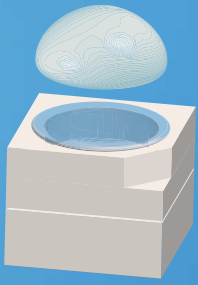




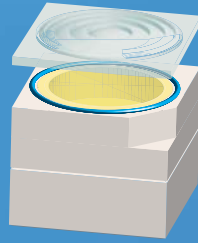
Lens and Reflector Bonding for LED Packages



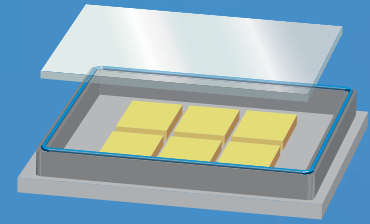
Lenses bonded to LEDs



Permanent transparency
Through-light applications



Fast curing, high yellowing resistance
Application: Flash lens



High reliability
Application: Head lamp

Transparent, yellowing-resistant, reliable – the new OB adhesives

Optically clear, low-outgassing adhesives with optimal LED compatibility

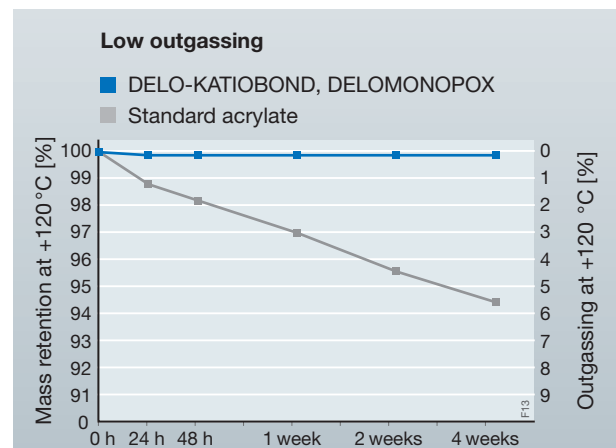
LEDs – the illuminant of the future – are already used in a broad variety of applications in room lighting, automotive industry or electronic consumer products. The challenge the manufacturers face is to produce ever more powerful packages at low cost and in a great variety of variants. Bonding as a joining technology is the key to success, especially when assembling lenses or reflectors.

DELO has developed a range of special DELO KATIOBOND OB* and DELO DUALBOND OB* adhesives to perfectly fulfill the LED manufacturers' requirements. In addition, DELO supplies further, well-proven heat-curing DELOMONOPOX adhesives for this task.

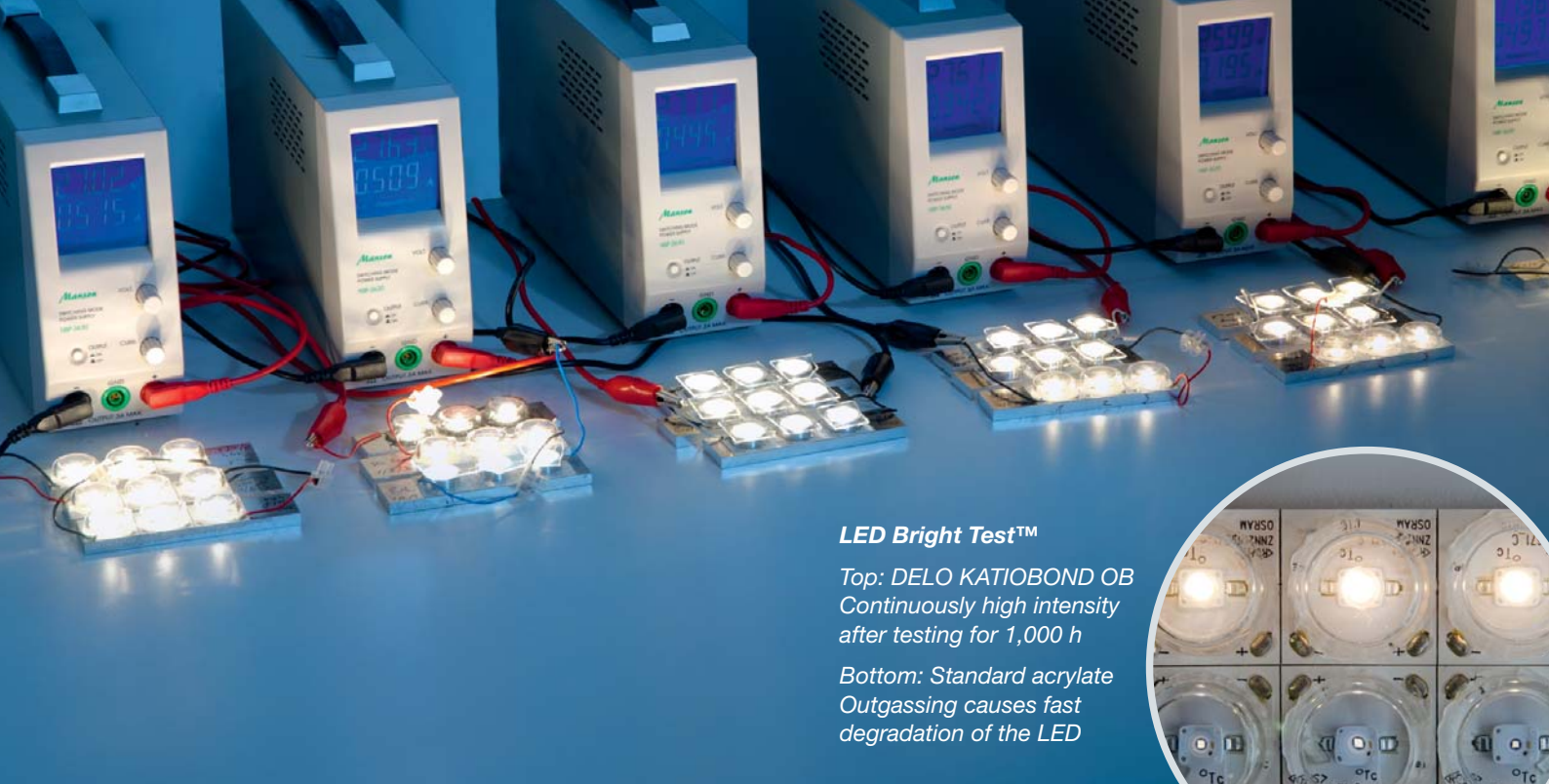
* OB = Optical Bonding

Product properties – customer's benefits

- Very low outgassing (high mass retention), and consequently, there is stable light intensity
- Optically clear products available
- Yellowing-resistant
- High temperature stability
- Reflow resistance
- Easy dispensing and integration into the manufacturing process
- Short fixing times
- Optimal curing with DELOLUX LED lamps
- Low temperature stress thanks to light curing or heat curing at low temperatures
- Halogen-free according to IEC 61249-2-21



Clearly lower outgassing of DELO KATIOBOND OB and DELOMONOPOX compared to standard acrylates



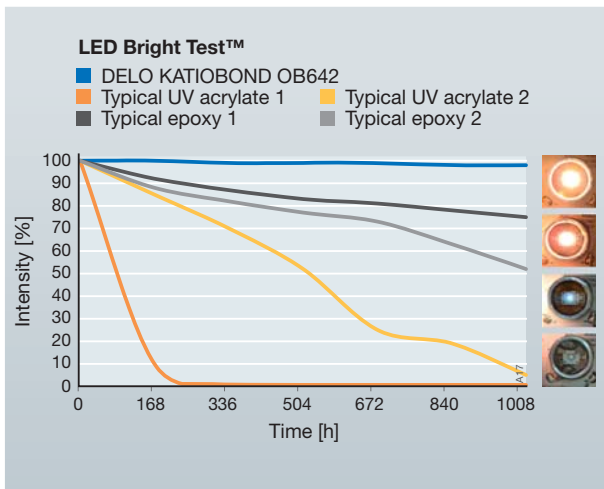
LED Bright Test™

Top: DELO KATIOBOND OB
Continuously high intensity
after testing for 1,000 h

Bottom: Standard acrylate
Outgassing causes fast
degradation of the LED



LED compatibility



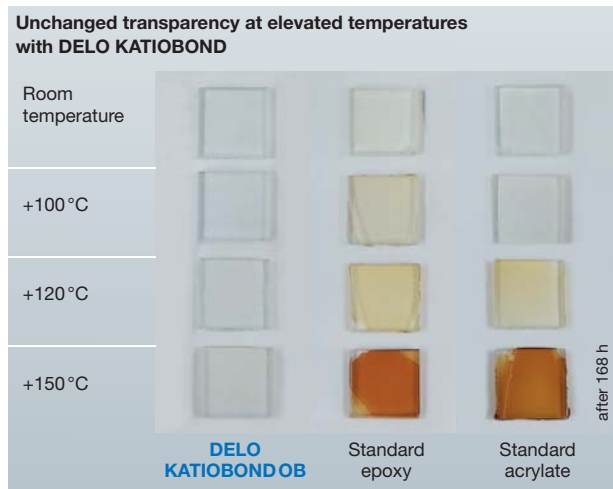
Progress of the LED intensity in the LED Bright Test™. The outgassing behavior of many adhesives reduces the intensity. However, DELO KATIOBOND OB642 virtually does not impair the intensity.



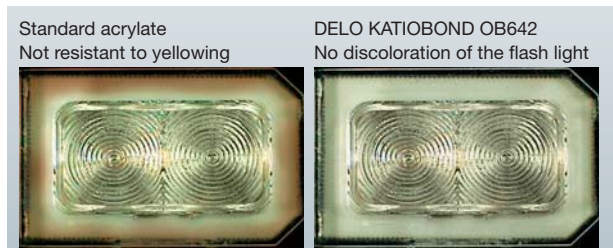
LED Bright Test™

An LED on a printed circuit board is hermetically sealed inside a housing with a glass lid. A larger adhesive quantity is inserted into the housing from which material can outgas when the LED is on. Measurement of the time progress of the light intensity and visual inspection make it possible to assess if the LED's performance is influenced by adhesive outgassing, or not. The test usually takes 1,000 h.

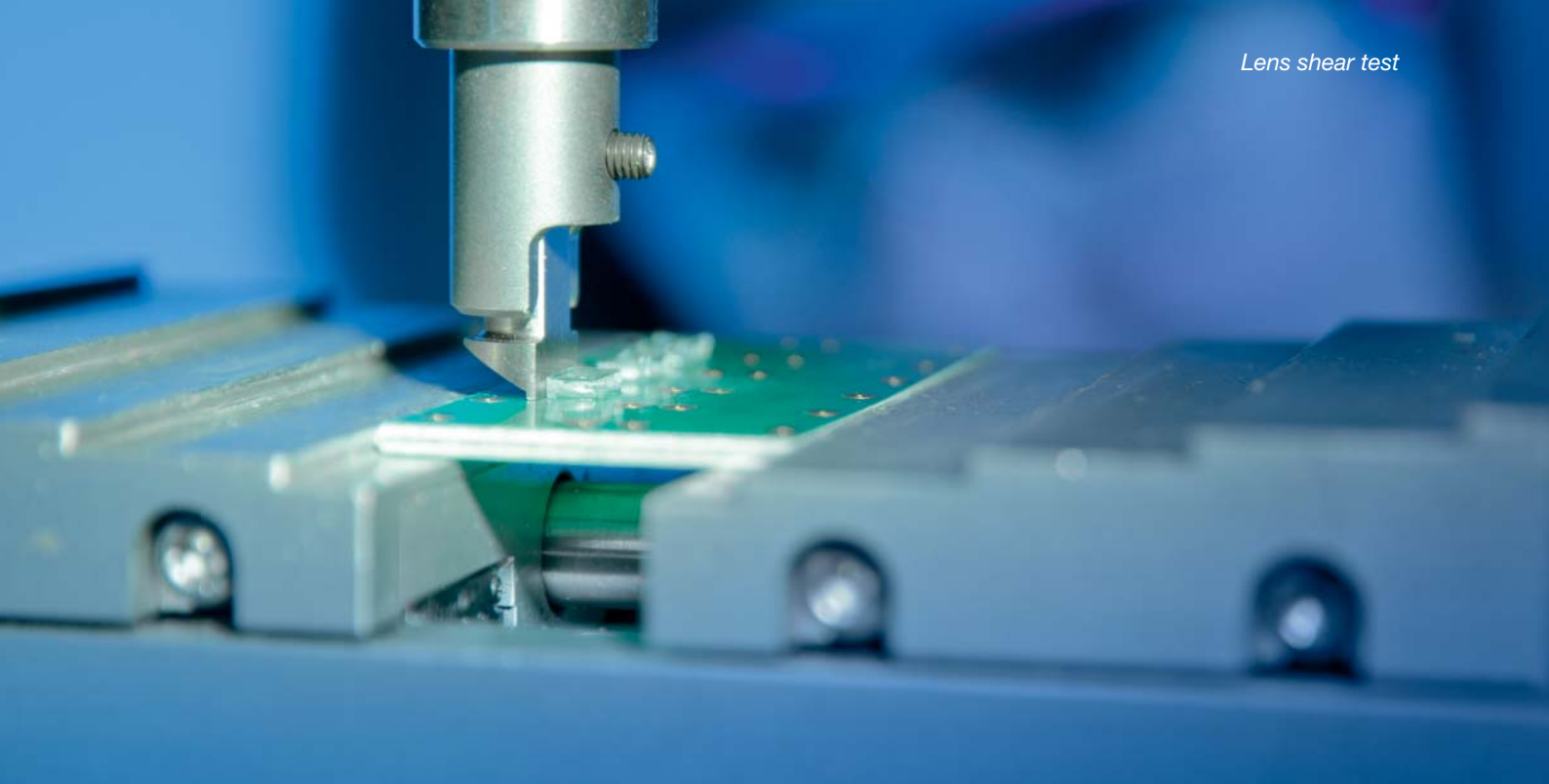
Optical stability



Bonded connections are often designed in such a way that the adhesive layer lies in the beam path of the optical component. Therefore, it is essential that the adhesive is highly transparent for the relevant wavelengths, and retains its transparency when it is exposed to higher temperatures, UV radiation and soldering processes. DELO's OB adhesives are transparent and stabilized against thermal aging. Therefore, they become significantly less yellow than other UV- or heat-curing products do.



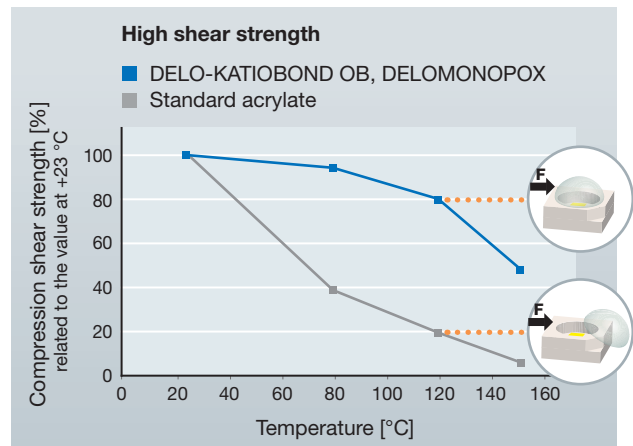
Lens of a mobile phone flash light after storage at +120°C for 168 h



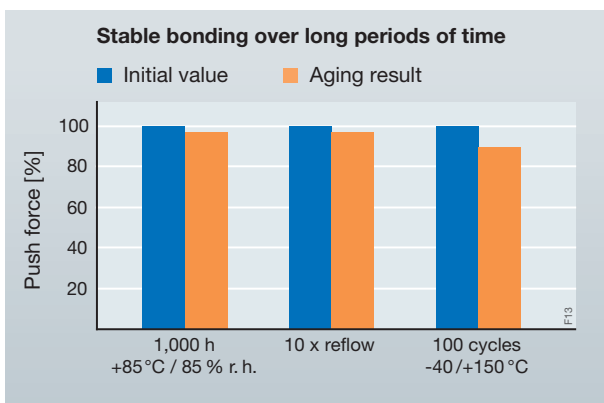
High reliability

A reliable connection is particularly important when bonding optoelectronic components for consumer applications such as smartphones. To ensure that bonds are durable, adhesives are put through rigorous reliability tests.

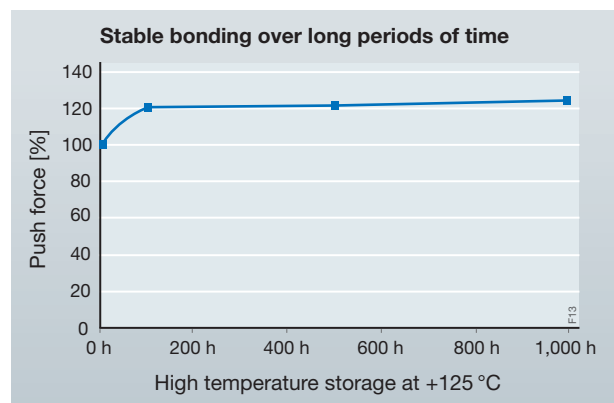
DELO KATIOBOND OB adhesives performed extremely well by showing stable results in the humidity storage, and thermal shock tests. These products also proved to be reliable during repeated reflow test for solderable components.



DELO KATIOBOND OB and DELOMONOPOX achieve higher bond strength than, for example, standard acrylates – especially at elevated temperatures

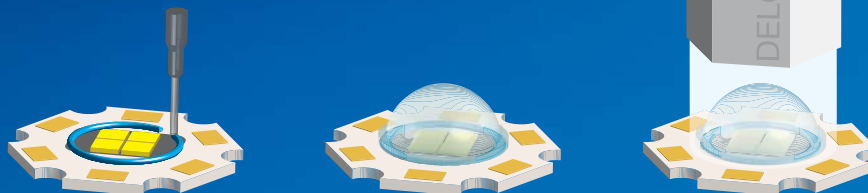


DELO adhesives show no significant change in bond strength in standard reliability tests

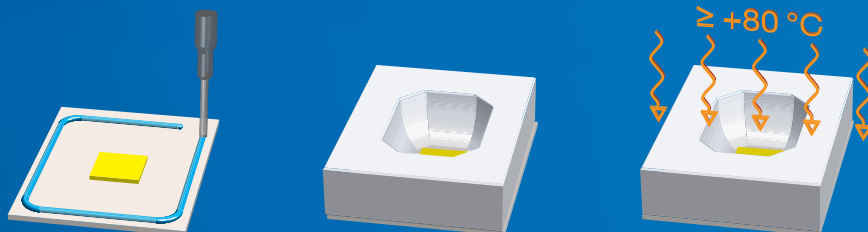


High thermal stability:
Constant push force over long periods of time

Dispensing of tiny adhesive drops with DELO-DOT



The bonding process: Dispensing of the adhesive, placement of the lens or reflector and curing with light or heat



Dispensing and curing

Reliable dispensing of minute quantities

For manufacturers, it is a high priority to bond components quickly during the production process, but it is equally important to consistently dispense adhesive in very small and accurate quantities. Often times a volume of less than 1 mg needs to be dispensed. Adhesives need to adapt well to specific dispensing systems, and dispense homogeneously every time.

All DELO KATIOBOND OB products are homogenized and filtered by ultra-modern aggregates. They can be applied with all conventional dispensing methods, such as micro jet valves, dispensers or by pin transfer.

- Placement of smallest drops
- Suitable for dispensing, jetting, stencil printing, ...
- No clogging of G30 needles or jetting valves
- Repeatable results
- High accuracy: place/amount



Everything from one source:
DELO supplies perfectly matching adhesive – dispensing – lamp solutions!

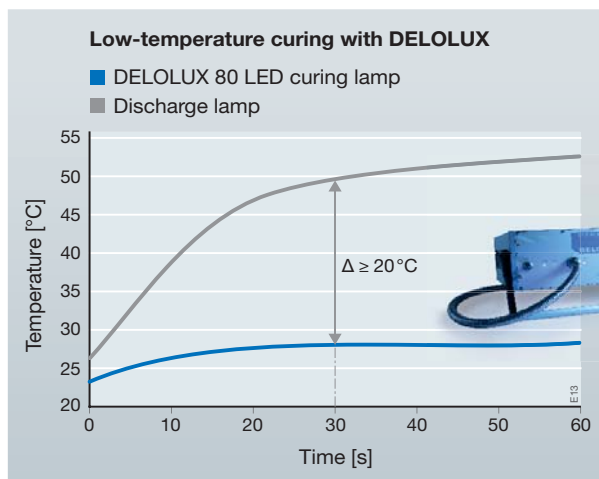
Low-temperature curing with DELOLUX LED lamps

Light-curing adhesives can be cured at room temperature, making them ideal for components that require precise positioning, and a low thermal load capacity.

For opaque components, DELO offers a range of products that can be heat-cured from just +80°C on.




Our DELOLUX LED curing lamps work in perfect harmony with our light-curing adhesives, and deliver the proper UV wavelengths that target the adhesive's photo initiators. This combination creates the strongest possible bonds in the shortest amount of time. As a result, with the DELOLUX LED curing lamps manufacturers do not need to be concerned about emitting unnecessary radiation that can heat up substrates and inhibit a strong bond.






- Shortest curing times thanks to ideal LED lamp – adhesive match
- Less heat results in better accuracy
- Significantly lower outgassing from organic components due to less heat generation
- Bond strength as high as with discharge lamp curing



Temperature development of a PC lens under a discharge lamp with 60 mW/cm² and under the DELOLUX 80 LED curing lamp

Adhesives for Lens Bonding | Material Selection Guide

Product	Product group	DELO KATIOBOND	DELO KATIOBOND	DELO DUALBOND	
	Product code	OB642	OB678	OB749	
General	Basis	epoxy	epoxy	epoxy	
	Color	transparent	transparent	white translucent	
Application	Lens / reflector	✓	✓	✓	
	Lens / encapsulant	✓	✓		
	Lens / substrate	✓	✓	✓	
	Reflector / substrate			✓	
	Cover glass / frame	✓	✓	✓	
	Frame / substrate			✓	
	Cover glass / substrate	✓	✓	✓	
	Special properties	Fast curing	●●	●●	●
High T _g		●●●	●●●	●●	
Optically clear in thin layers		●●●	●●●	●	
Low yellowing at +120°C		●●●	●●●	●●●	
Low outgassing		●●●	●●●	●●●	
High shear strength at +100°C		●●	●●●	●●●	
Halogen-free according to IEC 61249-2-21					
Curing	Curing mechanism	UV/VIS light 320 – 440 nm	UV light 320 – 380 nm	UV/VIS light or heat 320 – 440 nm	
	Min. curing time @ 55 mW/cm ²	6 s	5 s	9 s	
	Heat curing time	–	–	60 min @ +80°C 30 min @ +100°C 10 min @ +150°C	
Values	Viscosity [mPas]	9,500	60,000	13,000	
	Tensile strength [MPa]	46	37	41	
	Elongation at tear [%]	2	2	0.9	
	Young's modulus [MPa]	2,000	1,700	5,200	
	Glass transition temperature T _g [°C] rheometer	+136	+118	+116	
	Shore hardness	D 81	D 80	D 81	
	Water absorption [%]	0.7	0.3	0.1	
	Volume shrinkage [%]	4	4	2.2	
	Refractive index	1.53	1.52	1.51	
	Compression shear strength [MPa]	glass/glass	23	15	25
		PC/PC	9	12	8
		glass/PC	6	4	7
		PMMA/PMMA	10	6	9
		glass/PMMA	6	3	not determined
glass/LCP		6	6.5	5	
glass/FR4		12	12	16	
FR4/FR4		not determinable	not determinable	12	
Al/Al	not determinable	not determinable	38		
Die shear strength [MPa]	glass/ceramic	12	19	21	

DELO DUALBOND	DELO PHOTOBOND	DELO PHOTOBOND	DELO DUALBOND	DELO MONOPOX
OB787	PB437	GB368	AD340	MK040
epoxy	acrylate	acrylate	mCD	epoxy
white	transparent	transparent	beige	black
✓	✓	✓	✓	✓
	✓	✓		
✓	✓	✓	✓	✓
✓			✓	✓
✓	✓	✓	✓	✓
✓			✓	✓
✓	✓	✓	✓	✓
•	•••	••	•••	•
••	••	••	•	•••
•	•••	•••	product is beige	product is black
•••	•	••	product is beige	product is black
•••	•	••	••	•••
•••	•	•	•	•••
				
UV/VIS light 320 – 440 nm	UV/VIS light 320 – 420 nm	UV/VIS light 320 – 420 nm	UV light and heat 320 – 400 nm	heat
9 s	6 s	15 s	1 – 5 s (fixing time)	–
60 min @ +80 °C 30 min @ +100 °C 10 min @ +150 °C	–	–	30 min @ +80 °C 10 min @ +100 °C 3 min @ +150 °C	30 min @ +100 °C 3 min @ +150 °C
150,000	8,000	5,700	12,000	25,000
39	21	20	11	50
0.8	110	17	4	1.4
5,700	520	900	400	3,400
+154 DMTA	+114	+102	+68	+126
D 92	D 65	D 67	D 52	D 84
0.1	1.0	0.5	0.5	0.2
2.1	9	7	3.1	2.4
1.51	1.5	1.51	not determined	not determined
20	31	23	23	38
13	22	6	36	6.5
5	14	7	9	not determined
10	9	15	3	7
8	8	16	2	not determined
6	5	8	7	15
14	25.5	22.5	not determined	39
6	not determinable	not determinable	32	65
25	not determinable	not determinable	15	29
17	25	30	24	45

AD = ADhesive GB = Glass Bonding OB = Optical Bonding PB = PHOTOBOND MK = MONOPOX Klebstoff



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02/17

Adhesives

Dispensing

Curing

Consulting

DELO