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CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS
INSTITUTO EDUARDO TORROJA

Designated according to Article29 of Regulation (EU) Nº 305/2011

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European Technical Assessment

ETA 12/0397 of 17/12/2015

English translation prepared by IETcc. Original version in Spanish language

General Part

Technical Assessment Body issuing the ETA designated according to Art. 29 of Regulation (EU) 305/2011:	Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)
Trade name of the construction product	**Anchor MTP** **Anchor MTP-G** **Anchor MTP-X**
Product family to which the construction product belongs	Torque controlled expansion anchor made of zinc plated or sherardized steel of sizes M8, M10, M12, M16, M20 and M24 for use in cracked and non-cracked concrete.
Manufacturer	**Index - Técnicas Expansivas S.L.** Segador 13 26006 Logroño (La Rioja) Spain. website: www.indexfix.com
Manufacturing plant	Ningbo Londex Industrial Co. Ltd. Cixi city. Zhejiang province, China
This European Technical Assessment contains	11 pages including 4 annexes which form an integral part of this assessment. **Annex E contains confidential information and is not included in the European Technical Assessment when that assessment is publicly available.**
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	Guideline for European Technical Approval ETAG 001 “Metal anchors for use in concrete”, ed. April 2013, Parts 1 and 2 used as European Assessment Document (EAD)
This version replaces	ETA 12/0397 issued on 26/06/2014

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SPECIFIC PART

1. Technical description of the product

The Index MTP through bolt is an anchor made of zinc plated steel with stainless steel clip. The Index MTP-G through bolt is an anchor made of sherardized steel with stainless steel clip. The Index MTP-X through bolt is an anchor made of zinc plated steel with sherardized clip. The anchors are made in sizes M8, M10, M12, M16, M20 and M24 and are placed into a drilled hole and anchored by torque-controlled expansion.

The Index MTP, MTP-G and MTP-X anchors in the range of M8 to M24 correspond to the pictures and provisions given in annexes A and B. The characteristic material values, dimensions and tolerances of the anchors not indicated in annexes A and B shall correspond to the respective values laid down in the technical documentations (1) of this European Technical Assessment.

For the installation process see figure given in annex C; for the installed anchor see figure given in annex D.

Each expansion sleeve is marked with the identifying mark of the producer, the trade name and the anchor diameter; each anchor bolt is marked with the diameter (metric) and the total anchor length. Additionally a letter mark on the anchor tip shows the length, according to annexes. A blue colour ring marking identifies the embedment depth.

The performance of the anchors, including installation data, characteristic anchor values, displacements and fire resistance, for the design of anchorages is given in chapter 3.

The anchors shall only be packaged and supplied as complete units.

2. Specification of the intended use in accordance with the applicable EAD.

2.1 Intended use

The anchors are intended to be used for anchorages for which requirements for mechanical resistance and stability, safety in case of fire and safety and accessibility in use in the sense of the basic requirements 1, 2 and 4 of Construction Product Regulation no 305/21011 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.

The anchors are to be used only for anchorages subject to static or quasi-static loading in reinforced or unreinforced normal weight concrete of strength class C20/25 to C50/60, according to EN 206. They may be anchored in cracked and non-cracked concrete.

The anchors may only be used in concrete subject to dry internal conditions.

The anchors may be used for anchorages with requirements related to resistance to fire.

The Index MTP anchor may be used for seismic applications in categories C1 and C2.

(1) The quality plan has been deposited at Instituto de Ciencias de la Construcción Eduardo Torroja and is only made available to the approved bodies involved in the AVCP procedure.

Intended use	M8	M10	M12	M16	M20	M24
Static or cuasi static loads in cracked and uncracked concrete	MTP, MTP-G, MTP-X					MTP
Fire resistance R30 to R120	MTP, MTP-G, MTP-X					MTP
Seismic performance category C1	--	MTP			--	
Seismic performance category C2	--		MTP		--	

Design under static or cuasi-static actions shall be performed in accordance with ETAG 001 annex C or CEN/TS 1992-4-4, design method A. For applications 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”. For applications under seismic actions the anchorages are designed in accordance with method given in TR045 “Design of metal anchors for use in concrete under seismic actions”. Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.

Verifiable calculations and drawings are prepared taking into account of the load 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.).

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The assumed working life is the foreseen period of time throughout which the construction product, as installed into the construction work, will keep its performances allowing the construction work, behaving under predictable actions and with normal maintenance, to meet the basic requirements for construction works.

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 anchor according to the basic work requirements (BWR) were carried out in compliance with the ETAG 001. The characteristics of the components shall correspond to the respective values laid down in the technical documentation of this ETA, checked by IETcc.

3.1 Mechanical resistance and stability (BWR 1)

Mechanical resistance and stability has been assessed according to ETAG 001 “Metal anchors to be used in concrete”, parts 1 and 2.

Seismic performances have been assessed according to ETAG 001 annex E “Assessment of metal anchors under seismic actions”

Installation parameters			Performance					
			M8	M10	M12	M16	M20	M24
d_o	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 *)	40	60	100	200	250
L_{min}	Total length of the bolt	[mm]	68	82	98	119	140	175
L_{max}		[mm]	200	200	250	250	300	400
h_{min}	Minimum thickness of concrete member:	[mm]	100	120	140	170	200	250
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	[mm]	L - 66	L – 80	L – 96	L - 117	L - 138	L - 170
s_{min}	Minimum spacing:	[mm]	50	60	70	85/128 *)	100/150*	125
c_{min}	Minimum edge distance:	[mm]	50	60	70	85/128*	100/150*	125

*) Respective values for anchors MTP / MTP-G, MTP-X

Characteristic values of resistance to tension loads of design according to design method A				Performance					
				M8	M10	M12	M16	M20	M24
Tension loads: steel failure									
$N_{Rk,s}$	Characteristic tension steel failure:		[kN]	18.1	31.4	40.4	72.7	116.6	179.2
γ_{Ms}	Partial safety factor: **)		[-]	1.5	1.5	1.5	1.5	1.5	1.5
Tension loads: pull-out failure in concrete									
MTP anchor									
$N_{Rk,p,ucr}$	Characteristic pull out failure in non cracked C20/25 concrete		[kN]	9	16	20	35	50	50
$N_{Rk,p,cr}$	Characteristic pull out failure in cracked C20/25 concrete		[kN]	5	9	12	25	30	30
MTP-G anchor									
$N_{Rk,p,ucr}$	Characteristic pull out failure in non cracked C20/25 concrete		[kN]	9	16	30	35	50	--
$N_{Rk,p,cr}$	Characteristic pull out failure in cracked C20/25 concrete		[kN]	6	9	16	25	30	--
MTP-X anchor									
$N_{Rk,p,ucr}$	Characteristic pull out failure in non C20/25 cracked concrete		[kN]	9	16	25	35	50	--
$N_{Rk,p,cr}$	Characteristic pull out failure in cracked C20/25 concrete		[kN]	6	9	16	25	30	--
ψ_c	Increasing factor for $N_{Rk,p}$	C30/37	[-]	1.22	1.16	1.22	1.22	1.16	1.22
ψ_c		C40/50	[-]	1.41	1.31	1.41	1.41	1.31	1.41
ψ_c		C50/60	[-]	1.55	1.41	1.55	1.55	1.41	1.55
γ_{Mp}	Partial safety factor: **)		[-]	1.8	1.5	1.5	1.5	1.5	1.8
Tension loads: 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	11.0	11.0	11.0	11.0	11.0
$k_{cr,N}$	Factor for cracked concrete		[-]	7,7	7,7	7,7	7,7	7,7	7,7
γ_{Mc}	Partial safety factor: **)		[-]	1.8	1.5	1.5	1.5	1.5	1.8
$s_{cr,N}$	Critical spacing:		[mm]	144	180	210	255	300	375
$c_{cr,N}$	Critical edge distance:		[mm]	72	90	105	128	150	188
$s_{cr,sp}$	Critical spacing (splitting):		[mm]	288	300	350	425/510*)	500/600*)	560
$c_{cr,sp}$	Critical edge distance (splitting):		[mm]	144	150	175	213/255*)	250/300*)	280
γ_{Msp}	Partial safety factor: **)		[-]	1.8	1.5	1.5	1.5	1.5	1.8

*) Respective values for anchors MTP / MTP-G, MTP-X
**) In absence of other national regulations

Displacements under tension loads			Performance					
			M8	M10	M12	M16	M20	M24
MTP anchor								
N	Service tension load	[kN]	2.5	4.3	6.3	10.4	13.9	18.0
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]	2.5	4.3	6.3	10.4	13.9	--
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]	2.5	4.3	7.6	11.9	14.3	--
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	--

Characteristic values of resistance to shear loads of design according to design method A			Performance					
			M8	M10	M12	M16	M20	M24
MTP, MTP-G, MTP-X anchors								
Shear loads: steel failure without lever arm								
$V_{Rk,s}$	Characteristic shear steel failure:	[kN]	11.0	17.4	25.3	47.1	73.1	84.7
γ_{Ms}	Partial safety factor: *)	[-]	1.25	1.25	1.25	1.25	1.25	1.25
Shear loads: steel failure with lever arm								
$M^0_{Rk,s}$	Characteristic bending moment:	[Nm]	22.5	44.8	78.6	199.8	389.4	673.5
γ_{Ms}	Partial safety factor: *)	[-]	1.25	1.25	1.25	1.25	1.25	1.25
Shear loads: concrete pryout failure								
k_3	k_3 factor:	[-]	1	2	2	2	2	2
γ_{Mpr}	Partial safety factor: *)	[-]	1.5	1.5	1.5	1.5	1.5	1.5
Shear loads: concrete edge failure								
l_f	Effective anchorage length:	[mm]	48	60	70	85	100	125
d_{nom}	Outside anchor diameter:	[mm]	8	10	12	16	20	24
γ_{Mc}	Partial safety factor: *)	[-]	1.5	1.5	1.5	1.5	1.5	1.5

*) In absence of other national regulations

Displacements under shear loads			Performance					
			M8	M10	M12	M16	M20	M24
MTP anchor								
V	Service shear load:	[kN]	4.9	6.8	8.5	15.1	24.6	33.6
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]	4.9	6.8	8.5	15.1	24.6	-
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]	4.9	6.8	8.5	15.1	24.6	--
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	--

Design information for seismic performance C1 MTP anchor			Performance					
			M8	M10	M12	M16	M20	M24
$N_{Rk,s,seis}$	Characteristic tension steel failure:	[kN]	--	31.4	40.4	72.7	--	--
γ_{Ms} ***)	Partial safety factor:	[-]	--	1.5	1.5	1.5	--	--
$N_{Rk,p,seis}$	Characteristic pull out failure:	[kN]	--	5.3	8.4	17.5	--	--
γ_{Mp} ***)	Partial safety factor:	[-]	--	1.5	1.5	1.5	--	--
$V_{Rk,p,seis}$	Characteristic shear steel failure:	[kN]	--	12.2	17.8	33.0	--	--
γ_{Mp} ***)	Partial safety factor:	[-]	--	1.25	1.25	1.25	--	--

Design information for seismic performance C2 MTP anchor			Performance					
			M8	M10	M12	M16	M20	M24
$N_{Rk,s,seis}$ **)	Characteristic tension steel failure:	[kN]	--	--	40.4	72.7	--	--
γ_{Ms} ***)	Partial safety factor:	[-]	--	--	1.5	1.5	--	--
$N_{Rk,p,seis}$ **)	Characteristic pull out failure:	[kN]	--	--	5.2	8.9	--	--
γ_{Mp} ***)	Partial safety factor:	[-]	--	--	1.5	1.5	--	--
$\delta_{N,seis\ (DSL)}$ *)**)	Displacem. Damage Limitation State	[mm]	--	--	2.34	3.99	--	--
$\delta_{N,seis\ (USL)}$ *)	Displacement Ultimate Limit State:	[mm]	--	--	9.54	10.17	--	--
$V_{Rk,p,seis}$ **)	Characteristic shear steel failure:	[kN]	--	--	17.8	33.0	--	--
γ_{Mp} ***)	Partial safety factor:	[-]	--	--	1.25	1.25	--	--
$\delta_{V,seis(DSL)}$ *)**)	Displacem. Damage Limitation State	[mm]	--	--	5.53	5.96	--	--
$\delta_{V,seis(USL)}$ *)	Displacement Ultimate Limit State:	[mm]	--	--	9.08	10.66	--	--

*) The listed displacements represent mean values

**) A small displacement may be required in the design in the case of displacement sensitive fastenings of "rigid" supports. The characteristic resistance associated with such smaller displacement may be determined by linear interpolation or proportional reduction.

***) The recommended safety factors under seismic actions $\gamma_{M,seis}$ are the same as for static loading

3.2 Safety in case of fire (BWR 2)

Reaction to fire has been assessed according to Commission Decision 96/603/EC, amended by 2000/605/EC. See class in table below:

Reaction to fire		M8	M10	M12	M16	M20	M24
Reaction to fire anchors MTP, MTP-G, MTP-X	[--]	Class A1					

Resistance to fire has been assessed according to Technical Report 020: "Evaluation of anchorages in concrete concerning resistance to fire"

Fire resistance duration = 30 minutes			M8	M10	M12	M16	M20	M24
Tension loads steel failure								
$N_{Rk,s,fi,30}$	Characteristic tension resistance	[kN]	0,4	0,9	1,7	3,1	4,9	7,1
Pull-out failure								
$N_{Rk,p,fi,30}$	Character. resistance in concrete C20/25 to C50/60	[kN]	1,3/1,5*)	2,3	3,0/4,0*)	6,3	7,5	7,5
Concrete cone failure **)								
$N_{Rk,c,fi,30}$	Character. resistance in concrete C20/25 to C50/60	[kN]	2.9	5,0	7,4	12,0	18,0	31,4
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,30}$	Characteristic shear resistance	[kN]	0,4	0,9	1,7	3,1	4,9	7,1
Shear loads steel failure with lever arm								
$M_{Rk,s,fi,30}$	Characteristic bending resistance	[Nm]	0,4	1,1	2,6	6,7	13,0	22,5

*) Respective values for anchors MTP / MTP-G, MTP-X
**) As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Fire resistance duration = 60 minutes			M8	M10	M12	M16	M20	M24
Tension loads steel failure								
$N_{Rk,s,fi,60}$	Characteristic tension resistance	[kN]	0,3	0,8	1,3	2,4	3,7	5,3
Pull-out failure								
$N_{Rk,p,fi,60}$	Character. resistance in concrete C20/25 to C50/60	[kN]	1,3 / 1,5*)	2,3	3,0 / 4,0*)	6,3	7,5	7,5
Concrete cone failure **)								
$N_{Rk,c,fi,60}$	Character. resistance in concrete C20/25 to C50/60	[kN]	2.9	5,0	7,4	12,0	18,0	31,4
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,60}$	Characteristic shear resistance	[kN]	0,3	0,8	1,3	2,4	3,7	5,3
Shear loads steel failure with lever arm								
$M_{Rk,s,fi,,60}$	Characteristic bending resistance	[Nm]	0,3	1,0	2,0	5,0	9,7	16,8

*) Respective values for anchors MTP / MTP-G, MTP-X
**) As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Fire resistance duration = 90 minutes			M8	M10	M12	M16	M20	M24
Tension loads steel failure								
$N_{Rk,s,fi,90}$	Characteristic tension resistance	[kN]	0,3	0,6	1,1	2,0	3,2	4,6
Pull-out failure								
$N_{Rk,p,fi,90}$	Character. resistance in concrete C20/25 to C50/60	[kN]	1,3 / 1,5*)	2,3	3,0 / 4,0*)	6,3	7,5	7,5
Concrete cone failure **)								
$N_{Rk,c,fi,90}$	Character. resistance in concrete C20/25 to C50/60	[kN]	2.9	5,0	7,4	12,0	18,0	31,4
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,90}$	Characteristic shear resistance	[kN]	0,3	0,6	1,1	2,0	3,2	4,5
Shear loads steel failure with lever arm								
$M_{Rk,s,fi,90}$	Characteristic bending resistance	[Nm]	0,3	0,7	1,7	4,3	8,4	14,6

*) Respective values for anchors MTP / MTP-G, MTP-X
**) As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Fire resistance duration = 120 minutes			M8	M10	M12	M16	M20	M24
Tension loads steel failure								
$N_{Rk,s,fi,120}$	Characteristic tension resistance	[kN]	0,2	0,5	0,8	1,6	2,5	3,5
Pull-out failure								
$N_{Rk,p,fi,120}$	Character. resistance in concrete C20/25 to C50/60	[kN]	1,0 / 1,2*)	1,8	2,4 / 3,2*)	5,0	6,0	6,0
Concrete cone failure **)								
$N_{Rk,c,fi,120}$	Character. resistance in concrete C20/25 to C50/60	[kN]	2,3	4,0	5,9	9,6	14,4	25,2
Shear loads steel failure without lever arm								
$V_{Rk,s,fi,120}$	Characteristic shear resistance	[kN]	0,2	0,5	0,8	1,6	2,5	3,5
Shear loads steel failure with lever arm								
$M_{Rk,s,fi,120}$	Characteristic bending resistance	[Nm]	0,2	0,6	1,3	3,3	6,5	11,2

*) Respective values for anchors MTP / MTP-G, MTP-X
**) As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

Spacing and minimum edge distance			M8	M10	M12	M16	M20	M24
$S_{cr,N}$	Spacing	[mm]	192	240	280	340	400	500
$C_{cr,N}$	Edge distance	[mm]	96	120	140	170	200	250
S_{min}	Minimum spacing	[mm]	50	60	70	85/128*)	100/150*)	125
C_{min}	Minimum edge distance (one side fire)	[mm]	96	120	140	170	200	250
C_{min}	Minimum edge distance (more than one side fire)	[mm]	300	300	300	300	300	300
γ_{Msp}	Partial safety factor**)	[-]	1.0	1.0	1.0	1.0	1.0	1.0

*) Respective values for anchors MTP / MTP-G, MTP-X
**) In absence of other national regulations

Concrete pry-out failure	M8	M10	M12	M16	M20	M24
k_3 factor [--]	1,0	2,0	2,0	2,0	2,0	2,0
In equation 5.6 of ETAG 001 annex C, or equation 16 of CEN/TS 1992-4-4 these values of k_3 factor and the relevant values of $N_{Rk,c,fi}$ given in the above tables have to be considered in the design.						

Concrete edge failure
The characteristic resistance $V^0_{RK,c,fi}$ in C20/25 to C50/60 concrete is determined by: $V^0_{RK,c,fi} = 0,25 \times V^0_{RK,c}$ (≤ R90) and $V^0_{RK,c,fi} = 0,20 \times V^0_{RK,c}$ (R120) With $V^0_{RK,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature according to ETAG 001 annex C, equation (5.7a) or CEN / TS 1992-4-4, equation 18

3.3 Hygiene, health and the environment (BWR 3)

This requirement is not relevant for the anchors.

3.4 Safety in use (BWR 4)

Requirements with respect to the safety in use are not included in this Essential Requirement but are treated under the Essential Requirement Mechanical Resistance and Stability (see section 3.1)

3.5 Protection against noise (BWR 5)

This requirement is not relevant for the anchors.

3.6 Energy economy and heat retention (BWR 6)

This requirement is not relevant for the anchors.

3.7 Sustainable use of natural resources (BWR 7)

No Performance Determined

4. System of assessment and verification of constancy of performance

According to the decision 96/582/EC of the European Commission [(2)] the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table applies:

Product	Intended use	Level or class	System
Metal anchors to be used in concrete (heavy duty type)	For fixing and/or supporting concrete structural elements or heavy units such as cladding and suspended ceilings	All / any	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 quality plan deposited at Instituto de Ciencias de la Construcción Eduardo Torroja.

Instituto de ciencias de la construcción Eduardo Torroja
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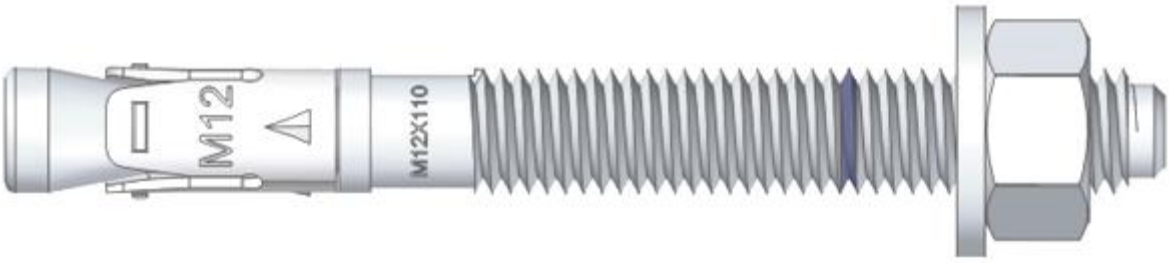
On behalf of the Instituto de Ciencias de la Construcción Eduardo Torroja
Madrid, 17th of December 2015

Marta Mª Castellote Armero
Director

(2) Published in the Official Journal of the European Union (OJEU) L254 of 24.06.1996 See www.new.eur-lex.europa.eu/oj/direct-access.html

INDEX OF ANNEXES:

Annex A: Assembled anchor



Identification on anchor:

- Expansion clip:
  - Anchor MTP: Index logo + “MTP“ + Metric.
  - Anchor MTP-G: Index logo + “MTP-G” + Metric
  - Anchor MTP-X: Index logo + “MTP-X” + Metric
- Anchor body: Metric x Length
- Thread: Embedment blue ring mark
- Anchor tip: Length letter code, as per table below

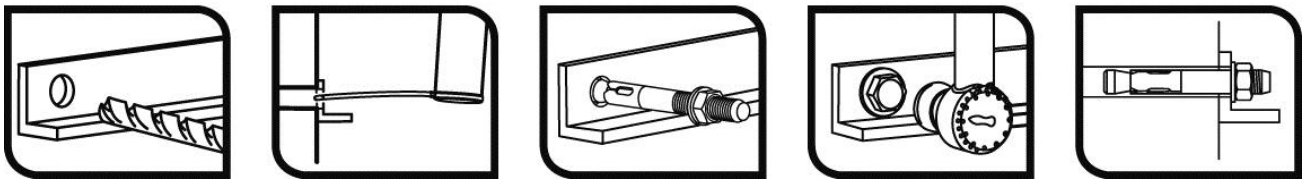
Letter code	Length [mm]
C	68 ÷76
D	76 ÷ 89
E	89 ÷ 102
F	102 ÷ 114
G	114 ÷ 127
H	127 ÷139
I	140 ÷ 152
J	152 ÷ 165
K	165 ÷ 178

Letter code	Length [mm]
L	178 ÷ 191
M	191 ÷ 203
N	203 ÷ 216
O	216 ÷ 229
P	229 ÷ 241
Q	241 ÷ 254
R	254 ÷ 267
S	267 ÷ 300

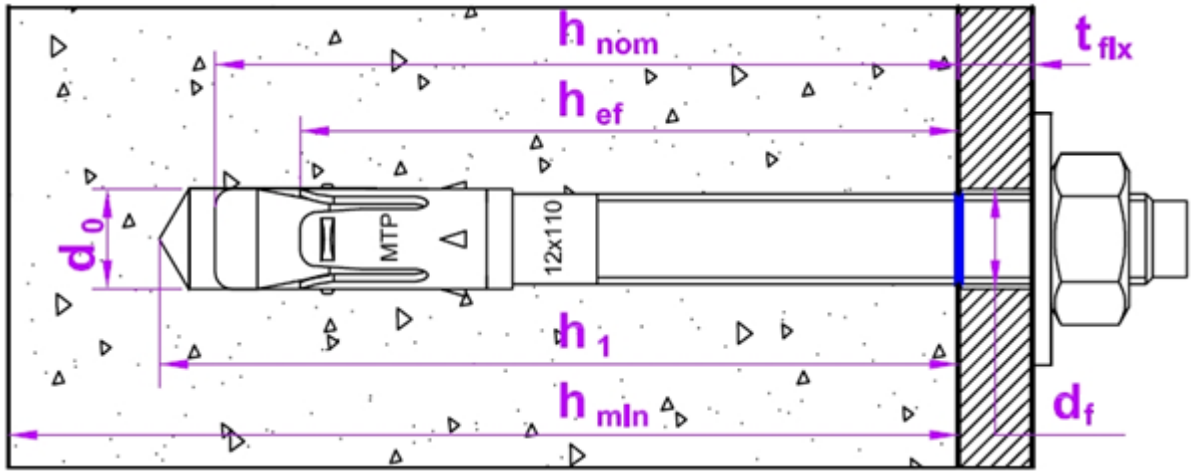
Annex B. Materials

Item	MTP anchor	MTP-G anchor	MTP-X anchor
Anchor Body	M8 to M20: carbon steel, wire rod cold forged M24: carbon steel, machined Electro zinc plated ≥ 5 µm ISO 4042 A2, with antifriction coating:	Carbon steel wire rod, cold forged, sherardized EN 13811 ≥ 40 µm	Carbon steel wire rod, cold forged , electro zinc plated ≥ 5 µm ISO 4042 A2, with antifriction coating
Washer	DIN 125 or DIN 9021 electro zinc plated ≥ 5 µm, ISO 4042 A2	DIN 125 or DIN 9021, sherardized EN 13811 ≥ 40 µm	DIN 125 or DIN 9021 electro zinc plated ≥ 5 µm, ISO 4042 A2
Nut	DIN 934 class 6, electro zinc plated ≥ 5 µm ISO 4042 A2	DIN 934 class 6, sherardized EN 13811 ≥ 40 µm	DIN 934 class 6, electro zinc plated ≥ 5 µm ISO 4042 A2
Expansion clip	Stainless steel, grade A4	Stainless steel, grade A4	Carbon steel, sherardized EN 13811 ≥ 40 µm

Annex C. Installation process



Annex D. Schema of the anchor in use



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}: Thickness of fixture
d_0: Nominal diameter of drill bit
d_f: Fixture clearance hole diameter