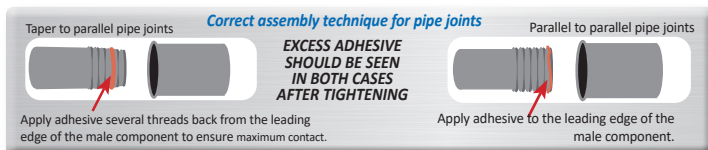


QUICK REFERENCE PRODUCT SELECTOR

ANAEROBICS (AA)

The Permabond range of anaerobic adhesives is formulated to provide superior performance benefits in applications with self-supporting or closely-mating metallic components such as threadlocking, threadsealing of pipes, gasketing and retaining bearings.

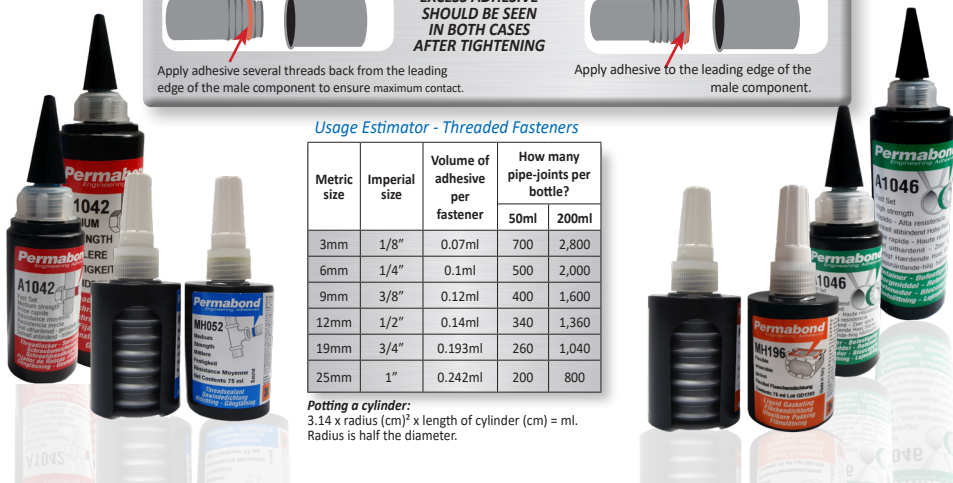
Product	A1042	A1046	MH052	MH196
Use	Threadlocking	Retaining	Pipesealing	Gasketing
Colour	Blue	Green	Yellow	Red
Viscosity (mPa.s)	2rpm: 8000 20rpm: 1700	2rpm: 9000 20rpm: 2500	2rpm: 65,000 20rpm: 25,000	2rpm: 500,000 20rpm: 100,000
Max. Gap Fill (mm)	0.12	0.25	0.5	0.5
Handling Time - Steel (mins)	5	5 to 10	15	15
Strength - Steel (MPa)	12	25	10	15
Torque - Breakaway (Nm)	16	30	20	20
Torque - Prevail (Nm)	8	50	11	23
Packaging	10ml, 50ml or 200ml bottles	10ml, 50ml or 200ml bottles	50ml & 200ml bottles, 75ml accordion bottles or 300ml cartridges	75ml accordion bottles or 300ml cartridges



Usage Estimator - Threaded Fasteners

Metric size	Imperial size	Volume of adhesive per fastener	How many pipe-joints per bottle?	
			50ml	200ml
3mm	1/8"	0.07ml	700	2,800
6mm	1/4"	0.1ml	500	2,000
9mm	3/8"	0.12ml	400	1,600
12mm	1/2"	0.14ml	340	1,360
19mm	3/4"	0.193ml	260	1,040
25mm	1"	0.242ml	200	800

Potting a cylinder:
 $3.14 \times \text{radius (cm)}^2 \times \text{length of cylinder (cm)} = \text{ml}$
 Radius is half the diameter.





A1042

- Locks & seals threaded nut & bolt assemblies
- Prevents vibration loosening
- Can be undone with tools if necessary
- Lubricates for easier assembly
- Prevents nuts rusting onto bolts = easy MRO

IDEAL FOR: Locking nuts and bolts on machinery, vehicles etc Preventing vibration loosening. Tamper-proofing.

A1046

- Reduces machining costs as fit can be relaxed (No need for interference fits)
- Better fatigue resistance: prevents metal fretting
- Quick & easy to use
- Very high strength
- Dissimilar metals can be bonded & sealed

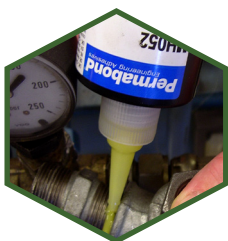
IDEAL FOR: The co-axial permanent bonding of metal parts such as bearings into housings, keyways and splines, bushes, gears, rotors, pulleys, cylinder linings etc.



MH052

- Easy to apply = accurate positioning of pipes & fittings
- Lubricates for easy assembly
- Resists wide range of chemicals, liquids & gases
- Seals to the burst rating of the pipe
- No loose particles to clog valves
- Use instead of PTFE tape
- Gas & drinking water approvals

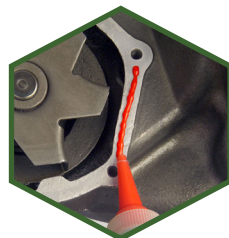
IDEAL FOR: Use on threaded metal pipework, plumbing, sprinklers, valves etc.



MH196

- No need to stock pre-cut gaskets – one bottle fits all!
- No relaxation or shrinkage over time – no bedding in or servicing required
- Vibration proof
- No long term embrittlement or degradation
- 100% metal to metal contact = better stress distribution
- No disintegration – so no blockages or leaks
- Less machining required – surfaces do not need to be so smooth

IDEAL FOR: Replacing traditional pre-formed gaskets. Sealing between rigid, mating metal surfaces and applications where a durable, leak-proof seal is required without the need for re-tightening.





CYANOACRYLATES (CA)

Cyanoacrylate “instant” adhesives are an ideal way to quickly and effectively bond or repair parts. They take seconds to cure to handling strength, do not require any mixing and will bond most materials. They are ideal for use on high-speed production lines.

Product	105	737	792	947	2011
Use	For difficult plastics & rubbers	Black, toughened	Ultra-rapid cure	Low odour, non-blooming	Non-drip gel
Colour	Clear	Black	Clear	Clear	Clear
Viscosity (mPa.s)	40	3000	90	1200	Gel
Max. Gap Fill (mm)	0.1	0.5	0.15	0.25	0.5
Handling Time (secs)	Rubber: 5-10 Phenolic: 5-10 Metal: 10-15	Rubber: 10-15 Phenolic: 5-10 Metal: 15-20	Rubber: 2-3 Phenolic: 2-3 Metal: 2-3	Rubber: 2-5 Phenolic: 10-15 Metal: 20-30	Rubber: 5-10 Phenolic: 5-10 Metal: 5-10
Strength Steel (MPa)	18-22	19-23	18-22	16-20	20-24
Temp. resist °C	80	120	120	80	120
Packaging	20g, 50g or 500g bottles	20g, 50g or 500g bottles	20g, 50g or 500g bottles	20g, 50g or 500g bottles	20g tubes or 300g cartridges

Usage Estimator - drops of cyanoacrylate

The number of free flow drops per container:

Container Size	# of Drops	Container Size	# of Drops
3g	45	10ml	150
20g	300	50ml	750
28g (1 oz)	420	75ml	1125
30g	450	250ml	3750
300g	4500	300ml	4500
454g (1lb)	6810	500ml	7500
500g	7500	750ml	11,250
2kg	30,000	1 litre	15,000

To get an answer in ml, convert all your dimensions to cm first. **Flat bond:** Length (cm) x Width (cm) x Gap (cm) = Volume (ml)





105

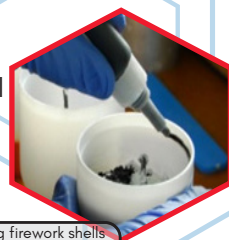
- Bonds difficult rubbers and plastics more readily than other cyanoacrylates
- Low viscosity, easy to apply
- Easily automated in a high speed production line

IDEAL FOR: Bonding difficult rubbers such as EPDM. Use with PermaBond POP primer to bond low surface energy plastics like polyethylene, polypropylene, and silicone rubber.

737

- Higher peel and impact resistance compared with other cyanoacrylates
- Ideal for bonding dissimilar materials where differential expansion and contraction could be an issue
- Excellent resistance to vibration

IDEAL FOR: Bonding applications requiring high peel strength or impact/vibration resistance such as sports equipment and automotive.



Sealing firework shells
HDPE + HDPE

792

- Surface insensitive - cures extremely quickly, even on unreactive materials
- Low viscosity, easy to apply
- Easily automated in a high speed production line

IDEAL FOR: Substrates with acidic or low surface moisture where other cyanoacrylates cure too slowly. Also ideal for automotive and high-speed production lines requiring ultra-fast cure times.



947

- Non-hazardous option for better workplace comfort
- Low odour = happier workers and better for workplaces where ventilation is difficult
- No characteristic white powdery "fogging" as seen with other cyanoacrylates

IDEAL FOR: Use on black surfaces to prevent "blooming", and applications where bond appearance is important such as plastic earpieces/headphones.



2011

- Surface insensitive - cures extremely quickly, even on unreactive materials
- Gel viscosity for accurate application and non-drip on vertical applications

IDEAL FOR: General-purpose bonding across a wide range of materials. Applications include automotive hoses and nameplate bonding on machinery and equipment.





EPOXIES- 1 PART (ES)

Single part epoxies offer maximum strength, durability and performance. They can be used to bond a wide variety of materials including metals, composites, ferrites and some plastics. These adhesives require a heat cure.

Product	ES550	ES558
Use	Structural bonding	Structural bonding
Colour	Silver-grey	Silver-grey
Viscosity mPa.s	1,500,000	200,000
Max. Gap Fill mm	5	0.5
Curing Schedule mins	130° C: 75 150°C: 60 170°C: 40	130° C: 75 150°C: 60 170°C: 40
Strength MPa	27- 41	27- 41
Temp. resist °C	180	180
Packaging	10 x 100g syringes or 10 x 320ml cartridges	10 x 100g syringes or 10 x 320ml cartridges

How to cure:

Adhesive will remain liquid / uncured until exposed to high temperature (typically above 100°C).

Once adhesive has been applied and parts assembled and clamped, they can be batch-cured in an oven.

Other methods of curing include infra-red heat or induction curing depending on the nature of the parts.

Coverage

50ml of adhesive will go how far?

Bead Diameter	Length of Bead	Glue line thickness (over 25mm width)
1.5mm	25m	0.075mm
3mm	6m	0.3mm
6mm	1.5m	1.2 mm

Handy Tip: 1 litre of adhesive covers 1sq.m at a thickness of 1 mm i.e. if only 0.5 mm thick, 1 litre will cover 2 sq.m



ES550



- Extremely high shear and peel strength
- No need to measure and mix – easy to apply
- Excellent resistance to high temperature, harsh environmental conditions and chemical exposure.
- Good gap filling ability

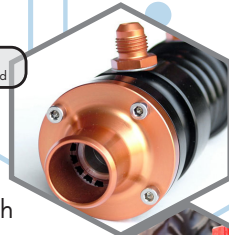
IDEAL FOR: Effective alternative to welding or brazing. Suitable for tool making, heavy machinery, heat exchangers, diamond bonding.

ES558

- Extremely high shear and peel strength
- No need to measure and mix – easy to apply
- Excellent resistance to high temperature, harsh environmental conditions and chemical exposure.
- Can wick into small gaps during heat cure to provide an excellent seal

IDEAL FOR: Similar to ES550 but where some flow is required into gaps.

Oil cooler production-
various materials bonded



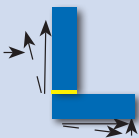
(ES)

These are examples of bad adhesive joint design.



Straight Butt-Joint: Bad ☹☹☹

Problems occur because this type of joint is not very stable; a slightly off-centre force will cause a crack to propagate through the joint.

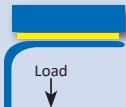


Corner Butt-Joint: Bad ☹☹☹

A similar problem can occur with a corner joint, if an indirect force is applied, it can result in the introduction of a cleavage force into the joint.

Peel: Bad ☹☹☹

Flexible Component



Cleavage: Bad ☹☹☹



Also, see Epoxies – 2 part
for good joint design suggestions



EPOXIES- 2 PART (ET)

Two part epoxies are suitable for bonding a wide variety of materials. The resin and hardener come in dual cartridges with mixing nozzles so no need to manually mix and measure. They can be used to bond, fill, coat, encapsulate or pot.

Product	ET500	ET5428
Use	Mix & Fix	Structural bonding
Colour	Clear	Charcoal Black
Viscosity mPa.s	18,000	Thixo Paste
Max. Gap Fill mm	2	5
Handling time mins	5-8	30-45
Strength MPa	12-18	28-34
Temp. resist °C	80	120
Packaging	15 x 25ml syringes- (no gun required) 10 x 50ml cartridges 6 x 200ml cartridges 6 x 400ml cartridges	10 x 50ml cartridges 6 x 400ml cartridges



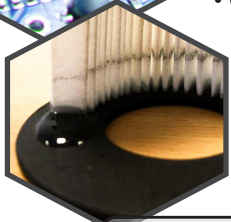
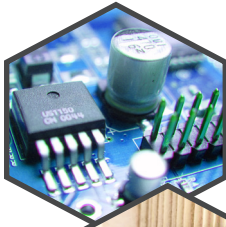
ET500

25ml syringe is easy and convenient to use, with a mixing nozzle and replaceable cap meaning you can dispense as much or as little at a time and it even fits inside your pocket!

ET5428

Available in charcoal black to match carbon fibre or cream to match GRP





Truck crank case filters -
Rubber / polymer blends + cellulose
fibre paper

ET500

- Rapid cure and fast strength development - ideal for items that need to be de-clamped or used soon after bonding
- Ideal for use on a wide range of substrate materials
- Clear and colourless

IDEAL FOR: Electronics - potting, bonding devices, sealing housing, pins & connectors, bonding ID plates onto vehicles, equipment, machinery, outdoor applications e.g. signs, lighting, street furniture (where regular epoxies may take too long to cure).

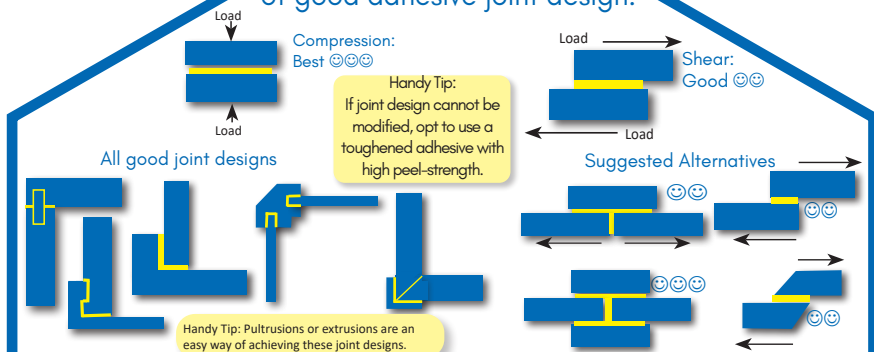


ET5428

- Extremely high shear and peel strength - toughened
- Excellent resistance to impact and vibration.
- Fantastic for structural bonding - especially composite materials e.g. carbon fibre
- Good gap filling ability

IDEAL FOR: Composite to metal structural bonding, lightweight composite bonding in racing cars (and other vehicles), structural bonding of drive shaft couplings, suspension systems, bonding sporting equipment such as fishing rods, golf clubs, snow boards.

These are examples
of good adhesive joint design.



Also, see Epoxies - 1 part tab for examples of bad joint design



TOUGHENED (STRUCTURAL) ACRYLICS (TA)

Permabond structural acrylic adhesives offer a powerful combination of high strength, fast cure times, and rapid strength development. Ideal for bonding metals, composites, plastics, glass, wood, and more, their rubber-toughened formulation provides excellent tensile and peel strength - perfect for demanding joint designs and tough applications.

Product	TA4204	TA4208BK	TA4611	TA4550
Use	Clear plastics & glass	Composites & metals	Multibonder – including PE & PP	Multibonder – including Nylon
Colour	Clear	Black	Translucent white	Greeny-blue*
Viscosity mPa.s	55,000	100,000 (thixo)	21,500	100,000 (thixo)
Max. Gap Fill mm	3	3	0.5	5
Fixture time mins	1-2	4-9	12-15	5-6
Strength MPa	18-20 Steel	27-31 Steel	>7 (SF~on PE)	>6 (SF~on PA6) 24-28 (steel)
Temp. resist °C	150 (180 peak)	150 (180 peak)	100	100
Packaging	15 x 24ml syringes (no gun needed) 10 x 50ml cartridges 6 x 400ml cartridges	10 x 50ml cartridges 6 x 400ml cartridges	15 x 24ml syringes (no gun needed) 10 x 50ml cartridges 6 x 400ml cartridges	10 x 50ml cartridges 6 x 400ml cartridges

* Changes colour during cure / ~ SF= Substrate Failure





Ceiling light –
Glass to brass

TA4204

- Rapid cure and fast strength development
- Clear and colourless
- For use on a wide range of substrate materials
- High structural strength – excellent shear & peel strength
- Toughened – excellent impact resistance
- Ideal for bonding dissimilar materials
- Good gap filling ability

IDEAL FOR: Point of sale displays, signs, lamps, plexiglas windows.

TA4208 Black

- Rapid cure and fast strength development
- Incorporates special surface adhesion technology
- Minimal surface prep required
- Black to match carbon fibre
- For use on a wide range of substrate materials
- Toughened – excellent impact resistance
- Ideal for bonding dissimilar materials
- Good gap filling ability
- High structural strength – excellent shear & peel strength

IDEAL FOR: Bonding carbon fibre for automotive, sports applications, prosthetics, yacht masts etc.



Oil filter housing
– PE+PE



TA4611

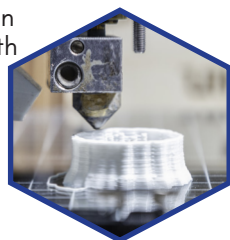
- Bonds to UNTREATED polypropylene, polyethylene, EPDM rubber & even PTFE!
- No need for expensive flame, corona or plasma surface treatment of parts before bonding
- No need to prime or use hazardous surface etchants
- Also bonds to other materials such as metal, composites or even concrete or tarmac!

IDEAL FOR: Tanks & vats, difficult plastic bonding & assembly, battery housings.

TA4550

- Fantastic adhesion to Nylon 6, 6.6, 12 & glass filled Nylon
- High structural strength – excellent shear & peel strength
- Rapid cure and fast strength development
- Toughened – excellent impact resistance
- Ideal for bonding dissimilar materials
- Good gap filling ability
- For use on a wide range of substrate materials as well as polyamide

IDEAL FOR: 3D-Printed parts, drone assembly, sports equipment, electronic enclosures, automotive parts.





UV LIGHT CURE (UV)

Permabond UV-curable adhesives are single part liquid resins which cure on demand when flashed with a UV light. They are suitable for bonding a wide variety of substrate materials (but one must be transparent to allow UV light to reach the adhesive). They form a high strength, aesthetically pleasing bond, remaining clear and colourless.

Product	UV605	UV639	UV643
Use	Low viscosity glass bonding	For glass & plastics	For rigid plastics, tack free
Colour	Clear	Clear	Clear
Viscosity mPa.s	75	1300	20rpm: 2000 2rpm: 17,600
Max. Gap Fill mm	0.1	0.25	0.4
Cure Speed secs	Low power 4mW/cm lamp: 15 LED 100mW/cm lamp: 4 High Intensity UV light guide: 3	Low power 4mW/cm lamp: 5 (PMMA) LED 200mW/cm lamp: <1 (PMMA) Low power 4mW/cm lamp: 10 (PC)	Mercury short arc lamp 330mW/cm: <1 UV LED 400nm 150 mW/cm: <1 UV LED 400nm 0.1m W/cm: 19
Strength MPa	10-14 Steel to glass	>8 (SF on PC)	7 (PMMA)
Temp. resist °C	120	120	120
Packaging	10 x 50ml bottles 10 x 250ml bottles	10 x 50ml bottles 10 x 250ml bottles	10 x 50ml bottles 10 x 250ml bottles



UV605



Frameless corner window
- Glass + steel

- Clear and colourless
- Low viscosity allows easy spreading & assembly of large bevels
- Slower to cure in low intensity UV light, allowing partial cure & easy clean up around edges of bevel / decorative glass
- Reduced hazard formulation

IDEAL FOR: Bonding decorative glass bevels, glass / metal furniture, architectural glass.

UV639

- Clear and colourless
- Versatility - can be used to bond a multitude of different plastics
- Excellent environmental resistance
- Low shrinkage

IDEAL FOR: Point of sale display bonding, signage, LED lighting.



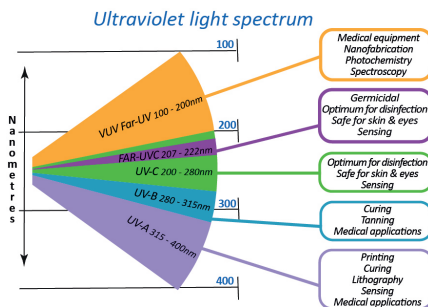
UV643



- Clear and colourless when fully cured
- High strength - particularly suited to bonding rigid plastics to themselves or other materials
- Excellent environmental resistance - passes 85/85 automotive durability tests
- Cures to a tack-free finish

IDEAL FOR: Bonding instrument windows, lamps, signage.

UV Light features on the Electromagnetic Spectrum and it has it's own scale within that range. Therefore one UV lamp has the potential to be weaker or stronger than another UV lamp.



This in turn can affect the speed of curing UV adhesives and the quality of the bond.

PermaBond uses 365 and 395nm activation systems (one or both photoinitiators are present in our UV products), so the use of LED lamps with a narrow output in terms of frequency will reduce the cure speed.



Product Selection Questions (PSQs)

When discussing a new application with a customer, here are some useful questions you may wish to ask that will help you and us make the correct adhesive recommendation.

What is the finished item?

Are any specific approvals required?

What are the substrate materials you wish to adhere?

What size is the bond area?

What size gap do you need to fill, or are you looking for a coating?

What temperature will it be exposed to?

What environment will it be used in? eg. Indoors / Outside / Marine etc

Which chemicals will it be exposed to?

What cure speed do you need?

Is heat cure possible?

Is colour important? If so, please state preference

How many are you making per week?

Have you tried any other adhesive products?

If currently using a product, why are you looking to change?

Is there a target price for the adhesive?

What is the estimated adhesive consumption per month?



Did you know:

How to “unbond” adhesives?

Some anaerobics are designed to be low strength so that parts can be easily dismantled with normal tools. However, other Permabond adhesives are designed to be permanent so removing them can be challenging. Generally, heating parts up to a high temperature and then trying to prise them apart when hot will facilitate easier dismantling. Peeling, prising and levering is easier than directly pulling. Cured adhesive can be removed with solvent or paint stripper (take care not to damage substrate materials).

How to quick calculate adhesive volumes?

1 litre of adhesive covers 1 square metre at a thickness of 1 mm
i.e. if only 0.5 mm thick, 1 litre will cover 2 square metres.

Frequently Asked Questions (FAQs)

What is surface wettability / surface energy / surface tension?

A “wetable” surface is one which is said to have “**high surface energy**”.

Liquid can be spread across the surface without the bunching of droplets. Low surface energy materials which do not “wet out” leave liquid droplets standing proud – imagine a freshly waxed car sprayed with water droplets – the drops bunch up at a steep angle to the paintwork. Adhesives are developed to have as low a surface tension as possible to “wet-out” on difficult surfaces.

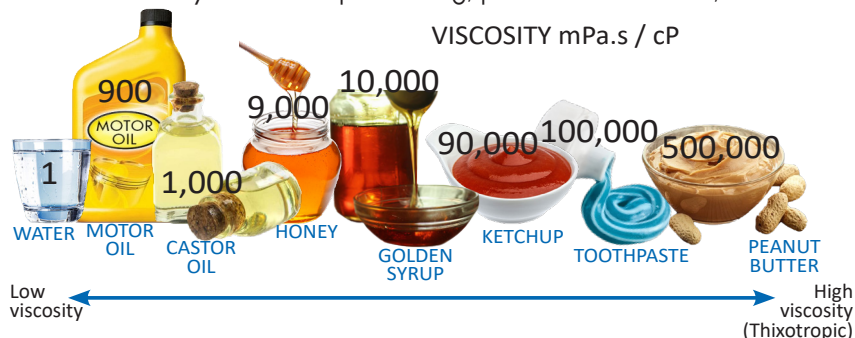
Surface energy is normally measured in mJ/m^2 or Dynes.



How can I best explain viscosity?

The viscosity of a particular fluid is how easily it flows, measured on a scale from 1 millipascal-second (mPa.s) to upwards of 1,000,000. For example:

Water is 1mPa.s = you can't stop it flowing, peanut butter is 500,000 mPa.s.



What do I need to remember with dissimilar material bonding?

Pay particular attention to the environment of the materials and if it is subject to temperature changes. This is because differential thermal expansion and contraction between materials can induce stress into the substrates and into the joint. For this reason slightly flexible, toughened adhesives can be better than rigid methods of fixture – such as mechanical fastenings.

Are there any tips for applying adhesives?

Cyanoacrylates: ‘Less is more’ - cyanoacrylates are very efficient so only small drops are required to obtain a high-strength bond.

Anaerobics: For blind holes, apply the adhesive directly into the bottom of the hole, not the fastener. If there is a void then apply the adhesive to the internal thread instead.

Anaerobics: Apply adhesive to leading edges of both components and assemble with a rotating action. Take extra care to prevent adhesive entering mechanisms and bearing races!

All adhesives: Pay attention to the pattern of the glue line – avoid drawing “squares” which will entrap air and cause air bubbles in the bond.

Other Innovations From Permabond®

Rubber-toughened anaerobics for dissimilar metals

Bio-based resins for select anaerobic & epoxy formulations

High temperature resistant cyanoacrylates & epoxies

Cytotoxicity approved medical ISO10993 grade adhesives

FDA & EU10/2011 compliant food grade adhesives

Fire retardant formulations

Low density adhesives for composites & lightweighting

Thermally conductive adhesives for electronics & batteries

Dual cure products - UVCA / UVAA

Polyurethane & MS Polymer products

Range of activators, primers & cleaners

"White" SDS anaerobics

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klebetechnik

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KLEBEN VERBINDET



Permabond Blue Centre, Misinto, Italy.

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