CATHETER and GUIDEWIRE-BONDING ADHESIVES

The Dymax "CTH" line of UV and visible light-curable catheter bonding adhesives provides reliable cost-saving assembly solutions for catheter manufacturers. These products are ISO 10993 approved and formulated to meet the unique assembly challenges associated with the newest catheter materials.

Dymax light-curable adhesives are solvent free, have excellent adhesion, a high degree of flexibility, and fast cure speeds for consistent, low-stress catheter assembly. In-line inspection is possible with patented fluorescing technology included in all featured catheter adhesives. These products are compatible with gamma, EtO, and E-Beam sterilization.

PROPERTIES	203A-CTH-F	204-CTH-F	208-CTH-F	209-CTH	211-CTH-SC
Bondable Substrates Include:	SS, aluminum, NiTi, PA, PMMA	PC, PVC, PU, ABS, PET, PEBA	PC, PA, PMMA, PU, PVC, SS, ABS, PEBA, PET, PI, PS	PC, PVC, ABS, PMMA, PA, SS	ABS, CAP, PA, PC, PVC, SAN, TPU, EP, SS, PU, PS
Features	Secondary thermal cure capability	Flexible; moisture resistant; use with BlueWave® LED Prime UVA Spot Curing System	Flexible; moisture resistant	Multipurpose; use with BlueWave® LED Prime UVA Spot Curing System	Blue-to-clear color change; Use with BlueWave® LED Prime UVA Spot Curing System
Applications	Guidewire assembly, lumen sealing, sensor attachment	Balloon/lumen, plastics bonder	Balloon/lumen, hub/lumen, tube sets & fittings	Manifold/lumen, plastic and metal bonder	Needle bonding, catheter assembly, balloon bonding, connectors to tubing
Fluorescing (U.S. Patent 6,080,450)	Yes	Yes	Yes	Yes	No
ISO 10993 Biocompatibility	Yes	Yes	Yes	Yes	Yes
USP Class VI Biocompatibility	Yes	Yes	Yes	Yes	Yes
Nominal Viscosity, cP (20 rpm)	600*	500*	225	300	450
Durometer Hardness	D80	D58	D55	D70	D70
Tensile at Break, MPa [psi]	30 [4,300]	17 [2,500]	9 [1,300]	17 [2,500]	14 [2,000]
Elongation at Break, %	13	200	250	120	470
Modulus of Elasticity, MPa [psi]	640 [93,000]	110 [16,000]	69 [10,000]	300 [44,000]	230 [34,000]
Linear Shrinkage, %	1.6	2.0	2.0	0.8	0.59
CURE DATA:					
Fixture Time: (0.05 mm) 0.002 Inch Depth (in seconds) Between Glass					
Dymax BlueWave® 200 Spot Lamp (10,000 mW/cm^2)**	1.6	0.2	0.2	<0.2	1.0
SUBSTRATE BONDING GUIDE					
ABS acrylonitrile-butadiene-styrene	✓	✓	✓	✓	✓
CAP Cellulose acetate propionate					✓
EP epoxy, FR-4 circuit board					✓
NiTi nickel titanium	✓	o		o	
PA polyamide	✓	o	✓	o	✓
PC polycarbonate		✓	✓	✓	✓
PE polyethylene		st		st	
PEBA polyether-block-amide	✓	o	✓	o	
PET poly(ethylene terephthalate)	st	o	✓	✓	
PETG poly(ethylene terephthalate)glycol		o		✓	
PI polyimide	o	✓	✓	o	
PMMA poly(methyl methacrylate)	✓	o	✓	✓	
PS polystyrene	✓	✓	✓	✓	✓
PU polyurethane	✓	✓	✓	o	✓
PVC poly(vinyl chloride)		✓	✓	o	✓
SAN styrene-acrylonitrile	✓				✓
SS stainless steel	✓	o	✓	o	✓
TPU Thermoplastic polyurethane					✓

✓ *Recommended adhesive* **o** *Limited applications* **st** *Requires surface treatment (e.g., plasma, corona treatment, etc.)*

*Other viscosity variations may be available upon request.

**10,000 mW/cm^2 measured at work surface over the UVA range (320-395 nm) using the Dymax ACCU-CAL™ 50 radiometer.*

NEEDLE-BONDING and SYRINGE-ASSEMBLY ADHESIVES

High-speed, high-volume needle bonding and syringe needle assembly is possible with Dymax UV/visible light-curable adhesives. They are ISO 10993 approved and bond on demand at room temperature when exposed to UV or visible light. Dymax MD® needle bonding adhesives are solvent free, single component, and fluoresce for in-line testing and inspection.

They are ideal for automated assembly lines. Applications include bonding cannulas to hubs in various hypodermic and biopsy needles, syringes, and winged-infusion sets made from multiple plastics, metals, and glass. Dymax MD® needle-bonding adhesives are compatible with gamma, EtO, and E-Beam sterilization.

PROPERTIES	1161-M	1162-M*	1180-M*
Bondable Substrates Include:	PC, ABS, PVC, PMMA, SS, PA	PC, SS, glass, PVC, ABS	PC, PVC, PU, ABS, SS
Features	Multipurpose plastic and metal bonder	Strong bonds to a variety of substrates; low shrinkage	Multipurpose; plastic and metal bonder
Applications	Tube sets and fittings, reservoirs, needle bonding	Needle bonding	Needle bonding, reservoirs, transducer assembly
Fluorescing (U.S. Patent 6,080,450)	Yes	Yes*	Yes*
ISO 10993 Biocompatibility	Yes	Yes	Yes
USP Class VI Biocompatibility	Yes	Yes	Yes
Nominal Viscosity, cP (20 rpm)	300	200	150*
Durometer Hardness	D70	D75	D70
Tensile at Break, MPa [psi]	17 [2,500]	15 [2,100]	17 [2,500]
Elongation at Break, %	120	140	90
Modulus of Elasticity, MPa [psi]	300 [44,000]	390 [57,000]	310 [45,000]
Linear Shrinkage, %	0.8	0.4	0.8
CURE DATA			
Fixture Time: (0.05 mm) 0.002 Inch Depth (in seconds) Between Glass			
Dymax BlueWave® 200 Spot Lamp (10,000 mW/cm^2)**	<0.2 s	<0.2 s	0.2 s
Dymax 5000-EC Flood Lamp (200 mW/cm^2)***	<1 s	<1 s	<1 s
Dymax UVC-6 Conveyor w/Fusion "D" Bulb (2,500 mW/cm^2)****	>8.2 m/min [>27 ft/min]	>8.2 m/min [>27 ft/min]	>8.2 m/min [>27 ft/min]
SUBSTRATE BONDING GUIDE			
ABS acrylonitrile-butadiene-styrene	✓	✓	✓
CAP cellulose acetate propionate	✓		✓
GL glass	✓	✓	✓
PA polyamide	o		✓
PC polycarbonate	✓	✓	✓
PE polyethylene	st	st	st
PMMA poly(methyl methacrylate)	✓		✓
PP polypropylene	o	st	o
PS polystyrene	✓	✓	✓
PU polyurethane	o		o
PVC poly(vinyl chloride)	o	✓	✓
SS stainless steel	✓	✓	✓

✓ *Recommended adhesive* **o** *Limited applications* **st** *Requires surface treatment (such as corona, etc., or a mechanical lock hub design)*

*Other viscosity variations may be available upon request.

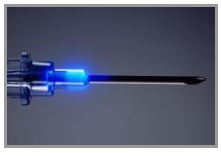
**10,000 mW/cm^2 measured at work surface over the UVA range (320-395 nm) using the Dymax ACCU-CAL™ 50 radiometer.

***200 mW/cm^2 measured 2.5" below bottom of lamp housing. Measured by the ACCU-CAL™ 50 radiometer.

****2,500 mW/cm^2 measured by EIT Power Puck radiometer 2.1" below lamp housing.

*Ultra-Red™ fluorescing grades available

Fluorescing for in-line inspection



Bond needle to hub

RESPIRATORY-DEVICE ADHESIVES: ANESTHESIA MASKS, RESUSCITATOR BAGS, and BREATHING CIRCUITS

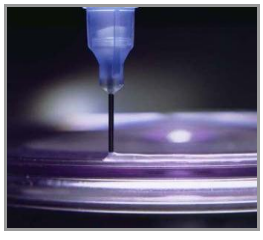
The Dymax "MSK" line of UV/visible light-curable adhesives is formulated for bonding respiratory devices such as anesthesia masks, resuscitator bags, and breathing circuits. These products are solvent free, ISO 10993-5 Cytotoxicity approved, and form strong, flexible bonds to a variety of substrates as well as highly plasticized plastics. "On demand" bonding at line speeds greater than 20 feet per minute (6.1 meters per minute) is possible, providing increased through- put without additional labor or line expansion.

The ability of selected "MSK" products to fluoresce upon exposure to low-intensity "black" light makes them ideally suited for in-line inspection. Dymax respiratory-device adhesives are easily dispensed by syringe, dipping well, screen print, or spray and are compatible with gamma, EtO, and E-Beam sterilization.

PROPERTIES	109-MSK-UR	110-MSK	111-MSK
Bondable Substrates Include:	ABS, PVC, PU, surface-treated silicone	PVC, PC, PU, ABS	PVS, SEBS, PU, PS
Features	Moisture resistant; strong bonds to plasticized PVC; Ultra-Red™ fluorescing	Flexible; bonds to plasticized substrates	Bonds to thermoplastic elastomers; moisture resistant
Applications	Facemasks, breathing circuits	Facemasks, tube sets and fittings, breathing circuits, resuscitator bags	Facemasks, tube sets and fittings, breathing circuits, resuscitator bags
Fluorescing (U.S. Patent 6,080,450)	No	No	Yes
ISO 10993 Biocompatibility	ISO 10993-5	ISO 10993-5	ISO 10993-5
USP Class VI Biocompatibility	Cytotoxicity	Cytotoxicity	Cytotoxicity
Nominal Viscosity, cP (20 rpm)	800	9,500	280
Durometer Hardness	D65	A58	D50
Tensile at Break, MPa [psi]	22 [3,200]	4.1 [590]	6 [900]
Elongation at Break, %	38	230	200
Modulus of Elasticity, MPa [psi]	430 [62,000]	3.6 [520]	70 [10,000]
Linear Shrinkage, %	0.6	1.8	0.5
CURE DATA			
Fixture Time: (0.05 mm) 0.002 Inch Depth (in seconds) Between Glass			
Dymax 5000-EC Flood Lamp (200 mW/cm^2)*	1 s	1 s	<1 s
Dymax UVC-6 Conveyor w/Fusion "D" Bulb (2,500 mW/cm^2)**	8.2 m/min [27 ft/min]	>8.2 m/min [>27 ft/min]	8.2 m/min [27 ft/min]
SUBSTRATE BONDING GUIDE			
ABS acrylonitrile-butadiene-styrene	✓	✓	✓
PC polycarbonate	o	✓	o
PVC poly(vinyl chloride)	✓	✓	✓
SEBS styrene-ethylene/butylene-styrene			✓
Silicone platinum cured	st		

*✓ Recommended adhesive **o** Limited applications **st** Requires surface treatment (e.g., plasma, corona treatment, etc.)*
**200 mW/cm^2 measured 2.5" below bottom of lamp housing. Measured by the ACCU-CAL™ 50 radiometer.*
***2,500 mW/cm^2 measured by EIT Power Puck radiometer 2.1" below lamp housing.*

Automated facemask curing



MSK adhesives bond to a wide variety of substrates

MD® MULTIPURPOSE BONDING ADHESIVES

Dymax UV and visible light-curable adhesives for medical devices significantly reduce assembly process costs. The Dymax MD® "1000" series adhesives are solvent free and cure within seconds upon exposure to UV and visible light and permit bonding of UV-inhibited and tinted plastics. In-line inspection of the adhesive bond line is made possible with the patented fluorescing chemistry.

Dymax medical device adhesives glow brightly when exposed to a low-intensity "black light" and enhance the function of automated vision equipment for high-speed, high-volume production.

These products are ISO 10993 approved and are ideal for bonding a wide variety of substrates found in reservoirs and housings, respiratory devices, needles and syringes, transducers, tube sets and fittings, and other medical disposables. Dymax MD® adhesives are compatible with gamma, EtO, and E-Beam sterilization.

PROPERTIES	1128A-M	1161-M	1162-M*	1165-M	1180-M*	1187-M
Bondable Substrates Include:	SS, aluminum, glass, PA, PMMA, PS	PC, ABS, PVC, PMMA, SS, PA	PC, SS, glass, PVC, ABS	PVC, PC, PU, ABS, EVA	PC, PVC, PU, ABS, SS	PC, PVC, PU, ABS, PET
Features	High strength; impact resistant; secondary thermal cure capability	Multipurpose plastic and metal bonder; use with BlueWave® LED Prime UVA Spot Curing System	Strong bonds to a variety of substrates; low shrinkage; use with BlueWave® LED Prime UVA Spot Curing System	Silicone-like softness; cures with dry surface	Multipurpose; plastic and metal bonder	Moisture resistant; clear bond lines; flexible; use with BlueWave® LED Prime UVA Spot Curing System
Applications	Metal bonding	Needle bonding, tube sets, reservoirs	Plastic and needle bonding	Tube sets, gaskets	Needle bonding, reservoirs, transducer assembly	Reservoirs, tube sets
Fluorescing (U.S. Patent 6,080,450)	Yes	Yes	Yes*	Yes	Yes*	Yes
ISO 10993 Biocompatibility	Yes	Yes	Yes	Yes	Yes	Yes
USP Class VI Biocompatibility	Yes	Yes	Yes	Yes	Yes	Yes
Nominal Viscosity, cP (20 rpm)	600*	300	200	10,000	150*	450*
Durometer Hardness	D80	D70	D75	A55	D70	D55
Tensile at Break, MPa [psi]	30 [4,300]	17 [2,500]	15 [2,100]	3.8 [550]	17 [2,500]	17 [2,500]
Elongation at Break, %	13	120	140	250	90	170
Modulus of Elasticity, MPa [psi]	640 [93,000]	300 [44,000]	390 [57,000]	3.6 [520]	310 [45,000]	170 [25,000]
Linear Shrinkage, %	1.6	0.8	0.4	1.6	0.8	2.0
CURE DATA						
Fixture Time: (0.05 mm) 0.002 Inch Depth (in seconds) Between Glass						
Dymax BlueWave® 200 Spot Lamp (10,000 mW/cm^2)**	1.6 s	<0.2 s	<0.2 s	0.4 s	0.2 s	0.2 s
Dymax 5000-EC Flood Lamp (200 mW/cm^2)***	1 s	<1 s	<1 s	1 s	<2 s	<1 s
Dymax UVC-6 Conveyor w/Fusion "D" bulb (2,500 mW/cm^2)****	8.2 m/min [27 ft/min]	>8.2 m/min [>27 ft/min]	>8.2 m/min [>27 ft/min]	>8.2 m/min [>27 ft/min]	>8.2 m/min [>27 ft/min]	>8.2 m/min [>27 ft/min]

Other viscosity variations may be available upon request.
***10,000 mW/cm^2 measured at work surface over the UVA range (320-395 nm) using the Dymax ACCU-CAL™ 50 radiometer.*
****200 mW/cm^2 measured 2.5" below bottom of lamp housing. Measured by the ACCU-CAL™ 50 radiometer.*
*****2,500 mW/cm^2 measured by EIT Power Puck radiometer 2.1" below lamp housing.*
**Ultra-Red™ fluorescing grades available*

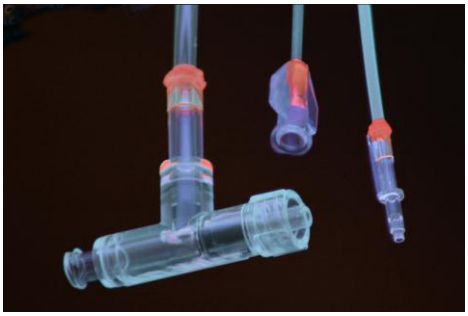
MD® MULTIPURPOSE ADHESIVE / Substrate Bonding Guide - Medical Plastics/Materials

PRODUCTS	1128A-M	1161-M	1162-M*	1165-M	1180-M*	1187-M
PLASTICS						
ABS acrylonitrile-butadiene-styrene	o	✓	✓	✓	✓	✓
CAP cellulose acetate propionate	o	✓			✓	
COPE copolyetheresters	o	✓			**o**	✓
EP epoxy, FR-4 circuit board		✓			✓	
EVA ethylene-vinyl acetate	st			✓		
HDPE high-density polyethylene		st	st	st	st	st
LDPE low-density polyethylene	st	st	st	st	st	st
MBS methacrylate-butadiene-styrene	o	o			✓	o
PA polyamide	✓	o				o
PC polycarbonate		✓	✓	✓	✓	✓
PC/ABS Blend blend of PC and ABS		✓	✓	✓	✓	✓
PC/PCTG Blend blend of PC and PCTG		✓	✓	✓	✓	o
PCTG poly(cyclohexylene dimethylene terephthalate)glycol		✓	✓	✓	✓	o
PEBA polyether block amide	o	o				✓
PEI polyetherimide		o				
PES polyethersulfone		o				o
PET poly(ethylene terephthalate)	st	✓	✓	o	✓	✓
PETG poly(ethylene terephthalate)glycol		✓			✓	✓
PI polyimide	o	o		o		✓
PMMA poly(methyl methacrylate)	✓	✓		o	✓	o
POM polyoxymethylene						
PPO poly(phenylene oxide)	o	o			o	o
PS polystyrene	✓	✓	✓	o	✓	✓
PSU polysulfone		o			o	o
PU polyurethane	o	o		✓	o	✓
PVC poly(vinyl chloride)		o	✓	✓	✓	✓
SB styrene-butadiene		o		o	✓	
SAN styrene-acrylonitrile	✓	✓			o	✓
TPU thermoplastic polyurethane	o	o		o	✓	✓
OTHER MATERIALS						
AL aluminum	✓		✓			
CER ceramic	✓	o		o		
GL glass	✓	✓	✓	o	✓	
SS stainless steel	✓	✓	✓	o	✓	

✓ Recommended adhesive **o** *Limited applications* **st** *Requires surface treatment (such as corona, etc., or a mechanical lock hub design)*
**Ultra-Red™ fluorescing grades available*

Ultra-Red™ Fluorescing Technology

Dymax has introduced a new technology that enhances bond-line inspection processes and product authentication. Ultra-Red™ Fluorescing technology can be incorporated into existing adhesive formulations. The adhesives remain clear until exposed to low-intensity UV light (typical inspection lights), at which point they fluoresce bright red. This is particularly effective when bonding plastics that naturally fluoresce blue, such as PVC and PET. The patented *Ultra-Red* fluorescence also produces a unique spectral signature that can be used by manufacturers for their product authentication.



Tube sets bonded with Dymax *Ultra-Red* adhesives fluoresce bright red

SEE-CURE TECHNOLOGY

How do I know that sufficient adhesive has been dispensed? How do I know when it's cured?

Dymax adhesives containing See-Cure technology provide the ability to answer these questions. Uncured See-Cure adhesives are bright blue in color. This makes them easy to see after dispensing.

During the light-curing process, the blue color transitions to clear, indicating that sufficient energy was received by the adhesive to complete the curing process. This visual cure-indicator may initially be used to qualify the process and then to ensure that the process remains within the qualified parameters.

PROPERTIES	211-CTH-SC	1201-M-SC	1202-M-SC	1204-M-SC
Bondable Substrates Include:	ABS, CAP, PA, PC, PVC, SAN, TPU, EP, SS, PU, PS	PC, PVC, PU, ABS, PET, PEBA	PMMA, PA, PC, PU, PVC, PET, SS	PVC, PU, ABS, PC, EVA
Features	Blue-to-clear color change; Use with BlueWave® LED Prime UVA Spot Curing System	Blue-to-clear color change; flexible; use with BlueWave® LED Prime UVA Spot Curing System	Blue-to-clear color change; flexible	Blue-to-clear color change; low shrinkage; very flexible
Applications	Needle bonding, catheter assembly, balloon bonding, connectors to tubing	Tube sets, reservoirs, catheters	Tube sets, metal-to-plastic assembly, catheters, reservoirs	Tube sets and fittings, face masks, tracheal tubes
ISO 10993 Biocompatibility	Yes	Yes	Yes	Yes
Nominal Viscosity, cP (20 rpm)	450	600	200	12,000
Durometer Hardness	D70	D60	D55	A60
Tensile at Break, MPa [psi]	14 [2,000]	14 [2,000]	11 [1,600]	6.9 [1,000]
Elongation at Break, %	470	170	230	380
Modulus of Elasticity, MPa [psi]	230 [34,000]	120 [17,000]	100 [15,000]	5.1 [740]
Linear Shrinkage, %	0.59	2.4	2.0	0.1

Note: Please refer to individual Product Data Sheets (PDS) for cure data information

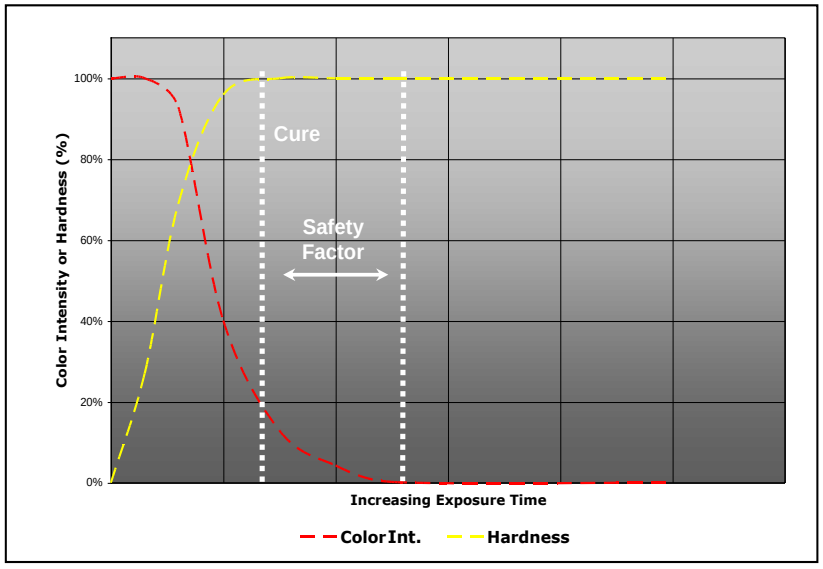
The Safety Factor Chart

To verify that See-Cure technology consistently serves as a reliable indicator of full cure, Dymax performed extensive testing with a wide variety of its light-curing adhesive products. The test matrix included standard adhesives with a broad range of adhesive cure speeds and cured properties. Using existing specifications from each standard adhesive as a control, the adhesives adjusted with See-Cure were tested again to the same specifications. All physical cured properties of the sample group remained within the measured values of the original specifications.

In addition, the adhesive products designated for medical device assembly were formulated with the See-Cure technology and tested for biocompatibility. The test results confirm that the addition of See-Cure technology has no affect on the biocompatibility rating of the original product.

To illustrate the concept of See-Cure technology, measurements of product hardness were taken during curing cycles to determine the point of full cure. These were plotted against measurements of adhesive color intensity at the same time intervals.

The Safety Factor Chart



The graph above depicts the typical relationship between the progression of adhesive cure and the diminishing color of See-Cure technology within the adhesive. As verified by the graphed measurements, the final color change from blue occurs after adhesive curing has taken place.

SEE-CURE ADHESIVES / Substrate Bonding Guide – Medical Plastics/Materials

PRODUCTS	211-CTH-SC	1201-M-SC	1202-M-SC	1204-M-SC
PLASTICS				
ABS acrylonitrile-butadiene-styrene	✓	✓	✓	✓
CAP cellulose acetate propionate	✓			
COPE copolyetheresters		✓		
EP epoxy, FR-4 circuit board	✓			
EVA ethylene-vinyl acetate				✓
HDPE high-density polyethylene		st	st	st
LDPE low-density polyethylene		st	st	st
MBS methacrylate-butadiene-styrene		o	✓	
PA polyamide	✓	o	✓	
PC polycarbonate	✓	✓	✓	✓
PC/ABS Blend blend of PC and ABS		✓	✓	✓
PC/PCTG Blend blend of PC and PCTG		o	✓	✓
PCTG poly(cyclohexylene dimethylene terephthalate)glycol		o	✓	✓
PEBA polyether block amide		✓	o	
PEI polyetherimide				✓
PES polyethersulfone		o		
PET poly(ethylene terephthalate)		✓	✓	o
PETG poly(ethylene terephthalate)glycol		✓	✓	
PI polyimide			✓	
PMMA poly(methyl methacrylate)		o	✓	o
POM polyoxymethylene				
PPO poly(phenylene oxide)				
PS polystyrene	✓	✓	o	o
PSU polysulfone				
PU polyurethane	✓	✓	✓	✓
PVC poly(vinyl chloride)	✓	✓	✓	✓
SB styrene-butadiene			✓	o
SAN styrene-acrylonitrile	✓	✓		
TPU thermoplastic polyurethane	✓	✓	✓	✓
OTHER MATERIALS				
AL aluminum			o	
CER ceramic				
GL glass				
SS stainless steel	✓		o	

✓ *Recommended adhesive* **o** *Limited applications* **st** *Requires surface treatment (such as corona, etc., or a mechanical lock hub design)*

See it Dispense.

See It Cure

See the Solution.

See it Cure from Blue to Clear

A Dymax adhesive formulated with See-Cure technology changes from bright blue to clear, indicating the adhesive is fully cured.