

## Declaration of Performance

**1109-CPR-0501**

**1. Unique identification code of the product-type:** Torque-controlled expansion anchor m2 and m2-C for use in non-cracked concrete

**2. Manufacturer:** Mungo Befestigungstechnik AG, Bornfeldstrasse 2, CH-4603 Olten/Switzerland

**3. System/s of AVCP:** System 1

**4. Intended use or use/es:**

Product	Intended use
Metal anchor for use in non-cracked concrete	The anchor is to be used for static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength classes C20/25 to C50/60 according to EN 206-1:2000

**5. European Assessment Document:** European Assessment Document EAD 330232-00-0601

**European Technical Assessment:** ETA-05/0070 of 11 April 2017

**Technical Assessment Body:** DIBt – Deutsches Institut für Bautechnik

**Notified body/ies:** No 305/2011 (Construction Product Regulation)

**6. Declared performance:**

**Mechanical resistance and stability (BWR 1)**

Essential characteristic	Performance
Characteristic resistance (static and quasi-static loading) and displacement	See appendix, especially Annex C1 to C2
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed

**Safety in case of fire (BWR 2)**

Essential characteristic	Performance
Reaction to fire	Anchorage satisfy requirements for Class A1
Resistance to fire	No performance assessed

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Dipl.-Ing. Massimo Pirozzi  
Head of Engineering



Olten, 2018-26-07



This DoP Has been prepared in different languages. In case there is a dispute on the interpretation the English version shall always prevail.

The Appendix includes voluntary and complementary information in English language exceeding the (language as neutrally specified) legal requirements.

Mungo

Befestigungstechnik AG

Bornfeldstrasse 2

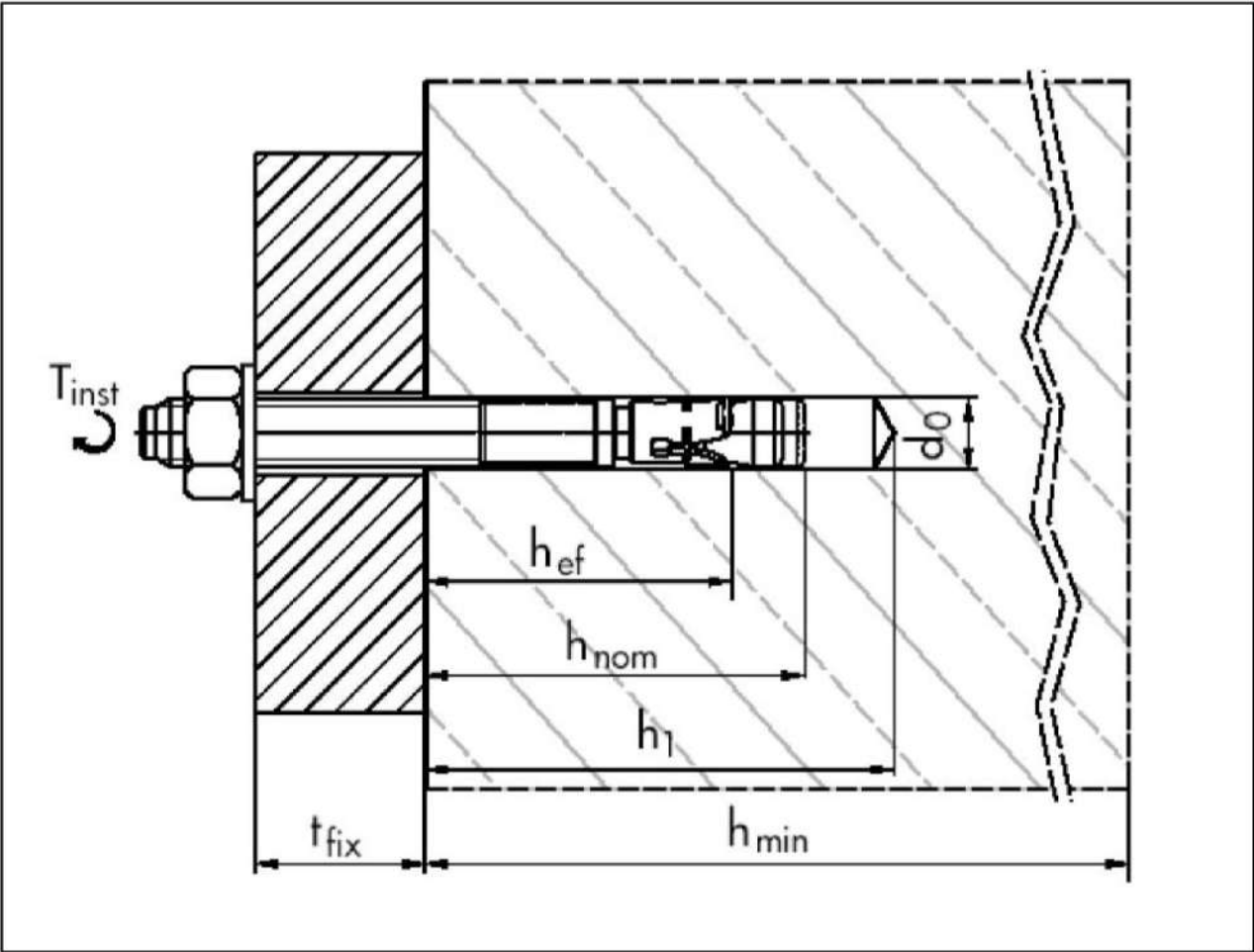
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Installed fastener



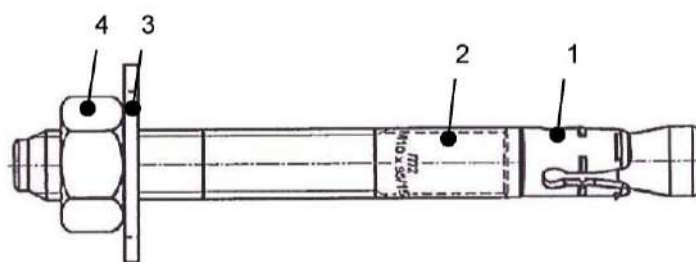
- Legend:
- $h_{ef}$  = effective anchorage depth
  - $h_{nom}$  = embedment depth
  - $h_1$  = depth of drill hole
  - $h_{min}$  = minimum thickness of concrete member
  - $d_0$  = nominal diameter of drill bit
  - $t_{fix}$  = thickness of fixture
  - $T_{inst}$  = installation torque

m2, m2-C, m2-CG

Product description  
Installed condition

Annex A 1

## Fastener type



- 1 expansion element
- 2 bolt
- 3 washer
- 4 hexagonal nut

## Shapes of clips:



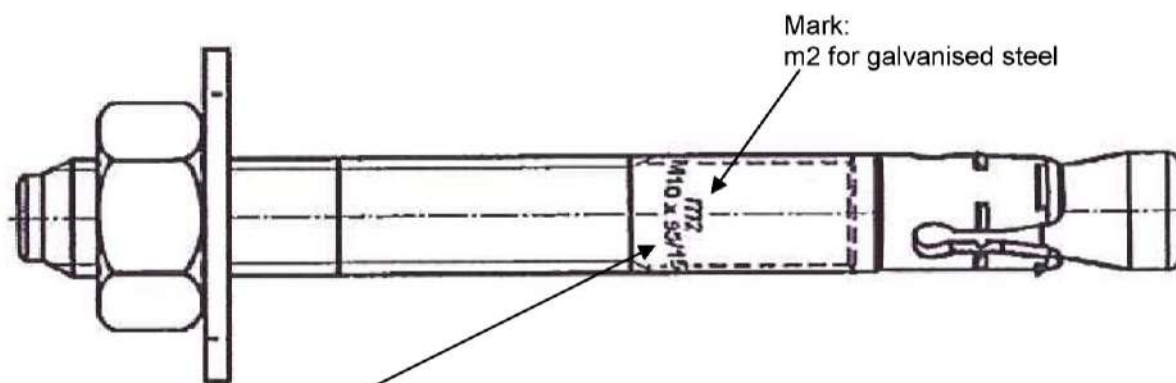
m2 M6  
m2 M16 Typ A  
m2 M20



m2 M8  
m2 M10  
m2 M12



m2 M16 Typ B



Reading:  
Nominal diameter (e.g. M10) x fastener length (e.g. 95) x max. member thickness (e.g. 15)

## Fastener types:

- m2 bolt m2 with washer EN ISO 7089:2000 and hexagonal nut DIN 934:1987-10
- m2-C bolt m2 with washer EN ISO 7093-1:2000 and hexagonal nut DIN 934:1987-10
- m2-CG bolt m2 with washer EN ISO 7094:2000 and hexagonal nut DIN 934:1987-10

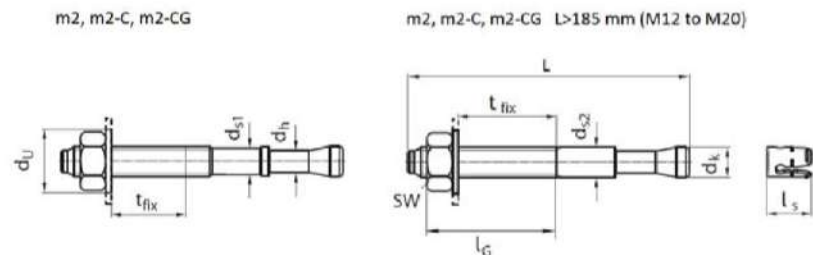
m2, m2-C, m2-CG

**Product description**  
Marking and denomination

**Annex A 2**

**Table A1: Dimensions**

Part	Designation		M6	M8	M10x60	M10	M12	M16	M20
1	Bolt	$d_k$ [mm]	6	8	10	10	12	16	20
		$d_h$ [mm]	4	5,6	7,2	7,2	8,5	11,5	15,2
		$d_{s1}$ [mm]	5,25	7,05	8,9	8,9	10,7	14,5	-
		$d_{s2}$ [mm]	-	-	-	-	12	16	20
		min $l_G$ [mm]	19	43	23	23	32	33	70
		max $l_G$ [mm]	62	120	120	120	120	120	120
		min L [mm]	50	80	60	95	80	90	130
		max L [mm]	95	165	180	180	360	440	270
2	Expansion element	type A	$l_s$ [mm]	9,5	13,2	15,2	15,2	17,5	19,3
		type B		-	-	-	-	19,7	-
3	Washer	EN ISO 7089:2000	$d_u$ [mm]	12	16	20	20	24	30
			s [mm]	1,6	1,6	2	2	2,5	3
		EN ISO 7093-1:2000	$d_u$ [mm]	18	24	30	30	37	50
			s [mm]	1,6	2	2,5	2,5	3	3
		EN ISO 7094:2000	$d_u$ [mm]	22	28	34	34	44	56
			s [mm]	2	3	3	3	4	5
4	Hexagonal nut	SW [mm]	10	13	17	17	19	24	30



**Table A2: Materials**

Part	Designation		Material
1	Bolt	$L \leq 185$ mm	cold forged steel EN10263-2:2001, electroplated $\geq 5$ $\mu$ m
		$L > 185$ mm <sup>1)</sup>	free-cutting steel EN 10087:1998, electroplated $\geq 5$ $\mu$ m
2	Expansion element	$L \leq 185$ mm	cold rolled steel strip EN10139:1997, electroplated $\geq 5$ $\mu$ m
		$L > 185$ mm <sup>1)</sup>	cold rolled stainless steel strip EN10088-2:2014, no coating
3	Washer		cold rolled steel strip EN10139:1997, electroplated $\geq 5$ $\mu$ m
4	Hexagonal nut		steel, property class 8, DIN 934:1987-10, electroplated $\geq 5$ $\mu$ m

<sup>1)</sup> valid for sizes M12 and M16, valid for size M20 independent of length

m2, m2-C, m2-CG

**Product description**  
Dimensions and materials

**Annex A 3**

### Specifications of intended use

**Anchorage subject to:**

- Static and quasi-static loading

**Base materials:**

- Non-cracked concrete according to EN 206-1:2000
- Strength classes C20/25 to C50/60 according to EN 206-1:2000

**Use conditions:**

- Structures subject to dry internal conditions  
(zinc coated steel)

**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.
- Anchorages under static or quasi-static actions are designed in accordance with EN 1992-4:2017.

**Installation:**

- Hole drilling by hammer drilling only.
- Fastener installation in accordance with the manufacturer's specifications using the appropriate tools carried out by appropriately qualified personnel.
- Cleaning the holes.
- The fastener may only be set once.

m2, m2-C, m2-CG

**Intended use**  
Specifications

**Annex B 1**



**Table B1: Installation parameters**

Fastener size			M6	M8	M10x60	M10	M12	M16	M20
Nominal drill hole diameter	$d_0$	[mm]	6	8	10		12	16	20
Effective embedment depth	$h_{ef}$	[mm]	40	50	33	58	68	80	100
Installation torque	$T_{inst}$	[Nm]	5	15	30		50	100	200
Cutting diameter at the upper tolerance limit (maximum diameter bit)	$d_{cut,max}$	[mm]	6,4	8,45	10,45		12,5	16,5	20,55
Depth of drill hole	$h_1$	[mm]	60	70	50	80	90	110	130
Diameter of clearance hole in fixture	$d_f$	[mm]	7	9	12		14	18	22
Minimum fixture thickness	$t_{fix,min}$	[mm]	1	1	1		1	1	1
Maximum fixture thickness	$t_{fix,max}$	[mm]	25	95	130		265	325	140

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

Size			M6	M8	M10x60	M10	M12		M16		M20
Fastener length	L	[mm]					≤ 185	> 185	≤ 185	> 185	
Minimum thickness of concrete member	$h_{min}$	[mm]	100	100	120	120	140		160		200
Minimum spacing	$s_{min}$	[mm]	40	45	50	50	75	110	100	120	200
for edge distance	c	[mm]	70	45	50	50	80	200	190	320	400
Minimum edge distance	$c_{min}$	[mm]	40	-	-	-	-	150	130	240	300
for spacing	s	[mm]	80					210	190	240	350

m2, m2-C, m2-CG

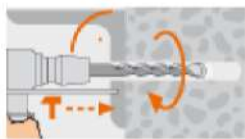
**Intended use**

Installation parameters

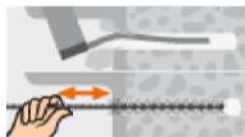
Minimum thickness of concrete member, minimum spacing and edge distances

**Annex B 2**

## Installation instructions



Drilling the hole



Cleaning the hole



Fixing plug and building material



Tightening with torque wrench and predetermined value of  $T_{inst}$



Tightened fixation

m2, m2-C, m2-CG

Intended use  
Installation instructions

Annex B 3

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

Fastener size			M6	M8 <sup>2)</sup>	M10x60 <sup>3)</sup>	M10 <sup>2)</sup>	M12 <sup>2)</sup>		M16	M20
Fastener length	L	[mm]					≤ 185	> 185		
Installation safety factor	γ <sub>inst</sub>	[-]	1,0					1,2		
Steel failure										
Characteristic resistance	N <sub>Rk,s</sub>	[kN]	10	19	33	33	43	43	77	124
Partial safety factor	γ <sub>Ms</sub> <sup>1)</sup>	[-]	1,4							
Pull-out failure										
Characteristic resistance	N <sub>Rk,p</sub>	[kN]	7,5	12	n.d. <sup>4)</sup>	16	24	24	30	50
Increasing factor for N <sub>Rk,p</sub>	ψ <sub>c</sub>	C30/37	1,17		1,22	1,17				
		C40/50	1,32		1,41	1,32				
		C50/60	1,42		1,55	1,42				
Concrete cone failure										
Effective embedment depth	h <sub>ef</sub>	[mm]	40	50	33	58	68		80	100
Factor uncracked concrete	k <sub>1</sub> =k <sub>ucr,N</sub>	[-]	11,0							
Spacing	s <sub>cr,N</sub>	[mm]	120	150	100	175	205		240	300
Edge distance	c <sub>cr,N</sub>	[mm]	60	75	50	87	102		120	150
Concrete splitting failure										
Spacing	s <sub>cr,sp</sub>	[mm]	200	250	165	290	340		400	500
Edge distance	c <sub>cr,sp</sub>	[mm]	100	125	82,5	145	170		200	250

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup> Valid for clip in annex A2

<sup>3)</sup> Only for application with statically indeterminate structural components.

<sup>4)</sup> Pull-out failure not decisive.

**Table C2: Displacements under tension load**

Fastener size			M6	M8	M10x60	M10	M12	M16	M20
Tension load	N	[kN]	3,6	5,7	4,6	7,6	9,9	11,9	19,8
Displacement	$\delta_{N0}$	[mm]	0,3		0,14	0,3			
	$\delta_{N\infty}$	[mm]	1,3						

m2, m2-C, m2-CG

**Performances**

Design method A, characteristic values under tension load  
Displacements under tension load

**Annex C 1**



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

Fastener size			M6	M8 <sup>2)</sup>	M10x60 <sup>2),3)</sup>	M10 <sup>2)</sup>	M12 <sup>2)</sup>		M16	M20
Fastener length L [mm]							≤ 185	> 185		
Steel failure without lever arm										
Characteristic resistance	V <sub>Rk,s</sub>	[kN]	4,5	11	18	18	24	28	33	51
Partial safety factor	γ <sub>Ms</sub> <sup>1)</sup>	[-]	1,5	1,29	1,27	1,27	1,25	1,33	1,5	
Steel failure with lever arm										
Characteristic resistance	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	12,0	27	56,8	56,8	91,6	104,7	249	486,2
Partial safety factor	γ <sub>Ms</sub> <sup>1)</sup>	[-]	1,5	1,29	1,27	1,27	1,25	1,33	1,5	
Concrete pryout failure										
Factor	k <sub>8</sub>	[-]	1,0				2,0			
Concrete edge failure										
Effective fastener length under shear load	l <sub>f</sub>	[mm]	40	50	33	58	68		80	100
external fastener diameter	d <sub>nom</sub>	[mm]	6	8	10	10	12		16	20

<sup>1)</sup> In absence of other national regulations.

<sup>2)</sup> valid for clip in annex A2

<sup>3)</sup> Only for application with statically indeterminate structural components.

**Table C4: Displacements under shear load**

Fastener size		M6	M8	M10x60	M10	M12	M16	M20
Shear load	[kN]	1,9	3,5	4,6	5,5	7,5	14	21,9
Displacement	$\delta_{VO}$ [mm]	1,6	2,2	2,1	2,4	2,7	3,3	3,8
	$\delta_{V\infty}$ [mm]	2,4	3,2	3,2	3,6	4,1	4,9	5,7

m2, m2-C, m2-CG

**Performances**

Design method A, characteristic values under shear load  
Displacements under shear load

**Annex C 2**