

December, 2017

APM Epsilon 2103

Description	
System:	2-Component Epoxy (1-Component Frozen Epoxy)
Colour:	colourless, transparent
Consistency:	low viscosity, capillary
Solid bodies:	100% / solvent-free
Pot Life:	6 hours
Temp. range:	-55°C to +150 °C, tight up to +190°C

Specifications	
APM Number:	101698
Fungal resistance:	Class 0 (no growth)
Biocompatibility:	ISO 10993-5 ; ISO 10993-12
RoHS compatible	
compliant with REACH	

APM Epsilon 2103 is a very low viscosity, flexible epoxy adhesive with excellent capillary tendency. The adhesive is available as a 2-component adhesive or as a deep-frozen 1-component adhesive. APM Epsilon 2103 is generally used in the watch-making industry to make age-resistant bonds for clock glasses and crystals or in the optics industry to bond optical glasses. APM Epsilon 2103 is highly resistant to yellowing, even if exposed for extended periods to UV light. Typically, adhesive bonds of very few micrometres can be used as well as adhesive bonds up to 0.2 mm due to the low setting shrinkage of the adhesive. The adhesive generally produces excellent results for bonding a wide variety of materials, such as glass, ceramics, metals, wood, concrete, rubber and most plastics.

Properties of fluid adhesive	
Colour of resin component A: clear, very slightly yellow	
Colour of resin component B: clear, colourless	
Resin component:	mod. epoxy resin
Hardener component:	mod. amine hardener
Resin viscosity (25°C):	13.1 Pa*s
Hardener (25°C)	90 mPa*s
Mixture (25°C):	440 – 660 mPa*s
Mixture ratio A/B:	100 : 35 (g : g)
Mixture ratio A/B:	100 : 40 (V : V)
Pot life at 25°C:	6 hours

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). Above all, mechanical pre-treatment, e.g. grinding or sand-blasting, achieves an improvement in adhesion for metals and in many cases for non-ferrous surfaces as well. It is best to clean glass surfaces using the aqueous ultrasound cleaning method at raised temperature. Clean metallic surfaces with aqueous cleaners or clean solvents.

For these materials and in particular plastics, surface pre-treatment using oxygen plasma has proven successful. Plasma treatment dries the surface and improves wettability. This achieves 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 pre-treatment. 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 (Speed mixer) or manually without admixing air bubbles. To obtain a perfect mixture, produce between 10 g and 50 g of the mixture. After mixing it must then be free from streaks, clear and colourless.

Adhesion with deep-frozen mixtures

Remove the deep-frozen adhesive from the deep freeze 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.

Applying the adhesive

The ideal processing temperature is between 20°C and 28°C. Viscosity falls at higher temperature and pot life shortens.

Normally, the adhesive can be applied from the cartridge using a dosing device. This adhesive has a very high tendency to produce capillaries, i.e. the adhesive flows into ultra-fine adhesive cavities at room temperature and joins the substrates permanently. A uniform adhesive thickness can be ensured by a specific bond geometry or by inserting spacers, e.g. glass fibres or plastic beads.

Curing the adhesive

Heating cabinet	40°C	24 hours
Heating cabinet	60°C	12 hours
Heating cabinet	80 °C	3 hours

Properties of cured adhesive

Colour:	clear, colourless
Shore D (25°C):	75-85
Tensile shear strength (25°C):	12.0 N/mm ²
Elongation at rupture (25°C):	not defined
Modulus of elasticity (25°C):	2000 N/mm ²
Thermal conductivity:	0.20 W/mK
Glass transition temp. (T _g ; °C):	70 - 80°C
Refractive index (589 nm):	1.5649

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 soft at temperatures over 100 °C.

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. Thermal destruction of the adhesive only occurs at temperatures over 175 °C.

Ageing resistance of adhesive bonds

The typical application temperature range of APM Epsilon 2103 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.

Frozen Cartridges

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 crystallised 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 these risks can be avoided if the mixing process if small quantities of adhesive (up to 55 cm³ cartridges) are used and the pot life is not too short (> 30 minutes). If the deep-frozen 1-component version of the same adhesive is used, the adhesive components are decrystallised, homogenised, degassed, machine mixed and filled in cartridges without air bubbles. The cartridges can be stored below -40°C from 2 to 12 months without loss of quality. The adhesion process with deep-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

Epicol 2103 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 24 months under these conditions. Higher temperatures shorten the standard shelf life. Lower temperatures temporarily cause higher viscosity and may lead to crystallisation.

Frozen 1-component 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 6 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.

Disposal

The liquid components of the adhesive must be disposed of as hazardous waste in the same way as synthetic resin or paint components. Under no circumstances mix large quantities (> 100 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.

The specifications in this data sheet are based on meticulous tests and our previous experience in everyday practice. They are non-binding instructions, in the same way as our application advisories are also non-binding, whether verbal, in writing or by trials since we cannot accept any liability due to the wide variety of possible influences during processing and application. APM Technica AG disclaims all other explicit or implicit warranties, conditions and terms, be they of real or legal nature, including those which refer to usual market quality, their suitability for a particular use, satisfactory quality or observance of third-party trademarks. APM Technica excludes all liability to the extent permitted by law – whether arising from contract, quasi contract or tort (including negligence) – for direct, indirect and consequential damages, punitive damages awarded by court, loss of business of all kinds, loss of information or data or any other financial losses which may result from the sale, installation, maintenance, use, performance, failure or interruption of operation of the product or in connection therewith, even if we were informed of the possibility of occurrence of such damages. Data and other specifications concerning the nature and suitability of our products are non-binding general conditions and specifically represent no guarantee of certain characteristics. We advise you to perform your own adequate tests to determine the suitability of our products for your specific application. The user himself is responsible for defining the suitability of production methods mentioned in the technical data sheet for his purposes and for taking precautionary measures which are suitable to protect assets and persons from any danger which may occur during the handling and usage of these products. In all other cases our General Terms and Conditions of Business shall apply.