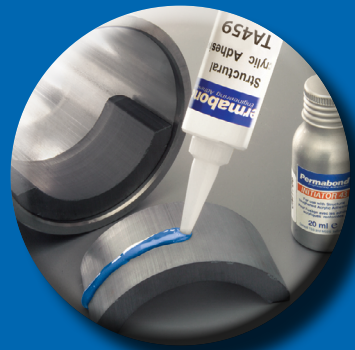
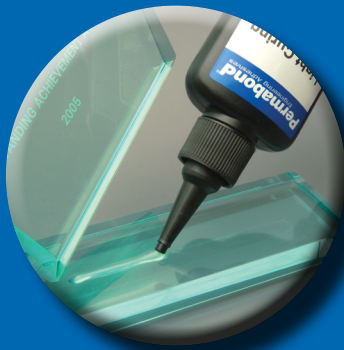
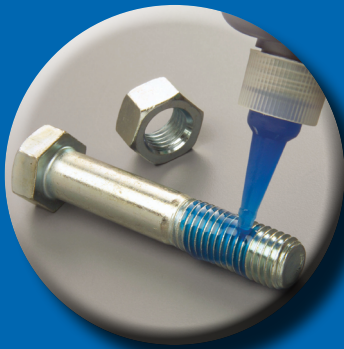


# Permabond®

*Engineering Adhesives*



***“Our Science... Your Success!”***

[www.permabond.com](http://www.permabond.com)

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## CALL

800-640-7599 ■ 732-868-1372



## CHAT

[www.permabond.com](http://www.permabond.com)



## EMAIL

[info.americas@permabond.com](mailto:info.americas@permabond.com)



# CONTACT US

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We look forward to assisting you in selecting the best stock or custom engineering grade adhesive for your application!

Our team is dedicated to providing high quality products that meet today's challenges for improvements in performance, efficiency, and cost effectiveness.

---

Permabond manufactures engineering adhesives and sealants for industrial use. We have a large number of specialty products and work with design engineers to custom formulate to engineering specifications. A sampling of products is listed on the following pages. Please note strength results will vary depending on the level of surface preparation and gap.

***ISO 9001:2015 Certified***

Permabond products conform to many company and industry specifications. Some of the most common are listed here.



Automotive



Defense and Aerospace



Sports and Leisure



Machinery



Transportation



Electric Motor

### MIL-A-46050C<sup>1</sup>

Permabond Grade	Type/Class
101	Type II, Class 1
102	Type II, Class 2
105	Type II, Class 1
108	Type II, Class 3
170	Type I, Class 3
268	Type II, Class 3
790	Type II, Class 1
791	Type II, Class 1
792	Type II, Class 2
795	Type II, Class 3
798	Type II, Class 3
799	Type II, Class 4
910	Type I, Class 2
910FS	Type I, Class 1
919	Type V, Class 1
920	Type V, Class 2
922	Type V, Class 3
QFS16	All Types

### CID A-A-3097

Permabond Grade	Type/Class
101	Type II, Class 1
108	Type II, Class 3
200	Type II, Class 3
268	Type II, Class 3
791	Type II, Class 1
792	Type II, Class 2
795	Type II, Class 3
910	Type I, Class 2
910FS	Type I, Class 1
2011	Type II, Class 5
QFS16	All Types

## Military Specifications and Standards

### MIL-S-22473E<sup>1</sup> • ASTM D5363<sup>2</sup>

Permabond Grade	Grade	ASTM D5363 Assigned #	Group	Class	Grade
HH120	AVV	AN 0124	01	2	4
HL126	AA	AN 0111	01	1	1
MM115	CVV	AN 0143	01	4	3
LM012	HVV	AN 0163	01	6	3
ASC10	N & T	N/A	N/A	N/A	N & T

### MIL-S-46163A<sup>1</sup> • ASTM D5363<sup>2</sup>

Permabond Grade	Type / Grade	ASTM D5363 Assigned #	Group	Class	Grade
HH120	I / L	AN 0211	02	1	1
HL126	III / R	AN 0261	02	6	1
HM118	II / O	AN 0331	03	3	1
HM128	I / K	AN 0221	02	2	1
LM113	II / M	AN 0311	03	1	1
MM115	II / N	AN 0321	03	2	1
ASC10	F	N/A	N/A	N/A	N & T

### MIL-R-46082B<sup>1</sup> • ASTM D5363<sup>2</sup>

Permabond Grade	Type	ASTM D5363 Assigned #	Group	Class	Grade
HL138	I	AN 0411	04	1	1
HM160	II	AN 0412	04	1	2
HM161	III	AN 0421	04	2	1

<sup>1</sup>MIL-SPECS are for existing designs ONLY

<sup>2</sup>ASTM D5363 is for NEW designs



Permabond has adhesives and sealants that bond virtually any substrate including composites, glass, metal, plastics, rubber, wood, and leather.

## Biocompatibility

### CYTOTOXICITY ISO 10993-5

Permabond Grade
4C10
4C20
4C30
4C40
731
820
920
ET530
UV630
POP

### USP CLASS VI

Permabond Grade
4C10
4C20
4C30
4C40

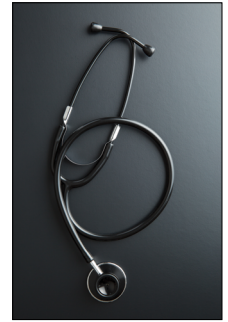
### SENSITIZATION ISO 10993-10

Permabond Grade
ET530

## Food

Permabond Grade	CFR 175.105 and 175.300
ET5145	Formulated using FDA approved raw materials.
ET5147	

Permabond Grade	NSF Non-food Compound Category Code P1
792	Reg # 156137
2011	Reg # 155298



Medical Device



Filters



Food Contact



Speaker





Fire Protection


## Oxygen Gas

Permabond Grade	BAM Certification
MH052	Approved for use with gaseous oxygen up to 10 bar (145 psi) and 60°C (140°F).

## Potable Water

 	Permabond Grade
	HH040 PURE
	LH050 PURE
	MM115 PURE

## Underwriters Laboratory

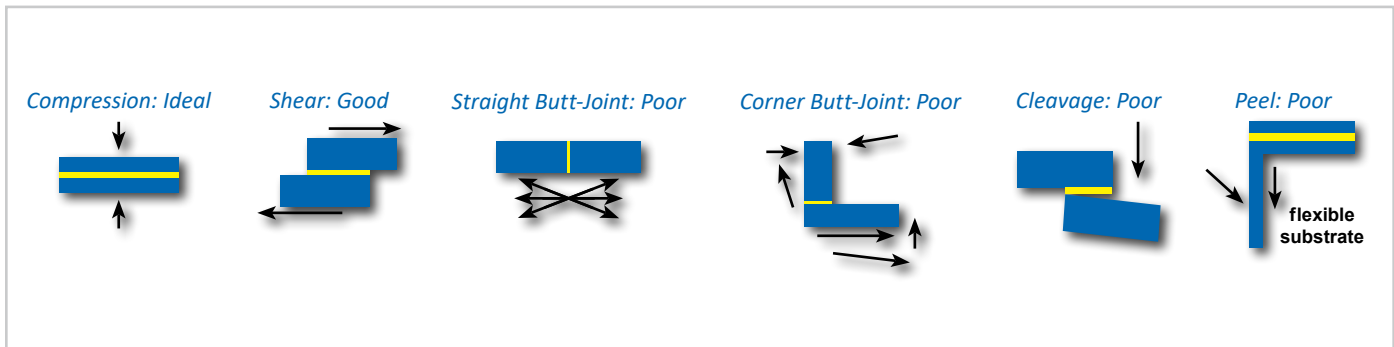
	Permabond Grade
	LH050
	LH150

# DESIGN CONSIDERATIONS

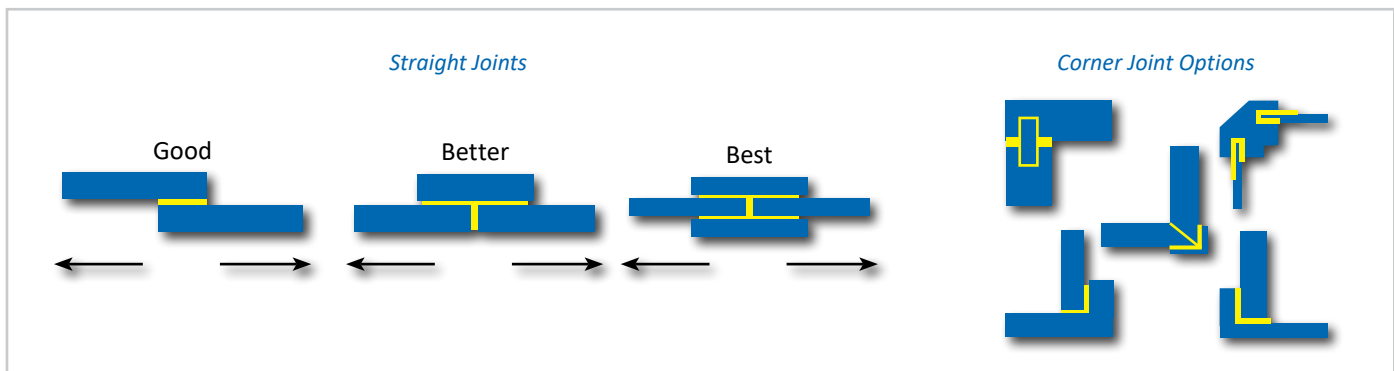
Designing components and assembly processes with adhesive use in mind improves quality and efficiency. In addition to adhesion, consider joint design, surface preparation, gap fill and viscosity, adhesive usage, and service conditions.

## Joint Designs

### Typical Joints



### Suggested Improvements



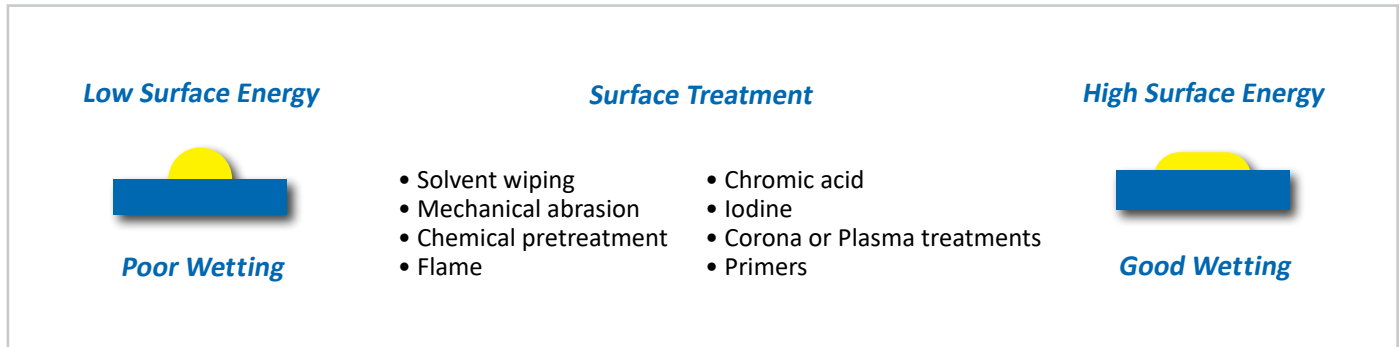
Substance	Viscosity mPa.s = cP	Substance	Viscosity mPa.s = cP
Water	1	Maple syrup	5,000
Milk	3	Honey	10,000
SAE 10 Motor oil	85-140	Chocolate syrup	25,000
SAE 20 Motor oil	140-420	Ketchup	50,000
SAE 30 Motor oil	420-650	Mustard	70,000
SAE 40 Motor oil	650-900	Sour cream	100,000
Castor oil	1,000	Peanut butter	250,000

## Gap Fill and Adhesive Viscosity

Adhesive viscosity and gap fill capability are closely related - generally, for a given chemistry, the higher the adhesive viscosity, the larger the gap filling capability. It is important to note the maximum gap fill for each product. Exceeding the maximum gap fill can weaken bond strength. To help "get a feel" for viscosity measurements, the list to the left shows everyday substances and their approximate viscosity.

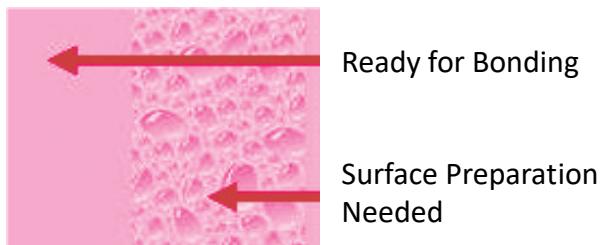
## Surface Preparation

Most materials can be bonded without surface pre-treatment unless surfaces are grossly contaminated. To achieve maximum performance and repeatable results, it is advisable to ensure the bond-able surface is clean and consistent. Increasing the surface energy can optimize the bond strength. Various surface treatments can be used to increase the surface energy.



## Permabond 2K Primer

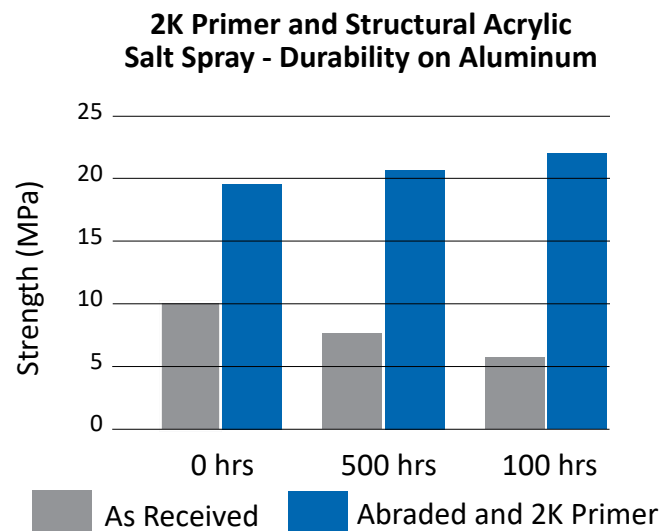
Permabond 2K Primer improves adhesion, prevents corrosion, and provides easy visual inspection of surface bondability.



On the left, the 2K Primer wets out the surface leaving a uniform coating. The surface to the right is not yet prepared well for bonding and the 2K primer beads up. Showing further surface treatment is needed.

## Salt Spray - Durability on Aluminum

The graph to the right shows the strength retention with and without Permabond 2K Primer on abraded aluminum surfaces bonded with structural acrylic adhesive. The results of the salt spray aging test show improved durability.



# ADHESIVE SELECTION

Selecting the most appropriate adhesive for an engineering application requires consideration of a number of factors. The following tables and charts will aid to narrow down the options. Permabond welcomes the opportunity to assist in your selection.

Please call 800-714-0170

Adhesion					Cured State	
Chemistry	Metal	Glass	Plastic	Composite	Flexibility	Hardness
Anaerobic	Excellent	Not Applicable	Not Applicable	Not Applicable	Low	Rigid
Cyanoacrylate	Very Good	Poor	Excellent	Good	Low to High	Rigid to Very Soft
Epoxy - 1 Part	Excellent	Excellent	Substrate Specific	Excellent	Low	Rigid
Epoxy - 2 Part	Excellent	Excellent	Fair	Excellent	Medium	Semi Rigid
Epoxy - Modified	Excellent	Excellent	Excellent	Excellent	High	Very Soft
MS Polymer	Very Good	Good	Excellent	Very Good	High	Very Soft
Polyurethane	Very Good	Good	Excellent	Excellent	Medium	Semi Rigid
Structural Acrylic - No Mix	Excellent	Good	Product Specific	Very Good	Low	Semi Rigid
Structural Acrylic - 2 Part	Excellent	Good	Product Specific	Very Good	Low	Semi Rigid
Structural Acrylic - 2 Part MMA	Excellent	Product Specific	Excellent	Excellent	Low	Semi Rigid
UV Curable	Very Good	Excellent	Excellent	Very Good	Product Specific	Product Specific

Solvent Resistance			Temperature Resistance	
Examples of polar solvents: Water, Ethylene Glycol, IPA, Acetone Examples of non-polar solvents: Motor Oil, Toluene, Gasoline			Products can withstand higher temperatures for brief periods providing the joint is not unduly stressed.	
Chemistry	Polar	Non Polar	Standard	High Temp Grade
Anaerobic	Very Good	Very Good	300°F (150°C)	450°F (230°C)
Cyanoacrylate	Poor	Good	185°F (85°C)	480°F (250°C)
Epoxy - 1 Part	Very Good	Excellent	350°F (180°C)	570°F (300°C)
Epoxy - 2 Part	Very Good	Very Good	175°F (80°C)	570°F (300°C)
Epoxy - Modified	Good	Very Good	175°F (80°C)	-
MS Polymer	Good	Fair	175°F (80°C)	-
Polyurethane	Good	Good	250°F (120°C)	-
Structural Acrylic - No Mix	Good	Very Good	300°F (150°C)	390°F (200°C)
Structural Acrylic - 2 Part	Good	Very Good	250°F (120°C)	-
Structural Acrylic - 2 Part MMA	Good	Very Good	250°F (120°C)	-
UV Curable	Good	Very Good	250°F (120°C)	300°F (150°C)



Following are some common conversions for easy reference.

Conversions		
<div> <div> <b>Weight</b> </div> <div> 1 kilogram (kg) = 1000 grams (g)  = 2.2 pounds (lbs) </div> <div> 1 pound (lb) = 16 ounces (oz)  = 453.6 grams (g) </div> <div> 1 ounce (oz) = 28.35 grams (g) </div> <div> 1 gram (g) = 1,000 milligrams (mg) </div> <div> <b>Length</b> </div> <div> 1 meter (m) = 100 centimeters (cm)  = 1000 millimeters (mm)  = 3.28 feet  = 39.37 inches </div> <div> 1 inch = 2.54 centimeters (cm)  = 25.4 millimeters (mm)  = 1000 mil (thou) </div> <div> 1 centimeter (cm) = 0.39 inches  = 10 millimeters (mm) </div> <div> 1 millimeter (mm) = 1,000 microns (μm) </div> <div> 1 mil (thou) = 40 microns </div> </div> <div> <div> <b>Volume</b> </div> <div> 1 US gallon = 8 US pints  = 3.79 liters = 4 US quarts  = 0.83 UK gallons </div> <div> 1 Imperial gallon = 8 UK pints  = 4.55 liters  = 4 UK quarts  = 1.2 US gallons </div> <div> 1 liter = 1000 milliliters (ml)  = 0.22 UK gallons  = 0.26 US gallons  = 1.76 UK pints  = 2.11 US pints  = 33.81 fluid ounces </div> <div> 1 US pint = 473 milliliters (ml) </div> <div> 1 UK pint = 568 milliliters (ml) </div> <div> 1 milliliter (ml) = 1 cubic centimeter (cc) </div> <div> 1 cubic inch = 16.39 cubic centimeter </div> <div> 1 micro-liter = 0.001 milliliters (ml) </div> <div> <b>Pressure</b> </div> <div> 1 MPa = 145 psi </div> <div> 1 psi = 0.0069 MPa </div> <div> 1 MPa = 1 N/mm<sup>2</sup> </div> <div> 1 bar = 14.50 psi </div> <div> 1 psi = 0.069 bar </div> </div> <div> <div> <b>Temperature</b> </div> <div> 250°C ————— 482°F </div> <div> 232°C ————— 450°F </div> <div> 200°C ————— 392°F </div> <div> 177°C ————— 350°F </div> <div> 150°C ————— 302°F </div> <div> 121°C ————— 250°F </div> <div> 100°C ————— 212°F </div> <div> 66°C ————— 150°F </div> <div> 50°C ————— 122°F </div> <div> 38°C ————— 100°F </div> <div> 10°C ————— 50°F </div> <div> 0°C ————— 32°F </div> <div> -18°C ————— 0°F </div> <div> -40°C ————— -40°F </div> <div> -50°C ————— -58°F </div> </div>		

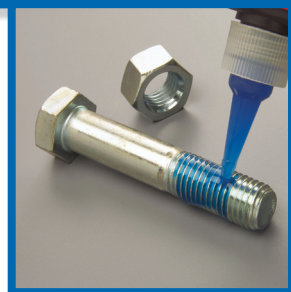


# ANAEROBIC THREADLOCKERS

Anaerobic Threadlockers									
	REMOVABLE			PERMANENT (Disassemble with Heat)					
Grade	LM113	MM115	MM115 PURE	HM118	HL126	HH120	HM128	HM129	HH131
Feature	Low Strength	General Purpose	NSF/ANSI 61 Certified	High Strength	Wicking and Weld Sealing	Gap Filling	General Purpose	High Strength	High Temperature
Color	Purple	Blue	Colorless	Red	Green	Red	Red	Red	Red
Viscosity	2 rpm 5,000 cP 20 rpm 1,200 cP	2 rpm 5,000 cP 20 rpm 1,300 cP		2 rpm 5,000 cP 20 rpm 1,800 cP	12 cP	7,000 cP	500 cP	500 cP	2 rpm 23,000 cP 20 rpm 7,500 cP
Fluorescent	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Max Gap Fill	0.006 in	0.006 in		0.008 in	0.001 in	0.01 in	0.006 in	0.006 in	0.012 in
	0.15 mm	0.15 mm		0.20 mm	0.05 mm	0.25 mm	0.15 mm	0.15 mm	0.30 mm
Max Bolt Size	3/4"	3/4"		3/4"	1/2"	1 1/2"	3/4"	3/4"	2"
	M20	M20		M20	M10	M30	M20	M20	M56
Shear Strength Steel	750 psi	1,450 psi		2,500 psi	2,200 psi	2,500 psi	2,500 psi	2,500 psi	2,500 psi
	5 MPa	10 MPa		17 MPa	15 MPa	17 MPa	17 MPa	17 MPa	17 MPa
Torque Breakaway M10 Nuts and Bolts	80 in•lb	140 in•lb		200 in•lb	125 in•lb	275 in•lb	275 in•lb	290 in•lb	240 in•lb
	9 N•m	16 N•m		23 N•m	14 N•m	31 N•m	31 N•m	33 N•m	27 N•m
Torque Prevail M10 Nuts and Bolts	40 in•lb	60 in•lb		280 in•lb	300 in•lb	300 in•lb	350 in•lb	520 in•lb	480 in•lb
	5 N•m	7 N•m		32 N•m	34 N•m	34 N•m	40 N•m	58 N•m	54 N•m
Fixture	15 min	10 min		10 min	8 min	10 min	15 min	10 min	15 min
Full Cure	24 hr	24 hr		24 hr	24 hr	24 hr	24 hr	24 hr	24 hr
Temp. Range	-65 to 300°F	-65 to 300°F		-65 to 300°F	-65 to 300°F	-65 to 300°F	-65 to 300°F	-65 to 300°F	-65 to 445°F
	-55 to 150°C	-55 to 150°C		-55 to 150°C	-55 to 150°C	-55 to 150°C	-55 to 150°C	-55 to 150°C	-55 to 230°C
Approvals									
MIL-46163A for EXISTING designs only.	Type II Grade M	Type II Grade N		Type II Grade O	Type III Grade R	Type I Grade L	Type I Grade K		
ASTM D5363 for NEW designs.	AN0311	AN0321		AN0331	AN0261	AN0211	AN0221		
MIL-S-22473E for EXISTING designs only.		Grade CVV			Grade AVV	Grade AVV			
ASTM D5363 for NEW designs.		AN0143			AN0111	AN0124			
NSF / ANSI 61			NSF/ANSI61						
ASC 10 Anaerobic Surface Conditioner									
PermaBond ASC10 is a surface activator for anaerobic adhesives, suitable for use on non-metallic surfaces or on less active metals (see chart on page 10) to accelerate cure speed and allow products to cure through larger gaps.									

**Permabond threadlocking anaerobic adhesives and sealants enable you to lock screws, nuts, bolts, and studs against loosening.**

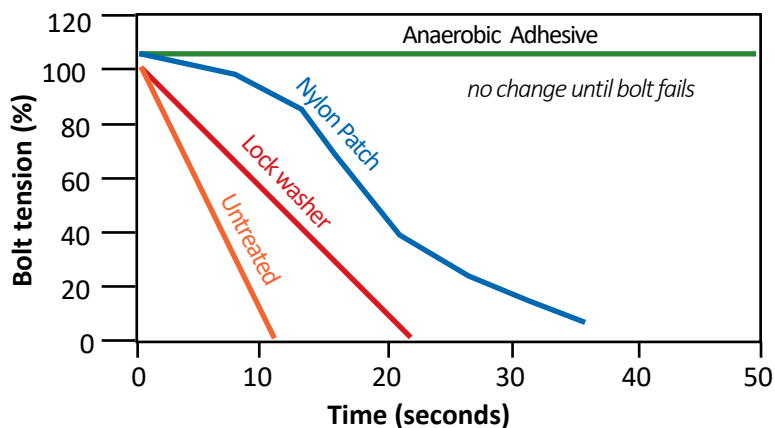
- Lubricate for easier assembly and prevents rust
- Seal against leaks
- Prevent loosening due to thermal expansion
- Stop nuts and bolts from working loose due to vibration
- Varying strengths to meet removable and permanent requirements
- More cost-effective than mechanical locking devices



### Metal Reactivity as Related to Anaerobic Cure Speed

Reactivity	Super Active	Active	Less Active	Passive
Anaerobic Cure Speed	Very Fast Cure	Fast Cure	Slow Cure	Activator Needed
Metal	Brass Copper	Steel Nickel Iron Aluminum Zinc	Anodized aluminum Cadmium finishes Chrome finishes Passivated metals Stainless steel Titanium	Ceramics Glass Plastics Painted finishes Lacquered finishes

### Threadlocking



# ANAEROBIC THREAD SEALANTS

Permabond anaerobic thread sealants are designed to replace traditional materials such as hemp, PTFE tape, and pipe dope.

- No loose particles to clog valves
- Will not shred, creep, or relax over time
- Lubricates for easier assembly, allows accurate positioning of pipes
- Fully cured sealants typically seal to the burst pressure of the pipe
- Grades available for water, gas, air, and hydraulic systems
- Resistant to a wide variety of chemicals

Anaerobic Thread Sealants						
Grade	LM012	LH050	LH050 PURE	LH051	MH052	LH150
Features	No Fillers, Hydraulics Sealing Grade	General Purpose, UL Classified	NSF/ANSI 61 Certified, Potable Water Grade	Automatic Dispensing	Medium Strength, BAM Approved for Oxygen	Stainless Steel Grade, UL Classified
Color	Brown	White		White	Yellow	White
Viscosity	2,000 cP	250,000 cP		2 rpm 450,000 cP 20 rpm 70,000 cP	2 rpm 65,000 cP 20 rpm 25,000 cP	260,000 cP
Fluorescent	Yes	No		No	Yes	No
Max Gap Fill	0.008 in	0.020 in		0.020 in	0.020 in	0.020 in
	0.20 mm	0.50 mm		0.50 mm	0.50 mm	0.50 mm
Shear Strength Steel	750 psi	1,000 psi		1,000 psi	1,450 psi	1,000 psi
	5 MPa	7 MPa		7 MPa	10 MPa	7 MPa
Torque Breakaway M10 Nuts and Bolts	25 in•lb	35 in•lb		35 in•lb	180 in•lb	50 in•lb
	3 N•m	4 N•m		4 N•m	20 N•m	6 N•m
Torque Prevail M10 Nuts and Bolts	15 in•lb	25 in•lb		25 in•lb	100 in•lb	25 in•lb
	2 N•m	3 N•m		3 N•m	11 N•m	3 N•m
Fixture	30 min	120 min		120 min	15 min	120 min
Full Cure	24 hr	24 hr		24 hr	24 hr	24 hr
Temperature Range	-65 to 350°F	-65 to 350°F		-65 to 350°F	-65 to 300°F	-65 to 350°F
	-55 to 177°C	-55 to 177°C		-55 to 177°C	-55 to 150°C	-55 to 177°C
Approvals						
		UL® Classified	NSF/ANSI 61 Certified		BAM Approved*	UL® Classified
ASC 10 Anaerobic Surface Conditioner						
Permabond ASC10 is a surface activator for anaerobic adhesives, suitable for use on non-metallic surfaces or on less active metals to accelerate cure speed and allow products to cure through larger gaps.						

\*BAM Approved for use with gaseous oxygen up to 10 bar (145 psi) and 60°C (140°F).





## Chemical Compatibility of Anaerobic Adhesives & Sealants

Few industrial chemicals have a damaging effect on Permabond's anaerobic adhesives. However, strong concentrations or elevated temperature may make the adhesive more susceptible to chemical degradation.

Liquids									Gases		
Acetic acid	B	Chromic acid	C	Glycerine	A	Oil (hydraulic)	A	Shellac	A	Air	A
Acetone	A	Citric acid	C	Gypsum	A	Oil (linseed)	A	Sodium Hydroxide	C	Carbon dioxide	A
Alcohols	A	Copper sulphate	A	Hexane	A	Oil (lubricating)	A	Starch	A	Carbon monoxide	A
Ammonia sol.	C	Creosote	A	Hydrochloric acid	C	Oil (mineral)	A	Sugar	A	Chlorine	X
Animal fat	A	Cyanide sol.	B	Ink	A	Ozone (wet)	X	Sulfuric acid	C	Freon	C
Battery acid	B	Detergents	A	Insecticide*	A	Paraffin	A	Sulphurous acid	C	Helium	A
Bleach	A	Dielectric fluid*	A	Isocyanate resin	A	Perfume	A	Toluene	A	Methane	A
Bromine	X	Dye stuffs	A	Jet fuel	A	Petrol	A	Trichloroethane	A	Natural gas	A
Carbolic acid	B	Ethyl acetate	A	Kerosene	A	Petroleum jelly	A	Turpentine	A	Pure oxygen	**
Carbonic acid	B	Ferric chloride	B	Lactic acid	A	Photo Developer	A	Water (fresh/sea)	A	Ozone	X
Cement	A	Fertilizer*	A	Nitric acid	X	Phosphoric acid	C	Water (heavy)	A	Propane	A
China Clay	A	Formaldehyde	C	Oil (fuel)	A	Sewage	A	Xylene	A	Steam	X

A: Most Permabond products are suitable

B: For concentrations up to 10% most adhesives can be used

C: Only use high-strength Permabond products

X: Not suitable for Permabond anaerobic adhesives

*\*Test first as some brands/types are more aggressive than others*

**\*\* MH052 - Approved for use with gaseous oxygen up to 10 bar (145 psi) and 60°C (140°F).**

### Thread Sealing Assembly and Removal Technique

■ Parallel to parallel pipe joints

(Fig A.) Apply sealant to the leading edge of the male component.

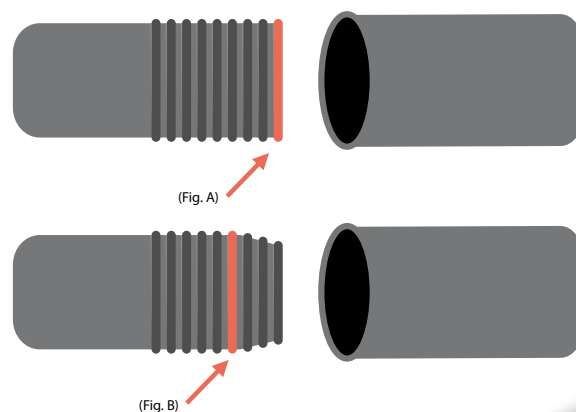
■ Tapered to parallel pipe joints

(Fig B.) Apply sealant several threads back from the leading edge of the male component to ensure maximum contact.

\* IN EACH CASE EXCESS SEALANT SHOULD BE VISIBLE AFTER TIGHTENING

The purpose of the excess is to visualize complete 360° coverage to ensure no leaks. The exposed sealant will not cure as it is in contact with air. This excess can be wiped away.

Pipe joints sealed with low-strength thread sealants can be dismantled using normal tools. Heating parts with a hot air gun or blow torch will make parts easier to disassemble. Before reapplying sealant, clean pipe joints with a wire brush.



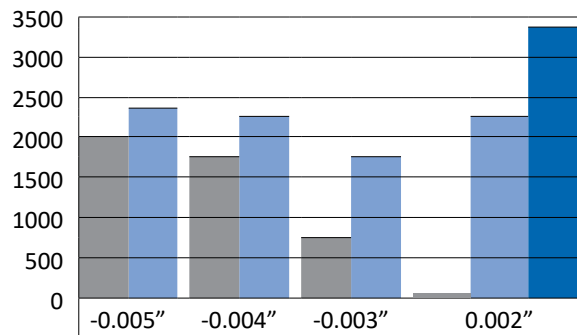
# ANAEROBIC RETAINING COMPOUNDS

Permabond retaining compounds are for the permanent bonding of co-axial joints. They provide 100% surface-to-surface contact while mechanical joining techniques provide only 20% of surface-to-surface contact. The resulting surface area increase allows for a greater load carrying capacity, more than 5 times that of mechanical joining techniques.



- Augment slip fits
- Prevent corrosion
- Mount bearings
- Restore correct fit
- Reduce machining time due to relaxed tolerances
- Quick and easy assembly of parts
- 100% surface-to-surface contact
- Allow for greater load carrying capacity

Retaining Compounds vs. Press Fits



Press Fit (6 micro-inch finish)

Adhesive (6 micro-inch finish)

Adhesive (machine finish)

**Adhesive Bonded**

100% contact area is used to transfer load

**Press Fit**

25% to 30% of metal to metal contact

Note: The highest strength is achieved with the least expensive tolerance and finish.

## Anaerobic Retaining Compounds

Grade	HH040	HH040 PURE	HL138	HM160	HM161	HM162	HM165	HH167
Features	General purpose, maximum gap fill	General purpose, NSF/ANSI 61 Certified	General purpose, press fit	General purpose, slip fit	Gap fill, slip fit	Fast curing, high temperature resistant	Maximum gap fill, high temperature resistant	Maximum gap fill, metal repair
Color	Green	Colorless	Green	Green	Green	Green	Green	Silver
Viscosity	5,000 cP		225 cP	600 cP	2,000 cP	1,000 cP	2 rpm 25,000 cP 20 rpm 10,000 cP	2 rpm 500,000 cP 20 rpm 90,000 cP
Fluorescing	Yes	No	No	Yes	Yes	Yes	Yes	No
Max Gap Fill	0.010 in		0.005 in	0.008 in	0.010 in	0.008 in	0.012 in	0.02 in
	0.254 mm		0.127 mm	0.203 mm	0.254 mm	0.203 mm	0.305 mm	0.500 mm
Shear Strength <small>Steel</small>	2,000 psi		2,300 psi	2,000 psi	3,500 psi	4,300 psi	2,900 psi	4,700 psi
	14 MPa		16 MPa	14 MPa	24 MPa	30 MPa	20 MPa	32 MPa
Torque Breakaway <small>M10 Steel Nuts and Bolts</small>	220 in•lb		180 in•lb	270 in•lb	275 in•lb	280 in•lb	310 in•lb	400 in•lb
	25 N•m		20 N•m	30 N•m	31 N•m	32 N•m	35 N•m	45 N•m
Torque Prevail <small>M10 Steel Nuts and Bolts</small>	330 in•lb		315 in•lb	450 in•lb	400 in•lb	510 in•lb	450 in•lb	280 in•lb
	37 N•m		36 N•m	50 N•m	45 N•m	57 N•m	50 N•m	32 N•m
Fixture	15 min		10 min	10 min	10 min	5 min	15 min	15 min
Full Cure	24 hr		24 hr	24 hr	24 hr	24 hr	24 hr	24 hr
Temperature Range	-65 to 300°F		-65 to 250°F	-65 to 350°F	-65 to 300°F	-65 to 390°F	-65 to 445°F	-65 to 300°F
	-55 to 150°C		-55 to 120°C	-55 to 177°C	-55 to 150°C	-55 to 200°C	-55 to 230°C	-55 to 150°C

# ANAEROBIC F.I.P. GASKETING

Permabond gasketing anaerobic adhesives replace traditional cork, wood, rubber, paper, and silicone gaskets.

- No relaxation or shrinkage eliminates need to re-tighten over time
- One adhesive will replace many pre-cut gasket shapes
- No need to handle fragile gaskets
- No disintegration means no leaks or blockages
- Vibration proof
- No long-term embrittlement
- Easy to dismantle with normal tools
- 100% surface contact for uniform stress distribution
- Seals rough surfaces; reduces machining needs
- Non-shimming

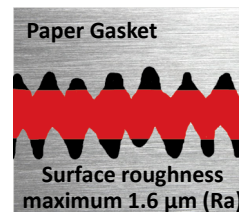
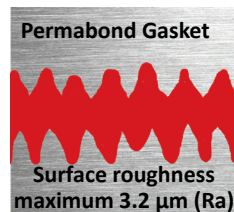


## Anaerobic Form-in-Place Gasketing

Grade	HH190	MH196	LH197	MH199
Features	General purpose flange sealant	Fast curing, high temperature resistant	Flexible, easy to remove even from soft metals	Highly thixotropic, high temperature resistant
Color	Purple	Red	Green	Red
Viscosity	300,000 cP	2 rpm 500,000 cP 20 rpm 100,000 cP	2 rpm 50,000 cP 20 rpm 20,500 cP	2 rpm 225,000 cP 20 rpm 75,000 cP
Fluorescing	No	Yes	No	Yes
Max Gap Fill	0.012 in	0.020 in	0.012 in	0.020 in
	0.3 mm	0.5 mm	0.3 mm	0.5 mm
Shear Strength Steel	900 psi	1,450 psi	750 psi	1,100 psi
	6 MPa	10 MPa	5 MPa	8 MPa
Fixture Steel	15 min	15 min	20 min	20 min
Full Cure	24 hr	24 hr	24 hr	24 hr
Temperature Range	-65 to 250°F	-65 to 390°F	-65 to 300°F	-65 to 390°F
	-55 to 120°C	-55 to 200°C	-55 to 150°C	-55 to 200°C
Oil Resistance	Excellent	Excellent	Excellent	Excellent
Water Resistance	Excellent	Excellent	Excellent	Excellent

## Form-in-Place Gaskets

Liquid gasketing adhesives give 100% contact between metal parts and also allow the engineer to cut down the amount of surface-finish machining, therefore reducing costs and increasing production rates.



# CYANOACRYLATES

**Permabond® Cyanoacrylate (instant) Adhesives** are single component adhesives that cure by reacting to small traces of moisture on the surface of the substrates being bonded. They develop strength very quickly at room temperature, eliminating the need for costly ovens or curing equipment. Full strength is achieved in 24 hours.

For best results, use only enough adhesive to cover the bond area. Excess adhesive will not increase bond strength and can reduce cure speed.

Mil Specs and other approvals are listed on pages 3 and 4.



*The original cyanoacrylate*, 910, set the highest standard against which all our formulations are measured. 910 is still the only pure methyl and creates the strongest bonds. Permabond continues the tradition of excellence by formulating products that meet many diverse application needs for very strong bonds, high temperature resistance, and purity. “The Original 910” formula remains unchanged. The reason is simple - it is the best metal bonding formulation there is.

Instant Bonds! Apply the adhesive, assemble the components, and count... one, two, three, four, five, six, seven, eight, 9, 10! That’s It! Parts are bonded.

## Primers, Accelerators and Solvents

Grade	Description
<b>POP</b>	POP (Polyolefin Primer) improves the adhesion of cyanoacrylate adhesives to PP, PE, PTFE, other low surface energy plastics, and silicones.
<b>QFS10 QFS16 CSA-NF</b>	QFS10, QFS16, and CSA NF increase the speed of cure of cyanoacrylates and cure any exposed cyanoacrylate adhesive very quickly, reducing blooming and allowing products to cure through larger gaps.
<b>CA Solvent 100</b>	Permabond CA solvent dissolves cured cyanoacrylate adhesive.

## Typical Applications

- Electronics wire tacking
- Bonding headsets
- Hose clips onto hoses
- Bonding automotive interior trim
- Tacking parts during assembly process
- Fabricate silicone and standard o-rings
- Disposable medical device bonding
- Bonding musical instruments
- Mobile phone casings, antennae
- Keypads for phones and tablets
- Sealing batteries
- Glazing applications
- Sealing transformer laminates



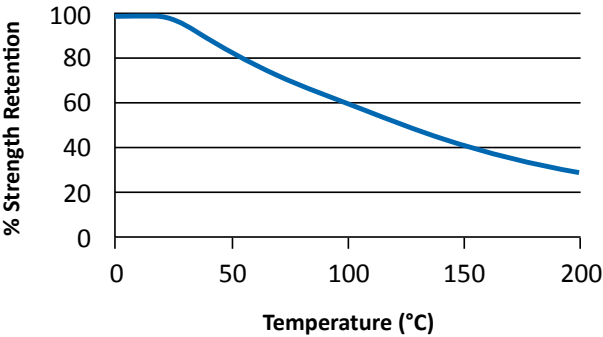


# NEW HIGH TEMPERATURE RESISTANT CYANOACRYLATES!

## High strength at high temperature!

PERMABOND® 825 is a low viscosity cyanoacrylate adhesive that provides higher strength at high temperature. This fast setting cyanoacrylate bonds metals, rubbers, plastics, and more. Permabond 825 resists up to 200°C (392°F) and has excellent retention of strength during thermal ageing. **Patented Technology**

Hot Strength



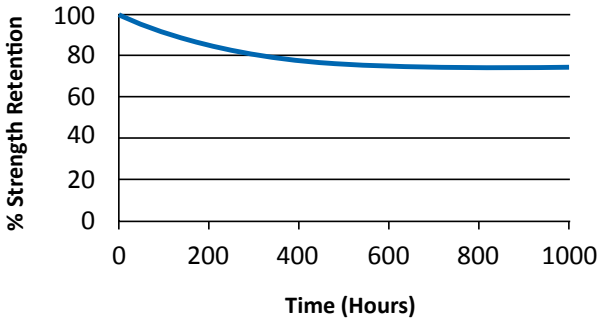
## Features and Benefits

- Strong bonds that resist up to 200°C (392°F)
- Low viscosity 120 cPs
- Tolerates stresses at high temperature
- Does not require zero gap
- 2500 psi bonds to mild steel at 25°C (77°F)
- 600 psi bonds to mild steel at 150°C (300°F)
- Patented Technology

Permabond 825 Cyanoacrylate

Viscosity	100-150 cPs
Fixture Time Steel	10-20 sec
Shear Strength Steel (ISO4587)	2,175-2,900 psi 15-20 N/mm <sup>2</sup>

Thermal Ageing at 180°C (356°F)



# CYANOACRYLATES



\* Note the 800 series does not require a secondary heat cure. Following is the secondary heat cure process for 919, 920, and 922: 1) Parts are bonded and clamped at room temperature for four hours. 2) The clamped parts are then heated at 150°C (302°F) for two hours. 3) After two hours, the bond will be thermally resistant up to 250°C (482°F).

*Without the secondary heat cure activation of the high temperature resistance properties, these products will only resist temperatures up to 180°F (82°C)*

Permabond general purpose ethyl cyanoacrylate adhesives quickly form bonds to a wide variety of substrates. Strengths listed here are for grit blasted steel, but these adhesives are known for their ability to very effectively bond plastics and other substrates.	General Purpose	101	Wicking type, plastic bonding
		102	Plastic bonding
		105	Elastomer bonding
		108	Intermediate gap fill, plastic bonding
		240	Plastic bonding, max. gap fill and flow control
		268	Fast curing maximum gap fill
		2010	Thixotropic, maximum gap fill
The original instant adhesive, 910, a pure methyl cyanoacrylate, creates very strong bonds between metal substrates.	Metals	170	Maximum gap fill
		910	<b>The Original!</b> General purpose
		910FS	Wicking type
Toughened cyanoacrylates are preferred when the assembly is subject to vibration, impact, peel, flexing stresses, or higher temperature.	Toughened	731	Excellent peel, impact, and shear strength
		735	Similar to 731, black
		737	Impact resistant, gap filling, black
		2050	Toughened
Surface insensitive cyanoacrylates overcome the challenges posed when bonding acidic surfaces such as wood, leather, paper, or cork. These ethyl cyanoacrylates also perform well on very dry or porous materials, extending the range of application possibilities.	Surface Insensitive	790	Very fast set, wicking type
		791	Very fast set, close fitting parts
		792	Very fast curing, higher temp. resist
		795	Fast curing, general purpose
		799	Fast curing, maximum gap fill
		2011	Non-sag, max. gap fill, high temp. resist
Permabond 800 series offers the highest temperature resistance available in ambient cure conditions.  Permabond 919, 920, and 922 are formulated to offer increased temperature resistance with the use of the secondary heat cure process.	High Temperature Resistant*	801	Resists to 130°C, wicking type
		802	Resists to 160°C
		825	Resists to 200°C, <b>Patented Technology</b>
		919	Resists to 250°C after post cure, wicking type
		920	Resists to 250°C after post cure
		922	Resists to 250°C after post cure, max gap fill
Low odor formulations contain low vapor pressure monomers which result in a less volatile product. There is little to no odor during application and virtually no residue when cured.	Low Odor	940	Low odor and non-blooming, wicking type
		941	Low odor and non-blooming
		943	Low odor and non-blooming, general purpose
		947	Low odor and non-blooming, gap fill
USP Class VI and Cytotoxicity tested products for use in medical devices	Medical Device	4C10	Low viscosity
		4C20	Low - medium viscosity
		4C30	Medium - high viscosity
		4C40	High viscosity
3D Print infiltrants strengthen and seal 3D printed models produced via granular 3D printing methods.	3D Print Infiltrants	3D10	Ultra fast set time, high gloss surface
		3D30	Fast set time, shiny surface
		3D90	Delayed set, max strength, matte surface

Grade	Viscosity	Gap Fill		Shear Strength		Set Time			Temperature Range	
	23 °C	Max.		Steel		Rubber	Plastic	Metal	Lower	Upper
Grade	cP	in.	mm	psi	N/mm <sup>2</sup>	sec	sec	sec	°F (°C)	°F (°C)
101	2-3	0.002	0.05	2,800-3,300	19-23	2-5	5-10	3-5	-65 (-55)	180 (82)
102	70-90	0.006	0.15	2,800-3,300	19-23	5-10	10-15	10-15	-65 (-55)	180 (82)
105	30-50	0.004	0.10	2,600-3,200	18-22	5-10	5-10	10-15	-65 (-55)	180 (82)
108	400-600	0.008	0.20	2,900-3,200	20-22	10	10	10	-65 (-55)	180 (82)
240	1,200-2,500	0.017	0.43	3,000-3,600	21-25	15-20	15-20	15-20	-65 (-55)	180 (82)
268	1,200-2,400	0.017	0.43	2,900-3,200	20-22	5-10	5-10	5-10	-65 (-55)	180 (82)
2010	10,000-20,000	0.020	0.50	2,800-3,300	19-23	10-15	10-15	10-15	-65 (-55)	180 (82)
170	1,000-2,000	0.015	0.38	3,300-3,600	23-25	10-20	10-20	10-20	-65 (-55)	195 (90)
910	70-90	0.006	0.15	3,300-4,200	23-29	10-15	10-15	10-15	-65 (-55)	195 (90)
910FS	2-4	0.002	0.05	3,300-4,200	23-29	<10	<10	<10	-65 (-55)	195 (90)
731	100-200	0.006	0.15	3,500-4,400	24-30	15-20	15-20	<30	-65 (-55)	250 (120)
735	100-200	0.006	0.15	3,500-4,400	24-30	10-15	5-10	30-50	-65 (-55)	250 (120)
737	2,000-4,000	0.020	0.50	2,800-3,300	19-23	10-15	5-10	15-20	-65 (-55)	250 (120)
2050	1,200-1,800	0.008	0.20	2,300-2,900	16-20	5-10	5-10	10-15	-65 (-55)	180 (82)
790	1-3	0.002	0.05	2,600-3,200	18-22	2-3	2-3	2-3	-65 (-55)	180 (82)
791	30-50	0.004	0.10	2,600-3,200	18-22	2-3	2-3	2-3	-65 (-55)	180 (82)
792	60-125	0.006	0.15	2,600-3,200	18-22	2-3	2-3	2-3	-65 (-55)	250 (120)
795	400-600	0.007	0.18	2,600-3,200	18-22	3-6	3-6	3-6	-65 (-55)	180 (82)
799	4,000-6,000	0.020	0.50	2,900-3,200	20-22	6-10	6-10	6-10	-65 (-55)	180 (82)
2011	Gel	0.020	0.50	2,900-3,500	20-24	5-10	5-10	5-10	-65 (-55)	250 (120)
801	10-15	0.002	0.05	2,800-3,300	19-23	10-15	10-15	10-15	-65 (-55)	270 (130)
802	90-110	0.006	0.15	2,800-3,300	19-23	10-15	10-15	10-15	-65 (-55)	320 (160)
825	100-150	0.006	0.15	2,175-2,900	15-20	5-15	10-20	10-20	-65 (-55)	390 (200)
919	2-6	0.002	0.05	2,900-3,200	20-22	<20	<20	<20	-65 (-55)	*482 (250)
920	70-90	0.006	0.15	2,800-3,300	19-23	10-15	10-15	15-20	-65 (-55)	*482 (250)
922	1,200-2,000	0.017	0.43	2,800-3,300	19-23	<45	<45	<20	-65 (-55)	*482 (250)
940	3-10	0.002	0.05	2,300-2,900	16-20	2-5	10-15	10-15	-65 (-55)	180 (82)
941	10-20	0.003	0.08	2,300-2,900	16-20	2-5	10-15	10-15	-65 (-55)	180 (82)
943	90-110	0.006	0.15	2,300-2,900	16-20	<5	5-10	10-15	-65 (-55)	180 (82)
947	900-1,500	0.010	0.25	2,300-2,900	16-20	2-5	20-30	10-15	-65 (-55)	180 (82)
4C10	30-50	0.004	0.10	2,600-3,200	18-22	5-10	5-10	10-15	-65 (-55)	180 (82)
4C20	400-600	0.008	0.20	2,900-3,200	20-22	10	10	10	-65 (-55)	180 (82)
4C30	1,500	0.015	0.38	2,900-3,200	20-22	15	15	15	-65 (-55)	180 (82)
4C40	2,000	0.017	0.43	2,900-3,200	20-22	5-10	5-10	5-10	-65 (-55)	180 (82)
3D10	10-20	-	-	-	-	-	-	-	-65 (-55)	180 (82)
3D30	90-120	-	-	-	-	-	-	-	-65 (-55)	180 (82)
3D90	4	-	-	-	-	-	-	-	-65 (-55)	180 (82)



# EPOXY TWO COMPONENT

## Key benefits of Permabond Two Part Epoxies include

- High peel strength for design versatility
- Easily dispensed with static mix nozzles
- Excellent chemical and environmental durability
- No curing equipment required

Epoxies - Two Component								
Grade	Mix	Description	Color	Viscosity	Viscosity A mPa.s (cP)	Viscosity B mPa.s (cP)	Specific Gravity	Max. Gap
ET500	1:1	Fast, non-yellowing	Clear	Low	12,000-18,000	15,000-30,000	A) 1.2 B) 1.1	0.08 in 2.00 mm
ET505	1:1	Tough, multi purpose	Amber	Medium Low	14,000-28,000	10,000-25,000	A) 1.1 B) 1.0	0.08 in 2.00 mm
ET510	1:1	Flexible, resists peel & impact	Amber	Medium	14,000-28,000	30,000-50,000	A) 1.1 B) 1.1	0.08 in 2.00 mm
ET514	1:1	Toughened	Grey	Thixotropic Paste	20 rpm: 50,000-80,000 2 rpm: 150,000-300,000	20 rpm: 50,000-80,000 2 rpm: 100,000-200,000	A) 1.1 B) 1.2	0.08 in 2.00 mm
ET515	1:1	Clear, flexible	Clear	Medium	20 rpm: 10,000-20,000	20 rpm: 14,000-24,000	A) 1.1 B) 1.1	0.08 in 2.00 mm
ET536	1:1	Toughened	Grey	Thixotropic Paste	20 rpm: 50,000-100,000 2 rpm: 150,000-300,000	20 rpm: 100,000-200,000 2 rpm: 200,000-400,000	A) 1.1 B) 1.2	0.20 in 5.00 mm
ET538	1:1	Bonds many plastics	Grey	Thixotropic Paste	20 rpm: 50,000-100,000 2.5 rpm 150,000-300,000	20 rpm: 20,000-40,000 2 rpm: 30,000-90,000	A) 1.1 B) 1.4	0.20 in 5.00 mm
ET5145	1:1	Food grade	Off-white	Thixotropic Paste	20rpm: 50,000-80,000 2rpm: 200,000-300,000	20 rpm: 100,000-200,000 2 rpm: 250,000-400,000	A) 1.3 B) 1.3	0.08 in 2.00 mm
ET5147	2:1	Food grade	Off-white	Thixotropic Paste	20rpm: 25,000-40,000 2rpm: 80,000-160,000	20 rpm: 90,000-150,000 2 rpm: 150,000-300,000	A) 1.3 B) 1.2	0.08 in 2.00 mm
ET5401	2:1	High Temp. resistance	Grey	Thixotropic Paste	20 rpm: 60,000-120,000 2.5rpm: 250,000-450,000	20 rpm: 50,000-100,000 2.5rpm: 150,000-250,000	A) 1.2 B) 1.1	0.20 in 5.00 mm
-	-	-	-	-	-	-	-	-
ET5422		Toughened	Blue	Thixotropic Paste	20 rpm: 105,000	20 rpm: 100,000	A) 1.14 B) 1.00	0.20 in 5.00 mm
ET5428	2:1	Composite bonder	Cream	Thixotropic Paste	20rpm: 80,000-150,000 2rpm: 200,000-400,000	20 rpm: 100,000-300,000 2rpm: 700,000-1,500,000	A) 1.1 B) 1.1	0.20 in 5.00 mm
ET5429	2:1	Composite bonder	Charcoal Black	Thixotropic Paste	20rpm: 150,000-250,000 2rpm: 200,000-400,000	20 rpm: 40,000-80,000 2 rpm: 100,000-200,000	A) 1.0 B) 1.0	0.20 in 5.00 mm



## Available Accessories

- Mixing nozzles
- Caulking gun adaptor
- Dispensing guns



### Epoxies - Two Component *(continued)*

Grade	Shore Hardness	Elongation	Dielectric Strength kV/mm	Thermal Conductivity W/(m.K)	Tg Glass Transition	Shear Strength Steel	Handling Strength	Peel Strength	Temp Resist
ET500	D 70 - 80	<5%	15-25	0.22	40-50°C (104-122°F)	1,700 - 2,600 psi 12-18 N/mm <sup>2</sup>	5 - 8 min	1-4 PIW 5-20 N/25mm	80°C 175°F
ET505	D 65 - 75	5 - 10%	15-25	0.35	40-50°C (104-122°F)	2,600 - 3,000 psi 18 - 21 N/mm <sup>2</sup>	3 - 5 hr	13-18 PIW 60-80 N/25mm	80°C 175°F
ET510	D 45 - 60	15-25%	15-25	0.35	40-50°C (104-122°F)	1,160-1,740 psi 8 - 12 N/mm <sup>2</sup>	20 - 40 min	16-20 PIW 70-90 N/25mm	80°C 175°F
ET514	D 60 - 75	10 - 15%	15-25	0.3	40-50°C (104-122°F)	2,900 - 4,350 psi 20 - 30 N/mm <sup>2</sup>	1 - 2 hr	23-34 PIW 100-150 N/25mm	80°C 175°F
ET515	D 30 - 50	20 - 40%	15-25	0.34	20°C (68°F)	1,160-1,740 psi 8 - 12 N/mm <sup>2</sup>	20 - 30 min	23-34 PIW 100-150 N/25mm	100°C 212°F
ET536	D 65 - 75	4 - 8%	15-25	0.4	45-55°C (113-131°F)	3,190-4640 psi 22-32 N/mm <sup>2</sup>	1.5 - 2 hr	16-21 PIW 70-90 N/25mm	80°C 175°F
ET538	D 70 - 80	4 - 8%	15-25	0.55	45-55°C (113-131°F)	3,625-4,350 psi 25-30 N/mm <sup>2</sup>	3 - 5 hr	13-18 PIW 60-80 N/25mm	100°C 212°F
ET5145	D 75 - 85	-	15-25	-	40-50°C (104-122°F)	2,800 - 3,000 psi 19 - 21 N/mm <sup>2</sup>	3 - 5 hr	7-11 PIW 30-50 N/25mm	80°C 175°F
ET5147	D 68 - 72	-	15-25	-	50-60°C (122-140°F)	2,600 - 2,900 psi 18 - 20 N/mm <sup>2</sup>	3 - 5 hr	7-11 PIW 30-50 N/25mm	120°C 250°F
ET5401 cured 7 days @ 25°C	D 75 - 85	4 - 8%	15-25	0.32	50°C (122°F)	1,450 - 2,200 psi 10 - 15 N/mm <sup>2</sup>	1 - 1.5 hr	3-5 PIW 20-25 N/25mm	80°C 175°F
ET5401 cured 1 hr @ 80°C	D 75 - 85	4 - 8%	15-25	0.32	110°C (230°F)	2,900-4,400 psi 20 - 30 N/mm <sup>2</sup>	-	55-66 <sup>1</sup> PIW 250-300 N/25mm	140°C 285°F
ET5422	>D 80	-	-	-	see TDS	4,350-5,510 psi 30-38 N/mm <sup>2</sup>	16 hr	59 -70 PIW 270-320 N/25mm	120°C 250°F
ET5428	D 65 - 75	<5%	15-25	-	50-60°C (122-140°F)	4,060-4,930 psi 28 - 34 N/mm <sup>2</sup>	30 - 45 min	33-55 PIW 150-250 N/25mm	120°C 250°F
ET5429	D 65 - 75	<5%	15-25	-	50-60°C (122-140°F)	3,335-4,350 psi 23-28 N/mm <sup>2</sup>	6 - 10 hr	33-51 PIW 150-230 N/25mm	120°C 250°F

# MODIFIED EPOXY

**Permabond Modified Epoxies** are two component hybrid technology adhesives that cure at ambient temperature. Products are available in 10:1 and 2:1 dual cartridges for dispensing through static mix tips. These soft, flexible adhesives cure with very low shrinkage and are ideal for bonding thin materials with no read through, and for potting without disturbing sensitive electronic components. They form strong bonds to composites, metals, wood, FRP, glass, plastics, concrete, masonry, brick, and stone.

Modified Epoxies -Two Component			
Grade	MT382	MT3821	MT3809
Description	Self Leveling	Thixotropic Paste	Self Leveling, Ideal for plastics
Mix Ratio	2:1 by Volume 130:50 by Weight	2:1 by Volume 100:63 by Weight	10:1 by Volume 12.5: 1 by Weight
Color Part A	Black	Black	Grey
Color Part B	Amber	Charcoal Black	Black
Specific Gravity Part A	1.3	1.3	1.3
Specific Gravity Part B	1.0	1.7	1.1
Viscosity Part A cP(mPa.s)	20,000 - 45,000	200,000 thixotropic	20 rpm 6,000 - 10,000 2 rpm 15,000 - 25,000
Viscosity Part B cP(mPa.s)	200 - 400	100,000	5,000 - 10,000
Pot Life	20 - 50 min	10 - 20 min	10 - 12 min
Handling Time	105 - 120 min	60 - 90 min	25 - 30 min
Full Cure	≥72 hr	≥72 hr	≥72 hr
Shore Hardness	A 55 - 85, D 20 - 30	A 55 - 85, D 20 - 30	A 75 - 85, D 20 - 30
Elongation	150 - 200%	100 - 150%	150%
Temperature Range	-40 to +248°F (-40 to +120°C)	-40 to +248°F (-40 to +120°C)	-40 to +248°F (-40 to +120°C)
Shear Strength			
<i>Steel</i>	4-7 N/mm <sup>2</sup> (600 - 1,000 psi)	4-7 N/mm <sup>2</sup> (600 - 1,000 psi)	6-8 N/mm <sup>2</sup> (900-1,200 psi)
<i>Aluminum</i>	6-8 N/mm <sup>2</sup> (900-1,200 psi)	6-8 N/mm <sup>2</sup> (900-1,200 psi)	6-8 N/mm <sup>2</sup> (900-1,200 psi)
<i>ABS</i>	4-6 N/mm <sup>2</sup> (600-900 psi)	4-6 N/mm <sup>2</sup> (600-900 psi)	4-6 N/mm <sup>2</sup> (600-900 psi)
<i>Acrylic</i>	3-5 N/mm <sup>2</sup> (400-700 psi)	2-5 N/mm <sup>2</sup> (300-700 psi)	3-5 N/mm <sup>2</sup> (400-700 psi)
<i>Nylon</i>	3-5 N/mm <sup>2</sup> (400-700 psi)	2-4 N/mm <sup>2</sup> (300-600 psi)	3-5 N/mm <sup>2</sup> (400-700 psi)
<i>Polycarbonate</i>	5-7 N/mm <sup>2</sup> (700-1,000 psi)	4-6 N/mm <sup>2</sup> (600-900 psi)	5-7 N/mm <sup>2</sup> (700-900 psi)
<i>PVC</i>	3-5 N/mm <sup>2</sup> (400-700 psi)	3-5 N/mm <sup>2</sup> (400-700 psi)	4-6 N/mm <sup>2</sup> (600-900 psi)
<i>FRP Glass Epoxy</i>	5-7 N/mm <sup>2</sup> (700-1,000 psi)	5-7 N/mm <sup>2</sup> (700-1,000 psi)	5-7 N/mm <sup>2</sup> (700-1,000 psi)
<i>FRP Glass Polyester</i>	5-7 N/mm <sup>2</sup> (700-1,000 psi)	5-7 N/mm <sup>2</sup> (700-1,000 psi)	5-7 N/mm <sup>2</sup> (700-1,000 psi)
<i>Carbon Fiber</i>	6-8 N/mm <sup>2</sup> (600-1,200 psi)	6-8 N/mm <sup>2</sup> (600-1,200 psi)	6-8 N/mm <sup>2</sup> (600-1,200 psi)

**Tip:** Permabond 2 component modified epoxies are available in dual cartridges with static mix nozzles. When using a mixing nozzle for the first time, dispense a bead of adhesive a couple of inches long onto a paper towel prior to dispensing onto your assembly. This will ensure the adhesive is completely mixed.

# EPOXY ONE COMPONENT

## Key benefits of Single Part Epoxies include

- High shear, impact, and peel strength increases joint design versatility
- Excellent chemical, temperature, and environmental resistance
- A good alternative to welding or brazing - reduces costs

Contact Permabond for low temperature curing grades for bonding heat vulnerable parts.



Epoxies - One Component									
Grade	Description	Color	Flow	Viscosity cP (MPa)	Specific Gravity	Gap Fill	Cure Times	Shore Hardness	Elongation
ES550	Toughened, high impact strength	Silver Grey	No Flow	1,500,000	1.5	0.20 in (5.00 mm)	130°C (266°F) 75 min 150°C (300°F) 60 min 170°C (338°F) 40 min	D 80 - 85	<3%
ES558	Toughened, high impact strength	Grey	Free Flowing	200,000	1.5	0.02 in (0.50 mm)	130°C (266°F) 75 min 150°C (300°F) 60 min 170°C (338°F) 40 min	D 80 - 85	<3%
ES562	Low viscosity	White	Free Flowing	22,500	1.2	0.01 in (0.25 mm)	130°C (266°F) 60 min 150°C (300°F) 45 min 160°C (320°F) 20 min	D 80 - 85	<3%
ES569	Non stringing, high peel strength	Black	No Sag	375,000	1.2	0.20 in (5.00 mm)	130°C (266°F) 75 min 150°C (300°F) 60 min 170°C (338°F) 40 min	D 80 - 85	<3%
ES578	Thermally conductive, electrically insulative	Black	Flowing	700,000	1.6	0.20 in (5.00 mm)	130°C (266°F) 75 min 150°C (300°F) 60 min 170°C (338°F) 25 min	D 80 - 85	<3%

## Epoxies - One Component *(continued)*

Grade	E-modulus	Coefficient of Thermal Expansion	Thermal Conductivity	Tg Glass Transition	Shear Strength psi (N/mm <sup>2</sup> )	Service Temp
ES550	3.5 GPa	45 x 10 <sup>-6</sup> mm/mm/°C (below Tg) 160 x 10 <sup>-6</sup> mm/mm/°C (above Tg)	0.55 W/(m.K)	120°C (250°F)	Steel 4,000 - 6,000 (27 - 41) Aluminum 2,500 - 4,500 (17 - 31) Zinc 2,000 - 4,000 (14 - 27)	-40°F to 355°F (-40°C to 180°C)
ES558	3.5 GPa	45 x 10 <sup>-6</sup> mm/mm/°C (below Tg) 160 x 10 <sup>-6</sup> mm/mm/°C (above Tg)	0.9 W/(m.K)	120°C (250°F)	Steel 4,000 - 6,000 (27 - 41) Aluminum 2,500 - 4,500 (17 - 31) Zinc 2,000 - 4,000 (14 - 27)	-40°F to 355°F (-40°C to 180°C)
ES562	2.1 GPa	50 x 10 <sup>-6</sup> mm/mm/°C (below Tg) 165 x 10 <sup>-6</sup> mm/mm/°C (above Tg)	0.25 W/(m.K)	115°C (240°F)	Steel 3,000 - 5,000 (20 - 35) Aluminum 2,000 - 4,000 (14 - 27) Zinc 2,000 - 4,000 (14 - 27)	-40°F to 355°F (-40°C to 180°C)
ES569	3.5 GPa	90 x 10 <sup>-6</sup> mm/mm/°C (below Tg) 180 x 10 <sup>-6</sup> mm/mm/°C (above Tg)	0.5 W/(m.K)	130°C (266°F)	Steel 4,000 - 6,000 (27 - 41) Aluminum 2,500 - 4,500 (17 - 31) Zinc 2,000 - 4,000 (14 - 27) FRP Glass/Epoxy 1,300 - 1,600 (9 - 11) Carbon Fiber 1,450 - 1,700 (10 - 12)	-40°F to 355°F (-40°C to 180°C)
ES578	2.5 GPa	45 x 10 <sup>-6</sup> mm/mm/°C (below Tg)	1.0 W/(m.K)	105°C (220°F)	Steel 4,000 - 6,000 (27 - 41) Aluminum 2,500 - 4,500 (17 - 31) Zinc 2,000 - 4,000 (14 - 27)	-40°F to 355°F (-40°C to 180°C)

# MS POLYMERS

**Permabond MS Polymers** are single component, hybrid technology adhesives that moisture cure at ambient temperature. The high elongation and flexible nature of these strong bonds meet the demands of stress from impact, peel and expansion that can occur when bonding dissimilar materials. They have excellent environmental resistance and remain very flexible.



MS Polymers - Single Component			
Grade	MS359 Grey	MS359 A Grey	MS359 Clear
Description	Non-Sag	Self Leveling	Non-Sag Clear
Viscosity cP (mPa.s)	5 rpm 1,500,000 - 2,500,000 1 rpm 4,500,000 - 9,000,000	15,000 - 70,000	1,200,000
Specific Gravity	1.5	1.5	1.1
Skin Over Time	10 - 20 min	10 - 20 min	10 - 20 min
Cure Rate	~5mm / 24 hr	~3-4mm / 24 hr	~4mm / 24 hr
Shore Hardness	A 45 - 60	A 40 - 50	A 40 - 50
Elongation	150 - 350%	100 - 170%	80 - 100%
Tensile Strength	2 - 3 MPa (290 - 440 psi)	0.5 - 1.5 MPa (70 - 200 psi)	0.7 - 1.5 MPa (100 - 200 psi)
Temperature Range	-40 to +212°F (-40 to +100°C)	-40 to +212°F (-40 to +100°C)	-40 to +212°F (-40 to +100°C)
Shear Strength			
<i>Steel</i>	2-3 N/mm <sup>2</sup> (290 - 440 psi)	1-2 N/mm <sup>2</sup> (145 - 290 psi)	2-3 N/mm <sup>2</sup> (290 - 440 psi)
<i>Aluminum</i>	2-3 N/mm <sup>2</sup> (290 - 440 psi)	1-2 N/mm <sup>2</sup> (145 - 290 psi)	2-3 N/mm <sup>2</sup> (290 - 440 psi)
<i>Zinc</i>	2-3 N/mm <sup>2</sup> (290 - 440 psi)	1-2 N/mm <sup>2</sup> (145 - 290 psi)	2-3 N/mm <sup>2</sup> (290 - 440 psi)
<i>PVC</i>	2-3 N/mm <sup>2</sup> (290 - 440 psi)	1-2 N/mm <sup>2</sup> (145 - 290 psi)	2-3 N/mm <sup>2</sup> (290 - 440 psi)
<i>Polycarbonate</i>	1-1.5 N/mm <sup>2</sup> (145 - 220 psi)	0.5-1 N/mm <sup>2</sup> (75 - 145 psi)	1-1.5 N/mm <sup>2</sup> (145 - 220 psi)
<i>Polystyrene</i>	1-1.5 N/mm <sup>2</sup> (145 - 220 psi)	0.5-1.5 N/mm <sup>2</sup> (75 - 220 psi)	1-1.5 N/mm <sup>2</sup> (145 - 220 psi)
<i>Wood</i>	2-3 N/mm <sup>2</sup> (290 - 440 psi)	1-2 N/mm <sup>2</sup> (145 - 290 psi)	2-3 N/mm <sup>2</sup> (290 - 440 psi)

## Benefits of MS Polymers

- Adhesion to a variety of substrates
- Fast tack free time
- Non-corrosive
- Paintable

# POLYURETHANES

## Key benefits of Permabond Polyurethanes include

- Good tensile strength
- No primer needed
- Ease of application
- Various set times to match production needs
- Adhesion to a variety of substrates

**Permabond Polyurethanes** are ideal for many bonding applications including bonding composites, plastics, leather, and other materials in automotive applications.



Products are available with long working life to allow use on large bonding and potting areas. In addition to composites, leather, and plastics, Permabond Two Component Polyurethanes form strong bonds to metals, wood, and glass.

Polyurethanes have good resistance to both polar and non polar solvents. They form resilient bonds with higher adhesive tensile strength than MS polymers or modified epoxies.

Polyurethane - Two Component			
Grade	PT321	PT326	PT328
Description	Fast, Strong	Moderate Pot Life	Extended Pot Life
Color Part A	Black	Black	Black
Color Part B	Cream	Cream	Cream
Viscosity Part A cP (mPa.s)	4,000-8,000	4,000-8,000	4,000-8,000
Viscosity Part B cP (mPa.s)	3,000-6,000	3,000-6,000	3,000-6,000
Specific Gravity Part A	1.25	1.25	1.25
Specific Gravity Part B	1.45	1.45	1.45
Mix Ratio	1:1	1:1	1:1
Bond Gap Fill	0.2 in. (5mm)	0.2 in. (5mm)	0.2 in. (5mm)
Pot Life	1 - 1.5 min	4 - 7 min	15 - 20 min
Handling Strength	10 - 15 min	60 - 90 min	90 - 120 min
Full Strength cured @ 23°C	24 hours	4-5 days	4-5 days
Full Strength cured @ 90°C	30 min	30 min	30 min
Hardness	D 70 - 80	D 65 - 75	D 60 - 75
Elongation	<10%	<15%	<20%
Shear Strength Grit Blasted Steel	2,600-3,600 psi (18 - 25 N/mm <sup>2</sup> )	1,700-2,900 psi (12 - 20 N/mm <sup>2</sup> )	1,700-2,600 psi (12 - 18 N/mm <sup>2</sup> )
Tensile Strength	2,900-3,600 psi (20 - 25 N/mm <sup>2</sup> )	2,300-3,600 psi (16 - 25 N/mm <sup>2</sup> )	2,200-2,900 psi (15 - 20 N/mm <sup>2</sup> )
Temperature Range	-40 to 248 °F (-40 to +120 °C)	-40 to 248 °F (-40 to +120 °C)	-40 to 248 °F (-40 to +120 °C)

**Tip:** Permabond two component polyurethanes are available in dual cartridges with static mix nozzles. When using a mixing nozzle for the first time, dispense a bead of adhesive a couple of inches long onto a paper towel prior to dispensing onto your assembly. This will ensure the adhesive is completely mixed.



# UV LIGHT CURABLES

**Permabond UV Light Curable Adhesives** are single part, cure on demand, solvent-free adhesives. With temperature ranges of -65 to 250°F (-54 to 120°C), they are suitable for a wide range of applications. UV curable adhesives cure when UV light activates the photo initiators. Many products also have visible light cure capabilities. Except for dual cure formulas, the curing process will cease when the light is removed.

**Permabond UV7141** has a secondary anaerobic cure mechanism. UV light can be used to cure the exposed area and the adhesive between the two pieces of metal will continue curing anaerobically. This product also has a slightly higher temperature resistance -65°F to 300°F (-54°C to 150°C).

## Key benefits of UV Curable Adhesives include

- High strength bonds
- Cure only when exposed to light – permits alignment of parts prior to bonding
- Select a cure speed – double production speed by simply adding another lamp to the line
- Solvent-free – Non-flammable, increased safety
- Single part product – No mixing required
- 100% solids – No waste
- Save energy – UV lamps require less electricity than heat cure ovens for epoxies
- Space savings – UV lamps require less space than heat cure oven tunnels
- Appearance – UV adhesives are available in clear colorless formulations

Cure speed is affected by the wavelength and intensity of light at the bond site. Distance, attenuation, and light absorption by the substrate and through the gap of the adhesive all play a role in cure rate. Permabond adhesives have been designed to cure quickly with low intensity lamps.



## Applications include

- Glass furniture
- Glass to metal structural bonding
- Lenses
- Solar panels
- Acrylic display racks
- Electronics
- Glass ornaments
- Trophies



## UV Light Curable Adhesives

Grade	Description	Cure Type	Visc. cP (mPa.s)	Tensile Strength	Shear Strength	Shore Hardness	Elongation	Temp. Range
Metal and Glass Bonding					Steel To Glass			
UV610	High strength, glass to metal	UV	600-1,300	2,500 psi 17 N/mm <sup>2</sup>	1,900 - 2,300 psi 13 - 16 N/mm <sup>2</sup>	D 70	95%	-65 to +250°F -55 to +120°C
UV620	General purpose, optically clear	UV	2,200-2,900	2,300 psi 16 N/mm <sup>2</sup>	1,300 - 1,500 psi 9 - 10 N/mm <sup>2</sup>	D 68	>80%	-65 to +250°F -55 to +120°C
UV625	Large gaps, vertical application	UV	2.5 rpm: 185,000 20 rpm: 42,500	2,300 psi 16 N/mm <sup>2</sup>	1,300 - 1,500 psi 9 - 10 N/mm <sup>2</sup>	D 65	>60%	-65 to +250°F -55 to +120°C
UV670	Metal to glass, flexible	UV	2,000 - 3,000	1,700 psi 12 N/mm <sup>2</sup>	870 - 1,450 psi 6 - 10 N/mm <sup>2</sup>	D 55	>80%	-65 to +250°F -55 to +120°C
UV6160	Excellent optical clarity	UV-Visible	1,000 - 2,000	3,265 psi 25 N/mm <sup>2</sup>	1,600 psi 11 N/mm <sup>2</sup>	D 70	125%	-65 to +250°F -55 to +120°C
UV6231	Optical clarity, moisture resistance	UV	5,000 - 8,000	1,450 psi 10 N/mm <sup>2</sup>	1,450 psi 10 N/mm <sup>2</sup>	D 48	>120%	-65 to +250°F -55 to +120°C
UV7141	Metals, dual cure	UV-Anerobic	1,000 - 1,700	2,900 psi 20 N/mm <sup>2</sup>	2,000 - 2,500 psi 14 - 17 N/mm <sup>2</sup>	D 65	35%	-65 to +300°F -55 to +150°C
Plastic Bonding					Polycarbonate			
UV630	Low viscosity	UV-Visible	200 - 300	2,000 psi 14 N/mm <sup>2</sup>	Substrate failure	D 60	110%	-65 to +250°F -55 to +120°C
UV632	Low viscosity, acrylic bonder	UV-Visible	200 - 400	1,900 psi 13 N/mm <sup>2</sup>	Substrate failure	D 65	>70%	-65 to +250°F -55 to +120°C
UV639	Acrylic and PETG bonder	UV-Visible	1,200 - 1,800	2,900 psi 20 N/mm <sup>2</sup>	Substrate failure	D 40	>220%	-65 to +250°F -55 to +120°C
UV640	Medium viscosity	UV-Visible	2.5 rpm 18,500 20 rpm 4,000	1,900 psi 13 N/mm <sup>2</sup>	Substrate failure	D 65	110%	-65 to +250°F -55 to +120°C
UV645	High viscosity	UV-Visible	2.5 rpm 45,000 20 rpm 9,000	1,600 psi 11 N/mm <sup>2</sup>	Substrate failure	D 58	>70%	-65 to +250°F -55 to +120°C
UV648	High viscosity, acrylic bonder	UV-Visible	20rpm: 30,000 2rpm: 150,000	1,600 psi 11 N/mm <sup>2</sup>	Substrate failure	D 58	>70%	-65 to +250°F -55 to +120°C
UV649	Thixotropic gel	UV-Visible	Thixotropic Gel	2,200 psi 15 N/mm <sup>2</sup>	Substrate failure	D 58	>70%	-65 to +250°F -55 to +120°C
Coating								
UV681	Low viscosity, tack free coating	UV-Visible	80 - 120	1,700 psi 12 N/mm <sup>2</sup>	-	D 58	>50%	-65 to +250°F -55 to +120°C
UV683	Doming viscosity, tack free coating	UV-Visible	1,000 - 1,600	2,000 psi 14 N/mm <sup>2</sup>	-	D 58	>50%	-65 to +250°F -55 to +120°C

# STRUCTURAL ACRYLICS



PermaBond's line of structural acrylics was developed for demanding applications that require high tensile, shear, and peel strength as well as maximum shock and impact resistance.

They offer fast fixture and cure at room temperature providing a solution to the continuous demands for increased line speeds while decreasing the manufacturing costs that are associated with heat curing.

PermaBond structural acrylics are suitable for bonding a wide variety of substrates, offering great material selection. Materials such as metals, glass, and composites are easily bonded with PermaBond structural acrylics.

## Structural Acrylic adhesive types:

- Two component low odor
- No-mix surface activated
- Two component
- Two component polyolefin bonders

## Structural Acrylic - Two Component Low Odor

Grade	TA452	TA4522
Description	Fast, strong on metal	For rigid plastics and metal
Appearance	Part A: Red and Part B: Green Mixed: Brownish Purple	Part A: White and Part B: Green / Blue Mixed: Green
Viscosity @ 25°C	Mixed: 3,000-6,000 cP	Mixed: 3,000-6,000 cP
Mix Ratio	1:1	1:1
Nozzle Life @23°C	2-3 min	4-7 min
Handling Time	6-9 min	10-15 min
Shear Strength	<p>Mild Steel (Abraded): 28-32 N/mm<sup>2</sup> (4060-4640 psi)  Mild Steel (Degreased): 22-25 N/mm<sup>2</sup> (3190-3625 psi)  Aluminium (Abraded): 18-22 N/mm<sup>2</sup> (2610-3190 psi)  Aluminium (Degreased): 17-20 N/mm<sup>2</sup> (2465-2900 psi)  Stainless Steel (Abraded): 28-32 N/mm<sup>2</sup> (4060-4640 psi)  Stainless Steel (Degreased): 26-30 N/mm<sup>2</sup> (3770-4350 psi)  Zinc: 18-22 N/mm<sup>2</sup> (2600-3200 psi)  FRP Glass/Polyester: 4-6 N/mm<sup>2</sup> (580-870 psi)  FRP Glass/Epoxy: 10-13 N/mm<sup>2</sup> (1450-1885 psi)  Carbon Fiber: 10-13 N/mm<sup>2</sup> (1450-1885 psi)  PVC: &gt;4 N/mm<sup>2</sup> (&gt;580 psi) Substrate Failure  PMMA: &gt;4 N/mm<sup>2</sup> (&gt;580 psi) Substrate Failure  Polycarbonate: 2-4 N/mm<sup>2</sup> (290-580 psi)  ABS: &gt;5 N/mm<sup>2</sup> (&gt;725 psi) Substrate Failure  Polyamides (Glass filled): 5-7 N/mm<sup>2</sup> (725-1015 psi)</p>	<p>Mild Steel (Abraded): 21-23 N/mm<sup>2</sup> (3045-3335 psi)  Mild Steel (Degreased): 22-25 N/mm<sup>2</sup> (2465-2900 psi)  Aluminium (Abraded): 14-16 N/mm<sup>2</sup> (2030-2320 psi)  Aluminium (Degreased): 9-11 N/mm<sup>2</sup> (1305-1595 psi)  Stainless Steel (Abraded): 18-22 N/mm<sup>2</sup> (2610-3190 psi)  Stainless Steel (Degreased): 17-20 N/mm<sup>2</sup> (2465-2900 psi)  Phenolic: 3-6 N/mm<sup>2</sup> (435-870 psi)  FRP Glass/Polyester: 3-5 N/mm<sup>2</sup> (435-725 psi)  FRP Glass/Epoxy: 7-9 N/mm<sup>2</sup> (1015-1305 psi)  Carbon Fibre: 9-12 N/mm<sup>2</sup> (1305-1740 psi)  PVC: &gt;4 N/mm<sup>2</sup> (&gt;580 psi) Substrate Failure  PMMA: &gt;4 N/mm<sup>2</sup> (&gt;580 psi) Substrate Failure  Polycarbonate: 4-6 N/mm<sup>2</sup> (580-870 psi)  ABS: &gt;5 N/mm<sup>2</sup> (&gt;725 psi) Substrate Failure  Polyamides (Glass filled): 4-6 N/mm<sup>2</sup> (580-870 psi)</p>
Service Temperature	-65 to +270°F peak 300°F (-55 to +130°C peak 150°C)	

PermaBOND no-mix, surface activated structural acrylics are solvent free and greatly increase design possibilities. They form strong bonds to a wide variety of substrates including metals, glass, magnets, and composites. They are ideal for applications involving close fitting parts.

Structural Acrylic - No-Mix Surface Activated							
Grade	TA430 and Initiator 41	TA435 and Initiator 41	TA436 and Initiator 43	TA437 and Initiator 41	TA439 and Initiator 41*	TA4590 and Initiator 44	TA4246 and Initiator 46
Color	Amber	Amber	Amber	Orange	Amber	Blue	Amber
Feature	Gen. Purpose	Gen. Purpose High Peel Strength	High Temp	Anaerobic Cure	Acid Free	Acid Free	MMA - very high strength
Visc. cP 2.5 rpm	50,000	70,000	60,000	130,000	-	85,000 - 90,000	-
Visc. cP 20 rpm	20,000	30,000	25,000	60,000 - 40,000	1,000	20,000	28,000
Specific Gravity	1.1	1.0	1.1	1.1	1.0	1.1	1.0
Gap Fill inch (mm)	0.02 (0.51)	0.02 (0.51)	0.02 (0.51)	0.02 (0.51)	0.006 (0.15)	0.02 (0.51)	0.02 (0.51)
Handling Time	3 - 5 min	3 - 5 min	1 - 3 min	1 - 3 min 15 - 20 min**	40 - 75 sec	30 - 60 sec	2 - 4 min
Working Strength	40 - 60 min	30 - 60 min	30 - 60 min	30 - 60 min 60 - 120 min**	3 - 5 min	2 - 3 min	15 - 30 min
Full Cure	24 hr	24 hr	24 hr	24 hr	24 hr	24 hr	24 hr
Impact Strength	10-15 kJ/m <sup>2</sup>	10-15 kJ/m <sup>2</sup>	10-15 kJ/m <sup>2</sup>	10-15 kJ/m <sup>2</sup>	10-20 kJ/m <sup>2</sup>	15-20 kJ/m <sup>2</sup>	50-60 kJ/m <sup>2</sup>
Shear Strength Steel	2,200-3,600 psi 15 - 25 N/mm <sup>2</sup>	2,200-3,600 psi 15 - 25 N/mm <sup>2</sup>	2,200-3,600 psi 15 - 25 N/mm <sup>2</sup>	2,000-3,000 psi 14 - 20 N/mm <sup>2</sup>	2,900-3,600 psi 20 - 25 N/mm <sup>2</sup>	2,900-3,600 psi 20 - 25 N/mm <sup>2</sup>	4,800-5,100 psi 33 - 35 N/mm <sup>2</sup>
Peel Strength Aluminum	10 - 14 PIW 45-65 N/25mm	18 - 22 PIW 85-100 N/25mm	10 - 14 PIW 45-65 N/25mm	18 - 22 PIW 85-100 N/25mm	18 - 22 PIW 85-100 N/25mm	18 - 22 PIW 85-100 N/25mm	33 - 40 PIW 150-180 N/25mm
CTE	80 x 10 <sup>-6</sup> 1/K	80 x 10 <sup>-6</sup> 1/K	80 x 10 <sup>-6</sup> 1/K	80 x 10 <sup>-6</sup> 1/K	80 x 10 <sup>-6</sup> 1/K	80 x 10 <sup>-6</sup> 1/K	80 x 10 <sup>-6</sup> 1/K
Thermal Conductivity	0.1 W/(m.K)	0.1 W/(m.K)	0.1 W/(m.K)	0.1 W/(m.K)	0.1 W/(m.K)	0.1 W/(m.K)	0.1 W/(m.K)
Dielectric Constant	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Dielectric Strength	30-50 kVmm	30-50 kVmm	30-50 kVmm	30-50 kVmm	30-50 kVmm	30-50 kVmm	30-50 kVmm
Volume Resistivity	2 x 10 <sup>13</sup> Ohm.cm	2 x 10 <sup>13</sup> Ohm.cm	2 x 10 <sup>13</sup> Ohm.cm	2 x 10 <sup>13</sup> Ohm.cm	2 x 10 <sup>13</sup> Ohm.cm	2 x 10 <sup>13</sup> Ohm.cm	2 x 10 <sup>13</sup> Ohm.cm
Temperature Range	-65 to +250°F -55 to +120°C	-65 to +250°F -55 to +120°C	-65 to +300°F -55 to +150°C	-65 to +390°F -55 to +200°C	-65 to +330°F -55 to +165°C	-65 to +330°F -55 to +165°C	-40 to +250°F -40 to +120°C

\* Initiator 43 can be used when bonding plastic.

\*\*TA437 time on metal with no initiator. TA437 has an anaerobic cure mechanism and can be used with no initiator.

# STRUCTURAL ACRYLICS

## Permabond Two Component Structural Acrylics

Permabond TA4207 is a fast cure, multi-purpose adhesive that bonds a wide variety of substrates including difficult to bond metals such as galvanized steel. Permabond TA4810 and TA4820 form high strength, durable bonds to many plastics, metals, and unprimed metals. Permabond TA440 is non-flammable and dispensed one bead on top of the other.



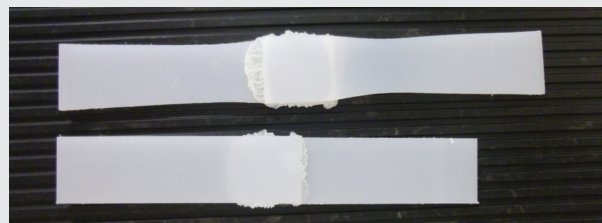
Structural Acrylic - Two Component				
Grade	TA4207	TA4810	TA4820	TA440 A&B
Description	2-part 1:1 toughened methacrylate adhesive	2-part 1:1 toughened methacrylate adhesive	2-part 1:1 toughened methacrylate adhesive	2-part 1:1 non-flammable structural acrylic
Dispensing	Dual cartridge with static mix nozzles or bead on bead	Dual cartridge with static mix nozzles	Dual cartridge with static mix nozzles	Bead on Bead
Key features	1 hour cure, multi-purpose, acid free with excellent adhesion to difficult to bond metals ex. galv. steel	Thixotropic, non-sag, fast set	Thixotropic, non-sag, delayed set	Non-flammable, lower odor
Appearance	Light Yellow	Off-White/Amber	Off-White/Amber	Amber/Green
Viscosity cP (mPa.s)	2,000 – 5,000 cP (mPa.s)	175,000 cP (mPa.s)	200,000 cP (mPa.s)	10,000 cP (mPa.s)
Fixture Time	8 - 10 minutes	10 - 15 min	30 - 35 min	<30 sec
Working Strength	25 - 30 minutes	50 - 60 min	100 - 120 min	30 - 60 min
Full Strength	1 hr	24 hr	24 hr	24 hr
Shear Strength Steel	>3800 psi (>26 N/mm <sup>2</sup> )	3,000 - 4,000 psi (21 - 28 N/mm <sup>2</sup> )	3,000 - 4,000 psi (21 - 28 N/mm <sup>2</sup> )	2,200 - 3,600 psi (15 - 25 N/mm <sup>2</sup> )
Shear Strength Aluminum	>3,600 psi (>25 N/mm <sup>2</sup> )	2,000 - 3,200 psi (14 - 22 N/mm <sup>2</sup> )	2,500 - 3,500 psi (17 - 24 N/mm <sup>2</sup> )	1,500 - 2,500 psi (10 - 17 N/mm <sup>2</sup> )
Shear Strength Fiber Glass	-	1,700 psi (>12 N/mm <sup>2</sup> )	1,700 psi (>12 N/mm <sup>2</sup> )	-
Shear Strength PPO, PVC, SMC, HIPS	Substrate Failure	Substrate Failure	Substrate Failure	-
Peel Strength Aluminum	-	15 - 20 PIW (70 - 90 N/25mm)	15 - 20 PIW (70 - 90 N/25mm)	10 - 14 PIW (45 - 65 N/25mm)
Gap Fill	0.02 in (0.5 mm)	0.08 in. (2.0 mm)	0.08 in. (2.0 mm)	0.02 in (0.5 mm)
Temperature Range	-40 to +250°F (-40 to +120°C)	-40 to +250°F (-40 to +120°C)	-40 to +250°F (-40 to +120°C)	-65 to +250°F (-55 to +120°C)



**Permabond Structural Acrylics** bond polyolefins and other low surface energy plastics which were commonly called “difficult-to-bond” plastics. Difficult to bond no more!!

Structural Acrylic Polyolefin Bonders				
Grade	TA4605	TA4610	TA4611	TA4631
Appearance	A: Off-white B: Almost colorless Mixed: Off-white	A: Off-white B: Almost colorless Mixed: Off-white	A: White B: Transparent Mixed: Off-white	A: White B: White Mixed: White
Features	Fast cure	Fast cure for large components	Smaller gap fill (no micro beads)	Low odor, smaller gap fill (no micro beads)
Viscosity @ 25°C	Mixed: 125,000 cPs	Mixed: 210,000 cPs	Mixed: 21,500 cPs	Mixed: 21,500 cPs
Mix Ratio	1:1	1:1	1:1	1:1
Fixture Time	5-10 minutes	12-15 minutes	10-16 minutes	12-18 minutes
Handling Time	20-25 minutes	40-50 minutes	40-50 minutes	40-50 minutes
Working Strength	2-4 hours	6-8 hours	6-8 hours	6-8 hours
Shear Strength Polypropylene	>8 N/mm <sup>2</sup> (>1200 psi) Substrate Failed	>8 N/mm <sup>2</sup> (>1200 psi) Substrate Failed	>8 N/mm <sup>2</sup> (>1200 psi) Substrate Failed	>8 N/mm <sup>2</sup> (>1200 psi) Substrate Failed
Shear Strength Polyethylene	>7 N/mm <sup>2</sup> (>1015 psi) Substrate Failed	>7 N/mm <sup>2</sup> (>1015 psi) Substrate Failed	>7 N/mm <sup>2</sup> (>1015 psi) Substrate Failed	>7 N/mm <sup>2</sup> (>1015 psi) Substrate Failed
Service Temp	-55 to +100°C	-55 to +100°C	-55 to +100°C	-55 to +100°C
Packaging Cartridges*	10 x 50ml	10 x 50ml	15 x 25ml & 10 x 50ml	15 x 25ml & 10 x 50ml
	6 x 400ml	6 x 400ml	6 x 400ml	6 x 400ml
Storage	5-25°C (41 to 77°F)	5-25°C (41 to 77°F)	5-25°C (41 to 77°F)	5-25°C (41 to 77°F)

\*Bulk available upon request



#### Untreated polypropylene lap shears bonded with TA4610.

The adhesive bond is so strong the plastic stretches, deforms, and fails before the bonded joint.



# **Permabond<sup>®</sup>**

*Engineering Adhesives*

Permabond adhesives and sealants are available worldwide through authorized distributors.

**CONTACT US FOR A DISTRIBUTOR IN YOUR AREA!**

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