



Designated according to The Construction Products (Amendment etc.) (EU Exit) Regulations 2020

UK Technical Assessment	UKTA-0836-22/6202-of 11/11/2022
Technical Assessment Body issuing the UK Technical Assessment:	British Board of Agrément
Trade name of the construction product:	Rawlplug R-HPTIIZF Zinc Flake Throughbolts
Product family to which the construction product belongs:	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(s):	Manufacturing Plant No. 2
This UK Technical Assessment contains:	15 pages including 10 annexes which form an integral part of this assessment
This UK Technical Assessment is issued in accordance with The Construction Products (Amendment etc.) (EU Exit) Regulations 2020 on the basis of:	UKAD 330232-00-0601 "Mechanical fasteners for use in concrete"

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1. Technical description of the product

The Rawlplug R-HPTIIZF Zinc Flake Throughbolts are through-fixing torque-controlled expansion anchors in the following sizes: M8, M10, M12, M16 and M20. Each type comprises a special bolt with a taper, an expansion sleeve, a hexagonal nut and a washer. The anchors are made from carbon steel finished in zinc/aluminium coating.

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(s) in accordance with the applicable UK Assessment Document (hereinafter UKAD)

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 UK 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 to tension load (static and quasi-static loading)	See Annex C 1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 2
Characteristic resistance and displacement for seismic performance category C2	See Annex C 4

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

3.3 Health, hygiene and the environment (BWR 3)

Not relevant.

3.4 Safety and accessibility in use (BWR 4)

Not relevant.

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)

No performance assessed.

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied

4.1 System of assessment and verification of constancy of performance

According to UKAD No. 330232-00-0601 and Annex V of the Construction Products Regulation (Regulation (EU) 305/2011 as brought into UK law and amended, the system of assessment and verification of constancy of performance (AVCP) 1 applies.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with the British Board of Agrément and made available to the UK Approved Bodies involved in the conformity attestation process.

5.1 UKCA marking for the product/ system must contain the following information:

- Identification number of the Approved Body
- Name/address of the manufacturer of the product/ system
- Marking with intention of clarification of intended use
- Date of marking
- Number of certificate of constancy of performance
- UKTA number.

On behalf of the British Board of Agrément



Date of Issue: 11 November 2022

Hardy Giesler
Chief Executive

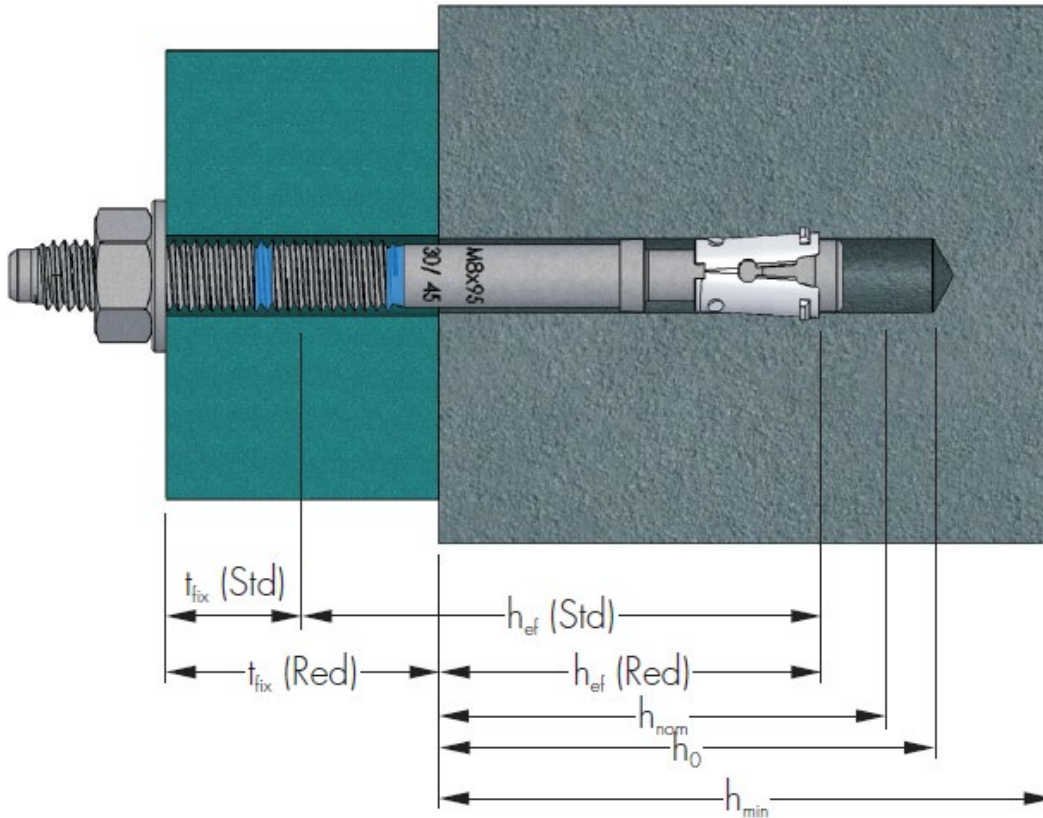


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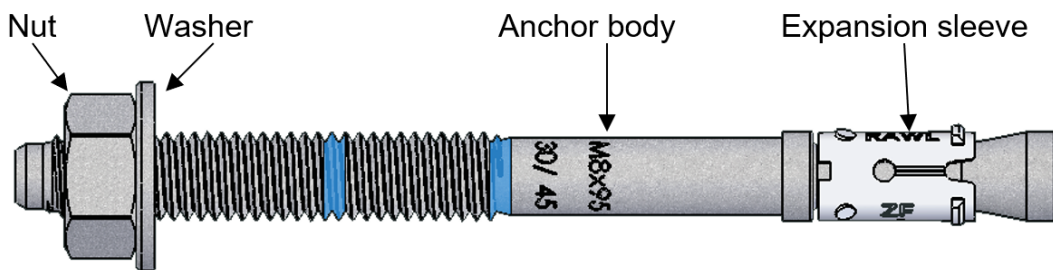
ANNEXES

These annexes apply to the product described in the main body of the UK Technical Assessment.

Rawlplug R-HPTIIZF Zinc Flake Throughbolts - Installed anchor



Rawlplug R-HPTIIZF Zinc Flake Throughbolts - components



Rawlplug R-HPTIIZF Zinc Flake Throughbolts

Product description
Installed conditions and components

Annex A 1

Table A1 - Materials

Component	Material
Anchor body	Steel rod on coil cold forged bolts
Expansion sleeve	Steel grade DC03, M8-M12 C590, M16-M20 C490, according to EN 10139
Hexagonal nut	according to DIN 934
Washer	according to DIN 125A or DIN 9021

Table A2 – Material properties

		M8 - M12	M16 - M20
Expansion sleeve – hardness	[HV]	185 - 215	155 - 185

Table A3 – 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				
Bolt marking	-/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							
Bolt marking	-/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
Bolt marking	-/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					
Bolt marking	-/5	-/10	5/25	10/30	20/40	30/50	40/60	60/80	80/100	100/120	130/150	160/180	180/200					
M20																		
Bolt length [mm]	125	140	160	165	180	200	250	300										
Head marking	H	K	M	m	P	R	U	Y										
Bolt marking	-/5	-/20	20/40	24/45	40/60	60/80	110/130	160/180										

Rawlplug R-HPTIIZF Zinc Flake Throughbolts

Product description
Materials and marking

Annex A 2

Specifications of intended use

Anchorage subject to:

- Static and quasi-static load
- Fire exposure
- Seismic actions category C2 (max w = 0.8 mm), size M10, M12, M16, only standard embedment

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 to EN 206:2013.

Use conditions (Environmental conditions)

- Structures subject to dry internal conditions.

Design:

- The anchorages are designed in accordance with the EN 1992-4:2018 and EOTA Technical Report TR 055, December 2016 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 seismic actions (cracked concrete) have to be designed in accordance with EN 1992-4:2018 and EOTA Technical Report TR 055, December 2016.
- Anchorages under fire exposure have to be designed in accordance with EN 1992-4:2018 and EOTA Technical Report TR 055, December 2016.

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 cases of aborted drill holes: 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-HPTIIZF Zinc Flake Throughbolts

Intended use
Specifications

Annex B 1

Table B1 - Installation parameters

Size	Drill hole diameter d _o [mm]	Bolt length l [mm]	Thread length l _G [mm]	Hole diameter in fixture d _f [mm]	Standard embedment				Reduced embedment				Installation torque T _{inst} [N.m]
					Min. hole depth h _o [mm]	Nominal embedment depth h _{nom} [mm]	Effective embedment depth h _{ef} [mm]	Max. fixture thickness t _{fix} [mm]	Min. hole depth h _o [mm]	Nominal embedment depth h _{nom} [mm]	Effective embedment depth h _{ef} [mm]	Max. fixture thickness t _{fix} [mm]	
M8	8	60	25	9	-	-	-	-	50	40	32	10	10
		65	30	9	-	-	-	-	50	40	32	15	
		75	35	9	65	55	47	10	50	40	32	25	
		80	40	9	65	55	47	15	50	40	32	30	
		85	45	9	65	55	47	20	50	40	32	35	
		90	50	9	65	55	47	25	50	40	32	40	
		95	55	9	65	55	47	30	50	40	32	45	
		100	60	9	65	55	47	35	50	40	32	50	
		105	65	9	65	55	47	40	50	40	32	55	
		115	75	9	65	55	47	50	50	40	32	65	
		120	80	9	65	55	47	55	50	40	32	70	
		140	100	9	65	55	47	75	50	40	32	90	
150	100	9	65	55	47	85	50	40	32	100			
160	100	9	65	55	47	95	50	40	32	110			
M10	10	65	21	11	-	-	-	-	59	49	39	5	20
		80	31	11	-	-	-	-	59	49	39	20	
		85	36	11	79	69	59	5	59	49	39	25	
		90	41	11	79	69	59	10	59	49	39	30	
		95	46	11	79	69	59	15	59	49	39	35	
		115	66	11	79	69	59	35	59	49	39	55	
		120	71	11	79	69	59	40	59	49	39	60	
		130	81	11	79	69	59	50	59	49	39	70	
		140	91	11	79	69	59	60	59	49	39	80	
		150	101	11	79	69	59	70	59	49	39	90	
M12	12	80	30	13	-	-	-	-	70	60	48	5	40
		100	40	13	90	80	68	5	70	60	48	25	
		105	45	13	90	80	68	10	70	60	48	30	
		110	50	13	90	80	68	15	70	60	48	35	
		115	55	13	90	80	68	20	70	60	48	40	
		120	60	13	90	80	68	25	70	60	48	45	
		125	65	13	90	80	68	30	70	60	48	50	
		135	75	13	90	80	68	40	70	60	48	60	
		140	80	13	90	80	68	45	70	60	48	65	
		150	90	13	90	80	68	55	70	60	48	75	
		160	100	13	90	80	68	65	70	60	48	85	
		180	100	13	90	80	68	85	70	60	48	105	
		200	100	13	90	80	68	105	70	60	48	125	
		220	100	13	90	80	68	125	70	60	48	145	
		240	100	13	90	80	68	145	70	60	48	165	
		250	100	13	90	80	68	155	70	60	48	175	
		260	100	13	90	80	68	165	70	60	48	185	
		280	100	13	90	80	68	185	70	60	48	205	
M16	16	100	30	18	-	-	-	-	90	80	65	5	100
		105	35	18	-	-	-	-	90	80	65	10	
		125	45	18	110	100	85	5	90	80	65	25	
		130	50	18	110	100	85	10	90	80	65	30	
		140	60	18	110	100	85	20	90	80	65	40	
		150	70	18	110	100	85	30	90	80	65	50	
		160	80	18	110	100	85	40	90	80	65	60	
		180	100	18	110	100	85	60	90	80	65	80	
		200	100	18	110	100	85	80	90	80	65	100	
		220	100	18	110	100	85	100	90	80	65	120	
		250	100	18	110	100	85	130	90	80	65	150	
		280	100	18	110	100	85	160	90	80	65	180	
300	100	18	110	100	85	180	90	80	65	200			
M20	20	125	50	22	-	-	-	-	110	100	80	5	180
		140	50	22	-	-	-	-	110	100	80	20	
		160	61	22	129	119	99	20	110	100	80	40	
		165	66	22	129	119	99	25	110	100	80	45	
		180	81	22	129	119	99	40	110	100	80	60	
		200	100	22	129	119	99	60	110	100	80	80	
		250	100	22	129	119	99	110	110	100	80	130	
300	100	22	129	119	99	160	110	100	80	180			

Rawlplug R-HPTIIZF Zinc Flake Throughbolts

Intended use
Installation parameters

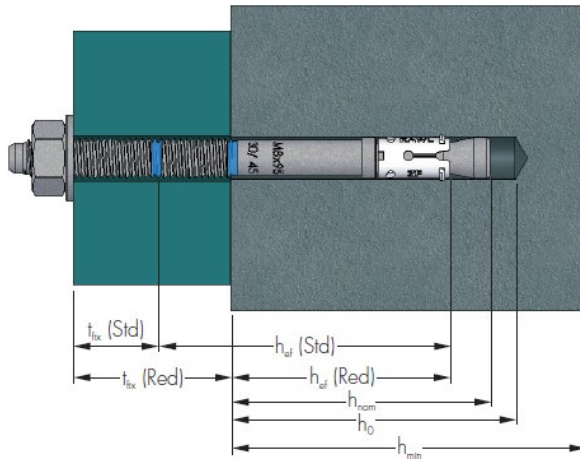
Annex B 2

Table B2 - Installation parameters – Minimum spacing and edge distance

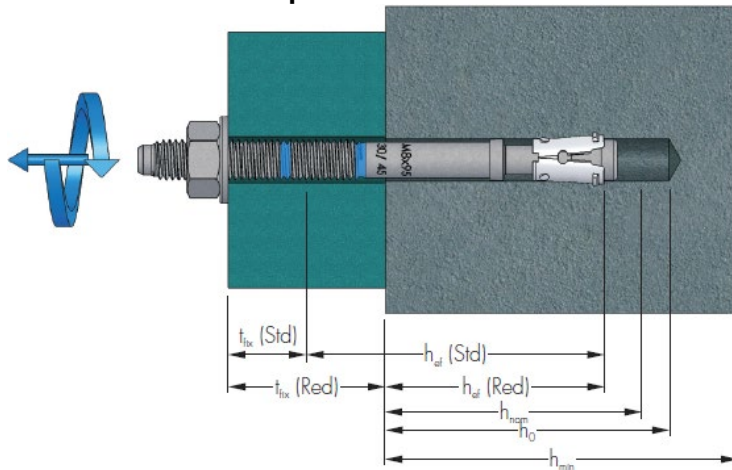
Size			M8		M10		M12		M16		M20	
	Red ¹⁾	Std	Red ¹⁾	Std	Red	Std	Red	Std	Red	Std	Red	Std
Minimum thickness of concrete member	h_{min}	[mm]	100	100	100	120	100	140	130	170	160	200
Minimum spacing and edge distance in cracked concrete												
Minimum spacing	s_{min}	[mm]	55	50	75	70	150	90	190	160	300	180
		for edge distance $c \geq$	[mm]	45	50	60	65	100	80	125	130	200
Minimum edge distance	c_{min}	[mm]	40	40	50	45	80	65	110	90	120	100
		for spacing $s \geq$	[mm]	80	80	100	100	180	150	280	240	260
Minimum spacing and edge distance in uncracked concrete												
Minimum spacing	s_{min}	[mm]	55	50	75	70	150	90	190	160	300	180
		for edge distance $c \geq$	[mm]	45	50	60	65	100	80	125	130	200
Minimum edge distance	c_{min}	[mm]	45	40	60	50	70	65	100	85	160	100
		for spacing $s \geq$	[mm]	55	100	75	110	150	180	190	240	300

1) Use restricted to anchoring statically indeterminate structural components

Pre-torque installation



Post-torque installation



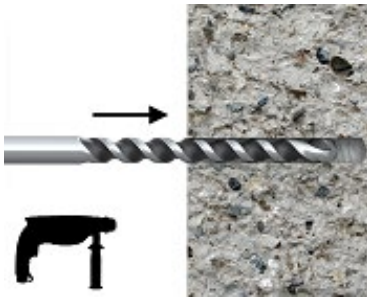
Rawplug R-HPTIIZF Zinc Flake Throughbolts

Intended use
Installation parameters

Annex B 3


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-HPTIIZF Zinc Flake Throughbolts

Intended use
Installation instructions

Annex B 4

Table C1 – Characteristic resistance under tension load

Steel failure												
Size			M8		M10		M12		M16		M20	
			Red ¹⁾	Std	Red ¹⁾	Std	Red	Std	Red	Std	Red	Std
Characteristic resistance	N _{Rk,s}	[kN]	11.0		17.5		25.8		45.8		70.0	
Partial safety factor	γ _{Ms}	[-]	1.4		1.4		1.4		1.4		1.4	

Pull-out failure												
Characteristic resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	3.0	5.0	6.0	9.0	9.0	12.0	16.0	20.0	- ²⁾	30.0
Characteristic resistance in uncracked concrete C20/25	N _{Rk,p}	[kN]	7.5	9.0	9.0	12.0	12.0	20.0	- ²⁾	35.0	- ²⁾	- ²⁾
Installation safety factor	γ _{inst}	[-]	1.2	1.2	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Increasing factor												
Cracked and uncracked concrete	C30/37	ψ _c	1.20	1.12	1.16	1.22	1.22	1.00	1.11	1.14	1.12	1.07
	C40/50		1.40	1.22	1.33	1.44	1.44	1.00	1.22	1.28	1.26	1.14
	C50/60		1.60	1.33	1.50	1.67	1.67	1.00	1.33	1.43	1.39	1.21

Concrete cone failure												
Factor for concrete cone failure for cracked concrete	k _{cr,N}	[-]	7.7									
Factor for concrete cone failure for uncracked concrete	k _{ucr,N}	[-]	11.0									
Installation safety factor	γ _{inst}	[-]	1.2	1.2	1.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Effective anchorage depth	h _{ef}	[mm]	32	47	39	59	48	68	65	85	80	99
Spacing	s _{cr,N}	[mm]	96	141	117	177	144	204	195	255	240	297
Edge distance	c _{cr,N}	[mm]	48	71	59	89	72	102	98	128	120	149

Splitting failure												
Spacing	s _{cr,sp}	[mm]	170	220	200	300	250	340	320	430	410	530
Edge distance	c _{cr,sp}	[mm]	85	110	100	150	125	170	160	215	205	265
Installation safety factor	γ _{inst}	[-]	1.2	1.2	1.2	1.0	1.0	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		M20	
			Red ¹⁾	Std	Red ¹⁾	Std	Red	Std	Red	Std	Red	Std
Tension load in cracked concrete	N	[kN]	1.2	2.0	2.4	4.3	4.3	5.7	7.6	9.5	12.3	14.3
Displacement	δ _{N0}	[mm]	0.6	0.8	0.3	1.0	0.5	0.7	0.3	0.4	0.4	0.4
	δ _{N∞}	[mm]	1.0	0.9	1.1	1.4	1.0	0.9	0.8	1.1	1.3	0.7
Tension load in uncracked concrete	N	[kN]	3.0	3.6	3.6	5.7	5.7	9.5	12.6	16.7	17.2	23.6
Displacement	δ _{N0}	[mm]	0.1	0.3	0.3	0.3	0.1	0.6	0.5	0.2	0.1	0.6
	δ _{N∞}	[mm]	1.0	0.9	1.1	1.4	1.0	0.9	0.8	1.1	1.3	0.7

- 1) Use restricted to anchoring statically indeterminate structural components

Rawlplug R-HPTIIZF Zinc Flake 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			M8		M10		M12		M16		M20	
Size			Red ¹⁾	Std	Red ¹⁾	Std	Red	Std	Red	Std	Red	Std
			Characteristic resistance	$V^{0}_{Rk,s}$	[kN]	9.1	15.7	23.7	47.1	60.6		
Ductility factor	k_7	[-]	0.8	0.8	0.8	0.8	0.8					
Partial safety factor	γ_{Ms}	[-]	1.25	1.25	1.25	1.25	1.25					

Steel failure with lever arm			M8		M10		M12		M16		M20	
Characteristic resistance	$M^{0}_{Rk,s}$	[Nm]	22	45	79	200	389					
Partial safety factor	γ_{Ms}	[-]	1.25	1.25	1.25	1.25	1.25					

Concrete pry-out failure			M8		M10		M12		M16		M20	
Factor	k_8	[-]	1.0	1.0	1.0	1.0	1.0	2.0	2.0	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	1.0	1.0

Concrete edge failure			M8		M10		M12		M16		M20	
Effective length of anchor	l_f	[mm]	32	47	39	59	48	68	65	85	80	99
Anchor diameter	d_{nom}	[mm]	8	10	12	16	20					
Installation safety factor	γ_{inst}	[-]	1.0	1.0	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		M20	
			Red ¹⁾	Std	Red ¹⁾	Std	Red	Std	Red	Std	Red	Std
Shear load in cracked and uncracked concrete	V	[kN]	5.8	5.8	9.2	9.2	13.3	13.3	24.5	24.5	38.5	38.5
Displacement	δ_{v0}	[mm]	1.2	1.2	1.5	1.5	2.0	2.0	2.4	2.4	2.6	2.6
	$\delta_{v\infty}$	[mm]	1.8	1.8	2.3	2.3	3.0	3.0	3.6	3.6	3.9	3.9

¹⁾ Use restricted to anchoring statically indeterminate structural components

Rawlplug R-HPTIIZF Zinc Flake 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 exposure¹⁾

Size			M8		M10		M12		M16		M20	
	Red ²⁾	Std	Red ²⁾	Std	Red	Std	Red	Std	Red	Std	Red	Std
Characteristic fire resistance duration at 30 minutes												
Steel failure	N _{Rk,s,fi}	[kN]	0.4		0.9		1.7		3.1		4.9	
Pull-out failure	N _{Rk,p,fi}	[kN]	0.8	1.3	1.5	2.3	2.3	3.0	4.0	5.0	-	-
Concrete cone failure	N _{Rk,c,fi}	[kN]	1.0	2.7	1.7	4.8	2.9	6.9	6.1	12.0	10.3	17.6
Characteristic fire resistance duration at 60 minutes												
Steel failure	N _{Rk,s,fi}	[kN]	0.3		0.8		1.3		2.4		3.7	
Pull-out failure	N _{Rk,p,fi}	[kN]	0.8	1.3	1.5	2.3	2.3	3.0	4.0	5.0	-	-
Concrete cone failure	N _{Rk,c,fi}	[kN]	1.0	2.7	1.7	4.8	2.9	6.9	6.1	12.0	10.3	17.6
Characteristic fire resistance duration at 90 minutes												
Steel failure	N _{Rk,s,fi}	[kN]	0.3		0.6		1.1		2.0		3.2	
Pull-out failure	N _{Rk,p,fi}	[kN]	0.8	1.3	1.5	2.3	2.3	3.0	4.0	5.0	-	-
Concrete cone failure	N _{Rk,c,fi}	[kN]	1.0	2.7	1.7	4.8	2.9	6.9	6.1	12.0	10.3	17.6
Characteristic fire resistance duration at 120 minutes												
Steel failure	N _{Rk,s,fi}	[kN]	0.2		0.5		0.8		1.6		2.5	
Pull-out failure	N _{Rk,p,fi}	[kN]	0.6	1.0	1.2	1.8	1.8	2.4	3.2	4.0	-	-
Concrete cone failure	N _{Rk,c,fi}	[kN]	0.8	2.2	1.4	3.9	2.3	5.5	4.9	9.6	8.2	14.0
Spacing	Scr,N	[mm]	4 x h _{ef}									
	S _{min}	[mm]	55	50	75	70	150	90	190	160	300	180
Edge distance	Cor,N	[mm]	2 x h _{ef}									
	C _{min}	[mm]	C _{min} = 2 x 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 x h _{ef}									

1) In absence of other national regulations the partial safety factor for resistance under fire exposure. $\gamma_{Mfi} = 1,0$ 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		M20	
	Red ¹⁾	Std	Red ¹⁾	Std	Red	Std	Red	Std	Red	Std	Red	Std
Characteristic fire resistance duration at 30 minutes												
Steel failure without lever arm	V _{Rk,s,fi}	[kN]	0.4		0.9		1.7		3.1		4.9	
Steel failure with lever arm	M _{Rk,s,fi}	[Nm]	0.4		1.1		2.6		6.7		13.0	
Characteristic fire resistance duration at 60 minutes												
Steel failure without lever arm	V _{Rk,s,fi}	[kN]	0.3		0.8		1.3		2.4		3.7	
Steel failure with lever arm	M _{Rk,s,fi}	[Nm]	0.3		1.0		2.0		5.0		9.7	
Characteristic fire resistance duration at 90 minutes												
Steel failure without lever arm	V _{Rk,s,fi}	[kN]	0.3		0.6		1.1		2.0		3.2	
Steel failure with lever arm	M _{Rk,s,fi}	[Nm]	0.3		0.7		1.7		4.3		8.4	
Characteristic fire resistance duration at 120 minutes												
Steel failure without lever arm	V _{Rk,s,fi}	[kN]	0.2		0.5		0.8		1.6		2.5	
Steel failure with lever arm	M _{Rk,s,fi}	[Nm]	0.2		0.6		1.3		3.3		6.5	
Concrete pry-out failure												
Factor ²⁾	k ₈	[-]	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0
Concrete edge failure	The characteristic resistance V _{Rk,c,fi} in concrete C20/25 to C50/60 is determined by: V _{Rk,c,fi} ⁰ = 0,25 x V _{Rk,c(≤90)} ⁰ and V _{Rk,c,fi} ⁰ = 0,20 x V _{Rk,c(≤120)} ⁰ with the initial value of the characteristic resistance V _{Rk,c} ⁰ in cracked concrete C20/25 under normal temperature											

1) Use restricted to anchoring statically indeterminate structural components

2) The values of factor k₈ and relevant values of N_{Rk,c,fi} given in the Table C5 have to be considered in the design

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Characteristic values of resistance under fire exposure

Annex C 3

Table C7 – Characteristic values of resistance under seismic action category C2

Size			M10	M12	M16
			Standard		
Tension load					
Steel failure					
Characteristic resistance	$N_{Rk,s,eq,C2}$	[kN]	17.5	25.8	45.8
Partial safety factor	$\gamma_{Ms,eq}$	[-]	1.4	1.4	1.4
Pull-out failure					
Characteristic resistance in concrete C20/25	$N_{Rk,p,eq,C2}$	[kN]	3.4	7.0	10.9
Installation safety factor	$\gamma_{inst,eq}$	[-]	1.0	1.0	1.0
Shear load					
Steel failure without lever arm					
Characteristic resistance	$V_{Rk,s,eq,C2}$	[kN]	9.2	11.1	28.2
Partial safety factor	$\gamma_{Ms,eq}$	[-]	1.25	1.25	1.25
Factor for annular gap	α_{gap}	[-]	0.5		

Table C8 – Displacement under tensile and shear load - seismic category C2

Size		M10	M12	M16
$\delta_{N,eq}(DLS)$	[mm]	2.8	3.0	4.2
$\delta_{N,eq}(ULS)$	[mm]	9.3	12.2	13.0
$\delta_{V,eq}(DLS)$	[mm]	4.5	4.3	5.8
$\delta_{V,eq}(ULS)$	[mm]	7.0	7.0	10.2

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Reduction factors for seismic design

Annex C 4



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