

The Electromagnetic Compatibility Directive

Purpose

The Electromagnetic Compatibility (EMC) Directive 89/336/EEC is one a series of measures introduced under article 100a of the Treaty of Rome. Article 100a directives all have the primary objective of creating a single European market in goods and services with the objective of providing producers and consumers with the benefits of economies of scale that this offers. The directive was originally enacted in 1989 but was modified in 1993 by directive 93/68/EEC to modify the marking requirements of the original directive and bring them into line with the other [CE mark directives](#).

The effect of the directive has been to introduce identical requirements for the EMC performance of electrical apparatus in every country within the [European Economic Area](#) (EEA).

As with all CE mark directives, the primary purpose of the EMC Directive is the creation of a single market for electrical goods throughout Europe. The protection requirements of the Directive are the means by which this is achieved, not the fundamental objective. In contrast to all the other CE mark directives, the EMC Directive's primary requirement is the protection of the electromagnetic spectrum, not the safety of equipment.

Scope

The Directive is one of the widest in its application and all electrical products must comply. The only exceptions are for components or sub assemblies with no intrinsic function (i.e. their use cannot be defined unless they are combined with other components) and certain electrical products and systems which are already covered by other directives. Examples of products which do not need to comply are plugs and sockets, capacitors, resistors and integrated circuits. More complex sub-assemblies such as thermostats, power supplies and micro-controllers do have to comply but would normally only be considered as parts of a complete product or system. [Medical devices](#), military, automotive and certain agricultural equipment are all excluded from the scope of the EMC Directive itself because they are subject to more specific directives containing equivalent EMC provisions but almost all other apparatus, whether it is mains or battery powered, must comply. This includes the simplest hand held system (e.g. a battery powered torch) right up to the most complex installation (even a power station or chemical factory!).

As of April 2000, most transmitting and communications apparatus is excluded from the scope of the EMC Directive itself, either wholly or in part, but instead comes under the scope of the [R&TTE directive](#).

Requirements

In essence the requirements of the Directive are very simple - it basically states that products must not emit unwanted electromagnetic pollution (interference). Because there is a certain amount of electromagnetic pollution in the environment, the Directive also states that products must be immune to a reasonable amount of interference. The Directive itself gives no figures or guidelines on what the required level of emissions or immunity are, nor does it state the frequency band limits. This interpretation of the Directive's requirements is left to the [standards](#) that are used to demonstrate compliance with the Directive.

Implementation date

The Directive came fully into force on 1 January 1996 and all equipment which comes within its scope MUST comply with its provisions.

Enforcement

The Directive is enforced in the United Kingdom by the [Trading Standards Service](#) and the Civil Aviation Authority. For practical purposes, other bodies (e.g. the [DTI's Radiocommunication Agency](#) and [BABT](#)) will be involved in investigations into non-compliant products.

Penalties

The maximum penalty for the supply of non-compliant equipment is three months imprisonment and/or a £5000 fine. More normally the manufacturer would be required to recall or replace any non-compliant apparatus. The enforcing authorities have the power to suspend or prohibit sale of apparatus for which they have reasonable evidence that it does not comply.

Complying with the Directive

For the purposes of being able to test whether or not equipment complies with the Directive, tests are divided into five classes:

1. **Radiated emissions** *Checks to ensure that the product does not emit unwanted radio signals;*
2. **Conducted emissions** *Checks to ensure the product does not send out unwanted signals along its supply connections and connections to any other apparatus;*
3. **Radiated susceptibility** *Checks that the product can withstand a typical level of electromagnetic pollution;*
4. **Conducted susceptibility** *Checks that the product can withstand a typical level of noise on the power and other connections.*
5. **Electrostatic discharge** *Checks that the product is immune to a reasonable amount of static electricity.*

Definitions of the levels above which emissions are defined as unwanted or below which pollution and noise are accepted as being reasonable are contained in the relevant test [standards](#). The manufacturer (and any test house performing tests on the equipment) must agree on which of the various standards for each category apply to the product in question. Since the different standards have different levels for emissions or immunity, it would theoretically be possible for the same product to be acceptable in one application but not in another - for instance noise emission levels acceptable in an industrial environment may be excessive when created in a domestic setting. In practice the scope of the different standards is fairly clearly defined, but even so it is important for manufacturers or importers of products to have a good idea of where they are intending their product to be used.

Demonstrating compliance

The Directive allows three routes to compliance. Of these, the EC type examination route, which requires full testing to recognised standards, is only mandatory for telecommunications (i.e. transmitting) apparatus and has been rendered largely obsolete by the [R&TTE Directive](#).

For other equipment there are two routes: the *Standards Route* and the *Technical Construction File*.

The Standards Route allows the manufacturer to compare the performance of the equipment with the requirements of the relevant standards, and if they are sure that the standards are met, the manufacturer makes a declaration that the Directive has been complied with. Testing may be required in order to demonstrate that the appliance does meet the requirements of the standard, **but this is not mandatory**.

The [Technical Construction File](#) route to compliance is designed for equipment for which there is no clearly applicable standard - or which is of such a size that testing in the normal laboratory facilities defined in the

standards is not possible. The manufacturer creates a file which provides a range of information, and draws it together to form the conclusion that the product meets the requirements of the EMC Directive. This conclusion is then audited by a [Competent Body](#) which takes responsibility for ensuring that the logic used to justify the declaration of compliance is valid and accurate and issues a certificate accordingly.

Note that the *Technical Construction File* which is an optional method of complying with the EMC Directive is not necessarily the same as the *Technical File* which is an obligatory part of complying with the [Low Voltage](#) and other directives.

Administrative requirements

While the essence of the Directive is, of course, to ensure that products meet the essential protection requirements of immunity and emissions, there are two other requirements which the Directive makes of manufacturers or importers. These are to assist officials charged with responsibility for enforcing the Directive. One is that the product, its instructions or packaging, be marked with the CE logo. The other is that the [manufacturer or importer](#) must make an official pronouncement of the product's compliance with the Directive, known as a [Declaration of Conformity](#).

The CE Mark

The [CE logo](#) must be affixed (in order of preference) to the product, its instruction manual or to its packaging. It must be at least 5mm high.

The Declaration of Conformity

The Declaration of Conformity must be signed by a person of authority within the company responsible for the product (usually a Director). It must include a list of any standards used to justify the claim of compliance with the Directive. For further advice on this, see our [Declaration of Conformity](#) page.

Realities

Most manufacturers of electrical products have little to fear from the EMC Directive and compliance will be straightforward so long as they take a logical approach to the requirements and maintain accurate records. Manufacturers of more complex electronic products may have to spend some time and money testing equipment they are not already completely confident of the EMC performance.

Many consultants and test houses are offering services to help manufacturers to meet their EMC obligations so companies which do have problems have no shortage of people to whom to turn for help. However, it is important to be sure that you actually have a problem before spending time and money trying to solve it. Remember that consultants and test houses have a vested interest in getting you to spend money on their services, so a little time spent doing some basic familiarisation research for yourself may well be a good investment.

The bulk of the EMC standards are to do with setting up and performing tests in such a way as to be able to get reasonably meaningful and repeatable results. What the test labs don't tend to admit is that this doesn't always work. There is a 6dB margin of error permitted in the measurements under most standards and the same product tested to the same standard in different labs quite often gives results which vary by 10dB or more.

It's vital to understand that the EMC Directive does not actually require you to perform testing, it simply requires you to comply with the protection requirements outlined above. For simple electrical apparatus containing only electromechanical controls and induction motors, one can have a reasonable level of certainty that equipment will comply with these requirements (i.e. will meet the levels defined in the standards) without

ever actually needing to do any testing. Even where testing is required, it may be that only partial testing is needed to determine performance in one particular aspect (e.g. performance under flickering mains conditions).

One can adopt a number of strategies to deal with the Directive. One is to bite the bullet and test every piece of apparatus comprehensively. This is expensive and it doesn't really guarantee compliance since it's possible that the standards are not appropriate for the actual application that the equipment is being sold for.

Another strategy is to ignore the EMC issue completely, or at least to assume that the products will comply and that testing will only be an expensive way to prove this. The dangers in this approach are obvious and it cannot be recommended to any reputable manufacturer.

The best strategy is to learn enough about EMC and the requirements of the Directive that you can spend a reasonable testing budget in a way that actually gives you both useful design information and some confidence that your products comply.

Useful links

The European Commission have a [special section on EMC](#) with a great deal of useful information on their [EUROPA](#) server. This includes the full text of the directive, lists of the current [harmonised standards](#) as well as guidance documents and a list of the national [implementing measures](#) in each of the member states of the EU. Details of the SLIM process to update and modify the directive can also be found on this site.

For details of draft standards, the [New Approach](#) web site is a good EU-funded resource.

The UK government's Department of Trade and Industry (DTI) publish a number of useful guides on the Directive and these are available for [download](#).

Useful information may also be found on the [UK Radiocommunications Agency web site](#) and [Trading Standards Service](#) web sites.

Links to some bodies notified under the directive can be found on our [Notified Bodies](#) page.

Lots of other information on EMC can be found on the web. The best starting point to look for links is [The Safety Link](#).

Further advice

As with all CE marking directives, the actual requirements for any piece of equipment under the directive and harmonised standards are complex and dependent on not only the design but also the type of user, the intended use and sometimes even what is claimed in the instructions or sales literature.

Conformance are not an EMC test laboratory, nor do we specialise in EMC related design. We do, however, know several people who are specialists and we're happy to recommend reputable test laboratories to clients where testing is actually necessary. We also have extensive experience of applying the requirements of the Directive and CE marking equipment as part of a package where (as is usually the case) the EMC Directive is only one of several directives which have to be considered.

For further advice specific to your products, please [contact us at Conformance](#) and we will be pleased to discuss your needs. If you'd like us to prepare a no-obligation quote for assisting you with CE marking your products, please take a look at our page which gives details of the [information required](#) in order to be able to give you an accurate idea of the costs and procedures involved.

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[*Back to the Conformance CE marking contents page*](#)