GE Silicones

Fluids, Emulsions & Specialties

Materials & Applications

fluids

antifoams

emulsions

organofunctional

volatiles

flui

antifoams

volatiles

specialties

GE Silicones

Fluids, Emulsions, And Specialties

The strengths of GE Silicones are deeply rooted in the long and prestigious history of GE technology innovation, technical service, and application engineering. Milestones include the discovery of new chemistries and the birth of breakthrough products. It's also a story about commitment to successful business relationships, about global reach, and about value-added process innovations that can help our customers reduce costs, improve quality, and realize their business objectives.

For 50 years, GE Silicones has pioneered developments in silicone technology for the world's most prominent manufacturing industries, including chemical manufacturing and processing, aerospace, automotive, personal care, building and construction, consumer hardware, electronics and business equipment, appliances, and OEM assembly and maintenance.

Expanded Product Portfolio Increases Application Reach

In our continuing quest to provide the benefits of silicone technology to more industries, GE has expanded its specialty silicones portfolio for Chemical Processing, Textiles and Plastics. The GE product offering for these industries includes general and specialty fluids, additives, reactive and non-reactive intermediates, silanes, volatiles, surfactants, standard and specialty emulsions, antifoams, and specialty blends. Find out more about us at www.GESilicones.com.

emulsions

organofunctional

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Why Silicones For Chemical Processing, Textiles, & Plastics?

Silicones have a chemical backbone of silicon-oxygen linkages very similar to those in high temperature inorganic materials such as quartz, glass, and sand. This molecular backbone is much stronger than the typical carbon-to-carbon chains of organic hydrocarbon fluids, enabling silicones to provide superior performance in a wide variety of applications.

- In chemical processing, silicones offer unmatched resistance to the effects of temperature extremes, chemicals, compression, thermal cycling, oxidation, and shear stresses.
- In textiles, both manufacturing and finishing improve dramatically with increased water repellency and absorption, as well as maintenance of both the physical properties and dye retention of fabrics.
- In the plastics industry, silicones can dramatically improve weatherability, impact strength, and mold release characteristics.

Whether used as process aids in Chemical Manufacturing, as softeners for Textile Finishing, or as additives for Plastics, these materials offer customers the opportunity to make processes more efficient and finished products better and longer-lasting. Please give us a call on the GE Silicones SourceLine at 800.255.8886 to discuss your process or application needs, or access our global web site @ www.GESilicones.com.

Silicones bring a remarkable set of attributes to the global chemical and process industries. For companies manufacturing products as diverse as petrochemicals, food and food packaging, pulp and paper, power transmission, and wire and cable, the unique properties of silicones *add efficiency to processes and value to finished products.*

GE Silicones manufactures Fluids and Emulsions used as lubricants, intermediates, mold release, antifoams, additives, and coatings in these and other chemical and process industries.

The application possibilities for silicones in chemical processing are diverse and constantly expanding as new ways are found to use them. Here are the product categories, primary application benefits, and *key* segments in the chemical and process industries.

GE Silicones in Chemical Processing

FLUIDS

Dimethyl
General purpose lubrication and heat transfer in a full range of viscosities.
For petroleum, food, power transmission.

Alkyl
Metal-to-metal lubrication, paintability.
For petroleum, motors, machine tools, hydraulics.

Phenyl
High temperature heat transfer, high temperature breakdown resistance.
For motors, machine tools, chemical processing.

Volatiles (cyclics)
Miscible in lower alcohols and typical aliphatic, aromatic, and hydrocarbon solvents.
For chemical intermediates, household products.

Organofunctional Reactives
Hydrophobicity (water repellency), weatherability, chemical resistance.
For automotive polishes, industrial paints, equipment coatings.

Organofunctional or Hydrophilic Non-Reactives
Chemical resistance, hydrolytic stability, water solubility (only for polyethers).
For industrial paints, cosmetics.

SE Gums
High viscosity for substantivity, easier handling and dispersion.
For plastics processing.

EMULSIONS

Standard
Easy application, lubricity, non-hazardous.
For mold release, polishes.

Specialty
Water repellency (hydrophobicity), lubricity, durability, non-hazardous.
For textiles, polishes.

Antifoams
Suppression of foam formation.
For process industries, waste water treatment.

Silicones bring both practical and aesthetic benefits to a wide range of fabrics including wovens, knits, non-wovens, cottons, cotton/polyester blends, and 100% synthetics. Textiles require finishes that contribute to fabric durability, softness, and color protection. The GE Silicones product portfolio for textile finishing includes fluids, specialties, and emulsions with the following performance benefits:

Softening Capabilities ranging from a soft to a dry fabric hand with minimized yellowing under excessive dry/cure conditions.

Durability Maintenance of fabric softness and integrity despite multiple launderings and dry cleanings; improvement of physical properties such as tear strength, abrasion resistance, wrinkle recovery angles, and durable press ratings; and the capacity to increase the stretch recovery properties of knit fabrics.

Color Protection Silicones protect the integrity of fabric color by sustaining the retention of fabric dyes.

Hydrophilicity Capacity for water absorption into synthetic fabrics such as wovens, knits and non-wovens.

Hydrophobic Treatment Water repellency and waterproofing for fabrics used in outdoor clothing, tents, and raingear. For cottons, cotton/polyester blends and 100% synthetics.

GE Silicones in Textiles

FLUIDS

Dimethyl
Softening for cotton and synthetic fabrics. Also provide durable press finish, improve fabric sewability, wrinkle recovery, and tear and abrasion resistance.

Alkyl
Fiber and thread lubrication.

Phenyl
High heat stability lubrication for synthetic fibers.

Organofunctional Reactives
Impart an elastomeric hand and provide wrinkle recovery, tear and abrasion resistance.
Certain grades are used as intermediates to formulate textile antifoams, softeners, and special additives.

Organofunctional Non-Reactives
Surfactants used as wetting agents, fiber and thread lubricants, printing and dye additives.

SPECIALTIES

Solutions
Water repellent finishes, additives.

Standard
Imparts lubricity, aids in cutting and sewing process. Improves fabric hand and provides water repellent finish.

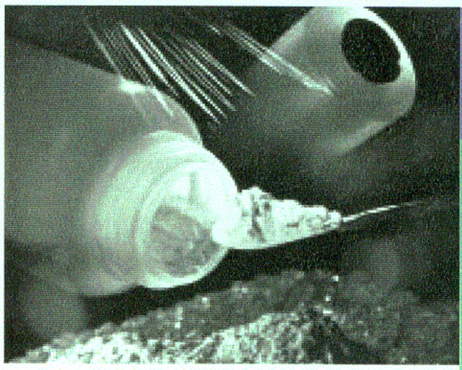
Specialty
Provides softening for durable press finishes, high loft resiliency for thread, and hydrophobic treatment for fabrics.

Antifoams
Defoaming additive in fabric dyeing, finishing, and sizing.

In the plastics industry, silicone additives from GE provide outstanding release properties for enhanced processing, and lubrication and weatherability in finished products.

Silicone release agents are used as process aids for thermoplastics such as polystyrene, polyolefins, and other hydrocarbon resins, and for thermosets such as polyesters, polyurethanes, and epoxies. For plastic film processing, silicone "slip" agents, also known as antiblocking agents, provide critical release properties for these substrates, both preventing the adherence of plastic film to itself as well as providing essential mold release benefits.

The GE Silicones product portfolio for the plastics industry includes fluids, solutions and solid additives, standard emulsions, and antifoams.



GE Silicones in Plastics

FLUIDS
Internal mold release, vinyl plastisol dispersions, vinyl top coats, resin compounding additives and lubricants.

SOLUTIONS & SOLID ADDITIVES
Processing additives, antiblocking agents.

EMULSIONS & ANTIFOAMS
Additives for lubrication, mold release and foam reduction.

GE Silicones

Fluids, Emulsions, & Specialties *Application Selector*

This chart is intended as a guide indicating the GE Silicones product(s) commonly used in a given application.

	FLUIDS																								
	Dimethyl				Alkyl	Phenyl	Volatiles		Organofunctional																
										Reactives													Polyether		
TYPICAL APPLICATIONS	SF96® Series	Viscasil®	SF97-50	SF18-350	SF1147/8843	SF1154	SF1173/1202/1204	81798D	SE Gums	Chlorosilanes	SF1706	Amino Fluids	SF69	SF99	SF1023	Silanol Fluids	Epoxy Fluids	Methoxy Fluids	DF1040	Vinyl Fluids	Fluorofluids	SF1188A	SF1288	SF1328	SF1488
Mechanical																									
Damping	•	•				•																			
Heat Transfer	•		•			•																			
Power Transmission	•	•																							
Hydraulic Fluid	•				•	•																			
Lubrication																									
Printing Processes																									
Aluminum					•																				
Rubber & Plastic	•	•		•	•	•																			
Base Fluid for Grease	•	•		•	•	•																			
Sliding Metal-on-Metal					•																				
Electrical																									
Dielectric Fluid			•											•											
Chemical Specialties																									
Silicone Intermediates							•	•		•	•	•	•	•	•	•	•	•	•	•					
Polishes & Household Cleaners	•	•					•		•		•		•			•		•			•	•	•		•
Cured Coatings on Glass Containers (water repellent)										•	•			•		•		•	•						
Cosmetics & Toiletries	•	•		•		•	•		•		•	•										•	•	•	•
Mold Release																									
Tires	•	•			•																				
Rubber & Plastics	•	•							•																•
Food Packaging				•																					
Paintable Releases					•																				
Foundry Release					•	•																			
Latex Dip Additive																									
Antifoams																									
Pulp & Paper/Jet Dye																									
Petroleum		•							•							•					•				
Food Applications				•																					
Formulation of Aqueous Defoaming Products	•	•					•									•						•			
Textiles																									
Anti-Crocking																•									
Fiber & Thread Lubricants	•	•			•	•																•			
Nonwoven Treatments																						•	•		•
Softeners & Modifiers	•	•									•	•				•	•	•				•			•
Water Repellent Finishes											•	•							•						
Industrial Fabric Coatings																									
Paint & Ink Additives																									
Flow Control	•	•									•		•		•	•						•			•
Mar Resistance	•												•		•										•
Gloss	•	•				•							•		•			•				•			
Printing Ink																									
Water Repellent																									
Masonry																									
Particle Treatment							•				•			•		•	•	•							
Perlite & Vermiculite Coatings														•			•								
Plastic Additives																									
Extruded Film		•		•		•										•					•				
Wire & Cable Manufacturing	•	•							•		•					•									
Plastic Molding		•							•		•					•	•		•	•	•		•		

TYPICAL APPLICATIONS	SPECIALTIES							EMULSION														ANTIFOAMS						
								Standard							Specialty													
	SFR100	SS4098	SS4177	SS4230/4267	SS4255	SR1000	Tospearl™	SM2128	SM2133/2135	SM2140	SM2162/2163	SM2164	SM2167	SM2169	SM2059/2159	SM2068A/2765	SM2101	SM2112/2138	SM2154	SM2245	SM2658	AF60	AF67	AF9000 Compound	AF9010/9020/9030	AFP2001	Silblock™	Silicone Liquid Elastomers
Mechanical																												
Damping																												
Heat Transfer																												
Power Transmission																												
Hydraulic Fluid																												
Lubrication																												
Printing Processes											•		•															
Aluminum																												
Rubber & Plastic								•	•	•	•	•				•				•								
Base Fluid for Grease																												
Sliding Metal-on-Metal																												
Electrical																												
Dielectric Fluid																												
Chemical Specialties																												
Silicone Intermediates																							•					
Polishes & Household Cleaners		•		•	•	•			•	•	•	•		•	•	•	•			•	•	•	•		•			
Cured Coatings on Glass Containers (water repellent)											•				•	•		•		•	•	•						
Cosmetics & Toiletries				•										•		•	•				•				•			
Mold Release																												
Tires																•			•	•				•				
Rubber & Plastics			•	•				•	•	•						•			•	•								
Food Packaging								•																				
Paintable Releases																			•									
Foundry Release																•			•									
Latex Dip Additive								•			•		•													•		
Antifoams																												
Pulp & Paper /Jet Dye																						•				•		
Petroleum																							•			•		
Food Applications																								•	•			
Formulation of Aqueous Defoaming Products						•																	•	•				
Textiles																												
Anti-Crocking										•				•		•							•					
Fiber & Thread Lubricants				•				•		•				•	•				•	•	•							
Nonwoven Treatments														•	•					•								
Softeners & Modifiers									•	•	•	•			•	•	•	•		•	•		•					
Water Repellent Finishes		•													•		•			•								
Industrial Fabric Coatings																												•
Paint & Ink Additives																												
Flow Control																												
Mar Resistance														•	•	•				•			•					
Gloss																												
Printing Ink							•				•														•			
Water Repellent																												
Masonry																											•	
Particle Treatment								•				•			•			•		•	•							
Perlite & Vermiculite Coatings															•			•		•	•							
Plastic Additives																												
Extruded Film							•	•											•				•					
Wire & Cable Manufacturing	•										•			•								•	•	•	•	•		
Plastic Molding	•						•													•								

GE Silicones

General Purpose & Specialty Fluids

Unique Properties

GE Silicones manufactures both general purpose and specialty silicone fluids with performance attributes designed to meet customers' needs. General purpose fluids include the dimethyl, alkyl, phenyl, and volatiles product lines. Specialty fluids include chlorosilanes, gums, and organofunctional reactive and non-reactive fluids.

The data in these charts is designed to help qualify and select the right silicone fluids from GE for your specific application requirements. After you've had the opportunity to review this information, please contact GE Silicones to discuss your application in detail, to obtain additional technical data, or to request customer service assistance.

Organofunctional Reactive Fluids

	Product No.	Description	Functionality, %	Viscosity, cstks @ 25°C (77°F)
	Amino (www.GEAmineFluids.com)			
	SF1706	Curable Amine	0.48 Meq Base/Gram	10-50
	SF1708	Amine Ultra Softener	0.7 Meq Base/Gram	1,250-2,500
	SF1921	Non-curable Amine	0.15 Meq Base/Gram	150-500
NEW!	SF1922	Curable Amine	0.25 Meq Base/Gram	1,000-3,000
	TSF4703	Curable Amine	0.6 Meq Base/Gram	600-1,400
	TSF4707	Curable Amine	0.15 Meq Base/Gram	7,000-17,000
	TSF4708	Curable Amine	0.36 Meq Base/Gram	600-1,400
NEW!	XS69-B5476	Polyether Amine	0.35 Meq Base/Gram	600-4,000
	Silanol (www.GESilanolFluids.com)			
	SF1023	Hydroxy Base	28-40 Phenyl	40-80
	CRTV944	Hydroxy	Dimethyl	500-800
	CRTV942	Hydroxy	Dimethyl	2,550-3,570
	CRTV955	Hydroxy	Dimethyl	5,100-6,900
	CRTV946LV	Hydroxy	Dimethyl	16,000-20,000
	CRTV941	Hydroxy	Dimethyl	25,000-35,000
	CRTV50M	Hydroxy	Dimethyl	45,000-55,000
	CRTV949	Hydroxy	Dimethyl	70,000-90,000
	CRTV940	Hydroxy	Dimethyl	100,000-155,000
	SF69	Hydroxy Fluid/Cyclic Blend	Dimethyl	1-40
	SF99	Hydroxy Fluid (T)/Cyclic Blend	Dimethyl	5-40
	DF581	Hydroxy (T)/Cyclic Blend	Dimethyl	13-25
	SFR100	Hydroxy/Resin Blend	Dimethyl	200,000-900,000
	AF67	High Viscosity Fluid	Dimethyl	10,000-15,000
	Methoxy (www.GEMethoxyFluids.com)			
	SR107	Methoxy 60% Solids/Solvent	—	10-30
	TPR178	Silanol/Methoxy Fluid Blend	—	20-70
	TPR179	Methoxy Fluid	15-25 Methoxy	200-700
	DF104	Methoxy 70% Solids/Solvent	—	25-70
	Methyl Hydrogen (www.GEMHFluids.com)			
	DF1040	Hydride Fluid	1.6	15-40
	Vinyl (www.GEVinylFluids.com)			
NEW!	U2	Vinyl Fluid	—	200
	88568	Vinyl Fluid	1.08	200-300
	88934	Vinyl Fluid	0.78	500-1,000
NEW!	U1	Vinyl Fluid	—	1,000
	RTV609	Vinyl Fluid	0.17	3,300-3,900
NEW!	U5	Vinyl Fluid	—	4,500
NEW!	U10	Vinyl Fluid	—	10,000
	88865	Vinyl Fluid	0.14	35,000-45,000
NEW!	U65	Vinyl Fluid	—	65,000
	RTV633	Vinyl Fluid	0.067	72,000-89,000
NEW!	U165	Vinyl Fluid	—	165,000
	Epoxy (www.GEEpoxyFluids.com)			
	UV9300	Epoxy Fluid	800-1,050	200-500
	UV9320	Epoxy Fluid	1,200-2,200	200-500
	UV9425	Epoxy Fluid	800-1,200	2,000-6,000

Organofunctional Non-Reactive Fluids

Product No.	Description	Functionality, %	Viscosity, cstks @ 25°C (77°F)
Fluoro (www.GEFluoroFluids.com)			
FF157	Trifluoropropyl Fluid*	All $CH_2CH_2CF_3$	950-1,050
FF150-10M	Trifluoropropyl Fluid*	All $CH_2CH_2CF_3$	9,000-11,000
FF160	Trifluoropropyl Copolymer Vinyl Stopped Fluid	$CH_3/CH_2CH_2CF_3$ 40m %F	14,000-25,000
FF7149	Trifluoropropyl Silanol Stopped Fluid	All $CH_2CH_2CF_3$ 5-7 wt % SiOH	40-200
Polyethers (www.GEPolyetherFluids.com)			
SF1188A	Polyether Fluid	EO† /PO‡	800-1,400
SF1288	Polyether Fluid	All EO	250-600
SF1328	Polyether 10% in Cyclics	EO/PO	100-1,000
SF1388	Polyether Solid	EO	100-650 @ 40°C
SF1488	Polyether Fluid	EO	20-60
SF1528	Polyether 10% in D5	EO/PO	20-1,000
Fluid Blends (www.GEGum.com)			
SF1214	Cyclics/Gum Blend	—	4,000-8,000
SF1236	Fluid/Gum Blend	—	3,000-5,500
SF1276	Fluid/Gum Blend	—	7,500-10,000 (cps)
CF1251	Fluid/Gum Blend	—	350,000-850,000 (cps)

* 45% SiOH terminated.
† Ethylene oxide.
‡ Propylene oxide.

General Purpose Fluids

Typical Properties & Applications

Typical product data values should not be used as specifications.
For assistance and specifications, call GE Silicones at 800.255.8886.

	Product	Nominal Viscosity, ctks @ 25°C (77°F)	Approximate Molecular Weight (avg.)	Viscosity Temperature Coefficient	Specific Gravity	Refractive Index @ 25°C (77°F)	Pour Point, °F [1]	Flash Point, °F [1] Pensky-Martens Open Cup	Flash Point, °F [1] Pensky-Martens Closed Cup	Surface Tension, dynes/cm @ 25°C (77°F)	Thermal Expansion, cc/cc/°C, 0-150°C (32-302°F)	Thermal Conductivity, Btu/hr. ft. °F (150) [2]	Maximum Volatility, % Wt. Loss, 24 hrs. @ 150°C (302°F)	Specific Heat, Btu/lb. °F	Electrical Properties 25°C (77°F) 10^2-10^6 Cycles: Dielectric Strength, kV	Dissipation Factor	Dielectric Constant	Volume Resistivity, Ohm-cm
	SF96® Dimethyl Fluids – Low Viscosity (www.SF96.com)																	
NEW!	SF96-3	3	530	0.53	0.9	1.394	-148	144	—	—	0.00105	—	—	0.36	35.0	0.0001	—	1 x 10^{15}
	SF96-5	5	800	0.53	0.916	1.397	-120	277	—	19.7	0.00105	0.067	90	0.36	35.0	0.0001	2.60	1 x 10^{15}
	SF96-10	10	1,250	0.56	0.939	1.399	-90	325	—	20.2	0.00106	0.075	15	0.36	35.0	0.0001	—	1 x 10^{14}
	SF96-20	20	2,000	0.58	0.953	1.401	-85	442	—	20.8	0.00107	0.082	10	0.36	35.0	0.0001	2.69	1 x 10^{14}
	SF96-50	50	3,800	0.59	0.963	1.402	-67	588	—	20.8	0.00106	0.087	0.5	0.36	35.0	0.0001	2.73	1 x 10^{14}
	SF96-100	100	6,000	0.59	0.968	1.4030	-67	604	—	20.9	0.000925	0.090	0.5	0.36	35.0	0.0001	2.74	1 x 10^{14}
	SF96-200	200	9,400	0.59	0.959	—	—	575	—	—	0.000925	0.090	0.5	0.36	35.0	0.0001	2.75	1 x 10^{14}
	SF96-350	350	13,700	0.60	0.973	1.4032	-58	637	—	21.1	0.000925	0.092	0.5	0.36	35.0	0.0001	2.75	1 x 10^{14}
	SF96-500	500	17,300	0.60	0.973	1.4033	-58	662	—	21.1	0.000925	0.092	0.5	0.36	35.0	0.0001	2.76	1 x 10^{14}
	SF96-1,000	1,000	28,000	0.60	0.974	1.4035	-58	658	—	21.1	0.000925	0.092	0.5	0.36	35.0	0.0001	2.77	1 x 10^{14}
	Viscasil® Dimethyl Fluids – High Viscosity (www.Viscasil.com)																	
	Visc-5M	5,000	49,300	0.60	0.975	1.4035	-56	—	500	21.3	0.000925	0.090	1.0	0.36	35.0	0.0001	2.75	1 x 10^{14}
	Visc-10M	10,000	62,700	0.60	0.975	1.4035	-53	601	—	21.3	0.000925	0.090	1.0	0.36	35.0	0.0001	2.75	1 x 10^{14}
	Visc-12M	12,500	67,700	0.60	0.975	1.4035	-53	—	500	21.3	0.000925	0.090	1.0	0.36	35.0	0.0001	2.75	1 x 10^{14}
	Visc-30M	30,000	91,700	0.60	0.976	1.4035	-50	601	—	21.3	0.000925	0.090	1.0	0.36	35.0	0.0001	2.75	1 x 10^{14}
	Visc-60M	60,000	116,500	0.60	0.977	1.4035	-47	601	—	21.3	0.000925	0.090	1.0	0.36	35.0	0.0001	2.75	1 x 10^{14}
	Visc-100M	100,000	139,000	0.60	0.978	1.4035	-40	601	—	21.3	0.000925	0.090	1.0	0.36	—	—	—	—
NEW!	Visc-300M	300,000	143,000	0.60	0.970	1.4042	-40	608	—	21.0	0.000925	0.174	0.3	0.36	35.0	0.0001	2.9	1 x 10^{15}
NEW!	Visc-500M	500,000	155,000	0.60	0.970	1.4042	-40	608	—	21.0	0.000925	0.174	0.3	0.36	35.0	0.0001	2.9	1 x 10^{15}
NEW!	Visc-600M	600,000	160,000	0.60	0.970	1.4042	-40	608	—	21.0	0.000925	0.174	0.3	0.36	35.0	0.0001	2.9	1 x 10^{15}
NEW!	Visc-1000M	1,000,000	175,000	0.60	0.970	1.4042	-40	608	—	21.0	0.000925	0.174	0.3	0.36	35.0	0.0001	2.9	1 x 10^{15}
	Specialty Dimethyl Fluids (www.SF96.com)																	
	SF97-50†	50	3,800	0.59	0.963	1.402	-67	588	—	20.8	0.00106	0.087	0.5	0.36	35.0	0.0001	2.73	1 x 10^{14}
	SF18-350‡	350	13,700	0.60	0.973	1.4030	-58	637	—	21.1	0.000925	0.092	0.5	0.36	35.0	—	—	—
	Alkyl (www.GEAlkylFluids.com)																	
	SF1147	50	—	0.76	0.890	1.4433	-60	527	—	26.0	0.00040	0.113	5.0	0.48	—	0.0001	2.39	3 x 10^{13}
	SF8843	2,000	—	0.77	1.035	1.4930	-50	601	—	—	—	—	4.0	0.47	—	—	—	—
	Phenyl (www.GEPhenylFluids.com)																	
	SF1154	160	—	0.78	1.0501	1.4980	-40	581	—	24.5	0.00075	0.082	2.0	0.39	—	0.0005	2.83	1 x 10^{14}
	Volatiles (www.GEVolatiles.com)																	
	SF1173 (D4)	2.4	296	—	0.960	1.3935	64FP	—	135	17.4	0.000131	—	100	0.36	—	—	—	—
	SF1202 (D5)	3.8	520	—	0.950	1.3982	-40FP	—	181	17.4	0.000121	—	100	0.36	—	—	—	—
	SF1204 (D4/D5)	2.6	—	—	0.960	1.3939	53FP	—	142	17.4	—	—	100	0.36	—	—	—	—
NEW!	SF1256 (D5/D6)	4.5	—	—	0.960	1.397	-40FP	—	180	—	—	—	100	—	—	—	—	—
	81798D (MM)	0.65	162	0.32	0.757	1.3748	-89	30F	—	15.9	—	—	100	—	—	—	—	—

Gums (www.GEGum.com)

Grade	Type	Penetration, mm (unless specified)	Vinyl Level, mol%	Chain End	Status (make to order/stock)
SE30	MQ	500-1,500	—	Methyl	MTS
SE72	MQ	600-1,000	—	Methyl	MTS
SE76	MQ	1,100-1,900	—	Methyl	MTS
SE772	MQ	600-1,000	—	Methyl	MTO
NG137	MQ	700-950	—	Methyl	MTO
SE33	VMQ	250-600	0.1-0.4	Methyl	MTO
SE64	VMQ	1,200-2,500	0.1-0.3	Methyl	MTS
SE73	VMQ	600-1,000	0.04-0.1	Vinyl	MTS
SE74	VMQ	0.25M-2.5M cp	—	Methyl	MTO
SE771	MQ	200-500	—	Methyl	MTO
SE2081	FVMQ (fluoro)	165-220 plasticity	0.04-0.06	Vinyl	MTS
SE52	PVMQ (phenyl)	100-300	—	Methyl	MTO
SE54	PVMQ (phenyl)	100-600	0.1-0.3	Methyl	MTO

Chlorosilane Fluids (www.GEChlorosilanes.com)

Product Number	Description	Specific Gravity	Boiling Pt., °C (°F)	Freezing Pt., °C (°F)
SC3001	Trimethyl Chlorosilane	0.85	58 (135)	<0 (<32)
SC3102	Methyl H Dichlorosilane	1.10	41 (107)	<0 (<32)
SC3013	Methyl Trichlorosilane	1.27	NA	NA
SC3105	Dimethyl H Chlorosilane	0.89	35 (96)	NA
SC3022	Diphenyl Dichlorosilane	1.22	305 (581)	<0 (<32)

Need More Help?

- You can also access GE Silicones for the product information you need through our worldwide Web Site: **www.GESilicones.com**
- **Customer Service: TEL 800.332.3390 or 518.237.3330** (USA & Canada)
- **Technical Support: TEL 800.255.8886 or 518.237.3330** (USA & Canada)

† Transformer fluid.
‡ Meets many FDA requirements – see CDS 4319

Emulsions & Specialties

Unique Properties

fluids

Emulsions

Silicone emulsions are economical, easy to use and are excellent release agents for mechanical rubber, wire, and cable goods. They are also used as general purpose release agents. They offer the following application benefits:

- Easy to apply
- Good lubricity
- Easy release
- High temperature stability
- Low volatility
- Chemically inert
- Can be used in low concentrations
- Water-dispersable

Applications

Silicone emulsions are used as release agents in rubber applications such as the molding of automotive floor mats, shock mounts, fan belts, and O-rings; in consumer goods such as soles and heels for footwear; and in household products such as floor tiles.

Use Guidelines

- An optimum point for release efficiency and operating economy needs to be determined for each application. Actual use concentrations range from 0.2 to 2.5% silicone in most applications. A 2.0% silicone concentration is an excellent starting point.
- Although silicone emulsions are generally stable in hard water, a 200 ppm water hardness or higher indicates the need for softened water or a boiler condensate as a diluent.
- Diluting an emulsion with water can create the need for added bacteriostat/fungistat to combat possible microbial activity. Evaluate all diluted emulsions prior to use.
- Silicone emulsions are shipped with sufficient biocide for preservation. Shipment of emulsions with sufficient biocide for all dilution levels in all applications is not feasible. It is recommended that each user evaluate whether it is necessary to add additional biocide to diluted products.
- Reactive silicone emulsions may not be compatible with materials that contain hydroxy groups (can deactivate the emulsion) or anionics, lower alcohols and salts (can break the emulsion). Any mixture of reactive emulsions with other materials must be checked before it is put into production.

Emulsion Terminology and Tests

A silicone emulsion is an oil-in-water dispersion where the oil phase is a silicone fluid. Following are some ommonly used terms regarding emulsion appearance are:

- **Creaming** – oil-rich phase separates from the oil-lean phase. This can be either an "upward" creaming (where water is heavier than oil) or "downward" creaming (where oil is heavier than water).

Prior to use, emulsions can be agitated for uniform consistency to help avoid creaming. Creaming is a natural occurrence depending on age and storage conditions.

- **Free Oil** – varying amounts of actual oil separate from the body of the emulsion. A good emulsion has no large oil separation.

Antifoam Emulsions

Antifoam emulsions are designed to break down foam. The defoaming agent in any silicone emulsion is the silicone fluid in the system. The major function of the emulsion is to enable the silicone fluid to be thoroughly dispersed throughout the aqueous medium that requires defoaming.

Diluting Antifoam Emulsions

Antifoam emulsions are designed to break when diluted with water. This characteristic is designed into the products so they can act as efficient defoaming agents. If the customer wants to dilute an emulsion with water, water can be added while maintaining mild agitation, both prior to and during use. This enables the emulsion to continue performing as a defoamer.

Stable Low-Solid Emulsions

Thickeners can be added to antifoam emulsions to make them dilution-stable. The final emulsion viscosity should be between 1000 and 2000 cps. Viscosity is controlled by % of thickener, which should be well dispersed in water before the antifoam is added.

Typical recommended process for creating a 10% or lower **industrial grade** defoamer is as follows:

Ingredients	Procedure
Part A: 62.3% H20 4.0% Acrysol ASE-108 (Rohn & Haas)	Mix Part A.
Part B: 2.7% of a 10% NaOH solution	Add Part B until clear viscous solution forms at pH of about 6-7.
Part C: 31.0% antifoam emulsion	Add Part C and stir until uniform.

Typical recommended process for formulating **food contact grade** defoamers. Only FDA compliant GE silicone antifoams can be used (all equipment used must be sterile).

Ingredients	Procedure
Part A: 49.0% H_20 (sterile)	Heat Part A to 21°C/70°F (after sterilization).
Part B: 1.0% CMC-7HF (Hercules)	Add Part B and mix until dissolved.
Part C: 50.0% antifoam emulsion	Begin cooling. Add Part C and stir until uniform.

Emulsions & Specialties Typical Properties & Specifications

Typical product data values should not be used as specifications. For assistance and specifications, call GE Silicones at 800.255.8886.

Emulsions (www.GEEmulsions.com)

		Emulsifier Type	Base Oil	Silicone Content, %	Viscosity of Contained Oil, cstk @ 25°C (77°F)	Emulsion Viscosity, max cstk @ 25°C (77°F)	Density, lbs/gal	Total Solids, %*	Color
Standard	SM2128	Nonionic	SF18	35	350	500	8.2	37-41	White
	SM2133	Nonionic	SF96®	50	100	500	8.2	53-56	White
	SM2135	Nonionic	SF96	50	1,000	500	8.2	54.5-57.5	White
	SM2140	Nonionic	Viscasil®	50	10,000	500	8.2	51.5-54.5	White
	SM2162	Nonionic	SF96	50	350	500	8.2	52.5-55.5	White
	SM2163	Nonionic	SF96	60	350	2,500	8.2	60-64	White
	SM2164	Anionic	SF96	50	100	500	8.2	50-53	White
	SM2167	Cationic	SF96	50	350	1,500	8.2	50-53	White
	SM2169	Nonionic	Viscasil	60	60,000	4,000	8.2	60-64	White
Specialty	SM2059	Cationic	Silanol/Amino	35	—	350	8.2	35-41	Off-White
	SM2068A	Anionic	Silanol	35	>100,000	350	8.2	35-41	Off-White
	SM2112	Cationic	Silanol	35	—	2,500	8.2	35-41	White
	SM2138	Nonionic	Silanol	60	3,000	2,500	8.4	60-64	White
	SM2154**	Nonionic	SF8843	50	1,500	450	8.2	53-56	White to Lt. Yellow
	SM2658/SM6754	Cationic	Silanol/Amino	35	—	500	8.2	35-41	Straw
	SM2765/2725	Anionic	Silanol	50	>750,000	7,000	8.2	53-56	Off-White
	SM2245***	Nonionic	Silanol	40	—	3,000	8.2	49-54	Off-White

Antifoams (www.GEAntifoams.com)

	Type	Silicone Content, %	Specific Gravity	Density, lbs/gal	Color	Viscosity, cps @ 25°C (77°F)
AF9000	Compound	100	1.01	8.4	Straw	2,500 max
AF9010	Emulsion	10	1.01	8.4	White	2,500 max
AF9020	Emulsion	20	1.01	8.4	White	3,500 max
AF9030	Emulsion	30	1.01	8.4	White	7,000 max
AF60	Emulsion	30	1.01	8.4	White	1,000 max
AF67	Fluid	100	0.97	8.1	Clear	10,000-15,000 (cstks)
AFP2001	Emulsion	30	1.01	8.4	Lt. Brown	7,000 max

Specialties (www.GESpecialtyFluids.com)

		Description	Viscosity, cstks @ 25°C (77°F)	Specific Gravity	Flash Point, °F
	SS4098	50% Solids (MQ/Fluids/Catalyst)/Solvent	5-13	0.89	88
	SS4177	50% Solids (MQ/Fluid)/Solvent	8-25	0.95	93
	SS4230	50% MQ/50% D5	70-200	1.05	>150
	SS4255	50% MQ/50% Xylene	3-10	1.01	63
	SS4267	35% MQ/65% SF96-50	300-700	1.04	395
	SR1000	Solid MQ Resin	—	—	NA
NEW!	XS66-B0900	14% Solids	2,000-5,000	0.81	54

Water Repellent Masonry Coatings (www.Silblock.com)

		Description	Silicone Content, %	Viscosity, cstks @ 25°C (77°F)	Specific Gravity
NEW!	Silblock™ LO-N	Alkylated Alkoxy Siloxane	100	10-70	1.10
NEW!	Silblock™ LV-N	Silicone Resin	50	40-60	1.03
NEW!	Silblock™ SK	Potassium Methyl Siliconate	25	—	1.35
NEW!	Silblock™ WA	Siloxane/Silane Emulsions	60	—	0.98
NEW!	Silblock™ LD	Alkoxy Siloxane Emulsion	35	—	1.06

Silicone Liquid Elastomers (www.GESLE.com)

		Viscosity, cstks @ 25°C (77°F)	Shore A	Specific Gravity	Blend Ratio	Color
	SLE5300	15,000-30,000	37	1.16	10:1	White
NEW!	SLE5400	15,000-50,000	47	1.01	1:1	Translucent
	SLE5500	50,000-150,000	27	1.27	10:1	White
	SLE5600	100,000-200,000	58	1.01	1:1	Beige
	SLE5700	20,000-25,000	40	1.10	1:1	Translucent

Powder Resin (www.Tospearl.com)

	Appearance	Average Particle Size, μm	Water Content, 105°C (221°F), 60 min	pH	Specific Gravity	Bulk Density	Specific Surface Area, 25°C (77°F)	Linseed Oil Absorption Rate, mL/100g
Tospearl™ 105	Spherical Fine White Powder	0.5	5% or less	7.5	1.32	0.25	70	95
Tospearl 120	Spherical Fine White Powder	2.0	2% or less	6-8.5	1.32	0.35	15-35	75
Tospearl 130	Spherical Fine White Powder	3.0	2% or less	6-8.5	1.32	0.36	10-30	62
Tospearl 145	Spherical Fine White Powder	4.5	2% or less	6-8.5	1.32	0.43	10-30	58
Tospearl 240	Amorphous White Powder	4.0	2% or less	6-8.5	1.32	0.17	20-45	84
Tospearl 2000	Spherical Fine White Powder	6.0	11% or less	6-8.5	1.43	0.46	20-30	60
Tospearl 3120	Spherical Fine White Powder	12.0	2% or less	7.5	1.32	0.46	18	50

* % Total solids: % of nonvolatile material in the emulsion. ** Non-reactive polymer. *** Cured with SM2146C catalyst @ 10% use level.

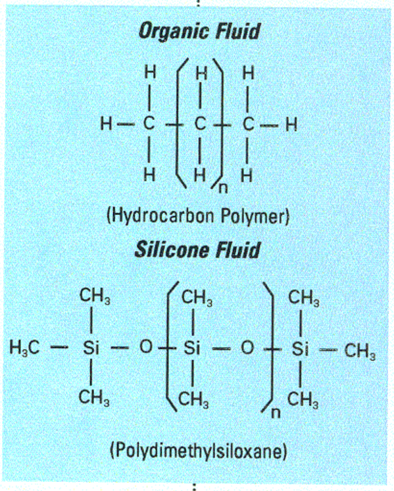
Technical Supplement

fluids

Unique Chemical Structure

Dimethyl silicone fluids are unique materials. Silicone fluids have a backbone of silicon-oxygen linkages similar to the Si-O linkages in high-temperature inorganic materials such as quartz, glass and sand. This molecular backbone is much stronger than the typical carbon-to-carbon chain and more resistant to attack by temperature extremes, oxidation, shear stresses and chemicals. See sample structures, center of page.

GE manufactures both low-and high viscosity dimethyl silicone fluids. The chemical structure of all silicone fluids gives them a unique set of properties.



Low Viscosity-Temperature Change

Silicone fluids exhibit a much smaller degree of change over a wider temperature range than non-silicone fluids.

Wide Temperature Range

Low temperature limits and high temperature capabilities of silicone fluids far surpass those of conventional fluids.

Thermal Stability

Silicone fluids show excellent stability when exposed to high temperatures for extended periods of time.

Oxidation Stability

The oxidation stability of silicone fluids is excellent. Absence of copper-induced oxidation is critical and contrasts with the sludging that occurs with mineral oils, especially at high temperatures.

Chemical Inertness

Silicone fluids are chemically inert to most common materials of construction.

Low Flammability

Flash points in the range of 205°C to 260°C (400°F to 500°F) and auto-ignition temperatures in the range of 438°C to 460°C (820°F to 860°F) are typical for silicone fluids.

Low Surface Tension

Silicone fluids have unusually low surface tensions which help provide easy and efficient spreading, high surface activity and low internal cohesive energies.

Compressibility

Silicone fluids of 10 centistokes or more exhibit compressibility of 1.34% at pressures of 2000 psi at room temperature.

Shear Stability

Silicone fluids have unusually high resistance to breakdown by mechanical shearing. The shear stability of silicone fluids can be as much as twenty times that of quality petroleum oils, providing longer life at higher speeds and loadings.

Thermal Conductivity

The thermal conductivity of silicone fluids over a wide temperature range is comparable to hydrocarbon fluids.

Dielectric Properties

Electrical grade silicone fluids offer excellent dielectric properties which are maintained for prolonged periods, even under adverse operating conditions.

Non-Corrosive

Silicone fluids contain no acid-producing chemicals to cause staining or corrosion.

FDA Compliant Silicone Fluids

Some GE silicone fluids can be used in food contact and in additive applications, if FDA regulations are followed.

Solubility

Silicone fluids are non-polar and insoluble in water or the lower alcohols. They are completely miscible in typical aliphatic and aromatic solvents, including the halogenated solvents, but are only partially miscible with the intermediate petroleum fractions such as the naphthenes. These materials can dissolve enough silicone, particularly lower viscosity grades, to be sufficient for many purposes. Silicones are insoluble in higher hydrocarbons, lube oils, waxes, fatty acids, vegetable oils and animal oils.

SOLUBILITY OF SOME SILICONES

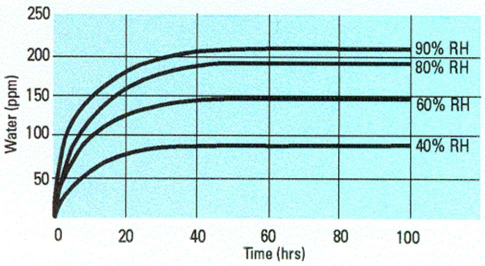
Key: ○ = Insoluble • less than 1%
◐ = Partially Soluble • 1-10% by weight
● = Soluble • 10% or higher
△ = Soluble Hot

SOLVENT TYPE	MATERIAL	SF96-5	SF96-350	SF1202, SF1173, SF1204	SF1188A	SF1214
Highly Polar	Water	○	○	○	○	○
Hydrocarbon Solvents	Aliphatic	●	●	●	○	●
	Aromatic	●	●	●	●	●
Hydrocarbon & Vegetable Oils	Mineral Oils 65/75 SSU	●	○	●	○	○
	200/210 SSU	◐	○	●	○	○
	Petrolatum	○	○	△	○	○
	Cottonseed Oil	○	○	●	○	○
	Castor Oil	○	○	◐	●	○
	Sunflower Seed Oil	◐	○	●	○	○
	Maleated PS Soybean Oil	◐	○	●	○	○
	Wheat Germ Oil	○	○	●	○	○
Alcohols & Glycols	Cetyl Alcohol	△	○	△	△	○
	Ethanol 95%	○	○	○	●	○
	Ethanol SDA-40	●	○	●	●	○
	Isopropanol, 99%	●	○	●	●	○
	2-Ethyl-Hexanol	●	●	●	●	○
	Lauryl Alcohol	●	●	●	●	○
	Stearyl Alcohol	○	○	○	○	○
	Ethylene Glycol	○	○	○	○	○
	Propylene Glycol	○	○	○	○	○
	Glycerin	○	○	○	○	○
Silicones	SF96® (350)	●	●	●	○	●
	SF1202	●	●	●	○	●
	SF1318	◐	○	●	○	○
	SF1550	●	●	●	●	●

Moisture Absorption

Although dimethyl silicones are generally insoluble in water, they have been known to absorb up to 200 ppm water.

Moisture Absorption Rate of SF96® (50) Silicone Fluid at 25°C (77°F)



Radiation Resistance

It has been demonstrated that the radiation resistance of silicone fluids is a function of their aromatic content. Methyl phenyl and other aromatic siloxanes demonstrate a much greater radiation resistance than SF96® and Viscasil® dimethyl fluids, which contain no aromatic groups in their structure.

Tests have shown that a dosage of 1×10^7 roentgens will produce a large increase in the viscosity of dimethyl fluid. A dosage of 1×10^8 roentgens is usually sufficient to cause gelation. Dosage conditions may be equally as important as total dosage. Fluids exposed to low rates of exposure may stand up fairly well to the radiation, while high rates may result in less than expected total dosage before gelation.

Low Temperature Properties

A fluid's pour point is a measure of its low temperature properties. Analogous to the freezing point for a pure compound, pour point is the temperature at which a fluid becomes so viscous it loses its ability to flow.

Extended storage of silicone fluids at low temperatures will produce no precipitation because no additives are present. The fluid will remain unchanged even when frozen for long periods, and when returned to normal operating temperatures will perform as effectively as before.

Pumping Characteristics of Silicone Fluids

Because of their low temperature pour points, silicone fluids are well suited for pumping applications. With the exception of a high pressure piston pump, virtually any type of pump can be used with silicone fluids: gear, centrifugal, internally spline, positive displacement or vane.

Centrifugal or gear pumps are recommended in electronic liquid cooling applications where pressures are low and flow rates are moderate. A gear pump is recommended in electronic coolant applications where flow pressure is needed to filter the fluid. When low pressure and high flow are required in light or compact equipment, centrifugal pumps are often used.

Refractive Index

The refractive index is a useful tool in establishing purity and is also used to distinguish between chemically different silicone fluids. For example, the phenyl-containing products have significantly higher values than the dimethyl silicones.

fluids

The Figure below shows variations in values between lower molecular weight dimethyl silicones and their higher molecular weight homologues. The value for dimethyl fluids above 1,000 centistokes is relatively constant.

Ultraviolet & Infrared Characteristics

Phenyl-containing silicone fluids, like other aromatic materials, absorb energy in the ultraviolet region of the electromagnetic spectrum. Dimethyl silicone fluids do not have strong absorption bands in the ultraviolet.

In the infrared region, both dimethyl and phenyl-containing silicone fluids show strong characteristic bands which are useful in qualitative identification and quantitative analysis.

Flammability

Flash Point – High viscosity silicone fluids (50 centistokes and above) have flash points of 238°C to 260°C (460°F to 500°F) when measured by the conventional "closed cup" method. Low viscosity (20 centistokes and below) dimethyl fluids and cyclic fluids are more volatile and do not have the high flash points of the more viscous materials.

Fire Point – The fire points of silicone fluids are significantly higher than their flash points. This difference between flash and fire points accounts for the self-extinguishing characteristics of non-volatile, high molecular weight silicone fluids. Conventional non-silicone fluids frequently have flash and fire points within a few degrees of each other, reducing the likelihood that they will have self-extinguishing characteristics.

Auto-Ignition Temperature – The temperature at which the fluid ignites spontaneously occurs above 460°C (860°F) for most dimethyl and phenyl-containing silicone fluids. Only fluids with viscosities of 20 centistokes or below show lower values.

Surface Tension

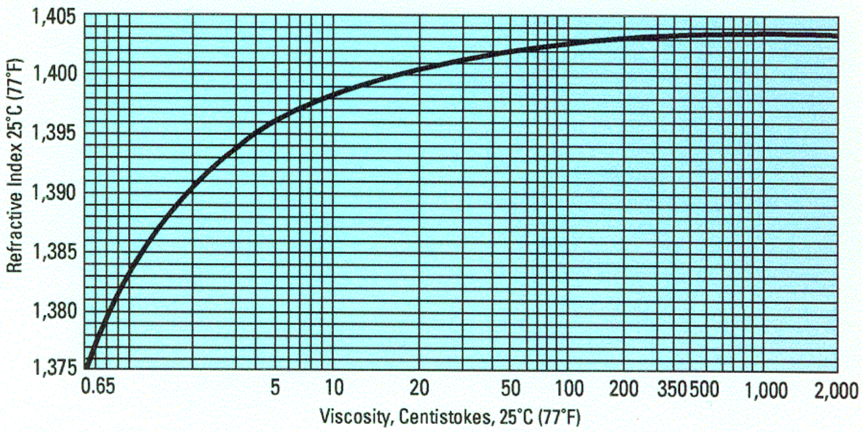
Surface tension of silicone fluids is unusually low, resulting in unique performance by these materials in applications where high surface activity and great spreading power are necessary. Dimethyl silicones have low surface tension values largely independent of viscosity (about 21 dynes per centimeter at 25°C (77°F) over a viscosity range of 20 to 100,000 centistokes). Phenyl-containing fluids have slightly higher surface tension values [about 24 to 25 dynes per centimeter at 25°C (77°F)], but these values are still much lower than those of organic materials.

The surface tension of organic fluids is typically in the range of 35 to 40 dynes per centimeter. The value for water at room temperature is about 72 dynes/cm.

Thermal Expansion

Thermal expansion of silicone fluid is expressed in cc/cc/°C in the range of 0°C to 150°C (32°F to 302°F). Multiplying this factor by the change in temperature, °C, closely approximates the change in unit

Refractive Index of GE Dimethyl Fluids



volume of any silicone fluid in this temperature range.

Thermal Conductivity

Thermal conductivity of silicone fluids is relatively constant over temperatures ranging from 26°C to 93°C (80°F to 200°F). There is little variation between dimethyl and phenyl-containing fluids.

Volatility

Vapor Pressure – Because dimethyl silicone fluids of 50 centistokes and above are polymers of mixed molecular weights, they have no true boiling points or reproducible vapor pressure curves. These properties can be applied only to chemical compounds of a single molecular weight.

In silicone fluids, volatility and measurable vapor pressure come from the lower molecular weight fraction present. When exposed to relatively high temperatures or high vacuums, the small quantities of lower molecular weight polymers will escape, leaving a fluid which will undergo no further weight loss at that temperature and pressure. At very high temperatures, more volatiles will be given off because of molecular rearrangement, which forms volatile short-chain molecules.

Volatile Fluids – Volatile cyclics should be used in applications where volatility is desirable. Cyclics are low viscosity fluids composed of cyclic molecules of uniform molecular weight.

Weight Loss at Atmospheric Pressure – The weight loss of silicone fluids is determined in a forced air circulating oven at atmospheric pressure. Dimethyl fluids are conventionally measured after exposure at 150°C (302°F) for 24 hours. Phenyl fluids may also be measured by this test, although higher temperatures are frequently employed. At very high temperatures, the loss in simple volatiles is compounded by some oxidative effects.

Specific Heat

Specific heat of most silicone fluids falls in the 0.36 to 0.39 BTU/lb./°F range at room temperature.

Dielectric Properties

SF97 electrical grade fluid is a dimethyl silicone fluid processed to provide outstanding dielectric properties. Because of the basic properties of silicone fluids, these electrical properties are maintained for prolonged periods and under adverse operating conditions.

Lubrication Properties

- Methyl alkyl and certain modified phenyl fluids are outstanding lubricants suitable for severe applications at room temperatures from -73°C to 232°C (-100°F to 450°F).
- Dimethyl fluids are effective lubricants in rubber or plastic-to-metal applications.
- Dimethyl and phenyl silicone fluids lack the lubricity required for most mechanical applications involving sliding friction and are generally not recommended as metal-to-metal lubricants.

Shear Characteristics

The viscosity of a fluid is defined as the ratio of shear stress to shear rate. In the ideal (Newtonian) fluid, this ratio is constant and is independent of the shear rate. In a non-Newtonian fluid, the ratio is not constant and the apparent viscosity at high shear rates is less than the true viscosity.

Dimethyl fluids approach Newtonian behavior. The lower the viscosity, the more nearly Newtonian the fluid. However, the apparent lowering in viscosity (pseudoplastic flow at high shear rates) is a transitory condition as dimethyl fluids will return to their original nominal viscosity on cessation of shear.

Silicone fluids demonstrate a *recoverable drop* in viscosity after prolonged shearing action. Organic fluids show a drop in nominal viscosity that is a *permanent loss* in viscosity resulting from poor shear stability. The permanent viscosity change results from the molecules being torn apart by the mechanical action. Silicones show excellent shear stability and retain their original viscosity characteristics, as they are not affected by mechanical working.

fluids

Oxidation Stability

In the presence of air, oxidation stability becomes an important factor in the high temperature performance of silicone fluids. In oxidative breakdown, oxygen reacts with the organic groups of the molecules, causing the fluids to lose volatiles and increase in viscosity until gelation occurs. The reaction is dependent on the temperature and supply of air.

Oxidation Threshold

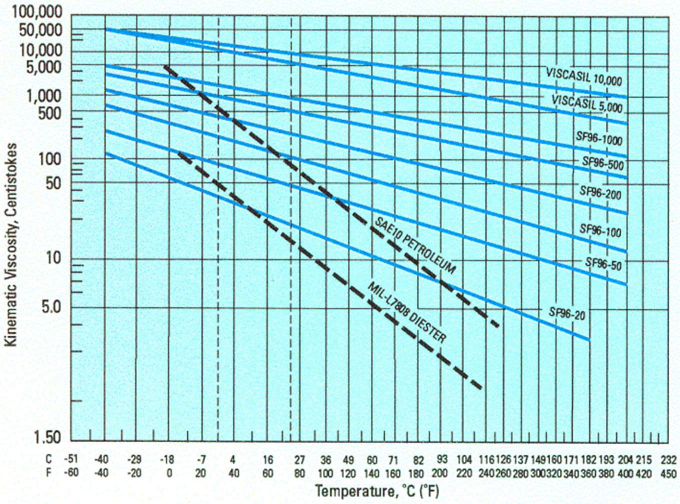
Oxidation threshold is the temperature at which a significant amount of oxidation by-products start to appear. Below this temperature, some oxidation will occur, which will not adversely affect the useful life of the silicone fluids.

Viscosity-Temperature Relationship

Silicone fluids exhibit a relatively small viscosity change with temperature change compared to petroleum oils and dibasic acid esters. A common measure of viscosity change with temperature is the viscosity-temperature coefficient (VTC) which is defined as:

$$VTC = \frac{V38°C\ (100°F) - V99°C\ (210°F)}{V38°C\ (100°F)}$$

A lower value indicates less viscosity change with temperature. For dimethyl silicone fluids, the VTC is 0.6 or less. Phenyl fluids have slightly higher values. Typical values for organic fluids are 0.8 or higher.



Thermal Stability

In the absence of air, silicone fluids show excellent stability when exposed to high temperatures for long periods of time. In sealed systems or in an inert atmosphere such as nitrogen or carbon dioxide, high temperatures above their thermal activation points can break the bonds linking silicon and oxygen in the silicone fluid to form lower molecular weight volatile silicones. The activation point for dimethyl fluids is about 316°C (600°F), and for phenyl-containing fluids it is slightly higher. The useful life of silicone fluids under non-oxidative conditions below their thermal activation points continues for many hundreds of hours.

The degradation products that form at or near the thermal activation temperature are completely compatible with the base polymer. In a sealed system, a decrease in overall nominal viscosity is usually experienced when thermal degradation produces low molecular weight fractions which lower the average molecular weight of the silicone fluid. An increase in vapor pressure in sealed systems results from the formation of volatile silicones.

Specific Gravity

Specific gravities of silicone fluids are normally measured at a 25/25°C (77/77°F) temperature and are less than that of water for all dimethyl fluids. Except for the very low viscosity products, the nominal specific gravity range for dimethyl fluids is 0.94 to 0.98. The phenyl-containing silicone fluids are slightly heavier, with specific gravities range from 1.05 to 1.10.

Plastics

Many plastic materials are unaffected by silicone fluids. However, low molecular weight fluids (10 centistokes or less) may behave as solvents and damage the surface of plastics or resin coatings.

Tensile and impact tests were used to measure property changes in thermoplastic and thermoset materials immersed for 30 days in SF96 fluids. Results:

- Nylon, polystyrene, methylacrylics and modified methacrylics, LEXAN® polycarbonate resin and general purpose phenolic molding compounds were unaffected by this 30-day exposure.
- TEFLON® coating has been successfully used in contact with both dimethyl and phenyl materials.
- Cellulose acetate butyrate is stiffened and crazed by SF96 dimethyl fluids.
- Evidence exists that silicone fluids contribute to stress-cracking of polyethylene. This plastic must be stress-relieved to operate reliably in contact with silicone fluids for long periods of time. The linear polyethylene and polypropylenes are less susceptible to stress-cracking.
- Polyacetal (DELRIN®) is stiffened and crazed by both dimethyl and phenyl fluids.
- Long period contact with highly plasticized materials such as polyvinyl chloride (PVC) should be avoided since the silicone fluids leach out the plasticizer, causing shrinkage and hardening.

Effect on Plastic After 30-Day Immersion

Plastic	Dimethyl SF96® (350)	Phenyl Containing SF
Nylon	No Effect	No Effect
Polystyrene	No Effect	No Effect
Methacrylics	No Effect	No Effect
Modified Methacrylics	No Effect	No Effect
Polycarbonates (LEXAN®)	No Effect	No Effect
Phenolics	No Effect	No Effect
Cellulose Acetate Butyrate	Stiffened	No Effect
Polyacetal (DELRIN®)	Stiffened & Crazed	Stiffened & Crazed
Polyethylene	*Some Stress Cracking	*Some Stress Cracking
Linear Polyethylene	*Some Stress Cracking	*Some Stress Cracking
Linear Polypropylene	*Some Stress Cracking	*Some Stress Cracking
Polyvinyl Chloride	Shrinks & Hardens	Shrinks & Hardens
PIFE (TEFLON®)	No Effect	No Effect

* Linear polyethylene and linear polypropylene are not as susceptible to stress-cracking or crazing as ordinary polyethylene.

Rubber

Very low viscosity fluids (10 centistokes or less) will have the most adverse effects on rubber during prolonged immersion or contact. However, when silicone fluids are used to provide surface coatings to impart slip to rubber parts, no effect is noted. Rubber materials with little or no plasticizer compatible with silicone fluids are unaffected. Examples of such rubbers are Neoprene, butyl, nitrile, natural and fluororubber.

Rubber compounds can be affected by immersion in silicone fluids. The effect varies with the viscosity of the fluid, composition of the rubber and temperature. The effect is usually a reduction of weight and volume and an increase in hardness caused by leaching of the plasticizer.

Rubber in Silicone Fluid Systems

Type	Product	Recommended Service Temp. Range, °F
Chloroprene	Neoprene	-40 TO 200
Isobutylene-Isoprene	Butyl	-40 to 200
Nitrile-Butadiene	Nitrile Buna N	-40 to 200
Fluororubber	VITON® FLUOREL™	-20 to 450

Metals

- Metal alloys such as stainless steel, cold-rolled steel, aluminum, duralumin, nickel, magnesium, zinc, cadmium, titanium, silver and monel have no appreciable effect on silicone fluids at temperatures up to 204°C (400°F).
- Copper and phosphor bronze act as oxidation inhibitors to the dimethyl fluids up to 204°C (400°F) and stabilize the viscosity of the fluid. Lead also inhibits gelation of dimethyl fluids although relatively high weight loss occurs. Some brasses may cause gelation of the fluid. Selenium and tellurium should also be avoided as there is evidence that these metals act as catalysts for gelation of silicone fluids.

fluids

Metals (cont.)

Effect on Silicone Fluid at High Temperatures

Metal	Dimethyl	Phenyl
Aluminum	None	None
Stainless Steel	None	None
Cold-Rolled Steel	None	None
Duralumin	None	None
Nickel	None	None
Magnesium	None	None
Zinc	None	None
Cadmium	None	None
Titanium	None	None
Silver	None	None
Monel	None	None
Copper	*Inhibits Gelation	None
Phosphor Bronze	*Inhibits Gelation	None
Lead	Inhibits Gelation	Causes Volatilization
Yellow brass	Causes Gelation	None
Selenium	Causes Gelation	Causes Gelation
Tellurium	Causes Gelation	Causes Gelation

*Copper and phosphor breeze inhibit gelation up to 204°C (400°F). At higher temperature, little effect is noted.

Blending Silicone Fluids

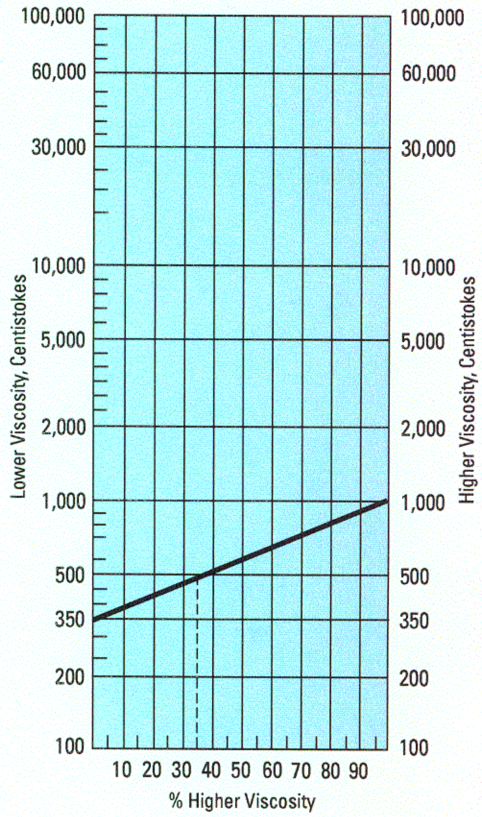
Any standard viscosity grade of SF96®, SF97 or Viscasil® fluids can be blended together with another viscosity grade of the same fluid to produce an intermediate viscosity. This blend chart provides a means for determining the proper blend ratio.

Blend Scale for Intermediate Viscosities

The chart should be used as follows:

1. Decide upon viscosity grades to be blended. For high accuracy, measure actual viscosity of blending fluids.
2. Locate lower viscosity on left hand scale.
3. Locate higher viscosity on right hand scale.
4. Connect these two points with a straight line.
5. Locate the point where the line indicating the desired blend viscosity intersects the constructed line. From this point, follow down to read the percent of higher viscosity fluid to use in the blend.

This method is reasonably accurate in predicting blend viscosity when the two fluids differ in viscosity by no more than one magnitude (one power of ten). When fluids covering a wider range are blended, the chart will only approximate the finished viscosity. SF96-350 and SF96-1000 fluids are used in the example in the chart. To blend a viscosity at approximately 500 centistokes, use about 35% SF96-1000.



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World Wide Offices

Americas
GE Silicones

GE Silicones
260 Hudson River Road
Waterford, New York 12188
Technical Assistance:
800-255-8886
Customer Service:
800-332-3390

GE Canada, Inc.
2300 Meadowvale Blvd.
Mississauga, Ontario
Canada L5N 5P9
Telephone:
800-668-4644
Customer Service:
800-332-3390

GE Silicones Latin America
Av. Prolongación Reforma
#490 – 4 To. Piso
Col. Santa Fé
México, D.F.C.P. 01207
Telephone: 525-257-6095
Fax: 525-257-6094

Europe
GE Bayer Silicones

GE Bayer Silicones GmbH & Co KG
1 Falkenberg
D-40699 Erkrath
Germany
Telephone: 49-2104-9430
Fax: 49-2104-943111

GE Bayer Silicones GmbH & Co KG
1 Plasticslaan
P.O. Box 117
4600 AC Bergen op Zoom
The Netherlands
Telephone: 31-16429-2291
Fax: 31-16429-2708

GE Bayer Silicones GmbH & Co KG
15, Olaf Palme-Strasse
D-51368 Leverkusen
Germany
Telephone: 49-21430-31922
Fax: 49-21430-28435

Pacific
GE Toshiba Silicones

GE Toshiba Silicones
Roppongi 6-2-31, Minato-Ku
Tokyo 106-8550, Japan
Telephone: 81-3-3479-3918
Fax: 81-3-3479-2944

GE Silicones Hong Kong
Room 1008, Tower 1
The Gateway
25 Canton Road
Tsimshatsui, Kowloon
Hong Kong
Telephone: 852-2629-0888
Fax: 852-2629-0803

GE Silicones Korea
c/o Dongyang Silicones Company, Ltd.
GEPK Bldg. 4th Floor
231-8 Nonhyun-dong
Kangnem-Ku
Seoul, Korea 135-010
Telephone: 82-2-518-2626
Fax: 82-2-517-2646

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