



## SILASTIC™ MS-1002 Moldable Silicone

SILASTIC™ MS-1002 Moldable Silicone is a medium viscosity, high Shore A hardness, two-part, 1 to 1 ratio, fast curing optical molding resin for producing fine detail with good resistance to environmental aging.

### Features & Benefits

- Two-part 1:1 mixing ratio
- Lighter than glass
- High luminous transmittance
- Low chromatic dispersion
- Low haze and scatter
- Better heat and intrinsic UV resistance than optical grade plastics
- Less yellowing than plastics
- Low pressure liquid injection molding
- Excellent surface feature replication
- Easily molded into complex shapes optics
- Medium hardness
- Designed for collimator and TIR lenses of reasonable light path length
- UL 94, UL 746A, UL 746C(f1)(f8), AMECA

### Composition

- Polydimethylsiloxane

### Applications

- Injection or compression molding for primary or secondary lenses, light pipes, light guides and other optic devices

### 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	39,900
	Pa-sec	40
Viscosity (Part B)	cP	17,900
	Pa-sec	17.9
Viscosity (Mixed)	cP	26,250
	Pa-sec	26.2
Durometer	Shore A	72

## Typical Properties (Cont.)

Property	Unit	Result	
Tensile	Psi	1625	
	MPa	11.2	
Specific Gravity	g/cc	1.07	
Elongation	%	80	
Refractive Index (nD, 589.3 nm)		1.413	
Luminous transmittance at <sup>1</sup> : 10 mm	%	90	
	25 mm	%	84
	50 mm	%	75
	100 mm	%	59
Abbe Number	a.i.	52	
Working Time at 25°C (Pot Life - Hours)	hr	48	
Cure/Demold Times at 140°C			
2 x 12 x 125 mm	sec	< 16	
6 x 12 x 125 mm	sec	< 60	
Linear CTE (by TMA)	ppm/°C	275	
Specific Heat at 25°C	Btu/lb*°F	0.327	
	J/g°C	1.37	
	cal/gm°C	0.327	
Specific Heat at 50°C	Btu/lb*°F	0.337	
	J/g°C	1.41	
	cal/gm°C	0.337	
Dielectric Strength	volts/mil	475	
	kV/mm	19	

1. Weighted total transmittance between 360 and 780 nm according to CIE Colorimetry 15:2004.

## Description

Dow 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 from Dow 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, transfer molding, and others.

## Mixing and De-airing

Dow silicone 1 to 1 optical molding materials are supplied in two parts that do not require lot matching. The 1 to 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 and 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.

## **Mixing and De-airing (Cont.)**

In liquid injection molding operations where changeover from a standard general purposes LSR to a moldable optical silicone may be done frequently, it is highly recommended to dedicate a separate dosing and mixing system, e.g., pumps, valves, hoses and static mixer for the moldable optical silicones series.

## **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. Mix at 1 to 1 ratio. They are lower in viscosity than traditional LSR materials but they are not shear thinning as the LSR's are. This allows for reduced pressure in the pumping and mixing areas but similar performance in the injection unit compared to LSR's. In the mold the heat does thin the material dramatically allowing for good flow and reproduction in the mold cavity. Dow OS fluids are recommended to clean cured or uncured silicone residue from application 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.

## **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 Temperature Ranges**

For most uses, silicone elastomers should be operational over a temperature range of -45 to 150°C (-49 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. For low-temperature performance, thermal cycling to conditions such as -55°C (-67°F) may be possible, but performance should be verified for your parts or assemblies. 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 chemicals issued from materials in contact with the liquid mixture of parts A and B can inhibit the curing reaction of addition cure silicone elastomers. Most notable of these include chemicals such as 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 each 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.

## **Compatibility (Cont.)**

Beyond possible problems of curing inhibition described above, particular attention needs to be paid in selecting dosing pump hoses and O-rings that will not leach out chemicals susceptible to cause optical silicone discoloration—for liquids parts A and B separately or mixed as well as cured parts after injection molding processing. A non-exhaustive list of chemicals that we have identified from experience causing major discoloration of silicone optics is as follows.

- Diphenylamine
- Anthracene
- Pyrene
- Squalene
- Dibutylphthalate
- Bis(2-ethylhexyl)phthalate
- 2-ethylhexyl benzoate (benzoic acid, 2-ethyl hexyl ester),
- Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester
- Phthalate (1,3-benzendicarboxylic acid, bis(2-ethylhexyl) ester)
- Butyl stearate (octadecanoic acid, butyl ester)
- Dimethacrylate ester (typical residue from acrylic adhesives)
- Caprolactam (typical residue from crosslinker used in PU adhesives)

At the injection molding equipment level, these chemicals have been found leaching out from standard EPDM rubber hoses and O-rings. It is therefore recommended to use lined hoses made of polyester or PTFE and sealing rings made of compatible silicone rubber for dosing and injection molding of Dow moldable optical silicones.

At the installation level of the cured silicone optics into the LED lighting fixtures, these chemicals have been found in acrylic or polyurethane adhesives used in proximity of the LED and/or the silicone optics. It is therefore recommended to use silicone sealant or adhesives compatible with LED light sources and silicone optics.

## **Handling Precautions**

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 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, [dow.com](http://dow.com) or consult your local Dow representative.

## **Disposal Considerations**

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

## **Product Stewardship**

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## **Customer Notice**

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

## **How Can We Help You Today?**

Tell us about your performance, design, and manufacturing challenges. Let us put our silicon-based materials expertise, application knowledge, and processing experience to work for you.

**For more information** about our materials and capabilities, visit **dow.com**.

To discuss how we could work together to meet your specific needs, go to **dow.com** for a contact close to your location. Dow has customer service teams, science and technology centers, application support teams, sales offices, and manufacturing sites around the globe.

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