

March, 2014

## APM Epicol 11

Description	
APM number:	102700
System:	2-component adhesive in double cartridge
Colour:	transparent, yellowish
Consistency:	viscous
Pot life:	5 – 10 minutes
Curing:	1 hour at room temperature
Temp. range:	-55°C to +85 °C, dense up to +150°C

Applications	
Directive 2011/65/EC:	RoHS compatible
EC No. 1907/2006:	compliant with REACH
Fungal resistance:	Class I accepted
Solvent resistance:	good
Water resistance:	good
Weather resistance:	good
Ageing resistance:	good

APM Epicol 11 is a fast curing viscous epoxy adhesive. This universal adhesive is a two-component adhesive dosed from the double cartridge by a static mixing tube. The advantages are that the adhesive is easy to use and it cures fast at room temperature. The viscous reactive adhesive can be applied both as a thin glue line of over 0.05 mm or as a potting compound of up to several millimetres of layer thickness. This is practical for repair work and making prototypes when reinforcing materials can be bonded over the fracture point. Epicol 11 is used to glue plastic to glass, metal or plastic in devices and sensors. The adhesive produces generally excellent mechanical properties and resistances 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:	yellowish
Resin component:	mod. epoxy resin
Hardener component:	mod. amine hardener
Solid bodies:	100% / solvent-free
Mixture viscosity:	50 – 70 Pa.s
Mixture ratio A/B:	1 : 1 parts by weight
Mixture ratio A/B:	1 : 1 part by volume
Pot life at 25°C:	5 – 10 minutes
Density at 25°C:	1.1 g/cm <sup>3</sup>
Flashpoint:	> 100°C

Surface pretreatment / cleaning
The surfaces to be bonded must be dry and free from dust, oil, separating agents and other impurities. The selected type of surface treatment depends on the requirements profile (cleanliness, mechanical strength, ageing resistance). Clean the surfaces with aqueous cleaners or clean solvents. Mechanical pretreatment, e.g. grinding, achieves a significant improvement in adhesion for metals and in many cases for non-ferrous surfaces as well.

### Mixing the adhesive components

Press the two adhesive components out of the double cartridge manually or using a dosing device. The two components are mixed homogeneously and bubble-free as they flow through the mixing tube. Apply the adhesive directly from the mixing tube. Applications with low quantities of adhesive: press mixed adhesive into a small vessel and then apply it to the bonding surface using a suitable dosing needle or a tooth pick. The pot life is only 5 – 10 minutes so the parts must be bonded within this time.

### Applying the adhesive

The ideal processing temperature is between 20°C and 28°C. Viscosity falls at higher temperature and pot life shortens. Normally you can apply the adhesive directly from the double cartridge but you can also apply it using a spatula or a tooth pick.

A uniform adhesive thickness can be ensured by a specific adhesion geometry or by inserting spacers, e.g. fibres or foil. The parts are placed together and prevented from slipping during curing by attaching clamps or fixing devices.

### Curing the adhesive

Fixture time at 25°C:	30 minutes
Curing time at 25°C:	60 minutes
Final strength at 25°C:	2 days
Final strength at 60°C:	2 hours

Parts can be further processed after a waiting time of 30 minutes at room temperature. However, the bond only achieves its final strength and resistance after a few days.

### Properties of cured adhesive

Colour:	transparent, yellowish
Shore D (25°C):	70 – 80
Tensile strength (25°C):	28.0 N/mm <sup>2</sup>
Elongation at rupture (25°C):	50 %
Modulus of elasticity (25°C):	1600 N/mm <sup>2</sup>
Thermal conductivity:	0.20 W/mK
Therm. expansion (-50+30°C)	$\alpha = 75 \times 10^{-6}/K$
(+50 - 110°C)	$165 \times 10^{-6} /K$
Softening temperature T <sub>g</sub> :	10 to 20 °C
Temp. range:	-70°C to +85 °C
Decomposition temperature:	350 °C
Dielectric strength:	36.0 kV/mm
Volume resistance:	$4.0 \times 10^{12} \Omega/cm$

### Cleaning the adhesive

Residue from non-cured adhesive on the substrates and processing equipment can be removed using a solvent such as industrial alcohol, isopropanol or acetone. Organic solvents may lead to component destruction or stress cracking in plastics. For this reason, avoid using aggressive solvents such as acetone, ketones and esthers to clean plastics. Comply with the official safety regulations when handling combustible solvents.

Cured adhesive is very resistant chemically and can only be removed mechanically. The adhesive becomes soft at temperatures over 125°C but never fluid. The adhesive become brittle at temperatures over 200 °C. The adhesive is cured in the mixing tube and can then be disposed of together with adhesive waste.

### Temperature stability

The typical application temperature range is from -55 °C to +85°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 +85°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 stresses without becoming destroyed. After cooling down to room temperature, the adhesive assumes its usual properties. The adhesive becomes brittle at temperatures of over 150°C. Decomposition starts at temperatures of 250°C over long periods or very rapidly at over 350°C.

### Tensile shear strength / test temperature

Aluminium, etched / at -55°C	15.0 N/mm <sup>2</sup>
Aluminium, etched / at +23 °C	18.0 N/mm <sup>2</sup>
Aluminium, etched / at +85 °C	2.0 N/mm <sup>2</sup>

### Tensile shear strength at 23°C:

Anodised aluminium	16.8 N/mm <sup>2</sup>
Stainless steel	17.1 N/mm <sup>2</sup>
Copper	12.0 N/mm <sup>2</sup>
Brass	16.8 N/mm <sup>2</sup>
NBR on steel	1.0 N/mm <sup>2</sup>
ABS plastic	4.8 N/mm <sup>2</sup>
PVC plastic	3.5 N/mm <sup>2</sup>
Polycarbonate PC	5.1 N/mm <sup>2</sup>
Plexiglas PMMA	3.3 N/mm <sup>2</sup>
Glass-fibre reinforced polyester	10.4 N/mm <sup>2</sup>

### Ageing resistance of adhesive bonds

The typical application temperature range of Epicol 11 is from -55°C to +85°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 7 days cured at RT	18.0 N/mm <sup>2</sup>
Thermal cabinet 40 days at +70°C	20.0 N/mm <sup>2</sup>
Stored in water 25°C after 30 days	15.8 N/mm <sup>2</sup>
70 °C / 100% rel. hum. after 3 days	8.3 N/mm <sup>2</sup>
35°C / 5% salt spray test / 14 days	3.5 N/mm <sup>2</sup>

### Compliance

Epicol 11 and all its constituents comply with the requirements of RoHS and REACH guidelines. Always comply with the safety data sheet 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. 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

The adhesive has maximum shelf life at temperatures between 15°C and 25°C. The shelf life of the two components is at least 15 months under these conditions. Higher temperatures shorten the standard shelf life. Lower temperatures cause a temporary higher viscosity.

### Disposal

The liquid components of the adhesive must be disposed of as hazardous waste in the same way as synthetic resin or paint components. Cured adhesive is disposed of as hazardous waste in the same way as thermosetting plastics depending on local legal requirements or as domestic waste.

### Procurement

The adhesive is available in practical double cartridges of 4 g, 10 g or 55 g with integrated or replaceable static mixing tube.

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