

APM Epicol 230004

Description	
System:	2-component adhesive or PMF
Colour:	violet-red or coloured
Consistency:	viscous / thixotropic
Solid bodies:	100% / solvent-free
Pot Life:	90 minutes
Curing:	at room temperature or in oven
Temp.-Range:	-55°C to +125°C, seal up to +180°C

Specifications	
APM number:	230004
NASA/ESA outgassing:	< 1% TML
	< 0.02% CVCM
Fungus resistance:	Class I accepted
ISO 10993:	complies with 10993 -5 and -12
Directive 2011/65/EC:	RoHS compatible
EC No. 1907/2006:	compliant with REACH

APM Epicol 230004 is a viscous epoxy adhesive which cures at room temperature. The adhesive is available as a 2-component adhesive or as premixed frozen adhesive (PMF). APM Epicol 230004 is used as a construction adhesive and has excellent adhesion. This extreme adhesion and good humidity ageing resistance permits its application in lightweight construction and to produce composite materials (CFRP, GRP). A thin glue line of 0.10 mm is typical. It can be varied from 0.05 to 0,8 mm due to its thixotropic properties depending on the dimensions of the parts to be bonded, the temperature range of the application and the difference in thermal expansion. Due to the extremely good shear and impact resistance and peel strength, it is excellent for bonding plastics, ceramics and metals. The adhesive produces excellent results for bonding a wide range of materials, such as glass, ceramics, metals, wood, concrete, rubber and most plastics.

Properties of fluid adhesive	
Colour of resin component A:	white
Colour of resin component B:	violet-red
Resin component:	modified epoxy resin
Hardener component:	modified amine hardener
Viscosity Resin (25°C):	400 Pa.s
Hardener (25°C)	10 Pa.s
Mixture (25°C):	30 Pa.s
Mixing ratio A/B:	100:27 parts by weight
Mixture ratio A/B:	100:30 parts by volume
Pot life at 25°C:	90 minutes

Surface pretreatment / cleaning

The surfaces to be bonded must be dry and free from dust, oil, separating agents and other impurities. The type of surface pretreatment depends on the requirements profile. Above all, mechanical pretreatment, e.g. grinding or sand-blasting, achieves an improvement in adhesion for metals and in many cases for non-metallic surfaces as well. Glass surfaces and metallic surfaces can be cleaned with aqueous cleaners or clean solvents.

For these materials and in particular plastics, surface pretreatment using oxygen plasma has proven successful. Plasma treatment dries the surface and improves wettability. This is an advantage for good adhesion of the adhesive. With plastics, the surface is also chemically modified. With poor adhesive plastics this produces an adhesive surface.

Primers are no replacement for surface pretreatment. Adhesion and ageing resistance can also be improved by using primers.

Mixing the adhesive components

The two adhesive components are weighed in the clean mixing beakers in the specified mixing ratio. The components must be machine mixed (Speedmixer) or manually without admixing air bubbles. To obtain a perfect mixture, produce between 10 g and 50 g of the mixture and then colour it homogeneously red after mixing.

Using Premixed Frozen Adhesive (PMF)

Remove the frozen adhesive from the freezer and allow it to reach room temperature in the air. This requires 5 to 10 minutes depending on the cartridge size. As soon as the cartridge is no longer covered with condensation and the adhesive is fluid, work can start with dosing.

Application of the adhesive

The ideal processing temperature is between 20°C and 28°C. Viscosity falls at higher temperature and pot life shortens. The adhesive is applied from the cartridge using a dosing device. It can also be applied with a spatula. Optimum strength can be achieved with adhesive thicknesses of 0.05 to 0.15 mm.

Optimum environmental resistance is dependent on the temperature range of the application and the expansion coefficients of the single parts. A uniform adhesive thickness can be ensured by a specific adhesion geometry or by inserting spacers, e.g. glass fibres or plastic beads.

The parts are placed together and prevented from slipping during curing by attaching clamps or fixing devices.

Curing the adhesive

Room temperature	25 °C	24 hours
Heating chamber	40°C	8 hours
Heating chamber	60°C	2 hours
Heating chamber	120°C	5 minutes

After the adhesive is cured, the parts can be further processed. However, the bond only achieves optimum strength and resistance after a few days.

Properties of cured adhesive

Colour:	beige red
Shore D (25°C):	80
Tensile strength (25°C):	40 N/mm ²
Elongation at rupture (25°C):	
Modulus of elasticity (25°C):	
Thermal conductivity:	0.20 W/mK
Decomposition temperature:	375°C
Degassing values:	< 1% TML
	< 0.02% CVCM

Cleaning the adhesive

Residue from non-cured adhesive on the substrates and processing equipment can be removed or cleaned using a solvent such as isopropanol or acetone. Organic solvents may lead to component destruction or stress cracking in plastics. For this reason, avoid use of aggressive solvents such as acetone, ketones and esthers. Comply with the official safety regulations when handling combustible solvents. Cured adhesive can only be removed mechanically. The adhesive becomes softer at temperatures over 125°C.

Temperature stability

The typical application temperature range is from -55°C to +125°C. Depending on the application, the adhesive can also be used below -55°C. The adhesive becomes very hard at these temperatures and may result in cracks in the substrate or signs of the adhesive detaching from the substrate.

At temperatures of +125°C the adhesive becomes very soft, which may be an advantage depending on the load since the adhesive can compensate for a variety of thermal expansion scenarios without becoming destroyed. After cooling down to room temperature, the adhesive assumes its usual properties. Thermal destruction of the adhesive only occurs at temperatures over 180°C.

Tensile shear strength / test temperature

Aluminium, etched / at -55°C	38 N/mm ²
Aluminium, etched / at +23 °C	36 N/mm ²
Aluminium, etched / at +82 °C	23 N/mm ²
Aluminium, etched / at +120 °C	4.0 N/mm ²

Ageing resistance of adhesive bonds

The typical service temperature range of Epicol 230004 is from -55°C to +125°C. Adhesive bonds are very resistant to ageing within this temperature range. The cured adhesive demonstrates excellent temperature stability, humidity ageing resistance and solvent resistance.

Tensile shear strength after ageing

Aluminium, etched / at 23 °C	
after 15 days cured at RT	38 N/mm ²
Thermal cabinet 15 days at +120°C	35 N/mm ²
Thermal cabinet 40 days at +150 °C	34 N/mm ²
50°C / 100% rel. hum. after 15 days	34 N/mm ²
70 °C / 100% rel. hum. after 15 days	33 N/mm ²
Stored in water 25°C after 15 days	34 N/mm ²
Salt mist test 35°C after 15 days	34 N/mm ²
Lead-free petrol	37 N/mm ²
Hydraulic oil 25°C after 15 days	36 N/mm ²
Engine oil 25°C after 15 days	36 N/mm ²

Premixed frozen cartridges (PMF)

Processing 2-component adhesives poses risks to adhesive bond quality which is not tolerated in certain applications, e.g. space, aviation, electronics or medical technology. The individual components may become crystallized during storage or might separate from the filler; the mixing ratio may be incorrect, the mixture inhomogeneous or air bubbles may become admixed with the adhesive mixture. All the risks during the mixing process can be avoided if small quantities of adhesive (cartridges up to 55 cm³) are used and the pot life is not shorter than 30 minutes.

If the deep-frozen 1-component version of the same adhesive is used, the adhesive components are decrystallized, homogenized, degassed, machine mixed and filled in cartridges without air bubbles. These cartridges can be stored for at least two months below -40°C or for at least six months below -60°C without loss of quality.

The application process using premixed frozen cartridges is simple and robust since the adhesive is processed as a 1-component adhesive. Deep-frozen adhesives are used whenever the quality of the bond must be guaranteed and the quantity of adhesive used does not justify use of a 2-component mixing machine.

Compliance

APM Epicol 230004 and all its constituents comply with the requirements of RoHS and REACH guidelines. Always comply with the material safety data sheet (MSDS) when handling the adhesive.

Safety Instructions

Avoid contact with skin and eyes. When applying the adhesive, always wear gloves and safety goggles. If adhesive comes into contact with the skin, do not use solvents to remove. Instead wash the affected area (hands) with warm water and soap and then dry it. Liquid adhesive irritates on contact with the eyes and may lead to permanent eye damage. Before use, please observe the instructions in the safety data sheet.

Storage Conditions

The adhesive has maximum shelf life at temperatures between 15°C and 25°C . The shelf life of the two components is at least 24 months under these conditions. Higher temperatures shorten the standard shelf life. Lower temperatures cause a temporary higher viscosity. Frozen 1-component adhesive (PMF adhesive in cartridges) must always be stored at a temperature of below -40°C . At this temperature the mixture has a shelf life of at least 2 months. Never defrost the cartridges, otherwise the pot life is shorter or the adhesive is already cured. As a result the product is always delivered with dry ice at -78°C .

Procurement

The 2-component unmixed adhesive is available as a set of 650 g or as a small bipack (8 grams). The deep-frozen adhesive PMF is available in cartridges of 3 / 5 / 10 / 30 or 55 cc .

Disposal

The liquid components of the adhesive must be disposed of as hazardous waste, such as synthetic resin or paint components. Under no circumstances mix large quantities ($> 100\text{ g}$) of the components for curing since the curing process is strongly exothermic and could result in the mixture heating up to a dangerous extent. Cured adhesive is disposed of as hazardous waste in the same way as thermosetting plastics depending on local legal requirements or as domestic waste.

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