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Adelphi A-978

Stack Lamination Adhesives

Adelphi A-978 is a two-part, thermosetting, epoxy for bonding stack laminations used in stators, rotors, gyros, servomechanisms, synchros, transformers and magnetic amplifiers. It can also be used as an insulating varnish for impregnated coils and small electrical equipment. Because so little adhesive is needed to accomplish a strong bond which resists shear stress, Adelphi A-978 has proved practical as an adhesive/dielectric in the fabrication of magnetic accelerator units such as cyclotrons and cosmotrons.

Adelphi A-978 is a strong metal-to-metal adhesive. Because of its excellent mechanical strength plus its resistance to many solvents, water, atmospheric conditions and temperature changes, this adhesive is adaptable to many industrial uses. It is particularly suited to the bonding of large surface areas and mass production processing

Bonding is achieved by heat and only sufficient pressure to assure complete contact is needed.

Performance Properties:

Typical Lap Shear properties are as follows:

Typical lap shear values obtained when Adelphi A-978 is used to bond 0.064" etched 2024T3 aluminum alloy to itself in a 1/2 overlap are as follows:

Test Temperature	Av. Lap Shear, psi
-67 F or -55C	2800
77F or 25C	4000
180F or 82C	3000
260F or 127C	1000
300F or 149C	800
400F or 204C	200

Compressive Strength (approximately): 60,000 psi

Modulus (approximately): 5.0 x 10^5 psi

Linear Coefficient of Expansion (approximately): 65 x 10^{-6} inches/inches/C

Thermal Conductivity (approximately): 5000 x 10^{-7} calories/(second)(square cm)(C)(cm)

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Hardness Shore D: 75(ASTM D 2240)

Tg: 114C

% TML: 0.50 (when cured 1 hr at 100°C in air followed by 4 hrs at 180C at 10-2 Torr Vacuum. (NASA Outgassing Technical Note TND-8008)

Dielectric Strength: 400 volts per mil

Dielectric Constant: 3-4 at 106 cycles per second at 20C

Loss Factor: 0.06 at 20C

Cure Time:

The adhesive must be thoroughly dried before curing. Drying may be accomplished at room temperature or by forced drying in circulating air ovens. If all of the solvent is not removed before curing, blisters or weakening of the adhesive film will result. Thick or highly diluted films will take longer to dry.

At normal room temperatures, air drying may take 4-8 hours.

For best results, force dry at 125F or 52C for 60 minutes or at 200F or 93C for 10 minutes.

Do not dry at temperatures above 250F or 120C (adhesive will start to cure at 250F or 120C).

The adhesive dries tack free at room temperature. Prior to full cured, coated parts may be stored for periods of up to 6 months at room temperature. The coated adhesive film must be kept clean and dry.

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Heat Curing:

The hardening agent (Part II) of Adelphi A-978 is reactive above 250F or 121C. Normal cure temperatures at the glue line range from 265F-400F or (129C-204). Curing temperature below 375F or (190C) are recommended because it is practically impossible to degrade the adhesive in that range even if the recommended curing time is exceeded.

Before curing, Adelphi A-978 is thermoplastic and flows freely as the temperature is raised. This allows the films to fuse to a stronger bond and assures complete "wetting" of the materials being bonded.

For certain specialized applications, however, some users prefer to retard the normal flow out. This can be done by partially curing the adhesive at contact pressure only for about 1/4 to 1/2 the minimum gel time shown in Table 1. Any of the normal time and temperature cycles listed may then be used for subsequent curing, but with slightly increased pressure.

Table 1 Heat Curing Schedule

Glue Line Temperature	Minimum Gel Time	Minimum Cure Time	Maximum Cure Time
266F or 130C	40 min	14 hours	None
284F or 140C	32 min	7 hours	None
302F or 150C	20 min	4 hours	None
320F or 160C	15 min	2 hours	None
338F or 170C	10 min	1.5 hours	None
356F or 180C	8 min	1 hours	None
374F or 190C	6 min	45 min.	None
392F or 200C	4 min	30 min.	24 hours
428F or 220C	2 min	10 min	60 min.

The table refers to the temperature of the adhesive film. Allow sufficient time for the stack to attain the correct temperature. The time required for cure depends on the temperature selected, on the mass of metal and on the heat capacity of the metal in the laminate. The temperature chosen depends on the heat sensitivity of the materials being bonded and time limitations in production scheduling. If the maximum cure time is exceeded, over-curing can cause failures.

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Curing Pressure:

Pressure is not needed to affect the bond but is essential that the coated surfaces be in complete and intimate contact over the entire area of the materials being bonded. Accordingly, sufficient pressure must be applied to assure such contact. The specific amount of pressure needed will vary, depending upon the flatness of the components, porosity, resiliency, etc.

Supplemental Information:

Fungus resistance: Adelphi A-978 after cured is fungus inert and is not conducive to fungus growth. It is, however, necessary to conduct specific tests under service conditions to determine actual compatibility with end use application.

Shelf Life:

NOTE: Mixed material has a shelf life of 3 months.

Un-Mixed material has a shelf life of 1 year.

Technical Questions? Call us. We are happy to help! +631-537-8390

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