

R-RBL Rawlbolt - Loose Bolt for use in cracked and non-cracked concrete

World's most popular all-purpose expanding shield anchor - loose bolt version



Approvals and Reports

- ETA-11/0479 (M6 - M20)



Product information

Features and benefits

- RAWLBOLT® - first ever mechanical anchor in the world, forerunner of all of the later mechanical anchors
- For use in cracked and non-cracked concrete (ETA option 1), hollow-core slabs, flooring blocks and ceramics
- Product recommended for applications requiring fire resistance
- Three-pieces expanding sleeve of maximum expansion provides optimal load and safety of use in any substrate
- Wide range of diameters (M6 to M24)

Applications

- Roller shutter doors
- Fire doors
- Structural steelwork
- Security grills
- Heavy machinery
- Pipework/ductwork supports

Base materials

Approved for use in:

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

Also suitable for use in:

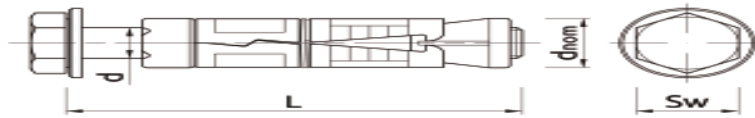
- Solid clay brick 20MPa
- Hollow Sand-lime Brick 15MPa
- Natural Stone
- Hollow Lightweight Concrete Block
- Hollow-core Slab
- Concrete hollow floor block (eg. Teriva)

Installation guide



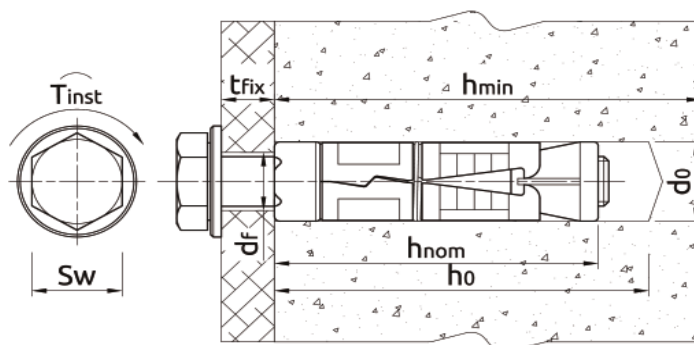
1. Drill a hole of required diameter and depth. Note: When fixing into brickwork, mortar joints should be avoided
2. Clear the hole of drilling dust and debris (using blowpump or equivalent method)
3. Remove pre-assembled bolt and washer. Insert shield into hole and tap home with hammer until flush with surface
4. Insert bolt with washer through fixture into the shield
5. Tighten to the recommended torque

Product information



Size	Product Code	Anchor			Fixture		
		Diameter	External diameter	Length	Min. thickness	Max. thickness	Hole diameter
		d	d_{nom}	L	t_{fix}		d_f
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
M6	R-RBL-M06/10W	6	12	55	-	10	6.5
	R-RBL-M06/25W	6	12	70	-	25	6.5
	R-RBL-M06/40W	6	12	85	-	40	6.5
M8	R-RBL-M08/10W	8	14	65	-	10	9
	R-RBL-M08/25W	8	14	80	-	25	9
	R-RBL-M08/40W	8	14	95	-	40	9
M10	R-RBL-M10/10W	10	16	75	-	10	11
	R-RBL-M10/25W	10	16	90	-	25	11
	R-RBL-M10/50W	10	16	115	-	50	11
	R-RBL-M10/75W	10	16	140	-	75	11
M12	R-RBL-M12/10W	12	20	90	-	10	13
	R-RBL-M12/25W	12	20	105	-	25	13
	R-RBL-M12/40W	12	20	120	-	40	13
	R-RBL-M12/60W	12	20	140	-	60	13
M16	R-RBL-M16/15W	16	25	135	-	15	17
	R-RBL-M16/30W	16	25	150	10	30	17
	R-RBL-M16/60W	16	25	180	30	60	17
M20	R-RBL-M20/60W	20	32	195	25	60	22
	R-RBL-M20/100W	20	32	235	60	110	22
M24	R-RBL-M24/100W	24	38	255	25	100	26
	R-RBL-M24/150W	24	38	300	100	150	26

Installation data



Installation in solid substrate

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]	12	14	16	20	25	32	38
Installation torque	T _{inst}	[Nm]	6.5	15	27	50	120	230	400
Wrench size	Sw	[mm]	10	13	17	19	24	30	36
Min. hole depth in substrate	h ₀	[mm]	50	55	65	85	125	140	160
Installation depth	h _{nom}	[mm]	45	50	60	80	120	135	155
Min. substrate thickness	h _{min}	[mm]	100	100	100	100	142.5	172.5	240
Min. spacing	s _{min}	[mm]	35	40	50	60	95	115	210
Min. edge distance	c _{min}	[mm]	53	60	75	90	143	173	188

Mechanical properties

Size			M6	M8	M10	M12	M16	M20	M24
Nominal ultimate tensile strength - tension	f _{uk}	[N/mm ²]	500	500	500	500	500	500	500
Nominal yield strength - tension	f _{yk}	[N/mm ²]	400	400	400	400	400	400	400
Cross sectional area - tension	A _s	[mm ²]	20.1	36.6	58	84.3	157	245	353
Elastic section modulus	W _{el}	[mm ³]	12.7	31.2	62.3	109.2	277.5	540.9	935.5
Characteristic bending resistance	M _{Rk,s}	[Nm]	7.6	19	37	66	166	325	561
Design bending resistance	M	[Nm]	6.1	15	30	52	133	260	449

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}								
NON-CRACKED CONCRETE	[kN]	6.36	8.35	15.24	18.48	48.77	56.55	94.30
CRACKED CONCRETE	[kN]	4.06	5.31	7.12	12.01	18.24	34.16	-
SHEAR LOAD V _{Ru,m}								
NON-CRACKED CONCRETE	[kN]	6.04	10.98	17.40	25.30	47.10	73.50	105.90
CRACKED CONCRETE	[kN]	6.04	10.98	17.40	25.30	47.10	73.50	-
CHARACTERISTIC LOAD								
TENSION LOAD N _{Rk}								
NON-CRACKED CONCRETE	[kN]	6.00	7.50	12.00	16.00	40.00	50.00	70.00
CRACKED CONCRETE	[kN]	4.00	5.00	6.00	12.00	16.00	30.00	-
SHEAR LOAD V _{Rk}								
NON-CRACKED CONCRETE	[kN]	5.03	7.50	12.00	21.08	39.25	61.25	88.30
CRACKED CONCRETE	[kN]	4.00	5.00	6.00	21.08	39.25	61.25	-
DESIGN LOAD								
TENSION LOAD N _{Rd}								
NON-CRACKED CONCRETE	[kN]	3.33	4.17	6.67	8.89	22.22	27.78	38.90
CRACKED CONCRETE	[kN]	2.22	2.78	3.33	6.67	8.89	16.67	-
SHEAR LOAD V _{Rd}								
NON-CRACKED CONCRETE	[kN]	3.33	4.17	6.67	16.86	31.40	49.00	70.60
CRACKED CONCRETE	[kN]	2.22	2.78	3.33	16.86	31.40	49.00	-

Basic performance data

Design performance data

Size			M6	M8	M10	M12	M16	M20	M24
Effective embedment depth	h_{ef}	[mm]	35.00	40.00	50.00	60.00	95.00	115.00	125.00
TENSION LOAD									
STEEL FAILURE									
Characteristic resistance	$N_{Rk,s}$	[kN]	10.05	18.30	29.00	42.15	78.50	122.50	176.50
Design resistance $V_{Ms} = 1.5$	$N_{Rd,s}$	[kN]	6.70	12.20	19.33	28.10	52.33	81.67	117.60
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	70.00
Design resistance $V_{Mp} = 1.8$	$N_{Rd,p}$	[kN]	3.33	4.17	6.67	8.89	22.22	27.78	38.90
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 $V_{Mp} = 1.8$	$N_{Rd,p}$	[kN]	2.22	2.78	3.33	6.67	8.89	16.67	-
Spacing	$s_{cr,N}$	[mm]	105.00	120.00	150.00	180.00	285.00	345.00	375.00
Edge distance	$c_{cr,N}$	[mm]	53.00	60.00	75.00	90.00	143.00	173.00	188.00
SHEAR LOAD									
CONCRETE EDGE FAILURE; NON-CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	53.00	60.00	75.00	90.00	143.00	173.00	190.00
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	7.38	9.11	13.03	17.72	36.78	50.82	58.89
Design resistance $V_{Mc} = 1.8$	$V_{Rd,c}$	[kN]	4.10	5.06	7.24	9.84	20.44	28.23	32.72
CONCRETE EDGE FAILURE; CRACKED CONCRETE C20/25									
Edge distance	c_1	[mm]	53.00	60.00	75.00	90.00	143.00	173.00	-
Characteristic resistance for c_1	$V_{Rk,c}$	[kN]	5.16	6.46	9.23	12.55	25.94	35.86	-
Design resistance $V_{Mc} = 1.8$	$V_{Rd,c}$	[kN]	2.87	3.59	5.13	6.97	14.41	19.92	-
CONCRETE PRY-OUT FAILURE; NON-CRACKED CONCRETE C20/25									
	k	-	1.00	1.00	1.00	2.00	2.00	2.00	2.00
Characteristic resistance	$V_{Rk,cp}$	[kN]	6.00	7.50	12.00	32.00	80.00	100.00	140.00
Design resistance $V_{Mc} = 1.8$	$V_{Rd,cp}$	[kN]	3.33	4.17	6.67	17.78	44.44	55.56	77.78
CONCRETE PRY-OUT FAILURE; CRACKED CONCRETE C20/25									
	k	-	1.00	1.00	1.00	2.00	2.00	2.00	-
Characteristic resistance	$V_{Rk,cp}$	[kN]	4.00	5.00	6.00	24.00	32.00	60.00	-
Design resistance $V_{Mc} = 1.8$	$V_{Rd,cp}$	[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	88.30
Design resistance $V_{Ms} = 1.25$	$V_{Rd,s}$	[kN]	4.02	7.32	11.60	16.86	31.40	49.00	70.60

Design performance data

Reduction / increasing resistance factors for edge distance and spacing

Edge distance (tension)

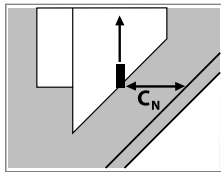
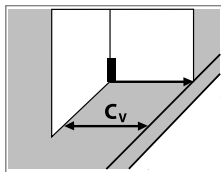


Table only valid for one edge $<C_{cr,N}$ and $S \geq S_{cr,N}$. For other cases use the Rawlplug Anchor Calculator

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]	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}
55	1,0	1,0												
60			1,0	1,0										
75					1,0	1,0								
90							1,0	1,0						
145									1,0	1,0				
175											1,0	1,0		
190													1,0	1,0

Edge distance (shear)



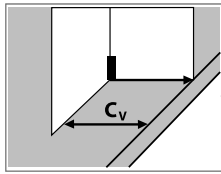
Tables only valid for one edge $>C_{min}$ and $s \geq 3c_v$. For other cases use the Rawlplug Anchor Calculator

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		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}
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		
190								1,61	1,45	1,03	1,13	0,88	1,00	0,82
200								1,69	1,56	1,07	1,21	0,92	1,09	0,86
240										1,25	1,53	1,06	1,38	0,99
265										1,36	1,75	1,15	1,57	1,08
305										1,53		1,29	1,88	1,21
350												1,45		1,35
430												1,73		1,60
550														1,98

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 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

Spacing

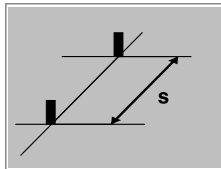


Table only valid for one spacing
 $s_{cr,N}$ and $c \geq c_{cr,N}$ For other cases
 use the Rawlplug Anchor Calculator

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	
	$h \geq 1.84h_{\min}$	$h_{\min}$	$h \geq 1.84h_{\min}$	$h_{\min}$	$h \geq 1.84h_{\min}$	$h_{\min}$	$h \geq 1.84h_{\min}$	$h_{\min}$	$h \geq 1.84h_{\min}$	$h_{\min}$	$h \geq 1.84h_{\min}$	$h_{\min}$	$h \geq 1.84h_{\min}$	$h_{\min}$
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	0,70	0,70
180							1,00	1,00	0,82	0,82	0,76	0,76	0,74	0,74
200									0,85	0,85	0,79	0,79	0,77	0,77
220									0,89	0,89	0,82	0,82	0,79	0,79
250									0,94	0,94	0,86	0,86	0,83	0,83
285									1,00	1,00	0,91	0,91	0,88	0,88
300											0,93	0,93	0,90	0,90
345											1,00	1,00	0,96	0,96
375													1,00	1,00

Design performance data

Spacing

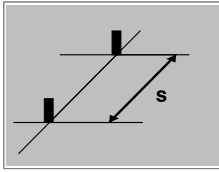


Table only valid for one spacing
 $< s_{cr,N}$ and $c \geq c_{cr,N}$ For other cases
 use the Rawlplug Anchor Calculator

Reduction factors for spacing $< s_{cr,N}$ applicable to N_{Rd}/V_{Rd} or N_{rec}/V_{rec} for 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}
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

Design performance data

Resistance to tension and shear loads under fire exposure

Size			M6	M8	M10	M12	M16	M20
R (for EI) = 30 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.40	0.90	1.70	3.10	4.90
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
CONCRETE CONE FAILURE								
Characteristic resistance	$N_{Rk,c}$	[kN]	1.30	1.80	3.20	5.00	15.70	25.40
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.40	0.90	1.70	3.10	4.90
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.20	0.40	1.10	2.60	6.70	13.00
R (for EI) = 60 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.20	0.30	0.80	1.30	2.40	3.70
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
CONCRETE CONE FAILURE								
Characteristic resistance	$N_{Rk,c}$	[kN]	1.30	1.80	3.20	5.00	15.70	25.40
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.20	0.30	0.80	1.30	2.40	3.70
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.10	0.30	1.00	2.00	5.00	9.70
R (for EI) = 90 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.10	0.30	0.60	1.10	2.00	3.20
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
CONCRETE CONE FAILURE								
Characteristic resistance	$N_{Rk,c}$	[kN]	1.30	1.80	3.20	5.00	15.70	25.40
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.10	0.30	0.60	1.10	2.00	3.20
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.10	0.30	0.70	1.70	4.30	8.40
R (for EI) = 120 min								
TENSION LOAD								
STEEL FAILURE								
Characteristic resistance	$N_{Rk,s}$	[kN]	0.10	0.20	0.50	0.80	1.60	2.50
PULL-OUT FAILURE								
Characteristic resistance	$N_{Rk,p}$	[kN]	1.00	1.30	1.50	3.00	4.00	7.50
CONCRETE CONE FAILURE								
Characteristic resistance	$N_{Rk,c}$	[kN]	1.00	1.40	2.50	4.00	12.60	20.30
SHEAR LOAD								
STEEL FAILURE								
Characteristic resistance without lever arm	$V_{Rk,s}$	[kN]	0.10	0.20	0.50	0.80	1.60	2.50
Characteristic resistance with lever arm	$M_{Rk,s}$	[kN]	0.10	0.20	0.60	1.30	3.30	6.50

Product commercial data

Size	Product Code	Anchor		Quantity [pcs]			Weight [kg]			Bar Codes
		Diameter [mm]	Length [mm]	Box	Outer	Pallet	Box	Outer	Pallet	
M6	R-RBL-M06/10W ¹⁾	6	55	50	400	16000	1.56	12.4	527.6	5906675283210
	R-RBL-M06/25W ¹⁾	6	70	50	400	16000	1.65	13.2	556.4	5906675283234
	R-RBL-M06/40W ¹⁾	6	85	50	50	8000	1.81	1.81	319.6	5906675283258
M8	R-RBL-M08/10W ¹⁾	8	65	50	400	16000	2.7	21.6	895.6	5906675283272
	R-RBL-M08/25W ¹⁾	8	80	50	50	8000	3.0	3.0	502.0	5906675283296
	R-RBL-M08/40W ¹⁾	8	95	50	50	8000	3.2	3.2	541.2	5906675283319
M10	R-RBL-M10/10W ¹⁾	10	75	50	50	8000	4.6	4.6	765.2	5906675283333
	R-RBL-M10/25W ¹⁾	10	90	50	50	8000	5.0	5.0	832.4	5906675283357
	R-RBL-M10/50W ¹⁾	10	115	50	50	6000	5.6	5.6	705.6	5906675283371
	R-RBL-M10/75W ¹⁾	10	140	50	50	8000	6.4	6.4	1054.0	5906675283395
M12	R-RBL-M12/10W ¹⁾	12	90	25	25	4000	4.2	4.2	700.4	5906675283401
	R-RBL-M12/25W ¹⁾	12	105	25	25	4000	4.5	4.5	749.6	5906675283418
	R-RBL-M12/40W ¹⁾	12	120	25	25	3000	4.9	4.9	614.7	5906675283425
	R-RBL-M12/60W ¹⁾	12	140	25	25	4000	5.2	5.2	862.0	5906675283432
M16	R-RBL-M16/15W ¹⁾	16	135	10	10	1600	4.2	4.2	693.5	5906675283449
	R-RBL-M16/30W ¹⁾	16	150	10	10	1600	4.4	4.4	734.3	5906675283456
	R-RBL-M16/60W ¹⁾	16	180	10	10	1200	4.8	4.8	608.3	5906675283463
M20	R-RBL-M20/60W ¹⁾	20	195	10	10	1200	9.0	9.0	1113.5	5906675283487
	R-RBL-M20/100W ¹⁾	20	235	10	10	1200	9.8	9.8	1207.8	5906675283470
M24	R-RBL-M24/100W	24	255	5	5	400	7.4	7.4	622.2	5906675283494
	R-RBL-M24/150W	24	300	10	10	400	16.3	16.3	681.5	5906675283500

¹⁾ ETA-11/0479 (M6 - M20)