



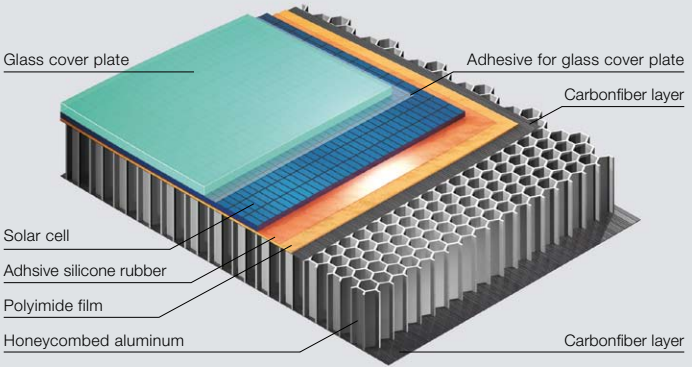
WACKER

SILICONES

ELASTOSIL®

SILICONE RUBBER
ADHESIVES FOR OUTER SPACE

CREATING TOMORROW'S SOLUTIONS



ELASTOSIL[®] S – DEVELOPED ON EARTH FOR USE IN OUTER SPACE

RESISTANT TO RADIATION AND HEAT, WITH LOW OUTGASSING RATE

Comprising specialty, RTV-2 silicone elastomers for use in satellite construction and space flight, the ELASTOSIL® S product line enters a new dimension of reliability in outer space.

All silicone rubber grades in this line were put through their paces in close collaboration with major aerospace companies. In this way, we ensure that our products always comply even with very stringent ESA/NASA standards regarding material properties, processing and durability.

For Outer-Space Applications

- Bonding solar cells to their support structure
- Bonding cover glass to solar cells
- Ensuring components stay in place
- Prevention of electrostatic charging via ablative bonding/ connection to grounding
- Encapsulation of electronic components for their protection and insulation

Limitless Benefits

- Versatile applications thanks to low-temperature flexibility and high-temperature resistance
- High radiation resistance
- Extremely low volatiles content
- Undershoots ESA PSS-014-702 specification limits regarding the outgassing rate
- Platinum-catalyzed curing without shrinking or the formation of by-products

FASCINATING PROPERTIES

Materials used in satellite construction must permanently withstand vacuum, ionizing radiation and extreme temperature fluctuations. Thanks to its fascinating properties, you'll be truly impressed by ELASTOSIL® S.

For Maximum Demands

Our products boast high radiation resistance and retain their full elasticity until glass transition. Their application range extends from approx. -110 °C to +250 °C. Silicones can reliably compensate for materials' varied expansion properties. This is because if considerable and rapid temperature changes produce thermomechanical stress within the rubber, silicones can dissipate this stress and keep it away from the interfaces. This permits reliable functionality over a long service life.

Tested to NASA/ESA Standards

Due to its platinum-catalyzed cross-linking mechanism, ELASTOSIL® S releases absolutely no EH&S-relevant by-products during curing. Silicones cure without shrinking and are unaffected by factors such as relative humidity or diffusion rates. The raw materials undergo special treatment to ensure a low volatiles content at all times. As a result, our products are well below ASTM E 595 specification limits and their NASA/ESA counterparts, such as ESA PSS-014-702. In this respect, of course, we test every production batch in an accredited lab.

IMPRESSIVE PRODUCTS

Primer G 790

Low-viscosity (17%) solution in hydrocarbons; it contains reactive silanes and silicone resins. Once the solvent evaporates, a resin film forms on contact with atmospheric moisture. Anchoring to the substrate, this film forms the bond with the subsequently applied RTV-2 silicone rubber. Together with RTV-S 691, it is approved for adhesion enhancement.

ELASTOSIL® S 690

Transparent, low-modulus adhesive, which – despite needing to be radiation-permeable – must itself not be damaged by radiation. The product is used to bond the cover glass of sensitive GaAs solar cells. This glass protects the cells against particles, dust and any accompanying physical damage. If these transparent layers turn yellow, their efficiency could be greatly impaired. Thanks to its pronounced shear thinning rheology, ELASTOSIL® S 690 can be applied readily without running out of the coater gap during application. Additionally, the product is ideal for encapsulating components or securing them in place.

RTV-S 691

A free-flowing, two-part, addition-curing silicone rubber with a particularly low volatiles content and hence a minimal outgassing rate as per ECSS-Q-70-02A (formerly ESA PSS-01-701) specifications. It is therefore ideal for bonding solar cells in solar generators. Listed according to ECSS-Q70-71A rev1 (2004).

ELASTOSIL® S 692

This electrically ablative product was developed mainly to dissipate electrostatic charging. Ion and electron currents may cause surfaces to become electrostatically charged, which could damage them. With its lower volume resistivity, ELASTOSIL® S 692 can help dissipate this charging. What's more, ELASTOSIL® S 692 is suitable for grounding assemblies. Because of its jet-black pigmentation, the product can also be used to bond optical equipment without outgassing or light penetration.

Please refer to our product data sheets for further details.

LAUNCH DETAILS

Processing Information

First, a primer is used to coat the substrate with an active, adhesion-promoting film. This film increases adhesion to the materials used (polyimide and aluminum) and to

the solar cells. Once the film has set and the solvent has evaporated, the silicone adhesive is applied to the pretreated surface via screen printing, doctor-blade techniques or metering equipment.

ELASTOSIL S 690			
Properties	Test Method	Unit	Value
Product data uncured			
Color			A: transparent
Viscosity at 23 °C	ISO 3219	[mPa s]	A: 7,500
Density	ISO 1183-1	[g/cm ³]	
Refractive Index at 25 °C	DIN 51 423		A: 1.4277
Product data catalyzed			
Mixing ratio A : B		p.b.w	1 : 1
Viscosity at 23 °C (ca. 5 min. after mixing the 2 components)	ISO 3219	[mPa s]	6,000 (D=0.89 1/s)
Pot life at 23 °C		[min]	240
Product data cured			
cured 5'/165 °C, pos			
Density at 23 °C	ISO 2781	[g/cm ³]	1.06
Hardness Shore A	ISO 867		35
Tensile strength	ISO 37	[N/mm ²]	
Elongation at break	ISO 37	[%]	150
Tear resistance	ASTM D 624 B	[N/mm]	3.0
Glass transition temperature	DIN 53 765	[°C]	-107
Linear shrinkage		[%]	< 0.1
Dielectric strength	IEC 60243	[kV/mm]	20
Surface resistivity at 100 V	IEC 93	[Ohm]	-
Volume resistivity at 100 V	IEC 93	[Ohm cm]	10 ¹⁵
Compression set, 22 h/150 °C	ISO 815-B	[%]	20 *)
Total loss of weight (TML)	ESA Spec ECSS-Q-70-02A	[%]	< 1.0
Condensable constituents (CVCN)	ESA Spec ECSS-Q-70-02A	[%]	< 0.1

*) cured 24 h/23 °C/50 % relative humidity

These figures are only intended as a guide and should not be used in preparing specifications

The adhesive now forms the flexible bond between the support structure and solar cells.

RTV-S 691		ELASTOSIL S 692		
B: transparent	A: red	B: transparent	A: black	B: transparent
B: 4,000	A: 65,000	B: 220	A: 70,000	B: 220
	A: 1.42	B: 1.0		B: 1.0
B: 1.4276	-		-	
	9 : 1		9 : 1	
2,500 (D=25 1/s)	20,000		40,000	
	100		240	
postcured 6 h/100 °C	cured 6 h/100 °C		cured 5/165 °C, postcured 6 h/100 °C	
	1.42		1.05	
	55		35	
2.5	4.5		1.5	
	110		200	
	5.0		3.0	
	-107		-109	
	< 0.1		< 0.1	
	-		-	
	> 1.0 x 10 ¹²		-	
	10 ¹⁴		200 (VDE 0303)	
	-		20	
	< 1		< 1.0	
	< 0.1		< 0.1	

The data presented in this brochure are in accordance with the present state of our knowledge, but do not absolve the user from carefully checking all supplies immediately upon receipt. We reserve the right to alter product constants within the scope of technical progress or new developments. The information given in this brochure should be checked by preliminary trials because of conditions during processing over which we have no control, especially where other companies' raw materials are also being used. The information provided by us does not absolve the user from the obligation of investigating the possibility of infringement of third parties' rights and, if necessary, clarifying the position. Recommendations for use do not constitute a warranty, either express or implied, of the fitness or suitability of the product for a particular purpose.

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