avantor™ | NuSil™

Aviation and defense silicones

Version uploaded 03/11/2020

Silicones for mission-critical demands

SUPERIOR PERFORMANCE SHAPED BY RICH FLIGHT HERITAGE

With a flight heritage that spans more than four decades, NuSil® has delivered ultra-high purity silicones to the world's leading aviation manufacturers and major defense contractors. Our expertise in formulating ultra-high purity silicones and fabricating silicone components allows us to develop innovative technologies that serve vital and demanding requirements.

SILICONES FOR AVIATION AND DEFENSE

From interior applications like digital avionics displays to exterior aircraft coatings and silicone gaskets, our cutting-edge solutions answer the demanding requirements set by today's aviation and defense industries.

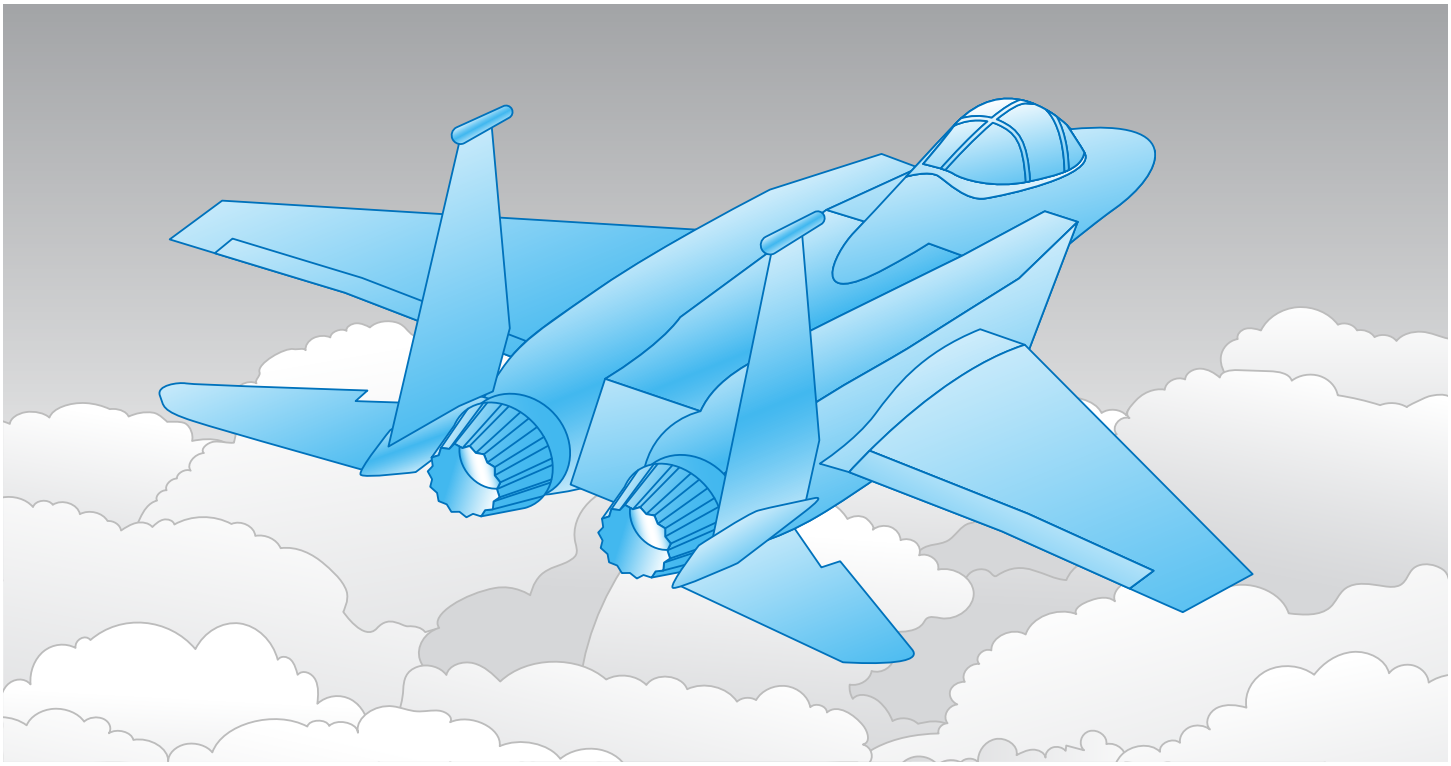
Our experience equips us to formulate for applications with specific requirements, all while providing exceptional customer care. For example, we provide customized fabricated components for defense applications. Our solutions also meet the aviation industry's need for fuel efficiencies while considering ever-present safety concerns. NuSil offers both off-the-shelf and customized materials to meet our customers' specific needs.

Applications

Whether it's helping to ensure commercial aircrafts safely reach their destination or collaborating with defense contractors to develop the next military flight innovation, our expertise, products and solutions have repeatedly proven themselves.

Our silicones are used in a wide range of applications, from commercial and defense aircraft to unmanned aerial vehicles (UAVs). The aviation and defense industries incorporate NuSil silicones into:

- Aircraft exteriors
- Engines
- Control surfaces and structures
- Electrical, hydraulic and pneumatic systems
- Cockpits



Aviation and defense silicones

HIGH-PURITY SILICONES THAT HELP AVIATION AND DEFENSE AIRCRAFT TAKE FLIGHT

Backed by our extensive history, NuSil has developed silicones with a broad operating temperature range that are optimized to remain flexible at extremely low temperatures and resist breakdown at elevated temperatures. We can formulate silicones and engineer fabricated parts for sophisticated systems, such as engines and electrical and pneumatic systems.

To meet increasing demands for fuel and solvent resistance, NuSil formulates fluorosilicones for long-lasting stability in harsh environments. They resist degradation, which makes them highly suitable for the most demanding aircraft applications.

With a diverse range of off-the-shelf and customized products, NuSil offers one of the most extensive solutions for the aviation and defense industries.

FLUOROSILICONES

NuSil's fluorosilicone portfolio, one of the most diverse available, resists degradation to protect the aircraft's outer mold line and seals from damaging fuels and solvents. They are formulated to perform in broad operating temperature ranges — reliability proven through decades of flight service.

ADHESIVES AND SEALANTS

NuSil silicone adhesives range from traditional liquid adhesives to novel peel-and-stick films to pressure-sensitive adhesives. Primers are also available to improve adhesion.

POTTING AND ENCAPSULATING MATERIALS

NuSil potting and encapsulating silicones provide excellent protection against thermal cycling, shock and contaminants, such as moisture and debris.

COATINGS

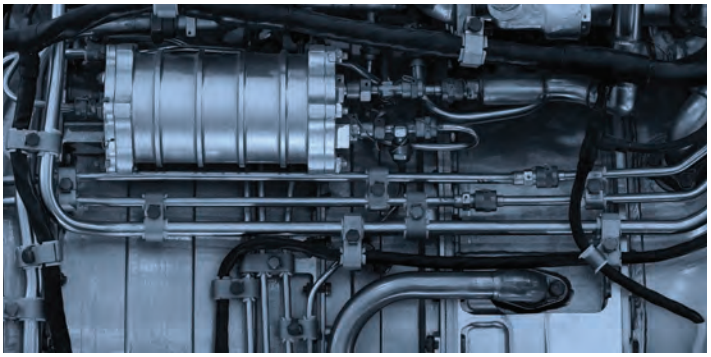
Primarily used on aircraft exteriors, silicone coatings provide UV protection and can operate under a wide range of temperatures. They can be used on a variety of aircraft and control surfaces.

THERMALLY AND ELECTRICALLY CONDUCTIVE MATERIALS

NuSil thermally conductive silicones facilitate heat transfer from electronic devices without adding stress to systems. Our electrically conductive silicones can carry a current, while our dissipative silicones enable static to dissipate continuously rather than accumulate and discharge, thus causing damage.

CUSTOMIZATION MASTERED

Off-the-shelf solutions don't always fit the needs of aviation and defense manufacturers. That's why we meet our customers' highly specialized needs with customization from formulation to packaging. With more than 3,000 products and over 40 years of expertise, we can take customization to a mass scale.



NUSIL SUPPORT

With a documented quality management system certified to AS9100, we ensure our silicones meet the reliability and consistency needs of our customers. NuSil's comprehensive quality systems also include the standard ISO 9001 certification.

To ensure complete confidentiality, NuSil is compliant with National Institute of Standards and Technology (NIST) 800-171 and Defense Federal Acquisition Regulation Supplement (DFARS) clause 282.204-7012, allowing us to handle Controlled Unclassified Information (CUI). Additionally, NuSil is registered with the DDTC and has a robust export compliance program.

We collaborate with customers to ensure our silicone solutions meet their individual needs, from developing revision-controlled material specifications to supporting the inclusion of specified part numbers to fulfilling unique labeling requirements.

Fluorosilicones

Description

Fuel- and solvent-resistant, our fluorosilicones offer reliable protection, even during prolonged exposure. They are precisely optimized for a broad operating temperature range, remaining flexible at extremely low temperatures and resisting breakdown at very high temperatures. A versatile material, fluorosilicones can be formulated into various product types depending on the application, from coatings to potting and encapsulating materials.

Applications

Fluorosilicones protect against degradation from hydrocarbons, including jet fuel, de-icing fluids or crude oil, making these silicones ideal solutions for applications like O-rings, gaskets, seals and other precision-molded parts.

FLUOROSILICONES

COATINGS

PRODUCT NUMBER	VISCOSITY (cP/mPa·s)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	COLOR	SPECIAL FEATURES
R-3930	735	30	750 (5.2)	400	Translucent	Available in Federal Color Standards 36118, 36622, 36375, 36099
R-3975	1,625	25	425 (2.9)	400	Translucent	Broad operating temperature

All materials are acetoxy cure

ADHESIVES & SEALANTS - ONE-PART

PRODUCT NUMBER	EXTRUSION RATE (g/minute)	ADHESION LAP SHEAR psi (mPa)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	TACK-FREE TIME	COLOR	SPECIAL FEATURES
FS-3730	180	380 (2.6)	33	900 (6.2)	440	25 m	White	Also available in gray and black
FS3-3730	230	200 (1.4)	35	820 (5.7)	400	15 m	Translucent	-
FS-3775	250	-	30	450 (3.1)	400	8 m	Translucent	Broad operating temperature

All materials are acetoxy cure

ADHESIVES & SEALANTS - TWO-PART

PRODUCT NUMBER	VISCOSITY (cP/mPa·s) EXTRUSION RATE (g/minute)	ADHESION LAP SHEAR psi (mPa)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	WORK TIME	COLOR	SPECIAL FEATURES
CF1-3510	70,000	-	20	210 (1.5)	135	4 h	Red	High-temperature resistant
FS9-3521	50 g/minute	280 (1.9)	29	750 (5.2)	300	3 h	Brown	High-temperature resistant and available in dual cartridge packaging

All materials are acetoxy cure

MOLDING ELASTOMERS

PRODUCT NUMBER	EXTRUSION RATE (g/minute)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	WORK TIME	COLOR	SPECIAL FEATURES
FS-3511	40	40	1,150 (7.9)	335	> 8 h	Translucent	100% Fluoro for hydrocarbon resistance

THERMALLY CONDUCTIVE

PRODUCT NUMBER	THERMAL CONDUCTIVITY w/(mK)	VISCOSITY (cP/mPa·s)	CURE SYSTEM	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	WORK TIME
CF1-3800	1.25	Thixotropic	Platinum	50	125 (0.9)	50	90 m

GELS

PRODUCT NUMBER	VISCOSITY (cP/mPa·s)	DUROMETER TYPE 00	WORK TIME	COLOR
FS-3502-1	1,200	10	-	White
LS-3238	1,500	15	11 h	Clear
GEL-3500	11,250	50	12 h	Translucent

GREASE

PRODUCT NUMBER	VISCOSITY (cP/mPa·s)	VOLATILITY	CURE SYSTEM	COLOR	SPECIAL FEATURES
G-9041	2,000,000	0.20%	Non-curing	White to Gray	Non-slump grease for intermittent exposures to solvents or fuels

Coatings

Description
Protective coatings work in a variety of ways to ensure that aviation and defense platforms function safely and to specifications. Solvent-based coatings are well-suited for processes where the silicone is applied as a thin film coating. Solventless coatings can cure more quickly than solvent-based and are ideal for applications requiring a nonflammable solution.

Applications
Our silicone coatings protect parts and surfaces in critical defense technologies, including missiles, rockets, launch equipment and unmanned aerial vehicles. Manufacturers and contractors use NuSil ice-release coatings to minimize ice adhesion to increase lift and decrease drag.

COATINGS

PRODUCT NUMBER	CURE SYSTEM	VISCOSITY (cP/mPa·s)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	COLOR	SPECIAL FEATURES
GENERAL PURPOSE							
R-1182	Acetoxy	10	-	-	-	Translucent	Low-friction coating
R-1082	Acetoxy	700	25	1,425 (9.8)	950	Translucent	Excellent adhesion to a variety of substrates
R-1008-0	Oxime	1,300	23	235 (1.6)	223	Translucent	-
R-1077	Oxime	3,300	40	700 (4.8)	350	Translucent	-
R-1009	Oxime	6,150	45	1,150 (7.9)	650	Translucent	-
CF19-2615	Platinum	1,050	30	120 (0.9)	100	Clear	Solventless
R-2180	Platinum	3,075	40	1,700 (11.7)	1,050	Translucent	High-strength coating and available in black. Requires heat to cure.
ABLATIVE							
R-2588	Alkoxy	825,000	65	750 (5.2)	95	Red	Available in 100:3.8 (Base: Catalyst) and 10:1 (Base: Catalyst) mix ratio (R10-2588)

Processing tips
Homogeneously premix before drawing from the container. Deairing may be required to ensure a bubble-free product. It is recommended to increase the cure temperature slowly or utilize a multistep curing process, which allows the solvent to evaporate prior to the silicone curing.

Adhesives and sealants

Description

Our adhesives provide excellent bonding to a wide range of substrates, including metals, plastics and glass. NuSil silicone adhesives range from liquid to film. We also offer primers to improve adhesion.

Applications

Many NuSil adhesives can be heat accelerated to speed up processing time, or can be cured at room temperature faster than traditional adhesives.

ADHESIVES & SEALANTS

ONE-PART

PRODUCT NUMBER	CURE SYSTEM	EXTRUSION (g/minute)	ADHESION LAP SHEAR psi (mPa)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	WORK TIME (TACK FREE TIME)	COLOR	BROAD OPERATING TEMPERATURE	SPECIAL FEATURES
R-1140	Acetoxy	Thixotropic	625 (4.3)	30	700 (4.8)	350	7 m	Translucent		Available in black
R4-1140	Acetoxy	93 g/minute	-	25	1,400 (9.7)	750	10 m	Translucent		Recommended for applications where some flow is required and adhering to plastics
R-1130	Oxime	Thixotropic	485 (3.3)	35	850 (5.9)	325	25 m	Translucent		Recommended for adhering to plastics
R-1600	Oxime	Thixotropic	205 (1.4)	45	650 (4.5)	300	30 m	Translucent	•	Recommended for adhering to plastics
EPM-2840	Oxime	30 g/minute	290 (2.0)	35	685 (4.7)	280	25 m	Translucent	•	Low volatility. Available in black and white

TWO-PART

PRODUCT NUMBER	MIX RATIO	VISCOSITY (cP/mPa·s) EXTRUSION RATE (g/minute)	ADHESION LAP SHEAR psi (mPa)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	WORK TIME	COLOR	PRIMERLESS ADHESION	SPECIAL FEATURES
R32-2186	1:1	80,000	130 (0.9)	15	850 (5.9)	800	15 h	Translucent	•	Long pot life and minimum 80°C to cure
R31-2186	1:1	82,000	110 (0.8)	20	1,000 (6.9)	775	15 m	Translucent	•	RTV or cures rapidly with heat
R33-2186	1:1	83,000	100 (0.7)	20	1,015 (7.0)	740	2 h	Translucent	•	RTV or cures rapidly with heat, available in white
R-2141	1:1	90,000	350 (2.4)	40	650 (4.5)	250	1.5 h	Translucent	•	Non-slump and tack free in ~5 hrs
R34-2186	1:1	520 g/minute	150 (1.0)	45	800 (5.5)	400	> 8 hrs	Translucent	•	Minimum 60°C to cure. Adheres to plastic films such as PET. Tested per UL 94 and passed V-1 at 4.7 mm.
R-2145	1:1	295 g/minute	560 (3.9)	45	1,050 (7.2)	400	15 m	Dark gray	•	Fast cure
R1-2145	1:1	285 g/minute	540 (3.7)	45	1,000 (6.9)	400	1 h	Dark gray	•	Tough. RTV or cures rapidly with heat. Tested per UL 94 and passed V-1 at 4.6 mm.
R-2187	10:1	23,000	-	42	790 (5.4)	175	6 h	Translucent		Broad operating temperature
R-2160	10:1	250,000	-	20	750 (5.2)	625	50 m	Red		Recommend for high-temperature applications

All platinum cure system

FILM ADHESIVES

PRODUCT NUMBER	ADHESION LAP SHEAR psi (mPa)	THICKNESS	CURE SYSTEM	SPECIAL FEATURES
R1-2680-4	-	0.004 in (0.1 mm)	Platinum	Compatible with a variety of activators
R-2682-12	100	0.012 in (0.12 mm)	Platinum	Contains reinforcing mesh

PRESSURE-SENSITIVE ADHESIVES

PRODUCT NUMBER	180° PEEL STRENGTH ppi (kN/m)	VISCOSITY cP (mPa·s)	SOLIDS CONTENT %	SOLVENT	SPECIAL FEATURES
PSA-1170	3.75 (0.7)	300	50	Ethyl acetate	-
PSA-1270	3.5 (0.6)	1,700	50	Naphtha	1.43 RI
PSA-1180	5.0 (0.9)	3,500	70	Ethyl acetate	For applications requiring higher cohesive strength, 2.8 lb (12 N) tack

Next-generation adhesives

An alternative to traditional liquid adhesives, NuSil curable silicone film adhesives offer reliable bond line control in a simple-to-use peel-and-stick format that doesn't require mixing.

Customization

NuSil offers an extensive array of film adhesive options. We can formulate solutions that meet aviation or defense application requirements, such as parameters for size, thickness and adhesion to specific substrates. Mesh or carriers can also be used for structural support, improving the integrity of the adhesive.

PRIMERS

PRODUCT NUMBER	% SOLIDS	ADHESIVE CURE SYSTEM	SPECIAL FEATURES
SP-120	4	Naphtha	General all-purpose primer. Recommended for polyphthalamide (PPA). Use with platinum or tin-catalyzed silicones.
SP-121	3	Naphtha	SP-120 with red pigment to identify where primer has been applied
SP-126	6	IPA	Compatible with acrylics. Designed to use where slight platinum inhibition is of concern.
SP-142	15	Naphtha	Recommended for increasing adhesion to plastics, such as polycarbonate (PC) and polyurethane (PU)
CF1-135	4	Naphtha	Recommended for platinum cure silicones where there is slight cure inhibition
CF6-135	9	Naphtha	Increased adhesion to polysulfone (PSU) and substrates where severe platinum inhibition is of concern
CF1-136	4	Naphtha	Contains red pigment to identify where primer has been applied. Designed to use where slight platinum inhibition is of concern.
CF2-137	7	Naphtha	CF1-135 with UV-light-detectable dye for inspections
CF1-141	6	IPA	SP-126 with red pigment to identify where primer has been applied
SP-270	15	Naphtha	Improved adhesion to polyimide (PI) and composite materials. Compatible with platinum cure fluorosilicones.
SP-271	20	Naphtha	Recommended for adhering to gold substrates
SP-272	9	Tert-butyl acetate	Contains red pigment to identify where primer has been applied. Improved adhesion to polyimide (PI) and composite materials. Compatible with fluorosilicones.
SP-273	9	Naphtha	Designed for platinum cure fluorosilicones to reduce risk of cure inhibition

Processing tips

For the best bond, ensure the substrate is thoroughly clean. Activating and/or priming the surface can also improve adhesion. When working with silicone adhesives, it is important to consider the solvents, chemicals or substrates they may contact in their uncured state. Certain chemical elements and compounds can retard or inhibit the adhesive's curing.

Thermally and electrically conductive materials

Description

We formulate silicones that help protect critical aviation and defense components. Thermally conductive silicones conform to complex geometries to aid in heat transfer, while our electrically conductive materials allow static to dissipate continuously rather than build up to a rapid, damaging discharge.

Applications

NuSil's thermally conductive materials, available with flowable and non-flowable options, are used in a variety of applications, such as sealing grooves or adhering openings in sensors, modules and housings. Our electrically conductive silicones can be found in RFI and EMI shielding for vital components, like control panels, sensors and gaskets that require continuity across the seal.

ELECTRICALLY CONDUCTIVE/STATIC DISSIPATIVE

PRODUCT NUMBER	VOLUME RESISTIVITY (ohm-cm)	VISCOSITY (cP/mPa·s) EXTRUSION RATE (g/minute)	CURE SYSTEM	DUROMETER TYPE A	TENSILE psi (MPa)	ELONGATION %	WORK TIME	COLOR	SPECIAL FEATURES
R-2634	0.001	160 g/minute	Alkoxy	80	250 (1.7)	90	3 h	Gray-green	Broad operating temperature
R-2637	0.006	Thixotropic	Platinum	60	210 (2.1)	275	4 h	Tan	-
R-2630	6	11,700	Platinum	60	690 (4.7)	95	15 h	Black	Self-leveling
R-1505	8	Thixotropic	Oxime	75	525 (3.6)	25	-	Black	One-part, broad operating temperature
R-2631	23	150 g/minute	Platinum	40	600 (4.2)	300	20 m	Black	Moldable

THERMALLY CONDUCTIVE

PRODUCT NUMBER	THERMAL CONDUCTIVITY w/(mK)	VISCOSITY (cP/mPa·s)	DUROMETER TYPE A	TENSILE psi (mPa)	ELONGATION %	WORK TIME	COLOR	SPECIAL FEATURES
R-2930	1.46	Thixotropic	80	260 (1.7)	20	3 h	White	-
R-2940	1.00	Thixotropic	90	740 (5.1)	28	4 h	Gray	For bond line applications ≥ 175 micron
R-2949	0.75	75,000	75	270 (1.8)	50	3.5 h	White	Broad operating temperature
R-2939	0.75	70,000	70	300 (2.1)	70	4 h	White	For bond line applications ≥ 50 micron
R-2165	0.50	4,000	60	500 (3.4)	100	10 m	Gray	Self-leveling, available in white
R-2175	0.40	3,000	50	525 (3.5)	130	1 h minimum	Black	Self-leveling

All materials are platinum cure

Processing tips

To ensure a homogenous blend, individually mix part A and B prior to combining. De-airing may be required to assure a bubble-free product. For thermally conductive materials, thinner bond lines will result in lower thermal resistance.

For optimum adhesion, it is recommended to use NuSil primers prior to applying these conductive coatings.

Potting and encapsulating materials

Description

Our potting and encapsulating silicones provide excellent protection against thermal cycling, shock, vibration and outside contaminants. NuSil low modulus gels offer the flexibility to prevent shearing in delicate wire bonds and warping in components with complex geometries. Elastomers offer a resilient, more rigid solution for stability and surface protection, while foams are ideal for shock and vibration dampening in applications requiring lightweight and flexible material.

Applications

NuSil potting and encapsulating compounds are used in power electronics that operate or assist in aircraft functionality.

GELS

PRODUCT NUMBER	VISCOSITY (cP/mPa·s)	PENETRATION (mm)	WORK TIME	SPECIAL FEATURES
GEL-8136	450	13	2 h	RTV or cures rapidly with heat. High tack.
GEL-8150	500	5	4 h	Cures with heat
GEL8-8150	500	5	1.5 h	RTV in 48 hours or cures rapidly with heat
GEL-8100	535	9	> 24 h	Very soft, flows when cured
GEL-8111	535	10	> 24 h	Low volatility, very soft
GEL-8170	600	8	6 h	-
LS1-3443	650	8	2 h	RTV or cures rapidly with heat, high-tack gel with broad operating temperature
GEL1-8155	14,500	0.4	24 h	Very firm

FOAMS

PRODUCT NUMBER	FOAM DENSITY lbs/ft³ (g/cm³)	VISCOSITY (cP/mPa·s)	WORK TIME	COLOR	SPECIAL FEATURES
R-2360	12 (0.2)	40,000	2 m	White	Tough
SFM5-2350	25 (0.4)	52,500	20 m	Gray	Tested per UL 94 and passes V-0 at 4.8 mm
CF3-2350	25 (0.4)	90,000	20 m	Black	–

All materials are platinum cure

Processing tips

Blend both components of the material into a homogenous mixture and de-air, if necessary, to remove bubbles. Foams do not require a de-airing process. Gels may need to be mixed longer and more aggressively compared to other silicone systems due to their low viscosity. Note: Heat can easily be generated during the mixing process, which can cause an adverse effect on pot life.

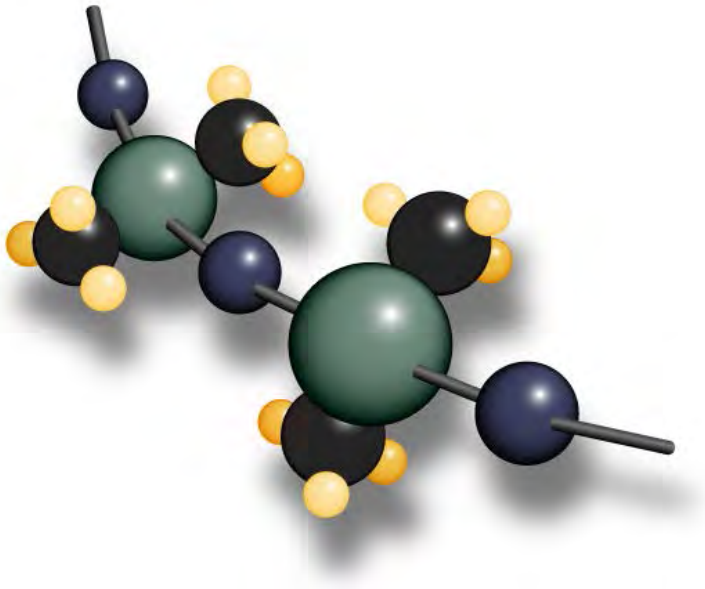
Silicone Sales & Services
UK - Ireland - Benelux

Unit 2. Network 4. Cressex Business Park,
Lincoln Road, High Wycombe, Bucks. HP12 3RF

tel: +44 (0) 1494 446610

web: https://www.silicone-polymers.com

email: sales@silicone-polymers.co.uk



Version uploaded 03/11/2020