

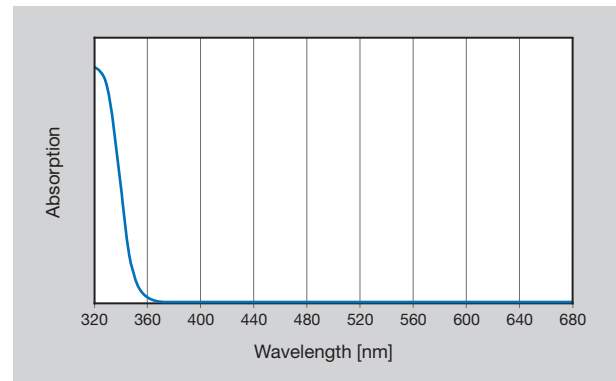
Photoinitiated-curing adhesives		DELO®-DUALBOND light- and heat-curing		DELO®-KATIOBOND® light-activated, UV/VIS-curing							DELO®-KATIOBOND® UV-curing			
Product code number		DB777	4552	KB554	4557	4578	4591	4594	45952	4597	AD640	4670	DF698	AD610
Application area (B = bonding, S = sealing, C = coating)		B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	B/S/C	S/C	S/C	B/S/C
Color cured product	in 0.1 mm layer thickness	yellow	brown clear	yellow fluorescent	brown clear	brown milky	brown milky	brown milky	brown milky fluorescent	brown milky	yellowish transparent, fluorescent	transparent	light gray transparent	clear transparent
	in 1.0 mm layer thickness	yellow	brown clear	yellow fluorescent	brown clear	brown milky	brown milky	brown milky	brown milky fluorescent	brown milky	yellowish transparent, fluorescent	light gray translucent	light gray translucent	clear transparent
Density [g/cm³] at room temperature (+23 °C ± +73 °F)		1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.4	1.4	1.1
Viscosity [mPas] (+23 °C ± +73 °F) Brookfield	DIN 54453	37,000 thix (± cP)	1,200 (± cP)	1,500 (± cP)	3,500 (± cP)	12,400 thix (± cP)	23,000 thix (± cP)	32,000 thix (± cP)	32,000 thix (± cP)	48,000 thix (± cP)	9,000 thix (± cP)	4,800 (± cP)	180,000 thix (± cP)	400 (± cP)
Curing/irradiation		UV- and VIS-curing from 400 to 550 nm	← Can be activated with visible light in a wavelength range from 400 to 550 nm →							UV- and VIS-curing from 320 to 440 nm	UV-curing from 320 to 400 nm		UV-curing from 320 to 380 nm	
Preactivation time [s] UVA intensity ³⁾ approx. 55 – 60 mW/cm²	DELO Standard 19	–	3	2	5	2	6	4	5	6	–	–	–	–
Open time after preactivation [s] +23 °C (± +73 °F) + normal room lighting	DELO Standard 19	–	20	27	17	18	17	13	18	16	–	–	–	–
Minimum irradiation time [s] DSC: UVA intensity ³⁾ 55 – 60 mW/cm², +30 °C (± +86 °F)	DELO Standard 37	60	15	24	24	15	15	14	22	24	9	9	17	10
Recommended irradiation time [s] DELOLUX 03 S: UVA intensity ³⁾ 55 – 60 mW/cm²		60	60	60	60	60	60	60	60	60	15	60	60	15
Curing time with heat [min] without heating time of the components, at +130 °C (± +266 °F)		3	–	–	–	–	–	–	–	–	–	–	–	–
Curing time until final strength [h]		← 24 →												
Compression shear strength [MPa] DELO® Standard 5 Irradiation and curing conditions: DELOLUX® 03 S UVA intensity ³⁾ 55 – 60 mW/cm² irradiation time 60 s curing time 24 h at room temperature (approx. +23 °C (± +73 °F))	glass/glass	19 (± 2,755 psi)	24 (± 3,480 psi)	31 (± 4,495 psi)	10 (± 1,450 psi)	27 (± 3,915 psi)	20 (± 2,900 psi)	25 (± 3,625 psi)	30 (± 4,350 psi)	10 (± 1,450 psi)	22 (± 3,190 psi)	35 (± 5,075 psi)	28 (± 4,060 psi)	24 (± 3,480 psi)
	glass/Al	17 (± 2,465 psi)	17 (± 2,465 psi)	22 (± 3,190 psi)	9 (± 1,305 psi)	20 (± 2,900 psi)	15 (± 2,175 psi)	20 (± 2,900 psi)	13 (± 1,885 psi)	10 (± 1,450 psi)	16 (± 2,320 psi)	10 (± 1,450 psi)	12 (± 1,740 psi)	11 (± 1,595 psi)
	glass/FR4	18 (± 2,610 psi)	27 (± 3,915 psi)	21 (± 3,045 psi)	14 (± 2,030 psi)	20 (± 2,900 psi)	19 (± 2,755 psi)	18 (± 2,610 psi)	19 (± 2,755 psi)	11 (± 1,595 psi)	20 (± 2,900 psi)	35 (± 5,075 psi)	23 (± 3,335 psi)	22 (± 3,190 psi)
	PC/Al	7 (± 1,015 psi)	6 (± 870 psi)	6 (± 870 psi)	7 (± 1,015 psi)	4 (± 580 psi)	8 (± 1,160 psi)	6 (± 870 psi)	4 (± 580 psi)	5 (± 725 psi)	4 (± 580 psi)	– ¹⁾	– ¹⁾	– ¹⁾
	PC/PC	14 (± 2,030 psi)	30 (± 4,350 psi)	10 (± 1,450 psi)	18 (± 2,610 psi)	30 (± 4,350 psi)	13 (± 1,885 psi)	28 (± 4,060 psi)	14 (± 2,030 psi)	19 (± 2,755 psi)	6 (± 870 psi)	– ¹⁾	– ¹⁾	– ¹⁾
	PMMA/PMMA	11 (± 1,595 psi)	10 (± 1,450 psi)	5 (± 725 psi)	8 (± 1,160 psi)	10 (± 1,450 psi)	6 (± 870 psi)	10 (± 1,450 psi)	9 (± 1,305 psi)	11 (± 1,595 psi)	10 (± 1,450 psi)	– ¹⁾	– ¹⁾	– ¹⁾
PBT/PBT (with preactivation)	4 ⁴⁾ (± 580 psi)	6 (± 870 psi)	6 (± 870 psi)	9 (± 1,305 psi)	8 (± 1,160 psi)	7 (± 1,015 psi)	9 (± 1,305 psi)	9 (± 1,305 psi)	8 (± 1,160 psi)	–	– ¹⁾	– ¹⁾	– ¹⁾	
PETP/PETP (with preactivation)	2 ⁴⁾ (± 290 psi)	8 (± 1,160 psi)	7 (± 1,015 psi)	10 (± 1,450 psi)	7 (± 1,015 psi)	6 (± 870 psi)	6 (± 870 psi)	8 (± 1,160 psi)	9 (± 1,305 psi)	–	– ¹⁾	– ¹⁾	– ¹⁾	
Tensile strength [MPa]	DIN EN ISO 527	15 ⁵⁾ (± 2,175 psi)	24 (± 3,480 psi)	16 (± 2,320 psi)	6 (± 870 psi)	21 (± 3,045 psi)	8 (± 1,160 psi)	31 (± 4,495 psi)	18 (± 2,610 psi)	4 (± 580 psi)	45 (± 6,525 psi)	30 (± 4,350 psi)	22 (± 3,190 psi)	15 (± 2,175 psi)
Elongation at tear [%]	DIN EN ISO 527	48 ⁵⁾	3	45	10	3	50	4	54	7	3	6	20	5
Young's modulus [MPa]	DIN EN ISO 527	– ²⁾	1,100 (± 159.5 ksi)	100 (± 14.5 ksi)	100 (± 14.5 ksi)	900 (± 130.5 ksi)	– ²⁾	1,200 (± 174 ksi)	– ²⁾	– ²⁾	2,000 (± 290 ksi)	1,700 (± 246.5 ksi)	160 (± 23.2 ksi)	600 (± 87 ksi)
Shore hardness D	according to DIN EN ISO 868	50 ⁵⁾	58	51	29	65	26	69	44	40	65	79	61	69
Glass transition temperature [°C]	rheometer	56 ⁵⁾ (± 133 °F)	130 (± 266 °F)	37 (± 99 °F)	50 (± 122 °F)	132 (± 270 °F)	30 (± 86 °F)	158 (± 316 °F)	44 (± 111 °F)	55 (± 131 °F)	100 (± 212 °F)	62 (± 144 °F)	35 (± 95 °F)	56 (± 133 °F)
Average coefficient of linear expansion [ppm/K]	TMA, in temperature range: +30 °C to +150 °C (± +86 °F to +302 °F)	214 ⁵⁾	158	200	185	154	202	156	196	180	135	150	147	175
Shrinkage [vol. %]	DELO Standard 13	3.4 ⁵⁾	3.7	3.8	2.5	4.1	2.7	3.9	3.8	2.9	3.7	3	2.9	4.6
Water absorption [weight %]	according to DIN EN ISO 62 24 h at approx. +23 °C (± +73 °F)	0.5 ⁵⁾	1.5	1.0	1.2	0.9	0.8	1.0	0.9	1.1	0.3	0.19	0.4	0.4
Specific volume resistance [Ωcm]	VDE 0303, part 3	> 1 x 10 ¹³ ⁵⁾	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹⁰	> 1 x 10 ¹³	> 1 x 10 ¹¹	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹⁰	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹³
Surface resistance [Ω]	VDE 0303, part 3	> 1 x 10 ¹² ⁵⁾	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹⁰	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹³	> 1 x 10 ¹²	> 1 x 10 ¹⁰	> 1 x 10 ¹³	> 1 x 10 ¹²	> 1 x 10 ¹²
Dielectric constant	1 MHz	3.3 ⁵⁾	3.9	4.0	4.8	4.0	3.9	3.9	4.3	4.9	3.7	3.3	3.6	3.7
	1 GHz	3.0 ⁵⁾	3.2	3.2	3.5	3.3	3.3	3.2	3.2	3.6	2.9	3.0	3.3	2.9
Special features of product		fills gaps in shadowed areas the product can be cured by heat light and heat curing mechanism can be used independently	good flow behavior hard composite fast curing	good flow behavior tough-elastic tension-equalizing fast curing	good flow behavior tough-hard	medium-viscous hard composite fast curing	medium-viscous tension-equalizing	fills gaps hard composite fast curing	fills gaps tough-elastic tension-equalizing	fills gaps tough-hard	medium-viscous very fast build-up of adhesion very good chemical resistance low water absorption low ion content very low outgassing	good flow behavior low water absorption very low ion content chip encapsulation compound	very steady low water absorption very low ion content Dam for chip encapsulation compounds	good flow behavior very fast build-up of adhesion transparent low water absorption low ion content

Product description

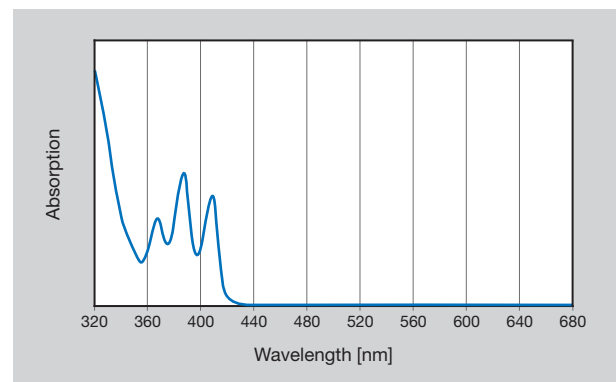
DELO®-KATIOBOND® and DELO®-DUALBOND are one-component, solvent-free adhesives based on epoxy resins. DELO®-KATIOBOND® are cured to their initial strength in seconds by irradiating them with UVA or visible light (VIS). DELO®-DUALBOND products are cured to their initial strength in seconds by irradiating them with visible light. 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 °C to +150 °C (± –40 °F to +305 °F). Many product properties depend on the temperature and can permanently change, especially at high temperatures. Therefore, the suitability of the respective adhesive for the intended temperature range of use must be tested according to the application before use. You can find details on the behavior of the products under the influence of elevated temperatures in the respective technical data sheet.



Absorption spectrum of the photoinitiator of DELO®-KATIOBOND® 4670 and DELO®-KATIOBOND® DF698 in an epoxy resin basic matrix. The absorption spectrum of DELO®-KATIOBOND® AD610 is very similar to the illustrated spectrum as regards quality and is not shown explicitly.



Absorption spectrum of the photoinitiator of DELO®-KATIOBOND® AD640 in an epoxy resin basic matrix.

Processing

The products are usually supplied ready for use and can be processed well from the original container or with dispensing units. You can find more details in the DELO® equipment brochure.

Curing

DELO®-KATIOBOND® products require an irradiation time of 9 – 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.

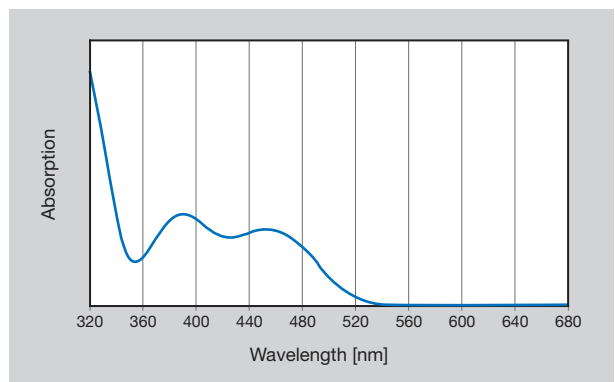
Preactivation method for one opaque component: light-activated DELO®-KATIOBOND® adhesives are typically activated with short irradiation times of 2 – 6 s. The adhesive remains liquid within an open time of 10 – 30 s so that a second component can be joined. Then, the adhesive cures to final strength at room temperature.

UVA-curing DELO®-KATIOBOND® products and DELO®-KATIOBOND® AD640 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 +120 °C (± +248 °F). The heating time of the components should not exceed 15 min. DELO®-DUALBOND products cure in 6 min at +120 °C (± +248 °F) and in 3 min at the preferred temperature of +130 °C (± +266 °F). 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.



Absorption spectrum of the photoinitiator of the light-activated DELO®-KATIOBOND® adhesives in an epoxy resin basic matrix.

¹⁾ No component permeable to UVA light

²⁾ Young's modulus not measurable

³⁾ Intensity meter: DELOLUXcontrol

⁴⁾ Measuring values with heat curing

⁵⁾ Measuring values with combined light and heat curing



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

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

DELO®-PHOTOBOND®	1-component acrylates UV-curing · light-curing
DELO®-KATIOBOND®	1-component epoxies UV-curing · light-activated
DELO®-DUALBOND	1-component epoxies light-curing · heat-curing
DELO®-MONOPOX®	1-component epoxies heat-curing
DELO®-DUOPOX	2-component epoxies cold-curing
DELO®-ML	1-component methacrylates anaerobic-curing
DELO®-CA	1-component cyanoacrylates fast-curing
DELO®-GUM	1-component silicones highly flexible
DELO®-PUR	2-component polyurethanes cold-curing · tough-elastic
DELOTHEN	Cleaners CFC-free
DELOMAT	Dispensing units precise
DELOLUX®	Curing lamps intensive

Our selection charts are a technical selection aid giving an overview of various product variants. We will be pleased to provide you with sales details, such as available container sizes, stock availability and minimum order quantities, on request.

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. Many product properties are dependent on the temperature and can permanently change especially at increased temperatures. It is the user's responsibility to test the suitability of the product for the intended purpose and temperature range by considering all specific requirements. Type and 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.

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Surface pretreatment

For optimal adhesion, the surfaces to be bonded must be free of 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. For the cleaning of glass DELOTHEN EP cleaner has proven to be efficient.

Storage life

Most DELO®-KATIOBOND® and DELO®-DUALBOND products are durable for > 6 months if stored in unopened original container at room temperature.

Some products must be stored at temperatures of 0°C to +10°C (± +32°F to +50°F). You can find detailed information in the technical data sheet.

Further information

You can find more details on type-specific properties in the technical data sheets and material safety data sheets.

Our Engineering Department will be pleased to support you in technical application tests and questions resulting from processing DELO® products.

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 cured by UVA or visible light (VIS).

DELO® curing lamps for photoinitiated-curing adhesives

Lamp type	Radiation exit area	Emission spectrum [nm]	Bulb type	Typical service life [h]
DELOLUX® 03 S; hand-held lamp	212 x 170 mm	325–600	Iron-doped halide high-pressure bulb	1,000
DELOLUX® 04; spot lamp with light guide	Single light guide: Ø 5 mm resp. Ø 8 mm Double light guide resp. fourfold light guide: Ø 3 mm	315–500	halide super-pressure bulb	1,500
DELOLUX® 80 LED light source with Coldguide	Diameter: 23.0 mm 16.9 mm	365 400, 460	LED	20,000

Product selection

Application area	Casting and coating	Bonding of UVA- and VIS-permeable materials	Bonding of VIS-permeable materials	Bonding of opaque materials	Bonding, casting and coating with reliable curing in shadowed areas
Products	All DELO®-KATIOBOND® and DELO®-PHOTOBOND® products	All DELO®-KATIOBOND® and DELO®-PHOTOBOND® products	Light-activated DELO®-KATIOBOND® and light-curing DELO®-PHOTOBOND® products	Light-activated DELO®-KATIOBOND® products	DELO®-DUALBOND products
Processing suggestion	Application ↓ Irradiation	Application ↓ Joining ↓ Irradiation	Application ↓ Preactivation ↓ Joining	Application ↓ Joining	Application ↓ Joining ↓ Irradiation and/or heating