Guide to ATEX Safety Regulations

When Power Is Critical

IPU GROUP
Engine Starting

WELCOME

Staff safety is a critical consideration for all organisations in all economic climates. Quite apart from a business' moral obligation to preserve human life and health, the financial penalties and reputational chaos that follow industrial accidents put health and safety at the top of any manager's list of priorities.

IPU is dedicated to helping its customers meet and exceed their health and safety obligations. We work closely with customers in oil and gas, mining and other safety-critical industries to simplify the demands of regulatory compliance. We help on all levels by providing safety-compliant engine starting systems, the certification that goes with them and the promotion of our customers' dedication to staff safety.

ATEX standards are a critical part of IPU's commitment to safety on oil and gas platforms, in underground mines and at industrial sites. Although they have been in effect since the 1990s, their scope and advantages are not well understood. With ATEX-compliant equipment being demanded more regularly in Europe and around the world this guide will help you understand how ATEX helps you and your business.

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WHAT IS ATEX?

The name ATEX stands for 'Atmospheres Explosibles'. It is a set of European Union regulations that applies to products intended for use in any hazardous or explosive environment. The standard is built around two Directives:

- Directive 94/9/EC ('ATEX 95' or 'the ATEX Equipment Directive') refers to the equipment and protective systems intended for use in explosive atmospheres.

- Directive 99/92/EC (the 'ATEX Workplace Directive') refers to minimum requirements for improving the health and safety protection of workers at risk from explosive atmospheres.

IPU supplies engine starting equipment under Directive 94/9/EC, the ATEX Equipment Directive. The focus of this guide is on its implications. For more information on the ATEX Workplace Directive refer to the UK Health & Safety Executive website[1].

The mark for ATEX-certified electrical equipment for explosive atmospheres.

EN-1834-1
EN-1834-2

[1] http://www.hse.gov.uk/fireandexplosion/atex.htm#workplace.

DUST AND GAS ENVIRONMENTS

Hazardous environments are sub-divided according to the nature of the hazard. A distinction is made between atmospheres that are hazardous because of:

- gas, vapour or mist and
- combustible dust

Equipment is approved separately for the two different hazardous environments. It is possible – even common – for equipment to be approved for one environment but not the other.

The distinction is particularly relevant to the engine starting systems provided by IPU. Two of our key markets – mining on one hand and oil and gas on the other – experience different hazards. On oil and gas platforms gas is the hazard. In underground mines dust presents a greater danger.

IPU's ATEX-approved engine starters are approved for both hazardous environments.

ZONE CLASSIFICATIONS

Hazardous areas are classified according to the persistence of the hazard. The following table explains the zoning schemes that apply:

	Gases, Vapours & Mists	Combustible Dust
"...present continuously or for long periods or frequently"	Zone 0	Zone 20
"...likely to occur in normal operation occasionally"	Zone 1	Zone 21
"...not likely to occur in normal operation"	Zone 2	Zone 22

WHICH PRODUCTS ARE AFFECTED?

No safety directive can refer specifically to all the equipment that might be affected by it. It comes as no surprise that ATEX does not list starting systems by name.

It does, however, cover all forms of equipment which are capable of creating an explosion through their own source of ignition (it excludes equipment such as cookers and heaters which are meant to provide ignition). Starting systems clearly fall into this category because they could cause sparks when the rapidly spinning pinion touches an engine's ring-gear.

Different categories of equipment approval are available for the different classifications of hazardous zones. The following table explains:

Zone 0 or 20	Category 1 equipment
Zone 1 or 21	Category 2 equipment
Zone 2 or 22	Category 3 equipment

Approval ratings cascade down e.g. equipment with Category 1 approval can be used in Zones 1, 21, 2 and 22 as well as Zones 0 and 20.

IPU's ATEX-approved engine starters are Category 1-approved.

WHO IS AFFECTED BY ATEX?

ATEX regulations are not limited to specific industries. They apply to any industry where specific conditions ('explosive environments') are found. An explosive atmosphere is defined as "a mixture of dangerous substances with air, under atmospheric conditions, in the form of gases, vapours, mist or dust in which after ignition has occurred, combustion easily spreads."

Even though some industries are often cited as being clearly affected by ATEX, being outside this list does not mean your industry is exempt from the regulations.

Commonly-cited industries include:

- Oil and gas (offshore, onshore and transport or upstream, downstream or midstream)
- Underground mining
- Agriculture (e.g. grain silos)
- Forestry (e.g. lumber mills)
- Industry (e.g. paint manufacture and spraying)

WHERE DOES IT APPLY?

The Directives that underpin ATEX regulations were created by the European Union. Although not laws in their own right, they do become law when adopted by an EU member state.

The ATEX Equipment Directive was adopted in the UK under the BIS Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (SI 1996/192). The UK Department for Business, Innovation and Skills (BIS) has policy responsibility for the regulations but the Health and Safety Executive (HSE) enforces them.

The maximum penalty for the supply of non-compliant equipment is 3 months imprisonment or a £5,000 fine (NB: an incident is not required; the offence is **supplying** non-compliant equipment).

Incidents involving injury or damage at the workplace also fall under other UK legislation such as the Health and Safety at Work Act 1974.

The geographical reach of ATEX regulations extends beyond the European Union. Authorities and companies around the world find it easy to specify ATEX as the minimum standard for equipment used in mines, on platforms and at other dangerous sites. It is only a matter of time until ATEX approval is a global standard but, as it stands, products with ATEX approval remain superior to those without.

HOW DOES ATEX HELP YOU?

Regulations – especially the “dreaded health and safety” – are rarely considered helpful. ATEX is different.

If you supply products to the oil and gas or mining industries – or if you operate directly in them – you will be required to prove the equipment you supply and use is safe. ATEX is the gold standard for safety. By providing ATEX certification you are saying that your equipment meets or exceeds the standards required in many parts of the world.

Using equipment that complies with ATEX standards places you above other suppliers. It’s rather like your customers asking you to supply a car and replying “would a Rolls-Royce do?”

The role of ATEX in procurement

ATEX can help you satisfy your compliance obligations.

When specifying new installations or upgrading existing ones make ATEX-compliance your safety standard. Thanks to the steady advance of ATEX-adoption around the world this is becoming the de-facto route to ensuring a safe working environment.

ROUTES TO ATEX APPROVAL

Certification ensures that all equipment is fit for its intended purpose and that all adequate information is supplied so it can be used properly.

Manufacturers and suppliers can self-certify equipment made to be used in less hazardous atmospheres (Zones 1, 21, 2 and 22). However, the market can sometimes show reluctance to trust ATEX certificates issued by the same company that manufactured the product. It is seen as preferable to use equipment certified by a third party (also known as a Notified Body).

IPU believe self-certification should be avoided where possible – the risks of bias are greater and there is the possibility that testing may not be as rigorous as it should be. If an inferior starter motor is self-certified incorrectly the results can be devastating for the end-user.

Once certified, equipment is marked by the 'EX' symbol to identify it as such. The approval marking will also include the equipment category number (1, 2, or 3), the letter G and/or D depending on whether it is intended for use in gas or dust atmospheres, and other essential safety information.

All of IPU's ATEX-approved starters achieved certification after going through rigorous testing by an independent third party. They are certified to EN1834-1 and 2 meaning they are safe to use in gas and dust environments. They achieved compliance through many factors including:

- Using a cast iron casing to avoid a thermite reaction which can take place when an aluminium casing is used
- Using a pre-engaged system as opposed to inertia engagement – totally eliminating the risk of sparks being created during the contact of the pinion and ring-gear.
- Giving the option for beryllium-copper which is a non-sparking alloy to further eliminate the risk of sparks.

EN-1834-1
EN-1834-2

ATEX AND ALUMINIUM

Starter motors with aluminium casings often find it difficult to win ATEX approval. The latest ATEX guidelines strongly discourage its use:

"Friction impacts … involving … light metals (e.g. aluminium and magnesium) … may initiate an aluminothermic (thermite) reaction which can give rise to particularly incendive sparking."

Why is aluminium deemed unsafe in hazardous environments?

Aluminium is one of the primary fuels for creating a thermite reaction[2] – a chemical reaction that gives off massive amounts of heat. When aluminium comes into contact with an oxidiser such as iron oxide (or "rust" as it is better known) and is ignited by heat or by a spark, the acute reaction produces molten metal at a temperature of around 3000°C.

If water is added to the mix – a distinct possibility on offshore platforms and in underground mines - explosive hydrogen gases can be created.

The chances of such a combination of factors happening is small. Unfortunately, major disasters are always the result of a just such a combination of unlikely factors.

[2] https://en.wikipedia.org/wiki/Thermite

Thermite reactions were responsible for 11 mine explosions in the US in the 1950s. The lessons learned from these disasters started the move against allowing exposed aluminium surfaces. Responsible health and safety planning is based on eradicating small threats.

While it is theoretically possible for a starter with an aluminium case to gain ATEX approval, any operator that suffers an accident that was exacerbated by the ferocity of a thermite reaction will have to explain their decision.

Alternatives to aluminium

So what's the solution to an aluminium starter motor in such a potentially hazardous environment?

Cast iron.

A cast iron body is used on all of IPU's ATEX-approved starter motors. This removes the risk of a thermite reaction and its consequent dangers.

ATEX AND STARTING TECHNIQUES

High-speed friction impacts between two metal components create an obvious risk of sparks. In a hazardous environment, sparks can be lethal.

For engine starting systems, the most likely point at which sparks can occur is when the starter motor's pinion engages with the engine's ring-gear. To reduce this risk, IPU's ATEX-approved starter motors use a pre-engaged system in preference to the inertia technique used on non-approved starters.

Pre-engaged engine starting

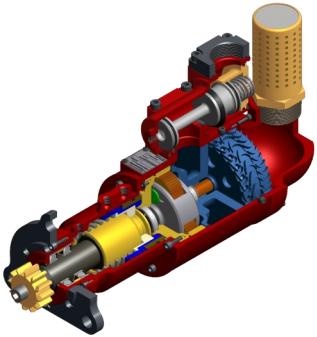
IPU's pre-engaged starter motors are ATEX-approved because the starting process eliminates the possibility of sparks. The high-speed pinion rotation that cranks the engine only starts **after** the pinion is fully engaged with the ring-gear. There is no collision between a rapidly rotating pinion and a stationary ring-gear.

A relay valve is fitted to control the movement of the pinion, moving it up the shaft until it connects with the ring-gear. Once engaged, the full pneumatic (air) or hydraulic pressure of the starting system is released to crank the engine.

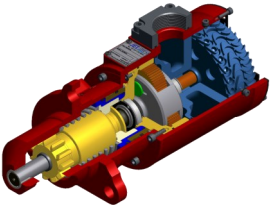
Inertia starters

Inertia starters rotate the pinion at high-speed as soon as the starting process begins. Centrifugal force moves the pinion forwards towards the ring-gear. As it continues to spin the pinion's teeth lock into the ring-gear and crank the engine.

Despite being a reliable method, the potential for sparks are high when the rapidly-moving pinion comes into contact with the stationary ring-gear. A spark alone could cause a catastrophe in an explosive environment. A spark combined with an aluminium casing and rust particles could be even worse.



Pre-engaged Starter



Inertia Starter

ATEX AND ELECTRIC STARTING

ATEX regulations do not proscribe the use of electricity nor do they ban its use to start engines.

IPU's ATEX-approved engine starting systems avoid any complications over the approved use of electricity because they work without electrical power. They are either air (pneumatic) or hydraulically powered.

This has a two-fold advantage:

- There are no electrical components that might pose a risk in hazardous environments

- They still work in emergency situations after electrical power has failed. In most installations, this is exactly why they are installed. They start emergency generators, fire pumps and compressors.

IPU SOLUTIONS

IPU provides a range of safe engine starting solutions based on ATEX-approved starter motors. They are perfectly adapted for use in hazardous environments.

Air (pneumatic) starter motors

- Starting for engines up to 150 litres
- ATEX-approved models for hazardous environments
- Integrated relay valve
- Maintenance-free

IPU's air starter range combines the reassurance of ATEX-approved safety with the convenience of using your existing pressurised air supply.

IPU provide complete air starting systems including starter motors, compressors, receivers and control panels. We even offer a full installation and commissioning service.

IPU's Jetstream air turbine starters are the most rugged starters for diesel engines in marine, offshore and land-based environments. Developed as an easy-to-install, fit-and-forget solution, Jetstream starters are guaranteed to start any make of diesel engine up to 150 litres. The Jetstream 4 and 5 starter motors have been developed to be maintenance-free, leaving you with the knowledge that your starter motor will do its job without disrupting yours.

By operating at pressures from 3 to 30 bar they are flexible enough to suit any application. The ATEX-approved versions of the Jetstream 4 and 5 are ideal for offshore platforms, underground mines and other environments where safety is critical. Their cast-iron casing precludes the thermite reaction that is possible with an aluminium-cased starter and the pre-engaged mechanism prevents sparking during the cranking process.

As well as standard starting systems IPU specialise in the design and manufacture of bespoke air starting packages. A custom package can be sized to provide the correct cranking time for your engine and designed to fit the physical constraints of your location.

Hydraulic starter motors

- Starting for engines up to 80 litres
- ATEX-approved models for hazardous environments
- Low maintenance
- Ideal for offshore, marine and mining applications

When safety is important there is no better choice than IPU's hydraulic starting systems. Hydraulic starters are an ideal solution as a back-up starter as they combine quick acceleration with a high torque output, guaranteeing starting in extreme temperatures and after long shut down periods.

IPU's hydraulic starters are unique in winning ATEX approval for use in both gas and dust environments (e.g. on oil and gas platforms or in underground mines). Their accreditation stems from two technical advantages not found on other hydraulic starters: a cast-iron casing and pre-engaged mechanism.

IPU's hydraulic starters provide single and multiple starts for diesel and gas engines up to 80 litres. Their low-maintenance design make them perfect for hostile environments and inaccessible areas. They are ideal for marine applications and are society-approved.

As well as complete starting systems, IPU are a trusted supplier for hydraulic starting system components such as accumulators, hand pumps, filters and valves.

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Users should obtain fuel system information from their equipment manufacturer's user manual or service department for their specific application.

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