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European Technical Assessment

ETA 17/0185 of 16/12/2021

Technical Assessment Body issuing the ETA: Technical and Test Institute for Construction Prague	
Trade name of the construction product	Rawlplug R-HPTIIA4 Stainless Steel Throughbolts
Product family to which the construction product belongs	Product area code: 33 Torque controlled expansion anchor for use in cracked and uncracked concrete
Manufacturer	Rawlplug S.A. Ul. Kwidzyńska 6 51-416 Wrocław Poland
Manufacturing plant	Manufacturing Plant No 2
This European Technical Assessment contains	12 pages including 10 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	EAD 330232-01-0601
This version replaces	ETA 17/0185 issued on 02/10/2017

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

1. Technical description of the product

The Rawlplug R-HPTIIA4 Stainless Steel Throughbolts are through-fixing torque-controlled expansion anchors in sizes of M8, M10, M12 and M16. Each type comprises a special bolt with a taper, an expansion sleeve, a hexagonal nut and a washer. The anchors are made from A4 grade stainless steel.

The anchor is installed in a drilled hole; tightening the nut draws the cone into the sleeve. The expansion of this sleeve applies the anchorage.

The installed anchor is shown in Annex 1.

2. Specification of the intended use in accordance with the applicable EAD

The performances given in Section 3 are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the products in relation to the expected economically reasonable working life of the works.

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance (static and quasi-static loading)	See Annex C 1 and C 2
Displacement	See Annex C 1 and C 2
Characteristic resistance for seismic performance category C1 and C2	See Annex C 4 and C 5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1 according to EN 13501-1
Resistance to fire	Seen Annex C 3

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

According to the Decision 97/463/EC of the European Commission[1], the system 1 of assessment verification of constancy of performance (see Annex V to the Regulation (EU) No 305/2011) apply.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Technical and Test Institute for Construction Prague.

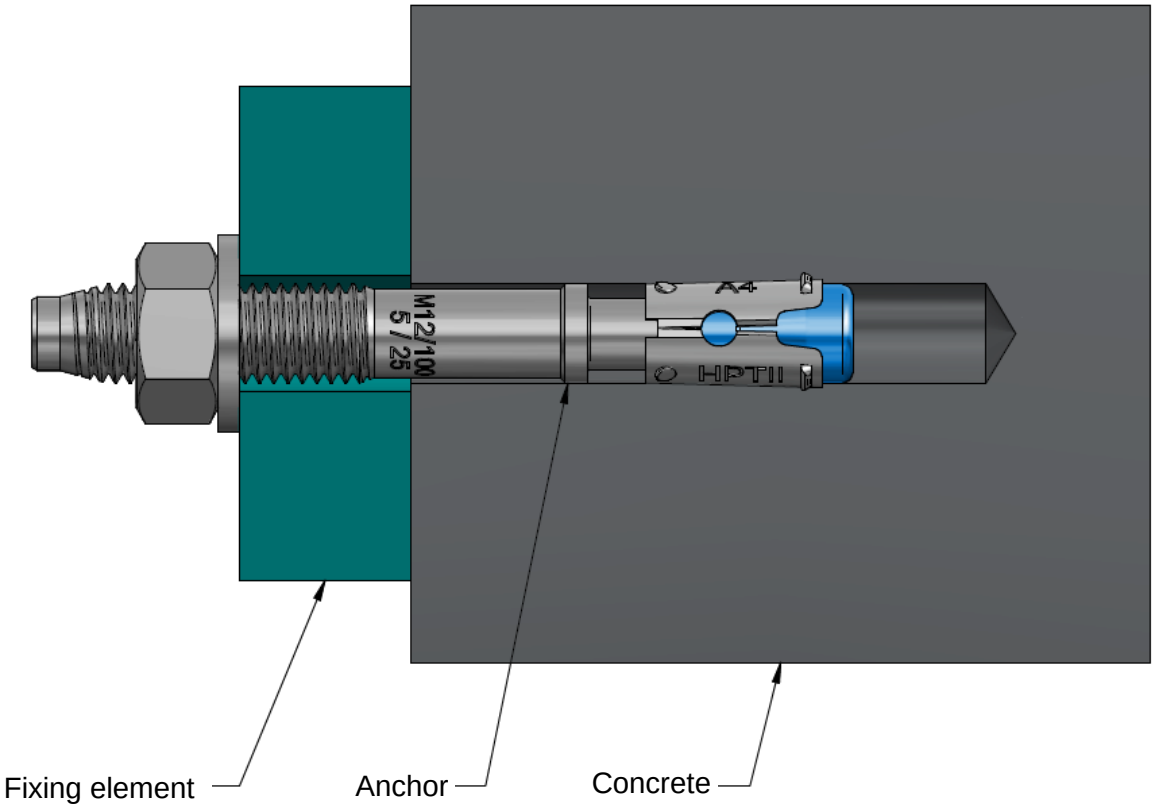
Issued in Prague on 16.12.2021

By

Ing. Mária Schaan
Head of the Technical Assessment Body

[1] Official Journal of the European Communities L 198/31 25.7.1997

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts - Installed anchor



Rawlplug R-HPTIIA4 Stainless Steel Throughbolts	**Annex A 1**
Product description Installed conditions	

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts - components

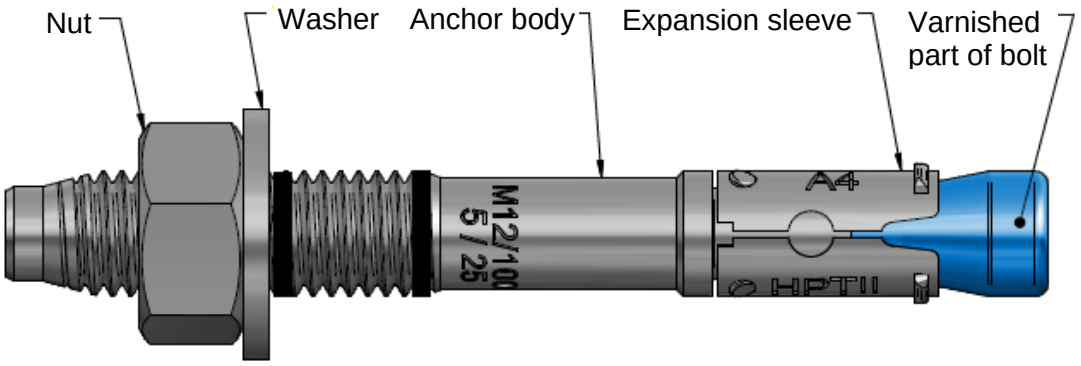


Table A1 - Materials

Component	Material	Corrosion resistance
Anchor body	Steel rod on coil cold forged bolts Steel grade 1.4578, according EN 10263-5	Class CRC III according EN 1993-1-4
Expansion sleeve	Steel grade 1.4401, according EN 10088-2	
Hexagonal nut	according DIN 934	
Washer	according DIN 125A or DIN 9021	

Table A2 – Marking

M8														
Bolt length [mm]	60	65	75	80	85	90	95	100	105	115	120	140	150	160
Head marking	B	b	C	d	D	e	E	F	f	G	H	K	L	M
$t_{fix,std}/t_{fix,red}$	-/10	-/15	10/25	15/30	20/35	25/40	30/45	35/50	40/55	50/65	55/70	75/90	85/100	95/110

M10											
Bolt length [mm]	65	80	85	90	95	115	120	130	140	150	180
Head marking	B	D	d	e	E	G	H	J	K	L	P
$t_{fix,std}/t_{fix,red}$	-/5	-/20	5/25	10/30	15/35	35/55	40/60	50/70	60/80	70/90	100/120

M12																		
Bolt length [mm]	80	100	105	110	115	120	125	135	140	150	160	180	200	220	240	250	260	280
Head marking	D	F	f	G	g	h	H	J	K	L	M	P	R	S	T	U	V	X
$t_{fix,std}/t_{fix,red}$	-/5	5/25	10/30	15/35	20/40	25/45	30/50	40/60	45/65	55/75	65/85	85/105	105/125	125/145	145/165	155/175	165/185	185/205

M16													
Bolt length [mm]	100	105	125	130	140	150	160	180	200	220	250	280	300
Head marking	F	f	H	J	K	L	M	P	R	S	U	X	Y
$t_{fix,std}/t_{fix,red}$	-/5	-/10	5/25	10/30	20/40	30/50	40/60	60/80	80/100	100/120	130/150	160/180	180/200

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts	**Annex A 2**
Product description Materials, Marking	

Specifications of intended use

Anchorages subject to:

- Static and quasi-static load.
- Fire exposure
- Seismic performance category C1
- Seismic performance category C2, only size M10, M12

Base materials

- Cracked or uncracked concrete.
- Reinforced or unreinforced normal weight concrete of strength class C20/25 at minimum and C50/60 at maximum according EN 206+A2.

Use conditions (Environmental conditions)

- Structures subject to dry internal conditions.
- Structures subject to external atmospheric exposure (including industrial and marine environment) or exposure to permanently damp internal condition, if no particular aggressive conditions exist.

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:

- The anchorages are designed in accordance with the EN 1992-4 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 anchored. The position of the anchor is indicated on the design drawings.
- Anchorages under fire exposure have to be designed in accordance with EN 1992-4, Annex D.
- Anchorages under seismic actions have to be designed in accordance with EN 1992-4, Annex C.

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 components of the anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings using the appropriate tools.
- Effective anchoring depth, edge distance and spacing not less than the specified values without minus tolerance.
- In case of aborted drill 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.

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts	**Annex B 1**
Intended use Specifications	

Table B1 - Installation parameters

Size	Drill hole diameter d_0 [mm]	Max. hole diameter in fixture d_f [1)] [mm]	Standard embedment: Min. hole depth h_0 [mm]	Standard embedment: Nominal embedment depth h_{nom} [mm]	Reduced embedment: Min. hole depth h_0 [mm]	Reduced embedment: Nominal embedment depth h_{nom} [mm]	Installation torque T_{inst} [Nm]
M8	8	9	65	55	50	40	15
M10	10	12	79	69	59	49	30
M12	12	14	90	70	70	60	50
M16	16	18	110	90	90	80	100

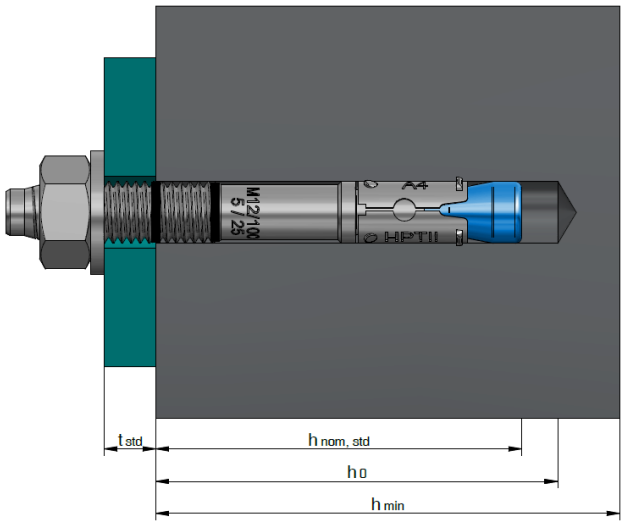
1) For the design of bigger clearance holes in the fixture see EN 1992-4:2018

Table B2 - Installation parameters – Minimum spacing and edge distance

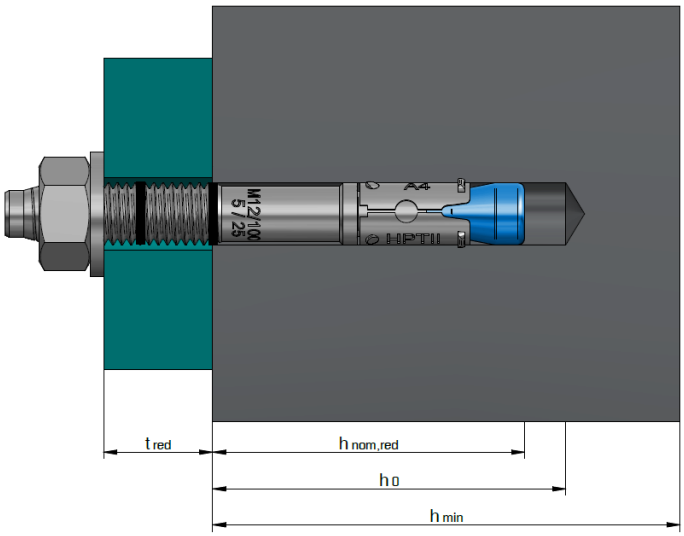
Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Minimum thickness of concrete member	h_{min}	[mm]	100	100	100	120	100	140	130	170
Minimum spacing and edge distance in cracked concrete										
Minimum spacing	s_{miin}	[mm]	50	55	70	70	120	90	150	135
for edge distance	$c \geq$	[mm]	50	55	70	70	95	75	100	105
Minimum edge distance	c_{min}	[mm]	40	40	50	45	70	55	85	70
for spacing	$s \geq$	[mm]	80	70	120	90	150	140	200	200
Minimum spacing and edge distance in uncracked concrete										
Minimum spacing	s_{min}	[mm]	50	55	70	70	120	90	150	135
for edge distance	$c \geq$	[mm]	50	55	70	70	95	75	100	105
Minimum edge distance	c_{min}	[mm]	50	40	60	50	70	55	90	80
for spacing	$s \geq$	[mm]	50	100	70	115	120	125	150	200

1) Use restricted to anchoring statically indeterminate structural components

Standard



Reduced

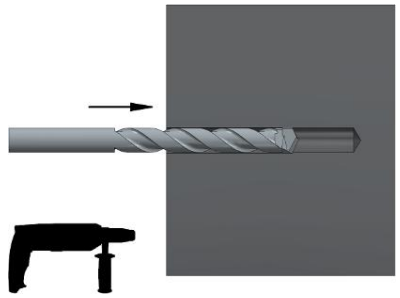


Rawlplug R-HPTIIA4 Stainless Steel Throughbolts

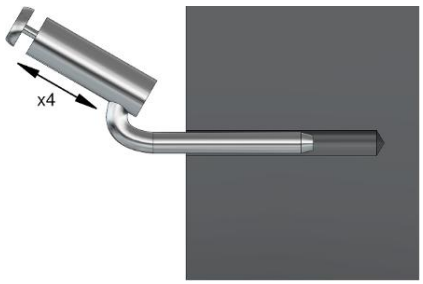
Intended use
Installation parameters

Annex B 2

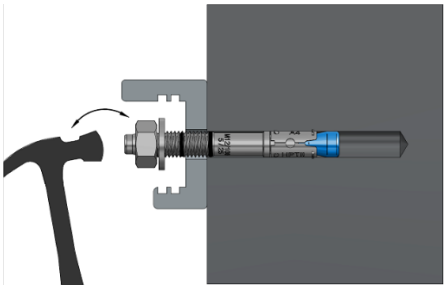
Installation instructions

1. 

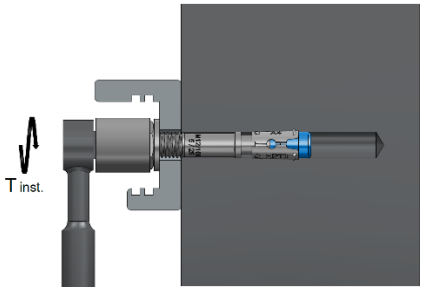
Drill a hole of required diameter and depth

2. 

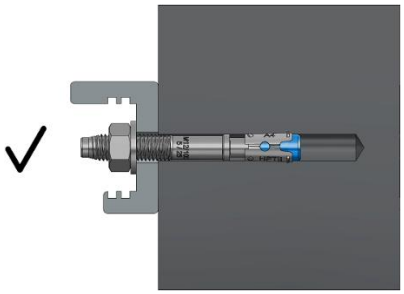
Clear the hole of drilling dust and debris
(using blowpump or equivalent method)

3. 

Lightly tap the throughbolt through the fixture into hole with a hammer, until fixing depth is reached

4. 

Tighten to the recommended torque

5. 

Assembled condition of anchor

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts	**Annex B 3**
Intended use Installation instructions	

Table C1 – Characteristic resistance under tension load

Steel failure										
Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Characteristic resistance	$N_{Rk,s}$	[kN]	21,2		33,6		44,8		82,6	
Partial safety factor	γ_{Ms}	[-]	1,5		1,5		1,5		1,5	

Pull-out failure										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	3,0	6,0	7,5	9,0	9,0	12,0	16,0	25,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	9,0	12,0	16,0	-[2)]	25,0	-[2)]	-[2)]
Installation safety factor	γ_{inst}	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0
Increasing factor										
Cracked and uncracked concrete C30/37	ψ_c	[-]	1,07	1,16	1,07	1,26	1,16	1,23	1,18	1,18
Cracked and uncracked concrete C40/50	ψ_c	[-]	1,13	1,33	1,13	1,52	1,32	1,45	1,37	1,37
Cracked and uncracked concrete C50/60	ψ_c	[-]	1,20	1,50	1,20	1,78	1,49	1,67	1,55	1,55

Concrete cone failure										
Factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0							
Factor for cracked concrete	$k_{cr,N}$	[-]	7,7							
Installation safety factor	γ_{inst}	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0
Effective anchorage depth	h_{ef}	[mm]	32	47	39	59	48	68	65	85
Spacing	$s_{cr,N}$	[mm]	96	141	117	177	144	204	195	255
Edge distance	$c_{cr,N}$	[mm]	48	71	59	89	72	102	98	128

Splitting failure										
Spacing	$s_{cr,sp}$	[mm]	160	240	200	300	250	340	320	430
Edge distance	$c_{cr,sp}$	[mm]	80	120	100	150	125	170	160	215
Installation safety factor	γ_{inst}	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0

[1)] Use restricted to anchoring statically indeterminate structural components
[2)] Pull-out failure mode is not decisive

Table C2 – Displacement under tension load

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Tension load in cracked concrete	N	[kN]	1,2	2,4	3,0	4,3	4,3	5,7	7,6	11,9
Displacement	δ_{N0}	[mm]	1,1	0,5	0,5	1,2	0,8	1,0	0,2	1,0
	$\delta_{N\infty}$	[mm]	1,8	1,3	0,8	1,2	1,0	1,3	0,6	1,1
Tension load in uncracked concrete	N	[kN]	3,0	3,6	4,8	7,6	8,0	11,9	12,6	18,8
Displacement	δ_{N0}	[mm]	0,1	0,3	0,2	0,2	0,1	0,5	0,3	0,5
	$\delta_{N\infty}$	[mm]	0,8	1,3	0,8	1,2	1,0	1,3	0,6	1,1

[1)] Use restricted to anchoring statically indeterminate structural components

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts

Performances
Characteristic resistance under tension load
Displacement under tension load

Annex C 1

Table C3 – Characteristic resistance under shear load

Steel failure without lever arm										
Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Characteristic resistance	$V^0_{Rk,s}$	[kN]	11,7		18,5		24,6		45,4	
Ductility factor	k_7	[-]	1,0		1,0		1,0		1,0	
Partial safety factor	γ_{Ms}	[-]	1,25		1,25		1,25		1,25	

Steel failure with lever arm										
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	22		45		72		180	
Partial safety factor	γ_{Ms}	[-]	1,25		1,25		1,25		1,25	

Concrete pry-out failure										
Factor	k_8	[-]	1,0	1,0	1,2	1,0	1,0	2,0	2,0	2,0
Installation safety factor	γ_{inst}	[-]	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0

Concrete edge failure										
Effective length of anchor	ℓ_f	[mm]	32	47	39	59	48	68	65	85
Anchor diameter	d_{nom}	[mm]	8		10		12		16	
Installation safety factor	γ_{inst}	[-]	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0

[1)] Use restricted to anchoring statically indeterminate structural components

Table C4 – Displacement under shear load

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red	Std	Red	Std
Shear load in cracked and uncracked concrete	V	[kN]	6,7	6,7	5,8	10,6	14,1	14,1	25,9	25,9
Displacement	δ_{V0}	[mm]	3,0	3,0	1,5	2,7	2,5	2,5	2,2	2,2
	$\delta_{V\infty}$	[mm]	4,5	4,5	2,2	4,1	3,8	3,8	3,8	3,3

[1)] Use restricted to anchoring statically indeterminate structural components

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts

Performances
Characteristic resistance under shear load
Displacement under shear load

Annex C 2

Table C5 – Characteristic values of resistance to tension load under fire exposure[1)]

Size			M8		M10		M12		M16	
			Red[2)]	Std	Red[2)]	Std	Red	Std	Red	Std
Characteristic fire resistance duration at 30 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,7	0,7	1,5	1,5	2,5	2,5	4,7	4,7
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,8	1,5	1,9	2,3	2,3	3,0	4,0	6,3
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	1,0	2,7	1,7	4,8	2,9	6,9	6,1	12,0
Characteristic fire resistance duration at 60 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,6	0,6	1,2	1,2	2,1	2,1	3,9	3,9
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,8	1,5	1,9	2,3	2,3	3,0	4,0	6,3
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	1,0	2,7	1,7	4,8	2,9	6,9	6,1	12,0
Characteristic fire resistance duration at 90 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,4	0,4	0,9	0,9	1,7	1,7	3,1	3,1
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,8	1,5	1,9	2,3	2,3	3,0	4,0	6,3
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	1,0	2,7	1,7	4,8	2,9	6,9	6,1	12,0
Characteristic fire resistance duration at 120 minutes										
Steel failure	$N_{Rk,s,fi}$	[kN]	0,4	0,4	0,8	0,8	1,3	1,3	2,5	2,5
Pull-out failure	$N_{Rk,p,fi}$	[kN]	0,6	1,2	1,5	1,8	1,8	2,4	3,2	5,0
Concrete cone failure	$N_{Rk,c,fi}$	[kN]	0,8	2,2	1,4	3,9	2,3	5,5	4,9	9,6
Spacing	$s_{cr,N}$	[mm]	$4 \times h_{ef}$							
	s_{min}	[mm]	50	55	70	70	120	90	150	135
Edge distance	$c_{cr,N}$	[mm]	$2 \times h_{ef}$							
	c_{min}	[mm]	$c_{min} = 2 \times h_{ef}$ however if the fire attack is from more than one side, the edge distance of the anchor has to be ≥ 300 mm and ≥ $2 \times h_{ef}$							

[1)] In absence of other national regulations the partial safety factor for resistance under fire exposure. $\gamma_{M,fi} = 1,0$ is recommended

[2)] Use restricted to anchoring statically indeterminate structural components

Table C6 – Characteristic values of resistance to shear load under fire exposure

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red[)]	Std	Red	Std
Characteristic fire resistance duration at 30 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,7		1,5		2,5		4,7	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,7		1,9		3,9		10,0	
Characteristic fire resistance duration at 60 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,6		1,2		2,1		3,9	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,6		1,5		3,3		8,3	
Characteristic fire resistance duration at 90 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,4		0,9		1,7		3,1	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,4		1,2		2,6		6,7	
Characteristic fire resistance duration at 120 minutes										
Steel failure without lever arm	$V_{Rk,s,fi}$	[kN]	0,4		0,8		1,3		2,5	
Steel failure with lever arm	$M_{Rk,s,fi}$	[Nm]	0,4		1,0		2,1		5,3	
Concrete pry-out failure										
Factor[2)]	k_8	[-]	-	-	1,2	-	-	-	-	-
Concrete edge failure	The characteristic resistance $V^0_{Rk,c,fi}$ in concrete C20/25 to C50/60 is determined by: $V^0_{Rk,c,fi} = 0,25 \times V^0_{Rk,c(\leq 90)}$ and $V^0_{Rk,c,fi} = 0,20 \times V^0_{Rk,c(\leq 120)}$ with the initial value of the characteristic resistance $V^0_{Rk,c}$ in cracked concrete C20/25 under normal temperature									

[1)] Use restricted to anchoring statically indeterminate structural components

[2)] The values of factor k_8 and relevant values of $N_{Rk,c,fi}$ given in the Table C5 have to be considered in the design

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts

Performances
Characteristic values of resistance under fire exposure

Annex C 3

Table C7 – Characteristic values of resistance under seismic action category C1

Size			M8		M10		M12		M16	
			Red[1)]	Std	Red[1)]	Std	Red[1)]	Std	Red[1)]	Std
Tension load										
Steel failure										
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	21,2		33,6		44,8		82,6	
Partial safety factor	$\gamma_{Ms,C1}$	[-]	1,5		1,5		1,5		1,5	
Pull-out failure										
Characteristic resistance in concrete C20/25	$N_{Rk,p,C1}$	[kN]	3,0	6,0	7,5	9,0	9,0	12,0	16,0	25,0
Installation safety factor	γ_{inst}	[-]	1,2	1,2	1,2	1,0	1,0	1,0	1,0	1,0
Shear load										
Steel failure without lever arm										
Characteristic resistance	$V^0_{Rk,s,C1}$	[kN]		6,7		12,5	18,4		39,0	
Partial safety factor	$\gamma_{Ms,C1}$	[-]	1,25		1,25		1,25		1,25	

[1)] Use restricted to anchoring statically indeterminate structural components

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts

Performances
Characteristic values of resistance under seismic action category C1

Annex C 4

Table C8 – Characteristic values of resistance under seismic action category C2

Size			M10		M12	
			Red[1)]	Std	Red[1)]	Std
Tension load						
Steel failure						
Characteristic resistance	$N_{Rk,s,C2}$	[kN]	33,6		44,8	
Partial safety factor	$\gamma_{Ms,C2}$	[-]	1,5		1,5	
Pull-out failure						
Characteristic resistance in concrete C20/25	$N_{Rk,p,C2}$	[kN]	2,6	3,0	3,0	4,2
Installation safety factor	γ_{inst}	[-]	1,2	1,0	1,0	1,0
Shear load						
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s,C2}$	[kN]		8,3		11,1
Partial safety factor	$\gamma_{Ms,C2}$	[-]	1,25	1,25	1,25	1,25
Factor for annular gap	α_{gap}	[-]	0,5			

[1)] Use restricted to anchoring statically indeterminate structural components

Table C9 – Displacement under tensile and shear load - seismic category C2

Size		M10	M12
$\delta_{N,eq(DLS)}$	[mm]	3,5	5,4
$\delta_{N,eq(ULS)}$	[mm]	9,9	13,4
$\delta_{V,eq(DLS)}$	[mm]	4,1	4,4
$\delta_{V,eq(ULS)}$	[mm]	10,0	9,9

Rawlplug R-HPTIIA4 Stainless Steel Throughbolts

Performances
Characteristic values of resistance under seismic action category C2

Annex C 5