NORSEAL

Silicone Rubber Solutions

SAINT-GOBAIN

Norseal® Silicone Rubber Solutions

The Norseal Silicone Advantage

Saint-Gobain® Norseal Silicone Rubber is a family of high-performance products featuring a unique chemical structure that provides high temperature stability and general inertness unavailable in any other elastomer. As a result, **Norseal** Silicone Rubber works in applications where no other material can be used. These high performing products are frequently used in a variety of applications and many markets including military, aerospace, electronics, life science, transportation, LED lighting, electric vehicles (EV) and packaging.

KEY MARKETS

- Aerospace
- Rail
- Electronics
- Lighting
- Industrial
- Military
- Life Science
- Food Industry
- Automotive-Electric Vehicle

Silicone Features & Benefits

- Silicone offers a very unique combination of properties not possible in other materials, including high temperature resistance combined with low compression set and a non-stick surface. Silicone is the only material that can satisfy these specifications.
- Extreme temperature resistance ensures all inherent properties are maintained and material remains elastomeric over a wide temperature range of -100°F to +500°F.
- Weather, moisture, ozone, UV and fungus resistance mean extended service life in outdoor applications.
- Superior compression set resistance results in quick recovery in gasketing applications.

Inertness

Norseal Silicone Rubber is odorless, tasteless and non-toxic. It contains no acid-producing chemicals; therefore, is non-corrosive and non-staining. Silicone Rubber has excellent weatherability because it is unaffected by sunlight, ozone and/or extremely moist or dry conditions and will not support the growth of fungus. The service life of **Norseal** Silicone Rubber in room temperature applications is virtually unlimited.

Thermal Stability

Silicone's physical properties are not adversely affected by prolonged exposure to temperatures from -100°F to +500°F. In addition, it can withstand intermittent exposure to even higher temperatures (Time/Temperature Resistance). Silicone far outdistances other elastomers in resistance to thermal degradation and outperforms in general service life, compression set resistance, electrical strength and non-stick properties. Silicone also delivers good chemical and fluid resistance. Although it may swell in contact with some solvents, the rubber will return to its original dimensions, usually without permanent deterioration after the solvent has evaporated. At elevated temperatures, **Norseal** Silcone Rubber will outgas far less than other silicone elastomers. If they should burn, they will produce a non-conductive white ash and odorless, non-toxic smoke.

Compression Modulus

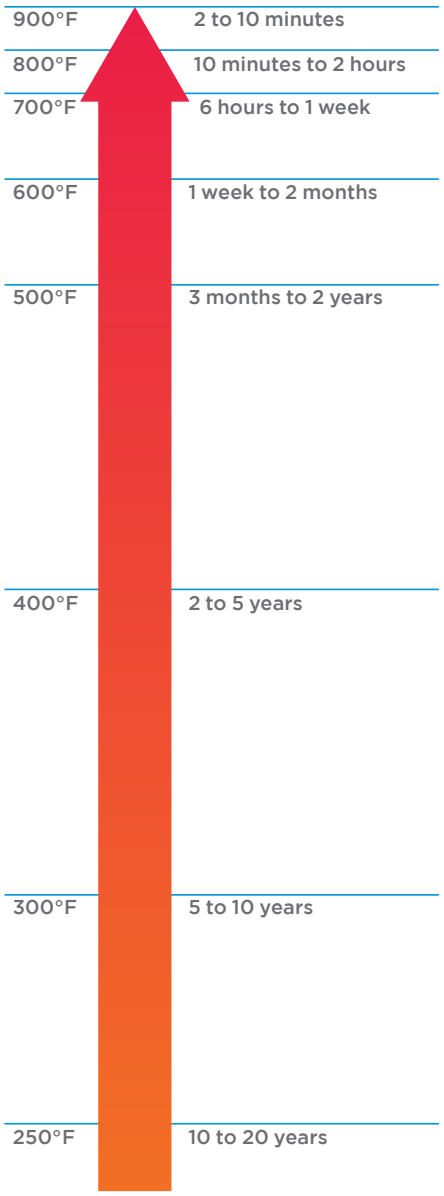
Compression modulus refers to the amount of pressure required to compress a piece of rubber to a certain percentage of original thickness. Compression Modulus (see below) shows the values for silicone sponge, solid and foam. Testing was performed on ½" thick cylindrical specimens.

Problem Solver

Our reputation for solving tough design problems is based on over 65 years of silicone rubber experience. And we are committed to developing and supplying the highest quality products and technical assistance that meet your exact needs. Bring us your most demanding silicone rubber requirements and we'll deliver a **Norseal** Silicone Rubber product that exceeds your expectations.

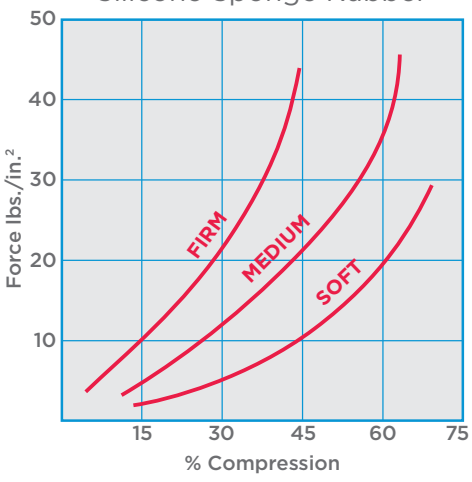
Time/Temperature Resistance

Based on temperature for 8 hours daily until rubber can no longer be elongated 50%

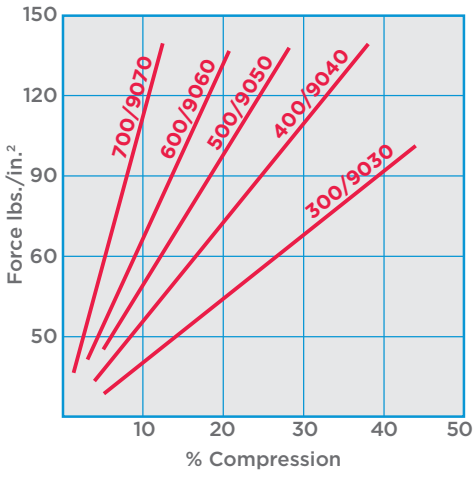


Compression Modulus (at room temperature)

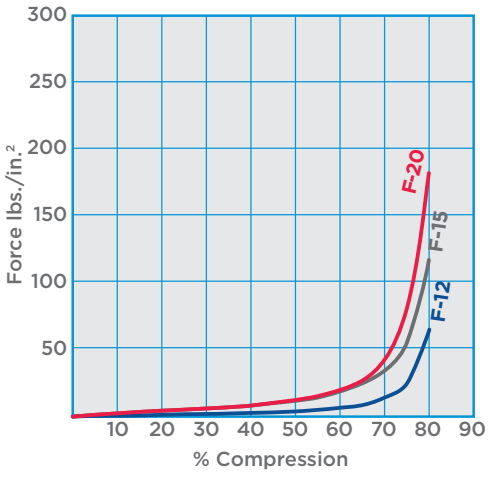
Silicone Sponge Rubber



Silicone Solid Rubber



Silicone Foam



Silicone Sponge Rubber

The full line of **Norseal** Silicone Sponge Rubber is designed for a variety of gasketing, cushioning, insulating and protecting applications, with a wide range of temperatures and environments. Our experts can help you chose the proper product for your requirements, including formulations designed for general gasketing, flame retardant cushions, specification grade, solvent resistant gaskets and weather seals.

Key benefits of our closed cell sponge include thermal stability over a wide temperature range, excellent compression set resistance, ozone and UV resistance. All closed-cell **Norseal** Silicone Sponge products are subjected to the most extreme post-cure cycle process in the industry in order to lower material out-gassing for cleaner operation in critical applications. Alternatively, non-post-cured competitive silicone rubber is known to have high out-gassing, which causes contamination issues in electronics and safety concerns in the aerospace industry.

Product Range

R10400 – Unparalleled flame retardant properties with enhanced solvent resistance; thicknesses down to and including 1/16″ pass UL 94 with a V-0 rating. Available in medium grade.

R10404 – A thermally conductive silicone sponge rubber, this material offers electrical isolation and compression set resistance.

R10450 – Features a unique construction with fiberglass reinforcement providing dimensional stability. Available in medium grade.

R10460 – Flame retardant (UL 94 HB/ V-1 for thicknesses > 11.7 mm) and especially resistant to compression set. Available in medium grade.

R10470 – General-purpose silicone sponge, appropriate for most applications. Available in medium and firm grades.

R10480 – Features an extremely low compression set and maintains resiliency even under extended compression. Available in soft and medium grades.

R10490 – Excellent solvent resistance Fluorosilicone grade for use as a gasket where it is necessary to contain fluids that would degrade normal silicone sponge and solid materials. Temperature range of -80°F to +400°F.

Norseal Silicone Sponge Rubber

Common Properties (Reference)	
Water Absorption (ASTM D1056)	<5%
Dielectric Strength	145 volts/mil (approx.)
Thermal Conductivity (average)	0.11 W/mK*
Specific Heat	0.3 BTU/lb./°F
Linear Thermal Expansion (room temp. to +350°F)	1.8 x 10^{-4} in./in./°F
Outgassing (NASA Testing)	Less than 1% weight loss (after 24 hrs. at 257°F in vacuum)

* Excluding R10404.

Norseal Silicone Sponge Rubber

Construction	General Purpose			Low Compression Set		Flame Retardant				Reinforced		Fluorosilicone		Thermally Conductive	
Width/Sheet Size	36" wide	36"x36"		36" wide	36"x36"	36" wide	36"x36"	36"wide	36"x36"	36" wide	36"x36"	36" wide	36"x36"	36" wide	36"x36"
															
Specific Properties	**R10470**			**R10480**		**R10460**		**R10400**		**R10450**		**R10490**		**R10404**	
	medium	medium	firm	soft	medium	medium	medium	medium	medium	medium	medium	medium	medium	firm	firm
Color	orange-tan / black††† / grey†††			red	brown	dk blue	dk blue	grey	grey	blue-grey	blue-grey	blue	blue	lt green	lt green
Thickness/Tolerance (inches)															
1/32 /±.010	■	■	***									■	■	■	■
1/16 /±1/64	■	■	■		■	■	■	■	■	■	■	■	■	■	■
3/32 /±1/64	***	***	***	■	***	***	***	■	■	***	***	■	■	***	***
1/8 /±1/32	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3/16 /±1/32	■	■	■	■	■	■	■	■	■	■	■			■	■
1/4 /±3/64 to -1/32	■	■	■	■	■	■	■		■					***	***
1/2 /±3/64		■	■	■	■	■	■		■						
Compression Deflection (psi)** (compressed 25% at room temperature)	10	10	16	5	10	10	10	10	10	15	15	15	15	20	20
Tensile Strength (psi)**	90	90	130	50	75	75	75	100	100	125	125	180	180	120	120
Elongation at Break (%)**	150	150	200	75	125	125	125	250	250	<10	<10	125	125	150	150
Compression Set (%)** (compressed 50% for 22 hrs. at 212°F)	15	15	15	5	5	5	5	5	5	25	25	25	25	15	15
Density (lb./ft.³)**	29	29	43	21	29	29	29	35	35	35	35	35	35	69	69

††† R10470 Medium available in black and grey on a minimum quantity basis. R10470 Firm available in black on a minimum quantity basis. R10470 Firm not available in grey.

** ASTM Test Method used: Compression Deflection and Compression Set (D1056), Tensile Strength and Elongation (D412), Density (D3574).

*** Special order. Minimum quantities apply.

■ = Thickness available.

Norseal provides certification to specifications listed when requested with order. All properties are typical values and should not be used for writing specifications. Please contact Customer Care concerning updated specifications.

For a list of all product specifications, please see page 14.

Because of the softness and the processing of R10480 Soft, we do not recommend die-cutting narrow width gasketing. Contact Application Engineering.

APPLICATIONS INCLUDE

- Press relief pads
- Electric meters
- Military specification grade gasketing
- Lighting gaskets
- Drones
- Digital signage
- Space exploration

Silicone Solid Rubber

The **Norseal** Silicone Solid Rubber line includes specification grade, high-performance grade and electrically conductive grade products. Products range in thicknesses from .031" (.79mm) to 1/4" (6.35mm) in durometer, hardness from 30-70 on the Shore A scale. Temperature ratings generally range between -100°F to +500°F (-73°C to +260°C).

Often referred to as "red rubber" because historical offerings were red in color, **Norseal** Silicone Solid Rubber also comes in clear, grey, black and green with minimum quantity restrictions.

Product Range

Series 300-700 – Specification-grade general purpose **sheet** goods, available in thicknesses up to 1/4" and withstanding temperatures from -100°F to +500°F.

Series 9030-9070 – Specification-grade continuous general purpose **yard** goods produced in 36" wide continuous lengths for the most efficient utilization of material, minimizing waste.

Series 9200 – Providing great tensile strength and tear resistance, this series is tougher and more resilient than general-purpose silicone and can withstand temperatures from -100°F to +400°F.

For information on EC102 please see page 13.

APPLICATIONS INCLUDE

- Environmental gasketing
- Aircraft wings and helicopter blades
- Vibration damping and cushioning
- MRI/CAT Scan cabinets
- Flood lights and spotlights
- Commercial appliances
- Military equipment

Norseal Silicone Solid Rubber

Common Properties (Reference)	
Dielectric Strength	500 volts/mil (approx.)
Thermal Conductivity (average)	0.19 W/mK
Specific Heat	0.3 BTU/lb./°F
Linear Thermal Expansion (room temp. to +350°F)	1.5 x 10^{-4} in./in./°F

Norseal Silicone Solid Rubber

Specific Properties	General Purpose					High-Performance	
	300/9030†	400/9040†	500/9050†	600/9060†	700/9070†	9235	9255
Color	red	red	red	red	red	grey	grey
Thickness/Tolerance (inches)							
1/32	±.010	±.005	±.005	±.005	±.006	±.005	±.005
1/16	±.010	±.005	±.005	±.005	±.005	±.005	±.005
3/32†††	±.010	±.010	±.010	±.010	±.010	±.010	±.010
1/8	±.010	±.010	±.010	±.010	±.010	±.010	±.010
3/16*	±.016	±.016	±.016	±.016	±.016		
1/4*	±.031	±.031	±.031	±.031	±.031		
Durometer (Shore A ±5)††	30	40	50	60	70	30	50
Tensile Strength (psi)††	850	900	900	700	750	1150	1200
Elongation (%)††	500	500	400	200	160	800	600
Tear Strength (ppi)††	40	80	75	50	65	150	160
Compression Set (%) (after 70 hrs. at 320°F)††	15	15	15	20	20	30	30
After Dry Heat Aging for 70 hrs. at 437°F							
Durometer Change (points, Shore A)	+5	+5	+5	+5	+5	+10	+10
Tensile Strength Change (%)	-10	-10	-10	-10	-10	-15	-20
Elongation Change (%)	-20	-20	-30	-30	-30	-30	-30
After Immersion in ASTM Oil #1 (high aniline point) for 70 Hrs. at 302°F							
Durometer Change (points, Shore A)	-5	-10	-10	-10	-10	-5	-5
Tensile Strength Change (%)	-10	-10	-10	-10	-10	+5	0
Elongation Change (%)	-10	-5	-5	-5	-5	-5	-5
Volume Change (%)	+10	+5	+5	+5	+5	+5	+5

* Provided in 36" x 36" sheets only. No yard goods available for these thicknesses.

† **Norseal** 300 – 700 provided in 36" x 36" sheets. **Norseal** 9030 – 9070 provided as 36" wide yard goods.

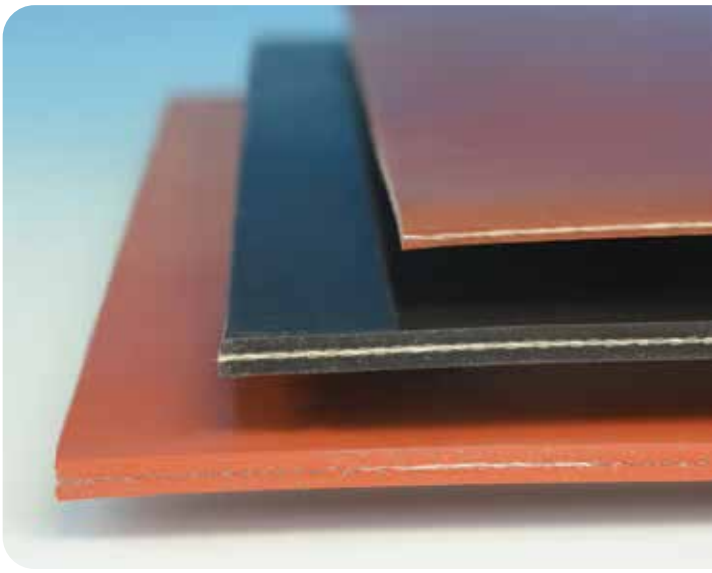
†† ASTM Test Method used: Durometer (D2240), Tensile Strength and Elongation (D412), Tear Strength (D624), Compression Set (D395). Die B Method B, ASTM D2000 + Fed. Spec. ZZ-R-765.

††† Special order. Minimum quantities apply.

For a list of general product specifications, please see page 14.

Reinforced Solid Rubber

Norseal Silicone Reinforced Solid Rubber with fiberglass increases the product's dimensional stability for high-pressure applications, while functioning over a wide temperature range. Most products feature different solid silicone rubber durometers (hardness) on both sides of the fiberglass reinforcement. We also offer a product with a closed cell silicone sponge on both sides of the fiberglass substrate. Materials are available in yard goods and sheets, with and without pressure-sensitive adhesive on one side. Thicknesses range from .031" (.79mm) up to .125" (3.17mm). Products are designed for various ranges of pressure and temperature resistance.



Product Range

3320 – General purpose press pad developed to meet AMS 3320; for temperatures up to 350°F (177°C) and pressure up to 500 psi. Resistant to lubricating oil along with excellent compression set resistance.

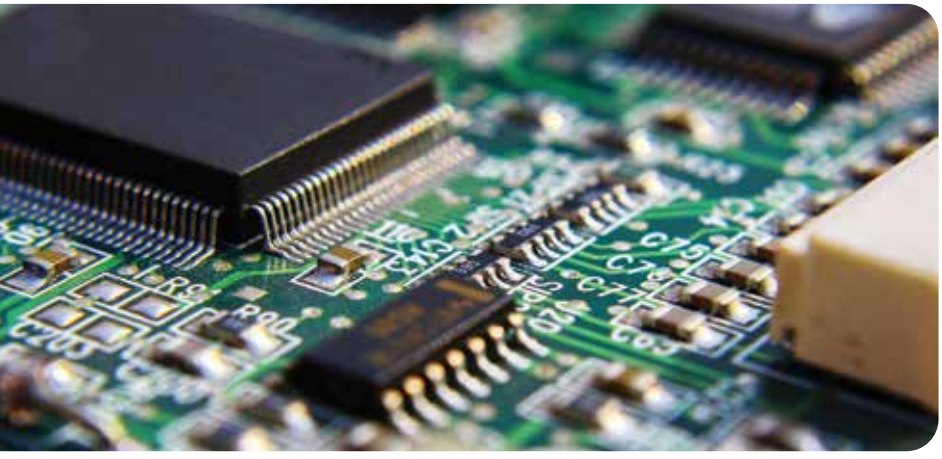
4032 – Thin, flexible and abrasion resistant; typically chosen for flexible gasketing applications.

4100 – Flame retardant silicone compound is available in 2 thicknesses. Contact Customer Care for additional information.

4420 – Specially formulated for thermal stability and long life under extreme heat and pressure for extended dwell times; formulated for increased temperature resistance up to 400°F (204°C) and pressures up to 500 psi.

4444 – Uniquely designed to give better reversion resistance; features a special crush-resistant fiberglass, making it excellent for press pads in high-temperature and pressure lamination applications; for increased temperature resistance up to 400°F (204°C) and pressures up to 1000 psi.

4480 – Our most reversion resistant silicone compound, 4480 is designed for use in applications involving the tough combination of prolonged high-pressure confinement (up to 1000 psi) at temperatures up to 575°F (302°C).



APPLICATIONS INCLUDE

- Press pads for PCB laminations
- Engine compartments
- High-strength gasketing
- Flexible circuit boards
- Printed circuit boards
- Military aircraft
- High pressure gaskets

Norseal Reinforced Solid Rubber

Common Properties											
Dielectric Strength	500 volts/mil (approx.)										
Thermal Conductivity (avg. from +75 to +350°F)	0.27 W/mK										
Elongation at Break	< 10%										
Linear Thermal Expansion	4.7 × 10^{-6} in./in./°F (fiberglass) 1.5 × 10^{-4} in./in./°F (silicone rubber)										
	Continuous Length										
Width	36″ wide				36″ or 40″ wide		26″ or 38″ wide			38″ wide	
Specific Properties	**4032**	**3320**			**4420**		**4444**			**4480**	
Color	grey	red			brown		red			dark grey	
Thickness (inches)*	1/32	1/16	3/32	1/8	.045	1/16	1/16	3/32	1/8	1/16	1/8
Tolerance (inches)*	±.005	±.005	±.010	±.010	±.005	±.005	±.005	±.010	±.010	±.005	±.010
Fiberglass Thickness (inches)	.014	.014	.014	.014	.007	.014	.018	.018	.018	.014	.014
Weight (ounces per square yard)*	35	65	94	124	48	65	72	104	144	65	150
Fiberglass (% of weight)	37	20	14	10	13	20	20	14	10	20	10
Weight Loss (4 hrs. at 400°F) (%)*	1.0	1.5	1.5	1.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Break Strength (warp) (PPI)*	300	300	300	300	225	300	400	400	400	300	300
Durometer (Shore A ±5)**	81	74	66	65	78	74	79	72	67	81	75

** ASTM Test Method used: Thickness/Tolerance, Weight, Weight Loss, Break Strength and Diaphragm Burst Strength (D751), Durometer (D2240).

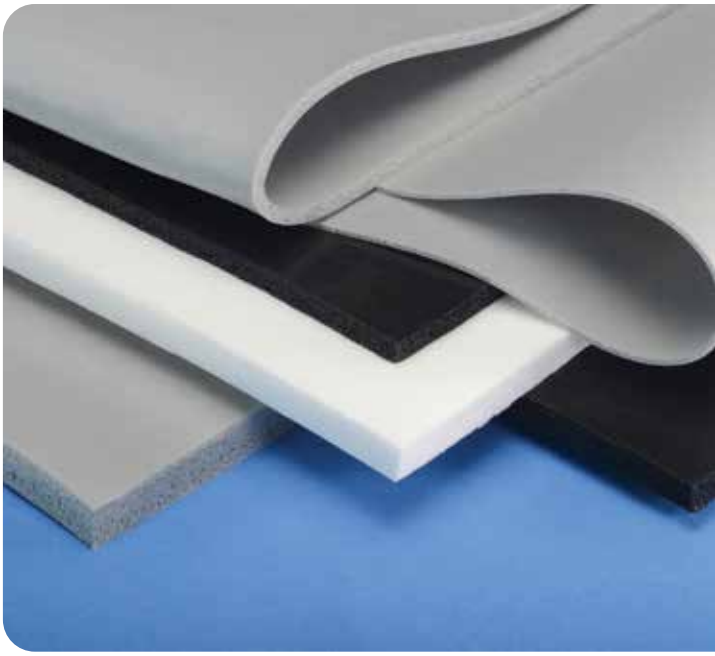
** Actual rubber durometer is 50 for 4032; 60 for 3320, 4420, 4444; 70 for 4480.

Norseal provides certification to the specifications listed when requested with order. All properties are typical values and should not be used for writing specifications. Please contact Customer Care concerning updated specifications.

For a list of all product specifications, please see page 14.

Silicone Foam

Low-density, flame-retardant **Norseal** Silicone Foam yard goods provide outstanding performance for industries ranging from aviation and mass transit to automotive, electronics construction and furniture. Available as **Norseal** F-12, F-15, F-20 and FG20 Silicone Foam Rubber, these materials provide excellent flame retardance with low toxicity and smoke generation in a conformable expanded cellular material.



Non-corrosive for use with metals and in hostile environments, **Norseal** Silicone Foam has a low compression set. Applications include fireblocks, thermal barriers, noise and vibration dampeners, insulation and high-performance gaskets or seals. Its weather, moisture, ozone, UV and fungus resistance make it the perfect gasketing material for outdoor applications.

For available product thicknesses, see page 10. The standard color is grey for F-12, F-15, F-20 and FG20, but other options including white and black are available, with minimum quantity requirements.

Product Range

F-12 and **F-15** – Have a modified cell structure and are produced in a low density for lightweight gasketing and insulation applications. F-12 and F-15 silicone foams combine unique flame retardancy and low toxic gas emission properties with excellent compression set resistance, conformity and low density. Combining two or all of these properties makes these products the ultimate fire blocking silicone foam for fire- and heat-resistant gaskets, seals and cushioning, as well as radiant heat shields and insulation blankets. F-12 standard surface features include smooth one side and textured one side. F-15 standard surface is smooth both sides.

F-20 – Features a finer cell structure (closed-cell) and is produced in a medium density design for mass transit and transportation applications. F-20 offers excellent compression set resistance and is often the product of choice in aircraft, aerospace, mass transit, military and electronic applications with extremely stringent smoke, flame and toxicity requirements. F-20 and FG20 offer excellent resistance to environmental conditions, making them an excellent choice for both indoor and outdoor sealing and gasketing applications. Standard offering is smooth both sides for excellent sealing attributes.

APPLICATIONS INCLUDE

- Gasket seal for outdoor lighting
- Seat cushioning
- Medical equipment
- Electronic vehicle (EV)
- Access panel seals for railcar applications
- Mass transit gasketing and insulation
- Engine gaskets for aerospace

Norseal Silicone Foam Rubber

Properties*

Product	F-12									F-15							F-20								FG20				
Width	36" wide								18" wide	36" wide							36" wide								36" wide				
Color	grey*									grey*							grey*								grey*				
Thickness (inches)	1/16	3/32	1/8	3/16	1/4	3/8	1/2	3/4	1	1/16	3/32	1/8	3/16	1/4	3/8	1/2	1/32	1/16	3/32	1/8	3/16	1/4	3/8	1/2	1/16	3/32	1/8	3/16	1/4
Tolerance (inches)	±1/64	±1/64	±1/32	±1/32	+3/64 – 1/32	±3/64		±5/64	±1/10	±1/64	±1/64	±1/32	±1/32	+3/64, -1/32	±3/64		+11/800, -1/160	±1/64	±1/64	±1/32	±1/32	+3/64, -1/32	±3/64		±1/64	±1/64	±1/32	±1/32	+3/64, -1/32
Surface Description	Textured on one side									Smooth both sides							Smooth both sides								Smooth both sides				
Tensile Strength (psi)††	25									30							30								30				
Elongation at Break (%)††	60									50							60								60				
Density (lb./ft.^{3})††	12									15							20								20				
Temperature Range (°F)	-60 to +400									-60 to +400							-60 to +400								-60 to +400				
Compression Set (%) (compressed 50% for 22 hrs. at 212°F)††	5									10							5								<5				
Thermal Conductivity / Thermal Insulation R-Value***	0.42 (BTU-in./hr. • ft^2 • °F (k factor))																1.94 (ft.^{2} • h • °F/BTU • in.)												
Compression Deflection (psi)††	3									6							8								6				

* Stated properties are based on a 1/4" slab of material. Values are typical.

** Standard color. Other colors available on a minimum order basis.

*** Reference only.

†† Test method used: Surface description (visual), tensile Strength and Elongation Break (ASTM D412), Density (ASTM D3574), Compression set and Compression Deflection (ASTM D1056), Thermal Conductivity (ASTM C177).

Tests, claims, representations and descriptions regarding flammability are based on standard laboratory tests and, as such, may not be reliable for determining, evaluating, predicting or describing the flammability or burning characteristics under actual fire conditions, whether used alone or in combination with other products. Accordingly, each potential user should make an individual determination whether the flammability or burning characteristics of the product are suitable for the purpose intended by the user. **Norseal** provides certification to the specifications listed when requested with order. All properties are typical values and should not be used for writing specifications. Please contact Customer Care concerning updated specifications.

For a list of all product specifications, please see page 14.

Performance Tests*	Units/Values		
Product	**F-12**	**F-15**	**F-20**
Flame Spread Index, Radiant Panel, ASTM D3675	(Is) / 12.1		
Flame Spread Index, ASTM E162	< 35	< 35	< 35
Limiting Oxygen Index, ASTM 2863	(%) 34.0		
Dielectric Constant, ASTM D150			3.5
	at 100Hz / 1.31		
	at 1 KHz / 1.30		
	at 1 MHz / 1.32		
Arc Resistance, ASTM D495	(sec.) / 123		(sec.) 127
Insulation Resistance, ASTM D257	(ohms) / 2.3 × 10^{14}		
FDA Extractables, 21 CFR177.2600	Pass	Pass	Pass
Noise Reduction Coefficient, ASTM C423	NRC / 0.3		
FAR 25.856 (A-1 and B)	Pass		
FAR 25.853 (12s & 60s)			Pass
UL94 V-0	Pass	Pass	Pass
Smoke Density, ASTM E662*	D_s 4 min < 30 D_s 1.5 min < 15	D_s 4 min < 40 D_s 1.5 min < 20	D_s 4 min < 50 D_s 1.5 min < 20
Bombardier SMP 800-C	Pass	Pass	Pass

* Performance tests are run using standard test procedure. The values presented are typical values and should not be used for specification purpose. For more details, please contact your local **Saint-Gobain** Customer Care Representative.

SNS Silicone Tapes

Norseal Silicone SNS Tapes provide all of the benefits of our silicone rubber in an easy-to-apply, pressure-sensitive adhesive tape form. Compressible and flexible, it can conform to irregular surfaces, wrap over cylinders or be formed to produce right angles. Applications include gasketing, vibration damping and thermal insulation. The tape reduces the need for expensive die-cut parts — you don't pay for the center. Available with both high and low temperature silicone adhesive and aggressive, strong anchorage acrylic pressure-sensitive adhesive on one side. **Norseal** SNS Tapes can be supplied with closed cell sponge backing (SNS 100S, SNS 200A), fiberglass-reinforced closed cell sponge (SNS 300AR), soft and thin solid silicone (SNS 440S, SNS 440A) or flame retardant foam backing (SNS 512AF, SNS 512GF, SNS 515GF, SNS 520AF, SNS 520GF).

Product Range

100S – General-purpose closed cell sponge with silicone pressure-sensitive adhesive; available in thicknesses from 1/16″ to 1/4″ (1.59 mm to 6.35 mm).

200A – General-purpose closed cell sponge with acrylic pressure-sensitive adhesive; available in thicknesses from 1/16″ to 1/4″ (1.59 mm to 6.35 mm).

300AR – Reinforced silicone closed cell sponge with aggressive acrylic pressure-sensitive adhesive; available in thicknesses from 1/16″ to 3/16″ (1.59 mm to 3.18 mm).

440S – A 1/32″ thick Shore A durometer silicone solid with a high-temperature silicone adhesive.

440A – Combines 30 durometer soft and conformable solid rubber with a high-adhesion acrylic adhesive for an excellent 1/32″ (0.79 mm) thick gasket material.

512AF, **512GF** and **515GF** – Soft, conformable flame-retardant silicone foam backing with film-supported aggressive acrylic pressure-sensitive adhesive; available in thicknesses from 1/16″ to 1/2″ (1.59 mm to 12.7 mm). **512GF** and **515GF** offer our flame-retardant, lightweight, modified F-12 and F-15 Silicone Foam as the base materials, along with a film-supported acrylic pressure-sensitive adhesive.

520AF – Medium density closed cell flame-resistant foam with a film-supported acrylic pressure-sensitive adhesive; available in thicknesses from 1/16″ to 1/2″. **520GF** offers flame-retardant, closed cell F-20 Silicone Foam as the base material, along with a film-supported acrylic pressure-sensitive adhesive.

Temperature Range for PSA

Acrylic PSA: -20°F to + 325°F (-29°C to +163°C)
Silicone PSA: -100°F to + 500°F (-73°C to + 260°C)

APPLICATIONS INCLUDE

- Outdoor light gasketing
- Electronic packaging weather gasketing
- Flame retardant insulation used in transportation
- Light weight gasketing for aerospace
- Thermal insulation
- Military- Communication systems
- Walkie talkies

Norseal SNS Silicone Tapes

Properties*										
Product	**100S***	**200A**	**300AR**	**440S**	**440A**	**512AF†**	**520AF**	**512GF**	**515GF**	**520GF**
Color	orange-tan	orange-tan	blue-grey	light grey	light grey	grey	grey	grey	grey	grey
Base Material	R10470M	R10470M	R10450			F-12	F-20	F-12	F-15	F-20
Silicone Rubber Material Type	sponge	sponge	fiberglass reinforced sponge	solid	solid	foam	foam	foam	foam	foam
Adhesive Type** (all with release liner)	silicone	acrylic	acrylic	silicone	acrylic	PET reinforced acrylic	PET reinforced acrylic	PET reinforced acrylic	PET reinforced acrylic	PET reinforced acrylic
Density of Backing (lb./ft.^{3})*	29	29	35	69	69	12	20	12	15	20
Adhesion to Steel (oz./in.)***	15	30	15	15	30	30	30	30	30	30
Compression Deflection (psi) (compressed to 75% of orig. thickness)*	10	10	15	45	45	3	8	3	6	8
Tensile Strength (psi)*	90	90	125 fabric break (lb/in)	700	700	20 film break (lb/in)	20 film break (lb/in)	25 film break (lb/in)	25 film break (lb/in)	25 film break (lb/in)
Elongation (%)*	150	150	< 10	650	650	75	75	75	50	75
Compression Set (%) (compressed 50% for 22 hrs. at 212°F)*	15	15	25	30*	30*	5	5	5	< 8	5
Thickness/Tolerance (inches)***										
1/32 /±.010				■	■					
1/16 /±1/64	■	■	■			■	■	■	****	■
3/32 /±1/64	■	■	****			****	****		****	
1/8 /±1/32	■	■	■			■	■	■	****	■
3/16 /±1/32	■	■	■			■	■	■	****	■
1/4 /±3/64 to -1/32	■	■				■	■	■		■
3/8 /±3/64						■	****			
1/2 /±3/64						■	****			
Width (inches)	1/2 to 35	1/2 to 36	1/4 to 36	1/2 to 18	1/2 to 18	1/2 to 36	1/2 to 36	1/2 to 36		1/2 to 36

† Meets UL 157.

* ASTM Test Method used: Density of Backing (D3574), Adhesion to Steel (D1000), Compression Deflection and Compression Set (D1056), Tensile Strength and Elongation (D412). Samples with supported adhesive are shown in force per width to the increased strength of the film support.

** Adhesive shelf-life when stored at 70° to 90°F at less than 50% humidity: silicone adhesive on sponge – 6 months, silicone adhesive on solid – 6 months, acrylic adhesive on sponge – 2 years. To maximize shelf-life, store at 40° to 50°F.

*** Thickness tolerances for backing material only.

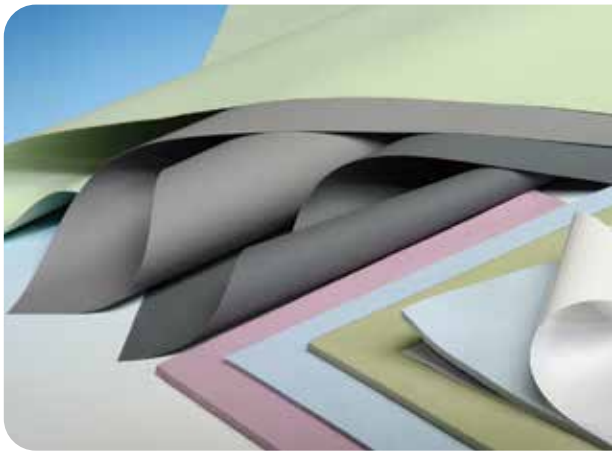
**** Special order. Minimum quantities apply.

■ = Thickness available.

Norseal provides certification to the specifications listed when requested with order. All properties are typical values and should not be used for writing specifications. SNS Dimensions: Upon removal of the liner, the potential exists for dimensions changes as the sponge relaxes. Please contact Customer Care concerning updated specifications. For a list of all product specifications, please see page 14.

Thermally & Electrically Conductive Products

Our **ThermaCool®** family of high performance thermally conductive gap fillers provides solutions to difficult thermal management applications. These products can be used to fill gaps and enhance thermal performance of the electrical system.



Product Range

TF1818 – Silicone coated fabric offering high temperature capability and conformability in a heat sink gasket.

TF1867, 1869, 1877, 1879 and Furo 400 Series – Thermally conductive coated fabrics providing thin, cost-effective heat transfer capability. All products can be supplied with a thermally conductive acrylic adhesive on one side.

TC100 – Unsupported thermally conductive solid silicone rubber. This material offers thermal conductivity along with electrical isolation for heat transfer applications.

TC100U – Similar to TC100 but supplied in uncured configuration. Refrigerated storage is required.

EC102 – electronically conductive solid silicone. Featuring a unique chemical structure that gives it a high temperature stability and general inertness not available in any other elastomer.

TC2006, TC3006 and **TC3008** are extremely compressible Gap Fillers to complement our **ThermaCool** family.

ThermaCool Thermally & Electrically Conductive Products

Properties	**Silicone-Coated Fabrics**							**Thermally Conductive Solid Silicone**		**Electrically Conductive Silicone**
Width/Sheet Size	**18" wide**	**36" wide**						**18" wide**		**36" wide**
	SCF 1818	**SCF 1867***	**SCF 1869**	**SCF 1877***	**SCF 1879**	**SCF 407***	**SCF 409***	**TC100**	**TC100U**	**EC102**
Color	grey	grey	grey	lt green	lt green	grey	grey	lt blue	white	black
Thickness (inches)	.018	.0075	.0095	.0070	.009	.007	.009	.025 .05 1/32 1/16	.015 1/32 1/16	.020 1/32 1/16
Tolerance (inches)	±.003	±.001	±.001	±.001	±.001	±.001	±.001	±.031 ±.005 ±.005 ±.005	±.003 ±.005 ±.005	±.005 ±.005 ±.005
Break Strength (ppi)	60	100	100	100	100	100	100	250	200	700
Elongation (%)	< 5	< 5	< 5	< 5	< 5	< 5	< 5	200	350	200
Dielectric (volts total)	9000	2500	3000	3000	3500	3500	4000	250 (VPM)	250 (VPM)	
Volume Resistivity (ohm-cm)	1×10^{14}	1×10^{14}	1×10^{14}	1×10^{14}	1×10^{14}	1×10^{14}	1×10^{14}	5×10^{14}	1×10^{14}	5†
Thermal Conductivity (W/m-K)	1.0	0.8	0.8	1.2	1.2	0.9	0.9	1.3	1.3	
Thermal Impedance (°C $in.^2$/W) (ASTM E1530)††	0.71	0.37	0.44	0.23	0.29	0.31	0.39	1.25	1.25	
Temperature Range (°F)	80 to +400									

* Thermally conductive acrylic PSA is available for 1867, 1877 and Furo 407 and 409. Thermally conductive silicone PSA is available for 1877 and 1879. PSA adds approx. .06°C/W to the thermal resistance of each product.

† ASTM Test Method used: Tensile Strength and Elongation (D412), Tear Strength (D624, Die B), Volume Resistivity (D991).

†† Thermal Impedance was conducted on 1/16" TC 100 and TC 100U.

ThermaCool provides certification to the specifications listed when requested with order. All properties are typical values and should not be used for writing specifications. Please contact Customer Care concerning updated specifications. For a list of all product specifications, please see page 14.

Silicone Product Industry Specifications

Silicone Sponge Rubber Specifications

	Norseal Product	AMS 3195	AMS 3196	MIL-R-46089	ASTM D1056 Type 2, Class A,D	ASTM D1056 Type 2, Class A, B, C	MIL-R-6130 Type II, Grade A	MIL-R-6130 Type II, Grade B & C	ASTM D6576 Type 2, Grade A,B,C	ASTM D6576 Type 2, Grade B,C	ASTM D6576 Type 2, Grade A	UL94 V-0**	UL 94 HB/ V-1 for thick-nesses > 11.7 mm	JMST2 Gasket Materials	JMLU2 Gasket Materials
Silicone Sponges	R10400	●							●	●	●	●			
	R10460	●			●		●	●	●	●	●		●	●	
	R10470M	●		●	●			●		●				●	
	R10470F		●		●			●		●					
	R10480M	●			●			●		●					
	R10480S							●		●					●
	R10490*					●	●	●	●	●	●				

*R10490 does not comply with flame retardant requirement of specification.

Norseal R10460 UL-94 HBF.

Silicone Solid Rubber Specifications

	Norseal Product	ZZ-R-765, A-A-59588 (2a & 2b)	ZZ-R-765, A-A-59588 (3b)
	400/9040	●	
	500/9050	●	
	600/9060	●	
	700/9070	●	
High Performance	9235		●
	9255		

***Note:** For FDA Extraction information contact Customer Care at **customercare.tapesolutions@saint-gobain.com**.

SNS Silicone Tape Specifications

Norseal Product	UL Gasket JMST2, MH12835
100S	●
512AF	●

Silicone Foam Rubber Specifications

Norseal Product	FAR 25.856 (A-1 and B)	UL94 V-0	JMLU2 Gasket Materials
F-12	●	●	
F-15		●	
F-20		●	●
FG20		●	

ThermaCool Thermally & Electrically Conductive Product Specifications

Norseal Product	UL94 V-0	UL 94-HB	UL 94 VTM-1
SCF TF1867	●		
SCF TF1869			●
SCF TF1877	●		
SCF TF1879	●		
TC100		●	

Listing has been simplified for the purpose of this promotional piece.

Please contact us for possible approvals not listed above and possible specific exceptions that might be taken.

Providing Protection in Extreme Environments

Markets / Applications

Aerospace

- Fire-retardant thermal insulation and seals
- Wire harness protection
- Acoustic attenuation
- Vibration damping pads
- Floor seals

Transportation (Rail & Auto)

- Lighting enclosures
- HVAC seals
- Access panel seals
- Electric vehicle battery pack seals

Electronics

- Press pad for flex and multi-layer circuitry
- Thermally conductive gaskets
- Static dissipative seals
- LCD screens

Industrial

- Decal press pad machines
- Membranes for laminated wood fabrication
- Commercial lighting
- High temperature gaskets
- Environmental seals

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