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Član EOTA
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European Technical Assessment ETA-17/0337 of 03/05/2017

English version prepared by ZAG

GENERAL PART

Organ za tehnično ocenjevanje, ki je izdal ETA *Technical Assessment Body issuing the ETA*	**ZAG Ljubljana**
Komercialno ime gradbenega proizvoda *Trade name of the construction product*	**Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA**
Družina proizvoda *Product family to which the construction product belongs*	**33: Torzijsko kontrolirano zatezno kovinsko sidro iz galvansko pocinkanega jekla velikosti M6, M8, M10, M12, M16, M20 in M24 za vgradnjo v beton** *33: Torque controlled expansion anchor made of galvanised steel of sizes M6, M8, M10, M12, M16, M20 and M24 for use in concrete*
Proizvajalec *Manufacturer*	**Apolo MEA Befestigungssysteme GmbH Industriestrasse 6 86551 Aichach, Germany**
Proizvodni obrat *Manufacturing plant*	**Werk 18 / Plant 18**
Ta Evropska tehnična ocena vsebuje *This European Technical Assessment contains*	14 strani vključno z 11 prilogami, ki so sestavni del te ocene *14 pages including 11 annexs which form an integral part of this assessment*
Ta Evropska tehnična ocena je izdana na podlagi Uredbe (EU) št. 305/2011 na podlagi *This European Technical Assessment is issued in accordance to Regulation (EU) No 305/2011, on the basis of*	EAD 330232-00-0601, izdaja oktober 2016 *EAD 330232-00-0601, edition October 2016*

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II SPECIFIC PART

1 Technical description of the product

The Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA in the range of M6, M8, M10, M12, M16, M20 and M24 is an anchor made of galvanised steel, which is placed into a drilled hole and anchored by torque-controlled expansion.

An illustration and description of the anchor are given in Annex A.

2 Specification of the intended use

The performances given in Chapter 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 manufacturer, 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.

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

3.1 Mechanical resistance and stability (BWR 1)

The essential characteristics for mechanical resistance and stability are listed in Annexes C1 to C4.

3.2 Safety in case of fire (BWR 2)

The essential characteristics for safety in case of fire are listed in Annex C5.

3.3 Hygiene, health and environment (BWR 3)

Regarding dangerous substances contained in this European Technical Assessment, there may be requirements applicable to the products falling within its scope (e.g. transported European legislation and national laws, regulations and administrative provisions). In order to meet provisions of the regulation (EU) No 305/2011, these requirements need also to be complied with, when they apply.

3.4 Safety in use (BWR 4)

For basic requirement safety in use the same criteria are valid as for basic requirement mechanical resistance and stability.

3.5 Protection against noise (BWR 5)

Not relevant.

3.6 Energy economy and heat retention (BWR 6)

Not relevant.

3.7 Sustainable use of natural resources (BWR 7)

For sustainable use of natural resources no performance was determined for this product.

3.8 Characteristics of the components

Durability and serviceability are only ensured if specifications of intended use according to Annex B1 are kept.

4 Assessment and verification of constancy of performance (hereafter 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 and verification of constancy of performance (see Annex V to regulation (EU) No 305/2011) 1 apply.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ZAG Ljubljana.

Issued in Ljubljana on 03. 05. 2017

Signed by:
Franc Capuder, M.Sc.
Head of Service of TAB

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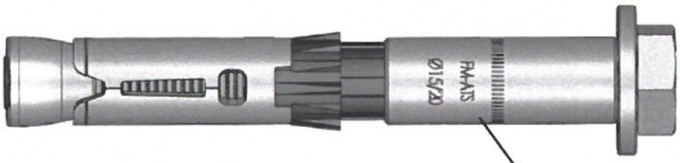
1 Official Journal of the European Communities L 254 of 8.10.1996



Type **S** with screw

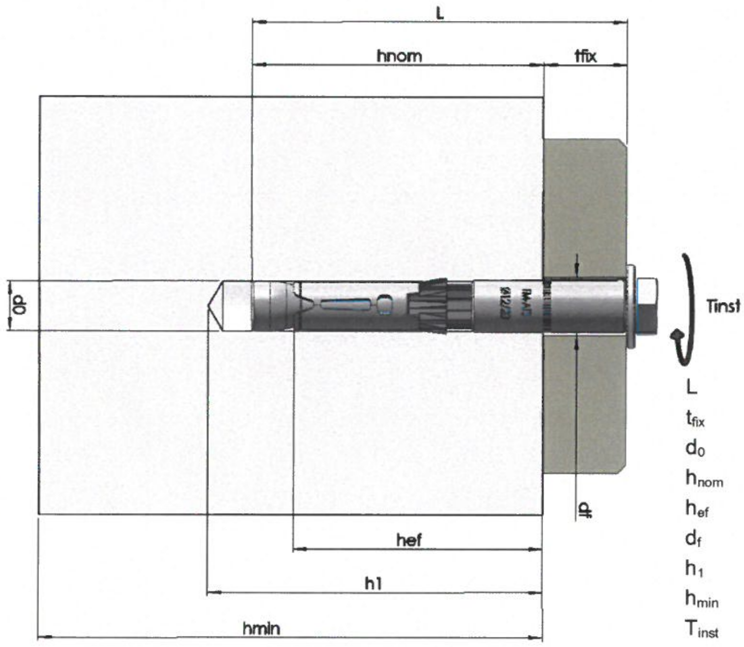
(SH)

Marking: Identification mark of the producer - trade name of the anchor
nominal drill hole diameter / max thickness of fixture
(and line for minimum embedment and max thickness of fixture)
e.g.: SLA: FM-ATS
Ø15/20

Type **B** with threaded bar

Type **SK** with countersunk screw

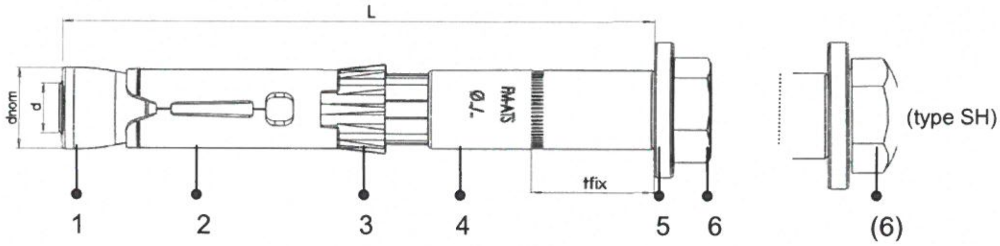
Sleeve for size M16 – M24



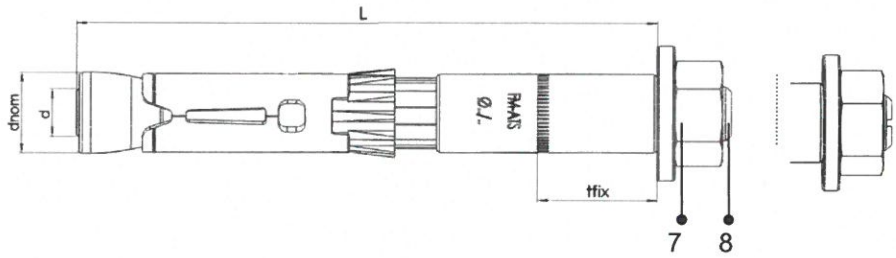
L	=	length of the anchor (mm)
t_{fix}	=	thickness of fixture (mm)
d_0	=	nominal drill hole diameter (mm)
h_{nom}	=	minimum installation depth (mm)
h_{ef}	=	effective anchorage depth (mm)
d_f	=	diameter of clearance hole in the fixture (mm)
h_1	=	depth of drill hole (mm)
h_{min}	=	minimum thickness of the concrete member (mm
T_{inst}	=	torque moment (Nm)

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA	**Annex A1**
Product description Product and intended use	

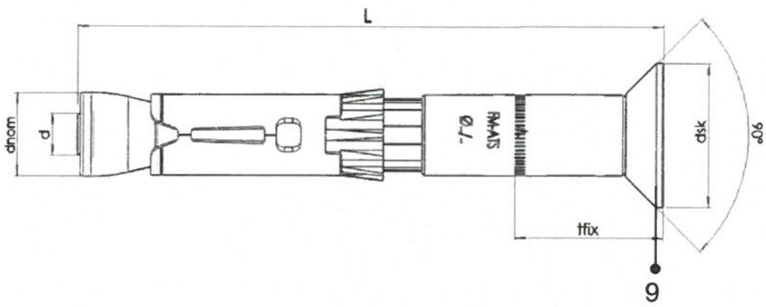
SLA-S



SLA -B



SLA -SK



1 Cone
2 Expansion sleeve
3 Plastic sleeve
4 Distance sleeve
5 Washer
6 Hexagonal screw
7 Hexagonal nut
8 Threaded bar
9 Countersunk screw

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Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA	**Annex A2**
Product description Product and components	

Table A1: Materials

Part of anchor		Material
1	Cone	hardened steel EN 10087 (EN 10277) [1)]
2	Expansion sleeve	M6 - M12 hardened steel acc. to EN 10132 [1)] M16 - M24 steel acc. to EN 10087 (EN 10277) [1)]
3	Plastic sleeve	PA 6 acc. to ISO 1874/1
4	Distance sleeve	Steel acc. to EN 10025 [1)]
5	Washer	Steel acc. to EN 10139 [1)]
6	Hexagon screw	Steel grade 8.8 acc. to EN ISO 898/1[1)] (DIN 931 -DIN 933 - type SH= large head) [1)]
7	Hexagonal nut	Steel grade 8 acc. to EN ISO 898/2 (DIN 934) [1)]
8	Threaded bar	Steel grade acc. to 8.8 EN ISO 898/1 [1)]
9	Countersunk screw	Steel grade acc. to 8.8 EN ISO 898/1 [1)]

[1)] Zinc plated 5μm according to EN ISO 4042

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Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA

Product description

Materials

Annex A3

Specifications of intended use

Anchorages subjected to:

- Static, quasi static, seismic load and fire.

Base materials:

- Cracked and non-cracked concrete.
- Reinforced and unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according to EN 206:2013+A1:2013.

Use conditions (Environmental conditions):

- Structures subjected to dry internal conditions.

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Anchorages under static and quasi-static actions are designed in accordance with EOTA TR 055, Edition December 2016 or CEN/TS 1992-4-4.
- For seismic application the anchorages are designed in accordance with EOTA TR 045, Edition February 2013.
- For application with resistance under fire exposure the anchorages are designed in accordance with method given in EOTA TR 020, edition May 2004.
- Verifiable calculation notes and drawings are prepared taking into account of the load to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).

Installation:

- Anchor installation carried out by appropriately qualified personnel and under supervision of the person responsible for technical matters of the site.
- Use of the anchor only supplied by the manufacturer without exchanging the components of an anchor.
- Anchor installation in accordance with the manufacturer's specification and drawings and using the appropriate tools.
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the rang given and is not lower that of the concrete to which the characteristic loads apply for.
- Check of concrete being well compacted, e.g. without significant voids.
- Effective anchorage depth, edge distances and spacing not less than the specified values without minus tolerances.
- Hole drilling by hammer drill.
- Cleaning of the hole of drilling dust.
- Positioning of the drill holes without damaging the reinforcement.
- Application of specified torque moment using a calibrated torque wrench.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength mortar and no shear or oblique tension loads in the direction of aborted hole.

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA	ZAVOD ZA GRADBENIŠTVO SLOVENIJE LJUBLJANA 17 **Annex B1**
Intended use Specification	

Table B1: Dimensions

Anchor size			M6	M8	M10	M12	M16	M20	M24
Nominal diameter of anchor		d_{nom} [mm]	10	12	15	18	24	28	32
Minimum installation depth		$h_{nom} \geq$ [mm]	60	70	80	100	115	145	165
Length of the anchor		L [mm]	t_{fix} + 60	t_{fix} + 70	t_{fix} + 80	t_{fix} + 100	t_{fix} + 115	t_{fix} + 145	t_{fix} + 165
Thickness of the fixture	Type S (SH) /B	$t_{fix,min}$ [mm]	0	0	0	0	0	0	0
	Type SK	$t_{fix,min}$ [mm]	5	6	6	8	-	-	-
	Type S (SH)/B/SK	$t_{fix,max}$ [mm]	200	250	300	350	400	450	500
Nominal diameter of the head of the countersunk screw	Type SK	d_{sk} [mm]	17	21	26	31	-	-	-

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA

Intended use

Dimensions of the anchors

Annex B2

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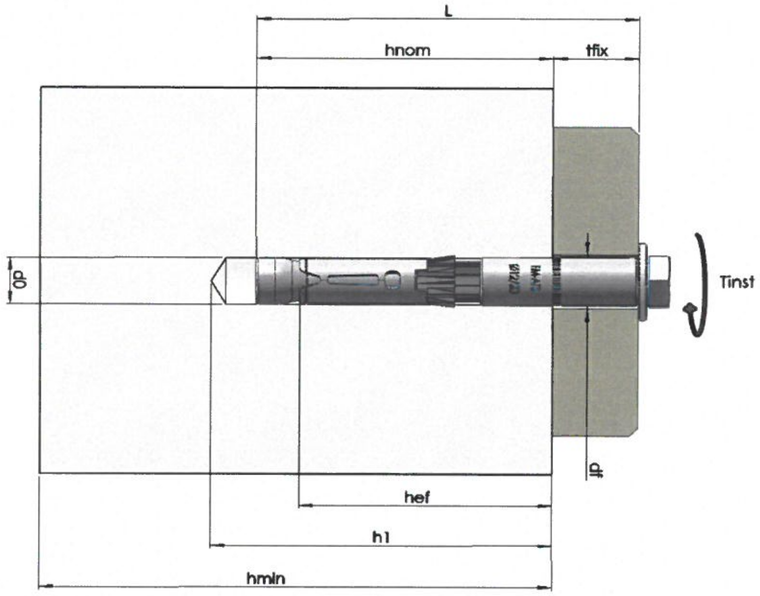

Table B2: Installation data

Anchor size		M6	M8	M10	M12	M16	M20	M24
Nominal drill hole diameter	d_0 [mm]	10	12	15	18	24	28	32
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	10,45	12,50	15,50	18,50	24,55	28,55	32,55
Depth of drill hole	$h_1 \geq$ [mm]	75	85	95	115	130	160	180
Minimum installation depth	$h_{nom} \geq$ [mm]	60	70	80	100	115	145	165
Effective anchorage depth	h_{ef} [mm]	49	59	67	88	99	125	150
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	12	14	17	20	26	31	35
Length of the anchor	L [mm]	t_{fix} + 60	t_{fix} + 70	t_{fix} + 80	t_{fix} + 100	t_{fix} + 115	t_{fix} + 145	t_{fix} + 165
Torque moment	T_{inst} [Nm]	10	20	45	80	150	170	200

Table B3: Minimum thickness of concrete member, spacing, and edge distances

Anchor size		M6	M8	M10	M12	M16	M20	M24
Minimum thickness of the concrete member	h_{min} [mm]	100	120	140	180	200	250	300
Minimum spacing	s_{min} [mm]	50	60	70	80	100	125	150
	for c [mm] ≥	75	90	100	150	200	250	300
Minimum edge distance	c_{min} [mm]	50	60	70	80	100	125	150
	for s ≥ [mm]	75	90	100	150	200	250	300

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA

Annex B3

Intended use

Installation parameters

Table C1: **Characteristic values for Tension loads in case of static and quasi-static loading for acc. to EOTA TR 055 or CEN/TS1992-4-4**

Essential characteristics			Performance						
			M6	**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Installation parameters									
d_0	Nominal diameter of drill bit	[mm]	10	12	15	18	24	28	32
h_{nom}	Anchorage depth	[mm]	60	70	80	100	115	145	165
h_{ef}	Effective anchorage depth	[mm]	49	59	67	88	99	125	150
h_{min}	Minimum thickness of concrete member	[mm]	100	120	140	180	200	250	300
T_{inst}	Torque moment	[Nm]	10	20	45	80	150	170	200
s_{min}	Minimum spacing	[mm]	50	60	70	80	100	125	150
for c ≥	Edge distance	[mm]	75	90	100	150	200	250	300
c_{min}	Minimum edge distance	[mm]	50	60	70	80	100	125	150
for s ≥	Spacing	[mm]	75	90	100	150	200	250	300
Tension steel failure mode									
$N_{Rk,s}$	Characteristic tension steel failure	[kN]	16	29	46	67	126	203	293
γ_{MsN}	Partial safety factor	[-]	1,5						
Pull-out failure mode									
$N_{Rk,p}$	Characteristic pull-out failure in non-cracked concrete	[kN]	-1)	-1)	-1)	-1)	-1)	-1)	-1)
$N_{Rk,p}$	Characteristic pull-out failure in cracked concrete	[kN]	9	12	16	25	-1)	-1)	-1)
γ_2	Partial safety factor	[-]	1,0						
γ_{Mp}		[-]	1,5						
$s_{cr,N}$	Characteristic spacing	[mm]	3 x h_{ef}						
$c_{cr,N}$	Characteristic edge distance	[mm]	1,5 x h_{ef}						
ψ_c C30/37	Increasing factor for $N_{Rk,p}$ for concrete	[-]	1,22						
ψ_c C40/50		[-]	1,41						
ψ_c C50/60		[-]	1,55						
Concrete Cone failure mode									
k_{cr}	Factor for cracked concrete CEN/TS 1992-4-4 §. 6.2.1.4	[-]	7,2						
k_{ucr}	Factor for un-cracked concrete CEN/TS 1992-4-4 §. 6.2.1.4	[-]	10,1						
γ_{Mc}	Partial safety factor	[-]	1,5						
Splitting failure mode									
$s_{cr,sp}$	Characteristic spacing	[mm]	3 x h_{ef}						
$c_{cr,sp}$	Characteristic edge distance	[mm]	1,5 x h_{ef}						
γ_{Msp}	Partial safety factor	[-]	1,5						
Displacement under tension load									
Non-cracked concrete C20/25									
N	Service tension load	[kN]	7,7	10,9	13,2	19,8	23,6	33,6	44,2
δ_{N0}	Short term displacement	[mm]	0,47	0,81	0,30	0,25	0,20	2,08	2,45
$\delta_{N\infty}$	Long term displacement	[mm]	2,38	2,49	1,99	1,12	2,15	2,08	2,45
Cracked concrete C20/25									
N	Service tension load	[kN]	4,3	5,7	7,6	11,9	16,9	23,9	31,5
δ_{N0}	Short term displacement	[mm]	1,21	0,83	1,25	0,98	0,96	0,99	1,41
$\delta_{N\infty}$	Long term displacement	[mm]	2,38	2,49	1,99	1,12	2,15	0,99	1,41

1) The pull-out is not decisive

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA	**Annex C1**
Design acc. EOTA TR 055 or CEN/TS 1992-4-4 Characteristic resistance under Tension loads – BWR 1	

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Table C2: **Characteristic values for Shear loads in case of static and quasi-static loading for design acc. to EOTA TR 055 or CEN/TS 1992-4-4**

Essential characteristics			Performance						
			M6	M8	M10	M12	M16	M20	M24
Shear steel failure mode									
$V_{Rk,s}$	Characteristic shear steel failure	[kN]	14	26	42	50	97	125	151
$M^0_{Rk,s}$	Bending moment characteristic failure	[Nm]	12	30	60	105	266	542	932
γ_{MsV}	Partial safety factor	[-]	1,25						
Shear concrete pry-out and edge failure									
k_3	Factor in equation (16) of CEN/TS 1992-4 § 6.2.2.3	[-]	1,0		2,0				
l_{ef}	Effective anchorage depth	[mm]	46	59	67	88	99	125	150
d_{nom}	Diameter of anchor	[mm]	10	12	15	18	24	28	32
Displacement under tension load									
Non-cracked concrete C20/25									
V	Service shar load	[kN]	8,0	14,9	24,0	28,6	55,4	71,4	86,3
δ_{V0}	Short term displacement	[mm]	1,39	1,94	2,71	1,69	2,69	7,84	8,87
$\delta_{V\infty}$	Long term displacement	[mm]	2,09	2,91	4,07	2,54	4,04	11,76	13,31

Table C3: **Characteristic values for resistance in case of Seismic performance category C1 acc. EOTA TR 045 "Design of Metal anchor under Seismic Actions"**

Essential characteristics			Performance						
			M6	M8	M10	M12	M16	M20	M24
Tension steel failure									
$N_{Rk,s,seis\ C1}$	Characteristic tension steel failure	[kN]	16	29	46	67	126	203	293
$\gamma_{MsN,seis}$ 2)	Partial safety factor	[-]	1,5						
Pull-out failure mode $N_{Rk,p,seis} = \psi_C \times N^0_{Rk,p,seis}$									
$N_{Rk,p,seis\ C1}$	Characteristic pull-out failure in concrete C20/25	[kN]	6,8	12	16	25	35,5 1)	50,2 1	66,1 1)
$\gamma_{Mp,seis}$ 2)	Partial safety factor	[-]	1,5						
Shear steel failure									
$V_{Rk,s,seisC1}$	Characteristic shear steel failure	[kN]	9,8	13	20	20	48,5	87,5	105,7
$\gamma_{MsV,seis}$ 2)	Partial safety factor	[-]	1,25						

1) The pull-out is not decisive

2) The recommended partial safety factors under seismic action ($\gamma_{M,seis}$) are the same as for static loading

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA	**Annex C3**
Design according to EOTATR 045 Characteristic resistance under Seismic actions – BWR 1	

Table C4: **Characteristic values for resistance in case of Seismic performance category C2 acc. EOTA TR 045 "Design of Metal anchor under Seismic Actions"**

Essential characteristics			Performance						
			M6	M8	M10	M12	M16	M20	M24
Tension steel failure									
$N_{Rk,s,seis\ C2}$ 2)	Characteristic tension steel failure	[kN]	16	29	46	67	126	203	293
γ_{MsN} 3)	Partial safety factor	[-]	1,5						
Pull-out failure $N_{Rk,p,seis} = \psi_C \times N^0_{Rk,seis}$									
$N_{Rk,p,seis\ C2}$ 2)	Characteristic pull-out failure in concrete C20/25	[kN]	-	3,9	7,8	15,3	28,8	32,8	41,3
γ_{MpN} 3)	Partial safety factor	[-]	1,5						
$\delta_{N,sei(DSL)}$ 1)2)	Displacement at DSL	[mm]	-	2,7	4,9	3,6	3,1	7,0	7,0
$\delta_{N,sei(USL)}$ 1)2)	Displacement at USL	[mm]	-	12,8	15,2	14,0	11,5	18,4	16,2
Shear steel failure									
$V_{Rk,s,seis\ C2}$ 2)	Characteristic shear failure	[kN]	-	10,2	17,0	17,0	43,9	72,9	74,6
γ_{MsV} 3)	Partial safety factor	[-]	1,25						
$\delta_{V,sei(DSL)}$ 1)2)	Displacement at DSL	[mm]	-	3,5	2,7	2,5	2,7	7,0	7,0
$\delta_{V,sei(USL)}$ 1)2)	Displacement at USL	[mm]	-	6,8	6,3	5,8	6,1	20,9	18,6

1) The listed displacement represent mean values

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

3) The recommended partial safety factors under seismic action ($\gamma_{M,seis}$) are the same as for static loading

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA	**Annex C4**
Design according to EOTA TR 045 Characteristic resistance under Seismic actions - BWR 1	

Table C5: **Characteristic resistance under Fire exposure for design acc. to EOTA TR 020 or CEN/TS 1992-4-4**

Essential characteristics			Performance						
			M6	M8	M10	M12	M16	M20	M24
Tension steel failure mode									
$N_{Rk,s,fi,30}$	Duration = 30 minutes	[kN]	0,20	0,37	0,87	1,69	3,14	4,90	7,06
$N_{Rk,s,fi,60}$	Duration = 60 minutes	[kN]	0,18	0,33	0,75	1,26	2,36	3,68	5,30
$N_{Rk,s,fi,90}$	Duration = 90 minutes	[kN]	0,14	0,26	0,58	1,10	2,04	3,19	4,59
$N_{Rk,s,fi,120}$	Duration = 120 minutes	[kN]	0,10	0,18	0,46	0,84	1,57	2,45	3,53
Pull-out failure mode									
$N_{Rk,p,fi,30}$	Duration = 30 minutes	[kN]	2,25	3,00	4,00	6,25	8,88	12,58	16,54
$N_{Rk,p,fi,60}$	Duration = 60 minutes	[kN]	2,25	3,00	4,00	6,25	8,88	12,58	16,54
$N_{Rk,p,fi,90}$	Duration = 90 minutes	[kN]	2,25	3,00	4,00	6,25	8,88	12,58	16,54
$N_{Rk,p,fi,120}$	Duration = 120 minutes	[kN]	1,80	2,40	3,20	5,00	7,10	10,06	13,23
Concrete cone failure mode									
$N_{Rk,c,fi,30}$	Duration = 30 minutes	[kN]	3,03	4,81	6,61	13,08	17,55	31,44	49,61
$N_{Rk,c,fi,60}$	Duration = 60 minutes	[kN]	3,03	4,81	6,61	13,08	17,55	31,44	49,61
$N_{Rk,c,fi,90}$	Duration = 90 minutes	[kN]	3,03	4,81	6,61	13,08	17,55	31,44	49,61
$N_{Rk,c,fi,120}$	Duration = 120 minutes	[kN]	2,42	3,85	5,29	10,46	14,04	25,16	39,68
$s_{cr,N}$	Characteristic spacing	[mm]	4 x h_{ef}						
$c_{cr,N}$	Characteristic edge distance	[mm]	2 x h_{ef}						
s_{min}	Minimum spacing	[mm]	50	60	70	80	100	125	150
c_{min}	Minimum edge distance	[mm]	c_{min} = 2 h_{ef}; if fire attack from more than one side, the edge distance of the anchor has to be ≥ 300mm and ≥ 2 h_{ef}						
$\gamma_{M,fi}$	Partial safety factor	[-]	1,0[1)]						
Shear steel failure without lever arm									
$V_{Rk,s,fi,30}$	Duration = 30 minutes	[kN]	0,20	0,37	0,87	1,69	3,14	4,9	7,06
$V_{Rk,s,fi,60}$	Duration = 60 minutes	[kN]	0,18	0,33	0,75	1,26	2,36	3,68	5,30
$V_{Rk,s,fi,90}$	Duration = 90 minutes	[kN]	0,14	0,26	0,58	1,10	2,04	3,19	4,59
$V_{Rk,s,fi,120}$	Duration = 120 minutes	[kN]	0,10	0,18	0,46	0,84	1,57	2,45	3,53
Shear steel failure with lever arm									
$M^0_{Rk,s,fi,30}$	Duration = 30 minutes	[Nm]	0,15	0,37	1,12	2,62	6,66	13,07	22,45
$M^0_{Rk,s,fi,60}$	Duration = 60 minutes	[Nm]	0,14	0,34	0,97	1,96	5,00	9,80	16,84
$M^0_{Rk,s,fi,90}$	Duration = 90 minutes	[Nm]	0,11	0,26	0,75	1,70	4,33	8,49	14,59
$M^0_{Rk,s,fi,120}$	Duration = 120 minutes	[Nm]	0,08	0,19	0,60	1,31	3,33	5,44	9,35
Shear concrete pry-out failure									
k_3	Factor in equation (16) of CEN/TS 1992-4 § 6.2.2.3	[mm]	1,0			2,0			
Shear concrete edge failure									
The characteristic resistance $V^0_{Rk,c,fi}$ in C 20/25 to C5 0/60 concrete is determined by: $V^0_{Rk,c,fi} = 0,25 \times V^0_{Rk,c}$ (≤ R90) and $V^0_{Rk,c,fi} = 0,20 \times V^0_{Rk,c}$ (R120) with $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature									

1) In absence of other national regulations

Apolo MEA Schwerlastanker SLA / Apolo MEA Heavy-duty anchor SLA	**Annex C5**
Design according to EOTA TR 020 Characteristic resistance under Fire exposure - BWR 2	

ZAVOD ZA GRADBENIŠTVO SLOVENIJE LJUBLJANA 17