Declaration of Performance

0679-CPR-0832

1. Unique identification code of the product-type: Torque-controlled expansion anchor m1t and m1t-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, October 2016
   European Technical Assessment: ETA-12/0547 of 19/07/2017
   Technical Assessment Body: CSTB - Centre Scientifique et Technique du Bâtiment
   Notified body/ies: n°0679 - CSTB le futur en construction

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

Essential characteristic	Performance
Characteristic tension resistance acc. ETAG001, Annex C	See appendix, especially Annex C1
Characteristic shear resistance acc. ETAG001, Annex C	See appendix, especially Annex C2
Characteristic tension resistance acc. CEN/TS 1992-4	See appendix, especially Annex C5
Characteristic shear resistance acc. CEN/TS 1992-4	See appendix, especially Annex C6
Characteristic resistance under seismic action Cat 1 acc. TR045	See appendix, especially Annex C9
Characteristic resistance under seismic action Cat 2 acc. TR045	See appendix, especially Annex C10
Displacements	See appendix, especially Annex C11

   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. ETAG001, Annex C	See appendix, especially Annex C3
Characteristic shear resistance under fire acc. ETAG001, Annex C	See appendix, especially Annex C4
Characteristic tension resistance under fire acc. CEN/TS 1992-4	See appendix, especially Annex C7
Characteristic shear resistance under fire acc. CEN/TS 1992-4	See appendix, especially Annex C8

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.
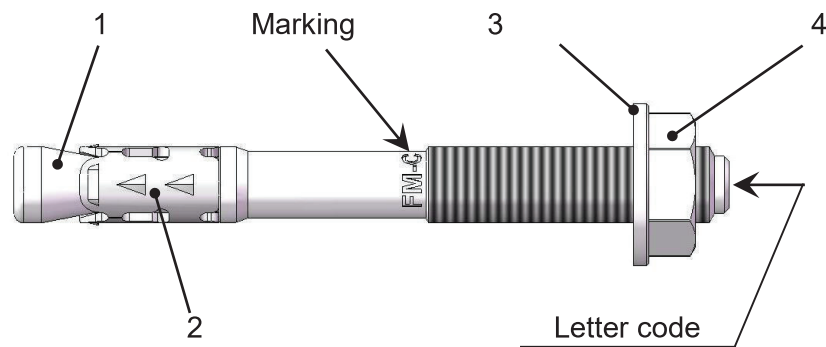
Singed for and on behalf of the manufacturer by:

Dipl.-Ing. Robert Klemencic
Head of Engineering
Olten, 2020-07-09

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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Assembled anchor:

1. Bolt
2. Expansion sleeve
3. Washer
4. Hexagonal nut

<u>**Marking on the bolt:**</u>

FM-C (product name)

followed by MX/Y where

MX   =   thread diameter
Y   =   fixture thickness

Table 1: Materials

Part	Designation	Material	Protection
1	Bolt	M8 and M10: 19MnB4 DIN 1654-T4	Galvanised $\geq$ 8µm
		M12 and M16 C30BKD EU 119-74	
2	Expansion sleeve	Stainless steel X2CrNiMo 17-12-2 UNI EN 10088/2	-
3	Washer	C-steel DIN 125/1 (normal), DIN 9021 (large)	Galvanised $\geq$ 8µm
4	Hexagonal nut	C-steel DIN 934, steel grade 8	Galvanised $\geq$ 8µm

Mungo m1t- expansion anchor

Product description

Installation condition - Materials

Annex A1

Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads,
- Seismic load (category C2) loads,
- Fire.

Base materials:
- Cracked concrete and non-cracked concrete
- Reinforced or unreinforced normal weight concrete of strength classes C 20/25 at least to C50/60 at most according to ENV 206: 2000-12.

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions.

Design:
- The anchorages are designed in accordance with the ETAG001 Annex C "Design Method for Anchorages" or CEN/TS 1992-4-4 " Design of fastenings for use in concrete" under the responsibility of an engineer experienced in anchorages and concrete work.
- For seismic application the anchorages are designed in accordance with TR045 "Design of Metal Anchors For Use In Concrete Under Seismic Actions".
- For application with resistance under fire exposure the anchorages are designed in accordance with method given in TR020 "Evaluation of Anchorage in Concrete concerning Resistance to Fire".
- 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.

Installation:
- Anchor installation 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.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Effective anchorage depth, edge distances and spacing not less than the specified values without minus tolerances.
- Hole drilling by hammer drill.
- Cleaning of the hole of drilling dust.
- Application of specified torque moment using a calibrated torque wrench.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength mortar and no shear or oblique tension loads in the direction of aborted hole.
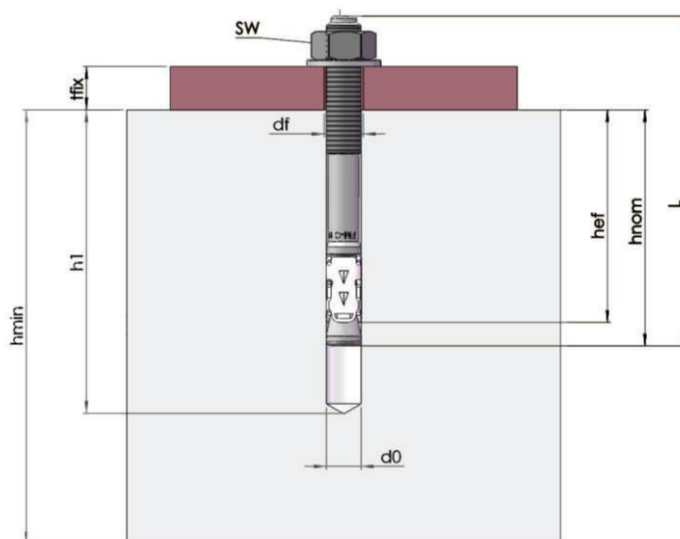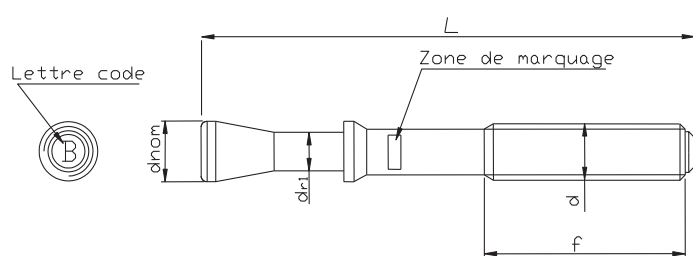
Mungo m1t- expansion anchor	
Intended Use Specifications	**Annex B1**

Table 2: Anchor dimensions

	d x L	Marking	Letter code ID	L (mm)	d_{nom} (mm)	d_{r1} (mm)	f (mm)
M8	M8x68	FM-C 8/4	A	68	8	5,8	30
	M8x75	FM-C 8/10	B	75			30
	M8x90	FM-C 8/25	C	90			40
	M8x115	FM-C 8/50	D	115			60
	M8x135	FM-C 8/70	E	135			80
	M8x165	FM-C 8/100	G	165			80
M10	M10x90	FM-C 10/10	A	90	10	7,4	40
	M10x105	FM-C 10/25	B	105			55
	M10x115	FM-C 10/35	C	115			55
	M10x135	FM-C 10/55	D	135			85
	M10x155	FM-C 10/75	E	155			85
	M10x185	FM-C 10/105	F	185			85
M12	M12x110	FM-C 12/10	A	110	12	8,8	65
	M12x120	FM-C 12/20	B	120			65
	M12x145	FM-C 12/45	C	145			85
	M12x170	FM-C 12/70	D	170			85
	M12x200	FM-C 12/100	E	200			85
M16	M16x130	FM-C 16/10	A	130	16	11,8	65
	M16x150	FM-C 16/30	B	150			85
	M16x185	FM-C 16/60	C	185			85
	M16x220	FM-C 16/100	D	220			85

Mungo m1t- expansion anchor	
Intended Use Installation parameters	**Annex B2**

Table 3: Installation data

	dxL	ID	t_{fix} (mm)	d_0 (mm)	h_1 (mm)	h_{nom} (mm)	h_{ef} (mm)	d_f (mm)	h_{min} (mm)	T_{inst} (Nm)	sw (mm)	Marking
M8	M8x68	A	4	8	70	54	48	9	100	20	13	FM-C 8/4
	M8x75	B	10									FM-C 8/10
	M8x90	C	25									FM-C 8/25
	M8x115	D	50									FM-C 8/50
	M8x135	E	70									FM-C 8/70
	M8x165	G	100									FM-C 8/100
M10	M10x90	A	10	10	80	67	60	12	120	40	17	FM-C 10/10
	M10x105	B	25									FM-C 10/25
	M10x115	C	35									FM-C 10/35
	M10x135	D	55									FM-C 10/55
	M10x155	E	75									FM-C 10/75
	M10x185	F	105									FM-C 10/105
M12	M12x110	A	10	12	100	81	72	14	150	60	19	FM-C 12/10
	M12x120	B	20									FM-C 12/20
	M12x145	C	45									FM-C 12/45
	M12x170	D	70									FM-C 12/70
	M12x200	E	100									FM-C 12/100
M16	M16x130	A	10	16	115	97	86	18	170	120	24	FM-C 16/10
	M16x150	B	30									FM-C 16/30
	M16x185	C	60									FM-C 16/60
	M16x220	D	100									FM-C 16/100

			M8	M10	M12	M16
Min. member thickness	h_{min}	[mm]	100	120	150	170
Minimum edge distance	c_{min}	[mm]	50	60	70	85
Corresponding spacing	s ≥	[mm]	75	120	150	170
Minimum spacing	s_{min}	[mm]	50	60	70	80
Corresponding edge distance	c ≥	[mm]	65	80	90	120

Mungo m1t- expansion anchor

Intended Use
Installation parameters

Annex B3

Table 4: Characteristic values for tension loads in case of static and quasi static loading for design design method A acc. ETAG001, Annex C

			M8	M10	M12	M16
Steel failure						
Char. resistance	$N_{Rk,s}$	[kN]	23,8	38,7	54,7	98,4
Partial safety factor	γ_{Ms}[1]	[-]	1,5			
Pullout failure $N_{Rk,p} = \Psi_c \times N^0_{Rk,p}$						
Char. resistance in concrete C20/25 — non-cracked	$N^0_{Rk,p}$	[kN]	**9**	**16**	**20**	**35**
Char. resistance in concrete C20/25 — cracked	$N^0_{Rk,p}$	[kN]	**6**	**12**	**16**	**20**
Partial safety factor for cracked or non-cracked concrete	γ_{Mp}[1]	[-]	1,5[2]			
Increasing factor for N_{RK} — concrete C30/37		[-]	1,22			
Increasing factor for N_{RK} — concrete C40/50	Ψ_c	[-]	1,41			
Increasing factor for N_{RK} — concrete C50/60		[-]	1,55			
Concrete cone failure and splitting failure						
Effective embedment depth	h_{ef}	[mm]	48	60	72	86
Partial safety factor for craked or non-cracked concrete	$\gamma_{Mc} = \gamma_{Msp}$[1]	[-]	1,5[2]			
Increasing factor for N_{RK} — concrete C30/37		[-]	1,22			
Increasing factor for N_{RK} — concrete C40/50	Ψ_c	[-]	1,41			
Increasing factor for N_{RK} — concrete C50/60		[-]	1,55			
Char. spacing — concrete cone failure	$s_{cr,N}$	[mm]	140	180	220	260
Char. spacing — splitting failure	$s_{cr,sp}$	[mm]	290	360	430	520
Char. edge distance — concrete cone failure	$c_{cr,N}$	[mm]	70	90	110	130
Char. edge distance — splitting failure	$c_{cr,sp}$	[mm]	145	180	215	260

[1] In absence of other national regulations
[2] The value contains an installation safety factor $\gamma_2 = 1.0$

Mungo m1t- expansion anchor

Design according to ETAG001, Annex C
Characteristic resistance under tension loads

Annex C1

Table 5: Characteristic values for shear loads in case of static and quasi static loading for design design method A acc. ETAG001, Annex C

			M8	M10	M12	M16
Steel failure without lever arm						
Char. resistance	$V_{Rk,s}$	[kN]	12,9	24,2	33,8	66,4
Partial safety factor	γ_{Ms}[1]	[-]	1,5			
Steel failure with lever arm						
Char. bending resistance	$M^0_{Rk,s}$	[Nm]	34	67	118	300
Partial safety factor	γ_{Ms}[1]	[-]	1,5			
Concrete pry-out failure						
Factor in equation (5.6) of ETAG Annex C, § 5.2.3.3	k	[-]	1,0	2,0	2,0	2,0
Partial safety factor	γ_{Mc}[1]	[-]	1,5[2]			
Concrete edge failure						
Effective length of anchor under shear loading	l_f	[mm]	48	60	72	86
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16
Partial safety factor	γ_{Mc}[1]	[-]	1,5[2]			

[1] In absence of other national regulations

[2] The value contains an installation safety factor γ_2= 1.0

Mungo m1t- expansion anchor

Design according to ETAG001, Annex C
Characteristic resistance under shear loads

Annex C2

Table 6: Characteristic tension resistance in cracked and non-cracked concrete under fire exposure for design method A acc. ETAG001, Annex C

			M8	M10	M12	M16
Steel failure						
Characteristic resistance	R30 $N_{Rk,s,fi}$	[kN]	0,4	0,9	1,7	3,1
	R60 $N_{Rk,s,fi}$	[kN]	0,3	0,8	1,3	2,4
	R90 $N_{Rk,s,fi}$	[kN]	0,3	0,6	1,1	2,0
	R120 $N_{Rk,s,fi}$	[kN]	0,2	0,5	0,8	1,6
Pullout failure (cracked and non-cracked concrete)						
Char. resistance in concrete ≥ C20/25	R30 $N_{Rk,p,fi}$	[kN]	1,5	3,0	4,0	5,0
	R60 $N_{Rk,p,fi}$	[kN]	1,5	3,0	4,0	5,0
	R90 $N_{Rk,p,fi}$	[kN]	1,5	3,0	4,0	5,0
	R120 $N_{Rk,p,fi}$	[kN]	1,2	2,4	3,2	4,0
Concrete cone and splitting failure[2] (cracked and non-cracked concrete)						
Char. resistance in concrete ≥ C20/25	R30 $N^0_{Rk,c,fi}$	[kN]	2,9	5,0	7,9	12,3
	R60 $N^0_{Rk,c,fi}$	[kN]	2,9	5,0	7,9	12,3
	R90 $N^0_{Rk,c,fi}$	[kN]	2,9	5,0	7,9	12,3
	R120 $N^0_{Rk,c,fi}$	[kN]	2,3	4,0	6,3	9,9
Characteristic spacing	$s_{cr,N,fi}$	[mm]	4 x h_{ef}			
Characteristic edge distance	$c_{cr,N,fi}$	[mm]	2 x h_{ef}			

[1] Design under fire exposure is performed according to the design method given in TR020. Under fire exposure usually cracked concrete is assumed. The design equations are given in TR020, Section 2.2.1.

[2] As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

TR020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} ≥ 300$ mm and ≥ 2 · h_{ef}.

Mungo m1t- expansion anchor

Design according to ETAG001, Annex C
Characteristic tension resistance under fire exposure

Annex C3

Table 7: Characteristic shear resistance in cracked and non-cracked concrete under fire exposure for design method A acc. ETAG001, Annex C

			M8	M10	M12	M16
Steel failure without lever arm						
Characteristic resistance	R30 $V_{Rk,s,fi}$	[kN]	0,4	0,9	1,7	3,1
	R60 $V_{Rk,s,fi}$	[kN]	0,3	0,8	1,3	2,4
	R90 $V_{Rk,s,fi}$	[kN]	0,3	0,6	1,1	2,0
	R120 $V_{Rk,s,fi}$	[kN]	0,2	0,5	0,8	1,6
Steel failure with lever arm						
Characteristic bending moment	R30 $M^0_{Rk,s,fi}$	[Nm]	0,4	1,1	2,6	6,7
	R60 $M^0_{Rk,s,fi}$	[Nm]	0,3	1,0	2,0	5,0
	R90 $M^0_{Rk,s,fi}$	[Nm]	0,3	0,7	1,7	4,3
	R120 $M^0_{Rk,s,fi}$	[Nm]	0,2	0,6	1,3	3,3
Concrete pry-out failure						
Factor in equation (5.6) of ETAG Annex C, § 5.2.3.3	k	[-]	1,0	2,0	2,0	2,0
Characteristic resistance	R30 $V_{Rk,cp,fi}$	[kN]	2,9	10,0	15,8	24,7
	R60 $V_{Rk,cp,fi}$	[kN]	2,9	10,0	15,8	24,7
	R90 $V_{Rk,cp,fi}$	[kN]	2,9	10,0	15,8	24,7
	R120 $V_{Rk,cp,fi}$	[kN]	2,3	8,0	12,7	19,8
Concrete edge failure						
Eff. length of anchor under shear loading	l_f	[mm]	48	60	72	86
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16

[1] Design under fire exposure is performed according to the design method given in TR020. Under fire exposure usually cracked concrete is assumed. The design equations are given in TR020, Section 2.2.2.

TR020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} \geq 300$ mm and $\geq 2 \cdot h_{ef}$.

Mungo m1t- expansion anchor

Design according to ETAG001, Annex C
Characteristic shear resistance under fire exposure

Annex C4

Table 8: Characteristic values for tension loads in case of static and quasi static loading for design design method A acc. CEN/TS 1992-4

				M8	M10	M12	M16
Steel failure							
Char. resistance		$N_{Rk,s}$	[kN]	23,8	38,7	54,7	98,4
Partial safety factor		$\gamma_{Ms}^{1)}$	[-]	1,5			
Pullout failure $N_{Rk,p} = \Psi_c \times N^0_{Rk,p}$							
Char. resistance in concrete C20/25	non-cracked	$N^0_{Rk,p}$	[kN]	**9**	**16**	**20**	**35**
	cracked	$N^0_{Rk,p}$	[kN]	**6**	**12**	**16**	**20**
Partial safety factor for cracked or non-cracked concrete		$\gamma_{Mp}^{1)}$	[-]	$1,5^{2)}$			
Increasing factor for $N_{RK,p}$	concrete C30/37		[-]	1,22			
	concrete C40/50	Ψ_c	[-]	1,41			
	concrete C50/60		[-]	1,55			
Concrete cone failure and splitting failure							
Effective embedment depth		h_{ef}	[mm]	48	60	72	86
Factor for cracked concrete		k_{cr}		7,2			
Factor for non cracked concrete		k_{ucr}		10,1			
Partial safety factor		$\gamma_{Mc} = \gamma_{Msp}^{1)}$		$1,5^{2)}$			
Char. spacing	concrete cone failure	$s_{cr,N}$	[mm]	140	180	220	260
	splitting failure	$s_{cr,sp}$	[mm]	290	360	430	520
Char. edge distance	concrete cone failure	$c_{cr,N}$	[mm]	70	90	110	130
	splitting failure	$c_{cr,sp}$	[mm]	145	180	215	260

[1] In absence of other national regulations
[2] The value contains an installation safety factor $\gamma_2 = 1.0$

Mungo m1t- expansion anchor	**Annex C5**
Design according to CEN/TS 1992-4 Characteristic resistance under tension loads	

Table 9: Characteristic values for shear loads in case of static and quasi static loading for design design method A acc. CEN/TS 1992-4

			M8	M10	M12	M16
Steel failure without lever arm						
Char. resistance	$V_{Rk,s}$	[kN]	12,9	24,2	33,8	66,4
Factor considering ductility	k_2	[-]	0,8			
Partial safety factor	γ_{Ms}[1]	[-]	1,5			
Steel failure with lever arm						
Char. bending moment	$M^0_{Rk,s}$	[Nm]	34	67	118	300
Partial safety factor	γ_{Ms}[1]	[-]	1,5			
Concrete pry-out failure						
Factor in equation (16) of CEN/TS 1992-4-4, § 6.2.2.3	k_3	[-]	1,0	2,0	2,0	2,0
Partial safety factor	γ_{Mc}[1]	[-]	1,5[2]			
Concrete edge failure						
Effective length of anchor under shear loading	l_f	[mm]	48	60	72	86
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16
Partial safety factor	γ_{Mc}[1]	[-]	1,5[2]			

[1] En absence de réglementation nationale

[2] La valeur comprend un coefficient de sécurité d'installation γ_2= 1.0

Mungo m1t- expansion anchor	**Annex C6**
Design according to CEN/TS 1992-4 Characteristic resistance under shear loads	

Table 10: Characteristic tension resistance in cracked and non-cracked concrete under fire exposure for design method A acc. CEN/TS 1992-4

			M8	M10	M12	M16
Steel failure						
Characteristic resistance	R30 $N_{Rk,s,fi}$	[kN]	0,4	0,9	1,7	3,1
	R60 $N_{Rk,s,fi}$	[kN]	0,3	0,8	1,3	2,4
	R90 $N_{Rk,s,fi}$	[kN]	0,3	0,6	1,1	2,0
	R120 $N_{Rk,s,fi}$	[kN]	0,2	0,5	0,8	1,6
Pullout failure (cracked and non-cracked concrete)						
Char. resistance in concrete ≥ C20/25	R30 $N_{Rk,p,fi}$	[kN]	1,5	3,0	4,0	5,0
	R60 $N_{Rk,p,fi}$	[kN]	1,5	3,0	4,0	5,0
	R90 $N_{Rk,p,fi}$	[kN]	1,5	3,0	4,0	5,0
	R120 $N_{Rk,p,fi}$	[kN]	1,2	2,4	3,2	4,0
Concrete cone and splitting failure[2] (cracked and non-cracked concrete)						
Char. resistance in concrete ≥ C20/25	R30 $N^0_{Rk,c,fi}$	[kN]	2,9	5,0	7,9	12,3
	R60 $N^0_{Rk,c,fi}$	[kN]	2,9	5,0	7,9	12,3
	R90 $N^0_{Rk,c,fi}$	[kN]	2,9	5,0	7,9	12,3
	R120 $N^0_{Rk,c,fi}$	[kN]	2,3	4,0	6,3	9,9
Characteristic spacing	$s_{cr,N,fi}$	[mm]	4 x h_{ef}			
Characteristic edge distance	$c_{cr,N,fi}$	[mm]	2 x h_{ef}			

[1] Design under fire exposure is performed according to the design method given in TR020. Under fire exposure usually cracked concrete is assumed. The design equations are given in TR020, Section 2.2.1.

[2] As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

TR020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} ≥ 300$ mm and $≥ 2 \cdot h_{ef}$.

Mungo m1t- expansion anchor	**Annex C7**
Design according to CEN/TS 1992-4 Characteristic tension resistance under fire exposure	

Table 11: Characteristic shear resistance in cracked and non-cracked concrete under fire exposure for design method A acc. CEN/TS 1992-4

			M8	M10	M12	M16
Steel failure without lever arm						
Characteristic resistance	R30 $V_{Rk,s,fi}$	[kN]	0,4	0,9	1,7	3,1
	R60 $V_{Rk,s,fi}$	[kN]	0,3	0,8	1,3	2,4
	R90 $V_{Rk,s,fi}$	[kN]	0,3	0,6	1,1	2,0
	R120 $V_{Rk,s,fi}$	[kN]	0,2	0,5	0,8	1,6
Steel failure with lever arm						
Characteristic bending moment	R30 $M^0_{Rk,s,fi}$	[Nm]	0,4	1,1	2,6	6,7
	R60 $M^0_{Rk,s,fi}$	[Nm]	0,3	1,0	2,0	5,0
	R90 $M^0_{Rk,s,fi}$	[Nm]	0,3	0,7	1,7	4,3
	R120 $M^0_{Rk,s,fi}$	[Nm]	0,2	0,6	1,3	3,3
Concrete pry-out failure						
Factor in equation (16) of CEN/TS 1992-4-4, § 6.2.2.3	k_3	[-]	1,0	2,0	2,0	2,0
Characteristic resistance	R30 $V_{Rk,cp,fi}$	[kN]	2,9	10,0	15,8	24,7
	R60 $V_{Rk,cp,fi}$	[kN]	2,9	10,0	15,8	24,7
	R90 $V_{Rk,cp,fi}$	[kN]	2,9	10,0	15,8	24,7
	R120 $V_{Rk,cp,fi}$	[kN]	2,3	8,0	12,7	19,8
Concrete edge failure						
Eff. length of anchor under shear loading	l_f	[mm]	48	60	72	86
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16

[1] Design under fire exposure is performed according to the design method given in TR020. Under fire exposure usually cracked concrete is assumed. The design equations are given in TR020, Section 2.2.2.

TR020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to $c_{min} \geq 300$ mm and $\geq 2 \cdot h_{ef}$.

Mungo m1t- expansion anchor	
Design according to CEN/TS 1992-4 Characteristic shear resistance under fire exposure	**Annex C8**

Table 12: Characteristic values for resistance in case of seismic performance category C1 acc. TR045 "Design of Metal anchor under Seismic Actions"

Anchor sizes			M8	M10	M12	M16
Tension load						
Steel failure						
Characteristic resistance	$N_{Rk,s,seis}$	[kN]	23,8	38,7	54,7	98,4
Partial safety factor[1)]	$\gamma_{Ms,seis}$	[-]	1,5			
Pull-out failure $N_{Rk,p,seis} = \Psi_c \times N^0_{Rk,p,seis}$						
Characteristic resistance	$N^0_{Rk,p,seis}$	[kN]	6	12	16	20
Partial safety factor[1)]	$\gamma_{Mp, seis}$	[-]	1,5			
Shear loads						
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s,seis}$	[kN]	7,7	17,0	30,4	57,6
Partial safety factor[1)]	$\gamma_{Ms, seis}$	[-]	1,5			

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

Mungo m1t- expansion anchor	**Annex C9**
Design according to TR045 Characteristic resistance under seismic actions	

Table 13: Characteristic values for resistance in case of seismic performance category C2 acc. TR045 "Design of Metal anchor under Seismic Actions"

Anchor sizes			M8	M10	M12	M16
Tension load						
Steel failure						
Characteristic resistance [2]	$N_{Rk,s,seis}$	[kN]	-	38,7	54,7	98,4
Partial safety factor[3]	$\gamma_{Ms,seis}$	[-]	1,5			
Pull-out failure $\quad N_{Rk,p,seis} = \Psi_c \times N^0_{Rk,p,seis}$						
Characteristic resistance[2]	$N^0_{Rk,p,seis}$	[kN]	-	3,3	11,8	20,0
Partial safety factor[3]	$\gamma_{Mp, seis}$	[-]	1,5			
Displacement at DLS[1] [2]	$\delta_{N,sei\ (DSL)}$	[mm]	-	2,5	5,0	4,4
Displacement at DLS [1] [2]	$\delta_{N,sei\ (ULS)}$	[mm]	-	10,7	20,4	17,8
Shear loads						
Steel failure without lever arm						
Characteristic resistance[2]	$V_{Rk,s,seis}$	[kN]	-	11,9	19,3	31,2
Partial safety factor[3]	$\gamma_{Ms, seis}$	[-]	1,5			
Displacement at DLS [1] [2]	$\delta_{V,sei\ (DSL)}$	[mm]	-	5,0	7,0	7,0
Displacement at DLS[1] [2]	$\delta_{V,sei\ (ULS)}$	[mm]	-	7,1	9,1	6,6

1) The listed displacements represent mean values.
2) A smaller displacement may be required in the design provisions stated in section "Design of Anchorage", e.g. in the case of displacement sensitive fastenings or "rigid" supports. The characteristic resistance associated with such smaller displacement may be determined by linear interpolation or proportional reduction.
3) The recommended partial safety factors under seismic action ($\gamma_{M,seis}$) are the same as for static loading.

Mungo m1t- expansion anchor	
Design according to TR045 Characteristic resistance under seismic actions	**Annex C10**

Table 14: Displacements under tension loading

			M8	M10	M12	M16
Tension load in non-cracked concrete C20/25 [kN]			4,29	7,62	9,52	16,67
Displacement	δ_{N0}	[mm]	0,1	0,1	0,1	0,1
	$\delta_{N\infty}$	[mm]	0,5	0,5	0,5	0,5
Tension load in non-cracked concrete C50/60 [kN]			6,64	11,91	14,76	25,83
Displacement	δ_{N0}	[mm]	0,1	0,2	0,2	0,3
	$\delta_{N\infty}$	[mm]	0,5	0,5	0,5	0,5
Tension load in cracked concrete C20/25 [kN]			2,86	5,71	7,62	9,52
Displacement	δ_{N0}	[mm]	1,4	1,2	0,9	0,6
	$\delta_{N\infty}$	[mm]	1,4	1,2	1,3	0,6
Tension load in cracked concrete C50/60 [kN]			4,43	8,86	11,81	14,76
Displacement	δ_{N0}	[mm]	1,8	1,8	1,8	1,8
	$\delta_{N\infty}$	[mm]	1,8	1,8	1,8	1,8

Table 15: Displacements under shear loads

			M8	M10	M12	M16
Shear load in cracked and non-cracked concrete C20/25 to C50/60		**[kN]**	6,19	11,43	16,19	31,43
Displacement	δ_{V0}	[mm]	2,3	2,6	2,9	3,3
	$\delta_{V\infty}$	[mm]	3,4	3,9	4,3	4,9

Additional displacement due to anular gap between anchor and fixture is to be taken into account.

Mungo m1t- expansion anchor	**Annex C11**
Design Displacements	