R-SPL – High performance expansion anchor

PRODUCT INFORMATION

R-SPL-C

R-SPL

R-SPL-BP

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Reinforced and unreinforced concrete

APPROVALS AND REPORTS:

- ETA-11/0126 Option 7
- AT-15-7570/2008 Option 7

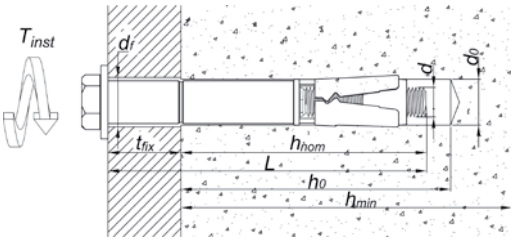
FEATURES:

- Through fixing
- R-SPL - Loose Bolt
- R-SPL-BP - Bolt Projecting
- R-SPL-C - Coutersunk head
- Zinc electroplated carbon steel 8.8 grade
- Min. coating thickness: 5µm

Size	Product Code			Anchor			Fixture	
	Loose Bolt	Bolt Projecting	Countersunk	Thread size	External diameter	Length	Max. thickness	Hole diameter
				d	d_{nom}	L	t_{fix}	d_f
				[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-SPL-08090/15	-	-	8	12	90	15	14
	-	-	R-SPL-C-08090/20	8	12	90	20	22*/14
	-	R-SPL-BP-08095/15	-	8	12	95	15	14
	R-SPL-08110/40	-	-	8	12	110	40	14
M10	R-SPL-10105/20	-	-	10	15	105	20	17
	-	-	R-SPL-C-10105/25	10	15	105	25	28*/17
	-	R-SPL-BP-10110/20	-	10	15	110	20	17
	R-SPL-10120/40	-	-	10	15	120	40	17
	R-SPL-10140/60	-	-	10	15	140	60	17
M12	R-SPL-12120/25	-	-	12	18	120	25	20
	-	-	R-SPL-C-12125/30	12	18	125	30	33*/20
	-	R-SPL-BP-12135/25	-	12	18	135	25	20
	R-SPL-12150/50	-	-	12	18	150	50	20
	-	R-SPL-BP-12160/50	-	12	18	160	50	20
M16	R-SPL-16145/25	-	-	16	24	145	25	26
	-	-	R-SPL-C-16145/30	16	24	145	30	40*/26
	-	R-SPL-BP-16160/25	-	16	24	160	25	26
	R-SPL-16170/50	-	-	16	24	170	50	26
	-	R-SPL-BP-16185/50	-	16	24	185	50	26
M20	R-SPL-20175/30	-	-	20	28	175	30	30
	-	R-SPL-BP-20190/30	-	20	28	190	30	30

* maximum head diameter

INSTALLATION DATA



Size			M8	M10	M12	M16	M20
Thread diameter	d	[mm]	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	12	15	18	24	28
Installation torque	T_{inst}	[Nm]	25	50	80	180	275
Min. hole depth in substrate	h_0	[mm]	80	90	100	125	155
Installation depth	h_{nom}	[mm]	70	80	90	110	130
Min. substrate thickness	h_{min}	[mm]	100	105	120	150	188
Min. spacing	s_{min}	[mm]	60	70	80	100	125
Min. edge distance	c_{min}	[mm]	90	105	120	150	186

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert anchor through fixture into hole and tap until required installation depth is achieved.
4. Tighten to the recommended torque.

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	830
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58.0	84.3	157.0	245.0
Elastic section modulus	W_{el}	[mm³]	50.27	98.17	169.65	402.12	785.40
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	45.04	87.97	152.01	365.97	728.54
Design bending resistance	M	[Nm]	36.03	70.38	121.61	292.78	582.83

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BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Size		M8	M10	M12	M16	M20
Embedment depth h_{ef}	[mm]	60	70	80	100	125
MEAN ULTIMATE LOAD						
TENSION LOAD $N_{Ru,m}$	[kN]	15.70	19.70	28.20	60.10	66.80
SHEAR LOAD $V_{Ru,m}$	[kN]	25.08	35.04	57.61	98.15	88.42
CHARACTERISTIC LOAD						
TENSION LOAD N_{Rk}	[kN]	9.00	12.00	16.00	35.00	40.00
SHEAR LOAD V_{Rk}	[kN]	18.00	24.00	32.00	70.00	73.68
DESIGN LOAD						
TENSION LOAD N_{Rd}	[kN]	4.29	5.71	7.62	16.67	19.05
SHEAR LOAD V_{Rd}	[kN]	8.57	11.43	15.24	33.33	38.10
RECOMMENDED LOAD*						
TENSION LOAD N_{rec}	[kN]	3.06	4.08	5.44	11.90	13.61
SHEAR LOAD V_{rec}	[kN]	6.12	8.16	10.89	23.81	27.21

* partial safety factor 1.4 steel failure pry-out failure

DESIGN PERFORMANCE DATA

Data based on ETA-11/0126

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	60	70	80	100	125
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	29.30	46.40	57.40	125.60	196.00
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	19.53	30.93	38.27	83.73	130.67
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	12.00	16.00	35.00	40.00
Design resistance γ_{Mp}=2.1	$N_{Rd,p}$	[kN]	4.29	5.71	7.62	16.67	19.05
Spacing	$s_{cr,N}$	[mm]	180	210	240	300	375
Edge distance	$c_{cr,N}$	[mm]	90	105	120	150	188
SHEAR LOAD							
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	90	105	120	150	186
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	16.50	21.48	26.96	39.32	55.68
Design resistance γ_{Mc}=2.1	$V_{Rd,c}$	[kN]	7.86	10.23	12.84	18.72	26.51
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
	k	[-]	2	2	2	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	18.00	24.00	32.00	70.00	80.00
Design resistance γ_{Mc}=2.1	$V_{Rd,cp}$	[kN]	8.57	11.43	15.24	33.33	38.10
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	19.20	30.00	43.20	77.60	73.68
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	15.36	24.00	34.56	62.08	58.94

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

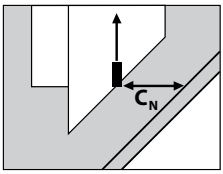


Table only valid for one edge
$<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the
Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

C_N	M8		M10		M12		M16		M20	
[mm]	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
90	1.00	1.00								
105			1.00	1.00						
120					1.00	1.00				
150							1.00	1.00		
190									1.00	1.00

EDGE DISTANCE (SHEAR)

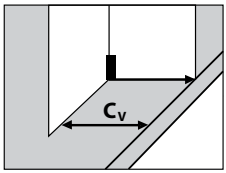


Table only valid for one edge
$>C_{min}$ and $S \geq 3C_V$
For other cases use the
Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

C_V	M8		M10		M12		M16		M20	
[mm]	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
90	1.00	0.86								
95	1.08	0.90								
100		0.94								
105		0.98	1.00	0.82						
115		1.06	1.12	0.88						
120				0.91	1.00	0.82				
135				1.01	1.17	0.90				
150				1.10		0.98	1.00	0.82		
180						1.15	1.27	0.95		
190							1.36	0.99	1.00	0.83
200							1.46	1.03	1.10	0.87
230							1.76	1.16	1.32	0.97
245								1.22	1.43	1.02
300								1.45		1.21
360								1.70		1.41
370								1.74		

SPACING

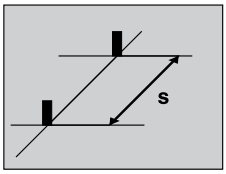


Table only valid for one spacing
$<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the
Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s	M8		M10		M12		M16		M20	
[mm]	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
60	0.67	0.67								
70	0.69	0.69	0.67	0.67						
80	0.72	0.72	0.69	0.69	0.67	0.67				
90	0.75	0.75	0.71	0.71	0.69	0.69				
100	0.78	0.78	0.74	0.74	0.71	0.71	0.67	0.67		
120	0.83	0.83	0.79	0.79	0.75	0.75	0.70	0.70		
125	0.85	0.85	0.80	0.80	0.76	0.76	0.71	0.71	0.67	0.67
150	0.92	0.92	0.86	0.86	0.81	0.81	0.75	0.75	0.70	0.70
160	0.94	0.94	0.88	0.88	0.83	0.83	0.77	0.77	0.71	0.71
180	1.00	1.00	0.93	0.93	0.88	0.88	0.80	0.80	0.74	0.74
200			0.98	0.98	0.92	0.92	0.83	0.83	0.77	0.77
210			1.00	1.00	0.94	0.94	0.85	0.85	0.78	0.78
220					0.96	0.96	0.87	0.87	0.79	0.79
240					1.00	1.00	0.90	0.90	0.82	0.82
250							0.92	0.92	0.83	0.83
300							1.00	1.00	0.90	0.90
375									1.00	1.00

R-SPL-LE – High performance expansion anchor

PRODUCT INFORMATION

R-SPL-LE

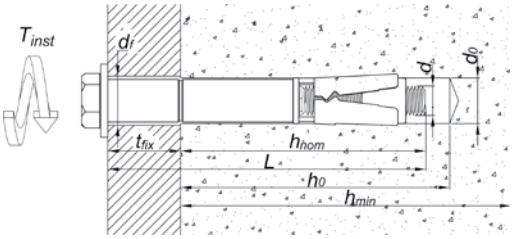
BASE MATERIAL:
- Non-cracked concrete, class C20/25-C50/60
- Reinforced and unreinforced concrete

FEATURES:
- Through fixing
- R-SPL-LE- Limited embedment
- Zinc electroplated carbon steel 8.8 grade
- Min. coating thickness: 5µm

Size	Product Code	Anchor			Fixture	
		Thread size	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-SPL-LE-08080/25*	8	12	80	25	14
M10	R-SPL-LE-10090/25*	10	15	90	25	17
M12	R-SPL-LE-12100/25*	12	18	100	25	20
M16	R-SPL-LE16130/30*	16	24	130	30	26

* not covered by approval

INSTALLATION DATA



Size			M8*	M10*	M12*	M16*
Thread diameter	d	[mm]	8	10	12	16
Hole diameter in substrate	d_0	[mm]	12	15	18	24
Installation torque	T_{inst}	[Nm]	25	50	80	180
Min. hole depth in substrate	h_0	[mm]	55	70	85	100
Installation depth	h_{nom}	[mm]	50	65	75	90
Min. substrate thickness	h_{min}	[mm]	100	110	130	165
Min. spacing	s_{min}	[mm]	60	70	80	100
Min. edge distance	c_{min}	[mm]	60	75	90	110

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INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert anchor through fixture into hole and tap until required installation depth is achieved.
4. Tighten to the recommended torque.

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Size		M8*	M10*	M12*	M16*
Embedment depth h_{ef}	[mm]	40	50	60	75
CHARACTERISTIC LOAD					
TENSION LOAD N_{Rk}	[kN]	7.50	9.00	12.00	25.00
SHEAR LOAD V_{Rk}	[kN]	7.50	9.00	24.00	50.00
DESIGN LOAD					
TENSION LOAD N_{Rd}	[kN]	4.17	5.00	5.71	11.90
SHEAR LOAD V_{Rd}	[kN]	4.17	5.00	11.43	23.81
RECOMMENDED LOAD**					
TENSION LOAD N_{rec}	[kN]	2.98	3.57	4.08	8.50
SHEAR LOAD V_{rec}	[kN]	2.98	3.57	8.16	17.01

* not covered by approval
** partial safety factor 1.4

steel failure

pry-out failure

DESIGN PERFORMANCE DATA

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Size			M8*	M10*	M12*	M16*
Embedment depth	h_{ef}	[mm]	40	50	60	75
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	29.30	46.40	57.40	125.60
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	19.53	30.93	38.27	83.73
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25						
Characteristic resistance	N_{Rk}	[kN]	7.50	9.00	12.00	25.00
Design resistance γ_{Mp}=1.8 (M8-M10) / 2.1 (M12-M16)	N_{Rd}	[kN]	4.17	5.00	5.71	11.90
Spacing	$s_{cr,N}$	[mm]	120	150	180	225
Edge distance	$c_{cr,N}$	[mm]	60	75	90	113
SHEAR LOAD						
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25						
Edge distance	c_1	[mm]	60	75	90	110
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	8.93	12.91	17.45	24.75
Design resistance γ_{Mc}=1.8 (M8-M10) / 2.1 (M12-M16)	$V_{Rd,c}$	[kN]	4.96	7.17	8.31	11.78
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25						
	k	[-]	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	7.50	9.00	24.00	50.00
Design resistance γ_{Mc}=1.8 (M8-M10) / 2.1 (M12-M16)	$V_{Rd,cp}$	[kN]	4.17	5.00	11.43	23.81
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	19.20	30.00	43.20	77.60
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	15.36	24.00	34.56	62.08

* not covered by approval

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm^2]	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm^2]	640	640	640	640
Cross sectional area - tension	A_s	[mm^2]	36.6	58.0	84.3	157.0
Elastic section modulus	W_{el}	[mm^3]	50.27	98.17	169.65	402.12
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	45.04	87.97	152.01	365.97
Design bending resistance	M	[Nm]	36.03	70.38	121.61	292.78

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REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

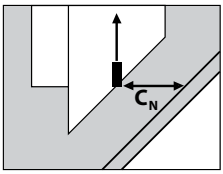


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

C_N [mm]	M8		M10		M12		M16	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
60	1.00	0.75						
70		0.83						
75		0.87	1.00	0.78				
80		0.91		0.82				
90		1.00		0.89	1.00	0.81		
100				0.96		0.87		
105				1.00		0.90		
110						0.93	0.98	0.80
115						0.97	1.00	0.82
120						1.00		0.85
130								0.90
140								0.95
150								1.00

EDGE DISTANCE (SHEAR)

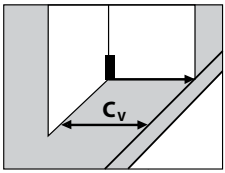


Table only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

C_V [mm]	M8		M10		M12		M16	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
60	0.84	0.84						
75			0.70	0.70				
90					1.00	0.98		
100					1.15	1.07		
110					1.31	1.16	1.00	1.00
115					1.39	1.20	1.06	1.06
120						1.25	1.12	1.07
130						1.33	1.24	1.15
185							1.99	1.53
200								1.64
220								1.78
240								1.91
250								1.98

SPACING

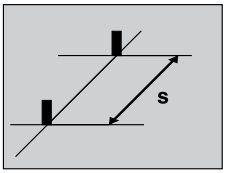


Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M8		M10		M12		M16	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
60	0.75	0.67						
70	0.79	0.69	0.73	0.67				
80	0.83	0.72	0.77	0.69	0.72	0.67		
90	0.88	0.75	0.80	0.71	0.75	0.69		
100	0.92	0.78	0.83	0.74	0.78	0.71	0.72	0.67
120	1.00	0.83	0.90	0.79	0.83	0.75	0.77	0.70
130		0.86	0.93	0.81	0.86	0.77	0.79	0.72
150		0.92	1.00	0.86	0.92	0.81	0.83	0.75
160		0.94		0.88	0.94	0.83	0.86	0.77
180		1.00		0.93	1.00	0.88	0.90	0.80
200				0.98		0.92	0.94	0.83
210				1.00		0.94	0.97	0.85
225						0.97	1.00	0.88
240						1.00		0.90
250								0.92
280								0.97
300								1.00

R-SOC – Socket anchor

PRODUCT INFORMATION

R-SOC

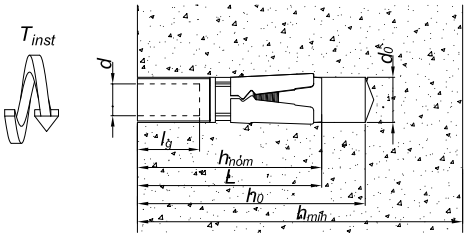
BASE MATERIAL:
- Non-cracked concrete, class C20/25-C50/60
- Reinforced and unreinforced concrete

FEATURES:
- Through fixing
- R-SOC- Socket anchor
- Zinc electroplated carbon steel 8.8 grade
- Min. coating thickness: 5µm

Size	Product Code	Anchor			Fixture	
		Thread size	External diameter	Length	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-SOC-08*	8	12	55	-	10
M10	R-SOC-10*	10	15	67	-	12
M12	R-SOC-12*	12	18	80	-	14
M16	R-SOC-16*	16	24	95	-	18
M20	R-SOC-20*	20	28	115	-	24

* not covered by approval

INSTALLATION DATA



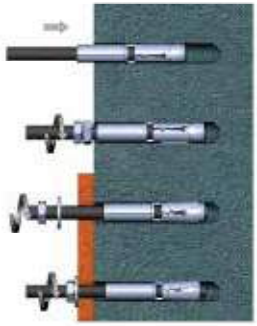
Size			M8*	M10*	M12*	M16*	M20*
Thread diameter	d	[mm]	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	12	15	18	24	28
SET FLUSH TO SURFACE							
Installation torque	T_{inst}**	[Nm]	11/19	22/37	39/65	96/163	187/280
Min. hole depth	h_0	[mm]	65	75	90	105	125
Installation depth	h_{nom}	[mm]	55	67	80	95	115
Min. substrate thickness	h_{min}	[mm]	90	110	130	160	190
Min. spacing	s_{min}	[mm]	60	70	80	100	125
Min. edge distance	c_{min}	[mm]	60	75	90	110	140
SET AT DEPTH							
Installation torque	T_{inst}**	[Nm]	11/19	22/37	39/65	96/163	187/280
Min. hole depth in substrate	h_0	[mm]	80	90	105	125	155
Installation depth	h_{nom}	[mm]	70	80	95	115	145
Min. substrate thickness	h_{min}	[mm]	120	140	160	200	250
Min. spacing	s_{min}	[mm]	60	70	80	100	125
Min. edge distance	c_{min}	[mm]	90	105	120	150	186

* not covered by approval

** 4.6 stud/8.8 stud

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Screw studding into socket. Assemble two nuts at the other end of the studding.
4. Ensuring nuts are securely locked together, apply the recommended torque through the top nut. Carefully slacken and remove nuts.
5. Apply fixture, washer and hexagon nuts.
6. Apply torque to ensure clamping of fixture against concrete surface.



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BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Size		M8*	M10*	M12*	M16*	M20*
Embedment depth h_{ef}	[mm]	45/60	55/70	65/80	80/100	95/125
CHARACTERISTIC LOAD N_{Rk}						
STEEL 4.6						
Set flush to the surface	[kN]	7.50	9.00	12.00	25.00	35.00
Set at depth	[kN]	9.00	12.00	16.00	35.00	40.00
STEEL 5.8						
Set flush to the surface	[kN]	7.50	9.00	12.00	25.00	35.00
Set at depth	[kN]	9.00	12.00	16.00	35.00	40.00
STEEL 8.8						
Set flush to the surface	[kN]	7.50	9.00	12.00	25.00	35.00
Set at depth	[kN]	9.00	12.00	16.00	35.00	40.00
DESIGN LOAD N_{Rd}						
STEEL 4.6						
Set flush to the surface	[kN]	4.17	5.00	5.71	11.90	16.67
Set at depth	[kN]	4.29	5.71	7.62	16.67	19.05
STEEL 5.8						
Set flush to the surface	[kN]	4.17	5.00	5.71	11.90	16.67
Set at depth	[kN]	4.29	5.71	7.62	16.67	19.05
STEEL 8.8						
Set flush to the surface	[kN]	4.17	5.00	5.71	11.90	16.67
Set at depth	[kN]	4.29	5.71	7.62	16.67	19.05
RECOMMENDED LOAD N_{rec} **						
STEEL 4.6						
Set flush to the surface	[kN]	2.98	3.57	4.08	8.50	11.90
Set at depth	[kN]	3.06	4.08	5.44	11.91	13.61
STEEL 5.8						
Set flush to the surface	[kN]	2.98	3.57	4.08	8.50	11.90
Set at depth	[kN]	3.06	4.08	5.44	11.91	13.61
STEEL 8.8						
Set flush to the surface	[kN]	2.98	3.57	4.08	8.50	11.90
Set at depth	[kN]	3.06	4.08	5.44	11.91	13.61

* not covered by approval ** partial safety factor 1.4

DESIGN PERFORMANCE DATA

SET FLUSH TO THE SURFACE

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	45	55	65	80	95
TENSION LOADS							
STEEL FAILURE GRADE 4.6							
Characteristic resistance	$N_{Rk,s}$	[kN]	14.60	23.20	33.70	62.80	98.00
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	9.73	15.47	22.47	41.87	65.33
STEEL FAILURE GRADE 5.8							
Characteristic resistance	$N_{Rk,s}$	[kN]	19.00	30.20	43.80	81.60	127.40
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	12.67	20.13	29.20	54.40	84.93
STEEL FAILURE GRADE 8.8							
Characteristic resistance	$N_{Rk,s}$	[kN]	29.30	46.40	67.40	125.60	203.40
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	19.53	30.93	44.93	83.73	135.60
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	7.50	9.00	12.00	25.00	35.00
Design resistance γ_{Mp}=1.8 (M8-M10) / 2.1 (M12-M20)	$N_{Rd,p}$	[kN]	4.17	5.00	5.71	11.90	16.67
Increasing factors for $N_{Rd,p}$	C30/37	-	1.20				
	C40/50	-	1.40				
	C50/60	-	1.50				
Spacing	$s_{cr,N}$	[mm]	135	165	195	240	285
Edge distance	$c_{cr,N}$	[mm]	68	83	98	120	143

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

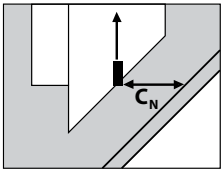

Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N	M8		M10		M12		M16		M20	
[mm]	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
60	0.91	0.75								
70	1.00	0.83								
75		0.87	0.93	0.78						
85		0.96	1.00	0.85						
90		1.00		0.89	0.94	0.81				
100				0.96	1.00	0.87				
105				1.00		0.90				
110						0.93	0.93	0.80		
120						1.00	1.00	0.85		
140								0.95	0.99	0.81
145								0.97	1.00	0.83
150								1.00		0.85
160										0.89
180										0.97
190										1.00

SPACING

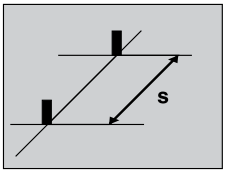

Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s	M8		M10		M12		M16		M20	
[mm]	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
60	0.72	0.67								
70	0.76	0.69	0.71	0.67						
80	0.80	0.72	0.74	0.69	0.71	0.67				
100	0.87	0.78	0.80	0.74	0.76	0.71	0.71	0.67		
125	0.96	0.85	0.88	0.80	0.82	0.76	0.76	0.71	0.72	0.67
135	1.00	0.88	0.91	0.82	0.85	0.78	0.78	0.73	0.74	0.68
150		0.92	0.95	0.86	0.88	0.81	0.81	0.75	0.76	0.70
165		0.96	1.00	0.89	0.92	0.84	0.84	0.78	0.79	0.72
180		1.00		0.93	0.96	0.88	0.88	0.80	0.82	0.74
195				0.96	1.00	0.91	0.91	0.83	0.84	0.76
200				0.98		0.92	0.92	0.83	0.85	0.77
210				1.00		0.94	0.94	0.85	0.87	0.78
220						0.96	0.96	0.87	0.89	0.79
240						1.00	1.00	0.90	0.92	0.82
285								0.98	1.00	0.88
300								1.00		0.90
350										0.97
375										1.00

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SET AT DEPTH

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	60	70	80	100	125
TENSION LOADS							
STEEL FAILURE GRADE 4.6							
Characteristic resistance	$N_{Rk,s}$	[kN]	14.60	23.20	33.70	62.80	98.00
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	9.73	15.47	22.47	41.87	65.33
STEEL FAILURE GRADE 5.8							
Characteristic resistance	$N_{Rk,s}$	[kN]	19.00	30.20	43.80	81.60	127.40
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	12.67	20.13	29.20	54.40	84.93
STEEL FAILURE GRADE 8.8							
Characteristic resistance	$N_{Rk,s}$	[kN]	29.30	46.40	67.40	125.60	203.40
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	19.53	30.93	44.93	83.73	135.60
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	12.00	16.00	35.00	40.00
Design resistance γ_{Mp}=2.1	$N_{Rd,p}$	[kN]	4.29	5.71	7.62	16.67	19.05
Increasing factors for $N_{Rd,p}$	C30/37	-	1.20				
	C40/50	-	1.40				
	C50/60	-	1.50				
Spacing	$s_{cr,N}$	[mm]	180	210	240	300	375
Edge distance	$c_{cr,N}$	[mm]	90	105	120	150	188

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension (5.8 grade)	f_{uk}	[N/mm^2]	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm^2]	416	416	416	416	416
Cross section area - tension	A_s	[mm^2]	36.6	58.0	84.3	157.0	245.0
Elastic section modulus	W_{el}	[mm^3]	50.27	98.17	169.65	402.12	785.40
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	45.04	87.97	152.01	365.97	728.54
Design bending resistance	M	[Nm]	36.03	70.38	121.61	292.78	582.83

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

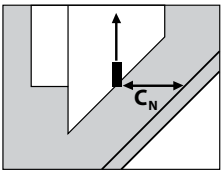


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

C_N [mm]	M8		M10		M12		M16		M20	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
90	1.00	1.00								
105			1.00	1.00						
120					1.00	1.00				
150							1.00	1.00		
190									1.00	1.00

SPACING

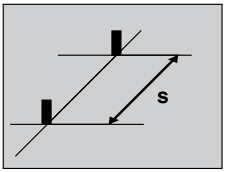


Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M8		M10		M12		M16		M20	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
60	0.67	0.67								
70	0.69	0.69	0.67	0.67						
80	0.72	0.72	0.69	0.69	0.67	0.67				
100	0.78	0.78	0.74	0.74	0.71	0.71	0.67	0.67		
125	0.85	0.85	0.80	0.80	0.76	0.76	0.71	0.71	0.67	0.67
135	0.88	0.88	0.82	0.82	0.78	0.78	0.73	0.73	0.68	0.68
150	0.92	0.92	0.86	0.86	0.81	0.81	0.75	0.75	0.70	0.70
165	0.96	0.96	0.89	0.89	0.84	0.84	0.78	0.78	0.72	0.72
180	1.00	1.00	0.93	0.93	0.88	0.88	0.80	0.80	0.74	0.74
195			0.96	0.96	0.91	0.91	0.83	0.83	0.76	0.76
200			0.98	0.98	0.92	0.92	0.83	0.83	0.77	0.77
210			1.00	1.00	0.94	0.94	0.85	0.85	0.78	0.78
220					0.96	0.96	0.87	0.87	0.79	0.79
240					1.00	1.00	0.90	0.90	0.82	0.82
285							0.98	0.98	0.88	0.88
300							1.00	1.00	0.90	0.90
350									0.97	0.97
375									1.00	1.00

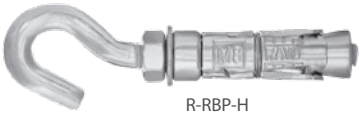
R-RB – All purpose expansion anchor

PRODUCT INFORMATION

R-RBL

R-RBP

R-RBL-E



R-RBP-H

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Cracked concrete, class C20/25-C50/60 (Option 1 approval)
- Reinforced and unreinforced concrete

APPROVALS AND REPORTS:

- ETA-11/0479 Option 7
- AT-15-7280/2012 Option 1

FEATURES:

- Shield anchor
- Carbon steel 5.8 grade acc. to EN ISO 898-1
- Min. coating thickness: 5µm acc. to EN ISO 4042

R-RBL - Loose Bolt
R-RBP - Bolt Projecting
R-RBL-E - Eye Bolt
R-RBL-H - Hook Bolt

Size	Product Code		Anchor			Fixture	
	Loose Bolt	Bolt Projecting	Thread size	External diameter	Length	Max. thickness	Hole diameter
			d	d_{nom}	L	t_{fix}	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-RBL-M6/10	-	6	12	55	10	6.5
	-	R-RBP-M6/10	6	12	65	10	6.5
	R-RBL-M6/25	-	6	12	70	25	6.5
	-	R-RBP-M6/25	6	12	80	25	6.5
	R-RBL-M6/40	-	6	12	85	40	6.5
	-	R-RBP-M6/60	6	12	115	60	6.5
M8	R-RBL-M8/10	-	8	14	65	10	9
	-	R-RBP-M8/10	8	14	75	10	9
	R-RBL-M8/25	-	8	14	80	25	9
	-	R-RBP-M8/25	8	14	90	25	9
	R-RBL-M8/40	-	8	14	95	40	9
	-	R-RBP-M8/60	8	14	125	60	9
M10	R-RBL-M10/10	-	10	16	75	10	11
	-	R-RBP-M10/15	10	16	90	15	11
	R-RBL-M10/25	-	10	16	90	25	11
	-	R-RBP-M10/30	10	16	105	30	11
	R-RBL-M10/50	-	10	16	115	50	11
	-	R-RBP-M10/60	10	16	135	60	11
	R-RBL-M10/75	-	10	16	140	75	11

Size	Product Code		Anchor			Fixture	
	Loose Bolt	Bolt Projecting	Thread size	External diameter	Length	Max. thickness	Hole diameter
			d	d_{nom}	L	t_{fix}	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]
M12	R-RBL-M12/10	-	12	20	90	10	13
	-	R-RBP-M12/15	12	20	110	15	13
	R-RBL-M12/25	-	12	20	105	25	13
	-	R-RBP-M12/30	12	20	125	30	13
	R-RBL-M12/40	-	12	20	120	40	13
	R-RBL-M12/60	-	12	20	140	60	13
	-	R-RBP-M12/75	12	20	170	75	13
M16	R-RBL-M16/15	-	16	25	135	15	17
	-	R-RBP-M16/15	16	25	150	15	17
	R-RBL-M16/30	-	16	25	150	30	17
	-	R-RBP-M16/35	16	25	170	35	17
	R-RBL-M16/60	-	16	25	180	60	17
	-	R-RBP-M16/75	16	25	210	75	17
M20	-	R-RBP-M20/15	20	32	170	15	22
	-	R-RBP-M20/30	20	32	185	30	22
	R-RBL-M20/60	-	20	32	195	60	22
	R-RBL-M20/100	-	20	32	235	110	22
	-	R-RBP-M20/100	20	32	255	100	22

Size	Product Code		Anchor			Fixture	
	Eye bolt	Hook bolt	Thread size	External diameter	Length	Max. thickness	Hole diameter
			d	d_{nom}	L	t_{fix}	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-RBL-E-M06*	-	6	12	73	-	-
	-	R-RBL-H-M06*	6	12	83	-	-
M8	R-RBL-E-M08*	-	8	14	87	-	-
	-	R-RBL-H-M08*	8	14	98	-	-
M10	R-RBL-E-M10*	-	10	16	108	-	-
	-	R-RBL-H-M10*	10	16	120	-	-
M12	R-RBL-E-M12*	-	12	20	130	-	-
	-	R-RBL-H-M12*	12	20	145	-	-

* not covered by approval

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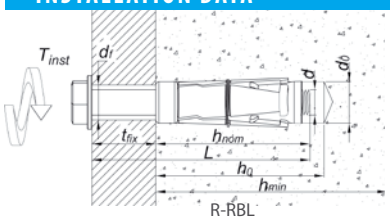
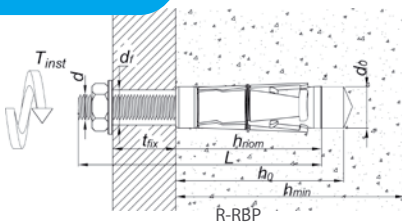
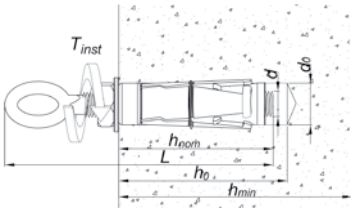
INSTALLATION DATA



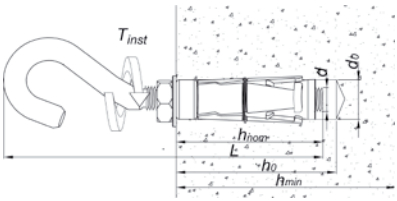
R-RBL



R-RBP



R-RBL-E



R-RBP-H

Size			M6	M8	M10	M12	M16	M20
Thread diameter	d	[mm]	6	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	12	14	16	20	25	32
Installation torque	T_{inst}	[Nm]	6.5	15	27	50	120	230
Min. hole depth in substrate	h_0	[mm]	50	55	65	85	125	140
Installation depth	h_{nom}	[mm]	45	50	60	80	120	135
Min. substrate thickness	h_{min}	[mm]	100	100	100	100	142.5	172.5
Min. spacing	s_{min}	[mm]	35	40	50	60	95	115
Min. edge distance	c_{min}	[mm]	53	60	75	90	143	173

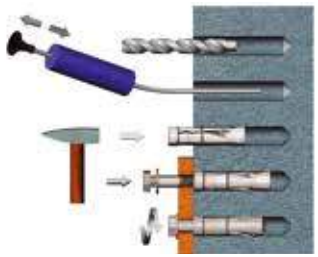
INSTALLATION GUIDE

R-RBL

1. Drill a hole of required diameter and depth.
   NOTE: When fixing into brickwork, mortar joints should be avoided.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Remove bolt and washer. Insert shield and tap home.
4. Place fixture over the hole and insert bolt with washer through the fixture.
5. Tighten to the recommended torque.

R-RBP

1. Drill a hole of required diameter and depth.
   NOTE: When fixing into brickwork, mortar joints should be avoided.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Remove nut and washer. Insert shield and tap home.
4. Position fixture over the thread and add washer and nut.
5. Tighten to the recommended torque.



R-RBL-E, R-RBL-H

1. Drill a hole of required diameter and depth.
   NOTE: When fixing into brickwork, mortar joints should be avoided.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert the Hook Bolt or Eye Bolt and position accordingly.
4. Tighten to recommended torque, using the nut (not the Eye, Hook).

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Size		M6	M8	M10	M12	M16	M20	M6	M8	M10	M12	M16	M20
Concrete type		Non-cracked concrete						Cracked concrete					
Embedment depth h_{ef}	[mm]	35	40	50	60	95	115	35	40	50	60	95	115
MEAN ULTIMATE LOAD													
TENSION LOAD $N_{Ru,m}$	[kN]	6.36	8.35	15.24	18.48	48.77	56.55	4.06	5.31	7.12	12.01	18.24	34.16
SHEAR LOAD $V_{Ru,m}$	[kN]	6.04	10.98	17.40	25.30	47.10	73.50	6.04	10.98	17.40	25.30	47.10	73.50
CHARACTERISTIC LOAD													
TENSION LOAD N_{Rk}	[kN]	6.00	7.50	12.00	16.00	40.00	50.00	4.00	5.00	6.00	12.00	16.00	30.00
SHEAR LOAD V_{Rk}	[kN]	5.03	7.50	12.00	21.08	39.25	61.25	4.00	5.00	6.00	21.08	32.00	60.00
DESIGN LOAD													
TENSION LOAD N_{Rd}	[kN]	3.33	4.17	6.67	8.89	22.22	27.78	2.22	2.78	3.33	6.67	8.89	16.67
SHEAR LOAD V_{Rd}	[kN]	3.33	4.17	6.67	16.86	31.40	49.00	2.22	2.78	3.33	13.33	17.78	33.33
RECOMMENDED LOAD*													
TENSION LOAD N_{rec}	[kN]	2.38	2.98	4.76	6.35	15.87	19.84	1.59	1.99	2.38	4.76	6.35	11.91
SHEAR LOAD V_{rec}	[kN]	2.38	2.98	4.76	12.05	22.43	35.00	1.59	1.99	2.38	9.52	12.70	23.81

* partial safety factor 1.4

steel failure

pry-out failure

DESIGN PERFORMANCE DATA

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Size			M6	M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	35	40	50	60	95	115
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	10.05	18.30	29.00	42.15	78.50	122.50
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	6.70	12.20	19.33	28.10	52.33	81.67
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	6.00	7.50	12.00	16.00	40.00	50.00
Design resistance γ_{Mp}=1.8	$N_{Rd,p}$	[kN]	3.33	4.17	6.67	8.89	22.22	27.78
PULL-OUT FAILURE; CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	4.00	5.00	6.00	12.00	16.00	30.00
Design resistance γ_{Mp}=1.8	$N_{Rd,p}$	[kN]	2.22	2.78	3.33	6.67	8.89	16.67
Spacing	$s_{cr,N}$	[mm]	105	120	150	180	285	345
Edge distance	$c_{cr,N}$	[mm]	53	60	75	90	143	173
SHEAR LOAD								
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25								
Edge distance	c_1	[mm]	53	60	75	90	143	173
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	7.38	9.11	13.03	17.72	36.78	50.82
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	4.10	5.06	7.24	9.84	20.44	28.23
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25								
Edge distance	c_1	[mm]	53	60	75	90	143	173
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.16	6.46	9.23	12.55	25.94	35.86
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	2.87	3.59	5.13	6.97	14.41	19.92
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
	k	[-]	1	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	6.00	7.50	12.00	32.00	80.00	100.00
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	3.33	4.17	6.67	17.78	44.44	55.56
PRY-OUT FAILURE; CRACKED CONCRETE C20/25								
	k	[-]	1	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	4.00	5.00	6.00	24.00	32.00	60.00
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	2.22	2.78	3.33	13.33	17.78	33.33
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.03	9.15	14.50	21.08	39.25	61.25
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	4.02	7.32	11.60	16.86	31.40	49.00

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

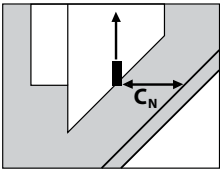
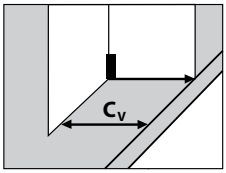


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked and cracked concrete from 'Basic Performance' table

c_N [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
55	1.00	1.00										
60			1.00	1.00								
75					1.00	1.00						
90							1.00	1.00				
145									1.00	1.00		
175											1.00	1.00

EDGE DISTANCE (SHEAR)



Tables only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
55	0.81	0.81										
60			0.82	0.82								
75					0.92	0.92						
90							1.00	0.86				
100							1.15	0.94				
135							1.72	1.21				
145								1.28	1.00	0.82		
160								1.39	1.16	0.89		
175								1.50	1.30	0.96	1.00	0.82
200								1.69	1.56	1.07	1.21	0.92
240										1.25	1.53	1.06
265										1.36	1.75	1.15
305										1.53		1.29
350												1.45
430												1.73

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for cracked concrete from 'Design Performance' table

c_V [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
55	0.78	0.78										
60			0.77	0.77								
75					0.65	0.65						
90							1.00	0.86				
100							1.15	0.94				
145							1.89	1.28	1.02	0.83		
165								1.43	1.21	0.92		
175								1.50		0.96	1.02	0.83
200								1.69		1.08	1.21	0.92
230								1.91		1.21	1.45	1.03
255											1.67	1.12
340												1.42
380												1.56
410												1.66

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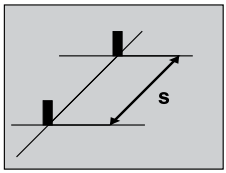
SPACING



Tables only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M6		M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
35	0.67	0.67										
40	0.69	0.69	0.67	0.67								
50	0.74	0.74	0.71	0.71	0.67	0.67						
60	0.79	0.79	0.75	0.75	0.70	0.70	0.67	0.67				
80	0.88	0.88	0.83	0.83	0.77	0.77	0.72	0.72				
95	0.95	0.95	0.90	0.90	0.82	0.82	0.76	0.76	0.67	0.67		
100	0.98	0.98	0.92	0.92	0.83	0.83	0.78	0.78	0.68	0.68		
105	1.00	1.00	0.94	0.94	0.85	0.85	0.79	0.79	0.68	0.68		
115			0.98	0.98	0.88	0.88	0.82	0.82	0.70	0.70	0.67	0.67
120			1.00	1.00	0.90	0.90	0.83	0.83	0.71	0.71	0.67	0.67
150					1.00	1.00	0.92	0.92	0.76	0.76	0.72	0.72
180							1.00	1.00	0.82	0.82	0.76	0.76
200									0.85	0.85	0.79	0.79
220									0.89	0.89	0.82	0.82
250									0.94	0.94	0.86	0.86
285									1.00	1.00	0.91	0.91
300											0.93	0.93
345											1.00	1.00

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for cracked concrete from 'Basic Performance' table

s [mm]	M6		M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
35	0.67	0.67										
40	0.69	0.69	0.67	0.67								
50	0.74	0.74	0.71	0.71	0.67	0.67						
60	0.79	0.79	0.75	0.75	0.70	0.70	0.67	0.67				
80	0.88	0.88	0.83	0.83	0.77	0.77	0.72	0.72				
95	0.95	0.95	0.90	0.90	0.82	0.82	0.76	0.76	0.67	0.67		
100	0.98	0.98	0.92	0.92	0.83	0.83	0.78	0.78	0.68	0.68		
105	1.00	1.00	0.94	0.94	0.85	0.85	0.79	0.79	0.68	0.68		
115			0.98	0.98	0.88	0.88	0.82	0.82	0.70	0.70	0.67	0.67
120			1.00	1.00	0.90	0.90	0.83	0.83	0.71	0.71	0.67	0.67
140					0.97	0.97	0.89	0.89	0.75	0.75	0.70	0.70
150					1.00	1.00	0.92	0.92	0.76	0.76	0.72	0.72
180							1.00	1.00	0.82	0.82	0.76	0.76
200									0.85	0.85	0.79	0.79
285									1.00	1.00	0.91	0.91
300											0.93	0.93
345											1.00	1.00

RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE

Size			M6	M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	35	40	50	60	95	115
R (for EI) = 30 minutes								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s,\ fi=30}$	[kN]	0.20	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,p,\ fi=30}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,c,\ fi=30}$	[kN]	1.30	1.80	3.20	5.00	15.70	25.40
SHEAR LOAD								
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60								
	k		1	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=30}$	[kN]	1.00	1.30	1.50	6.00	8.00	15.00
STEEL FAILURE								
Characteristic resistance	$V_{Rk,s,\ fi=30}$	[kN]	0.20	0.40	0.90	1.70	3.10	4.90
R (for EI) = 60 minutes								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s,\ fi=60}$	[kN]	0.20	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,p,\ fi=60}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,c,\ fi=60}$	[kN]	1.30	1.80	3.20	5.00	15.70	25.40
SHEAR LOAD								
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60								
	k		1	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=60}$	[kN]	1.00	1.30	1.50	6.00	8.00	15.00
STEEL FAILURE								
Characteristic resistance	$V_{Rk,s,\ fi=60}$	[kN]	0.20	0.30	0.80	1.30	2.40	3.70

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RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE continued

Size			M6	M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	35	40	50	60	95	115
R (for EI) = 90 minutes								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s,\ fi=90}$	[kN]	0.10	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,p,\ fi=90}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,c,\ fi=90}$	[kN]	1.30	1.80	3.20	5.00	15.70	25.40
SHEAR LOAD								
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60								
	k		1	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=90}$	[kN]	1.00	1.30	1.50	6.00	8.00	15.00
STEEL FAILURE								
Characteristic resistance	$V_{Rk,s,\ fi=90}$	[kN]	0.10	0.30	0.60	1.10	2.00	3.20
R (for EI) = 120 minutes								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s,\ fi=120}$	[kN]	0.10	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,p,\ fi=120}$	[kN]	0.80	1.00	1.20	2.40	3.20	6.00
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60								
Characteristic resistance	$N_{Rk,c,\ fi=120}$	[kN]	1.00	1.40	2.50	4.00	12.60	20.30
SHEAR LOAD								
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60								
	k		1	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=120}$	[kN]	0.80	1.00	1.20	4.80	6.40	12.00
STEEL FAILURE								
Characteristic resistance	$V_{Rk,s,\ fi=120}$	[kN]	0.10	0.20	0.50	0.80	1.60	2.50

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400
Cross section area - tension	A_s	[mm²]	20.1	36.6	58.0	84.3	157.0	245.0
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12	785.40
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12.72	30.16	58.90	101.79	241.27	471.24
Design bending resistance	M	[Nm]	10.18	24.13	47.12	81.43	193.02	376.99

R-HPTII-ZF – Throughbolt for cracked and non-cracked concrete

PRODUCT INFORMATION

R-HPTII-ZF

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Cracked concrete, class C20/25-C50/60 (Option 1 approval)
- Reinforced and unreinforced concrete

APPROVALS AND REPORTS:

- ETA-12/0309 Option 1

FEATURES:

- Through fixing
- Carbon steel, finished in zinc/aluminium flake coating
- Min. coating thickness: 6µm

Size	Product Code	Anchor		Fixture		
		Thread size	Length	Max. thickness		Hole diameter
		d	L	$t_{fix,r}$	$t_{fix,s}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-HPTII-ZF-08065/15	8	65	15	-	9
	R-HPTII-ZF-08080/15	8	80	30	15	9
	R-HPTII-ZF-08085/20	8	85	35	20	9
	R-HPTII-ZF-08100/35	8	100	50	35	9
	R-HPTII-ZF-08115/50	8	115	65	50	9
M10	R-HPTII-ZF-10065/5	10	65	5	-	11
	R-HPTII-ZF-10080/20	10	80	20	-	11
	R-HPTII-ZF-10095/15	10	95	35	15	11
	R-HPTII-ZF-10115/35	10	115	55	35	11
	R-HPTII-ZF-10130/50	10	130	70	50	11
M12	R-HPTII-ZF-12080/5	12	80	5	-	13
	R-HPTII-ZF-12100/5	12	100	25	5	13
	R-HPTII-ZF-12120/25	12	120	45	25	13
	R-HPTII-ZF-12135/40	12	135	60	40	13
	R-HPTII-ZF-12150/55	12	150	75	55	13
M16	R-HPTII-ZF-16100/5	16	100	5	-	18
	R-HPTII-ZF-16105/10	16	105	10	-	18
	R-HPTII-ZF-16140/20	16	140	40	20	18
	R-HPTII-ZF-16160/40	16	160	60	40	18
	R-HPTII-ZF-16180/60	16	180	80	60	18
M20	R-HPTII-ZF-20125/5	20	125	5	-	22
	R-HPTII-ZF-20160/20	20	160	40	20	22

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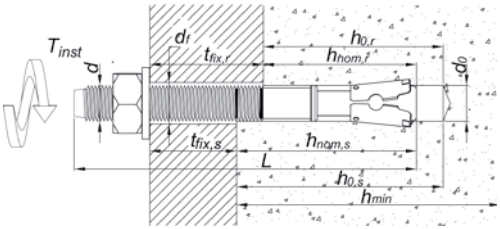
INSTALLATION DATA



Size			M8	M10	M12	M16	M20
Anchor diameter	d	[mm]	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	8	10	12	16	20
Installation torque	T_{inst}	[Nm]	10	20	40	100	180
STANDARD EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,s}$	[mm]	55	69	80	100	119
Installation depth	$h_{nom,s}$	[mm]	55	69	80	100	119
Min. substrate thickness	$h_{min,s}$	[mm]	100	120	140	170	200
Min. spacing (Non-cracked concrete)	$s_{min,s}$	[mm]	50	70	90	160	180
Min. spacing (Cracked concrete)	$s_{min,s}$	[mm]	50	70	90	160	180
Min. edge distance (Non-cracked concrete)	$c_{min,s}$	[mm]	40	50	65	100	120
Min. edge distance (Cracked concrete)	$c_{min,s}$	[mm]	40	45	65	90	100
REDUCED EMBEDMENT DEPTH							
Min. hole depth in substrate	$h_{0,r}$	[mm]	40	49	60	80	100
Installation depth	$h_{nom,r}$	[mm]	40	49	60	80	100
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	130	160
Min. spacing (Non-cracked concrete)	$s_{min,r}$	[mm]	55	75	150	190	300
Min. spacing (Cracked concrete)	$s_{min,r}$	[mm]	55	75	150	190	300
Min. edge distance (Non-cracked concrete)	$c_{min,r}$	[mm]	45	60	100	125	200
Min. edge distance (Cracked concrete)	$c_{min,r}$	[mm]	40	50	80	110	120

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert anchor through fixture into hole and tap until required installation depth is achieved.
4. Tighten to the recommended torque.

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Concrete type		Non-cracked					Cracked				
Size		M8	M10	M12	M16	M20	M8	M10	M12	M16	M20
MEAN ULTIMATE LOAD											
TENSION LOAD $N_{Ru,m}$											
Standard embedment depth	[kN]	12.44	20.63	27.68	45.50	64.80	7.52	12.45	19.93	27.25	41.86
Reduced embedment depth	[kN]	9.55	13.59	17.57	34.50	47.10	4.79	8.58	12.82	26.75	32.66
SHEAR LOAD $V_{Ru,m}$											
Standard embedment depth	[kN]	12.15	19.24	27.95	51.54	80.85	12.15	19.24	27.95	51.54	80.85
Reduced embedment depth	[kN]	12.15	19.24	27.95	51.54	80.85	12.15	19.24	27.95	51.54	80.85
CHARACTERISTIC LOAD											
TENSION LOAD N_{Rk}											
Standard embedment depth	[kN]	9.00	12.00	20.00	35.00	49.60	5.00	9.00	12.00	20.00	30.00
Reduced embedment depth	[kN]	7.50	9.00	12.00	26.40	36.10	3.00	6.00	9.00	16.00	25.80
SHEAR LOAD V_{Rk}											
Standard embedment depth	[kN]	9.00	12.00	23.30	43.00	67.40	5.00	9.00	23.30	40.00	60.00
Reduced embedment depth	[kN]	7.50	9.00	12.00	43.00	67.40	3.00	6.00	9.00	32.00	51.60
DESIGN LOAD											
TENSION LOAD N_{Rd}											
Standard embedment depth	[kN]	5.00	8.00	13.33	23.33	33.07	2.78	6.00	8.00	13.33	20.00
Reduced embedment depth	[kN]	4.17	5.00	8.00	17.60	24.07	1.67	3.33	6.00	10.67	17.20
SHEAR LOAD V_{Rd}											
Standard embedment depth	[kN]	5.00	8.00	18.64	34.40	53.92	2.78	6.00	16.00	26.67	40.00
Reduced embedment depth	[kN]	4.17	5.00	8.00	34.40	48.13	1.67	3.33	6.00	21.33	34.50
RECOMMENDED LOAD*											
TENSION LOAD N_{rec}											
Standard embedment depth	[kN]	3.57	5.71	9.52	16.67	23.62	1.98	4.29	5.71	9.52	14.29
Reduced embedment depth	[kN]	2.98	3.57	5.71	12.57	17.19	1.19	2.38	4.29	7.62	12.29
SHEAR LOAD V_{rec}											
Standard embedment depth	[kN]	3.57	5.71	13.31	24.57	38.51	1.99	4.29	11.43	19.05	28.57
Reduced embedment depth	[kN]	2.98	3.57	5.71	24.57	34.38	1.19	2.38	4.29	15.24	24.64

* partial safety factor 1.4

steel failure
pry-out failure
concrete cone failure

DESIGN PERFORMANCE DATA

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STANDARD EMBEDMENT DEPTH

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	47	59	68	85	99
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	15.80	25.20	37.30	66.10	101.00
Design resistance γ_{Ms}=1.4	$N_{Rd,s}$	[kN]	11.29	18.00	26.64	47.21	72.14
PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	12.00	20.00	35.00	49.60
Design resistance γ_{Mp}=1.8 (M8) / 1.5 (M10-M20)	$N_{Rd,p}$	[kN]	5.00	8.00	13.33	23.33	33.07
PULL-OUT FAILURE; CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	5.00	9.00	12.00	20.00	30.00
Design resistance γ_{Mp}=1.8 (M8) / 1.5 (M10-M20)	$N_{Rd,p}$	[kN]	2.78	6.00	8.00	13.33	20.00
Increasing factors for $N_{Rd,p}$ and $N_{Rd,c}$	C30/37	-	1.12	1.22	1.00	1.14	1.07
	C40/50	-	1.22	1.44	1.00	1.28	1.14
	C50/60	-	1.33	1.67	1.00	1.43	1.21
Spacing	$s_{cr,N}$	[mm]	141	177	204	255	297
Edge distance	$c_{cr,N}$	[mm]	71	89	102	128	149
SHEAR LOAD							
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	40	50	65	100	120
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.03	7.32	10.96	21.08	28.55
Design resistance γ_{Mc}= 1.8 (M8) / 1.5 (M10-M20)	$V_{Rd,c}$	[kN]	2.79	4.88	7.30	14.06	19.03
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	40	45	65	90	100
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	3.56	4.52	7.76	13.01	15.98
Design resistance γ_{Mc}= 1.8 (M8) / 1.5 (M10-M20)	$V_{Rd,c}$	[kN]	1.98	3.01	5.17	8.68	10.65
CONCRETE PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
	k	[-]	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	9.00	12.00	40.00	70.00	99.20
Design resistance γ_{Mc}= 1.8 (M8) / 1.5 (M10-M20)	$V_{Rd,cp}$	[kN]	5.00	8.00	26.67	46.67	66.13
CONCRETE PRY-OUT FAILURE; CRACKED CONCRETE C20/25							
	k	[-]	1	1	2	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	5.00	9.00	24.00	40.00	60.00
Design resistance γ_{Mc}= 1.8 (M8) / 1.5 (M10-M20)	$V_{Rd,cp}$	[kN]	2.78	6.00	16.00	26.67	40.00
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	10.10	16.00	23.30	43.00	67.40
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	8.08	12.80	18.64	34.40	53.92

concrete cone failure $N_{Rk,c}$; $N_{Rd,c}$

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REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40	0.68	0.55								
50	0.78	0.61	0.68	0.53						
65	0.94	0.70	0.80	0.59	0.73	0.56				
70	1.00	0.73	0.84	0.62	0.76	0.58				
80		0.79	0.92	0.66	0.83	0.62				
90		0.86	1.00	0.70	0.91	0.66				
100		0.93		0.75	0.98	0.70	0.83	0.62		
105		0.96		0.77	1.00	0.72	0.86	0.63		
110		1.00		0.80		0.74	0.89	0.65		
120				0.85		0.78	0.95	0.68	0.85	0.61
130				0.90		0.82	1.00	0.71	0.90	0.63
150				1.00		0.91		0.77	1.00	0.68
170						1.00		0.84		0.73
215								1.00		0.85
240										0.93
265										1.00

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for cracked concrete from 'Basic Performance' table

c_N [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40	0.68	0.55								
45	0.73	0.58	0.64	0.51						
50	0.78	0.61	0.68	0.53						
65	0.94	0.70	0.80	0.59	0.73	0.56				
70	1.00	0.73	0.84	0.62	0.76	0.58				
80		0.79	0.92	0.66	0.83	0.62				
90		0.86	1.00	0.70	0.91	0.66	0.78	0.59		
100		0.93		0.75	1.00	0.70	0.83	0.62	0.76	0.56
110		1.00		0.80		0.74	0.89	0.65	0.80	0.58
130				0.90		0.82	1.00	0.71	0.90	0.63
150				1.00		0.91		0.77	1.00	0.68
170						1.00		0.84		0.73
215								1.00		0.85
240										0.93
265										1.00

Tables only valid for one edge$<C_{cr,N}$ and $S \geq S_{cr,N}$. For other cases use the Rawlplug Anchor Calculator.

EDGE DISTANCE (SHEAR)

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M8		M10		M12		M16		M20	
	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}
40	1.00	1.00								
50	1.35	1.35	1.00	1.00						
60	1.58	1.58	1.24	1.24						
65	1.68	1.68	1.31	1.31	1.00	1.00				
70	1.72	1.72	1.38	1.38	1.10	1.10				
80			1.52	1.52	1.32	1.32				
88			1.56	1.56	1.49	1.49				
100					1.77	1.71	1.00	1.00		
120					2.27	2.00	1.27	1.24	1.00	1.00
130					2.53	2.14	1.41	1.32	1.11	1.11
158						2.53	1.83	1.55	1.43	1.32
195							2.44	1.86	1.90	1.57
260								2.38	2.79	2.00
265								2.42		2.03
340										2.52
385										2.81

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for cracked concrete from 'Design Performance' table

c_V [mm]	M8		M10		M12		M16		M20	
	h≥1.5c_V	h_{min}	h≥ 1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥ 1.5c_V	h_{min}	h≥ 1.5c_V	h_{min}
40	0.96	0.96								
45	1.03	1.03	1.00	1.00						
50	1.10	1.10	1.15	1.15						
65	1.32	1.32	1.59	1.59	1.00	1.00				
70	1.35	1.35	1.67	1.67	1.10	1.10				
75			1.76	1.76	1.21	1.21				
80			1.84	1.84	1.32	1.32				
90			1.97	1.97	1.54	1.54	1.00	1.00		
100					1.77	1.71	1.15	1.15	1.00	1.00
130					2.53	2.14	1.62	1.52	1.40	1.40
150					3.07	2.42	1.96	1.71	1.69	1.60
195						3.04	2.80	2.13	2.40	1.98
210							3.09	2.27	2.65	2.11
270								2.82	3.72	2.61
295								3.05		2.82
410										3.75

Tables only valid for one edge$>C_{min}$ and $S \geq 3C_V$. For other cases use the Rawlplug Anchor Calculator.

SPACING

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

S [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
50	0.68	0.61								
70	0.75	0.66	0.70	0.62						
90	0.82	0.70	0.75	0.65	0.72	0.63				
100	0.85	0.73	0.78	0.67	0.75	0.65				
110	0.89	0.75	0.81	0.68	0.77	0.66				
140	1.00	0.82	0.90	0.73	0.84	0.71				
160		0.86	0.95	0.77	0.89	0.74	0.81	0.69		
180		0.91	1.00	0.80	0.94	0.76	0.85	0.71	0.80	0.67
205		0.97		0.84	1.00	0.80	0.90	0.74	0.85	0.69
220		1.00		0.87		0.82	0.93	0.76	0.87	0.71
225				0.88		0.83	0.94	0.76	0.88	0.71
240				0.90		0.85	0.97	0.78	0.90	0.73
255				0.93		0.88	1.00	0.80	0.93	0.74
300				1.00		0.94		0.85	1.00	0.78
340						1.00		0.90		0.82
380								0.94		0.86
430								1.00		0.91
530										1.00

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for cracked concrete from 'Basic Performance' table

S [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
50	0.68	0.61								
70	0.75	0.66	0.70	0.62						
80	0.78	0.68	0.73	0.63						
90	0.82	0.70	0.75	0.65	0.72	0.63				
100	0.85	0.73	0.78	0.67	0.75	0.65				
140	1.00	0.82	0.90	0.73	0.84	0.71				
150		0.84	0.92	0.75	0.87	0.72				
160		0.86	0.95	0.77	0.89	0.74	0.81	0.69		
180		0.91	1.00	0.80	0.94	0.76	0.85	0.71	0.80	0.67
205		0.97		0.84	1.00	0.80	0.90	0.74	0.85	0.69
220		1.00		0.87		0.82	0.93	0.76	0.87	0.71
240				0.90		0.85	0.97	0.78	0.90	0.73
255				0.93		0.88	1.00	0.80	0.93	0.74
300				1.00		0.94		0.85	1.00	0.78
340						1.00		0.90		0.82
400								0.97		0.88
430								1.00		0.91
530										1.00

Tables only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$. For other cases use the Rawlplug Anchor Calculator.

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REDUCED EMBEDMENT DEPTH

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	32	39	48	65	80
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s}$	[kN]	15.80	25.20	37.30	66.10	101.00
Design resistance γ_{Ms}=1.4	$N_{Rd,s}$	[kN]	11.29	18.00	26.64	47.21	72.14
PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	7.50	9.00	12.00	26.40	36.10
Design resistance γ_{Mp}=1.8 (M8-M10) / 1.5 (M12-M20)	$N_{Rd,p}$	[kN]	4.17	5.00	8.00	17.60	24.07
PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	3.00	6.00	9.00	16.00	25.80
Design resistance γ_{Mp}=1.8 (M8-M10) / 1.5 (M12-M20)	$N_{Rd,p}$	[kN]	1.67	3.33	6.00	10.67	17.20
Increasing factors for $N_{Rd,p}$ and $N_{Rd,c}$	C30/37	-	1.20	1.16	1.22	1.11	1.12
	C40/50	-	1.40	1.33	1.44	1.22	1.26
	C50/60	-	1.60	1.50	167	1.33	1.39
Spacing	$s_{cr,N}$	[mm]	96	117	144	195	240
Edge distance	$c_{cr,N}$	[mm]	48	59	72	98	120
SHEAR LOAD							
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	45	60	100	125	200
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.52	8.67	18.36	27.01	54.09
Design resistance γ_{Mc}=1.8 (M8-M10) / 1.5 (M12-M20)	$V_{Rd,c}$	[kN]	3.07	4.82	12.24	18.01	36.06
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25							
Edge distance	c_1	[mm]	40	50	80	110	120
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	3.33	4.80	9.61	16.12	19.38
Design resistance γ_{Mc}=1.8 (M8-M10) / 1.5 (M12-M20)	$V_{Rd,c}$	[kN]	1.85	2.67	6.41	10.75	12.92
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
	k	[-]	1	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	7.50	9.00	12.00	52.80	72.20
Design resistance γ_{Mc}=1.8 (M8-M10) / 1.5 (M12-M20)	$V_{Rd,cp}$	[kN]	4.17	5.00	8.00	35.20	48.13
PRY-OUT FAILURE; CRACKED CONCRETE C20/25							
	k	[-]	1	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	3.00	6.00	9.00	32.00	51.60
Design resistance γ_{Mc}=1.8 (M8-M10) / 1.5 (M12-M20)	$V_{Rd,cp}$	[kN]	1.67	3.33	6.00	21.33	34.40
STEEL FAILURE							
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	10.10	16.00	23.30	43.00	67.40
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	8.08	12.80	18.64	34.40	53.92

concrete cone failure $N_{Rk,c}$; $N_{Rd,c}$

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REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
45	0.95	0.66								
50	1.00	0.70								
60		0.78	1.00	0.70						
70		0.86		0.77						
85		1.00		0.88						
100				1.00	1.00	0.85				
125						1.00	1.00	0.83		
140								0.90		
150								0.95		
160								1.00		
200									1.00	0.98
205										1.00

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for cracked concrete from 'Basic Performance' table

c_N [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40	0.87	0.62								
45	0.95	0.66								
50	1.00	0.70	0.89	0.64						
60		0.78	1.00	0.70						
80		0.95		0.85	1.00	0.73				
85		1.00		0.88		0.76				
100				1.00		0.85				
110						0.91	1.00	0.76		
120						0.97		0.81	1.00	0.69
125						1.00		0.83		0.71
160								1.00		0.83
180										0.90
200										0.98
205										1.00

Tables only valid for one edge$<C_{cr,N}$ and $S \geq S_{cr,N}$. For other cases use the Rawlplug Anchor Calculator.

valid for s ≥ETA s for c_{min}

EDGE DISTANCE (SHEAR)

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M8		M10		M12		M16		M20	
	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}
45	1.00	1.00								
50	1.15	1.15								
55	1.32	1.32								
60			1.00	1.00						
100					0.65	0.65				
125							1.00	0.83		
150							1.28	0.97		
200							1.89	1.25	1.00	0.73
220								1.35	1.14	0.79
247								1.50	1.33	0.87
280								1.67		0.98
320								1.89		1.10
380										1.27
400										1.33

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for cracked concrete from 'Design Performance' table

c_V [mm]	M8		M10		M12		M16		M20	
	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}
40	0.90	0.90								
50			1.00	1.00						
55			1.14	1.14						
60			1.14	1.14						
80					0.94	0.94				
110							1.00	0.89		
120							1.12	0.95	1.00	0.94
150							1.52	1.15	1.34	1.13
180							1.95	1.35	1.72	1.32
200								1.48	1.98	1.44
245								1.77	2.60	1.72
270								1.93		1.87
350										2.34
400										2.64

Tables only valid for one edge$>C_{min}$ and $S \geq 3C_V$. For other cases use the Rawlplug Anchor Calculator.

SPACING

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

S [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
55	0.79	0.66								
65	0.84	0.69								
75	0.89	0.72	0.82	0.69						
85	0.94	0.75	0.86	0.71						
95	1.00	0.78	0.91	0.74						
100		0.79	0.93	0.75						
120		0.85	1.00	0.80						
140		0.91		0.85						
150		0.94		0.88	1.00	0.80				
170		1.00		0.93		0.84				
190				0.98		0.88	0.99	0.80		
195				0.99		0.89	1.00	0.80		
200				1.00		0.90		0.81		
250						1.00		0.89		
300								0.97	1.00	0.87
320								1.00		0.89
380										0.96
410										1.00

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for cracked concrete from 'Basic Performance' table

S [mm]	M8		M10		M12		M16		M20	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
55	0.79	0.66								
75	0.89	0.72	0.82	0.69						
80	0.92	0.74	0.84	0.70						
95	1.00	0.78	0.91	0.74						
100		0.79	0.93	0.75						
120		0.85	1.00	0.80						
150		0.94		0.88	1.00	0.80				
170		1.00		0.93		0.84				
180				0.95		0.86				
190				0.98		0.88	0.99	0.80		
195				0.99		0.89	1.00	0.80		
200				1.00		0.90		0.81		
250						1.00		0.89		
260								0.91		
280								0.94		
300								0.97	1.00	0.87
320								1.00		0.89
410										1.00

Tables only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$. For other cases use the Rawlplug Anchor Calculator.

valid for c ≥ETA c for s_{min}

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RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - STANDARD EMBEDMENT DEPTH

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	47	59	68	85	99
R (for EI) = 30 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=30}$	[kN]	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=30}$	[kN]	1.30	2.30	3.00	5.00	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=30}$	[kN]	2.70	4.80	6.90	12.00	17.60
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=30}$	[kN]	1.30	2.30	6.00	10.00	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=30}$	[kN]	0.40	0.90	1.70	3.10	4.90
R (for EI) = 60 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=60}$	[kN]	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=60}$	[kN]	1.30	2.30	3.00	5.00	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=60}$	[kN]	2.70	4.80	6.90	12.00	17.60
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=60}$	[kN]	1.30	2.30	6.00	10.00	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=60}$	[kN]	0.30	0.80	1.30	2.40	3.70

RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - STANDARD EMBEDMENT DEPTH
continued

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	47	59	68	85	99
R (for EI) = 90 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=90}$	[kN]	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=90}$	[kN]	1.30	2.30	3.00	5.00	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=90}$	[kN]	2.70	4.80	6.90	12.00	17.60
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=90}$	[kN]	1.30	2.30	6.00	10.00	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=90}$	[kN]	0.30	0.60	1.10	2.00	3.20
R (for EI) = 120 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=120}$	[kN]	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=120}$	[kN]	1.00	1.80	2.40	4.00	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=120}$	[kN]	2.20	3.90	5.50	9.60	14.00
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	2	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=120}$	[kN]	1.00	1.80	4.80	8.00	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=120}$	[kN]	0.20	0.50	0.80	1.60	2.50

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RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - REDUCED EMBEDMENT DEPTH

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	32	39	48	65	80
R (for EI) = 30 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=30}$	[kN]	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=30}$	[kN]	0.80	1.50	2.30	4.00	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=30}$	[kN]	1.00	1.70	2.90	6.10	10.30
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=30}$	[kN]	0.80	1.50	2.30	8.00	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=30}$	[kN]	0.40	0.90	1.70	3.10	4.90
R (for EI) = 60 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=60}$	[kN]	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=60}$	[kN]	0.80	1.50	2.30	4.00	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=60}$	[kN]	1.00	1.70	2.90	6.10	10.30
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=60}$	[kN]	0.80	1.50	2.30	8.00	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=60}$	[kN]	0.30	0.80	1.30	2.40	3.70

RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - REDUCED EMBEDMENT DEPTH
continued

Size			M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	32	39	48	65	80
R (for EI) = 90 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=90}$	[kN]	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=90}$	[kN]	0.80	1.50	2.30	4.00	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=90}$	[kN]	1.00	1.70	2.90	6.10	10.30
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=90}$	[kN]	0.80	1.50	2.30	8.00	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=90}$	[kN]	0.30	0.60	1.10	2.00	3.20
R (for EI) = 120 minutes							
TENSION LOAD							
STEEL FAILURE							
Characteristic resistance	$N_{Rk,s,\ fi=120}$	[kN]	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,p,\ fi=120}$	[kN]	0.60	1.20	1.80	3.20	-
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60							
Characteristic resistance	$N_{Rk,c,\ fi=120}$	[kN]	0.80	1.40	2.30	4.90	8.20
SHEAR LOAD							
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60							
	k		1	1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=120}$	[kN]	0.60	1.20	1.80	6.40	-
STEEL FAILURE							
Characteristic resistance	$V_{Rk,s,\ fi=120}$	[kN]	0.20	0.50	0.80	1.60	2.50

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MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20
Nominal ultimate strength - tension	f_{uk}	[N/mm^2]	620	620	620	620	620
Nominal ultimate strength - shear	f_{uk}	[N/mm^2]	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm^2]	533.2	533.2	533.2	533.2	533.2
Nominal yield strength - shear	f_{yk}	[N/mm^2]	416	416	416	416	416
Cross section area - tension	A_s	[mm^2]	25.5	40.7	60.1	106.6	162.9
Cross section area - shear	A_s	[mm^2]	38.9	61.7	89.6	165.2	259.1
Elastic section modulus	W_{el}	[mm^3]	34.3	68.3	119.6	299.5	588.3
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19.0	38.0	67.0	167.0	328.0
Design bending resistance	M	[Nm]	15.2	30.4	53.6	133.6	262.4

R-HPTII-A4 – Throughbolt for cracked and non-cracked concrete

PRODUCT INFORMATION

R-HPTII-A4

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Cracked concrete, class C20/25-C50/60 (Option 1 approval)
- Reinforced and unreinforced concrete

APPROVALS AND REPORTS:

- ETA-12/0021 Option 1

FEATURES:

- Through fixing
- ETAG 001 - Option 1
- Fire reaction class A1 (acc. to 96/603/EC Directive)
- Stainless steel grade A4 (1.4587)
- Suitable in corrosion categories C1, C2 and C3 according to EN ISO 12944-2:2001

Size	Product Code	Anchor		Fixture		
		Thread size	Length	Max. thickness		Hole diameter
		d	L	$t_{fix,r}$	$t_{fix,s}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-HPTII-A4-08060/10	8	60	10	-	9
	R-HPTII-A4-08075/10	8	75	25	10	9
	R-HPTII-A4-08085/20	8	85	35	20	9
	R-HPTII-A4-08095/30	8	95	45	30	9
	R-HPTII-A4-08105/40	8	105	55	40	9
	R-HPTII-A4-08115/50	8	115	65	50	9
M10	R-HPTII-A4-10065/5	10	65	5	-	11
	R-HPTII-A4-10080/20	10	80	20	-	11
	R-HPTII-A4-10095/15	10	95	35	15	11
	R-HPTII-A4-10115/35	10	115	55	35	11
	R-HPTII-A4-10130/50	10	130	70	50	11
	R-HPTII-A4-10140/60	10	140	80	60	11
M12	R-HPTII-A4-12080/5	12	80	5	-	13
	R-HPTII-A4-12100/5	12	100	25	5	13
	R-HPTII-A4-12125/30	12	125	50	30	13
	R-HPTII-A4-12150/55	12	150	75	55	13
	R-HPTII-A4-12180/85	12	180	105	85	13
M16	R-HPTII-A4-16125/5	16	125	25	5	18
	R-HPTII-A4-16140/20	16	140	40	20	18
	R-HPTII-A4-16150/30	16	150	50	30	18
	R-HPTII-A4-16180/60	16	180	80	60	18

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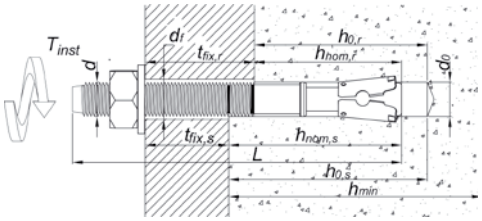
INSTALLATION DATA



Size			M8	M10	M12	M16
Anchor diameter	d	[mm]	8	10	12	16
Hole diameter in substrate	d_0	[mm]	8	10	12	16
Installation torque	T_{inst}	[Nm]	15	30	50	100
STANDARD EMBEDMENT DEPTH						
Min. hole depth in substrate	$h_{0,s}$	[mm]	55	69	80	100
Installation depth	$h_{nom,s}$	[mm]	55	69	80	100
Min. substrate thickness	$h_{min,s}$	[mm]	100	120	140	170
Min. spacing (Non-cracked concrete)	$s_{min,s}$	[mm]	55	70	90	135
Min. edge distance (Non-cracked concrete)	$c_{min,s}$	[mm]	40	50	55	80
Min. spacing (Cracked concrete)	$s_{min,s}$	[mm]	55	70	90	135
Min.edge distance (Cracked concrete)	$c_{min,s}$	[mm]	40	45	55	70
REDUCED EMBEDMENT DEPTH						
Min. hole depth in substrate	$h_{0,r}$	[mm]	40	49	60	80
Installation depth	$h_{nom,r}$	[mm]	40	49	60	80
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	130
Min. spacing (Non-cracked concrete)	$s_{min,r}$	[mm]	50	70	120	150
Min. edge distance (Non-cracked concrete)	$c_{min,r}$	[mm]	50	70	95	100
Min. spacing (Cracked concrete)	$s_{min,r}$	[mm]	50	70	120	150
Min. edge distance (Cracked concrete)	$c_{min,r}$	[mm]	40	50	70	85

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert anchor through fixture into hole and tap until required installation depth is achieved.
4. Tighten to the recommended torque.

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Concrete type		Non-cracked				Cracked			
Size		M8	M10	M12	M16	M8	M10	M12	M16
MEAN ULTIMATE LOAD									
TENSION LOAD $N_{Ru,m}$									
Standard embedment depth	[kN]	15.39	22.77	29.21	55.78	9.71	11.45	18.61	30.43
Reduced embedment depth	[kN]	10.39	16.01	22.09	37.90	5.55	9.76	13.37	22.21
SHEAR LOAD $V_{Ru,m}$									
Standard embedment depth	[kN]	14.00	22.20	29.60	54.50	14.00	22.20	29.60	54.50
Reduced embedment depth	[kN]	14.00	19.20	29.60	54.50	14.00	19.20	29.60	54.50
CHARACTERISTIC LOAD									
TENSION LOAD N_{Rk}									
Standard embedment depth	[kN]	9.00	16.00	25.00	39.50	6.00	9.00	12.00	25.00
Reduced embedment depth	[kN]	7.50	12.00	16.80	26.40	3.00	7.50	9.00	16.00
SHEAR LOAD V_{Rk}									
Standard embedment depth	[kN]	11.70	18.50	24.60	45.40	6.00	9.00	24.00	45.40
Reduced embedment depth	[kN]	11.70	14.70	24.60	45.40	3.00	7.50	9.00	32.00
DESIGN LOAD									
TENSION LOAD N_{Rd}									
Standard embedment depth	[kN]	5.00	10.67	16.67	26.33	3.33	6.00	8.00	16.67
Reduced embedment depth	[kN]	4.17	6.67	11.20	17.60	1.67	4.17	6.00	10.67
SHEAR LOAD V_{Rd}									
Standard embedment depth	[kN]	9.36	14.80	19.68	36.32	3.33	6.00	16.00	33.33
Reduced embedment depth	[kN]	9.36	8.17	19.68	36.32	1.67	4.17	6.00	21.33
RECOMMENDED LOAD*									
TENSION LOAD N_{rec}									
Standard embedment depth	[kN]	3.57	7.62	11.90	18.81	2.38	4.29	5.71	11.90
Reduced embedment depth	[kN]	2.98	4.76	8.00	12.57	1.19	2.98	4.29	7.62
SHEAR LOAD V_{rec}									
Standard embedment depth	[kN]	6.69	10.57	14.06	25.94	2.38	4.29	11.43	23.81
Reduced embedment depth	[kN]	6.69	5.83	14.06	25.94	1.19	2.98	4.29	15.24

* partial safety factor 1.4

steel failure
pry-out failure
concrete cone failure

DESIGN PERFORMANCE DATA

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STANDARD EMBEDMENT DEPTH

Size			M8	M10	M12	M16
Embedment depth	h_{ef}	[mm]	47	59	68	85
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	21.20	33.60	44.80	82.60
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	14.13	22.40	29.87	55.07
PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	9.00	16.00	25.00	39.50
Design resistance γ_{Mp}=1.8 (M8) / 1.5 (M10-M16)	$N_{Rd,p}$	[kN]	5.00	10.67	16.67	26.33
PULL-OUT FAILURE; CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	6.00	9.00	12.00	25.00
Design resistance γ_{Mp}=1.8 (M8) / 1.5 (M10-M16)	$N_{Rd,p}$	[kN]	3.33	6.00	8.00	16.67
Increasing factors for $N_{Rd,p}$ and $N_{Rd,c}$	C30/37	-	1.16	1.26	1.23	1.18
	C40/50	-	1.33	1.52	1.45	1.37
	C50/60	-	1.50	1.78	1.67	1.55
Spacing	$s_{cr,N}$	[mm]	141	177	204	255
Edge distance	$c_{cr,N}$	[mm]	71	89	102	128
SHEAR LOAD						
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25						
Edge distance	c_1	[mm]	40	50	55	80
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.03	7.32	8.81	15.77
Design resistance γ_{Mc}=1.8 (M8) /1.5 (M10-M16)	$V_{Rd,c}$	[kN]	2.79	4.88	5.87	10.51
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25						
Edge distance	c_1	[mm]	40	45	55	70
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	3.56	4.52	6.24	9.41
Design resistance γ_{Mc}=1.8 (M8) /1.5 (M10-M16)	$V_{Rd,c}$	[kN]	1.98	3.01	4.16	6.27
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25						
	k	[-]	-	-	-	-
Characteristic resistance	$V_{Rk,cp}$	[kN]	-	-	-	-
Design resistance γ_{Mc}=1.8 (M8) /1.5 (M10-M16)	$V_{Rd,cp}$	[kN]	-	-	-	-
PRY-OUT FAILURE; CRACKED CONCRETE C20/25						
	k	[-]	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	6.00	9.00	24.00	50.00
Design resistance γ_{Mc}=1.8 (M8) /1.5 (M10-M16)	$V_{Rd,cp}$	[kN]	3.33	6.00	16.00	33.33
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	11.70	18.50	24.60	45.40
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	9.36	14.80	19.68	36.32

concrete cone failure $N_{Rk,c}$; $N_{Rd,c}$

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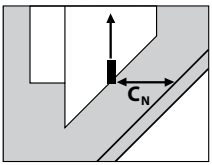
REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)



Tables only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

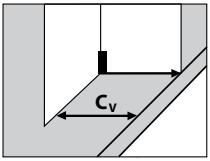
Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

C_N [mm]	M8		M10		M12		M16	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40	0.68	0.53						
50	0.78	0.58	0.68	0.53				
60	0.88	0.64	0.76	0.57	0.70	0.55		
70	1.00	0.69	0.84	0.62	0.76	0.58		
75		0.72	0.88	0.64	0.80	0.60		
80		0.75	0.92	0.66	0.83	0.62	0.72	0.56
90		0.81	1.00	0.70	0.91	0.66	0.78	0.59
100		0.87		0.75	0.98	0.70	0.83	0.62
110		0.93		0.80		0.74	0.89	0.65
120		1.00		0.85		0.78	0.95	0.68
130				0.90		0.82	1.00	0.71
150				1.00		0.91		0.77
170						1.00		0.84
215								1.00

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for cracked concrete from 'Basic Performance' table

C_N [mm]	M8		M10		M12		M16	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40	0.68	0.53						
45	0.73	0.56	0.64	0.51				
55	0.83	0.61	0.72	0.55	0.66	0.53		
65	0.94	0.66	0.80	0.59	0.73	0.56		
70	1.00	0.69	0.84	0.62	0.76	0.58	0.67	0.53
75		0.72	0.88	0.64	0.80	0.60	0.70	0.54
90		0.81	1.00	0.70	0.91	0.66	0.78	0.59
100		0.87		0.75	0.98	0.70	0.83	0.62
110		0.93		0.80	1.00	0.74	0.89	0.65
120		1.00		0.85		0.78	0.95	0.68
130				0.90		0.82	1.00	0.71
150				1.00		0.91		0.77
170						1.00		0.84
215								1.00

EDGE DISTANCE (SHEAR)



Tables only valid for one edge $>C_{min}$ and $S \geq 3C_V$
For other cases use the Rawlplug Anchor Calculator

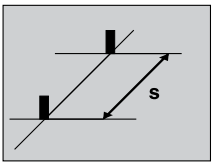
Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

C_V [mm]	M8		M10		M12		M16	
	h≥ $1.5c_V$	h_{min}	h≥ $1.5c_V$	h_{min}	h≥ $1.5c_V$	h_{min}	h≥ $1.5c_V$	h_{min}
40	1.00	1.00						
50	1.35	1.35	1.00	1.00				
60	1.72	1.72	1.27	1.27	1.12	1.12		
70	2.13	2.08	1.56	1.56	1.37	1.37		
75	2.34	2.20	1.71	1.71	1.50	1.50		
80	2.55	2.33	1.87	1.87	1.64	1.64	1.00	1.00
95	3.23	2.71	2.36	2.17	2.06	2.04	1.25	1.25
100		2.84	2.53	2.26	2.20	2.13	1.34	1.34
114		3.18	3.02	2.53	2.63	2.38	1.59	1.59
120		3.33		2.65	2.82	2.49	1.70	1.65
135				2.94	3.31	2.75	1.99	1.82
140				3.03		2.84	2.09	1.88
165						3.27	2.60	2.16
200							3.37	2.54
250								3.08
280								3.40

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for cracked concrete from 'Design Performance' table

C_V [mm]	M8		M10		M12		M16	
	h≥ $1.5c_V$	h_{min}	h≥ $1.5c_V$	h_{min}	h≥ $1.5c_V$	h_{min}	h≥ $1.5c_V$	h_{min}
40	1.00	1.00						
45	1.17	1.17	1.00	1.00				
59	1.47	1.47	1.43	1.43	1.10	1.10		
70	1.68	1.68	1.67	1.67	1.37	1.37	1.00	1.00
75			1.76	1.76	1.50	1.50	1.09	1.09
80			1.84	1.84	1.64	1.64	1.19	1.19
90			1.97	1.97	1.91	1.91	1.38	1.38
100					2.20	2.13	1.59	1.59
105					2.35	2.22	1.69	1.69
115					2.66	2.40	1.91	1.89
150					3.82	3.01	2.72	2.36
198						3.84	3.95	2.99
245							5.28	3.59
280								4.03
320								4.53
380								5.28

SPACING



Tables only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M8		M10		M12		M16	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
55	0.70	0.61						
70	0.75	0.65	0.70	0.62				
80	0.78	0.67	0.73	0.63				
90	0.82	0.69	0.75	0.65	0.72	0.63		
100	0.85	0.71	0.78	0.67	0.75	0.65		
115	0.91	0.74	0.82	0.69	0.78	0.67		
125	0.94	0.76	0.85	0.71	0.81	0.68		
135	0.98	0.78	0.88	0.73	0.83	0.70	0.76	0.66
140	1.00	0.79	0.90	0.73	0.84	0.71	0.77	0.66
180		0.88	1.00	0.80	0.94	0.76	0.85	0.71
200		0.92		0.83	0.99	0.79	0.89	0.73
205		0.93		0.84	1.00	0.80	0.90	0.74
220		0.96		0.87		0.82	0.93	0.76
240		1.00		0.90		0.85	0.97	0.78
255				0.93		0.88	1.00	0.80
300				1.00		0.94		0.85
340						1.00		0.90
430								1.00

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for cracked concrete from 'Basic Performance' table

s [mm]	M8		M10		M12		M16	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
55	0.70	0.61						
70	0.75	0.65	0.70	0.62				
80	0.78	0.67	0.73	0.63				
90	0.82	0.69	0.75	0.65	0.72	0.63		
100	0.85	0.71	0.78	0.67	0.75	0.65		
135	0.98	0.78	0.88	0.73	0.83	0.70	0.76	0.66
140	1.00	0.79	0.90	0.73	0.84	0.71	0.77	0.66
150		0.81	0.92	0.75	0.87	0.72	0.79	0.67
160		0.83	0.95	0.77	0.89	0.74	0.81	0.69
180		0.88	1.00	0.80	0.94	0.76	0.85	0.71
200		0.92		0.83	0.99	0.79	0.89	0.73
205		0.93		0.84	1.00	0.80	0.90	0.74
220		0.96		0.87		0.82	0.93	0.76
240		1.00		0.90		0.85	0.97	0.78
255				0.93		0.88	1.00	0.80
300				1.00		0.94		0.85
340						1.00		0.90
430								1.00

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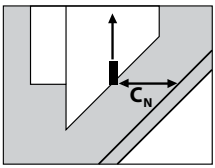
REDUCED EMBEDMENT DEPTH

Size			M8	M10	M12	M16
Embedment depth	h_{ef}	[mm]	32	39	48	65
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s}$	[kN]	21.20	33.60	44.80	82.60
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	14.13	22.40	29.87	55.07
PULL-OUT AND CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	7.50	12.00	16.80	26.40
Design resistance γ_{Mp}=1.8 (M8-M10) /1.5 (M12-M16)	$N_{Rd,p}$	[kN]	4.17	6.67	11.20	17.60
PULL-OUT FAILURE; CRACKED CONCRETE C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	3.00	7.50	9.00	16.00
Design resistance γ_{Mp}=1.8 (M8-M10) /1.5 (M12-M16)	$N_{Rd,p}$	[kN]	1.67	4.17	6.00	10.67
Increasing factors for $N_{Rd,p}$ and $N_{Rd,c}$	C30/37	-	1.07	1.07	1.16	1.18
	C40/50	-	1.13	1.13	1.32	1.37
	C50/60	-	1.20	1.20	1.49	1.55
Spacing	$s_{cr,N}$	[mm]	96	117	144	195
Edge distance	$c_{cr,N}$	[mm]	48	59	72	98
SHEAR LOAD						
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25						
Edge distance	c_1	[mm]	50	70	95	100
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	6.37	10.70	17.12	20.04
Design resistance γ_{Mc}=1.8 (M8-M10) /1.5 (M12-M16)	$V_{Rd,c}$	[kN]	3.54	5.94	11.42	13.36
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25						
Edge distance	c_1	[mm]	40	50	70	85
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	3.33	4.80	8.03	11.45
Design resistance γ_{Mc}=1.8 (M8-M10) /1.5 (M12-M16)	$V_{Rd,c}$	[kN]	1.85	2.67	5.35	7.63
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25						
	k	[-]	-	1.20	-	-
Characteristic resistance	$V_{Rk,cp}$	[kN]	-	14.70	-	-
Design resistance γ_{Mc}=1.8 (M8-M10) /1.5 (M12-M16)	$V_{Rd,cp}$	[kN]	-	8.17	-	-
PRY-OUT FAILURE; CRACKED CONCRETE C20/25						
	k	[-]	1	1	1	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	3.00	7.50	9.00	32.00
Design resistance γ_{Mc}=1.8 (M8-M10) /1.5 (M12-M16)	$V_{Rd,cp}$	[kN]	1.67	4.17	6.00	21.33
STEEL FAILURE						
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	11.70	18.50	24.60	45.40
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	9.36	14.80	19.68	36.32

concrete cone failure $N_{Rk,c}$; $N_{Rd,c}$

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)



Tables only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

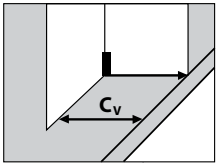
Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N [mm]	M8		M10		M12		M16	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
40								
50	1.00	0.72						
55		0.76						
70		0.90	1.00	0.77				
75		0.95		0.81				
80		1.00		0.85				
95				0.96	1.00	0.82		
100				1.00		0.85	1.00	0.72
110						0.91		0.76
125						1.00		0.83
130								0.86
140								0.90
150								0.95
160								1.00

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for cracked concrete from 'Basic Performance' table

c_N [mm]	M8		M10		M12		M16	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
40	0.87	0.64						
45	0.95	0.68						
50	1.00	0.72	0.89	0.64				
55		0.76	0.95	0.67				
60		0.81	1.00	0.70				
70		0.90		0.77	0.98	0.68		
75		0.95		0.81	1.00	0.70		
80		1.00		0.85		0.73		
85				0.88		0.76	0.90	0.66
95				0.96		0.82	0.98	0.70
100				1.00		0.85	1.00	0.72
125						1.00		0.83
140								0.90
160								1.00

EDGE DISTANCE (SHEAR)



Tables only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

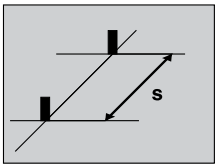
Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M8		M10		M12		M16	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
50	1.00	1.00						
60	1.28	1.28						
70	1.59	1.55	1.00	1.00				
80	1.91	1.75	1.20	1.20				
85	2.08	1.84	1.30	1.30				
95	2.43	2.04			1.00	1.00		
100	2.61	2.13			1.07	0.88	1.00	1.00
110		2.32			1.22	0.95	1.14	1.14
125		2.61			1.46	1.06	1.35	1.12
140					1.70	1.17	1.57	1.24
150						1.25	1.72	1.31
160						1.32	1.88	1.38
175						1.43	2.13	1.50
210						1.68	2.73	1.75
250								2.04
340								2.68

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for cracked concrete from 'Design Performance' table

c_V [mm]	M8		M10		M12		M16	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
40	0.90	0.90						
50			1.00	1.00				
60			1.28	1.28				
65			1.43	1.43				
70			1.58	1.58	1.00	1.00		
75					1.10	1.10		
85							1.00	1.00
90							1.08	1.08
95							1.16	1.16
100							1.24	1.24
120							1.58	1.34
150							2.14	1.63
180							2.74	1.90
200								2.08
220								2.26
275								2.76

SPACING



Tables only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M8		M10		M12		M16	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
50	0.76	0.66						
55	0.79	0.67						
60	0.81	0.69						
70	0.86	0.72	0.80	0.68				
80	0.92	0.75	0.84	0.70				
90	0.97	0.78	0.88	0.73				
100	1.00	0.81	0.93	0.75				
110		0.84	0.97	0.78				
120		0.88	1.00	0.80	0.92	0.74		
130		0.91		0.83	0.95	0.76		
145		0.95		0.86	1.00	0.79		
150		0.97		0.88		0.80	0.88	0.73
160		1.00		0.90		0.82	0.91	0.75
180				0.95		0.86	0.96	0.78
195				0.99		0.89	1.00	0.80
200				1.00		0.90		0.81
250						1.00		0.89
320								1.00

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for cracked concrete from 'Basic Performance' table

s [mm]	M8		M10		M12		M16	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
50	0.76	0.66						
60	0.81	0.69						
70	0.86	0.72	0.80	0.68				
80	0.92	0.75	0.84	0.70				
90	0.97	0.78	0.88	0.73				
100	1.00	0.81	0.93	0.75				
110		0.84	0.97	0.78				
120		0.88	1.00	0.80	0.92	0.74		
140		0.94		0.85	0.99	0.78		
145		0.95		0.86	1.00	0.79		
150		0.97		0.88		0.80	0.88	0.73
160		1.00		0.90		0.82	0.91	0.75
170				0.93		0.84	0.94	0.77
180				0.95		0.86	0.96	0.78
195				0.99		0.89	1.00	0.80
200				1.00		0.90		0.81
250						1.00		0.89
320								1.00

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RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - STANDARD EMBEDMENT DEPTH

Size			M8	M10	M12	M16
Embedment depth	h_{ef}	[mm]	47	59	68	85
R (for EI) = 30 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=30}$	[kN]	0.70	1.50	2.50	4.70
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=30}$	[kN]	1.50	2.30	3.00	6.30
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=30}$	[kN]	2.70	4.80	6.90	12.00
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=30}$	[kN]	1.50	2.30	6.00	12.60
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=30}$	[kN]	0.70	1.50	2.50	4.70
R (for EI) = 60 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=60}$	[kN]	0.60	1.20	2.10	3.90
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=60}$	[kN]	1.50	2.30	3.00	6.30
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=60}$	[kN]	2.70	4.80	6.90	12.00
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=60}$	[kN]	1.50	2.30	6.00	12.60
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=60}$	[kN]	0.60	1.20	2.10	3.90

RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - STANDARD EMBEDMENT DEPTH
continued

Size			M8	M10	M12	M16
Embedment depth	h_{ef}	[mm]	47	59	68	85
R (for EI) = 90 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=90}$	[kN]	0.40	0.90	1.70	3.10
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=90}$	[kN]	1.50	2.30	3.00	6.30
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=90}$	[kN]	2.70	4.80	6.90	12.00
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=90}$	[kN]	1.50	2.30	6.00	12.60
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=90}$	[kN]	0.40	0.90	1.70	3.10
R (for EI) = 120 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=120}$	[kN]	0.40	0.80	1.30	2.50
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=120}$	[kN]	1.20	1.80	2.40	5.00
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=120}$	[kN]	2.20	3.90	5.50	9.60
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	2	2
Characteristic resistance	$V_{Rk,cp,\ fi=120}$	[kN]	1.20	1.80	4.80	10.00
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=120}$	[kN]	0.40	0.80	1.30	2.50

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RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - REDUCED EMBEDMENT DEPTH

Size			M8	M10	M12	M16
Embedment depth	h_{ef}	[mm]	32	39	48	65
R (for EI) = 30 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=30}$	[kN]	0.70	1.50	2.50	4.70
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=30}$	[kN]	0.80	1.90	2.30	4.00
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=30}$	[kN]	1.00	1.70	2.90	6.10
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	1	2
Characteristic resistance	$V_{Rk,cp,\ fi=30}$	[kN]	0.80	1.90	2.30	8.00
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=30}$	[kN]	0.70	1.50	2.50	4.70
R (for EI) = 60 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=60}$	[kN]	0.60	1.20	2.10	3.90
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=60}$	[kN]	0.80	1.90	2.30	4.00
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=60}$	[kN]	1.00	1.70	2.90	6.10
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	1	2
Characteristic resistance	$V_{Rk,cp,\ fi=60}$	[kN]	0.80	1.90	2.30	8.00
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=60}$	[kN]	0.60	1.20	2.10	3.90

RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE - REDUCED EMBEDMENT DEPTH
continued

Size			M8	M10	M12	M16
Embedment depth	h_{ef}	[mm]	32	39	48	65
R (for EI) = 90 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=90}$	[kN]	0.40	0.90	1.70	3.10
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=90}$	[kN]	0.80	1.90	2.30	4.00
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=90}$	[kN]	1.00	1.70	2.90	6.10
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	1	2
Characteristic resistance	$V_{Rk,cp,\ fi=90}$	[kN]	0.80	1.90	2.30	8.00
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=90}$	[kN]	0.40	0.90	1.70	3.10
R (for EI) = 120 minutes						
TENSION LOAD						
STEEL FAILURE						
Characteristic resistance	$N_{Rk,s,\ fi=120}$	[kN]	0.40	0.80	1.30	2.50
PULL-OUT FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,p,\ fi=120}$	[kN]	0.60	1.50	1.80	3.20
CONCRETE CONE FAILURE; CONCRETE C20/25 - C50/60						
Characteristic resistance	$N_{Rk,c,\ fi=120}$	[kN]	0.80	1.40	2.30	4.90
SHEAR LOAD						
PRY-OUT FAILURE; CONCRETE C20/25 - C50/60						
	k		1	1	1	2
Characteristic resistance	$V_{Rk,cp,\ fi=120}$	[kN]	0.60	1.50	1.80	6.40
STEEL FAILURE						
Characteristic resistance	$V_{Rk,s,\ fi=120}$	[kN]	0.40	0.80	1.30	2.50

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16
Nominal ultimate strength - tension	f_{uk}	[N/mm^2]	545	545	500	500
Nominal ultimate strength - shear	f_{uk}	[N/mm^2]	600	600	550	550
Nominal yield strength - tension	f_{yk}	[N/mm^2]	436	436	400	400
Nominal yield strength - shear	f_{yk}	[N/mm^2]	480	480	440	440
Cross section area - tension	A_s	[mm^2]	38.9	61.7	89.6	165.2
Cross section area - shear	A_s	[mm^2]	38.9	61.7	89.6	165.2
Elastic section modulus	W_{el}	[mm^3]	34.3	68.3	119.6	299.5
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	22.0	45.0	72.0	180.0
Design bending resistance	M	[Nm]	17.6	36.0	57.6	144.0

R-XPT-Throughbolt zinc-plated, R-XPT-HD-Throughbolt hot dip galvanized

PRODUCT INFORMATION

R-XPT

R-XPT-HD

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Reinforced and unreinforced concrete

APPROVALS AND REPORTS:

- ETA-08/0339 Option 7

FEATURES:

- Through fixing
- ETAG 001 - Option 7
- Fire reaction class A1 (acc. to 96/603/EC Directive)

R-XPT

- Zinc-plated and passivated steel
- Min. coating thickness: 5µm

R-XPT-HD*

- Hot dip galvanized steel
- M6 – mean coating thickness 25-55µm
- M8-M20 – mean coating thickness 45-75µm
- M24 – mean coating thickness 55-85µm

Size	Product Code		Anchor		Fixture		
	Zinc electroplated anchor	Hot dip galvanized anchor	Diameter	Length	Max. thickness		Hole diameter
			d	L	$t_{fix,r}$	$t_{fix,s}$	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-XPT-06050/10*	R-XPT-HD-06050/10*	6	50	10	-	7
	R-XPT-06065/5*	-	6	65	25	5	7
	R-XPT-06085/25*	R-XPT-HD-06085/25*	6	85	45	25	7
	R-XPT-06100/40*	R-XPT-HD-06100/40*	6	100	60	40	7
M8	R-XPT-08050/5*	R-XPT-HD-08050/5*	8	50	5	-	9
	R-XPT-08060/10	R-XPT-HD-08060/10*	8	60	10	-	9
	R-XPT-08065/15	R-XPT-HD-08065/15*	8	65	15	-	9
	R-XPT-08075/10	R-XPT-HD-08075/10*	8	75	25	10	9
	R-XPT-08080/15	R-XPT-HD-08080/15*	8	80	30	15	9
	R-XPT-08085/20	-	8	85	35	20	9
	R-XPT-08095/30	R-XPT-HD-08095/30*	8	95	45	30	9
	R-XPT-08115/50	R-XPT-HD-08115/50*	8	115	65	50	9
	R-XPT-08140/75	R-XPT-HD-08140/75*	8	140	90	75	9
	R-XPT-08150/85	-	8	150	100	85	9

* not covered by approval

Size	Product Code		Anchor		Fixture		
	Zinc electroplated anchor	Hot dip galvanized anchor	Diameter	Length	Max. thickness		Hole diameter
			d	L	$t_{fix,r}$	$t_{fix,s}$	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]
M10	R-XPT-10065/5	R-XPT-HD-10065/5*	10	65	5	-	11
	R-XPT-10080/10	R-XPT-HD-10080/10*	10	80	20	10	11
	R-XPT-10085/15	-	10	85	25	15	11
	R-XPT-10095/25	R-XPT-HD-10095/25*	10	95	35	25	11
	R-XPT-10115/45	R-XPT-HD-10115/45*	10	115	55	45	11
	R-XPT-10130/60	R-XPT-HD-10130/60*	10	130	70	60	11
	R-XPT-10140/70	R-XPT-HD-10140/70*	10	140	80	70	11
	R-XPT-10150/80	-	10	150	90	80	11
	R-XPT-10180/110	-	10	180	120	110	11
M12	R-XPT-12080/5	R-XPT-HD-12080/5*	12	80	5	-	13
	R-XPT-12100/5	R-XPT-HD-12100/5*	12	100	25	5	13
	R-XPT-12120/25	R-XPT-HD-12120/25*	12	120	45	25	13
	R-XPT-12125/30	R-XPT-HD-12125/30*	12	125	50	30	13
	R-XPT-12135/40	R-XPT-HD-12135/40*	12	135	60	40	13
	R-XPT-12140/45	-	12	140	65	45	13
	R-XPT-12150/55	R-XPT-HD-12150/55*	12	150	75	55	13
	R-XPT-12180/85	R-XPT-HD-12180/85*	12	180	105	85	13
	R-XPT-12220/125*	R-XPT-HD-12220/125*	12	220	145	125	13
	R-XPT-12300/205*	-	12	300	225	205	13
M16	R-XPT-16100/5	R-XPT-HD-16100/5*	16	100	5	-	18
	R-XPT-16105/10	R-XPT-HD-16105/10*	16	105	10	-	18
	R-XPT-16125/5	R-XPT-HD-16125/5*	16	125	25	5	18
	R-XPT-16140/20	R-XPT-HD-16140/20*	16	140	40	20	18
	R-XPT-16150/30	R-XPT-HD-16150/30*	16	150	50	30	18
	R-XPT-16160/40	R-XPT-HD-16160/40*	16	160	60	40	18
	R-XPT-16180/60	R-XPT-HD-16180/60*	16	180	80	60	18
	R-XPT-16220/100*	R-XPT-HD-16220/100*	16	220	120	100	18
	R-XPT-16280/160*	-	16	280	180	160	18
M20	R-XPT-20125/5	R-XPT-HD-20125/5*	20	125	5	-	22
	R-XPT-20160/20	R-XPT-HD-20160/20*	20	160	40	20	22
	R-XPT-20200/60*	R-XPT-HD-20200/80*	20	200	80	60	22
	R-XPT-20300/160*	-	20	300	180	160	22
M24	R-XPT-24180/20*	-	24	180	35	20	26
	R-XPT-24260/100*	R-XPT-HD-24260/100*	24	260	115	100	26
	R-XPT-24300/140*	-	24	300	155	140	26

* not covered by approval

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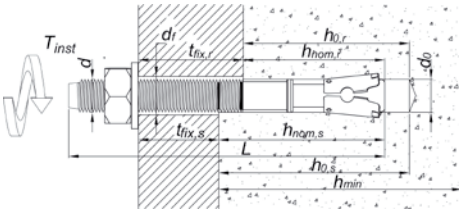
INSTALLATION DATA



Size			M6*	M8	M10	M12	M16	M20	M24*
Thread diameter	d	[mm]	6	8	10	12	16	20	24
Hole diameter in substrate	d_0	[mm]	6	8	10	12	16	20	24
Installation torque	T_{inst}	[Nm]	5	15	30	50	100	200	300
STANDARD EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,s}$	[mm]	50	55	59	80	100	119	135
Installation depth	$h_{nom,s}$	[mm]	50	55	59	80	100	119	135
Min. substrate thickness	$h_{min,s}$	[mm]	100	100	100	136	170	198	224
Min. spacing	$s_{min,s}$	[mm]	45	50	55	75	90	140	180
Min. edge distance	$c_{min,s}$	[mm]	50	40	50	65	80	100	200
REDUCED EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,r}$	[mm]	30	40	49	60	80	99	120
Installation depth	$h_{nom,r}$	[mm]	30	40	49	60	80	99	120
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	100	130	158	194
Min. spacing	$s_{min,r}$	[mm]	40	45	55	100	100	125	160
Min. edge distance	$c_{min,r}$	[mm]	45	40	65	100	100	125	160

* not covered by approval

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert anchor through fixture into hole and tap until required installation depth is achieved.
4. Tighten to the recommended torque.

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Size		M6*	M8	M10	M12	M16	M20	M24*
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
Standard embedment depth	[kN]	8.70	18.10	19.80	28.00	49.70	65.30	67.60
Reduced embedment depth	[kN]	5.70	11.90	11.40	21.50	43.00	45.50	62.70
SHEAR LOAD $V_{Ru,m}$								
Standard embedment depth	[kN]	6.04	12.15	19.24	27.95	51.54	80.85	118.60
Reduced embedment depth	[kN]	5.98	12.15	16.00	27.95	51.54	92.40	118.60
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
Standard embedment depth	[kN]	6.80	12.00	12.00	25.00	40.00	40.00	50.00
Reduced embedment depth	[kN]	4.50	9.00	9.00	16.00	30.00	35.00	48.90
SHEAR LOAD V_{Rk}								
Standard embedment depth	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Reduced embedment depth	[kN]	5.50	10.10	12.00	23.30	43.00	67.40	97.10
DESIGN LOAD								
TENSION LOAD N_{Rd}								
Standard embedment depth	[kN]	3.78	6.67	6.67	13.89	22.22	22.22	27.78
Reduced embedment depth	[kN]	2.50	5.00	5.00	8.89	16.67	19.44	27.17
SHEAR LOAD V_{Rd}								
Standard embedment depth	[kN]	4.40	8.08	12.80	18.64	34.40	53.92	77.68
Reduced embedment depth	[kN]	4.40	8.08	6.67	18.64	34.40	53.92	77.68
RECOMMENDED LOAD**								
TENSION LOAD N_{rec}								
Standard embedment depth	[kN]	2.70	4.76	4.76	9.92	15.87	15.87	19.84
Reduced embedment depth	[kN]	1.79	3.57	3.57	6.35	11.90	13.89	19.40
SHEAR LOAD V_{rec}								
Standard embedment depth	[kN]	3.14	5.77	9.14	13.31	24.57	38.51	55.49
Reduced embedment depth	[kN]	3.14	5.77	4.76	13.31	24.57	38.51	55.49

* not covered by approval
** partial safety factor 1.4

steel failure
pry-out failure

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DESIGN PERFORMANCE DATA

STANDARD EMBEDMENT DEPTH

Size			M6*	M8	M10	M12	M16	M20	M24*
Embedment depth	h_{ef}	[mm]	42	47	49	68	85	99	112
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.10	15.80	25.20	37.30	66.10	101.00	137.20
Design resistance γ_{Ms}=1.4	$N_{Rd,s}$	[kN]	5.79	11.29	18.00	26.64	47.21	72.14	98.00
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	6.80	12.00	12.00	25.00	40.00	40.00	50.00
Design resistance γ_{Mp}=1.8	$N_{Rd,p}$	[kN]	3.78	6.67	6.67	13.89	22.22	22.22	27.78
Increasing factors for $N_{Rd,p}$	C30/37	-	1.10	1.10	1.37	1.16	1.17	1.30	1.10
	C40/50	-	1.21	1.21	1.74	1.33	1.34	1.59	1.21
	C50/60	-	1.32	1.32	2.10	1.49	1.50	1.89	1.32
Spacing	$s_{cr,N}$	[mm]	126	141	147	204	255	297	336
Edge distance	$c_{cr,N}$	[mm]	63	71	74	102	128	149	168
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	50	40	50	65	80	100	200
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	6.39	5.03	7.07	10.96	15.77	22.56	58.63
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	3.55	2.79	3.93	6.09	8.76	12.53	32.57
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
	k	[-]	-	-	-	-	-	-	-
Characteristic resistance	$V_{Rk,cp}$	[kN]	-	-	-	-	-	-	-
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	-	-	-	-	-	-	-
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	4.40	8.08	12.80	18.64	34.40	53.92	77.68

* not covered by approval

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

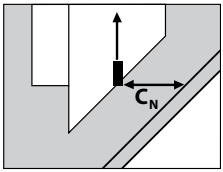

Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N [mm]	M6		M8		M10		M12		M16		M20		M24	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
40			0.68	0.53										
50	0.84	0.58	0.78	0.58	0.76	0.56								
55	0.90	0.61	0.83	0.61	0.81	0.59								
65	1.00	0.66	0.94	0.66	0.91	0.64	0.73	0.54						
70		0.69	1.00	0.69	0.96	0.66	0.76	0.56						
75		0.72		0.72	1.00	0.69	0.80	0.58						
80		0.75		0.75		0.71	0.83	0.59	0.72	0.56				
90		0.81		0.81		0.77	0.91	0.63	0.78	0.59				
100		0.87		0.87		0.82	0.98	0.66	0.83	0.62	0.78	0.56		
105		0.90		0.90		0.85	1.00	0.68	0.86	0.63	0.80	0.57		
120		1.00		1.00		0.94		0.74	0.95	0.68	0.87	0.61		
130						1.00		0.78	1.00	0.71	0.92	0.63		
160								0.89		0.81	1.00	0.71		
170								0.94		0.84		0.73		
185								1.00		0.89		0.77		
200										0.94		0.81	1.00	0.75
215										1.00		0.85		0.79
265												1.00		0.91
300														1.00

EDGE DISTANCE (SHEAR)

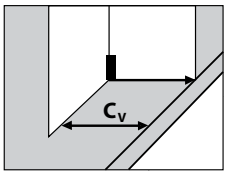

Table only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M6		M8		M10		M12		M16		M20		M24	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
40			1.00	1.00										
50	1.00	1.00	1.35	1.35	1.00	1.00								
60	1.28	1.28	1.72	1.72	1.28	1.28								
65			1.92	1.92	1.42	1.42	1.00	1.00						
80			2.55	2.33	1.88	1.72	1.32	1.32	1.00	1.00				
85			2.78	2.46	2.04	1.81	1.43	1.43	1.08	1.08				
100				2.84	2.55	2.08	1.77	1.69	1.34	1.34	1.00	1.00		
115					3.09	2.35	2.14	1.90	1.61	1.60	1.20	1.20		
150						2.98	3.07	2.39	2.29	1.99	1.69	1.59		
195								3.00	3.26	2.48	2.40	1.97		
200									3.37	2.54	2.48	2.02	1.00	0.86
220									3.84	2.75	2.82	2.18	1.13	0.93
300										3.61	4.29	2.85	1.72	1.21
320										3.82		3.01	1.87	1.28
385												3.53	2.41	1.50
480												4.29		1.81
650														2.37

SPACING

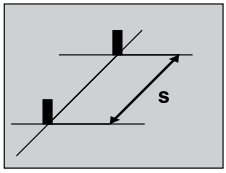

Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M6		M8		M10		M12		M16		M20		M24	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
45	0.68	0.59												
50	0.70	0.60	0.68	0.60										
55	0.72	0.61	0.70	0.61	0.69	0.61								
75	0.80	0.66	0.77	0.66	0.76	0.64	0.68	0.60						
90	0.86	0.69	0.82	0.69	0.81	0.67	0.72	0.62	0.68	0.60				
100	0.90	0.71	0.85	0.71	0.84	0.69	0.75	0.64	0.70	0.62				
125	1.00	0.76	0.94	0.76	0.93	0.74	0.81	0.67	0.75	0.65				
140		0.79	1.00	0.79	0.98	0.77	0.84	0.69	0.77	0.66	0.74	0.63		
150		0.81		0.81	1.00	0.79	0.87	0.70	0.79	0.67	0.75	0.64		
180		0.88		0.88		0.85	0.94	0.74	0.85	0.71	0.80	0.67	0.77	0.65
200		0.92		0.92		0.88	0.99	0.77	0.89	0.73	0.84	0.69	0.80	0.67
205		0.93		0.93		0.89	1.00	0.78	0.90	0.74	0.85	0.69	0.81	0.67
240		1.00		1.00		0.96		0.82	0.97	0.78	0.90	0.73	0.86	0.70
255						0.99		0.84	1.00	0.80	0.93	0.74	0.88	0.71
260						1.00		0.85		0.80	0.94	0.75	0.89	0.72
300								0.91		0.85	1.00	0.78	0.95	0.75
335								0.95		0.89		0.82	1.00	0.78
370								1.00		0.93		0.85		0.81
430										1.00		0.91		0.86
530												1.00		0.94
600														1.00

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REDUCED EMBEDMENT DEPTH

Size			M6*	M8	M10	M12	M16	M20	M24*
Embedment depth	h_{ef}	[mm]	22	32	39	48	65	79	97
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.10	15.80	25.20	37.30	66.10	101.00	137.20
Design resistance γ_{Ms}=1.4	$N_{Rd,s}$	[kN]	5.79	11.29	18.00	26.64	47.21	72.14	98.00
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	4.50	9.00	9.00	16.00	30.00	35.00	48.90
Design resistance γ_{Mp}=1.8	$N_{Rd,p}$	[kN]	2.50	5.00	5.00	8.89	16.67	19.44	27.17
Increasing factors for $N_{Rd,p}$	C30/37	-	1.25	1.25	1.36	1.20	1.12	1.18	1.25
	C40/50	-	1.50	1.50	1.72	1.40	1.23	1.36	1.50
	C50/60	-	1.76	1.76	2.08	1.60	1.34	1.54	1.76
Spacing	$s_{cr,N}$	[mm]	66	96	117	144	195	237	291
Edge distance	$c_{cr,N}$	[mm]	33	48	59	72	98	119	146
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	45	40	65	100	100	125	160
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.05	4.70	9.67	18.36	20.04	28.81	42.54
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	2.80	2.61	5.37	10.20	11.13	16.00	23.63
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
	k	[-]	-	-	1	-	-	2	-
Characteristic resistance	$V_{Rk,cp}$	[kN]	-	-	12.00	-	-	68.70	-
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	-	-	6.67	-	-	38.17	-
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	10.10	16.00	23.30	43.00	67.40	97.10
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	4.40	8.08	12.80	18.64	34.40	53.92	77.68

* not covered by approval

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16	M20
Nominal ultimate strength - tension	f_{uk}	[N/mm²]	620	620	620	620	620
Nominal ultimate strength - shear	f_{uk}	[N/mm²]	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm²]	533.2	533.2	533.2	533.2	533.2
Nominal yield strength - shear	f_{yk}	[N/mm²]	416	416	416	416	416
Cross section area - tension	A_s	[mm²]	25.5	40.7	60.1	106.6	162.9
Cross section area - shear	A_s	[mm²]	38.9	61.7	89.6	165.2	259.1
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.0	276.4	539.9
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	17.0	35.0	61.0	154.0	301.0
Design bending resistance	M	[Nm]	13.6	28.0	48.8	123.2	240.8

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

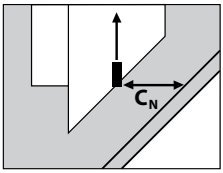

Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40			0.87	0.64										
45	1.00	0.68	0.95	0.68										
50		0.72	1.00	0.72										
65		0.86		0.86	1.00	0.74								
80		1.00		1.00		0.85								
90						0.92								
100						1.00	1.00	0.85	1.00	0.67				
120								0.97		0.75				
125								1.00		0.77	1.00	0.71		
150										0.87		0.80		
160										0.91		0.83	1.00	0.71
180										1.00		0.90		0.77
205												1.00		0.84
240														0.94
260														1.00

EDGE DISTANCE (SHEAR)

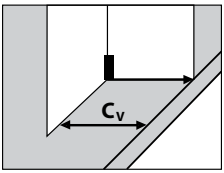

Table only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}
40			1.00	1.00										
45	1.00	1.00	1.17	1.17										
60	1.50	1.50	1.74	1.74										
65			1.94	1.94	0.98	0.98								
75			2.37	2.23	1.22	1.15								
80			2.59	2.37	1.18	1.18								
90			3.06	2.63	1.22	1.21								
100				2.89			1.00	0.82	1.00	0.93				
105				3.02			1.07	0.85	1.07	0.97				
125							1.36	0.99	1.35	1.12	1.00	0.92		
155							1.83	1.20	1.80	1.35	1.33	1.10		
160								1.23	1.88	1.38	1.39	1.13	1.00	0.90
230								1.70	3.09	1.90	2.26	1.53	1.62	1.21
240								1.77		1.97	2.40	1.59	1.71	1.26
250										2.04		1.65	1.81	1.30
380										2.96		2.37	3.19	1.86
388										3.02			3.29	1.90
720														3.27

SPACING

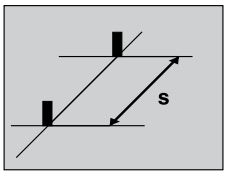

Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40	0.80	0.63												
45	0.84	0.64	0.73	0.64										
55	0.92	0.67	0.79	0.67	0.74	0.64								
65	1.00	0.70	0.84	0.70	0.78	0.66								
95		0.80	1.00	0.80	0.91	0.74								
100		0.81		0.81	0.93	0.75	0.85	0.70	0.76	0.64				
120		0.88		0.88	1.00	0.80	0.92	0.74	0.81	0.67				
125		0.89		0.89		0.81	0.93	0.75	0.82	0.67	0.76	0.65		
145		0.95		0.95		0.86	1.00	0.79	0.87	0.70	0.81	0.68		
160		1.00		1.00		0.90		0.82	0.91	0.72	0.84	0.70	0.77	0.65
195						1.00		0.89	1.00	0.77	0.91	0.74	0.84	0.69
200								0.90		0.78	0.92	0.74	0.84	0.69
240								0.98		0.83	1.00	0.79	0.91	0.73
250								1.00		0.85		0.80	0.93	0.74
290										0.90		0.85	1.00	0.78
360										1.00		0.94		0.85
410												1.00		0.89
520														1.00

R-XPTII-A4 – Throughbolt stainless steel A4

PRODUCT INFORMATION

R-XPTII-A4

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Reinforced and unreinforced concrete

APPROVALS AND REPORTS:

- ETA-12/0384 Option 7

FEATURES:

- Through fixing
- Austenitic corrosion resistant (stainless steel)
- Grade A4, class 80 (M6) and class 50 (M8-M24)
- Suitable in corrosion categories C1, C2 and C3 according to PN-EN ISO 12944-2:2001

Size	Product Code	Anchor		Fixture		
	Hot deep galvanized	Diameter	Length	Max. thickness		Hole diameter
		d	L	$t_{fix,r}$	$t_{fix,s}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-XPTII-A4-06050/10*	6	50	10	-	7
	R-XPTII-A4-06085/25*	6	85	45	25	7
	R-XPTII-A4-06100/40*	6	100	60	40	7
M8	R-XPTII-A4-08060/10	8	60	10	-	9
	R-XPTII-A4-08075/10	8	75	25	10	9
	R-XPTII-A4-08085/20	8	85	35	20	9
	R-XPTII-A4-08095/30	8	95	45	30	9
	R-XPTII-A4-08105/40	8	105	55	40	9
	R-XPTII-A4-08115/50	8	115	65	50	9
M10	R-XPTII-A4-10065/5	10	65	5	-	11
	R-XPTII-A4-10080/20	10	80	20	-	11
	R-XPTII-A4-10095/15	10	95	35	15	11
	R-XPTII-A4-10115/35	10	115	55	35	11
	R-XPTII-A4-10130/50	10	130	70	50	11
	R-XPTII-A4-10140/60	10	140	80	60	11
M12	R-XPTII-A4-12080/5	12	80	5	-	13
	R-XPTII-A4-12100/5	12	100	25	5	13
	R-XPTII-A4-12125/30	12	125	50	30	13
	R-XPTII-A4-12150/55	12	150	75	55	13
	R-XPTII-A4-12180/85	12	180	105	85	13

* not covered by approval

Size	Product Code	Anchor		Fixture		
	Hot deep galvanized	Diameter	Length	Max. thickness		Hole diameter
		d	L	$t_{fix,r}$	$t_{fix,s}$	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]
M16	R-XPTII-A4-16125/5	16	125	25	5	18
	R-XPTII-A4-16140/20	16	140	40	20	18
	R-XPTII-A4-16150/30	16	150	50	30	18
	R-XPTII-A4-16180/60	16	180	80	60	18
	R-XPTII-A4-16220/100*	16	220	120	100	18
M20	R-XPTII-A4-20125/5*	20	125	5	-	22
	R-XPTII-A4-20160/20*	20	160	40	20	22
	R-XPTII-A4-20200/60*	20	200	80	60	22
	R-XPTII-A4-20300/160*	20	300	180	160	22
M24	R-XPTII-A4-24260/100*	24	260	115	100	26

* not covered by approval

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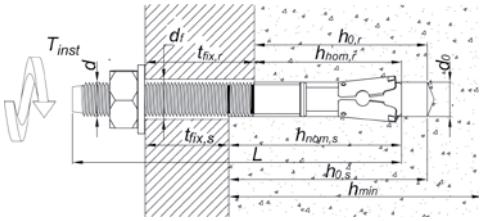
INSTALLATION DATA



Size			M6*	M8	M10	M12	M16	M20*	M24*
Thread diameter	d	[mm]	6	8	10	12	16	20	24
Hole diameter in substrate	d_0	[mm]	6	8	10	12	16	20	24
Installation torque	T_{inst}	[Nm]	5	15	30	50	100	200	300
STANDARD EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,s}$	[mm]	50	55	69	80	100	119	135
Installation depth	$h_{nom,s}$	[mm]	50	55	69	80	100	119	135
Min. substrate thickness	$h_{min,s}$	[mm]	100	100	120	140	170	200	240
Min. spacing	$s_{min,s}$	[mm]	45	65	90	110	170	140	180
Min. edge distance	$c_{min,s}$	[mm]	50	50	60	85	90	160	200
REDUCED EMBEDMENT DEPTH									
Min. hole depth in substrate	$h_{0,r}$	[mm]	35	40	49	60	80	99	120
Installation depth	$h_{nom,r}$	[mm]	30**	40	49	60	80	99	120
Min. substrate thickness	$h_{min,r}$	[mm]	100	100	100	100	130	160	200
Min. spacing	$s_{min,r}$	[mm]	40	65	115	150	190	125	160
Min. edge distance	$c_{min,r}$	[mm]	45	50	80	100	120	125	160

* not covered by approval

** installation depth for R-XPTII-A4-06050/10 h_{nom}=24 mm

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert anchor through fixture into hole and tap until required installation depth is achieved.
4. Tighten to the recommended torque.

BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing

Size		M6*	M8	M10	M12	M16	M20*	M24*
MEAN ULTIMATE LOAD								
TENSION LOAD $N_{Ru,m}$								
Standard embedment depth	[kN]	9.80	15.39	22.77	29.21	55.78	68.50	82.80
Reduced embedment depth	[kN]	5.70	10.39	16.01	22.09	37.90	44.60	62.70
SHEAR LOAD $V_{Ru,m}$								
Standard embedment depth	[kN]	9.00	14.00	22.20	29.60	54.50	73.00	103.50
Reduced embedment depth	[kN]	9.00	14.00	19.20	29.60	54.50	73.00	103.50
CHARACTERISTIC LOAD								
TENSION LOAD N_{Rk}								
Standard embedment depth	[kN]	7.60	9.00	16.00	25.00	39.50	54.30	64.70
Reduced embedment depth	[kN]	4.50	7.50	12.00	16.80	26.40	35.00	48.90
SHEAR LOAD V_{Rk}								
Standard embedment depth	[kN]	5.50	11.70	18.50	24.60	45.40	67.40	97.10
Reduced embedment depth	[kN]	5.50	11.70	14.70	24.60	45.40	67.40	97.10
DESIGN LOAD								
TENSION LOAD N_{Rd}								
Standard embedment depth	[kN]	3.52	5.00	10.67	16.67	26.33	25.14	29.95
Reduced embedment depth	[kN]	2.08	4.17	6.67	11.20	17.60	16.20	22.64
SHEAR LOAD V_{Rd}								
Standard embedment depth	[kN]	4.40	9.36	14.80	19.68	36.32	53.92	77.68
Reduced embedment depth	[kN]	4.40	9.36	8.20	19.68	36.32	53.92	77.68
RECOMMENDED LOAD**								
TENSION LOAD N_{rec}								
Standard embedment depth	[kN]	2.51	3.57	7.62	11.90	18.81	17.96	21.40
Reduced embedment depth	[kN]	1.49	2.98	4.76	8.00	12.57	11.57	16.17
SHEAR LOAD V_{rec}								
Standard embedment depth	[kN]	3.14	6.69	10.57	14.06	25.94	38.51	55.49
Reduced embedment depth	[kN]	3.14	6.69	5.86	14.06	25.94	38.51	55.49

* not covered by approval

** partial safety factor 1.4

steel failure

pry-out failure

DESIGN PERFORMANCE DATA

A

STANDARD EMBEDMENT DEPTH

Size			M6*	M8	M10	M12	M16	M20*	M24*
Embedment depth	h_{ef}	[mm]	42	47	59	68	85	99	112
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.10	21.20	33.60	44.80	82.60	101.00	137.20
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	5.40	14.13	22.40	29.87	55.07	67.33	91.47
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	7.60	9.00	16.00	25.00	39.50	54.30	64.70
Design resistance γ_{Mp}=2.16 (M6, M20, M24) / 1.8 (M8) / 1.5 (M10-M16)	$N_{Rd,p}$	[kN]	3.52	5.00	10.67	16.67	26.33	25.14	29.95
Increasing factors for $N_{Rd,p}$	C30/37	-	1.46	1.46	1.37	1.20	1.18	1.18	1.18
	C40/50	-	1.91	1.91	1.73	1.40	1.37	1.37	1.37
	C50/60	-	2.36	2.36	2.10	1.60	1.55	1.55	1.55
Spacing	$s_{cr,N}$	[mm]	126	141	177	204	255	297	336
Edge distance	$c_{cr,N}$	[mm]	63	71	89	102	128	149	168
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	50	50	60	85	90	160	200
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	6.39	6.78	9.32	15.62	18.37	41.63	58.63
Design resistance γ_{Mc}=1.8 (M6, M8, M20, M24) / 1.5 (M10-M16)	$V_{Rd,c}$	[kN]	3.55	3.77	6.21	10.41	12.25	23.13	32.57
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
	k	[-]	-	-	-	-	-	-	-
Characteristic resistance for c_1	$V_{Rk,cp}$	[kN]	-	-	-	-	-	-	-
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	-	-	-	-	-	-	-
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	11.70	18.50	24.60	45.40	67.40	97.10
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	4.40	9.36	14.80	19.68	36.32	53.92	77.68

* not covered by approval

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

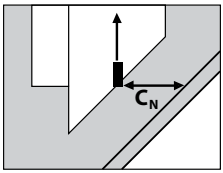


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

C_N [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
50	0.84	0.58	0.78	0.58										
60	0.96	0.64	0.88	0.64	0.76	0.57								
65	1.00	0.66	0.94	0.66	0.80	0.59								
70		0.69	1.00	0.69	0.84	0.62								
85		0.78		0.78	0.97	0.68	0.87	0.64						
90		0.81		0.81	1.00	0.70	0.91	0.66	0.78	0.59				
100		0.87		0.87		0.75	1.00	0.70	0.83	0.62				
120		1.00		1.00		0.85		0.78	0.95	0.68				
130						0.90		0.82	1.00	0.71				
150						1.00		0.91		0.77				
160								0.95		0.81	1.00	0.73		
170								1.00		0.84		0.76		
200										0.94		0.85	1.00	0.77
215										1.00		0.89		0.81
250												1.00		0.90
285														1.00

EDGE DISTANCE (SHEAR)

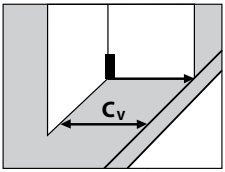


Table only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

C_v [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}
50	1.00	1.00	1.00	1.00										
60	1.28	1.28	1.28	1.28	1.00	1.00								
85			2.06	1.82	1.59	1.55	1.00	1.00						
90			2.23	1.92	1.72	1.62	1.08	1.08	1.00	1.00				
95			2.40	2.01	1.85	1.70	1.16	1.15	1.07	1.07				
115				2.38	2.41	2.01	1.50	1.35	1.38	1.37				
135						2.31	1.86	1.55	1.71	1.56				
140						2.38		1.60	1.79	1.61				
160								1.80	2.14	1.80	1.00	0.91		
165								1.84	2.23	1.85	1.04	0.94		
200									2.89	2.18	1.35	1.10	1.00	0.89
205										2.23	1.39	1.12	1.03	0.91
280										2.91	2.12	1.46	1.56	1.18
300											2.32	1.55	1.72	1.25
350												1.77	2.11	1.43
380												1.90	2.36	1.53
400												1.99		1.60
470												2.29		1.84
620														2.35

SPACING

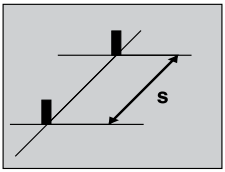


Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
45	0.68	0.59												
65	0.76	0.64	0.73	0.64										
90	0.86	0.69	0.82	0.69	0.75	0.65								
110	0.94	0.73	0.89	0.73	0.81	0.68	0.77	0.66						
125	1.00	0.76	0.94	0.76	0.85	0.71	0.81	0.68						
140		0.79	1.00	0.79	0.90	0.73	0.84	0.71			0.74	0.64		
170		0.85		0.85	0.98	0.78	0.92	0.75	0.83	0.70	0.79	0.67		
180		0.88		0.88	1.00	0.80	0.94	0.76	0.85	0.71	0.80	0.68	0.77	0.66
205		0.93		0.93		0.84	1.00	0.80	0.90	0.74	0.85	0.71	0.81	0.68
240		1.00		1.00		0.90		0.85	0.97	0.78	0.90	0.74	0.86	0.71
255						0.93		0.88	1.00	0.80	0.93	0.76	0.88	0.72
300						1.00		0.94		0.85	1.00	0.80	0.95	0.76
335								0.99		0.89		0.84	1.00	0.79
340								1.00		0.90		0.84		0.80
430										1.00		0.93		0.88
500												1.00		0.94
550														0.98
570														1.00

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REDUCED EMBEDMENT DEPTH

Size			M6*	M8	M10	M12	M16	M20*	M24*
Embedment depth	h_{ef}	[mm]	22	32	39	48	65	79	97
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	8.10	21.20	33.60	44.80	82.60	101.00	137.20
Design resistance γ_{Ms}=15	$N_{Rd,s}$	[kN]	5.40	14.13	22.40	29.87	55.07	67.33	91.47
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
Characteristic resistance	$N_{Rk,p}$	[kN]	4.50	7.50	12.00	16.80	26.40	35.00	48.90
Design resistance γ_{Mp}=2.16 (M6, M20, M24) / 1.8 (M8-M10) / 1.5 (M12-M16)	$N_{Rd,p}$	[kN]	2.08	4.17	6.67	11.20	17.60	16.20	22.64
Increasing factors for $N_{Rd,p}$	C30/37	-	1.07	1.07	1.11	1.16	1.18	1.18	1.18
	C40/50	-	1.13	1.13	1.22	1.32	1.37	1.37	1.37
	C50/60	-	1.20	1.20	1.33	1.49	1.55	1.55	1.55
Spacing	$s_{cr,N}$	[mm]	66	96	117	144	195	237	291
Edge distance	$c_{cr,N}$	[mm]	33	48	59	72	98	119	146
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	45	50	80	100	120	125	160
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.05	6.37	12.84	18.36	25.57	28.81	42.54
Design resistance γ_{Mc}=1.8 (M6, M8, M10, M20, M24) / 1.5 (M12-M16)	$V_{Rd,c}$	[kN]	2.80	3.54	7.13	12.24	17.05	16.00	23.63
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
	k	[-]	-	-	1.20	-	-	-	-
Characteristic resistance	$V_{Rk,cp}$	[kN]	-	-	14.70	-	-	-	-
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	-	-	8.20	-	-	-	-
STEEL FAILURE									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.50	11.7	18.5	24.6	45.4	67.40	97.10
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	4.40	9.36	14.80	19.68	36.32	53.92	77.68

* not covered by approval

MECHANICAL PROPERTIES

Size			M8	M10	M12	M16
Nominal ultimate strength - tension	f_{uk}	[N/mm²]	545	545	500	500
Nominal ultimate strength - shear	f_{uk}	[N/mm²]	600	600	550	550
Nominal yield strength - tension	f_{yk}	[N/mm²]	436	436	400	400
Nominal yield strength - shear	f_{yk}	[N/mm²]	480	480	440	440
Cross section area - tension	A_s	[mm²]	38.9	61.7	89.6	165.2
Cross section area - shear	A_s	[mm²]	38.9	61.7	89.6	165.2
Elastic section modulus	W_{el}	[mm³]	34.3	68.3	119.6	299.5
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	22.0	45.0	72.0	180.0
Design bending resistance	M	[Nm]	17.6	36.0	57.6	144.0

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

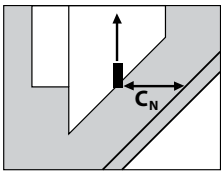


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
45	1.00	0.68												
50		0.72	1.00	0.72										
70		0.90		0.90										
80		1.00		1.00	1.00	0.85								
100						1.00	1.00	0.85						
120								0.97	1.00	0.81				
125								1.00		0.83	1.00	0.72		
160										1.00		0.85	1.00	0.73
200												1.00		0.85
250														1.00

valid for $s \geq ETA\ s$ for c_{min}

EDGE DISTANCE (SHEAR)

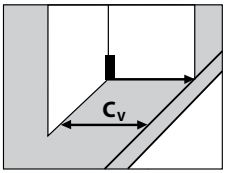


Table only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}	h≥1.5c_V	h_{min}
45	1.00	1.00												
50	1.16	1.16	1.00	1.00										
60	1.50	1.50	1.28	1.28										
80			1.91	1.75	1.00	0.91								
90			2.25	1.94	1.18	1.01								
100			2.61	2.13		1.11	1.00	0.82						
120				2.51			1.28	0.96	1.00	0.85				
125				2.61			1.36	0.99	1.06	0.88	1.00	0.92		
140							1.59	1.09	1.23	0.97	1.16	1.01		
160								1.23	1.47	1.09	1.39	1.13	1.00	0.91
210								1.57	2.14	1.37	2.00	1.43	1.43	1.14
305										1.91	3.33	1.97	2.37	1.56
340										2.10		2.17	2.74	1.72
390												2.44	3.31	1.93
550												3.32		2.61
710														3.28

SPACING

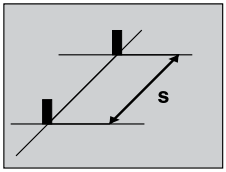


Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

S [mm]	M6		M8		M10		M12		M16		M20		M24	
	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}	h≥ $1.84h_{min}$	h_{min}
40	0.80	0.63												
65	1.00	0.70	0.84	0.70										
80		0.75	0.92	0.75										
95		0.80	1.00	0.80										
115		0.86		0.86	1.00	0.79								
125		0.89		0.89		0.81					0.76	0.66		
150		0.97		0.97		0.88	1.00	0.80			0.82	0.69		
160		1.00		1.00		0.90		0.82			0.84	0.70	0.77	0.66
190						0.98		0.88	0.99	0.80	0.90	0.74	0.83	0.69
195						0.99		0.89	1.00	0.80	0.91	0.74	0.84	0.70
200						1.00		0.90		0.81	0.92	0.75	0.84	0.70
240								0.98		0.88	1.00	0.80	0.91	0.74
250								1.00		0.89		0.81	0.93	0.75
290										0.95		0.86	1.00	0.79
320										1.00		0.90		0.82
400												1.00		0.90
450														0.95
500														1.00

valid for $c \geq ETA\ c$ for s_{min}

R-DCA-Wedge anchor zinc-plated, R-DCL-Lipped wedge anchor zinc-plated

PRODUCT INFORMATION

R-DCA

R-DCL

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Reinforced and unreinforced concrete

APPROVALS AND REPORTS:

- AT-15-7555/2011 Option 7
- ETA-08/0198[1] Option 7
- 210005470-1[1]

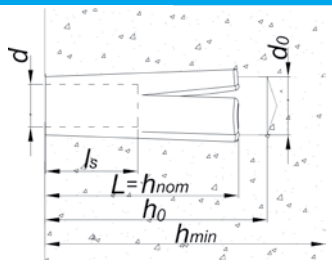
[1] covers M8-M12

FEATURES:

- Wedge anchor
- Galvanized carbon steel acc. to ASTM A510, SAE 1008 or SAE 1010
- Coating thickness 5µm
- **R-DCA** - wedge anchor
- **R-DCL** - lipped wedge anchor

Size	Product Code		Anchor				Fixture	
			Thread diameter	External diameter	Length	Thread length	Max. thickness	Hole diameter
			d	d_{nom}	L	l_s	t_{fix}	d_f
			[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-DCA-06-25	R-DCL-06*	6	8	25	11	-	7
M8	R-DCA-08-30	R-DCL-08	8	10	30	13	-	9
M10	R-DCA-10-40	R-DCL-10	10	12	40	15	-	12
M12	R-DCA-12-50	R-DCL-12	12	15	50	20	-	14
M16	R-DCA-16-65	R-DCL-16*	16	20	65	25	-	18
M20	R-DCA-20-80	-	20	25	80	35	-	22

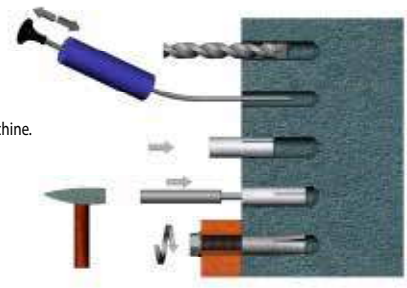
INSTALLATION DATA



Size			M6	M8	M10	M12	M16	M20
Thread diameter	d	[mm]	6	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	8	10	12	15	20	25
Installation torque	T_{inst}	[Nm]	4.5	11	22	38	95	185
Min. hole depth in substrate	h_0	[mm]	27	32	42	53	70	85
Installation depth	h_{nom}	[mm]	25	30	40	50	65	80
Min. substrate thickness	h_{min}	[mm]	80	80	90	110	140	160
Min. spacing	s_{min}	[mm]	105	105	220	220	220	250
Min. edge distance	c_{min}	[mm]	105	105	220	220	220	250

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert wedge anchor, slotted end first.
4. Use the setting tool to drive the internal wedge into the anchor.
5. Alternatively use mechanical setting tool with hammer action drilling machine.



BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing (based on AT-15-7555/2011)

Concrete type		Non-cracked						Cracked					
Size		M6	M8	M10	M12	M16	M20	M6	M8	M10	M12	M16	M20
Embedment depth h_{ef}	[mm]	25	30	40	50	65	80	25	30	40	50	65	80
CHARACTERISTIC LOAD													
TENSION LOAD N_{Rk}	[kN]	6.46	13.30	20.85	29.60	43.80	59.70	3.17	6.05	8.20	10.00	15.65	21.40
SHEAR LOAD V_{Rk}	[kN]	5.20	9.50	15.10	21.90	40.80	63.70	3.17	6.05	8.20	10.00	31.30	42.80
DESIGN LOAD													
TENSION LOAD N_{Rd}	[kN]	2.56	5.29	8.29	11.75	17.35	23.70	1.25	2.40	3.26	3.97	6.20	8.50
SHEAR LOAD V_{Rd}	[kN]	3.59	7.39	11.58	16.44	32.64	50.96	1.76	3.36	4.56	5.56	17.39	23.78
RECOMMENDED LOAD*													
TENSION LOAD N_{rec}	[kN]	1.83	3.78	5.92	8.39	12.39	16.93	0.89	1.71	2.33	2.84	4.43	6.07
SHEAR LOAD V_{rec}	[kN]	2.56	5.28	8.27	11.74	23.31	36.40	1.26	2.40	3.26	3.97	12.42	16.99

* partial safety factor 1.4

steel failure

pry-out failure

A

DESIGN PERFORMANCE DATA

Data based on AT-15-7555/2011

Size			M6	M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	25	30	40	50	65	80
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	10.40	15.40	19.80	34.80	81.60	127.40
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	6.93	10.27	13.20	23.20	54.40	84.93
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	6.46	13.30	20.85	29.60	43.80	59.70
Design resistance γ_{Mp}=2.52	$N_{Rd,p}$	[kN]	2.56	5.30	8.30	11.75	17.35	23.70
PULL-OUT FAILURE; CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	3.17	6.05	8.20	10.00	15.65	21.40
Design resistance γ_{Mp}=2.52	$N_{Rd,p}$	[kN]	1.25	2.40	3.25	3.95	6.20	8.50
Spacing	$s_{cr,N}$	[mm]	75	90	120	150	195	240
Edge distance	$c_{cr,N}$	[mm]	38	45	60	75	98	120
SHEAR LOAD								
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25								
Edge distance	c_1	[mm]	105	105	220	220	220	250
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	16.90	17.68	52.70	54.86	58.29	73.20
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	9.39	9.82	29.28	30.48	32.38	40.67
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25								
Edge distance	c_1	[mm]	105	105	220	220	220	250
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	11.97	12.52	37.33	38.86	41.29	51.85
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	6.65	6.96	20.74	21.59	22.94	28.81
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
	k	[-]	1	1	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	6.46	13.30	20.85	29.60	87.60	119.40
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	3.59	7.39	11.58	16.44	48.67	66.33
PRY-OUT FAILURE; CRACKED CONCRETE C20/25								
	k	[-]	1	1	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	3.20	6.10	8.20	10.00	31.30	42.80
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	1.76	3.36	4.56	5.56	17.39	23.78
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.20	9.50	15.10	21.90	40.80	63.70
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	4.16	7.60	12.08	17.52	32.64	50.96

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

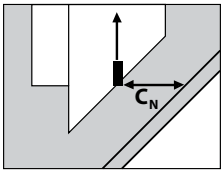
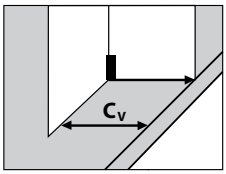


Table only valid for one edge$<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked and cracked concrete from 'Basic Performance' table

c_N [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
105	1.00	1.00	1.00	1.00								
220					1.00	1.00	1.00	1.00	1.00	1.00		
250											1.00	1.00

EDGE DISTANCE (SHEAR)



Tables only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

c_V [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
105	0.38	0.38	0.75	0.75								
220					0.40	0.40	0.54	0.54	1.00	0.65		
240										0.70		
250										0.73	1.00	0.65
260										0.75	1.05	0.68
280										0.81	1.17	0.72
295										0.84	1.25	0.75
350										0.98		0.88
400												0.99
450												1.09
520												1.24

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for cracked concrete from 'Design Performance' table

c_V [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
105	0.26	0.26	0.48	0.48								
220					0.22	0.22	0.26	0.26	0.76	0.76		
250											0.83	0.83

SPACING

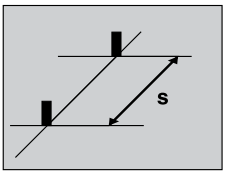


Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked and cracked concrete from 'Basic Performance' table

s [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
105	1.00	1.00	1.00	1.00								
220					1.00	1.00	1.00	1.00	1.00	1.00		
250											1.00	1.00

A

RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE

Size			M8	M10	M12
Embedment depth	h_{ef}	[mm]	30	40	50
R (for EI) = 30 minutes					
TENSION LOAD					
STEEL FAILURE					
Characteristic resistance	$N_{Rk,s,\ fi=30}$	[kN]	0.40	0.90	1.70
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
Characteristic resistance	$N_{Rk,p,\ fi=30}$	[kN]	1.20	3.80	6.40
SHEAR LOAD					
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
	k		1	1	1
Characteristic resistance	$V_{Rk,cp,\ fi=30}$	[kN]	1.20	3.80	6.40
STEEL FAILURE					
Characteristic resistance	$V_{Rk,s,\ fi=30}$	[kN]	0.40	0.90	1.70
R (for EI) = 60 minutes					
TENSION LOAD					
STEEL FAILURE					
Characteristic resistance	$N_{Rk,s,\ fi=60}$	[kN]	0.30	0.80	1.30
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
Characteristic resistance	$N_{Rk,p,\ fi=60}$	[kN]	1.40	2.60	4.40
SHEAR LOAD					
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
	k		1	1	1
Characteristic resistance	$V_{Rk,cp,\ fi=60}$	[kN]	1.40	2.60	4.40
STEEL FAILURE					
Characteristic resistance	$V_{Rk,s,\ fi=60}$	[kN]	0.30	0.80	1.30

RESISTANCE TO TENSION AND SHEAR LOADS UNDER FIRE EXPOSURE continued

Size			M8	M10	M12
Embedment depth	h_{ef}	[mm]	30	40	50
R (for EI) = 90 minutes					
TENSION LOAD					
STEEL FAILURE					
Characteristic resistance	$N_{Rk,s,\ fi=90}$	[kN]	0.30	0.60	1.10
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
Characteristic resistance	$N_{Rk,p,\ fi=90}$	[kN]	0.80	1.50	2.40
SHEAR LOAD					
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
	k		1	1	1
Characteristic resistance	$V_{Rk,cp,\ fi=90}$	[kN]	0.80	1.50	2.40
STEEL FAILURE					
Characteristic resistance	$V_{Rk,s,\ fi=90}$	[kN]	0.30	0.60	1.10
R (for EI) = 120 minutes					
TENSION LOAD					
STEEL FAILURE					
Characteristic resistance	$N_{Rk,s,\ fi=120}$	[kN]	0.20	0.50	0.80
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
Characteristic resistance	$N_{Rk,p,\ fi=120}$	[kN]	0.50	1.00	1.60
SHEAR LOAD					
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25 - C50/60					
	k		1	1	1
Characteristic resistance	$V_{Rk,cp,\ fi=120}$	[kN]	0.50	1.00	1.60
STEEL FAILURE					
Characteristic resistance	$V_{Rk,s,\ fi=120}$	[kN]	0.20	0.50	0.80

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20
Nominal ultimate strength - tension	f_{uk}	[N/mm²]	520	520	520	520	520	520
Nominal yield strength - tension	f_{yk}	[N/mm²]	416	416	416	416	416	416
Cross section area - tension	A_s	[mm²]	20.1	36.6	58.0	84.3	157.0	245.0
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12	785.40
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	13.24	31.37	61.26	105.86	250.92	490.09
Design bending resistance	M	[Nm]	10.59	25.10	49.01	84.69	200.74	392.07

R-DCA-A4-Wedge anchor stainless steel for cracked and non-cracked concrete

PRODUCT INFORMATION

R-DCA-A4

BASE MATERIAL:

- Non-cracked concrete, class C20/25-C50/60 (Option 7 approval)
- Cracked concrete, class C20/25-C50/60 (Option 1 approval)
- Reinforced and unreinforced concrete

FEATURES:

- Wedge anchor
- Stainless steel grade A4 class 50 acc. to PN-EN ISO 3506-1:2009

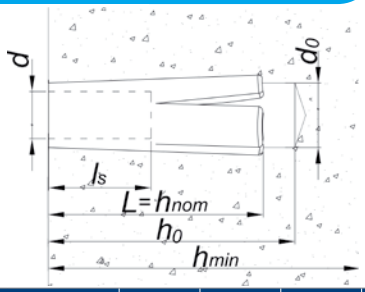
APPROVALS AND REPORTS:

- AT-15-7555/2011 Option 1

B

Size	Product Code	Anchor				Fixture	
		Thread diameter	External diameter	Length	Thread length	Max. thickness	Hole diameter
		d	d_{nom}	L	l_s	t_{fix}	d_f
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-DCA-A4-06-25	6	8	25	11	-	7
M8	R-DCA-A4-08-30	8	10	30	13	-	9
M10	R-DCA-A4-10-40	10	12	40	15	-	12
M12	R-DCA-A4-12-50	12	15	50	20	-	14
M16	R-DCA-A4-16-65	16	20	65	25	-	18
M20	R-DCA-A4-20-80	20	25	80	35	-	22

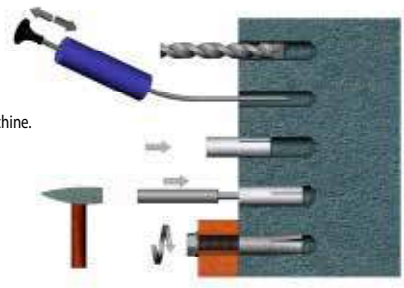
INSTALLATION DATA



Size			M6	M8	M10	M12	M16	M20
Thread diameter	d	[mm]	6	8	10	12	16	20
Hole diameter in substrate	d_0	[mm]	8	10	12	15	20	25
Installation torque	T_{inst}	[Nm]	4.5	11	22	38	95	185
Min. hole depth in substrate	h_0	[mm]	27	32	42	53	70	85
Installation depth	h_{nom}	[mm]	25	30	40	50	65	80
Min. substrate thickness	h_{min}	[mm]	80	80	90	110	140	160
Min. spacing	s_{min}	[mm]	105	105	220	220	220	250
Min. edge distance	c_{min}	[mm]	105	105	220	220	220	250

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert wedge anchor, slotted end first.
4. Use the setting tool to drive the internal wedge into the anchor.
5. Alternatively use mechanical settong tool with hammer action drilling machine.



BASIC PERFORMANCE DATA

Performance data for single anchor without influence of edge distance and spacing (based on AT-15-7555/2011)

Concrete type		Non-cracked						Cracked					
Size		M6	M8	M10	M12	M16	M20	M6	M8	M10	M12	M16	M20
Embedment depth h_{ef}	[mm]	25	30	40	50	65	80	25	30	40	50	65	80
MEAN ULTIMATE LOAD													
TENSION LOAD $N_{Ru,m}$	[kN]	9.01	15.95	22.27	28.58	41.12	53.65	4.74	6.95	10.15	13.35	18.13	22.90
SHEAR LOAD $V_{Ru,m}$	[kN]	6.24	11.40	18.12	26.28	48.96	76.44	6.24	11.40	18.12	26.28	48.96	76.44
CHARACTERISTIC LOAD													
TENSION LOAD N_{Rk}	[kN]	6.46	12.15	18.05	24.00	44.70	59.70	3.17	6.05	8.20	10.00	15.65	21.40
SHEAR LOAD V_{Rk}	[kN]	5.20	9.50	15.10	21.90	40.80	63.70	3.17	6.05	8.20	10.00	31.30	42.80
DESIGN LOAD													
TENSION LOAD N_{Rd}	[kN]	2.56	4.80	7.15	9.50	17.75	23.70	1.25	2.40	3.25	3.95	6.20	8.50
SHEAR LOAD V_{Rd}	[kN]	3.59	6.75	10.03	13.33	32.64	50.96	1.76	3.36	4.56	5.56	17.39	23.78
RECOMMENDED LOAD*													
TENSION LOAD N_{rec}	[kN]	1.83	3.43	5.11	6.79	12.68	16.93	0.89	1.71	2.32	2.82	4.43	6.07
SHEAR LOAD V_{rec}	[kN]	2.56	4.82	7.16	9.52	23.31	36.40	1.26	2.40	3.26	3.97	12.42	16.99

* partial safety factor 1.4

steel failure

pry-out failure

MECHANICAL PROPERTIES

Size			M6	M8	M10	M12	M16	M20
Nominal ultimate strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	525	525	525	525	525	525
Cross section area - tension	A_s	[mm²]	20.1	36.6	58.0	84.3	157.0	245.0
Elastic section modulus	W_{el}	[mm³]	21.21	50.27	98.17	169.65	402.12	785.40
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	17.81	42.22	82.47	142.50	337.78	659.73
Design bending resistance	M	[Nm]	11.88	28.15	54.98	95.00	225.19	439.82

A

DESIGN PERFORMANCE DATA

Data based on AT-15-7555/2011

Size			M6	M8	M10	M12	M16	M20
Embedment depth	h_{ef}	[mm]	25	30	40	50	65	80
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	14.10	25.60	40.60	59.00	109.90	171.50
Design resistance γ_{Ms}=1.5	$N_{Rd,s}$	[kN]	9.40	17.07	27.07	39.33	73.27	114.33
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	6.46	12.15	18.05	24.00	44.70	59.70
Design resistance γ_{Mp}=2.52	$N_{Rd,p}$	[kN]	2.56	4.80	7.15	9.50	17.75	23.70
PULL-OUT FAILURE; CRACKED CONCRETE C20/25								
Characteristic resistance	$N_{Rk,p}$	[kN]	3.17	6.05	8.20	10.00	15.65	21.40
Design resistance γ_{Mp}=2.52	$N_{Rd,p}$	[kN]	1.25	2.40	3.25	3.95	6.20	8.50
Spacing	$s_{cr,N}$	[mm]	75	90	120	150	195	240
Edge distance	$c_{cr,N}$	[mm]	38	45	60	75	98	120
SHEAR LOAD								
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25								
Edge distance	c_1	[mm]	105	105	220	220	220	250
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	16.90	17.68	52.70	54.86	58.29	73.20
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	9.39	9.82	29.28	30.48	32.38	40.67
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25								
Edge distance	c_1	[mm]	105	105	220	220	220	250
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	11.97	12.52	37.33	38.86	41.29	51.85
Design resistance γ_{Mc}=1.8	$V_{Rd,c}$	[kN]	6.65	6.96	20.74	21.59	22.94	28.81
PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25								
	k	[-]	1	1	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	6.46	12.15	18.05	24.00	89.40	119.40
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	3.59	6.75	10.03	13.33	49.67	66.33
PRY-OUT FAILURE; CRACKED CONCRETE C20/25								
	k	[-]	1	1	1	1	2	2
Characteristic resistance	$V_{Rk,cp}$	[kN]	3.20	6.10	8.20	10.00	31.30	42.80
Design resistance γ_{Mc}=1.8	$V_{Rd,cp}$	[kN]	1.76	3.36	4.56	5.56	17.39	23.78
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	5.20	9.50	15.10	21.90	40.80	63.70
Design resistance γ_{Ms}=1.25	$V_{Rd,s}$	[kN]	4.16	7.60	12.08	17.52	32.64	50.96

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

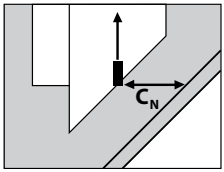
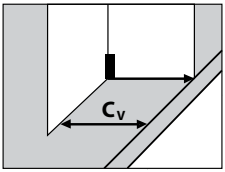


Table only valid for one edge$<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked and cracked concrete from 'Basic Performance' table

C_N [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
105	1.00	1.00	1.00	1.00								
220					1.00	1.00	1.00	1.00	1.00	1.00		
250											1.00	1.00

EDGE DISTANCE (SHEAR)



Tables only valid for one edge $>C_{min}$ and $S \geq 3C_v$
For other cases use theRawlplug Anchor Calculator

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for non-cracked concrete from 'Design Performance' table

C_V [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
105	0.38	0.38	0.69	0.69								
220					0.34	0.34	0.44	0.44	1.00	0.65		
240										0.70		
250										0.73	1.00	0.65
260										0.75	1.05	0.68
295										0.84	1.25	0.75
320										0.91		0.81
360										1.01		0.90
400												0.99
450												1.09
500												1.20
520												1.24

Increasing factors for edge distance $>C_{min}$ applicable to $V_{Rd,c}$ for cracked concrete from 'Design Performance' table

C_V [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}	$h \geq 1.5c_V$	h_{min}
105	0.26	0.26	0.48	0.48								
220					0.22	0.22	0.26	0.26	0.76	0.76		
250											0.83	0.83

SPACING

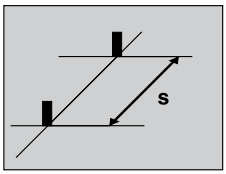


Table only valid for one spacing$<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked and cracked concrete from 'Basic Performance' table

s [mm]	M6		M8		M10		M12		M16		M20	
	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}	$h \geq 1.84h_{min}$	h_{min}
105	1.00	1.00	1.00	1.00								
220					1.00	1.00	1.00	1.00	1.00	1.00		
250											1.00	1.00

R-RLK-L, R-RLK-C, R-RLK-P, – Rawlok

PRODUCT INFORMATION

R-RLK-L – Loose bolt

R-RLK-C – Countersunk

R-RLK-P – Bolt projecting

BASE MATERIAL:

- Non-cracked concrete min C20/25
- Reinforced and unreinforced concrete
- Blockwork min 7.0 MPa

FEATURES:

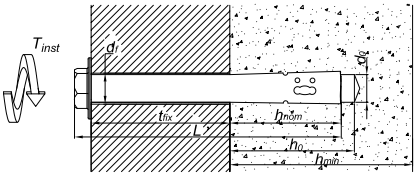
- Through fixing
- Zinc electroplated carbon steel

R-RLK-L - Loose Bolt
R-RLK-P - Bolt Projecting
R-RLK-C - Countersunk

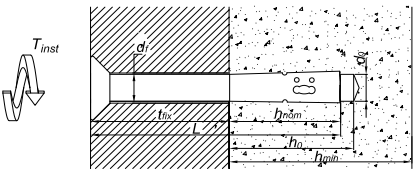
Size	Product code			Anchor		Fixture	
				Diameter	Length	Max. thickness	Hole diameter
	Bolt Projecting	Loose Bolt	Countersunk	d	L	t_{fix}	d_f
				[mm]	[mm]	[mm]	[mm]
M5*	R-RLK-P-05056	-	-	5	56	25	8
	-	-	R-RLK-C-05053	5	53	25	8
	-	-	R-RLK-C-05080	5	80	46	8
M6*	R-RLK-P-06040	-	-	6	40	10	10
	R-RLK-P-06065	-	-	6	65	35	10
M8*	R-RLK-P-08050	-	-	8	50	10	12
	-	R-RLK-L-08060	-	8	60	15	12
	R-RLK-P-08075	-	-	8	75	36	12
	-	R-RLK-L-08080	-	8	80	35	12
	R-RLK-P-08095	-	-	8	95	55	12
M10*	R-RLK-P-10060	-	-	10	60	10	14
	-	R-RLK-10070	-	10	70	14	14
	R-RLK-P-10075	-	-	10	75	27	14
	-	R-RLK-L-10100	-	10	100	44	14
	R-RLK-P-10100	-	-	10	100	50	14
	R-RLK-P-10130	-	-	10	130	80	14
M12*	R-RLK-P-12110	-	-	12	110	55	18
	R-RLK-P-12145	-	-	12	145	85	18

* not covered by approval

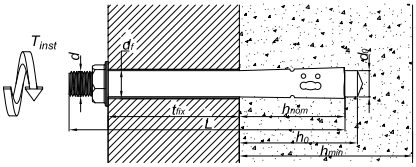
INSTALLATION DATA



R-RLK-L



R-RLK-C



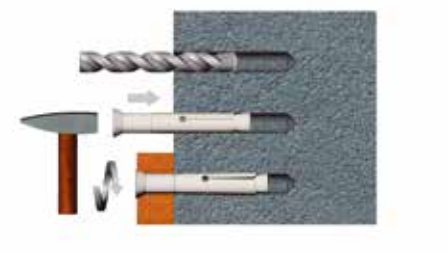
R-RLK-P

Size				M5*	M6*	M8*	M10*	M12*
Anchor diameter		d	[mm]	6.5	8	10	12	16
Hole diameter in substrate		d_0	[mm]	6.5	8	10	12	16
Installation torque	concrete	T_{inst}	[Nm]	2.5	6	11	22	38
	blockwork 14MPa			1.5	3	6	11	25
	blockwork 7MPa			1	2	4	8	12
Min. hole depth in substrate		h_0	[mm]	30	35	45	55	60
Installation depth		h_{nom}	[mm]	30	35	45	55	60
Min. substrate thickness		h_{min}	[mm]	50	55	65**	85	90
Min. Spacing		s_{min}	[mm]	40	50	60	70	90
Min. edge distance		c_{min}	[mm]	40	50	60	70	90

* not covered by approval
** 70mm for RLK-L

INSTALLATION GUIDE

1. Drill a hole of required diameter and depth.
2. Remove debris and thoroughly clean hole with brush and pump.
3. Insert Rawlok Sleeve Anchor through the fixture into the hole.
4. Tighten to the recommended torque.



BASIC PERFORMANCE DATA

A

Performance data for single anchor without influence of edge distance and spacing

Size		M5*	M6*	M8*	M10*	M12*
Embedment depth	[mm]	26	26	36	43	50
CHARACTERISTIC LOAD N_{RK}						
TENSION LOAD N_{Rk}						
Concrete	[kN]	5.00	6.90	9.30	11.40	14.50
Blockwork 7MPa	[kN]	1.50	2.40	3.50	4.50	5.80
SHEAR LOAD V_{Rk}						
Concrete	[kN]	3.60	5.40	9.00	12.60	19.80
Blockwork 7MPa	[kN]	2.30	2.50	2.70	3.10	3.40
DESIGN LOAD N_{Rd}						
TENSION LOAD N_{Rd}						
Concrete	[kN]	2.31	3.19	4.31	5.28	6.71
Blockwork 7MPa	[kN]	0.69	1.11	1.62	2.08	2.69
SHEAR LOAD V_{Rd}						
Concrete	[kN]	2.00	3.00	5.00	7.00	11.00
Blockwork 7MPa	[kN]	1.28	1.39	1.50	1.72	1.89
RECOMMENDED LOAD N_{rec} **						
TENSION LOAD N_{rec}						
Concrete	[kN]	1.65	2.28	3.08	3.77	4.79
Blockwork 7MPa	[kN]	0.50	0.79	1.16	1.49	1.92
SHEAR LOAD V_{rec}						
Concrete	[kN]	1.43	2.14	3.57	5.00	7.86
Blockwork 7MPa	[kN]	0.91	0.99	1.07	1.23	1.35

* not covered by approval

** partial safety factor 1.4

DESIGN PERFORMANCE DATA

A

STANDARD EMBEDMENT DEPTH

Size			M5*	M6*	M8*	M10*	M12*
Embedment depth	h_{ef}	[mm]	26	26	36	43	50
TENSION LOAD							
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25							
Characteristic resistance	$N_{Rk,p}$	[kN]	5.00	6.90	9.30	11.40	14.50
Design resistance γ_{Mp}=2.16	$N_{Rd,p}$	[kN]	2.31	3.19	4.31	5.28	6.71
PULL-OUT FAILURE; BLOCKWORK 7.0MPa							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.50	2.40	3.50	4.50	5.80
Design resistance γ_{Mp}=2.16	$N_{Rd,p}$	[kN]	0.69	1.11	1.62	2.08	2.69
PULL-OUT FAILURE; BLOCKWORK 14.0MPa							
Characteristic resistance	$N_{Rk,p}$	[kN]	1.90	3.20	4.50	5.60	6.90
Design resistance γ_{Mp}=2.16	$N_{Rd,p}$	[kN]	0.88	1.48	2.08	2.59	3.19
PULL-OUT FAILURE; BLOCKWORK 20.5MPa							
Characteristic resistance	$N_{Rk,p}$	[kN]	2.40	3.70	5.00	6.00	7.30
Design resistance γ_{Mp}=2.16	$N_{Rd,p}$	[kN]	1.11	1.71	2.31	2.78	3.38
SHEAR LOADS							
NON-CRACKED CONCRETE C20/25							
Characteristic resistance	N_{Rk}	[kN]	3.60	5.40	9.00	12.60	19.80
Design resistance γ_{Mc}=1.8	N_{Rd}	[kN]	2.00	3.00	5.00	7.00	11.00
BLOCKWORK 7.0MPa							
Characteristic resistance	N_{Rk}	[kN]	2.30	2.50	2.70	3.10	3.40
Design resistance γ_{Mc}=1.8	N_{Rd}	[kN]	1.28	1.39	1.50	1.72	1.89
BLOCKWORK 14.0MPa							
Characteristic resistance	N_{Rk}	[kN]	3.40	5.20	8.60	10.30	13.10
Design resistance γ_{Mc}=1.8	N_{Rd}	[kN]	1.89	2.89	4.78	5.72	7.28
BLOCKWORK 20.5MPa							
Characteristic resistance	N_{Rk}	[kN]	3.40	5.20	8.60	10.30	13.10
Design resistance γ_{Mc}=1.8	N_{Rd}	[kN]	1.89	2.89	4.78	5.72	7.28

* not covered by approval

REDUCTION/INCREASING RESISTANCE FACTORS FOR EDGE DISTANCE AND SPACING

EDGE DISTANCE (TENSION)

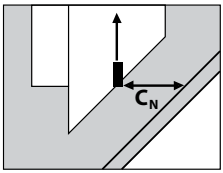


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to N_{Rd} or N_{rec} for non-cracked concrete from 'Basic Performance' table

c_N [mm]	M5	M6	M8	M10	M12
40	0.75				
50	0.87	0.79			
60	1.00	0.89	0.81		
70		1.00	0.91	0.77	
80			1.00	0.85	
90				0.92	0.81
100				1.00	0.87
120					1.00

EDGE DISTANCE (SHEAR)

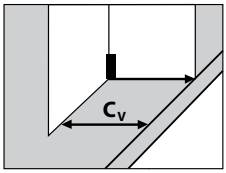


Table only valid for one edge $<C_{cr,N}$ and $S \geq 3C_v$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for edge distance $<C_{cr,N}$ applicable to V_{Rd} or V_{rec} for non-cracked concrete from 'Basic Performance' table

c_V [mm]	M5	M6	M8	M10	M12
40	0.58				
50	0.79	0.53			
60	1.00	0.69	0.50		
70		0.84	0.62	0.48	
80		1.00	0.75	0.58	
90			0.87	0.69	0.45
100			1.00	0.79	0.53
120				1.00	0.69
140					0.84
160					1.00

SPACING

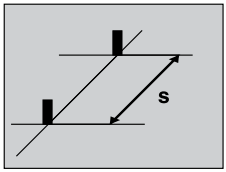


Table only valid for one spacing $<S_{cr,N}$ and $C \geq C_{cr,N}$
For other cases use the Rawlplug Anchor Calculator

Reduction factors for spacing $<S_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for non-cracked concrete from 'Basic Performance' table

s [mm]	M5	M6	M8	M10	M12
40	0.80				
50	0.90	0.77			
60	1.00	0.85	0.76		
70		0.92	0.82	0.75	
80		1.00	0.88	0.80	
90			0.94	0.85	0.74
100			1.00	0.90	0.77
120				1.00	0.85
140					0.92
160					1.00