



GETELEC

We protect your electronics



OUR SOLUTIONS FOR RAILWAYS INDUSTRIES

www.getelec.com

INTRODUCTION

Combining more than 50 years of experience in EMC shielding, heat dissipation and environmental sealing solutions, GETELEC teams design and deliver innovative solutions dedicated to the railway sector..

The diversification of this sector requires specific knowledge for the various infrastructures, both for rolling stock and for railway signaling.

Today, railway sector is a strategic activity where each actor tries to strengthen himself. GETELEC provides a Research and Development team to ensure the daily development of microwave shielding, heat dissipation and environmental sealing solutions meeting the requirements of EN 45545-2.



EMBEDDED SYSTEMS

Systems embedded in rail transport are numerous and indispensable. Often faced with problems related to corrosion, humidity and electromagnetic compatibility, GETELEC develops conductive mixtures to guarantee an EMC shielding adapted to your environment as well as specific solutions for heat dissipation.



ROLLING MATERIALS

Rolling stock is exposed to harsh environments representing design challenges for engineers. By enriching our range of conductive mixes and elastomers environmental sealing, GETELEC intervenes with market players.



SIGNALING

The regulation of rail traffic is ensured by signaling systems controlled from power electronics arranged over the entire CBTC type network

The flow of information generated by these systems must not be hampered by electromagnetic disturbances. Using an EMC shielding gasket is necessary to ensure the proper functioning of the systems.

RANGE OF PRODUCTS

EMI CONDUCTIVE SILICONE GASKETS

GETELEC develops its own conductive mixtures meeting the requirements of standards MIL G 83528, MIL STD 285, GAM EG-13. Our EMC experts are at your disposal to assist you in the definition of your projects. All of these seals are available as molded, cut flat, extruded and overmolded parts.

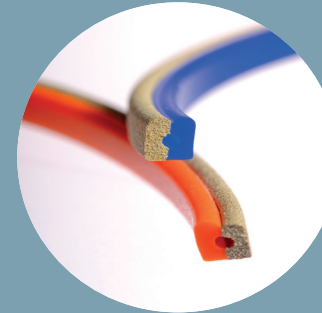
Volume Resistivity of 0.0016 Ω .cm to 2.7 Ω .cm
Shielding effectiveness between 80dB to 140dB (20MHz - 10GHz)



EMI CONDUCTIVE CORROSION-RESISTANT SILICONE GASKET

Bi-material seals are an effective solution to the corrosion problems encountered by using conductive gaskets while they are in contact with different electrolytic agents, salt spray or acid medium. Composed of a conductive silicone part and an environmental sealing part, all joined in one gasket by a principle of co-extrusion, they generate a gain in terms of size in your equipment.

Volume resistivity from 0.016 Ω .cm to 2.7 Ω .cm
Shielding effectiveness between 80 dB and 140 dB (20 MHz - 10GHz)

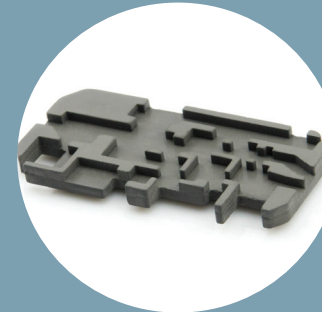


MICROWAVE ABSORBERS

Microwave absorbers consists of flexible silicone materials filled of magnetic particles. These materials ensure an excellent attenuation performance over given frequency bands, which can reach an attenuation greater than 20 dB of the incident wave.

Our laboratory has developed several formulations composed of epoxy type rigid microwave absorbers, silicone-based flexible microwave absorbers and foams of different thicknesses.

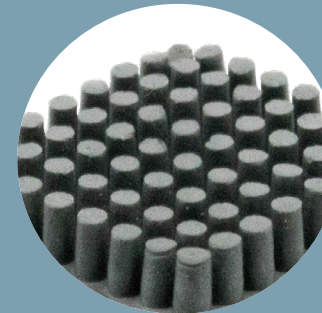
Range of natural frequencies of absorptions between 1 GHz and 40 GHz.



THERMAL INTERFACE MATERIALS

Positioned between the power component and the cooler, thermal pads are designed to optimize the heat dissipation and thus reduce the thermal resistance of your equipment. Our complete range consists of high flexible thermally conductive gap fillers, thermally conductive electrical insulators, both electrical and thermal conductive silicones.

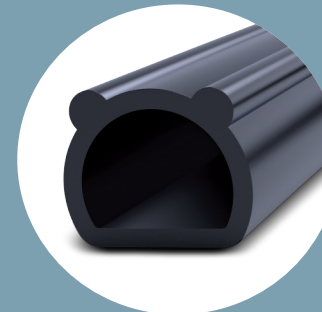
Thermal conductivity of our products is between 1 and 8.5 W/ m.K



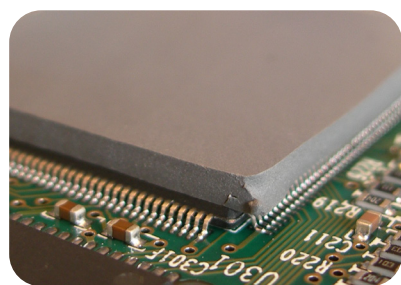
ENVIRONMENTAL SEALING SILICONE

GETELEC formulates its own silicone mixtures and masters the transformation, allowing it to offer a tailor-made solution to its customers

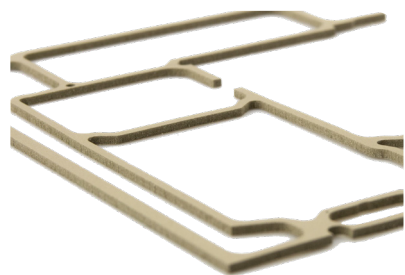
The use of specific silicone grade allows us to offer a complete range of silicones and fluorosilicones available at **hardnesses between 20 and 90 Shore A.**



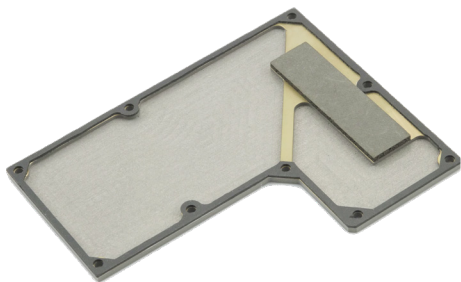
APPLICATIONS FOR THE RAILWAYS INDUSTRY



Thermal pad for heat dissipation
Thermal conductivity : 8.5W/m.K

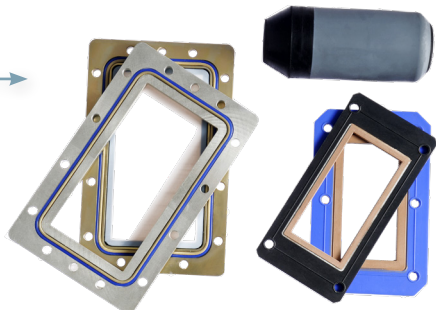


EMI Shielding gasket for electronic module
Conductive silicone charged Aluminum
Silver : Attenuation up to 140 dB



Environmental gasket molded on mechanical for signaling beacon

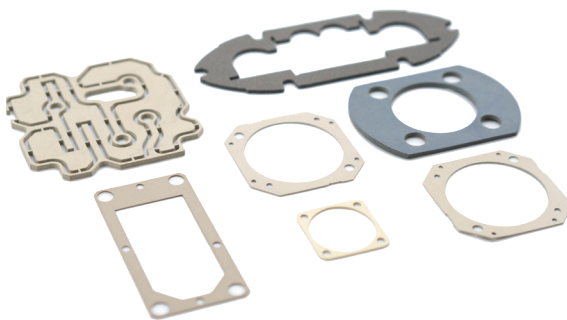
Anti-corrosion conductive silicone gaskets for waveguide flange (EMI Shielding)



EMI CONDUCTIVE SILICONE GASKETS

Our conductive materials are developed in every respect by our chemical engineers. From the selection of raw materials to the final transformation, they make specific formulations for each application and master all the processes of development.

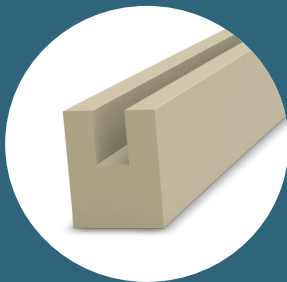
This mastery allows us to define the material according to your equipment, in order to offer you a bespoke solution adapted to your needs.



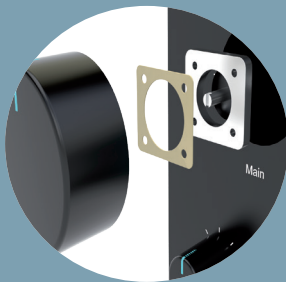
Properties	Standards	GT 1000	GT 5000	GT 3100	BL 10000
Type MIL G 83528		K	B		
Elastomer		Silicone	Silicone	Silicone	Silicone
Conductive filler		Silver-plated copper	Silver-plated aluminum	Nickel graphite	Carbon
Volume resistivity $\Omega \cdot \text{cm}$	MIL G 83528	< 0.005	< 0.0054	< 0.10	2.7
Hardness Shore A	ASTM D 2240	82	65	65	70
Density g/cm^3	ASTM D 792 Method A	3.40	1.90	2	1.22
Break resistance (Mpa)	ASTM D 412 Method A C	2.80	1.89	1.37	4.41
Elongation at break (%)	ASTM D 412 Method A C	250	286	150	200
Tear strength (N/mm)	ASTM D 624 Method C	13.44	8.43	8.73	11.77
Residual deformation after 70 hours at 100°C (%)	ASTM D 395 Method B	17.50	17.30	40	18
Working temperature (°C)		-55 °C to +125°C	-55 °C to +160°C	-55 °C to +160°C	-55 °C to +125°C
Shielding performance :					
20 MHz		130 dB	128 dB	100 dB	60 dB
100 MHz		140 dB	137 dB	100 dB	105 dB
500 MHz		120 dB	133 dB	100 dB	105 dB
2 GHz		120 dB	122 dB	100 dB	105 dB
10 GHz		120 dB	104 dB	100 dB	105 dB
Color		Grey	Grey	Dark grey	Black

All these products may be available in fluorinated version on demand.

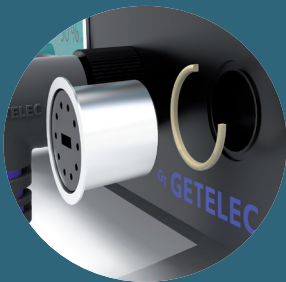
AVAILABLE FORMATS :



Extruded

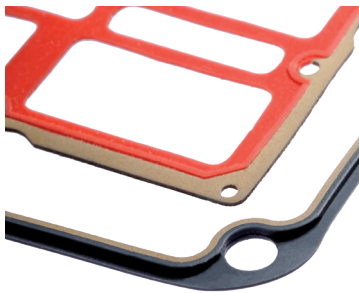


Cut



Molded

EMI CONDUCTIVE CORROSION-RESISTANT SILICONE GASKETS



By separating the EMI shielding function from the environmental sealing function, the seal becomes more resistant to extreme environments. Resistant to water and pressure, these bi-material seals offer a longer service life than a conductive mono-material seal.

Our expertise in silicone mixtures offers a range of materials with EMC performance characteristics, hardness and multi-contaminant behavior.

Properties	Standards	GT 1040	GT 1060	GT 5040	GT 5060
Elastomer		Silicone	Silicone	Silicone	Silicone
Conductive filler		Silver-plated copper		Slver-plated aluminum	
Volume resistivity Ω.cm	MIL G 83528	< 0.005		< 0.0054	
Hardness Shore A ± 7	ASTM D 2240	82		65	
Density g/cm ³	ASTM D 7992 Method A	3.40		1.90	
Break resistance (Mpa)	ASTM D 412 Method AC	2.20		1.89	
Elongation at break (%)	ASTM D 412 Method AC	250		286	
Tear strength (Kg/cm)	ASTM D 624 Method C	13.70		8.60	
Residual deformation after 70 hours at 100°C (%)	ASTM D 395 Method B	17.50		17.30	
Shielding performance					
20 MHz		130 dB		128 dB	
100 MHz		140 dB		137 dB	
500 MHz		120 dB		133 dB	
2 GHz		120 dB		122 dB	
10 GHz		120 dB		104 dB	
Working temperature (°C)		-55°C to +125°C		-55°C to+160°C	
Color		Beige		Beige	
Environmental sealing silicone					
Density g/cm ³	ASTM D 792	1.10	1.27	1.10	1.27
Hardness shore A ± 7	ASTM D 2240	40	60	40	60
Tensile strength					
Psi	ASTM D 412	1000	950	1000	950
Mpa		6.80	6.55	6.80	6.55
Elongation (%)	ASTM D 412	500	300	500	300
Residual deformation after 22 hours at 177°C (%)	ASTM D 395 Method B	30	33	30	33
Color		Orange	Blue	Orange	Blue

AVAILABLE FORMATS :



Extruded



Cut

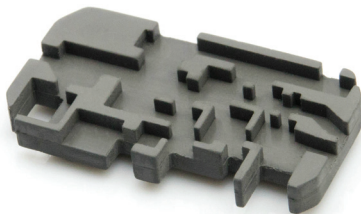


Molded

MICROWAVE ABSORBERS

Flexible silicone microwave absorbers

GT602 range have narrowband performance but also high-power density performance (> 1W / cm2) for positioning on antennas or high-power equipment. Thanks to its low degassing properties, our GT602 range is suitable for space applications. These absorbers are frequently used with adhesives for simplified implementation. Homogeneity is ensured by a complex mixture developed internally by GETELEC.



Our entire product range is available in sheet form or custom cut pieces.

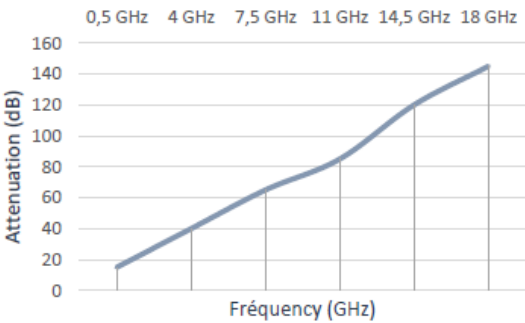
Attenuation guide

Attenuation		Percentage absorbed	
- 5 dB		68.38 %	
-10 dB		90.00 %	
-15 dB		96.84 %	
-20 dB		99.00 %	
-40 dB		99.99 %	
Getelec material reference		Thickness (mm)	Resonance frequency
GT 602 R90		4.5	1 GHz
GT 602 R90		3.2	2 GHz
GT 602 R90		2.4	3 GHz
GT 602 R90		2.2	4 GHz
GT 602 R88		2	5 GHz
GT 602 R85		2	6 GHz
GT 602 R85		1.8	7 GHz
GT 602 R85		1.6	8 GHz
GT 602 R85		1.5	9 GHz
GT 602 R85		1.3	10 GHz
GT 602 R74		1.7	11 GHz
GT 602 R71		1.6	12 GHz
GT 602 R71		1.5	13 GHz
GT 602 R71		1.45	14 GHz
GT 602 R71		1.4	15 GHz
GT 602 R71		1.3	16 GHz
GT 602 R65		1.2	17 GHz
GT 602 R65		1.15	18 GHz
GT 602 R64		1.1	24 GHz
GT 602 R63		0.95	28 GHz
GT 602 R62		1.1	35 GHz

Sheets or finished parts are available, on request, in version with or without adhesive.

Rigid microwave absorber | Epoxy

Properties	Standards	GT 502
Material		Epoxy
Hardness shore D	ASTM D 2240	95
Density g/cm3	ASTM D 792 Method A	4.57
Tensile strength Mpa	NF EN ISO 527-1	56
Elongation at break %	NF EN ISO 527-1	2.4
Working temperature °C		-180 °C to + 200°C



THERMAL INTERFACE MATERIAL

The GTG range includes highly conductive thermal mattresses ideal for applications requiring high thermal conductivity. Its specific formulations developed by our laboratory, as well as its loads, give these silicone elastomers an exceptional thermal conductivity.

Thanks to their great flexibility, flexibility and ease of installation, they follow the surface irregularities between the power component and the cooler as soon as they are assembled, which helps to dissipate heat and protect your equipment.



Thermal conductivity	Reference	Color	Hardness Shore 00	Thickness mm	Flame retardant	RoHs	Working temperature (°C)	Densitéy g/cm3	Elongation %	Thermal conductivity W/m.k	Dielectric strength kV/mm	Breakdown voltage kV/mm	Volume resistivity Ohm.m	Dielectric strength @1Mhz	Dissipation factor @1MHz
Standards			ASTM D2240		UL 94			ASTM D792	ASTM D412	ASTM D 7984 Modified transient plane source(MTPS)	ASTM D149	ASTM D149	ASTM D257	ASTM D150	ASTM D150
1 W/m.K	GTG 1-40	Grey	40 ± 2	0.5 to 20 mm	V0	Yes	-60°C to +200°C	2.6	< 200	1 ± 0.1	11	17	10 ¹³	4	0.006
	GTG 1.3-45*		45 ± 2							1.3 ± 0.1	5	18			
	GTG 1-60		60 ± 2							1 ± 0.1	11	17			
	GTG 1-75		75 ± 2												
	GTG 1-85		85 ± 2												
2 W/m.K	GTG 2-40	Blue	40 ± 2	0.5 to 20 mm	V0	Yes	-45 °C to +200°C	2.7	< 100	2 ± 0.1	14	17	10 ¹²	4.2	0.005
	GTG 2.5-50		50 ± 2					2.75		2.5 ± 0.1	18	16			
	GTG 2-60		60 ± 2					2.7		2 ± 0.1	14	17			
	GTG 2-75		75 ± 2												
	GTG 2-85		85 ± 2												
3 W/m.K	GTG 3-35	Light blue	35 ± 2	0.5 to 20 mm	V0	Yes	-40°C to + 200 °C	2.9	< 100	3 ± 0.1	11	15	10 ¹¹	5.5	0.005
	GTG 3-40		40 ± 2												
	GTG 3.5-50		50 ± 2					2.95		3.5 ± 0.1					
	GTG 3-60		60 ± 2												
	GTG 3-75		75 ± 2					2.9		3 ± 0.1					
	GTG 3-85		85 ± 2												
4 W/m.K	GTG 4-40	Green	40 ± 2	0.5 to 20 mm	V0	Yes	-40°C to + 200 °C	3.09	< 100	4 ± 0.1	16	18	10 ¹¹	7	0.008
	GTG 4-60		60 ± 2												
	GTG 4-75		75 ± 2												
	GTG 4-85		85 ± 2												
5 W/m.K	GTG 5-40	Green	40 ± 2	0.5 to 20 mm	V0	Yes	-40°C to +200°C	3.12	< 50	5 ± 0.1	15	18	10 ¹¹	7.5	0.006
	GTG 5-60		60 ± 2												
	GTG 5-75		75 ± 2												
	GTG 5-85		85 ± 2												
6 W/m.K	GTG 6-40	Green	40 ± 2	0.8 to 20 mm	V0	Yes	-40°C to +200°C	3.23	< 50	6 ± 0.1	14	17	10 ¹¹	8.1	0.007
	GTG 6-55		55 ± 2												
	GTG 6-75		75 ± 2												
	GTG 6-85		85 ± 2												
7 W/m.K	GTG 7.5-35	Light grey	35 ± 2	0.8 to 20 mm	V0	Yes	-40°C to +200°C	3.22	< 40	7.5 ± 0.1	10	16	10 ¹¹	7.9	0.013
	GTG 7.5-55		55 ± 2												
	GTG 7.5-75		75 ± 2												
	GTG 7.5-85		85 ± 2												
8 W/m.K	GTG 8-65	Light grey	65 ± 2	1 to 20 mm	V0	Yes	-40°C to +200°C	3.3	< 30	8 ± 0.1	8	14	10 ¹¹	7	0.02
	GTG 8.5-80		80 ± 5	1.5 to 10 mm	V0	Yes	-40°C to +150°C	3.02	> 20	8.6 ± 0.1	11	17	1*10 ¹¹	8.1	0.014

ENVIRONMENTAL SEALING SILICONE

Using specific silicone grades, forming the basis of our formulations, has allowed us to develop two main product families: Fluorinated silicones and non-fluorinated silicones, within our complete range of environmental sealing silicones.

The family of fluorinated silicones : FVMQ type (ASTM D1418), these elastomers offer excellent resistance to solvents, fuels, organic oils and silicone oils, while maintaining their mechanical properties over a wide range of temperatures (-60°C to + 230°C).

The family of non-fluorinated silicones : Of the VMQ type (ASTM D 1418), these elastomers allow the production of molded parts, extruded joints, flat seals cut or adhesively vulcanized. They retain their mechanical properties over a wide range of temperatures (-73°C to + 232°C).



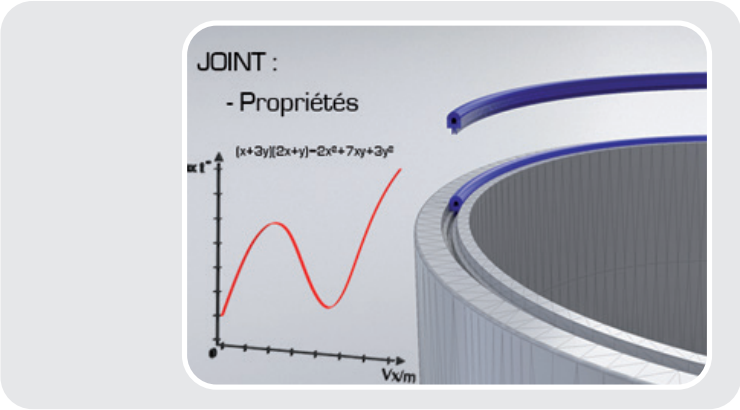
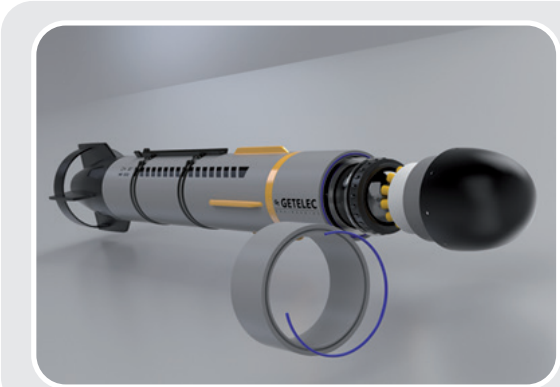
Properties	Standards	GT 20	GT 40	GT 47	GT 50	GT 57	GT 60	GT 67	GT 70	GT 77
Elastomer		Silicone	Silicone	Fluoro-silicone	Silicone	Fluoro-silicone	Silicone	Fluoro-silicone	Silicone	Fluoro-silicone
Hardness shore A ±5	ASTM D 2240	25	40	40	50	50	60	60	70	70
Specific mass at 25°C (g/cm3)	ASTM D 792	1.10	1.10	1.43	1.19	1.44	1.27	1.46	1.35	1.48
Tensile strength PSI MPa	ASTM D 412	870 6	1000 6.80	1250 8.60	980 6.75	1200 8.45	950 6.55	1200 8.30	1000 6.89	1250 8.60
Elongation (%)	ASTM D 412	950	500	400	380	350	300	300	180	300
Residual deformation after 22 hours at 177°C (%)	ASTM D 395 Method B	20	30	20	32	25	33	25	34	25
Color		Red*	Orange *	Blue *	Red *	Blue *	Blue*	Blue*	Red*	Blue*

*Customized color on request

TECHNICAL SEALING EXPERTISE

Requirements analysis

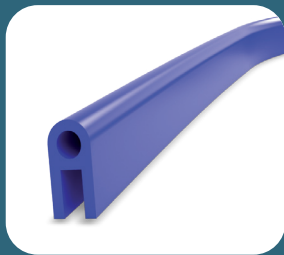
Our engineers help you to specify the product and develop a diagnostic, based on your requirements. Wether it is an extruded seal or a technical moulded item, our experts will use their know-how to guide you through design and production.



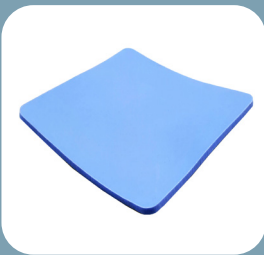
R&D : Formulation and processing

Our in-house control of elastomer formulations enables us to provide our customers with bespoke solutions, maintaining great responsiveness to customer requirements. Thanks to our team of chemical engineers and extensive range of machinery, we are very flexible, able to find the right choice of materials and process to meet your technical requirements.

AVAILABLE FORMATS :



Extruded



Cut



Molded

Tooling design

Our technical team determines and designs tools adapted to your projects. This in-house expertise allows us to offer your a turnkey solution, and support you throughout the duration of your project.



THEY TRUST US :

ALSTOM

SIEMENS

THALES



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