Declaration of Performance

2323-CPR-0061

1. Unique identification code of the product-type: Torque-controlled expansion anchor m1, m1-C, m1r and m1r-C for use in cracked and uncracked concrete

2. Manufacturer: Mungo Befestigungstechnik AG, Bornfeldstrasse 2, CH-4600 Olten/Switzerland

3. System/s of AVCP: System 1

4. Intended use or use/es:

Product	Intended use
Metal anchor for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units

5. European Assessment Document: EAD 330232-00-0601 Mechanical fasteners for use in concrete
European Technical Assessment: ETA-20/0295 of 08.12.2020
Technical Assessment Body: ETA-Danmark A/S
Notified body/ies: IFA GmbH & Co. KG, No. 2323

6. Declared performance:
Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic tension resistance acc. EN 1992-4	See appendix, especially Annex C1
Characteristic shear resistance acc. EN 1992-4	See appendix, especially Annex C2
Characteristic resistance under seismic action cat. C1 acc. TR049	See appendix, especially Annex C2

Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Characteristic tension resistance under fire acc. TR020	See appendix, especially Annex C3
Characteristic shear resistance under fire acc. TR020	See appendix, especially Annex C3

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.

Singed for and on behalf of the manufacturer by:
Robert Klemencic Dipl.-Ing.
Head of Engineering

ppa

Olten, 04.01.2021

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.

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Excerpt 1/7

Figure A1 Mungo m1 powerGrip anchor dimensions and marking

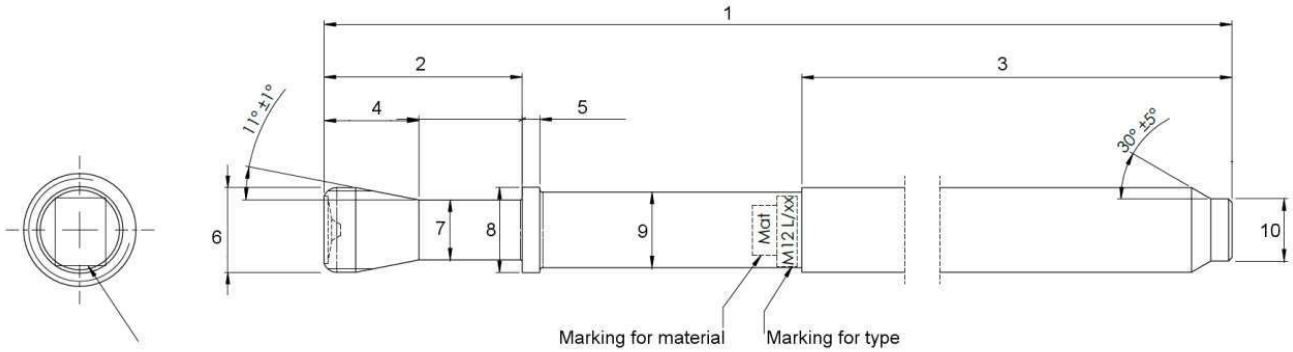

Table A1. Dimensions of the anchor

Pos.	[mm]									
	1	2	3	4	5	6	7	8	9	10
M8	L ± 2	20.5 ± 0.8	L1 +1/-0	9.5	2.5 ± 0.2	8.1 ± 0.3	5.6 ± 0.3	8.1 +0/-0.2	7.05 ± 0.10	6.0 ± 0.2
M10	L ± 2	25.4 ± 0.8	L1 +1/-0	11.8	2.5 ± 0.2	10.05 ± 0.3	7.2 ± 0.3	10.1 +0/-0.3	8.9 ± 0.10	8.0 ± 0.2
M12	L ± 2	28.2 ± 0.8	L1 +1/-0	13.5	2.5 ± 0.2	12.0 +0/-0.2	8.5 ± 0.1	12.1 +0/-0.3	10.7 ± 0.15	8.8 ± 0.2
M16	L ± 2	35.7 ± 0.8	L1 +1/-0	18.5	4.4 ± 0.2	15.9 +0/-0.2	11.2 ± 0.1	15.9 +0/-0.3	14.5 ± 0.15	12.3 ± 0.2

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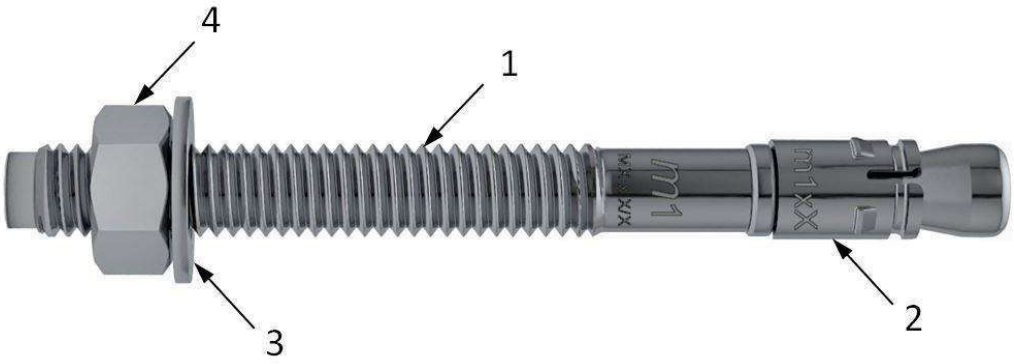
Table A2. Materials

	Designation	Material	
		m1	**m1r**
1	Bolt	Cold formed steel Surface Treatment 1: zinc plated (GreenTec) ≥ 5 µm Surface Treatment 2: Lubricating	Cold formed stainless steel (A4/316)
2	Clip	1.4404 SSTL, surface finish 2B	
3	Washer	Zinc plated (GreenTec) ≥ 5 µm	Stainless steel (A4/316)
		DIN125A (for type m1 and m1r), DIN9021 (for type m1-C and m1r-C)	
4	Hex-nut	Surface Treatment 1: zinc plated (GreenTec) ≥ 5 µm, DIN EN ISO 4032:2013-04	A4 acc. DIN EN ISO 4032:2013-04



Mungo m1 powerGrip	**Annex A2**
Product description Materials	of European Technical Assessment ETA-20/0295

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Use:
The anchors are intended to be used for anchorages for which requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements 1 and 4 of Regulation 305/2011 (EU) 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.

Anchors subject to:
- Static and quasi-static loads: sizes M8, M10, M12 and M16.
- Seismic loads performance category C1: sizes from M8 to M16
- Resistance to fire

Base materials:
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum to C50/60 at maximum according to EN 206.
- Cracked and Non-cracked concrete: sizes M8, M10, M12 and M16.

Temperature range:
- The covered temperature range of the anchorage base concrete during the working life is within the range -40 °C to +80 °C

Use conditions (Environmental conditions):
- The m1 and m1-C anchors may be used in structures subject to dry internal conditions only.
- The m1r and m1r-C anchors may be used in structures subject to external atmospheric exposure (including industrial and marine environment) and to permanent damp internal conditions if no particular aggressive conditions exist

Installation:
- The anchors may be installed in:
  - Dry concrete: sizes M8, M10, M12 and M16.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Check before placing the anchor to ensure that the strength class of the concrete, in which the anchor is to be placed, is identical with the values which the characteristic loads apply.
- Check of concrete being well compacted, e.g. without significant voids.
- Edge distances and spacings not less than the specified values without minus tolerances.
- Positioning of the 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 drill hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of load application.
- Cleaning of the hole of drilling dust
- Anchor installation such that the effective anchorage depth is complied with; the compliance is ensured if the thickness of the fixture is not larger than the maximum values given in Annex B2.
- Anchor expansion by impact on the wedge of the anchor; the anchor is properly set if the wedge is fully dropped in.

Proposed design methods:
- 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 transmitted. 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 and quasi-static loads are designed in accordance EN 1992-4

Mungo m1 powerGrip	**Annex B1** of European Technical Assessment ETA-20/0295
Intended use – Specification	

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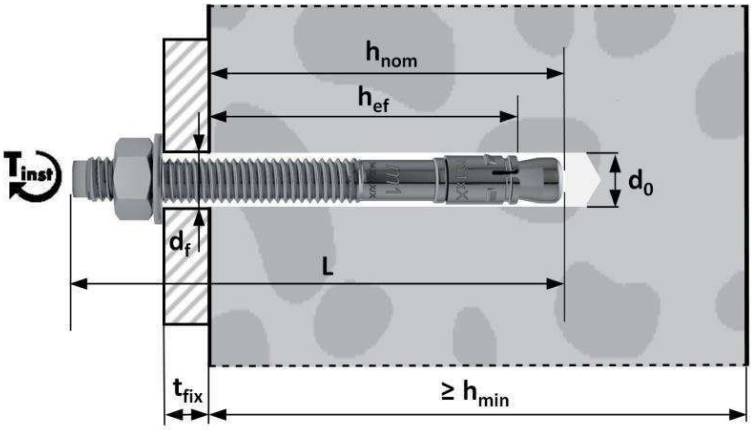
Table B1. Installation parameters



				M8	M10$_{hnom,1}$	M10$_{hnom,2}$	M12	M16
Nom. drill hole diameter	Ø d_0	[mm]	=	8	10	10	12	16
Max. cutting diameter of drill bit	Ø d_{cut}	[mm]	≤	8,45	10,45	10,45	12,50	16,50
Depth of length of bolt in drill hole	h_{nom}	[mm]	≥	55	50	70	81	98
Effective anchorage depth	h_{ef}	[mm]	≥	48	40	60	70	80
Diameter of clearance hole for in-place installation	d_f	[mm]	≤	9	12	12	14	18
Installation moment	T_{inst}	[Nm]	=	20	45	45	60	80
Torque wrench socket size	SW	[mm]	=	13	17	17	19	24

Table B2. Minimum thickness of member, minimum edge distance and minimum spacing

		m1				**m1r**			
		M8	M10$_{hnom,1}$ / M10$_{hnom,2}$	M12	M16	M8	M10$_{hnom,1}$ / M10$_{hnom,2}$	M12	M16
Minimum thickness of member	h_{min} [mm] =	110	120	140	160	100	120	140	160
Minimum edge distance	c_{min} [mm] =	70	55	60	90	50	65	60	70
Minimum spacing	s_{min} [mm] =	60	80	110	130	50	80	100	120

Mungo m1 powerGrip	**Annex B2**
Intended use – installation parameters	of European Technical Assessment ETA-20/0295

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Table C1: Characteristic resistance to tension load (static and quasi-static loading) according to EN 1992-4

			m1					m1r				
			M8	M10 $h_{nom,1}$	M10 $h_{nom,2}$	M12	M16	M8	M10 $h_{nom,1}$	M10 $h_{nom,2}$	M12	M16
Steel failure												
Resistance to steel failure	$N_{Rk,s}$	[kN]	19	33	33	43	77	19	33	33	46	82
Partial safety factor under tension load	γ_{Ms} [1)]	[-]	1,40					1,60				
Pull-out failure												
Resistance to pull-out failure in non-cracked concrete C20/25	$N_{Rk,p,ucr}$	[kN]	9,00	7,50	15,00	18,00	26,00	12,00	7,50	20,00	24,00	26,00
Increase factors for non-cracked concrete in C50/60	Ψ_c	[-]	1,41	1,27	1,42	1,58	1,33	1,41	1,29	1,38	1,48	1,58
Resistance to pull-out failure in cracked concrete C20/25	$N_{Rk,p,cr}$	[kN]	3,50	4,50	7,50	14,00	20,00	4,00	4,00	9,00	15,00	24,00
Increase factors for cracked concrete in C50/60	Ψ_c	[-]	1,44	1,36	1,58	1,47	1,52	1,58	1,58	1,58	1,58	1,51
Concrete cone failure												
Effective embedment depth	h_{ef}	[mm]	48	40	60	70	80	48	40	60	70	80
Faktor for cracked concrete	k_{cr}	[-]	7,7									
Faktor for non-cracked concrete	k_{ucr}	[-]	11,0									
Edge distance	$c_{cr,N}$	[mm]	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$	$1,5xh_{ef}$
Spacing	$s_{cr,N}$	[mm]	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$	$3xh_{ef}$
Robustness												
Installation safety factor	γ_{inst}	[-]	1,0					1,0				
Minimum edge distance and spacing												
Minimum edge distance	$s \geq$	[mm]	70	55	55	60	90	50	65	65	60	70
Minimum spacing distance	$c \geq$	[mm]	60	80	80	110	130	50	80	80	100	120
Min. thickness of the concrete member	h_{min}	[mm]	110	120	120	140	160	100	120	120	140	160
Edge distance to prevent splitting under load												
Characteristic edge distance	$c_{cr,sp}$	[mm]	96	120	120	140	140	96	120	120	140	160
Characteristic spacing	$s_{cr,sp}$	[mm]	192	240	240	280	280	192	240	240	280	320
Displacements under static and quasi-static loading												
Tension load	**N**	[kN]	4,29	3,57	7,14	8,57	12,38	5,71	3,57	9,52	11,43	12,38
Short time tension displacement	δ_{N0}	**[mm]**	0,01	0,12	0,01	0,26	0,41	0,09	0,14	0,21	0,39	0,16
Long-time tension displacement	$\delta_{N\infty}$	**[mm]**	0,96	0,65	1,03	1,01	1,49	1,01	0,69	1,63	1,30	1,39

[1)] In absence of other national regulation

Mungo m1 powerGrip	**Annex C1** of European Technical Assessment ETA-20/0295
Performance for static and quasi-static loads: Resistances	

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Table C2: Characteristic resistance to shear load (static and quasi-static loading) according to EN 1992-4

			m1					m1r				
			M8	M10 $h_{nom,1}$	M10 $h_{nom,2}$	M12	M16	M8	M10 $h_{nom,1}$	M10 $h_{nom,2}$	M12	M16
Resistance to steel failure under shear load												
Resistance to shear load without lever arm	$V^0_{Rk,s}$	[kN]	9,15	9,10	14,50	21,08	34,00	9,15	11,42	14,50	21,08	39,25
Partial safety factor under shear load	γ_{Ms} [1)]	[-]	1,50					1,33				
Resistance to shear load with lever arm	$M^0_{Rk,s}$	[kN]	30,16	58,90	58,90	101,79	241,27	30,16	58,90	58,90	101,79	241,27
Partial safety factor under shear load	γ_{Ms} [1)]	[-]	1,50					1,33				
Resistance to pry-out failure												
Factor for pry-out failure	k_8	[-]	1,0	1,0	2,0	2,0	2,0	1,0	1,0	2,0	2,0	2,0
Resistance to concrete edge failure												
Outside diameter of the fastener relevant for shear loading	d_{nom}	[mm]	8,00	10,00	10,00	12,00	16,00	8,00	10,00	10,00	12,00	16,00
Effective length of the fastener for transfer of shear load	l_f	[mm]	48	40	60	70	80	48	40	60	70	80
Displacements under static and quasi-static loading												
Shear load	V	[kN]	4,36	4,33	6,90	10,04	16,19	4,36	6,53	6,90	10,04	18,69
Short time shear displacement	δ_{V0}	[mm]	0,89	0,85	1,37	1,74	1,76	1,35	2,01	0,79	1,63	2,14
Long-time shear displacement	$\delta_{V\infty}$	[mm]	1,33	1,28	2,05	2,61	2,64	2,02	3,02	1,19	2,44	3,20

1) In absence of other national regulation

Table C3: Characteristic resistance to seismic performance category C1 acc. TR 049

			m1				m1r			
			M8	M10 $h_{nom,2}$	M12	M16	M8	M10 $h_{nom,2}$	M12	M16
Tension steel failure										
Characteristic steel failure	$N_{Rk,s,C1}$	[kN]	15,88	26,92	39,90	73,49	8,82	14,96	22,17	40,83
Partial safety factor	$\gamma_{MsN,seis}$ [1)]	[-]	1,4				1,4			
Pull-out failure mode										
Characteristic pull-out failure in C20/25	$N_{Rk,p,C1}$	[kN]	3,00	7,00	12,00	19,00	4,50	11,00	13,00	22,00
Partial safety factor	$\gamma_{Mp,seis}$ [1)]	[-]	1,5				1,5			
Shear steel failure										
Characteristic shear steel failure	$V_{Rk,s,C1}$	[kN]	9,15	14,50	21,08	34,00	9,15	14,50	21,08	39,25
Partial safety factor	$\gamma_{MsV,seis}$ [1)]	[-]	1,5				1,25			

1) The recommended partial safety factors under seismic action ($\gamma_{M,seis}$) are the same as for static loading

Mungo m1 powerGrip	**Annex C2** of European Technical Assessment ETA-20/0295
Performance for static, quasi-static and seismic loads: Resistances	

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Table C4: Resistance to fire

Characteristic values for tension load under fire exposure according to EOTA TR 020
Steel failure:

		m1				m1r			
		M8	$M10_{hnom,2}$	M12	M16	M8	$M10_{hnom,2}$	M12	M16
	$h_{ef} \geq$ [mm]	48	60	70	80	48	60	70	80
$N_{Rk,s,fi}$ [kN]	R30	0,50	1,18	2,26	4,02	1,01	1,96	3,39	6,03
	R60	0,45	1,02	1,70	3,02	0,80	1,57	2,83	5,03
	R90	0,35	0,79	1,47	2,61	0,60	1,26	2,26	4,02
	R120	0,25	0,63	1,13	2,01	0,50	1,10	1,81	3,22

Pullout failure (cracked and non-cracked concrete)

		m1				m1r			
		M8	$M10_{hnom,2}$	M12	M16	M8	$M10_{hnom,2}$	M12	M16
	$h_{ef} \geq$ [mm]	48	60	70	80	48	60	70	80
$N_{Rk,p,fi}$ [kN]	R30	2,40	3,94	4,86	6,77	3,14	5,11	6,01	6,46
	R60								
	R90								
	R120	1,92	3,15	3,89	5,42	2,51	4,09	4,81	5,17

Characteristic values for shear load under fire exposure according to EOTA TR 020
Steel failure without lever arm

		m1				m1r			
		M8	$M10_{hnom,2}$	M12	M16	M8	$M10_{hnom,2}$	M12	M16
	$h_{ef} \geq$ [mm]	48	60	70	80	48	60	70	80
$V_{Rk,s,fi}$ [kN]	R30	0,50	1,18	2,26	4,02	1,01	1,96	3,39	6,03
	R60	0,45	1,02	1,70	3,02	0,80	1,57	2,83	5,03
	R90	0,35	0,79	1,47	2,61	0,60	1,26	2,26	4,02
	R120	0,25	0,63	1,13	2,01	0,50	1,10	1,81	3,22

Characteristic values for shear load under fire exposure according to EOTA TR 020
Steel failure with lever arm

		m1				m1r			
		M8	$M10_{hnom,2}$	M12	M16	M8	$M10_{hnom,2}$	M12	M16
	$h_{ef} \geq$ [mm]	48	60	70	80	48	60	70	80
$M^0_{Rk,s,fi}$ [Nm]	R30	0,60	1,77	4,07	9,65	1,21	2,95	6,11	14,48
	R60	0,54	1,53	3,05	7,24	0,97	2,36	5,09	12,06
	R90	0,42	1,18	2,65	6,27	0,72	1,88	4,07	9,65
	R120	0,30	0,94	2,04	4,83	0,60	1,65	3,26	7,72

The recommended partial safety factors under fire are $\gamma_{M,fi} = 1,0$ and $\gamma_{inst} = 1,0$

Table C5: Reaction to fire
The anchors are made from steel and is classified as reaction to fire Class A1 as provided for in the Delegated Regulation 2016/364/EC and EN 13501-1

Mungo m1 powerGrip	**Annex C3** of European Technical Assessment ETA-20/0295
Performance for exposure to fire	

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