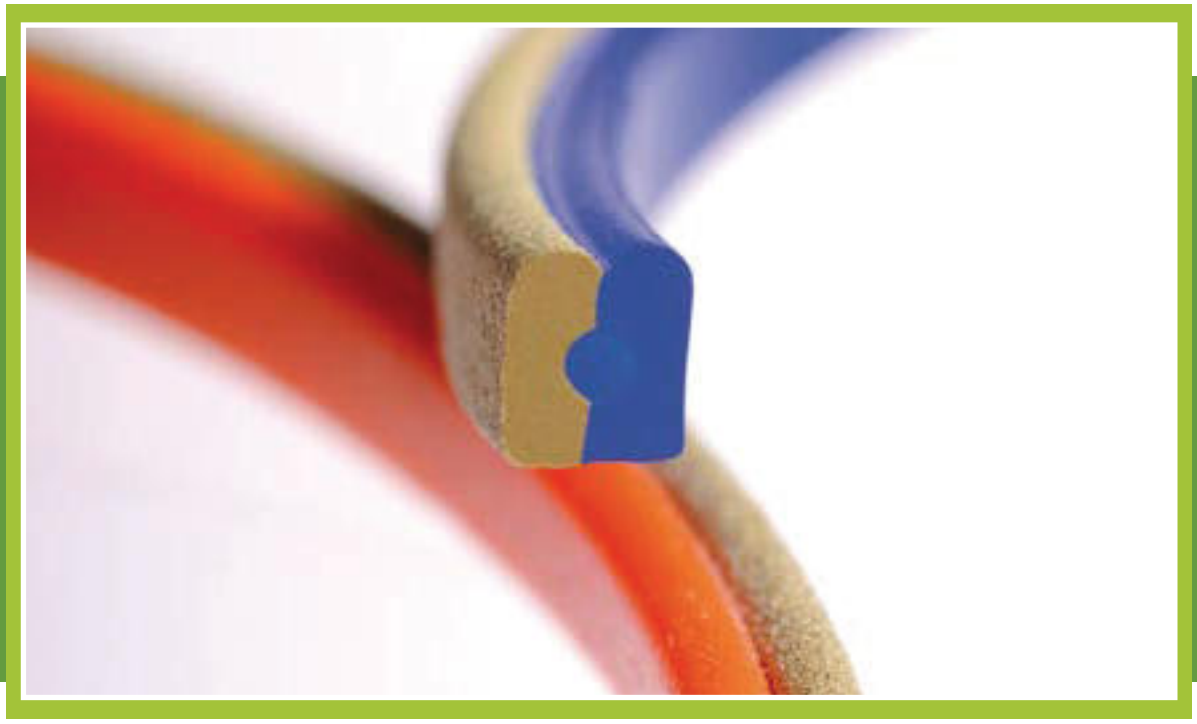
GETELEC

CORROSION-RESISTANT SILICONE GASKETS



GETELEC - 375 avenue Morane Saulnier - CS 34030 - 78535 Buc Cedex - France
Tel. **+33 1 39 20 42 42** - Fax: **+33 1 39 20 42 43** - Email: **info@getelec.com**

SUMMARY

Introduction

GETELEC offers and effective solution to the problems of corrosion encountered with the use of conductive seals, when they are in contact with different electrolytes such as salt fog or acid. These gaskets are water and pressure resistant.

Seals for these applications are bi-material, as they are made of a conductive silicone and an insulating silicone bonded together by co-extrusion into one seal.

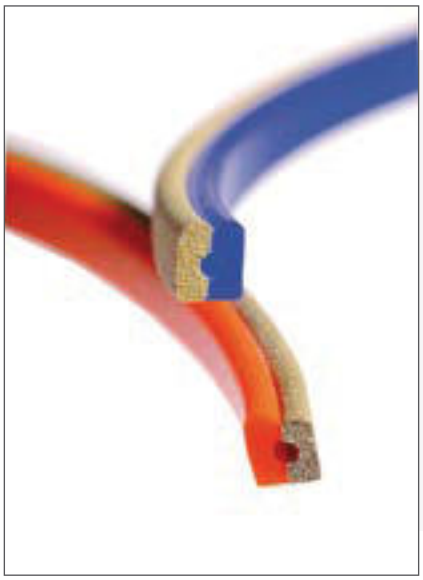
And in fact, by separating the microwave shielding and environmental sealing functions, the seal gains considerably in resistance to extreme environments, in which single component conductive seals would have much shorter lifespans.

In this way, bi-material gaskets provide you with microwave shielding and environmental sealing in just one groove, or in other words, gains as regards congestion in your equipment and also regarding the machining of your part.

Our control of silicone mixes enables us to offer our customers a wide choice in terms of electromagnetic performance, hardness and hydrocarbon resistance etc.

These materials are available as extruded seals, moulded seals or cut lengths.

This method is also available as equipment housing covers by direct vulcanisation in our workshops.



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Guide to corrosion-resistant conductive silicones by industry sector

GETELEC has been developing its own conductive mixtures for more than 45 years, meeting the requirements of MIL G 83528. Our engineers have developed a broad range of corrosion-resistant conductive silicones with various loads (Cu/Ag, Al/Ag, Ag, Ni/C, Carbon, etc.) Thus, we obtain electrically conductive materials meeting the different requirements of our customers starting from a durable solution that was tested for several thousand hours under an extreme environment.

MILITARY / AERONAUTIC APPLICATIONS PRODUCTS

Reference	Load	Attenuation 200 MHZ-10GHz	Temperature (°C)	Comments	Transformation possibilities
GT 1040 GT1047 GT 1060 GT 1067	Silver-plated copper Silver-plated copper (fluorinated) Silver-plated copper Silver-plated copper (fluorinated)	120 to 140 dB	-55 to +125	Very good shielding performance Good EMP shielding Low degassing rate Electrical and thermal conductor all in one Very stable over time High mechanical strength	
GT 5040 GT 5047 GT 5040 GT 5047	Silver-plated aluminum Silver-plated aluminum (fluorinated) Silver-plated aluminum Silver-plated aluminum (fluorinated)	104 to 137 dB	-55 to +160	Compatible with most alloys Low density Resistant to high temperatures (200°C peak)	
GT 2040 GT 2047 GT 2060 GT 2067	Pure silver Pure silver (fluorinated) Pure silver Pure silver (fluorinated)	60 dB	-55 to +160	High electromagnetic performance product Highly conductive Very low volume resistivity Excellent attenuation performance Resistant to high temperatures (200°C)	
GT 5068	Silver-plated aluminum	104 to 137 dB	-55 to +160	Low permeability to water vapor and other gases Resistance to hydraulic fluids like phosphoric ester (Skydrol) Good resistance to abrasion Reach and Rohs Compliant	

CIVILIAN ELECTRONIC APPLICATIONS PRODUCTS

Reference	Load	Attenuation	Temperature (°C)	Comments	Transformation possibilities
GT 1040 GT1047 GT 1060 GT1047	Silver-plated copper Silver-plated copper (fluorinated) Silver-plated copper Silver-plated copper (fluorinated)	120 to 140 dB	-55 to +125	Very good shielding performance Good EMP shielding Low degassing rate Electrical and thermal conductor all in one Very stable over time High mechanical strength	
GT 3140 GT 3147 GT 3160 GT 3167	Nickel Graphite Fluorinated version Nickel graphite Fluorinated version	100 dB	-55 to +150	Good low frequency performance. Low resistivity. UL 94 V1 certified	

TELECOMS APPLICATIONS PRODUCTS

Reference	Load	Attenuation	Temperature (°C)	Comments	Transformation possibilities
BL 10000 BL 10007	Carbon Fluorinated version	105 dB	-55 to +125	Conductive and leaktight product very often used for sealing telecoms cabinet doors. Good mechanical properties (RDC, elongation at break) Very good salt fog resistance UL 157 compliant.	

Molded Extruded Cut Secured by vulcanization Sheet

GETELEC

Corrosion-resistant conductive silicones

	Standards	GT 1040	GT 1047	GT 1060	GT 1067	GT 2040	GT 2047	GT 2060	GT 2067
Elastomer		Silicone	Fluorinated silicone	Silicone	Fluorinated silicone	Silicone	Fluorinated silicone	Silicone	Silicone fluorinated
Load		Silver-plated copper				Pure silver			
Volume resistivity Ω-cm	MIL G 83528	< 0.005				< 0.006			
Shore hardness A ±7	ASTM D 2240	82				75			
Density g/cm3	ASTM D 792 /Method A	3.40				3.90			
Break resistance (Mpa)	ASTM D 412 Method AC	2.20				4.61			
% Elongation at break	ASTM D 412 Method AC	341				355			
Tear strength kg/cm	ASTM D 624 Method C	13.70				14			
% residual deformation after 70 hours compression at 100°C	ASTM D 395 Method B	17.50				33.12			
Shielding performance: 20 MHz 100 MHz 500 MHz 2GHz 10GHz		130 dB 140 dB 120 dB 120 dB 120 dB				110 dB 110 dB 110 dB 110 dB 110 dB			
Working temperature °C		-55 to +125				-55 to +160			
Color		Beige				Light beige			
Insulating silicone component									
Specific mass at 25°C	ASTM D 792	1.10	1.43	1.27	1.46	1.10	1.43	1.27	1.46
Shore hardness A ±5	ASTM D 2240	40	40	60	60	40	40	60	60
Tensile strength Psi Mpa	ASTM D 412	1000 6.80	1250 8.60	950 6.55	1200 8.30	1000 6.80	1250 8.60	950 6.55	1200 8.30
% Elongation	ASTM D 412	500	400	300	300	500	400	300	300
% residual deformation after 22 hours compression at 177°C	ASTM D 395 Method B	30	20	33	25	30	20	33	25
Color		Orange	Orange	Blue	Light blue	Orange	Orange	Blue	Light blue

Molded Extruded Cut Secured by vulcanization Sheet

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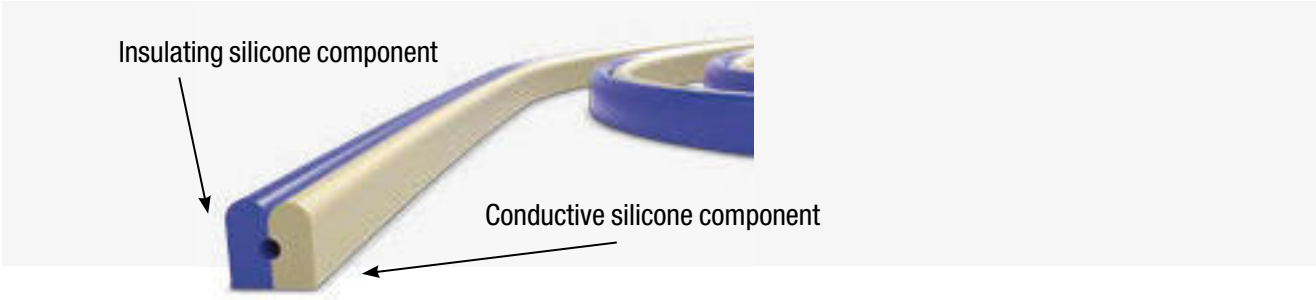

	GT 3140	GT 3147	GT 3160	GT 3167	GT 5040	GT 5047	GT 5060	GT 5067	BL 10060	BL 10067
Elastomer	Sili-cone	Fluori-nated silicone	Silicone	Fluori-nated silicone	Silicone	Fluori-nated silicone	Silicone	Fluori-nated silicone	Silicone	Fluori-nated silicone
Load	Nickel Graphite				Silver-plated aluminum				Carbon	
Volume resistivity Ω-cm	< 0.10				< 00054				6	
Shore hardness A ±7	65				65				70	
Density g/cm3	2				1.90				1.22	
Break resistance (Mpa)	1.37				1.89				4.41	
% Elongation at break	150				286				150	
Tear strength kg/cm	8.9				8.60				-	
% residual deformation after 70 hours compression at 100°C	40				17.30				40	
Shielding performance: 20 MHz 100 MHz 500 MHz 2GHz 10GHz	100 dB 100 dB 100 dB 100 dB 100 dB				128 dB 137 dB 133 dB 122 dB 104 dB				60 dB 105 dB 105 dB 105 dB 105 dB	
Working temperature °C	-55 to +150				-55 to +160				-55 to +125	
Color	Gray				Beige				Black	
Insulating silicone component										
Specific mass at 25°C	1.10	1.43	1.27	1.46	1.10	1.43	1.27	1.46	1.27	1.46
Shore hardness A ±5	40	40	60	60	40	40	60	60	60	60
Tensile strength Psi Mpa	1000 6.80	1250 8.60	950 6.55	1200 8.30	1000 6.80	1250 8.60	950 6.55	1200 8.30	950 6.55	1200 8.30
% Elongation	500	400	300	300	500	400	300	300	300	300
% residual deformation after 22 hours compression at 177°C	30	20	33	25	30	20	33	25	33	25
Color	Orange	Orange	Blue	Light blue	Orange	Orange	Blue	Light blue	Blue	Light blue

Conductive silicone Extruded bi-material

Most of GT conductive materials can be extruded in various sections and profile shapes. The vulcanization of the extruded seal ends allow the production of customized O-ring gaskets, without tooling charge and within very short deadline.
Large range of standard profiles available (see following pages).
For special profiles please contact us.

CHARACTERISTICS

CORROSION-RESISTANT CONDUCTIVE SILICONE ELASTOMER			
MATERIAL	INSULATING ELASTOMER	LOAD	MAX RESISTIVITY (mΩ/cm) MIL G 83528
GT 1040	Silicone 40 sh	Silver-plated copper	15
GT 1060	Silicone 60 sh	Silver-plated copper	15
GT 2040	Silicone 40 sh	Silver	10
GT 2060	Silicone 60 sh	Silver	10
GT 3140	Silicone 40 sh	Nickel Graphite	100
GT 3160	Silicone 60 sh	Nickel Graphite	100
GT 5040	Silicone 40 sh	Silver-plated Aluminum	8
GT 5060	Silicone 60 sh	Silver-plated Aluminum	8
GT 5068	EPDM-Si 65 sh	Silver-plated Aluminum	8
BL 10060	Silicone 60 sh	Carbon	< 6 Ω-cm

CORROSION-RESISTANT CONDUCTIVE FLUORINATED SILICONE ELASTOMER			
MATERIAL	INSULATING ELASTOMER	LOAD	MAX RESISTIVITY (mΩ/cm) MIL G 83528
GT 1047	Fluorinated silicone 40 sh	Silver-plated copper	15
GT 1067	Fluorinated silicone 60 sh	Silver-plated copper	15
GT 2047	Fluorinated silicone 40 sh	Silver	10
GT 2067	Fluorinated silicone 60 sh	Silver	10
GT 3147	Fluorinated silicone 40 sh	Nickel Graphite	100
GT 3167	Fluorinated silicone 60 sh	Nickel Graphite	100
GT 5047	Fluorinated silicone 40 sh	Silver-plated Aluminum	8
GT 5067	Fluorinated silicone 60 sh	Silver-plated Aluminum	8
BL 10067	Fluorinated silicone 60 sh	Carbon	< 6 Ω-cm

RADIUS OF CURVATURE

Solid round section	The minimum inner radius of curvature is 1.5 times the cross section of the profile
Hollow round section (tube)	The minimum inner radius of curvature is 2.5 times the cross section of the profile insofar as the inner diameter of the tube does not exceed 30% of its section.

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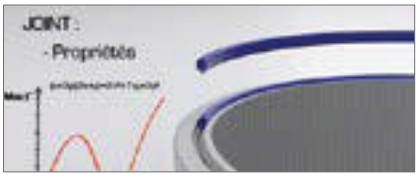


Loaded Conductive Silicone + EPDM

Conductive silicone + EPDM-Si– ref. GT5068

To meet specific applications, we have developed bi-material products

by combining a conductive silicone loaded with silver-plated aluminum (GT5000) with a doped EPDM silicone 65 shore.
Like all of our bi-material gaskets, this mixture is intended to meet the constraints of a corrosive environment by separating the shielding function and the sealing function.
The use of EPDM-Si instead of silicone, addresses in particular the problem of permeability to water vapor and gas.

Advantages:

- **Low permeability to water vapor and other gases.**
- **Resistance to hydraulic fluids like phosphoric ester (Skydrol).**
- **Good resistance to abrasion.**
- **Reach and Rohs Compliant.**

CHARACTERISTICS

Characteristics	Standards - Test	GT5000	Specification MIL G 83528
Type	-	B	-
Elastomer	-	Silicone	-
Load	-	Al/Ag	-
Volume resistivity Ω.cm	MIL G 83528	< 00054	0.012
Shore A hardness	ASTM D 2240	65	70
Density g/cm³	ASTM D 792 Method A	1.90	2.00
Break resistance Mpa	ASTM D 412 Method A C	1.89	-
% Elongation at break	ASTM D 412 Method A C	286	60 - 260
Tear strength N/mm	ASTM D 624 C	8.43	-
% residual deformation after 70 hours compression at 100°C	ASTM D 395 Method B	17.30	30
Continuous working temperature		-55°C to +160°C	-55°C to +160°C
Color		Gray	-

Characteristics	Standards - Test	EPDM-Si
Density (g/cm3)	ASTM D 792	1.27
Shore A hardness	ASTM D 2240	65
Tear strength N/mm	ASTM D 624 C	25.4
Break resistance MPa	ASTM D 412	6.4
% Elongation at break	ASTM D 412	486
Color		Black

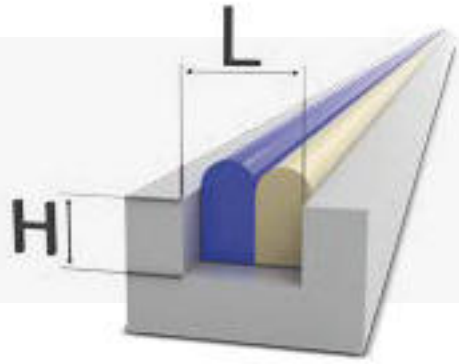
FORMAT OPTIONS

Molded Cut Extruded

Secured by vulcanization

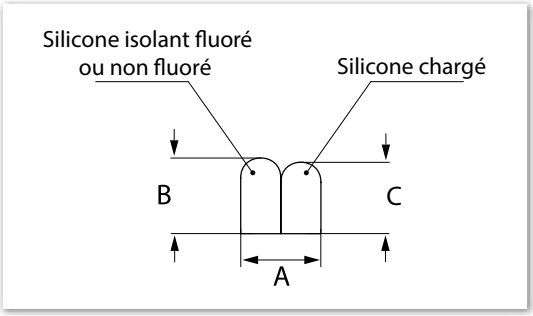
Solid double D profile

Cross-section of seal



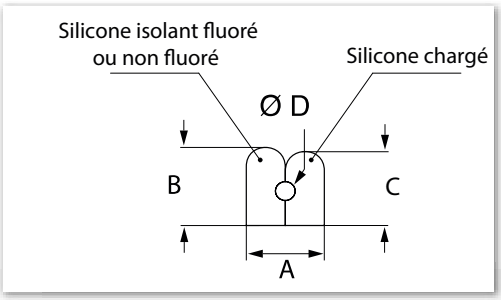
Recommended groove dimensions
Machining tolerance: ± 0.05

Ref.	A (mm)	B (mm)	C (mm)	L (mm)	H (mm)
1414	1,40	1,45	1,35	1,70	1.10
15017	1,50	1,70	1,55	1.80	1,30
16017	1,60	1,70	1,60	1,90	1,35
1718	1.70	2.0	1.80	2.10	1.50
1822	1.80	2.30	1.90	2.30	1.60
2015	2.00	1,55	1,45	2.40	1,20
2020	2.00	2,10	1,90	2,40	1,60
2122	2.10	2.30	1.90	2.60	1.60
22180	2,20	1,80	1,70	2,60	1,40
2435	2,40	3,50	3,30	2,80	2,80
2520	2,50	2.00	1,90	2,90	1,60
2522	2,60	2,20	2,10	3.00	1,70
2634	2,60	3,30	3,20	3.00	2,70
2824	2,80	2,80	2,40	3.30	2.00
2825	2,80	2,50	2,40	3,20	2.00
2935	2.95	3.65	3.30	3.40	2.85
3028	3.00	2,90	2,80	3,40	2,40
3034	3.00	3,30	3,20	3,40	2,70
3227	3,20	2,70	2,60	3,60	2,20
3329	3.30	3.20	2.60	3.80	2.20
3430	3.40	2.90	2.80	3.80	2.40
3736	3,70	3,60	3,50	4.10	3.00
4040	4.00	4,10	3,90	4,40	3,40
4746	4,60	4,70	4,50	5.10	3.90
4844	4,60	4,30	4,10	5.00	3,60
4835	4.80	3.40	3.20	5.30	2.70
6060	6.00	6.20	6.10	6.60	5.30
6070	6.00	6.90	6.70	6.60	5.90
7065	7.00	6.60	5.60	8.00	4.90

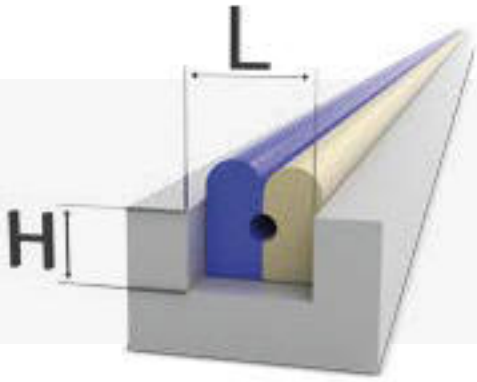


Hollow double D profile

Ref.	A (mm)	B (mm)	C (mm)	D (mm)	L (mm)	H (mm)
14014	1,40	1,45	1,35	0,50	1,60	1,05
16185	1,60	1,85	1,70	0,50	1,85	1,35
1720	1.70	2.0	1.8	0.5	2.10	1.50
1823	1,80	2,30	1,90	0,50	2,10	1.60
2021	2,00	2,10	1,90	0,50	2,30	1,60
20021	2,00	2,10	1,90	0,90	2,20	1,60
2123	2,10	2,30	1,90	0,50	2,50	1,60
2220	2,20	2,00	1,90	0,50	2,40	1,60
2528	2,50	2,00	1,90	0,80	2,70	1,50
2622	2,60	2,20	2,10	0,80	2,80	1,70
2623	2,60	2,35	2,20	1,10	2,90	1,80
2832	2,80	3,30	3,20	1,10	3,20	2,50
2936	2,95	3,65	3,30	1,30	3,20	2,70
3029	3,00	3,20	2,80	1,10	3,30	2,30
3030	3,00	3,00	2,80	0,80	3,30	2,40
3036	3,00	3,50	3,40	1,10	3,20	2,80
3037	3,00	3,75	3,40	1,30	3,25	2,80
30039	3,00	3,95	3,40	1,50	3,30	2,80
3134	3,00	3,40	2,80	0,80	3,40	2,40
3136	3,00	3,50	3,40	1,30	3,30	2,60
3236	3,00	3,50	3,40	2,00	3,25	2,45
3330	3,30	3,00	2,60	0,90	3,70	2,20
3331	3,30	3,00	2,60	1,00	3,60	2,20
3429	3,40	2,90	2,80	0,80	3,80	2,30
4041	4,00	4,10	3,90	1,10	4,30	3,40
4044	4,00	4,40	3,90	1,10	4,40	3,40
4047	4,00	4,70	3,90	1,10	4,50	3,40
4240	4,00	4,20	4,00	1,20	4,30	3,40
4647	4,60	4,70	4,50	1,10	4,90	3,90
4648	4,60	4,70	4,50	2,00	4,90	3,50
4834	4,80	3,40	3,20	1,00	5,20	2,70
6061	6,00	6,20	6,10	3,00	6,50	4,80
6063	6,00	6,20	6,10	3,50	6,50	4,65
6069	6,00	6,90	6,70	3,00	6,50	5,60
7066	7,00	6,60	5,60	2,50	7,50	4,90



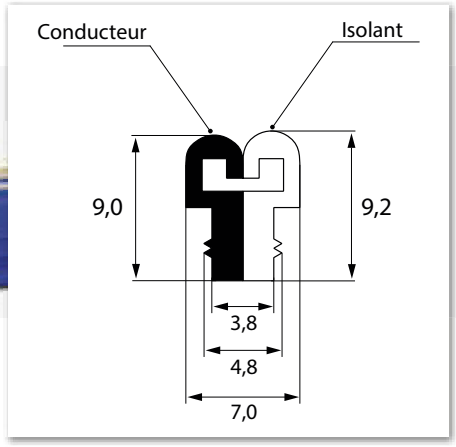
Recommended groove dimensions
Machining tolerance: ± 0.05

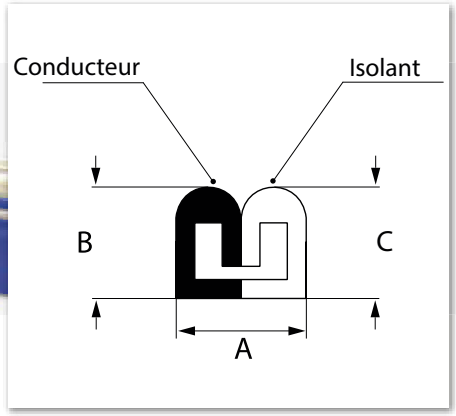


Cross-section of seal

Other corrosion-resistant extruded profiles

Ref. 7092





Reference	A (mm)	B (mm)	C (mm)	Reference	A (mm)	B (mm)	C (mm)
6959	6.90	5.60	5.80	7858	7.80	5.70	5.90
7082	7.00	8.00	8.20	9539	9.50	3.90	4.10

Contact us for alternative sizes.

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NBC (Nuclear, Bacteriological, Chemical) resistant moulded seals

Our bi-material moulded seals for NBC applications comprise a conductive layer secured to a fluorocarbon insulating layer.

The conductive layer is a silicone loaded with metal particles (silver plated aluminium, silver plated copper, or silver) ensuring excellent electrical continuity. Materials used meet the requirements of MIL G 83528 standard.

The fluorocarbon insulating layer has the following properties:

- Very good mechanical properties. Tear resistance, compression set, hardness range to suit that of the conductive products.
- Excellent resistance to chemicals (acids, solvents, hydrocarbons, oils etc.)
- Very low gas permeability. Very good hydrolytic stability.
- Excellent resistance to climate-related attack (oxidation, ozone, sunlight-related weathering).
- Excellent bacteriological resistance.
- Excellent flame-resistance.
- Very wide working temperature range (-25°C to +200°C). Very low working temperature (down to -40°C) for certain grades.

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