

Kester Aquabond The Preferred Lead-Free Solder

General Information

International Drinking Water Standards ban the use of lead alloy solders for joining copper tubing and fittings which supply potable (drinking) water. This elimination of the most commonly used 50/50 tin/lead solder has left only 95/5 tin/antimony and 95/5 tin/silver alloys as substitute solders.

Even experienced plumbing solderers experience difficulty soldering with the antimony alloy as the narrow melting range results in the solder running out of the joint and down the copper tubing. The silver alloy has a wider pasty melting range but is very high priced.

To overcome these objections for substitute alloys, Kester has a new alloy called **AQUABOND**. This high tin percentage alloy has been thoroughly tested to determine it is an ideal substitute for the traditionally used tin/lead solders. Capillary penetration, pasty working range and capping-off ability are all very similar to tin/lead alloys without the high cost of other alternatives. Soldering can be done with the same fluxes and heating equipment as used for 50/50.

- * A plumbing solder which does not contain lead.
- * The capillary penetration and flow properties of 50/50.
- * Excellent capping-off.
- * More than 20% more joints per kilogram.
- * Higher joint strength.
- * Twice the corrosion resistance of 50/50 tin/lead.
- * Seven times the corrosion resistance of 95/5 tin/antimony.
- * Meets Canadian Plumbing Code 1990.
- * Conforms to U.S.A. Safe Drinking Water Act of 1986.
- * High purity requirements of ASTM-B32.

Packaging

Kester **AQUABOND** solder is available in solid wire, 3-mm (0.118-inch) diameter on 250-g, 500-g, 2½ kg and 10-kg spools.

Properties

<u>Solder Alloy</u>	<u>Melting Temperature</u>	<u>Pasty Range</u>	<u>Meters/kg (3 mm Dia.)</u>	<u>Bulk Strength</u>	
				<u>Tensile</u>	<u>Strength</u>
AQUABOND	225-257°C (438-495°F)	32°C (57°F)	17.6	6900 psi	7200 psi
50/50 tin/lead	183-214°C (361-420°F)	31°C (59°F)	14.5	6500 psi	5900 psi
95/5 tin/antimony	233-240°C (450-464°F)	7°C (14°F)	17.7	5900 psi	6200 psi

Melting Temperature

The pasty melting range of the solder is an important physical property. The 95/5 tin/antimony alloy is known by the experienced plumbing solder to melt and flow out too fast to be able to cap-off or make a good solder fillet between the copper tubing and fitting. Kester **AQUABOND** solder has the same wide melting range as 50/50 tin/lead which results in similar melted solder viscosity during soldering.

More Joints per Kilogram

Kester **AQUABOND** is a high tin percentage solder with a lower density than 50/50 tin/lead. This means there is more wire length and more solder joints per kilogram. In actual practice, Kester **AQUABOND** will solder 20% more joints than 50/50. Also the improved wetting ability results in a more rapid completion of the soldering.

Increased Strength

The bulk strength of the solder alloys is a measure of the tensile and shear strengths of cast solder. This would be a factor for very poor fitting connections. However, for most plumbing soldered joints, the rupture and creep strengths are more applicable.

RUPTURE STRENGTH

For this test $\frac{3}{4}$ " L-type copper tubing was soldered to copper fittings and caps. When tested at room temperature and 120°C (250°F) under pressure the copper burst and failed rather than the solder joint. Test pressures exceeded 4000-psi (pounds per square inch).

CREEP STRENGTH

An important physical property is the ability of the solder to withstand stress (such as in high pressure systems) for a period of time. This is known as creep strength.

For this test $\frac{3}{4}$ " L-type copper tubing was soldered to copper fittings. Leveraged weights were applied to pull on the soldered joints until they came apart. With a 500-kg (1100-lbs) pull, the joints made with 50/50 tin/lead failed in less than one day. With Kester **AQUABOND** the failures occurred after more than 100-days.

Corrosion

Corrosion is dependent on the environment inside the plumbing. The acidity and the softness of the water affect the corrosion rate. Because both tin and lead are anodic to copper in the galvanic series, with electrolyte (any conductive ions) in the water, the solder can corrode. This corrosion or pitting is often the cause of leaks in the system.

Solders containing lead are more anodic to copper and are therefore more easily corroded than solder (such as Kester **AQUABOND**) which does not contain lead. Electrochemical testing confirms that Kester **AQUABOND** corrodes at half the rate of 50/50 tin/lead solder and one-seventh as fast as 95/5 tin/antimony.

Health & Safety

This product, during handling or use, may be hazardous to health or the environment. Read the Material Safety Data Sheet and warning label before using this product.

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