





# European Technical Assessment

ETA-15/0594 of 29/12/2017

# **General Part**

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Technical Assessment Body issuing the European Technical Assessment

Trade name of the construction product SM01/

Product family to which the construction product belongs

Manufacturer

Manufacturing plant(s)

This European Technical Assessment contains

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of

This version replaces

Instytut Techniki Budowlanej

SM0IA, SMIAL, SMIAI and SMIAD

Deformation-controlled expansion anchors for use in non-cracked concrete

PGB – Polska Sp. z o.o. ul. F. W. Redena 3 41-807 Zabrze

Poland

Manufacturing Plants no. 5a and 5b

13 pages including 3 Annexes which form an integral part of this assessment

European Assessment Document (EAD) 330232-00-0601 "Mechanical fasteners for use in concrete"

ETA-15/0594 issued on 30/09/2015

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# **Specific Part**

# 1 Technical description of the product

The SM0IA, SMIAL, SMIAI and SMIAD are deformation-controlled expansion anchors. The anchors SM0IA, SMIAL and SMIAD are made of zinc plated steel and SMIAI are made of stainless steel.

The anchor is installed in a drilled hole and anchored by deformation-controlled expansion.

The description of the product is given in Annex A.

# 2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

The performances given in Annex C are only valid if the anchors are 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 or the Technical 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.

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

# 3.1 Performance of the product

## 3.1.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance	See Annexes C1 to C5
Edge distances and spacings	See Annexes C1 to C5

# 3.1.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchors satisfy requirements for Class A1
Resistance to fire	No performance assessed

### 3.2 Methods used for the assessment

The assessment of fitness of the anchors for declared intended use has been made in accordance with the EAD 330232-00-0601 "Mechanical fasteners for use in concrete".

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

According to Decision 96/582/EC of the European Commission 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 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 European Assessment Document (EAD)

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited in Instytut Techniki Budowlanej.

For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

Issued in Warsaw on 29/12/2017 by Instytut Techniki Budowlanej

Deputy Director of ITB

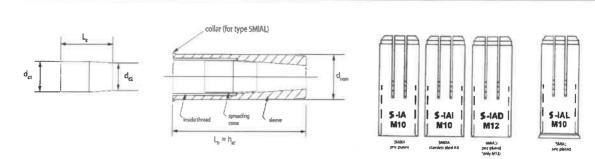


Table A1. Anchors SM0IA, SMIAL, SMIAD – dimensions and materials

Anchor type			4-1-1	5	MOIA, SM	IAL			SMIAD
Anchor size		M6x25	M8x30	M10x30	M10x40*	M12x50	M16x65	M20x80	M12x50
Anchor length L <sub>H</sub>	[mm]	25	30	30	40	50	65	80	50
Thread inside	[mm]	6	8	10	10	12	16	20	12
External diameter d <sub>nom</sub>	[mm]	8	10	12	12	15	20	25	16
Anchor material	f <sub>uk</sub> ≥ 450 *cold for	N/mm² and ming steel	$d f_{yk} \ge 360$	N/mm² EN 10277; :	nickness of a				

Table A2. Anchor SMIAI – dimensions and materials

Anchor type		SMIAI								
Anchor size		M6x25	M8x30	M10x40	M12x50	M16x65	M20x80			
Anchor length L <sub>H</sub>	[mm]	25	30	40	50	65	80			
Thread inside	[mm]	6	8	10	12	16	20			
External diameter dnom	[mm]	8	10	12	15	20	25			
Anchor material		steel 1.4401 : N/mm² and f <sub>yk</sub>		88 (AISI 316)						

Table A3. Spreading cone – dimensions and materials

Spreading cone	g cone M6 M8 M10 M12 M16									
Rear diameter d <sub>c1</sub>	[mm]	5,0	6,4	8,0	10,3	13,5	16,8			
Front diameter d <sub>c2</sub>	[mm]	4,3	5,1	6,8	7,8	13,0	15,2			
Length I <sub>c</sub>	[mm]	9,8	11,4	16,0	20,8	29,2	30,0			
Spreading cone material			008; thickness 01, 1.4404 acc			· ·				

**Product description**Characteristic of the product

Annex A1

### SPECIFICATION OF INTENDED USE

### Anchorages subject to:

Static and quasi-static loads: sizes from M6 to M20.

#### Base material:

- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum to C50/60 at maximum according to EN 206.
- Non-cracked concrete.

### Use conditions (environmental conditions):

- Structures subject to dry internal conditions:
   zinc coated steel (all the sizes) and stainless steel (size M6).
- Structures subject to dry internal conditions and also external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist:

stainless steel (sizes M8 to M20)

**Note:** 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).

#### Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be transmitted.
   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 and quasi-static loads are designed in accordance with EOTA Technical Report TR 055.

### Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging any component of the anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Check of concrete being well compacted, e.g. without significant voids.
- Positioning of the drill holes without damaging the reinforcement.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application.
- Anchor installation such that the effective anchorage depth is complied with.

SM0IA, SMIAL, SMIAI and SMIAD

Annex B1

of European
Technical Assessment
ETA-15/0594

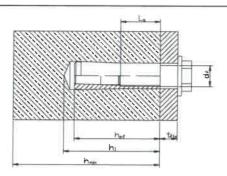


Table B1: Installation parameters - SM0IA and SMIAL

Anchor size	Effective anchorage depth	Drill hole depth	Drill hole diameter	Installation torque (max)	Thickness of concrete member (min)	Screwing depth (min)	Screwing depth (max)	Diameter of clearance hole in the fixture	Spacing (min)	Edge distance (min)
	[mm]	[mm]	[mm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
	h <sub>ef</sub>	h <sub>1</sub>	d <sub>0</sub>	max T <sub>inst</sub>	h <sub>min</sub>	Ls, min	L <sub>s, max</sub>	df	Smin	C <sub>min</sub>
M6x25	25	30	8	4,5	100	6	10	7	60	105
M8x30	30	32	10	11	100	8	13	9	90	105
M10x30	30	32	12	22	100	8	13	12	90	105
M10x40	40	42	12	22	100	10	17	12	90	140
M12x50	50	54	15	38	100	12	21	16	100	175
M16x65	65	70	20	98	130	16	27	18	130	230
M20x80	80	85	25	130	160	20	34	22	160	280

Table B2: Installation parameters – SMIAI and SMIAD

Anchor size	Effective anchorage depth	Drill hole depth	Drill hole diameter	Installation torque (max)	Thickness of concrete member (min)	Screwing depth (min)	Screwing depth (max)	Diameter of clearance hole in the fixture	Spacing	Edge distance
	[mm]	[mm]	[mm]	[Nm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
	h <sub>ef</sub>	h <sub>1</sub>	d <sub>0</sub>	max T <sub>inst</sub>	h <sub>min</sub>	L <sub>s, min</sub>	L <sub>s, max</sub>	df	Smin	Cmin
M6x25	25	30	8	4,5	100	6	10	7	60	105
M8x30	30	32	10	11	100	8	13	9	90	105
M10x40	40	42	12	22	100	10	17	12	90	140
M12x50	50	54	15	38	100	12	21	16	100	175
M12x50*	50	54	16	38	100	12	21	16	100	175
M16x65	65	70	20	98	130	16	27	18	130	230
M20x80	80	85	25	130	160	20	34	22	160	280

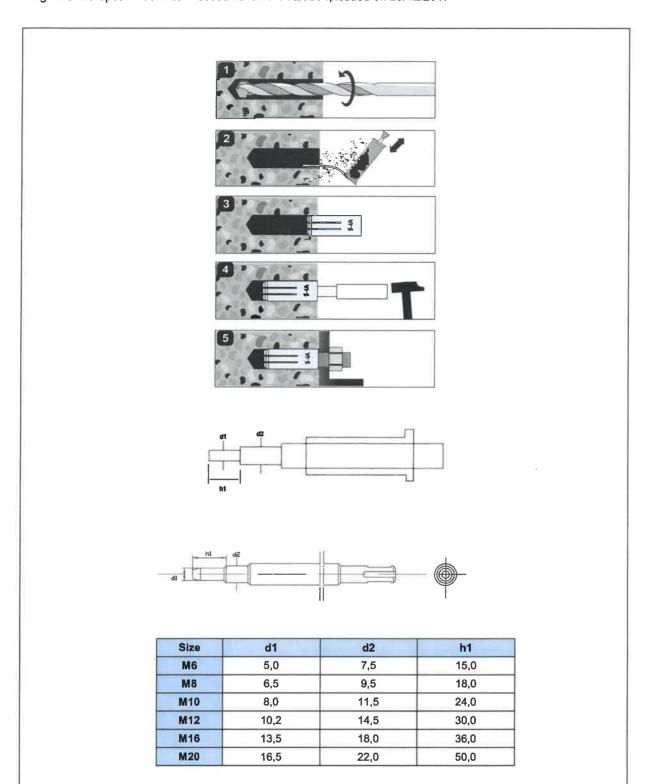
<sup>\*</sup> SMIAD only

Fastening screws or anchor threaded rods:

Steel, property class 4.6 / 4.8 / 5.6 / 6.8 / 8.8 according to EN-ISO 898-1; galvanized  $\geq$  5  $\mu m$  (SM0IA, SMIAD, SMIAL)

Stainless steel 1.4401 according to EN 10088, property class 50 or 70 according to EN ISO 3506 (SMIAI)

SM0IA, SMIAI, SMIAL and SMIAD	Annex B2
Intended use Installation parameters	of European Technical Assessment ETA-15/0594



# Intended use Installation instruction and tools

# Annex B3

Table C1: Characteristic resistance for tension loads in non-cracked concrete – SM0IA and SM	Table C1: Characteristic resistance	or tension loads in non-cracked	concrete - SM0IA and SMI
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Size				M6x25	M8x30	M10x30	M10x40	M12x50	M16x65	M20x80
Steel failure			i dun n'	100	0.0					
Steel failure with threade	ed rod grade 4.0	3								
Characteristic resistance		N <sub>Rk,s</sub>	[kN]	8,0	14,6	23,2	23,2	33,7	62,8	98.0
Partial safety factor		γMs 1)	[-]				2,00		0=,0	
Steel failure with threade	ed rod grade 4.8			The Said					-	
Characteristic resistance		N <sub>Rk,s</sub>	[kN]	8,0	14,6	23,2	23,2	33,7	62,8	98.0
Partial safety factor		γ <sub>Ms</sub> 1)	[-]		,-		1,50			50,5
Steel failure with threade	d rod grade 5.6	3		the second						
Characteristic resistance		N <sub>Rk,s</sub>	[kN]	8,4	15,4	24,4	29,0	35,4	65.9	102,9
Partial safety factor		γ <sub>Ms</sub> ()	[-]				1,50			,.
Steel failure with threade	d rod grade 5.8	3						//		17-1
Characteristic resistance		N <sub>Rk,s</sub>	[kN]	8.4	15,4	24,4	29,0	35.4	65.9	102,9
Partial safety factor		γMs 1)	[-]				1,50		,-	
Steel failure with threade	d rod grade 6.8									
Characteristic resistance		N <sub>Rk,s</sub>	[kN]	8,4	15.4	24,4	29.0	35,4	65.9	102,9
Partial safety factor		/Ms	[-]				1,50		, .	
Steel failure with threade	d rod grade 8.8	3				-				
Characteristic resistance		N <sub>Rk,s</sub>	[kN]	8,4	15.4	24,4	29.0	35,4	65,9	120,9
Partial safety factor		YMs 1)	[-]				1.50			
Pull-out failure								LLL.	JII 5.0	34.5
Characteristic resistance	in	N	PI A IZ	-	5)	5)	40	5)		
non-cracked concrete C2	20/25	$N_{Rk,p}$	[kN]	5	-,	, ,	12	٠,	20	35
Installation safety factor		$\gamma_2^{(2)} = \gamma_{\text{inst}}^{(3)4}$	[-]	1,4	1,4	1,4	1,4	1,2	1,2	1,4
Income in a factor for	C30/37				· · · · · · · · · · · · · · · · · · ·		1,05			
Increasing factor for concrete:	C40/50	Ψε	[-j				1,08			
concrete:	C50/60	- "	[-]				1,11			
Concrete cone failure a	nd splitting fa	ilure							N III	
Effective embedment der		h <sub>ef</sub>	[mm]	25	30	30	40	50	65	80
Factor for non-cracked co	oncrete	$k_1^{(2)} = k_{ucr}^{(3)}$	[-]	1,4	1,4	1,4	1,4	1,2	1,2	1,4
Factor for non-cracked co	oncrete	K <sub>ucr,N</sub> <sup>4)</sup>	[-]				10,1			
Installation safety factor		$\gamma_2^{(2)} = \gamma_{\text{inst}}^{(3)4)}$	[-]				11,0			
Characteristic resistance	for splitting	N <sup>0</sup> <sub>Rk,sp</sub>	[kN]	5	5)	5)	12	5)	20	25
in non-cracked concrete		IN Rk,sp	[KIN]				12		20	35
Spacing		S <sub>cr.N</sub>	[mm]	50	60	60	80	100	130	160
Edge distance		C <sub>cr,N</sub>	[mm]	75	90	90	120	150	195	240

Table C2: Displacement under tension and shear loads - SM0IA and SMIAL

Size		M6x25	M8x30	M10x30	M10x40	M12x50	M16x65	M20x80
Tension and shear loads in non-cracked concrete	N = V [kN]	1,70	2,82	2,82	4,08	7,10	7,94	11,90
Displacement	δ <sub>No</sub> [mm]	2,56	2,22	2,14	1,55	7,24	1,93	2,15
Displacement	δ <sub>N∞</sub> [mm]	1,44	1,44	1,44	1,44	1,44	1,44	1,44

### **Performances**

Characteristic resistance for tension loads and displacement -SM0IA and SMIAL

## Annex C1

<sup>1)</sup> In the absence of other national regulations
2) Parameter for design acc. to ETAG 001 Annex C

<sup>Approximate ror design acc. to ETAG UTTAMILEX C

APProximate ror design acc. to CEN/TS 1992-4-4:2009

APProximate ror design acc. to EN 1992-4:2016

Bull-out value is not decisive</sup> 

Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Value of the failure with threaded rod grade 8.8  Characteristic resistance  Value of the failure with threaded rod grade 8.8  Characteristic resistance  Value of the failure with lever arm  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor		3 4,0 3 5,0 3 5,0 4 6,0 6,1	7,3 7,3 9,2 9,2 11,0	11,6 11,6 14,5 14,5 17,4 23,2	11,6 1,67 11,6 1,25 14,5 1,25 14,5 1,25 23,2 1,25 0,8	16,9 16,9 21,1 21,1 25,3 33,7	41,4 41,4 39,3 39,3 47,1 62,8	49,0 49,0 61,3 61,3 73,5 98,0
Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Value of the same of the s	1	3 4,0 3 5,0 3 5,0 4 6,0 6,1	9,2 9,2 11,0 14,6	11,6 14,5 14,5 17,4	1,67  11,6 1,25  14,5 1,25  14,5 1,25  17,4 1,25  23,2 1,25 0,8	21,1 21,1 25,3 33,7	39,3 39,3 47,1	49,0   61,3   73,5   98,0
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Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  VR  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  VR  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  More  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  More  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  More  Partial safety factor	Ks   KN   KN   KN   KN   KN   KN   KN	5,0	9,2	14,5	1,25 14,5 1,25 17,4 1,25 23,2 1,25 0,8	21,1	39,3 47,1 62,8	73,5 98,0
Partial safety factor  Steel failure with threaded rod grade 5.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover 10 meters	Ks   KN   KN   KN   KN   KN   KN   KN	5,0	9,2	14,5	1,25 14,5 1,25 17,4 1,25 23,2 1,25 0,8	21,1	39,3 47,1 62,8	73,5 98,0
Steel failure with threaded rod grade 5.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  VR  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  More  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  More  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  More  Partial safety factor	Ks	5,0	11,0	23,2	14,5 1,25 17,4 1,25 23,2 1,25 0,8	25,3	62,8	73,5
Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  More Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  More Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  More Partial safety factor	ks (kN ks (kN s) (-) ks (kN s) (-) ks (kN s) (-) ks (kN s) (-) ks (Nn ks (Nn ks (Nn	6,0	11,0	23,2	1,25 17,4 1,25 23,2 1,25 0,8	25,3	62,8	73,5
Partial safety factor  Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover Partial safety factor	ks (kN ks (kN s) (-) ks (kN s) (-) ks (kN s) (-) ks (kN s) (-) ks (Nn ks (Nn ks (Nn	6,0	11,0	23,2	1,25 17,4 1,25 23,2 1,25 0,8	25,3	62,8	73,5
Steel failure with threaded rod grade 6.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Moreover and Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover Partial safety factor	ks [kN s) [-] ks [kN s) [-] ks [Nn ks [Nn ks [Nn ks [Nn	] 6,0 ] 8,0	14,6	23,2	17,4 1,25 23,2 1,25 0,8	33,7	62,8	98,0
Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and the safety factor  Moreover and the safety factor for the safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and the safety factor for the safety factor fact	ks [kN s] [-] ks [kN s] [-] kks [Nn kks [Nn	] 8,0	14,6	23,2	1,25 23,2 1,25 0,8	33,7	62,8	98,0
Partial safety factor  Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover 10 Mee	ks [kN s] [-] ks [kN s] [-] kks [Nn kks [Nn	] 8,0	14,6	23,2	1,25 23,2 1,25 0,8	33,7	62,8	98,0
Steel failure with threaded rod grade 8.8  Characteristic resistance  Partial safety factor  Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and safety factor  Moreover and safety factor  Moreover and safety factor  Moreover and safety factor	k,s [kNs] s [-] s [-] Rk,s [Nn] Rk,s [Nn]	6,1	15,0		23,2 1,25 0,8			
Characteristic resistance  Partial safety factor Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Moreover and the safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and the safety factor	${}_{3}^{(1)} = {}_{3}^{(1)} = {}_{4}^{(2)} = {}_{7}^{(4)} = {}_{$	6,1	15,0		1,25 0,8 29,9			
Partial safety factor Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Moreover and the steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and the steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and the steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor	${}_{3}^{(1)} = {}_{3}^{(1)} = {}_{4}^{(2)} = {}_{7}^{(4)} = {}_{$	6,1	15,0		1,25 0,8 29,9			
Factor considering ductility  Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Moreover and the steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and the steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and steel failure with threaded rod grade 5.6  Characteristic resistance  Moreover and steel failure with threaded rod grade 5.6  Characteristic resistance	$R_{k,s}$ [Nn			29,9	0,8 29,9	52,4	133,3	259,
Steel failure with lever arm  Steel failure with threaded rod grade 4.6  Characteristic resistance M <sup>o</sup> r  Partial safety factor ym  Steel failure with threaded rod grade 4.8  Characteristic resistance M <sup>o</sup> r  Partial safety factor ym  Steel failure with threaded rod grade 5.6  Characteristic resistance M <sup>o</sup> r  Steel failure with threaded rod grade 5.6  Characteristic resistance M <sup>o</sup> r  Partial safety factor ym  Partial safety factor ym	Rk.s [Nn 1) [-]			29,9	29,9	52,4	133,3	259,
Steel failure with threaded rod grade 4.6 Characteristic resistance M <sup>0</sup> <sub>F</sub> Partial safety factor ym Steel failure with threaded rod grade 4.8 Characteristic resistance M <sup>0</sup> <sub>F</sub> Partial safety factor ym Steel failure with threaded rod grade 5.6 Characteristic resistance M <sup>0</sup> <sub>F</sub> Characteristic resistance ym Partial safety factor ym Partial safety factor ym	s <sup>1)</sup> [-]			29,9		52,4	133,3	259,
Characteristic resistance M <sup>o</sup> r Partial safety factor ym Steel failure with threaded rod grade 4.8 Characteristic resistance M <sup>o</sup> r Partial safety factor ym Steel failure with threaded rod grade 5.6 Characteristic resistance M <sup>o</sup> r Partial safety factor ym Partial safety factor ym	s <sup>1)</sup> [-]			29,9		52,4	133,3	259,
Partial safety factor  Steel failure with threaded rod grade 4.8  Characteristic resistance  Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Merchanteristic resistance  Partial safety factor	s <sup>1)</sup> [-]			29,9		52,4	133,3	259,
Steel failure with threaded rod grade 4.8  Characteristic resistance M <sup>o</sup> r  Partial safety factor y <sub>M</sub> Steel failure with threaded rod grade 5.6  Characteristic resistance M <sup>o</sup> r  Partial safety factor y <sub>M</sub>	Rk,s [Nn	] 6,1	12.0		1,67			
Characteristic resistance M <sup>o</sup> <sub>r</sub> Partial safety factor y <sub>Ms</sub> Steel failure with threaded rod grade 5.6 Characteristic resistance M <sup>o</sup> <sub>r</sub> Partial safety factor y <sub>Ms</sub>	Rks [Nn	] 6,1	1.0	_				
Partial safety factor  Steel failure with threaded rod grade 5.6  Characteristic resistance  Partial safety factor  Yes	Rks [Nn	6,1	4 = 0					
Steel failure with threaded rod grade 5.6 Characteristic resistance M <sup>0</sup> <sub>F</sub> Partial safety factor y <sub>M</sub>	1) [-]		15,0	29,9	29,9	52,4	133,3	259,
Steel failure with threaded rod grade 5.6  Characteristic resistance M <sup>o</sup> s  Partial safety factor yes					1,25			
Characteristic resistance M <sup>0</sup> <sub>F</sub> Partial safety factor y <sub>Ms</sub>		110						
Partial safety factor YMs	Rk.s [Nn	7,6	18,8	37,4	37,4	65,6	166,6	324,
0. 169 314 11 1 1 5	1) [-]				1.25		,.	,
Steel failure with threaded rod grade 5.8								
Characteristic resistance M <sup>o</sup> F	Rks [Nn	7,6	18,8	37,4	37,4	65,6	166,6	324,
Partial safety factor	1) [-]				1,25	00,0	100,0	02.1,
Steel failure with threaded rod grade 6.8					-,			
Characteristic resistance M <sup>0</sup> <sub>F</sub>	kks [Nn	] 9,2	22,5	44,9	44,9	78,7	199,9	389,
Partial safety factor YMS	1) [-]	0,2		11,0	1,25	70,7	100,0	000,
Steel failure with threaded rod grade 8.8					1,20			
Characteristic resistance More	k,s [Nn	12,2	30,0	59,9	59,9	104,9	266,6	519,
		12,2	30,0	55,5		104,3	200,0	519,
Partial safety factor γ <sub>Ms</sub> Concrete pry-out failure	1	_			1,25			
Factor for non-cracked concrete $k^{(2)} = k_3^{(3)}$	) _ L 4)   F1	1.0	4.0	10	10	10	20 1	0.0
	$k_8^{(4)} = k_8^{(4)}$	1,0	1,0	1,0	1,0	1,0	2,0	2,0
Partial safety factor YMG Concrete edge failure	1). [-]				1,50			
	T 1 P.0	1 0	40	1 40 1	40	40	00	
Outside diameter of the anchor d <sub>no</sub>			10	12	12	15	20	25
Effective length of anchor under shear loads	[mn	] 25	30	30	40	50	65	80
Partial safety factor	[-]				1,50			
Minimum member thickness h <sub>m</sub> In the absence of other national regulation	<sub>in</sub> [mn	100	100	100	100	100	130	160

SM0IA, SMIAL, SMIAI and SMIAD	Annex C2
Performances Characteristic resistance for shear loads – SM0IA and SMIAL	of European Technical Assessment ETA-15/0594

Table C4:	Characteristic resistance f	or tension loads in non-cracked concrete – S	IAIMS
Lable C4:	Unaracteristic resistance t	or tension loads in non-cracked concrete 🗕 🥄	SMI

Size				ELLICO, L		SN	IAI		104
Oike				M6x25	M8x30	M10x40	M12x50	M16x65	M20x8
Steel failure									
Steel failure with stainles	s steel thr	eaded rod A4-50							
Characteristic resistance		N <sub>Rk,s</sub>	[kN]	10,1	18,3	29,0	42,2	78,5	122,5
Partial safety factor		YMs 1)	[-]		,	<u> </u>	50		
Steel failure with stainles	s steel thre			1000					
Characteristic resistance		N <sub>Rks</sub>	[kN]	14,1	25,6	40,6	59,0	109.9	171,5
Partial safety factor		7Ms	[-]			<del></del>	50		,0
Pull-out failure		, IND							
Characteristic resistance non-cracked concrete C2		$N_{Rk,p}$	[kN]	3	5	6	12	20	20
Installation safety factor		$\gamma_2^{(2)} = \gamma_{\text{Inst}}^{(3)(4)}$	[-]	1,4	1,4	1,4	1,0	1,0	1,0
Increasing factor	C30/37		[-]				18		.,,-
Increasing factor for concrete:	C40/50	Ψο	[-]				35		
or concrete:	C50/60		í-i	1,46					
Concrete cone failure a	nd splittir	g failure							
Effective embedment der	oth	h <sub>ef</sub>	[mm]	25	30	40	50	65	80
Factor for non-cracked co	oncrete	$k_1^{(2)} = k_{ucr}^{(3)}$	[-]	1,4	1,4	1,4	1,0	1,0	1,0
Factor for non-cracked concrete		Kucr N <sup>4)</sup>	i-i		.,		),1		1,0
Installation safety factor		$\gamma_2^{(2)} = \gamma_{\text{inst}}^{(3)4}$	[-]	11,0					
Characteristic resistance splitting in non-cracked co		N <sup>0</sup> <sub>Rk,sp</sub>	[kN]	3	5	6	12	20	20
Spacing		Scr.N	[mm]	50	60	80	100	130	160
Edge distance		C <sub>cr N</sub>	[mm]	75	90	120	150	195	240

Table C5: Characteristic resistance for shear loads in non-cracked concrete – SMIAI

Size		9177	SMIAI					
0126			M6x25	M8x30	M10x40	M12x50	M16x65	M20x80
Steel failure without lever arm								
Steel failure with stainless steel	threaded rod A4-5	0						
Characteristic resistance	V <sub>Rks</sub>	[kN]	5,0	9,2	14,5	21,1	39,3	61,3
Partial safety factor	γ <sub>Ms</sub> 1)	[-]				25	,-	,-
Steel failure with stainless steel	threaded rod A4-7	0						
Characteristic resistance	V <sub>Rks</sub>	[kN]	7,0	12,8	20,3	29,5	55,0	85,8
Partial safety factor	YMs 1)	[-]				25		
Steel failure with lever arm								-
Steel failure with stainless steel	threaded rod A4-5	0					CAPILL .	
Characteristic resistance	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	7,6	18,8	37,4	65,6	166,6	324,8
Partial safety factor	7Ms 1)	[-]				25		
Steel failure with stainless steel t	threaded rod A4-7					To 1		
Characteristic resistance	M Rk.s	[Nm]	10,7	26,3	52,4	91,8	233,3	454,7
Partial safety factor	7/Ms 1)	[-]				25		
Concrete pry-out failure								
Factor for non-cracked concrete	$k^{2)} = k_3^{3)} = k_8^{4)}$	[-]	1,0	1,0	1,0	1,0	2,0	2,0
Partial safety factor	γ <sub>Mc</sub> <sup>1)</sup>	[-]			1,	50		
Concrete edge failure								
Outside diameter of the anchor	d <sub>nom</sub>	[mm]	8	10	12	15	20	25
Effective length of anchor under shear loads	l <sub>f</sub>	[mm]	25	30	40	50	65	80
Partial safety factor	γ <sub>Mc</sub> 1)	[-]			1,5	50		
Minimum member thickness	h <sub>min</sub>	[mm]	100	100	100	100	130	160
<sup>1)</sup> In the absence of other nationa <sup>2)</sup> Parameter for design acc. to E	Il regulation TAG 001 Annex C		4	Parameter fo	or design acc. to or design acc. t	to CEN/TS 19	92-4-4:2009	

## **Performances**

Characteristic resistance for tension and shear loads – SMIAI

## **Annex C3**

Size			SMIAD M12x50
Steel failure			
Steel failure with threaded rod grade	4.6		
Characteristic resistance	N <sub>Rk,s</sub>	[kN]	33,7
Partial safety factor	γ <sub>Ms</sub> 1)	[-]	2,00
Steel failure with threaded rod grade			
Characteristic resistance	N <sub>RK,s</sub>	[kN]	33,7
Partial safety factor	7Ms 1)	[-]	1,50
Steel failure with threaded rod grade			
Characteristic resistance	N <sub>Rk,s</sub>	[kN]	35,4
Partial safety factor	7Ms 1)	[-]	1,50
Steel failure with threaded rod grade	5.8		
Characteristic resistance	N <sub>Rk,s</sub>	[kN]	35,4
Partial safety factor	γ <sub>Ms</sub> <sup>(1)</sup>	[-]	1,50
Steel failure with threaded rod grade	6.8		
Characteristic resistance	N <sub>Rk,s</sub>	[kN]	35,4
Partial safety factor	γMs	[-]	1,50
Steel failure with threaded rod grade	8.8		
Characteristic resistance	N <sub>Rk,6</sub>	[kN]	35,4
Partial safety factor	YMs 1)	[-]	1,50
Pull-out failure			
Characteristic resistance in non-cracked concrete C20/25	N <sub>Rk,p</sub>	[kN]	5)
Installation safety factor	$\gamma_2^{(2)} = \gamma_{inst}^{(3)4)}$	[-]	1,2
C30/			1,05
Increasing factor for C40/	50 Ψ <sub>c</sub>	i-j	1,08
concrete: C50/		[-]	1,11
Concrete cone failure and splitting	failure		
Effective embedment depth	h <sub>ef</sub>	[mm]	50
Factor for non-cracked concrete	$k_1^{(2)} = k_{ucr}^{(3)}$	[-]	1,2
Factor for non-cracked concrete	Kucr N	i-i	10,1
Installation safety factor	$\gamma_2^{(2)} = \gamma_{\text{inst}}^{(3)4)}$	[·j	11.0
Characteristic resistance for splitting in non-cracked concrete	n N <sup>0</sup> <sub>Rk,sp</sub>	[kN]	5)
Spacing	S <sub>cr.N</sub>	[mm]	100
Edge distance	C <sub>cr.N</sub>	[mm]	150

Table C7: Displacement under tension and shear loads - SMIAI and SMIAD

Size		SMIAI							
Size		M6x25	M8x30	M10x40	M12x50	M16x65	M20x80	M12x50	
Tension and shear loads in non-cracked concrete	N = V [kN]	1,02	1,70	2,04	5,71	9,52	9,52	7,10	
Disalossment	δ <sub>No</sub> [mm]	2,24	1,23	1,95	3,54	4,30	2,10	2,41	
Displacement	δ <sub>N∞</sub> [mm]	1,27	1,27	1,27	1,27	1,27	1,27	1,44	

# **Performances**

Characteristic resistance for tension loads - SMIAD and displacement - SMIAI and SMIAD

# **Annex C4**

<sup>&</sup>lt;sup>2)</sup> Parameter for design acc. to ETAG 001 Annex C
<sup>3)</sup> Parameter for design acc. to CEN/TS 1992-4-4:2009

<sup>&</sup>lt;sup>4)</sup> Parameter for design acc. to EN 1992-4:2016

<sup>5)</sup> Pull-out value is not decisive

l	Table C8.	Characteristic regist	ance for chear l	nade in non oros	ked concrete - SMIAD
1	I apie co.	Characteristic resist	ance for snear i	oads in non-crac	:kea concrete – SMIAD

Size			SMIAD M12x50
Steel failure without lever arm			
Steel failure with threaded rod grade 4.6			
Characteristic resistance	V <sub>Rk,s</sub>	[kN]	49,0
Partial safety factor	γ <sub>Ms</sub> <sup>1)</sup>	[+]	1,67
Steel failure with threaded rod grade 4.8			
Characteristic resistance	V <sub>Rks</sub>	[kN]	49,0
Partial safety factor	γMs 1)	[-]	1,25
Steel failure with threaded rod grade 5.6			
Characteristic resistance	V <sub>Rk,s</sub>	[kN]	61,3
Partial safety factor	)/Ms 1)	[-]	1,25
Steel failure with threaded rod grade 5.8			
Characteristic resistance	V <sub>Rk,s</sub>	[kN]	61,3
Partial safety factor	YMs <sup>1)</sup>	[-]	1,25
Steel failure with threaded rod grade 6.8			
Characteristic resistance	V <sub>Rk,s</sub>	[kN]	73,5
Partial safety factor	γ <sub>Ms</sub> 1)	[-]	1,25
Steel failure with threaded rod grade 8.8			
Characteristic resistance	$V_{Rk,s}$	[kN]	98,0
Partial safety factor	$ \frac{\gamma_{Ms}}{k^{2}} = k_2^{3} = k_7^{4} $	[-]	1,25
Factor considering ductility	$k^{2} = k_2^{3} = k_7^{4}$	e e	0,8
Steel failure with lever arm			
Steel failure with threaded rod grade 4.6			
Characteristic resistance	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	52,4
Partial safety factor	γMs <sup>1)</sup>	[-]	1,67
Steel failure with threaded rod grade 4.8			
Characteristic resistance	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	52,4
Partial safety factor	γ <sub>Ms</sub> 1)	[-]	1,25
Steel failure with threaded rod grade 5.6			
Characteristic resistance	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	65,6
Partial safety factor	γMs 1)	[-]	1,25
Steel failure with threaded rod grade 5.8			
Characteristic resistance	M <sup>0</sup> Rk,s	[Nm]	65,6
Partial safety factor	γ <sub>Ms</sub> 1)	[-]	1,25
Steel failure with threaded rod grade 6.8			
Characteristic resistance	M Rk,s	[Nm]	78,7
Partial safety factor	γ <sub>Ms</sub> 1)	[-]	1,25
Steel failure with threaded rod grade 8.8			
Characteristic resistance	M <sup>0</sup> Rk,s	[Nm]	104,9
Partial safety factor	γ <sub>Ms</sub> 1)	[-]	1,25
Concrete pry-out failure			
Factor for non-cracked concrete	$k^{2)} = k_3^{(3)} = k_8^{(4)}$	[-]	1,0
Partial safety factor	7Mc 1)	[-]	1,5
Concrete edge failure			
Outside diameter of the anchor	d <sub>nom</sub>	[mm]	16
Effective length of anchor under shear			
loads	l <sub>f</sub>	[mm]	50
Partial safety factor	YMc 1)	[-]	1,5
Minimum member thickness	h <sub>min</sub>	[mm]	100

# **Performances**

Characteristic resistance for shear loads - SMIAD displacement - SMIAI and SMIAD

# **Annex C5**

<sup>1)</sup> In the absence of other national regulation
2) Parameter for design acc. to ETAG 001 Annex C
3) Parameter for design acc. to CEN/TS 1992-4-4:2009
4) Parameter for design acc. to EN 1992-4:2016

