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An overview of the EU Low Voltage Directive (LVD) 2006/95/EC



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Introduction

Anyone involved in the development or quality assurance of electrical products needs to be aware of the essential requirements of the Low Voltage Directive (LVD) 2006/95/EC. The LVD is one of the 'New Approach Directives'; a collection of European complementary legislative measures that are intended to help facilitate free trade in line with Article 95 of the EU Treaty. The New Approach Directives include:

- Construction Products Directive (now evolving into the Construction Products Regulation)
- The Eco-Design & Energy Labelling Directive
- Electromagnetic Compatibility Directive
- Equipment for Explosive Atmospheres (ATEX) Directive
- Gas Appliances Directive
- The Low Voltage Directive
- The Machinery Directive
- The Measurement Instruments Directive
- The Medical Devices Directive (MDD)
- The New Legislative Framework
- Radio & Telecommunications Terminal Equipment (R&TTE) Directive
- Restriction of hazardous substances (RoHS)

The LVD provides a common framework of regulation for certain types of electrical products across all EU member states - effectively levelling the performance playing field between them. In short, if a product is produced in one member state, it would have the same basic level of safety performance as a product made in any other member state.

The LVD has been implemented into national law by each member state's government. In the UK this was achieved through the application of the Electrical Equipment (Safety) Regulations 1994.

This paper is intended to provide an overview of the LVD.

Overview

The LVD legislation aims to ensure a degree of conformity assessment occurs on a product before it is placed on the market and that the Essential Health and Safety Requirements (EHSRs) relating to that product are met directly or by means of assessment to harmonised standards.

For equipment within its scope, the Directive covers all health and safety risks, ensuring that electrical equipment is safe for its intended use.

The vast majority of products that fall within the scope of the LVD also fall within the scope of the Electromagnetic Compatibility (EMC), RoHS, WEEE and Machinery Directives. The (Eco-Design) Energy Related Products (ERP) Directive may also apply.

Medical equipment and equipment for potentially explosive environments will not be covered by the LVD because they are covered by the Medical Device Directive and the ATEX Directives respectively.

Note: Certain types of radio and telecommunications equipment can also fall under the remit of the LVD – so it's worth checking with your test and certification partner if you are unsure which Directives apply.

Objectives of the Directive

The Directive states that, "Only electrical equipment which does not jeopardise the safety of people, domestic animals and property shall be placed on the market.

"Only electrical equipment which does satisfy the CE Marking requirements will be taken as complying and can be freely circulated in the European Economic Area".

The scope of the LVD

The Directive applies to all electrical equipment designed for use with a voltage rating of between 50 and 1000 V for alternating current, 75 and 1500 V for direct current. Voltage ratings refer to the voltage of the electrical input or output, not to voltages that may appear inside the equipment. Some examples of equipment covered by the LVD are:

- Electrical appliances
- Lighting equipment including ballasts
- Switch gear and control gear
- Electric wiring
- Appliance couplers and cord sets
- Electrical installation equipment
- Cable management systems

Accompanying battery-chargers, as well as equipment with an integrated power supply within the voltage ranges of the Directive do fall within the scope. This also applies to battery operated equipment with supply voltage rating under 50 V AC and 75 V DC, for the accompanying power supply unit (e.g. Notebooks).

Note: Battery operated equipment outside the voltage rating of the Directive falls outside the scope of the LVD; however there are some instances where battery powered devices generate internal voltages that will bring them within the scope of the LVD.

Equipment for incorporation

In general the scope includes units intended for incorporation into other equipment and equipment to be used directly without incorporation. Indeed, some basic components *can only be properly assessed for safety once incorporated.*

These includes components such as integrated circuits, transistors, diodes, rectifiers, triacs, GTO's, IGBT's, opto-semi-conductors; passive components such as capacitors, inductance, resistors, filters, connectors, devices for mechanical protection which are part of equipment, relays with terminals for printed circuit boards and micro switches, as well as sub-assemblies. For example an open framed power supply will fall under the LVD but has to be incorporated for assessment.

Note: Electrical motors are to be CE Marked, but under the requirements of the Machinery Directive 2006/42 EC rather than the LVD, as they will have exposed rotating parts and possible access to live parts and therefore are treated as a sub-assembly for incorporation.

Exclusions from the Directive

Below are some examples of equipment excluded from the Directive. Even though these items are excluded, it does not mean that the manufacturer needs to do nothing as products falling outside the scope of the LVD are still subject to conformity with the General Product Safety Directive 2001/95/EC among others.

Those directives will often refer to the LVD in their explanations and criteria, so manufacturers should still be familiar with this Directive. Exclusions include:

- Electrical equipment for use in a potentially explosive atmosphere
- Electrical equipment for radiology and medical purposes
- Electrical parts for lifts
- Electricity supply meters
- Plugs and socket outlets for domestic use
- Electric fence controllers
- Certain specialised electrical equipment, for use on ships, aircraft or railways which complies with certain other provisions
- Lawn mowers and certain garden tools
- Power tools
- Electrical equipment for export to a non EEA member state
- DEF STAN 59-411 part 1 Annex F

Mandatory safety provisions

If all of the following provisions are not adhered to *the equipment is not compliant* with the requirements of the LVD:

- The brand name or trademark should be clearly printed on the equipment or if not possible, the packaging. This requirement will soon include the address of the manufacturer or responsible vendor.
- The equipment should be made in such a way to make sure it can be safely assembled and connected
- The equipment should be designed and manufactured to ensure that protection against hazards is assured
- Persons and animals should be protected from physical injury
- Dangerous temperatures, arcs and radiation are not produced
- The product must offer protection against non-electrical dangers
- Insulation must be suitable for foreseeable conditions
- The product must provide protection against external hazards
- Meet expected mechanical standards to not cause a hazard

- The product should be resistant to non-mechanical influences
- An overload event will not cause a hazard
- Appropriate application of CE Marking has been made
- A Declaration of Conformity (DoC) has been completed

Technical documentation

Technical documentation is the cause of more non-compliance than any other part of the assessment regime. Its importance is often underestimated and viewed as secondary to the physical electrical / mechanical testing. Technical documentation must contain:

- A general description of the electrical equipment
- Design and manufacture drawings plus diagrams of components, subassemblies, circuits, etc.
- Descriptions and explanations needed to understand the above
- A list of the standards used, in full or in part
- Bill of materials
- A description of the solutions employed to meet the safety aspects of this directive when standards have not been applied,
- The results of design calculations and of checks carried out.
- Test reports / photographs
- Name and address of manufacturer (or representative)
- Description of equipment
- Reference to the standards
- Reference to the specifications on which conformity is declared
- Identification of the signatory
- Details of year of manufacture
- Evidence of quality management system
- Any other safety related documents/procedures
- Declaration of Conformity

The Declaration of Conformity (DoC) must be drawn up in at least one official language of the EU and must identify:

- Manufacturer
- Responsible person (by name and job title)
- Exact product type/name
- Year of affixation of CE Marking
- List of applicable standards

It is the written declaration by the manufacturer or his authorised representative that the equipment to which CE Marking is affixed, complies with the LVD.

Technical Documentation must be retained in the EU by both manufacturers and importers for 10 years after production/ sales have ceased. The documentation must be made available to the enforcement authorities on request, and it can be stored in paper form or electronic copy.

NOTE: It is important to remember that the person who signs the Declaration of Conformity is taking legal responsibility for the compliance of the product and could potentially be liable to fines or imprisonment in the event of serious product non-conformity involving a prosecution process.

Design Checklist

Advice

- Seek professional advice on which Standards to test to.

Design

- Ensure creepage and clearance distances do not create risk of electrocution
- Use an appropriate level of insulation
- Use critical components (like switches and cut-outs) that have already been approved by an appropriate Body and include documentary evidence of their assessment.
- Mechanical hazards considered

Documentation & labelling

- Ensure your Bill of Materials is properly defined
- Ensure that your manuals and safety information is both complete and correctly translated into the language of the target market.
- Don't forget your 'Statement of Origin'
- Check you have appropriate markings, appearing in the right format and size and that they cannot be removed.
- Ensure your DoC has the right wording and contains the correct information.

If you are in doubt as to what you need to include, confer with your partner test and certification body, who will be able to give you specific advice.

CE Marking



If your product is compliant with all of the Directives that apply to it, then you can make a Declaration of Conformity (DoC) and apply CE Marking to your product and its packaging. This mark is not a certification of safety. It is simply a trading mark that enables free movement of goods within the European Union

What are the common reasons for product non-conformity?

Although there are many causes of failure, the following are the most common:

- Insufficient insulation distances in connectors and PCBs
- Unknown safety status of safety-critical components
- “Compliant with the standard” NOT just CE
- Bill of materials incorrectly defined
- Incomplete manuals / documentation (operators manual/ safety manual)
- No statement of origin
- Errors on the DoC
- Poor protection of batteries

In our experience, the best way to ensure a pass first time is to design compliance in from the start. If compliance is engineered in, it will prevent costly retrospective re-engineering and re-testing.

- Use the Standards relating to your product as a source of reference when you design.
- Seek a ‘design review’ from your test and certification partner early on – this inexpensive pre-compliance check can be done with drawings, paper plans or even a cardboard mock-up.
- Undertake some basic testing during the prototype phase to get an indication of how your product will perform in ‘real’ testing later on.

Non-conformity and penalties

There is a misconception that the penalties for non-compliance are non-existent, but the directive states that:

“It is an offence to supply electrical equipment which does not comply with the requirements of the Regulations. Any person committing an offence is liable, under summary conviction to imprisonment, a fine or both”.

If a product is non-compliant - it may not be that it is unsafe. When compliance failures can be something as simple as parts of documentation missing (or not being translated into the appropriate language for the market), the product isn't necessarily a hazard, but it is non-compliant, so corrective actions need to be made to make it compliant - so the DoC is accurate and truthful and CE Marking can be applied.

Most non-compliance is not intentional, though some unscrupulous manufacturers make non-compliant products and make a false DoC. This is why ongoing surveillance of product conformity by the EU enforcement authorities (such as Trading Standards in the UK) is so important.

If self-declaration is unjustified it can lead to:

- Product recalls and other corrective actions
- Product being restricted or excluded from certain markets
- Loss of brand value
- Loss of investor confidence leading to retraction of funding
- Loss of shareholder confidence leading to falls in share price
- Possible prosecution, if found to be in breach of the legislation in a court of law.

Summary

The LVD is relatively straight forward to understand, but attention to detail is important in ensuring your ongoing compliance with it.

- Make sure your documentation is complete and accurate
- Test products to appropriate harmonised Standards
- If in doubt about some aspect of any Directive - seek advice. Most Notified Bodies will answer quick questions for free.
- Keep a copy of the LVD on file and make sure it's covered in the on-boarding process of new employees working on product design and compliance
- Your trade association may have a compliance club - these are a great source of compliance advice.
- Don't consider compliance with the LVD in isolation. You'll also need to make provisions for Directives like the Electromagnetic Compatibility (EMC) Directive, the REACH Directive (on the restriction of hazardous chemicals in the production of articles (i.e. products), the WEEE Directive (on Waste Electrical & Electronic Equipment at end of product life), the Ecodesign Directive for improving the environmental performance of energy related products (ERPs) and possibly the R&TTE Directive (for wireless equipment).

About the Author

Andrew Lyndon-Dykes is an expert in the safety of electrical products with more than 10 years experience supporting businesses to meet the obligations of the LVD. Having worked for several European Notified bodies over the years, Andrew is now responsible for the Home Appliance & Electronics, ICT, Defence & Aerospace, Industry & Laboratory and Lighting teams at Intertek in the UK.

If you have a question for Andrew, please feel free to contact him at andrew.lyndondykes@intertek.com

Credits

A great deal has already been written on the subject of the LVD and naming all of the individual sources would require a directory of its own, but the author would like to make a special thanks to Conformance, Enterprise and Industry, BERR, The HSE and the LVD Working Committee for their excellent materials on the subject.

How Intertek can help

Working with manufacturers to ensure that electrical products meet the requirements of European Directives that relate to them is a core activity for Intertek.

Our engineering experts provide support and guidance at every point during the design process to ensure products comply with market requirements - through design review and pre-compliance testing, full testing to Standards and stringent professional assessment.

Whether you need advice on factory production control, building a technical file or even how CE Marking should be applied, we can help.

From evidence to support your CE Marking and DoC activities or for a full product certification and Marking - or even working towards international market access via the IECEE CB scheme, Intertek have a compliance route to meet your needs and budget.

We are an EU Notified Body, a member of the IECEE CB scheme and a Nationally Recognised Test Laboratory for North America, so get in touch with us today no matter what your market access needs.

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