Technical Data Sheet

DOWSIL™ MS-4002 Moldable Silicone

FEATURES & BENEFITS

- High light transmittance
- Low light attenuation coefficient
- Two-part 1:1 mixing ratio
- Lighter than glass
- Medium viscosity for injection molding
- Excellent surface features replication
- Smooth surface feeling
- Better heat and UV resistance than optical grades plastics
- Less yellowing than plastics
- UL rated

COMPOSITION

- Polydimethylsiloxane

DOWSIL™ MS-4002 Moldable Silicone is a medium viscosity, high Shore A hardness, two-part, 1:1 ratio, fast heat curing optical molding resin for producing optical parts with good resistance to environmental aging.

APPLICATIONS

- Injection molding for secondary optics, lenses clusters, light pipes, light guides and free forms collimators.

TYPICAL PROPERTIES

Specification Writers: These values are not intended for use in preparing specifications.

Property	Unit	Result
Mixing ratio (Two-part)	w/w	1:1
Viscosity (Part A)	cP Pa-sec	50,000 50
Viscosity (Part B)	cP Pa-sec	21,000 21
Viscosity (Mixed)	cP Pa-sec	25,000 25
Working Time at 25°C - (Pot Life - hours)	hr	48
Specific Gravity	g/cc	1.08
Durometer	Shore A	84
Tensile Strength	psi MPa	1700 11.7
Elongation at break	%	60
Linear CTE (by TMA)	ppm/°C	250
Transmittance at 380 nm, 10 mm	%	89
Transmittance at 450 nm, 10 mm	%	92
Transmittance at 760 nm, 10 mm	%	93
Refractive Index at 633 nm	-	1.42
Abbe number	n/a	52

DESCRIPTION

DOWSIL™ optical molding materials are designed to meet the challenging needs of the optical market; high purity, moisture resistance, thermal stability and optical transmittance. Injection moldable optical silicone materials are two-part, heat-cure silicone resins that are especially suitable for precision molding applications, as micrometer-sized features can be replicated on the lens surface to direct light output.

Silicone optical molding materials can be molded into complex shapes, withstand heat and resist yellowing better than plastic, and are lighter than glass. Parts have been fabricated using a variety of techniques, including injection molding, casting or cavity molding.

MIXING AND DE-AIRING

DOWSIL™ silicone 1:1 optical molding materials are supplied in two-parts that do not require lot matching. The 1:1 mix ratio, by weight or volume, simplifies the proportioning process. To ensure best properties, Parts A and B must each be thoroughly mixed. Inadequate mixing may result in incomplete cure or reduced physical properties. Automated meter, mix and dispense equipment may be utilized. In applications or molds that are sensitive to air entrapment, de-airing or vacuum application in the mold may be helpful.

PROCESSING/CURING

These products are compatible with commercially available equipment and industry standard processes. These materials can be pumped, meter mixed and molded similarly to Liquid Silicone Rubber (LSR). Mix at a 1:1 ratio. They are lower in viscosity than traditional LSR materials, but they are not shear thinning as LSRs. This allows for reduced pressure in the pumping and mixing areas but similar performance in the injection unit compared to LSRs. In the mold the heat does thin the material dramatically allowing for good flow and reproduction in the mold cavity. DOWSIL™ OS fluids, or alternatively, RPM Technology PolyGone® 505 silicone emulsifier, or IBS Special Cleaning Agent Securol are recommended to clean cured or uncured silicone residue from injection molding equipment.

In order to reach the ultimate physical properties indicated in the table above, it is recommended to post cure the molded parts at 150°C for 1–2 hours in an air circulating oven depending on the thickness of the part.

TYPICAL PROPERTIES (continued)

Property	Unit	Result
Specific Heat at 25°C	Btu/lb*°F	0.33
	J/g°C	1.39
	cal/gm°C	0.33
Specific Heat at 50°C	Btu/lb*°F	0.35
	J/g°C	1.48
	cal/gm°C	0.35
Dielectric Strength	volts/mil	711.2
	kV/mm	28
Volume Resistivity	Ohm.cm	$1.0\ 10^{14}$

POT LIFE AND CURE RATE

Cure reaction begins with the mixing process. Initially, cure is evidenced by a gradual increase in viscosity, followed by gelation and conversion to a solid elastoplastic material. Pot life is defined as the time required for viscosity to double after Parts A and B (base and curing agent) are mixed and is highly temperature dependent. Please refer to the data table. The cure time depends on the thickness and the cure temperature used.

USEFUL OPERATING TEMPERATURE RANGES

For most uses, silicone elastomers should be operational over a temperature range of -40 to 150°C (-40 to 302°F) for long periods of time. However, at both the low- and high-temperature ends of the spectrum, behavior of the materials and performance in particular applications can become more complex and require additional considerations and should be adequately tested for the particular end use environment. Factors that may influence performance are configuration and stress sensitivity of components, cooling rates and hold times, and prior temperature history. At the high-temperature end, the durability of the cured silicone elastomer is time and temperature dependent. As expected, the higher the temperature, the shorter the time the material will remain useable.

COMPATIBILITY

Certain materials, chemicals, curing agents and plasticizers can inhibit the cure of addition cure silicone materials. Most notable of these include: organotin and other organometallic compounds, silicone rubber containing organotin catalyst, sulfur, polysulfides, polysulfones or other sulfur containing materials, unsaturated hydrocarbon plasticizers, and some solder flux residues. If a substrate or material is questionable with respect to potentially causing inhibition of cure, it is recommended that a small scale compatibility test

be run to ascertain suitability in a given application. The presence of liquid or uncured product at the interface between the questionable substrate and the cured material indicates incompatibility and inhibition of cure. Presence of contaminants that can leach out in liquid parts A and B of Moldable Silicone may also come from standard EPDM sealing rings or hoses used in standard equipment, which may therefore cause yellowing discoloration of molded parts afterwards. These contaminants are strong chromophores, such as, e.g., diphenylamine, anthracene, pyrene, dibutylphtalate, bis (2-ethylhexyl) phthalate). It is therefore recommended to use lined hoses in polyester or PTFE, and sealing rings made of compatible silicone rubber for dosing and injection molding of DOWSIL™ moldable silicone.

HANDLING PRECAUTIONS

PRODUCT SAFETY PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE SAFETY DATA SHEET IS AVAILABLE ON THE DOW WEBSITE AT WWW.CONSUMER.DOW.COM, OR FROM YOUR DOW SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CUSTOMER SERVICE.

USABLE LIFE AND STORAGE

Refer to product label for storage temperature conditions. Containers should be kept tightly closed and kept at room temperature at all times to extend shelf life. Shelf life is indicated by the “Use By” date found on the product label.

LIMITATIONS

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

HEALTH AND ENVIRONMENTAL INFORMATION

To support customers in their product safety needs, Dow has an extensive Product Stewardship organization and a team of product safety and regulatory compliance specialists available in each area.

For further information, please see our website, www.consumer.dow.com or consult your local Dow representative.

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