

What is involved with product safety testing?

We sometimes find that customers know that they have an obligation to perform product safety testing, however do not understand what is involved. Product safety testing can be complex and the importance may be underestimated, especially if there is a cost challenge during a project. In this article we discuss the basic principles of product safety testing, and why it is of great importance.

Consumer safety

Initially, the aim of product safety testing is to identify and address any potential safety hazards. A safe product is one that presents no risk, or minimum acceptable level of risk, when used as intended.

Legal requirements

If you are a manufacturer or importer of goods, you have a legal obligation to ensure they are safe for the consumer to use by complying with the appropriate standards and directives. Independent verification helps to demonstrate due diligence, which can help avoid legal issues.

In Europe, the Low Voltage Directive (LVD) (2014/35/EU) exists to ensure electrical equipment within certain voltage limits does not present risk to the user. The LVD covers health and safety risks on electrical equipment operating with an input or output voltage of between 50 and 1000 V for alternating current, 75 and 1500 V for direct current.

In the UK, manufacturers must comply with the Electrical Equipment (Safety) Regulations 2016.

Most electrical and electronic products must be CE marked to be sold on the European market, showing that it meets all of the necessary health and safety requirement.

Risk mitigation

At Cranage EMC and Safety, we offer pre-compliance testing which can help to identify potential issues early in the design stage, allowing for product changes to be made at a more cost-effective point in the process.

The basic principles of product safety testing

Safety standards are often long and complex, and a basic understanding of the principles involved will assist in designing a product that is more likely to comply with regulations and therefore reduce testing costs. Depending on the complexity of a product, a full safety assessment can take between one to several weeks.

We do not expect everyone to understand what is involved in the safety evaluations, our engineers are experts and can explain in simple terms what is involved in the product assessments so that there is a much better understanding of the process. Such as:

Marking and instructions

Essential information must be presented to the user on the product and within the instructions, so this forms part of the assessment and the product standard defines what should be detailed.

Protection against access to live parts

This to ensure that anything the user is able to touch on the product is not at a hazardous voltage level to avoid electric shock risks.

Power input and current

This confirms that the rating of the product matches the stated ratings on the product and that the wiring and components are rated accordingly to handle the power.

Heating

The heat generated by a product is critical, this test ensures that the user is not at risk from excessive temperatures and also the components are not subject to excessive heat above their rated values for their environment.

Leakage current and electric strength at operating temperature

These tests ensure that there is adequate isolation between parts such as high voltage parts and parts that can be touched. It also confirms that any parts that the user can touch does not cause an excessive current flow through the person to earth.

Transient overvoltages.

These tests ensure that a lightning strike or surge does not affect the product in an unsafe way.

Moisture resistance

If the product is specified for use in a wet environment, then water ingress tests are to be performed based on the IP rating of the product. This confirms that no water shall enter the product, or if it does it does not cause a hazard.

Abnormal operation

This evaluation is somewhat based on the experience of the testing engineer. Foreseeable abnormal conditions are considered, including the faults of certain components, so the engineers have to be able to understand the circuit diagrams and principles of operation of the product in detail.

Stability, mechanical hazards and mechanical strength

Here the product is evaluated to ensure it is stable in normal use and does not topple over. The strength of the product and enclosures is also checked to confirm that there is no access to hazardous parts.

Internal wiring

The internal wiring is critical as it can be close to hot parts, moving parts or form part of a high voltage circuit, so the wiring is evaluated to ensure they are rated and routed correctly.

Components

The components are a critical part of the product. They are evaluated to ensure that they conform to the required standards if they are deemed critical to the safety of the product, and also if necessary have the required operational endurance for its applications, such as a mains switch.

Resistance to heat and fire

The majority of enclosures have to be fire rated as well as certain connectors, this is to ensure that if there is a fire within then product it does not propagate the flames. **The connectors shall be resistant to softening of the material if, for example, a screw terminal is not fully tightened thus allowing a heat source to generate.**

Where will the product be sold?

A designer needs to know which country a product will be sold within, as the standard requirements defer according to the market and may therefore affect the design. For example, voltage ratings wiring methods, environmental conditions may vary by continent.

Different countries also have different safety-related marks. The CE mark in Europe and UKCA in Great Britain, are self-certification methods, whereby manufacturers can evaluate a product themselves but this can be a high-risk strategy, so a test house is often used to evaluate the product. Safety marking in the USA and Canada consists of a few options, with certifiers being accredited as a Nationally Recognised Test Lab (NRTL) and by the Standards Council of Canada (SCC). For the rest of the world, manufacturers can look to get their product ILAC/MRA or CB tested, both are internationally recognized schemes aimed at making test requirements more straightforward across over 50 countries.

As well as the country that it will be sold in, it is important to consider the environment in which the product will be situated as this may impact the materials that are used and the tests that are needed. For example, a designer will need to know whether a product is likely to be exposed to high humidity, dust, water or temperature fluctuations.

PCB design

It goes without saying that good PCB design is vital, and ensuring the layout is correct can help to mitigate against other issues, such as creepage and clearance. Standards detail the minimum amount of creepage and clearance allowed and this is important to ensure conductors cannot arc to one another and cause a safety issue.

EMC Testing

An EMC failure may result in changes to components, which in turn may have an effect on safety testing. It is therefore advisable that EMC is carried out first.

How to choose a test lab

-UKAS accreditation

It can be difficult to choose a test laboratory, but it is often useful to start by finding one that is UKAS accredited, such as Cranage EMC & Safety. A UKAS accredited lab has been externally audited and is found to be technically competent, meeting strict industry requirements for quality assurance. Our UKAS accredited test results are considered accurate, reliable and trustworthy, which can help to give an edge over competitors who may not have carried out accredited testing.

Cranage has been UKAS accredited for 20 years, and we continually review and update our comprehensive scope.

-Flexibility

Choosing a lab such as Cranage EMC and Safety, where all testing facilities are in one location, helps with flexibility. We can help with a complete EMC, Safety and Environmental testing programme for your product.

Communication with our customers is key, and we provide regular feedback on projects and progress. As a family run business, you will find that the Directors are also involved in testing and are always aware of live projects.