

**LOCTITE<sup>®</sup>**  
**BONDERITE<sup>®</sup>**

Henkel's Solutions  
for Touch Panels & Displays



### Engineering Support

With unsurpassed development, engineering and field support – Henkel provides the expertise to empower customers to improve quality, efficiency and innovation.

### Design Partnership

Our experienced team of engineers provide documented design and application support.

### Global Capabilities

We are the global technology leader with an extensive network to support the customers' value stream.

### Customer Intimacy

Through close collaboration and intimate knowledge of customer applications and processes, Henkel creates exciting solutions that enable innovation.

### Innovation Leader

As the innovation leader in sealing, bonding and coating – Henkel delivers solutions to meet fast design changes and developmental challenges.

## YOUR TOTAL SOLUTION PROVIDER FOR ADHESIVES AND SEALANTS.

Through close customer partnership, industry know-how and engineering support, we enable innovative design for touch panels and displays



### Achieving more with less

Our commitment to leadership in sustainability is deeply embedded in our values. With our revised Sustainability Strategy for 2030, we are building on our strong track record. At the same time, we are aiming to address one of the central future challenges: to decouple growth from resource consumption. At the heart of this strategy is therefore the simple, yet challenging, ambition: to achieve more with less. It aims to create more value for our customers, consumers, communities and the company alike, while simultaneously reducing the environmental footprint.

MEMBER OF  
**Dow Jones Sustainability Indices**  
In Collaboration with RobecoSAM

**FTSE4Good**



## Henkel. Improving your process, understanding your challenges.

Proven touch panel and display total solutions for all your needs – today and tomorrow.

Touch panel and display device manufacturers face daily challenges – reducing costs, improving efficiency, and staying ahead of the competition, to name just a few. Many suppliers can offer an adhesive. But Henkel offers much more: engineering expertise to integrate the adhesives into your manufacturing process; custom-formulated products to meet your specific application requirements; and the innovation pipeline to offer you a continuous stream of new and creative solutions.

**Henkel is in the business of solving problems.** With our history and experience in the industry, our experts can help find ways to improve your touch panel and display device process. We can show you how to reduce your adhesive consumption while improving performance and efficiency. And we'll provide all the testing data to back up our recommendations.



# Touch Sensor Solutions LCD Solutions

## Benefits of Functional Sealants

### Light Shielding Sealant

- High bonding strength on glass/polarizer/stainless steel
- Fast cure after dispensing/jetting
- No permeation to back light unit during curing
- Easy for dispensing or jetting
- Excellent light shielding performance at 0.15 mm thickness

### Glass Edge Protection

- Protect glass edge from handling issues
- Improve surface and side impact performance of the glass
- Simplify manufacturing process

### Liquid Assembly Tape

- Ultra-fast fixture strength to eliminate clamping process
- Good re-workability
- Compatible with automation process
- Reduced total cost of ownership

### Water-proof Sealant

- Good barrier performance against moisture
- Excellent reliability
- Good adhesion strength
- Fast cure

## Benefits of Overcoat Materials

### Indium Tin Oxide (ITO) Overcoat

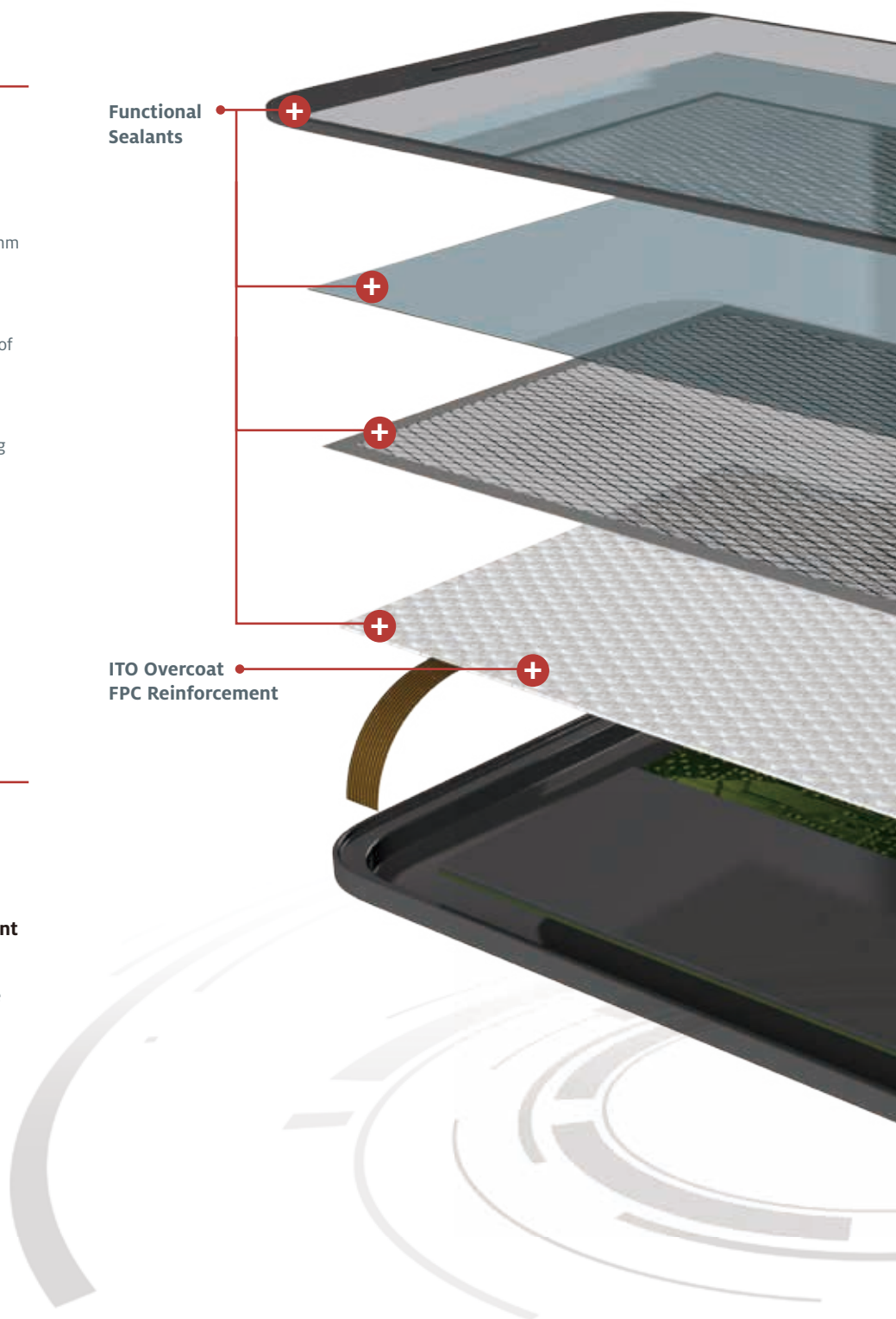
- Good re-workability
- Excellent protection to ITO against moisture
- Compatible with various dispensing methods
- Compatible with LED UV curing

### Flexible Printed Circuit (FPC) Reinforcement

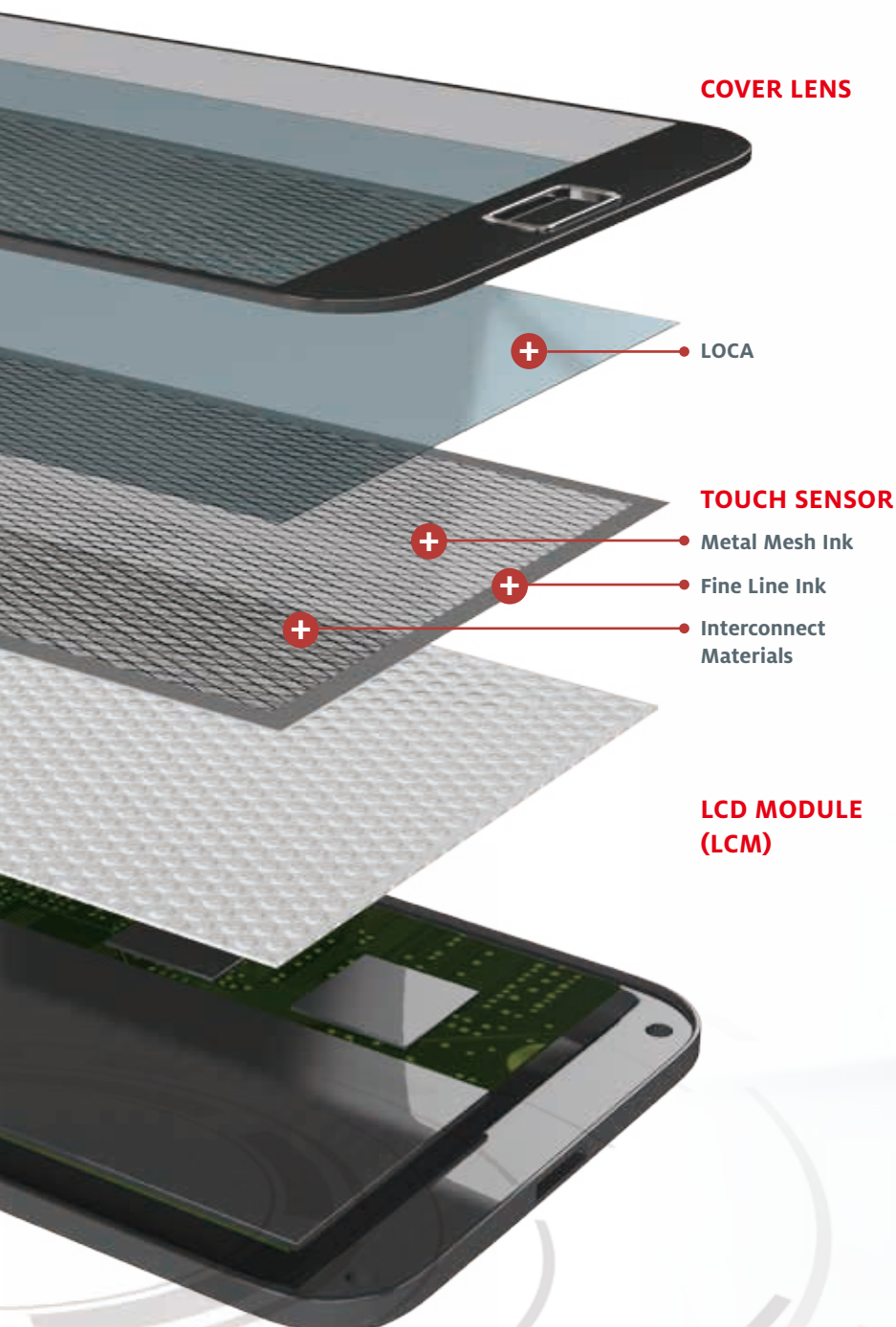
- Provide excellent mechanical protection
- Good dispensing performance
- Excellent barrier performance against moisture

### Functional Sealants

### ITO Overcoat FPC Reinforcement







## Benefits of Display Inks

### Fine Line Ink

- Excellent fine-line and high-resolution printing
- Printability: 70  $\mu\text{m}$  lines and spaces attainable
- Excellent adhesion to sputtered ITO and PET
- Good electrical conductivity

### Metal Mesh Ink

- Good adhesion
- Excellent conductivity
- Enable a more flexible and more conductive transparent film compared to those using ITO

### Black Ink

- Good compatibility to metal mesh ink
- Decrease reflection of silver ink effectively

### Ag Nanowire Ink

- Excellent optical performance with high transmittance
- Low sheet resistance
- Excellent conductivity
- Compatible with various printing methods

### Transparent Protective Ink

- Suitable for flatbed and rotary screen printing
- Excellent printability and open screen time
- Good adhesion to treated polyester film
- Improved UV stability

## Benefits of Liquid Optically Clear Adhesive (LOCA)

- Simple, low-cost process
- Vacuum reduces potential for bubbles
- 5 – 10% thickness uniformity
- < 0.25 mm edge control
- Minimizes MURA

## Benefits of Temporary Bonding

- High-temperature resistance
- Easy to debond
- Improved yield rate

# OLED Solutions

## Benefits of OLED Sealant

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- Good barrier against moisture and oxygen
- Good adhesion performance
- Low outgassing
- Fast curing at lower UV energy
- Good dispensing performance

## Benefits of OLED Anisotropic Conductive Film (ACF) / Flexible Printed Circuit (FPC) Reinforcement

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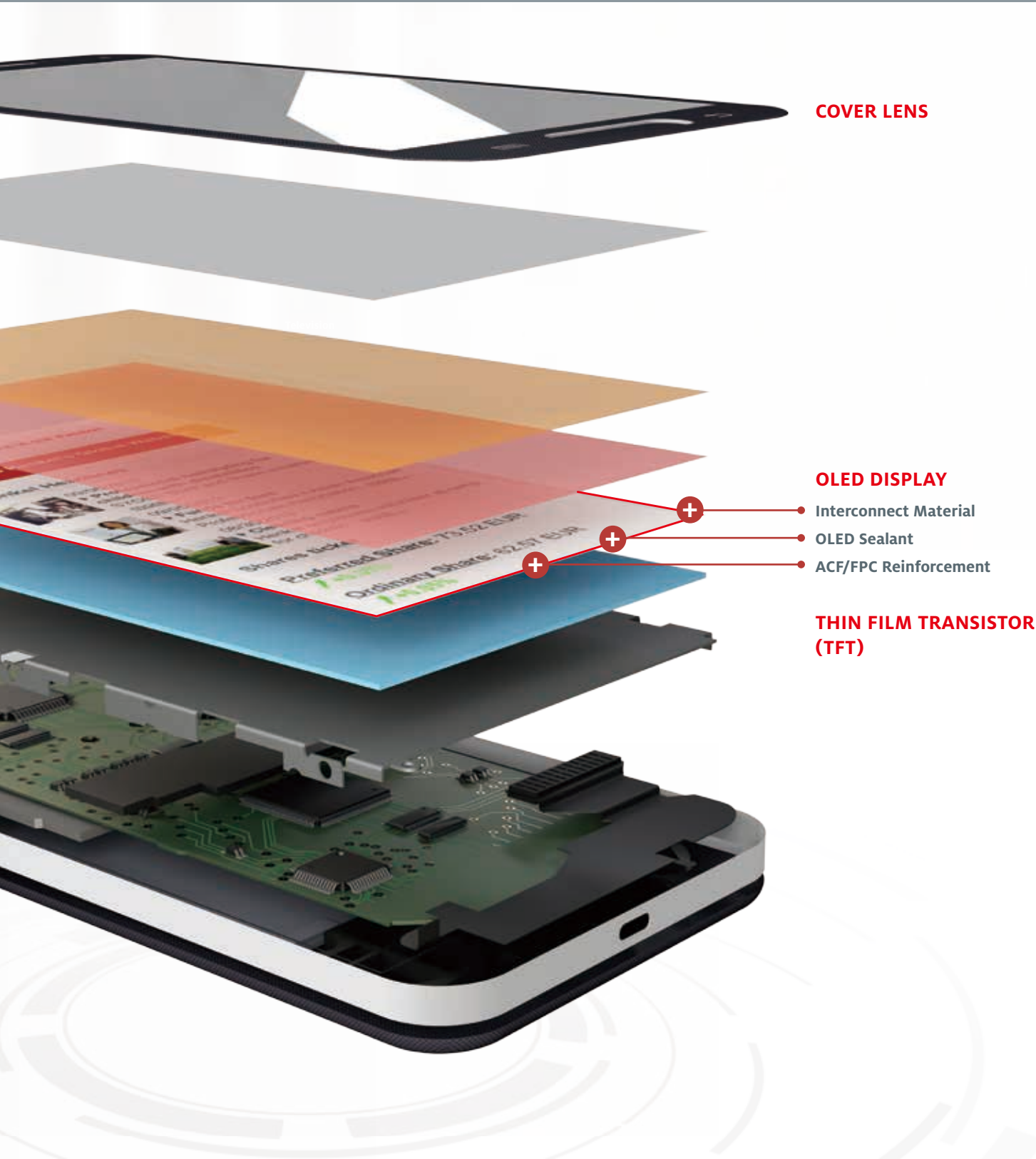
- Good adhesion to PI
- Good flexibility
- Compatible with various dispensing methods
- Compatible with LED UV curing

## Benefits of Interconnect Materials

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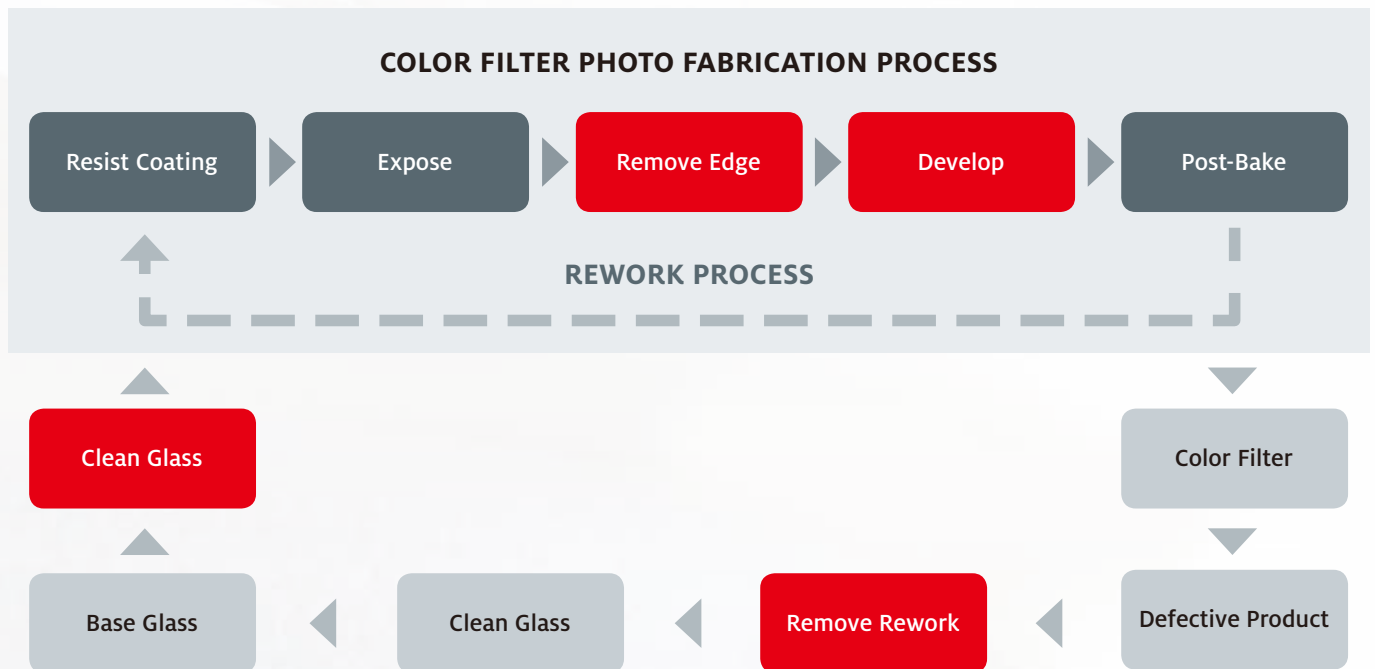
- High elongation and low modulus for stress release
- Good conductivity
- Good dispensing performance



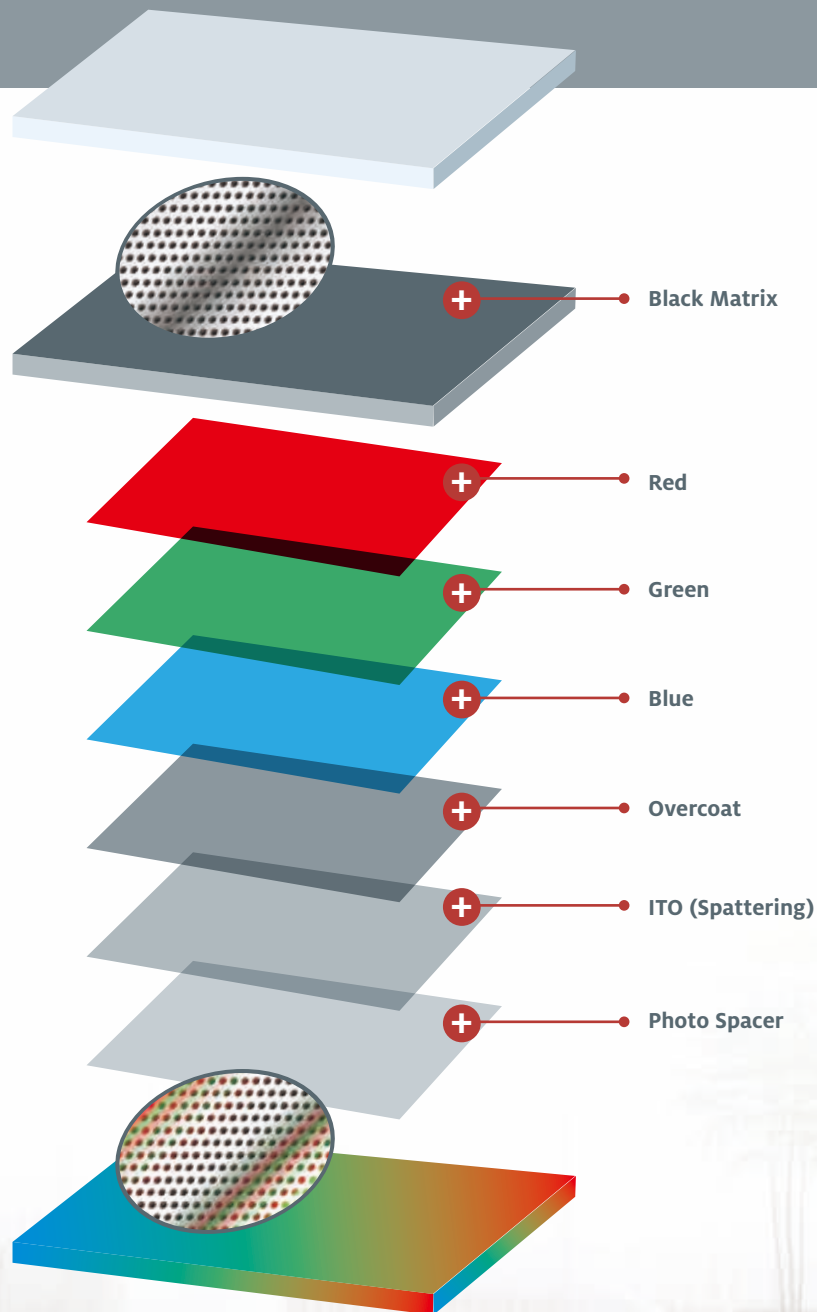


# Cleaner Solutions for LCD & OLED Panels

## Manufacturing Process







## Benefits of LCD Cleaners

### Glass Cleaner

- Strong cleaning ability
- Easily cleaned with de-ionized (DI) water
- No damage to the glass or metal

### Color Filter Developer

- Excellent performance on fine pitch patterning process
- Universal formulation with strong compatibility to most photo resists
- Outstanding anti-corrosion performance to protect metals (Al, Cu...)
- High concentration
- Production efficiency

### Rework Stripper

- Applicable to all kinds of color filter, black matrix and overcoat materials
- Reduced total cost of ownership based on short cleaning process time and long bath life
- Low damage to glass

# Product Selector Guide

## FUNCTIONAL SEALANT

Product Name	Curing Type	Curing Condition	Typical Application	Appearance	Chemistry	Viscosity (Pa·s)	Application Temperature	Open Time	Light Transmittance	
LOCTITE HDD 3573	Self-cure	Room Temperature	Light shielding	Black	Polyurethane Hotmelt	453	90~110°C	3 min.	0.1	
LOCTITE HDD 3574	Self-cure	Room Temperature	Light shielding	Black	Polyurethane Hotmelt	6.5	90~110°C	1 min.	0.04	
LOCTITE HDD 3579	Self-cure	Room Temperature	Light shielding	Black	Polyurethane Hotmelt	6.3	90~110°C	2 min.	0.15	
LOCTITE HDD 3597	Self-cure	Room Temperature	Light shielding ACF/FPC reinforcement	Black	Polyurethane Hotmelt	5.7	90~110°C	1.5 min.	0.05	
LOCTITE LAT 3990	Self-cure	Room Temperature	Liquid assembly tape	Black	Polyurethane Hotmelt	5.6	160~180°C	4 min.	-	
Product Name	Curing Type	Curing Condition	Typical Application	Appearance	Chemistry	Viscosity (Pa·s)	Elongation (%)	Hardness	Refractive Index	Water Absorption (%)
LOCTITE AA 3103	UV/Visible light	2400 mJ/cm²	Edge reinforcement for LCM	Transparent	Acrylic	11	260	51 Shore A	1.5	2.72
LOCTITE AA 3105	UV	2400 mJ/cm²	Gap filling for OLED	Transparent	Acrylic	0.3	265	64 Shore D	1.5	5.36
LOCTITE AA 3106	UV	2400 mJ/cm²	Edge reinforcement for LCM	Transparent	Acrylic	5.5	250	53 Shore D	1.5	3.18
LOCTITE AA 3301	UV	2400 mJ/cm²	Gap filling for OLED	Transparent	Acrylic	0.2	50	69 Shore D	1.5	3
LOCTITE AA 3311	UV	2400 mJ/cm²	Gap filling for OLED	Transparent	Acrylic	0.3	265	64 Shore D	1.5	5.36
LOCTITE AA 3492	UV	500 mJ/cm²	Gap filling for OLED	Transparent	Acrylic	0.5	5	79 Shore D	-	-
LOCTITE DSP 190024	UV	2400 mJ/cm²	Edge reinforcement for LCM	Bone-white	Acrylic	26.5	85	-	-	-
LOCTITE HDD 9391	Atmospheric moisture	24 hours @ 22°C / 50±5% RH	Edge reinforcement for LCM	White	Polymer	95	245	30 Shore A	-	-

## OLED SEALANT

Product Name	Curing Type	Curing Condition	Typical Application	Appearance	Thixotropic Index	Viscosity (Pa·s)	Shelf Life @ 2 — 8°C	Work Life @ 25°C	Water Permeability @ 50°C/100% RH (g·mil/100in²·day)	Die Shear Strength @ RT, 4 x 4 mm glass / glass (kg·f)
LOCTITE ECCOBOND DS 8027LV	UV & Heat Cure	UV cure: 7.5 J/cm² + Heat cure: 60 min. @ 85°C	Rigid OLED	Translucent paste	4.6	84	6 months	1 month	3.32	28

## DISPLAY INK

Product Name	Curing Type	Curing Condition	Typical Application	Solid Content, TGA (%)	Thixotropic Index	Viscosity (Pa·s)	Sheet Resistance (Ohm/sq·mil)	Electrical Resistance (mOhm/sq)	Haze
LOCTITE ECI 1006	Heat cure	10 min. @ 130°C	Fine line ink	75	7.2	57	0.03	-	-
LOCTITE ECI 5003	Heat cure	3 min. @ 85°C +5 min. @ 140°C	Ag nanowire ink	3	-	0.23	< 100	-	9%
LOCTITE ECI 5004	Hot air drying	10 min. @ 150°C	Metal mesh Ag nano ink	76	1.6	2	-	< 0.005	-
LOCTITE NCI 9001	Hot air drying	5 min. @ 130°C	Transparent protective ink	-	-	0.45	-	-	0.03%
LOCTITE ECI 9002B	Heat cure	30 min. @ 130°C	Metal mesh black masking ink	38	2	4	-	-	-



## OVERCOAT MATERIAL

Product Name	Curing Type	Full Cure Energy (mJ/cm²)	Typical Application	Appearance	T <sub>g</sub> by DMA	Viscosity (Pa·s)	Shelf Life @ 2 — 8°C	Reliability	
								60°C/90% RH for 300 hr.	85°C/85% RH for 240 hr.
LOCTITE ECCOBOND DS 3318BL	UV LED cure	350	Chip on Flex	Blue	86°C	2.25	6 months	Pass	Pass
LOCTITE ECCOBOND DS 3318BK	UV light or UV LED cure	425/350	Chip on Flex	Black	75°C	1.75	6 months	Pass	Pass
LOCTITE ECCOBOND DS 3318BLX	UV LED cure	> 1,000	Chip on Glass	Blue	68°C	2.05	6 months	Pass	Pass
LOCTITE ECCOBOND DS 3318LV	Mercury Lamp	Mercury Lamp: > 800	FPC reinforcement	Transparent	64°C	0.97	12 months	Pass	Pass
LOCTITE ECCOBOND DS 3318LVT	Mercury Lamp	Mercury Lamp: > 800	Chip on Glass	Transparent	96°C	0.14	6 months	Pass	Pass
Product Name	Curing Type	Full Cure Energy (mJ/cm²)	Typical Application	Appearance	Chemistry	Viscosity	Elongation	Hardness	
LOCTITE AA 3523	UV	12,000	FPC reinforcement	Transparent	Acrylate	20	218%	70 Shore D	
LOCTITE ECCOBOND EN 3410	UV	1,000	FPC reinforcement	Light yellow	Acrylate	0.68	360%	66 Shore A	

## INTERCONNECT MATERIAL

Product Name	Curing Type	Curing Condition	Typical Application	Thixotropic Index	Volume Resistivity (ohms-cm)	Viscosity (Pa·s)	Elongation	Solid
LOCTITE ICP 4015	Heat Cure	30 min. @ 80°C	Display grounding	2.5	0.0001	22	> 100%	85%

## CLEANER

Product Name	Recommended Working Temp	Recommended Dilution Rate	Typical Application	PH Value Undiluted @ 25°C
BONDERITE C-AK TKA	35 — 45°C	1 — 5 %	Glass cleaner	> 12
BONDERITE C-NE APX	40 — 60°C	3 — 8 %	Glass cleaner	≈ 8.5
BONDERITE C-AK HAC	Room Temperature	1	RGB / Black Matrix / Photo Spacer color filter developer	> 12.5
BONDERITE C-AK HA	Room Temperature	0.5	RGB / Black Matrix / Photo Spacer color filter developer	> 12.5
BONDERITE C-AK BMC	Room Temperature	0.8	Black Matrix / Photo Spacer color filter developer	> 12.5
BONDERITE C-AK GRX	Room Temperature	2.5	RGB / Black Matrix / Photo Spacer color filter developer	8 — 9
BONDERITE C-AK 930	65 — 75°C	No Dilution	Rework stripper on RGB / Black Matrix UV/Heat cure overcoat / Photo Spacer	> 12

## TEMPORARY BONDING

Product Name	Curing Type	Full Cure Energy (mJ/cm <sup>2</sup> )	Typical Application	Shear Modulus, G (kPa)	Chemistry	Viscosity (Pa·s)	Elongation (%)	Hardness	Haze (%)	Refractive Index	Transmittance, average 380 — 780 nm	Volume Shrinkage (%)	Adhesion - Glass to Glass, (MPa)	Yellowness (b*)
LOCTITE DSP 3214	UV	8,000	Temporary bonding	230	Acrylate	3.1 — 5	100	64 Shore ∞	0.19	1.5	> 98%	1.95	0.9	0.46
LOCTITE DSP 3215	UV	8,000	Temporary bonding	265	Acrylate	10.5 — 15.5	100	68 Shore ∞	0.27	1.5	> 98%	1.75	1.2	0.48

# Product Selector Guide

## LIQUID OPTICALLY CLEAR ADHESIVE (LOCA)

CHARACTERISTICS		DIRECT BONDING LOCA		PSA DIRECT BONDING LOCA	HIGH VISCOSITY LOCA
		LOCTITE DSP 3195DM	LOCTITE DSP 3196	LOCTITE DSP 3803	LOCTITE DSP 3808
Chemistry		Acrylic	Acrylic	Acrylic	Acrylic
Curing Method		UV	UV	UV	UV
Full Cure Energy (mJ/cm <sup>2</sup> )		3,000	3,000	3,000	1,000
Viscosity (Pa·s)		35	3.7	8.5	50
Hardness		60 Shore ∞	11 Shore ∞	6 Shore ∞	15 Shore ∞
Shear Modulus, G (kPa)		166	17	-	-
Elongation (%)		165	235	600	400
Refractive Index		1.52	1.52	1.47	1.48
Transmittance (%)		> 99	> 99	> 98	> 99
Volume Shrinkage (%)		1.3	1.4	3.7	0.9
Adhesion	Glass to Glass	0.9	1	-	-
	Glass to Polarizer, Nitto Denko AG 254 µm gap (MPa)	1	0.37	-	-
	Glass to Polarizer, LG Bare 254 µm gap (MPa)	0.9	0.21	-	-
Yellowness (b*)		0.5	0.18	< 0.5	0.15
Haze (%)		0.24	0.1	< 0.5	0.2
Dielectric Constant, 1 MHz		2.59	2.67	5.04	2.82

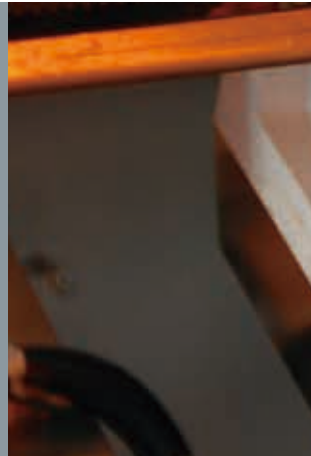




### SILICONE LOCA

LOCTITE DSP 5191	LOCTITE DSP 5192	LOCTITE DSP 5192DM	LOCTITE DSP 5193	LOCTITE DSP 5195
Silicone	Silicone	Silicone	Silicone	Silicone
UV	UV/Moisture	UV	UV/Moisture	UV
3,000	8,000	5,000	3,000	5,000
2.7	4.5	40 — 60	2.9	4
68 Shore ∞	65 Shore ∞	42 Shore ∞	70 Shore ∞	32 Shore ∞
319	70	47	339	37
130	155	150	120	> 200
1.41	1.42	1.41	1.41	1.41
> 99	> 99	> 99	> 99	> 99
< 0.5	0.54	0.4	0.7	< 0.5
0.3	0.4	0.7	0.5	-
0.17	0.59	-	0.23	-
0.23	0.63	-	0.23	-
0.07	0.19	0.33	0.04	< 0.25
0.2	0.3	0.17	0.1	< 0.3
2.87	2.88	2.85	2.88	2.8

# Henkel Process Capabilities



## Henkel Display Centers

Henkel has invested in its own Display center and technical sites in key locations such as China, Taiwan, Korea and Japan to offer our customers access to rapid prototyping support and advanced product and process development in the Display industry. These facilities have been outfitted with state of the art equipment for assembling and testing displays, such as lamination machines, curing ovens and MURA detection machines. Henkel has the ability to assemble display sizes up to 65 inches with liquid optically clear adhesives (LOCA) using a wide range of lamination techniques.

## Equipment Partners

The LOCA lamination process and equipment will have a large impact on the final quality, manufacturability and cost of the display. While Henkel has unparalleled expertise in fluid handling and light curing equipment, Henkel does not design or supply lamination equipment. To provide best-in-class process support for our LOCA product line, Henkel has formally partnered with three leading LOCA lamination equipment manufacturers.



EASY FIELD CORPORATION



IINUMA GAUGE MANUFACTURING CO., LTD.



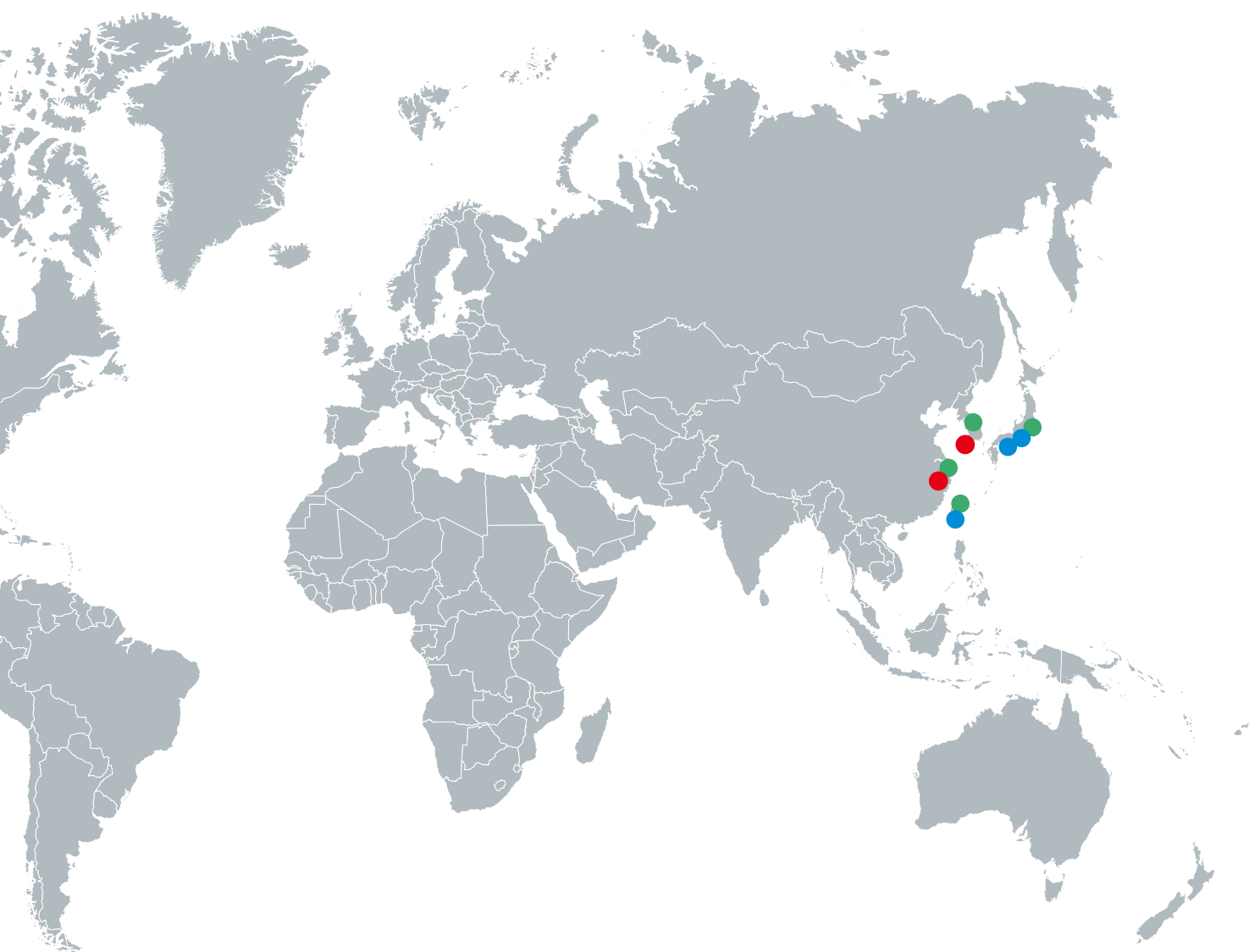
SHIBAURA MECHATRONICS CORPORATION

## Equipment Partner Operating Model

With each of our equipment partners, Henkel has purchased one or more mass production representative laminators. The laminating equipment is either located in a Henkel dedicated space at the partner's facility or in a Henkel lab. Henkel has also funded a technician from our partner's team to operate the equipment for Henkel. By locating the equipment in the partner's facility and hiring an expert from the partner's team to operate the equipment, it ensures that Henkel's equipment has the maximum capability, productivity and availability as well as the fastest turnaround time when custom tooling is required to create prototype parts.

As our partners develop new innovations, Henkel will invest to ensure that our equipment maintains best-in-class capabilities.





- Henkel Display Center
- Henkel Technical Site
- Partner Site

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[henkel-adhesives.com/electronics](http://henkel-adhesives.com/electronics)