An Introduction to ATEX Regulation

An introduction to the European regulations relating to explosive atmospheres and how these affect hydraulic component manufacturers and the specification and use of hydraulic systems.

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About Hydraulics Online

Hydraulics Online is a leading, award-winning, ISO 9001 accredited provider of customer-centric fluid power solutions to 130 countries and 24 sectors worldwide.

Highly committed employees and happy customers are the bedrock of our business.

Our success is built on quality and technical know-how and the fact that we are 100% independent – we provide truly unbiased advice and the most optimal solutions for our customers. Every time.
Hydraulics can be found in many everyday objects and play a myriad of different roles in modern industrial processes.

Inevitably, some of these industrial applications will take place in hazardous environments.

In hazardous environments where there is risk of potential explosion, the European Directives of ATEX 95 and ATEX 137 come into play.

These directives have implications for the hydraulic systems employed in these environments, so hydraulic engineers and hydraulic systems designers need to be aware of these directives and their implications for system design, specification and operation.

If you use or supply hydraulic equipment that may be used in potentially explosive atmospheres, or your workplace involves the use of flammable materials that could create a potentially explosive atmosphere, then ATEX applies to you.
The ATEX Directive is a European regulatory standard specified by the EU.

The term ATEX comes from “atmospheres explosibles”. It sets out minimum standards which should be met in explosive atmospheres.

There are two elements to the regulations:
- ATEX 95
- ATEX 137

**Equipment standards for explosive atmospheres**

ATEX 95 or, to give it its full name, Directive 94/9/EC was introduced in 1995 with an eight year transition period. It came into effect on July 1, 2003.

The EU Directive 94/9/EC was replaced on April 19, 2016 with the updated standards specified in Directive 2014/34/EU.

**Workplace standards for explosive atmospheres**

ATEX 137 or, more officially, Directive 99/92/EC was introduced in 1999 with a four year transition period. It also came into effect on July 1, 2003.
As a directive, European states were free to implement the standards into law locally.

In the UK, where Hydraulics Online is based, the government implemented the directive through two acts of Parliament: The Dangerous Substances and Explosive Atmosphere Regulations 2002 (DSEAR) and The Equipment and Protective Systems for Use in Potentially Explosive Atmospheres Regulations 1996.

Importantly, however individual member states of the EU chose to ratify the standards nationally, the standards remain the same.

Although they were originally drafted by and for the EU, ATEX standards have become a de facto global standard for products and workplace safety in potentially explosive atmospheres.

However, it is worth noting that similar standards exist in North America: the National Electrical Code (NEC) or NFPA 70 in the U.S.A. and the Canadian Electrical Code (CEC) published by the Canadian Standards Association (CSA) in Canada. Some standards laid down by the International Electrotechnical Commission (IEC) are also relevant.
Why do we need ATEX?

Before we consider the standards set out by the two directives, it is worth considering why they exist.

To do this, we need to understand the type of environments in which the regulations will apply.

The regulations are designed to minimise the risk of fire or explosion in "atmospheres explosibles".

Explosions and fires are events which require the right combination of three different elements:
- Flammable material (the fuel)
- An ignition source (e.g. heat)
- An oxidising agent (usually oxygen in the air)

Collectively, these three elements are known as the "combustion triangle".

When all three of these elements are present and combined in the necessary mixture a fire or explosion will result.
Examples of potentially explosive atmospheres in the workplace include vehicle paint spraying in a car body workshop, the high concentration of wood dust particles in the air of a saw mill, or offshore platforms used to extract highly flammable gas and oil.

The paint vapours and the wood dust are flammable material and, if there are enough of such substances in the air, a source of ignition is all that is needed to cause an explosion.

In a car body shop, this ignition source might come from welding equipment. In a saw mill, the ignition source might be overheated metal machinery.

The ATEX directives were developed to minimise risk in this type of environment.
Before specifying any equipment, it is important to understand the environment and the risks it poses as well as the equipment rating.

Both ATEX 2014/34/EU and ATEX Directive 99/92/EC will play a part in this decision making.

In areas where an explosive atmosphere has a high likelihood of occurring, reliance is placed on using apparatus that has a low likelihood of creating a source of ignition.

However, employers and specifiers can adopt workplace standards and protections that reduce the likelihood of an explosive atmosphere occurring. When this approach is followed, apparatus constructed to a less rigorous standard may be used.
In most practical situations where flammable materials are used, it is difficult to ensure that an explosive atmosphere will never occur. It is also difficult to ensure that equipment will never give rise to a source of ignition. Sparks, flames, electric arcs and hot surfaces can all be potential ignition sources.

Other potential ignition hazards include:

- Static electricity: these charges can end up resulting in a dangerous discharge and must be prevented.
- Leakage currents: the overheating of surfaces in conductive equipment parts can provoke an ignition and dangerous corrosion.
- Overheating: if two parts of a rotating system were to contact each other, overheating may occur. This risk should always be prevented at the design stage.
- Pressure compensation operators: equipment and protective systems must be fitted with integrated measuring, control and regulation devices that pressure compensations arising from them don't generate shock waves or compressions.
- Power failure: in the event of a power failure, some equipment and protective systems can experience additional risks.
- Connections: equipment and protective systems must be fitted with suitable cable and conduit entries. When equipment and protective systems are intended for use in combination with other equipment and protective systems, the interface must be safe.
- Radiation: electro-magnetic waves, optical radiation, ionising radiation and ultrasound.
The 99/92/EC Directive applies to employers and premises where workers might be at risk from explosive atmospheres, defined in the directive as: “a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture”.

While Directive 2014/34/EU details the requirements and certification procedures for new equipment of different categories, the 99/92/EC Directive explains how to select the right Group and Category of equipment for different explosive atmospheres.

Directive 99/92/EC classifies hazardous areas where an explosive atmosphere could form, by type of hazard, into Zones.

**Hazard: Gas, Mists or Vapours**
- **Zone 0**: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist is present continuously or for long periods or frequently.
- **Zone 1**: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist is likely to occur in normal operation occasionally.
- **Zone 2**: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapor or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

**Hazard: Dusts**
- **Zone 20**: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.
- **Zone 21**: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally.
- **Zone 22**: A place in which an explosive atmosphere in the form or a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
It is a requirement of Directive 99/92/EC that only certain categories of Group II ATEX certified equipment are used in specific Zones.

<table>
<thead>
<tr>
<th>Zones</th>
<th>Equipment Category</th>
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</thead>
<tbody>
<tr>
<td>Zones 0 &amp; 20</td>
<td>Category 1 Equipment only</td>
</tr>
<tr>
<td>Zones 1 &amp; 21</td>
<td>Category 1 or 2 Equipment</td>
</tr>
<tr>
<td>Zones 2 &amp; 22</td>
<td>Category 1, 2 or 3, Equipment</td>
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</tbody>
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As well as guiding equipment specification, purchasing and use, this requirement also serves to help guide manufacturers as to what Category of ATEX certification their product(s) need to achieve according to the markets they serve and their products’ intended use.

The EU states that, “Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX) cover a range of products, including those used on fixed offshore platforms, petrochemical plants, mines, and flour mills, amongst others”.

ATEX 2014/34/EU details the requirements and certification procedures for new equipment of different groups and categories.

Two Groups of Categories

Equipment and Products that fall within the scope of the Directive are divided into two Groups:

- Group I comprises equipment intended for use in mines, above and below ground.
- Group II comprises equipment intended for use in other locations endangered by explosive atmospheres.

Equipment and products in each Group are divided into Categories based on the level of protection required.
ATEX 2014/34/EU Categories

Group I
- Category M1 - Equipment in this category is required to remain functional with an explosive atmosphere present.
- Category M2 - This equipment is intended to be de-energised in the event of an explosive atmosphere forming.

Group II
- Category 1 - Equipment in this category is intended for use in areas in which explosive atmospheres caused by mixtures of air and gases, vapours or mists or by air/dust mixtures are present continuously, for long periods or frequently.
- Category 2 - Equipment in this category is intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are likely to occur.
- Category 3 - Equipment in this category is intended for use in areas in which explosive atmospheres caused by gases, vapours, mists or air/dust mixtures are unlikely to occur or, if they do occur, are likely to do so only infrequently and for a short period only.
What Equipment Manufacturers Need to Know

As we’ve seen, ATEX equipment or “explosion proof equipment” is currently classified within the ATEX 95 (Equipment 94/9/EC) Directive in 3 categories.

Higher categories can be used in lower categories, but not vice versa, e.g. equipment in group 2 or 3, cannot be used in group 1.

CATEGORY 1 equipment can be used in Zone 0 (gas) or Zone 20 (dust) atmospheres and is designed to ensure a very high level of safety when operated correctly, even in rare fault situations. The equipment must provide two independent protection methods and safety must still be maintained even if two faults exist simultaneously.

CATEGORY 2 equipment can be used in Zone 1 (gas) or Zone 21 (dust) atmospheres and is designed to ensure a high level of safety during repeated error situations or normal equipment fault situations.

CATEGORY 3 equipment can be used in Zone 2 (gas) or Zone 22 (dust) atmospheres and is designed to ensure a normal level of safety, during normal operation. The manufacturer’s declaration of conformity will often suffice and third party approval is not required.
Compliance procedures vary depending on the category of equipment and the zones for which the equipment is intended to be used.

In general, they are as follows:

- **EC Type Examination:** examination by a Notified Body of compliance documentation and a sample of the product to be certified.
- **Production Quality Assurance:** the manufacturer shall operate a quality system for production, inspection and testing that has been approved and is regularly assessed by a Notified Body.
- **Product Verification:** each separate unit produced shall be individually assessed by a Notified Body.
- **Conformity to Type:** the manufacturer shall take all steps necessary to ensure that all units are manufactured in compliance with the Directive and to the same design and quality as the sample type tested. Each unit manufactured will be subjected to testing approved by a Notified Body.
- **Internal Control of Production:** the manufacturer shall prepare technical documentation that allows the conformity of a product to be assessed. In some circumstances a copy of this documentation shall be presented to a Notified Body for review.

In all cases it will be necessary for the manufacturer to prepare a full Technical File for the product(s) that demonstrates their conformity with the requirements of the ATEX Directive 2014/34/EU.

![Specific Marking of Explosion Protection](image-url)
The ATEX Equipment Directive also dictates marking and documentation requirements; the manufacturer must ensure that the following information is marked on the product in addition to the "Ex" symbol:

- ATEX equipment markings
- Manufacturer’s name and address
- “CE” marking to show compliance with European Directive
- Serial or type marking
- Serial number (if applicable)
- Year of manufacture
- Equipment group and class (1, 2 or 3)
- Marking of the gas (G) and/or the dust class (D)
- Other markings related to the safe use of the product, e.g. a temperature rating (a "T" marking), and occasionally a gas group.

ATEX equipment manufacturers must also be able to supply the correct ATEX certification / documentation to show that their product(s) are suitable for use within explosion proof areas in the EU.

These documents are:
- EU Declaration of Conformity for products, or
- Certificate of Conformity for components.
Hydraulics are used in many different industrial applications and, inevitably, some of these applications must operate in potentially explosive atmospheres.

This has implications for hydraulic system specification; you will need to consider the environment in which the system will operate, as well as the qualities of the system itself.

This needn't be a problem, however, when you have the right advice.

Whether you simply need help choosing the right equipment or replacement part for single application, or whether you need detailed technical assistance with bespoke system design for industrial or commercial solutions, Hydraulics Online's technical team can give you the support you need to make the right specification and purchase decisions.

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