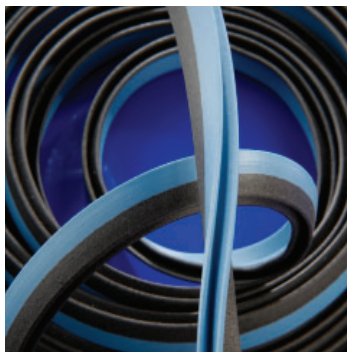

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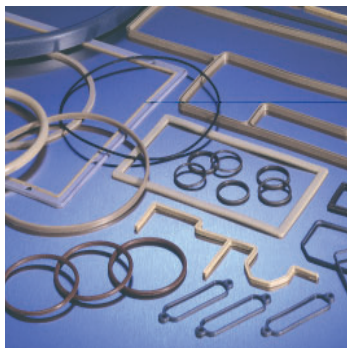
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



Conductive Elastomer EMI Gaskets

Molded and Extruded Materials Selector Guide

Parker Chomerics

ENGINEERING YOUR SUCCESS.

Table 1: CHO-SEAL® ELASTOMERS FOR TYPICAL COMMERCIAL AND MILITARY APPLICATIONS (M = Molded only, E = Extruded only, F = Fluorosilicone)			
Material	**Filler and Binder**	**Equipment Shielding Requirements (Typ.)**	**Remarks**
CHO-SEAL 1224 [M]	Silver in silicone	> 120 dB	Highest shielding effectiveness and through conductivity performance; higher physical properties; excellent processing; also available in a fabric reinforced format.
CHO-SEAL 1221 [M]	Silver in fluorosilicone		
CHO-SEAL 6502	Nickel-plated aluminum in silicone	> 100 dB	Highest performance in harsh environments; excellent shielding; best choice for corrosion requirements against aluminum.
CHO-SEAL 6503	Nickel-plated aluminum in fluorosilicone		
CHO-SEAL 1298	Silver-plated aluminum in fluorosilcone	90 - 110 dB	High performance in harsh corrosive environments; material of choice for aircraft and marine military applications; good physical properties; molded, extruded and reinforced product forms.
CHO-SEAL 1285	Silver-plated aluminum in silicone	90 - 110 dB	Military grade gasket for corrosive environments; lightweight, 200°C max use temperature; good EMP resistance; molded, extruded and reinforced product forms.
CHO-SEAL 1287	Silver-plated aluminum in fluorosilcone		
CHO-SEAL 1215	Silver-plated copper in silicone	105 - 120 dB	Resists highest level of EMP induced current; military gasket of choice in non-corrosive environments; excellent processing for molding and extrusion.
CHO-SEAL 1217	Silver-plated copper in fluorosilicone		
CHO-SEAL 1273 CHO-SEAL 1270 [M]	Silver-plated copper in silicone	80 - 105 dB	Material of choice for high-end commercial applications; superior performance in non-corrosive environments; tear trim compression and injection molding. 1270, a low durometer hardness elastomer, is recommended for applications requiring low compression forces.
CHO-SEAL S6305, 6330[M], 6370 [E], 6371 [M], 6372 [E], 6308 [E]	Nickel-plated graphite in silicone	100 dB	Good performance in moderately corrosive environments; material of choice for flange finishes needing "bite-through" for good electrical contact. Flame retardant 6370[E] and 6371[M] are UL 94 V-0 rated. 6330 and 6372[E] are UL 94 V1 rated, 6308[E] is designed for thin wall extrusions; 6330[M], a low durometer hardness elastomer, is designed for applications requiring low compression forces.
CHO-SEAL L6303	Nickel-plated graphite in fluorosilicone		
CHO-SEAL 1350	Silver-plated glass in silicone	80 - 105 dB	Standard material for high volume injection and compression molding and small extrusions; high performance in non-corrosive environments; used in grounding applications with little or no vibration.
CHO-SEAL 1310 [M]	Silver-plated glass in silicone	80 - 100 dB	Moderate performance in non-corrosive environments; no corrosion or fluid resistance; material of choice for small, delicate injection-molded parts or large dimension extrusions.
CHO-SEAL 0860 [E], 0862 [E]	Carbon in silicone	30 - 80 dB	Low-end shielding and ESD protection; high tensile strength; no corrosion or fluid resistance. 0862[E] is UL 94 V-0 rated.
CHO-SEAL S6600 [M]	Carbon in silicone	30 - 80 dB	Low-end shielding and ESD protection; high tensile strength; no corrosion or fluid resistance. Molded only.

Table 2: SPECIALTY ELASTOMERS (M= Molded only, E = Extruded only, F = Fluorosilicone, EP=EPDM)			
Material	**Filler and Binder**	**Equipment Shielding Requirements (Typ.)**	**Remarks**
CHO-SEAL 1401	Silver in reticulate silicone	80 -100 dB	High performance for non-corrosive environments; soft (45 Shore A) for low closure force where gasket geometry cannot be exploited; low tear strength; no fluid resistance.
CHO-SEAL 1239 [M]	Silver-plated copper in silicone with expanded copper reinforcement	110 dB	Material for waveguide choke, cover, and flange EMI shielding and pressure sealing; maximum heat transfer and minimum outgassing; hard (80 Shore A), high-strength material; available with raised lip around iris opening for high power/high pressure applications.
CHO-SEAL 1212 [M]	Silver-plated copper in silicone	120 dB	High strength, hard (80 Shore A) material for waveguide, choke, cover, and flanges with grooves for EMI and pressure sealing.
CHO-SEAL 6435 [M] [EP]	Silver-plated nickel in EPDM	95 dB	Material of choice for high shielding effectiveness where NBC fluid resistance is needed; good performance in corrosive environments.
CHO-SEAL 6307 [M] [EP], 6452 [E] [EP]	Nickel-plated graphite in EPDM	> 90 dB	Good performance in moderately corrosive environments; excellent NBC fluid resistance; good physical properties.
CHO-SEAL V6433 [M]	Silver-plated nickel in fluorosilicone/fluorocarbon	100 dB	Material of choice for extensive fluid resistance; no corrosion resistance.

INTRODUCTION

- Availability
- Design Flexibility
- Cost Effectiveness
- Proven Performance

...just four of the reasons why conductive elastomer gaskets are so often the right EMI shielding solution!

Once used mainly to shield critical defense and aerospace electronic systems, Parker Chomerics conductive elastomers have become the progressive choice for packaging designers of consumer, telecommunications, business, industrial equipment, automotive, medical devices and much more.

Conductive elastomers are reliable over the life of the equipment. The same gasket is both an EMI shield and an environmental seal. Elastomer gaskets resist compression set, accommodate low closure force, and help control airflow. They're available in corrosion-resistant and flame-resistant grades. Their aesthetic advantages are obvious.

Almost any elastomer profile can be extruded or custom-molded with modest tooling costs and short lead times for either prototypes or large orders. Parker Chomerics can take a customer-supplied design and deliver finished parts, typically within just a few weeks. Parker Chomerics offers hundreds of standard molded and extruded products. Molded products provide moisture/pressure sealing and EMI/EMP shielding when compressed properly in seals, flanges, bulkheads, and other assemblies. Extrusions provide similar benefits and are also readily lathe-cut into washers, spliced, bonded, kiss-cut, or die-cut to reduce installation labor and to conserve material, resulting in a cost-effective alternative to other methods of EMI shielding and environmental sealing.

CHO-SEAL® CONDUCTIVE ELASTOMERS

Over the years, Parker Chomerics has developed and enhanced virtually every aspect of conductive elastomer materials technology, from the earliest silver and silver-plated copper filled silicones, to the latest and more cost-effective silver-plated aluminum and nickel-plated graphite composites. Today we offer the most comprehensive selection and highest quality products available.

Each conductive elastomer consists of a silicone, fluorosilicone, EPDM or fluorocarbon-fluorosilicone binder with a filler of pure silver, silver-plated copper, silver-plated aluminum, silver-plated nickel, silver-plated glass, nickel-plated graphite, nickel-plated aluminum or unplated graphite particles.

The development of these composites is the result of decades of research and testing, both in the laboratory and in the field. Our proprietary filler powder technology allows us to carefully control the composition, size, and morphology of the conductive particles. Their precise, uniform dispersion within the resinous binders produces materials with stable and consistent electrical and physical properties.

Parker Chomerics' conductive elastomers feature excellent resistance to compression set over a wide temperature range, resulting in years of continuous service. In addition to EMI shielding, these materials can provide an environmental or pressure seal if required.

For those materials containing silver, both packaging and storage conditions should be similar to those for other silver-containing components, such as relays or switches. They should be stored in sheet plastic, such as polyester

or polyethylene, and kept away from sulfur-containing materials, such as sulfur-cured neoprene, cardboard, etc. To remove dirt, clean the elastomer with water or alcohol containing mild soap (do not use aromatic or chlorinated solvents). Shelf life of these conductive elastomers without the presence of pressure sensitive adhesive (PSA) is indefinite.

The tables at the end of this brochure outline the properties and specification limits of Parker Chomerics' conductive elastomers. These materials are produced in a virtually unlimited variety of molded, die-cut and extruded shapes and sizes. Our Applications Engineering Department is very accessible, and ready to assist with material selection and gasket design. We welcome your inquiry.

MATERIAL SELECTION

The Parker Chomerics array of conductive elastomers offers true flexibility in selecting the appropriate material for a specific application on the basis of cost and level of attenuation required. Price varies directly with shielding performance.

For typical military/aerospace applications, we recommend that users of conductive elastomer gaskets specify that materials meet the requirements of MIL DTL- 83528 QPL sources. To avoid the risk of system EMI or environmental seal failure, any change in conductive elastomer seal supplier (including MIL DTL-83528 QPL suppliers) should be preceded by thorough system qualification testing.

Fluid Resistance of Non-Silicone Based Elastomers

Certain specialty elastomers and fluorosilicone based materials, are offered specifically for their fluid resistance properties. Table 6 illustrates the qualitive assessment of fluid resistance towards various fluids for three non-silicone binders used for Parker Chomerics conductive elastomers.

Conductive Elastomer Applications

In general, certain types of Parker's conductive elastomers are specified more often for military/aerospace applications or for commercial applications. However, there is a considerable overlap, and our Applications Engineering department will be pleased to assist you with your product selection.

ELASTOMER PRODUCT OFFERING

(Sorted by filler family and by ascending electrical conductivity)

Military and Commercial Products

CHO-SEAL

1221 – Fluorosilicone, Molded Only
1224 - Molded Only
6502
6503 – Fluorosilicone
1298 – Fluorosilicone
1285
1287 – Fluorosilicone
1215
1217 – Fluorosilicone
1270 – Molded Only
1273
S6305
6330 – Molded Only
6370 – Extruded only
6371 – Molded only
6372 – Extruded Only
6308 – Extruded Only
L6303 – Fluorosilicone
1310 – Molded Only
1350
0860 – Extruded Only
0862 – Extruded Only
S6600 – Molded Only

Specialty Products

CHO-SEAL

1401
1239 - Molded Only
1212 – Molded Only
6435 – Molded Only
6307 – Molded Only
6452 – Extruded Only
V6433 – Molded Only

Corrosion Resistant Products

CHO-SEAL
6502
6503 – Fluorosilicone
1298 – Fluorosilicone
1285
1287 – Fluorosilicone

Refer to the following tables for specific material properties and material guidelines.

CONDUCTIVE ELASTOMER SELECTION GUIDE

The tables contained herein provide selection guidelines for Chomerics' most general-purpose EMI elastomer materials. With the exception of certain limitations noted under "Remarks", these materials are electrically stable over time and provide excellent moisture and pressure sealing. They are all medium-durometer materials and differ mainly in shielding performance and corrosion resistance. (Nickel-plated aluminum materials are significantly more corrosion-resistant than silver-plated copper, silver-plated aluminum, and silver-plated nickel filled materials against aluminum.)

Note on Gasket Deflection and Closure Force:

We do not recommend basing material selection primarily on hardness. Unlike unfilled elastomers, material hardness is not always an accurate indicator of deflection properties. The geometry of the gasket is generally the most important determinant of deflection under load.

For applications requiring large gasket deflection with minimum closure force, a hollow part geometry is recommended.

Please refer to the product specification data included within the next several pages for technical information regarding:

- Compression-Deflection
- Stress Relaxation
- Compression Set
- EMP Survivability
- Vibration Resistance
- Heat Aging
- Outgassing
- Volume Resistivity

TOP CORROSION RESISTANT MATERIALS

CHO-SEAL 6502 and 6503 gaskets with Ni/Al particles provide the material of choice for corrosion resistance against aluminum in harsh environments. These materials have lower transfer impedance at frequencies >10 MHz providing more than 100 dB of shielding effectiveness. After 2,000 hours, 125°C heat aging life testing, the shielding effectiveness is virtually unchanged. Ni/Al will lower the total cost of ownership by reducing or eliminating field service issues or maintenance schedules regardless of end use environment.

UL 94 V-0 RATED MATERIALS

Chomerics introduced the first conductive elastomer with a UL 94 V-0 rating (UL file number 96ME 17043) with allowable thicknesses down to 0.014 inch (0.356 mm). Mated to aluminum, this fully extrudable material is a corrosion-resistant nickel-plated graphite filled silicone with shielding effectiveness equivalent to or greater than other commercial grade gaskets: 95 dB from 50 MHz to 10 GHz. CHO-SEAL 6370, 6371 and 0862 are UL 94 V-0 flammability rated materials. CHO-SEAL 6330 and 6372 are UL 94 V-1 rated.

For UL certifications, please visit www.ul.com

LIGHTNING STRIKE RESISTANCE

The survivability of any system to lightning strike is dependent on specific flange design. Lightning strike testing of CHO-SEAL 1298 gasket material has demonstrated survivability beyond 5 kA/in. Test data is available upon request. (Request Test Report TR-34A.)

FLUID RESISTANCE – HARSH ENVIRONMENTS

Table 6 lists a qualitative assessment of fluid resistance by material type. The customer is encouraged to evaluate specific materials to the requirements demanded by the application.

FLUID RESISTANCE – COMMON FLUIDS ON SILICONE

Table 5 illustrates the change in physical properties of CHO-SEAL S6305 after exposure to a variety of common fluids. The complete report is available from Chomerics upon request.

DUAL FUNCTIONALITY GASKETS, “Co-Extruded and Co-Molded”

Co-Extruded and Co-Molded gaskets (dual gaskets with both a conductive and a non-conductive element, cured in parallel) provide additional environmental sealing and corrosion protection. Seam vulcanization ensures the long term integrity and stability of the gaset.

Co-Extruded and Co-Molded gaskets permit the cost-effective use of existing flange designs, while offering attachment alternatives via the less expensive, non-conductive material. Compared to bonding and mounting separate gaskets or double-groove designs, Co-Extruded and Co-Molded gaskets offer design, cost and handling advantages.

168 Hour Exposure

Table 3: Typical Elastomers-Galvanic Compatibility 168 Hour Exposure to Salt Spray / Salt Fog in Accordance wIth CHO-TM-100					
	Filler				
Substrate	Nickel-Plated Aluminum*	Passivated Silver-Plated Aluminum	Silver-Plated Aluminum	Nickel-Plated Graphite	Silver-Plated Copper
Aluminum: 6061-T6 CR6 Finish	Excellent	Excellent	Excellent / Good	Fair	Poor
Aluminum: 6061-T6 CR3 Finish	Excellent	Excellent	Good	Fair	Poor
Aluminum: 6061-T6 Unplated	No Data	Good	Fair	Fair / Poor	Not Recommended
Stainless Steel: 304SS, 316SS	Excellent	Excellent	Excellent	Excellent	No Data
Electroless Nickel .002" thick	Good	Good	Good	Poor	No Data
Magnesium	Not Recommended	Not Recommended	Not Recommended	Not Recommended	Not Recommended

*Tested via CHO-TM-101

504 Hour Exposure

Table 4: Typical Elastomers-Galvanic Compatibility 504 Hour Exposure to Salt Spray / Salt Fog in Accordance wIth CHO-TM-100					
	Filler				
Substrate	Nickel-Plated Aluminum*	Passivated Silver-Plated Aluminum	Silver-Plated Aluminum	Nickel-Plated Graphite	Silver-Plated Copper
Aluminum: 6061-T6 CR6 Finish	Excellent	Good	Fair	Poor	Not Recommended
Aluminum: 6061-T6 CR3 Finish	Good	Good	Fair	Poor	Not Recommended

*Tested via CHO-TM-101

Table 5: Exposure of CHO-SEAL® S6305 to Common Household Fluids

Tensile/Elongation in accordance with ASTM D412

Exposure Conditions: 70 hrs @ 22°C/50% RH		**Pre-Exposure**	**Post-Exposure**	**% Change**
Test 1				
ClearVue®	Tensile [psi]	200	178	-11%
	Elongation [%]	289	317	10%
Formula 409®	Tensile [psi]	200	197	-2%
	Elongation [%]	289	219	-24%
Windex®	Tensile [psi]	200	202	1%
	Elongation [%]	289	166	-43%
Test 2				
Carpet Cleaner	Tensile [psi]	203	207	2%
	Elongation [%]	414	443	7%
Coffee	Tensile [psi]	203	211	4%
	Elongation [%]	414	439	6%
Cola	Tensile [psi]	203	199	-2%
	Elongation [%]	414	433	5%
Hairspray	Tensile [psi]	203	207	2%
	Elongation [%]	414	326	-21%
Tire Cleaner	Tensile [psi]	203	175	-14%
	Elongation [%]	414	418	1%
Vinyl Protectant	Tensile [psi]	203	172	-15%
	Elongation [%]	414	433	5%
Tap Water	Tensile [psi]	203	199	-2%
	Elongation [%]	414	439	6%
Windshield Washer Solvent	Tensile [psi]	203	207	2%
	Elongation [%]	414	418	1%

Table 6: Typical Elastomer Fluid Resistance

Exposure / Fluid Type	**Elastomer Choice**		
	Silicone	**Fluorosilicone**	**EPDM**
High Temp	Excellent	Good	Fair
Low Temp	Excellent	Excellent	Excellent
ASTM 1 Oil	Fair/Good	Good	Poor
Hydraulic Fluids (Phosphate Ester)	Poor	Poor	Poor
Hydrocarbon Fuels	Poor	Good	Excellent
Ozone, Weather	Good	Good	Good
STB (NBC Decontamination Fluid)	Poor	Fair/Good	Good
Dilute Acids	Fair	Good	Good

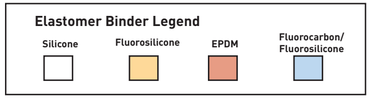
NOTE: Recommendations in application design and material selection are based upon available technical data and are offered as suggestions only. Customers should always test the seal material under actual operating conditions.

Table 7: Material Guidelines - Military and Commercial

		Test Procedure (Type of Test)	CHO-SEAL® 1221	CHO-SEAL® 1224	CHO-SEAL® 6502	CHO-SEAL® 6503	CHO-SEAL® 1298	CHO-SEAL® 1285	CHO-SEAL® 1287	CHO-SEAL® 1215
Physical	Molded (M) or Extruded (E)	--	M	M	M/E	M/E	M/E	M/E	M/E	M/E
	Conductive Filler	--	Ag	Ag	Ni/Al	Ni/Al	Passivated Ag/Al	Ag/Al	Ag/Al	Ag/Cu
	Elastomer Binder	--	Fluorosilicone	Silicone	Silicone	Fluorosilicone	Fluorosilicone	Silicone	Fluorosilicone	Silicone
	Type (Ref. MIL-DTL-83528)	--	Type F	Type E	Not Applicable	Not Applicable	Type D	Type B	Type D	Type A
	Volume Resistivity, ohm-cm, max., as supplied without pressure sensitive adhesive	CEPS-0002[c] (Q/C)	Not Applicable	Not Applicable	0.150	0.250	Not Applicable	Not Applicable	Not Applicable	Not Applicable
		MIL-DTL-83528 (Q/C)	0.002	0.002	Not Applicable	Not Applicable	0.012	0.008	0.012	0.004
	Hardness, Shore A	ASTM D2240 (Q/C)	75 ±7	65 ±7	65 ±10	74 ±7	70 ±7	65 ±7	70 ±7	65 ±7
	Specific Gravity	ASTM D792 (Q/C)	4.00 ±0.50	3.50 ±0.45	1.85 ± 0.25	2.05 ± 0.25	2.00 ± 0.25	2.00 ± 0.25	2.00 ± 0.25	3.50 ±0.45
	Tensile Strength, psi (MPa), min.	ASTM D412 (Q/C)	250 (1.72)	300 (2.07)	150 (1.03)	150 (1.03)	180 (1.24)	200 (1.38)	180 (1.24)	200 (1.38)
	Elongation, % min. or % min./max.	ASTM D412 (Q/C)	100/300	200/500	100 min	65 min	60/260	100/300	60/260	100/300
	Tear Strength, lb/in. [kN/m], min.	ASTM D624 (Q)	40 (7.00)	50 (8.75)	40 (7.00)	35 (6.13)	35 (6.13)	30 (5.25)	35 (6.13)	40 (7.00) / 25 (4.38)
	Compression Set, 70 hrs at 100°C, % max. [a]	ASTM D395, Method B (Q)	60	45	30	30	30	32	30	32
Thermal	Low Temperature Flex TR10, °C, min.	ASTM D1329 (Q)	-65	-65	-55	-55	-55	-65	-55	-65
	Maximum Continuous Use Temperature, °C [b]	--	160/200	160/200	125	125	160/200	160/200	160/200	125
	Thermal Conductivity, W/m-K [Typical] 300 psi [2.07 MPa]	ASTM D5470	Not Tested	2.8	1.0	0.9	1.2	2.2	Not Tested	2.1
Electrical	Shielding Effectiveness, dB, min. [f]	Method 1: CHO-TM-TP08[c] (Q)	Method 2	Method 2	Method 3	Method 3	Method 2	Method 2	Method 2	Method 2
	200 kHz (H Field)	Method 2: MIL-DTL-83528 Para. 4.6.12 (Q)	70	70	Not Tested	Not Tested	55	60	55	70
	100 MHz (E Field)		120	120	100	95	110	115	110	120
	500 MHz (E Field)		120	120	Not Tested	Not Tested	100	110	100	120
	2 GHz (Plane Wave)		120	120	110	110	95	105	95	120
	10 GHz (Plane Wave)	Method 3: CHO-TM-TP09[c] (Q)	120	120	85	100	90	100	90	120
	40 GHz (Plane Wave)		Not Tested				75	Not Tested	75	90
	Electrical Stability, ohm-cm, max.									
	Heat Aging	CEPS-0002[c] (Q)	Not Applicable	Not Applicable	0.200 [e]	0.250 [e]	Not Applicable	Not Applicable	Not Applicable	Not Applicable
		MIL-DTL-83528 Para. 4.6.15 (Q/C)	0.010	0.010	Not Applicable	Not Applicable	0.015	0.010	0.015	0.010
	Resistance During Vibration	MIL-DTL-83528 Para. 4.6.13 (Q)	0.010	0.010	Not Applicable	Not Applicable	0.015	0.012	0.015	0.004
	Resistance After Vibration	MIL-DTL-83528 Para. 4.6.13 (Q)	0.002	0.002	Not Applicable	Not Applicable	0.012	0.008	0.012	0.008
	Post Tensile Set Volume Resistivity	MIL-DTL-83528 Para. 4.6.9 (Q/C)	0.010	0.010	Not Applicable	Not Applicable	0.015	0.015	0.015	0.008
Regulatory	EMP Survivability, kA per in. perimeter	MIL-DTL-83528 Para. 4.6.16 (Q)	>0.9	>0.9	Not Applicable	Not Applicable	>0.9	>0.9	>0.9	>0.9
	RoHS Compliant	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	UL 94 Flammability Rating	--	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested

Table 7: Material Guidelines - Military and Commercial

	CHO-SEAL® 1217	CHO-SEAL® 1270	CHO-SEAL® 1273	CHO-SEAL® S6305	CHO-SEAL® 6330	CHO-SEAL® 6370	CHO-SEAL® 6371	CHO-SEAL® 6372	CHO-SEAL® 6308	CHO-SEAL® L6303	CHO-SEAL® 1310	CHO-SEAL® 1350	CHO-SEAL® 0860	CHO-SEAL® 0862	CHO-SEAL® S6600
Molded (M) or Extruded (E)	M/E	M	M/E	M/E	M	E	M	E	E	M/E	M	M/E	E	E	M
Conductive Filler	Ag/Cu	Ag/Cu	Ag/Cu	Ni/C	Ni/C	Ni/C	Ni/C	Ni/C	Ni/C	Ni/C	Ag/Glass	Ag/Glass	Carbon	Carbon	Carbon
Elastomer Binder	Fluorosilicone	Silicone	Silicone	Silicone	Silicone	Silicone	Silicone	Silicone	Silicone	Fluorosilicone	Silicone	Silicone	Silicone	Silicone	Silicone
Type (Ref. MIL-DTL-83528)	Type C	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Type M	Not Applicable	Not Applicable	Not Applicable
Volume Resistivity, ohm-cm, max., as supplied without pressure sensitive adhesive	Not Applicable	0.050	0.004	0.100	0.250	0.100	0.100	0.750	0.100	0.100	0.010	Not Applicable	3	24	7
	0.010	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0.006	Not Applicable	Not Applicable	Not Applicable
Hardness, Shore A	75 ±7	40 ±7	65 ±8	65 ±10	40 ±7	60 ±10	65 ±10	57 ±7	65 ±10	65 ±10	70 ±10	65 ±7	70 ±5	70 ±5	75 ±7
Specific Gravity	4.00 ± 0.50	2.90 ± 0.25	3.70 ± 0.25	2.00 ± 0.25	1.70 ± 0.25	2.10 ± 0.25	2.00 ± 0.25	1.80 ± 0.25	2.00 ± 0.25	2.20 ± 0.25	1.80 ± 0.25	1.90 ± 0.25	1.28 ± 0.30	1.20 ±0.30	1.20 ±0.25
Tensile Strength, psi (MPa), min.	180 (1.24)	80 (0.55)	175 (1.21)	200 (1.38)	120 (0.83)	150 (1.03)	150 (1.03)	150 (1.03)	200 (1.38)	150 (1.03)	200 (1.38)	200 (1.38)	500 (3.45)	600 (4.14)	650 (4.48)
Elongation, % min. or % min./max.	100/300	75	75	100	75	100	100	100	75	60	100	100/300	75	100	70
Tear Strength, lb/in. [kN/m], min.	35 (6.13)	Not Tested	Not Tested	50 (8.75)	Not Tested	35 (6.13)	Not Tested	35 (6.13)	40 (7.00)	35 (6.13)	Not Tested	30 (5.25)	50 (8.75)	60 (10.51)	Not Tested
Compression Set, 70 hrs at 100°C, % max. [a]	35	30	32	30	25	40	40	30	30	25	35	30	Not Tested	Not Tested	45
Low Temperature Flex TR10, °C, min.	-55	-60	-65	-45	-40	-45	-40	-40	-60	-45	-40	-55	-51	-51	-45
Maximum Continuous Use Temperature, °C [b]	125	125	125	150	150	150	150	150	150	150	160	160	177	177	200
Thermal Conductivity, W/m-K [Typical] 300 psi [2.07 MPa]	Not Tested	0.8	Not Tested	0.8	0.6	0.9	1.1	Not Tested	Not Tested	0.8	Not Tested	1.2	Not Tested	Not Tested	0.6
Shielding Effectiveness, dB, min. [f]	Method 2	Method 3	Method 1	Method 1	Method 3	Method 1	Method 1	Method 1	Method 1	Method 1	Method 1	Method 2	Not Applicable	Not Applicable	Method 1
200 kHz (H Field)	70	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	50	Not Tested	Not Tested	Not Tested
100 MHz (E Field)	120	80	100	100	75	100	100	80	100	100	100	100	Not Tested	Not Tested	80
500 MHz (E Field)	120	80	100	100	75	100	100	80	100	100	100	100	Not Tested	Not Tested	80
2 GHz (Plane Wave)	115	70	100	100	70	95	80	80	100	100	90	90	Not Tested	Not Tested	60
10 GHz (Plane Wave)	110	70	100	100	70	95	80	80	100	100	80	80	Not Tested	Not Tested	50
40 GHz (Plane Wave)	Not Tested	Not Tested	Not Tested	75	0.6	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	75	Not Tested	Not Tested	Not Tested
Electrical Stability, ohm-cm, max.															
Heat Aging	Not Applicable	0.100[e]	0.010	0.250[e]	0.250[e]	0.250[e]	0.250[e]	0.850[e]	0.250[e]	0.250[e]	0.010	Not Applicable	Not Tested	Not Tested	7 [e]
	0.015	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0.015	Not Applicable	Not Applicable	Not Applicable
Resistance During Vibration	0.010	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0.009	Not Applicable	Not Applicable	Not Applicable
Resistance After Vibration	0.015	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0.006	Not Applicable	Not Applicable	Not Applicable
Post Tensile Set Volume Resistivity	0.015	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0.009	Not Applicable	Not Applicable	Not Applicable
EMP Survivability, kA per in. perimeter	>0.9	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0.015	Not Applicable	Not Applicable	Not Applicable
RoHS Compliant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UL 94 Flammability Rating	Not Tested	Not Tested	Not Tested	HB	V-1	V-0	V-0	V-1	Not Tested	Not Tested	HB	Not Tested	not tested	V-0	Not Tested



Note A: Compression set is expressed as a percentage of deflection per ASTM D395 Method B, at 25% deflection. To determine percent recovery, subtract 0.25 of the stated compression set value from 100%. For example, in the case of 30% compression set, recovery is 92.5%.

Note B: Where two values are shown, the first represents max. operating temp. for conformance to MIL-DTL-83528 (which requires Group A life testing at 1.25 times max. operating temp.) and the second value represents the practical limit for ex posure up to 1000 hrs. (compressed between flanges 7-10%). Single values conform to both definitions.

Note C: Copies of CEPS-0002, CHO-TM-TP08 and CHO-TM-TP09 are available from Chomerics. Contact Applications Engineering.

Note D: Heat aging condition: 100°C for 48 hrs.

Note E: Heat aging condition: 150°C for 48 hrs.

Note F: It may not be inferred that the same level of shielding effectiveness provided by a gasket material tested in the fixture per MIL-DTL-83528 Para. 4.5.12 would be provided in an actual equipment flange, since many mechanical factors of the flange design (tolerances, stiffness, fastener location and size, etc.) could lower or enhance shielding effectiveness. This procedure provides data applicable only to the test fixture design of MIL-DTL-83528, but which is useful for making comparisons between different gasket materials. 40 ghz test data for all materials uses TP08 test method.

Note G: Heat aging condition: 200 °C for 48 hours

Note H: Heat aging condition: 125 °C for 1000 hours

Table 8: Material Guidelines - Specialty Products

		Test Procedure (Type of Test)	CHO-SEAL® 1401	CHO-SEAL® 1239	CHO-SEAL® 1212	CHO-SEAL® 6435	CHO-SEAL® 6307	CHO-SEAL® 6452	CHO-SEAL® V6433
Physical	Molded (M) or Extruded (E)	--	M/E	M	M	M	M	E	M
	Conductive Filler	--	Ag	Ag/Cu	Ag/Cu	Ag/Ni	Ni/C	Ni/C	Ag/Ni
	Elastomer Binder	--	Silicone	Silicone & Expanded Cu Foil	Silicone	EPDM	EPDM	EPDM	Fluorocarbon/ Fluorosilicone
	Type (Ref. MIL-DTL-83528)	--	Not Qualified	Type G	Type K	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Volume Resistivity, ohm-cm, max., as supplied without pressure sensitive adhesive	CEPS-0002[1] (Q/C)	Not Applicable	Not Applicable	Not Applicable	0.006	5.000	Not Applicable	Not Applicable
		MIL-DTL-83528 (Q/C)	0.010	0.007	0.005	Not Applicable	Not Applicable	0.500	0.006
	Hardness, Shore A	ASTM D2240 (Q/C)	45 ±5	80 ±7	85 ±7	80 ±7	75 ±7	70 ±10	85 ±7
	Specific Gravity	ASTM D792 (Q/C)	1.60 ± 0.25	4.75 ± 0.75	3.50 ± 0.45	3.70 ± 0.25	1.90 ± 0.25	1.95 ± 0.25	4.80 ± 0.25
	Tensile Strength, psi (MPa), min.	ASTM D412 (Q/C)	200 (1.38)	600 (4.14)	400 (2.76)	200 (1.38)	200 (1.38)	200 (1.38)	400 (2.76)
	Elongation, % min. or % min./max.	ASTM D412 (Q/C)	75	20	100/300	200	75	200	50
	Tear Strength, lb/in. (kN/m), min.	ASTM D624 (Q)	20 (3.50)	70 (12.25)	40 (7.00)	75 (13.13)	60 (10.51)	55 (9.63)	70 (12.25)
	Compression Set, 70 hrs at 100°C, % max. [A]	ASTM D395, Method B (Q)	35	Not Tested	35	40	40	35	45
Thermal	Low Temperature Flex TR10, °C, min.	ASTM D1329 (Q)	-55	Not Tested	-45	-40	-45	Pending	-25
	Maximum Continuous Use Temperature, °C [B]	--	160/200	125	125	100	100	100	200
	Thermal Conductivity, W/m-K (Typical) 300 psi (2.07 MPa)	ASTM D5470	0.9	1.9	1.8	1.8	0.6	Not Tested	2.1
Electrical	Shielding Effectiveness, dB, min. [F] [G] [H]	Method 1: CHO-TM-TP08[2] (Q) Method 2: MIL-DTL-83528 Para. 4.6.12 (Q) Method 3: CHO-TM-TP09[2] (Q)	Method 2	Method 2	Method 2	Method 2	Method 2	Method 3	Method 2
	200 kHz (H Field)		60	70	70	Not Tested	Not Tested	Not Tested	Not Tested
	100 MHz (E Field)		100	110	120	105	95	75	105
	500 MHz (E Field)		100	110	120	100	90	Not Tested	100
	2 GHz (Plane Wave)		90	110	120	85	85	105	90
	10 GHz (Plane Wave)		80	110	120	85	85	85	90
	40 GHz (Plane Wave)		Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested
	Electrical Stability, ohm-cm, max.								
	Heat Aging	CEPS-0002[1] (Q)	Not Applicable	Not Applicable	Not Applicable	0.0125 [d]	10[4]	Not Applicable	0.008[3]
		MIL-DTL-83528 Para. 4.6.15 (Q/C)	0.015	0.010	0.010	Not Applicable	Not Applicable	0.350	Not Applicable
	Resistance During Vibration	MIL-DTL-83528 Para. 4.6.13 (Q)	0.015	0.007	0.010	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Resistance After Vibration	MIL-DTL-83528 Para. 4.6.13 (Q)	0.010	Not Applicable	0.005	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	Post Tensile Set Volume Resistivity	MIL-DTL-83528 Para. 4.6.9 (Q/C)	0.020	Not Applicable	0.010	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Regulatory	EMP Survivability, kA per in. perimeter	MIL-DTL-83528 Para. 4.6.16 (Q)	>0.9	>0.9	>0.9	Not Applicable	Not Applicable	Not Applicable	Not Applicable
	RoHS Compliant	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	UL 94 Flammability Rating	--	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not tested

Q: Qualification Tested
C: Conformance Tested

Elastomer Binder Legend

Silicone | Fluorosilicone | EPDM | Fluorocarbon/ Fluorosilicone

Note A: Compression set is expressed as a percentage of deflection per ASTM D395 Method B, at 25% deflection. To determine percent recovery, subtract 0.25 of the stated compression set value from 100%. For example, in the case of 30% compression set, recovery is 92.5%.

Note B: Where two values are shown, the first represents max. operating temp. for conformance to MIL-DTL-83528 (which requires Group A life testing at 1.25 times max. operating temp.) and the second value represents the practical limit for exposure up to 1000 hrs. (compressed between flanges 7-10%). Single values conform to both definitions.

Note C: Copies of CEPS-0002, CHO-TM-TP08 and CHO-TM-TP09 are available from Chomerics. Contact Applications Engineering.

Note D: Heat aging condition: 100°C for 48 hrs.

Table 9: Material Guidelines - Corrosion Resistant Materials

		Test Procedure (Type of Test)	CHO-SEAL® 6502	CHO-SEAL® 6503	CHO-SEAL® 1298	CHO-SEAL® 1285	CHO-SEAL® 1287
Physical	Molded (M) or Extruded (E)	--	M/E	M/E	M/E	M/E	M/E
	Conductive Filler	--	Ni/Al	Ni/Al	Passivated Ag/Al	Ag/Al	Ag/Al
	Elastomer Binder	--	Silicone	Fluorosilicone	Fluorosilicone	Silicone	Fluorosilicone
	Type (Ref. MIL-DTL-83528)	--	Not Applicable	Not Applicable	Type D	Type B	Type D
	Volume Resistivity, ohm-cm, max., as supplied without pressure sensitive adhesive	CEPS-0002[1] (Q/C)	0.150	0.250	Not Applicable	Not Applicable	Not Applicable
		MIL-DTL-83528 (Q/C)	Not Applicable	Not Applicable	0.012	0.008	0.012
	Hardness, Shore A	ASTM D2240 (Q/C)	65 ±10	74 ±7	70 ±7	65 ±7	70 ±7
	Specific Gravity	ASTM D792 (Q/C)	1.85 ± 0.25	2.05 ± 0.25	2.00 ± 0.25	2.00 ± 0.25	2.00 ± 0.25
	Tensile Strength, psi (MPa), min.	ASTM D412 (Q/C)	150 (1.03)	150 (1.03)	180 (1.24)	200 (1.38)	180 (1.24)
	Elongation, % min. or % min./max.	ASTM D412 (Q/C)	100 min	65 min	60/260	100/300	60/260
	Tear Strength, lb/in. (kN/m), min.	ASTM D624 (Q)	40 (7.00)	35 (6.13)	35 (6.13)	30 (5.25)	35 (6.13)
	Compression Set, 70 hrs at 100°C, % max. [A]	ASTM D395, Method B (Q)	30	30	30	32	30
Thermal	Low Temperature Flex TR10, °C, min.	ASTM D1329 (Q)	-55	-55	-55	-65	-55
	Maximum Continuous Use Temperature, °C [B]	--	125	125	160/200	160/200	160/200
	Thermal Conductivity, W/m-K (Typical) 300 psi (2.07 MPa)	ASTM D5470	1.0	0.9	1.2	2.2	Not Tested
Electrical	Shielding Effectiveness, dB, min. [F]	Method 1: CHO-TM-TP08[2] (Q) Method 2: MIL-DTL-83528 Para. 4.6.12 (Q) Method 3: CHO-TM-TP09[2] (Q)	Method 3	Method 3	Method 2	Method 2	Method 2
	200 kHz (H Field)		Not Tested	Not Tested	55	60	55
	100 MHz (E Field)		100	95	110	115	110
	500 MHz (E Field)		Not Tested	Not Tested	100	110	100
	2 GHz (Plane Wave)		110	110	95	105	95
	10 GHz (Plane Wave)		85	100	90	100	90
	40 GHz (Plane Wave)		Not Tested	Not Tested	75	Not Tested	75
	Electrical Stability, ohm-cm, max.						
	Heat Aging	CEPS-0002[1] (Q)	0.200 [e]	0.250 [e]	Not Applicable	Not Applicable	Not Applicable
		MIL-DTL-83528 Para. 4.6.15 (Q/C)	Not Applicable	Not Applicable	0.015	0.010	0.015
	Resistance During Vibration	MIL-DTL-83528 Para. 4.6.13 (Q)	Not Applicable	Not Applicable	0.015	0.012	0.015
	Resistance After Vibration	MIL-DTL-83528 Para. 4.6.13 (Q)	Not Applicable	Not Applicable	0.012	0.008	0.012
	Post Tensile Set Volume Resistivity	MIL-DTL-83528 Para. 4.6.9 (Q/C)	Not Applicable	Not Applicable	0.015	0.015	0.015
Regulatory	EMP Survivability, kA per in. perimeter	MIL-DTL-83528 Para. 4.6.16 (Q)	Not Applicable	Not Applicable	>0.9	>0.9	>0.9
	RoHS Compliant	--	Yes	Yes	Yes	Yes	Yes
	UL 94 Flammability Rating	--	Not tested	Not tested	Not Tested	Not Tested	Not Tested

Note E: Heat aging condition: 150°C for 48 hrs.

Note F: It may not be inferred that the same level of shielding effectiveness provided by a gasket material tested in the fixture per MIL-DTL-83528 Para. 4.5.12 would be provided in an actual equipment flange, since many mechanical factors of the flange design (tolerances, stiffness, fastener location and size, etc.) could lower or enhance shielding effectiveness. This procedure provides data applicable only to the test fixture design of MIL-DTL-83528, but which is useful for making comparisons between different gasket materials. 40 ghz test data for all materials uses TP08 test method.

Note G: Heat aging condition: 200 °C for 48 hours

Note H: Heat aging condition: 125 °C for 1000 hours

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