SILICONES and more

Silicones and their resistance in practice.

Silicone is a **versatile** material known for its **good resistance to heat and certain chemicals**, but it's also important to know that it can't withstand everything. The specific properties of silicone can vary depending on the exact mixture of substances from which they are made.

Chemical resistance

Acids and bases: Silicones generally have **good resistance** to dilute acids and bases, but can be damaged by strong, concentrated versions56. Experiments have shown that silicones offer **high resistance** to dilute hydrochloric acid (2 mol/L), but concentrated hydrochloric acid (10 mol/L) attacks some silicones. Silicones are also resistant to diluted caustic soda (2 mol/L), but concentrated caustic soda (50%) can affect some silicones.

Organic substances: Silicones are **strong** against animal and vegetable oils, aliphatic, aromatic and oxygenated fuels. However, they do not tolerate ketones, paint solvents and certain esters and ethers. Tests have shown that silicone can swell in gasoline. Acetone has a less potent effect.

Solvents: In general, silicones are **resistant to** many solvents, but they can have problems with halogenated hydrocarbons. Another source suggests that silicones have a serious effect when exposed to acetone and a number of other hydrocarbons.

Other substances: Silicone is **highly resistant** to ammonia, silicone oil and many refrigerants1. They also tolerate many types of alcohol. A detailed list of chemicals and their compatibility with silicone is available, ranging from excellent to strong....

Physically active substances: Substances that do not react directly with silicone but can cause it to swell, such as hydrocarbons, can impair the properties of silicone. The resistance depends on the polarity and the degree of cross-linking.

Temperature resistance

High temperatures: Silicone is very heat-resistant **with a temperature range of about 200 °C to 230 °C**. Some special silicones can even withstand up to 300°C. Above 200 °C, however, the material can begin to decompose. The addition of special substances allows silicone to withstand heat better.

Silicone oils also decompose when heated for a long time. When in contact with air, CO, CO2, formaldehyde, etc. can form. In the absence of air (i.e. in closed chambers), cyclic silicones can form (especially D3 and D4).

Low temperatures: Silicone remains flexible at low temperatures down to approximately -60 °C [-85 °F].

Decomposition: At high temperatures and with oxygen, silicone can become harder. Without oxygen, hydrolysis can occur, in which the silicone chains break down, which in turn leads to softer material. To reduce this degradation, special substances can be added, especially if they are used without air.

Other features

Strength: Silicones have a certain hardness (0 to 80 Shore A), tensile strength (200 to 1500 PSI), and can stretch between 100% and 480%. Their tear resistance is **moderate to good**, as is their flexibility, impact resistance and resilience. Vibrations are well absorbed and gas can penetrate reasonably well.

The frictional resistance of silicone is often much lower than that of other elastomers.

Environment: Silicones have **excellent resistance** to ozone, oxidation, sunlight, weathering, and water. They also have a low odor and can be made in many colors.

Additives: Various substances can be added to make silicone better. Thus, the **ELASTOSIL® AUX stabilizer H** can increase the heat resistance to 300 °C. **ELASTOSIL® Color Paste FL** can improve the heat resistance of certain silicones. Special silicones, such as **ELASTOSIL® R 756** and **ELASTOSIL® R plus 4450**, are better suited for high temperatures....

Surface treatment: For special purposes, silicone cables can be coated with substances such as Teflon, so they **can withstand almost all chemicals**.

Table of Everyday Chemicals and Silicone Resistance:

Chemical	**Resistance Silicone**
Acetone	**Bad**, causes serious effects.
Alcohol (ethyl, isopropyl)	**Good to Excellent**
Ammonia	**Good to excellent**, especially diluted.
Petrol	**Bad,** causes significant swelling.
Bleach	**Moderate to good**, depending on concentration.
Fuels (aliphatic)	**Excellent**
Fuels (aromatic)	**Good to excellent**.
Diesel	**Bad**, serious effects.

Household cleaning products	**Good to excellent** in dilution.
Hydraulic oil	**Good**.
Ketones	**Bad**, serious effects.
Coolant	**Good**.
Paint solvents	**Bad**, serious effects.
Mineral oil	**Good to excellent**.
Caustic soda (diluted)	**Excellent**.
Sodium hydroxide solution (concentrated)	**Good**, but can affect some silicones.
Olive oil	**Bad.**
Silicone oil	**Excellent**.
Hydrochloric acid (diluted)	**Excellent**.
Hydrochloric acid (concentrated)	**Moderate to poor**, may attack some silicones
Sunflower oil	**Excellent**

Note: This table is a general guideline. The specific resistance of silicone can vary depending on the specific composition, the concentration of chemicals, the temperature and the duration of exposure.

So, in general, silicones are versatile and have a **good balance between** chemical and thermal resistance, but they also have limitations that depend on the specific conditions. This information is intended to serve as a starting point. We recommend that you test whether silicone is sufficient for your process and do not accept any liability for any results.