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European Technical Assessment ETA-11/0141 of 08/08/2016

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	RAWL RP-30 / RAWL R-KF2
Product family to which the construction product belongs	Bonded anchor with anchor rod made of galvanized steel or stainless steel for use in non-cracked concrete
Manufacturer	RAWLPLUG S.A. ul. Kwidzyńska 6 51-416 Wrocław, Poland
Manufacturing plant	Manufacturing Plant no. 3
This European Technical Assessment contains	16 pages including 3 Annexes which form an integral part of this Assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European Technical Approval ETAG 001, Edition April 2013 “Metal anchors for use in concrete – Part 1: Anchors in general and Part 5: Bonded anchors”, used as European Assessment Document (EAD)
This version replaces	ETA-11/0141 issued on 28/06/2013

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Specific Part

1 Technical description of the product

This European Technical Assessment applies to the following products' trade names: RAWL RP30 and RAWL R-KF2. RAWL RP-30 / RAWL R-KF2 is bonded anchor (injection type) consisting of a injection mortar cartridge using an applicator gun equipped with a special mixing nozzle and threaded anchor rod of the sizes M8 to M30 made of:

- galvanized carbon steel,
- stainless steel,
- high corrosion resistant stainless steel,

with hexagon nut and washer.

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 threaded rod is anchored by the bond between rod, mortar and concrete.

The threaded rods are available for all diameters with three type of tip end: a one side 45° chamfer, a two sides 45° chamfer or a flat. The threaded rods are either delivered with the mortar cartridges or commercial standard threaded rods purchased separately. The mortar cartridges are available in different sizes and types.

An illustration and the description of the products are given in Annexes A.

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

The performances given in Section 3 are only valid if the anchors are used in compliance with the specifications and conditions given in Annexes B.

The performances given 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.

3 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)

The essential characteristic is detailed in the Annexes C.

3.1.2 Safety in case of fire (BWR 2)

Essential characteristics	Performances
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance assessed

3.1.3 Hygiene, health and the environment (BWR 3)

Regarding the dangerous substances there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.1.4 Safety and accessibility in use (BWR 4)

For Basic Requirement Safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability (BWR 1).

3.1.5 Sustainable use of natural resources (BWR 7)

No performance assessed.

3.2 Methods used for the assessment

The assessment of fitness of the anchors for declared 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 ETAG 001 *"Metal anchors for use in concrete*", Part 1: "*Anchors in general*" and Part 5: "*Bonded anchors*", on the basis of Option 7.

4 Assessment and verification of constancy of performance (AVCP) 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

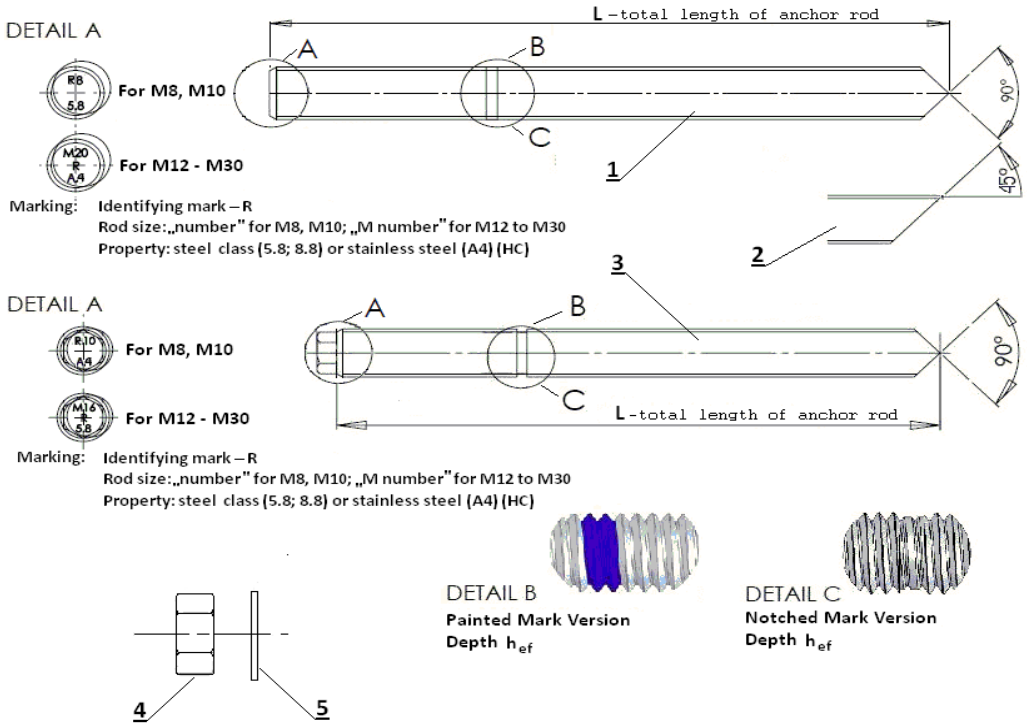
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document (EAD)

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

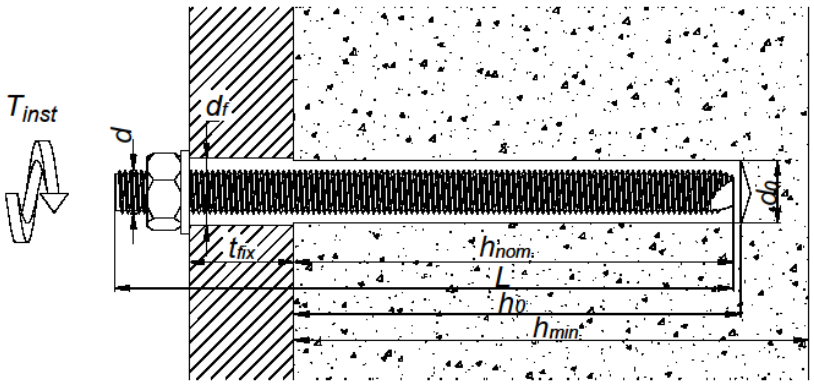
For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

Issued in Warsaw on 08/08/2016 by Instytut Techniki Budowlanej

Marcin M. Kruk, PhD
Director of ITB



1. Anchor rod R-STUDS–(88),(A4),(HC)-FL
2. 45° shape with anchor rod
3. Anchor rod R-STUDS–(88),(A4),(HC) with the hexagonal tip
4. Hexagonal nut
5. Washer



RAWL RP-30 / RAWL R-KF2	**Annex A1** of European Technical Assessment ETA-11/0141
Product description Characteristic of the product	

Table A1: Threaded rods

Part	Designation		
	Steel, zinc plated	**Stainless steel**	**High corrosion resistance stainless steel (HCR)**
Threaded rod	Steel, property class 5.8 to 12.9, acc. to EN ISO 898-1 electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; property class 70 and 80 (A4-70 and A4-80) acc. to EN ISO 3506	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; property class 70 acc. to EN ISO 3506
Hexagon nut	Steel, property class 5 to 12, acc. to EN ISO 898-2; electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; property class 70 and 80 (A4-70 and A4-80) acc. to EN ISO 3506	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; property class 70 acc. to EN ISO 3506
Washer	Steel, acc. to EN ISO 7089; electroplated ≥ 5 µm acc. to EN ISO 4042 or hot-dip galvanized ≥ 45 µm acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088

Commercial standard threaded rods (in the case of rods made of galvanized steel – standard rods with property class ≤ 8.8 only), with:

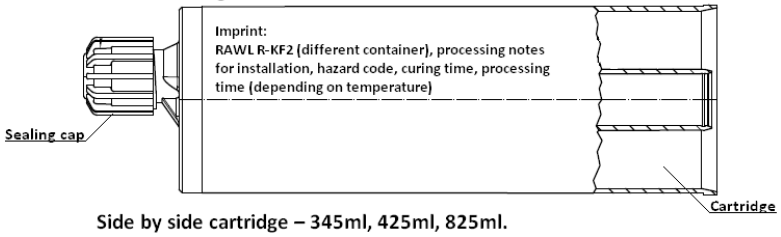
- material and mechanical properties according to Table A1,
- confirmation of material and mechanical properties by inspection certificate 3.1 according to EN-10204:2004; the documents shall be stored,
- marking of the threaded rod with the embedment depth.

Note: Commercial standard threaded rods made of galvanized steel with property class above 8.8 are not permitted in some Member States.

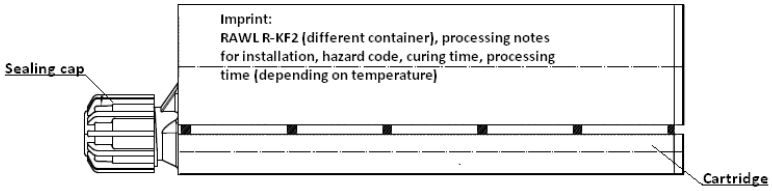
Table A2: Injection mortar

Product	**Composition**
RAWL RP-30 / RAWL R-KF2	Bonding agent: polyester based resin Hardener: dibenzoyl peroxide Additive: quartz sand (filler)

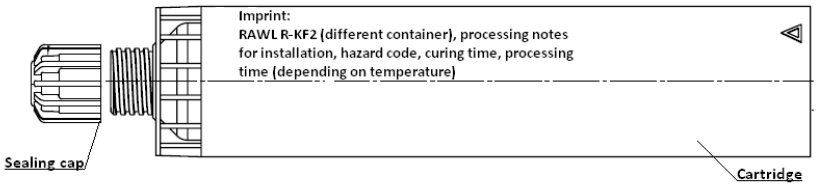
Coaxial cartridge – 150ml, 310ml, 330ml, 380ml, 400ml, 410ml.



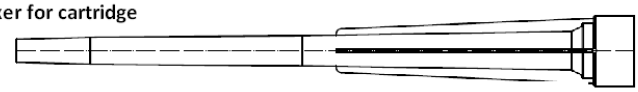
Side by side cartridge – 345ml, 425ml, 825ml.



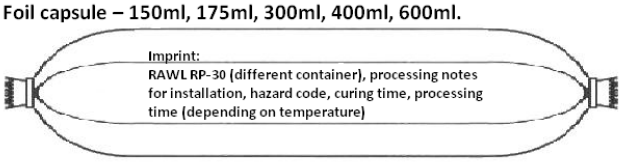
Cartridge for two part foil capsules within a single components – 150ml, 175ml, 300ml, 310ml, 380ml, 400ml, 550ml, 600ml.



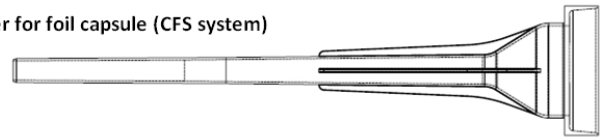
Mixer for cartridge



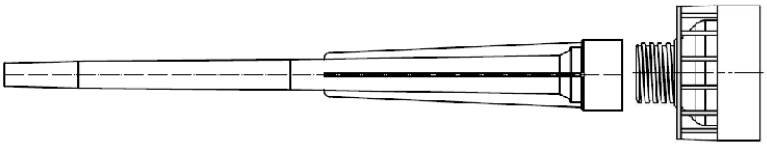
Foil capsule – 150ml, 175ml, 300ml, 400ml, 600ml.



Mixer for foil capsule (CFS system)



Mixer standard plus adapter CFS+ for foil capsule



RAWL RP-30 / RAWL R-KF2	**Annex A3** of European Technical Assessment ETA-11/0141
Product description Cartridge types and sizes	

SPECIFICATION OF INTENDED USE

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 (EU) 305/2011 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 M30.

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: sizes from M8 to M30.

Temperature range:

The anchors may be used in the following temperature range:

- -40°C to +40°C (max. short term temperature +40°C and max. long term temperature +24°C).
- -40°C to +80°C (max. short term temperature +80°C and max. long term temperature +50°C).

Use conditions (environmental conditions):

- Elements made of galvanized steel may be used in structures subject to dry internal conditions.
- Elements made of stainless steel may be used in structures subject to dry internal conditions and also in concrete subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist. Such 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).
- Elements made of high corrosion resistant stainless steel may be used in structures subject to dry internal conditions and also in concrete subject to external atmospheric exposure or exposure in permanently damp internal conditions or in other particular aggressive conditions. Such 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 chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used).

Installation:

- Dry or wet concrete (use category 1): sizes from M8 to M30.
- Flooded holes with the exception of seawater (use category 2): sizes from M8 to M30.
- The anchors are suitable for rotary hammer drilled holes: sizes from M8 to M30.

Design methods:

EOTA Technical Report TR029 (September 2010) or CEN/TS 1992-4.

RAWL RP-30 / RAWL R-KF2	**Annex B1** of European Technical Assessment ETA-11/0141
Intended use Intended use	

Table B1: Installation data

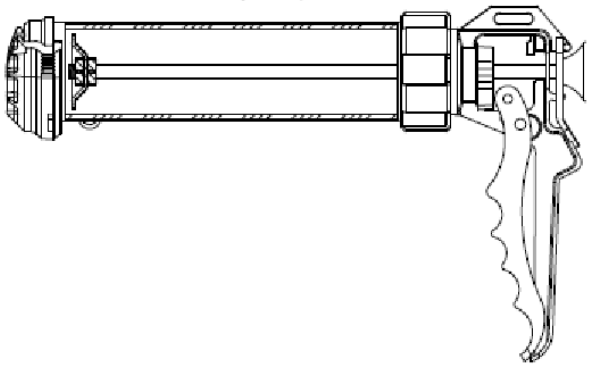
Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M30**
Diameter of anchor rod	d [mm]	8	10	12	16	20	24	30
Nominal drilling diameter	d_0 [mm]	10	12	14	18	24	28	35
Maximum diameter hole in the fixture	d_f [mm]	9	12	14	18	22	26	32
Effe$_m$ctive embedment depth $h_{ef} = h_{no}$	min [mm]	60	70	80	100	120	140	165
	max [mm]	100	120	145	190	240	290	360
Depth of the drilling hole	h_0 [mm]	h_{ef} + 5 mm						
Minimum thickness of the concrete memeber	h_{min} [mm]	h_{ef} + 30 mm; ≥ 100 mm				$h_{ef} + 2 \cdot d_0$		
Torque moment	T_{inst} [Nm]	10	20	40	80	120	180	300
Minimum spacing	s_{min} [mm]	$0,5 \cdot h_{ef} \geq 40$ mm						
Minimum edge distance	c_{min} [mm]	$0,5 \cdot h_{ef} \geq 40$ mm						

Table B2: Processing time and minimum curing time

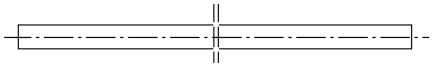
Mortar temperature	Concrete temperature	Processing (open) time	Minimum curing time[1)]
5°C	-5°C	60 min.	6 h
5°C	0°C	40 min.	3 h
5°C	5°C	20 min.	2 h
10°C	10°C	12 min.	80 min.
15°C	15°C	8 min.	60 min.
20°C	20°C	5 min.	45 min.
25°C	30°C	2 min.	20 min.

[1)] Curing time shall be doubled for the wet concrete.

Gun for foil capsule (RAWL CFS system)

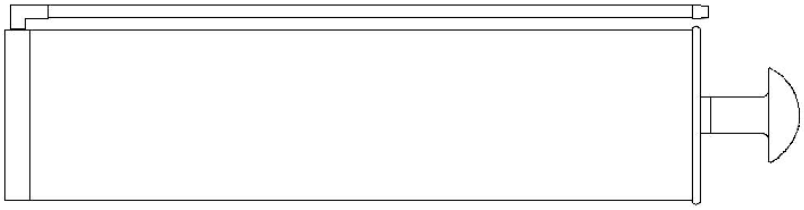


Additional mixer extension



*Variable length from 300mm up to 1000mm.

Manual blower pump

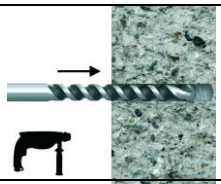
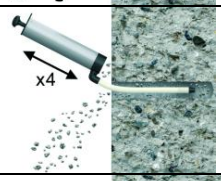
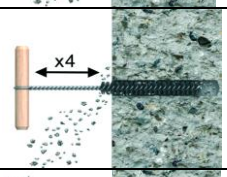
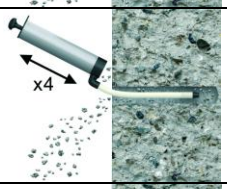
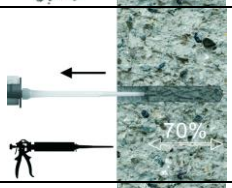
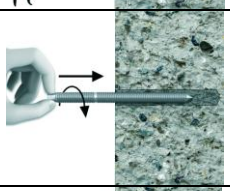
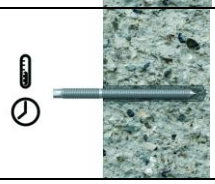
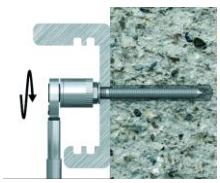


Steel brush

Brush diameter

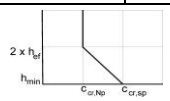
Size rod	M8	M10	M12	M16	M20	M24	M30
Brushes diameter d_b (mm)	12	14	16	20	26	30	37

RAWL RP-30 / RAWL R-KF2	**Annex B4** of European Technical Assessment ETA-11/0141
Intended use Cleaning tools	

	Drill a hole to the required diameter and depth using a rotary hammer drilling machine.
	4x times blowing, starting from the bottom of the drilled hole, using the hand pump.
	4x times brushing (at least) using the specified steel brush
	4x times blowing, starting from the bottom of the drilled hole, using the hand pump.
	Insert the mixing nozzle to the far end of the hole and inject the mortar, slowly withdrawing the nozzle as the hole is filled to 2/3 of its' depth.
	Immediately insert the rod, slowly and with a slight twisting motion. Remove excess of mortar around the hole before it sets.
	Leave the fixing undisturbed until the cure time elapses.
	Attach the fixture and tighten the nut to the required torque.

RAWL RP-30 / RAWL R-KF2	**Annex B5** of European Technical Assessment ETA-11/0141
Intended use Installation instruction	

Table C1: Characteristic values for tension loads

Size				M8	M10	M12	M16	M20	M24	M30
Steel failure with threaded rod grade 5.8										
Characteristic resistance		$N_{Rk,s}$	[kN]	18	29	42	78	122	176	280
Partial safety factor		γ_{Ms} [1)]	[-]	1,50						
Steel failure with threaded rod grade 8.8										
Characteristic resistance		$N_{Rk,s}$	[kN]	29	46	67	126	196	282	449
Partial safety factor		γ_{Ms} [1)]	[-]	1,50						
Steel failure with threaded rod grade 10.9										
Characteristic resistance		$N_{Rk,s}$	[kN]	37	58	84	157	245	353	561
Partial safety factor		γ_{Ms} [1)]	[-]	1,40						
Steel failure with threaded rod grade 12.9										
Characteristic resistance		$N_{Rk,s}$	[kN]	44	70	101	188	294	424	673
Partial safety factor		γ_{Ms} [1)]	[-]	1,40						
Steel failure with stainless steel threaded rod grade A4-70										
Characteristic resistance		$N_{Rk,s}$	[kN]	26	41	59	110	171	247	393
Partial safety factor		γ_{Ms} [1)]	[-]	1,87						
Steel failure with stainless steel threaded rod grade A4-80										
Characteristic resistance		$N_{Rk,s}$	[kN]	29	46	67	126	196	282	449
Partial safety factor		γ_{Ms} [1)]	[-]	1,60						
Steel failure with high corrosion threaded rod grade 70										
Characteristic resistance		$N_{Rk,s}$	[kN]	26	41	59	110	171	247	393
Partial safety factor		γ_{Ms} [1)]	[-]	1,87						
Combined pull-out and concrete cone failure										
Characteristic bond resistance in non-cracked concrete C20/25										
Temperature range I: 40°C/24°C		$\tau_{Rk,ucr}$	[N/mm²]	9,5	10	9,5	9	8,5	7	5
Temperature range II: 80°C/50°C		$\tau_{Rk,ucr}$	[N/mm²]	8,5	9	8,5	8	7,5	6	4,5
Increasing factor for $\tau_{Rk,ucr}$ in non-cracked concrete		ψ_c	C30/37	1,11	1,08				1,0	
			C40/50	1,15					1,0	
			C50/60	1,19					1,0	
Installation safety factors for use category 1		γ_2 [2)] = γ_{inst} [3)]	[-]	1,2	1,2	1,2	1,2	1,2	1,4	1,4
Installation safety factors for use category 2			[-]	1,4	1,4	1,4	1,4	1,4	1,4	1,4
Splitting failure										
Effective anchorage depth h_{ef}	min		[mm]	60	70	80	100	120	140	165
	max		[mm]	100	120	145	190	240	290	360
Edge distance	$c_{cr,N} = c_{cr,Np}$		[mm]	$c_{cr,Np} = \frac{s_{cr,Np}}{2}$						
	$c_{cr,sp}$ for h_{min}		[mm]	2,5 · h_{ef}		2,0 · h_{ef}		1,5 · h_{ef}		
	$c_{cr,sp}$ for $h_{min} < h$ [4)] $< 2 \cdot h_{ef}$ ($c_{cr,sp}$ from linear interpolation)		[mm]							
	$c_{cr,sp}$ for $h \geq 2 \cdot h_{ef}$		[mm]	$c_{cr,Np}$						
Spacing	$s_{cr,N} = s_{cr,Np}$		[mm]	3,0 · h_{ef}						
	$s_{cr,sp}$		[mm]	2,0 · $c_{cr,sp}$						

1) in the absence of national regulations
2) Parameter for design according to EOTA Technical Report TR 029
3) Parameter for design according to CEN/TS 1992-4:2009;
4) h – concrete member thickness

RAWL RP-30 / RAWL R-KF2

Annex C1

of European Technical Assessment ETA-11/0141

Performances
Characteristic resistance under tension loads in non-cracked concrete

Table C2: Shear loads for steel failure without lever arm

Size			M8	M10	M12	M16	M20	M24	M30
Steel failure with threaded rod grade 5.8									
Characteristic resistance	$V_{Rk,s}$	[kN]	9	14	21	39	61	88	140
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 8.8									
Characteristic resistance	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	224
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 10.9									
Characteristic resistance	$V_{Rk,s}$	[kN]	18	29	42	78	122	176	280
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with threaded rod grade 12.9									
Characteristic resistance	$V_{Rk,s}$	[kN]	22	35	51	94	147	212	337
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with stainless steel threaded rod grade A4-70									
Characteristic resistance	$V_{Rk,s}$	[kN]	13	20	29	55	86	124	196
Partial safety factor	γ_{Ms}	[-]	1,56						
Steel failure with stainless steel threaded rod grade A4-80									
Characteristic resistance	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	224
Partial safety factor	γ_{Ms}	[-]	1,33						
Steel failure with high corrosion stainless steel threaded rod grade 70									
Characteristic resistance	$V_{Rk,s}$	[kN]	13	20	29	55	86	124	196
Partial safety factor	γ_{Ms}	[-]	1,56						

Table C4: Shear loads for steel failure with lever arm

Size			M8	M10	M12	M16	M20	M24	M30
Steel failure with threaded rod grade 5.8									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 8.8									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Partial safety factor	γ_{Ms}	[-]	1,25						
Steel failure with threaded rod grade 10.9									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	37	75	131	333	649	1123	2249
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with threaded rod grade 12.9									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	45	90	157	400	779	1347	2699
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with stainless steel threaded rod grade A4-70									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Partial safety factor	γ_{Ms}	[-]	1,56						
Steel failure with stainless steel threaded rod grade A4-80									
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
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	1574
Partial safety factor	γ_{Ms}	[-]	1,56						

Table C4: Characteristic values for shear loads – pry out and concrete edge failure

Size			M8	M10	M12	M16	M20	M24	M30
Effective anchorage depth h_{ef}	min	[mm]	60	70	80	100	120	140	165
	max	[mm]	100	120	145	190	240	290	360
Pry out failure									
Factor acc. to equation (5.7) of TR 029 or acc. to equation (27) of CEN/TS 1992-4:2009	$k^{1)} = k_3$ [2)]	[-]	2	2	2	2	2	2	2
Partial safety factor [3)]	γ_{Mp}	[-]	1,5						
Concrete edge failure: see clause 5.2.3.4 of Technical Report TR 029									
Partial safety factor [3)]	γ_{Mc}	[-]	1,5						

1) factor according to EOTA Technical Report TR 029
2) factor according to CEN/TS 1992-4:2009
3) in the absence of national regulation

Table C5: Displacement under tension loads – non-cracked concrete

Size			M8	M10	M12	M16	M20	M24	M30
Characteristic displacement in non-cracked concrete C20/25 to C50/60 under tension loads									
Admissible service load [1)]	F	[kN]	7,2	11,1	13,9	22,7	31,6	31,2	33,9
Displacement	δ_{N0}	[mm]	0,20	0,20	0,25	0,25	0,35	0,40	0,40
	$\delta_{N\infty}$	[mm]	0,80	0,80	0,80	0,80	0,80	0,80	0,80

$F = F_{Rk} / \gamma_F \cdot \gamma_{Mc}$, with $\gamma_F = 1,4$
These values are suitable for each temperature range and categories specified in Annex B1

Table C6: Displacement under shear loads

Size			M8	M10	M12	M16	M20	M24	M30
Characteristic displacement under shear loads									
Admissible service load [1)]	F	[kN]	3,7	5,8	8,4	15,7	24,5	35,3	55,6
Displacement	δ_{V0}	[mm]	2,5	2,5	2,5	2,5	2,5	2,5	2,5
	$\delta_{V\infty}$	[mm]	3,7	3,7	3,7	3,7	3,7	3,7	3,7

1) $F = F_{Rk} / \gamma_F \cdot \gamma_{Mc}$, with $\gamma_F = 1,4$
These values are suitable for each temperature range and categories specified in Annex B1