CPC BELGELENDİRME
MUAYENE VE DENEY
HİZMETLERİ TİC. LTD. ŞTİ.
Çamlıca Mah. (Timko Eti) Anadolu
Blv. No:20-R Blok No:4
Yenimahalle/Ankara
www.cpcert.org

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European Technical Assessment

ETA-24/0833
of (24.10.2024)

Technical Assessment Body issuing the European Technical Assessment: CPC Belgelendirme Muayene ve Deney Hizmetleri Tic. Ltd. Şti.	
Trade name of the construction product	PESF, PESF-E, PESF-C Chemical Anchor
Product family to which the construction product belongs	Product Area Code: 33 Bonded injection type anchor for use in non-cracked concrete
Manufacturer	**Metsan Endustriyel Yapistiricilar Tic. A.S.** Birlik Organize Sanayi Bölgesi Batı Caddesi 1.Sokak No.1 34953 Tuzla, İstanbul TÜRKİYE
Manufacturing plant(s)	**Metsan Endustriyel Yapistiricilar Tic. A.S.**
This European Technican Assessment contains	17 pages including 4 Annexes which forms an integral part of this assessment Annex may contain confidential information and is/are not included in the European Technical Assessment when that assessment is publicly disseminated
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330499-02-0601 Bonded Fasteners for Use In Concrete

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1. Technical description of the product

The Metsan Chemical Anchor PESF, PESF-E, PESF-C, a polyester resin chemical anchor infused without styrene designed for non-cracked concrete, represents a bonded anchoring system comprising a cartridge containing injection mortar and a steel component. The Metsan Chemical Anchor PESF, PESF-E, PESF-C is a chemical anchor system that employs polyester resin infused without styrene, specifically formulated for adherence to non-cracked concrete. This system comprises a cartridge containing injection mortar and a steel component, wherein the steel elements consist of commercially available threaded rods equipped with a hexagon nut and washer. These steel components are crafted from either galvanized steel or stainless steel.

The anchoring process involves placing the steel element into a pre-drilled hole filled with injection mortar, establishing a secure connection through the amalgamation of the metal part, injection mortar, and the concrete substrate.

For a comprehensive visual representation and detailed product description, please consult Annex A.

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 B.

The provisions made in this European Technical Assessment are based on an assumed 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, but are to be regarded only as a means for choosing the products in relation to the expected economically reasonable working life of the works.

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for tension loads	See Annex C 1
Characteristic resistance for shear loads	See Annex C 2
Characteristic resistance for shear loads	See Annex C 3
Displacement	See Annex C 4

3.2 Hygiene, health and environment (BWR 3)

No performance determined.

3.3 General aspects relating to fitness for use

Durability and serviceability are only ensured if the specifications of intended use according to Annex B 1 are kept.

4. Assessment and verification of constancy of performance (AVCP) system applied with reference to its legal base

According to the Decision 96/582/EC of the European Commission[1] the system of assessment verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	-	1

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

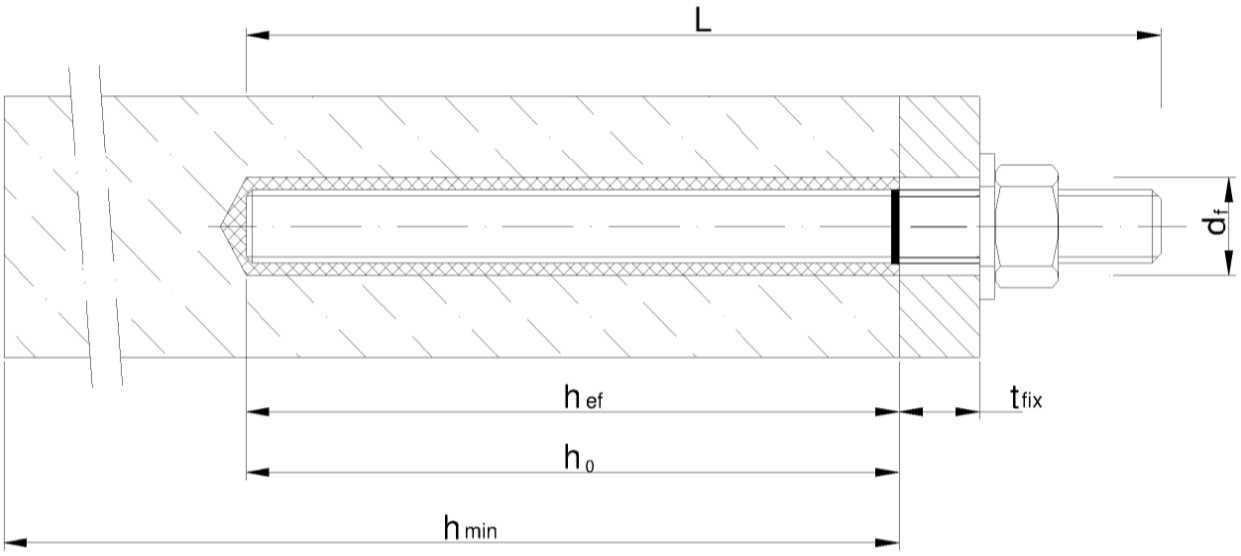
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited by the Technical Assessment Body. The notified product certification body shall visit the factory at least once a year for surveillance of the manufacturer.

Issued in Ankara on 24.10.2024
by
UĞUR GEDİK

e-imzalıdır/e-signed
Uğur GEDİK
GENEL MÜDÜR/GENERAL MANAGER

Installed condition

Installation threaded rod



d_f = diameter of clearance hole in the fixture

t_{fix} = thickness of fixture

h_{ef} = effective anchorage depth

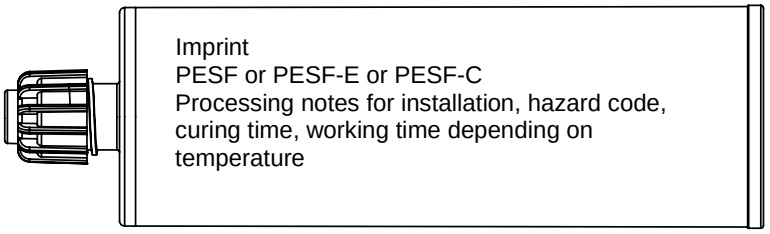
h_0 = depth of drill hole

h_{min} = minimum thickness of member

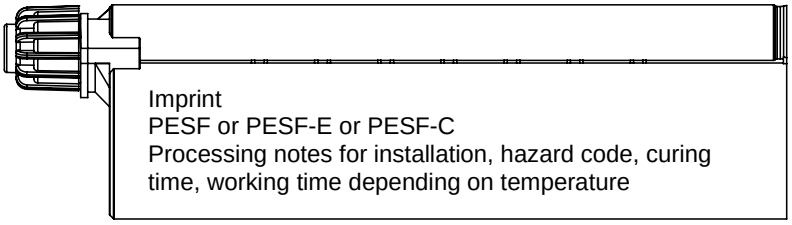
Injection system

Cartridge: PESF, PESF-E, PESF-C

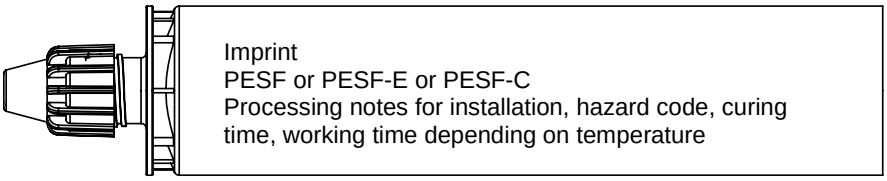
Type: Coaxial, 380ml up to 420ml cartridge



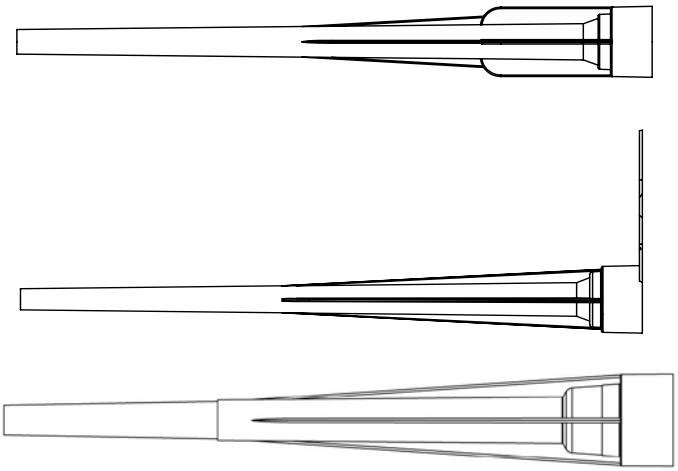
Type: Side-by-side, 345ml up to 360ml



Type: Foil tube, 165ml and 300ml cartridge



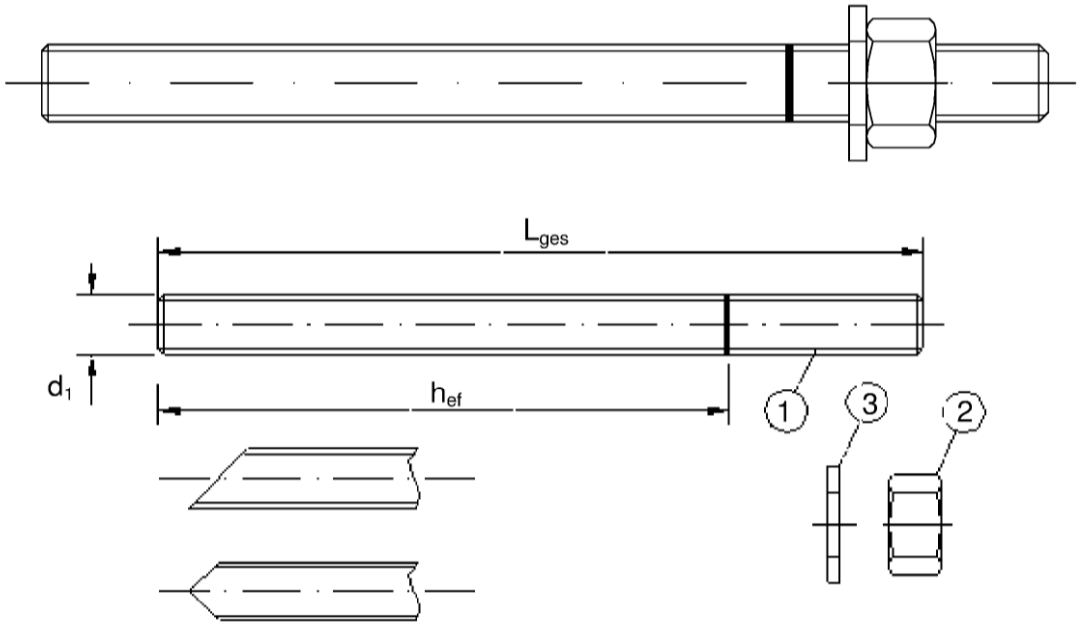
Static mixer A, B and C



Injection system PESF, PESF-E, PESF-C Chemical Anchor	**Annex A2** of European Technical Assessment ETA-24/0833
Product description Injection system	

Threaded rod

Threaded rod M8, M10, M12, M16, M20, M24 with washer and hexagon nut



Commercial standard threaded rod with:

- Materials, dimensions, and mechanical properties according to Table A1
- Inspection certificate 3.1 according to EN 10204:2004
- Marking of embedment depth

Injection system PESF, PESF-E, PESF-C Chemical Anchor	**Annex A3** of European Technical Assessment ETA-24/0833
Product description Threaded rod	

Table A1: Materials

Part	Designation	Material
Steel, zinc plated ≥ 5 µm according to EN ISO 4042:1999 or Steel, hot-dip galvanised ≥ 40 µm according to EN ISO 1461:2009 and EN ISO 10684:2004+AC:2009		
1	Anchor rod	Steel, EN 10087:1998 or EN 10263:2001 Property class 4.6 , 4.8, 5.8, 8.8, EN 1993-1-8:2005+AC:2009
2	Hexagon nut, EN ISO 4032:2012	Steel according to EN 10087:1998 or EN 10263:2001 Property class 4 (for class 4.6 or 4.8 rod) EN ISO 898-2:2012 Property class 5 (for class 5.8 rod) EN ISO 898-2:2021 Property class 8 (for class 8.8 rod) EN ISO 898-2:2021
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Steel, zinc plated or hot-dip galvanised
Stainless steel		
1	Anchor rod	Material 1.4401 / 1.4404 / 1.4571, EN 1088-1:2005 Property class 70 and 80, EN ISO 3506-1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4401 / 1.4404 / 1.4571, EN 1088-1:2005 Property class 70 and 80, EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4401 / 1.4404 / 1.4571, EN 1088-1:2005
High corrosion resistance steel		
1	Anchor rod	Material 1.4529 / 1.4565 / 1.4547, EN 1088-1:2005 Property class 70 EN ISO 3506-1:2009
2	Hexagon nut, EN ISO 4032:2012	Material 1.4529 / 1.4565 / 1.4547, EN 1088-1:2005 Property class 70 EN ISO 3506-2:2009
3	Washer, EN ISO 887:2006, EN ISO 7089:2000, EN ISO 7093:2000 or EN ISO 7094:2000	Material 1.4529 / 1.4565 / 1.4547, EN 1088-1:2005

Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads: M8 to M24

Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Non-cracked concrete: M8 to M24

Temperature range:

- I: -40°C to +40°C (max long-term temperature + 24 °C max short-term temperature + 40 °C)
- II: -40°C to +80°C (max long-term temperature + 50 °C max short-term temperature + 80 °C)

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials)
- For all other condition intended use of materials according to EN 1993-1-4:2006+A1:2015 Annex A4, Table A1 related corrosion resistance classes (CRC).

Design:

- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g., position of the anchor relative to reinforcement or to supports, etc.).
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Anchorages under static or quasi-static actions are designed in accordance with:
    - EOTA Technical Report TR 029 “Design of bonded anchors”, Edition September 2010 or
    - CEN/TS 1992-4:2009

Installation:

- Dry, wet and flooded holes(not sea water)
- Hole drilling by hammer or compressed air drill mode.
- Overhead installation allowed.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.

Injection system PESF, PESF-E, PESF-C Chemical Anchor	**Annex A5** of European Technical Assessment ETA-24/0833
Intended use	

Installation parameters

Table B1: Installation parameters for threaded rod

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Diameter of anchor bolt or thread diameter	d	mm	8	10	12	16	20	24
Nominal diameter of drill bit	d_0	mm	10	12	14	18	24	28
Diameter of clearance hole in the fixture (≤)	d_f	mm	9	12	14	18	22	26
Diameter of steel brush (≥)	d_b	mm	12	14	16	20	26	30
Minimum effective anchorage depth	$h_{ef,min}$	mm	60	60	70	80	90	96
Maximum effective anchorage depth (20*d)	$h_{ef,max}$	mm	160	200	240	320	400	480
Minimum thickness of the concrete member	h_{min}	mm	h_{ef}+30mm ≥100mm			h_{ef} + 2*d_0		
Nominal torque moment	T_{inst}	Nm	10	20	40	80	120	160
Thickness of the fixture	t_{fix}	mm	0 < t_{fix} < 1500					
Minimum spacing (5*d)	s_{min}	mm	40	50	60	80	100	120
Minimum edge distance (5*d)	c_{min}	mm	40	50	60	80	100	120

Cleaning and setting tools

Cleaning brush (steel brush with steel bristles)

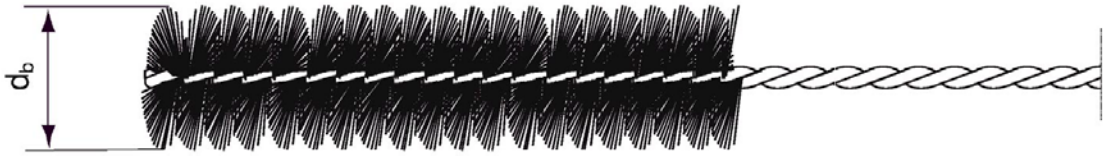


Table B3: Cleaning and setting parameters

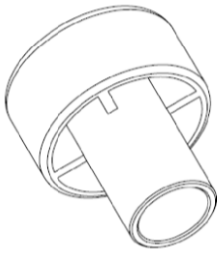
Threaded Rod	d_0	d_b	$d_{b,min}$	Piston Plug
mm	**mm**	**mm**	**mm**	**#**
M8	10	12	10,5	Not required to use piston plug
M10	12	14	12,5	
M12	14	16	14,5	
M16	18	20	18,5	
M20	24	26	24,5	24
M24	28	30	28,5	28

Compressed air tool

d_0 between 10mm to 40mm

Hand operated blowing pump

d_0 between 10mm to 20mm

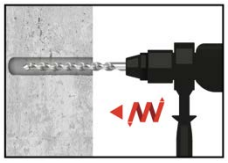


Piston plug for overhead and horizontal installation

d_0 between 24mm to 40mm

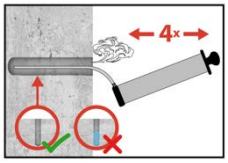
Injection system PESF, PESF-E, PESF-C Chemical Anchor	**Annex B2** of European Technical Assessment ETA-24/0833
Intended use Cleaning and setting tools	

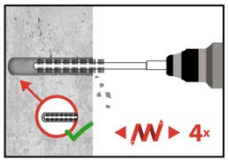
Installation instructions

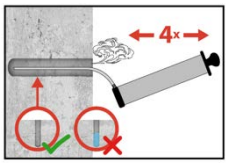


1. Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor (Table B1 or Table B2). In case of aborted drill hole: the drill hole shall be filled with mortar.

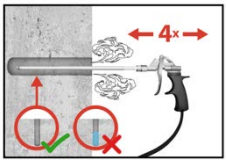
a.

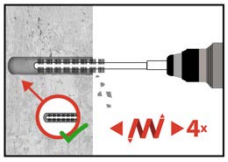


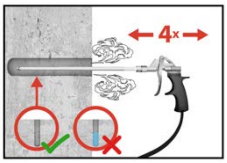




b.







2. Hole cleaning

Attention! Standing water in the bore hole must be removed before cleaning.

a. Clean the hole with brush and hand pump:

- starting from the drill hole bottom blow the hole at least 4 times using the hand pump,

- using the specified brush, mechanically brush out the hole at least 4 times,

- starting from the drill hole bottom, blow at least 4 times with the hand pump.

The hand-pump can only be used for anchor sizes in uncracked concrete up to bore hole diameter 20mm or embedment depth up to 240mm.

b. Cleaning hole with compressed air:

- starting from the drill hole bottom blow the hole at least 4 times by compressed air (6 atm),

- using the specified brush, mechanically brush out the hole at least 4 times,

- blow the hole at least 4 times by compressed air (6 atm),

Compressed air (min.6 bar) can be used for all sizes in cracked and uncracked concrete.

After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning repeated has to be directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

Injection system PESF, PESF-E, PESF-C Chemical Anchor	**Annex B3** of European Technical Assessment ETA-24/0833
Intended use Installation instructions	

Curing time

Table B4: Maximum working time (min) and minimum curing time (min) of PESF, PESF-E, PESF-C Chemical Anchor

Temperature of base material	Temperature of cartridge	Maximum working time t_{work}			Minimum curing time[1)] t_{load} or t_{cure}		
		PESF-C	PESF	PESF-E	PESF-C	PESF	PESF-E
-20°C to -11°C	+5°C to +9°C	45	-	-	960	-	-
-10°C to -1°C	+5°C to +9°C	20	-	-	360	-	-
0°C to +4°C	+5°C to +9°C	6	-	-	240	-	-
+5°C to +9°C	+5°C to +9°C	3	10	-	75	150	-
+10°C to +19°C	+10°C to +19°C	1,5	6	15	45	85	300
+20°C to +24°C	+20°C to +24°C	1	5	10	25	50	150
+25°C to +29°C	+25°C to +29°C	-	4	7,5	-	40	85
+30°C to +34°C	+30°C to +34°C	-	2	5	-	35	50
+35°C to +39°C	+35°C to +39°C	-	-	3,5	-	-	40
+40°C to +44°C	+40°C to +44°C	-	-	2,5	-	-	35

[1)] In wet or water filled holes the curing times must be doubled.

Table C1: Characteristic resistance under tension load in uncracked concrete – static and quasi-static loads

Size			M8	M10	M12	M16	M20	M24
Steel failure [(1)]								
Steel failure with standard threaded rod grade 4.6								
Characteristic resistance	$N_{Rk,s}$	[kN]	14	23	33	62	98	141
Partial safety factor	γ_{Ms}	[-]	2.00					
Steel failure with standard threaded rod grade 4.8								
Characteristic resistance	$N_{Rk,s}$	[kN]	14	23	33	62	98	141
Partial safety factor	γ_{Ms}	[-]	1.50					
Steel failure with standard threaded rod grade 5.8								
Characteristic resistance	$N_{Rk,s}$	[kN]	18	29	42	78	122	176
Partial safety factor	γ_{Ms}	[-]	1.50					
Steel failure with standard threaded rod grade 8.8								
Characteristic resistance	$N_{Rk,s}$	[kN]	29	46	67	125	196	282
Partial safety factor	γ_{Ms}	[-]	1.50					
Steel failure with standard stainless steel threaded rod A4-70								
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	59	110	171	247
Partial safety factor	γ_{Ms}	[-]	1.87					
Steel failure with standard stainless steel threaded rod A4-80								
Characteristic resistance	$N_{Rk,s}$	[kN]	29	46	67	126	196	282
Partial safety factor	γ_{Ms}	[-]	1.60					
Steel failure with standard high corrosion threaded rod grade 70								
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	59	110	171	247
Partial safety factor	γ_{Ms}	[-]	1.87					
Combined pull-out and concrete cone failure (working life 50)								
Characteristic bond resistance in uncracked concrete C20/25, working life 50 years								
Temperature range I: 40ºC/24ºC	$\tau_{Rk,ucr,50}$	[N/mm²]	7.5	7.5	7.5	7.0	7.0	6.5
Temperature range II: 80ºC/50ºC	$\tau_{Rk,ucr,50}$	[N/mm²]	7.0	7.0	6.5	6.5	6.5	6.0
Sustained load factor for $\tau_{Rk,ucr,50}$ in uncracked concrete	$\psi^0_{sus,50}$	40ºC/24ºC	0.55					
		80ºC/50ºC	0.57					
Increasing factor for $\tau_{Rk,ucr}$ in uncracked concrete	ψ_c	C30/37	1.17					
		C40/50	1.32					
		C50/60	1.42					

[1)] in the absence of national regulations

Table C1: (continuation)

Concrete cone failure					
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11.0		
Edge distance	$c_{cr,N}$	[mm]	$1{,}5 \cdot h_{ef}$		
Spacing	$s_{cr,N}$	[mm]	$3{,}0 \cdot h_{ef}$		
Splitting failure					
Edge distance	$c_{cr,sp}$ for h_{min}	[mm]	$2{,}5 \cdot h_{ef}$	$2{,}0 \cdot h_{ef}$	$1{,}5 \cdot h_{ef}$
	$c_{cr,sp}$ for h[2)] $\geq 2 \cdot h_{ef}$	[mm]	$c_{cr,Np}$		
Spacing	$s_{cr,sp}$	[mm]	$2{,}0 \cdot c_{cr,sp}$		
Installation safety factors for combined pull-out, concrete cone and splitting failure					
Installation safety factors for dry and wet concrete	γ_{inst}	[-]	1.2		
Installation safety factors for flooded bore hole	γ_{inst}	[-]	1.4		

[1)] in the absence of national regulations [2)] h – concrete member thickness

Injection system PESF, PESF-E, PESF-C Chemical Anchor	Annex C1 of European Technical Assessment ETA-24/0833
Performances Characteristic resistance under tension loads in non-cracked concrete (2)	

Table C2: Characteristic resistance under shear load in non-cracked concrete – steel failure without lever arm

Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Steel failure with standard threaded rod grade 4.6								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	7	11	17	31	49	70
Partial safety factor	γ_{Ms}	[-]	1.67					
Ductility factor	k_7	[-]	0.8					
Steel failure with standard threaded rod grade 4.8								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	7	11	17	31	49	70
Partial safety factor	γ_{Ms}	[-]	1.25					
Ductility factor	k_7	[-]	0.8					
Steel failure with standard threaded rod grade 5.8								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	9	14	21	39	61	88
Partial safety factor	γ_{Ms}	[-]	1.25					
Ductility factor	k_7	[-]	0.8					
Steel failure with standard threaded rod grade 8.8								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	14	23	33	62	98	141
Partial safety factor	γ_{Ms}	[-]	1.25					
Ductility factor	k_7	[-]	0.8					
Steel failure with standard stainless steel threaded rod A4-70								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	13	20	29	55	85	123
Partial safety factor	γ_{Ms}	[-]	1.56					
Ductility factor	k_7	[-]	0.8					
Steel failure with standard stainless steel threaded rod A4-80								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	14	23	33	62	98	141
Partial safety factor	γ_{Ms}	[-]	1.33					
Ductility factor	k_7	[-]	0.8					
Steel failure with high corrosion stainless steel threaded rod grade 70								
Characteristic resistance	$V^0_{Rk,s}$	[kN]	12	20	29	55	85	123
Partial safety factor	γ_{Ms}	[-]	1.56					
Ductility factor	k_7	[-]	0.8					

Table C3: Characteristic values for shear load in non-cracked concrete – steel failure with lever arm

Size			M8	M10	M12	M16	M20	M24
Steel failure with standard threaded rod grade 4.6								
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	15	30	52	133	260	449
Partial safety factor	γ_{Ms}	[-]	1.67					
Steel failure with standard threaded rod grade 4.8								
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	15	30	52	133	260	449
Partial safety factor	γ_{Ms}	[-]	1.25					
Steel failure with standard threaded rod grade 5.8								
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561
Partial safety factor	γ_{Ms}	[-]	1.25					
Steel failure with standard threaded rod grade 8.8								
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898
Partial safety factor	γ_{Ms}	[-]	1.25					
Steel failure with standard stainless steel threaded rod A4-70								
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786
Partial safety factor	γ_{Ms}	[-]	1.56					
Steel failure with standard stainless steel threaded rod A4-80								
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898
Partial safety factor	γ_{Ms}	[-]	1.33					
Steel failure with high corrosion stainless steel threaded rod grade 70								
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786
Partial safety factor	γ_{Ms}	[-]	1.56					

Table C4: Concrete edge failure

Size			M8	M10	M12	M16	M20	M24
Concrete edge failure								
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20	24
Effective length of anchor shear loading	l_f	[mm]	min (h_{ef}; $12d_{nom}$)					

Table C5: Displacement under tension load

Size			M8	M10	M12	M16	M20	M24
Characteristic displacement in non-cracked C20/25 to C50/60 concrete								
Temperature Rande I : 40°C/24°C	$\delta_{N0\text{-factor}}$	[mm/(N/mm²)]	0.029	0.038	0.038	0.046	0.055	0.067
	$\delta_{N\infty\text{-factor}}$	[mm/(N/mm²)]	0.049	0.046	0.058	0.058	0.069	0.066
Temperature range II: 80°C/50°C	$\delta_{N0\text{-factor}}$	[mm/(N/mm²)]	0.028	0.048	0.049	0.055	0.068	0.075
	$\delta_{N\infty\text{-factor}}$	[mm/(N/mm²)]	0.069	0.066	0.075	0.086	0.087	0.085

Calculation of the displacement: $\delta_{N0} = \delta_{N0\text{-factor}} \cdot V$; $\delta_N = \delta_{N\infty\text{-factor}} \cdot V$; (V – applied shear load)

Table C6: Displacement under shear loads load

Size			M8	M10	M12	M16	M20	M24
Characteristic displacement in non-cracked C20/25 to C50/60 concrete								
Displacement	$\delta_{V0\text{-factor}}$	[mm]	0.026	0.025	0.018	0.017	0.017	0.016
	$\delta_{V\infty\text{-factor}}$	[mm]	0.037	0.038	0.036	0.027	0.025	0.026

Calculation of the displacement: $\delta_{N0} = \delta_{N0\text{-factor}} \cdot V$; $\delta_N = \delta_{N\infty\text{-factor}} \cdot V$; (V – applied shear load)

Injection system PESF, PESF-E, PESF-C Chemical Anchor

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Performances

Concrete Egde Failure, Displacement (threaded rod)