

EF500R+ EXTREME STRENGTH STRUCTURAL CHEMICAL ANCHOR

CERTIFICATION

TDS

MSDS

Technical Data Sheet

For additional design information please
download **Allfasteners AFOS®** design software.

allfasteners.com.au/afos



NCC
COMPLIANT
AS 5216



100
YEAR



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EF500R+

EF500R+ is the best-performing two-component pure epoxy based bonded anchoring system, which offers extremely high load-bearing capacity in both cracked and uncracked concrete.

It has excellent performance at 50°C long-term service temperature range, making it the ideal choice for hot climates found withing Australia.

Assessed and tested to meet the requirements for NCC and AS 5216 standards for bonded anchoring and post-installed connections.

Key Features

- Installations in dry, wet and flooded holes
- Fixings close to free edges
- Overhead applications
- Anchoring without expansion pressure
- Extremely high load capacity
- Excellent fire resistance
- Styrene Free
- Available in side-by-side cartridges (585ml 3:1)
- Extended working times
- Mixed colour: pink

Applications

- Fixing into cracked concrete, hard natural stone and solid rock
- Post-installed rebar connections
- Crash barriers
- Structural steel-to-concrete connections
- Anchoring of threaded bars in seismic regions

Approvals & Certifications

- ETA Option 1 for cracked and uncracked concrete
- ETA according to TR023 for post-installed rebar connections including diamond cored holes
- AS 5216 compliant: The ETA document meets anchor testing and reporting requirements of AS 5216:2018, essential for compliance with the NCC.
- Tested according to LEED 2009 EQ c4.1, SCAQMD rule 1168 (2005)
- Fire resistance F240 for reinforcing bars
- WRAS Approved for use in potable water
- French VOC A+ rating
- Approved for seismic action Categories C1 & C2 EN 1992-4



Application Times

Temp. (°C)*	5°	10°	15°	20°	25°	30°	35°	40°
Working (mins.)	300'	150'	40'	25'	18'	12'	8'	6'
Cure (hrs.)	24	18	12	8	6	4	2	2

*Base material & cartridge temperature. Cartridge must be conditioned to minimum 10°C.

Storage

Cartridges should be stored in their original packaging, the correct way up and in cool dry conditions (+10°C to +25°C) out of direct sunlight. When stored correctly, the shelf life will be for 24 months from the date of manufacture.

Safety

For health and safety information, please refer to the relevant Safety Data Sheet.

EF500R+ EXTREME STRENGTH

CHEMICAL ANCHOR

Physical Properties

Property		Value	Unit	Test Standard
Density		1.5	g/cm3	ASTM D 1875 @ +20°C
Compressive Strength	24 hrs	90	N/mm2	ASTM D 695 @ +20°C
	7 days	100		
Tensile Strength	24 hrs	25	N/mm2	ASTM D 638 @ +20°C
	7 days	27		
Elongation at Break	24 hrs	6.6	%	ASTM D 638 @ +20°C
	7 days	5.7		
Tensile Modulus	24 hrs	6.7	GN/m2	ASTM D 638 @ +20°C
	7 days	8.0		
Flexural Strength	24 hrs	45	N/mm2	ASTM D 790 @ +20°C
HDT	7 days	49	°C	ASTM D 648 @ +20°C
VOC		0	g/l	ASTM D 2369

Chemical Resistance

Chemical mortar has undergone extensive chemical resistance testing. The results are summarised in the table below.

Chemical Environment	Concentration	Result
Aqueous Solution Acetic Acid	10%	C
Acetone	100%	✗
Aqueous Solution Aluminium Chloride	Saturated	✓
Aqueous Solution Aluminium Nitrate	10%	✓
Ammonia Solution	5%	✓
Jet Fuel	100%	C
Benzene	100%	C
Benzoic Acid	Saturated	✓
Benzyl Alcohol	100%	✗
Sodium Hypochlorite Solution	5 - 15%	✓
Butyl Alcohol	100%	C
Calcium Sulphate Aqueous Solution	Saturated	✓
Carbon Monoxide	Gas	✓
Carbon Tetrachloride	100%	C
Chlorine Water	Saturated	✗
Chloro Benzene	100%	✗
Citric Acid Aqueous Solution	Saturated	✓
Cyclohexanol	100%	✓
Diesel Fuel	100%	C
Diethylene Glycol	100%	✓
Ethanol	95%	✗
Ethanol Aqueous Solution	20%	C
Heptane	100%	C
Hexane	100%	C

Chemical Environment	Concentration	Result
Hydrochloric Acid	10%	✓
	15%	✓
	25%	C
Hydrogen Sulphide Gas	100%	✓
Isopropyl Alcohol	100%	✗
Linseed Oil	100%	✓
Lubricating Oil	100%	✓
Mineral Oil	100%	✓
Paraffin / Kerosene (Domestic)	100%	C
Phenol Aqueous Solution	1%	C
Phosphoric Acid	50%	✓
Potassium Hydroxide	10% / pH13	✓
Sea Water	100%	C
Styrene	100%	C
Sulphur Dioxide Solution	10%	✓
Sulphur Dioxide (40°C)	5%	✓
Sulphuric Acid	10%	✓
	50%	✓
Turpentine	100%	C
White Spirit	100%	✓
Xylene	100%	C

✓ = Resistant to 75°C with at least 80% of physical properties retained.

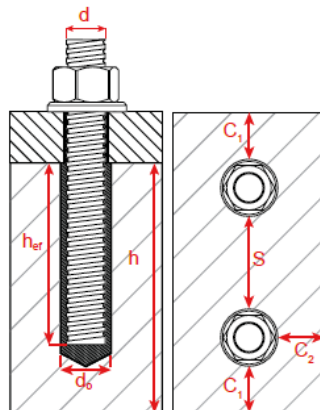
C = Contact only to a maximum of 25°C.

✗ = Not resistant.

INSTALLATION PARAMETERS

Installation Parameters - Threaded Rods

Property: Threaded Rod			Anchor Diameter						
			M8	M10	M12	M16	M20	M24	M30
Nominal Drill Hole Diameter	d_0	mm	10	12	14	18	22	26	35
Cleaning Brush Diameter	d_b	mm	11	14	14	22	24	31	38
Torque Moment	T_{inst}	Nm	10	20	40	80	120	160	200
Minimum Effective Embedment Depth	h_{ef}	mm	60	60	70	80	90	96	120
Minimum Edge Distance	c_{min}	mm	40	40	40	40	50	50	60
Minimum Anchor Spacing	s_{min}	mm	40	40	40	40	50	50	60
Minimum Member Thickness	h_{min}	mm	$h_{ef} + 30 \text{ mm} \geq 100 \text{ mm}$				$h_{ef} + 2d_0$		



Installation Parameters - Rebar

Property: Rebar			Anchor Diameter					
			10mm	12mm	16mm	20mm	25mm	32mm
Nominal Drill Hole Diameter	d_0	mm	14	16	20	25	32	40
Cleaning Brush Diameter	d_b	mm	14	18	22	27	35	43
Torque Moment	T_{inst}	Nm	20	40	80	120	180	200
Minimum Effective Embedment Depth	h_{ef}	mm	60	70	80	90	100	128
Minimum Edge Distance	c_{min}	mm	40	40	40	50	50	70
Minimum Anchor Spacing	s_{min}	mm	40	40	40	50	50	70
Minimum Member Thickness	h_{min}	mm	$h_{ef} + 30 \text{ mm} \geq 100 \text{ mm}$				$h_{ef} + 2d_0$	

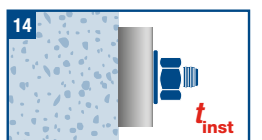
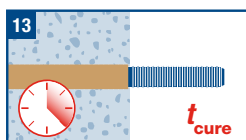
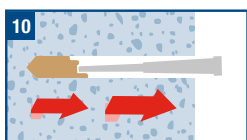
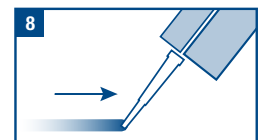
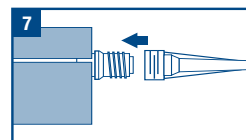
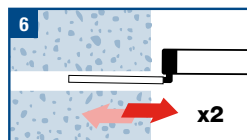
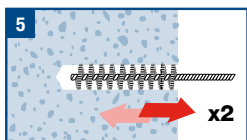
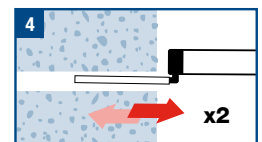
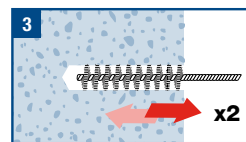
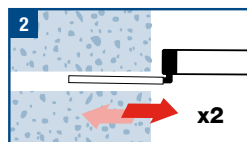
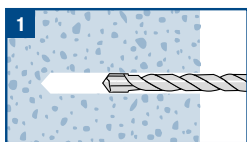
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INSTALLATION INSTRUCTIONS

Horizontal Installation Instructions

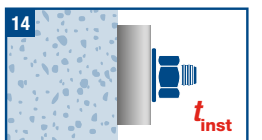
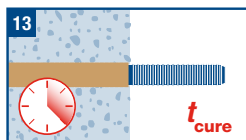
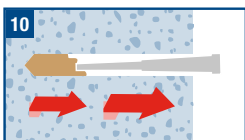
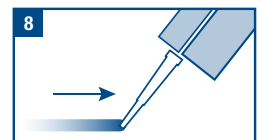
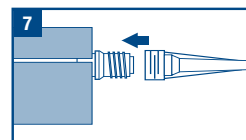
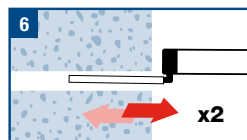
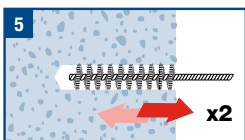
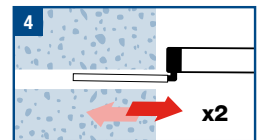
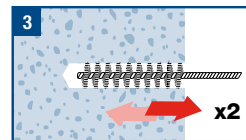
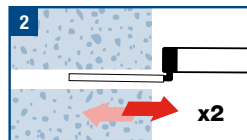
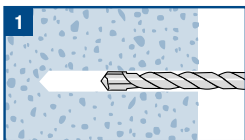
Before commencing installation ensure the operative is equipped with appropriate personal protection equipment, SDS Hammer Drill, Air, Hole Cleaning Brush, good quality Dispensing Tool – either manual or power operated, Chemical cartridge with mixing nozzle and extension tube, if needed.

- Using the** SDS Hammer Drill in rotary hammer mode for drilling, with a carbide tipped drill bit of the appropriate size, drill the hole to the specified hole diameter and depth.
- Insert the** Air pump to the bottom of the hole and blow for at least 2 seconds. The compressed air must be clean – free from water and oil – and at a minimum pressure of 6bar. **Perform the blowing operation twice.**
- Select the** correct size Hole Cleaning Brush. Ensure that the brush is in good condition and the correct diameter. Insert the brush to the bottom of the hole, using a brush extension if needed to reach the bottom of the hole and withdraw with a twisting motion. *There should be positive interaction between the steel bristles of the brush and the sides of the drilled hole. Perform the brushing operation twice.*
- Repeat 2**
- Repeat 3**
- Repeat 2**
- Select the** appropriate static mixer nozzle, checking that the mixing elements are present and correct (**do not modify the mixer**). Attach mixer nozzle to the cartridge. Check the Dispensing Tool is in good working order. Place the cartridge into the dispensing tool.
- Extrude some** resin to waste until an even-coloured mixture is extruded. The cartridge is now ready for use.
- Attach an** extension tube with resin stopper (if required) to the end of the mixing nozzle with a push fit (the extension tubes may be pushed into the resin stoppers and are held in place with a coarse internal thread).
- Insert the** mixing nozzle to the bottom of the hole. Extrude the resin and slowly withdraw the nozzle from the hole. **Ensure no air voids are created** as the nozzle is withdrawn. Inject resin until the hole is approximately $\frac{3}{4}$ full and remove the nozzle from the hole.
- Select the** steel anchor element ensuring it is free from oil or other contaminants, and mark with the required embedment depth. Insert the steel element into the hole using a back and forth twisting motion to ensure complete cover, until it reaches the bottom of the hole. Excess resin will be expelled from the hole evenly around the steel element and there shall be no gaps between the anchor element and the wall of the drilled hole.
- Clean any** excess resin from around the mouth of the hole.
- Do not** disturb the anchor until at least the minimum cure time has elapsed. Refer to the Application Times Table to determine the appropriate cure time.
- Position the** fixture and tighten the anchor to the appropriate installation torque. **Do not over-torque the anchor as this could adversely affect its performance.**



Overhead Installation Instructions

- Using the SDS Hammer Drill** in rotary hammer mode for drilling, with a carbide tipped drill bit of the appropriate size, drill the hole to the specified hole diameter and depth.
- Insert the** Air pump to the bottom of the hole and blow for at least 2 seconds. The compressed air must be clean – free from water and oil – and at a minimum pressure of 6bar. **Perform the blowing operation twice.**
- Select the** correct size Hole Cleaning Brush. Ensure that the brush is in good condition and the correct diameter. Insert the brush to the bottom of the hole, using a brush extension if needed to reach the bottom of the hole and withdraw with a twisting motion. *There should be positive interaction between the steel bristles of the brush and the sides of the drilled hole. Perform the brushing operation twice.*
- Repeat 2**
- Repeat 3**
- Repeat 2**
- Select the** appropriate static mixer nozzle, checking that the mixing elements are present and correct (**do not modify the mixer**). Attach mixer nozzle to the cartridge. Check the Dispensing Tool is in good working order. Place the cartridge into the dispensing tool.
- Extrude some** resin to waste until an even-coloured mixture is extruded. The cartridge is now ready for use.
- Attach an** extension tube with resin stopper (if required) to the end of the mixing nozzle with a push fit (the extension tubes may be pushed into the resin stoppers and are held in place with a coarse internal thread).
- Insert the** mixing nozzle to the bottom of the hole. Extrude the resin and slowly withdraw the nozzle from the hole. **Ensure no air voids are created** as the nozzle is withdrawn. Inject resin until the hole is approximately $\frac{3}{4}$ full and remove the nozzle from the hole.
- Select the** steel anchor element ensuring it is free from oil or other contaminants, and mark with the required embedment depth. Insert the steel element into the hole using a back and forth twisting motion to ensure complete cover, until it reaches the bottom of the hole. Excess resin will be expelled from the hole evenly around the steel element and there shall be no gaps between the anchor element and the wall of the drilled hole.
- Clean any** excess resin from around the mouth of the hole.
- Do not** disturb the anchor until at least the minimum cure time has elapsed. Refer to the Application Times Table to determine the appropriate cure time.
- Position the** fixture and tighten the anchor to the appropriate installation torque. **Do not over-torque the anchor as this could adversely affect its performance.**



EF500R+ EXTREME STRENGTH

CHEMICAL ANCHOR

CHARACTERISTIC RESISTANCE VALUES

Steel Failure in Tension - Threaded Rods

Characteristic resistance values under tension loading

Steel Grade			Anchor Diameter						
			M8	M10	M12	M16	M20	M24	M30
Steel Grade 4.6	$N_{Rk,s}$	(kN)	15	23	34	63	98	141	224
Partial Safety Factor	γ_{Ms}	(-)	2.00						
Steel Grade 5.8	$N_{Rk,s}$	(kN)	18	29	42	79	123	177	281
Partial Safety Factor	γ_{Ms}	(-)	1.50						
Steel Grade 8.8	$N_{Rk,s}$	(kN)	29	46	67	126	196	282	449
Partial Safety Factor	γ_{Ms}	(-)	1.50						
Steel Grade 10.9*	$N_{Rk,s}$	(kN)	37	58	84	157	245	353	561
Partial Safety Factor	γ_{Ms}	(-)	1.33						
Stainless Steel A2-70, A4-70	$N_{Rk,s}$	(kN)	26	41	59	110	172	247	393
Partial Safety Factor	γ_{Ms}	(-)	1.87						
Stainless Steel A4-80	$N_{Rk,s}$	(kN)	29	46	67	126	196	282	449
Partial Safety Factor	γ_{Ms}	(-)	1.60						

* Galvanised rod of high strength are sensitive to hydrogen embrittlement

Steel Failure in Tension - Reinforcing Bars

Characteristic resistance values under tension loading

Steel Grade			Anchor Diameter					
			10mm	12mm	16mm	20mm	25mm	32mm
Rebar Grade 500	$N_{Rk,s}$	(kN)	39.3	56.5	100.5	157	245	402
Partial Safety Factor	γ_{Ms}	(-)	1.40					

**EF500R+ EXTREME STRENGTH**
CHEMICAL ANCHOR**Characteristic Resistance - Combined Pullout & Concrete Cone Failure Using Threaded Rods**

Dry / Wet Concrete | Temperature Range: -40°C to +70°C

Property				Anchor Diameter						
				M8	M10	M12	M16	M20	M24	M30
Characteristic Bond Strength in Uncracked Concrete		τ_{Rk}	N/mm2	14.0	13.0	13.0	12.0	12.0	11.0	9.0
Factor for Uncracked Concrete Strength	C25/30	Ψ_c	-	1.02						
	C30/37			1.04						
	C35/45			1.06						
	C40/50			1.07						
	C45/55			1.08						
	C50/60			1.09						
Partial Safety Factor		γ_{Mp}	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Characteristic Bond Strength in Cracked Concrete		τ_{Rk}	N/mm2	8.0	8.0	7.5	7.5	7.0	7.0	5.0
Factor for Cracked Concrete Strength	C25/30	Ψ_c	-	1.02						
	C30/37			1.04						
	C35/45			1.06						
	C40/50			1.07						
	C45/55			1.08						
	C50/60			1.09						
Partial Safety Factor		γ_{Mp}	-	1.5	1.5	1.5	1.5	1.5	1.5	1.5

EF500R+ EXTREME STRENGTH

CHEMICAL ANCHOR

RESISTANCE VALUES FOR THREADED RODS

Resistance Values for Threaded Rods in Uncracked Concrete

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter						
			M8	M10	M12	M16	M20	M24	M30
Effective Embedment Depth = MIN	h_{ef}	mm	60	60	70	80	90	96	120
Characteristic Resistance	N_{Rk}	kN	21.11	23.47	29.58	36.13	43.12	47.50	66.38
Design Resistance	N_{Rd}	kN	14.07	15.65	19.72	24.09	28.75	31.67	44.26
Controlling Resistance			Pullout	Concrete Cone					
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	192	240
Characteristic Resistance	N_{Rk}	kN	22.52	32.67	47.05	73.13	102.20	134.35	187.76
Design Resistance	N_{Rd}	kN	15.01	21.78	31.37	48.75	68.14	89.57	125.17
Controlling Resistance			Pullout			Concrete Cone			
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	240	300
Characteristic Resistance	N_{Rk}	kN	28.15	36.76	53.91	73.13	111.93	187.76	254.47
Design Resistance	N_{Rd}	kN	18.77	24.50	35.94	48.75	74.62	125.17	169.65
Controlling Resistance			Pullout			Concrete Cone			Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288	360
Characteristic Resistance	N_{Rk}	kN	33.78	49.01	70.57	115.81	180.96	238.86	305.36
Design Resistance	N_{Rd}	kN	22.52	32.67	47.05	77.21	120.64	159.24	203.58
Controlling Resistance			Pullout						
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	480	600
Characteristic Resistance	N_{Rk}	kN	56.30	81.68	117.62	193.02	301.59	398.10	508.94
Design Resistance	N_{Rd}	kN	37.53	54.45	78.41	128.68	201.06	265.40	339.29
Controlling Resistance			Pullout						

- Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to AS 5216. Resistance for steel failure must also be considered - the lowest value controls.
- Resistance values are for single anchors without close edges or eccentric loading considerations.
- Tabulated values correspond to the above stated temperature range and installation conditions only.
- The compressive strength of the concrete (f'_c) is assumed to be 20 N/mm².
- Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

For additional design information please download Allfasteners AFOS® design software.

Resistance Values for Threaded Rods in Cracked Concrete

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter						
			M8	M10	M12	M16	M20	M24	M30
Effective Embedment Depth = MIN	h_{ef}	mm	60	60	70	80	90	96	120
Characteristic Resistance	N_{Rk}	kN	12.06	15.08	19.79	25.76	30.74	33.86	47.32
Design Resistance	N_{Rd}	kN	8.04	10.05	13.19	17.17	20.49	22.57	31.55
Controlling Resistance			Pullout			Concrete Cone			
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	192	240
Characteristic Resistance	N_{Rk}	kN	12.87	20.11	27.14	48.25	70.37	95.78	113.10
Design Resistance	N_{Rd}	kN	8.58	13.40	18.10	32.17	46.91	63.85	75.40
Controlling Resistance			Pullout					Concrete Cone	Pullout
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	240	300
Characteristic Resistance	N_{Rk}	kN	16.08	22.62	31.10	48.25	74.77	126.67	141.37
Design Resistance	N_{Rd}	kN	10.72	15.08	20.73	32.17	49.85	84.45	94.25
Controlling Resistance			Pullout						
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288	360
Characteristic Resistance	N_{Rk}	kN	19.30	30.16	40.72	72.38	105.56	152.00	169.65
Design Resistance	N_{Rd}	kN	12.87	20.11	27.14	48.25	70.37	101.34	113.10
Controlling Resistance			Pullout						
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	480	600
Characteristic Resistance	N_{Rk}	kN	32.17	50.27	67.86	120.64	175.93	253.34	282.74
Design Resistance	N_{Rd}	kN	21.45	33.51	45.24	80.42	117.29	168.89	188.50
Controlling Resistance			Pullout						

- Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to AS 5216.
Resistance for steel failure must also be considered - the lowest value controls.
- Resistance values are for single anchors without close edges or eccentric loading considerations.
- Tabulated values correspond to the above stated temperature range and installation conditions only.
- The compressive strength of the concrete (f'_c) is assumed to be 20 N/mm².
- Splitting in cracked concrete is limited by reinforcing to a maximum crack width of 0.3mm.

For additional design information please download Allfasteners AFOS® design software.

EF500R+ EXTREME STRENGTH

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Seismic Loading Category C1

Seismic Loading Category C1		Anchor Diameter						
		M8	M10	M12	M16	M20	M24	M30
Characteristic Bond Strength in Cracked Concrete under Seismic action (Performance Category C1)	τ_{Rk} (N/mm ²)	8.0	8.0	7.5	7.5	7.0	7.0	4.5
Partial Safety Factor	γ_{Mp}	1.5	1.5	1.5	1.5	1.5	1.5	1.5

Resistance Values to tension loads for Threaded Rods in Cracked Concrete Seismic loading category C1

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter						
			M8	M10	M12	M16	M20	M24	M30
Effective Embedment Depth = MIN	h_{ef}	mm	60	60	70	80	90	96	120
Characteristic Resistance	N_{Rk}	kN	12.06	15.08	19.79	25.76	30.74	33.86	47.32
Design Resistance	N_{Rd}	kN	8.04	10.05	13.19	17.17	20.49	22.57	31.55
Controlling Resistance			Pullout			Concrete Cone			
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	192	240
Characteristic Resistance	N_{Rk}	kN	12.87	20.11	27.14	48.25	70.37	95.78	101.79
Design Resistance	N_{Rd}	kN	8.58	13.40	18.10	32.17	46.91	63.85	67.86
Controlling Resistance			Pullout				Concrete Cone		Pullout
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	240	300
Characteristic Resistance	N_{Rk}	kN	16.08	22.62	31.10	48.25	74.77	126.67	127.23
Design Resistance	N_{Rd}	kN	10.72	15.08	20.73	32.17	49.85	84.45	84.82
Controlling Resistance			Pullout						
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288	360
Characteristic Resistance	N_{Rk}	kN	19.30	30.16	40.72	72.38	105.56	152.00	152.68
Design Resistance	N_{Rd}	kN	12.87	20.11	27.14	48.25	70.37	101.34	101.79
Controlling Resistance			Pullout						
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	480	600
Characteristic Resistance	N_{Rk}	kN	32.17	50.27	67.86	120.64	175.93	152.00	254.47
Design Resistance	N_{Rd}	kN	21.45	33.51	45.24	80.42	117.29	101.34	169.65
Controlling Resistance			Pullout						

- Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to TR045. Resistance for steel failure must also be considered - the lowest value controls.
- Resistance values are for single anchors without close edges or eccentric loading considerations.
- Tabulated values correspond to the above stated temperature range and installation conditions only.
- The compressive strength of the concrete ($f'c$) is assumed to be 20 N/mm².
- Splitting in cracked concrete is limited by reinforcing.

For additional design information please download Allfasteners AFOS® design software.

Seismic Loading Category C2

Seismic Loading Category C2			Anchor Diameter		
			M12	M16	M20
Characteristic Bond Strength in Cracked Concrete under Seismic action (Performance Category C2)	τ_{Rk}	N/mm ²	3.2	3.7	4.2
Partial Safety Factor	γ_{Mp}	-	1.5	1.5	1.5

Resistance Values to tension loads for Threaded Rods in Cracked Concrete Seismic loading category C2

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter		
			M12	M16	M20
Effective Embedment Depth = MIN	h_{ef}	mm	70	80	90
Characteristic Resistance	N_{Rk}	kN	8.44	14.88	23.75
Design Resistance	N_{Rd}	kN	5.63	9.92	15.83
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 8d	h_{ef}	mm	96	128	160
Characteristic Resistance	N_{Rk}	kN	11.58	23.81	42.22
Design Resistance	N_{Rd}	kN	7.72	15.87	28.15
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = STD	h_{ef}	mm	110	128	170
Characteristic Resistance	N_{Rk}	kN	13.27	23.81	44.86
Design Resistance	N_{Rd}	kN	8.85	15.87	29.91
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	144	192	240
Characteristic Resistance	N_{Rk}	kN	17.37	35.71	63.33
Design Resistance	N_{Rd}	kN	11.58	23.81	42.22
Controlling Resistance			Pullout	Pullout	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	240	320	400
Characteristic Resistance	N_{Rk}	kN	28.95	59.51	105.56
Design Resistance	N_{Rd}	kN	19.30	39.68	70.37
Controlling Resistance			Pullout	Pullout	Pullout

- Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to TR045. Resistance for steel failure must also be considered - the lowest value controls.
- Resistance values are for single anchors without close edges or eccentric loading considerations.
- Tabulated values correspond to the above stated temperature range and installation conditions only.
- The compressive strength of the concrete (f'_c) is assumed to be 20 N/mm².
- Splitting in cracked concrete is limited by reinforcing.

For additional design information please download Allfasteners AFOS® design software.

EF500R+ EXTREME STRENGTH

CHEMICAL ANCHOR

RESISTANCE VALUES FOR REBAR

Characteristic Resistance - Combined Pullout & Concrete Cone Failure Using Reinforcing Bars

Dry / Wet Concrete | Temperature Range: -40°C to +70°C

Property				Anchor Diameter					
				10mm	12mm	16mm	20mm	25mm	32mm
Characteristic Bond Strength in Uncracked Concrete		τ_{Rk}	N/mm ²	12.0	12.0	11.0	11.0	11.0	7.0
Factor for Uncracked Concrete Strength	C25/30	Ψ_c	-	1.02					
	C30/37			1.04					
	C35/45			1.06					
	C40/50			1.07					
	C45/55			1.08					
	C50/60			1.09					
Partial Safety Factor (Dry & wet)		γ_{Mp}	-	1.5	1.5	1.5	1.5	1.5	1.5
Partial Safety Factor (Flooded)		γ_{Mp}	-	1.8	1.8	1.8	1.8	1.8	1.8
Characteristic Bond Strength in Cracked Concrete		τ_{Rk}	N/mm ²	10.0	9.0	9.0	8.0	8.0	5.0
Factor for Cracked Concrete Strength	C25/30	Ψ_c	-	1.02					
	C30/37			1.04					
	C35/45			1.06					
	C40/50			1.07					
	C45/55			1.08					
	C50/60			1.09					
Partial Safety Factor (Dry & wet)		γ_{Mp}	-	1.5	1.5	1.5	1.5	1.5	1.5
Partial Safety Factor (Flooded)		γ_{Mp}	-	1.8	1.8	1.8	1.8	1.8	1.8

**EF500R+ EXTREME STRENGTH**
CHEMICAL ANCHOR**Resistance Values for Reinforcing Bars in Uncracked Concrete**

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter					
			10mm	12mm	16mm	20mm	25mm	32mm
Effective Embedment Depth = MIN	h_{ef}	mm	60	70	80	90	100	128
Characteristic Resistance	N_{Rk}	kN	22.62	29.58	36.13	43.12	50.50	73.13
Design Resistance	N_{Rd}	kN	15.08	19.72	24.09	28.75	33.67	48.75
Controlling Resistance			Pullout			Concrete Cone		
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	200	256
Characteristic Resistance	N_{Rk}	kN	30.16	43.43	70.77	99.56	139.14	180.12
Design Resistance	N_{Rd}	kN	20.11	28.95	47.18	66.37	92.76	120.08
Controlling Resistance			Pullout			Concrete Cone		Pullout
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	250	300
Characteristic Resistance	N_{Rk}	kN	33.93	49.76	70.77	109.04	194.45	211.08
Design Resistance	N_{Rd}	kN	22.62	33.18	47.18	72.69	129.64	140.72
Controlling Resistance			Pullout			Concrete Cone		Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	300	384
Characteristic Resistance	N_{Rk}	kN	45.24	65.14	106.16	165.88	259.18	270.22
Design Resistance	N_{Rd}	kN	30.16	43.43	70.77	110.58	172.79	180.15
Controlling Resistance			Pullout					
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	500	640
Characteristic Resistance	N_{Rk}	kN	75.40	108.57	176.93	276.46	431.96	450.38
Design Resistance	N_{Rd}	kN	50.27	72.38	117.96	184.31	287.98	300.25
Controlling Resistance			Pullout					

- Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to AS 5216. Resistance for steel failure must also be considered - the lowest value controls.
- Resistance values are for single anchors without close edges or eccentric loading considerations.
- Tabulated values correspond to the above stated temperature range and installation conditions only.
- The compressive strength of the concrete (f'_c) is assumed to be 20 N/mm².
- Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure

For additional design information please download Allfasteners AFOS® design software.

EF500R+ EXTREME STRENGTH

CHEMICAL ANCHOR

Resistance Values for Reinforcing Bars in Cracked Concrete

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter					
			10mm	12mm	16mm	20mm	25mm	32mm
Effective Embedment Depth = MIN	h_{ef}	mm	60	70	80	90	100	128
Characteristic Resistance	N_{Rk}	kN	16.73	21.08	25.76	30.74	34.45	52.13
Design Resistance	N_{Rd}	kN	11.15	14.06	17.17	20.49	22.96	34.76
Controlling Resistance			Concrete Cone					
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	200	256
Characteristic Resistance	N_{Rk}	kN	25.13	32.57	49.87	66.69	97.40	128.66
Design Resistance	N_{Rd}	kN	16.76	21.71	33.25	46.46	64.93	85.77
Controlling Resistance			Pullout		Concrete Cone			Pullout
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	250	300
Characteristic Resistance	N_{Rk}	kN	28.27	37.32	49.87	76.33	136.18	150.77
Design Resistance	N_{Rd}	kN	18.85	24.88	33.25	50.89	90.75	100.52
Controlling Resistance			Pullout		Concrete Cone			Pullout
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	300	384
Characteristic Resistance	N_{Rk}	kN	37.70	48.86	86.86	120.64	178.93	193.02
Design Resistance	N_{Rd}	kN	25.13	32.57	57.91	80.42	119.29	128.68
Controlling Resistance			Pullout				Concrete Cone	Pullout
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	500	640
Characteristic Resistance	N_{Rk}	kN	62.83	81.43	144.76	201.06	314.16	321.70
Design Resistance	N_{Rd}	kN	41.89	54.29	96.51	134.04	209.44	214.47
Controlling Resistance			Pullout					

- Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to AS 5216. Resistance for steel failure must also be considered - the lowest value controls.
- Resistance values are for single anchors without close edges or eccentric loading considerations.
- Tabulated values correspond to the above stated temperature range and installation conditions only.
- The compressive strength of the concrete ($f'c$) is assumed to be 20 N/mm².
- Splitting in cracked concrete is limited by reinforcing to a maximum crack width of 0.3mm

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Seismic Loading Category C1

Seismic Loading Category C1		Anchor Diameter					
		10mm	12mm	16mm	20mm	25mm	32mm
Characteristic Bond Strength in Cracked Concrete under Seismic action (Performance Category C1)	τ_{Rk} (N/mm ²)	8.9	9.0	9.0	8.0	7.5	4.8
Partial Safety Factor (Dry & Wet)	γ_{Mp}	1.5	1.5	1.5	1.5	1.5	1.5

Resistance Values to tension loads for Reinforcing Bars in Cracked Concrete Seismic Loading Category C1

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure | Temperature Range: -40°C to +70°C

Property			Anchor Diameter					
			10mm	12mm	16mm	20mm	25mm	32mm
Effective Embedment Depth = MIN	h_{ef}	mm	60	70	80	90	100	128
Characteristic Resistance	N_{Rk}	kN	16.73	21.08	25.76	30.74	36.00	52.13
Design Resistance	N_{Rd}	kN	11.15	14.06	17.17	20.49	24.00	34.76
Controlling Resistance			Concrete Cone					
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	200	256
Characteristic Resistance	N_{Rk}	kN	22.37	32.57	52.13	72.86	101.82	123.53
Design Resistance	N_{Rd}	kN	14.91	21.71	34.76	48.57	67.88	82.35
Controlling Resistance			Pullout		Concrete Cone			
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	250	300
Characteristic Resistance	N_{Rk}	kN	25.16	37.32	52.13	79.80	142.30	144.76
Design Resistance	N_{Rd}	kN	16.78	24.88	34.76	53.20	94.87	96.51
Controlling Resistance			Pullout		Concrete Cone			
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	300	384
Characteristic Resistance	N_{Rk}	kN	33.55	48.86	86.86	120.64	176.71	185.30
Design Resistance	N_{Rd}	kN	22.37	32.57	57.91	80.42	117.81	123.53
Controlling Resistance			Pullout					
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	500	640
Characteristic Resistance	N_{Rk}	kN	55.92	81.43	144.76	201.06	294.52	308.83
Design Resistance	N_{Rd}	kN	37.28	54.29	96.51	134.04	196.35	205.89
Controlling Resistance			Pullout					

- Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EOTA TR045. Resistance for steel failure must also be considered - the lowest value controls.
- Resistance values are for single anchors without close edges or eccentric loading considerations.
- Tabulated values correspond to the above stated temperature range and installation conditions only.
- The compressive strength of the concrete (f'_c) is assumed to be 20 N/mm².
- Splitting in cracked concrete is limited by reinforcing

For additional design information please download Allfasteners AFOS® design software.

EF500R+ EXTREME STRENGTH

CHEMICAL ANCHOR

POST-INSTALLED REBAR CONNECTIONS

Installation Parameters

Rebar		Drill Hole Diameter (mm)	Cleaning Brush (mm)	Max. Embedment Depth (mm)
Diameter (mm)	f_{yk} (N/mm ²)			
8	500	12	12	400
10	500	14	14	500
12	500	16	18	600
14	500	18	22	700
16	500	20	20	800
20	500	25	27	1000
25	500	32	35	1000
28	500	35	38	1000
32	500	40	43	1000

Design Bond Strength Values - Hammer Drilled or Compressed Air Drilled Holes

Design values of the ultimate bond resistance f_{bd} in N/mm² for rotary hammer drilling and compressed air drilling for good bond conditions.

Rebar Ø (mm)	Concrete Class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
10	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
12	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
14	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
16	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
20	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
25	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
28	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
32	1.6	2.0	2.3	2.7	3.0	3.4	3.7	3.7	3.7

Tabulated values are valid for good bond conditions according to EN 1992-1-1. For all other bond conditions multiply the values of f_{bd} by 0.7.

Design Bond Strength Values - Diamond Core Drilled Holes

Design values of the ultimate bond resistance f_{bd} in N/mm² for diamond core drilling for good bond conditions

Rebar Ø (mm)	Concrete Class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
10	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
12	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
14	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
16	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
20	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
25	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.3
28	1.6	2.0	2.3	2.7	3.0	3.4	3.7	4.0	4.0
32	1.6	2.0	2.3	2.7	3.0	3.4	3.4	3.4	3.4

Tabulated values are valid for good bond conditions according to EN 1992-1-1. For all other bond conditions multiply the values of f_{bd} by 0.7.

**EF500R+ EXTREME STRENGTH**
CHEMICAL ANCHOR**IMPORTANT NOTES****Use in Porous Substrates**

This bonded anchor is not intended for use as a cosmetic or decorative product. When anchoring into porous or reconstituted stone it is recommended that technical assistance is sought. Due to the nature of the product, migration of the monomer in the resin may cause staining in certain materials. If you are still uncertain, it is advisable to test the resin by applying it in a small, discrete area and testing before using the resin on the project.

Important Note

Whilst all reasonable care is taken in compiling technical data on the Company's products, all information, recommendations or suggestions regarding the use of such products are made without guarantee, since the conditions of use are beyond the control of the Company. It is the customer's responsibility to satisfy himself that each product is fit for the purpose for which he intends to use it, that the actual conditions of use are suitable and that, in the light of our continual research and development programme the information relating to each product has not been superseded.

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