

Potting Compounds and Encapsulants

Reliable Protection
of Components



The perfect adhesive for any potting or encapsulation

The Perfect Product for Your Potting or Encapsulation Project

	Rigid potting compounds and encapsulants	
Application focus	Dam & fill, glob top	✗
	Partial encapsulation	✗
	Full encapsulation	✗
	Large-volume potting	✓
Application example (encapsulants represented in magenta in all illustrations)		
Number of components/chemical basis	1C anhydride	2C anhydride
Curing	 heat, light fixation optional	 heat
Product group	DELO MONOPOX DELO DUALBOND	DELO-DUOPOX
Product features	<ul style="list-style-type: none"> high reliability excellent media and temperature resistance 	<ul style="list-style-type: none"> high reliability long processing time at room temperature
Temperature of continuous use [°C]	up to +250	+180
Min. curing temperature [°C]	+100 resp. +120 (DELO DUALBOND)	+130
Shortest curing time	20 min (+180 °C)	20 min (+150 °C)
Coefficient of linear expansion CTE [ppm/K]	11 to 60	18 to 35
Glass transition temperature T _g [°C]	+150 to +200	+165 to +180
Young's modulus [MPa]	8,000 to 12,000	6,000 to 8,000
Elongation at tear [%]	< 1	< 1
Media resistance	+++	++
Transparency possible	✓	✗
Purity	<ul style="list-style-type: none"> halogen-free low outgassing 	<ul style="list-style-type: none"> low outgassing
Details	P. 4/5	P. 6



DELO offers high-tech adhesives tailored to meet the specific needs of any industrial application.

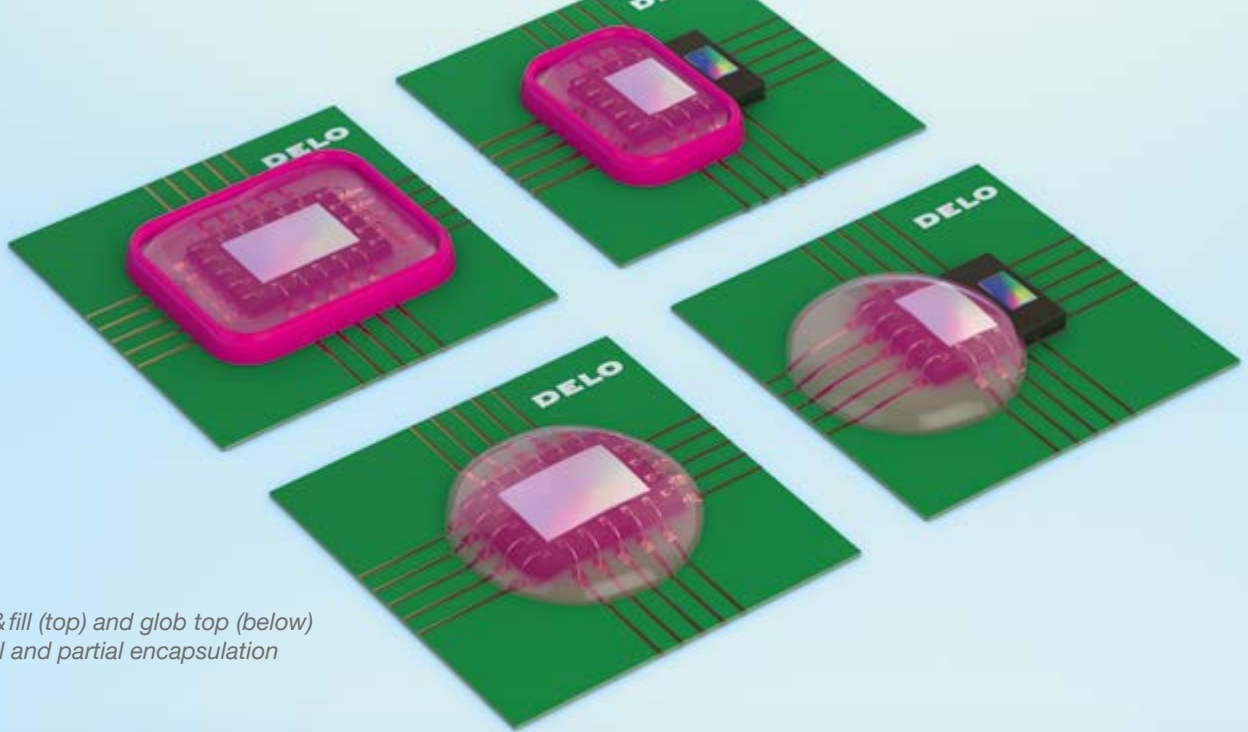
Our wide range of products allows us to satisfy any requirement.

Light-curing, heat-curing, or dual-curing, soft or hard, transparent or black – DELO has the ideal adhesive for any potting and encapsulation process.

Dr. Karl Bitzer, Head of Product Management



Encapsulants	Permanently flexible potting compounds and encapsulants		
✓	✗	✗	✗
✓	✗	✓	✓
✓	✗	✓	✗
✓	✓	✗	✗
1C epoxy	2C epoxy	1C epoxy	1C acrylate
light and/or heat	room temperature, heat optional	light and/or heat	light, light and heat, or light and humidity
DELO KATIOBOND DELO DUALBOND DELO MONOPOX	DELO-DUOPOX	DELO KATIOBOND DELO DUALBOND	DELO PHOTOBOND DELO DUALBOND
<ul style="list-style-type: none"> fast curing 	<ul style="list-style-type: none"> curing at room temperature large containers easy transport and storage 	<ul style="list-style-type: none"> fast curing long processing time 	<ul style="list-style-type: none"> curing within seconds immediate final strength
+180 to +200	+180	+150	+150
+80 or light curing	room temperature	+80 or light curing	+110 or light curing
< 10 s	5 min (+80 °C)	< 10 s	< 10 s
13 to 52	80 to 280	200 to 300	approx. 200
+130 to +200	room temperature up to +80	-40 to +50	-60 to +100
3,000 to 23,000	20 to 1,500	10 to 1,000	1 to 500
< 2	5 to 70	10 to 120	150 to 500
++	+	+	+
✗	✓	✓	✓
<ul style="list-style-type: none"> RoHS-compliant low outgassing 	<ul style="list-style-type: none"> unfilled possible 	<ul style="list-style-type: none"> halogen-free RoHS-compliant unfilled 	<ul style="list-style-type: none"> halogen-free RoHS-compliant unfilled
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*Dam & fill (top) and glob top (below)
for full and partial encapsulation*

Heat-curing Encapsulants for Chips and Sensors

Unique combination of high reliability and outstanding processing properties

It is essential that electronic components, such as chips and sensors, work properly in the most diverse fields of application, even under extreme conditions. Sensors used, for example, to check the oil level or pressure must be highly resistant to aggressive media and elevated temperatures. Specifically for such applications, we

have developed encapsulants based on anhydride-curing epoxy resins, featuring outstanding media and temperature resistance. The optimized flow behavior and various curing options of these adhesives provide additional benefits in terms of efficient production processes.

Application areas

- Automotive, e.g. sensor encapsulation
- Power electronics, e.g. rectifiers
- Industry, e.g. print heads
- Consumer electronics, e.g. sensor encapsulation
- Medical technology

Customer's benefits

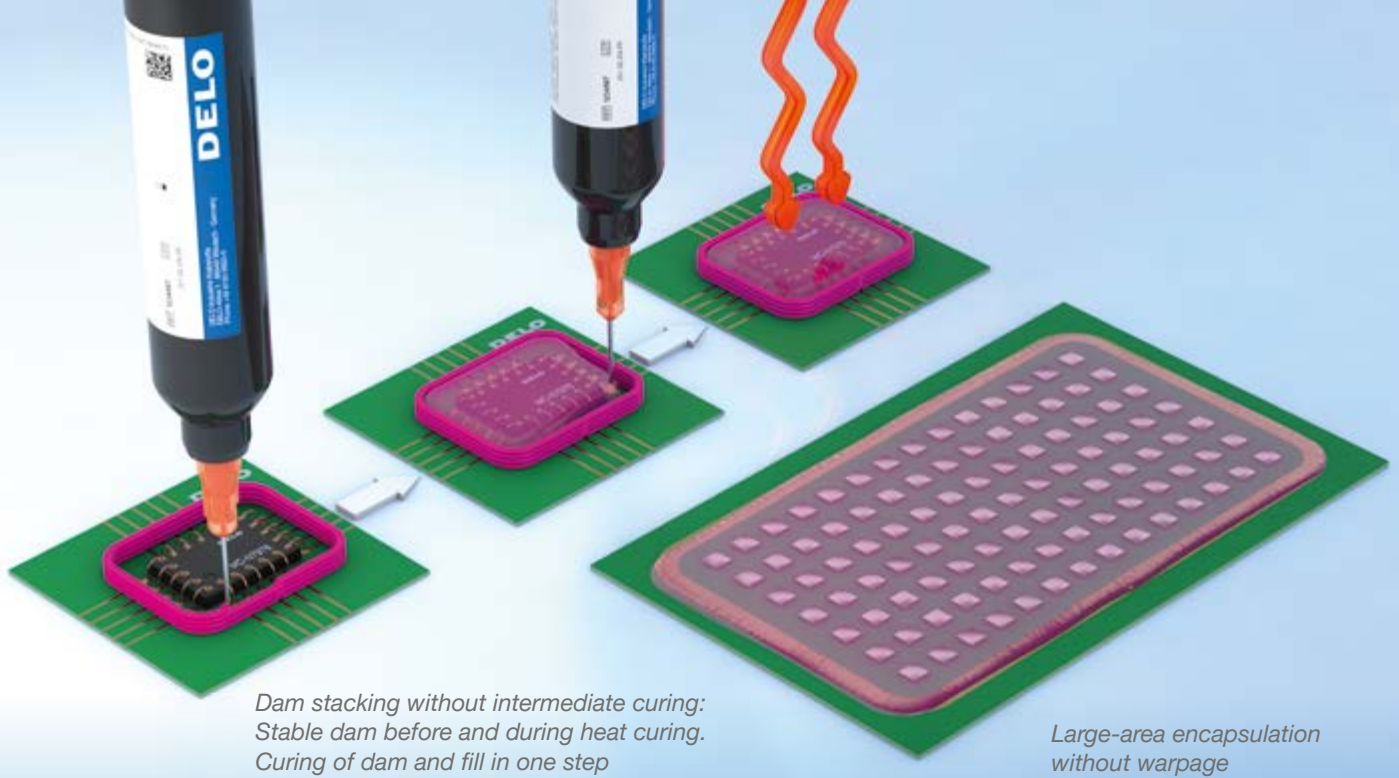
- Flowability adjusted to your application, e.g. stable dam and flowable fill
- Excellent properties for partial and full encapsulation
- Dam and fill curing in one step for an efficient production process
- Variable curing parameters (fast curing or low curing temperature) for optimized processes

Product properties

- 1C anhydrides and 1C epoxy (DELO MONOPOX, DELO DUALBOND)
- Color: Black (transparency and coloring possible)
- Temperature of use ranging from -65 to +180 °C or +250 °C, respectively
- Very low CTE (11 – 60 ppm/K) for minimum warpage and reduced stress on the components
- Excellent resistance to media and temperatures



Material selection guides
"Adhesives for Automotive Sensors"
"Encapsulants"

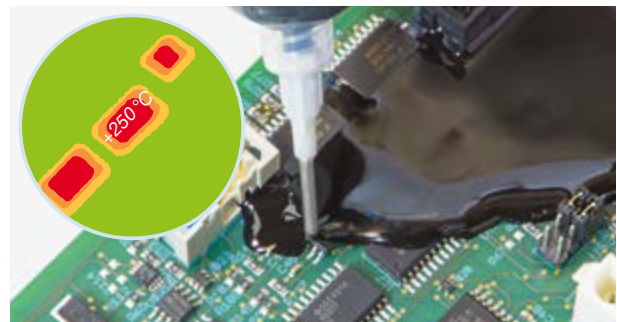


*Dam stacking without intermediate curing:
Stable dam before and during heat curing.
Curing of dam and fill in one step*

*Large-area encapsulation
without warpage*

High temperature resistance up to +250 °C

- Temperature of use ranging from -65 to +250 °C
- Very good temperature resistance and temperature stability
- Very good bond strength



Encapsulant lasts and protects up to +250 °C

Light fixation in seconds

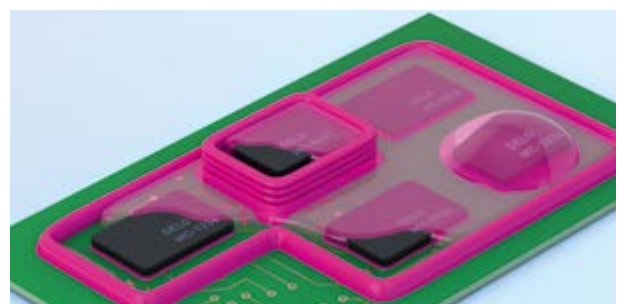
- Fast and reliable processes: Fixation within seconds, easy handling of the fixed components, final curing by heat (e.g. 30 min at +150 °C)
- Defined, highly accurate encapsulation in tiny spaces (no flowing)
- Viscosities available for different applications (e.g. glob top, bonding, dam)



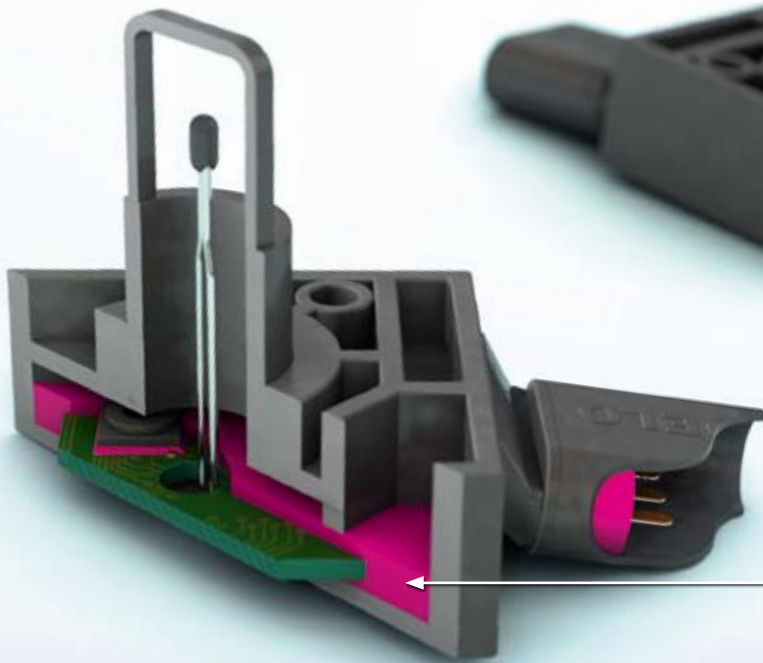
*Defined glop top encapsulation within seconds
(left during curing, right after curing)*

Delicate structures and large-area encapsulation

- Efficient protection of the individual components
- Small-sized fillers for narrow wire spacing and cavities
- Dam: Stack of fine adhesive beads featuring high flow resistance and an aspect ratio of up to 2.5
- Fill: Good flow behavior combined with a low CTE



*Large-area encapsulation without warpage
High flow resistance with a stack of fine adhesive beads*



*Encapsulation of a pressure sensor (TMAP)
for the automotive industry*

Heat-curing Compounds for Large-scale Encapsulation

Safe and reliable protection of sensors

The automotive sector, in particular, makes high demands on encapsulants regarding excellent resistance to media such as petrol, diesel or oil as well as to temperatures. The two-component heat-curing DELO-DUOPOX CR

types (CR = Casting Resin) clearly meet these requirements and stand out with excellent flow properties and rapid curing in an air convection oven as well as simple logistics.

Application areas

- Sensors, e.g. for the automotive industry
- General industrial electric and electronic products
- Machinery and equipment industry

Product properties

- 2C anhydrides (DELO-DUOPOX CR)
- Black, opaque even in thin layers
- Curing at +130 to +180 °C
(e.g. 20 min at +150 °C in an air convection oven)
- Very low CTE (18 – 35 ppm/K) for minimum warpage and reduced stress on the components
- Very good media resistance
(e.g. to fluids in vehicles, harmful gases)
- Very good temperature resistance
- Good adhesion to plastic and metal

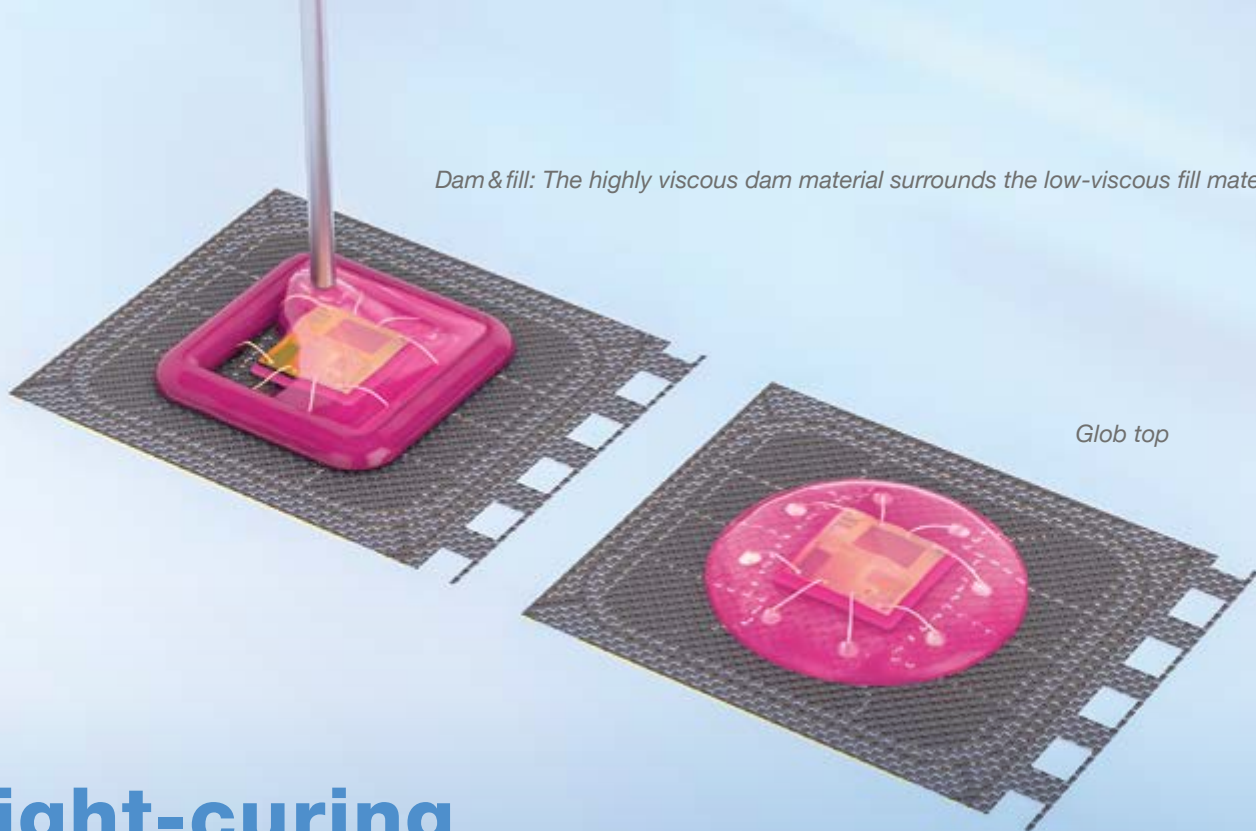
Customer's benefits

- Reduced assembly size:
The adhesive's outstanding media resistance allows electronic components to be directly installed in units (e.g. in a gearbox in the ATF)
- Flexible processing options:
 - ▶ Manual processing or (fully) automated processes
 - ▶ Excellent flow properties for easy dispensing and short cycle times
 - ▶ Flow behavior adjustment by heating the components in the system
- Economic packaging and logistics thanks to larger containers, easy and cost-efficient transport, and storage at room temperature



Material selection guides
"Adhesives for Automotive Sensors"
"Encapsulants"

Dam & fill: The highly viscous dam material surrounds the low-viscous fill material



Glob top

Light-curing Chip Encapsulants

Defined encapsulation to protect electronic components

The light-fixable one-component epoxy resins are primarily used when bonded or encapsulated components are exposed to extreme temperatures and aggressive media. Brief light fixation enables greater bonding

accuracy, a defined fillet, and easier handling of the fixed components. Glob top encapsulation additionally allows “freezing the shape”, since the skin formed prevents the compound from flowing during subsequent heat curing.

Application areas

- Polymeric protection system
- Encapsulation, coating, and mounting of microelectronics
- Smart cards

Product properties

- 1C epoxy (DELO KATIOBOND, DELO DUALBOND, DELO MONOPOX)
- Color: Variable
- Very low CTE (13 – 52 ppm/K) for minimum warping and reduced stress on the components
- Very good media and temperature resistance
- Low outgassing

Customer's benefits

- Short cycle times thanks to
 - ▶ Light curing within seconds (DELO KATIOBOND)
 - ▶ Light fixation, fast and reliable curing at low temperatures from +80 °C even in shadowed areas (DELO DUALBOND)
- Simple processing
- Long processing time (> 5 days) at room temperature
- Availability in large containers (up to 10 kg) makes packaging and logistics economical

Glob top encapsulation



Material selection guide
“Encapsulants”

Encapsulation of electronic circuit carriers to protect its individual components

Flexible Compounds for Large-volume Encapsulation

Simple processing at room temperature

DELO-DUOPOX two-component encapsulants distinguish themselves by easy processing, energy-efficient curing,

and simple logistics. Different hardener systems provide diverse product properties.

Application areas

- Sensors, e.g. for the automotive industry
- General industrial electric and electronic products
- Machinery and equipment industry

Product properties

- 2C epoxy (DELO-DUOPOX)
- Color: Yellowish translucent, black
- Curing at room temperature or accelerated curing at +60 to +80 °C (e.g. 1 h at +80 °C in air convection oven)
- Reactivity ranging from fast curing to long processing time for large volumes
- From flexible and tension-equalizing to tough-hard
- Very good media resistance (e.g. to fluids in vehicles, harmful gases)
- Good adhesion to plastic and metal

Customer's benefits

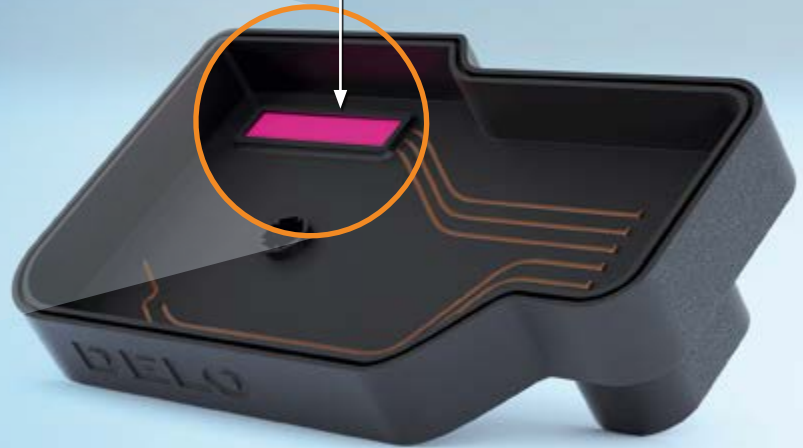
- Simple, economic processing at room temperature
- Flexible processing options:
 - ▶ Manual processing or (fully) automated processes
 - ▶ Excellent flow properties for easy dispensing and short cycle times
 - ▶ Flow behavior adjustment by heating the components in the system
- Simplified component design: Sealing of status LEDs or similar components in clear or translucent colors allows additional components to be dispensed with
- Economic packaging and logistics thanks to larger containers, easy and cost-efficient transport, and storage at room temperature



Material selection guides
"Adhesives for Automotive Sensors"
"Encapsulants"



Fixing and encapsulating of Hall sensors in cars



Encapsulation of Sensors

Fixation within seconds for rapid further processing

DELO KATIOBOND and DELO DUALBOND, the flexible and light-fixable one-component epoxy resins, protect sensors and other electronic components reliably against

thermal influences, media, and vibrations, while still enabling cycle times < 10 s.

Application areas

- Sensor encapsulation, e.g. Hall sensor (see figure)
- Sealing of sensors
- Encapsulation of control electronics or other electronic components

Product properties

- 1C epoxy (DELO KATIOBOND, DELO DUALBOND)
- Color: Yellowish, transparent
- Light fixation in < 10 s for immediate further processing, curing to final strength within 24 h (DELO KATIOBOND) or accelerated heat-curing within a few minutes (DELO DUALBOND)
- Flexible and tension-equalizing, even in case of thermal stress
- Good media resistance (e.g. to oil, petrol, brake fluid, salt spray test)
- Good temperature resistance
- Dry surface

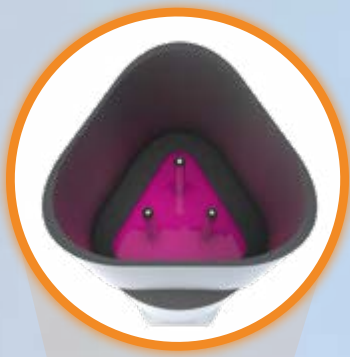
Customer's benefits

- Short cycle times thanks to light fixation within seconds with DELOLUX LED lamps
- Process reliability thanks to reliable curing in shadowed areas at only +120 °C
- A convenient processing time of several days or weeks at room temperature simplifies the production process
- Improved functionality: Reliable protection of components against thermal influences, media, and vibrations



Material selection guides
"DELO DUALBOND"
"Adhesives for Automotive Sensors"

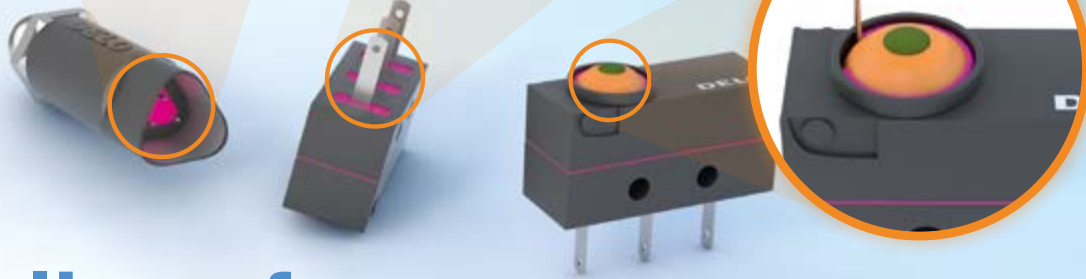
Plugs:
Reliable pin
sealing



Microswitches:
Pin sealing



Microswitches:
Pushbutton sealing,
bonding of housings,
pin sealing



Sealing of Switches and Plugs

Curing within seconds ensures short cycle times

DELO PHOTOBOND and DELO DUALBOND, the light-curing one-component acrylates, guarantee reliable sealing of microswitches and plugs, fixation of electronic components, and bonding of housing parts.

Fast bonding processes combining short cycle times and reliable process control are particularly important for applications in the automotive sector.

Application areas

- Sensors
 - Microswitches
 - Plugs
- e.g. for the automotive industry

Product properties

- 1C acrylate (DELO PHOTOBOND, DELO DUALBOND)
- Color: Variable, fluorescence optional
- Light-curing in < 10 s, immediate final strength
- Highly flexible and tension-equalizing
- Good temperature resistance

Customer's benefits

- Direct quality control (in-line quality control) saves time and costs
- Ideal for fully automated production lines
- No thermal stress applied to components
- Process reliability thanks to reliable curing in shadowed areas (curing in the presence of heat or humidity, depending on the product)
- Optimally suited for hybrid and plastic bonding

Sealing of microswitches,
e.g. for the automotive industry



Material selection guide
"Sealing of Electromechanical
Components"

Curing within Seconds with DELOLUX

DELOLUX LED lamps are the leading technology when it comes to fast curing and allow optimal adjustment to the adhesive used. They have a high energy efficiency and can achieve a service life of more than 20,000 hours, which is significantly higher than that of conventional

discharge lamps. For optimal curing, the wavelengths are adjusted to the adhesive properties. The lamps stand out for their low power consumption and allow the lamp power to be set individually. All these additional features guarantee cost-efficient production processes.



LED lamp

DELOLUX 80

DELOLUX 20
DELOLUX 202
Version: A1 / A2

DELOLUX 820

Description	High-intensity area lamp for small bonding areas	High-intensity area lamp for homogeneous irradiation	Area lamp for homogeneous irradiation
Light exit area	365 nm: 23.0 mm dia. 400 nm: 23.0 mm dia. 460 nm: 16.9 mm dia.	DELOLUX 20: 100 mm × 100 mm DELOLUX 202: 202 mm × 49 mm	×4: 848 mm × 30 mm ×6: 1,250 mm × 30 mm
Wavelength / typ. intensity	365 nm: ≥ 4,000 mW/cm ² 400 nm: ≥ 5,500 mW/cm ² 460 nm: ≥ 2,500 mW/cm ²	365 nm (A1): ≥ 600 mW/cm ² 365 nm (A2): ≥ 1,200 mW/cm ² 400 nm (A1): ≥ 1,000 mW/cm ² 400 nm (A2): ≥ 2,000 mW/cm ² 460 nm (A1): ≥ 1,000 mW/cm ² 460 nm (A2): ≥ 2,000 mW/cm ²	365 nm: ≥ 250 mW/cm ²
Reliability	Intensity measurement with DELOLUXcontrol		



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..... www.DELO-adhesives.com

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