

Fluid Resistance Guide

Performance Profiles for *Silastic*[®] brand Silicone and Fluorosilicone Rubber and XIAMETER[®] brand Silicone Rubber

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Introduction

This guide is intended to give you an idea of the performance profile of various classes of silicone rubbers when immersed in different fluids.

It's our hope that the information will save you the time and cost of preliminary screening and feasibility tests. We recommend that you test specific materials prior to use. Keep in mind that service conditions are usually less severe than immersion tests. For instance, in actual service the rubber is often only partly exposed or is subjected only to spills or splashing. This means that a rubber that shows only fair results in a prolonged total immersion test will often perform quite adequately under actual conditions.

Types of *Silastic* and XIAMETER Silicone Rubbers

Immersion test results refer to types of silicone rubber by their ASTM designation. The polymer classification described in ASTM D 1418 is based on the organic group side chains attached to the silicon-oxygen chain. If other groups are present, their initials are listed prior to the MQ designation: MQ indicates methyl groups, V indicates phenyl groups. Where several types of rubber have been tested for resistance to one fluid, they are listed in this order in the tables:

***Silastic* and XIAMETER Silicone Rubbers**

MQ } General purpose stocks
VMQ }

PMQ } Extremely low-temperature stocks
PVMQ }

***Silastic* Fluorosilicone Rubbers**

FVMQ Fuel-, oil-and solvent-resistant stocks

Effects of Immersion

If a fluid affects a silicone rubber at all, after prolonged immersion and usually at elevated temperatures, the changes are evidenced as increases or decreases of several physical properties: hardness, tensile strength, elongation, and volume. The values that appear in the tables have been calculated as prescribed in ASTM D 471. The figures have been rounded and represent typical values.

The effects that have been tabulated often go hand in hand, but there is no quantitative correlation. For example, a silicone rubber in one fluid may swell 10 percent and lose 15 percent in tensile strength, whereas in another fluid the same rubber may also swell 10 percent but lose 30 percent in tensile strength.

The effects of solvent or fuel immersion often proceed until they reach a limit and then increase no more. This limit corresponds to the maximum amount of solvent or fuel that the rubber structure can absorb at the test temperature. While a fluid may produce little effect at room temperature, it may cause a noticeable change at 204°C (400°F).

Swelling caused by fluid penetration of rubber is usually the most obvious effect. However, this swelling does not necessarily indicate permanent deterioration. The rubber often regains most of its original properties after the fluid has evaporated.

Hardness changes are tabulated in durometer points on the Shore A-2 scale. Changes in tensile strength and elongation are expressed as percentages of the original values. These changes are usually losses that appear as negative values. Volume changes due to penetration of fluids between silicone polymer chains appear as positive values, that is, swelling. Negative volume changes indicate chemical degradation, such as the tables show for 20 percent sulfuric acid at 83°C (180°F) for seven days.

Service Considerations

Duration of exposure may be very important in some applications. In the case of silicone rubber used as electrical insulation, this may mean that no permanent harm will result from short exposures to washing or rinsing, even with powerful solvents. After prolonged periods at high temperatures, hydrocarbon oils may slowly decompose. The breakdown products may have an entirely different solvent effect than that of the original oil. On the other hand, heating may sometimes have the favorable result of driving off volatile components of oils. Contamination in service may also produce changes in lubricating oils and their effect as immersion media. Swelling may be a limiting factor in service, even though a small amount may be desirable for certain applications. For example, o-rings often work better if they swell slightly in the fluid they seal; but if they swell too much, they may push themselves out of position and lose effectiveness. Also, swelling may produce tears in tightly restricted parts.

Selection Recommendations

1. *Silastic*[®] brand fluorosilicone rubber shows superior resistance to many fluids; however, other types of rubber offer better resistance to acetone, certain other ketones, and some esters. The fluorosilicone polymer can be blended with other silicone polymers to obtain resistance intermediate between the two types.
2. The higher the aromatic or phenyl content of oils and fuels, the greater is their effect on most types of silicone rubber except fluorosilicone rubber. The stocks most affected are usually the types with ASTM designations including P (phenyl groups). This follows the common principle of organic to solvents that “like dissolves like.”
3. For high-temperature applications, parts should generally be cured at temperatures higher than anticipated service temperatures, no matter whether the parts will contact liquid or air. Property changes are usually less for fully cured parts than for as-vulcanized or partially cured parts.

Test Conditions

The immersion tests tabulated were conducted according to ASTM D 471. Specimens were cut from slabs that were molded and oven-cured in accordance with recommended procedures for the individual stocks.

Many fluids were tested only for their effects on volume and hardness because these values are usually the most critical.

In regard to the limited correlation between test conditions and service conditions, the most widely used test, ASTM D 471, states:

“Owing to the wide variations often present in service conditions, no direct correlation between this accelerated test and service performance may be given or implied. However, the method yields comparative data on which to base judgment (as to service quality and is especially useful in research and development work).”

Test results refer to types of silicone rubber products by ASTM designation. Because tests were conducted over a period of several years, the specific products used may no longer be available. Test results, therefore, can be used to project general performance only. If more specific information is required, refer to individual data sheets or conduct new tests.

Fluids Index

Classification of Immersion Media

Fluids for testing have often been submitted with only a trade name for identification. It has been difficult to classify some of these fluids for the tabular sections of this guide. The overall classification has been designed for easy reference by users in different industries.

A		Coca-Cola Syrup	26	G	
Acetic Acid	29	Coffee	26	Gas Drip Oil	19
Acetone	21	Coolanol 35	18	Gasohol	15
Acetonitrile	31	Coolanol 45	18	Gasoline	14
Aroclor 1254	19	Copper Sulfate	31	GE Transil Oil	19
Aerosafe 2300	15	Cosmoline 2046	19	GM Hydraniatic Fluid (Type A)	12
Ammonia	31	Crude Oil 7 API	19	GM 14X Heavy Duty Oil	19
Ammonium Hydroxide	30	Crude Oil 315 API	19	Gulf Synthetic Lube No. 2 Oil	10
AMOCO Super Permuable 10W-30	11	Cyclohexane	22		
ANG 15 Industrial Grease	18	D		H	
ANG 25 Diester Base	18	Delco No. 9	19	Heptane	22
ANG 25 Glycerol Ester	18	Delco No. 11	19	HMS 20-1083	33
Aniline	31	Delco Shock Absorber Fluid	13	Hydrazine	33
ANO No. 3 Grade M; Extreme Pressure	18	Delco Supreme 550 Heavy-Duty Brake Fluid	13	Hydrochloric Acid	29
ANO No. 6 Oil	18	Diacetone Alcohol	22	Hydrofluoric Acid	29
ANO No. 9 Oil	18	Dichloroisopropyl Ether	22	Hydrogen Peroxide	33
ANO No. 11 Oil	18	Diesel Fuel	14	Hydrolube H-2 Fluid	15
ANO No. 366 Oil	18	Diethyl Ether	22	Hypoid EP Lubricant	13
Aroclor 1254	19	Di (2-Ethylhexyl) Sebacate	7	I	
Askerol Transformer Oil	17	Dimethyl Formamide	32	Inerteen Transformer Oil	17
ASTM No. 1 Oil	6	Dioctyl Phthalate	32	IRM 902 Oil	7
ASTM No. 2 Oil	6	Dowtherm A Heat Transfer Oil	19	IRM 903 Oil	7
ASTM No. 3 Oil	6	Dowtherm 209	32	Isooctane	7
ASTM reference fuel A Isoctane	7	<i>Dow Corning</i> [®] brand Compounds	25, 26	Isopropyl Alcohol	22
ASTM Reference Fuel B	8	<i>Dow Corning</i> [®] brand Fluids	24, 25	Isopropyl Nitrate	33
ASTM Reference Fuel C	8	<i>Dow Corning</i> [®] brand Greases	25, 26		
ASTM Test Fluid 101	7	Dynaflow Automatic Transmission Fluid	12	J	
B		E		JP-4 Fuel	14
Beer	26	Ethanol	15	JP-5 Fuel	14
Benzene	21	Ethyl Alcohol	22	JP-8 Fuel	14
Brayco 880D Oil	10	Ethylenedichloride	22	L	
Bromine (liquid)	31	Ethylene Glycol	32	Lard	26
Butter (liquid)	26	Ethylene Oxide	32	Lithium Hydroxide	30
Butyl Acetate	22	Exxon Turbo Oil No. 15	9	M	
Butyl Alcohol	22	Exxon Univis J-43 Oil	9	Manufactured Gas	14
Butylene Oxide	31	Exxon WS2406 Fluid	15	Mazola Oil	26
C		F		Methanol	8, 15
Calcium Oxide	30	FC-75 Fluorochemical Fluid	19	Methyl Alcohol	22
Calcium Silicate	31	Ferric Chloride	31	Methyl Chloride	22
Caprolactam Monomer	31	Freon	32, 33	Methylene Chloride	22
Carbon Tetrachloride	22			Methyl Methacrylate	33
Chlorobromomethane	22			MIL-A-8243 Deicer Fluid	10
1-Chlorodecane	32			MIL-H-5606	9
Chloroform	22			MIL-H-5606 Oil	9
Chlorothene Solvent	22			MIL-J-5624F-14	14

MIL-L4600 Oil Bis	11	PQ 4226	9	Tetrahydrofuran	34
MIL-L-7808D Oil	9	PQ 8365	10	Texaco 10W 30 Motor Oil	11
MIL-L-7808E Oil	10	PRL 3313	20	Texaco Regal Starfak	
MIL-L-7808E, F, and G Oil	10	Propylenedichloride	23	Special Grease	18
MIL-L-7808F Oil	10	Propylene Oxide	34	Texaco TG-749	18
MIL-L-7808G Oil	10	Pydraul Fluids	16	Texamatic A Transmission Fluid	12
MIL-7808J Jet Engine Oil	11	Pyranol Transformer Oil	17	Texamatic C Transmission Fluid	12
MIL-L-23699 Oil	10			Texamatic TL 3528	
MIL-O-6085 Oil	9	R		Transmission Fluid	12
Mineral Oil	19	RCA-Gulf Instrument Oil A	17	Texas 1500 Oil (HD Concentrate)	20
Mineral Oil (Shell No. 5)	19	Royco 808GF Oil	10	Tia Maria Liquor	27
Mineral Spirits	22	RX-1099 (Vinyl Plastisol)	34	TL 3450 Lubricant	13
Mobil 5W-30HP Engine oil	11			Toluene	23
Mobil Jet II Oil	11	S		Toluene Vapor	23
Mobil Oil No. 20 Oil	11	SAE No. 10 Oil	11	TTS-735 Type VII	9
Mobilube GX-90 General Lubricant	13	SAE No. 20 Oil	11	Trichloroethylene	34
Mobil XRM-139A Oil	10	Salicylanilide	34	Tricresyl Phosphate	21
Molybdenum Disulfide	33	Santicizer 141	34	Trifluorochloroethylene	34
Monochlorobenzene	22	Scotch Whisky	27	Turbo Oil No. 35	21
Monoethanolamine	33	SG 4766 Glycol Ester Base Grease	20	Turpentine	23
Motor Oil - 10W-30	11	Shell Aircraft Turbine Lubricants	20		
		Shell B & B Grease	20	U	
		Skydrol Fluids	16, 17	Ucon Lubricants	21
N		Socony Mobil RL 147-A No. 7	20	Univolt 35 Transformer Oil	17
Naphtha	23	Socony Mobil Transmission Fluid		Unsymmetrical Dimethyl	
Navy Crankcase Oil No. 2135	20	(Type A)	12	Hydrazine	15
Navy Crankcase Oil No. 9250	20	Sodium Carbonate	31		
N-43 Fluorocarbon Capacitor Fluid	17	Sodium Chloride	31	V	
Nitric Acid	29, 30	Sodium Hydroxide	31	Vegetable Oil	27
Nitrocellulose Solvent	23	Solvatone Solvent	23	Vinegar	27
No Lead Gasolines	15	Spry Shortening	27		
		Standard Oil Shock		W	
O		Absorber Fluid	13	Wagner 21B Brake Fluid	13
1-Chlorodecane	32	Staufferjet II Oil	10	Water	28
Oil	26, 27	Steam	28, 29	Wemco C Transformer Oil	18
Orange Peel Oil	26	Stoddard Solvent	23	White Gasoline Vapors	14
Orange Syrup	27	Styrene Monomer	34		
Oronite Fluids	15, 16	Sulfur	34	X	
Ortho-Chloroethylbenzene	23	Sulfur Dioxide	34	XIAMETER® PMX-200 Silicone Fluid	23, 24
Ortho-Chlorotoluene	23	Sullur Hexafluoride	34	Xylene	23
Oxylene Solvent	23	Sulfuric Acid	30		
		Sun Oil No. 8 X2513-I L	20		
P		Sun 5W-3 Auto Engine Oil	11		
Pacemaker Fluid 100T	20	Sun 109 Transmission Fluid	12		
Pentachlorophenol	33	SUNOCO HD	11		
Perchloroethylene	23	Swan Finch EP90 Lubricant	13		
Phenol	33				
Phosphoric Acid	30	T			
Phthalic Acid Anhydride	33	Tab Concentrate	27		
Phthalic Anhydride	33	Tar	34		
Polyglycol	34	Tectyl 502C Rust Inhibitor	20		
Polystyrene	34	Tectyl 511-M Rust Inhibitor	20		
Potassium Hydroxide	30				

ASTM and IRM Oils, Fuels and Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
ASTM No. 1 Oil	VMQ PVMQ	3 days/25°C (77°F)	nil -5	- -	- -	nil 5
	MQ VMQ PVMQ	3 days/100°C (212°F)	-5 -5 -10	-5 -10 -10	-5 -5 -10	5 5 10
	MQ VMQ PVMQ	1 day/150°C (302°F)	-10 -5 -10	-10 -10 -15	5 -10 -10	5 10 10
	MQ VMQ PVMQ FVMQ	3 days/150°C (302°F)	-10 -10 -10 -5	-10 -5 -20 nil	nil -5 -15 -5	5 10 10 nil
	MQ VMQ PVMQ	7 days/150°C (302°F)	-10 -10 -10	-10 -10 -20	-10 -10 -10	10 10 10
	VMQ	30 days/150°C (302°F)	-10	-35	-25	10
	MQ VMQ PVMQ	3 days/177°C (350°F)	-10 -5 -15	-10 -10 -20	-10 -10 -10	5 10 10
	VMQ	7 days/177°C (350°F) 14 days/177°C (350°F)	-20 -20	-50 -50	-30 -30	10 10
ASTM No. 2 Oil	VMQ FVMQ	70 hr/150°C(302°F)	-6 nil	4 nil	-2 -14	1 1
	VMQ FVMQ	7 days/150°C (302°F)	-6 -2	8 1	nil -13	8 1
ASTM No. 3 Oil	MQ PVMQ	3 days/24°C (75°F)	-5 -10	- -	- -	15 25
	MQ PVMQ	3 days/100°C (212°F)	-10 -15	- -	- -	20 35
	PVMQ FVMQ	7 days/110°C(230°F)	-30 -5	-75 -5	-60 -5	60 5
	MQ VMQ PVMQ FVMQ	1 day/150°C (302°F)	-20 -15 -25 -5	-50 -35 -40 -10	-20 -20 -20 10	50 45 50 5
	MQ VMQ PVMQ PVMQ FVMQ	3 days/150°C (302°F)	-25 -20 -35 -25 -5	-50 -45 -50 - -25	-25 -25 -30 - -10	35 35 55 85 5
	VMQ FVMQ	7 days/150°C (302°F)	-25 -5	-45 -17	nil -15	40 5
	FVMQ	14 days/150°C (302°F) 21 days/150°C (302°F) 28 days/150°C (302°F)	-5 -10 -10	-25 -60 -85	5 5 -20	5 5 5

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

ASTM and IRM Oils, Fuels and Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
ASTM No. 3 Oil (cont.)	VMQ	4 hr/177°C (350°F)	-25	-35	-25	45
	MQ VMQ PVMQ FVMQ	3 days/177°C (350°F)	-35 -40 -40 -10	-85 -60 -65 -25	-25 -15 5 5	55 60 70 5
	VMQ FVMQ	7 days/177°C (350°F)	-50 -10	-80 -40	-30 5	70 5
	VMQ	3 days/200°C (392°F)	-15	-45	nil	5
	FVMQ	14 days/200°C (392°F)	-25	-40	-10	nil
IRM-902 Oil	VMQ PVMQ FVMQ	3 days/23°C (73°F)	-5 -8 -6	-12 -12 -7	-14 -12 -1	5 7 1
	VMQ PVMQ FVMQ	3 days at 150°C (302°F)	-6 -16 0	-7 -7 -7	-17 -21 -8	10 19 1
IRM-903 Oil	VMQ PVMQ FVMQ	3 days/23°C (73°F)	-12 -21 -4	-7 -31 -7	-11 -23 -3	18 33 1
	VMQ PVMQ FVMQ	3 days/150°C (302°F)	-26 -33 -2	-23 -68 -11	-28 -62 -15	40 84 2
	FVMQ (70 Durometer)	70 hours/150°C (302°F) 7 days/150°C (302°F)	-4 -3	-8 -9	4 6	2 2
ASTM Test Fluid 101 Di (2-Ethylhexyl) Sebacate +0.5% Phenothiazine Di (2-Ethylhexyl) Sebacate (Plexol-201)	FVMQ	7 days/135°C (275°F)	-4	-7	-11	5
	MQ VMQ	48 hr/150°C (302°F) 7 days/100°C (212°F)	-10 -15 -10	-25 - -	-25 - -	10 20 20
	FVMQ	4 days/232°C (450°F)	DT	DT	DT	DT
ASTM Reference Fuel A - Isooctane (also TTS-735 Type I)	VMQ PMQ PVMQ	5 min/-54°C (-65°F)	- - -	- - -	- - -	10 10 10
	VMQ PMQ PVMQ	10 min/-54°C (-65°F)	- - -	- - -	- - -	20 20 15
	VMQ PMQ PVMQ	30 min/-54°C (-65°F)	- - -	- - -	- - -	30 35 30
	VMQ PMQ PVMQ	5 min/24°C (75°F)	- - -	- - -	- - -	25 30 25
	VMQ PMQ PVMQ	10 min/24°C (75°F)	- - -	- - -	- - -	35 50 40
	VMQ PMQ PVMQ	30 min/24°C (75°F)	- - -	- - -	- - -	90 85 75
	FVMQ	7 days/24°C (75°F) 3 days/150°C (302°F)	-5 -20	-40 -60	-30 -30	15 25

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

ASTM and IRM Oils, Fuels and Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
ASTM Reference Fuel B (70% Isooctane, 30% Toluene by Volume) (also TTS-735 Type III)	FVMQ	1 day/-54°C (-65°F)	-5	-20	-20	10
		3 days/24°C (75°F)	-5	-55	-35	20
		7 days/24°C (75°F)	-5	-40	-30	20
14 days/24°C (75°F)		-10	nil	-30	15	
	VMQ FVMQ	3 days/65°C (150°F)	-5	-50	-40	215 15
	FVMQ	3 days/150°C (302°F) 3 days/232°C (450°F)	-20 DT	-60 DT	-35 DT	30 DT

MIL Specification Oils, Fuels and Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
ASTM Reference Fuel C (M0)	FVMQ (60 Durometer)	1 day/23°C (73°F)	-15	-25	-23	18
		1 week/23°C (73°F)	-14	-20	-19	19
		3 months/23°C (73°F)	-14	-23	-20	19
		1 year/23°C (73°F)	-13	-22	-18	19
		1 day/60°C (140°F)	-14	-30	-15	21
		1 week/60°C (140°F)	-14	-36	-32	21
		3 months/60°C (140°F)	-17	-37	-28	22
		6 months/60°C (140°F)	-14	-33	-35	21
85% ASTM Reference Fuel C 15% Methanol (M15)	FVMQ (60 Durometer)	1 day/23°C (73°F)	-24	-52	-29	26
		1 week/23°C (73°F)	-18	-56	-42	24
		3 months/23°C (73°F)	-18	-50	-38	25
		1 year/23°C (73°F)	-14	-53	-38	24
		1 day/60°C (140°F)	-21	-57	-41	29
		1 week/60°C (140°F)	-21	-64	-48	31
		3 months/60°C (140°F)	-24	-64	-45	31
75% ASTM Reference Fuel C 25% Methanol (M25)	FVMQ (60 Durometer)	1 day/23°C (73°F)	-19	-53	-43	26
		1 week/23°C (73°F)	-19	-54	-40	25
		3 months/23°C (73°F)	-18	-50	-39	25
		1 year/23°C (73°F)	-13	-51	-36	24
		1 day/60°C (140°F)	-20	-63	-51	32
		1 week/60°C (140°F)	-23	-62	-48	33
		3 months/60°C (140°F)	-26	-68	-48	33
		6 months/60°C (140°F)	-27	-64	-45	28
50% ASTM Reference Fuel C 50% Methanol (M50)	FVMQ (60 Durometer)	1 day/23°C (73°F)	-18	-52	-41	25
		1 week/23°C (73°F)	-18	-48	-37	24
		3 months/23°C (73°F)	-19	-49	-39	23
		1 year/23°C (73°F)	-17	-50	-33	22
		1 day/60°C (140°F)	-21	-60	-47	29
		1 week/60°C (140°F)	-22	-59	-46	30
		3 months/60°C (140°F)	-24	-64	-43	28
15% ASTM Reference Fuel C 85% Methanol (M85)	FVMQ (60 Durometer)	1 day/23°C (73°F)	-15	-36	-27	14
		1 week/23°C (73°F)	-14	-37	-19	13
		3 months/23°C (73°F)	-11	-32	-21	11
		1 year/23°C (73°F)	-11	-38	-20	11
		1 day/60°C (140°F)	-17	-38	-24	15
		1 week/60°C (140°F)	-18	-42	-20	14
		3 months/60°C (140°F)	-17	-49	-25	12
6 months/60°C (140°F)	-15	-50	-31	8		
60% ASTM Reference Fuel C 40% Methanol by Volume (M40)	FVMQ (75 Durometer)	24 hours/110°C (230°F)	-30	-66	-50	46

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

MIL Specification Oils, Fuels and Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %		
TTS-735 Type VII (30% Toluene, 10% Isooctane, 59% Cyclohexane, 1.0% n-Butyl Disulfide)	FVMQ	3 days/24°C (75°F)	-10	-40	-25	20		
		3 days/100°C (212°F)	-10	-40	-35	20		
MIL-H-5606 Oil (Exxon Univis J-43)	VMQ	14 days/24°C (75°F)	-	-	-	65		
	PVMQ		-	-	-	95		
	MQ PMQ FVMQ	1 day/71°C (160°F)	-20 -30 -5	-75 -65 -30	-60 -55 -10	160 120 5		
		FVMQ	3 days/71°C (160°F)	-10	-30	-15	5	
		VMQ PVMQ	14 days/71°C (160°F)	- -	- -	- -	80 110	
	FVMQ	19 days/121°C (250°F)	-10	-10	-15	5		
		3 days/150°C (302°F)	-10	-35	-10	10		
		3 days/177°C (350°F)	-20	-50	-10	10		
		7 days/177°C (350°F)	-20	-55	5	10		
	3 days/200°C (392°F)	-35	-85	15	15			
	MIL-H-5606 (American Oil PQ 4226)	FVMQ	70 hr/150°C (302°F)	-6	-8	-16	6	
	MIL-O-6085 Oil	FVMQ	14 days/177°C (350°F)	-20	-70	-15	10	
MIL-L-7808D Oil (Exxon Turbo Oil No. 15)	FVMQ	1 day/-54°C (-65°F)	-5	-15	nil	nil		
	MQ VMQ PMQ	3 days/24°C (75°F)	-5 -10 -10	-10 -10 -25	nil -5 -15	10 10 20		
		PVMQ	3 days/24°C (75°F)	-15	-10	-5	20	
			7 days/24°C (75°F)	-25	-55	-40	30	
	VMQ PMQ	3 days/71°C (160°F)	-15 -15	-10 -45	-10 -40	15 30		
		MQ VMQ PMQ PVMQ	7 days/71°C (160°F)	-10 -10 -20 -25	- - - -65	- - - -50	15 15 30 35	
	MQ VMQ PMQ		1 day/121°C (250°F)	-10 -10 -10	- - -	- - -	20 20 40	
			VMQ FVMQ	3 days/121°C (250°F)	-10 -5	-25 nil	-20 nil	20 5

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

MIL Specification Oils, Fuels and Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
MIL-L-7808D Oil (Exxon Turbo Oil No. 15)	MQ VMQ PMQ	1 day/150°C (302°F)	-10 -5 -10	- - -	- - -	15 10 20
	VMQ PVMQ FVMQ	3 days/150°C(302°F)	-15 -25 -5	-40 -45 -15	-10 5 nil	25 40 10
	MQ	1 hr/177°C (350°F)	-10	-	-	10
	FVMQ	1 day/177°C (350°F)	-10	-35	-10	10
	MQ VMQ PMQ PVMQ FVMQ	3 days/177°C (350°F)	-30 -35 -25 -35 -15	-65 - -50 -55 -40	-5 - -15 -15 -10	35 30 45 50 5
	FVMQ	7 days/177°C (350°F) 14 days/177°C (350°F) 1 day/200°C (392°F)	-20 DT -30	-60 DT -70	nil DT -15	10 DT 15
	VMQ FVMQ	3 days/200°C (392°F)	-35 -45	- -95	- -45	30 15
	MIL-L-7808E Oil (Brayco 880D)	VMQ FVMQ	70 hr/150°C (302°F)	-20 -5	-35 -80	-10 -60
VMQ FVMQ		70 hr/177°C (350°F)	-35 -5	-75 -95	-30 -90	25 -5
MIL-L-7808E, F, and G Oil (StaufferJet I)	VMQ FVMQ	70 hr/150°C (302°F)	-20 -10	-25 -25	-10 -25	25 10
	VMQ FVMQ	70 hr/177°C (350°F)	-35 -15	-65 -60	-10 -35	35 10
MIL-L-7808F Oil (Gulf Synthetic Lube No. 2)	FVMQ	70 hr/150°C (302°F)	-10	-30	-15	15
MIL-L-7808F Oil (Royco 808GF)	FVMQ	70 hr/150°C (302°F) 70 hr/177°C (350°F)	-10 -20	-45 -60	-15 -20	10 15
	FVMQ	70 hr/150°C (302°F)	-15	-30	-20	10
MIL-L-7808G (Amendment 2) PQ8365	VMQ FVMQ	70 hr/150°C (302°F)	-14 -8	-21 -9	-19 -24	25 8
	MIL-A-8243 Deicer Fluid	PVMQ	70 hr/71°C (160°F)	-5	-15	-10
MIL-L-23699 Oil (Mobil XRM-139A)	FVMQ	96 hr/177°C (350°F)	-15	-	-	10
StaufferJet II Oil	FVMQ	70 hr/177°C (350°F)	-8	-25	-21	12
	VMQ FVMQ	100 hr/177°C (350°F)	-9 -9	2 -19	42 -36	11 12
	VMQ FVMQ	300 hr/177°C (350°F)	-8 -15	-3 -73	50 -33	7 9

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

ASTM and MIL Specification Oils, Fuels and Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Mobil Jet II Oil	VMQ FVMQ	22 hr/25°C (77°F)	- -	- -	- -	4 3
	VMQ FVMQ	70 hr/150°C (302°F)	-10 nil	10 20	15 -35	10 10
	VMQ FVMQ	7 days/1500C(302°F)	-10 nil	10 5	25 -35	10 10
MIL-L-4600 Oil Bis (2-Ethylhexyl) Sebacate	PVMQ	3 days/25°C (77°F)	-14	-	-	28
		7 days/25°C (77°F)	-14	-	-	30
MIL-L-7808JJet Engine Oil	75% FVMQ 25% VMQ Blend.	22 hours/24°C (75°F)	-6	-28	-22	4

Automotive Oils and Fluids

Motor Oils

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
SAE No. 10 Oil (Sunoco HD)	FVMQ	3 days/150°C (302°F)	-5	-5	nil	nil
SAE No. 20 Oil (Mobil Oil)	MQ PMQ	1 day/100°C (212°F)	- -	- -	- -	10 20
	MQ PMQ	1 day/121°C (250°F)	- -	- -	- -	15 25
	MQ PMQ	1 day/150°C (302°F)	- -	- -	- -	15 25
10W-30 Motor Oil (Texaco)	FVMQ	15 days/177°C(350°F)	-4	-33	-8	2
		30 days/177°C (350°F)	1	-52	-58	1
	50/50 VMQ/FVMQ	15 days/177°C (350°F) 30 days/177°C (350°F)	-16 -9	-35 -76	10 -80	9 3
AMOCO Super Permalube 10W-30	VMQ	250 hr/150°C (302°F)	-18	-21	5	23
Sun 5W-30 SJ Auto Engine Oil	FVMQ (70 Durometer)	70 hours/150°C (302°F) 7 days/150°C (302°F)	-1 1	1 -3	0 -6	0 0
Mobil 5W-30 HP Engine Oil	75% FVMQ 25% VMQ Blend.	3 days/150°C (302°F)	-9	-21	-15	12
		7 days/150°C (302°F)	-9	-26	-22	12

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

Automotive Oils and Fluids (Cont.)

Automobile Transmission Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Dynaflow Automatic Transmission Fluid	MQ	70 hr/93°C (200°F)	-15	-	-	15
	VMQ		-15	-	-	25
	PMQ		-10	-	-	35
GM Hydramatic Fluid (Type A)	VMQ	3 days/150°C (302°F)	-35	-40	-5	35
	FVMQ		-5	-10	-5	5
Socony Mobil Transmission Fluid (Type A)	MQ	1 day/121°C (250°F)	-10	-	-	35
	PMQ		-10	-	-	40
	MQ	7 days/121°C(250°F)	-10	-	-	35
Sun 109 Transmission Fluid	VMQ	100 hr/177°C (350°F)	-25	-40	nil	30
Texamatic A Transmission Fluid (Texaco)	VMQ	70 hr/65°C (150°F)	-10	-	-	10
	VMQ	70 hr/150°C (302°F)	-20	-30	-10	25
	PVMQ		-30	-85	-65	65
	FVMQ		nil	-25	-15	nil
	VMQ	70 hr/177°C (350°F)	DT	DT	DT	DT
Texamatic C Transmission Fluid (Texaco)	MQ	1 day/121°C (250°F)	-10	-	-	35
	PMQ		-10	-	-	45
	MQ	7 days/121°C (250°F)	-20	-	-	40
	VMQ	70 hr/150°C (302°F)	-25	-60	-25	25
Texamatic TL 3528 Transmission Fluid (Texaco)	VMQ	70 hr/121°C (250°F)	-15	5	nil	25

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Automotive Oils and Fluids (Cont.)

Transmission and Differential Lubricants

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Hypoid EP Lubricant	FVMQ	14 days/149°C (300°F)	-20	nil	-10	nil
Mobilube GX-90 General Lubricant	VMQ FVMQ	3 days/149°C(300°F)	DT DT	DT DT	DT DT	DT DT
Swan Finch EP90 Lubricant	FVMQ	3 days/121°C (250°F) 3 days/150°C (302°F)	-10 DT	-70 DT	nil DT	-10 DT
TL 3450 Lubricant	VMQ	3 days/100°C (212°F)	-10	-	-	15
	VMQ FVMQ	3 days/121°C (250°F)	-10 -5	-60 -5	-45 -5	10 5
	VMQ FVMQ	3 days/150°C (302°F)	DT DT	DT DT	DT DT	DT DT

Shock Absorber Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Delco Shock Absorber Fluid	PMQ	3 days/71°C (160°F)	-	-	-	65
Standard Oil Shock Absorber Fluid	MQ VMQ	1 hr/150°C (302°F)	-15 -20	- -	- -	25 35
	MQ VMQ	1 hr/177°C (350°F)	-15 -20	- -	- -	30 45

Brake Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %	
Wagner 21B Brake Fluid	MQ VMQ PVMQ	7 days/24°C (75°F)	-5 0 -5	- - -	- - -	5 5 5	
	PVMQ FVMQ	3 days/150°C (302°F)	-5 DT	-90 DT	-85 DT	10 DT	
	MQ VMQ PVMQ	7 days/88°C(190°F)	-5 -5 -5	- - -	- - -	5 5 5	
	Delco Supreme 550 Heavy-Duty Brake Fluid	VMQ	70 hr/150°C (302°F)	-4	-25	nil	4

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Fuels

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %	
Diesel Fuel	MQ VMQ PVMQ	7 days/24°C (75°F)	-25 -25 -35	- - -	- - -	85 100 130	
	MQ VMQ PVMQ	7 days/54°C (130°F)	-25 -30 -40	- - -	- - -	90 105 140	
	Gasoline	VMQ PVMQ	5 min/24°C (75°F)	- -	- -	- -	25 20
		VMQ PVMQ	30 min/24°C (75°F)	- -	- -	- -	60 75
		MQ	18 hr/24°C (75°F)	-25	-	-	245
	Gasoline -Regular	FVMQ	24 hr/25°C (77°F)	-12	-39	-30	21
Gasoline -Low Lead	FVMQ	24 hr/25°C (77°F)	-12	-41	-30	20	
White Gasoline Vapors	PMQ	14 days/24°C (75°F)	-10	-	-	50	
	VMQ	7 days/24°C (75°F)	-20	-	-	165	
JP-4 Fuel (MIL-J-5624F)	FVMQ	1 day/-54°C (-65°F)	-5	-10	nil	nil	
	PVMQ	10 min/24°C (75°F)	-10	-	-	30	
	PVMQ FVMQ	1 day/24°C (75°F)	- -5	- -20	- -50	105 10	
	FVMQ	3 days/24°C (75°F)	-5	-35	-20	10	
	PVMQ FVMQ	7 days/24°C (75°F)	-25 -5	-75 -20	-60 -50	330 10	
	FVMQ	14 days/24°C (75°F) 21 days/24°C (75°F) 30 days/24°C (75°F)	-5 -5 -5	-20 -30 -30	-50 -55 -55	10 10 10	
		3 days/115°C (240°F) 15 days/121°C (250°F)	-5 -20	-55 -65	-40 -40	15 20	
		3 days/177°C (350°F) 3 days/200°C (392°F)	-25 -35	-65 -80	-20 -10	25 30	
		3 days/232°C (450°F)	-45	-90	-20	20	
	JP-5 Fuel (MIL-J-5624F)	FVMQ	7 days/24°C (75°F)	-5	-15	nil	5
JP-5 Fuel Jet Engine Oil	75% FVMQ 25% VMQ Blend.	22 hours/24°C (75°F)	-11	-45	-37	21	
JP-8 Fuel	FVMQ	1 day/24°C (75°F)	-9	-8	0	3.7	
		7 days/24°C (75°F)	-9	-13	-6	4.6	
JP-8Jet Engine Fuel	FVMQ (75 Durometer)	7 days/163°C (325°F)	-11	0	-8	12	
		28 days/163°C (325°F)	-18	-73	-38	14	
Manufactured Gas (24% Methane, 3% Ethane, 18% Carbon Monoxide, 55% Hydrogen)	FVMQ	2 mo/121°C (250°F)	GR	GR	GR	GR	

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

GR - good resistance

Fuels (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Gasohol 10%; Methanol/ 90%; No Lead Gasoline	FVMQ	1 day/24°C (75°F)	-19	-47	-35	27.5
		7 days/24°C (75°F)	-19	-19	-26	25.9
		14 days/24°C (75°F)	-20	-48	-26	26.6
		28 days/24°C (75°F)	-21	-50	-26	24.4
Gasohol 10%; Ethanol/90%;	FVMQ	1 day/24°C (75°F)	-18	-37	-19	21.5
		7 days/24°C (75°F)	-16	-37	-16	21.3
Unsymmetrical Dimethyl Hydrazine	VMQ	4 days/24°C (75°F)	nil	-25	-50	60
	FVMQ		DT	DT	DT	

Hydraulic Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Aerosafe 2300 (Stauffer)	VMQ	70 hr/25°C (77°F)	-12	-26	-17	21
	VMQ FVMQ	70 hr/70°C (158°F)	-15 -49	-36 -97	-5 -62	22 18
Exxon WS2406 Fluid	MQ VMQ PMQ	7 days/71°C (160°F)	-15 -10 -20	- - -	- - -	15 20 35
	MQ VMQ PMQ	1 day/121°C (250°F)	-5 -10 -5	- - -	- - -	20 35 45
	MQ VMQ PMQ	1 hr/177°C (350°F)	-10 -10 -15	- - -	- - -	15 20 30
	MQ VMQ PVMQ	70 hr/24°C (75°F)	-5 -5 -5	-15 nil -15	10 15 -10	5 5 5
	MQ PMQ	5 days/24°C (75°F)	-5 -10	- -	- -	5 10
	MQ PMQ	14 days/24°C (75°F)	-5 -10	- -	- -	10 15
Hydrolube H-2 Fluid	MQ PMQ	27 days/24°C (75°F)	-5 -10	- -	- -	10 15
	MQ PMQ	5 days/65°C (150°F)	-10 -10	- -	- -	10 20
	MQ PMQ	24 days/65°C (150°F)	-5 -10	- -	- -	15 20
	MQ VMQ PVMQ	7 days/70°C (158°F)	-10 -10 -5	-10 - -15	20 - -10	5 5 5
	VMQ FVMQ	7 days/100°C (212°F)	-19 -3	-57 nil	-62 -16	73 2
	VMQ FVMQ	7 days/150°C (302°F)	-24 nil	-70 -22	-63 -12	96 4
	VMQ FVMQ	7 days/177°C (350°F)	-35 -4	-86 -34	-77 -38	130 5

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Hydraulic Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Oronite 8200 Fluid (Chevron)	FVMQ	3 days/177°C(350°F)	-15	-10	-10	5
Oronite 8515 Fluid (Chevron)	FVMQ	1 day/-54°C (-65°F)	nil	5	5	nil
	MQ VMQ PVMQ	3 days/24°C (75°F)	-15 -20 -15	- - -	- - -	40 45 40
	MQ VMQ PVMQ	3 days/130°C (265°F)	-20 -30 -25	- - -	- - -	60 80 115
	FVMQ	3 days/150°C(302°F) 3 days/177°C (350°F) 3 days/200°C (392°F)	-5 -10 -45	-10 -40 -95	-10 -5 -40	5 10 15
	FVMQ VMQ	70 hr/70°C(158°F)	-25 -10	-79 -4	59 9	24 9
Pydraul 60 Fluid	VMQ PVMQ FVMQ	3 days/24°C (75°F)	-5 -10 -5	- - -	- - -	5 5 5
	VMQ PVMQ FVMQ	3 days/121°C (250°F)	-10 -25 -15	- - -	- - -	10 10 5
Pydraul A-200 Fluid	VMQ PVMQ FVMQ	3 days/24°C (75°F)	-5 -10 -5	- - -	- - -	5 5 nil
	VMQ PVMQ FVMQ	3 days/121°C (250°F)	-10 -10 -5	- - -	- - -	10 15 5
	VMQ PVMQ FVMQ	1 day/177°C (350°F)	-5 -10 -5	- - -	- - -	15 120 5
Pydraul F9 Fluid	MQ VMQ PMQ PVMQ	3 days/24°C (75°F)	-5 -5 -10 -10	-15 - - nil	nil - - 5	5 5 10 5
	MQ VMQ PMQ PVMQ FVMQ	3 days/150°C (302°F)	-5 -5 -10 -10 -5	-15 nil - nil -5	-5 10 - -5 5	10 10 15 15 5
	FVMQ	3 days/177°C (350°F)	-10	-60	-15	-10
	FVMQ	7 days/150°C (302°F)	DT	DT	DT	DT
Skydrol 500B (Monsanto)	VMQ PVMQ	70 hr/70°C (158°F)	-9 -15	-17 -24	3 -11	10 19
	VMQ PVMQ	70 hr/70°C (158°F)	-13 -24	-23 -50	-8 -32	20 40

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Hydraulic Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Skydrol LD (Monsanto)	VMQ	70 hr/70°C (158°F)	-16	-22	-3	26
	FVMQ		-37	-87	-71	108
Skydrol LD-4 (Monsanto)	FVMQ	1 day/24°C (75°F)	-24	-82	-68	68
		1 day/70°C (158°F)	-29	-85	-73	87
Skydrol 7000 Fluid (Monsanto)	MQ	3 days/24°C (75°F)	-5	-10	-5	5
	VMQ		nil	-5	-5	5
	PVMQ		-10	-10	-5	10
	MQ	14 days/24°C (75°F)	nil	-	-	5
	PMQ		-10	-	-	5
	MQ	3 days/93°C (200°F)	-5	-10	nil	5
VMQ	-5		-10	-10	5	
PVMQ	-10		-15	-10	10	

Transformer and Instrument Oils

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Askerol Transformer Oil (Monsanto) - Chlorinated	VMQ	35 days/24°C (75°F)	nil	-20	-15	10
		44 days/24°C (75°F)	-5	-10	-15	10
		60 days/24°C (75°F)	-5	-10	-15	10
		7 days/70°C (158°F)	-5	-10	-20	10
		14 days/70°C (158°F)	-5	-20	-20	15
		28 days/70°C (158°F)	-5	-15	-15	10
		38 days/70°C (158°F)	-5	-15	-15	15
		1 day/121°C (250°F)	-5	-15	-15	20
		3 days/121°C (250°F)	-5	-15	-15	20
		7 days/121°C (250°F)	-10	-15	-15	15
		14 days/121°C (250°F)	-5	-10	-15	20
Inerteen Transformer Oil (Westinghouse) - Chlorinated	MQ	3 days/24°C (75°F)	-5	-10	-5	10
	VMQ		-5	-10	-5	10
	PVMQ		-10	-15	-15	15
	MQ	3 days/115°C (240°F)	-10	-25	-5	15
	PVMQ		-10	-25	-10	15
	FVMQ		nil	-15	nil	5
VMQ	3 days/177°C (350°F)	-15	-25	-15	30	
N-43 Fluorocarbon Capacitor Fluid	VMQ	3 days/150°C (302°F)	-5	-	-	5
	PVMQ		nil	-	-	5
Pyranol Transformer Oil (General Electric) - Chlorinated	PMQ	7 days/100°C (212°F)	-10	-	-	25
RCA-Gulf Instrument Oil A	VMQ	3 days/93°C (200°F)	-20	-	-	70
	PVMQ		-30	-	-	5
Univolt 35 Transformer Oil	MQ	3 days/150°C (302°F)	-15	-25	-20	40
	VMQ		-15	-45	-45	50
	PVMQ		-30	-30	-15	55
	FVMQ		nil	-10	nil	5

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

Transformer and Instrument Oils (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Wemco C Transformer Oil	MQ	3 days/24°C (75°F)	-15	-	-	35
	VMQ		-20	-	40	
	PVMQ		-30	-	45	
	VMQ	1 yr/79°C (175°F)	-35	-	-	40
	VMQ FVMQ	3 days/177°C(350°F)	-55 -5	- -20	- 5	140 10
Coolanol 35 (Monsanto)	VMQ	3 days/121°C (250°F)	-21	-67	-68	101
	FVMQ		1	1	-10	3
Coolanol 45 (Monsanto)	FVMQ	70 hr/177°C(350°F)	-3	-12	-14	4

Speciality Oils, Greases and Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
ANG 15 Industrial Grease (Texaco Regal Starfak Special)	MQ	3 days/24°C (75°F)	-5	nil	nil	10
	VMQ		-10	nil	nil	10
	MQ VMQ		3 days/150°C (302°F)	-10 -15	nil nil	nil nil
ANG 25 Diester Base (Texaco TG-749)	VMQ	3 days/25°C (77°F)	-5	-	-	15
ANG 25 Diester Base (Texaco TG-749)	PMQ	3 days/93°C (200°F)	-15	-	-	30
		1 day/150°C (302°F)	-20	-	-	40
		7 days/ 150°C (302°F)	TB	TB	TB	TB
ANG 25 Glycerol Ester (Texaco)	PMQ	1 day/71°C (160°F)	-10	-	-	10
ANO No. 3 Grade M; Extreme Pressure (GAF Corp.)	MQ	3 days/177°C (350°F)	-	-	-	45
	PMQ		-	-	-	30
ANO No. 6 Oil (GAF Corp.)	MQ	1 day/24°C (75°F)	-10	-	-	30
	PMQ		-10	-	-	45
	MQ PMQ		7 days/24°C (75°F)	-15 -20	- -	- -
ANO No. 9 Oil (GAF Corp.)	MQ	1 day/121°C (250°F)	-10	-	-	35
	PMQ		-15	-	-	40
	MQ PMQ		3 days/121°C (250°F)	-15 -20	- -	- -
ANO No. 11 Oil (GAF Corp.)	MQ	7 days/121°C(250°F)	-15	-	-	45
	PMQ		-20	-	-	65
	MQ PMQ		1 day/121°C (250°F)	-5 -15	- -	- -
ANO No. 11 Oil (GAF Corp.)	MQ	3 days/121°C (250°F)	-10	-	-	15
	PMQ		-15	-	-	25
	MQ PMQ		7 days/121°C (250°F)	-10 -15	- -	- -
ANO No. 366 Oil (GAF Corp.)	MQ	3 days/93°C (200°F)	-20	-	-	95
	PMQ		-10	-	-	140

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

TB - too brittle to test

Speciality Oils, Greases and Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Aroclor 1254 (Monsanto)	VMQ	3 days/24°C (75°F)	-5	10	5	5
		3 days/150°C(302°F)	-10	-5	nil	10
Cosmoline 2046 (Fritzsche, Dodge & Olcott)	VMQ	4 days/24°C (75°F)	-35	-	-	55
Crude Oil 7 API	FVMQ	14 days/24°C (75°F)	-	-	-	5
	VMQ	3 days/83°C (180°F)	-10	-	-	25
	FVMQ	14 days/83°C (180°F) 14 days/135°C (275°F)	- -10	- -	- -	5 5
Crude Oil 315 API	VMQ	14 days/24°C (75°F) 3 days/83°C (180°F)	- -20	- -	- -	10 60
	FVMQ	14 days/83°C (180°F) 14 days/135°C (275°F)	- -5	- -70	- -45	5 -2
Delco No. 9	PVMQ	1 day/100°C (212°F)	-15	-15	15	10
	VMQ PVMQ	5 days/100°C (212°F)	-10 -15	- -	- -	10 10
Delco No. 11	MQ	5 days/100°C (212°F)	-5	-	-	5
	VMQ		-5	-	-	5
Dowtherm A Heat Transfer Oil (Dow)	VMQ	3 days/24°C (75°F)	-10	-	-	10
		3 days/177°C (350°F)	-30	-	-	40
FC-75 Fluorochemical Fluid (3M)	VMQ	1 day/24°C (75°F)	-5	-	-	nil
	PVMQ		-5	-	-	nil
	FVMQ	7 days/65°C (150°F)	5	-	-	nil
	VMQ		nil	-	-	5
	PVMQ		-5	-	-	5
	FVMQ		nil	-	-	5
Gas Drip Oil	VMQ	3 days/24°C (75°F)	-25	-	-	250
	PVMQ		-30	-	-	500
	FVMQ		-5	-	-	20
GE Transil Oil	VMQ	3 days/24°C (75°F)	-20	-	-	35
		3 days/93°C (200°F)	-30	-	-	50
GM 14X Heavy Duty Oil	VMQ	5 days/100°C (212°F)	-5	-	-	5
Mineral Oil	VMQ	3 days/24°C (75°F)	-10	-30	-10	25
	PVMQ		-15	-20	-10	35
Mineral Oil (Shell No. 5)	VMQ	3 days/121°C (250°F)	-20	-55	-35	60
	PVMQ		-35	-55	-20	75
	MQ	1 day/100°C (212°F)	-10	-	-	25
	PMQ		-5	-	-	40
MQ	1 day/121°C (250°F)	-15	-	-	25	
PMQ		-10	-	-	40	
MQ	1 day/149°C (300°F)	-15	-	-	30	
PMQ		-10	-	-	55	

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

Speciality Oils, Greases and Fluids (cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Navy Crankcase Oil No. 2135	VMQ	4 days/93°C (200°F)	-15	-	-	10
Navy Crankcase Oil No. 9250	VMQ	4 days/93°C (200°F)	-10	-	-	10
Pacemaker Fluid 100T	VMQ PVMQ	1 day/177°C (350°F)	-25 -35	- -	- -	50 60
	VMQ PVMQ FVMQ	3 days/177°C (350°F)	-30 -40 -5	- - -20	- - -10	55 65 5
PRL 3313 (Rohm and Haas)	MQ VMQ PMQ	1 day/71°C (160°F)	-15 -15 -20	- - -	- - -	15 15 30
	MQ PMQ	3 days/71°C (160°F)	DT DT	DT DT	DT DT	DT DT
	MQ VMQ PMQ	1 day/121°C (250°F)	DT -25 DT	DT - DT	DT - DT	DT 20 DT
SG 4766 Glycol Ester Base Grease (Standard Oil)	MQ PMQ	70 hr/24°C (75°F)	-10 -10	- -	- -	5 10
	MQ PMQ	3 days/24°C (75°F)	-10 -10	- -	- -	10 15
	PMQ	1 day/71°C (160°F) 3 days/71°C (160°F)	-10 -10	- -	- -	10 10
Shell Aircraft Turbine Lubricant A	FVMQ	70 hr/150°C (302°F) 140 hr/150°C(302°F)	-5 -11	-9 -24	-25 -32	8 10
Shell Aircraft Turbine Lubricant B	FVMQ	70 hr/150°C (302°F) 140 hr/150°C (302°F)	-3 -8	-26 -71	-50 -69	6 7
Shell B & B Grease	VMQ	70 hr/74°C (165°F) 912 hr/74°C (165°F)	-15 -16	-34 -9	-10 -20	26 26
	PMQ	70 hr/74°C (165°F) 912 hr/74°C (165°F)	-17 -19	-11 -15	-7 -13	30 30
Socony Mobil RL 147-A No. 7	PMQ	1 day/150°C (302°F)	-15	-	-	50
		6days/150°C (302°F)	-20	-	-	50
Sun Oil No. 8X2513-1 L	PMQ	1 day/150°C (302°F)	-25	-	-	70
		6days/150°C (302°F)	-45	-	-	55
Tectyl 502C Rust Inhibitor	MQ	14 days/24°C (75°F)	-5	5	5	nil
Tectyl 511-M Rust Inhibitor	MQ	14 days/24°C (75°F)	nil	5	-5	nil
Texas 1500 Oil (HD Concentrate)	MQ	10 days/150°C (302°F)	-15	-20	-20	10
		21 days/150°C (302°F)	-20	-30	-10	10

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Speciality Oils, Greases and Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Tricresyl Phosphate	MQ VMQ PVMQ	3 days/24°C (75°F)	nil nil nil	nil -5 -5	-5 5 -5	nil nil nil
	MQ VMQ PVMQ	3 days/177°C (350°F)	nil -5 nil	-40 -25 -45	-40 -10 -50	5 5 5
	VMQ	3 days/200°C (392°F)	DT	DT	DT	DT
Turbo Oil No. 35	PVMQ	7 days/24°C (75°F) 7 days/65°C (150°F)	-15 -20	-35 -35	-20 -25	15 15
	VMQ PMQ	3 days/71°C (160°F)	-10 -15	-10 -35	-15 -25	10 15
	VMQ PMQ	3 days/121°C (250°F)	-15 -15	-10 -35	-15 -20	10 15
	FVMQ	3 days/150°C (302°F)	-10	-30	25	10
Ucon Lubricant LB1145 (gear oil) (Union Carbide)	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
	MQ VMQ PMQ	3 days/150°C (302°F)	-5 -5 nil	- - -	- - -	nil nil nil
	MQ VMQ PMQ	3 days/150°C (302°F)	nil -5 nil	- - -	- - -	nil nil nil
Ucon Lubricant 50-HB-260 (Union Carbide)	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
	MQ VMQ	3 days/150°C (302°F)	-5 -5	- -	- -	nil nil
Ucon Lubricant 50-HB-660 (Union Carbide)	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
Ucon Lubricant 50-HB-5100 (Union Carbide)	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil
	MQ VMQ PMQ	3 days/150°C (302°F)	nil nil nil	- - -	- - -	nil nil nil

Solvents

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Acetone	MQ VMQ PVMQ FVMQ	7 days/24°C (75°F)	-10 -10 -10 -20	- - - -85	- - - -75	25 15 20 180
	VMQ FVMQ	14 days/24°C (75°F)	- -17	- -22	- -15	175 23
	FVMQ	3 days/70°C (158°F)	-10	-50	-40	20

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Solvents (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Butyl Acetate	VMQ	7 days/24°C (75°F)	-30	-	-	150
	PMQ		nil	-	-	150
	PVMQ		-25	-	-	125
Butyl Alcohol (Butanol)	MQ	7 days/24°C (75°F)	-10	-	-	20
	VMQ		-10	-	-	15
	PMQ		-15	-	-	40
	PVMQ		-10	-	-	35
	FVMQ		nil	-	-	10
Carbon Tetrachloride	VMQ	7 days/24°C (75°F)	-20	-	-	165
	PVMQ		-10	-	-	165
	FVMQ		-5	-45	-30	20
	FVMQ	5 days/49°C (120°F)	-10	-	-	20
Chlorobromomethane	FVMQ	7 days/24°C (75°F)	-10	-45	-50	25
	MQ	2 days/67°C (153°F)	-20	-	-	70
	VMQ		-20	-	-	95
PVMQ	-25		-	-	235	
Chloroform	FVMQ	5 days/24°C (75°F)	-10	nil	nil	30
Chloroethene Solvent (Dow)	FVMQ	1 day/24°C (75°F)	-15	-	-	50
	VMQ	7 days/24°C (75°F)	-	-	-	245
Cyclohexane	FVMQ	2 days/24°C (75°F)	-	-	-	15
	VMQ	7 days/24°C (75°F)	-	-	-	250
Diacetone Alcohol	VMQ	5 days/24°C (75°F)	-5	-	-	5
Dichloroisopropyl Ether	PMQ	7 days/24°C (75°F)	-	-	-	nil
Diethyl Ether	FVMQ	7 days/24°C (75°F)	-10	-40	-45	50
Ethyl Alcohol	MQ	7 days/24°C (75°F)	-5	-	-	nil
	VMQ		-5	-	-	5
	PVMQ		-10	-	-	20
	FVMQ		nil	-30	-15	5
Ethylenedichloride	FVMQ	3 days/24°C (75°F)	-10	-	-	50
	VMQ	7 days/24°C (75°F)	-	-	-	45
Heptane	FVMQ	7 days/60°C (140°F)	-10	-30	-30	25
Isopropyl Alcohol	PMQ	7 days/24°C (75°F)	-10	-	-	10
Methyl Alcohol	MQ	7 days/24°C (75°F)	nil	nil	nil	nil
Methyl Chloride	FVMQ	14 days/25°C (77°F)	-12	-34	-11	4
	MQ	7 days/24°C (75°F)	NR	NR	NR	NR
	PVMQ		-15	-	-	150
	FVMQ		-15	-	-	150
Methylene Chloride	VMQ	72 hr/25°C (77°F)	-	-	-	180
	FVMQ		-	-	-	70
Mineral Spirits	FVMQ	30 days/24°C (75°F)	nil	nil	nil	nil
Monochlorobenzene	FVMQ	7 days/24°C (75°F)	-5	-45	-40	25

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

NR - not recommended

Solvents (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Naphtha	FVMQ	3 days/24°C (75°F)	-	-	-	10
Nitrocellulose Solvent (Toluene, Ethyl Alcohol, Ethyl Acetate, Methyl ethyl ketone, Butyl Acetate)	VMQ	2 days/24°C (75°F)	-25	-	-	135
	PVMQ		-45	-	-	165
	FVMQ		-25	-	-	65
Ortho-Chloroethylbenzene	FVMQ	7 days/24°C (75°F)	-5	-55	-40	15
Ortho-Chlorotoluene	FVMQ	7 days/24°C (75°F)	-5	-45	-45	20
Oxylene Solvent	FVMQ	1 day/24°C (75°F)	-15	-	-	90
Perchloroethylene	FVMQ	3 days/24°C (75°F)	-10	-	-	10
	PMQ	14 days/24°C (75°F)	-10	-	-	45
	FVMQ	1 day/107°C (225°F)	-15	-	-	20
Propylenedichloride	FVMQ	5 days/49°C (120°F)	-10	-	-	55
Solvatone Solvent (Union Carbide)	VMQ	1 day/24°C (75°F)	-15	-	-	30
Stoddard Solvent	MQ	7 days/24°C (75°F)	NR	NR	NR	NR
	VMQ		-20	-	-	160
	PVMQ		-15	-	-	150
Toluene	MQ	7 days/24°C (75°F)	NR	NR	NR	NR
	VMQ		-	-	-	205
	PVMQ		-20	-	-	150
	FVMQ		-10	-50	-35	20
Toluene Vapor	PMQ	14 days/24°C (75°F)	-10	-	-	50
Turpentine	VMQ	16 hr/24°C (75°F)	-	-	-	230
	FVMQ		-	-	-	15
Xylene (Xylol)	VMQ	15 min/24°C (75°F)	-20	-	-	40
		30 min/24°C (75°F)	-25	-	-	45
		1 hr/24°C (75°F)	-30	-	-	60
		2 hr/24°C (75°F)	-30	-	-	80
		5 days/24°C (75°F)	-35	-	-	135
	FVMQ	3 days/24°C (75°F)	-10	-45	-35	20
		7 days/24°C (75°F)	-10	-55	-40	20

Silicone Fluids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
XIAMETER® PMX-200 Silicone Fluid, 0.65 centistokes	FVMQ	3 days/24°C (75°F)	-5	-45	-30	5
		1 day/100°C (212°F)	-5	-	-	15
		3 days/150°C (302°F)	-10	-60	-30	25
XIAMETER® PMX-200 Silicone Fluid, 3 centistokes	FVMQ	3 days/24°C (75°F)	nil	-15	-10	nil
		3 days/150°C (302°F)	-10	-30	-10	10
XIAMETER® PMX-200 Silicone Fluid, 10 centistokes	FVMQ (40 Durometer)	3 days/23°C (73°F)	-1	-5	3	0
		14 days/23°C (73°F)	-2	-9	0	0
		3 days/100°C (212°F)	-3	-4	3	1
		14 days/100°C (212°F)	-1	-6	0	1
XIAMETER® PMX-200 Silicone Fluid, 100 centistokes	FVMQ (40 Durometer)	3 days/23°C (73°F)	-3	3	7	0
		14 days/23°C (73°F)	-4	1	5	0
		3 days/100°C (212°F)	-4	6	10	0
		14 days/100°C (212°F)	-3	5	10	0

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

NR - not recommended

Silicone Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Change	Hardness Change points	Tensile Change %	Elongation Change %	Volume %	
XIAMETER® PMX-200 Silicone Fluid, 1000 centistokes	FVMQ (40 Durometer)	3 days/23°C (73°F)	-3	3	4	0	
		14 days /23°C (73°F)	-4	1	2	0	
		3 days/100°C (212°F)	-5	-2	0	1	
		14 days/100°C (212°F)	-2	0	5	0	
XIAMETER® PMX-200 Silicone Fluid, 60000 centistokes	VMQ PMQ FVMQ	1 day 24°C (75°F)	-5 -5 nil	-10 -10 -10	nil -10 nil	5 5 nil	
		PMQ FVMQ	3 days/24°C (75°F)	-5 nil	-15 -10	-5 -15	5 nil
			VMQ PMQ FVMQ	7 days/24°C (75°F)	-5 -10 nil	-10 -5 -5	nil -5 nil
	VMQ PMQ FVMQ	1 day 150°C (302°F)		-5 -10 -5	-15 -5 -15	-10 nil -5	15 10 nil
		VMQ PMQ FVMQ	3 days/150°C (302°F)	-10 -10 -5	-15 -15 -25	-10 -10 nil	15 10 nil
	VMQ PMQ FVMQ		7 days/150°C (302°F)	-10 -10 -5	-30 nil -25	-20 -25 -15	15 15 nil
		Dow Corning® 210 Fluid (other side of rubber exposed to air)	FVMQ	2 mo/121°C (250°F)	NE	NE	NE
Dow Corning® 210 H Fluid, 1000 centistokes	FVMQ	16 hr/260°C (500°F)	-	-	-	-3	
Dow Corning® 210 H Fluid, 6000 centistokes	75/25 VMQ/FVMQ 50/50 VMQ/FVMQ	70 hr/177°C (350°F)	-10	-16	-20	11	
		70 hr/177°C (350° F)	-10	-13	-21	8	
Dow Corning® 220 Fluid	FVMQ	2 days/150°C (302°F)	nil	-	-	10	
Dow Corning® 510 Fluid	MQ VMQ PVMQ	3 days/24°C (75°F)	-15 -15 -20	- - -	- - -	40 35 35	
		VMQ	1 day/150°C (302°F)	-20	-	-	35
		MQ VMQ PVMQ FVMQ	3 days/150°C (302°F)	-20 -25 -30 nil	- - - -10	- - - -15	40 45 50 nil
	MQ VMQ PVMQ		3 days/24°C (75°F)	-5 -5 -10	- - -	- - -	5 10 10
MQ VMQ PVMQ FVMQ		3 days/150°C (302°F)	-10 -10 -10 nil	- - - -3	- - - -15	10 10 10 nil	
		VMQ	7 days/150°C (302°F)	-	-	-	10

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

NE - no effect

Silicone Fluids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %	
Dow Corning® 702 Fluid	VMQ	1 day/150°C (302°F)	-25	-	-	60	
Dow Corning® 703 Fluid	VMQ	1 day/150°C (302°F)	-25	-	-	50	
Dow Corning® 710 Fluid	FVMQ	3 days/150°C (302°F)	nil	nil	-15	nil	
	VMQ	7 days/150°C (302°F)	-5	-	-	5	
		7 days/150°C (302°F) 7 days/200°C (392°F)	-10 -10	- -	- -	5 10	
Dow Corning® 710 Fluid	MQ VMQ PVMQ	3 days/24°C (75°F)	-5 -5 -5	- - -	- - -	nil 5 5	
	MQ VMQ PVMQ	3 days/150°C (302°F)	-10 -5 -10	- - -	- - -	5 5 10	
	FVMQ	14 days/200°C (392°F)	-20	-70	10	nil	
	Dow Corning® FS-1265 Fluid	VMQ	7 days/150°C (302°F)	nil	10	-5	nil
		FVMQ		-20	-55	-45	80
		PVMQ		-5	15	-10	5

Silicone Compounds and Greases

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %	
Dow Corning® 4 Compound	PMQ	1 day/24°C (75°F)	-5	-	-	5	
		3 days/24°C (75°F)	-5	-	-	10	
		7 days/24°C (75°F)	-5	-	-	20	
	MQ VMQ PMQ	1 day/150°C (302°F)		-20	-	-	25
				-15	-	-	25
				-5	-	-	15
	VMQ PMQ	3 days/150°C (302°F)		-	-	-	25
				-10	-	-	25
	VMQ PMQ	7 days/150°C (302°F)		-	-	-	30
				-10	-	-	30
PMQ	1 day/200°C (392°F) 3 days/200°C (392°F) 7 days/200°C (392°F)		-10	-	-	20	
			-20	-	-	30	
			-30	-	-	40	
Dow Corning® 5 Compound	MQ VMQ	1 day/150°C (302°F)	-20 -15	- -	- -	20 15	
	PMQ	1 day/150°C (302°F)	nil	-	-	10	
3 days/150°C (302°F)		nil	-	-	10		
1 day/200°C (392°F)		nil	-	-	10		
1 day/250°C (482°F)		-25	-	-	nil		
Dow Corning® 33 Grease	FVMQ	3 days/25°C (77°F)	-5	-	-	4	
		3 days/177°C (350°F)	-11	-	-	9	

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

Silicone Compounds and Greases (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Dow Corning® 44L Grease	VMQ	7 days 150°C (302°F)	-	-	-	15
Dow Corning® 55 Pneumatic Grease	PMQ	3 days/93 °C (200 °F) 3 days /250°C (482°F)	-15 DT	- DT	- DT	60 DT
	VMQ FVMQ	3 days/177°C (350°F) 3 days/25°C (77°F) 3 days/177°C (350°F)	DT -5 -11	DT - -	DT - -	DT 4 9
Dow Corning® Heat Sink Compound 304	VMQ	70 hr/150°C (302°F)	-9			11
Dow Corning® FS-1281 Compound	VMQ	7 days/70°C (158° F)	-5		-	5
	FVMQ		-10	-	-	10
Dow Corning® FS-1292 Grease	75/25 VMQ/FVMQ	70 hr/177°C(350°F)	-6	-11	-28	6
	50/50 VMQ/FVMQ	70 hr/177°C (350°F)	-17	1	-6	16

Food Products

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Beer	VMQ	22 hr/70°C (158°F)	nil			nil
	FVMQ		-5	-	-	nil
Butter (liquid)	VMQ	22 hr/70°C(158°F)	-5	-	-	nil
	FVMQ		-3	-	-	nil
Coca-Cola Syrup	VMQ	1 day/24°C (75°F)	nil	nil	nil	nil
	PVMQ		nil	10	15	nil
	FVMQ		5	nil	5	nil
	VMQ	28 days/24°C (75°F)	nil	-10	-10	nil
	PVMQ		nil	20	20	nil
	FVMQ		nil	nil	10	nil
Coffee	VMQ	7 days/83°C(180°F)	-5	-15	nil	nil
		14 days/83°C (180° F)	-5	-5	nil	5
Lard	VMQ (High Strength)	1 day/200°C (392°F)	nil	-35	-40	5
		3 days/200°C (392°F)	-5	-80	-75	5
		7 days/200°C (392°F)	BR	BR	BR	BR
	VMQ	7 days/200°C (392°F) 1 hr/260°C (500°F)	nil -10	-30 -25	-35 -20	nil 5
Mazola Oil	VMQ	7 days/150°C (302°F)	-5	-15	-10	nil
Orange Peel Oil	VMQ	1 day/24°C (75°F)	-	-	-	-100

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated
BR - brittle

Food Products (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %	
Orange Syrup	VMQ PVMQ FVMQ	1 day/24°C (75°F)	nil nil nil	nil 5 -15	5 10 5	nil nil 5	
	VMQ PVMQ FVMQ	28 days/24°C (75°F)	nil nil -5	-5 15 -15	-5 25 5	nil nil nil	
	VMQ PVMQ FVMQ	60 days/24°C (75°F)	nil nil -5	-5 nil -35	-10 5 -15	nil nil 5	
	Scotch Whisky	VMQ PVMQ FVMQ	1 day/24°C (75°F)	nil nil nil	nil nil -15	-5 5 3	nil nil 5
		VMQ PVMQ FVMQ	28 days/24°C (75°F)	nil nil -5	-5 5 -15	10 20 15	nil nil nil
		VMQ PVMQ FVMQ	60 days/24°C (75°F)	nil nil -5	-10 -10 -35	5 -5 -15	nil 5 3
Spry Shortening	VMQ	7 days/150°C (302°F)	-5	-15	-15	nil	
Tab Concentrate	VMQ PVMQ FVMQ	1 day/24°C (75°F)	nil nil nil	nil nil -5	5 3 3	nil nil nil	
	VMQ PVMQ FVMQ	28 days/24°C (75°F)	nil nil nil	5 5 nil	30 10 10	nil nil nil	
	VMQ PVMQ FVMQ	60 days/24°C (75°F)	nil nil nil	nil -5 -10	-10 -5 -5	nil nil nil	
Tia Maria Liquor	VMQ PVMQ FVMQ	1 day/24°C (75°F)	nil nil nil	nil 10 -10	5 10 3	nil nil nil	
	VMQ PVMQ FVMQ	28 days/24°C (75°F)	nil nil -5	nil 10 -15	10 10 20	nil nil nil	
	VMQ PVMQ FVMQ	60 days/24°C (75°F)	nil nil -5	-5 -5 -25	-5 nil -5	nil nil nil	
Vegetable Oil (Kraft)	VMQ (High Strength)	1 day/200°C (392°F) 3 days/200°C (392°F) 7 days/200°C (392°F)	-5 nil -5	-30 -40 -80	-25 -45 -75	5 5 5	
Vinegar	VMQ (High Strength)	1 day/24°C (75°F) 7 days/24°C (75°F)	nil nil	-5 -5	nil nil	nil nil	

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

Water and Steam

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Water	MQ VMQ PVMQ	7 days/24°C (75°F)	nil nil nil	-5 - -5	-5 - -10	5 nil nil
	MQ VMQ PVMQ	7 days/70°C (158°F)	-5 nil -5	-5 -5 -10	5 10 -5	5 nil nil
	VMQ PVMQ FVMQ	3 days/100°C (212°F)	-5 -3 nil	-5 -5 -	-15 -5 -	nil nil nil
	MQ VMQ	7 days/100°C (212°F)	-5 nil	-20 -	20 -	nil 5
	VMQ	14 days/100°C (212°F)	nil	-	-	5
	MQ	1 day/121°C (250°F) 3 days/121°C (250°F)	-5 -5	- -	- -	5 5
	FVMQ	70 hr/150°C (302°F)	-5	-	-	nil
	MQ	1 day/177°C (350°F) 3 days/177°C (350°F)	-15 DT	- DT	- DT	15 DT
Steam	MQ VMQ PVMQ	7 days/5 psi	-5 -5 -5	-25 -15 -10	5 5 10	nil 5 nil
	MQ VMQ PVMQ	14 days/5 psi	-5 -5 -5	-35 -30 -3	-10 -15 10	5 3 nil
	MQ VMQ PVMQ	7 days/10 psi	-5 -5 -5	-30 -30 -10	-10 -10 -10	5 5 nil
	MQ VMQ PVMQ	14 days/10 psi	-5 -5 -5	-35 -40 -10	-15 -20 -10	5 5 nil
	MQ VMQ PVMQ	7 days/20 psi	-5 -5 -3	-35 -35 -15	-15 -20 -15	5 3 nil
	MQ VMQ PVMQ	14 days/20 psi	-5 -5 -5	-45 -45 -20	-20 -40 -15	5 5 nil
	VMQ	1 day/50 psi 3 days/50 psi 5 days/50 psi 7 days/50 psi	-5 -5 -5 -5	-25 -30 -40 -65	-10 -5 -25 -30	5 5 5 5

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Water and Steam (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Steam	VMQ	1 day/65 psi	-10	-30	-30	5
		3 days/65 psi	-5	-50	-25	5
		7 days/65 psi	-10	-65	-50	5
		1 day/80 psi	-10	-40	-10	5
		3 days/80 psi	-10	-60	-40	10
		7 days/80 psi	-10	-75	-45	5
	MQ	16 hr/100psi	-10	-30	25	nil
	MQ VMQ* PVMQ FVMQ	1 day/100 psi	-10 3 -5 -5	-40 -11 -25 -20	-10 -2 5 15	5 -2 nil nil
	MQ VMQ PVMQ	3 days/100 psi	-10 4 -10	-60 -25 -35	-20 -10 -5	10 -4 nil
	MQ VMQ PVMQ	7 days/100 psi	-20 6 -20	-30 -35 -75	-25 -26 -75	5 -6 nil

Acids

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Acetic Acid (5%)	VMQ	7 days/24°C (75°F)	-5	-	-	5
Acetic Acid, glacial	MQ VMQ PVMQ	7 days/24°C (75°F)	-5 -5 -5	- - -	- - -	nil 5 5
	FVMQ	2 days/24°C (75°F)	-	-	-	20
Hydrochloric Acid (5% in Perchloroethylene)	VMQ FVMQ	1 day/100°C (212°F)	-30 -15	- -	- -	100 10
	MQ VMQ PVMQ FVMQ	7 days/24°C (75°F)	nil -5 nil -5	- - - -25	- - - -15	nil nil nil nil
Hydrochloric Acid (18%)	FVMQ	3 days/24°C (75°F) 3 days/65°C (150°F)	nil nil	-20 -35	-10 -10	nil 10
Hydrochloric Acid (36%, concentrated)	MQ VMQ PVMQ FVMQ	7 days/24°C (75°F)	PR -5 BR -5	PR - BR -45	PR - BR -30	PR 5 BR 10
Hydrofluoric Acid (48%)	PMQ	9 days/27°C (80°F)	DT	DT	DT	DT
Nitric Acid (10%)	MQ	7 days/24°C (75°F)	nil	-	-	10
	VMQ		nil	-	-	nil
	PVMQ		nil	-	-	nil
	FVMQ		nil	-10	-3	nil

* Data based on *Silastic*[®] NCP-80 and NCP-40 Silicone Rubber.

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated
PR - poor

BR - brittle

Acids (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Nitric Acid (50%)	FVMQ	3 days/24°C (75°F) 3 days/65°C (150°F)	5	-15	-10	5
			-10	-80	-30	5
Nitric Acid (70%, concentrated)	MQ VMQ PVMQ FVMQ	7 days/24°C (75°F)	PR	PR	PR	PR
			5	-	-	-10
			BR	BR	BR	BR
			nil	-40	-30	5
Phosphoric Acid (10%)	MQ PMQ	7 days/24°C (75°F)	UA	UA	UA	UA
			UA	UA	UA	UA
	MQ PMQ	7 days/100°C (212°F)	UA	UA	UA	UA
			UA	UA	UA	UA
Phosphoric Acid (85%, concentrated)	MQ PMQ	7 days/24°C (75°F)	UA	UA	UA	UA
			UA	UA	UA	UA
	VMQ FMQ	7 days/100°C (212°F)	UA	-39	nil	-23
			4	-8	-9	-2
Stearic Acid	MQ PMQ	7 days/100°C (212°F)	UA	UA	UA	UA
			UA	UA	UA	UA
Sulfuric Acid (20%)	MQ	1 day/83°C (180°F) 7 days/83°C (180°F)	nil	-10	-5	-5
			nil	-25	-15	-10
Sulfuric Acid (30%)	PVMQ	2 hr/93°C (200°F)	nil	-20	-5	nil
Sulfuric Acid (50%)	FVMQ	3 days/24°C (75°F) 3 days/65°C (150°F)	nil	-5	-5	nil
			5	-35	-15	nil
Sulfuric Acid (95%, concentrated)	MQ VMQ FVMQ PVMQ	7 days/24°C (75°F)	DC	DC	DC	DC
			DC	DC	DC	DC
			DC	DC	DC	DC
			DC	DC	DC	DC

Bases

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Ammonium Hydroxide (saturated)	MQ VMQ PMQ PVMQ FVMQ	7 days/24°C (75°F)	-5	-	-	nil
			nil	-	-	nil
			UA	UA	UA	UA
			nil	-	-	0
			-5	-45	-5	5
Calcium Oxide (10%, saturated)	VMQ	1 day/150°C (302°F)	5	-15	-10	5
Lithium Hydroxide (2%)	VMQ	1 day/150°C (302°F)	nil	-25	-10	-5
Lithium Hydroxide (5%)	VMQ	1 day/150°C (302°F)	-10	-70	nil	-35
Lithium Hydroxide (10%, saturated)	VMQ	1 day/150°C (302°F)	DT	DT	DT	DT
Potassium Hydroxide (10%)	VMQ	1 day/150°C (302°F)	5	-20	-15	-5
Potassium Hydroxide (25%)	MQ PMQ	7 days/83°C (180°F)	nil	-	-	5
			-5	-	-	nil
Potassium Hydroxide (saturated)	VMQ	1 day/150°C (302°F)	-20	-40	-10	-10

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated
BR - brittle

PR - poor
UA - unaffected
DC - decomposed

Bases (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Sodium Hydroxide (10%)	MQ	7 days/24°C (75°F)	-5	-	-	nil
	VMQ		-5	-	-	nil
	PMQ		-	-	-	5
	PVMQ		-5	-	-	nil
	FVMQ		-5	-45	-10	nil
Sodium Hydroxide (25%)	MQ	7 days/83°C (180°F)	-5	-	-	nil
	PMQ		-5	-	-	-10
Sodium Hydroxide (50%)	VMQ	7 days/24°C (75°F)	-5	-	-	nil
	PMQ		-	-	-	10
	FVMQ		-5	-10	5	nil
	PMQ	7 days/100°C (212°F)	-	-	-	15

Salts

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Copper Sulfate (50%)	PMQ	5 days/100°C (212°F)	UA	UA	UA	UA
Ferric Chloride (60%)	MQ	7 days/100°C (212°F)	UA	UA	UA	UA
	PMQ		FR	FR	FR	FR
Sodium Carbonate (2%)	MQ	7 days/24°C (75°F)	nil	-	-	nil
	VMQ		-5	-	-	nil
	PVMQ		5	-	-	nil
Sodium Chloride (10%)	MQ	7 days/24°C (75°F)	nil	-	-	nil
	VMQ		nil	-	-	nil
	PVMQ		5	-	-	nil

Other Chemicals

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Acetonitrile	VMQ	20 hr/24°C(75°F)	-	-	-	nil
	FVMQ		-	-	-	5
	VMQ	168hr/150°C (302°F)	-	-	-	5
	FVMQ		DI	DI	DI	DI
Ammonia	MQ	7 days/24°C (75°F)	nil	-	-	nil
	VMQ		-10	-	-	nil
	PVMQ		-5	-	-	5
	VMQ	24hr/110°C(230°F) 300 lb. pressure	-	260	200	-
	FVMQ		DT	DT	DT	DT
Aniline	FVMQ	7 days/24°C (75°F)	nil	-30	-15	5
Bromine (liquid)	MQ	7 days/24°C (75°F)	25	-	-	15
Butylene Oxide	MQ	1 day/24°C (75°F)	-	-	-	20
	PMQ		-	-	-	40
Calcium Silicate (10% saturated)	VMQ	1 day/150°C (302°F)	nil	nil	nil	5
Caprolactam Monomer	VMQ	3 days/24°C (75°F)	nil	-20	-10	nil
	FVMQ		-5	-20	nil	nil

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated
UA - unaffected

FR - fair
DI - disintegrated

Other Chemicals (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %	
1-Chlorodecane	FVMQ	7 days/24°C (75°F)	-5	-20	-20	10	
Dimethyl Formamide	FVMQ	1 day 24°C (75°F)	DT	DT	DT	DT	
	MQ PMQ	7 days/24°C (75°F)	nil nil	- -	- -	2 2	
Diocetyl Phthalale	VMQ	3 days/70°C (158°F) 6days/70°C (158°F) 70 hr/150°C (302°F)	-1 -5 -15	-10 -16 -4	-12 -9 8	10 11 13	
	FVMQ	70 hr/150°C (302°F)	-9	-13	-13	7	
Dowtherm 209 (Dow) (50/50 Water)	VMQ	14 days/100°C (212°F)	2	-7	-17	nil	
Elhylene Glycol	FVMQ	7 days/24°C (75°F)	nil	-10	-10	nil	
Elhylene Glycol (60%)	MQ	7 days/135°C (275°F)	-25	-	-	20	
Ethylene Glycol (50%)	VMQ FVMQ	7 days/83°C (180°F)	nil nil	nil -5	10 5	nil nil	
	VMQ	70 hr/100°C (212°F) 7 days/100°C (212°F) 14 days/100°C (212°F)	-1 -7 -4	-4 -5 -10	nil 2 -12	1 nil 1	
	PVMQ	7 days/121 °C (250°F)	-5	-	-	5	
Ethylene Glycol Mixture ($\frac{1}{3}$ Ethylene Glycol; $\frac{1}{3}$ EthylAlcohol: $\frac{1}{3}$ Water)	VMQ	7 days/100°C (212°F)	-1	-2	2	5	
Ethylene Oxide	MQ	3 days/24°C (75°F)	-	-	-	25	
	FVMQ	7 days/24°C (75°F)	-15	-75	-60	100	
	VMQ	7 days/71°C (160°F)	-30	-70	-65	95	
	MQ	14 days/71°C (160°F)	-	-	-	45	
	PVMQ	32hr/110°C (230°F)	nil	-25	-30	nil	
Freon 11 (DuPont)	VMQ PVMQ FVMQ	3 days/24°C (75°F)	- - -	- - -	- - -	175 260 30	
	Freon 12 (DuPont)	VMQ PVMQ FVMQ	3 days/24°C (75°F)	- - -	- - -	- - -	150 195 45
		Freon 21 (DuPont)	MQ	7 days/-55°C (-67°F) 7 days/24°C (75°F)	-5 -15	- -	- -
Freon 22 (DuPont)			MQ FVMQ MQ VMQ	7 days/-55°C (-67°F) 3 days/24°C (75°F) 7 days/24°C (75°F)	-10 - -5 -5	- - - -	- - - -

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated

Other Chemicals (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Freon 113 (DuPont)	MQ	7 days/-55°C (-67°F)	-5	-	-	200
		7 days/24°C (75°F)	-5	-	-	150
Freon 114 (DuPont)	VMQ	3 days/24°C (75°F)	-	-	-	130
	PVMQ		-	-	-	135
	FVMQ		-	-	-	25
HMS 20-1083	VMQ	3 days/24°C (75°F)	-20	-	-	125
	PVMQ		-15	-	-	100
Hydrazine (Anhydrous)	FVMQ	3 days/24°C (75°F)	ES	ES	ES	ES
Hydrogen Peroxide (3%)	PMQ	7 days/24°C (75°F)	UA	UA	UA	UA
Hydrogen Peroxide (30%)	PMQ	7 days/24°C (75°F)	UA	UA	UA	UA
Hydrogen Peroxide HTP (90%)	FVMQ	7 days/65°C (150°F)	nil	-20	-15	5
Isopropyl Nitrate	FVMQ	7 days/24°C (75°F)	-	-	-	200
Methyl Methacrylate	VMQ	4 hr/25°C (77°F)	-	-	-	106
	FVMQ		-	-	-	104
Molybdenum Disulfide	VMQ	3 days/24°C (75°F)	nil	-	-	nil
	PVMQ		nil	-	-	nil
	FVMQ		nil	-	-	nil
	VMQ	3 days/150°C (302°F)	nil	-	-	nil
PVMQ	nil		-	-	nil	
FVMQ	5		-	-	nil	
Monoethanolamine	VMQ	70 hr/24°C (75°F)	nil	-20	5	nil
		70 hr/38°C (100°F)	-5	-25	5	5
	VMQ	70 hr/121°C (250°F)	-25	-80	-5	5
	FVMQ		DT	DT	DT	DT
Pentachlorophenol (10% in Ethanol)	PMQ	7 days/24°C (75°F)	-	-	-	5
Phenol (70%)	MQ	7 days/100°C (212°F)	-30	-	-	5
Phenol (85%)	MQ	7 days/24°C (75°F)	-10	-	-	10
Phthalic Acid Anhydride	MQ	7 days/149°C (300°F)	5	-	-	nil
Phthalic Anhydride	MQ	1 day/200°C (392°F)	nil	-	-	nil
	VMQ		nil	-	-	nil
	FVMQ		nil	-	-	nil
	MQ	5 days/200°C (392°F)	-2	-	-	nil
	VMQ		nil	-	-	nil
	FVMQ		-2	-	-	7
	MQ	7 days 200°C (392°F)	-2	-	-	2
	VMQ		nil	-	-	nil
	FVMQ		2	-	-	7

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated
UA - unaffected

ES - excessive swell

Other Chemicals (Cont.)

Immersion Medium	ASTM Designation	Immersion Conditions	Hardness Change points	Tensile Change %	Elongation Change %	Volume Change %
Polyglycol (Dow 80-6)	VMQ PVMQ	7 days/24°C (75°F)	-5 -5	- -	- -	5 5
	MQ VMQ	7 days/ 121°C (250°F)	-5 -10	- -	- -	5 5
Polystyrene (expandable)	VMQ	7 days/24°C (75°F)	nil	5	10	nil
Propylene Oxide	MQ	7 days/24°C (75°F)	-20	-	-	150
RX-1099 (Vinyl Plastisol)	VMQ	7 days/24°C (75°F)	-5	-	-	10
	FVMQ		-5	-	-	5
Salicylanilide (10% in 2 B Ethanol)	PMQ	7 days/24°C (75°F)	-	-	-	5
Santicizer 141 (Monsanto)	VMQ	70 hr/150°C (302°F)	DT	DT	DT	DT
	PVMQ		DT	DT	DT	
	FVMQ		DT	DT	DT	
Styrene Monomer	PVMQ	1 hr/24°C (75°F)	-10	-	-	55
		1 hr/100°C (212°F)	-20	-	-	115
Sulfur (molten)	PMQ	7 days/121°C (250°F)	UC	UC	UC	UC
	VMQ	4 days/199°C (390°F)	-22	DT	DT	DT
Sulfur Dioxide (dry gas)	MQ	7 days/24°C (75°F)	nil	-	-	nil
	VMQ		-5	-	-	nil
	PVMQ		nil	-	-	nil
Sulfur Dioxide (liquid)	MQ	7 days/24°C (75°F)	nil	-	-	5
Sulfur Hexafluoride	VMQ FVMQ	1 day/150°C (302°F)	nil nil	- -	- -	nil nil
	VMQ FVMQ	2 days/199°C (390°F)	nil 5	- -	- -	nil nil
	VMQ FVMQ	3 days/199°C (390°F)	nil 5	- -	- -	nil nil
Tar	PMQ	7 days/100°C (212°F)	nil	-	-	10
Tetrahydrofuran (Tetramethylene Oxide)	VMQ	1 day/25°C (77°F)	-	-	-	260
	FVMQ		-	-	-	170
Trichloroethylene	FVMQ	1 day/24°C (75°F)	-10	-	-	25
	MQ	7 days/24°C (75°F)	-	-	-	250
	FVMQ	5 days/49°C (120°F)	-10	-	-	20
Trifluorochloroethylene	MQ	7 days/-58°C (-65 °F)	-20	-	-	100

MQ - methyl groups only
V - vinyl groups

P - phenyl groups
F - fluorine-containing groups

DT - deteriorated
UC - unchanged

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