

1. Definition and Characteristics

Silicone oils of SILOKSAN DM series are liquid molecular mixtures of linear siloxane macromolecule with blocked ends of the polymer chain. The chemical composition of silicone oils of SILOKSAN DM series is made of a, w - bis - trimethylsiloxy - polydimethylsiloxanes of varying average molecular weight ($M_n = 4000-125000$), which can be represented by the formula:

$$x = 50-1700.$$

Owing to a specific organic-inorganic structure, silicone oils of SILOKSAN DM series have a unique set of characteristics, and the most important ones are:

- high thermal, chemical, oxidative and radiation stability of the structure over a wide temperature range,
- minimum variability of the physical characteristics depending on temperature (viscosity, density, compressibility, electrical and thermal properties, etc.)
- excellent dielectric properties,
- hydrophobicity and incompatibility with organic compounds,
- low surface tension,
- low vapour pressure,
- good resistance to fire and
- non-toxicity and physiological inertness

2. Product Range

The assortment of silicone oils of SILOKSAN DM-Series covers a wide range of viscosity: average (100-1000 mm² /s) and high (5000 - 60000 mm² /s). The standard range includes the following silicone oils:

SILOKSAN	DM	100	*
SILOKSAN		DM	200
SILOKSAN		DM	300
SILOKSAN		DM	500
SILOKSAN		DM	1000
SILOKSAN		DM	5000
SILOKSAN	DM	10	000
SILOKSAN	DM	60	000

* The characteristic number contained in the commercial name of the product, specifies nominal viscosity (actual viscosity $\pm 10\%$, mm² /s at 20 ° C).

3. Areas of Application

Because of a unique combination of physicochemical properties, silicone oils of SILOKSAN DM series are used in a wide variety of products and processes, and the most important are:

- hydraulic, compressor, brake and damping fluids: control, measurement and regulation instruments of all kinds, "liquid springs", clutches, etc..
- thermal fluids for temperature range from - 50 to 200 ° C: heating units, bathrooms, thermostats, lyophilizers
- release and sliding agents: processing of rubber, plastics, elastomers, casting industry, gas welding and arc welding, insulating and cooling equipment: electrical engineering and electronics (transformer, capacitor and switching device oils)

- foam-preventive and foam-destroying agents (defoamers), especially in non-aqueous media (rectification of oil, natural gas production, the production of styrene-butadiene, rubber)
- surfactants: for plastisols - improve their rheological properties, deaerate and lubricate the surface of finished products
- lubricating fluids: plastics, synthetic textile fibres, a variety of metal-plastics systems (photocopiers, magnetic tapes, movie cameras, toys)
- additives for cosmetic and dermatological preparations: an essential component of hand creams, sunscreens lotions, protective creams, hair sprays, etc.
- additives for paints and varnishes: used against separation of pigments, roughness and "orange peel" and "Hammerschlag"-additive
- additives for polishing and cleaning products for the automotive cosmetics and for polishes for floor coverings, furniture, shoes, windows, etc.
- hydrophobization of glass and ceramics: neon tubes (bulbs), high voltage insulators, medical containers (bottles, ampoules) and syringes, surgical instruments
- plasticizing agent for RTV silicone elastomers.

4. Solubility

Silicone oils of SILOKSAN DM series are soluble in chlorinated and fluorinated hydrocarbons (for example chloroform, perchlorethylene, carbon tetrachloride, trichlorethylene, ethylene chloride, chlorobenzene, chlorofluorocarbons), toluene, xylene, benzene, butyl acetate, amyl acetate, methyl ethyl ketone, a white spirit, turpentine, etc. Silicone oils of SILOKSAN DM series are insoluble in cyclohexanone, dimethyl phthalate, ethylene glycol, propylene glycol, methanol, dodecanol, paraffin oil and water.

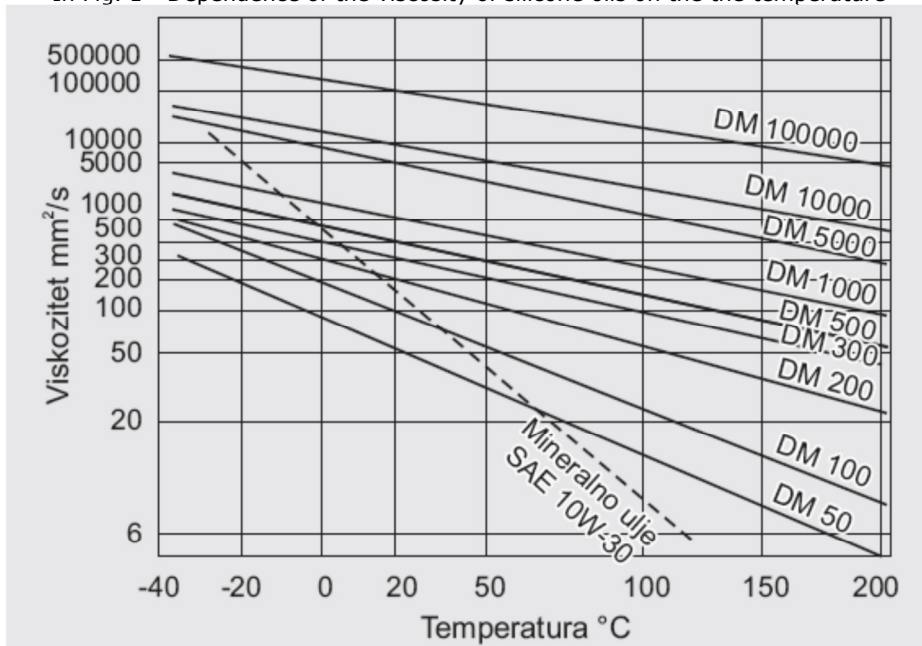
5. The thermal and oxidative stability

Silicone oils of SILOKSAN DM series with a viscosity above 100 mm² /s are very resistant to oxidation in air at temperatures up to 150° C. At temperatures above 200° C in the presence of air, a change in viscosity (gelling) and the development of formaldehyde and formic acid occur. In the absence of air or in an inert atmosphere, these oils are stable at temperatures up to 200° C. Under these conditions, they can be heated briefly to 350° C. Many metals, organic and organometallic compounds have catalytic or inhibitory effect on the processes that affect oxidation and thermal stability of silicone oils.

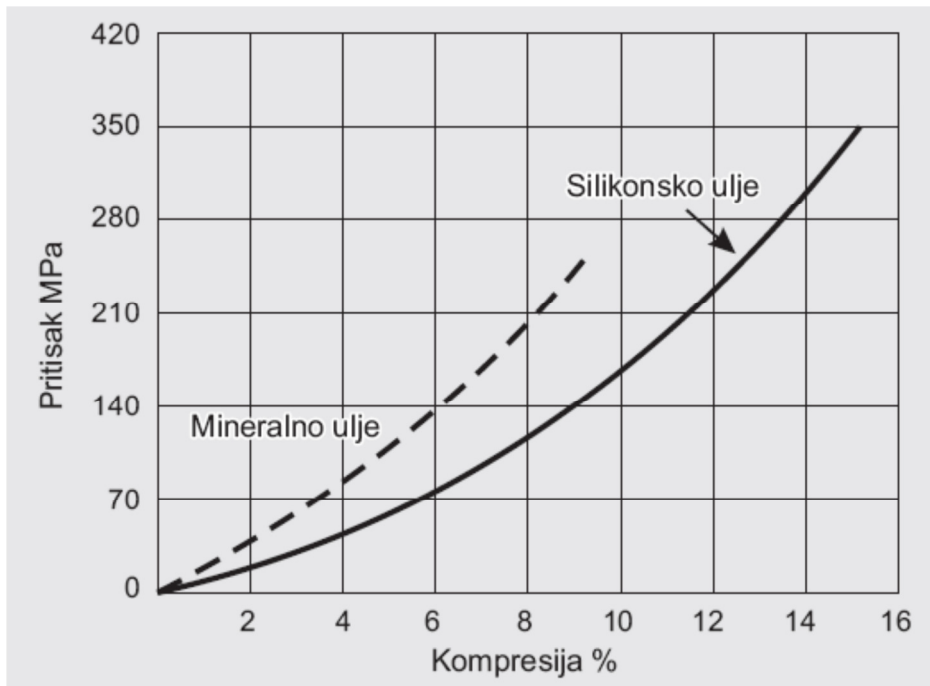
6. Viscosity and compressibility

One of the most important qualities of oils, for engineering practice, is the behaviour of viscosity as a function of temperature. Compared with mineral oils, silicone oils of SILOKSAN DM series, manifest a very small change in viscosity as a function of temperature. Silicone oils SILOKSAN DM series are characterized by high compressibility and stability at high pressures. When compressed, their viscosity is increased considerably, but in contrast to mineral oils, silicone oils solidify at much higher pressures.

In Fig. 1 - Dependence of the viscosity of silicone oils on the the temperature



In Fig. 2 - Dependence of the degree of compression of silicone oils on the pressure



7. Lubricating properties

Silicone oils of SILOKSAN DM series have good lubricating properties, although the area of their use as lubricants is specific. They represent an excellent lubricant for plastic – plastic combination, as well as a good lubricant for steel - bronze, steel-babbitt, steel – nylon combinations, especially suitable for slow linear movement and high temperatures. Due to the low loading capacity, silicone oils of SILOKSAN DM series are not recommended for the steel-steel combination and other metal-metal combinations, especially in rotation. Their viscosity is little dependent on shear rate.

8. Mixability

Silicone oils of SILOKSAN DM series can be mixed in any proportions. In principle, use of the oils with standard viscosity is more appropriate. As a rule, the oils with non-standard viscosity are obtained by mixing the oils with similar viscosities (in accordance with the attached nomogram, Figure 4). The rheological characteristics of the oil obtained by blending oils with viscosities that differ greatly, are different from the rheological characteristics of the original oils. This is due to "expansion" of the molecular weight distribution. Standard silicone oils are characterized by a symmetric unimodal distribution curve with a polydispersity index = 2.

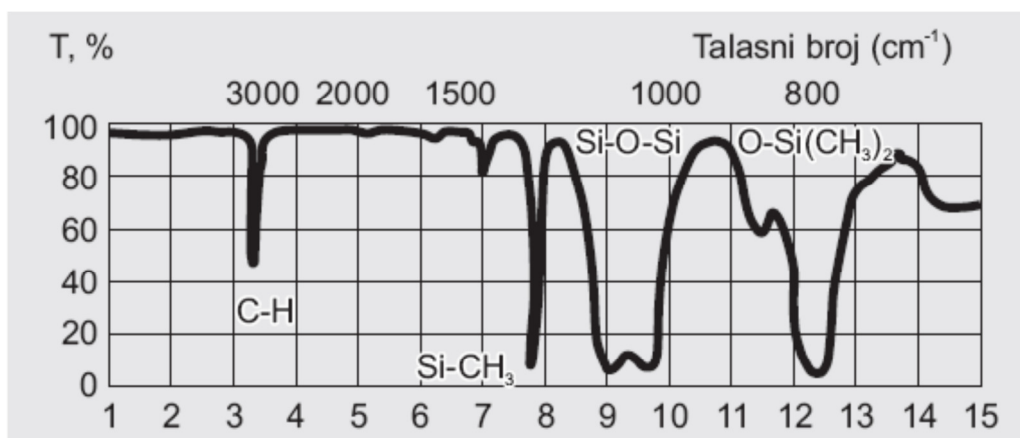
9. Chemical properties

Silicone oils of SILOKSAN DM series are chemically inert substances; they have no effect on metals (iron, copper, aluminium, tin, chromium, nickel, etc.), are resistant to weak acids and alkalis. They decompose under the influence of strong acids (sulphuric, nitric acid), corrosive gases (chlorine, fluorine) and hot concentrated alkali. Hydrofluoric acid completely decomposes them by splitting of siloxane bonds.

10. Physical and chemical characteristics

Silicone oils of SILOKSAN DM series are colourless, odourless and tasteless fluids of varying consistencies (thin - thick). Silicone oils of SILOKSAN DM series (except SILOKSAN DM-B) have the following characteristics:

IR spectrum, Fig. 3



• kinematic viscosity at 20° C mm²/S	10 – 60000
• density at 20° C	965± 15 kg/m ³
• index of refraction at 20° C	1,405 ± 3
• content of volatile substances at 200°C / 2h	max. 1%
• neutralization number max, mg KOH /g	0.02
• viscosity ratio V50/V100	2,1 ± 0,3
• viscosity index VTK = 1-V99/V38	0.6
• ignition temperature ° C	280-320
• auto-ignition temperature ° C	450
• pour point ° C	-50
• heat of combustion kJ / kg	25 500
• specific heat capacity at 20° C, J/ kg/K	1500
• coefficient of thermal conductivity at 50°C, W/m/K	0.16
• cubic expansion coefficient at 20°C, m³/ m³/K	1x10 ⁻³
• adiabatic compressibility factor at 30°C, m²/N	1x10 ⁻⁹
• surface tension at 20°C, mN /m	22
• vapour pressure at 200° C	1,33
• dielectric constant at 800Hz	2.7
• dielectric strength at 20° C, kV/cm	200
• dielectric loss factor at 800Hz	2x10 ⁻⁴
• bulk electrical resistivity at 20°C, ohmxcm	1x10 ¹³

11. Physiological effects

According to present knowledge, silicone oils of SILOKSAN DM series do not have any harmful effects. Because of their neutrality, as well as their hydrophobicity, these oils are very suitable for use in cosmetics and pharmaceuticals. Eye contact may cause mild temporary irritation.

12. Packaging and storage

Silicone oils SILOKSAN DM are supplied in PE-canisters with a net weight of 5, 10, 20, 25 and 50 kg or PE-drums with a net weight of 220 kg.

When stored in the original containers, silicone oils of SILOKSAN DM series have an indefinite shelf life under any conditions.

Silicone oils of SILOKSAN DM series do not require special storage conditions during transport.