

# ATEX: AN INTRODUCTION

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ATEX is an amalgamation of the French words 'Atmospheres' and 'Explosibles' which means 'Potentially Explosive Atmospheres' and was realised with the introduction of the ATEX 'equipment' directive 94/9/EC, and the ATEX 'workplace' directive 99/92/EC. This European Union (EU) legislation standardises the way to build, install and operate equipment (mechanical or electrical) in potentially explosive atmospheres safely; to ensure that no harm can come to the people in the vicinity and to the environment.

ATEX is an EU legislation and as such is law and adherence to it is mandatory within the European Union. Before the directive came into force the use of equipment in explosive atmospheres was mandated by national laws and working practices. Most of these are historically evolved from the experience gathered in the mining industry and were mostly limited to electrical equipment.

So how is compliance to the ATEX directive shown?

Depending on the type of equipment (mechanical or electrical) and on the equipment category (category 1, 2 or 3) the ATEX directive dictates that in some cases a notified body has to certify compliance to the directive whereas in other cases the manufacturer or importer into the EU can self-certify the equipment. Table 1 shows which type of equipment can be self-certified by the manufacturer and which ones need the involvement of a notified body.

	Mechanical equipment	Electrical equipment
Category 1	Notified Body	Notified Body
Category 2	Self-Certification (technical file lodged with notified body)	Notified Body
Category 3	Self-Certification	Self-Certification (technical file lodged with notified body)

Table 1: Certifiers of ATEX equipment

Notified bodies are conformity assessment bodies nominated by the European Commission, which is the legislative body within the EU.

In order to aid both the notified bodies and the manufacturers of equipment destined to be used in explosive atmospheres, harmonized standards have been written. Whilst the directive is law and defines the level of safety to be applied, standards give

practical guidance to show how to comply with the directive, taking into account state of the art technical solutions. EU standards are written and reviewed on a constant basis by groups of technical experts in each EU member country.

The very basis of every ATEX certification for mechanical equipment is the Ignition Hazard Assessment based on EN80079-36 (EN= European Norm) in which the manufacturer assesses the possible ignition sources based on the likelihood that they become effective. Vacuum pumps can be classed as mechanical equipment.

Depending on the equipment category required, measures have to be put in place to ensure that the ignition sources cannot become effective during normal operation and during foreseeable or rare malfunctions.

A good example is the overall thermal state of a 'dry' i.e. oil free mechanical vacuum pump. If the temperature of the pump exceeds a certain pump specific value, thermal seizure can occur due to thermal expansion of the rotor. If the rotor expands to a point where it touches the stator, sparks with potentially enough energy to ignite a flammable atmosphere present inside the pump can be created. In order to avoid this happening, the thermal state of the pump needs to be controlled. Several measures, depending on the pump design, can be put in place, for example:

- Using a temperature transmitter to measure the case temperature of the pump
- Using a temperature transmitter to measure the exhaust gas temperature of the pump
- Monitor the cooling media supply to the pump

Each of these measures give one level of protection.

Thermal seizure must not be allowed to occur when the pump is running within the pre-defined operating conditions given in the relevant pump instruction manual. However, during malfunctions such as loss of cooling media, there is a risk of too high a thermal load remaining inside the pump leading to expansion of the rotor until the pump seizes. The loss of cooling media can typically be considered as an expected malfunction. A common method of preventing or mitigating this potential failure (and ignition source) is by installing a flow switch into the cooling media line.

In order to designate a level of safety for the equipment different categories have been defined. Depending on the explosive zone present, the correct equipment has to be chosen by the end-user.

As illustrated in Table 2, category 3 equipment will only assure safety during normal operation. However, in the zone it is placed (zone 2) an explosive atmosphere is unlikely to occur during normal operation and if it does only for a short period of time. The likelihood of the explosive atmosphere being present at the same time as the malfunction is occurring in the pump is considered by the ATEX directive to be an 'acceptable risk'.


For vacuum pumps the internal zone (defined as all areas inside the pump that can come into contact with the pumped media (gases or vapours) and the external zone (the atmosphere outside of the vacuum pump) are considered separately.


Area classification		Equipment classification	
Zone (European & IEC Classification)	Definition of Zone	Definition of Category	Equipment Classification
Zone 0	An area in which an explosive mixture is continuously present or present for long periods (most of the time)	Protection assured in the case of two independent failures	Category 1
Zone 1	Explosive atmosphere will be present for some of the time	Protection is assured in the event of foreseeable malfunctions	Category 2
Zone 2	Explosive atmosphere is not expected to be present during normal operation and if so only for short amount of time (for example once a month and then for 30 minutes only)	Protection is assured during normal operation	Category 3

Table 2: ATEX Equipment Categories and Zones

Once either the manufacturer or the notified body is assured that all ignition sources cannot become active, taking into account the level of protection required for the equipment category to be achieved, the equipment can be marked as being ATEX certified. All ATEX certified equipment must be marked to make them easily identifiable for use in explosive atmospheres.

The following information can usually be found on the equipment rating label:

-  All equipment suitable for use in potentially explosive atmosphere must show this symbol.
- Equipment category: I for mining and II for non-mining equipment
- Explosion protection concept used to prevent ignition sources from igniting a potentially explosive atmosphere
- If applicable the gas group that the equipment can be used in
- Temperature rating ('T rating')

A typical marking is more like  II 1 G Ex h IIB T4 Gb

II	Equipment group II - Non Mining Equipment
1	Equipment Category 1
G	Explosive Atmospheres caused by Gases, Vapours or Mists
Ex h	Non- Electrical Equipment for Explosive Atmospheres
IIB	Flammable gas group
T4	Temperature class
Gb	Equipment protection level.

Table 3: Explanation of the markings

The UK has now left the EU, the legislative requirements for equipment for use in potentially explosive atmospheres must comply with the Equipment and Protective Systems for use in Potentially Explosive Atmospheres Regulations 2016, the essential safety requirements of these regulations align with the ATEX Directive. The path to conformity assessment also remains aligned i.e. examination of product and production surveillance as applicable to ATEX, but to place product on the GB market (England, Wales and Scotland) the UKCA mark must be applied. Cat 1 and 2 products must have a certificate issued by a UK Notified/Approved body.

*Note: The Northern Ireland Protocol came into force on 1 January 2021. For as long as it is in force, Northern Ireland will align with relevant EU rules relating to the placing on the market of manufactured goods.*

## References

*Legislation | Atex information (hazardex.com)*

*Using the UKNI marking - GOV.UK (www.gov.uk)*

*Placing manufactured goods on the market in Northern Ireland - GOV.UK (www.gov.uk)*