

GUIDE TO COMPLIANCE WITH THE ROHS DIRECTIVE

Welcome to the step by step guide to compliance with the RoHS Directives.

This guide has been put to help you understand more about the Restriction of use of certain Hazardous Substances (RoHS) Directive which comes into force on 1st July 2006.

RoHS Directives – What do you need to consider?

The Directive applies to electrical and electronic equipment that is dependent on electric or electromagnetic fields in order to work properly. Also, equipment for the generation, transfer and measurement of such currents and fields falling in the categories listed in Appendix A of this guide and designed for use with a voltage rating not exceeding 1,000 volts for alternating current and 1,500 volts for direct current.

Contact suppliers and ask if their materials, parts, components, etc. contain any of the six restricted substances

- Lead, cadmium, mercury, hexavalent chromium, PBB or PBDE flame retardants.
- Suppliers should provide a declaration which could be in various formats. Some will provide this information on websites.

Is there any doubt about the presence of a restricted substance?

- Use the decision tree that appears on below in this guide to decide if analysis is advisable.
- The frequency of analysis will depend on many factors, including your relationship with suppliers.
- Analysis frequency also depends on the potential environmental impact from inadvertent use of a restricted substance. The authorities will expect more frequent analysis of parts in products sold in very large quantities than in those sold in relatively small numbers.

Some suppliers may not change their part numbers so separation of RoHS compatible and RoHS incompatible parts will be needed.

Keep supplier declarations and analysis data in a technical file

The authorities will expect to see this in case of a suspected infringement.

Your customers may ask about RoHS compliance and expect you to provide a declaration.

Introduction to the RoHS Directive

The Restriction of the use of certain Hazardous Substances (RoHS) Directive comes into force on 1st July 2006. From this date, producers of certain categories of electrical and electronic equipment will not be able to place on the market products that contain six banned substances unless specific exemptions apply. This much is clear, but what will producers be expected to do by the authorities?

What is a compliant product?

The RoHS Directive applies to equipment that is within the scope of the Directive (see above). None of the "homogeneous materials" within compliant products must contain the six restricted substances at concentrations above the "maximum concentration values".

Who is responsible?

Producers of equipment are held responsible for ensuring that their products do not contain the six restricted substances. The Directive does not cover components or sub-assemblies and so the equipment producers will have to take their own steps to ensure that all parts and materials used in their products do not contain restricted substances. "Producer" means any person who, irrespective of the selling technique used:

(i) manufactures and sells electrical and electronic equipment under his own brand;

(ii) resells under his own brand equipment produced by other suppliers; or

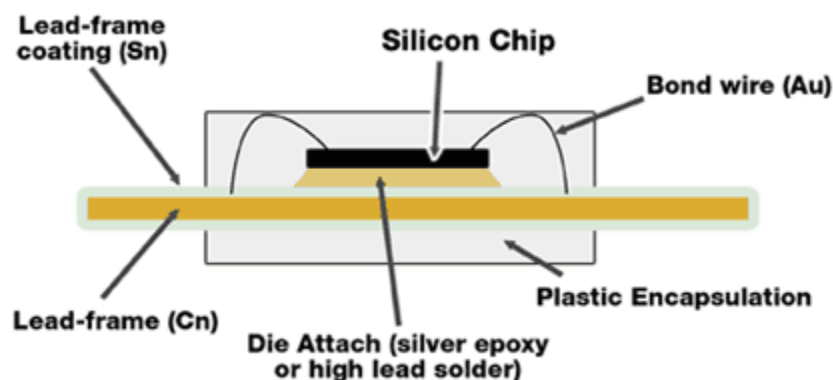
(iii) imports or exports electrical and electronic equipment on a professional basis into a member state. It is clear from this that there will be circumstances in which it is not the actual manufacturer of a product who will assume the "producer" responsibilities.

What are the maximum concentration values (MCV)?

These have not been formally agreed, but are likely to be 0.1 weight percent of lead, mercury, hexavalent chromium, PBB and PBDE and 0.01 weight percent cadmium in homogeneous materials.

What is a homogeneous material?

The definition of homogeneous materials has caused some confusion in the past, but has been clarified in draft guidelines published by the European Commission. A homogeneous material is a single substance such as a plastic, for example the PVC insulation on insulated copper wire. Components such as capacitors, transistors and semiconductor packages are not "materials" but will contain several different materials. For example, a semiconductor package will contain at least six as shown below.



What will Producers be required to do to comply with RoHS legislation?

By placing their products on the market, producers are declaring that these comply with RoHS legislation. This is the basis for "self-declaration" which is used for several other European Union directives. There are no requirements for the application of a specific mark or testing by independent third parties. However, the authorities within each Member State will carry out market surveillance and conduct checks on products. If they find that a product does not comply with RoHS legislation, the producer will be asked to show that due diligence has been used and he has taken "reasonable steps" to comply. This legal defense is used for other legislation, but what constitutes "reasonable steps" has not been defined.

Producers will be expected to use two approaches to comply:

- Obtain declarations of compliance for materials, components and other parts from suppliers.
- Selected analysis.

Where authorities find non-compliant equipment, they will audit the producer's records, which should be in the form of a "technical file". These files must be kept for at least four years.

Compliance Declarations

Equipment producers will need to obtain materials declarations or certificates of compliance from their suppliers. At present there are no standard formats for these, although several are being developed. The minimum that these need to state is that the materials, parts or components may be used to produce RoHS compliant equipment. This confirmation must be for individual materials, not for whole components (due to the homogeneous material requirement mentioned above).

Some component manufacturers produce materials declarations for ranges of products, for example one declaration for all types of Quad Flat Pack (QFP) packages. This is reasonable because all of these would consist of the same materials and so a declaration for one part number would be identical to one for another part in the same range, and because the composition of all of the materials is identical.

Equipment producers often obtain a part on a regular basis from a supplier and these can, over a period of time, be from a number of batches. Separate declarations for each batch should not be necessary unless the manufacturer has made a change to the production process. However, equipment producers need to be aware that batch-to-batch variation may occur.



The absence or presence of the six restricted substances is tracked throughout the supply chain. For example, a notebook PC manufacturer will obtain declarations on individual components and sub-assemblies, as well as carrying out selected analysis. Materials declarations may be in paper or electronic format.

Selected analysis – when to analyze?

There may be occasions when it will be advisable for a producer to carry out analysis to determine whether a restricted substance is present. There are various reasons why this might be necessary, but the decision whether to analyze is left to the equipment producer. ERA Technology developed an example of a decision tree to help producers decide whether analysis is necessary and this was included in the Government's Proposed Guidance Notes on the UK RoHS legislation. A modified version is included here:



*There are certain materials that have a relatively high risk of containing a restricted substance. For example, PVC obtained from the Far East often contains lead and cadmium and these are occasionally found in other types of plastics.

In addition, there may be significant variation between different batches and therefore an equipment producer using multiple batches should be aware of this issue.

To a significant extent, the decision whether to analyze will depend on the relationship with the supplier. Analysis will be needed less often for items from well-established suppliers with proven reliability than from new "unknown" suppliers. In some cases, a producer may never need to analyze.

How and what to analyze

It is clearly unnecessary and far too costly to analyze every material. Only materials that are likely to contain a restricted substance need be checked. For example, in the case of the semiconductor package shown above, the only location where a restricted substance may occur is in the tin plated termination coating as an impurity or because tin/lead alloy was used instead of tin. Connectors may contain restricted substances both in the plastic parts (lead, cadmium or PBDE) and in electroplated tin coatings.

The recommended procedure for routine analysis to check components and materials is a two-step approach. In all cases a producer should ensure that the analyst has expertise in the analysis of electronic components.

Step 1 – Routine screening.

The first step is to use a screening technique such as energy dispersive X-ray analysis (EDXRF). This has sufficient accuracy to determine:

- If no Pb, Cd, Cr, Hg or Br are present or
- If Pb, Cd, Cr, Hg or Br are present at "significant" concentrations.

This technique gives approximate values only, unless the machine is pre-calibrated with suitable standards. Where no standards are available, analysis by a different technique may be required when the result is close to the MCV. The detection limit for lead in tin is about 0.03% if optimum analysis conditions are used.

Two types of EDXRF are available. Handheld equipment is quick and easy to use but not as accurate as desktop machines. Both types have limitations that should be clearly understood by the analyst. There are other routine screening methods available.

Step 2 – More accurate analysis

This will be necessary under the following circumstances:

- Pb, Cd or Hg was found at "borderline" concentrations – additional, more accurate, analysis would be needed. The method used will depend on the material.
- Cr was detected
- Br was detected

Under these circumstances, it would be advisable to ask a professional analytical laboratory to analyze suspect materials.

Appendix A

List of categories of equipment that will need to comply with RoHS legislation

The list of products below each category heading is illustrative and not exhaustive.

- **Large household appliances**
Such as large cooling appliances; refrigerators; freezers; other large appliances used for refrigeration, conservation and storage of food; washing machines; clothes dryers; dish washing machines; cooking; electric stoves; electric hot plates; microwaves; other large appliances used for cooking and other processing of food; electric heating appliances; electric

radiators; other large appliances for heating rooms, beds, seating furniture; electric fans; air conditioner appliances; other fanning, exhaust ventilation and conditioning equipment.

- **Small household appliances**

Such as vacuum cleaners; carpet sweepers; other appliances for cleaning; appliances used for sewing, knitting, weaving and other processing for textiles; irons and other appliances for ironing, mangling and other care of clothing; toasters; fryers; grinders, coffee machines and equipment for opening or sealing of containers or packages; electric knives; appliances for hair-cutting, hair drying, tooth brushing, shaving, massage and other body care appliances; clocks, watches and equipment for the purpose of measuring, indicating or registering time; scales.

- **IT and telecommunications equipment**

Such as centralized data processing; mainframes; minicomputers; printer units; personal computing; personal computers, including the CPU, mouse and keyboard; laptop computers, including the CPU, mouse and keyboard; notebook computers; notepad computers; printers; copying equipment; electrical and electronic typewriters; pocket and desk calculators; other products and equipment for the collection, storage, processing, presentation or communication of information by electronic means; user terminals and systems; facsimile; telex; telephones; pay telephones; cordless telephones; cellular telephones; answering systems; other products or equipment of transmitting sound, images or other information by telecommunications.

- **Consumer equipment**

Such as radio sets; television sets; video cameras; video recorders; hi-fi recorders; audio amplifiers; musical instruments; other products or equipment for the purpose of recording or reproducing sound or images, including signals or other technologies for the distribution of sound and image than by telecommunications.

- **Lighting equipment, (including electric light bulbs and household luminaires)**

Such as luminaires for fluorescent lamps; straight fluorescent lamps; compact fluorescent lamps; high intensity discharge lamps, including pressure sodium lamps and metal halide lamps; low pressure sodium lamps; other lighting equipment for the purpose of spreading or controlling light.

- **Electrical and electronic tools (with the exception of large-scale stationary industrial tools)**

Such as drills; saws; sewing machines; equipment for turning, milling, sanding, grinding, sawing; cutting; shearing; drilling; making holes; punching; folding; bending or similar processing of wood, metal and other materials; tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses; tools for welding, soldering or similar use; equipment for spraying, spreading, dispersing or other treatment of liquid or gaseous substances by other means; tools for mowing or other gardening activities.

- **Toys, leisure and sports equipment**

Such as electric trains or car racing sets; hand-held video game consoles; video games; computers for biking, diving, running, rowing, etc.; sports equipment with electric or electronic components; coin slot machines.

- **Automatic dispensers**

Such as automatic dispensers for hot drinks; automatic dispensers for hot or cold bottles or cans; automatic dispensers for solid products; automatic dispensers for money; all appliances which deliver automatically all kind of products.

Appendix B

Exemptions

The RoHS legislation does not apply to:

- Large-scale stationary industrial tools. (This is a machine or system, consisting of a combination of equipment, systems or products, each of which is manufactured and intended to be used only in fixed industrial applications).
- Spare parts for the repair of Electrical and Electronic Equipment (EEE) placed on the market before 1 July 2006 and to replacement components that expand the capacity of and/or upgrade of EEE placed on the market before 1 July 2006.
- The reuse of EEE placed on the market before 1 July 2006.
- The specific applications of mercury, lead, cadmium and hexavalent chromium set out below.

Applications of lead, mercury, cadmium and hexavalent chromium, which are exempted from the requirements of the RoHS Directive.

- Mercury in compact fluorescent lamps not exceeding 5 mg per lamp.
- Mercury in straight fluorescent lamps for general purposes not exceeding:
 - halophosphate 10 mg
 - triphosphate with normal lifetime 5 mg
 - triphosphate with long lifetime 8 mg.
- Mercury in straight fluorescent lamps for special purposes.
- Mercury in other lamps not specifically mentioned in this Appendix.
- Lead in glass of cathode ray tubes, electronic components and fluorescent tubes.
- Lead as an alloying element in steel containing up to 0.35% lead by weight, aluminium containing up to 0.4% lead by weight and as a copper alloy containing up to 4% lead by weight.
- Lead in high melting temperature type solders (i.e. tin-lead solder alloys containing more than 85% lead),
- Lead in solders for servers, storage and storage array systems (exemption granted until 2010),
- Lead in solders for network infrastructure equipment for switching, signaling, and transmission as well as network management for telecommunication,
- Lead in electronic ceramic parts (e.g. piezoelectronic devices).
- Cadmium plating except for applications banned under Directive 91/338/EEC (1) amending Directive 76/769/EEC (2) relating to restrictions on the marketing and use of certain dangerous substances and preparations.
- Hexavalent chromium as an anti-corrosion of the carbon steel cooling system in absorption refrigerators.

Note - The Commission will further evaluate the applications for:

- Deca BDE
- Mercury in straight fluorescent lamps for special purposes
- Lead in solders for servers, storage and storage array systems, network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunications (with a view to setting a specific time limit for this exemption), and Light bulbs, as a matter of priority in order to establish as soon as possible whether these items are to be amended accordingly.

Possible future exemptions

The European Commission is currently reviewing the status of two of the exemptions mentioned above and of light bulbs, as well as seven new cases for further exemptions and one clarification of the existing exemptions.

The seven new cases for possible exemption are:

- Lead used in compliant-pin VHDM (Very High Density Medium) connector systems

- Lead as a coating material for a thermal conduction module c-ring
- Lead and cadmium in optical and filter glass
- Lead in optical transceivers for industrial applications
- Lead in solders consisting of more than two elements for the connection between the pins and the package of microprocessors with a lead content of more than 85% in proportion to the tin-lead content (proposed exemption until 2010)
- Lead in solders to complete a viable electrical connection internal to certain Integrated Circuit Packages ('Flip Chips') (proposed exemption until 2010)
- Lead in lead-bronze bearing shells and bushes

The existing exemption that is being reviewed for possible clarification and extension may be amended as follows:

Lead in high melting temperature type solders (i.e. tin-lead solder alloys containing more than 85% lead) and any lower melting temperature solder required to be used with high melting temperature solder to complete a viable electrical connection.

In addition, the Commission is reviewing the status of Deca BDE. At the moment, Deca BDE is included within the scope of the Directive. A study, undertaken on behalf of the Commission, has recently concluded that the risk assessment on the use of Deca BDE should be closed without restrictions for any applications. The study also concluded that questions relating to the environmental findings of Deca BDE in Europe should be addressed by the initiation of a monitoring program and complemented by a further voluntary program of industrial emissions controls in partnership with the Deca BDE user industries in Europe.

The Commission is currently considering how these conclusions should apply in respect of the scope of the RoHS Directive.

Please note:

The information contained in this guide is of a general nature and is not intended to address the circumstances of any particular individual or entity. Although we endeavor to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.

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