

Permabond[®]

Engineering Adhesives



***"Our Science . . .
Your Success"***

www.permabond.com

Permabond manufactures engineering adhesives and sealants for industrial use. A sampling of products is listed on the following pages.

Permabond has a large number of specialty products and works with design engineers to custom formulate to engineering specifications.

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ISO 9001:2008 Certified

www.permabond.com

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

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

Contact Permabond for all of your bonding and sealing needs!



800-714-0170 ■ 732-868-1372



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We welcome your call!



Permabond's App "Engineers Guide to Adhesives" is available for iPhone and Android.





Aerospace



Defense



Electronics



Furniture



Medical Device



Lighting

Military Specifications & Standards

MIL-S-22473E¹ • ASTM D5363²

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-A-46050C¹

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

MIL-S-46163A¹ • ASTM D5363²

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-46082B¹ • ASTM D5363²

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

¹MIL-SPECS are for existing designs ONLY
²ASTM D5363 is for NEW designs

**Medical - Biocompatibility
USP CLASS VI**

Permabond Grade	USP CLASS VI
4C10	PASS
4C20	PASS
4C30	PASS
4C40	PASS

**Oxygen Gas
BAM Certified**

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

CYTOTOXICITY - ISO 10993-5

Permabond Grade	CYTOTOXICITY
4C10	PASS
4C20	PASS
4C30	PASS
4C40	PASS
4UV80	PASS
820	PASS

Potable Water

NSF / ANSI 61 Certified

Permabond Grade
HH040 PURE™
LH050 PURE™
MM115 PURE™

**Underwriters Laboratory
UL® Classified**

Permabond Grade
LH050
LH150

**Fire Protection
CPVC Approvals**

Permabond Grade	CPVC Approvals
LH056	*FBC™ System Compatible Spears® FlameGuard® Approved Approved for use on threaded metal connections in systems that may also contain CPVC.

*FBC™ System Compatible indicates that this product has been tested, and is monitored on an ongoing basis, to assure its chemical compatibility with FlowGuard Gold®, BlazeMaster® and Corzan® pipe and fittings.
 FBC, FlowGuard Gold, BlazeMaster and Corzan are licensed trademarks of The Lubrizol Corporation.



Transportation



Automotive



Electric Motor



Fire Protection



Wind Energy



Utilities

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.

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

Note:
Examples of **polar** solvents include: Water, Ethylene Glycol, IPA, Acetone
Examples of **non-polar** solvents include: Motor Oil, Toluene, Gasoline

Note: Products can withstand higher temperatures for brief periods providing the joint is not unduly stressed.

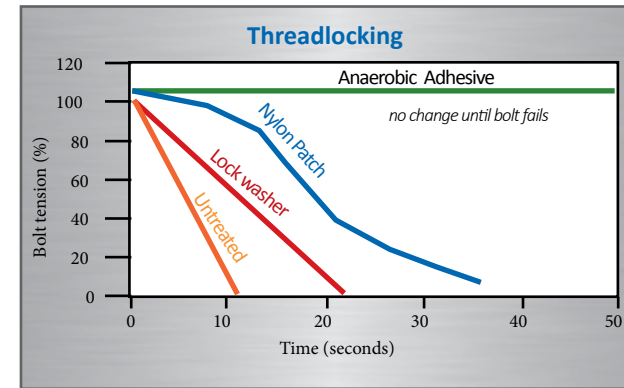
	Solvent Resistance	
	Polar	Non Polar
Anaerobic	Very Good	Very Good
Cyanoacrylate	Poor	Good
Epoxy - 1 Part	Very Good	Excellent
Epoxy - 2 Part	Very Good	Very Good
Epoxy - Modified	Good	Very Good
MS Polymer	Good	Fair
Polyurethane	Good	Good
Structural Acrylic - No Mix	Good	Very Good
Structural Acrylic - 2 Part	Good	Very Good
Structural Acrylic - 2 Part MMA	Good	Very Good
UV Curable	Good	Very Good

	Temperature Resistance	
	Standard	High Temp Grade
Anaerobic	300°F (150°C)	450°F (230°C)
Cyanoacrylate	185°F (85°C)	480°F (250°C)
Epoxy - 1 Part	350°F (180°C)	570°F (300°C)
Epoxy - 2 Part	175°F (80°C)	570°F (300°C)
Epoxy - Modified	175°F (80°C)	
MS Polymer	175°F (80°C)	
Polyurethane	250°F (120°C)	
Structural Acrylic - No Mix	300°F (150°C)	200°F (390°C)
Structural Acrylic - 2 Part	250°F (120°C)	
Structural Acrylic - 2 Part MMA	250°F (120°C)	
UV Curable	250°F (120°C)	300°F (150°C)

Metal Reactivity as Related to Anaerobic Cure Speed			
Super Active	Active	Less Active	Passive
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
Very Fast Cure	Fast Cure	Slow Cure	Activator Needed

Note: Use Permabond ASC10 Anaerobic Surface Conditioner to speed-up anaerobic adhesive cure and to activate inactive surfaces.
Tip: Permabond UV7141 is a dual cure anaerobic. The exposed surface can be cured with UV light. See page 18.

About Anaerobics

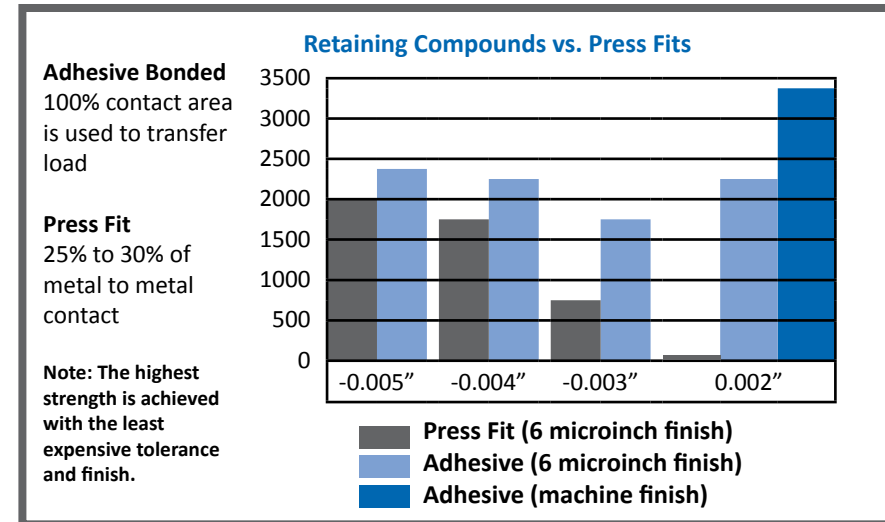
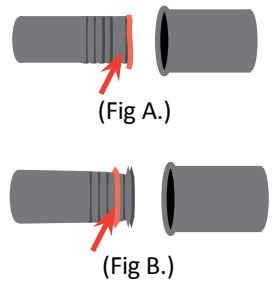


Thread Sealing Assembly & Removal Technique

- 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.

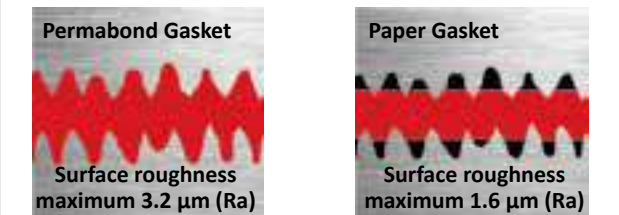
* IN EACH CASE EXCESS SEALANT SHOULD BE VISIBLE AFTER TIGHTENING

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.



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.



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).

Anaerobic Threadlockers



Perma-Bond 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 & permanent requirements
- More cost-effective than mechanical locking devices

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 & 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 0.15 mm	0.006 in 0.15 mm		0.008 in 0.20 mm	0.001 in 0.05 mm	0.01 in 0.25 mm	0.006 in 0.15 mm	0.006 in 0.15 mm	0.012 in 0.30 mm
Max Bolt Size	3/4" M20	3/4" M20		3/4" M20	1/2" M10	1 1/2" M30	3/4" M20	3/4" M20	2" M56
¹ Shear Strength	750 psi 5 MPa	1,450 psi 10 MPa		2,500 psi 17 MPa	2,200 psi 15 MPa	2,500 psi 17 MPa	2,500 psi 17 MPa	2,500 psi 17 MPa	2,500 psi 17 MPa
² Torque Breakaway	80 in•lb 9 N•m	140 in•lb 16 N•m		200 in•lb 23 N•m	125 in•lb 14 N•m	275 in•lb 31 N•m	275 in•lb 31 N•m	290 in•lb 33 N•m	240 in•lb 27 N•m
² Torque Prevail	40 in•lb 5 N•m	60 in•lb 7 N•m		280 in•lb 32 N•m	300 in•lb 34 N•m	300 in•lb 34 N•m	350 in•lb 40 N•m	520 in•lb 58 N•m	480 in•lb 54 N•m
² 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 -55 to 150°C	-65 to 300°F -55 to 150°C		-65 to 300°F -55 to 150°C	-65 to 300°F -55 to 150°C	-65 to 300°F -55 to 150°C	-65 to 300°F -55 to 150°C	-65 to 300°F -55 to 150°C	-65 to 445°F -55 to 230°C

Approvals

	Type II Grade M	Type II Grade N		Type II Grade O	Type III Grade R	Type I Grade L	Type I Grade K		
³ MIL-46163A				AN0331	AN0261	AN0211	AN0221		
⁴ ASTM D5363	AN0311	AN0321							
³ MIL-S-22473E		Grade CVV			Grade AVV	Grade AVV			
⁴ ASTM D5363		AN0143			AN0111	AN0124			
NSF			NSF/ANSI 61						

ASC 10 Anaerobic Surface Conditioner

Perma-Bond ASC10 is a surface activator for anaerobic adhesives, suitable for use on non-metallic surfaces or on less active metals (see chart on page 5) to accelerate cure speed and allow products to cure through larger gaps.

Notes

Strength results will vary depending on the level of surface preparation and gap.

¹Steel --- ²M10 Nuts and Bolts --- ³MIL Specs are for EXISTING designs only. --- ⁴ASTM D5363 is for NEW designs.

Anaerobic Thread Sealants



Perma-Bond 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, & hydraulic systems
- Resistant to a wide variety of chemicals

Anaerobic Thread Sealants

Grade	LM012	LH050	LH050 PURE™	LH051	LH056	MH052	LH150
Features	No Fillers, Hydraulics Sealing Grade	General Purpose UL Classified	NSF/ANSI 61 Certified, Potable Water Grade	Automatic Dispensing	Fire Protection Grade	Medium Strength BAM Approved for Oxygen	Stainless Steel Grade
Color	Brown	White		White	White	Yellow	White
Viscosity	2,000 cP	250,000 cP		2 rpm 450,000 cP 20 rpm 70,000 cP	120,000 cP	2 rpm 65,000 cP 20 rpm 25,000 cP	260,000 cP
Fluorescent	Yes	No		No	No	Yes	No
Max Gap Fill	0.008 in 0.20 mm	0.020 in 0.50 mm		0.020 in 0.50 mm	0.020 in 0.50 mm	0.020 in 0.50 mm	0.020 in 0.50 mm
¹ Shear Strength	750 psi 5 MPa	1,000 psi 7 MPa		1,000 psi 7 MPa	1,000 psi 7 MPa	1,450 psi 10 MPa	1,000 psi 7 MPa
² Torque Breakaway	25 in•lb 3 N•m	35 in•lb 4 N•m		35 in•lb 4 N•m	35 in•lb 4 N•m	180 in•lb 20 N•m	50 in•lb 6 N•m
² Torque Prevail	15 in•lb 2 N•m	25 in•lb 3 N•m		25 in•lb 3 N•m	25 in•lb 3 N•m	100 in•lb 11 N•m	25 in•lb 3 N•m
Fixture	30 min	120 min		120 min	120 min	15 min	120 min
Full Cure	24 hr	24 hr		24 hr	24 hr	24 hr	24 hr
Temperature Range	-65 to 350°F -55 to 177°C	-65 to 350°F -55 to 177°C		-65 to 350°F -55 to 177°C	-65 to 350°F -55 to 177°C	-65 to 300°F -55 to 150°C	-65 to 350°F -55 to 177°C

Approvals

		UL® Classified	NSF/ANSI 61 Certified		³ FBC™ System Compatible Spears® FlameGuard® Approved	⁴ BAM Approved	
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ASC 10 Anaerobic Surface Conditioner

Perma-Bond 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.

Strength results will vary depending on the level of surface preparation and gap.

¹Steel

²M10 Nuts and Bolts

³FBC System Compatible FBC™ System Compatible indicates that this product has been tested, and is monitored on an ongoing basis, to assure its chemical compatibility with FlowGuard Gold®, BlazeMaster® and Corzan® pipe and fittings. FBC, FlowGuard Gold, BlazeMaster and Corzan are licensed trademarks of The Lubrizol Corporation.

⁴BAM Approved for use with gaseous oxygen up to 10 bar (145 psi) and 60°C (140°F).

Note: LH056 is for use on metal pipe in systems that also contain CPVC.



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

- No relaxation or shrinkage eliminates need to retighten 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
- Seals rough surfaces; reduce machining needs
- Non-shimming
- 100% surface contact for uniform stress distribution

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 0.3 mm	0.020 in 0.5 mm	0.012 in 0.3 mm	0.020 in 0.5 mm
¹ Shear Strength	900 psi 6 MPa	1,450 psi 10 MPa	750 psi 5 MPa	1,100 psi 8 MPa
¹ Fixture	15 min	15 min	20 min	20 min
Full Cure	24 hr	24 hr	24 hr	24 hr
Temperature Range	-65 to 250°F -55 to 120°C	-65 to 390°F -55 to 200°C	-65 to 300°F -55 to 150°C	-65 to 390°F -55 to 200°C
² Oil Resistance	Excellent	Excellent	Excellent	Excellent
² Water Resistance	Excellent	Excellent	Excellent	Excellent
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.				
Notes				
Strength results will vary depending on the level of surface preparation and gap.				
¹ Steel				
² See Chemical Compatibility Chart page 3				

TIP: 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.

50ml of adhesive will go how far?	
Bead Diameter	Length of Bead
1.5mm ●	25m
3mm ●	6m



Permabond retaining compounds are for the permanent bonding of co-axial joints.

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

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	5000 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 0.254 mm		0.005 in 0.127 mm	0.008 in 0.203 mm	0.010 in 0.254 mm	0.008 in 0.203 mm	0.012 in 0.305 mm	0.02 in 0.500 mm
¹ Shear Strength	2,000 psi 14 MPa		2,300 psi 16 MPa	2,000 psi 14 MPa	3,500 psi 24 MPa	4,300 psi 30 MPa	2,900 psi 20 MPa	4,700 psi 32 MPa
² Torque Breakaway	220 in•lb 25 N•m		180 in•lb 20 N•m	270 in•lb 30 N•m	275 in•lb 31 N•m	280 in•lb 32 N•m	310 in•lb 35 N•m	400 in•lb 45 N•m
² Torque Preval	330 in•lb 37 N•m		315 in•lb 36 N•m	450 in•lb 50 N•m	400 in•lb 45 N•m	510 in•lb 57 N•m	450 in•lb 50 N•m	280 in•lb 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 300°F		-65 to 250°F -55 to 120°C	-65 to 350°F -55 to 177°C	-65 to 300°F -55 to 150°C	-65 to 390°F -55 to 200°C	-65 to 445°F -55 to 230°C	-65 to 300°F -55 to 150°C
Approvals								
NSF		NSF/ANSI 61						
³ MIL-R-46082B			Type I	Type II	Type III			
⁴ ASTM D5363			0411	0412	0421			
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.								

Strength results will vary depending on the level of surface preparation and gap.

- ¹Steel
- ²M10 Steel Nuts & Bolts
- ³MIL Specs are for EXISTING designs only.
- ⁴ASTM D5363 is for NEW designs.

TIP: Permabond's adhesives and sealants 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.

Cyanoacrylates "Instant Adhesives"



PermaBond cyanoacrylate adhesives are single component adhesives that cure by reacting to small traces of moisture on the surface of the substrates being bonded. They cure very quickly at room temperature, eliminating the need for costly ovens or curing equipment.

Applications include:

- Electronics wire tacking
- Bonding headsets
- Hose clips onto hoses
- Bonding automotive interior trim
- Tacking parts during assembly process
- Fabricate silicone & 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



Primers, Accelerators & Solvents

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



TIP: Use only enough adhesive to cover the bond area. Excess adhesive will not increase bond strength and can reduce cure speed.

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)

***NOTE:** Although these products set very quickly, it is important to note that strength will increase for 24 hours.

***NOTE:** Strength results will vary depending on the level of surface preparation and gap.

			Grade	Description	Viscosity	Gap Fill		Shear Strength*		Set Time			Temperature Range		
					23 °C	Max.		Steel		Rubber	Plastic	Metal	Lower	Upper	
					cP	in.	mm	psi	MPa	sec	sec	sec	°F (°C)	°F (°C)	
<p>NOTE: For Mil Specs and other approvals, see page 3 & 4.</p> <p>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.</p>			General Purpose	101	Wicking type, plastic bonding	2-3	0.002	0.05	2,800-3,300	19-23	2-5	5-10	3-5	-65 (-55)	180 (82)
				102	Plastic bonding	70-90	0.006	0.15	2,800-3,300	19-23	5-10	10-15	10-15	-65 (-55)	180 (82)
				105	Elastomer bonding	30-50	0.004	0.10	2,600-3,200	18-22	5-10	5-10	10-15	-65 (-55)	180 (82)
				108	Intermediate gap fill, plastic bonding	400-600	0.008	0.20	2,900-3,200	20-22	10	10	10	-65 (-55)	180 (82)
				240	Plastic bonding, max. gap fill & flow control	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	Fast curing maximum gap fill	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	Thixotropic, maximum gap fill	10,000-20,000	0.020	0.50	2,800-3,300	19-23	10-15	10-15	10-15	-65 (-55)	180 (82)
<p>The original instant adhesive, 910, a pure methyl cyanoacrylate, creates very strong bonds between metal substrates.</p>			Metals	170	Maximum gap fill	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	The Original! General purpose	70-90	0.006	0.15	3,300-4,200	23-29	10-15	10-15	10-15	-65 (-55)	195 (90)
				910FS	Wicking type	2-4	0.002	0.05	3,300-4,200	23-29	<10	<10	<10	-65 (-55)	195 (90)
<p>Toughened Cyanoacrylates are preferred when the assembly is subject to vibration, impact, peel, flexing stresses, or higher temperature.</p>			Toughened	731	Excellent peel, impact & shear strength	100-200	0.006	0.15	3,500-4,400	24-30	15-20	15-20	<30	-65 (-55)	250 (120)
				735	Similar to 731 - black	100-200	0.006	0.15	3,500-4,400	24-30	10-15	5-10	30-50	-65 (-55)	250 (120)
				737	Impact resist., gap fill, black	2,000-4,000	0.020	0.50	2,800-3,300	19-23	10-15	5-10	15-20	-65 (-55)	250 (120)
<p>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.</p>			Surface Insensitive	790	Very fast set, wicking type	1-3	0.002	0.05	2,600-3,200	18-22	2-3	2-3	2-3	-65 (-55)	180 (82)
				791	Very fast set, close fitting parts	30-50	0.004	0.10	2,600-3,200	18-22	2-3	2-3	2-3	-65 (-55)	180 (82)
				792	Very fast curing, higher temp. resist	60-125	0.006	0.15	2,600-3,200	18-22	2-3	2-3	2-3	-65 (-55)	250 (120)
				795	Fast curing, general purpose	400-600	0.007	0.18	2,600-3,200	18-22	3-6	3-6	3-6	-65 (-55)	180 (82)
				799	Fast curing, maximum gap fill	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	Non-sag, max. gap fill, high temp. resist	Gel	0.020	0.50	2,900-3,500	20-24	5-10	5-10	5-10	-65 (-55)	250 (120)
<p>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 listed to the left.</p>			High Temp. Resistant	801	Resists to 130°C / wicking type	10-15	0.002	0.05	2,800-3,300	19-23	10-15	10-15	10-15	-65 (-55)	270 (130)
				802	Resists to 160°C	90-110	0.006	0.15	2,800-3,300	19-23	10-15	10-15	10-15	-65 (-55)	320 (160)
				820	Resists to 200°C	90-110	0.006	0.15	2,800-3,300	19-23	10-15	10-15	10-15	-65 (-55)	390 (200)
				919	Resists to 250°C after post cure / wicking type	2-6	0.002	0.05	2,900-3,200	20-22	<20	<20	<20	-65 (-55)	*482 (250)
				920	Resists to 250°C after post cure	70-90	0.006	0.15	2,800-3,300	19-23	10-15	10-15	15-20	-65 (-55)	*482 (250)
				922	Resists to 250°C after post cure / max gap fill	1,200-2,000	0.017	0.43	2,800-3,300	19-23	<45	<45	<20	-65 (-55)	*482 (250)
<p>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.</p>			Low Odor	940	Low odor & non-blooming, wicking type	3-10	0.002	0.05	2,300-2,900	16-20	2-5	10-15	10-15	-65 (-55)	180 (82)
				941	Low odor & non-blooming	10-20	0.003	0.08	2,300-2,900	16-20	2-5	10-15	10-15	-65 (-55)	180 (82)
				943	Low odor & non-blooming, general purpose	90-110	0.006	0.15	2,300-2,900	16-20	<5	5-10	10-15	-65 (-55)	180 (82)
				947	Low odor & non-blooming, gap fill	900-1,500	0.010	0.25	2,300-2,900	16-20	2-5	20-30	10-15	-65 (-55)	180 (82)

Epoxy One Component

Epoxy Two Component



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 Sag	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. (0.51 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%



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 (continued)						
Grade	E-modulus	Coefficient of Thermal Expansion	Thermal Conductivity	Tg Glass Transition	Shear Strength* psi (N/mm ²)	Service Temp
ES550	3.5 GPa	45 x 10 ⁻⁶ mm/mm/°C (below Tg) 160 x 10 ⁻⁶ 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 ⁻⁶ mm/mm/°C (below Tg) 160 x 10 ⁻⁶ 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)
ES562	2.1 GPa	50 x 10 ⁻⁶ mm/mm/°C (below Tg) 165 x 10 ⁻⁶ mm/mm/°C (above Tg)	0.30 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 ⁻⁶ mm/mm/°C (below Tg) 180 x 10 ⁻⁶ 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 ⁻⁶ mm/mm/°C (below Tg)	1.3 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)

*Strength results will vary depending on the level of surface preparation and gap.

Epoxies - Two Component										
Grade	Mix	Description	Color	Viscosity	Viscosity A mPa.s (cP)	Viscosity B mPa.s (cP)	Specific Gravity	Usable Pot Life	Max. Gap	
ET500	1:1	Fast, non-yellowing	Clear	Low	12,000-18,000	15,000-30,000	A) 1.2 B) 1.1	3 - 4 min	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	60 - 120 min	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	10 - 20 min	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	30 - 50 min	0.08 in. 2.00 mm	
ET515	1:1	Clear, flexible	Lt. Amber	Medium	20 rpm: 10,000-20,000	20 rpm: 14,000-24,000	A) 1.1 B) 1.1	10 - 20 min	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	50 - 80 min	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	120 - 150 min	0.20 in. 5.00 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	10 - 12 min	0.20 in. 5.00 mm	

Key benefits of Permabond Two Part Epoxies include:

- High Peel Strength for Design Versatility
- Excellent Chemical & Environmental Durability
- Easily Dispensed with Static Mix Nozzles
- No Curing Equipment Required

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 ²	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 ²	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)	1,200 - 1,750 psi 8 - 12 N/mm ²	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)	2,600 - 2,900 psi 18 - 20 N/mm ²	1 - 2 hr	13-18 PIW 60 - 80 N/25mm	80°C 175°F
ET515	D 30 - 50	20 - 40%	15-25	0.3	20°C (68°F)	1,200 - 1,750 psi 8 - 12 N/mm ²	20 - 30 min	16-20 PIW 70-90 N/25mm	100°C 212°F
ET536	D 65 - 75	4 - 8%	15-25	0.4	45-55°C (113-131°F)	2,200 - 3,500 psi 15 - 24 N/mm ²	1.5 - 2 hr	13-18 PIW 60-80 N/25mm	80°C 175°F
ET538	D 70 - 80	4 - 8%	15 - 25	0.55	45-55°C (113-131°F)	2,600 - 2,900 psi 18 - 20 N/mm ²	3 - 5 hr	13 - 18 PIW 60-80 N/25mm	100°C 212°F
ET5401 cured 7 days @ 25°C	D 65 - 75	4 - 8%	15-25	0.35	50°C (122°F)	1,450 - 2,200 psi 10 - 15 N/mm ²	1 - 1.5 hr	3-5 PIW 20-25 N/25mm	80°C 175°F
ET5401 cured 1 hour @ 80°C	D 75 - 85	4 - 8%	15-25	0.35	110°C (230°F)	2,900-4400 psi 20 - 30 N/mm ²	N/A	55-66 ¹ PIW 250-300 ¹ N/25mm	140°C 285°F

*Strength results will vary depending on the level of surface preparation and gap.

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.

Key benefits of Modified Epoxies and MS Polymers include:

- Paintable
- Non-corrosive
- Fast Tack Free Time
- Adhesion to a Variety of Substrates
- No Primer Needed
- Weather Resistant
- Ease of Application - Use in Most Weather Conditions
- No Cracking or Splitting

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	1.50	1.50	1.05
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 - 150%
Tensile Strength	2 - 3 MPa (290 - 440 psi)	0.5 - 1.5 MPa (70 - 200 psi)	0.7 - 1.5 MPa (100 - 200 psi)
*Shear Strength			
<i>Steel</i>	2-3 N/mm ² (290 - 440 psi)	1-2 N/mm ² (145 - 290 psi)	2-3 N/mm ² (290 - 440 psi)
<i>Aluminum</i>	2-3 N/mm ² (290 - 440 psi)	1-2 N/mm ² (145 - 290 psi)	2-3 N/mm ² (290 - 440 psi)
<i>Zinc</i>	2-3 N/mm ² (290 - 440 psi)	1-2 N/mm ² (145 - 290 psi)	2-3 N/mm ² (290 - 440 psi)
<i>PVC</i>	2-3 N/mm ² (290 - 440 psi)	1-2 N/mm ² (145 - 290 psi)	2-3 N/mm ² (290 - 440 psi)
<i>Polycarbonate</i>	1-1.5 N/mm ² (150 - 220 psi)	0.5 - 1.5 N/mm ² (150 - 200 psi)	1-1.5 N/mm ² (150 - 220 psi)
<i>Polystyrene</i>	1-1.5 N/mm ² (150 - 220 psi)	0.5 - 1.5 N/mm ² (150 - 200 psi)	1-1.5 N/mm ² (150 - 220 psi)
<i>Wood</i>	2-3 N/mm ² (290 - 440 psi)	1-2 N/mm ² (145 - 290 psi)	2-3 N/mm ² (290 - 440 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)

***NOTE:** Strength results will vary depending on the level of surface preparation and gap.



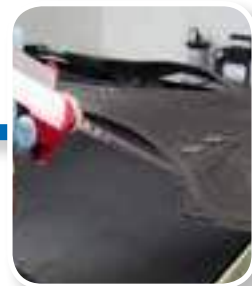
Permabond Modified Epoxies are two component hybrid technology adhesives that cure at ambient temperature. Products are available in 10:1 and 2:1 dual cartridges for dispensing through static mix tips. These soft, flexible adhesives cure with very low shrinkage and are ideal for bonding thin materials 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 130:85 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	1.0
Viscosity Part A cP(mPa.s)	20,000-45,000	200,000 thixotropic	20 rpm 6,000 - 1,000 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%	200%
*Shear Strength			
<i>Steel</i>	4-7 N/mm ² (600 - 1,000 psi)	4-7 N/mm ² (600 - 1,000 psi)	6 - 8 N/mm ² (900 - 1,200 psi)
<i>Aluminum</i>	6-8 N/mm ² (900-1,200 psi)	6-8 N/mm ² (900-1,200 psi)	6-8 N/mm ² (900-1,200 psi)
<i>ABS</i>	4-6 N/mm ² (600-900 psi)	4-6 N/mm ² (600-900 psi)	4-6 N/mm ² (600-900 psi)
<i>Acrylic</i>	2-5 N/mm ² (300-700 psi)	2-5 N/mm ² (300-700 psi)	3-5 N/mm ² (400-700 psi)
<i>Nylon</i>	2-4 N/mm ² (300-600 psi)	2-4 N/mm ² (300-600 psi)	3-5 N/mm ² (400-700 psi)
<i>Polycarbonate</i>	4-6 N/mm ² (600-900 psi)	4-6 N/mm ² (600-900 psi)	5-7 N/mm ² (700-900 psi)
<i>PVC</i>	3-5 N/mm ² (400-700 psi)	3-5 N/mm ² (400-700 psi)	4-6 N/mm ² (600-900 psi)
<i>FRP Glass Epoxy</i>	5-7 N/mm ² (700-1,000 psi)	5-7 N/mm ² (700-1,000 psi)	5-7 N/mm ² (700-1,000 psi)
<i>FRP Glass Polyester</i>	5-7 N/mm ² (700-1,000 psi)	5-7 N/mm ² (700-1,000 psi)	5-7 N/mm ² (700-1,000 psi)
<i>Carbon Fiber</i>	6-8 N/mm ² (600-1,200 psi)	6-8 N/mm ² (600-1,200 psi)	6-8 N/mm ² (600-1,200 psi)
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 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.



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 plastic, 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	45 - 60 min	60 - 90 min	90 - 120 min
Full Strength cured @ 23°C	4-5 days	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 Steel	2,600-3,600 psi (18 - 25 N/mm ²)	1,700-2,900 psi (12 - 20 N/mm ²)	1,700-2,600 psi (12 - 18 N/mm ²)
Tensile Strength	2,900-3,600 psi (20 - 25 N/mm ²)	2,300-3,600 psi (16 - 25 N/mm ²)	2,200-2,900 psi (15 - 25 N/mm ²)
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)

Strength results will vary depending on the level of surface preparation and gap.

Tip: Permabond two component polyurethanes are available in dual cartridge 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.



Permabond UV Light Curable Adhesives are single part, cure on demand and 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)).

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.

UV Light Curable Adhesives									
Grade	Description	Cure Type	Visc. cP (mPa.s)	Tensile Strength	Shear Strength	Shore Hardness	Elongation	Refractive Index	Temp. Range
Metal & Glass Bonding					Steel To Glass				
UV610	High strength, glass to metal	UV	800-1,000	2,500 psi 17 N/mm ²	1,900 - 2,300 psi 13 - 16N/mm ²	D 70	95%	>1.490	-65 to +250°F -55 to +120°C
UV620	General purpose, optically clear	UV	2,200-2,900	2,300 psi 16 N/mm ²	1,300 - 1,500 psi 9 - 10N/mm ²	D 68	>80%	>1.490	-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 ²	1,300 - 1,500 psi 9 - 10N/mm ²	D 65	>60%	>1.490	-65 to +250°F -55 to +120°C
UV670	Metal to glass, flexible	UV	2,000 - 3,000	2,000 psi 12 N/mm ²	870 - 1,450 psi 6 - 10N/mm ²	D 55	80%	>1.490	-65 to +250°F -55 to +120°C
UV7141	Metals, Dual Cure	UV- Anaerobic	1,000 - 1,700	2,900 psi 20 N/mm ²	2,000 - 2,500 psi 14 - 17N/mm ²	D 65	35%	1.490	-65 to +300°F -55 to +150°C
Plastic Bonding					Polycarbonate				
UV630	Low viscosity	UV-Visible	200 - 300	2,000 psi 14 N/mm ²	Substrate failure*	D 60	110%	>1.490	-65 to +250°F -55 to +120°C
UV632	Low viscosity, acrylic bonder	UV-Visible	200 - 400	1,900 psi 13 N/mm ²	Substrate failure*	D 65	>70%	>1.490	-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 ²	Substrate failure*	D 65	110%	>1.490	-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 ²	Substrate failure*	D 58	>70%	>1.490	-65 to +250°F -55 to +120°C
UV649	Thixotropic gel	UV-Visible	Thixotropic Gel	2,200 psi 15 N/mm ²	Substrate failure*	D 58	>70%	>1.490	-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 ²	N/A	D 58	>50%	>1.490	-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 ²	N/A	D 58	>50%	>1.490	-65 to +250°F -55 to +120°C
Optically Clear**					Steel to Glass				
UV6160	Excellent optical clarity	UV-Visible	1,000 - 2,000	3,265 psi 25 N/mm ²	1,600 psi 11 N/mm ²	D 70	125%	>1.490	-65 to +250°F -55 to +120°C
UV6231	Optical clarity, moisture resistance	UV	5,000 - 8,000	1,450 psi 10 N/mm ²	1,450 psi 10 N/mm ²	D 48	>120%	>1.490	-65 to +250°F -55 to +120°C

Strength results will vary depending on the level of surface preparation and gap.

*The polycarbonate failed but the bond remained intact.

**See UV620 for glass to metal

Applications include:

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

Structural Acrylics



PermaBond Two Component Structural Acrylics

PermaBond TA4810 and TA4820 are methyl methacrylate adhesives. Both form high strength, durable bonds to many plastics, metals, and unprimed metals. TA4810 sets up quickly and TA4820 allows more working time for complex assemblies. Both resist temperatures from -40°F to 250°F (-40°C to 120°C).

Note that two component PermaBond TA440 is not dispensed through a static mixer but is designed to mix itself upon assembly. Simply dispense a bead of Part A, then dispense a bead of Part B on top of it. As the components are assembled, adequate mixing occurs to initiate cure. TA440 forms very strong durable bonds to metals and ferrites and resists temperatures from -65°F to 250°F (-54°C to 120°C).

Note: All Structural Acrylics listed here are non-flammable with the exception of TA4246, TA4810, and TA4820.

Tip: PermaBond TA4246, TA4810, and TA4820 offer extremely high adhesion to difficult to bond plastics.

Acrylic - Two Component

Grade	TA440 A & B	TA4810	TA4820
Description	Bead on bead for metal, glass, wood, and rigid plastic	2-part 1:1 toughened methacrylate adhesive, thixotropic, non-sag, ideal for plastics	2-part 1:1 toughened methacrylate adhesive, thixotropic, non-sag, ideal for plastics
Color	Amber/Green	Off-White/Amber	Off-White/Amber
Viscosity cP (mPa.s)	8,500 cP (mPa.s)	175,000 cP (mPa.s)	175,000 cP (mPa.s)
Fixture Time	<30 sec	10 - 15 min	30 - 35 min
Working Strength	30 - 60 min	50 - 60 min	100 - 120 min
Full Strength	24 hr	24 hr	24 hr
Shear Strength Steel	2,200 - 3,600 psi 15 - 25 N/mm ²	3,000 - 4,000 psi 21 - 28 N/mm ²	3,000 - 4,000 psi 21 - 28 N/mm ²
Shear Strength Aluminum	1,500 - 2,500 psi 10 - 17 N/mm ²	2,000 - 3,200 psi 17 - 24 N/mm ²	2,500 - 3,500 psi 17 - 24 N/mm ²
Shear Strength Fiber Glass	NA	1,700 psi >12 N/mm ²	1700 psi >12 N/mm ²
Shear Strength PPO, PVC, SMC, HIPS	NA	Substrate Failure	Substrate Failure
Peel Strength Aluminum	10 - 14 PIW 45 - 65 N/25mm	15 - 20 PIW 70 - 90 N/25mm	15 - 20 PIW 70 - 90 N/25mm
Impact Strength	25 N/mm/mm ²	25 N/mm/mm ²	25 N/mm/mm ²
Gap Fill	0.02 in 0.5 mm	0.08 in. 2.0 mm	0.08 in. 2.0 mm
Temperature Range	-65 to +250°F -55 to +120°C	-40 to +250°F -40 to +120°C	-40 to +250°F -40 to +120°C

Strength results will vary depending on the level of surface preparation and gap.

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

Acrylic - No-Mix Surface Activated

Grade	TA430 & Initiator 41	TA435 & Initiator 41	TA436 & Initiator 43	TA437 & Initiator 41	TA439 & Initiator 41 ²	TA4590 & Initiator 44	TA4246 & 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	-
Visc. cP 20 rpm	20,000	30,000	25,000	60,000	1,000	20,000	23,000
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)	0.02 (0.51)	0.02 (0.51)	0.02 (0.51)
Handling Time¹	3 - 5 min	3 - 5 min	1 - 3 min	1 - 3 min 15 - 20 min ³	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	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 ²	10-15 kJ/m ²	10-15 kJ/m ²	10-15 kJ/m ²	10-20 kJ/m ²	15-20 kJ/m ²	50-60 kJ/m ²
Shear Strength Steel	2,200-3,600 psi 15 - 25 N/mm ²	2,200-3,600 psi 15 - 25 N/mm ²	2,200-3,600 psi 15 - 25 N/mm ²	2,000-3,000 psi 14 - 20 N/mm ²	2,900-3,600 psi 20 - 25 N/mm ²	2,900-3,600 psi 20 - 25 N/mm ²	4,800-5,100 psi 33 - 35 N/mm ²
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 ⁻⁶ 1/K	80 x 10 ⁻⁶ 1/K	80 x 10 ⁻⁶ 1/K	80 x 10 ⁻⁶ 1/K	80 x 10 ⁻⁶ 1/K	80 x 10 ⁻⁶ 1/K	80 x 10 ⁻⁶ 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 ¹³ Ohm.cm	2 x 10 ¹³ Ohm.cm	2 x 10 ¹³ Ohm.cm	2 x 10 ¹³ Ohm.cm	2 x 10 ¹³ Ohm.cm	2 x 10 ¹³ Ohm.cm	2 x 10 ¹³ Ohm.cm
Temperature Range	-65 to +250°F -55 to +120°C	-65 to +250°F -55 to +120°C	-65 to +250°F -55 to +120°C	-65 to +390°F -55 to +200°C	-65 to +250°F -55 to +120°C	-65 to +300°F -55 to +150°C	-65 to +250°F -55 to +120°C

Strength results will vary depending on the level of surface preparation and gap.

¹ Handling time is the length of time required to achieve 0.3N/mm² at 23°C with no induced gap

² Initiator 43 can be used on plastic applications

³ TA437 on metal with no initiator. TA437 has an anaerobic cure mechanism and can be used with no initiator

Additional Products & Information

Accelerators, Primers, Activators, and Solvents

CYANOACRYLATE - ACCELERATORS

Permabond CSA-NF, QFS10, and QFS16 are accelerators for use with Permabond cyanoacrylates. They are used to speed the cure rate, particularly on porous or acidic surfaces. These products also reduce blooming, cure adhesive that is outside of a joint, and allow products to cure through larger gaps.



CYANOACRYLATE - PRIMER FOR POLYOLEFIN

Permabond POP is designed to increase adhesion when bonding surfaces such as polypropylene, polyethylene, silicone and PTFE with cyanoacrylate adhesives.

ANAEROBIC ADHESIVE - ACTIVATOR

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 5) to accelerate cure speed and allow products to cure through larger gaps.

ACRYLIC ADHESIVE - INITIATORS

Permabond Initiators are adhesive specific; consult the TDS for the appropriate initiator for each adhesive.

CYANOACRYLATE - SOLVENT

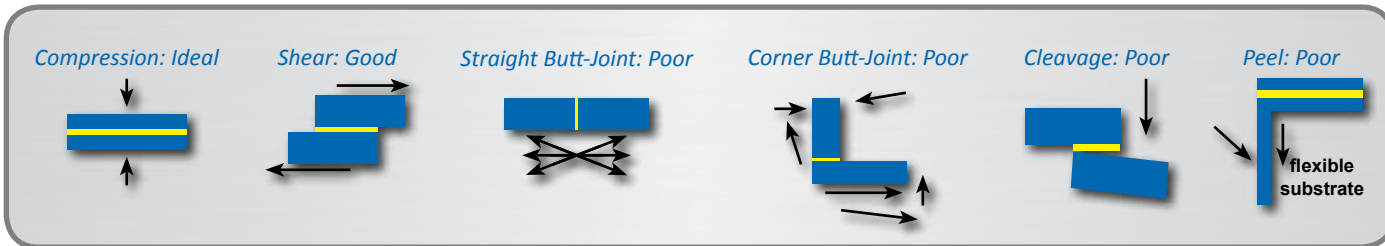
Permabond CA Solvent is extremely effective for dissolving cyanoacrylate bonds or removing cured excess adhesive.

Design Considerations

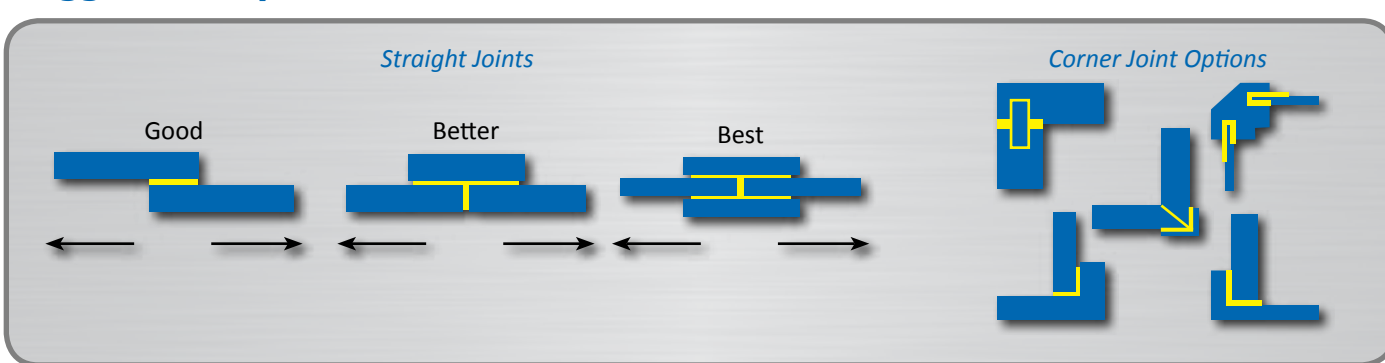
Designing components and assembly processes with adhesive use in mind improves quality and efficiency. In addition to adhesion, consider joint design, surface preparation, gap fill & viscosity, adhesive usage, and service conditions.

Joint Designs

Typical Joints



Suggested Improvements



TIP: Contact Permabond's Technical Support Department for joint design assistance.

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 bondable 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.

Low Surface Energy	Surface Treatment	High Surface Energy
	<ul style="list-style-type: none"> Solvent wiping Mechanical abrasion Chemical pretreatment Flame 	
Poor Wetting	<ul style="list-style-type: none"> Chromic acid Iodine Corona or Plasma treatments Primers 	Good Wetting

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.

Adhesive Usage Estimates

The number of free flow drops per container is listed to the right. All of the data was determined using an 18 gauge needle to create an 1/8" (3.17mm) drop.

Actual Size

Usage Estimator (Weight)		Usage Estimator (Volume)		Usage Estimator (Coverage)	
Container Size	Number of Drops	Container Size	Number of Drops	Container Size	Coverage Area
3 g	45	10 ml	150	1 Liter	1 square meter at a thickness of 1mm
20 g	300	50 ml	750		
28 g (1 oz)	420	75 ml	1,125		
30 g	450	250 ml	3,750		
300 g	4,500	300 ml	4,500		
454 g (1 lb)	6,810	500 ml	7,500		
500 g	7,500	750 ml	11,250		
2 Kg	30,000	1 Liter	15,000		

Service Conditions

Chemical exposure can affect adhesives. It is important to consider not only the type of chemical the adhesive will be exposed to, but the concentration and the temperature of that chemical, the loading of the joint, and whether the joint design leaves the adhesive vulnerable to attack.

The temperature range the joint will be exposed to is an important factor in deciding which adhesive to use. In general, adhesive strength reduces as temperature increases. Provided adhesives are kept within their recommended temperature range, full strength should be regained upon returning to room temperature. Products can withstand higher temperatures for brief periods providing the joint is not unduly stressed.

Permabond adhesives and sealants are available worldwide through authorized distributors. Contact us for a distributor in your area.



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