

A guide to

INTRINSICALLY SAFE TOOLS

for MROs



This free resource explains the term 'intrinsically safe' in the context of aviation and the MRO environment. It also highlights the obligations of MROs to use intrinsically safe equipment, and the potential consequences if incorrect equipment is used.

We've covered the following topics:

- What is meant by Intrinsic Safety?
- Why do MROs need intrinsically safe tools?
- How are tools designed to meet the Intrinsic Safety standards?
- When should intrinsically safe tools be used?
- Are intrinsically safe tools more expensive than non-certified equipment?
- What are the benefits of using intrinsically safe tools rather than purging aircraft of fuel?
- What are the different area classifications?



Disclaimer: Whilst MK Test Systems manufactures an Intrinsically Safe tool (the ExLRT) commonly used in MRO facilities to carry out loop resistance testing, this guide is an impartial explanation of Intrinsic Safety for aviation MROs and does not reference our products.

A technician in a blue uniform is working on the engine of a red and white aircraft in a hangar. The technician is using a tool to inspect or adjust the engine components. The aircraft is the central focus, with its engine bay open, revealing various mechanical parts. The hangar environment is visible in the background, showing structural elements and other aircraft parts.

*What is meant by
Intrinsic Safety?*

The aviation industry is rightly consumed with safety and accident prevention; this includes when the planes are grounded.

MROs are working with aircraft that often contain fuel and need maintenance of electrical parts – a dangerous combination.

These conditions require MROs to use tools which are classified as ‘intrinsically safe’, but what does this mean?

Why do MROs need Intrinsically safe tools?

Tools used near aircraft are subject to increased safety standards to prevent the possibility of fire and explosions. These locations are deemed 'hazardous areas' when there is the possibility of fuel or fumes to be present. This includes all areas on the hangar floor.

The term Intrinsically Safe describes equipment "which is incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions which may cause ignition of a specific hazardous atmospheric mixture in its most easily ignited concentration".

In plain English, an intrinsically safe tool does not release enough electrical energy to ignite aircraft fuel vapours or other sources of fuel in an MRO hangar.





How are tools designed to meet the Intrinsic Safety Standards?

The electronic circuitry is designed to limit the electrical or thermal energy, by several methods:

- Current limiting
- Creating fused isolated areas
- Using overvoltage protection
- Minimising the amount of stored energy
- Reducing the amount of surface static on its enclosure.

When should Intrinsically Safe tools be used?

For aviation MROs, the decision-making regarding the necessary equipment has been done for you. The hazardous zones are clearly defined, and only equipment classified for use within these zones should be used.

As an example, The Boeing Company specify the use of Intrinsically Safe tools within the fuel vapour zones around airplanes and on fuelled aircraft. All equipment must be suitably certified for use within these zones to avoid the risk of spark ignition and the potential for catastrophic damage to personnel.

The diagram shown here displays the hazardous zones as determined by The Boeing Company.

Figure 2: Hazardous locations: open fuel tanks — before the airplane is purged and unfueled

Only explosion-proof equipment can be used within these flammability zones, which extend to a 50-foot (15-meter) radius around the airplane.

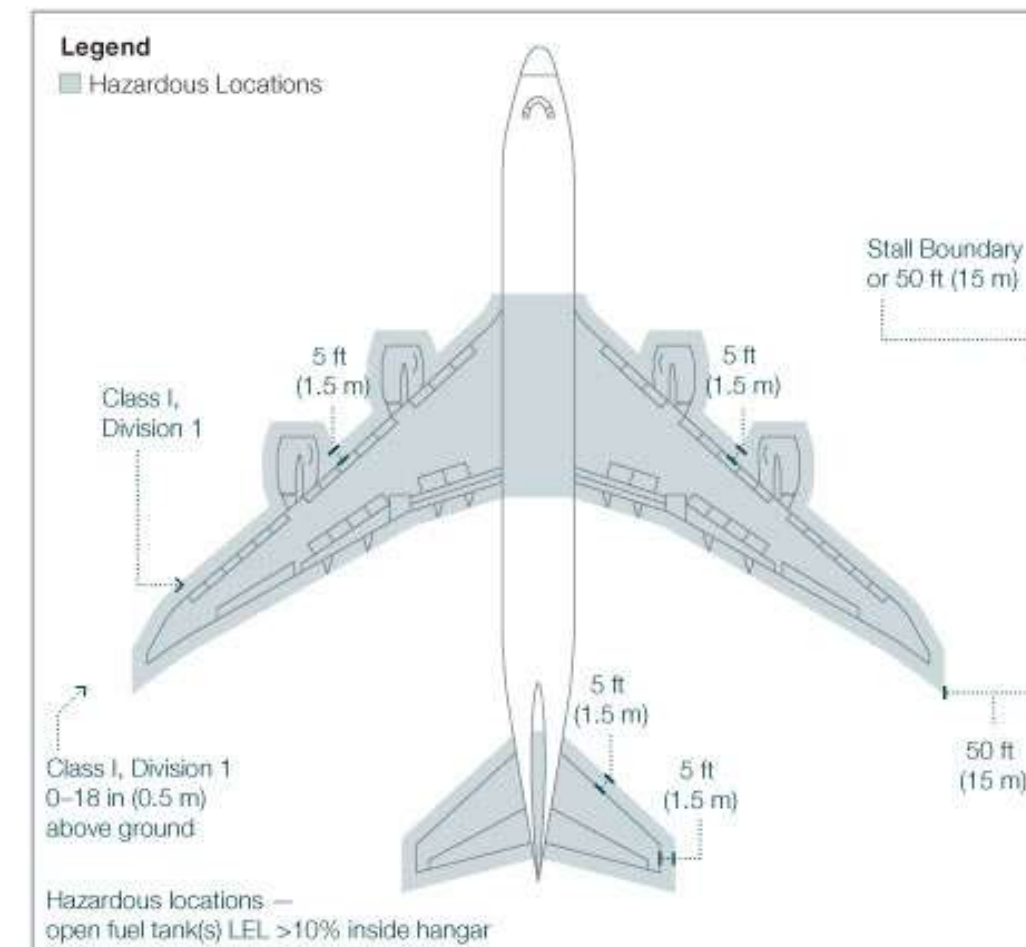
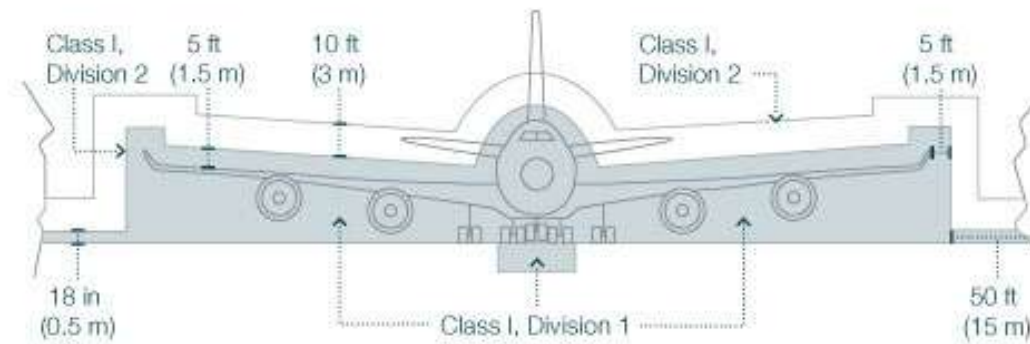
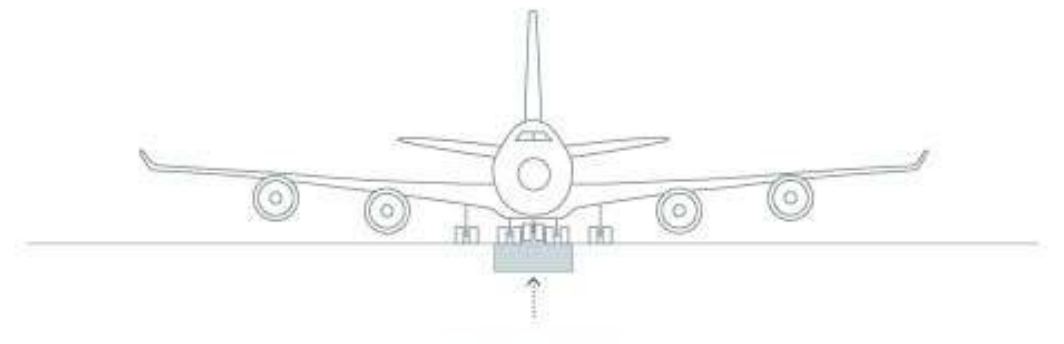


Figure 3: Hazardous locations: open fuel tanks — after the airplane is purged and unfueled

After all of the fuel is removed from all of the fuel tanks and the tanks are purged, the airplane can be considered in fire safe condition.



Aircraft hazardous zones. Image courtesy of The Boeing Company

What are the different area classifications?

Zone 0:

An area in which an explosive gas atmosphere is present continuously or for long periods of time.

Zone 1:

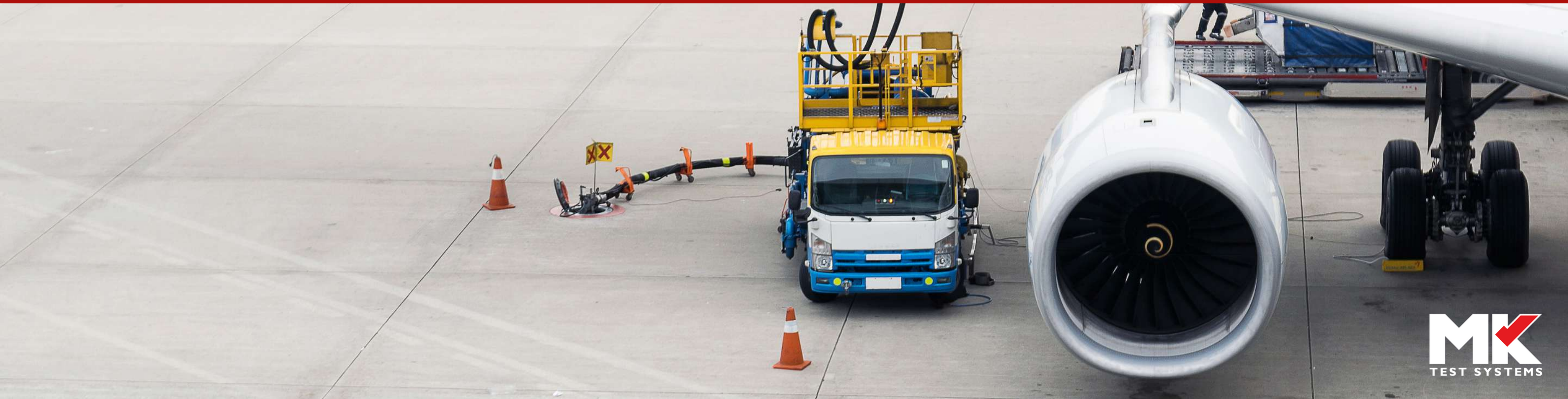
An area in which an explosive gas atmosphere is likely to occur under normal operating conditions.

Zone 2:

An area in which an explosive gas atmosphere is not likely to occur under normal operating conditions.

Non-hazardous:

An area with very low risk of release of explosive or flammable gas; such as the propellant in an aerosol spray in an office.





Are Intrinsically Safe tools more expensive than non-certified equipment?

In a word – yes. Electronic equipment designed to operate in hazardous areas must comply to the ATEX Directive and must therefore meet the harmonised standards within this.

Although the components within the equipment are generally cost-neutral compared to standard equipment, the costs of the R&D programme and the process of obtaining the certification incur additional costs.

In the case of an intrinsically safe design, increased costs are incurred because of the additional testing requirement by an external notifying body. A company cannot self-certify because of the equipment's intended use – in this case, hazardous environments.

*What are the benefits of using
Intrinsically Safe tools rather than
purging aircraft of fuel?*

There are several benefits of using explosion-proof equipment for busy MROs:

- The #1 point and of key importance is the fact that it helps to ensure a safe work environment and protects those nearby from explosion risks.
- Ensuring compliance with the AMM (Aircraft Maintenance Manual), which have been written with safety in mind.
- Maintenance and diagnostic work can be performed without shutting down production and ventilating the working area.
- Insurance premiums may be lower because of the risk reduction.



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