

# Adhesives for the Transport Industry

## Application: Panel Bonding

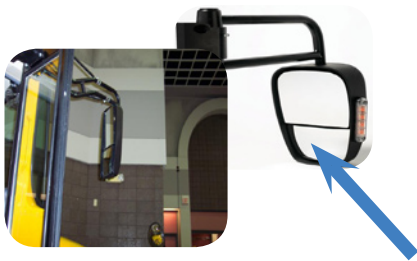


Securing exterior panels or "skins" to buses, coaches, trains etc with old fashioned screws and fasteners is now a thing of the past. Nowadays for a seam-free, streamlined exterior, manufacturers are opting to use adhesives for joining panels to framework. Not only is it a requirement that the adhesive be strong, toughened and able to withstand vibration and impact, it is also essential that shrinkage is minimal during adhesive cure so as not to show witness marks through thin skins.

Adhesive used: Permabond TA4310 Structural Acrylic



## Application: Mirror Bonding



Toughened, impact resistant adhesives for bonding vehicle mirrors to ABS. It is vitally important the adhesive has flexibility to cope with differential thermal expansion and contraction and a high level of vibration.

- Excellent resistance to salt water
- 100% seal prevents corrosion
- Much easier than welding

Adhesive used: Permabond ET515

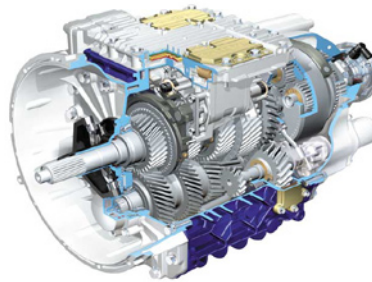
Planes, trains and automobiles all require adhesives for a broad range of bonding applications. In many cases, welding, brazing and mechanical fasteners are simply not suitable. Planes use many lightweight composites which cannot be welded and using bulky mechanical fasteners would add to component weight, making the use of adhesives in the aviation industry widespread. In an attempt to improve fuel efficiency, trains and buses are adopting similar lightweight materials and require suitable adhesive for joining and fixing these materials which cannot be welded.

Adhesives are vital for locking nuts and bolts together to prevent vibration loosening. They also help prevent parts seizing through corrosion, so if at some future stage maintenance and repair work is carried out, parts can be disassembled easily.

Permabond adhesives are specified by a number of aerospace, bus and train manufacturers worldwide, along with many of their associated maintenance and repair contractors.



## Application: Chassis, Engines & Gearboxes

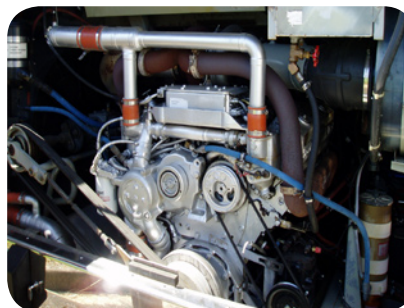


### Gearbox and transmission

- Gasketing adhesives for gearbox cover - no bedding in, one adhesive can make any shaped gasket (no need to keep a large stock of pre-cut gaskets)
- High strength bonding of gears to shafts
- Threadlocking nuts and bolts to prevent vibration loosening
- Bearing fit adhesives

### Driveshaft and axle

- Driveshaft and axle bonding with high strength toughened adhesives.
- Bonding bearing into housings and yokes
- Threadlocking bolts
- Sealing hubs
- Retaining shafts and splines



### Engine

- High temperature resistant gasketing adhesives - sealing sump, crankcase etc
- Sealing oil cooler tubes
- High temperature threadlocking adhesives for nuts and bolts and high strength retainers for pins, studs, flywheels and cogs.
- High temperature instant adhesives for bonding hose clips and clamps
- Pipe sealants for coolant, brake fluid, hydraulic fluid, fuel and oil

# Adhesives for the Transport Industry

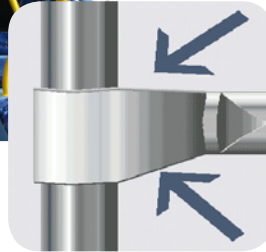
## Application: Bellows Bonding



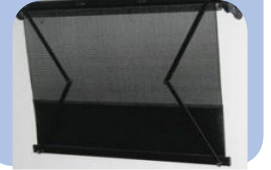
Bellows (the accordion part) on bendy buses and in between train carriages are often bonded with Permabond POP primer and a cyanoacrylate.



Permabond anaerobics retainer, HM163 is a popular choice for bonding handrails. It is a very high strength single-part adhesive which cures quickly, even on stainless steel and where tolerances are loose or variable.



Bus blind mesh bonded to roller strip



Composite materials are bonded together in the construction of aircraft seat trays. Flexible, tough and chemically non-aggressive adhesives are required for such applications.



## Heating & Aircon



Copper piping heating ducts for buses sealed with Permabond anaerobic adhesive.

Floor tread plates, stair nosings and rubber matting are all bonded in place to reduce the public's risk of slips, trips and falls.



Edging on train tables bonded with Permabond cyanoacrylate adhesive

Air vents and passenger reading light fascia components bonded with rapid curing Permabond 2011 cyanoacrylate adhesive.



Fuel filters, oil filters and air filter media can all be bonded with adhesives. Cabin air filters are potted into end caps with a low viscosity 2-part epoxy, Permabond ET530.



Pressurised oxygen pipework in aircraft cabins requires an approved pipesealant. Permabond's MH052 holds BAM oxygen approval and is also used in hospital patient air supplies.



Heat exchanger tubes and end-plates in the past were welded or brazed but the introduction of new lightweight and dissimilar materials means these methods of joining and sealing have been replaced with adhesives which offer greater versatility in terms of materials used, tolerances and joint design.



# Product selector

Example Application	Product	Features	Cure method	Viscosity (mPa.s) <i>cP</i>	Gap fill (mm) <i>in</i>	Fixture time	Max. shear strength steel (MPa) <i>psi</i>
Exterior panels / skins, interior composite panelling	TA4310*	Toughened, gap filling, low shrinkage, 1:1 mix ratio, easy to apply	2-part pre-mix acrylic (cartridge and mixing nozzle system) room temperature cure	Thixotropic paste	(2.0) 0.08	10-15 minutes	(26) 3800
Gasketing - engine and gearbox	MH196	High temperature resistant, can form gaskets in all shapes and sizes. Slightly flexible to cope with any differential thermal expansion	Single part anaerobic, cures at room temperature in the presence of metal and in the absence of oxygen	150,000 Thixotropic	(0.5) 0.02	15 minutes (on steel)	(10) 1500
Fixing bearings, shafts & splines	HM135	High strength, high temperature resistance, rapid cure	Single part anaerobic, cures at room temperature in the presence of metal and in the absence of oxygen	500	(0.2) 0.008	5 minutes (on steel)	(30) 4400
Sealing pipework, heating etc	MH052	Suitable for sealing against fuel, autogas, water, oxygen	Single part anaerobic, cures at room temperature in the presence of metal and in the absence of oxygen	50,000 Thixotropic	(0.5) 0.02	15 minutes (on steel)	(10) 1500
Heat exchanger sealing	ES558	Wicking to penetrate around tubes and fins. Metallic appearance.	Single part heat cure epoxy	Flows like solder when heated	(0.5) 0.02	5-10 seconds (on plastic)	(24) 3500
Bonding seat trays, wing mirrors	ET515	Toughened, flexible, rapid curing, clear epoxy with high peel strength	2-part pre-mix epoxy (cartridge and mixing nozzle system) room temperature cure	20,000	(2.0) 0.08	10-15 minutes	(12) 1700
Bonding interior trim, blinds, fascia	2011	Non-drip, rapid curing, high strength surface insensitive gel	No mix, moisture cure cyanoacrylate	Gel	(0.5) 0.02	5-10 seconds (on plastic)	(24) 3500
Bonding interior handrails	HM163	High performance, high strength, rapid curing	Single part anaerobic, cures at room temperature in the presence of metal and in the absence of oxygen	4,000 Thixotropic	(0.5) 0.02	5 minutes (on steel)	(40) 5800

If you can't see the exact product you are looking for, or need more in depth technical information, Permabond's technical team would be more than happy to help.

\*Available Europe, Middle East, Asia and Australasia

## Contact Permabond

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

US Helpline - 800-640-7599

• UK - 0800 975 9800

• Asia + 86 21 5773 4913

• General Enquiries +44(0)1962 711661

• Deutschland 0800 101 3177

• France 0805 111 388

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

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

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

### Permabond Worldwide

Wherever your manufacturing or R&D site may be located, Permabond representatives can be called upon to assist you. We have an extensive network of trained distributors worldwide.



Permabond's sales engineers are available to assess your production line and find the best possible turnkey adhesive solution that will result in production efficiencies.

The experienced team of Permabond chemists is on hand to help you with custom formulations and fulfilling your technical data requests.



# Permabond®

Engineering Adhesives

The information given and the recommendations made herein are based on our experience and are believed to be accurate. No guarantee as to, or responsibility for, their accuracy can be given or accepted, however, and no statement herein is to be treated as a representation or warranty. In every case we urge and recommend that purchasers, before using any product, make their own tests to determine, to their own satisfaction, its suitability for their particular purposes under their own operating conditions.

MKT\_Transport\_rev2