMS-7,5) and the relevant values of $N_{Rk,c,fi}^0$ of Table 8 have to be considered |                 |       |         |     |     |     |   |     |     |     |        |     |     |     |
| <b>Concrete edge failure</b>   |                 |       |         |     |     |     |   |     |     |     |        |     |     |     |
| The initial value $V_{Rk,c,fi}^0$ of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by:                      |                 |       |         |     |     |     |   |     |     |     |        |     |     |     |
| $V_{Rk,c,fi}^0 = 0,25 \times V_{Rk,c}^0$ (R30, R60, R90)   |                 |       |         |     |     |     | $V_{Rk,c,fi}^0 = 0,20 \times V_{Rk,c}^0$ (R120) |     |     |     |        |     |     |     |
| with $V_{Rk,c}^0$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature   |                 |       |         |     |     |     |   |     |     |     |        |     |     |     |

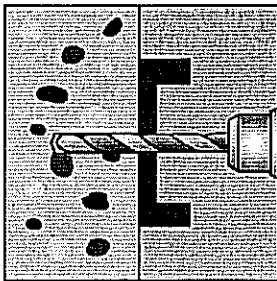
in absence of other national regulations the partial safety factor for resistance under fire exposure  $\gamma_{M,fi} = 1.0$  is recommended

## HECO MULTI-MONTI MMS A4

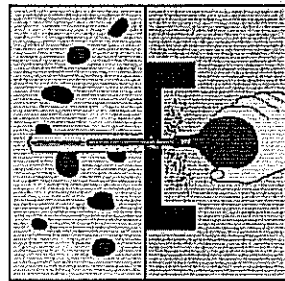
Characteristic values of tension and shear load resistance under fire exposure

## Annex 6

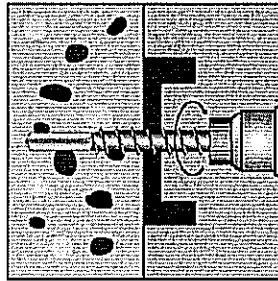
of European technical approval  
ETA-05/0011



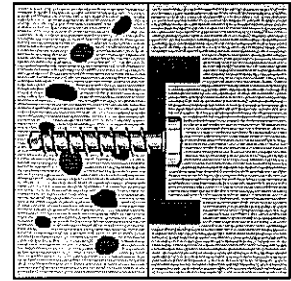
**Drilling**  
Drill diameter  $d_0$   
and drilling depth  $h_1$   
have to be kept



**Removal of drill dust**  
e.g. blowing



**Installation**  
e.g. by hand or  
with impact screw-  
driver



**Complete verification:**  
head supported to  
fixture and embedment  
depth  $h_{nom}$

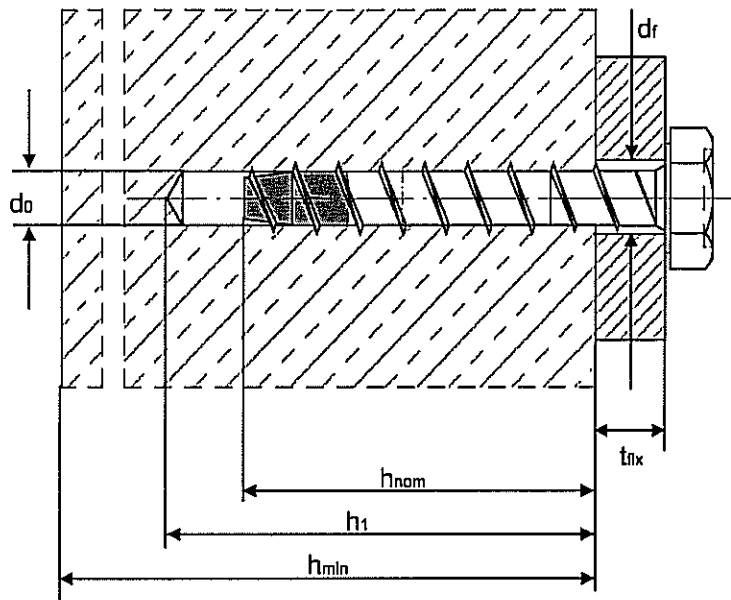


Table 10: Installation instructions

| Anchor size                               |   |             | MMS-7,5 A4 | MMS-10 A4 | MMS-12 A4 |
|---|---|-------------|------------|-----------|-----------|
| Nominal drill diameter                    | $d_0$   | [mm]        | 6.0        | 8.0       | 10.0      |
| Depth of drill hole                       | $h_1$   | $\geq$ [mm] | 75         | 90        | 100       |
| Embedment depth                           | $h_{nom}$   | $\geq$ [mm] | 65         | 75        | 90        |
| Diameter of clearance hole in the fixture | $d_f$   | $\leq$ [mm] | 9.0        | 12.0      | 14.0      |
| Recommended installation tool             | Impact screw driver, max. power output $T_{max}$ according manufacturer information |             |            |           |           |
|   |   |             |            | 100 Nm    | 250 Nm    |

**HECO MULTI-MONTI MMS**

Installation Instruction

**Annex 7**

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