

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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Working and loading time

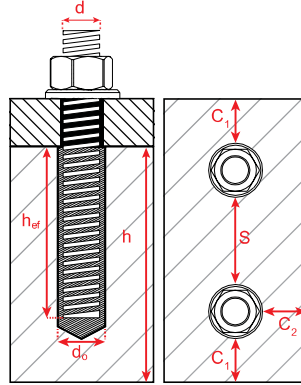
Working time is typical gel time at the highest temperature of the given range.

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



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 _i	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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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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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_{SLS} 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 $\gamma=1,4$. 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
 - o Hammer drilled holes, hammer drilled holes with hollow drill bit: $\psi_{SUS}^0 = 0,88$
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- For recommended loads: overall partial safety factor for action $\gamma=1,4$. 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

TDS

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Shear	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
	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

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
- $\alpha_{gap}=0,5$

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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

EMS Dubell® Chemical Anchor F.2111

- Temperature range -40°C to +40°C
- Short term loading. For long term loading apply ψ_{SUS} according to EN 1992-4
 - o Hammer drilled holes, hammer drilled holes with hollow drill bit: $\psi_{\text{SUS}}^0 = 0,88$
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- For recommended loads: overall partial safety factor for action $\gamma=1,4$. 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

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

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	-	-

EMS Dubell® Chemical Anchor F.2111

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
 - o Hammer drilled holes, hammer drilled holes with hollow drill bit: $\psi_{\text{sus}}^0 = 0,88$
- For hammer drilled holes, hammer drilled holes with hollow drill bit
- For recommended loads: overall partial safety factor for action $\gamma=1,4$. 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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EMS Dubell® Chemical Anchor F.2111

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
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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

TDS

EMS Dubell® Chemical Anchor F.2111

- 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
- $\alpha_{gap}=1,0$

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

EMS Dubell® Chemical Anchor F.2111



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		

EMS Dubell® Chemical Anchor F.2111



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.

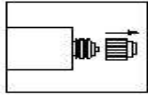
Threaded bar	M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Diameter of threaded bar (mm)	8	10	12	16	20	24	27	30	30	30	30
Diameter of hole in concrete (mm)	10	12	14	18	24	28	32	35	37	40	42
Anchoring depth (mm)	80	90	110	125	170	210	240	270	300	330	360
Consumption per hole (ml)	5	8	13	24	58	97	145	195	242	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

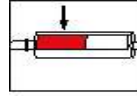
EMS Dubell® Chemical Anchor F.2111

Directions for use

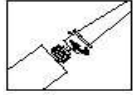
Cartridge preparation



- 1) Open the cap at the tip of the cartridge.



- 2) Place the cartridge into application gun.

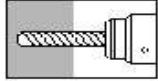


- 3) Place mixing nozzle to the cartridge (Screw down and tight)

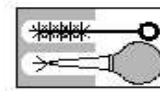


- 4) Extrude the product by 10cm to ensure homogenous mixing.

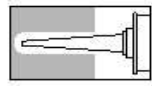
Application of the product



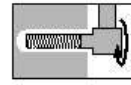
- 1) Choose the drill bit suitable for the diameter of the anchor showed in consumption table.



- 2) Clean inside of the hole with air pump or brush.



- 3) Fill 2/3 of the hole by injecting Chemical Anchor.



- 4) Place anchoring bar by rotating. Spare resin must overflow out of the hole.



Packaging

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

- 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.

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

The data contained herein are furnished for informational purposes only and are believed to be reliable. However, our company does not assume responsibility for any results obtained by persons over whose methods our company has no control. It is the user's responsibility to determine the suitability of our company products or any production methods mentioned herein for a particular purpose, and to adopt such precautions as may be advisable for the protection of property and persons against any hazards that may be involved in the handling and use of any our company products. our company specifically disclaims all warranties express or implied, including warranties of saleability and suitability for a particular purpose arising from sale or use of our company products. our company further disclaims any liability for consequential or incremental damages of any kind including lost profits.