EMS Dubell® F.1511-SF Chemical Anchor VESF

Product description

VESF is two component bonded anchoring system anchoring of wide variety of construction applications. Since it is formulated free of styrene, VESF has very low odour and is ideal for indoor and outdoor applications.
VESF is for heavy-duty applications in non-cracked concrete and masonry and many other base materials like aerated concrete, lightweight solid or hollow concrete blocks or sand lime bricks. VESF chemical anchor can be used for post-installed rebar connections Ø8 to Ø20. VESF has three version for various climate conditions.

- VESF: Normal working and loading time
- VESF-C: Faster working and loading time for winter climate
- VESF-E: Slower working and loading time for hot climate

Main constituent	:	Vinylester resin
Appearance (uncured)	:	Paste
Colour	:	Grey
Viscosity	:	Thixotropic, high

Applications:
Masonry support, Handrails, Fences, balcony parapets, road signs, Pipe systems, lighting systems, canopies, safety barriers, racking, machinery, ventilation systems, reinforcement bar systems.

Features:

- Use for medium-high loads, static or quasi-static.
- Working life of 50 and/or 100 years.
- Dry, wet and flooded holes
- Temperature range: from -40°C to +80°C (long term maximum temperature +50°C).
- For high loads
- Styrene free formulation (SF)
- Compatible with several building materials including perforated brick.
- Assessed for non-carbonated concrete class from C12/15 to C50/60

EMS Dubell® F.1511-SF Chemical Anchor VESF

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.

Polyester Styrene Free (VESF)

Temperature of base material	+5°C	+5°C to +10°C	+10°C to +20°C	+20°C to +25°C	+25°C to +30°C	+30°C
Temperature of cartridge	+5°C	+5°C to +10°C	+10°C to +20°C	+20°C to +25°C	+25°C to +30°C	+30°C
Working time (mins)	18	10	6	5	4	3
Loading time (mins)	150	150	85	50	40	35

Polyester Styrene Free Winter Grade (VESF-C)

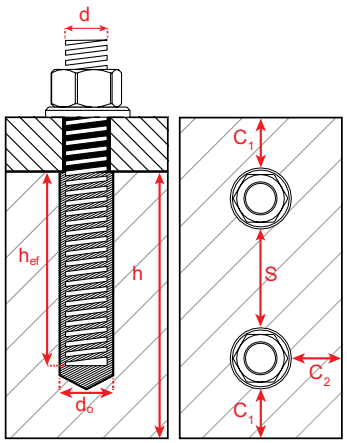
Temperature of base material	-20°C	-20°C to -10°C	-10°C to 0°C	0°C to +5°C	+5°C to +15°C	+15°C
Temperature of cartridge	+5°C	+5°C	+5°C	+5°C	+5°C to +15°C	+15°C
Working time (mins)	60	45	20	6	3	2
Loading time (mins)	600	450	360	240	75	30

Polyester Styrene Free Tropical Grade (VESF-E)

Temperature of base material	+10°C	+10°C to +20°C	+20°C to +25°C	+25°C to +30°C	+30°C to +35°C	+35°C to +40°C	+40°C to +45°C	+45°C
Temperature of cartridge	+10°C	+10°C to +20°C	+20°C to +25°C	+25°C to +30°C	+30°C to +35°C	+35°C to +40°C	+40°C to +45°C	+45°C
Working time (mins)	30	15	10	7.5	5	3.5	2.5	1.5
Loading time (mins)	300	300	150	85	50	40	35	15

EMS Dubell® F.1511-SF Chemical Anchor VESF

Installation Parameters



Installation parameter - Threaded Rod								
Anchor size			M8	M10	M12	M16	M20	M24
d	Diameter of anchor bolt or thread diameter	mm	8	10	12	16	20	24
d_0	Nominal diameter of drill bit	mm	10	12	14	18	24	28
d_f	Diameter of clearance hole in the fixture (≤)	mm	9	12	14	18	22	26
d_b	Diameter of steel brush (≥)	mm	12	14	16	20	26	30
$h_{ef,min}$	Minimum effective anchorage depth	mm	64	80	96	128	160	192
h_{ef}	Standard effective anchorage depth	mm	80	90	110	128	170	210
$h_{ef,max}$	Maximum effective anchorage depth (20*d)	mm	160	200	240	320	400	480
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	120	160
s_{min}	Minimum spacing (5*d)	mm	40	50	60	80	100	120
$s_{cr,N}$	Spacing	mm	184	252	304	376	506	582
c_{min}	Minimum edge distance (5*d)	mm	40	50	60	80	100	120
$c_{cr,N}$	Edge distance	mm	92	126	152	188	253	291

EMS Dubell® F.1511-SF Chemical Anchor VESF

Load values – Characteristic Resistance – Threaded bar

Characteristic resistances for C20/25 concrete for an isolated anchor (without considering anchor-to-anchor or anchor-to-edge distance effects) and class 5.8,8.8,10.9 studs or A4-70 and A4-80, 1,4529 stainless steel are shown in tables below.

Characteristic resistance values to tension load – threaded rod								
Steel Failure - Characteristic resistance								
Size			M8	M10	M12	M16	M20	M24
Steel grade 5.8	$N_{Rk,s}$	[kN]	18	29	42	79	123	177
Partial safety factor	γ_{Ms}	[-]	1,5					
Steel grade 8.8	$N_{Rk,s}$	[kN]	29	46	67	126	196	282
Partial safety factor	γ_{Ms}	[-]	1,5					
Steel grade 10.9	$N_{Rk,s}$	[kN]	37	58	84	157	245	353
Partial safety factor	γ_{Ms}	[-]	1,4					
Stainless Steel grade A4-70	$N_{Rk,s}$	[kN]	26	41	59	110	172	247
Partial safety factor	γ_{Ms}	[-]	1,9					
Stainless Steel grade A4-80	$N_{Rk,s}$	[kN]	29	46	67	126	196	282
Partial safety factor	γ_{Ms}	[-]	1,6					
Stainless Steel grade 1,4529	$N_{Rk,s}$	[kN]	26	41	59	110	172	247
Partial safety factor	γ_{Ms}	[-]	1,5					

Characteristic resistance values to shear load – threaded rod								
Steel Failure - Without Lever Arm								
Size			M8	M10	M12	M16	M20	M24
Steel grade 5.8	$V_{Rk,s}$	[kN]	9	15	21	39	61	88
Partial safety factor	γ_{Ms}	[-]	1,25					
Steel grade 8.8	$V_{Rk,s}$	[kN]	15	23	34	63	98	141
Partial safety factor	γ_{Ms}	[-]	1,25					
Steel grade 10.9	$V_{Rk,s}$	[kN]	18	29	42	79	123	177
Partial safety factor	γ_{Ms}	[-]	1,5					
Stainless Steel grade A4-70	$V_{Rk,s}$	[kN]	13	20	30	55	86	124
Partial safety factor	γ_{Ms}	[-]	1,56					
Stainless Steel grade A4-80	$V_{Rk,s}$	[kN]	15	23	34	63	98	141
Partial safety factor	γ_{Ms}	[-]	1,33					
Stainless Steel grade 1,4529	$V_{Rk,s}$	[kN]	13	20	30	55	86	124
Partial safety factor	γ_{Ms}	[-]	1,25					

EMS Dubell® F.1511-SF Chemical Anchor VESF

Steel Failure - With Lever Arm								
Size			M8	M10	M12	M16	M20	M24
Steel grade 5.8	$M^0_{Rk,s}$	[kN]	19	37	66	166	325	561
Partial safety factor	γ_{Ms}	[-]	1,25					
Steel grade 8.8	$M^0_{Rk,s}$	[kN]	30	60	105	266	519	898
Partial safety factor	γ_{Ms}	[-]	1,25					
Steel grade 10.9	$M^0_{Rk,s}$	[kN]	37	75	131	333	649	1123
Partial safety factor	γ_{Ms}	[-]	1,5					
Stainless Steel grade A4-70	$M^0_{Rk,s}$	[kN]	26	52	92	233	454	786
Partial safety factor	γ_{Ms}	[-]	1,56					
Stainless Steel grade A4-80	$M^0_{Rk,s}$	[kN]	30	60	105	266	519	898
Partial safety factor	γ_{Ms}	[-]	1,33					
Stainless Steel grade 1,4529	$M^0_{Rk,s}$	[kN]	26	52	92	233	454	786
Partial safety factor	γ_{Ms}	[-]	1,25					
Concrete pry-out failure								
Factor for resistance to pry-out failure	k_3	[-]	2,0					
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0					

Concrete edge failure – threaded bar								
Size			M8	M10	M12	M16	M20	M24
Outside diameter of fastener	d_{nom}	[mm]	8	10	12	16	20	24
Effective length of fastener	ℓ_f	[mm]	min (h_{ef},8*d_{nom})					
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,00					

Characteristic resistance to tension load – threaded rod [1]										
Characteristic bond resistance in non-cracked concrete C20/25										
Concrete Class	Temperature Range[2]	Embedment depth	Size		M8	M10	M12	M16	M20	M24
NON-CRACKED CONCRETE	24˚C / 40˚C	$h_{ef,min}$	$N_{Rk,p}$	[kN]	16,1	20,1	32,6	61,1	85,5	115,8
		$h_{ef,standard}$	$N_{Rk,p}$	[kN]	20,1	22,6	37,3	61,1	90,8	126,7
		$h_{ef,max}$ = 12*d	$N_{Rk,p}$	[kN]	40,2	50,3	81,4	152,8	213,6	289,5
	50˚C / 80˚C	$h_{ef,min}$	$N_{Rk,p}$	[kN]	12,1	14,3	23,1	43,3	65,7	89,1
		$h_{ef,standard}$	$N_{Rk,p}$	[kN]	15,1	16,0	26,5	43,3	69,8	97,4
		$h_{ef,max}$ = 12*d	$N_{Rk,p}$	[kN]	30,2	35,6	57,8	108,4	164,3	222,7

EMS Dubell® F.1511-SF Chemical Anchor VESF

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Load values – Design Resistance – Threaded bar

Design resistance values to tension load -threaded bar								
Steel Failure - Design resistance								
Size			M8	M10	M12	M16	M20	M24
Steel grade 5.8	$N_{Rd,s}$	[kN]	12	19	28	53	82	118
Steel grade 8.8	$N_{Rd,s}$	[kN]	19	31	45	84	131	188
Steel grade 10.9	$N_{Rd,s}$	[kN]	26	41	60	112	175	252
Stainless Steel grade A4-70	$N_{Rd,s}$	[kN]	14	22	31	58	91	130
Stainless Steel grade A4-80	$N_{Rd,s}$	[kN]	18	29	42	79	123	176
Stainless Steel grade 1,4529	$N_{Rd,s}$	[kN]	17	27	39	73	115	165

Design resistance values to shear load - threaded bar								
Steel Failure - Design resistance								
Size			M8	M10	M12	M16	M20	M24
Steel grade 5.8	$V_{Rd,s}$	[kN]	7	12	17	31	49	70
Steel grade 8.8	$V_{Rd,s}$	[kN]	12	18	27	50	78	113
Steel grade 10.9	$V_{Rd,s}$	[kN]	12	19	28	53	82	118
Stainless Steel grade A4-70	$V_{Rd,s}$	[kN]	8	13	19	35	55	79
Stainless Steel grade A4-80	$V_{Rd,s}$	[kN]	11	17	26	47	74	106
Stainless Steel grade 1,4529	$V_{Rd,s}$	[kN]	10	16	24	44	69	99

Design resistance values to tension load - threaded bar (1)										
Characteristic bond resistance in non-cracked concrete C20/25										
Concrete Class	Temperature Range(2)	Embedment depth	Size		M8	M10	M12	M16	M20	M24
NON-CRACKED CONCRETE	24˚C / 40˚C	$h_{ef,min}$	$N_{Rd,p}$	[kN]	10,7	11,2	18,1	34,0	47,5	64,3
		$h_{ef,standard}$	$N_{Rd,p}$	[kN]	13,4	12,6	20,7	34,0	50,4	70,4
		$h_{ef,max}$ = 12*d	$N_{Rd,p}$	[kN]	26,8	27,9	45,2	84,9	118,7	160,8
	50˚C / 80˚C	$h_{ef,min}$	$N_{Rd,p}$	[kN]	8,1	7,9	12,8	24,1	36,5	49,5
		$h_{ef,standard}$	$N_{Rd,p}$	[kN]	10,1	8,9	14,7	24,1	38,8	54,1

		$h_{ef,max}$ = 20*d	$N_{Rd,p}$	[kN]	20,2	19,8	32,1	60,2	91,3	123,7

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Load values – Maximum load recommended – Threaded bar

The recommended loads are only valid for single anchor for a roughly design, if the following conditions are valid:
$c \geq c_{cr,N}$ $s \geq s_{cr,N}$ $h \geq 2*h_{ef}$
The safety factors are already included in the recommended loads.

Maximum loads recommended - Tension load – threaded bar

Steel Failure - Design resistance

Size			M8	M10	M12	M16	M20	M24
Steel grade 5.8	$N_{Rec,s}$	[kN]	9	14	20	38	59	84
Steel grade 8.8	$N_{Rec,s}$	[kN]	14	22	32	60	93	134
Steel grade 10.9	$N_{Rec,s}$	[kN]	19	30	43	80	125	180
Stainless Steel grade A4-70	$N_{Rec,s}$	[kN]	10	15	22	41	65	93
Stainless Steel grade A4-80	$N_{Rec,s}$	[kN]	13	21	30	56	88	126
Stainless Steel grade 1,4529	$N_{Rec,s}$	[kN]	12	20	28	52	82	118

Maximum loads recommended - Shear load – threaded bar

Steel Failure - Design resistance

Size			M8	M10	M12	M16	M20	M24
Steel grade 5.8	$V_{Rec,s}$	[kN]	5	9	12	22	35	50
Steel grade 8.8	$V_{Rec,s}$	[kN]	9	13	19	36	56	81
Steel grade 10.9	$V_{Rec,s}$	[kN]	9	14	20	38	59	84
Stainless Steel grade A4-70	$V_{Rec,s}$	[kN]	6	9	14	25	39	57
Stainless Steel grade A4-80	$V_{Rec,s}$	[kN]	8	12	18	34	53	76
Stainless Steel grade 1,4529	$V_{Rec,s}$	[kN]	7	11	17	31	49	71

Maximum loads recommended - Tension load – threaded bar (1)

Maximum load in non-cracked concrete C20/25

Concrete Class	Temperature Range(2)	Embedment depth	Size		M8	M10	M12	M16	M20	M24
NON-CRACKED CONCRETE	24˚C / 40˚C	$h_{ef,min}$	$N_{Rec,p}$	[kN]	7,7	8,0	12,9	24,3	33,9	46,0

EMS Dubell® F.1511-SF Chemical Anchor VESF

	$h_{ef,standard}$	$N_{Rec,p}$	[kN]	9,6	9,0	14,8	24,3	36,0	50,3
	$h_{ef,max}$ = 12*d	$N_{Rec,p}$	[kN]	19,1	19,9	32,3	60,6	84,8	114,9
50˚C / 80˚C	$h_{ef,min}$	$N_{Rec,p}$	[kN]	5,8	5,7	9,2	17,2	26,1	35,4
	$h_{ef,standard}$	$N_{Rec,p}$	[kN]	7,2	6,4	10,5	17,2	27,7	38,7
	$h_{ef,max}$ = 12*d	$N_{Rec,p}$	[kN]	14,4	14,1	22,9	43,0	65,2	88,4

(1) For more detailed load information, please Declaration of Performance(DOP).

(2) Short term temperature / long term temperature. Long term concrete temperatures are roughly constant over significant periods of time. Short term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

EMS Dubell® F.1511-SF Chemical Anchor VESF

Chemical resistance of cured anchor

Chemical environment	Concentration	Result	Chemical environment	Concentration	Result
Aqueous Solution Acetic Acid	10%	G	Heptane	100%	C
Acetone	100%	F	Hexane	100%	C
Aluminium Chloride Aqueous Solution	Saturated	G	Hydrochloric Acid	10%	G
Aluminium Nitrate Aqueous Solution	10%	G	Hydrochloric Acid	15%	G
Ammonia Aqueous Solution	5%	F	Hydrochloric Acid	25%	C
Jet Fuel	100%	F	Hydrogen Sulphide	100%	G
Benzene	100%	F	Isopropyl Alcohol	100%	F
Benzoic Acid	Saturated	G	Linseed Oil	100%	G
Benzyl Alcohol	100%	F	Lubricating Oil	100%	G
Sodium Hypochlorite Solution	15%	G	Mineral Oil	100%	G
Butyl Alcohol	100%	C	Paraffin / Kerosene	100%	C
Calcium Sulphate Aqueous Solution	Saturated	G	Phenol Aqueous Solution	1%	F
Carbon Monoxide	100%	G	Phosphoric Acid	50%	G
Carbon Tetrachloride	100%	C	Potassium Hydroxide	10% pH13	C
Chlorine Water	Saturated	F	Sea Water	100%	C
Chloro Benzene	100%	F	Styrene	100%	F
Citric Acid Aqueous Solution	Saturated	G	Sulphur Dioxide Solution	10%	G
Cyclohexanol	100%	G	Sulphuric Acid	10%	G
Diesel Fuel	100%	G	Sulphuric Acid	50%	G
Diethylene Glycol	100%	G	Turpentine	100%	C
Ethanol Aqueous Solution	95%	F	White Spirit	100%	G
Ethanol Aqueous Solution	20%	C	Xylene	100%	F

Resistance up to 75C with minimum 80% retained properties	G
Resistance up to 25C with minimum 80% retained properties	C
Not resistant	G

TDS

EMS Dubell® F.1511-SF Chemical Anchor VESF

Physical properties

Density (at +20°C)	ASTM D1875	g/ml	1.7
HDT (at +20°C)	ASTM D648	°C	83
Tensile Strength (at +20°C)	ASTM D638	N/mm^2	12.1
Tensile Modulus	ASTM D638	GN/mm^2	4.2
Compressive strength	BS 6319	N/mm^2	85
Service temperature	-	-	-40°C - +80°C* *maximum long term temperature is 50°C

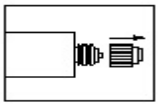
Consumption table

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

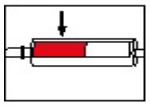
Threaded bar	M8	M10	M12	M16	M20	M24
Diameter of threaded bar (mm)	8	10	12	16	20	24
Diameter of hole in concrete (mm)	10	12	14	18	24	28
Anchoring depth (mm)	80	90	110	125	170	210
Consumption per hole (ml)	3	4	6	9	31	45
Number of holes with 300ml cartridge	87	63	44	29	8	6
Number of holes with 345ml cartridge	100	73	50	34	10	7
Number of holes with 410ml cartridge	119	86	60	40	11	8

Directions for use

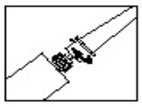
Cartridge preparation



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



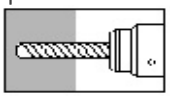
2) Place the cartridge into application gun.



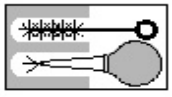
3) Place mixing nozzle to the cartridge (Screw down and tight)

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

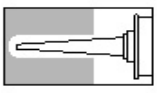
Application of the product



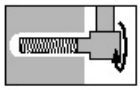
1) Choose the drill bit suitable for the diameter of the anchor showed in consumption table.



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.

EMS Dubell® F.1511-SF Chemical Anchor VESF

Packaging

Cartridge	Pieces in a box	Pieces on a wooden pallet
300ml	20	1500
345ml	12	1200
410ml	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 25°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.
Metsan cannot take any responsibility for product which has been contaminated or stored under conditions different than previously indicated.

Shelf life: 18 months at 22°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, Metsan does not assume responsibility for any results obtained by persons over whose methods Metsan has no control. It is the user's responsibility to determine the suitability of Metsan 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 Metsan products. Metsan specifically disclaims all warranties express or implied, including warranties of saleability and suitability for a particular purpose arising from sale or use of Metsan products. Metsan further disclaims any liability for consequential or incremental damages of any kind including lost profits.

Metsan Endüstriyel Yapıştırıcılar Ticaret Anonim Şirketi
Birlik Organize Sanayi Bölgesi Batı Caddesi 1. Sokak No:1 Tuzla İstanbul / Turkey
Telephone: +90 444 0 649
Telefax: +90 212 253 42 12
www.metsan.gen.tr