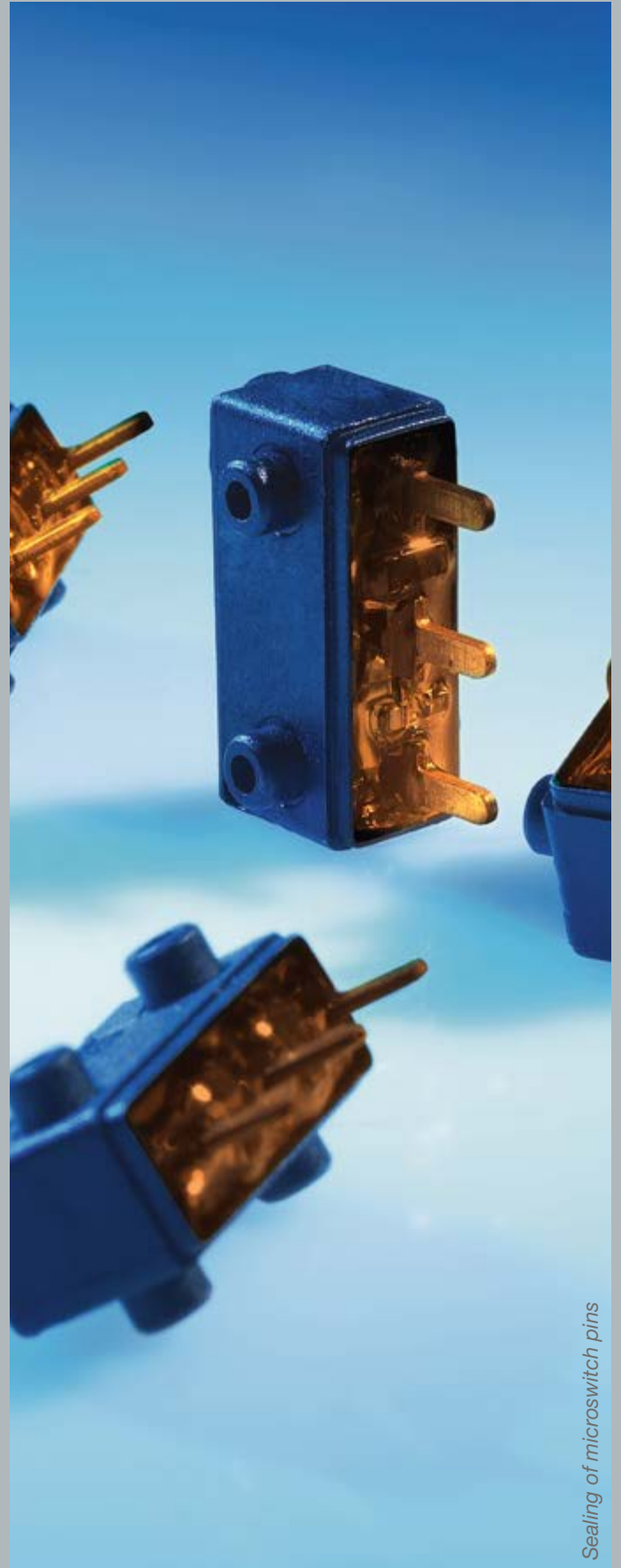


Bonding in Electronics

Design Examples
and Product Range



Sealing of microswitch pins

Bonding and fixing

Bonding of stator to housing



DELO®-ML DB135

- Very high impact resistance
- Excellent media resistance (for example to oil, gasoline, Diesel)
- Normal temperature range of use up to +356 °F (+180 °C)
- Tension-equalizing: High-strength bonding of metals with dissimilar coefficients of expansion
- Immediate initial strength by light fixation; anaerobic curing of adhesive in shadowed areas



Bonding of a steel stator to an aluminum housing (© ebm-papst)

Bonding of magnets to stator



DELO® MONOPOX

(various structural adhesives)

- Excellent media resistance
- Very high temperature stability
- High static and dynamic loading capacity even at elevated temperatures
- Ideal for bonding metals, temperature-resistant plastics, ferrite and ceramic
- Is used, e.g., in motors produced by the DLR (German Aerospace Center)



Magnets bonded to a stator of space motors (© DLR) for the ISS International Space Station (© NASA)

Bonding of rotor to shaft



DELO®-ML DB133

- High impact resistance
- Excellent media resistance
- Tension-equalizing with an elongation at tear of 130 %
- Ideal for laminar bonding
- Immediate initial strength by light fixation; anaerobic curing of adhesive in shadowed areas



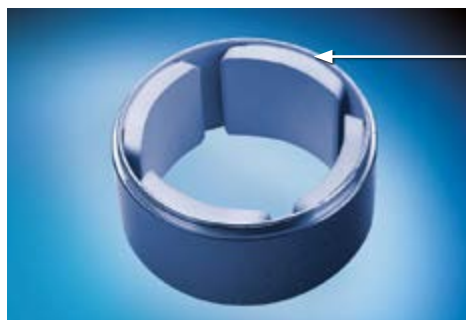
High-strength bonding of a rotor package to a shaft

Bonding of magnets into stator housing



DELO® MONOPOX HT2860

- High temperature stability
- Gap-filling
- Excellent media resistance (for example to oil, gasoline, brake fluid)
- Normal temperature range of use up to +428 °F (+220 °C)
- High static and dynamic loading capacity



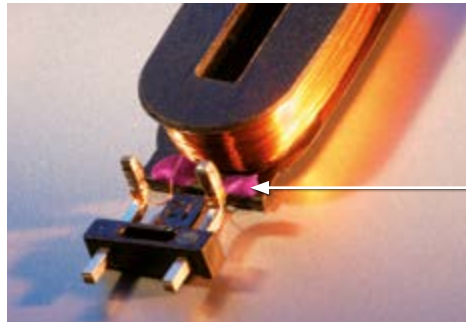
Bonding of magnets into the stator housing of an electric motor

Fixing of coil wires



DELO® PHOTOBOND® 4497

- Dry surface
- Tension-equalizing with an elongation at tear of 200 %
- Functionality: Additional mechanical protection, for example during vibration or subsequent molding



Fixing of coil wires of coil carriers (adhesive colored magenta to indicate the bonding area)

Fixing of ferrites in coils



DELO® MONOPOX GE2710

- Excellent flow behavior: Adhesive capillates through the windings
- Outstanding adhesion to lacquered coil wire and ferrite
- Process reliability: Reliable fixing for further processing during the assembly process
- Also suitable for potting



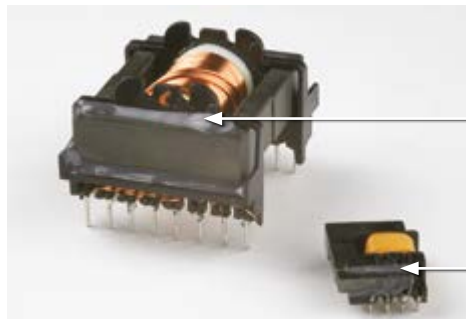
Fixing of ferrites in coils
Top: Shorter after application, the adhesive is still visible
Bottom: The adhesive capillates through the windings

Fixing of ferrites and coil bodies



DELO-DUOPOX® FR898

- High-strength construction adhesive
- Excellent media resistance
- Quality: Good strength of the assembly during mechanical stress
- Functionality: Reduction of mechanical vibrations and associated noise development
- Multi-purpose
- Easy processing from side-by-side cartridges
- UL 94 V-0, E467212 (Yellow Card)



Fixing of ferrites and coil bodies

Fixing of a diode



DELO®-CA 2153

- Good filling of gaps up to 7.9 mil (0.2 mm)
- Accelerated curing in combination with DELO®-QUICK 2002 activator
- Multi-purpose for rubber, plastic and metal bondings
- Good adhesion to the nickel-plated surface
- Production reliability: Steady viscosity enables constant production parameters



Fast fixing of a diode in the housing of an optical converter

Bonding and fixing

Bonding of coils

1C epoxy 40 min @ 356 °F pasty viscosity

DELO® MONOPOX SJ2981

- Run-resistant
- Normal temperature range of use up to +392 °F (+200 °C)
- Good strength on laminated copper foil and aramid foil
- High stability and strength even upon high magnetic forces



Bonding of coils for high current transformers
Top: Adhesive between the copper windings and the foil
Bottom: Fixture of the coil body on the aluminum cooling plate

Vibration protection on PCBs

2C poly-urethane A+B 2h initial strength pasty viscosity

DELO®-PUR 9694

- Run-resistant
- High static and dynamic loading capacity
- Functionality: Optimal vibration damping
- Multi-purpose
- Easy processing from side-by-side cartridges



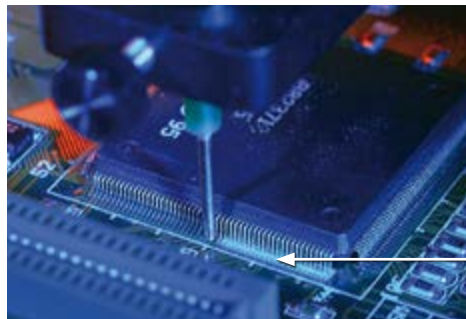
Vibration protection of soldered electronic components, for example capacitors

Securing of soldered contacts

1C epoxy UV 22s 63 P viscosity

DELO® KATIOBOND® 45952

- High peel resistance
- High corrosion resistance
- Perfect solution: Preactivation enables bonding of opaque components
- Production reliability: Application control by fluorescent adhesive
- Prolonged lifetime: Reliable protection from desoldering and shocks



Securing of soldered contacts of electronic components, such as CSP or QFP

Fixing of SMD components

1C epoxy 20 min @ 266 °F pasty viscosity

DELO® MONOPOX EG2596

- Low outgassing
- High corrosion resistance
- Processing on standard systems: Jetting, dispensing from cartridge, screen printing
- Suitable for high-speed processes (more than 30,000 drops/h)



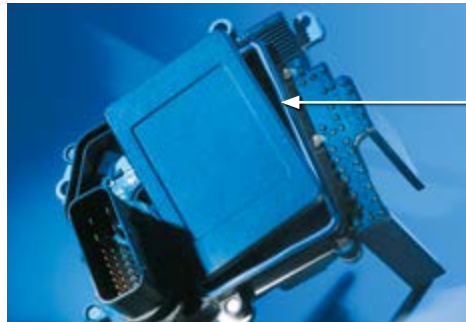
Fixing of SMD components, especially of melfs or glass SMD components

Bonding of PBT cover and housing



DELO® MONOPOX GE2710

- Good media resistance (for example to oil, gasoline)
- Excellent vibration resistance
- Very high resistance to elevated temperatures and thermal cycling test
- Multi-purpose for various plastics (such as ABS, PA, PBT)



Bonding of the cover to the housing of an automotive control unit

Bonding of displays



DELO® PHOTOBOND® LA4880

- Curing on demand
- Preactivated adhesive cures without further irradiation by humidity at room temperature
- Dry surface
- Highly flexible, soft
- Good peel resistance
- Initial strength after 1 – 2 minutes
- Final strength after 72 h



Display frame bonding in the Center Information Display

YouTube

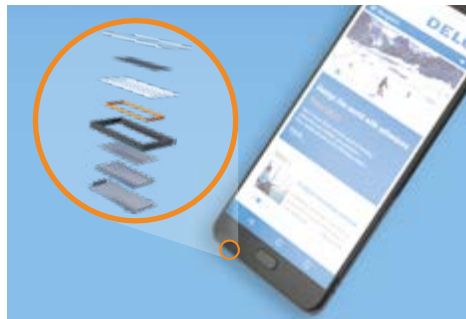


Bonding of mini speakers



DELO® PHOTOBOND® UB4086

- Temperature range of use up to +302 °F (+150 °C)
- High temperature stability
- High impact resistance and flexibility
- Production reliability: Application control by fluorescent adhesive
- Quality: Loudspeakers bonded with DELO® PHOTOBOND® are characterized by excellent acoustic quality



Bonding of mini speaker components for mobile phones

Bonding of automotive cameras



DELO DUALBOND® AD345, OB786

- Good resistance to temperature, climatic changes, humidity and in salt spray test
- Production capacity: Short cycle times by light fixation in less than 1 s
- Optimized process flow: Heat curing at only +176 °F (+80 °C) allows the use of temperature-sensitive materials and ensures the maintenance of the adjusted optical system
- Process reliability: Steady, low shrinkage delivers high yield



Bonding of automotive camera modules for camera-based driver assistance systems (adhesive colored magenta)

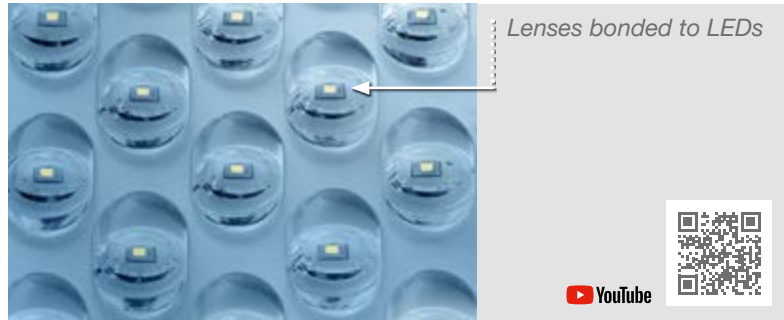
Bonding and fixing

Bonding of LED reflectors and lenses



DELO® KATIOBOND® OB642

- Optically clear
- High yellowing resistance
- High temperature stability
- Low outgassing
- Suitable for reflow processes
- High reliability: For example for the use in headlights, flash lenses and backlighting applications

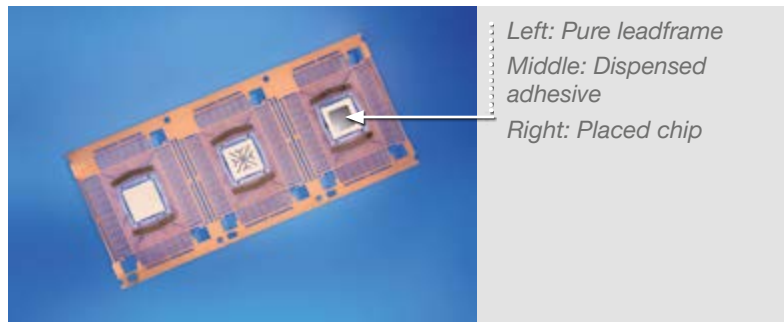


Die attach



DELO® MONOPOX DA255

- High temperature resistance up to +500 °F (+260 °C)
- Fast curing in seconds with a thermode, for example 6 s @ +356 °F (+180 °C)
- Low-tension curing
- Optimized products for many chip sizes



Flip-chip bonding



DELO® MONOPOX AC268

- Good humidity resistance
- High ion purity, high corrosion resistance
- Fast curing in seconds with a thermode, for example 6 s @ +356 °F (+180 °C)
- Multi-purpose (for example on PET, paper, FR4, PI, Cu, Al, Ag, Au)
- Anisotropic non-conductive product variants available

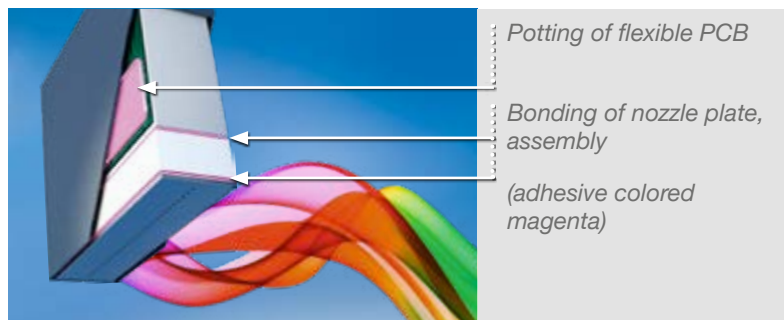


Bonding inkjet print heads



DELO® MONOPOX GE6585 (Dam), GE6525 (Fill), DELO DUALBOND® OB787 DELO® KATIOBOND® DI6049

- Excellent media resistance (for example to aggressive inks)
- Minimization of tensions by low CTE and curing from +176 °F (+60 °C)
- High bonding accuracy by light fixation
- Small fillers possible
- Viscosity can be set



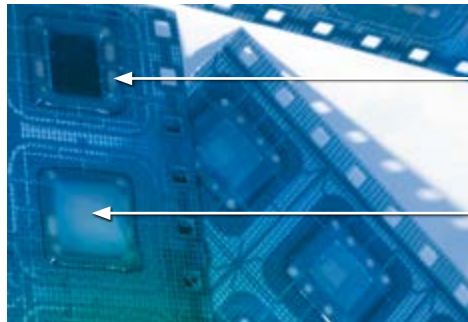
Potting and coating

Dam & Fill chip encapsulation



DELO® KATIOBOND® DF698 (Dam), 4670 (Fill)

- High production capacity: Encapsulation of up to 40,000 modules/h (glob top; Dam & Fill: 20,000)
- Dam & Fill adhesives form a chemically homogeneous unit
- Functionality: High ion purity and strengths ensure the chip function over the entire lifetime
- Quality: Steady dispensing results even when using showerhead dispensers



Dam & Fill smart card modules

The circumferential, high-viscous dam encloses the low-viscous fill

Opaque Dam & Fill chip encapsulation



DELO® DAM&FILL®

- Production capacity: Short cycle times thanks to very fast curing
- Absolutely opaque even in thin layers; very high mechanical protection effect
→ Protection of the chip from unauthorized views, chip removal and copying



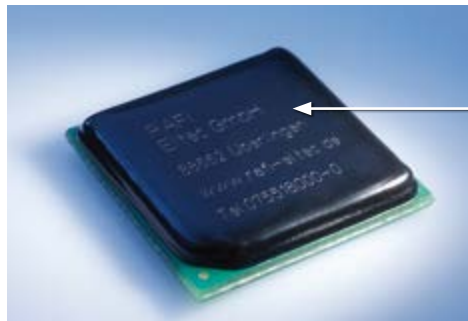
Black Dam & Fill chip encapsulation – absolutely opaque even in thin layers

Chip-on-board encapsulation on PCB



DELO® MONOPOX GE785 (Dam), GE725 (Fill)

- Excellent media resistance (for example to Diesel, oil, grease)
- Temperature range of use from –85 °F to +356 °F (–65 °C to +180 °C) (modifications up to +482 °F [+250 °C])
- Resistance to lead-free soldering
- Universal adhesion to standard substrates (such as FR4, PA, PPS)
- Variable curing parameters: Fast curing or low curing temperature possible



*Chip-on-board encapsulation
(© RAFI Eltec GmbH)*

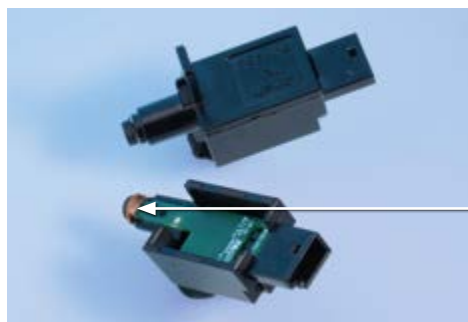


Potting of PCBs in sensor heads



DELO®-ML DB136

- Low-viscous for good flowing into the sensor head
- Normal temperature range of use from –76 °F to +356 °F (–60 °C to +180 °C)
- Tension-equalizing
- Immediate initial strength (after 5 s) by light fixation; anaerobic curing of adhesive in shadowed areas
- Production reliability: Application control by fluorescent adhesive



Potting of a PCB in a copper sensor head of a temperature sensor

Potting and coating

Sealing of electronic housings

1C
silicone

2mm
/24h

low-
viscous

DELO®-GUM

- Neutral crosslinking
- High flexibility from -58 °F to +356 °F (-50 °C to +180 °C)
- Tension-equalizing
- Low water absorption
- High corrosion resistance
- Excellent for microelectronic applications



Fixing / sealing of a PCB
in a housing (© viaSonic)

Sealing of microswitch pins

mod. 1C
acrylate

UV

20 P
viscosity

DELO DUALBOND® GE4910

- Excellent flow and wetting behavior
- Reliable curing in shadowed areas
- Tension-equalizing
- High flexibility even at low temperatures down to -40 °F (-40 °C)
- Very good adhesion to metal and plastic
- Production capacity: Short cycle times thanks to very fast curing within seconds
- Longer lifetime: Resistance to humidity and thermal shock



Sealing of switches,
for example for the
automotive industry



YouTube

Potting of sensor PCB

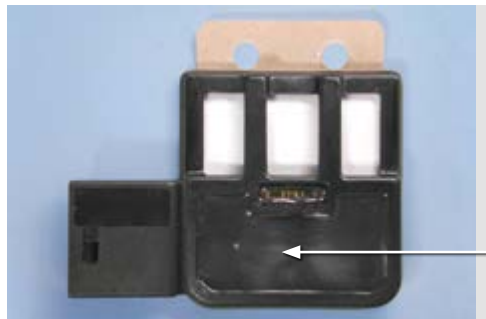
2C poly-
urethane

A+B
1.5h
initial strength

800 P
viscosity

DELO®-PUR 9691

- Tough-elastic
- Flowable, suitable for small potting applications
- Normal temperature range of use from -40 °F to +257 °F (-40 °C to +125 °C)
- High static and dynamic loading capacity
- Easy processing from side-by-side cartridges



Potting of a PCB of a
window hygrometer

Potting of electronic connectors

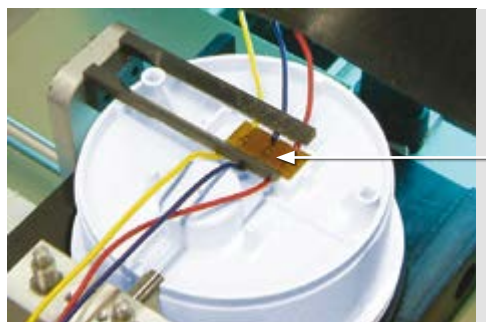
1C epoxy

UV
15s

12 P
viscosity

DELO® KATIOBOND® 4552

- High glass transition temperature T_g
- Good flow behavior
- Production capacity: Short cycle times thanks to very fast curing in seconds
- Suitable for rigid bonding and sealing



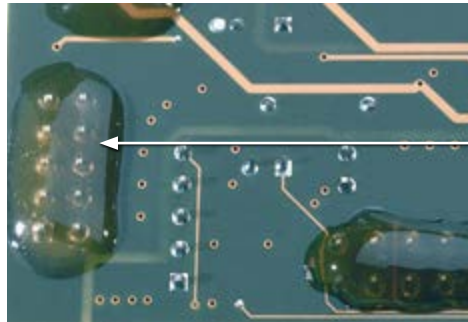
Potting and sealing of
soldered connection
contacts in the cavity of
indication instruments

Corrosion protection of soldered contacts



DELO® KATIOBOND® KB554

- High resistance to thermal cycling test
- High corrosion resistance
- Production reliability: Application control by fluorescent adhesive
- Increased operational reliability and prolonged lifetime: Excellent wetting of the soldered contact



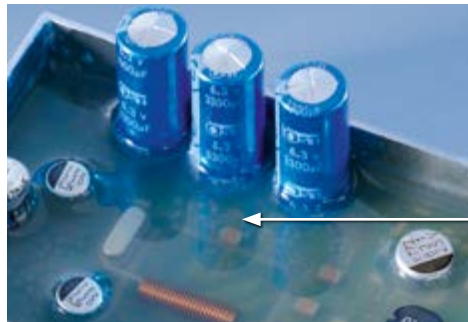
Corrosion protection of soldered contacts, for example on PCBs

Potting of circuit carriers



DELO-DUOPOX® CR8021

- Good flow behavior
- Low shrinkage
- Aging-resistant, permanently flexible
- Low water absorption
- High creep resistance and dielectric strength
- Multi-purpose in mechanical engineering, electrical engineering and electronics
- Easy processing from side-by-side cartridges



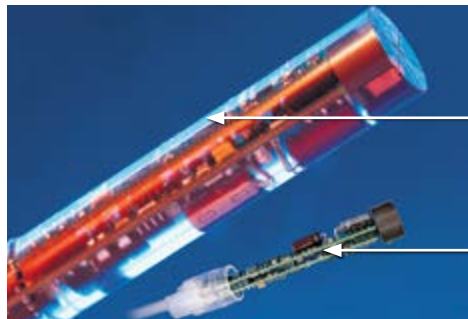
Potting of electronic circuit carriers

Potting of electronic sensor elements



DELO-DUOPOX® CR8014

- Low-viscous for good flowing around the electronic assemblies
- Normal temperature range of use from -40° to +284 °F (-40 °C to +140 °C)
- Tension-equalizing
- Aging-resistant, permanently flexible
- Bubble-free potting thanks to low viscosity
- Suitable for large potting volumes



Potting of electronic elements in a safety sensor

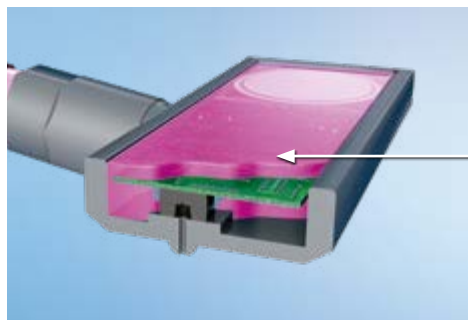
*Top: potted
Bottom: bare*

Sensor potting



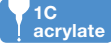



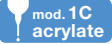
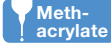







Various DELO-DUOPOX® DB adhesives

- Fast initial strength by light fixation (10 – 60 s)
- Low-viscous for good flowing around the electronic assemblies
- Low shrinkage
- Aging-resistant, permanently flexible
- Tension-equalizing
- Multi-purpose in mechanical engineering, electrical engineering and electronics



Potting of various sensors and sealing of pins (adhesive colored magenta)

DELO®'s adhesives for the electronics industry at a glance












	DELO® PHOTOBOND®	DELO® KATIOBOND®	DELO DUALBOND®	DELO®-ML
Basis	 1C acrylate  1C polymer	 1C epoxy	 mod. 1C epoxy  mod. 1C acrylate	 Meth-acrylate
Curing	 8s  UV-curing, light-curing, preactivated. Special product variants are dual-curing: light-curing and humidity-curing	 9s UV-curing, UV-/light-curing, preactivated	  Dual-curing: light-curing and heat- or humidity-curing depending on the product	 2-4 min  Anaerobic-curing, for example in 2 – 4 min (accelerated curing by DELO®-QUICK activator). Special product variants are dual-curing: anaerobic-curing and light- or UV-curing
Application areas	<ul style="list-style-type: none"> ▪ Automotive ▪ Mobile phones ▪ Displays ▪ Optoelectronics ▪ Smart labels ▪ Printed circuit boards 	<ul style="list-style-type: none"> ▪ Automotive ▪ Mobile phones ▪ Displays ▪ Optoelectronics ▪ Organic electronics ▪ Smart cards ▪ Printed circuit boards 	<ul style="list-style-type: none"> ▪ Automotive ▪ Mobile phones ▪ Displays ▪ Optoelectronics ▪ Photovoltaics ▪ Printed circuit boards 	<ul style="list-style-type: none"> ▪ Automotive ▪ Electric motors ▪ Magnet bonding
Special features *	<ul style="list-style-type: none"> ▪ Extremely fast curing ▪ High equalization of tensions ▪ High peel resistance ▪ High optical clearness and UV resistance ▪ Universally good adhesion ▪ Bonding of opaque components by preactivation 	<ul style="list-style-type: none"> ▪ High thermal and media resistance ▪ Low outgassing ▪ Optically clear and yellowing-resistant even at elevated temperatures ▪ High ion purity ▪ Low corrosion potential ▪ High barrier effect against water ▪ Bonding of opaque components by preactivation 	<ul style="list-style-type: none"> ▪ Secondary curing mechanism for reliable curing in shadowed areas ▪ Depending on the product, heat curing mandatory after light fixation 	<ul style="list-style-type: none"> ▪ Anaerobic- and light-curing, one-component adhesives ▪ Excellent adhesion to metal ▪ Good adhesion even to certain plastics ▪ Tension-equalizing and impact-resistant

* The strong points show in which areas the product groups are particularly efficient.
Depending on the product, these strong points may differ.

Satisfied customers

AAC - American Audio Components Ltd., ABM Greiffenberger Antriebstechnik GmbH, Amphenol-Tuchel Electronics GmbH, Barun Electronics Co., Ltd., BSH Bosch und Siemens Hausgeräte GmbH, ContiTemic microelectronic GmbH, Daimler AG, DLR Deutsche Forschungsanstalt für Luft- und Raumfahrt, ebm-papst GmbH & Co. KG, Festo KG, Goertek Electronics Co.,

Ltd., Honeywell AG, Huawei Technologies Co., Ltd., Infineon Technologies AG, Knowles Electronics Austria GmbH, Leopold Kostal GmbH & Co. KG, Preh GmbH, Robert Bosch GmbH, Siemens AG A&D MC, TRW Airbag Systems GmbH, Tyco Electronics AMP GmbH, ZF Electronics GmbH, Zollner Elektronik AG, and many more...

DELO® MONOPOX	DELO-DUOPOX®	DELO®-PUR	DELO®-GUM	DELO®-CA
				
 Heat curing, depending on the product in the range from +140 to +356 °F (+60 to +180 °C)	  At room temperature after mixing resin and hardener, for example initial strength after 5.5 h (products with fixation times from 15 min to 8 h available). Special product variants are light-fixable (light fixation in 10 s – 60 s)	 At room temperature after mixing resin and hardener, for example initial strength after 1.5 h (products with fixation times from 30 min to 7 h available)	 By air humidity at room temperature, for example 2 mm/24 h	 By air humidity at room temperature, for example initial strength after 30 s (accelerated curing by DELO®-QUICK 2002 activator)
<ul style="list-style-type: none"> ▪ Automotive ▪ Electric motors ▪ Magnet bonding ▪ Smart labels ▪ Smart cards ▪ Printed circuit boards ▪ Microelectronic packaging ▪ Potting 	<ul style="list-style-type: none"> ▪ Automotive ▪ Electric motors ▪ Tool and plant construction ▪ Printed circuit boards ▪ Potting 	<ul style="list-style-type: none"> ▪ Automotive ▪ Electric motors ▪ Tool and plant construction ▪ Printed circuit boards ▪ Potting 	<ul style="list-style-type: none"> ▪ Automotive ▪ Electric motors ▪ Tool and plant construction ▪ Printed circuit boards ▪ Potting 	<ul style="list-style-type: none"> ▪ Automotive ▪ Tool and plant construction ▪ Printed circuit boards
<ul style="list-style-type: none"> ▪ High thermal and media resistance ▪ High strength even at elevated temperatures ▪ Good adhesion to many metals and plastics ▪ Wide property variety, for example high T_g, low CTE, curing at low temperatures from +140 °F (+60 °C) 	<ul style="list-style-type: none"> ▪ High thermal and media resistance ▪ High shear strength on metal and certain plastics ▪ Partly excellent peel resistance on smooth surfaces ▪ Products with dissimilar curing speeds available 	<ul style="list-style-type: none"> ▪ High strength and good elasticity ▪ High peel resistance ▪ Products with dissimilar curing speeds available 	<ul style="list-style-type: none"> ▪ Permanently flexible ▪ Very good aging resistance ▪ Very wide temperature range of use 	<ul style="list-style-type: none"> ▪ Especially for fast fixing of components ▪ Universal adhesion to metals, ceramic, many plastics and elastomers

Numeric product key

AC = Anisotropic Conductive
AD = ADhesive
CR = Casting Resin
DA = Die Attach
DB = Dual Bonding
DF = Dam & Fill
DI = Dual Initiator
FR = Flame-Retardant

LA = Light-Activated
GE = General Encapsulant
HT = High Temperature
KB = KATIOBOND
OB = Optical Bonding
SJ = Structural Joining
UB = Universal Bonding

All products are

- solvent-free
- compliant with RoHS Directive 2015/863/EU



Many products are halogen-free according to or by the criteria of IEC 61249-2-21. Details can be found in the specific technical data sheet.





CONTACT

DELO Industrial Adhesives
Headquarters

► **Germany** • Windach/Munich



- **China** • Shanghai
- **Japan** • Yokohama
- **Malaysia** • Kuala Lumpur
- **Singapore**
- **South Korea** • Seoul
- **Taiwan, China** • Taipei
- **Thailand** • Bangkok
- **USA** • Sudbury, MA

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

The data and information provided are based on tests performed under laboratory conditions. Reliable information about the behavior of the product under practical conditions and its suitability for a specific purpose cannot be concluded from this. It is the customer's responsibility to test the suitability of a product for the intended purpose by considering all specific requirements and by applying standards the customer deems suitable (e.g. DIN 2304-1). Type, physical and chemical properties of the materials to be processed with the product, as well as all actual influences occurring during transport, storage, processing and use, may cause deviations in the behavior of the product compared to its behavior under laboratory conditions. All data provided are typical average values or uniquely determined parameters measured under laboratory conditions. The data and information provided are therefore no guarantee for specific product properties or the suitability of the product for a specific purpose. Nothing contained herein shall be construed to indicate the non-existence of any relevant patents or to constitute a permission, encouragement or recommendation to practice any development covered by any patents, without permission of the owner of this patent. All products provided by DELO® are subject to DELO®'s General Terms of Business. Verbal ancillary agreements are deemed not to exist.

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01/21

ADHESIVES

DISPENSING

CURING

CONSULTING

DELO