KLIMAS Sp. z o.o. ul. W. Witosa 135/137
Kuźnica Kiedrzyńska 42-233 Mykanów
tel. +48 34 377 71 00, fax. +48 34 328 01 73 Infolinia: 801 477 477, www.wkret-met.com

Section 1. PRODUCT DESCRIPTION

Description

WCF-VESF is vinylester two-component (10:1 ratio) bonded anchoring system approved for use in uncracked concrete with medium performance level. Formulated free of styrene, WCF-VESF has a very low odour and is ideal for use in confined spaces and indoors. Suitable for both DIY applications and also professional use.

Storage

Cartridges should be stored in their original packaging, the correct way up, in cool conditions (+5°C to +25°C) out of direct sunlight. When stored correctly, the product shelf life will be 12 months from the date of manufacture.

Base materials

-Uncracked concrete
-Solid rock
-Hard natural stone

Health & Safety

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

Accessories

-Applicators
-Mixing nozzles
-Cleaning blow pump
-Cleaning brushes
-Extension tubes
-Resin stoppers

Approvals & Tests

-ETA according to ETAG 001 -Part 1 and Part 5 , used as European Assessment Document (EAD) for uncracked concrete

Features

-Suitable for use with close edge distance and small anchor spacings
-Suitable for dry, wet & flooded holes with no loss of performance.
-Reduced drilling diameters, 22mm for M20 and 26mm for M24; results in significant material and labour savings.
-Variable embedment depths 8d to 12d
-Available in single piston foil pack cartridges (300 ml & 410 ml)

Uses/Applications

-Canopies
-Boilers
-Bicycle Racks
-Hand Rails
-Safety Barriers
-Balcony Fences
-Racking
-Machinery
-Satellite Dishes

Section 2. WORKING & LOADING TIMES

WCF-VESF - Working & Loading Times			
Cartridge Temperature	**T Work**	**Base Material Temperature**	**T Load**
5°C	18 Minutes	5°C	145 Minutes
5°C to 10°C	10 Minutes	5°C to 10°C	145 Minutes
10°C to 20°C	6 Minutes	10°C to 20°C	85 Minutes
20°C to 25°C	5 Minutes	20°C to 25°C	50 Minutes
25°C to 30°C	4 Minutes	25°C to 30°C	40 Minutes
30°C		30°C	35 Minutes

Note: T Work is typical gel time at highest base material temperature in the range.
T Load is minimum set time required until load can be applied at the lowest base material temperature in the range.

WCF-VESF-E - Working & Loading Times			
Cartridge Temperature	**T Work**	**Base Material Temperature**	**T Load**
10°C	30 Minutes	10°C	5 hours
10°C to 20°C	15 Minutes	10°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
40°C to 45°C	2,5 Minutes	40°C to 45°C	35 Minutes
45°C		45°C	12 Minutes

Note: T Work is typical gel time at highest base material temperature in the range.
T Load is minimum set time required until load can be applied at the lowest base material temperature in the range.

Section 3. PHYSICAL PROPERTIES

Physical Properties				
Property		**Value**	**Unit**	**Test Standard**
Density		1.7	g/cm^3	ASTM D 1875 @ +20°C
Compressive Strength	24 hrs	70	N/mm^2	BS6319
	7 days	75		
Tensile Strength	24 hrs	11	N/mm^2	ASTM D 638 @ +20°C
	7 days	11.5		
Elongation at Break	24 hrs	0.12	%	ASTM D 638 @ +20°C
	7 days	0.15		
Tensile Modulus	24 hrs	3.4	GN/m^2	ASTM D 638 @ +20°C
	7 days	4.5		
Flexural Strength	7 days	28.3	N/mm^2	ASTM D 790 @ +20°C
HDT	7 days	78	°C	ASTM D 648 @ +20°C

Section 4. CHEMICAL RESISTANCE

Chemical Resistance					
Chemical Environment	**Concentration**	**Result**	**Chemical Environment**	**Concentration**	**Result**
Aqueous Solution Acetic Acid	10%	C	Hexane	100%	C
Acetone	100%	×	Hydrochloric Acid	10%	✓
Aqueous Solution Aluminium Chloride	Saturated	✓		15%	✓
Aqueous Solution Aluminium Nitrate	10%	✓		20%	C
Ammonia Solution	5%	×	Hydrogen Sulphide Gas	100%	✓
Jet Fuel	100%	×	Linseed Oil	100%	✓
Benzoic Acid	Saturated	✓	Lubricating Oil	100%	✓
Sodium Hypochlorite Solution	5 - 15%	✓	Mineral Oil	100%	✓
Butyl Alcohol	100%	C	Paraffin / Kerosene (Domestic)	100%	C
Calcium Sulphate Aqueous Solution	Saturated	✓	Phenol Aqueous Solution	1%	×
Carbon Monoxide	Gas	✓	Phosphoric Acid	50%	✓
Carbon Tetrachloride	100%	C	Potassium Hydroxide	10% / pH13	✓
Chlorine Water	Saturated	×	Sea Water	100%	C
Chloro Benzene	100%	C	Sulphur Dioxide Solution	10%	✓
Citric Acid Aqueous Solution	Saturated	✓	Sulphur Dioxide (40°C)	5%	✓
Cyclohexanol	100%	✓	Sulphuric Acid	10%	✓
Diesel Fuel	100%	C		30%	✓
Diethylene Glycol	100%	✓	Turpentine	100%	C
Ethanol	95%	×	White Spirit	100%	✓
Heptane	100%	C	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.

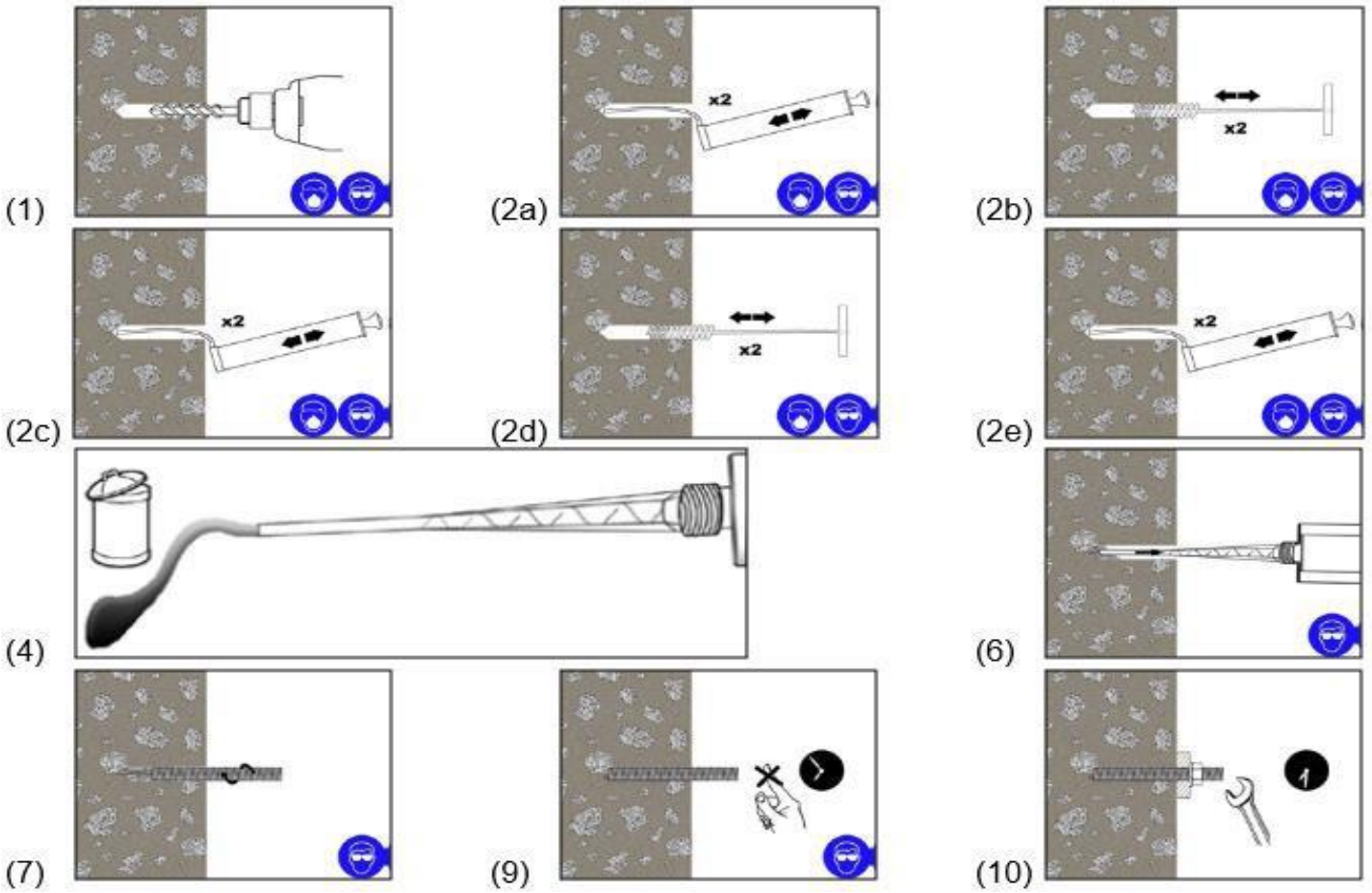
Section 5. SOLID SUBSTRATE INSTALLATION METHOD

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 a brush with the required extensions and a source of clean compressed air. For holes of 400mm or less deep, a 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.
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.

8. Any exces 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, 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.



Section 6. INSTALLATION PARAMETERS – THREADED RODS

Size			M8	M10	M12	M16	M20	M24
Nominal Drill Hole Diameter	d_o	[mm]	10	12	14	18	22	26
Diameter of Cleaning Brush	d_b	[mm]	14	14	20	20	29	29
Torque Moment	T_{inst}	[Nm]	10	20	40	80	150	200
$h_{ef,min}$ = 8d								
Depth of drill hole	h_0	[mm]	64	80	96	128	160	192
Minimum Edge Distance	c_{min}	[mm]	35	40	50	65	80	96
Minimum Spacing	s_{min}	[mm]	35	40	50	65	80	96
Minimum Member Thickness	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$	
$h_{ef,max}$ = 12d								
Depth of drill hole	h_0	[mm]	96	120	144	192	240	288
Minimum Edge Distance	c_{min}	[mm]	50	60	70	95	120	145
Minimum Spacing	s_{min}	[mm]	50	60	70	95	120	145
Minimum Member Thickness	h_{min}	[mm]	h_{ef} + 30 mm ≥ 100 mm				h_{ef} + $2d_0$	

Section 7. CHARACTERISTIC RESISTANCE – COMBINED PULL-OUT & CONCRETE CONE FAILURE USING THREADED RODS

Characteristic Resistance - Combined Pullout & Concrete Cone Failure Using Threaded Rods Working life of 50 years

Size				M8	M10	M12	M16	M20	M24
Characteristic Bond Resistance in Uncracked Concrete -40°C to 80°C		$\tau_{Rk,uncr}$	N/mm²	10.0	8.0	9.0	9.5	8.5	8.5
Installation Factor	Dry Concrete Wet Concrete Flooded Holes	γ_{inst}	[-]	1.8					
Factor for Concrete		Ψ_c	C30/37	1.12					
			C35/45	1.19					
			C50/60	1.30					

Section 8. SPLITTING FAILURE

Splitting Failure

Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Edge Distance	$c_{cr,sp}$	mm	2hef			1.5hef		
Spacing	$s_{cr,sp}$	mm	4hef			3hef		

Section 9. RESISTANCE VALUES FOR THREADED ROD IN UNCRACKED CONCRETE -50 YEARS WORKING LIFE

Resistance Values for Threaded Rod in Uncracked Concrete - Working Life of 50 Years
Combined Pullout & Concrete Cone Failure and Concrete Cone Failure
Temperature Range: -40°C to 80°C

Property	Unit		Anchor Diameter					
			M8	M10	M12	M16	M20	M24
Effective Embedment Depth = MIN = 8d	h_{ef}	mm	64	80	96	128	160	192
Design Resistance	N_{Rd}	kN	8.5	11.0	18.0	33.5	47.0	68.0
Effective Embedment Depth = STD	h_{ef}	mm	80	90	110	128	170	210
Design Resistance	N_{Rd}	kN	11.0	12.5	20.5	33.5	50.0	74.5
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288
Design Resistance	N_{Rd}	kN	13.0	16.5	27.0	50.5	71.0	102.5

1. Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EC2-4. Resistance for steel failure must also be considered - the lowest value controls.
2. Resistance values are for single anchors without close edges or eccentric loading considerations.
3. Tabulated values correspond to the above stated temperature range and installation conditions only.
4. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.
5. The compressive strength of the concrete ($f_{ck,cylinder}$) is assumed to be 20 N/mm².
6. Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Section 10. THREADED RODS – CHARACTERISTIC VALUES FOR STEEL FAILURE (TENSION)

Threaded Rods - Characteristic Values for Steel Failure (Tension)								
Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Steel Grade **5.8**	$N_{Rk,s}$	kN	18	29	42	79	123	177
Partial Safety Factor	γ_{Ms}	[-]	1.50					
Steel Grade **8.8**	$N_{Rk,s}$	kN	29	46	67	126	196	282
Partial Safety Factor	γ_{Ms}	[-]	1.50					
Steel Grade **10.9***	$N_{Rk,s}$	kN	37	58	84	157	245	353
Partial Safety Factor	γ_{Ms}	[-]	1.40					
Stainless Steel Grade **A4-70**	$N_{Rk,s}$	kN	26	41	59	110	172	247
Partial Safety Factor	γ_{Ms}	[-]	1.90					
Stainless Steel Grade **A4-80**	$N_{Rk,s}$	kN	29	46	67	126	196	282
Partial Safety Factor	γ_{Ms}	[-]	1.60					
Stainless Steel Grade **1.4529**	$N_{Rk,s}$	kN	26	41	59	110	172	247
Partial Safety Factor	γ_{Ms}	[-]	1.50					

*Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.

Section 11. THREADED RODS – CHARACTERISTIC VALUES FOR STEEL FAILURE (SHEAR – WITHOUT LEVER ARM)

Threaded Rods - Characteristic Values for Steel Failure (Shear – without lever arm)								
Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Steel Grade **5.8**	$V_{Rk,s}$	kN	9	15	21	39	61	88
Partial Safety Factor	γ_{Ms}	[-]	1.25					
Steel Grade **8.8**	$V_{Rk,s}$	kN	15	23	34	63	98	141
Partial Safety Factor	γ_{Ms}	[-]	1.25					
Steel Grade **10.9***	$V_{Rk,s}$	kN	18	29	42	79	123	177
Partial Safety Factor	γ_{Ms}	[-]	1.50					
Stainless Steel Grade **A4-70**	$V_{Rk,s}$	kN	13	20	30	55	86	124
Partial Safety Factor	γ_{Ms}	[-]	1.56					
Stainless Steel Grade **A4-80**	$V_{Rk,s}$	kN	15	23	34	63	98	141
Partial Safety Factor	γ_{Ms}	[-]	1.33					
Stainless Steel Grade **1.4529**	$V_{Rk,s}$	kN	13	20	30	55	86	124
Partial Safety Factor	γ_{Ms}	[-]	1.25					

*Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.

Section 12. THREADED RODS – CHARACTERISTIC VALUES FOR STEEL FAILURE (SHEAR – WITH LEVER ARM)

Threaded Rods - Characteristic Values for Steel Failure (Shear – with lever arm)								
Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**
Steel Grade **5.8**	$M^0_{Rk,s}$	N.m	19	37	66	166	325	561
Partial Safety Factor	γ_{Ms}	[-]	1.25					
Steel Grade **8.8**	$M^0_{Rk,s}$	N.m	30	60	105	266	519	898
Partial Safety Factor	γ_{Ms}	[-]	1.25					
Steel Grade **10.9***	$M^0_{Rk,s}$	N.m	37	75	131	333	649	1123
Partial Safety Factor	γ_{Ms}	[-]	1.50					
Stainless Steel Grade **A4-70**	$M^0_{Rk,s}$	N.m	26	52	92	233	454	786
Partial Safety Factor	γ_{Ms}	[-]	1.56					

Stainless Steel Grade **A4-80**	$M^0_{Rk,s}$	N.m	30	60	105	266	519	898
Partial Safety Factor	γ_{Ms}	[-]	1.33					
Stainless Steel Grade **1.4529**	$M^0_{Rk,s}$	N.m	26	52	92	233	454	786
Partial Safety Factor	γ_{Ms}	[-]	1.25					
Concrete pryout failure								
Factor k **			2					
Partial Safety Factor	γ_{Mc}		1.8					

*Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.
** K Value from TR029 Design of bonded anchors pt 5.2.3.3

Section 13. IMPORTANT NOTES

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.

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.