At Dymax, we’re committed to providing our customers with the solutions they need for their specific application challenges. Inherent in the Dymax Edge approach is the commitment to view a customer’s challenge differently by listening, focusing, and using an entire toolbox of resources and expertise to deliver the most efficient solution. This expertise isn’t limited to the formulation of chemistry or the calibration of a machine. Rather, it’s defined by a depth and breadth of knowledge that allows us to devise innovative solutions based on an optimal balance of material, chemistry, and equipment. The Dymax Edge is more than the combined resources of product, technology, and service. It’s the fundamental belief that you best serve a customer when you look at the need from their perspective, not yours.

Dymax Corporation is an ISO 9001 certified global manufacturer of light-curable adhesives, oligomers, coatings, light-curing equipment, and dispensing systems supplied to the medical device, electronic, appliance, transportation, and alternative energy markets. Since pioneering light-cure technology over 30 years ago, Dymax has continued to set new standards with innovative ways to co-optimize the disposable medical device assembly process with customer-centric solutions that meet today’s application challenges. Our global team of technical professionals understands the demands of the medical device market and is readily available to assist manufacturers with adhesive selection, dispensing options, curing recommendations, biocompatibility testing, component design, and process validation. The result is faster, more reliable processing, less energy consumption, and lower production costs.

Dymax MD® Adhesives, specially formulated for disposable medical device assembly, help optimize assembly speeds, allow for 100% in-line inspection, and increase throughput. These solvent-free RoHS-compliant adhesives meet both USP Class V and ISO 10993 biocompatibility standards and are used in a wide range of applications including catheter, syringe, anesthesia mask, reservoir, and tube set assembly. They’re intended for use in short-term (<29 days) or single-use disposable-device applications only. Dymax does not authorize their use in long-term implant applications. In all cases, it is the user’s responsibility to determine and validate the suitability of these adhesives in the intended medical device.

Compatible sterilization methods include gamma irradiation and ethylene oxide. Sterilization by autoclaving may be limited to certain applications. It remains the user’s obligation to ascertain the effect of sterilization on the cured adhesive.

Typical ISO 10993 Biocompatibility Tests performed on Dymax MD® Medical Device Adhesives:
- Acute Systemic Toxicity
- Cytotoxicity
- Hemocompatibility
- Irritation / Intracutaneous
- Implantation (14 day)
# 1100 SERIES NEEDLE BONDERS

## Unique Product Feature
- **Low-Viscosity Adhesive for Tight Tolerances**

## Multipurpose Adhesives for a Variety of Plastics and Metals

### Available Grades
- **1160-M**
- **1161-M**
- **1162-M**
- **1163-M**
- **1180-M**
- **1180-M-UR**
- **1180-M-SV**
- **1180-M-T-UR**
- **1180-M-SV04**
- **1180-M-SV05**
- **1180-M-T-UR**
- **1180-M-UR**
- **1180-M-SC**
- **1180-M-SV**
- **1193-M**
- **1193-M-SC**
- **1193-M-SV**
- **1193-M-SV04**
- **1193-M-SV05**
- **1193-M-SV05-UR**
- **1401-M-UR**
- **1402-M**
- **1403-M**
- **1404-M-UR**
- **1405-M-UR-SC**

## Variety of Viscosity and Rheological Characteristics
- **1160-M**
- **1161-M**
- **1162-M**
- **1163-M**
- **1180-M**
- **1180-M-UR**
- **1180-M-SV**
- **1180-M-SV04**
- **1180-M-SV05**
- **1180-M-T-UR**
- **1180-M-UR**
- **1180-M-SC**
- **1180-M-SV**
- **1193-M**
- **1193-M-SC**
- **1193-M-SV**
- **1193-M-SV04**
- **1193-M-SV05**
- **1193-M-SV05-UR**
- **1401-M-UR**
- **1402-M**
- **1403-M**
- **1404-M-UR**
- **1405-M-UR-SC**

## Recommended for
- **High-Speed Manufacturing**

## LED Curable Adhesives for Plastics and Metal and High-Speed Needle Bonding

### Advantages
- **1160-M**
- **1161-M**
- **1162-M**
- **1163-M**
- **1180-M**
- **1180-M-UR**
- **1180-M-SV**
- **1180-M-SV04**
- **1180-M-SV05**
- **1180-M-T-UR**
- **1180-M-UR**
- **1180-M-SC**
- **1180-M-SV**
- **1193-M**
- **1193-M-SC**
- **1193-M-SV**
- **1193-M-SV04**
- **1193-M-SV05**
- **1193-M-SV05-UR**
- **1401-M-UR**
- **1402-M**
- **1403-M**
- **1404-M-UR**
- **1405-M-UR-SC**

### Individual Product Data Sheets (PDS) list complete test data, with copies of test reports available upon request.

### Substrate Bonding Guide
- **ABS**
- **PC**
- **PMMA**
- **PP**
- **SS**

### Fluorescing*
- **Blue**
- **Ultra-Red™**

### Durometer Hardness
- **D75**
- **D70**
- **D65**
- **D60**

### Rheometer Hardness
- **D75**
- **D70**
- **D65**
- **D60**

### Tensile at Break, Mpa [psi]
- **21 [3,000]**
- **17 [2,500]**
- **14 [2,000]**
- **9 [1,400]**
- **8 [1,200]**
- **7 [1,000]**

### Elongation at Break, %
- **50**
- **120**
- **160**
- **160**
- **90**
- **66**
- **150**
- **66**

### Modulus of Elasticity
- **510 [74,000]**
- **300 [44,000]**
- **200 [30,000]**
- **100 [15,000]**
- **290 [42,000]**
- **330 [48,000]**
- **260 [38,000]**
- **190 [29,000]**

### Fluorescing*
- **Blue**
- **Blue**
- **Blue**
- **Blue**
- **Blue**
- **Blue**
- **Blue**
- **Blue**

---

* U.S. Patents 6,080,450 & 7,892,386

-- Recommended adhesive

### Limited applications

ST - Requires surface treatment (e.g., plasma, corona treatment, etc.)
Dymax dispensing and light-curing systems are perfectly matched to our adhesives’ chemistry. Our field-proven dispense solutions are designed to fit many adhesive dispensing applications and include various automatic and manual dispense systems, spray valves, and related components for seamless integration into your assembly process.

We offer a complete line of conventional and LED light-curing equipment including spot, flood, and conveyor systems, as well as radiometers for measuring light intensity. Our equipment can be configured as stand-alone units or integrated into existing manufacturing assembly lines for fast processing.

**BlueWave® 200 Version 3.0**

The BlueWave® 200 Version 3.0 spot-curing lamp delivers UV and visible energy (300-450 nm) for curing adhesives, coatings, and encapsulants. The lamp uses a patented intensity adjustment feature that allows users to deliver the optimized level of energy for their application requirements. The CE certified BlueWave® 200 Version 3.0 contains an integral shutter which can be actuated by a foot pedal or PLC making it ideal for both manual and automated processes. A universal power input provides consistent performance at any voltage (90-264 V, 47-63 Hz).

**BlueWave® LED DX-1000**

The Dymax BlueWave® LED DX-1000 is an LED light-curing system designed to provide users with cooler curing temperatures, lower intensity degradation over time, more consistent cure results, lower energy consumption, and reduced costs. The CE certified system, which utilizes an environmentally friendly, high-intensity LED light source, can be configured to operate in either small-area flood or spot-cure mode and is clean-room compatible. The BlueWave® LED DX-1000’s adjustable intensity capability and long-life LED facilitates superior accuracy versus “closed loop feedback” units, while achieving consistent frequency and intensity output for better process control.

**BlueWave® LED Prime UVA**

The BlueWave® LED Prime UVA light-curing system delivers maximum curing energy up to 15 W/cm² through liquid-filled or fiber-optic lightguides. This design provides more curing energy while also eliminating the safety concerns associated with high heat generated by units with the LED array at the end of the wand. The environmentally friendly system utilizes an environmentally friendly, relatively narrow frequency band produced by LEDs generates cooler curing temperatures at the substrate level. The Prime is CE certified, has a useful LED life of up to 20,000 hours, and is easy to operate. It’s used for adhesive bonding of metal, glass, and plastic substrates, as well as for spot curing coatings.

**ACCU-CAL™ Radiometers**

ACCU-CAL™ radiometers allow operators to monitor, document, and maintain a reliable UV/Visible light-curing process, while ensuring the system is providing the intensity and dosage levels required for successful curing. A radiometer can signal an operator to replace a curing system’s degrading bulb, reflector, or lightguide to help prevent incomplete cures from happening. ACCU-CAL™ radiometers can also measure the intensity of stray or reflected energy and confirm that operators are properly shielded from light exposure. The ACCU-CAL™ 50 measures UV-A (320-390 nm) intensity and dose (energy). The ACCU-CAL™ 50-LED measures energy levels emitted from lightguides and LED flood lamps and has a spectral sensitivity range of 350 to 450 nm. The radiometers have an intensity measurement range from 1 mW/cm² to 40 W/cm², durable temperature-resistant sensors, and are PTB and NIST traceable.

**SD-100 Digital Syringe Dispenser**

The SD-100 digital syringe dispenser addresses the need to dispense low- to high-viscosity materials. Operators are able to quickly and easily set up the system for the deposit size needed by utilizing the digital timer control and adjustable pressure gauge. The digital timer has a range of 0.01 to 9999 seconds giving the operator precise control over fluid dispense, and the adjustable vacuum suck-back results in clean, drip-free shut-off of materials. This dispensing system replaces manual syringe dispensers and squeeze bottles, reducing operator fatigue. It’s ideal for use as an operator work station and can also be integrated into an automated process. The SD-100, a portable light-weight unit with a space-saving footprint, is compatible with a variety of syringe sizes from 3 to 55 cc. The unit is CE certified for global use and is RoHS compliant.
When 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, and assembly speed and method should all be considered when selecting viscosity. Viscosity is a material’s resistance to flow. Low-viscosity adhesives flow more readily than high-viscosity adhesives. Thixotropic 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. The identifiers appear as suffixes on product names as follows:

- VLV = Very Low Viscosity
- LV = Low Viscosity
- T = Thick
- VT = Very Thick
- GEL = Gel

Standard viscosity products do not have a suffix.

<table>
<thead>
<tr>
<th>Typical Centipoise (cP/µPas)</th>
<th>Typical Reference Liquids at 20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water</td>
</tr>
<tr>
<td>10</td>
<td>Kerosene</td>
</tr>
<tr>
<td>110</td>
<td>SAE 10 Oil</td>
</tr>
<tr>
<td>200</td>
<td>Maple Syrup</td>
</tr>
<tr>
<td>440</td>
<td>SAE 30 Oil</td>
</tr>
<tr>
<td>1,100</td>
<td>Castor Oil</td>
</tr>
<tr>
<td>3,000</td>
<td>Honey</td>
</tr>
<tr>
<td>10,000</td>
<td>Molasses</td>
</tr>
<tr>
<td>18,000</td>
<td>Chocolate Syrup</td>
</tr>
<tr>
<td>65,000</td>
<td>Vaseline</td>
</tr>
<tr>
<td>100,000</td>
<td>Sour Cream</td>
</tr>
<tr>
<td>200,000</td>
<td>Peanut Butter</td>
</tr>
<tr>
<td>1,500,000</td>
<td>Shortening</td>
</tr>
</tbody>
</table>

An adhesive should be chosen according to the needs of the application and joint design. Adhesive flow or wicking can be critical if the adhesive is required to bond both substrates. Adhesives with a lower viscosity flow better and will wick better between substrates.

**REFERENCE TABLES**

The following tables provide additional information about the Dymax adhesives in this guide.

**VISCOSITY**

- **VLV** = Very Low Viscosity
- **LV** = Low Viscosity
- **T** = Thick
- **VT** = Very Thick
- **GEL** = Gel

**JOINT DESIGN**

An adhesive should be chosen according to the needs of the application and joint design. Adhesive flow or wicking can be critical if the adhesive is required to bond both substrates. Adhesives with a lower viscosity flow better and will wick better between substrates.

**WELL CONFIGURATION**

A hub that is flared at the distal end is described as a “well” configuration. Filling the well with adhesive secures the needle in place. In many cases the hubs are opaque but can be cured from above so UV light is not required to pass through the plastic. In the “well” design, adhesion to both the hub substrate and cannula are of critical importance. The well in this configuration is usually large enough to permit using mid-range viscosities. Refer to the Substrate Bonding Guide on pages 2-3 for help in choosing a suitable adhesive.

**MECHANICAL LOCK**

A hub can be molded with annular grooves in its inside diameter. The annular rings are typically 0.005” to 0.008” (0.127-0.2 mm) deep per side subject to molding limitations. This allows the cured adhesive to form a mechanical lock, substantially increasing pullout strength. Adhesives will form a structural bond with the stainless steel cannula and lock in place with the added groove feature. With this design, a low- to medium-viscosity adhesive is used to wick between the stainless steel cannula and hub forming a mechanical lock.

**CYLINDRICAL HUB**

The close-fitting cannula-to-hub design is commonly encountered in medical disposable syringes. A cylindrical hub that is closely fit to the cannula requires a low-wicking-grade-viscosity adhesive. It is also critical to choose an adhesive that has superior bond strength to both substrates. Recommended gap: 0.002”-0.004” (0.05-0.1 mm) per side.

**DOTS**

Volume of a dot is 1/2 the volume of a sphere \( V = \frac{4}{3} \pi r^3 \)

<table>
<thead>
<tr>
<th>Dots</th>
<th>Volume (µL)</th>
<th>Volume (mL)</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.0001</td>
<td>0.00005</td>
<td>0.73</td>
</tr>
<tr>
<td>0.5</td>
<td>0.0005</td>
<td>0.001</td>
<td>1.24</td>
</tr>
<tr>
<td>1.0</td>
<td>0.001</td>
<td>0.005</td>
<td>1.56</td>
</tr>
<tr>
<td>5.0</td>
<td>0.010</td>
<td>0.025</td>
<td>2.67</td>
</tr>
<tr>
<td>10.0</td>
<td>0.100</td>
<td>0.025</td>
<td>3.27</td>
</tr>
<tr>
<td>25.0</td>
<td>0.130</td>
<td>0.180</td>
<td>4.57</td>
</tr>
</tbody>
</table>
### Production Throughput Planner

<table>
<thead>
<tr>
<th>1 Piece Every…</th>
<th>Minute</th>
<th>Hour</th>
<th>*Day (8 hours)</th>
<th>*Week (40 hours)</th>
<th>*Month (31 days)</th>
<th>*Year (50 weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 second</td>
<td>120</td>
<td>7,200</td>
<td>57,600</td>
<td>288,000</td>
<td>1,289,600</td>
<td>14,400,000</td>
</tr>
<tr>
<td>1 second</td>
<td>60</td>
<td>3,600</td>
<td>28,800</td>
<td>144,000</td>
<td>604,800</td>
<td>7,200,000</td>
</tr>
<tr>
<td>5 seconds</td>
<td>12</td>
<td>720</td>
<td>5,760</td>
<td>28,800</td>
<td>120,960</td>
<td>1,440,000</td>
</tr>
<tr>
<td>10 seconds</td>
<td>6</td>
<td>360</td>
<td>2,160</td>
<td>14,400</td>
<td>60,480</td>
<td>720,000</td>
</tr>
<tr>
<td>30 seconds</td>
<td>2</td>
<td>120</td>
<td>480</td>
<td>2,400</td>
<td>9,600</td>
<td>108,000</td>
</tr>
<tr>
<td>1 minute</td>
<td>1</td>
<td>60</td>
<td>480</td>
<td>2,400</td>
<td>9,600</td>
<td>108,000</td>
</tr>
<tr>
<td>5 minutes</td>
<td>*</td>
<td>12</td>
<td>96</td>
<td>480</td>
<td>1,920</td>
<td>21,600</td>
</tr>
<tr>
<td>10 minutes</td>
<td>*</td>
<td>6</td>
<td>48</td>
<td>240</td>
<td>960</td>
<td>10,800</td>
</tr>
<tr>
<td>30 minutes</td>
<td>*</td>
<td>2</td>
<td>16</td>
<td>80</td>
<td>384</td>
<td>4,320</td>
</tr>
<tr>
<td>1 hour</td>
<td>*</td>
<td>1</td>
<td>8</td>
<td>40</td>
<td>1,600</td>
<td>18,000</td>
</tr>
</tbody>
</table>

*Based on 8-hour shifts.

### Estimating Usage

<table>
<thead>
<tr>
<th>Bond-Line Gap or Coating Thickness</th>
<th>Theoretical Area Covered by 1 Liter of Adhesive or Coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.002” (51 μm)</td>
<td>30,500 in² (212 ft²) (19.7 m²)</td>
</tr>
<tr>
<td>0.005” (127 μm)</td>
<td>12,200 in² (84.7 ft²) (7.88 m²)</td>
</tr>
<tr>
<td>0.010” (254 μm)</td>
<td>6,100 in² (42.4 ft²) (3.94 m²)</td>
</tr>
<tr>
<td>0.015” (381 μm)</td>
<td>4,070 in² (26.3 ft²) (2.63 m²)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bead Size</th>
<th>Theoretical Usage (Length per Liter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/32” (.79 mm)</td>
<td>66,300 in (1,684 m)</td>
</tr>
<tr>
<td>1/16” (1.6 mm)</td>
<td>16,600 in (422 m)</td>
</tr>
<tr>
<td>3/32” (2.4 mm)</td>
<td>7,400 in (181 m)</td>
</tr>
<tr>
<td>1/8” (3.2 mm)</td>
<td>4,100 in (104 m)</td>
</tr>
<tr>
<td>3/16” (4.8 mm)</td>
<td>1,900 in (48 m)</td>
</tr>
<tr>
<td>1/4” (6.4 mm)</td>
<td>1,050 in (26.4 m)</td>
</tr>
</tbody>
</table>

### Hardness

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>70</td>
<td>80</td>
<td>90</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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