

UV Light Curing Adhesives for Glass, Metal and Plastic Assembly



DYMAX

Discover a Better Solution

BENEFITS OF LIGHT CURING ADHESIVES

Light Curing Adhesives (LCAs) offer significant performance and process cost advantages over other adhesive technologies.

STRONGER BONDS – LCAs form structural bonds to a wide variety of substrates. Bond strengths frequently exceed the strength of materials being bonded.

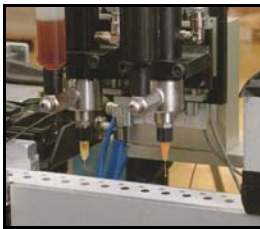
BOND TO DISSIMILAR SUBSTRATES – Because LCAs bond so many different substrates, they are exceptional adhesives for bonding dissimilar materials, something that cannot be done with welding methods and other types of adhesives.

SINGLE COMPONENT FORMULATIONS – Simple dispensing, no mixing, no purging, no pot life issues and no waste.

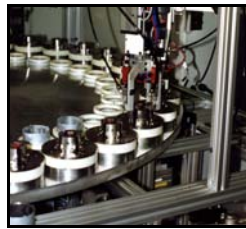
INSTANT CURE – LCAs fully cure in seconds, not minutes or hours. This means simplified automation, reduced work in process, in-line inspection and greater throughput than with any other adhesive process.

BOND ON DEMAND – Dispense adhesives at one point on the production line, assemble substrates at a second point on the line, and cure the adhesives with light at a third point on the line. Design a process to suit your needs and cure when you are ready.

100% SOLVENT-FREE FORMULATIONS – LCAs are 100% reactive. They contain no solvents.



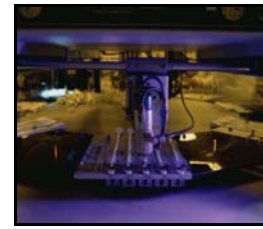
Dispense



Assemble

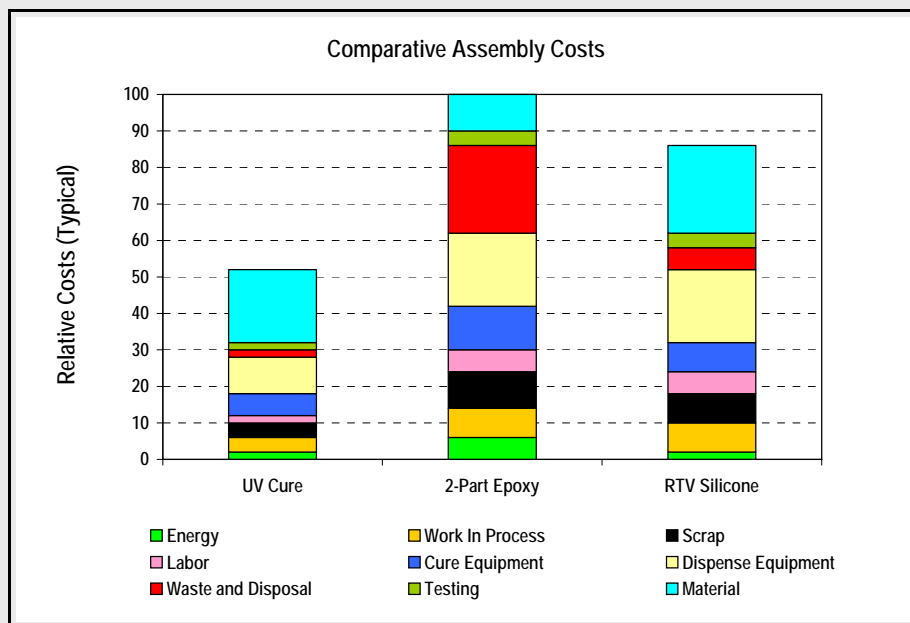


Cure



Inspect

Comparative Assembly Costs for LCAs and Two Other Assembly Technologies



HOW TO CHOOSE THE BEST ADHESIVE FOR YOUR MANUFACTURING PROCESS

A Five Step Adhesive Selection Process

The adhesives featured in this selector guide represent proven products, appropriate for evaluation in many applications. The following steps are offered as a guide to selecting the best adhesive for your application. If one or more of the products listed in this document is not suitable for your application, DYMAX has a library of thousands of other formulations. Contact DYMAX Applications Engineering for other possible candidates.

STEP 1. ADHESION

The first and most basic property that all adhesives must have is good adhesion to the substrates being bonded. Substrate selector guides, pages 4-5 of this document, are a good place to start for choosing candidates.

When only one substrate material is to be bonded (for example, polycarbonate to polycarbonate) the process of selecting a group of adhesive candidates is straightforward. When two different substrates are to be bonded, i.e., acrylic to glass, a range of candidates should be evaluated. After a few adhesion tests (see page 4 of this document), it will be obvious which substrate is more difficult to bond and adhesive choices can be optimized for that substrate.

STEP 2. PHYSICAL PROPERTIES

DYMAX supplies adhesives with a wide range of physical properties. The table on page 6 includes a number of properties important when selecting an adhesive. Since bond and part performance are dependent on adhesive physical properties, it is critical that full consideration be given to the stresses that will be applied to your parts during their expected lifetime. Product Data Sheets include an extensive list of product properties.

STEP 3. VISCOSITY

In choosing a viscosity, consideration should be given to how the adhesive must flow (or not flow) on the part after the adhesive is applied. Part geometry, process design, assembly speed and method should all be considered when selecting a viscosity.

Viscosity is a material's resistance to flow. Low viscosity adhesives flow more readily than high viscosity adhesives. Gels flow very slowly and are recommended when adhesive flow on a part after dispensing must be minimal.

*DYMAX adhesives are available in a variety of viscosities. An intuitive nomenclature is used to identify relative viscosities. The identifiers appear as suffixes on product names: **VLV** = Very Low Viscosity, **LV** = Low Viscosity, **T** = Thick, **VT** = Very Thick, **Gel** = GEL. Standard viscosity products do not have a suffix. In general, all viscosity grades of a particular adhesive offer similar physical properties.*

STEP 4. CURING EQUIPMENT

DYMAX light curing adhesives cure either with ultraviolet (UV) light only or with both UV and visible light. Those that cure with UV and visible light typically cure faster, deeper, and through transparent, but UV-blocked, substrates. All DYMAX UV curing systems emit both UV and visible light and are designed to cure all DYMAX UV and UV/visible curing adhesives. In applications where the adhesive is exposed to air during the cure, higher intensity lamps may be required to achieve a tack-free surface. As with any manufacturing process, a safety factor should be incorporated into the UV curing process. [For more information on DYMAX UV curing equipment, see page seven of this document and Lit010A.](#)

STEP 5. FUNCTIONAL TESTING

Prior to production, actual parts (assembled with the candidate adhesive(s)) should be subjected to real-life stress conditions to ensure adequate performance. In addition, actual parts, assembled at the upper and lower limits of the dispensing and curing process, should also be tested to ensure all parts produced meet the end-use performance criteria.

In most cases, use testing should employ accelerated testing. DYMAX adhesives are used in many applications where parts must endure stressful conditions for long periods of time from years to even decades. Adhesive use testing should include stresses somewhat above those expected for assembled parts. The severity of this testing is best determined by part designers.

SUBSTRATE SELECTOR GUIDE

PRODUCT NUMBERS												
	401	425	429	488	4-20418	4-20586	4-20623	602 Rev. B*	605*	621*	625-SV01 Rev. A*	6-20353*
PLASTICS												
ABS	0	0		0	◆	◆		◆	◆	◆	◆	0
FR-4			0		◆	0	0	0	◆	◆	0	◆
LDPE				(0)		(◆)						(0)
PA				0	0(◆)				◆	◆	◆	
PBT									0	0		(0)
PC			0	0	0	(0)						(0)
PEI			0		◆	0		0	0	0		
PES		0	0	0	◆		0	◆	◆	◆		◆
PETG	0	0			0(◆)				0	0		
PI				0				0	0	0	0	0
PMMA				0	◆			(0)	0	0	0	
POP	0	0	0	0		0						◆
PP						(0)						(0)
PPS		◆		0	◆			◆	◆	◆	0	◆
PS	0		0	0	0			0	◆	◆		
PSU				0		◆						◆
PUR				0	0	(◆)			0	0		(◆)
PVC (flexible)					◆							
PVC (rigid)		0	0	0		(◆)				0		(◆)
SAN				0	0	0		0		0		◆
METALS												
Aluminum	0	0			0	◆		◆	◆	◆		0
Cold-Rolled Steel	0	0	0		0			◆	◆	◆	◆	0
Copper	0	0	0	0	0			0	◆	◆	◆	0
Galvanized Steel	0	0	0	0	0	0		0	◆	◆		
Stainless Steel	◆	0	0		0			0	◆	◆		
Zinc		0			0	0		◆	◆	◆	◆	◆
NON-METALS												
Crystal		0	0		0		0	◆	◆	◆	0	0
Glass	◆	◆	◆	0	0		◆	◆	◆	◆	◆	0
Ferrite	0	0		0	0	0		◆	◆	◆	◆	◆

◆ = Good to Excellent Adhesion 0 = Fair to Good Adhesion () = indicates adhesion measurement value with surface treatment

This guide represents only a small portion of the DYMAX adhesive library. Call us to help you select the appropriate adhesive for your specific application. Optimal curing of DYMAX UV adhesives requires a light source with peak intensity at 365 nm. Our light curing adhesives will also absorb visible light at 400-450 nm from the same light source for deeper and faster curing through UV inhibited or translucent substrates. Recommendations should be used as a guide for evaluation and laboratory testing of particular substrate grades and applications.

*Recommended for plated metals

Refer to the back page of this selector guide for substrate, polymer and registered trademark name information.

EVALUATING SUBSTRATE ADHESION *Adhesion Test* (Per ASTM D3808)

- DISPENSE** a drop of the adhesive onto your substrate and cure under a DYMAX Lamp. If you are testing multiple adhesives, apply each adhesive to the substrate and cure them all at once. Label each adhesive accordingly.
- ALLOW** the part to cool for approximately 1-2 minutes. *(The adhesive is warm after curing and may not provide optimum values when tested.)*
- CONDUCT** adhesion test. The ASTM adhesion test consists of lifting the adhesive drop with the tip of a dental pick or a safety razor. Rate products per the degree of difficulty in lifting off pieces or the entire drop of adhesive from each substrate. Evaluating adhesion is somewhat subjective and may vary from person to person. Having more than one person perform the test and using a composite rating minimizes this error.
- RECORD** results. More rigorous adhesion tests may include exposure of cured adhesive to hot or cold temperatures or to water or other solvents if adhesion under those exposure conditions is expected.

SUBSTRATE SELECTOR GUIDE

PRODUCT NUMBERS															
	3013	3015	3016	3017	3019	3020	3021	3069	3070	3072	3086	3089	3094	3099	CA-301
PLASTICS															
ABS	◆	○		○	○	○	○	◆		◆	○		◆		◆
FR-4	◆	○	○	○	○		◆	○	○	○	◆		○	○	◆
LDPE	(○)	(○)		(○)	(○)						(○)	(○)		(○)	(○)
PA	○	○(◆)			○		(○)			○		○(◆)		○	◆
PBT	○						○		○(◆)	◆		○	○(◆)		
PC	◆	◆	○	◆	◆	◆		◆	○	○			◆	◆	◆
PEI	○			○				○		◆			○		
PES	○	○	○				(◆)	○			○		○		◆
PETG	○		◆	○			(○)	○			○		◆		○
PI	○	○	○		○	◆		◆	○	○	○	○	○		
PMMA		○		○			(○)	○					◆	◆	◆
POP		○		○	○	○	(○)		○	○	○		○		
PP					○		(○)	○(◆)					○		○
PPS	◆	○		○			(○)	○		○	○		○		
PS	◆	○		◆	○	◆	(○)	○	○	◆	◆	○	◆		◆
PSU		○	○	◆		○				○			○		◆
PUR	○			(◆)	◆		○(◆)	○	◆	◆	◆	○	◆	○	
PVC (flexible)			○	◆				○(◆)	○(◆)	○(◆)	○		◆	○	◆
PVC (rigid)	◆	○(◆)	○	◆	○	◆	(◆)	○	○	◆	○		○	○	◆
SAN	○			◆	○	○	○	○			○		◆	◆	◆
METALS															
Aluminum	○		○	○	○		○	○	○	○	◆	○	○	○	◆
Cold-Rolled Steel	○					○	○	○		○	○		○		◆
Copper	○		○		○		○			○		○			○
Galvanized Steel							◆	○		○	○	○			◆
Stainless Steel											○	○		○	◆
Zinc	○			○		○				○	○	○	○	○	○
NON-METALS															
Crystal	○	○		○	○		○	○				○	○		○
Glass			○	○	○		○	○		○	○			◆	◆
Ferrite			◆		○	○	○						○		◆

FUNCTIONAL TESTING

There is no substitute for functional testing adhesive candidates for your application. While charts are useful in selecting adhesive candidates, they are not fully predictive of how adhesives will perform with respect to different joint designs and under real-life environmental stresses. To better understand how adhesive candidates will perform in your application, a number of steps can be taken to better understand the variety and magnitude of variables that can affect your application.

1. **Assemble actual parts.** Do not rely solely on simple adhesion tests to qualify an adhesive for your application. Adhesion varies greatly depending on joint design, substrate surface condition, and stress forces, and cannot be completely assessed using simple adhesive strength tests. **Caution** – Prototype parts may frequently differ from production parts. Use production-ready components for final evaluations.
2. **Subject actual parts to anticipated stresses.** This can be difficult since many assemblies are expected to survive in the real world for many years or decades. Perform accelerated testing, which normally includes bond strength testing at more severe conditions than those expected during actual use. If water, humidity, temperature and/or chemical resistance are required, actual parts should be tested for suitability with appropriate exposure.
3. **Validate the assembly process.** Once your process for part assembly has been established, validate that process by comparing production and laboratory parts in life tests. Do not compromise on your results. Parts prepared on a controlled assembly line should compare favorably to those made by hand in a lab.

Functional testing is the responsibility of the user. While DYMAX will assist customers with their testing and the establishment of a controlled production process, responsibility for functional testing and maintenance of a validated process are the responsibility of the user.

ADHESIVE PROPERTIES

PRODUCT	Features	Standard Nominal Viscosities* (cP=mPas) Brookfield, 25°C	Durometer Hardness	Tack Free**	Tensile (psi • MPa)	Elongation at Break %	Modulus of Elasticity (psi • MPa)	Linear Shrinkage %	Water Absorption %	Cured Appearance
GLASS • METAL ADHESIVES										
401	Low viscosity; metal/glass bonder	70	D-80	No	6,600 • 45.5	8	2,300,000 • 16,000	3.1	0.8	Clear
425	Low viscosity; water clear; dishwasher safe	4,000	D-80	Yes	6,200 • 42.7	7	500,000 • 3,400	1.9	0.7	Clear
429	Resilient glass bonder	2,500 / T / Gel	D-60	Yes	3,000 • 20.7	120	35,000 • 240	1.0	1.2	Clear
488	Flexible glass sealant	500 / T	A-70	No	500 • 3.4	300	2,000 • 14	5.8	0.5	Clear
4-20418	Glass to acrylic; mirrors	450 / Gel	D-50	No	1,400 • 9.7	130	100,000 • 700	2.0	4.1	Hazy
4-20586	UV epoxy; hard; clear	1,200	D-60	Yes	2,400 • 16.6	2.7	750,000 • 5,200	1.1	2.0	Hazy
4-20623	Low stress laminating	20,000	D-55	Yes	1,500 • 10.3	120	3,000 • 21	<0.5	1.0	Clear
602 Rev. B	Metal to glass bonder; activator cure	5,000 / T / VT / Gel	D-70	Yes	6,000 • 41.0	30	400,000 • 2,760	2.0	5.0	Clear
605	Bonds glass/thermoset cure	600 / VLV / T / Gel	D-70	Yes	4,300 • 29.6	20	300,000 • 2,100	2.4	2.0	Clear/Straw
621	Metal to glass bonder; activator cure	750 / T / VT / Gel	D-75	Yes	5,200 • 35.9	35	320,000 • 2,200	3.0	1.1	Clear
625-SV01 Rev. A	Resilient metal to glass bonder; lenses/windows; activator cure	10,000*	D-45	Yes	1,700 • 12.0	10	12,000 • 83	7.0	2.1	Hazy
6-20353	UV epoxy/encapsulant	450	D-90	Yes	12,600 • 86.87	0	5,600,000 • 39,000	0.5	1.1	Hazy
PLASTIC ADHESIVES										
3013	Low viscosity; moisture resistant; flexible; for plastics and metal	135 / T / VT / Gel	D-70	No	2,800 • 19.3	60	230,000 • 1,600	1.1	1.0	Clear
3015	For flexible plastics	1,300 / T / Gel	D-60	Yes	1,600 • 11.0	120	47,500 • 330	2.4	1.0	Clear
3016	UV epoxy	75	D-75	Yes	5,500 • 37.9	1.5	420,000 • 2,900	2.2	0.6	Clear
3017	Bonds polysulfone; fluorescing plastic bonder	200	D-85	Yes	9,200 • 63.4	2.65	2,600,000 • 18,000	1.6	16	Clear
3019	Moisture resistant; for plastics	450 / T / VT / Gel	D-55	No	1,700 • 11.7	170	30,000 • 210	3.0	2.1	Clear
3020	High strength; low out-gassing; bond headlamps	1,200	D-70	Yes	10,400 • 71.7	0.1	4,000,000 • 28,000	2.1	3.4	Hazy
3021	UV epoxy	500 / Gel	D-85	Yes	8,900 • 63.4	2	800,000 • 5,500	0.2	1.0	Clear
3069	General purpose; for flexible and rigid substrates	450 / T / Gel	D-55	Yes	1,700 • 11.7	175	260,000 • 1,800	1.7	1.8	Clear
3070	High water resistance; for bonding rigid fittings to flexible tubing	8,500	D-60	Yes	3,660 • 25.2	55	100,000 • 700	2.0	0.7	Clear
3072	General purpose; for electrical potting and sealing	8,700	D-60	No	3,000 • 20.7	200	60,000 • 410	1.6	0.5	Hazy
3086	For packaging	135 / T	D-85	Yes	7,250 • 50.0	4	800,000 • 5,500	1.3	0.6	Hazy
3089	For low stress laminating and bonding	1,200 / Gel	A-65	No	300 • 2.1	225	475 • 3	1.9	0.5	Hazy
3094	General purpose; for laminating plastic sheets; display cases and shelves	1,000 / T / Gel	D-60	No	5,300 • 36.6	180	21,000 • 145	1.6	20	Hazy
3099	Acrylic bonding	150 / T / VT	D-75	Yes	4,000 • 27.6	95	200,000 • 1,400	0.8	3.9	Clear

* Other viscosities may be available upon request **200 mW for 30 seconds



Acrylic hanger bonded to glass feeder with 4-20418



Glass block bonded to plastic with 4-20586



Glass trophy bonded with 429



Glass finial bonded to brass lamp with 605



Window fixture mounted with 625-SV01 Rev. A

UV LIGHT CURING EQUIPMENT FOR GLASS, METAL & PLASTIC ASSEMBLY WITH UV ADHESIVES

UV Curing Flood Lamps, UV Curing Spot Lamps, UV Curing Conveyor Systems & Radiometers

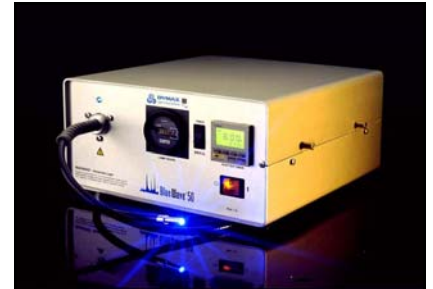
Successful UV processing demands that the curing equipment be matched to the resin to optimize both performance and cost savings. DYMAX manufactures both UV curable resins and UV curing equipment, and specializes in optimization of UV curing processes. Our technical specialists are ready to help you optimize your process, and maximize your profit and product performance. For resin and equipment selection assistance, please call the DYMAX Applications Engineering Department at 877.396.2988.



DYMAX BlueWave™ 200 UV Curing Spot Lamp with patent pending intensity adjustment feature provides high intensity UV/visible light in a concentrated area. Ideal for integration with automated equipment and multiple output light-guides. **CE Marked.**



DYMAX BlueWave™ 50 AS UV Curing Spot Lamp provides curing efficiency, low operating cost, and an auto-switching power supply to neutralize the effects of variations in line-voltage.



DYMAX BlueWave™ 50 UV Spot Curing Lamp provides the optimal combination of low operating cost with sufficient intensity output to accommodate a majority of bonding applications. **For European markets only. CE Marked.**



DYMAX 5000 UV Curing Flood Lamp System with shutter and protective enclosure. Ideal for single component or batch curing processes requiring moderate intensity and a 5" x 5" (32.3 cm x 32.3 cm) cure area. **CE Marked** PC Series Flood Systems available for European production facilities.



Lightguide Stand Keeps Lightguide Stationary Ideal for single component bonding. Log onto www.dymax.com/products/curing_equipment/accessories/index.php for more information on this and other DYMAX UV light curing equipment accessories.



ACCU-CAL™ 50 Radiometers are perfect for process monitoring of spot and flood UV light curing systems. **CE Marked.**



DYMAX UV Light Curing Conveyor Systems Ideal for providing consistent curing for high volume and high-speed assembly.



DYMAX UV Light Curing Conveyor Systems Specifically designed for compliance with European standards. **For European markets only. CE Marked.**



Accessories for DYMAX UV Curing Lamps including lightguides, shutters, lightshields, goggles, bulbs and rod lenses are available to complement any DYMAX UV curing system. Log onto www.dymax.com/products/curing_equipment/accessories/index.php for more information.

SUBSTRATE & REGISTERED NAME KEY

SUBSTRATE	POLYMER NAME	REGISTERED TRADE NAMES
ABS	Acrylonitrile-butadiene-styrene	Lustran [®] , Terluran [®] , Cycolac [®]
FR-4	Epoxy Fiberglass	
LDPE	Low-density polyethylene	
PA	Polyamide	Nylon [®]
PBT	Poly (butylene terephthalate)	Valox [®]
PC	Polycarbonate	Makrolon [®] , Lexan [®] , Apec [®] , Calibre [®]
PEI	Polyetherimide	Ultem [®]
PES	Polyester sulfone	Ultrason [®] , Udel [®]
PETG [®]	Copolyester	Eastar [®]
PI	Polyimide	Kapton [®]
PMMA	Poly (methyl methacrylate)	Acrylic, Plexiglass [®] , Perspex [®] , Cryolite [®]
POP	Poly (phenylene oxide)	Noryl [®]
PP	Polypropylene	
PPS	Poly (phenylene sulfide)	Ryton [®]
PS	Polystyrene	Novacor [®] , Styron [®]
PSU	Polysulfone	Ultrason [®]
PUR	Polyurethane	
PVC	Polyvinyl chloride	
SAN	Styrene-acrylonitrile	Lustran [®]

® Registered trademarks of the following companies: Atohaas: Plexiglass BASF: Ultrason Bayer: Apec, Lustran, Makrolon, Terluran Cyro: Cyrolite Dow: Calibre DuPont: Kapton, Nylon Eastman: Eastar GE: Lexan, Noryl, Cycolac, Ultem, Valox ICI: Perspex Nova Chemicals: Novacor, Zylar Phillips: Ryton

For further assistance with adhesive and equipment selection, contact your DYMAX Applications Engineer.

In the U.S. Call: 877.396.2988
 In North and South America Call: 860.482.1010
 In Europe Call: 0049.69.7165.3568
 In Asia Call: 852.2460.7038

www.dymax.com

© 2007 DYMAX Corporation

The data contained in this bulletin is of a general nature and is based on laboratory test conditions. DYMAX does not warrant the data contained in this bulletin. Any warranty applicable to the product, its application and use is strictly limited to that contained in DYMAX's standard Conditions of Sale. DYMAX does not assume responsibility for test or performance results obtained by users. It is the user's responsibility to determine the suitability for the product application and purposes and the suitability for use in the user's intended manufacturing apparatus and methods. The user should adopt such precautions and use guidelines as may be reasonably advisable or necessary for the protection of property and persons. Nothing in this bulletin shall act as a representation that the product use or application will not infringe a patent owned by someone other than DYMAX or act as a grant of license under any DYMAX Corporation Patent. DYMAX recommends that each user adequately test its proposed use and application before actual repetitive use, using the data contained in this bulletin as a general guide. LIT220 03/19/2007

DYMAX Corporation - 318 Industrial Lane - Torrington, CT 06790 - Phone: 860.482.1010 - Fax: 860.496.0608 - E-mail: info@dymax.com - www.dymax.com

DYMAX Europe GmbH - Trakehner Strasse 3 - D-60487 Frankfurt am Main - Germany - Phone: 0049.69.7165.3568 - Fax: 0049.69.7165.3830 - E-mail: dymaxinfo@dymax.de - www.dymax.de

DYMAX Asia (HK) - Unit 1006, 10/F., Carnarvon Plaza, No. 20, Carnarvon Road, T.S.T., Kowloon, Hong Kong - Phone: 852.2460.7038 - Fax: 852.2460.7017 - E-mail: simon_ang@dymax.com - www.dymax.com.cn

DYMAX[®], Light-Weld[®], Light-Welder[®], Multi-Cure[®], Ultra Light-Weld[®], MEDI-CURE[®], MD[®] and SPEEDMASK[®] are registered trademarks of DYMAX Corporation

