GETELEC

We protect your electronics

OUR SOLUTIONS FOR **SPACE INDUSTRY**

www.getelec.com

OUR COMPANY

An independent French company with unique know-how since 1968, Getelec has become a European specialist in elastomer formulations and a key partner for major clients in many industrial sectors. For 50 years, Getelec has been designing and manufacturing customised solutions for technical sealing, electromagnetic protection (EMC), microwave absorption and thermal dissipation. Getelec's products are particularly well suited to the protection of high-tech equipment placed under severe environmental constraints.

More than **130 000** products in orbit

30 material qualified aerospace

OUR KNOW-HOW

Our materials are developed by our chemical engineers. From the selection of raw materials to final processing, we make specific formulations for each application and master all the processes of development.

This mastery allows us to offer you a bespoke solution adapted to your needs and respecting your specifications.

OUR DEPARTMENTS :

- **Laboratory**
- **Innovation - R&D**
- **Industrialization**
- **Production**

Space industry represent for us a major part of our investissment. In consequence, all the formulation and processing are under control. In fact, our in-house control of elastomer formulations enables us to provide our customer with bespoke solutions, maintenaining great responsiveness to customer requirements.

Our highly qualified teams will assist you in defining your needs and are at your disposal throughout your project. From choosing the material to the final production of your product, they will advise and guide you to ensure your technological succcess.

Our 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, maintenaining 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.

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.

OUR REFERENCES :

ArianeGroup · ThalesAlenia Space · cnes · TRYO Aerospace

INTRODUCTION

Combining over 50 years of experience in EMC shielding, thermal dissipation and environmental sealing solutions, GETELEC's teams design and deliver innovative solutions for orbital infrastructure.

The space sector is a high-tech industry with many constraints due to the final intended use of the product, and its evolution in a hostile universe.

Today, the miniaturisation of equipment and the harsh environment in which electronics operate necessitates high-precision EMC shielding, heat dissipation and microwave absorption products.

GETELEC offers unique solutions adapted to your needs by proposing a range of products specifically developed to meet your requirements.

SATELLITES & EMBEDDED SYSTEMS

On-board electronic sub-assemblies are used in harsh environments, where the electronics are subject to significant problems. To overcome these constraints, GETELEC has developed specific products that meet the problems of outgassing rates and the requirements of the ESA standard

ROBOTS

Robots are an integral part of the conquest of space. Increasingly autonomous, these robots are confronted with significant EMC constraints and microwave shielding of the electronic systems is essential for the proper functioning of the equipment. These constraints are mostly design challenges that GETELEC meets through its range dedicated to outer space.

RADAR ANTENNAS

GETELEC is also involved in ground-based systems for communicating and processing data from orbital infrastructures.

Subject to multiple constraints such as the environment and electromagnetic compatibility, GETELEC's technical teams support you in choosing your solutions from a wide range of products and ensure you a bespoke realization for your equipment.

RANGE OF PRODUCTS

EMC CONDUCTIVE SILICONE GASKETS

GETELEC develops its own conductive mixes that meet the requirements of standards MIL G 83528, MIL STD 285, GAM EG-13 and ESA, with mixes specifically developed to comply with low outgassing requirements. All of these seals are available as moulded seals, cut flat seals, extruded profiles or custom overmoulded seals.

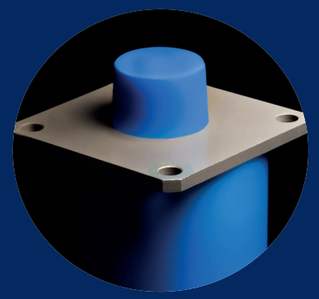
Volume resistivity from 0.0016 Ω.cm to 2.7 Ω.cm
Shielding efficiency from 80 dB to 140 dB (frequencies 20 MHz to 10 GHz)

MICROWAVE ABSORBERS

The range of microwave absorbers consists of flexible silicone materials filled with magnetic particles. These materials provide excellent performance over given frequency bands, with attenuation of more 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.

Absorption natural frequency range from 1GHz to 40GHz



ENVIRONMENTAL SEALING SILICONE

GETELEC formulates its own silicone mixes. This mastery allows us to define the ideal material according to your equipment and your specifications, in order to offer you a tailor-made insulating solution adapted to your needs.

The use of specific silicone grades allows us to offer a complete range of silicones, fluorosilicones, foams and EPDM products available in hardness ratings **between 20 and 90 Shore A.**

THERMALLY CONDUCTIVE PADS

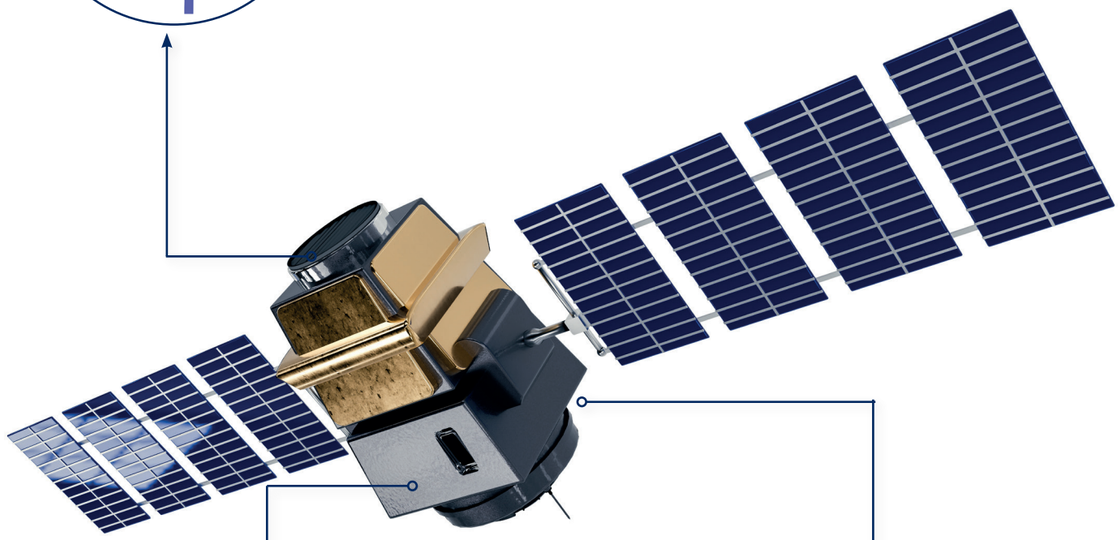
Positioned between the power component and the cooler, the thermal gap filler pad are designed to optimise heat dissipation and thus reduce the thermal resistance of your equipment. Our complete range consists of flexible thermal gap pad, conductive electrical insulators and electrically and thermally conductive silicone.

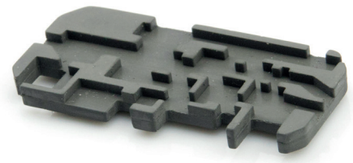
The thermal conductivity of our products is between 1 and 10 W/m.K

APPLICATIONS FOR SPACE INDUSTRY

Electronic module

EMI shielding gasket for electronic module
Conductive silicone : Attenuation up to 140 dB





Microwave absorbers on embedded calculator
Flexible silicone absorber

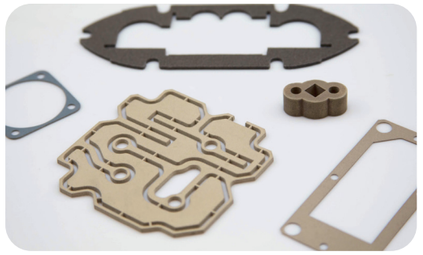
Environmental sealing gasket with low degassing rate
Fluorosilicone

EMC CONDUCTIVE SILICONE GASKETS

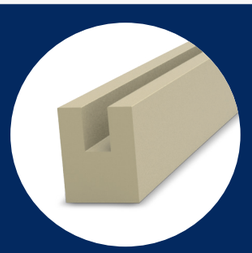
Our conductive elastomers are developed in every respect by our chemical engineers. From the selection of raw materials to the final transformation, they create specific formulations for each request and master all the development processes and procedures.

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

Properties	Standards	GT 1000	GT 2020	GT 5000 SP	GT 5000 EX SP	GT 1000 FLEX
Elastomer		Silicone	Silicone	Silicone	Silicone	Silicone
Conductive filler		Silver-plated copper	Pure silver	Silver-plated aluminum	Silver-plated aluminum	Silver-plated copper
Volume resistivity Ω.cm	MIL G 83528	< 0.005	< 0.006	< 0.008	Max 0.5	< 0.005
Hardness Shore A	ASTM D 2240	82	75	69	45	40
Density g/cm^3	ASTM D 792 Method A	3.40	3.90	2.10	1.0	2.67
Working temperature °C		-55°C to +125 °C	-55°C to +160 °C	-55°C to +160 °C	-55°C to +160 °C	-55°C to +125°C
TML %		0.30 %	0.08 %	0.05 %	0.18 %	0.37 %
RML %		0.29 %	0.07 %	0.04 %	0.15 %	0.37 %
CVCM %		0.07 %	0.03 %	0.05 %	0.08 %	0.07 %

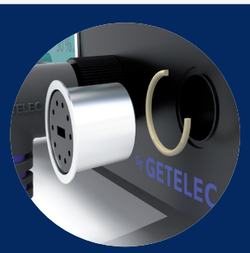


AVAILABLE FORMATS :



Extruded

Cut



Molded

MICROWAVE ABSORBERS

Flexible microwave absorbers

Our GT602 range of microwave absorbers have narrow-band performance but also high power-density performance (>1 W/cm2) allowing them to be positioned on high-power antennas or equipment.

Thanks to its low outgassing properties, our GT602 range is suitable for space applications. The homogeneity of the mixture is ensured by a complex system developed by Getelec.

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

Attenuation Guide

Attenuation	Percentage absorption
- 5 dB	68.38 %
-10 dB	90.00 %
-15 dB	96.84 %
-20 dB	99.00 %
-40 dB	99.99 %

Getelec references	Thickness (mm)	Resonance frequency	Attenuation	ESA standard Compliance
GT 602 R85	2	6 GHz	28 dB	Yes
GT 602 R85	1.8	7 GHz	27 dB	Yes
GT 602 R85	1.6	8 GHz	21 dB	Yes
GT 602 R85	1.5	9 GHz	27 DB	Yes
GT 602 R85	1.3	10 GHz	27 dB	Yes
GT 602 R65	1.2	17 GHz	25 dB	Yes
GT 602 R65	1.15	18 GHz	25 dB	Yes

Contact us for more products and solutions.

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.

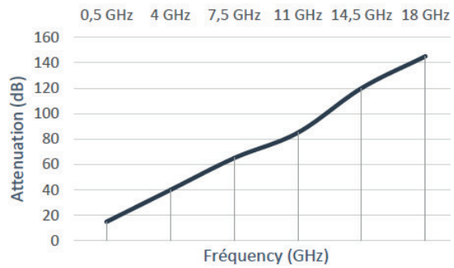
Fluorosilicone: FVMQ type (ASTM D1418), these elastomers offer excellent resistance to solvents, fuels, organic oils and silicone oils, while maintaining their mechanical properties over a wide range of temperatures (-60°C to + 230°C).

Silicone: 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).

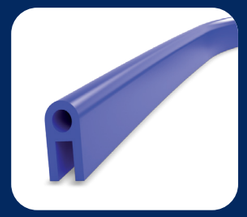
Properties	Standards	GT 40ED	GT 50ED	GT 60ED
Elastomer		Silicone	Silicone	Silicone
Hardness Shore A	ASTM D 2240	40	50	60
Density g/cm^3	ASTM D 792 Method A	1.12	1.21	1.38
Break resistance (MPa)	ASTM D 412 Method AC	8.14	8.78	6.40
Elongation at break (%)	ASTM D 412 Method AC	753	729	461
Tear strength (N/mm)	ASTM D 624 Method C	38.60	37.07	32.20
Working temperature (°C)		-73°C to +232 °C		
ESA standard compliance	ASTM D E 395	Yes		

Rigid microwave absorbers | Expoxy

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
ESA standard compliance	ASTM E 395	Yes



AVAILABLE FORMATS :



Extruded

Cut

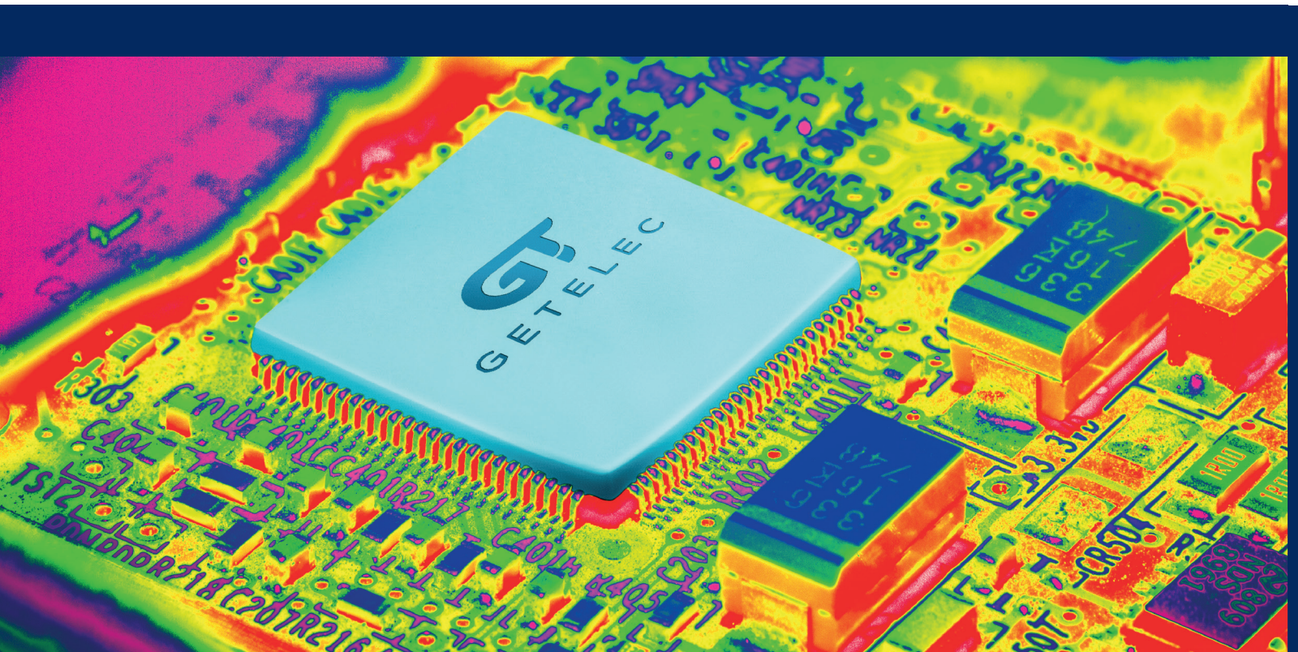
Molded

THERMALLY CONDUCTIVE PADS

Our range of thermal pad includes highly conductive products ideal for applications requiring high thermal conductivity. The specific formulations developed by our laboratory give these silicone elastomers exceptional thermal conductivity.

Thanks to their great flexibility and ease of installation, they adapt to the surface irregularities between the power component and the cooler, thus promoting heat dissipation and protecting your equipment.

Properties	Standards	GT 901/60	GTS 6-70R	GTS 8-65	GTS 9-80	GTS 10-50
Thermal conductivity W/m.K		2.89	6 ± 0.2	8.1 ± 0.1	9.1 ± 0.2	10.1 ±0.2
Hardness (Shore 00 ± 5)	ASTM D 2240	60 (Shore A)	70	65	80	50
Density g/cm^3	ASTM D 792 Method A	3.50	3.23	3.3	3.35 ± 0.05	3.44
Working temperature °C		-50°C to +125°C	-45°C to +200°C	-40 °C to +150°C	-40°C to +160°C	-40°C to +160°C
TML (%) RML (%) CVCM (%)	ESA-ECSS-Q-ST-70-02C	0.25 % 0.24 % 0.08 %	0.09 % 0.04 % 0.03 %	0.07 % 0.07 % 0.02 %	0.07 % 0.06 % 0.01 %	0.08 % 0.07 % 0.03 %
Available thickness		0.5 to 10 mm	0.8 to 10 mm	1.5 to 10 mm	1 to 20 mm	1 to 20 mm



SUMMARY OF OUTGASSING MEASUREMENTS

Range of products	Products	Unit	Standards	Features	Typical results
Electrically conductive elastomer	GT1000	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.30 0.29 0.07
	GT1000 FLEX	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.37 0.37 0.07
	GT2020	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.08 0.07 0.03
	GT5000 SP	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.05 0.04 0.05
	GT5000 EX SP	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.18 0.15 0.08
Environmental sealing solutions	GT40SP	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.19 0.14 0.05
Microwave absorbers	GT602R85 + Adhesive	%	ESA PSS 01-702	TML RML CVCM	0.386 0.380 0.097
	GT602R65	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.21 0.19 0.07
	GT602R65 + Adhesive	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.27 0.25 0.10
	GT602R63	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.25 0.24 0.10
	GT602R63 + Adhesive	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.31 0.29 0.12
	GT602R90 + Adhesive	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.23 0.22 0.075
Thermally conductive pads	GT901/60*	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.25 0.24 0.08
	GTS 6-70R	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.09 0.04 0.03
	GTS 8-65	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.07 0.07 0.02
	GTS 9-80	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.07 0.06 0.01
	GTS 10-50	%	ECSS-Q-ST-70-02C	TML RML CVCM	0.08 0.07 0.03

Standard ESA-ECSS-Q-ST-70-02C (replace ESA PSS 01-702) :

Maximum admissible values for spatial use:
- TML (Total Mass Loss): loss of mass during vacuum degassing. <1%
- RML (Recovered mass Loss): loss of mass after returning to atmospheric pressure. <1%
- CVCM (Collected Volatile Condensable material): condensates. <0.1%

*In the temperature range -50°C to +150°C, the coefficient of linear expansion is : 3.94x10^{-4} mm / mm x°C for the GT901/60.

For a non conductive silicone, the coefficient of linear expansion is : 5.9 to 7.9 x10^{-4} mm/mm x °C

THEY TRUSTED US :

AIRBUS DEFENCE & SPACE

ThalesAlenia Space
A Thales / Finmeccanica Company

cnes

arianeGROUP

GETELEC
We protect your electronics

375 avenue Morane Saulnier
78530 - Buc | FRANCE

Tel : +331 39 20 42 42

infos@getelec.net

MADE IN FRANCE