WACKER

CREATING TOMORROW'S SOLUTIONS

ELASTOSIL®

LUMISIL®

WACKER SilGel®

SEMICOSIL®

MOBILITY

e-NOVATION FOR AUTOMOTIVE DISPLAYS POWERED BY SILICONES

SILICONES FOR DISPLAYS: A CLEAR DECISION

Bigger and More – the Dashboard Challenge
Vehicles are no longer merely a means of getting from A to B: they are evolving into living spaces with far more functions than are needed just for driving. Navigation systems and multimedia equipment for both drivers and passengers are only some of the devices with displays that are rapidly becoming automotive must-haves. These displays are now often quite large and curved. For passenger safety, the display glass needs to have a damping function. Readability must be ensured irrespective of the light situation (direct sunlight, irradiation angle and light intensity). Finally, the display has to work reliably throughout the vehicle's entire lifetime, despite exposure to high temperatures and sunlight. WACKER has developed a range of crystal-clear silicones that meet these challenges.

e-Novation is Our Business
As a globally-operating company and a long-term partner of the automotive industry, we at WACKER have a wealth of know-how. Our strong R&D departments around the world not only create innovative and intelligent solutions but also optimize our customers' existing ones. We invite you to benefit from both our experience and our expertise in the world of silicones.

Let's power up the future.
Let's put the wheels on e-Mobility.

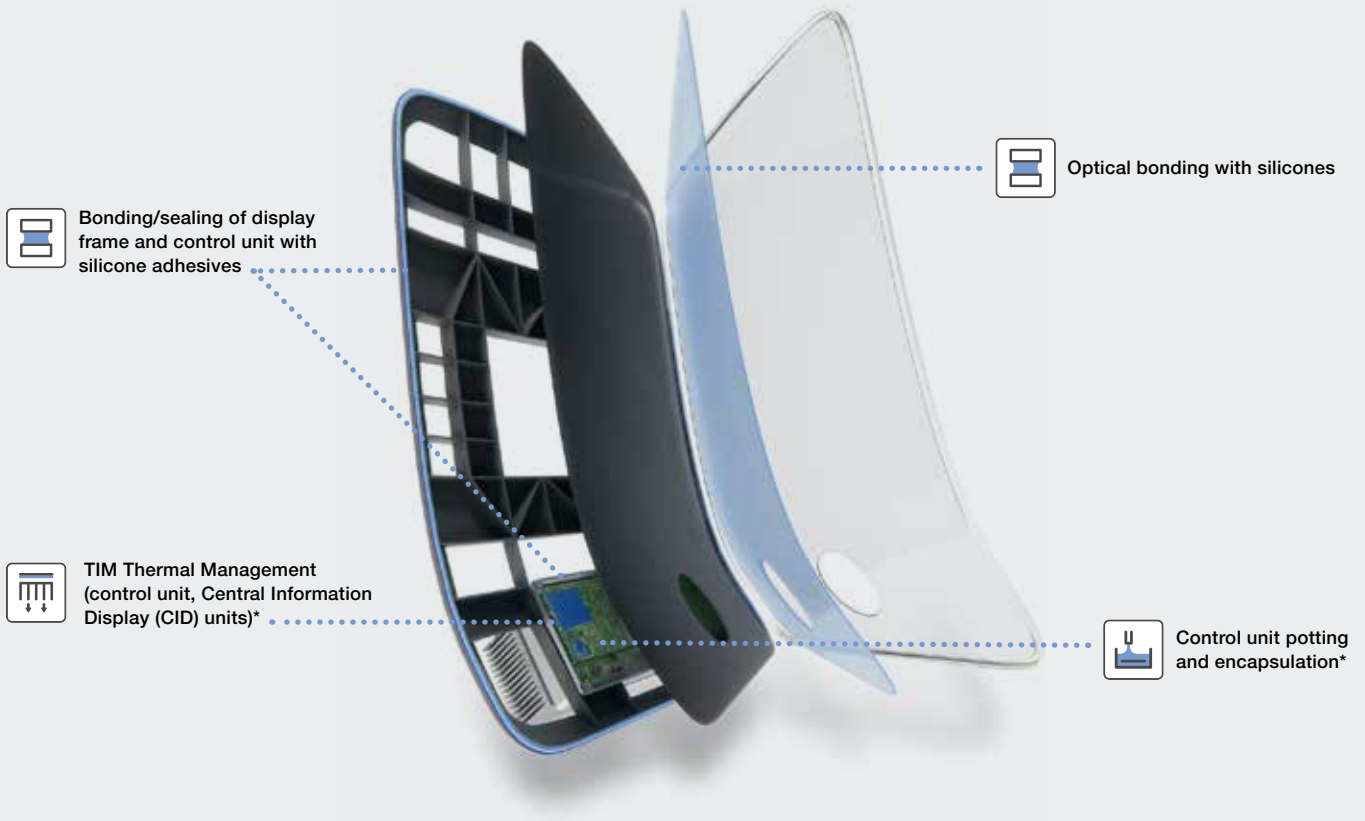
FOR DEFINITION AND CLARITY IN BRIGHT LIGHT

The user interface in a vehicle should remain simple and intuitive, however many new functions are added. More importantly, for road safety reasons, it is essential that displays are always clearly readable. However, in bright sunlight, reflectance causes problems.

Increasing the display brightness under direct sunlight would lead to issues such as high power consumption, excessive heat dissipation and a shortened lifetime, to name but a few.

In order to minimize display reflection, alternatives, such as the lamination of a low-reflective (LR) polarizer, the application of an anti-reflective (AR) film or the use of a top surface polarizer are not enough. Optical bonding of the display module is essential. Providing improved durability and higher impact resistance, silicone optical bonding is considered one of the best and most effective ways to ensure optimum display readability in all lighting conditions.

Silicone Application Fields



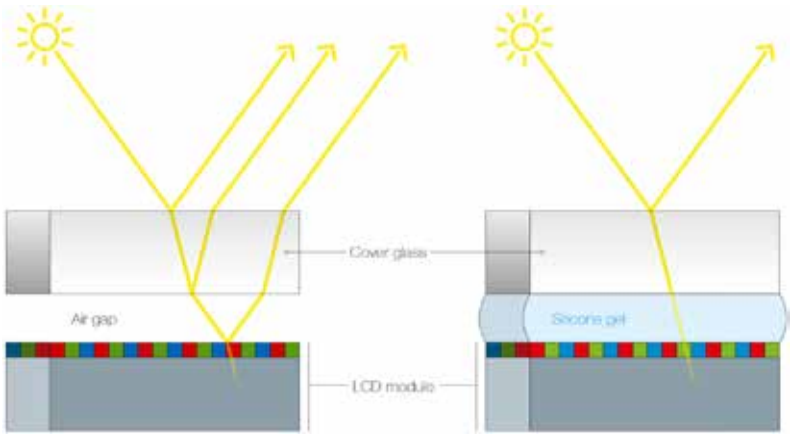
*Suitable products on the topic of thermal management and control unit potting can be found in the brochures “Power Conversion” and “Battery”.

SILICONE –
A DISTINCT WINNING OPTION

With a proven track record in automotive electronics for encapsulants and sealing adhesives, silicones from WACKER, with their unique properties, provide tailor-made solutions in the form of soft silicones and silicone gels for all types of display applications and processing.

While acrylic OCRs (optically clear resins) have some glasslike properties, they are less well suited for optical bonding in automotive displays. Yellowing, delamination and fogging can arise under intense conditions, such as extreme temperatures, high humidity and bright light, reducing the brightness, contrast and legibility. The optical reliability is compromised by the tendency of the screen to yellow, and any optical distortions (mura) caused by mechanical stress from the high moduli of the organic materials. This can even be a safety hazard if the driver is distracted. Adding a silicone layer with a refractive index close to that of glass increases the display's contrast ratio by reducing the amount of ambient light that is reflected. Moreover, increased optical clarity is not the only benefit: the display has higher impact resistance and is less easily damaged. Also, removing the air gap between the cover glass and the display both prevents dust and moisture from entering and stops condensation from fogging up the display. WACKER's high-quality silicones, LUMISIL®, deliver these benefits in a range of products that meet the industry's high demands.

Optical Bonding with LUMISIL®



LUMISIL® – SEE THE DIFFERENCE

The 2-part silicones in WACKER's LUMISIL® range are clearly superior, making them particularly suitable for high-end applications. The result can be summed up in one word – quality.

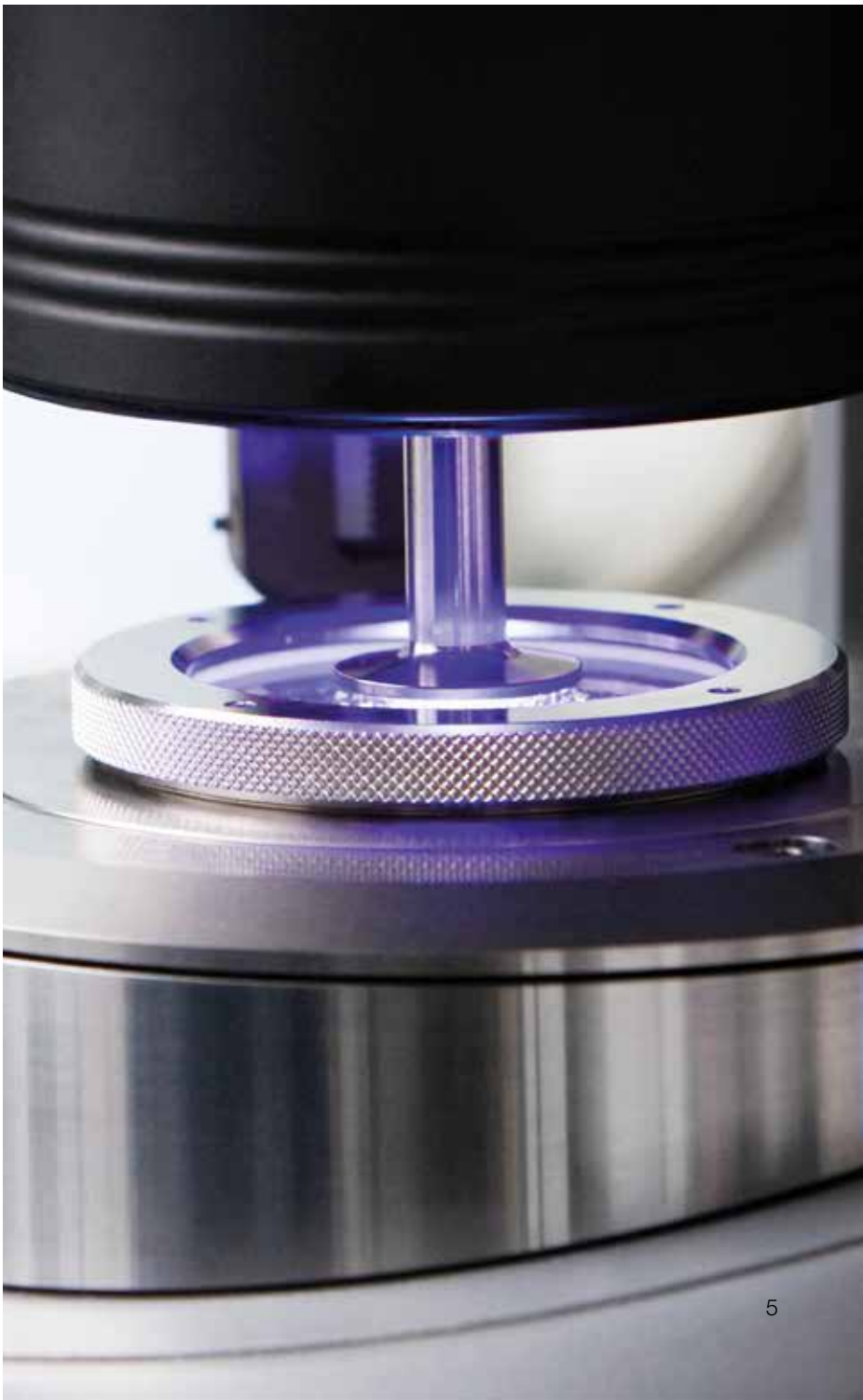
Capable of functioning reliably under intense conditions, they offer optimal processing efficiency, as well as cost-effective production. While also exhibiting optimized flow and crosslinking characteristics, their excellent adhesion and outstanding transparency ensure customer expectations are fully met. LUMISIL® products require either UV or thermal curing. LUMISIL® UV products cure after UV activation. Bonding is possible after irradiation so this offers the use of non-UV transparent substrates and curing in shadow areas too (either by process or choice of catalyst). These odorless products offer several advantages in display manufacture, including low shrinkage during curing and low modulus. Along with reliable optical stability, very low haze and very low yellowness, their viscoelastic damping behavior and low modulus provides improved shock and vibration resistance. They are also well-suited for the increasingly popular large-size displays, as they are mura-free.

Applications for Next-Generation Displays

- Optical bonding of touch-screen panels
- Encapsulation of optical and electronic components
- Production of damping elements
- Large-screen displays
- Navigation devices

Benefits

- Low shrinkage (< 0.1%, before/after cure)
- Low E-modulus
- Low dielectric constant (2.7 – 2.8)
- No photoinitiators used
- No oxygen inhibition



PRODUCT OVERVIEW

SILICONES FOR AUTOMOTIVE DISPLAYS

Optical Bonding: Thermal Curing Optical Clear Silicone Resins

LUMISIL® thermal cure series – addition-cure, 2-part (1:1 A/B) systems

Product	Color	Processing	Potlife at 23 °C [hr]	Viscosity (Mix) D = 0.5 1/s [mPa·s]	Gel Timer at 65 °C [min]	Curing Time at 65 °C (T90) [min]	Density at 23 °C [g/cm³]	Hardness (Penetration) [mm/10]	Pull Strength [Kgf/cm²]	Transmittance* [%] Minolta CM-5	Haze* Initial [%]	1,000 h	Yellowness Index* Initial	1,000 h	Refractive Index at 23 °C
LUMISIL® 100	Optically clear	Dispensing	3	480	13	60	0.97	50	2.5	> 99.4	< 0.1	< 0.1	< 0.2	< 0.3	1.41
LUMISIL® 102	Optically clear	Dispensing	3	1,900	11	46	0.97	50	3.5	> 99.4	< 0.1	< 0.1	< 0.2	< 0.3	1.41
LUMISIL® 102 FC	Optically clear	Dispensing	0.4	2,200	3.7	10	0.97	50	3.5	> 99.3	< 0.1	< 0.1	< 0.2	< 0.4	1.41
LUMISIL® 105	Optically clear	Slit coating	3	4,800	10	38	0.97	50	3.5	> 99.3	< 0.1	< 0.1	< 0.2	< 0.4	1.41
WACKER SilGel® 612 PT	Optically clear	Dispensing	0.5	1,000	3.7	20	0.97	50	2.2	> 98.8	< 0.1	< 0.1	< 0.2	< 0.6	1.41

Optical Bonding: UV Curing Optical Clear Silicone Resins

LUMISIL® UV cure series – addition-cure, 2-part (10:1) systems

Product	Color	Features	Processing	Potlife at 23 °C [hr]	Viscosity (Mix) D = 0.5 1/s [mPa·s]	Density at 23 °C [g/cm3]	Volume Shrinkage [%]	Hardness (Shore 00)	Pull Strength [Kgf/cm²]	Transmittance* [%] Minolta CM-5	Haze* Initial [%]	85 °C/85% RH/1,000 h	Yellowness Index* Initial [%]	85 °C/85% RH/1,000 h	Refractive Index at 23 °C
LUMISIL® 202 UV	Optically clear	Low-viscosity soft gel	Dispensing	> 24	2,000	0.97	< 0.1	10 ± 5	3.5	> 99.0	< 0.2	< 0.2	< 0.2	< 0.5	1.41
LUMISIL® 203 UV	Optically clear	Low-viscosity soft tough gel	Dispensing/slit coating	> 24	3,500	0.97	< 0.1	37 ± 5	4.0	> 99.0	< 0.2	< 0.2	< 0.2	< 0.4	1.41
LUMISIL® 205 UV	Optically clear	Middle-viscosity tough gel	Dispensing/slit coating/ screen printing	> 24	5,500	0.97	< 0.1	48 ± 5	4.5	> 99.0	< 0.2	< 0.2	< 0.2	< 0.3	1.41
LUMISIL® 245 UV	Optically clear	High-viscosity tough gel	Stencil printing	> 24	45,000	0.97	< 0.1	45 ± 5	5.0	> 99.0	< 0.2	< 0.2	< 0.2	< 0.3	1.41

Optical Bonding: Dam Materials

Addition-cure, 2-part (10:1) systems for dam processes

Product	Color	Features	Processing	Potlife at 23 °C	Viscosity (Mix) D = 0.5 1/s [mPa·s]	Density at 23 °C [g/cm³]	Volume Shrinkage [%]	Hardness (Shore 00)	Pull Strength [Kgf/cm²]	Transmittance* [%] Minolta CM-5	Haze* Initial [%]	85 °C/85% RH/1,000 h	Yellowness Index* Initial [%]	85 °C/85% RH/1,000 h	Refractive Index at 23 °C
ELASTOSIL® RT 724	Black		Dam material	> 30 min. mit EL CAT PT F; 8h mit EL CAT UV	550,000	0.99	< 0.1	50	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LUMISIL® 307 UV DAM	Optically clear	Flowable, fast curing	Dam material	> 24 h	7,000	0.99	< 0.1	45			0	0.12	0.1	0.48	1.41
LUMISIL® 345 UV DAM	Translucent	Thixotropic, UV or thermal cure possible	Dam material	> 30 min. mit EL CAT PT F; 8h mit EL CAT UV	550,000	0.99	< 0.1	50	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

*Silicone thickness 300 µm, double sided with 0.7 mm LCD bare glass (Corning Eagle XG)

Adhesives

Silicone adhesives for display frame and control unit sealing

Product	Features	Curing Type	Curing Initiated by	Product Type	Viscosity D = 0.5 1/s [mPa·s]	Hardness	Tensile Strength [MPa]	Elongation at Break [%]	Density [g/cm³]	Curing
ELASTOSIL® RT 725 LV	Low energy cure adhesive, low volatile, UV tracer	Addition	Heat	2-part, 1:1	Non slump	50 Shore A	7	250	1,1	10 min/100 °C; 30 min/60 °C
SEMICOSIL® 811	Low energy cure adhesive, low temperature cure, oven free, fast adhesion build-up at moderate temperature, FIPG	Addition	RT, heat or UV	2-part 10:1, BKS**	260,000 thixotropic	30 Shore A	3.3	330	1.08	BKS**
SEMICOSIL® 821 UV*, 822 UV*, 823 UV*	UV curing adhesives at different viscosity levels, very good adhesion to different plastic substrates, eg PC.	Addition	UV							

* Under development
**BKS = Batch-Kit System: base component + ELASTOSILR CAT PT, CAT PT-F or CAT UV to allow curing at room temp., under heat or by UV light.

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7537D e/04.18 replaces 7537D e/11.17