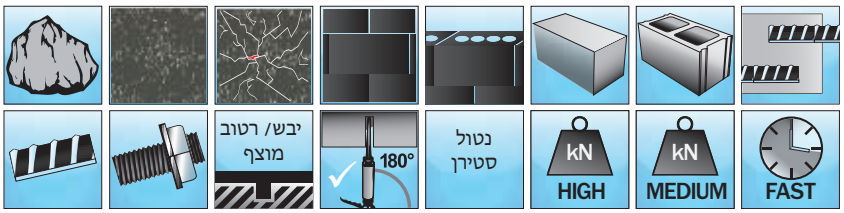
עוגן כימי V200

אפוקסי אקרילט בחוזק מיוחד ובעל תקן סיסמי

דף מידע

European Technical Assessment
ETAG 001 Parts 1 & 5 Option 1
Anchoring in concrete
ETA-14/0104

European Technical Approval
According to TR023
Post-installed rebar connections
ETA-13/0586



תיאור

מערכת דבק 100% פולימר אפוקסי אקרילט בעל אחוז נמוך של נדיפים אשר מעניק יכולת הדבקות מצויינת לבטון סדוק / לא סדוק,
המוזרק לתוך חור קידוח ומשמש כדי להחזיק בכוח רב מוט מתכת בעל הברגה למטרות שונות
..היום משמשים העוגנים באופן נרחב בבניית תעלות, הנדסה אזרחית וענף הבנייה. חיבור בטון חדש לישן
מתאים לתקני עמידות סמיים (רעידות אדמה

אחסנה

.יש לאחסן את המוצר בין הטמפרטורות -15- +25 במקום יבש ומוצל עד ל12 חודשים מזמן היצור

Health & Safety

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

Base Materials

- Cracked concrete
- Uncracked concrete
- Solid & hollow masonry
- Hard natural stone
- Solid rock
- Voided stone or rock

Approvals & Tests

- ETA according ETAG 001 Part 5 Option 1 for anchoring of threaded bars into cracked and uncracked concrete
- ETA according to TR023 for post-installed rebar connections
- Tested according to LEED 2009 EQ c4.1, SCAQMD rule 1168 (2005)

Features

- Anchors may be placed close to free edges
- Suitable for dry, wet & flooded holes
- Reduced drilling diameters i.e. M20 only requires a 22mm hole and M24 requires only a 26mm hole making it an economical injection system
- Variable embedment depths
- Available in co-axial cartridges (380; 400; 410ml), side by side cartridges (345; 825ml), and single piston foil pack cartridges (150; 160; 170; 300; 550; 850ml)
- Ratio of 10:1

Accessories

- Dispenser guns
- Mixing nozzles
- Cleaning blow pump
- Cleaning brushes
- High flow mixing nozzles
- Extension tubes
- Resin stoppers
- Plastic sleeves

Uses/Applications

- Structural applications in cracked and non cracked concrete
- Reinforcing & starter bars
- Suspended ventilation systems
- Safety barriers
- Machinery & heavy machinery
- Racking
- Rolling cranes

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Contents

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Note: Presented data relates to standard grade EASF-V Epoxy Acrylate Styrene Free. T Work is typical gel time at highest base material temperature in the range. T Load is set at the lowest base material temperature in the range.

Epoxy Acrylate Styrene Free עוגן כימי V200 Working & Loading Times

Resin cartridge Temperature	T Work	Base Material Temperature	T Load
+15°C to +20°C	15 minutes	+15°C to +20°C	5 hours
+20°C to +25°C	10 minutes	+20°C to +25°C	145 minutes
+25°C to +30°C	7.5 minutes	+25°C to +30°C	85 minutes
+30°C to +35°C	5 minutes	+30°C to +35°C	50 minutes
+35°C to +40°C	3.5 minutes	+35°C to +40°C	40 minutes

Note: Presented data relates to standard grade עוגן כימי V200 Epoxy Acrylate Styrene Free. T Work is typical gel time at highest base material temperature in the range. T Load is set at the lowest base material temperature in the range.

** Data not included in the ETA*

עוגן כימי V200 Styrene Free

Product Data Sheet

Physical Properties

Property		Unit	Value	Test Standard
Compressive Strength	24 hours	psi (N/mm²)	72.3	ASTM D 695 @ +20°C
	7 days	psi (N/mm²)	77.8	
Compressive Modulus Strength	24 hours	psi (GN/m²)	5	
	7 days	psi (GN/m²)	7	
Tensile Strength	24 hours	psi (N/mm²)	13.5	ASTM D 638 @ +20°C
	7 days	psi (N/mm²)	15.2	
Tensile Strength Elongation at Break	24 hours	%	6	
	7 days		6.7	
Tensile Modulus	24 hours	psi (GN/m²)	3.75	
	7 days	psi (GN/m²)	3.8	
Flexural Strength	24 hours	psi (N/mm²)	29.3	ASTM D 790 @ +20°C
	7 days	psi (N/mm²)	38.7	

Chemical Resistance

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

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

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

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

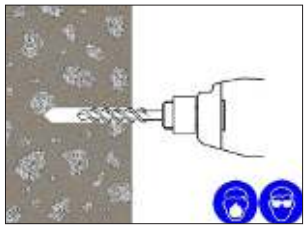
× = Not Resistant

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

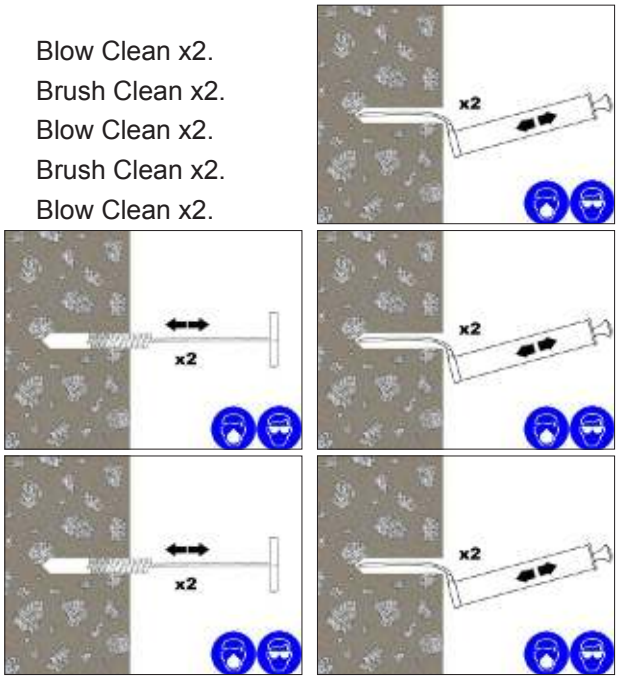
Solid Substrate Installation Method

1. Drill the hole to the correct diameter and depth. This can be done with either a rotary percussion or rotary hammer drilling machine depending upon the substrate.



2. Thoroughly clean the hole in the following sequence using the 2K DF Brush with the required extensions and a source of clean compressed air. For holes of 400mm or less deep, a 2K Blow Pump may be used:

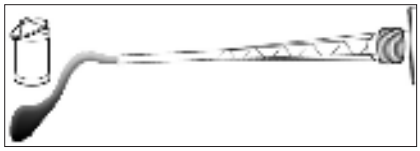
   Blow Clean x2.
   Brush Clean x2.
   Blow Clean x2.
   Brush Clean x2.
   Blow Clean x2.



If the hole collects water, the current best practice is to remove standing water before cleaning the hole and injecting the resin. Ideally, the resin should be injected into a properly cleaned, dry hole. However, this product may also be used in a flooded hole.

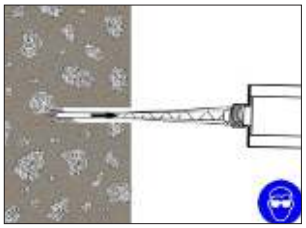
3. Select the appropriate static mixer nozzle for the installation, open the cartridge/foil pack and screw nozzle onto the mouth of the cartridge. Insert the cartridge into a good quality applicator.

4. Extrude the first part of the cartridge to waste until an even colour has been achieved without streaking in the resin.



5. If necessary, cut the extension tube to the depth of the hole and push onto the end of the mixer nozzle, and (for rebars 16mm dia. or more) fit the correct resin stopper to the other end. Attach extension tubing and resin stopper.

6. Insert the mixer nozzle (resin stopper / extension tube if applicable) to the bottom of the hole. Begin to extrude the resin and slowly withdraw the mixer nozzle from the hole ensuring that there are no air voids as the mixer nozzle is withdrawn. Fill the hole to approximately ½ to ¾ full and withdraw the nozzle completely.



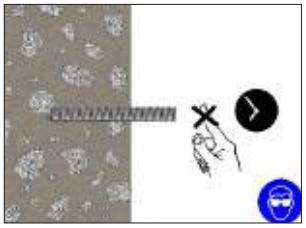
7. Insert the clean threaded bar, free from oil or other release agents, to the bottom of the hole using a back and forth twisting motion ensuring all the threads are thoroughly coated. Adjust to the correct position within the stated working time (see table on page 4).

8. Any excess resin will be expelled from the hole evenly around the steel element showing that the hole is full.

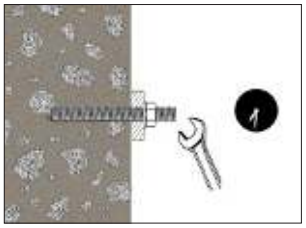
   This excess resin should be removed from around the mouth of the hole before it sets.

9. Leave the anchor to cure.

   Do not disturb the anchor until the appropriate loading time, on page 4, has elapsed depending on the substrate conditions and ambient temperature.



10. Attach the fixture and tighten the nut to the recommended torque, Do not overtighten.

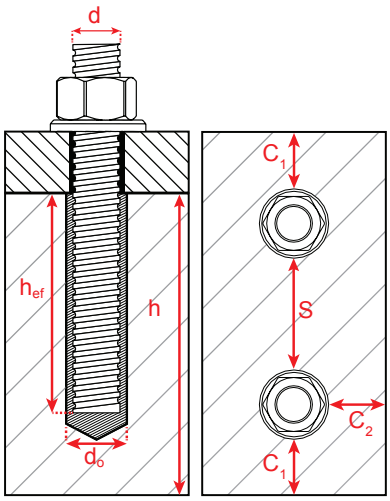


עוגן כימי V200 Styrene Free

Product Data Sheet

Installation Parameters of Threaded Bars

Size			M8	M10	M12	M16	M20	M24	M27	M30
Nominal drill hole diameter	$Ød_0$	[mm]	10	12	14	18	22	26	30	35
Diameter of cleaning brush d_b	d_b	[mm]	14	14	20	20	29	29	40	40
Torque moment T_{inst}	T_{inst}	[Nm]	10	20	40	80	150	200	240	275
$h_{ef,min}$ = 8d										
Depth of drill hole h_0	h_0	[mm]	64	80	96	128	160	192	216	240
Minimum edge distance c_{min}	c_{min}	[mm]	35	40	50	65	80	96	110	120
Minimum spacing s_{min}	s_{min}	[mm]	35	40	50	65	80	96	110	120
Minimum thickness of member h_{min}	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$			
$h_{ef,max}$ = 20d										
Depth of drill hole h_0	h_0	[mm]	160	200	240	320	400	480	540	600
Minimum edge distance c_{min}	c_{min}	[mm]	80	100	120	160	200	240	270	300
Minimum spacing s_{min}	s_{min}	[mm]	80	100	120	160	200	240	270	300
Minimum thickness of member h_{min}	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$			



Installation Parameters of Reinforcing Bars Used as Anchors

Size			Ø8	Ø10	Ø12	Ø16	Ø20	Ø25	Ø32
Nominal drill hole diameter	$Ød_0$	[mm]	12	14	16	20	25	32	40
Diameter of cleaning brush d_b	d_b	[mm]	14	14	19	22	29	40	42
$h_{ef,min}$ = 8d									
Depth of drill hole h_0	h_0	[mm]	64	80	96	128	160	200	256
Minimum edge distance c_{min}	c_{min}	[mm]	35	40	50	65	80	100	130
Minimum spacing s_{min}	s_{min}	[mm]	35	40	50	65	80	100	130
Minimum thickness of member h_{min}	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$		
$h_{ef,max}$ = 20d									
Depth of drill hole h_0	h_0	[mm]	160	200	240	320	400	500	640
Minimum edge distance c_{min}	c_{min}	[mm]	80	100	120	160	200	250	320
Minimum spacing s_{min}	s_{min}	[mm]	80	100	120	160	200	250	320
Minimum thickness of member h_{min}	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$		

Theoretical Number of Fixings Per Cartridge

Applies to installations in solid substrates only

Cartridge Volume	h_{ef}	M8	M10	M12	M16	M20	M24
		Drilling Ø 10mm	Drilling Ø 12mm	Drilling Ø 14mm	Drilling Ø 18mm	Drilling Ø 22mm	Drilling Ø 26mm
410 ml	8d	148	91	60	32	19	12
	10d	118	72	48	26	15	9
	STD	118	81	52	32	17	11
	12d	98	60	40	21	12	8
300 ml	8d	106	65	43	23	13	8
	10d	85	52	34	18	11	7
	STD	85	58	38	23	12	8
	12d	71	43	29	15	9	5

Note: Jobsite/contractor installations usually result in more resin being injected than the theoretical requirement resulting in lower number of fixings per cartridge. The reduction to the number of fixings per cartridge in practice is greater for smaller diameter holes and shallower embedment depths.

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Steel Failure Information - Threaded Bars

Characteristic resistance values to tension load

Steel Failure - Characteristic resistance										
Size			M8	M10	M12	M16	M20	M24	M27	M30
Steel grade 4.6	$N_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
Partial safet y factor	γ_{Ms}	[-]	2							
Steel grade 5.8	$N_{Rk,s}$	[kN]	18	29	42	79	123	177	230	281
Partial safety factor	γ_{Ms}	[-]	1.5							
Steel grade 8.8	$N_{Rk,s}$	[kN]	29	46	67	126	196	282	367	449
Partial safety factor	γ_{Ms}	[-]	1.5							
Steel grade 10.9	$N_{Rk,s}$	[kN]	37	58	84	157	245	353	459	561
Partial safety factor	γ_{Ms}	[-]	1.4							
Stainless steel grade A4-70	$N_{Rk,s}$	[kN]	26	41	59	110	172	247	321	393
Partial safety factor	γ_{Ms}	[-]	1.9							
Stainless steel grade A4-80	$N_{Rk,s}$	[kN]	29	46	67	126	196	282	367	449
Partial safety factor	γ_{Ms}	[-]	1.6							
Stainless steel grade 1.4529	$N_{Rk,s}$	[kN]	26	41	59	110	172	247	321	393
Partial safety factor	γ_{Ms}	[-]	1.5							

Characteristic resistance values to shear load

Steel Failure - without lever arm										
Size			M8	M10	M12	M16	M20	M24	M27	M30
Steel grade 4.8	$V_{Rk,s}$	[kN]	7	12	17	31	49	71	92	112
Partial safety factor	γ_{Ms}	[-]	1.67							
Steel grade 5.8	$V_{Rk,s}$	[kN]	9	15	21	39	61	88	115	140
Partial safety factor	γ_{Ms}	[-]	1.25							
Steel grade 8.8	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
Partial safety factor	γ_{Ms}	[-]	1.25							
Steel grade 10.9	$V_{Rk,s}$	[kN]	18	29	42	79	123	177	230	281
Partial safety factor	γ_{Ms}	[-]	1.5							
Stainless steel grade A4-70	$V_{Rk,s}$	[kN]	13	20	30	55	86	124	161	196
Partial safety factor	γ_{Ms}	[-]	1.56							
Stainless steel grade A4-80	$V_{Rk,s}$	[kN]	15	23	34	63	98	141	184	224
Partial safety factor	γ_{Ms}	[-]	1.33							
Stainless steel grade 1.4529	$V_{Rk,s}$	[kN]	13	20	30	55	86	124	161	196
Partial safety factor	γ_{Ms}	[-]	1.25							

Steel Failure - with lever arm										
Size			M8	M10	M12	M16	M20	M24	M27	M30
Steel grade 4.8	$V_{Rk,s}$	[kN]	15	30	52	133	260	449	666	900
Partial safety factor	γ_{Ms}	[-]	1.67							
Steel grade 5.8	$V_{Rk,s}$	[kN]	19	37	66	166	325	561	832	1125
Partial safety factor	γ_{Ms}	[-]	1.25							
Steel grade 8.8	$V_{Rk,s}$	[kN]	30	60	105	266	519	898	1332	1799
Partial safety factor	γ_{Ms}	[-]	1.25							
Steel grade 10.9	$V_{Rk,s}$	[kN]	37	75	131	333	649	1123	1664	2249
Partial safety factor	γ_{Ms}	[-]	1.50							
Stainless steel grade A4-70	$V_{Rk,s}$	[kN]	26	52	92	233	454	786	1165	1574
Partial safety factor	γ_{Ms}	[-]	1.56							
Stainless steel grade A4-80	$V_{Rk,s}$	[kN]	30	60	105	266	519	898	1332	1799
Partial safety factor	γ_{Ms}	[-]	1.33							
Stainless steel grade 1.4529	$V_{Rk,s}$	[kN]	26	52	92	233	454	786	1165	1574
Partial safety factor	γ_{Ms}	[-]	1.25							
Concrete pryout failure										
Factor k from TR 029 Design of bonded anchors pt 5.2.3.3			2							
Partial safety factor	γ_{Ms}	[-]	1.5							

עוגן כימי V200 Styrene Free

Product Data Sheet

Using עוגן כימי V200 with Threaded Bars Combined pullout and concrete cone failure in non-cracked concrete C20/25

Size			M8	M10	M12	M16	M20	M24	M27	M30
Characteristic bond resistance in non-cracked concrete										
Characteristic bond resistance dry/wet concrete	τ_{Rk}	[N/mm²]	10	9.5	9.5	9.0	8.5	8.0	6.5	5.5
Partial safety factor	γ_{Mc}	[-]	1.8						2.1	

Tension load calculations for combined concrete cone & pullout failure at various embedment depths

using threaded rods in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size							
			M8	M10	M12	M16	M20	M24	M27	M30
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	192	216	240
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	16.08	23.88	34.38	57.91	85.45	115.81	119.09	124.41
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Effective Embedment Depth = 10d	h_{ef}	mm	80	100	120	160	200	240	270	300
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	20.11	29.85	42.98	72.38	106.81	144.76	148.86	155.51
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	210	270	300
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	20.11	26.86	39.40	57.91	90.79	126.67	148.86	155.51
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288	324	360
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	24.13	35.81	51.57	86.86	128.18	173.72	178.64	186.61
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Effective Embedment Depth = 14d	h_{ef}	mm	112	140	168	224	280	336	378	420
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	28.15	41.78	60.17	101.34	149.54	202.67	208.41	217.71
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Effective Embedment Depth = 16d	h_{ef}	mm	128	160	192	256	320	384	432	480
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	32.17	47.75	68.76	115.81	170.90	231.62	238.18	248.81
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Effective Embedment Depth = 18d	h_{ef}	mm	144	180	216	288	360	432	486	540
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	36.19	53.72	77.36	130.29	192.27	260.58	267.96	279.92
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	480	540	600
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	40.21	59.69	85.95	144.76	213.63	289.53	297.73	311.02
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at 8d embedment depth

using threaded rods in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size							
			M8	M10	M12	M16	M20	M24	M27	M30
Nominal Anchor Diameter	d	mm	8	10	12	16	20	24	27	30
Characteristic Bond Strength	τ_{Rk}	N/mm²	10.00	9.50	9.50	9.00	8.50	8.00	6.50	5.50
Effective Embedment Depth	h_{ef}	mm	64	80	96	128	160	192	216	240
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	16.08	23.88	34.38	57.91	85.45	115.81	119.09	124.41
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	192	240	288	384	480	576	648	720
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	96	120	144	192	240	288	324	360
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	185	225	270	351	426	496	503	514
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	92	113	135	175	213	248	251	257

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge: Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size							
	M8	M10	M12	M16	M20	M24	M27	M30
35	0.56							
40	0.59	0.55						
50	0.66	0.60	0.56					
60	0.74	0.66	0.60					
65	0.78	0.69	0.63	0.56				
70	0.82	0.72	0.65	0.57				
80	0.90	0.78	0.70	0.61	0.56			
90	0.98	0.85	0.75	0.65	0.59			
92	N/R	0.86	0.76	0.65	0.59			
96		0.89	0.78	0.67	0.61	0.57		
100		0.91	0.80	0.68	0.62	0.58		
110		0.98	0.86	0.72	0.65	0.60	0.60	
113		N/R	0.87	0.73	0.66	0.61	0.61	
120			0.91	0.76	0.68	0.63	0.62	0.62
130			0.97	0.80	0.71	0.65	0.65	0.64
135			N/R	0.82	0.73	0.67	0.66	0.65
140				0.85	0.74	0.68	0.68	0.67
150				0.89	0.78	0.71	0.70	0.69
160				0.93	0.81	0.74	0.73	0.72
170				0.98	0.84	0.76	0.76	0.75
175				N/R	0.86	0.78	0.77	0.76
180					0.88	0.79	0.78	0.77
200					0.95	0.85	0.84	0.83
213					N/R	0.89	0.88	0.87
220						0.91	0.90	0.89
240						0.97	0.96	0.95
248						N/R	0.99	0.97
251							N/R	0.98
257								N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing: Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size							
	M8	M10	M12	M16	M20	M24	M27	M30
35	0.67							
40	0.68	0.65						
50	0.70	0.67	0.65					
60	0.72	0.69	0.66					
65	0.73	0.70	0.67	0.63				
70	0.74	0.71	0.68	0.64				
80	0.77	0.73	0.69	0.65	0.63			
90	0.79	0.75	0.71	0.67	0.64			
96	0.80	0.76	0.72	0.67	0.64	0.62		
100	0.81	0.77	0.73	0.68	0.65	0.63		
110	0.84	0.79	0.74	0.69	0.66	0.64	0.66	
120	0.86	0.81	0.76	0.70	0.67	0.65	0.67	0.68
125	0.87	0.82	0.77	0.71	0.68	0.65	0.67	0.68
150	0.92	0.86	0.81	0.74	0.70	0.67	0.69	0.70
175	0.98	0.91	0.85	0.78	0.73	0.70	0.71	0.72
185	N/R	0.93	0.87	0.79	0.74	0.71	0.72	0.73
200		0.95	0.89	0.81	0.76	0.72	0.74	0.74
225		N/R	0.93	0.84	0.78	0.75	0.76	0.76
250			0.97	0.87	0.81	0.77	0.78	0.79
270			N/R	0.90	0.83	0.79	0.80	0.80
275				0.90	0.84	0.79	0.80	0.81
300				0.94	0.87	0.82	0.83	0.83
351				N/R	0.92	0.86	0.87	0.87
400					0.97	0.91	0.91	0.91
426					N/R	0.94	0.93	0.93
450						0.96	0.96	0.95
496						N/R	0.99	0.99
503							N/R	0.99
514								N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at std embedment depth

using threaded rods in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size							
			M8	M10	M12	M16	M20	M24	M27	M30
Nominal Anchor Diameter	d	mm	8	10	12	16	20	24	27	30
Characteristic Bond Strength	τ_{Rk}	N/mm²	10.00	9.50	9.50	9.00	8.50	8.00	6.50	5.50
Effective Embedment Depth	h_{ef}	mm	80	90	110	128	170	210	270	300
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	20.11	26.86	39.40	57.91	90.79	126.67	148.86	155.51
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	240	270	330	384	510	630	810	900
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	120	135	165	192	255	315	405	450
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	185	225	270	351	426	496	503	514
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	92	113	135	175	213	248	251	257

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge: Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size							
	M8	M10	M12	M16	M20	M24	M27	M30
40	0.59							
45	0.63	0.57						
50	0.66	0.60						
55	0.70	0.63	0.58					
60	0.74	0.66	0.60					
65	0.78	0.69	0.63	0.56				
70	0.82	0.72	0.65	0.57				
80	0.90	0.78	0.70	0.61				
85	0.94	0.81	0.72	0.63	0.57			
90	0.98	0.85	0.75	0.65	0.59			
92	N/R	0.86	0.76	0.65	0.59			
100		0.91	0.80	0.68	0.62			
105		0.95	0.83	0.70	0.63	0.59		
110		0.98	0.86	0.72	0.65	0.60		
113		N/R	0.87	0.73	0.66	0.61		
120			0.91	0.76	0.68	0.63		
130			0.97	0.80	0.71	0.65		
135			N/R	0.82	0.73	0.67	0.66	
140				0.85	0.74	0.68	0.68	
150				0.89	0.78	0.71	0.70	0.69
160				0.93	0.81	0.74	0.73	0.72
170				0.98	0.84	0.76	0.76	0.75
175				N/R	0.86	0.78	0.77	0.76
200					0.95	0.85	0.84	0.83
213					N/R	0.89	0.88	0.87
225						0.93	0.92	0.90
248						N/R	0.99	0.97
251							N/R	0.98
257								N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing: Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size							
	M8	M10	M12	M16	M20	M24	M27	M30
40	0.69							
45	0.70	0.67						
50	0.71	0.68						
55	0.72	0.69	0.66					
60	0.73	0.70	0.67					
65	0.74	0.71	0.68	0.63				
70	0.75	0.72	0.69	0.64				
80	0.78	0.73	0.70	0.65				
85	0.79	0.74	0.71	0.66	0.64			
90	0.80	0.75	0.72	0.67	0.64			
100	0.82	0.77	0.73	0.68	0.65			
105	0.83	0.78	0.74	0.69	0.66	0.64		
125	0.87	0.82	0.77	0.71	0.68	0.66		
135	0.90	0.84	0.79	0.72	0.69	0.67	0.69	
150	0.93	0.87	0.81	0.74	0.71	0.68	0.70	0.71
175	0.98	0.91	0.85	0.78	0.73	0.70	0.73	0.73
185	N/R	0.93	0.87	0.79	0.74	0.71	0.73	0.74
200		0.96	0.89	0.81	0.76	0.73	0.75	0.75
225		N/R	0.93	0.84	0.79	0.75	0.77	0.77
270			N/R	0.90	0.84	0.79	0.81	0.81
300				0.94	0.87	0.82	0.83	0.83
351				N/R	0.92	0.87	0.88	0.87
400					0.97	0.91	0.92	0.91
426					N/R	0.94	0.94	0.93
450						0.96	0.96	0.95
496						N/R	0.99	0.99
503							N/R	0.99
514								N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at 20d embedment depth

using threaded rods in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size							
			M8	M10	M12	M16	M20	M24	M27	M30
Nominal Anchor Diameter	d	mm	8	10	12	16	20	24	27	30
Characteristic Bond Strength	τ_{Rk}	N/mm²	10.00	9.50	9.50	9.00	8.50	8.00	6.50	5.50
Effective Embedment Depth	h_{ef}	mm	160	200	240	320	400	480	540	600
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	40.21	59.69	85.95	144.76	213.63	289.53	297.73	311.02
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	2.10	2.10
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	480	600	720	960	1200	1440	1620	1800
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	240	300	360	480	600	720	810	900
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	185	225	270	351	426	496	503	514
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	92	113	135	175	213	248	251	257

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge: Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size							
	M8	M10	M12	M16	M20	M24	M27	M30
80	0.90							
90	0.98							
92	N/R							
100		0.91						
110		0.98						
113		N/R						
120			0.91					
130			0.97					
135			N/R					
140								
150								
160				0.93				
170				0.98				
175				N/R				
180								
190								
200					0.95			
210					0.99			
213					N/R			
220								
230								
240						0.97		
248						N/R		
251								
257								
260								
270							N/R	
280								
290								
300								N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing: Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size							
	M8	M10	M12	M16	M20	M24	M27	M30
80	0.79							
90	0.81							
100	0.83	0.79						
110	0.85	0.81						
120	0.87	0.83	0.79					
130	0.89	0.85	0.81					
140	0.91	0.86	0.82					
150	0.93	0.88	0.83					
160	0.95	0.90	0.85	0.79				
170	0.97	0.91	0.86	0.80				
185	N/R	0.94	0.88	0.82				
200		0.96	0.90	0.84	0.79			
225		N/R	0.94	0.86	0.82			
240			0.96	0.88	0.83	0.80		
250			0.97	0.89	0.84	0.81		
270			N/R	0.91	0.86	0.82	0.83	
275				0.92	0.86	0.83	0.83	
300				0.95	0.89	0.85	0.85	0.85
351				N/R	0.93	0.89	0.89	0.89
400					0.98	0.93	0.92	0.92
426					N/R	0.95	0.94	0.94
450						0.96	0.96	0.96
496						N/R	0.99	0.99
503							N/R	0.99
514								N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Styrene Free

Product Data Sheet

Using עוגן כימי V200 with Threaded Bars Combined pullout and concrete cone failure cracked concrete C20/25

Size			M10	M12	M16	M20	M24
Characteristic bond resistance in non-cracked concrete							
Characteristic bond resistance dry/wet concrete	τ_{Rk}	[N/mm²]	4.5	4.5	4.5	4.0	4.0
Partial safety factor	γ_{Mc}	[-]	1.8				

Tension load calculations for combined concrete cone & pullout failure at various embedment depths

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit					
			M10	M12	M16	M20	M24
Effective Embedment Depth = 8d	h_{ef}	mm	80	96	128	160	192
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	11.31	16.29	28.95	40.21	57.91
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 10d	h_{ef}	mm	100	120	160	200	240
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	14.14	20.36	36.19	50.27	72.38
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	210
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	12.72	18.66	28.95	42.73	63.33
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	288
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	16.96	24.43	43.43	60.32	86.86
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 14d	h_{ef}	mm	140	168	224	280	336
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	19.79	28.50	50.67	70.37	101.34
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 16d	h_{ef}	mm	160	192	256	320	384
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	22.62	32.57	57.91	80.42	115.81
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 18d	h_{ef}	mm	180	216	288	360	432
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	25.45	36.64	65.14	90.48	130.29
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 20d	h_{ef}	mm	200	240	320	400	480
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	28.27	40.72	72.38	100.53	144.76
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at 8d embedment depth

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	M10	M12	M16	M20	M24
Nominal Anchor Diameter	d	mm	10	12	16	20	24
Characteristic Bond Strength	τ_{Rk}	N/mm²	4.50	4.50	4.50	4.00	4.00
Effective Embedment Depth	h_{ef}	mm	80	96	128	160	192
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	11.31	16.29	28.95	40.21	57.91
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	240	288	384	480	576
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	120	144	192	240	288
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	155	186	248	292	351
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	77	93	124	146	175

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	M10	M12	M16	M20	M24
40	0.65				
50	0.74	0.66			
60	0.83	0.74			
65	0.88	0.77	0.65		
70	0.92	0.81	0.68		
77	N/R	0.87	0.72		
80		0.89	0.74	0.67	
90		0.97	0.79	0.72	
93		N/R	0.81	0.73	
96			0.83	0.74	0.67
100			0.85	0.76	0.68
110			0.91	0.81	0.72
120			0.97	0.86	0.76
124			N/R	0.88	0.78
130				0.91	0.80
140				0.97	0.85
146				N/R	0.87
150					0.89
160					0.93
170					0.98
175					N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	M10	M12	M16	M20	M24
40	0.72				
50	0.75	0.72			
60	0.77	0.74			
65	0.78	0.75	0.71		
70	0.80	0.76	0.71		
80	0.82	0.78	0.73	0.71	
90	0.85	0.80	0.75	0.73	
96	0.86	0.82	0.76	0.73	0.70
100	0.87	0.83	0.76	0.74	0.71
110	0.89	0.85	0.78	0.75	0.72
120	0.92	0.87	0.80	0.77	0.73
130	0.94	0.89	0.81	0.78	0.74
140	0.97	0.91	0.83	0.80	0.76
150	0.99	0.93	0.85	0.81	0.77
155	N/R	0.94	0.85	0.82	0.77
160		0.95	0.86	0.82	0.78
170		0.97	0.88	0.84	0.79
180		0.99	0.89	0.85	0.80
186		N/R	0.90	0.86	0.81
190			0.91	0.86	0.82
200			0.93	0.88	0.83
220			0.96	0.90	0.85
240			0.99	0.93	0.87
248			N/R	0.94	0.88
260				0.96	0.90
280				0.98	0.92
292				N/R	0.93
300					0.94
325					0.97
351					N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at std embedment depth

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	M10	M12	M16	M20	M24
Nominal Anchor Diameter	d	mm	10	12	16	20	24
Characteristic Bond Strength	τ_{Rk}	N/mm²	4.50	4.50	4.50	4.00	4.00
Effective Embedment Depth	h_{ef}	mm	90	110	128	170	210
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	12.72	18.66	28.95	42.73	63.33
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	270	330	384	510	630
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	135	165	192	255	315
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	155	186	248	292	351
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	77	93	124	146	175

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge: Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	M10	M12	M16	M20	M24
45	0.69				
50	0.74				
55	0.78	0.70			
60	0.83	0.74			
65	0.88	0.77	0.65		
70	0.92	0.81	0.68		
77	N/R	0.87	0.72		
80		0.89	0.74		
85		0.93	0.76	0.69	
90		0.97	0.79	0.72	
93		N/R	0.81	0.73	
100			0.85	0.76	
105			0.88	0.79	0.70
110			0.91	0.81	0.72
120			0.97	0.86	0.76
124			N/R	0.88	0.78
130				0.91	0.80
140				0.97	0.85
146				N/R	0.87
150					0.89
160					0.93
170					0.98
175					N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing: Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	M10	M12	M16	M20	M24
45	0.74				
50	0.75				
55	0.76	0.73			
60	0.77	0.74			
65	0.79	0.75	0.71		
70	0.80	0.77	0.71		
80	0.82	0.79	0.73		
85	0.84	0.80	0.74	0.72	
90	0.85	0.81	0.75	0.73	
100	0.87	0.83	0.76	0.74	
105	0.88	0.84	0.77	0.75	0.72
120	0.92	0.87	0.80	0.77	0.74
140	0.97	0.91	0.83	0.80	0.76
155	N/R	0.94	0.85	0.82	0.78
160		0.95	0.86	0.82	0.78
180		0.99	0.89	0.85	0.81
186		N/R	0.90	0.86	0.81
200			0.93	0.88	0.83
220			0.96	0.91	0.85
240			0.99	0.93	0.88
248			N/R	0.94	0.89
260				0.96	0.90
280				0.98	0.92
292				N/R	0.94
300					0.94
320					0.97
340					0.99
351					N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at 20d embedment depth

using threaded rods in dry / wet, cracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	M10	M12	M16	M20	M24
Nominal Anchor Diameter	d	mm	10	12	16	20	24
Characteristic Bond Strength	τ_{Rk}	N/mm²	4.50	4.50	4.50	4.00	4.00
Effective Embedment Depth	h_{ef}	mm	200	240	320	400	480
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	28.27	40.72	72.38	100.53	144.76
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	600	720	960	1200	1440
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	300	360	480	600	720
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	155	186	248	292	351
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	77	93	124	146	175

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge:
Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	M10	M12	M16	M20	M24
77					
80					
90			NOT PERMISSIBLE		
93					
100	N/R				
110					
120		N/R			
124					
130					
140					
146					
150					
160			N/R		
170					
175					
180					
190		NO REDUCTION			
200				N/R	
210					
220					
230					
240					N/R

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing:
Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	M10	M12	M16	M20	M24
100	0.88				
110	0.90				
120	0.92	0.88			
130	0.95	0.90			
140	0.97	0.92			
150	0.99	0.94			
155	N/R	0.94			
160		0.95	0.88		
170		0.97	0.89		
180		0.99	0.90		
186		N/R	0.91		
190			0.92		
200			0.93	0.89	
220			0.96	0.91	
240			0.99	0.94	0.89
248			N/R	0.95	0.90
260				0.96	0.91
280				0.99	0.93
292				N/R	0.94
300					0.95
320					0.97
340					0.99
351					N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Styrene Free

Product Data Sheet

Using עוגן כימי V200 with Reinforcing Bars Combined pullout and concrete cone failure in non-cracked concrete C20/25

Size			Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Characteristic bond resistance in non-cracked concrete									
Characteristic bond resistance dry/wet concrete	τ_{Rk}	[N/mm²]	11	9.5	9.5	9.0	8.5	8.5	5.5
Partial safety factor	γ_{Mc}	[-]	1.8						

Tension load calculations for combined concrete cone & pullout failure at various embedment depths

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size						
			Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	200	256
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	17.69	23.88	34.38	57.91	85.45	133.52	141.55
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 10d	h_{ef}	mm	80	100	120	160	200	250	320
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	22.12	29.85	42.98	72.38	106.81	166.90	176.93
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	210	300
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	22.12	26.86	39.40	57.91	90.79	140.19	165.88
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	300	384
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	26.54	35.81	51.57	86.86	128.18	200.28	212.32
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 14d	h_{ef}	mm	112	140	168	224	280	350	448
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	30.96	41.78	60.17	101.34	149.54	233.66	247.71
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 16d	h_{ef}	mm	128	160	192	256	320	400	512
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	35.39	47.75	68.76	115.81	170.90	267.04	283.10
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 18d	h_{ef}	mm	144	180	216	288	360	450	576
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	39.81	53.72	77.36	130.29	192.27	300.41	318.48
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	500	640
Characteristic Load (Combined Concrete Cone & Pullout Failure)	$N^0_{Rk,p}$	kN	44.23	59.69	85.95	144.76	213.63	333.79	353.87
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at 8d embedment depth

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size						
			Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	8	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm²	11.00	9.50	9.50	9.00	8.50	8.50	5.50
Effective Embedment Depth	h_{ef}	mm	64	80	96	128	160	200	256
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	17.69	23.88	34.38	57.91	85.45	133.52	141.55
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	192	240	288	384	480	600	768
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	96	120	144	192	240	300	384
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	192	225	270	351	426	532	548
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	96	113	135	175	213	266	274

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge: Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size						
	Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
35	0.55						
40	0.58	0.55					
50	0.65	0.60	0.56				
60	0.72	0.66	0.60				
65	0.76	0.69	0.63	0.56			
70	0.79	0.72	0.65	0.57			
80	0.87	0.78	0.70	0.61	0.56		
90	0.95	0.85	0.75	0.65	0.59		
96	N/R	0.89	0.78	0.67	0.61		
100		0.91	0.80	0.68	0.62	0.56	
110		0.98	0.86	0.72	0.65	0.58	
113		N/R	0.87	0.73	0.66	0.59	
120			0.91	0.76	0.68	0.61	
130			0.97	0.80	0.71	0.63	0.62
135			N/R	0.82	0.73	0.64	0.63
140				0.85	0.74	0.65	0.64
150				0.89	0.78	0.68	0.67
160				0.93	0.81	0.70	0.69
170				0.98	0.84	0.73	0.72
175				N/R	0.86	0.74	0.73
180					0.88	0.76	0.74
190					0.92	0.78	0.77
200					0.95	0.81	0.79
210					0.99	0.84	0.82
213					N/R	0.85	0.83
220						0.87	0.85
240						0.92	0.90
260						0.98	0.96
266						N/R	0.98
274							N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing: Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size						
	Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
35	0.65						
40	0.66	0.65					
50	0.69	0.67	0.65				
60	0.71	0.69	0.66				
65	0.72	0.70	0.67	0.63			
70	0.73	0.71	0.68	0.64			
80	0.75	0.73	0.69	0.65	0.63		
90	0.78	0.75	0.71	0.67	0.64		
100	0.80	0.77	0.73	0.68	0.65	0.61	
125	0.85	0.82	0.77	0.71	0.68	0.63	
130	0.86	0.82	0.78	0.72	0.68	0.63	0.68
150	0.91	0.86	0.81	0.74	0.70	0.65	0.69
175	0.96	0.91	0.85	0.78	0.73	0.67	0.71
192	N/R	0.94	0.88	0.80	0.75	0.69	0.72
200		0.95	0.89	0.81	0.76	0.70	0.73
225		N/R	0.93	0.84	0.78	0.72	0.75
250			0.97	0.87	0.81	0.74	0.77
270			N/R	0.90	0.83	0.76	0.79
275				0.90	0.84	0.77	0.79
300				0.94	0.87	0.79	0.81
325				0.97	0.89	0.81	0.83
351				N/R	0.92	0.84	0.85
375					0.95	0.86	0.87
400					0.97	0.88	0.89
426					N/R	0.90	0.91
450						0.93	0.93
500						0.97	0.96
532						N/R	0.99
548							N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at std embedment depth

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size						
			Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	8	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm²	11.00	9.50	9.50	9.00	8.50	8.50	5.50
Effective Embedment Depth	h_{ef}	mm	80	90	110	128	170	210	300
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	22.12	26.86	39.40	57.91	90.79	140.19	165.88
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	240	270	330	384	510	630	900
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	120	135	165	192	255	315	450
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	194	225	270	351	426	532	548
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	97	113	135	175	213	266	274

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge: Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size						
	Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
40	0.58						
45	0.61	0.57					
50	0.65	0.60					
55	0.68	0.63	0.58				
60	0.72	0.66	0.60				
65	0.75	0.69	0.63	0.56			
70	0.79	0.72	0.65	0.57			
80	0.87	0.78	0.70	0.61			
85	0.90	0.81	0.72	0.63	0.57		
90	0.94	0.85	0.75	0.65	0.59		
97	N/R	0.89	0.79	0.67	0.61		
100		0.91	0.80	0.68	0.62		
105		0.95	0.83	0.70	0.63	0.57	
110		0.98	0.86	0.72	0.65	0.58	
113		N/R	0.87	0.73	0.66	0.59	
120			0.91	0.76	0.68	0.61	
130			0.97	0.80	0.71	0.63	
135			N/R	0.82	0.73	0.64	
140				0.85	0.74	0.65	
150				0.89	0.78	0.68	0.67
160				0.93	0.81	0.70	0.69
170				0.98	0.84	0.73	0.72
175				N/R	0.86	0.74	0.73
180					0.88	0.76	0.74
190					0.92	0.78	0.77
200					0.95	0.81	0.79
213					N/R	0.85	0.83
250						0.95	0.93
266						N/R	0.98
274							N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing: Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size						
	Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
40	0.67						
45	0.68	0.67					
50	0.70	0.68					
55	0.71	0.69	0.66				
60	0.72	0.70	0.67				
65	0.73	0.71	0.68	0.63			
70	0.74	0.72	0.69	0.64			
80	0.76	0.73	0.70	0.65			
85	0.77	0.74	0.71	0.66	0.64		
90	0.78	0.75	0.72	0.67	0.64		
100	0.80	0.77	0.73	0.68	0.65		
105	0.81	0.78	0.74	0.69	0.66	0.62	
125	0.86	0.82	0.77	0.71	0.68	0.63	
150	0.91	0.87	0.81	0.74	0.71	0.66	0.70
175	0.96	0.91	0.85	0.78	0.73	0.68	0.72
194	N/R	0.94	0.88	0.80	0.75	0.70	0.73
200		0.96	0.89	0.81	0.76	0.70	0.74
225		N/R	0.93	0.84	0.79	0.72	0.76
250			0.97	0.87	0.81	0.75	0.78
270			N/R	0.90	0.84	0.76	0.79
275				0.90	0.84	0.77	0.80
300				0.94	0.87	0.79	0.81
351				N/R	0.92	0.84	0.85
400					0.97	0.88	0.89
426					N/R	0.90	0.91
450						0.93	0.93
500						0.97	0.96
532						N/R	0.99
548							N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

Tension load calculations for combined concrete cone & pullout failure at 20d embedment depth

using reinforcing bars in dry / wet, uncracked, C20/25 concrete. Temperature range -40°C to +80°C.

Property	Symbol	Unit	Anchor Size						
			Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
Nominal Anchor Diameter	d	mm	8	10	12	16	20	25	32
Characteristic Bond Strength	τ_{Rk}	N/mm²	11.00	9.50	9.50	9.00	8.50	8.50	5.50
Effective Embedment Depth	h_{ef}	mm	160	200	240	320	400	500	640
Characteristic Load (Combined Concrete Cone and Pullout Failure)	$N^0_{Rk,p}$	kN	44.23	59.69	85.95	144.76	213.63	333.79	353.87
Partial Safety Factor	γ_{Mc}	-	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Characteristic Anchor Spacing (Splitting Failure)	$S_{cr,sp}$	mm	480	600	720	960	1200	1500	1920
Characteristic Edge Distance (Splitting Failure)	$C_{cr,sp}$	mm	240	300	360	480	600	750	960
Characteristic Anchor Spacing (Combined Concrete Cone and Pullout Failure)	$S_{cr,Np}$	mm	194	225	270	351	426	532	548
Characteristic Edge Distance (Combined Concrete Cone and Pullout Failure)	$C_{cr,Np}$	mm	97	113	135	175	213	266	274

1. *Characteristic loads are valid for combined concrete cone and pullout failure as defined by TR029 only. All other failure modes, including steel failure, detailed in TR029 as well as including combined effects of tension and shear, must be considered in accordance with TR029.*
2. *Characteristic loads are valid for single anchors without close edge, anchor spacing or eccentric loading considerations.*
3. *Tabulated values are valid for temperture range -40°C to +80°C (Max LTT = +50°C; Max STT = +80°C).*
4. *Tabulated values are only valid for the installation conditions stated. Other conditions, such as different temperature ranges, may affect the performance of the product.*
5. *Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, eg: diurnal cycling.*
6. *The compressive strength of the concrete ($f_{ck,cube}$) is assumed to be 25 N/mm² for C20/25 concrete.*
7. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*

Reduction factors for close edge: Combined concrete cone and pullout failure

Close Edge Distance, C (mm)	Anchor Size						
	Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
80	0.87						
90	0.94						
97	N/R						
100		0.91					
110		0.98					
113		N/R					
120			0.91				
130			0.97				
135			N/R				
140							
150							
160				0.93			
170				0.98			
175				N/R			
180							
190							
200					0.95		
210					0.99		
213					N/R		
220							
230							
240							
250						0.95	
260						0.98	
266						N/R	
270							
274							
280							
300							
320							N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a single anchor with a single close edge. Tabulated values must not be used if multiple close edges exist.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Close edge distances must exceed or be equal to the minimum close edge distance (C_{min}) as defined in the ETA.*

Reduction factors for anchor spacing: Combined concrete cone and pullout failure

Anchor Spacing Distance, S (mm)	Anchor Size						
	Ø8mm	Ø10mm	Ø12mm	Ø16mm	Ø20mm	Ø25mm	Ø32mm
80	0.78						
90	0.80						
100	0.82	0.79					
120	0.86	0.83	0.79				
140	0.90	0.86	0.82				
160	0.94	0.90	0.85	0.79			
180	0.97	0.93	0.88	0.81			
194	N/R	0.95	0.90	0.83			
200		0.96	0.90	0.84	0.79		
225		N/R	0.94	0.86	0.82		
250			0.97	0.89	0.84	0.79	
270			N/R	0.91	0.86	0.80	
275				0.92	0.86	0.81	
300				0.95	0.89	0.83	
320				0.97	0.91	0.84	0.85
351				N/R	0.93	0.86	0.87
400					0.98	0.90	0.90
426					N/R	0.92	0.92
450						0.94	0.94
500						0.98	0.97
532						N/R	0.99
548							N/R

NOT PERMISSIBLE

NO REDUCTION

1. *Tabulated values are only applicable for instances where combined concrete cone and pullout failure is the controlling failure mode as described by TR029. All other failure modes must be considered and different reduction factors may apply.*
2. *Tabulated values are based on a group of 2 anchors with the geometry defined by "S" and "$S_{cr,Np}$" but without close edge considerations.*
3. *Anchors with geometry different to that defined in the above table must be considered separately and the tabulated values must not be used.*
4. *Interpolation is allowed.*
5. *Tabulated values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.*
6. *Anchor spacing distances must exceed or be equal to the minimum anchor spacing (S_{min}) as defined in the ETA.*

עוגן כימי V200 Styrene Free

Product Data Sheet

Using עוגן כימי V200 with Post-installed Rebar Connections

Installation parameters

Rebar		Drill Hole (mm)	Cleaning Brush* (mm)	Min. Anchorage Length (mm)	Min. Lap/Splice Length (mm)	Max. Embedment Depth (mm)
Diameter (mm)	$f_{y,k}$ (N/mm2)					
8	500	12 (10)	14	114	200	400
10	500	14 (12)	14	142	200	500
12	500	16	19	171	200	600
14	500	18	22	199	210	700
16	500	20	22	227	240	800
20	500	25	29	284	300	1000
25	500	32	40	355	375	1000

Note: Post-installed rebar connection data is valid for EASF-V and EASF-VE only.
** Values in parenthesis represent alternative drilling diameters.*

Design bond strength values

Design values of the ultimate bond resistance f_{bd} in N/mm^2 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									
12									
14									
16									
20								3.7	
25						3.0			

Note: Post-installed rebar connection data is valid for EASF-V and EASF-VE only.
Tabulated values for f_{bd} are valid for good bond conditions according to EN 1992-1-1. For all other bond conditions multiply the values for f_{bd} by 0.7.

עוגן כימי V200 Epoxy Acrylate Styrene Free

Product Data Sheet

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 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.

Manufactured for Elram
Professional Adhesives Ltd in
the United Kingdom
Website: www.2kps.net