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European Technical Assessment

**ETA-10/0108
of 23/06/2015**

General Part

Technical Assessment Body issuing the European Technical Assessment

Instytut Techniki Budowlanej

Trade name of the construction product

R-CAS-V

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

14 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-10/0108 issued on 28/06/2013

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Specific Part

1 Technical description of the product

The R-CAS-V are a bonded anchors (injection type) consisting of a injection mortar glass capsules 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 glass capsule is placed into a drilled hole previously cleaned and threaded rod is driven by machine with turning. The threaded rod is anchored by the bond between rod, mortar and the concrete.

The threaded rods are available for all diameters with three type of tip end: a one side 45° chamfer or a two sides 45° chamfer.

An illustration and the description of the products are given in Annex A1 to A2.

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 Annex B1 to B4.

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 Annex C1 to C4.

3.1.2 Safety in case of fire (BWR 2)

No performance assessed.

3.1.3 Hygiene, health and the environment (BWR 3)

Regarding the dangerous substances clauses contained in this European Technical Assessment, 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 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 the intended use in relation to the requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements 1 and 4 has been made in accordance with the 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.

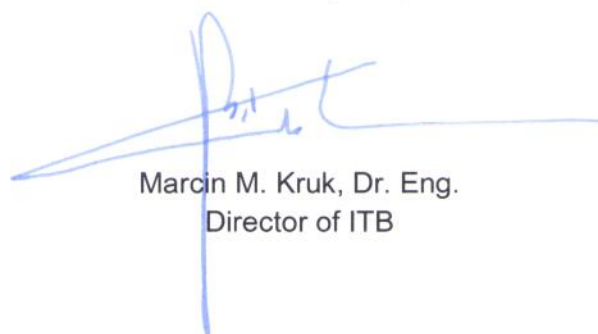
Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete structural elements (which contributes to the stability of the works) or heavy units	-	1

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

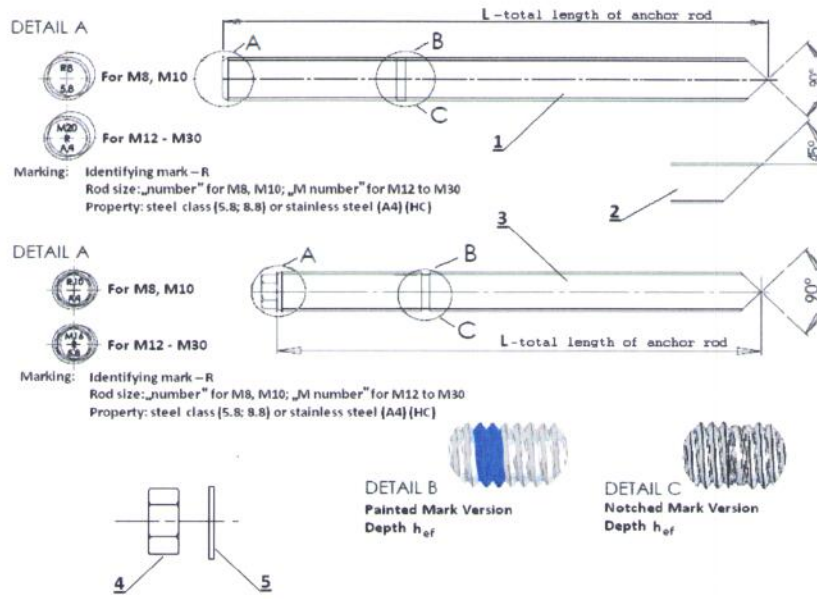
Technical details necessary for the implementation of the AVCP system are laid down in the Control Plan which is deposited at Instytut Techniki Budowlanej.

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.

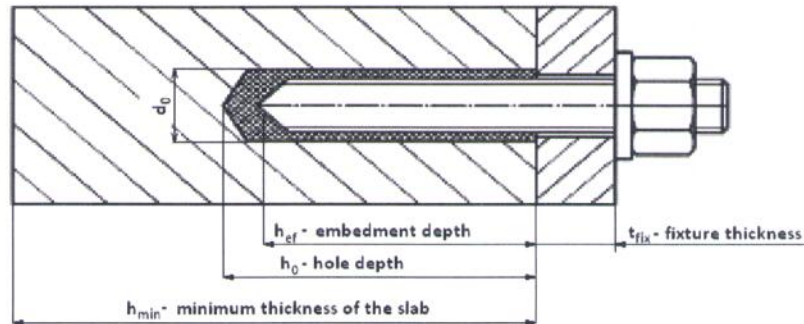
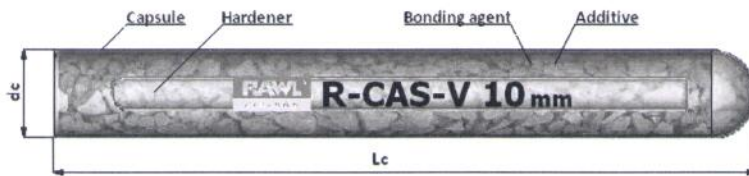
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Marcin M. Kruk, Dr. Eng.
Director of ITB



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



R-CAS-V

Product description
 Characteristic of the product

Annex A1
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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 $\geq 5 \mu\text{m}$ acc. to EN ISO 4042 or hot-dip galvanized $\geq 45 \mu\text{m}$ 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 $\geq 5 \mu\text{m}$ acc. to EN ISO 4042 or hot-dip galvanized $\geq 45 \mu\text{m}$ 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 $\geq 5 \mu\text{m}$ acc. to EN ISO 4042 or hot-dip galvanized $\geq 45 \mu\text{m}$ acc. to EN ISO 10684	Material 1.4401, 1.4404, 1.4571 acc. to EN 10088; corresponding to anchor rod material	Material 1.4529, 1.4565, 1.4547 acc. to EN 10088; corresponding to anchor rod material

Table A2: Injection mortar

Product	Composition
R-CAS-V	Bonding agent: vinylester styrene free resin Hardener: dibenzoyl peroxide Additive: quartz sand (filler)

R-CAS-V	Annex A2 of European Technical Assessment ETA-10/0108
Product description Materials	

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.

R-CAS-V	Annex B1 of European Technical Assessment ETA-10/0108
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 _{fix} [mm]	9	12	14	18	22	26	32
Effective embedment depth	h _{ef} [mm]	80	90	110	125	170	210	270
Depth of the drilling hole	h ₀ [mm]	h _{ef} + 5 mm						
Minimum thickness of concrete member	h _{min} [mm]	120	130	140	180	230	270	340
Torque moment	T _{inst} [N·m]	10	20	40	80	120	180	300
Minimum spacing	s _{min} [mm]	0,5 · h _{ef} ≥ 40 mm						
Minimum edge distance	c _{min} [mm]	0,5 · h _{ef} ≥ 40 mm						

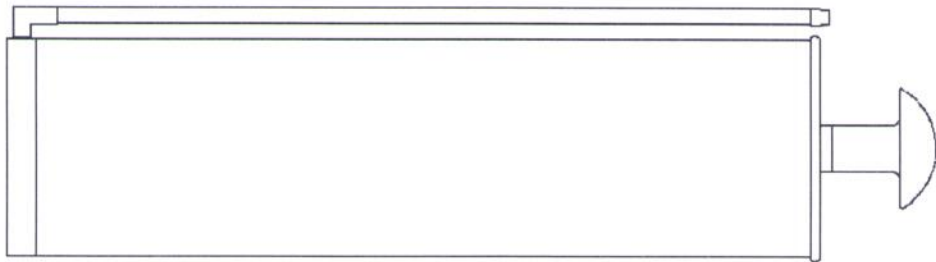
Table B2: Minimum curing time

Concrete temperature	Minimum curing time ¹⁾
-5°C	480 min
0°C	240 min
5°C	150 min
10°C	120 min
15°C	90 min
20°C	45 min
30°C	20 min
40°C	10 min

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

R-CAS-V	Annex B2 of European Technical Assessment ETA-10/0108
Intended use Installation data	

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

R-CAS-V

Intended use
Cleaning tools

Annex B3
of European
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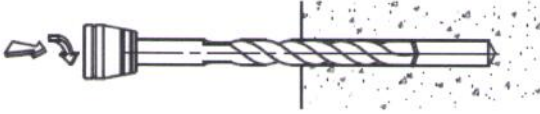

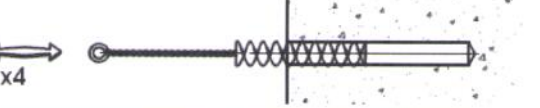
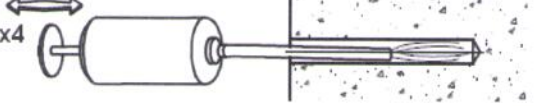

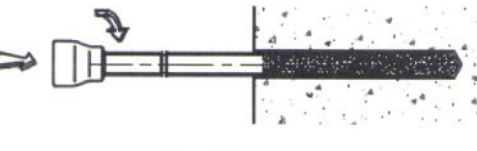


	<p>Drill a hole to the required diameter and depth using a rotary hammer drilling machine.</p>	
	<p>Starting from the drill hole bottom blow the hole at least 4 times using the hand pump.</p>	
	<p>Using the specified brush, mechanically brush out the hole at least 4 times.</p>	
	<p>Starting from the drill hole bottom, blow at least 4 times with the hand pump.</p>	
	<p>Insert the glass capsule into the cleaned hole.</p>	
	<p>Position the stud into the glass capsule then switch on the drilling machine and drive the stud into the capsule. Switch off the drilling machine as soon as the bottom of the hole is reached.</p>	
	<p>Leave the fixing undisturbed until the cure time elapses.</p>	
	<p>Attach the fixture and tighten the nut to the required torque.</p>	
<p>R-CAS-V</p>	<p>Annex B4</p>	
<p>Intended use Installation instruction</p>	<p>of European Technical Assessment ETA-10/0108</p>	

Table C1: Characteristic values for tension loads

Size	M8	M10	M12	M16	M20	M24	M30		
Steel failure									
Steel failure with threaded rod grade 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18	29	42	78	122	176	280
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	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	$\gamma_{Ms}^{1)}$	[-]	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	$\gamma_{Ms}^{1)}$	[-]	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	$\gamma_{Ms}^{1)}$	[-]	1,40						
Steel failure with stainless steel threaded rod A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26	41	59	110	171	247	393
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,87						
Steel failure with stainless steel threaded rod A4-80									
Characteristic resistance	$N_{Rk,s}$	[kN]	29	46	67	126	196	282	449
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	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	$\gamma_{Ms}^{1)}$	[-]	1,87						
Combined pull-out and concrete cone failure									
Characteristic bond resistance in non-cracked concrete C20/25	$\tau_{Rk,ucr}$	[N/mm ²]	13	12	12	11	10	9	8,5
Increasing factor for $\tau_{Rk,ucr}$ in non-cracked concrete	ψ_c	C30/37	1,04					1,0	
		C40/50	1,07					1,0	
		C50/60	1,09					1,0	
Partial safety factor for use category 1	$\gamma_{Mc} = \gamma_{Mp}^{1)}$	[-]	1,8						
Partial safety factor for use category 2	$\gamma_{Mc} = \gamma_{Mp}^{1)}$	[-]	2,1						
Splitting failure									
Effective anchorage depth	h_{ef}	[mm]	80	90	110	125	170	210	270
Edge distance	$C_{cr,N} = C_{cr,Np}$	[mm]	120	135	165	190	255	315	340
	$C_{cr,sp}$ for h_{min}	[mm]	200	225	220	250	255	315	405
	$C_{cr,sp}$ for $h_{min} < h^2) < 2 \cdot h_{ef}$ ($C_{cr,sp}$ from linear interpolation)	[mm]							
	$C_{cr,sp}$ for $h \geq 2 \cdot h_{ef}$	[mm]	120	135	165	190	255	315	405
Spacing	$s_{cr,N} = s_{cr,Np}$	[mm]	240	270	330	375	510	630	810
	$s_{cr,sp}$	[mm]	400	450	440	500	510	630	810

1) in the absence of national regulations

2) h – concrete member thickness

3) $s_{cr,N} = 2,5 \cdot h_{ef}$ **R-CAS-V**

Performances
Characteristic resistance under tension loads
in non-cracked concrete

Annex C1
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Table C3: 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 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 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						

R-CAS-V

Performances
Characteristic resistance under shear loads

Annex C2
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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	$M_{Rk,s}^0$	[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	$M_{Rk,s}^0$	[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	$M_{Rk,s}^0$	[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	$M_{Rk,s}^0$	[Nm]	45	90	157	400	779	1347	2699
Partial safety factor	γ_{Ms}	[-]	1,50						
Steel failure with stainless steel threaded rod A4-70									
Characteristic resistance	$M_{Rk,s}^0$	[Nm]	26	52	92	233	454	786	1574
Partial safety factor	γ_{Ms}	[-]	1,56						
Steel failure with stainless steel threaded rod A4-80									
Characteristic resistance	$M_{Rk,s}^0$	[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	$M_{Rk,s}^0$	[Nm]	26	52	92	233	454	786	1574
Partial safety factor	γ_{Ms}	[-]	1,56						

R-CAS-V

Performances
Characteristic resistance under shear loads

Annex C3
of European
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Table C5: Characteristic values for shear loads – pry out and concrete edge failure

Size			M8	M10	M12	M16	M20	M24	M30
Effective anchorage depth	h_{ef}	[mm]	80	90	110	125	170	210	270
Pry out failure									
Factor	k	[-]	2	2	2	2	2	2	2
Partial safety factor ¹⁾	γ_{Mp}	[-]	1,5						
Concrete edge failure: see clause 5.2.3.4 of Technical Report TR 029									
Partial safety factor ¹⁾	γ_{Mc}	[-]	1,5						

¹⁾ in the absence of national regulation

Table C6: 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]	11,5	14,2	22,1	30,0	47,3	62,9	95,1
Displacement	δ_{N0}	[mm]	0,30	0,30	0,35	0,35	0,40	0,45	0,50
	$\delta_{N\infty}$	[mm]	0,65	0,65	0,65	0,65	0,65	0,65	0,65

$F = F_{Rk} / \gamma_F \cdot \gamma_{Mc}$, with $\gamma_F = 1,4$

These values are suitable for each temperature range and categories specified in Annex B1

Table C7: 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

R-CAS-V

Performances

Characteristic resistance under shear loads.
Displacement under service loads: tension and shear loads

Annex C4

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