PERMABOND® ET5441

Two-Part Epoxy

Provisional Technical Datasheet

Features & Benefits

- Full cure at room temperature
- Adhesion to a variety of substrates
- Thermally conductive
- High temperature resistance
- Excellent chemical resistance

Description

PERMABOND® ET5441 is a thixotropic, thermally conductive two-component adhesive based on epoxy resin. It is specifically designed to bond metal substrates when excellent resistance to high temperature is required. The full cure is achieved in 7 days at room temperature, but it can be obtained in 24 hours at room temperature followed by 30 minutes at +80°C *(176°F)*.
Permabond ET5441 provides excellent resistance to motor oil, glycol and hot and cold water.

Permabond ET5441 has been specifically formulated to meet the requirements of:

- Flammability rating UL94 HB
- Thermal vacuum outgassing test for the screening of space material ECSS-Q-ST-70-02C

Physical Properties of Uncured Adhesive

	ET5441A	**ET5441B**
Chemical composition	Epoxy Resin	Amine Hardener
Appearance	White	Dark Grey
Viscosity @ 23°C*	25,000 mPa.s *(cP)* Thixo	22,000 mPa.s *(cP)* Thixo
Specific gravity	2.1	2.1

* Due to its viscosity this product may be difficult to dispense from 50ml cartridges when cold. Please warm cartridges before attempting to dispense via mixing nozzle.

Typical Curing Properties

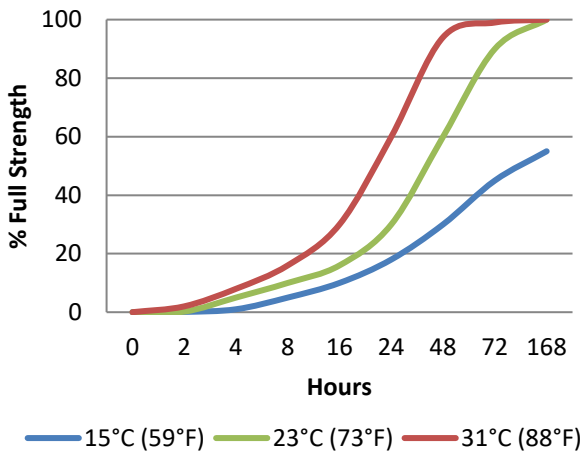
Mix ratio	2:1 by weight 2:1 by volume
Maximum gap fill	2 mm *0.08 in*
Usable / pot life @23°C *(77°F)*	150 minutes
Working strength @23°C *(77°F)*	8 hours
Full cure	23°C *(77°F)*: 7 days 80°C *(176°F)*: 2 hours

Typical Performance of Cured Adhesive

Shear strength* (ISO4587)	Steel: 20-25 N/mm² *(2900-3625 psi)* Aluminium: 17-21 N/mm² *(2465-3045 psi)* Stainless Steel: 20-25 N/mm² *(2900-3625 psi)* Carbon Fibre: 25-30 N/mm² *(3625-4350 psi)* GRP (Glass/Polyester): >10 N/mm² ** *(>1450 psi)* FRP (Glass/Epoxy): >19 N/mm² ** *(>2755 psi)* ABS: >6 N/mm² ** *(>870 psi)* Polycarbonate: 2-4 N/mm² *(290-580 psi)*
Tensile strength at break (DIN 53504)	50 N/mm² *(7250 psi)*
Elongation at Break	2.9%
Hardness (ISO868)	85-95 Shore D
Tg (DSC) 7d @ 23°C	65°C *(149°F)*
Tg (DSC) 24h@ 23°C + 30min @80°C	113°C *(235°F)*
Coefficient of thermal expansion	Below Tg: 23 x 10^{-6} /K Above Tg: 111 x 10^{-6} /K
Thermal Conductivity (ISO 8302)	1.1 W/(m.K)

**Strength results will vary depending on the level of surface preparation and gap.*
*** Substrate failure was observed*

Strength Development



Graph shows typical strength development of bonded components. An increase of 8°C *(46°F)* in temperature will halve the cure time. Lower temperatures will result in a slower cure time.

Hot Strength

Test Temperature	Curing Conditions		
	7 days 23°C *(73°F)*	24h 23°C *(73°F)* + 1h 60°C *(140°F)*	2h 80°C *(176°F)*
23°C *(73°F)*	100%	100%	100%
80°C *(176°F)*	117%	126%	108%
150°C *(302°F)*	41%	44%	43%
200°C *(392°F)*	30%	30%	31%

"Hot strength" shear strength tests performed on mild steel. Fully cured specimens conditioned to pull temperature for 30 minutes before testing at temperature. Results show % strength retained compared with room temperature control.

ET5441 can withstand higher temperatures for brief periods (such as for paint baking and wave soldering processes) providing the joint is not unduly stressed. The minimum temperature the cured adhesive can be exposed to is -40°C *(-40°F)* depending on the materials being bonded.

Additional Information

This product is not recommended for use in contact with strong oxidizing materials.
Information regarding the safe handling of this material may be obtained from the safety data sheet (SDS).

Users are reminded that all materials, whether innocuous or not, should be handled in accordance with the principles of good industrial hygiene.
This Technical Datasheet (TDS) offers guideline information and does not constitute a specification.

Storage & Handling

Storage Temperature	5 to 25°C *(41 to 77°F)*

Surface Preparation

Surfaces should be clean, dry and grease-free before applying the adhesive. Use a suitable solvent (such as acetone or isopropanol) for the degreasing of surfaces. Some metals such as aluminium, copper and its alloys will benefit from light abrasion with emery cloth (or similar), to remove the oxide layer.

Directions for Use

1. Dual cartridges:
   a) Insert the cartridge into the application gun and guide the plunger into the cartridge.
   b) Remove the cartridge cap and dispense material until both sides are flowing.
   c) Attach the static mixer to the end of the cartridge and begin dispensing the material.
2. Apply material to one of the substrates.
3. Join the parts. Parts must be joined within the usable pot life of mixing the two epoxy components.
4. Large quantities and/or higher temperature will decrease the usable life or pot life.
5. Apply pressure to the assembly by clamping until handling strength is obtained.
6. Full cure will be obtained after 7 days at 23°C *(73°F)*. Heat can be used to accelerate the curing process.

NB. Exercise caution when mixing large quantities due to exothermic reaction.

Video Links

Surface preparation:
https://youtu.be/8CMOMP7hXjU

Two-part epoxy directions for use:
https://youtu.be/GRX1RyknYqc

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