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European Technical Assessment

ETA 12/0397
10/06/2025

English translation prepared by IETcc. Original version in Spanish language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)
Trade name of the construction product	**Anchors MTP**
Product family to which the construction product belongs	Torque controlled expansion anchor made of galvanized steel, sherardized steel or stainless steel of sizes M8, M10, M12, M16, M20 and M24 for use in cracked or uncracked concrete
Manufacturer	**Index - Técnicas Expansivas S.L.** Segador 13 26006 Logroño (La Rioja) Spain. website: www.indexfix.com
Manufacturing plant	Index plant 2
This European Technical Assessment contains	22 pages including 3 annexes which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	European Assessment Document EAD 330232-01-0601 “Mechanical Fasteners for use in concrete”, ed. December 2019
This ETA replaces	ETA 12/0397 revision 6 dated 26/06/2024

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SPECIFIC PART

1. Technical description of the product

The Index MTP range wedge anchors are torque-controlled, mechanical expansion anchors consisting of an anchor body, expansion clip, nut, and washer. The anchor body has a tapered mandrel formed on the installed end of the anchor and a threaded section at the opposite end. The taper of the mandrel increases in diameter towards the installed end of the anchor. The three-segment expansion clip wraps around the tapered mandrel. Before installation, this expansion clip is free to rotate about the mandrel. The anchor is set by applying torque to the hex nut; the mandrel is drawn into the expansion clip, which engages the drilled hole and transfers the load to the base material. The anchorage is characterized by friction between expansion clip and concrete.

The Index MTP wedge anchor in the range of M8, M10, M12, M16, M20 and M24 is an anchor made of galvanised steel. The Index MTP-AT wedge anchor in the range of M8, M10, M12, M16 and M20 is an anchor coated in zinc-nickel. The Index MTP-G wedge anchor in the range of M8, M10, M12, M16 and M20 is an anchor made of sherardized steel. The Index MTP-X wedge anchor in the range of M8, M10, M12, M16 and M20 is an anchor made of galvanized steel. The Index MTP-A4 wedge anchor in the range of M8, M10, M12, M16 and M20 is an anchor made of stainless steel.

Product and installation descriptions are given in annexes A1 and A2.

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

2.1 Intended use

This ETA covers fasteners to be used in compacted, reinforced or unreinforced, normal weigh, cracked or uncracked concrete with strength classes in the range of C20/25 to C50/60 all in accordance with EN 206, for static or quasi-static or under seismic actions (categories C1 and C2) and with requirements related to fire exposure, loaded in tension, shear or combined tension and shear.

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.

2.2 Relevant general conditions for the use of the product

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the fastener for the intended use of 50 years when installed in the works (provided that the fastener is subject to appropriate installation). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or its representative nor by EOTA when drafting the EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a mean for expressing the expected economically reasonable working life of the product.

This ETA covers fasteners for installation in pre-drilled holes in compacted reinforced or unreinforced normal weight concrete considering annexes B and C.

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

The identification tests and the assessment for the intended use of this product according to the Basic Work Requirements (BWR) were carried out in compliance with EAD 330232-01-0601. The

characteristics of each system shall correspond to the respective values laid down in following tables of this ETA, checked by IETcc.

Methods of verification and of assessing and judging are listed afterwards.

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Relevant clause in EAD	Performance	Annex
Resistance to steel failure	2.2.1	$N_{Rk,s}$ [kN]	C3, C4
Resistance to pull-out failure	2.2.2	$N_{Rk,p}$ [kN] ψ_c [-]	C3, C4
Resistance to concrete cone failure	2.2.3	$k_{cr,N}$, $k_{ucr,N}$ [-] h_{ef}, $c_{cr,N}$ [mm]	C3, C4
Robustness	2.2.4	γ_{inst} [-]	C3, C4
Minimum edge distance and spacing	2.2.5	c_{min}, s_{min}, h_{min} [mm]	C1
Edge distance to prevent splitting under load	2.2.6	$N^0_{Rk,sp}$ [kN], $c_{cr,sp}$ [mm]	C3, C4
Resistance to steel failure under shear load	2.2.7	$V^0_{Rk,s}$ [kN], $M^0_{Rk,s}$ [Nm], k_7 [-]	C5
Resistance to pry-out failure	2.2.8	k_8 [-]	C5
Displacement under static and quasi-static loading	2.2.10	δ_{N0}, $\delta_{N\infty}$, δ_{V0}, $\delta_{V\infty}$ [mm]	C6
Resistance to seismic tension loads; displacements	2.2.11 2.2.12	$N_{Rk,s,C1}$, $N_{Rk,p,C1}$ [kN] $N_{Rk,s,C2}$, $N_{Rk,p,C2}$ [kN], $\delta_{N,C2}$ [mm]	C7 to C10
Resistance to seismic shear loads; displacements	2.2.13 2.2.14	$V_{Rk,s,C1}$ [kN], $V_{Rk,s,C2}$ [kN], $\delta_{V,C2}$ [mm]	C7 to C10
Factor for annular gap	2.2.15	α_{gap} [-]	C7 to C10

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Relevant clause in EAD	Performance	Annex
Reaction to fire	2.2.16	Anchorages satisfy requirements for class A1 according to EN 13501-1	--
Fire resistance to steel failure, tension load	2.2.17	$N^0_{Rk,s,fi}$ [kN]	C11, C12
Fire resistance to pull out failure, tension load	2.2.18	$N^0_{Rk,p,fi}$ [kN]	C11, C12
Fire resistance to steel failure, shear load	2.2.19	$V^0_{Rk,s,fi}$ [kN] $M^0_{Rk,s,fi}$ [Nm]	C11, C12

3.3 Durability

Essential characteristic	Relevant clause in EAD	Performance	Annex
Durability: MTP, MTP-X MTP-AT MTP-G MTP-A4	2.2.20	 Coated in zinc plated Coated in zinc nickel Sherardized A4 stainless steel	A2

4. Assessment and Verification of Constancy of Performance (hereinafter AVCP) system applied, with reference to its legal base

The applicable European legal act for the system of Assessment and Verification of Constancy of Performance (see annex V to Regulation (EU) No 305/2011) 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 European Assessment Document.

Technical details necessary for the implementation of the AVCP system are laid down in the quality plan which is deposited at IETcc(1).

Prepared by: Manuel Vargas García (Innovative Products Assessment Unit, IETcc – CSIC)

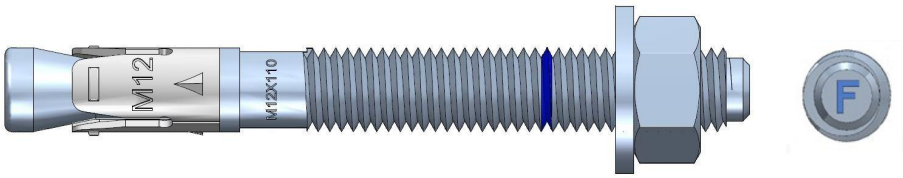
Issued in Madrid on 10th of June 2025

Mr. Ángel Castillo Talavera
Director
on behalf of Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc – CSIC)

(1) The Quality Plan is a confidential part of the ETA and only handled over to the notified certification body involved in the assessment and verification of constancy of performance.

Product and installed condition

MTP, MTP-AT, MTP-G, MTP-X. MTP-A4 anchor



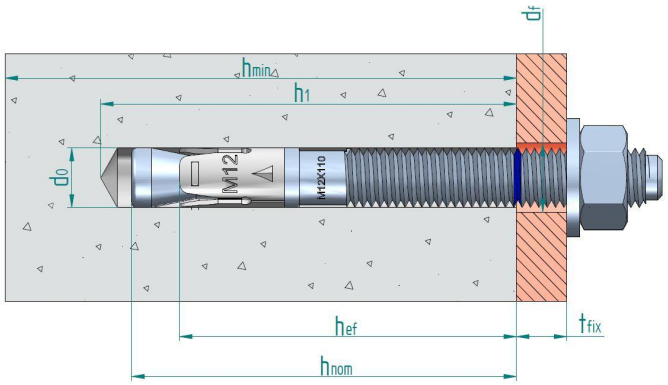
Identification on anchor:

- Expansion clip:
  - Anchor MTP: Company logo + “MTP” + Metric.
  - Anchor MTP-AT Company logo + “MTP-AT” + Metric.
  - Anchor MTP-G: Company logo + “MTP-G” + Metric.
  - Anchor MTP-X: Company logo + “MTP-X” + Metric
  - Anchor MTP-A4: Company logo + “MTP-A4” + Metric
- Anchor body: Metric x Length
- Blue ring mark to show embedment depth
- Length letter code on head:

Letter on head	Length [mm]
C	68 ÷75
D	76 ÷ 88
E	89 ÷ 101
F	102 ÷ 113
G	114 ÷ 126
H	127 ÷139

Letter on head	Length [mm]
I	140 ÷ 151
J	152 ÷ 164
K	165 ÷ 177
L	178 ÷ 190
M	191 ÷ 202
N	203 ÷ 215

Letter on head	Length [mm]
O	216 ÷ 228
P	229 ÷ 240
Q	241 ÷ 253
R	254 ÷ 266
S	267 ÷ 304
T	305 ÷ 329
U	330 ÷ 366



d_0: Nominal diameter of drill bit
d_f: Fixture clearance hole diameter
h_{ef}: Effective anchorage depth
h_1: Depth of drilled hole
h_{nom}: Overall anchor embedment depth in the concrete
h_{min}: Minimum thickness of concrete member
t_{fix}: Fixture thickness

MTP anchors	**Annex A1**
Product description Installed condition	

Table A1: materials

Item	Designation	Material for MTP	Material for MTP-AT
1	Anchor body	M8 to M20: carbon steel wire rod, galvanized ≥ 5 µm ISO 4042 Zn5/An/T0 with antifriction coating M24: machined carbon steel, galvanized ≥ 5 µm ISO 4042 Zn5/An/T0 with antifriction coating	Carbon steel wire rod, zinc nickel ≥ 8 µm, sealed, ISO 4042 ZnNi8/An/T2, with antifriction coating
2	Washer	DIN 125, DIN 9021, DIN 440 galvanized ≥ 5 µm ISO 4042 Zn5/An/T0	DIN 125, DIN 9021 or DIN 440 zinc nickel ≥ 8 µm, sealed, ISO 4042 ZnNi8 /An/T2
3	Nut	DIN 934 class 6, galvanized ≥ 5 µm ISO 4042 Zn5/An/T0	DIN 934 class 6 zinc nickel ≥ 8 µm, sealed, ISO 4042 ZnNi8/An/T2, class 6
4	Expansion clip	Stainless steel	Stainless steel

Item	Designation	Material for MTP-G	Material for MTP-X
1	Anchor body	Carbon steel wire rod, sherardized ≥ 40 µm EN 13811	Carbon steel wire rod, galvanized ≥ 5 µm ISO 4042 Zn5/An/T0 with antifriction coating
2	Washer	DIN 125, DIN 9021, DIN 440 sherardized ≥ 40 µm EN 13811	DIN 125, DIN 9021, DIN 440 galvanized ≥ 5 µm ISO 4042 Zn5/An/T0
3	Nut	DIN 934 class 6, sherardized ≥ 40 µm EN 13811	DIN 934 class 6 galvanized ≥ 5 µm ISO 4042 Zn5/An/T0
4	Expansion clip	Stainless steel	Carbon steel strip, sherardized ≥ 15 µm EN 13811

Item	Designation	Material for MTP-A4
1	Anchor body	Stainless steel, grade A4
2	Washer	DIN 125, DIN 9021, DIN 440 stainless steel, grade A4
3	Nut	Stainless steel, grade A4 with antifriction coating
4	Expansion clip	Stainless steel, grade A4, galvanized ≥ 5 µm ISO 4042 Zn5/An/T0

MTP anchors	**Annex A2**
Product description Materials	

Specifications of intended use

Version	Intended use	M8	M10	M12	M16	M20	M24
MTP	Static or quasi static loads	✓	✓	✓	✓	✓	✓
	Seismic loads category C1		✓	✓	✓		
	Seismic loads category C2			✓	✓		
	Resistance to fire exposure	✓	✓	✓	✓	✓	✓
MTP-AT	Static or quasi static loads	✓	✓	✓	✓	✓	
	Seismic loads category C1		✓	✓	✓		
	Seismic loads category C2			✓	✓		
	Resistance to fire exposure	✓	✓	✓	✓	✓	
MTP-G	Static or quasi static loads	✓	✓	✓	✓	✓	
	Seismic loads category C1	✓	✓	✓	✓	✓	
	Seismic loads category C2			✓	✓	✓	
	Resistance to fire exposure	✓	✓	✓	✓	✓	
MTP-X	Static or quasi static loads	✓	✓	✓	✓	✓	
	Seismic loads category C1	✓	✓	✓	✓	✓	
	Seismic loads category C2		✓	✓		✓	
	Resistance to fire exposure	✓	✓	✓	✓	✓	
MTP-A4	Static or quasi static loads	✓	✓	✓	✓	✓	
	Seismic loads category C1		✓	✓	✓	✓	
	Seismic loads category C2		✓	✓	✓	✓	
	Resistance to fire exposure	✓	✓	✓	✓	✓	

Base materials:

- Reinforced or unreinforced normal weight concrete with or without fibres (MTP, MTP-AT, MTP-G, MTP-X) or in concrete without fibres (MTP-A4) according to EN 206:2013+A2:2021
- Strength classes C20/25 to C50/60 according to EN 206:2013+A2:2021
- Cracked or uncracked concrete

Use conditions (environmental conditions):

- Temperature range of the anchorage base material during the working life: -40 ºC to +80 ºC.
- MTP, MTP-AT, MTP-X: anchorages subjected to dry internal conditions.
- MTP-G:
  - Anchorages in cracked concrete: dry internal conditions
  - Anchorages in uncracked concrete: durability depending on the following environmental corrosivity categories according to ISO 9223:2012:

Corrosivity category	Corrosivity	Durability [years]
C1	Very low	50 [1)]
C2	Low	50 [1)]
C3	Medium	19
C4	High	9.5
C5	Very high	4.7
CX	Extreme	--

1) Working life of fastener limited to 50 years according to EAD 330232-01-0601 section 1.2.2

MTP anchors	**Annex B1**
Intended use Specifications	

- MTP-A4: anchorages subjected to dry internal conditions, to external atmospheric exposure (including industrial and marine environment) or to permanent internal damp 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). Atmospheres under Corrosion Resistance Class CRC III according to EN 1993-1-4:2006+A1:2015 annex A.

Corrosivity category	Corrosivity	Typical environments – Examples	
		Indoor	Outdoor
C1	Very low	Heated spaces with low relative humidity and insignificant pollution; e.g., offices, schools, museums.	Dry or cold zone, atmospheric environment with very low pollution and time of wetness; e.g., certain desserts, Central Artic/Antarctic.
C2	Low	Unheated spaces with varying temperature and relative humidity. Low frequency of condensation and low pollution; e.g., storage, sport halls.	Temperate zone, atmospheric environment with low pollution (SO_2 < 5 µg/m³); e.g., rural areas, small towns. Dry or cold zone, atmospheric environment with short time or wetness, e.g., deserts, subarctic areas.
C3	Medium	Spaces with moderate frequency of condensation and moderate pollution from production process; e.g., food-processing plants, laundries, breweries, dairies.	Temperate zone, atmospheric environment with medium pollution (SO_2 5 µg/m³ to 30 µg/m³), or some effect of chlorides, e.g., urban areas, coastal areas with low deposition of chlorides. Subtropical and tropical zone, atmosphere with low pollution.
C4	High	Spaces with high frequency of condensation and high pollution from production process; e.g., industrial processing plants.	Temperate zone, atmospheric environment with high pollution(SO_2 30 µg/m³ to 90 µg/m³), or substantial effect of chlorides; e.g., polluted urban areas, industrial areas, coastal areas without spray of salt water or exposure to strong effect of de-icing salts. Subtropical and tropical zone, atmosphere with medium pollution.
C5	Very High	Spaces with very high frequency of condensation and/or high pollution from production process; e.g., mines, caverns for industrial purposes, unventilated sheds in subtropical and tropical zones	Temperate zone, atmospheric environment with very high pollution (SO_2 90 µg/m³ to 250 µg/m³), or significant effect of chlorides; e.g., industrial areas, coastal areas, sheltered positions on coastline. Subtropical and tropical zone, atmosphere with medium pollution.
CX	Extreme	Spaces with almost permanent condensation or extensive periods of exposure to extreme humidity effects and/or high pollution from production process; e.g., unventilated sheds inhumid tropical zones with penetration of outdoor pollution including airborne chlorides and corrosion-stimulating particulate matter	Subtropical and tropical zone (very high time of wetness), atmospheric environment with very high SO_2 pollution (higher than 250 µg/m³) including accompanying and production factors and/or strong effect of chlorides; e.g., extreme industrial areas, coastal and offshore areas, occasional contact with salt spray.

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete.
- Verifiable calculation rules and drawings are prepared taking into 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 for design method A in accordance with EN 1992-4:2018
- Anchorages under seismic actions are designed in accordance with EN 1992-4:2018. Anchorages shall be positioned outside of critical regions (e.g. plastic hinges) of the concrete structure. Fastening in stand-off installation or with grout layer are not allowed.
- Anchorages under fire exposure are designed in accordance with EN 1992-4:2018. It must be ensured that local spalling of the concrete cover does not occur.

MTP anchors	**Annex B2**
Intended use Specifications	

Installation:

- Hole drilling by rotary plus hammer mode.
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of 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.

MTP anchors	**Annex B3**
Intended use Specifications	

Table C1: Installation parameters for MTP, MTP-AT, MTP-G, MTP-X anchors

Installation parameters			Performances					
			M8	M10	M12	M16	M20	M24
d_0	Nominal diameter of drill bit:	[mm]	8	10	12	16	20	24
d_f	Fixture clearance hole diameter:	[mm]	9	12	14	18	22	26
T_{inst}	Nominal installation torque:	[Nm]	20 / 15[1)]	40	60	100	200	250
L_{min}	Minimum total length of the bolt:	[mm]	68	82	98	119	140	175
h_1	Depth of drilled hole:	[mm]	60	75	85	105	125	155
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	55	68	80	97	114	143
h_{ef}	Effective anchorage depth:	[mm]	48	60	70	85	100	125
t_{fix}	Thickness of fixture for washer DIN 125 ≤ [2)]	[mm]	L - 66	L – 80	L – 96	L - 117	L - 138	L - 170
t_{fix}	Thickness of fixture for washers DIN 9021, DIN 440≤[2)]	[mm]	L - 67	L – 81	L – 97	L - 118	L - 139	L - 171
s_{min}	Minimum allowable spacing: for edge distance c ≥	[mm] [mm]	40 55	40 70	60 75	65 95	95 105	125 125
c_{min}	Minimum allowable distance: for spacing s ≥	[mm] [mm]	45 55	45 90	55 110	70 115	95 105	125 125
h_{min}	Minimum thickness of concrete member: MTP, MTP-AT, MTP-G	[mm]	100	120	140	170	200	250
h_{min}	Minimum thickness of concrete member: MTP-X	[mm]	80	90	105	130	150	--

[1)] Respective values for anchors MTP, MTP-AT / MTP-G, MTP-X
[2)] L = total anchor length,

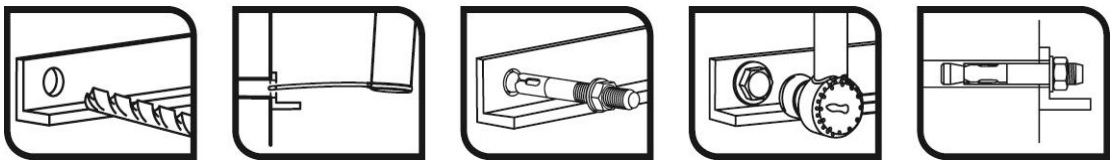
Table C2: Installation parameters for MTP-A4 anchor

Installation parameters			Performances				
			M8	M10	M12	M16	M20
d_0	Nominal diameter of drill bit:	[mm]	8	10	12	16	20
d_f	Fixture clearance hole diameter:	[mm]	9	12	14	18	22
T_{inst}	Nominal installation torque:	[Nm]	15	30	60	100	200
L_{min}	Minimum total length of the bolt:	[mm]	68	82	98	119	140
h_1	Depth of drilled hole:	[mm]	60	75	85	105	125
h_{nom}	Overall anchor embedment depth in the concrete:	[mm]	55	68	80	97	114
h_{ef}	Effective anchorage depth:	[mm]	48	60	70	85	100
t_{fix}	Thickness of fixture for washer DIN 125 ≤ [1)]	[mm]	L - 66	L – 80	L – 96	L - 117	L – 138
t_{fix}	Thickness of fixture for washers DIN 9021, DIN 440 ≤ [1)]	[mm]	L - 67	L – 81	L – 97	L - 118	L – 139
s_{min}	Minimum allowable spacing:	[mm]	42	47	57	75	100
c_{min}	Minimum allowable distance:	[mm]	47	52	62	75	90
h_{min}	Minimum thickness of concrete member:	[mm]	100	120	140	170	200

[1)] L = total anchor length

MTP anchors	
Performances Installation parameters	**Annex C1**

Installation process



MTP anchors	**Annex C2**
Performances Installation procedure	

Table C3: Characteristic values to tension loads of design method A according to EN 1992-4 for MTP, MTP-AT, MTP-G, MTP-X anchors

Characteristic values of resistance to tension loads of design according to design method A				Performances					
				M8	M10	M12	M16	M20	M24
Resistance to steel failure									
$N_{Rk,s}$	Characteristic resistance:		[kN]	18.1	31.4	40.4	74.9	120.0	179.2
γ_{Ms}	Partial safety factor [1]:		[-]	1.5	1.5	1.5	1.5	1.5	1.5
Resistance to pull-out failure									
MTP, MTP-AT anchor									
$N_{Rk,p,ucr}$	Characteristic resistance in C20/25 uncracked concrete:		[kN]	9	18	20	36	48	55
$N_{Rk,p,cr}$	Characteristic resistance in C20/25 cracked concrete:		[kN]	5	9.5	12	25	32	35
MTP-G anchor									
$N_{Rk,p,ucr}$	Characteristic resistance in C20/25 uncracked concrete:		[kN]	10	18	$\geq N^0_{Rk,c}$ [2]	36	$\geq N^0_{Rk,c}$ [2]	--
$N_{Rk,p,cr}$	Characteristic resistance in C20/25 cracked concrete:		[kN]	6	10	16	$\geq N^0_{Rk,c}$ [2]	30	--
MTP-X anchor									
$N_{Rk,p,ucr}$	Characteristic resistance in C20/25 uncracked concrete:		[kN]	10	18	28	34	$\geq N^0_{Rk,c}$ [2]	--
$N_{Rk,p,cr}$	Characteristic resistance in C20/25 cracked concrete:		[kN]	7	11	15	$\geq N^0_{Rk,c}$ [2]	$\geq N^0_{Rk,c}$ [2]	--
γ_{inst}	Robustness:		[-]	1.2	1.0	1.0	1.0	1.0	1.2
ψ_c	Increasing factor for $N^0_{Rk,p}$:	C30/37	[-]	1.22	1.17	1.22	1.22	1.17	1.22
		C40/50	[-]	1.41	1.31	1.41	1.41	1.31	1.41
		C50/60	[-]	1.58	1.43	1.58	1.58	1.43	1.58
Resistance to concrete cone and splitting failure									
h_{ef}	Effective embedment depth:		[mm]	48	60	70	85	100	125
$k_{ucr,N}$	Factor for uncracked concrete:		[-]	11.0					
$k_{cr,N}$	Factor for cracked concrete:		[-]	7,7					
γ_{inst}	Robustness:		[-]	1.2	1.0	1.0	1.0	1.0	1.2
$s_{cr,N}$	Spacing, edge distance for concrete cone failure:		[mm]	$3 \times h_{ef}$					
$c_{cr,N}$			[mm]	$1.5 \times h_{ef}$					
$N^0_{Rk,sp}$	Characteristic splitting resistance:		[kN]	min ($N_{Rk,p}$; $N^0_{Rk,c}$)					
$s_{cr,sp}$	Spacing, edge distance for splitting failure:		[mm]	288	300	350	425/510 [3]	500/600 [3]	560
$c_{cr,sp}$			[mm]	144	150	175	213/255 [3]	250/300 [3]	280

1) In absence of other national regulations
2) Pull out failure is not decisive. $N^0_{Rk,c}$ calculated according to EN 1992-4
3) Respective values for anchors MTP, MTP-AT / MTP-G, MTP-X

MTP anchors	**Annex C3**
Performances Characteristic values to tension loads	

Table C4: Characteristic values to tension loads of design method A according to EN 1992-4 for for MTP-A4 anchor

Characteristic values of resistance to tension loads of design according to design method A				Performances				
				M8	M10	M12	M16	M20
Resistance to steel failure								
$N_{Rk,s}$	Characteristic resistance:		[kN]	18.5	30.9	45.5	71.5	122.5
γ_{Ms}	Partial safety factor [1]:		[-]	1.4	1.4	1.4	1.4	1.4
Resistance to pull-out failure								
$N_{Rk,p,ucr}$	Characteristic resistance in uncracked concrete: C20/25		[kN]	12	16	22	$\geq N^0_{Rk,c}$ [2]	$\geq N^0_{Rk,c}$ [2]
ψ_c	Increasing factor for $N^0_{Rk,p}$:	C30/37	[-]	1.22	1.22	1.22	1.22	1.09
		C40/50	[-]	1.41	1.41	1.41	1.41	1.16
		C50/60	[-]	1.58	1.58	1.58	1.58	1.22
$N_{Rk,p,cr}$	Characteristic resistance in cracked concrete: C20/25		[kN]	8.5	14	19	$\geq N^0_{Rk,c}$ [2]	$\geq N^0_{Rk,c}$ [2]
ψ_c	Increasing factor for $N^0_{Rk,p}$:	C30/37	[-]	1.01	1.00	1.09	1.09	1.17
		C40/50	[-]	1.02	1.00	1.15	1.16	1.32
		C50/60	[-]	1.02	1.00	1.20	1.22	1.44
γ_{inst}	Robustness:		[-]	1.0	1.0	1.2	1.2	1.2
Resistance to concrete cone and splitting failure								
h_{ef}	Effective embedment depth:		[mm]	48	60	70	85	100
$k_{ucr,N}$	Factor for uncracked concrete:		[-]	11.0				
$k_{cr,N}$	Factor for cracked concrete:		[-]	7,7				
γ_{inst}	Robustness:		[-]	1.0	1.0	1.2	1.2	1.2
$s_{cr,N}$	Spacing, edge distance for concrete cone failure		[mm]	3 x h_{ef}				
$c_{cr,N}$			[mm]	1.5 x h_{ef}				
$N^0_{Rk,sp}$	Characteristic splitting resistance:		[kN]	min ($N_{Rk,p}$; $N^0_{Rk,c}$)				
$s_{cr,sp}$	Spacing, edge distance for splitting failure:		[mm]	164	204	238	290	380
$c_{cr,sp}$			[mm]	82	102	119	145	190

1) In absence of other national regulations
2) Pull out failure is not decisive. $N^0_{Rk,c}$ calculated according to EN 1992-4

MTP anchors	
Performances Characteristic values to tension loads	**Annex C4**

Table C5: Characteristic values to shear loads of design method A according to EN 1992-4 for MTP, MTP-AT, MTP-G, MTP-X anchors

Characteristic values of resistance to shear loads of design according to design method A			Performances					
			M8	M10	M12	M16	M20	M24
Resistance to steel failure under shear loads								
$V^0_{Rk,s}$	Characteristic resistance:	[kN]	11.9	20.3	29.5	54.9	85.7	84.7
k_7	Ductility factor:	[-]	1.00					
$M^0_{Rk,s}$	Characteristic bending moment:	[Nm]	26.2	52.3	91.7	233.1	454.4	673.5
γ_{Ms}	Partial safety factor 1):	[-]	1.25	1.25	1.25	1.25	1.25	1.25
Resistance to pry-out failure								
k_8	Pryout factor:	[-]	1	2	2	2	2	2
γ_{inst}	Robustness:	[-]	1.00					
Resistance to concrete edge failure								
ℓ_f	Effective length of anchor under shear loads:	[mm]	48	60	70	85	100	125
d_{nom}	Outside anchor diameter:	[mm]	8	10	12	16	20	24
γ_{inst}	Robustness:	[-]	1.00					

1) In absence of other national regulations

Table C6: Characteristic values to shear loads of design method A according to EN 1992-4 for MTP-A4 anchor

Characteristic values of resistance to shear loads of design according to design method A			Performances				
			M8	M10	M12	M16	M20
Resistance to steel failure under shear loads							
$V_{Rk,s}$	Characteristic resistance:	[kN]	11.9	18.9	27.4	55.0	85.9
k_7	Ductility factor:	[-]	1.00				
$M^0_{Rk,s}$	Characteristic bending moment:	[Nm]	26.2	52.3	91.7	233.1	454.3
γ_{Ms}	Partial safety factor 1):	[-]	1.25	1.25	1.25	1.25	1.25
Resistance to pry-out failure							
k_8	Pryout factor:	[-]	1	2	2	2	2
γ_{inst}	Robustness:	[-]	1.00				
Resistance to concrete edge failure							
ℓ_f	Effective length of anchor under shear loads:	[mm]	48	60	70	85	100
d_{nom}	Outside anchor diameter:	[mm]	8	10	12	16	20
γ_{inst}	Robustness:	[-]	1.00				

1) In absence of other national regulations

MTP anchors	**Annex C5**
Performances Characteristic values to shear loads	

Table C7: Displacements under tension loads for MTP, MTP-AT, MTP-G, MTP-X, MTP-A4 anchors

Displacements under tension loads			Performances					
			M8	M10	M12	M16	M20	M24
MTP, MTP-AT anchor								
N	Service tension load:	[kN]	3.6	8.6	9.5	17.1	22.9	21.8
δ_{N0}	Short term displacement:	[mm]	1.1	0.7	1.0	0.4	1.6	0.4
$\delta_{N\infty}$	Long term displacement:	[mm]	1.9	1.9	1.9	1.9	1.9	2.0
MTP-G anchor								
N	Service tension load:	[kN]	4.0	8.6	13.7	17.1	23.4	--
δ_{N0}	Short term displacement:	[mm]	1.0	1.1	0.9	1.5	1.2	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.9	1.9	1.9	1.9	1.9	--
MTP-X anchor								
N	Service tension load:	[kN]	4.0	8.5	13.3	16.2	23.4	--
δ_{N0}	Short term displacement:	[mm]	1.0	1.1	0.9	1.5	1.3	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.6	1.6	1.6	1.6	1.6	--
MTP-A4 anchor								
N	Service tension load in non cracked concrete:	[kN]	5.7	7.6	8.7	15.3	19.5	--
δ_{N0}	Short term displacement:	[mm]	1.4	1.4	1.4	1.8	1.8	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.9	1.9	1.9	1.9	1.9	--
MTP-A4 anchor								
N	Service tension load in cracked concrete:	[kN]	4.0	6.7	7.5	10.7	13.7	--
δ_{N0}	Short term displacement:	[mm]	1.2	1.3	1.3	1.3	1.3	--
$\delta_{N\infty}$	Long term displacement:	[mm]	1.7	1.7	1.7	1.7	1.7	--

Table C8: Displacements under shear load for MTP, MTP-AT, MTP-G, MTP-X, MTP-A4 anchors

Displacements under shear loads			Performances					
			M8	M10	M12	M16	M20	M24
MTP, MTP-AT anchor								
V	Service shear load:	[kN]	6.8	11.6	16.9	31.4	46.9	48.4
δ_{V0}	Short term displacement:	[mm]	1.0	1.5	1.8	1.9	3.1	1.4
$\delta_{V\infty}$	Long term displacement:	[mm]	1.5	2.3	2.7	2.9	4.7	2.1
MTP-G anchor								
V	Service shear load:	[kN]	6.8	11.6	16.9	31.4	46.9	-
δ_{V0}	Short term displacement:	[mm]	1.0	1.5	1.8	1.9	3.1	--
$\delta_{V\infty}$	Long term displacement:	[mm]	1.5	2.3	2.7	2.9	4.7	--
MTP-X anchor								
V	Service shear load:	[kN]	6.8	11.6	16.9	31.4	46.9	--
δ_{V0}	Short term displacement:	[mm]	1.0	1.5	1.8	1.9	3.1	--
$\delta_{V\infty}$	Long term displacement:	[mm]	1.5	2.3	2.7	2.9	4.7	--
MTP-A4 anchor								
V	Service shear load:	[kN]	6.8	10.8	15.7	31.4	46.9	--
δ_{V0}	Short term displacement:	[mm]	1.9	1.6	1.6	2.2	2.2	--
$\delta_{V\infty}$	Long term displacement:	[mm]	2.4	2.4	2.4	3.3	3.3	--

MTP anchors	**Annex C6**
Performances Displacements under static or quasi-static tension and shear loads	

Table C9: Characteristic values for seismic performance category C1 for MTP, MTP-AT, MTP-G, MTP-X anchors

Characteristic values for seismic performance category C1			Performances					
			M8	M10	M12	M16	M20	M24
Resistance to steel failure under tension loads								
$N_{Rk,s,C1}$	Characteristic tension steel failure:	[kN]	18.1	31.4	40.4	72.7	116.6	--
γ_{Ms}	Partial safety factor: 1)	[-]	1.5	1.5	1.5	1.5	1.5	--
Resistance to steel failure under shear loads								
MTP, MTP-AT anchor								
$V_{Rk,s,C1}$	Characteristic shear steel failure:	[kN]	--	12.2	17.8	33.0	--	--
MTP-G anchor								
$V_{Rk,s,C1}$	Characteristic shear steel failure:	[kN]	6.6	12.5	18.9	35.4	54.8	--
MTP-X anchor								
$V_{Rk,s,C1}$	Characteristic shear steel failure:	[kN]	7.7	12.2	17.8	33.0	58.5	--
α_{gap}	Factor for annular gap:	[-]	0.5					--
γ_{Ms}	Partial safety factor: 1)	[-]	1.25	1.25	1.25	1.25	1.25	--
Resistance to pull-out failure								
MTP, MTP-AT anchor								
$N_{Rk,p,C1}$	Characteristic pull out failure:	[kN]	--	5.3	8.4	17.5	--	--
MTP-G anchor								
$N_{Rk,p,C1}$	Characteristic pull out failure:	[kN]	6.0	9.0	16.0	25.0	30.0	--
MTP-X anchor								
$N_{Rk,p,C1}$	Characteristic pull out failure:	[kN]	5.9	8.9	16.0	25.0	30.0	--
γ_{inst}	Robustness:	[-]	1.2	1.0	1.0	1.0	1.0	--
Resistance to concrete cone failure								
h_{ef}	Effective embedment depth:	[mm]	48	60	70	85	100	--
$s_{cr,N}$	Spacing:	[mm]	3 x h_{ef}					--
$c_{cr,N}$	Edge distance:	[mm]	1.5 x h_{ef}					--
γ_{inst}	Robustness:	[-]	1.2	1.0	1.0	1.0	1.0	--

1) In absence of other national regulations

MTP anchors	**Annex C7**
Performances Characteristic values for seismic performance category C1	

Table C10: Characteristic values for seismic performance category C1 for MTP-A4 anchors

Characteristic values for seismic performance category C1			Performances				
			M8	M10	M12	M16	M20
Resistance to steel failure under tension loads							
$N_{Rk,s,C1}$	Characteristic tension steel failure:	[kN]	--	30.9	45.5	71.5	122.5
γ_{Ms}	Partial safety factor:[1)]	[-]	--	1.4	1.4	1.4	1.4
Resistance to steel failure under shear loads							
$V_{Rk,s,C1}$	Characteristic shear steel failure:	[kN]	--	10.6	19.2	40.2	45.5
α_{gap}	Factor for annular gap:	[-]	--	0.5			
γ_{Ms}	Partial safety factor:[1)]	[-]	--	1.25	1.25	1.25	1.25
Resistance to pull-out failure							
$N_{Rk,p,C1}$	Characteristic pull out failure:	[kN]	--	6.4	11.8	17.5	20.6
γ_{inst}	Robustness:	[-]	--	1.0	1.2	1.2	1.2
Resistance to concrete cone failure							
h_{ef}	Effective embedment depth:	[mm]	--	60	70	85	100
$s_{cr,N}$	Spacing:	[mm]	--	3 x h_{ef}			
$c_{cr,N}$	Edge distance:	[mm]	--	1.5 x h_{ef}			
γ_{inst}	Robustness:	[-]	--	1.0	1.2	1.2	1.2

[1)] In absence of other national regulations

MTP anchors	**Annex C8**
Performances Characteristic values for seismic performance category C1	

Table C11: Characteristic values for seismic performance category C2 for MTP, MTP-AT, MTP-G, MTP-X anchors

Characteristic values for seismic performance category C2			Performances					
			M8	M10	M12	M16	M20	M24
Resistance to steel failure under tension loads								
$N_{Rk,s,C2}$	Characteristic tension steel failure:	[kN]	--	31.4	40.4	72.7	116.6	--
γ_{Ms}	Partial safety factor:[1)]	[-]	--	1.5	1.5	1.5	1.5	--
Resistance to steel failure under shear loads								
$V_{Rk,s,C2}$	Characteristic shear steel failure:	[kN]	--	12.2	17.8	33.0	58.5	--
α_{gap}	Factor for annular gap	[-]	--	0.5	0.5	0.5	0.5	--
γ_{Ms}	Partial safety factor:[1)]	[-]	--	1.25	1.25	1.25	1.25	--
Resistance to pull-out failure								
MTP, MTP-AT anchor								
$N_{Rk,p,C2}$	Characteristic pull out failure:	[kN]	--	--	5.2	8.9	--	--
MTP-G anchor								
$N_{Rk,p,C2}$	Characteristic pull out failure:	[kN]	--	--	5.9	16.3	17.2	--
MTP-X anchor								
$N_{Rk,p,C2}$	Characteristic pull out failure:	[kN]	--	3.9	9.1	--	21.0	--
γ_{inst}	Robustness:	[-]	--	1.0	1.0	1.0	1.0	--
Resistance to concrete cone failure								
h_{ef}	Effective embedment depth:	[mm]	--	60	70	85	100	--
$s_{cr,N}$	Spacing:	[mm]	--	$3 \times h_{ef}$				--
$c_{cr,N}$	Edge distance:	[mm]	--	$1.5 \times h_{ef}$				--
γ_{inst}	Robustness:	[-]	--	1.0	1.0	1.0	1.0	--
Displacements								
MTP, MTP-AT anchor								
$\delta_{N,C2\,(DLS)}$	Displacement Damage Limitation State:[2) 3)]	[mm]	--	--	2.34	3.99	--	--
$\delta_{V\,C2\,(DLS)}$		[mm]	--	--	5.53	5.96	--	--
$\delta_{N,C2\,(ULS)}$	Displacement Ultimate Limit State:[2)]	[mm]	--	--	9.54	10.17	--	--
$\delta_{V,C2\,(ULS)}$		[mm]	--	--	9.08	10.66	--	--
MTP-G anchor								
$\delta_{N,C2\,(DLS)}$	Displacement Damage Limitation State:[2) 3)]	[mm]	--	--	6.79	5.21	5.72	--
$\delta_{V\,C2\,(DLS)}$		[mm]	--	--	5.53	5.96	6.37	--
$\delta_{N,C2\,(ULS)}$	Displacement Ultimate Limit State:[2)]	[mm]	--	--	24.70	19.58	17,20	--
$\delta_{V,C2\,(ULS)}$		[mm]	--	--	9.08	10.66	12.32	--
MTP-X anchor								
$\delta_{N,C2\,(DLS)}$	Displacement Damage Limitation State:[2) 3)]	[mm]	--	3.15	5.57	--	6.82	--
$\delta_{V\,C2\,(DLS)}$		[mm]	--	5.61	5.53	--	6.37	--
$\delta_{N,C2\,(ULS)}$	Displacement Ultimate Limit State:[2)]	[mm]	--	14.77	20.31	--	29.12	--
$\delta_{V,C2\,(ULS)}$		[mm]	--	8.68	9.08	--	12.32	--

1) In absence of other national regulations
2) The listed displacements represent mean values
3) A small displacement may be required in the design in the case of displacements sensitive fastening of "rigid" supports. The characteristics resistance associated with such small displacements may be determined by linear interpolation or proportional reduction.

MTP anchors	**Annex C9**
Performances Characteristic values for seismic performance category C2	

Table C12: Characteristic values for seismic performance category C2 for MTP-A4 anchors

Characteristic values for seismic performance category C2			Performances				
			M8	M10	M12	M16	M20
Resistance to steel failure under tension loads							
$N_{Rk,s,C2}$	Characteristic tension steel failure:	[kN]	--	30.9	45.5	71.5	122.5
γ_{Ms}	Partial safety factor:[1)]	[-]	--	1.4	1.4	1.4	1.4
Resistance to steel failure under shear loads							
$V_{Rk,s,C2}$	Characteristic shear steel failure:	[kN]	--	10.6	19.2	40.2	45.5
α_{gap}	Factor for annular gap	[-]	--	0.5	0.5	0.5	0.5
γ_{Ms}	Partial safety factor:[1)]	[-]	--	1.25	1.25	1.25	1.25
Resistance to pull-out failure							
$N_{Rk,p,C2}$	Characteristic pull out failure:	[kN]	--	3.0	4.0	15.8	15.7
γ_{inst}	Robustness:	[-]	--	1.0	1.2	1.2	1.2
Resistance to concrete cone failure							
h_{ef}	Effective embedment depth:	[mm]	--	60	70	85	100
$s_{cr,N}$	Spacing:	[mm]	--	3 x h_{ef}			
$c_{cr,N}$	Edge distance:	[mm]	--	1.5 x h_{ef}			
γ_{inst}	Robustness:	[-]	--	1.0	1.2	1.2	1.2
Displacements							
$\delta_{N,C2\ (DLS)}$	Displacement Damage Limitation State:[2) 3)]	[mm]	--	2.6	4.9	5.2	5.5
$\delta_{V\ C2\ (DLS)}$		[mm]	--	4.5	4.5	5.2	5.6
$\delta_{N,C2\ (ULS)}$	Displacement Ultimate Limit State:[2)]	[mm]	--	9.3	15.2	13.2	15.7
$\delta_{V,C2\ (ULS)}$		[mm]	--	6.9	7.2	8.3	7.9

1) In absence of other national regulations
2) The listed displacements represent mean values
3) A small displacement may be required in the design in the case of displacements sensitive fastening of “rigid” supports. The characteristics resistance associated with such small displacements may be determined by linear interpolation or proportional reduction.

MTP anchors	**Annex C10**
Performances Characteristic values for seismic performance category C2	

Table C13: Characteristic values for resistance under fire exposure for MTP, MTP-AT, MTP-G, MTP-X anchors

Characteristic values under fire exposure				Performances					
				M8	M10	M12	M16	M20	M24
Fire resistance to steel failure									
$N^0_{Rk,s,fi}$	Characteristic tension resistance:	R30	[kN]	1.11	2.22	3.90	7.26	11.32	16.32
		R60	[kN]	0.92	1.70	2.82	5.25	8.19	11.80
		R90	[kN]	0.73	1.18	1.74	3.24	5.05	7.29
		R120	[kN]	0.64	0.83	1.20	2.23	3.49	5.02
$V^0_{Rk,s,fi}$	Characteristic shear resistance:	R30	[kN]	1.11	2.22	3.90	7.26	11.32	16.32
		R60	[kN]	0.92	1.70	2.82	5.25	8.19	11.80
		R90	[kN]	0.73	1.18	1.74	3.24	5.05	7.29
		R120	[kN]	0.64	0.83	1.20	2.23	3.49	5.02
$M^0_{Rk,s,fi}$	Characteristic bending resistance:	R30	[Nm]	1.14	2.87	6.05	15.39	30.00	51.88
		R60	[Nm]	0.94	2.20	4.38	11.13	21.70	37.52
		R90	[Nm]	0.75	1.52	2.70	6.87	13.39	23.16
		R120	[Nm]	0.65	1.06	1.86	4.74	9.24	15.98
Fire resistance to pull-out failure									
$N_{Rk,p,fi}$	Characteristic resistance:	R30 R60 R90	[kN]	1.3/1.5[1)]	2.3	3.0/4.0[1)]	6.3	7.5	7.5
		R120	[kN]	1.0/1.2[1)]	1.8	2.4/3.2[1)]	5.0	6.0	6.0
Fire resistance to concrete cone failure [2)]									
$N_{Rk,c,fi}$	Characteristic resistance:	R30 R60 R90	[kN]	2.9	5.0	7.4	12.0	18.0	31.4
		R120	[kN]	2.3	4.0	5.9	9.6	14.4	25.2
$s_{cr,N,fi}$	Spacing:	R30 to R120	[mm]	$4 \times h_{ef}$					
$s_{min,fi}$	Minimum spacing:	R30 to R120	[mm]	50	60	70	85/128[1)]	100/150[1)]	125
$c_{cr,N,fi}$	Edge distance:	R30 to R120	[mm]	$2 \times h_{ef}$					
$c_{min,fi}$	Minimum edge distance:	R30 to R120	[mm]	$c_{min} = 2 \times h_{ef}$; if fire attack comes from more than one side, the edge distance of the anchor has to be ≥ 300 mm and ≥ $2 \times h_{ef}$					
Fire resistance to concrete pry-out failure									
k_8	Pryout factor:	R30 to R120	[-]	1	2	2	2	2	2

[1)] Respective values for anchors MTP, MTP-AT / MTP-G, MTP-X

[2)] As a rule, splitting failure can be neglected since cracked concrete and reinforcement is assumed.
In absence of other national regulations, the partial safety factor for resistance under fire exposure $\gamma_{m,fi}$ = 1,0 is recommended

MTP anchors	**Annex C11**
Performances Characteristic values under fire exposure	

Table C14: Characteristic values for resistance under fire exposure for MTP-A4 anchor

Characteristic values under fire exposure					Performances				
					M8	M10	M12	M16	M20
Fire resistance to steel failure									
$N^0_{Rk,s,fi}$	Characteristic tension resistance:		R30	[kN]	4,20	7,11	11,00	20,49	31,97
			R60	[kN]	2,96	5,84	10,16	18,93	29,53
			R90	[kN]	1,73	3,47	6,10	11,37	17,74
			R120	[kN]	1,11	2,28	4,08	7,59	11,85
$V^0_{Rk,s,fi}$	Characteristic shear resistance:		R30	[kN]	4,20	7,11	11,00	20,49	31,97
			R60	[kN]	2,96	5,84	10,16	18,93	29,53
			R90	[kN]	1,73	3,47	6,10	11,37	17,74
			R120	[kN]	1,11	2,28	4,08	7,59	11,85
$M^0_{Rk,s,fi}$	Characteristic bending resistance:		R30	[Nm]	4,30	9,16	17,09	43,45	84,70
			R60	[Nm]	3,03	7,53	15,79	40,14	78,24
			R90	[Nm]	1,77	4,47	9,49	24,12	47,01
			R120	[Nm]	1,14	2,95	6,34	16,10	31,39
Fire resistance to pull-out failure									
$N_{Rk,p,fi}$	Characteristic resistance:		R30 R60 R90	[kN]	2,1	3,5	4,8	6,74	8,60
			R120	[kN]	1,7	2,8	3,8	5,39	6,88
Fire resistance to concrete cone failure [1)]									
$N_{Rk,c,fi}$	Characteristic resistance:		R30 R60 R90	[kN]	2.7	4,8	7,1	11,5	17,2
			R120	[kN]	2,2	43,8	5,6	9,2	13,8
$s_{cr,N,fi}$	Spacing:	R30 to R120		[mm]	4 x h_{ef}				
$s_{min,fi}$	Minimum spacing:	R30 to R120		[mm]	42	47	57	75	100
$c_{cr,N,fi}$	Edge distance:	R30 to R120		[mm]	2 x h_{ef}				
$c_{min,fi}$	Minimum edge distance:	R30 to R120		[mm]	c_{min} = 2 x h_{ef}; if fire attack comes from more than one side, the edge distance of the anchor has to be ≥ 300 mm and ≥ 2 x h_{ef}				
Fire resistance to concrete pry-out failure									
k_8	Pryout factor:	R30 to R120		[-]	1	2	2	2	2

[1)] As a rule, splitting failure can be neglected since cracked concrete and reinforcement is assumed.
In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{m,fi}$ = 1,0 is recommended

MTP anchors	**Annex C12**
Performances Characteristic values under fire exposure	