ZAVOD ZA GRADBENIŠTVO SLOVENIJE

SLOVENIAN NATIONAL BUILDING AND CIVIL ENGINEERING INSTITUTE

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Notified certification body
NB 1404

Certificate of constancy of performance

1404 – CPR – 3144

In compliance with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 (the Construction products Regulation or CPR), this certificate applies to the construction product

TCM MPRO / CFM PESF Bonded anchor

Bonded injection type anchor for use in non-cracked concrete: sizes M8 to M16

placed on the market under the name or trade mark of

Trutek Fasteners Polska Sp. z o.o.,
Al. Krakowska 38, Janki, PL-05-090 Raszyn, Poland

and produced in the manufacturing plant

Factory Plant 1.

This certificate attests that all provisions concerning the assessment and verification of constancy of performance described in the

ETA-19/0153, issued on 6. 3. 2019

and

EAD 330499-00-0601

under system **1** for the performance set out in the ETA are applied and that the factory production control conducted by the manufacturer is assessed to ensure the

constancy of performance of the construction product.

This certificate was first issued on **12. 4. 2019** and will remain valid until **12. 4. 2024** as long as neither the ETA, the EAD, the construction product, the AVCP method nor the manufacturing conditions in the plant are modified significantly, unless suspended or withdrawn by the notified product certification body.

More detailed information about the scope of the product is given in the annex to this certificate.

Ljubljana, 12. 4. 2019

Authorised signatory of the Certification body:
Marjan Japelj, B. Sc.

INJECTION RESIN
TRUTEK TCM MPRO

Usage:

- sticking threaded rods in concrete, reinforced concrete, natural stone and masonry substrates
- fastening light construction structures, roofs, barriers, balustrades and handrails
- fixing all types of equipment in various building substrates
- fixing of fence panels, entrance gates and garage doors
- fixing in hollow substrates using TPS and TMS perfused sleeves

Advantages:

- universal resin for various building substrates
- unscented resin - does not contain styrene
- adheres perfectly to porous substrates
- highest strength parameters in masonry substrates
- resin available in 420ml and 300ml tubes
- for use in a wide range of TCS threaded rod types, galvanized steel, hot-dip galvanized steel, A2 and A4 stainless steel and stainless steel with increased corrosion resistance 1.4529

Resin setting times							
Substrate temperature	°C	35	25	15	5	-5	-10*
Gel time	min	3	8	13	21	50	60
Cure time	min	20	20	20	30	90	180

Anchor rod material:
Threaded rods are made of ordinary carbon steel in the mechanical properties class 4.6, 5.8 and 8.8 are covered with a layer of galvanic zinc coating min. 5µm or fire up to 45µm. Threaded rods made of stainless steel, A2 and A4 class.

Substrate material:
Non-cracked concrete, minimum class C20 / 25, full brick, class 15, silicate brick, class 15, and perforated brick, class 7.5;

TCM MPRO resin with threaded rods in non-cracked concrete

Resin / type of anchored rod	TCM MPRO / TCS threaded rod steel class 5.8			
Rod diameterd [mm]	**M8**	**M10**	**M12**	**M16**
Design load-bearing capacity for pulling out of non-cracked concrete NRd [kN]	4,3	6,2	8,0	10,4
Shear load capacity in non-cracked concrete VRd [kN]	7,2	12,0	16,8	31,19
Hole / drill diameter up to [mm]	10	12	14	18
Hole depth h1 [mm]	85	95	115	130
Effective anchorage depth hef [mm]	80	90	110	125
Substrate thickness hmin [mm]	100	120	125	140
Minimum spacing between smin anchors [mm]	40	45	55	65
Minimum distance from the edge cmin [mm]	40	45	55	65
Required tightening torque Tinst [Nm]	8	10	15	25
Approximate amount of resin per hole in [ml]	3,7	5,1	7,4	11,1
Number of mounts from one tube - 420ml capacity	131	82	56,7	37,8

Technical data Trutek TCM M PRO based on the strength of concrete C20 / 25 (according to PN-EN 206-1: 2003).
The entire European Technical Assessment No. ETA-19/0153 should be taken into account when designing

TCM MPRO resin with TCS threaded rods in solid masonry substrates

Resin / type of anchored rod	TCM MPRO / TCS threaded rods, steel class 5.8											
Type of ground	**FULL BRICK 15 grade**				**FULL SILICATE BRICK 15 grade**				**FULL CLINKER BRICK grade 35**			
Rod diameter d [mm]	**M8**	**M10**	**M12**	**M16**	**M8**	**M10**	**M12**	**M16**	**M8**	**M10**	**M12**	**M16**
Design loads for pulling and shearing NRd and VRd [kN]	1,68	2,6	3,12	3,36	3,1	3,2	3,8	4,1	2,3	3,0	3,7	4,6
Hole / drill diameter up to [mm]	10	12	14	18	10	12	14	18	10	12	14	18
Hole depth h1 [mm]	85	95	115	130	85	95	115	130	85	95	115	130
Effective anchorage depth hef [mm]	80	90	110	125	80	90	110	125	80	90	110	125
Substrate thickness hmin [mm]	100	120	125	140	100	120	125	140	100	120	125	140
Distance between anchors Smin [mm]	120	135	165	188	120	135	165	188	120	135	165	188
Distance from the edge Cmin [mm]	240	270	330	390	240	270	330	390	240	270	330	390
Required tightening torque Tinst [Nm]	4	6	8	10	4	6	8	10	15	30	50	80
Approximate amount of resin per hole in [ml]	4	5	8	12	4	5	8	12	4	5	8	12
Number of mounts from one tube - 420ml capacity	105	80	50	35	105	80	50	35	105	80	50	35

Technical data Trutek TCM 420M PRO were developed in accordance with ITB-KOT-2018/0124 edition 2 for the following strength of substrates:
- full ceramic brick, class 15 PN-EN 771-1: 2015 standards;
- full silicate brick class 15 according to PN-EN 771-2: 2015 standards;
- full clinker brick, class 35 according to PN-EN 771-1: 2015 standards;

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TCM MPRO resin with TCS threaded rods in solid masonry substrates cont.

Resin / type of anchored rod	TCM MPRO / TCS threaded rods, steel class 5.8											
Type of ground	Aerated concrete / YTONG grade 6				Aerated concrete / YTONG grade 4				Aerated concrete / YTONG grade 2			
Rod diameter d [mm]	M8	M10	M12	M16	M8	M10	M12	M16	M8	M10	M12	M16
Design loads for pulling and shearing NRd and VRd [kN]	2,2	2,9	3,1	3,1	1,8	2,6	2,8	2,8	1,3	1,7	1,8	1,9
Hole / drill diameter up to [mm]	10	12	14	18	10	12	14	18	10	12	14	18
Hole depth h1 [mm]	85	95	115	130	85	95	115	130	85	95	115	130
Effective anchorage depth hef [mm]	80	90	110	125	80	90	110	125	80	90	110	125
Substrate thickness hmin [mm]	100	120	125	140	100	120	125	140	100	120	125	140
Distance between anchors Smin [mm]	120	135	165	188	120	135	165	188	120	135	165	188
Distance from the edge Cmin [mm]	240	270	330	390	240	270	330	390	240	270	330	390
Required tightening torque Tinst [Nm]	5	8	8	10	5	8	8	10	4	6	8	10
Approximate amount of resin per hole in [ml]	4	5	8	12	4	5	8	12	4	5	8	12
Number of mounts from one tube - 420ml capacity	105	80	50	35	105	80	50	35	105	80	50	35

Technical data Trutek TCM 420M PRO were developed in accordance with ITB-KOT-2018/0124 edition 2 for the following strength of substrates:

- aerated concrete e.g. YTONG class 6, density ≥700 by PN-EN 771-4 + A1: 2015 standards
- aerated concrete e.g. YTONG class 4, density ≥650 by PN-EN 771-4 + A1: 2015 standards
- aerated concrete e.g. YTONG class 2, density ≥400 by PN-EN 771-4 + A1: 2015 standards

TCM MPRO resin with TCS threaded rods and TPS or TMS perforated sleeves in masonry substrates with holes

Resin / type of anchored rod	TCM MPRO / TCS threaded rods steel class 5.8 / TPS perforated sleeves or TMS mesh											
Type of ground	CLINKER BRICK WITH HOLES OF CLASS 20				POORIZED CERAMIC FLUSHES, class 15				SILICATE BRICK WITH HOLES OF CLASS 15			
Rod diameter d[mm]	M8	M10	M12	M16	M8	M10	M12	M16	M8	M10	M12	M16
Pull-out and shear load capacity NRd and VRd [kN]	1,8	3,3	3,7	4,0	0,9	1,6	1,6	1,7	1,8	3,3	3,7	4,0
Hole / drill diameter up to [mm]	12	16	16	20	12	16	16	20	12	16	16	20
Dimensions of the TPS or TMS perforated sleeve	12x50	15x85	15x85	20x85	12x50	15x85	15x85	20x85	12x50	15x85	15x85	20x85
Hole depth h1 [mm]	60	95	95	95	60	95	95	95	60	95	95	95
Effective anchorage depth hef [mm]	50	85	85	85	50	85	85	85	50	85	85	85
Substrate thickness hmin [mm]	80	110	110	110	80	110	110	110	80	110	110	110
Distance between anchors Smin [mm]	100	170	170	170	100	170	170	170	100	170	170	170
Distance from the edge Cmin [mm]	100	100	100	100	100	100	100	100	100	100	100	100
Required tightening torque Tinst [Nm]	5	8	8	10	5	8	8	10	5	8	8	10
Approximate amount of resin per hole in [ml]	7	20	20	30	7	20	20	30	7	20	20	30
Nbr of mounts from one tube - capacity 420 ml	60	21	21	14	60	21	21	14	60	21	21	14

Technical data Trutek TCM 420M PRO were developed in accordance with ITB-KOT-2018/0124 edition 2 for the following strength of substrates:

- clinker brick with holes class 20 according to PN-EN 771-1: 2015 standards (wall thickness ≥10mm);
- class 15 ceramic hollow bricks according to PN-EN 771-1: 2015 standards (wall thickness ≥12mm);
- silicate brick with holes of class 15 acc. PN-EN 771-2: 2015 standards (wall thickness ≥15mm);

TCM MPRO resin with TIS threaded sleeves in solid masonry substrates

Resin / type of anchored sleeve	TCM MPRO / TIS threaded sleeves / TPS perforated sleeves or TMS mesh sleeves											
Type of ground	FULL BRICK 15 grade				Aerated concrete / YTONG class 6				Aerated concrete / YTONG class 4			
Rod diameter d [mm]	TIS06	TIS08	TIS10	TIS12	TIS06	TIS08	TIS10	TIS12	TIS06	TIS08	TIS10	TIS12
Pull-out and shear load capacity NRd and VRd [kN]	2,6	2,4	6,7	8,2	1,0	2,3	2,7	2,8	0,3	1,2	1,5	1,6
Hole / drill diameter up to [mm]	10	14	16	18	10	14	16	18	10	14	16	18
Hole depth h1 [mm]	60	95	95	95	60	95	95	95	60	95	95	95
Effective anchorage depth hef [mm]	55	85	85	85	55	85	85	85	55	85	85	85
Substrate thickness hmin [mm]	80	110	110	110	80	110	110	110	80	110	110	110
Distance between anchors Smin [mm]	100	160	160	160	100	160	160	160	100	160	160	160
Distance from the edge Cmin [mm]	150	240	240	240	150	240	240	240	150	240	240	240
Required tightening torque Tinst [Nm]	4	10	13	24	4	10	13	24	4	10	13	24
Approximate amount of resin per hole in [ml]	2,6	6,7	8,0	9,5	2,6	6,7	8,0	9,5	2,6	6,7	8,0	9,5
Number of mounts from one tube - 420ml capacity	162	63	52	44	162	63	52	44	162	63	52	44

Technical data Trutek TCM 420M PRO were developed in accordance with ITB-KOT-2018/0124 edition 2 for the following strength of substrates:

- full ceramic brick, class 15 PN-EN 771-1: 2015 standards;
- aerated concrete e.g. YTONG class 6, density ≥700 by PN-EN 771-4 + A1: 2015 standards
- aerated concrete e.g. YTONG class 4, density ≥650 by PN-EN 771-4 + A1: 2015 standards

TCM MPRO resin with TIS threaded sleeves and TPS or TMS perforated sleeves in masonry substrates with holes

Resin / type of anchored rod	TCM MPRO / TIS threaded sleeves / TPS perforated sleeves or TMS mesh sleeves			
Type of ground	POORIZED CERAMIC FLUSHES, class 15			
Rod diameter d [mm]	**TIS06**	**TIS08**	**TIS10**	**TIS12**
Design loads for pulling and shearing NRd and VRd [kN]	0,4	1,0	1,3,	1,5
Hole / drill diameter up to [mm]	12	16	20	20
Dimensions of the TPS or TMS perforated sleeve	12x50	15x85	20x85	20x85
Hole depth h1 [mm]	60	95	95	95
Effective anchorage depth hef [mm]	50	85	85	85
Substrate thickness hmin [mm]	80	110	110	110
Distance between anchors Smin [mm]	100	170	170	170
Distance from the edge Cmin [mm]	100	100	100	100
Required tightening torque Tinst [Nm]	4	10	13	24
Approximate amount of resin per hole in [ml]	7	20	30	30
Number of mounts from one tube - 420ml capacity	60	21	14	14

Technical data Trutek TCM 420M PRO were developed in accordance with ITB-KOT-2018/0124 edition 2 for the following strength of substrates: - class 15 ceramic hollow bricks according to PN-EN 771-1: 2015 standards (wall thickness ≥12mm);

Chemical anchor rods and accessories

Rod diameter d [mm]	Hole diameter d_o [mm]	Minimum substrate thickness h_{min} [mm]	Hole depth h_1 [mm]	Nylon perforated sleeve TPS	Steel Mesh Sleeve TMS	TCS Anchor rod steel class 5.8 and 8.8	Anchor rod TCS G steel class 5.8 hot dipped galvanised	Anchor rod TCS SSA4 stainless steel A4-316	Hole cleaning brush TCB	Drill Bits
8	10	100	85	-	-	TCS08110	TCS08110G	TCS08110SSA4	TCB08	TCPP10160
10	12	120	95	-	-	TCS10130	TCS10130G	TCS10130SSA4	TCB10	TCPP12160
12	14	125	115	-	-	TCS12160	TCS12160G	TCS12160SSA4	TCB12	TCPP14160
16	18	140	130	-	-	TCS16190	TCS16190G	TCS16190SSA4	TCB16	TCPP18210
8	12	120	60	TPS01	TMS12	TCS08110	TCS08110G	TCS08110SSA4	TCB12	TCPP12160
10	16	120	95	TPS02	TMS16	TCS10130	TCS10130G	TCS10130SSA4	TCB16	TCPP16160
12	16	120	95	TPS02	TMS16	TCS12160	TCS12160G	TCS12160SSA4	TCB16	TCPP16160
16	22	120	95	TPS04	TMS22	TCS16190	TCS16190G	TCS16190SSA4	TCB20	TCMU22340

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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-19/0153 of 2019/03/06

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S	
Trade name of the construction product:	TCM MPRO / CFM PESF Bonded anchor
Product family to which the above construction product belongs:	Bonded injection type anchor for use in non-cracked concrete: sizes M8 to M16
Manufacturer:	Trutek Fasteners Polska Sp z o.o. Al. Krakowska 38 Janki PL-05-090 Raszyn Tel. +48 22 701 93 24 Fax +48 22 100 12 31 Internet www.trutek.com.pl
Manufacturing plant:	Trutek Fasteners Polska Sp z o.o. Factory Plant 1
This European Technical Assessment contains:	16 pages including 11 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	EAD 330499-00-0601, Bonded fasteners for use in concrete
This version replaces:	

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product
The TCM MPRO / CFM PESF is a bonded anchor (injection type) consisting of an injection mortar cartridge equipped with a special mixing nozzle and threaded anchor rod of the sizes M8 to M16 made of galvanized carbon steel, stainless steel A4-70 or high corrosion resistant steel. See table A2 for material specification of the rods.

The threaded rod is placed into a drilled hole previously injected (using an applicator gun) with a mortar with a slow and slight twisting motion. The anchor rod is anchored by the bond between rod, mortar and concrete.

Each mortar cartridge is marked with the identifying mark of the producer and with the trade name. The mortar cartridges are available in different sizes.

The anchor in the range of M8 to M16 and the mortar cartridges corresponds to the drawings given in the Annex A1 and A2.

The characteristic material values, dimensions and tolerances of the anchors not indicated in Annexes shall correspond to the respective values laid down in the technical documentation[1] of this European Technical Assessment.

The anchors are intended to be used with embedment depth given in Annex A2, Table A1. For the installed anchor, see Figure given in Annex A2. The intended use specifications of the product are detailed in the Annex B1.

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

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B1 to B9

The provisions made in this European Technical Assessment are based on an assumed intended working life of the anchor of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

1 The technical documentation of this European Technical Assessment is deposited at ETA-Danmark and, as far as relevant for the tasks of the Notified bodies involved in the attestation of conformity procedure, is handed over to the notified bodies.

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

3.1 Characteristics of product

Mechanical resistance and stability (BWR 1):
The essential characteristics are detailed in the Annex from C1 to C3.

Safety in case of fire (BWR 2):
The essential characteristics are detailed in the Annex from C4.

Hygiene, health and the environment (BWR3):
No performance assessed

Safety in use (BWR4):
For basic requirement Safety in use the same criteria are valid for Basic Requirement Mechanical resistance and stability (BWR1).

Sustainable use of natural resources (BWR7)
No performance determined

Other Basic Requirements are not relevant.

3.2 Methods of assessment

The assessment of fitness of the anchor for the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements 1 and 4 has been made in accordance with the EAD 330499-00-0601, Bonded fasteners for use in concrete.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 96/582/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 1.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

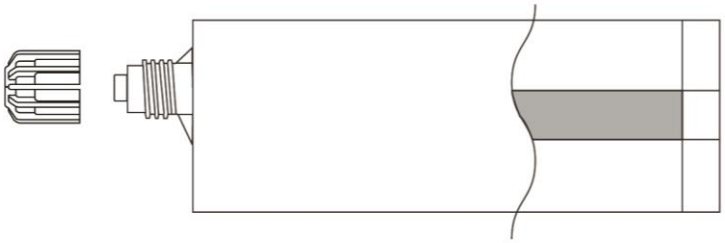
Issued in Copenhagen on 2019-03-06 by

Thomas Bruun
Managing Director, ETA-Danmark

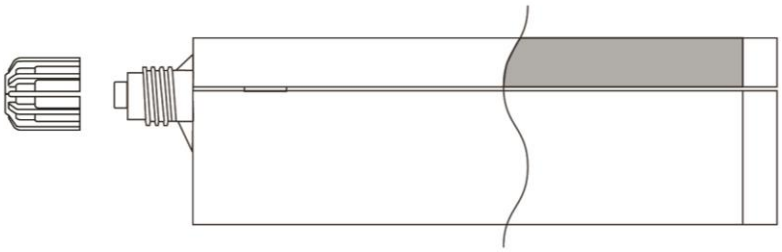
Injection Mortar : TCM MPRO / CFM PESF Resin System

Foil Bag Cartridge
165ml - 410ml

Coaxial Cartridge
280ml, 380ml - 420ml



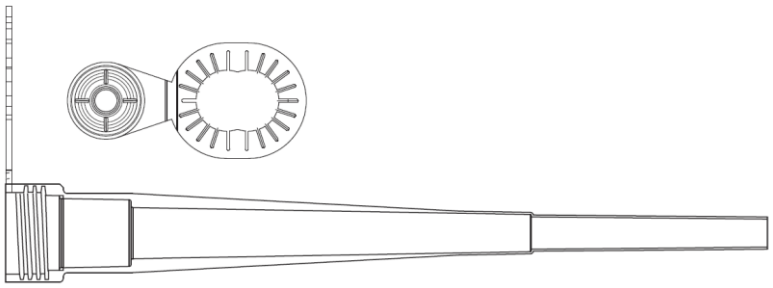
Side by Side Cartridge
235ml - 825ml



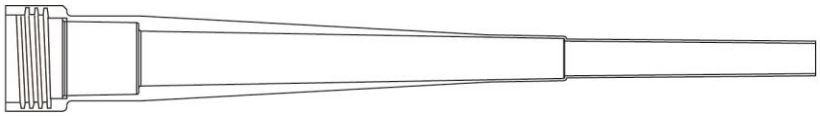
Marking:

TCM MPRO / CFM PESF
Batch code, either expiry date or manufacturing date with shelf life

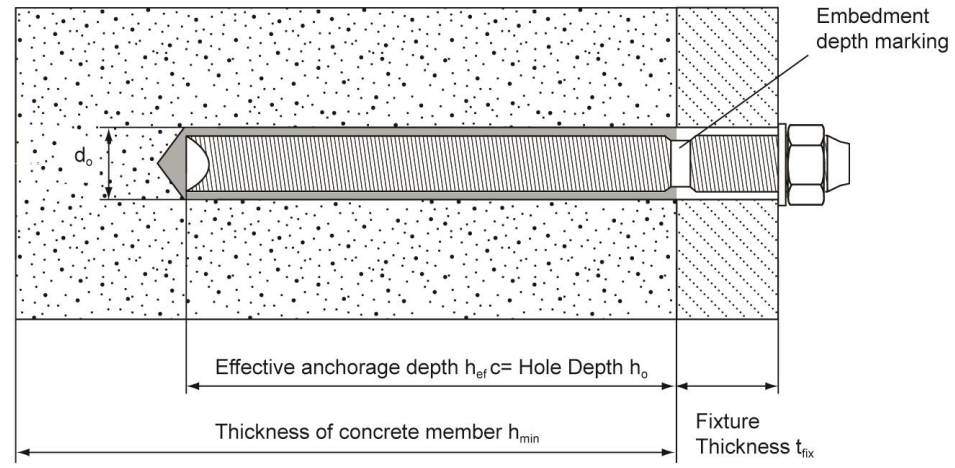
Mixer with hanger



Mixer



TCM MPRO / CFM PESF	**Annex A1** of European Technical Assessment ETA-19/0153
Product and intended use	



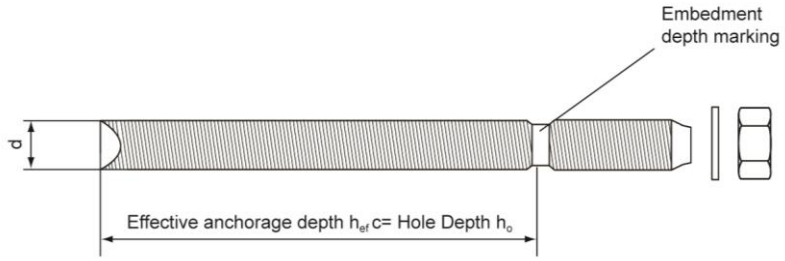


Table A1: Threaded rod dimensions

Anchor size			**M8**	**M10**	**M12**	**M16**
Diameter of anchor rod	d	[mm] =	8	10	12	16
Range of anchor depth h_{ef} and bore hole depth h_0	min	[mm] =	60	60	70	80
	max	[mm] =	160	200	240	320
Nominal anchorage depth	h_{ef}	[mm] =	80	90	110	125
Nominal diameter of drill bit	d_0	[mm] =	10	12	14	18
Diameter of clearance hole in the fixture	d_f	[mm] ≤	9	12	14	18
Diameter of steel brush	d_b	[mm] ≤	12	13,3	14,9	19,35
Installation torque moment	T_{inst}	[Nm] =	8	10	15	25
Minimum thickness of concrete member	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm			h_{ef} + 2d_0
Minimum spacing	S_{min}	[mm] =	0,5 h_{ef}			
Minimum edge distance	C_{min}	[mm] =	0,5 h_{ef}			

Table A2: Threaded rod materials

Designation	Material
Threaded rods made of zinc coated steel	
Threaded rod M8 – M16	Strength class 5.8, 8.8, 10.9 EN ISO 898-1 Steel galvanized ≥ 5µm EN ISO 4042 Hot dipped galvanized ≥ 45µm EN ISO 10684
Washer ISO 7089	Steel galvanized EN ISO 4042; hot dipped galvanized EN ISO 10684
Nut EN ISO 4032	Strength class 8 EN ISO 898-2 Steel galvanized ≥ 5µm EN ISO 4042 Hot dipped galvanized ≥ 45µm EN ISO 10684
Threaded rods made of stainless steel	
Threaded rod M8 – M16	Strength class 70 EN ISO 3506-1; Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 en 10088
Washer ISO 7089	Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 en 10088
Nut EN ISO 4032	Strength class 70 EN ISO 3506-1; Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 en 10088
Threaded rods made of high corrosion resistant steel	
Threaded rod M8 – M16	R_m = 800 N/mm^2; $R_{p0,2}$=640 N/mm^2 High corrosion resistant steel 1.4529, 1.4565 EN 10088
Washer ISO 7089	High corrosion resistant steel 1.4529, 1.4565 EN 10088
Nut EN ISO 4032	Strength class 70 EN ISO 3506-2; High corrosion resistant steel 1.4529, 1.4565 EN 10088

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 from M8 to M16.

Base materials:
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum to C50/60 at maximum according to EN 206-1.
- Non cracked concrete: sizes from M8 to M16

Temperature range:
The anchors may be used in the following temperature range:
(a) Winter version: max short term temperature + 40 °C and max long term temperature + 24 °C;
(b) Standard version: max short term temperature + 80 °C and max long term temperature + 50 °C.

Use conditions (Environmental conditions):
Elements made of galvanized steel and stainless steel may be used in structures subject to the following conditions:
- Internal dry conditions
- Dry internal conditions, external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist.
- dry internal conditions, external atmospheric exposure, in permanently damp internal conditions or in other particular aggressive conditions - e.g. permanent, alternating immersion in seawater, splash zone of seawater, chloride atmosphere of indoor swimming pools or atmosphere with chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Installation:
The anchors may be installed in:
- Dry or wet concrete (use category 1): sizes from M8 to M16.
- Flooded holes with the exception of seawater (use category 2): sizes from M8 to M16.
- All the diameters may be used overhead: sizes from M8 to M16.
- The anchor is suitable for hammer drilled holes: sizes from M8 to M16.

Proposed design methods:
- Static and quasi-static load: EN 1992-4

Table B1: Installation data

Threaded rod And rebar	Size	Nominal drill bit diameter d_o (mm)	Steel Brush	Cleaning methods	
				Manual cleaning (MAC)	Compressed air cleaning (CAC)
Studs 	M8	10	12mm	Yes … $h_{ef} \leq 80$ mm	Yes
	M10	12	14mm	Yes … $h_{ef} \leq 100$mm	
	M12	14	16mm	Yes … $h_{ef} \leq 120$mm	
	M16	18	20mm	Yes … $h_{ef} \leq 160$mm	

Manual Cleaning (MAC):
Hand pump
recommended for
Blowing out bore holes with diameters
$d_o \leq 24$ mm and bore holes depth $h_o \leq 10d$

Compressed air cleaning (CAC):
Recommended air nozzle with an
Orifice opening of minimum
3,5mm in diameter.

Table B2: Minimum curing time

Minimum base material temperature C°	Gel time (working time) In dry/wet concrete	Cure time
0°C ≤ $T_{base\ material}$ < 10°C	20 min	90 min
10°C ≤ $T_{base\ material}$ < 20°C	9 min	60 min
20°C ≤ $T_{base\ material}$ < 30°C	5 min	30 min
30°C ≤ $T_{base\ material}$ ≤ 40°C	3 min	20 min

The temperature of the bond material must be ≥ 20°C

Table B3 - parameters: drilling, hole cleaning and installation

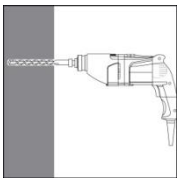
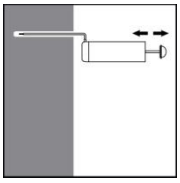
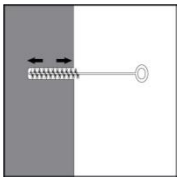
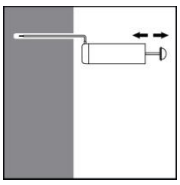
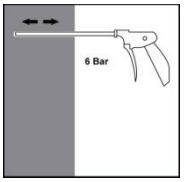
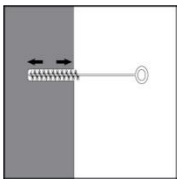
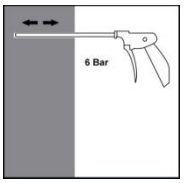
Bore hole drilling		
		Drill hole in the substrate to the required embedment depth using the appropriately sized carbide drill bit.
Bore hole cleaning Just before setting an anchor, the bore hole must be free of dust and debris.		
a) Manual air cleaning (MAC) for all bore hole diameters $d_o \leq 24$mm and bore hole depth $h_o \leq 10d$		
	**X 4**	The manual pump shall be used for blowing out bore holes up to diameters $d_o \leq 24$mm and embedment depths up to $h_{ef} \leq 10d$. Blow out at least 4 times from the back of the bore hole, using an extension if needed.
	**X 4**	Brush 4 times with the specified brush size (see Table B1) by inserting the steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it.
	**X 4**	Blow out again with manual pump at least 4 times.
b) Compressed air cleaning (CAC) for all bore hole diameters d_o and all bore hole depths		
	**X 2**	Blow 2 times from the back of the hole (if needed with a nozzle extension) over the whole length with oil-free compressed air (min. 6 bar at 6 m³/h).
	**X 2**	Brush 2 times with the specified brush size (see Table B1) by inserting the steel brush to the back of the hole (if needed with an extension) in a twisting motion and removing it.
	**X 2**	Blow out again with compressed air at least 2 times.

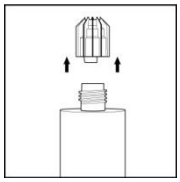
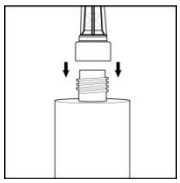
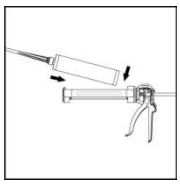
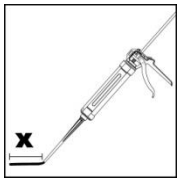
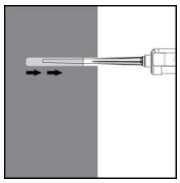
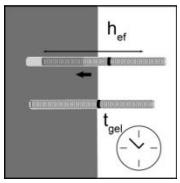
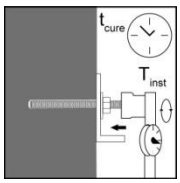
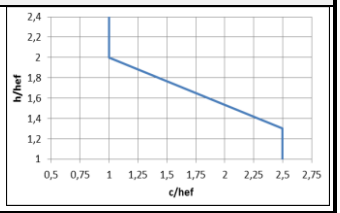
Table B4 - parameters: drilling, hole cleaning and installation	
	Remove the threaded cap from the cartridge.
	Tightly attach the supplied mixing nozzle. Do not modify the mixer in any way. Made sure the mixing element is inside the mixer. Use only the supplied mixer.
	Insert the cartridge into the dispenser gun.
	Discard the initial trigger pulls of adhesive. Depending on the size of the cartridge, an initial amount of adhesive mix must be discarded. Discard quantities are - 5cm for between 150ml, 300ml & 400ml Foil Pack - 10cm for all other cartridges
	Inject the adhesive starting at the back of the hole, slowly withdrawing the mixer with each trigger pull. Fill holes approximately 2/3 full, to ensure that the annular gap between the anchor and the concrete is completely filled with adhesive along the embedment depth.
	Before use, verify that the threaded rod is dry and free of contaminants. Install the threaded rod to the required embedment depth during the open gel time t_{gel} has elapsed. The working time t_{gel} is given in Table B2.
	The anchor can be loaded after the required curing time t_{cure} (see Table B2). The applied torque shall not exceed the values T_{max} given in Table A1.

Table C1: Design method A, characteristic tension load values

TCM MPRO / CFM PESF with threaded rods			M8	M10	M12	M16
Steel failure						
Characteristic resistance, class 5.8	$N_{Rk,s}$	[kN]	**18**	**29**	**42**	**79**
Characteristic resistance, class 8.8	$N_{Rk,s}$	[kN]	**29**	**46**	**67**	**126**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,5			
Characteristic resistance, class 10.9	$N_{Rk,s}$	[kN]	**36**	**58**	**84**	**157**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,4			
Characteristic resistance, A4-70	$N_{Rk,s}$	[kN]	**26**	**41**	**59**	**110**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,87			
Characteristic resistance, HCR	$N_{Rk,s}$	[kN]	**29**	**46**	**67**	**126**
Partial safety factor	$\gamma_{Ms,N}$ [1]	[-]	1,5			
Combined Pull-out and Concrete cone failure [2]						
Diameter of threaded rod	d	[mm]	8	10	12	16
Characteristic bond resistance in non-cracked concrete C20/25 – dry or wet concrete						
Temperature range a [3] : **40°C/24°C**	$\tau_{Rk,ucr}$	[N/mm²]	**6,0**	**5,5**	**5,0**	**4,0**
Temperature range b [3] : **80°C/50°C**	$\tau_{Rk,ucr}$	[N/mm²]	**4,5**	**4,0**	**3,5**	**3,0**
Partial safety factor – dry or wet concrete	$\gamma_{Mp}=\gamma_{Mc}$ [1]	[-]	2,1[5]	1,8[6]		
Characteristic bond resistance in non-cracked concrete C20/25 – flooded holes						
Temperature range a [3] : **40°C/24°C**	$\tau_{Rk,ucr}$	[N/mm²]	**5,0**	**4,0**	**4,0**	**3,5**
Temperature range Ib [3] : **80°C/50°C**	$\tau_{Rk,ucr}$	[N/mm²]	**3,5**	**3,0**	**3,0**	**3,0**
Partial safety factor – flooded holes	$\gamma_{Mp}=\gamma_{Mc}$ [1]	[-]	2,1[5]			
Increasing factor for $\tau_{Rk,ucr}$ in non-cracked concrete	ψ_c	C30/37	1,08			
		C40/50	1,15			
		C50/60	1,19			
Splitting failure[2]						
Edge distance $c_{cr,sp}$ [mm] for		h / h_{ef} [4] ≥ 2,0	**1,0 h_{ef}**			
		2,0 > h / h_{ef} [4] > 1,3	**5,28 h_{ef} - 2,14 h**			
		h / h_{ef} [4] ≤ 1,3	**2,5 h_{ef}**			
Spacing	$s_{cr,sp}$	[mm]	2 $c_{cr,sp}$			
Partial safety factor – dry or wet concrete	$\gamma_{Msp}=\gamma_{Mc}$ [1]	[-]	2,1[5]	1,8[6]		
Partial safety factor – flooded holes	$\gamma_{Msp}=\gamma_{Mc}$ [1]	[-]	2,1[5]			



[1] In absence of national regulations
[2] Calculation of concrete and splitting, see annex B1
[3] Explanations, see annex B1
[4] h concrete member thickness, h_{ef} effective anchorage depth
[5] The partial safety factor γ_{inst}=1,4 included
[6] The partial safety factor γ_{inst}=1,2 included

Table C2: Displacements under tension load

TCM MPRO / CFM PESF with threaded rods			M8	M10	M12	M16
Temperature range a [7]: 40°C / 24°C						
Admissible service load	F	[kN]	9,0	10,4	13,2	16,1
Displacement	δ_{N0}	[mm]	0,22	0,21	0,19	0,25
Displacement	$\delta_{N\infty}$	[mm]	-	-	0,29	-
Temperature range b [7]: 80°C / 50°C						
Admissible service load	F	[kN]	6,8	7,5	9,2	12,1
Displacement	δ_{N0}	[mm]	0,35	0,33	0,30	0,40
Displacement	$\delta_{N\infty}$	[mm]	-	-	0,38	-

[7] Explanation see annex B1

Table C3: Design method A, Characteristic shear load values

TCM MPRO / CFM PESF with threaded rods			M8	M10	M12	M16
Steel failure without lever arm						
Characteristic resistance, class 5.8	$V_{Rk,s}$	[kN]	**9**	**15**	**21**	**39**
Characteristic resistance, class 8.8	$V_{Rk,s}$	[kN]	**15**	**23**	**34**	**63**
Characteristic resistance, class 10.9	$V_{Rk,s}$	[kN]	**18**	**29**	**42**	**79**
Characteristic resistance, A4-70	$V_{Rk,s}$	[kN]	**13**	**20**	**30**	**55**
Characteristic resistance, HCR	$V_{Rk,s}$	[kN]	**15**	**23**	**34**	**62,8**
Steel failure with lever arm						
Characteristic resistance, class 5.8	$M^0_{Rk,s}$	[Nm]	**19**	**37**	**66**	**167**
Characteristic resistance, class 8.8	$M^0_{Rk,s}$	[Nm]	**30**	**60**	**105**	**266**
Characteristic resistance, class 10.9	$M^0_{Rk,s}$	[Nm]	**38**	**75**	**131**	**333**
Characteristic resistance, A4-70	$M^0_{Rk,s}$	[Nm]	**26**	**53**	**92**	**233**
Characteristic resistance, HCR	$M^0_{Rk,s}$	[Nm]	**30**	**60**	**105**	**266**
Partial safety factor steel failure						
grade 5.8 or 8.8	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
grade 10.9	$\gamma_{Ms,V}$ [1)]	[-]	1,50			
A4-70	$\gamma_{Ms,V}$ [1)]	[-]	1,56			
HCR	$\gamma_{Ms,V}$ [1)]	[-]	1,25			
Concrete pryout failure						
Factor in equation (27) of CEN/TS 1992-4-5, 6.3.3	k_3	[-]	2,0			
Partial safety factor	γ_{Mc} [1)]	[-]	2,1 [5)]	1,8 [6)]		
Concrete edge failure						
Partial safety factor	γ_{Mc} [1)]	[-]	2,1 [5)]	1,8 [6)]		

[1)] In absence of national regulations
[5)] The partial safety factor γ_{inst}=1,4 included
[6)] The partial safety factor γ_{inst}=1,2 included.

Table C4: Displacements under shear load

TCM MPRO / CFM PESF with threaded rods			M8	M10	M12	M16
Displacement [8)]	δ_{V0}	[mm/kN]	0,06	0,06	0,05	0,04
Displacement [8)]	$\delta_{V\infty}$	[mm/kN]	0,09	0,08	0,08	0,06

[8)] Calculation of displacement under service load: V_{sd} design value of shear load
Displacement under short term loading = $\delta_{V0} \cdot V_{sd}/1,4$
Displacement under short term loading = $\delta_{V\infty} \cdot V_{sd}/1,4$

Table C5: Resistance to fire

ESSENTIAL CHARACTERISTICS	PERFORMANCE
Resistance to fire	No performance assessed

Table C6: Reaction to fire

ESSENTIAL CHARACTERISTICS	PERFORMANCE
Reaction to fire	In the final application, the thickness of the mortar layer is about 1 to 2 mm and most of the mortar is material classified class A1 according to EC Decision 96/603/EC. Therefore, it may be assumed that the bonding material (synthetic mortar or a mixture of synthetic mortar and cementitious mortar) in connection with the metal anchor in the end use application do not contribute to fire growth or to the fully developed fire and they have no influence to the smoke hazard.