



kerakoll

DECLARATION OF PERFORMANCE No. 0481

1. Unique identification code of the product-type: **GeoSteel SRG**
(GeoSteel G1200 and Geocalce F Antisismico/Geocalce FL Antisismico/Geolite/Geolite Magma)
2. Intended use/es: **The SRG kit is suitable for strengthening and seismic upgrade of clay, tuff, natural stone masonry and reinforced concrete elements and structures.**
3. Manufacturer: **Kerakoll S.p.A Via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia**
4. System/s of AVCP: **System 2+**
5. European Assessment Document: **EAD 340275-00-0104, January 2018**
European Technical Assessment : **ETA-19/0325 of 13/07/2022**
Technical Assessment Body: **ITC CNR**
Notified body/ies: **ITC n°0970**
6. Declared performance/s:
 - Characteristic value for tensile strength and tensile strain
 - Average value for modulus of elasticity

Essential characteristics	Performance
Reaction to fire	Class A1
GeoSteel G1200 – Geocalce F Antisismico/Geocalce FL Antisismico/Geolite/Geolite Magma	See Annex A

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by: **Romano Sghedoni (legal representative)**

At Sassuolo, on 29/07/2022

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Annex A – GeoSteel G1200-Geocalce F Antisismico/Geocalce FL Antisismico/Geolite/Geolite Magma

Essential characteristics	Performance			
		Average value	Characteristic value	
Direct Tensile Strength - Ambient				
Tensile strength (σ_u)	GL	2964 MPa	2798 MPa	
Strain (ϵ_u)		1,91 %	1,52 %	
Stress-strain curve (E)		Elastic modulus of stage A	1352 GPa	636 GPa
		Stiffness modulus in stage C	196 GPa	170 GPa
Tensile strength (σ_u)	GCF	2918 MPa	2460 MPa	
Strain (ϵ_u)		1,82 %	1,41 %	
Stress-strain curve (E)		Elastic modulus of stage A	1063 GPa	563 GPa
		Stiffness modulus in stage C	187 GPa	175 GPa
Direct Tensile Strength – maximum service temperature				
Tensile strength ($\sigma_{u, 80}$)	GL	2402 MPa	1714 MPa	
Strain ($\epsilon_{u, 80}$)		1,25 %	1,14 %	
Stress-strain curve ($E_{1, 80}; E_{3, 80}$)		Elastic modulus of stage A	579 GPa	254 GPa
		Stiffness modulus in stage C	191 GPa	144 GPa
Tensile strength ($\sigma_{u, 80}$)	GCF	1980 MPa	1038 MPa	
Strain ($\epsilon_{u, 80}$)		1,08 %	0,45 %	
Stress-strain curve ($E_{1, 80}; E_{3, 80}$)		Elastic modulus of stage A	865 GPa	-(1)
		Stiffness modulus in stage C	187 GPa	161 GPa
Interlaminar shear strength (τ)	G1200 + GL		5.13 MPa	3.10 MPa
	G1200 + GCF		1.65 MPa	0.94 MPa
Lap tensile strength (σ_{lap})	Tested Overlap length $l_{lap} = 300$ mm	GL	1227 MPa	1125 MPa
		GCF	1043 MPa	802 MPa

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Essential characteristics			Performance	
			Average value	Characteristic value
Bond strength on substrate CONCRETE: pull-off test (f_h) G1200+GL	ambient		0.77 MPa	-
	water	1000 h	f_h 0.77 MPa $f_{h \text{ ret}}$ 99 %	-
		3000 h	f_h 0.91 MPa $f_{h \text{ ret}}$ 117 %	-
	saltwater	1000 h	f_h 3.02 MPa $f_{h \text{ ret}}$ 390 %	-
		3000 h	f_h 3.20 MPa $f_{h \text{ ret}}$ 413 %	-
	alkali	1000 h	f_h 3.15 MPa $f_{h \text{ ret}}$ 407 %	-
		3000 h	f_h 3.02 MPa $f_{h \text{ ret}}$ 390 %	-
	Bond strength on substrate CLAY: pull-off test (f_h) G1200+GCF	ambient		0.60 MPa
water		1000 h	f_h 0.52 MPa $f_{h \text{ ret}}$ 87 %	-
		3000 h	f_h 0.49 MPa $f_{h \text{ ret}}$ 82 %	-
saltwater		1000 h	f_h 0.61 MPa $f_{h \text{ ret}}$ 102 %	-
		3000 h	f_h 0.78 MPa $f_{h \text{ ret}}$ 131 %	-
alkali		1000 h	f_h 0.69 MPa $f_{h \text{ ret}}$ 116 %	-
		3000 h	f_h 0.65 MPa $f_{h \text{ ret}}$ 109 %	-
Bond strength on substrate TUFF: pull-off test (f_h) G1200+GCF		ambient		0.43 MPa
	water	1000 h	f_h 0.42 MPa $f_{h \text{ ret}}$ 97 %	-
		3000 h	f_h 0.44 MPa $f_{h \text{ ret}}$ 103 %	-
	saltwater	1000 h	f_h 0.40 MPa $f_{h \text{ ret}}$ 94 %	-
		3000 h	f_h 0.43 MPa $f_{h \text{ ret}}$ 100 %	-
	alkali	1000 h	f_h 0.49 MPa $f_{h \text{ ret}}$ 114 %	-
		3000 h	f_h 0.42 MPa $f_{h \text{ ret}}$ 97 %	-

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Bond strength on substrate CONCRETE: single-lap shear test G1200+GL	ambient		P_{max} 8061 N P_{deb} 7512 N $\sigma_{lim,conv}$ 936 MPa	P_{max} 7175 N P_{deb} 6791 N $\sigma_{lim,conv}$ 834 MPa
	water	1000 h	P_{max} 8569 N P_{deb} 7914 N $P_{max ret}$ 106 % $P_{deb ret}$ 105 %	-
		3000 h	P_{max} 8440 N P_{deb} 7803 N $P_{max ret}$ 105 % $P_{deb ret}$ 104 %	-
	saltwater	1000 h	P_{max} 9761 N P_{deb} 8558 N $P_{max ret}$ 121 % $P_{deb ret}$ 114 %	-
		3000 h	P_{max} 10102 N P_{deb} 9157 N $P_{max ret}$ 125 % $P_{deb ret}$ 122 %	-
	alkali	1000 h	P_{max} 10209 N P_{deb} 9480 N $P_{max ret}$ 127 % $P_{deb ret}$ 126 %	-
		3000 h	P_{max} 8669 N P_{deb} 8325 N $P_{max ret}$ 108 % $P_{deb ret}$ 111 %	-
	Bond strength on substrate CLAY: single-lap shear test G1200+GCF	ambient		P_{max} 7535 N P_{deb} 6890 N $\sigma_{lim,conv}$ 875 MPa
water		1000 h	P_{max} 8309 N P_{deb} 7743 N $P_{max ret}$ 110 % $P_{deb ret}$ 112 %	-
		3000 h	P_{max} 8053 N P_{deb} 7471 N $P_{max ret}$ 107 % $P_{deb ret}$ 108 %	-
saltwater		1000 h	P_{max} 6718 N P_{deb} 6137 N $P_{max ret}$ 89 % $P_{deb ret}$ 89 %	-
		3000 h	P_{max} 6356 N P_{deb} 5803 N $P_{max ret}$ 84 % $P_{deb ret}$ 84 %	-
alkali		1000 h	P_{max} 6626 N P_{deb} 6230 N $P_{max ret}$ 88 % $P_{deb ret}$ 90 %	-
		3000 h	P_{max} 8510 N P_{deb} 8195 N $P_{max ret}$ 113 % $P_{deb ret}$ 119 %	-

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Bond strength on substrate TUFF: single-lap shear test G1200+GCF	ambient		P_{max} 7620 N P_{deb} 7425 N $\sigma_{lim,conv}$ 885 MPa	P_{max} 6998 N P_{deb} 6657 N $\sigma_{lim,conv}$ 813 MPa
	water	1000 h	P_{max} 7358 N P_{deb} 7238 N $P_{max,ret}$ 97 % $P_{deb,ret}$ 97 %	-
		3000 h	P_{max} 6580 N P_{deb} 5953 N $P_{max,ret}$ 86 % $P_{deb,ret}$ 80 %	-
	saltwater	1000 h	P_{max} 6646 N P_{deb} 5913 N $P_{max,ret}$ 87 % $P_{deb,ret}$ 80 %	-
		3000 h	P_{max} 5915 N P_{deb} 5503 N $P_{max,ret}$ 78 % $P_{deb,ret}$ 74 %	-
	alkali	1000 h	P_{max} 6921 N P_{deb} 6629 N $P_{max,ret}$ 91 % $P_{deb,ret}$ 89 %	-
		3000 h	P_{max} 5829 N P_{deb} 4843 N $P_{max,ret}$ 76 % $P_{deb,ret}$ 65 %	-
	Bond strength on substrate NATURAL STONE: single-lap shear test G1200+GCF	ambient		P_{max} 7505 N P_{deb} 6112 N $\sigma_{lim,conv}$ 872 MPa
Pull out from substrate CONCRETE: (failure mode FR) G1200+GLM	ambient		$\sigma_{pull-out}$ 2577 MPa $\delta_{pull-out}$ 8,3 mm	-
	water	1000 h	$\sigma_{pull-out}$ 2330 MPa $\delta_{pull-out}$ 7.22 mm $\sigma_{pull-out,ret}$ 90 %	-
		3000 h	$\sigma_{pull-out}$ 2347 MPa $\delta_{pull-out}$ 6.56 mm $\sigma_{pull-out,ret}$ 91 %	-
	saltwater	1000 h	$\sigma_{pull-out}$ 2399 MPa $\delta_{pull-out}$ 9.94 mm $\sigma_{pull-out,ret}$ 93 %	-
		3000 h	$\sigma_{pull-out}$ 2103 MPa $\delta_{pull-out}$ 6.10 mm $\sigma_{pull-out,ret}$ 82 %	-
	alkali	1000 h	$\sigma_{pull-out}$ 2351 MPa $\delta_{pull-out}$ 7.18 mm $\sigma_{pull-out,ret}$ 91 %	-
		3000 h	$\sigma_{pull-out}$ 2357 MPa $\delta_{pull-out}$ 7.70 mm $\sigma_{pull-out,ret}$ 91 %	-

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Pull out from substrate CLAY: (failure mode MS) G1200+GCFL	ambient		$\sigma_{\text{pull-out}}$ 2281 MPa $\delta_{\text{pull-out}}$ 7,7 mm	-
	water	1000 h	$\sigma_{\text{pull-out}}$ 2151 MPa $\delta_{\text{pull-out}}$ 6.60 mm $\sigma_{\text{pull-out ret}}$ 94 %	-
		3000 h	$\sigma_{\text{pull-out}}$ 2160 MPa $\delta_{\text{pull-out}}$ 6.98 mm $\sigma_{\text{pull-out ret}}$ 95 %	-
	saltwater	1000 h	$\sigma_{\text{pull-out}}$ 2128 MPa $\delta_{\text{pull-out}}$ 7.10 mm $\sigma_{\text{pull-out ret}}$ 93 %	-
		3000 h	$\sigma_{\text{pull-out}}$ 2173 MPa $\delta_{\text{pull-out}}$ 7.08 mm $\sigma_{\text{pull-out ret}}$ 95 %	-
	alkali	1000 h	$\sigma_{\text{pull-out}}$ 2475 MPa $\delta_{\text{pull-out}}$ 8.38 mm $\sigma_{\text{pull-out ret}}$ 108 %	-
		3000 h	$\sigma_{\text{pull-out}}$ 2296 MPa $\delta_{\text{pull-out}}$ 7.02 mm $\sigma_{\text{pull-out ret}}$ 101 %	-
	Pull out from substrate TUFF: (failure mode TS) G1200+ GCFL	ambient		$\sigma_{\text{pull-out}}$ 2383 MPa $\delta_{\text{pull-out}}$ 9,5 mm
water		1000 h	$\sigma_{\text{pull-out}}$ 2041 MPa $\delta_{\text{pull-out}}$ 6.82 mm $\sigma_{\text{pull-out ret}}$ 86 %	-
		3000 h	$\sigma_{\text{pull-out}}$ 1940 MPa $\delta_{\text{pull-out}}$ 6.28 mm $\sigma_{\text{pull-out ret}}$ 81 %	-
saltwater		1000 h	$\sigma_{\text{pull-out}}$ 1591 MPa $\delta_{\text{pull-out}}$ 5.52 mm $\sigma_{\text{pull-out ret}}$ 67 %	-
		3000 h	$\sigma_{\text{pull-out}}$ 1552 MPa $\delta_{\text{pull-out}}$ 4.82 mm $\sigma_{\text{pull-out ret}}$ 65 %	-
alkali		1000 h	$\sigma_{\text{pull-out}}$ 1696 MPa $\delta_{\text{pull-out}}$ 5.40 mm $\sigma_{\text{pull-out ret}}$ 71 %	-
		3000 h	$\sigma_{\text{pull-out}}$ 1529 MPa $\delta_{\text{pull-out}}$ 4.92 mm $\sigma_{\text{pull-out ret}}$ 64 %	-

GL = GeoLite; GCF = Geocalce F Antisismico

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
 via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
 Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Essential characteristics	Performance					
			Average Value	Characteristic value		
Freezing and Thawing	Direct tension	GL	Tensile strength $\sigma_{u,FT}$ Strain $\varepsilon_{u,FT}$ Stiffness moduli E_{1FT} Stiffness moduli E_{3FT} Inter shear strength (τ_{FT})	2942 MPa 1,84 % 984 GPa 180 GPa 4.74 MPa	2792 MPa 1,46 % 535 GPa 147 GPa 3.72 MPa	
		GCF	Tensile strength $\sigma_{u,FT}$ Strain $\varepsilon_{u,FT}$ Stiffness moduli E_{1FT} Stiffness moduli E_{3FT} Inter shear strength (τ_{FT})	2947 MPa 1,88 % 469 GPa 188 GPa 1.31 MPa	2787 MPa 1,11 % 149 GPa 147 GPa 1.03 MPa	
	Retained properties	GL	Tensile strength $\sigma_{u,FT,ret}$ Stiffness moduli $E_{1FT,ret}$ Stiffness moduli $E_{3FT,ret}$ Inter shear strength ($\tau_{FT,ret}$)	99 % 73% 92% 92 %	-	
		GCF	Tensile strength $\sigma_{u,FT,ret}$ Stiffness moduli $E_{1FT,ret}$ Stiffness moduli $E_{3FT,ret}$ Inter shear strength ($\tau_{FT,ret}$)	101% 44% 101% 79 %	-	
	Water resistance	Direct tension (1000 h)	GL	Tensile strength $\sigma_{u,w}$ Strain $\varepsilon_{u,w}$ Stiffness moduli E_{1w} Stiffness moduli E_{3w} Inter. shear strength (τ_w) Lap tensile ($\sigma_{lap,w}$)	2941 MPa 2.02 % 1288 GPa 172 GPa 4.48 MPa 1056 MPa	2738 MPa 1,23 % -(1) 135 GPa 2.01 MPa 863 MPa
			GCF	Tensile strength $\sigma_{u,w} \geq$ Strain $\varepsilon_{u,w} \geq$ Stiffness moduli $E_{1w} \geq$ Stiffness moduli $E_{3w} \geq$ Inter. shear strength (τ_w) Lap tensile ($\sigma_{lap,w}$)	3029 MPa 2.10 % 934 GPa 176 GPa 2.20 MPa 987 MPa	3000 MPa 1,46 % 767 GPa 117 GPa 1.56 MPa 866 MPa
Direct tension (3000 h)		GL	Tensile strength $\sigma_{u,w}$ Strain $\varepsilon_{u,w}$ Stiffness moduli E_{1w} Stiffness moduli E_{3w} Inter. shear strength (τ_w) Lap tensile ($\sigma_{lap,w}$)	2965 MPa 1,76 % 858 GPa 168 GPa 4.84 MPa 1327 MPa	2792 MPa 1,30 % 413 GPa 135 GPa 2.29 MPa 1205 MPa	
		GCF	Tensile strength $\sigma_{u,w} \geq$ Strain $\varepsilon_{u,w} \geq$ Stiffness moduli $E_{1w} \geq$ Stiffness moduli $E_{3w} \geq$ Inter. shear strength (τ_w) Lap tensile ($\sigma_{lap,w}$)	3006 MPa 1,76 % 501 GPa 189 GPa 1.77 MPa 827 MPa	2876 MPa 1,03 % 146 GPa 141 GPa 0.48 MPa 614 MPa	
Retained properties (1000 h)		GL	Tensile strength $\sigma_{u,w,ret}$ Stiffness moduli $E_{1w,ret}$ Stiffness moduli $E_{3w,ret}$ Inter. shear strength ($\tau_{w,ret}$) Lap tensile ($\sigma_{lap,w,ret}$)	99 % 95 % 88 % 87 % 86 %	-	
		GCF	Tensile strength $\sigma_{u,w,ret}$ Stiffness moduli $E_{1w,ret}$ Stiffness moduli $E_{3w,ret}$ Inter. shear strength ($\tau_{w,ret}$) Lap tensile ($\sigma_{lap,w,ret}$)	104 % 88 % 94 % 134 % 95 %	-	
Retained properties (3000 h)		GL	Tensile strength $\sigma_{u,w,ret}$ Stiffness moduli $E_{1w,ret}$ Stiffness moduli $E_{3w,ret}$ Inter. shear strength ($\tau_{w,ret}$) Lap tensile ($\sigma_{lap,w,ret}$)	100 % 63 % 86 % 94 % 108 %	-	

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

		GCF	Tensile strength $\sigma_{u,sw,ret}$ Stiffness moduli $E_{1,sw,ret}$ Stiffness moduli $E_{3,sw,ret}$ Inter. shear strength ($\tau_{sw,ret}$) Lap tensile ($\sigma_{lap,sw,ret}$)	103 % 47 % 101 % 108 % 79 %	-
--	--	-----	--	---	---

GL = GeoLite; GCF = Geocalce F Antisismico

Essential characteristics			Performance		
				Average Value	Characteristic value
Saltwater resistance	Direct tension (1000 h)	GL	Tensile strength $\sigma_{u,sw}$ Strain $\epsilon_{u,sw}$ Stiffness moduli $E_{1,sw}$ Stiffness moduli $E_{3,sw}$ Inter. shear strength (τ_{sw}) Lap tensile ($\sigma_{lap,sw}$)	2750 MPa 1,73 % 1594 GPa 181 GPa 4.56 MPa 1268 MPa	2440 MPa 1,31 % 298 GPa 168 GPa 3.24 MPa 1085 MPa
		GCF	Tensile strength $\sigma_{u,sw}$ Strain $\epsilon_{u,sw}$ Stiffness moduli $E_{1,sw}$ Stiffness moduli $E_{3,sw}$ Inter. shear strength (τ_{sw}) Lap tensile ($\sigma_{lap,sw}$)	2672 MPa 1.51 % 1208 GPa 183 GPa 2.93 MPa 910 MPa	2207 MPa 1.22 % (*) 165 GPa 2.28 MPa 834 MPa
	Direct tension (3000 h)	GL	Tensile strength $\sigma_{u,sw}$ Strain $\epsilon_{u,sw}$ Stiffness moduli $E_{1,sw}$ Stiffness moduli $E_{3,sw}$ Inter. shear strength (τ_{sw}) Lap tensile ($\sigma_{lap,sw}$)	2350 MPa 1.35 % 1028 GPa 177 GPa 4.11 MPa 1233 MPa	1833 MPa 0,88 % 6.7 GPa 123 GPa 2.95 MPa 1003 MPa
		GCF	Tensile strength $\sigma_{u,sw}$ Strain $\epsilon_{u,sw}$ Stiffness moduli $E_{1,sw}$ Stiffness moduli $E_{3,sw}$ Inter. shear strength (τ_{sw}) Lap tensile ($\sigma_{lap,sw}$)	2638 MPa 1.43 % 1015 GPa 191 GPa 2.42 MPa 882 MPa	2407 MPa 1.25 % 492 GPa 166 GPa 1.30 MPa 807 MPa
	Retained properties (1000 h)	GL	Tensile strength $\sigma_{u,sw,ret}$ Stiffness moduli $E_{1,sw,ret}$ Stiffness moduli $E_{3,sw,ret}$ Inter. shear strength ($\tau_{sw,ret}$) Lap tensile ($\sigma_{lap,sw,ret}$)	93 % 118 % 93 % 89 % 103 %	-
		GCF	Tensile strength $\sigma_{u,sw,ret}$ Stiffness moduli $E_{1,sw,ret}$ Stiffness moduli $E_{3,sw,ret}$ Inter. shear strength ($\tau_{sw,ret}$) Lap tensile ($\sigma_{lap,sw,ret}$)	92 % 114 % 98 % 178 % 87 %	-
	Retained properties (3000 h)	GL	Tensile strength $\sigma_{u,sw,ret}$ Stiffness moduli $E_{1,sw,ret}$ Stiffness moduli $E_{3,sw,ret}$ Inter. shear strength ($\tau_{sw,ret}$) Lap tensile ($\sigma_{lap,sw,ret}$)	79 % 76 % 91 % 80 % 100 %	-
		GCF	Tensile strength $\sigma_{u,sw,ret}$ Stiffness moduli $E_{1,sw,ret}$ Stiffness moduli $E_{3,sw,ret}$ Inter. shear strength ($\tau_{sw,ret}$) Lap tensile ($\sigma_{lap,sw,ret}$)	90 % 95 % 102 % 147 % 85 %	-

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Essential characteristics			Performance			
				Average Value	Characteristic value	
Alkali resistance	Direct tension (1000 h)	GL	Tensile strength $\sigma_{u, alk} \geq$ Strain $\epsilon_{u, alk} \geq$ Stiffness moduli $E_{1, alk} \geq$ Stiffness moduli $E_{3, alk} \geq$ Inter. shear strength (τ_{alk}) Lap tensile ($\sigma_{lap alk}$)	2978 MPa 1,84 % 1551 GPa 176 GPa 4.27 MPa 1324 MPa	2807 MPa 1,51 % 767 GPa 172 GPa 3.94 MPa 1218 MPa	
		GCF	Tensile strength $\sigma_{u, alk} \geq$ Strain $\epsilon_{u, alk} \geq$ Stiffness moduli $E_{1, alk} \geq$ Stiffness moduli $E_{3, alk} \geq$ Inter. shear strength (τ_{alk}) Lap tensile ($\sigma_{lap alk}$)	2732 MPa 1,78 % 1072 GPa 187 GPa 2.05 MPa 874 MPa	2216 MPa 1,42 % 738 GPa 168 GPa 0.98 MPa 837 MPa	
	Direct tension (3000 h)	GL	Tensile strength $\sigma_{u, alk} \geq$ Strain $\epsilon_{u, alk} \geq$ Stiffness moduli $E_{1, alk} \geq$ Stiffness moduli $E_{3, alk} \geq$ Inter. shear strength (τ_{alk}) Lap tensile ($\sigma_{lap alk}$)	2974 MPa 1,89 % 1186 GPa 167 GPa 5.58 MPa 1145 MPa	2748 MPa 1,63 % 709 GPa 144 GPa 3.58 MPa 1036 MPa	
		GCF	Tensile strength $\sigma_{u, alk} \geq$ Strain $\epsilon_{u, alk} \geq$ Stiffness moduli $E_{1, alk} \geq$ Stiffness moduli $E_{3, alk} \geq$ Inter. shear strength (τ_{alk}) Lap tensile ($\sigma_{lap alk}$)	3026 MPa 1,91 % 691 GPa 174 GPa 2.69 MPa 801 MPa	2965 MPa 1,53 % 161 GPa 159 GPa 2.12 MPa 700 MPa	
	Retained properties (1000 h)	GL	Tensile strength $\sigma_{u, alk, ret}$ Stiffness moduli $E_{1, alk, ret}$ Stiffness moduli $E_{3, alk, ret}$ Inter. shear strength ($\tau_{alk, ret}$) Lap tensile ($\sigma_{lap alk, ret}$)	100 % 115 % 90 % 83 % 108 %	-	
		GCF	Tensile strength $\sigma_{u, alk, ret}$ Stiffness moduli $E_{1, alk, ret}$ Stiffness moduli $E_{3, alk, ret}$ Inter. shear strength ($\tau_{alk, ret}$) Lap tensile ($\sigma_{lap alk, ret}$)	94 % 101 % 100 % 124 % 84 %	-	
	Alkali resistance	Retained properties (3000 h)	GL	Tensile strength $\sigma_{u, alk, ret}$ Stiffness moduli $E_{1, alk, ret}$ Stiffness moduli $E_{3, alk, ret}$ Inter. shear strength ($\tau_{alk, ret}$) Lap tensile ($\sigma_{lap alk, ret}$)	100 % 88 % 86 % 109 % 93 %	-
			GCF	Tensile strength $\sigma_{u, alk, ret}$ Stiffness moduli $E_{1, alk, ret}$ Stiffness moduli $E_{3, alk, ret}$ Inter. shear strength ($\tau_{alk, ret}$) Lap tensile ($\sigma_{lap alk, ret}$)	104 % 65 % 93 % 164 % 77 %	-

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Essential characteristics			Performance		
				Average Value	Characteristic value
Alkali soil resistance	GL	Direct tension (1000 h)	Tensile strength $\sigma_{u, soil}$ Strain $\epsilon_{u, soil}$ Stiffness moduli $E_{1 soil}$ Stiffness moduli $E_{3 soil}$	2486 MPa 1.47 % 1550 GPa 172 GPa	2074 MPa 1.03 % 1195 GPa 144 GPa
		Retained properties (1000 h)	Tensile strength $\sigma_{u, soil,ret}$ Stiffness moduli $E_{1 soil,ret}$ Stiffness moduli $E_{3 soil,ret}$	84 % 115 % 88 %	-
	GCF	Direct tension (1000 h)	Tensile strength $\sigma_{u, soil}$ Strain $\epsilon_{u, soil}$ Stiffness moduli $E_{1 soil}$ Stiffness moduli $E_{3 soil}$	2756 MPa 1.81 % 1005 GPa 185 GPa	2330 MPa 1.35 % 633 GPa 162 GPa
		Retained properties (1000 h)	Tensile strength $\sigma_{u, soil,ret}$ Stiffness moduli $E_{1 soil,ret}$ Stiffness moduli $E_{3 soil,ret}$	94 % 95 % 99 %	-
Dry heat resistance	GL	Direct tension (1000 h)	Tensile strength $\sigma_{u, heat}$ Strain $\epsilon_{u, heat}$ Stiffness moduli $E_{1 heat}$ Stiffness moduli $E_{3 heat}$	2800 MPa 1.64 % 995 GPa 183 GPa	2447 MPa 1.32 % 163 GPa 163 GPa
		Retained properties (1000 h)	Tensile strength $\sigma_{u, heat,ret}$ Stiffness moduli $E_{1 heat,ret}$ Stiffness moduli $E_{3 heat,ret}$	94 % 74 % 94 %	-
		Direct tension (3000 h)	Tensile strength $\sigma_{u, heat}$ Strain $\epsilon_{u, heat}$ Stiffness moduli $E_{1 heat}$ Stiffness moduli $E_{3 heat}$	2984 MPa 1.86 % 1047 GPa 176 GPa	2757 MPa 1.64 % 158 GPa 158 GPa
		Retained properties (3000 h)	Tensile strength $\sigma_{u, heat,ret}$ Stiffness moduli $E_{1 heat,ret}$ Stiffness moduli $E_{3 heat,ret}$	101 % 77 % 90 %	-
	GCF	Direct tension (1000 h)	Tensile strength $\sigma_{u, heat}$ Strain $\epsilon_{u, heat}$ Stiffness moduli $E_{1 heat}$ Stiffness moduli $E_{3 heat}$	3006 MPa 1.93 % 816 GPa 178 GPa	2849 MPa 1.54 % 514 GPa 151 GPa
		Retained properties (1000 h)	Tensile strength $\sigma_{u, heat,ret}$ Stiffness moduli $E_{1 heat,ret}$ Stiffness moduli $E_{3 heat,ret}$	103 % 77 % 95 %	-
		Direct tension (3000 h)	Tensile strength $\sigma_{u, heat}$ Strain $\epsilon_{u, heat}$ Stiffness moduli $E_{1 heat}$ Stiffness moduli $E_{3 heat}$	3017 MPa 1.74 % 717 GPa 195 GPa	2833 MPa 1.56 % 148 GPa 148 GPa
		Retained properties (3000 h)	Tensile strength $\sigma_{u, heat,ret}$ Stiffness moduli $E_{1 heat,ret}$ Stiffness moduli $E_{3 heat,ret}$	103 % 67 % 105 %	-

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Reg. MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Essential characteristics			Performance		
				Average Value	Characteristic value
Fuel resistance	GL	Direct tension	Tensile strength $\sigma_{u, fuel}$ Strain $\varepsilon_{u, fuel}$ Stiffness moduli $E_{1 fuel}$ Stiffness moduli $E_{3 fuel}$	2928 MPa 2.00 % 1112 GPa 162 GPa	2752 MPa 1.76 % 605 GPa 151 GPa
		Retained properties	Tensile strength $\sigma_{u, fuel,ret}$ Stiffness moduli $E_{1 fuel,ret}$ Stiffness moduli $E_{3 fuel,ret}$	99 % 82 % 83 %	-
	GCF	Direct tension	Tensile strength $\sigma_{u, fuel}$ Strain $\varepsilon_{u, fuel} \geq$ Stiffness moduli $E_{1 fuel}$ Stiffness moduli $E_{3 fuel}$	3054 MPa 2.25 % 597 GPa; 174 GPa	3031 MPa 2.11 % 491 GPa; 168 GPa
		Retained properties	Tensile strength $\sigma_{u, fuel,ret}$ Stiffness moduli $E_{1 fuel,ret}$ Stiffness moduli $E_{3 fuel,ret}$	105 % 56 % 93 %	-
Creep behaviour related to the adhesion on substrate	Substrate: concrete		Displacement vs time (tabular) Maximum load $P_{max, creep}$ Bond capacity $P_{max, creep}$	0.003 mm 5627 N 5236 N	- 4477 N 5236 N
	Substrate: clay		Displacement vs time (tabular) Maximum load $P_{max, creep}$ Bond capacity $P_{max, creep}$	0.007 mm 6947 N 6697 N	- 5736 N 6697 N
	Substrate: tuff		Displacement vs time (tabular) Maximum load $P_{max, creep}$ Bond capacity $P_{max, creep}$	0.013 mm 6203 N 5701 N	- 5211 N 5701 N
Tensile strength after long term actions (creep) - GL	100 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3 creep}$	3018 MPa 2.18 % 176 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep,ret}$ Stiffness moduli $E_{3 creep,ret}$	102 % 90 %	
	500 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3 creep}$	2987 MPa 1.85 % 201 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep,ret}$ Stiffness moduli $E_{3 creep,ret}$	101 % 102 %	
	1000 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3 creep}$	2997 MPa 1.97 % 210 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep,ret}$ Stiffness moduli $E_{3 creep,ret}$	101 % 107 %	
	4000 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3 creep}$	3043 MPa 1.97 % 199 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep,ret}$ Stiffness moduli $E_{3 creep,ret}$	103 % 102 %	

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
Rea MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.



kerakoll

Essential characteristics			Performance		
				Average Value	Characteristic value
Tensile strength after long term actions (creep) - GCF	100 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3, creep}$	2766 MPa 1.67 % 192 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep, ret}$ Stiffness moduli $E_{3, creep, ret}$	95 % 102 %	
	500 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3, creep}$	2854 MPa 1.89 % 194 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep, ret}$ Stiffness moduli $E_{3, creep, ret}$	98 % 104 %	
	1000 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3, creep}$	2576 MPa 1.86 % 178 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep, ret}$ Stiffness moduli $E_{3, creep, ret}$	88 % 95 %	
	4000 h	Direct tension	Tensile strength $\sigma_{u, creep}$ Strain $\varepsilon_{u, creep}$ Stiffness moduli $E_{3, creep}$	2788 MPa 1.98 % 170 GPa	
		Retained properties	Tensile strength $\sigma_{u, creep, ret}$ Stiffness moduli $E_{3, creep, ret}$	96 % 91 %	
	Tensile strength after low number of cycles (seismic behaviour)	GL	Tensile strength $\sigma_{u, seismic}$ Strain $\varepsilon_{u, seismic}$ Stiffness moduli $E_{1, seismic, ret}$ Stiffness moduli $E_{3, seismic, ret}$	3023 MPa 2.00 % 1237 GPa 189 GPa	2864 MPa 1.61 % 510 GPa 185 GPa
		GCF	Tensile strength $\sigma_{u, seismic}$ Strain $\varepsilon_{u, seismic}$ Stiffness moduli $E_{1, seismic, ret}$ Stiffness moduli $E_{3, seismic, ret}$	3071 MPa 2.30 % 840 GPa 176 GPa	3027 MPa 1.51 % 548 GPa 172 GPa
	Tensile strength after high number of cycles (fatigue actions)	GL	Tensile strength $\sigma_{u, fatigue}$ Strain $\varepsilon_{u, fatigue}$ Stiffness moduli $E_{1, fatigue, ret}$ Stiffness moduli $E_{3, fatigue, ret}$	2938 MPa 1.87 % 493 GPa 177 GPa	2746 MPa 1.31 % 367 GPa 149 GPa
		GCF	Tensile strength $\sigma_{u, fatigue}$ Strain $\varepsilon_{u, fatigue}$ Stiffness moduli $E_{1, fatigue, ret}$ Stiffness moduli $E_{3, fatigue, ret}$	3043 MPa 1.83 % 635 GPa 195 GPa	2990 MPa 1.54 % 530 GPa 168 GPa
Mechanical properties of fabric	10 cords		Ultimate stress $\sigma_{u, f}$ Ultimate strain $\varepsilon_{u, f}$ Mean elastic modulus E_f	3005 MPa 1,90 % 184 GPa	2794 MPa 1,42 % 145 GPa
	16 cords		Ultimate stress $\sigma_{u, f}$ Ultimate strain $\varepsilon_{u, f}$ Mean elastic modulus E_f	3050 MPa 2,00 % 194 GPa	2847 MPa 1,48 % 159 GPa
	16 cords	concrete + GL clay + GCF tuff + GCF natural stone+ GCF	$\varepsilon_{lim, conv}$ $\varepsilon_{lim, conv}$ $\varepsilon_{lim, conv}$ $\varepsilon_{lim, conv}$	0,48 % 0,45 % 0,45 % 0,45 %	0,43 % 0,41 % 0,42 % 0,38 %
Tensile strength on bent fabric	Straight fabric		$\sigma_{u, f, straight}$ $\sigma_{u, f, straight, sw1000}$ $\sigma_{u, f, straight, sw3000}$	3110 MPa 2898 MPa 2670 MPa	3046 MPa 2621 MPa 2524 MPa
	Bent fabric		$\sigma_{u, f, bent}$ $\sigma_{u, f, bent, sw1000}$ $\sigma_{u, f, bent, sw3000}$	2510 MPa 2464 MPa 2052 MPa	2406 MPa 2348 MPa 1948 MPa

GL = GeoLite; GCF = Geocalce F Antisismico
 (1) value not determinable due to the high dispersion of results
 (2) Rupture of fibres was observed outside the bonded length

kerakoll.com

KERAKOLL Spa - Società con unico socio Fin Firel Spa - Soggetta a direzione e coordinamento di Fin-Firel Spa
 via dell'Artigianato, 9 - 41049 Sassuolo (MO) Italia - Tel +39 0536 816 511 - Fax +39 0536 816 581 - e-mail: info@kerakoll.com
 Reg. MO n. 231812 - Reg. Imp. / Cod. Fisc. / P. Iva IT 01174510360 - Cap. Soc. € 2.000.000,00 i.v.