EMS Dubell F.2111 Pure Epoxy

ტექნიკური მონაცემების ქართული საინფორმაციო ვერსია

დოკუმენტის სტრუქტურა: თავდაპირველად მოცემულია ძირითადი ტექნიკური ტექსტის ქართული თარგმანი და გამოკვეთილი მონაცემები; შემდეგ უცვლელად ერთვის მწარმოებლის სრული ინგლისური TDS, მათ შორის ყველა საინჟინრო ცხრილი, ფორმულა და ნახაზი.

მნიშვნელოვანი: ეს არ არის მწარმოებლის მიერ დამოწმებული სრული ქართულენოვანი TDS. ინგლისური საინჟინრო ცხრილები არ არის თარგმნილი. რაოდენობრივი ანგარიშისა და მონტაჟისთვის უპირატესობა ენიჭება ოფიციალურ ინგლისურ TDS-სა და ETA-ს.

პროდუქტის აღწერა

EMS Dubell F.2111 არის 3:1 თანაფარდობის ორკომპონენტიანი სუფთა ეპოქსიდური ქიმიური ანკერი. გამოიყენება ხრახნიანი ღეროებისა და არმატურის ბეტონში ჩამაგრებისთვის, განსაკუთრებით მაღალი და კრიტიკული სტრუქტურული დატვირთვებისას.

შეუმყარებელი მასა: ვარდისფერი, მაღალი თიქსოტროპიულობის პასტა. არ შეიცავს სტიროლს, გამოირჩევა მაღალი შეჭიდულობითა და დაბალი შეკლებით.

გამოყენების სფერო

დაბზარული და დაუბზარავი ბეტონი; ლითონის კონსტრუქციები, მოაჯირები, საძირკვლის საყრდენი ფირფიტები, ბრაკეტები და კონსოლები, ფასადის კონსტრუქციები, კაბელის არხები, მილსადენები, კოჭები, საყრდენები და შემდგომი არმირება.

არმატურის გამოყენება ბეტონის ელემენტების შეერთებასა და გაძლიერებაში, ბეტონის ნაკერებისა და ძვრის გადამტანი კავშირების მოწყობა.

უპირატესობები და ტექნიკური პირობები

მწარმოებლის TDS-ის მიხედვით: მაღალი ქიმიური მდგრადობა; დაბალი შეკლება; მშრალ, ნესტიან და წყლით სავსე ხვრელებში ინსტალაციის შესაძლებლობა; პერკუსიული და ბრილიანტის ბურღით მომზადებული ხვრელები; სეისმური კატეგორიები C1 და C2; მითითებული საპროექტო სამუშაო ვადა 100 წელი შესაბამის პირობებში.

მითითებული გამოყენების გარემოს ტემპერატურული დიაპაზონია −40°C-დან +72°C-მდე (ხანგრძლივად მაქსიმუმ +50°C). გამყარება შესაძლებელია საფუძვლის −5°C ტემპერატურაზეც, თუმცა დრო საგრძნობლად იზრდება.

ანკერისა და არმატურის ზომები

ხრახნიანი ანკერები: M8–M39; არმატურა: Ø8–Ø40 — კონკრეტული ბურღვის დიამეტრი, ჩაღრმავება, ბეტონის მინიმალური სისქე და კიდის მანძილი იხილეთ ორიგინალურ ცხრილებში.

მონტაჟამდე უნდა გადაამოწმოთ ბეტონის კლასი, ბზარების მდგომარეობა, წამყვანი დატვირთვა, კიდეებთან სიახლოვე და დანადგარის საპროექტო მოთხოვნები.

მონტაჟისა და გამაგრების ინსტრუქცია

საჭირო სიღრმისა და დიამეტრის ხვრელი უნდა გაიბურღოს და სრულად გაიწმინდოს. ფისი შეიყვანეთ შესაბამისი სტატიკური მიქსერით, ხვრელის ძირიდან. პირველ გამოშვებულ, არასრულად შერეულ მასალას ნუ გამოიყენებთ. ჩასვით სუფთა ღერო ან არმატურა ბრუნვითი მოძრაობით და გააჩერეთ გამაგრებამდე.

გამაგრების ზუსტი დრო დამოკიდებულია მასალისა და კარტრიჯის ტემპერატურაზე; იხილეთ ქვემოთ წარმოდგენილი სამუშაო ცხრილი და ორიგინალი TDS.

საინჟინრო ცხრილების მნიშვნელობა

დანართში სრულადაა შენარჩუნებული როგორც დაბზარული, ისე დაუბზარავი ბეტონის დაჭიმვისა და ძვრის დამახასიათებელი/საანგარიშო დატვირთვების ცხრილები, ჩაღრმავების მონაცემები, არმატურის წებოვანი კავშირების მაჩვენებლები და გამოყენების პირობები.

სამუშაო და დატვირთვამდე გამაგრების დრო — შერჩეული მონაკვეთები

მწარმოებლის TDS-იდან ამოღებული მონაცემები; შეადარეთ იმავე ვარიანტისა და ტემპერატურის შესაბამის რიგს ორიგინალურ ცხრილში.

საფუძვლის ტემპერატურა	სამუშაო დრო	დატვირთვამდე დრო
−5…−1°C	120 წთ	168 სთ
0…+4°C	120 წთ	48 სთ
+5…+9°C	120 წთ	24 სთ
+10…+14°C	90 წთ	16 სთ
+15…+19°C	60 წთ	12 სთ
+20…+24°C	30 წთ	7 სთ
+25…+29°C	20 წთ	6 სთ
+30…+34°C	15 წთ	5 სთ
+35…+40°C	12 წთ	4.5 სთ

დანართი — მწარმოებლის სრული ინგლისური TDS (უცვლელი ცხრილებით)

EMS Dubell® Chemical Anchor F.2111

Product description

EMS Dubell® F.2111 is a chemical anchoring injection system consisting of two components in a 3:1 ratio. It is made from pure epoxy with exceptional bond strength and is primarily designed to anchor threaded rods and reinforcing bars into concrete. It is commonly used in high-performance structural applications where the load is critical.

Main constituent	:	Pure epoxy resin
Appearance (uncured)	:	Paste
Colour	:	Pink
Viscosity	:	Thixotropic, high
Ratio (Part A:Part B)	:	3:1

Applications:
Heavy duty fastenings in cracked and uncracked concrete: Steel structures, railings, base plates, supports, brackets, facade structures, sanitary devices, consoles, beams, cable trays, piping, post installed rebar connections (reconstruction or reinforcement) etc.
Fastenings with rebar in cracked and uncracked concrete with shear force: Shear connectors, wall connecting reinforcement, concrete joints.

Features:

- Dry, wet and flooded holes
- Temperature range: from -40°C to +72°C (long term maximum temperature +50°C).
- For very high loads
- High chemical resistance
- Usable in percussion drilled and diamond drilled holes
- Cures down to -5°C
- 100 years working life
- Styrene free formulation (SF)
- For heavy anchoring - doweling and post-installed rebar connection
- Odourless and VOC content (A+)
- Suitable for seismic actions of requirement levels C1 & C2
- Low shrinkage: suitable for larger annular gaps
- Fixings in concrete, wood, or other high strength materials.

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EMS Dubell® Chemical Anchor F.2111

Working and loading time

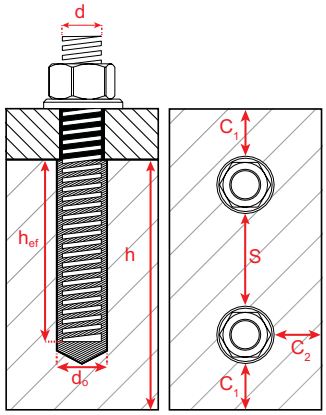
Working time is typical gel time at the highest temperature of the given range.
Loading time is setting time at the lowest temperature of the given range.

Temperature of base material			Temperature of cartridge			Maximum working time (minutes) t_{work}	Minimum curing time[1)] (hours) t_{load} or t_{cure}
-5°C	to	-1°C	+5°C			120	168
0°C	to	+4°C	+5°C			120	48
+5°C	to	+9°C	+5°C	to	+9°C	120	24
+10°C	to	+14°C	+10°C	to	+14°C	90	16
+15°C	to	+19°C	+15°C	to	+19°C	60	12
+20°C	to	+24°C	+20°C	to	+24°C	30	7
+25°C	to	+29°C	+25°C	to	+29°C	20	6
+30°C	to	+34°C	+30°C	to	+34°C	15	5
+35°C	to	+40°C	+35°C	to	+40°C	12	4.5

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EMS Dubell® Chemical Anchor F.2111

Installation Parameters



Installation parameter - Threaded Rod												
Anchor size			M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
d	Diameter of anchor	mm	8	10	12	16	20	24	27	30	33	36	39
d_0	Nominal diameter of drill bit	mm	10	12	14	18	22	28	30	35	37	40	42
d_f	Diameter of clearance hole in the fixture (≤)	mm	9	12	14	18	22	26	30	33	36	39	42
d_b	Diameter of steel brush (≥)	mm	12	14	16	20	24	30	32	37	40	44	47
$h_{ef,min}$	Minimum effective anchorage depth	mm	60	60	70	80	90	96	108	120	132	144	156
h_{ef}	Effective anchorage depth	mm	80	90	110	125	170	210	240	270	300	330	360
$h_{ef,max}$	Maximum effective anchorage depth	mm	160	200	240	320	400	480	540	600	660	720	780
h_{min}	Minimum thickness of the concrete member	mm	h_{ef}+30mm ≥100mm			$h_{ef} + 2d_0$							
T_{inst}	Nominal torque moment	Nm	10	20	40	80	150	200	270	300	330	360	390
s_{min}	Minimum spacing	mm	40	50	60	75	90	115	120	140	165	180	195
c_{min}	Minimum edge distance	mm	40	45	45	50	55	60	75	80	165	180	195

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EMS Dubell® Chemical Anchor F.2111

	Installation parameter - Reinforcing bar														
Anchor size			Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
d	Diameter of anchor	mm	8	10	12	14	16	20	25	25	28	30	32	36	40
d_0	Nominal diameter of drill bit	mm	10 12	12 14	14 16	18	20	25	30 32	30 32	35	37	40	45	50
d_b	Diameter of steel brush (≥)	mm	10 12	12 14	14 16	18	20	25	32	32	35	37	40 42	45	50
$h_{ef,min}$	Minimum effective anchorage depth	mm	60	60	70	75	80	90	96	100	112	120	128	144	240
h_{ef}	Effective anchorage depth	mm	80	90	110	125	125	170	190	210	270	270	300	330	360
$h_{ef,max}$	Maximum effective anchorage depth	mm	160	200	240	280	320	400	480	500	560	600	640	720	800
h_{min}	Minimum thickness of the concrete member	mm	h_{ef}+30mm ≥100mm		h_{ef} + $2d_0$										
s_{min}	Minimum spacing	mm	40	50	60	70	80	100	125	125	140	150	160	180	200
c_{min}	Minimum edge distance	mm	40	45	45	50	50	65	70	70	75	80	80	180	200

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EMS Dubell® Chemical Anchor F.2111

Static and quasi static load values – Threaded bar (Working life of 50 years)

Data in this section according to:

- For a single anchor
- No edge distance and spacing influence
- Highlighted text indicates steel failure
- Anchor rod strength class 5.8 and 8.8, A4 and high corrosion steel(HCR)
- Installation parameters according to above tables, embedment depth is effective embedment depth
- C20/25 concrete
- Temperature range -40°C to +40°C
- Short term loading. For long term loading apply ψ_{sus} according to EN 1992-4
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- For recommended loads: overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Characteristic resistance to tension and shear load – threaded rod (1)

Characteristic bond resistance in non-cracked concrete C20/25

	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Tension	5.8	N_{Rk}	[kN]	18,3	29,0	42,2	68,8	109,0	149,7	182,9	218,2	255,6	294,9	336,0
	8.8	N_{Rk}	[kN]	29,3	42,0	56,8	68,8	109,0	149,7	182,9	218,2	255,6	294,9	336,0
	A4	N_{Rk}	[kN]	25,6	40,6	56,8	68,8	109,0	149,7	182,9	218,2	255,6	294,9	336,0
	HCR	N_{Rk}	[kN]	29,3	42,0	56,8	68,8	109,0	149,7	182,9	218,2	255,6	294,9	336,0
Shear	5.8	V_{Rk}	[kN]	11,0	17,4	25,3	47,1	73,5	105,9	137,7	168,3	208,2	245,1	292,8
	8.8	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	141,2	183,6	224,4	277,6	326,8	390,4
	A4	V_{Rk}	[kN]	12,8	20,3	29,5	55,0	85,8	123,6	114,8	140,3	173,5	204,3	244,0
	HCR	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	123,6	160,7	196,4	173,5	204,3	244,0

Characteristic bond resistance in cracked concrete C20/25

Tension	5.8	N_{Rk}	[kN]	15,1	25,4	39,7	48,1	76,3	104,8	128,0	152,8	-	-	-
	8.8	N_{Rk}	[kN]	15,1	25,4	39,7	48,1	76,3	104,8	128,0	152,8	-	-	-
	A4	N_{Rk}	[kN]	15,1	25,4	39,7	48,1	76,3	104,8	128,0	152,8	-	-	-
	HCR	N_{Rk}	[kN]	15,1	25,4	39,7	48,1	76,3	104,8	128,0	152,8	-	-	-
Shear	5.8	V_{Rk}	[kN]	11,0	17,4	25,3	47,1	73,5	105,9	137,7	168,3	-	-	-
	8.8	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	141,2	183,6	224,4	-	-	-
	A4	V_{Rk}	[kN]	12,8	20,3	29,5	55,0	85,8	123,6	114,8	140,3	-	-	-
	HCR	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	123,6	160,7	196,4	-	-	-

Design resistance to tension and shear load – threaded rod (1)

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Design bond resistance in non-cracked concrete C20/25														
	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Tension	5.8	N_{Rd}	[kN]	12,2	19,3	28,1	45,8	72,7	99,8	121,9	145,5	142,0	163,8	186,7
	8.8	N_{Rd}	[kN]	19,5	28,0	37,8	45,8	72,7	99,8	121,9	145,5	142,0	163,8	186,7
	A4	N_{Rd}	[kN]	13,7	21,7	31,6	45,8	72,7	99,8	80,2	98,1	121,3	142,8	170,6
	HCR	N_{Rd}	[kN]	19,5	28,0	37,8	45,8	72,7	99,8	121,9	145,5	142,0	163,8	186,7
Shear	5.8	V_{Rd}	[kN]	8,8	13,9	20,2	37,7	58,8	84,7	110,2	134,6	166,6	196,1	234,2
	8.8	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	113,0	146,9	179,5	222,1	261,4	312,3
	A4	V_{Rd}	[kN]	8,2	13,0	18,9	35,2	55,0	79,2	48,2	58,9	72,9	85,8	102,5
	HCR	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	70,6	91,8	112,2	87,0	102,0	122,0
Design bond resistance in cracked concrete C20/25														
Tension	5.8	N_{Rd}	[kN]	10,0	17,0	26,5	32,1	50,9	69,9	85,4	101,8	-	-	-
	8.8	N_{Rd}	[kN]	10,0	17,0	26,5	32,1	50,9	69,9	85,4	101,8	-	-	-
	A4	N_{Rd}	[kN]	10,0	17,0	26,5	32,1	50,9	69,9	80,2	98,1	-	-	-
	HCR	N_{Rd}	[kN]	10,0	17,0	26,5	32,1	50,9	69,9	85,4	101,8	-	-	-
Shear	5.8	V_{Rd}	[kN]	8,8	13,9	20,2	37,7	58,8	84,7	110,2	134,6	-	-	-
	8.8	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	113,0	146,9	179,5	-	-	-
	A4	V_{Rd}	[kN]	8,2	13,0	18,9	35,2	55,0	79,2	48,2	58,9	-	-	-
	HCR	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	70,6	91,8	112,2	-	-	-

Recommended tension and shear load – threaded rod [1]

Recommended loads in non-cracked concrete C20/25														
	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Tension	5.8	N_{Rec}	[kN]	8,7	13,8	20,1	32,7	51,9	71,3	87,1	103,9	101,4	117,0	133,3
	8.8	N_{Rec}	[kN]	13,9	20,0	27,0	32,7	51,9	71,3	87,1	103,9	101,4	117,0	133,3
	A4	N_{Rec}	[kN]	9,8	15,5	22,5	32,7	51,9	71,3	57,3	70,1	86,7	102,0	121,9
	HCR	N_{Rec}	[kN]	13,9	20,0	27,0	32,7	51,9	71,3	87,1	103,9	101,4	117,0	133,3
Shear	5.8	V_{Rec}	[kN]	6,3	9,9	14,5	26,9	42,0	60,5	78,7	96,2	119,0	140,1	167,3
	8.8	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	80,7	104,9	128,2	158,6	186,7	223,1
	A4	V_{Rec}	[kN]	5,9	9,3	13,5	25,2	39,3	56,6	34,4	42,1	52,1	61,3	73,2
	HCR	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	50,4	65,6	80,1	62,1	72,9	87,1

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Recommended loads in cracked concrete C20/25														
Tension	5.8	N_{Rec}	[kN]	7,2	12,1	18,9	22,9	36,3	49,9	61,0	72,7	-	-	-
	8.8	N_{Rec}	[kN]	7,2	12,1	18,9	22,9	36,3	49,9	61,0	72,7	-	-	-
	A4	N_{Rec}	[kN]	7,2	12,1	18,9	22,9	36,3	49,9	61,0	72,7	-	-	-
	HCR	N_{Rec}	[kN]	7,2	12,1	18,9	22,9	36,3	49,9	61,0	72,7	-	-	-
Shear	5.8	V_{Rec}	[kN]	6,3	9,9	14,5	26,9	42,0	60,5	78,7	96,2	-	-	-
	8.8	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	80,7	104,9	128,2	-	-	-
	A4	V_{Rec}	[kN]	5,9	9,3	13,5	25,2	39,3	56,6	34,4	42,1	-	-	-
	HCR	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	50,4	65,6	80,1	-	-	-

Static and quasi static load values – Threaded bar (Working life of 100 years)

Data in this section according to:

- For a single anchor
- No edge distance and spacing influence
- Highlighted text indicates steel failure
- Anchor rod strength class 5.8 and 8.8, A4 and high corrosion steel(HCR)
- Installation parameters according to above tables, embedment depth is effective embedment depth
- C20/25 concrete
- Temperature range -40°C to +40°C
- Short term loading. For long term loading apply ψ_{sus} according to EN 1992-4
  - Hammer drilled holes, hammer drilled holes with hollow drill bit: $\psi^0_{sus} = 0,88$
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- For recommended loads: overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Characteristic resistance to tension and shear load – threaded rod (1)

Characteristic bond resistance in non-cracked concrete C20/25												
	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30	
Tension	5.8	N_{Rk}	[kN]	18,3	29,0	42,2	68,8	109,0	149,7	182,9	218,2	
	8.8	N_{Rk}	[kN]	29,3	42,0	56,8	68,8	109,0	149,7	182,9	218,2	
	A4	N_{Rk}	[kN]	25,6	40,6	56,8	68,8	109,0	149,7	182,9	218,2	
	HCR	N_{Rk}	[kN]	29,3	42,0	56,8	68,8	109,0	149,7	182,9	218,2	
Shear	5.8	V_{Rk}	[kN]	11,0	17,4	25,3	47,1	73,5	105,9	137,7	168,3	
	8.8	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	141,2	183,6	224,4	
	A4	V_{Rk}	[kN]	12,8	20,3	29,5	55,0	85,8	123,6	114,8	140,3	
	HCR	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	123,6	160,7	196,4	
Characteristic bond resistance in cracked concrete C20/25												
Tension	5.8	N_{Rk}	[kN]	14,1	22,6	37,3	48,1	76,3	104,8	128,0	152,8	
	8.8	N_{Rk}	[kN]	14,1	22,6	37,3	48,1	76,3	104,8	128,0	152,8	

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	A4	N_{Rk}	[kN]	14,1	22,6	37,3	48,1	76,3	104,8	128,0	152,8
	HCR	N_{Rk}	[kN]	14,1	22,6	37,3	48,1	76,3	104,8	128,0	152,8
Shear	5.8	V_{Rk}	[kN]	11,0	17,4	25,3	47,1	73,5	105,9	137,7	168,3
	8.8	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	141,2	183,6	224,4
	A4	V_{Rk}	[kN]	12,8	20,3	29,5	55,0	85,8	123,6	114,8	140,3
	HCR	V_{Rk}	[kN]	14,6	23,2	33,7	62,8	98,0	123,6	160,7	196,4

Design resistance to tension and shear load – threaded rod [1]

Design bond resistance in non-cracked concrete C20/25

	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30
Tension	5.8	N_{Rd}	[kN]	12,2	19,3	28,1	45,8	72,7	99,8	121,9	145,5
	8.8	N_{Rd}	[kN]	19,5	28,0	37,8	45,8	72,7	99,8	121,9	145,5
	A4	N_{Rd}	[kN]	13,7	21,7	31,6	45,8	72,7	99,8	80,2	98,1
	HCR	N_{Rd}	[kN]	19,5	28,0	37,8	45,8	72,7	99,8	121,9	145,5
Shear	5.8	V_{Rd}	[kN]	8,8	13,9	20,2	37,7	58,8	84,7	110,2	134,6
	8.8	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	113,0	146,9	179,5
	A4	V_{Rd}	[kN]	8,2	13,0	18,9	35,2	55,0	79,2	48,2	58,9
	HCR	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	70,6	91,8	112,2
Design bond resistance in cracked concrete C20/25											
Tension	5.8	N_{Rd}	[kN]	9,4	15,1	24,9	32,1	50,9	69,9	85,4	101,8
	8.8	N_{Rd}	[kN]	9,4	15,1	24,9	32,1	50,9	69,9	85,4	101,8
	A4	N_{Rd}	[kN]	9,4	15,1	24,9	32,1	50,9	69,9	80,2	98,1
	HCR	N_{Rd}	[kN]	9,4	15,1	24,9	32,1	50,9	69,9	85,4	101,8
Shear	5.8	V_{Rd}	[kN]	8,8	13,9	20,2	37,7	58,8	84,7	110,2	134,6
	8.8	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	113,0	146,9	179,5
	A4	V_{Rd}	[kN]	8,2	13,0	18,9	35,2	55,0	79,2	48,2	58,9
	HCR	V_{Rd}	[kN]	11,7	18,6	27,0	50,2	78,4	70,6	91,8	112,2

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Recommended tension and shear load – threaded rod [1]											
Recommended loads in non-cracked concrete C20/25											
	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30
Tension	5.8	N_{Rec}	[kN]	8,7	13,8	20,1	32,7	51,9	71,3	87,1	103,9
	8.8	N_{Rec}	[kN]	13,9	20,0	27,0	32,7	51,9	71,3	87,1	103,9
	A4	N_{Rec}	[kN]	9,8	15,5	22,5	32,7	51,9	71,3	57,3	70,1
	HCR	N_{Rec}	[kN]	13,9	20,0	27,0	32,7	51,9	71,3	87,1	103,9
Shear	5.8	V_{Rec}	[kN]	6,3	9,9	14,5	26,9	42,0	60,5	78,7	96,2
	8.8	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	80,7	104,9	128,2
	A4	V_{Rec}	[kN]	5,9	9,3	13,5	25,2	39,3	56,6	34,4	42,1
	HCR	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	50,4	65,6	80,1
Recommended loads in cracked concrete C20/25											
Tension	5.8	N_{Rec}	[kN]	6,7	10,8	17,8	22,9	36,3	49,9	61,0	72,7
	8.8	N_{Rec}	[kN]	6,7	10,8	17,8	22,9	36,3	49,9	61,0	72,7
	A4	N_{Rec}	[kN]	6,7	10,8	17,8	22,9	36,3	49,9	57,3	70,1
	HCR	N_{Rec}	[kN]	6,7	10,8	17,8	22,9	36,3	49,9	61,0	72,7
Shear	5.8	V_{Rec}	[kN]	6,3	9,9	14,5	26,9	42,0	60,5	78,7	96,2
	8.8	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	80,7	104,9	128,2
	A4	V_{Rec}	[kN]	5,9	9,3	13,5	25,2	39,3	56,6	34,4	42,1
	HCR	V_{Rec}	[kN]	8,4	13,3	19,3	35,9	56,0	50,4	65,6	80,1

Seismic load values – Threaded bar (Working life of 50 years)

Data in this section according to:

- For a single anchor
- No edge distance and spacing influence
- Highlighted text indicates steel failure
- Anchor rod strength class and 8.8 and 8.8 sherardised
- Installation parameters according to above tables, embedment depth is effective embedment depth
- C20/25 concrete
- Temperature range -40°C to +40°C
- Short term loading. For long term loading apply ψ_{sus} according to EN 1992-4
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- α_{gap}=0,5

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Characteristic resistance to tension and shear load in case of seismic performance category C2 – threaded rod

	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30
Tension	8.8	$N_{Rk,seis}$	[kN]	-	-	15,3	40,8	61,9	89,1	101,7	129,9
	8.8 sherardised	$N_{Rk,seis}$	[kN]	-	-	15,3	40,8	61,9	89,1	101,7	129,9
Shear	8.8	$V_{Rk,seis}$	[kN]	-	-	12,0	20,0	35,5	45,0	60,5	67,5
	8.8 sherardised	$V_{Rk,seis}$	[kN]	-	-	9,0	15,0	23,0	33,0	-	-

Design resistance to tension and shear load in case of seismic performance category C2 – threaded rod

	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30
Tension	8.8	$N_{Rd,seis}$	[kN]	-	-	10,2	27,2	41,3	59,4	67,8	86,6
	8.8 sherardised	$N_{Rd,seis}$	[kN]	-	-	10,2	27,2	41,3	59,4	67,8	86,6
Shear	8.8	$V_{Rd,seis}$	[kN]	-	-	9,6	16,0	28,4	36,0	48,4	54,0
	8.8 sherardised	$V_{Rd,seis}$	[kN]	-	-	7,2	12,0	18,4	26,4	-	-

Characteristic resistance to tension and shear load in case of seismic performance category C1 – threaded rod

	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30
Tension	8.8	$N_{Rk,seis}$	[kN]	13,7	23,2	33,8	40,9	64,9	89,1	108,8	129,9
Shear	8.8	$V_{Rk,seis}$	[kN]	4,5	8,0	13,5	20,5	19,5	-	-	-

Design resistance to tension and shear load in case of seismic performance category C1 – threaded rod

	Material	Size		M8	M10	M12	M16	M20	M24	M27	M30
Tension	8.8	$N_{Rd,seis}$	[kN]	9,1	15,4	22,5	27,3	43,3	59,4	72,6	86,6
Shear	8.8	$V_{Rd,seis}$	[kN]	3,6	6,4	10,8	16,4	15,6	-	-	-

Static and quasi static load values – Rebar (Working life of 50 years)

Data in this section according to:

- For a single anchor
- No edge distance and spacing influence
- Highlighted text indicates steel failure
- Rebar B500
- Installation parameters according to above tables, embedment depth is effective embedment depth
- C20/25 concrete

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- Temperature range -40°C to +40°C
- Short term loading. For long term loading apply ψ_{sus} according to EN 1992-4
  - Hammer drilled holes, hammer drilled holes with hollow drill bit: ψ^0_{sus} = 0,88
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- For recommended loads: overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Characteristic resistance to tension and shear load – rebar

Characteristic bond resistance in non-cracked concrete C20/25

	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Tension	Rebar B500B	N_{Rk}	[kN]	20,1	42,0	56,8	68,8	68,8	109,0	128,8	149,7	218,2	218,2	255,6	294,9	336,0
Shear	Rebar B500B	V_{Rk}	[kN]	14,0	22,0	31,0	42,0	55,0	86,0	124,0	135,0	169,0	194,0	221,0	280,0	346,0

Characteristic bond resistance in cracked concrete C20/25

	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Tension	Rebar B500B	N_{Rk}	[kN]	11,1	28,3	39,7	48,1	48,1	76,3	90,2	104,8	152,8	152,8	178,9	-	-
Shear	Rebar B500B	V_{Rk}	[kN]	14,0	22,0	31,0	42,0	55,0	86,0	124,0	135,0	169,0	194,0	221,0	-	-

Design resistance to tension and shear load – rebar

Design bond resistance in non-cracked concrete C20/25

	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Tension	Rebar B500B	N_{Rd}	[kN]	13,4	28,0	37,8	45,8	45,8	72,7	85,9	99,8	145,5	145,5	170,4	163,8	186,7
Shear	Rebar B500B	V_{Rd}	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	82,7	90,0	112,7	129,3	147,3	186,7	230,7

Design bond resistance in cracked concrete C20/25

	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Tension	Rebar B500B	N_{Rd}	[kN]	7,4	18,8	26,5	32,1	32,1	50,9	60,1	69,9	101,8	101,8	119,3	-	-
Shear	Rebar B500B	V_{Rd}	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	82,7	90,0	112,7	129,3	147,3	-	-

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Recommended tension and shear load – rebar															
Recommended loads in non-cracked concrete C20/25															
	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Tension	Rebar B500B	N_{Rec}	[kN]	9,6	20,0	27,0	32,7	32,7	51,9	61,4	71,3	103,9	103,9	121,7	117,0	133,3
Shear	Rebar B500B	V_{Rec}	[kN]	6,7	10,5	14,8	20,0	26,2	41,0	59,0	64,3	80,5	92,4	105,2	133,3	164,8
Recommended loads in cracked concrete C20/25															
Tension	Rebar B500B	N_{Rec}	[kN]	5,3	13,5	18,9	22,9	22,9	36,3	42,9	49,9	72,7	72,7	85,2	-	-
Shear	Rebar B500B	V_{Rec}	[kN]	6,7	10,5	14,8	20,0	26,2	33,3	41,0	59,0	64,3	80,5	92,4	105,2	-

Static and quasi static load values – Rebar (Working life of 100 years)

Data in this section according to:

- For a single anchor
- No edge distance and spacing influence
- Highlighted text indicates steel failure
- Rebar B500
- Installation parameters according to above tables, embedment depth is effective embedment depth
- C20/25 concrete
- Temperature range -40°C to +40°C
- Short term loading. For long term loading apply ψ_{sus} according to EN 1992-4
    - Hammer drilled holes, hammer drilled holes with hollow drill bit: ψ^0_{sus} = 0,88
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- For recommended loads: overall partial safety factor for action γ=1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Characteristic resistance to tension and shear load – rebar														
Characteristic bond resistance in non-cracked concrete C20/25														
	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32
Tension	Rebar B500B	N_{Rk}	[kN]	20,1	42,0	56,8	68,8	68,8	109,0	128,8	149,7	218,2	218,2	255,6
Shear	Rebar B500B	V_{Rk}	[kN]	14,0	22,0	31,0	42,0	55,0	86,0	124,0	135,0	169,0	194,0	221,0
Characteristic bond resistance in cracked concrete C20/25														
Tension	Rebar B500B	N_{Rk}	[kN]	10,1	25,4	39,7	48,1	48,1	63,3	76,3	90,2	104,8	152,8	152,8

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Shear	Rebar B500B	V_{Rk}	[kN]	14,0	22,0	31,0	42,0	55,0	86,0	124,0	135,0	169,0	194,0	221,0

Design resistance to tension and shear load – rebar														
Design bond resistance in non-cracked concrete C20/25														
	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32
Tension	Rebar B500B	N_{Rd}	[kN]	13,4	28,0	37,8	45,8	45,8	72,7	85,9	99,8	145,5	145,5	170,4
Shear	Rebar B500B	V_{Rd}	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	82,7	90,0	112,7	129,3	147,3
Design bond resistance in cracked concrete C20/25														
Tension	Rebar B500B	N_{Rd}	[kN]	7,4	18,8	26,5	32,1	32,1	50,9	60,1	69,9	101,8	101,8	119,3
Shear	Rebar B500B	V_{Rd}	[kN]	9,3	14,7	20,7	28,0	36,7	57,3	82,7	90,0	112,7	129,3	147,3

Recommended tension and shear load – rebar														
Recommended loads in non-cracked concrete C20/25														
	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32
Tension	Rebar B500B	N_{Rec}	[kN]	9,6	20,0	27,0	32,7	32,7	51,9	61,4	71,3	103,9	103,9	121,7
Shear	Rebar B500B	V_{Rec}	[kN]	6,7	10,5	14,8	20,0	26,2	41,0	59,0	64,3	80,5	92,4	105,2
Recommended loads in cracked concrete C20/25														
Tension	Rebar B500B	N_{Rec}	[kN]	4,8	12,1	18,9	22,9	22,9	36,3	42,9	49,9	72,7	72,7	85,2
Shear	Rebar B500B	V_{Rec}	[kN]	6,7	10,5	14,8	20,0	26,2	41,0	59,0	64,3	80,5	92,4	105,2

Seismic load values – Rebar (Working life of 50 years)

Data in this section according to:

- For a single anchor
- No edge distance and spacing influence
- Highlighted text indicates steel failure
- Rebar B500
- Installation parameters according to above tables, embedment depth is effective embedment depth

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- C20/25 concrete
- Temperature range -40°C to +40°C
- Short term loading. For long term loading apply ψ_{sus} according to EN 1992-4
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- α_{gap}=1,0

Characteristic resistance to tension and shear load in case of seismic performance category C1 – rebar

	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32
Tension	Rebar B500B	$N_{Rk,seis}$	[kN]	-	25,0	33,8	40,9	40,9	64,9	76,7	89,1	129,9	129,9	152,1
Shear	Rebar B500B	$V_{Rk,seis}$	[kN]	-	15,0	22,0	29,0	39,0	60,0	87,0	95,0	118,0	136,0	155,0

Design resistance to tension and shear load in case of seismic performance category C1 – rebar

	Material	Size		Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32
Tension	Rebar B500B	$N_{Rd,seis}$	[kN]	-	16,7	22,5	27,3	27,3	43,3	51,1	59,4	86,6	86,6	101,4
Shear	Rebar B500B	$V_{Rd,seis}$	[kN]	-	10,0	14,7	20,0	26,0	40,0	58,0	63,3	78,7	90,7	103,3

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Chemical resistance of cured anchor

Chemical environment	Concentration	Result	Chemical environment	Concentration	Result
Aqueous Solution Acetic Acid	10%	F	Ethanol Aqueous Solution	20%	G
Acetone	100%	F	Linseed Oil	100%	G
Aluminium Chloride Aqueous Solution	Saturated	G	Lubricating Oil	100%	G
Aluminium Nitrate Aqueous Solution	10%	G	Phenol Aqueous Solution	8%	F
Ammonia Aqueous Solution	5%	G	Potassium Hydroxide	100%	F
Ammonia Aqueous Solution	32%	F	Sea Water	100%	G
Jet Fuel	100%	G	Styrene	100%	F
Benzene	100%	F	Sulphuric Acid	10%	F
Benzoic Acid	Saturated	G	Sulphuric Acid	50%	F
Benzyl Alcohol	100%	F	Turpentine	100%	G
Butyl Alcohol	2%	C	Heptane	17%	G
Carbon Tetrachloride	100%	G	Hydrochloric Acid	10%	F
Chlorine Water	Saturated	F	Hydrochloric Acid	15%	F
Citric Acid Aqueous Solution	Saturated	G	Hydrochloric Acid	25%	F
Diesel Fuel	100%	G	Isopropyl Alcohol	100%	F
Diethylene Glycol	100%	G	White Spirit	60%	G
Ethanol Aqueous Solution	95%	G	Xylene	30%	G

Resistance up to 75C with minimum 80% retained properties	G
Resistance up to 25C with minimum 80% retained properties	C
No data	N

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Physical properties

Density (at +20°C)	ASTM D1875	g/ml	1.4
Hardness Shore D			86
Tensile Modulus	DIN EN ISO 527-2	N/mm^2	6300
Compressive strength	EN 196-1	N/mm^2	122
Service temperature	-	-	-40°C - +72°C* *Maximum long term temperature is 40°C

Consumption table

Consumption of chemical anchor depends on the dimensions of threaded bar, rebar, and drilled hole. The table given below shows the theoretical consumption of chemical anchor with recommended application parameters.

Threaded bar	M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Diameter of threaded bar (mm)	8	10	12	16	20	24	27	30	30	30	30
Diameter of hole in concrete (mm)	10	12	14	18	24	28	32	35	37	40	42
Anchoring depth (mm)	80	90	110	125	170	210	240	270	300	330	360
Consumption per hole (ml)	5	8	13	24	58	97	145	195	242	311	374
Number of holes with 385ml cartridge	74	45	27	15	6	4	2	2	1	1	1
Number of holes with 585ml cartridge	112	69	41	22	9	5	4	3	2	2	1

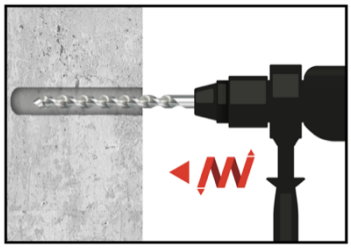
Rebar	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø24	Ø25	Ø28	Ø30	Ø32	Ø36	Ø40
Diameter of threaded bar (mm)	8	10	12	14	16	20	24	25	28	30	32	36	40
Diameter of hole in concrete (mm)	12	14	16	18	20	24	30	32	35	37	40	45	50
Anchoring depth (mm)	80	90	110	115	125	170	190	210	270	300	330	360	390
Consumption per hole (ml)	8	12	19	25	33	65	114	144	221	274	352	487	651
Number of holes with 385ml cartridge	45	29	18	13	10	5	3	2	1	1	0	0	0
Number of holes with 585ml cartridge	68	44	28	21	15	8	4	3	2	1	1	1	0

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Directions for use

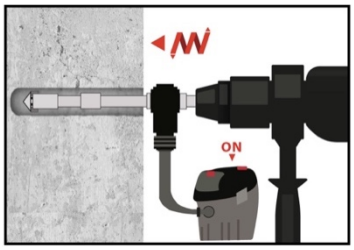
Drilling of the hole (HD, HDB, CD)



1a. **Hammer drilling (HD) / Compressed air drilling (CD)**

Drill with hammer drill a hole into the base material to the size and embedment depth required by the selected anchor according to “Installation Parameters”. Aborted drill holes shall be filled with mortar.

Proceed with Step 2.



1b. **Hollow drill bit system (HDB)**

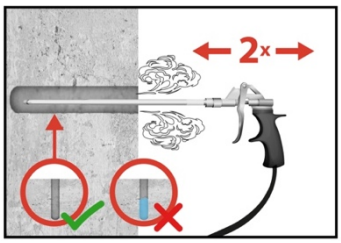
Check Annex B before the application.

Drill a hole into the base material to the size and embedment depth required by the selected anchor.

The hollow drilling system removes the dust and cleans the hole while drilling with the vacuum. Proceed with Step 3.

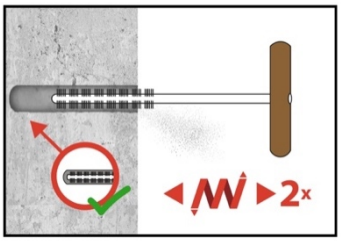
Compressed air cleaning (CAC):

covers all diameter in cracked non-cracked concrete

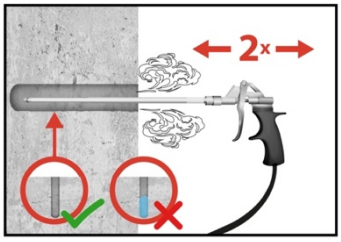


2a. **Attention! Standing water in the bore hole must be removed before cleaning.**

Starting from the drill hole bottom blow the hole at least 2 times using the compressed air (min. 6 bar, oil-free) until return air stream is free of noticeable dust. If necessary, nozzle extension can be attached to the top of air blow to reach bottom of the hole.



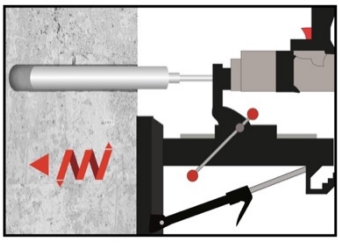
2b. Using the specified brush, mechanically brush out the hole at least 2 times over the entire embedment depth in a twisting motion. (If necessary, use brush extension to reach bottom of the hole)



2c. Finally, blow the hole at least 2 times using the compressed air (min. 6 bar, oil-free) until return air stream is free of noticeable dust. If necessary, nozzle extension can be attached to the top of air blow to reach bottom of the hole.

<u>After cleaning, the bore hole must be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning repeated must be directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.</u>

Drilling of the hole, Diamond drilling (DD)



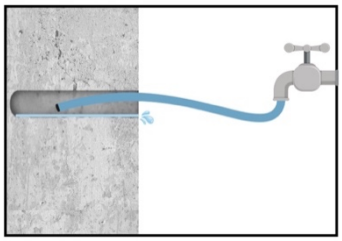
1a. **Diamond drilling (DD)**

Drill with diamond drill a hole into the base material to the size and embedment depth required by the selected anchor. Aborted drill holes shall be filled with mortar. Proceed with Step 2.

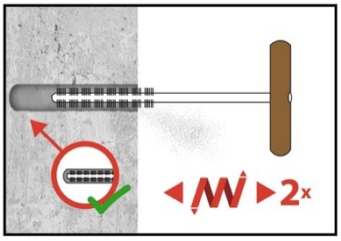
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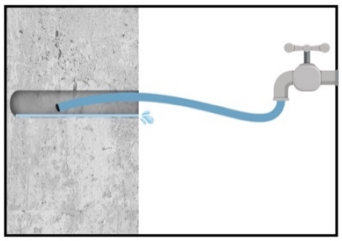
Flush & Compressed Air Cleaning (FLCAC): covers all diameter in non-cracked concrete



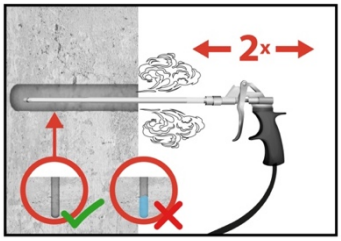
2a. Flushing with water until clear water comes out.



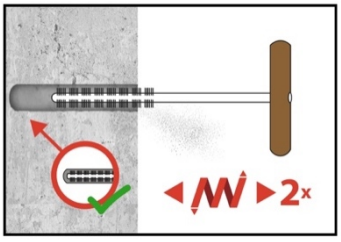
2b. Using the specified brush, mechanically brush out the hole at least 2 times over the entire embedment depth in a twisting motion. (If necessary, use brush extension to reach bottom of the hole)



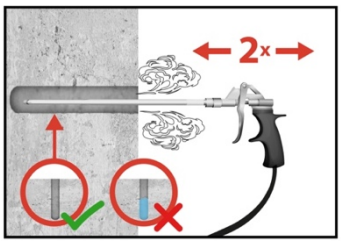
2c. Flushing again with water until clear water comes out.



2d. **Attention! Standing water in the bore hole must be removed before cleaning.**
Starting from the drill hole bottom blow the hole at least 2 times using the compressed air (min. 6 bar, oil-free) until return air stream is free of noticeable dust. If necessary, nozzle extension can be attached to the top of air blow to reach bottom of the hole.

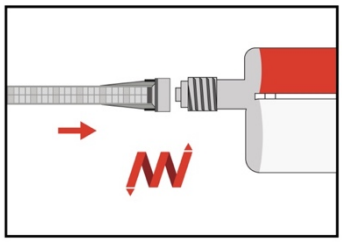


2e. Using the specified brush, mechanically brush out the hole at least 2 times over the entire embedment depth in a twisting motion. (If necessary, use brush extension to reach bottom of the hole)

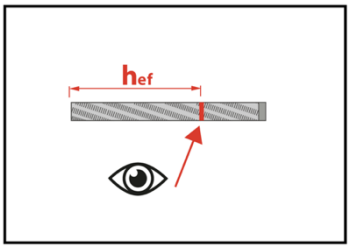


2f. Finally, blow the hole at least 2 times using the compressed air (min. 6 bar, oil-free) until return air stream is free of noticeable dust. If necessary, nozzle extension can be attached to the top of air blow to reach bottom of the hole.
After cleaning, the bore hole has to be protected against re-contamination in an appropriate way, until dispensing the mortar in the bore hole. If necessary, the cleaning repeated has to be directly before dispensing the mortar. In-flowing water must not contaminate the bore hole again.

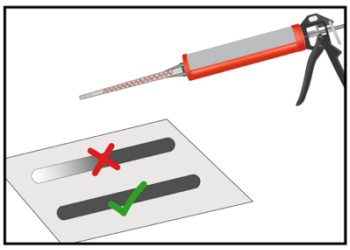
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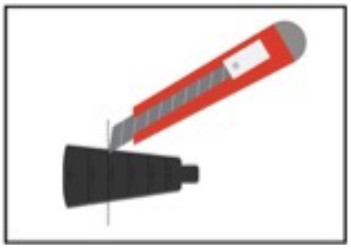
3. Attach supplied static-mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool.
   For every working interruption longer than the maximum working time as well as for new cartridges, a new static mixer shall be used.



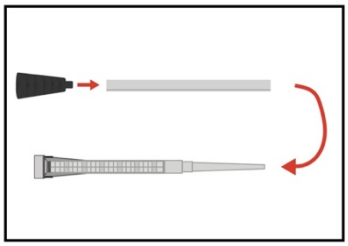
4. Mark embedment depth on the anchor rod, such as threaded rod and rebar.
   The anchor rod should be free of dirt, grease, oil or other foreign material.



5. Dispense to waste until even colour is obtained (at least 3 full strokes). Discard the uneven coloured first strokes.

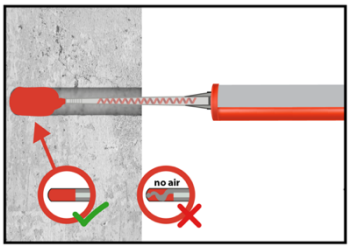


6. Cut the injection plug to match the diameter of injection plug with the hole diameter.

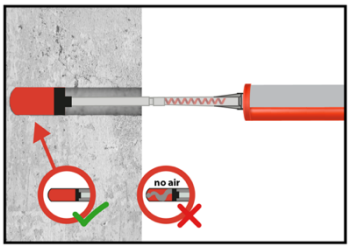


7. Injection plug and mixer nozzle extension should be used for the following applications:
   - o Horizontal and downwards direction: For drill bit diameter higher than 16mm and embedment depth higher than 250mm
   - o Upwards direction: Drill bit higher than 16mm

   Assemble mixing nozzle, mixer extension and injection plug before injecting mortar.



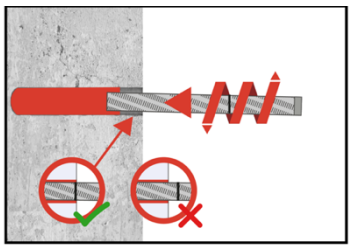
8a. Injecting mortar without using injection plug
   Starting from the bottom or back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. Slowly withdraw the static mixing nozzle as the hole fills to avoid creating air pockets. Observe the gel-/ working times given.



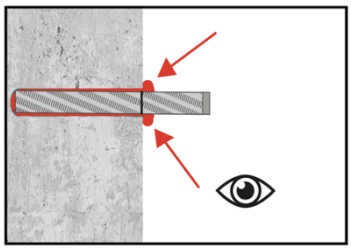
8b. Injecting mortar with using injection plug
   Starting from the bottom or back of the cleaned anchor hole fill the hole up to approximately two-thirds with adhesive. During injection the injection plug is pushed out of the hole by the back pressure of the injected mortar. Observe the gel-/ working times given.

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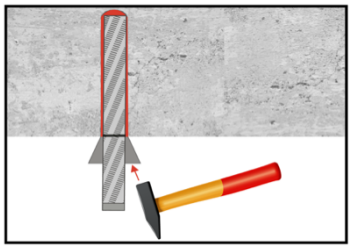


9. Push the threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached.

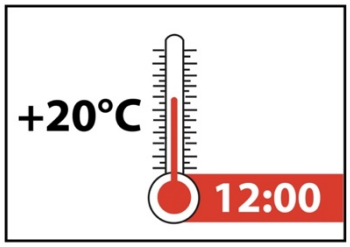


10. Annular gap between anchor rod and base material must be completely filled with mortar.

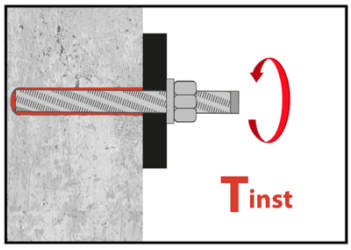
    Otherwise, the installation must be repeated starting from step 6 before the maximum working time reached.



11. For overhead application the anchor rod should be fixed (e.g wedges).



12. Allow the adhesive to cure to the specified time prior to applying any load or torque. Do not move or load the anchor until it is fully cured.



13. After full curing, the add-on part can be installed with the max. torque by using a calibrated torque wrench.

Packaging

Cartridge	Pieces in a box	Pieces on a wooden pallet
385ml	12	1200
585ml	12	768

- For each cartridge, there are two static mixers in the box.

Storage and shelf life

Keep product in its original container at 22°C and avoid contacting with direct sunlight. Storage below 5°C and above 30°C can negatively affect product properties.
Material removed from its original container can be contaminated during usage which affects both adhesive performance and storage life. Therefore, do not return contaminated product to the original container.

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EMS Dubell® Chemical Anchor F.2111

We cannot take any responsibility for product which has been contaminated or stored under conditions different than previously indicated.

Shelf life: 24 months at +5 to +30°C

Health and safety

For further information, please consult Safety Data Sheet (SDS) before use.

Disclaimer

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