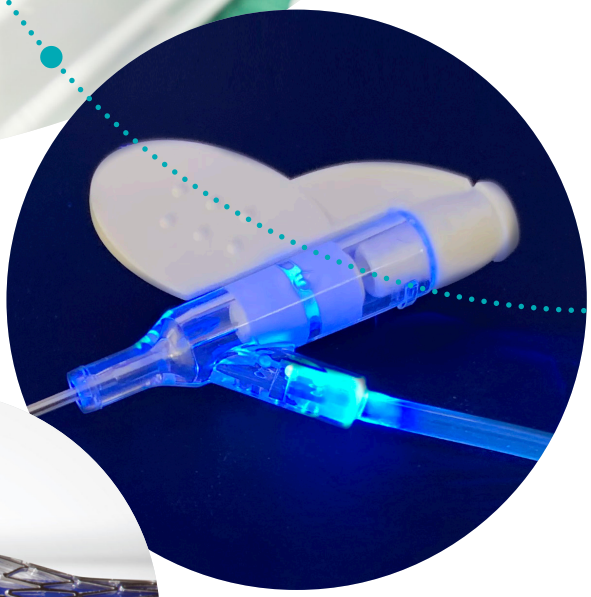
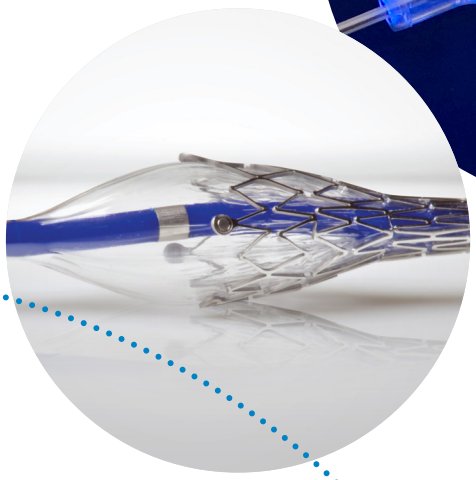
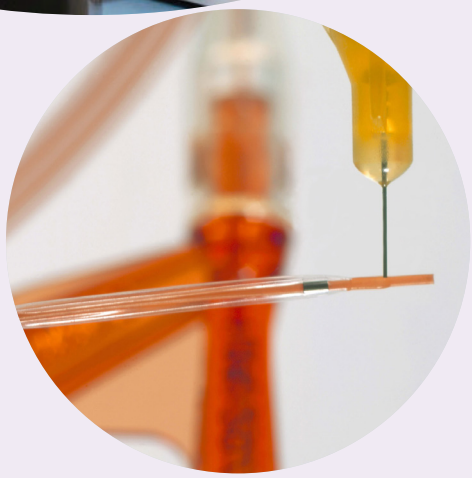




# ADHESIVES FOR CATHETER ASSEMBLY

DYMAX®



Only Dymax offers expert knowledge of light-cure technology, along with a full array of light-cure products. Dymax is committed to developing a true collaborative partnership — applying our extensive process knowledge to your specific application challenges.

We create custom solutions to ensure that chemistry and equipment work seamlessly together with maximum efficiency. Our application engineering team works side-by-side with our customers, providing assistance with formulation, testing, evaluation, and pre-production trials. We also offer an extensive inventory of curing equipment, manual and automated dispensing systems to help you achieve a more efficient, cost-effective manufacturing process.

# About Our Products

Since pioneering light-cure technology over 40 years ago, Dymax has continued to develop innovative ways to optimize medical device assembly. We understand the demands of the medical device market and are ready to assist you with every step of the product development process including adhesive selection, dispensing options, curing recommendations, biocompatibility testing, component design, and process validation. We are continually developing new technologies to help you build safer, higher quality products that increase your manufacturing efficiency, and deliver the best possible outcomes.

## MD® Adhesives

Dymax MD® adhesives are specially formulated for disposable medical device assembly and used in a variety of applications.*

- Optimize assembly speeds enabling faster processing, greater output, and in-line inspection of bond lines
- No added solvents
- RoHS compliant
- Many meet ISO 10993 biocompatibility and/or USP Class VI standards.

*MD® adhesives are 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's 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.

## CTH-Series Adhesives

These single-component adhesives provide excellent adhesion, a high degree of flexibility, and fast light cures for consistent, low stress catheter assembly.

- Formulated to meet the unique assembly challenges associated with the newest catheter materials, including Nylon 12 and PEBA
- Rapid cure using LED or UV/Visible light
- Excellent moisture and humidity resistance
- Available with patented fluorescing technology, making in-line inspection easy

## HLC™ Adhesives

HLC™ adhesives combine the advantages of light-curable and anionic chemistries in a unique hybrid platform, curing rapidly in both light and dark areas. These materials enable bonding of opaque or light-blocking substrates, expanding design and process flexibility.

# CTH-Series Adhesives

| Product | Unique Product Feature | Recommended Substrates | Viscosity, mPas | Rheology | Durometer Hardness | Tensile Break, MPa [psi] | Elongation at Break, % | Modulus of Elasticity, MPa [psi] | Fluorescing* |
|---|---|---|---|---|---|---|---|---|---|
| **203A-CTH-F** | Catheter & Guidewire Adhesive with Secondary Heat-Cure Capability | SS, NiTi, ABS, PC, PU | 600 | Newtonian | D80 | 30 [4.300] | 13 | 640 [93,000] | Blue |
| **204-CTH-F-Z** | Flexible Adhesive | PC, PVC, PU, ABS, PET, PEBA | 600 | Newtonian | D58 | 15,2 [2.200] | 194 | 282.7 [41,000] | Blue |
| **209-CTH** | Multipurpose Adhesive for Plastics & Metals | PC, PCTG, PET, NiTi | 300 | Newtonian | D70 | 17 [2.500] | 120 | 300 [44,000] | Blue |
| **211-CTH-SC-Z** | LED UV Curable Adhesive; See-Cure Technology | ABS, PC, PU, PVC | 400 | Newtonian | D70 | 14 [2.050] | 124 | 680 [98,000] | No |
| **215-CTH-SV01-UR-SC** | LED UV Curable; Excellent Adhesion to Nylon 12 & PEBA; Encompass Technology | PA, PEBA, PET, TPU | 1.100 | Thixotropic | D53 | 11,7 [1.700] | 300 | 410 [60,000] | Ultra-Red® |
| **203A-CTH-F-T** | Catheter & Guidewire Adhesive with Secondary Heat-Cure Capability | SS, NiTi, PC, ABS, PU | 3.250 | Thixotropic | D80 | 26 [3.800] | 2.6 | 630 [92,000] | Blue |
| **203A-CTH-F-VT** | | SS, NiTi, PC, ABS, PU | 11.000 | Thixotropic | D80 | 28 [4.100] | 8 | 550 [80.000] | Blue |
| **203-CTH-F-VLV** | | SS, NiTi, PC, ABS, PU | 55 | Thixotropic | D85 | 32 [4.600] | 7 | 640 [93.000] | Blue |
| **215-CTH-UR-SC** | LED UV Curable; Excellent Adhesion to Nylon 12 & PEBA; Encompass Technology | PA, PEBA, PET, TPU | 18.000 | Thixotropic | D55 | 15,1 [2.200] | 360 | 165 [24.000] | Ultra-Red® |
| **215-CTH-LV-UR-SC** | | PA, PEBA, PET, TPU | 350 | Newtonian | D53 | 11 [1.600] | 300 | 117 [17.000] | Ultra-Red® |
| **215-CTH-T-UR-SC** | | PA, PEBA, PET, TPU | 6.000 | Thixotropic | D50 | 11,7 [1.700] | 260 | 154 [22.400] | Ultra-Red® |
| **250-CTH** | UV and/or Heat Cure Cationic Epoxy; Extremely Low Shrinkage | ABS, PC, PETG, PS, PU, GL | 52.500 | Thixotropic | D90 | 51,7 [7.500] | 2 | 1.425 [260.800] | No |

**SV** Special Viscosity
**T** Thick
**VT** Very Thick
**VLV** Very Low Viscosity

**Z** TPO Free
**SC** See-Cure (Patented Color-Change Technology)
**UR** Ultra-Red® (Patented Fluorescing Technology)

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

## Substrate Bonding Guide

| PRODUCT | ABS acrylonitrile-butadiene-styrene | CAP cellulose acetate propionate | PA polyamide (nylon 6/6) | PA polyamide (nylon 12) | PC polycarbonate | PEBA polyether block amide | PEI polyetherimide | PET poly(ethylene tere-phthalate) | PETG poly(ethylene terephthalate)/glycol | PI polyimide | PPO poly(phenylene oxide) | PS polystyrene | PSU polysulfone | PU polyurethane | PVC poly(vinyl chloride) | SAN styrene-acrylonitrile | SIL silicone | TPU thermoplastic polyurethane | NiTi nickel titanium | PL platinum | SS stainless steel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 203A-CTH-F | • | | ❍ | | • | ❍ | • | | | | | • | ❍ | • | | • | | | • | | • |
| 204-CTH-F-Z | • | | | | • | ❍ | | ❍ | | • | | • | | • | • | | | | | | |
| 209-CTH | • | • | ❍ | ❍ | • | ❍ | | • | • | ❍ | | • | | ❍ | ❍ | • | | | • | | • |
| 211-CTH-SC-Z | • | • | • | | • | | | | | | | • | | • | • | • | | • | • | | |
| 215-CTH-SV01-UR-SC | • | | • | • | • | • | • | • | • | ❍ | ❍ | • | • | • | • | ❍ | | • | | | |
| 203A-CTH-F-T | • | | ❍ | | • | ❍ | • | | | | | • | ❍ | • | | • | Please contact Dymax Application Engineering for assistance. | | • | | • |
| 203A-CTH-F-VT | • | | ❍ | | • | ❍ | • | | | | | • | ❍ | • | | • | | | • | | • |
| 203-CTH-F-VLV | • | | ❍ | | • | ❍ | • | | | | | • | ❍ | • | | • | | | • | | • |
| 215-CTH-UR-SC | • | | • | • | • | • | • | • | • | ❍ | ❍ | • | • | • | • | ❍ | | • | | | |
| 215-CTH-LV-UR-SC | • | | • | • | • | • | • | • | • | ❍ | ❍ | • | • | • | • | ❍ | | • | | | |
| 215-CTH-T-UR-SC | • | | • | • | • | • | • | • | • | ❍ | ❍ | • | • | • | • | ❍ | | • | | | |
| 250-CTH | • | • | ❍ | | • | ❍ | • | ❍ | • | ❍ | | • | | • | • | • | | | | | |

- • Recommended adhesive
- ❍ Limited applications
- **ST** Requires surface treatment (e.g., plasma, corona treatment, etc.)

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

# HLC™ Adhesives

## Patented Hybrid Light-Curable Materials with On-Contact Dark Area Cure Capability

Dymax hybrid light-curable technology is a revolutionary new adhesive platform that combines the best attributes of anionic and free radical chemistries into one. HLC adhesives exhibit the exceptional physical and performance properties of Dymax standard light-curable materials and the rapid on-contact cure of anionics. The incorporation of contact curing allows these materials to be used with a larger range of substrates and provides curing in dark areas not reachable by light.

HLC™ adhesives are ideal for medical device assemblies with shadowed bond areas, including many catheter bonding applications. Due to their unique hybrid curing chemistry, these adhesives require specific storage, handling, application, and curing practices. For complete guidance, refer to the ***Guide to HLC™ Adhesives***.

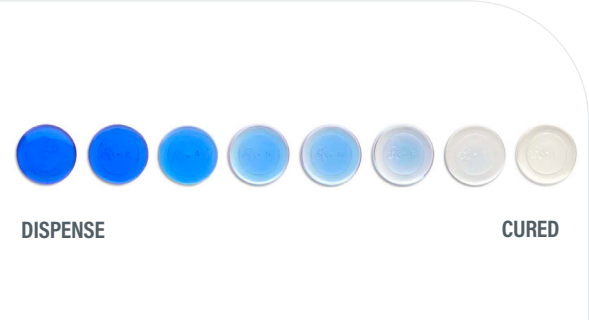
| Product | Features & Applications | Nominal Viscosity, cP | Durometer Hardness | Modulus of Elasticity, MPa (psi) | Tensile at Break, MPa [psi] | Elongation at Break, % | Linear Shrinkage, % | ISO 10993 Biocompatibilty |
|---|---|---|---|---|---|---|---|---|
| **HLC-M-1000** | • Hybrid light & contact cure adhesive<br>• Low to no blooming with light cure<br>• Wicking grade viscosity<br>• Recommended substrates: ABS, PC, PCTG, PEBA, PETG, PMMA, PS, SAN, SS | 3 | D80 | 2.144,3 [311.000] | 49 [7.100] | 4 | 0,7 | • ISO 10993-4 Hemolysis<br>• ISO 10993-5 Cytotoxicity<br>• ISO 10993-6 Implantation<br>• ISO 10993-11 Systemic Toxicity<br>• ISO 10993-23 Intracutaneous Irritation |
| **HLC-M-1004** | • Hybrid light & contact cure adhesive<br>• Limited blooming with light cure<br>• Recommended substrates: ABS, CAP, PC, PEI, PMMA, SAN | 1.300 | D65 | 544,7 [79.000] | 13,1 [1.900] | 150 | 0,2 | |

### Key Attributes

- Fast, tack-free cure with UV light - broad spectrum or LED
- Cures with very low intensity (~20 mW/cm$^2$)
- On-contact dark area cure capability
- Improved physical properties with low to no blooming after proper light cure
- Heat and humidity resistance
- Wicking-grade viscosity available for fast flow into tight-fitting assemblies
- ISO 10993 evaluated per intended use
- Cold ship/storage

# Adhesive Innovations

As an innovator in the adhesive and coating industries, Dymax strives to create new technologies that help manufacturers increase process efficiency, productivity, and throughput while decreasing costs and inventory. Through the years, our dedication to innovation has resulted in over 30 patents and numerous awards for our innovative technologies and service.




## See-Cure Technology
### Confirm Adhesive Placement & Cure

- Material transitions color when cure is complete
- Provides critical safety feature for manufacturing processes
- Simple visual confirmation of cure, no special equipment needed

## Ultra-Red® Technology
### Enhance Bond-Line Inspection

- Fluoresces bright red when exposed to low-intensity black light so bond lines can be easily inspected
- Produces a unique energy peak exclusive to Dymax so products can be marked and positively identified

## Encompass® Technology
### Enhance Bond-Line Inspection & Confirm Cure

- Ultra-Red® and See-Cure technologies incorporated into one product
- Manufactures gain efficiencies from rapid curing with easy cure confirmation and post-cure bond-line inspection

## Multi-Cure® Technology
### Eliminate Uncured Material in Shadow Areas

- Cures with light but features secondary heat cure for material that flows into shadow areas.

## TPO-Free Adhesives
### Trusted Quality, Future-Ready Formulations

- Formulated without Trimethylbenzoyl Diphenylphosphine Oxide (TPO)
- Same trusted performance and reliability while supporting long-term product planning and compliance

# Dispensing & Light-Curing Equipment

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 also 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. Visit the dymax.com website for a complete listing of our equipment.



## Dymax Dispensing Systems

- Pneumatic dispense and spray systems
- Available with suck back control for crisp shutoff even with stringy/tacky materials
- Valves with disposable fluid paths available for contaminate-free dispensing

## BlueWave® QX4 LED Spot-Curing System

- One controller controls up to four LED heads
- LED heads available in 365, 385, and 405nm
- PLC interface

## BlueWave® MX-150 LED Spot-Curing System

- Emitter design for set up flexibility and consistent intensity
- LED curing emitters in 365, 385, and 405 nm
- PLC interface for easy integration into fully automated lines

## Radiometers

- Provides accurate measurement of system lamp intensity and dosage
- UV broad-spectrum and LED compatible radiometers
- Wand and puck style radiometers available for spot, flood, and conveyor systems

# Reference Tables

## Viscosity

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  VT = Very Thick

LV = Low Viscosity  GEL = Gel

T = Thick

Standard viscosity products do not have a suffix.

| Typical Centipoise (MPas) | Typical Reference Liquids at 20°C |
|---|---|
| 1 | Water |
| 10 | Kerosene |
| 110 | SAE 10 Oil |
| 200 | Maple Syrup |
| 440 | SAE 30 Oil |
| 1.100 | Castor Oil |
| 3.000 | Honey |
| 10.000 | Molasses |
| 18.000 | Chocolate Syrup |
| 65.000 | Vaseline |
| 100.000 | Sour Cream |
| 200.000 | Peanut Butter |
| 1.500.000 | Shortening |

**LV** Low Viscosity
Newtonian

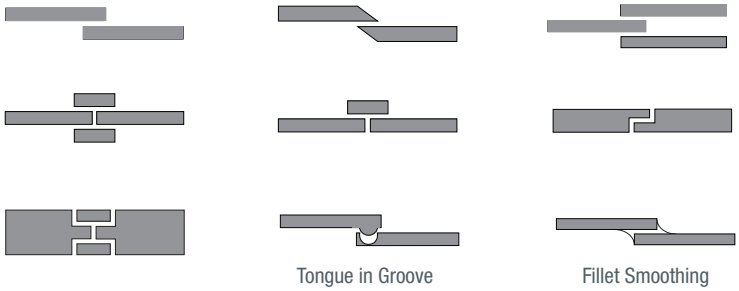
**T** Viscosity
Slightly Thixotropic

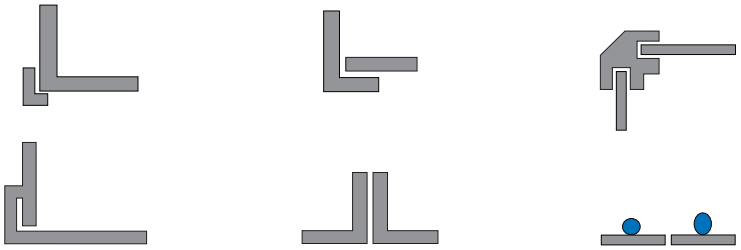
**VT** Viscosity
Thixotropic

**GEL** Viscosity
Highly Thixotropic

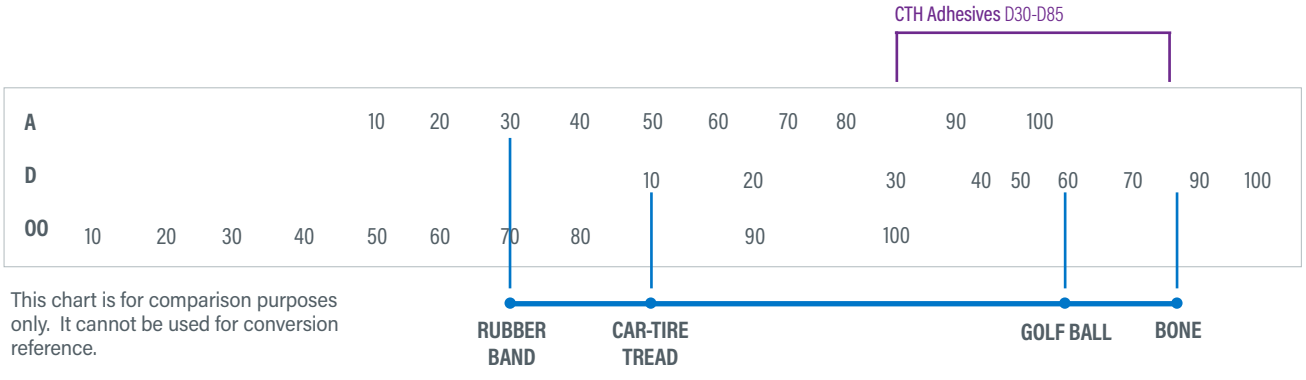
## Dots

| Volume of a dot is 1/2 the volume of a sphere $V=0{,}2618D^3$ | | | | | | |
|---|---|---|---|---|---|---|
| | · | • | • | ● | ● | ● |
| **Volume (ul)** | 0,10 | 0,51 | 0,05 | 0,01 | 00,0 | 25,0 |
| **Volume (mL)** | 0,0001 | 0,00050 | 0,0010 | 0,0050 | 0,0100 | 0,025 |
| **Diameter (mm)** | 0,73 | 1,241 | 0,56 | 2,673 | 0,37 | 4,57 |
| **Diameter (in)** | 0,0290 | 0,0490 | 0,0610 | 0,1030 | 0,1330 | 0,180 |

| Avoid butt joints: cleavage or asymmetric-type forces can result in part failure | Suggested alternatives: (Recommended bond gaps: 0,05 -0,15 mm) |
|---|---|
|  |   |

| Avoid corner butt joints: Cleavage-type forces can result in part failure | Suggested alternatives: (Recommended bond gaps: 0,05 -0,15 mm) |
|---|---|
|  |  |

## Hardness




This chart is for comparison purposes only. It cannot be used for conversion reference.

## Production Throughput Planner

| 1 Piece Every... | Minute | Hour | *Day (8 hours) | *Week (40 hours) | *Month (21 days) | *Year (50 weeks) |
|---|---|---|---|---|---|---|
| 0.5 second | 120 | 7,200 | 57,600 | 288,000 | 1,209,600 | 14,400,000 |
| 1 second | 60 | 3,600 | 28,800 | 144,000 | 604,800 | 7,200,000 |
| 5 seconds | 12 | 720 | 5,760 | 28,800 | 120,960 | 1,440,000 |
| 10 seconds | 6 | 360 | 2,880 | 14,400 | 60,480 | 720,000 |
| 30 seconds | 2 | 120 | 960 | 4,800 | 20,160 | 240,000 |
| 1 minute | 1 | 60 | 480 | 2,400 | 10,080 | 120,000 |
| 5 minutes | - | 12 | 96 | 480 | 2,016 | 24,000 |
| 10 minutes | - | 6 | 48 | 240 | 1,008 | 12,000 |
| 30 minutes | - | 2 | 16 | 80 | 336 | 4,000 |
| 1 hour | - | 1 | 8 | 40 | 168 | 2,000 |

*Based on 8-hour shifts.

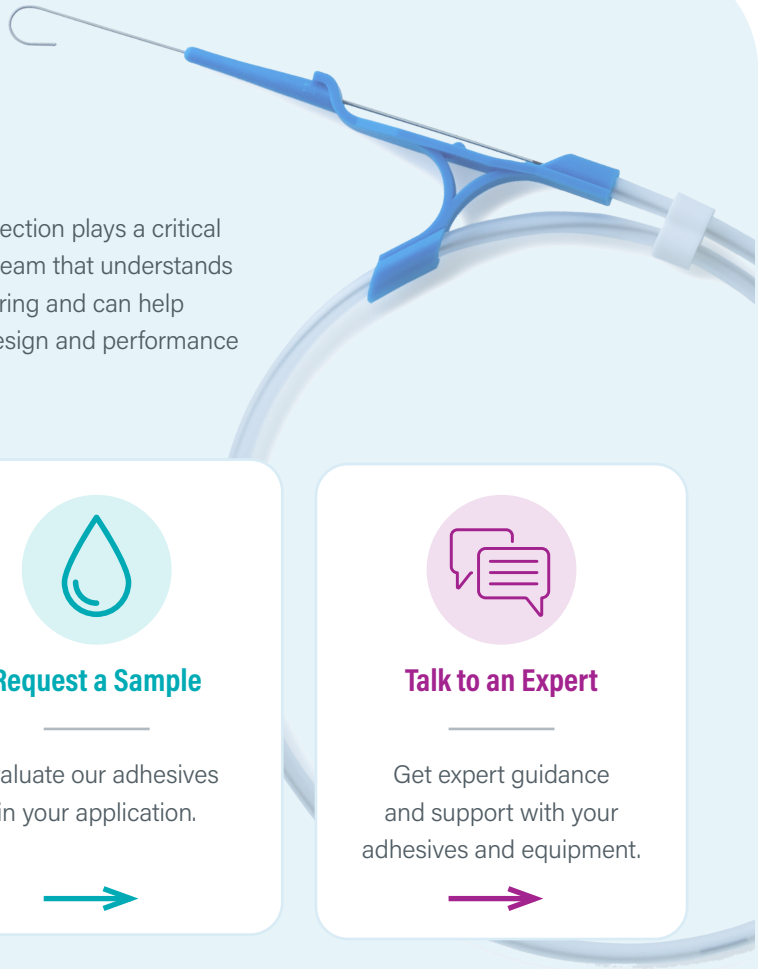
## Estimating Usage

| Bond-Line Gap or Coating Thickness | Theoretical Area Covered by 1 Liter of Adhesive or Coating |
|---|---|
| 0,002" (51 µm) | 30.500 $in^2$ (212 $ft^2$) (19,7 $m^2$) |
| 0,005" (127 µm) | 12.200 $in^2$ (84,7 $ft^2$) (7,88 $m^2$) |
| 0,010" (254 µm) | 6.100 $in^2$ (42,4 $ft^2$) (3,94 $m^2$) |
| 0,015" (381 µm) | 4.070 $in^2$ (28,3 $ft^2$) (2,63 $m^2$) |

| Bead Size | Theoretical Usage (Length per Liter) |
|---|---|
| 1/32" (0,79 mm) | 66.300 in (1.684 m) |
| 1/16" (1,6 mm) | 16.600 in (422 m) |
| 3/32" (2,4 mm) | 7.400 in (188 m) |
| 1/8" (3,2 mm) | 4.100 in (104 m) |
| 3/16" (4,8 mm) | 1.900 in (48 m) |
| 1/4" (6,4 mm) | 1.000 in (25,4 m) |

# Bring Your Next Catheter Innovation to Life

From concept through field use, adhesive selection plays a critical role in catheter performance. Partner with a team that understands the unique challenges of catheter manufacturing and can help identify adhesive solutions tailored to your design and performance requirements.



### Download Technical Data

Access specifications, test data, and performance information.

### Request a Sample

Evaluate our adhesives in your application.

### Talk to an Expert

Get expert guidance and support with your adhesives and equipment.

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