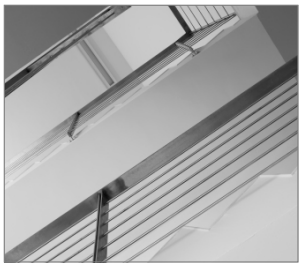
R-KEX II with Threaded Rods

Premium pure epoxy resin approved for use in cracked and non-cracked concrete



Approvals and Reports

- ETA-13/0455

Product information

Features and benefits

- The strongest resin in the epoxy resin class
- Approved for use with threaded rods for use in cracked and non-cracked concrete (ETAG001 Option 1)
- Suitable for use in dry and wet substrates including under water
- Very high chemical resistance – suitable for applications exposed to influence of various agents (industrial or marine environment)
- Minimal shrinkage provides option of use in diamond-drilled holes and oversized holes
- Extended bonding time ensures easy installation of metal components (up to 30 min. in 20°C)
- For use in positive temperatures

Applications

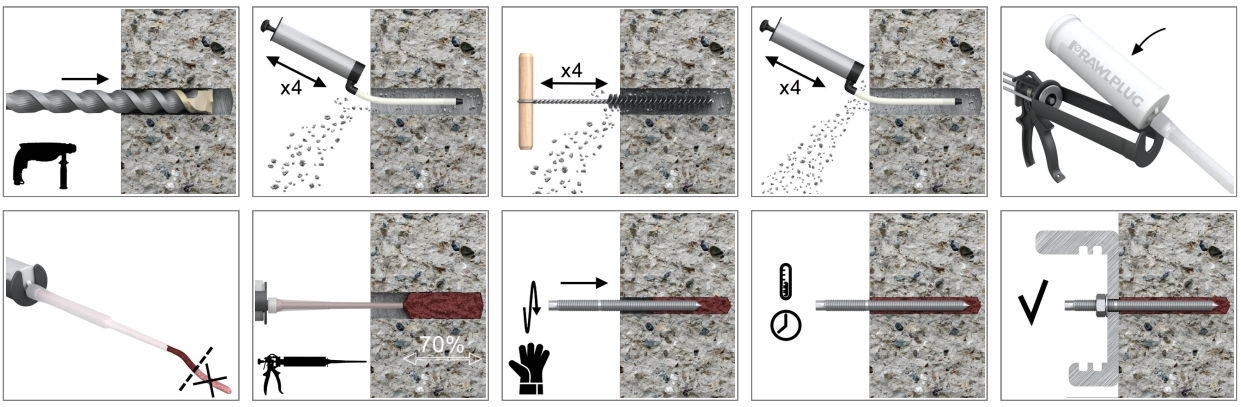
- Safety barriers
- Formwork support systems
- Structural steelwork
- Street lamps
- Curtain walling
- Racking systems
- Balustrading
- Barriers
- Cladding restraints
- Masonry support
- Heavy machinery
- Platforms

Base materials

Approved for use in:

- Cracked concrete C20/25-C50/60
- Non-cracked concrete C20/25-C50/60

Installation guide



Product information

1. Drill hole to the required diameter and depth for stud size being used.
2. Clean the hole with brush and hand pump at least four times each. It is very important and necessary before installation.
3. Insert cartridge into gun and attach nozzle.
4. Dispense to waste until even colour is obtained.
5. Insert the mixing nozzle to the far end of the hole and inject resin, slowly withdrawing the nozzle as the hole is filled to 2/3 of its depth.
6. Immediately insert the stud, slowly and with slight twisting motion. Remove any excess resin around the hole before it sets and leave it undisturbed until the curing time elapses.
7. Attach fixture and tighten the nut to the required torque.

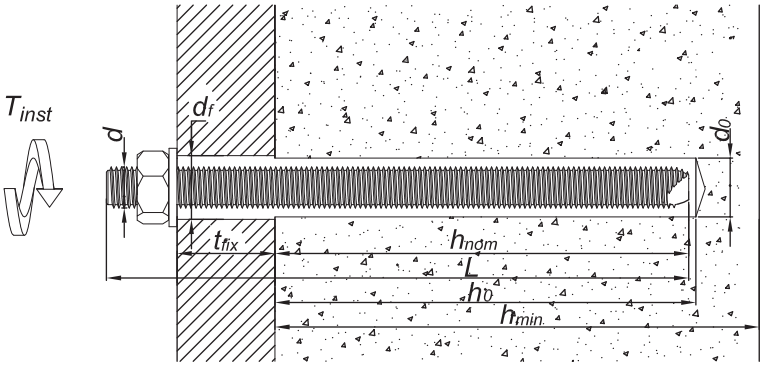
Size	Product Code	Resin	Description / Resin Type	Volume
				[ml]
M8	R-KEX-II-385	R-KEX II	Epoxy Resin	385
M30	R-KEX-II-600			600

Product Code	Resin	Description / Resin Type	Volume
			[ml]
R-KEX-II-385	R-KEX II	Epoxy Resin	385
R-KEX-II-600			600

R-STUDS

Size	Product Code			Anchor		Fixture			
	Steel class 5.8	Steel class 8.8	Steel grade A4	Diameter	Length	Hole diameter	Max. thickness t_{fix} for:		
				d	L	d_f	$h_{nom,\ min}$	$h_{nom,std}$	$h_{nom,\ max}$
				[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M8	R-STUDS-08110	R-STUDS-08110-88	R-STUDS-08110-A4	8	110	9	40	20	-
	R-STUDS-08160	-	R-STUDS-08160-A4	8	160	9	90	70	50
M10	R-STUDS-10130	R-STUDS-10130-88	R-STUDS-10130-A4	10	130	12	48	28	-
	R-STUDS-10170	-	R-STUDS-10170-A4	10	170	12	88	68	38
	R-STUDS-10190	-	R-STUDS-10190-A4	10	190	12	108	88	58
M12	R-STUDS-12160	R-STUDS-12160-88	R-STUDS-12160-A4	12	160	14	65	35	-
	R-STUDS-12190	-	R-STUDS-12190-A4	12	190	14	95	65	30
	R-STUDS-12220	-	R-STUDS-12220-A4	12	220	14	125	95	60
	R-STUDS-12260	-	R-STUDS-12260-A4	12	260	14	165	135	100
	R-STUDS-12300	-	R-STUDS-12300-A4	12	300	14	205	175	140
M16	R-STUDS-16190	R-STUDS-16190-88	R-STUDS-16190-A4	16	190	18	71	46	-
	R-STUDS-16220	-	R-STUDS-16220-A4	16	220	18	101	76	11
	R-STUDS-16260	-	R-STUDS-16260-A4	16	260	18	141	116	51
	R-STUDS-16300	-	R-STUDS-16300-A4	16	300	18	181	156	91
	R-STUDS-16380	-	R-STUDS-16380-A4	16	380	18	261	236	171
M20	R-STUDS-20260	R-STUDS-20260-88	R-STUDS-20260-A4	20	260	22	117	67	-
	R-STUDS-20300	-	R-STUDS-20300-A4	20	300	22	157	107	37
	R-STUDS-20350	-	R-STUDS-20350-A4	20	350	22	207	157	87
M24	R-STUDS-24300	R-STUDS-24300-88	R-STUDS-24300-A4	24	300	26	132	62	-
M30	R-STUDS-30380	R-STUDS-30380-88	R-STUDS-30380-A4	30	380	32	181	106	-

Installation data



R-STUDS

Size			M8	M10	M12	M16	M20	M24	M30
Thread diameter	d	[mm]	8	10	12	16	20	24	30
Hole diameter in substrate	d_0	[mm]	10	12	14	18	24	28	35
Installation torque	T_{inst}	[Nm]	10	20	40	80	120	180	300
Min. hole depth in substrate	h_0	[mm]	h_{ef} + 5	h_{ef} + 5	h_{ef} + 5	h_{ef} + 5	h_{ef} + 5	h_{ef} + 5	h_{ef} + 5
Min. substrate thickness	h_{min}	[mm]	h_{ef} + 30 100	h_{ef} + 30 100	h_{ef} + 30 100	h_{ef} + 30 100	h_{ef} + 2*d_0	h_{ef} + 2*d_0	h_{ef} + 2*d_0
Min. spacing	s_{min}	[mm]	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40
Min. edge distance	c_{min}	[mm]	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40	0.5 * h_{ef} 40
MINIMUM EMBEDMENT DEPTH									
Installation depth	$h_{nom, min}$	[mm]	60	70	80	100	120	140	165
STANDARD EMBEDMENT DEPTH									
Installation depth	$h_{nom,s}$	[mm]	80	90	110	125	170	210	240
MAXIMUM EMBEDMENT DEPTH									
Installation depth	$h_{nom, max}$	[mm]	100	120	145	190	240	290	360

Minimum working and curing time

Resin temperature	Concrete temperature	Curing time*	Working time
[°C]	[°C]	[min]	[min]
5	5	150	2880
10	10	120	1080
20	20	35	480
25	30	12	300

Mechanical properties

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 5.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f_{yk}	[N/mm²]	400	400	400	400	400	400	400
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	19	37	65	166	324	561	1124
Design bending resistance	M	[Nm]	15	30	52	133	259	449	899
Allowable bending resistance	M_{rec}	[Nm]	11	21	37	95	185	321	642

Mechanical properties

Size			M8	M10	M12	M16	M20	M24	M30
R-STUDS Metric Threaded Rods - Steel Class 8.8									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	800	800	800	800	800	800	800
Nominal yield strength - tension	f_{yk}	[N/mm²]	640	640	640	640	640	640	640
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	30	60	105	266	519	898	1799
Design bending resistance	M	[Nm]	24	48	84	213	416	718	1439
Allowable bending resistance	M_{rec}	[Nm]	17	34	60	152	297	513	1028
R-STUDS Metric Threaded Rods - A4									
Nominal ultimate tensile strength - tension	f_{uk}	[N/mm²]	700	700	700	700	700	700	700
Nominal yield strength - tension	f_{yk}	[N/mm²]	350	350	350	350	350	350	350
Cross sectional area - tension	A_s	[mm²]	36.6	58	84.3	157	245	352.8	559.8
Elastic section modulus	W_{el}	[mm³]	31.2	62.3	109.2	277.5	541	935	1868
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454	786	1574
Design bending resistance	M	[Nm]	17	34	59	149	291	504	1009
Allowable bending resistance	M_{rec}	[Nm]	12	24	42	107	208	360	721

Basic performance data

R-STUDS

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

Size		M8	M10	M12	M16	M20	M24	M30	M12	M16	M20	M24
Substrate		Non-cracked concrete							Cracked concrete			
MEAN ULTIMATE LOAD												
TENSION LOAD $N_{Ru,m}$												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	21.6	34.8	50.4	78.0	102.5	129.1	165.0	32.6	54.3	73.0	97.7
Standard embedment depth	[kN]	21.6	34.8	50.4	93.8	146.7	211.6	289.6	44.8	67.9	115.3	146.5
Maximum embedment depth	[kN]	21.6	34.8	50.4	93.8	146.7	211.6	336.6	50.4	93.8	146.7	202.3
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	34.9	45.7	55.6	78.0	102.5	129.1	165.0	32.6	54.3	73.0	97.7
Standard embedment depth	[kN]	34.9	55.3	80.5	108.9	172.6	237.1	289.6	44.8	67.9	115.3	146.5
Maximum embedment depth	[kN]	34.9	55.3	80.5	151.5	235.6	339.0	532.0	59.0	103.2	162.8	202.3
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	31.3	45.7	55.6	78.0	102.5	129.1	165.0	32.6	54.3	73.0	97.7
Standard embedment depth	[kN]	31.3	49.3	70.9	108.9	172.6	237.1	289.6	44.8	67.9	115.3	146.5
Maximum embedment depth	[kN]	31.3	49.3	70.9	132.2	205.6	296.9	532.0	59.0	103.2	162.8	202.3
SHEAR LOAD $V_{Ru,m}$												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	18.3	29.0	42.2	78.5	122.5	176.5	280.5	42.2	78.5	122.5	176.5
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	29.3	46.4	67.4	125.6	196.0	282.4	448.8	67.4	125.6	196.0	282.4
R-STUDS METRIC THREADED RODS - A4	[kN]	25.6	40.6	59.0	109.9	171.5	247.1	392.7	59.0	109.9	171.5	247.1

Basic performance data

Size		M8	M10	M12	M16	M20	M24	M30	M12	M16	M20	M24
CHARACTERISTIC LOAD												
TENSION LOAD N_{Rk}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	18.0	29.0	36.1	50.5	66.4	83.7	107.0	21.1	35.2	47.3	59.6
Standard embedment depth	[kN]	18.0	29.0	42.0	70.6	111.9	153.7	187.8	29.0	44.0	74.8	95.0
Maximum embedment depth	[kN]	18.0	29.0	42.0	78.0	122.0	176.0	280.0	38.3	66.9	105.6	131.2
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	23.5	29.6	36.1	50.5	66.4	83.7	107.0	21.1	35.2	47.3	59.6
Standard embedment depth	[kN]	29.0	43.1	58.3	70.6	111.9	153.7	187.8	29.0	44.0	74.8	95.0
Maximum embedment depth	[kN]	29.0	46.0	67.0	126.0	187.8	249.4	344.9	38.3	66.9	105.6	131.2
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	23.5	29.6	36.1	50.5	66.4	83.7	107.0	21.1	35.2	47.3	59.6
Standard embedment depth	[kN]	26.0	41.0	58.3	70.6	111.9	153.7	187.8	29.0	44.0	74.8	95.0
Maximum embedment depth	[kN]	26.0	41.0	59.0	110.0	171.0	247.0	344.9	38.3	66.9	105.6	131.2
SHEAR LOAD V_{Rk}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	9.00	14.0	21.0	39.0	61.0	88.0	140.0	21.0	39.0	61.0	88.0
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	224.0	34.0	63.0	98.0	141.0
R-STUDS METRIC THREADED RODS - A4	[kN]	13.0	20.0	29.0	55.0	86.0	124.0	196.0	29.0	55.0	86.0	124.0
DESIGN LOAD												
TENSION LOAD N_{Rd}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	12.0	19.3	24.1	33.7	44.3	55.8	71.3	14.1	23.5	31.5	39.8
Standard embedment depth	[kN]	12.0	19.3	28.0	47.1	74.6	102.5	125.2	19.4	29.3	49.8	63.3
Maximum embedment depth	[kN]	12.0	19.3	28.0	52.0	81.3	117.3	186.7	25.5	44.6	70.4	87.5
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	15.7	19.7	24.1	33.7	44.3	55.8	71.3	14.1	23.5	31.5	39.8
Standard embedment depth	[kN]	19.3	28.7	38.9	47.1	74.6	102.5	125.2	19.4	29.3	49.8	63.3
Maximum embedment depth	[kN]	19.3	30.7	44.7	84.0	125.2	166.3	229.9	25.5	44.6	70.4	87.5
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	13.9	19.7	24.1	33.7	44.3	55.8	71.3	14.1	23.5	31.5	39.8
Standard embedment depth	[kN]	13.9	21.9	31.6	47.1	74.6	102.5	125.2	19.4	29.3	49.8	63.3
Maximum embedment depth	[kN]	13.9	21.9	31.6	58.8	91.4	132.1	210.2	25.5	44.6	70.4	87.5
SHEAR LOAD V_{Rd}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	7.20	11.2	16.8	31.2	48.8	70.4	112.0	16.8	31.2	48.8	70.4
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	179.2	27.2	50.4	78.4	112.8
R-STUDS METRIC THREADED RODS - A4	[kN]	8.33	12.8	18.6	35.3	55.1	79.5	125.6	18.6	35.3	55.1	79.5

Basic performance data

Size		M8	M10	M12	M16	M20	M24	M30	M12	M16	M20	M24
RECOMMENDED LOAD												
TENSION LOAD N_{rec}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8												
Minimum embedment depth	[kN]	8.57	13.8	17.2	24.0	31.6	39.9	51.0	10.00	16.8	22.5	28.4
Standard embedment depth	[kN]	8.57	13.8	20.0	33.6	53.3	73.2	89.4	13.8	21.0	35.6	45.2
Maximum embedment depth	[kN]	8.57	13.8	20.0	37.1	58.1	83.8	133.3	18.2	31.9	50.3	62.5
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8												
Minimum embedment depth	[kN]	11.2	14.1	17.2	24.0	31.6	39.9	51.0	10.00	16.8	22.5	28.4
Standard embedment depth	[kN]	13.8	20.5	27.8	33.6	53.3	73.2	89.4	13.8	21.0	35.6	45.2
Maximum embedment depth	[kN]	13.8	21.9	31.9	60.0	89.4	118.8	164.2	18.2	31.9	50.3	62.5
R-STUDS METRIC THREADED RODS - A4												
Minimum embedment depth	[kN]	9.93	14.1	17.2	24.0	31.6	39.9	51.0	10.00	16.8	22.5	28.4
Standard embedment depth	[kN]	9.93	15.7	22.6	33.6	53.3	73.2	89.4	13.8	21.0	35.6	80.6
Maximum embedment depth	[kN]	9.93	15.7	22.5	42.0	65.3	94.3	150.1	18.2	31.9	50.3	62.5
SHEAR LOAD V_{rec}												
R-STUDS METRIC THREADED RODS - STEEL CLASS 5.8	[kN]	5.14	8.00	12.0	22.3	34.9	50.3	80.0	12.0	22.3	34.9	50.3
R-STUDS METRIC THREADED RODS - STEEL CLASS 8.8	[kN]	8.57	13.1	19.4	36.0	56.0	80.6	128.0	19.4	36.0	56.0	80.6
R-STUDS METRIC THREADED RODS - A4	[kN]	5.95	9.16	13.3	25.2	39.4	56.8	89.7	13.3	25.2	39.4	56.8

Design performance data

R-STUDS Maximum embedment depth

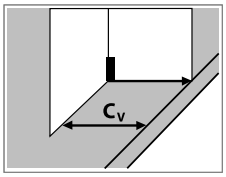
Size			M8	M10	M12	M16	M20	M24	M30
Effective embedment depth	h_{ef}	[mm]	100.00	120.00	145.00	190.00	240.00	290.00	360.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Design resistance γ_{Ms}= 1.5	$N_{Rd,s}$	[kN]	12.00	19.30	28.00	52.00	81.30	117.30	186.70
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	449.00
Design resistance γ_{Ms}= 1.5	$N_{Rd,s}$	[kN]	19.30	30.70	44.70	84.00	130.70	188.00	299.30
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	393.00
Design resistance γ_{Ms}= 1.87	$N_{Rd,s}$	[kN]	13.90	21.90	31.60	58.80	91.40	132.10	210.20
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	42.70	28.50	-	-	-	-	-
Design resistance γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	28.50	19.00	-	-	-	-	-
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	37.70	52.80	82.00	124.20	-	-	339.30
Design resistance γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	25.10	35.20	54.70	82.80	-	-	226.20
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Spacing	$s_{cr,N}$	-	-	-	361.00	453.00	566.00	632.00	-
Edge distance	$c_{cr,N}$	-	-	-	181.00	226.00	283.00	316.00	-
CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,c}$	[kN]	-	-	88.20	132.30	187.80	249.40	344.90
Design resistance γ_{Mc}= 1.5	$N_{Rd,c}$	[kN]	-	-	58.80	88.20	125.20	166.30	229.90
PULL-OUT FAILURE									
Characteristic resistance	$N_{Rk,p}$	-	-	-	-	-	-	-	-
Design resistance	$N_{Rd,p}$	-	-	-	-	-	-	-	-
PULL-OUT FAILURE; CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	38.30	66.90	105.60	131.20	-
Design resistance γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	-	-	25.50	44.60	70.40	87.50	-
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	32.80	57.30	90.50	109.30	-
Design resistance γ_{Mc} = γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	-	-	21.90	38.20	60.30	72.90	-
CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,c}$	[kN]	-	-	-	-	187.80	249.40	-
Design resistance γ_{Mc}= 1.5	$N_{Rd,c}$	[kN]	-	-	-	-	125.20	166.30	-

Design performance data

Size			M8	M10	M12	M16	M20	M24	M30
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	50.00	60.00	73.00	95.00	120.00	145.00	180.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	7.83	10.80	15.00	23.80	35.30	48.80	70.70
CONCRETE EDGE FAILURE									
Design resistance	$V_{Rd,c}$	-	-	-	-	-	-	-	-
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Design resistance γ_{Mc}= 1.5	$V_{Rd,c}$	[kN]	5.22	7.20	10.00	15.80	23.60	32.50	47.20
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	7.20	11.20	16.80	31.20	48.80	70.40	112.00
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	12.00	18.40	27.20	50.40	78.40	112.80	179.20
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Design resistance γ_{Ms}= 1.56	$V_{Rd,s}$	[kN]	8.33	12.80	18.60	35.30	55.10	79.50	125.60
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25									
Design resistance γ_{Mc}= 1.5	$V_{Rd,c}$	[kN]	-	-	7.09	11.20	16.70	23.00	-
Edge distance	c_1	[mm]	-	-	73.00	95.00	120.00	145.00	-
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	-	-	10.60	16.80	25.00	34.60	-

Reduction / increasing resistance factors for edge distance and spacing

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		M20		M24		M30	
	$h \geq 1.5c_V$	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}
50	1.00	1.00												
60	1.31	1.31	1.00	1.00										
73	1.76	1.76	1.34	1.34	1.00	1.00								
95	2.62	2.50	1.99	1.99	1.48	1.48	1.00	1.00						
100	2.83	2.63	2.15	2.15	1.60	1.60	1.08	1.08						
105		2.76	2.32	2.26	1.73	1.73	1.16	1.16						
120			2.83	2.58	2.11	2.08	1.42	1.42	1.00	1.00				
145			3.76	3.12	2.80	2.51	1.89	1.89	1.33	1.33	1.00	1.00		
180				3.87	3.87	3.12	2.61	2.35	1.84	1.84	1.38	1.38	1.00	1.00
200						3.46	3.05	2.62	2.15	2.11	1.62	1.62	1.17	1.17
230							3.77	3.01	2.65	2.42	2.00	2.00	1.44	1.44
250							4.27	3.27	3.01	2.64	2.26	2.17	1.64	1.64
300								3.92	3.95	3.16	2.98	2.61	2.15	2.10
350								4.58	4.98	3.69	3.75	3.04	2.71	2.45
400										4.22	4.58	3.48	3.31	2.80
450												3.91	3.95	3.15
500												4.35	4.63	3.51
550													5.34	3.86
675														4.73

Design performance data

Edge distance (tension)

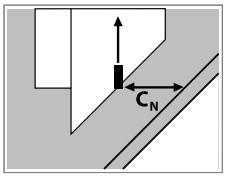


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

c_N [mm]	M12		M16		M20		M24	
	$h \geq 1.40h_{min}$	h_{min}	$h \geq 1.44h_{min}$	h_{min}	$h \geq 1.41h_{min}$	h_{min}	$h \geq 1.41h_{min}$	h_{min}
73	0.58	0.51						
95	0.65	0.57	0.59	0.52				
100	0.67	0.58	0.60	0.53				
120	0.75	0.64	0.66	0.57	0.59	0.55		
140	0.83	0.69	0.72	0.61	0.63	0.59		
150	0.87	0.72	0.75	0.63	0.66	0.61	0.62	0.57
165	0.93	0.76	0.79	0.66	0.69	0.64	0.65	0.59
180	1.00	0.81	0.84	0.69	0.73	0.67	0.68	0.62
200		0.84	0.91	0.74	0.78	0.71	0.73	0.65
225		0.89	1.00	0.79	0.84	0.76	0.78	0.69
265		0.96		0.85	0.95	0.85	0.87	0.77
300		1.00		0.89	1.00	0.92	0.96	0.83
320				0.92		0.94	1.00	0.87
360				0.97		1.00		0.91
400				1.00				0.96
450								1.00

Spacing

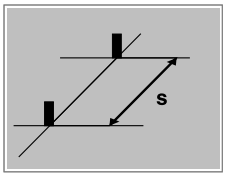


Table only valid for one spacing $<s_{cr,N}$ and $c \geq c_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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

s [mm]	M12		M16		M20		M24	
	$h \geq 1.40h_{min}$	h_{min}	$h \geq 1.44h_{min}$	h_{min}	$h \geq 1.41h_{min}$	h_{min}	$h \geq 1.41h_{min}$	h_{min}
73	0.60	0.56						
95	0.63	0.58	0.60	0.56				
100	0.64	0.59	0.61	0.57				
120	0.67	0.60	0.63	0.58	0.61	0.58		
145	0.70	0.63	0.66	0.60	0.63	0.60	0.61	0.58
180	0.75	0.66	0.70	0.62	0.66	0.63	0.64	0.60
200	0.78	0.67	0.72	0.63	0.68	0.64	0.66	0.61
225	0.81	0.69	0.75	0.65	0.70	0.66	0.68	0.63
250	0.85	0.72	0.78	0.66	0.72	0.67	0.70	0.64
280	0.89	0.74	0.81	0.68	0.75	0.69	0.72	0.66
320	0.94	0.78	0.85	0.71	0.78	0.72	0.75	0.68
360	1.00	0.81	0.90	0.74	0.82	0.75	0.78	0.71
400		0.84	0.94	0.76	0.85	0.78	0.82	0.73
450		0.89	1.00	0.80	0.90	0.81	0.86	0.76
500		0.93		0.83	0.94	0.85	0.90	0.79
570		0.99		0.88	1.00	0.90	0.95	0.83
630		1.00		0.91		0.94	1.00	0.86
760				1.00		1.00		0.94
950								1.00

Design performance data

Edge distance (tension)

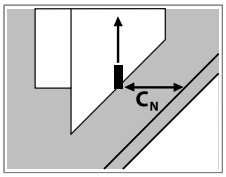


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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

c_N [mm]	M8		M10		M12		M16		M20	M24	M30
	$h \geq 1.33h_{min}$	h_{min}	$h \geq 1.37h_{min}$	h_{min}	$h \geq 1.40h_{min}$	h_{min}	$h \geq 1.44h_{min}$	h_{min}	$h \geq h_{min}$		
50	0.58	0.49									
60	0.64	0.53	0.58	0.49							
73	0.71	0.57	0.64	0.53	0.53	0.50					
95	0.84	0.65	0.74	0.59	0.60	0.55	0.53	0.50			
100	0.87	0.66	0.76	0.60	0.61	0.56	0.54	0.51			
120	0.99	0.74	0.86	0.66	0.67	0.61	0.59	0.54	0.53		
140	1.00	0.78	0.97	0.72	0.73	0.66	0.63	0.58	0.57		
150		0.80	1.00	0.75	0.77	0.69	0.65	0.60	0.58	0.54	
165		0.83		0.78	0.82	0.73	0.69	0.63	0.61	0.56	
180		0.86		0.80	0.87	0.77	0.73	0.66	0.64	0.58	0.53
200		0.90		0.83	0.94	0.82	0.77	0.69	0.67	0.61	0.56
225		0.95		0.88	1.00	0.89	0.84	0.75	0.72	0.65	0.58
265		1.00		0.94		0.96	0.94	0.83	0.80	0.71	0.63
300				1.00		1.00	1.00	0.89	0.87	0.77	0.67
320								0.92	0.91	0.80	0.70
360								0.97	1.00	0.87	0.75
400								1.00		0.94	0.80
450										1.00	0.87
550											1.00

Design performance data

Edge distance (tension)

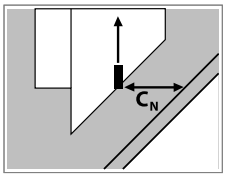


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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	M24	M30
	$h \geq 1.33h_{min}$	h_{min}	$h \geq 1.37h_{min}$	h_{min}	$h \geq 1.40h_{min}$	h_{min}	$h \geq 1.44h_{min}$	h_{min}	$h \geq h_{min}$		
50	0.58	0.49									
60	0.64	0.53	0.58	0.49							
73	0.71	0.57	0.64	0.53	0.53	0.50					
95	0.84	0.65	0.74	0.59	0.60	0.55	0.53	0.50			
100	0.87	0.66	0.76	0.60	0.61	0.56	0.54	0.51			
120	0.99	0.74	0.86	0.66	0.67	0.61	0.59	0.54	0.53		
140	1.00	0.78	0.97	0.72	0.73	0.66	0.63	0.58	0.57		
150		0.80	1.00	0.75	0.77	0.69	0.65	0.60	0.58	0.54	
165		0.83		0.78	0.82	0.73	0.69	0.63	0.61	0.56	
180		0.86		0.80	0.87	0.77	0.73	0.66	0.64	0.58	0.53
200		0.90		0.83	0.94	0.82	0.77	0.69	0.67	0.61	0.56
225		0.95		0.88	1.00	0.89	0.84	0.75	0.72	0.65	0.58
265		1.00		0.94		0.96	0.94	0.83	0.80	0.71	0.63
300				1.00		1.00	1.00	0.89	0.87	0.77	0.67
320								0.92	0.91	0.80	0.70
360								0.97	1.00	0.87	0.75
400								1.00		0.94	0.80
450										1.00	0.87
550											1.00

Design performance data

Spacing

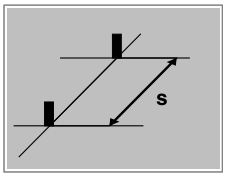


Table only valid for one spacing $<s_{cr,N}$ and $c \geq c_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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	M24	M30
	$h \geq 1.33h_{min}$	h_{min}	$h \geq 1.37h_{min}$	h_{min}	$h \geq 1.40h_{min}$	h_{min}	$h \geq 1.44h_{min}$	h_{min}	$h \geq h_{min}$		
50	0.60	0.55									
60	0.62	0.56	0.60	0.55							
73	0.65	0.57	0.62	0.56	0.58	0.56					
95	0.70	0.60	0.66	0.58	0.61	0.58	0.58	0.56			
100	0.71	0.60	0.67	0.58	0.61	0.59	0.59	0.57			
120	0.75	0.62	0.71	0.60	0.64	0.60	0.61	0.58	0.58		
145	0.80	0.65	0.75	0.62	0.67	0.63	0.63	0.60	0.60	0.58	
180	0.87	0.68	0.81	0.65	0.71	0.66	0.66	0.62	0.63	0.60	0.58
200	0.92	0.70	0.84	0.67	0.73	0.67	0.68	0.63	0.64	0.61	0.59
225	0.97	0.73	0.89	0.69	0.76	0.69	0.70	0.65	0.66	0.63	0.60
250	1.00	0.75	0.93	0.71	0.79	0.72	0.72	0.66	0.67	0.64	0.62
280		0.78	0.98	0.73	0.82	0.74	0.75	0.68	0.69	0.66	0.63
320		0.82	1.00	0.77	0.87	0.78	0.78	0.71	0.72	0.68	0.65
360		0.86		0.80	0.91	0.81	0.82	0.74	0.75	0.71	0.67
400		0.90		0.83	0.96	0.84	0.85	0.76	0.78	0.73	0.69
450		0.95		0.88	1.00	0.89	0.89	0.80	0.81	0.76	0.71
500		1.00		0.92		0.93	0.94	0.83	0.85	0.79	0.73
570				0.98		0.99	1.00	0.88	0.90	0.83	0.76
630				1.00		1.00		0.91	0.94	0.86	0.79
760								1.00	1.00	0.94	0.85
950										1.00	0.94
1100											1.00

Design performance data

Minimum embedment depth

Size			M8	M10	M12	M16	M20	M24	M30
Effective embedment depth	h_{ef}	[mm]	60.00	70.00	80.00	100.00	120.00	140.00	165.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Design resistance γ_{Ms}= 1.5	$N_{Rd,s}$	[kN]	12.00	19.30	28.00	52.00	81.30	117.30	186.70
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	449.00
Design resistance γ_{Ms}= 1.5	$N_{Rd,s}$	[kN]	19.30	30.70	44.70	84.00	130.70	188.00	299.30
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	393.00
Design resistance γ_{Ms}= 1.87	$N_{Rd,s}$	[kN]	13.90	21.90	31.60	58.80	91.40	132.10	210.20
CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,c}$	[kN]	23.50	29.60	36.10	50.50	66.40	83.70	107.00
Design resistance γ_{Mc}= 1.5	$N_{Rd,c}$	[kN]	15.70	19.70	24.10	33.70	44.30	55.80	71.30
PULL-OUT FAILURE									
Characteristic resistance	$N_{Rk,p}$	-	-	-	-	-	-	-	-
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	22.60	-	-	-	-	-	-
PULL-OUT FAILURE									
Design resistance	$N_{Rd,p}$	-	-	-	-	-	-	-	-
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25 (80°C/50°C)									
Design resistance γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	15.10	-	-	-	-	-	-
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Spacing	$s_{cr,N}$	[mm]	180.00	210.00	240.00	300.00	360.00	420.00	495.00
Edge distance	$c_{cr,N}$	[mm]	90.00	105.00	120.00	150.00	180.00	210.00	248.00
CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,c}$	[kN]	-	29.60	36.10	50.50	66.40	83.70	107.00
Design resistance γ_{Mc}= 1.5	$N_{Rd,c}$	[kN]	-	19.70	24.10	33.70	44.30	55.80	71.30
PULL-OUT FAILURE; CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	21.10	35.20	-	-	-
Design resistance γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	-	-	14.10	23.50	-	-	-
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	12.10	20.10	30.20	35.20	-
CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,c}$	[kN]	-	-	-	-	47.30	59.60	-
Design resistance γ_{Mc}= 1.5	$N_{Rd,c}$	[kN]	-	-	-	-	31.50	39.80	-

Design performance data

Size			M8	M10	M12	M16	M20	M24	M30
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	40.00	40.00	40.00	50.00	60.00	70.00	83.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.27	5.68	6.09	9.06	12.50	16.40	22.20
CONCRETE EDGE FAILURE									
Design resistance	$V_{Rd,c}$	-	-	-	1.50	1.50	1.50	1.50	-
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Design resistance γ_{Mc}= 1.5	$V_{Rd,c}$	[kN]	3.51	3.79	4.06	6.04	8.34	10.90	14.80
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	7.20	11.20	16.80	31.20	48.80	70.40	112.00
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	12.00	18.40	27.20	50.40	78.40	112.80	179.20
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Design resistance γ_{Ms}= 1.56	$V_{Rd,s}$	[kN]	8.33	12.80	18.60	35.30	55.10	79.50	125.60
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25 (80°C/50°C)									
Design resistance $\gamma_{Mc} = \gamma_{Mp}$= 1.5	$N_{Rd,p}$	[kN]	-	-	18.10	30.20	45.20	52.80	-
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	-	-	40.00	50.00	60.00	70.00	-
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	-	-	2.87	4.28	5.91	7.75	-

Reduction / increasing resistance factors for edge distance and spacing

Edge distance (tension)

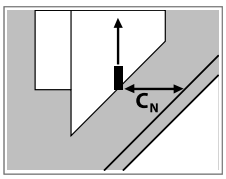


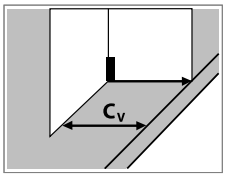
Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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

c_N [mm]	M8		M10		M12		M16		M20	M24	M30
	$h \geq 1.13h_{min}$	h_{min}	$h \geq 1.25h_{min}$	h_{min}	$h \geq 1.28h_{min}$	h_{min}	$h \geq 1.33h_{min}$	h_{min}			
40	0.60	0.53	0.56	0.50	0.53	0.50					
50	0.65	0.58	0.62	0.54	0.58	0.54	0.53	0.50			
60	0.71	0.63	0.68	0.59	0.64	0.58	0.57	0.53	0.53		
70	0.77	0.68	0.75	0.63	0.69	0.63	0.62	0.57	0.57	0.53	
85	0.87	0.77	0.85	0.70	0.78	0.70	0.68	0.62	0.62	0.58	0.54
90	0.90	0.80	0.89	0.72	0.81	0.72	0.70	0.64	0.64	0.59	0.55
105	0.96	0.85	1.00	0.80	0.90	0.80	0.77	0.69	0.69	0.64	0.59
120	1.00	0.90		0.84	1.00	0.88	0.85	0.75	0.75	0.68	0.63
150		1.00		0.93		0.97	1.00	0.88	0.87	0.78	0.71
165				0.97		1.00		0.91	0.93	0.84	0.75
180				1.00				0.95	1.00	0.89	0.79
210								1.00		1.00	0.88
250											1.00

Design performance data

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		M20		M24		M30	
	$h \geq 1.5c_V$	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	1.00	1.00	1.00	1.00								
50	1.40	1.40	1.40	1.40	1.40	1.40	1.00	1.00						
60	1.84	1.84	1.84	1.84	1.84	1.84	1.31	1.31	1.00	1.00				
70	2.32	2.26	2.32	2.26	2.32	2.32	1.66	1.66	1.26	1.26	1.00	1.00		
83	2.99	2.68	2.99	2.68	2.99	2.81	2.14	2.14	1.63	1.63	1.29	1.29	1.00	1.00
90	3.38	2.90	3.38	2.90	3.38	3.05	2.41	2.37	1.84	1.84	1.46	1.46	1.13	1.13
100	3.95	3.23	3.95	3.23	3.95	3.39	2.83	2.63	2.15	2.15	1.71	1.71	1.32	1.32
115	4.87	3.71	4.87	3.71	4.87	3.89	3.49	3.03	2.65	2.62	2.11	2.11	1.63	1.63
150		4.84	7.26	4.84	7.26	5.08	5.20	3.95	3.95	3.42	3.14	2.93	2.43	2.43
165				5.33	8.38	5.59	5.99	4.34	4.56	3.76	3.62	3.22	2.80	2.73
200				6.45		6.77	8.00	5.27	6.09	4.55	4.83	3.90	3.74	3.31
250						8.46	11.18	6.58	8.51	5.69	6.75	4.88	5.23	4.14
300								7.90	11.18	6.83	8.87	5.86	6.87	4.97
350								9.22		7.97	11.18	6.83	8.66	5.79
400								10.53		9.11	13.66	7.81	10.58	6.62
450										10.25		8.78	12.62	7.45
500										11.39		9.76	14.79	8.28
600												11.71		9.93
700												13.66		11.59
900														14.90

Design performance data

Spacing

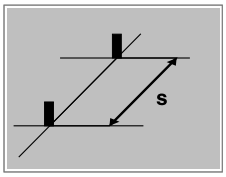


Table only valid for one spacing $<s_{cr,N}$ and $c \geq c_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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	M24	M30
	h≥ $1.13h_{min}$	h_{min}	h≥ $1.25h_{min}$	h_{min}	h≥ $1.28h_{min}$	h_{min}	h≥ $1.33h_{min}$	h_{min}			
40	0.61	0.57	0.60	0.56	0.58	0.56					
50	0.64	0.58	0.62	0.57	0.60	0.58	0.58	0.56			
60	0.67	0.60	0.64	0.59	0.63	0.59	0.60	0.58	0.58		
70	0.69	0.62	0.67	0.60	0.65	0.61	0.62	0.59	0.60	0.58	
85	0.72	0.64	0.70	0.62	0.68	0.63	0.64	0.61	0.62	0.60	0.59
100	0.75	0.67	0.74	0.64	0.71	0.66	0.67	0.63	0.64	0.62	0.60
125	0.80	0.71	0.80	0.68	0.76	0.70	0.71	0.66	0.67	0.65	0.63
150	0.85	0.75	0.86	0.71	0.81	0.73	0.75	0.69	0.71	0.68	0.65
180	0.90	0.80	0.93	0.76	0.88	0.78	0.80	0.73	0.75	0.71	0.68
200	0.94	0.83	0.98	0.79	0.92	0.81	0.83	0.75	0.78	0.74	0.70
225	0.99	0.88	1.00	0.82	0.97	0.85	0.88	0.78	0.81	0.77	0.73
250	1.00	0.92		0.86	1.00	0.89	0.92	0.81	0.85	0.80	0.75
275		0.96		0.89		0.93	0.96	0.84	0.88	0.83	0.78
300		1.00		0.93		0.97	1.00	0.88	0.92	0.86	0.80
325				0.96		1.00		0.91	0.95	0.89	0.83
360				1.00				0.95	1.00	0.93	0.86
400								1.00		0.98	0.90
440										1.00	0.94
500											1.00

Design performance data

Standard embedment depth

Size			M8	M10	M12	M16	M20	M24	M30
Effective embedment depth	h_{ef}	[mm]	80.00	90.00	110.00	125.00	170.00	210.00	240.00
TENSION LOAD									
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	18.00	29.00	42.00	78.00	122.00	176.00	280.00
Design resistance γ_{Ms}= 1.5	$N_{Rd,s}$	[kN]	12.00	19.30	28.00	52.00	81.30	117.30	186.70
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance	$N_{Rk,s}$	[kN]	29.00	46.00	67.00	126.00	196.00	282.00	449.00
Design resistance γ_{Ms}= 1.5	$N_{Rd,s}$	[kN]	19.30	30.70	44.70	84.00	130.70	188.00	299.30
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance	$N_{Rk,s}$	[kN]	26.00	41.00	59.00	110.00	171.00	247.00	393.00
Design resistance γ_{Ms}= 1.87	$N_{Rd,s}$	[kN]	13.90	21.90	31.60	58.80	91.40	132.10	210.20
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	30.20	-	-	-	-	-	-
Design resistance γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	22.80	-	-	-	-	-	-
PULL-OUT FAILURE; NON-CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	30.20	39.60	-	-	-	-	-
Design resistance γ_{Mp}= 1.5	$N_{Rd,p}$	[kN]	20.10	26.40	-	-	-	-	-
Increasing factors for $N_{Rd,p}$ - C30/37	Ψ_c	-	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Increasing factors for $N_{Rd,p}$ - C40/50	Ψ_c	-	1.07	1.07	1.07	1.07	1.07	1.07	1.07
Increasing factors for $N_{Rd,p}$ - C50/60	Ψ_c	-	1.09	1.09	1.09	1.09	1.09	1.09	1.09
Spacing	$s_{cr,N}$	-	-	-	330.00	375.00	510.00	630.00	-
Edge distance	$c_{cr,N}$	-	-	-	165.00	188.00	255.00	315.00	-
CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,c}$	[kN]	-	43.10	58.30	70.60	111.90	153.70	187.80
Design resistance γ_{Mc}= 1.5	$N_{Rd,c}$	[kN]	-	28.70	38.90	47.10	74.60	102.50	125.20
PULL-OUT FAILURE									
Characteristic resistance	$N_{Rk,p}$	-	-	-	-	-	-	-	-
Design resistance	$N_{Rd,p}$	-	-	-	-	-	-	-	-
CONCRETE CONE FAILURE; NON-CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,c}$	[kN]	-	-	58.30	70.60	111.90	153.70	187.80
Design resistance γ_{Mc}= 1.5	$N_{Rd,c}$	[kN]	-	-	38.90	47.10	74.60	102.50	125.20
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25 (40°C/24°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	29.00	44.00	74.80	95.00	-
Design resistance $\gamma_{Mc} = \gamma_{Mp}$= 1.5	$N_{Rd,p}$	[kN]	-	-	19.40	29.30	49.80	63.30	-
COMBINED PULL-OUT AND CONCRETE CONE FAILURE; CRACKED CONCRETE C20/25 (80°C/50°C)									
Characteristic resistance	$N_{Rk,p}$	[kN]	-	-	24.90	37.70	64.10	79.20	-
Design resistance $\gamma_{Mc} = \gamma_{Mp}$= 1.5	$N_{Rd,p}$	[kN]	-	-	16.60	25.10	42.70	52.80	-

Design performance data

Size			M8	M10	M12	M16	M20	M24	M30
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	40.00	45.00	55.00	63.00	85.00	105.00	120.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.60	7.00	9.84	12.80	21.10	30.10	-
CONCRETE EDGE FAILURE									
Design resistance	$V_{Rd,c}$	-	-	-	-	-	-	-	-
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Design resistance γ_{Mc}= 1.5	$V_{Rd,c}$	[kN]	3.73	4.67	6.56	8.53	14.10	20.10	25.80
STEEL FAILURE; STEEL CLASS 5.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	9.00	14.00	21.00	39.00	61.00	88.00	140.00
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	7.20	11.20	16.80	31.20	48.80	70.40	112.00
STEEL FAILURE; STEEL CLASS 8.8									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	15.00	23.00	34.00	63.00	98.00	141.00	224.00
Design resistance γ_{Ms}= 1.25	$V_{Rd,s}$	[kN]	12.00	18.40	27.20	50.40	78.40	112.80	179.20
STEEL FAILURE; STEEL GRADE A4-70									
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	13.00	20.00	29.00	55.00	86.00	124.00	196.00
Design resistance γ_{Ms}= 1.56	$V_{Rd,s}$	[kN]	8.33	12.80	18.60	35.30	55.10	79.50	125.60
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25									
Design resistance γ_{Mc}= 1.5	$V_{Rd,c}$	[kN]	-	-	4.65	6.05	9.97	14.23	-
Edge distance	c_1	[mm]	-	-	55.00	63.00	85.00	105.00	-
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	-	-	6.97	9.07	15.00	21.30	-

Reduction / increasing resistance factors for edge distance and spacing

Edge distance (tension)

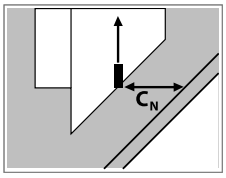


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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

c_N [mm]	M8		M10		M12		M16		M20	M24	M30
	$h \geq 1.28h_{min}$	h_{min}	$h \geq 1.31h_{min}$	h_{min}	$h \geq 1.35h_{min}$	h_{min}	$h \geq 1.38h_{min}$	h_{min}	$h \geq h_{min}$		
40	0.53	0.48									
45	0.56	0.50	0.53	0.48							
55	0.61	0.53	0.58	0.51	0.53	0.50					
63	0.65	0.56	0.62	0.54	0.56	0.52	0.53	0.50			
85	0.78	0.65	0.72	0.61	0.65	0.59	0.61	0.56	0.53		
105	0.90	0.73	0.83	0.68	0.73	0.66	0.68	0.62	0.58	0.53	
120	1.00	0.80	0.91	0.74	0.79	0.71	0.73	0.66	0.62	0.56	0.53
135		0.84	1.00	0.80	0.86	0.76	0.79	0.71	0.66	0.59	0.56
165		0.91		0.87	1.00	0.88	0.91	0.80	0.74	0.65	0.61
180		0.95		0.90		0.91	0.97	0.85	0.78	0.68	0.64
200		1.00		0.94		0.95	1.00	0.90	0.83	0.73	0.67
225				1.00		1.00		0.95	0.91	0.78	0.72
265								1.00	1.00	0.88	0.80
300										0.96	0.87
320										1.00	0.91
360											1.00

Design performance data

Edge distance (tension)

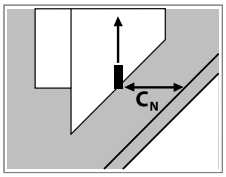


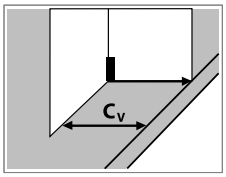
Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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	M24	M30
	$h \geq 1.28h_{min}$	h_{min}	$h \geq 1.31h_{min}$	h_{min}	$h \geq 1.35h_{min}$	h_{min}	$h \geq 1.38h_{min}$	h_{min}	$h \geq h_{min}$		
40	0.53	0.48									
45	0.56	0.50	0.53	0.48							
55	0.61	0.53	0.58	0.51	0.53	0.50					
63	0.65	0.56	0.62	0.54	0.56	0.52	0.53	0.50			
85	0.78	0.65	0.72	0.61	0.65	0.59	0.61	0.56	0.53		
105	0.90	0.73	0.83	0.68	0.73	0.66	0.68	0.62	0.58	0.53	
120	1.00	0.80	0.91	0.74	0.79	0.71	0.73	0.66	0.62	0.56	0.53
135		0.84	1.00	0.80	0.86	0.76	0.79	0.71	0.66	0.59	0.56
165		0.91		0.87	1.00	0.88	0.91	0.80	0.74	0.65	0.61
180		0.95		0.90		0.91	0.97	0.85	0.78	0.68	0.64
200		1.00		0.94		0.95	1.00	0.90	0.83	0.73	0.67
225				1.00		1.00		0.95	0.91	0.78	0.72
265								1.00	1.00	0.88	0.80
300										0.96	0.87
320										1.00	0.91
360											1.00

Design performance data

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		M20		M24		M30	
	$h \geq 1.5c_V$	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												
45	1.19	1.19	1.00	1.00										
55	1.61	1.61	1.35	1.35	1.00	1.00								
63	1.98	1.98	1.66	1.66	1.23	1.23	1.00	1.00						
85	3.10	2.88	2.60	2.52	1.92	1.92	1.57	1.57	1.00	1.00				
105	4.25	3.55	3.56	3.11	2.64	2.49	2.15	2.13	1.37	1.37	1.00	1.00		
120		4.06	4.35	3.56	3.22	2.84	2.63	2.44	1.68	1.68	1.22	1.22	1.00	1.00
150				4.44	4.50	3.55	3.67	3.05	2.34	2.31	1.71	1.71	1.40	1.40
180					5.92	4.26	4.83	3.66	3.08	2.77	2.24	2.23	1.84	1.84
225						5.33	6.75	4.57	4.31	3.46	3.14	2.78	2.57	2.46
250							7.90	5.08	5.04	3.85	3.67	3.09	3.01	2.73
300								6.10	6.63	4.62	4.83	3.71	3.95	3.28
350								7.12		5.38	6.09	4.33	4.98	3.83
400										6.15	7.44	4.95	6.09	4.37
450										6.92		5.57	7.26	4.92
500												6.19	8.51	5.47
550												6.81		6.01
600												7.43		6.56
650														7.11
800														8.75

Design performance data

Spacing

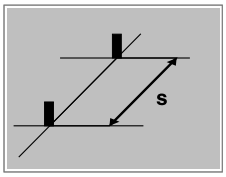


Table only valid for one spacing $<s_{cr,N}$ and $c \geq c_{cr,N}$ For other cases use the Rawlplug Anchor Calculator

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	M24	M30
	$h \geq 1.28h_{min}$	h_{min}	$h \geq 1.31h_{min}$	h_{min}	$h \geq 1.35h_{min}$	h_{min}	$h \geq 1.38h_{min}$	h_{min}	$h \geq h_{min}$		
40	0.58	0.55									
45	0.59	0.56	0.58	0.55							
55	0.61	0.57	0.60	0.56	0.58	0.56					
63	0.63	0.58	0.62	0.57	0.60	0.57	0.58	0.56			
85	0.68	0.61	0.66	0.59	0.63	0.60	0.61	0.59	0.58		
105	0.72	0.63	0.69	0.62	0.66	0.62	0.64	0.61	0.60	0.58	
120	0.75	0.65	0.72	0.63	0.68	0.64	0.66	0.62	0.62	0.60	0.58
150	0.81	0.69	0.78	0.67	0.73	0.67	0.70	0.65	0.65	0.62	0.60
180	0.88	0.73	0.83	0.70	0.77	0.70	0.74	0.68	0.68	0.64	0.63
200	0.92	0.75	0.87	0.72	0.80	0.73	0.77	0.70	0.70	0.66	0.64
240	1.00	0.80	0.94	0.77	0.86	0.77	0.82	0.74	0.74	0.69	0.67
280		0.85	1.00	0.81	0.92	0.82	0.87	0.78	0.77	0.72	0.69
350		0.94		0.89	1.00	0.90	0.97	0.85	0.84	0.78	0.74
400		1.00		0.94		0.95	1.00	0.90	0.89	0.82	0.78
450				1.00		1.00		0.95	0.94	0.86	0.81
500								1.00	0.99	0.90	0.85
550									1.00	0.94	0.88
630										1.00	0.94
760											1.00

Product commercial data

Size	Product Code	Volume [ml]	Quantity [pcs]			Weight [kg]			Bar Codes
			Box	Outer	Pallet	Box	Outer	Pallet	
Ø32	R-KEX-II-385[1)]	385	10	10	380	6.7	6.7	285.0	5906675028538
	R-KEX-II-600[1)]	600	7	7	441	7.0	7.0	472.7	5906675293721

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