Deutsches Institut für Bautechnik

DIBt

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

# European Technical Assessment

# ETA-05/0199 of 15 February 2016

English translation prepared by DIBt - Original version in German language

**General Part**

| | |
|---|---|
| Technical Assessment Body issuing the European Technical Assessment: | Deutsches Institut für Bautechnik |
| Trade name of the construction product | mungo Througbolt m2r |
| Product family to which the construction product belongs | Torque-controlled expansion anchor made of stainless steel for use in non-cracked concrete |
| Manufacturer | Mungo Befestigungstechnik AG<br>Bornfeldstrasse 2<br>4603 OLTEN<br>SCHWEIZ |
| Manufacturing plant | Mungo Werk Olten |
| This European Technical Assessment contains | 12 pages including 3 annexes |
| This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of | Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 2: "Torque controlled expansion anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011. |

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## Specific Part

### 1 Technical description of the product

The mungo Throughbolt m2r in the range of M6, M8, M10, M12 and M16 is an anchor made of stainless steel which is placed into a drilled hole and anchored by torque-controlled expansion.

The product description is given in Annex A.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document

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 verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 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.

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

#### 3.1 Mechanical resistance and stability (BWR 1)

| Essential characteristic | Performance |
|---|---|
| Characteristic resistance tension and shear loads, Displacements | See Annex C 1 to C 2 |

#### 3.2 Safety in case of fire (BWR 2)

| Essential characteristic | Performance |
|---|---|
| Reaction to fire | Anchorages satisfy requirements for Class A1 |
| Resistance to fire | No performance assessed |

#### 3.3 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

### 4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 15 February 2016 by Deutsches Institut für Bautechnik

Andreas Kummerow
p. p. Head of Department

*beglaubigt:*
Lange

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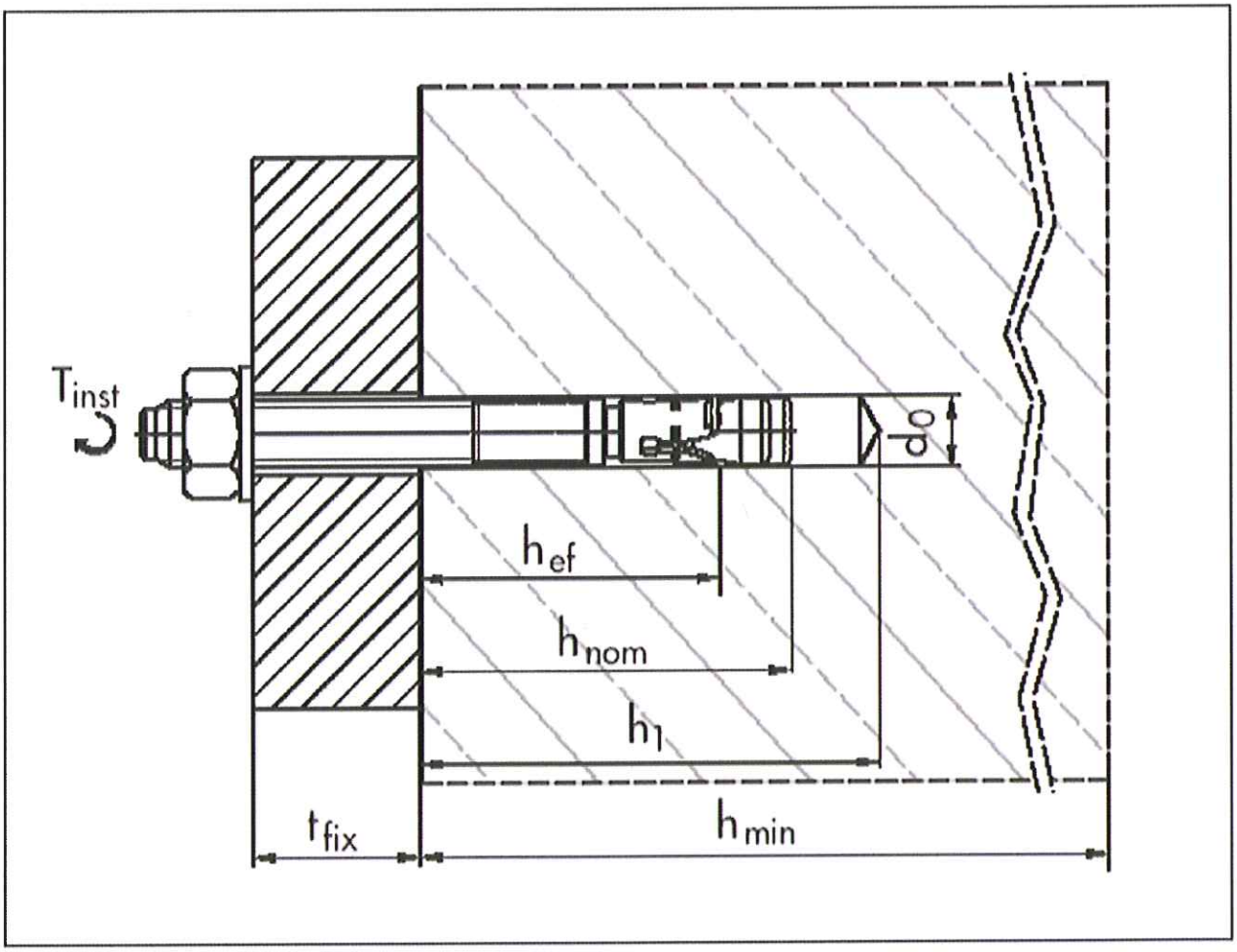
**Installed anchor**




Legend:

| | | |
|---|---|---|
| $h_{ef}$ | = | effective anchorage depth |
| $h_{nom}$ | = | embedment depth |
| $h_1$ | = | depth of drill hole |
| $h_{min}$ | = | minimum thickness of concrete member |
| $d_0$ | = | nominal diameter of drill bit |
| $t_{fix}$ | = | thickness of fixture |
| $T_{inst}$ | = | installation torque |

| | |
|---|---|
| **m2r** | **Annex A 1** |
| **Product description**<br>Installed condition | |

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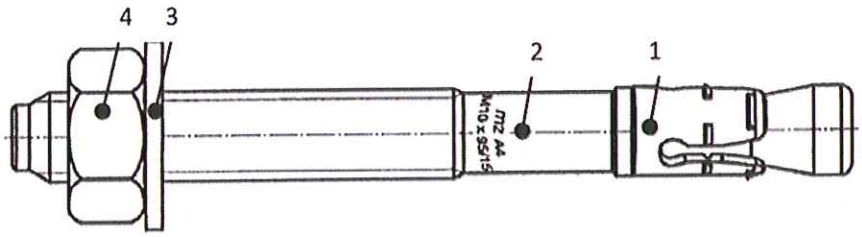
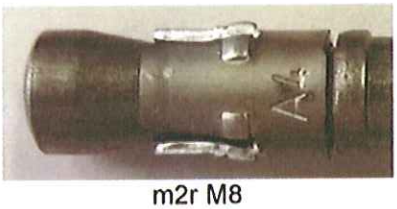
## Anchor type



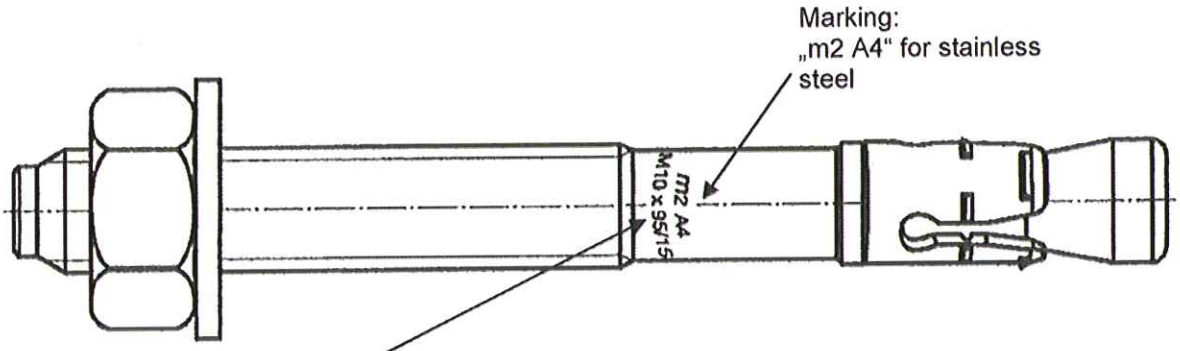

1 expansion element
2 bolt
3 washer
4 hexagonal nut

Design of expansion elements

m2r M6
m2r M16



m2r M8
m2r M10
m2r M12




Anchor types:

m2r bolt m2 with washer EN ISO 7089:2000 and hexagonal nut DIN 934:1987-10

| m2r | Annex A 2 |
|---|---|
| **Product description**<br>Marking and denomination | |

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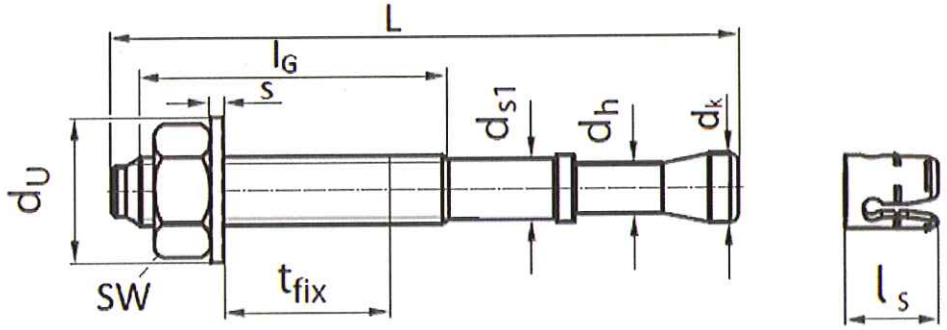
## Table A1: Dimensions

| Part | Designation | | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Bolt | | $d_k$ | [mm] | 6 | 8 | 10 | 12 | 16 |
| | | | $d_h$ | [mm] | 4 | 5,6 | 7,2 | 8,5 | 11,5 |
| | | | $d_{s1}$ | [mm] | 5,25 | 7,05 | 8,9 | 10,7 | 14,5 |
| | | | min $l_G$ | [mm] | 32 | 43 | 52 | 62 | 73 |
| | | | max $l_G$ | [mm] | 62 | 120 | 120 | 120 | 120 |
| | | | min L | [mm] | 65 | 80 | 95 | 110 | 130 |
| | | | max L | [mm] | 95 | 165 | 180 | 185 | 180 |
| 2 | Expansion element - length | | $l_s$ | [mm] | 9,5 | 13,2 | 15,2 | 17,5 | 19,3 |
| 3 | Washer | EN ISO 7089:2000 | $d_u$ | [mm] | 12 | 16 | 20 | 24 | 30 |
| | | | s | [mm] | 1,6 | 1,6 | 2 | 2,5 | 3 |
| 4 | Hexagonal nut | | SW | [mm] | 10 | 13 | 17 | 19 | 24 |




## Table A2: Materials

| Part | Designation | Material |
|---|---|---|
| 1 | Bolt | Stainless steel according to EN 10088 |
| 2 | Expansion element | Stainless steel according to EN 10088 |
| 3 | Washer | Stainless steel according to EN 10088 |
| 4 | Hexagonal nut | Stainless steel A4 ISO3506, EN 10088 |

| m2r | Annex A 3 |
|---|---|
| **Product description**<br>Dimensions and materials | |

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## Specifications of intended use

**Anchorages subject to:**
- Static and quasi-static loads

**Base materials:**
- Reinforced or unreinforced normal weight concrete according to EN 206:2013
- Strength classes C20/25 to C50/60 according to EN 206:2013
- Non-cracked concrete

**Use conditions:**
- Structures subject to dry internal conditions
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist.

**Design:**
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the 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 under static or quasi-static actions are designed in accordance with ETAG 001, Annex C, design method A, Edition August 2010
- It must be ensured that local spalling of the concrete cover does not occur.

**Installation:**
- Hole drilling by hammer drilling only
- Anchor installation in accordance with the manufacturer's specifications using the appropriate tools carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor
- Check concrete strength before placing the anchor to ensure that the strength class of the concrete is covered by the product's assessment
- Positioning the drill holes without damaging the reinforcement
- Cleaning the holes
- Edge distances and spacing not less than the specified values without minus tolerances
- Anchor installation such that the effective embedment depth is complied with. This compliance is ensured if the anchor's embedment mark doesn't exceed the concrete surface.
- The anchor may only be set once.
- In case of aborted holes: 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 isn't in the direction of load application.
- Using a calibrated torque wrench for installation.

| m2r | Annex B 1 |
|---|---|
| **Intended use**<br>Specifications | |

## Table B1: Installation parameters

| Anchor size | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|
| Nominal drill hole diameter | $d_0$ | [mm] | 6 | 8 | 10 | 12 | 16 |
| Effective anchorage depth | $h_{ef}$ | [mm] | 40 | 50 | 58 | 68 | 80 |
| Installation torque | $T_{inst}$ | [Nm] | 6,5 | 15 | 30 | 50 | 140 |
| Cutting diameter at the upper tolerance limit (maximum diameter bit) | $d_{cut} \leq$ | [mm] | 6,4 | 8,45 | 10,45 | 12,5 | 16,5 |
| Depth of drill hole | $h_1 \geq$ | [mm] | 60 | 65 | 80 | 90 | 110 |
| Diameter of clearance hole in fixture | $d_f \leq$ | [mm] | 7 | 9 | 12 | 14 | 18 |
| Minimum fixture thickness | $t_{fix,min}$ | [mm] | 1 | 1 | 1 | 1 | 1 |
| Maximum fixture thickness | $t_{fix,max}$ | [mm] | 10 | 45 | 100 | 90 | 65 |

## Table B2: Minimum thickness of concrete member, minimum spacing and edge distances

| Size | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|
| Minimum thickness of concrete member | $h_{min}$ | [mm] | 100 | 100 | 120 | 140 | 160 |
| Minimum spacing | $s_{min}$ | [mm] | 40 | 45 | 55 | 75 | 100 |
| for edge distance | c | [mm] | 70 | 45 | 55 | 75 | 190 |
| Minimum edge distance | $c_{min}$ | [mm] | 40 | - | - | - | 130 |
| for spacing | s | [mm] | 80 | - | - | - | 190 |

m2r

**Intended use**
Installation parameters
Minimum thickness of concrete member, minimum spacing and edge distances

**Annex B 2**

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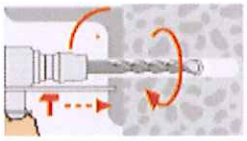
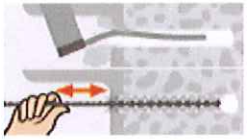
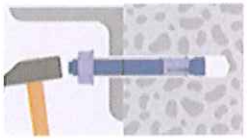
## Installation instructions



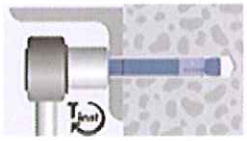
Drilling the hole



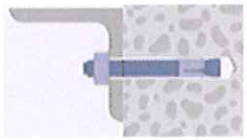
Cleaning the hole



Fixing plug and building material



Tightening with torque wrench and predetermined value of $T_{inst}$ (see Table B2)



Tightened fixation

| m2r | Annex B 3 |
|---|---|
| **Intended use**<br>Installation instructions | |

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## Table C1: Design method A, characteristic values under tension load

| **Anchor size** | | | **M6** | **M8** | **M10** | **M12** | **M16** |
|---|---|---|---|---|---|---|---|
| Installation safety factor | $\gamma_2$ | [-] | 1,0 | | | | |
| **Steel failure** | | | | | | | |
| Characteristic resistance | $N_{Rk,s}$ | [kN] | 10 | 19 | 33 | 46 | 82 |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,6 | | | | |
| **Pull-out failure** | | | | | | | |
| Characteristic resistance | $N_{Rk,p}$ | [kN] | 7,5 | 12,0 | 16,0 | 25,0 | 30,0 |
| Increasing factor for $N_{Rk,p}$ | $\psi_C$ | C30/37 | 1,17 | | | | |
| | | C40/50 | 1,32 | | | | |
| | | C50/60 | 1,42 | | | | |
| **Concrete cone failure** | | | | | | | |
| Effective anchorage depth | $h_{ef}$ | [mm] | 40 | 50 | 58 | 68 | 80 |
| Spacing | $s_{cr,N}$ | [mm] | $3\ h_{ef}$ | | | | |
| Edge distance | $c_{cr,N}$ | [mm] | $1{,}5\ h_{ef}$ | | | | |
| **Concrete splitting failure** | | | | | | | |
| Spacing | $s_{cr,sp}$ | [mm] | $6\ h_{ef}$ | | | $5\ h_{ef}$ | |
| Edge distance | $c_{cr,sp}$ | [mm] | $3\ h_{ef}$ | | | $2{,}5\ h_{ef}$ | |

[1)] In absence of other national regulations.

## Table C2: Displacements under tension load

| **Anchor size** | | | **M6** | **M8** | **M10** | **M12** | **M16** |
|---|---|---|---|---|---|---|---|
| Tension load | N | [kN] | 3,6 | 5,7 | 7,6 | 9,9 | 11,9 |
| Displacement | $\delta_{N0}$ | [mm] | 0,3 | | | | |
| | $\delta_{N\infty}$ | [mm] | 1,3 | | | | |

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## Table C3: Design method A, characteristic values under shear load

| Anchor size | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|
| **Steel failure without lever arm** | | | | | | | |
| Characteristic resistance | $V_{Rk,s}$ | [kN] | 7 | 13 | 21 | 30 | 56 |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,33 | | | | |
| **Steel failure with lever arm** | | | | | | | |
| Characteristic resistance | $M^0_{Rk,s}$ | [Nm] | 12 | 30 | 60 | 105 | 266 |
| Partial safety factor | $\gamma_{Ms}$ [1)] | [-] | 1,33 | | | | |
| **Concrete pryout failure** | | | | | | | |
| Factor in equation (5.6) of ETAG Annex C 5.2.3.3 | k | [-] | 1,0 | | 2,0 | | |
| **Concrete edge failure** | | | | | | | |
| Effective anchor length under shear load | $l_f$ | [mm] | 40 | 50 | 58 | 68 | 80 |
| external anchor diameter | $d_{nom}$ | [mm] | 6 | 8 | 10 | 12 | 16 |

[1)] In absence of other national regulations.

## Table C4: Displacements under shear load

| Anchor size | | | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|
| Shear load | | [kN] | 3,9 | 7,1 | 11,2 | 16,3 | 30,3 |
| Displacement | $\delta_{V0}$ | [mm] | 1,5 | 1,9 | 2,3 | 3,1 | 3,9 |
| | $\delta_{V\infty}$ | [mm] | 2,3 | 2,9 | 3,5 | 4,7 | 5,9 |