Photoinitiated-curing epoxy resins

Product group / curing class		DELO DUALBOND UV-/light-/heat-curing			DELO KATIOBOND light-activated, UV-/light-curing			
Product code		**AD761**	**OB749**	**OB786**	**4552**	**KB554**	**4594**	**45952**
Application area	B = bonding, S = sealing, C = coating	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C
Color cured product	in 0.1 mm layer thickness	yellowish clear	white translucent	milky translucent	brown clear	yellow fluorescent	brown milky	brown milky fluorescent
	in 1.0 mm layer thickness	yellowish translucent	milky translucent	milky	brown clear	yellow fluorescent	brown milky	brown milky fluorescent
Density [g/cm³]	DELO Standard 13 at room temperature (+73 °F [+23 °C])	1.14	1.48	1.60	1.10	1.10	1.10	1.10
Viscosity [cP = mPas]	rheometer Anton Paar at room temperature (+73 °F [+23 °C])	7,300	n. d.	n. d.	1,200	1,500	5,000	6,000
Curing / irradiation		UV or visible light from 320 to 420 nm or with heat	UV or visible light from 320 to 440 nm or with heat	UV light from 320 to 380 nm or with heat	← UV or visible light from 320 to 550 nm →			
Recommended preactivation time [s] LED 460 nm, intensity 200 mW/cm², DELOLUXcontrol	DELO Standard 19	–	–	–	3	7	3	8
Minimum irradiation time [s] LED lamp, intensity: 200 mW/cm², DELOLUXcontrol	DELO Standard 37	8	6	4	12	21	10	21
Recommended irradiation time [s] LED lamp, intensity: 200 mW/cm², DELOLUXcontrol		30	20	n. d.	60	60	60	60
Curing time with heat [min] without heating time of the components, at +266 °F (+130 °C)		5	15	10	–	–	–	–
Curing time until final strength [h]		← 24 →						
Curable layer thickness [mm]	DELO Standard 20	2	0.6	0.76	> 4	> 4	> 4	> 4
Compression shear strength DELO Standard 5 after 24 h at room temperature (≈ +73 °F [+23 °C])	glass / glass	2,900 psi [1] (20 MPa)	2,900 psi [1] (20 MPa)	2,900 psi [1] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)
	glass / Al	2,900 psi [1] (20 MPa)	2,900 psi [1] (20 MPa)	2,900 psi [1] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)
	glass / FR4	2,900 psi [1] (20 MPa)	2,900 psi [1] (20 MPa)	2,900 psi [1] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)	2,900 psi [2] (20 MPa)
	glass / LCP	435 psi [1] (3 MPa)	n. d.	290 psi [1] (2 MPa)	1,015 psi [2] (7 MPa)	1,015 psi [2] (7 MPa)	1,305 psi [2] (9 MPa)	870 psi [2] (6 MPa)
	glass / PBT	725 psi [1] (5 MPa)	n. d.	290 psi [1] (2 MPa)	2,175 psi [2] (15 MPa)	1,885 psi [2] (13 MPa)	1,595 psi [2] (11 MPa)	1,015 psi [2] (7 MPa)
	PC / Al	870 psi [1] (6 MPa)	n. d.	n. d.	870 psi [2] (6 MPa)	1,015 psi [2] (7 MPa)	1,160 psi [2] (8 MPa)	1,450 psi [2] (10 MPa)
	PC / PC 400 nm	290 psi [1] (2 MPa)	5,220 psi [1] (36 MPa)	5,655 psi [3] (39 MPa)	5,365 psi [2] (37 MPa)	1,595 psi [2] (11 MPa)	4,205 psi [2] (29 MPa)	2,175 psi [2] (15 MPa)
Tensile strength	by the criteria of DIN EN ISO 527 after 24 h at room temperature (≈ +73 °F [+23 °C])	3335 psi (23 MPa)	5,945 psi (41 MPa)	4,930 psi (34 MPa)	3,480 psi (24 MPa)	2,320 psi (16 MPa)	4,495 psi (31 MPa)	4,350 psi (30 MPa)
Elongation at tear [%]	by the criteria of DIN EN ISO 527 after 24 h at room temperature (≈ +73 °F [+23 °C])	84	0.9	0.9	3	45	4	86
Young's modulus	DMTA, 2nd run	145 ksi (1,000 MPa)	n. d.	1,087.8 ksi (7,500 MPa)	261.1 ksi (1,800 MPa)	174 ksi (1,200 MPa)	333.6 ksi (2,300 MPa)	159.5 ksi (1,100 MPa)
Shore hardness D	by the criteria of DIN EN ISO 868 after 24 h at room temperature (≈ +73 °F [+23 °C])	58	81	92	58	51	69	44
Glass transition temperature T_g	DMTA, 2nd run at room temperature (≈ +73 °F [+23 °C])	+118 °F (+48 °C)	+309 °F (+154 °C)	+354 °F (+179 °C)	+307 °F (+153 °C)	+109 °F (+43 °C)	+273 °F (+134 °C)	+102 °F (+39 °C)
Coefficient of linear expansion [ppm/K] DELO Standard 26, TMA	α_1	86 (–40 °F to +14 °F) (–40 °C to –10 °C)	44 (+86 °F to +158 °F) (+30 °C to +70 °C)	38 (+86 °F to +176 °F) (+30 °C to +80 °C)	120 (+104 °F to +129 °F) (+40 °C to +54 °C)	209 (+86 °F to +302 °F) (+30 °C to +150 °C)	123 (+86 °F to +131 °F) (+30 °C to +55 °C)	200 (+86 °F to +293 °F) (+30 °C to +145 °C)
	α_2	201 (+104 °F to +302 °F) (+40 °C to +150 °C)	97 (+293 °F to +347 °F) (+145 °C to +175 °C)	53 (+266 °F to +302 °F) (+130 °C to +150 °C)	173 (+266 °F to +324 °F) (+130 °C to +162 °C)	n. d.	175 (+230 °F to +338 °F) (+110 °C to +170 °C)	n. d.
Shrinkage [vol. %]	DELO Standard 13 at room temperature (+73 °F [+23 °C])	3.0	2.2	1.6	3.7	3.8	3.9	3.8
Water absorption [weight %]	by the criteria of DIN EN ISO 62 after 24 h at room temperature (≈ +73 °F [+23 °C])	0.3	0.1	0.08	1.15	1	1	0.9
Specific volume resistance [Ωcm]	VDE 0303, part 3	> 1×10^{13}	n. d.	n. d.	> 1×10^{13}	> 1×10^{13}	> 1×10^{13}	> 1×10^{13}
Surface resistance [Ω]	VDE 0303, part 3	> 1×10^{13}	n. d.	n. d.	> 1×10^{13}	> 1×10^{13}	> 1×10^{13}	> 1×10^{13}
Dielectric constant	1 MHz	3.5	n. d.	n. d.	3.9	4.0	3.9	4.3
	1 GHz	3.0	n. d.	n. d.	3.2	3.2	3.2	3.2

[1] Curing: combination of light and heat
[2] Curing: light
[3] Curing: heat
n. d. = not determined

AD = **AD**hesive **KB** = **K**ATIO**B**OND **OB** = **O**ptical **B**onding

Product description

DELO® KATIOBOND® and DELO DUALBOND® are one-component, solvent-free adhesives based on epoxy resins.
DELO® KATIOBOND® and DELO DUALBOND® are cured to their initial strength in seconds by irradiating them with UVA or visible light (VIS). The products of both adhesive families cure to final strength even after removing the light source.
DELO DUALBOND® products can also be cured by heat addition. This is advantageous where the adhesive cannot be reached by light at all or only insufficiently, e. g., in shadowed areas. Both curing mechanisms can be used independently.

Standard temperature range

DELO® KATIOBOND® and DELO DUALBOND® products are normally used in a temperature range of –40 °F to +302 °F (–40 °C to +150 °C).
Many product properties depend on the temperature and can change permanently, in particular at high temperatures. Therefore, it has to be checked before each use whether a certain adhesive is suitable for the temperatures in the required area of application.
Please see the Technical Data Sheet for more information on how our products react to temperatures.

Processing

The products are normally delivered ready for use. They are applied directly from the container or using dispensing units.

Curing

DELO® KATIOBOND® products require an irradiation time of 5 – 60 s. To reach initial strength, we recommend an irradiation time of 15 – 60 s. Longer irradiation times, higher intensities or higher temperatures accelerate curing. The adhesive cures to final strength at room temperature without further irradiation.
Preactivation method for one opaque component: light-activated DELO® KATIOBOND® adhesives are typically activated with short irradiation times of 2 – 6 s. The adhesive remains liquid within an open time of 10 – 30 s so that a second component can be joined. Then, the adhesive cures to final strength at room temperature.
UV-curing DELO® KATIOBOND® products become gel-like very quickly when being irradiated and can virtually not be preactivated. In addition to light curing, DELO DUALBOND® products can also be cured in areas not accessible to light by heat addition. After adhesive dispensing or joining, the components are heated to at least +176 °F (+80 °C). DELO DUALBOND® products cure in 5 min at the preferred temperature of +266 °F (+130 °C). The light and heat curing mechanisms can be used independently as well as in combination. Thus, it is possible to light-cure the DELO DUALBOND® adhesives fast in the areas accessible to light and heat-cure them afterwards to reliably cure shadowed areas.
The curing, preactivation and open times mentioned are based on tests according to DELO® Standards with defined techniques, equipment and specimens. The irradiation times can deviate accordingly in practice. They can be particularly influenced by irradiation intensity and temperature when using certain components. The curing time decreases with increasing temperature and / or irradiation intensity. The preactivation and open times also decrease accordingly.
DELO® KATIOBOND® and DELO DUALBOND® have a completely dry surface after curing. Therefore, they can also be used for casting and coating applications.

Surface pretreatment

To achieve optimum bond strength, the surfaces must be free from dust, oil, grease, separating agents and other contaminations. Highly alkaline surfaces can inhibit adhesive curing – resulting in an only moderate build-up of adhesion.
Adhesion can be improved by suitable pretreatment methods, such as sand blasting, flaming and plasma or corona treatment.

Storage life

After delivery, in the unopened original container:
see Technical Data Sheet of the product.

Further information

More type-specific properties are included in the Technical Data Sheets, Material Safety Data Sheets and Instructions for Use.
For application tests and any question you might have regarding the use of DELO® products, please do not hesitate to contact our Engineering Department.
Please also refer to the DELO® PHOTOBOND® Selection Chart.
DELO® PHOTOBOND® are also photoinitiated, one-component and solvent-free adhesives. Contrary to the cationic-curing epoxies DELO® KATIOBOND®, DELO® PHOTOBOND® are based on radical-curing acrylate resins and can be very quickly cured until final strength by UVA or visible light (VIS).

Curing of photoinitiated adhesives

Curing with UV light or visible light in the specific wavelength range. DELOLUX® LED curing lamps are especially suitable as per the chart below.

All standard DELOLUX® HID lamps are also suitable. For preactivation, only visible light in a wavelength range from 400 to 550 nm can be used.

Lamp type	DELOLUX® 80, DELOLUX® 50 and 502, DELOLUX® 20 and 202		
	365	400	460
DELO DUALBOND® AD761	++	+	–
DELO DUALBOND® OB749	++	+	–
DELO DUALBOND® OB786	++	–	–
DELO® KATIOBOND® 4552	+*	+	++
DELO® KATIOBOND® KB554	+*	+	++
DELO® KATIOBOND® 4594	+*	+	++
DELO® KATIOBOND® 45952	+*	+	++

++ especially suitable + suitable – not suitable * suitable only for direct irradiation, preactivation not possible

Product selection

Application area	Potting / encapsulation Coating	Bonding of UVA- and VIS-permeable materials	Bonding of VIS-permeable materials	Bonding of opaque materials	Bonding, potting, encapsulation, coating with reliable curing in shadowed areas
Products	DELO® KATIOBOND®, DELO® PHOTOBOND®	DELO® KATIOBOND®, DELO® PHOTOBOND®	Light-activated DELO® KATIOBOND®, light-curing DELO® PHOTOBOND®	Light-activated DELO® KATIOBOND®, light-activated humidity-curing DELO® PHOTOBOND® LA	DELO DUALBOND®
Processing suggestion	Application ↓ Irradiation	Application ↓ Joining ↓ Irradiation		Application ↓ Preactivation ↓ Joining	Application ↓ Joining ↓ Irradiation and / or heat or air humidity

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▶ **Singapore**
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▶ **Taiwan** · Taipei
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ADHESIVES DISPENSING CURING CONSULTING DELO

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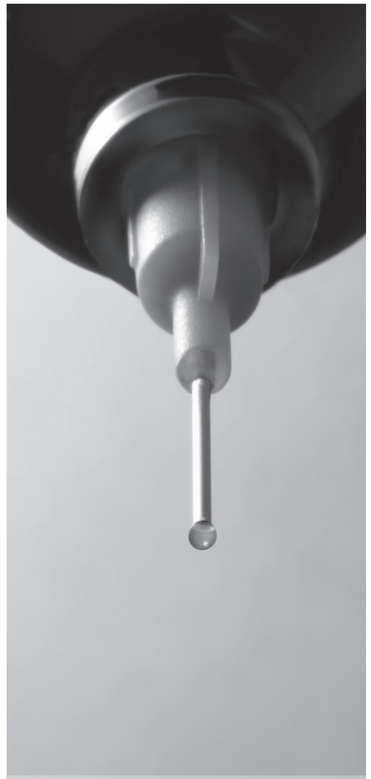

SELECTION CHART

DELO® KATIOBOND®

Epoxy resins
one-component · light-activated · UV- / light-curing

DELO DUALBOND®

Epoxy resins
one-component · UV- / light- / heat-curing