



What is Lead Crystal Glass?

Lead crystal glass is one of the four main categories of glass primarily used for decorative purposes. It becomes 'lead' glass when lead oxide is added during the manufacturing stage to replace calcium oxide. The lead is added as it reduces the temperature of the molten material to allow for increased 'work time' with the glass. The addition of lead also provides an improved look to the finished product through increasing the refractive index and density of the glass, making it a clearer, less flawed substance. The term 'crystal' is misleading as there is no crystal structure within the glass as it is an amorphous solid, meaning that the arrangement of the elements in glass is variable and held together by tight chemical bonds.

Traditional English full lead crystal contains a minimum of 30% lead oxide, but any glass containing at least 24% lead oxide is classified as lead crystal. Glass which contains less than 24% lead oxide is known as crystal glass. The lead is locked away within the chemical structure of the glass and should not pose a risk to human health. A typical composition for lead crystal glass is: 25% oxygen, 30% silicon, 25% lead, 10% sodium or potassium, 10% calcium, 1% other components such as iron, tin and fluorine – which are added to alter the chemical and physical properties of the glass.

Lead crystal glassware has lost popularity in recent years due to the potential health risks of lead products. Now, more commonly 'reduced-lead' or 'lead-free' crystal glass is manufactured using zinc oxide, potassium oxide or barium oxide to substitute the lead to produce a similar product.

What is Lead Crystal Glass Used For?

Lead crystal glass has many uses in various industries, with applications ranging from its use as table glassware to shielding healthcare and scientific workers from radiation. The most common uses of lead crystal glass are drinking glasses, ornaments, decanters, jewellery, optical lenses, enamels and lacquers, glass sealants and solders and radiation shielding from gamma and x-rays. The wide scope of applications is made possible by the physical, chemical and mechanical properties of lead.

Why must we test Lead Crystal Glass?

Lead is a toxic heavy metal which, even at low levels of continued exposure, can cause irreversible damage to both the intellectual and behavioural development of children. Babies and younger children are particularly susceptible, given that their central nervous systems are still under development and their increased tendency to suck items and ingest leachates. There are a wide range of non-specific ailments described by adults suffering from lead poisoning including fatigue and confusion which may be accompanied by headaches and anaemia and can lead to coma and death.

Lead in some articles can leach out and be ingested, for example with glassware made of lead crystal glass, and lead has been detected in quantities that could be hazardous to health. It is recommended

that glassware used for eating or drinking is cleaned thoroughly after storage and it is best not to allow young children to use these articles as a precautionary measure.

Legislation in Effect from 9th October 2013 for Lead Crystal Glass

As part of the EU REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) Regulations, the lead content of jewellery and other associated items such as watches, hair accessories and their components is restricted. However, it is understood that there are no suitable alternatives for some materials which have a high lead content. This includes vitreous enamels, semi-precious and precious stones and crystal glass; these substances are therefore exempt from the regulation.

To ensure jewellery pieces containing lead glass crystal are fit for sale within the EU, testing will be required to verify that all glass components fall within the recognised definition of crystal glass. Given the lack of test method available to mimic the release of lead under mouthing action, it is accepted that each individual part must contain less than 500 parts per million (0.05%) lead in comparison to their weight to comply as described in EU 836/2012:63. This will apply from the 9th of October 2013 to all jewellery articles placed on the market in the European Union.

What must be tested?

In order for this exemption to apply, crystal glass must fall in to one of four categories.

1. Full Lead Crystal = Lead Oxide content $\geq 30\%$
2. Lead Crystal = Lead Oxide content $\geq 24\%$
3. Crystal Glass (crystallin) = Lead Oxide/Barium Oxide/Zinc Oxide/Potassium Oxide $\geq 10\%$
4. Crystal Glass (crystallin) = Lead Oxide/Barium Oxide/Potassium Oxide $\geq 10\%$

Jewellery articles are defined in the Regulation as jewellery, imitation jewellery articles, hair accessories, bracelets, necklaces, ring, piercing jewellery, wrist watches and wrist-wear, brooches, cufflinks, and any individual part which include materials from which the jewellery is made and also includes the individual components of the jewellery articles.

What testing does the Sheffield Assay Office offer?

The Analytical Services Division of Sheffield Assay Office uses in-house methods to help your company remain compliant. We test your product to ensure that the material is classified as Full Lead Crystal, Lead Crystal or Crystal Glass (with or without zinc oxide) through the determination of the elemental composition of the material through the skilled application of Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES).

Should you have any further questions relating to crystal glass testing and the associated legislation, please do not hesitate to contact us. We would be happy to discuss this with you.

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Sheffield Analytical Service strives to give our customers as much information and guidance as possible in relation to current and upcoming legislation concerning the testing of lead and other toxic metals found in costume jewellery but advises that companies should always seek their own legal advice on these very important issues.